

Tune Up Procedure

7.0 Align RF Carrier Frequency

Test Equipment

Frequency Counter (HP 5386A or equivalent)

20 dB attenuator (Mini Circuits VAT-20+ or equivalent)

RF coaxial cable or RF cable-adapter combination, to connect from Attenuator to Frequency Counter

Set Up

Remove the body pack's antenna. Attach the attenuator to the bodypack's antenna connector.

Attach the RF cable from the attenuator to the frequency counter's RF port.

Procedure

Set the body pack's RF carrier frequency to its nominal mid-band value, as given in the table below. This can be done using either the main menu or the service menu.

Hardware Group	Frequency Bands	Mid-band (MHz)
A	H4, H4E	548.000
B	J5, J5E	607.000
C	L3, L3E	668.000

Measure the body pack's midband carrier frequency using the frequency counter. Adjust trim capacitor to set the body pack's midband carrier frequency within ± 500 Hz of the desired frequency.

7.1 VCO Tuning

Test Equipment

Digital Multimeter (Fluke 87 or equivalent)

Frequency Counter (HP 5386A or equivalent)

20 dB attenuator (Mini Circuits VAT-20+ or equivalent)

RF coaxial cable or RF cable-adaptor combination, to connect from Attenuator to Frequency Counter

Set Up

Remove the body pack's antenna. Attach the attenuator to the bodypack's antenna connector.

Attach the RF cable from the attenuator to the frequency counter's RF port.

Enabling the Service Menu:

Put the body pack into Service Menu mode (ie, capable of displaying the service menu) by shorting the pads for unplaced resistor R802 while powering on the body pack. If the display module is not attached to the PC board, the pads for R802 can be shorted with tweezers. Alternatively, a zero ohm jumper can be installed to accomplish the same task with the display in place.

On initial powerup in Service Menu mode, the title screen is displayed.

Press the "enter" (right) button to view the service menu.

Procedure

Test frequencies are given in the following table. Perform the test described below at the Lower & Upper band edges and at Midband.

Hardware Group	Frequency Bands	Lower Band Edge (MHz)	Midband (MHz)	Upper Band Edge (MHz)	Tuning Tolerance (KHz)
A	H4, H4E	518.000	548.000	578.000	1.2
B	J5, J5E*	578.000	608.000	638.000	1.3
C	L3, L3E	638.000	668.000	698.000	1.4

* Some frequency bands are limited in frequency range by software, but the hardware uses the entire frequency range for VCO tuning.

Enable the service menu. In the first screen of the service menu, use the up & down buttons to scroll to the desired frequency. The body pack's RF carrier frequency will track the displayed value during scrolling.

Verify that the synthesizer is locked (ie, RF carrier frequency drift < 500 Hz during each measurement sequence) at the correct RF frequency & within the Tuning Tolerance given in the table above. Then measure the voltage at the tune voltage input pin of the VCO module.

Note: On the PC board, the tune voltage input pin is near the grounded end of C550.

Verify that measured tune voltage falls within the range given in the table below.

	@ Lower Band Edge	@ Mid-band	@ Upper Band Edge
Vtune (Vdc)	≥ 0.5	1.8 to 2.8	≤ 4.5

Remove the jumper at R802 to resume normal menu operation.

7.2 RF Output Power Adjustment

7.2.1 Maximize Power Amp Supply Voltage

Test Equipment

Digital Multimeter (Fluke 87 or equivalent)

Antenna or 20 dB attenuator (Mini Circuits VAT-20+ or equivalent)

Set Up

The body pack can be tested with either the antenna (use the correct antenna for the hardware group being tested) or with a 20 dB attenuator attached to the body pack's antenna connector.

Important Note: The body pack should not be operated with its antenna connector unterminated.

Note: This test can be done at any test frequency in the body pack's operating band.

Procedure

Use the DMM to probe test point I750 while adjusting potentiometer TR750 to peak the measured voltage. When peaked, this voltage should measure ≥ 4.85 Vdc.

7.2.2 Adjust Power Amp Quiescent Voltage

Note: Power Amp Supply Voltage must be maximized (See section 7.2.1) before doing this test.

Test Equipment

Digital Multimeter (Fluke 87 or equivalent)

Antenna or 20 dB attenuator (Mini Circuits VAT-20+ or equivalent)

Set Up

The body pack can be tested with either the antenna or with a 20 dB attenuator attached to the body pack's antenna connector.

Important Note: The body pack should not be operated with its antenna connector unterminated.

Note: This test can be done at any test frequency in the body pack's operating band.

Procedure

Enable the service menu using the procedure described in section 7.1. The second service menu screen is accessed by pushing the Enter (right) button twice after system powerup. In the second service menu screen, use the down button to mute the VCO.

Use the DMM to differentially probe test points I750/I751 while adjusting potentiometer TR700. Slowly adjust TR700 to set the measured voltage difference to 13.5 to 14.5 mVdc. This yields 67.5 to 72.5 mA_{dc} Quiescent drain terminal current.

7.2.3 Adjust Output Power

Note: Power Amp Quiescent Voltage must be adjusted (See section 7.2.2) before doing this test.

Test Equipment

20 dB attenuator (Mini Circuits VAT-20+ or equivalent)

RF Adapter: SMA Male to Type-N Female (Mini Circuits NF-SM50+ or equivalent)

RF Power Meter & Sensor (Agilent E4418B & 8482H or equivalent)

Set Up

Perform the Power Meter's Zero & Calibrate procedures. Then set the Power Meter's Calibration Factor to the value specified for the test frequency by the Power Sensor. Set the Power Meter's Offset to +20 dB to correct for the loss of the attenuator & adapter.

Remove the body pack's antenna. Attach the attenuator to the bodypack's antenna connector.

Attach the RF Power Sensor to the attenuator.

Procedure

Test frequencies are given in the following table.

Hardware Group	Frequency Bands	Lower Band Edge (MHz)	Upper Band Edge (MHz)
A	H4, H4E	518.000	578.000
B	J5, J5E*	578.000	638.000
C	L3, L3E	638.000	698.000

* Some frequency bands are limited in frequency range by software, but the hardware uses the entire frequency range for VCO tuning.

Enable the service menu using the procedure described in section 7.1. In the first screen of the service menu, use the up & down buttons to move the RF carrier frequency from one band edge to the other. Use the RF Power Meter to measure power at the band edges, and perform the following adjustment at the band edge frequency that yields greater output power. Slowly adjust TR750 to set the RF output power to 23.45 to 23.55 dBm.

7.3 Audio Compander and Deviation tuning

Please note: the compander and deviation tuning procedures are combined below. For easy reference, the portion of this procedure that refers only to deviation tuning is in *italics*.

Purpose:

Tune the compressor threshold and limiter threshold. *Tune the RF deviation of the UR1H.*

Test equipment:

Audio generator (sine wave sweep, output in dB)

Audio analyzer (input in dB, filters: 400Hz HPF, at least 30kHz LPF, A-weighting)

RF signal generator

Either:

IF mixer and IF receiver with 10.7MHz filter

or

UR4 receiver

or

Modulation Analyzer with a HPF <30kHz

Set up:

1. *Reset unit.*
2. *Set sensitivity on UR1H to 0dB. Set user gain on UR1H to 0dB.*
3. *Set UR1H's RF carrier frequency as indicated below:*

Group	Frequency
A	530MHz
B	638MHz
C	698MHz

4. *Record value and turn off UR1H.*
5. *Establish deviation tuning level as follows.*

a. If using IF mixer and IF receiver:

--Set RF signal generator to 10.7MHz carrier frequency with an amplitude of -30dBm.

If using UR4 receiver:

--Set RF signal generator to proper carrier frequency (from table in #3 above) with an amplitude of -50dBm.

--Tune UR4 receiver to proper carrier frequency (from table in #3 above).

If using a Modulation Analyzer:

--Skip directly to step 6.

b. Set the RF generator to modulate the carrier with a 1kHz sine wave at 28kHz deviation.

c. Inject RF signal from RF generator directly into IF input of IF receiver or RF input of UR4 receiver.

d. If using a UR4 receiver, disable tonekey muting. This is accessible under RF, then Squelch.

e. Inject output of IF receiver or UR4 receiver into audio analyzer.

Engage as many of the following filters on analyzer as possible:

400Hz HPF, at least 30kHz LPF, A-weighting. (These filters will be used with the transmitter to eliminate any noise, as well as the effect of the UR1H's 32kHz tone key when using the IF mixer/receiver

method. The filters should be engaged here to provide a good reference level.)

f. Measure and record IF receiver or UR4 receiver's audio output on analyzer. **The audio level present when injecting 28kHz deviation into receiver is defined as 0dBd (dB deviation). An output level during tuneup will be referenced to the level recorded.**

6. Connect RF output of UR1H, using a 20dB RF pad, to the RF input of IF mixer, UR4 receiver or Modulation Analyzer. (Output may be radiated via antennae if using UR4 receiver method.)

If using IF mixer and IF receiver:

--Add or subtract 10.7MHz to the frequency UR1H is set to from table in #2 above.

--Set RF signal generator to the resulting frequency with an amplitude of -30dBm.

--Turn off modulation on RF signal generator.

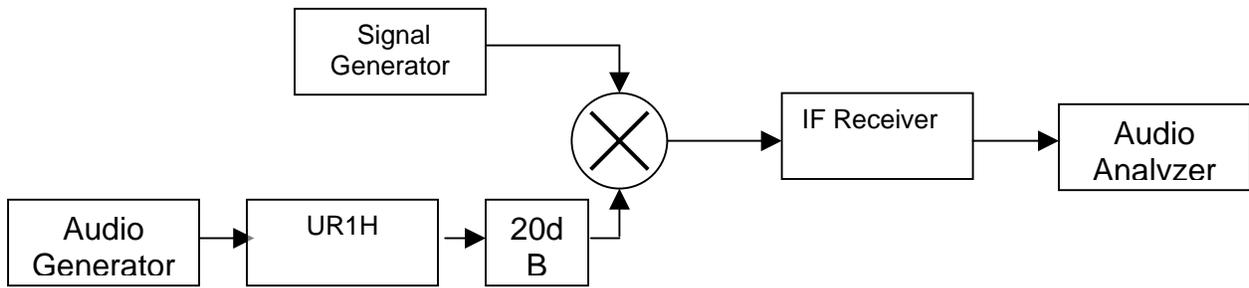
--Inject RF signal from generator into LO (local oscillator) input of IF mixer.

--Inject IF output of mixer into IF receiver.

Procedure:

7. Turn on UR1H.
8. Inject a 1kHz tone from an audio signal generator into the input of the UR1H. Measure AC signal level at I301 on UR1H. Adjust level of audio input signal until a level of $-20\text{dBu} \pm 0.05\text{dB}$ is measured at I301. **The level of audio input to achieve this condition is defined as 0dBr. Other output levels will be referenced to this level in dBr.**
9. Add 40dB to output level on the audio signal generator (+40dBr). Measure AC signal level at I301 on UR1H. Adjust TR350 until output at I301 is $-4\text{dBu} \pm 0.05\text{dB}$.
10. Inject audio output of UR4 or IF receiver into audio analyzer. Adjust TR400 until output of receiver is $0\text{dBd} \pm 0.1\text{dB}$, as recorded in step 5e. If using a modulation analyzer, adjust TR400 until it reads 28kHz +/- .3kHz.
11. Change audio analyzer back to measuring I301.
12. Add another 20dB to output level of the audio signal generator. (+60dBr) Measure AC signal level at I301 on UR1. Adjust TR351 until output at I301 is $0\text{dBu} \pm 0.01\text{dB}$.

Deviation Tuning Set Up



Or

