2.1033, Item 9

UM700 Tune Up Procedure

Equipment Required

RF Spectrum Analyzer with sensitivity of –100 dBm or better, frequency range of 10 MHz to 3 GHz or wider, 50 ohms, capable of +25 dBm without overload or distortion. Capable of measuring occupied bandwidth. Used in development: HP-E4405B

Frequency Counter covering 10 MHz to 806 MHz with an accuracy of +/- 100 Hz and readout to 10 Hz or better. This function may be resident in higher end spectrum analyzers. Used in Development: Tektronix CMC251

Digital Multimeter capable of measuring current to at least 200 mA and voltage to 10 VDC with an accuracy of 3% or better. Used in development: Fluke Model 87

Power Supply for bench top use capable of supplying 9.0 VDC at 200 mA . Both current and voltage should be metered. Used in development: Leader LPS 152A

RF Power Meter, 50 Ohm, capable of measuring RF power to 806 MHz at power levels to +20 dBm at an accuracy of 5%. Used in development: Agilent E4418B with HP 8482H power sensor.

Audio Analyzer capable of output signal level of +10dBu and distortion measurement less than 1% THD+N. Used in development: Audio Precision A75-1

Test Accessories

Audio cable with XLR 3 pin audio connector on one end with pin 1 grounded and pin 3 as audio. The other end should be BNC male.

50 Ohm coaxial cable 2 to 3 feet long is necessary for connecting the RF output of the UM700 to the spectrum analyzer. One end is SMA male, the other is appropriate for spectrum analyzer. There will be approximately 1 dB of loss in this cable at UHF frequencies. All power measurements should correct this loss.

Metallic tweezers(electrically conductive) required for putting the transmitter in test mode. Note that this adjustment is performed with the PCBs removed from the housing and is accessible only to Lectrosonics personnel.

Check Power Indicator, on/off Status

Substitute the power supply for the battery. The supply should current limit at 150 mA. Set the supply for 9.0VDC and turn on the UM700. The current drain should be less than 80 mA on a fully aligned unit. The Red battery indicator on the front panel should be illuminated. Verify that the power led remains illuminated when the DC power is adjusted to +5.0V VDC.

Monitor the RF output on the spectrum analyzer with the following settings:

Center Frequency to RF carrier
Span set to 200 KHz per horizontal division
Resolution Bandwidth set to 10 KHz
Video Bandwidth set to 10 KHz

Verify that there is delay of about 1 second when cycling the power switch from off to on before RF appears. Verify that there is delay of about 1.5 second when cycling the power switch from on to off before RF switches off. This completes the Power indicator test.

Preparation

Except where noted, all adjustments are performed on the PCB # 17293. Adjustments are to be performed with the power supply set to +9.0VDC and current limit set to 150 mA. All measurements are referenced to the RF-cold PC ground plane. The PCB # 17292 and 17293 should be mated together with the front panel attached.

Preset Adjustments

There are two hexadecimal switches on the PCB. The left switch, SW2, sets the RF carrier frequency in 1.6 MHz steps. The right switch, SW1, sets the frequency in 100 KHz steps. The notation used here will be (# #) or (SW2 SW1) or steps of (1.6 MHz 100 KHz). For example, (A 7) means set SW2 at A and SW1 at 7.

Audio Alignment

Set Audio Limit Level

Using the Audio analyzer, apply a +10 dBu, 1 KHz tone to the audio input of the UM700. Monitor the output at TP2. Set THD+N for less than 1% by adjusting R42. This completes the audio alignment.

RF Alignment

RF Synthesizer Locking Voltage

Adjust the frequency to (0 0) and measure the DC voltage at J6-1. Repeat with frequency set to (F F). Verify that the lock voltages lie between 0.8 VDC and 2.5 VDC for the lower and upper limit of the RF frequency range, respectively.

Fine Tune Carrier Suppression

Set frequency to (7 F), which is about the mid-band of the transmitter. Monitor the signal on the spectrum analyzer using the following setting:
Center frequency to RF carrier
Span set to 200 KHz per horizontal division
Resolution Bandwidth set to 10 KHz
Video Bandwidth set to 10 KHz
Reference level set to +20 dBm
Using tweezers, short pins 1 and 7 on J7. Maintain shorted condition for remainder of fine adjustment. Set SW2 SW1 to (0 0). This puts the UM700 in the single sideband test mode. Carrier suppression is achieved by iteratively adjusting the DC offset voltages that are applied to the modulator.

a. With SW2 set to 0, adjusting SW1 adds an offset voltage to the I channel. Adjust for best carrier suppression.
b. Set SW2 to 1. Adjusting SW1 now adds an offset voltage to the Q channel. Adjust for best carrier suppression.

Repeat a and b above until best carrier suppression is achieved. Final carrier suppression should be better that 25 dB(carrier is 25 dB below sideband). Remove tweezers when complete. DC offset values are stored in EEPROM.

Fine Tune Carrier Frequency

Set frequency to (7 F) and monitor the transmitter RF output on the frequency counter. Using tweezers, short pins 1 and 7 on J7. Maintain shorted condition for remainder of adjustment. Set SW2 SW1 to (F 0). This puts the UM700 in the frequency adjust mode.

a. With SW2 set to F, adjusting SW1 offsets the carries frequency. Adjust SW1 such that the RF carrier frequency is within 1 KHz of the desired frequency

Remove the tweezers when complete. Fine tune adjustment is stored in EEPROM

Occupied Bandwidth

Set the frequency to (7 F) and monitor the transmitter RF output on the spectrum analyzer. Apply a 1 KHz, +10 dBu tone to the audio input of the UM700. Set the spectrum analyzer to measure occupied bandwidth using the following settings:

Span set to 1 MHz
Resolution Bandwidth set to 10 KHz
Video Bandwidth set to 10 KHz

Verify that the occupied bandwidth, 99%, is less than 180 KHz (175 KHz nominal). Repeat for frequency settings of (0 0) and (F F).

Spurious Emissions

Set the frequency to (0 0) and monitor the transmitter RF output on the spectrum analyzer using the following settings:

Start Frequency set to 10 MHz
Stop Frequency set to 3 GHz
Reference level set to +17 dBm
Resolution Bandwidth set to 1 MHz
Video Bandwidth set to 10 KHz

Monitor and identify all observable spurious signals. Verify that no signal(excluding carrier) exceeds –16 dBm. Repeat with the frequency set to (F F).

RF Output Power

Monitor the transmitter RF output power on the power meter. Measure the RF power with the frequency set to (0 0), (7 F), and (F F). Verify that the RF power is +17dBm, +/ 0.5 dB.

This completes the RF and Audio alignments on the UM700