GREENHECK

MSTS

MOTOR STARTER TWO SPEED

Installation & Operation Manual

SCM

STARTER CONTROL MODULE

c UL us LISTED

SAFETY PRECAUTIONS

To prevent injury and property damage, follow these instructions. Failure to adhere to installation/operation procedures and all applicable codes may result in hazards as indicated by warning codes below:

⚠ DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

⚠ WARNING

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

⚠ CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

⚠

This is the safety alert symbol. Read and follow instructions carefully to avoid a dangerous situation.

⚠

This symbol alerts the user to the presence of "dangerous voltage" inside the product that might cause harm or electrical shock.

⚠ CAUTION

As with all electrical products, read manual thoroughly. Only qualified, expert personnel should perform maintenance and installation. Contact the nearest authorized service facility for examination, repair, or adjustment. Do not disassemble or repair unit unless described in this manual; death or injury due to electrical shock or fire hazard may result. Specifications and manual data are subject to change. Consult manufacturer for additional information.

⚠ DANGER

Equipment can start automatically. Lockout/tagout before servicing

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1. Introduction

Overview

The Cerus Starter Control Module consists of a customer interface board assembly in combination with a meter base, which provides 1 or 3 phase electric motor control, motor protection, and power metering. Communications and energy display features are available. The SCM provides motor control and protection for the Cerus MSTS, IPS, and PAS series starters and is also available as a standalone unit.

SCM Customer Interface Assembly (MSTS/PAS Shown)	SCM Meter Base

Additional features may be added to the SCM via optional circuit boards. Features include:

***For detailed descriptions of SCM optional circuit boards, see Appendix X**

1) Power Meter Option Board (MSTS)
   - Provides energy metering on both a kWh pulse output and a 4-20mA kW output terminal.

2) BACnet Communications Option Board (MSTS)
   - Provides Building Automation and Control Network (BACnet) Master Slave Token Passing (MS/TP) data link protocol communications. Also provides one dry contact digital input, one output relay, and an analog input, configurable to support 4-20mA, 0-10V, and 10K Thermistor input signals.

3) Ethernet I/O Option Board (MSTS)
   - Provides data/fault logging with accurate date and time stamping for up to 100 events. Also provides four dry contact digital and one analog input, configurable to support 4-20mA, 0-10V, and 10k thermistor input signals.

Applications

- HVAC Building Automation (MSTS)

Features

- LCD Energy Display - kW, kVA, kVAR, kWh
- Power Metering
- Motor Protection (1 or 3 Phase up to 95A @ 600V)
- Motor Control - HOA keypad with Run/Fault LED's
- 5 Year Warranty

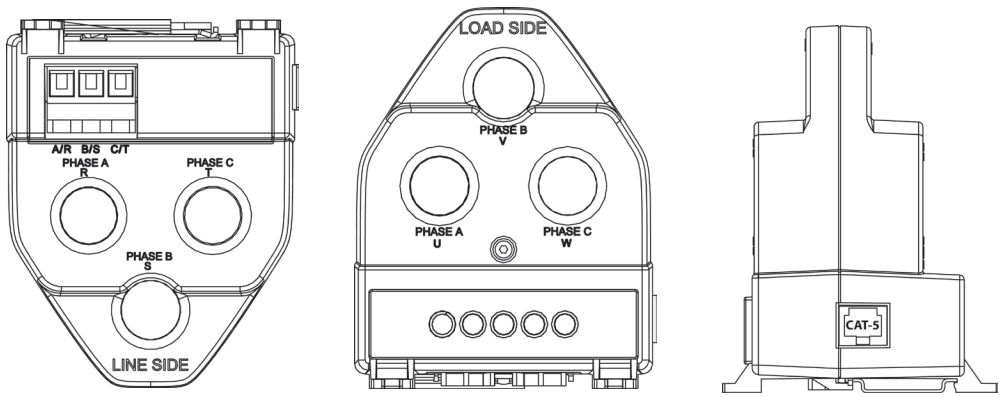
Motor Protection Overview	
Protection	**Cerus Starter**
	MSTS
Thermal Overload	Yes
Overload Trip Class	5-30
Phase Unbalance	Yes
Phase Loss	Yes
Reverse Phase	Yes
Cycle Fault	Yes
Locked Rotor	Yes
Ground Fault	Optional
Under Power	Optional
Over Power	Optional
Over/Under Voltage	Optional
Backspin Delay	Optional
ON Delay	Optional
Warm Start Provision	Yes
Cool Down Profile	Yes
Automatic/Manual Reset	Selectable

2) Specifications

Motor Protection Descriptions

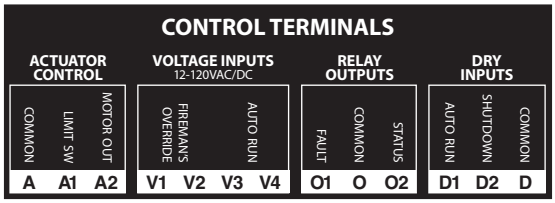
Feature	Description
Cycle Fault	Trips when motor contact closure exceeds a rate of 1200 starts/hour
Ground Fault	UL 1053 (see Appendix A for trip curve, Appendix B for test procedure)
Locked Rotor	Trip in 0.5 seconds
Overload (Class 5-30)	Trip Class (selectable), trip within inverse trip curve (see Appendix A)
Over Power	101%-200% (selectable) Trip in 1-99 seconds
OV/UV	± 5%-25% (selectable) Trip in 1-99 seconds
Power Failure	Return state (selectable - Off, Last, Advanced)
Under Power	0%-99% (selectable) Trip in 1-99 seconds
Voltage Phase Loss	1%-50% (selectable) Trip in 1 second
Voltage Phase Unbalanced	1%-20% (selectable) Trip in 1 second
Voltage Reverse Phase	Trip within 0.1 second if phases are reversed

Meter Base Layout and Terminal Descriptions



Name	Type	Description	Details
A/R	Terminal	Phase A voltage taken from line side or contactor	Max 600VAC, 24-10 AWG wire
B/S	Terminal	Phase B voltage taken from line side or contactor	Max 600VAC, 24-10 AWG wire
C/T	Terminal	Phase B voltage taken from line side or contactor	Max 600VAC, 24-10 AWG wire
CAT-5	CAT-5	Connection to SCM control board	Non-crossover CAT-5 cable only. Connect to SCM Customer Interface Board only.
PHASE A	Tunnel	Current measurement on Phase A	Max 1 AWG. Feed phase A load wire through tunnel and connect to contactor. Ensure “LOAD SIDE” faces motor and “LINE SIDE” faces contactor terminals.
PHASE B	Tunnel	Current measurement on Phase B	Max 1 AWG. Feed phase B load wire through tunnel and connect to contactor. Ensure “LOAD SIDE” faces motor and “LINE SIDE” faces contactor terminals.
PHASE C	Tunnel	Current measurement on Phase C	Max 1 AWG. Feed phase C load wire through tunnel and connect to contactor. Ensure “LOAD SIDE” faces motor and “LINE SIDE” faces contactor terminals.

SCM Main Circuit Board Terminal Descriptions

MSTS Control Terminals		
		
Symbol	Name	Description
Actuator - Motor output supplies same voltage as control power input. 24VAC (optional 120VAC) for actuator motor. Normally open dry contact or transistorized input for actuator limit switch input.		
A	Common	Common terminal for actuator motor and actuator limit input
A1	Limit Switch Input (NO)	When active (closed), the actuator is in position.
A2	Motor Output (NO)	Provides voltage to the actuator motor when the starter commands the (primary) motor to start. The primary motor will be disabled until the actuator is in position
Voltage Inputs - Apply 10-120VAC/DC, 10mA Max to energize		
V1-V2	Fireman's Override (NO)	When active (closed), the starter will command the motor to start in all modes and will supersede Shutdown. All mode LEDs will blink.
V3-V4	Auto Run (NO)	When active (closed), the starter will start the motor in Auto Mode.
Relay Outputs - Relay contacts rated for: 0.3A @ 125VAC, 1A @ 24VDC		
O1	Fault (NO)	When active (closed), a fault has occurred and the starter is no longer running.
O	Common	Common terminal for Fault and Status Output.
O2	Status (NO)	When active (closed), the motor is running in a loaded condition at the customer selectable threshold.
Programmable Dry Inputs - Contacts or transistorized inputs		
D1	Auto Dry (NO)	**Default:** When active (closed), the starter will start the motor in Auto Mode.
	Permissive Auto (NO)	**Option:** When inactive (open), the Auto Dry and Auto Voltage Inputs are disabled.
D2	Shut Down (NC)	**Default:** When active (open), the starter will stop the motor in all modes (except when Fireman's Override is in effect).
	Permissive Auto (NO)	**Option:** When inactive (open), the Auto Dry and Auto Voltage Inputs are disabled.
D	Common	Common terminal for Shutdown and Auto Dry inputs.

MSTS Power Connections		
PWR	Control Power Input	24VAC (120VAC optional)
COIL	Contactor Coil Output	Supplies same voltage as control power input
CAT-5	CAT-5 Connection	Non-crossover CAT-5 cable only. Connect to SCM Meter Base only.

3) Installation/Wiring

⚠⚠ DANGER

HAZARDOUS VOLTAGE

- Disconnect and lock out all power before installing or servicing equipment.
- This equipment may require locking out multiple power sources prior to service
- Install and wire in accordance with all applicable local & national electrical and construction codes

FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN DEATH OR SERIOUS INJURY

Mounting

Mount the starter on a vertical surface, with the line terminals facing up.
Install using 1/4" diameter hardware suitable for the mounting surface.

⚠ WARNING

- To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer's instructions for selecting current elements and setting the instantaneous-trip circuit breaker must be followed.
- Tripping of the instantaneous-trip circuit breaker is an indication that a fault current has been interrupted. Current-carrying components of the magnetic motor controller should be examined and replaced if damaged to reduce the risk of fire or electric shock. If burnout of the current element of an overload relay occurs, the complete overload relay must be replaced.
- Do not locate starter in an environment subject to flammable gases, dusts or materials. Contact arcing can induce explosion or fire.
- Locate starter in a location appropriate to enclosure ratings and operational ratings. (e.g. NEMA 1 should only be located in a dry, protected environment).
- Do not allow any metal shavings or debris from installation to enter enclosure.

Wiring

Wire main power input and motor leads to the appropriate terminals tightened to specified torques indicated in the Torque Table below. Use only copper conductors rated at least 60°C for applications less than 100A and at least 75°C ≥ 100A. Maintain proper clearances and verify that no possibility of an electrical short exists between the power conductors or enclosure. Ensure that wires are not under stress and all insulation is intact. Verify voltage input matches label and the control power is tapped per schematic.

Low Voltage Wiring

Automation system control wiring should be run in a separate conduit. The control terminals accept 26~14AWG wire torqued to 3.5 in-lb.

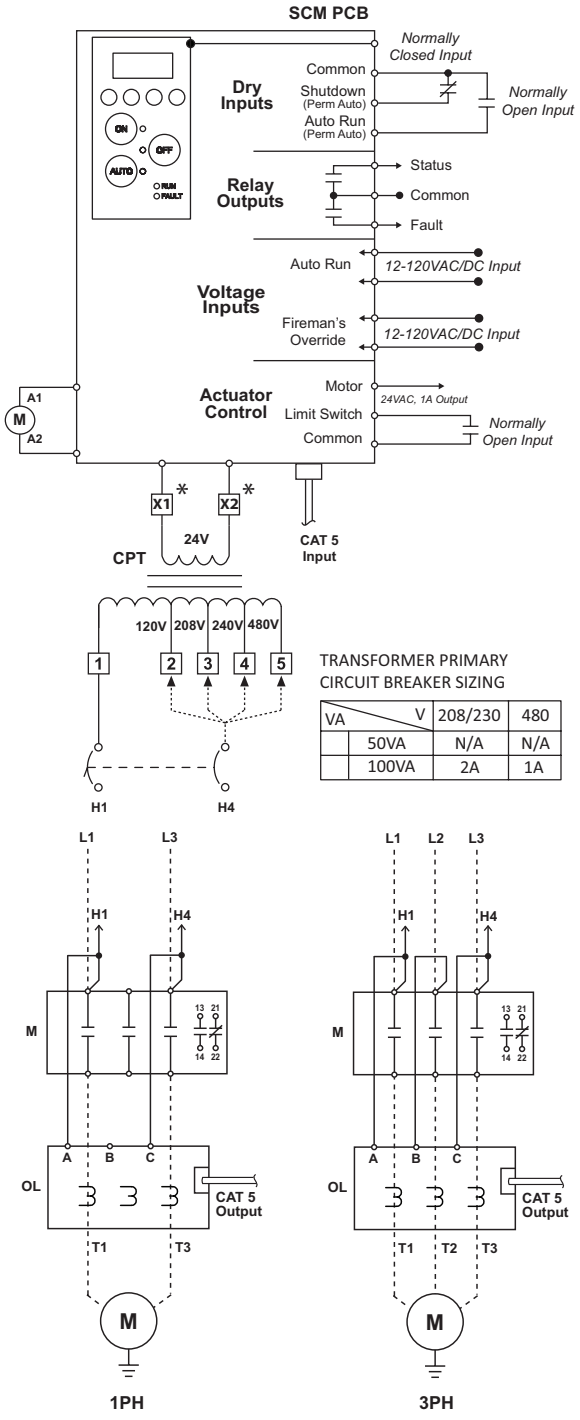
Torque Table

MSTS

NEMA Size	Input (lb-in)		Output (lb-in)
	Standard	Combination	Motor Leads
00	20	18	20
0	20	18	20
1	20	18	20
2	35	36	35
3	45	53	45
4	80-86	150-180	80-86
5	300-390	180-250	300-390

MSTS Wiring Schematic(s)

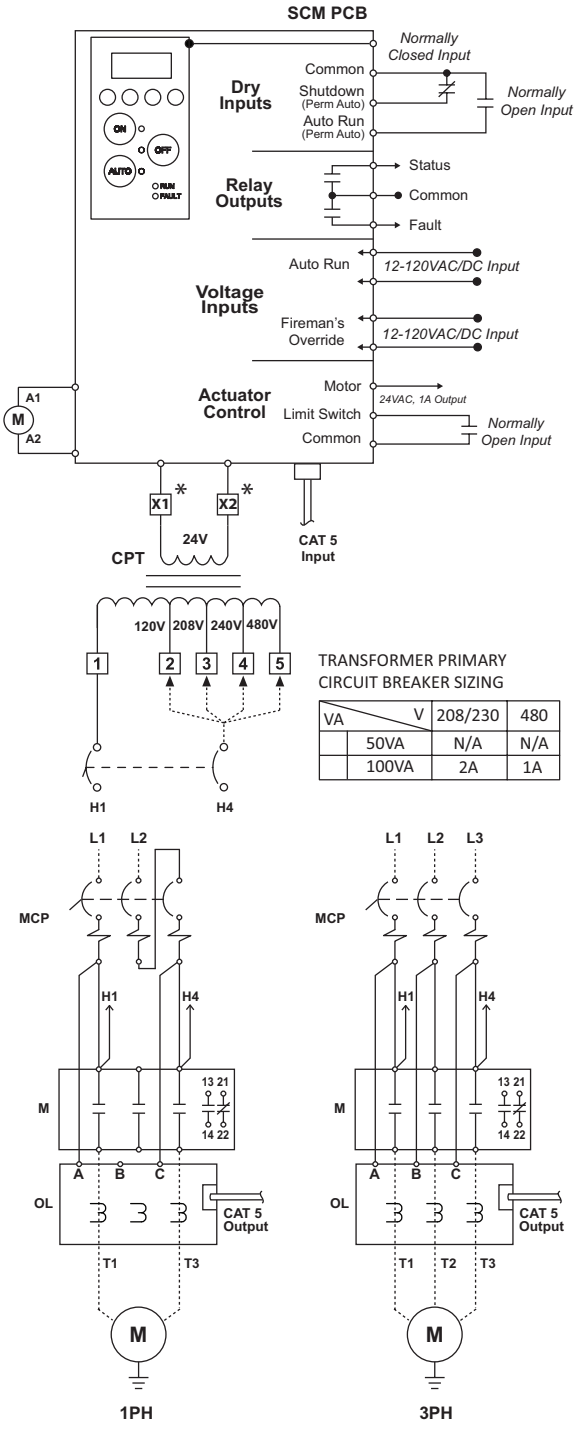
Standard



TRANSFORMER PRIMARY CIRCUIT BREAKER SIZING

VA \ V	208/230	480
50VA	N/A	N/A
100VA	2A	1A

Combination



TRANSFORMER PRIMARY CIRCUIT BREAKER SIZING

VA \ V	208/230	480
50VA	N/A	N/A
100VA	2A	1A

*X1 and X2 terminals do not apply to Type 1 enclosed configurations

4) Operation

MSTS Starters

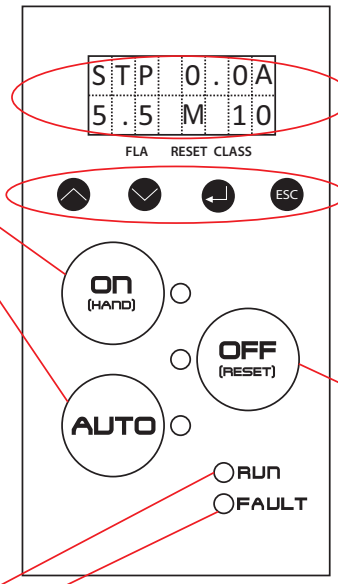
Each function of SCM controlled starters is accessible through the keypad (shown below).

Hand Mode - Depressing the Hand button on the keypad operates the motor starter. The Red LED adjacent to the Hand button indicates Hand Mode is selected. The Green Run LED indicates proof of flow.

Automatic Mode - Depressing the Auto button on the keypad enables the control inputs to operate the motor starter. The Red LED adjacent to the Auto button indicates the Automatic mode is selected. The Green Run LED indicates proof of flow when the control inputs are commanded.

Run LED (green) - LED will be on if contactor coil is energized and there is proof of flow. (LED will blink if run has been commanded and there is no proof of flow)

Fault LED (red)- When the starter is in a fault condition, the red fault LED is on and the mode selected (Hand, Off or Auto) LED will be blinking. (LED will blink if current is above FLA)



SCM KEYPAD

Default Screen

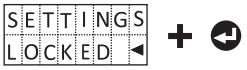
OFF/RESET - The motor starter is off when this button on the keypad is selected. The Green LED adjacent to the Off button indicates this mode is selected and the Run LED should be off. To reset, press the OFF button.

Lockout Feature

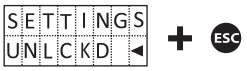
SCM Controlled starters are pre-configured to protect a motor based on customer selected specification. If adjustments need to be made to the overload or ground fault settings, they must first be unlocked. Follow the steps below to unlock the SCM settings.

1)

Press and hold the up and down buttons on the keypad for 2 seconds, or until the screen matches the figure below

2) 

Press the enter button on the kaypad to change the menu from “locked” to “unlocked”, then press escape



The lockout feature should now be disabled. Press the escape key to return to the default display screen. Adjustments may now be made to the overload FLA setting and ground fault level setting*. The lockout feature will automatically re-enable itself after 2 minutes.

***Ground Fault protection is an optional feature on MSTS series starters**

Advanced Settings

Unlocking the advanced settings menu will allow the user to cycle through the complete list of SCM motor protection functions and settings. Follow the steps below to unlock the advanced settings menu.

1)

Press and hold the up and down buttons on the keypad for 8 seconds, or until the screen matches the figure below.

2)

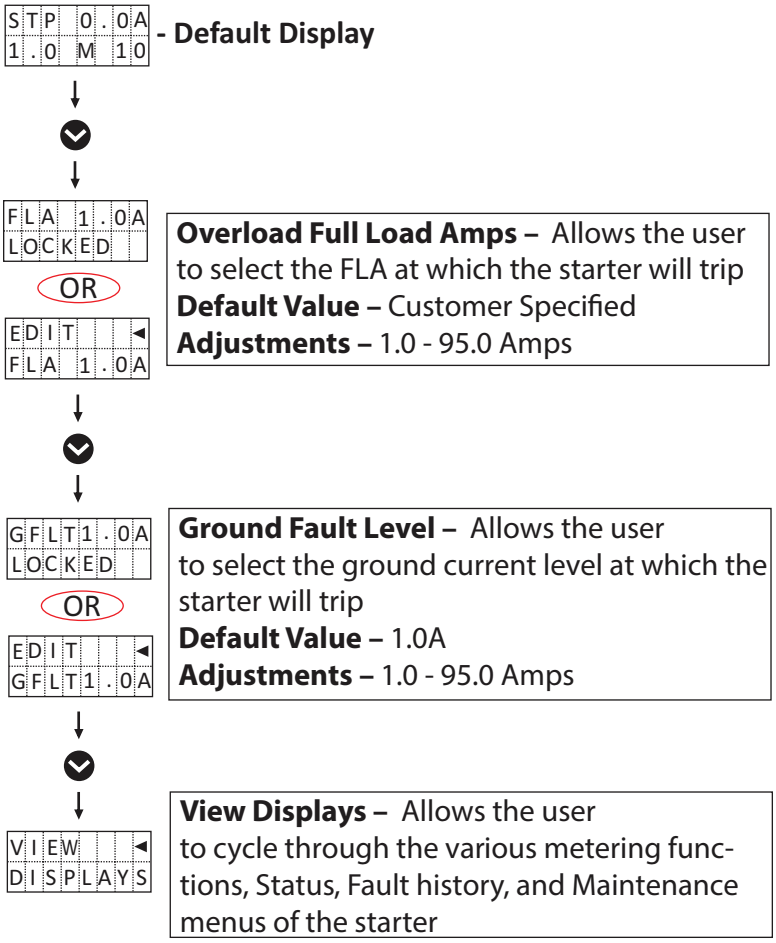
Press the enter button on the keypad to change the menu from “locked” to “unlocked”.

The lockout feature should now be disabled. Press the escape key to return to the default display screen.

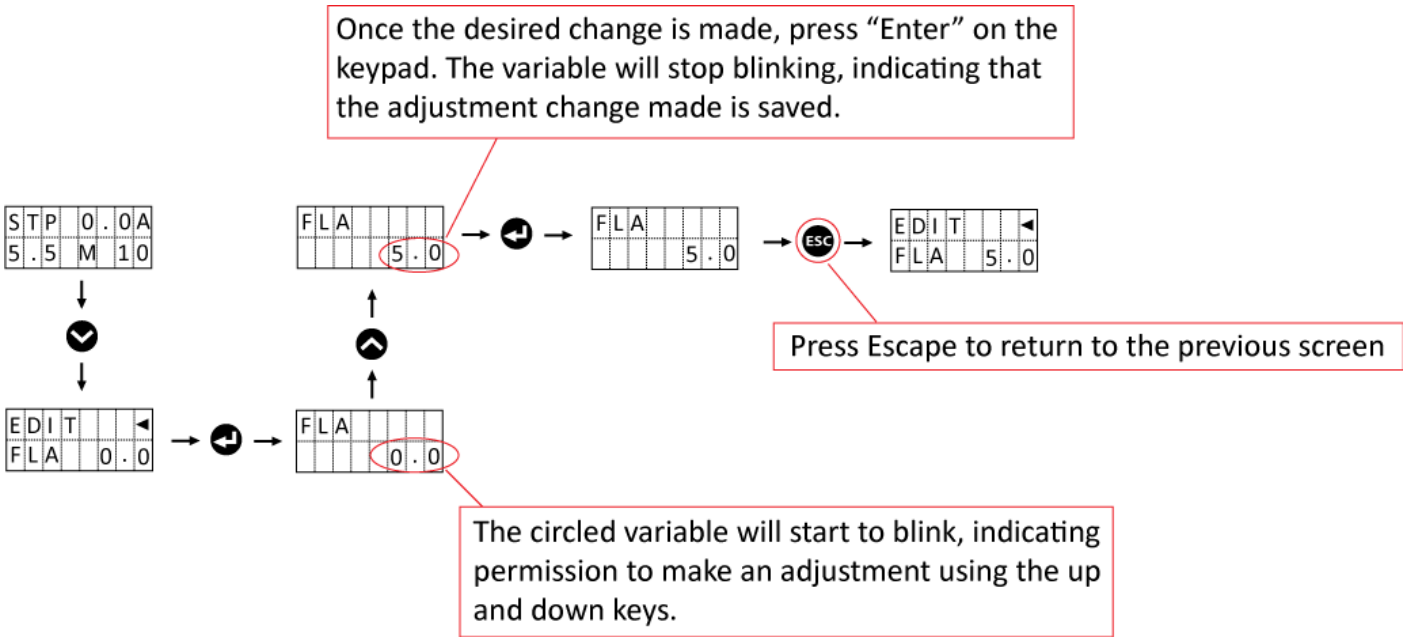
The advanced settings menu is now accessible by pressing the enter button on the SCM keypad when the default screen is displayed. Use the up and down keys to cycle through the various features of the SCM. Press the escape key to return to the default display screen. The lockout feature will automatically re-enable itself after 2 minutes.

Setting Adjustments

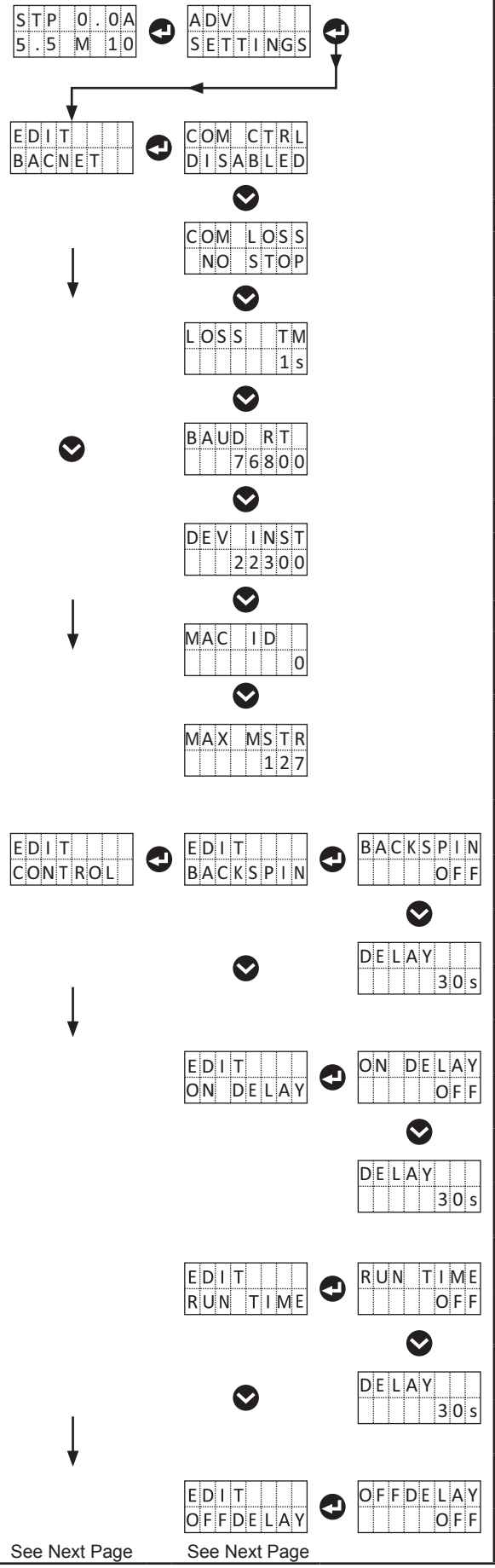
Using the up and down keys will allow the user to scroll through the following. Press the escape key to return to the previous screen. In order to access the complete list of motor protection functions of the SCM, the Advanced Settings Menu must be unlocked (see page 12).



Once the lockout feature is disabled, follow the example below to make adjustments to the overload FLA or ground fault current level settings if desired.

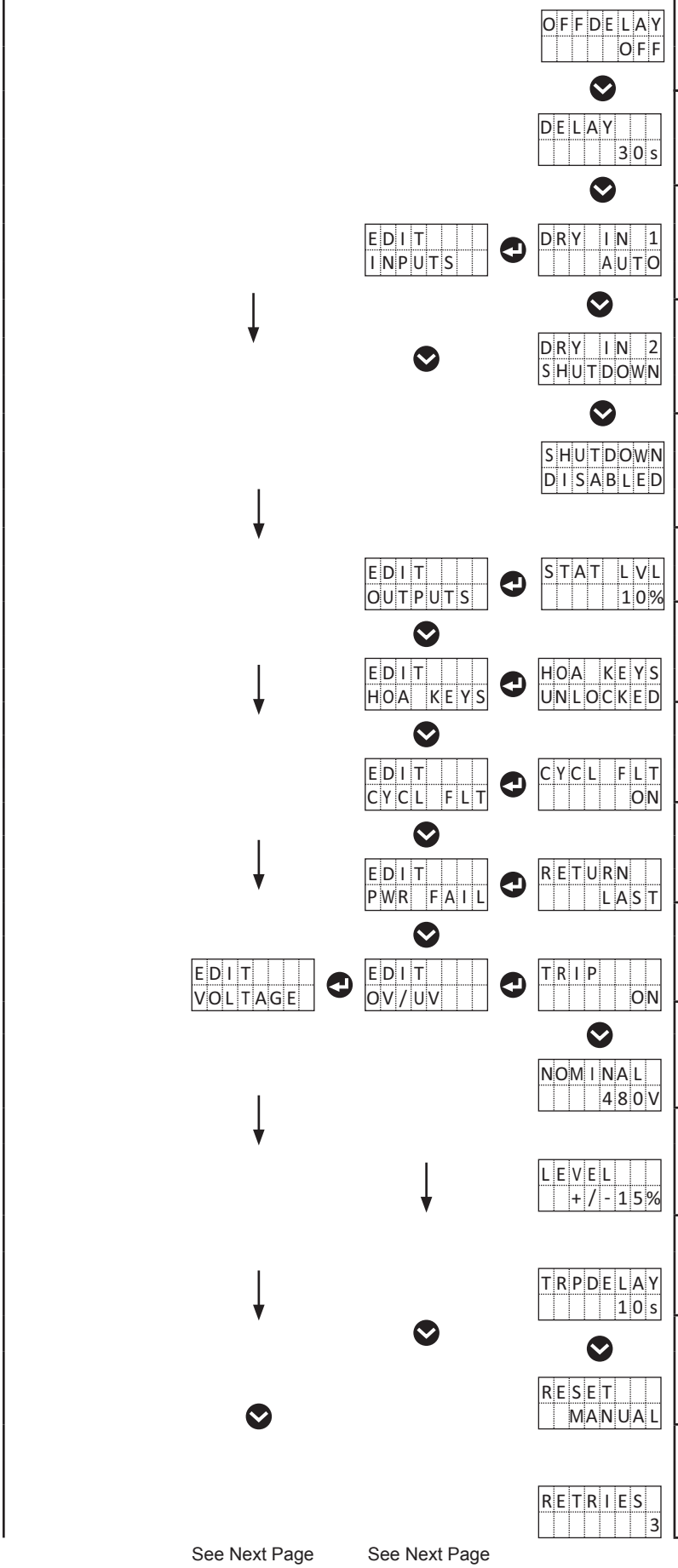


Advanced Settings Menu Structure - MSTS



Feature	Adjustment	Description
MSTS - OPT	ENABLED/ DISABLED	**Communication Control**: This setting enables or disables communication via BACnet. • In the event of a loss in BACnet communications, the user may select if the starters should continue to RUN or STOP. • Loss TM detects receipt of any ReadProperty or WriteProperty request. When received, resets a running seconds counter which is checked against the COM LOSS parameter. • Baud Rate allows the user to select the desired Baud Rate. Note: The board detects BACnet communications by the receipt of any ReadProperty or WriteProperty request, which when received resets a running seconds counter. The running counter is checked against the BACnet object AV2 (CommTimeout in seconds) and indicates Loss of Communications if exceeded. • Device Instance allows the user to assign and inter-network Device Instance to the starter. • MAC ID (Address) allows the user to set a unique MAC ID. Each master device on the MS/TP daisy chain must have a unique MAC ID. Note: MAC ID 127 is used for broadcast communications only. • Max Master parameter determines the max # of possible addresses assigned to the network.
MSTS - OPT	STOP/ NO STOP	
MSTS - OPT	1 - 120 Seconds	
MSTS - OPT	9600,19200, 38400,76800	
MSTS - OPT	0 - 4194302	
MSTS - OPT	0 - 127	
MSTS - OPT	0 - 127	
OPT	ON / OFF	**Backspin Delay**: Minimum delay between a stop and the next allowed start; Backspin delay prevents rapid attempts at restarting. • The Backspin Delay feature is disabled when OFF. Default = OFF • Delay time is the minimum delay between stop and the next allowed start. Default = 30 sec.
OPT	0 - 9999 Seconds	
OPT	ON / OFF	**On Delay**: Delay from start commanded until motor started. • The On Delay feature is disabled when OFF. Default = OFF • Delay time is the minimum delay from start command until motor started. Default = 30 sec.
OPT	0 - 9999 Seconds	
OPT	ON / OFF	**Runtime Delay**: Minimum runtime delay. When AUTO signal received, starter will run for at least this duration. Timer reset if AUTO is removed and returns. • The Runtime Delay feature is disabled when OFF. Default = OFF • Delay time is the minimum runtime from motor start. Default = 30 sec.
OPT	0 - 9999 Seconds	
OPT	ON / OFF	**Off Delay**: Delay from start command removed until motor stopped. • The Off Delay feature is disabled when OFF. Default = OFF

Advanced Settings Menu Structure Continued - MSTS



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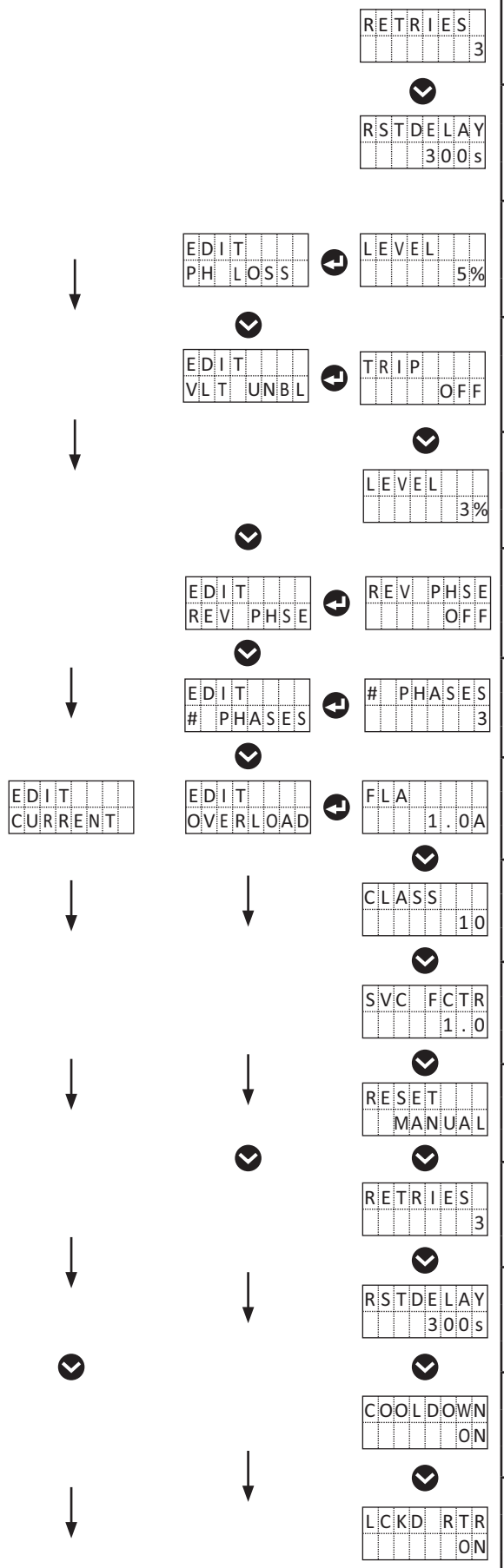
Feature	Adjustment	Description
OPT	0 - 9999 Seconds	**Off Delay Continued**: • Delay time is the duration of run time after removal of run command. Default = 30 sec.
MSTS - STD	AUTO/ PERM	**Inputs**: Allows programming of programmable dry inputs. • Dry Input 1 allows the user to define Input 1 as either Auto Run or Permissive. Default = Auto run • Dry Input 2 allows the user to define Input 2 as either Shutdown or Permissive. Default = Shutdown • Shutdown
MSTS - STD	SHUTDOWN/ PERM	
MSTS - N/A	ENABLED/ DISABLED	
MSTS - OPT	1% - 100%	**Outputs**: Status Relay is closed when the motor is running in a loaded condition at the user selected percentage limit
STD	LOCKED/ UNLOCKED	**HOA Keys**: Allows the user to lock or unlock the use of the HOA keys on the SCM keypad. Default = Unlocked
STD	ON / OFF	**Cycle Fault**: Trips when an unusually high amount of motor starts and stops are detected at a rate > 1200/hour. Default = ON
STD	OFF, LAST, ADVANCED	**Power Failure**: Allows the user to select the return mode of the starter in the event of a power failure. Default = Last
MSTS - OPT	ON / OFF	**OV/UV**: Trips when the measured voltage is over or under the nominal voltage. • Trip is disabled when OFF. Alarm is still displayed. Default = ON • Nominal Voltage is the voltage used for calculations. Default = Factory • Level is the % Level over Nominal Voltage, at which OV/UV Trip occurs. • Trip Delay time is the minimum delay between stop and the next allowed start in the event of an OV/UV Trip. Default = 10 sec. • Reset allows the user to select between manual and automatic reset of the starter in the event of an OV/UV trip. Default = Manual • Retries allows the user to select the maximum number of reset retries the SCM will attempt in the event of an OV/UV trip. Default = 3 • Reset delay allows the user to select the time between reset retries in the even of an OV/UV trip. Default = 300 seconds
MSTS - OPT	120V, 208V, 240V, 277V, 480V, 600V	
MSTS - OPT	± 5% - 25%	
MSTS - OPT	0 - 99 Seconds	
MSTS - OPT	Manual/ Auto	
MSTS - OPT	0 - 5	

Advanced Settings Menu Structure Continued - MSTS



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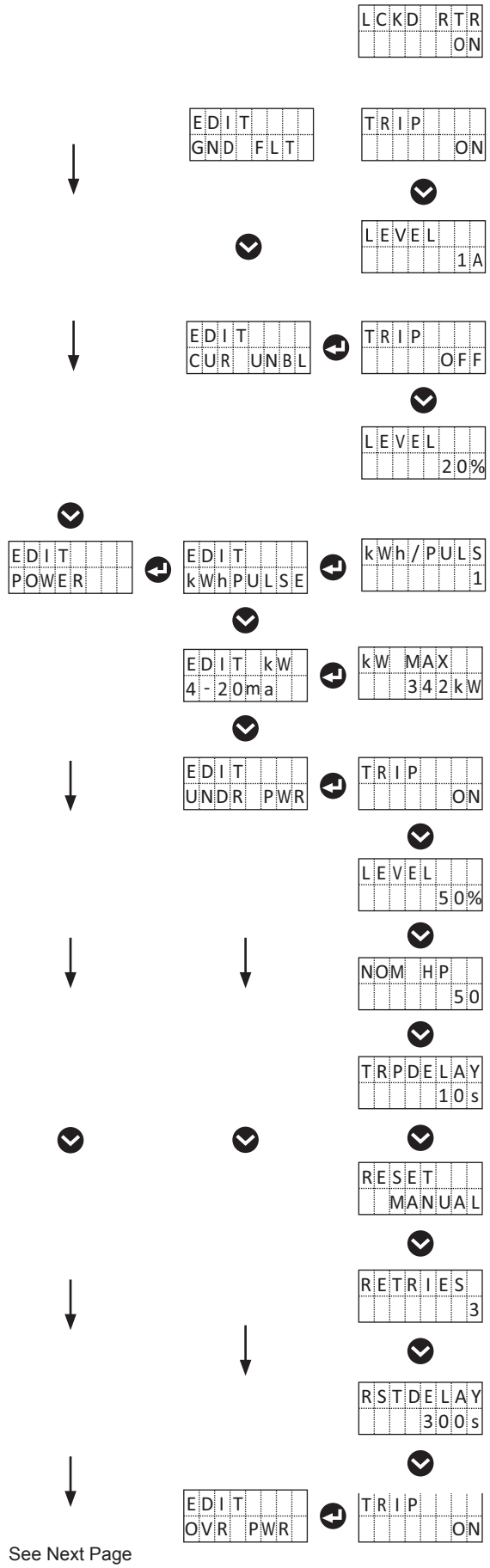
Feature	Adjustment	Description
MSTS - OPT	5 - 9999 Seconds	**OV/UV Continued**: • Reset delay allows the user to select the time between reset retries in the even of an OV/UV trip. Default = 300 seconds
STD (3PH)	1% - 50%	Voltage Phase Loss: A trip will occur when the percentage of deviation between any one phase and the average voltage is greater than the selected % level. Default = 5%
STD (3PH)	ON / OFF	Voltage Phase Unbalance: A trip will occur when there is a voltage unbalace on all three phases. • Trip is disabled when OFF. Alarm is still displayed. Default = OFF • Trip will occur when the percentage of deviation between any one phase and the average voltage is greater than the selected % level. Default = 3%
STD (3PH)	1% - 50%	
STD (3PH)	ON / OFF	**Reverse Phase**: Trips when voltage phase sequence is reversed. • Trip is disabled when OFF. Default = OFF
STD	1 / 3 Phases	**# of Phases**: The SCM is capable of controlling 1 or 3 phase motors. Default = Factory
STD	1A - 95A	**Overload**: Trips according to trip curve in Appendix A. Thermal overload protection is provided as a built-in function os the main digital processor on the SCM. This simulates the tripping action of a bi-metallic overload relay, with the accuracy and repeatability of a digital control system. • FLA allows the user to select the appropriate full load amps obtained from the namplate of the motor to be controlled. Default = Customer Specified • Trip Class allows the user to select the trip class, obtained from the nameplate of the motor to be controlled. Default = 10 • Service factor is the FLA multiplier used to increase the time of the overload trip. If service factor is unknown, set to 1.0. Default = 1.0 • Reset allows the user to select between manual and automatic reset of the starter in the event of an overload trip. Default = Manual • Retries allows the user to select the maximum number of reset retries the SCM will attempt in the event of an overload trip. Default = 3 • Reset delay allows the user to select the time between reset retries in the even of an overload trip. Default = 300 seconds • Cooldown prevents the motor from starting for 3 minutes in the event of an overload condition. Default = ON • Locked rotor trip is disabled when OFF. Alarm is still displayed. Default = OFF
STD	5-30	
STD	0.0 - 2.0	
STD	Manual/ Auto	
STD	0 - 5	
STD	5 - 9999 Seconds	
STD	ON / OFF	
STD	ON / OFF	

Advanced Settings Menu Structure Continued - MSTS



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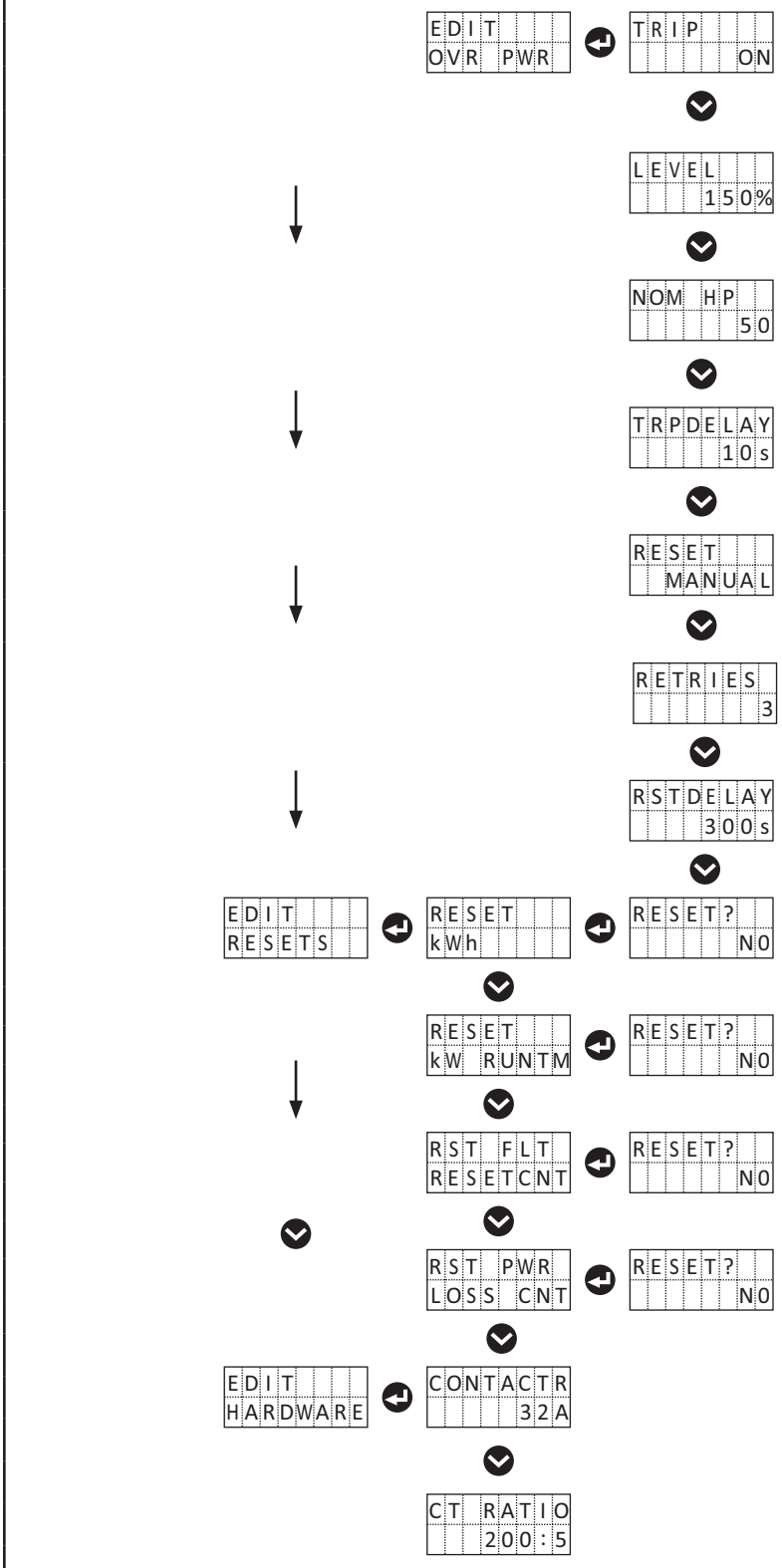
Feature	Adjustment	Description
MSTS - OPT	ON / OFF	**Ground Fault**: Trips according to trip curve in Appendix A. Trips when there is a leakage of current to the ground, greater than the amperage level. • Trip is disabled when OFF. Alarm is still displayed. Default = ON • Level allows the user to select the amperage level at which a ground fault trip will occur. Default = 1A
MSTS - OPT	1A - 9.9A	
STD (3PH)	ON / OFF	**Current Unbalance**: Trips when there is a current unbalance on all three phases • Trip is disabled when OFF. Alarm is still displayed. Default = OFF • Level % allows the user to select the percentage of deviation between any one phase and the average current, at which point, the SCM will trip. Default = 10%
STD (3PH)	1% - 50%	
OPT	.25, .5, 1, 2 kWh per pulse	**kWh Pulse**: Setup for the kWh Pulse Output from the Power Meter Option Board. Default = 1 kWh/Pulse
OPT	.5 - 342	**Edit kW**: Setup for the kW PWM output from the Power Meter Option Board. • kW Max sets the maximum kW used for the PWM. (Minimum output = 0) Default = 342kW
MSTS - OPT	ON / OFF	**Under Power**: Trips when the measured horsepower is less than the nominal horesepower • Trip is disabled when OFF. Alarm is still displayed. Default = OFF • Level % allows the user to select the % level under nominal HP, at which trip occurs. Default = 20% • Nominal HP should be set to the nominal HP of the motor the SCM is to control. Default = Factory Setting • Trip Delay time is the minimum delay between stop and the next allowed start in the event of an under power Trip. Default = 10 sec. • Reset allows the user to select between manual and automatic reset of the starter in the event of an under power trip. Default = Manual • Retries allows the user to select the maximum number of reset retries the SCM will attempt in the event of an under power trip. Default = 3 • Reset delay allows the user to select the time between reset retries in the even of an under power trip. Default = 300 seconds
MSTS - OPT	0% - 99%	
MSTS - OPT	0.125 - 1000	
MSTS - OPT	0 - 99 Seconds	
MSTS - OPT	Manual/ Auto	
MSTS - OPT	0 - 5	
MSTS - OPT	5 - 9999 Seconds	
MSTS - OPT	ON / OFF	**Over Power**: Trips when the measured horsepower is greater than the nominal horesepower

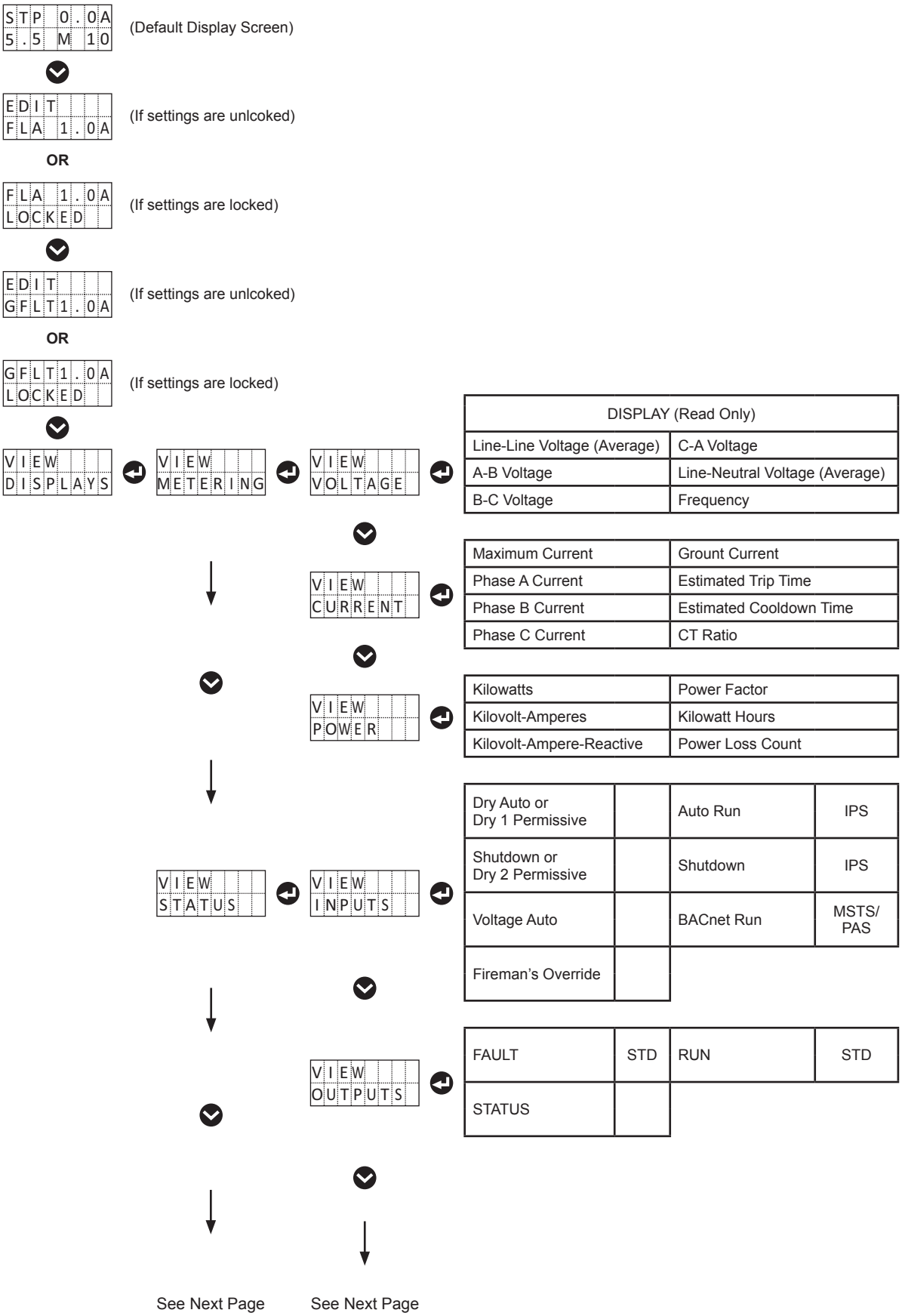
Advanced Settings Menu Structure Continued - MSTS



Feature	Adjustment	Description
MSTS - OPT	101% - 200%	**Over Power** Continued: • Trip is disabled when OFF. Alarm is still displayed. Default = ON • Level % allows the user to select the % level over nominal HP, at which trip occurs. Default = 125% • Nominal HP should be set to the nominal HP of the motor the SCM is to control. Default = Factory Setting • Trip Delay time is the minimum delay between stop and the next allowed start in the event of an over power Trip. Default = 10 sec. • Reset allows the user to select between manual and automatic reset of the starter in the event of an over power trip. Default = Manual • Retries allows the user to select the maximum number of reset retries the SCM will attempt in the event of an over power trip. Default = 3 • Reset delay allows the user to select the time between reset retries in the even of an over power trip. Default = 300 seconds
MSTS - OPT	0.125 - 1000	
MSTS - OPT	0 - 99 Seconds	
MSTS - OPT	Manual/ Auto	
MSTS - OPT	0 - 5	
MSTS - OPT	5 - 9999 Seconds	
STD	NO / YES	**kWh Reset** • Resets the SCM kWh clock.
STD	NO / YES	**kW Runtime Reset** • Resets the SCM kW runtime clock.
STD	NO / YES	**Fault Count Reset** • Resets the SCM fault count.
STD	NO / YES	**Power Loss Count Reset** • Resets the SCM power loss count.
OPT	9A - 1520A (Read Only)	**Contactor** • Displays the contactor FLA of the SCM starter.
OPT	N/A, 150:5, 200:5, 300:5, 500:5, 800:5 (Read Only)	**CT Ratio** • Displays the CT Ratio when the SCM starter is needed to operate motors that require > 95A

MSTS - Display Features

To view the display features of the SCM, follow the steps below using the keypad.



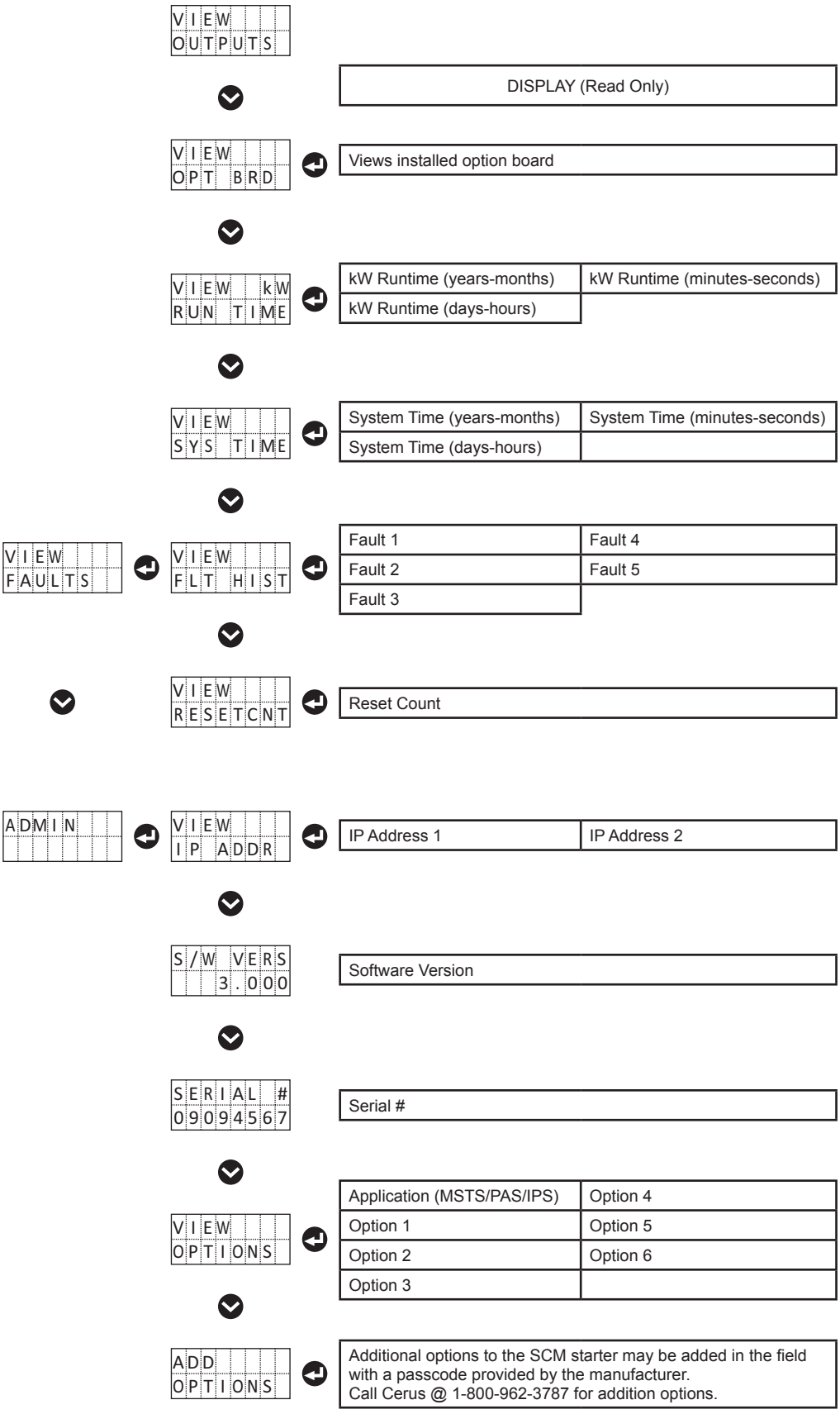
DISPLAY (Read Only)	
Line-Line Voltage (Average)	C-A Voltage
A-B Voltage	Line-Neutral Voltage (Average)
B-C Voltage	Frequency

Maximum Current	Grount Current
Phase A Current	Estimated Trip Time
Phase B Current	Estimated Cooldown Time
Phase C Current	CT Ratio

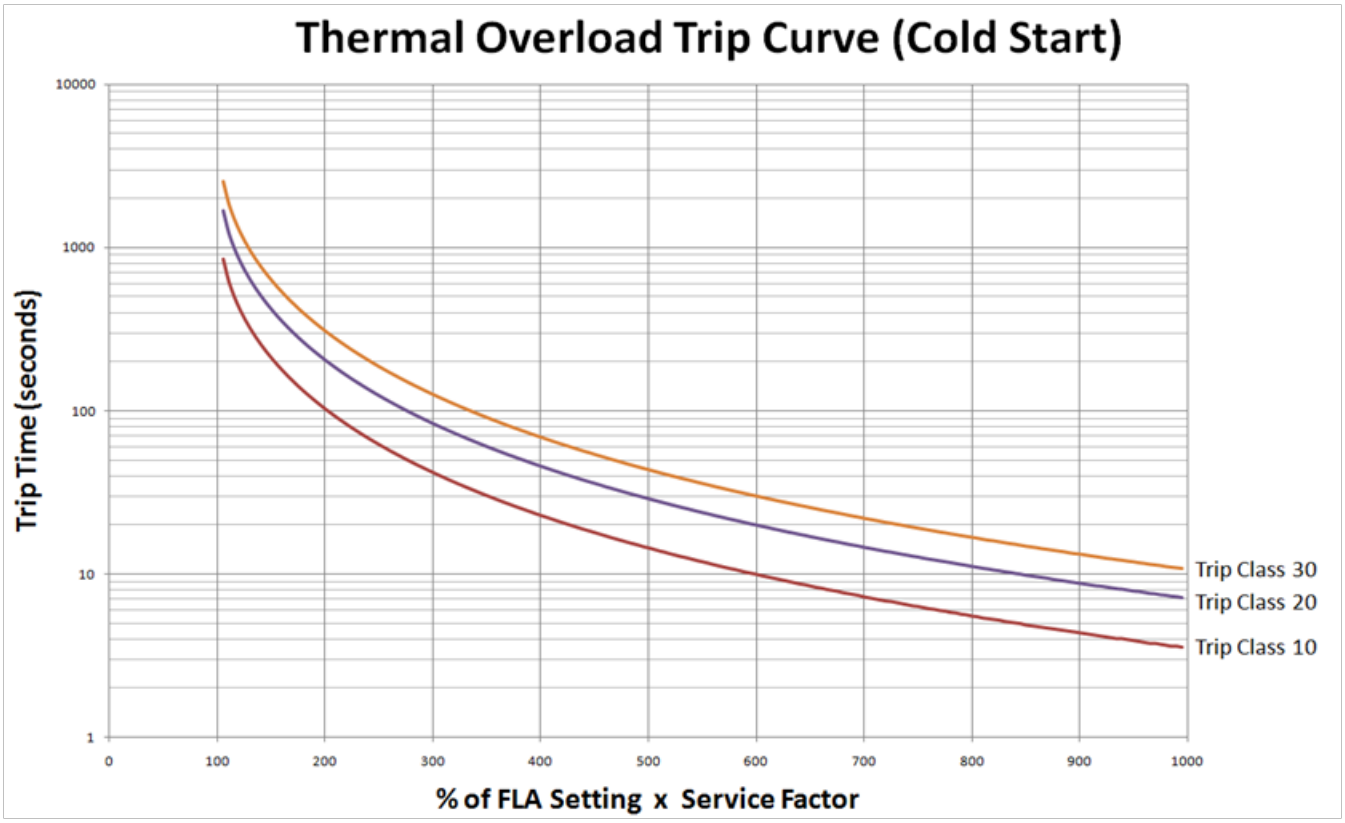
Kilowatts	Power Factor
Kilovolt-Amperes	Kilowatt Hours
Kilovolt-Ampere-Reactive	Power Loss Count

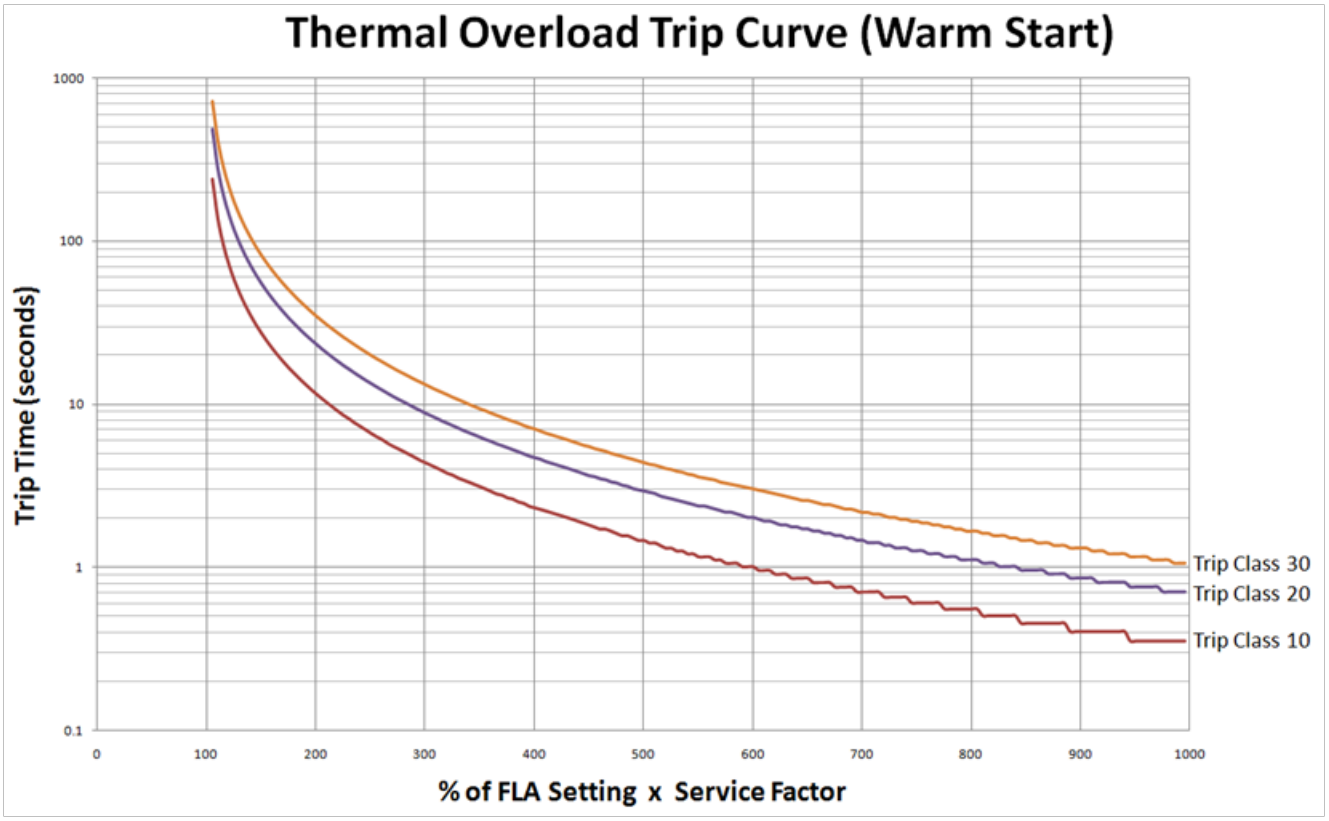
Dry Auto or Dry 1 Permissive		Auto Run	IPS
Shutdown or Dry 2 Permissive		Shutdown	IPS
Voltage Auto		BACnet Run	MSTS/ PAS
Fireman's Override			

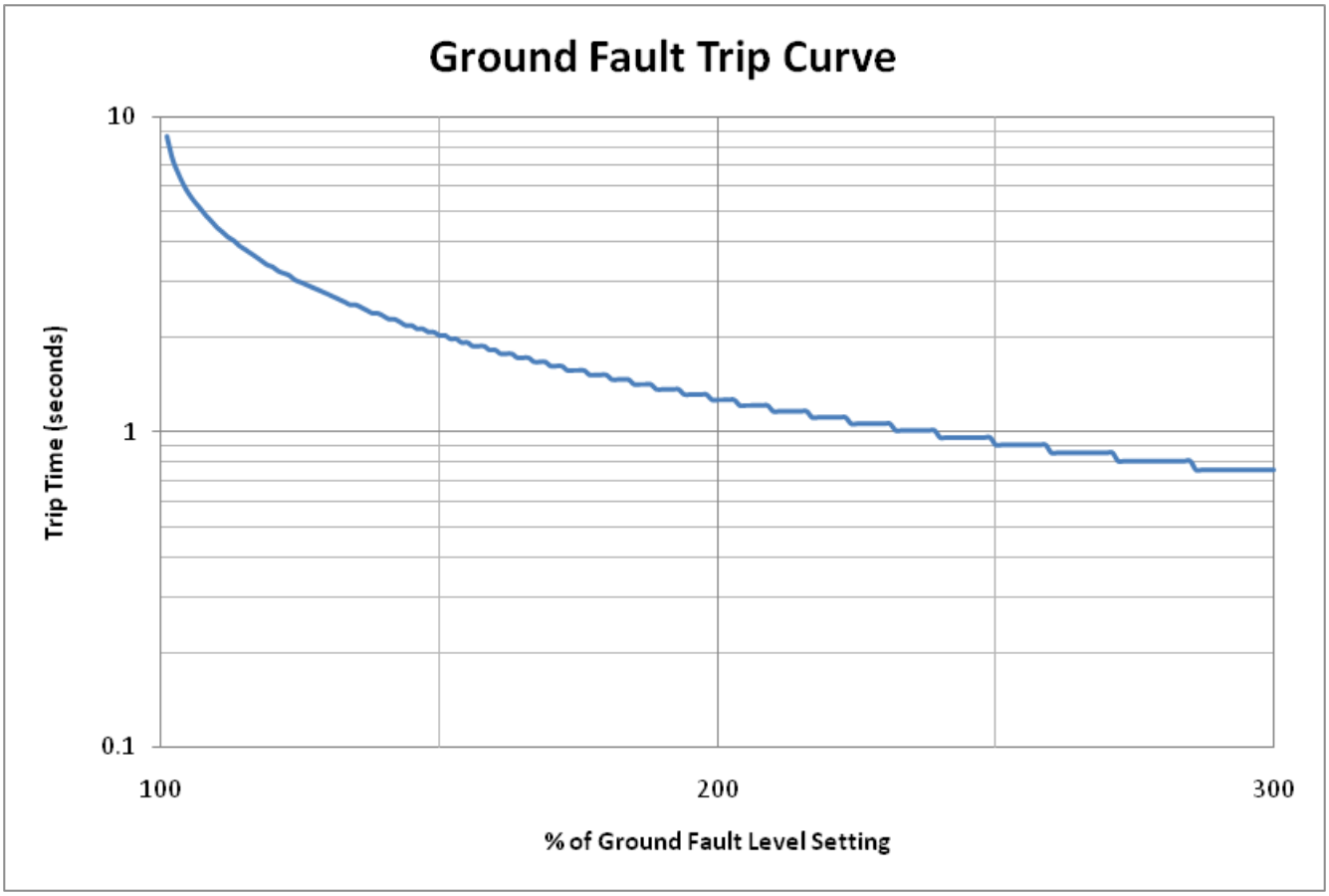
FAULT	STD	RUN	STD
STATUS			


VIEW OUTPUTS
DISPLAY (Read Only)
VIEW OPT BRD
Views installed option board
VIEW kW RUN TIME
kW Runtime (years-months)
kW Runtime (minutes-seconds)
kW Runtime (days-hours)
VIEW SYS TIME
System Time (years-months)
System Time (minutes-seconds)
System Time (days-hours)
VIEW FAULTS
VIEW FLT HIST
Fault 1
Fault 4
Fault 2
Fault 5
Fault 3
VIEW RESETCNT
Reset Count
ADMIN
VIEW IP ADDR
IP Address 1
IP Address 2
S/W VERS 3.000
Software Version
SERIAL # 09094567
Serial #
VIEW OPTIONS
Application (MSTS/PAS/IPS)
Option 4
Option 1
Option 5
Option 2
Option 6
Option 3
ADD OPTIONS
Additional options to the SCM starter may be added in the field with a passcode provided by the manufacturer.
Call Cerus @ 1-800-962-3787 for addition options.

Appendix A - Overload and Ground Fault Trip Curves






Ground Fault Trip Curve
10
1
0.1
Trip Time (seconds)
100
200
300
% of Ground Fault Level Setting

Appendix B - Ground Fault Testing Procedure

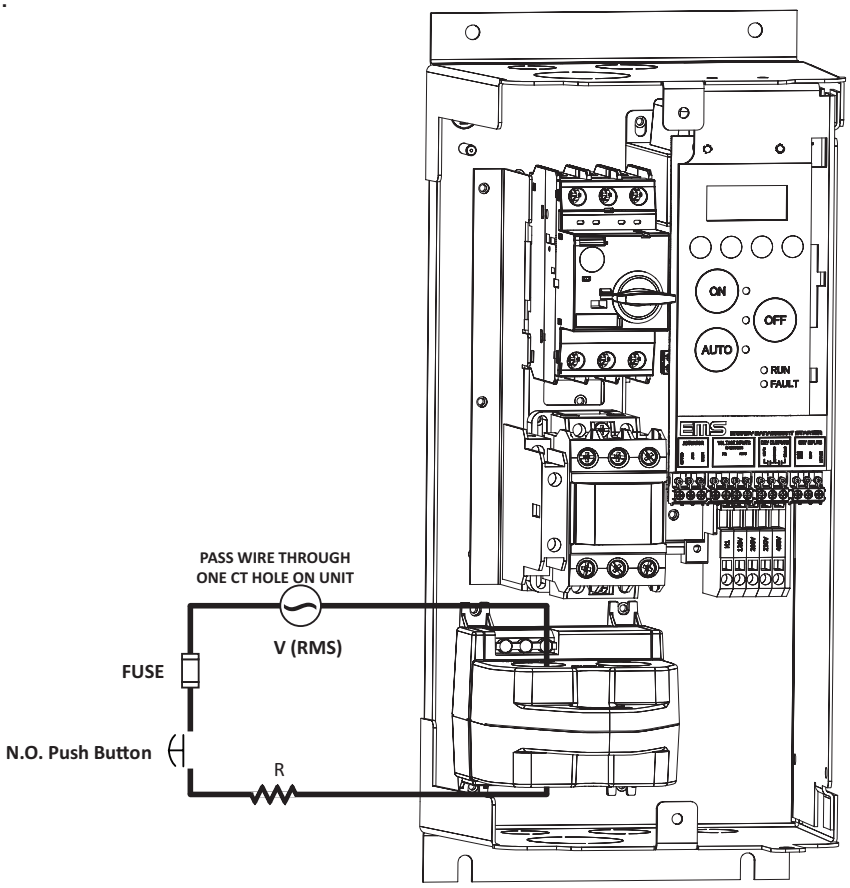
1) Disconnect Power.

2) Connect the three line voltages to terminals R(L1), S(L2), T(L3) on the contactor. (MCP disconnect or MCCB if this is a combination starter)

3) Apply power to starter.

4) For test purposed, turn Ground Fault Trip “ON”, and set the Ground Fault Level to “1.0A”.

5) Using an AC power supply, construct the circuit below. This circuit simulates a ground fault condition by generating a current in one of the phases. Alternate test circuits may be used. The only requirement is the current through the current transformer must be at least 115% of the ground fault setting and pass through only one CT window.



6) The values of V and R will be determined by the current required to generate a ground fault trip condition: I = Vrms/R, where I = 115% of ground fault setting.

7) Place the unit in “Hand” mode, apply three phase power, and allow the contactor to close.

8) Energize the test circuit by pushing and holding the “N.O. Push Button” until the unit trips. The SCM Display should show a Ground Fault alarm and the N.O. contacts should be open. Release the “N.O. Push Button”.

Ground Fault Test Results

Date: _____

Performed By: _____

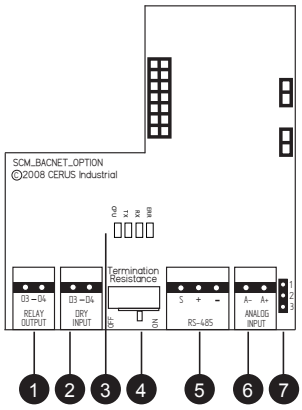
Trip (Y/N) _____

Location: _____

***Form should be retained by the building’s electrical foreman**

BACnet® Option Board for MSTS Series Starters

BACnet Communications



1. Relay Output
2. Dry Input
3. Status LEDs
4. Termination Resistance Switch
5. RS-485 Interface
6. Analog Input
7. Analog Input Selector Jumper

Relay Output (BV5)	Relay output contact rated for 0.3A @ 125VAC, 1A @ 24VDC.
Dry Input (BI10)	Dry input terminal. Normally open contact or transistorized input.
Status LEDs	**CPU (Green)** ***Flashing*** - During normal operation, the CPU LED will blink in 1 second intervals. ***Off*** - BACnet board is not receiving power or potential board malfunction **TX (Green)** The TX LED will flash when the starter is transmitting data. **RX (Green)** The TX LED will flash when the starter is receiving data. **ERR (Red)** The ERR LED will flash if a data interruption occurs between the BACnet board and the starter's main control board. ERR LED will also flash if BACnet communications fail.
Termination Resistance Switch	Select the ON position to enable termination resistor for RS-485 communication.
RS-485 Interface	Connect communication wiring using provided RS-485 terminals.
Analog Input (AI19)	Analog input for 4-20mA, 0-10V or 10KΩ thermistor.
Analog Input Selector Jumper	**No Jumper:** 0-10V Input **Jumper Pin 1 & 2:** 4-20mA Input **Jumper Pin 2 & 3**: 10KΩ Thermistor Input

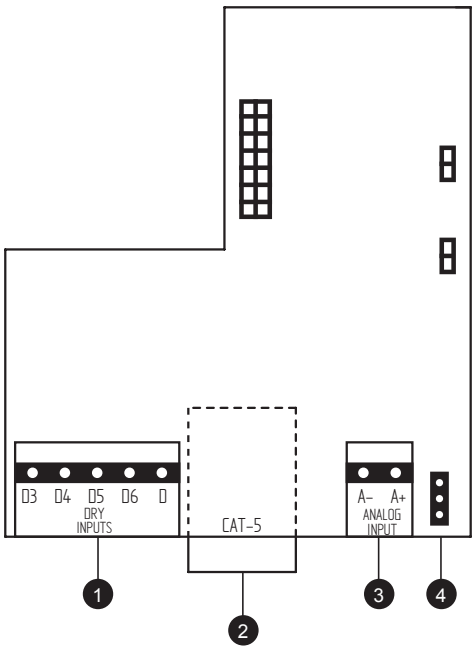
BACnet Parameter Setup

It may be necessary to adjust settings and configure the starter for proper BACnet operation. From the Default Display screen, access the BACnet parameters to begin setup.

ADV SETTINGS	In order to edit BACnet communication parameters, the Advanced Menu Settings must be unlocked
↵	
EDIT BACNET	Press ENTER to access BACnet parameters and begin setup. Use the ARROW keys to navigate through parameters. Press ENTER to confirm your selections.
↵	
COM CTRL DISABLED	Setting enables or disables communication via BACnet.
⌄	
COM LOSS NO STOP	In the event of a loss in BACnet communications, select if the starter should continue to RUN.
⌄	
LOSS TM 30s	Detects receipt of any ReadProperty or WriteProperty request. When received, resets a running seconds counter which is checked against the COM LOSS parameter.
⌄	
BAUD RT 76800	Adjust parameter to the desired Baud Rate 9600, 19200, 34800, or 76800.
⌄	
DEV INST 223000	Assign an inter-network Device Instance to the starter. Select a unique identifier within a range of 1~4194302.
⌄	
MAC ID 0	Set a unique Media Access Control (MAC) address. Each master device on the MS/TP daisy chain must have a unique MAC address (addressable range 0~127).
⌄	
MAX MSTR 127	The Max Master parameter determines the maximum number of possible addresses assigned to the network.

Press ESC to return to the Default Display screen.

Ethernet Connections



1. Dry Contact Inputs
2. Ethernet Cable Connection
3. Analog Input
4. Analog Input Selector Jumper

Dry Contact Inputs	Dry input terminals. Normally open contacts or transistorized inputs.
Ethernet Cable Connection	CAT-5 Cable with RJ-45 Connection
Analog Input	Analog input for 4-20mA, 0-10V or 10KΩ thermistor.
Analog Input Selector Jumper	**No Jumper:** 0-10V Input **Jumper Pin 1 & 2:** 10KΩ Thermistor Input **Jumper Pin 2 & 3**: 4-20mA Input

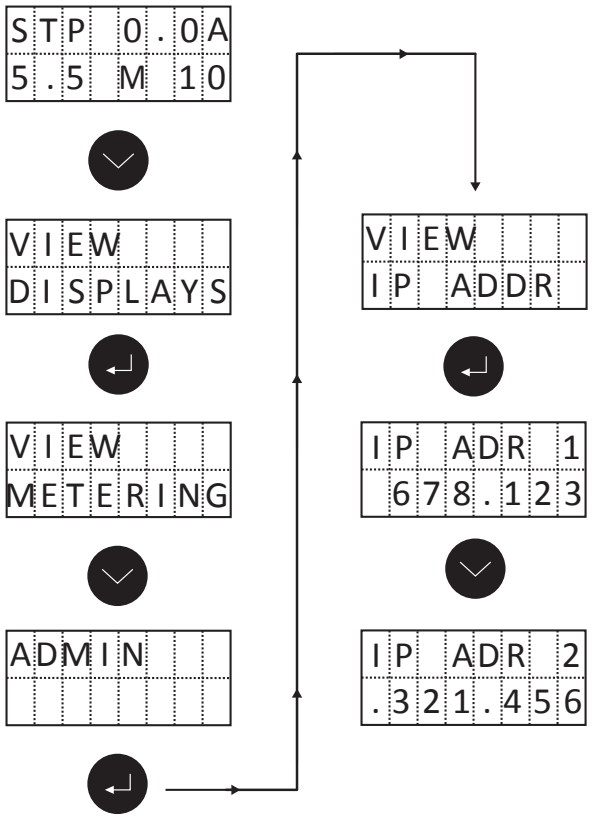
Ethernet Setup

Establishing Ethernet Connection

- Turn off and disconnect power to the starter
- Connect ethernet cable from the starter's CAT-5 terminal to one of the following:
  1) Personal computer (PC will assign IP address)
  2) Network (Router will assign IP address)

- After establishing connections, return power to the starter
- Obtain IP address by following the steps below:

Display Screens:



- In web browser, type IP address (IP address = IP ADR 1 + IP ADR 2)

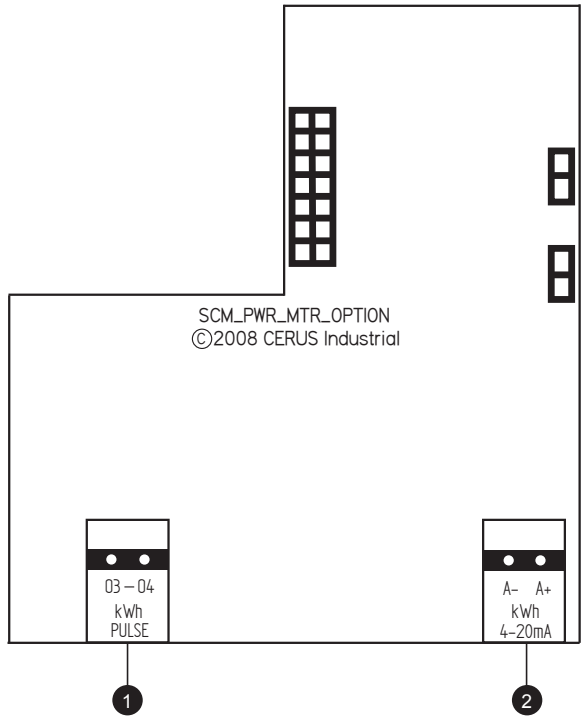
- After web page loads the user can set the location, description, date, time and view fault history

⚠ WARNING

- Replace battery with Renata SA, Part No. CR2032RV MFR only. Use of another battery may present a risk of fire or explosion. Contact Cerus Industrial for replacement batteries.

- Battery may explode if mistreated. Do not recharge, disassemble or dispose of in fire.

Tru-Power™ Outputs

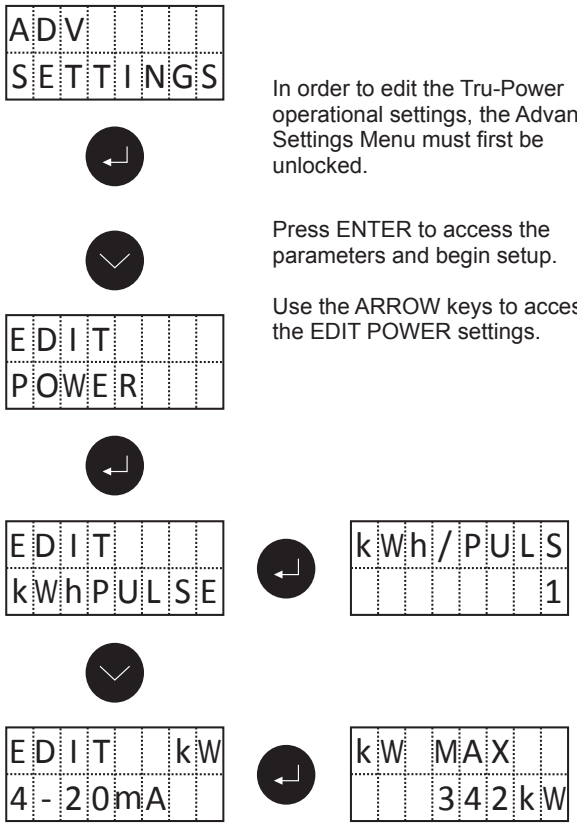


1. Digital Pulse Output
2. Analog Output

Digital Pulse Output	Solid state output that cycles based on EDIT kWh PULSE parameter settings (Select from 0.25, 0.5, 1, 2). Default setting is 1 kWh per pulse. Output contacts rated at 24 VAC/DC, 150 mA.
Analog Output	4~20 mA analog value for measured kW. 0 measured kW results in 4 mA. kW MAX parameter results in 20 mA. Maximum output rating is 24V, self-powered loop.

Tru-Power™ Parameter Setup

It may be necessary to adjust settings and configure the starter for proper Tru-Power operation. From the Default Display screen, access the parameters to begin setup.



In order to edit the Tru-Power operational settings, the Advanced Settings Menu must first be unlocked.

Press ENTER to access the parameters and begin setup.

Use the ARROW keys to access the EDIT POWER settings.

Set the desired number of kWh per pulses and press ENTER.

Press ESC and use the down arrow to access EDIT kW parameter. Enter the desired output scaling of the 4~20 mA reference signal.

Note: Always set kW MAX parameter based on actual motor sizing. Default value of 342kW may deliver lower resolution in small motor applications. Programming the kW MAX parameter accurately ensures detailed kW consumption output. The analog scale follows the relationship below:

4 mA → 0 kW

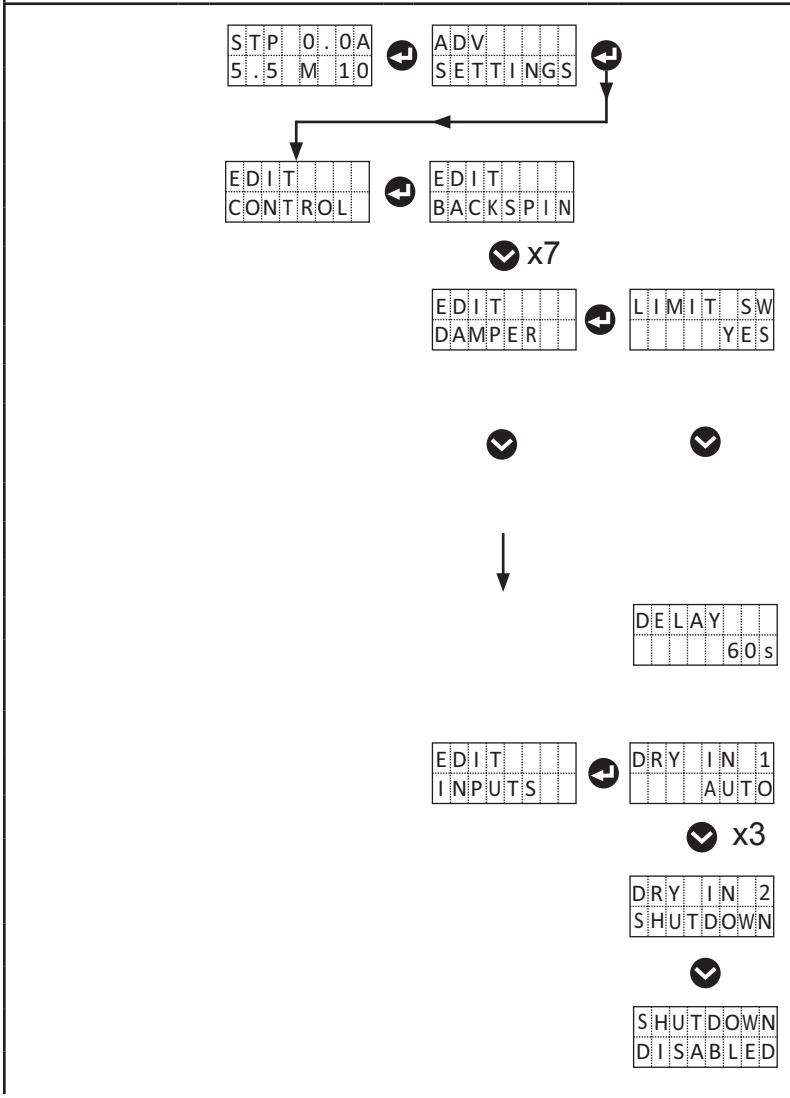
20 mA → MAX kW

Proper parameter mapping of the MAX kW value will ensure accurate scaling.

Appendix D - MCS, Multi-Contactor Starters

There are four MCS configurations designed to implement most of the IPS starter's default features. They are: Part-Winding, Wye-Delta, Two-Speed single-winding and Two-Speed two-winding starters. The starter utilizes a main SCM control board with meter base and an additional option board. (MCS Starters are incompatible with the use of other SCM option boards) All MCS units have a selectable damper motor output and a provision for a damper limit switch. The damper control selection can be changed in advanced settings to: Timer, Switch or None. The damper feature allows a damper actuator motor for fan applications and a lubrication solenoid valve for hollow shaft pump applications to be controlled by the starter.

Menu Structure - MCS (All) - Damper Control and Inputs



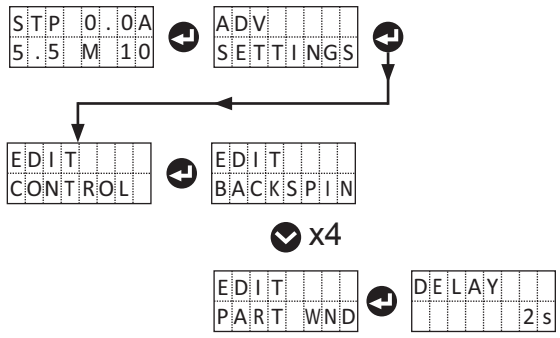
Adjustment	Description
NONE/ SWITCH/ TIMER	**Damper Control**: Selection determines how the MCS controls • NONE: (Default) Damper Switch input and Damper Timer are disabled. The MCS starts the motor without monitoring a damper status. • SWITCH: The MCS provides a damper motor output and starts the motor after a damper limit switch is closed. • TIMER: The MCS provides a damper motor output and starts the motor after a damper timer delay is expired. The damper limit switch input is ignored. If damper switch is selected, the MCS monitors after start a damper limit switch input and if it is not closed for a doubled the damper timer setting, the Damper fault will occur. The motor will stop if damper switch is open during MCS operation.
0-9999 Seconds	The Damper Time Delay setting should be adjusted to a time setting enough to open a damper. The MCS starts a motor after a damper time delay is expired. When Damper Switch is selected, the damper fault timer = 2x Damper Delay. Default = 60 sec.

SD (N.C.) / F.O. (N.O.)	**Dry Input 8:** Dry input 8 (D8) is an input on the option board which can be configured as a normally open Fireman's override or a normally closed shutdown command.
ENABLED / DISABLED	**Shutdown:** If D8 is configured as shutdown it must be enabled to work. If configured as F.O. it will operate regardless of the shutdown setting.

MCS, Part Winding Starters

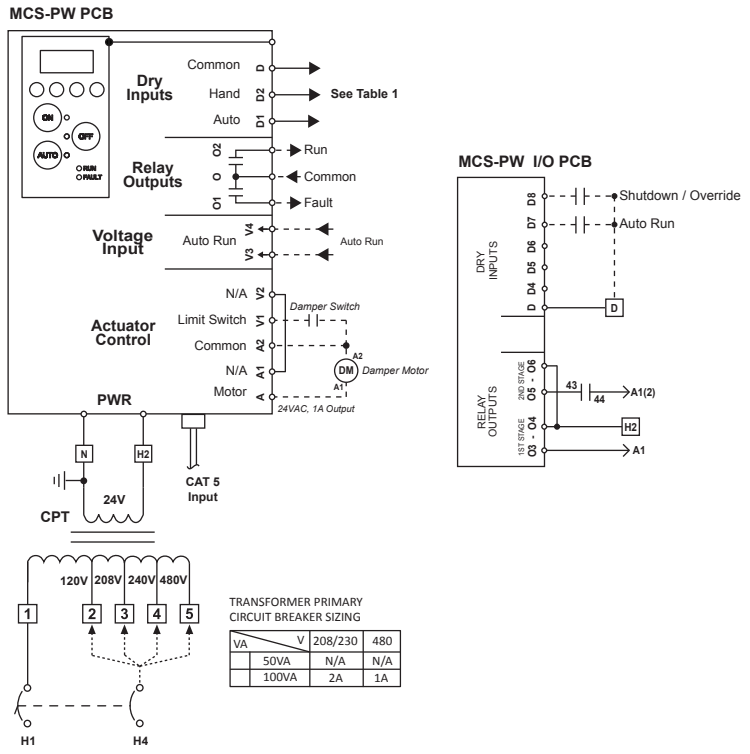
The part winding configuration allows the MCS to control part winding start motors. There are two 3-phase contactors each rated at 50% of the motor horse power. Each is connected to one set of windings on the motor. The MCS will connect one set of windings to power line during motor start and after a short adjustable time delay power will be applied to the second set of windings. Consult the motor manufacturer's documentation to determine which winding should be powered first and to check if contactor sizes should be adjusted for non-standard winding ratios. The time delay can be changed in advanced settings.

Menu Structure - MCS-PW



Adjustment	Description
0-3 Seconds	**Part Winding Delay:** Upon starting a part winding motor, the M1 contactor is closed first and the PW Timer starts. When the timer has expired, the M2 contactor will be closed and both sets of windings will be energized. • Default = 2.0 sec. • Delay cannot be disabled.

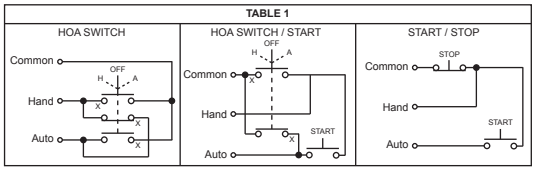
WIRING DIAGRAM
MCS-PW: SCM PART-WINDING STARTER

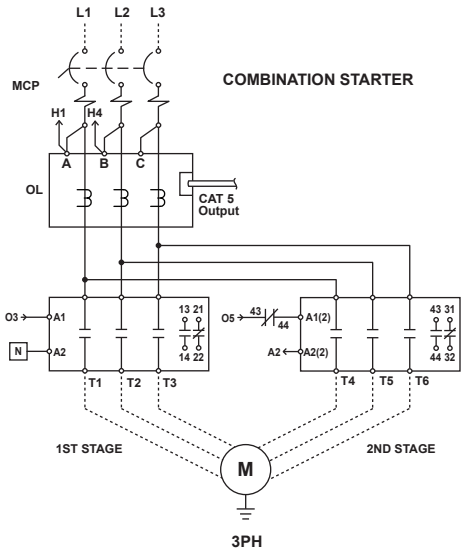


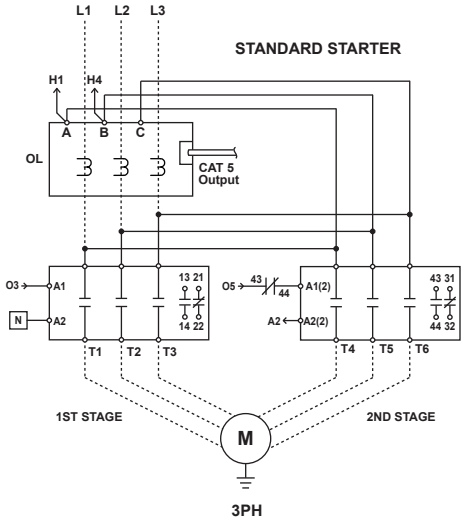
TRANSFORMER PRIMARY CIRCUIT BREAKER SIZING

VA \ V	208/230	480
50VA	N/A	N/A
100VA	2A	1A

TABLE 1



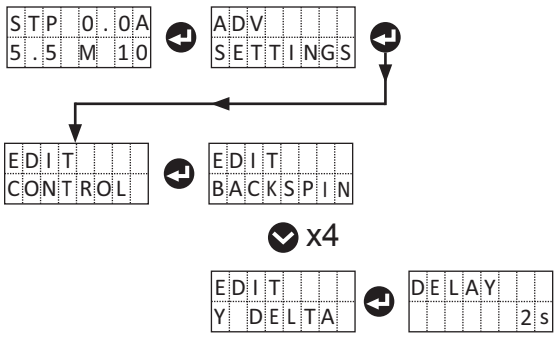




MCS, Wye-Delta Starters

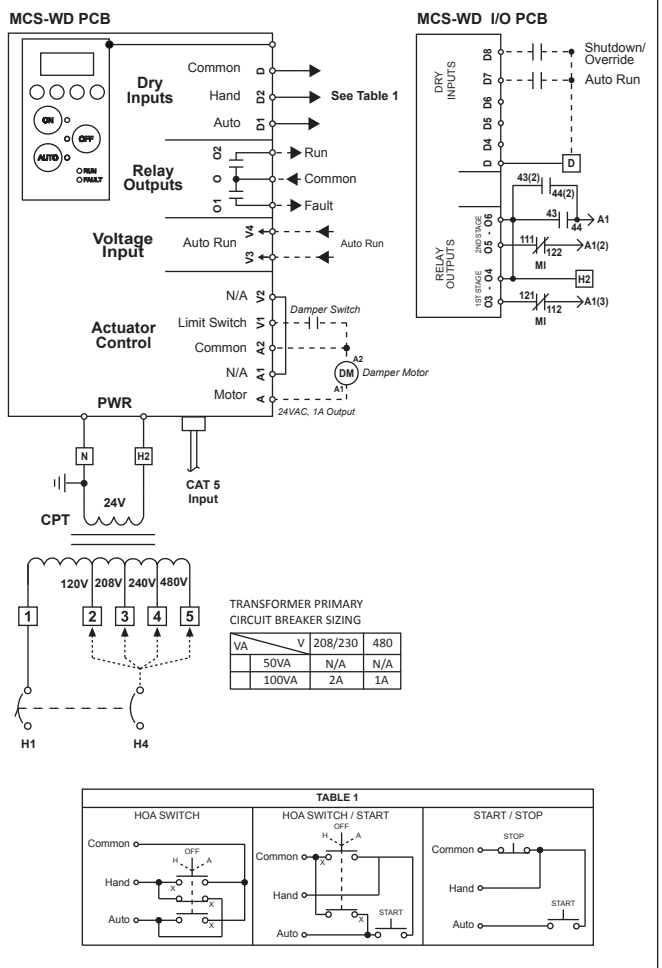
The Wye-Delta configuration allows the MCS to control Wye-Delta start motors by providing proper sequencing and time delay. The MCS controls three 3-phase contactors to start motor in Wye configuration and after time delay switching to Delta configuration. Upon receiving a start signal, the MCS energizes a shorting contactor S then contactor M1 and after a time delay S is de-energized and M2 is energized. The shorting contactor S and Delta contactor M2 are mechanically interlocked. The time delay can be changed in advanced settings.

Menu Structure - MCS-WD



Adjustment	Description
0-3 Seconds	**Wye-Delta Delay:** Upon starting a wye-delta motor, the S and M1 contactors will close and the Y-Delta timer will be started. When the timer is expired, the S contactor will be de-energized M2 contactor will be energized. • Default = 2.0 sec. • Delay cannot be disabled.

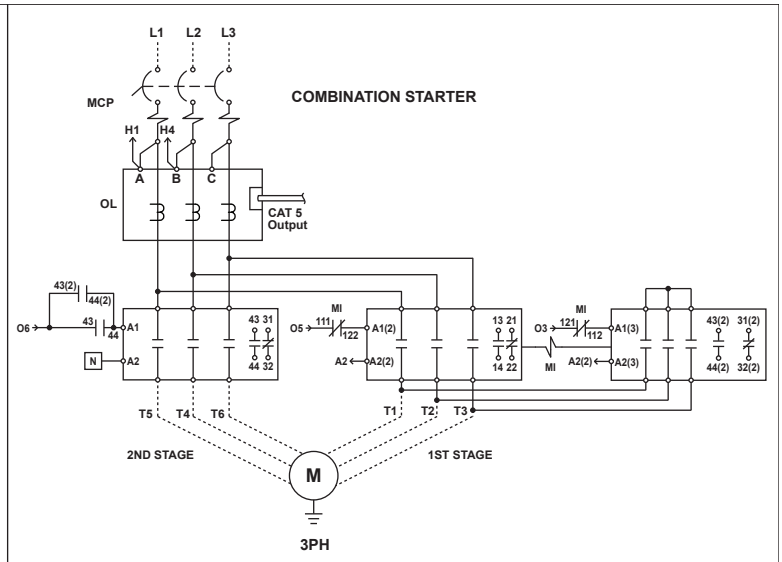
WIRING DIAGRAM
MCS-WD: SCM WYE-DELTA STARTER

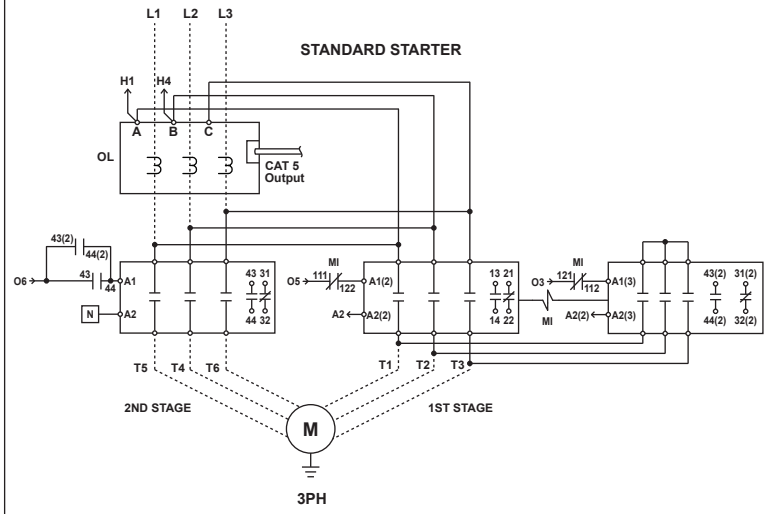


TRANSFORMER PRIMARY CIRCUIT BREAKER SIZING

VA \ V	208/230	480
50VA	N/A	N/A
100VA	2A	1A

TABLE 1

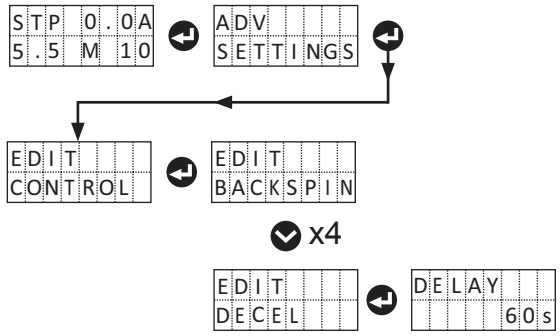




MCS, 2-Speed, 2-Winding and 2-Speed, 1-Winding Reconnectable Starters

The two-speed configuration allows the MCS to control either two-speed one-winding motors or two-speed two-winding motors. The connection details depend on the application, but in general, both setups are controlled by the MCS in the same manner. Each configuration has a high speed and a low speed contactor, only one of which is active at a given time. The MCS two-speed option also allows the user to individually set the FLA and nominal HP for the High and Low speed contactors.

Menu Structure - MCS-2S/2R



Adjustment	Description
0-9999 Seconds	**Decel Delay:** Whenever a two speed motor is switched from high to low speed, the Decel delay occurs. This delay allows the system to slow down before engaging the low speed contactor and should be set to a time enough to decrease motor RPMs to a half of motor nominal speed. • Default = 2.0 sec. • Delay cannot be disabled.

Appendix D - Warranty Information

Model Number	Starter Control Module		Warranty Period	
Customer Information	Name			
	Address			
	Tel.			
Sales Offics (Distributor)	Name			
	Address			
	Tel.			

Warranty period is 60 months after date of invoice when used in a motor control application. Detailed warranty terms and conditions are available from Cerus Industrial or can be found at www.cerusind.com

- **Warranty Service Information**
  - If the defective part has been identified under normal and proper use within the warranty term, contact and autorized Cerus distributer or Cerus service center.

- **Warranty is void if damage to the unit was caused by any of the following**
  - Damage was caused by misuse, negligence, or accident.
  - Damage was caused by abnormal voltage or peripheral devices' malfunction (failure).
  - Damage was caused by improper repair, or altering by someone other than a Cerus authorized distributor or service center.
  - Damage was caused by an earthquake, fire, flooding, lightning, or other natural calamities.
  - When Cerus nameplate is not attached.
  - When the warranty period has expired.