

6. Transistor complement and functions:
 - Q121, npn, crystal oscillator, 1/3 final frequency
 - Q122, fet, frequency tripler
 - Q123, npn, class A tuned buffer
 - Q124, npn, class A broadband amplifier
 - Q125, npn, class C broadband driver amplifier (modulated)
 - Q126, npn, class C broadband final amplifier (modulated)
7. Circuit diagrams: all stages are shown on dwg. 4101424
8. Instruction book: draft attached
9. Transmitter tune-up procedure:

The last three stages are broadband amplifiers and have no tuning adjustments. The crystal oscillator has one adjustment, C122A, to "trim" the oscillator frequency up or down over a range of approximately 2 KHz. If the M15 contains more than one channel, C122A affects all channels, and should be adjusted so all channels are as near as possible to their nominal frequencies and within .003% frequency tolerance (.002% for fixed stations). The frequency tripler and tuned buffer stages have three adjustments, L124, L125 and L126. Before adjusting these, first set the varactor tracking voltage Vt to the correct value for each frequency selector switch position (see tracking voltage table in service manual) using trimmers R110A, R110B, etc. Then select the channel nearest the center of the channel range and adjust L124, L125 and L126 for maximum peak carrier output. This is most easily done with a minimum of test equipment by tuning for maximum power under modulation. This output should be between 4.5 watts and 7.0 watts.
10. Frequency stabilization: provided by the crystal-controlled oscillator circuit with Q121. The circuit can be redrawn as a Colpitts oscillator in which the base-collector inductance is provided by the crystal operating slightly above series resonance at its third overtone. The collector-emitter capacity is obtained by the combination L121, C122 and C122A, which together appear capacitive over the oscillator's frequency range of 39.3 to 45.7 Mhz. (In the crystal fundamental frequency range, 13.1 to 15.2 Mhz, these elements appear inductive, preventing oscillation at these frequencies.) The crystals are AT cut for best frequency stability.
- 11.1 Modulation limiting: the automatic level control integrated circuit U6 prevents the microphone audio signal level from exceeding 0.3 v. p-p at pin 8. This audio signal is amplified by one section of the quad op amp U3; the voltage gain of this stage is closely controlled by 5% tolerance resistors R80 and R84. Q7 and Q8 then form a unity gain power amplifier. Thus the output at the collector of Q8 is limited in amplitude to approximately 12 volts p-p. Since the d.c. component of the modulation signal applied to the r.f. power amplifier is 6.3 volts, overmodulation is prevented.
- 11.2 Harmonic suppression: The transmitter r.f. output passes through a pin diode T-R switch (CR110 and CR111) and 7-element Tchebychef 50 ohm low pass filter (C166, L131, C167, L133, C168, L134, C170).