

For the West Somerset Amateur Radio Club

Constructing Two Computer to Rig Interfaces for ICOM, Ten-Tec and Yaesu Radios

by Bas Helman G4TIC

Introduction

The following two circuits are both based on the Max232 chip and solve the problem of converting from the rig's TTL computer interface voltages to those of the RS232 connection on the computer. Each of the circuits is self powered from the RS232 output and any software used with these interfaces must have RTS and DTR enabled. Whilst the designs are intended to work with all desktop PC computers there may be problems with some laptops where independently powered versions of these circuits may be required.

The Max232 chip is a line driver/receiver designed for the RS232 interface. The detailed properties of the IC can be downloaded in .pdf format from <http://www.maxim-ic.com>. The chip requires four external electrolytic capacitors to function. Confusingly, the recommended value for these has changed over time. I've used the currently advised 1 μ F although values as high as 20 μ F have been used in the past.

Software for use with these interfaces is available free from the internet and is covered in the final section.

Overview

The two interfaces are for:-

1. ICOM and TEN-TEC rigs which both use the CI-V interface
2. Modern Yaesu rigs including the FT-817 for which the included Yaesu design has been customised

The circuits are intended for direct, real time, control of the rig.

The ICOM CI-V interface is implemented in their CT-17 control unit which retails at about £100 in the UK.

Both circuits have been built on matrix board to simplify construction and detailed layouts and photographs are included to aid novice constructors and entice those reluctant to reach for the soldering iron.

The only test equipment you should require is a multimeter to check resistance, voltages and continuity.

The completed projects have been tested, as appropriate, on an ICOM 7400 and Yaesu 817 transceivers. I have not experienced any RF problems with the circuits in use; consequently I have not added any bypass capacitors or inductive filtering.

Matrix Board

A few tips for those of you unfamiliar with matrix board.

- Mark out the size of board you require
- Score both sides of the board with a craft knife
- Snap to break to length
- Remove the rough edges with the knife or a file
- Before mounting any components clean the copper tracks with a BrilloPad and dry

The only specialist requirement for constructing with matrix board is a device for cutting the copper tracks. In the UK a spot face cutter is available from Maplin's, at a price. Fortunately there are many convenient alternatives. A drill bit set into a piece of dowelling makes a very effective tool as do some reamers – check your Swiss army knife.

The usual order of construction is to start with the lowest profile components and work systematically to those of the highest profile. I found it easier to start by placing the pins and socket in order to define the key positions on the matrix. This makes it easier to locate and solder the links followed by the remaining components.

A soldering iron tip of 2.5mm is ideal for these projects.

Construction

The ICOM & TEN-TEC Interface

ICOM and Ten-Tec both use a carrier-sense multiple access collision detect (CSMA/CD) bus. Did you hear it here first? In theory more than one rig could be attached to this design. However an independently powered version of the circuit would be preferable if this is your intention.

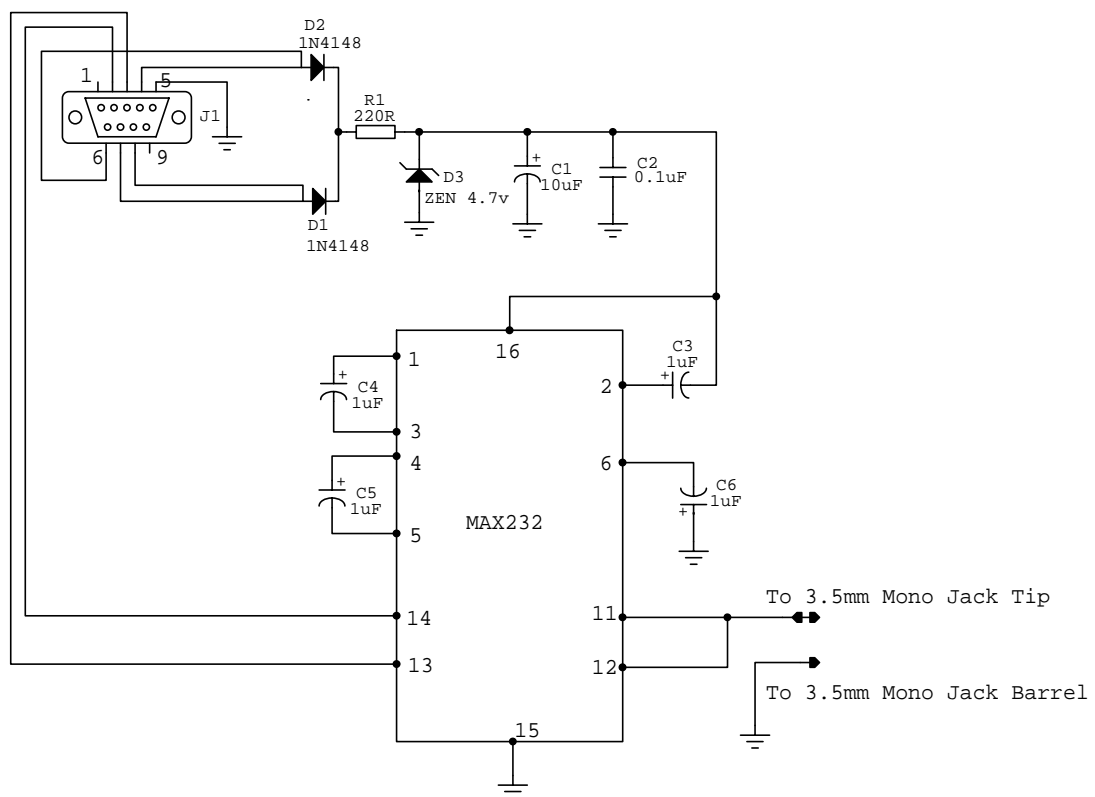
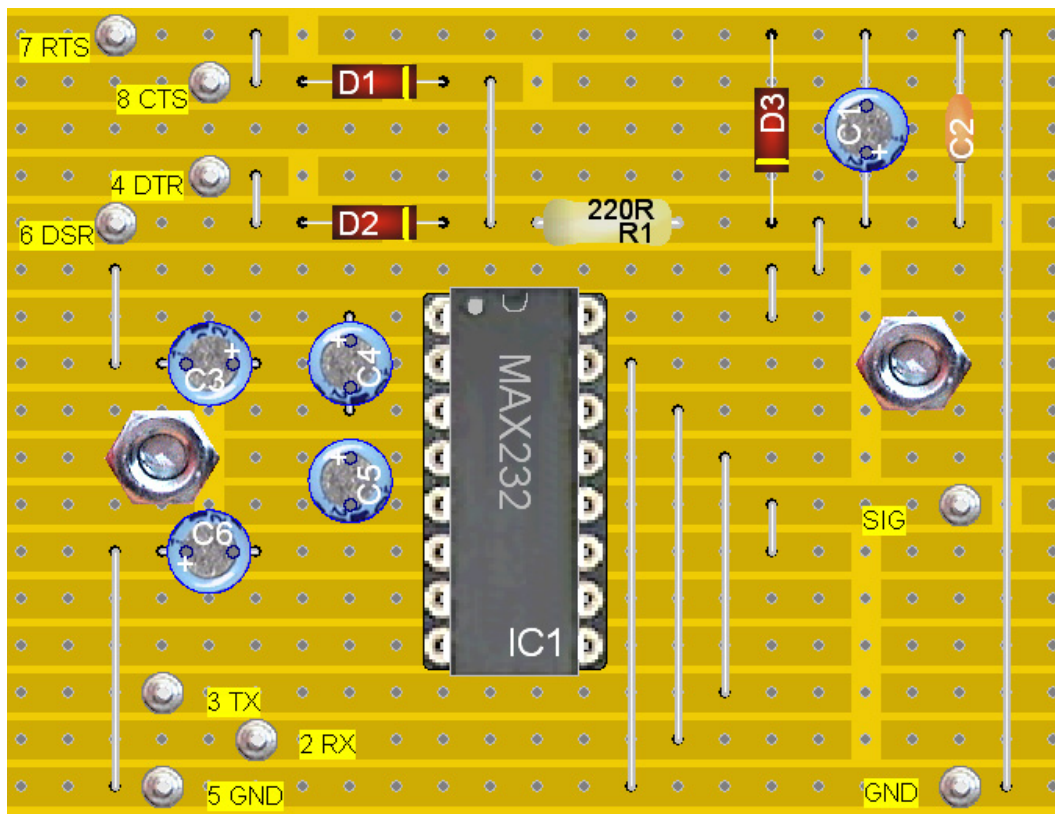
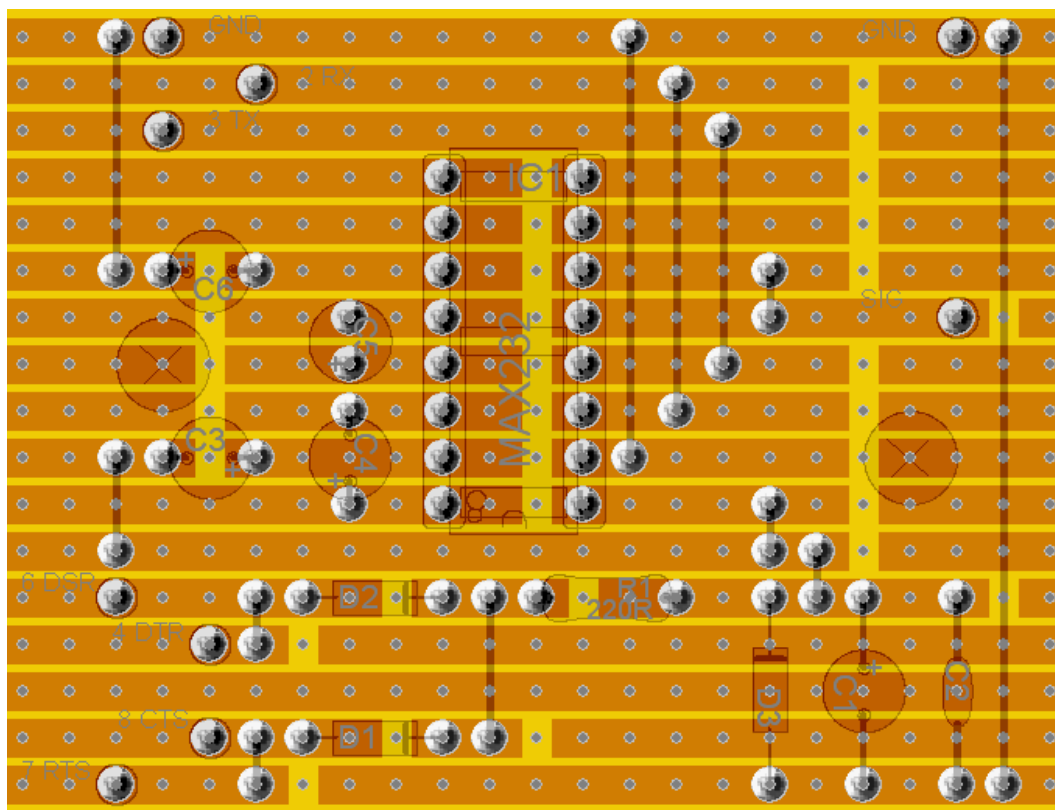


Figure 1 ICOM Interface

The Matrix Board Layout – Component side:-



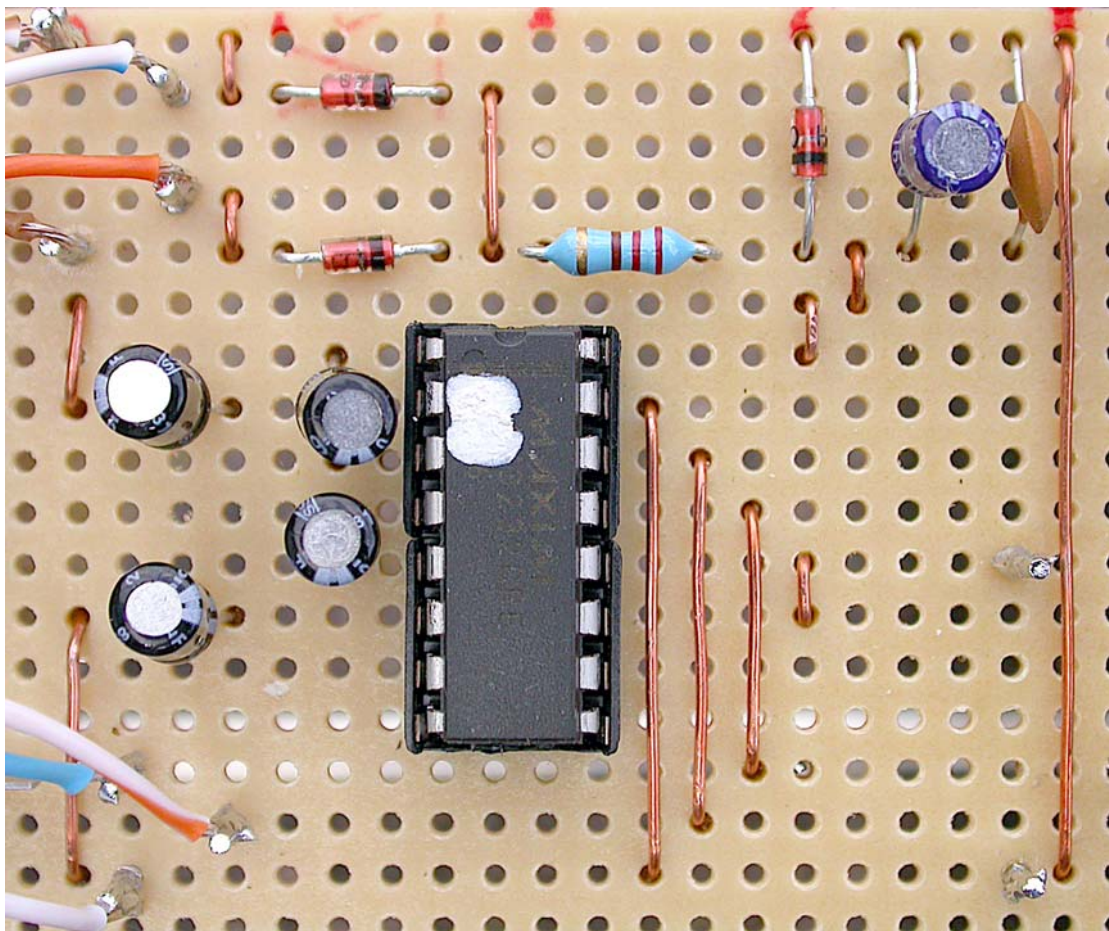
Solder side:-



Component List:-

- IC1 DIL16, MAX232
- SC1 Socket DIL16
- C1 Electrolytic capacitor 4.5mm, 10 μ F
- C2 Ceramic 0.1 μ F
- C3 Electrolytic capacitor 4.5mm, 1 μ F
- C4 Electrolytic capacitor 4.5mm, 1 μ F
- C5 Electrolytic capacitor 4.5mm, 1 μ F
- C6 Electrolytic capacitor 4.5mm, 1 μ F
- D1 SI-diode, 1N4148
- D2 SI-diode, 1N4148
- D3 Zenner diode 4.7V
- R1 Resistor 220R
- Solder pins, 1 mm
- M3, Fixing bolts

A 3.5mm jack is required to connect to the ICOM rig. The signal is connected to the tip.



Photograph of completed board.

The Yaesu Interface

The Yaesu interface has one less link and one more pin than the ICOM version. However to simplify presentation and reduce the need for cross-reference I have treated it in full despite the repetition.

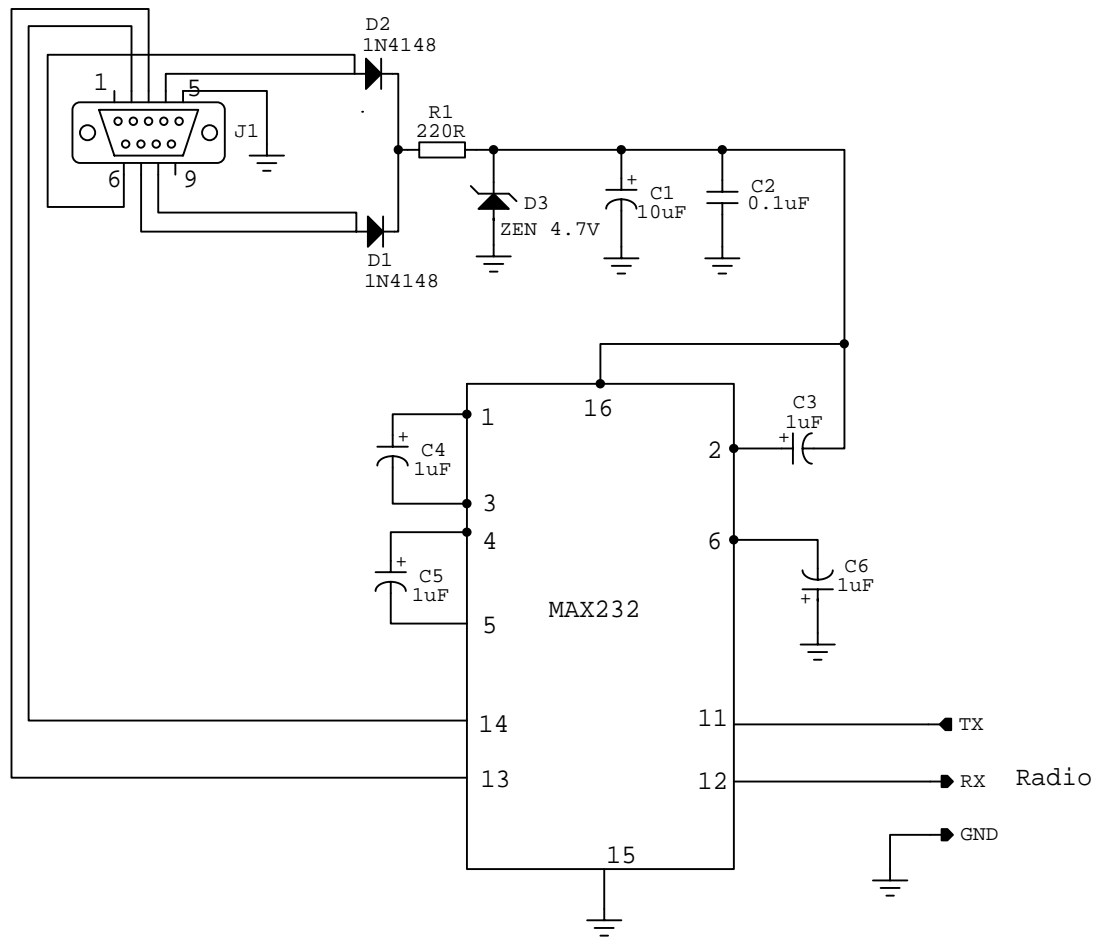
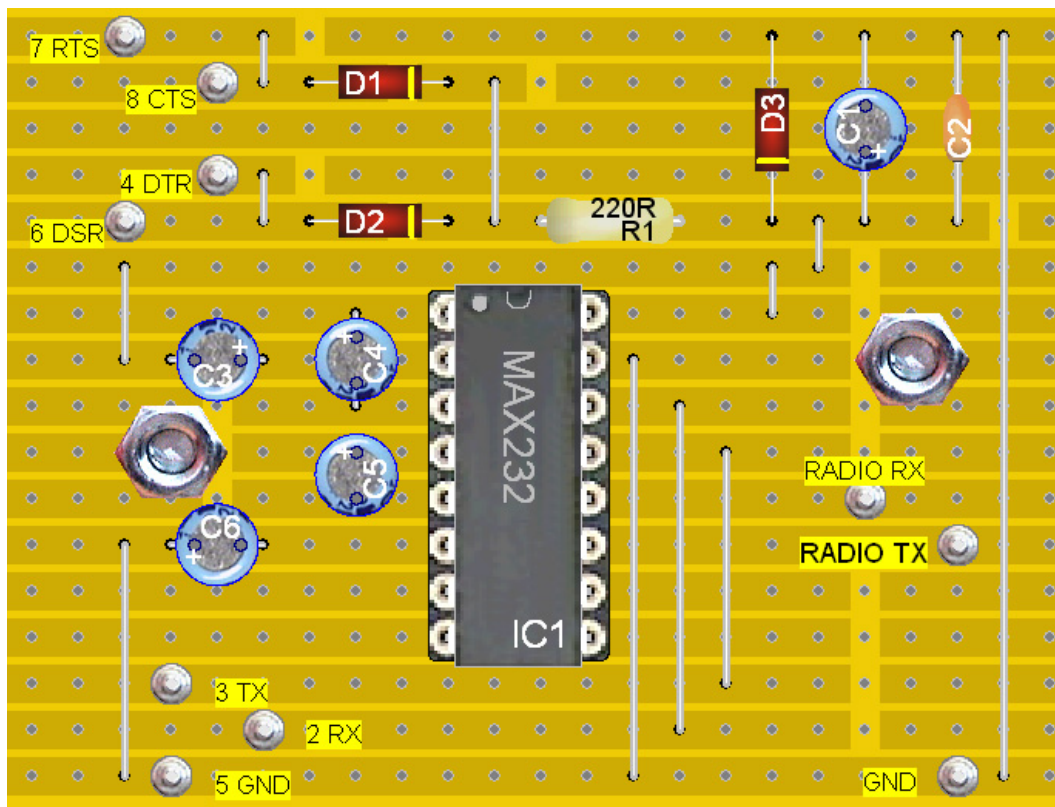


Figure 2 YAESU Interface

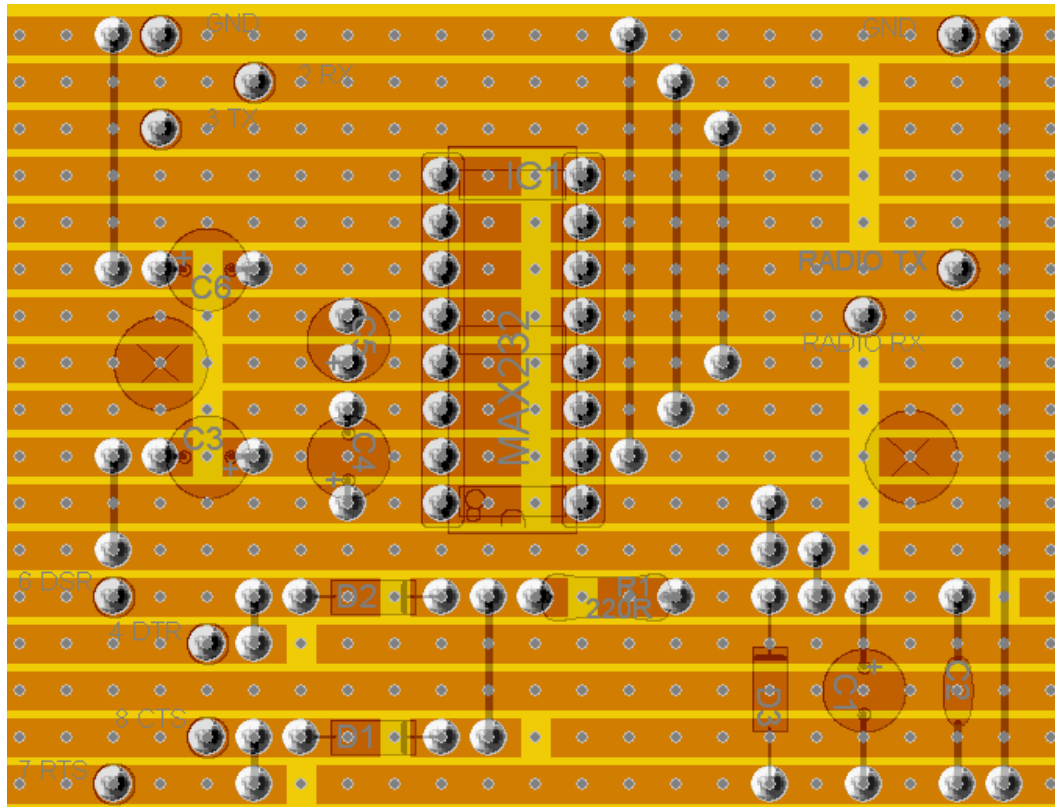
Should you want a dual purpose box switchable between both ICOM and Yaesu rigs then proceed as follows:

1. Build the Yaesu version of the circuit and carry R/TX, R/RX and Ground to a 3 pin Din line socket or use a larger box and a chassis socket
2. Make up two leads one for Yaesu rigs which continues the three lines to the rig and the other for ICOM rigs which shorts Radio/TX and Radio/RX in the three pin line plug
3. Inset the appropriate lead for the rig in use

The Matrix Board Layout – component side:-



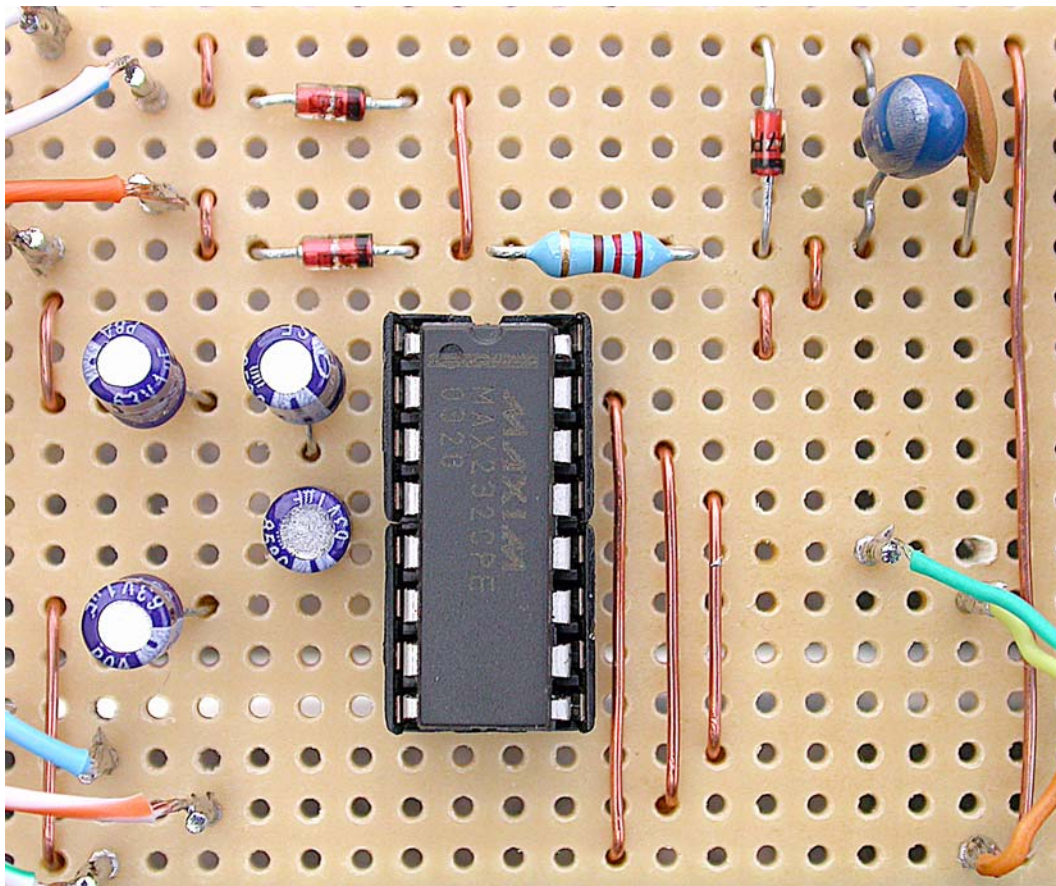
Solder side:-



Component List:-

- IC1 DIL16, MAX232
- SC1 Socket DIL16
- C1 Electrolytic capacitor 4.5mm, 10 μ F
- C2 Ceramic, 0.1 μ F
- C3 Electrolytic capacitor 4.5mm, 1 μ F
- C4 Electrolytic capacitor 4.5mm, 1 μ F
- C5 Electrolytic capacitor 4.5mm, 1 μ F
- C6 Electrolytic capacitor 4.5mm, 1 μ F
- D1 SI-diode, 1N4148
- D2 SI-diode, 1N4148
- D3 Zenner diode 4.7V
- R1 Resistor 220R
- Solder pins, 1 mm
- M3, Fixing bolts
- 8 pin Yaesu ACC plug and lead

Whilst it is possible to obtain the 8 pin ACC plug and wire it up it is small and the pins crowded so a steady hand is essential. A simple solution is to buy a ready wired version with a moulded plug from G3TUX. The wire assignments are included on the package.



Photograph of completed board.

Boxing the Completed Project

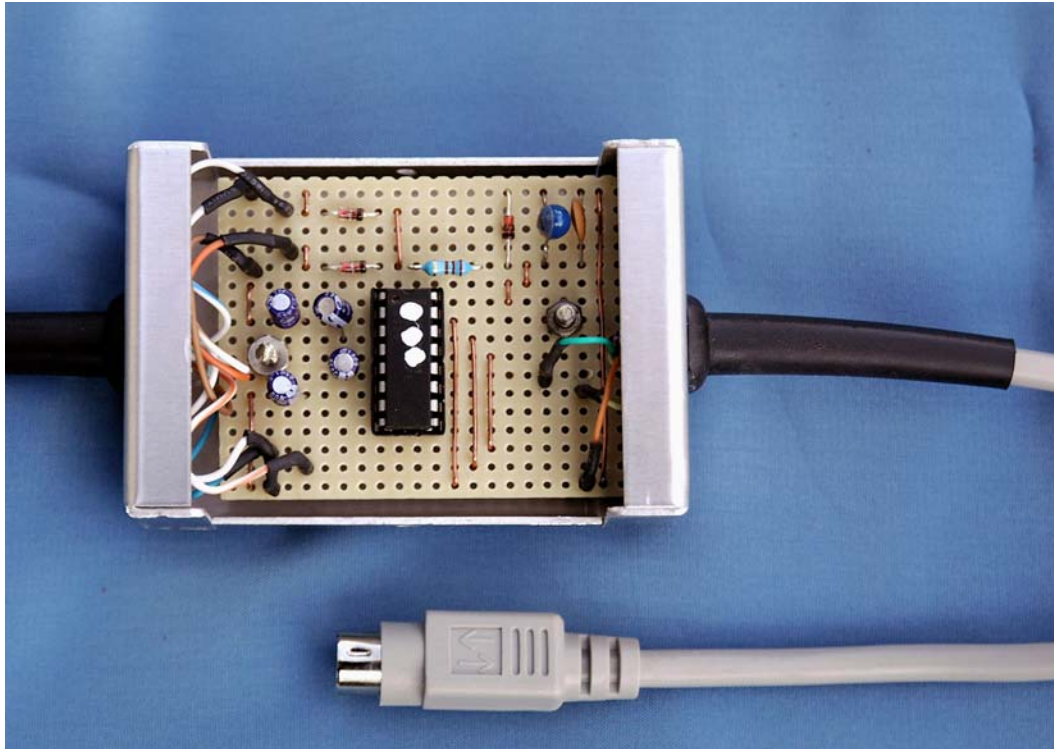
Once the board is complete and working the project needs to be boxed. A cheap light weight aluminium or plastic box is all that is required. Both of these circuits were built into aluminium boxes approximately 75mm by 50mm by 25mm. The leads were passed out via strain relief grommets. For the smaller wire to the ICOM rig I used a gripper grommet available from Maplin. For the larger wires I used rubber grommets with an integral flex guard from the same source.

I find it easier to drill the necessary holes undersize and then open them up with a reamer. This results in a much neater hole. Pass the leads through the grommets and secure those in the rubber grommets with a few dabs of superglue. The board itself is best fixed by nuts and bolts but double sided adhesive foam pads or hot melt glue could also be used - just avoid shorts.

Paste a scaled down circuit diagram in the lid of your box for future reference.



The finished ICOM interface



The finished YAESU interface.

Software

Simon Brown HB9DRV, assisted by Peter Halpin PH1PH, has written some excellent software for controlling rigs. This started with a program for the FT-817 called *FT-817 Commander* available from <http://www.kns.ch/sysgem/hb9drv/FT817Commander.htm> and this has been developed into *Ham Radio Deluxe* available from <http://www.kns.ch/sysgem/hb9drv/HamRadioDeluxe.htm> which allows the control of a wide range of rigs. The interfaces illustrated here were tested with one or other of these programs.

Simon has forgone the temptation to produce an analogue of the rig controls with software control knobs requiring a rotational action to change frequency. His solution is a linear band spread which is much easier to activate with a mouse and provides a superior ergonomic solution.

As an extra, both of these programs have mapping facilities and PSK31 software. The ticker-tape PSK31 Super Browser is an awesome facility.

Visit Simon and Peter's sites to get further information.

Sources

<http://www.halpin.tomaatnet.nl>

<http://www.kns.ch/sysgem/hb9drv/index.htm>

<http://g3tux.co.uk>

<http://www.maplin.co.uk>

<http://groups.yahoo.com/group/ham-radio-deluxe>

Contact

If you have any comments or suggestions you can contact me by email at basil.helman@btopenworld.com.