

**The Citation Fifteen**

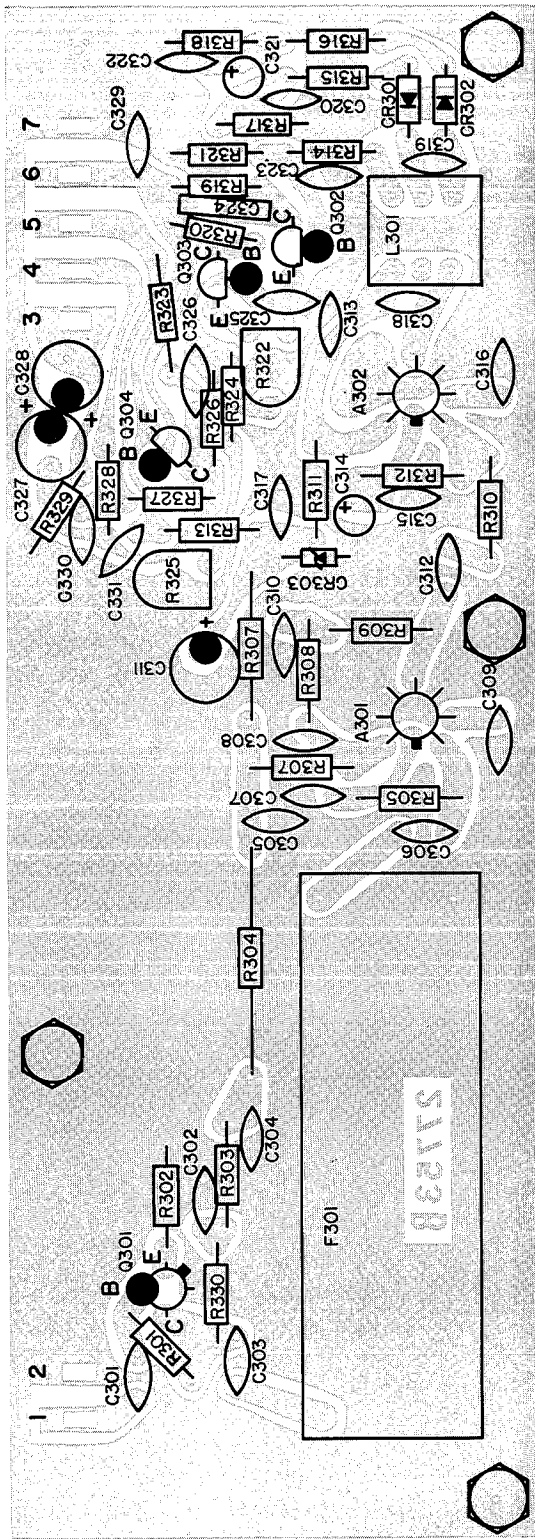
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**Professional FM/Stereo FM Tuner**

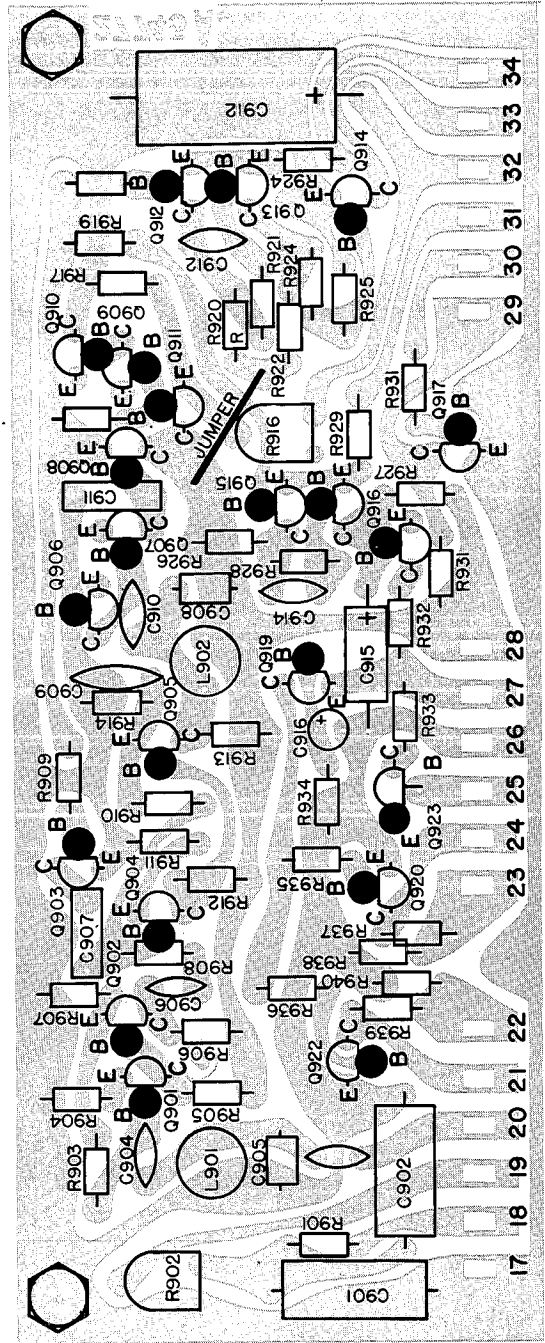
**Technical Manual**

**harman/kardon**

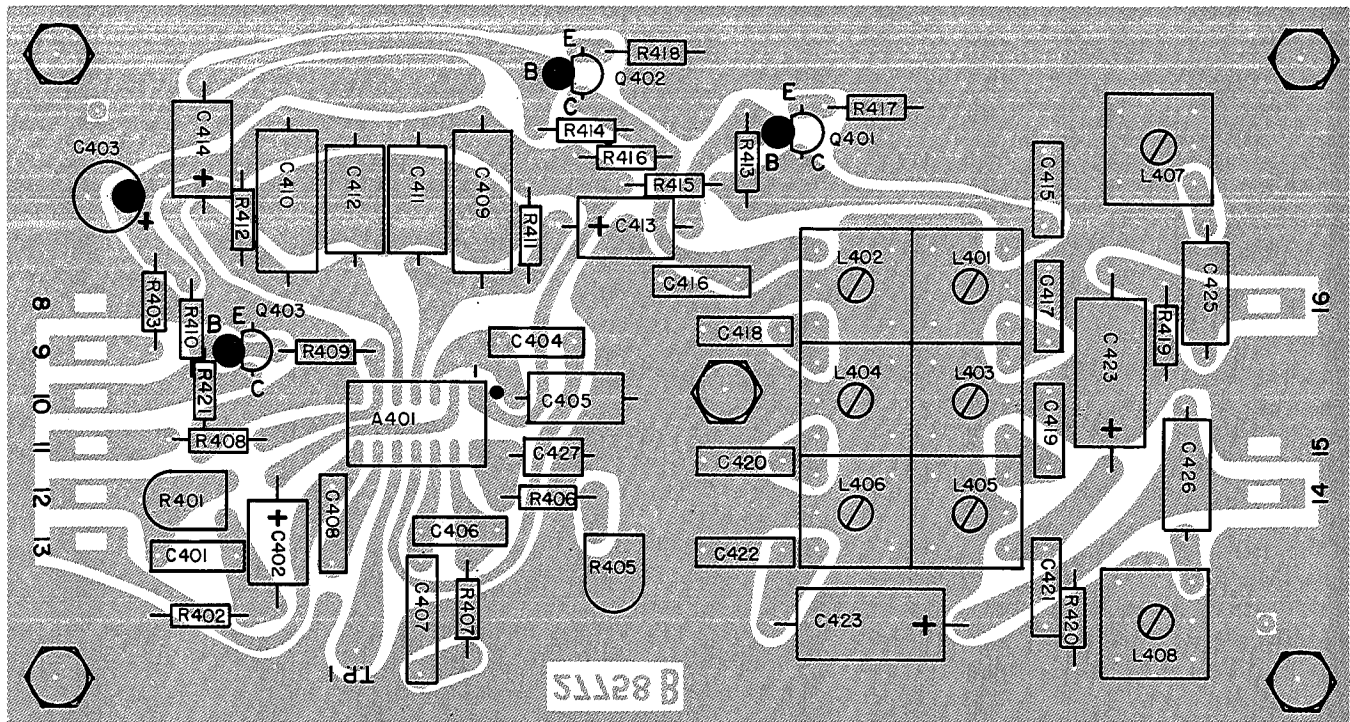
IF METER AMP BOARD



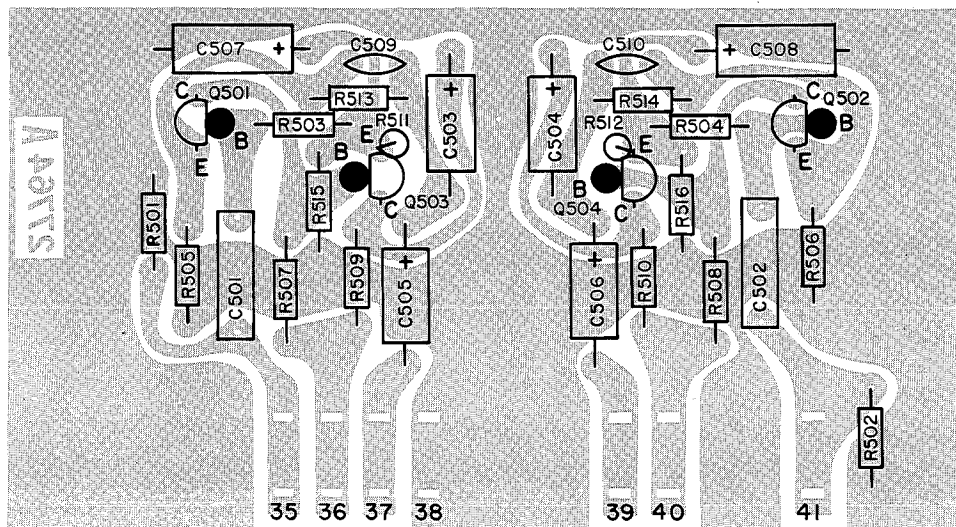
METER MUTING BOARD



# MULTIPLEX/MULTIPLEX FILTER BOARD



# OUTPUT BOARD



## CITATION FIFTEEN ALIGNMENT PROCEDURE

Do not attempt alignment unless the following equipment is available:

1. FM Signal generator
2. Oscilloscope — must have at least 4.5 MHz bandwidth
3. AC — V.T.V.M.
4. Audio Generator
5. Multiplex generator
6. Harmonic distortion analyzer
7. Frequency counter

Before FM alignment is started, check mechanical zero of center balance meter with unit off. Adjust mechanical zero if necessary.

### FM ALIGNMENT

1. Observe output at the fixed output jacks with the scope and harmonic analyzer.
2. Short pin #4 of the 2nd IC-A302 to the case of IC-A302.
3. Set the offset control R322 located on the IF/meter amp board for zero center on the tuning meter.
4. Remove the short from pin 4 of IC-A302. Using only noise (No input signal of any kind), adjust the top of the ratio detector transformer for zero center on the tuning meter. Be sure that the meter swings positive and negative from this point of adjustment.
5. Set FM generator at 90 MHz — 400 Hz — 100% modulation. Use 1000 microvolts signal strength. Tune in signal for zero on tuning meter. Adjust the bottom of the ratio detector transformer for minimum harmonic distortion. Use care that output level does not drop during this adjustment.
6. Reduce the R.F. level of the generator to the weakest signal which still permits observation of the sine wave output. Set the tuning dial of the Citation 15 to 90 MHz. Adjust the coils L105 — L101 — T102 — T103 for maximum signal and best symmetry of sine wave output. (Best useable sensitivity as measured on the Harmonic analyzer).
7. Tune the Generator to 106 MHz — tune to 106 on the Citation 15. Adjust C128B — C101B — C106B — C113B as in step #6.
8. Repeat steps 6 & 7 until no further improvement can be achieved.
9. Adjust T104 for best usable sensitivity.
10. Increase R.F. input level to 1000 microvolts — modulate at 10 KHz — 100% — Slightly optimize T104 for lowest harmonic distortion. No more than 1/2 turn on either top or bottom adjustment should be necessary.
11. Recheck tuning meter for zero on noise only. If not at zero — repeat steps 4 through 9.

### MX ALIGNMENT

1. Using multiplex signal at 1000 microvolt level, observe composite waveform at FM output jack. (before de-emphasis) Adjust I.F. frequency compensation control R325 for flat base line on composite signal.
2. Using CW 1000 microvolts R.F. input signal, observe counter at 19 KHz test point TP-1 on Multiplex board. Adjust 19 KHz oscillator control R 405 for 19 KC.
3. Using 9% pilot signal as the only modulation, adjust 19 KC traps L 407 and L 408 for minimum output as observed at the fixed output jacks.
4. Using 1 KHz stereo modulation, adjust separation control R 401 for maximum separation.
5. Using 10 KHz stereo modulation, optimize the 19 KHz oscillator control slightly for maximum 10 KHz separation.

### MISC. ADJUSTMENTS

#### MONO LEVEL ADJUST

Using a mono 400 Hz 100% signal, adjust the mono level control on meter muting board so that there is no level change between the auto stereo and the mono positions of the mode switch.

#### QUIETING METER ADJUST

With no signal input, adjust quieting meter control for full right deflection of the quieting meter.

#### INTERNAL 400 Hz OSCILLATOR

Adjust oscillator output level control R811 so that the output level at the fixed output jacks is 6db below that achieved with 400 Hz 100% modulated FM mono signal.

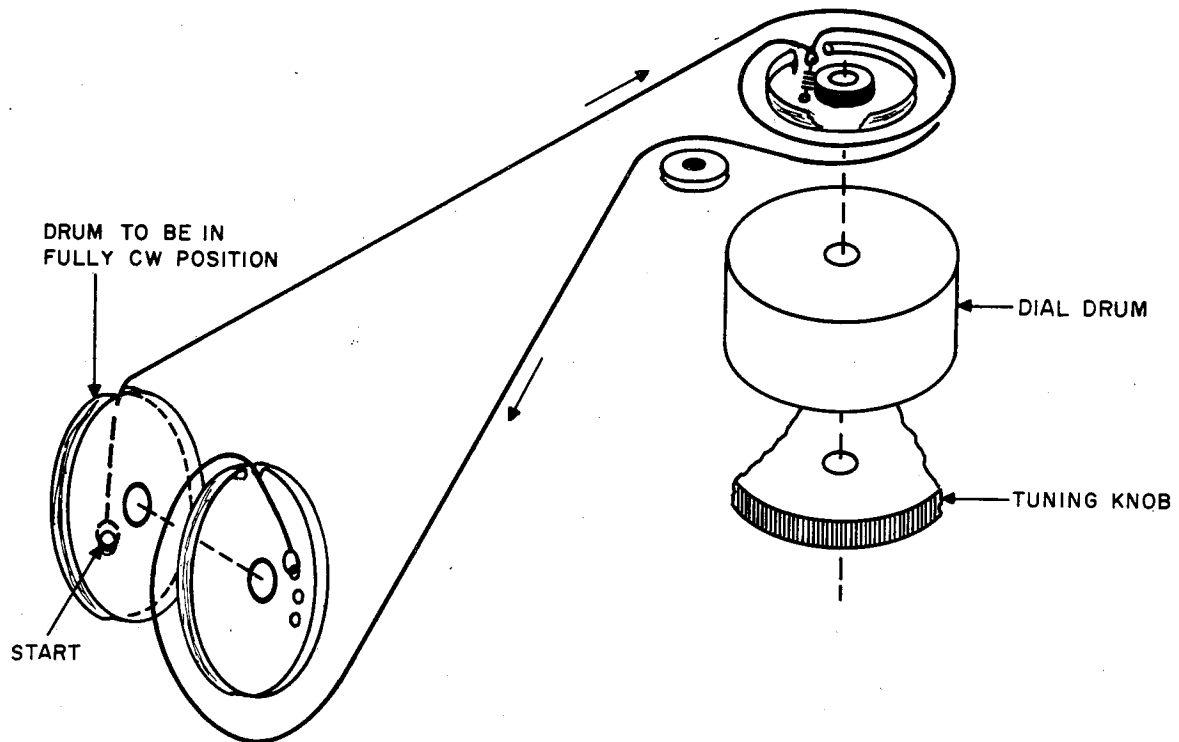
### Special Notes

L-401, L-402, L-403, L-405, L-406 are factory adjusted — Do not attempt to adjust these precision inductors.

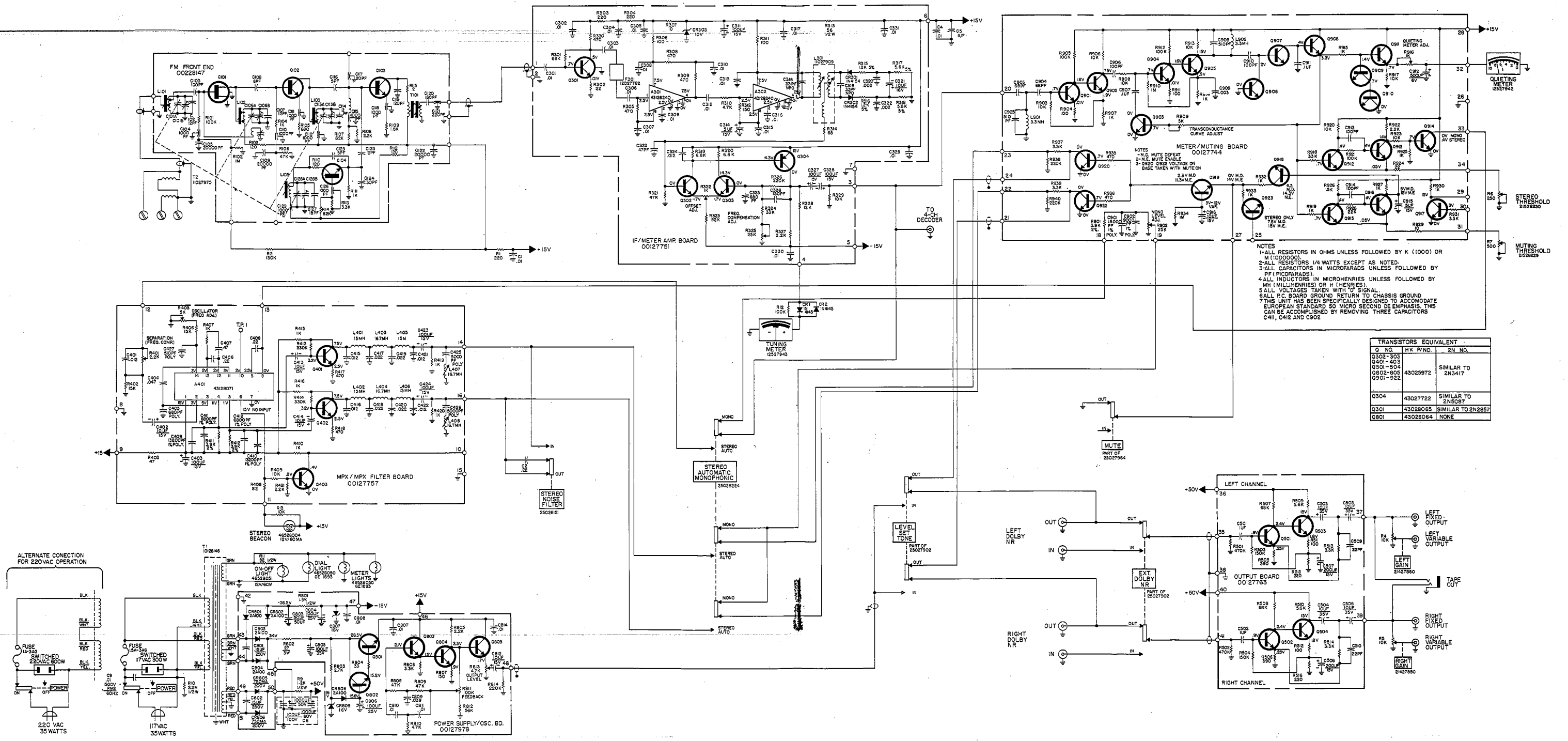
If any have been maladjusted, the procedure to be followed is:

1. Remove inductor from P.C. Board.
2. Adjust inductor to schematic value with inductance bridge.
3. Replace in P.C. Board.

### STRINGING DIAGRAM



**SCHEMATIC DIAGRAM — CITATION FIFTEEN**

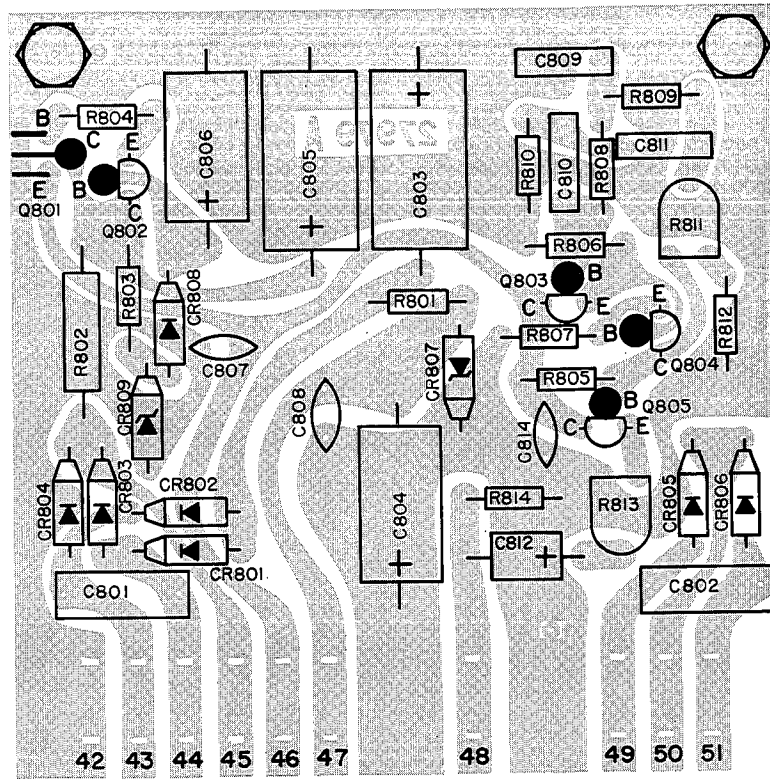


NOTES

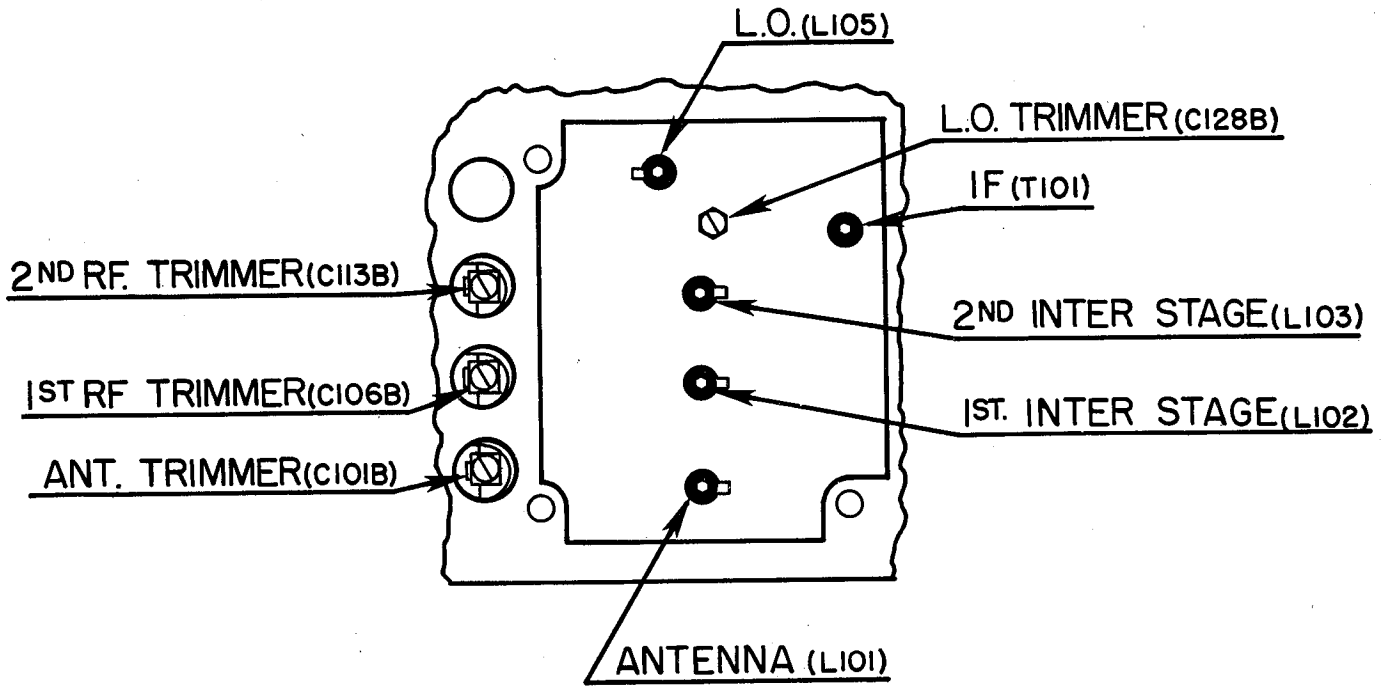
- 1-ALL RESISTORS IN OHMS UNLESS FOLLOWED BY K (1000) OR M (1000000).
- 2-ALL RESISTORS 1/4 WATTS EXCEPT AS NOTED.
- 3-ALL CAPACITORS IN MICROFARADS UNLESS FOLLOWED BY PF (PICOFARADS).
- 4-ALL INDUCTORS IN MICROHENRIES UNLESS FOLLOWED BY MH (MILLIHENRIES) OR H (HENRIES).
- 5-ALL VOLTAGES TAKEN WITH '0' SIGNAL.
- 6-ALL R.C. BOARD GROUND RETURN TO CHASSIS GROUND.
- 7-THIS UNIT HAS BEEN SPECIFICALLY DESIGNED TO ACCOMMODATE EUROPEAN STANDARD 50 MICRO SECOND DE EMPHASIS. THIS CAN BE ACCOMPLISHED BY REMOVING THREE CAPACITORS C411, C412 AND C902.

Q NO.	H.K. P/N.	2N NO.
Q302-Q303		
Q401-Q403		SIMILAR TO 2N3417
Q501-Q504		
Q802-Q805		
Q901-Q922		
Q304	43027722	SIMILAR TO 2N5587
Q301	43028085	SIMILAR TO 2N2887
Q801	43028084	NONE

**POWER SUPPLY/OSCILLATOR BOARD**



**TUNER FRONT END DIAGRAM**



**BOTTOM VIEW**

## REPLACEMENT PARTS LIST

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
<b>INTEGRATED CIRCUITS</b>					
A1-A300	Not Used		C405	Polystyrene, 680 PF $\pm$ 5%, 63V	30619136
A301, A302	IC RCA CA 3076	43128240	C406	Mylar, .22 UF $\pm$ 10%, 100V	31918791
A303-A400	Not Used		C407	Mylar, .47 UF $\pm$ 10%, 100V	31919107
A401	IC Motorola MC 1310	43128071	C408	Mylar, .22 UF $\pm$ 10%, 100V	31918791
			C409, C410	Polystyrene, 13200 PF $\pm$ 1%, 63V	30619134
			C411, C412	Polystyrene, 6800 PF $\pm$ 1%, 63V	30619133
			C413, C414	Lytic, 10 UF, 15V	31518926
			C415, C416	Mylar, .012 UF $\pm$ 10%, 250V	31919130
			C417, C418	Mylar, .022 UF $\pm$ 10%, 250V	31919099
			C419, C420	Mylar, .022 UF $\pm$ 10%, 250V	31919099
			C421, C422	Mylar, .012 UF $\pm$ 10%, 250V	31919130
			C423, C424	Lytic, 100 UF, 15V	31518129
			C425, C426	Polystyrene, .005 UF $\pm$ 5%, 63V	30619112
			C427-C500	Not Used	
			C501, C502	Mylar, 1 UF $\pm$ 10%, 100V	31918839
			C503, C504	Lytic, 10 UF, 35V	31518805
			C505, C506	Lytic, 10 UF, 35V	31518805
			C507, C508	Lytic, 200 UF, 15V	31518802
			C509, C510	Disc, 22 PF $\pm$ 10%, 500V	31718798
			C511-C800	Not Used	
			C801, C802	Mylar, .15 UF $\pm$ 10%, 250V	31919119
			C803	Lytic, 50 UF, 50V	31519122
			C804	Lytic, 100 UF, 25V	31519121
			C805	Lytic, 100 UF, 35V	31519120
			C806	Lytic, 100 UF, 25V	31519121
			C807, C808	Disc, .01 UF +80, -20%, 100V	31719830
			C809	Mylar, .039 UF $\pm$ 10%, 100V	31919118
			C810, C811	Mylar, .01 UF $\pm$ 10%, 250V	31918774
			C812	Lytic, 10 UF, 15V	31518926
			C813	Not Used	
			C814	Disc, .01 UF +80, -20%, 100V	31718930
			C815-C900	Not Used	
			C901	Polystyrene, 18000 PF $\pm$ 1%, 63V	30619138
			C902	Polystyrene, 9000 PF $\pm$ 1%, 63V	30619137
			C903, C904	Disc, 68 PF $\pm$ 10%	31722086
			C905	Polystyrene, 510 PF $\pm$ 10%, 63V	30619124
			C906	Disc, 100 PF	31718778
			C907	Mylar, .1 UF $\pm$ 10%, 100V	31918784
			C908	Polystyrene, 510 PF $\pm$ 10%, 63V	30619124
			C909	Disc, .003 UF $\pm$ 10%	31718832
			C910	Disc, 100 PF	31718778
			C911	Mylar, .1 UF $\pm$ 10%, 100V	31918784
			C912	Lytic, 500 UF, 6V	31519123
			C913, C914	Disc, 100 PF	31718778
			C915	Lytic, 5 UF, 16V	31519146
			C916	Lytic, 10 UF, 15V	32418571
<b>CAPACITORS</b>					
C1	Disc, .01 UF +80, -20%, 100V	30418491			
C2	Mylar, .22 UF $\pm$ 10%, 100V	30219145			
C3	Not Used				
C4	Disc, .01 UF +80, -20%, 100V	30418491			
C5	Mylar, 1 UF $\pm$ 10%, 100V	30219150			
C6	Lytic, 100 UF, 100V, 1000 UF, 50V, 1000 UF, 6V	31437778			
C7, C8	Not Used				
C9	Disc, .01 UF (1500 VRMS @ 60Hz)	30419090			
C10-C100	Not Used				
C101-C126	P/O FM Front End	Not Supplied			
C127-C300	Not Used				
C301, C302	Disc, .01 UF +80, -20%, 100V	31718930			
C303, C304	Disc, .01 UF +80, -20%, 100V	31718930			
C305, C306	Disc, .01 UF +80, -20%, 100V	31718930			
C307, C308	Disc, .01 UF +80, -20%, 100V	31718930			
C309, C310	Disc, .01 UF +80, -20%, 100V	31718930			
C311	Lytic, 100 UF, 15V	31818880			
C312, C313	Disc, .01 UF +80, -20%, 100V	31718930			
C314	Lytic, 5 UF, 15V	31818834			
C315, C316	Disc, .01 UF +80, -20%, 100V	31718930			
C317	Disc, .01 UF +80, -20%, 100V	31718930			
C318, C319	Disc, 33 PF $\pm$ 10%, 500V	31718947			
C320	Disc, .002 UF $\pm$ 10%, 500V	31718794			
C321	Lytic, 10 UF, 16V	31819147			
C322	Disc, .002 UF $\pm$ 10%, 500V	31718794			
C323	Disc, 47 PF $\pm$ 10%, 500V	31719149			
C324	Mylar .012 UF $\pm$ 10%, 250V	31919130			
C325	Disc, 680 PF $\pm$ 10%	30418372			
C326	Disc, 150 PF $\pm$ 10%	31718873			
C327, C328	Lytic, 100 UF, 15V	31818880			
C329, C330	Disc, .01 UF +80, -20%, 100V	31718930			
C331	Disc, .01 UF +80, -20%, 100V	31718930			
C332-C400	Not Used				
C401	Mylar, .012 UF $\pm$ 10%, 250V	31919130			
C402	Lytic, 10 UF, 15V	31518926			
C403	Lytic, 100 UF, 15V	31818880			
C404	Mylar, .047 UF $\pm$ 10%, 100V	31918808			

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
<b>DIODES</b>			<b>RESISTORS</b>		
CR1, CR2	Diode 1N4154	41622859	R1	220 ±10%, ¼W	33212211
CR3-CR300	Not Used		R2	150K ±10%, ¼W	33321541
CR301, CR302	Diode 1N4154	41622859	R3	Not Used	
CR303	Zener, 10V, 1W	42020737	R4, R5	Slide Pot, 10K Volume	21427880
CR304-CR800	Not Used		R6	250 Stereo Threshold Control	21528230
CR801, CR802	Diode, 2A, 100V	41020618	R7	500 FM Muting Control	21528229
CR803, CR804	Diode, 2A, 100V	41020618	R8	Not Used	
CR805, CR806	Diode, 200V, PIV, 750mA	41022464	R9	1.2K ±10%, ½W	33311221
CR807	Zener, 16V, 1W, 10%	42027092	R10	2.2M ±10%, ½W	33312251
CR808	Diode, 2A, 100V	41020618	R11	82 ±10%, ½W	33318201
CR809	Zener, 16V, 1W, 10%	42027092	R12	100K ±10%, ¼W	33211041
CR810-CR1100	Not Used		R13	10K ±10%, ¼W	33211031
<b>FILTER</b>			R14-R100	Not Used	
F301	IF Filter	12027962	R101-R113	P/O FM Front End	Not Supplied
<b>COILS</b>			R114-R300	Not Used	
L1-L100	Not Used		R301	68K ±10%, ¼W	33216831
L101	P/O FM Front End	Not Supplied	R302	22 ±10%, ¼W	33212201
L102-L300	Not Used		R303, R304	220 ±10%, ¼W	33212211
L301	Ratio Detector	11027909	R305	470 ±10%, ¼W	33214711
L302-L400	Not Used		R306	100 ±10%, ¼W	33211011
L401, L402	Inductor, 15mH, VAR	12027960	R307	10 ±10%, ¼W	33211001
L403, L404	Inductor, 16.7mH, VAR	12027961	R308, R309	470 ±10%, ¼W	33214711
L405, L406	Inductor, 15mH, VAR	12027960	R310	4.7K ±10%, ¼W	33214721
L407, L408	Inductor, 16.7mH, VAR	12027961	R311	100 ±10%, ¼W	33211011
L409-L900	Not Used		R312	150 ±10%, ¼W	33211511
L901, L902	Inductor, 3.3mH	12028060	R313	56 ±10%, ½W	33315601
<b>TRANSISTORS</b>			R314	68 ±10%, ¼W	33216801
Q1-Q100	Not Used		R315, R316	1.2K ±5%, ¼W	33211225
Q101-Q104	P/O FM Front End	Not Supplied	R317, R318	5.6K ±5%, ¼W	33215625
Q105-Q300	Not Used		R319, R320	6.8K ±10%, ¼W	33216821
Q301	Transistor, RF RCA 40897	43028065	R321	47K ±10%, ¼W	33214731
Q302, Q303	Transistor	43025972	R322	1K Trim Pot Linear (Hor Mtg)	23 28062
Q304	Transistor	43027722	R323	82K ±10%, ¼W	33218231
Q305-Q400	Not Used		R324	33K ±10%, ¼W	33213331
Q401-Q403	Transistor	43025972	R325	25K Trim Pot Linear (Hor Mtg)	23527511
Q404-Q500	Not Used		R326	220K ±10%, ¼W	33212241
Q501-Q504	Transistor	43025972	R327	2.2K ±10%, ¼W	33212221
Q505-Q800	Not Used		R328	12K ±10%, ¼W	33211231
Q801	Transistor Regulator	43028064	R329	10K ±10%, ¼W	33211031
Q802-Q805	Transistor	43025972	R330	470 ±10%, ¼W	33214711
Q806-Q900	Not Used		R331-R400	Not Used	
Q901-Q920	Transistor	43025972	R401	2.2K Trimpot Linear (Hor Mtg)	23528063
Q921	Not Used		R402	15K ±10%, ¼W	33211531
Q922, Q923	Transistor	43025972	R403	47 ±10%, ¼W	33214701
Q924-Q1100	Not Used		R404	Not Used	
			R405	5K Trimpot Linear (Hor Mtg)	23528061
			R406	15K ±10%, ¼W	33211531
			R407	1K ±10%, ¼W	33211021
			R408	82 ±10%, ¼W	33218201
			R409	10K ±10%, ¼W	33211031
			R410	1K ±10%, ¼W	33211021
			R411, R412	3.9K ±10%, ¼W	33213924
			R413, R414	330K ±10%, ¼W	33213341



CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
<b>MISCELLANEOUS</b>				Antenna Terminal Strip	65427994
	Pushbutton, Stereo, Auto-Mono	25029244		Phono Jack Assembly	65428148
	Pushbutton, Stereo, Noise Filter	25026151		IF/Meter Amp P. C. Board W/Components	00127751
	FM Front End	00228147		MPX & MPX Filter P. C. Board W/Components	00127757
	Lamp (Power)	46528051		Meter/Muting P. C. Board W/Components	00127744
	Lamp (Meter)	46528050		Output P. C. Board W/Components	00127763
	Lamp (Dial)	46528050		Power Supply/Oscillator P. C. Board W/Components	00127978
	Green Filter (Dial Lamp)	61228074		P. C. Board Connector Housing	65425952
	Lamp (Stereo)	46528004		P. C. Board Connector Terminal Pin (Male)	65425915
	Fuse Holder	65427001		Owner Manual	90728152
	Light Shield	61828223		Technical Manual	90728153
	Line Cord	53021115			
	Strain Relief	65421116			
	AC Receptacle	65412751			

NOTE: To speed handling of your order be sure to include both the model and serial numbers which appear at the back of the chassis, in addition to the quantity, part number and part description of the items ordered. Orders from independent dealers, independent servicemen, and retail customers will be shipped on a cash in advance basis. Harman-Kardon reserves the right to substitute equivalent parts for those originally installed in this chassis. All parts should be ordered from Harman-Kardon, 55 Ames Court, Plainview, L.I., N.Y. 11803, Att: Parts Department.