

## TROUBLESHOOTING AND REPAIR

Symptoms	Causes	Solution
Relays are not operating properly	Configuration	<ul style="list-style-type: none"> <li>Verify that both rotary switches are set to 0.</li> <li>Verify that the jumpers are set properly.</li> </ul>
	Calibration	Re-calibrate the unit.
Red LED is flashing once/second	Alarm condition	Set both rotary switches to 8 to view the alarm condition.
Red and Green LEDs flashing	GM tube failure	The number of flashes of the red and green LEDs indicates which GM tube failed (Example: 2 flashes = GM tube no. 2). Replace faulty GM tube.
Red LED flashes 8 times	Calibration failure	Re-calibrate the GM-17, increasing the percentage change in radiation.
Red LED flashes 2 times	EEPROM failure	<ul style="list-style-type: none"> <li>Follow the procedure to set the number of tubes.</li> <li>Power cycle the unit and verify that no errors are showing.</li> <li>Re-calibrate the unit.</li> </ul>

## FIELD REPAIR PROCEDURES

**Caution!** Use great care to prevent damage to the electrical components of the level switch. VEGA recommends appropriate electrostatic discharge procedures.

### To replace the circuit board

- Turn off power to the GM-17.
- Remove the 3 screws that hold the electronics bracket into the enclosure.
- Remove the electronics from the housing.
- Remove the 4 screws holding the tube-front plate.
- Remove the tube-front plate.
- Slide the GM tubes out of the circuit board and bracket.
- Verify that the O-ring on the GM tube remains on the tube.
- Remove the plastic cover on the back of the bracket.
- Remove the circuit board from the back of the bracket.
- Install the new circuit onto the back of the bracket.
- Install the plastic cover onto the bracket.
- Insert the GM tubes through the bracket to the circuit board.
- Ensure the pins of the GM tubes slide completely into the board's sockets.
- Ensure all GM tubes have an O-ring (between the bracket and the tube-front plate) around them.
- Install the tube-front plate.
- Install the electronics into the housing.
- Apply power the GM-17.
- Perform the procedure to configure new GM tubes.

### To replace the GM tubes

- Turn off power to the GM-17.
- Remove the 3 screws that hold the electronics bracket into the enclosure.
- Remove the electronics from the housing.
- Remove the 4 screws holding the tube-front plate.
- Remove the tube-front plate.
- Remove any GM tubes that need replacement.
- Insert the new GM tubes through the bracket to the circuit board.
- Verify that the GM tubes' pins slide completely into the board's sockets.
- Install the O-ring around the top of the GM tube.
- Verify that all GM tubes have an O-ring (between the bracket and the tube-front plate) around them.
- Install the tube-front plate.
- Install the electronics into the housing.
- Apply power to the GM-17.
- To install additional GM tubes, follow the procedure below to configure the circuit board for the new GM tubes.
- To replace GM tubes, the procedure is unnecessary.

### To configure new GM tubes

- Verify that the GM-17 is in a minimal radiation field.
- Set rotary switches S1 and S2 to 4.
- The red LED begins a sequence of 7 flashes that continues for 2 minutes.
- The green LED flashes to indicate that tube detection is complete.
- Set S1 and S2 to 0 to return to operating mode.
- Wait 10 seconds before performing any other operation or power cycling.

## PERIODIC MAINTENANCE

Follow this suggested schedule to prevent problems and to comply with radiation regulations.

- ✓ Recalibrate—As required by process conditions
- ✓ Source holder shutter check—Every 6 months unless otherwise required by the appropriate nuclear regulatory body
- ✓ Source wipe—Every 3 years unless otherwise required by the appropriate nuclear regulatory body

**Note:** No special cleaning is required. Refer to the GM-17 Installation and Operation Guide for further information concerning recalibration. Refer to the Radiation Safety Manual and Reference CD for further information concerning the shutter check and source wipe tests.

Description	Part Number
CPU board – configured for 110 VAC	243902
CPU board – configured for 220 VAC	245016
GM tube	244431
2A fuse on power supply*	244863

**Note:** When replacing the fuse, apply a rubber silicone sealant around the fuse and the holder to prevent the fuse from falling out due to vibration. VEGA recommends GE silicones RTV-167.

### VEGA Customer Service information

To request field service within the United States and Canada, call 513-272-0131. Customers outside of the United States and Canada should contact their local VEGA representative for parts and service.

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# VEGA

## GM-17 QUICK REFERENCE MAINTENANCE, DIAGNOSTICS, AND REPAIR GUIDE

Version 1.2



## SAFETY INSTRUCTIONS

Refer to the Radiation Safety Manual and Reference CD that came with your source holder.

Always refer to the safety instructions in this guide and the country specific installation standards. Follow the prevailing safety regulations and accident prevention rules of your company and country.

### General

There are no restrictions on the use of this instrument on the outside of closed metal vessels. The GM-17 should not be used in temperatures less than  $-40\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F}$ ) or greater than  $+70\text{ }^{\circ}\text{C}$  ( $+158\text{ }^{\circ}\text{F}$ ).

### CE conformity

The GM-17 level switch is in compliance with CE requirements for EMI/EMC per EN61000-4 and EN-50011.

### Safety information for EX areas

This equipment is suitable for use in the following environment:

- CSA Class I, Div 1, Groups B, C, & D
- CSA Class I, Div 2, Groups B, C, & D
- CSA Class II, Div 1 Groups E, F, & G
- CSA Class II, Div 2, Groups F & G
- CSA Class III Ta =  $-40\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$
- ATEX Certificate # FM06ATEX0007 II 2 G EExd IIB + H2 T6  
Ta =  $-40\text{ }^{\circ}\text{C}$  to  $+70\text{ }^{\circ}\text{C}$ , ATEX II D T80C IP66
- NEMA Type 4X IP66
- Non-hazardous locations

### Special installation, maintenance, or operating instructions

If it is necessary to open the sensor, the following warning applies:

**EXPLOSION HAZARD** - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

**Caution!** Open circuits before removing cover. An explosion-proof seal shall be installed within 450 mm (18") of the enclosure (including division 2 installations).

**Warning!** To avoid electrostatic discharge, wipe enclosure with a damp cloth.

**Warning! Explosion hazard** – Substitution of components may impair stability for Class I, Division 2.

## GAUGE DIAGNOSTICS

The GM-17 unit alerts you to detector problems by:

- De-energizing the fail safe relay (if the unit's K2 relay is configured for fail safe operation)
- Flashing the status LED red instead of green

The GM-17 can detect these errors:

- GM tube failure
- EEPROM corruption
- Calibration failure

### Relays

Relay	Normal Condition	Alarm Condition
K1 = process relay ▪ SPDT (Form C)	Energized	De-energized
K2 = process relay (jumper PROCESS/FAIL (K2) is on) ▪ SPDT (Form C)	Energized	De-energized
K2 = gauge alarm indicator (jumper PROCESS/FAIL (K2) is off)	Energized	De-energized √ GM tube failure √ Calibration failure

The red and green RLYS LEDs near the 2 relays indicate the relays' status.

LED Color	ON	OFF
Green		
Process relay K1	Energized	De-energized
Red		
Fail safe alarm relay K2	Energized	De-energized

### Relay test

#### To simulate process alarm condition

- Set rotary switch S1 to 1 and S2 to 5

Both relays turn on simultaneously.

The relays stay energized until the switches change.

- Set S1 and S2 to 0 to return to operating mode.

#### To simulate normal process condition

- Set rotary switch S1 to 2 and S2 to 5

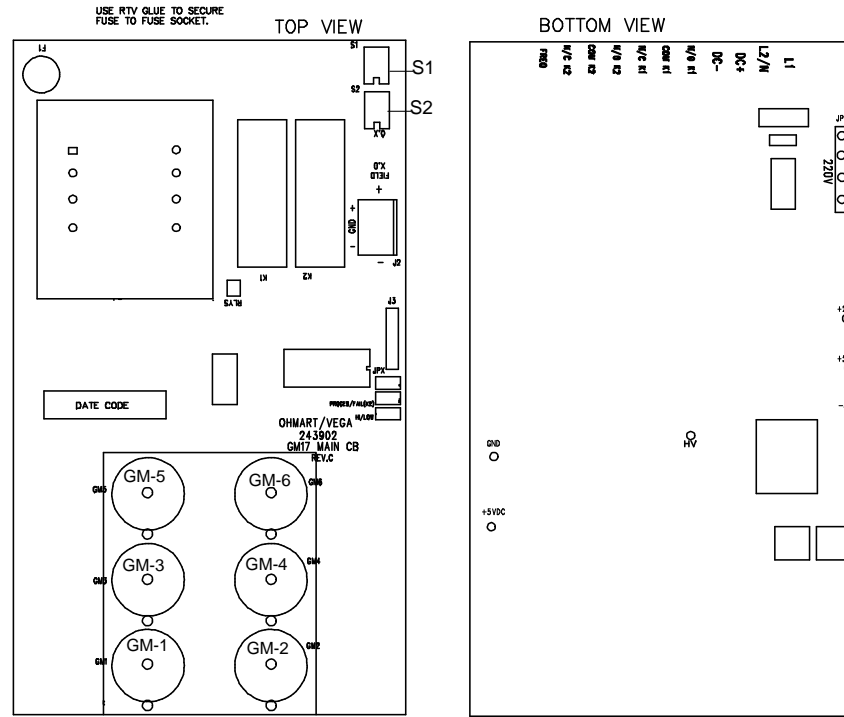
Both relays turn off simultaneously.

The relays stay de-energized until the switches change.

- Set S1 and S2 to 0 to return to operating mode.

#### GM-17 terminal pins and functions

Pin	Description	Function
1	L1	AC power input
2	L2/N	AC power input
3	+	DC power input
4	-	DC power input
5		normally open contact
6	Process relay K1	common contact
7		normally closed contact
8		normally open contact
9	Fail Safe Alarm Relay K2	common contact
10		normally closed contact
11		Frequency output



### Rotary switches

Two rotary switches, identified as S1 and S2, are used to setup and configure the GM-17. Switch S1 is located next to the terminal block receptacle. Switch S2 is located below S1. The function starts five seconds after changing the rotary switches. Refer to the GM-17 Installation and Operation guide for full descriptions of the rotary switch functions.

**Caution!** In order to monitor the process and activate the process relay, both rotary switches (S1 and S2) must be set to position 0. When you change the switch positions to anything other than 0 and 0, the process relay will de-energize.

S1	S2	Function
0	0	Operating mode
X*	1	Perform a single point calibration
1	2	Perform a low process calibration for a 2-point calibration
2	2	Perform a high process calibration for a 2-point calibration
3	2	Calculate results for a 2-point calibration
X	3	Set the calibration hysteresis value (60% is the default)
4	4	Program number of tubes installed in unit
1	5	Relay test - energize both relays
2	5	Relay test - de-energize both relays
5	5	Show active tubes
6	5	Show low cal counts
7	5	Show high cal counts
8	5	Show calibration operating time interval
8	8	Show diagnostic information

\*X=Any position

### Status LED indicators

The flashing sequence of these red and green LEDs (near the rotary switches) indicates the gauge's status. When the GM-17 is operating normally (both switches in position 0), the status LED flashes green once/second. If the GM-17 unit detects a problem, the LED flashes red once/second. To determine the reason for the error, set both switches to position 8. The status LED flashes to indicate the failure condition.

Position of Switch	LED Color	Flashes	Status
S1 S2			
0 0	Green	1/second	Operating
0 0	Red	1/second	Failure
X 3	Green	6	Hysteresis setting is complete.
4 4	Green	7	Number of tubes setting is complete

Position of Switch	LED Color	Flashes	Status
4 4	Red	7	Determining no. of tubes
1 2	Red	2	2-point calibration - low level
2 2	Red	3	2-point calibration - high level
X 1	Red	5	1-point calibration
3 2 or X 1	Red	8	Calibration error
8 8	Red	2	EEPROM corrupt: all setup and calibration data are reset.
8 8	Red	8	Calibration failure: the calculated operating time > 2 minutes.
8 8	Red and Green	1-6	The number of flashes indicates the tube that failed.
8 8	Red and Green	10	All tubes failed.

### Test Points

Test Point	Description
+5.3V	+5.3V power supply voltage
-5.2V	-5.2V power supply voltage
J3 pin 1	5V power supply voltage
J3 pin 2	Ground reference

### To verify the number of active tubes

- Set rotary switches S1 and S2 to 5
  - The red LED begins a flashing sequence to show the active tubes.
  - The number of flashes corresponds to the tube's number.
  - There is a pause after each tube's flashing sequence. Example: If the GM-17 activates tubes 1 and 3, the LED flashes once for tube 1, pauses, and flashes 3 times for tube 3.
  - The flashing sequence continues until the rotary switches change.
- Set S1 and S2 to 0 to return to operating mode.

**Note:** Calibration counts can be determined by the flashing sequence of the LEDs.

- Red and Green LEDs flash simultaneously = 100s
- Red LED = 10s
- Green LED = 1s
- There is a pause after each flashing sequence.
- The flashing sequence continues until the rotary switches change.

### To verify the low process calibration count

- Set rotary switch S1 to 6 and S2 to 5

The LEDs begin a flashing sequence to show the calibration value:  
Example: If the GM-17 is calibrated with a low process count value of 135, the red and green LEDs flash simultaneously once, the red LED flashes 3 times, and the green LED flashes 5 times.
- Set S1 and S2 to 0 to return to operating mode.

### To verify the high process calibration count

- Set rotary switch S1 to 7 and S2 to 5

The LEDs begin a flashing sequence to show the calibration value as seen in the above procedure.

  - Example: If the GM-17 is calibrated with a high process count value of 26, the red and green LEDs do not flash simultaneously, the red LED flashes twice, and the green LED flashes 6 times
- Set S1 and S2 to 0 to return to operating mode.

### To verify the calibration operating time

- Set rotary switch S1 to 8 and S2 to 5

The LEDs begin a flashing sequence to show the time value.

  - Example: If the GM-17 is calibrated with an operating time value of 15 seconds, the red and green LEDs do not flash simultaneously, the red LED flashes once, and the green LED flashes 5 times.
- Set S1 and S2 to 0 to return to operating mode.