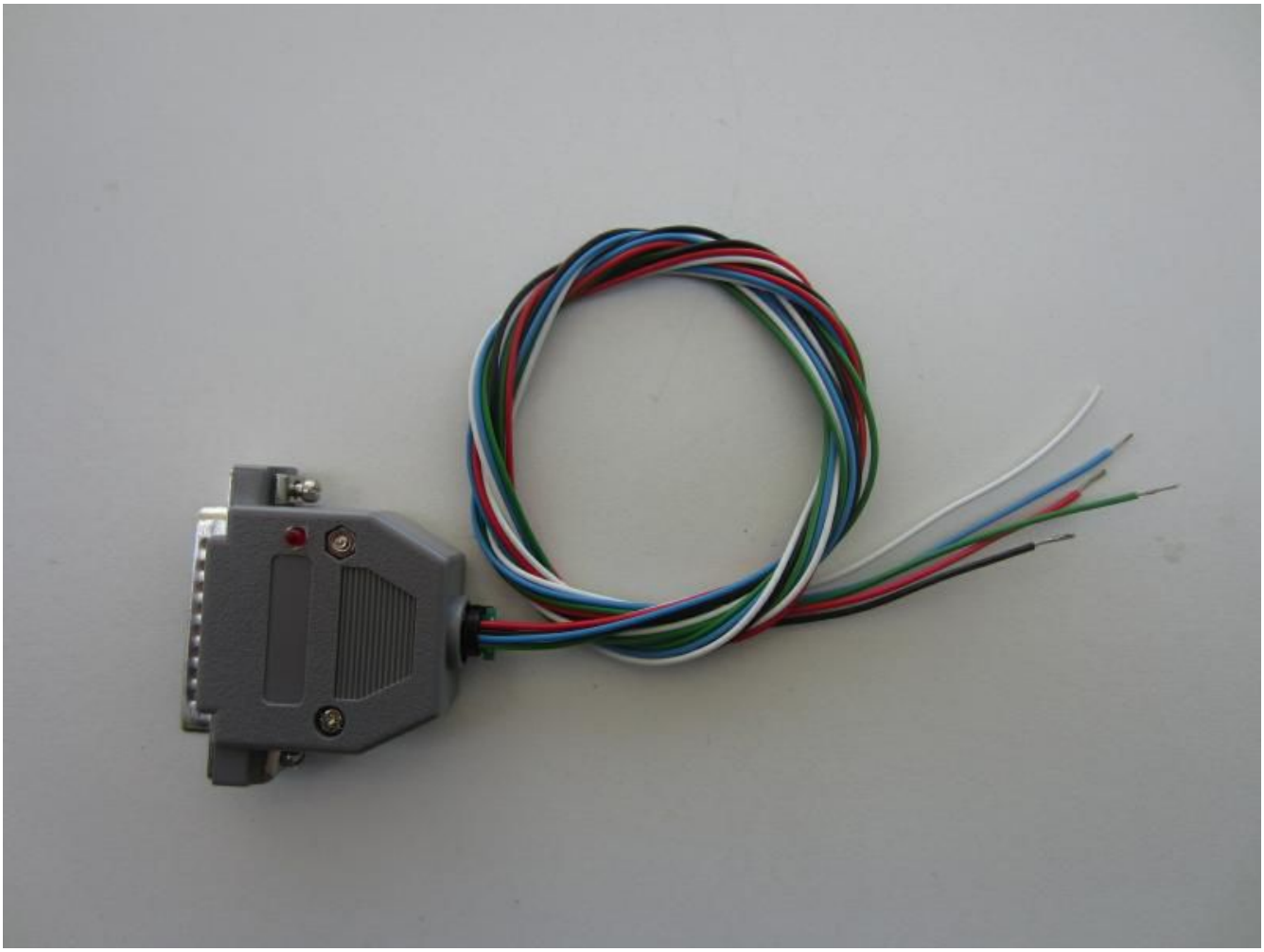
MGL Avionics CAN bus interface
for
Trig Avionics TT21/TT22 transponders



General

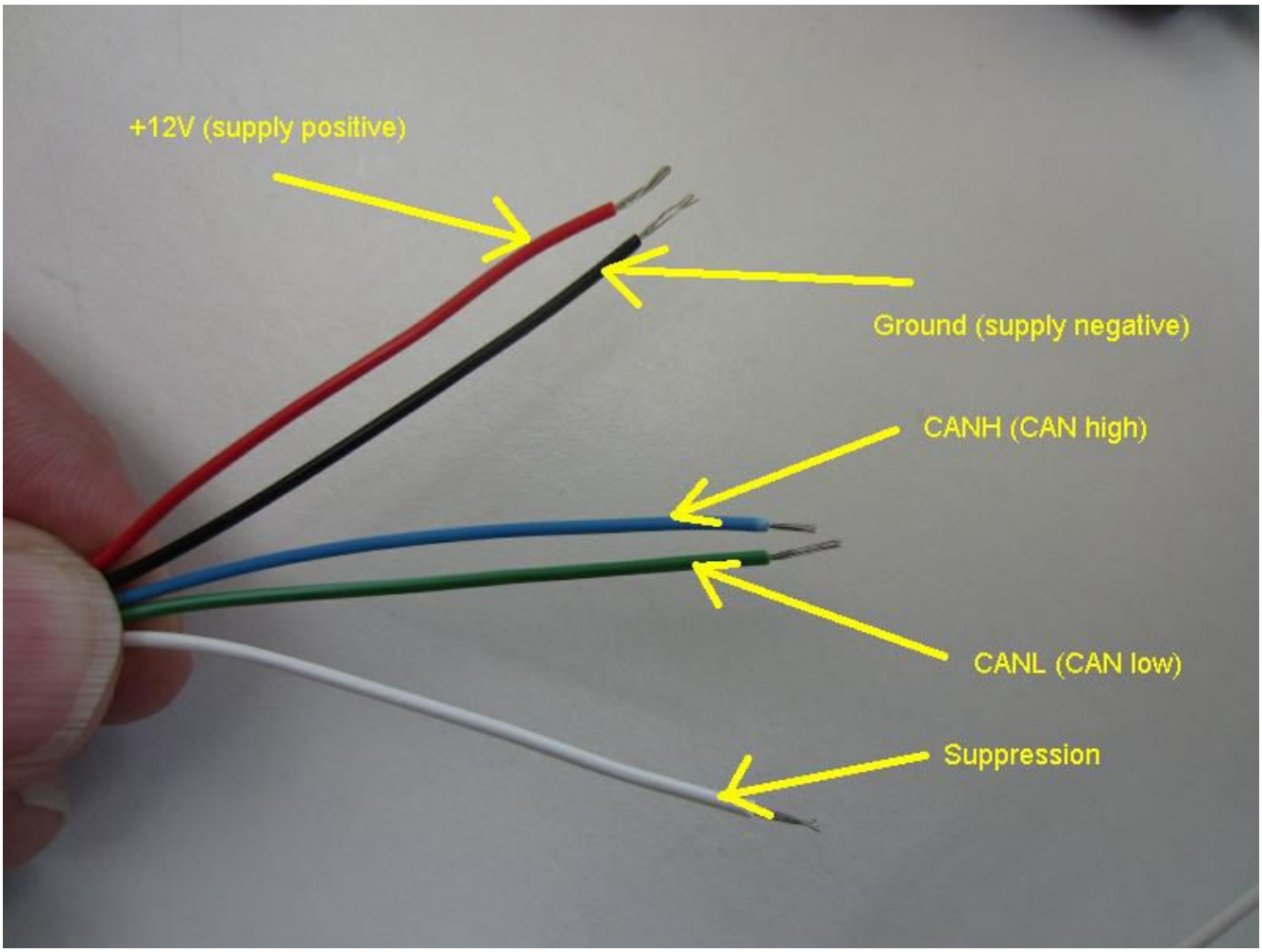
The MGL Avionics CAN bus interface for the Trig Avionics TT21 and TT22 transponders provides a simple solution to allow any G2 or G2 iEFIS or G2 Odyssey/Voyager system to remotely interface to the Trig transponder.

Installation

Plug to interface into the rear of the transponder bodies DB25 connector as shown in this image. Secure the interface by means of the screws on each side of the interface.

Note: It is not possible to use the Trig panel mount head in conjunction with this transponder. It is however possible to use a MGL panel mount head (not available for sale at time of this writing).

Note: NEVER apply power to the interface with a connected transponder unless you have a correctly matched antenna connected to the transponder. Operating the transponder without a correct antenna can destroy the transponders transmitter. Please double check your antenna and cable according to the requirements outlined in the Trig Avionics transponder installation manual.



The interface has a total of 5 wires:

RED: Connect to your aircraft's positive power supply rail (typically via the avionics circuit breaker). Please consult the Trig installation manual for permissible voltage range and current requirements.

BLACK: Connects to your avionics ground bus (power supply ground or negative).

BLUE: Connects to the CAN-H line from the iEFIS iBOX or panel CAN interface.

GREEN: Connects to the CAN-L line from the iEFIS iBOX or panel CAN interface.

WHITE: This connects to the transponders suppression line. Please consult the Trig installation manual on usage. In most cases this line is not needed and can be cut off and insulated.

The status LED

The transponder interface has a red status LED.

System status is indicated by means of LED flash sequences, repeated every second.

Three short flashes followed by a pause: No connection to EFIS data feed, no data received from transponder.

> Interpretation: Interface board has power, not connected to EFIS or transponder. Transponder may be faulty if plugged in.

Short, single flash: No connection to EFIS data feed, data received from transponder.

> Interpretation: EFIS not connected or not operational.

Long, single flash: EFIS data feed OK, no response from transponder.

> Interpretation: Transponder not connected or faulty.

Regular flash – on/off at ½ second interval: EFIS data feed OK, response from transponder OK.

> Interpretation: System operating normally. No problems.

Environmental compliance of the transponder interface

DO-160 compliance statement based on Do-160D

Note: This equipment extends to existing compliance of the VT-0102 Garrecht transponder. No environmental compiance of the existing transponder equipment is compromised by the fitment of this interface board.

Temperature and Altitude	4.0	Equipment intended for use with categories A4, C4
Low temperature ground survival (declared)	4.5.1	-55°C
Low temperature operating (declared)	4.5.1	-20°C
High temperature operating (declared)	4.5.3	+55°C
High temperature short-time operating (declared)	4.5.2	+70°C
High temperature ground survival (declared)	4.5.2	+85°C
Loss of Cooling	4.5.4	No cooling required
Altitude	4.6.1	No restriction
Decompression	4.6.2	No restriction
Overpressure	4.6.3	No restriction
Temperature Variation	5.0	Equipment complies with Category C
Humidity	6.0	Equipment complies with Category A
Operational Shocks	7.2	Equipment complies with Category B
Crash Safety	7.3	Equipment complies with Category A Note: tested

		separate from transponder equipment.
Vibration	8.0	Compiles with Categories S, R
Explosion	9.0	Not applicable
Waterproofing	10.0	Not applicable
Fluids Susceptibility	11.0	Not applicable
Sand and Dust	12.0	Not applicable
Fungus	13.0	Not applicable
Salt Spray	14.0	Not applicable
Magnetic Effect	15.0	Not applicable
Power Input	16.0	Equipment complies with Category B
Voltage Spike	17.0	Equipment complies with Category B
Audio frequency conducted susceptibility	18.0	Equipment complies with Category B
Induced signal susceptibility	19.0	Equipment complies with Category AC
Radio frequency susceptibility	20.0	Equipment complies with Category T
Radio frequency emission	21.0	Equipment complies with Category B
Lightning induced transient susceptibility	22.0	Not applicable
Lightning direct effects	23.0	Not applicable
Icing	24.0	Not applicable
Electrostatic Discharge	25.0	Not applicable

Transponder setup in EFIS

Transponder setup between various EFIS systems is similar. This example is based on the iEFIS.

Please enter all relevant setups as required. Note that the ICAO code must be entered as an Octal number (each digit has a value from 0 to 7).

Select how you would like your squat switch to work. The squat switch tells your transponder whether it is in flight or ground mode. You have the following options on an iEFIS system:

a) EFIS Flight detect

If a flight is active (either by manual or automatic flight detect) the transponder is in flight mode.

b) External contact

You have an external contact that determines the flight status. In this case select and configure the external contact via the Inputs setup menu. The external contact will be wired to one of the inputs on the iBOX.

c) Always in flight mode

The transponder will always be in flight mode.

Your Trig Transponder will send out different information to ATC when it is in ground mode so make sure this operates correctly.

Testing the transponder using the EFIS

With the Odyssey/Voyager G2 you control the transponder via the Radio Stack. You need to enable the transponder in the Radio Stack setup and your screen design(s) require a radio stack component.

With the IEFIS you need to enable the transponder in “Equipment Enables” and also select a screen design that has the transponder item visible.

In both cases, with the transponder connected and powered, the transponder screen item should not have a red cross. If it has a red cross, then the EFIS is not communicating with the transponder. Please check your wiring.

Transponder item from an iEFIS system.

Operation of the transponder is similar between EFIS systems. On the iEFIS touch screen, tap the transponder to bring up the larger transponder user interface.

For the Odyssey/Voyager there will be an “RF” button on the left keypad if the screen design has a radio stack component. If the transponder is the only radio stack item, pressing the RF button will activate the transponder user interface directly, otherwise all enabled items will be shown and you need to select which one you would like to control.

Ground test of the transponder

Before usage, the transponder must pass a ground test according to the requirements of your local aviation authorities. Typically this is done using a dedicated transponder test set by your AMO. The transponder test set will transmit to your transponder antenna and expect correct replies.

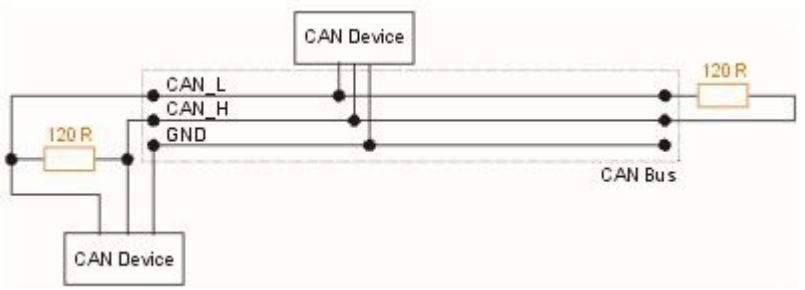
Verify that the transponder test set is receiving replies and that all replies contain the correct information as entered in your transponder setup menu. Verify correct altitude readout and squawk code. Press the Ident button and verify that the ident is active on the reply for 18 seconds.

Depending on your local regulations the transponder may require retesting at intervals

(typically every two years in most countries).

CAN bus primer

The CAN bus (Controller Area Networking) was defined in the late 1980's 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 (a 100 ohm resistor works well).

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.