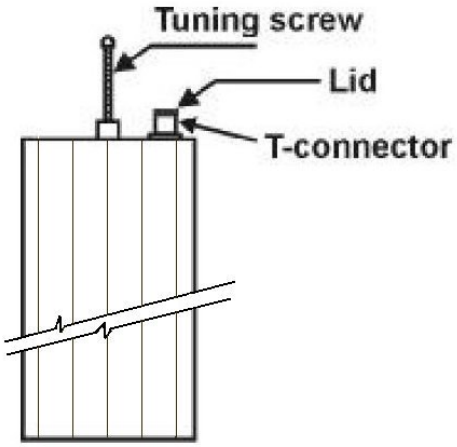
Field Adjustment of the DPRE4-6VL Duplexer

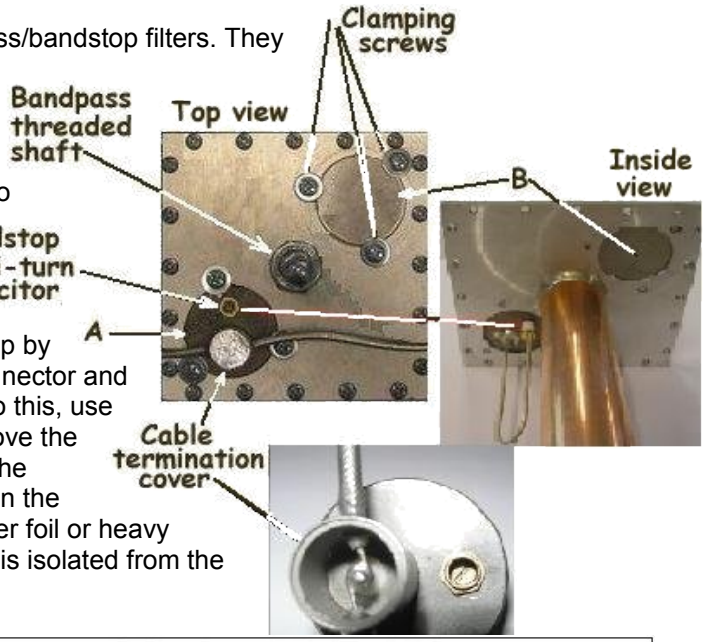


Rx – 145.150 MHz and Tx - 145.750 MHz

The DPRE4-6VL duplexer when sold by the manufacturer has been pretuned to the ordered frequencies and is ready to be installed.

If it is necessary to retune or change to another close frequency, it is essential to understand the adjustment principles and follow the instructions below.

The duplexer consists of two independent bandpass/bandstop filters. They become isolated when they appear as open circuits to the signal at the Tee connector. This condition occurs when a quarter wavelength of cable is short-circuited at the first terminal of the filter. At the reject frequency the filter has near zero impedance and reflects the signal, giving the appearance of an open circuit at the Tee connector.



To adjust the duplexer this condition is easily set up by first short-circuiting the cable between the Tee connector and the first receiver cavity at the cavity terminal. To do this, use a heavy wattage soldering iron to temporarily remove the soldered cover of the cavity cable terminal. Short the incoming cable with a soldered connection between the inner core and cable screen using a piece of copper foil or heavy stranded wire. Now we know that the receive filter is isolated from the transmit filter at the rejection frequency.

To adjust the duplexer it is desirable to use a Network Analyzer with a dynamic range of 100 db capable of measuring both transmission and reflection modes. Suitable instruments would be HP 8712, 8714, 8753 or similar. Having connected the transmit filter as shown in Figure 1 you can adjust the cavities to achieve the desired frequency response and VSWR at the transmitter's frequency. The ideal response is shown on the following page.

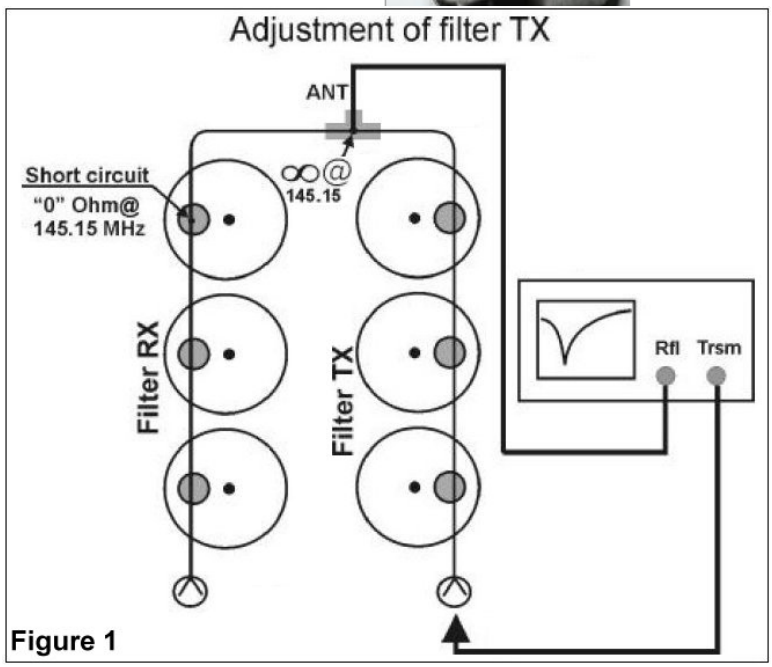


Figure 1

Initially do not worry about the bandstop frequency response, which will be the last adjustment to be made. If the coupling loops have been adjusted at the factory and the clamping screws are still tight, do not touch them.

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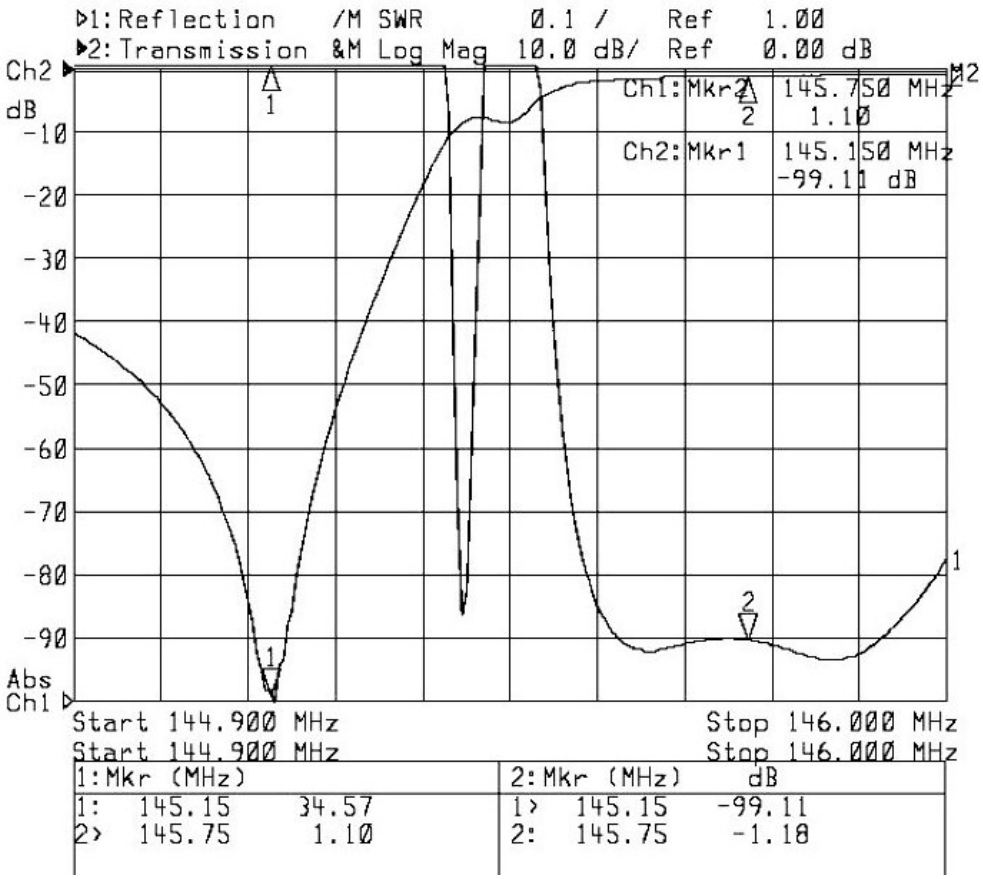

As the factory has installed the quarter wave cables between the cavities, the final tuning can be carried out very quickly. If the cables have had to be replaced because of a large change in frequency, it will be necessary to loosen the clamping screws and rotate the terminal platform changing the inductor coupling and thus the shape of the pass band curve. It will be necessary to adjust at the same time the central tuning threaded shaft on each of the three cavities having first released the locknut. These control the bandpass response, adjust these to minimise the VSWR throughout the bandpass, they will also reduce the through loss of the transmitted signal. There will a movement of the stop band as well, but ignore it for the moment. When the pass band has been optimized, then tune the bandstop response at the receiver frequency by adjusting the capacitors on the three cavities using a screwdriver. This adjustment maximises the attenuation of the white noise generated in the transmitter, preventing it desensing the receiver.

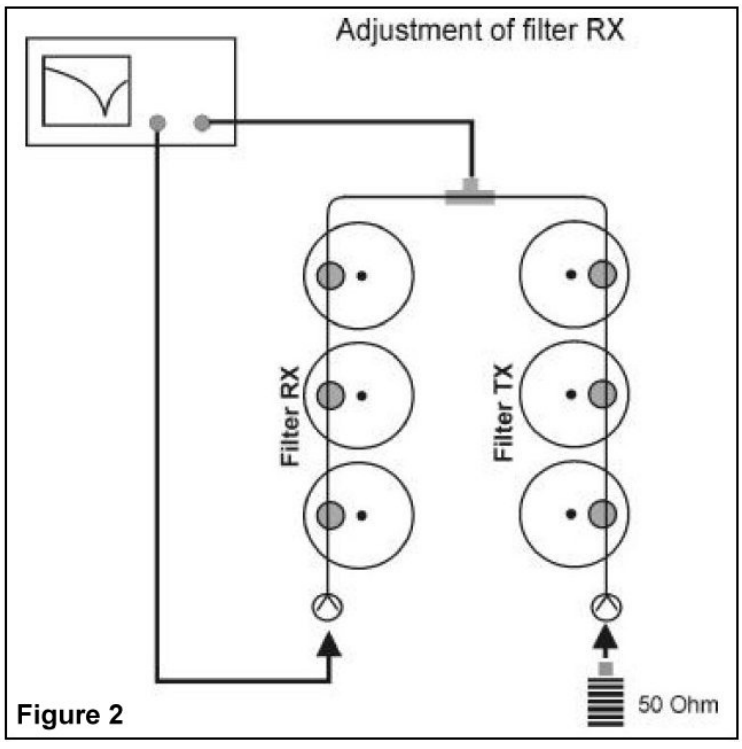

Figure 2

Adjustment of the receive filter must also be made with the same precision. Take off the short-circuit and connect the circuit as shown in Figure 2. Attach

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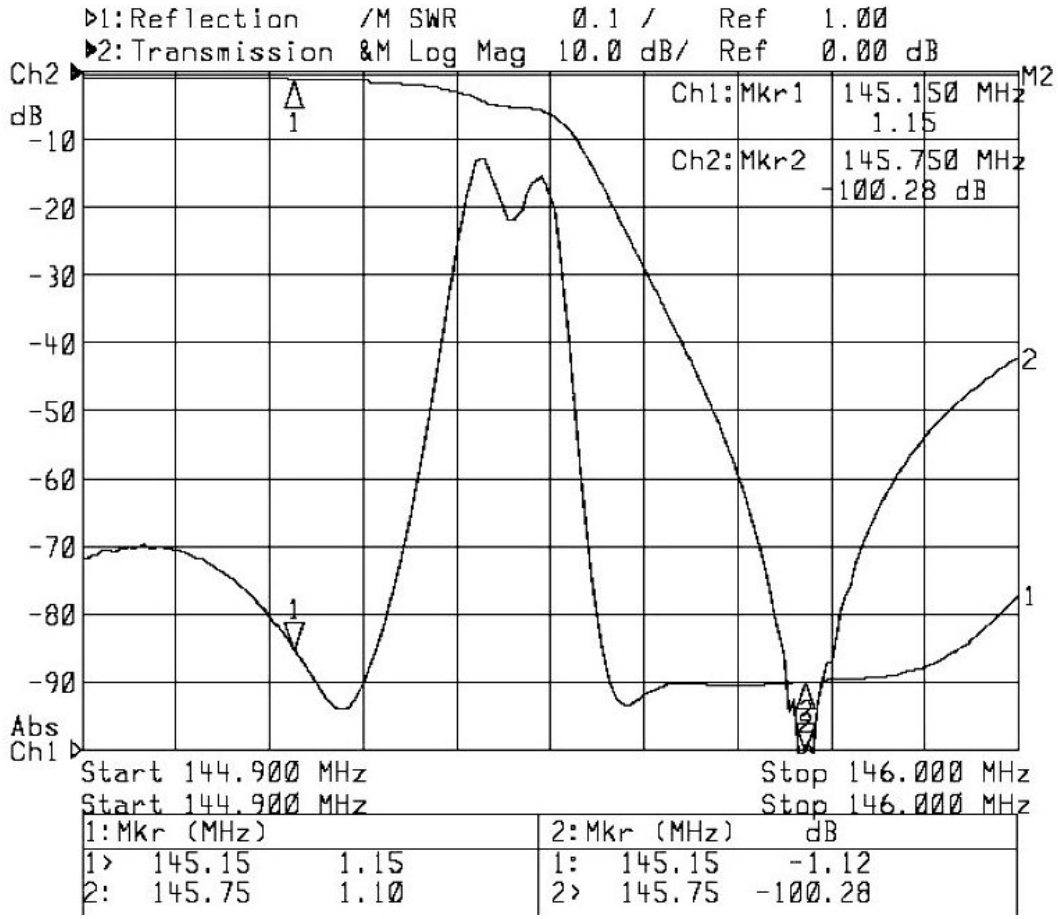

a 50-ohm dummy load at the transmitter terminal. There is not need to short-circuit any cable as the reject response of the optimized transmit filter provides the necessary short-circuit.

Again do not worry about the bandstop frequency response, which will be the last adjustment to be made. . If the cables have had to be replaced, it will be necessary to loosen the clamping screws and rotate the terminal platform changing the inductor coupling and thus the shape of the pass band curve. It will be necessary to adjust at the same time the central tuning threaded shaft on each of the three cavities having first released the locknut. These control the bandpass response, adjust these to minimise the VSWR throughout the bandpass, they will also reduce the through loss of the received signal. When that has been optimized, then tune the bandstop response at the transmitter frequency by adjusting the capacitors on the three cavities using a screwdriver. This adjustment maximises the attenuation of the transmit output signal generated by the transmitter, preventing the catastrophic destruction the receiver's frontend.

At the completion of the tuning process do not forget to tighten every locknut; this will maintain the filter characteristic by locking each threaded shaft tight. Remove the 50-ohm dummy load.

The duplexer is ready to be installed. A point to consider is that the adjustment of the duplexer has been made using "ideal" 50-ohm terminations of the measuring instrument and the dummy load. Therefore it is desirable to check the in-circuit "transmitter-duplexer-antenna" operation under real conditions. You may have to slightly readjust the central threaded shaft of the cavity filter nearest the transmitter to improve the final VSWR.

A video clip showing the alignment of one cavity of a similar unit is available. Pay attention from 2 minutes into the 3-minute clip to the instrument display to the end of the clip.
http://www.youtube.com/watch?v=tCidV9IpV6s