User's Manual

DATALOGGER– 8040

Masibus Automation & Instrumentation Pvt. Ltd.
B/30, GIDC Electronics Estate,
Sector-25, Gandhinagar-382044, Gujarat, India
☎+91 79 23287275-79 +91 79 23287281-82
Email:support@masibus.com
Web: www.masibus.com

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1. INTRODUCTION:

Foreword

Thank you for purchasing 8040 - Datalogger. This manual describes the basic functions and operation methods of Data logger 8040. Please read this user's manual carefully before using the product.

Overview

This product provides a wide variety of features in a data acquisition and control application. It includes three I/O-slots Data – Logger 8040 (Half 19" Rack)(Obsolete) and 10 I/O-slots Data - Logger 8040(Full 19" Rack). They are remotely controlled by the host computer through a set of commands and transmitted in a RS-485/RS232/Ethernet (Optional) network. The modular design also provides more flexibility in the system configuration. The following is a summary of the major Data – Logger 8040 system components. The Data – Logger 8040 (Half 19")(Obsolete) system architecture includes a SMPS Card, CPU card with a built-in RS-232/RS-485 communication port, one built-in RS-422 communication ,3 I/O – slot backplane and Ethernet option for Modbus TCP/IP communication. The Data – Logger 8040 (Full 19") system includes all of the above components, except it has 10 I/O – slot backplane. There are some software utilities available to the Data – Logger 8040 systems. The Windows utility software helps you to configure your Data – Logger 8040 Model. One can either configure the data-logger from operator terminal or through host computer via RS232/RS485port.

Notice

The contents of this manual are subject to change without notice as a result of continuing 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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Checking the contents of the package

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

Product ordering code

The Datalogger-8040 unit has a nameplate affixed to the one side of the enclosure. Check the model and suffix codes inscribed on the nameplate to confirm that the product received is that which was ordered.

Ordering Code																			
Model	**No Of Input (max 8 cards)**		**Input Type & Configuration**				**Operator terminal**		**Aux Output (max 2 cards)**			**Signal Termination**		**Communication**			
8040	**X**		**X**		**X**		**X**		**X**	**Relay (card)**	**OC (card)**	**X**		**X**	**Port-1**	**X**	**Port-2**
	A	16	N	Non Isolated	1	E	N	None	XX	0	0	N	None	2	RS232	2	RS485
	B	32	I	Isolated	2	J	1	Yes	RX	1	0	1	Pre Fab cable	4	RS485	4	RS485
	C	48			3	K			RO	1	1	2	Pre Fab cable with DIN terminal Modules			E	Ethernet*
	D	64			4	T			XO	0	1						
	E	80			5	B			OO	0	2						
	F	96			6	R			RR	2	0						
	G	112			7	S											
	H	128			8	N											
					9	Pt 100, 3W											
					M	NI -120											
					C	4-20 mA											
					D	0-20 mA											
					E	1-5 VDC											
					F	0-5 VDC											
					S	Special#											

X - Specify from table

Consult factory

***** with Ethernet option: One No. less I/O Slot will be available

Table 1 : Ordering code

2. SAFETY AND WARNING PRECAUTIONS:

2.1 Safety Precautions:

- ✓ ⚠ Before installation or beginning of any troubleshooting procedures power to all equipments must be switched off and isolated. Units suspected of being faulty must be disconnected and removed first and brought to a properly equipped workshop for testing and repair. Component replacement and interval adjustments must be done by a Masibus authorized or trained person only.

2.2 Warning Precautions:

- ✓ It is recommended that power of these units to be protected by fuses, circuit breakers or external over current rated at the minimum value possible.
- ✓ 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.
- ✓ Unused control terminals should not be used as jumper points as they may be internally connected, causing damage to the unit.
- ✓ Verify the ratings of the output devices and the inputs are as specified in Chapter 4 are not exceeded.
- ✓ Do not use this instrument in areas such as excessive shock, dirt, moisture, corrosive gases or rain. The ambient temperature of the areas should not exceed the maximum rating specified.
- ✓ 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. As counter measures against noise, do not place the primary and secondary power cables close to each other.

Note*:*

Information in this manual is subject to change without prior notice or permission due to continuous improvement.

Printer Output and RS485-232 software selection is not available in this version so please do not consider any parameter for configuration

CAUTION:

High voltage transients may occur when switching inductive loads such as some contactors or solenoid valves. Through the internal contacts, these transients may introduce disturbances which could affect the performance of the instrument.

For this type of load it is highly recommended that a “snubber” is connected across the normally open contact of the relay switching though load. The snubber recommended consists of a series connected resistor/capacitor (typically **15nF/100 Ohms**). A snubber will also prolong the life of the relay contacts. A snubber should also be connected across the output of a trip output to prevent false triggering under line transient conditions.

3. HARDWARE SPECIFICATIONS

3.1 Product Specifications:

MODEL	Data logger 8040
MODEL TYPE	Micro-controller based, 128 channel data acquisition

3.2 Analog Input Specifications:

Noise Rejection Ratio	• NMRR > 40 dB • CMRR >120 dB
No of Inputs	16
Input Impedance	> 2MΩ
ADC Resolution	16 Bits
Accuracy	±(0.1%of Full Scale + 1 digit)
Range	Table 2
Data Update Rate	3 sec
Sensor Burnout Current	0.4 µA
RTD Excitation Current	500 µA
Open sensor indication	"Open " displayed
Channel to channel isolation (Optional)	125 VAC/ 300 VDC
Maximum Voltage	20 VDC
Open thermocouple indication	
Input types	E,J,K,T,B,R,S,N
CJC Error	±2°C maximum
Input Resolution	1°C
Auto Cold junction compensation	0 to +55°C
RTD Inputs:	
Input types	PT-100, NI-120
Input Resolution	0.1°C
3 Wire compensation	Using Hardware Technique
Voltage and Current inputs:	
Input types	1 to 5V,0 to 5V, 4 to 20mA & 0 to 20 mA

3.3 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
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.

3.4 Status Indication:

Status LEDs	• Power ON • Main Controller Module Status, Communication Status • Analog Module Status • Relay and OC Module: Channel Status and Module status
Switch	Power ON/OFF Switch

3.5 CPU Specifications:

CPU	32 Bit Micro – Controller
Watchdog Reset	Yes
Real Time Clock	Yes (With Battery Backup)
I/O Capacity	3 Slots (Half 19”) (Obsolete) (1) 10 Slots (Full 19”) (8 AI and 2 DO max)
Width	10T, 16T(In Case Ethernet or USB Port Option Selected)

(1) **Half 19” Data logger is obsolete and hence it is not in production.**

3.6 Communication Specifications:

Serial Communication:	
RS – 485/RS-232(J1)	1(Hardware switch selectable) See appendix B
RS – 485/RS-232(J3)	1(Hardware switch selectable) See appendix B
Interface	RS – 485, Twisted Cable (2 wire, EIA RS-485) RS – 232, Twisted Cable (3 wire, EIA RS-232)
Baud Rate	9600 bps, 19200 bps and 57600 bps
Max. Communication Distance	1200 mtr. for RS – 485 10 mtr. for RS – 232
Protocol	MODBUS RTU (Command Response)
Asynchronous Data Format	1 start bit, 8 data bits, 1 stop bit, no parity (1 start, 8-N-1)
Ethernet Communication(Optional):	
No. of Port	1
Interface	RJ45
Speed	10/100 Mbps
Protocol	Modbus-TCP/IP(Modnet) Slave
I/O Capacity	8 AI and 1 DO max
Width	16T

USB Communication(Optional):	
No. of Port	1
Standard	2.0
Fetch Data Format	Standard Tabular or AES-128 bit Encrypted(Optional)
Data File Format	*.xls
Max. USB Pen Drive Size	4 GB Supported with FAT16/FAT32 Formatting

3.7 Data Logging Specification :

Data logging Memory Type	Flash Nonvolatile Memory (32 MB)
Data logging type	Periodic
Periodic Logging Memory Size	25 MB
Memory Storage	Total records : (26083328/ ((2 x No of channels) + 14)) - 1
Logging Period in Days	(Total records x logging time in seconds)/ (3600 x 24)
RTC Time format	DD/MM/YY – HH:MM:SS
Periodic Logging sampling time	1 Second minimum
Logged data retrieval	Through macPLUS software in excel format or pdf formate(optional) using Modbus protocol
Record	Measured Value with Time stamp
USB Port	1(USB mass storage device , USB 2.0)
USB Function	For retrieving logged data only
Max. USB Mass storage device size	Upto 32 GB
USB Mass storage device format	• FAT16 (Recommended) • FAT32
USB fetched data file format	.xls
USB data retrieving option	• Full Data Fetch

3.8 Output Specifications:

Relay Output	
No. of outputs	8 per card
Connector	25 PIN D type
Rating	2A @ 250 V AC, 30V DC max
Set points	2 or 4
Types	H-VH, VL-L, L-H and VL-L-H-VH
Response time	< 3 Sec

Open collector Output	
No. of outputs	16 per card
Connector	25 PIN D type
Rating	100mA @ 30V DC max
Set points	2 or 4
Types	H-VH, VL-L, L-H and VL-L-H-VH
Response time	< 3 Sec
Application	Any Output is mapped to any channel alarm

3.9 Operator Terminal Specifications:

Display Type	16 x 2 Large Character LCD Display with backlight
No. Of keys	24 keys with membrane keypad
Communication interface	RS 422 – 4 wire full duplex communication
Connector	RJ 45
Protocol	Modbus - RTU Slave
Baud Rate	19200 bps
Power Supply	18 - 36 VDC
Power Consumption	< 2.5 VA
Dimension	96 mm (W) * 192 mm (H) * 45 mm (D)
Weight	650 gms

3.10 Electrical Specifications:

Supply Voltage	85 to 265VAC or 120 to 370VDC
Supply frequency	50/60 Hz ± 3 %
Power Consumption	35 VA max.

3.11 Mechanical Specifications:

Data logger 8040 Chassis	
½ 19" System Dimension (Obsolete)	270(W)*132.5(H)*260(D)
19" System Dimension	482 mm (W) * 132.5 mm (H) * 260 mm (D)
Mounting	19" Sub rack mount
Weight	4.5 Kg (full 19")(without OT)

3.12 Environmental Specifications:

Operating Temperature	0°C to 55°C
Relative humidity	30 to 90% RH non condensing

Type	Range	Resolution
J	-200°C to +760°C	1°C
K	-200°C to +1350°C	1°C
T	-200°C to +400°C	1°C
E	-200°C to +1000°C	1°C
B	+450°C to 1750°C	1°C
S	0°C to +1750°C	1°C
R	0°C to +1750°C	1°C
N	-230°C to +1270°C	1°C
RTD	-200.°C TO 850.0°C	0.1°C
NI-120	-70.0°C to 279.0°C	0.1°C
0 to 20 mA	-19000 to +19000	1 COUNT
4 to 20 mA	-19000 to +19000	1 COUNT
0 to 5V	-19000 to +19000	1 COUNT
1 to 5V	-19000 to +19000	1 COUNT

Table 2 : Input types with ranges

4. SYSTEM CONFIGURATION

4.1 Data logger 8040 with full 19” chassis:

The following Diagram shows the System Configuration possible with Data logger 8040.

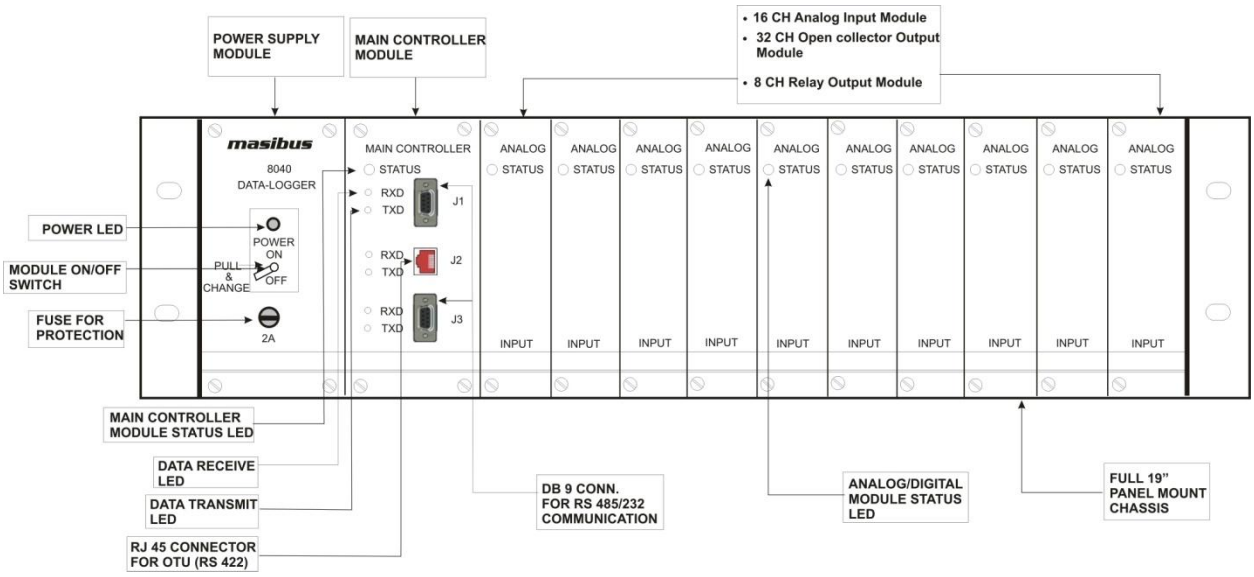


Figure 1 : Standard System setup for data logger 8040 (Full 19”)

4.2 Data logger 8040 with half 19” chassis (Obsolete):

The following Diagram shows the System Configuration possible with Data logger 8040.

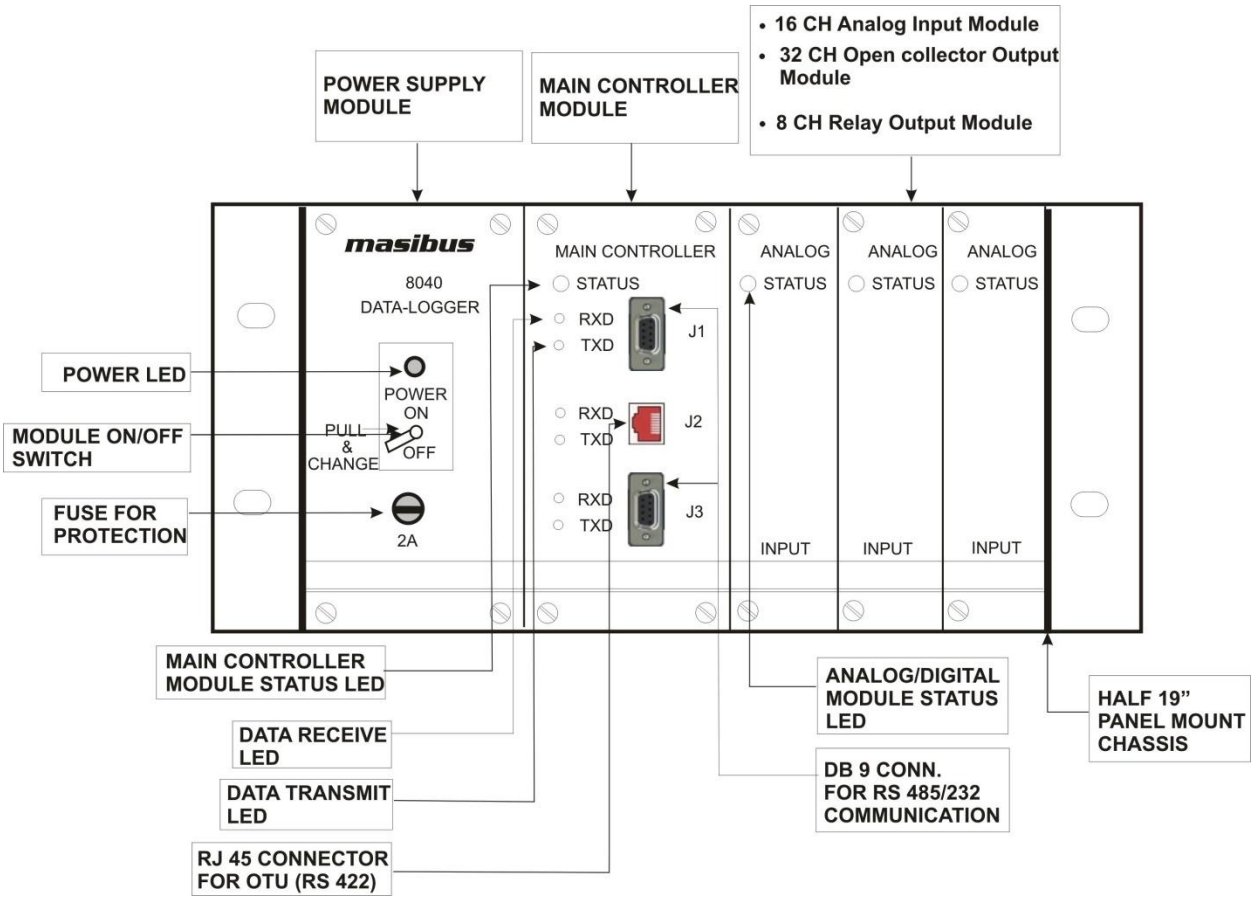


Figure 2 : Standard System setup for data logger 8040 (Half 19”)

4.3 Data logger 8040 with full 19” chassis (with Ethernet option):

The following Diagram shows the System Configuration possible with Data logger 8040 (with Ethernet communication).

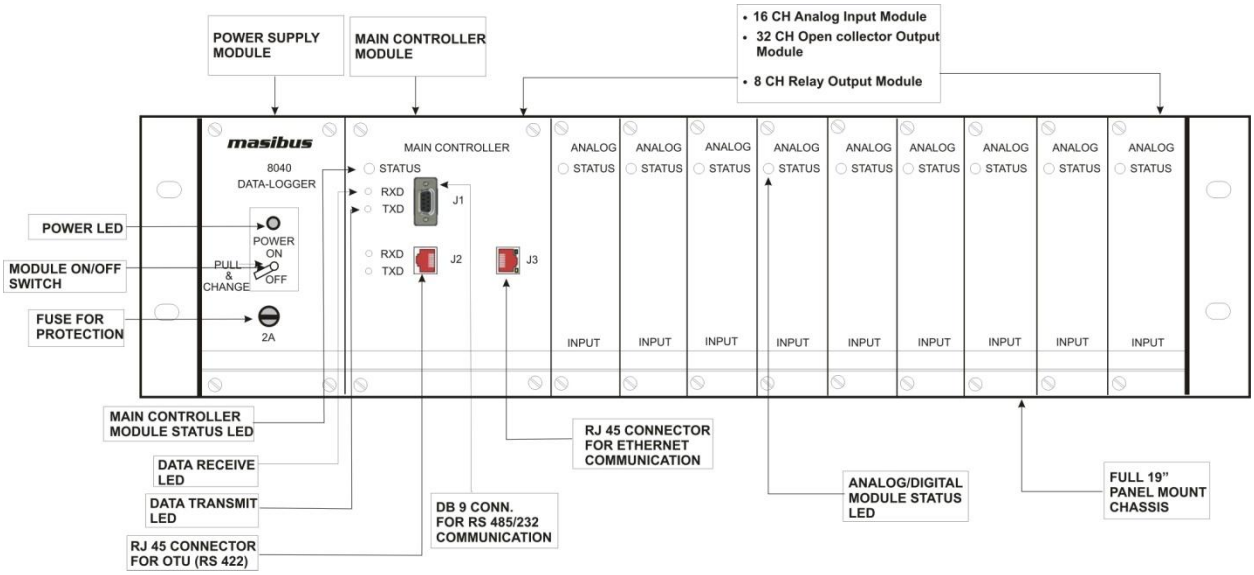


Figure 3 : System setup for data logger 8040 with Ethernet communication (Full 19”)

4.4 Data logger 8040 with half 19” chassis (with Ethernet option)(Obsolete):

The following Diagram shows the System Configuration possible with Data logger 8040 (with Ethernet communication).

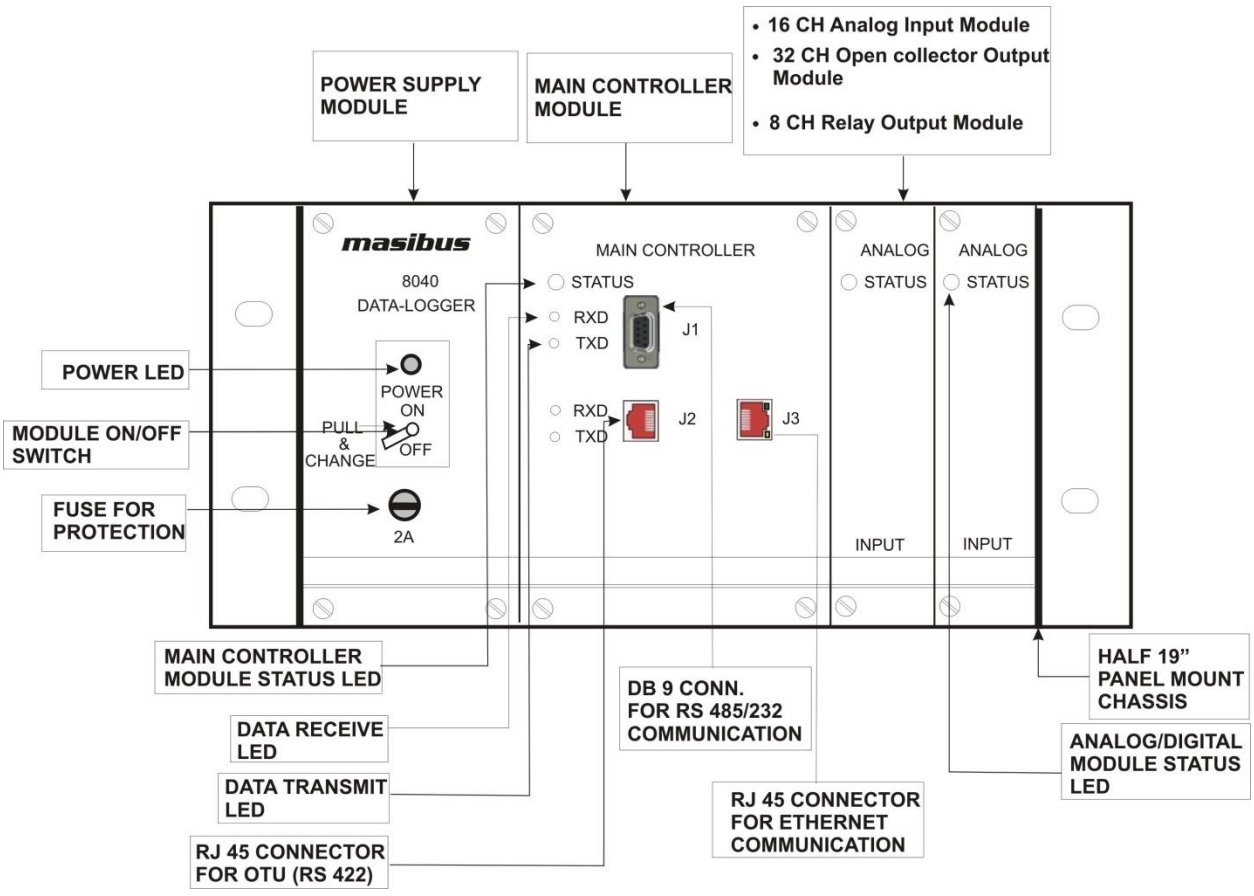


Figure 4 : System setup for data logger 8040 with Ethernet communication (Half 19”)

5. FRONT PANEL DESCRIPTION:

5.1 Operator terminal Unit:

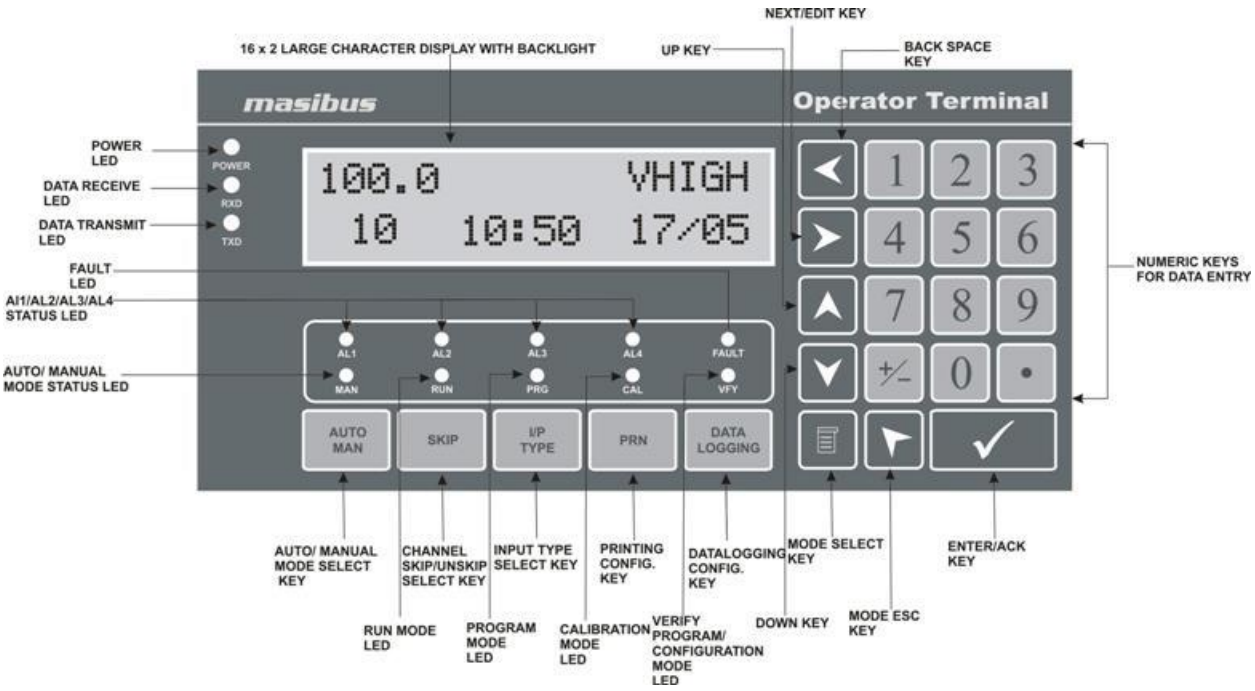


Figure 5 : Operator terminal front description

5.1.1 Key function description:

1. Numeric keys (0-9, ・, ±):
   The Numeric Keys are used for entering values of Process Variable, Alarm Values etc.

2. Up key :
   This key is used to increment mode selection and process parameter.

3. Down Key:
   This key is used to decrement mode selection and process parameter.

4. Next/Edit Key:
   This key is used to select the next level and to edit the configuration parameters.

5. Back space Key:
   This key is used delete digit in process parameters.

6. Mode Select Key:
   This key is used to switch between run mode and configuration modes. For example if we want to switch between status mode and run mode then press mode select key and then press enter key.

7. Mode Esc key:
   This key is used to escape from various modes.

8. Enter/ Ack Key:
   This Key is used to enter the Process parameter and write into memory. This key is also used as Acknowledgement for alarm.

9. Auto/Manual Key: AUTO MAN
   This key is used for Auto / Manual mode of channel display in Run mode.

10. Skip key: SKIP
    This key is used to Skip and unskip the channels.

11. I/P Type Key: I/P TYPE
    This key is used to configure the input type for individual channels.

12. Printing configuration Key: PRN
    This key is used to select the printing configuration in Data logger. User can select online printing mode, Log printing mode, printer reset by using this key.

13. Data logging Key: DATA LOGGING
    This Key is used to select online data logging, data logging start and stop.

5.1.2 LED/Display function description:

1. 16X2 Large Character display:

This LCD is used to display run time process value, time, data, channels, and configuration of data logger.

2. Power LED:
   This LED will be on when OTU get proper power supply according to specification.

3. Data Receive LED:
   This LED will be blink when OTU is receiving some data.

4. Data Transmit LED:
   This LED will be blink when OTU is Transmitting some data.

5. Alarm LEDs(AL1 to Al 4):
   This LED will be in ON condition when Process value is crossing the set point limits. Datalogger have four set point limits. This LED will be Common for 1 to 128 channels in data logger. If anyone channel's Process value will cross the set point limit than this LED will be ON.

6. Fault LED:
   This LED will be ON when any fault or any error occurs in Operator terminal unit.

7. Manual Mode LED:
   This LED will be ON when RUN time Process value display is in Manual mode. If Press the Auto/Man key then this LED will be ON.

8. RUN LED:
   This LED will be in ON condition in RUN mode.

9. PRG LED:
   This LED will be in ON condition in Program mode.

10. CAL LED:
    This LED will be in ON condition in Calibration mode.

11. VFY LED:
    This LED will be in ON condition in verify configuration and Program mode.

6. MECHANICAL GUIDELINES:

6.1 Mounting details:

Mounting method: Panel Mounting

Mounting Dimensions:

- ✓ For Full 19” Chassis: 482 mm(W) * 132.5 mm(H) * 260 mm(D)
- ✓ For Half 19” Chassis: 270 mm(W) * 132.5 mm(H) * 260 mm(D)(Obsolete)
- ✓ For Operator Terminal Unit: 96 mm (W) * 192 mm(H) * 45 mm(D)

6.2 Panel Cutouts:

6.2.1 for Full 19” Datalogger Chassis:

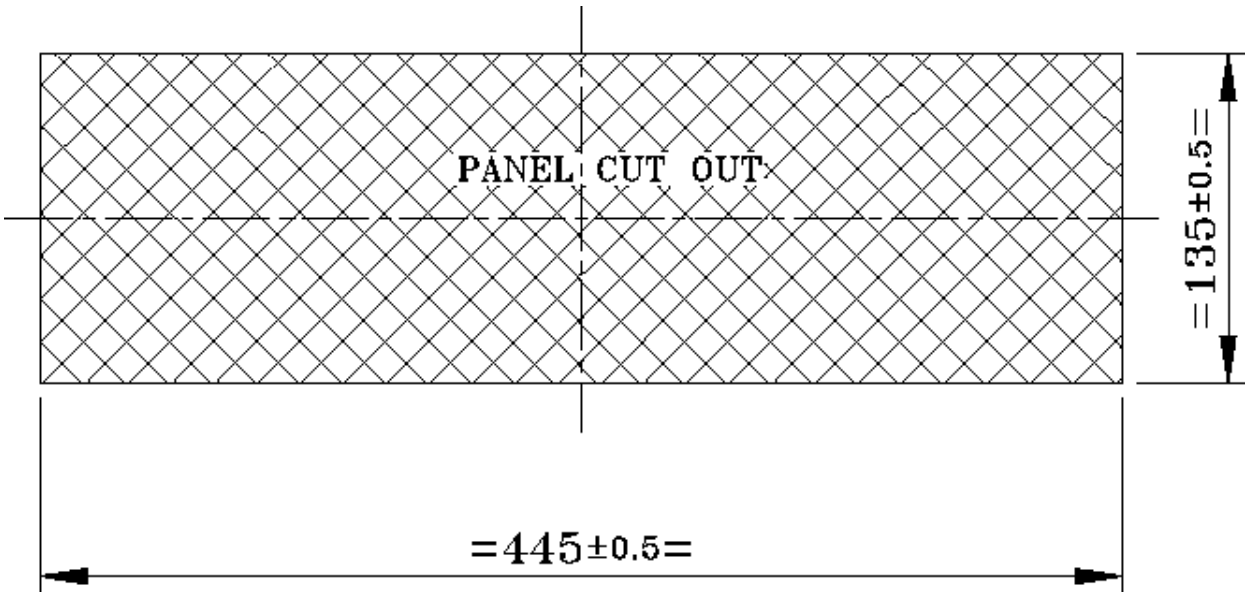


Figure 6 : Full 19”Datalogger Chassis Panel Cutout

6.2.2 For Half 19" data logger Chassis (Obsolete):

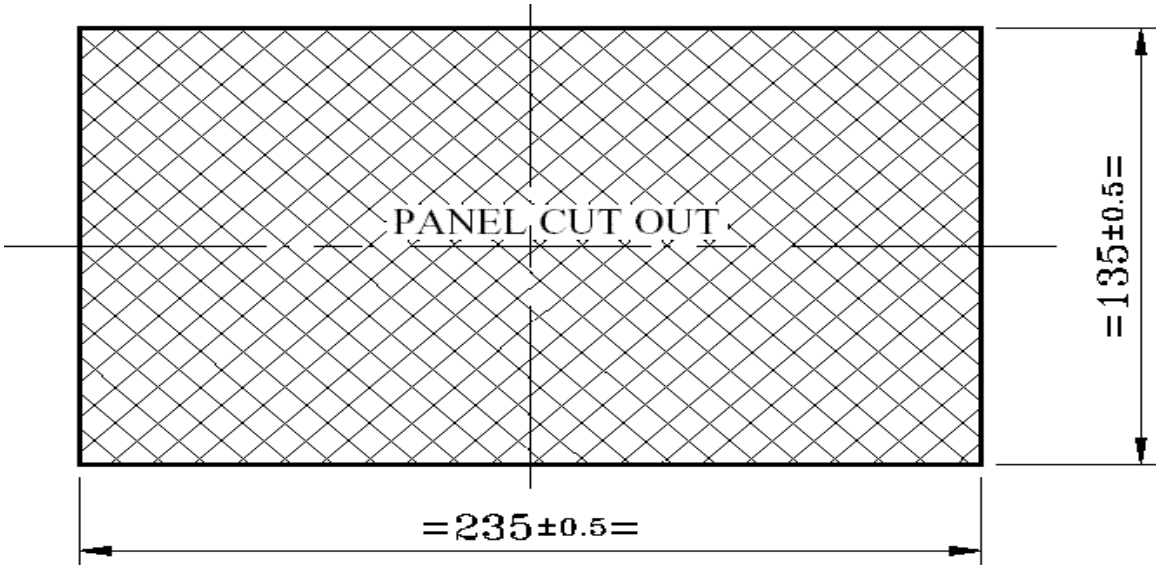


Figure 7 : Half 19"Data logger Chassis Panel Cutout

6.2.3 for Operator Terminal Unit (Display Unit):

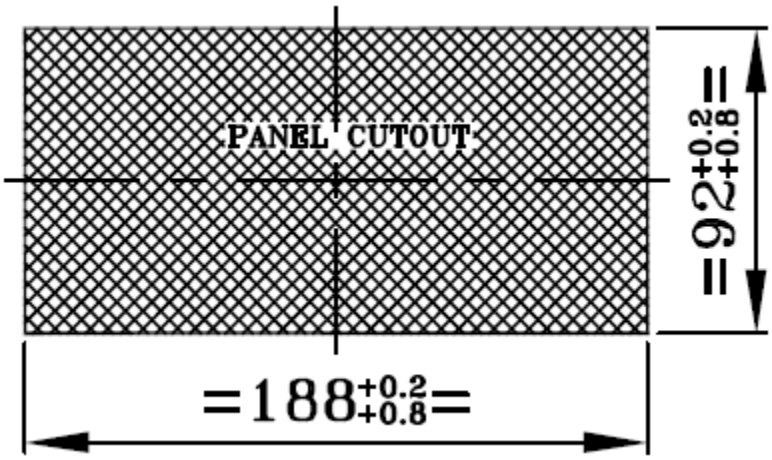


Figure 8 : Operator Terminal Unit Panel Cutout

6.3 Dimensions Detail:

6.3.1 Full 19” data logger Chassis front view dimensions:

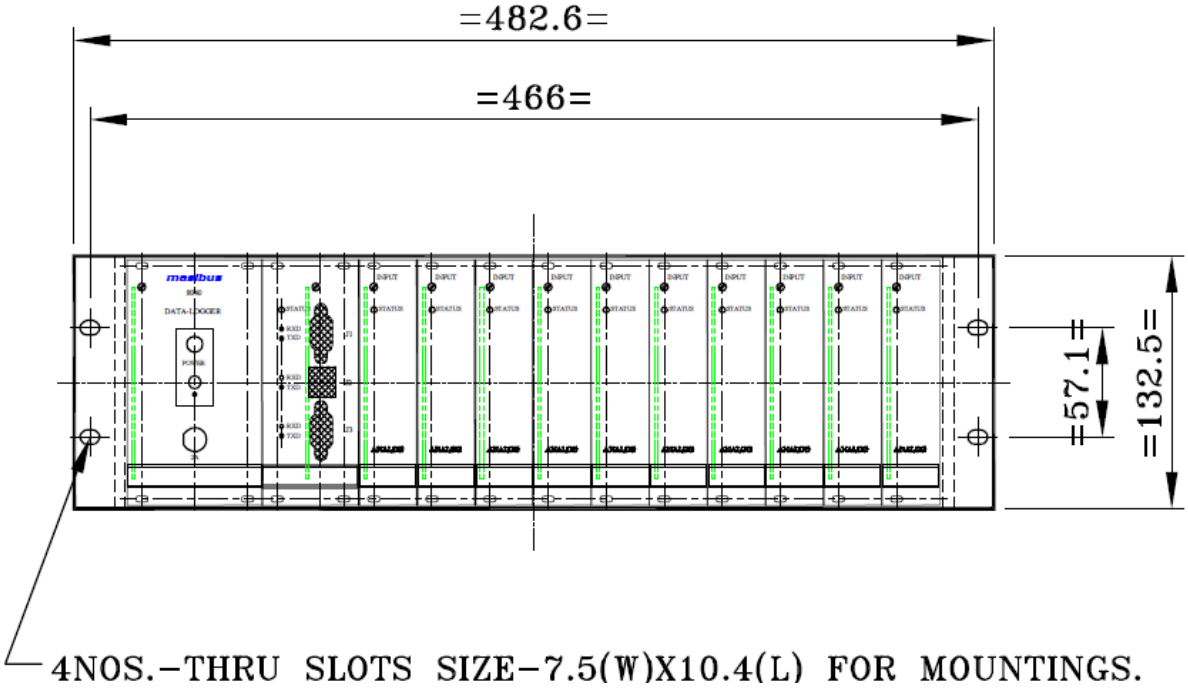


Figure 9 : Full 19”Data logger Dimension front view

6.3.2 Half 19” data logger Chassis front view dimensions(Obsolete):

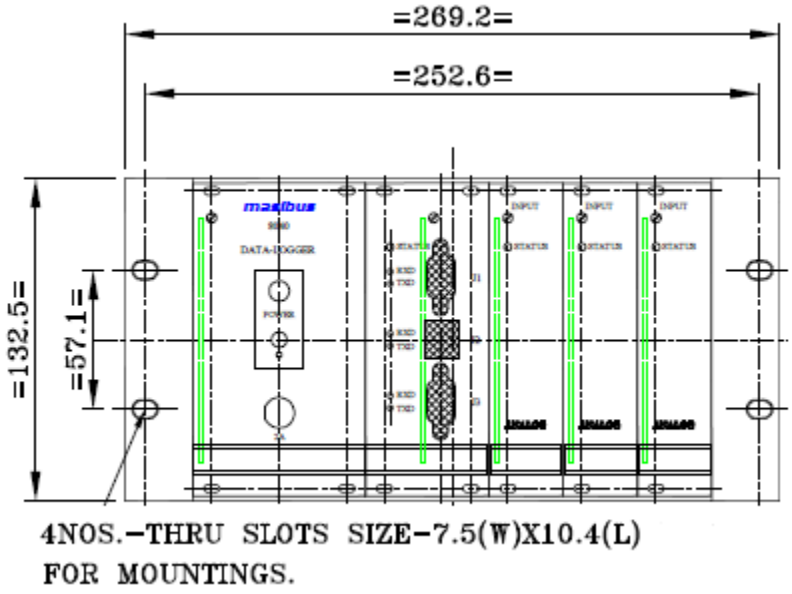


Figure 10 : Half 19”Data logger Dimensions front view

6.3.3 Data logger Chassis Side view dimensions:

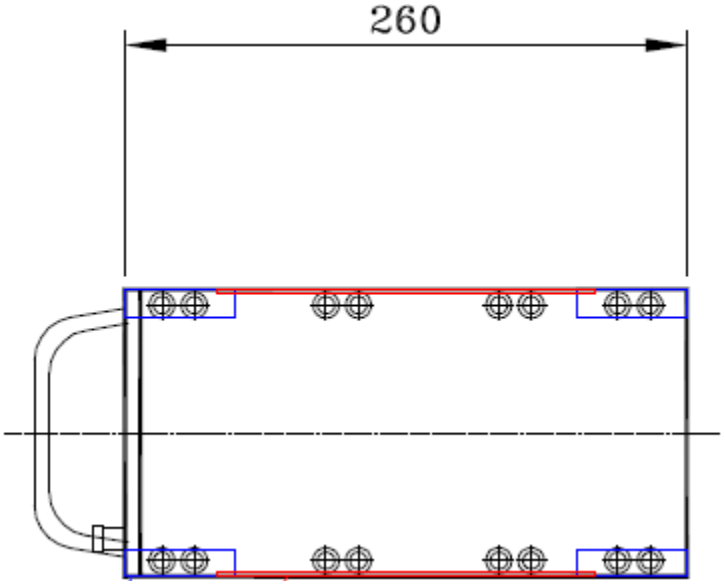


Figure 11 : Data logger chassis side view dimensions

6.3.4 Operator terminal Unit Dimensions:

Front View **Side View**

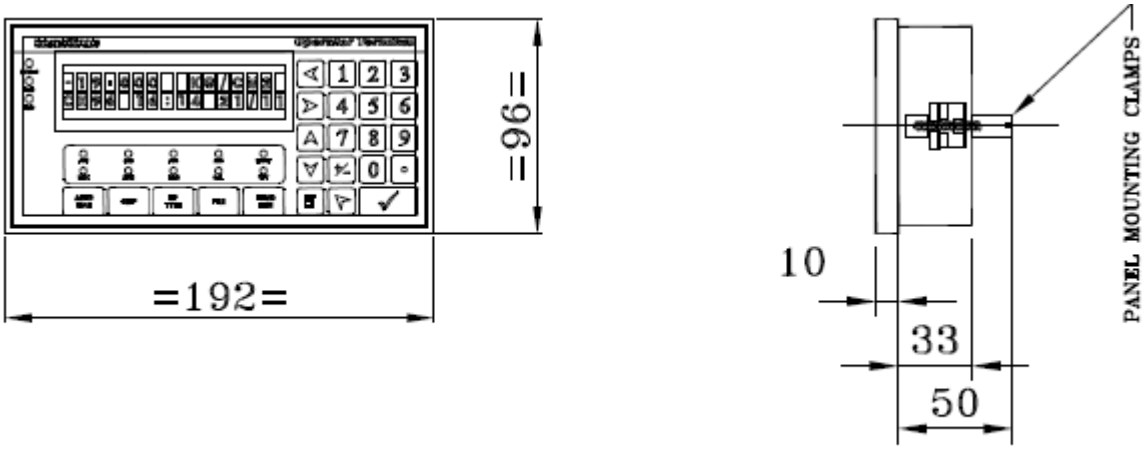


Figure 12 : operator Terminal Unit front and side view dimensions

6.3.5 Operator terminal Unit mounting clamp Dimensions:

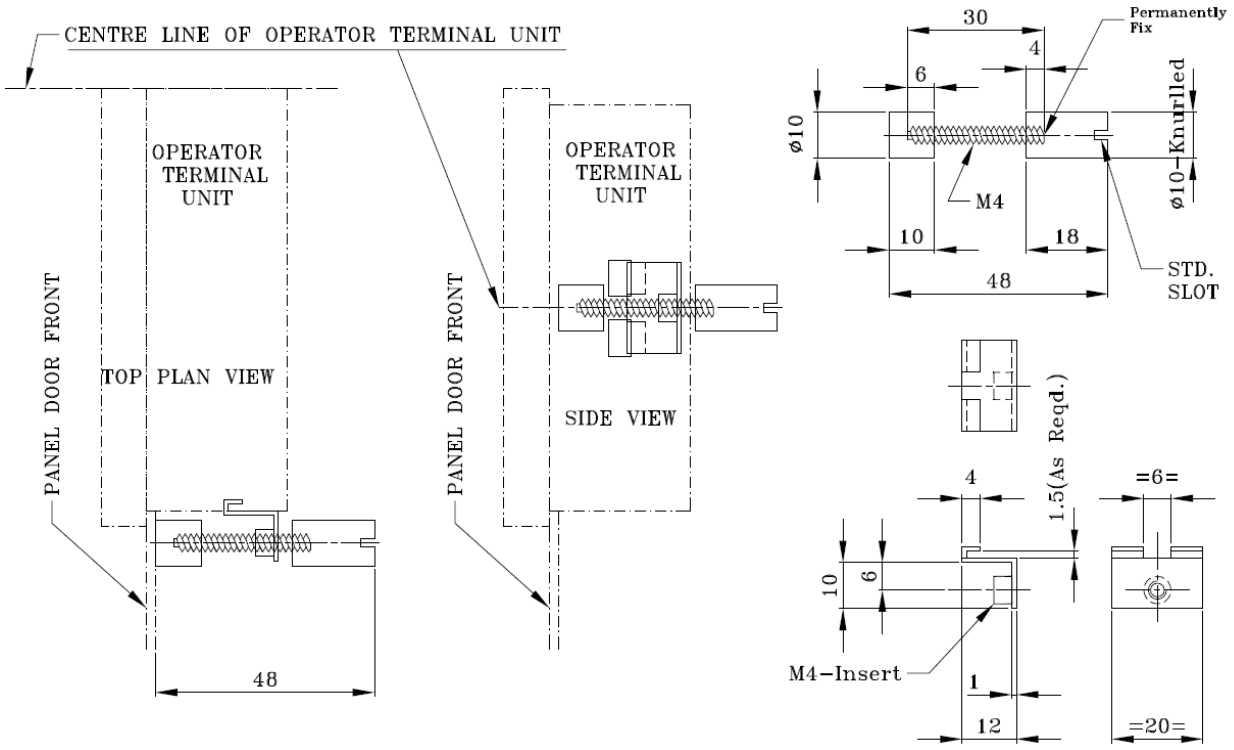


Figure 13 : operator Terminal Unit mounting clamp dimensions

7. WIRING GUIDELINES:

This section provides basic information on wiring the power supply and I/O units, and on connecting the network.

7.1 Power Supply Module Wiring:

Be sure that the power supply voltage remains within the allowed fluctuation between range of 90 to 260 VAC. Terminals L, N and E are for power supply wiring.
***Note*:** The wire(s) used should be at least 2mm.

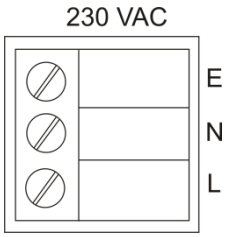
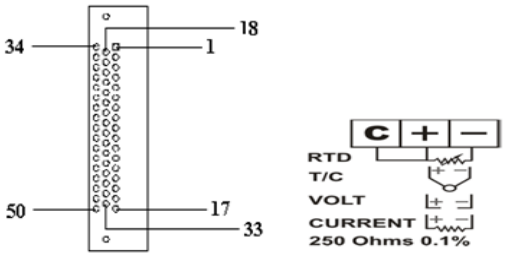


Figure 14 : Power Supply Connections:

7.2 Non isolated and Isolated Analog input Module Wiring:

The system uses 50 pin 'D' type Male connector for the interface between Input module and field devices. The following information must be considered when connecting electrical devices to Input modules.

- ✓ Always use a continuous length of wire, do not combine wires to attain needed length
- ✓ Use the shortest possible wire length
- ✓ Use the wire trays for routing where possible.
- ✓ Avoid running wires near high energy wiring
- ✓ Avoid running input wiring in close proximity to output wiring where possible
- ✓ Avoid creating sharp bends in the wires



Pin. No.	Description	Pin. No.	Description	Pin. No.	Description
1	CH1 LOW (-)	18	CH1 HIGH (+)	34	CH1 COMMON (C)
2	CH2 LOW (-)	19	CH2 HIGH (+)	35	CH2 COMMON (C)
3	CH3 LOW (-)	20	CH3 HIGH (+)	36	CH3 COMMON (C)
4	CH4 LOW (-)	21	CH4 HIGH (+)	37	CH4 COMMON (C)
5	CH5 LOW (-)	22	CH5 HIGH (+)	38	CH5 COMMON (C)
6	CH6 LOW (-)	23	CH6 HIGH (+)	39	CH6 COMMON (C)
7	CH7 LOW (-)	24	CH7 HIGH (+)	40	CH7 COMMON (C)
8	CH8 LOW (-)	25	CH8 HIGH (+)	41	CH8 COMMON (C)
9	CH9 LOW (-)	26	CH9 HIGH (+)	42	CH9 COMMON (C)
10	CH10 LOW (-)	27	CH10 HIGH (+)	43	CH10 COMMON (C)
11	CH11 LOW (-)	28	CH11 HIGH (+)	44	CH11 COMMON (C)
12	CH12 LOW (-)	29	CH12 HIGH (+)	45	CH12 COMMON (C)
13	CH13 LOW (-)	30	CH13 HIGH (+)	46	CH13 COMMON (C)
14	CH14 LOW (-)	31	CH14 HIGH (+)	47	CH14 COMMON (C)
15	CH15 LOW (-)	32	CH15 HIGH (+)	48	CH15 COMMON (C)
16	CH16 LOW (-)	33	CH16 HIGH (+)	49	CH16 COMMON (C)
17	AMB (-)			50	AMB (+)

Figure 15 : Non isolated and isolated Analog input Module Wiring and cable detail

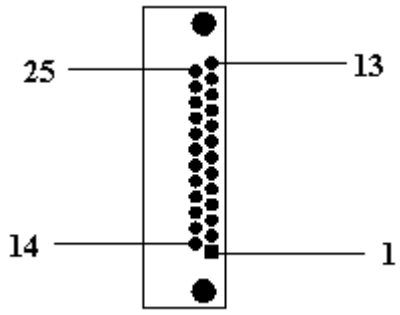
***Note* :**

- ✓ A Prefab 1 is to 1 cable is provided for connection from 50 pin D type connector to the Extension Connector. Wiring to be done as shown in figure: 14.
- ✓ For current input(0-20mA or 4-20mA connect 250Ω between High (+) and Low (-) terminals.
- ✓ For Voltage & TC input connect input between High (+) and Low (-) terminals.
- ✓ For RTD (3wire) input connect input between High (+), Low (-) & Common (C).

7.3 Relay Output Module Wiring:

The system uses 25 pin 'D' type Female connector for the interface between Relay module and field devices. The Relay Output Module has eight relays any output could be mapped to any channel for the alarm configuration or for fault or on-off through PC as shown in the flow chart of relay configuration. The following information must be considered when connecting electrical devices to relay modules.

- ✓ Always use a continuous length of wire, do not combine wires to attain needed length
- ✓ Use the shortest possible wire length
- ✓ Use the wire trays for routing where possible.
- ✓ Avoid running wires near high energy wiring
- ✓ Avoid running input wiring in close proximity to output wiring where possible
- ✓ Avoid creating sharp bends in the wires



Pin No.	Description	Pin No.	Description
1	Relay 8 NC	14	Relay 4 NC
2	Relay 8 C	15	Relay 4 C
3	Relay 8 NO	16	Relay 4 NO
4	Relay 7 NC	17	Relay 3 NC
5	Relay 7 C	18	Relay 3 C
6	Relay 7 NO	19	Relay 3 NO
7	Not Used	20	Relay 2 NC
8	Relay 6 NC	21	Relay 2 C
9	Relay 6 C	22	Relay 2 NO
10	Relay 6 NO	23	Relay 1 NC
11	Relay 5 NC	24	Relay 1 C
12	Relay 5 C	25	Relay 1 NO
13	Relay 5 NO		

Figure 16 : Relay output Module Wiring and cable detail

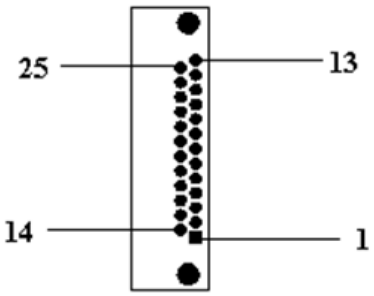
Note :

- ✓ A Prefab 1 is to 1 cable is provided for connection from 50 pin D type connector to the Extension Connector. Wiring to be done as shown in figure: 15.

7.4 Open collector output Module Wiring:

The system uses 25 pin 'D' type Female connector for the interface between Open Collector Output module and field devices. The Open Collector Output Module has sixteen Open Collector Outputs. Any output can be mapped to any channel for the alarm configuration or for fault or on-off through PC as shown in the flow chart of relay configuration. The following information must be considered when connecting electrical devices to Output Collector modules

- ✓ Always use a continuous length of wire, do not combine wires to attain needed length
- ✓ Use the shortest possible wire length
- ✓ Use the wire trays for routing where possible.
- ✓ Avoid running wires near high energy wiring
- ✓ Avoid running input wiring in close proximity to output wiring where possible
- ✓ Avoid creating sharp bends in the wires



Pin. No.	Description	Pin. No.	Description
1	OpenCollector Output -1	14	OpenCollector Output -14
2	OpenCollector Output -2	15	OpenCollector Output -15
3	OpenCollector Output -3	16	OpenCollector Output -16
4	OpenCollector Output -4	17	NC
5	OpenCollector Output -5	18	Ground
6	OpenCollector Output -6	19	NC
7	OpenCollector Output -7	20	NC
8	OpenCollector Output -8	21	NC
9	OpenCollector Output -9	22	NC
10	OpenCollector Output -10	23	NC
11	OpenCollector Output -11	24	NC
12	OpenCollector Output -12	25	NC
13	OpenCollector Output -13		

NC - Not Connect

Figure 17 : Open Collector output Module Wiring and cable detail

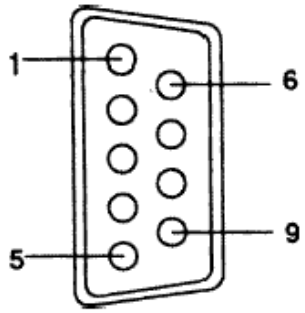
Note :

- ✓ A Prefab 1 is to 1 cable is provided for connection from 50 pin D type connector to the Extension Connector. Wiring to be done as shown in figure: 16.

7.5 RS 485 communication Port Wiring (J1 and J3 both):

There is a DB9 port in the Data – Logger 8040 system. The port is designed to link the RS-485 through a cable to a network in a system. The pin assignment of the port is as follows:

Pin No.	Description
Pin 1	Not Used
Pin 2	RS-485 Data -
Pin 3	RS-485 Data +
Pin 4	Not Used
Pin 5	RS-485 Signal Ground
Pin 6	Not Used
Pin 7	Not Used
Pin 8	Not Used
Pin 9	Not Used



Note: *The wiring of the RS-485 should be through a **twisted** pair. To reduce electrical noise, it should be twisted as tightly as possible*

Figure 18 : Port J1 and J3 RS 485 communication wiring and cable detail

7.6 RS 232 communication Port Wiring (J1 and J3 both):

The RS-232 port is designed for field configuration and diagnostics. The Data – Logger 8040 is used as Data Communication Equipment (DCE). Users may connect a notebook PC to the RS-232 port to configure or troubleshoot your system in the field. Further, the Data – Logger 8040 system can also be configured as the slave of the host computer through this port connection. The pin assignment of the port is as follows:

Pin No.	Description
Pin 1	Not Used
Pin 2	Data Send (TXD)
Pin 3	Data Received (RXD)
Pin 4	Not Used
Pin 5	RS-232 Signal Ground (GND)
Pin 6	Not Used
Pin 7	Not Used
Pin 8	Not Used
Pin 9	Not Used

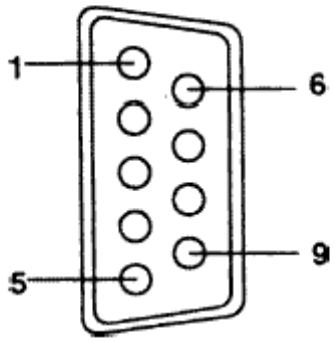


Figure 19 : Port J1 and J3 RS 232 communication wiring and cable detail

8. DATALOGGER 8040 SYSTEM:

8.1 Overview:

The Data – Logger 8040 series is a data acquisition and control system, which can control, monitor and acquire data through multichannel I/O modules. Encased in rugged industrial housing, the system provides intelligent signal conditioning, analog I/O, digital I/O, RS-232 and RS-485 communication. The system communicates with the controlling host over a multi-drop RS-485 network.

8.2 Major Features:

The Data – Logger 8040 system consists of two major parts: the system architecture and I/O modules. The system includes a SMPS Card, CPU card with a built-in RS-232/RS-485 communication port RS-422 port and 3 I/O – Slot backplane/ 10 I/O – Slot backplane. It also offers the following major features:

8.2.1 The CPU's basic functions:

The CPU is the heart of the system and has the following basic functions:

- ✓ Data acquisition and control for all I/O modules in the system
- ✓ Communication software and command set
- ✓ Alarm monitoring
- ✓ Management of the EEPROM device that holds the system parameters
- ✓ Data transformation
- ✓ Diagnosis
- ✓ Data-logging

8.2.2 Three-Way isolation and watchdog reset:

Electrical noise can enter a system in many different ways. It may enter through an I/O module, a power supply connection or the communication ground connection. The Data – Logger system provides isolation between analog ground and System ground**.** Isolation is also provided between the Serial Communication Port and the System ground. The 3-way isolation design prevents ground loops and reduces the effect of electrical noise to the system. It also offers better surge protection to prevent dangerous voltages or spikes from harming your system. The system also provides Watchdog reset to monitor the micro – controller. It will automatically reset the micro – controller in Data –Logger system if the software is affected due to spikes and brown outs.

8.2.3 Remote software configuration and calibration:

The Data - Logger system merely issues a command from the host computer, you can change an analog input module to accept several ranges of voltage input, current input, thermocouple input or RTD input. All the parameters including speed, parity, HI and LO alarm, ZERO and SPAN setting, Decimal position and calibration parameters setting

may be set remotely. Remote configuration can be done by using either the provided menu-based software or the command set's configuration and calibration commands. By storing configuration and calibration parameters in a nonvolatile EEPROM, the systems are able to retain these parameters in case of power failure.

8.2.4 Connectivity and Programming:

The Data – Logger 8040 systems can connect to and communicate with all computers and terminals. They RS-232 or RS-485 or Ethernet transmission(Optional) standards and communicate with MODBUS RTU format or MODNET format(Optional) commands. However, users can only select and use one communication port at any time. All communications to and from the system are performed in MODBUS RTU or in MODNET (Optional), which means that the Data - Logger systems can be interfaced with any SCADA and DCS system

8.3 System Setup:

8.3.1 A single system setup through RS 232 communication:

If users would like to use a PC to locally control and monitor a simple application, the Data – Logger 8040 system provides up to 48 points or 160 points and front-end wiring through the RS-232 port to the host computer

8.3.2 A Distributed I/O setup through RS485 Network:

Up to 32 Data – Logger 8040 systems may be connected to an RS-485 multi-drop network extendable up to 100 by using RS-485 repeaters, extending the maximum communication distance to 2,000 ft. The host computer is connected to the RS-485 network from one of its COM ports through the RS-232/RS-485 converter. Only two wires are needed for the RS-485 network: DATA+ and DATA-. Inexpensive shielded twisted-pair wiring is employed.

8.4 Data logger 8040 block diagram:

The below figure shows the system block diagram for data logger 8040:

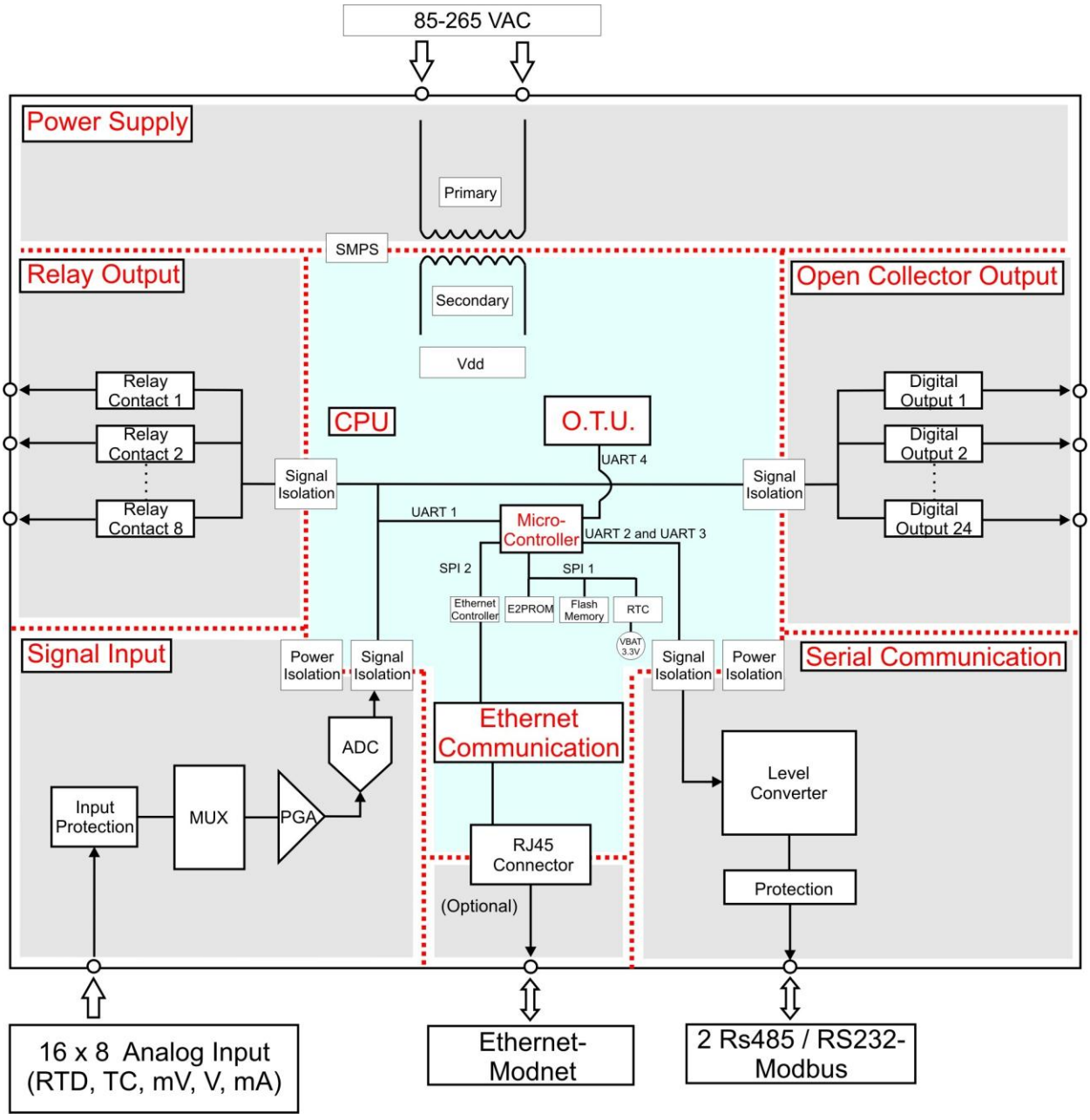


Figure 20 : Data logger 8040 system block diagram

9. DATALOGGER 8040 CONFIGURATION:

User can configure Data logger 8040 by using Operator terminal or Configuration software. Here we have explained the configuration using operator terminal unit:

9.1 Menu Function List:

STATUS MODE	Card Information	Analog I/P card, Digital O/P card, Relay O/p card, Slot is empty	
	Computer Status	Device Error, Device Connected, Not Connected	
	Memory Status	0-100%, Memory Full, Data Error, RTC is Failed	
VFY. CONF. MODE	Input type	Channel 1-160	Input Type as Table 2
	Zero Scale	Channel 1-160	Input Type Range as Table 2
	Span Scale	Channel 1-160	Input Type Range as Table 2
	DP Position	1 to 4	
	Log Parameter	HOLD, RESET, OVERLAP	
	Sr. No.	1 to 99	
	Baud rate	9600 , 19200 , 57600(1)	
	Password	0 to 65535	
	Hysteresis	0.1% to 9.9%	
	RS232/RS485 Sel.	RS232 , RS485	
	Today's Time	SEC: 0 -59 , MIN: 0-59 , HOUR: 0-23	
	Today's Date	Date: 1-31 , Month: 1-12 , Year: 2000-2100	
VFY. PROG. MODE	Set Point Config.	VL-L-H-VH, H-VH, L-H, VL-L	
	Set Alarm - 1	Channel 1-160	Input Type Range as Table 2
	Set Alarm - 2	Channel 1-160	Input Type Range as Table 2
	Set Alarm - 3	Channel 1-160	Input Type Range as Table 2
	Set Alarm - 4	Channel 1-160	Input Type Range as Table 2
	Skip/ Unskip Ch.	Channel 1-160	Skip, Unskip
	Data- Logging Ch.	Channel 1-160	Yes, No
	Unit Data	Unit Data Table as in Appendix XX.	

	Scan Time	1 to 99 sec			
	Logging time	SEC: 0 -59 , MIN: 0-59 , HOUR: 0-23			
	Open Sensor	Up Scale, Down Scale			
	Relay Config.	Relay 1 to 8	Channel 1 to 160	Yes,No	As Per Setpoint Type
	Alarm Latch	Yes, No			
	Relay Control	Normally On, Normally Off			
CAL. MODE	Channel 1 - 160	Zero	Input Type Range as Table 2		
		Span	Input Type Range as Table 2		
CONF. MODE	Input type	Channel 1-160	Input Type as Table 2		
	Zero Scale	Channel 1-160	Input Type Range as Table 2		
	Span Scale	Channel 1-160	Input Type Range as Table 2		
	DP Position	1 to 4			
	Log Parameter	HOLD, RESET, OVERLAP			
	Sr. No.	1 to 99			
	Baud rate	9600 , 19200 , 57600(1)			
	Password	0 to 65535			
	Hysteresis	0.1% to 9.9%			
	RS232/RS485 Sel.	RS232 , RS485			
	Today's Time	SEC: 0 -59 , MIN: 0-59 , HOUR: 0-23			
	Today's Date	Date: 1-31 , Month: 1-12 , Year: 2000-2100			
PROG. MODE	Set Point Config.	VL-L-H-VH, H-VH, L-H, VL-L			
	Set Alarm - 1	Channel 1-160	Input Type Range as Table 2		
	Set Alarm - 2	Channel 1-160	Input Type Range as Table 2		
	Set Alarm - 3	Channel 1-160	Input Type Range as Table 2		
	Set Alarm - 4	Channel 1-160	Input Type Range as Table 2		
	Skip/ Unskip Ch.	Channel 1-160	Skip, Unskip		
	Data- Logging Ch.	Channel 1-160	Yes, No		
	Unit Data	Unit Data Table as in Appendix XX.			
	Scan Time	1 to 99 sec			
	Logging time	SEC: 0 -59 , MIN: 0-59 , HOUR: 0-23			

	Open Sensor	Up Scale, Down Scale			
	Relay Config.	Relay 1 to 8	Channel 1 to 160	Yes,No	As Per Setpoint Type
	Alarm Latch	Yes, No			
	Relay Control	Normally On, Normally Off			

Table 3 : Menu Function List

Note : (1) 57600 baud rate can be set through Configuration software and Modbus software only. It can't be set through Operator Terminal.

9.2 Using Menu:

9.2.1 Run Mode Menu:

In Run Mode the Data – Logger can be operated either in Auto Mode or in Manual Mode.

✓ **Auto Mode :**

The Data – Logger is usually kept in Auto Mode of Operation. The values of all the unskipped channels are displayed sequentially at the set SCAN Time on the Liquid Crystal Display (LCD) of the Operator Terminal. During this mode of operation, the RUN led is ON. However, the MANUAL led is in OFF condition. In Auto Mode, the user can view the Channel Process Value, Time/Date, Alarm and Unit. The Alarm and Unit can be selectable by ➢ and ➢ button.

✓ **Manual Mode :**

The mode of operation of the Data – Logger can be changed to Manual Mode by pressing the AUTO MAN button. On pressing the same, the MAN led will glow. One can go out of Manual Mode by pressing the same key again.

As soon as the AUTO MAN key is pressed, the display will stop at the currently displayed channel. To view the data of any other channel, one can make use of the numeric key pad provided on the Operator Terminal or can make use of the ▲ or ▼ keys.

As for example on pressing the AUTO MAN key, the LCD of the Operator Terminal displays

The cursor on the LCD will be blinking on the displayed channel. Enter the new channel no using the numeric keypad or using the ▲ or ▼ keys. Suppose the new channel no entered is 11, then the display will show

9.2.2 Program Menu:

The Program Menu is entered by pressing the ▤ Key. There are six modes in the Program menu as below:

1. Status Mode
2. Verify Configuration Mode.
3. Verify Program Mode
4. Calibration Mode
5. Configuration Mode
6. Program Mode

Same key can be pressed again to go back to RUN Mode.

1. <u>Status Mode:</u>

To enter Status Mode, press the ▤ key. The Status Mode had sub menus as shown in the flow diagram. The sub menu can be entered by pressing the ➤ key. The different submenus of the Status Mode can be accessed by using the ▲ and ▼ keys. Once a particular sub menu is selected, press ➤ key. The Status Mode in brief gives information about the complete Data Acquisition System like card information (type of card & slot No. for e.g. Slot No.3 Relay Card), status of computer and printer connected to the Data – Logger and status of memory and version no. of the software.

2. <u>Verify Configuration mode:</u>

To enter Verify Configuration Mode, use ▲ key after pressing the ▤ key. The Verify Configuration Mode has sub menus as shown in the flow diagram. The sub menu can be entered by pressing the ➤ key. The different submenus of the Verify Configuration Mode can be accessed by using the ▲ and ▼ keys. Once a particular sub menu is

selected, press key. This will display the current settings of the selected parameter. In this mode one can only view the parameters set but cannot modify them.

3. Verify Program mode:

To enter Verify Program Mode, use twice key after pressing the key. The Verify Program Mode has sub menus as shown in the menu function list. The sub menu can be entered by pressing key. The different sub menus of the verify Program Mode can be accessed by using and keys. Once a particular sub menu is selected, press the key. This will display the current settings of the selected parameter. In this mode one can only view the parameters set but cannot modify them.

4. Calibration mode:

To enter Calibration Mode, press thrice the key after pressing the key. The Calibration Mode has sub menus as shown in menu function list. The sub menu can be entered by pressing the key. The LCD will display

The cursor will be on the Channel No. Once the desired channel is entered by pressing the numeric keypad or and keys, press the key. The LCD will display

The cursor will be on the Amb. The Amb. value can be changed using the numeric keypad or the and keys. Once the ambient is set, press key. The LCD will display “ACCEPTABLE”. Now using the key, go to Zero parameter. The LCD will display

The cursor will be on the Zero. Press the key. The Zero value can be changed in particular analog card using the numeric keypad or the and keys. Once the Zero is set, press the key. The LCD will display “ACCEPTABLE”. Now using the key, go to span parameter. The LCD will display

The cursor will be on the Span. Press the key. The Span value can be changed using the numeric keypad or the and keys. Once the Span is set, press the key . The LCD will display “ACCEPTABLE”. Once the Calibration is set, press the key to come out of the sub menu. Pressing the same key once again will come back to the Calibration Mode Menu. Press the key to come back to RUN Mode.

The Ambient parameter will not be displayed during calibration when the Input Type is RTD or Linear.

5. Configuration mode:

To enter Configuration Mode, press key after pressing the key. The Configuration Mode has sub menus as shown in menu function list. The sub menu can be entered by pressing the key. The different sub menus of the Configuration Mode can be accessed by using the and keys. Once a particular sub menu is selected, press key. This will display the current settings of the selected parameter. The selected parameter can be modified using the numeric key pad or the and keys. Once the parameters are modified, press key. The LCD will display “ACCEPTABLE”. Press the key to come out of the selected sub menu. Pressing the same key again, one comes back to the Configuration Mode Menu.

For example to modify the INPUT TYPE parameter for CH. No. 32, go to the Configuration Mode Menu. Then press the key to enter the sub menu. Press the same key again to enter INPUT TYPE parameter. The LCD will display

The cursor will be on the channel no. The channel no. can be changed using the numeric key pad or the and keys. Press the key to change the parameter.

The cursor will now be on the Parameter value. Change the Parameter value using ▲ and ▼ keys. The LCD will now display

Now press the ✓ key. The LCD will display “ACCEPTABLE”. Press the ► key to come out of the INPUT TYPE sub menu. Pressing the same key once again will come back to the Configuration Mode Menu. Press the ■ key to come back to RUN Mode.

The same procedure can be followed to change different parameters like Zero Scale, Span Scale, and DP Position of the Configuration Mode shown in the menu function list.

- ✓ **Input Type:**
  The Input type for each channel is set as per user requirement. For Linear type of Input, the maximum range that can be set is ±19000.

- ✓ **Zero Scale:**
  This parameter can be set only when Input type is linear. The Zero Scale is set depending on the Input Type of the particular channel as per user requirement.

- ✓ **Span Scale:**
  This parameter can be set only when Input type is linear. The Span Scale is set depending on the Input Type of the particular channel as per user requirement.

- ✓ **DP position:**
  This parameter can be set only when Input type is linear. The DP Position can be set between 0 to 4 for a particular channel depending upon the user requirement.

- ✓ **Log Parameter:**
  Data Logging can be configured in any one of the three ways as per user requirement. They are Reset, Hold and Overlap.

- ✓ **Sr. No.:**
  This parameter is used to assign the Sr. No. to the Instrument for Serial Communication using RS – 232/RS – 422.

- ✓ **Baud rate:**
  The Baud Rate can be set as per user requirement. The Baud Rates that can be set are 19200 and 9600. **Note :** Baud rate 57600 cannot be set through Operator Teminal Unit.

- ✓ **Password:**
  Password is set for entering into Program Mode, Configuration Mode and Calibration Mode. The value of Password can be set between 0 to 65535. Factory set password is 22. User can also change the password. User can avoid the password protection by making it zero.

- ✓ **Hysteresis:**
  The Hysteresis parameter is set for alarm limits. This parameter is can be set individually for all channels. The Hysteresis value is set between 0.1% to 9.9% of the complete range.

- ✓ **RS 232/ RS 485 Selection (not working in this version):**
  In this one can configure the serial communication to be RS 232 or RS 485

  depending on the requirement. Select RS 232 or RS 485 using the up/down (or) arrows and confirm the selection using enter key.

- ✓ **Today' Time:**
  The current time can be set in the Data – Logger by going into the Configuration Mode. Press key to go into sub menu. Using the key go to Today's Time. Press again to enter the Today's Time Parameter. The LCD will display

  The cursor position will be on Hour parameter. Set the required hour using the or the keys. Then press key. The LCD will show "ACCEPTABLE". Repeat the same procedure to change the Min and Sec parameter. Once the Today's Time Parameter is set, press the Key to come out of the Today's Time sub menu. Pressing the same key once again will come back to the Configuration Mode Menu. Press the key to come back to RUN Mode.

- ✓ **Today' Date:**
  The current Date can be set in the Data – Logger by going into the Configuration Mode. Press key to go into sub menu. Using the key go to Today's date. Press again to enter the Today's Date Parameter. The LCD will display

The cursor position will be on Date parameter. Set the required date using the ▼ or ▲ the keys. Then press ✓ key. The LCD will show "ACCEPTABLE". Repeat the same procedure to change the Month and Year parameter. Once the Today's Date Parameter is set, press the ◤ Key to come out of the Today's Date sub menu. Pressing the same key once again will come back to the Configuration Mode Menu. Press the ▤ key to come back to RUN Mode.

✓ **Print On Alarm:**
In this one can configure datalogger to print on alarm for the channel selected in print data section of program mode. Datalogger prints the data on alarm in that particular channel. Select Yes or No using the up/down (▼ or ▲)arrows and confirm the selection using enter ✓ key.

6. Program Mode:

Once the parameters are modified, press ✓ key. The LCD will display "ACCEPTABLE". Press the ◤ key to come out of the selected sub menu. Pressing the same key again, one comes back to the Program Mode Menu.

For example to modify the SET ALM –2 parameter for CH. No. 32, go to the Program Mode Menu by pressing the ▤ key. Then press the ▶ key to enter the sub menu. Now press the ▶ key to go to SET ALM – 2 parameter. Now press the ▲ key. The LCD will display

The cursor will be on the channel no. The channel no. can be changed using the numeric key pad or the ▼ or ▲ keys.

Set the channel no to 32 and press the ▶ key to change the parameter. The cursor will now be on the Parameter value. Change the Parameter value using the numeric keypad ▼ and ▲ keys. The LCD will now display

Now press the ✓ key. The LCD will display "ACCEPTABLE". Press the key to come out of the SET ALM –2 sub menu. Pressing the same key once again will

come back to the Program Mode Menu. Press the key to come back to RUN Mode.

The same procedure can be followed to change different parameters of the Program Mode shown in the menu function list.

- ✓ **Set Alarm 1 -4:**
  The SET ALM – 1, SET ALM – 2, SET ALM – 3 & SET ALM – 4 are configured to set the alarm limits of the process value for a particular channel depending upon the Input Type configured.

- ✓ **Skip/unskip:**
  This parameter is used for skipping unwanted channels. If input is not connected to some channel, that can be skipped so that it won't generate alarms and also not come in display and printing sequence. A skipped channel can also be unskipped.

- ✓ **Print Data:**
  If this parameter is set then printer will print the data along with current time and date if channel is unskip. Printing is done at the set Print Time.

- ✓ **Data logging:**
  If this parameter is set then data logging of the particular unskipped channel will be carried out at the set Logging Time.

- ✓ **Unit Data:**
  This parameter is used to set the unit for the Process Value of the Input Type selected for the particular channel.

- ✓ **Print time:**
  The Print Time value can be set between 0 to 99 Minutes. Printing of data of all the unskipped channels will be carried out at the set time interval.

- ✓ **Scan time:**
  The Scan Time value can be set between 0 to 99 Seconds. Scanning of all the unskipped channels will be carried out at the set time interval.

- ✓ **Logging time:**
  The Logging Time value can be set between 0 to 99 Minutes. Logging of data of all the unskipped channels will be carried out at the set time interval.

- ✓ **Relay Configuration:**
  The Relay configuration is enabled when a relay card is present in the Data – Logger. To enter Relay configuration press key. The LCD will display

The first term **RL** on the lower line of the LCD display represents Relay no. The Relay no can be changed by using the ▼ and ▲ keys. Once the desired Relay is set, press the ➔ key. The cursor will shift to **CH** which represents the Channel no. Any relay can be configured for any channel. The new channel no. can be entered by using the ▼ and ▲ keys. Once the desired Channel is set, press the ➔ key. The cursor will shift to **Sel**. The user can select YES or NO using the ▼ and ▲ keys. Once the selection is done, press the ✓ key. The LCD will display "ACCEPTABLE". Now press ➔ key to shift to **Conf.** The user can set any type of logic (as shown in flowchart) using the ▼ and ▲keys. Once the desired logic is set press ✓ key. The LCD will display "ACCEPTABLE". Press ↵ key to come out of Relay Configuration. In Relay configuration the ← key can also be used to switch between **RL**, **CH**, **Sel** and **Conf**.

Note:

The ← key is used to undo the numeric parameters in all the modes of operation of the Data – Logger except the RUN Mode.

9.3 Menu Flowcharts:

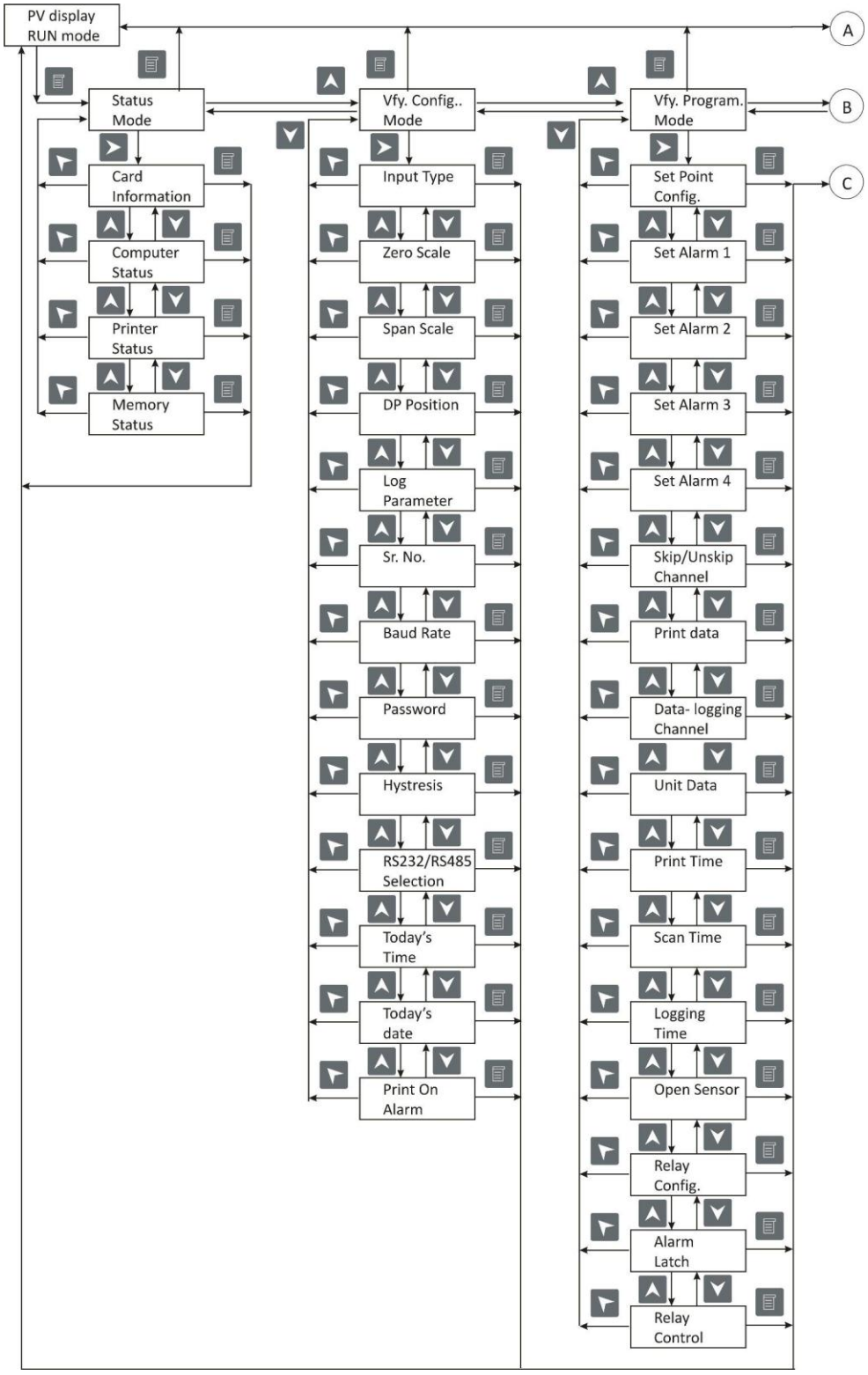


Figure 21 : Menu Flow Chart - 1

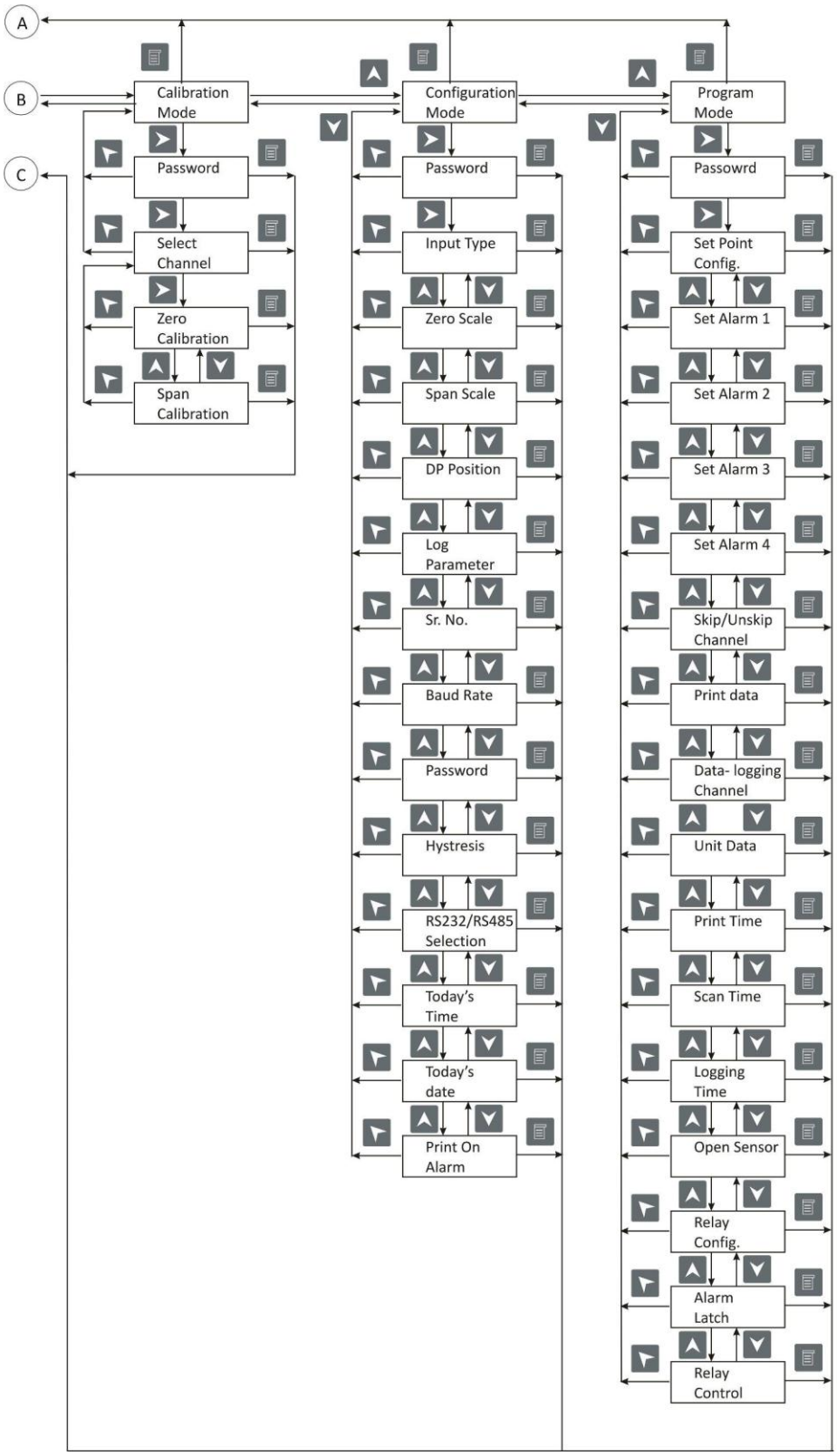


Figure 22 : Menu Flow Chart - 2

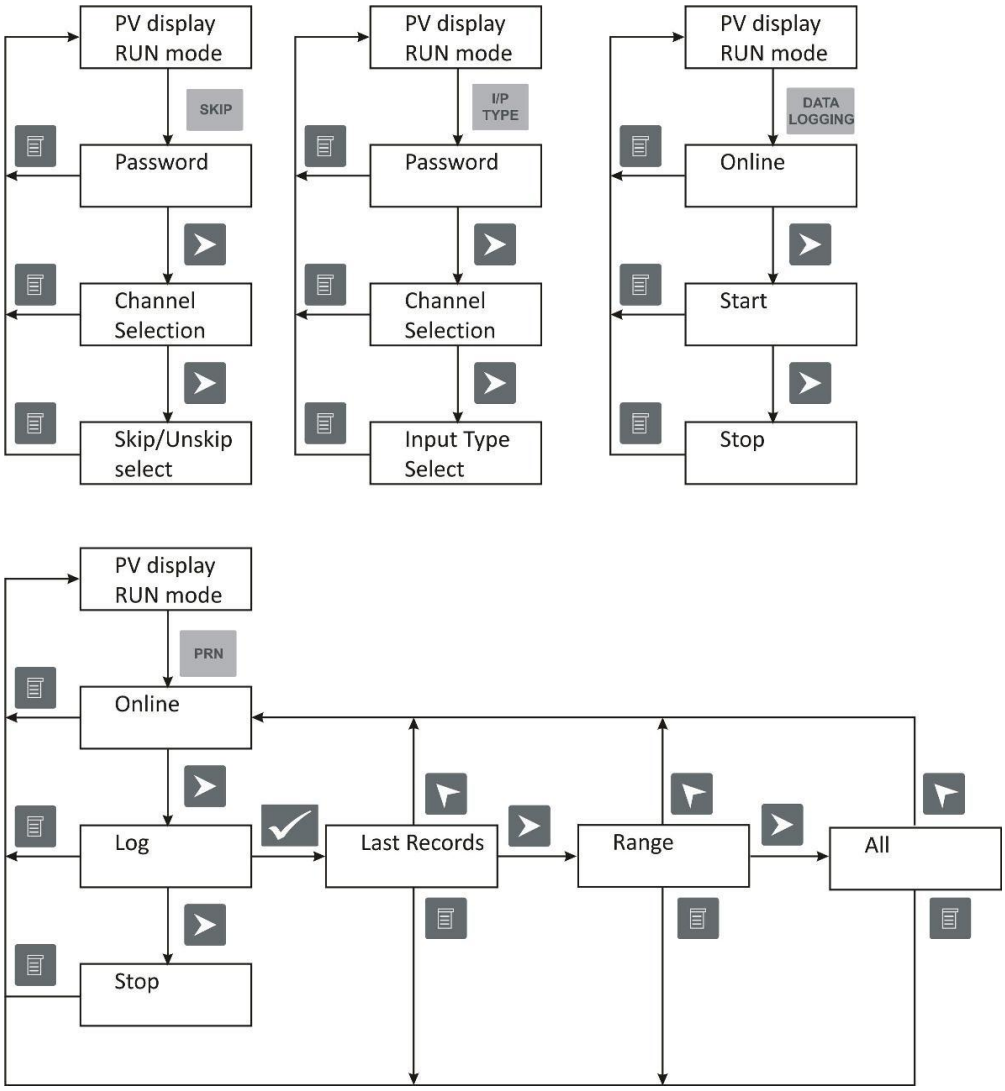


Figure 23 : Menu Flow Chart - 3

10. CALIBRATION:

The Data – Logger is having an internal architecture with 16 channels per multiplexer card-signal conditioners and hence calibration for each card is separate, but common for all channels on the same card. Inputs are divided into three groups i.e. T/C, Linear and RTD. For each group one channel needs to be calibrated. So, the user needs to calibrate any one channel from 1 to 8 channel and one channel from 9 to 16 channel of every card, for each group. The signal conditioner consists of various blocks, first block is multiplexer to select the channel, and then the signal is given to instrumentation amplifier. After instrumentation amplifier signal is fed to the another multiplexer for the selection of the group of particular input type & then it is fed to the gain of 25 (which is common for all inputs) & offset to make it unipolar signal. **By calibrating preferably 'E' type T/C** all other type of thermocouple of this group are calibrated, as same gain is used. For PT-100, there is a current source, which is used to pump the current into RTD. Then comes the lead wire cancellation circuit and then same block of instrumentation amplifier and gain circuit is used. The user needs to calibrate only 'E' type t/c for T/C, 0-5 Vdc for Linear & pt-100 to calibrate all the available input types in this Data – Logger.

10.1 Calibration Method:

- ✓ The data of the channel being observed will be updated after every unskipped channel is scanned. So, to see the effect of reading change instantly, first of all select the channel you want to calibrate and skip rest of the channels of Data – Logger.

- ✓ Press key of the operator terminal & then go in to Calibration Mode as mentioned earlier. Now user can set the particular channel, which he wants to calibrate. Only unskipped channels are allowed for calibration so user has to unskip the channel, which he wants to calibrate for particular Input Type. If, by mistake user selects the skipped channel, LCD shows the error message "Calibration Not Allowed". Select the channel, which one wants to calibrate.

- ✓ If Input Type of selected channel is 'T/C' type, one can do the calibration in any type of T/C input but for better accuracy it is advisable to calibrate in "E" type of thermocouple. Now pressing and key user can select the calibration parameter like AMB. Calibration, ZERO calibration, SPAN calibration. Now select the particular calibration parameter & feed with in the range preferably near min value of range for ZERO & near max. value of range for SPAN(Please check the range of particular input type before doing the calibration) through reliable calibrated source. For ambient calibration user need to check the ambient temperature of the

room where Data – Logger is kept. While calibrating to match given input use numerical

keypad or ▼ and ▲ keys. First calibrate ZERO and then SPAN and repeat the above procedure until zero value & span value both does not show any error in reading.

- ✓ Now if input type is “PT-100” then only zero scale & span scale of the input needs to be calibrated. Feed the zero scale value & calibrate by using numerical keypad or ▼ and ▲ key.
- ✓ For linear input like 0-20mA, 4-20mA, user has to feed 250Ω resistance to convert it into voltage source. One needs to check zero scale & span scale value for calibration of input type. Value less than zero scale & more than span scale is not acceptable for any type of input. If the user feeds a value, which is not in the range, LCD of the Operator Terminal will display “Not Acceptable”. So it will not allow to calibrate the channel. The Data - Logger will not allow to do the calibration, if there is no input feed to the channel, which is selected for calibration. The LCD will show the message “Calibration not Allowed”. User must feed the particular value of zero scale & span scale while doing the calibration. Calibration mode is also password protected so unauthorized person is not allow to do the calibration. Password for calibration mode is same as password for program mode/ configuration mode.

11. MODBUS COMMUNICATION DETAIL:

When controllers 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.

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

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

Table 4 : Modbus Function codes

1	Relay Output cards	0x81
2	Non isolated Analog Input cards	0x7f
3	Isolated Analog Input cards	0x7f
4	Digital Output cards	0x82

Table 5 : I/O card ID for Report slave ID

11.1 Modbus Address for configuration parameters:

Sr. No	Parameter	Absolute Address	Type	Minimum value	Maximum Value	Access Type
1	Channel Skip Status	00001	Bit	0	1	R/W
2	Channel Print Status	00257	Bit	0	1	R/W
3	Channel Log Status	00513	Bit	0	1	R/W
4	Open Sensor	00769	Bit	0	1	R
5	Alarm 1 status	01025	Bit	0	1	R
6	Alarm 2 Status	01281	Bit	0	1	R

7	Alarm 3 Status	01537	Bit	0	1	R
8	Alarm 4 Status	01793	Bit	0	1	R
9	Process Value	40001	Integer	Input Zero	Input Span	R
10	Input type	40257	Integer	0	13	R/W
11	Set Alarm 4	40513	Integer	Ref. Table 2	Ref. Table 2	R/W
12	Set Alarm 3	40769	Integer	Ref. Table 2	Ref. Table 2	R/W
13	Set Alarm 2	41025	Integer	Ref. Table 2	Ref. Table 2	R/W
14	Set Alarm 1	41281	Integer	Ref. Table 2	Ref. Table 2	R/W
15	Zero	41537	Integer	Ref. Table 2	Ref. Table 2	R/W
16	Span	41793	Integer	Ref. Table 2	Ref. Table 2	R/W
17	Hysteresis	42049	Integer	0.0%	9.9%	R/W
18	Decimal Position	42305	Integer	0	4	R/W
19	Unit	42561	Integer	0	58	R/W
20	Scan Time	42817	Integer	1 Sec	99 Sec	R/W
21	*Open sensor Modbus (Alarm Status)	42818	Integer	0	1	R/W
22	Log Time(R)	42819	Integer	0 Sec 0 Min, 0 Hours	59 Sec, 59 Min, 23 Hours	R
23	Log Time(W)	44353	Integer	0 Sec 0 Min, 0 Hours	59 Sec, 59 Min, 23 Hours	W
24	Logging Status	42820	Integer	0	1	R/W
25	Log mode	42821	Integer	0	2	R/W
26	Slave ID	42822	Integer	1	99	R/W
27	Baud Rate	42823	Integer	2	4	R/W
28	Password	42824	Integer	0	65535	R/W
29	Alarm Configuration	42825	Integer	*Ref. Note2*	*Ref. Note2*	R/W
30	Sec	42827	Integer	0	59	R/W
31	Min	42828	Integer	0	59	R/W
32	Hour	42829	Integer	0	23	R/W
33	Date	42830	Integer	1	31	R/W
34	Month	42831	Integer	1	12	R/W
35	Year	42832	Integer	0	100	R/W
36	Log memory percentage	42834 (Higher Byte)	Integer	0	100	R
37	DO type	42835-42866	Integer	0	3 / 7 (Refer Note 3)	R/W
38	Ambient	43073	Integer	-	-	R
39	Ethernet IP Address 1	43241	Integer	0	255	R/W

40	Ethernet IP Address 2	43242	Integer	0 (Refer Note 4)	255 (Refer Note 4)	R/W
41	Ethernet IP Address 1	43243	Integer			R/W
42	Ethernet IP Address 1	43244	Integer			R/W
43	Ethernet Subnet Mask 1	43245	Integer			R/W
44	Ethernet Subnet Mask 2	43246	Integer			R/W
45	Ethernet Subnet Mask 3	43247	Integer			R/W
46	Ethernet Subnet Mask 4	43248	Integer			R/W
47	Ethernet Gateway 1	43249	Integer			R/W
48	Ethernet Gateway 2	43250	Integer			R/W
49	Ethernet Gateway 3	43251	Integer			R/W
50	Ethernet Gateway 4	43252	Integer			R/W
51	Ethernet MAC ID 1	43253	Integer	-	-	R
52	Ethernet MAC ID 2	43254	Integer	-	-	R
53	Ethernet MAC ID 3	43255	Integer	-	-	R
54	Ethernet MAC ID 4	43256	Integer	-	-	R
55	Ethernet MAC ID 5	43257	Integer	-	-	R
56	Ethernet MAC ID 6	43258	Integer	-	-	R
57	Card Identification Information	43341-43350	Integer	-	-	R
58	Open sensor Indication	43585	Integer	0	1	R
59	Alarm 1 Status	44353	Integer	0	1	R
60	Alarm 2 Status	44609	Integer	0	1	R
61	Alarm 3 Status	44865	Integer	0	1	R
62	Alarm 4 Status	45121	Integer	0	1	R
63	Total Number of Channels	48001	Integer	16	160	R/W

64	Watchdog Output Status	48004	Integer	- (Refer Appendix D)	- (Refer Appendix D)	R
65	Baud Rate for Display Terminal	48005	Integer	0	1	R/W

Table 6 : Modbus Address for configuration parameters

Note 1:

- ✓ All above address are starting address for that particular group. End address will be starting address + 160.
- ✓ for e.g. starting add [channel 1]for open sensor indication is 43585, end add. [160th channel] is 43585 + 160 = 43745 and from 43746 to 44353 will be reserved address for modbus.
- ✓ *Open sensor [Modbus] is not available in this version

Note 2:

- ✓ 42825 register is of 16 bit. There are some bit wise parameters configuration in this register.

1. 42825 – BIT0 and BIT 1 : **Set Point Configuration**

   00 - H-VH
   01 - L- H
   10 - VL - L.
   11 - VL - L - H - VH.

2. 42825 – BIT8: **Open sensor PV Upscale/ Downscale**
   0 - Down scale.
   1 - Upscale.

3. 42825 – BIT12: **Latch Alarm**
   0 - Alarm Latch No
   1 - Alarm Latch Yes.

4. 42825 – BIT14: **Relay control**
   0 -Normal relay off.
   1 - Normal Relay On.

5. Other BITs are **reserved** for future Use.

Note 3:

- ✓ 42835 - 42866 registers stores DO type of maximum 32 DOs. DO types depend on following Set Point Configuration.

  - If BIT1 and BIT 0 of 42825 is 00, it represents H-VH type set points and DO types which can be assigned as following table.

DO Type Number	DO Type Description

0	High Alarm
1	Very High Alarm
2	High Trip
3	Very High Trip

Table 7 : DO Type and its description for H-VH type Set Point

- If BIT1 and BIT 0 of 42825 is 01, it represents L-H type set points and DO types which can be assigned as following table.

DO Type Number	DO Type Description
0	Low Alarm
1	High Alarm
2	Low Trip
3	High Trip

Table 8 : DO Type and its description for L-H type Set Point

- If BIT1 and BIT 0 of 42825 is 10, it represents VL-L type set points and DO types which can be assigned as following table.

DO Type Number	DO Type Description
0	Very Low Alarm
1	Low Alarm
2	Very Low Trip
3	Low Trip

Table 9 : DO Type and its description for VL-L type Set Point

- If BIT1 and BIT 0 of 42825 is 11, it represents VL-L-H-VH type set points and DO types which can be assigned as following table.

DO Type Number	DO Type Description
0	Very Low Alarm
1	Low Alarm
2	Very Low Trip
3	Low Trip
4	High Alarm
5	Very High Alarm
6	High Trip
7	Very High Trip

Table 10 : DO Type and its description for VL-L-H-VH type Set Point

Note 4:

- ✓ Ethernet IP 1 , Ethernet IP 2, Ethernet IP 3 and Ethernet IP 4 is for setting Ethernet IP address. Value should be entered sequencially. i.e. if Ethernet IP address of 192.168.100.190 needs to be configured , then set value 192 to Ethernet IP 1, set value 168 to Ethernet IP 2, set value 100 to Ethernet IP 3 and then set value 190 to Ethernet IP 4.
- ✓ Ethernet mask is for setting Ethernet mask address and Ethernet Gateway is for setting Ethernet Gateway address . Both settings must be set as explained in above note.

Note 5:

48005 is single register to set baud rate for Display Terminal.

Value	Baud Rate
0	9600
1	19200

Table 11 : Value and Baud Rate for Display Terminal

11.2 Modbus Address for diagnostics parameters:

Sr. No	Parameter	Absolute Address	Type	Minimum value	Maximum Value	Access Type
1	IO card failure$	43329	Integer	0	1	R
2	IO card memory failure$	43330	Integer	0	1	R
3	IO card ADC failure$	43331	Integer	0	1	R

Table 12 : Modbus Address for Diagnostics parameters

Note:

- ✓ Here value ‘1’ means fault or N/C and ‘0’ means ok.
- ✓ $ marked parameters are bit wise for parameters. For E.g. BIT 0 for card 1, BIT 1 for card 2…

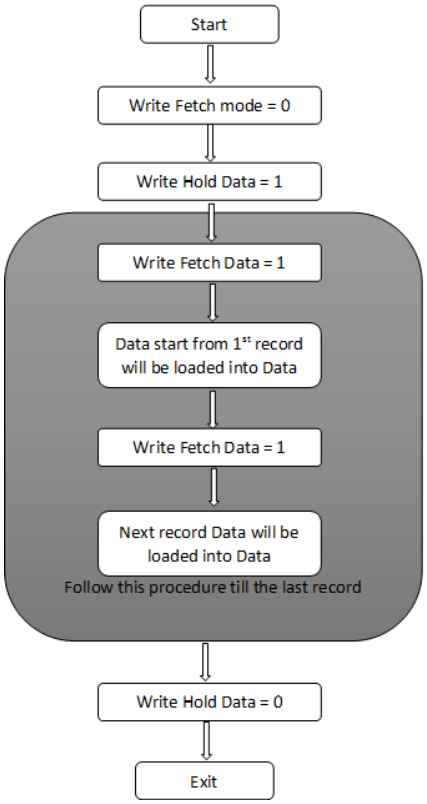
APPENDIX A: HOW TO FETCH HYSTORICAL DATA THROUGH MODBUS?

- **HOW TO FETCH HISTORICAL DATA :**

Parameter Detail	Bytes
Log Frame start bytes(101,102)(in decimal)	2
Record Number	4
Time Stamp	6
No of Bytes for PV	(2* Channels Selected for logging)
Log Frame end bytes(103,104) (in decimal)	2
Total Bytes in 1 record =	14 + (2* Channels Selected for logging)

Table 13. Periodic Data logging Record Frame Detail

Data Fetching Method:



Sr. No	Parameter Description	Modbus Address	Parameter Type	Access	Remarks
1	Fetched Data Buffer	45889-45952	Integer	R	-
2	Hold Data	45801	Integer	R/W	-
3	Fetch Data	45802	Integer	R/W	-
4	Fetch mode	45803	Integer	R/W	
5	Total Periodic Records	45806-45807	Integer	R	45806 [Higher Word] 45807[Lower Word]
6	Log Roll Over counter for Overlap Mode	45808	Integer	R	-

Table 14. Modbus Address for Periodic Data fetching:

Description :

- For Data logging, 25 MB Flash memory is used . So data will be fetched in the form of multiple records / bytes. Flash page size is of 256 bytes and 1 sector size is 65536 bytes. For 25 MB flash memory, 398 sectors , each sector size of 65536 bytes, are used.
- The record length is based on total number of Channels which are enabled for logging.
- By using below equation we can get total number of records i.e.

Total Records = ((Integer) (26083328 / Length of 1 record)) - 1

- Example for Fetching data :

Example 1 :

If we have selected 8 channels for periodic data logging so that
Total Bytes in 1 record = 14 + (2 * 8) = 30
Total records = (26083328 / 30) – 1 = 869444 – 1 = 869443

In this case for fetching data, follow below procedure:

1. Write Hold Data = 1
2. Write Fetch Data = 1
3. Data of first 128 bytes of 1st page will be loaded into data registers
4. Write Fetch Data = 1
5. Data of next 128 bytes of 1st page will be loaded into data registers
6. Write Fetch data = 1
7. Data of first 128 bytes of 2nd page will be loaded into data registers
8. Write Fetch data = 1

9. Data of next 128 bytes of 2nd page will be loaded into data registers
10. In same manner, data registers will be filled.
11. After fetching all data, Write Hold Data = 0.

Note that, after Fetching page data, extract the data as per record frame detail.

Example 2 :

If we have selected 128 channels for periodic data logging,

Total Bytes in 1 record = 14 + (2 * 128) = 270
Total records = (26083328 / 270) – 1 = 96604 – 1 = 96603

So, in this case whole record can't be stored on one page. Thus for retrieving one record data, user has to fetch two pages.

Follow below procedure for fetching.

1. Write Hold Data = 1
2. Write Fetch Data = 1
3. Data of first 128 bytes of 1st page will be loaded into data registers
4. Write Fetch Data = 1
5. Data of next 128 bytes of 1st page will be loaded into data registers
6. Write Fetch data = 1
7. Data of first 128 bytes of 2nd page will be loaded into data registers
8. Write Fetch data = 1
9. Data of next 128 bytes of 2nd page will be loaded into data registers
10. In same manner, data registers will be filled.
11. After fetching all data, Write Hold Data = 0.

In this case, one record contains 270 bytes, thus 256 bytes will be stored on 1 page and remaining 14 bytes will be stored on next page. So, user has to fetch two pages for fetching one record data. Fetch the data until Frame end bytes are detected.

Note that, after Fetching page data, extract the data as per record frame detail.

APPENDIX B: SWITCH SELECTION FOR PORT J1 AND J3

Communication Port J1	**For RS485**	**For Rs232**
	Switch 1,2 On and 3,4 Off in SW1 & SW2	Switch 3,4 On and 1,2 Off in SW1 & SW2
Communication Port J3	**For RS485**	**For Rs232**
	Switch 1,2 On and 3,4 Off in SW3 & SW4	Switch 3,4 On and 1,2 Off in SW3 & SW4

Table 15 : Switch selection for RS 485 / RS 232 communication

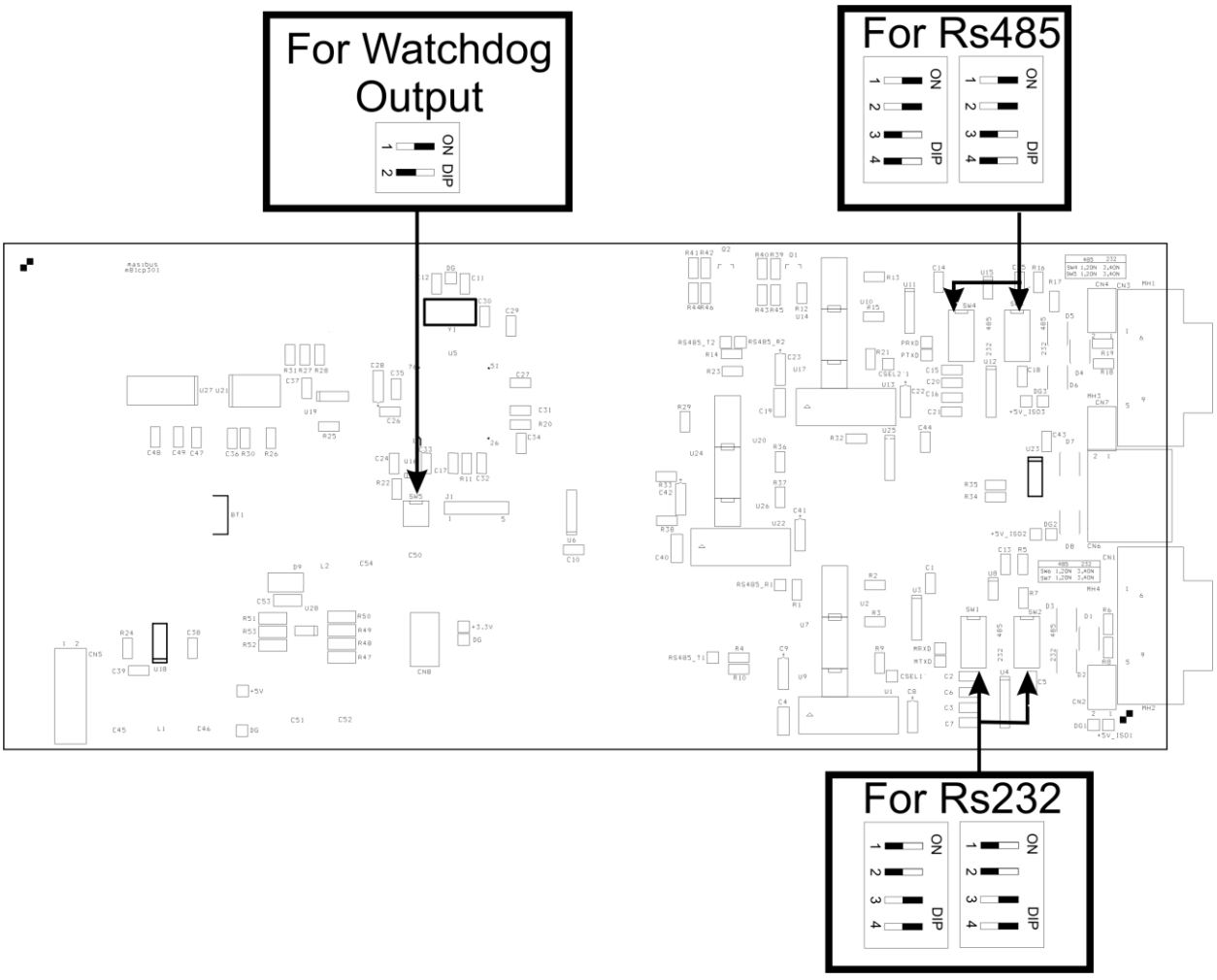


Figure 24 : Switch selection for RS 485 / RS 232 communication and for Watchdog Output

APPENDIX C: HARDWARE(LED) DIAGNOSTICS

Main Controller card Diagnostics:

Status LED Indication	Diagnostic
Red	No I/O card is connected
Red Blink	RTC failure
Green	Working ok as per specification
Green Blink	Log Memory Full (This condition will occur when log mode is set to HOLD)
Red - Green Blank	Flash / EEPROM Memory Error
Red Green	Watchdog Error (Refer Appendix D)

Table 16 : LED diagnostics for CPU

I/O card Diagnostics:

Status LED Indication	Diagnostic
Red Blink	CPU card not connected
Green	Working ok as per specification
Red - Green Blink	Memory Error
Red – Green - Off Blink	ADC Error

Table 17 : LED diagnostics for I/O cards

APPENDIX D: WATCHDOG OUTPUT OPERATION

The Watchdog Output can be enabled by Switch selection as shown in Figure 24. Switch 1 should be “ON” in **SW5** to enable watchdog output.

The Watchdog output ,when enabled, operates by giving reset signal externally by means of hardware. The Watchdog output can be used to detect system software malfunctions by resetting the device, if the Watchdog output is not cleared periodically in software. If malfunctioning of device persist even after watchdog reset, device will go into shutdown mode. Which peripheral caused watchdog reset is shown in Absolute Modbus register 48004 as explained in below table.

Modbus Address 48004 Bit Value	Fault
0000 0000 0011 1110	CONTROLLER TIMER Error
0000 0000 0011 1101	CPU EEPROM Error
0000 0000 0011 1011	COM PORT 1 Error
0000 0000 0011 0111	COM PORT 2 Error
0000 0000 0010 1111	DISPLAY COMMUNICATION Error
0000 0000 0001 1111	BACKPLATE COMMUNICATION Error

Table 18 Watchdog Error Value and its Description

Note : Any/multiple of the above values will be shown only after watchdog reset occurs.

APPENDIX E: USB DATA FECHING MODE

Before proceeding for setting of data fetching by USB Mass storage device (MSD), make sure that USB Mass storage device follows the specification.

How to Fetch Data in USB Mass Storage Device:-

1. Format USB Mass storage device in FAT16/FAT32 Format before connect to Data logger.
2. After connect to Data logger USB Mass storage device will detect automatically and Data is being fetched from Data Logger.(LED Blinks Red-Green Continuously)
3. When all data is fetched and stored into USB Mass storage device (USB Normal) wait for 15 sec to remove USB Mass Storage Device.(LED Green On Continuously)
4. When all data is fetched and stored into USB Mass storage device(USB Normal) Reset Memory by Operational Terminal Unit or Configuration Software.

USB Data Fetching Diagnostics:

Status LED Indication	Diagnostic	Condition of occurrence
Red - Green (Fast, Continuously)	USB Data Fetching	When USB Mass Storage Device is connected and Data is being fetched from Data Logger and is being stored into USB Mass storage device.
Green	USB Normal	When All data is fetched and stored into USB Mass storage device.
Green Blink	USB Memory Full Error	USB Mass storage device is full. (This condition will occur when insufficient space in USB Device)
Red Blink	USB Device Error	USB Mass storage device is not properly initialize.

Table 19 : USB Data Fetching diagnostics for CPU

APPENDIX F: TROUBLESHOOTING

For primary troubleshooting of instrument use following procedure:

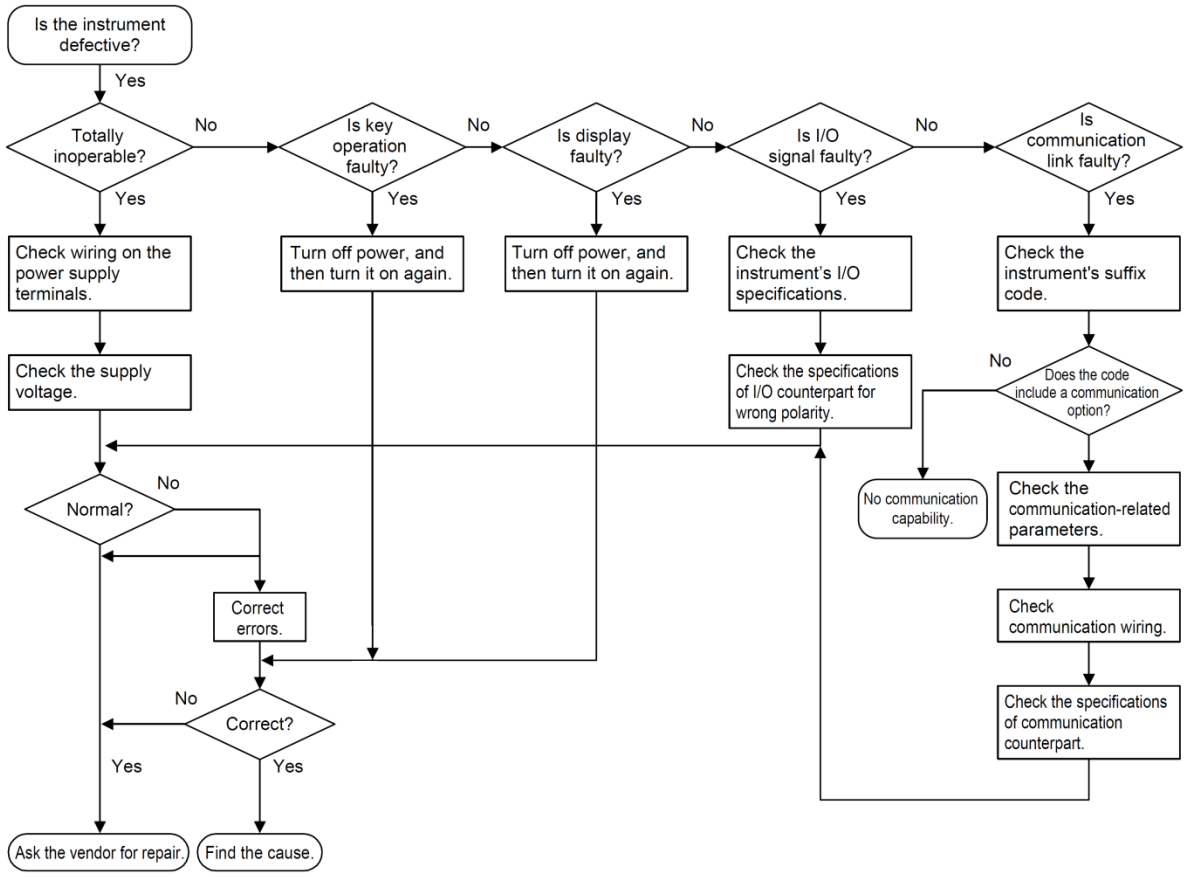


Figure 25: Trouble shooting block diagram

For particular module failure follow the below instructions:

- **Data – Logger 8040/Operator Terminal does not Switch ON.**
  - ✓ Check the Mains Cord.
  - ✓ Check fuse, if blown off replace it
  - ✓ Check Power ON switch/ Power ON Indication LED.
  - ✓ Check the S.M.P.S. O/P voltages of the Unit and the Operator Terminal

- **Printing is not proper unknown characters printed/ unit isn't printing.**
  - ✓ Check for the loose connection of printer cable connector.
  - ✓ Check the printer cable
  - ✓ Check the printer settings.

- ✓ Replace CPU card.

- **Communication Problem between the Unit and Host PC/Operator Terminal**
  - ✓ Check the cabling.
  - ✓ Check the serial No.
  - ✓ Check the RS-485 to RS232 converter.
  - ✓ Check the serial port of the computer & baud rate settings, etc.
  - ✓ Check RJ – 45 connection between the Data – Logger 8040 and the Operator Terminal.
  - ✓ Replace the CPU

- **Certain keys on the Operator Terminal not working.**
  - ✓ Check for Communication between the Unit and the Operator Terminal.
  - ✓ Ensure that the unit is in program mode.
  - ✓ If a particular row is failed, one of the lines of lay board matrix may be having problem.

- **Date/time other parameter changes when unit is restarted.**
  - ✓ Check the NVRAM on the CPU card. If not ok, replace the same.

- **Calibration of the unit is doubted to have drifted.**
  - ✓ Calibrate the unit as explained in the manual. Select the proper method according to your data - logger input type.

- **Reading indicated by data - logger is unstable**
  - ✓ Check the process input.
  - ✓ Ensure the perfect EARTHING to the unit & Neutral should not be floating.
  - ✓ Shielded cables should used for input. Shield should be EARTHED near the unit only.
  - ✓ Check any of the RTD's is not getting EARTHED or having weak insulation with respect to earth. If so, remove that RTD and check the cabling.
  - ✓ Check the lead resistance of all the three arms of RTD's. All the three leads should have same lead resistance. If no, change the cables.

- **In linear type input the unit shows false reading or 'OVER' or 'UNDER'.**
  - ✓ Check for the polarity of the I/p connections.
  - ✓ Check that the 250Ω resistor is connected across the I/P terminals, if the I/P type is 4 – 20 mA.
  - ✓ Check the current I/P coming from the field, it may be below 4 or over 20 mA.
  - ✓ Check for the proper range programmed in that channel.

- **In thermocouple input type, reading indicated has some error.**
  - ✓ Check for the proper I/p type selected.
  - ✓ Ensure that the compensating cables used are of proper type and connected in proper direction.
  - ✓ Check the calibration of the unit.

Masibus Automation & Instrumentation Pvt. Ltd.
Customer Support Division
B/30, GIDC Electronics Estate,
Sector-25, Gandhinagar-382044, Gujarat, India
Ph: 91-079-23287275/23287276/23287277
Fax: 91-079-23287281
Email: support@masibus.com
Web: www.masibus.com