

G4HUP Panoramic Adaptor Installation – FT950

These instructions cover installation of the PAT board in the 1st IF of the FT950 – 69.45MHz– this gives access to all receiver options on the main receiver.

The Rx and Tx signal paths are separate within the rig. It is recommended that PAT is powered from the Rx9 line, which will automatically mute it on transmit (unless you want to see your Tx signal...)

Basic instructions are given for installing the PAT as an IF Panoramic Adaptor Tap – used in this mode your SDR must be tuned to the 1st IF of the radio, and then your display will track the tuning of your rig – however, the displayed frequency will be that of the IF, not the radio. Because the connection point on the FT950 is between the mixer and the IF filter, a wide bandwidth is available to display – typically limited by the SDR, not the rig.

- 1 Build and test the PAT kit – use a 9v supply and you should measure a gain of approx 1dB at 70MHz.
- 2 Remove bottom cover from the FT950 (18 screws). Lift the cover off.
- 3 Although there are rear panel ventilation slots, these are associated with the PA parts of the rig, and are not easily accessible from the lower part, which contains the low level Tx and Rx circuits. Therefore, it is simplest to mount a suitable connector (SMA) on the rear panel – there is plenty of space.
Mark the rear panel, and centre punch for drilling – be careful to keep swarf out of the rig! I chose to mount the SMA centrally under the uTUNE connectors, as you can see in Fig 1.

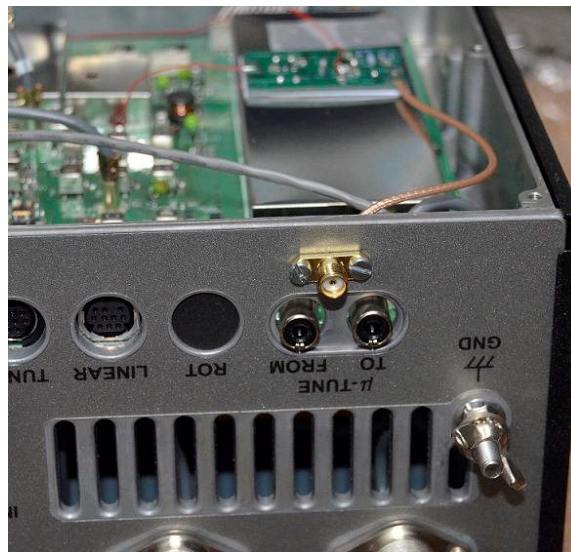


Fig 1 – position of SMA connector on rear panel

The centre of the SMA socket is 40mm from the right hand vertical edge of the rear panel, and the horizontal line through the pin and mounting holes is 11mm down from the top edge of the panel – this will ensure that the connector does not foul the bottom cover when it is re-attached.

- 4 The PAT board mounts directly on the long screening can to the right of the Main Unit (as you view it with the back of the rig nearest to you, it is on the right hand side) - see Fig 2. It does not obstruct anything, and can be positioned to minimise the length of the input wire.



Fig 2 – General view of PAT inside FT950

- 5 The PAT board is held in place by double sided tape, so can easily be removed should it become necessary. It is recommended to use DS tape to hold a layer of card to the screening can, then a second piece of DS tape to hold the PAT board in place.
- 6 The RF signal is mixed up to 69.45MHz in Q1060, which is followed by matching transformers and a tapping point for the optional Yaesu DMU2000. This tapping point feeds an RF signal to the band scope function – however, the composite signal used also includes the Tx signal. To avoid picking the Tx signal, the PAT connection is taken before the DMU buffer stage (Q1076) at the output of T1020 - see Figs 3 and 4. Because this is before any IF filters, the signal bandwidth will still be wide here.

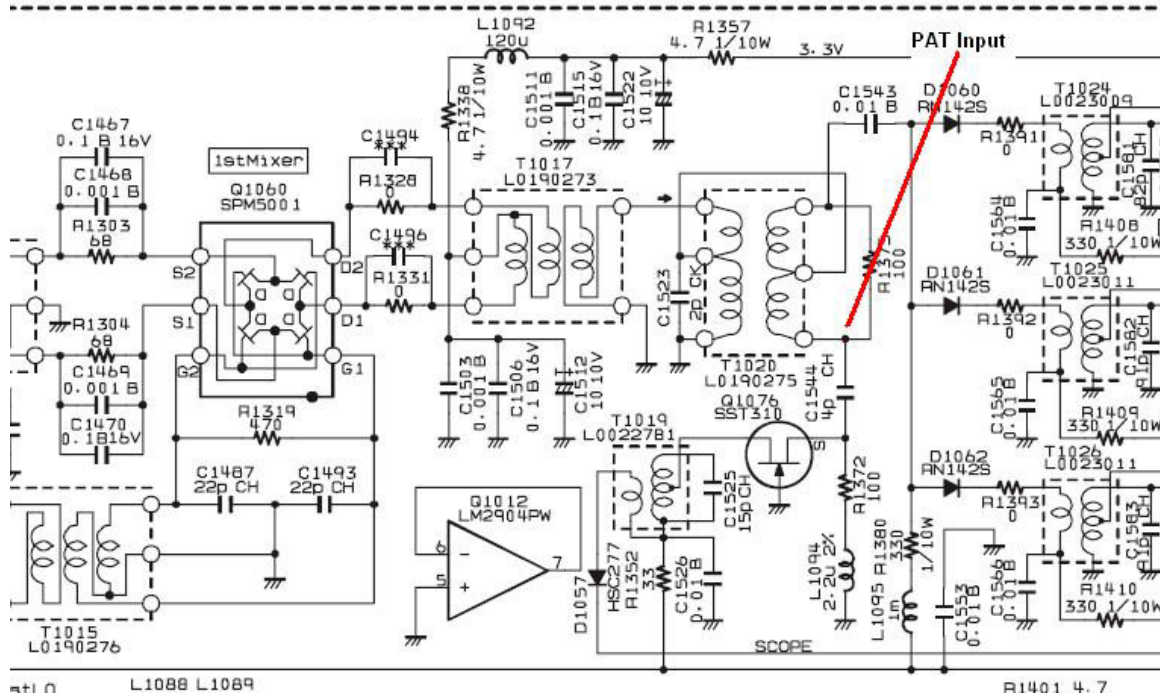


Fig 3 – Panadaptor input connection at T1020/C1544

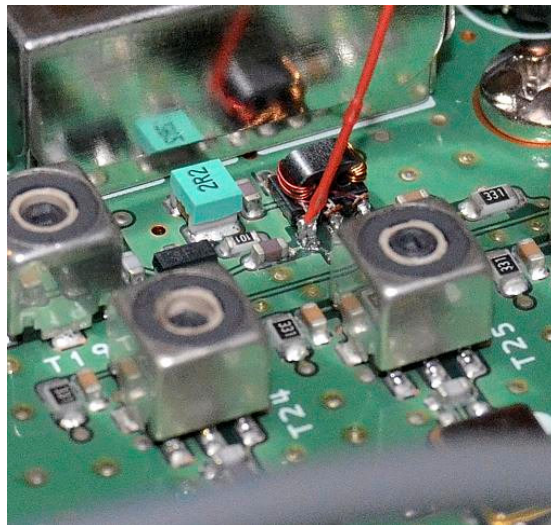


Fig 4 – Wire connection at T1020 for PAT

- 7 Prepare a 70mm length of red wire to make the connection between T1020 and the PAT input, and a 170mm length of RG178 for the output connection. Dimensions for preparing the ends of the cables are given in Table 1 and Fig 9. Do not pigtail the ends of the coax, but make them off as in Fig 4. See also details at the end of this note.

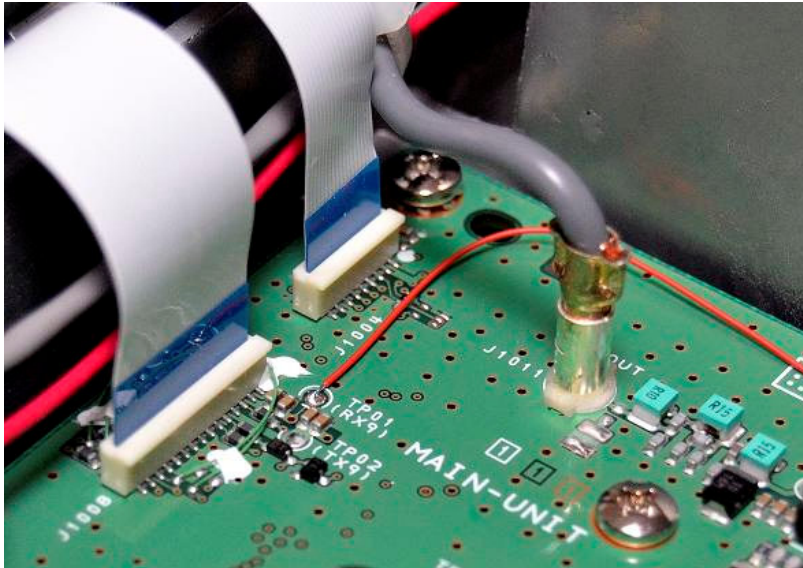


Fig 5 – Power (Vcc) connection at J1008/TP01

- 8 Vcc for PAT is picked up from TP01, close by J1008 where it enters the board. This point is marked as Rx9, so the PAT is unpowered during Tx. You will need approx 350mm of wire, since it is at the opposite side of the Main Unit PCB to the PAT location! 90mm length of fine red wire is supplied to make this connection. 0V is brought from the rear panel connector via the coax, so no separate 0v connection is needed.
- 9 Replace the cover, connect and test.

Connection as a Second Receiver Tap

PAT may also be used to take an output before the first mixer, so that your SDR will provide a wider spectrum view of the band that you are using. The Vcc and output connections are as given above, but the input connection needs to be taken from T1012, as shown in Fig 6 below. T1012 itself is inside the screening can behind T1020 in Fig 4 above. However, TP1047 is directly behind that can, and accessible from outside the can, so this is the recommended physical point to make the connection.

Due to the wide spectrum available on the IF tap, as described above, the 2nd Rx Function connection has not been explored any further currently – so no pictures are available for the 2nd Rx application.

If you do decide to implement a 2nd Rx function, then remember that the requirements on your SDR are different – for IF Tap it needs to cover 69.45MHz. For 2nd Rx use, it must cover every band that you want to listen to, since it must be set to the same frequency as the rig tuning.

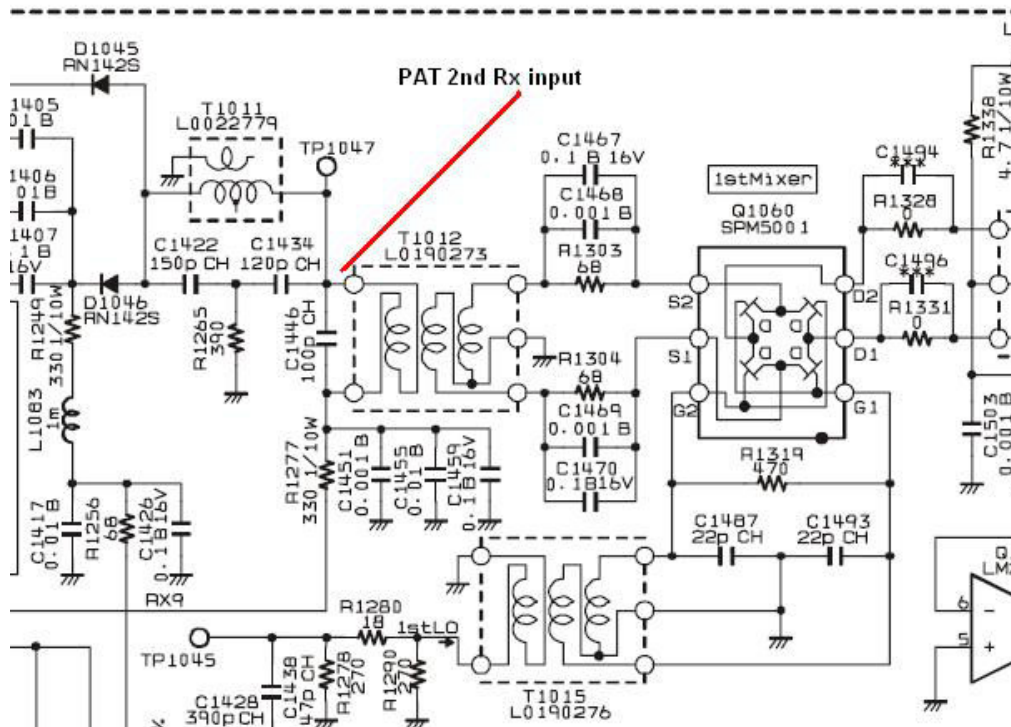


Fig 6 – PAT input for 2nd Rx function – other connections also shown

Terminating PTFE Coax cables

These instructions could be used, with suitable modification, to correctly terminate any of the PTFE coax cables, such as RG142, RG178, RG188, RG196, RG316, etc. The termination method ensures good quality RF connections up to higher microwave frequencies

Using a scalpel, cut the sheath back at the required length.

With a hot iron, tin the exposed braid fully.

With the scalpel, score around the point where the braid must end.

Use long-nose pliers to bend the end of the coax outside the score line – the braid will crack on the score line and the excess can be slid off the dielectric.

Strip the dielectric to reveal the inner.

Fig 7 shows a correctly terminated cable installed in the FT950; other examples may be seen in the other instruction sheets posted.



Fig 7 – Routing and termination for the RG178 cable

Table 1 below shows the measurements recommended for the cable end preparation for the FT950 installation and Fig 8 below gives further clarification.

Cable	FT950 Connection	Sheath	Braid	Dielectric	Inner
Output	PAT	9mm	3.5mm	2mm	3.5mm
Output	SMA	9mm	3.5mm	2mm	3.5mm

Table 1 – Cable stripping details for FT950 installation

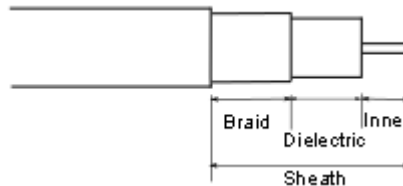


Fig 8 – Cable termination preparation details

PAT in Use

The screen shots given here are only for the Panoramic Adaptor application; as explained above, by taking signal before the IF filter, there is an adequate width of spectrum available. Connections of PAT as a second receiver function are given above, but no tests have been carried currently.

IF Panoramic Adaptor

Note that due to the mixing inversion that has occurred in the radio before the signal is taken out to the PAT board, the behaviour on screen is the opposite of what you would expect -as you tune the radio up in frequency, the signals will move to the right on the screen. If you want to demodulate signals on the SDR, then to resolve the LSB of 40m, you must select USB on the SDR!

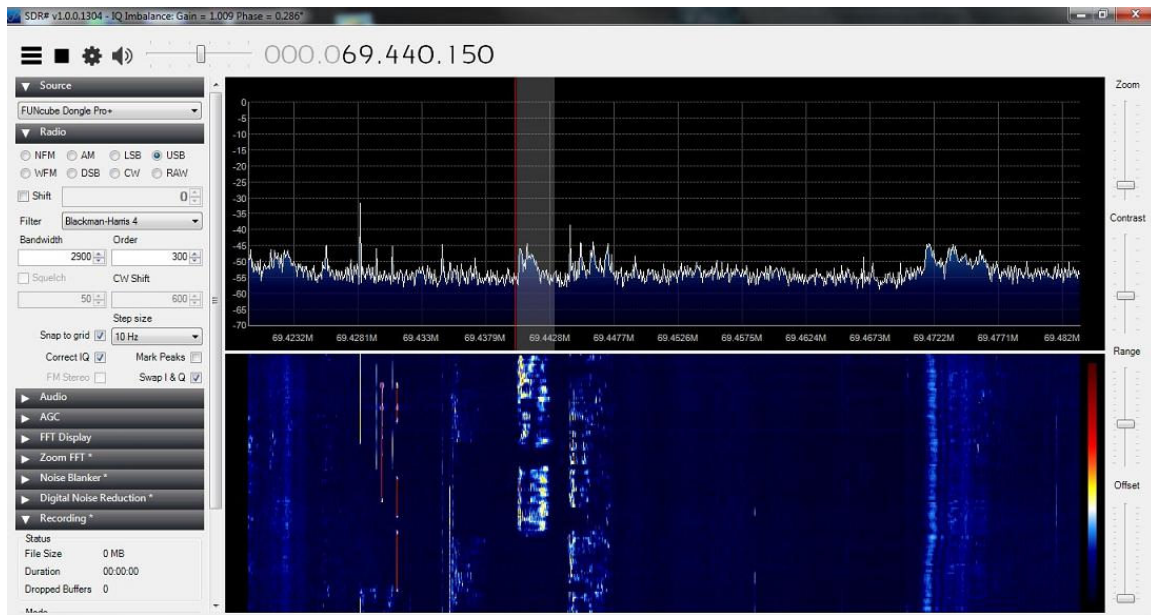


Fig 9 – SDR display with PAT connected as IF Panoramic Adaptor

In Fig 9, the bandwidth of the display is limited by the SDR – in this case, it is showing about 60kHz of the 40m band, roughly centred on 7055kHz. The advantage of this mode is that as you tune the radio, the signals move across the display. However, it is not possible to set the rig frequency display on the SDR.

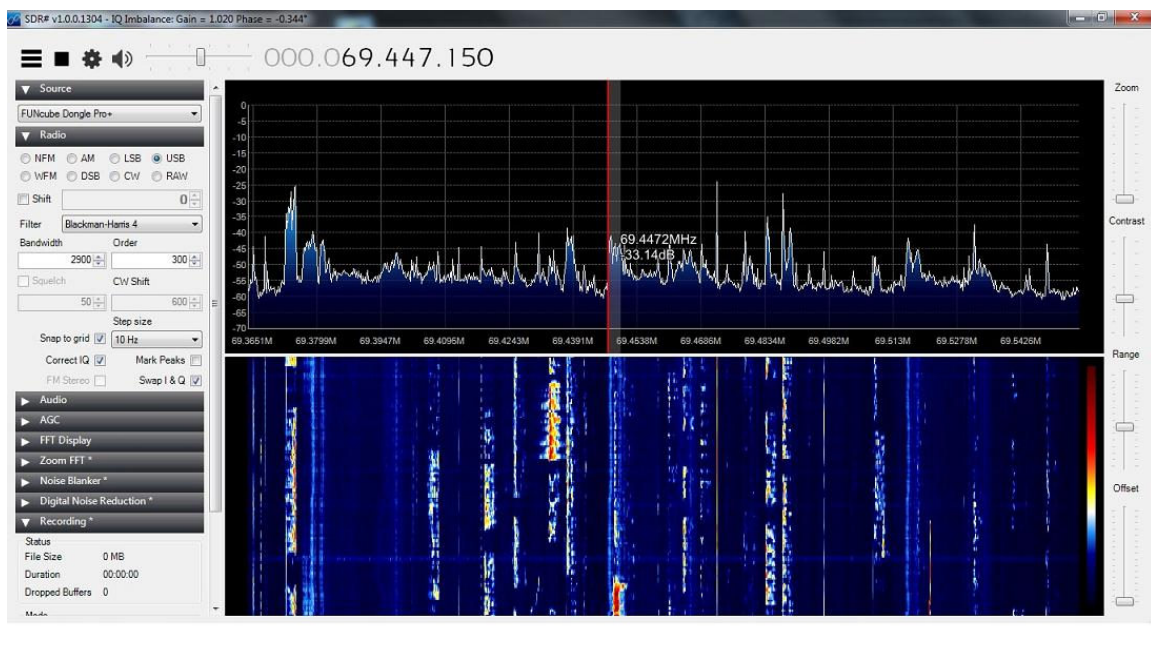


Fig 10 – 160kHz of the 40m band

Fig 10 shows a wider view, also of the 40m band, and in this case about 160kHz wide. Depending on your SDR, it is possible to see almost the entire 200kHz of the band.

Both screen shots were taken using the FunCube Dongle Prop Plus and SDR# software.