Programming and Configuring the Mobile Data Radio

Once the appropriate equipment for performing the factory test are gathered, perform the following steps to program and configure an DT450 Mobile Data Radio:

Step 1 Enter the following information on the ***Mobile Data Radio Performance Test Data Sheet***:

- Radio Serial number
- Date test being performed
- Tester's Name

Step 2 Program the radio to the current Firmware revision using the AVR programming utility.

Step 3 Connect a PC to the radio using IPMessage program. In the IPMessage window, type in the following command:

```
factory default
```

Press the **[ENTER]** key and the radio will load default configuration values into the IPMessage window.

Step 4 Enter the appropriate values for the radio's frequency band.

```
[To: Radio] ?
[From: 192.168.3.10] Host serial = 19200,N,8,1, timeout=200
[From: 192.168.3.10] Host framing =
[From: 192.168.3.10] SLIP no status messages
[From: 192.168.3.10] Injection = LOW SIDE, 45MHz
[From: 192.168.3.10] channel spacing = 25000
[From: 192.168.3.10] Channel = 0
[From: 192.168.3.10] TX Power = 0
[From: 192.168.3.10] Car to car TX power = 0
[From: 192.168.3.10]          Channel       Tx freq       Rx freq       Inj freq
[From: 192.168.3.10] Frequency=0      ,    486.000000,    481.000000,    436.000000
[From: 192.168.3.10] Serial number: undefined
[From: 192.168.3.10] TX quiet time = 5
[From: 192.168.3.10] TX sync time = 12 milliseconds, 0 extra inter-split-frame count
[From: 192.168.3.10] TX tail time = 5
[From: 192.168.3.10] Radio data rate = 19200
[From: 192.168.3.10] Max data tx time = 60 seconds
[From: 192.168.3.10] PLL load to txkey delay = 2 milliseconds
[From: 192.168.3.10] Carrier detect delay time = 3 milliseconds
[From: 192.168.3.10] Polarity = TX-, RX+
[From: 192.168.3.10] allow crc errors = 0
[From: 192.168.3.10] Duplicate time = 10 milliseconds
[From: 192.168.3.10] RSSI step = 12   (=234mV)
[From: 192.168.3.10] noise = -62dBm, -131dBm
[From: 192.168.3.10] Fixed TX Delay = 0 milliseconds
[From: 192.168.3.10] Scale TX Delay = 0 microseconds
[From: 192.168.3.10] IP Address = 192.168.3.10 (VIU = 172.16.19.1, PC = 172.16.18.1)
[From: 192.168.3.10] netmask = 255.255.255.0
[From: 192.168.3.10] num timeslots = 16
[From: 192.168.3.10] timeslot period = 992ms
[From: 192.168.3.10] timeslots per voice packet = 4
[From: 192.168.3.10] 15Sep2000 04:54:46 (PST), calibration=511
[From: 192.168.3.10] diversity speed = 5
[From: 192.168.3.10] receiver = auto
```

Adjustment / Alignment Procedures

Receiver Injection

Perform the following steps to adjust the receiver injection and injection frequency:

Step 1 Select the **TX TEST** function on the service monitor. Connect a scope probe from the monitor's antenna input connector.

This configuration looks at leakage energy from the VCO so that a frequency reading can be obtained.

Step 2 Edit the Tune Frequency entry in the service monitor menu so the received frequency is 45 MHz lower than the client's default receive frequency.

Step 3 Read the VCO frequency error using the scope probe closely coupled to VC01. The error should be +/-100 Hz or less. If necessary, coarse adjust the VCTCXO ADJ trimmer for minimum error. Fine adjust RV3 for minimum error. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Note that some frequency ranges of the DT450 use high side injection. If a reading not registered, change the Tune Frequency entry for a value 45 MHz higher than the client's default receive frequency.

Step 4 Change the Tune Frequency entry on the service monitor to 44.545 MHz. This looks at leakage energy from the IF local oscillator to enable a signal level reading. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 5 Read the IF local oscillator frequency by touching Y1A with the scope probe. Adjust trimmer capacitor (CV2A) to the center of its tuning range. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 6 Change the Tune Frequency entry back to the client's default receive frequency.

Receiver 1

Step 1 Select the **RX TEST** function on the service monitor.

Step 2 Connect the RF jumper cable to the monitor's RF input/output connector. This applies an RF signal to the radio for adjustment purposes.

Step 3 Connect the DMM test leads to ground and to test point RSSI1.

If reading not registered, check the Tune Frequency entry on the monitor. It may not be set to the client's default receive frequency.

Step 4 Adjust each pole of filter (FT4A) for maximum RSSI voltage. Go back and forth between these adjustments until no further increase is noted.

Step 5 Adjust each pole of filters (FT3A and FT2A) for maximum RSSI voltage. Go back and forth between these adjustments until no further increase is noted.

Step 6 Adjust the trimmer capacitor (CV1A) for maximum RSSI voltage. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 7 Connect the scope probe to the service monitor's audio input.

Step 8 Connect the probe to test point (TP1) in the radio. This looks at the 1 KHz recovered audio output. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 9 Check to ensure the distortion reading on the monitor is 3% or less. If necessary, adjust trimmer capacitor (CV1A) for minimum distortion.

Step 10 Select the **SINAD** measurement on the service monitor and read the results. SINAD should be 12 dBm or better for an RF input of –119 dBm.

Step 11 Read the level of the recovered modulation at TP1.

Step 12 Move the DMM test probe to TP1.

Step 13 Adjust pot R19A for a reading of 2.500 VDC (+/-10 mV) on the DMM.

Step 14 The previous two (2) adjustments are interactive. Repeatedly adjust R19A until you obtain 340 mV RMS and 2.500 VDC. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Receiver 2

Step 1 Ensure the RX TEST function is in use on the service monitor. Move the RF jumper cable to the radio's RX2 antenna input.

Step 2 Move the DMM test probe to test point RSSI2.

Step 3 Verify the scope test probe is still connected to test point TP1.

Step 4 Adjust each pole of filter (FT4B) for maximum RSSI voltage. Go back and forth between these adjustments until no further increase is noted.

Step 5 Adjust each pole of filters (FT3B and FT2B) for maximum RSSI voltage. Go back and forth between these adjustments until no further increase is noted.

Step 6 Adjust the trimmer capacitor (CV1B) for maximum RSSI voltage.

Step 7 Check to ensure the distortion on the monitor reads 3% or less. If necessary, adjust trimmer capacitor (CV1B) slightly to get it under 3%. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 8 Select the **SINAD** measurement on the service monitor and read the results. SINAD should be 12 dBm or better for an RF input of –119 dBm.

Step 9 Measure the AC level of the recovered modulation at TP1. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 10 Move the DMM test probe to TP1.

Step 11 Adjust pot R19B for a reading of 2.500 (+/-10 mV) VDC.

Step 12 The previous two (2) adjustments are interactive. Repeatedly adjust R19B until you obtain 340 mV RMS and 2.500 VDC.

Step 13 Remove the DMM and scope probes.

Transmit Data

Step 1 Edit the parameters in the TX TEST function on the service monitor as follows:

Tune Freq:	Client's default TX frequency
Input Port:	RF In
Filter 1:	300 Hz HPF
Filter 2:	3 KHz LPF

Step 2 Verify the RF jumper cable is connected between the RF input/output connector on the service monitor and the RX1/TX antenna input on the radio.

WARNING! Damage to the service monitor can result during the following adjustments unless the unit has an internal dummy load. Verify the monitor has an internal dummy load before performing any other test. Otherwise, use an external dummy load with the service monitor.

Step 3 At the computer desktop, run the dial-up networking connection by double clicking on the **SLIP2IPMN** shortcut.

Step 4 On the computer, run the IP Message Utility by double clicking on the **IPMsg** shortcut. The '*IPMobileNet Simple Wireless Messaging Demo*' window displays.

Step 5 In the **To:** field, enter the radio's IP address and click the **Send** button.

Step 6 Type a **?** in the lower window and click on the **Send** button. A list of radio configuration parameters appears in the upper message window.

Step 7 In the lower message window type **unlock=password** (entering the appropriate password) and click on the **Send** button. This command unlocks the radio Firmware for programming.

It will be necessary to send this command periodically as the radio automatically locks after three (3) minutes.

Step 8 Locate and make note of the **TX Power = NNN** parameter in the upper message window of IP Message.

Step 9 In the lower message window type **TX Power = 0** and click on the **Send** button. This change reduces transmitter power output to about 1 mW for testing purposes.

Step 10 In the lower message window type **X=2000,19** and click on the **Send** button. The radio transmits 19 test messages of 2,000 characters each.

Step 11 Notice the frequency error shown on the monitor screen. Adjust pot R284 for minimum error. Send the **X=2000,19** command again if more messages required. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 12 In the lower message window type **X=2000,19** and click on the **Send** button. Adjust pot RV1 for 5.0 KHz deviation. Send the command again if more messages are needed to make the adjustment.

The "X=2000,19" command will generate different messages with differing DC components. Each message will slightly slew the frequency from the center frequency. Ensure that, on average, the transmit frequency error has been minimized.

Step 13 In the lower message window type **X=2000,19** and click on the **Send** button.

Step 14 Review the display of data quality on the calibrated Base Station System computer by typing **V** to enable verbose.

Step 15 Slowly adjust pot RV2 until you get a data quality reading of **248 (Q = 248)**. The minimum acceptable indication is Q = 240. Send **the X=2000,19** command again if more messages are needed to make the adjustment.

Step 16 In the lower message window type **X=2000,19** and click on the **Send** button.

Step 17 Read the frequency error shown on the service monitor. If necessary, readjust pot R284 for minimum error. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 18 In the lower message window type **X=2000,19** and click on the **Send** button. If necessary, readjust pot RV1 for 5.0 KHz deviation.

Power Setting

Step 1 Verify the RF jumper cable from the service monitor is connected to the radio's TX/RX1 input.

Step 2 Set monitor to read RF power output.

WARNING! Damage to the service monitor can result during the following adjustments unless the unit has an internal dummy load. Verify the monitor has an internal dummy load before performing any other test. Otherwise, use an external dummy load with the service monitor.

Step 3 In the lower message window type **unlock=password** (enter the appropriate password) and click on the **Send** button.

Step 4 In the lower message window type **TX Power = NNN** (replace the Ns with the value from Step 8 on Page 4-24 for the Transmitter) and click on the **Send** button. This change restores the transmitter power output to the client's authorized level.

WARNING! Do not exceed 40 watts output or the life of the transmitter power amp module will be reduced.

Step 5 Verify that the TX Power change was accepted by the radio.

Step 6 In the lower message window type a **?** and click on the **Send** button.

Step 7 Compare the TX Power parameter with the one displayed in the upper message window. If TX Power = 0, repeat Steps 4 and 5. Record this value on the ***Mobile Data Radio Performance Test Data Sheet***.

Step 8 Disconnect the radio and reinstall the cover and return the radio to service if Firmware programming is not required