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1. Introduction

General Description

The 75RTA-....B Ratemeter/Totalizer is a compact, self-contained, microprocessor-based instrument that accepts input from an analog output flowmeter and performs two basic functions:

- Totals the flow
- Displays flow rate

The 4 to 20 mA analog input signal is interpreted as being proportional to either:

- Flow rate, for linear flowmeters
- Differential pressure, for square root primary elements

When the input signal is from a differential pressure device, the 75RTA internally calculates flow rate from the differential pressure input signal.

The 75RTA is available for panel or field mounting.

Totalizer

Operation

In Totalizer mode, the 75RTA computes the total amount of material that has moved past the flowmeter. Totals are displayed to ten digits.

The total is calculated from the latest value for flow rate. The totalizer is updated every 100 milliseconds. The accuracy of the totalizer is limited by the accuracy of the analog input, ± 1 update.

The equation used to calculate the total contains a total multiplier, C2, which allows the user to display the total in engineering units different from those used for rate display.

The totalizer is unidirectional; it counts only up. The totalizer count can be reset using the front panel Reset key or a control input configured for that function.

Outputs

Output T2 provides a totalizer output pulse for remote totalizing applications. The output pulse duration can be configured for Fast (125 µsec), Medium (2 msec) or Slow (50 msec). The totalizer has a buffer capable of storing 255 scaled counts if the totalizer count rate temporarily exceeds the totalizer output rate. If the buffer capacity is exceeded, any further totalizer pulse output count is lost and the message PULSE OVERFLOW appears on the display. The contents of this buffer are saved if the power is removed from the unit before all the counts have been output. This buffer is reset when the totalizer is reset.
**Hi/Lo Alarm Outputs**

The Total Hi and Lo alarm points are used to set values at which the total output alarms turn on. The Lo output is turned on when the total reaches the Lo alarm point, and the Hi output is turned on when the total reaches the Hi alarm point. The outputs can be configured to time out or to latch until a keyboard or input signal is received. In the time-out mode of operation, the outputs can be configured to turn on for 0.01 to 99.99 seconds. Programming a value of 0.00 disables the timer and causes the outputs to latch until unlatched by a keyboard or input signal.

**Total Label**

The 75RTA can show a label representing units of measure along with the total on the display. This label can be up to three alphanumeric characters in length.

**Ratemeter**

**Operation**

In Ratemeter mode, the 75RTA calculates the rate at which material is moving past the flowmeter. Rates are displayed to six digits.

In Ratemeter mode, the 75RTA calculates flow rate or differential pressure from the calculated input current every 100 milliseconds. The displayed rate is averaged from the 100 msec values and updated every 0.5 second. Two formulas are used:

- **Linear Mode:** \( Q = Q_{\text{input}} \)
- **DP Mode:** \( Q = C_1 \times \sqrt{h_{\text{input}}} \)

where \( C_1 \) represents the product of several parameters contained in the flow equation used to convert differential pressure into flow rate. The specific parameters used to determine the value of \( C_1 \) depend on the equation being used, the fluid being metered, and the desired engineering units. Some terms are constants; others may vary with process conditions. In the latter case, the user must assume a normal process condition and use the value of that parameter at this normal condition to determine the value of \( C_1 \).

For example, referring to TI 016-064, the equation to calculate mass flow rate for a liquid in U.S. units is:

\[
Q = N_{\text{MP}} \times K \times F_a \times d^2 \times \sqrt{\rho_F \times h_{\text{input}}} 
\]

Hence, \( C_1 \) is:

\[
C_1 = N_{\text{MP}} \times K \times F_a \times d^2 \times \sqrt{\rho_F} 
\]

Values of the parameters \( N_{\text{MP}}, K, F_a, d, \) and \( \rho_F \) determined for a defined normal process condition are substituted in the above equation to calculate \( C_1 \). \( C_1 \) can have a value between 0.00001 and 999999. If the value calculated for \( C_1 \) is not within that range, different engineering units for rate must be selected to bring the \( C_1 \) value within range.

The ratemeter has six digits of display. A programmable decimal point can be positioned in one of four locations or not used at all. If the calculated rate exceeds 999999, the message `OFLOW` appears on the display. The time base for rate can be seconds, minutes, hours, or days.
The rate goes to 0 approximately 1.5 seconds after the input is removed. When exiting Program mode and when powering up, the first calculated rate value is 000000.

**Trending**

The trending function allows the ratemeter to average rate readings over a time interval that can be adjusted from 1.0 seconds to 7.5 seconds in 0.5 second increments. There is no trending when the interval is configured for 0.5 second.

For example, if trending is 2.0 seconds, the latest rate along with the previous three values are averaged. Trending is cleared when there is no input present or when the input is less than the configured cut-off value. The number of averaged values is reset on powerup. Overflows are not averaged.

**4 to 20 mA Analog Output**

The analog rate output range can be configured at both the 4 mA and 20 mA points. This permits analog rate indications from 0 to full-scale rate or over a selected portion of the rate range. The analog output can be digitally calibrated in Program mode.

The analog output drops to 3.8 mA if:

- The 75RTA is not configured or has an invalid configuration
- The flow input current is less than 3.95 mA
- A configured alarm or diagnostic failure event occurs

The 75RTA has a configurable cut-off point (between 4 and 10 mA) for the current input. The analog output is at 4 mA when the flow input current is between 4 mA and the configured cut-off point. The output is fixed at 4 mA if the input current is between 3.95 mA and 4.00 mA.

The analog output stays fixed at 20 mA if the flow input current is between 20 and 20.3 mA. Whenever the input current exceeds 20.3 mA, the output current goes to 21 mA and the FLOW INPUT HIGH message is displayed.

In Linear mode, the analog output is calibrated to the same range as the analog input and has the same engineering units of measure. In the DP mode, rate is calculated from the input current representing differential pressure. The values for the 4 and 20 mA output points, in the desired engineering units, must be configured into the 75RTA during initial configuration.

**CAUTION:** All count and rate functions are inhibited when the unit is in Program mode.

**Hi/Lo Alarm Outputs**

The rate Hi and Lo alarm points set values for the rate output alarms. The Hi output is turned on if the rate reaches the Hi alarm point; the Lo output is turned on if the rate is lower than the Lo alarm point.
The outputs can be configured to either:

- Follow
- Time out
- Latch until a keyboard or input signal is received

In the Follow mode of operation, the rate is compared to the Hi and Lo alarm points after each rate update. If an output is turned on, it remains on until the next rate update occurs, then the output is either left on or turned off, depending on the comparison of the new rate reading with the alarm points. In the Time-out mode of operation, the outputs can be configured to turn on for 0.01 to 99.99 seconds. Programming a time-out value of 0.00 disables the timer and causes the outputs to latch until unlatched by the reset key or a control input programmed for that function.

**Rate Label**

The 75RTA can show a label representing units of measure along with the rate on the display. This label can be up to three alphanumeric characters in length.

**Reference Documents**

For additional information, please refer to the documents listed below:

- PL 008-726 75RTA Ratemeter/Totalizer Parts List
- DP 019-542 75RTA Dimensional Print

**Standard Specifications**

### Totalizer

| Display | 10 digits with 3 alphanumeric characters of measurement unit |

### Ratemeter

<table>
<thead>
<tr>
<th>Type</th>
<th>1/TAU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td>6 digits with 3 alphanumeric characters of measurement unit</td>
</tr>
<tr>
<td>Trending</td>
<td>0.5 to 7.5 seconds in 0.5 second increments</td>
</tr>
</tbody>
</table>

### Power

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>115 V ~</td>
<td>+14%, -11%, 50/60 Hz, 0.2 A maximum, 7 W maximum, Fuse T200 mA, 250 V</td>
</tr>
<tr>
<td>230 V ~</td>
<td>+14%, -11%, 50/60 Hz, 0.1 A maximum, 7 W maximum, Fuse T100 mA, 250 V</td>
</tr>
<tr>
<td>24 V ~-</td>
<td>18 to 27 V dc, 0.4 A maximum, 5 W maximum, Fuse T400 mA, 250 V</td>
</tr>
</tbody>
</table>
## Ambient Temperature Limits

<table>
<thead>
<tr>
<th>Operating</th>
<th>0 and 50°C (32 and 122°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage</td>
<td>-40 and 70°C (-40 and 158°F)</td>
</tr>
</tbody>
</table>

## Relative Humidity Limits

0 and 85%, noncondensing

## Inputs

<table>
<thead>
<tr>
<th>Analog</th>
<th>4 to 20 mA; proportional to flow rate or differential pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>Quantity</td>
</tr>
<tr>
<td>Type</td>
<td>Requires current sinking device such as contact closure-to-ground or NPN transistor to ground.</td>
</tr>
<tr>
<td>Impedance</td>
<td>5.8 Kohm to +5 V dc</td>
</tr>
<tr>
<td>Voltage</td>
<td>High = 3.5 to 24 V dc</td>
</tr>
<tr>
<td></td>
<td>Low = 0.0 to 1.0 V dc</td>
</tr>
<tr>
<td>Bounce</td>
<td>30 ms, minimum</td>
</tr>
</tbody>
</table>

## Outputs

<table>
<thead>
<tr>
<th>Analog</th>
<th>4 to 20 mA, 12 to 27 V dc compliance voltage, 2 Hz response, proportional to displayed rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totalizer Pulse</td>
<td>Type</td>
</tr>
<tr>
<td></td>
<td>Rating</td>
</tr>
<tr>
<td>Operation</td>
<td>O utputs pulse for every increment of least significant whole digit on displayed total. The output pulse width is configurable from:</td>
</tr>
<tr>
<td></td>
<td>♦ Fast: 125 µs width, 1.5 kHz maximum</td>
</tr>
<tr>
<td></td>
<td>♦ Medium: 2 ms width, 200 Hz maximum</td>
</tr>
<tr>
<td></td>
<td>♦ Slow: 50 ms width, 10 Hz maximum</td>
</tr>
<tr>
<td>Alarms</td>
<td>Quantity</td>
</tr>
<tr>
<td></td>
<td>Type</td>
</tr>
<tr>
<td></td>
<td>Rating</td>
</tr>
<tr>
<td>Indication</td>
<td>Total or rate outside Lo/Hi limits</td>
</tr>
<tr>
<td>Operation</td>
<td>Configurable from:</td>
</tr>
<tr>
<td></td>
<td>♦ Follow (Rate only)</td>
</tr>
<tr>
<td></td>
<td>♦ Time out after 0.01 to 99.99 seconds</td>
</tr>
<tr>
<td></td>
<td>♦ Latch until acknowledged</td>
</tr>
<tr>
<td>Power</td>
<td>24 V dc ±5%, 100 mA maximum</td>
</tr>
</tbody>
</table>
Panel-Mounted Enclosure

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

Field-Mounted Enclosure

The instrument is mounted flush in the door of a glass-filled polyester enclosure. 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 the rear surface of the enclosure. These terminal blocks accommodate all input and output terminations. For ac power wiring, use a minimum wire size of 18 ga. (1 mm², 600 V) and a maximum of 14 ga. (1.8 mm², 600 V). For panel mounted devices, include a disconnect switch in the installation, mounted in close proximity to the equipment and within easy reach of the operator, and clearly marked as the disconnecting device for the equipment. Switches and circuit breakers must comply with IEC 947. |
| Field-Mounted Enclosure | Same as for panel-mounted instrument. Access to terminal blocks is obtained by opening the enclosure door. Conduit entry ports and openings must be provided by the user. |

Agency Approval

The 75RTA is Canadian Standards Association (CSA) certified for use in general purpose (nonhazardous) locations.

Approximate Mass

| Panel-Mounted Unit | 0.8 kg (1.75 lb) |
| Field-Mounted Unit | 4 kg (8.8 lb) |

General

Pollution Degree II

Overvoltage Category II
2. Installation

Unpacking and Inspection

1. Carefully remove the instrument from its shipping container.

CAUTION: Be particularly careful to separate the instrument from the top layer of the foam packing material to avoid inadvertently dropping the instrument. Save the packing material for reshipment and storage.

2. Examine the instrument for visible damage.

3. If it has been damaged, notify the shipping carrier immediately. Obtain a signed copy of the damage report from the carrier.

A small bag of parts is packed with the instrument. Save these parts. They are needed for installation. The parts include:

- An O-ring front bezel gasket
- Two mounting clips
- Four mounting screws
- Five electrical connectors with screw terminals. (Only four are used on the 75RTA.)

NOTE: A replacement parts kit containing the parts mentioned above is available from Foxboro. See PL 008-726.

Instrument Identification

The data plate is located on the top surface of the instrument. A typical data plate is shown below.
Installing Panel-Mounted Instrument

1. Prepare a cutout in the panel as shown in the illustration. The illustration shows cutouts for four instruments to indicate minimum spacing.

2. Place the O-ring gasket on the instrument and carefully seat it in the groove around the front bezel.

3. Examine the two plastic mounting clips. A screw symbol molded into each clip indicates the proper orientation of the clip. The screw head should point toward the rear of the instrument. Also note the threaded holes on each side of the clip.

4. Insert the instrument into the panel opening.
5. Snap the two plastic mounting clips onto the instrument so that they sit in the notches on the instrument case. See the illustration below.

6. Thread the four mounting screws through the threaded holes on the mounting clips and finger tighten them against the panel.

7. Carefully tighten the screws until the front bezel just touches the front panel.

**CAUTION:** Do not overtighten the mounting screws. Damage to the instrument can result.

**NOTES:**
1. A switch shall be included in the building installation;
2. It shall be in close proximity to the equipment and within easy reach of the operator.
3. It shall be marked as the disconnecting device for the equipment.
4. Switches and circuit breakers must comply with IEC 947.

Figure 3. Panel Mounting Detail - O-ring and Mounting Clips

**Installing Field-Mounted Instrument**

**Preparing Enclosure for Field Wiring**

The field-mounted enclosure is supplied with a cutout of the proper size for the instrument. However, no openings or knockouts for wiring are provided. After planning the wiring route,
the user must drill appropriate holes for wiring or conduit fittings, typically on the bottom surface of the enclosure.

**CAUTION**: To preserve NEMA Type 4X and IEC IP65 environmental protection ratings, appropriate wiring fittings must be used and proper installation practices must be followed.

**Installing Instrument in Enclosure**

After preparing the field-mounted enclosure for wiring, to install the instrument in the enclosure, refer to the instructions on the previous page for installing the panel-mounted instrument and follow steps 2–7.

**Mounting Enclosure to a Surface**

To mount the field enclosure against a surface, use the four holes provided on the rear flange of the enclosure. See the diagram below.

**Figure 4. Field Mounting (NEMA 4X) Dimensions**
Mounting Enclosure on a Pipe

To mount the field enclosure on a DN50 or 2-inch vertical pipe, securely fasten the two U-bolts provided. See Figure 5.

Figure 5. Field Mounting (NEMA 4X) Pipe Mounting Detail
Wiring

I/O Terminal Descriptions

This section covers I/O terminal descriptions.

Figure 6. I/O Terminal Locations
TB1 - ac Power Input

L1  ac power live line
L2  ac power neutral line
Terminals  115/230 voltage selection jumpers
between L1 and L2  (See wiring instructions below)

Safety earth (safety ground).

TB2 - Digital Outputs, 24 V dc Power Input and Output

OUTPUT 2  Digital output T2. Totalizer scaled pulse output.
OUTPUT 3  Digital output T3. Lo alarm output.
OUTPUT 4  Digital output T4. Hi alarm output.

dc common. When the unit is powered by 24 V dc, connect the negative side of the power supply to this terminal.
When the unit supplies 24 V dc power for accessories, connect the accessory dc common to this terminal.

24 V dc IN  When the unit is supplied by dc, connect the plus side of 18 to 27 V dc power supply to this terminal.

24 V dc OUT  Positive 24 V dc accessory power. Connect this terminal to the accessory's positive 24 V dc input. Accessory power is available only when the unit is powered by ac.
TB4 - Analog Output, Flowmeter Input, RS485 Communications

ANLG OUT +  The analog output positive terminal is connected to the analog circuit power supply positive or the 24 V DC OUT terminal on TB2. Maximum voltage applied to ANLG OUT + is 27 V dc. Minimum voltage is 12 V dc + load drop at 20 mA.

ANLG OUT -  The analog output negative terminal is connected to the analog load positive terminal. The 4 to 20 mA signal with respect to dc common is output at the ANLG OUT - terminal.

B Count inhibit input.

\( ^\circ \) dc common. The reference level for the flowmeter and control inputs is dc common. Inputs are active when connected to dc common and digital outputs conduct to dc common when in the on state. dc common is not connected to chassis earth (ground).

4 to 20 FLOW INPUT +  The 4 to 20 mA signal with respect to dc common \( ^\circ \). See analog input wiring diagrams below.

CAUTION: Connecting power directly across terminals labeled 4-20 FLOW INPUT “+” and \( ^\circ \) will cause severe damage to instrument.

RS485 COM  Communications common terminal. Connected to dc common by a 100 ohm internal resistor.

RS485-/RS485+  Communications differential signal input/output.
**TB5 - Control Inputs**

- dc common.

**CONTROL INPUTS 1-5**

Five programmable inputs that may be assigned to various functions as explained in the chapter named Configuration. Control inputs are active when connected to dc common.

**Wiring**

The connectors for this instrument use compression-type wiring terminals. Follow the steps listed below to connect a wire to one of these terminals. The illustration shows a detail of the screw terminal.

1. Using a small slotted screwdriver, turn the terminal screw counter-clockwise until the clamp is fully open.
2. Strip the wire about 5 mm (0.2 inch).
3. Insert the wire until it stops.
4. Turn the terminal screw clockwise to tighten the clamp.
5. Check that the clamp grips the metal wire only and not the insulation.
6. Check that the wire is securely held in place.

**ac Power Wiring**

**WARNING:** Exposed terminals on the instrument power connector can present a shock hazard when energized. Provide a power disconnect on the instrument's power line. The disconnect must be turned off when installing, servicing or removing the instrument. The live ac line (black or brown) to the instrument should be protected with a fuse as shown in the 115 V and 230 V wiring diagrams that follow.
115 V Wiring

1. Locate the instrument power (TB1) connector packaged in the accessory parts bag. It is a six-position screw terminal connector with a keying insert blocking one position.

2. Prepare two jumper wires about 25 cm (1 inch) long of the same gauge as the power wires.

3. Wire the terminal as described below. (Also refer to the 115 V Wiring diagram that follows.)
   - Black (live) lead to terminal L1
   - White (neutral) lead to terminal L2
   - Green lead (safety earth/ground) to the terminal
   - Jumper L1 and L2 to their adjacent center terminals.

4. Plug the connector into the instrument’s POWER pins.

5. Carefully check the power wiring before applying power.

![115 V Wiring Diagram](image)

Figure 7. 115 V ac Power Input

230 V Wiring

1. Locate the instrument power (TB1) connector packaged in the accessory parts bag. It is a six-position screw terminal connector with a keying insert blocking one position.

2. Prepare one jumper wire about 25 cm (1 inch) long of the same gauge as the power wire.
3. Wire the terminal as described below. (Also refer to the 230 V Wiring diagram that follows.)
   - Black or brown lead (live) to terminal L1
   - White or blue lead (neutral) to terminal L2
   - Green or green/yellow lead (safety earth/ground) to the terminal
   - Jumper center terminals together

4. Plug the connector into the instrument's POWER pins.

5. Carefully check the power wiring before applying power.

---

**Figure 8. 230 V ac Power Input**

**DC Power Wiring**

**CAUTION:** Provide a power disconnect on the instrument's power line. The disconnect should be turned off when installing, servicing or removing the instrument. The +24 V dc line to the instrument should be protected with a 0.5A slow-blow fuse (T500 mA, 250 V).

1. Locate the instrument TB1 and TB2 connector packaged in the accessory parts bag. TB1 is a six-position screw terminal connector with a keying insert blocking one position. TB2 is a seven-position screw terminal connector with no keying insert. The same size connector is also used for TB5.
2. Wire a safety earth (ground) to the pin on the TB1 connector.
3. Wire the TB2 connector as shown in the dc power wiring diagram below.
4. Plug the TB1 connector into the instrument's POWER pins.
5. Plug the TB2 connector into the instrument's OUTPUTS 24 V dc pins.
6. Carefully check the power wiring before applying power.

Signal Wiring

1. Locate the instrument TB2, TB4 and TB5 connectors packaged in the accessory parts bag. They are seven- and nine-position screw terminal connectors with no keying insert.
2. Wire the connectors as shown in the wiring diagrams that follow. Also refer to the
information on TB2, TB4 and TB5 given in the previous section, I/O Terminal
Descriptions.

3. Plug the connectors into the appropriate pins.

**CAUTION:** The two seven-pin connectors are not keyed and should be labeled to
prevent their being placed on the wrong pins.

4. Carefully check the wiring before applying power.

For particular Foxboro transmitters, see the analog input wiring diagrams below and on the
following pages.
Figure 10. Analog Input Wiring with External Power
Figure 11. Analog Input Wiring with 75RTA Powering Loop
Figure 12. 4 to 20 mA Flow Input — Interfacing with IMT20 or MAG 8000 Transmitters
Figure 14. Analog Output (Internal Power)
Figure 15. Analog Output and 75RTA Powered by Common External 24 V dc
## 2. Installation

**4 to 20 mA Input – Interfacing IMT 10 Transmitters and the 75RTA-....B**

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>75RTA TB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Self-Powered Transmitter

### 4 to 20 mA Input - Internal Power from the IMT 10 Transmitter

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Externally Powered Transmitter

### 4 to 20 mA Input - Separate External Power

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Externally Powered Transmitter

### 4 to 20 mA Input - Powered from the 75RTA

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>75RTA TB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from 75RTA-Powered Transmitter

**4 to 20 mA Input - Interfacing IMT 25 Transmitters and the 75RTA-....B**

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>75RTA TB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Self-Powered Transmitter

### 4 to 20 mA Input - Internal Power from the IMT 25 Transmitter

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Externally Powered Transmitter

### 4 to 20 mA Input - Separate External Power

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from Externally Powered Transmitter

### 4 to 20 mA Input - Powered from the 75RTA

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>75RTA TB4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from 75RTA-Powered Transmitter

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from 75RTA-Powered Transmitter

<table>
<thead>
<tr>
<th>Transmitter</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

4 to 20 mA Input Signal from 75RTA-Powered Transmitter
Figure 13. 4 to 20 mA Flow Input — Interfacing with IMT 10 or IMT 25 Transmitters

Figure 16. Analog Output (External Power)
Figure 17. Wiring DC Loads to Digital Outputs

LOADS MUST NOT DRAW MORE THAN 150 mA.
Control input can be switch or NPN transistors.

Figure 18. Control Inputs
Figure 19. Count Inhibit Input

Control input can be switch or NPN transistors.
3. Configuration/Program Mode

**CAUTION:** Put control loop in manual before entering Program mode. All count and rate functions are inhibited when the unit is in Program mode.

**NOTE:** When the 75RTA is first powered up, the message “configure unit” should appear on the display. Press the reset key to clear this message from the display and to proceed with the configuration.

**Accessing Program Mode**

To be configured, the unit must be placed in Program mode. Pressing the < and > keys at the same time causes the display to prompt the user for a *PASSWORD*. When the correct password is entered, the unit enters Program mode and displays the message *PROGRAM?*. The password is not displayed but an underscore is shown for each digit entered.

**NOTE:** The unit comes from the factory with the password 000000. When the password is set to zeros, the unit enters Program mode directly after you press the < and > keys.

**PROGRAM?**

Configuration of the 75RTA is done by stepping through a series of submenus. There are two ways to access menu and submenu items from the Program mode entry/exit display:

1. Scrolling with the arrow keys. Press the ^ key to scroll through the main menu items (row X). Press the < or > keys to scroll through the submenu items (column Y).

2. Entering an XY number in the Program display, where X and Y are the row (X) and column (Y) of the submenu desired as shown on the program menu chart on page 52. This method provides direct access without scrolling with the arrow keys.

In some cases, submenus are layered (Z axis). Press the appropriate front panel number key to get to these submenus from the top layer of the submenu. All submenus are described in detail following the program menu chart.

An important feature of the 75RTA is the help key function. While in Program mode, the help key can provide detailed programming information. When the key is pressed, a message scrolls across the screen. You can pause or restart the message scroll for easy reading by using
the ^ key. You can abort the help message and return to programming by pressing any other key. A list of the help messages for the various programming blocks is included at the end of this section, beginning on page 55.

In any submenu of the Program mode, pressing the < and > keys at the same time returns the unit to the Program mode entry/exit display.

Pressing the Reset key at this time causes the unit to go to Run mode.

NOTE: When the 75RTA is first powered up, the display blinks CONFIGURE UNIT. The unit is not preconfigured at the factory, and must be configured prior to startup. Once the unit is configured, this prompt does not appear again.

Key Functions

Key in numerical values for parameters, or select a submenu block location when the PROGRAM? prompt appears. Also, select layered (Z axis) blocks within a submenu.

Clear the old parameter value from memory prior to keying in a new value.

Enter a new parameter value into memory.

Get help messages for any submenu. Press the ^ key to pause or restart the message scroll for easy reading. Press any other key to abort the message scroll and return to the submenu block.

Scroll between submenus, or select a parameter or character shown in a submenu block.
3. Configuration/Program Mode

Press simultaneously to enter Program mode from Run mode, or to return to the PROGRAM prompt from any submenu.

Use to:
- Scroll between menu rows when Program or row indicator prompts appear.
- Select a parameter within a submenu.
- Pause or restart a help message scroll.

Enter a decimal point when keying in parameter values using number keys.

Exit Program mode and enter Run mode when the PROGRAM prompt appears.

Row 1 Cal. Input

Submenu 11 - Mode

- Use the ^ key to select between Linear mode and DP mode.
- Select Linear mode when a linear flowmeter is used. In a linear meter, the analog signal from the transmitter changes linearly with measured flow rate. Examples include:
  - Vortex shedding meters
  - Magnetic flowmeters
  - Coriolis mass meters
  - Turbine meters

In Linear mode, the analog output of the 75RTA has the same engineering units of measure as the input, although the output range can be a subset of the input range (see submenu 13) and a cutoff point can be configured (see submenu 15).

Select DP mode when a primary element, such as an orifice plate, venturi, or nozzle, is used to measure flow. In this case the analog signal from the transmitter represents the differential pressure created by the primary element, which changes as a square root function with flow rate. The 75RTA internally computes a value for flow rate from the measured differential pressure.
The 75RTA is not compatible with electronic DP transmitters that have square root extractors, or with primary elements that do not follow a square root flow relationship, such as weirs.

In DP mode, engineering units for the 75RTA output are chosen by computing the proper value for the C1 multiplier (submenu 21). The values of the lower range limit (4 mA output) and upper range limit (20 mA output) must be specified by the user during configuration (see submenu 23). The analog output range specified in submenu 23 can be the same as or a subset of the flow range corresponding to the input range for differential pressure. A cutoff point can be configured for the differential pressure input (see submenu 15).

Submenu 12 – Input Time Base (Linear Mode Only)

- Use the ^ key to select seconds, minutes, hours, or days.

The time unit selected is the time base corresponding to the current input for flow rate.

Submenu 13 – Input 4 to 20 mA Range (Linear Mode Only)

The input current range is configured at both the 4 mA and 20 mA points.

1. Use the ^ key to select the 4 mA point.
2. Press the CLR key to enable entry of a new value.
3. Use keys 0–9 to enter a value for the input current lower range value (LRV) in correct engineering units.
4. Press ENT to write the new LRV value into memory.
5. Use the ^ key to select the 20 mA point.
6. Press the CLR key to enable entry of a new value.
7. Use keys 0–9 to enter a value for the input current upper range value (URV) in correct engineering units.
8. Press ENT to write the new URV value into memory.
**Submenu 14 - Input Calibration (Linear Mode Only)**

1. Input a 4 mA signal accurate to 3 decimal places.
2. Press RESET.
3. Use the `^` key to select 20 mA.
4. Input a 20 mA signal accurate to 3 decimal places.
5. Press RESET.

**NOTE:** The 75RTA will not allow a 4 mA input calibration current that is greater than 7 mA, or a 20 mA input calibration current that is less than 16 mA. If the user tries to calibrate the input with current values outside of this range, the 75RTA display will read “invalid input” for one second and not accept the value.

**NOTE:** The trim feature can be used to perform the input calibration (see submenu 24).

**Submenu 13 - Input 4 to 20 mA Range (DP Mode Only)**

The input current range is configured at both the 4 mA and 20 mA points.

1. Use the `^` key to select the 4 mA point.
2. Press the CLR key to enable entry of a new value.
3. Use keys 0–9 to enter a value for the input current lower range value (LRV).
4. Press ENT to write the new LRV value into memory.
5. Use the `^` key to select the 20 mA point.
6. Press the CLR key to enable entry of a new value.
7. Use keys 0–9 to enter a value for the input current upper range value (URV).
8. Press ENT to write the new URV value into memory.

**NOTE:** DP units of measure must correspond to the value programmed for C₁ in submenu 21.
Submenu 14 – Input Calibration (DP Mode Only)

1. Input a 4 mA signal accurate to 3 decimal places.
2. Press RESET.
3. Use the ^ key to select 20 mA.
4. Input a 20 mA signal accurate to 3 decimal places.
5. Press RESET.

NOTE: The 75RTA will not allow a 4 mA input calibration current that is greater than 7 mA, or a 20 mA input calibration current that is less than 16 mA. If the user tries to calibrate the input with current values outside of this range, the 75RTA display will read “invalid input” for one second and not accept the value.

NOTE: The trim feature can be used to perform the input calibration (see submenu 24).

Submenu 15 – Input Current Cutoff Point (Linear or DP Mode)

1. Use the CLR key to enable entry of a new value.
2. Use keys 0–9 to enter a value for the input current cutoff point.
3. Use ENT to write the new value into memory.

The input current cutoff point can be configured for any value between 4.00 and 10.00 mA. The analog output of the 75RTA is fixed at 4 mA whenever the input current has a value between 4 mA and the cutoff value.

Row 2 Cal. Output

Submenu 21 – C1 Multiplier (DP Mode Only)

1. Use the Clear key to enable entry of a new value for C1.
2. Use keys 0–9 and the D/. key to enter a value between 0.00001 and 999999.
3. Use ENT to write the new value into memory.
C₁ is a multiplier used in the equation to convert differential pressure into flow rate. For an explanation of how to calculate the value for C₁, see the section on ratemeter operation on page 4 in the Introduction.

**Submenu 22 – Output Rate Time Base (DP Mode Only)**

- Use the ^ key to select seconds, minutes, hours, or days.
- The time unit selected is the time base for the ratemeter display.

**Submenu 23 – Output Rate 4 to 20 mA Calibration (DP Mode Only)**

- The rate output current range is configured at both the 4 mA and 20 mA points.
  1. Use the ^ key to select the 4 mA point.
  2. Press the CLR key to enable entry of a new value.
  3. Use keys 0–9 to enter a value for the lower range value (LRV) in the units of measure selected in submenus 21 and 22 (C₁ and TIME BASE).
  4. Press ENT to write the new LRV value into memory.
  5. Use the ^ key to select the 20 mA point.
  6. Press the CLR key to enable entry of a new value.
  7. Use keys 0–9 to enter a value for the upper range value (URV) in the units of measure selected in submenus 21 and 22.
  8. Press ENT to write the new URV value into memory.

**Submenu 24 – 4 to 20 mA Output Trim (Linear or DP Mode)**

- With the power turned off, connect the (+) and (-) terminals of the analog output as indicated below.
- Turn the power back on.
3. Press the CLR key to start the trim process for the 4 mA output.

4. Use the < and > keys to adjust the current to 4 mA if necessary.

5. Press the ENT key to set the 4 mA trim.

6. Use the ^ key to select the 20 mA point.

7. Press CLR to start the trim process.

8. Use the < and > keys to adjust the current to 20 mA if necessary.

9. Press the ENT key to set the 20 mA trim.

The trim feature can be used to calibrate the analog input. Connect the analog output to the input terminals and follow the instructions above, except that in steps 5 and 9 you must press the RESET key prior to pressing ENT. Using the trim feature eliminates the need to perform submenu 14.

**Submenu 25 – Alarm Rate/Total Selection (Linear or DP Mode)**

1. Use the < or > keys to select the Lo or Hi alarm function (the R or T character blinks).
2. Use the ^ key to select whether the alarm function is to work for Rate (R) or Total (T).

Hi and Lo can be configured independently. For example, Hi may be set for Total and Lo for Rate.

Row 3 Totalizer

Submenu 31 – C2 Multiplier

1. Press the CLR key to enable entry of a new value for C2.
2. Use keys 0–9 and the D/. key to enter a new value for C2. C2 must be between 0.00001 and 999999.
3. Press ENT to save the new value of C2.

C2 is a multiplier used to convert rate engineering units of measure into desired engineering units for the totalizer. If C2 is 1.0, the ratemeter and totalizer display in the same unit of measure.

Example: (Linear Mode) Analog input corresponds to 0 gpm at 4 mA, and to 100 gpm at 20 mA. It is preferable to display the total in engineering units of cubic feet. There are 7.481 gallons in a cubic foot; therefore, the value of C2 is 1 cubic foot/7.481 gallons or 0.13368.

Conversion factors for some common units of volume and mass are given below.

**CAUTION:** Conversion factors are shown to the maximum accuracy that can be entered into the unit. Using factors marked * results in some loss of accuracy (~0.1%). Using factors marked ** results in significant loss of accuracy (~1%).

<table>
<thead>
<tr>
<th>To Obtain Multiply Below by</th>
<th>U.S. Gallon (liquid)</th>
<th>Cubic Foot</th>
<th>Barrel (oil)</th>
<th>Cubic Meter</th>
<th>Liter</th>
<th>Imperial Gallon</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Gallon</td>
<td>1.00000</td>
<td>0.13368</td>
<td>0.02381</td>
<td>0.00379*</td>
<td>3.78541</td>
<td>0.83267</td>
</tr>
<tr>
<td>Cubic Foot</td>
<td>7.48052</td>
<td>1.00000</td>
<td>0.17811</td>
<td>0.02832</td>
<td>28.3168</td>
<td>6.22884</td>
</tr>
<tr>
<td>Barrel (Oil)</td>
<td>42.0000</td>
<td>5.61458</td>
<td>1.00000</td>
<td>0.15899</td>
<td>158.987</td>
<td>34.9723</td>
</tr>
<tr>
<td>Cubic Meter</td>
<td>264.172</td>
<td>35.3147</td>
<td>6.2981</td>
<td>1.00000</td>
<td>1000.00</td>
<td>219.969</td>
</tr>
<tr>
<td>Liter</td>
<td>0.26417</td>
<td>0.035310</td>
<td>0.00629</td>
<td>0.00100</td>
<td>1.00000</td>
<td>0.21997</td>
</tr>
<tr>
<td>Imperial Gallon</td>
<td>1.20095</td>
<td>0.16054</td>
<td>0.02859</td>
<td>0.00455*</td>
<td>4.54609</td>
<td>1.00000</td>
</tr>
</tbody>
</table>
Table 2. Conversion Factors (Mass)

<table>
<thead>
<tr>
<th>To Obtain</th>
<th>Multiply Below by</th>
<th>Pounds</th>
<th>Kilogram</th>
<th>Gallon H₂O (32°F, in vacuum)</th>
<th>Ton (Short)</th>
<th>Tonne (Metric)</th>
<th>Ton (Long)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pounds</td>
<td></td>
<td>1.00000</td>
<td>0.45359</td>
<td>0.11985</td>
<td>0.00050</td>
<td>0.00045**</td>
<td>0.00045**</td>
</tr>
<tr>
<td>Kilogram</td>
<td></td>
<td>2.20462</td>
<td>1.00000</td>
<td>0.26422</td>
<td>0.00110*</td>
<td>0.00100</td>
<td>0.00098**</td>
</tr>
<tr>
<td>Gallon H₂O (32°F)</td>
<td></td>
<td>8.34360</td>
<td>3.78460</td>
<td>1.00000</td>
<td>0.00417*</td>
<td>0.00378*</td>
<td>0.00372*</td>
</tr>
<tr>
<td>Ton (Short)</td>
<td></td>
<td>2000.00</td>
<td>907.185</td>
<td>239.704</td>
<td>1.00000</td>
<td>0.90718</td>
<td>0.89286</td>
</tr>
<tr>
<td>Tonne (Metric)</td>
<td></td>
<td>2204.62</td>
<td>1000.00</td>
<td>264.228</td>
<td>1.10231</td>
<td>1.00000</td>
<td>0.98421</td>
</tr>
<tr>
<td>Ton (Long)</td>
<td></td>
<td>2240.00</td>
<td>1016.05</td>
<td>268.469</td>
<td>1.12000</td>
<td>1.01605</td>
<td>1.00000</td>
</tr>
</tbody>
</table>

Submenu 32 – Totalizer Control Inputs

Press 1 to 5 to access control input 1 through control input 5.

INPUT 1 RST & UNL
INPUT 1 UNL. ALARM
INPUT 1 RST. COUNT
INPUT 1 NONE

INPUT 5 NONE
INPUT 4 NONE
INPUT 3 NONE
INPUT 2 NONE

Same selections for control input 2 through control input 5.
Any of the five control inputs can be configured to perform a function on the totalizing operation.

1. Press front panel keys 1, 2, 3, 4, or 5 to select a control input. Key 1 selects control input 1, key 2 selects control input 2, and so on.

2. The control input is shown on the left side of the display and its function is shown on the right side.

3. Press the ^ key to change the function performed by that control input. The functions that can be assigned to an input are:
   - None
   - Reset count
   - Unlatch alarm
   - Reset count and unlatch alarm

NOTE: A control input assigned to perform a function to the totalizer can also be assigned to perform additional functions to the ratemeter in the ratemeter menu row. The chart on page 52 provides a convenient means of recording the tasks each control input has been assigned.

Submenu 33 – Totalizer Pulse Output

- Use the ^ key to select the mode of operation of the totalizer pulse output.
The totalizer pulse output can be configured for fast, medium, or slow pulse widths, or not to output pulses at all.

- **Fast** 125 µsec on 1500 Hz maximum frequency
- **Medium** 2 msec on 200 Hz maximum frequency
- **Slow** 50 msec on 10 Hz maximum frequency
- **No Pulse** Off continuously

This output has a 255-count buffer. The buffer is saved at powerdown and is reset when the totalizer is reset.

**Submenu 34 – Totalizer Alarm Timeout**

1. Select Lo or Hi using the < and > keys (the selected parameter blinks).
2. To enter a time-out value:
   - Press the CLR key.
   - Enter the desired time with keys 0–9.
   - Press the ENT key.

The totalizer alarm output can be configured to time out after a time period in the range of 0.01 to 99.99 seconds. The timer can be disabled by setting a time value of 0.00 seconds. When the timer is disabled, the alarm output remains latched until an input or keyboard command unlatches it.
**Submenu 35 – Reset Key Function for Totalizer**

- Press the ^ key to change the reset key function.

The Reset key can be configured to perform various functions on the totalizer operation. These are:

- None
- Reset count
- Unlatch alarm
- Reset count and unlatch alarm

Keys assigned to perform a function on the totalizer operation may also be assigned to perform additional functions to the ratemeter. The chart on page 52 provides a convenient means of recording the tasks of the Reset key.

**Submenu 36 – Totalizer Decimal Point**

- Use keys 0–4 to select the desired position for the totalizer decimal point.

The totalizer display can have a decimal point configured at any of four positions, or none at all.
Submenu 37 – Totalizer Label.

TOT LABEL  ***

A label can be configured to indicate the units of measure for the total display. The label can consist of up to 3 alphanumeric characters.

1. Use the < and > keys to select a character position. The selected character blinks.
2. Use the ^ key to scroll through the alphanumeric characters. Available characters are A–Z, 0–9, “/”, “*” and space.
3. If no label is desired, enter *** or three spaces.

Row 4 Ratemeter

Submenu 41 – Trending

TRENDING 7.5

TRENDING 1.0

TRENDING 0.5

- Use the ^ key to select the amount of trending desired. A value of 0.5 means no trending is done.

Rate is calculated and the rate display is updated every 0.5 second. When rate trending is selected to be greater than 0.5 second, the most recent calculation is averaged with previous rate calculations that were made during the trending period.
Submenu 42 – Ratemeter Control Inputs

Press 1 to 5 to access control input 1 through control input 5.

Any of the five control inputs can be configured to perform a function on the ratemeter operation.

1. Press front panel keys 1, 2, 3, 4, or 5 to select a control input. Key 1 selects control input 1, key 2 selects control input 2, and so on.

2. The control input is shown on the left side of the display and its function is shown on the right side.

3. Press the ^ key to change the function performed by that control input. The functions that can be assigned to an input are:
   - None
   - Unlatch alarm

Note: An input assigned to perform a function to the ratemeter can also be assigned to perform additional functions to the totalizer in the totalizer program row. The chart on page 52 provides a convenient means of recording the tasks each control input has been assigned.
Submenu 43 - Ratemeter Hi and Lo Outputs

**NOTE:** "----" displayed after Lo or Hi indicates that the alarm has not been configured for the ratemeter (see submenu 25).

1. Use the < or > keys to select either the Hi or Lo output. The word HI or LO blinks when selected.
2. Use the ^ key to select the Time-out or Follow mode of operation.
3. Press the CLR key to enable a new time-out value to be entered.
4. Use keys 0–9 to enter a value from 0.00 to 99.99.
5. Press the ENT key to write the new value into memory.

The rate Hi and Lo alarms set values for the rate output alarms. The Hi output is turned on if the rate reaches the high alarm point; the Lo output is turned on if the rate is lower than the Lo alarm point. The outputs can be configured to:

- Follow
- Time out
- Latch until a keyboard or input signal is received

In the Follow mode of operation, the rate is compared to the Hi and Lo alarm points after each rate update. If an output is turned on, it remains on until the next rate update occurs, then the output is either left on or turned off depending on the comparison of the new rate reading with the alarm points.

In the Time-out mode of operation, the outputs can be configured to turn off after 0.01 to 99.99 seconds.

Programming a value of 0.00 disables the timer and causes the outputs to latch until they are unlatched by the keyboard or input signal.

Because the rate display goes to 0 approximately 1.5 seconds after the last input, if the Rate Lo time is less than 1.5 seconds, and there is no flow input, the output times out and retriggers every 1.5 seconds.
Submenu 44 – Reset Key Function for Ratemeter

- Select the function of the Reset key on the ratemeter operation by pressing the ^ key.

The Reset key can be configured to unlatch the ratemeter Hi and Lo alarms, or it can be configured to have no effect on the alarms. The Reset key can be configured for additional functions on the totalizer operation. The chart on page 52 provides a convenient means of recording the tasks of the Reset key.

Submenu 45 – Ratemeter Decimal Point

- Use keys 0–4 to select the desired decimal point position.

The ratemeter can have a decimal point set in any of four positions, or none at all.

Submenu 46 – Rate Display Label

A label can be configured to indicate the units of measure for the rate display. The label can consist of up to 3 alphanumeric characters.

1. Use the < and > keys to select a character position. The selected character blinks.
2. Use the ^ key to scroll through the alphanumeric characters. Available characters are A–Z, 0–9, “/”, “*” and space.
Row 5 Other

Submenu 51 – Alarm Point Key Lock

The totalizer and ratemeter Hi/Lo alarm points can be locked to their current values by locking keys 4 and 5 in the Program mode.

1. Use keys 4 and 5 to select the Lo and Hi alarm points.
2. Use the ^ key to select whether changes can be made to the alarm point value while in the Run mode (open) or whether the current value should be locked out from any changes in the Run mode (locked).

NOTE: For initial configuration, Lo and Hi alarm point values must first be entered in the Run mode prior to locking key 4 and key 5 functions in the Program mode.

Submenu 52 – Password

A password can be configured into the 75RTA to provide security access to the Program mode.

1. Enter a number from 1 to 6 digits in length into the password data field to make that number the password. That number must be entered from then on to access Program mode.

CAUTION: Take care not to lose the password; if you do, call Foxboro.

2. If you enter all zeros (000000) into the password data field, no password will be required to enter Program mode.

The 75RTA does not require the entry of a password to enter the Program mode as it comes from the factory.
Submenu 53 – Communications Baud Rate and Parity

The baud rate and parity are set in this menu for serial communications.

1. Use the < and > keys to select baud rate or parity. The B or P character blinks when baud is selected.
2. Use the ^ key to select a baud rate of 300, 600, 1200, 2400, 4800, 9600, or 19200 when the B character is blinking.
3. Use the ^ key to select even, space, or odd parity when the P character is blinking.

CAUTION: Serial communication from the 75RTA is not compatible with serial communication from the 760 series controllers.

Submenu 54 – Unit ID Number and Response Delay Time

Use < or > to select baud (B) or parity (P).
When more than one device is on a serial communication bus, each device must have a unique identifying number between 1 and 255. The unit identification (ID) number for serial communication is set in this menu.

1. Press CLR to enable entry of the unit ID.
2. Enter the unit ID by using keys 0–9.
3. Press ENT to save the entered ID.

The length of time before the unit sends a control response after receiving a communication request can be set to accommodate various types of computer equipment.

4. Select a delay time of 0, 10, 100 or 500 milliseconds by using the ^ key.

Submenu 55 - Instrument Tag Identification Number

The instrument tag number can be set in this menu. The tag number can consist of up to eight alphanumeric characters. The tag number can be viewed in Run mode as a secondary parameter.

1. Use the < and > keys to select a character position on the display. The selected character blinks.
2. Use the ^ key to scroll through the alphanumeric characters. Available characters are A–Z, 0–9, “/”, “*”, and space.
3. Repeat steps 1 and 2 for up to eight character positions.

If no tag number is desired, enter ******** or eight blanks.

Submenu 56 - Diagnostics

The diagnostics allow the user to test the 75RTA’s display and internal memory.
1. Press the ^ key for display test 1. Each of the display’s 16 characters goes to 8 with the decimal points lit (8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8).

2. Press the ^ key for display test 2. Each of the display’s characters changes to * (**********).

3. Press the ^ key for the internal memory test.
   - The display reads TEST IN PROCESS for three seconds while the tests are being run.
   - The display reads SYSTEM TEST OK for two seconds, then goes back to DIAGNOSTICS if no memory errors were detected.

If the unit detects a memory error, the display shows one of the following error messages:
   - ROM ERROR
   - INTERNAL ERROR
   - EXTERNAL ERROR

These error codes are nonrecoverable. It is possible that electrical noise may have caused the diagnostic failure. The power to the unit should be cycled. The memory tests are always performed automatically on powerup. If the same failure message occurs, the unit needs to be replaced. If a different test fails, or if the unit powers up normally, it is likely that the unit is experiencing electrical noise problems.

**NOTE:** Error messages for the power-up memory tests may be different than the error messages for the Program mode diagnostic tests. The following table lists each test failure and its associated error message.

The power-up diagnostic memory test performs an additional test, the external RAM checksum. If the calculated checksum of the external RAM does not match the stored checksum, the user program has been corrupted and the message STORE ERROR appears on the display. The error is recoverable by pressing the Reset key. This causes the message VERIFY PGM DATA to appear on the display for one second to prompt the user to locate and correct the Program mode or Run mode items that may have been corrupted.

<table>
<thead>
<tr>
<th>Diagnostic Error Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Test Failure</strong></td>
</tr>
<tr>
<td>Submenu 56 Diagnostics</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>ROM checksum error</td>
</tr>
<tr>
<td>Internal RAM bit error</td>
</tr>
<tr>
<td>External RAM bit error</td>
</tr>
<tr>
<td>RAM checksum error</td>
</tr>
</tbody>
</table>
Program Reference Charts

Reset Key

The Reset key is programmable to perform different tasks for the totalizer and ratemeter functions of the 75RTA. The Reset key can perform one task under each of the two major control functions shown below. The following table lists the tasks that can be selected.

<table>
<thead>
<tr>
<th>Control Function</th>
<th>Key</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reset</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Hi/Lo Alarms</td>
<td>□ Reset Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
</tbody>
</table>

Control Inputs

There are five control inputs that can be configured to any of the functions shown in the chart below. An input can be assigned up to two tasks, but only one task can be assigned under each of the two control functions shown below. The following table lists the tasks that can be selected.

<table>
<thead>
<tr>
<th>Control Function</th>
<th>Control Input</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
<td>□ Reset Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
<td>□ Reset Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
<td>□ Reset Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>□ None</td>
<td>□ None</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
<td>□ Reset Count</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Unlatch Output</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>□ Reset and Unlatch</td>
</tr>
</tbody>
</table>
Help Message List

Main Help Message

PROGRAM BLOCKS ARRANGED IN 5 ROWS. FIRST BLOCK IN EACH ROW IS A TITLE BLOCK WITH ROW NUMBER. PRESS ^ TO SELECT A ROW WHEN TITLE BLOCK IS Displayed. PUSH < OR > TO SELECT A BLOCK WITHIN A ROW. PUSH HELP TO SEE HOW A BLOCK IS Configured. PUSH ^ TO PAUSE AND RESUME MESSAGE SCROLL. RETURN TO PROGRAMMING BEFORE MESSAGE ENDS BY PUSHING ANY OTHER KEY. RETURN TO RUN MODE BY PUSHING THE < AND > KEYS AND THEN THE RESET KEY.

Submenu 11: Mode

USE THE ^ KEY TO SELECT FLOWMETER TYPE. CHOOSE LINEAR METER OR DIFFERENTIAL PRESSURE - DP - ELEMENT.

Submenu 12: Input Time Base (Linear Mode Only)

SELECT TIME BASE FOR RATE INPUT/DISPLAY/OUTPUT. PUSH ^ TO SELECT SECONDS - MINUTES - HOURS - OR DAYS.

Submenu 13: Input 4 to 20 mA Range (Linear Mode or DP Mode)

PUSH ^ TO SELECT 4 OR 20 MA. PUSH CLR - KEY INPUT LRV OR URV IN DESIRED ENGR. UNITS - PUSH ENTER. THE INPUT AND OUTPUT RATE HAVE THE SAME LRV/URV WHEN LINEAR METER MODE IS SELECTED.

Submenu 14: Input Calibration (Linear Mode or DP Mode)

INPUT 4 MA SIGNAL FROM TRANSMITTER AND PUSH RESET. PUSH ^ TO SELECT 20 MA AND REPEAT PROCESS.

Submenu 15: Input Current Cutoff (Linear or DP Mode)

ENTER VALUE IN MA FOR CUTOFF POINT. RATE/DP WILL EQUAL ZERO WHEN INPUT SIGNAL FALLS BELOW CUTOFF VALUE. PUSH CLR - PUSH NUMBER KEYS - PUSH ENTER. RANGE FROM 4.00 MA TO 10.00 MA.

Submenu 21: C1 Multiplier (DP Mode Only)

C1 IS A CONSTANT USED IN THE DP EQUATION THAT REPRESENTS THE PRODUCT OF SEVERAL VARIABLES. SEE MI ON HOW TO CALCULATE C1. PUSH CLR - ENTER NUMBER WITH DEC. PT. - PUSH ENTER. RANGE FROM 0.00001 TO 999999.

Submenu 22: Output Rate Time Base (DP Mode Only)

SELECT TIME BASE FOR RATE OUTPUT/DISPLAY. PUSH ^ TO SELECT SECONDS - MINUTES - HOURS - OR DAYS.

Submenu 23: Output Rate 4 to 20 mA Calibration (DP Mode Only)

PUSH ^ TO SELECT 4 OR 20 MA. PUSH CLR - KEY LRV OR URV IN DESIRED ENGR. UNITS - PUSH ENTER.
Submenu 24: Analog Output Trim (Linear or DP Mode)

CONNECT ANALOG OUTPUT TO DVM PER MI. PUSH CLR AND THEN < OR > TO TRIM OUTPUT CURRENT TO 4 MA AND PUSH ENTER. PUSH ^ TO SELECT 20 MA AND REPEAT PROCESS.

Submenu 25: Alarm Rate/Total Select (Linear or DP Mode)

PUSH ^ TO SELECT ALARMS FOR RATE-R OR TOTAL-T. PUSH < OR > TO SELECT LO OR HI ALARM.

Submenu 31: C2 Multiplier

C2 IS CONVERSION FACTOR TO CONVERT RATE ENGR. UNITS INTO DESIRED ENGR. UNITS FOR TOTAL OUTPUT - DISPLAY. IF C2 IS EQUAL TO ONE, RATE AND TOTAL ARE DISPLAYED IN SAME ENGR. UNITS. REFER TO MI FOR VALUES FOR C2. PUSH CLR - KEY NUMBER WITH DEC. PT. - PUSH ENTER. RANGE FROM 0.00001 TO 999999.

Submenu 32: Totalizer Control Inputs

PUSH 1-5 TO SELECT EXTERNAL CONTROL SWITCH INPUT. PUSH ^ TO DEFINE SWITCH FUNCTION AS NONE - RESET COUNTER - UNLATCH ALARM OR RESET & UNLATCH.

Submenu 33: Totalizer Scaled Pulse Output

PUSH ^ TO ACTIVATE PULSE OUTPUT AND SELECT MAX FREQUENCY AND PULSE WIDTH. CHOOSE FAST-FST FOR 1500 HZ MAX AND 0.125 MS - MEDIUM-MED FOR 200 HZ MAX AND 2 MS OR SLOW-SLO FOR 10 HZ MAX AND 50 MS.

Submenu 34: Totalizer Alarm Timeout

ENTER TIME IN SECONDS ALARM OUTPUT STAYS LATCHED. OUTPUT STAYS LATCHED UNTIL UNLATCHED BY OPERATOR IF 0 IS ENTERED. PUSH CLR - ENTER NUMBER - PUSH ENTER. RANGE FROM 0.00 TO 99.99 “-----” INDICATES OUTPUT IS NOT ACTIVE.

Submenu 35: Reset Key Function for Totalizer

PUSH ^ TO SELECT RESET KEY FUNCTION FOR TOTAL. SELECT NONE - RESET COUNTER - UNLATCH ALARM OR RESET & UNLATCH.

Submenu 36: Total Decimal Point

PUSH 0-4 TO SELECT DEC. PT. FOR TOTAL.

Submenu 37: Totalizer Label

PROGRAM UP TO 3 CHARACTERS FOR TOTAL DISPLAY LABEL. PUSH < OR > TO SELECT POSITION - PUSH ^ TO SELECT CHARACTER.

Submenu 41: Ratemeter Trending

PUSH ^ TO SELECT NEW TRENDING TIME FROM 0.5 TO 7.5 SECONDS. TREND TIME IS INTERVAL USED TO AVG. INPUT READINGS.

Submenu 42: Ratemeter Control Inputs

PUSH 1-5 TO SELECT EXTERNAL CONTROL SWITCH INPUT. PUSH ^ TO DEFINE SWITCH FUNCTION AS NONE OR UNLATCH ALARM.
3. Configuration/Program Mode

Submenu 43: Ratemeter Hi and Lo Outputs

ENTER TIME IN SECONDS ALARM OUTPUT STAYS LATCHED. OUTPUT REMAINS LATCHED UNTIL UNLATCHED BY OPERATOR IF 0 IS ENTERED. OUTPUT AUTOMATICALLY UNLATCHES WHEN RATE RETURNS TO NORMAL VALUE IF FOLLOW IS SELECTED. PUSH CLR - ENTER NUMBER - PUSH ENTER. RANGE FROM 0.00 TO 99.99 SECONDS. "----" INDICATES OUTPUT IS NOT ACTIVE.

Submenu 44: Reset Key Function for Ratemeter

PUSH ^ TO SELECT RESET KEY FUNCTION FOR RATE. SELECT NONE OR UNLATCH ALARM.

Submenu 45: Ratemeter Decimal Point

PUSH 0-4 TO SELECT DEC. PT. FOR RATE.

Submenu 46: Ratemeter Label

PROGRAM UP TO 3 CHARACTERS FOR RATE DISPLAY LABEL. PUSH < OR > TO SELECT POSITION - PUSH ^ TO SELECT CHARACTER.

Submenu 51: Alarm Point Key Lock

PUSH 4 OR 5 TO SELECT LO OR HI ALARM KEY. PUSH ^ TO SELECT OPEN OR LOCKED. LOCKED DISABLES OPERATOR CHANGES FOR LO AND HI ALARM POINTS IN RUN MODE. VALUES FOR LO AND HI ALARM POINTS MUST BE ENTERED IN RUN MODE PRIOR TO LOCKING KEYS.

Submenu 52: Password

PUSH CLR - ENTER NUMBER - PUSH ENTER. RANGE FROM 000000 TO 999999. ENTER 0 FOR NO PASSWORD.

Submenu 53: Baud Rate and Parity

PUSH < OR > TO SELECT BAUD RATE OR PARITY. PUSH ^ TO SELECT 300 - 600- 1200- 2400- 4800- 9600- OR 19200 FOR THE BAUD RATE. PUSH ^ TO SELECT EVEN - SPACE - ODD FOR PARITY.

Submenu 54: Unit ID and Response Delay Time

PUSH CLR - ENTER NUMBER - PUSH ENTER TO ENTER THE UNIT IDENTITY. RANGE FROM 0 TO 255. EACH UNIT ON THE COMMUNICATION LINK MUST HAVE A UNIQUE NUMBER. PUSH ^ TO SELECT THE MINIMUM COMMUNICATION RESPONSE TIME. TIME CAN BE 0 - 10 - 100 OR 500 MILLISECONDS.

Submenu 55: Instrument Tag Number

PROGRAM UP TO 8 CHARACTERS FOR THE TAG NUMBER. PUSH < OR > TO SELECT POSITION - PUSH ^ TO SELECT CHARACTER.

Submenu 56: Diagnostics

PUSH ^ 3 TIMES TO TEST DISPLAY AND START THE DIAGNOSTIC ROUTINE.
4. Normal Operation

Key Functions

The various keys on the front panel of the 75RTA and their associated functions in Run mode are:

- **0 DISPLAY**
  - To **9**
  - Enter new values for Lo/Hi alarm points.

- **1 TOTAL**
  - Display total with label.

- **3 RATE**
  - Display rate with label.

- **4 LO ALARM**
  - Display Lo alarm point.

- **5 HI ALARM**
  - Display Hi alarm point.

- **0 DISPLAY**
  - Show default display.

- **CLR**
  - Clear old values for Lo/Hi alarm points from memory prior to entering new values.

- **HELP ENT**
  - Enter new values for Lo/Hi alarm points into memory once new values have been keyed in.
Accessing Run Mode from Program Mode

During normal operations, the unit is in Run mode. To access Run mode from Program mode, press the < and > keys at the same time. This returns the unit to the Program mode entry/exit display.

Press simultaneously to enter Program mode.

< and >

Display labels for default displays, or press and hold for 2 seconds to change the default display.

<

Scroll values for secondary parameters currently in memory, or scroll options for default display after the < key has been pressed for 2 seconds.

^

Use to do programmed functions on rate and/or total operations.

Pressing the Reset key at this time causes the unit to go to Run mode.

NOTE: If the unit has not been fully configured yet, the display blinks CONFIGURE UNIT. The unit is not preconfigured at the factory and must be configured prior to startup. Once the unit is configured, the CONFIGURE UNIT prompt no longer appears.
Viewing Data

Press the following keys in any order to display the data shown.

Pressing the Total, Rate, or Display keys causes the display to freeze at the current value for about 1 second. This is done to facilitate manual recording of values from the display for reporting purposes. Counting continues in the background. After the freeze time elapses, the display is updated to show the new current values and continues normal Run mode updating.

Entering Alarm Points

Select the desired alarm point by pressing keys 4 or 5. The current alarm point value is displayed. Press CLR, enter a new value for the alarm point using keys 0–9, then press ENTER to write the new value into memory. Keys 4 and 5 can be locked in the Program mode so that the current values cannot be changed in the Run mode. See submenu 51.

The display allows a value of up to 6 digits when programming alarms for Rate, and up to 10 digits when programming alarms for Total. The 75RTA stores individual alarm points for RLO and TLO, and for RHI and THI.

The configured decimal points for Rate and Total remain in a fixed position for the Hi and Lo alarm points.

Default Display

The data shown when the display key is pressed can be configured by the user. The default screen is automatically displayed after a powerup or after an exit from the Program mode. The available parameter options for the default display are:
- Total/Rate
- Total
- Rate
- Ana Out/Rate
- Ana Out
- Input Cur/Rate

where

Ana Out is a percentage of full scale for the analog output, and Input Cur is the input current to the unit (4 to 20 mA).

The Total/Rate, Ana Out/Rate, and Input Cur/Rate options are dual displays in which two parameter values are displayed simultaneously. When a dual display has been selected, momentarily pressing the D/. key in Run mode displays the full labels for the two values being shown.

To program the default display, press and hold the D/. key for about 2 seconds until the display blinks. Use the ^ key to scroll through the options. When the desired option is displayed, press any key 0–9 to display the data selected. The 75RTA is in Run mode while the default display is being configured. Counting, rate, control inputs, and reset are still enabled.

Secondary Parameters

Pressing the ^ key while in Run mode lets you scroll through the values of the following secondary parameters:
- Input Current
- Analog Out
- Mode
- Time Base
- Cutoff
- \( C_1 \) (DP mode only)
- \( C_2 \)
- Tag Number
- Software Version Identifier

When you are finished viewing the secondary parameters, press any key 0–9 to continue.

Reset Key

The Reset key is configured to perform set tasks for the totalizer and ratemeter operations. This key can be configured to perform one task each for Rate and Total.
Inputs and Outputs

Analog Input
The 75RTA can accept a 4 to 20 mA input proportional to flow rate (Linear mode) or differential pressure (DP mode). The 75RTA is not compatible with DP transmitters that have a built-in square root extractor or with primary elements that do not follow a square root relationship between differential pressure and flow rate (weirs, for example).

The 75RTA has a configurable input current cut-off point between 4 and 10 mA. The analog output of the 75RTA is fixed at 4 mA whenever the input current has a value between 4 mA and the configured cutoff point.

Ratemeter Operation

Linear Mode
Input current in Linear mode is proportional to the flow rate and is defined in submenu 13 at the 4 and 20 mA points. An input cut-off current is defined in submenu 15. Rate is calculated from the formula:
\[
Rate = (\text{Input Current} - 4 \text{ mA})(\text{Slope}) + 4 \text{ mA Rate}
\]
where
\[
\text{Slope} = \frac{(20 \text{ mA Rate} - 4 \text{ mA Rate})}{16 \text{ mA}}
\]
The displayed rate is zero whenever the input current is between 4 mA and the configured cut-off current value. The 4 and 20 mA points of the output current are the same as those defined for the input current.

Example:

<table>
<thead>
<tr>
<th>Input Current (submenu 13)</th>
<th>4 mA = 0.00 gpm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20 mA = 500.00 gpm</td>
</tr>
<tr>
<td>Cutoff (submenu 15)</td>
<td>cutoff = 6.00 mA</td>
</tr>
</tbody>
</table>
| Slope                     | \(
|                           | (500.00-0.00)/16 |
|                           | = 31.25 gpm/mA |
| Rate                      | \( (\text{Input Current} - 4.00)(31.25) + 0.00 \) |
**DP Mode**

Input current in DP mode is proportional to differential pressure. It is defined in submenu 13 at the 4 and 20 mA points. An input cutoff current is defined in submenu 15. The multiplier used in the equation to convert differential pressure to flow rate ($C_1$) is defined in submenu 21. The output current (proportional to flow rate) is defined in submenus 22 (time base) and 23 (4 and 20 mA points). The values entered in submenu 23 for the 4 and 20 mA output points must correspond to the differential pressure points specified in submenu 13.

Rate is calculated from the formula:

$$
\text{Rate} = C_1 \times \sqrt{D P}
$$

where

$$
D P = (\text{Input Current} - 4\text{mA})(\text{Slope}) + 4\text{mA} \text{ DP}
$$

and

$$
\text{Slope} = (20\text{mA} \text{ DP} - 4\text{mA} \text{ DP})/16 \text{ mA}
$$

Displayed rate is zero whenever the input current is between 4 mA and the configured cut-off current value. Below is an example.

<table>
<thead>
<tr>
<th>Input Current (mA)</th>
<th>Displayed Rate (gpm)</th>
<th>Output Current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.94</td>
<td>0.00</td>
<td>3.80</td>
</tr>
<tr>
<td>3.95</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>3.99</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>4.00</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>5.99</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>6.00</td>
<td>62.50</td>
<td>6.00</td>
</tr>
<tr>
<td>9.00</td>
<td>156.25</td>
<td>9.00</td>
</tr>
<tr>
<td>19.50</td>
<td>484.37</td>
<td>19.50</td>
</tr>
<tr>
<td>20.00</td>
<td>500.00</td>
<td>20.00</td>
</tr>
<tr>
<td>20.30</td>
<td>500.00</td>
<td>20.00</td>
</tr>
<tr>
<td>20.31</td>
<td>500.00</td>
<td>21.00</td>
</tr>
</tbody>
</table>

Input Current Submenu 13 4 mA = 0.00 inches of water
20 mA = 100.00 inches of water

Cutoff Submenu 15 = 6.00 mA

$C_1$ Multiplier Submenu 21 = 29.48

Time Base Submenu 22 = minutes

Output Current Submenu 23 4 mA = 0.00 gpm
20 mA = 294.80 gpm
4. Normal Operation

Slope \( = \frac{100.00 - 0.00}{16} \)
\( = 6.25 \text{ inches of water/mA} \)

\( DP = (\text{Input Current} - 4\text{mA}) \times (6.25) + 0.00 \)

Rate \( = 29.48 \times \sqrt{DP} \)

Analog Output = 
\( \frac{(\text{Displayed Rate} - 4\text{mA Rate})}{(20\text{mA Rate} - 4\text{mA Rate})} \times 16.0 \text{ mA} + 4\text{mA Rate} \)

<table>
<thead>
<tr>
<th>Input Current (mA)</th>
<th>Calc. DP (in water)</th>
<th>Displayed Rate (gpm)</th>
<th>Output Current (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.94</td>
<td>0.00</td>
<td>0.0</td>
<td>3.80</td>
</tr>
<tr>
<td>3.95</td>
<td>0.00</td>
<td>0.0</td>
<td>4.00</td>
</tr>
<tr>
<td>3.99</td>
<td>0.00</td>
<td>0.0</td>
<td>4.00</td>
</tr>
<tr>
<td>4.00</td>
<td>0.00</td>
<td>0.0</td>
<td>4.00</td>
</tr>
<tr>
<td>5.99</td>
<td>0.00</td>
<td>0.0</td>
<td>4.00</td>
</tr>
<tr>
<td>6.00</td>
<td>12.50</td>
<td>104.22</td>
<td>9.65</td>
</tr>
<tr>
<td>9.00</td>
<td>31.25</td>
<td>164.80</td>
<td>12.94</td>
</tr>
<tr>
<td>19.50</td>
<td>96.87</td>
<td>290.15</td>
<td>19.75</td>
</tr>
<tr>
<td>20.00</td>
<td>100.00</td>
<td>294.80</td>
<td>20.00</td>
</tr>
<tr>
<td>20.30</td>
<td>100.00</td>
<td>294.80</td>
<td>20.00</td>
</tr>
<tr>
<td>20.31</td>
<td>100.00</td>
<td>294.80</td>
<td>21.00</td>
</tr>
</tbody>
</table>

Totalizer Operation

The totalizer is updated every 100 milliseconds using the latest value calculated for rate. The equation for Total is:

\[ \text{Total} = \text{Total} + \left( C_2 \times Q \times \frac{dT}{TB} \right) \]

where:

- \( C_2 \) = multiplier used to convert rate engineering units into desired engineering units for total
- \( Q \) = flow rate calculated every \( dT \)
- \( dT \) = 100 milliseconds
- \( TB \) = flow rate time base
  - = 1 if rate is in seconds
  - = 60 if rate is in minutes
  - = 3600 if rate is in hours
  - = 86400 if rate is in days

The engineering units of measure for the total are determined by the value for \( C_2 \). When \( C_2 = 1 \), displayed total and rate have the same engineering units.
Control Inputs

There are five external control inputs that can be configured to perform various functions for the totalizer and ratemeter operations. Each control input can be configured to perform one task for Rate and one for Total.

The Rate task options are:
- None
- Unlatch Alarms

The Total task options are:
- None
- Reset Counter
- Unlatch Alarms
- Reset Counter and Unlatch Alarms

Control inputs are disabled in Program mode. The input debounce time for a control input is 30 milliseconds minimum. CTRL IN DISABLED is displayed for inputs that are not configured.

Analog Output

The 75RTA provides a 4 to 20 mA analog output proportional to flow rate. The analog output is calculated at each rate update (every 0.5 second). The analog output is always one of the following:

- 3.8 mA if (1,3) is not configured
- 3.8 mA if (2,3) is not configured in DP mode
- 3.8 mA if the input current is < 3.95 mA
- 4.0 mA if the input current is between 3.95 and 4.00 mA
- 4.0 mA if the input current is between 4.00 mA and the cutoff current
- 4 to 20 mA if the input current is between the cut-off current and 20 mA
- 20.0 mA if the input current is between 20 and 20.3 mA
- 21.0 mA if the input current is > 20.3 mA

The analog output can be displayed as a percentage of full scale, as a secondary parameter (pressing the ^ key), or by using the default display (Analog Out or Analog Out/Rate) options.

**NOTE:** The analog output goes to 4 mA on powerup and while the unit is in Program mode.

**CAUTION:** On power interrupts, the analog output may overrange to ~ 26 mA for a maximum of 2 seconds. This device is NOT intended for control purposes.
4. Normal Operation

Digital Outputs

T₁  Not used
T₂  Totalizer pulse to drive an external totalizer. Totalizer pulse output is coincident with change in the least significant whole digit in the displayed total. See submenu 33 for options. The totalizer pulse off time is increased when no counting is being done. If this output cannot keep pace with the unit totalizer and misses counts, PULSE OVERFLOW is displayed. The totalizer counts are buffered via a 255-count buffer that allows for momentary overranges. To avoid overflow, make sure that the selection of decimal point location is consistent with the maximum frequency selected in submenu 33.

T₃  Lo alarm output. Turns on if the calculated rate is lower than the Lo alarm rate point, or if Total reaches the Lo alarm total point. See submenu 34 or 43.

T₄  Hi alarm output. Turns on if the calculated rate reaches the Hi alarm rate point, or if the total reaches the Hi alarm total point. See submenu 34 or 43.

Digital outputs T₂, T₃, and T₄ are disabled in the Program mode. See submenu descriptions for directions to turn off T₂, T₃, and T₄.

When the Lo or Hi alarms are activated, the display blinks alternately between the selected parameter data and the message LO/HI ALARMS ACTIVE.

Run Mode Display Messages

A number of messages are available for display during Run mode, while the unit is entering Run mode from a powerup, and when it is exiting Program mode. See submenu 56 for possible messages resulting from a diagnostic test on powerup.

Power-up Messages

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>88888888888888888</td>
<td>Powerup display test (3 seconds)</td>
</tr>
<tr>
<td>ROM CHECKSUM ERR</td>
<td>ROM checksum error <strong>FATAL</strong></td>
</tr>
<tr>
<td>INT RAM BIT ERR</td>
<td>Microprocessor RAM error <strong>FATAL</strong></td>
</tr>
<tr>
<td>EXT RAM BIT ERR</td>
<td>Battery-backed RAM error <strong>FATAL</strong></td>
</tr>
<tr>
<td>STORE ERROR</td>
<td>Battery-backed RAM error (Recoverable)</td>
</tr>
</tbody>
</table>

Run Mode Messages (75RTA Halts)

<table>
<thead>
<tr>
<th>Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATCHDOG TIMEOUT</td>
<td>Software malfunction (Recoverable)</td>
</tr>
<tr>
<td>CONFIGURE UNIT</td>
<td>75RTA not configured</td>
</tr>
<tr>
<td>RATE RANGE ERROR</td>
<td>Submenu 13 incorrectly configured (Linear mode)</td>
</tr>
<tr>
<td>PRES RANGE ERROR</td>
<td>Submenu 13 incorrectly configured (DP mode)</td>
</tr>
</tbody>
</table>
Run Mode Messages (75RTA Remains Functional)

The 75RTA continually displays one or more of the following messages if an upset condition exists. The display stops when the condition returns to normal or is corrected.

- **RATE OVERFLOW**: Calculated rate > 999,999
- **HI ALARM ACTIVE**: Hi alarm output active
- **LO ALARM ACTIVE**: Lo alarm output active
- **PULSE OVERFLOW**: Scaled pulse output lagging (counts missed)
- **FLOW HW ERROR**: Flow analog input malfunction (nonrecoverable)
- **FLOW INHIBIT**: Count inhibit input is active
- **FLOW INPUT HIGH**: Flow analog input > 20 mA
- **FLOW INPUT LOW**: Flow analog input < 4 mA
- **FLOW CUTOFF**: Flow between 4 mA and cutoff
- **VERIFY C₂/TB**: Check values for C₂ and Time Base
5. Fault Isolation

The table below lists possible failure indications and recommended actions.

<table>
<thead>
<tr>
<th>Failure Indication</th>
<th>Recommended Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED display does not light up.</td>
<td>Check power connector and power wiring.</td>
</tr>
<tr>
<td>Unit fails power-up diagnostics.</td>
<td>Verify that power input voltage is within acceptable range. Cycle power. If the unit fails again, replace it.</td>
</tr>
<tr>
<td>Unit displays zero rate or no total change.</td>
<td>Make sure the unit is in Run mode. Check signal wiring and flowmeter.</td>
</tr>
<tr>
<td>Unit displays wrong values or operates incorrectly.</td>
<td>Enter Program mode and verify that all settings are correct. Run diagnostics.</td>
</tr>
<tr>
<td>Unit fails diagnostics.</td>
<td>Replace the unit.</td>
</tr>
<tr>
<td>Unit passes diagnostics but runs improperly.</td>
<td>Check for sources of electrical noise on signal and power wiring. Inspect the unit for physical damage. Make sure connector pins are not corroded. If the unit is installed in a harsh environment, check the enclosure for leaks. Make sure the enclosure operating temperature is within acceptable range.</td>
</tr>
</tbody>
</table>

**NOTE**: If a unit fails diagnostics, it may refuse to operate from then on, even if power is cycled. The unit must be replaced when this happens.

Replacing the Unit

**WARNING**: Turn off power to the unit before replacing it. The power connector has exposed metal parts that can present a shock hazard.

To replace the unit, follow these steps:

1. Unpack the replacement unit. Do not discard the shipping material.
2. Open the enclosure.
3. Turn off power to the defective unit.
4. Examine the data plate on the defective unit and the replacement unit. Verify that they are the same models.
5. Disconnect the power and signal connectors from the rear of the defective unit.
6. Unscrew the four screws that clamp the defective unit to the front panel.
7. Unsnap the two mounting brackets from the defective unit’s case.
8. Slide out the defective unit.
9. Place the O-ring gasket on the replacement unit and carefully seat it in the groove around the front bezel.

10. Examine the two plastic mounting clips. A screw symbol molded into each clip indicates the proper orientation of the clip. The screw head should point toward the rear of the instrument. Also note the threaded holes on each side of the clip.

11. Insert the replacement unit into the panel opening.

12. Snap the two plastic mounting clips onto the replacement unit.

13. Thread the four mounting screws through the threaded holes on the mounting clips and finger tighten against the panel.

14. Carefully tighten the screws until the front bezel just touches the front panel.

**CAUTION:** Do not overtighten the mounting screws. Damage to the instrument can result.

15. Reconnect power and signal connectors.

16. Pack the defective unit in the replacement unit’s shipping package.

This unit contains no serviceable parts. A defective unit must be returned to the local Foxboro office for replacement. Contact your local Foxboro office for shipping instructions.
6. Serial Communication

Purpose

The 75RTA is equipped with an RS485 serial communication port to allow a computer to:

- Issue control commands such as reset and unlatch
- Query Run mode data such as count, rate, and alarm points
- Load alarm points
- Query and program all Program mode submenus (except submenus 15, 42, 43, 44, and 46)

⚠️ **CAUTION:** Use of the serial communication feature requires expertise in computer programming and data communications. Development of systems using this feature should be carried out by properly trained personnel and should follow sound industrial practices for programming, documentation and testing.

**NOTE:** Serial communication from the 75RTA is not compatible with serial communication from the 760 Series Controllers.

Serial Communication Wiring

1. Locate the instrument TB4 connector. It is a seven-position screw terminal connector with no keying insert. It is shipped in the accessory parts bag but may already be installed on the instrument.

2. Wire the connector as described in the serial communication wiring diagram below.

3. Plug the TB4 connector into the instrument's Analog Output/Flow Input/RS485 pins.

4. If possible, check the serial link by sending commands from the host processor.

Serial Communication Description

The serial format follows the Opto 22 Optomux protocol. This consists of a start character (>), a two-character unit ID number, a three-character command, data for the command (if applicable), a two-character checksum, and a termination character.

Each character is ten bits. The first bit is the start bit, followed by seven data bits (ASCII code), followed by the parity bit, and the tenth bit is the stop bit. If the unit is configured to space parity, the unit ignores the received parity and transmits space parity. The unit ID number and checksum are in ASCII hexadecimal and have a range of 00 to FF. The checksum is the two least significant hexadecimal digits of the sum of the ASCII values of the unit ID.
number, the command, and the data. All hexadecimal characters A through F must be in upper case. All leading zeros in data fields must be sent. Decimal points within the data field are indicated by an ASCII comma. Commas within data fields sent to the unit are ignored. The termination character may be an ASCII carriage return or an ASCII decimal point.

The control responds in one of three ways:

1. A (acknowledge)
2. Ad...cc (acknowledge with data, d..., and checksum of the data, cc)
3. N ee (not acknowledge with a two-digit error code, ee)

Example: Command sent >01RST18B.

where
> is the start character
01 is the unit ID number
RST is the three-character command (reset)
1 is the data (reset option: reset only)
8B is the two least significant digits of the hexadecimal checksum
. is the termination character

Error Codes

01 Invalid Command
02 Communication Checksum Error
03 Buffer Overflow Error
05 Data Format Error
08 Parity or Framing Error
10 In Run Mode, Command not Allowed
12 In Program Mode, Command not Allowed
13 Mode Already Active, Command not Allowed
14 Incorrect Totalizer/Rate Output Mode, Command not Allowed
21 Data Out of Range

Classifications

All serial commands fall into one of the following categories:

1. Control Commands
2. Query Run Data
3. Load Run Data
4. Query Program Data
5. Load Program Data
The 75RTA has two modes of operation: Run mode and Program mode. The unit responds to specific commands only if the command is valid for the mode of operation the unit is in when the command is received. Command validity and all specific commands are described in detail in the following sections.

Control Commands

There are three control commands: Enter Program Mode, Exit Program Mode, and Reset. Enter Program Mode and Exit Program Mode are used to change the unit’s mode of operation. The 75RTA goes into Run mode when it powers up. Reset does not change the unit’s mode of operation, but performs a reset or unlatch function while leaving the unit in the Run mode. The Reset command is suffixed by one digit (a), which allows secondary functions to occur along with the Reset function.

The commands below are preceded by the start character (>) and unit ID number and followed by the two-character checksum and carriage return.

Table 3. Control Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RSTa</td>
<td>A</td>
<td>Reset command where “a” determines functions to perform.</td>
</tr>
<tr>
<td>Digit “a”</td>
<td>=1</td>
<td>Reset totalizer</td>
</tr>
<tr>
<td></td>
<td>=2</td>
<td>Unlatch totalizer alarm(s)</td>
</tr>
<tr>
<td></td>
<td>=3</td>
<td>Reset totalizer and unlatch totalizer alarm(s)</td>
</tr>
<tr>
<td></td>
<td>=4</td>
<td>Unlatch rate alarms</td>
</tr>
<tr>
<td></td>
<td>=5</td>
<td>Reset totalizer and unlatch rate alarm(s)</td>
</tr>
<tr>
<td></td>
<td>=6</td>
<td>Unlatch totalizer alarm and rate alarm</td>
</tr>
<tr>
<td></td>
<td>=7</td>
<td>Reset totalizer, and unlatch totalizer alarm and rate alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: Unit unlatches only the alarm configured.</td>
</tr>
<tr>
<td>EPM</td>
<td>A</td>
<td>Enter Program mode</td>
</tr>
<tr>
<td>PEX</td>
<td>A</td>
<td>Exit Program mode</td>
</tr>
</tbody>
</table>
Query Run Data Commands

This classification of commands allows the computer to read run data information such as status, count, rate, and alarm point. These commands are valid in Run mode only, except QST (Query Status) which is valid in both modes of operation.

Table 4. Query Run Data Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QST</td>
<td>ASTabc</td>
<td>Query Status where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = Current mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= R - Run mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= P - Program mode</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = Lo Alarm status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= A - Alarm On</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= N - Alarm Off</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c = Hi Alarm status</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= A - Alarm On</td>
</tr>
<tr>
<td></td>
<td></td>
<td>= N - Alarm Off</td>
</tr>
<tr>
<td>QRT</td>
<td>ARTaaaaaa</td>
<td>Query Rate where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaa = Rate w/Rate Dec. Pt.</td>
</tr>
<tr>
<td>QTC</td>
<td>ATCaaaaaaaaaa</td>
<td>Query Totalizer Count w/Dec. Pt. where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaaaaaa = Totalizer Count</td>
</tr>
<tr>
<td>QRL</td>
<td>ARLaaaaaa</td>
<td>Query Rate Lo Alarm Point w/Rate Dec. Pt. where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaaa = Lo Alarm Point</td>
</tr>
<tr>
<td>QRH</td>
<td>ARHaaaaaa</td>
<td>Query Rate Hi Alarm Point w/Rate Dec. Pt. where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaaa = Hi Alarm Point</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: N14 error is returned if QRH is requested and output T4 is configured for TH1 and so on.</td>
</tr>
<tr>
<td>QRL</td>
<td>ARLaaaaaa</td>
<td>Query Rate Lo Alarm Point w/Rate Dec. Pt. where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaaa = Lo Alarm Point</td>
</tr>
<tr>
<td>QTH</td>
<td>ATHaaaaaaaaaa</td>
<td>Query Rate Hi Alarm Point w/Rate Dec. Pt. where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaaaaaa = Hi Alarm Point</td>
</tr>
<tr>
<td>QMD</td>
<td>Aa...</td>
<td>Query Menu Data where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a... = Data specified in current menu</td>
</tr>
<tr>
<td>QAP</td>
<td>Aab c...ab c......</td>
<td>Query All Program Data (See page 71) where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = Program Menu Row</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = Program Menu Column</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c = Applicable Data</td>
</tr>
<tr>
<td>QIC</td>
<td>AIC,aaaa,aa</td>
<td>Query Flow Input Current where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaa,aa = Current</td>
</tr>
<tr>
<td>QAN</td>
<td>AANaaa,a</td>
<td>Query Analog Percent where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaa,a = Percent</td>
</tr>
</tbody>
</table>
Load Run Data Commands

This classification of commands allows the computer to write alarm points to the unit and specify the unit’s response to the QMD command. These commands are valid only in Run mode.

**Table 5. Load Run Data Commands**

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRLaaaaaa</td>
<td>A</td>
<td>Load Rate Lo Alarm Point (RLO pgmd) where: aaaaaa = Lo Alarm Point</td>
</tr>
<tr>
<td>LRH aaaaaa</td>
<td>A</td>
<td>Load Rate Hi Alarm Point (RHI pgmd) where: aaaaaa = Hi Alarm Point</td>
</tr>
<tr>
<td>LT Laaaaaaaaaa</td>
<td>A</td>
<td>Load Total Lo Alarm Point (TLO pgmd) where: aaaaaaaaaa = Lo Alarm Point</td>
</tr>
<tr>
<td>LTH aaaaaaaa</td>
<td>A</td>
<td>Load Total Hi Alarm Point (THI pgmd) where: aaaaaaaaaa = Hi Alarm Point</td>
</tr>
</tbody>
</table>

Note: N14 error is returned if LRH is received and output T4 is configured for TH1 and so on.

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCM abc</td>
<td>A</td>
<td>Load Communication Menu where abc determines the information that will be sent by the unit during Run mode when a QMD command is received. The following table illustrates the bit assignments for the available data. Setting the appropriate bits causes the data to be sent.</td>
</tr>
<tr>
<td>Digit a (0-F)</td>
<td>Bit 0</td>
<td>Status</td>
</tr>
<tr>
<td></td>
<td>Bit 1</td>
<td>Flow Rate</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
<td>Lo Alarm Point – Rate or Total</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
<td>Hi Alarm Point – Rate or Total</td>
</tr>
<tr>
<td>Digit b (0-F)</td>
<td>Bit 0</td>
<td>Totalizer Count</td>
</tr>
<tr>
<td></td>
<td>Bit 1</td>
<td>Input Current</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
<td>Time Base</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
<td>Cutoff Current</td>
</tr>
<tr>
<td>Digit c (0-F)</td>
<td>Bit 0</td>
<td>C₁ Multiplier</td>
</tr>
<tr>
<td></td>
<td>Bit 1</td>
<td>C₂ Multiplier</td>
</tr>
<tr>
<td></td>
<td>Bit 2</td>
<td>Analog Output Percent</td>
</tr>
<tr>
<td></td>
<td>Bit 3</td>
<td>Tag Number</td>
</tr>
</tbody>
</table>
Query Program Data/Load Program Data Commands

Query commands allow the computer to read data from the unit, and load commands allow the computer to write program data to the unit. Each command consists of an L (load) or a Q (query) and the two-digit submenu number of the Program mode submenu. All Program mode submenus are serially accessible except numbers 15, 42, 43, 44, and 46. These commands are valid only in Program mode.

The following Program mode commands are supported by the unit. Decimal points are not required by the command except for those blocks that allow a floating decimal point. All other program blocks insert the decimal point in the correct location.

Table 6. Query Program Data/Load Program Data Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L11 a</td>
<td>A</td>
<td>Load Linear/DP Select where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - Linear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - DP</td>
</tr>
<tr>
<td>Q11</td>
<td>A11 a</td>
<td>Query Linear/DP Select where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - Linear</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - DP</td>
</tr>
<tr>
<td>L12 a</td>
<td>A</td>
<td>Load Time Base (Linear Mode) where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - Seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - Minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 2 - Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 3 - Days</td>
</tr>
<tr>
<td>Q12 a</td>
<td>A12 a</td>
<td>Query Time Base (Linear Mode) where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - Seconds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - Minutes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 2 - Hours</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 3 - Days</td>
</tr>
<tr>
<td>L13 aaaaa bbbbb</td>
<td>A</td>
<td>Load Analog Input Rate/DP where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaa = 4mA Rate/DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bbbbbbb = 20mA Rate/DP</td>
</tr>
<tr>
<td>Q13</td>
<td>A13 aaaaa bbbbb</td>
<td>Query Analog Input Rate/DP where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaa = 4mA Rate/DP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bbbbbbb = 20mA Rate/DP</td>
</tr>
<tr>
<td>L15 a</td>
<td>A</td>
<td>Load Cutoff Current where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaa = Current</td>
</tr>
<tr>
<td>Q15</td>
<td>A15 aaaa</td>
<td>Query Cutoff Current where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaa = Current</td>
</tr>
<tr>
<td>L21 aaaaaa</td>
<td>A</td>
<td>Load C1 (Dec.Pt. valid) (DP) where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaaaa = Multiplier</td>
</tr>
</tbody>
</table>


### Table 6. Query Program Data/Load Program Data Commands (Continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q21</td>
<td>A21 aaaaaaa</td>
<td>Query C1 (Dec.Pt. valid) (DP) where: aaaaaa = Multiplier</td>
</tr>
<tr>
<td>L22 a</td>
<td>A</td>
<td>Load Time Base (DP Mode) where: a = 0 - Seconds a = 1 - Minutes a = 2 - Hours a = 3 - Days</td>
</tr>
<tr>
<td>Q22</td>
<td>A22 a</td>
<td>Query Time Base (DP Mode) where: a = 0 - Seconds a = 1 - Minutes a = 2 - Hours a = 3 - Days</td>
</tr>
<tr>
<td>L23 aaaaaa bbbbbb</td>
<td>A</td>
<td>Load Analog Output Rate (DP) where: aaaaaa = 4 mA Rate bbbbbb = 20 mA Rate</td>
</tr>
<tr>
<td>Q23</td>
<td>A23 aaaaaa bbbbbb</td>
<td>Query Analog Output Rate (DP) where: aaaaaa = 4 mA Rate bbbbbb = 20 mA Rate</td>
</tr>
<tr>
<td>L25 a b</td>
<td>A</td>
<td>Load Transistor 3 &amp; 4 Select where: a = 0 - Alarm 3 Rate Lo a = 1 - Alarm 3 Tot Lo b = 0 - Alarm 4 Rate Hi b = 1 - Alarm 4 Tot Hi</td>
</tr>
<tr>
<td>Q25</td>
<td>A25 a b</td>
<td>Query Transistor 3 &amp; 4 Select where: a = 0 - Alarm 3 Rate Lo a = 1 - Alarm 3 Tot Lo b = 0 - Alarm 4 Rate Hi b = 0 - Alarm 4 Tot Hi</td>
</tr>
<tr>
<td>Q31</td>
<td>A31 aaaaaa</td>
<td>Query C2 Mult. (Dec.Pt. Valid) where: aaaaaa = Multiplier</td>
</tr>
</tbody>
</table>
Table 6. Query Program Data/Load Program Data Commands (Continued)

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<thead>
<tr>
<th>Command</th>
<th>Response</th>
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</tr>
</thead>
<tbody>
<tr>
<td>L32 a b</td>
<td>A</td>
<td>Load Totalizer Control Input where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = Control Input 1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 0 - No Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 1 - Reset Tot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 2 - Unlatch Alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 3 - Reset &amp; Unlatch</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: Unlatch Total alarms has no effect if the Alarms are configured for rate Lo/Hi.</td>
</tr>
<tr>
<td>Q32</td>
<td>A32 a b</td>
<td>Query Totalizer Control Input where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = Control Input 1-5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 0 - No Function</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 1 - Reset Tot.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 2 - Unlatch Alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b = 3 - Reset &amp; Unlatch</td>
</tr>
<tr>
<td>L33 a</td>
<td>A</td>
<td>Load Tot. Pulse Alarm Speed where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - No Pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - Pulse Fast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 2 - Pulse Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 3 - Pulse Slow</td>
</tr>
<tr>
<td>Q33</td>
<td>A33 a</td>
<td>Query Tot. Pulse Alarm Speed where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - No Pulse</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - Pulse Fast</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 2 - Pulse Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 3 - Pulse Slow</td>
</tr>
<tr>
<td>L34 a bbbb</td>
<td>A</td>
<td>Load Tot. Alarm Times where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 0 - Lo Alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a = 1 - Hi Alarm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bbbb = Alarm Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Note: N14 error is returned if Total Lo/Hi is configured and Alarm is for rate Lo/Hi.</td>
</tr>
<tr>
<td>Q34</td>
<td>A34 aaaa bbbb</td>
<td>Query Tot. Alarm Times where:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>aaaa = Lo Alarm Time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bbbb = Hi Alarm Time</td>
</tr>
<tr>
<td>Command</td>
<td>Response</td>
<td>Description</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| L35 a    | A        | Load Tot. Reset Key Function where:  
|          |          | a = 0 - No Function  
|          |          | a = 1 - Reset Tot.  
|          |          | a = 2 - Unlatch Alarm  
|          |          | a = 3 - Reset & Unlatch  |
| Q35      | A35 a    | Query Tot. Reset Key Function where:  
|          |          | a = 0 - No Function  
|          |          | a = 1 - Reset Tot.  
|          |          | a = 2 - Unlatch Alarm  
|          |          | a = 3 - Reset & Unlatch  |
| L36 a    | A        | Load Tot. Dec. Pt. Loc. (0-4) where:  
|          |          | a = 0 - No Dec.Pt.  
|          |          | a = 1 - XXXXXXXXXX.X  
|          |          | a = 2 - XXXXXXXXX.XX  
|          |          | a = 3 - XXXXXXXX.XXX  
|          |          | a = 4 - XXXXX.XXXXX  |
| Q36      | A36 a    | Query Tot-Dec.Pt. Loc. (0-4) where:  
|          |          | a = 0 - No Dec.Pt.  
|          |          | a = 1 - XXXXXXXXXX.X  
|          |          | a = 2 - XXXXXXXXX.XX  
|          |          | a = 3 - XXXXXXXX.XXX  
|          |          | a = 4 - XXXXX.XXXXX  |
| L37 aaa  | A        | Load Total Display Label where:  
|          |          | aaa = Label  |
| Q37      | A37 aaa  | Query Total Display Label where:  
|          |          | aaa = Label  
|          |          | Note: Programming the label to *** or three spaces disables the label.  |
| L41 aa   | A        | Load Ratemeter Trending where:  
|          |          | aa = Trending time  
|          |          | 0.5–7.5 in 0.5 resolution  |
| Q41      | A41 aa   | Query Ratemeter Trending where:  
|          |          | aa = Trending time  |
### Table 6. Query Program Data/Load Program Data Commands (Continued)

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<th>Command</th>
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<th>Description</th>
</tr>
</thead>
</table>
| L42 a b       | A        | Load Ratemeter Control Input where:  
|               |          | a = Control Input 1-5  
|               |          | b = 0 - No Function  
|               |          | b = 1 - Unlatch Alarm  
|               |          | Note: Unlatch Rate Alarm has no effect if the Alarms are configured for total Lo/Hi. |
| Q42           | A42 a b  | Query Ratemeter Control Input where:  
|               |          | a = Control Input 1-5  
|               |          | b = 0 - No Function  
|               |          | b = 1 - Unlatch Alarm  |
| L43 a b       | A        | Load Ratemeter Alarm Time Func. where:  
| or L43 a b cccc|          | a = 0 - Lo Rate Alarm  
|               |          | a = 1 - Hi Rate Alarm  
|               |          | b = 0 - Timed  
|               |          | b = 1 - Follow  
|               |          | cccc = Alarm Time  
|               |          | Note: N14 ERROR is returned if Rate Lo/Hi is configured and alarm is for Total Lo/Hi. |
| Q43           | A43 aaaa bbbb | Query Ratemeter Alarm Time Func. where:  
|               |          | aaaa = Lo Rate Alarm  
|               |          | aaaa = FOLL - Follows  
|               |          | aaaa = ---- - No alarm  
|               |          | bbbb = Hi Rate Alarm  
|               |          | bbbb = FOLL - Follows  
|               |          | bbbb = ---- - No alarm  |
| L44 a         | A        | Load Ratemeter Reset Key Func. where:  
|               |          | a = 0 - No Function  
|               |          | a = 1 - Unlatch Alarm  |
| Q44           | A44 a    | Query Ratemeter Reset Key Func. where:  
|               |          | a = 0 - No Function  
|               |          | a = 1 - Unlatch Alarm  |
### Table 6. Query Program Data/Load Program Data Commands (Continued)

<table>
<thead>
<tr>
<th>Command</th>
<th>Response</th>
<th>Description</th>
</tr>
</thead>
</table>
| L45 a     | A        | Load Ratemeter Dec.Pt. Loc. (0-4) where:  
|           |          | a = 0 - No Dec.Pt.  
|           |          | a = 1 - XXXXX.X  
|           |          | a = 2 - XXXX.XX  
|           |          | a = 3 - XXX.XXX  
|           |          | a = 4 - XX.XXXX  |
| Q45       | A45 a    | Query Ratemeter Dec.Pt. Loc. where:  
|           |          | a = 0 - No Dec.Pt.  
|           |          | a = 1 - XXXXX.X  
|           |          | a = 2 - XXXX.XX  
|           |          | a = 3 - XXX.XXX  
|           |          | a = 4 - XX.XXXX  |
| L46 aaa   | A        | Load Rate Display Label where:  
|           |          | aaa = Rate Disp. Label  
|           |          | (Space, Upper case letters,  
|           |          | #, *, /, 0-9)  
|           |          | Note: Programming the label for *** or  
|           |          | three “spaces” disables the Rate Display  
|           |          | Label. |
| Q46       | A46 aaa  | Query Rate Display Label where:  
|           |          | aaa = Rate Disp. Label |
| L51 a b   | A        | Load Key Lock (Keys 4, 5) where:  
|           |          | a = 4 - Key 4  
|           |          | a = 5 - Key 5  
|           |          | b = 0 - Unlocked  
|           |          | b = 1 - Locked |
| Q51       | A51 a b  | Query Key Lock where:  
|           |          | a = 4 - Key 4  
|           |          | a = 5 - Key 5  
|           |          | b = 0 - Unlocked  
|           |          | b = 1 - Locked |
| L55 aaaaaaa | A | Load Tag Number where:  
|           |          | aaaaaaa = Tag Number  
|           |          | (Space, Upper case letters,  
|           |          | #, *, /, 0-9) |
| Q55       | A55 aaaaaaa | Query Tag Number where:  
|           |          | aaaaaaa = Tag Number |
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