

RT-15

24 VDC-POWERED LOCAL FLOW RATE TRANSMITTER



Operation & Installation Manual

Rev. 2

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Safety Definitions and Information

Do not attempt to install or use your AW Gear Meters product until you have read the safety instructions in this section. Save this manual and keep it in an easily accessible place.

Warning!

Warning means that failure to follow this safety statement may result in extensive product damage, serious personal injury, or death.

Caution

Caution means that failure to follow this safety statement may result in minor or moderate personal injury, property or equipment damage.

Notice

Notice is a statement that informs about installation, operation, maintenance, performance issues, or general tips that are important but do not create a hazard or safety concern.

Unpacking

Separate the RT-15 Flow Monitor from packaging materials and check for any visual signs of damage. If you determine there are damages caused by shipping, file a claim with the shipping company. If the flow monitor appears to have been improperly assembled or does not operate properly, return it for replacement or repair (see Limited Warranty information at the end of this manual).

Caution

Before connecting, programming, or operating the RT-15 Flow Monitor, read this manual.

Quick Start Guide

Caution

As with any precision-engineered device, always use the RT-15 in accordance with the manufacturer's instructions.

Installation

Secure appropriate sensor onto RT-15 Flow Monitor. Place flow monitor with sensor into fitting in flow meter.

Notice

Before attaching the RT-15 Flow Monitor to the flow meter, note any potential clearance issues.

Power Connection

Connect the RT-15 to a 15-24V/DC power supply. Use a screwdriver to secure three wires on the terminal strip inside the unit's rear cover: a (white) supply wire, a (black) negative wire, and a (green) ground wire. All wire locations are clearly marked on the terminal strip (see page 11).

Caution

Wiring must exit the unit through the 3/4-inch conduit connection to maintain hazardous location rating. Connection to conduit must meet all local and national electrical codes.

Warning!

To prevent ignition of hazardous atmospheres, disconnect circuits before removing cover. Keep cover tightly closed while circuits are alive.

Notice

Color of wires (above) may vary.

Enter KFR and KFT Factors

You will find the KFR and KFT factors on the Calibration Sheet packed with the flow meter(s). To program, change, or edit these variables, see the Quick Programming section below.

Quick Logo Display Programming

With the cover removed and outside of a hazardous area use the MODE/UP button to view the LOGO (RT-15) display. Press and hold the ENT button. Display first shows a "P" in the lower left-hand corner and then shows DISPLAY 00. (LOGO shows as DISPLAY 00 to allow programming access.) Use the SEL button to select from available display modes including OFF. Press the ENT button to store selection, increment display number, and show the next display assignment. Refer to flow chart on page 6.

Notice

For DN, UP, SEL, MODE, and RESET buttons, you can also use the magnetic switches if in a hazardous area with cover closed. See button locations below:

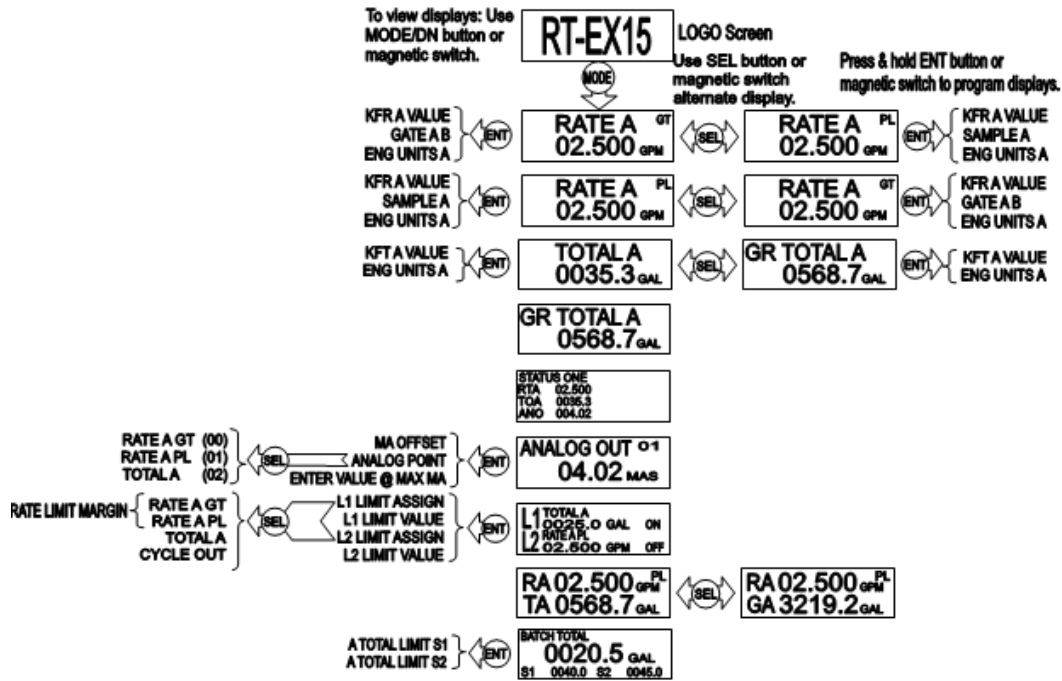


Figure 1: Quick Programming Flow Chart

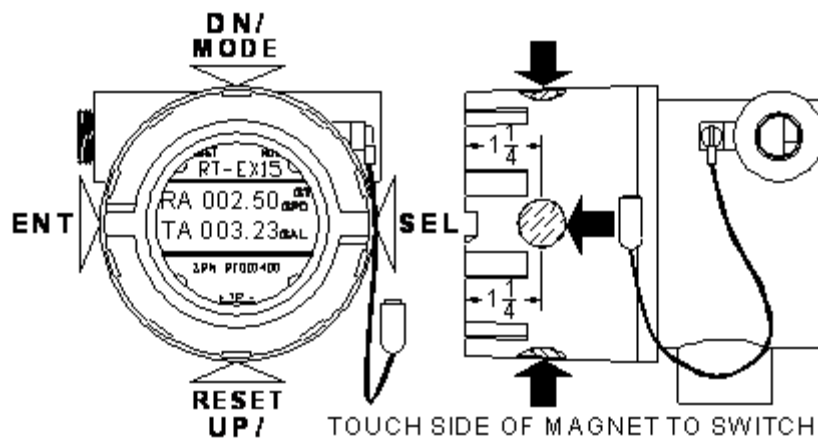


Figure 2: Magnetic Switch Locations

Quick Program RT-15 Parameters

With the cover removed and outside of a hazardous area, use the MODE/DN button to select the display to program. Press and hold the ENT button. The display first shows a “P” in the lower left-hand corner and then displays the first program variable. The RT-15 prompts for an entry.

When entering or editing numeric values or engineering units, the digit or character to enter or edit blinks starting with left-most position. Use the UP or DN button to increase or decrease a value, or change a character. Use the SEL button to move the blinking cursor to the next digit or character. After you have entered the entire value, use the ENT button to store it and advance to the next program variable.

Use the SEL button to select LIMIT and ANALOG OUT assignments. Use the ENT button to store the assignment and advance to the next program variable. The ENT button exits programming after you have programmed the last variable.

KFR

Scaling for display of rate in specific engineering units. Determines display decimal resolution.

Initial value = 100.00 (Hz. w/2 decimals); $KFR = T\text{-base SCALING FACTOR}/K\text{-FACTOR}$ where T-base SCALING FACTOR =

- 100 for engineering units per second
- 6000 for engineering units per minute
- 360000 for engineering units per hour
- 8640000 for engineering units per day

where K-FACTOR is the average number of pulses/engineering unit of the transducer.

Round result to desired decimal accuracy and enter KFR using only that number of decimal places. Use no more than four digits regardless of decimal position! Maximum is 65535 with the decimal in any location.

GATE AB

Gate time, .01 to 600 seconds. Display and analog output update time interval. Initial value is 002.00 seconds.

SAMPLE A & B

Digital filter on RATE PL, 0 to 253 (0 min., 253 max.) affecting the update of the display and analog output. Initial value is 010.

ENG UNITS

The desired engineering units for display of rate are programmable using up to four letters. Example: GPM_

KFT

Scaling for display of total in specific engineering units. Determines display decimal resolution.

- Initial value=10000. (pulses with no decimals)
- $KFT = 10000/K\text{-FACTOR}$

where K-FACTOR is the avg. number of pulses/ eng. unit of the transducer.

Round result to desired decimal accuracy and enter KFT using only that number of decimal places. Use no more than four digits regardless of decimal point position! Maximum = 65535 with the decimal in any location.

ENG UNITS

The desired engineering units for display of total are programmable using up to four letters. Example: GAL_

TOTAL RESET

With the cover removed and outside of a hazardous area use MODE/DN button to view TOTAL, and RESET/UP button to reset.

GR TOTAL RESET

With cover open only! Use MODE/DN button and SEL button to view GR TOTAL, press RESET/UP button plus ENT button. Use SEL button for "Y"; press ENT to reset and exit.

Product Description

The RT-15 is a meter-mounted digital flow monitor housed in a hazardous-location rated enclosure. The unit's large, backlit LCD display makes it easy to monitor flow rate and total in your choice of engineering units. A variety of sensor noses make the RT-15 compatible with many of the flow meters available from AW Gear Meters.

Access Information and Make Changes

You can make program or mode changes, or reset the totalizer in two ways. When the faceplate is open, enter information using pushbuttons; when the faceplate is closed, use a magnet wand to make changes.

You can also reset the totalizer, and monitor flow rate limits and total output remotely via a computer or PLC.

Specifications

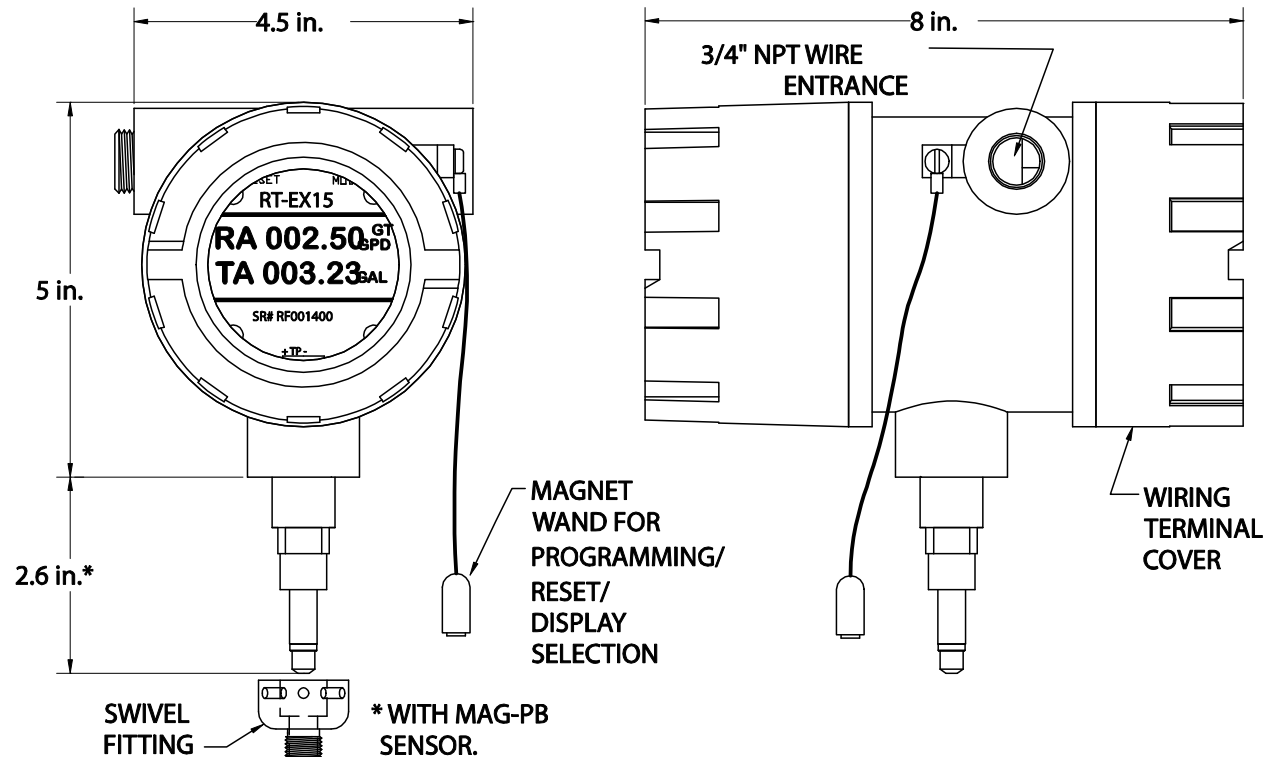
- **Power:** 15-24 VDC/200mA (customer supplied)
- **Sensor/Monitor Frequency Range:** 0-4000 Hz
- **Analog Output 4-20 mA:** 16-bit isolated loop powered 2-wire output; 12-27 VDC loop supply; max. load impedance = 500 Ohm.@ 27V; max. load impedance = 250 Ohm.@ 12V
- **Two Opto-Isolated Open-Collector Outputs:** 5-30 VDC rating, 50 mA Max. (minimum load impedance required = 600 Ohm @ 30 VDC)
- **Opto-Isolated Reset Input:** 5-30 VDC Input, 3.3Kohm Impedance
- **Temperature Ratings:** -20 to 60°C (-4 to 140°F) ambient; 85°C (185°F) max. fluid temperature (standard); 175°C (350°F) max. fluid temperature (RT-15C)
- **Enclosure Certification:** NEMA 4X
- **Connection:** screw terminal strips; ¾" NPT conduit entrance

Sensor Noses

A variety of sensor noses is available to provide compatibility with AW Gear Meters flowmeters. See chart below.

RT-Ex Model	Sensor Nose
RT-15A	MAG-PB sensor (standard) for JV-CG/KG, HPM and TRG series flowmeters.
RT-15B	IR-PB sensor for JVK series flowmeters.
RT-15C	CP-30 high temp sensor (to 350°F) for JVM-CG/KG, JVS-CG/KG HPM series meters.
RT-15D	MG-300 sensor for TR series turbine flowmeters.

Dimensions



Wiring Connections

Make wiring connections to terminal strips inside the rear cover. Unit has a 3/4-inch NPT wire exit for conduit connection. Connection to conduit maintains the enclosure's hazardous-location rating. The connection must meet all local and national electrical codes.

Warning!

To prevent ignition of hazardous atmospheres, disconnect circuits before removing cover. Keep cover tightly closed while circuits are alive.

DC Power Connection

The RT-15 requires a 15-24 VDC/200mA supply for operation.

Notice

A power supply is still required to operate the RT-15 even if the analog output is used in a loop-powered configuration.

The RT-15 is internally isolated from the DC supply by a DC/DC converter. A power-on LED is provided on the connection board and a two Amp mini-fuse protects the circuitry in case of a supply fault. (See drawing below.)

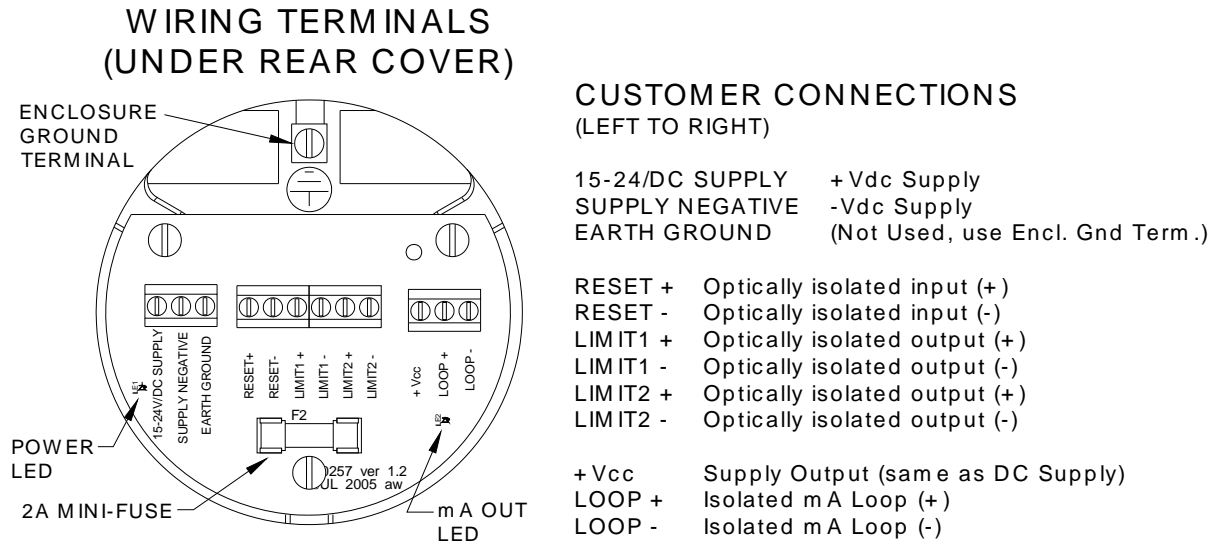
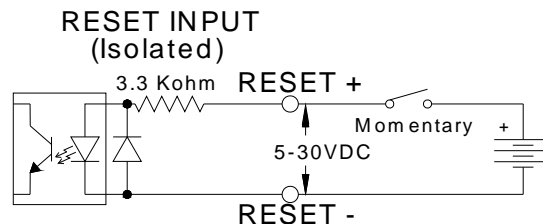


Figure 3: Wiring Connections

Reset Input

An opto-isolated input is used to reset the TOTAL A (Job Total). See TOTAL A RESET on page 21 for information regarding resetting the job totalizer.



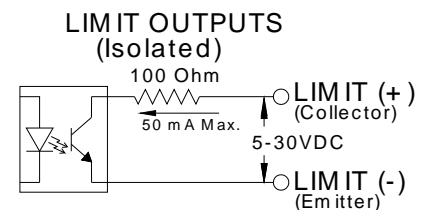
Limits/Pulse Outputs

Two opto-isolated NPN open-collector outputs can sink or source depending on connection (i.e., power can flow in or out).

Notice

Connection polarity: collector (+), emitter (-). See adjacent diagram.

Output ratings are listed on page 9. You can assign either output to a rate limit, total limit for batching, or as a totalizer pulsed output. See LIMITS Display Mode on page 25 and LIMITS



Programming on page 26 for information regarding displaying and programming the limit and pulse output.

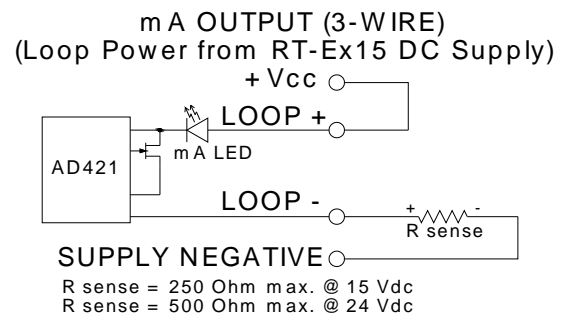
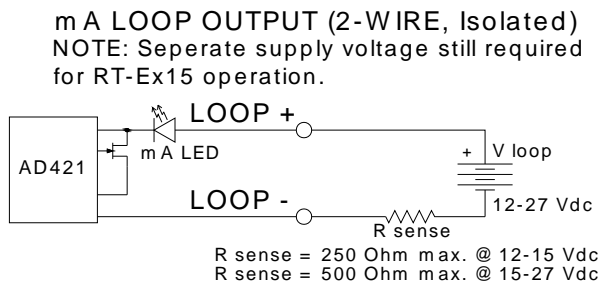
Analog Output

The isolated 16-bit 4-20mA output can be wired in a two-wire loop-powered arrangement, or loop power can be supplied via the DC supply as shown in the wiring examples below.

Notice

A separate power supply is required to operate the RT-15 even if the analog output is used in a loop-powered configuration.

The mA LED lights with varying intensity in proportion to the mA output for troubleshooting purposes. The assignment, offset, and scaling values for the mA output are programmable. See ANALOG OUT Programming on page 24 for information regarding setting up analog output.



Frequency Input Test Point

The RT-15 has a frequency input test point allowing you to input a frequency signal directly. This is especially useful for setting up and testing pulse output or analog output signals during commissioning when flow is not present or where it is not feasible to allow continuous flow for setup and calibration purposes. You must change the position of a programmable jumper to use the test point input. See the test points and jumper positions in the diagram below.

Caution

Change the jumper back to the correct position before beginning normal operation using the sensor nose.

Test Point Input Specifications

- Waveform: DC signal - pulse, square-wave, triangle, or sawtooth.
- Minimum signal amplitude: 2 Volts peak.

- Maximum signal amplitude: 10 Volts peak.
- Frequency: 0-4000Hz

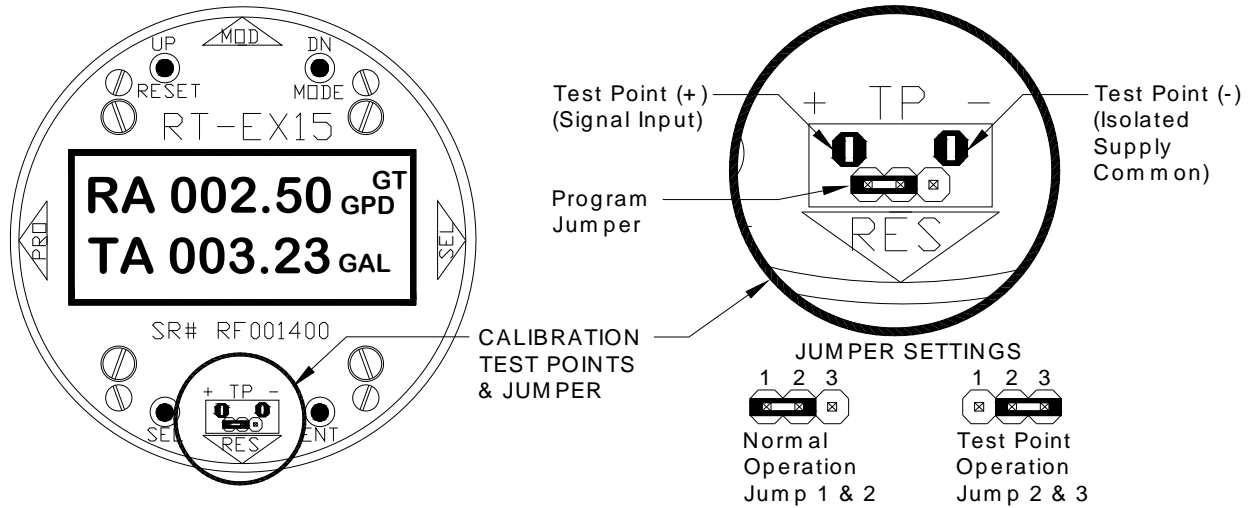
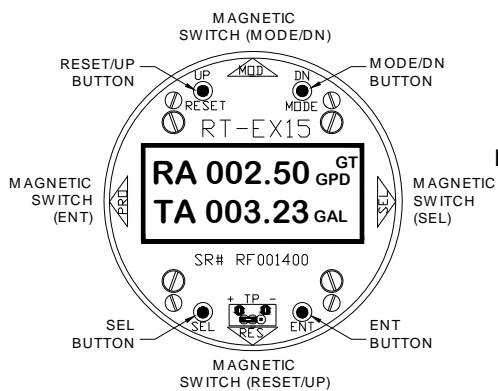


Figure 4: Test Points and Jumper Settings

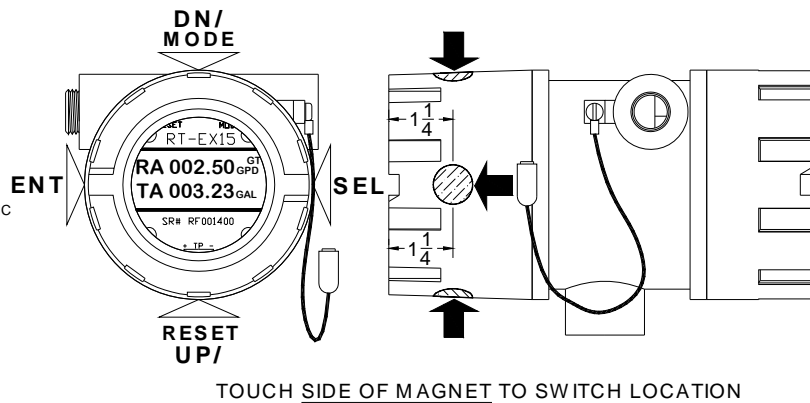
Display/Programming Buttons and Magnetic Switches

Use the buttons on the faceplate when the cover is off, or the magnetic switches when the cover is on, to program the unit, change the display, and reset total. The magnetic switches are located at the 3, 6, 9 and 12 o'clock positions on the side of the housing. See the faceplate of the RT-15 for the function of each position. Touching the side of the magnet wand to the appropriate location activates the magnetic switches.

DISPLAY/PROGRAMMING BUTTON LOCATIONS



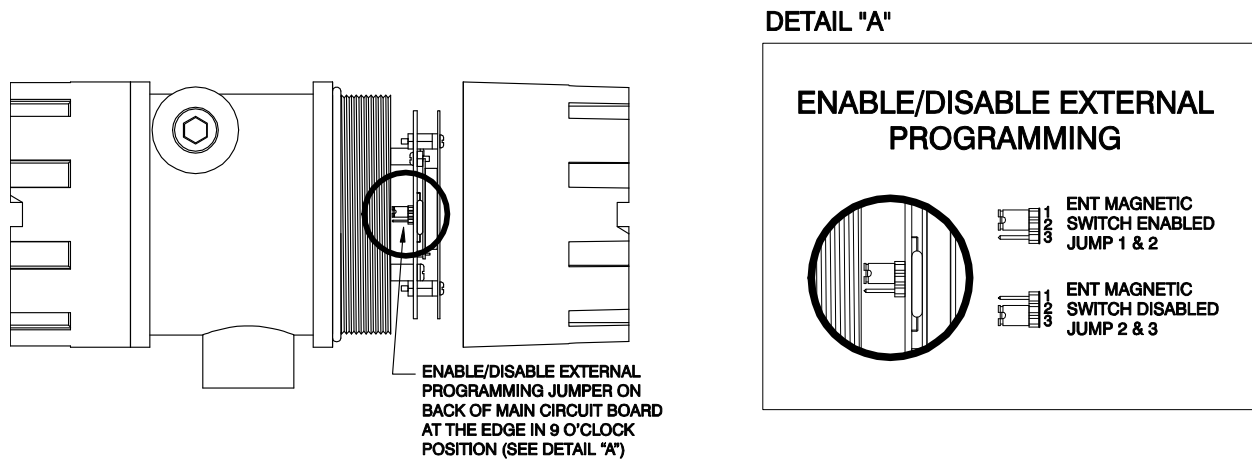
MAGNETIC SWITCH LOCATIONS



Disable External Programming

When the cover is off, initiate all programming with the ENT button located on the faceplate. When the cover is on, use the magnetic wand.

To prevent programming when the cover is on, use the jumper on the back of the main circuit board on the edge at the 9 o'clock position to disable the ENT external magnetic switch. When the ENT magnetic switch is disabled, the MODE and RESET external magnetic switches are still active to allow mode changes and total reset; however, you cannot make program changes without removing the cover and using the ENT button on the faceplate. Switch default is: Enabled.



Programming the RT-15

The RT-15 must be powered up to program and set up the unit. You can program the RT-15 in a hazardous area with the cover on using the magnetic switches (if function is enabled) or outside a hazardous area with the cover removed using the programming buttons.

Caution

If you have removed the cover, you must program the unit outside the hazardous area. After programming, disconnect the power and tightly re-install the cover before re-installation in the hazardous area. See Wiring Connections on page 11.

To scale the rate or total display, output, or limits, you must program the RATE, TOTAL, ANALOG OUT and LIMIT variables. Program all parameters from the corresponding display screen. For example, to program the rate scaling-factor, decimal resolution and engineering units for display, select the RATE A GT display. This manual takes you through the various programming steps in order.

Startup Message

The RT-15 displays an initial window at power up. After one second, the following message displays in the window for approximately two seconds. After this message, the display reverts to the Display Mode you last selected.

LOAD VARS	RT-15
TURN ON	0026.
MEM LEFT	099.9
VERSION	222 2006

LOAD VARS – Indicates that the variables are being recalled from memory.

TURN ON – Increments on each power-on cycle.

MEM LEFT – Memory life indicator: displays percent of memory life remaining in .1% increments.

Notice

The RT-15 stores programmed variables and retained totalizer values in EEPROM (electrically erasable programmable read-only memory). The limit on the number of times memory can be re-written results in a minimum EEPROM life of five years with continuous use. You can replace this memory IC if necessary (contact AW Gear Meters). You must re-program variables after a memory IC (integrated circuit) change.

VERSION – Indicates the software version installed in the RT-15.

Display Modes

The RT-15 has ten display/program modes:

- LOGO
- RATE A ^{GT}
- RATE A ^{PL}
- TOTAL A
- GR TOTAL A*
- STATUS ONE*
- ANALOG OUT
- LIMITS
- RAT A TOT A*
- BATCH TOTAL

*Display only; no programming function.

During normal operation with the cover secured, you can change the Display Mode by touching the side of the magnet wand to the MODE/DN location (top) on the outside of the housing. Use the MODE/DN button to change the Display Mode when the RT-15 cover is open. The RT-15 displays the last mode selected on power up. From seven of the display modes, you can also program the related variables.

LOGO Mode - Turn On/Off Displays, or Change Modes

Use LOGO – Display Mode “RT-15” during unit programming/set up to turn Display Modes on or off. Turn off any of them based on your needs. To reassign, turn on, or turn off a display mode, use the MODE/DN button (or magnetic switch) to select the LOGO display mode. Press and hold the ENT button or activate and maintain the ENT magnetic switch. First a “P” appears in the lower left-hand corner, and then DISPLAY 00, which indicates which display mode is assigned to DISPLAY 00. DISPLAY 00 is assigned to the LOGO screen allowing access for display activation/deactivation.

Notice

*Turn off displays one at a time and return to LOGO display after each screen is off. **Always turn off the highest numbered displays first.***

Turn Off Display Mode

To turn-off a display mode, use the ENT button (or magnetic switch) to scroll through the DISPLAY #s until you encounter the appropriate display mode. Use the RESET/UP button (or magnetic switch) to turn the display off. The DISPLAY # assignment will indicate OFF DISPL. Use the ENT button (or magnetic switch) to store the current assignment and advance the RT-15 to the next available display number (00-09) or exit the LOGO display programming procedure.

Change Mode

To change a DISPLAY # assignment to a different mode, use the SEL button (or magnetic switch) to select from the available display modes. Any DISPLAY # can be assigned as any display mode. Use the ENT button (or magnetic switch) to store the current assignment and advance the RT-15 to the next available display number (00-09), or exit the LOGO display programming procedure.

Turn Display Mode Back On

To restore a Display Mode that has been turned off, use the ENT button (or magnetic switch) to select a DISPLAY # with an OFF DSPL assignment. Select a display mode assignment using the SEL button (or magnetic switch). Use the ENT button (or magnetic switch) to store the current assignment and advance the RT-15 to the next available display number (00-09), or exit the LOGO display programming procedure.

Turn Logo Screen Back On

You can turn the LOGO screen off, but, as it will no longer appear, there is no way to access screen programming. If you turn off the LOGO display for any reason, you can restore to allow access to screen programming again. Cycle the power to the RT-15 while you press and hold the ENT button (or maintain the ENT magnetic switch). This reactivates the LOGO screen as DISPLAY 00 and restores access to LOGO screen programming.

Rate Display Mode

The RT-15 continuously calculates rate by two methods simultaneously:

- Gate Time, and
- Pulse Width.

Gate Time (RATE A GT)

The RT-Ex 15 displays rate based on the number of pulses the device counts during a prescribed time period. The RT-Ex 15 updates RATE A GT at the programmed interval regardless of the input frequency. Increasing the gate time interval produces a filtering or averaging effect useful for stable display and output of uneven or intermittent flows. The RT-15 analog output is assigned to RATE A GT.

Pulse Width (RATE A PL)

Rate is displayed based on the time from pulse edge to pulse edge. The Pulse Width Method is highly responsive, updating more frequently at high input frequencies and less frequently at lower input frequencies. RATE A PL is useful for observing flow variations or peak intermittent flows. A digital filter SAMPLE A can be used to produce a more stable display response.

RATE A Gate Time (RATE A GT)

Displays the rate by the gate time method based on the programmed GATE AB variable. It is displayed based on the corresponding KFR factors, decimal locations, and engineering units. The zero cutoff frequency for display and analog output is .3 Hertz. View the pulse length measurement RATE A PL using the SEL button (or magnetic switch) while in the RATE A GT display as illustrated below. The rate display reverts to RATE A GT if power is cycled to the RT-15. Typical display:



RATE A Pulse Length (RATE A PL)

The rate is calculated by the pulse length method based on the SAMPLE A variable. It is displayed based on the corresponding KFR factor, decimal location, and engineering units. View the gate time measurement RATE A GT by using the SEL button (or magnetic switch) while in the RATE A PL display as illustrated below. The rate display reverts to RATE A PL if power is cycled to the RT-15. A typical display:



RATE Mode Programming

Program the Rate parameters from the RATE A GT or RATE A PL display screen. Also program RATE A PL variables from the RATE A GT screen, or vice versa, by toggling to the RATE A PL mode using the SEL button (or magnetic switch). Use the MODE/DN button (or magnetic switch) to select the RATE GT display. Press and hold the ENT button or maintain the ENT magnetic switch. The display first shows a P in the lower left-hand corner and then displays the first program variable for that rate display mode. You can access three parameters for either mode as follows:

RATE A ^{GT}	RATE A ^{PL}
⇒ KFR A VALUE	⇒ KFR A VALUE
⇒ GATE A B	⇒ SAMPLE A
⇒ ENG UNITS A	⇒ ENG UNITS A

KFR A Value

Scaling factor to display rate in a desired engineering unit such as GPM. The KFR factor entered here also determines the decimal resolution of the rate display. The KFR is calculated using the K-factor of the transducer being monitored. The K-factor is the number of impulses per engineering unit established by the transducer manufacturer or by a calibration test.

Notice

The AW Gear Meters Calibration sheet provides the K-factor and recommended KFR values.

Initial default is: 100.00 (displays Hertz to two decimal places)

The KFR factor is calculated using the following formula:

$$\text{KFR} = \text{Time Base Constant}/\text{K-FACTOR}$$

where:

- 100 is the time base constant for engineering units per second
- 6000 is the time base constant for engineering units per minute
- 360000 is the time base constant for engineering units per hour
- 8640000 is the time base constant for engineering units per day
- K-FACTOR is the average number of pulses per desired engineering unit that the transducer produces

Method

1. Determine the number of decimal places desired for rate display.
2. Round off the result of the formula to the desired accuracy.
3. Enter the KFR using only that number of decimal places.

Using too few decimal places can cause relatively large display errors, up to several percent of actual reading. Using too many decimal places can result in displays with a level of precision exceeding the accuracy of the meter. Use no more than four digits regardless of decimal point position! The largest acceptable value for KFR is 65535 with the decimal in any location.

For example:

A flow meter has a K-factor of 2053.57 imp/Gal and the display should read in Gal/Min. with accuracy to three decimal places.

$$\text{KFR} = 6000/2053.57 = 2.921741 \text{ for GPM}$$

Round off 2.921741 to three decimal places and enter 2.922 for KFR.

When entering or editing the KFR value, the leftmost digit will blink (cursor). Use the SEL button (or magnetic switch) to select the digit to edit; the cursor moves to the right and wraps around. You can relocate the decimal point when it is selected (blinking). Use the UP or DN button or (magnetic switch) to increase or decrease the variable value, or to move the decimal point. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value displays, use the ENT button (or magnetic switch) to store the programmed value and advance to the next variable.

Gate time (GATE A B)

This variable sets the sample time on the incoming frequency for the RATE A GT (Gate Time) displays. Programmed in tenths of a second with an allowable range from .01 to 600 seconds, this variable affects the update of the display and analog output, and is useful in stabilizing the display and output when dealing with slight variations in flow. Do not set GATE TIME to zero as it will disable rate display.

When entering or editing the value, the digit you are editing blinks, starting with left-most digit. Use the SEL button (or magnetic switch) to select the digit to edit. Use the UP or DN button (or magnetic switch) to increase or decrease the variable value. When the desired value displays, use the ENT button (or magnetic switch) to store the value and advance to the next variable.

Initial default is: 002.00 seconds

SAMPLE A

This variable determines the amount of digital filtering performed on the incoming frequency for the RATE A PL (Pulse Length) display. The allowable range is from 0 to 253, with 0 providing the least level of filtering and 253 the maximum. This variable affects the update of the display and analog output and is used as a filter to stabilize the display and output.

Initial default is: 010

When entering or editing the value, the digit you are editing blinks, starting with left-most digit. Use the SEL button (or magnetic switch) to select the digit to edit. Use the UP or DN button (or magnetic switch) to increase or decrease the variable value. When the desired value displays, use the ENT button (or magnetic switch) to store the value and advance to the next variable.

ENG UNITS A

The desired engineering units for display of rate are programmable using up to four letters. Example: GPM_

Initial default is: HZ__

Notice

The engineering units display does not affect the scaling in any way and serves as nothing more than a label. The rate scaling is performed in the KFR calculation.

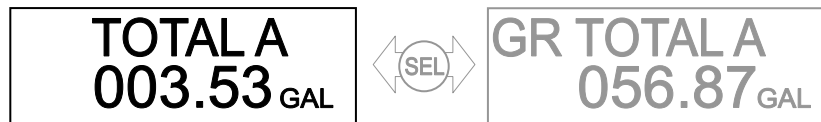
The first (left-most) character will be highlighted with the blinking cursor first. Use the SEL button (or magnetic switch) to move the cursor; use the UP or DN button (or magnetic switch) to scroll through the alphabet. After you have entered the characters, use the ENT button (or magnetic switch) to store the variable. The RT-15 then exits the variable programming mode and returns to the selected display.

TOTAL Display Modes

The RT-15 displays the JOB or GRAND total based on the programmed KFT, engineering unit, and decimal location. There are two TOTAL displays: TOTAL A (Job Total) and GRAND TOTAL A. The GRAND total is a second totalizer with a secured reset. The RT-15 retains both totals when the power is removed. The totals retained at power-down are updated once every 25 seconds. Due to this update interval, the totals retained may not include previous flow for up to 25 seconds if flow was present when the power was removed.

TOTAL A Display

Displays Job Total A. Also used for programming of total scaling factor KFT and reset of TOTAL A and GR TOTAL A. Use the SEL button (or magnetic switch) while in the TOTAL A display as illustrated below to view the grand total GR TOTAL A. The rate display reverts to RATE A GT if power is cycled to the RT-15.



GR TOTAL A Display

For display of GR TOTAL A only. No programming or reset functions associated with this display.



TOTAL A Reset

Use the RESET/UP magnetic switch (or the RESET/UP button while cover is open) to reset the Job total when TOTAL A or RAT A TOT A is displayed. Use the MODE/DN magnetic switch or button to select a total display. You can also use the Reset Input to reset TOTAL A at anytime. See page 11 for wiring information.

GR TOTAL A Reset

You can only reset the Grand total with the cover off via the front panel buttons. The reset method is a multiple-step sequence.

To reset GR TOTAL A:

1. Select the TOTAL A display mode using the MODE/DN button.
2. Use the SEL button to change to the GR TOTAL display.
3. Press the RESET/UP and ENT buttons simultaneously and hold until the RT-15 responds.
4. A warning will appear on the screen requesting yes/no verification before resetting the GR TOTAL.
5. The RT-15 prompts you to press the ENT button to accept the default answer of NO and exit the reset procedure at this point, or to reset the total.
6. To reset, use the SEL button first to toggle the response to YES and then press the ENT button.

This operation resets GR TOTAL A to zero.

TOTAL A Rollover

RT-15 JOB totals rollover to zero when the total reaches a value of 999999 regardless of the decimal location. When a JOB total rolls over or is reset, the device adds the contents of the JOB total in memory to the GRAND total.

GR TOTAL A Rollover

To allow retention of the largest possible GRAND total before data loss, after reaching a value of 999999 regardless of decimal location, a floating decimal feature automatically reduces decimal resolution by a maximum of two decimal places before rolling over to zero and losing the total. For example, for a KFT with four decimal places, the GRAND total reaches 9999.99 instead of 99.9999 before resetting to zero.

Total Mode Programming

Program the Total parameters from the TOTAL A display screen.

1. With the cover open, use the MODE/DN button (or magnetic switch) to select the TOTAL A display.
2. Press and hold the ENT button (or maintain the ENT magnetic switch).
3. The display first shows a P in the lower left-hand corner and then displays the first program variable for the TOTAL display mode.

You can access two parameters from the TOTAL screen:

- KFT A VALUE
- ENG UNITS A

KFT A VALUE

This is a scaling factor to display totals in a desired engineering unit such as gallons. The KFT value you enter from the TOTAL A screen also determines the decimal resolution of the total display. The RT-15 calculates the KFT using the K-factor of the transducer being monitored. The K-factor is the number of impulses per engineering unit established by the transducer manufacturer or by a calibration test. The AW Gear Meters Calibration sheet stipulates the K-factor and recommended KFT.

Initial default is: 10000. (displays total pulses with no decimals)

The KFT factor is calculated using the following formula:

$$\text{KFT} = 10000 / \text{K-FACTOR}$$

where:

- 10000 is a constant
- K-FACTOR is the average number of pulses per desired engineering unit that the transducer produces.

Method

1. Determine the number of decimal places desired for total display.
2. Round off the result of the formula to the desired accuracy.
3. Enter the KFT using only that number of decimal places.

Using too few decimal places can cause relatively large display errors, up to several percent of actual reading. Using too many decimal places can result in displays with a level of precision exceeding the accuracy of the meter. Use no more than four digits regardless of decimal point position! The largest acceptable value for KFT is 65535 with the decimal in any location.

For example:

A flow meter has a K-factor 2053.57 imp/gal and the display should read in gallons with accuracy to three decimal places.

$$\text{KFT} = 10000 / 2053.7 = 4.869568 \text{ for Gallons}$$

Round off 4.869568 to three decimal places and enter 4.870 for KFT.

When entering or editing the KFR value, the leftmost digit will blink (cursor). Use the SEL button (or magnetic switch) to select the digit to edit; the cursor moves to the right and wraps around. You can relocate the decimal point when it is selected (blinking). Use the UP or DN button (or magnetic switch) to increase or decrease the variable value, or to move the decimal point. Use DN to move the decimal point to the right, UP to move it to the left. When the desired value displays, use the ENT button (or magnetic switch) to store the programmed value and advance to the next variable.

ENG UNITS A

The desired engineering units for display of total are programmable using up to four letters. Example: GALS

Initial default is PULS

Notice

The engineering units display does not affect the scaling in any way and serves as nothing more than a label. The rate scaling is performed in the KFT calculation.

The first (left-most) character will be highlighted with the blinking cursor first. Use the SEL button (or magnetic switch) to move the cursor; use the UP or DN button (or magnetic switch) to scroll through the alphabet. After you have entered the characters, use the ENT button (or magnetic switch) to store the variable. The RT-15 then exits the variable programming mode and returns to the selected display.

STATUS ONE Display Mode

The STATUS ONE screen displays the Rate A PL, Total A, and the analog output value in mA. This screen is useful for setup or troubleshooting. A typical display is:

STATUS ONE	
RTA	02.500
TOA	0035.3
ANO	004.02

ANALOG OUT Display Mode

The ANALOG OUT display mode displays the analog output command value in milliamps.

Notice

This is the commanded value, not the actual value, and under certain conditions some difference could occur between the displayed value and the actual mA output value.

The two-digit number shown after ANALOG OUT indicates what the output represents. In this case, “00” indicates that the output represents RATE A GT. See the Analog Point parameter for more information regarding output assignment.

ANALOG OUT 00
04.02 MAS

ANALOG OUT Programming

Program the signal assignment, offset, and scaling values for the mA output from the ANALOG OUT display screen. The output can represent rate or total, and you can program the flow rate or total value represented by the maximum output. Use the MODE/DN button (or magnetic switch) to select the ANALOG OUT display.

To program, press and hold the ENT button (or maintain the ENT magnetic switch). The display first shows a P in the lower left-hand corner and then displays the first program variable for this mode. Three parameters are accessed in order:

- MA OFFSET
- ANALOG POINT
- ENTER VALUE AT MAX MAS

MA OFFSET

This variable is used to set to lowest value for the mA output span and as a fine offset adjustment in the field, if necessary. The low range of the output span is programmable between 4.00 and 10.00 mA. The RT-15 will not accept a value less than 4 mA. The RT-15 utilizes the output device AD421 manufactured

by Analog Devices. The minimum output is trimmed to 4.00mA by the device manufacturer. Consult the manufacturer's data sheet for AD421 for complete specifications regarding offset tolerance.

When entering or editing the value, the digit being edited blinks starting with left-most digit. Select the digit to edit using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease the variable value. When the desired value displays, use the ENT button (or magnetic switch) to store the programmed value and advance to the next variable.

ANALOG POINT

This variable is used to "point" to an output assignment for the analog output. The output can be assigned to represent one of three functions:

- RATE A GT (#00)
- RATE A PL (#01)
- TOTAL A (#02)

The RT-Ex displays a number corresponding to the output assignment indicating the current function of the analog output. The default assignment for the ANALOG POINT is RATE A GT (#00). RATE or TOTAL assignments produce an output ranging from the MA OFFSET value (4-10 mA) for a zero value to 20 mA for the maximum programmed flow rate or total.

Use the SEL button (or magnetic switch) to select the output assignment; use the ENT button (or magnetic switch) to store it.

ENTER VALUE AT MAX MA'S

This scaling variable is used to set the maximum mA output (20mA.) to a corresponding rate value producing an output ranging from the MA OFFSET value (4-10 mA) for a zero value to 20 mA for the maximum programmed flow rate. The entry corresponds with the KFR, decimal location, and engineering units for RATE A GT. The initial value is a rate of 10 HZ.

When you enter or edit the value, the digit you are editing blinks starting with left-most digit. Select the digit to edit using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease the variable value. When the desired value displays, use the ENT button (or magnetic switch) to store the programmed value and advance to the next variable.

LIMITS Display Mode

The RT-15 has two programmable limit outputs: L1 and L2. The LIMIT display shows the function to which each limit is assigned, the value in engineering units at which each limit becomes active or changes state, and the current status of the limit outputs. The RT-15 displays limit values using the KFR or KFT, decimal location, and engineering units corresponding to the limit assignment.

L1	RATE A GT	003.00 GPD	ON
L2	CYCLE OUT	000.10 GAL	OFF

LIMITS Programming

Program the Limits from the LIMIT display screen. You can assign L1 and L2 to any of these functions.

- RATE A GT
- RATE A PL
- TOTAL A
- CYCLE OUT (Pulse Output)

RATE Limits/Limit MARGIN

To operate a limit based on RATE, select a RATE A function based on pulse length or gate time measurement. The MARGIN variable is programmed in engineering units and determines whether the limit functions as an absolute limit or activates within a margin or “window” around the programmed RATE limit. When the MARGIN is programmed as zero, the limit activates whenever the selected RATE equals or exceeds the programmed value. When you enter a MARGIN value other than zero, the limit is active whenever the selected RATE is within the “window” of the programmed RATE limit value, plus or minus the MARGIN value.

TOTAL Limits

To operate a limit based on the JOB TOTAL, select TOTAL A for the Limit function. The limit activates whenever the selected TOTAL equals or exceeds the programmed value. See BATCH TOTAL Display Mode on page 28 for alternate setup of total limits.

CYCLE OUT (Pulse Output)

The CYCLE OUT limit function provides an incremental output signal for a remote totalizer, typically at a lower resolution and frequency. You can assign either or both limits to a CYCLE OUT function. Assigning a limit to the CYCLE OUT function toggles the state of the limit output whenever Job TOTAL A increments by the programmed cycle amount. The output remains ON until the cycle amount accumulates and does not turn OFF until the cycle amount accumulates again as represented in the diagram on page 27. The total accumulated between a rising and falling edge is the cycle value. The total accumulated between any two rising edges is twice the cycle value. You enter the cycle value in engineering units corresponding to the programmed KFT and decimal location.

Caution

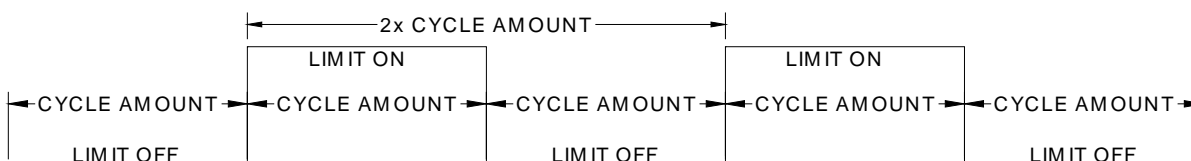
Do not program a cycle amount that produces more than ten pulses per second (10 Hz).

Consider the maximum flowrate to determine the resulting output frequency. The frequency produced (in Hz.) is the actual flow rate in Engineering Units per Minute divided by 120, divided by the CYCLE AMOUNT.

Notice

When considering a large cycle amount, keep in mind that any external totalizer misses at least one cycle amount of accumulation whenever power is cycled to the RT-15.

CYCLE OUT (PULSE OUTPUT) Limit Function



To program limit functions, use the MODE/DN button (or magnetic switch) to select the LIMIT display. Press and hold the ENT button (or maintain the ENT magnetic switch). The display first shows a P in the lower left-hand corner and then highlights the L1 indication with a blinking cursor. Use the SEL button or magnetic switch to select the function of the limit assignment. Use the ENT button (or magnetic switch) when the desired mode displays for L1. The cursor now highlights the numeric value to be entered for L1. Entries correspond with the scaling factor, decimal location, and engineering units for the function selected. The blinking cursor highlights the left-most digit. Move the cursor left to right using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease each digit's value. When editing is complete and the desired value displays, use the ENT button (or magnetic switch) to store the value for L1.

If you have made a RATE assignment, the RT-15 next prompts you to enter the RATE LIMIT MARGIN in percent. The blinking cursor highlights the left-most digit. Move the cursor using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease each digit's value. When you have completed editing and the value displays, use the ENT button (or magnetic switch) to store the RATE LIMIT MARGIN. A blinking cursor then highlights the L2 indication. Repeat the procedures for L1. When you have completed the L2 programming, use the ENT button (or magnetic switch) to store the values and exit LIMITS programming.

Notice

See *Wiring Connections and Connection Diagram* on page 11 for information regarding connection to limit outputs.

RATE A / TOTAL A Display Mode

View RATE A GT and TOTAL A (Job Total) on the same screen using the RATE A_TOT A display. The RT-15 displays rates and totals in the corresponding engineering units based on the programmed KFR and KFT factors and decimal locations. To view the GR TOTAL, use the SEL button (or magnetic switch) to switch between TOTAL A (TA) display and GR TOTAL A (GA) as illustrated below. After a power cycle, the RT-15

reverts to the Job Total (TA) display). You can reset Total A from this display using the RESET/UP button (or magnetic switch).

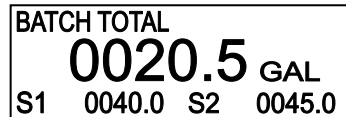


Notice

The *RAT A TOT A* display is only for viewing the rate and total simultaneously and has no programming function. Program Rate and Total variables from the RATE A^{GT} or RATE A^{PL} and TOTAL A screens respectively.

BATCH TOTAL Display Mode

The BATCH TOTAL displays the JOB A total and the S1 and S2 total limit activation levels. When the RT-15 is programmed for BATCH TOTAL operation, both limits are assigned as TOTAL A limits based on the KFT, decimal point, and engineering units. The TOTAL limit activation levels are displayed unless assigned to another function. If so, the S1 or S2 display reads XXXX to indicate that it is not assigned to JOB A TOTAL function.



BATCH TOTAL Programming

Use the BATCH TOTAL program mode to dedicate quickly both limits as total limits and program the values at which the limits (S1 and S2) activate. Program BATCH TOTAL limits from The BATCH TOTAL display. Use the MODE/DN button (or magnetic switch) to get there. Press and hold the ENT button (or maintain the ENT magnetic switch). The display first shows a P in the lower left-hand corner and then highlights the first limit assignment S1 indicated with a blinking cursor. Entering a value assigns the limit as a total limit based on the KFT, decimal location and KFT engineering units. Select the digit to edit using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease the variable value. When the desired value displays, use the ENT button (or magnetic switch) to store the programmed value and move the cursor to S2. Select the digit to edit using the SEL button (or magnetic switch). Use the UP or DN button (or magnetic switch) to increase or decrease the value. When the desired value displays, use the ENT button (or magnetic switch) to store the value and exit the BATCH TOTAL mode.

If either limit is already assigned to a function other than TOTAL A, the RT-15 responds by asking “Limit mode different, want to change it?” Use the SEL button (or magnetic switch) to toggle an “N” or “Y”

response and use the ENT button or magnetic switch to answer. A “Y” response resets any previous limit assignment to Total A and zeros the limit value. An “N” response leaves the limit assigned to the previous function; the S1 or S2 display reads XXXX, indicating that it has no function in this mode.

Limited Warranty

AW Gear Meters warrants the product to be in good working order for a period of 1 (one) year from the date of purchase from **AW Gear Meters** or an Authorized **AW Gear Meters** distributor. Should the product fail to be good working order at any time during this 1-year warranty period, **AW Gear Meters** will, at its option, repair or replace the product at no additional charge except as set forth below. Repair parts and replacement products will be furnished on an exchange basis and will be reconditioned or new. All replaced parts and products become the property of **AW Gear Meters**. This limited warranty does not include service to repair damage to the product resulting from accident, disaster, abuse, or a **non AW Gear Meters** modification to the product.

Limited Warranty service may be obtained by delivering the product during the 1-year warranty period to **AW Gear Meters** and provide proof of purchase date. If this product is delivered by mail, you agree to insure the product or assume the risk of loss or damage in transit, to prepay shipping charges to warranty location and use the original shipping container or equivalent.

For further information contact:

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