

Modification of Crew Box 2 Set and Design of an interface unit for Non-Clansman Radio sets. Joe Bell G4PMY

The Clansman range of harness boxes come in two flavours, black fronted which are dynamic microphones and used with the black coloured pressel boxes, and the Gold coloured boxes which are for electret microphone use and are used with the green coloured pressel boxes.

In my Russian radio station, I found the facility of a second headset for the logging computer operator who can also access that radio plus speak with the main operator over the intercom a most useful facility.

When I set about building a "commercial product" based radio station for special events and field day use I wanted to incorporate the same features. The Clansman Radio series of harness boxes provide the desired facilities, but, interface to the Clansman radio sets by virtue of current sensing.

The adoption of a true harness arrangement would also permit system monitoring outside of the truck, and also would facilitate the operators to set up on a side table external to the truck, both of which are desirable features to promote the hobby.

I have become accustomed to using aviation grade headsets which have an internal amplifier and capacitor microphone. This would require the provision of a bias supply of 8v DC to the headset connector. To interface the Clansman Interface Box 2 set to say an Icom radio set, or any radio set requiring a separate PTT key would also require the design of an interface box which converted the Clansman current sensing PTT to relay based PTT.

The diagram shows how both objectives were achieved. Firstly a couple of Clansman facts.

1, The Microphone input to the "Interface Box 2 set" is the secondary winding of the microphone transformer of the "Crew box 2 set". This connection is made via a relay and via the 12 way interface cable known as the harness cable.

2, The microphone audio output from the "Interface Box 2 set" consists of a resistor placed in series with each leg of the microphone transformer and a diode across the output. The DC resistance presented to the microphone input of the radio set is approximately 1.7K Ω . The diode across the microphone output will clip the audio waveform if the drive to line is set too high. There is also an added complication in that if you set the microphone level low enough for the radio set not to be over-driven, then the intercom is too quiet.

The diode also dictates that any DC placed on the output has to be polarity sensitive, and may not be considered as a 600 Ω circuit.

3, In normal two set operation the selected radio sets receive audio would be routed to the right ear, and the non selected radio receive audio would be routed to the left ear. If your intention is to run a single radio set, then you will need to link Pin D and Pin G together on the headset connector (pressel unit). If you are to run 2 sets, you can still link these pins and receive audio from both sets in both ears, it's your choice.

Modification of the Crew Box 2 set (black front type).

The microphone input from the headset, which is connected to the box via the pressel unit, connects to pins 8 & 9 on the PCB.

1, Lift the wire off pin 9 (this corresponds to Pin A of the headset connector) and this will be biased with 8v DC.

2, Place a 100 Ω pot across pins 8 & 9 leaving the wiper free.

3, Make a potential divider consisting of 2 resistors 1K Ω and 470 Ω . Wire the 1K end to pin 21 (+ve), and wire the 470 Ω end to the bottom of the electrolytic capacitor on the pcb (there is only one).

4, Solder a 10uF capacitor across the 470 Ω to smooth the supply.

5, Solder a 680 Ω and a 1uF Poly capacitor in series. Connect the resistor end to the centre of the potential divider, and the capacitor end to the wiper of the pot.

6, Solder the wire removed from Pin 9 to the joining point of the 680 Ω and the poly cap.

The box is now modified for electret microphone use. Connect the "Crew Box 2 set" to the "Interface Box 2 set" using the harness cable (looks like an ARFAT lead).

Power up the system by applying 24v DC to the power connector of the "Interface Box 2 set."

Connect your headset and switch on. Whilst operating PTT and speaking into the headset microphone (make sure set A is selected) connect a scope or line level meter to pins A & B of the "Set A" connector and adjust the new pot for a level of -10dBm. This level is too high for the radio set (and will be reduced further down the chain) but is good for the intercom system.

Non-Clansman Radio Interface.

As stated above, the output from each crew box microphone transformer is routed through a relay, down the harness lead and into the "interface box 2 set". This means that the only indication that PTT is required is the appearance of 1.7K Ω across the TX audio output terminals. This impedance is through 800 Ω resistor, the switched microphone transformer and out via another 800 Ω resistor in the other leg. The conversion of this impedance into a PTT signal that non-Clansman radio sets would recognise is achieved using the circuit on the extreme left of the diagram.

The transformer used has a 600 Ω secondary and a split primary. The primary winding is joined together via the resistor/transformer network described above when the operator presses the PTT key.

The top of the transformer primary is connected to the 28v DC supply, and when PTT is operated this voltage appears at the bottom end of the transformer where it biases a transistor base above its 0.6v operating point.

The base is also connected to ground via a 100k resistor to prevent operation from leakage currents, and it is bypassed to RF via a 1nF capacitor. The transistor has in series with its collector a 12v DC relay, which is also fed via a 150 Ω resistor from the 28vDC supply.

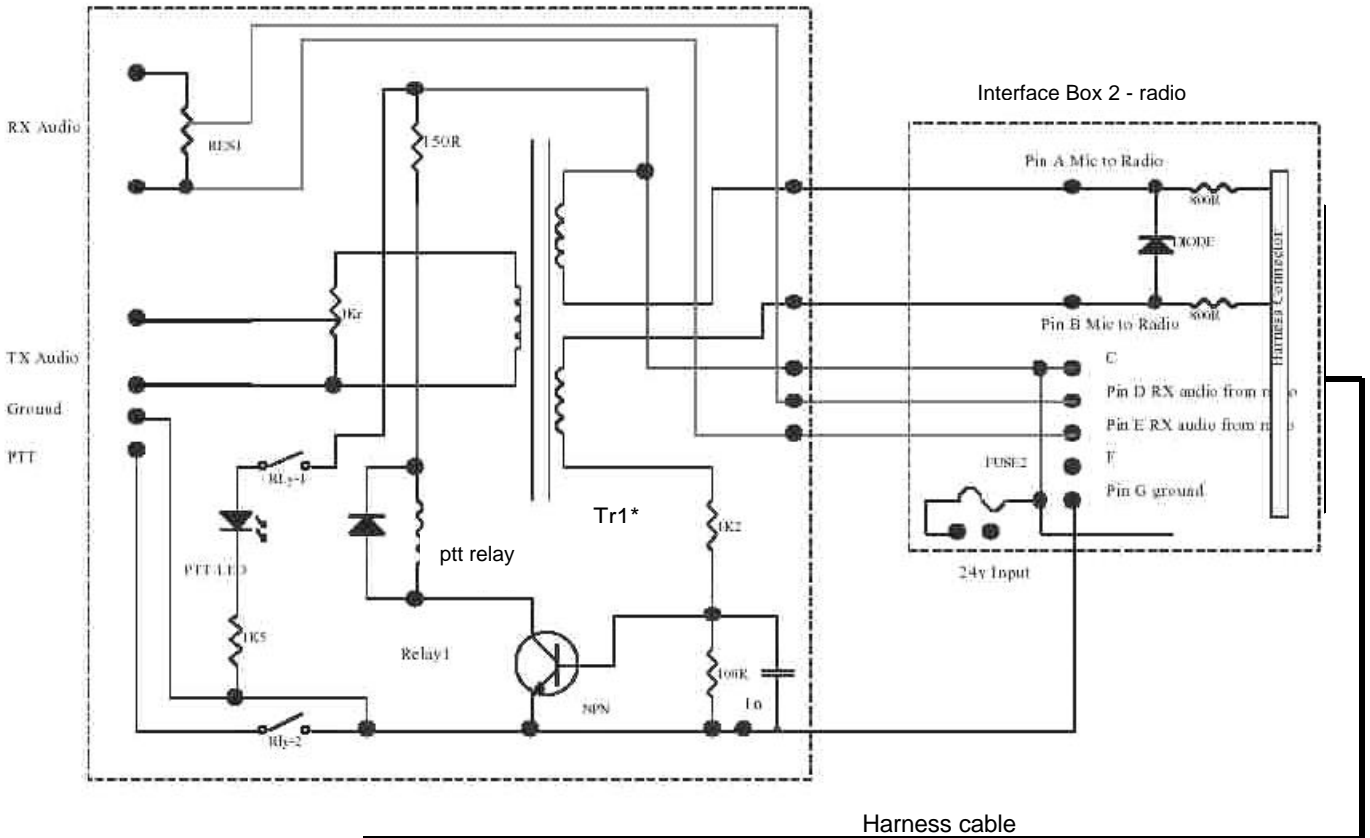
When the transistor operates the contacts RLY1 and RLY2 close. RLY1 connects the 28vDC to an LED device with a current limiting resistor in its cathode. The LED will therefore illuminate to indicate transmit condition.

RLY2 is the PTT contact, which on my diagram pulls the PTT line to ground when operated. You can choose your optional signalling method. The output from the transformer is placed across a 1k Ω pot and this is where the level to the transmitter is set.

Also on the interface is a pot across which the receive audio is placed. The pot will therefore permit the receive level to harness to be set, and it should typically be set for around -10dBm output to harness for full system receive level, although adjustment can be iterative and judged by ear.

Although not shown on the diagram, it would be good design practise to RF proof the inputs and outputs of the new interface box, and also to fit a current limiting resistor in the PTT line, say 500 Ω . It can be seen that pin C of the "Interface Box 2 set" which is normally unused has been employed to carry the fused 28vDC from the interface box to the new box.

Non-Clansman Interface

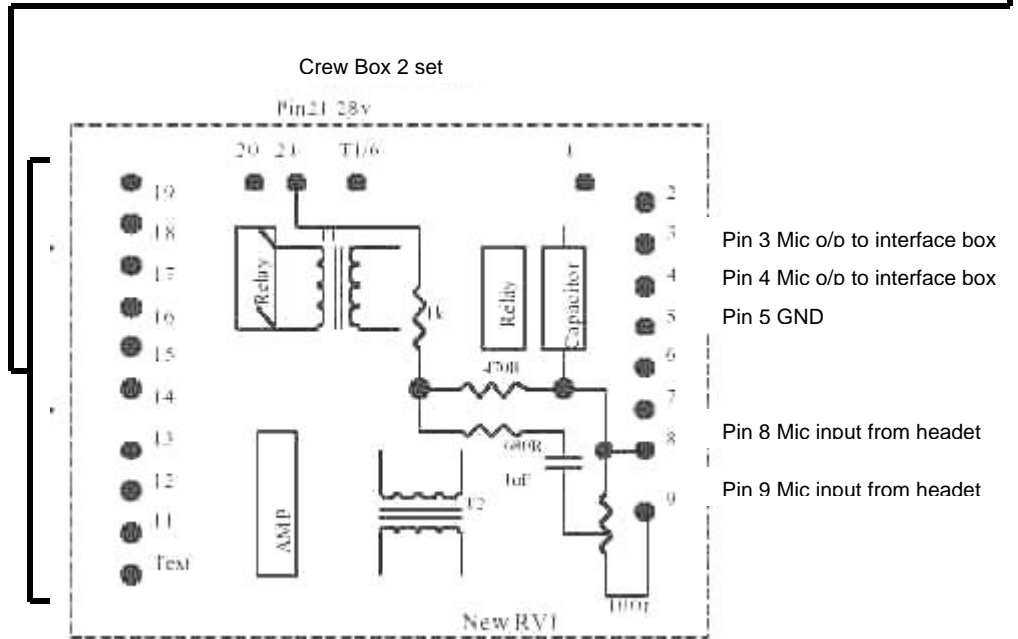


Operation.

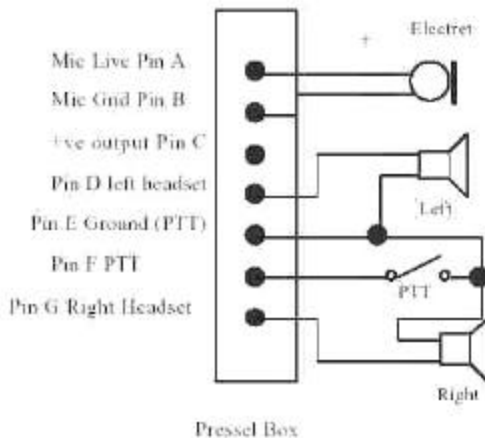
If you now set up two "Crew Boxes 2 set" and a single Interface Box 2 set" you will get one operator position (selects A set on his box plus +M on the right hand side switch), and the second operator or logger sets his box to the same settings. Both can now hear receive traffic, and will get side tone (only if the connected radio sets supports monitor or side tone), and either operator by selecting IC on his box will be able to speak to the other operator.

Further, extension to the outside world is simply achieved by extending the harness and adding more crew boxes.

Harness cable



Headset Circuit



Notes:

1. The transformer TR1 in the non-clansman interface box is a 600Ω - 2x 300Ω mic transformer, but as this is a fairly rare item, it is possible to use two standard 600Ω - 600Ω transformers with the primaries in series to give the desired effect.
2. It may be necessary to adjust the values of the resistors in the base circuit of the relay switching transistor for satisfactory operation, depending on the gain of the transistor.