

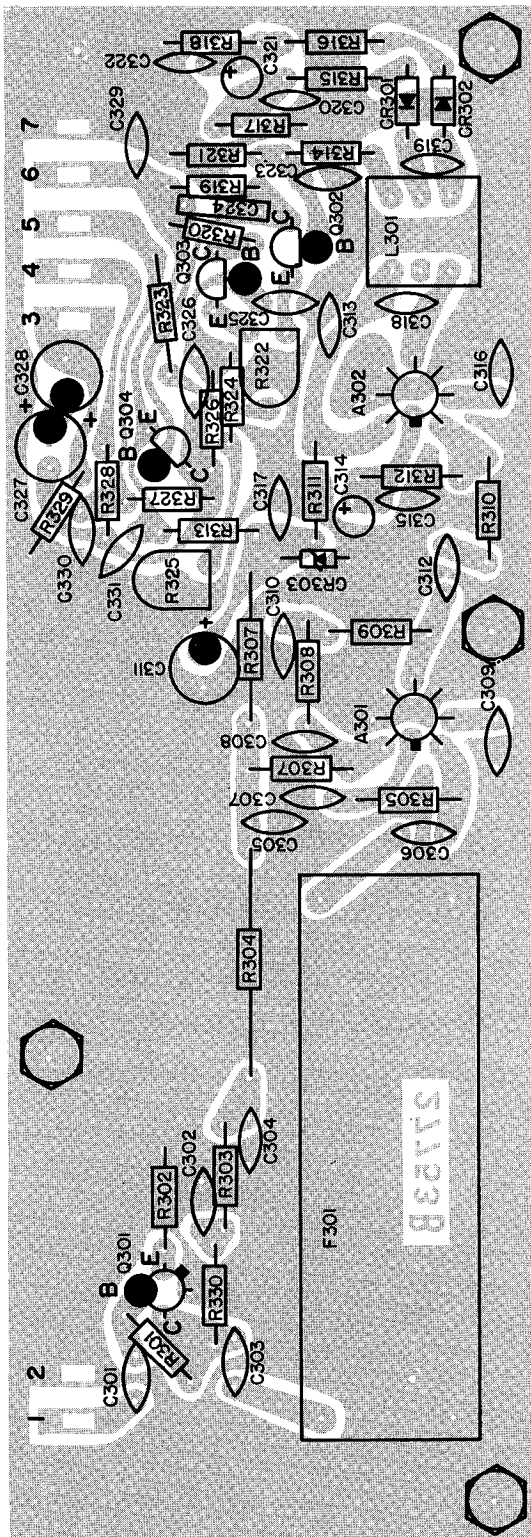
The Citation Fifteen

Professional FM/Stereo FM Tuner

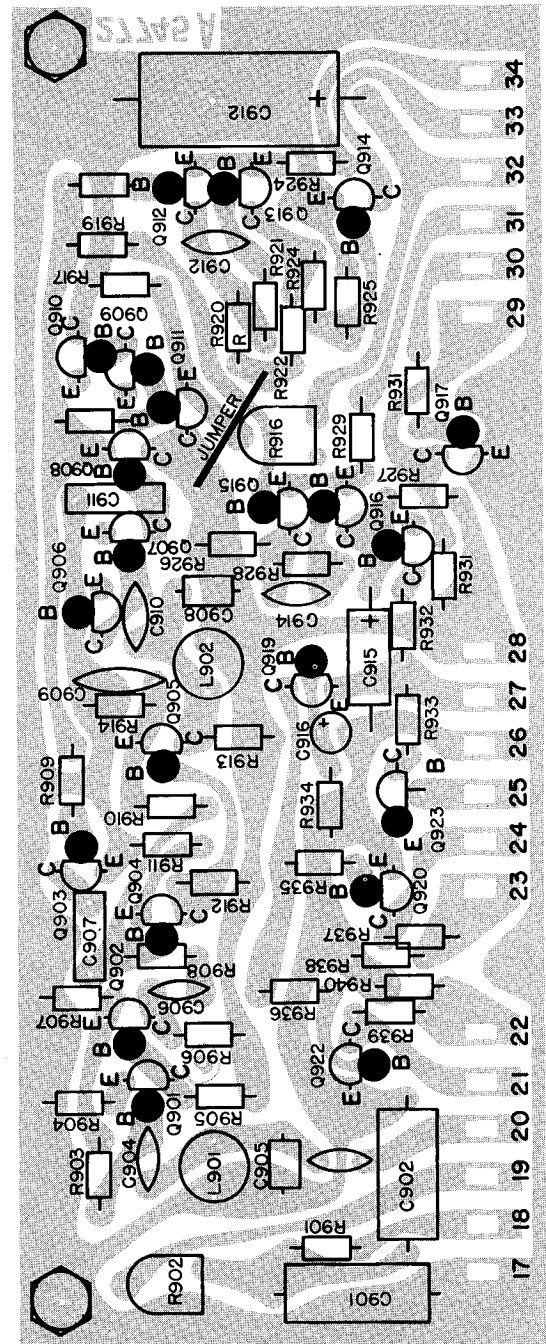
Technical Manual

harman/kardon

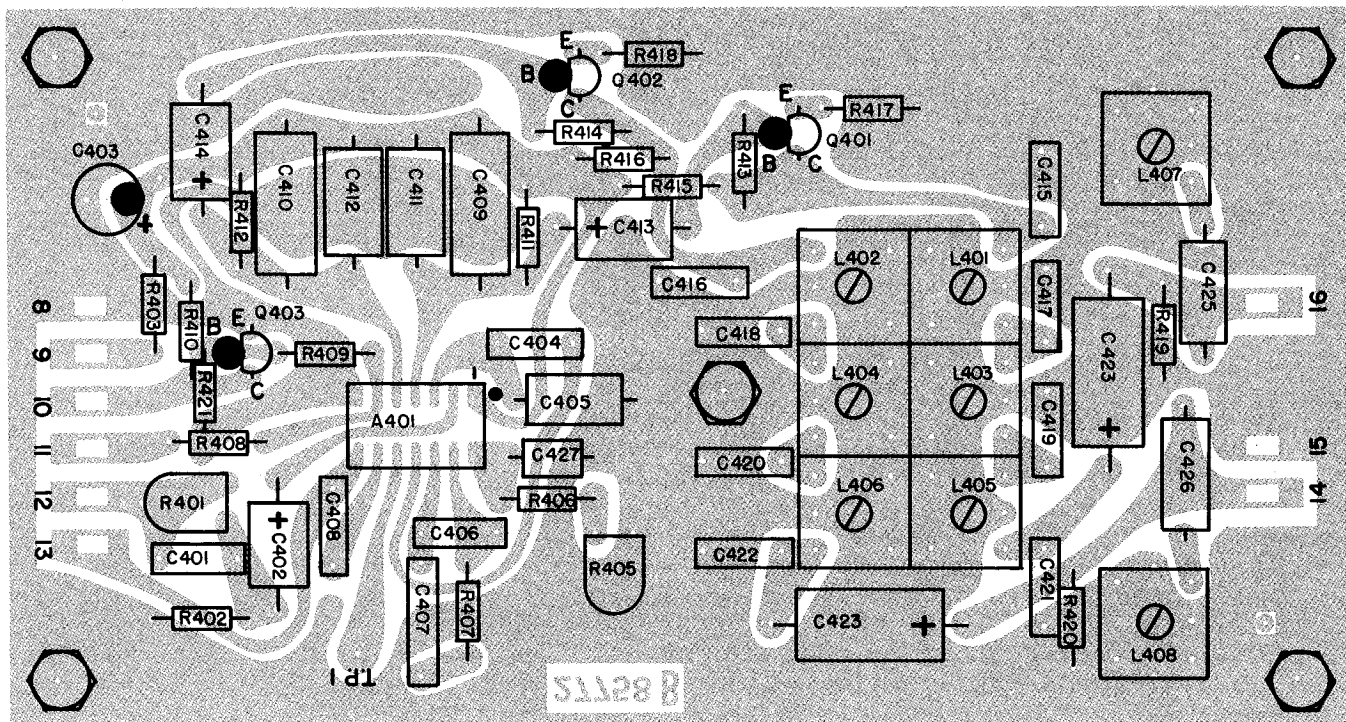
IF METER AMP BOARD



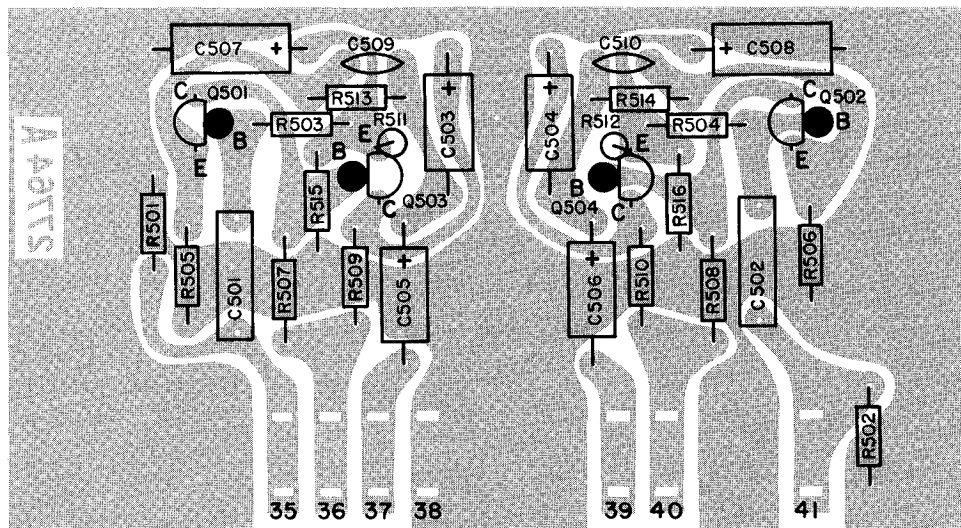
METER MUTING BOARD



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 useable 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.

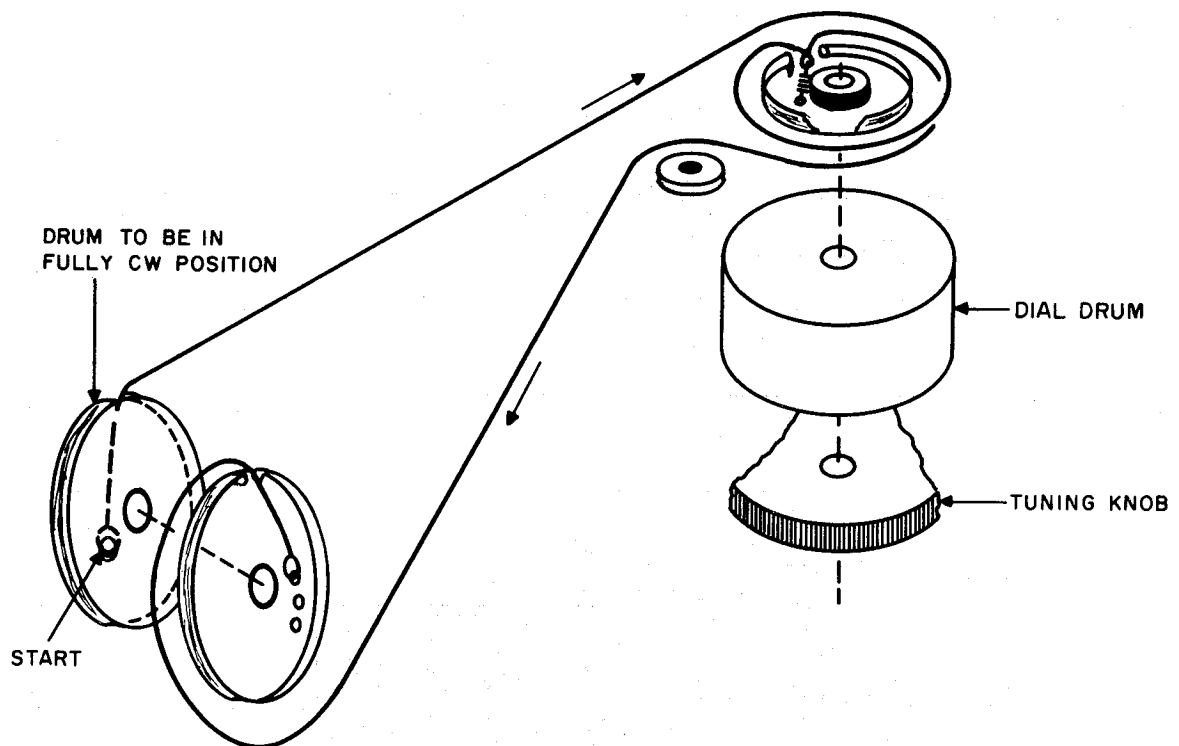
Special Notes

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

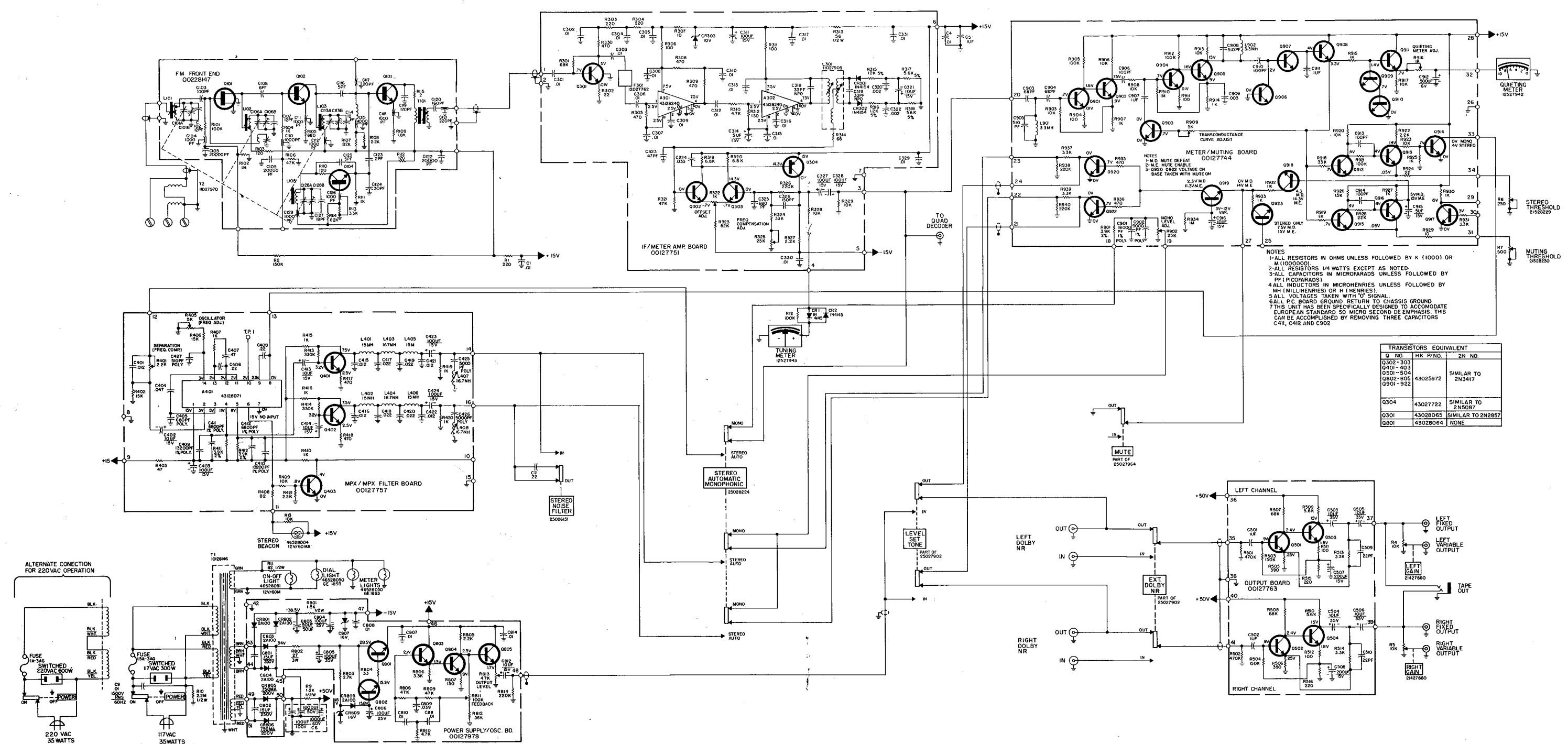
If any have been maladjusted, the procedure to be followed is:

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

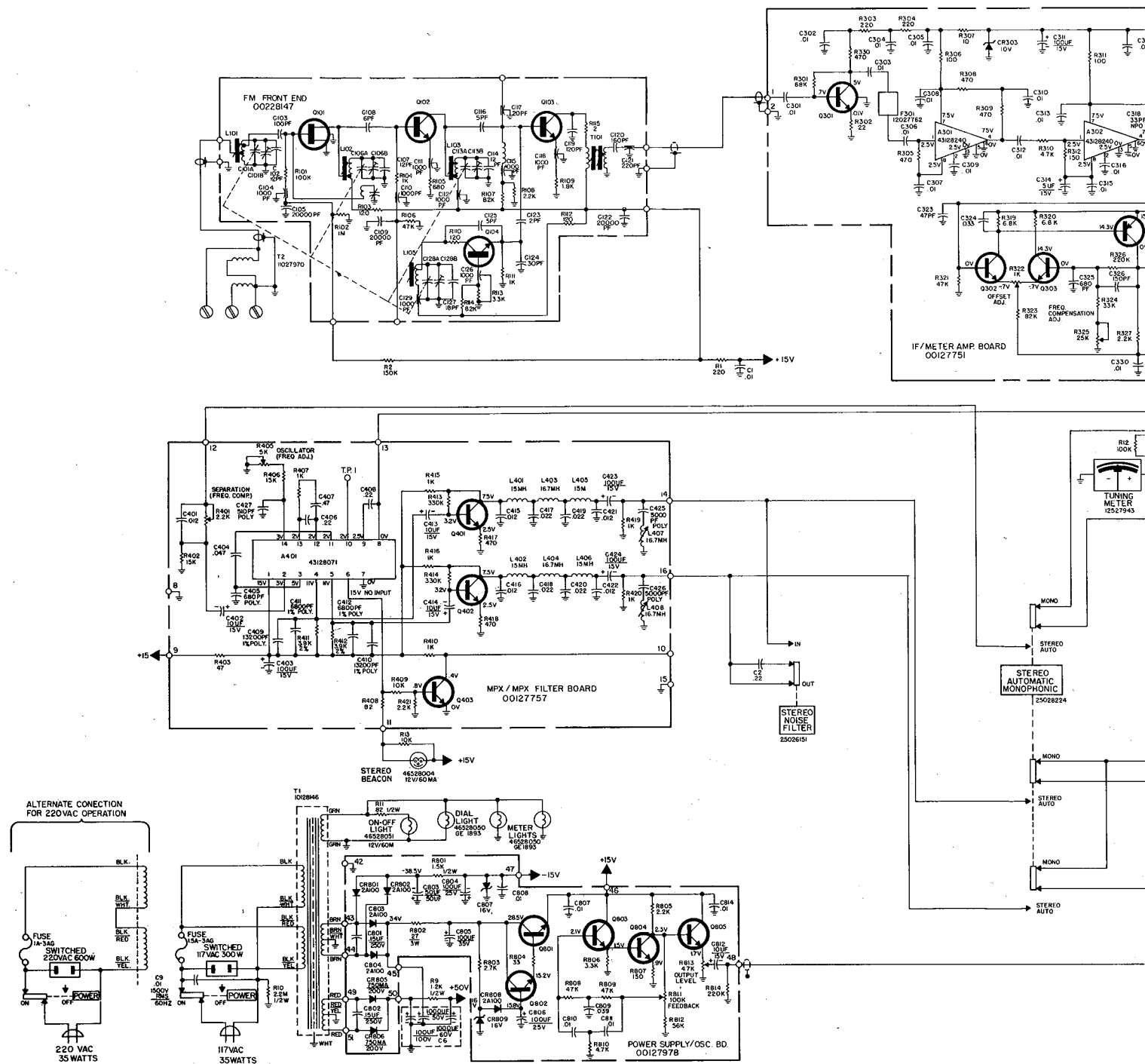
STRINGING DIAGRAM

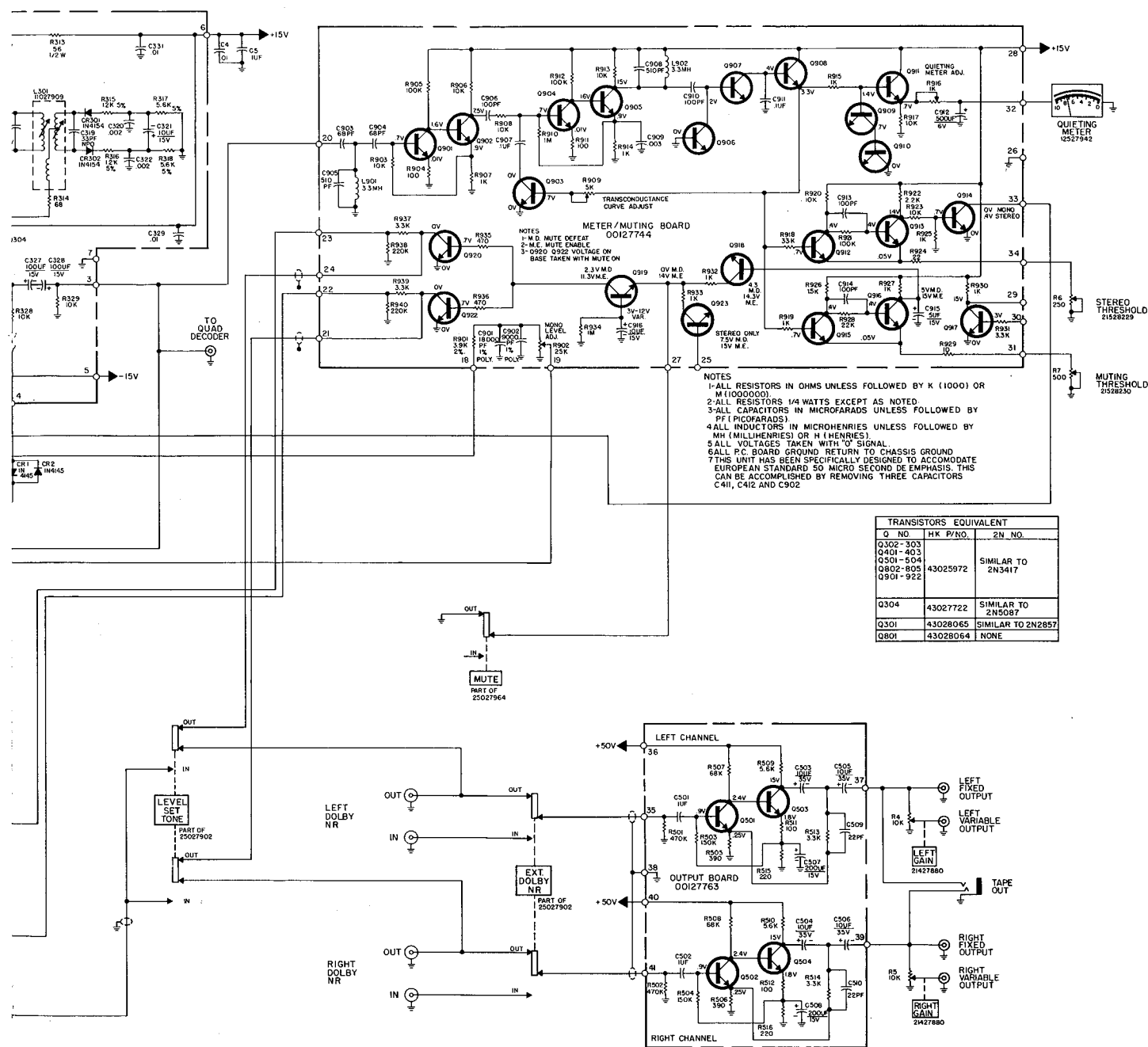


SCHEMATIC DIAGRAM — CITATION FIFTEEN

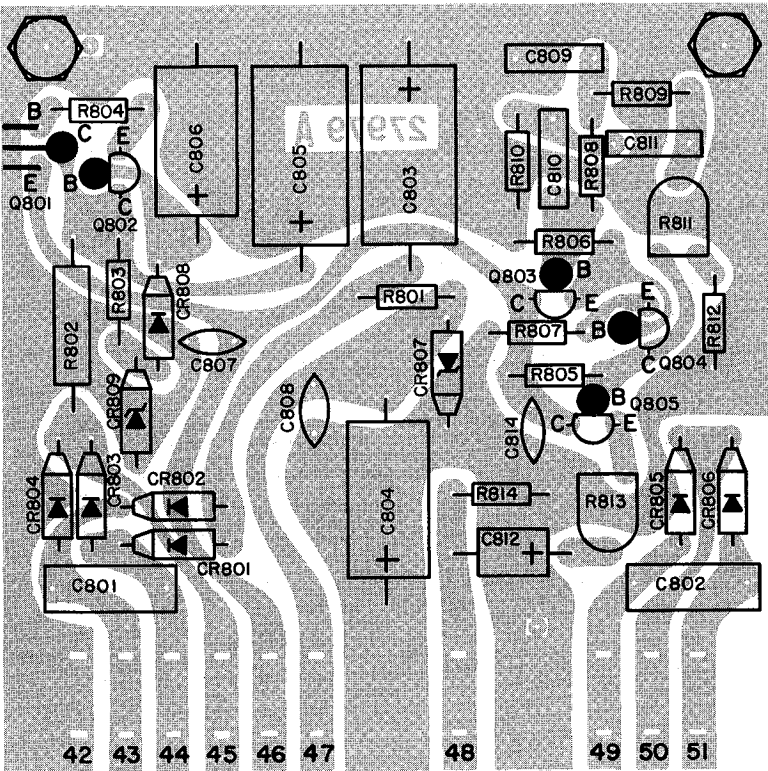


SCHEMATIC DIAGRAM — CITATION FIFTEEN

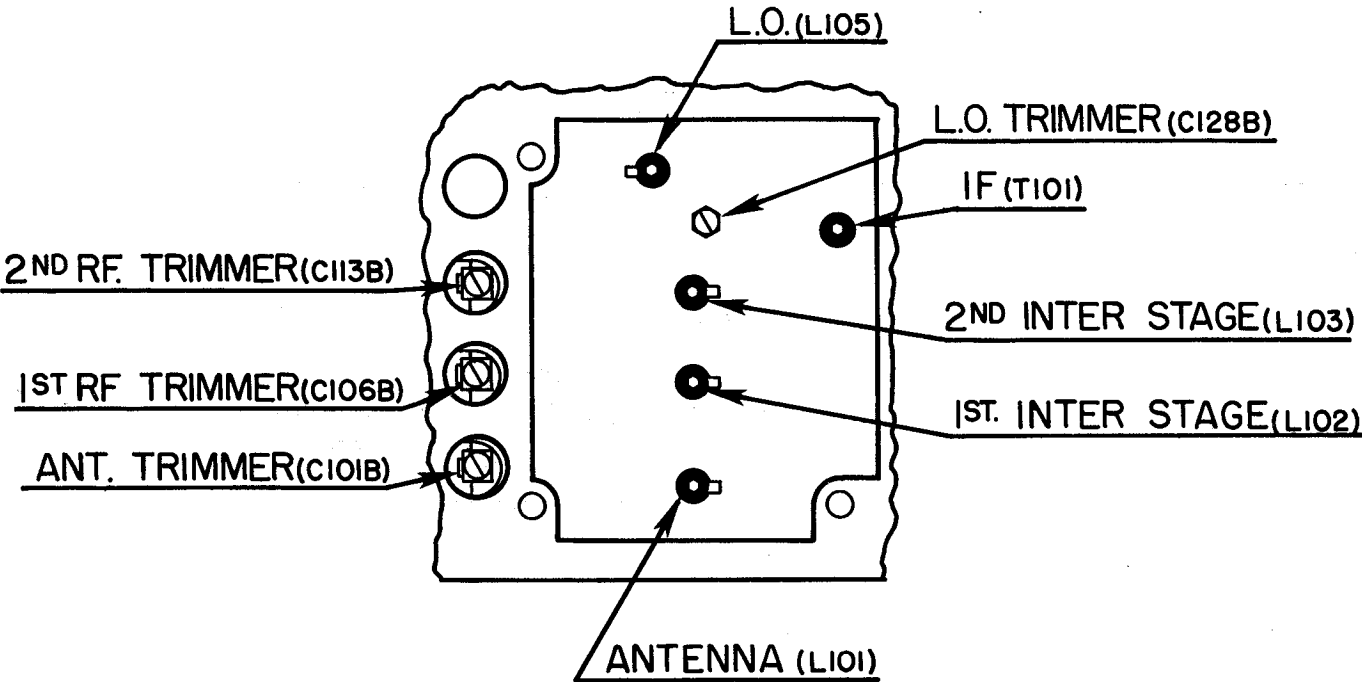




POWER SUPPLY/OSCILLATOR BOARD



TUNER FRONT END DIAGRAM



BOTTOM VIEW

REPLACEMENT PARTS LIST

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
INTEGRATED CIRCUITS					
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	31918842
A401	IC Motorola MC 1310	43128071	C408	Mylar, .22 UF $\pm 10\%$, 100V	31918791
CAPACITORS					
C1	Disc, .01 UF +80, -20%, 100V	30418491	C409, C410	Polystyrene, 13200 PF $\pm 1\%$, 63V	30619134
C2	Mylar, .22 UF $\pm 10\%$, 100V	30219145	C411, C412	Polystyrene, 6800 PF $\pm 1\%$, 63V	30619133
C3	Not Used		C413, C414	Lytic, 10 UF, 15V	31518926
C4	Disc, .01 UF +80, -20%, 100V	30418491	C415, C416	Mylar, .012 UF $\pm 10\%$, 250V	31919130
C5	Mylar, 1 UF $\pm 10\%$, 100V	31918839	C417, C418	Mylar, .022 UF $\pm 10\%$, 250V	31919099
C6	Lytic, 100 UF, 100V, 1000 UF, 50V, 1000 UF, 6V	31437778	C419, C420	Mylar, .022 UF $\pm 10\%$, 250V	31919099
C7, C8	Not Used		C421, C422	Mylar, .012 UF $\pm 10\%$, 250V	31919130
C9	Disc, .01 UF (1500 VRMS @ 60Hz)	30419090	C423, C424	Lytic, 100 UF, 15V	31518129
C10-C100	Not Used		C425, C426	Polystyrene, .005 UF $\pm 5\%$, 63V	30619112
C101-C126	P/O FM Front End	Not Supplied	C427-C500	Not Used	
C127-C300	Not Used		C501, C502	Mylar, 1 UF $\pm 10\%$, 100V	31918839
C301, C302	Disc, .01 UF +80, -20%, 100V	31718930	C503, C504	Lytic, 10 UF, 35V	31518805
C303, C304	Disc, .01 UF +80, -20%, 100V	31718930	C505, C506	Lytic, 10 UF, 35V	31518805
C305, C306	Disc, .01 UF +80, -20%, 100V	31718930	C507, C508	Lytic, 200 UF, 15V	31518802
C307, C308	Disc, .01 UF +80, -20%, 100V	31718930	C509, C510	Disc, 22 PF $\pm 10\%$, 500V	31718798
C309, C310	Disc, .01 UF +80, -20%, 100V	31718930	C511-C800	Not Used	
C311	Lytic, 100 UF, 15V	31818880	C801, C802	Mylar, .15 UF $\pm 10\%$, 250V	31919119
C312, C313	Disc, .01 UF +80, -20%, 100V	31718930	C803	Lytic, 50 UF, 50V	31519122
C314	Lytic, 5 UF, 15V	31818834	C804	Lytic, 100 UF, 25V	31519121
C315, C316	Disc, .01 UF +80, -20%, 100V	31718930	C805	Lytic, 100 UF, 35V	31519120
C317	Disc, .01 UF +80, -20%, 100V	31718930	C806	Lytic, 100 UF, 25V	31519121
C318, C319	Disc, 33 PF $\pm 10\%$, 500V	31718947	C807, C808	Disc, .01 UF +80, -20%, 100V	31719830
C320	Disc, .002 UF $\pm 10\%$, 500V	31718794	C809	Mylar, .039 UF $\pm 10\%$, 100V	31919118
C321	Lytic, 10 UF, 15V	32418571	C810, C811	Mylar, .01 UF $\pm 10\%$, 250V	31918774
C322	Disc, .002 UF $\pm 10\%$, 500V	31718794	C812	Lytic, 10 UF, 15V	31518926
C323	Disc, 47 PF $\pm 10\%$, 500V	31719149	C813	Not Used	
C324	Mylar, .003 UF $\pm 10\%$, 100V	31919101	C814	Disc, .01 UF +80, -20%, 100V	31718930
C325	Disc, 680 PF $\pm 10\%$	30418372	C815-C900	Not Used	
C326	Disc, 150 PF $\pm 10\%$	31718873	C901	Polystyrene, 18000 PF $\pm 1\%$, 63V	30619138
C327, C328	Lytic, 100 UF, 15V	31818880	C902	Polystyrene, 9000 PF $\pm 1\%$, 63V	30619137
C329, C330	Disc, .01 UF +80, -20%, 100V	31718930	C903, C904	Disc, 68 PF $\pm 10\%$	31722086
C331	Disc, .01 UF +80, -20%, 100V	31718930	C905	Polystyrene, 510 PF $\pm 10\%$, 63V	30619124
C332-C400	Not Used		C906	Disc, 100 PF	31718778
C401	Mylar, .012 UF $\pm 10\%$, 250V	31919130	C907	Mylar, .1 UF $\pm 10\%$, 100V	31918784
C402	Lytic, 10 UF, 15V	31518926	C908	Polystyrene, 510 PF $\pm 10\%$, 63V	30619124
C403	Lytic, 100 UF, 15V	31818880	C909	Disc, .003 UF $\pm 10\%$	31718832
C404	Mylar, .047 UF $\pm 10\%$, 100V	31918808	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

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
DIODES			RESISTORS		
CR1, CR2	Diode 1N4154	41622859	R1	220 $\pm 10\%$, $\frac{1}{4}W$	33212211
CR3-CR300	Not Used		R2	150K $\pm 10\%$, $\frac{1}{4}W$	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 $\pm 10\%$, $\frac{1}{2}W$	33311221
CR807	Zener, 16V, 1W, 10%	42027092	R10	2.2M $\pm 10\%$, $\frac{1}{2}W$	33312251
CR808	Diode, 2A, 100V	41020618	R11	82 $\pm 10\%$, $\frac{1}{2}W$	33318201
CR809	Zener, 16V, 1W, 10%	42027092	R12	100K $\pm 10\%$, $\frac{1}{4}W$	33211041
CR810-CR1100	Not Used		R13	10K $\pm 10\%$, $\frac{1}{4}W$	33211031
FILTER			R14-R100	Not Used	
F301	IF Filter	12027962	R101-R113	P/O FM Front End	Not Supplied
COILS			R114-R300	Not Used	
L1-L100	Not Used		R301	68K $\pm 10\%$, $\frac{1}{4}W$	33216831
L101	P/O FM Front End	Not Supplied	R302	22 $\pm 10\%$, $\frac{1}{4}W$	33212201
L102-L300	Not Used		R303, R304	220 $\pm 10\%$, $\frac{1}{4}W$	33212211
L301	Ratio Detector	11027909	R305	470 $\pm 10\%$, $\frac{1}{4}W$	33214711
L302-L400	Not Used		R306	100 $\pm 10\%$, $\frac{1}{4}W$	33211011
L401, L402	Inductor, 15mH, VAR	12027960	R307	10 $\pm 10\%$, $\frac{1}{4}W$	33211001
L403, L404	Inductor, 16.7mH, VAR	12027961	R308, R309	470 $\pm 10\%$, $\frac{1}{4}W$	33214711
L405, L406	Inductor, 15mH, VAR	12027960	R310	4.7K $\pm 10\%$, $\frac{1}{4}W$	33214721
L407, L408	Inductor, 16.7mH, VAR	12027961	R311	100 $\pm 10\%$, $\frac{1}{4}W$	33211011
L409-L900	Not Used		R312	150 $\pm 10\%$, $\frac{1}{4}W$	33211511
L901, L902	Inductor, 3.3mH	12028060	R313	56 $\pm 10\%$, $\frac{1}{2}W$	33315601
TRANSISTORS			R314	68 $\pm 10\%$, $\frac{1}{4}W$	33216801
Q1-Q100	Not Used		R315, R316	1.2K $\pm 5\%$, $\frac{1}{4}W$	33211225
Q101-Q104	P/O FM Front End	Not Supplied	R317, R318	5.6K $\pm 5\%$, $\frac{1}{4}W$	33215625
Q105-Q300	Not Used		R319, R320	6.8K $\pm 10\%$, $\frac{1}{4}W$	33216821
Q301	Transistor, RF RCA 40897	43028065	R321	47K $\pm 10\%$, $\frac{1}{4}W$	33214731
Q302, Q303	Transistor	43025972	R322	1K Trim Pot Linear (Hor Mtg)	23 28062
Q304	Transistor	43027722	R323	82K $\pm 10\%$, $\frac{1}{4}W$	33218231
Q305-Q400	Not Used		R324	33K $\pm 10\%$, $\frac{1}{4}W$	33213331
Q401-Q403	Transistor	43025972	R325	25K Trim Pot Linear (Hor Mtg)	23527511
Q404-Q500	Not Used		R326	220K $\pm 10\%$, $\frac{1}{4}W$	33212241
Q501-Q504	Transistor	43025972	R327	2.2K $\pm 10\%$, $\frac{1}{4}W$	33212221
Q505-Q800	Not Used		R328, R329	10K $\pm 10\%$, $\frac{1}{4}W$	33211031
Q801	Transistor Regulator	43028064	R330	470 $\pm 10\%$, $\frac{1}{4}W$	33214711
Q802-Q805	Transistor	43025972	R331-R400	Not Used	
Q806-Q900	Not Used		R401	2.2K Trimpot Linear (Hor Mtg)	23528063
Q901-Q920	Transistor	43025972	R402	15K $\pm 10\%$, $\frac{1}{4}W$	33211531
Q921	Not Used		R403	47 $\pm 10\%$, $\frac{1}{4}W$	33214701
Q922, Q923	Transistor	43025972	R404	Not Used	
Q924-Q1100	Not Used		R405	5K Trimpot Linear (Hor Mtg)	23528061
			R406	15K $\pm 10\%$, $\frac{1}{4}W$	33211531
			R407	1K $\pm 10\%$, $\frac{1}{4}W$	33211021
			R408	82 $\pm 10\%$, $\frac{1}{4}W$	33218201
			R409	10K $\pm 10\%$, $\frac{1}{4}W$	33211031
			R410	1K $\pm 10\%$, $\frac{1}{4}W$	33211021
			R411, R412	3.9K $\pm 10\%$, $\frac{1}{4}W$	33213924
			R413, R414	330K $\pm 10\%$, $\frac{1}{4}W$	33213341

CIRCUIT REF.	DESCRIPTION	HK PART NO.	CIRCUIT REF.	DESCRIPTION	HK PART NO.
RESISTORS			R926	15K $\pm 10\%$, $\frac{1}{4}W$	33211521
R415, R416	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	R927	1K $\pm 10\%$, $\frac{1}{4}W$	33211021
R417, R418	470 $\pm 10\%$, $\frac{1}{4}W$	33214711	R928	22K $\pm 10\%$, $\frac{1}{4}W$	33212231
R419, R420	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	R929	10 $\pm 10\%$, $\frac{1}{4}W$	33211001
R421	2.2K $\pm 10\%$, $\frac{1}{4}W$	33212221	R930	1K $\pm 10\%$, $\frac{1}{4}W$	33211021
R422-R500	Not Used		R931	3.3K $\pm 10\%$, $\frac{1}{4}W$	33213321
R501, R502	470K $\pm 10\%$, $\frac{1}{4}W$	33214741	R932, R933	1K $\pm 10\%$, $\frac{1}{4}W$	33211021
R503, R504	150K $\pm 10\%$, $\frac{1}{4}W$	33211541	R934	1M $\pm 10\%$, $\frac{1}{4}W$	33211051
R505, R506	390 $\pm 10\%$, $\frac{1}{4}W$	33213911	R935, R936	470 $\pm 10\%$, $\frac{1}{4}W$	33214711
R507, R508	68K $\pm 10\%$, $\frac{1}{4}W$	33216831	R937	3.3K $\pm 10\%$, $\frac{1}{4}W$	33213321
R509, R510	5.6K $\pm 10\%$, $\frac{1}{4}W$	33215621	R938	220K $\pm 10\%$, $\frac{1}{4}W$	33212241
R511, R512	100 $\pm 10\%$, $\frac{1}{4}W$	33211011	R939	3.3K $\pm 10\%$, $\frac{1}{4}W$	33213321
R513, R514	3.3K $\pm 10\%$, $\frac{1}{4}W$	33213321	R940	220K $\pm 10\%$, $\frac{1}{4}W$	33212241
R515, R516	220 $\pm 10\%$, $\frac{1}{4}W$	33212211			
R517-R800	Not Used				
R801	1.5K $\pm 10\%$, $\frac{1}{2}W$	33311521	TRANSFORMER		
R802	27 $\pm 10\%$, 3W WW	36612701	T1	Power Transformer	10128146
R803	2.7K $\pm 10\%$, $\frac{1}{4}W$	33212721	T2	Antenna, Matching Transformer	11027970
R804	33 $\pm 10\%$, $\frac{1}{4}W$	33213301	T3-T100	Not Used	
R805	2.2K $\pm 10\%$, $\frac{1}{4}W$	33212221	T101-T105	P/O FM Front End	Not Supplied
R806	3.3K $\pm 10\%$, $\frac{1}{4}W$	33213321			
R807	150 $\pm 10\%$, $\frac{1}{4}W$	33211511			
R808, R809	47K $\pm 10\%$, $\frac{1}{4}W$	33214731			
R810	4.7K $\pm 10\%$, $\frac{1}{4}W$	33214721			
R811	100K Trimpot Linear (Hor Mtg)	23526611			
R812	56K $\pm 10\%$, $\frac{1}{4}W$	33215631			
R813	4.7K Trimpot Linear (Hor Mtg)	23528061			
R814	220K $\pm 10\%$, $\frac{1}{4}W$	33212241			
R815-R900	Not Used				
R901	3.9K $\pm 2\%$, $\frac{1}{4}W$	33213924	MISCELLANEOUS		
R902	25K Trimpot Linear (Hor Mtg)	23527511	Knob, Pushbutton (Large)		00228156
R903	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Knob, Slide		63228033
R904	100 $\pm 10\%$, $\frac{1}{4}W$	33211011	Knob, Pushbutton (Small)		00226644
R905	100K $\pm 10\%$, $\frac{1}{4}W$	33211041	Escutcheon		00228150
R906	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Plexiglas		61628155
R907	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	Top Cover		60127959
R908	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Bottom Plate		60127788
R909	5K Trimpot (Vert. Mtg)	23523349	Rubber Feet		62011692
R910	1M $\pm 10\%$, $\frac{1}{4}W$	33211051	Tape Out Jack		65428021
R911	100 $\pm 10\%$, $\frac{1}{4}W$	33211011	Tuning Meter		12527943
R912	100K $\pm 10\%$, $\frac{1}{4}W$	33211041	Quieting Meter		12527942
R913	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Meter Shield		61828167
R914, R915	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	Tuning Knob		63228003
R916	1K Trimpot Linear (Hor Mtg)	23528062	Tuning Drum		61627677
R917	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Dial Scale		91228216
R918	33K $\pm 10\%$, $\frac{1}{4}W$	33213331	Dial Drum Shield		61828026
R919	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	Planetary Drive		60427035
R920	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Tuning Knob Bracket		60127681
R921	100K $\pm 10\%$, $\frac{1}{4}W$	33211041	Drum Mounting Bracket		60127680
R922	2.2K $\pm 10\%$, $\frac{1}{4}W$	33212221	Light Shield Controls		61426352
R923	10K $\pm 10\%$, $\frac{1}{4}W$	33211031	Pushbutton Switch Dolby,		
R924	22 $\pm 10\%$, $\frac{1}{4}W$	33212201	Tone Level Set		25027902
R925	1K $\pm 10\%$, $\frac{1}{4}W$	33211021	Pushbutton Switch Power, Mute		25027964
			AC Slide Switch W/Solder		
			Shield & Cover		24526153

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

Handwritten calculations and notes:

$$\begin{array}{r} 15 \\ 2 \overline{) 315} \\ \underline{30} \\ 15 \\ \underline{15} \\ 0 \end{array}$$

$$\begin{array}{r} 315 \\ 32 \overline{) 630} \\ \underline{64} \\ 10 \end{array}$$

$$\begin{array}{r} 305 \\ 157 \overline{) 472} \\ \underline{314} \\ 158 \end{array}$$

$$\begin{array}{r} 180 \\ 32 \overline{) 640} \\ \underline{64} \\ 0 \end{array}$$

10032

$$\begin{array}{r} 40 \\ 472 \overline{) 1808} \\ \underline{1888} \\ 20 \end{array}$$

$$\begin{array}{r} 6 \\ 2 \overline{) 12} \\ \underline{12} \\ 0 \end{array}$$