

**T80 TRANSMITTER
TUNING AND ALIGNMENT SPECIFICATION
JUNE 19, 2001
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1. EQUIPMENT REQUIRED:

- a. Hewlett Packard Model 53131A 225 Mhz Universal Counter; S/N 9416A06729
- b. Hewlett Packard Model HP8648A Signal Generator 100KHz to 100MHz
- c. Agilent E4411B 5KHz to 1.5 GHz ESA-L series Spectrum Analyzer
- d. Bird Wattmeter Model 43 with one(1) watt 60-80MHz Model 060-1 element
- e. one $\frac{1}{4}$ wavelength dipole antenna with 50 ohm match cable and BNC connectors and cable.
- f. Charged 9.6V Ni Cd power source.
- g. Wood test bench.
- h. Heathkit 50 ohm match "Cantenna", oil filled load.

2. GENERAL:

- a. The HP 53131A is the primary frequency standard and shall have a current calibration record on file.
- b. At least twice daily, the HP 8646A Signal Generator shall be calibrated using the primary frequency standard and the calibration posted and set on the signal generator for tuning at 72 MHz band center frequency and at the 75 MHz band center frequency, whichever is applicable to the UUT.
- c. At least twice daily, the Agilent E144B Spectrum Analyzer shall be calibrated by connecting directly from the output of the HP8646A Signal Generator to the input of the Spectrum Analyzer. Calibration bias shall be noted and set on the Spectrum Analyzer.
- d. The UUT for the T80 is designed to radiate well below the permissible level for R/C transmitters and the Bird Wattmeter is sufficiently accurate to confirm peak power into a 50 ohm source. The "Cantenna" forms an adequate load for power testing and suppresses radiation adequately to permit other activities in the facility.

3. TEST SET UP

Insure that the UUT is functional by observing and "rough tuning" against the spectrum analyzer. Once the UUT is roughly aligned and generating RF power, proceed with the alignment.

a. Confirmation of radiated power:

- 1) Connect from antenna output for the UUT to the Bird Wattmeter using a 50 ohm RG58U cable with a BNC connector to the wattmeter.
- 2) Connect from the wattmeter to the "Cantenna" using an RG58U cable with BNC ends.
- 3) Set the element of the wattmeter for radiated power(Arrow pointing to the right)

- 4) Apply power to the UUT.
- 5) Tune L4 and L5 for max radiation. These coils are a bandpass filter, so they interact and tuning must be iterated.
- 6) Tune L7; L9; and L10 for peak output power. You are tuning the output for a 50 ohm match with the wattmeter. The "Cantenna" is also a 50 ohm match, so no mismatch is present and the output reading will be reasonably accurate. Expect max power to be >400 milliwatts and < 500 milliwatts. Power must not exceed 700mw.
- 7) Remove the test cables, wattmeter, and "Cantenna".

b. Align the UUT

- 1) Install the standard collapsible antenna to the transmitter and extend fully to 39 ½ inches.
- 2) Calibrate the spectrum analyzer using the counter and the Signal Generator.
- 3) Connect the ¼ wavelength antenna to the spectrum analyzer input connector.
- 4) Set the analyzer for center frequency for f0; set Resolution Bandwidth to 3KHz; set span to 5 KHz per division.
- 5) Align L7; L9 & L10 for maximum output power. NOTE: the antenna is never exactly a 50 ohm match, so your setting will differ a bit from those that created the 50 ohm match into the wattmeter.
- 6) Observe the spectrum with normal PPM modulation applied from the encoder. Adjust R12 and R14 such that center frequency is exactly f0 and the modulation peaks are f0 +&- 1500 Hz(# KHz deviation)
- 7) Proper occupied spectrum shall be </= to FCC required.
- 8) Reduce the analyzer antenna length to ¼ wavelength for 2 F0.
- 9) Increase analyzer span sufficiently to observe the 2nd harmonic of F0.
10. Tune L9 and L10 to minimize 2nd harmonic and observe that it is < FCC specification.
11. Recheck occupied spectrum and center frequency.