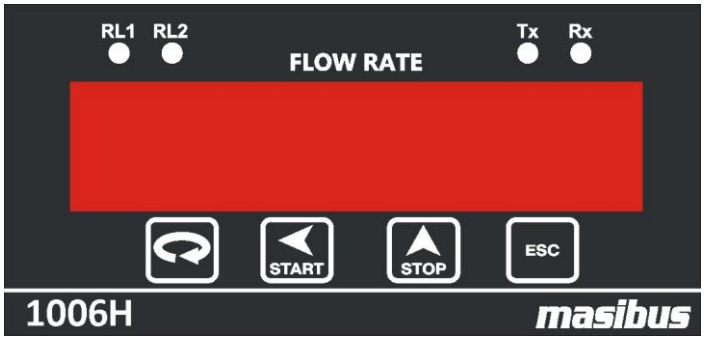
User's Manual

FLOW INDICATOR TOTALISER

1006H



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CONTENTS

1. INTRODUCTION....4

2. SAFETY AND WARNING PRECAUTIONS....6
2.1 Safety Precautions....6
2.2 Warning Precautions....6

3. SPECIFICATIONS....7
3.1 Measured input signal....7
3.2 Loop Power Supply Specification....7
3.3 Retransmission Output....7
3.4 Contact Input (Digital input)....8
3.5 Contact Output....8
3.6 Display Unit Specification....8
3.7 Electrical Specification....8
3.8 Isolation specification....9
3.9 Environmental Specification....9
3.10 Alarm Specification....9
3.11 Display Specification....9
3.12 Communication....10
3.13 Other Specification....10
3.14 Physical Specification....10

4. FRONT AND REAR PANEL DESCRIPTION....11
4.1 Front Panel Description....11
4.2 Rear Panel Diagram....11

5. MECHANICAL GUIDELINES....12
5.1 Mounting Details....12
5.2 Mounting Steps....12

6. TERMINAL CONNECTION DETAILS....13

7. WIRING DIAGRAM....14
7.1 Wiring Diagram of 1006H....14
7.2 Wiring Diagram and Jumper Setting of Pulse Input....15
7.2.1 NPN Proximity Input Jumper Setting....15
7.2.2 PNP Proximity Input Jumper Setting....16

8. OPERATING DETAILS....18
8.1 Display Section:....18
8.2 Keyboard Section....18
8.3 Run Mode....18
8.3.1 Run Mode Parameters Details....19
8.4 Edit Mode....20
8.4.1 Program mode....21
8.4.2 Configuration mode....22
8.4.3 Calibration mode....26
8.5 Parameter Flow....27

9. CALIBRATION PROCEDURE.....29
9.1 Input Calibration.....29
9.2 Output Calibration.....29
9.2.1 out zero and out span.....29

10. COMMUNICATION GUIDELINES.....30
10.1 Introduction.....30
10.2 Function Code for Modbus.....30
10.3 Modbus RTU protocol addresses for RS 485 Communication.....31
10.3.1 Addresses of 1006H.....31

11. MISCELLANEOUS.....33

12. Troubleshooting.....34

1. INTRODUCTION

Foreword

Thank you for purchasing **FLOW INDICATOR TOTALISER 1006H**. This manual describes the basic functions and operation methods of 1006H. Please read through this user's manual carefully before using the product.

Overview

This is a microcontroller based Indicator - Totaliser unit, with very high performance to price ratio. It is highly versatile, accurate and different from the conventional indicators.

The instrument is made in 96 x 48 x 110 mm size with DIN standard panel cutout of 92 x 44 mm.

Front is sealed membrane type to withstand dusty environment. On back plate screw type terminals are provided for easy connection.

The programming, calibration and operation of the instrument are by four simple keys and Single displays group for flow rate and batch total.

Operation of the instrument is menu driven with user understandable prompts. For protecting programmed data password protection facility is provided. Integrated total, batch total and roll count are cleared by special password.

The product is made to accept current (4-20 mA, 0-20mA), Voltage (1-5Volt, 0-5 Volt) input, pulse input & Digital input. It is available as a single input version only. The instrument is provided with the five-point calibration. The unit can be calibrated in installed condition itself by front panel keys at predefined points.

The set Parameters and integrated total are stored in serial EEPROM. No battery backup is required.

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 our 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 FLOW INDICATOR TOTALISER 1006H 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.

Model	Input Types		Digital Input		Power Supply		Communication		Relay		Retransmission O/P		Mounting	
1006H	X		X		XX		X		X		X		XX	
	C	4-20mA	N	None	A1	110-230V AC	N	None	N	NONE	N	None	P0	Panel
	D	0-20mA	Y	Yes	A3	24V DC	2	RS485	2	2 Relays	Y	Yes	W1	Wall-IP55
	E	1-5V DC											FP	Wall-FLP
	F	0-5V DC												
	N	0-10 KHz												
	S	SPECIAL*												

X - Specify from table

***Consult Factory**

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 our 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.
- 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.**

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. SPECIFICATIONS

3.1 Measured input signal

NUMBER OF INPUTS	1					
INPUT TYPE	DC Input		Current Input		*Pulse Input	Integrated/ Batch Total
	0-5 V	1-5 V	0-20 mA	4-20 mA		
MEASURING RANGE	0-30000 Range					0 - 999999
ACCURACY	± 0.25% of full scale ± 1 Count					**0.45 %
BURN OUT DETECTION	Available for 1 to 5VDC, 4 to 20 mA, 0 to 10 KHz.					
INPUT RESISTANCE	• 250 Ohms Internal for current Input • 320K Ohms for Voltage Input					
ALLOWABE SIGNAL SOURCE RESISTANCE	DC input voltage: 1KΩ or less. Effect from allowable signal source Resistance: 0.031 % / 100Ω or less					
ALLOWABLE INPUT VOLTAGE	DC voltage: ±20V DC					
NOISE REJECTION RATIO	**Common Mode:** > 100db **Normal mode:** > 40db					
RESPONSE TIME	**Input to relay o/p:** < 1 second. **Input to Analog o/p:** < 1 second or less, 63 % (10 - 90%) (Time required for o/p to reach 63% of the maximum excursion when PV changes from 10% to 90%)					
RESOLUTION	16 bit					
POLARITY PROTECTION	Not provided					
MEMORY BACKUP	EEPROM					

Note:

- Input type is factory set.
- * Max. Pulse level<=24V , Min. pulse level >=10V
- ** ±(0.45% of Reading + 1 Digit)

3.2 Loop Power Supply Specification

LOOP POWER SUPPLY	**24VDC ± 5% @ 50mA**

3.3 Retransmission Output

NUMBER OF OUTPUT POINTS	1
OUTPUT SIGNAL	4 to 20 mA DC
ON LOAD RESISTANCE	500Ω or less
OUTPUT ACCURACY	± 0.25% of full scale +1 count
RESOLUTION	12 bits (5μA)

3.4 Contact Input (Digital input)

NUMBER OF INPUTS	1
USAGE	Input 1 : Start Batch /Stop Batch
INPUT TYPE	Non- voltage contact input or transistor open collector input
INPUT CONTACT CAPACITY	24VDC,10mA or more (for non – voltage contact input)
ON/ OFF DETERMINATION	• **For non-voltage contact input** ON = contact resistance of 1KΩ or less, OFF = contact resistance of 20KΩ or more • **For transistor contact input** ON = 2V or less OFF = leak current of 100µA or less
MINIMUM RETENTION TIME FOR STATUS DETECTION	About 1 Second

3.5 Contact Output

USAGE	Flow alarm / Batch relay
NUMBER OF RELAY CONTACT OUTPUTS	2 (Flow alarm relays/ Batch relays)
RELAY CONTACT RATING	250VAC/5Amps
RELAY CONTACT TERMINAL	2(Common, NO)

3.6 Display Unit Specification

PROCESS VALUE DISPLAY/ INTEGRATED TOTAL DISPLAY	0.56” 6 digit 7- segment red LED display
PARAMETER DISPLAY	Same Process value display/ integrated total display

3.7 Electrical Specification

POWER SUPPLY	90 to 260 VAC, 50 / 60Hz ; 24VDC**(optional)**
POWER CONSUMPTION	<10Va
WITHSTANDING VOLTAGE	• Between primary terminal and secondary terminal : 1500VAC(For 1 min) • Between primary terminal and ground terminal : 500VDC(for 1 min) • Between ground terminal and Secondary terminal: 500V AC (for 1 minute). • (**Primary terminal:** Power supply, relay output) (**Secondary terminal:** Analog input/output signal terminals, contact input terminal)

3.8 Isolation specification

ISOLATION RESISTANCE	Between power supply terminal and ground terminal: 500 VDC, 50MΩ
MEASURED INPUT TERMINAL	Isolated from other input/output terminals. Not isolated from 24Vdc supply (Transmitter power supply) and internal circuit.
24V DC SUPPLY FOR TRANSMITTER	Not isolated from the measured input terminal & internal circuit, isolated from other input/output terminals.
RETRANSMISSION OUTPUT TERMINAL	Isolated from other input/output terminals and internal circuit.
CONTACT INPUT TERMINAL	Isolated from other input/output terminals and internal circuit.
RELAY CONTACT O/P TERMINAL (DIGITAL INPUT)	Isolated from other input /output terminals and internal circuit.
RS-485 COMMUNICATION TERMINAL	Isolated from other input/output terminals and internal circuit.
POWER SUPPLY TERMINAL	Isolated from other input / output terminals and internal circuit.
GROUND TERMINAL	Isolated from other input/ output terminals and internal circuit.

3.9 Environmental Specification

OPERATING TEMPERATURE	0 to 55°C
STORAGE TEMPERATURE	0 to 70°C
HUMIDITY	30 to 90% RH (non-condensing)
WARM UP TIME	>10 Minute
EFFECT OF AMBIENT TEMPERATURE	For Voltage Input: ± 0.005% of FS/ °C or less For analog output: ± 0.010% of FS/ °C or less

3.10 Alarm Specification

ALARM TYPES	Flow high limit, Flow low limit
BATCHING ALARM	Pre warn and set point
SETTING RANGES FOR PROCESS VALUE ALARMS	**Flow (PV) Alarms:** Min = Zero of individual I/P type Max = Span of individual I/P type

3.11 Display Specification

PV DISPLAY/ INTEGRATED TOTAL	6 digit red 7 segment display for flow rate/Integrated total
PARAMETER DISPLAY	Same 6 digit red 7 segment display flow rate/Integrated total
STATUS DISPLAY	Red LEDs (for alarm & Batch)

3.12 Communication

PROTOCOL	Modbus RTU serial
STANDARD	EIA RS-485
MAX. COMMUNICATION DISTANCE	1200 mtrs. (For 9600 bps RS 485)
COMMUNICATION METHOD	2 wire half duplex (RS 485)
DATA FRAME	N, 8, 1
COMMUNICATION RATE	9600, 19200 bps
MAX. CONNECTABLE CONTROLLERS/ INDICATOR	32
ADDRESS RANGE	1 to 99

3.13 Other Specification

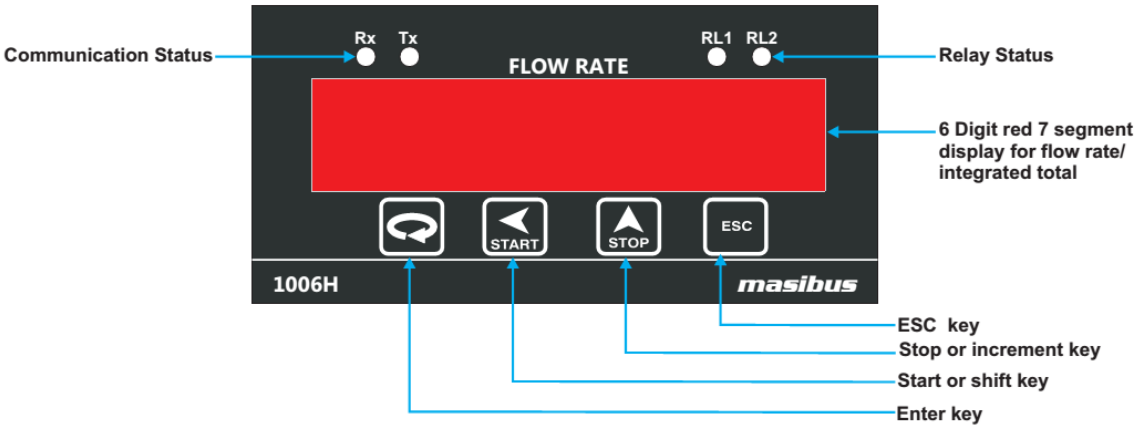
SQUARE ROOT EXTRACTION	Applicable
DIGITAL FILTER	Applicable
TIME BASE UNIT	Second, minute, hour, day
CONVERSION FACTOR	0.00 to 99.99
FIVE POINT LINEARIZATION	Applicable
LOW FLOW CUT OFF	Applicable

3.14 Physical Specification

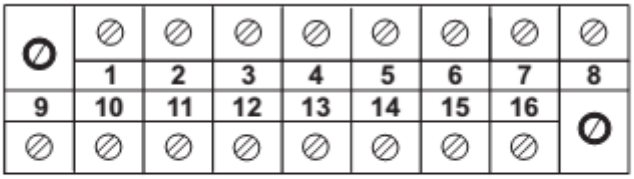
MOUNTING TYPE	Panel
BEZEL SIZE (in mm)	48 (H) x 96(W) x 110 (D)
CUT OUT DIMENSION (in mm)	44 (H) x 92(W)
WEIGHT	300 gms
IP CLASS	IP20
ENCLOSURE TYPE	Polycarbonate Plastic

4. FRONT AND REAR PANEL DESCRIPTION

4.1 Front Panel Description



4.2 Rear Panel Diagram



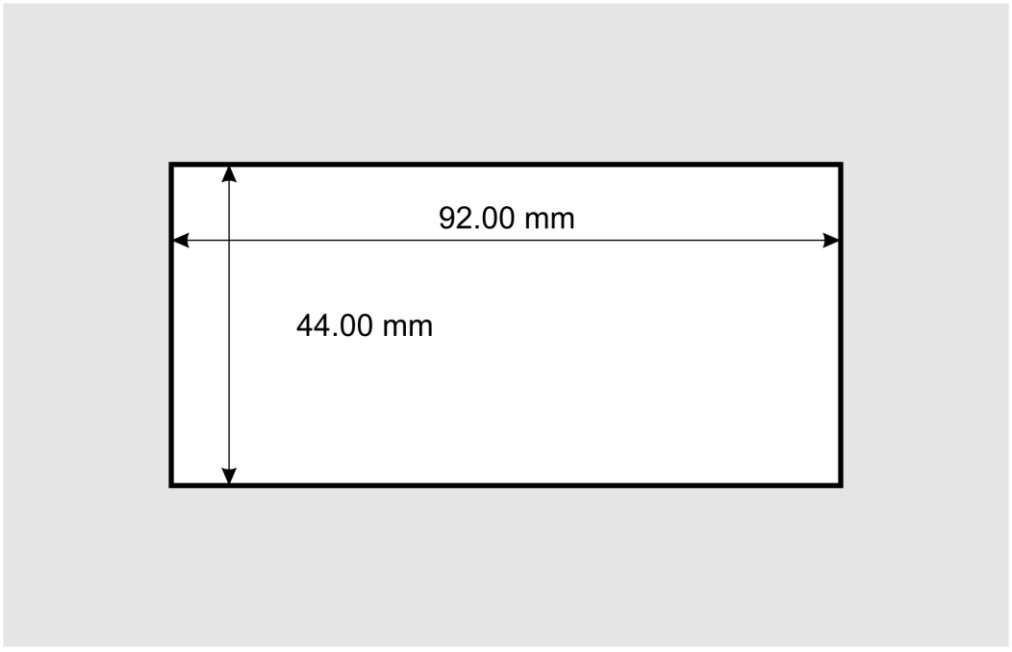
BACK TERMINAL DETAIL					
1	LINE	MAINS 110-230 VAC	9	PULSE +VE	
2	NEUTRAL		10	+24VDC (50mA)	
3	EARTH		11	INPUT +VE	ANALOG I/P 4-20mA
4	LOW / WP	RELAYS OUTPUT	12	INPUT -VE	
5	HIGH / EP		13	RxTx +	RS-485 SERIAL
6	RELAY COM.		14	RxTx -	
7	DIG.I/P +	DIGITAL INPUT	15	OUT +	CURRENT O/P 4-20mA
8	DIG.I/P -		16	OUT -	

TERMINAL DETAIL

5. MECHANICAL GUIDELINES

5.1 Mounting Details

- **Mounting Method** : Panel Mounting
- **Panel cut-out:** 92.00 mm X 44.00 mm



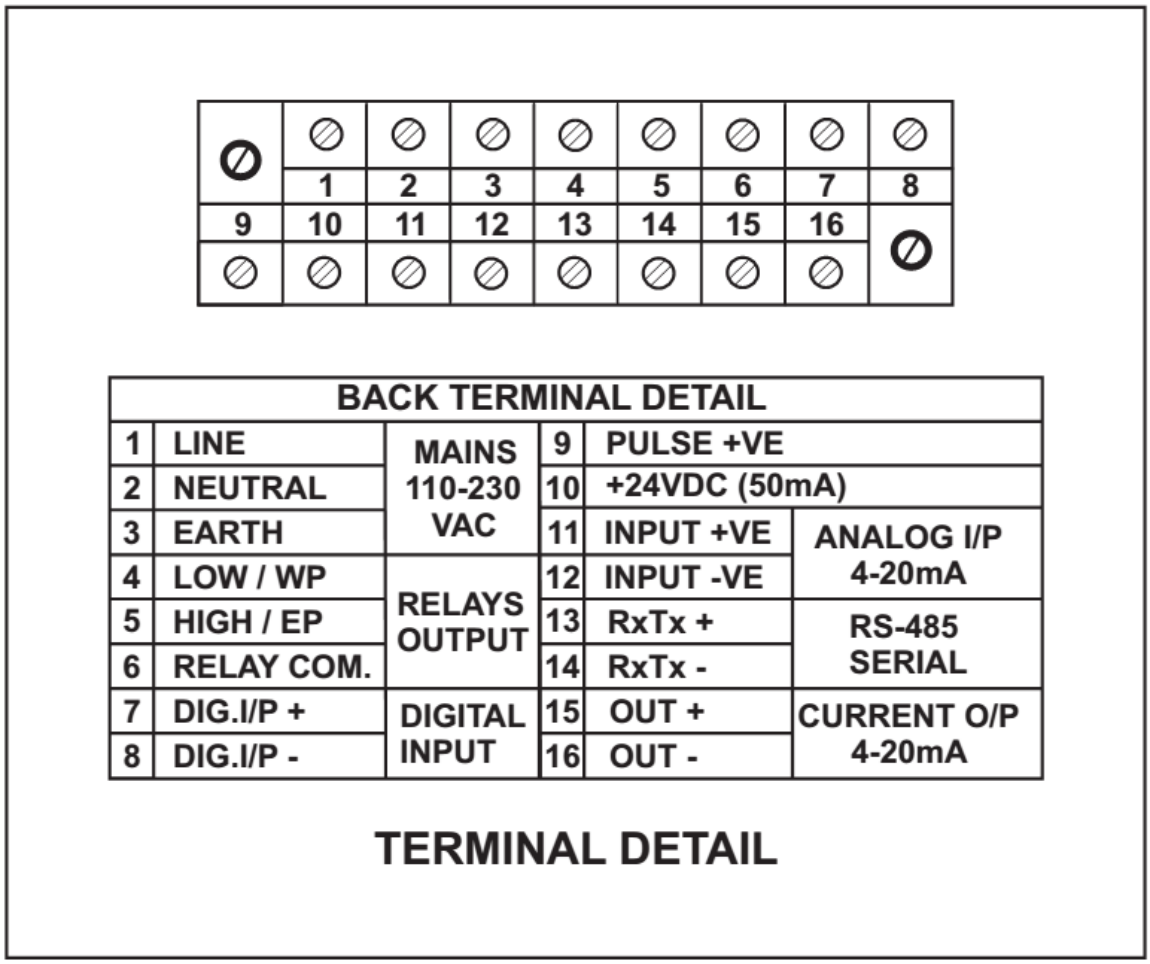
Panel Cutout Dimension

5.2 Mounting Steps

Following steps should be followed for proper installation of the instrument.

- Mount the instrument in the panel cutout of 92mm x 42mm.
- Fix the instrument with the panel using two side brackets.
- All the electrical connections to be done at back panel on screw type terminals
- Make sure that no wire is connected loosely to avoid generation of spark and RFI. Before connecting the mains, check the mains configuration on the back panel.
- Ensure that the instrument is properly earthed.
- Check voltage between earth and neutral terminal. It should be less than 2 volts AC. If this voltage is greater than it results in unstable reading. In such a case use ISOLATION TRANSFORMER to provide mains to the instrument.

6. TERMINAL CONNECTION DETAILS

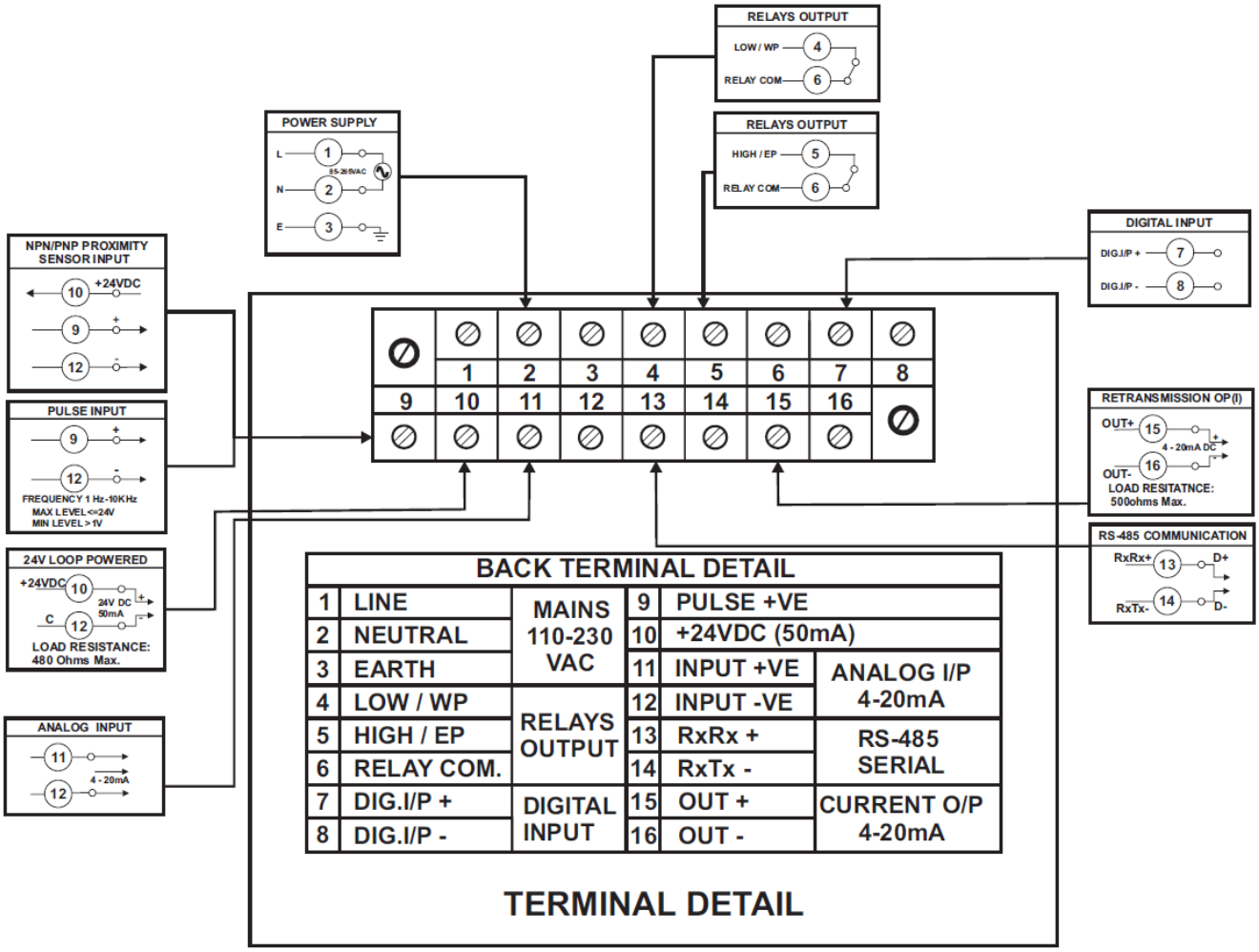


BACK TERMINAL DETAIL					
1	LINE	MAINS 110-230 VAC	9	PULSE +VE	
2	NEUTRAL		10	+24VDC (50mA)	
3	EARTH		11	INPUT +VE	ANALOG I/P 4-20mA
4	LOW / WP	RELAYS OUTPUT	12	INPUT -VE	
5	HIGH / EP		13	RxTx +	RS-485 SERIAL
6	RELAY COM.		14	RxTx -	
7	DIG.I/P +	DIGITAL INPUT	15	OUT +	CURRENT O/P 4-20mA
8	DIG.I/P -		16	OUT -	

TERMINAL DETAIL

7. WIRING DIAGRAM

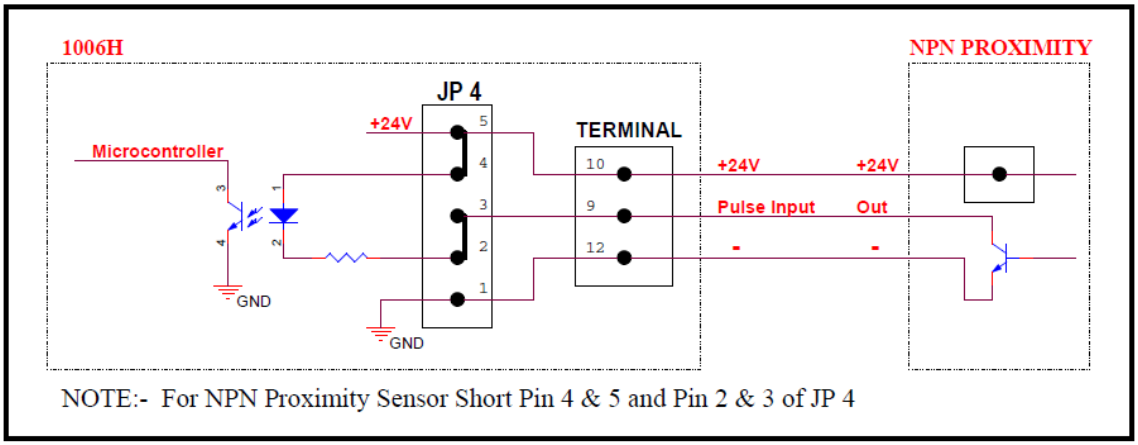
7.1 Wiring Diagram of 1006H



7.2 Wiring Diagram and Jumper Setting of Pulse Input

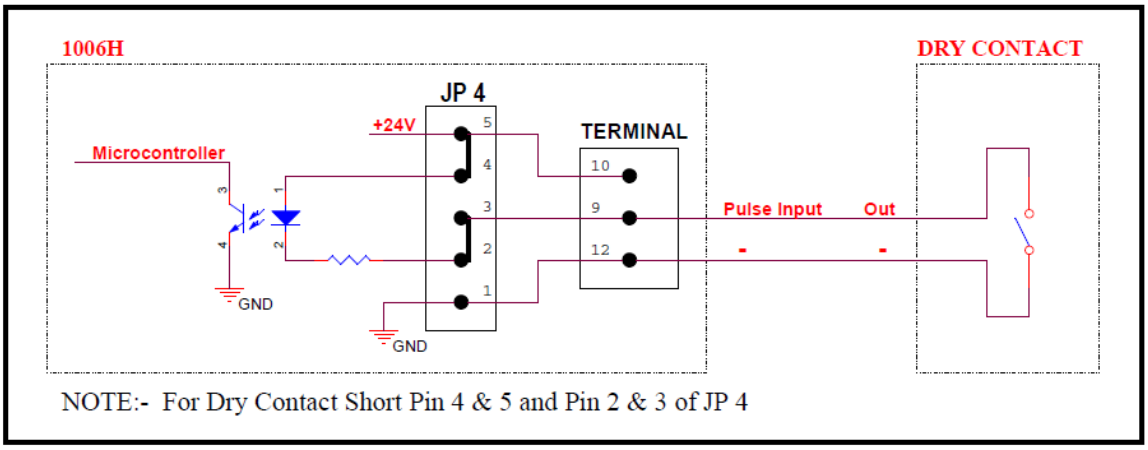
7.2.1 NPN Proximity Input Jumper Setting

7.2.1.A NPN Proximity Input



NOTE:- For NPN Proximity Sensor Short Pin 4 & 5 and Pin 2 & 3 of JP 4

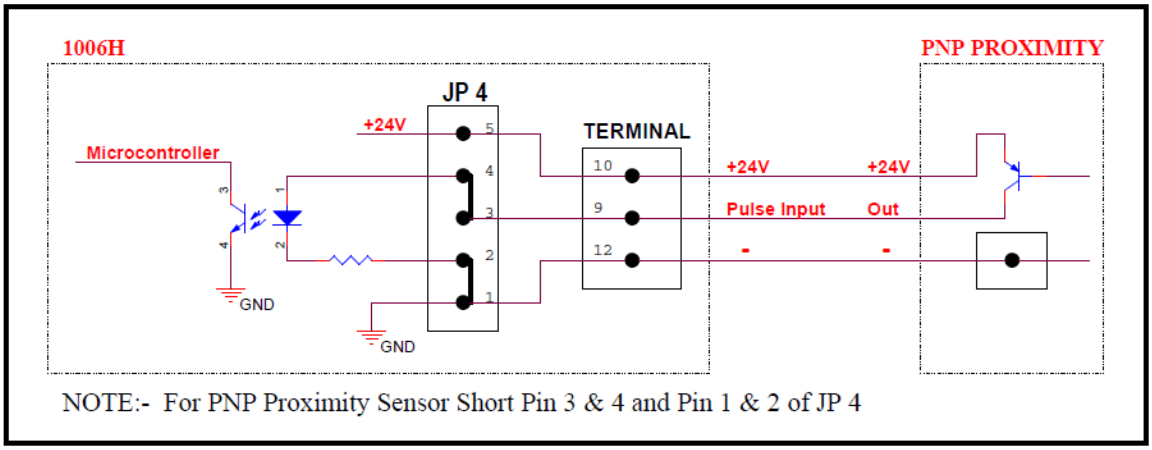
7.2.1.B Dry Contact (With NPN Input Jumper Setting)



NOTE:- For Dry Contact Short Pin 4 & 5 and Pin 2 & 3 of JP 4

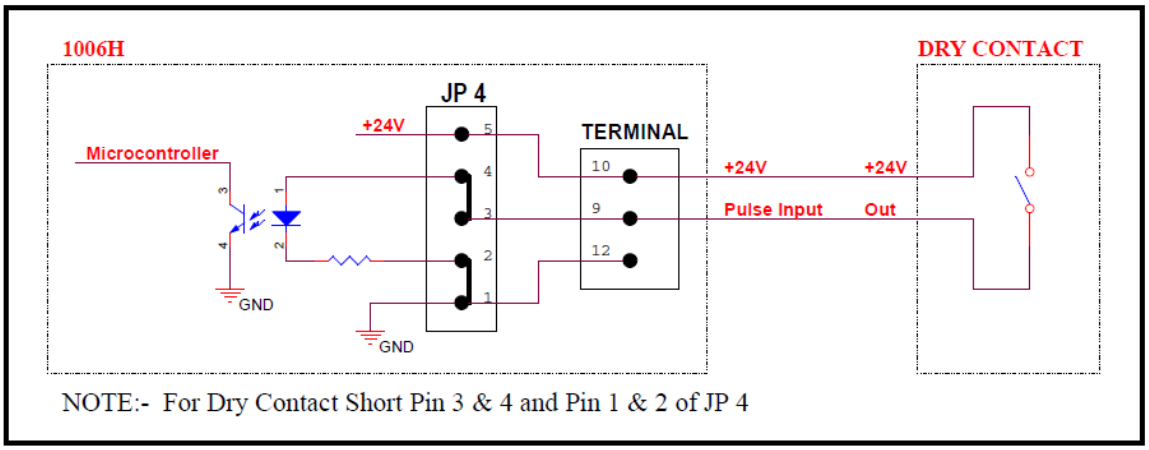
7.2.2 PNP Proximity Input Jumper Setting

7.2.2.A PNP Proximity Input



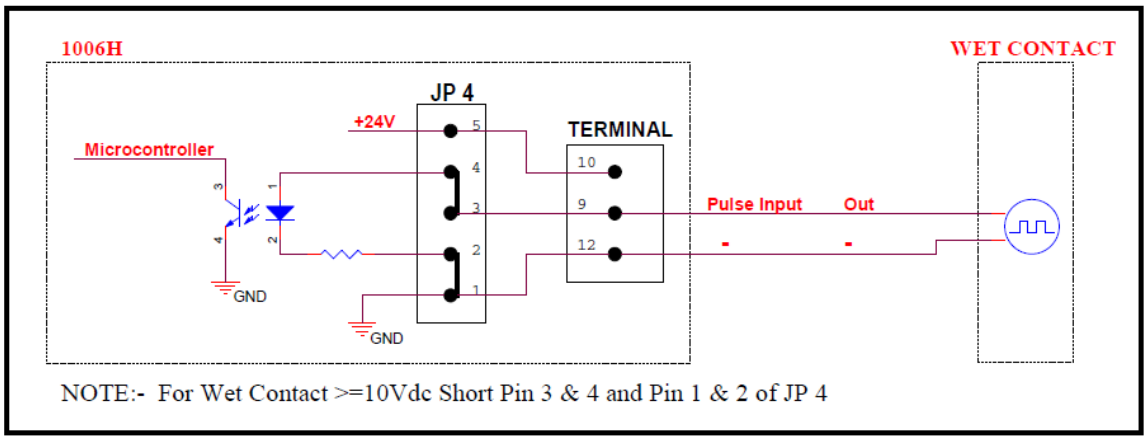
NOTE:- For PNP Proximity Sensor Short Pin 3 & 4 and Pin 1 & 2 of JP 4

7.2.2.B Dry Contact (With PNP Input Jumper Setting)

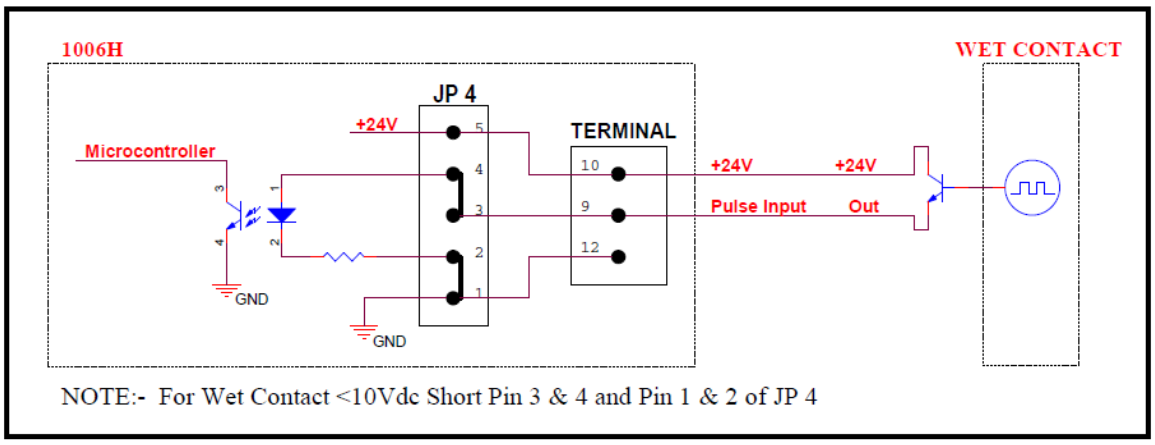


NOTE:- For Dry Contact Short Pin 3 & 4 and Pin 1 & 2 of JP 4

7.2.2.C Wet Contact >=10Vdc (With PNP Input Jumper Setting)



7.2.2.D Wet Contact <10Vdc (With PNP Input Jumper Setting)



8. OPERATING DETAILS

The following paragraphs give detailed description of how to operate the unit.
Before using the instrument, make sure to study and understand this section.

8.1 Display Section:

The unit has Single window and it is groups of display:
Six digits 7-segment, 0.56" Red LED display:
It displayed Flow rate/Integration Total.
While in EDIT mode, parameters are displayed in this window.

8.2 Keyboard Section

Unit has 4 key membrane keypad organized as 4 x 1 matrix.
Following Table explain the Operation of the Keys used for configuration.

SET OR SHIFT	1. It will allow user to enter in EDIT mode, when instrument is in RUN mode. 2. It will scroll menu and submenu when it is enabled 3. It will save edited data.
START OR SHIFT	1. It will enter into the submenu, when main menu is enabled and shows submenu's value. 2. It will select the digit to modify, when value is edited. 3. It will start batch, if pressed, when IT & BT are being displayed
STOP OR INCREMENT	1. It will increment value of digit selected or constant selected. 2. It will stop batch, if pressed, when BT/IT are being displayed.
ESCAPE	It will escape to previous status, with reference to its current status. Sequence of status: IT MENU SUB-MENU Parameter's Value Escape sequence When Esc key is pressed in Menu, the instrument will come in RUN Mode. If user wants to go in EDIT mode, he will have to enter the correct password again. It is Also use for show Either Flow Value or Integrated Total.

8.3 Run Mode

Whenever mains is switched on to the unit,

- Engineering value proportional to the input signal will be displayed as Process variable. Decimal point is displayed at selected position.
- Last saved batch total/integration total will be displayed on the window.

8.3.1 Run Mode Parameters Details

No.	Name	Description	Max digits	Limits
1	Batch Total	This parameter displays the Total flow since batch is started ('BT')	Max. 6	0 - 999999
2	Integrated Total	This parameter displays the Total flow since Last Reset. ('IT')	Max. 6	0 - 999999
3	Roll Count	This parameter displays the roll over count of the Integrated Total from '999999' to '0' ('rc')	Max. 4	0 - 9999

- **Batch total:**
  This is an eight digit totalized value, displayed as Batch total. As per the selected time base, Zero and Full-scale settings, this total is updated continuously, proportional to input. When New Batch Starts or Integration total is reset this value also gets initialized to 0.

- **Integration total:**
  This is an eight digit totalized value, displayed as integrated total. As per the selected time base, Zero and Full-scale settings, this total is updated continuously, proportional to input.

- **Rollover Count (RC):**
  This is a two-digit value, displayed as the rollover that takes place when integrated total gets higher than higher limit. When the integrated total crosses high limit, this count is incremented by one.

  So the total integration will be equal to
  (Rollover Count) x (hi limit + 1) + Integrated Total (It)

  Integrated total, batch total and roll count are cleared by special password.
  On power fail detection, current value of Batch total, integrated total and rollover count are stored in NVRAM.

  Next section will describe the different Item of individual submenu.

➢ **Start & Stop function:(In Run Mode)**

☞ **START key**:
- ✓ If this key pressed batching relays (WP/EP) gets ON & BATCH TOTAL = 0.It means a new batch is started. If START key is pressed again and again, it will not start the batch until WP/EP relays gets OFF.
- ✓ Relays get OFF by two ways:
  1. STOP key
  2. BATCH TOTAL crosses the value of SETPOINT.

☞ **STOP key**:
- ✓ If user presses **STOP** key in running batch, batching relays (WP/EP) gets off. If again **STOP** key is pressed again and again only batching relays gets ON/OFF

(only if BATCH TOTAL < (WP/EP) values. No new batch will be started by **STOP** key.

- ✓ When batch total value crosses the WP/EP value, relays gets OFF and batch is over.
- ✓ Again if START key is pressed then a new batch will start making BATCH TOTAL = 0. Batching relays gets ON.

8.4 Edit Mode

In this mode user can verify or modify, various parameters.
To enter the EDIT mode, correct password is to be entered.

- **Password Protection**
  When INDEX key is pressed, following prompt will be displayed at lower panel 7-segment display.

  “bt tot” , then
  “Int tot” , then
  “roL Cnt “ , then
  “PASS” .
  User Can select the Parameter –any of the above prompt to display corresponding value by pressing INDEX key and then pressing “START KEY”(It is digit select key for editing the parameters),
  At the selection of password, value “0000” is displayed.

  Enter the correct password value with the help of START (digit select key) and STOP key (Incr key) and press INDEX KEY (INDEX key is used as ENTER key)
  If correct password is entered & INDEX key is pressed, it will show the first mode PROG MOD. If wrong password is entered, then “0000” MSG will be displayed.

- **Parameter Description**
  There are total three Menu Items:

1.	Program Mode
2.	Configuration Mode
3.	Calibration Mode

Three parameters are displayed after entering correct password.
These parameters related with totaliser are mentioned in the following table.

8.4.1 Program mode

Programming menu provides facility to configure the relay for different function.

8.4.1.1 Program Mode parameters Details

No.	Name	Description	No of digit	Lo limit	Hi limit
1	Low Alarm	Alarm conditions for flow rate.	6	0	999998
2	High Alarm		6	0	999999
3	Pre warn Alarm	Batch control values.	6	0	999998
4	Set Point Alarm		6	0	999999
5	rEL1 (Relay 1)	Low alarm /Pre-warn/no			
6	rEL2 (Relay 2)	High alarm /Set Pnt /no			
7	Filter no		2	4	25

- **Low alarm and high alarm:**
  Value of Low alarm should be lower than that of high alarm. If user tries to set value of Low alarm **greater** than high alarm Value, error message will be displayed. Similarly, if user set value of High alarm **lower** than low alarm Value, error message will be displayed. Alarms value cannot be set greater than Full-scale Value (FS).

- **Comparison with Zero and full-scale**:
  Low Alarm value should be greater than Zero value. If user tries to set value of Low alarm less than Zero Value, error message will be displayed.
  If (Low Alarm< Zero value), "error" message appears.

  High-Alarm value should be greater than Full-scale value. . If user tries to set value of High-alarm greater than Full-scale value, error message will be displayed.
  If (High Alarm > full-scale value), "error" message appears.

- **Set point and pre-warn:**
  Error message will be displayed if, set point value is lower than pre-warn and vice versa.

- **Alarm ON-OFF :**
  Using these settings, user can set alarm/relay availability. If particular relay is set as 'yes', that particular alarm indication will be present over the display card and relay action will come into effect.

8.4.2 Configuration mode

Configuration mode provides facility to configure type of mode, type of input, baud rate for communication, etc. Every parameter is explained in the next section.

8.4.2.1 Configuration Mode Parameters of 1006H

Sr. No.	Name	Description	No Of Digit	Lo Limit	Hi Limit
1	Batch Mode	Type Of Mode, For Flow Control	-	Normal, Counter	
2	Input Type	Type Of Input	-	0-5V, 1-5V, 0-20mA, 4-20mA, Pulse	
3	Type Of Instrument	Type Of Instrument, Which You Want To Use.	-	Indicator/ Totaliser/Counter	
4	Square Root	Mode Of Linearization	-	Yes/No	
5	Digital Input	To Be Used To start and stop batch		Yes/No	
6	Digital Filter	If Yes Than In Programming Mode It Will Show Filter No.	-	Yes/No	
7	Time Base	For Calculation/Display Of Flow Rate	-	Sec, Min, Hour, Day	
8	**ZR1**	**Zero Value***	6	000000	999998
9	**FS1**	**Full Scale Value***	6	000000	999999
10	No Of Batches		2	00	99
11	Batch Count	Counter Will Count How Much Batches Has Been Taken	2	00	99
12	rounding	Base Rounding value of last digit	2	1,2,5,10	
13	Cut Off		4	000.0	999.9
14	DP	Decimal Point	-	0,0.1,0.01,0.001	
15	SF1	Full Scale For Segment 1	6	000000	999999
16	FL1	% Age Of Full Scale (Segment 1)	-	10,20,30,40,50,60,70,80,90,100	
17	SF2	Full Scale For Segment 2	6	000000	999999
18	FL2	% Age Of Full Scale (Segment 2)	-	10,20,30,40,50,60,70,80,90,100	
19	SF3	Full Scale For Segment 3	6	000000	999999
20	FL3	% Age Of Full Scale (Segment 3)	-	10,20,30,40,50,60,70,80,90,100	
21	SF4	Full Scale For Segment 4	6	000000	999999
22	FL4	% Age Of Full Scale (Segment 4)	-	10,20,30,40,50,60,70,80,90,100	
23	SF5	Full Scale For Segment 5	6	000000	999999
24	FL5	% Age Of Full Scale (Segment 5)	-	100	
25	Baud Rate	Baud Rate	-	9600,19200	
26	Serial No	Serial No	2	01 TO 99	
27	Pout	Pout	4	0001 TO 9999	
28	Default Display	Default Display	-	Batch Total/Integration Total (Bat Tot/Int Tot)	
29	password	password	4	0000-9999	
30	Conversion Factor	Conversion Factor	4	00.00-99.99	
31	Clear Total	To Clear Integration /Batch Total And Roll Count	4	3210	
32	K-FAC	K-FACTOR		000000-999999	
33	Pulse Time	Averaging of pulse input	2	00-20	
34	Frequency	For pulse input higher than 300Hz Select High else select Low		Low/High	
35	Pulse width	Pulse width of pulse input in millisecond	2	00-50	
36	Multiplying Factor	It is the factor for pulse input in counter mode	6	000000-999999	

*** Note: - Retransmission Output is Corresponds to the ZR1 (Zero Value) and FS1 (Full Scale Value).**

- **Batch Mode:**
  If *'Batch Mode'* (bat md) is selected to 'Counter', then two parameters "*Batch count*"(bt Cnt) and "*No of Batches"* (no bt) will be displayed in Configuration mode.
  If 'Batch *Mode'* is selected to 'Normal', then two parameters will not be displayed.

- **Input Type:**
  Based on requirement, user can select input type. It will be either Voltage or Current or Pulse.

- **Instrument Type:**
  If "*instrument type*" is set as indicator, then **Prewarn** and **Setpoint** parameter will not be displayed in Program mode.

- **Square root:**
  If user selects this mode as 'yes', flow rate will calculated using square root algorithm. Alternatively linear calculation will be done.

- **Digital Input:**
  If *Digital input* is selected as 'yes' than only digital input will work. One digital input is there For Start/Stop Function.

  DIG.I/P+: +24VDC
  DIG.I/P- : GND

  When any of these inputs is connected to DIN-, it will perform its specific function.

- **Digital Filter:**
  If *Digital filter* is selected as 'yes' than in programming mode user can see '*filter* no' parameter. If selected 'no' then *'filter* no' will not be displayed.

- **Time base:** Time base is used for calculation & display of flow rate.

Time base Setting details

Select	Time base	Divisor
0	Second	1
1	Minute	60 (1 x 60)
2	Hour	3600(60 x 60)
3	Day	86400(24 x 60 x 60)

Value of Integrated total for time period of t (in seconds) will be

Integration total= (flow rate * time't' in seconds)/divisor

- **Batch counter and no of batches:**
  These parameters will be displayed only if the 'Batch mode' is selected to counter type.

- **No of batches**: Set the parameter according to the requirement. It decides how much batches are to be taken

- **Batch counter:** It will be incremented by 1 whenever a new batch is started by START key in run mode. When batch counter value becomes equals to 'no of batches' value, then it will not *start* new batch.

Note: To reset batch counter, Enter in batch count (bt Cnt) parameter in configuration mode. Press "Start" key to see its value. Now if user presses "Stop" key Batch counter value will be cleared to 0.

- **Cut off: (Low flow cut-off)**
  Cut off could be set to 0000 to 0100.
  Cut off will display the % value.

  Cutoff value = Cutoff parameter (in %)*Full scale value
  If full scale value is 10000 and cut off is 5%
  Then cut off value will be calculated as
  = (5/100)*10000 = 500.
  So, if the displayed flow rate (displayed at upper window) is less than 500, it will not be added in integration.

- **Decimal Point Selection:**
  Decimal point selection will be given from the configuration mode.

Select	Decimal position
0	No decimal
0.1	One decimal
0.01	Two decimals
0.001	Three decimals

- **Five point Linearization:**
  This instrument has feature of five-point linearization. User can define up-to five different segments of the full-scale input (in percentage) with Full-scale engineering value for each segment. We have to program the value of flow rate at different inputs.

  Here we are defining five scale factors for the current input 4 mA to 20mA. Let's have one example to understand this concept.

  For Example:
  ZR = 00000 and FS = 10000, Let us assume the Unit is current input mode.

No.	Flow rate	Value	Parameter	Display Value	Input Current mA
1	FL1	10%	SF1	2000	5.6
2	FL2	50%	SF2	4000	12.0
3	FL3	60%	SF3	4500	13.6
4	FL4	80%	SF4	7500	16.8
5	FL5	100%	SF5	10000	20

  In above example
  Flow rate on Display varies between:
  - 0 – 2000 for input of 0 % – 10%
  - 2000 – 4000 for input of 10% – 50%
  - 4000 – 4500 for input of 50 % – 60%
  - 4500 – 7500for input of 60 % – 80%
  - 7500– 10000 for input of 80 % – 100%

  If user wants a flow to be linear throughout the span than configure this parameter as:
  SF1 = FS1, FL1 = 100 %.

User is not required to initialize SF2, SF3, SF4, SF5, FL2, FL3, FL4 and FL5.

- **Default Display:** This parameter will select the parameter to be displayed in run mode. If Int tot / Bat tot is selected then in run mode 'Integration total '/ 'Batch total 'will be displayed on lower panel accordingly.

  If "*instrument type*" parameter is set as indicator, then this parameter will not be displayed in Configuration mode and Integration total will be displayed in run mode.

- **Password:** A 'PASS' parameter is added in configuration mode. But it will always show '0000'.User has to remember the password .If user needs to change password, then go in 'pass' parameter, enter the required password and press Enter key.
  For e.g.: If user enters '1234' in '***pass'*** parameter, then, to enter in EDIT mode, a password '1234'is to be entered.

- **Conversion Factor (Conv-F):**
  It is a constant, which simply divides process value by the factor set. Usually, it is set as 1.00

  For example, if process value is 100 liters/minute & conversion factor is 1 then it will simply integrate process value as it is.
  If we change conversion factor = 2, then it will divide process value by that factor i.e. 100/2 = 50 & it integrates that value (in both integral and batch total) but on the display it shows original process value.

- **Clear total**:
  This Parameter is to reset IT, BT, and RC.
  If user enters the correct password, IT, BT and Roll over count gets cleared (initialized to Zero). And 'cleared' message is displayed on the lower window of display. By pressing ESC key, menu goes back to the clear total. If wrong password is entered, 'cleared' message will not appear.

- **K Factor (K-FA):**

Formula for K-FACTOR:

FLOW: - [(Pulse count per second *Time base)/ (K-FACT)]

Where, Time Base value =

Select	Time base	Divisor
0	Second	1
1	Minute	60 (1 x 60)
2	Hour	3600(60 x 60)
3	Day	86400(24 x 60 x 60)

For example: - if we want to set FLOW value equals to 250.00 and remaining parameter at: -

- For Flow per minute:

  Time base = 2 = 60
  Pulse count = 10000
  Then FLOW = [(10000 * 60)/2400]
  FLOW = 250 per minute.

- For Flow per Hour:
  Time base = 3 = 3600
  Pulse count = 10000
  Then FLOW = [(10000 * 3600)/144000]
  FLOW = 250 per Hour.

Note: - K-factor works linearly at 60/minute.

- **Pulse Time**
  Pulse time is the average parameter for averaging of pulse input.

- **Frequency**
  Frequency can be selected as high and low. For pulse input frequency higher than 300Hz selects HIGH. For frequency less than 300Hz select LOW.

- **Pulse width**
  Pulse width for pulse input in millisecond.

- **Multiplying Factor**
  It is the factor to be used as multiplication of pulse input when the instrument is used in counter mode.

8.4.3 Calibration mode

8.4.3.1 Calibration Mode Parameters Details this menu allows user to perform calibration of analog input & output.

No	Setting	Description	No of digit	Lo limit	Hi limit
1	Cal Zero	Zero Cal. Count	4		
2	Cal Span	Span Cal. Count	5		
3	Out Zero	Zero Cal. Count for Output	4	0000	4095
4	Out Span	Span Cal Count for Output	4	0000	4095
5	Default Out	If user selects 'yes', then Out zero = 800 and Out span (4000) is selected.	Yes/No		

➢ **INDICATION:**

For conversion in engineering value, the input is scaled between Zero and Full scale set values as per following formula (for linear mode):
For any type of input:

$$\text{Indication (Engineering Value)} = \frac{X}{(CALS-CALZ)} + \text{Zero}$$

X = (Input signal - CALZ) * (Full scale - Zero)
CALZ = Value of input applied during zero calibration

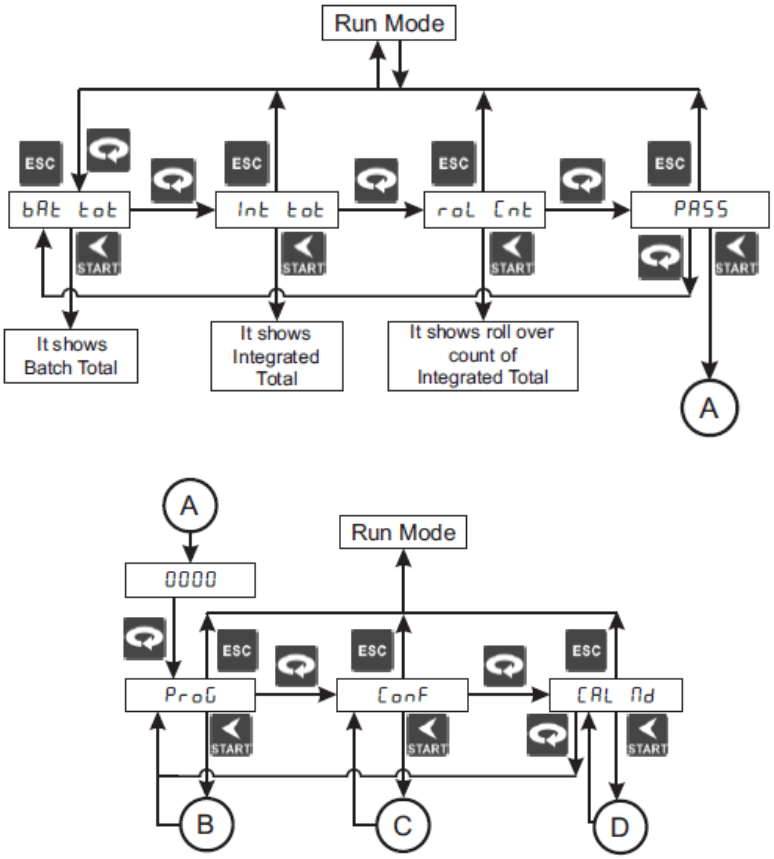
CALS = Value of input applied during Span calibration

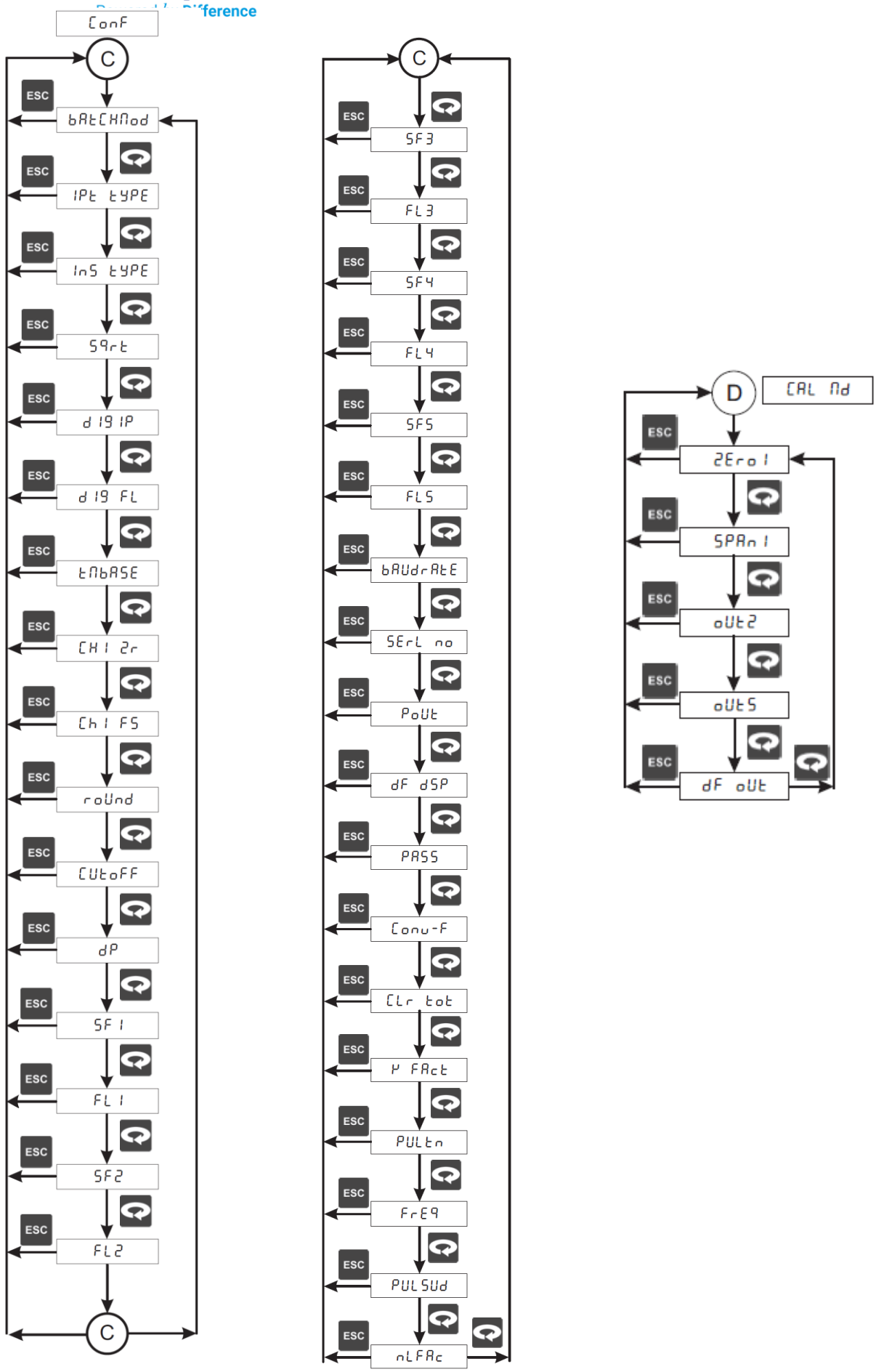
If input signal is outside the set Zero and Full-scale limit, all the four digits of the Process variable starts flashing. Only when input signal comes back into the allowed range, display becomes steady.

NOTE:
1). When no input is connected to the unit, it will display "open" message in pulse mode, current mode and voltage mode. (Pulse input 0 to 10 KHz, 4-20mA, 1-5V)
2). When input is out of the range the display will blink.

8.5 Parameter Flow

How to operate menu is shown below in the form of flow diagram:




ConF
C
ESC
bAtCHMod
IPt tYPE
InS tYPE
SQrt
d IQ IP
d IQ FL
tMbASE
CH I 2r
Ch I FS
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SF2
FL2
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C
SF3
FL3
SF4
FL4
SF5
FL5
bAUdrAtE
SErL no
PoUt
dF dSP
PASS
Conu-F
CLr tot
K FAct
PULtn
FrEQ
PULSUd
nLFAc
D
CAL Md
2Ero I
SPAn I
oUt2
oUtS
dF oUt

9. CALIBRATION PROCEDURE

9.1 Input Calibration

As explained earlier, One can do calibration thro' the keyboard itself, Zero and Full-scale values are stored in NVRAM.

1. Switch on the instrument and allow 15 minutes of warm up time before starting calibration.
2. Take a standard source. Set its output at desired Zero value. Apply output of the source to the input terminals of connector pin according to input select.
3. In calibration mode, Press shift /start key to calibrate zero. This will show prompt - "ZEro1". To enter in "ZEro1" mode press shift /start key
4. Now raw Count will be display. This is raw count proportional to analog input. Wait till counts are stable, save this count by pressing 'Index' key twice.
5. Press ESC key to come out from "ZEro1".
6. Now apply input equal to Full scale/Span (CALS):
7. Set output of the source at desired full-scale value. Apply output of the source to the input terminals
8. Press index key to go to calibration span. This will show prompt -" SPAn1". To enter in "SPAn1" mode press shift /start key.
9. Now raw Count will be display. This is raw count proportional to analog input.
10. Allow the reading to settle and Press 'Index' Key twice to save the count.
11. This reading will be stored as Span Now the instrument is calibrated.
12. Press ESC key to come out from "SPAn1".

9.2 Output Calibration

For output calibration, measuring instrument should be at least 3 times accurate.

9.2.1 out zero and out span

These two parameters are used for the calibration of re-transmission output. Users have to change the value of out zero and out span for the zero setting (for 4mA) and span setting (for 20 mA) respectively for re-transmission output.

1. In calibration mode, go to out zero calibration mode by pressing index key. This will show "oUtZ" prompt. To enter in "oUtZ" mode press shift /start key
2. Lower window displays a count. Using shift /start or inc/stop key to set reading (zero output) of connected ampere meter at output, exactly at 4.000mA and press index key to store the calibration value.
3. Press ESC key to come out from "oUtZ".
4. Press index key to go to out span calibration. This will show prompt- "oUtS". To enter in "oUtS" mode press shift /start key
5. Lower window displays a count. Using shift /start or inc/stop key to set reading (span output) of connected ampere meter at output, exactly at 20.000mA and press index key to store the calibration value.
6. Press ESC key to come out from "oUtS".

This reading will be stored. Now the instrument is calibrated.

If user enters values greater than 4095 "error" message will appear.

It user enters **out zero value > out span** value then also "error" message will appear.

Accuracy of retransmission O/p - 0.25% of Full span

10. COMMUNICATION GUIDELINES

10.1 Introduction

The unit can be connected in RS-485 communication data link either in multi drop or repeat mode. Each unit must have unique Serial Number. Entire range of addresses (1 to 247) may be used. Before starting any communication, choose a baud rate compatible to the host computer. The serial protocol used is MODBUS RTU.

10.2 Function Code for Modbus

CODE	NAME	Function
01	Read coil status	Use to read Relay and Digital output status
03	Read Holding registers	Use to read PV, Control, RSP output etc
05	Write input registers	Use to write digital parameter value.
06	Preset Single register	Use to write programmable register

The error checking field contains a 16-bit value implemented as two eight-bit bytes. The error check value is the result of a Cyclical Redundancy Check (CRC) calculation performed on the message contents.

Note:

- **For Analog Read**:
  FLx (FL1, FL2, FL3, FL4, and FL5) consists of 9 selectable values from 10 to 100.
  For 10 it will read…. 0
  For 20 it will read…. 1
  If FL1 =100, Hex address 0x0024 will show 9.

- **For Digital Read/Write**: Cmd Action = 1;
  Reg. Address = 0x0001 to 0x0004.
  1. Relays will read 0- OFF (relay) 1 – ON
  2. For start /stop function
     Cmd Action = 5
     Reg Address = 0x0005
     For Start – write 1
     For Stop – write 0

10.3 Modbus RTU protocol addresses for RS 485 Communication

10.3.1 Addresses of 1006H

Sr. No.	Reg. No.	Parameter Name	Length in bytes (Words)	Read/Write
1	40001	High alarm	2(1)	R/W
2	40002	High alarm+2	2(1)	R/W
3	40003	Low alarm	2(1)	R/W
4	40004	Low alarm+2	2(1)	R/W
5	40005	Set point	2(1)	R/W
6	40006	Setpoint+2	2(1)	R/W
7	40007	Pre-warn	2(1)	R/W
8	40008	Prewarn+2	2(1)	R/W
9	40009	Conv-Factor	2(1)	R/W (00.00-99.99)
10	40010	Filter no	2(1)	R/W (1 to 25)
11	40011	Batch mode	2(1)	R/W (0 for Normal, 1 for Counter)
12	40012	Type of input	2(1)	R/W (0 for 0-5V, 1 for 1-5V, 2 for 0-20mA, 3 for 4-20mA, 4 for pulse)
13	40013	Type of Inst	2(1)	R/W (0 for indicator, 1 for Totaliser, 2 for counter)
14	40014	Sqrt mode	2(1)	R/W (0 for Yes, 1 for No)
15	40015	Digital input	2(1)	R/W (0 for Yes, 1 for No)
16	40016	Digital filter	2(1)	R/W (0 for Yes, 1 for No)
17	40017	Time base	2(1)	R/W (0 for SECOND, 1 for MINUTE, 2 for HOUR, 3 for DAY)
18	40018	ZR	2(1)	R/W
19	40019	ZR+2	2(1)	R/W
20	40020	FS	2(1)	R/W
21	40021	FS+2	2(1)	R/W
22	40022	No of batches	2(1)	R/W (00 to 99)
23	40023	Batch counter	2(1)	Read only
24	40024	rounding	2(1)	R/W (1,2,5,10)
25	40025	Cut-off	2(1)	R/W (000.0 to 999.9)
26	40026	Dp	2(1)	R/W (0 for 0, 1 for 0.1, 2 for 0.01, 3 for 0.001)
27	40027	SF1	2(1)	R/W
28	40028	SF1+2	2(1)	R/W
29	40029	FL1	2(1)	R/W (0-9)*
30	40030	SF2	2(1)	R/W
31	40031	SF2+2	2(1)	R/W
32	40032	FL2	2(1)	R/W (0-9)*
33	40033	SF3	2(1)	R/W
34	40034	SF3+2	2(1)	R/W
35	40035	FL3	2(1)	R/W (0-9)*

Sr. No.	Reg. No.	Parameter	Length in byte (Word)	Read/Write
36	40036	SF4	2(1)	R/W
37	40037	SF4+2	2(1)	R/W
38	40038	FL4	2(1)	R/W (0-9)*
39	40039	SF5	2(1)	R/W
40	40040	SF5+2	2(1)	R/W
41	40041	FL5	2(1)	R (9)
42	40042	Baud rate	2(1)	R/W (0 for 9600, 1 for 19200)
43	40043	Serial no	2(1)	R/W (01 - 99)
44	40044	Pout	2(1)	R/W (0000-9999)
45	40045	Default display	2(1)	R/W (0 for batch total, 1 for integration total)
46	40046	Out zero	2(1)	R/W (0000-4094)
47	40047	Out span	2(1)	R/W (0000-4095)
48	40048	Default out	2(1)	R/W (0 for yes, 1 for no)
49	40049	Int total	2(1)	Read only
50	40050	Int total+2#	2(1)	Read only
51	40051	Batch total	2(1)	Read only
52	40052	Batch total+2	2(1)	Read only
53	40053	Roll count	2(1)	Read only
54	40054	Flow rate	2(1)	Read only
55	40055	Flow rate+2	2(1)	Read only
56	40056	K factor	2(1)	R/W
57	40057	K factor +2	2(1)	R/W
58	40058	Pulse time	2(1)	R/W (0-20)
59	40059	Frequency	2(1)	R/W (0 for LOW, 1 for HIGH)
60	40060	Pulse width	2(1)	R/W (0-50)
61	40061	Mul factor+2	2(1)	R/W
62	40062	Mul factor	2(1)	R/W
63	40063	Flow Rate dp	2(1)	Read only
64	40064	Setpoint Type	2(1)	R/W (0 - Absolute, 1 - Deviation)
Coil Registers				
65	1	Pre-warn relay/ Low alarm relay	1	R, digital (1 for ON, 0 for OFF)
66	2	Set point relay/ High alarm relay	1	R, digital (1 for ON, 0 for OFF)
67	5	Stop batch	0000	W, digital
68	5	Start batch	FF00	W, digital

 # 40050 : Int total+2 is MSB of Int total
40049 : Int total is LSB of Int total
Int Total = (65536 * MSB) + LSB ,
For example : MSB = 1 and LSB = 64662
Int Total = (65536 * 1) + 64662 = 130198

* **For FL1 to FL4**:
To write these parameters:
0 for 10, 5 for 60,
1 for 20, 6 for 70,
2 for 30, 7 for 80,

3 for 40, 8 for 90,
4 for 50, 9 for 100

11. MISCELLANEOUS

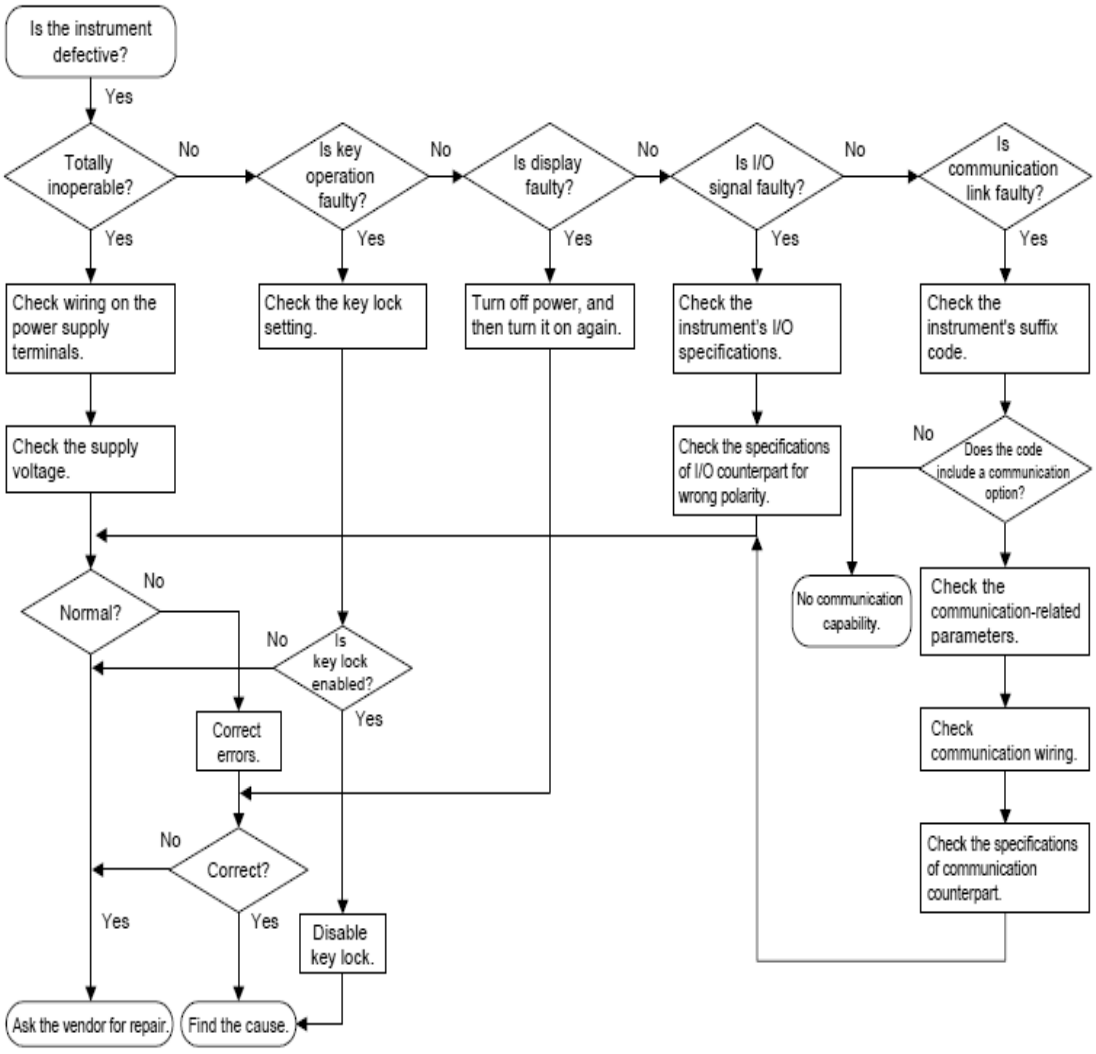
RETRAMISSION OUTPUT TABLE FOR OPEN /OVER /UNDER CONDITION:

- **For 4-20mA:-**

INPUT FEED (mA)	DISPLAY		RX O/P (mA)	
	LINEAR	SQUARE ROOT	LINEAR	SQUARE ROOT
I/P <1.60	OPEN	OPEN	4.00	4.00
1.60<I/P<3.20	UNDER	UNDER	4.00	4.00
3.20<I/P<4.00	Flow Rate	Flow Rate	4.00	4.00
20.00>I/P>20.80	Flow Rate	Flow Rate	20.00	20.00
20.80>I/P>22.40	OVER	OVER	20.00	20.00
22.40>I/P	OPEN	OPEN	20.00	20.00

NOTE:- For OPEN Sensor Condition Pre-warn and batch total (Set Point) Relays are in OFF State.

12. TROUBLESHOOTING

If the operating display does not appear after turning on the controller's power, follow the measures in the procedure below.

If a problem appears complicated, contact our sales representative.