MGL Avionics EFIS

Lycoming Engine Sender Installation Guide

This manual is intended to be a Quick Reference for installing certain engine senders on a Lycoming engine.

It should be seen as a supplement to the MGL Avionics EFIS Installation Manual, the RDAC Installation Manual, and the Installation Sheets provided with the UMA Tach Sender, UMA Fuel Pressure Sender, and Floscan and EI Red Cube Flow Senders.

Where shown, Sender setups are correct for the type of sender being shown to be installed, and all setups should be made as shown. However, temperature and pressure parameters are shown for an example Lycoming IO-360 engine, and should just be used as a guideline. Your aircraft/engine manual is the correct reference for all parameters.

Use these sender settings – not these parameters!
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RDAC mounted high on the firewall, away from exhaust, on standoffs to prevent contact with the firewall.

Oil Pressure sender mounted with clamp to the firewall.

Oil Temp sender.
RDAC Installation

- **RDAC Power and Ground wires**
- **RDAC Data Line** – run through grommet in firewall to EFIS
- **Craft bus for connecting RDAC Ground (Black Supply Wire) as well as all sender Ground wires directly to Engine Block and each other.**
- **Heavy gauge Ground wire run directly to Engine Block – very important.**
RDAC Installation Notes

• Mount RDAC on standoffs to keep off the firewall
• Mount RDAC high up to keep away from exhaust

**Install a Ground and Power Bus and connect Ground side to Engine Block with heavy gauge wire. Important!** Without this many of the engine senders will not read correctly.

• Connect RDAC Ground (Black Ground supply line out of the top of the RDAC) directly to this bus
• Connect all Ground wires from any engine senders requiring a Ground to this bus
• Take Power for RDAC from Secured Power Output from the back of the EFIS if you want the RDAC to be powered by the EFIS backup battery during power failure. If no backup battery present, power RDAC from Avionics/EFIS Master. Use the Power side of this bus to power RDAC and all engine senders that require power

**OAT Probe (outside/ambient air temp probe)**

• Although the OAT Probe is not part of the RDAC installation, it is shown here since its installation needs to be considered.
• The OAT probe should be installed preferably out of the sun (such as under a gear fairing as shown here), and away from any exit air from the engine cowling (or exhaust)
• The OAT probe wires should be routed as far away as possible from any RF (Radio and Transponder) power/ground leads or antennas and coax
EGT Probe Installation

- Install the EGTs between 2 and 4 inches down the exhaust pipes (based on engine manufacturer recommendations)
- Make sure EGTs do not protrude into cowling
- Use ‘EGT, Small Clamps’ on most installations. When pipes are greater than 1 ½” diameter, then ‘EGT, Large Clamps’ are recommended
- Drill a ¼” hole for clamp-type probes
- Use Thermocouple Channels TC1 through TC4 if you have a 4-cyl engine. Use TC1 through TC6 if you have a 6-cyl engine.
- Remember that all EGTs are type K thermocouples and that Yellow is Positive and Red is Negative
- Extend EGT leads if necessary with type-K extension wire (see instructions later in manual)

Wiring:
Connect to Thermocouple Channels TC1 and upwards (no gaps)

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Positive</td>
</tr>
<tr>
<td>Red</td>
<td>Negative</td>
</tr>
</tbody>
</table>

**EGT setup menu**

- Number of EGT channels: 4
- Highest temperature for display: 1600
- Alarm temperature: 1600
- Caution temperature: 1499
- Caution low temperature: 662
- Alarm low temperature: 662
- Lowest temperature for display: 662
CHT Probe Installation

- Screw 3/8-24 Threaded CHT probes into recesses in cylinders (no washers required)
- Use Thermocouple Channels TC5 through TC8 if you have a 4-cyl engine. Use TC7 through TC12 if you have a 6-cyl engine.
- Remember that some CHTs are type-J thermocouples (these can be used). MGL Avionics supplies only type-K thermocouples
- Remember that with type-K thermocouples that Yellow is Positive and Red is Negative

**Wiring:**

Connect to Thermocouple Channels starting from first available (not used by EGTs) and upwards (no gaps)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td>Positive</td>
</tr>
<tr>
<td>Red</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Parts Required:

- 4 x CHTBAYO, Extension Wire

<table>
<thead>
<tr>
<th>CHT setup menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Type: Thermocouple CHT probes</td>
</tr>
<tr>
<td>2 K-Type thermocouples</td>
</tr>
<tr>
<td>3 Number of CHT channels: 4</td>
</tr>
<tr>
<td>4 Highest temperature for display: 500</td>
</tr>
<tr>
<td>5 Alarm temperature: 500</td>
</tr>
<tr>
<td>6 Caution temperature: 436</td>
</tr>
<tr>
<td>7 Caution low temperature: 149</td>
</tr>
<tr>
<td>8 Alarm low temperature: 122</td>
</tr>
</tbody>
</table>
Extending CHT and EGT Probes

- MGL Avionics instruments feature cold-junction compensation, which means that the temperature of the cold junction of the thermocouple is measured (at the RDAC) and this temperature is used to compensate for ambient temp with the small voltage readout between the 2 alloys in the thermocouple. For this reason it is important that type-K thermocouples are extended with type-K extension wire directly to the RDAC.
- You can use the same extension wire for CHTs or EGTs.
- Length is not critical – you can use different lengths (within reason) and there will be no noticeable difference in temp reading.

Our CHT extension kit includes type-K thermocouple wire, splice barrels, and a length of meltable-inner heat shrink tubing. This heat shrink gets quite soft inside when it is heated up, and this eliminates all air inside the splice and makes an airtight seal. We use Raychem SCL-3/16 heat shrink.

1. Strip the CHTs and make little loops with the ends. Do the same with the type-K extension wire. Prepare the splice barrels and heat shrink.

2. Place a splice barrel and short length of meltable-inner shrink wrap on the wires. Lay the CHT and type-K extension loops over each other.

3. Slide the splice barrel over the parallel loops.

4. Crimp the splice barrel with a crimping tool (use a crimping tool with a grip for non-insulated terminals – the ones that have a cradle on one side and pierce a small hole on the other).

5. Slide the meltable-inner heat shrink over the splice and heat with a heat gun or lighter.

6. That is a solder-free, airtight and airless parallel thermocouple splice. Repeat as necessary.
Oil Temperature Probe Installation

- Screw in 5/8-18 UNF Threaded Westach Oil Temp sender as shown, with crush washer
- Use adapter fitting if required
- Sender has 2 black wires (interchangeable) – connect one wire to Oil Temp input and the other to RDAC Ground
- Note that EFIS will read 32 deg F (0 deg C) until you reach operating temp of 70 deg F

Wiring:

Connect 2 black wires (any way) as follows

<table>
<thead>
<tr>
<th>Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Oil Temp Input</td>
</tr>
<tr>
<td>Black</td>
<td>RDAC Ground</td>
</tr>
</tbody>
</table>

Parts Required:
1 x Westach Oil Temp Sender

OIL temperature setup

- Probe type: Westach probe
- Highest temperature for display: 259
- Alarm temperature: 245
- Caution temperature: 245
- Caution low temperature: 121
- Alarm low temperature: 40
- Lowest temperature for display: 40
• VDO Oil Pressure sender has 1/8” NPT male threads
• Sender either has 1 terminal (VDO 360-004) or 2 terminals (VDO 360-025)
• If sender has 1 terminal, it is Signal and the Case of the sender must be grounded to RDAC Ground by clamping or brazing a wire to the case
• If sender has 2 terminals, G is Signal and WK is not used (case is still Ground)
• Run a hose off the oil supply with a female 1/8” NPT fitting and connect to Oil Pressure sender

Wiring:

Connect Signal and Ground as follows:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Oil Pressure Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case or Ground terminal</td>
<td>RDAC Ground</td>
</tr>
</tbody>
</table>
Manifold Pressure

- You can take a manifold pressure line off one of the manifold ports on a cylinder, but this can cause some pulsing on the line and the sensor is very sensitive and will not display smooth readings. If you do this, using a restrictor/damper (with a small hole) will help prevent pulsing.
- If you can access the intake plenum under the engine that will yield best results.
- Use high temp fuel line and fittings to run a pressure line from the intake plenum to the RDAC Manifold Pressure port.
- Once installed, use the setup to calibrate the Manifold Pressure reading until it reads ambient pressure (not to be confused with altimeter setting).

<table>
<thead>
<tr>
<th>Manifold pressure setup</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probe calibration:</strong> +0.04 &quot;HG</td>
</tr>
<tr>
<td><strong>Highest pressure for display:</strong> 44.29 &quot;HG</td>
</tr>
<tr>
<td><strong>Alarm high pressure:</strong> 41.34 &quot;HG</td>
</tr>
<tr>
<td><strong>Caution high pressure:</strong> 35.44 &quot;HG</td>
</tr>
<tr>
<td><strong>Caution low Pressure:</strong> 29.54 &quot;HG</td>
</tr>
<tr>
<td><strong>Alarm low Pressure:</strong> 27.77 &quot;HG</td>
</tr>
<tr>
<td><strong>Lowest pressure for display:</strong> 26.59 &quot;HG</td>
</tr>
</tbody>
</table>
Fuel Flow Sender Installation

- Whether you use the Floscan or the FT-60 Red Cube, the wiring is the same.
- **A pullup resistor of 5,600 ohms is required between signal and 5V (or 12V). Without this resistor the fuel flow will not work.**
- Thread size on input and output side is ¼” NPT Female on both Floscan and Red Cube.
- Install sender as per instructions supplied with sender.
- K-factor on Red Cubes is always 18,000.
- K-factor on Floscans is the calibrated number on the Tag x 10 / 3.785. This is normally around 9,100.

**Wiring:**

<table>
<thead>
<tr>
<th>Wire</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>12V Power</td>
</tr>
<tr>
<td>Black</td>
<td>RDAC Ground</td>
</tr>
<tr>
<td>White</td>
<td>Fuel Flow input (with 5,600 ohm resistor to Power)</td>
</tr>
</tbody>
</table>

**Fuel flow setup menu**

1. Flow sender RDAC one enable
2. Flow sender type RDAC One: Turbine
3. Flow sender RDAC one K Factor: 18000
4. FF1 and FF2 are independent flow systems
5. Highest flow for display: 19.9 US Gallons
6. Fuel flow high alarm: 9.3 US Gallons
7. Fuel flow high caution: 8.0 US Gallons
8. Fuel flow low caution: 1.7 US Gallons

**Manifold Pressure line connected with fitting to intake plenum below engine.**
Tach Setup

- Remove the vent plug on either magneto. Use the vent plug that is closest to the drive side (see picture below). The other vent plug will not produce results.
- Install the T1A9-x into the magneto using thread locker, Loctite 242 or equivalent. Hand tighten plus 1/6th of a turn. Be careful not to overtighten and strip the magneto housing.
- The unit provides 1 pulse per revolution on 4-cylinder, 2 pole magnetos, which are the most common. The unit provides 3 pulses per 2 revolutions (1.5 pulses per revolution) on 6-cylinder, 2 pole magnetos, which are the most common.
- It may be necessary to remove the RDAC jumper labelled “BALLAST” to get a good reading.

**Parts Required:**
- 1 x UMA T1A9-1 (for Slick)
- or T1A9-2 (for Bendix)
- tach sensor

**Wiring:**

<table>
<thead>
<tr>
<th>Wire Color</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red (or Orange/White)</td>
<td>12V Power</td>
</tr>
<tr>
<td>Black (or Blue/White) AND Shield</td>
<td>RDAC Ground</td>
</tr>
<tr>
<td>White Wire</td>
<td>Rev Input on RDAC</td>
</tr>
</tbody>
</table>

**RPM setup menu**

- RPM. Pulses per revolution: 1.0
- RPM scale for display: 3000
- RPM alarm level: 2000
- RPM caution level: 2700
- RPM caution level: 500
- RPM alarm level: 500
- Lowest RPM for display: 500
Fuel Pressure

- Follow mounting instructions with sensor
- Pressure fitting on the sensor is 1/8" NPT Female (needs male NPT fitting on fuel pressure hose).
- Outer thread is for optional mounting use and is 5/8-18

Use MGL Avionics Modification “(M)” UMA Fuel Pressure Sensors Only (or any resistive pressure sender):

Typically used for **Injected Engines**:
100 PSI Fuel Pressure Sender - **UMA N1EU100G(M)**

Typically used for **Carbureted Engines**:
35 PSI Fuel Pressure Sender - **UMA N1EU35G(M)**

There are 3 possible locations for connecting the signal line of the Fuel Pressure Sensor to the RDAC. Use whichever is available, preferably CHT1/WT/AUX3:

- **CHT1/WT/AUX3**
- **CHT2/CARB ICE/AUX4**
- **Fuel Level 2**

Your setup should reflect the correct Probe Type (linear, voltage, 0.5-4.5V), Correct Location, and Correct Pressure range:

<table>
<thead>
<tr>
<th>Fuel pressure setup menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Probe type: linear, voltage 0.5-4.5V</td>
</tr>
<tr>
<td>2. Location CHT2/FP</td>
</tr>
<tr>
<td>3. Probe pressure range: 100.0 PSI</td>
</tr>
</tbody>
</table>

**Wiring:**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Red (or Orange/White)</td>
<td>12V Power</td>
</tr>
<tr>
<td>Black (or Blue/White)</td>
<td>RDAC Ground</td>
</tr>
<tr>
<td>AND SHIELD</td>
<td></td>
</tr>
<tr>
<td>White Wire</td>
<td>One of the 3 possible inputs:</td>
</tr>
<tr>
<td></td>
<td>- CHT1/WT/AUX3</td>
</tr>
<tr>
<td></td>
<td>- CHT2/CARB ICE/AUX4</td>
</tr>
<tr>
<td></td>
<td>- Fuel Level 2</td>
</tr>
</tbody>
</table>