



111 Powdermill Road, Maynard, Mass.

SERVICE BULLETIN  
For  
MODEL 310E BROADCAST MONITOR FM TUNER

SPECIFICATIONS

(These specifications are minimum - all H. H. Scott 310E tuners must meet or exceed these figures.)

Usable Sensitivity (IHFM) (For less than 3R Total Noise, distortion, hum - 30 db)	1.9 microvolts
Cross Modulation Rejection	85 db
Signal to Noise Ratio	65 db below 100% modulation
Total Harmonic Distortion	0.5%
Frequency Deviation	0.02%
Frequency Response	20-15,000 cps <u>+</u> 1 db
Capture Ratio	2.2 db
Selectivity	50 db
Spurious Response Rejection	90 db
Hum	66 db
AM Suppression	60 db
Separation	In excess of 30 db
Audio Output (100% modulation)	4 - 6 volts
Tuning Range	87-109 mc
Accuracy of Calibration	0.5%
Output Impedance	3000 ohms
Minimum Recommended Load Resistance	100,000 ohms
Minimum Recommended Cable Capacitance	1000 mmfds
Maximum Recommended Length of Output Lead	70 feet
Range of Line Voltage and Frequency	105-125 volt 50/60 cps
Power Consumption - AC ONLY - <u>DO NOT OPERATE</u> <u>WITH</u> <u>DIRECT CURRENT</u>	50 watts

GENERAL SERVICE NOTES

Service, other than replacement of either pilot lights or vacuum tubes, is usually not required. If the tuner is not operating properly, all external connections should be checked to make sure that the difficulty is in the tuner. Generally, it is advisable to replace the connection to the tuner with a tape recorder or similar device to check out the amplifier performance. If the difficulty appears to be located in the tuner, the level controls should be first checked, to insure that they are rotated away from their extreme counter-clockwise positions. Then, the vacuum tubes should be checked by replacing them with new ones, one by one. The tubes should be tight in their sockets and provided with shields where applicable. Tube defects frequently do not show up in a tube tester. Only operation in the tuner will insure the proper working of a vacuum.

### Tuning Dial Pilot Light Replacement:

1. First set the tuning dial so that the heavy white lines line up with the pointers on the dial and the logging scale is towards the top of the panel. In this position, the tuning condensers are closed.
2. Unscrew and remove the tuning knob and dial. This will permit access to the pilot light which is a #47 bulb.

After the bulb has been replaced, use the following procedure:

1. Close the condenser plates by rotating the condenser to the extreme counter-clockwise position.
2. Replace the dial, lining up the heavy white lines of the dial with the pointers and keeping the logging scale toward the top of the front panel.

### Meter and Indicator Pilot Light Replacement:

1. Remove the pilot light assembly by inserting a sharp instrument (a screw driver or knife) between the Control Shield and the Assembly Clip.
2. Remove the old bulb and install the new #47 bulb.
3. Reinstall the light assembly by snapping it into the hole.

### TEST PROCEDURE

Note: No attempt should be made to align the tuner or repair it unless the person so doing has had extensive experience in tuner alignment and repair procedures and has the necessary laboratory equipment. Without proper experience or equipment, the repairman may seriously damage the tuner.

### Equipment Needed:

VTVM (AC)  
Oscilloscope  
VOM  
Distortion Meter  
FM Signal Generator (must be measurements 210AB or equivalent)  
MX Generator  
Audio Generator  
15 kc Low Pass Filter  
Insulated Alignment Tools

### Set Controls to the Following:

Level pots	Max cw
Separation pots	Max ccw
Mono Threshold (top)	Max cw
Stereo Threshold (top)	Max cw
Comp. phase adj.	Max cw
AGC sw.	Normal
Dynaural Squelch (front)	Max ccw ('0')
Stereo Threshold (front)	Max ccw ('0')
Selector sw.	MONO
Function sw.	Normal

## 830 Settings:

- a. 400 cps audio input (balanced), about 1.5v p-p, to audio oscillator input.
- b. Input Selector - Audio Osc. pos.
- c. Pilot - OFF
- d. Sub and Main - ON
- e. Vertical input sel. - Composite signal
- f. Horizontal input sel. - Left Ch. Input
- g. Left and Right Channels - Pos. (+). (Equivalent MONO output)
- h. Composite signal output - to FM Generator Mod. input
- i. Horizontal (synch) output - H input on scope.
- j. Power sw. - ON

## Test Set-up Check Out:

- a. Using any known operating tuner, set to MONO position. Connect FM Generator, internal 400 cps modulation, 75 kc deviation, 100 uv output, at either 92 or 106 to tuner. Observe output on VTVM and scope and record output voltage.
- b. Switch FM Generator to External Mod., 300 kc deviation; using same frequency and R.F. Output, adjust Audio Osc. Amplitude control for same output reading as above.
- c. All checks can now be done using EXT. Mod., 300 kc deviation on FM Gen.

Note: Allow tuner and test equipment to warm up fully before beginning alignment. Adjust line voltage for 117 volts. Remove bottom cover of tuner. Always tune primary and secondary of I.F. transformers at the same time, using one alignment tool in each hand.

## 1. MONO ALIGNMENT AND SENSITIVITY CHECK

### Front End and IF Alignment

- a. With about 10 uv Generator output, align and peak front end for max. output.
- b. With 3 uv input, align IF's for max. audio.
- c. With 2K uv input, align detector for minimum distortion.
- d. With 5 uv input, scope probe to CPM 1.0 uf coupling capacitor (after 6U8), scope SYNC to INPUT, observe undistorted, symmetrical Lissajous pattern on scope - this must be a near-perfect Lissajous pattern - if not, IF's must be touched up (starting with last IF can).
- e. Right ch. selector on 830 to NEG (-), observe near-perfect butterfly pattern on scope. If not, repeat steps b and d.

### Sensitivity and Distortion

- f. Return 830 right ch. sel. to pos. (+). Scope probe to output. Scope SYNC to "INT". Measure sensitivity of tuner with 4.4 uv RF input. Must obtain 30 db useable sens. at 92, 98, and 106 mc. Audio output 2-4 volts.
- g. Recheck distortion, 2K uv input. 400 cps - max. dist. of 0.5%. At 10 kc max. dist. of 2.0% (output taken from detector output for 10 kc only).
- h. Reduce RF input from 1K uv to 0 uv, audio output level drop 15 ± 1 db.

### FM Hum Check

- i. Return modulation to 400 cps. RF input to 10K uv at either 92 or 96 or 106, take reference reading, turn modulation "OFF". Minimum of 54 db drop in output must be noted.

### De-emphasis Check

- j. Modulation 400 cps with 10K uv RF input. Change mod. to 8 kc, note decrease of  $12 \pm 2$  db in output.

Repeat for stereo. Leave tuner in Mono-short pins 2 and 3 on stereo switching tube (12DW7) to switchover to stereo.

### Calibration Check

- k. Check calibration against stations - Max. tolerance  $\pm .2$  mc.

### Filter Check

- l. With output meter and scope connected to ch. A. output jack, external modulation 10 kc, with pilot, 830 L = +, R = +, check for less than 1 db. change in output when switching between normal and sub chan. filter. Switch to Stereo Filter and note output drops 6-8 db. Now switch 830 to L = +, R = -, and switch between Sub Chan. Filter and Stereo Filter and note less than 1 db change in output. Switch between Normal and Sub Chan. Filter and note 6-8 db lower in Sub Chan. Filter position.

### Audio Hum Check

- m. Dynaural Squelch to '0', level pots minimum - max. hum 1 mv. Level pots max. Max. hum 3 mv both channels.

## 2. MULTIPLEX ALIGNMENT

### Pilot Adjustment

- a. RF input 3K uv. Pilot "ON", sub and main ch. "OFF", 10:1 scope probe to pilot junction point (after diodes from T-502) peak T-501 (bottom and top) and L-501 for maximum pilot signal as seen on scope. Calibrate scope and measure pilot level - specifications are 5 - 15 volts.

### Oscillator Sync. Adjustment

- b. Scope probe to output, sub and main ch. "ON", Right channel "OFF", pilot "OFF", scope SYNC to input, tuner to Ch. A output.

Short primary of T-501, short pins 2 and 3 on stereo switching tube (7247-12DW7), adjust T-502 for zero beat as seen on scope. Remove both shorts, scope SYNC to INT.

### High Frequency Separation Adjustment

- c. Pilot still "OFF", tuner still in MONO, 830 left ch. pos. (+), Right ch. OFF, Audio modulation to 12 kc. Change 830 sync. lead from H input on scope to sync. terminal. Switch scope SYNC to EXT. This now provides external sync. for scope. The external sync. coming from 830. When checking left ch., 830 Horiz. sel. sw. to left ch. when checking right ch., 830 horiz. sel. sw. to right ch. to maintain sync. 10:1. Scope probe to CPM 1.0 uf (after 6U8). Adjust scope to obtain pattern and with composite phase adj. balance middle portion of scope pattern for best symmetry and flatness. 830 left ch. OFF, Right ch. pos. (+), repeat adj. of middle portion of scope pattern for best symmetry and flatness. If necessary, slightly touch-up L-501 for best flatness and balance of this middle part of scope pattern.

### Low Frequency Separation Adjustment

- d. Audio Mod. to 400 cps. Pilot "ON". 830 SYNC lead back to H input, scope sync to INT., scope probe to output, tuner to stereo, output from ch. A, 830 to right ch. pos. (+), Left ch. OFF. Adj. scope to obtain pattern and

adj. ch. A. separation pot for minimum output observing scope. Slightly touch-up L-501 for minimum output. 830 to Left ch., tuner output from ch. B and adj. ch. B separation pot for minimum as outlined above. Repeat between A and B until no further improvement is seen.

Final Separation Measurements to be done in each channel, in order shown:

e.	<u>Audio Modulation</u>	<u>Minimum Separation</u>
	12 KC	28 db
	3 KC	30 db
	400 cps	34 db

If separation specs are not met, recheck IF's for proper alignment using separation scope pattern - slightly re-align IF's for min. separation at frequency where the specs are not met. Also recheck steps 2.b, c, and d. Also recheck 67 kc trap for proper null.

### 3. AUDIO OUTPUT LEVELS (Rear Chassis)

Audio modulation 400 cps 830 left and right channels to Pos. (+). RF input to 100 uv. Tuner to MONO. Note and record output voltage (2-4 volts) tuner to automatic stereo, then to stereo, output must remain within 1.5 db of mono level. Adjust each level control for 0 db on 3 v scale.

### 4. MONO THRESHOLD ADJUSTMENT (Top Chassis)

RF input to 100 uv. Dynaural Squelch control (front panel) to "10." Adj. Mono Threshold Adj. (on top chassis) until mono relay activates and signal cuts out. Leave adjustment at this point. Reduce RF input to 3 uv, turn Dynaural Squelch control slowly towards "0," note that MONO relay deactivates and signal reappears - this must happen between 3 and 6 on pot. Attach antenna to input, check to see that Dynaural Squelch pot operates between 3 and 6 on interstation "noise" all across the band. Leave Dynaural Squelch pot at "0."

Mono light must go out when relay is activated.

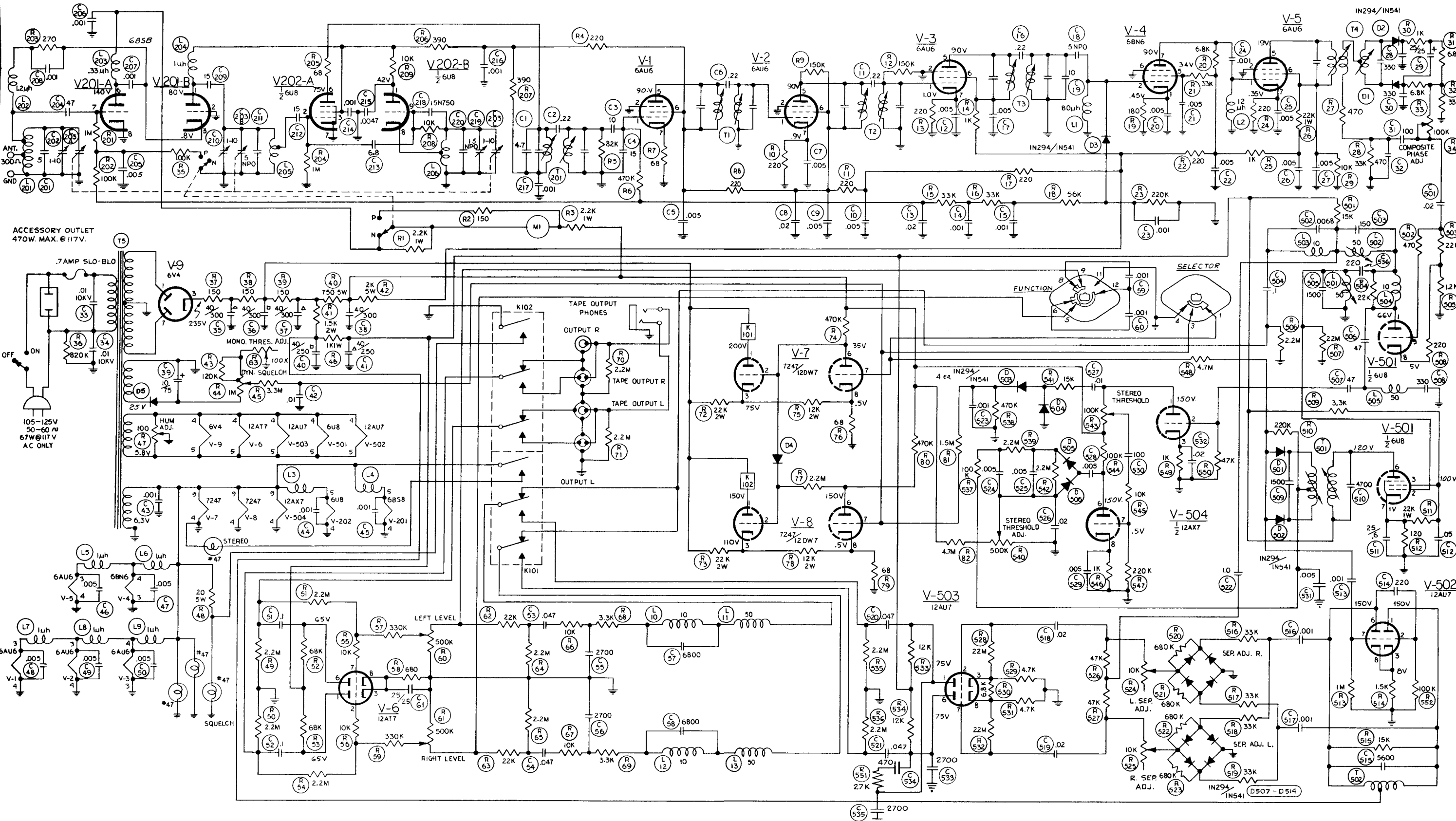
### 5. STEREO THRESHOLD ADJUSTMENT (Top Chassis)

RF input to 3k uv. 830 right ch. OFF, tuner output from ch. A, tuner to Automatic Stereo, Stereo Threshold pot to "10." Adjust Stereo Threshold Adj. (on top chassis) slowly until stereo relay activates and signal becomes MONO - leave adj. slightly beyond the mono switch - over point and reduce RF input to 10 uv. Turn Stereo Threshold pot slowly towards "0" until stereo relay deactivates and signal becomes stereo - this must occur between 0 and 2 on pot. If not, readjust Stereo Threshold Adj. (on top chassis). With relay activated (stereo signal switched to mono) turn selector sw. to Stereo and note that the mono relay activates and signal cuts out. Now increase RF input until both relays deactivate and stereo signal appears at output - This must occur between 10 to 20 uv input. Stereo light ON in Stereo, out when switched to MONO. Selector sw. to MONO, Dynaural Squelch and Stereo Threshold pot to "0," seal necessary pots.

### 6. FINAL LISTEN CHECK

Check all inputs and outputs (including phone jacks) switches and controls for proper operation. Check overall appearance. Check for proper switching of stereo and mono lights.

If there are any problems or questions, write to: Technical Services Department  
H. H. SCOTT, INC.  
111 Powder Mill Road  
Maynard, Massachusetts



ACCESSORY OUTLET  
470W. MAX. @ 117V.

105-125V  
50-60 Hz  
67W @ 117V  
AC ONLY

UNLESS OTHERWISE NOTED:  
 1. VOLTAGES MEASURED WITH V.O.M. - 2000 OHM/VOLT.  
 2. TUNER OFF STATION, MONO POSITION, 117 V LINE.  
 3. DYNAURAL SQUELCH CONTROL @ ZERO POSITION.  
 4. STEREO THRESHOLD CONTROL @ ZERO POSITION.

STEREO SELECTOR SW.

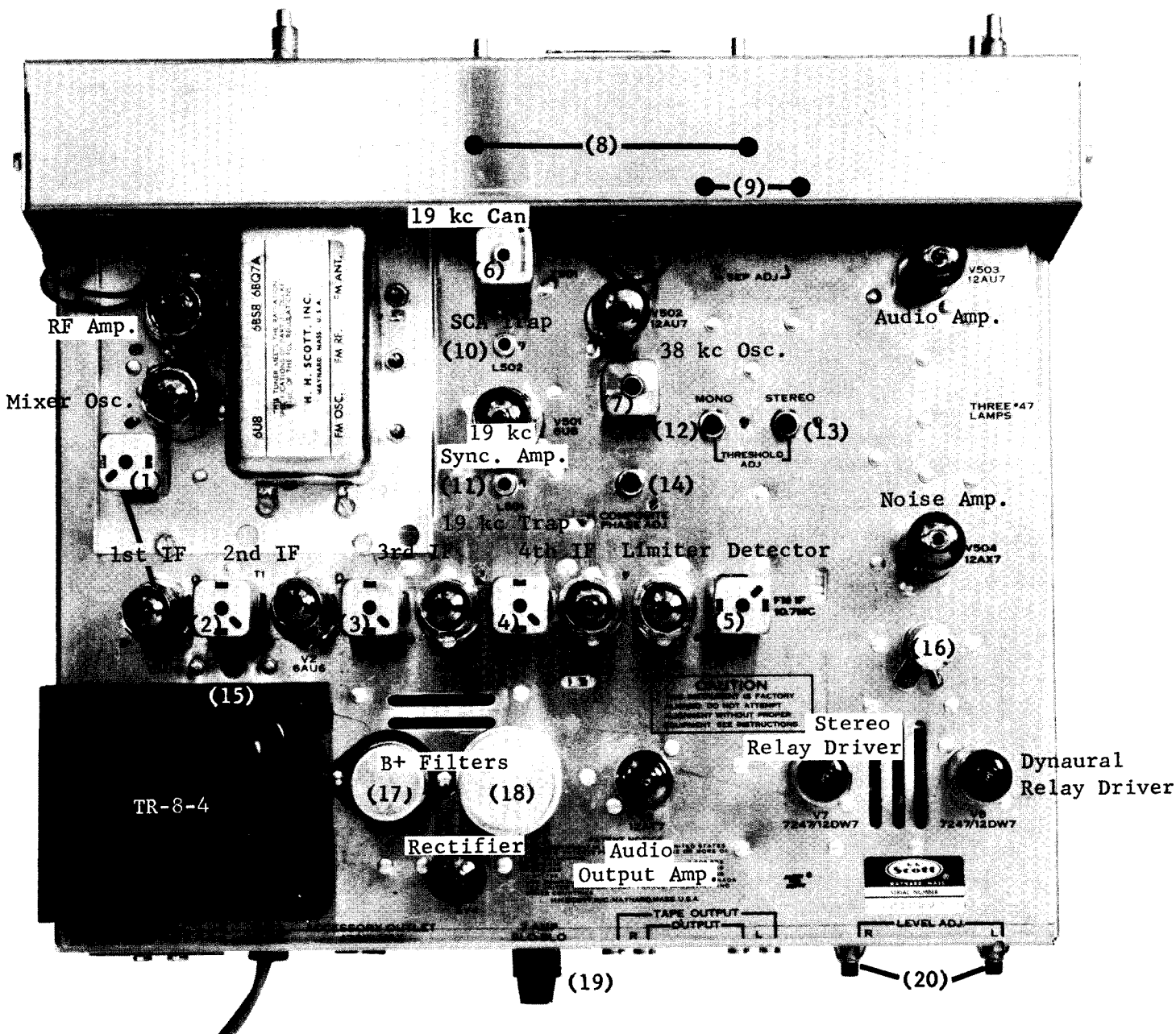
POSITION	FUNCTION
1	MONO
2	AUTOMATIC STEREO
3	STEREO

FUNCTION SWITCH

POSITION	FUNCTION
1	POWER OFF
2	STEREO
3	SUB CHAN. FILTER
4	STEREO FILTER

TYPE 310E FM MULTIPLEX STEREO TUNER

SCALE: —	310E CIRCUIT DIAGRAM	8-14-63
H. H. SCOTT, INC. MAYNARD, MASS., U.S.A.		
DR. A. P. RAMOS	ENG. DFM	DWG. NO.
CH. QJW	PROD. RAC	D-310E-C1 SUB. 0



Front Panel Switches and Controls	(5)	Detector Can .....	TRV-10.7D	
	(6)	19 kc Can .....	TRV-.02T	
Function Switch .....	SRW-44-11	(7)	38 kc Osc. Can .....	TRV-.04T
Selector Switch .....	SRW-13	(8)	Dynaural & Stereo Relays	
Dynaural Squelch Control.	RCV-1MST-3B		(under shield) .....	K3-CCA
Tape Jack .....	J3-ST	(9)	L & R Separation Pots ...	RCV-10K PH
Stereo Threshold Control.	RCV-100KL-3B	(10)	SCA Coil .....	LV-05
Tuning Meter .....	M-SS-7	(11)	19 kc Coil .....	LV-05
A.G.C. Switch .....	SS-22-2	(12)	Mono Threshold Pot .....	RCV-100K PH
Tuning Dial Light Socket.	XPL-U5	(13)	Stereo Threshold Pot .....	RCV-500K PH
Snap-in Light Sockets ...	XPL-U4-3	(14)	Composite Phase Pot .....	RCV-100K PH
		(15)	Hum Pot .....	RWV-100
Main Chassis Major Parts and Controls	(16)	Power Resistor .....	RWS-10-450 (3x150)	
	(17)	B+ Filter .....	CEC 2x40/250-25/25	
(1) 1st IF Can .....	TRV-10.7 IF	(18)	B+ Filter .....	CEC 4x40/300
(2) 2nd IF Can .....	TRV-10.7 IF	(19)	Fuse Post .....	XF-3AG
(3) 3rd IF Can .....	TRV-10.7 IF		Fuse .....	FSB-.7
(4) 4th IF Can .....	TRV-10.7 IF	(20)	L & R Level Pots .....	RCV-500K PH