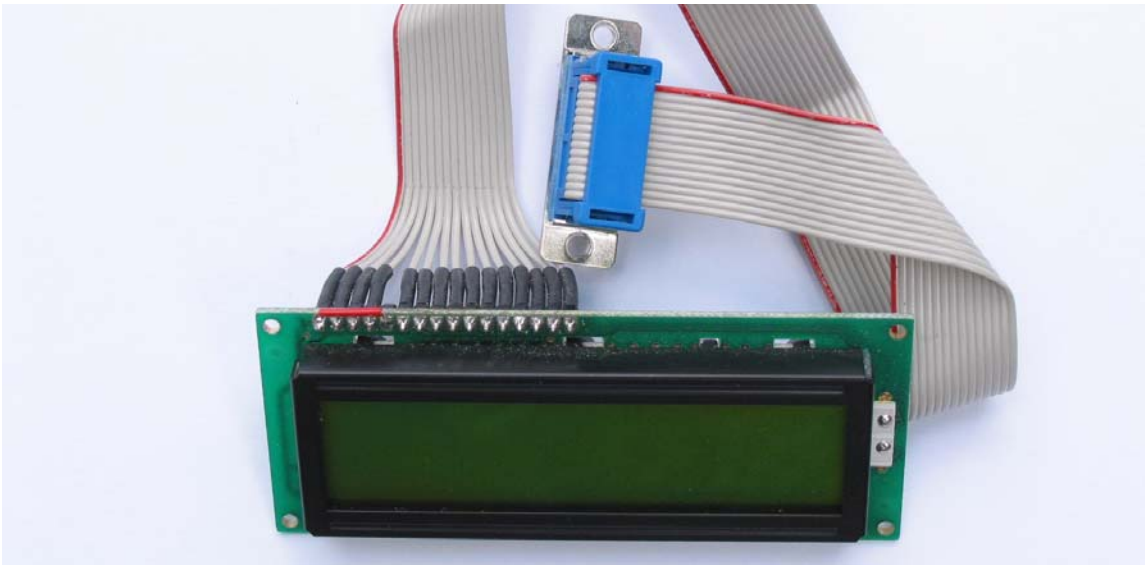
Attaching a new display to the ST Aviation Fuel Monitor

These notes describe how to wire up a different liquid crystal display (LCD) for the fuel monitor. You might wish to do this for example if the original display has become damaged or if a physically smaller device would be more suitable.

The original display should look something like this. It is usually referred to as a 16x2 display, meaning that it has 2 rows of 16 characters.



You will need a length of 15-way ribbon cable with a 15-pin D-type connector at one end as shown above. These connectors (blue in the above picture) are IDC devices, or Insulation Displacement Connectors. It is entirely possible to make this cable from scratch using the appropriate connectors. It may, however, save some time to desolder the row of pins from the existing display and use it on the new one. These notes are written on this basis.

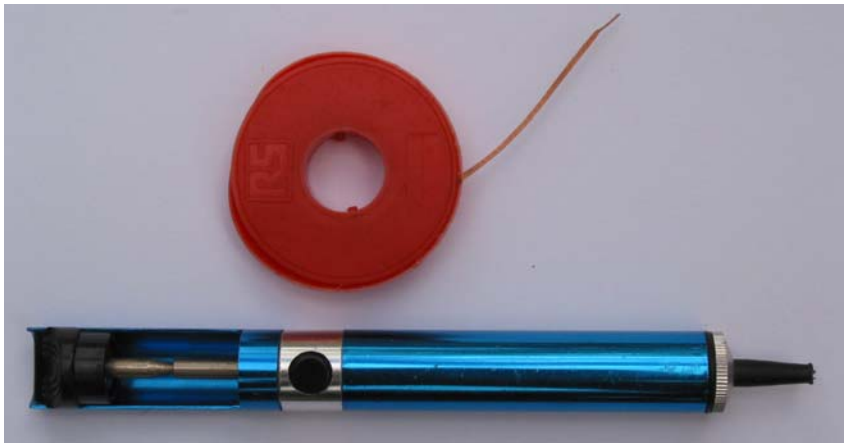
The first task is therefore to remove the row of pins from the display. It is worth noting that these electronic displays can be damaged by static electricity, and an earthed wristband is recommended when handling them. As example is shown on the next page.

NB In fact most semiconductor devices are susceptible to ESD (electrostatic discharge) damage. Components can be completely destroyed or just degraded slightly. It would be easy to think that the latter is preferable but in fact the reverse is often true. A device which has failed completely can easily be tracked down and replaced. A degraded component, however, might exhibit rise or fall times which are out of tolerance or perhaps propagation delays which are a few nanoseconds more than normal. This in turn can create unusual behaviour in high speed logic systems and identifying the defective part can prove difficult.

Analogue components (eg operational amplifiers or opamps) can also be affected. ESD may cause voltage drift or offsets which get worse over time, and this manifests itself as errors in eg temperature or pressure measurement.

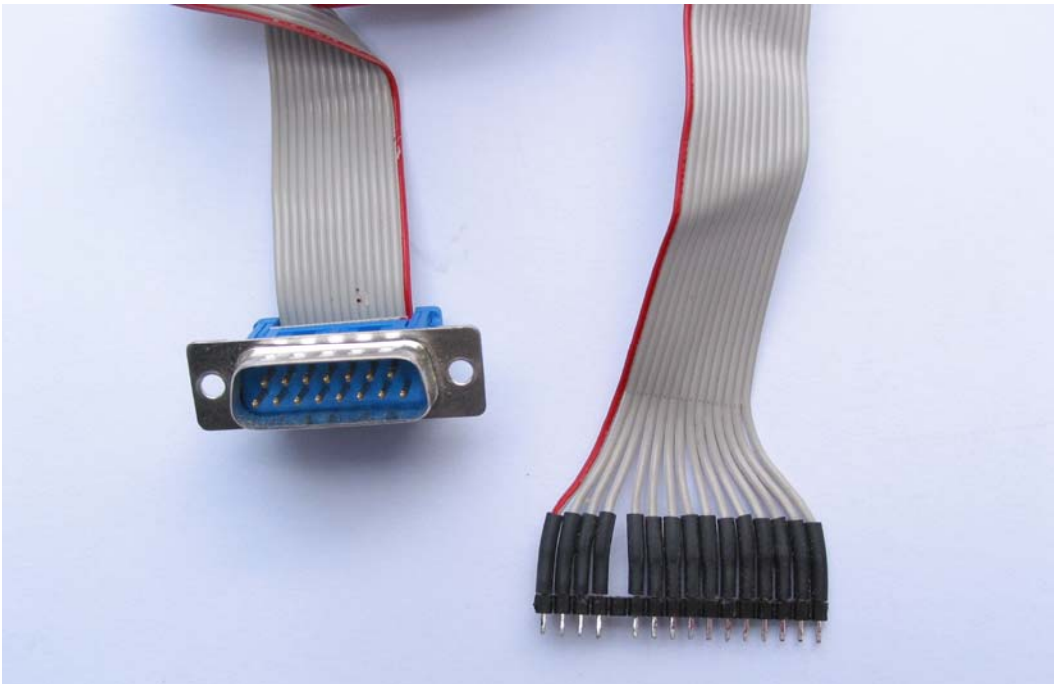
These have wires woven into the elasticated wristband, and a length of wire connects to the earth pin on the plastic mains plug, usually through a resistance of a few megohms. This type of product can also be useful when upgrading a PC for example, so it can be a worthwhile investment. We do not recommend that you try to make your own using a standard three-pin plug.

Returning to the display, you can use the items shown below to desolder the pins. The red reel is called solder braid (or solder wick), and can be remarkably effective in drawing off surplus solder from a joint. You might also consider the solder sucker. This is basically a spring loaded piston which is released by pressing the button. You melt the solder with an iron in the normal way and the sudden inrush of air at the nozzle draws up the molten solder.

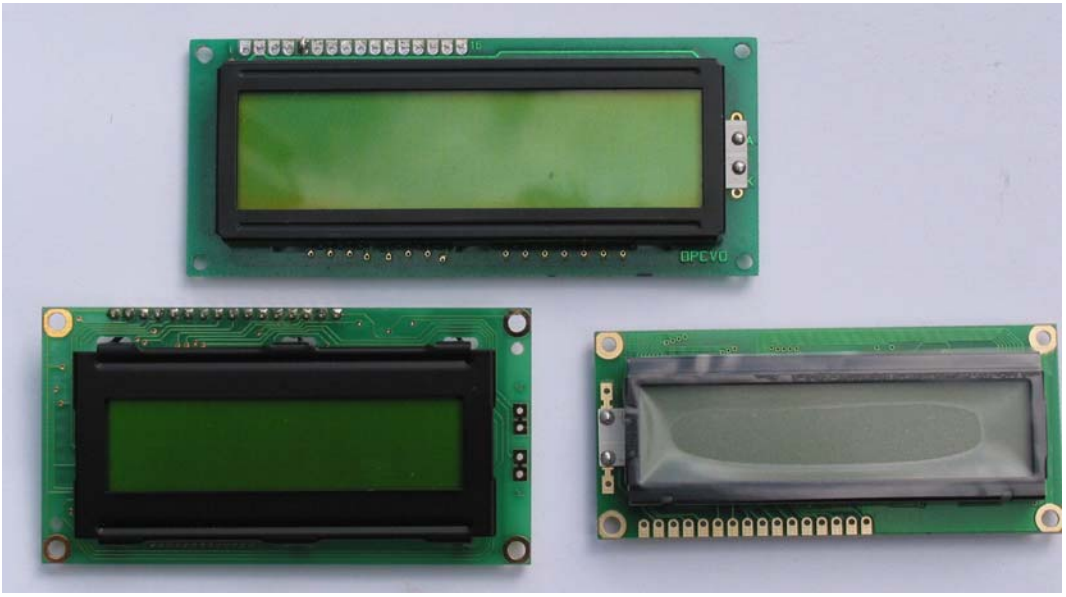


Best of all is a professional desoldering tool such as the one shown above. The hollow nozzle melts the solder and a squeeze of the red trigger activates a vacuum pump to draw off the solder. Most users will probably have to rely on the previous devices.

With the pins removed from the display you should now have something like this;



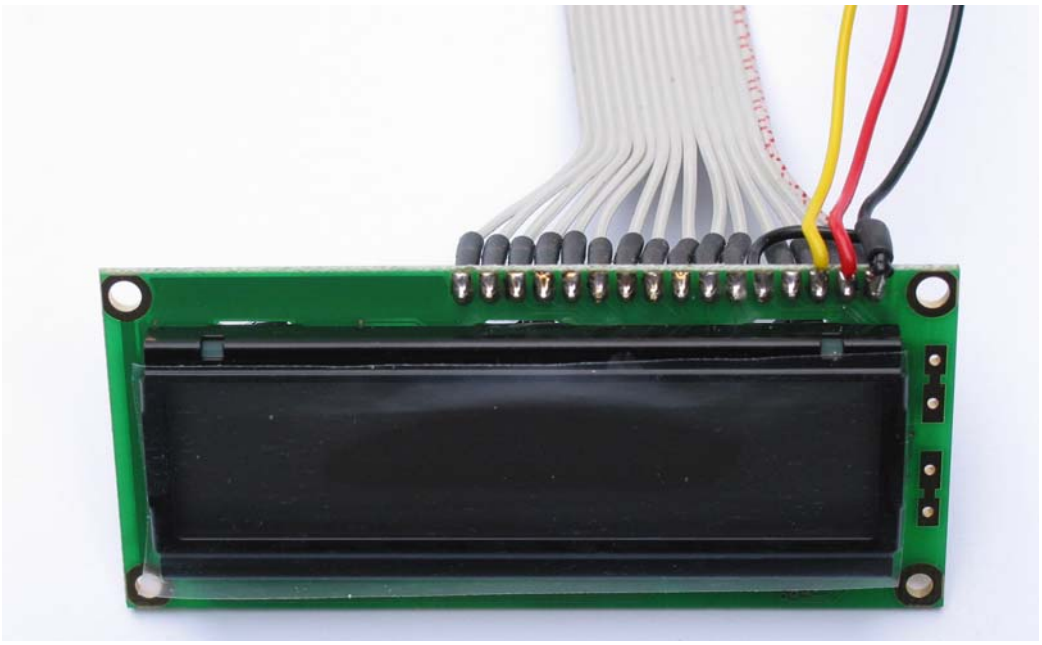
You will see that there is a red stripe on the grey ribbon cable which traditionally represents pin 1. Notice also that there is a pin missing (pin 5) from the connector on the right - this is deliberate.



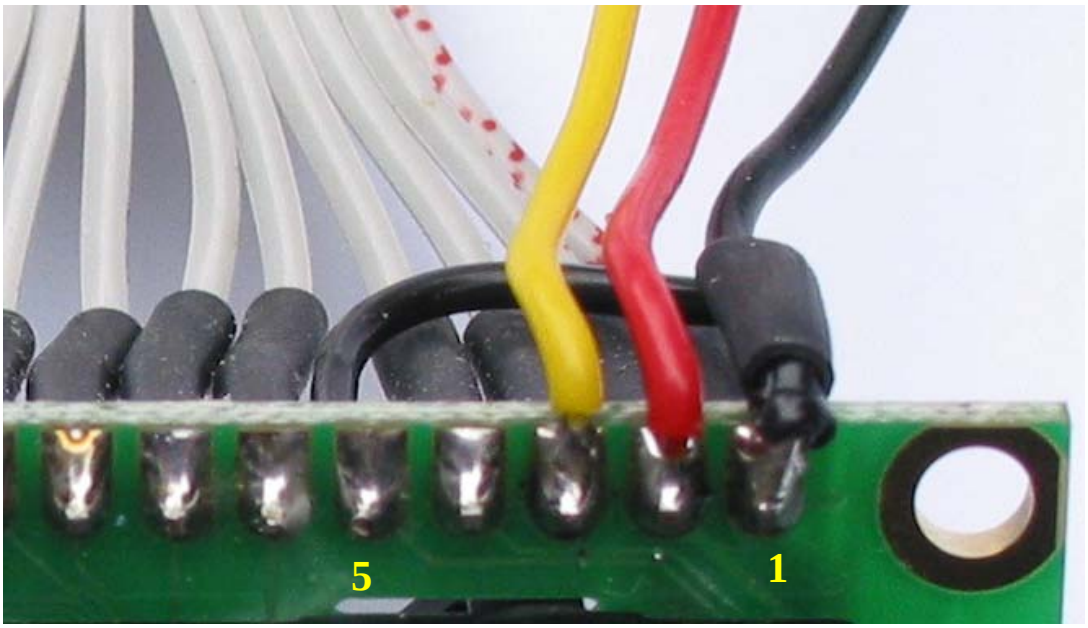
You now need to select your display. Just three examples are shown above but the following points are worth mentioning;

1) All three displays are 16x2. The size of the characters, the black bezel and the green circuit board usually varies from one manufacturer to another. The position of the four mounting holes is also different.
2) All these displays shown here are the right way up, therefore do not assume that the row of holes is always at the top.
3) There are normally 16 holes and you need to make sure that they are numbered from 1 to 16 in sequence. Some displays move pins 15 and 16 to odd places, and while it is possible to use such displays, the wiring becomes less straightforward. We will assume that a simple 1,2,3...16 numbering system is being used. Pin 1 and pin 16 are normally marked clearly on the circuit board.
4) We will be using RS Components stock code 294-8695. This display is shown in the bottom right of the above picture. This does not have an LED backlight. A suitable RS part with a backlight is 294-8774.

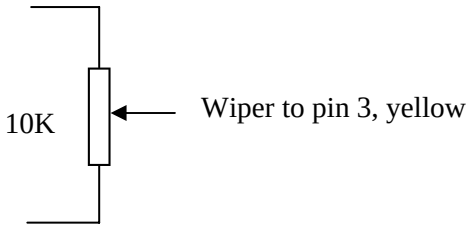
Bear in mind also that most suppliers such as RS Components will have a clause in their terms and conditions which allows them to change the specification of their goods. This means that if you buy a particular stock code on two occasions six months apart, the two products might not be physically identical even though the catalogue has described them accurately. This in turn could mean that the second purchase might not fit the panel cutout intended for the first. There is little that can be done about this other than buying an extra one to use as a spare if needed.



The pins have now been soldered to the new display. This display is shown upside down and pin 1 is on the right of the picture (recall the red stripe). Below you can see a bit more detail in the vicinity of pin 1. Observe that the grey ribbon cable does not go to pin 5. Instead a wire must be included which joins pin 1 to pin 5 (this wire was also on the original display shown on page 1). Three additional wires (coloured black, red and yellow here) must also be connected as shown. These will go to a 10K (ie 10,000 ohms) potentiometer.

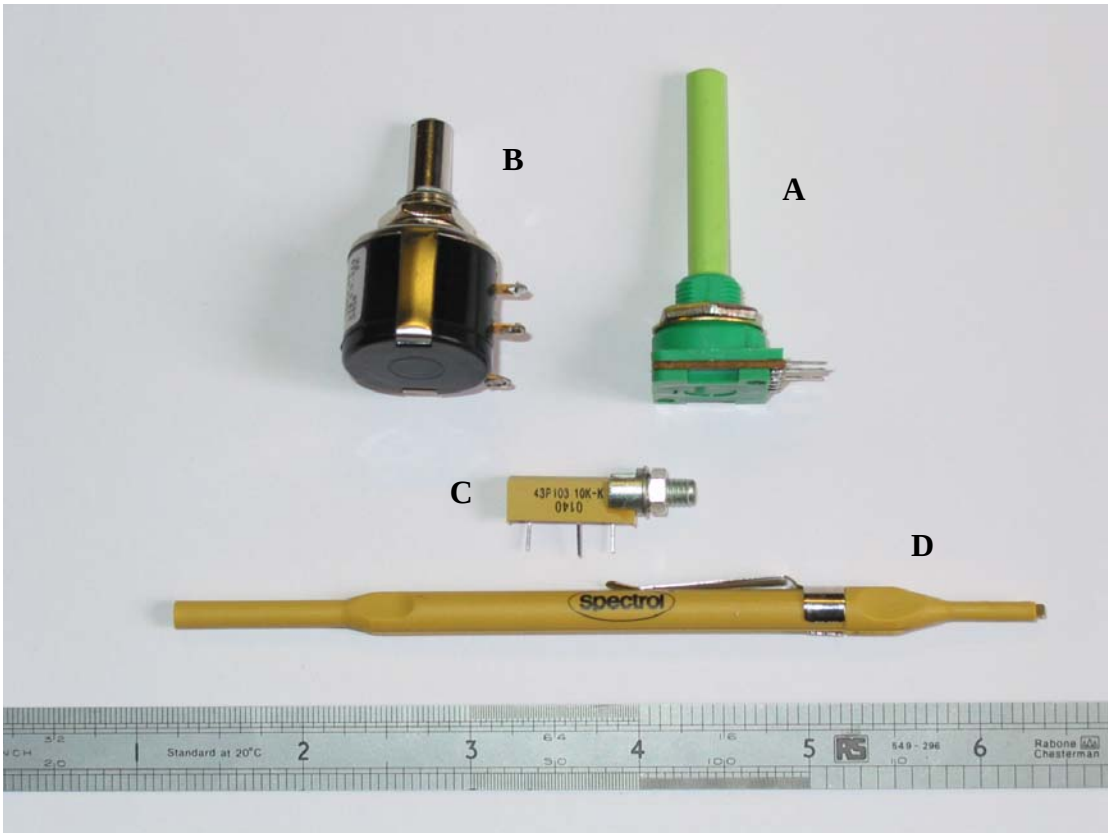


Pin 2 +5V Red



Pin 1 (0V) Black

The black and red wires need to go to the ends of the potentiometer (’pot’), which should be linear rather than logarithmic. The pot wiper is connected to pin 3 on the LCD. As you turn the pot spindle the bias voltage applied to pin 3 changes, and this alters the contrast of the display (anything from too dark to completely blank). Some example pots are shown below, with an inch-ruler for scale.



‘A’ is a cheap and cheerful 10K linear pot. The shaft rotates through about 270 degrees and in practice there can be a slight problem. You will find that the usable range of the pot is with the wiper very near to the bottom (0V) end. So, a very small turn of the shaft produces a very sudden change in the display contrast. One way to round this is to make the pot about 2K instead, and put a fixed series resistor of around 8K in the circuit (between pin 2 on the LCD and the pot). This makes the pot much less sensitive.

Another approach is to use a multiturn pot. ‘B’ is one such device. The shaft rotates through 10 turns or so instead of about 270 degrees. Thus, a given angular rotation moves the wiper by a much smaller amount. Unsurprisingly multiturn pots are more expensive. Knobs are available in various styles and colours to fit these potentiometers.

‘C’ is an example of another multiturn pot. It is usually considered to be more of a ‘trimmer’ device in that you just set it up and leave it. You could however mount it in the panel somewhere (it’s quite compact as the photo shows,) but you would need to have a special tool such as ‘D’ to adjust it.

Remember, when ordering a display you will also need to consider what else you may need. (10K potentiometer, suitable knob, solder braid etc)

Some supplier details

Combined Precision Components (usually known as CPC)
01772 654455 www.cpc.co.uk

Maplin
01226 751155 www.maplin.co.uk

RS Components
01536 201201 rswww.com

Farnell
0113 2636311 www.farnell.com