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OMEGA FTB300 Series Flow Verification Sensor User Guide

FTB300 Series Flow Verification Sensor
User Guide

Contents

Introduction

This flowmeter is designed to display flow rate and flow total on a six-digit LCD display. The meter can measure bi-directional flows in either vertical or horizontal mounting orientation. Six flow ranges and four optional pipe and tubing connections are available. Pre-programmed calibration K-factors can be selected for the corresponding flow range or a custom field calibration can be performed for higher accuracy at a specific flow rate. The meter is factory programmed for the correct K-factor of the body size included with the meter.

Features

- Four connection options available: 1/8″ F /NPT, 1/4″ F /NPT, 1/4″ OD x .170 ID Tubing & 3/8″ OD x 1/4″ ID Tubing sizes.

- Six body size/flow range options available:
   30 to 300 ml/min, 100 to 1000 ml/min, 200 to 2000 ml/min,
   300 to 3000 ml/min, 500 to 5000 ml/min, 700 to 7000 ml/min.

- 3 model display variations:
   FS = Sensor mounted display
   FP = Panel mounted display (includes 6′ cable)
   FV = No display. Sensor only. 5vdc current-sinking output

- 6 digit LCD, up to 4 decimal positions.

- Displays both rates of flow and total accumulated flow.
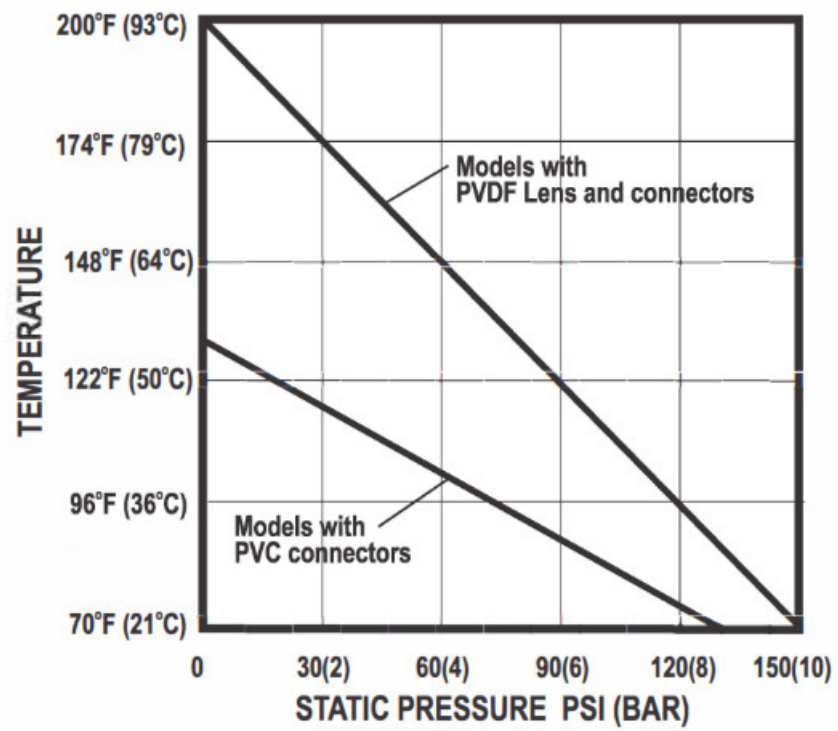
- Open collector alarm setpoint.

- User-selectable or custom programmable K-factor.

  Flow units: Gallons, Liters, Ounces, milliliters

  Time units: Minutes, Hours, Days
- Volumetric field calibration programming system.
- Non-volatile programming and accumulated flow memory.
- The total reset function can be disabled.
- Opaque PV DF chemical resistant lens.
- Weather-resistant Valox PBT enclosure. NEMA 4X

Specifications

Max. Working Pressure: 150 psig (10 bar)@ 70°F (21°C)
PVDF lens Max. Fluid Temperature: 200°F (93°C)@ 0 PSI
Full-scale accuracy
Input Power requirement: +/-6%
The sensor only output cable: 3-wire shielded cable, 6ft
Pulse output signal: Digital square wave (2-wire) 25ft max.
Voltage high = 5V de,
Voltage low < .25V de
50% duty cycle
Output frequency range: 4 to 500Hz
Alarm output signal:
NPN Open collector. Active low above
the programmable rate set point.
30V de maximum, 50mA max load.
Active low < .25V de
2K ohm pull-up resistor required.
Enclosure: NEMA type 4X, (IP56)
Approximate shipping wt: 1 lb. (.45 kg)

Temperature and Pressure limits

Maximum Temperature vs. Pressure

TEMPERATURE / STATIC PRESSURE PSI (BAR)

- 200°F (93°C)
- 174°F (79°C) — Models with PVDF Lens and connectors
- 148°F (64°C)
- 122°F (50°C)
- 96°F (36°C) — Models with PVC connectors
- 70°F (21°C)

0, 30(2), 60(4), 90(6), 120(8), 150(10)

Dimensions

5.00 in [127 mm]

2.22 in [56.26 mm]

1.48 in [37.71 mm]

3.51 in [89.03 mm]

Replacement Parts

PARTS LIST

Key	Part No.	Description	Qty.
1	90011-190	Screw 6-32x.50 Phil Flt SS	4
2	90002-228	Lens Cap Opaque PVDF	1
3	90003-143	O-Ring FKM	1
	90003-146	O-Ring EP	
4	90002-229	Paddle PVDF	1
5	90007-592	Axle PVDF	1
6	90003-012	O-Ring FKM	2
	90003-011	O-Ring EP	
7	76001-705	Body S1 PVDF (30-300ml/min)	1
	76001-301	Body S2 PVDF(100-1000ml/min)	
	76001-302	Body S3 PVDF (200-2000ml/min)	
	76001-706	Body S4 PVDF (300-3000ml/min)	
	76001-304	Body S5 PVDF (500-5000ml/min)	
	76001-305	Body S6 PVDF (700-7000ml/min)	
8	90011-178	Screw #4x.50 Phil Blk	2
9	76000-137	Adapter .250" F/NPT PVC	2
	76000-456	Adapter .125" F/NPT PVC	
	90002-038	Adapter .375" OD Tubing Connection, PVDF	
	90002-042	Adapter .250" OD Tubing Connection, PVDF	
	76001-360	Adapter .500" ID Hose Barb, PVC	
	76001-359	Adapter .500 F/NPT, PVC	
	76001-358	Adapter .500 M/NPT, PVC	
10	71010-182	Sensor	1
13	90002-242	Enclosure, Valox	1
14	90012-254	LCD display	1
15	90010-260	Circuit board	1
16	90006-604	Gasket, rear enclosure	1
17	90002-243	Cover, enclosure rear	
18	90008-199	Liquid Tight Connector Set	1
19	90011-075	Screw #4x.62 Phil SS Blk	6
20	90011-177	Screw #2x.25 L Phil St	2
21	76001-299	Tubing connector seal	1
22	90006-605	Gasket, sensor mount seal	1

Installation

Wiring Connections

KNOCK-OUT ½" diameter

Power Input

Rear view
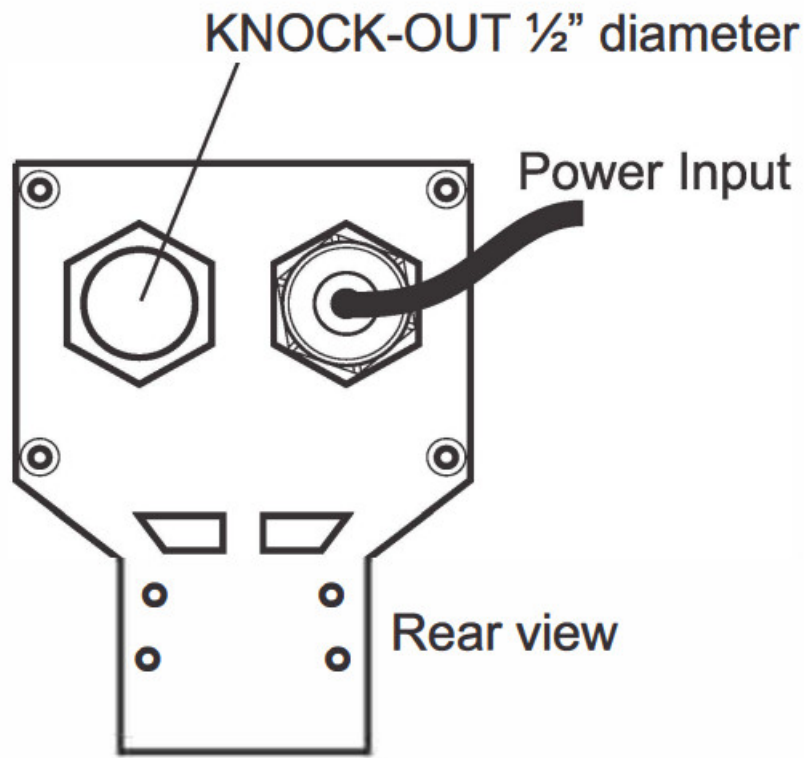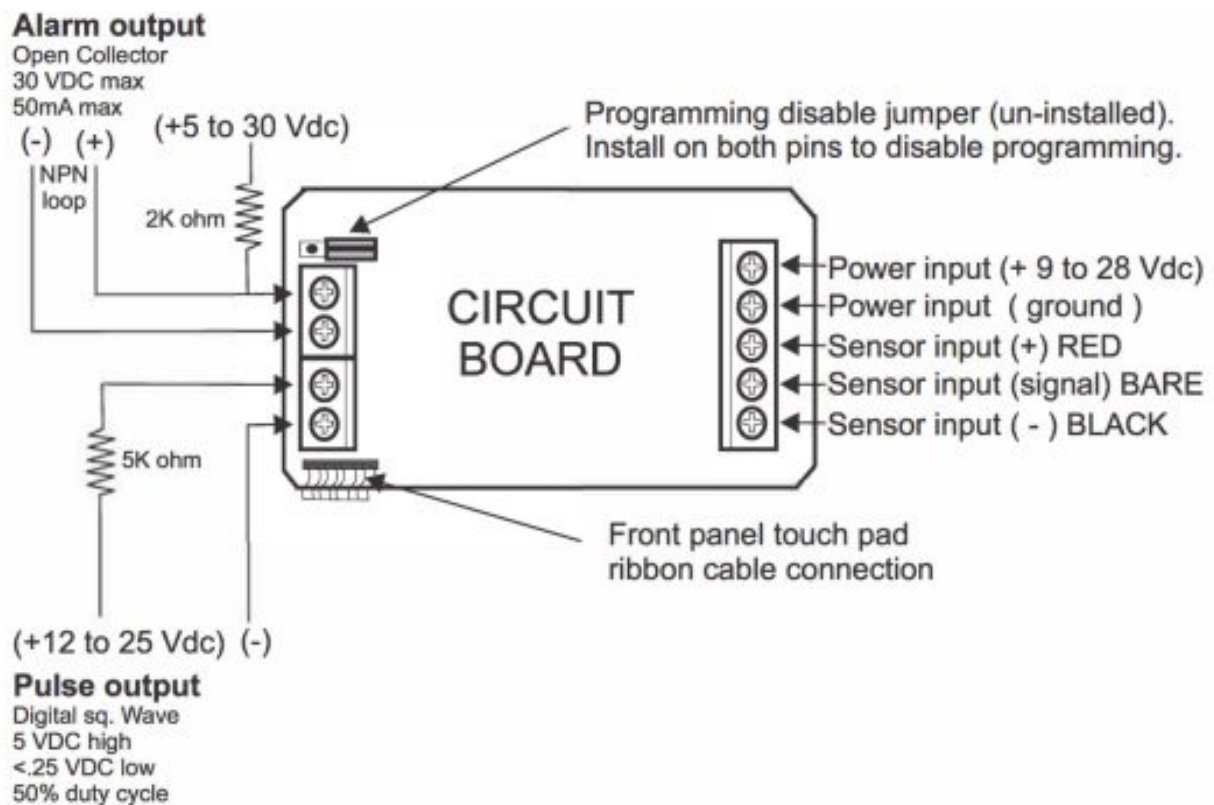
On sensor-mounted units, the output signal wires must be installed through the back panel using a second liquid-tite connector (included). To install the connector, remove the circular knock-out. Trim the edge if required. Install the extra liquid-tite connector.

On panel or wall-mounted units, wiring may be installed through the enclosure bottom or through the back panel. See below.
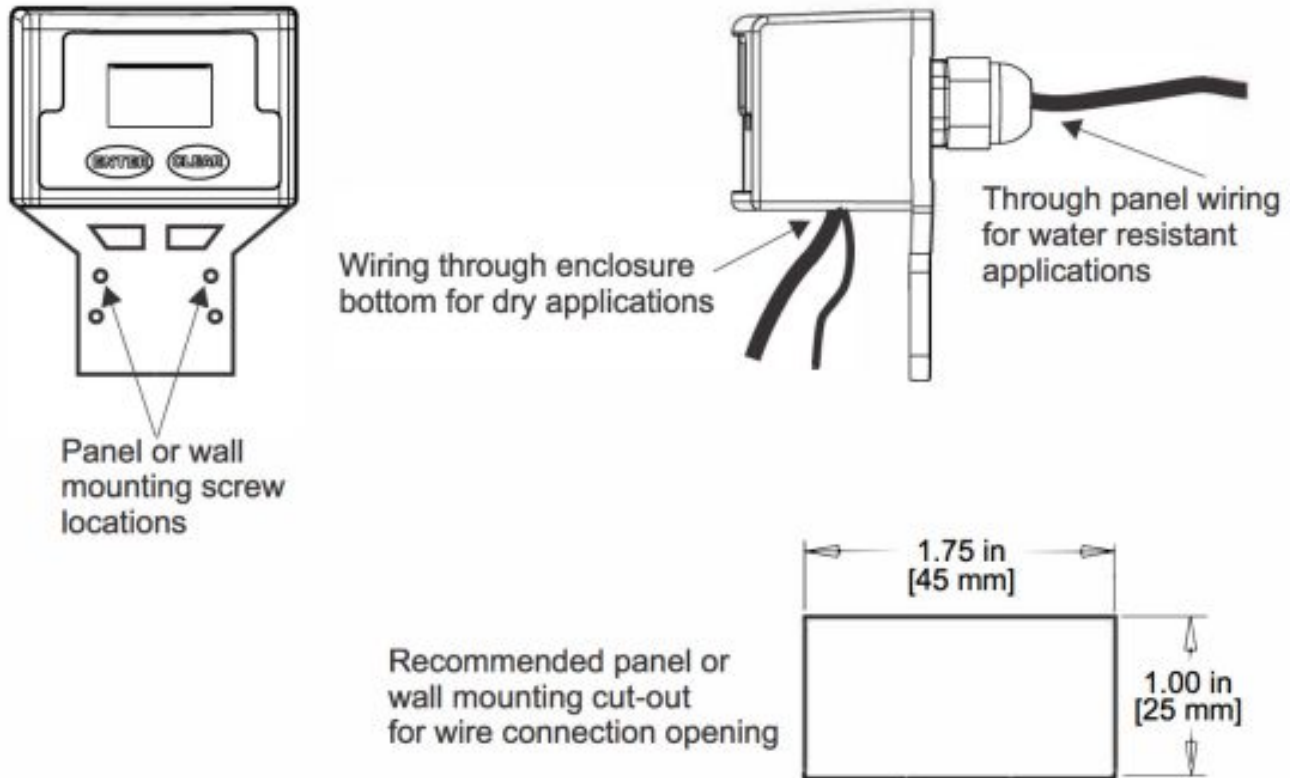
Circuit Board Connections

Alarm output
Open Collector
30 VDC max
50mA max
(-)   (+)   (+5 to 30 Vdc)
NPN
loop
2K ohm

Programming disable jumper (un-installed).
Install on both pins to disable programming.

CIRCUIT
BOARD

Power input (+ 9 to 28 Vdc)
Power input (ground)
Sensor input (+) RED
Sensor input (signal) BARE
Sensor input (-) BLACK

5K ohm

Front panel touch pad
ribbon cable connection

(+12 to 25 Vdc) (-)
Pulse output
Digital sq. Wave
5 VDC high
<.25 VDC low
50% duty cycle

NOTE: To reset the circuit board: 1) Disconnect power 2) Apply power while pressing the two front panel buttons.

Flow Verification Output Signal

When connected to external equipment such as a PLC, data logger, or metering pump, the pulse output signal can be used as a flow verification signal. When used with metering pumps, connect the positive (+) terminal on the circuit board to the pump's yellow signal input wire and the negative (-) terminal to the black input wire.

Panel or wall mounting

Wiring through enclosure bottom for dry applications

Through panel wiring for water resistant applications

Panel or wall mounting screw locations

Recommended panel or wall mounting cut-out for wire connection opening

1.75 in [45 mm]

1.00 in [25 mm]

Operation

Theory of operation

The flowmeter is designed to measure the flow rate and accumulate the total volume of a fluid. The unit contains a paddle wheel that has six (6) through holes to allow infrared light to pass through, a light-detecting circuit, and an LCD-display electronic circuit.
As fluid passes through the meter body, the paddlewheel spins. Each time the wheel rotates a DC square wave is output from the sensor. There are six (6) complete DC cycles induced for every revolution of the paddlewheel. The frequency of this signal is proportional to the velocity of the fluid in the conduit. The generated signal is then sent into the electronic circuit to be processed.

The meter is factory programmed for the correct K-factor of the body size included with the meter.
The flowmeter includes the following features:

- Displays either the flow rate or the accumulated total flow.
- Provides a pulse output signal that is proportional to the flow rate.
- Provides an open collector alarm output signal. Active low at flow rates above the user-programmed value.
- Provides user-selectable, factory preset calibration k-factors.
- Provides a field calibration procedure for more precise measurement.
- Front panel programming can be disabled by a circuit board jumper pin.

Control Panel

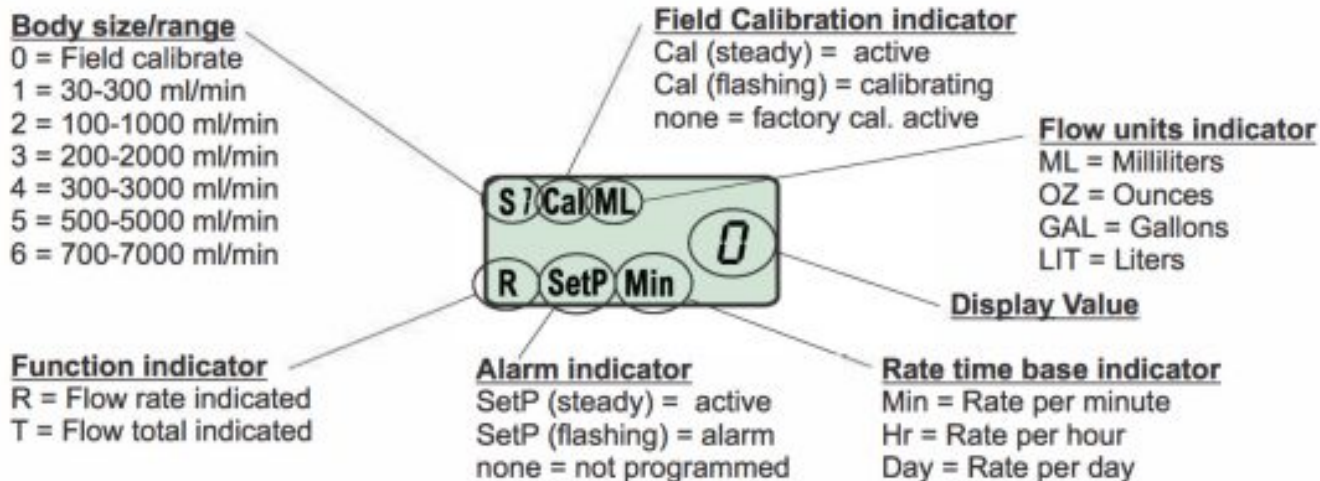
Enter Button (right arrow)

- **Press and release –** Toggle between Rate, Total, and Calibrate screens in the run mode. Select program screens in the program mode.
- **Press and hold 2 seconds –** Enter and exit program mode. (Automatic exit program mode after 30 seconds of no inputs).
  Clear/Cal (up arrow)
- **Press and release** – Clear total in the run mode. Scroll through and select options in the program mode.

NOTE: To reset the circuit board: 1) Disconnect power 2) Apply power while pressing the two front panel buttons.
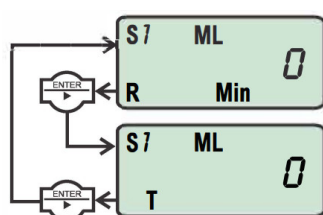
Flow stream requirements

- The flowmeter can measure fluid flow in either direction.
- The meter must be mounted so that the paddle axle is in a horizontal position – up to 10° off the horizontal is acceptable.
- The fluid must be capable of passing infra-red light.
- The fluid must be free of debris. A 150-micron filter is recommended especially when using the smallest body size (Sl), which has a 0.031″ through-hole.

Run mode display

Body size/range
0 = Field calibrate
1 = 30-300 ml/min
2 = 100-1000 ml/min
3 = 200-2000 ml/min
4 = 300-3000 ml/min
5 = 500-5000 ml/min
6 = 700-7000 ml/min

Field Calibration indicator
Cal (steady) = active
Cal (flashing) = calibrating
none = factory cal. active

Flow units indicator
ML = Milliliters
OZ = Ounces
GAL = Gallons
LIT = Liters

Display Value

Function indicator
R = Flow rate indicated
T = Flow total indicated

Alarm indicator
SetP (steady) = active
SetP (flashing) = alarm
none = not programmed

Rate time base indicator
Min = Rate per minute
Hr = Rate per hour
Day = Rate per day

Run mode operation

FLOW RATE DISPLAY – Indicates rate of flow, S1 = body size/range #1, ML = units displayed in milliliters, MIN = time units in minutes, R = flow rate displayed.
FLOW TOTAL DISPLAY – Indicates accumulated total flow, S1 = body size/range #1, ML = units displayed in milliliters, T = total accumulated flow displayed.

Viewing the K-factor (pulses per unit)

while in the run mode, Press and hold ENTER then press and hold CLEAR to display the K-factor.
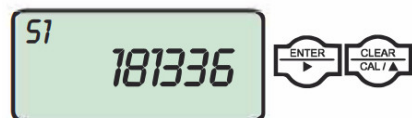
Release ENTER and CLEAR to return to run mode.

Body Size	Flow Range (ml/min)	Pulses per Gallon	Pulses per Liter
1	30-300	181,336	47,909
2	100-1000	81,509	21,535
3	200-2000	42,051	13,752
4	300-3000	25,153	6,646
5	500-5000	15,737	4,157
6	700-7000	9,375	2,477

Useful formulas

60 I K = rate scale factor
rate scale factor x Hz = flow rate in volume per minute
1 / K = total scale factor total scale factor x n pulses = total volume

Programming

The flowmeter uses a K-factor to calculate the flow rate and total. The K-factor is defined as the number of pulses generated by the paddle per volume of fluid flow. Each of the six different body sizes have different operating flow ranges and different K-factors. The meter is factory programmed for the correct K-factor of the body size included with the meter.

The meter's rate and total displays can be independently programmed to display units in milliliters (ML), ounces (OZ), gallons (gal), or liters (LIT). Rate and total can be displayed in different units of measure. The factory programming is in milliliters (ML).

The meter's rate display can be independently programmed to display timebase units in minutes (Min), Hours (Hr), or Days (Day). The factory programming is in minutes (Min).

For greater accuracy at a specific flow rate, the meter can be field cali brated. This procedure will automatically override the factory K-factor with the number of pulses accumulated during the calibration procedure. The factory default settings can be re-selected at any time.

Field Calibration

Anybody size/range can be field calibrated. Calibration will take into account your specific application's fluid properties, such as viscosity and flow rate, and increase the accuracy of the meter in your application. The Body Size/Range must be set for "SO" to enable the calibration mode. Follow the programming instructions on pages 10 & 11 to reset the Body Size/Range and perform the calibration procedure.

Programming for body size/ranges Although S6 –

Press and Hold ENTER to initiate the programming mode.
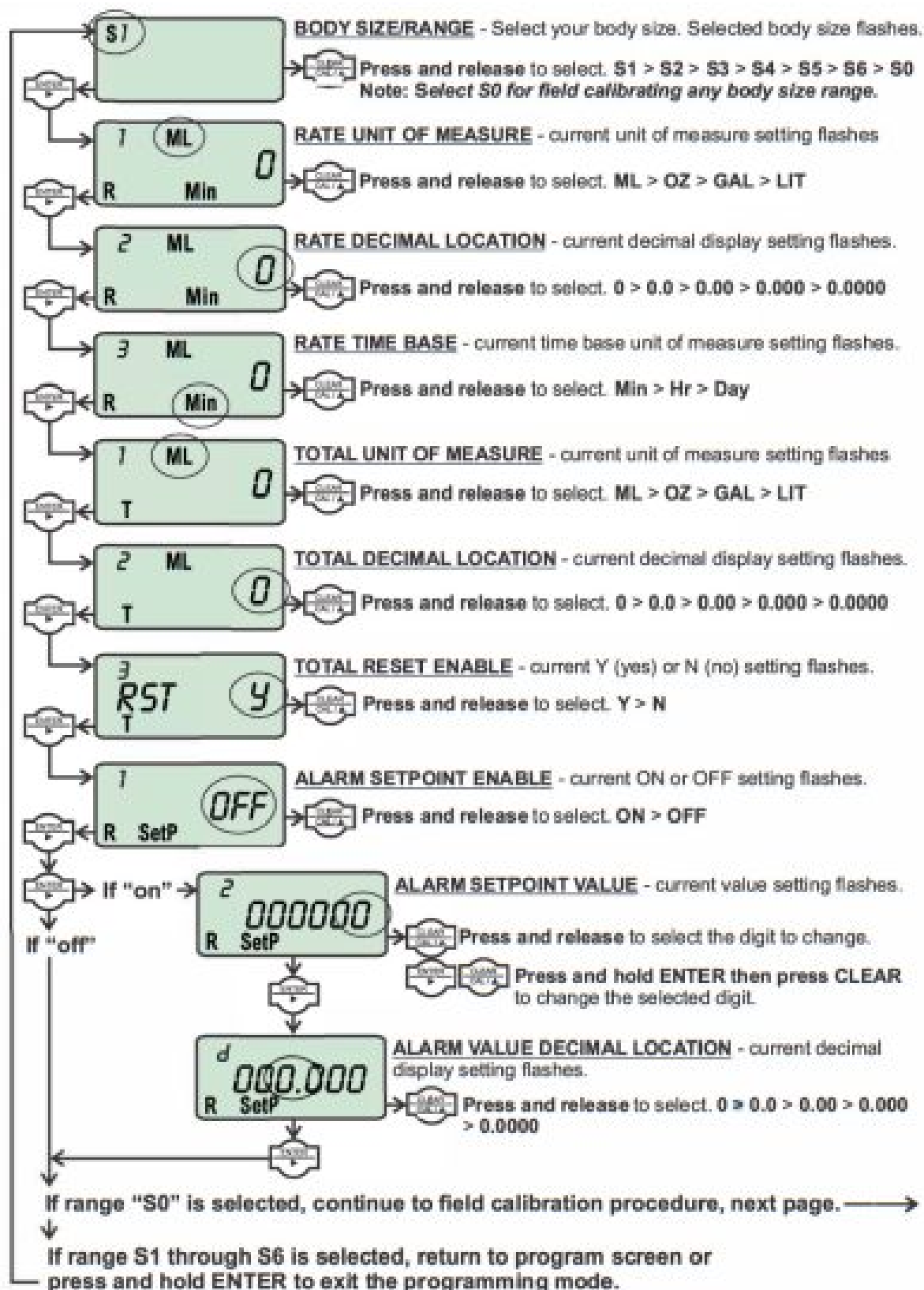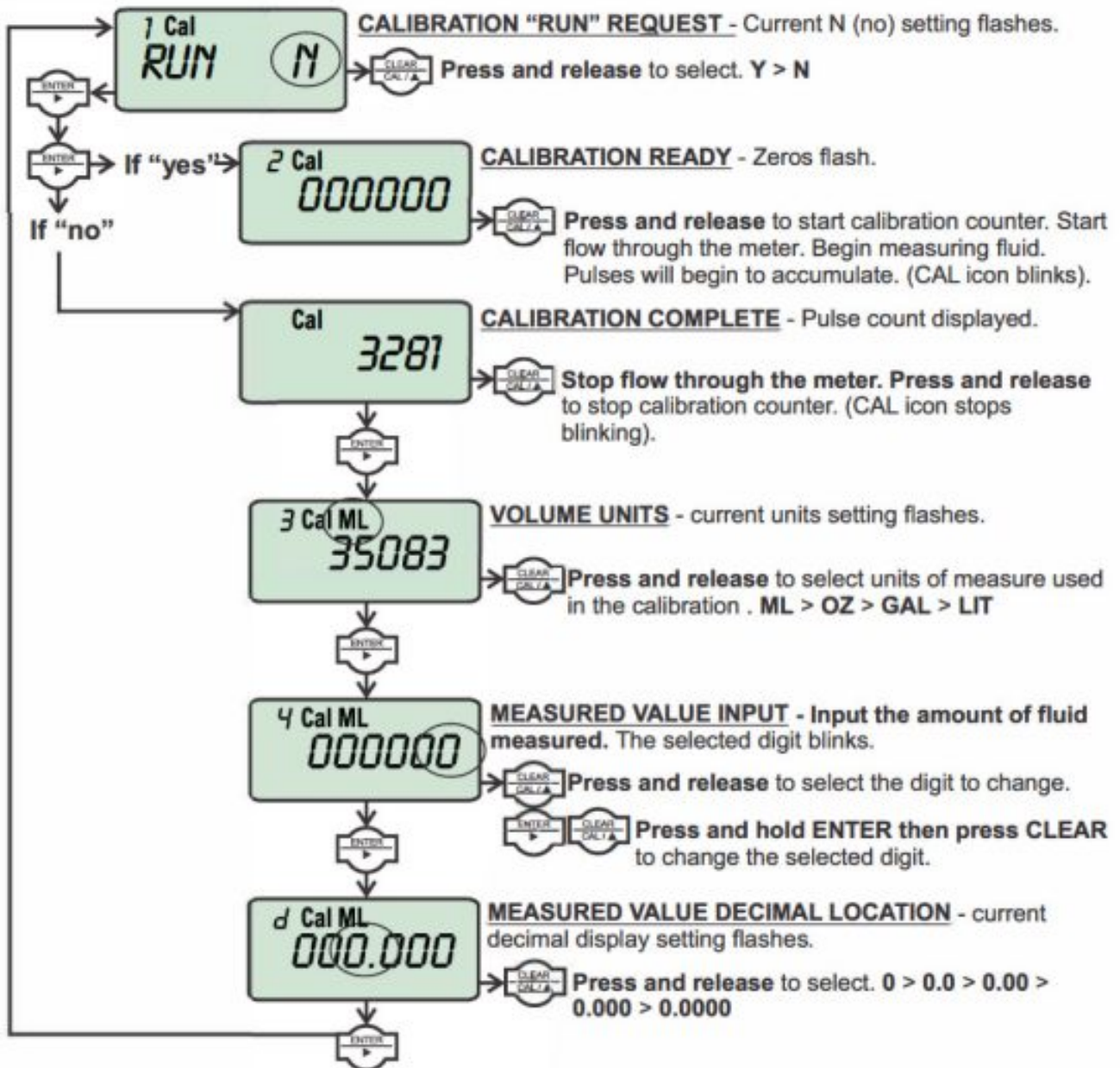
Field calibration size/range setting SO

– Continuation of programming sequence when range "SO" is selected.

The meter should be installed as intended in the application.

The amount of fluid that flows through the meter during the calibration procedure must be measured at the end of the calibration procedure.

Allow the meter to operate normally, in the intended application, for a period of time. A testing time of at least one minute is recommended. Note – the maximum number of pulses possible is 52,000. Pulses will accumulate in the display. After the test time period, Stop the flow through the meter. The pulse counter will stop.

Determine the amount of fluid that passed through the meter using a graduated cylinder, scale, or another method. The measured amount must be entered in calibration screen #4 "MEASURED VALUE INPUT."

CALIBRATION "RUN" REQUEST - Current N (no) setting flashes.

`1 Cal RUN (N)`

Press and release to select. **Y > N**

If "yes"

CALIBRATION READY - Zeros flash.

`2 Cal 000000`

Press and release to start calibration counter. Start flow through the meter. Begin measuring fluid. Pulses will begin to accumulate. (CAL icon blinks).

If "no"

CALIBRATION COMPLETE - Pulse count displayed.

`Cal 3281`

Stop flow through the meter. Press and release to stop calibration counter. (CAL icon stops blinking).

VOLUME UNITS - current units setting flashes.

`3 Cal ML 35083`

Press and release to select units of measure used in the calibration . **ML > OZ > GAL > LIT**

MEASURED VALUE INPUT - Input the amount of fluid measured. The selected digit blinks.

`4 Cal ML 000000`

Press and release to select the digit to change.

Press and hold ENTER then press CLEAR to change the selected digit.

MEASURED VALUE DECIMAL LOCATION - current decimal display setting flashes.

`d Cal ML 000.000`

Press and release to select. **0 > 0.0 > 0.00 > 0.000 > 0.0000**

Notes:

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 13 months from the date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture, or vibration; improper specification; misapplication; misuse, or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, THE PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance, and proper packaging to prevent breakage in transit.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,

2. Model and serial number of the product under warranty, and

3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,

2. Model and a serial number of the product, and

3. Repair instructions and/or specific problems relative to the product.

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