Programming and Configuring the Base Station Data Radio

Once the appropriate equipment for performing the factory test are gathered, perform the following steps to rpgoram and configure the DR4B Base Station Data Radio:

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

- Base Station Serial number
- Date test being performed
- Tester's name

Step 2 At the HyperTerminal window, type in the appropriate password and press **[ENTER]**.

Step 3 Type **?** and press **[ENTER]**. The following example displays in the HyperTerminal window:

```
Host serial = 115200,N,8,1, timeout=200
Host framing = SLIP, no split frames no status messages
tunnel = 0
TX format = new
Injection = LOW SIDE, 45MHz
channel spacing = 25000
Channel = 0
        Channel      Tx freq      Rx freq      Inj freq
Frequency=0     ,   481.000000,   486.000000,   441.000000
Serial number: yyyyyyyyy
RIM address = 1
Frequency group = 1
TX quiet time = 5
Symbol sync time = 12 milliseconds, 0 extra inter-split-frame count
TX tail time = 5
Radio data rate = 19200
Max data tx time = 60 seconds
Carrier detect delay time = 1 millisecond
Station ID = ABC123
Station ID time =10 minutes
Polarity = TX+, RX+
Allow crc errors = 0
Suppress keep alive = 0
Allow base to base = 0
Timeslot status = 0
Duplicate time = 10 milliseconds
Control head grant delay = 50 milliseconds
RIM DD delay = 0 milliseconds
Retry interval = 0 milliseconds
Retry time limit = 0 milliseconds
RSSI step = 25   (=19dBm)
IPNC = 192.168.3.3
SLIP Address = 192.168.4.6
RF IP Address = 192.168.3.1
SNTP interval = 60 seconds
num timeslots = 16
timeslot period = 992ms
timeslots per voice packet = 4
noise = -128dBm
Fixed TX Delay = 0 milliseconds
Scale TX Delay = 0 microseconds
```

Adjustment / Alignment Procedures

Receiver Injection

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

Step 1 **Using the HP high frequency probe,** verify that the receiver injection frequency is present at each of the three (3) receivers by monitoring the receivers' R12 surface mount pad which lies on the 50 ohm track between L3 and U3.6.

Step 2 Adjust R7 on the receiver injection circuit board to set the injection frequency within 10 Hz of the exact injection frequency. The amplitude of the injection frequency should read approximately +5 dBm ±1 dBm.

Receiver 1

Step 1 **Using the high frequency probe, monitor** the 44.545 MHz second injection frequency at U2 pin 3, adjust trimmer capacitor (C5) to the center of the oscillator's oscillation range. The amplitude level of pin 3 of U2 should read between +5 and +10 dBm.

Step 2 Inject an on-frequency signal at a level of –80 dBm, modulated with a 1 KHz test tone at ±5.0 KHz deviation into the receiver under test.

Step 4 While monitoring RSSI at TB1-4 with the digital multi-meter, adjust the trimmer capacitor (C1) for maximum RSSI. The RSSI properly tuned receiver should be approximately 2.8 to 3.4 VDC.

Step 5 Check the receiver's distortion and verify that it is less than 3%.

Step 6 Adjust C1 slightly if necessary for minimum distortion.

Step 7 Check the receiver's sensitivity, verifying that the SINAD is 12 dB or better at a maximum level of –119 dBm (-120 is typical).

Step 8 Repeat procedure for Receivers 2 and 3.

Diversity Reception Controller

Step 1 Inject an on-frequency signal at a level equal to Receiver 1 12dB SINAD level, modulated with a 1 KHz test tone at ±5.0 KHz deviation into Receiver 1.

Step 2 While monitoring TP1 with the digital multi-meter, adjust RSSI1 low adjust potentiometer (R12) for a reading of 0.750 VDC ±10 mV.

Step 3 Increase the amplitude of the signal by 50 dBm.

Step 4 While monitoring TP1 with the digital multi-meter, adjust RSSI1 high adjust potentiometer (R11) for a reading of 2.75 VDC ±10 mV.

Adjustments R11 and R12 are interactive adjustments, therefore continue adjustments until the DC voltage at TP1 is 0.750 VDC for the receiver's 12 dB SINAD level and 2.75 VDC for a 50 dBm increase from the receiver's 12 dB SINAD level.

Step 5 Inject an on-frequency signal at a level equal to Receiver 2 12dB SINAD level, modulated with a 1 KHz test tone at ±5.0 KHz deviation into Receiver 2.

Step 6 While monitoring TP2 with the digital multi-meter, adjust RSSI2 low adjust potentiometer (R10) for a reading of 0.750 VDC ±10 mV.

Step 7 Increase the amplitude of the signal by 50 dBm.

Step 8 While monitoring TP2 with the digital multi-meter, adjust RSSI2 high adjust potentiometer (R9) for a reading of 2.75 VDC ±10 mV.

Adjustments R9 and R10 are interactive adjustments, therefore continue adjustments until the DC voltage at TP2 is 0.750 VDC for the receiver's 12 dB SINAD level and 2.75 VDC for a 50 dBm increase from the receiver's 12 dB SINAD level.

Step 9 Inject an on-frequency signal at a level equal to Receiver 3 12dB SINAD level, modulated with a 1 KHz test tone at ±5.0 KHz deviation into Receiver 3.

Step 10 While monitoring TP3 with the digital multi-meter, adjust RSSI3 low adjust potentiometer (R33) for a reading of 0.750 VDC ±10 mV.

Step 11 Increase the amplitude of the signal by 50 dBm.

Step 12 While monitoring TP3 with the digital multi-meter, adjust RSSI3 high adjust potentiometer (R35) for a reading of 2.75 VDC ±10 mV.

Adjustments R33 and R35 are interactive adjustments, therefore continue adjustments until the DC voltage at TP3 is 0.750 VDC for the receiver's 12 dB SINAD level and 2.75 VDC for a 50 dBm increase from the receiver's 12 dB SINAD level.

Step 13 Adjust the carrier detect potentiometer (R74) to illuminate a level of –116 dBm.

Receive Data

Step 1 Using a calibrated mobile radio, generate uplink data messages using the **X=2000,19** command in the IP Message Utility program (*see the Internet Protocol (IP) Data Transceiver IP4/IP8 System Manual for instructions*).

Step 2 Attach an antenna to one of the base station's receiver ports and verify on the base station monitor screen (HyperTerminal) that the received message data quality are consistently 240 and higher for 2000 character messages. Repeat test for each receiver. Constant fluctuations in the data quality are indicative of group delay programs. The data quality readings should always be at or above 240.

Exciter

Step 1 Using the **X=2000,19** command, generate data messages so the transmit power and frequency can be checked.

Step 2 Connect the base stations' transmit port to the HP communication test set. Note the power level prior to adjusting.

Step 3 On the power amplifier circuit board adjust the potentiometer (RV1) fully clockwise (this will enable low power transmit operation).

Step 4 While transmitting data messages using the **X=2000,19** command, adjust the following:

- TCXO Y1 and R14 for minimum frequency error
- R11 for ±5.0 KHz deviation

Transmit output power should be approximately 1mWatt. The REFMOD adjustment needs to be made while the base station is transmitting real data messages to and from a mobile radio. This is most easily done using the ping command to ping the IPNC from a mobile radio. This will cause the base station to repeatedly send data messages and will facilitate the REFMOD adjustment.

Step 5 Connect the base station to the IPNC.

Step 6 Using a calibrated mobile radio operating on the base station's channel, adjust R4 for consistent data quality readings of 248 (as observed on the mobile radio's attached PC IP Message window). Access the MSDOS prompt and ping using the following command:

```
>;ping 192.168.3.3 -t -l 500 -w 2000
```

This command will ping the IPNC continuously with a 500-character test message. Press **[Ctrl]+C** to stop the ping.

Power Amplifier

Step 1 Connect the base stations' transmit port to the communication test set.

Step 2 Using the **X=2000,19** command, generate data messages.

Step 3 Slowly increase the base station output power by turning the power control potentiometer counterclockwise until the power noted previously or 40 Watts of output power is obtained or to the level.

Do not exceed 20 watts output power as this will reduce the life of the amplifier module.

Step 4 Perform a close visual inspection of the radio paying close attention to manufacturing related problems such as loose screws, solder practices, etc.