Stratomaster Enigma

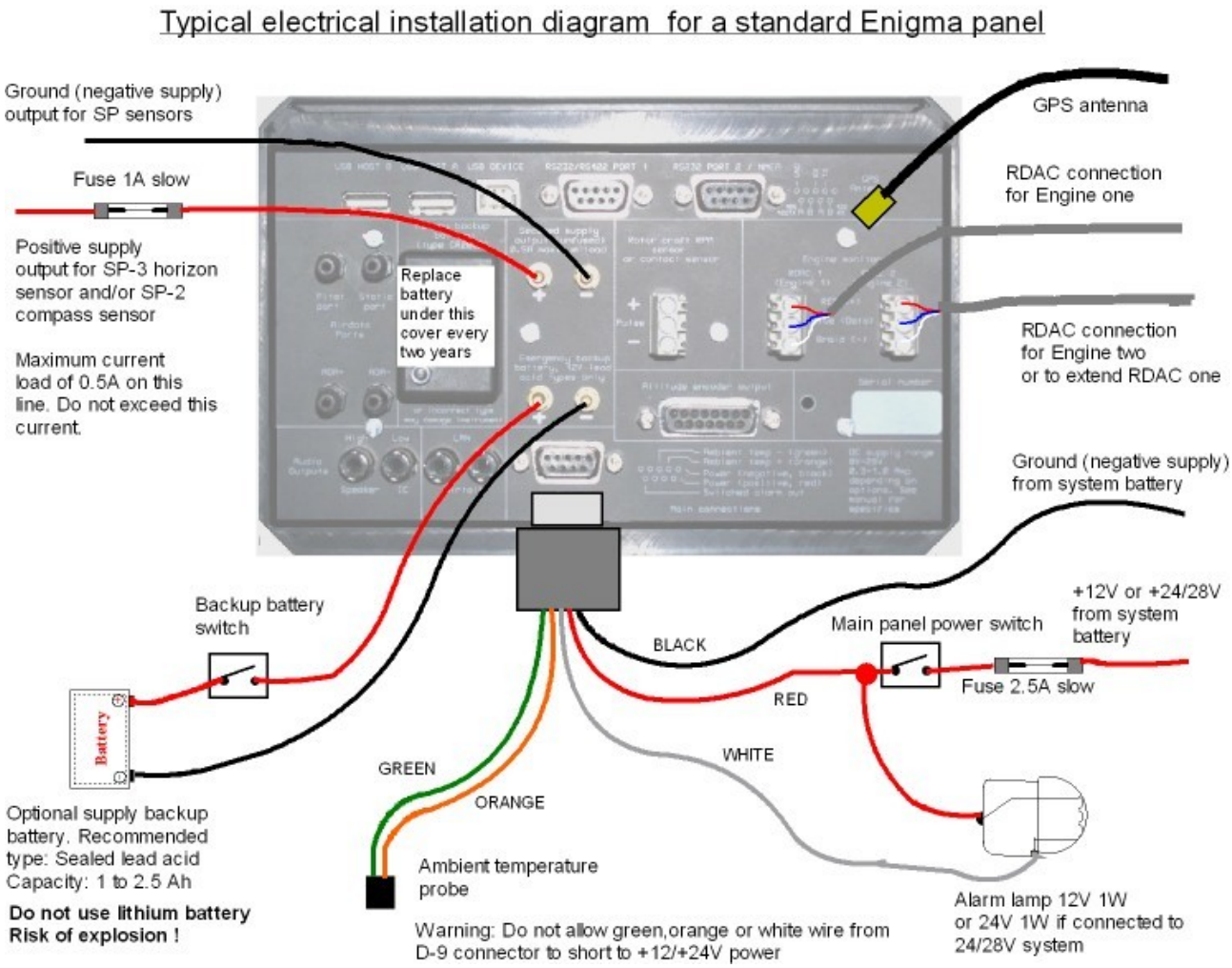
Preliminary installation documentation

General

This document describes the installation requirements for a single Enigma panel.

This document is work in progress and still very incomplete. Please check on our website for any updates to the Enigma installation documentation.

Electrical installation



This image shows typical wiring for an Enigma panel.

In this case a small backup battery is used. Note that two power switches are required. One power switch for the main incoming 12 or 24 V feed (switch in positive supply lead), another for the backup battery.

In flight, both switches would be “on” allowing the charging of the backup battery.

Preflight check would involve switching main power on, then battery power on. Check of battery power would involve switching main power off and verifying that Enigma continues to operate. Voltage on the backup battery should be measured by means of the backup voltage readouts which can be placed on any display.

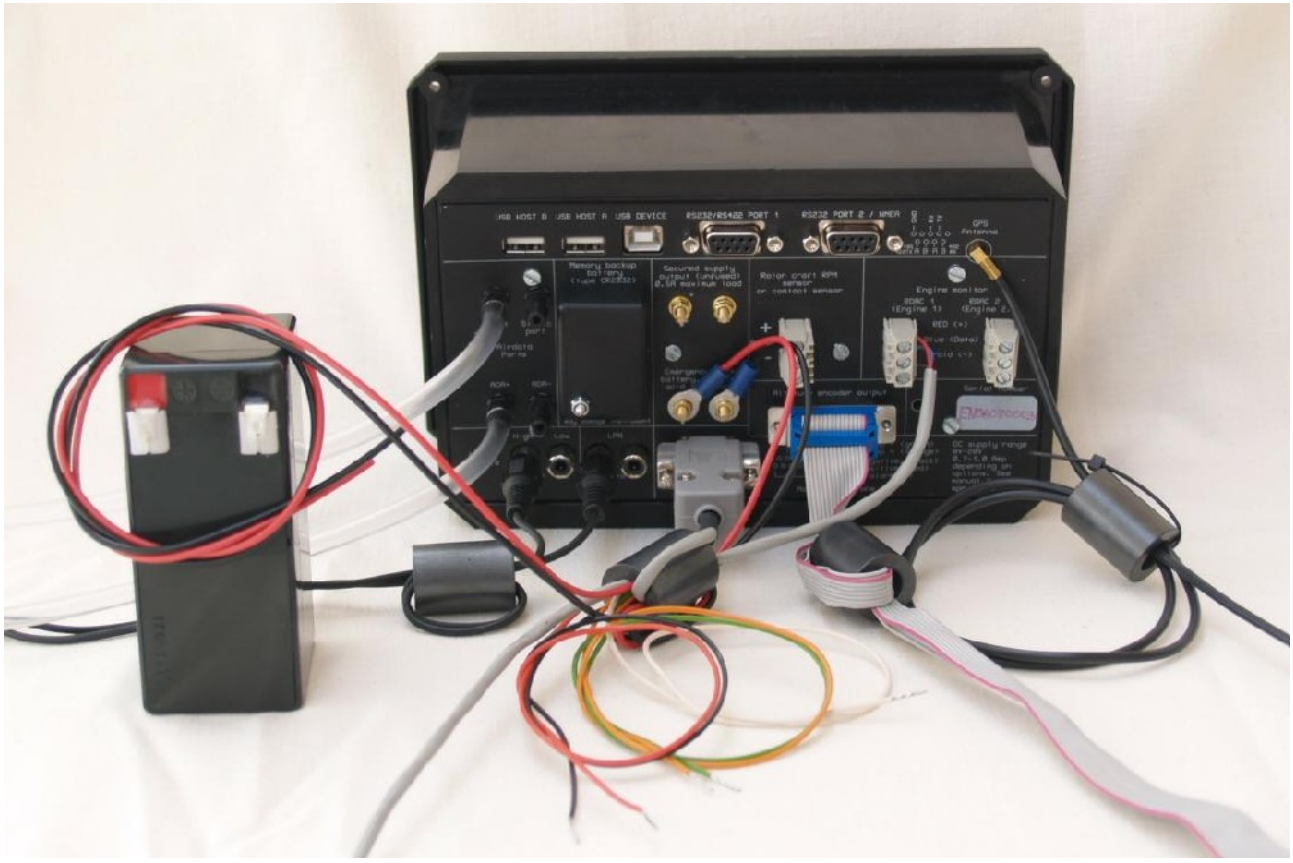
In this case the secured supply output is used to power a SP-3 or SP-2 horizon sensor and/or compass. This supply will draw from the backup battery in case of main power fail. Please note that it is not permissible to connect other high current users to this supply

output. Maximum permitted current draw from these terminals is 0.5A. Under no circumstances connect transceivers or lighting to these terminals.

Recommended backup battery types are 12V sealed lead acid with capacities ranging from 1Ah to 2.5Ah.

In case of a dual panel installation, it is permissible to connect both panels to a single backup battery.

Please note that inline fuses or over-current sensing interrupters must be installed as shown. It is wise to install these in such as way that it is possible to replace fuses in flight or reset a circuit breaker.



This image shows a photo of a typical, principle installation wiring. Note the use of ferrite beads on ALL wires leaving the instrument. Four ferrite beads are included with each instrument as standard. These ferrite beads are vital to eliminate any RF interfering signals that may cause radio interference particularly on VHF radios.

Beads may or may not be required, this will depend highly on installation and routing of wiring in the aircraft. As a rule, follow these guidelines:

- Antenna cables must never be routed alongside other wiring.
- Place antennas as far away from any digital instrumentation as possible.
- Avoid ground loops which can act as powerful, short range transmitting aerials for weak signals. Ensure that your aerial has a good and correct ground plane.
- Never share power or ground cables between RF equipment and digital equipment. Each requires their own routing of power to the battery.

Notes on the use of ferrite beads:

Install ferrite beads close to the source of interference. It does not help much if there is two meters of cable between source and ferrite bead. Distances as shown in the photo are correct.

Multiple wires may share a single ferrite bead with the exception of the GPS aerial antenna which requires a ferrite on its own.

In case of the GPS aerial, loop the cable twice through the ferrite. Notice the size of the loops. Never loop this cable tightly, you will greatly reduce the sensitivity and performance of the GPS system if you do. The size of the loops in the photo is correct.

Other wiring should be looped tightly as shown in the photo.

The more loops you can place around a ferrite, the better the effect.

Please note again that ALL wires leaving the instrument should have a ferrite bead if you have problems with RF interference.

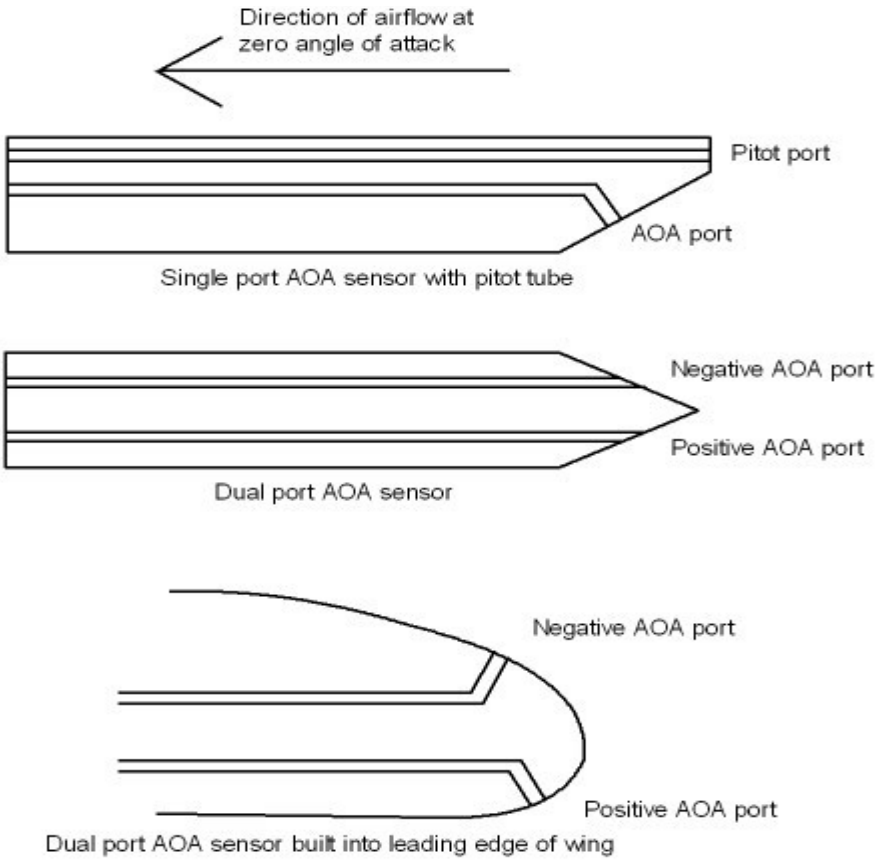
Identifying RF interference sources:

Enigma creates a signal that is highly dependent on the contents of the display and may sound like an “angry grrrrrr”. If you have radio noise, change the screens to see if the noise pattern changes as well. If it does, start identifying which cables are used to transmit the noise to your radio. Enigma itself does not transmit a significant signal due to strict EMI design techniques however, small signals may readily leak and use any attached wires as convenient antenna for transmission. Thus, remove the wires one by one. Start with the GPS – this is a long wire and may contribute significantly. You can remove this wire with the instrument switched on. Then try the audio and airtalk cables which can be unplugged easily, This way you will quickly find the source. Place ferrites as needed or reroute the cable to improve the situation.

A good installation should not generate any noticeable RF interference on your VHF radio with the squelch fully opened, you should hear only static noise.

Note that inside metal hangers noise interference may be considerably worse in some cases. Always check outside a hanger and move at least 100 ft away from any hanger structure.

AOA port types



Sample cross sections of possible AOA sensors. AOA sensors are either single port or dual port devices. In either case, the airspeed pitot port is mandatory as impact pressure from the pitot port is used in the calculations.
Select single port or dual port sensor mode in the Enigma instrument setup.
Different calibration methods are used for either port type.
AOA is calculated by means of comparing pressures on the AOA ports with those obtained at the pilot tube, taking airspeed into consideration.
In case of single port AOA sensors, the port is connected to the positive AOA port while the negative port is connected to the static port. If no static port is used, the AOA negative port is left open.

Photo of an experimental single port AOA probe mounted next to the pitot tube on the wing strut of our Jora aircraft. This probe, made from wood, works very well indeed.

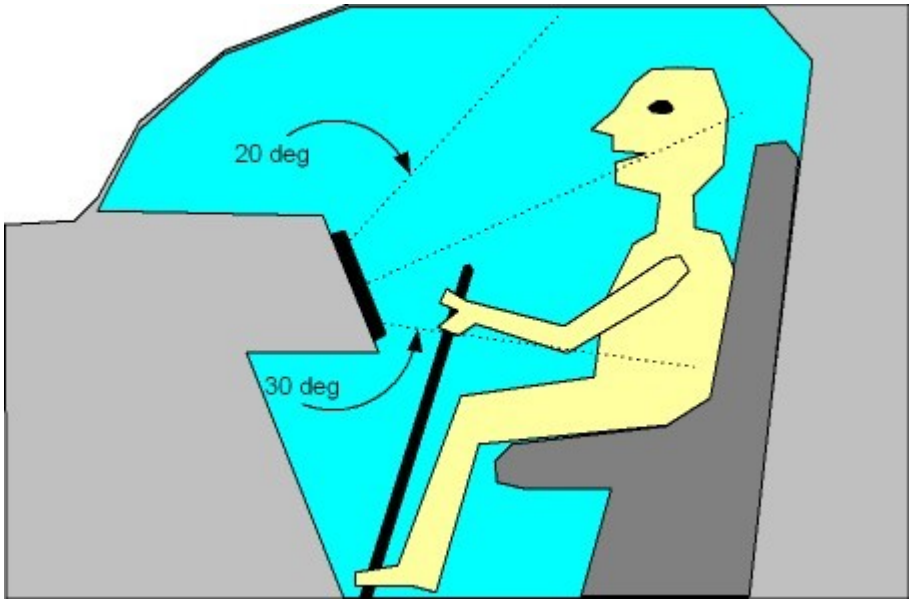
Ergonomical considerations

Enigma contains a very advanced LCD display that is able to perform well in direct sunlight conditions. In order to achieve this and further ensure low power consumption, the display contains a “light director”. This focuses the major part of available light towards the viewer, creating a brighter image but also reducing the effect of ambient light falling at an angle onto the display surface.

In order to take optimum advantage of this, the panel should be installed such that the pilots eye will look onto the panel in a vertical -30 to +20 degree angle maximum. The negative angle would be applicable for a steeply sloped panel where you would be looking onto the panel from below.

This can be achieved in two ways: Mount the instrument as high as possible onto the panel. This also aids the pilot as the image is closer to the windscreen avoiding eye fatigue while constantly changing view from the panel to outside the aircraft.

If this is not possible or can only be done in a limited way, consider tilting the instrument up slightly in order to aim the picture towards the pilot.



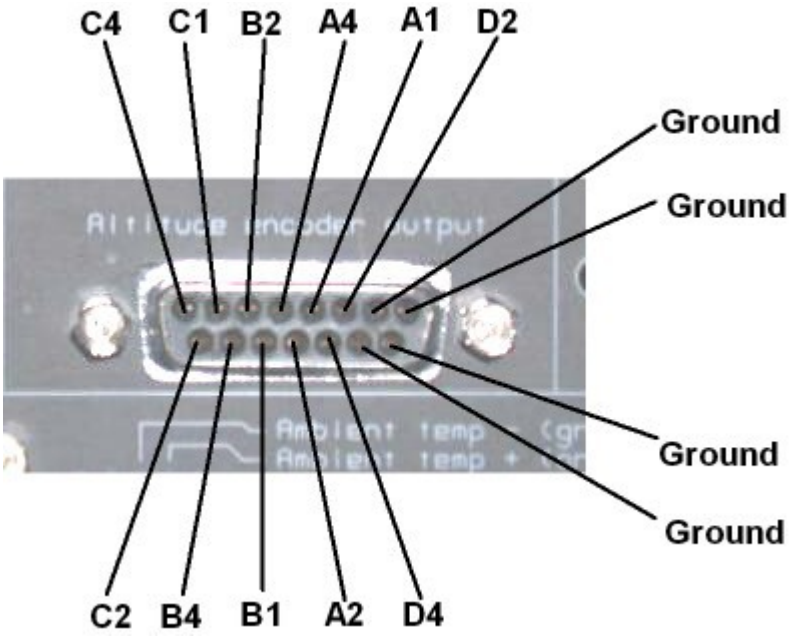
Idealized view of a sloped panel to optimize viewing quality. This image overdoes this somewhat, in practice the panel does not have to be angled this much and if it is possible to install the instrument relatively high on the panel, it is not normally required to mount the instrument angled.

Preferred horizontal viewing angles are within left 50 degrees to right 50 degrees. If a single instrument is to be shared between two pilots seated side by side, consider installation of the instrument towards the center of the panel or alternatively angle it towards the disadvantaged side somewhat. The panel can be read as angles greater than +/-50 degrees but with reduced brightness.

Transponder interface wiring

The transponder interface produces Gillman (Gray) coded altitude information suitable for connection to a mode C transponder.

Connections using the standard code identifiers are shown here. If your transponder does not support signals D4 and D2, leave them unconnected. At least one of the ground wires should be connected to the corresponding ground terminal of your transponder.



Transponder connections for popular models

Function	Bendix TPR2060	Bendix TR641A/B	Cessna RT359T, RT459A, RT859A	Garmin GTX300 Series	Honeywell KT70/71 (Connector JKT701)	Honeywell KT76A/78A	Honeywell KXP	Narco AT50/A, AT150	Narco AT5, AT6/A	UPSAT SL70	Wilcox 1014A
D4	No Connection	N	10	18	8	No Connection	V	No Connection	No Connection	35	C
A1	4	A	14	3	M	M	G	7	2	13	k
A2	6	B	13	5	K	K	H	6	4	31	c
A4	8	C	15	6	J	J	J	8	8	12	W
B1	9	D	19	9	E	E	K	12	9	33	T
Strobe/Enable	Aircraft Ground	Aircraft Ground	11	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	5	12	Aircraft Ground	Aircraft Ground
Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground
Aircraft Power	Note 1	Note 1	9 or per Note 1	Note 1	Note 1	Note 1	Note 1	18 or per Note 1	13 or per Note 1	Note 1	Note 1
B2	10	E	17	11	C	C	L	10	10	14	L
B4	11	F	16	12	B	B	M	9	11	32	D
C1	3	H	21	10	D	D	P	14	1	16	P
C4	7	K	20	7	H	H	S	13	5	15	Z
C2	5	J	18	4	L	L	R	11	3	34	f
Aircraft Power	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1	Note 1
Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground	Aircraft Ground

Transponder interface wiring for Microair T2000 (ignore pin numbers on DB15 connector). Also line “Encoder power” is not used with Enigma.