



Olive User Manual Totalizer

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1. INTRODUCTION

FMRT is microprocessor based, designed as a very versatile panel mount Flowmeter display unit. FMRT has the SMPS based power supply which enable the unit to be powered from 85V to 265V AC/DC and as well as from 24V DC supply. To power the flow sensors, the unit is equipped to provide 24V DC regulated output. The unit has two Flowmeter input options with two control inputs, two relay outputs for batching/alarm, one 4-20mA analog output and one retransmission PNP pulse output.

FMRT display can be set to view the instantaneous rate of flow and cumulative total of both two inputs and additionally addition and subtraction of the inputs on 16 characters 2 line LCD. The LCD has the capability to display two parameters simultaneously on single screen. Up to 8 parameters can be set to view on display which can be traversed by front keypad. The keypad is designed to use in rugged conditions with rating up to Ip65.

The instrument is designed to accept almost all kind of flow sensor types that includes NAMUR, Open Collector, PNP or NPN Voltage Pulse, TTL Pulse, 4/20mA Current Pulse, REED and Sinusoidal Magnetic Pick-off Input. This unit also provides One Voltage Pulse Output that can be set to retransmit either input frequency pulses.

Cumulative flow data is presented in direct engineering units on 8 digits and Rate of flow in 6 digits. The instrument is also equipped to display the units of measurement on the LCD itself & 10 point linearization input for more accurate measurements.

A RS485 COM port in the FMRT can be used for communication is also available in the FMRT unit. The communication protocol is Modbus RTU. In RS485 Modbus RTU communication, instantaneous flow data can be read by master in IEEE 754 Float format comprising of two words each.

2. TECHNICAL SPECIFICATIONS

Display	2 Line 16 Character with Backlit Alphanumeric LCD 6 Digit Flow Rate & 7 Digit Totaliser Selectable Decimal Points up to 4
Mounting Type	Panel Mount
Power Supply	85V To 265V AC/DC or 10V To 30V DC Short Circuit, Overload and Thermal Overload Protected
Transmitter Supply	24V DC, 150mA Short Circuit & Overload Protected
Configuration	Through 3 Front Panel Keys
Memory	Non-Volatile For Settings and Totaliser
Flowmeter Inputs	2 Flow Inputs

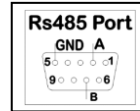
Flowmeter Input Types	High Impedance Digital Pulse Inputs Voltage Pulse, 4/20mA Current Pulse, Open-Collector Pulse, TTL, NAMUR, REED, Sinusoidal milli-Volt Frequency Range: 0 to 5 kHz Response Time < 20 msec Display Accuracy – <0.01% & ± 1 Count 10 Point Lineariser Flow Inputs Display Update Configurable from 100 msec to 10 sec Addition & Subtraction of Flow Inputs Rate & Totaliser Display Option
Control Inputs	2 Digital Inputs
Control Input Features	Start Count, Stop Count, Reset Count
Relay Outputs	2 1 N.O. & 1 N.C. Factory Default Other Options also Available (As N.O. + N.O or N.C. + N.C.)
Relay Modes	Timed Mode, Hysteresis Mode & Window Mode
Analog Output	4-20mA Analog Current Vs Rate 0-5V, 0-10V Analog Voltage Option also Available Reverse Polarity Protected Over-Voltage & ESD Protected Load Capacity 700 ohm Accuracy – 0.05% FS
Digital Pulse Output	Un-Scaled Pulse (Frequency Equal to Input Frequency) 1/2 VCC Pulse Level Load Capacity – 10 mA
Communication	Flow Data Available On Modbus RTU Protocol Rs485 (factory default), RS232 Option Available
Temperature	Operating: -20° C to +50° C Storage: -40° C to +80° C
Connections	16 No.s Plug-in Type Screw Terminals Wire Size: 0.32 to 2.5 mm ² (22-14 AWG)
Housing	Standard 1/4 DIN, Panel Cutout: 92 mm (W) x 92 mm (H) Depth Behind Panel 80 mm Bezel : 96 mm (W) x 96 mm (H) Material: ABS Plastic

3. TERMINAL DETAILS

01. AC	09. Analog Out+
02. AC	10. Analog Out-
03. Relay A(N.O.)	11. Ctrl I/P B Pout
04. Relay A COM	12. Ctrl I/P A
05. Relay B(N.O.)	13. Pulse I/P B
06. Relay B COM	14. Pulse I/P A
07. DC+	15. Signal GND
08. DC-(GND)	

Note:

When the unit is AC powered (85V To 265V AC), terminal 7&8 provides 24V DC transmitter supply output. While unit needs to be powered through DC Supply (10V To 30V DC), apply DC power on terminals 7&8.



4. PRINCIPLE OF OPERATION

FMRT has two pulse inputs for calculation of calculation of flow rate and totaliser.

FLOW RATE:

The FMRT calculates the live flow rate and the total volume and displays on the 16x2 LCD according to the Calibration factor (K-Factor) and Rate meter. Flow Rate at any input frequency is calculated by:

$$\text{Instantaneous Flow Rate} = (\text{Frequency} \times \text{Ratemeter}) / \text{K-Factor} \quad \dots\dots\dots \text{Eq 1}$$

CALCULATION OF MAXIMUM FREQUENCY:

Maximum frequency of flowmeter can be calculated by

$$F_{\text{max}} (\text{Hz}) = (\text{K-Factor} \times \text{Range}) / \text{Ratemeter} \quad \dots\dots\dots \text{Eq 2}$$

TOTALISER:

Cumulated Total can be calculated by the following formula

$$\text{Volume} = (\text{Time (secs)} \times \text{Flow Rate}) / \text{Ratemeter} \quad \dots\dots\dots \text{Eq 3}$$

PULSE OUTPUT:

Digital Voltage pulse output is available as the raw pulses (Un-scaled) which can be used remotely in any PLC or Indicator. The amplitude of the voltage pulse is ~12V DC when FMRT is 85V-265V DC powered.

In case of 10V-30V DC powered FMRT, the amplitude of the voltage pulse is $\sim 1/2 \times V_{\text{in}}$. The pulse output can be connected to any indicator or PLC/SCADA working on 10V to 30V DC voltages.

ANALOG OUTPUT:

Analog current output in 4-20mA is generated by the processed signal Vs live flow rate set.

Analog output can be set Vs Rate A, Rate B, Rate A+B or Rate A-B. To use 4-20mA analog output, only range i.e. maximum flow rate has to be set in to the FMRT unit. The value of current output in milli-Amperes can be calculated by:

$$\text{Analog Out (mA)} = \{ (\text{Flow Rate} \times 16) / \text{Maximum Range} \} + 4$$

LOAD LIMITATIONS:

Maximum load that can be introduced in the analog output loop without distorting the analog output.

There are different configurations in which the analog output can be connected.

1. FMRT Power Supply (Vin): 85V-265V AC/DC
Load Capacity: 750 ohm

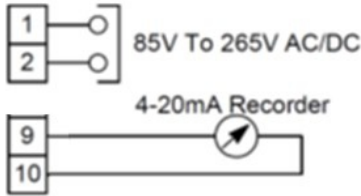


Fig. 1

2. FMRT Power Supply (Vin): 10V-30V DC
Load Capacity: (Vin - 10) x 50 ohm

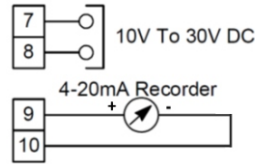


Fig. 2

5. PROGRAMMING

ENTER LOCK CODE:

Enter the set 4 digit lock code, if entered lock code does not match with the set lock code, the unit will display "INVALID LOCK CODE" will go to the RUN MODE automatically. If the entered LOCK CODE correct, the unit will go to the programming mode.

Default LOCK CODE = 1000

MAIN MENU:

The Main Menu consists of the following steps:

Parameter Setup, Configure I/Ps, Setup Ctrl I/Ps, Setup Ratemeter, Setup Relays, Setup Pulse O/P, Analog O/P, Setup Security, Setup Com Port, Reset Totaliser and EXIT.

The INCR key allows scrolling through these steps. PROG key allows to enter any menu. All these steps are given in brief below.

1. Parameter Setup:

The display mode can be selected as Unit Mode or Default Mode. In default mode, the parameter's name are fixed and will be displayed as Rate A, Total A, Rate B, Total B, RateA+B, TotalA+B, RateA-B and TotalA-B. In Unit mode, the flow units can be displayed over the LCD.

1.1 Volume Unit: The selectable options are as, M3, Ltr, GAL, BBL, KG, TON, FT3 and cc.

1.2 Rate Decimal: Decimal points in rate can be set from 0 to 4.

1.3 Total. Decimal: Decimal points in totaliser can be set from 0 to 4.

1.4 Parameter 1: The unit is capable of showing eight different parameters. Each parameters to be displayed in the RUN MODE can be set as any of Rate A, Total A, Rate B, Total B, RateA+B, TotalA+B, RateA-B and TotalA-B. The "Parameter 1" will be on first line of LCD of default screen (screen 1) in RUN MODE.

1.5 Parameter 2: "Parameter 2" can also be set any of Rate A, Total A, Rate B, Total B, RateA+B, TotalA+B, RateA-B, TotalA-B and Disabled. "Parameter 2" will be on the second line LCD of default screen. If "Disabled", the Parameter Setup will automatically go to the main menu. Also, when more parameters are selected, the display will be on screen 2 and so on.

2. Configure I/Ps: The unit is capable to measure two flow inputs i.e. Pulse I/P A and Pulse I/P B.

2.1 I/P Freq: The selectable options are High CPS and Low CPS. For low frequency pulse such as REED or if fast response is desired in the flow rate, of which maximum frequency below 1000 Hz, low CPS should be selected. If selected low CPS the unit will go to 2.1.1, otherwise 2.2.

2.1.1 Measure Pulses: The unit will measure the time between the number of pulses entered / set in measure pulses. Smallest possible setting is 1, i.e. time will be measured between consecutive pulses for the calculation of flow rate. Maximum setting can be 99 pulses.

2.1.2 Max. Window Time: When Low CPS is selected as input frequency the unit will ask to enter the maximum window time. Maximum window time (seconds) or "cut-off" is the wait time between two consecutive pulses after which the flow rate becomes zero. Totaliser will always work even if the maximum window time is not entered properly. The setting is in seconds & in selectable options are in $2n$; where n is between 0 to 10. E.g. maximum setting is 1024 seconds (or 17 minutes and 4 seconds). This setting is to read flow rate from very low frequency generating flow meters, however it is important to note that this setting is to display flow rate only. The totaliser will increment with each incoming pulse, working independently.

NOTE: For example, if Measure Pulses set as 20 and Max. Window Time or Cut-off as 4. Now, if the input frequency generated by any flowmeter is 100 Hz. Then, response/update time will be $2/100 = 0.02$ sec or 20 msec.

Also, the flow will be read as zero if 20 "Pulse" do not come in the time set in "Max. Window Time".

For above example, flow will be read as zero for input frequency less than $20/4 = 5$ Hz

User-configurable "Pulse" and "Cut-Off" settings are provided to cover the entire range/types of flow meters, either they generate low frequencies or high frequencies in their operating flow range.

2.2. I/P Type: A Input type A can be selected as Linear or Non-Linear. In Linear, only one general Kfactor of the Flowmeter has to be tuned in the unit. While in Non-Linear type, Frequency Vs Kfactor curve can be entered up to 10 points in increasing order of frequency. If selected NonLinear type, the unit will go to the 2.2.1, otherwise 2.2.2.

2.2.1. Input:A Freq Point:0: Enter the first lowest Point:0 frequency in 4 digit integer.

2.2.2. Input:A K-Factor 0: Enter the K-factor Point:0 in XXXXXXE-Y format. E.g. 3600 can be entered as 003600E-0 or 3600.12 can be entered as 360012E-2.

K-factor Range: 00.0001 to 999999.

Can be set up to 10 points. When entered K-factor or Freq at any point is zero, the unit will save the points of non-zero entered K-factors and frequencies and go to 2.3.

2.3. I/P Type: B The settings can be done as described for I/P Type:A, see 2.2. After setting I/P Type:B the unit will go to the next menu.

3. Setup Ctrl I/Ps: Two control inputs are available for START, STOP and RESET the selected Counts such as COUNT A, COUNT B, COUNT A+B and COUNT A-B. COUNT save the totaliser value of corresponding inputs (i.e. I/P:A and I/P:B).

3.1 Control I/P:A control input A can be configured to Stop Count A, Stop Count B, Stop Count A&B, Start Count A, Start Count B, Start Count A&B, Reset Count A, Reset Count B, Reset Count A&B and Disable.

3.2 Control I/P:B Settings for Control I/P:B are same as described in 3.1.

4. Setup Ratemeter: Ratemeter is the time base for the flow rate calculations. The ratemeter setting sets the time base for both inputs (i.e. I/P:A and I/P:B).

4.1 Time Base: /h for per hour, /m for per minute and /s for per second calculation of flow rates.

When Ratemeter selected as /hr, /min or /s the Rate of corresponding input either A or B will be displayed. For example A: Ltr/min.

4.2 Normalisation Factor: Higher normalization factor setting will lead to higher response time and vice-versa. However, it is advised that for maximum frequency F_{max} lower than 1000 Hz requires setting of normalization factor of nearest integer quotient value of $1000 / \text{Maximum frequency}$.

Normalisation Factor Range:- 1 To 29.

Calculated by Eq 2 described above

5. Setup Relays: Two potential free relay contacts are provided in the Unit. Check for the contact type whether N.O. or N.C. for proper operation.

5.1. Setup Relay A: In this the mode can be selected in which the relay has to operate. Selectable options are Timed Mode, Hysteresis Mode, Window Mode and Disable.

Timed Mode: In this mode, a High Preset Value of the selected parameter (Rate A, Total A, Rate B or Total B) has to be entered on which the relay is to be energized and the relay will reset after the set time to reset (in seconds).

NOTE: If relay has been set to timed mode and time set to energise is Zero, the relay will be energized after the set parameter value and will remain energised until manual reset.

Hysteresis Mode: In this mode the required settings are Low Preset Value and High Preset Value of the selected parameter (Rate A, Total A, Rate B or Total B). The relay will be energized after reaching the set High Preset Value and de-energized when the value reach set Low Preset Value.

Window Mode: Window Mode is exactly opposite of the Hysteresis Mode. The required settings are Low Preset Value and High Preset Value of the selected parameter (Rate A, Total A, Rate B or Total B). The relay will be energized after reaching the set Low Preset Value and deenergized when the value reach set High Preset Value.

5.2 Setup Relay B: The settings are same as described in 5.1. Setup Relay A.

6. Setup Pulse O/P: The unit is equipped to retransmit the input frequency via amplified voltage pulses of either input A or B.

6.1 Retransmit Pulse O/P: Selectable options are I/P:A, I/P:B and Disable.

7. Analog Output: Analog output can be 4-20mA Current, 0-5V DC Volt, 0-10V DC Volt, 1-5V DC Volt or 1-10V DC Volt depending upon the ordered unit.

7.1 Analog O/P Par: Analog Output can be selected for parameters Rate A or Rate B.

7.2. Analog O/P Span: Analog output span setting is the value of flow rate on which the maximum analog output is set.

Analog output setting can set in 6 digit integer.

8. Setup Security: Security setup is to configure the security features to avoid unauthorized access.

8.1 Key Reset in Run Mode: Reset feature through front panel keys can be configured from this setting. If it is required to reset the totalisers in RUN MODE without entering the LOCK CODE this setting should be selected as Enable or Otherwise Disable.

8.2 Security Code: This feature is to select user-configured 4 digit LOCK CODE. In default the unit displays the current LOCK CODE. The LOCK CODE can be changed to any 4 digit combination. After the EXIT from programming's menu, the unit will be unlocked by new code only.

9. Setup Communication Port: In this menu, the unit can be assigned a unique device-ID and the communication parameters, i.e. BaudRate, parity and Stop bit. The serial port can be used for data acquisition. The unit can communicate with a master device through a Modbus- RTU protocol. The addresses for all the nine parameters that can be read from the unit are as follows (the data given for each parameter is in IEEE float format comprising of 2 words each).

9.1. Set Device-Id: Set Device-Id in three digit integer. Device-Id Range: 1 – 250

9.2. Set Baud-Rate: The unit supported baud-rates are 9600 bps, 19200 bps, 38400 bps, 57600 bps and 115200 bps.

9.3. Setup Data, Par & Stop Bit: Data, Parity and Stop bits for communication can be selected in this option. Selectable options are 8N1, 8N2, 8O1, 8O2, 8E1 and 8E2.

10. Reset Totaliser: Totalisers can be reset from this menu.

10.1. Reset Total A: Select and enter "Yes" to reset the totaliser count A. Enter "NO" to skip.

10.2. Reset Total B: Select and enter "Yes" to reset the totalizer count A. Enter "NO" to skip.

10.3. Reset Total A+B: Select and enter "Yes" to reset the totalizer count A+B. Enter "NO" to skip.

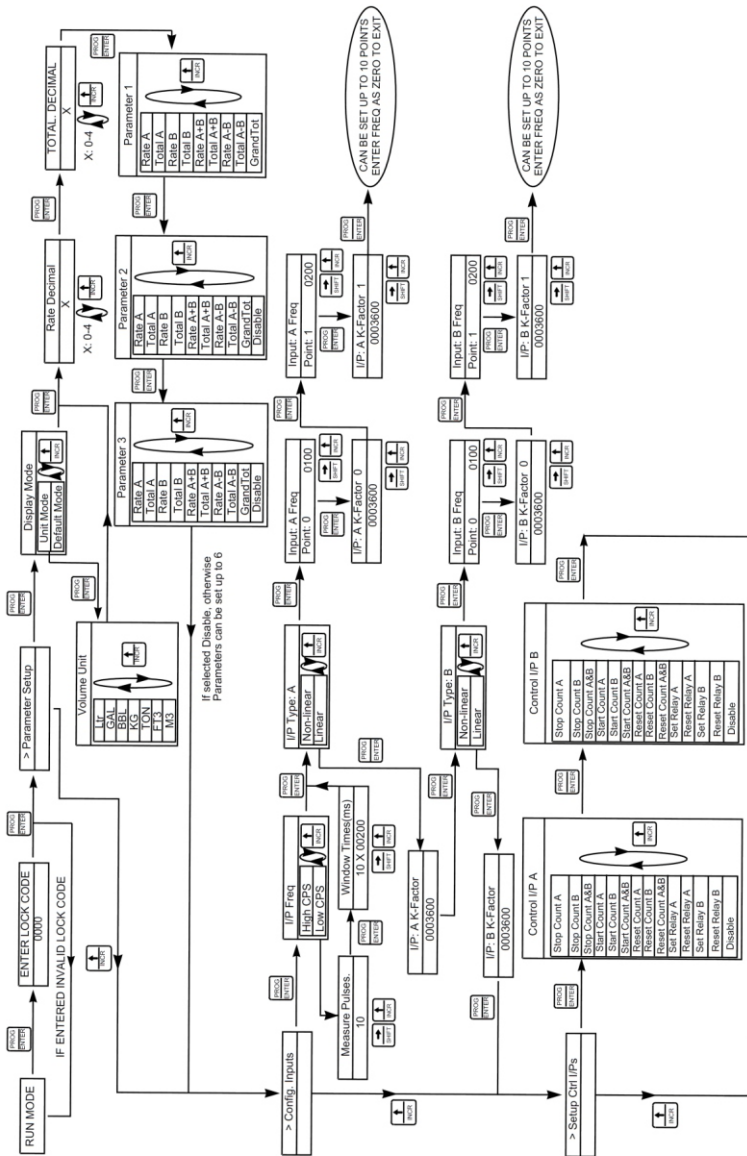
10.4. Reset Total A-B: Select and enter "Yes" to reset the totalizer count A-B. Enter "NO" to skip.

10.5. Reset Gr.Total: Select and enter "Yes" to reset the totalizer count Gr.Total. Enter "NO" to skip.

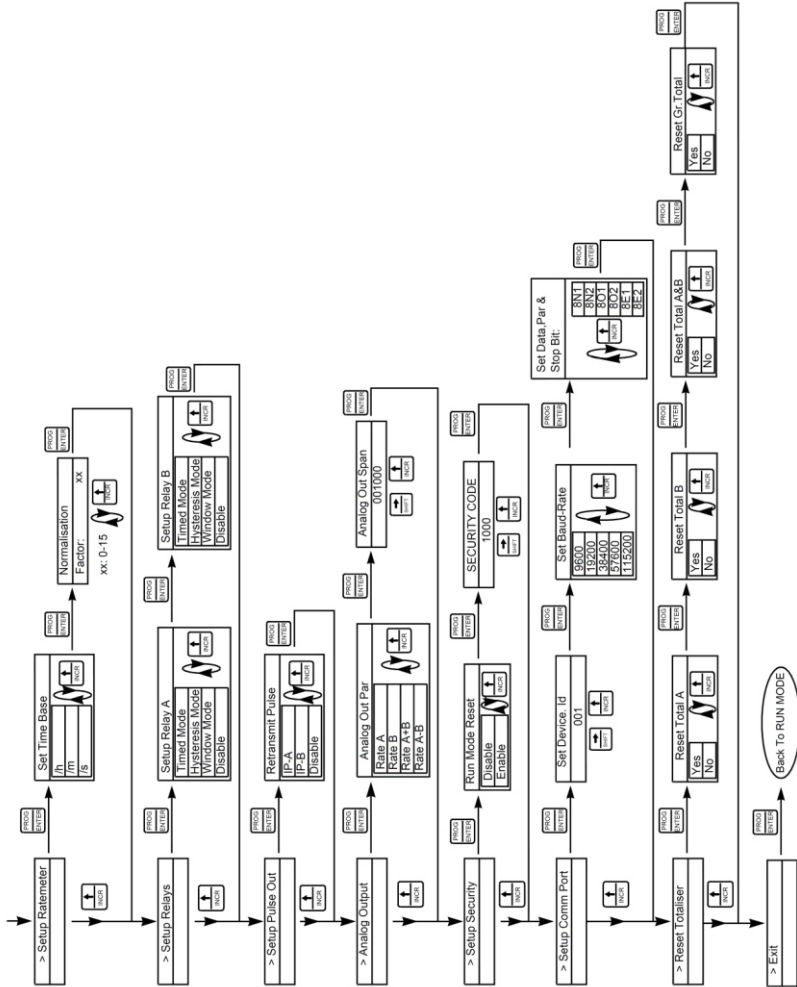
11. EXIT: Exit programming. Enter EXIT menu will bring the unit in RUN MODE

6. PROGRAMMING & FLOW CHART

PROGRAMMING FLOW CHART



PROGRAMMING FLOW CHART (Contd.)





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