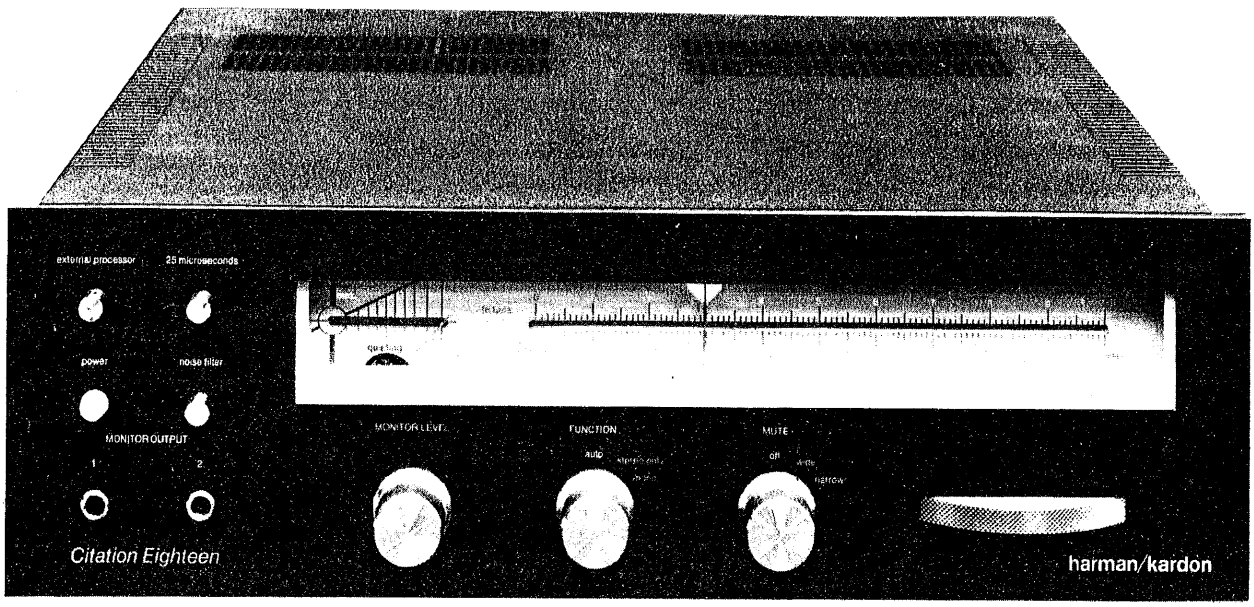
The Citation Eighteen

Professional Solid State FM Tuner

Technical Manual



WARNING

These technical instructions are for use by qualified service personnel only. To avoid electric shock, do not perform any servicing other than that contained in the operating instructions unless qualified to do so.

harman/kardon

TECHNICAL SPECIFICATIONS

30dB Quieting Sensitivity:	Better than 11.2dBf (2.0 microvolts), mono
50dB Quieting Sensitivity:	Better than 15.1dBf (3.2 microvolts), mono Better than 37.3dBf (40 microvolts), stereo
Alternate Channel Selectivity:	70dB
Capture Ratio:	1.5dB
Multiplex Separation:	Better than 50dB at 1000Hz
Total Harmonic Distortion:	Better than 0.15%, mono at 1000Hz; 0.09% typical Better than 0.30%, stereo at 1000Hz; 0.25% typical
Ultimate Signal to Noise Ratio:	74dB, mono 64dB, stereo
Image Rejection:	100dB
Fundamental Plus 1/2 IF Rejection:	100dB
IF Rejection:	100dB
SCA Rejection:	63dB
19kHz and 38kHz Rejection:	60dB
AM Rejection:	55dB
Mute Suppression:	70dB
Mute Threshold:	Variable from 10 to 50dBf (2 to 200 microvolts)
Stereo Threshold:	Variable from 10 to 50dBf (2 to 200 microvolts)
Audio Output:	Variable from 0.75 to 2.0 volts RMS
Audio Frequency Response:	10Hz to 50kHz, ±0.5dB (before de-emphasis)
Monitor Amplifier Power Output:	2 WATTS MIN. RMS PER CHANNEL, BOTH CHANNELS DRIVEN INTO 8 OHMS FROM 20Hz TO 20kHz, WITH LESS THAN 0.1% THD
Monitor Amplifier Intermodulation Distortion:	0.05% (SMPTE)
Monitor Amplifier Square Wave Rise Time:	5 microseconds
Antenna:	75 and 300 ohms
Dimensions:	16"W X 4-3/4"H X 13-1/2"D (406mm X 120mm X 343mm)
Weight:	23 lbs (10.4kg)

PRECAUTIONS

1. Insert multivoltage adapter plug in proper position to accommodate voltage appearing at AC line cord receptacle. Unplug AC line cord when changing multivoltage adapter plug.

2. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.

3. Never attempt to do any work on the circuits without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.

4. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the original type.

5. If one output transistor burns out (open or short) always remove all the output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.

6. When mounting a replacement power transistor, be sure that the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, for they may cause transistor failure.

7. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

8. Fuses must be replaced with size and type indicated. Use of other types can expose components to destructive current levels.

9. Use a non-conductive, non-ferrous tool when making alignment adjustments. Perform all specifications tests with all covers and escutcheon in place.

10. If necessary to replace a ceramic IF filter, both must be replaced. These are chosen as matched pairs having complimentary characteristics to ensure low distortion. To order replacement, see parts list of FM/IF P.C. board for H/K stock number.

ALIGNMENT PROCEDURES

NOTE: Unless otherwise specified, all electrical adjustments should be made under the following test conditions.

FRONT PANEL:
1. Power switch ON at appropriate AC line voltage.
2. Mute switch in the OFF position.
3. Function switch in the AUTO position.
4. Monitor level at FULL CCW position.
5. External processor switch in the OUT position.
6. 25 microseconds switch in the OUT position.
7. Noise filter switch in the OUT position.

REAR PANEL:
1. Level adjust at FULL CCW position.
2. Muting threshold at FULL CCW position.
3. Stereo threshold at FULL CCW position.

FRONT END
65 dBf (1000μV) No Modulation

STEP	ALIGNMENT	TEST SIGNAL	ADJUST	ADJUST FOR
1	Dial Scale Calibration	—	Tuning Wheel	Mechanical Stop at Low End of FM Band
2		None	Dial Scale Pointer	"0" on Logic Scale
3			Tuning Wheel	106MHz
4		106MHz	Oscillator Trimmer	Reception at Center of IF Bandwidth Using Method of FM/IF Alignment in Step 2
5	Match IF Coil To Ceramic IF Filter	106MHz	IF Slug	Maximum Voltage at TP1, FM/IF P.C. BD.
6	RF Alignment	90MHz	Tuning Wheel	See Step 4 Above
7			Slug L2/L3	Maximum Voltage at TP1, FM/IF P.C. BD.
8			Slug L4	
9			Slug L5	
10		106MHz	Antenna Trimmer	
11			1st Ref Trimmer	
12			2nd RF Trimmer	
13			Mixer Trimmer	
14	Repeat Steps 5 through 11 Until No Further Improvements			

FM/IF ADJUSTMENTS

NOTE: Set VR1 on FM/IF P.C. Board to Full CCW Rotation

STEP	ALIGNMENT	TEST SIGNAL	ADJUST	ADJUST FOR
1	Freedom of Interference	None	Tuning Wheel	No Broadcast Interference That Would Cause Quieting
2	Tune to Center of IF Bandpass	12dBf (2μV), 1kHz, Mono, 100% Modulation FM	Generator Frequency	Noise Interference that is Equally Distributed at Both Top and Bottom of 1kHz Detected Waveform
3	Quadrature Circuit Frequency Offset	65dBf (1000μV), 1kHz, Mono, 100% Modulation FM	Lower Slug of T1 on FM/IF P.C. Bd.	0 VDC Between TP2 and TP3 on FM/IF P.C. Bd.
4	Minimum Distorition	65dBf (1000μV), 1kHz, Mono, 100% Modulation FM	Upper Slug of T1 on FM/IF P.C. Bd.	Minimum THD of 1kHz Sinewave
5	Repeat Steps 3 and 4 until No Further Improvement			
6	In-Tune Light Defeat	12dBf (2μV) no Modulation	VR1 on FM/IF P.C. Bd.	Very Dim Glow of In-Tune Light

MULTIPLEX ADJUSTMENT

STEP	ALIGNMENT	TEST SIGNAL	ADJUST	ADJUST FOR
1	PLL Free-Running Oscillator Frequency	None	VR2 on MPX P.C. Bd.	19kHz ±50Hz at TP1 on MPX P.C. BD.
2	Right Separation	Left Only, 1kHz, 9% Pilot, 100% FM Modulation 65dBf (1000μV)	VR1 on MPX P.C. Bd.	Best Separation
3	Left Separation	Right Only, 1kHz, 9% Pilot, 100% FM Modulation 65dBf (1000μV)	VR1 on MPX P.C. Bd.	Halfway Between Current Reading and Reading in Step 2

MONITOR AMPLIFIER

STEP	ALIGNMENT	TEST SIGNAL	ADJUST	ADJUST FOR
1	Output Stage Idle Current Left	None	VR1 on Left Channel Monitor Amp. P.C. Bd.	20mVDC Between TP1 and TP2
2	Output Stage Idle Current Right	None	VR1 on Right Channel Monitor Amp. P.C. Bd.	20mVDC Between TP1 and TP2

NOISE METER

STEP	ALIGNMENT	TEST SIGNAL	ADJUST	ADJUST FOR
1	Freedom of Interference	None	Tuning Wheel	No Broadcast Interference That Would Cause Quieting
2	Meter Sensitivity	Noise Only	VR2 on Meter/MUTE P.C. Bd.	Full Right Hand Deflection of Meter
3	Meter Calibration	25dBf (10μV) into 300Ω Ant. Terminals at Freq. to be Received By Tuning in Step 1 Generated by Sound Technology 1000A FM Alignment Gen. Coupled Thru 50Ω to 300Ω Matching Transformer, (Sound Tech 100) 30% Modulation, 1kHz, Mono.	VR1 on Meter/Mute P.C. Bd.	Half Scale Deflection

DIAL-CORD STRINGING

RESTRINGING THE DIAL CORD

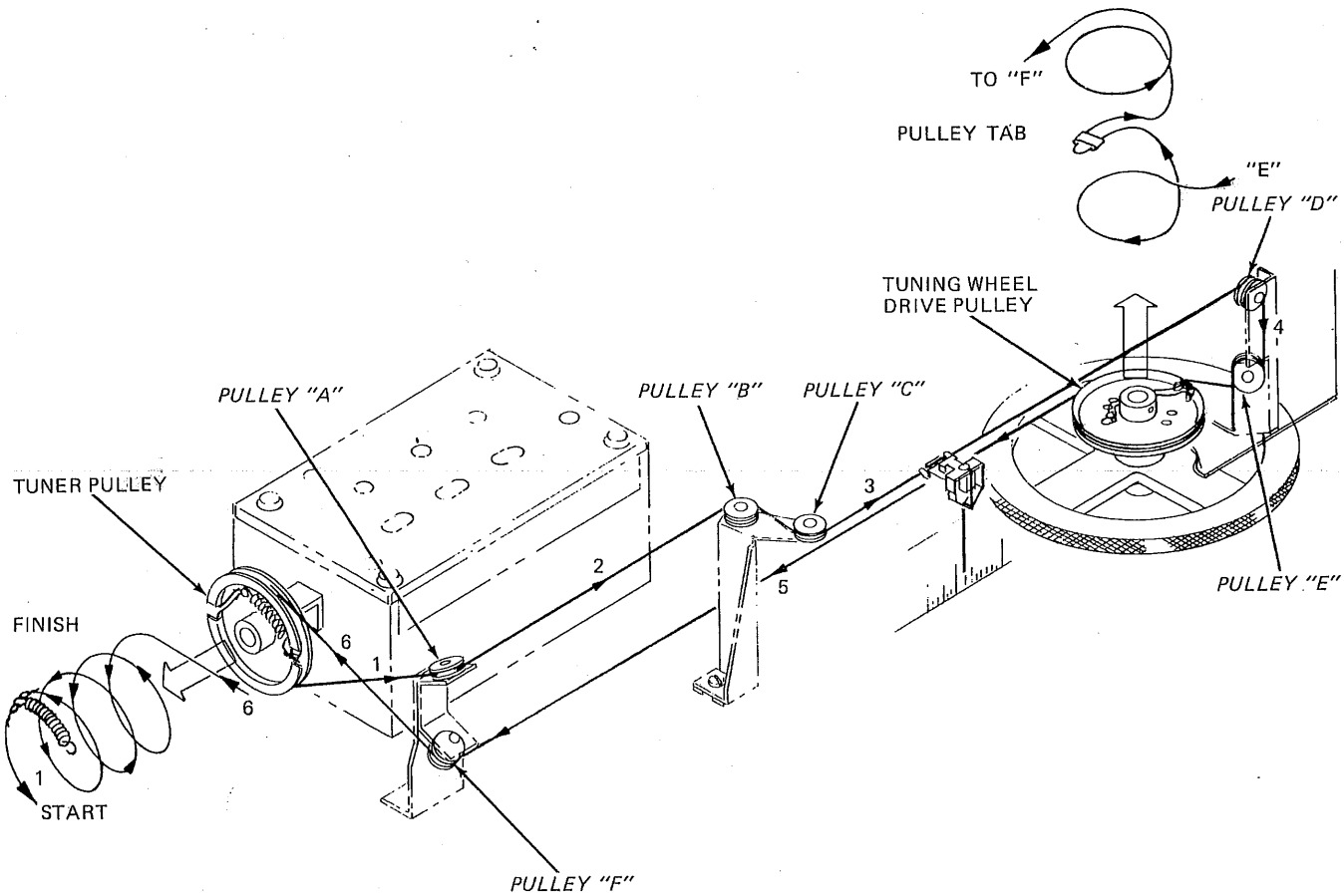
1. Cut a length of dial cord and tie a square-knot loop at each end. The length of the dial cord must be 67" (170 cm) from loop-end to loop-end. Secure one loop end to the tension spring of the tuner pulley.

2. Rotate the tuner pulley fully clockwise (minimum capacitance position). Hook the spring to the protruding stud opposite the rim set screw.

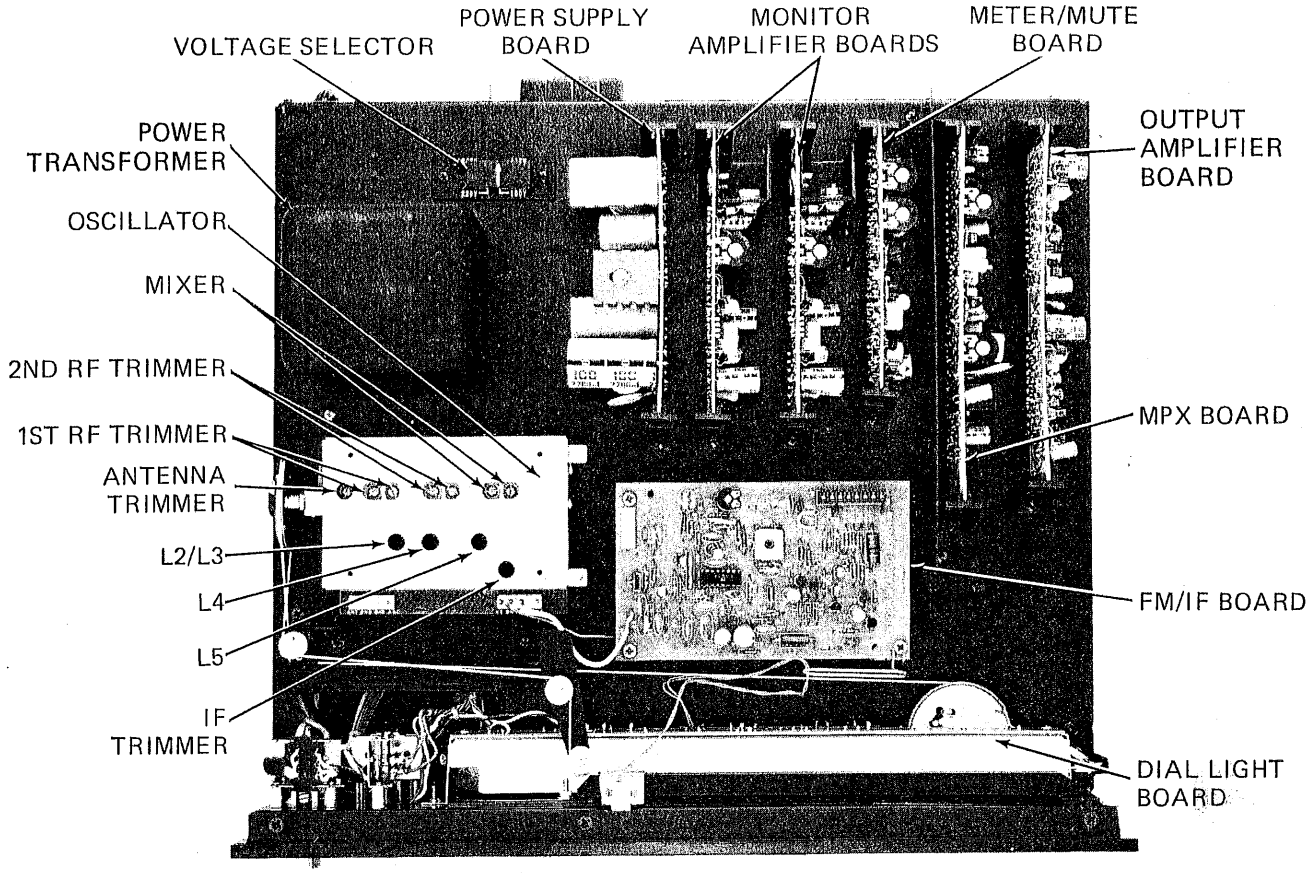
3. Run the cord thru the open slot in the tuner pulley rim and wrap the cord counterclockwise one-half turn toward pulley "A".

4. Run the cord over pulleys "A" thru "E". Then wrap the cord one counterclockwise turn around the tuning wheel drive pulley and into the pulley slot. Hook the cord around the pulley tab and out the pulley slot and wrap the cord one counterclockwise turn around the tuning drive pulley.

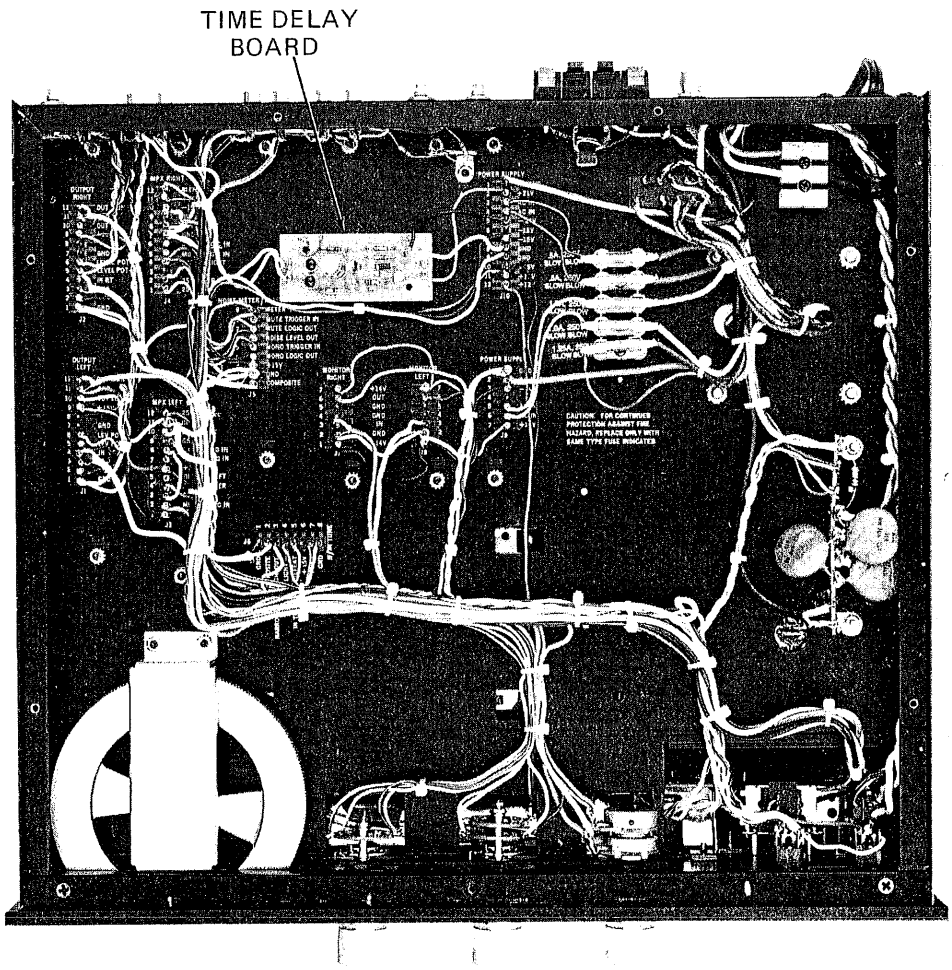
5. Run the cord over pulley "F". Then wrap the cord three counterclockwise turns around the tuner pulley. Hook the loop-end of the dial cord to the tension spring of the tuner drive pulley. Now that stringing is complete, the spring should be under tension.



COMPONENT LOCATION



TOP VIEW



BOTTOM VIEW

CHASSIS PARTS LIST

CHASSIS DECORATIVE

	63034526	Front Panel, Dress (Black)
	63034074	Front Panel, Dress (Silver)
	64634313	Cover, Top
	63234432	Knob, Pushbutton, Power
	0023356	Knob Assy, Pushbutton, Ext Proc/25μsec/noise filter
	00233528	Knob Assy, Monitor/Function/Mute

FRONT PANEL

S3, S6, S2	25026151	Switch, Pushbutton, 2 PDT, Ext Proc/25μsec/Noise Filter
S5	25034488	Switch, Pushbutton, Power
	22034483	Control, Monitor Level
S4	24034484	Switch, 3 Position, Function
S1	24034486	Switch, 3 Position, Mute
	65428021	Jack, Headphone
	12534197	Meter
	61633960	Dial Scale
	63034088	Mask, Dial Scale
	61633959	Clear Window, Dial Scale
	53234095	Tuning Wheel
	00234347	Pointer Assy With Lamp

ELECTRICAL

	22034487	Control, Level Adjust (Rear)
	21534485	Control, Muting/Stereo Threshold (Rear)
	65434479	Connector Assy, Antenna
	65423483	Connector, 750 ohm Ant
	65426318	Output Jack Assy (Rear)
	65434311	Ext. Proc. Jack Assy (Rear)
F1, 2	45234420M*	Fuse, Slo-Blo, 0.5A, 250V
F3, 4	45244420R*	Fuse, Slo-Blo, 1.0A, 250V
F5	45234420S*	Fuse, Slo-Blo, 1.25A, 250V
	65431677	Fuse Holder, 20mm
T2	12031333	Transformer, Balun
T1	10134065	Transformer, Multivoltage
	65427580	Voltage Selector, Connector Set
	00234339	FM Tuner Assy (Please Return All Defective FM Tuner Assy's to Factory)
Q1	43034949A*	Transistor, FM Tuner
Q2	43034950A*	Transistor, FM Tuner
Q3	43034951A*	Transistor, FM Tuner
IC1	43134745*	Integrated Circuit, FM Tuner

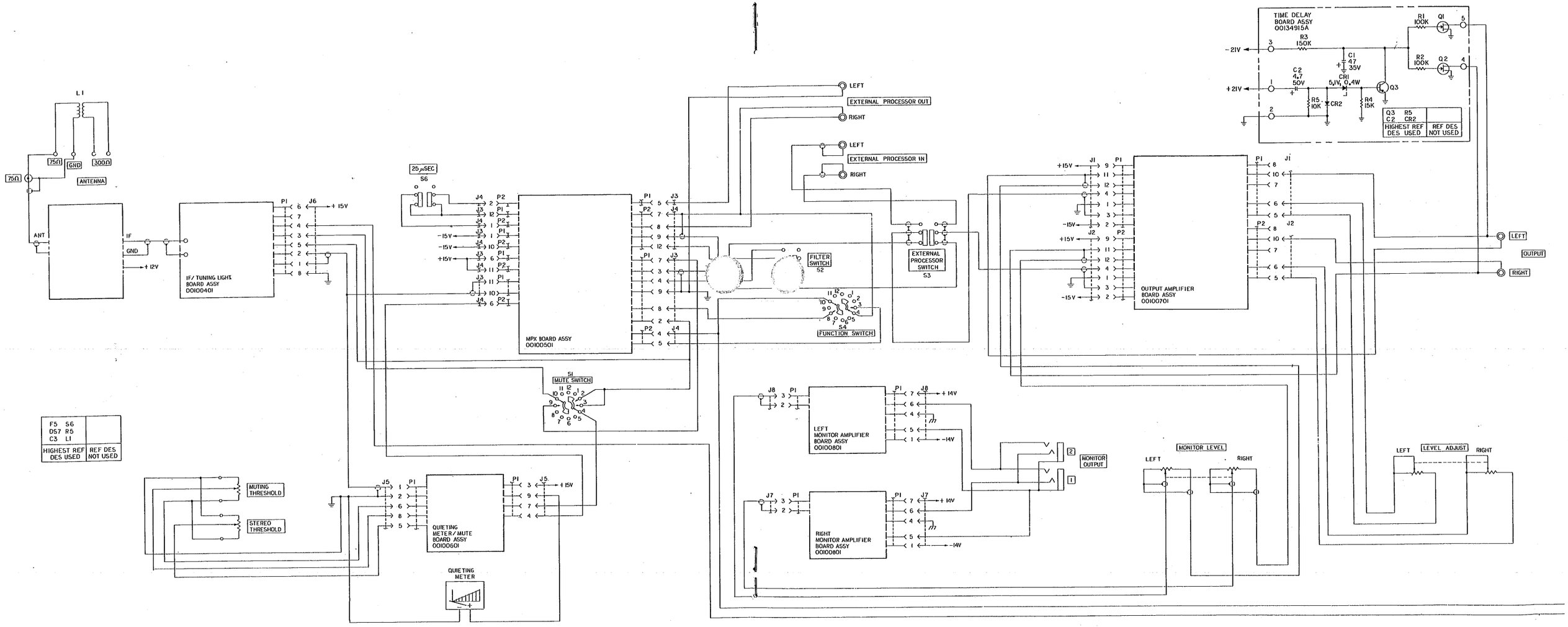
MISCELLANEOUS

	60431098	Drive Pulley, Tuner
	60822954	Drive Pulley, Tuning Wheel
	61634275	Holder/Guide, P.C. Board
	53029083	Line Cord

NOTE TO WARRANTY STATIONS: Items marked by asterisk (*) are recommended spare parts stock. Printed circuit board assembly numbers are shown for reference only. Harman/Kardon does not normally supply assembled printed circuit boards.

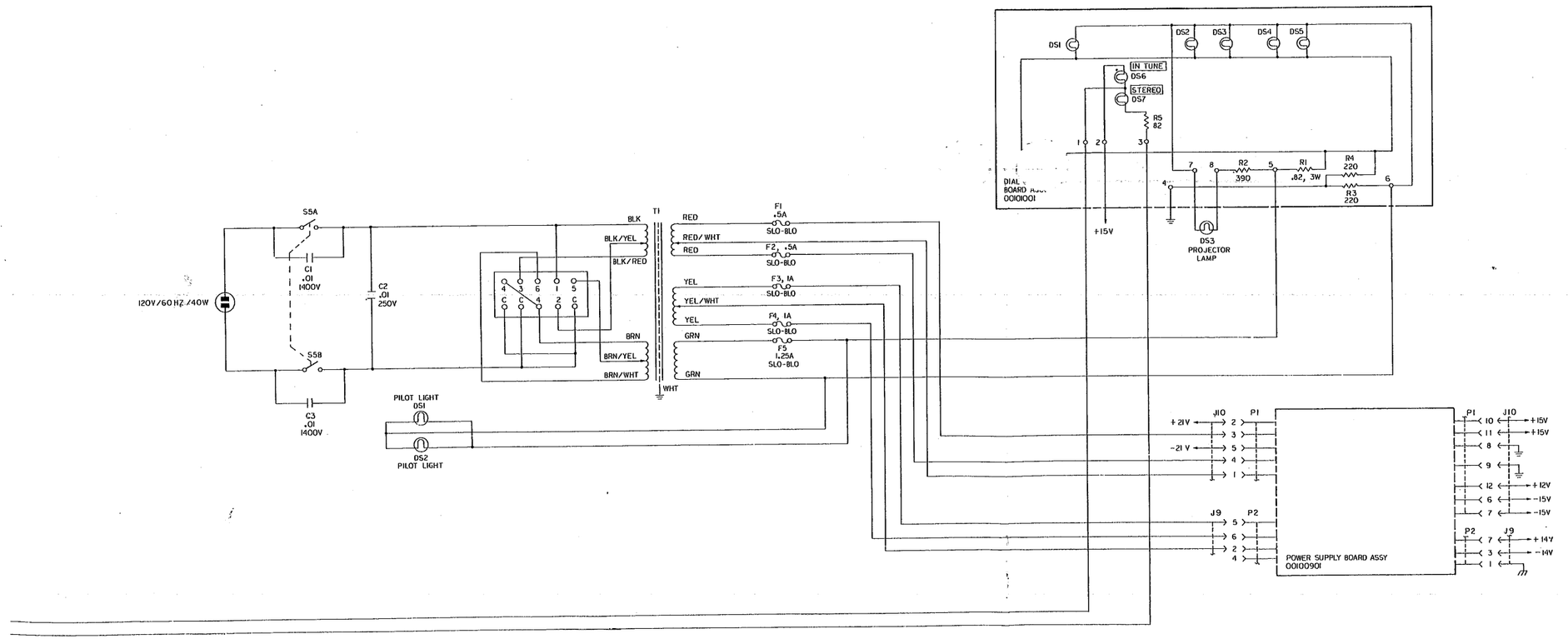
NOTE: To speed handling of your order be sure to include both the model and serial numbers, in addition to the quantity, part number and part description of the items ordered. Orders from independent dealers, independent servicemen, and retail customers will be shipped on a cash in advance basis. Harman/Kardon 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.

SCHEMATIC DIAGRAM — MODEL CITATION EIGHTEEN
SYSTEM INTERCONNECTION

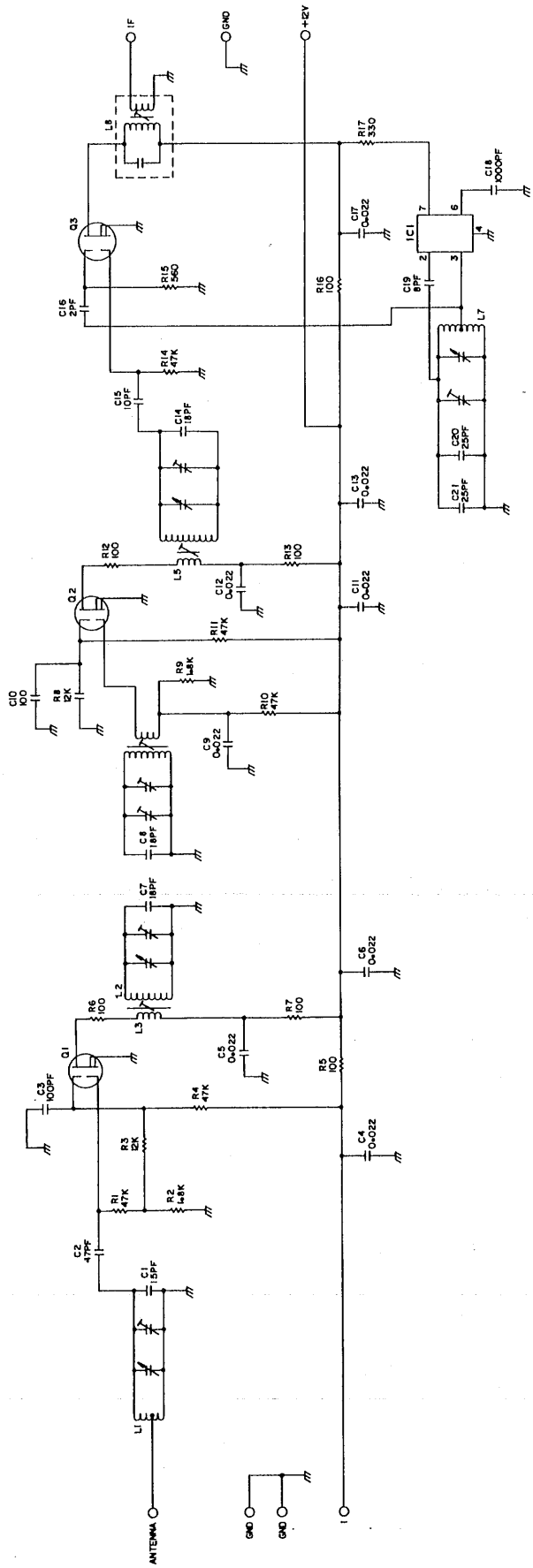


NOTES: UNLESS OTHERWISE SPECIFIED:

1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W.
3. ALL PUSHBUTTON SWITCHES ARE SHOWN IN THE "OUT" POSITION.
4. ALL ROTARY SWITCHES ARE SHOWN IN THE "CCW" POSITION.
5. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NO. IF NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSY OR LOCATION USED.



FRONT END
SCHEMATIC DIAGRAM



FM/IF
PC BOARD AND SCHEMATIC DIAGRAM

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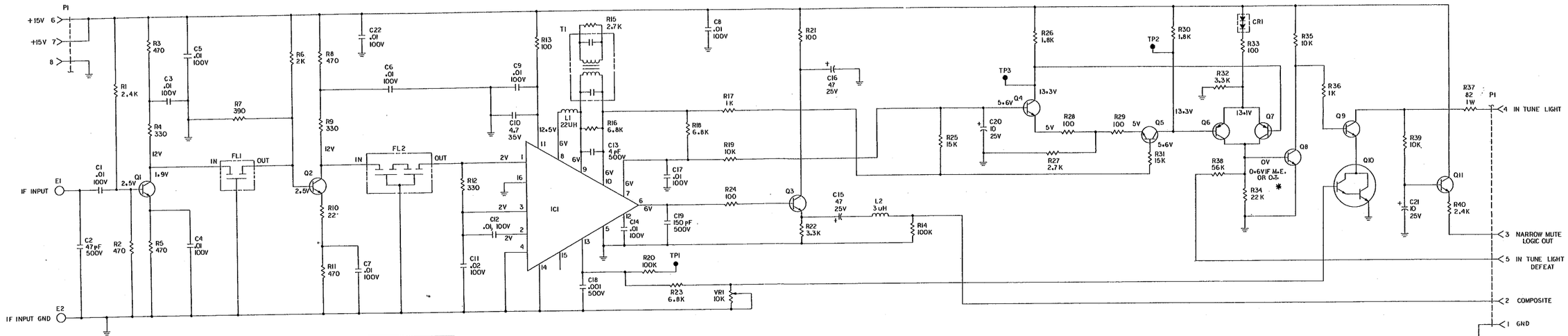
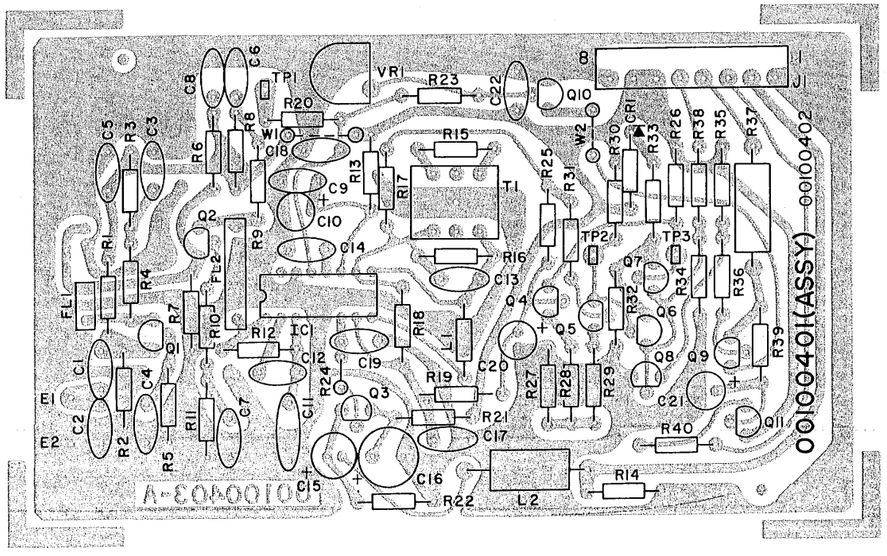
2. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W.
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE DESIGNATION AND ASSEMBLY USED ON I.E. R1, FM/IF BD., ASSY NO. 00100401.



* NOTES:
1. ME=MUTE EMITTED
2. OT=OUT OF TUNE

C22 CR1 FL2 L2 Q11 R41 T1 VR1 IC1	
HIGHEST REF DES USED	REF DES NOT USED



CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00100401	P.C. Board Assy, FM/IF
DIODE		
CR1	41624214*	Stabistor
TRANSISTOR		
Q3, 4, 5, 8, 9, 11	43025972*	NPN, GP
Q1, 2	43029701*	NPN, RF
Q6, 7	43027722*	PNP, GP
Q10	43029832*	NPN, MPS-A13
RESISTOR, VARIABLE		
VR1	21729324	10K
INDUCTOR		
L1	12029342	22μH
L2	12029678	3μH
INTEGRATED CIRCUIT		
IC1	43129341*	FM/IF
TRANSFORMER		
T1	11029332	FM Detector
MISCELLANEOUS		
FL1	12034521	Ceramic Filter
FL2	12034522	Ceramic Filter
		FL1 & FL2 Installed in Matched Pairs

MPX
PC BOARD AND SCHEMATIC DIAGRAM

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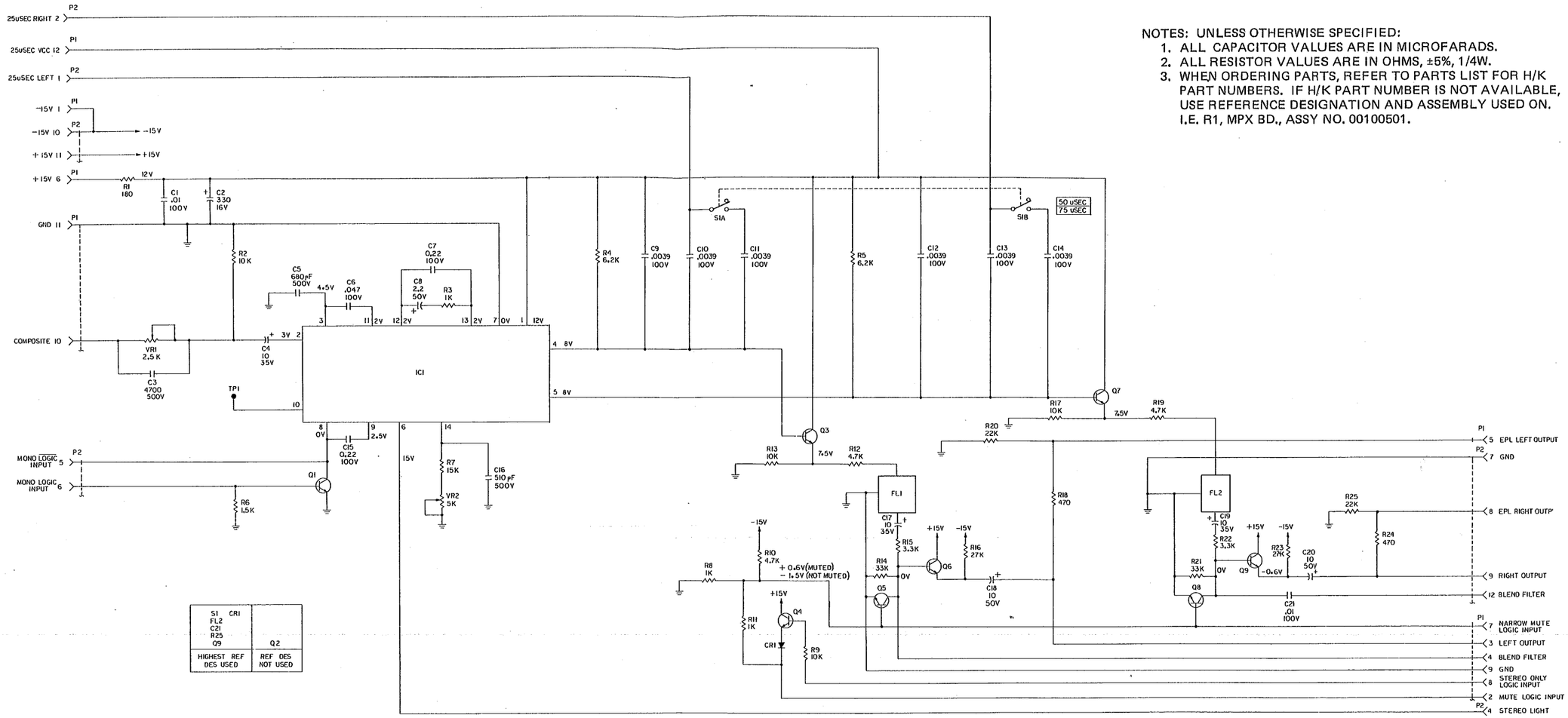
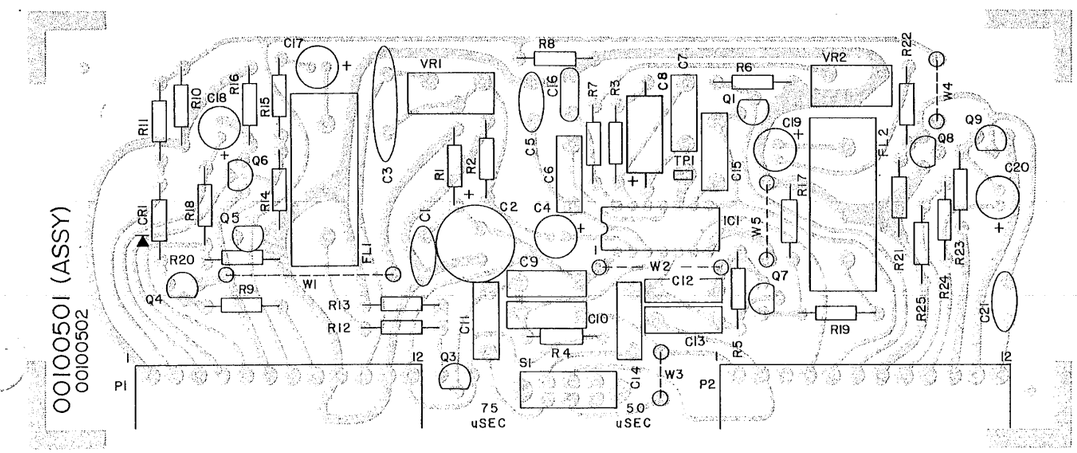
2. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W.
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSEMBLY USED ON. I.E. R1, MPX BD., ASSY NO. 00100501.

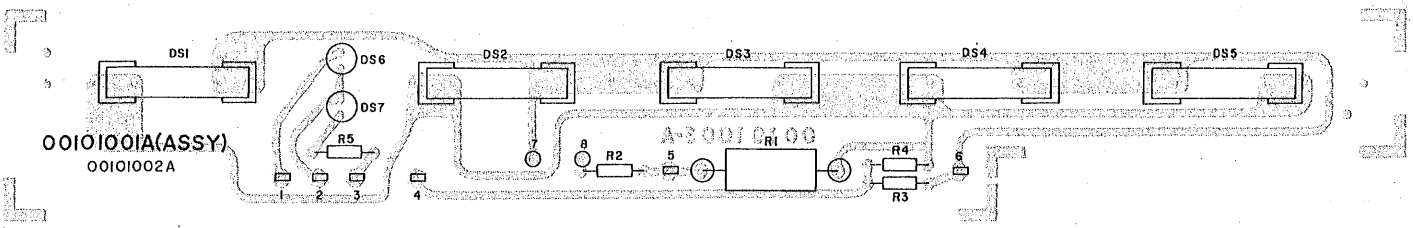


S1 CR1 FL2 C21 R25 Q9	Q2
HIGHEST REF DES USED	REF DES NOT USED



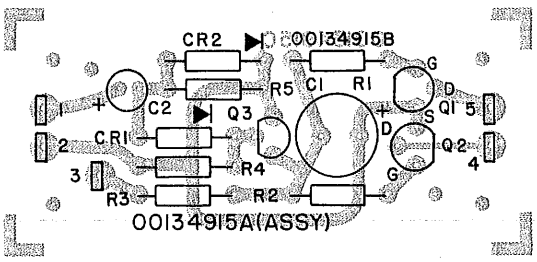
CIRCUIT REF. NO.	H/K PART NO	DESCRIPTION
	00100501	P.C. Board Assy, MPX
DIODE		
CR1	41629338*	Silicon, Signal 1N914
TRANSISTOR		
Q1, Q3-9	43025972*	NPN, GP
RESISTOR, VARIABLE		
VR1	21634318	2.5K
VR2	21631812	5K
INTEGRATED CIRCUIT		
IC1	43128017	FM Stereo Demodulator
MISCELLANEOUS		
FL1, FL2	12028102	Filter, RL-37
S1	26534519	Switch, DPDT, PC Mount

DIAL LIGHT PC BOARD



CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00101001	P.C. Board Assy, Dial Light
RESISTOR, WIREWOUND		
R1	36611071	10ohm, 3W
LAMP		
DS1-DS5	46529212*	Dial and Meter, 12V, 150mA
DS6, 7	46534359*	Stereo/In-Tune, 12V, 35mA

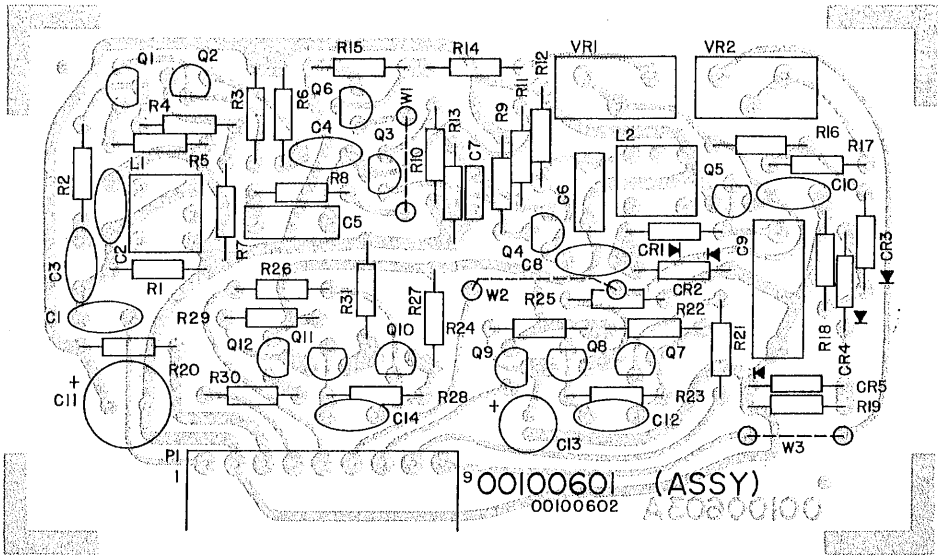
TIME DELAY PC BOARD



CIRCUIT REF.	H/K PART NO.	DESCRIPTION
	00134915A	PC Bd Assy Time Delay
TRANSISTOR		
Q1, 2	43031244*	FET
Q3	43027722*	NPN, GP
DIODE		
CR1	42030498*	Zener, 5.1V, 10%, 0.4W
CR2	41629338*	Silicon, 1N914

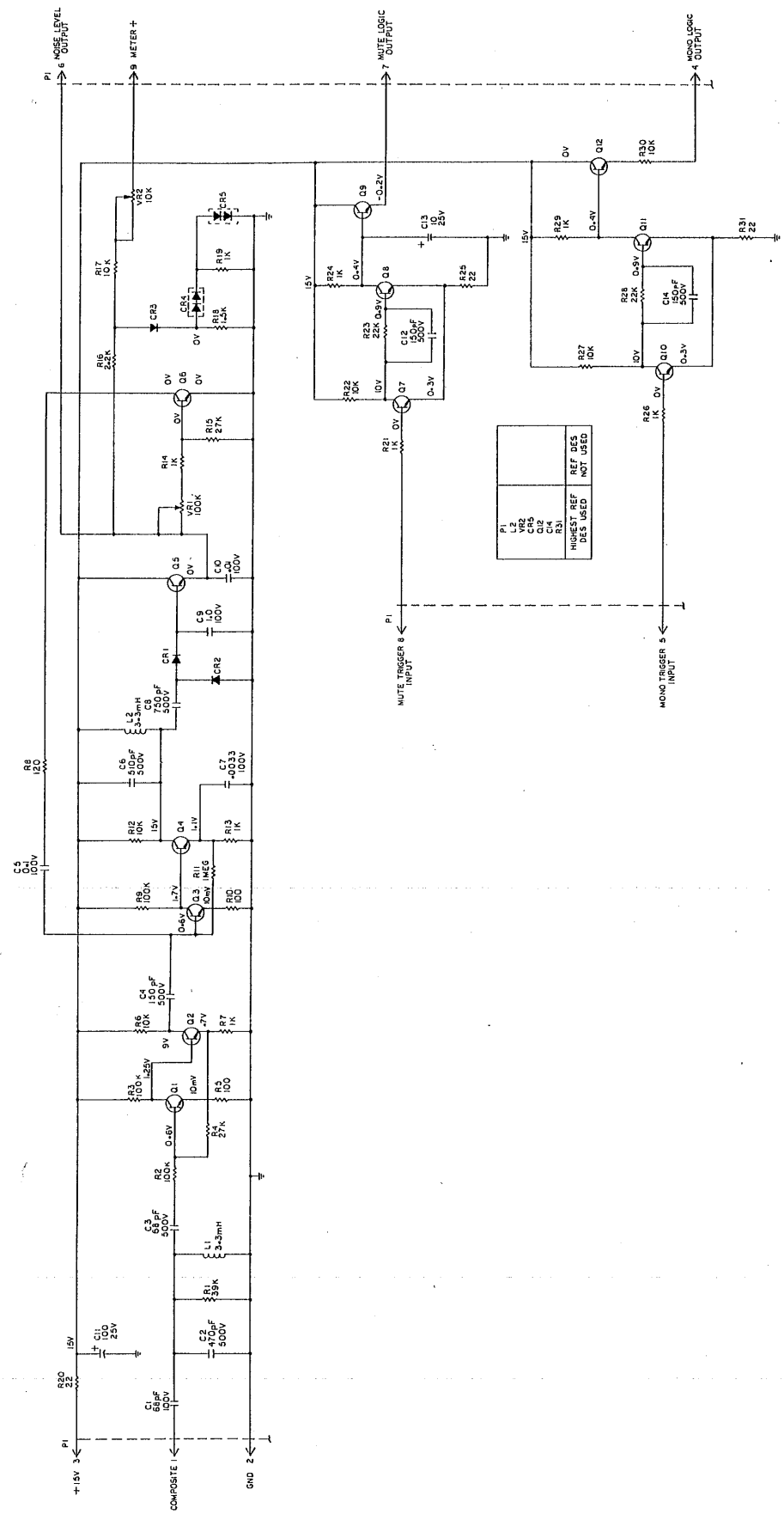
SCHEMATIC DIAGRAM FOR DIAL LIGHT & TIME DELAY PC BDS. SEE SYSTEM SCHEMATIC PG 10-13.

METER/MUTE
PC BOARD



CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00100601	P.C. Board Assy, Meter/Mute
DIODE		
CR1-CR3	41629338*	Silicon, Signal 1N914
CR4, 5	41624214*	Stabistor
TRANSISTOR		
Q1-Q12	43025972*	NPN, GP
RESISTOR, VARIABLE		
VR1	21634520	100K
VR2	21632932	10K
INDUCTOR		
L1, 2	12029052	3.3mH, 10%

METER/MUTE
SCHEMATIC DIAGRAM



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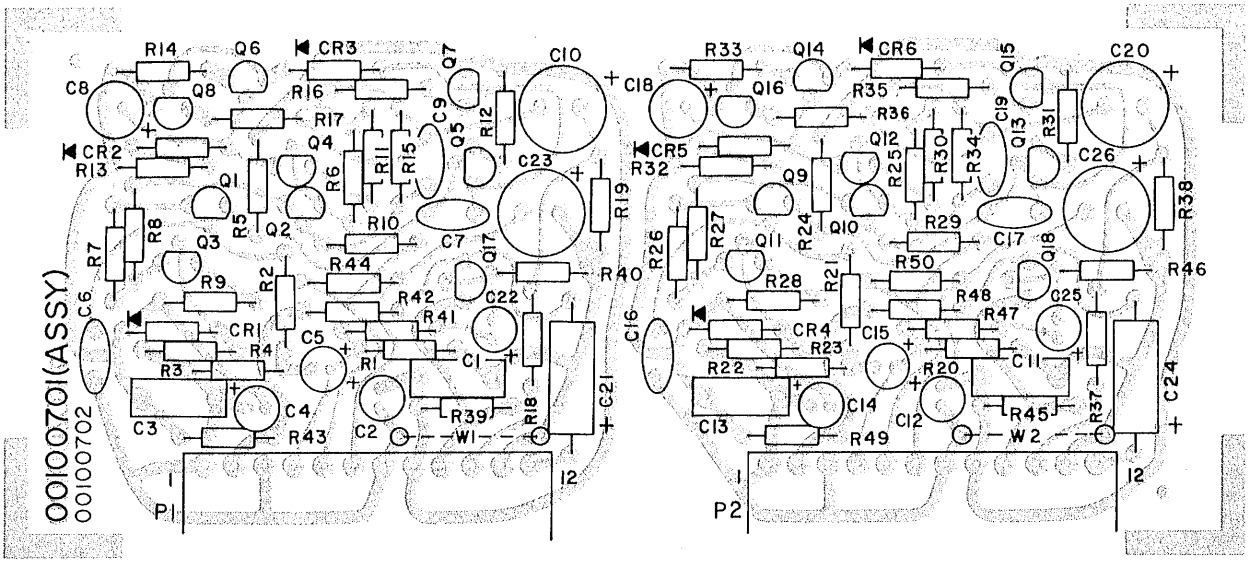
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSEMBLY USED ON. I.E. R1, METER MUTE BD., ASSY NO. 00100601.

OUTPUT AMPLIFIER PC BOARD



CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00100701	P.C. Board Assy, Output Amplifier
DIODE		
CR2, 5	41629338*	Silicon, Signal 1N914
CR1, 3, 4, 6	41624214*	Stabistor
TRANSISTOR		
Q3, 6, 7, 11, 14, 15	43025972*	NPN, GP
Q4, 5, 8, 12, 13, 16	43027722*	PNP, GP
Q1, 2, 9, 10, 17, 18	43027170*	Low Noise, MPS-A18

OUTPUT AMPLIFIER
SCHEMATIC DIAGRAM

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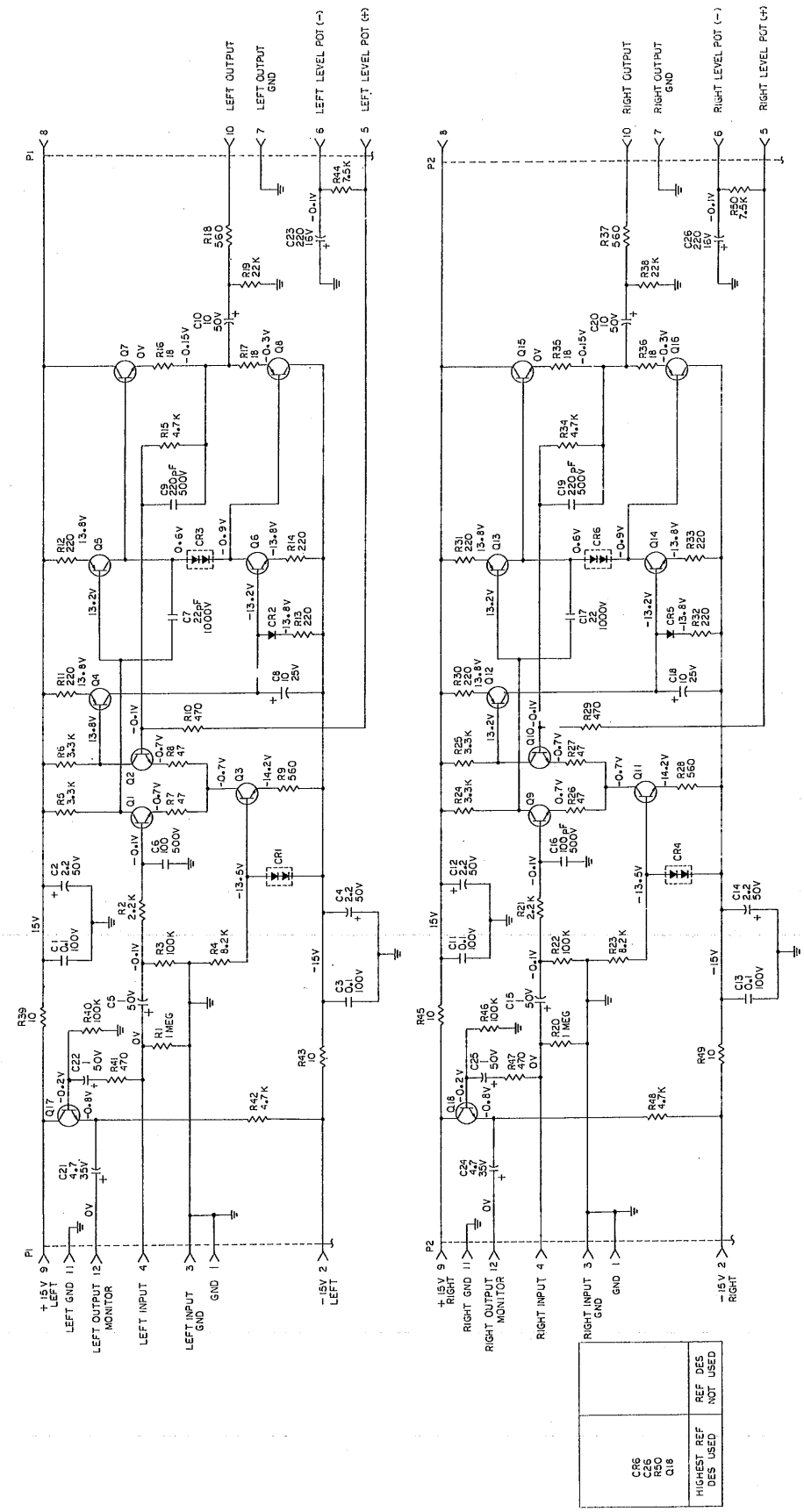
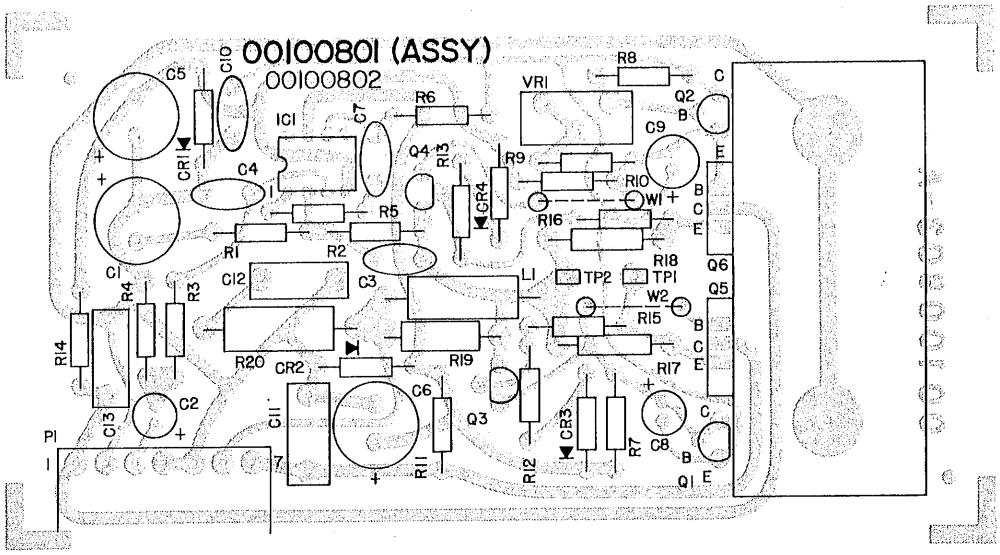
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSEMBLY USED ON. I.E. R1, OUTPUT AMPLIFIER BD., ASSY NO. 00100701.

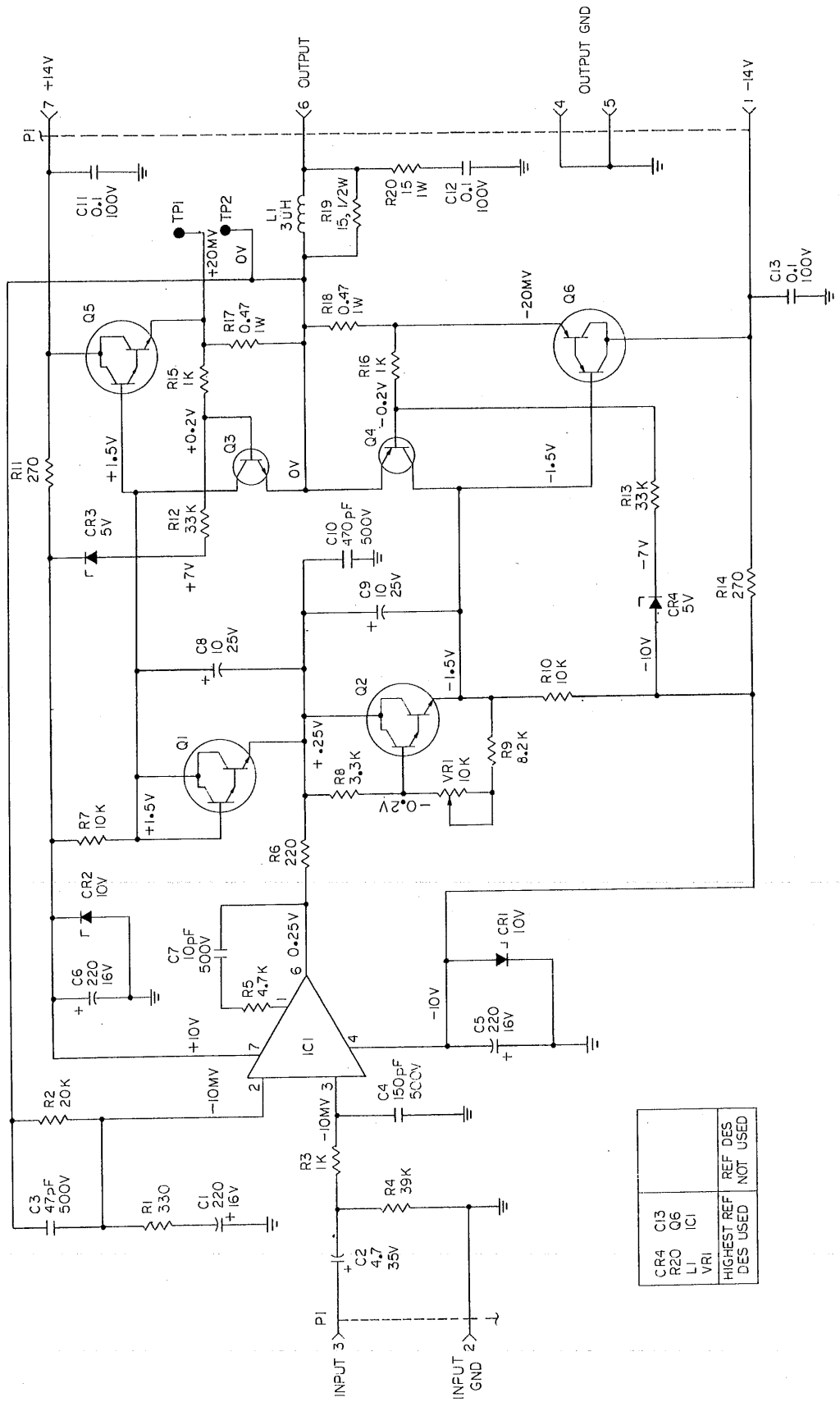


MONITOR AMPLIFIER
PC BOARD



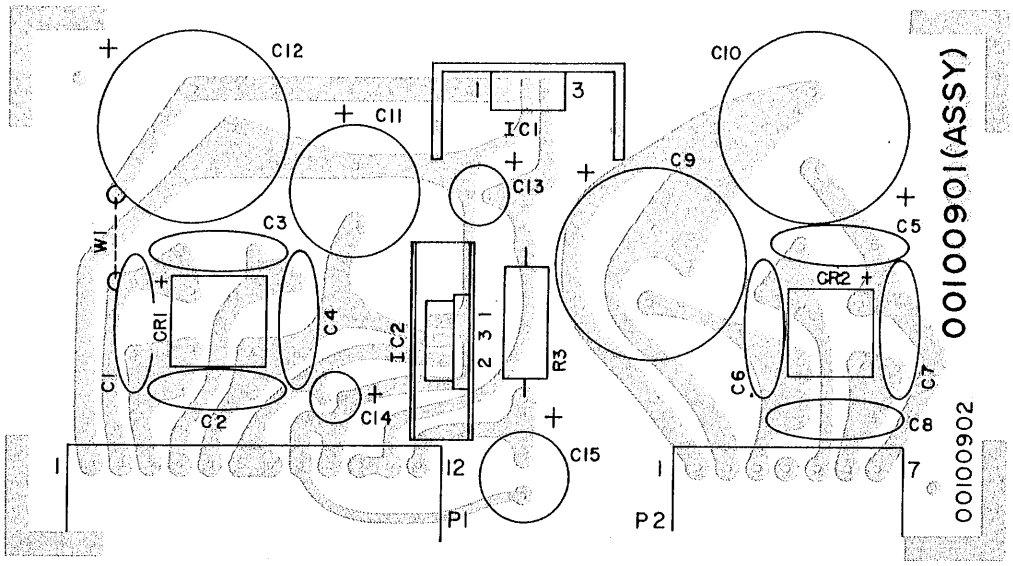
CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00100801	P.C. Board Assy, Monitor Amplifier
RESISTOR, WIREWOUND		
R17, 18	36414785	0.47 ohm, 1W, BW20
RESISTOR, VARIABLE		
VR1	21632932	10K
DIODE		
CR1, 2	42034531*	Zener, 1N961B
CR3, 4	42030498*	Zener, 5.1V
TRANSISTOR		
Q1, 2	43029832*	NPN, MPS-A13
Q3	43025972*	NPN, GP
Q4	43027722*	PNP, GP
Q5	43029037*	NPN, Darlington
Q6	43029038*	PNP, Dalrington
INTEGRATED CIRCUIT		
IC1	43134532*	OP AMP, LM318N
MISCELLANEOUS		
L1	12029678	Inductor, 3μH

MONITOR AMPLIFIER
SCHEMATIC DIAGRAM



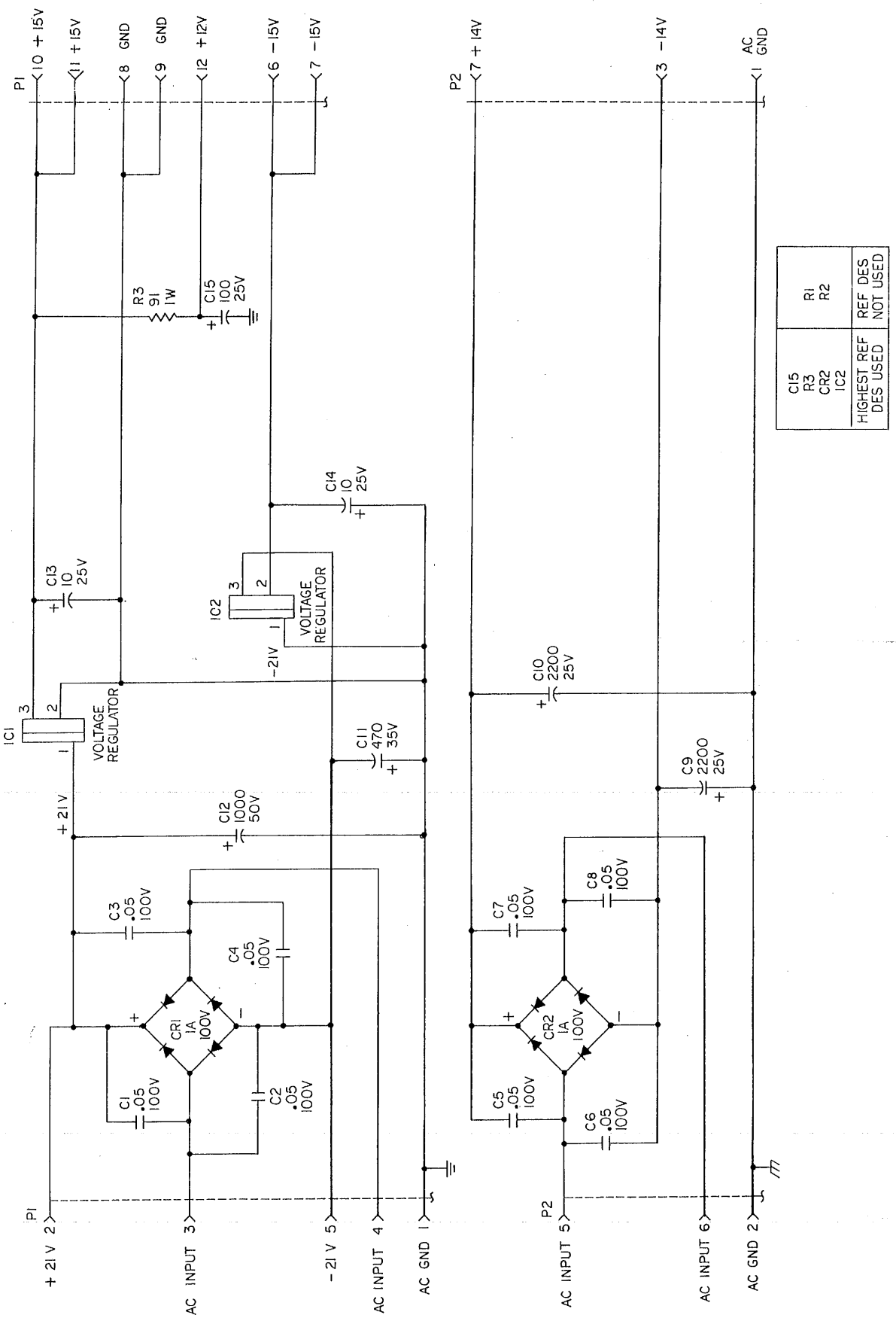
NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS, ±5%, 1/4W.
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSEMBLY USED ON. I.E. R1, MONITOR AMPLIFIER BD., ASSY NO. 00100801.

POWER SUPPLY
PC BOARD



CIRCUIT REF. NO.	H/K PART NO.	DESCRIPTION
	00100901	P.C. Board Assy, Power Supply
CAPACITOR		
C12	31832952	1000μF, 50V
C9, 10	31834329	2200μF, 25V
DIODE		
CR1, 2	42132947*	Bridge, 1 Amp, 100V
INTEGRATED CIRCUIT		
IC1	43134253*	Voltage Regulator, Positive, μA78M15UC
IC2	43134271*	Voltage Regulator, Negative, μA7915UC

POWER SUPPLY
SCHEMATIC DIAGRAM



NOTES: UNLESS OTHERWISE SPECIFIED:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. ALL RESISTOR VALUES ARE IN OHMS, ± 5%, 1/4W.
3. WHEN ORDERING PARTS, REFER TO PARTS LIST FOR H/K PART NUMBERS. IF H/K PART NUMBER IS NOT AVAILABLE, USE REFERENCE DESIGNATION AND ASSEMBLY USED ON. I.E. R1, POWER SUPPLY BD., ASSY NO. 00100901