

# MGL Avionics EFIS G2 and iEFIS



Guide to using the MGL RDAC CAN interface with the MW B22 engine



## General

The RDAC CAN interface forms the bridge between the MW B22 ECU and an MGL Avionics EFIS system.

The RDAC CAN interface provides the following:

- a) Since CAN Interface to B22 ECU (1MBit, 11bit ID).
- b) 2 fuel level sender inputs with internal pullups suitable for resistive senders. Pullup resistors can be disabled allowing senders with a voltage output to be connected.
- c) Oil pressure input suitable for use with a voltage output electronic sender.
- d) Input for a DC current monitor centered around 2.5V (range 0.5-4.5V).
- e) Two inputs suitable for connection to MW B22 engine NTC water temperature senders
- f) Fuel flow input by monitoring injector timing.

The RDAC CAN emulates the RDAC XF system.

## Data connections:

Connect the CAN ECU of the RDAC CAN interface to the CAN bus of the B22 ECU. Fit termination resistor of 60-100 ohms value between the CAN High and CAN Low wires (in case of a single resistor, CAN bus length  $\leq$  2 meters).

Connect the RDAC EFIS CAN to the CAN interface of the EFIS.

Observe CAN bus termination resistor recommendations for this connection as written in the EFIS installation manual. Also read the "CAN bus primer" as the end of this manual.

**Note: Do NOT connect the two CAN buses together. They are two separate buses each running at their own communications speed and using their own data exchange protocols.**

## MW B22 engine data

The RDAC CAN provides the following engine data:

### ***RPM***

Please configure your EFIS for 1.0 pulses per revolution.

Note: For EFIS screen designs this reading is available as RPM1.

Note: The RPM value of 9001 will be shown on the EFIS if the interface is connected to the EFIS but no data is being received from the ECU.

### ***Manifold air pressure***

No EFIS configuration is needed other than setting of desired indicator ranges. Please set

manifold calibration to zero unless you have an accurate reference source. In that case you may use the calibration as needed.

Note: For EFIS screen designs this reading is available as MAP

### ***Oil temperature***

Please configure your EFIS for “Probe type: LM335 semiconductor”.

Note: For EFIS screen designs this reading is available as OILT. It is also available as TC 4 configured as K-Type probe.

### ***Fuel pressure***

Please configure your EFIS for “Probe type: Linear 0-5V” Pressure range is 6.5 Bar

Note: For EFIS screen designs this reading is available as Fuel Pressure.

### ***OAT***

The MW engine provides an OAT reading. This is mapped to TC3 (as K-Type probe). The EFIS uses its own OAT sender. The MW engine OAT is used as cold junction reference for all TC channels (even though no thermocouple probes are used).

## **Functions provided by the RDAC CAN**

The RDAC CAN provides a number of additional sensor monitoring inputs on the D-25 connector.

### ***Fuel level sender inputs***

These inputs are marked “FL1” and “FL1”.

These are intended for connection to resistive fuel level senders. The RDAC CAN provides internal pullup resistors (470 ohms to 3.6V). These pullup resistors are switched into the circuit if the internal DIP switch array 7 and 8 are in the “ON” position.

If the switches are “OFF” it is possible to connect electronic level senders with a voltage output provided the output voltage is in the range of 0V to about 3.3V.

The fuel level sender readings are presented to the EFIS in a fashion compatible with the RDAC XF.

### ***DC current monitoring input***

Connect a DC current monitoring sensor to input D25 pin 20. The current sensor should produce a voltage of around 2.5V for a zero current and increase or decrease this voltage depending on the magnitude and direction of the current. Range is 0-5V.

Perform zero and gain calibration in the EFIS Voltage/Current setup as required.

## ***Fuel flow rate***

Connect input D25 pin 8 to either a flow sender (pulse type) or to the switched terminal of a fuel injector. Configure the EFIS according to your choice.

Note: For EFIS screen designs this reading is available as Fuel Flow 1.

## ***Water temperature sender 1***

Connect to D25 pin 10.

MW specified NTC to ground.

Note: For EFIS screen designs this reading is available as AUX 1. Please configure AUX 1 probe type as LM338. It may also be accessed as TC 1 configured as K-Type probe.

Quick test: A 220 ohm resistor between input and interface ground should result in a temperature reading of approximately 98 degrees Celsius.

## ***Water temperature sender 2***

Connect to D25 pin 11

MW specified NTC to ground.

Note: For EFIS screen designs this reading is available as AUX 2. It may also be accessed as TC 2 configured as K-Type probe

Quick test: A 220 ohm resistor between input and interface ground should result in a temperature reading of approximately 98 degrees Celsius.

## ***Oil pressure***

Connect to D25 pin 9.

Please configure your EFIS for "Probe type: Linear 0.5-4.5V". Pressure sender range is 5 bars.

Note: setup for standard MW oil pressure sender. Any sender compatible with a DC input range of 0-5V and within selection options in the EFIS setup may be used.

## **Diagnostics**

Please consult the EFIS diagnostics functions for raw measurement information. CAN RDAC ECU information for this engine will show largely as blanks as no information is available from the engine.

## Connector pins

### ***DB9 connector (Female on device, plug is male)***

- 1 Ground (Power supply negative).
- 2 +12V DC power supply for interface.
- 3 No connection
- 4 No connection
- 5 No connection
- 6 CAN EFIS Low
- 7 CAN EFIS High
- 8 CAN ECU Low
- 9 CAN ECU High

### ***DB25 connector (female on device, plug is male)***

- 1-7 No connection
- 20 Current sensor input (voltage centered at 2.5V for “no current”)
- 8 Fuel flow sensor input (turbine or injector pulse monitoring)
- 9 Oil pressure sender input (0.5-4.5V voltage output, 5 Bar)
- 10 Water temperature input 1 (MW specified, NTC)
- 11 Water temperature input 2 (MW specified, NTC)
- 12 Fuel level sender 2 input
- 13 Fuel level sender 1 input
- 14-19 No connection
- 21-25 Ground (same ground as power supply ground on DB 9).

## Grounding the RDAC CAN

As the RDAC can needs to refer to sensors that are grounded on the engine block, the RDAC power supply ground and any other ground on this device must be connected to the engine block. Note that you should provide a single, secure ground connection to the engine block. The engine block must then have its own ground connection to the aircraft's power supply negative (battery, alternator etc).

Do NOT wire more than one ground connection from the RDAC (for example one wire to the battery negative, other to the engine block). Only one connection to the engine block.

Failure to adhere to this can result in incorrect sensor readings.

## Power supply requirements for the RDAC CAN

Nominal 12V DC. Range: 8.5V to 36V. Voltages above 16V may only be applied short term (less than 30 seconds below 20V, less than 5 seconds to 36V).

Power supply must be filtered and free of surges, spikes and noise.

Current consumption: 50mA typical, maximum 70mA with fuel level senders grounded and

pull up resistors switched on.

## RDAC CAN dipswitch assignment

The RDAC CAN may be assigned as RDAC 1,2,3 or 4 by means of DIP switches 1 and 2.

Note: Odyssey/Voyager support only RDAC 1 and 2.

Switch	RDAC 1	RDAC 2	RDAC 3	RDAC 4
1	off	on	off	on
2	off	off	on	on

## Status LED

The RDAC CAN has a green status LED indicator.

Single flash: RDAC CAN is powered and working but there is not data received on the ECU CAN bus.

Double flash: RDAC CAN is powered and working, data is being received on the ECU CAN bus.

## Error codes

The RDAC CAN interface transmits the value 9001 as RPM in case there is no data received from a the ECU.

As the EFIS should be setup for 1.0 pulses per revolution (RPM setup menu) this results in the value 9001 displayed on the EFIS in this case.

If no data is received from the Rotax ECU for one second, all values will be transmitted as “zero” (except for the RPM which is transmitted as 9001).

Tip: If the RPM overs peed alarm is set and enabled, this will trigger the alarm on the EFIS.

## G2 EFIS setup

The G2 EFIS (Odyssey/Voyager) have two RDAC inputs intended for use with MGL's traditional RDAC systems.

Starting from RDAC model XF, the CAN bus is favored for the RDAC data feed connection.

The G2 needs to be told that you would like to use the CAN bus for the RDAC. You do this in the “Engine monitoring setup”:



There is no setup required for the iEFIS as the iEFIS uses only the CAN bus for RDAC connections.

With the traditional RDAC devices fuel pressure input and current sensor inputs used spare

RDAC inputs and this required selection of the inputs as needed.

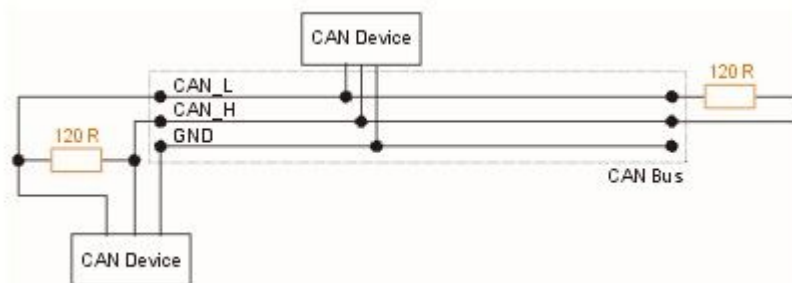
With the CAN based RDAC units this is not required as the CAN based systems have dedicated inputs for these senders and the input selections are blanked out.

Note: G2 RDAC on CAN bus is supported from software version 1.1.0.0 or higher.

## CAN bus primer

The CAN bus (Controller Area Networking) was defined in the late 1980 by Bosch, initially for use in automotive applications.

It has been found to be very useful in a wide variety distributed industrial systems and is becoming popular in avionics applications due its robustness and ease of use.



The connection uses two wires which are twisted around each other. This forms a “balanced transmission line”. It helps to reduce emissions and also makes the link more robust against external interferences.

The CAN bus is always implemented as a single cable allowing only short stubs to connect to equipment along the route. Never implement a CAN bus as a “star” or other wiring topology.

The CAN bus requires termination resistors at each end of the bus. These are to be 120 ohm resistors. 1/4W or 1/8W resistors are usually used here. The resistors must be installed at each end of the bus, not in the center or anywhere else.

For short CAN runs (less than three meters) it is possible to install a single resistor of lesser value (not less than 60 ohms) at any location in the cable run.

The two wires are referred to “CAN High” and “CAN Low”. These must connect to the corresponding lines at the devices. Never swap these connections (I.e. Never connect CAN H to CAN L at any device) as the CAN bus will not be able to function.

Never run the CAN bus connection inside a wire harness next to sensitive connection such as audio or signal wires. Never run the CAN bus next to RF cables.

### ***Making twisted wire***

It is very easy to make your own twisted wire. Simply take two equally long wires (for example 5 meters) in parallel and tie one end (both wires) to a fixture (a door handle works well). Insert the other end (both wires) into a drill. Stretch the wires so they are straight. Run the drill for a few short bursts at slow speed and you have a created a perfect twisted pair !



### ***Shielded, twisted wires***

It is possible to purchase shielded, twisted wire. This can be used in applications where there may be electrical noise issues. In this case we advise to connect the shield to ground AT A SINGLE LOCATION ONLY. This prevents creating a “ground loop” which can cause EMI issues.

### ***Basic wiring checks***

You can use a volt meter to perform basic checks on a CAN connection.

With at least one device connected and powered you should be able to measure voltages of around 1.0 – 3.0 volts on each cable with respect to ground. The voltage should appear very similar on each connection.