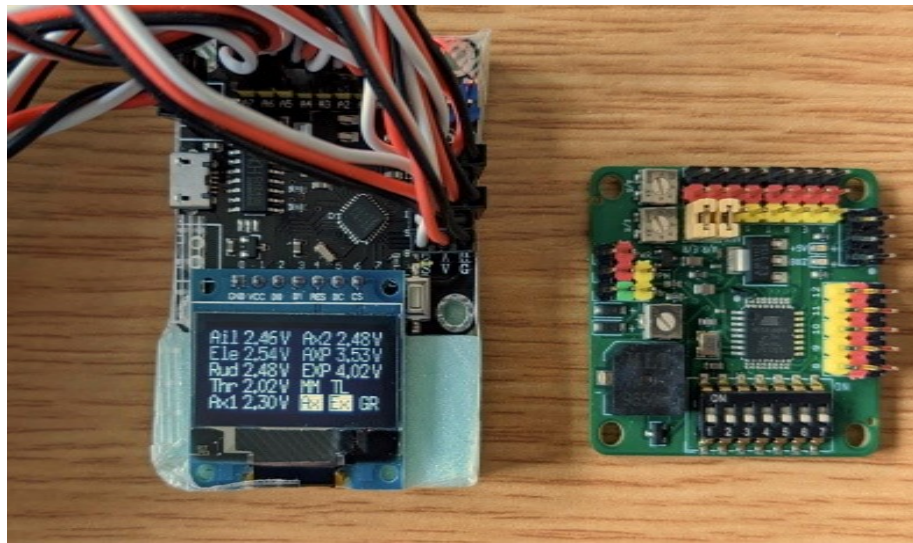


Simple “Wiring Tester” for GTS or Pro Strong Encoders V1.0a Draft

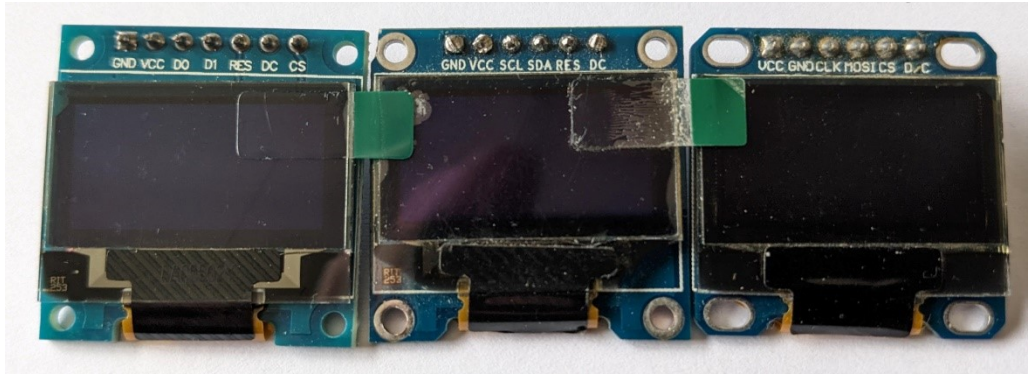


Introduction

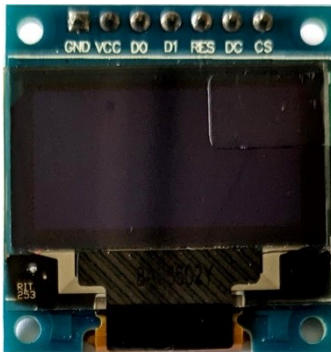
The GTS “Wiring Tester” is designed to test the wiring before connecting to a GTS or DM More Pro Mini Strong based encoder such as the Phil Green 7 channel encoder and the F3A 8 channel encoder modified by Mike Kitchen. In this way, the wiring can be verified and problems with a conversion can be rectified at an early stage. Alternatively it can be used to help identify problems with the wiring of an existing conversion. It is simple and inexpensive to build as it only used a DM More Pro Mini Strong and an 0.96” OLED

Building the “Wiring Tester”

- Components needed:
 - DM More Pro Mini Strong. Alternatively a DM More Nano can also be used, but must be programmed before the OLED is connected (any alterations must be made via the ICSP header). The reason is that pins D0 and D1 used to power the OLED are also used by the on-board CH340 USB to serial converter for USB programming and therefore pins D0 and D1 will go both HIGH and LOW when uploading the program. This can reverse polarity the OLED and terminally damage it as the OLED have no reverse polarity protection (as I found to my cost)
 - 0.96” 6 or 7 pin SPI OLED with 128 x 64 resolution. Other OLED are not suitable, an I²C 4-pin OLED can’t be driven by U8glib when connected to D0 - D7 as it hasn’t got a soft I²C driver and an 1.3” OLED is unsuitable as it fouls on the reset switch.
- Don’t do the normal encoder modification for the ppm module output as there is no ppm output and you then retain the reverse polarity protection
- As OLED only takes a few milliamp it is powered by Arduino pins 0 and 1, they are set to High and LOW in the program for the 0V(GND) and 5V (Vcc)



- There are numerous styles of 0.96" OLED with SPI interface and the pin order (and pin descriptions) vary enormously, including the GND and Vcc being swapped on some models. The descriptions can be confusing as SCL and SDA are often used, but these are descriptions for the I2C interface not SPI. Also 6-pin OLED can sometimes be missing either the RST (it has its own power on reset circuit) or the CS (chip select). The following is what the various pins can be described as:
 CLK is often called D0 or SCL
 MOSI is often called D1 or SDA
 DC is sometimes called D/C
- Different displays will need different #define for the 0V and 5V outputs and different U8GLIB "constructors" for the different OLED pin-outs, various examples are below. Just remember that what is marked as "0" on Pro Mini Strong is actually D1 and what is marked as "1" is actually D0



OLED with pins GND, VCC, D0, D1, RES, DC, CS

```
#define _0V 1
#define _5V 0
```

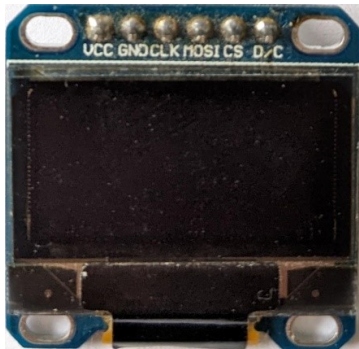
```
U8GLIB_SSD1306_128X64 u8g(2, 3, 6, 5, 4);
//SW SPI: SCK=2, MOSI=3, CS=6, DC=5, RST=4 ***0.96" 7 pin OLED***
```



OLED with pins GND, VCC, D0, D1, RES, DC

```
#define _0V 1
#define _5V 0
```

```
U8GLIB_SSD1306_128X64 u8g(2, 3, U8G_PIN_NONE, 5, 4);
//SW SPI: SCK=2, MOSI=3, DC=5, RST=4 ***0.96" 6 pin OLED***
```



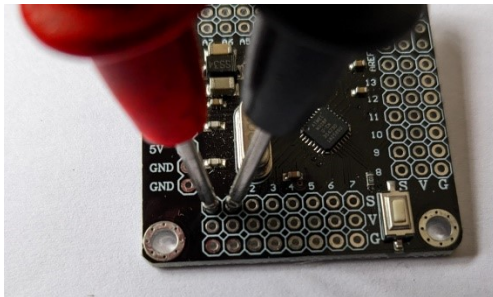
OLED with pins VCC, GND, CLK, MOSI, CS, D/C

```
#define _0V 0
```

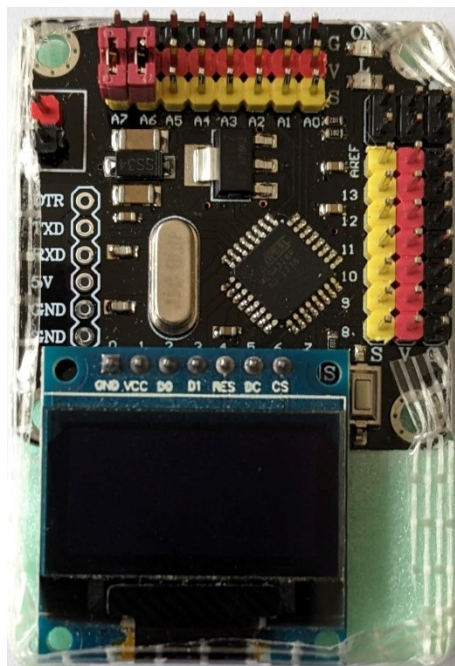
```
#define _5V 1
```

```
U8GLIB_SSD1306_128X64 u8g(2, 3, 4, 5, U8G_PIN_NONE);
```

```
//SW SPI: SCK=2, MOSI=3, CS=4, DC=5, (no RST) *0.96" 6 pin OLED*
```

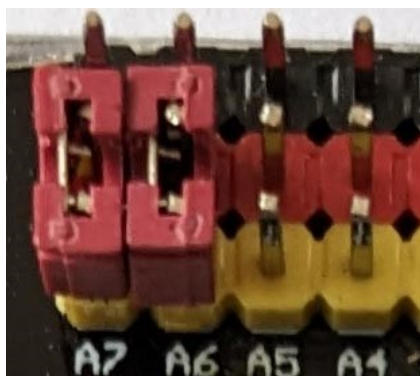


- Solder on the ICSP header and upload the program first, so you can check correct polarity on pins 0 and 1 to match your OLED before you solder the OLED in place. Or if you're using a DM More Nano, program in now, before the OLED is soldered in.
- Note you'll need the U8GLIB library installed in Arduino IDE, it isn't installed by default
- The OLED is soldered into pins 0 to 5 (for 6-pin OLED) and 0 to 6 (for 7-pin OLED)
- Assemble the pin headers the same as for a Pro Mini Strong encoder
- Once complete, I've used some 2mm depron off-cuts double sided taped behind the OLED, then another piece of 2mm depron taped behind the OLED and Pro Mini Strong, to support the OLED and to avoid shorting any terminals



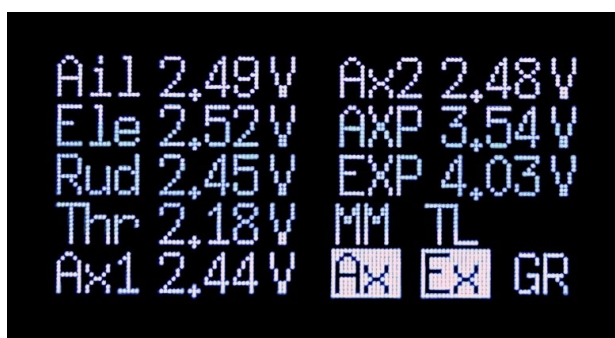
Using the “Wiring Tester”

The “wiring tester” has the same terminals as a GTS encoder (or DM More Pro Mini Strong or Nano), except there’s no ppm output or meter output. Connect up the “Wiring Tester” the same as you would the encoder.



If you are not using any of the channels or are using a GTS V1.4 encoder with the on-board rates/expo pot’s, then you will need to link the unused connections with 0.1” jumper headers between the red (5V) and yellow (signal). Adjacent, you can see A6 and A7 have been linked. For the GTS V1.4, if you have no spare jumpers, you can temporarily borrow them from the GTS V1.4 board (A/R and E/R). Alternatively you can also jumper from black (GND) to yellow with a Spektrum “bind” plug or make one from a servo plug if you have no 0.1” jumpers available.

Power up with the battery you are going to use for the conversion. The OLED will display the voltage from each joystick, auxiliary and rate/expo potentiometer and also the five switch positions, normal text is “Off” and reverse text is “On” for the switches. In the below the Aileron Rate/Expo and Elevator Rate/Expo switches are both on and the other switches are off.



The abbreviations used are as follows:

Ail – Aileron Joystick potentiometer (A0)
Ele – Elevator Joystick potentiometer (A1)
Rud – Rudder Joystick potentiometer (A2)
Thr – Throttle Joystick potentiometer (A3)
Ax1 – Auxiliary1 potentiometer (A4)
Ax2 – Auxiliary2 potentiometer (A5)
AXP – Aileron rates/expo potentiometer (A6)
EXP – Elevator rates/expo potentiometer (A7)

MM – Minute minder Switch (D8)
TL – Throttle lock switch (D9)
Ax – Aileron Rates/Expo switch (D10)
Ex – Elevator Rates/Expo switch (D11)
GR – Gear switch (D12)

Interpreting the Display

The display is self-explanatory if all is working properly, but it is of most use when things aren't working correctly, so the things to consider are as follows:

All the joystick and auxiliary voltages (and rates/expo pot's if used) should be fairly stable when the joysticks are not being moved, with only the least significant decimal moving ($\pm 0.01V$).

The voltage should increase/decrease linearly when a joystick or auxiliary lever is moved.

Don't expect the joystick voltages or the auxiliary channel lever voltages to vary from 0.0V to 5.0V when you move them full movement, joysticks aren't designed like that. Retro transmitters use standard commercial or industrial potentiometers that typically have 300° degree rotation, but the joysticks only move the pot's approximately 60° or around 20% of the total rotation. So if the pot's have a 5V supply, the output will have a voltage swing of around 1V, typically 1.0V to 2.0V with 1.5V centre for older sets (1960s to around the mid '70s) or 2.0V to 3.0V with 2.5V centre for sets based on the NE5044 chip with servo reversing. But those figures are only approximate, so for example, 0.89V to 2.05V would be quite normal (as measured on a Skyleader Clubman with Kraft joysticks).



Except when the channels have been jumped to 0V/GND or 5V or for the rates/expo pot's (they can move the full 300° degree rotation), none of the channels would normally read 0.00V or 5.00V.



If they are stuck at 5.0V, then the potentiometer has been wired incorrectly, probably as in the second diagram, or the 0V has not been connected.



If the reading is 0V or near 0V then it has either been wired as in the third diagram or the 5V is not connected or the servo plug has been plugged into the "Wiring Tester" in reverse.

Common causes for "unconnected" include bad soldering onto the pot' and/or faulty crimps in the servo plug (especially if the plugs have been hand crimped).

If a channel voltage varies when another channel is operated, often "following" what the proceeding channel is doing, then the wiring for that channel is probably open circuit, either the potentiometer is faulty, the soldering to the wiper terminal on the pot' is poor, the servo connector used to connect to the board has a faulty crimp or it is not connected properly to the "Wiring Tester".

It is important that the throttle joystick voltage reading increases when the throttle is opened, if not the throttle lock alarm will sound on the encoder.

For sets with separate trim pot's, ensure the voltage increases/decreases for the joystick and trim in the same direction. Trims should have approximately 20% of the "authority" of the joystick, so if moving the joystick from centre to end increases the voltage by 0.5V, you should expect the trim to increase by approximately 0.10V. If it's substantially different, say above 25% authority or below 15% authority, you may need to wire the joystick/trim pot's in a different way, there are two common circuits.