

Solid State Controls →

SSMC Motor Controller Manual



**Solid State Controls
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Version 1.4

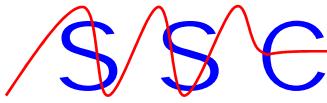
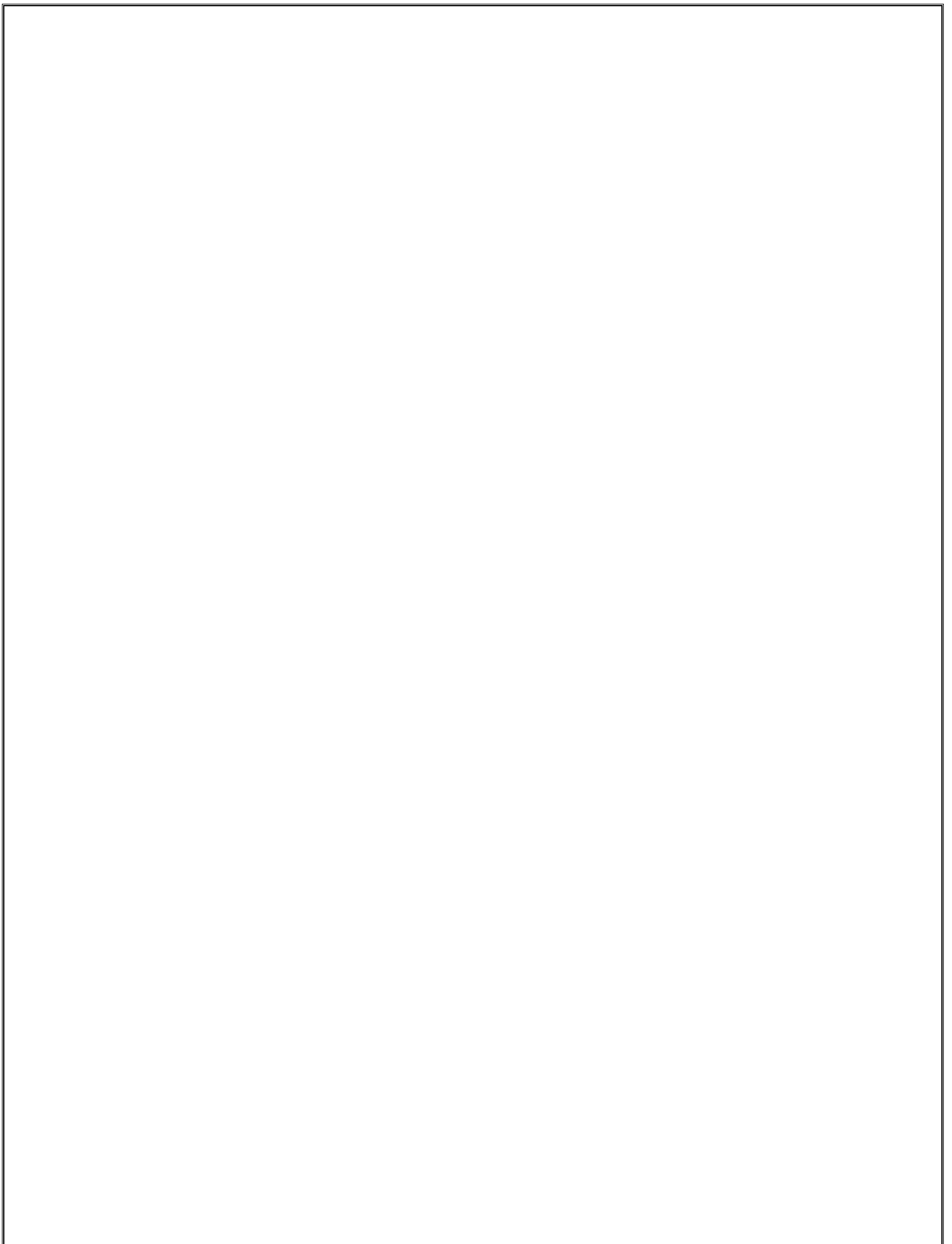
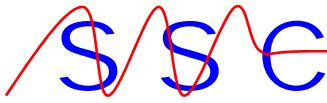


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Section 1

Specifications

Control Unit

Size – (w x l x h) – 5.87" x 7.62" x 2.00" (base plate dimensions)

Weight – 2.5 pounds

NEMA – NEMA 1 rated

Power – 110V AC (+- 10%), 0.25A load

Discrete Inputs – 2 dry contact inputs, can be configured as NO or NC, 5A Form“C”

Analog Inputs – 2, 0-10VDC full scale. Only AI1 has high and low set points.

CT Inputs – 3, one for each phase. CT range is 0-5 amps and should be set according to the tap point during installation to obtain correct operation.

PT Input – 1 – PT input is to Pins 1 and 2 on the Control Unit, and monitors the voltage between Phase A and Phase C.

Hand/Off/Auto – Control Unit has inputs for manual (Hand) or auto (Auto) operational control.

Outputs – 3, Contactor, Amber indicator and Red indicator closure for front panel indicators. Output may be 110VAC or Ground, depending on relay common configuration.

Comm 1 has two connectors allowing either RS/232 or RS/485 protocols. The RS/232 uses a 9-pin connector, while the RS/485 use a 5 pin phoenix connector. Comm 1 is the primary channel for external communications. Comm 2 is configured only for RS485 (RJ45 type connector), and is used to interface to the Operator Display unit. Standard protocol control is set to 9600 baud, 8 data bits, no parity, one stop bit, and no flow control.

Operator Display

Size – (w x l x h) – 3.10" x 4.25" x 1.37" (excludes mounting tabs)

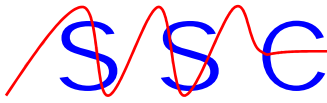
Weight – 0.5 pounds

NEMA – NEMA 4 rated

Power – Derives its power via the communications cable from the motor controller. Approximately 0.05A load.

Display – The unit is equipped with an operator's panel equipped with four micro-switches and two displays. The micro-switch controls scrolling through the unit parameters and settings. One display is to indicate which parameter is being displayed, the second display is the current value of the parameter. The display unit is hermetically sealed to prevent liquid entry into the unit.

Comm 1 has two RS/485 ports (RJ45 type connectors) to be used. Comm 1 is used to interface to the Motor Controller.



Section 2

Overview

Safety Warnings

Read and follow all Warnings, Precautions, Notes, and Instructions included in this document.

- A Warning identifies an immediate hazard that exists that poses some probability of causing death or serious injury.
- A Caution identifies potential conditions and actions that have the possibility of death or severe injury.
- A Note identifies the need for general safety practices which, if violated, could cause injury to personnel or damage to equipment.

**** EXAMPLES ****



Warning

High voltages are exposed during operation. Do not touch exposed surfaces during test.

Caution

Verify wiring connections prior to applying power to the system. Damage to the equipment could result from incorrect connections.

Note

Inspect system ground and bonds prior to power application. Shock hazard could exist if proper ground is not maintained.

**** EXAMPLES ****

Motor Control Unit



Warning

The Motor Control unit derives its power from the Power Transformer (PT), which is connected to the high voltage lines into the switchboard. High voltages are present during operation and set-up, and should be considered hazardous.

Specific connections for the Motor Control unit as well as parameter definition and values are given in other sections within this manual. In this section, an overview will be provided as an introduction to the operation of the Motor Control unit. Reference Figure 1 in the following descriptions.

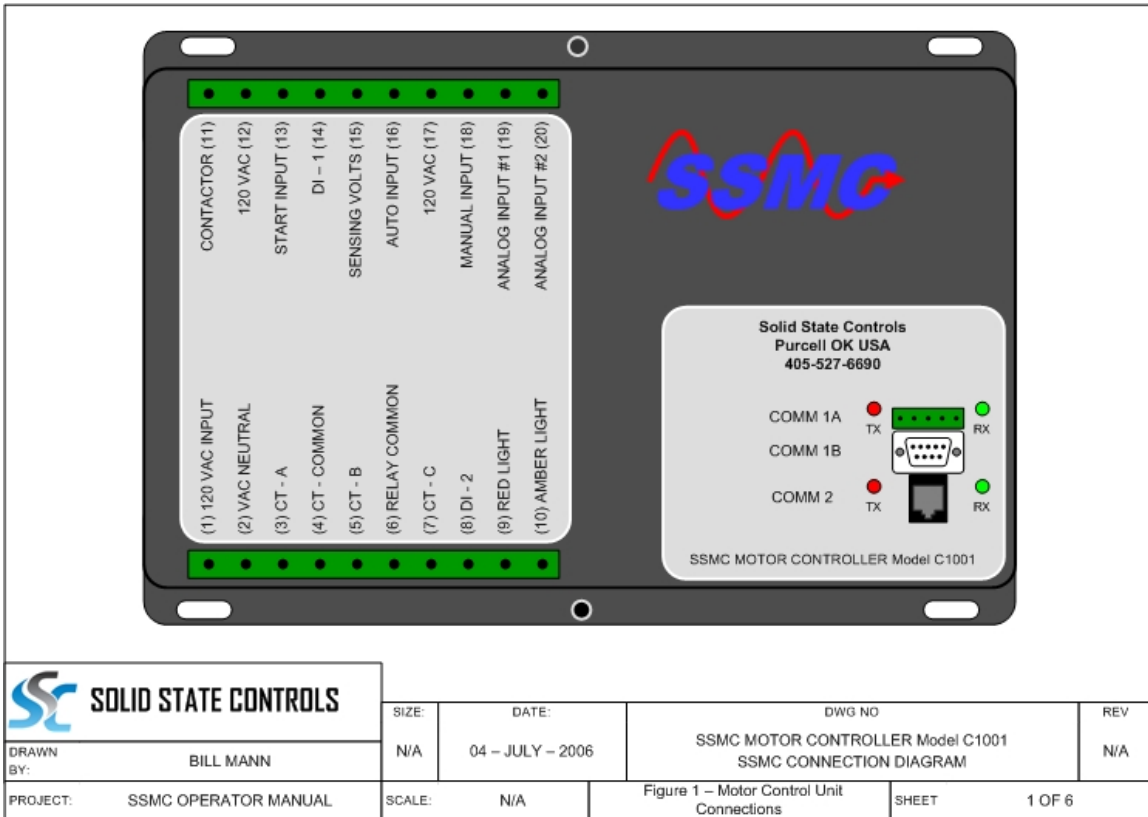
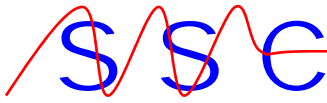


Figure 1 – Motor Control Unit Connections

Pins 1 and 2 – These two pins are connected to the Power Transformer (PT), and provide the voltage base between Phase A and Phase C of the motor input power. The voltage is expected to be 120 VAC, and achieves this value through tap settings on the PT. Care must be taken to ensure the correct PT tap is set to prevent possible damage to the Motor Control unit.



Pins 3, 4, 5, and 7 – These pins are associated with the Current Transformers (CT). Pins 3, 5, and 7 are the inputs from the CTs associated with the three phases of current flowing to the motor. Pin 4 is the common for the three taps. The CTs are all 0-5 amp range, and must have the proper tap setting to provide the correct sensing and check values during system operation. The tap setting should be the lowest that will permit the CT to maximize the amps/amp range of the input, with some allowance for over current occurrences.

In conjunction with the CT inputs, the Motor Controller has parameter set points for over and under current sensing conditions. These provide motor shutdown signals as required for motor safe operation. There is also a start-up time delay that allows the motor to come to normal operation before the over/under sensing begins.

Pins 6, 12, and 17 – These pins provide AC power and Common for use with switches, relays, or other devices requiring AC power for operation. Pin 6 can be tied to Pin 1 to switch hot, or Pin 2 to switch neutral.

Pins 8 and 14 – These are the Discrete Inputs and can be used with dry type contacts. They can be used as normally open (NO) or normally closed (NC) configured sensors, as determined by the parameter setting for each. Their use is installation requirement driven.

Pin 9 – RED indicator. Will normally be on for any of the following conditions:

- An alarm is active
- Last shutdown caused by alarm configured as Lockout
- Hand/Off/Auto switch is in OFF or HAND position

Pin 10 – AMBER indicator. Will normally be on for any of the following conditions:

- All alarms are clear
- Automatic restart will occur on delay timeout complete and H/O/A in Auto position

Pin 11 – Contactor. Enables motor contactor to energize, turning on motor. A green indicator may be tied to this line for motor running indication.

Pin 13 – Start. Start button on the front of the switchboard. Causes the motor to start given all conditions are correct.

Pin 15 – Phase AB. Sensing input point if phase AB is to be sensed and monitored. A second PT will have to be installed for this function.

Pin 16 – Auto. Input from AUTO position of the H/O/A switch.

Pin 18 – Manual. Input from HAND position of the H/O/A switch.

Pins 19 and 20 – Analog Inputs. 0-10 V analog input control signals.

Operator Display

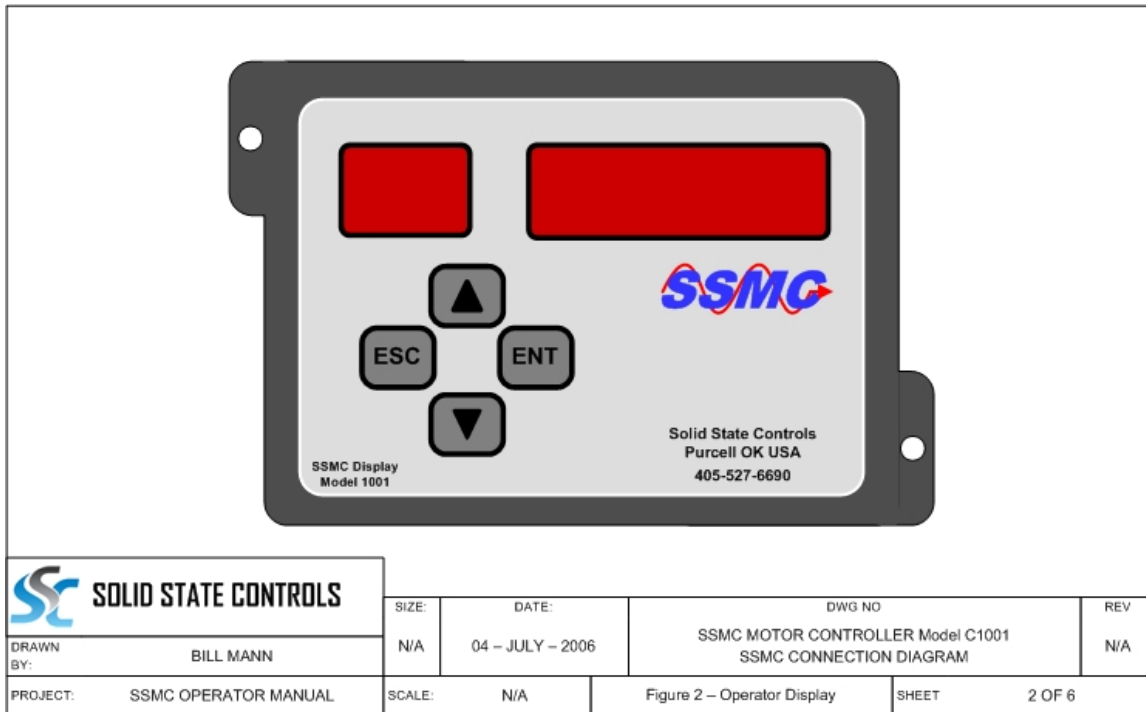
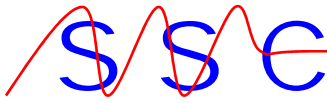


Figure 2 – Operator Display

The Operator Display unit can be either a permanently installed piece of equipment, or plugged in as desired to check and/or set system operating parameters. The unit is plugged into the Comm 2 port using an RS/485 type connector. The ESC arrow key permits the operator to switch between the parameter list number (on the left) and the parameter value display (on the right). The parameter list display is a two-digit display, while the value display is a four-digit display. Once the selection is made, the UP and DOWN arrow keys permit the operator to increase the displayed value (UP) or decrease the value (DOWN) to arrive at the desired parameter or set point. Once the desired point is reached, the ENT (Enter) key can be pressed to enter the data into the motor controller memory.

Typical operation would be to select ESC and then UP or DOWN to arrive at the parameter of interest. The selection would be followed by UP or DOWN to arrive at the value required for operation of that parameter. The operator would then depress ENT to save the value into memory. The parameters and range of value is given in the section covering parameter setting. Reference Figure 2 for the Operator Interface unit.



Section 3

PC Interface

An application support program is provided to support the Motor Controller in a fashion similar to the Operator Display. Through the Comm 1 interface (either RS/232 or RS/485), the PC can, using the same key convention as the Operator Display unit, select, view, and set the various parameters in the Motor Controller.

In addition to the functions of the Operator Display, the PC can also make status checks of analog and discrete inputs, check the current value of current measurements on CT1, CT2, and CT3, check the status of the light outputs (RED and AMBER), and other items of operational interest that have been saved in the Motor Controller memory.

Section 4

Installation



Warning

The Motor Control unit derives its power from the Power Transformer (PT), which is connected to the high voltage lines into the switchboard. High voltages are present during operation and set-up, and should be considered hazardous.

Control Unit

The Motor Controller is extremely easy to install. A typical wiring diagram is included in the appendix. The settings required for the parameter list must be determined prior to turning on the unit, and must be entered prior to attempting to operate the downhole unit.

Any fault that cannot be cleared must be resolved before continuing in the operation. Faults should not be bypassed or over ridden without explicit understanding of the underlying reasons for the fault.

Operator Display

The Operator Interface can be mounted inside the ammeter enclosure using the existing hardware.

There are no special connections required for the Operator Display. A typical installation is shown in Figure 2, with the cable being an industry standard UTP patch cord.

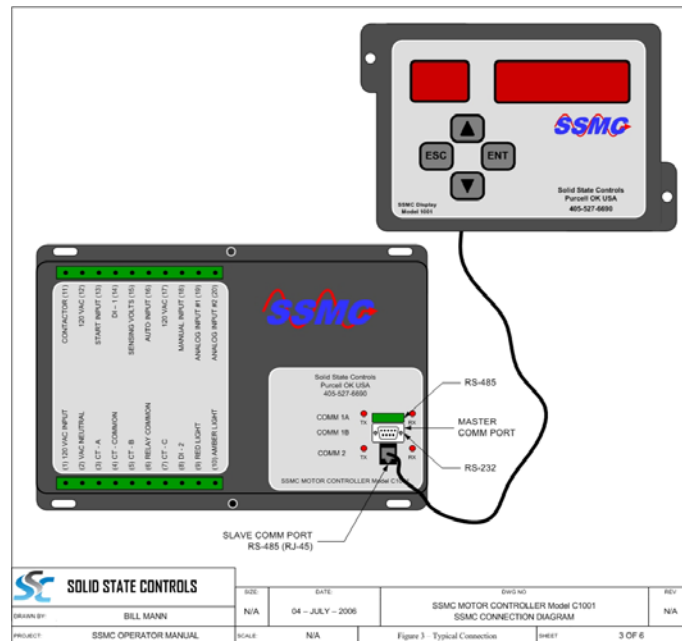
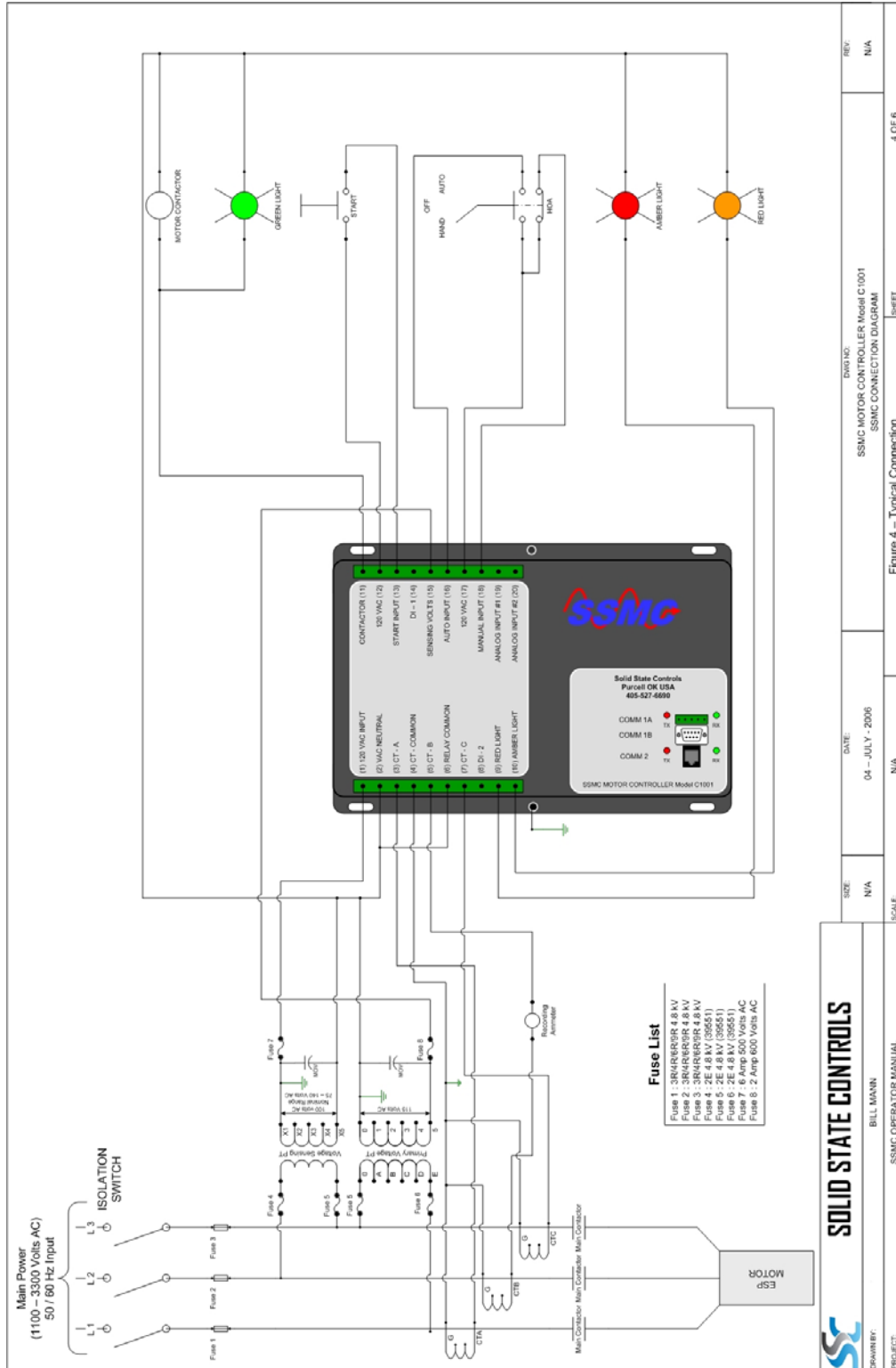


Figure 3 – Typical Connection



REV:	N/A
DATE:	04 - JULY - 2006
SIZE:	N/A
SCALE:	N/A
Figure 4 – Typical Connection	
PROJECT:	SSMC OPERATOR MANUAL
DRAWN BY:	BILL MAIN
DESIGNED BY:	SSMC MOTOR CONTROLLER Model C1001
SSMC CONNECTION DIAGRAM	4 OF 6

Figure 4 – Typical Connection

Section 5

Discrete Inputs

The SSMC has two each discrete inputs. These can be utilized for dry contact remote shutdowns. The discrete inputs can be configured for either N/O or N/C operations via software parameter list. Parameter list covering this operation is:

Di-1 ~ 44

Di-2 ~ 46

The SSMC parameter list default setting is N/O. An example of setup is illustrated below:

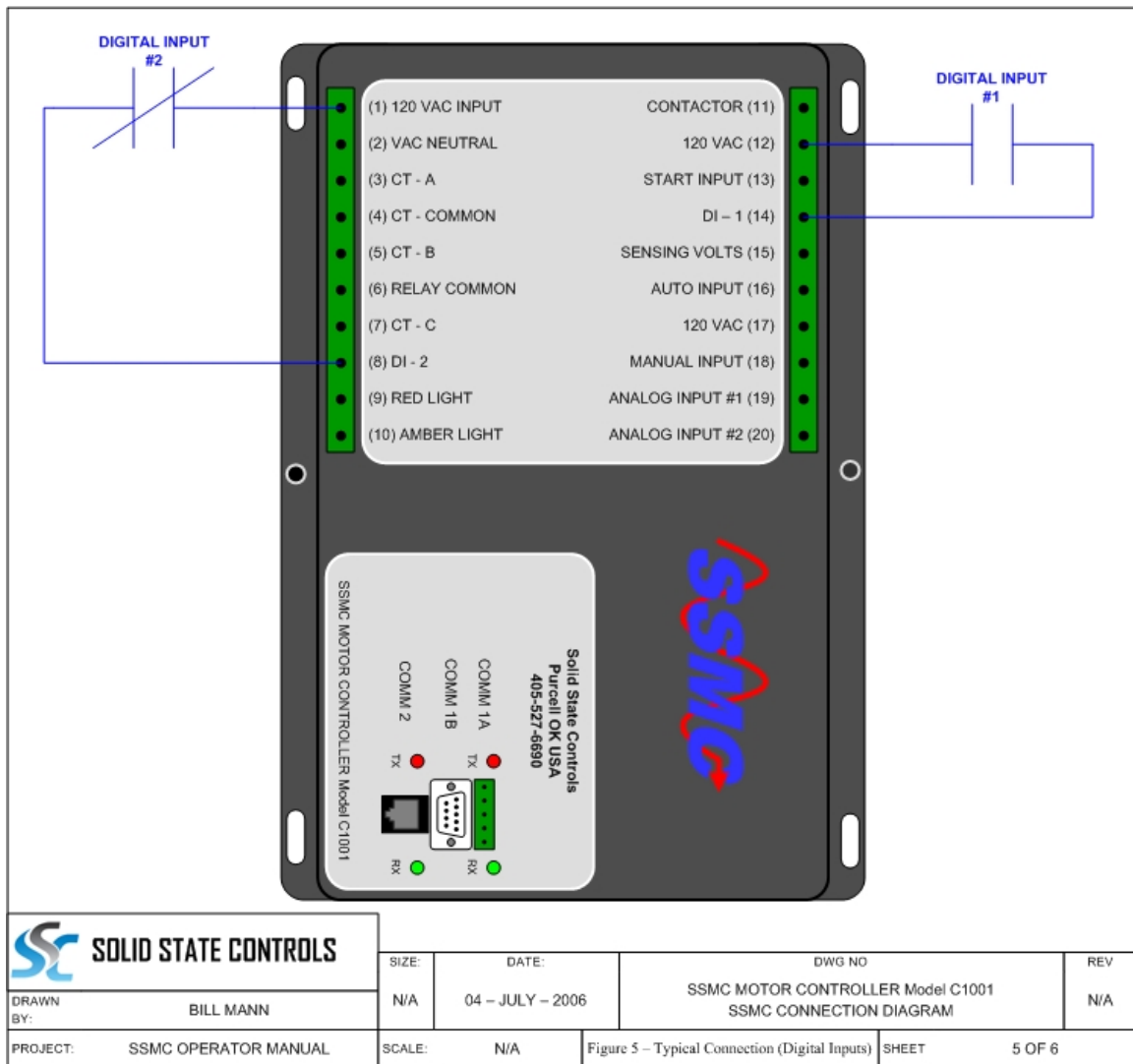
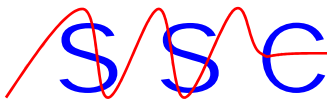


Figure 5 – Typical Connection



In the example, parameter list #44 is set to N/O and parameter list #46 is set to N/C. If the input to Di-1 is high, the motor controller will time out (the preset time value in parameter list #59) and shutdown. If the input to Di-2 is low, the motor controller will wait the preset time (parameter list #62) and shutdown. This is an example of N/O versus N/C configuration.

As mentioned above, there are 'shutdown' timers for each Di input. These are determining factors in how long the motor controller will operate the equipment in alarm status. Additionally, there are two other Di fault handling timers. There are identified as parameter list #58, and parameter list #60. For Di-1 and Di-2 respectfully, the purpose of these timers is to allow the equipment to reach normal operating status after start-up. It must be noted on startup that both timers are cumulative. The 'shutdown' timer will not initiate its timing function until the 'delay on start timer' has reached its preset value.

Parameters #45 and #47 designate restart capability with active alarm on respective Di. Since the 'delay on start timers' minimum value is 1 second, this parameter has been added to give the user greater control over restart and fault handling of the Di's.

Example:

Parameter #45 is set to 'NO'. The SSC receives a fault on Di-1 the contactor is opened and the alarm is still active on Di-1. The restart timer (Parameter#52) will count down to 1 minute and cease timing. It will stay in this dormant state until the alarm is cleared on Di-1. If parameter #45 had been set to "YES" in this instance, the unit would have restarted automatically regardless of the active alarm state if Di-1.

Section 6

Analog Inputs

The SSMC provides two each Analog Inputs. The potential reference is based on earth ground. The standard configuration is 0-10vdc. However, with the use of a shunt resistor and the correct setup of the offset menus, a 4-20ma signal can also be accepted.

It must be noted that Analog Input #1 is the only analog that can be configured to stop the equipment. Analog Input #2 is strictly for monitoring and has no control capability. With that exception both Analog Inputs have identical functionality.

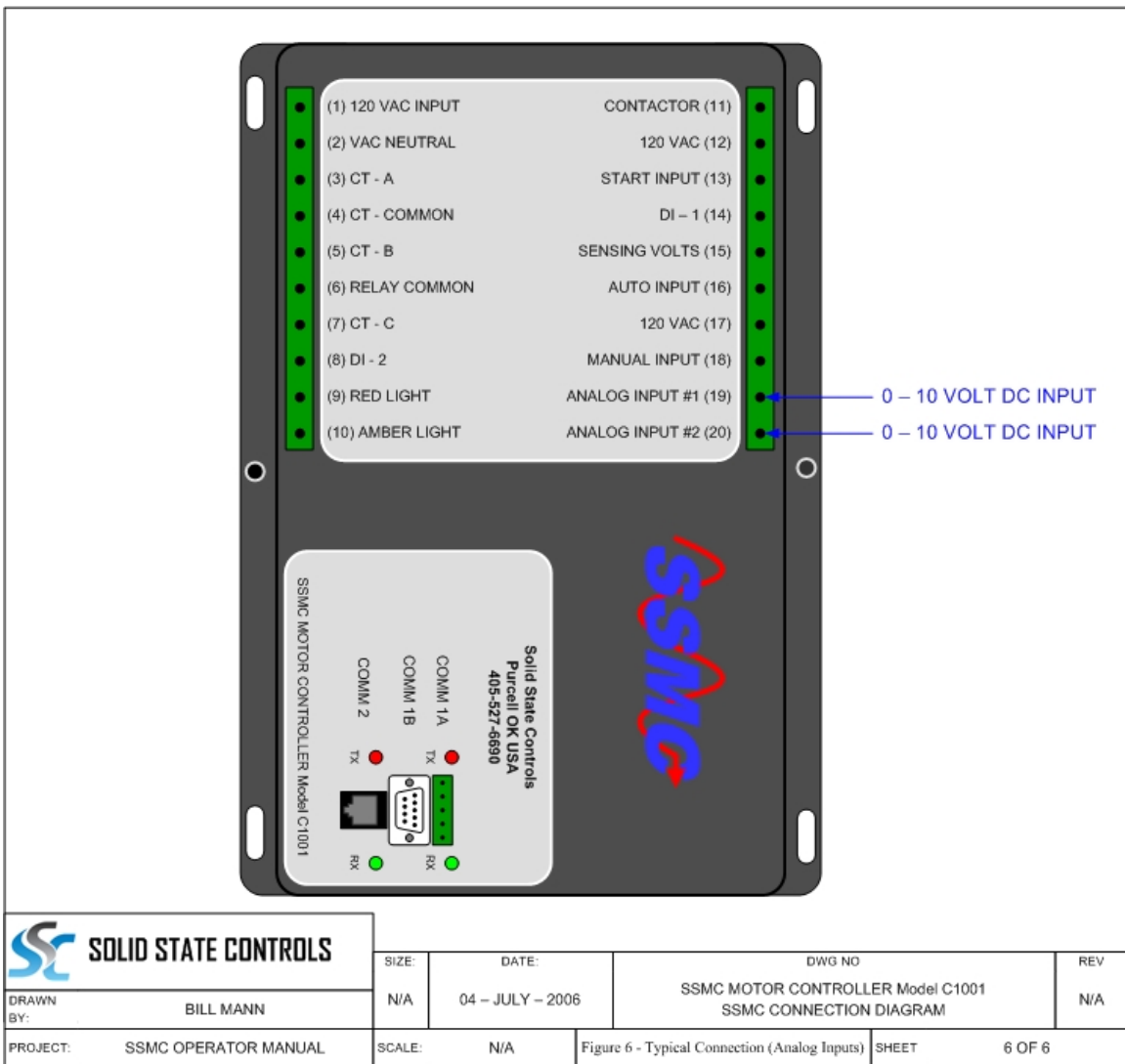
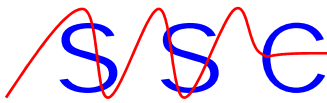


Figure 6 – Typical Connection



Example #1:

An external 0-10vdc signal has been connected to Analog Input #1. The external device is a downhole sensor rated at 0-5000 PSI. Conditions dictate if the pressure falls below 500PSI or increases above 4900 PSI (indicative of a loss of downhole signal) the SSMC must stop operation of the equipment.

Setup

Parameter #91~ 5000

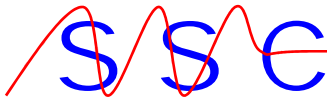
Parameter #92~ 0

Parameter #93~ 4900

Parameter #94~ 500

The actual engineering value can be seen in Parameter #89.

If a 4-20ma signal is used instead of a 0-10vdc, the offset and span can be adjusted accordingly. It must be stated that shunt resistance tolerances are critical to accuracy in this format.



Section 7

Panel Light Indication and Auto Restarts

The indicators in a normal application will consist of a Red, Amber, and Green indicators.

The green indicator is normally wired in parallel with the motor contactor off terminal 11 of the SSMC and is an indication of the unit operating.

The Amber indicator is connected to terminal 10 of the SSMC. The Amber indicator is no longer used in the Kratos functionality mode where it was used to indicate an underload condition. An Amber indication illuminated serves to display to the user there are no active alarms and the SSMC is timing out and WILL allow an automatic restart when the restart timer has reached zero.

The Red indicator is connected to terminal 9 of the SSMC. The Red indicator is no longer used in Kratos functionality mode where it was used to indicate an overload condition. A Red indication illuminated serves to indicate to the user that an active alarm is present and an automatic restart WILL NOT be allowed.

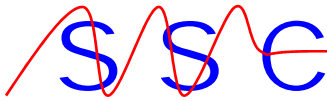
Automatic restarts are allowed only if no active alarms are present OR an active alarm has been approved in the Parameter list to allow a restart. An example of this would be Parameter #45.

Example #1:

Parameter # 27 (Voltage Unbalance Setpoint) ~ 10%

Parameter #52 (Restart Time) ~30 Minutes

A voltage unbalance occurs due to an overhead line fuse opening. The SSMC ceases motor operation. The Red indicator will illuminate. The restart timer will count from the preset of 30 minutes. Once the restart timer has reached 1 minute and the active alarm has not cleared, the timer will stop at 1 minute. If the alarm clears the timer will continue its count. If, however, between a count of 1 minute to zero an alarm becomes active, the count will automatically be reset to 1 minute.



Section 8

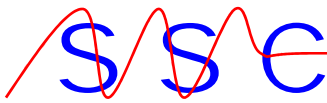
Shutdowns and Fault Handling

The restart counters are broken into 3 categories.

- 1) - Overload**
- 2) - Underload**
- 3) - Faults**

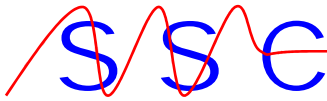
Each has its own specific set of allowable restart counters in the Parameter list. Parameter #41 is used strictly to control the maximum allowed Underload restarts. Parameter #42 only deals with the maximum number of Overload restarts. Parameter #43 handles all other restarts OTHER than Overload and Underload to include the Di's.

The reset time (Parameter #53) functions as an internal counter reset to clear all three categories of start counters. It is a time based value. Simply stated, if the unit operates the motor for a time exceeding the value in the reset time all internal shutdown counts are reset. This does not change the values entered in Parameters #41, #42, or #43. It clears the internal memory that tracks these shutdowns..

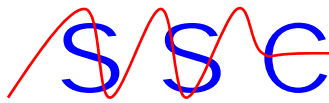


Section 9 Parameter List

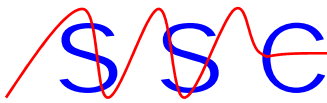
ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
1	A Phase Current	999.9	0	Amps	X	N/A	Real Time A Phase Current – True RMS Value; Scaled Via CT Ratio
2	B Phase Current	999.9	0	Amps	X	N/A	Real Time B Phase Current – True RMS Value; Scaled Via CT Ratio
3	C Phase Current	999.9	0	Amps	X	N/A	Real Time C Phase Current – True RMS Value; Scaled Via CT Ratio
4	Average Current	100.0	0	Percent		N/A	Real Time Current Average; (‘A’ Amps + ‘B’ Amps + ‘C’ Amps) / 3
5	Current Unbalance	999.9	0	Percent		N/A	Real Time Current Unbalance in Percent
6	Voltage A-B	9999	0	Volts	X		Real Time Voltage for Phases A & B
7	Voltage A-C	9999	0	Volts	X		Real Time Voltage for Phases A & C
8	Voltage B-C	9999	0	Volts	X		Real Time Voltage for Phases B & C
9	Average Voltage	9999	0	Volts			In Single Phase, Volts AB = Average Volts in 3 Phase Mode, Average Volts = (Volts AB + Volts AC + Volts BC)/3
10	Voltage Unbalance	100.00	0	Percent			Real Time Voltage Unbalance
11	Rotation	ABC	CBA	Text			Real Time Rotation Indication
12	Time Until Auto Restart	999	0	Minutes			Real Time Until Auto Restart is Attempted
13	Reason No Restart						Reason Until Will Not Auto Restart
14	Reserved						
15	Reserved						
16	Reserved						
17	Reserved						



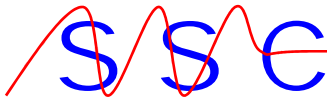
ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
18	Reserved						
19	Reserved						
20	Reserved						
21	Underload Setpoint	999.9	0	Amps	X	20.0	Underload Trip Setpoint, Trip is Determined From Average Current
22	Overload i2t Factor	128	0	N/A	X	64	Time Factor Considered in i2t Calculations
23	Overload Setpoint	999.9	0	Amps		80.0	Overload Trip Setpoint, Trip is Determined From Average Current
24	Current Unbalance	100.0	0	Percent	X	15.0	
25	Undervoltage Setpoint	9999	0	Volts	X	1000	
26	Overvoltage Setpoint	9999	0	Volts	X	2000	
27	Voltage Unbalance Setpoint	100.0	0	Percent	X	10.0	
28	Rotation Setpoint	ABC	CBA	Text	X	ABC	
29	Backspin Enable	Yes	No	Text	X	No	
30	Reserved						
31	Reserved						
32	Reserved						
33	Reserved						
34	Reserved						
35	Reserved						
36	Reserved						



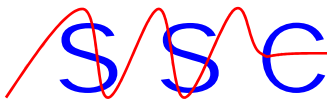
ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
37	Wait for Restart	Yes	No	N/A	X	No	A "Yes" Value in this Register Will Not Allow A Restart Remotely or Locally Unless Restart Time is at Zero.
38	Monitor 3 Phase Voltage	Yes	No	N/A	X	No	Note: If the Parameter is Set to NO, Parameters 7, 8, 9, 27 & 28 are Removed from the Menu List
39	Current X Fomer Ration (X : 5)	9999	0	Amos	X	100	
40	PT Ratio (X : 120)	9999	0	Volts	X	1500	
41	Number of Allowed Underload Restarts	100	0	N/A	X	3	3
42	Number of Allowed Overload Restarts	100	N/A	N/A	X	0	
43	Number of Allowed Fault Restarts	100	0	N/A	X	3	
44	Discrete Input #1 (N/O or N/C)	N/O	N/C	N/A	X	N/O	
45	Allowed to Start with Active Alarm on DI-1	Yes	No	N/A	X	No	
46	Discrete Input #2 (N/O or N/C)	N/O	N/C	N/A	X	N/O	
47	Allowed to Start with Active Alarm on DI-2	Yes	No	N/A	X	No	
48	Reserved						
49	Reserved						
50	Reserved						
51	Reserved						
52	Restart Time	999	0	Minutes	X	30	
53	Reset Time	999	0	Minutes	X	30	
54	Fault Delay On Restart	9999	0	Seconds	X	5	



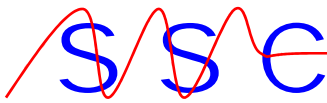
ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
55	Fault Shutdown Delay	9999	0	Seconds	X	5	
56	Underload Delay on Start	999	0	Seconds	X	10	
57	Underload Shutdown Delay	999	0	Seconds	X	30	
58	Discrete #1 Delay on Start	999	0	Seconds	X	5	
59	Discrete #1 Shutdown Delay	999	0	Minutes	X	5	
60	Discrete #2 Delay on Start	999	0	Seconds	X	5	
61	Discrete #2 Shutdown Delay	999	0	Seconds	X	5	
62	Reserved						
63	Reserved						
64	Reserved						
65	Reserved						
66	Reserved						
67	Reserved						
68	Reserved						
69	Reserved						
70	Alarm @ Last Shutdown	N/A	N/A	N/A			
71	Alarm @ 2 nd Last Shutdown	N/A	N/A	N/A			
72	Alarm @ 3 rd Last Shutdown Alarm @ Last Shutdown	N/A	N/A	N/A			
73	Alarm @ Last Shutdown	N/A	N/A	N/A			



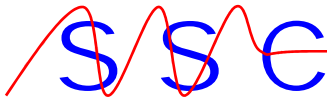
ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
74	Alarm @ Last Shutdown	N/A	N/A	N/A			
75	Total Starts Counter	65535	0	Text			
76	Resettable Starts Counter	66 Text 535	0	Text			
77	Total Run Time	66 Text 535					
78	Resettable	65535	0	Hours			
79	Reserved						
80	Reserved						
81	Reserved						
82	Reserved						
83	Reserved						
84	Reserved						
85	Reserved						
86	Reserved						
87	Reserved						
88	Reserved						
89	Analog Input #1 Real Time Value	9999	0	N/A			
90	Analog Input #2 Real Time Value	9999	0	N/A			
91	Analog Input #1 Span	9999	0	N/A	X	5000	
92	Analog Input #1 Offset	9999	0	N/A	X	0	



ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
93	Analog Input #1 High Trip	9999	0	N/A	X	5000	
94	Analog	9999	0	N/A	X	0	
95	Analog Input #2 Span	9999	0	N/A	X	100	
96	Analog Input #2 Offset	9999	0	N/A	X	0	
97	Controller Serial Number	9999	0	N/A			
98	Controller Firmware Revision	9999	0	N/A			
99	Display Serial Number	9999	0	N/A			
A1	Display Firmware Serial Number	9999	0	N/A			
A2	Backspin Module Serial Number	9999	0	N/A			
A3	Backspin Module Firmware Revision	9999	0	N/A			
A4							
A5							
A6							
A7							
A8							
A9							
B1							
B2							
B3							



ID	Parameter Name	Maximum	Minimum	Units	Field Adjustable	Default	Description
B3							
B4							
B5							
B6							
B7							
B8							
B9							
C1							
C2							
C3							
C4							
C5							
C6	Comm Port #1 Baud Rate	28800	1200	N/A	X	1200	Changes Baud Rate of Comm Port #1
C7	Modbus ID (Slave Address)	255	0	Text	X		
C8	Timeout	999	0	MS	X		
C9	Code	9999	0	N/A			Not Used by Field Personnel



Section 10

Parameter Definitions

Parameter #1

A Phase Current

This is a real time value of the actual current passing through the A Phase current transformer. This parameter is adjustable for fine tuning purposes.

Parameter #2

B Phase Current

This is a real time value of the actual current passing through the B Phase current transformer. This parameter is adjustable for fine tuning purposes.

Parameter #3

C Phase Current

This is a real time value of the actual current passing through the C Phase current transformer. This parameter is adjustable for fine tuning purposes.

Parameter #4

Average Current

This is a real time value. It is the average of A, B, and C Phase currents.

Parameter #5

Current Unbalance

This is a real time value and represents the % of imbalance between the highest and lowest of the three currents.

Parameter #6

Voltage A-B

This is a real time value of the voltage potential between A Phase and B Phase line. This reading is a product of the actual voltage scaled via the PT Ratio. This parameter is adjustable for fine tuning.

Not available in menu list if parameter #38 is set to 'NO'.

Parameter #7

Voltage A-C

This is a real time value of the voltage potential between A Phase and C Phase line. This reading is a product of the actual voltage scaled via the PT Ratio. This parameter is adjustable for fine tuning. This is also the input that provides the primary power for the SSMC.

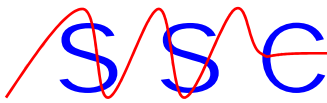
Not available in menu list if parameter #38 is set to 'NO'.

Parameter #8

Voltage B-C

This is a real time value of the voltage potential between A Phase and C Phase line. This reading is a calculated voltage based off of A-C and A-B inputs. This parameter is adjustable for fine tuning.

Not available in menu list if parameter #38 is set to 'NO'.



Parameter #9

Average Voltage

This is a real time value the average of the three line voltages.

Not available in menu list if parameter #38 is set to 'NO'.

Parameter #10

Voltage Imbalance

This is a real time value representing the % of imbalance between the highest and lowest of the three line voltages.

Not available in menu list if parameter #38 is set to 'NO'.

Parameter #11

Rotation

This is a real time value representing the actual rotation sequence of the incoming line.

Not available in menu list if parameter #38 is set to 'NO'.

Parameter #12

Time Until Auto Restart

This is a real time value representing the time until the SSMC will attempt to automatically restart the equipment.

Parameter #13

Reason for No Restart

This give the user indications of what active alarms are present prohibiting the SSMC from starting the equipment. Below is a list of possible display and corresponding meanings.

OVT	Overvoltage
UVT	Undervoltage
VUB	Voltage unbalance
ROT	Rotation error
DI1	Digital Input 1 Active
DI2	Digital Input 2 Active
AN1L	Analog 1 Below "Low Setpoint"
AN1H	Analog 1 Above "Hi Setpoint"

Parameter #14

Reserved

Parameter #15

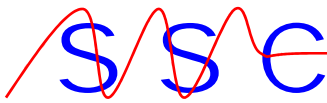
Reserved

Parameter #16

Reserved

Parameter #17

Reserved



Parameter #18
Reserved

Parameter #19
Reserved

Parameter #20
Reserved

Parameter #21
Underload Setpoint

This is a user defined value. If the AVERAGE of the three currents (parameter #4) falls below this setpoint for a duration that exceeds the underload delay timer, the SSMC will stop the operation of the equipment.

Parameter #22
Overload I(2)T Factor

This is a user defined parameter. This is the reaction factor for initiating an Overload trip. The lower the number the quicker the reaction to an Overload.

Parameter #23
Overload Setpoint

This is a user defined parameter. If the average current (parameter #4) exceeds this setpoint the SSMC will stop the operation of the equipment. The time it take to initiate an overload trip spends on the amount the average current exceeds the overload setpoint and the I(2)T factor in parameter #22.

Parameter #24
Current Unbalance Setpoint

This is a user defined setpoint. If the actual current unbalance (parameter #5) exceeds this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.

Parameter #25
Under Voltage Setpoint

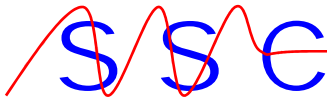
This is a user defined setpoint. If the average voltage (parameter #9) falls below this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.

Parameter #26
Over Voltage Setpoint

This is a user defined setpoint. If the average voltage (parameter #9) exceeds this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.

Parameter #27
Voltage Unbalance Setpoint

This is a user defined setpoint. If the actual voltage unbalance (parameter #10) exceeds this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.



Parameter #28

Rotation Setpoint

This is a user defined setpoint. If the actual rotation is different than the value entered into this setpoint the SSMC will stop the operation of the equipment.

Parameter #29

Reserved

Parameter #30

Reserved

Parameter #31

Reserved

Parameter #32

Reserved

Parameter #33

Reserved

Parameter #34

Reserved

Parameter #35

Reserved

Parameter #36

Reserved

Parameter #37

Wait For Restart Timer?

This is a user defined parameter. If a "YES" is entered into this parameter the SSMC will not allow a manual restart via the HOA and Start button. The unit can not be started until the restart timer has timed out.

Parameter #38

Monitor 3 Phase Power

This is a user defined parameter. Entering a "YES" into this parameter indicates nothing is connected to the sensing volts terminal. Therefore you do not have the capability to monitor three voltages.

Parameter #39

Current Transformer Ratio (X:5)

This is a user defined parameter. The actual current transformer value is entered in this parameter. It is based on X:5. If you are using 75:5 CT's, then the value of 75 will be entered.

Parameter #40

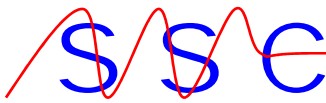
PT Ratio (X:120)

This is a user defined parameter. The actual PT tap setting is entered in this parameter.

Parameter #41

Number of Allowed Underload Restarts

This is a user defined parameter. The maximum number of allowed underload restarts before the SSMC will perform a lockout condition.



Parameter #42

Number of Allowed Overload Restarts

This is a user defined parameter. The maximum number of allowed overload restarts before the SSMC will perform a lockout condition.

Parameter #43

Number of Allowed Fault Restarts

This is a user defined parameter. The maximum number of allowed fault restarts before the SSMC will perform a lockout condition.

Parameter #44

Discrete Input #1 N/O or N/C?

This is a user defined parameter. If “N/C” is entered into this parameter the SSMC will stop operation of the equipment if 120VAC **IS NOT** present on terminal #14.

If “N/O” is entered into this parameter the SSMC will stop operation of the equipment if 120VAC **IS** present on terminal #14.

Parameter #45

Allow Start with Active Alarm on Digital Input #1

This is a user defined parameter. If this parameter is set to “NO” the SSMC will not allow an automatic restart or a manual start with Di-1 alarm active.

Parameter #46

Discrete Input #2 N/O or N/C?

This is a user defined parameter. If “N/C” is entered into this parameter the SSMC will stop operation of the equipment if 120VAC **IS NOT** present on terminal #8.

If “N/O” is entered into this parameter the SSMC will stop operation of the equipment if 120VAC **IS** present on terminal #8.

Parameter #47

Allow Start with Active Alarm on Digital Input #2

This is a user defined parameter. If this parameter is set to “NO” the SSMC will not allow an automatic restart or a manual start with Di-2 alarm active.

Parameter #48

Reserved

Parameter #49

Reserved

Parameter #50

Reserved

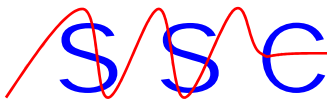
Parameter #51

Reserved

Parameter #52

Restart Time

This is a user defined parameter. The value entered in this parameter is the time the SSMC must wait before it attempts an automatic restart.



Parameter #53

Reset Time

This is a user defined parameter. The value entered in this parameter is the time the SSMC must be operating the equipment (RUN) before the Underload, Overload, and Fault counters are reset.

Parameter #54

Fault Delay on Start Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active fault **on startup** before it initiates a stop command.

Parameter #55

Fault Shutdown Delay Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active **while running** before it will initiate a stop command.

Parameter #56

Underload Delay on Start Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Underload **on startup** before it initiates a stop command.

Parameter #57

Underload Shutdown Delay Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Underload **while running** before it will initiate a stop command.

Parameter #58

Digital Input #1 Delay on Start Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Digital Input #1 alarm **on startup** before it initiates a stop command.

Parameter #59

Digital Input #1 Shutdown Delay Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Digital Input #1 alarm **while running** before it will initiates a stop command.

Parameter #60

Digital Input #2 Delay on Start Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Digital Input #2 alarm **on startup** before it initiates a stop command.

Parameter #61

Digital Input #2 Shutdown Delay Timer

This is a user defined parameter. The value entered in this parameter is the time the SSMC will ignore a active Digital Input #2 alarm **while running** before it will initiate a stop command.

Parameter #62

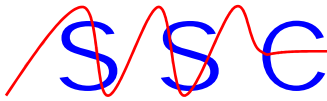
Reserved

Parameter #63

Reserved

Parameter #64

Reserved



Parameter #65
Reserved

Parameter #66
Reserved

Parameter #67
Reserved

Parameter #68
Reserved

Parameter #69
Reserved

Parameter #70
Alarm @Last Shutdown
This parameter displays the last shutdown alarm that occurred.

Parameter #71
Alarm @ 2nd Last Shutdown
This parameter displays the 2nd last shutdown alarm that occurred.

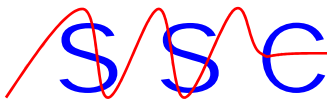
Parameter #72
Alarm @ 3rd Last Shutdown
This parameter displays the 3rd last shutdown alarm that occurred.

Parameter #73
Alarm @ 4th Last Shutdown
This parameter displays the 4th last shutdown alarm that occurred.

Parameter #74
Alarm @ 5th Last Shutdown
This parameter displays the 5th last shutdown alarm that occurred.

Legend For Parameter #70-#74

OLD	Current overload
ULD	Current underload
CUB	Current unbalance
OVT	Overvoltage
UVT	Undervoltage
VUB	Voltage unbalance
ROT	Rotation error
DI1	Digital Input 1 Active
DI2	Digital Input 2 Active
AN1L	Analog 1 Below "Low Setpoint"
AN1H	Analog 1 Above "Hi Setpoint"
MAN	Manual stop
PUV	Power failed



Parameter #75

Total Starts Counter

This displays the TOTAL number of starts the SSMC has performed. This is not changeable.

Parameter #76

Resetttable Starts Counter

This displays the number of start the SSMC has performed since being reset.

Parameter #77

Total Run Hours

This displays the TOTAL number of hours the SSMC has run. This is not changeable.

Parameter #78

Resetttable Run Hours

This displays the number of hours the SSMC has ran since being reset.

Parameter #79

Reserved

Parameter #80

Reserved

Parameter #81

Reserved

Parameter #82

Reserved

Parameter #83

Reserved

Parameter #84

Reserved

Parameter #85

Reserved

Parameter #86

Reserved

Parameter #87

Reserved

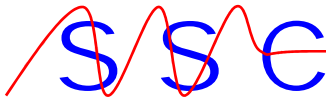
Parameter #88

Reserved

Parameter #89

Analog Input #1 Real Time Value

This parameter displays the real time engineered value of Analog Input #1.



Parameter #90

Analog Input #2 Real Time Value

This parameter displays the real time engineered value of Analog Input #2.

Parameter #91

Analog Input #1 Span

This is a user defined value. The maximum number displayed when the raw value input of 10vdc is applied to terminal #19 of the SSMC.

Parameter #92

Analog Input #1 Offset

This is a user defined value. When utilizing this analog input with a process value where 0 engineered value is not equivalent to a raw value of zero. Calculating the offset will allow the user to make a positive process value be displayed as zero without distorting the linear display to span.

Parameter #93

Analog Input #1 High Trip

This is a user defined setpoint. If the engineered value (parameter #89) exceeds this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.

Parameter #94

Analog Input #1 Low Trip

This is a user defined setpoint. If the engineered value (parameter #89) falls below this setpoint for a duration greater than the fault shutdown delay timer (parameter #55) the SSMC will stop the operation of the equipment.

Parameter #95

Analog Input #1 Span

This is a user defined value. The maximum number displayed when the raw value input of 10vdc is applied to terminal #19 of the SSMC.

Parameter #96

Analog Input #2 Offset

This is a user defined value. When utilizing this analog input with a process value where 0 engineered value is not equivalent to a raw value of zero. Calculating the offset will allow the user to make a positive process value be displayed as zero without distorting the linear display to span.

Parameter #97

Controller Serial Number

Displays the Serial Number of the Motor Controller

Parameter #98

Controller Firmware Revision

Displays the firmware residing in the Motor Controller

Parameter #99

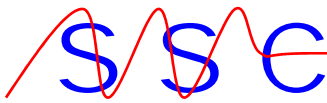
Display Serial Number

Displays the Serial Number of the Display

Parameter #A1

Display Firmware Revision

Displays the firmware residing in the Display



Parameter #A2

Backspin Module Serial Number

Displays the Serial Number of the Backspin Module

Parameter #A3

Backspin Module Firmware Revision

Displays the firmware residing in the Backspin Module

Parameter #A4

Reserved

Parameter #A5

Reserved

Parameter #A6

Reserved

Parameter #A7

Reserved

Parameter #A8

Reserved

Parameter #A9

Reserved

Parameter #B1

Reserved

Parameter #B2

Reserved

Parameter #B3

Reserved

Parameter #B4

Reserved

Parameter #B5

Reserved

Parameter #B6

Reserved

Parameter #B7

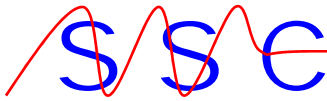
Reserved

Parameter #B8

Reserved

Parameter #B9

Reserved



Parameter #C1
Reserved

Parameter # C2
Reserved

Parameter # C3
Reserved

Parameter # C4
Reserved

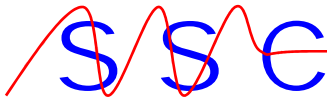
Parameter # 52
Reserved

Parameter # C6
Comm #1 Port Baud Rate
This is a user-defined parameter. Enter the Baud Rate From 1200 to 28800

Parameter # C7
Modbus ID
This is a user-defined parameter. Enter the MODBUS slave ID number

Parameter # C8
Timeout
This is a user-defined parameter. Comms timeout value

Parameter # C9
Code
Not to be Used by Field Personnel



SSMC Motor Controller

PRODUCT WARRANTY

WARRANTY COVERAGE:

Solid State Controls LLC (“SSC”) warrants SSC manufactured products (“Product”) to be free of workmanship and material defects for a period of eighteen (18) months from the date of shipment to Buyer or twelve (12) months from the date of installation.

SSC, at its option, will at no charge either repair, replace, or refund the purchase price of the Product during the warranty period, provided it is returned in accordance with the terms of this warranty to 35431 Hardesty Road, Shawnee, Oklahoma USA 74801, at SSC option, may include the replacement of parts or boards with functionally equivalent reconditioned or new parts or boards. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All replaced parts, boards or Product shall become the property of SSC. Shipping costs are to be borne by the purchasing party.

This express warranty is extended by SSC to the party purchasing the Product (“Buyer”) and is not assignable or transferable to any other party. This is the complete warranty for the Products, except as modified by separate agreement between SSC and Buyer. SSC is not responsible under this warranty for ancillary equipment, whether or not manufactured by SSC, which is attached to or used in connection with the Product, nor for operation of the Product with any such with any such ancillary equipment. Because each Product system is unique, SSC disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

This warranty applies within the fifty (50) United States and the District of Columbia.

WHAT THIS WARRANTY DOES NOT COVER:

Defects or damage resulting from use of the Product in other than its normal and customary manner, (b) Defects or damage from misuse, accident or neglect, (c) Defects or damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment, (d) Product disassembled or repaired in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim, (e) Product which has had the serial number removed or made illegible.

HOW TO GET WARRANTY SERVICE:

To receive warranty service, call 405-273-9292.

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This warranty sets forth the full extent of SSC’s responsibilities and liability regarding the Product, and repair, replacement, or refund of the purchase price, at SSC’s option, is Buyer’s exclusive remedy.

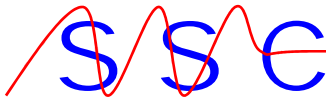
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This express warranty is extended by SSC to the party purchasing the Product (“Buyer”) and is not assignable or transferable to any other party. This is the complete warranty for the Products, except as modified by separate agreement between SSC and Buyer.

SSC is not responsible under this warranty for ancillary equipment, whether or not manufactured by SSC, which is attached to or used in connection with the Product, nor for operation of the Product with any such with any such ancillary equipment.

Because each Product system is unique, SSC disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

This warranty applies within the fifty (50) United States and the District of Columbia.

WHAT THIS WARRANTY DOES NOT COVER:

Defects or damage resulting from use of the Product in other than its normal and customary manner, (b) Defects or damage from misuse, accident or neglect, (c) Defects or damage from improper testing, operation, maintenance, installation, alteration, modification or adjustment, (d) Product disassembled or repaired in such a manner as to adversely affect performance or prevent adequate inspection and testing to verify any warranty claim, (e) Product which has had the serial number removed or made illegible.

HOW TO GET WARRANTY SERVICE:

To receive warranty service, call 405-273-9292.

GENERAL PROVISIONS:

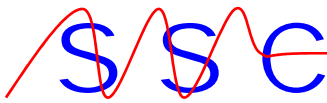
This warranty sets forth the full extent of SSC’s responsibilities and liability regarding the Product, and repair, replacement, or refund of the purchase price, at SSC’s option, is Buyer’s exclusive remedy.

THIS WARRANTY IS GIVEN IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHICH ARE SPECIFICALLY EXCLUDED INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE IN NO EVENT SHALL SSC BE LIABLE FOR DAMAGES IN EXCESS OF THE PURCHASE PRICE OF THE PRODUCT, FOR ANY LOSS OF USE, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, LOST PROFITS OR SAVINGS OR OTHER INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE SUCH PRODUCT.

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SSC will defend at its own expense any suit brought against Buyer to the extent that it is based on a claim that the Product or parts infringes a United States patent, and SSC will pay those costs and damages finally awarded against Buyer in any such suit which are attributable to any such claim, but such defense and payments are conditioned on the following: (i) that SSC will be notified promptly in writing by Buyer of any notice of such claim; and (ii) that SSC will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and (iii) should the Product or parts become, or in SSC’s opinion be likely to become, the subject of a claim infringement of a United States patent, that Buyer will permit SSC, at its option and expense, either to procure for Buyer the right to continue using the Product or parts or to replace or modify the same so that it becomes non-infringing or to grant Buyer a credit for the Product or parts as depreciated and accept its return. The depreciation will be an equal amount per year over the lifetime of the Product or parts as established by SSC.

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