Solder the negative wire from the PP3 connector to any convenient chassis earth point. Plug in a PP3 NiCad to the connector and use double-sided foam sticky things to attach it to the bottom cover. There are several possible positions but you must make sure that there is sufficient clearance when the cover is replaced.

With this mod, the NiCad is charging all the time that the set is connected to a 12 volt supply and when the supply is disconnected, memory back-up can be maintained for up to 36 hours. Mr. Abrams points out that this mod is valid only if a supply is normally maintained on the power socket, as the resistor value that has been chosen to provide the charging current will dictate a charging time of approximately 24 hours to fully charge a totally discharged battery. The charging rate is within the limits for continuous charging of a PP3 NiCad.

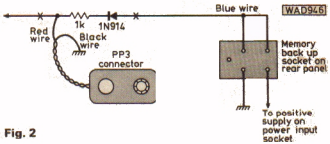


Fig. 2

## Memory Back-up

First remove the bottom cover and locate the blue wire that runs from the memory back-up socket on the back of the set—it's harnessed with some other wires and they are all in a channel on the right-hand side of the rig between the outer side rail and the inner chassis.

Cut this wire approximately halfway along its length and then make up the series circuit shown in Fig. 1.

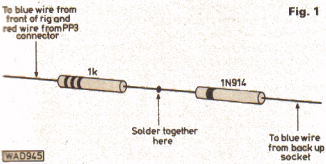


Fig. 1

Strip back the insulation from the newly cut end of the part of the blue wire which runs back to the socket and solder it to the free end of the 1N914 diode. Sleeve the resistor/diode assembly with approximately 40mm of suitable heat-shrink sleeving and then slide it back to show the free end of the resistor. Strip the insulation from the remaining cut end of the blue wire and solder this, along with the positive lead from a PP3 connector, to the free end of the resistor. Slide the heat-shrink sleeving back along the assembly so that it covers all the joints and then shrink it. Now carefully introduce this assembly back into the harness along the side of the rig.

## Extending the Frequency Range

The last of this month's mods deals with extending the frequency range. Mr J. R. Walker sent in a very descriptive letter which detailed the procedure for doing this. He suggests moving a diode (D32) and running two new wires and his idea works perfectly, but Kris G8AUU has improved on the original idea.

When rigs are made in Japan, the manufacturer knows that he has to sell his product all over the world and the trend now is for them to make sets that will work anywhere in the world with only one or two small mods needed to adjust the band edges and channel spacing. The Trio TR-9000 conforms to this pattern and the two key components are D31 and D32.

There are four basic markets for 2 metre amateur equipment and as you can see from Table 1, the TR-9000 can be made to work in any of them by just altering the two diodes. Mr Walker suggested moving the diode in position D31 to position D32 and this would indeed give us an extended frequency range *but* it would also give us channel spacings of 10 and 5kHz. This may suit some people but I far prefer 25kHz spacing when I'm operating mobile and I find it inconvenient to have to keep spinning the dial on a rig that has 5kHz spacing. Kris has solved the problem very simply and in the process he has made the TR-9000 into a rig that will work anywhere in the world, with any of the band edges coupled with any of the channel spacings and all for the price of a switch and two resistors.

**Table 1**

| Zone | Diodes | Band Limits | Channel Spacings | |
|---|---|---|---|---|
| Japan | None | 144·000–145·999 | 20 | 10 |
| USA | D31 | 143·800–148·995 | 10 | 5 |
| Europe | D32 | 144·000–145·9875 | 25 | 12½ |
| Aus/NZ | D31+D32 | 144·000–147·995 | 25 | 5 |

First of all remove all the knobs and the microphone socket threaded ring from the front panel. Then remove the top and bottom covers and the four screws holding the front panel, which can now be carefully pulled forward enough to allow the l.e.d.s to be disconnected. Remove the two screws on each side to allow the front chassis to drop forward and then it should be possible to remove the multi-way connectors from the MPU board. In the middle of this board is D32 and you should now lift the anode end of this diode.

You will need an s.p.d.t. switch (RS No. 316-973 is suitable) and this should be mounted anywhere you like on the set. Mine is on the back panel because there is a space for another hole there, but the position is not important.

Now run a wire from the anode of D32 to the common tag on the switch, then run two more wires from the other two tags back to the p.c.b. and solder them to the anode pads for D32 and D31. These are printed on the board and you will be able to see where the anodes would go if the diodes were there (see Fig. 6).

Two 470 ohm resistors should now be soldered to pins 17 and 18 on Q15 on the control board (X53-1160-61) and then two wires should then be soldered onto the free ends of these resistors. The other ends of these wires can then be soldered to pins 14 and 15 of Q15 on the p.l.l. board. The resistors should be properly sleeved and then they can be allowed to lie on the top of the chip.

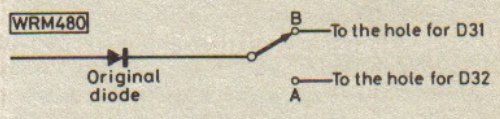


**Fig. 6**

The mod is now complete but it still needs to be explained. We must first differentiate between powering-up the set and turning it on. To power up something is to apply power to the power input socket, whereas turning something on means rotating the On/Off switch.

*continued on page 57*▶▶▶

▶▶▶ continued from page 25

The new switch will now perform two separate functions depending on when it is operated. Setting it to position "A" before powering-up sets the band edges when the power is applied and in this instance gives us the European band and channel spacing. If you now set the switch to position "B" while the power is being applied to the rear of the set, regardless of whether it is turned on or not, you will alter the channel spacing and not the band edges. In other words, you will now have European band edges coupled with US channel spacing, thus making it usable in Australia. Similarly, setting the switch to "B", then powering-up and then resetting the switch to "A" will give you US band edges and European spacing.

It is important to remember that it is the position of the switch before power is applied that sets the band edges and the position afterwards that sets the channel spacing. If you can obtain a miniature s.p.d.t. switch that has a centre off position, such as RS No. 317-005, then the centre position will give you the option of the Japanese band limits and channel spacing, i.e. neither of the diodes will be in circuit.

# Memory Scan

I said last month there are some mods that are recommended only for the very experienced constructor.

The same is true of this next mod from Kris G8AUU, who is probably better known as the co-author of the *International v.h.f. f.m. Guide*. Kris has noticed that several of the Trio rigs use the same microprocessor even though they don't all make use of the same functions, and he has suggested taking a closer look at the µPD 650C inside the TR-9000. This is the same chip that is used in several other sets and they have memory scan on them. It is then reasonable to assume that this chip can be persuaded to scan the memories of the TR-9000 and if we look at Fig. 5 we can see how easily this can be achieved.

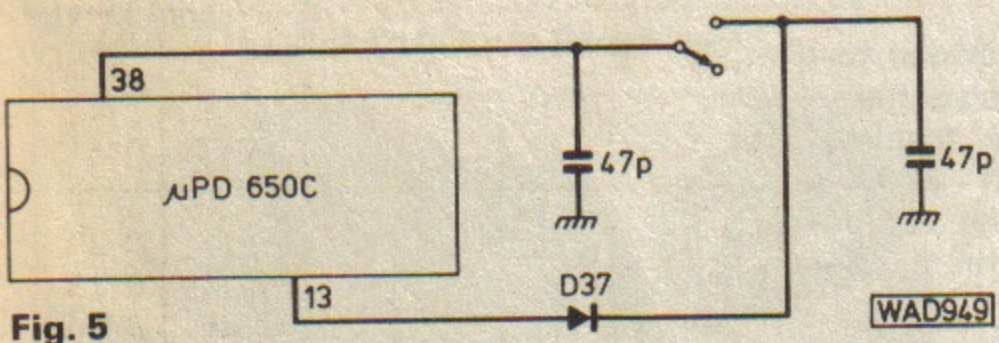


**Fig. 5**

Merely connecting a diode (almost anything will do) between pins 13 and 38 on the chip will start it scanning. The interconnecting lines should be decoupled, as in the diagram, and the switch can be mounted anywhere you like. You may even be able to use a couple of the pins inside the microphone socket, if you don't mind losing the Up/Down scan facility.

# Semi-Reverse Repeater

The second mod this month is for semi-reverse repeater (listen on the input) and it was sent in by Jim GI6BSQ. Jim has not supplied the "nuts and bolts" details for this mod, just the outlines, but I'm sure that most of you will be able to carry it out from the information that has been given.

To achieve a 600kHz shift it is necessary to break into the digital output lines which lead from the control board to the p.l.l. board. Connections 31 and 23 on the p.l.l. printed circuit board must then be made to reverse their logic states, i.e. 31 which is *1* must be made *0* and 23 which is *0* must be made *1*.

Jim mentions that this could be done very simply with a double-pole change-over switch but he has not used this method because it would mean cutting a hole in the case to mount the switch assembly. Instead he has used a quad 2-input NAND integrated circuit, either a 4011 or a 4093. This is connected up as in Fig. 3 and then the entire circuit, which was mounted on a piece of strip-board, can be wrapped in cling film, for insulation, and then fitted into the set. Jim recommends allowing it to lie at the front of the rig, just behind the display, as the interior of the TR-9000 is very cramped.

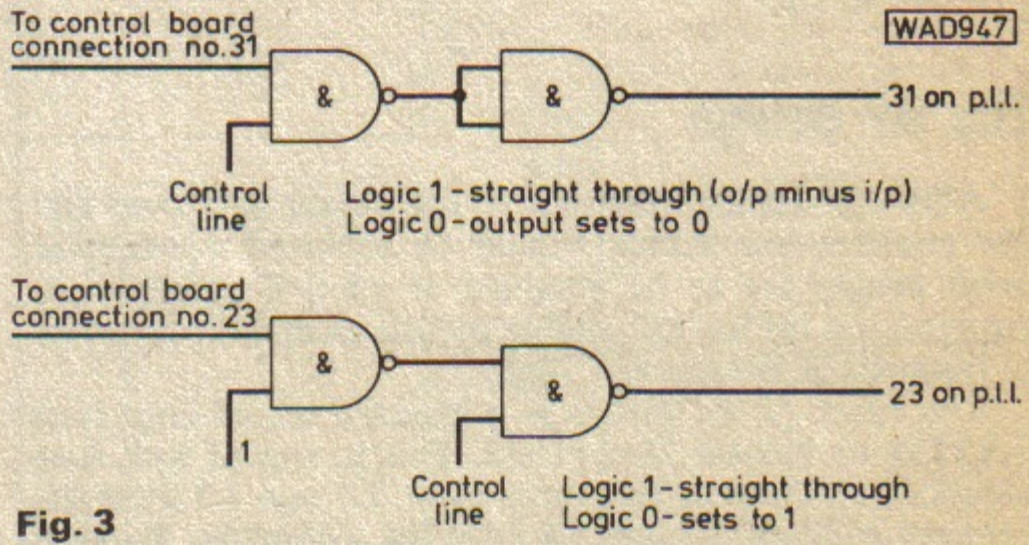


**Fig. 3**

*continued on page 58*▶▶▶

▶▶▶continued from page 43

The connection numbers are marked on the p.l.l. board, which is easy to get at as it is inside the top of the rig, under a cover. The control board is almost inaccessible.

It should be noted that the display is driven differently and it will not show the frequency change.

This mod can be activated by a switch on the microphone (Fig. 4) but you will need to change the microphone cable for one that has more cores. Jim used one from a Yaesu FT-707 microphone. It is not possible to change the whole microphone assembly instead of the cable because the Yaesu switches (UP, DOWN etc) do not close to low resistance contacts and so they are incompatible with the Trio.

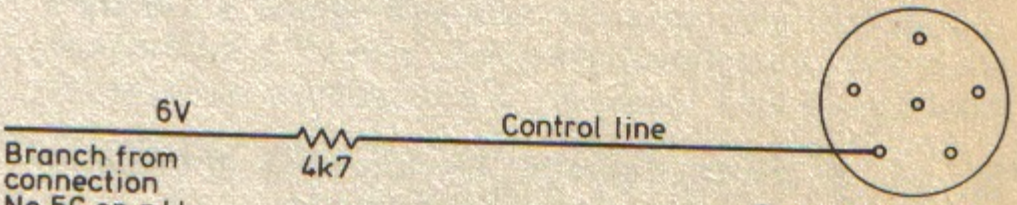


**Fig. 4**

As you will have gathered from the lack of constructional details, you should attempt this mod only if you know what you are doing.

**Next month we will continue with more mods for the TR-9000.**