

Appendix A – Diagnosing and Correcting Performance Problems

Factory technicians use the procedures in this section for initial modem alignment. After installation, a qualified electronic technician can use these procedures to diagnose and correct performance problems. Only an electronic technician with training in RF radio alignment should perform these procedures.

Always perform these procedures using calibrated test equipment. Use the following test equipment for these procedures [Clay, please check this list]:

- A calibrated service monitor (IFR) capable of generating and analyzing narrow-band FM signals in the frequency band of the radio being tested.
- DC power supply capable of supplying at least 1 amp of current at 10-12V DC.
- A computer terminal capable of 9600 Baud wired as a DTE.
- Oscilloscope with at least 5MHz bandwidth.
- Jumper cable to connect the modem PCB to the radio PCB, while performing the alignment.

Setting the Power Value

1. Set the IFR to receive at the radio's transmit frequency.
2. From the terminal emulator, enter programming mode.
3. Select the active channel for the radio as follows:
 - Select **Radio ↗ Select Active Channel**.
 - Enter the active channel assignment for the radio. The value must be a number in the range 01 – 64.
 - Press **ESC** to return to the **Main Menu**.
4. Select **Diagnostics ↗ Transmit Continuous Random Data**.
5. Set the power value as follows:
 - Select **Power** from the **Diagnostics** menu.
 - While watching the power gauge, change the power value and check the gauge to see that the power value registers correctly. The value must be a number in the range 0 – 1023.
6. Select **None** from the **Diagnostics** menu to stop the data transmission.

Setting the Frequency Trim (includes setting Power)

The power setting affects the frequency trim in the NL6000, so part of setting the frequency trim is setting the power.

1. Set the IFR to receive at the radio's transmit frequency.

2. From the terminal emulator, enter programming mode.
3. Select the active channel for the radio as follows:
 - Select **Radio ↗ Select Active Channel**.
 - Enter the active channel assignment for the radio. The value must be a number in the range 01 – 64.
 - Press **ESC** to return to the **Main Menu**.
4. Select **Diagnostics ↗ Transmit Continuous Random Data**.
5. Set the power value as follows:
 - Select **Power** from the **Diagnostics** menu.
 - While watching the power gauge, change the power value and check the gauge to see that the power value registers correctly. The value must be a number in the range 0 – 1023.
 - Press **ESC** to return to the **Diagnostics** menu.
6. Set the frequency trim as follows:
 - Select **Frequency Trim** from the **Diagnostics** menu.
 - While watching the Frequency Error gauge on the IFR, change the frequency trim value on the **Frequency Trim** window until the needle on the gauge is centered.
7. Select **None** from the **Diagnostics** menu to stop the data transmission.

Setting the Deviation and Balance

To properly set the deviation and balance, you must perform the following procedure twice – once near each “edge” of the transmit frequency band. In this procedure, an edge is defined as approximately 2.5 MHz from one end of the band range.

1. From the terminal emulator, enter programming mode.
2. Select one “edge” of the transmit frequency as follows:
 - Select **Radio ↗ Transmit Frequency for Active Channel**.
 - Enter a frequency that is on one “edge” of the frequency for the active radio channel. The value must be a number in the format **nnn.nnnn**.
 - Press **ESC** to return to the **Main Menu**.
3. Set the IFR to receive at the transmit frequency you set in Step 2.
4. Select **Diagnostics ↗ Transmit 100 Hz Square Wave**.
5. Set the balance value as follows:
 - Select **Balance** from the **Diagnostics** menu.

- While watching the square wave on the IFR, enter **1-Increase Balance 0.125 dB** or **2-Decrease Balance 0.125 dB** until the corners of the wave are at a 90 ° angle.
 - Press **Ctrl-A** or **Ctrl-B** to save the balance value as the first or second reference point.
 - Press **ESC** to return to the **Diagnostics** menu.
6. Select **None** from the **Diagnostics** menu to stop the square wave.
 7. Select **Transmit Continuous Random Data** from the **Diagnostics** menu.
 8. Set the deviation value as follows:
 - Select **Deviation** from the **Diagnostics** menu.
 - While watching the deviation gauge on the IFR, enter **1-Increase Deviation 0.25 dB** or **2-Decrease Deviation 0.25 dB** until the deviation gauge measures 2.5 kHz for a low data rate or 4 kHz for a high data rate.
 - Press **Ctrl-A** or **Ctrl-B** to save the deviation value as the first or second reference point.
 - Press **ESC** to return to the **Diagnostics** menu.
 9. Select **None** from the **Diagnostics** menu to stop the data transmission.
 10. Repeat Steps 1-7 for the opposite “edge.”

Setting the Receive Gain

Use this procedure to set the receive packets at the best level for this modem.

1. From the terminal emulator, enter programming mode.
2. Enable the Receive Diagnostic Mode as follows:
 - Select **Diagnostics** ↗ **Receive Diagnostic Mode**.
 - Select **1-Enable**.
 - Press **ESC** twice to return to the **Main Menu**.
 - Select **Exit** to save the Receive Diagnostic Mode setting and enter operating mode.
3. Set up another modem to send data to the modem. The terminal emulator will display the receive level correction value. Make note of this value.
4. From the terminal emulator, enter programming mode.
5. Set the receive gain level as follows:
 - Select **Diagnostics** ↗ **Receive Gain**.

- Enter the receive level correction value, using the **1-Increase Gain 0.25 dB** or **2-Decrease Gain 0.25 dB** options.
 - Press **ESC** twice to return to the **Main Menu**.
 - Select **Exit** to save the Receive Gain value and enter operating mode.
6. Repeat steps 3-5 to ensure the receive level remains near zero (± 0.5 dB) after your correction.
7. Disable the Receive Diagnostic Mode as follows:
- Select **Diagnostics** ↗ **Receive Diagnostic Mode**.
 - Select **2-Disable**.
 - Press **ESC** twice to return to the **Main Menu**.
 - Select **Exit** to save the Receive Diagnostic Mode setting and enter operating mode.