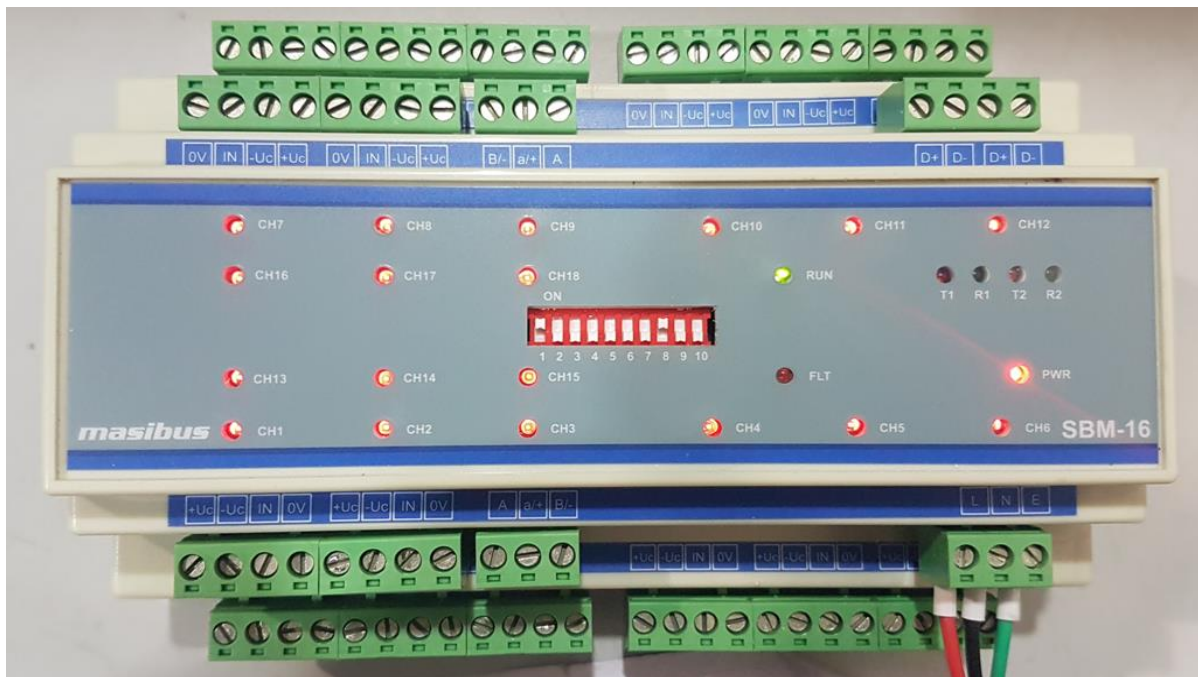# USER MANUAL

SBM-C-16S
String Box Monitor

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LIST OF FIGURES

- **SAFETY PRECAUTIONS**

The product and the instruction manual describe important information to prevent possible harm to users and damage to the property and to use the product safely.

Understand the following description (signs and symbols), read the text and observe Descriptions.

- **DESCRIPTION OF SIGNS**

⚡ RISK OF ELECTRICAL SHOCK	*This indicates a danger that may result in death or serious injury if not avoided.*

⚠ CAUTION	*This indicates a danger that may result in minor or moderate injury or only a physical damage if not avoided.*

1. INTRODUCTION

Foreword

Thank you for purchasing SBM-16 String Box Monitor. This manual describes the basic functions and operation methods of SBM-16. Please read through this user's manual carefully before using the product.

This is a 32 bit controller based instrument designed for universal input type. Please read instructions carefully before altering any programming or configuration information.

The SBM-16 module to a data Highway for remote systems communication functions through a personal computer or a distributed control system (DCS) using RS 485

Notice

The contents of this manual are subject to change without notice as a result of continual improvements to the instrument's performance and functions.

Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform Masibus Sales office or sales representative. Under no circumstances may the contents of this manual, in part or in whole, be transcribed or copied without our permission.

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Version Number : 1.07, August 2015.

Checking the Contents of the Package

Unpack the box and check the contents before using the product. If the product is different from which you have ordered, if any parts or accessories are missing, or if the product appears to be damaged, contact your sales representative.

2. INSTALLATION

2.1 Safety Precautions in Installation

⚡ RISK OF ELECTRICAL SHOCK

1. Before any other connection is made, the protective earth terminal shall be connected to a protective conductor. The mains (supply voltage) wiring must be terminated within the connector in such a way that, should it slip in the cable clamp, the Earth wire would be the last wire to become disconnected.

2. Do not use this instrument in areas under hazardous conditions such as excessive shock, vibration, dirt, moisture, corrosive gases or oil. The ambient temperature of the areas should not exceed the maximum rating specified.

3. To minimize the possibility of fire or shock hazards, do not expose this instrument to rain or excessive moisture.

⚠ CAUTION

Be sure all personnel involved in installation, servicing, and programming are qualified and familiar with electrical equipment and their ratings.

Do not install, store, or use it in the place with a lot of dust, corrosive and flammable gases, vibrations and shocks exceeding the allowed values, place low or high temperature outside of the installation condition, direct sunlight and near equipment generating strong radio waves or magnetic fields, It may cause accidents.

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2.2   Mounting of SBM-16

* **Mounting Method :** Standard DIN Rail Mounting

* **External Dimensions :**

Unit: mm
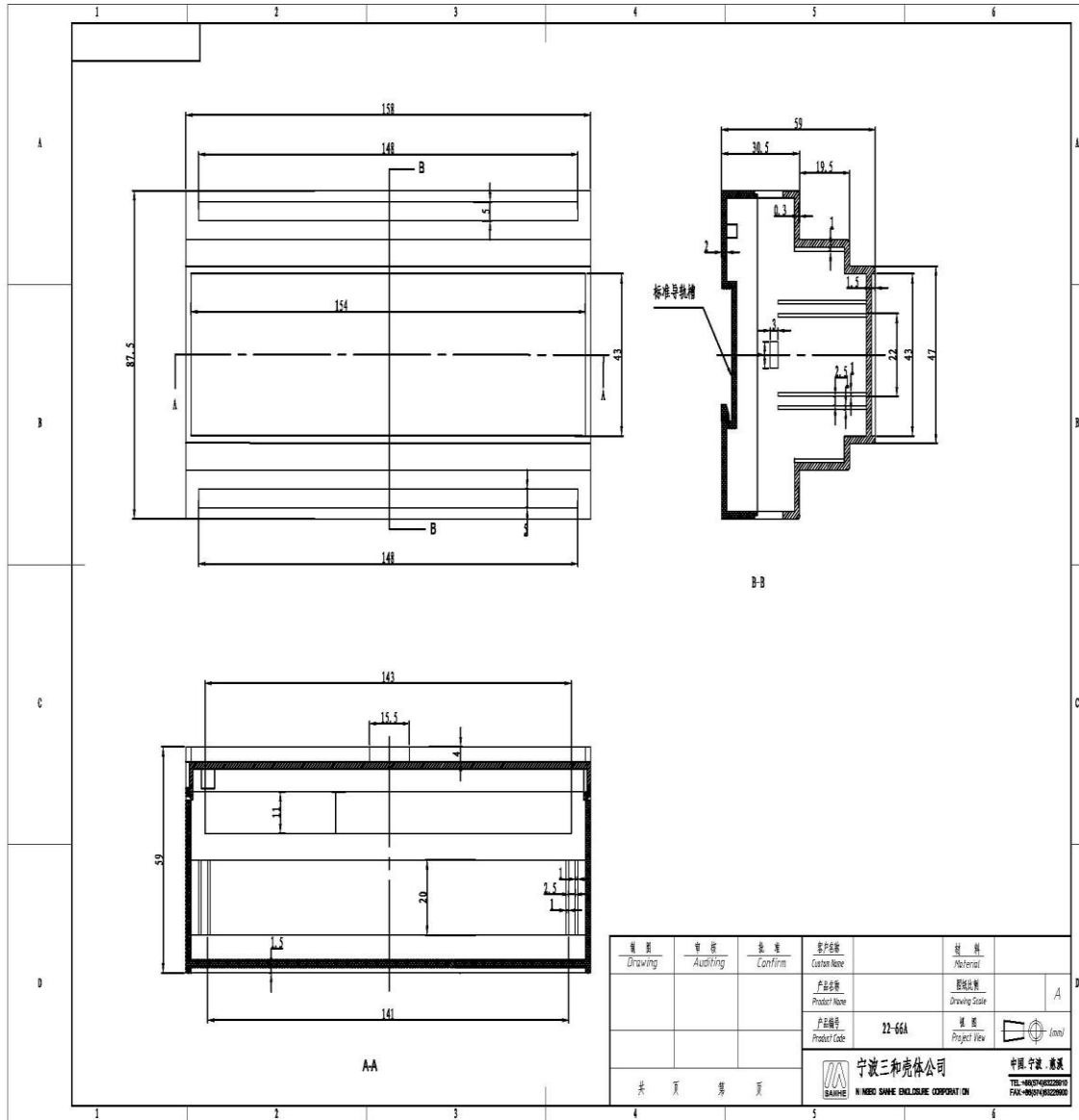
Figure 1 Instrument Dimension

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Unit Overall Dimensions with connector:
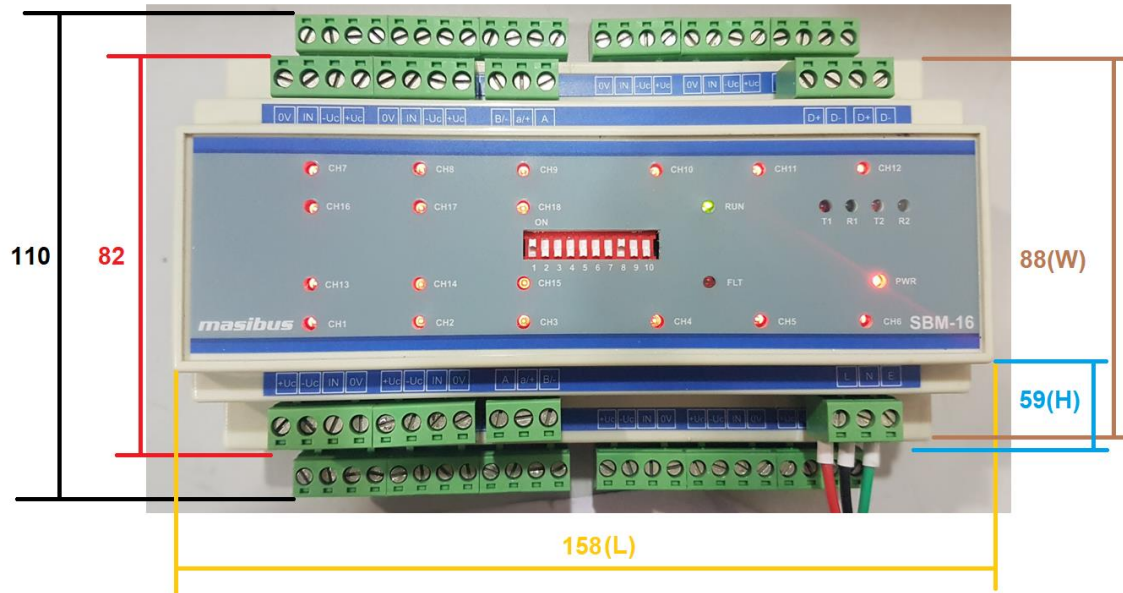
All dimensions are in mm.

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2.3   Maintenance and Inspection

This Section describes maintenance and inspection such as daily inspection, periodical inspection, and cleaning.

Power supply related:
- AC Power voltage (measure at the power terminal block of the unit) 85-265VAC-50/60Hz**(1)**
- DC Power voltage (measure at the power terminal block of the unit) 18-36VDC
- Check for looseness of the power terminal screw- No looseness.
- Check for damage of the wiring cable-No damage.

(1) Unit can also work on 110-370VDC Power Supply range however for this DC range it is not passed Through compliance tests.

Installation state:
Check for looseness of the cable connector and damage of the cable-No looseness or damage.

Ambient environment:
Check if the temperature and humidity are within the specified values.

3. HARDWARE SPECIFICATION

3.1 Input Specification

DC	16 channels from Hall Sensors or DC Shunts(Factory Set)
RANGE	0-5V(Hall Sensors), 0-75mV(DC Shunt)
EXCITATION SUPPLY	+15V@ 15mA / channel for Hall sensors
AUX. SENSORS	2 channels universal (RTD, Thermocouples, mV and Volts)
ACCURACY	0.1% FS
SCAN RATE	< 1 Sec
ADC RESOLUTION	17 Bits
SAMPLING RATE	Voltage/Current: 50mSec/Channels RTD: 100mSec/Channels
SENSOR BURNOUT CURRENT	0.4uA
MEASUREMENT CURRENT	250 µA
INPUT IMPEDANCE	>1 Mohm for RTD/Voltage inputs, 250ohms for current Input
NOISE REJECTION RATIO	• NMRR Normal mode rejection ratio) > 40 dB (50/60 Hz) or more • CMRR (Common mode rejection ratio) >120 dB (50/60 Hz) or more
TEMP-CO	<100ppm/°C
MAX VOLTAGE	20 VDC
CONNECTOR TYPE	Plug-In Screw Connector(MKDS ,Pinch 5.08 and Cable Cross Section 2.5 mm²)

Input Range for RTD (PT-100, CU53 and NI120), TC and Linear input:

Table 1 Input types, their ranges, accuracy and resolution

Analog Input Type	Range	Accuracy	Resolution
E	-200 to 1000°C	± 0.1% of instrument range ± 1 digit	0.1°C
J	-200 to 1200°C		
K	-200 to 1370°C		
T	-200 to 400°C		
B	450 to 1800°C	± 0.1% of instrument range ± 1 digit	1°C
R	0 to 1750°C		
S	0 to 1750°C		
N	-200 to 1300°C		
RTD(PT100)	-199.9 to 850.0°C	± 0.1% of instrument range ± 1 digit	0.1°C
CU53	-210.0 to 210.0°C		
NI120	-70.0 to 210.0°C		
-10 to 20 mV	-1999 to 9999 counts	± 0.1% of instrument range ± 1 digit	1 Count
0 to 100 mV			
4-20mA			
0 to 20 mA			
0 – 5 V			
1 – 5 V			
0 – 10V			

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3.2 Communication Specification

NO. OF COMMUNICATION PORT	2-RS485(COM-1 and COM-2) . COM2 is **Optional**
COMMUNICATION TYPE	Half duplex/Asynchronous
COMMUNICATION PROTOCOL	MODBUS RTU (Baud rate and Parity bit are selectable). All parameters are Configurable through MODBUS Protocol.
MAXIMUM NO. OF UNITS	32
COMMUNICATION ERROR DETECTION	CRC Check

.

3.3 Indications and Switch

STATUS LED	Power, Run, Fault, Transmit/Receive, Individual Channel status
SWITCH	DIP for Modbus Slave ID setting

3.4 Power Supply Specification

RATED VOLTAGE	85-265VAC-50/60Hz[1] or 18-36VDC (Optional)
POWER CONSUMPTION	Max. 12 VA (85-265 VAC) and Max. 8 VA (18-36 VDC)

[1] Unit can also work on 110-370VDC Power Supply range however for this DC range it is not passed through compliance tests.

3.5 Signal Isolations And Insulation Specification

ISOLATION RATING	Withstanding Voltage: 1) Between primary terminals[1] and secondary terminals[2]: 1500VAC for 1 minute 2) Between secondary terminals: 500V AC for 1 minute
SIGNAL ISOLATION	As specified in **Error! Reference source not found.**
INSULATION RESISTANCE	> 20 Mohms at 500V DC

[1] Primary terminals indicate power terminals and relay output terminals
[2] Secondary terminals indicate analog input signals, Digital Contact output terminals, communication terminals and Ethernet N/W terminal

Signal Isolation Specifications:

Table 2 Signal Isolation Specification

Sr No	Signals	Signal Isolation
1	Power Input	Isolated from other input/output terminals and internal circuit
2	Analog Inputs	Not isolated from other analog input terminals and from the internal circuit. But isolated from other input/output terminals.
3	RS-485 Communication	Isolated from other input/output terminals and internal circuit
4	Ethernet Communication	Isolated from other input/output terminals and internal circuit
5	Relay contacts	Isolated between contact output terminals and from other Input/output terminals and internal circuit
6	Digital Output	Isolated from other input/output terminals and internal circuit

3.6 Construction, Installation, and Wiring Specification

MATERIAL	ABS Plastic
CONSTRUCTION	Din Rail Mount
WEIGHT	400 gms
ENCLOSURE DIMENSION (without connector)	158mm (L) X 88mm (W) X 59mm (H)
ENCLOSURE DIMENSION (with connector)	158mm (L) X 110mm (W) X 59mm (H)

3.7 Environmental Specification

AMBIENT TEMPERATURE	-10 to 65°C
OPERATING TEMPERATURE	-10 to 65 °C
STORAGE TEMPERATURE	-10 TO 70 °C
HUMIDITY	30% to 95% RH (Non-Condensing)
INSTRUMENT WARM-UP TIME	<15 minutes after power on

4. FRONT AND REAR PANEL DIAGRAM

4.1 Front Panel Diagram
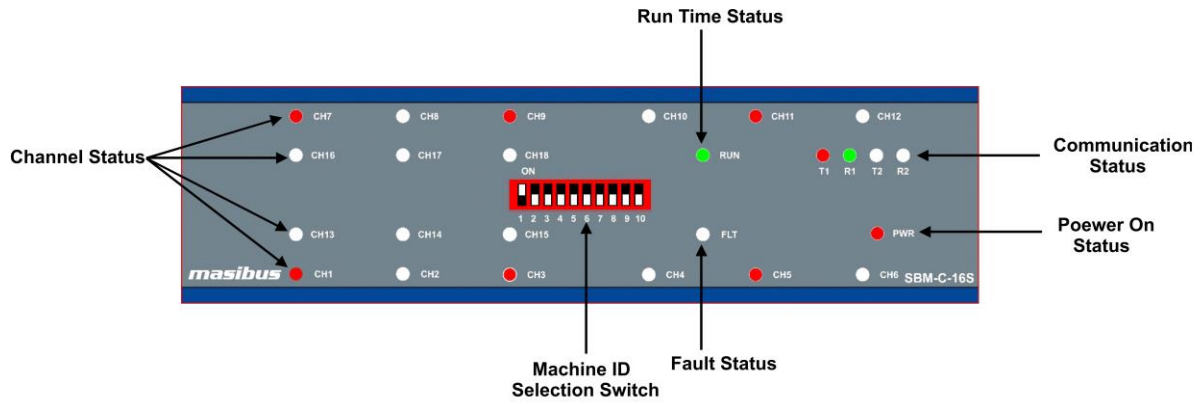
Figure 2 Front Panel Diagram

Name of Part	Indication on Front Panel
Channel Display	Channel Led
COM-1 RS485 slave indicator LED	T1 and R1
COM-2 RS485 master indicator LED	T2 and R2
Run indicator LED	RUN
Fault indication LED	FLT
Power On indication LED	PWR

5. CONNECTION DIAGRAM

5.1 Connection Terminal Details
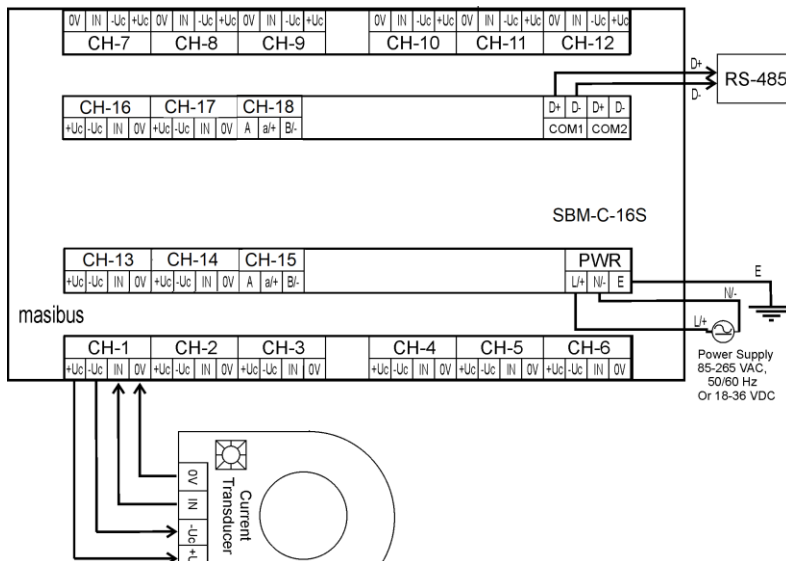
Figure 3 Connection Terminal

⚠
85-265 VAC
50/60Hz~16VA
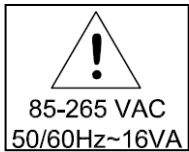
1 Do not touch the terminals of unit when power is ON. It may cause an electric shock.
2 Wire the power input terminal correctly, and avoid applying any voltage exceeding the specified voltage range. It may cause failure or damage.

⚠ **CAUTION**

1 All wiring must confirm to appropriate standards of good practice and local codes and regulations. Wiring must be suitable for Voltage, Current and temperature rating of the system.
2 Provide power from a single-phase instrument power supply. If there is a lot of noise in the power line, insert an insulating transformer into the primary side of the line and use a line filter on the secondary side. Do not place the primary and secondary power cables close to each other.

1) <u>Communication Cable Details:</u>
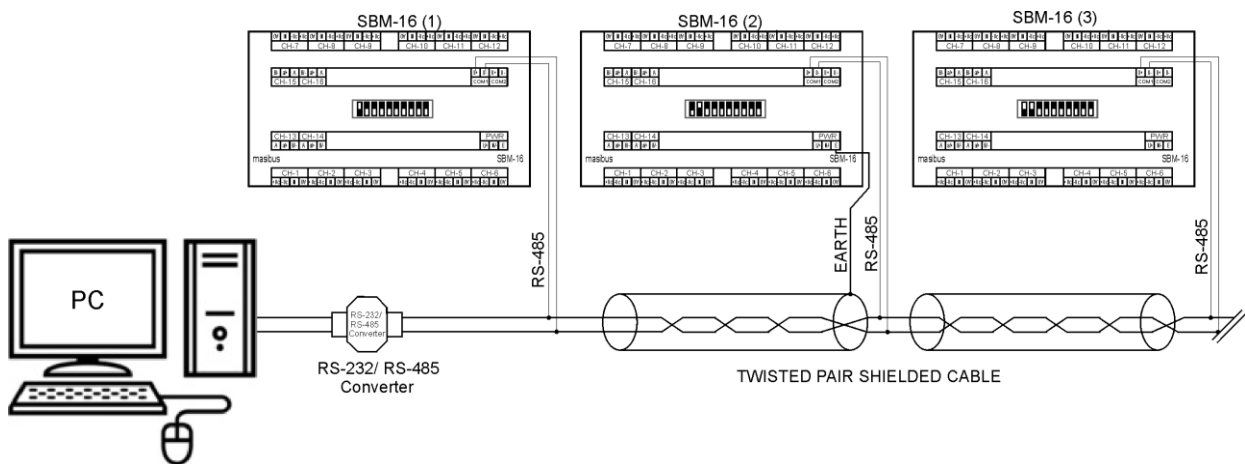
Figure 4 Communication Cable Connection

RS485 Cabling Methodology should be Shielded single twisted pair cable. RS485 is designed to be used with a single twisted pair cable. It would reduce noise induced through ground potential differences. This is the preferred option in areas where there is a potential for high electrical noise or if cabling lacks the cleanliness of conduit or wire trays.

Good installation practice for RS485 systems:
- Use RS485 shielded twisted cable to prevent electrical noise pickup.
- Use a screened cable to prevent electrical noise pickup. This screen must be earthed at one end only.
- Do not carry RS485 and power supply in same cables.
- Do proper termination and/or shielding to provide isolation from high frequency interference, RFI, and transients.

5.2 Switch Settings

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
+1	+2	+4	+8	+16	+32	+64	BD	X1	X2

5.2.1 Setting the Modbus Machine ID

Depend on the Switch position Machine ID is set

Table 3 Switch Setting Description

Switch	Function	Description
S1	Machine ID +1	Machine ID from 0 to 127 are set using switch 1 to 7
S2	Machine ID +2	"
S3	Machine ID +4	"
S4	Machine ID +8	"
S5	Machine ID +16	"
S6	Machine ID +32	"
S7	Machine ID +64	"
S8	BD	If ON then default comm. parameter
S9	X1	Termination Register 1 for RS-485 port 1
S10	X2	Termination Register 2 for RS-485 port 2

5.2.2 RS-485 Termination

If DIP Switch 9 is "ON" then Termination resistance for Com port 1 is "ON"
If DIP Switch 10 is "ON" then Termination resistance for Com port 2 is "ON"

5.3 Communication Setting

The data in the module is stored in 16 bit register. These register are accessed over the network using the MODBUS RTU communication protocol.

5.3.1 Communication settings with DIP Switch 8 ON (Default)

Baud Rate   : 9600
Parity   : None
Data length   : 8
Stop bits   : 2

5.3.2 Communication settings with DIP Switch 8 OFF (Programmed Baud Rate)

Baud Rate   : 9600, 19200, 57600
Parity   : None, even, old
Data length   : 8
Stop bits   : 1, 2

These communication settings are done from configuration software or any MODBUS Master software. After changing these parameter module must restart to take the effect of changed parameter.

6. CALIBRATION PROCEDURE

Calibration is provided for ambient temperature, PV sensor input
First select the calibration function as described below and then follow the procedure depending on the parameter to be calibrated. The sequences of parameters that will be available for calibration are listed below:

- Ambient temperature adjustment
- PV Sensor input

Ambient temperature adjustment:-

For ambient calibration user can enter ambient value in ambient calibration register using modbus master software.

PV input sensor calibration:-

Note that all input type group must be calibrated before proceeding further. There is no need to calibrate all input types. Just calibrate only one input type from one group and all other input types from the same group will be calibrated automatically. Group calibration detail is given in following table.

Table 4 Group Calibration Detail

Group NO	Input type	Calibration for input
1	E,J,K,T,N,0-100mv	Either of any input
2	B,R,S,-10 to 20mv	Either of any input
3	Pt-100(RTD), CU53, NI120	Either of any input
4	0-5v,1-5V, 0-10V, 4-20mamp,0-20mamp	Either of any input

Note : Kindly Calibrate following input type for gaining better accuracy.
1) For Group Number 1, calibrate 0-100 mV input type.
2) For Group Number 2, calibrate -10 to 20 mV input type.
3) For Group Number 3, calibrate Pt-100(RTD) input type and
4) For Group Number 4, calibrate 0 to 10 V input type.

For zero calibration feed input value according to input type and write the zero value using modbus register of channel. User can use any channel out of maximum number of channels to calibrate input type for lower reading. Feed sensor input using a calibrator, such that process value is close to lower range value.

Note: The SBM-16 allows the user to calibrate sensor's input anywhere in the range, but it is recommended that it should be calibrate the input at points close to lower and upper range values.

When the calculations are over, the new calibration values are stored automatically and Process value parameter show the calibrated value.

User can use any channel out of maximum number of channels to calibrate input type for span reading. Feed sensor input using a calibrator, such that process value is close to sensor's upper range value. Write span value using modbus register of channel. When the calculations are over, the new calibration values are stored automatically and Process value parameter show the calibrated value.

Zero and Span calibration is over.

In case, the SBM-16 cannot complete the calibration due to any reason, it will hold previous calibration parameters. Calibration for input sensor is over.

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7. MODBUS COMMUNICATION DETAIL

7.1 Overview

When SBM-16 are setup to communicate on a Modbus network using RTU (Remote Terminal Unit) mode, each 8–bit byte in a message contains two 4–bit Hexadecimal characters. The main advantage of this mode is that it's greater Character density allows better data throughput than ASCII for the same baud rate.

Each message must be transmitted in a continuous stream. The format for each byte in RTU mode is:

Coding System: 8–bit binary, hexadecimal 0–9, A–F
Two hexadecimal characters contained in each
8–bit field of the message

Bits per Byte: 1 start bit
8 data bits, least significant bit sent first
1 bit for even/odd parity; no bit for no parity
1 Stop bit if parity is used; 2 bits if no parity

Error Check Field: Cyclical Redundancy Check (CRC)

o   In RTU mode, messages start with a silent interval of at least 3.5 character times.

o   If a silent interval of more than 1.5 character times occurs before completion of the frame, the receiving device flushes the incomplete message and assumes that the next byte will be the address field of a new message.

Table 5 Modbus Communication frame format

START	ADDRESS	FUNCTION	DATA	CRC CHECK	END
T1–T2–T3–T4	8 BITS	8 BITS	n x 8 BITS	16 BITS	T1–T2–T3–T4

The Query–Response Cycle
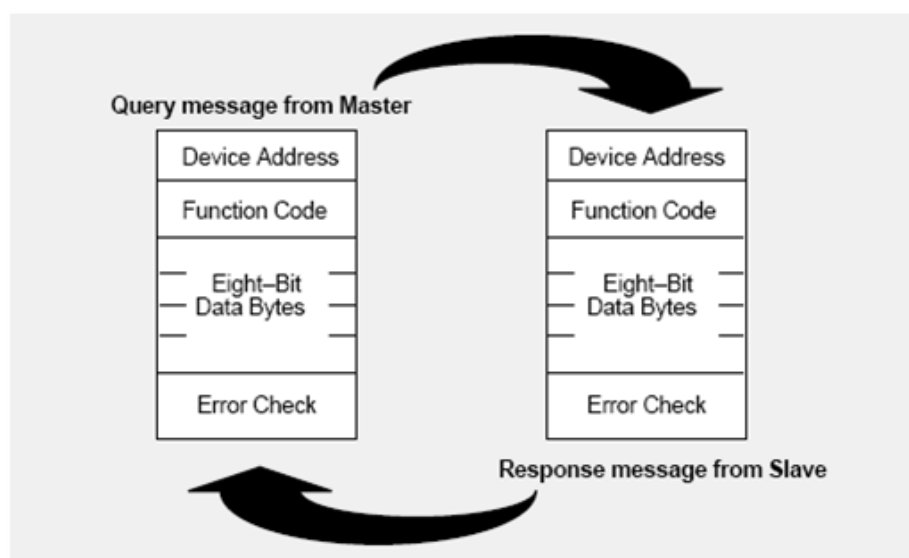
Figure 5 The Query-Response Cycle

o   Valid slave device addresses are in the range of 0 – 247 decimal.

- The individual slave devices are assigned addresses in the range of 1 – 247.
- Address 0 is used for the broadcast address, which all slave devices recognize.
- The data field is constructed using sets of two hexadecimal digits, in the range of 00 to FF hexadecimal.
- In RTU mode, messages include an error–checking field that is based on a Cyclical Redundancy Check (CRC) method
- The CRC field is two bytes, containing a 16–bit binary value. The CRC value is Calculated by the transmitting device, which appends the CRC to the message

- **Use only following function codes for data read/write purpose**

Table 6 Modbus Function code description

Function Code	Description
01	NA
02	NA
03	Read Holding Registers
04	Read Input Registers
05	NA
06	Force Single Register
15	NA
16	Force Multiple Registers

7.2 Exception Responses

❖ Except for broadcast messages, when a master device sends a query to a slave Device it expects a normal response. One of four possible events can occur from The master's query:
  ➢ If the slave device receives the query without a communication error, and can handle the query normally, it returns a normal response.
  ➢ If the slave does not receive the query due to a communication error, no Response is returned. The master program will eventually process a timeout Condition for the query.
  ➢ If the slave receives the query, but detects a communication error (parity, LRC, or CRC), no response is returned. The master program will eventually process a timeout condition for the query.
  ➢ If the slave receives the query without a communication error, but cannot Handle it (for example, if the request is to read a non–existent coil or register), The slave will return an exception response informing the master of the nature of the error.
  ➢ The exception response message has two fields that differentiate it from a normal Response:

Query:

Table 7 Modbus Query frame format

Byte	Contents	Example
1	Slave Address	0A
2	Function	01
3	Starting Address Hi	04
4	Starting Address Lo	A1
5	No Of Coils Hi	01
6	No Of Coils Lo	01
7	CRC Hi	XX
8	CRC Lo	XX

Exceptional Response:

Table 8 Exceptional Response

Byte	Contents	Example
1	Slave Address	0A
2	Function	81 (80 + Function Code From Query)
3	Exceptional Code	02
4	CRC Hi	XX
5	CRC Lo	XX

- **Exception Codes**

Table 9 Exception codes

CODE	NAME	MEANING
01	Illegal Function	The function code received in the query is not an allowable action for the slave. If a Poll Program Complete command Was issued, this code indicates that no Program function preceded it.
02	Illegal Data Address	The data address received in the query is not an allowable address for the Slave.
03	Illegal Data Value	A value contained in the query data field is not an allowable value for the Slave.

7.3 Modbus Addresses

Table 10 Process Value and Status Read Parameters

Sr. No	Parameter Description	Modbus Address	Parameter Type	Access	Remarks
1	Channel – 1 – PV	30001	Integer	R	-
2	Channel – 2 – PV	30002	Integer	R	-
3	Channel – 3 - PV	30003	Integer	R	-
4	Channel – 4 - PV	30004	Integer	R	-
5	Channel – 5 – PV	30005	Integer	R	-
6	Channel – 6 – PV	30006	Integer	R	-
7	Channel – 7 – PV	30007	Integer	R	-
8	Channel – 8 – PV	30008	Integer	R	-
9	Channel – 9 – PV	30009	Integer	R	-
10	Channel – 10 – PV	30010	Integer	R	-
11	Channel – 11 – PV	30011	Integer	R	-
12	Channel – 12 – PV	30012	Integer	R	-
13	Channel – 13 – PV	30013	Integer	R	-
14	Channel – 14 – PV	30014	Integer	R	-
15	Channel – 15 – PV	30015	Integer	R	-
16	Channel – 16 – PV	30016	Integer	R	-
17	Channel – 17 – PV	30017	Integer	R	-
18	Channel – 18 – PV	30018	Integer	R	-
19	Ambient PV	30025	Integer	R	-

Table 11 Details of abnormal Conditions of Process Value

Abnormal Value (Integer)	Description
32762	Reserved
32764	Channel Skip
32765	UNDER Value
32766	OVER Value
32767	Channel OPEN Indication

Table 12 Holding Registers Parameters – Part 1

Sr. No	Parameter Description	Modbus Address	Parameter Type	Min Value (Single Channel)	Max Value (Single Channel)	Access	Remarks
1	Ch–1 - 2 – Input Type	40097	Integer	-	-	R/W	Refer Table 15
2	Ch –3 - 4 – Input Type	40098	Integer	-	-	R/W	
3	Ch –5 - 6 – Input Type	40099	Integer	-	-	R/W	
4	Ch –7 - 8 – Input Type	40100	Integer	-	-	R/W	
5	Ch –9 - 10 – Input Type	40101	Integer	-	-	R/W	
6	Ch –11 - 12 – Input Type	40102	Integer	-	-	R/W	
7	Ch –13 - 14 – Input Type	40103	Integer	-	-	R/W	
8	Ch –15 - 16 – Input Type	40104	Integer	-	-	R/W	
9	Ch –17 - 18 – Input Type	40105	Integer	-	-	R/W	
10	Ch –1 – USER - Z	40109	Integer	-	-	R/W	Refer Table 15
11	Ch –2 – USER - Z	40110	Integer	-	-	R/W	
12	Ch –3 – USER - Z	40111	Integer	-	-	R/W	
13	Ch –4 – USER - Z	40112	Integer	-	-	R/W	
14	Ch –5 – USER - Z	40113	Integer	-	-	R/W	
15	Ch –6 – USER - Z	40114	Integer	-	-	R/W	
16	Ch –7 – USER - Z	40115	Integer	-	-	R/W	
17	Ch –8 – USER - Z	40116	Integer	-	-	R/W	
18	Ch –9 – USER - Z	40117	Integer	-	-	R/W	
19	Ch –10 – USER - Z	40118	Integer	-	-	R/W	
20	Ch –11 – USER - Z	40119	Integer	-	-	R/W	
21	Ch –12 – USER - Z	40120	Integer	-	-	R/W	
22	Ch –13 – USER - Z	40121	Integer	-	-	R/W	
23	Ch –14 – USER - Z	40122	Integer	-	-	R/W	
24	Ch –15 – USER - Z	40123	Integer	-	-	R/W	
25	Ch –16 – USER - Z	40124	Integer	-	-	R/W	
26	Ch –17 – USER - Z	40125	Integer	-	-	R/W	
27	Ch –18 – USER - Z	40126	Integer	-	-	R/W	
28	Ch –1 – USER – S	40133	Integer	-	-	R/W	Refer Table 15
29	Ch –2 – USER – S	40134	Integer	-	-	R/W	
30	Ch –3 – USER – S	40135	Integer	-	-	R/W	
31	Ch –4 – USER – S	40136	Integer	-	-	R/W	
32	Ch –5 – USER – S	40137	Integer	-	-	R/W	
33	Ch –6 – USER – S	40138	Integer	-	-	R/W	
34	Ch –7 – USER – S	40139	Integer	-	-	R/W	
35	Ch –8 – USER – S	40140	Integer	-	-	R/W	
36	Ch –9 – USER – S	40141	Integer	-	-	R/W	
37	Ch –10 – USER – S	40142	Integer	-	-	R/W	
38	Ch –11 – USER – S	40143	Integer	-	-	R/W	
39	Ch –12 – USER – S	40144	Integer	-	-	R/W	
40	Ch –13 – USER – S	40145	Integer	-	-	R/W	
41	Ch –14 – USER – S	40146	Integer	-	-	R/W	

42	Ch –15 – USER – S	40147	Integer	-	-	R/W	
43	Ch –16 – USER – S	40148	Integer	-	-	R/W	
44	Ch –17 – USER – S	40149	Integer	-	-	R/W	
45	Ch –18 – USER – S	40150	Integer	-	-	R/W	

Table 13 Holding Registers Parameters – Part 2

Sr. No	Parameter Description	Modbus Address	Parameter Type	Min Value (Single Channel)	Max Value (Single Channel)	Access	Remarks
61	CJC	42004 - H	Integer	0	2	R/W	Refer Table 16
62	FCJC	42005	Integer	-10.0	65.0	R/W	-
63	CCJC	42006 - H	Integer	1	24	R/W	-
64	Number Of Channel	42009	Integer	1	24	R/W	-
65	Machine ID	42059	Integer	1	128	R/W	-
66	Baud Rate COM 1	42060	Integer	0	2	R/W	Refer Table 17
67	Parity COM1	42061	Integer	0	2	R/W	Refer Table 18
68	Baud Rate COM 2	42062	Integer	0	2	R/W	Refer Table 17
69	Parity COM2	42063	Integer	0	2	R/W	Refer Table 18

Table 14 Calibration Registers Parameters

Sr. No	Parameter Description	Modbus Address	Parameter Type	Min Value	Max Value	Access	Remarks
55	Ambient calibration	42101	Integer	-10.0	65.0	W	
56	Ch –1 – CALZ	42102	Integer	-	-	W	
57	Ch –2 – CALZ	42103	Integer	-	-	W	
58	Ch –3 – CALZ	42104	Integer	-	-	W	
59	Ch –4 – CALZ	42105	Integer	-	-	W	
60	Ch –5 – CALZ	42106	Integer	-	-	W	
61	Ch –6 – CALZ	42107	Integer	-	-	W	
62	Ch –7 – CALZ	42108	Integer	-	-	W	
63	Ch –8 – CALZ	42109	Integer	-	-	W	
64	Ch –9 – CALZ	42110	Integer	-	-	W	Refer Table 15
65	Ch –10 – CALZ	42111	Integer	-	-	W	
66	Ch –11 – CALZ	42112	Integer	-	-	W	
67	Ch –12 – CALZ	42113	Integer	-	-	W	
68	Ch –13 – CALZ	42114	Integer	-	-	W	
69	Ch –14 – CALZ	42115	Integer	-	-	W	
70	Ch –15 – CALZ	42116	Integer	-	-	W	
71	Ch –16 – CALZ	42117	Integer	-	-	W	
72	Ch –17 – CALZ	42118	Integer	-	-	W	
73	Ch –18 – CALZ	42119	Integer	-	-	W	
74	Ch –1 – CALS	42126	Integer	-	-	W	
75	Ch –2 – CALS	42127	Integer	-	-	W	
76	Ch –3 – CALS	42128	Integer	-	-	W	Refer Table 15
77	Ch –4 – CALS	42129	Integer	-	-	W	

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78	Ch –5 – CALS	42130	Integer	-	-	W	
79	Ch –6 – CALS	42131	Integer	-	-	W	
80	Ch –7 – CALS	42132	Integer	-	-	W	
81	Ch –8 – CALS	42133	Integer	-	-	W	
82	Ch –9 – CALS	42134	Integer	-	-	W	
83	Ch –10 – CALS	42135	Integer	-	-	W	
84	Ch –11 – CALS	42136	Integer	-	-	W	
85	Ch –12 – CALS	42137	Integer	-	-	W	
86	Ch –13 – CALS	42138	Integer	-	-	W	
87	Ch –14 – CALS	42139	Integer	-	-	W	
88	Ch –15 – CALS	42140	Integer	-	-	W	
89	Ch –16 – CALS	42141	Integer	-	-	W	
90	Ch –17 – CALS	42142	Integer	-	-		
91	Ch –18 – CALS	42143	Integer	-	-		
92	Factory reset parameter	42170	Integer	0	2	R/W	Refer Table 19

Table 15 Input Type Selection Table

Input Type	I/P no (Decimal)	I/P No. (Hex)	Zero	Span	Resolution
None	0	0 x 00	-	-	-
E	1	0 x 01	-200	1000	0.1°C
J	2	0 x 02	-200	1200	0.1°C
K	3	0 x 03	-200	1370	0.1°C
T	4	0 x 04	-200	400	0.1°C
B	5	0 x 05	450	1800	1°C
R	6	0 x 06	0	1750	1°C
S	7	0 x 07	0	1750	1°C
N	8	0 x 08	0	1300	0.1°C
RTD	9	0 x 09	-199.9	850.0	0.1°C
CU53	10	0 x 0A	-210.0	210.0	0.1°C
NI120	11	0 x 0B	-70.0	210.0	0.1°C
-10 TO 20 mV	12	0 x 0C	-1999	9999	
0 to 100 mV	13	0 x 0D	-1999	9999	
4 to 20 mA	14	0 x 0E	-1999	9999	1 Count
0 to 20 mA	15	0 x 0F	-1999	9999	
0 to 5 V	16	0 x 10	-1999	9999	
1 to 5 V	17	0 x 11	-1999	9999	
0 to 10 V	18	0 x 12	-1999	9999	

Table 16 CJC Selection	
Modbus Index	**Parameter value**
0	ACJC
1	FCJC
2	CCJC

Table 17 COM Port Baud Rate Selection	
Modbus Index	**Parameter value**
0	9600
1	19200
2	57600

Table 18 COM Parity Selection	
Modbus Index	**Parameter value**
0	Parity None Stop Bit 2
1	Parity Odd Stop Bit 1
2	Parity Even Stop Bit 1

Table 19 Factory Reset Parameters	
Modbus Index	**Parameter value**
0	Calibration Values
1	Parameters Values
2	All Values

8. TROUBLESHOOTING

If the operating display does not appear after turning on the SBM-16 power, follow the measures in the procedure below.

If a problem appears complicated, contact our sales representative.
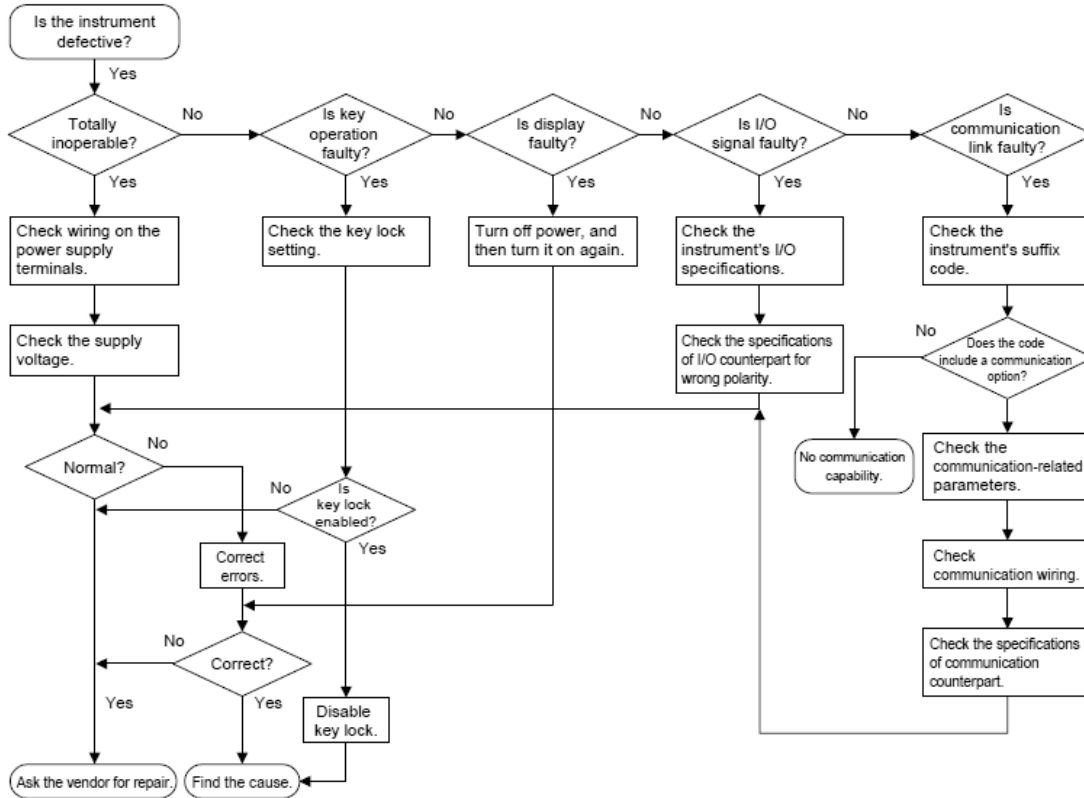
APPENDIX – A PV STATUS DURING SENSOR BURN OUT CONDITIONS

- **PV INPUT STATUS DISPLAY DURING BURNOUT CONDITION:**

Table 23 PV Status during Burn Out Condition

Input type	Modbus Message
E	OPEN
J	OPEN
K	OPEN
T	OPEN
B	OPEN
R	OPEN
S	OPEN
N	OPEN
RTD	OPEN
CU53	OPEN
NI120	OPEN
-10 to 20mV	OPEN
0 to 100 mV	OPEN
4 to 20mAmp	OPEN
0 to 20mAmp	PV LOW
0 to 5V	PV LOW
1 to 5V	OPEN
0 to 10V	PV LOW

Note: If set PV_low/ PV_high for input type is less then maximum value of zero and span then process value will display readings above 5% of display range (User set PV_low / PV_High), then after it will show OVER(32766)/ UNDER(32765) value until value crosses maximum value of Sensor range. Process value greater then maximum value of zero/span then display will show OPEN (32767) Value. In case of linear inputs scaling is applied then during OPEN sensor condition it may not show OPEN (32767) value instead it will show either OVER (32766)/ UNDER (32765).

REVISION HISTORY

- Initial Release

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