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**TECHNICAL NOTE TN-1037****Mobile Duplexer Tuning Instructions**15<sup>th</sup> June 2005

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**Applicability**

The following instructions can be used for all types of “pass-reject” (notch) style Mobile Duplexers. These Duplexers are commonly used in T800, TB8100 and TB7100 installations.

**1. Information**

- The Duplexer must be specified with the correct Tx-Rx frequency spacing. These Duplexers cannot be re-tuned for a different spacing between frequencies. Each Manufacturer has specific model types for this requirement. Determine that the correct model has been chosen for your application.
- Because the response notch is very narrow (in order to provide good isolation performance), these Duplexers are designed for single frequency operation. Moving the frequency of Tx or Rx by more than a few adjacent channels, or attempting to use them in a multi-channel situation may result in unacceptable performance.

**Required Equipment**

- Spectrum Analyser and Tracking Generator
- High quality 50ohm RF termination (x1)
- Short, high quality coax cables (e.g. RG214) reliably terminated with connectors to match the test equipment and Duplexer (note: avoid the use of adapters)
- High quality joiner for the above cables
- Screwdriver

## 2. Tuning Method

### Null the Cables

1. Connect one of the coax cables to the Tracking Generator output and the other coax cable to the Analyser input and join them together. Set the Analyser to a suitable frequency range and resolution, and check that there is no significant attenuation through the cables. Reference the sweep to a suitable "zero" point on the display. Disconnect the cables at the joiner.

### Tune the Low Frequency Pass Side

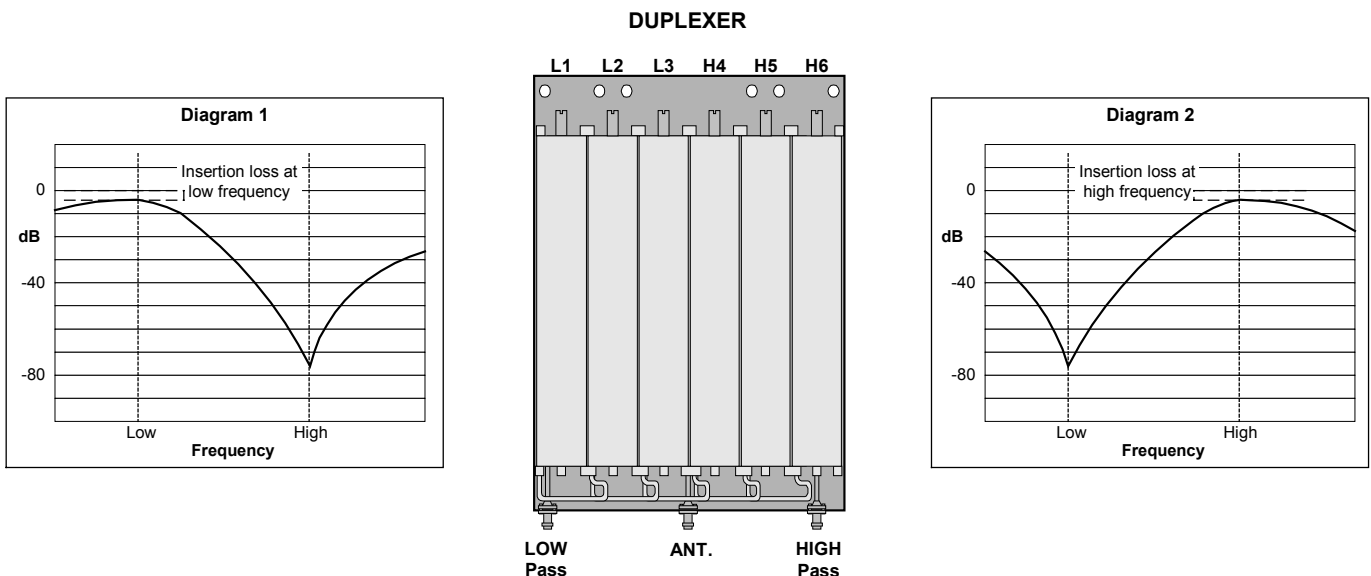
2. Connect the Generator output to the "Ant" (antenna) connector
3. Connect the Analyser input to the "LOW Pass" connector
4. Terminate the "HIGH Pass" connector with the 50ohm termination
5. Adjust the screws (L1, L2, L3) on the "LOW Pass" side of the Duplexer for maximum attenuation (i.e. notch depth) at the HIGH frequency. It is desirable to have all 3 screws adjusted to the same depth for the best matching between the resonators.
6. The Analyser sweep should look like Diagram 1

### Tune the High Frequency Pass Side

7. Connect the Generator output to the "Ant" (antenna) connector
8. Connect the Analyser input to the "HIGH Pass" connector
9. Terminate the "LOW Pass" connector with the 50ohm termination
10. Adjust the screws (H4, H5, H6) on the "HIGH Pass" side of the Duplexer for maximum attenuation (i.e. notch depth) at the LOW frequency. It is desirable to have all 3 screws adjusted to the same depth for the best matching between the resonators.
11. The Analyser sweep should look like Diagram 2.

12. Repeat steps 2 to 11, as often as necessary, to achieve the best possible results for **Insertion Loss** (typically <1.4dB) in conjunction with **Attenuation** (notch depth) (typically >80dB).

13. Connect the Duplexer into circuit with the Transmitter and Receiver and conduct some RF tests and measurements to confirm that the operation is acceptable for the type of System being built.



### 3. Suggested Testing

#### Measure the Transmit Loss.

Measure the direct Tx Power out of the Transmitter. Connect the Duplexer into circuit and then measure the Tx Power out of the Duplexer Antenna connector. Confirm that the loss is acceptable.

#### Measure the Receive Loss.

Measure the direct Rx Sensitivity of the Receiver. Connect the Duplexer into circuit and then measure the Rx Sensitivity through the Duplexer Antenna connector. Confirm that the loss is acceptable.

#### Observe any Receive de-sensing.

Connect the Duplexer into circuit with the Transmitter and Receiver. Connect an RF Signal Generator (with external attenuators if the Tx Power is too high for the Generator input) to the Duplexer Antenna connector. Set the RF Sig Gen to provide a low level, modulated signal that is below the gating threshold of the Receiver. It will be necessary to "override" the mute (using the Monitor Mute switch on the front panel, *not* by adjusting the gating level) so that the signal can be heard. Manually key the Transmitter. Listen to the quality and level of the recovered audio from the Receiver. There should be no, or very little degradation of either.

#### Compliance Issues

None

#### CSO Instruction

Please ensure all Technical Staff (especially system build staff) and dealers are made aware of this information.

### 4. Issuing Authority

#### Name and Position of Issuing Officer

Barry Crates  
Technical Support Team Leader

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#### Distribution Level

Associate

#### Document History

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