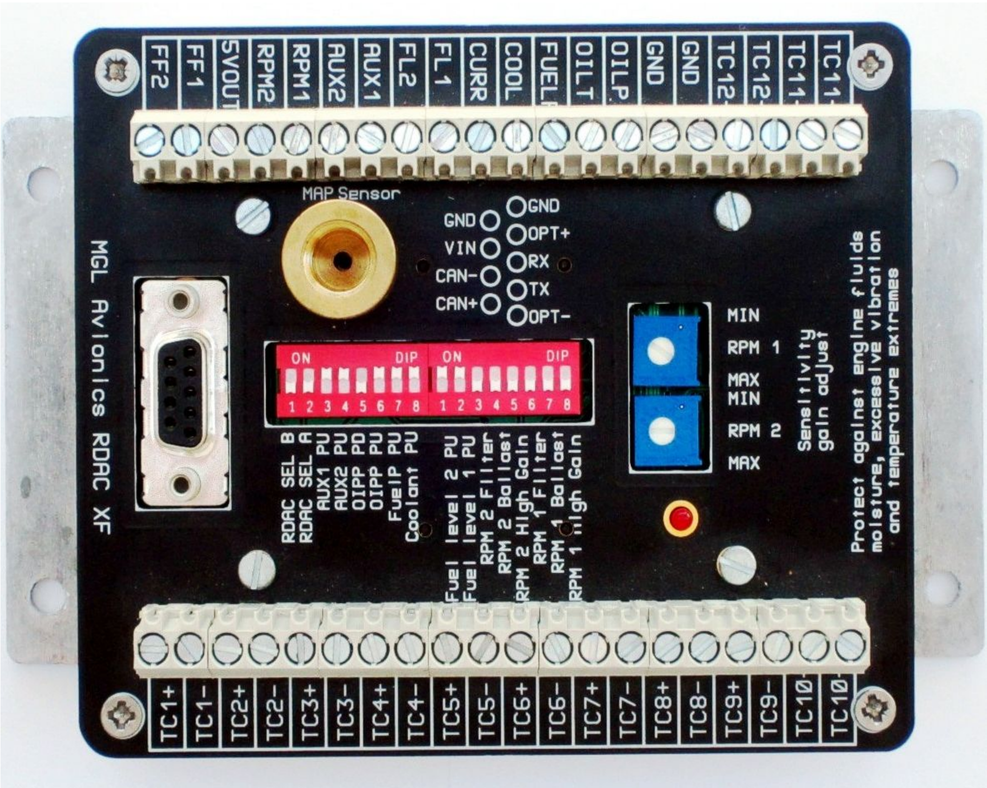
RDAC XF

RDAC XF and RDAC XF MAP

RDAC XF MAP version has a map sensor fitted.



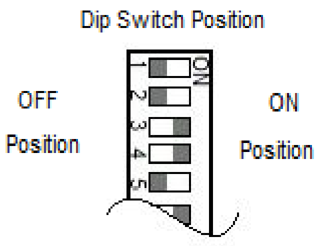
Input Connections

TC 1 to 12	Inputs for use with thermocouple temperature probes. Typcally used for EGT probes (K-types) and CHT probes (K or J types). Can also be used for other types of temperature monitoring depending on abilities of connected system.
GND	Grounding point. Connected to the engine block, also used as ground for sensors not electrically connected to the engine itself such as flow senders and current senders.
OIL P	Oil pressure sender
OIL T	Oil temperature sender
FUEL P	Fuel pressure sender
COOL	Coolant temperature sender
CURR	Electrical current sender (Example: MGL magnetic current sender)
FL 1	Fuel level sender for tank 1
FL 2	Fuel level sender for tank 2
AUX 1 & AUX 2	Auxiliary inputs. Used for example for Rotax 912/914 NTC type CHT probes
RPM 1	Engine RPM input 1
RPM 2	Engine RPM input 2 (also used for Rotor RPM for some systems)
5V OUT	5V DC supply output. Intended only for low current users (30mA maximum). Typically used as supply point for MGL fuel flow senders.
FF 1	Fuel flow sender 1
FF 2	Fuel flow sender 2 (also used for tank return flow sender in a differential flow installation)
MAP Sensor	This 1/8” NPT fitting connects to an internal MAP pressure sensor (Range: 0.2 – 2.5 Bar). Optional, fitted to RDAC XF MAP

DB9 Connections

pin 1 OPT-	Used only with EFIS systems fitted with a three way RDAC connector. Connect to “- or Ground” of RDAC connector.
pin 2 TX	RS232 TX line. Used for OEM applications only.
pin 3 RX	RS232 RX line. Used for OEM Applications only.
pin 4 OPT+	Used only with EFIS systems fitted with a three way RDAC connector. Connect to center connector (signal) of RDAC connector.
pin 5 GND	Ground. Connect this to engine block (and engine block to battery negative). Do not connect directly to battery negative. This must be routed via the engine block.
pin 6 CAN+	CANH signal line to EFIS
pin 7 CAN-	CANL signal line to EFIS
pin 8 VIN	+12V supply from battery via power switch / circuit breaker and fuse if required.
pin 9 GND	Ground. Connect this to engine block (and engine block to battery negative). Do not connect directly to battery negative. This must be routed via the engine block. This terminal may be left unconnected if desired, it is connected to pin 5 internally.

DIP Switches



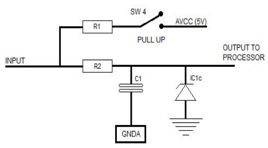
RDAC SEL B & RDAC SEL A	These switches are used to assign each RDAC in the system with an ID number. up to four RDACs can be connected at the same time on the CAN interface. Note: set both switches to “off” for a single RDAC installation.
AUX 1 PU	used to pull the AUX 1 sensing line high
AUX 2 PU	used to pull the AUX 2 sensing line high
OIPP PD	used to pull the OILP line low
OIPP PU	used to pull the OILP line high
Fuel P PU	used to pull the Fuel Pressure sensing line high
Coolant PU	used to pull the Coolant sensing line high
Fuel level 2 PU	used to pull the Fuel level 2 sensing line high
Fuel level 1 PU	used to pull the Fuel level 1 sensing line high
RPM 2 Filter	Adds a high frequency filter to the signal

	path
RPM 2 Ballast	used when the RPM 2 signal line requires a 220 ohm ballast resister to ground
RPM 2 High Gain	used when the RPM 2 signal needs a High Gain (increases signal sensitivity approximately by a factor 10)
RPM 1 Filter	Adds a high frequency filter to the signal path
RPM 1 Ballast	used when the RPM 1 signal line requires a 220 ohm ballast resister to ground
RPM 1 High Gain	used when the RPM 1 signal needs a High Gain (increases signal sensitivity approximately by a factor 10)

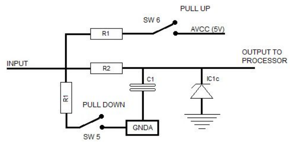
PD = pull down resister

PU = pull up resister

<u>This drawing illustrates the pull up resister circuit</u>



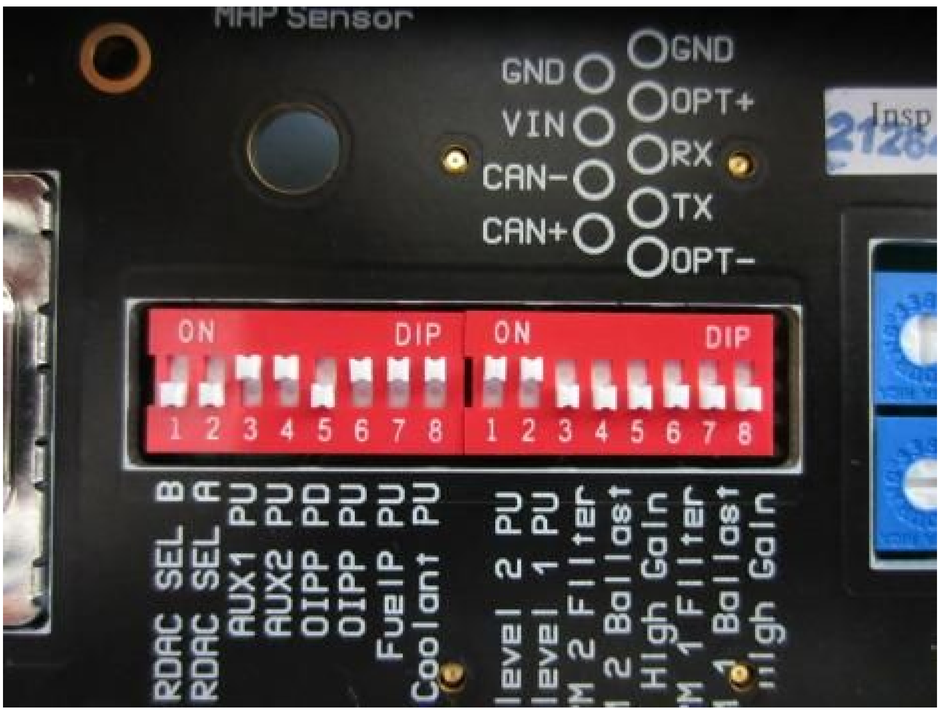
<u>This drawing illustrates the pull up and pull down resister circuit for the oil pressure</u>



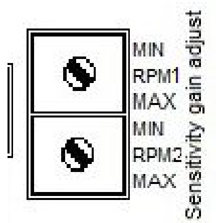
These circuits shows how the various PU switches feeds 5 volt onto the input(sense) line if required. <u>Please check the senders information for type and settings needed.</u>
The 2nd circuit shows a pull down circuit that has a 100Ω load resister switched to GND. This intended for use with the Rotax 4-20 mA oil pressure sender. The white wire is connected to the OILP input on the RDAC XF. The OILP PD switch must be in the ON position and the OIL PU switch must be in the OFF position.

Passive senders such as resistive temperature and pressure senders will require the pull-up resistor to be "ON". If you are using active senders (mostly used as electronic pressure senders) please switch the pull-up resistor "OFF".

Default settings for most installations (assuming the Rotax 4-20mA sender is not used):



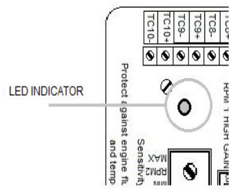
Sensitivity gain adjust



RPM 1 MIN MAX	Adjusts sensitivity of the RPM1 input
RPM 2 MIN MAX	Adjusts sensitivity of the RPM2 input

Sensitivity to input signals on the RPM inputs can be adjusted over a wide range I two switchable ranges (via the DIPSwitch selection, high and low range).

Highest sensitivity achievable is around 0.4V peak to peak in high gain and 4V peak to peak in low gain. From this level, the trimmers can be used to reduce the gain over a very wide range to around 50V peak to peak or higher depending on trimmer setting.



Indicator

The green LED flashes at about 1Hz during operation. If the LED is steady "ON" there is a serious fault with the RDAC and it cannot operate. If the LED is "OFF" the RDAC is not being supplied with power or there is a serious fault with the RDAC.

INSTALLATION

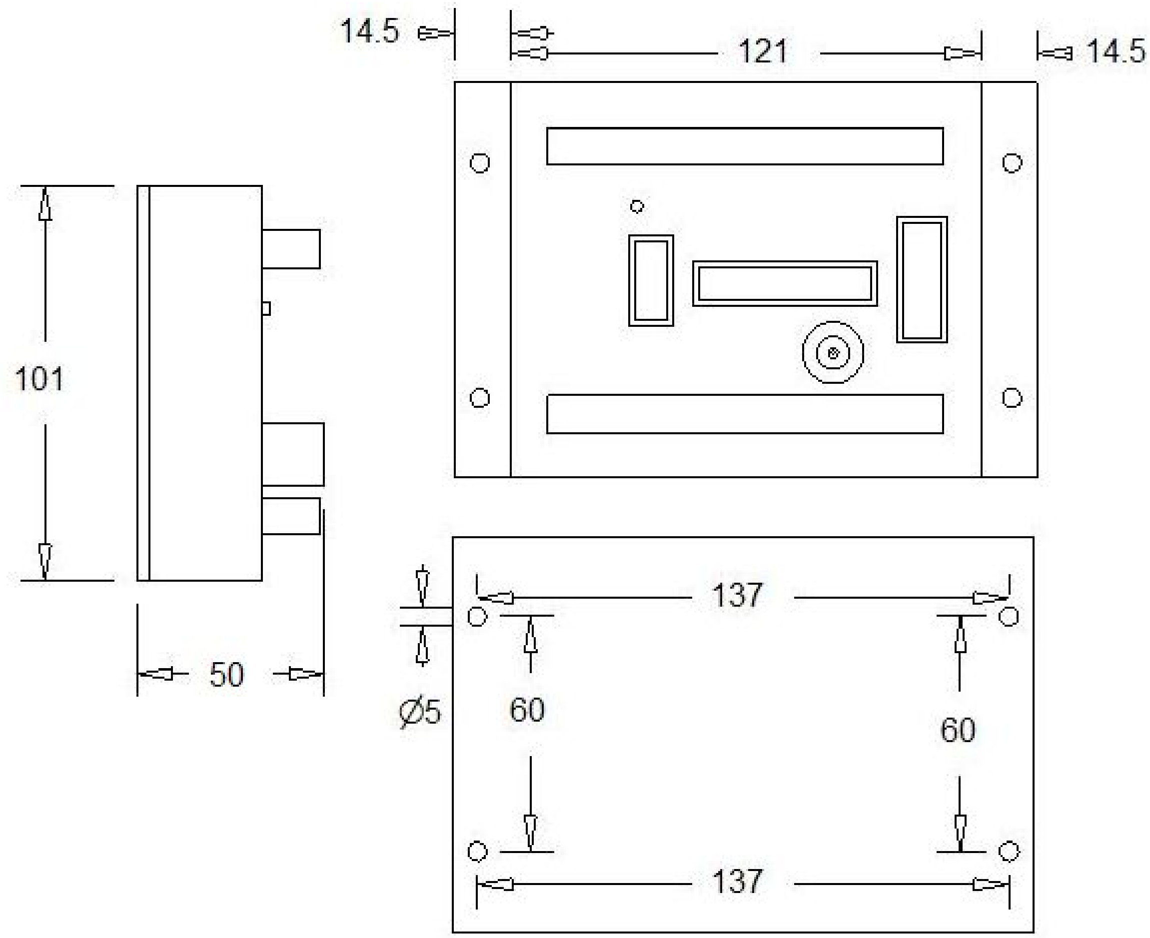
Precautions
Note that the unit is not waterproof, when installing the unit in a location where it will be exposed to fluids it is advisable to install it in an enclosure(box)

This unit is intended for mounting on the aircraft's fire-wall,engine side.
The unit is ***not*** designed for mounting directly to the engine!
Excessive vibration , moisture and temperature extremes will damage the RDAC or shorten its life span.

Advisory !

Once installation is complete and all setups regarding RDAC XF are done, it is important for the dip switches and sensitivity gain adjustment to be covered (Suggestion: clear self adhesive film)
This is to prevent dust and moisture getting in to the switches, variable resisters and other components.

RDAC XF DIMENSIONS



WIRING

It is important to connect the RDAC ground wire to the engine block. Failure to do so will result in the readings from the engine sensors to be incorrect. Please note that the following steps need to be done correctly otherwise unit may function incorrectly or damage could result from bad installation. Take care to insulate all exposed connections. Plan your wire routings carefully to minimise **chaffing** of cables. The engine compartment may get hot so use suitable wire.
Make neat connections with minimal exposed wire showing from connectors. If you are not sure, then ask for advise from an AMO.

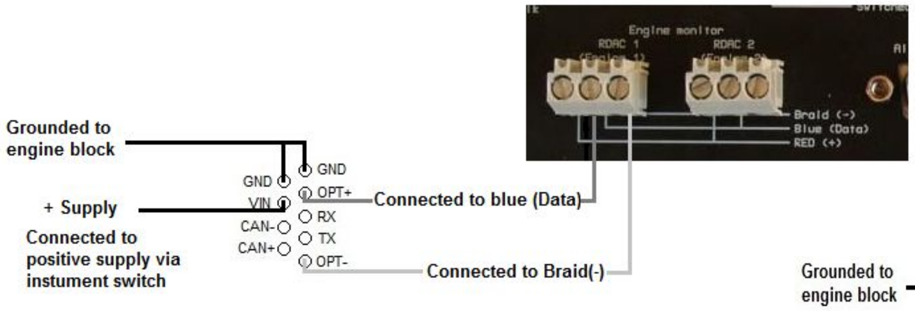
Connecting to EFIS / I-EFIS

Connecting the RDAC to an EFIS / IEFIS can be done in one of three ways.
The ENIGMA, VOYAGER and ODYSSEY G1 EFIS units can only use the OPT connection.
OPT (optical) is the the connection that is used on the EFIS units and connects to the RDAC1 input on the back of the units.

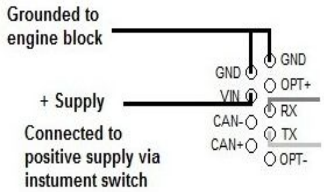
The ODYSSEY G2(pending relevant software updates) and the IEFIS systems use only the CAN interface.

XTreme EFIS, XTreme EMS can use one RDAC XF connected via CAN interface.

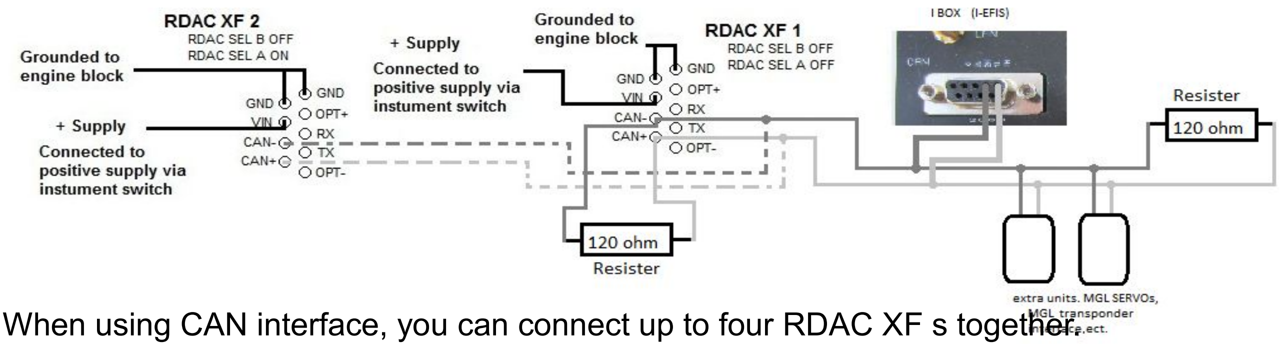
Connection to an ENIGMA, VOYAGER or ODYSSEY G1 and G2



The RDAC XF has a RS232 connection .
This connection is only used for OEM and 3rd party applications and is not used with any of MGL systems!



Connections to an ODYSSEY G2 and I-EFIS units



When using CAN interface, you can connect up to four RDAC XF s together.

Observe the polarity of the two CAN wires. One of the lines is called “CAN-” or “CANL”, the other “CAN+' or “CANH” depending on equipment. It is recommended that a twisted pair wire is used for this connection using two wire colors for ease of identification. The CAN bus must be terminated at each end with a 120 ohm resistor. Connections from equipment into the CAN bus (other than the ends) must only use short stubs into the bus (maximum length of a stub should not exceed 20cm if possible).
It is OK to use only a single resistor of value 60-120 ohms if the total length of the CAN bus is not more than two meters (6 feet).

You will need to set the RDAC SEL switches to the correct order so the ODYSSEY G2 and IEFIS depending on the number of RDAC units you have on your bus. Normally, only a single unit is used and thus the two SEL switches are set to “off”.

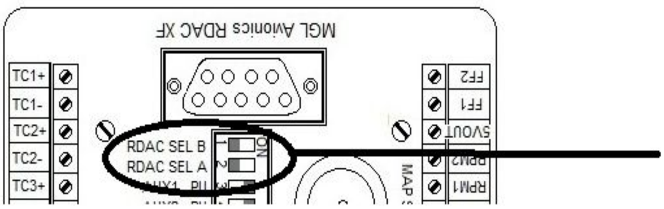


Table for Rdac number

RDAC	ID	A	B
rdac	1	off	off
rdac	2	on	off
rdac	3	off	on
rdac	4	on	on

The CAN bus will typically be shared with other equipment such as AHRS, compass, transponders etc. Please ensure that the CAN bus wiring is done to high standards and all connections are secure as this is a critical link in your aircraft.

Thermocouple Probes Inputs   (egt/cht)

TC 1 to 12 provide up to 12 channels for thermocouple temperature sensors. You can use “K” TYPE thermocouple probes for EGT and “K or J” TYPE thermocouple probes as CHT sensors. Note that you need to setup the EFIS so it knows the probe types and what channels you are using.

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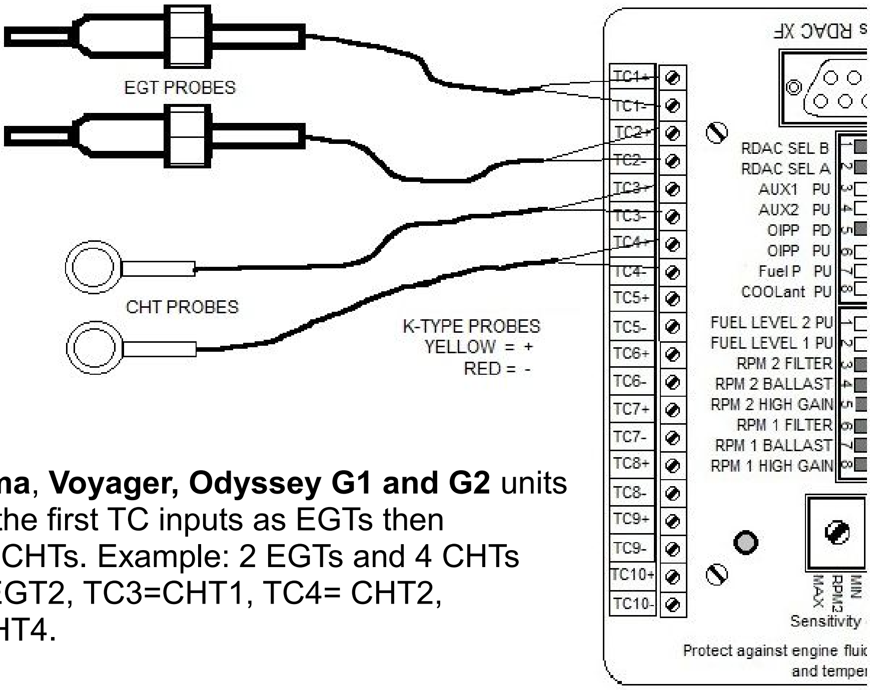


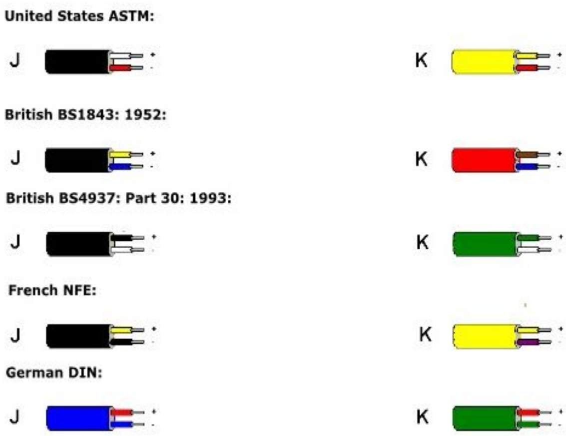
The TC setups on **Enigma**, **Voyager, Odyssey G1 and G2** units are programmed to see the first TC inputs as EGTs then followed immediately by CHTs. Example: 2 EGTs and 4 CHTs then TC1=EGT1, TC2=EGT2, TC3=CHT1, TC4= CHT2, TC5=CHT3 and TC6=CHT4.

On IEFIS systems you can assign TC channels as you prefer. It is however recommended to follow the above guide by grouping your EGT probes starting at TC1, followed by a group of CHT probes.

Depending on how many probes used for the engine ,it is possible to use open TC inputs with probes for monitoring other components like bearings, pulleys or gearboxes ect. Note that you need to use the screen design program to add these extra items into your desired screen pages on the IEFIS or EFIS systems

Note that thermocouple sensors can not be sheared across two RDACs.

These are some examples of “J” and “K” type thermocouple lead colour codes and corresponding polarity



RDAX XF thermocouple guidelines

The thermocouple amplifier is a precision device providing full cold junction compensation and bow voltage correction. In addition the amplifier measures and corrects for its own errors. This results in very accurate measurements providing you install high quality probes. Here are some guidelines:

EGT Probes: select probes that are made from 316 stainless steel and that use glass-fiber insulated conductors. Teflon insulated conductors as found in many cheap probes introduce errors as the insulation melts moving the measuring point towards the mounting bolt which transfers a lot of heat to the exhaust material. This results in under reading probes. Stay away from probes that use simple plastic heat shrink sleeving – it does not last. Choose probes that use a generous amount of stainless steel spring as strain relief. The Bolt itself should be stainless as well or it will rust very quickly.

CHT probes: These are made from washers to fit spark-plug bases. Temperatures are considerably lower so most thermocouple cables will work without problems. The biggest area of concern should be the connection of the thermocouple cable to the washer. This often breaks after the spark plug has been changed a few times. Choose a probe that is suitably reinforced at this point for a long and trouble free life.

EGT and CHT probes supplied by MGL Avionics are of highest quality. We recommend that you consider using our probes if at all possible.

Warning: Four stroke engines produce much hotter exhaust gases compared to two stroke engines. Do not use EGT probes made from lower grade stainless steel (for example 310), these probes will not withstand the high temperatures and can fail as the metal gets very soft at 800 degrees C. Many four strokes (such as the Rotax 912) will produce exhaust gases of up to 850 degrees C.

Important installation note:

EGT and CHT probes use wire made from plain Iron and other basic metals. As a result these probes are not able to withstand much flexing of the wires due to engine vibrations. Avoid making nice looking coils or similar constructions that will result in excessive vibration or flexing of the wire. Route the cables from the probe points tightly along suitable engine mounting points eliminating any chance of unnecessary wire flexing during engine operation.

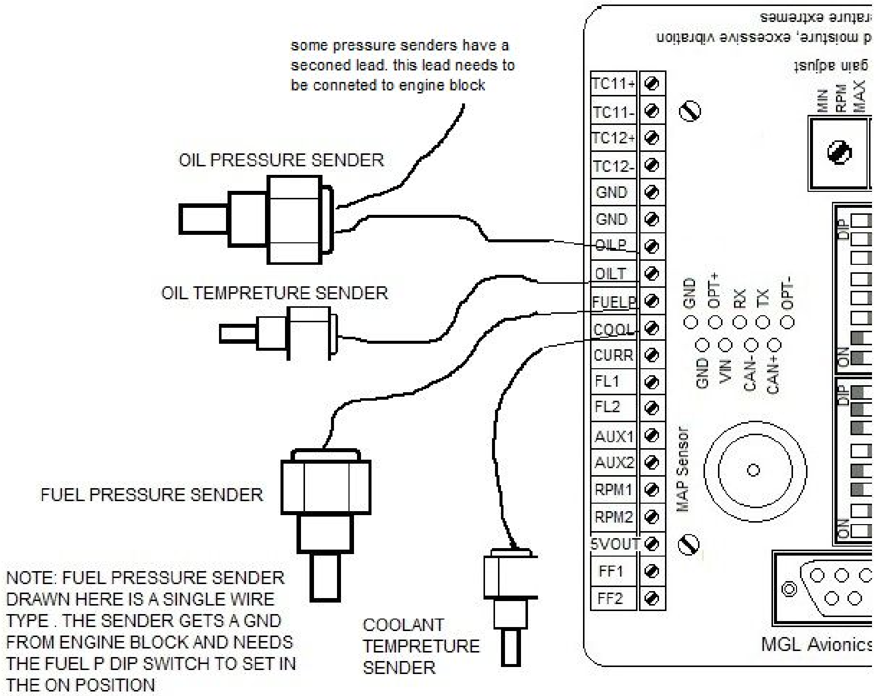
Oil, Fuel Pressure and Coolant monitoring

Oil P connect to oil pressure sender

OIL T connect to oil temperature sender

FUEL P connect to fuel pressure sender

COOL connect to water temperature sender



It is important to know what type, range and connections are needed for the sensors.
In the EFIS and I-EFIS units menu's relating to the sensors placement can show you what sensor types can be used.

Most sensor types are resistive. In this case you have a pull-up resistor enabled via the DIPSWITCH array. The pull-up resistor connects to 5V DC internally. The sensors resistance forms a resistive voltage divider to ground. The resultant voltage on the sensor is measured and translated into a sensor reading depending on the type of sensor connected.
Electronic pressure senders tend to output a voltage level in proportion to applied pressure. For these devices it is recommended to switch the pull-up resistor off.

Rotax 4-20 mA oil pressure sender part no.956413. The sensor cable is approx. 3 m long and has 3 leads. The **Black** lead is not to be connected and has no function. The **Red** lead from the sensor has to be connected to the positive bus via a fuse or circuit breaker The **White** lead (output signal) has to be connected directly to the OILP input on the RDAC XF. The OILP PD switch must be in the on position and the OILP PU switch must be in the off position.
This sets up the RDAC XF to measure the current injected into the grounded 100 ohm resistor.

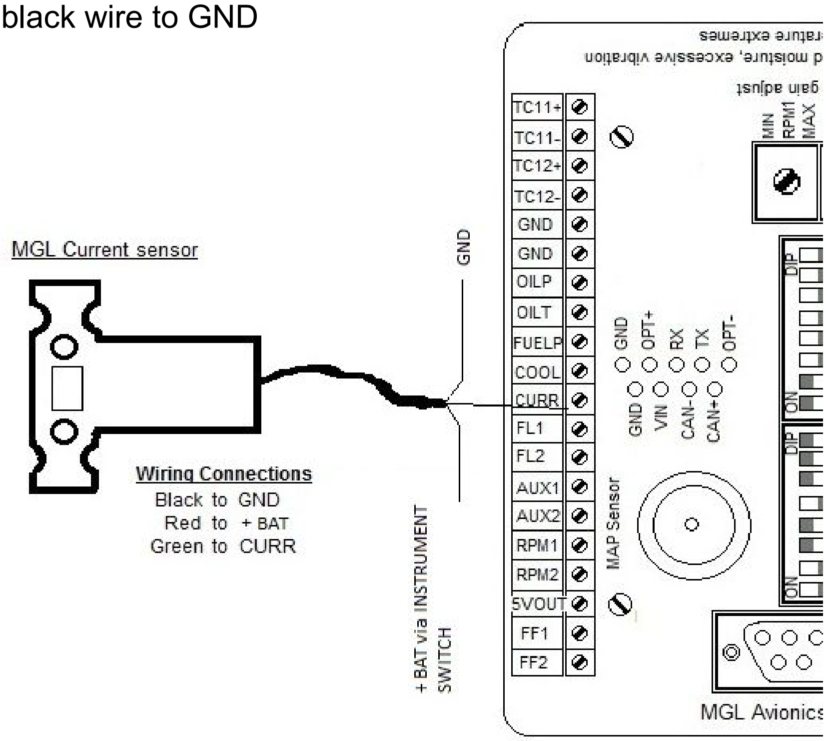
Current Input

CURR connect to MGL Current Sensor or any other electronic current sensor that provides an output centered around 2.5V for zero current.

This example shows connection of the MGL Magnetic current sensor.

Connect sensor wires as indicated.

Connect the current sensor power (red wire) to the RDAC positive supply and the black wire to GND

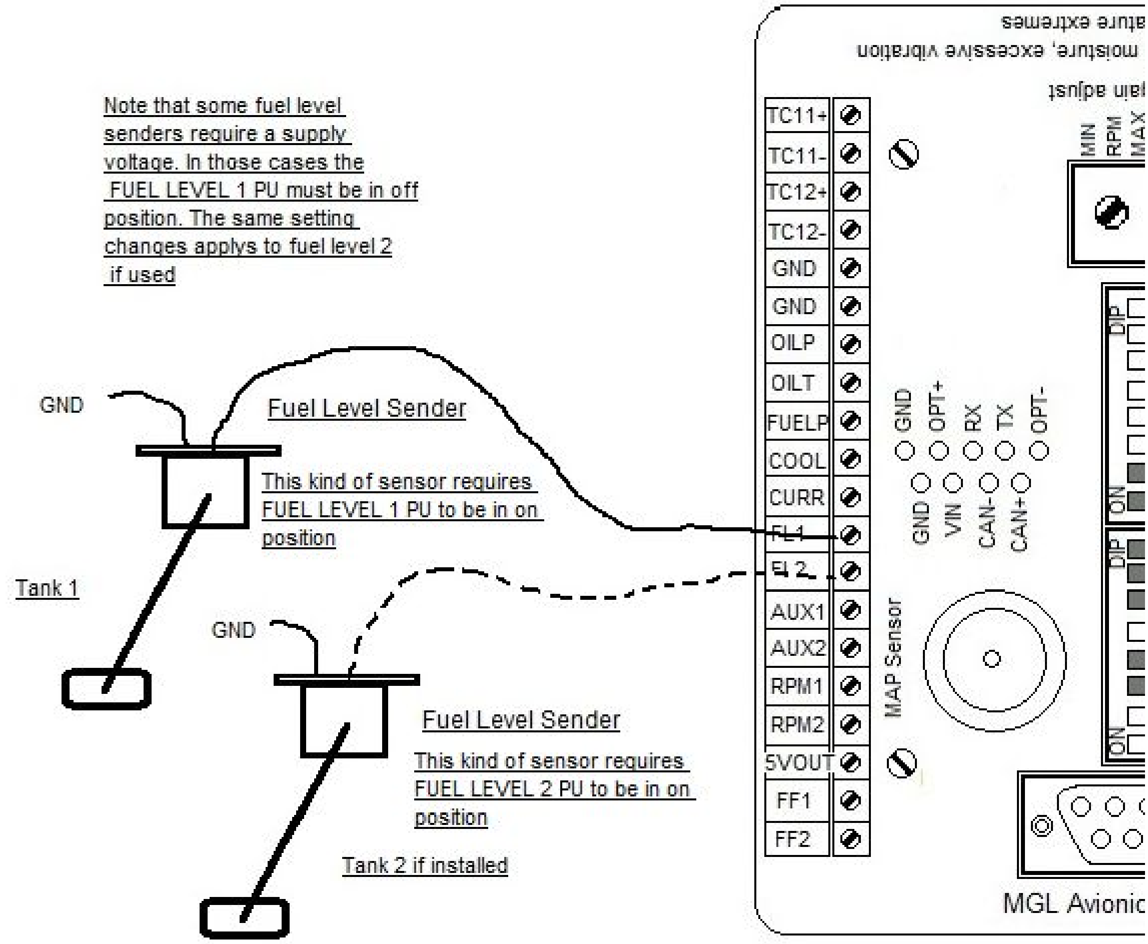


The magnetic current sensor can be installed in several ways depending on the current range it is to measure. Please refer to the documentation for this sensor.

Fuel Level Inputs

FL 1 connects to fuel level sender output/signal from tank1

FL 2 connects to fuel level sender output/signal from tank 2 (if installed)



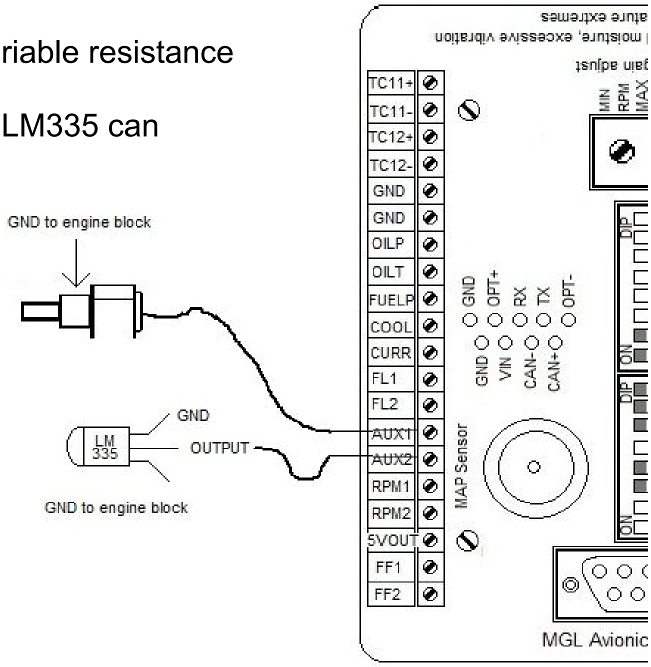
Safety Hazard ! Please read this:
Be careful when installing fuel level senders into fuel tanks. Ensure that the fuel tank is completely empty when you proceed with the installation. Ensure that the fuel tank is well ventilated and does not contain any fuel vapors – these are highly explosive when mixed with air.
Ensure that at all times the ground connection (the connection of the fuel level sender mounting flange) is securely connected to the aircraft frame (in case of a metal frame) and to the negative terminal of the battery. In addition the negative terminal of the battery must at all times be connected to the Supply ground terminal of the RDAC X EMS.
Please note – this wiring is critical and must never break in flight. It would be possible to create electrical sparks in the fuel tank if your wiring is faulty or incorrect. The consequences of this can be imagined. This has nothing to do with the RDAC EMS itself but is a general hazard for any automotive fuel level sender installation.
If you have no experience with electrical wiring, **PLEASE** delegate the task to a qualified automobile electrician or electronics technician.
If you need to remove the RDAC X EMS, please first disconnect and secure the fuel level sender wire before disconnecting anything else.

Aux Inputs

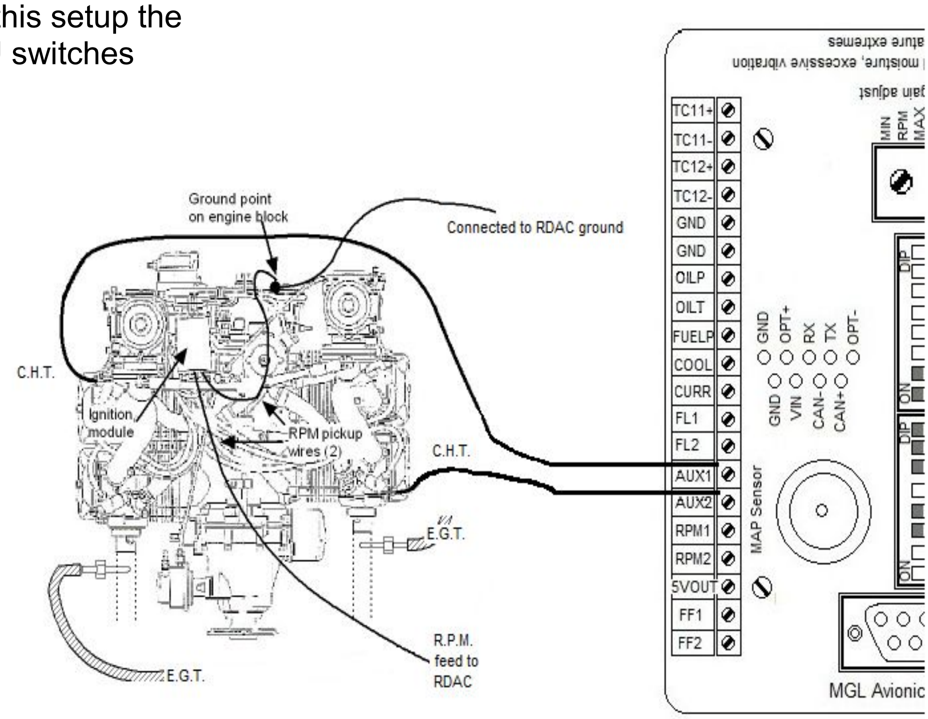
AUX 1 is an axillary input for extra temperature sensors(cht1,coolant)

AUX 2 is an axillary input for extra temperature sensors (cht2)

The AUX inputs can be used to measure temperature or pressure with the use of a variable resistance NTC type probes.
Electronic sensors such as the popular type LM335 can also be used.



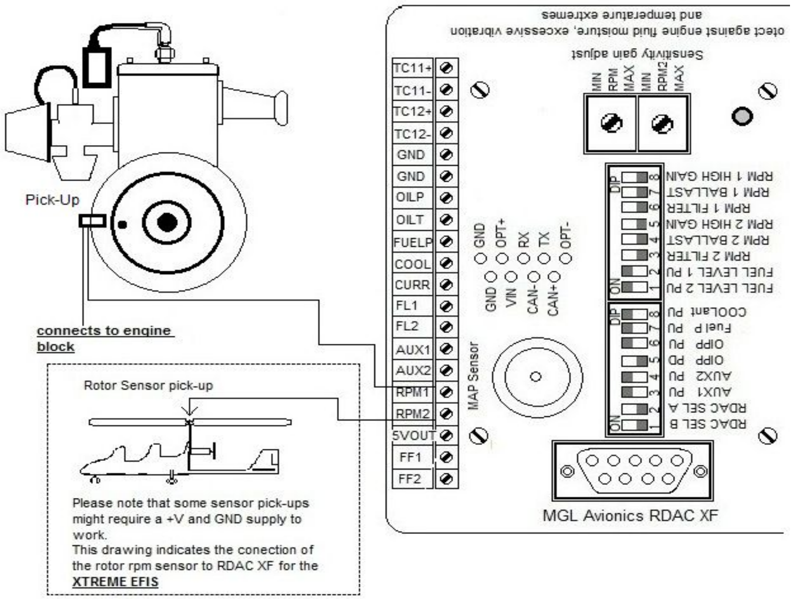
This is a typical Rotax 912/914 CHT sensor connection. With this setup the AUX 1 PU and AUX 2 PU switches will be in the ON position.



Rpm Inputs

RPM 1 This input connects to one of your magneto, ignition, ecu or pick-up units

RPM 2 This input can be used to see your second mag rpm
(dual magneto, ecu or ignition units)
This input is also setup for EXTREME units to get a rotor rpm feed.
(auto gyro or helicopters) **This setup is only for the Xtreme EFIS!**



On the EFIS AND IEFIS units the RPM generally works by taking the highest RPM reading for display on the standard screens.

This drawing of a system that uses a pick-up sensor (Hall Effect Sensor) sometimes seen on Rotax engines

Each RPM input has the following options:

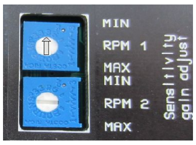
Noise filter: This can be switched into the signal path to help in removing high frequency noise artefacts from the signal that can result in unstable readings. Use this switch only if you rely on a “dirty” signal. An example of such a signal is a direct coupling to a magneto device.

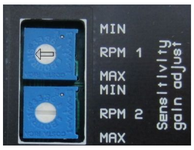
Ballast resistor: This switches a 220 ohm ballast resistor to ground. This can be used to reduce noise or secondary pulses on the RPM line. Often used with Rotax engines. Note: For direct magneto pickups this switch must be “OFF” as otherwise the magneto pulse may have low energy in particular at idle.

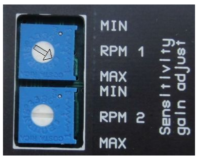
Gain setting: Switch “on” selects a high gain. In this case the input is about 10 times more sensitive than normal. Used only for low level signals such as inductive pickup coils.

Typical sensitivity settings and resultant minimum signal levels:

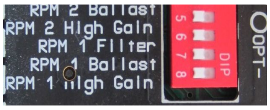
RPM 1 shows ¼ turn	RPM 1 shows mid position	RPM 1 shows max position
RPM 1 High Gain on 3.5 volt (peak to peak)	0.8 volt (peak to peak) RPM 1 High Gain on	RPM 1 High Gain ON 0.4 volt (peak to peak)
RPM High Gain OFF 35 volt (peak to peak)	RPM High Gain OFF 8 volt (peak to peak)	RPM High Gain OFF 4 volt (peak to peak)





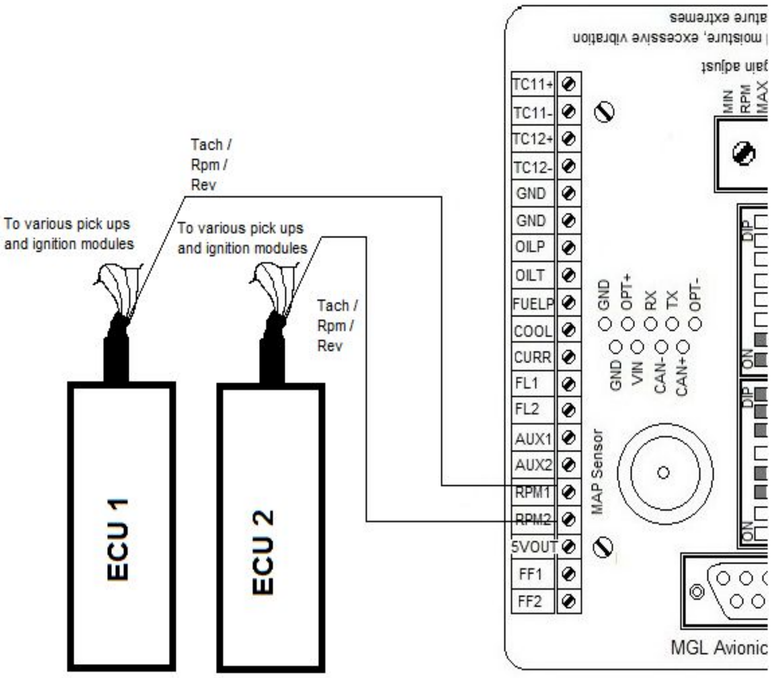


RPM 1 High Gain turned ON



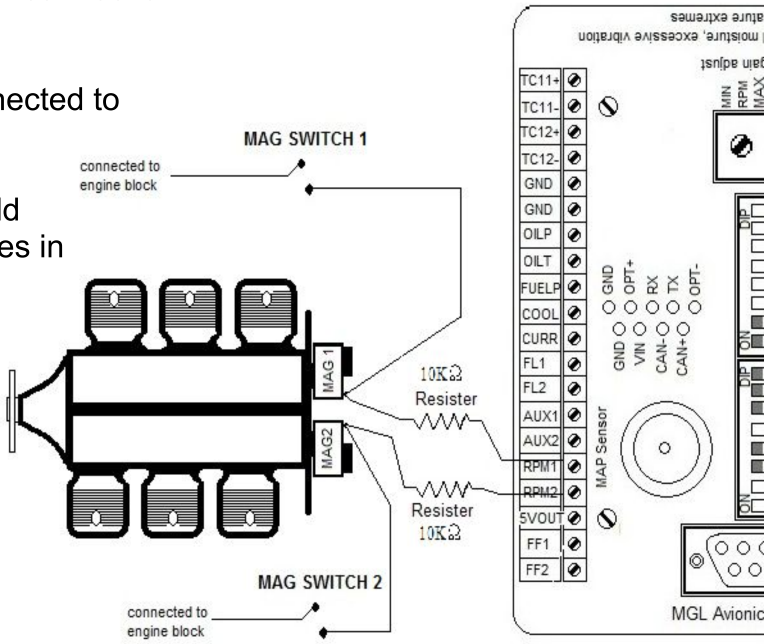
RPM 1 High Gain turned OFF

ECU units may have a digital RPM output you may be able to use



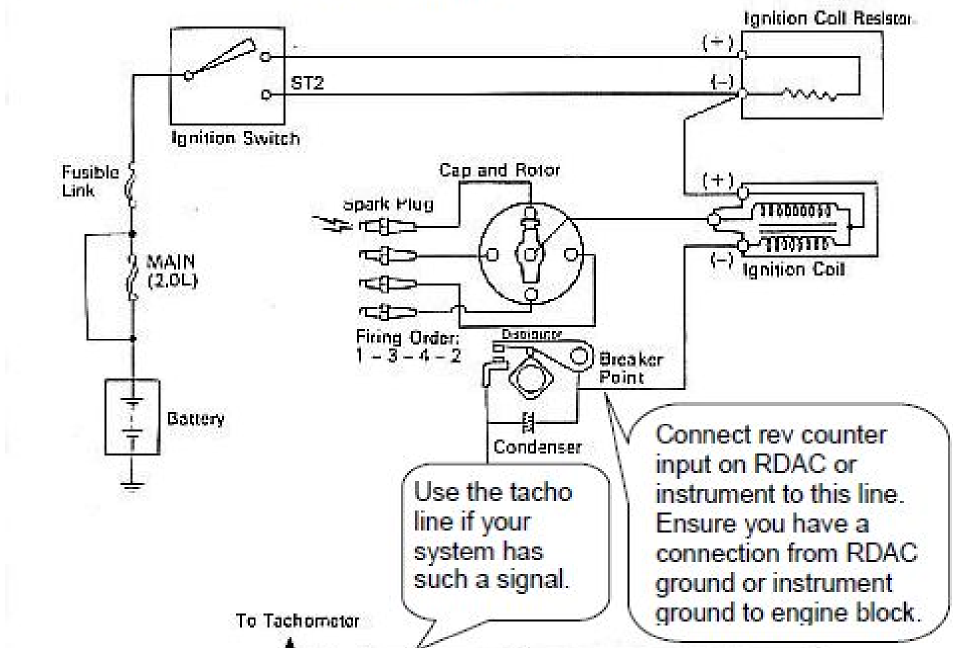
This a drawing of a magneto system. In this case the RPM feeds are taken from the “P” connection terminal.

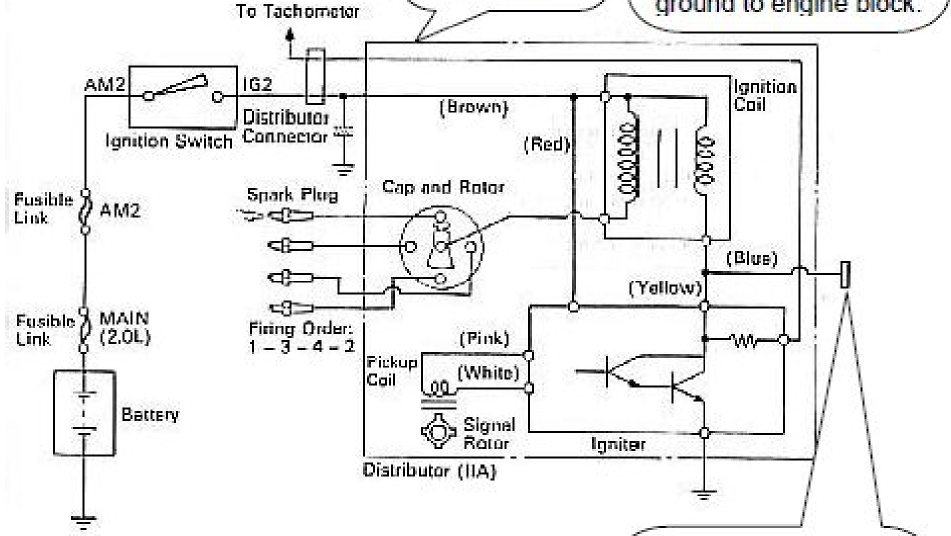
Note that the two magnetos are connected to the appropriate RPM inputs with a recommended 10KΩ (10.000 ohms) resister in line. In this case you would have the RPM 1&2 BALLAST switches in the OFF position.



Rev counter pickup for Stratomaster instruments fitted to automotive engines

Conventional contact breaker
ingnition system





Electronic ignition system with conventional ignition coil

Fuel Flow Inputs

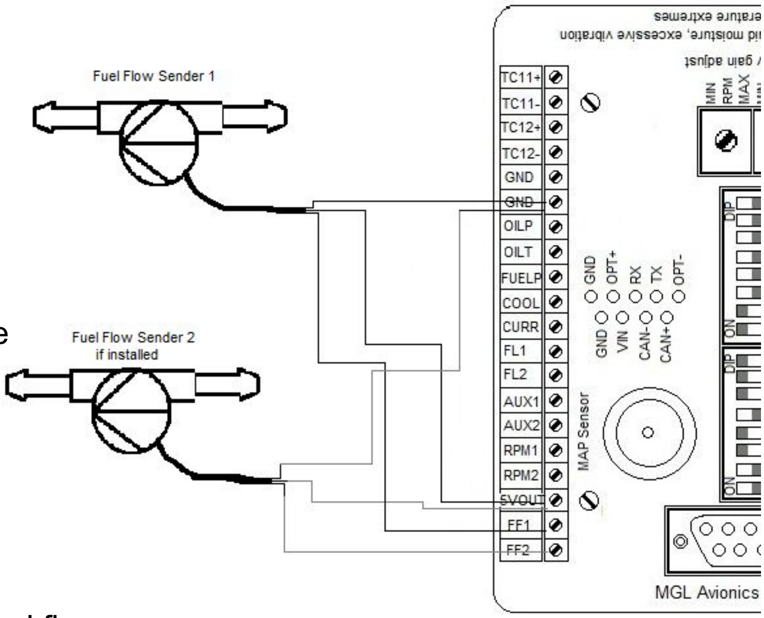
This example is based on typical MGL flow senders:

FF1 & FF2 Connection of fuel flow sender (Braid to GND, Red to +5 volts, Blue to FF1)
If a second fuel flow sensor is used then the braid and red wires of the second flow sender connect as the first sender but the blue wire (signal) connects to FF2.

Using the Fuel Flow Sender

Note the setup for Fuel flow sender on EFIS unit "Fuel related setup; Fuel flow setup menu"
"Flow sender type Rdac one: Turbine

It is important to install the fuel flow sender at an angle so that will no bubbles can get trapped in the impeller section. This will cause incorrect or erratic readings.

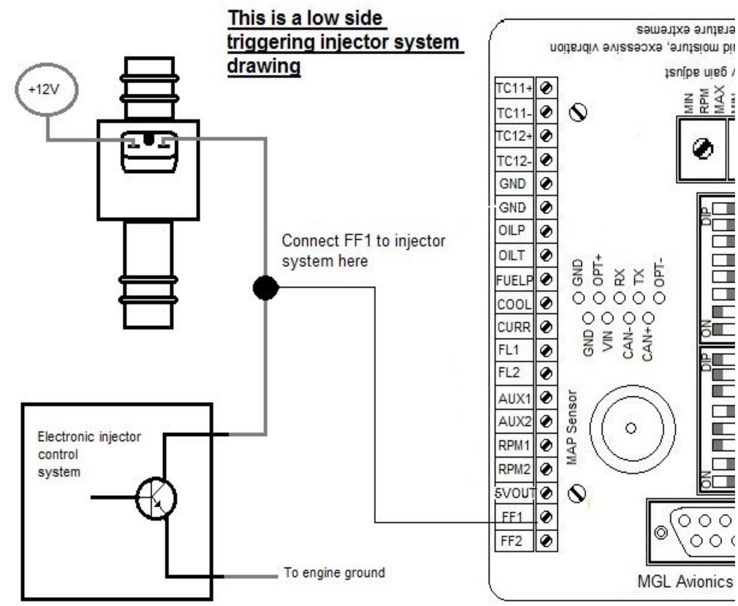


It is also important to work out what fuel flow to expect (generally manufacturers specify fuel usage per hour) in order to select the right jet for the fuel flow sender unit.

Please note that the installation of the Fuel Flow sender should be done in such a fashion that dirt or debris from the fuel tank cannot lodge inside the flow sender. These will not block your fuel flow but may lead to the impeller inside the sender jamming. It is usually sufficient to mount the Flow sender **AFTER** the fuel filter but before the fuel pump. It is a good idea to provide a small reservoir such as a primer bulb between the flow sender and the fuel pump.

Using Injectors

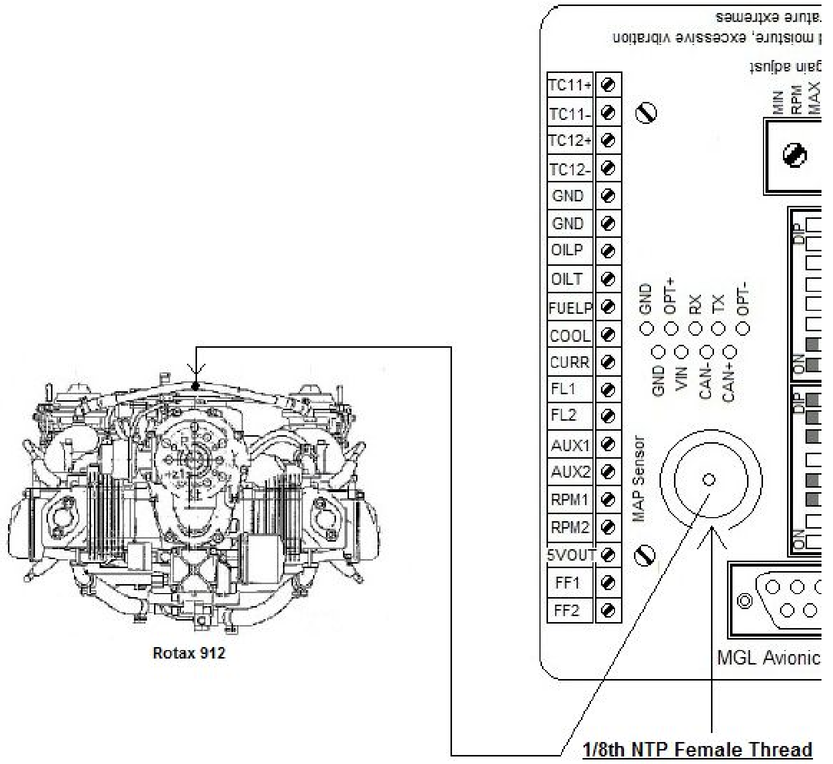
In this injector system is the injector has a +12volts connection but the negative (low) side of the injector is switched/fired by the electronic injector control system.
For this reason in "Fuel related setup;
Fuel flow setup menu" the selection should show as "Flow sender type Rdac one: InjectorL"
Most systems used are low triggering/firing systems
If a positive(high) switching/ firing injector system is used then the selection will show
"Flow sender type Rdac one: InjectorH"



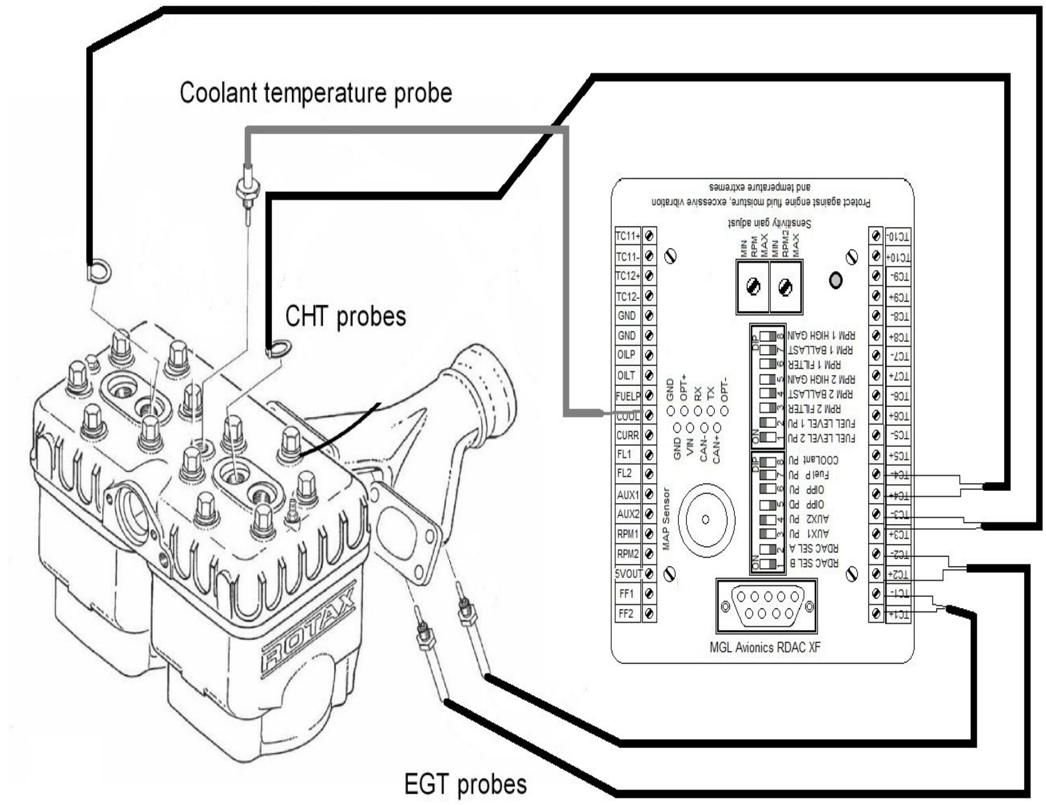
Manifold Air Pressure Input

Please note that the MAP Sensor is only available on th RDAC XF MAP

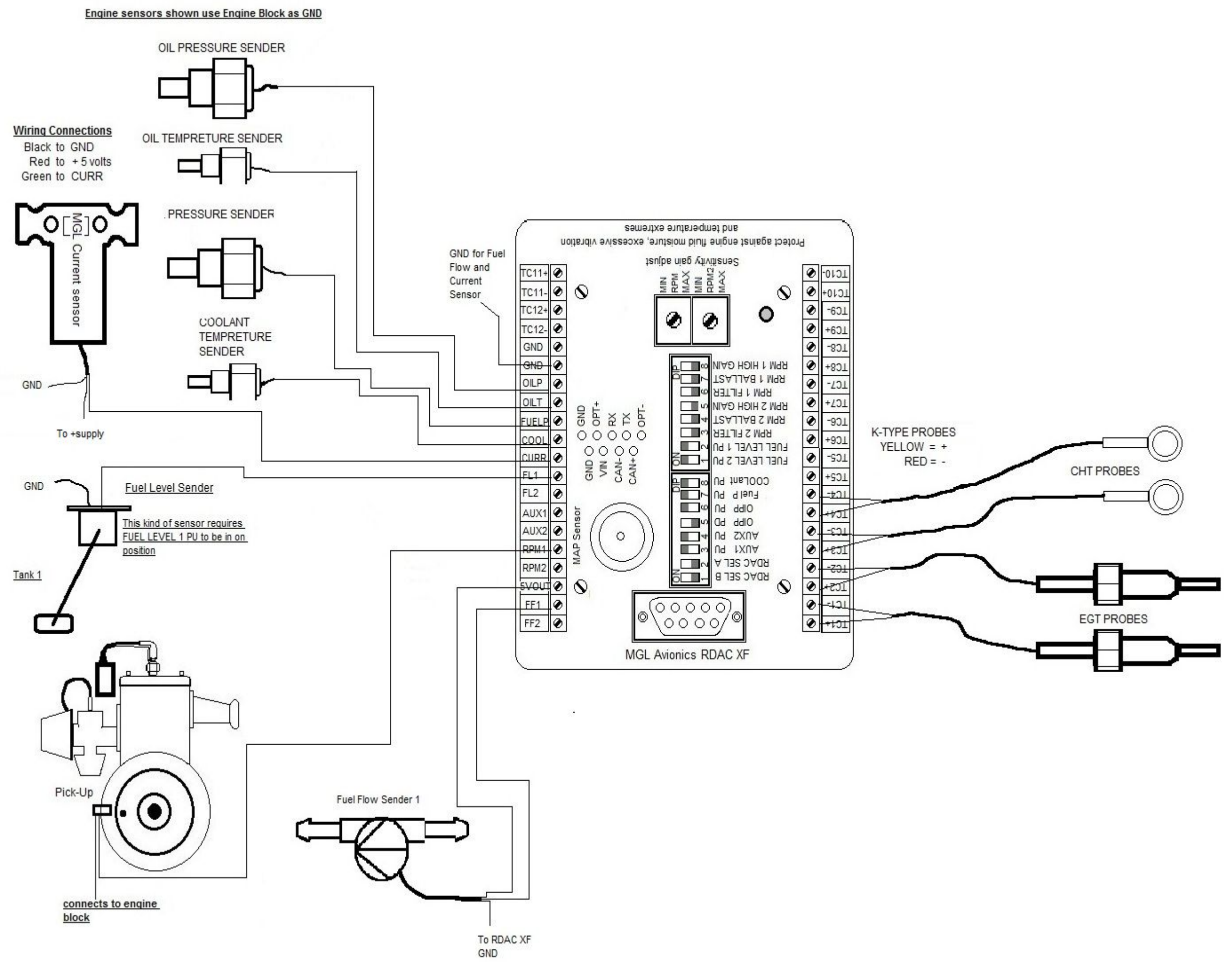
The MAP Sensor is connected to the manifold.
This sensor measures the air pressure or vacuum in the manifold.
In the case of the 912 and 914 Rotax engines there is a pipe connecting the two manifolds where this connection can be made.
On the RDAC there is a standard 1/8th NPT female threaded fitting.



Temperature monitoring connection for Rotax 582



A typical sensor connection layout



Technical data

Weight RDAC XF	340 grams
Weight RDAC XF MAP	370 grams
Power supply:	9-18V DC. DO-160 compliant to 120V/10mS pulse
CAN bus:	250kBaud, 11bit identifiers, MGL CAN bus protocol
RS232:	38400 Baud
OPT:	1250 Baud
Temperature range:	-30 degrees C to +70 degrees C ambient (operation)

Thermocouple common mode range: -2V to +3V with respect to GND terminals
Thermocouple temperature range: up to 1200 degrees C (K-type probes)

Analog input pull up resistors to +5V:

AUX1, AUX2, OILT, COOL: 1500 ohms
OILP: 1000 ohms
FL1, FL2: 220 ohms

RPM inputs:
Input impedance (A/C coupled):
High gain: 15.000 ohms
Low gain: 110.000 ohms
Ballast resistor (switchable): 220ohms, 5W to GND, DC coupled