ALIGNMENT METHOD

IMPORTANT

Speaker Impedance switch should be in 8 ohm position while adjusting center voltage and idling current.

INITIAL ADJUSTMENT (No load connected)

A. CENTER VOLTAGE
   1. Connect DC millivoltmeter to L channel output terminals.
   2. Turn on and adjust to 0 V < 30mV with VR401 (10kΩ). Connect DC millivoltmeter to R channel output terminals and adjust VR402 to 0 V < 30mV.

B. IDLING CURRENT
   1. Remove solder short across R471 and R472.
   2. Connect DC millivoltmeter across R471 (1 ohm) (output transistor's collector resistor) and adjust VR403 (1kΩ) for 26-30mV reading on meter.
      Repeat adjust with VR404 (1kΩ), connecting meter across R472 (1 ohm)
   3. Leave power on for minimum 5 minutes.

FINAL ADJUSTMENT

C. CENTER VOLTAGE
   1. Repeat step A above.

D. IDLING CURRENT
   1. Repeat step B and adjust with VR403, VR404 for 30mV reading on meter.
   2. After the alignment is finished, 1 ohm resistor R471, R472 is shorted by solder short.

AMPLIFIER ADJUSTMENT POINTS
FM ALIGNMENTS

NECESSARY INSTRUMENTATION
FM GENERATOR (less than 0.05% THD)
STEREO GENERATOR (less than 0.05% THD, more than 50 dB separation at 1 KHz)
AUDIO GENERATOR (not necessary if FM generator has built in sweepe, i.e. SOUND TECHNOLOGY ST 1000A and ST 1020A)
2 AC VTVM's (or one with left/right channel switch)
THD ANALYZER (resolution better than 0.1%)
OSCILLOSCOPE (5mV or better sensitivity, X input capability)
FREQUENCY COUNTER
VOM or DMM (high impedance, must read in mV)
DIODE DETECTOR PROBE
COPPER/FERRITE INDUCER

IMPORTANT
While all FM generator output levels hereafter are referred to the 300 ohm input, 75 ohm input can be used, but be aware of possible equipment ground loops and divide the RF output level by 2.
Before alignments commence set input selector to tuner and release tape, mono and FM MR, defeat switches (out)
ALIGNMENT OF FRONTEND should only be necessary after repair to frontend or crystal oscillator circuits (pin 2 and 3 on IC7)

A. TUNING VOLTAGE (OSCILLATOR)
It is essential to check tuning voltage before aligning the rest of the frontend.
1. Connect DMM between shield and pin 6 on frontend.
2. Tune to 108 MHz and adjust L 707 if voltage is incorrect.
   SPECIFICATION 20.5V ± 0.5V
3. Tune to 87.5 MHz and read voltage, repeat step 2 and 3 if incorrect.
   SPECIFICATION 3V ± 0.5V

B. RF ADJUSTMENT (TRACKING)
1. Connect RF generator to antenna input and detector probe to pin 1, IC 2 (IF DETECTOR)
   with ground to detector shield. Adjust sensitivity of oscilloscope to maximum (5mV or better) and modulate FM
   generator sweep ± 300 KHz or more with modulating (sweep) signal connected to X-input of oscilloscope.
2. Set tuner to 90 KHz, enter into preset 1, and tune generator so that curve appears on oscilloscope. Turn down RF
   input level so that curve covers approximately 1/2 of oscilloscope display.
3. Check alignments of L 702 - L 704 - L 705 by inserting copper/ferrite inductor close to them while watching curve
   on oscilloscope. Curve should decrease in height with either ferrite (same as increasing inductance, i.e.
   more core) or with copper (same as decreasing inductance, i.e. extend size of coil). If curve increases in size
   more than 10% adjust only the coil which reacts incorrectly. Adjust coils by gently extend or contract the
   aircell with a non-metalic and non-static tool (i.e. plastic knit-pin or a wooden stick). Be careful not to
   deform coil.
4. Set tuner to 105KHz, enter into preset 2, and tune generator so that curve appears on oscilloscope.
5. Check L 702 - L 704 - L 705 again with the ferrite/copper inductor. Curve should not increase more than 10% on
   any of the coils.
6. Repeat step 2 + 3 + 4 + 5 if curve height is outside of tolerances, if necessary distribute the error between 90
   and 105 KHz. Check tuning voltage again if tolerances not possible to achieve.

C. IF ADJUSTMENT
1. Set tuner to approximately 98 KHz (the tuner must be tuned to an unoccupied frequency) enter into preset 3, and
   tune FM generator to display a curve on the oscilloscope.
2. Adjust L 709 (IF1 tuner frontend) to maximum and symmetrical curve on th display, using as little input signal as
   possible.
D. DETECTOR COARSE ADJUSTMENT (OPTIONAL, NEEDED ONLY IF DETECTOR WAS REPAIRED).
1. Reduce sweep modulation level to +/- 15 kHz and set input level to 300 uv.
2. Adjust FM generator frequency so that both legs of the inverted U-shaped curve are equally high on the display. The curve should be almost perfectly symmetrical.
3. Disconnect detector probe from tuner and oscilloscope. Connect either of the tape rec. outputs to the oscilloscope.
4. Adjust IF 1 primary (closest to the rear of unit) to maximum curveheight and IF 2 secondary (closest to the front of unit) to minimum curveheight and straightest possible line. Go back and forth between primary and secondary until both are peaked.
NOTE: Both the cores should be within 1.5 mm from the top of the form.

E. DETECTOR ALIGNMENTS (FINAL)
1. Disconnect detector probe and connect tape rec. outputs to VTVM's, oscilloscope and distortion analyzer.
2. Switch stereo generator to 1 kHz 100%(+/-75kHz) mono modulation and oscilloscope to normal intervals sweep 0.2 mS and 0.5 V/cm sensitivity.
3. Detector reference frequency
   Reduce FM generator output level while monitoring THD from left channel. When THD increases to 3K, fine tune the FM generator frequency to minimum THD. Reduce FM generator output level and fine tune till no reduction in the 3K THD can be achieved by fine tuning. Use this frequency for all the following detector, MPX and FM NR adjustments.
NOTE: The typical input level for this 3K THD should be 1.5 uv to 2.3 uv. This is done only to "lineup" the frequency from the generator to the tuner's frequency. If IFH usable sensitivity (-30 dB THD+N= 3.15% THD+N) is to be verified, a proper IFH bandpass filter must be used.
4. Connect DMM ACROSS TP 2 (negative) and TP 1 (positive). Set FM generator output level to 1000 uv.
5. Adjust IF 1 primary (closest to the rear of unit) for 0 V on DMM.
   TOLERANCE +/- 50 mv
6. Adjust IF 1 secondary (closest to the front of unit) for lowest THD.
   SPECIFICATION less than 0.1%.
7. Revert steps 3 - 5 and 6 till no further improvements. Record the DMM's final reading for use later in the adjustment.

F. AUTOSEARCH LEVEL
1. Connect DMM between IC 2 pin 12 and ground.
2. Increase FM generator level upwards from 0 and adjust VR 1 so that DMM reading goes from 0 V to approximately 4.8 V at 10 uv.
   TOLERANCE +/- 2 uv

G. STEREO DECODER, MPX FILTERS.
1. VCO Connect a frequency counter between IC 6 pin 11 and ground.
2. Set FM generator to 1000 uv output and no modulation.
3. Adjust VR 3 for a 19000 Hz reading on the counter.
   TOLERANCE +/- 100Hz
5. Stereo switch threshold.
   Modulate FM generator 1 kHz 45° left only plus 19 kHz PILOT 8 - 10%.
6. Increase FM generator level upwards from 0 and adjust VR 2 so that stereo light turns on and audio outputs as watched on VTVM and oscilloscope, switches to one channel only at 10 uv input level.
   TOLERANCE +/- 5 V
NOTE: When turning input level down the unit will switch into mono at a lower level, typically 5 - 7 uv.
7. Stereo separation
   Set FM generator output to 1000 uv, modulate in mono only.
8. Adjust VR 4 for identical outputs in the two channels.
    TOLERANCE +/- 20mV.
9. Modulate FM generator left channel only and adjust VR 5 for minimum on right channel VIVM.
10. Modulate FM generator right channel only and adjust VR 5 for minimum on left channel VIVM.
11. If the minimum in step 9 and 10 are different, adjust VR 5 so that the readings are the same in both channels.
    SPECIFICATION better than 40db separation
12. MPX filter
    Turn off audio modulation, leaving pilot tone only. Disable IHF filter or external 19 kHz filter if used.
13. Adjust LPF 1 left channel and LPF 2 right channel for minimum output
    SPECIFICATION more than 60 db suppression

H. FM NR ADJUSTMENTS.
1. Turn VR 6 fully clockwise.
2. FM NR separation effect
   Observe output from left channel with FM generator output level 1000 uv and modulated 1 kHz left channel only.
   Reduce audio modulation only from stereo generator so that left channel output is reduced by 6 db (50% stereo modulation).
   The 19 kHz pilot signal MUST REMAIN modulated 8-10%.
3. Set FM generator output to 150 uv and adjust VR 6 for - 30 db separation left to right channel (or right to left)
   TOLERANCE +/- 2 db.

I. SYNTHESIZER FREQUENCY.
1. Tune to a known accurate frequency source, i.e. broadcasting station or synthesized / digital display FM generator, preferably in the midband (95 - 100 MHz).
2. Connect DMM across TP 2 (negative) and TP 1 (positive).
3. Adjust VC 2 so that DMM reads the same as recorded in E - 7.
   TOLERANCE +/- 10 mV.
AM ALIGNMENTS

Unless repairs have been done to Oscillator Section, do not adjust AM OSC coil or Trimming Capacitor. If OSC Adjustment is needed, connect high impedance voltmeter (preferably DMM) between R35 and ground.

A. OSC ADJUSTMENT
1. Tune unit to show 1610 KHz or 1620 KHz on display and adjust VC3 to read 7.5 on DMM.
2. Tune unit to show 520 KHz or 522 KHz on display and adjust L3 to read 1V±0.5V on DMM.
3. Repeat step 1 and unit no further improvement.

B. IF ADJUSTMENT
1. For IF adjustment and Tracing adjustment connect VTVM to loudspeaker output (or tape output), only one channel connection needed, and connect signal generator to antenna terminals. Adjust generator for 30% modulation and approx. 100 uV input.
   Tune both generator and receiver to approx. 1000 KHz, and adjust generator frequency for maximum reading on VTVM. Then adjust IF12, and IF13 for maximum reading on meter.

C. TRACKING ADJUSTMENT
1. Tune unit and generator to show approx. 600 KHz and adjust L2 to maximum reading on VTVM.
2. Tune unit and generator to show approx. 1400 KHz and adjust VC1 (Trimming Capacitor) for maximum reading on VTVM.
3. Repeat step 1 and 2 unit no further improvement is obtained.
TUNER PCB LAYOUT AND WIRING DIAGRAM