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Model 75RTA
Ratemeter/Totalizer



The Model 75RTA Ratemeter/Totalizer is a single loop, microprocessor-based instrument for use in applications where flow rate indication and total are required. An integral multi-function keypad allows local configuration and operator control.

FEATURES

- Pulse Input for Flow, or 4 to 20 mA Input for Flow or Differential Pressure
- Analog Output and Totalizer Pulse Outputs
- Local Configuration using Multi-Function Keypad
- Panel-Mounted Version, or NEMA 4X Field-Mounted Version
- Small Size and Light Weight
- Easy-to-Read Fluorescent Display; Ten Characters for Total, Six Characters for Rate
- Selectable Decimal Point Location for Rate and Total DisplaysÞSimultaneous Display of Two Variables
- assignable Alarm Settings
- 120 V ac, 220 V ac, or 24 V dc Operation by Simply Wiring to Proper Terminals on Instruments Terminal Block (TB1)
- Input/Output Loops can be Externally or Internally Powered. Internal Power Provided if 120 or 240 V ac Input Power is Used.
- Password Security

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GENERAL DESCRIPTION

The 75RTA is a single loop, microprocessor based Ratemeter/Totalizer. It provides a fluorescent display with a ten-digit capacity for totals in engineering units of measure, or a six-digit capacity flow rate in units the same as or other than those used for totalizing. The units of measure, along with other parameters, are configurable using the integral keypad. Primary inputs may be either pulse (0 to 10 kHz) or analog (4 to 20 mA).

The analog input can be proportional to flow rate (LINEAR MODE) or differential pressure (DP MODE). When used in the DP MODE, the 75RTA internally calculates flow rate from the differential pressure input. The 75RTA is not compatible with primary elements that do not follow a square root relationship between DP and flow rate (such as Weirs). The 75RTA is also not compatible with differential pressure transmitters having internal square root extractors.

The instrument is equipped with configurable Hi/Lo alarm points, an analog output to transmit rate, and a scaled pulse output for external totalization.

The instrument is provided in either a panel- or field-mounted configuration. The panel-mounted version has its front panel sealed to NEMA Type 4X. The field-mounted enclosure meets the requirements of IEC IP65 and NEMA Type 4X.

SIMPLIFIED CONFIGURATION AND OPERATION

The instrument operates in either the “run” or “program” mode. The run mode allows viewing of data, entering alarm points, and displaying messages. The “program” mode allows programming of the instrument. A security code prevents unauthorized access to the “program” mode. Programming the instrument is accomplished using the front panel keyboard.

Keyboard setup is accomplished by scrolling through a simple column and row format. Blocks are arranged by specific functions for easy understanding and accessibility. In addition, every block in the menu has a descriptive “Help” message that explains what information to enter and how to enter it. The “Help” message can be displayed by pressing the HELP key. This feature simplifies configuration and operation of the 75RTA. It's similar to having an instruction manual built into the instrument's memory.

Quick access can be gained to any frequently changed menu by entering the column and row location through the front panel.

OUTPUTS

The 75RTA can provide the following outputs simultaneously: an analog output proportional to flow rate, a totalizer pulse output coincident with the least significant digit on the totalizer, and two alarm outputs. In addition (with the pulse input version) the 75RTA can also retransmit the input pulse.

FRONT PANEL DISPLAY AND KEYPAD

The instrument can be configured and operated entirely from the front panel without the need for any external equipment. The front panel consists of an alphanumeric display and a keypad. Refer to Figure 1.

The fluorescent display consists of sixteen character positions. Each character is 5.1 mm (0.20 in) high and is comprised of 14 segments. The display provides an easy-to-read English language presentation of measurement values and engineering units.

Flow rate, total, K-factor, high and low alarm points, and rate multiplier are typical displays. The flow rate value can be six characters, while the “totals” value can be ten characters. Three characters can be used for display of engineering unit labels. See Figure 1.

A default display can be programmed by the user. This display will automatically be shown on power-up, or on any exit from the Program Mode to the Run Mode. The default display can also be viewed on demand by pressing the DISPLAY Key. This default display can be programmed to show a single variable, or two variables simultaneously, from those mentioned above.

The keypad consists of 16 pushbuttons, 8 of which have dual functions. The keypad is used for mode selections (run mode or program mode), setup, and all operational running and configuration requirements of the instrument. The use of each pushbutton in both the run and program modes is described in Table 1.

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DIAGNOSTICS AND UPSET MESSAGES

The 75RTA automatically performs internal diagnostic tests upon a power-up. Any detected malfunctions will cause an error message(s) to be displayed. The instrument's operations are discontinued when a diagnostic malfunction is detected. The diagnostic tests can also be performed on demand from the Program Mode.

The 75RTA will also display alert messages if certain upset conditions exist (such as low flow, high flow, etc.). The instrument's operations continue when these upset conditions are detected. The upset alert message will blink on the display, alternating with the normal data display, until corrected by the user.

PASSWORD SECURITY

Access to the Program Mode can be protected by a security password. This prevents unauthorized personnel from making changes to the 75RTA configuration once it has been programmed. In addition, all front panel keys used to change parameter values from the Run Mode can be programmed for open or locked. When locked, unauthorized personnel cannot change parameter values without first going into the Program Mode to open the keys.

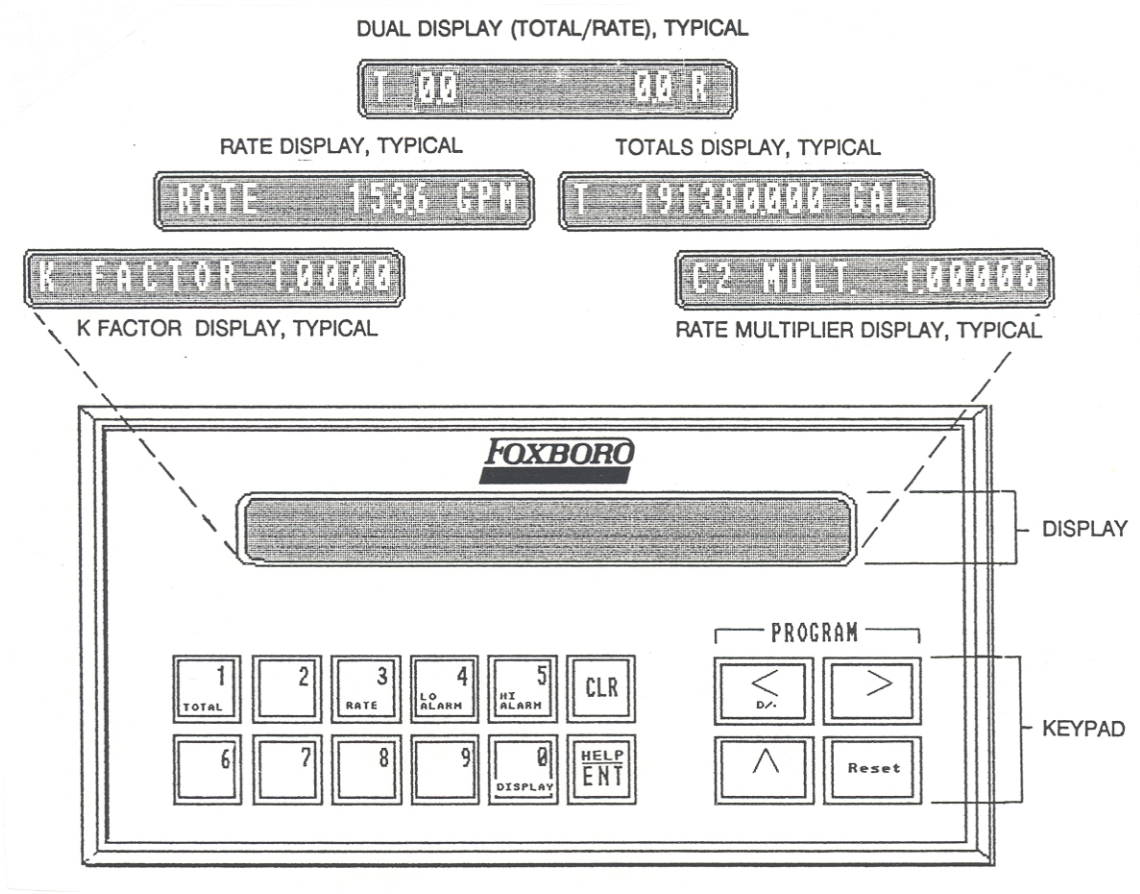
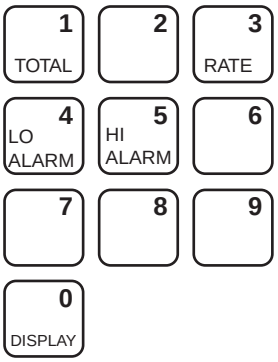
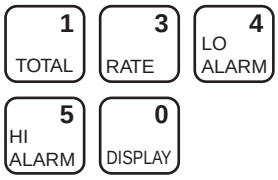


Figure 1. Front Panel Display and Keypad

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Table 1. Keypade Description and Use

Key(s)	Usage of Multi-functional Keys in Run and Program Mode	
	Run Mode	**Program Mode**
	The number keys (primary function) are disabled in the Run Mode, with the exception of entering Lo or Hi alarm rates when Keys 4 or 5 have been pressed and old rate has been cleared. Number keys are also used to key in Password when entering the Program Mode. Number Keys 2, 6, 7, 8, and 9 do not have secondary functions. Number Keys 1, 3, 4, 5 and 0 have secondary functions as described below.	In the Program Mode, the number keys: 1. Allow user to enter a numerical value for block parameters. 2. Allow user to directly enter specific menu block instead of using ^, <, or > keys. 3. Allow access to layered (z-axis) parameters within some blocks. 4. Allow user to set decimal point for total and rate displays.
	The secondary functions on Number Keys 1, 3, 4, 5, and 0 display the current information and value, when pressed. When pressed again, the display is “frozen” for one second.	Not Applicable
	After Number Key 4 or 5 has been pressed, pressing the CLR key allows new value to be entered by clearing the old value from the display.	In the Program Mode, the CLR key allows a number change within a block by clearing old value from the display.
	In the Run Mode, this key is used to change value for Lo/Hi alarm rates after old value has been cleared and new value entered using number keys. Press ENT to load new value into configuration.	In the Program Mode, this key: 1. Allows the new number keyed on display to be put into memory. 2. Delivers help message on display for any block. Stop/restart message scroll using ^ key. Exit message at any time using any other key.
	The up arrow key is used to 1. Allow user to scroll values for K, C_2, time base, tag number, firmware revision, and analog output (ANA OUT) entered in configuration. 2. Allow user to scroll/select default display options after < key has been pressed for two seconds.	In the Program Mode, the up arrow key: 1. Allows user to scroll vertically between rows when Row XXXXX or PROGRAM? prompt is displayed. 2. Allows user to select parameters within a block. 3. Enables diagnostics when pressed three times. 4. Pauses/Restarts HELP message scrolls.
	The Reset key is used to do programmed functions on rate and/or total operations.	In the Program Mode, the RESET key has no function unless display shows: PROGRAM? Pressing RESET at this prompt exits user to Run Mode.

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Table 1. Keypade Description and Use (Continued)

>	In the Run Mode, the right arrow key, by itself, has no function. However, when pressed simultaneously with <, you can enter the Program Mode.	In Program Mode, the right arrow key: 1. Allows user to scroll right in row between blocks. 2. Allows user to select parameters within a block. 3. Allows user to return to PROGRAM? prompt from any block when pressed simultaneously with <.
< D/°	1. Holding this key for two seconds allows you to select default screen option for “display.” Default display is called up by pressing DISPLAY key. Use Ÿ key to scroll screen options. 2. Pressing this key simultaneously with the > allows user to enter Program Mode.	In the Program Mode, this key: 1. Allows user to scroll left by row between blocks. 2. Allows user to select parameters within a block. 3. Allows user to set decimal point when keying in numerical values. 4. Allows user to return to PROGRAM? prompt from any block when pressed simultaneously with >.

MODEL CODE

Description	Model
Ratemeter/Totalizer	75RTA
Enclosure	
Panel Mounting	–PD
Field Enclosure, Surface Mounting	–FE
Field Enclosure, Pipe Mounting	–FF
Language	
English	E
Nominal Supply Voltage and Frequency	
120/240 V ac, 50/60 Hz; 24 V dc	F
Input Signal	
Pusle Primary Flow Input Signal, 0 to 10 kHz	A
Analog Primary Flow Input Signal, 4 to 20 mA	B
Example: 75RTA-PDEFB	

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OPERATING, TRANSPORTATION, AND STORAGE CONDITIONS

Influence	Reference Operating Conditions	Normal Operating Condition Limits	Transportation and Storage Limits
Ambient Temperature	25°C ±2°C (77°F ±3°F)	0 and 55°C (32 and 131°F)	–40 and +70°C (–40 and +158°F)
Relative Humidity	50% ±10%	0 and 85% Noncondensing	0 and 85% noncondensing
Supply Voltage (ac)	120 or 240 V ac ±1 V ac	Rated Voltage +10% and –15%	Not Applicable
Supply Frequency (ac)	50 or 60 Hz ±0.5 Hz	Rated Frequency ±3 Hz	Not Applicable
Supply Voltage (dc)	24 V dc ±0.5 V dc	18 and 27 V dc	Not Applicable
RFI Susceptibility	3 V/m from 27 to 1000 MHz	3 V/m from 27 to 1000 MHz	Not Applicable
Vibration	Negligible	Up to 200 Hz at an acceleration of 5 m/s^2 (1/2 “g”)	200 Hz at an acceleration of 5 m/s^2 (1/2 “g”)

PERFORMANCE SPECIFICATIONS

Accuracy - Pulse Input Version

Parameter	Under Reference Operating Conditions	Under Normal Operating Condition Limits
Analog Output	±0.1% of Span	±0.25% of Span
Rate Display	±0.015% of Rate	±0.015% of Rate

Accuracy - Analog Input Version

Parameter	Under Reference Operating Conditions	Under Normal OperatingCondition Limits
Analog Input	±0.1% of Span	±0.25% of Span
Analog Output	±0.2% of Span	±0.50% of Span
Rate Display	Same Accuracy as input ±0.015% of Rate	
Total Display	Same Accuracy as input ±1 Update	

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STANDARD SPECIFICATIONS

Ratemeter
TYPE
1/TAU
DISPLAY
6 digits with 3 alphanumeric characters of measurement identifier
TRENDING
0.5 to 7.5 seconds in 0.5 second increments

Totalizer
Displays 10 digits with 3 alphanumeric characters of measurement identifier

Power
120 V ac, +10%, –15%, 50/60 Hz, 0.2 A maximum
240 V ac, +10%, –15%, 50/60 Hz, 0.1 A maximum
18 to 27 V dc, 0.4 A maximum, 5 W maximum

Panel Mounted Enclosure
Noryl enclosure with polyester front panel. The panel-mounted instrument can be mounted flush on a control rack or panel. Instrument front face is sealed to provide the environmental protection of NEMA Type 4X.

Field Mounted Enclosure
The panel mounted instrument is mounted flush in the door of a glass-filled polyester enclosure with a baked gray finish. The field-mounted enclosure may be mounted to a surface or to a nominal DN 50 or 2-in pipe. It meets the requirements of IEC IP65 and NEMA Type 4X.

Wiring Connections
PANEL-MOUNTED ENCLOSURE
Four terminal blocks are located on rear surface of enclosure. These terminal blocks accommodate all input and output terminations.
FIELD-MOUNTED ENCLOSURE
Same as for panel mounted instrument. Access to terminal blocks obtained by opening enclosure door. Conduit entry ports and openings to be provided by user.

Agency Approvals
The 75RTA has been approved by CSA for use in general purpose (ordinary) locations.

Approximate Mass
PANEL MOUNTED UNIT
0.8 kg (1.75 lb)
FIELD MOUNTED UNIT
4 kg (8.8 lb)

Inputs
PULSE
0 to 10 kHz; 2.8 to 40 V p-p, 50 µs minimum width
ANALOG
4 to 20 mA; proportional to flow rate or differential pressure
CONTROL
Quantity
Five
Type
Requires current sinking device such as contact closure to ground, or NPN transistor to ground.
Impedance
5.8 k Ù to +5 V dc
Voltage
High = 3.5 to 24 V dc; Low = 0.0 to 1.0 V dc
Bounce
30 ms, minimum

Outputs
ANALOG
Analog 4 to 20 mA, 12 to 27 V dc compliance voltage, 2 Hz response, proportional to displayed rate
TOTALIZER PULSE
Type
NPN transistor for remote totalizing
Rating
150 mA maximum, 30 V dc blocking maximum
Operation
Outputs pulse for every increment of least significant digit on displayed total. The output pulse width is selectable from:
Fast: 125 µs width, 1.5 kHz maximum
Medium: 2 ms width, 200 Hz maximum
Slow: 50 ms width, 10 Hz maximum
RETRANSMITTED INPUT PULSE
Type
1 NPN transistor
Rating
Same as for Totalizer Pulse Output
Operation
Outputs one pulse for every input pulse
ALARMS
Type
2 NPN transistors indicating total and/or rate outside Low/High limits
Rating
150 mA maximum, 30 V dc blocking maximum
Operation
Follows (Rate only), or timed for 0.01 to 99.99 seconds, or latched until acknowledged
POWER
24 V dc ±5%, 100 mA maximum

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TECHNICAL INFORMATION(1)

PULSE INPUT VERSION OPERATION

Total is computed, and the display updated every 100 milliseconds (Δt) from the latest value for input pulse frequency (f_{input}) using the equation:

$$Total = Total + \left(\frac{f_{input} x \Delta t}{K}\right)$$

The engineering units for the total display are determined by the value programmed for the flowmeter “K” factor. For example, to totalize in gallons, you must enter a value for “K” in pulses per gallon; and to totalize in litres, you must enter a value for “K” in pulses per litre, etc. The totalizer is unidirectional, counting up, and rolls over at 9999999999. The totalizer has a programmable decimal point. A totalizer pulse output is provided by the 75RTA. A pulse is output for every increment in the least significant digit of the totalizer. Low and High alarm points can be programmed for the total. The totalizer can be reset, and/or alarms acknowledged, by using the RESET key and/or a control input(s).

Flow rate is computed, and the display/analog output updated every 0.5 seconds using the equation:

$$q = C_2 \times TimeBase \times \frac{f_{input}}{K}$$

The number of rate updates averaged together to update the display and analog output is determined by the value programmed for the trending time. The Time Base can be programmed for seconds, minutes, hours, or days. Engineering units for the rate display and analog output are determined by the value programmed for the C_2 multiplier. This multiplier is simply the conversion factor between the engineering units of measure for the totalizer (set by the value entered for “K”), and the desired engineering units of measure for the ratemeter. For example, if C_2 = 1.0, the total and rate will have the same engineering units of measure. The rate display has a programmable decimal point. Low and/or High alarm points can be programmed for the rate. The alarms can be acknowledged using the RESET key and/or a control input(s).

ANALOG INPUT VERSION OPERATION

Because this version has an analog input, some of the operations and equations are slightly different than in the pulse input version. However, in general, both versions offer the same features.If the analog input is to be directly proportional to flow rate, the 75RTA is programmed in the Linear Mode. If the analog input is to be directly proportional to differential pressure, the 75RTA is programmed in the DP Mode. Input flow rate or input differential pressure is computed every 100 milliseconds from the latest input current value using the equations:

$$\text{In the Linear Mode, } q = q_{input}$$

$$\text{In the DP Mode, } q = C_1 \sqrt[x]{h_{input}}$$

The flow rate display and analog output are updated every 0.5 seconds. C_1 is a multiplier which actually represents the product of several parameters contained in the flow equations used to convert differential pressure into flow rate. For example, referring to TI 016-064, and equation to calculate mass flow rate for a liquid in U.S. units is:

$$q = N_{M\rho} \times K \times F_a \times d^2 \times \sqrt{\zeta_f \times h_{input}}$$

For this equation, you would calculate a value for the constant C_1 as the product of the terms N_{Mp}, K, F_a, d^2, and the square root of $_{pf}$. The rate display and analog output would be in U.S. mass units per the programmed Time Base (seconds, minutes, hours, or days). In the Linear Mode, the analog output will have the same range as the analog input, and be in the same units of measure. In the DP Mode, the analog output will be in the units of measure as defined by the value for C_1, and the range will correspond to the flow rates calculated from the LRV and URV for the input differential pressure.

The total is calculated and the display updated every 100 milliseconds using the formula:

$$Total = Total + \frac{C_2 \times q \times \Delta t}{TimeBase}$$

Total engineering units of measure are determined by the value programmed for the C_2 multiplier. This multiplier is the conversion factor between the engineering units of measure selected for the rate and the engineering units of measure desired for the total. If C_2 = 1.0, the total will be displayed in the same units of measure as the rate.

(1) Symbology used in equations is taken from R.W. Miller's “Flow Measurement Engineering Handbook”. This handbook is available from Foxboro and is identified as Foxboro Part Number B0150YW.

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Program Menus

Refer to Figures 2 and 3 for the program menus for the pulse input and pulse output versions, respectively.

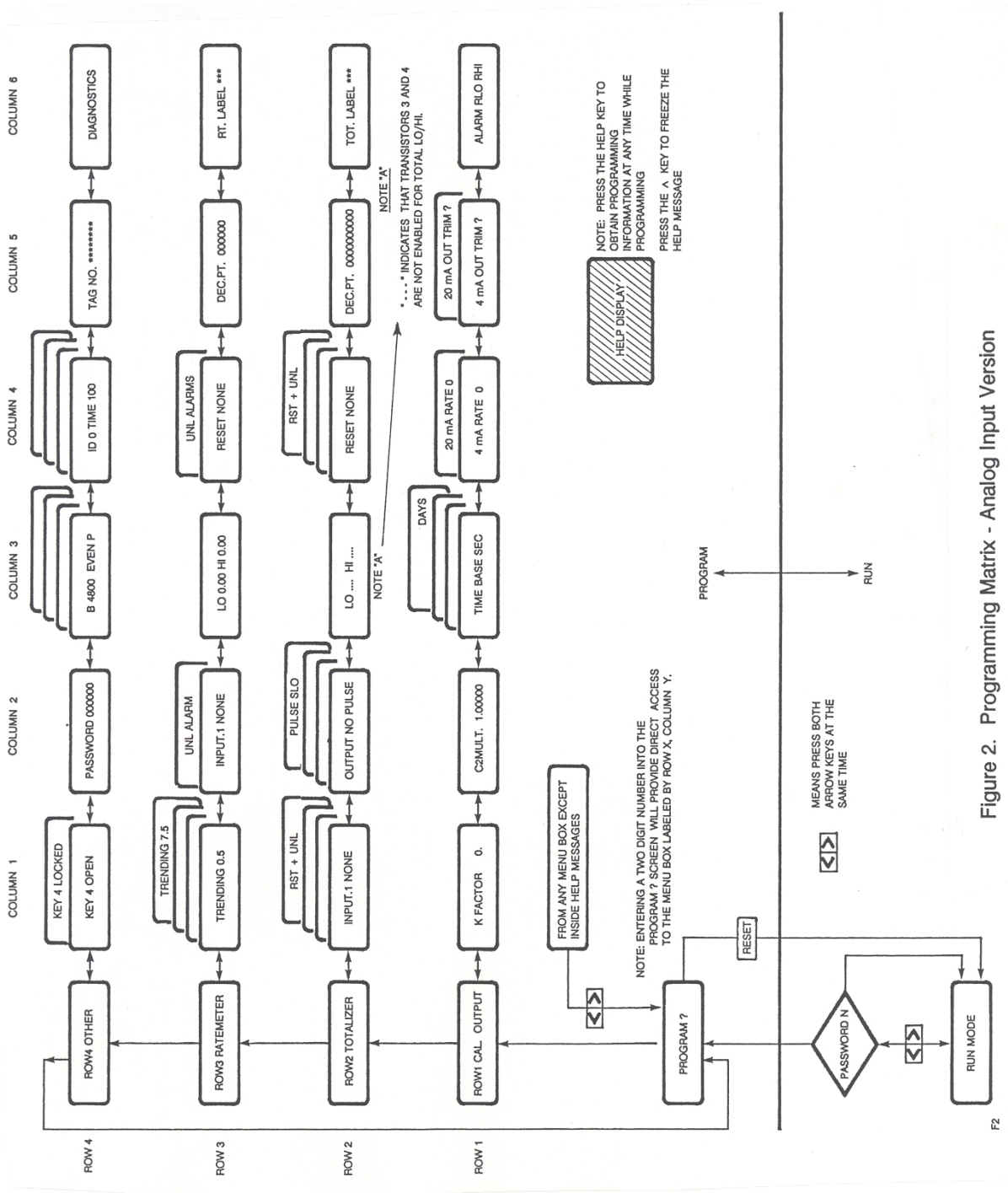


Figure 2. Programming Matrix - Analog Input Version

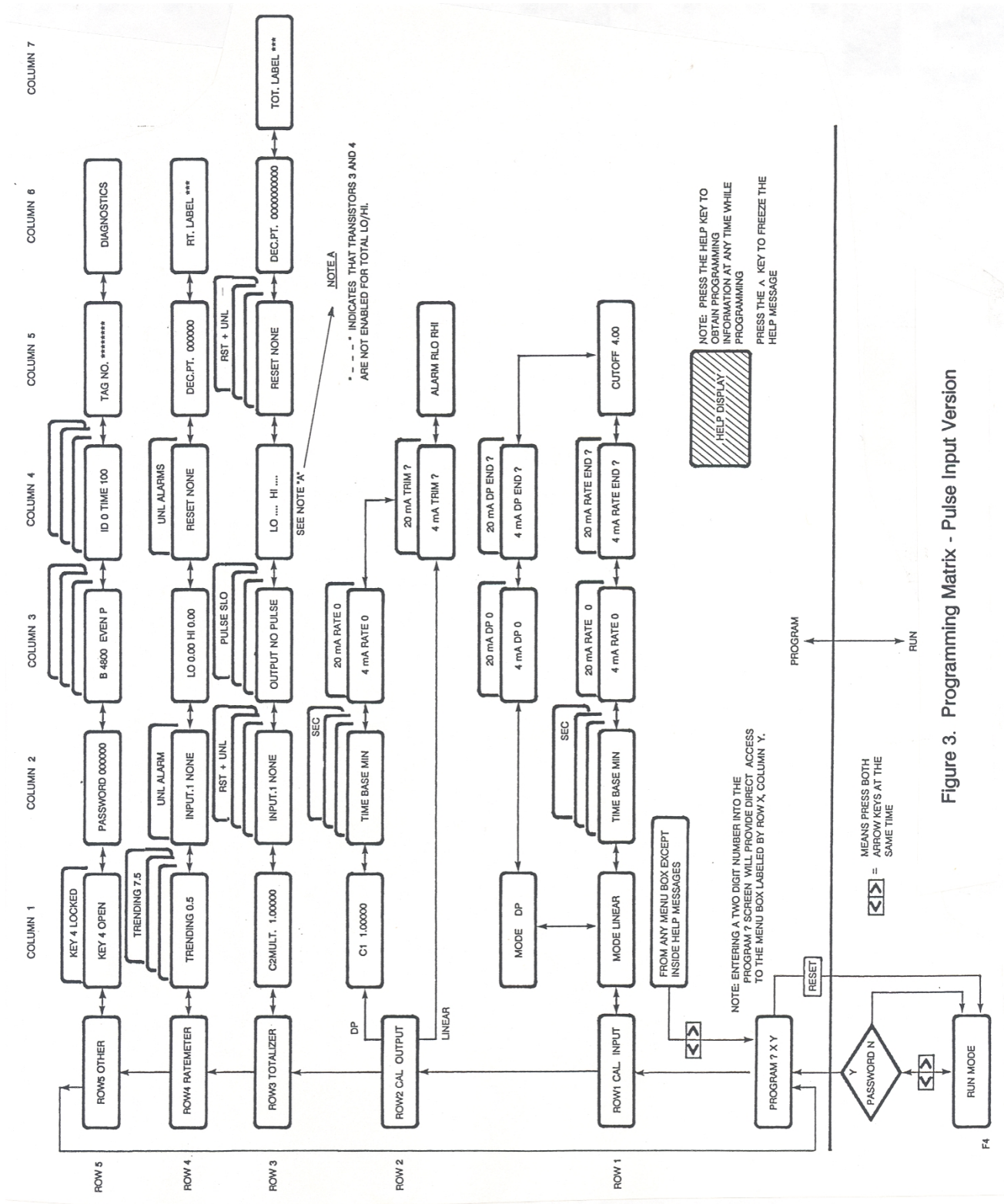


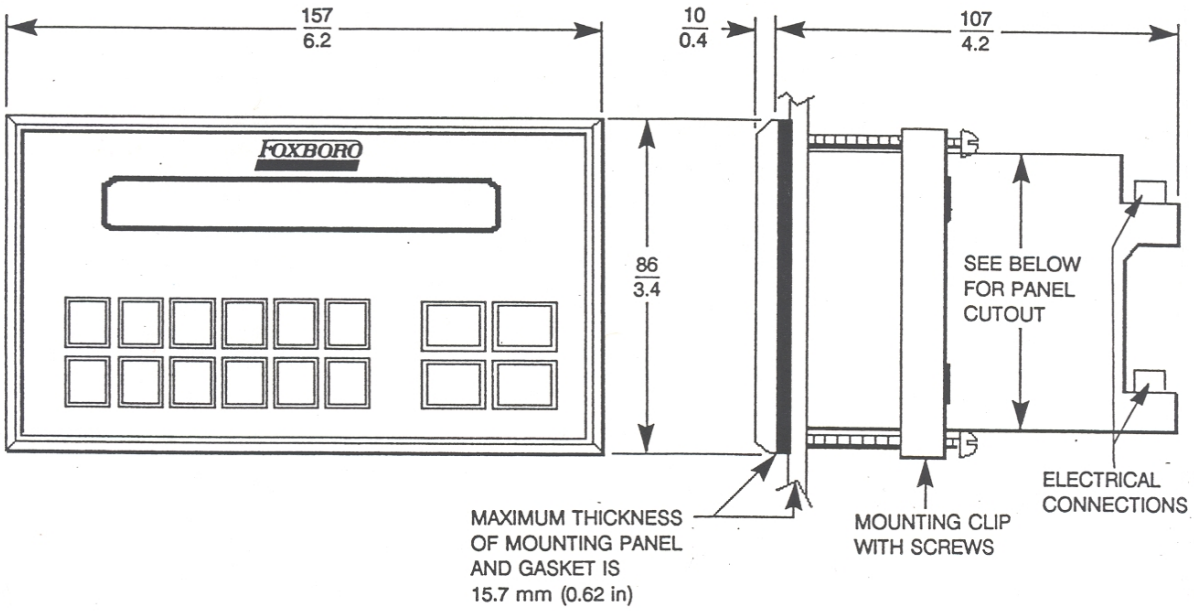
Figure 3. Programming Matrix - Pulse Input Version

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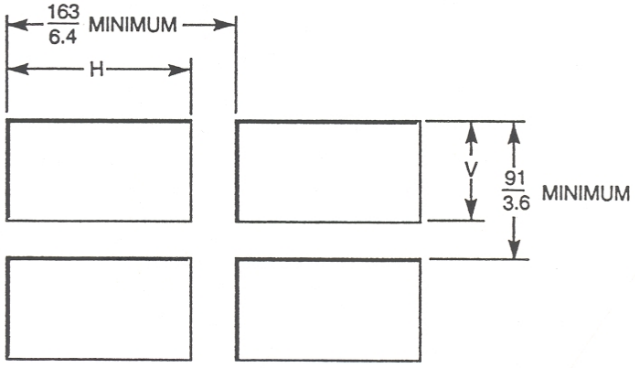
DIMENSIONS – NOMINAL

mm
in

PANEL MOUNTED ENCLOSURE



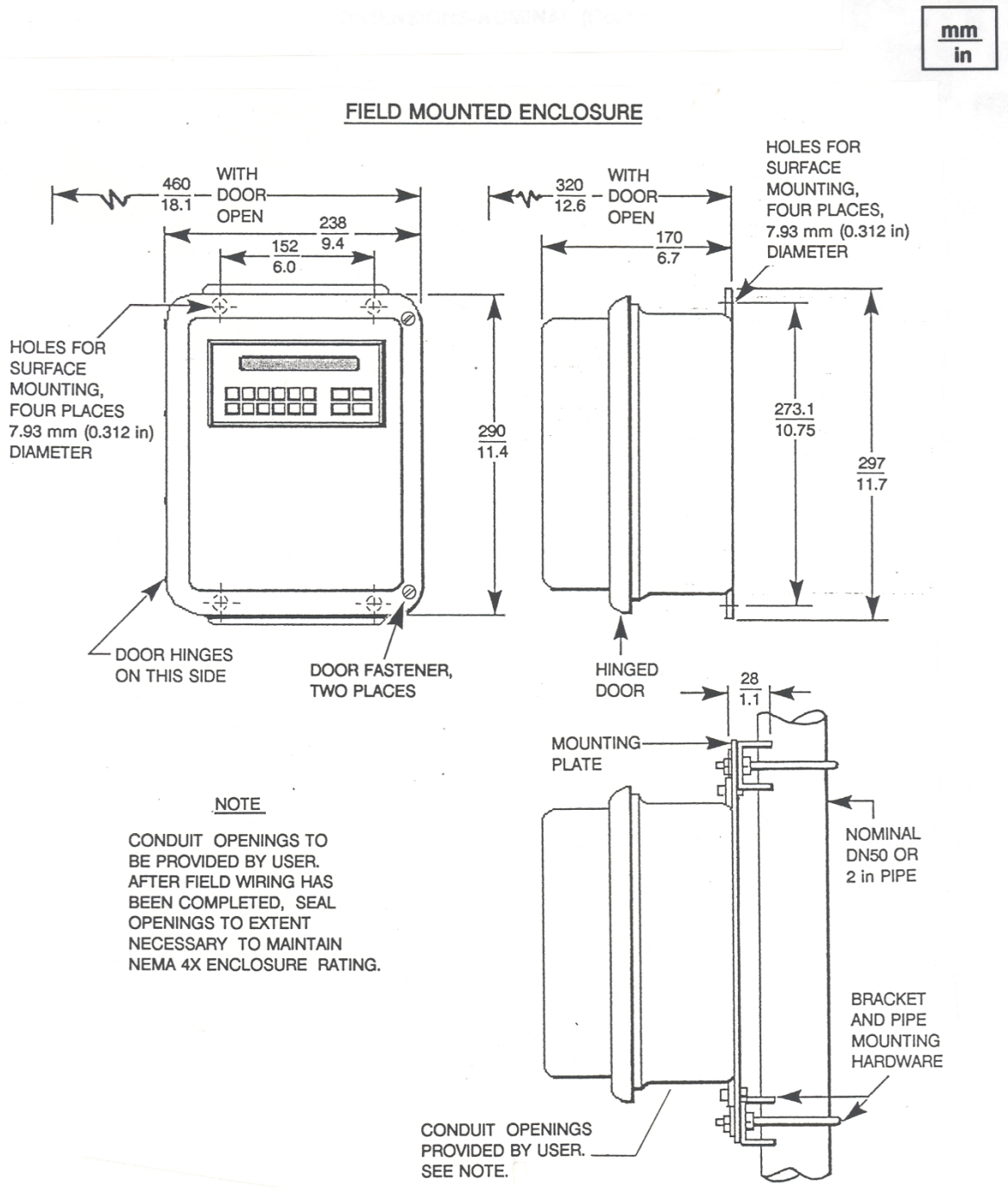
PANEL CUTOUT AND SPACING



H = 137.7 TO 138.7 mm (5.42 TO 5.46 in)
V = 67.6 TO 68.6 mm (2.66 TO 2.70 in)

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DIMENSIONS – NOMINAL (Cont.)



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