



# SubMonitor Connect Installation & Operation Manual



*S.W. Version 7.003*



# Safety Instructions

As with all electrical products, read the manual thoroughly before operating. Only qualified personnel should perform maintenance and installation. Contact the nearest authorized service facility for examination, repair, or adjustment. Do not disassemble or repair unit. Death or injury due to electrical shock or fire hazard may result. Specifications and manual data are subject to change.

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 to electrical shock or fire hazard may result. Specifications and manual data are subject to change. Consult factory for additional information.



## DANGER

Equipment can start automatically. Lockout/Tagout before servicing equipment.



## WARNING

This equipment must not be used by children or persons with reduced physical, sensory or mental abilities, or lacking in experience and expertise, unless supervised or instructed. Children may not use the equipment, nor may they play with the unit or in the immediate vicinity.

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## 1. Introduction

The Franklin Control Systems SubMonitor Connect is a technologically advanced electronic motor protection relay with integrated control inputs and a removable UL type 4X display.



### Features

- Overload
- Overcurrent
- Under and Overpower
- Under and Overvoltage
- Locked Rotor
- Stall
- Cycle Fault
- Insulation Check
- Current and Voltage Phase Unbalance
- Reverse Phase

### Overview

- 208 to 600VAC  $\pm$  10% for 3-Phase Systems
- 50 to 60 Hz  $\pm$  10%
- 0.1A to 1000A, External Current Transformers (CT's) are required above 135A
- Power Metering accurate to 1%
- PT100/PT1000 capable
- Password Protected Display
- 100+ events fault, start, and change logs

# SubMonitor

## CONNECT

### Protective Features Overview

Power Board Faults	SMS	SubMonitor Relay	RV	PW/WD
Overload	✓	✓	✓	✓
Out of Cal	✓	✓	N/A	N/A
Current Loss	✓	✓	✓	✓
Current Unbalance	✓	✓	✓	✓
False Start	✓	✓	✓	✓
Ground Fault	✓	✓	✓	✓
Insulation Check	✓	✓	✓	✓
Locked Rotor	✓	✓	✓	✓
Max Time to Start	✓	✓	N/A	✓
Negative Power	✓	✓	✓	✓
No Current	✓	✓	✓	N/A
Over Current	✓	✓	✓	✓
Over Power	✓	✓	✓	✓
Over Voltage	✓	✓	✓	✓
Overload	✓	✓	✓	✓
Stall	✓	✓	✓	✓
Subtrol+	✓	✓	✓	✓
Under Power	✓	✓	✓	✓
Under Voltage	✓	✓	✓	✓
Unexpected Current	✓	✓	✓	✓
Voltage Loss	✓	✓	✓	✓
Voltage Low	✓	✓	✓	✓
Voltage Reversal	✓	✓	✓	✓
Voltage Unbalance	✓	✓	✓	✓
Meter Hardware	✓	✓	✓	✓
Meter Software	✓	✓	✓	✓
I/O Board Faults	SMS	SubMonitor Relay	RV	PW/WD
Unexpected Current	✓		N/A	N/A
Voltage Loss	✓		N/A	N/A
Voltage Low	✓	✓	N/A	N/A
Voltage Reversal	✓	✓	✓	
Voltage Unbalance	✓	✓	N/A	N/A

## Protective Features Details

Motor Protection	Type	Displayed Text	Description	Default Setting (On/Off, Level, Trip Time)
Overload	Fault	OVERLOAD FAULT	Simulated I <sup>2</sup> T trip curve. Selectable Class 5-30, S and P. Trips if the current integrator exceeds the trip point. See Appendix A for details about integrator equation as well as trip curves.	Class 10
Over Current	Fault	OVERCURR FAULT	Trips if the measured current is continuously above the current threshold setting multiplied by the FLA for a time that exceeds the over current trip time setting.	On, 110%, 30 Sec
Over Power	Fault or Alarm	OVERPOWER FAULT	Trips if the measured kW is greater than the kW trip point setting continuously for a time that exceeds the over power trip time setting.	On, 125%, 3 Sec
Under Power	Fault or Alarm	UNDERPOWER FAULT	Trips if the measured kW is less than the kW trip point setting continuously for a time that exceeds the under power trip time setting.	On, 65%, 3 Sec
Negative Power	Alarm	NEG POWER FAULT	Alarms if the calculated real power is negative continuously for 1 second.	Off
False Start	Fault or Alarm	FALSE START FAULT	A start event should coincide with the current reading transitioning from the no current noise threshold to above this threshold. If these start transitions exceeds the number of starts in any 10 second period the starter will fault or alarm.	Off
Insulation Check	Fault	INSULATION FAULT	Trips if the measured resistance on a single motor winding is less than insulation check resistance trip threshold.	Off, 1000k Ohm (Alarm), 500k Ohm (Fault)
Over Voltage	Fault or Alarm	OVERVOLT FAULT	Trips if the average of the 3 line to line voltages exceeds the nominal voltage setting by the over voltage percentage setting continuously for a time exceeding the over voltage trip time setting.	On, 110%, 10 Sec
Under Voltage	Fault or Alarm	UNDERVOLT FAULT	Trips if the average of the 3 line to line voltages is lower than the nominal voltage setting by the under voltage percentage continuously for a time exceeding the under voltage trip time setting.	On, 90%, 10 Sec
Current Phase Unbalanced	Fault or Alarm	CURR UNBL FAULT	Trips if any of the 3 measured phase currents deviates from the average current by a value greater than or equal to the trip percentage setting.	On, 5%, 10 Sec
Voltage Phase Loss	Fault or Alarm	VOLT LOSS FAULT	Trips if the L-G voltage of any phase is below 60VAC.	

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Motor Protection	Type	Displayed Text	Description	Default Setting (On/Off, Level, Trip Time)
Voltage Phase Unbalanced	Fault or Alarm	VOLT UNBL FAULT	Trips if any of the 3 measured line to line voltages deviates from the average line to line voltage by a value greater than or equal to the voltage phase unbalance trip percentage setting for a time exceeding the Voltage Phase Unbalanced trip time setting.	Off, 1%, 10 Sec
Cycle Fault	Fault	CYCLE FAULT	Trips if run command is triggered at a rate exceeding the start limit divided by the limit period.	On
Locked Rotor	Fault	LCKD ROTOR FAULT	Trips if the current exceeds 300% of the FLA setting for 0.5 seconds, the current is flat or increasing and the power factor is not changing. This protection is active during the first 10 seconds of operation after a start.	On
Stall	Fault	STALL FAULT	Trips if the current exceeds 300% of the "calculated" FLA for 0.5 seconds, the current is flat or increasing and the power factor is not changing. This protection is active after the first 10 seconds of a start event and after the "calculated" FLA has been determined.	Off
Max Time to Start	Fault	START TIME FAULT	Trips if 10 seconds after current is detected following a contactor closure the average current is above 200% of the FLA setting and still declining. Disabled for 2 Speed Motor applications.	Off
Out of Calibration	Fault	OUT OF CAL FAULT	Trips if the measured peak inrush is outside the range of 400% to 1400% of the FLA/SFA setting. This protection is only active during each start sequence and for 10 seconds after every start. This fault is disabled for single phase and soft-starter applications.	Off
PT100/1000 Over Temp	Fault	RTD TEMP FAULT	Trips if the temperature measured by a PT100 or PT1000 exceeds the trip temperature setting.	Off
Reverse Phase	Fault	PHASE ORDR FAULT	Trips if the phase order detected is different than phase order setting of either A-B-C or A-C-B.	On
No Current	Fault or Alarm	CURR LOSS FAULT	Trips if after the contactor is engaged for 60 seconds and there has not been any current measured by the electronic motor protection relay. Disabled for submersible applications since some protection for this application is dependent on the presence of current.	Off



Motor Protection	Type	Displayed Text	Description	Default Setting (On/Off, Level, Trip Time)
Unexpected Current Flow	Alarm	UNEXP CURR FAULT	Alarms if the starter detects current flow above a threshold of 0.2 Amps while the starter is in the stopped state.	Off
Ground Fault	Fault	GROUND FAULT	Trips if the vector sum of the 3 measured phase currents exceeds the ground fault threshold setting. See Appendix A for details on this fault.	On, 1A
Invalid Float Switch State	Fault or Alarm	FLOATS FAULT	When using the float mode capability there are invalid float states in both fill and drain mode. If the starter detects either of these states the starter will fault or alarm.	On
Gate Drive Board Phase Failure (Soft Starters Only)	Fault	GDB PHASE FAULT	Trips on this fault when there is an absence of zero crossing on of the detection channels on the gate drive board.	On
Gate Drive Board Frequency Check (Soft Starters Only)	Fault	GDB FREQ FAULT	Trips on this fault if the line frequency measured by the gate drive board is outside of the range of 50-60Hz +/- 10%.	On
SCR Over Temperature (Soft Starters Only)	Fault	SCR TEMP FAULT	Trips on this fault if the estimated SCR junction temperature exceeds the rating of 110 degrees Celsius.	On

### Filling and Draining Using Float Switches

Together, the two dry inputs can be utilized for float switch operation. The float switch can either operate in fill or drain mode. The following table defines fill and drain operations. The float switches should be configured to be active when they are floating on the water.

#### Fill Operation:

SW1	Status	SW2	Status	Operation
LO	Inactive	HI	Inactive	Start Command
LO	Active	HI	Inactive	Continue Last State
LO	Active	HI	Active	Stop Command
LO	Inactive	HI	Active	Invalid State (Fault)

#### Drain Operation:

SW1	Status	SW2	Status	Operation
LO	Active	HI	Active	Start Command
LO	Active	HI	Inactive	Continue Last State
LO	Inactive	HI	Inactive	Stop Command
LO	Inactive	HI	Active	Invalid State (Fault)

The SubMonitor Connect overload relay serves as the platform the SubMonitor Connect Starter, Reduced-Voltage Starter, Part-Wind Starter, and Wye-Delta Starter. The following diagrams refer to input and outputs related to each specific product line.

## 2. Specifications

### SMUS

SM-US Control Terminals		
Symbol	Name	Description
Relay Outputs		
01	Fault	When active (closed), a fault has occurred and the starter is no longer running.
0	Common	Common terminal for Fault and Run Output.
02	Run	When active (closed), the motor is running and there is proof of flow.
PT100/1000		
I-/V-	Negative Connection for Excitation Current and Voltage Sense	Negative connection for both the excitation circuit and the voltage sensing circuit for 2, 3, and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
V+	Positive Voltage Sense	Positive connection for voltage sensing circuit for 2, 3, and 4 wire PT100/PT1000 RTD. See PT100/1000 operation section in this manual for details.
I+	Positive Excitation Current	Positive connection for excitation current circuit for 2, 3 and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
Modbus RTU		
+	Positive RS-485 Wire	Provides RS-485 connection for Modbus RTU Communications.
-	Negative RS-485 Wire	
SG	Shield Wire	
Control Circuit		
M1-M3	Contactor	Provides a Triac capable of closing 24 VAC to 600 VAC LS manufactured contactors rated up to 800 Amps. Capable of closing other contactors with coil current ratings up to 2 Amps.

## SMS/SMS-RV 150AF and Below

SMS Control Terminals		
<p>The diagram shows a control panel with the following components:         <ul style="list-style-type: none"> <li><b>TERMINATION</b>: Two square cutouts.</li> <li><b>RS-485 Modbus</b>: Terminals labeled '+', 'SG', and '-'.</li> <li><b>RELAY OUTPUT</b>: Terminals labeled '01', '02', and '0'.</li> <li><b>FAULT</b>: A terminal labeled 'I+'.</li> <li><b>PT100/1000</b>: Terminals labeled 'V+', 'I-', and 'V-'.</li> <li><b>12-250V VOLTAGE INPUT</b>: Terminals labeled 'V1' and 'V2'.</li> <li><b>DRY INPUTS</b>: Terminals labeled 'SG', 'D1', and 'D2'.</li> <li><b>PILOT DEVICE INPUTS</b>: Terminals labeled 'SG', 'D3', and 'D4'.</li> <li><b>TEST/RESET</b> and <b>FAULT</b>: Two circular buttons.</li> </ul> </p>		
Symbol	Name	Description
Wet Input 12-250VAC/DC		
V1-V2	Auto Run	When proper voltage is applied, the relay will start the motor in Auto Mode.
Relay Outputs		
01	Fault	When motor protection relay faults the relay output between 01 and 0 will be closed.
0	Common	Common terminal for Fault and Run Output.
02	Run	When motor protection relay starts and there is proof of flow the relay output between 02 and 0 will be closed.
Dry Inputs		
D1	Auto Run	Default: When active (closed between D1 and D), the motor protection relay will start the motor in Auto Mode.
	Low Float	Option: Used with D2 to make up float switch operation in fill or drain mode.
D2	Shut Down	Default: When active (open between D2 and D), the motor protection relay will stop the motor in all modes.
	High Float	Option: Used with D1 to make up float switch operation in fill or drain mode.
D	Common	Common terminal for D1/D2 Dry inputs.
Pilot Device Inputs		
D3	Hand	These dry inputs are factory wired to door mounted pilot devices.
D4	Auto	
D	Common	

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Symbol	Name	Description
PT100/1000		
I-/V-	Negative Connection for Excitation Current and Voltage Sense	Negative connection for both the excitation circuit and the voltage sensing circuit for 2, 3, and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
V+	Positive Voltage Sense	Positive connection for voltage sensing circuit for 2, 3, and 4 wire PT100/PT1000 RTD. See PT100/1000 operation section in this manual for details.
I+	Positive Excitation Current	Positive connection for excitation current circuit for 2, 3 and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
Modbus RTU		
+	Positive RS-485 Wire	Provides RS-485 connection for Modbus RTU Communications.
-	Negative RS-485 Wire	
SG	Shield Wire	
Control Circuit		
C+, C-	Contactor	Provides 24V PWM output for closing 24 VAC LS manufactured contactors rated up to 150 Amps.

### SMS/SMS-RV above 150AF

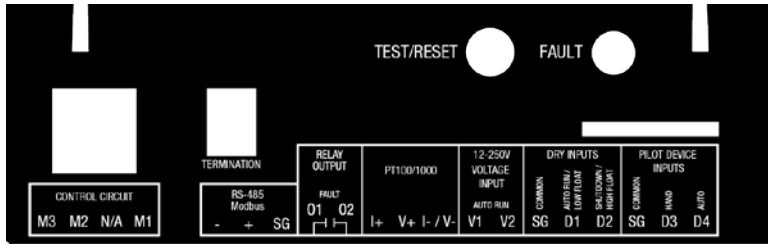
SMS+ Control Terminals		
Symbol	Name	Description
Wet Input 12-250VAC/DC		
V1-V2	Auto Run	When proper voltage is applied, the relay will start the motor in Auto Mode.
Relay Outputs		
01	Fault	When motor protection relay faults the relay output between 01 and 0 will be closed.
0	Common	Common terminal for Fault and Run Output.
02	Run	When motor protection relay starts and there is proof of flow the relay output between 02 and 0 will be closed.

Symbol	Name	Description
<b>Dry Inputs</b>		
D1	Auto Run	Default: When active (closed between D1 and D), the motor protection relay will start the motor in Auto Mode.
	Low Float	Option: Used with D2 to make up float switch operation in fill or drain mode.
D2	Shut Down	Default: When active (open between D2 and D), the motor protection relay will stop the motor in all modes.
	High Float	Option: Used with D1 to make up float switch operation in fill or drain mode.
D	Common	Common terminal for D1/D2 Dry inputs.
<b>Pilot Device Inputs</b>		
D3	Hand	By default, the dry inputs are factory wired to door mounted pilot devices.
D4	Auto	
D	Common	
<b>PT100/1000</b>		
I-/V-	Negative Connection for Excitation Current and Voltage Sense	Negative connection for both the excitation circuit and the voltage sensing circuit for 2, 3, and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
V+	Positive Voltage Sense	Positive connection for voltage sensing circuit for 2, 3, and 4 wire PT100/PT1000 RTD. See PT100/1000 operation section in this manual for details.
I+	Positive Excitation Current	Positive connection for excitation current circuit for 2, 3 and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
<b>Modbus RTU</b>		
+	Positive RS-485 Wire	Provides RS-485 connection for Modbus RTU Communications.
-	Negative RS-485 Wire	
SG	Shield Wire	
<b>Control Circuit</b>		
M1-M3	Contactor	Provides a Triac capable of closing 24 VAC to 600 VAC LS manufactured contactors rated up to 800 Amps. Capable of closing other contactors with coil current ratings up to 2 Amps.

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## SMS PW/WD – Part Winding and Wye-Delta Variant

### SMS-PW-WD Control Terminals



Symbol	Name	Description
Wet Input 12-250 VAC/DC		
V1-V2	Auto Run	When proper voltage is applied, the relay will start the motor in Auto Mode.
Relay Outputs (Relay contacts rated for: up to 240 Volts at 1.0 Amp)		
O1	Fault	When motor protection relay faults the relay output between O1 and O will be closed.
O	Common	Common terminal for Fault and Run Output.
O2	Run	When motor protection relay starts and there is proof of flow the relay output between O2 and O will be closed.
Dry Inputs		
D1	Auto Run	Default: When active (closed between D1 and D), the motor protection relay will start the motor in Auto Mode.
	Low Float	Option: Used with D2 to make up float switch operation in fill or drain mode.
D2	Shut Down	Default: When active (open between D2 and D), the motor protection relay will stop the motor in all modes.
	High Float	Option: Used with D1 to make up float switch operation in fill or drain mode.
D	Common	Common terminal for D1/D2 Dry inputs.
Pilot Device Inputs		
D3	Hand	By default, the dry inputs are factory wired to door mounted pilot devices.
D4	Auto	
D	Common	

Symbol	Name	Description
PT100/1000		
I-/V-	Negative Connection for Excitation Current and Voltage Sense	Negative connection for both the excitation circuit and the voltage sensing circuit for 2, 3, and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
V+	Positive Voltage Sense	Positive connection for voltage sensing circuit for 2, 3, and 4 wire PT100/PT1000 RTD. See PT100/1000 operation section in this manual for details.
I+	Positive Excitation Current	Positive connection for excitation current circuit for 2, 3 and 4 wire PT100/1000 RTD. See PT100/1000 operation section in this manual for details.
Modbus RTU		
+	Positive RS-485 Wire	Provides RS-485 connection for Modbus RTU Communications.
-	Negative RS-485 Wire	
SG	Shield Wire	
Control Circuit		
M1-M3	Contactor	Provides a Triac capable of closing 24VAC to 600VAC LS manufactured contactors rated up to 800 Amps. Capable of closing other contactors with coil current ratings up to 2 Amps.

## 3. Installation



### 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.
- 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.
- 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.
- Do not allow any metal shavings or debris from installation to enter enclosure.

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### Wiring

Wire main power input, ground and motor leads to the appropriate terminals tightened to specified torques indicated in the Torque Table. Use only copper conductors rated at least 60°C for applications less than 100A and at least 75°C  $\geq$  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.

### Terminal Torque Specifications

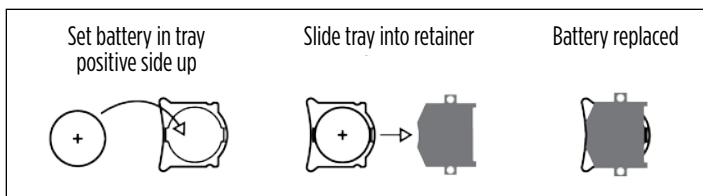
**Low Voltage Wiring** — Automation system control wiring should be run in a separate conduit. The control terminals accept 26-14AWG wire torqued to 3.5 in-lb.

SMS/SMS-RV Power Wiring Torque Table (lb-in)

NEMA Size	SMS			SMS-RV		
	Input		Output	Input		Output
	MMS Disconnect	No Disconnect		MCCB Disconnect	No Disconnect	
	L1-L2-L3	L1-L2-L3	T1-T2-T3	L1-L2-L3	L1-L2-L3	T1-T2-T3
1	60	10.6	35	60	10.6	35
2	90	10.6	35	90	10.6	35
3	150	61	35	150	61	35
3+	325	61	35	325	61	35
4	375	49.5	87	375	49.5	49.5
5	375	88	200	375	88	200
5+	375	88	200	N/A	N/A	N/A

### Battery Replacement

See Below





## Electrical Installation

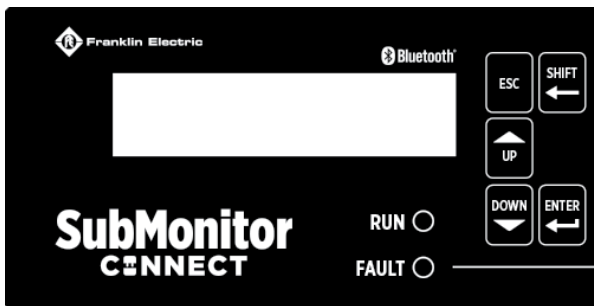
### DEVICE COMPONENTS for Overload Unit Only.

#### Base Unit



- ① | Voltage Inputs (L1, L2, L3)
- ② | Integrated Sensor Coils
- ③ | Insulation Check Connection
- ④ | Test/Reset Switch
- ⑤ | Fault Light (Base)
- ⑥ | Bluetooth Pairing QR Code
- ⑦ | Control Circuit Terminals
- ⑧ | Input/Output Terminals

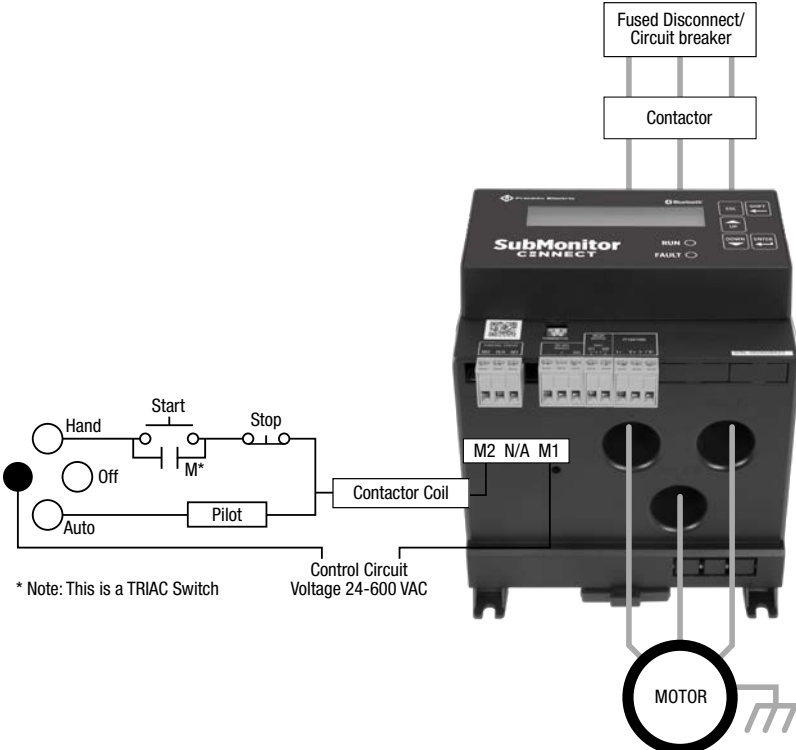
#### Detachable Display Unit



Menu Selector Buttons

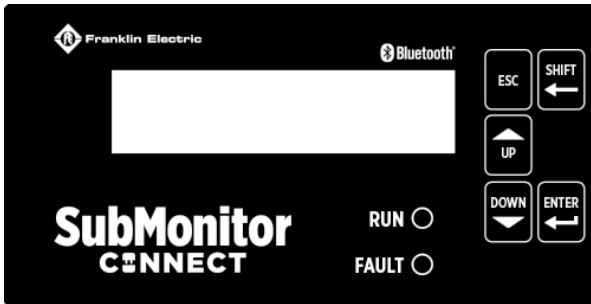
Fault Light LED

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## 4. Operation

Each function of this Motor Protection Relay is accessible through the keypad as shown below.



*Remote Display Non-HOA Version*

- **Run LED (Green)** — LED will be on if the contactor coil is energized and there is proof flow. This LED will blink if there is a run command to the starter 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 that the starter is in (Hand, Off, or Auto) will be blinking. This LED will also blink if the measured current is above the programmed FLA/SFA.
- **ESC button** — Navigates back one menu when depressed. Cancels parameter edit when in edit mode.
- **Shift button** — Shifts cursor position one position left for every button press while in edit mode.
- **Up/Down buttons** — Navigated Up/Down through menu when depressed. Increments/Decrements value of parameter where the cursors is blinking when in edit mode.
- **Enter button** — Depressing this button on an editable parameter will enter edit mode. Depressing again while in edit mode will save the current parameter value.

**Home Screen** — When starter is idle for X amount of time the starter will go to its home screen. Alternately, if you are not at the home screen, you can press ESC until you reach the home screen represented below.

SHDWN		0.1V
OFF	B	0.1A

**SHDWN** — This position will show the state of the Relay, i.e. Run/Stop/Fault/Shutdown.

**OFF** — This position will show the current state of the Hand/Off/Auto device, either the pilot device of the HOA remote device.

**B** — This position will show the status of Bluetooth Communications. If the Bluetooth logo is present then the starter is connected via Bluetooth to a mobile device. If the Bluetooth logo is not present, there is no active connection presently.

**0.1V** — This position will display the average Phase voltage measurement.

**0.1A** — This position will display the average Phase current measurement.

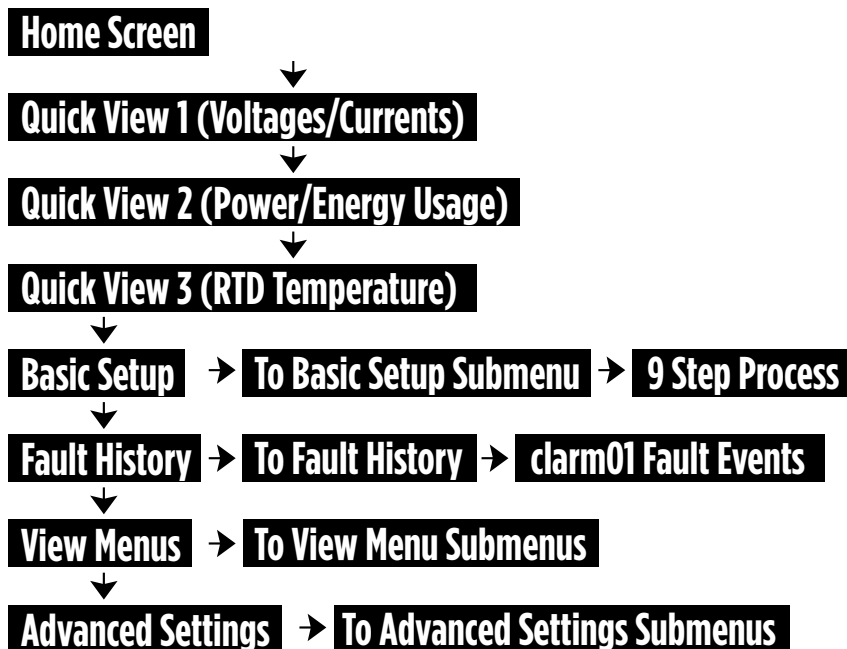
# SubMonitor

## CONNECT

### Startup

When unit is initially powered on, it will automatically go to the Basic Setup settings. Here you will set your Application, Motor HP, Incoming Voltage, Motor FLA/SFA, Power Fail Mode, Overvoltage, Underpower, Current Unbalance, Date and Time and Tag/Name of the Device (for Bluetooth usage if desired).

If you wish to make changes to the settings in Basic Setup, simply press down arrow from the Home Screen three times until you see Basic Setup.

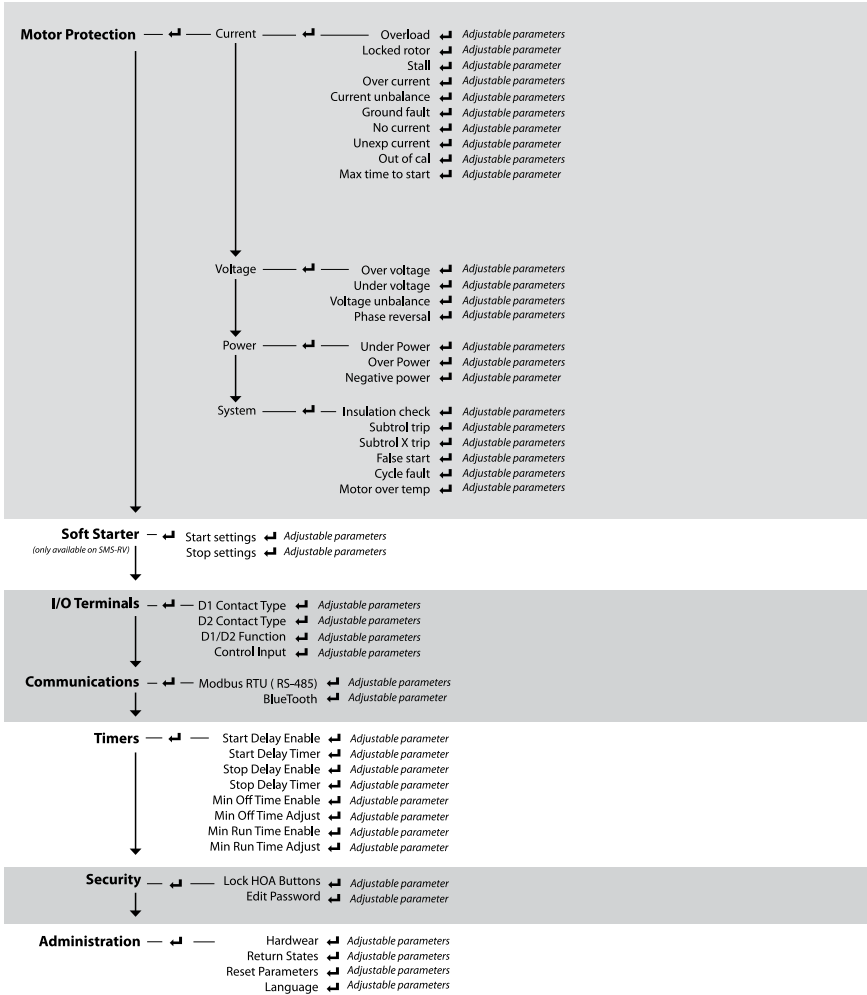


### Menu Overview

#### Basic Structure:

Basic Setup	Navigation	Function
Application	← →	Select application
Nominal Voltage	← →	Adjust voltage
Motor FLA/SFA	← →	Adjust amperage
Power Fail Mode	← →	Toggle "off" or "Last"
Overvoltage	← →	Alarm only, fault and alarm, off
Overvoltage	← →	Adjust percentage
Underpower	← →	Alarm only, fault and alarm, off
Underpower	← →	Adjust percentage
Current Unbal	← →	Alarm only, fault and alarm, off
Current Unbal	← →	Adjust percentage
Date		
Time		
Name Tag	← →	Assign name (16 characters, A-Z and underscores only)

## Advanced Settings:



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## Pilot Device Inputs

### Standard HOA Operation:

Function	Hand Input	Auto Input
Hand Run	Active	Inactive
Off Mode	Inactive	Inactive
Auto Mode	Inactive	Active
Invalid State	Active	Active

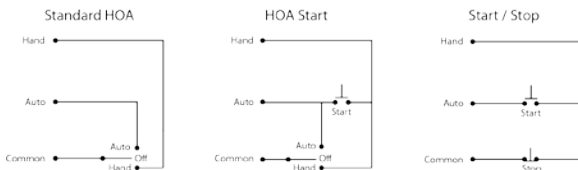
### HOA w/Start Operation:

Function	Hand Input	Auto Input
Hand Run + Start	Active	Momentarily Active
Off Mode	Inactive	Inactive
Auto Mode	Inactive	Active
Continue Hand (On/Off)	Active	Inactive

### Start Stop Operation:

Function	Hand Input	Auto Input
Start	Active	Momentarily Active
Stop	Momentarily Inactive	Inactive
Invalid State	Inactive	Active
Continue Run or Stop	Active	Inactive

### Control Input Wiring Diagrams:



## Communications

### Modbus RTU:

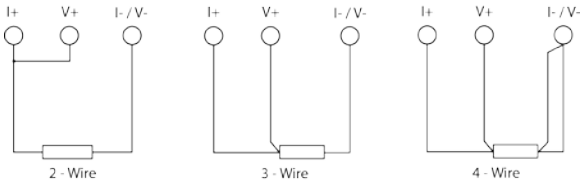
The SubMonitor Connect, and SMS platform provide a Modbus RTU communication interface via the RS-485 physical layer capable of supporting 128 total devices at a maximum baud rate of 115200 at a maximum distance of 2000 feet. See Table 1 for maximum baud rates and their respective maximum distances.

Maximum Distance	Maximum Baud Rate
2000 ft.	115200
3000 ft.	76800
4000 ft.	19200

Table 1 — Communication Cable Distance vs Communication Data Transfer Rates

## PT100/1000 and PTC Over Temperature

The PT100/1000 input is capable of measuring a resistance from 0 to 5Kohm to an accuracy of  $\pm 1\%$ . This covers the entire applicable temperature range for the PT100 and PT1000 and PTC thermistors. This temperature readout will be displayed to the nearest 1°C.



## Bluetooth and Mobile App

You are able to modify a majority of the basic and advanced settings on the relay via a mobile device equipped with iOSxx or greater and the relays onboard Bluetooth communications chip. In addition to modifying settings, you are able to monitor parameters, fault logs, configuration change logs and starts logs.

### Connecting to Bluetooth:

1. Download and Open the FE Connect App
2. Select SubMonitor Connect Product Family

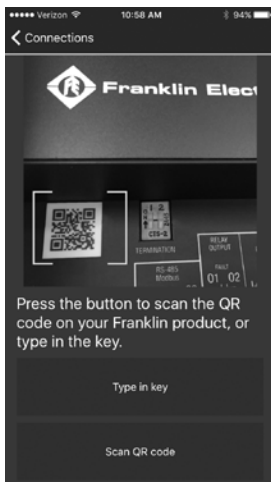


# SubMonitor CONNECT

### 3. Select +New Connection

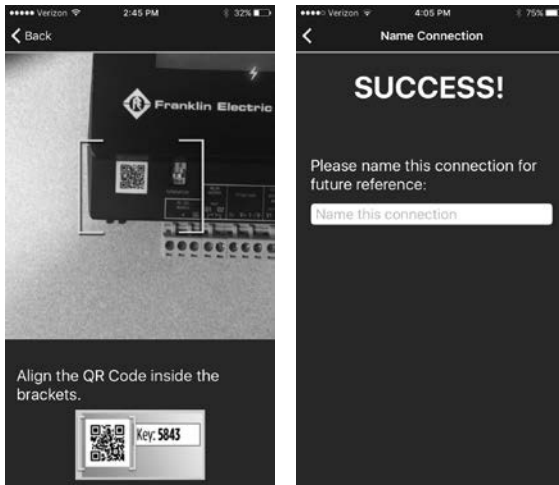


### 4. Select either Type in Key or Scan QR Code



- a. Type in key
  - i. Input the Bluetooth Key which can be found in plain text on the SubMonitor Connect label or via the user interface on the relay: View Menu > View I/O Status > Bluetooth Key
- b. Scan the QR Code
  - i. Locate the QR code on the front of the relay and place it within the Green box on your mobile device interface.
  - ii. Name and Save the connection for future use.





5. Once connected, you will see “Connected” at the top of your FE Connect App at the top of your mobile device and alternately the Bluetooth log will be shown on the Home Screen of the relay’s user interface. To get to the home screen, press the ESC key until you’re at the home screen.

## Subtrol

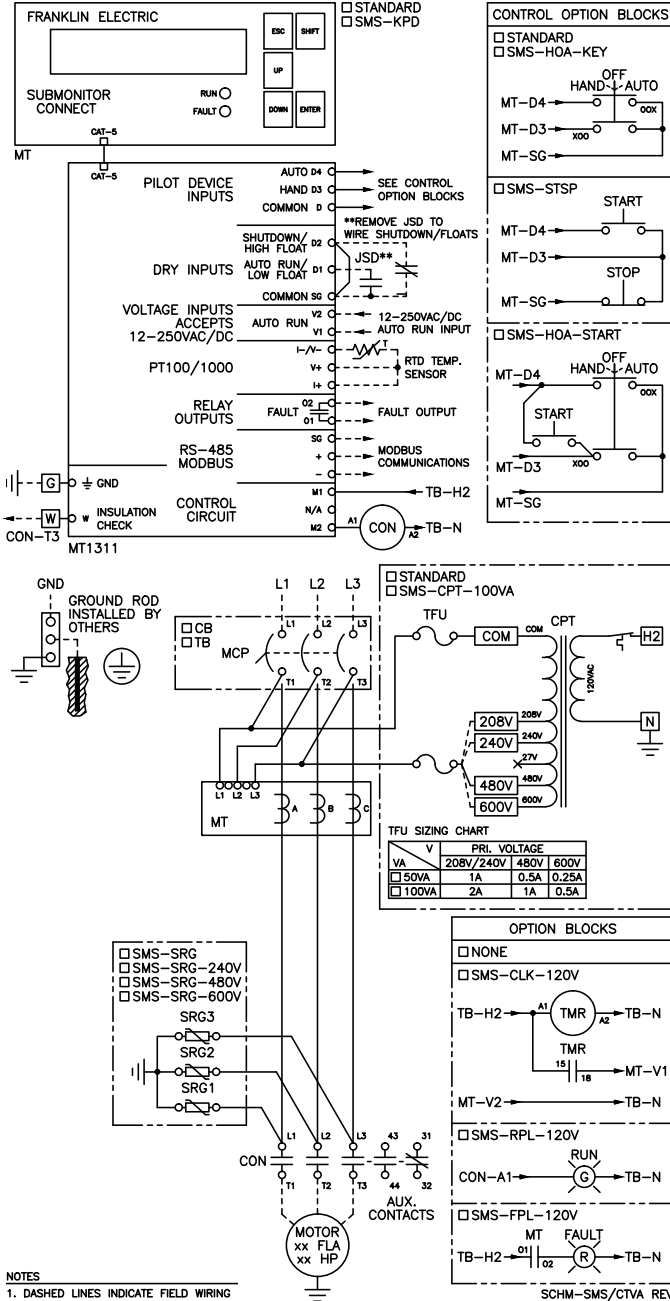
The SubMonitor Connect will be forward compatible with any future releases or revisions to the Subtrol technology. Future releases of this technology will include temperature readout to the SubMonitor Connect of both winding and lower bearing temperature.

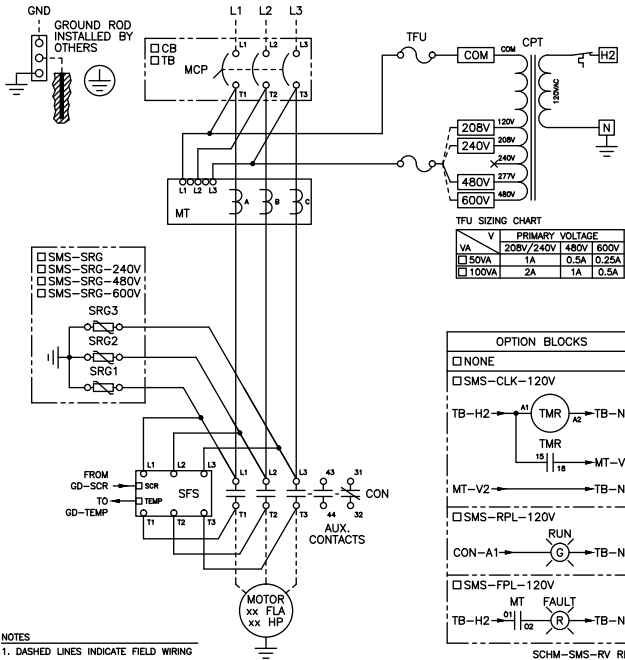
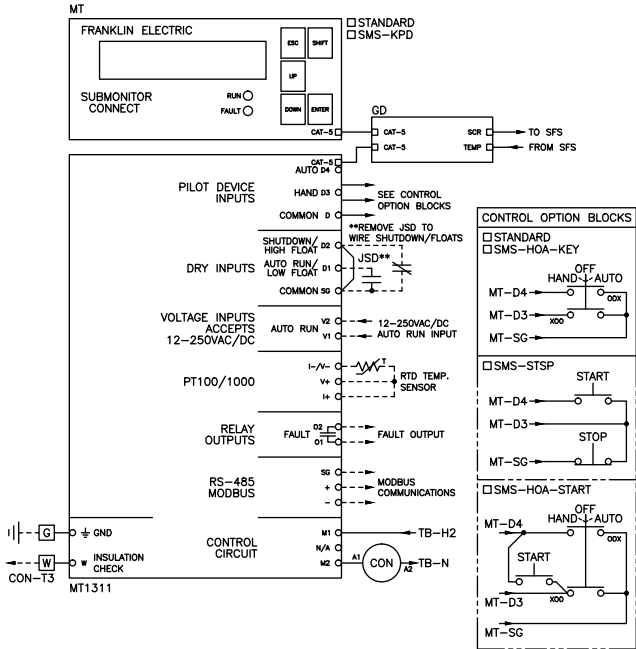
## Applicable Standards

- CSA
  - CSA C22.2 No. 90647-4-1-07-XXX
- IEC
  - IEC 61000-3-2:2006 – Electromagnetic Compatibility
  - IEC 61000-3-3:2008 – Electromagnetic Compatibility
  - IEC 61326-1:2006 – Electrical Equipment for Measurement, Control & Laboratory Use
  - IEC 60947 – Low Voltage Switchgear and Controlgear
- UL/CSA
  - UL 50 – Enclosures for Electrical Equipment, Environmental Considerations
  - UL 50E – Enclosures for Electrical Equipment, Environmental Considerations
  - UL 94 – Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
  - UL 508A – Industrial Control Panels (Reference)
  - UL 1053 – Ground Fault Sensing and Relaying Equipment
  - UL 60947-1 – Low Voltage Switchgear and Controlgear
  - UL 60947-4-1A – Contactors and motor-starters, Electromechanical Contactors and Motor-Starters

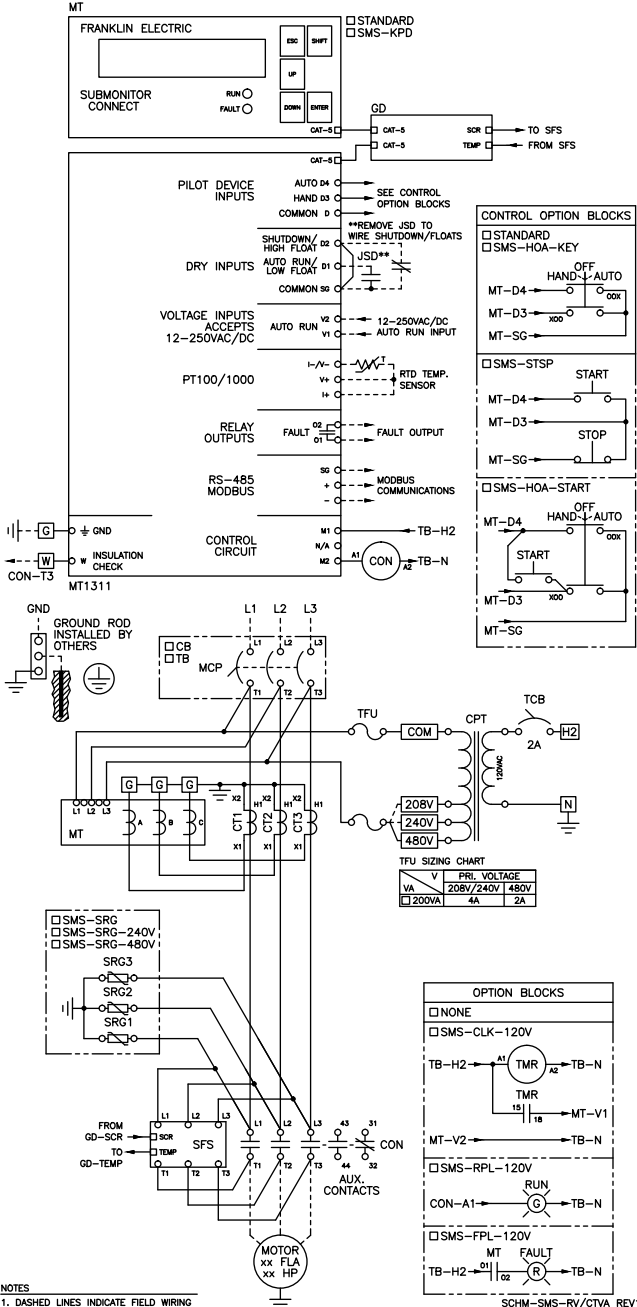
# SubMonitor CONNECT

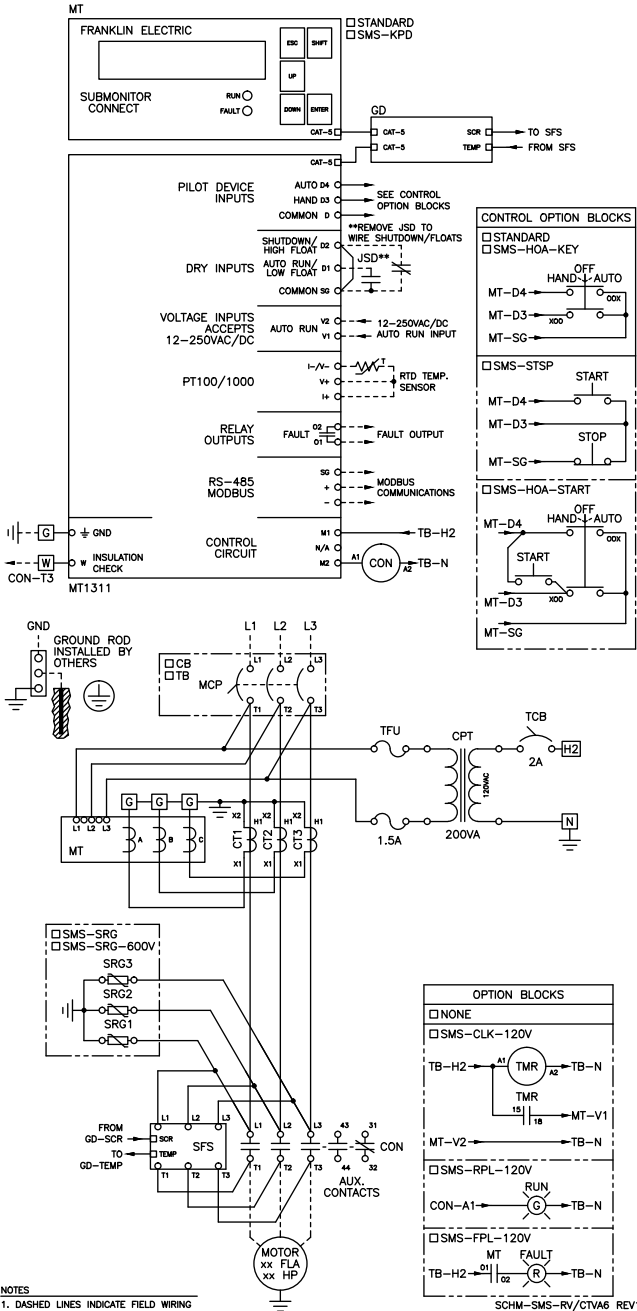
## Wiring Diagrams/Schematics



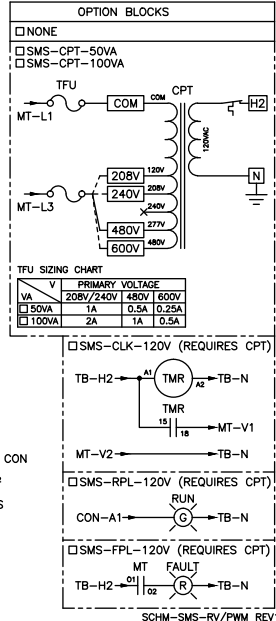
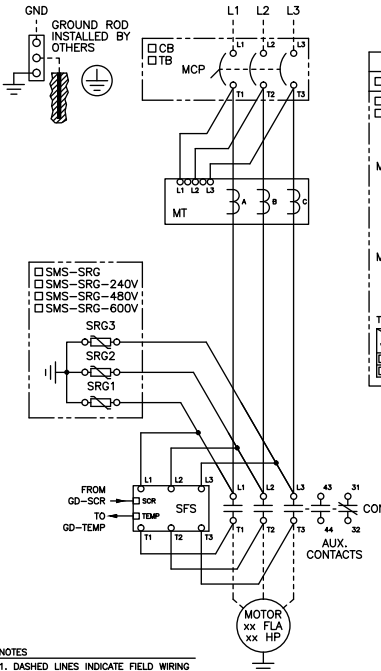
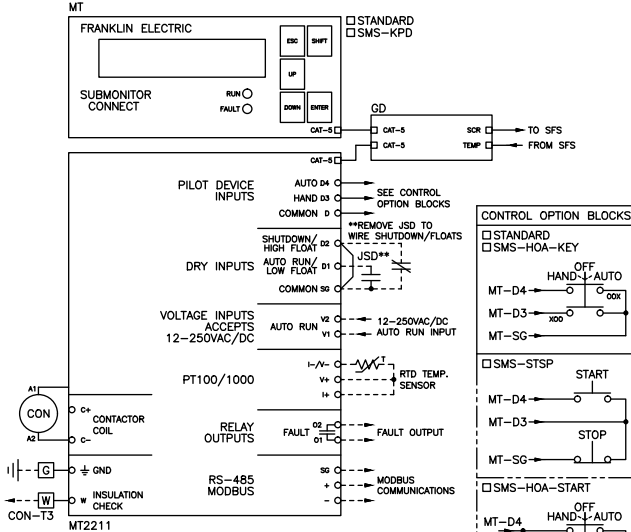


# SubMonitor CONNECT



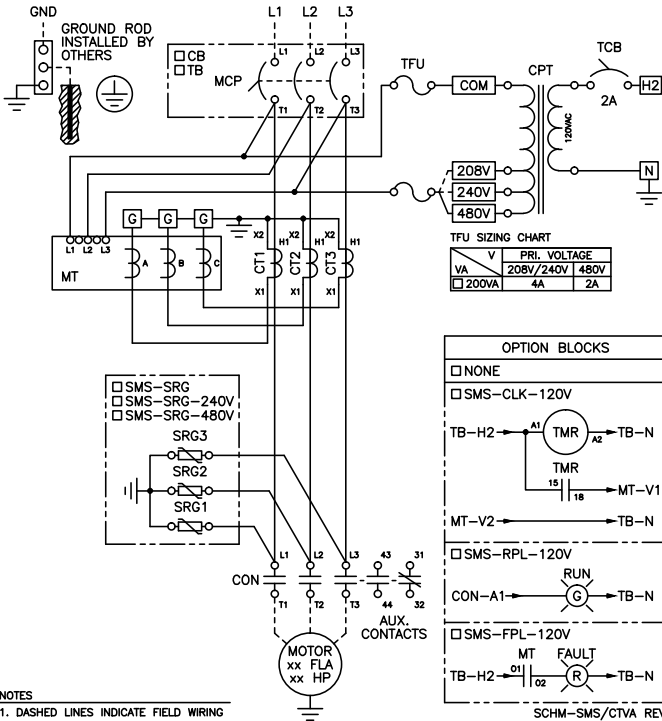
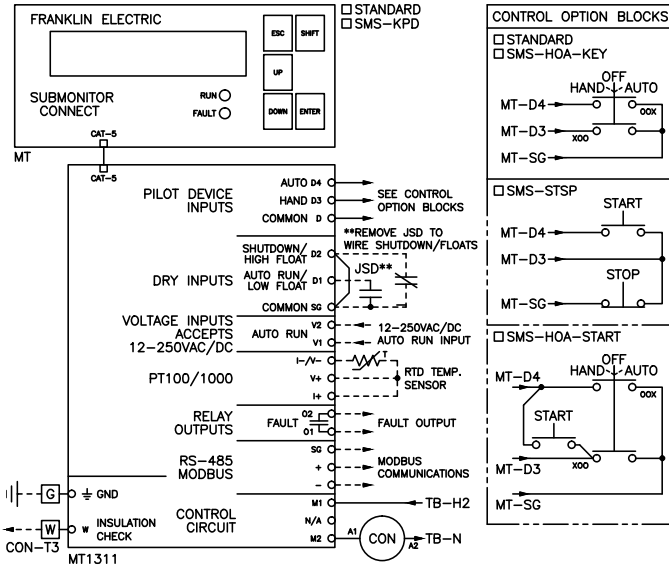


# SubMonitor CONNECT



NOTES  
1. DASHED LINES INDICATE FIELD WIRING

SCHM-SMS-RV/PWM REV1

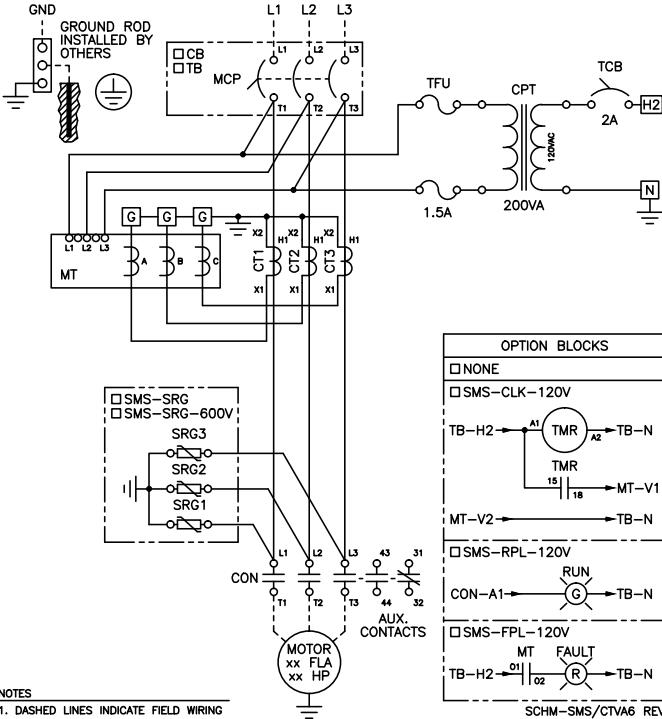
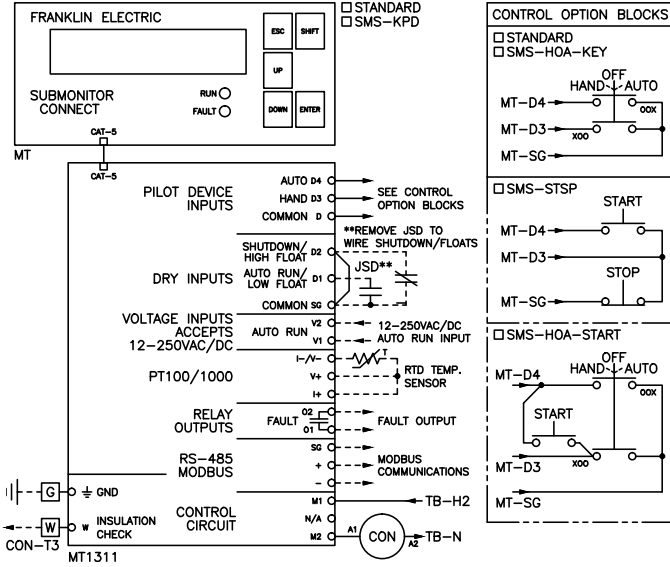


**NOTES**

1. DASHED LINES INDICATE FIELD WIRING

SCHM-SMS/CTVA REV1

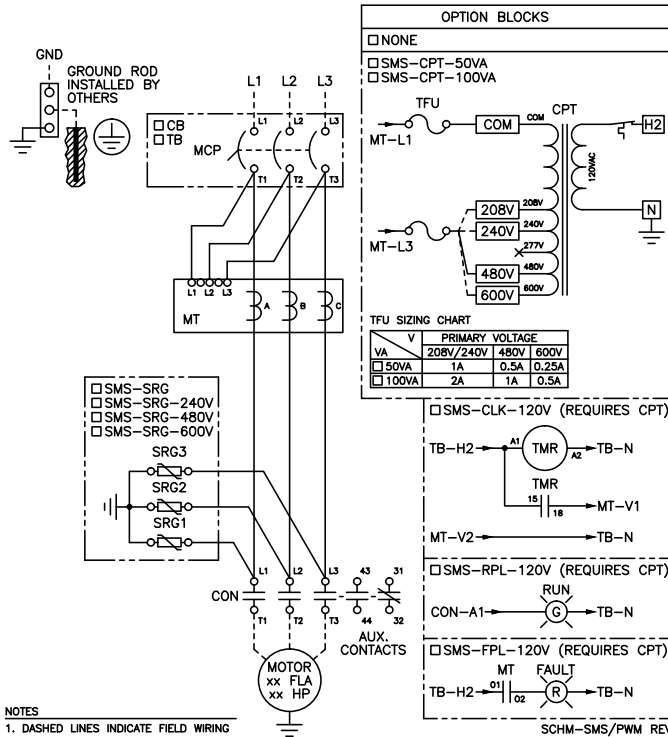
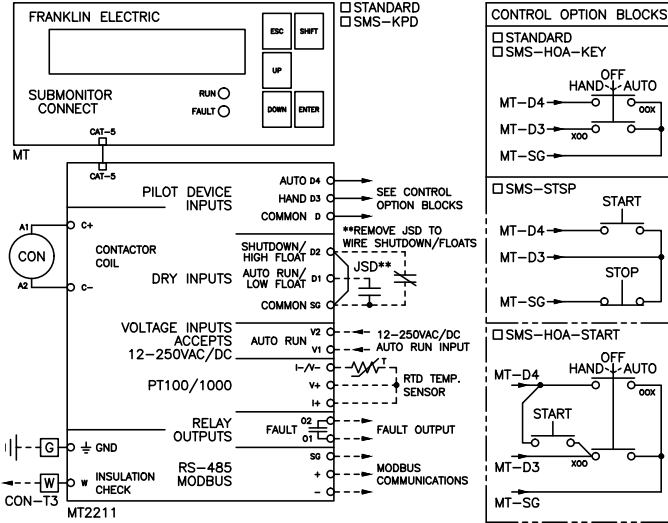
# SubMonitor CONNECT



**NOTES**

1. DASHED LINES INDICATE FIELD WIRING





## I. Appendix

### A. Overload and Ground Fault Trip Curves and Integrator Equations

- i. Overload Integrator — Thermal overload shall trip if the current integrator exceeds the trip point. The equation for the integrator is given by:

$$T_i[n] = T_i[n-1] - \frac{(T_i[n-1] - I_{max}^2) \times SVFC^2 \times T_s}{K \times T_c}$$

The equation for the trip point is given by:

$$T_p = (FLA \times SVFC)^2$$

$T_i$  = Thermal integrator

$I_{max}$  = Highest of the 3 measured phase currents.

**SVFC** = Motor service factor 1.15 by default. Note that the stored format of SVFC is different from format for calculations. Must divide by 100.

$T_s$  = Sample period in seconds. This must be equal to the time that elapses between calls of the thermal overload function. The SCM platform is based on a 100ms sample period. A maximum sample period of 50ms is required for the SubMonitor Connect while 1 sample per cycle -16.6ms sample period is desired.

$T_c$  = User selected trip class. 5, 10, 20, 30

**K** = Scaling Constant. For standard operation K = 36.

- ii. Ground Fault Integrator — Ground fault is determined by taking the vector sum of the three measured phase currents. This vector sum is fed into an integrator to generate a trip curve for the ground fault. The equation for ground fault trip integrator is given by:

$$G_i[n] = G_i[n-1] - \frac{(G_i[n-1] - I_{gnd}) \times Err \times T_s}{K \times T_c}$$

The trip point is equal to the user set ground fault current in amps. The ground fault must trip if the accumulator exceeds the trip point.

$G_i$  = Ground Fault Integrator.

$I_{gnd}$  = Calculated ground current, must be updated for each call of the ground fault function.

**Err** = Error factor set equal to 1.3

$T_s$  = Sample period set equal to the time between calls of the ground fault function.

**K** = Constant, ignore set equal to 1.

$T_c$  = Trip class multiplier, set equal to 2.5.

### B. Warranty Information

3 years



**TOLL-FREE HELP FROM A FRIEND**  
**Franklin Electric**  
**Technical Service Hotline**  
**800-348-2420**



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07.17



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