

harman/kardon

SUB-TS7

(HKTS 7 SUBWOOFER)

SERVICE MANUAL



harman/kardon, Inc.
250 Crossways Park Dr.
Woodbury, New York 11797

Rev1 6/2004

CONTENTS

BASIC SPECIFICATIONS	1
DETAILED SPECIFICATIONS	2
CONTROLS & CONNECTIONS.....	4
SPEAKER CONNECTIONS.....	6
OPERATION.....	9
BASIC TROUBLESHOOTING GUIDE	10
UNIT EXPLODED VIEW.	11
AMPLIFIER EXPLODED VIEW.	12
TEST SET-UP AND PROCEDURE.	13
BLOCK DIAGRAM	14
PCB DRAWINGS.	15
ELECTRICAL PARTS LIST	19
SEMICONDUCTOR PINOUTS	23
SCHEMATIC DIAGRAMS	24
PACKAGING.	26

SPECIFICATIONS

Amplifier Power (RMS)	100 Watts
Driver	10" woofer, Bass Reflex Enclosure
Inputs	Stereo Line Level, dedicated Subwoofer (LFE) and Speaker Level with gold-plated binding posts
Outputs	Speaker Level with gold-plated binding posts
Frequency Response	35Hz – 120Hz (Filter switch ON) 35Hz – 450Hz (Filter switch OFF)
Dimensions (H x W x D)	18-7/8" x 13-3/8" x 13-3/8" 479mm x 340mm x 340mm
Weight	33 lb/15kg

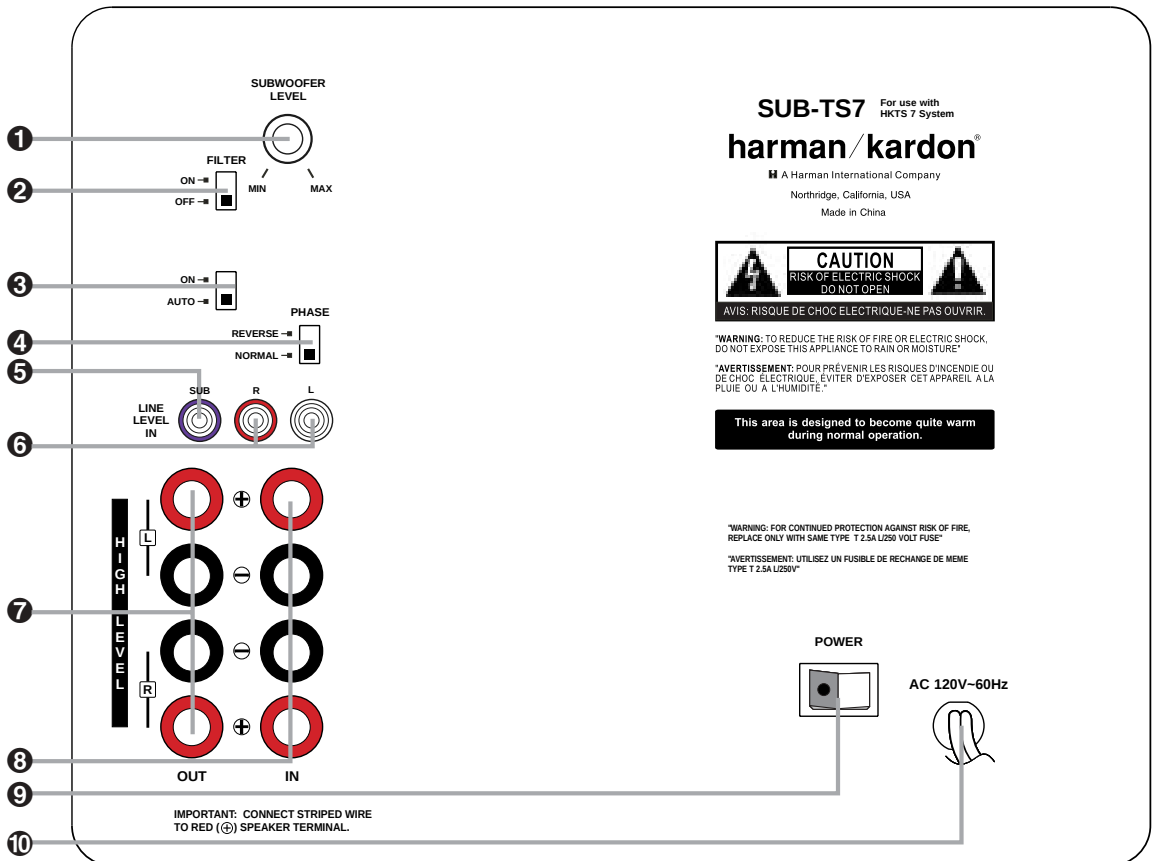
Occasional refinements may be made to existing products without notice but will always meet or exceed original specifications unless otherwise stated.

SUB-TS7 100W Powered Sub/ Plate Amp

LINE VOLTAGE	Yes/No	Hi/Lo Line	Nom.	Unit	Notes
US 120vac/60Hz	Yes	108-132	120	Vrms	Normal Operation
Parameter	Nonimal Specification	Unit	QA Test Limits	Conditions	Notes
Amp Section					
Type (Class AB, D, other)	AB	n/a	n/a		
Load Impedance (speaker)	4	Ohms	n/a	Nominal	
Rated Output Power	100	Watts	75	50 - 250 Hz, 1 input driven, limiter off	
THD @ Rated Power	0.08	%	0.1	22k filter	
THD @ 1 Watt	0.15	%	0.5	22k filter	
DC Offset	5	mV-DC	30	@ Speaker Outputs	
Damping factor	>100	n/a	30	Measured at amplifier board	Measured at the speaker at speaker output terminals on the amp board.
Input Sensitivity					
Input Frequency	50	Hz	n/a	Nominal Freq.	
Line (L&R) Input	220	mVrms	154 - 308	To Rated Power	Single input driven
SUB (LFE) Input	125	mVrms	87 - 175	To Rated Power	SUB (LFE) input driven only
Speaker/Hi Level Input	2.2	Vrms	1.5 - 3.0	To Rated Power	(20 dB below Line In), Single input driven
Hi Level Max. Input Voltage	32	Vrms	30	Nominal Freq., Min. Volume	
Signal to Noise					
SNR-A-Weighted	100	dB	85	relative to rated power	A-Weighting filter
SNR-unweighted	90	dB	80	relative to rated power	22k filter
SNR rel. 1W-unweighted	65	dB	60	relative to 1W Output	22k filter
Residual Noise Floor	1.2	mVrms	3.0	Volume @max, using RMS reading DMM/VOM (or A/P)	
Residual Noise Floor	0.8	mVrms	2.0	Volume @max, w/ A/P Swept Bandpass Measurement (Line freq.+ harmonics)	
Input Impedance					
Line Input (L, R,LFE)	10K	ohms	n/a	Nominal	
Speaker/Hi Level Input	4.7K	ohms	n/a	Nominal	
Filters					
L&R Fixed Low-Pass Filter	170	Hz	150 - 200	@ -6dB ref. 100Hz	2nd order fixed
SUB (LFE) Low pass Filter	270	Hz	240 - 300	@ -3dB ref. 100Hz	2nd order fixed
Subsonic filter (HPF) 3rd Order	28	Hz	22 - 28	@ -3dB ref. 30Hz	3rd order fixed
Limiter					
THD at Max. Output Power	2.0	%	5.0		
Features					
Auto - On -Off Selection Switch	YES		functional		Refer to ATO section
Phase Switch	0-180	deg	functional		
Filter On/Off Switch	YES		functional		
Volume Pot Taper (Lin/Log)	LOG		functional		A Taper
Speaker Out	YES		functional		Binding post connector L&R
2-Color LED power indicator	YES		functional		Blue: On, Amber: Stand-by
Power Switch	YES		functional		
Fuse Holder	YES		functional		
Input Configuration					
Line In (L,R)	YES		functional		Dual RCA jack
SUB (LFE)	YES		functional		RCA jack
Speaker/Hi Level In	YES		functional		Binding post connector L&R
Signal Sensing (ATO)					
Auto-Turn-On (yes/no)	YES		functional	Auto - on selection switch in Auto	
ATO Input test frequency	50	Hz	n/a	Auto - on selection switch in Auto	
ATO Level Line & SUB Input	4.0	mV	2.0 - 6.0	Auto - on selection switch in Auto	
ATO Level Speaker in	40	mV	25 - 55	Auto - on selection switch in Auto	
ATO Turn-on time	5	ms	functional	Amp connected and AC on, then input signal applied	
ATO Turn-OFF Time	15	minutes	10 - 20	Time before muting, after signal is removed	
Power on Delay time	3	sec.	functional	AC Power Applied	
Transients/Pops					
ATO Transient	5	mV-peak	10	@ Speaker Outputs	
Turn-on Transient	50	mV-peak	100	@ Speaker Outputs	AC Line cycled from OFF to ON

Parameter	Nominal Specification	Unit	QA Test Limits	Conditions	Notes
Turn-off Transient	50	mV-peak	100	@ Speaker Outputs	AC Line cycled from ON to OFF
Efficiency					
Stand-by Input Power	10	Watts	12	@ nom. line voltage	Maximum allowable input power under nominal input voltage and frequency, in stand-by mode (HOT or COLD operation).
Power Consumption @ rated pow	170	Watts	200	@ nom. line voltage	100 Watts @ 4.0 ohms and nominal line voltage
Protection					
Short Circuit Protection	YES		functional	Direct short at output	Amplifier should resume operation after short circuit condition is removed.
Thermal Protection	YES		functional		Any user accessible metal parts should always remain at 65 degree C or less for domestic version or 55 degree C or less for EU version.
DC Offset Protection	YES		functional	DC present at Speaker Out leads	Relay or crowbar (for driver/fire protection),
Primary Fuse Rating					
USA-Domestic (120V)	2.5	Amps	n/a	Type-T or Slo Blo	User-replacable fuse with UL/SEMCO rated holder.

SUB-TS7 SUBWOOFER AMPLIFIER PANEL CONTROLS AND CONNECTIONS



- 1 Subwoofer-Level Control
- 2 High-Cut (Low-Pass) Filter Switch
- 3 Music-Sense On/Off Switch
- 4 Phase Switch

- 5 Line-Level Subwoofer (SUB) Input
- 6 Line-Level Full-Range Inputs
- 7 Speaker-Level Outputs
- 8 Speaker-Level Inputs

- 9 Master Power Switch
- 10 AC Power Cord

1 Subwoofer-Level Control: Volume may be adjusted using the Subwoofer-Level Control. Turn the control clockwise to increase the SUB-TS7's volume, or counterclockwise to decrease it.

2 High-Cut (Low-Pass) Filter Switch: Placing this switch in the **ON** position activates circuitry that cuts out all audio input signals above 120Hz. This allows the SUB-TS7 to focus its power on reproducing the low-frequency portion of the signal, avoiding

inefficiency and distortion. Engage this filter when using the Speaker-Level Inputs **8**, or when using the Line-Level Full-Range Inputs **6**, unless your receiver or processor processes its line-level output using a low-pass filter. The filter has no effect when the SUB Input **5** is used.

3 Music-Sense On/Off Switch: When placed in the **AUTO** position, and when the Master Power Switch **9** is turned on, the SUB-TS7 will automatically turn itself on or

place itself in the Standby mode, depending on whether it is receiving an audio signal. When this switch is placed in the **ON** position, the SUB-TS7 will remain on, whether or not it is receiving an audio signal.

An LED located on top of the SUB-TS7 indicates whether the SUB-TS7 is in the ON or STANDBY state when used with the Music-Sense On/Off Switch **3** in the **AUTO** position. The LED is lit blue to indicate that the SUB-TS7 is receiving an audio signal

SUB-TS7 SUBWOOFER AMPLIFIER PANEL CONTROLS AND CONNECTIONS

and is turned on, and the LED is lit amber to indicate that no signal is being received and the SUB-TS7 is in Standby mode.

When the Music-Sense On/Off Switch **3** is in the **ON** position, the LED will be lit blue, whether or not an audio signal is present.

When the Master Power Switch **9** is turned off, the LED goes dark, no matter which position the Music-Sense On/Off Switch **3** is in.

4 Phase Switch: This switch determines whether the SUB-TS7 subwoofer's piston-like action moves in and out in phase with the main speakers. If the speakers were to play out of phase, the sound waves produced by the subwoofer would be cancelled out, reducing bass response. This phenomenon depends in part on the relative placement of the speakers in the room. In most cases, the Phase Switch **4** should be left in the **NORMAL** position. However, it does no harm to experiment with the Phase Switch **4**, and you may leave it in the position that maximizes bass response.

5 Line-Level Subwoofer (SUB) Input: Connect the subwoofer output of a receiver with digital surround sound decoding, such as Dolby® Digital or DTS®, to this input. This input bypasses the SUB-TS7's internal crossover circuitry, and should only be used with a filtered signal. If your receiver does not have digital decoding, you should use the Line-Level Full-Range Inputs **6** instead.

6 Line-Level Full-Range Inputs: Connect the line-level subwoofer output or preamp output(s) of your receiver or amplifier to these inputs. If your receiver does not have a separate subwoofer output, use a Y-adapter (not supplied) to bridge the receiver's preamp output to the main amp input for that channel, and connect the long end of the adapter to the corresponding line-level input on the SUB-TS7. If your receiver has only a single subwoofer output, you may connect it to either the left or right line-level input on the SUB-TS7, and no Y-adapter is needed.

7 Speaker-Level Outputs: If you are using the Speaker-Level Inputs **8** on the SUB-TS7, you should connect these binding-post terminals to your front left and right speakers, remembering to maintain polarity by connecting the (+) terminal on the SUB-TS7 subwoofer to the (+) terminal on the speaker, and the (–) terminal on the SUB-TS7 subwoofer to the (–) terminal on the speaker. If you are not using the Speaker-Level Inputs **8**, then connect your front left and right speakers directly to your receiver or amplifier. See pages 9 through 12 for further information on speaker connections.

8 Speaker-Level Inputs: Connect these binding-post terminals to the main left and right speaker terminals of your receiver or amplifier, if your receiver or amplifier does not have a line-level subwoofer output. Remember to maintain polarity by connecting the (+) terminal on the receiver/amplifier to the (+) terminal on the SUB-TS7 subwoofer, and the (–) terminal on the receiver/amplifier to the (–) terminal on the SUB-TS7 subwoofer.

9 Master Power Switch: Place this switch in the "•" position to power-on the SUB-TS7 subwoofer. The SUB-TS7 will then be either in the Standby mode or completely on, depending on the position of the Music-Sense On/Off Switch **3**.

10 AC Power Cord: Make sure to plug this cord into an active, unswitched electrical outlet for proper operation of the SUB-TS7. The cord should not be plugged into the accessory outlets found on some audio components.

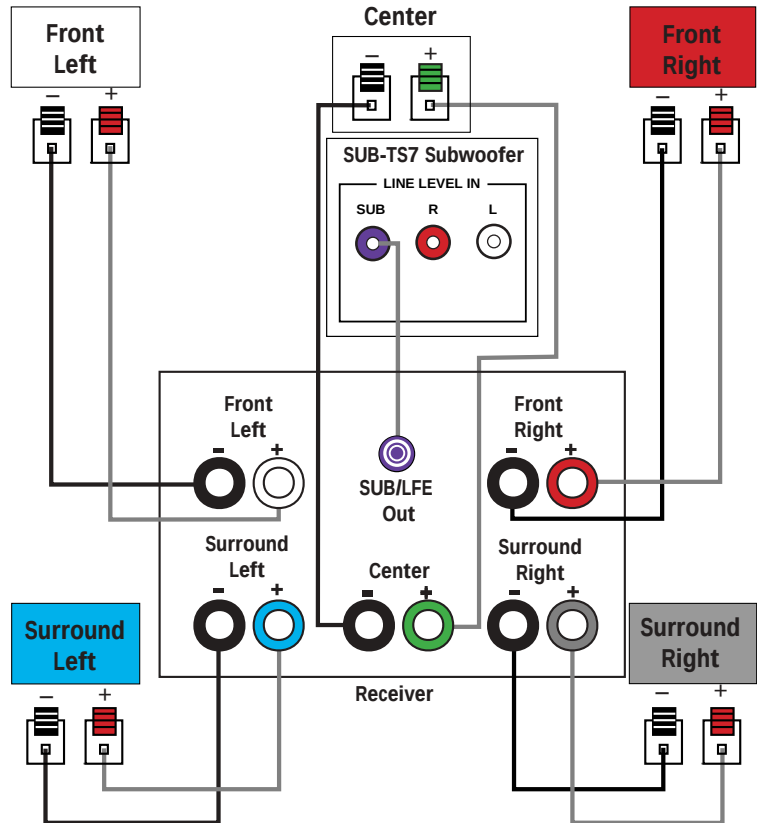
SPEAKER CONNECTIONS

Dolby® Digital or DTS® (or Other Digital Surround Mode) Connection
USE THIS INSTALLATION METHOD FOR DOLBY DIGITAL, DTS OR OTHER DIGITAL SURROUND PROCESSORS:

Use the line-level input jack marked SUB  for the Low-Frequency Effects channel. Connect this jack to the subwoofer output or LFE output on your receiver or amplifier. Connect each speaker to the corresponding speaker terminals on your receiver or amplifier.

Make sure you've configured your surround sound processor for "Subwoofer On." The front left, front right, center and surround speakers should all be set to "Small."

When all connections have been made, plug the AC power cord on the subwoofer into an AC outlet.



SPEAKER CONNECTIONS

Dolby Pro Logic***(Non-Digital) – Line Level**

USE THIS INSTALLATION METHOD FOR DOLBY PRO LOGIC APPLICATIONS (NOT DOLBY DIGITAL, DTS OR OTHER DIGITAL PROCESSING), WHERE THE RECEIVER/PROCESSOR IS EQUIPPED WITH A SUBWOOFER OUTPUT, OR A VOLUME-CONTROLLED PREAMP (LINE-) LEVEL OUTPUT:

Use the supplied RCA-type interconnect cable to connect the line-level subwoofer output on your receiver or amplifier to either the left or right Line-Level Full-Range Input **6** on the SUB-TS7 subwoofer. Use both the left and right inputs on the subwoofer if your receiver or processor has both left and right line-level outputs. In that case, you will need to supply a second interconnect cable.

If your receiver is equipped with line-level outputs but does not have a separate subwoofer output, use a Y-adaptor (not supplied) to bridge the receiver's preamp output to the main amp input for that channel, and connect the long end of the adaptor to the corresponding line-level input on the SUB-TS7.

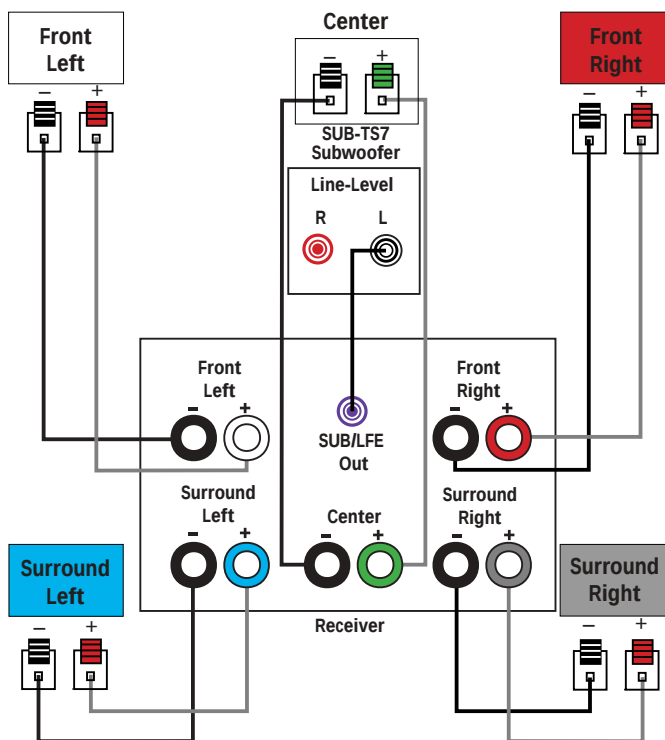
IMPORTANT: Do not use the SUB Input **5** on the subwoofer with Dolby Pro Logic processors.

If your receiver/processor has a built-in low-pass-crossover filter for the subwoofer output, you may use the SUB Input **5** to bypass the subwoofer's internal crossover.

Connect each speaker to the corresponding speaker terminals on your receiver or amplifier.

Make sure that you have configured your surround sound processor for "Subwoofer On." The front left, front right, center and surround speakers should all be set to "Small."

When all connections have been made, plug the AC power cord on the subwoofer into an AC outlet.



SPEAKER CONNECTIONS

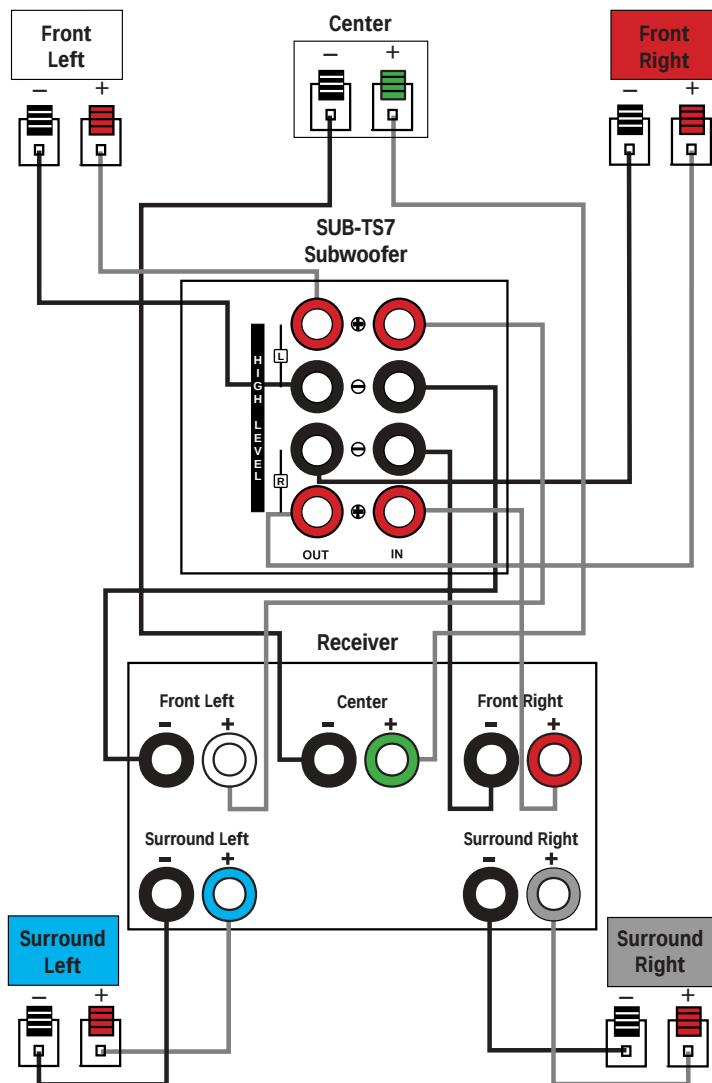
Dolby Pro Logic (Non-Digital) – Speaker Level

USE THIS INSTALLATION METHOD FOR DOLBY PRO LOGIC APPLICATIONS (NOT DOLBY DIGITAL, DTS OR OTHER DIGITAL PROCESSING), WHERE THE RECEIVER/PROCESSOR DOES NOT HAVE A SUBWOOFER OUTPUT, OR A VOLUME-CONTROLLED PREAMP (LINE-) LEVEL OUTPUT:

Connect your receiver or amplifier's front left and right speaker terminals to the left and right Speaker-Level Input ⑧ terminals on the SUB-TS7 subwoofer that are marked "High Level In." Connect the left and right Speaker-Level Output ⑦ terminals on the SUB-TS7 subwoofer that are marked "High Level Out" to the corresponding terminals on the back of your front left and right speakers.

Connect your receiver or amplifier's center and surround left and right speaker terminals to the corresponding terminals on the back of your center, and surround left and right speakers.

When all connections have been made, plug the AC power cord on the subwoofer into an AC outlet.



Move the Master Power Switch ⑨ (marked Power) to the "•" (On) position. The SUB-TS7 subwoofer will automatically turn itself on or go into Standby mode, depending on whether or not a signal is being sent to it by your receiver or surround processor, and provided that the Music-Sense On/Off Switch ③ is moved down so that it is in the **AUTO** position.

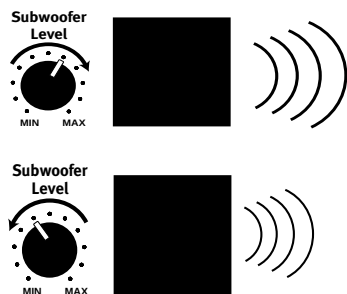
When your receiver or amplifier is off, or is not sending program material to the subwoofer, the subwoofer will be in Standby mode and the LED Indicator on the top of the subwoofer will turn amber. When the subwoofer senses an audio signal, it will automatically turn itself on and the LED Indicator will turn blue. If the subwoofer does not sense a signal after approximately twenty minutes, it will automatically go into Standby mode.

When the Music-Sense On/Off Switch ③ is switched to the **ON** position, the subwoofer will remain on, whether or not program material is playing, and the LED Indicator will remain lit blue.

If you'll be away from home for an extended period of time, or if the subwoofer will not be used, switch the Master Power Switch ⑨ to the **OFF** position.

Volume

Volume can be adjusted using the Subwoofer-Level Control ①, as shown. Turn the control knob clockwise to increase the volume of the subwoofer, and counterclockwise to decrease the subwoofer's volume.



Additional Bass Adjustments

In addition to the volume adjustments described above, the SUB-TS7 subwoofer includes a Phase Switch ④ and a Filter Switch ② that can be used to adjust the bass response to suit your listening environment or taste.

In most situations, the Phase Switch ④ should be left in the **NORMAL** position. If you suspect that the subwoofer is playing out of phase with the other speakers, which would tend to diminish bass response, try placing this switch in the **REVERSE** position. There is no harm in experimenting, and you may return the switch to the **NORMAL** position at any time. If you rearrange your room and reposition the speakers, it would be a good idea to check whether they are in phase by flipping this switch.

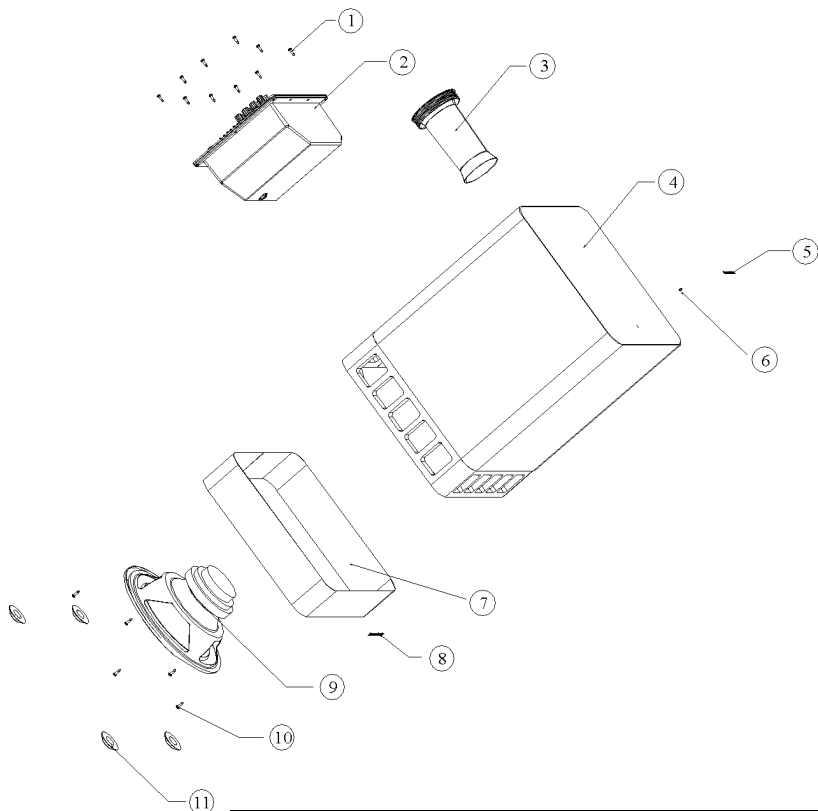
The High-Cut (Low-Pass) Filter Switch ② limits the frequencies of the audio signal inputted to the subwoofer to the low frequencies that the subwoofer reproduces best. This allows the subwoofer to perform more efficiently, and with superior bass reproduction, minimizing distortion that might occur if the subwoofer attempted to reproduce higher frequencies. This switch should be left in the **ON** position, except:

1. When the SUB Input ⑤ is being used, in which case it has no effect, or
2. When the Speaker-Level Inputs ⑧ or the Line-Level Full-Range Inputs ⑥ are being used with a crossover or filter aboard the receiver or processor.

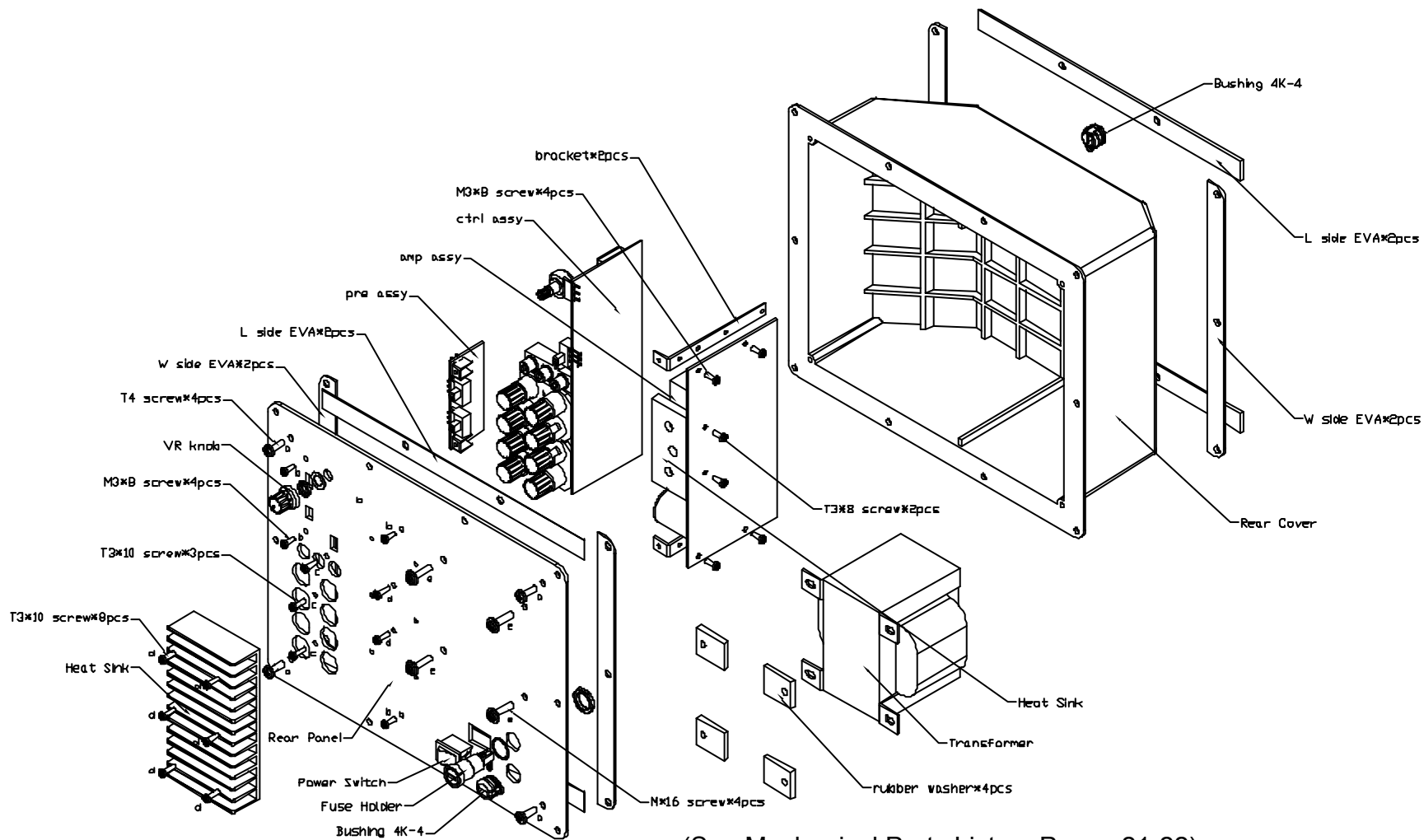
In these two circumstances, place the switch in the **OFF** position.

TROUBLESHOOTING

SYMPTOM	SOLUTION
If there is no sound from any of the speakers:	• Check that receiver/amplifier is on and a source is playing. • Check that the powered subwoofer is plugged in and its Master Power Switch ⑨ is switched on to the “•” position. • Check all wires and connections between receiver/amplifier and speakers. Make sure all wires are connected. Make sure none of the speaker wires are frayed, cut, punctured, or touching other wires. • Review proper operation of your receiver/amplifier.
If there is no sound coming from one speaker:	• Check the “Balance” control on your receiver/amplifier. • Check all wires and connections between receiver/amplifier and speakers. Make sure all wires are connected. Make sure none of the speaker wires are frayed, cut or punctured, and that no wires are touching each other. • In Dolby Digital or DTS mode, make sure that the receiver/processor is configured so that the speaker in question is enabled. • Turn off all electronics and switch the speaker in question with one of the other speakers that is working correctly. Turn everything back on, and determine whether the problem is in the same place: i.e., the speaker that was working previously now has no sound and the speaker that was not working now sounds fine; or whether it has moved: i.e., the speaker that was not working still has no sound and the speaker that was working is still fine. If the problem is in the same place, the source of the problem is most likely with your receiver or amplifier, and you should consult the owner's manual for that product for further information. If the problem has followed the speaker, consult your dealer for further assistance or, if that is not possible, visit our Web site at www.harmankardon.com for further information.
If there is no sound from the center speaker:	• Check all wires and connections between receiver/amplifier and speaker. Make sure all wires are connected. Make sure none of the speaker wires are frayed, cut, punctured, or touching other wires. • If your receiver/processor is set in Dolby Pro Logic mode, make sure the center speaker is not in phantom mode. • If your receiver/processor is set in Dolby Digital or DTS mode, make sure the receiver/processor is configured so that the center speaker is enabled.
If the system plays at low volumes but shuts off as volume is increased:	• Check all wires and connections between receiver/amplifier and speakers. Make sure all wires are connected. Make sure none of the speaker wires are frayed, cut, punctured, or touching other wires. • If more than one pair of main speakers is being used, check the minimum impedance requirements of your receiver/amplifier.
If there is low (or no) bass output:	• Make sure the SUB ❶ or Line-Level Inputs ❷ of the SUB-TS7 subwoofer and SUB or LFE output of your receiver or amplifier are properly connected by the RCA-type interconnect cable. • If you are using the SUB-TS7's Speaker-Level Inputs ❸, check your speaker cables to make sure they are all connected; that none of the wires are frayed, cut, punctured, or touching other wires; and that you have maintained the correct polarity by connecting positive terminals to positive terminals, and negative terminals to negative terminals. • Make sure the subwoofer is plugged into an active electrical outlet and its Master Power Switch ⑨ is switched on to the “•” position. • Check the speaker setup (bass management) settings in your A/V receiver or processor to make certain that the front, center and surround speakers are configured for “Small,” and that the subwoofer is set for “Yes” or “On.”
If there is no sound from the surround speakers:	• Check all wires and connections between receiver/amplifier and speakers. Make sure all wires are connected. Make sure none of the speaker wires are frayed, cut, punctured, or touching other wires. • Review proper operation of your receiver/processor and its surround sound features. • Make sure the movie or TV show you are watching is recorded in a surround sound mode. If it is not, check to see whether your receiver/processor has other surround modes you may use. • In Dolby Digital or DTS mode, make sure your receiver/processor is configured so that the surround speakers are enabled. • Review the operation of your DVD player and the jacket of your DVD to make sure that the DVD features the desired Dolby Digital or DTS mode, and that you have properly selected that mode using both the DVD player's menu and the DVD disc's menu.

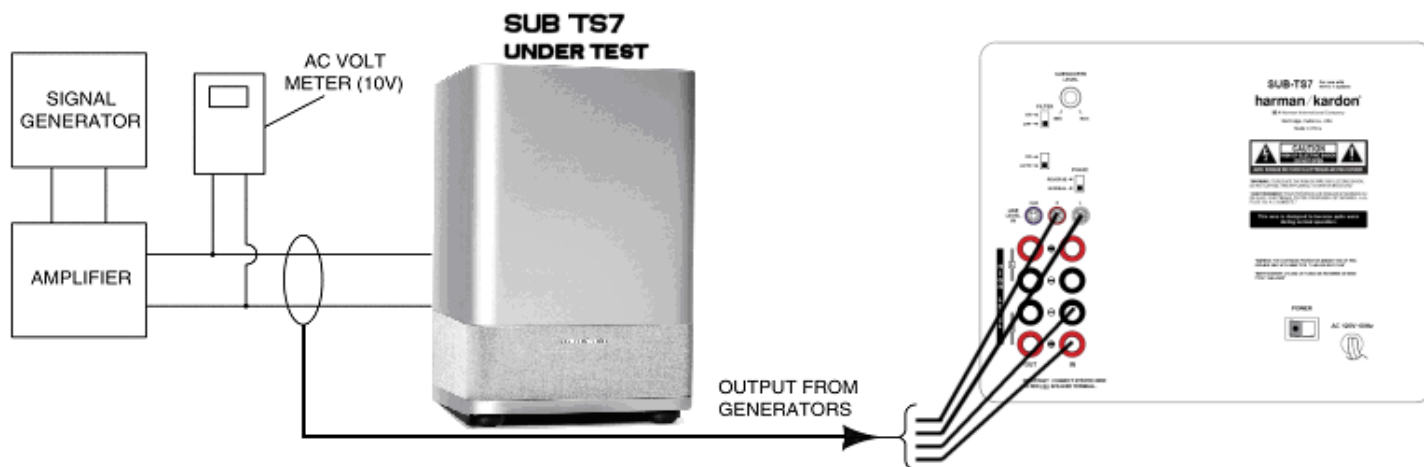


Ref#	Description	Part Number	Qty
1	Amplifier screw	352-AM04020D210	10
2	SUB-TS7 Amplifier	Not for Sale	1
3	Port Tube	Not for Sale	1
4	SUB-TS7 Cabinet	Not for Sale	1
5	Logo	316-AG-00557	1
6	LED	Not for Sale	1
7	Grille	Not for Sale	1
8	Logo	316-AL-00553	1
9	10" woofer	25PF12DZB-DW01	1
10	Woofer screw	352-FM04020D605	5
11	Foot Pad	320-EVA-00057	4



(See Mechanical Parts List on Pages 21-22)

Test Set Up and Procedure



Equipment needed:

- Function/signal generator/sweep generator
- Integrated Amplifier
- Multimeter
- Speaker cables

Initial Control Settings:

- Power Switch OFF; Filter OFF
- Level MIN (Full CCW)
- Phase, Auto/On switches do not matter

General Unit Function (UUT = Unit Under Test)

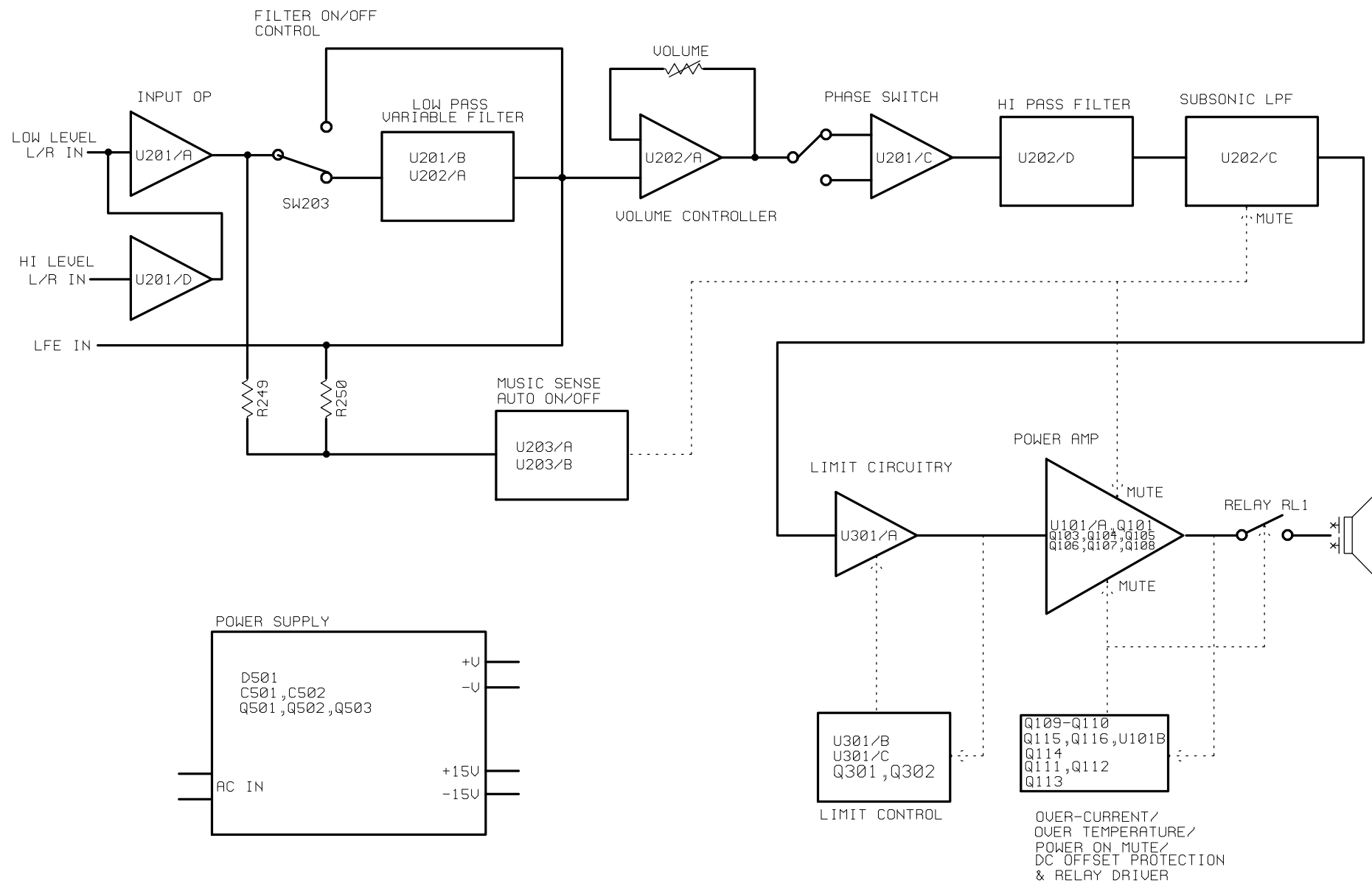
- 1) From the signal generator, connect one line level (RCA) cable to the Subwoofer Line Level Input jacks L/R on the UUT. Use a Y-cable from a mono source if necessary to connect to both inputs. Do not connect to the single, purple SUB input.
- 2) Turn on generator; adjust to **75mV, 50 Hz**.
- 3) Plug in UUT; turn the power switch ON. Turn LEVEL control full clockwise (MAX)
- 4) LED should turn from Amber to Blue (on top of UUT); immediate and vigorous bass response should be heard and felt from port tube opening.
- 5) Turn off generator, turn LEVEL control full counterclockwise (MIN), and disconnect RCA cable.
- 6) Connect one pair of speaker cables to Speaker Level input terminal (IN) on UUT. Cables should be connected to an integrated amplifier fed by the signal generator.
- 7) Turn on generator and adjust so that speaker level input at the amplifier is **1.6V, 50 Hz**. Turn LEVEL control full clockwise.
- 8) LED should turn from Amber to Blue; immediate and vigorous bass response should be heard and felt from the port tube opening.

Sweep Function

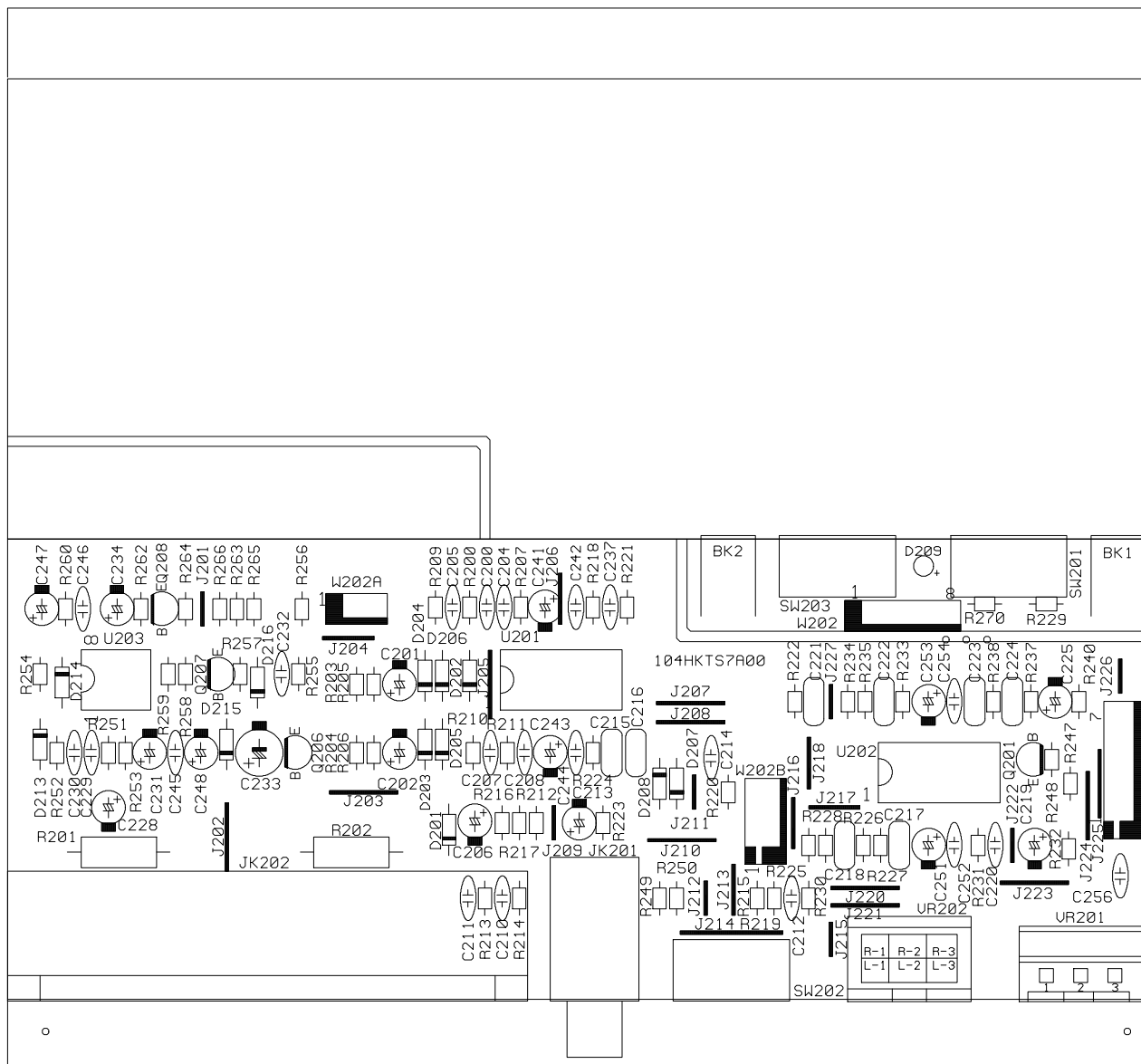
- 1) Follow steps 6-8 above, using a sweep generator as a signal source.
- 2) Sweep generator from 20Hz to 300Hz. Listen to the cabinet and drivers for any rattles, clicks, buzzes or any other noises. If any unusual noises are heard, remove woofers and test.

Driver Function

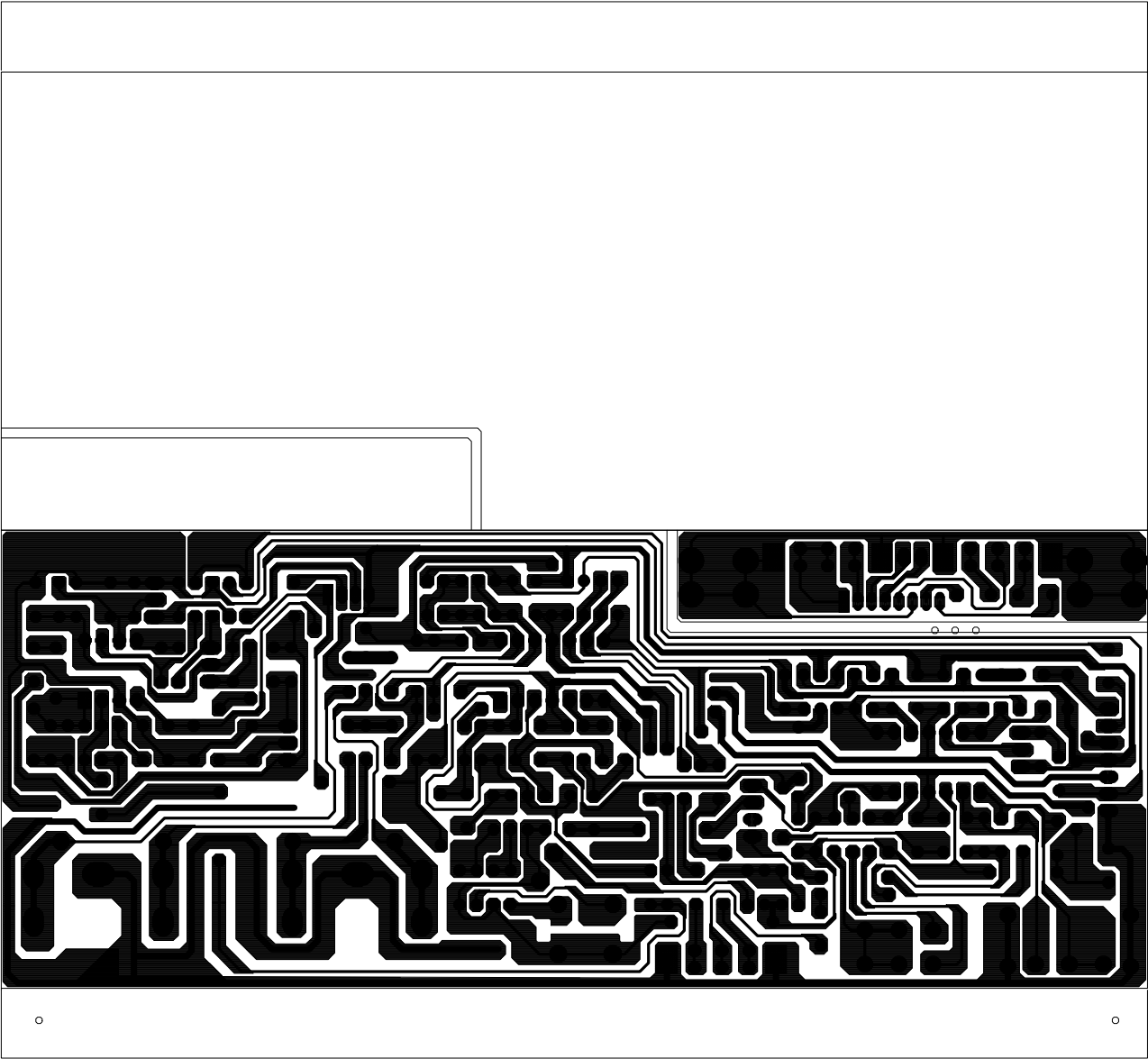
- 1) Remove woofer from cabinet; detach + and - wire clips.
- 2) Check DC resistance of woofer; it should be **3.0 ohms $\pm 10\%$**
- 3) Connect a pair of speaker cables to driver terminals. Cables should be connected to an integrated amplifier fed by a signal generator. Turn on generator and adjust so that speaker level output is **5.0V**.
- 4) Sweep generator from 20Hz to 1kHz. Listen to driver for any rubbing, buzzing, or other unusual noises.



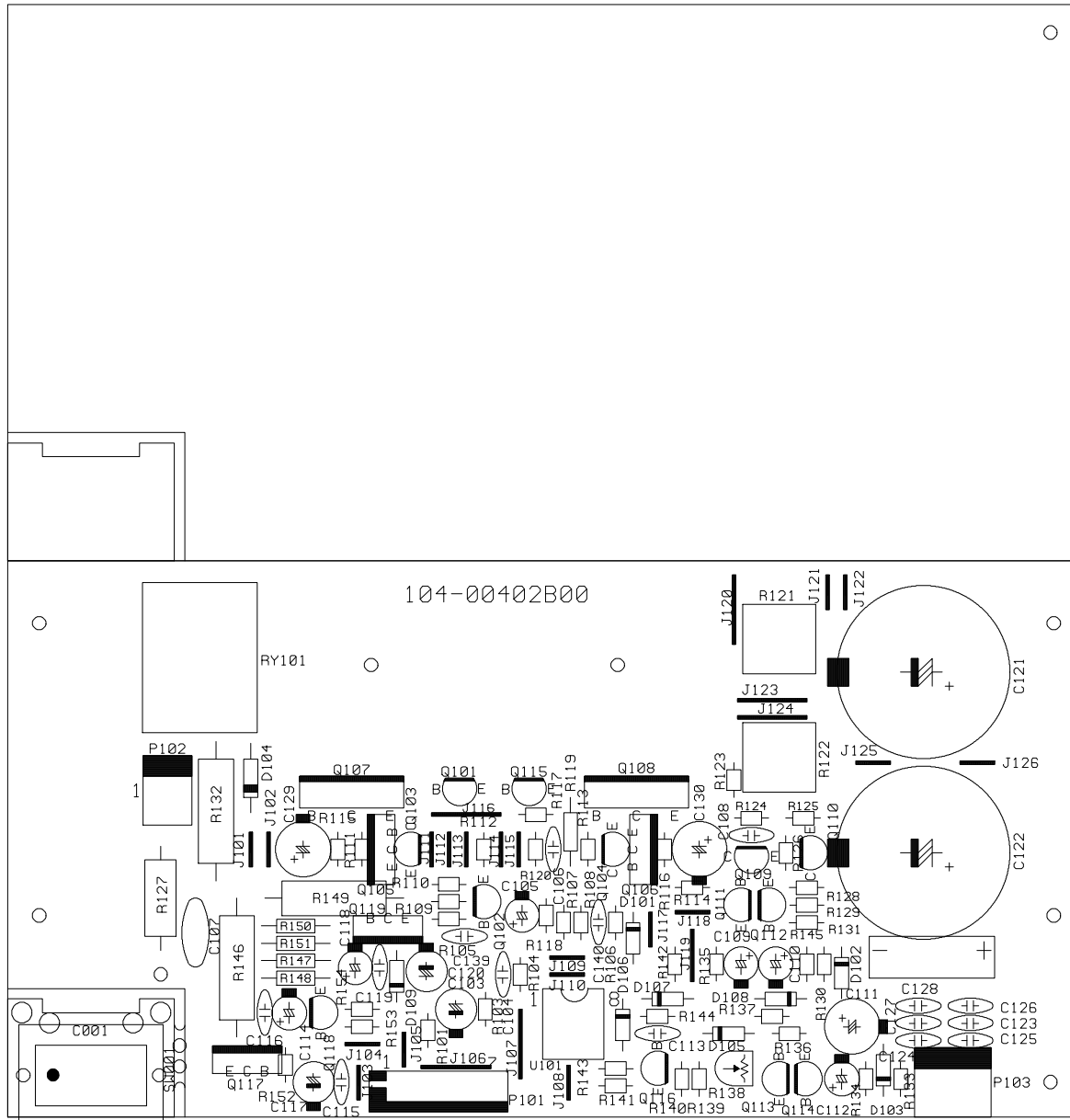
HKTS7 BLOCK DIAGRAM



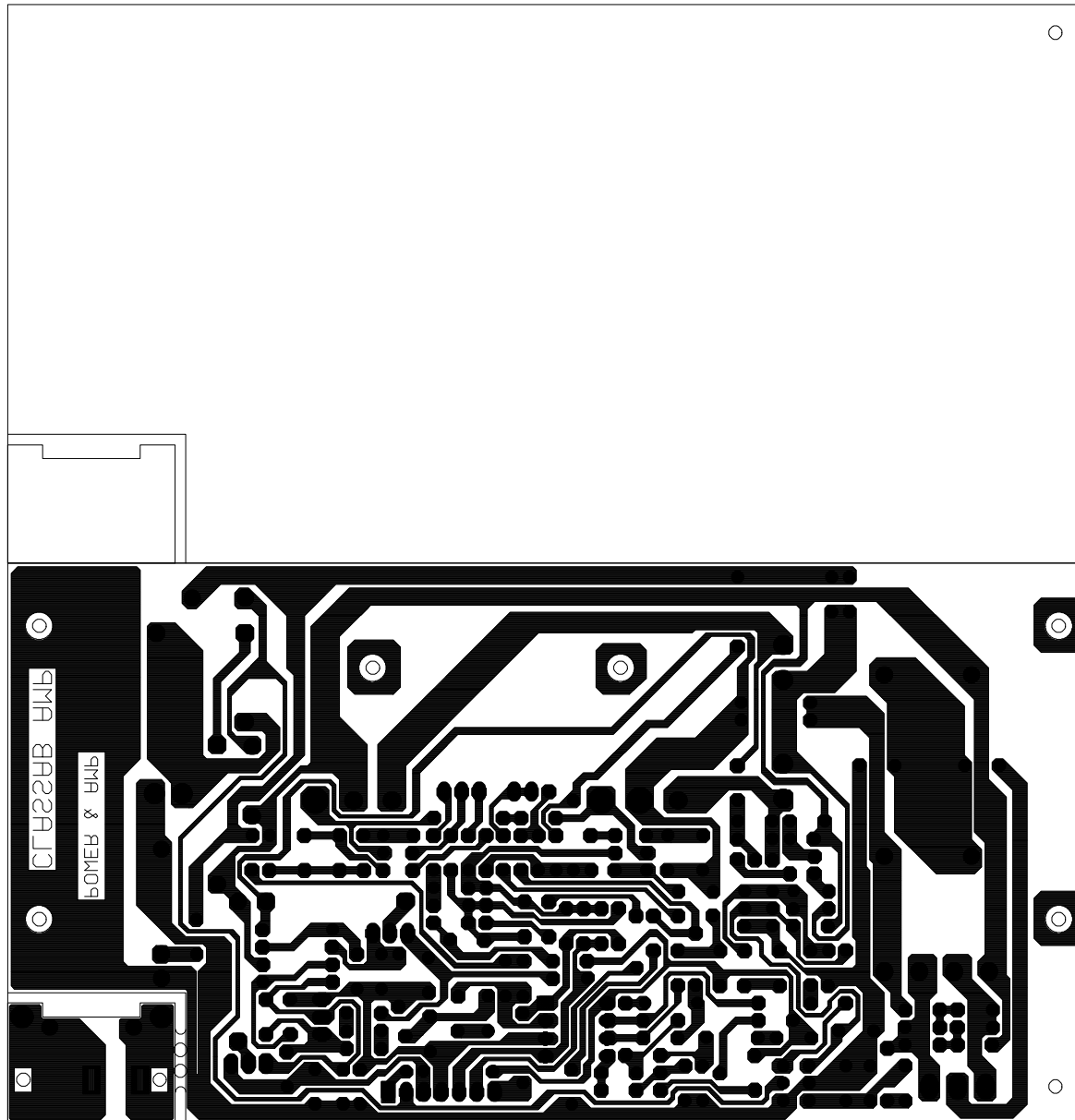
DRAW.	DSGN.	APUD.	FILENAME : HKS7PRE.PCB		REVISION:	
			MODEL NO. 104-HKS7A00		1	
			MATERIAL : FR-1 (94V0)		2	
			LAYER SILK SCREEN		3	



	DRAW.		DSGN.		APVD.		FILENAME : HKTS7PRE.PCB		REVISION:	
							MODEL NO. 104-HKTS7A00		1	
							MATERIAL : FR-1 (94V0)		2	
							LAYER SOLDER PATTERN		3	



				FILENAME : HKTS7U.PCB	REVISION:
				MODEL NO. 104-00402B00	1
				MATERIAL : FR-1 (94U0)	2
				LAYER SILK SCREEN	3



	DRAW.		DSGN.		APVD.		FILENAME : HKTS7U.PCB	REVISION:
							MODEL NO. 104-00402B00	1
							MATERIAL : FR-1 (94V0)	2
							LAYER SOLDER PATTERN	3

SUB-TS7 120V Electrical parts list			
Part number	Description	Qty	Reference Designator
PREAMP PCB			
<i>Resistors</i>			
110-12472j52	resistor 4.7K 1/2W ± 5% CF 52mm	2	R201,202
110-16102j26	resistor 1K 1/6W ± 5% CF 26mm	4	R213,214,215,254
110-16103j26	resistor 10K 1/6W ± 5% CF 26mm	18	R209,212,216,217,218,220,221,222,225,228,229,230,232,235, 240,248,260,270
110-16104j26	resistor 100K 1/6W ± 5% CF 26mm	3	R231,263,266
110-16105j26	resistor 1M 1/6W ± 5% CF 26mm	1	R259
110-16122j26	resistor 1.2K 1/6W ± 5% CF 26mm	1	R265
110-16124j26	resistor 120K1/6W ± 5% CF 26mm	1	R233
110-16151j26	resistor 150Ω1/6W ± 5% CF 26mm	1	R253
110-16154j26	resistor 150K 1/6W ± 5% CF 26mm	1	R252
110-16182j26	resistor 18K 1/6W ± 5% CF 26mm	1	R262
110-16203j26	resistor 20K 1/6W ± 5% CF 26mm	2	R237,238
110-16205j26	resistor 2M 1/6W ± 5% CF 26mm	2	R257
110-16223j26	resistor 22K 1/6W ± 5% CF 26mm	3	R247,255,256
110-16273j26	resistor 27K 1/6W ± 5% CF 26mm	2	R226,227
110-16472j26	resistor 4.7K 1/6W ± 5% CF 26mm	3	R200,207,258
110-16473j26	resistor 47K 1/6W ± 5% CF 26mm	5	R219,249,250,251,264
110-16512j26	resistor 5.1K 1/6W ± 5% CF 26mm	2	R210,211
110-16513j26	resistor 51K 1/6W ± 5% CF 26mm	2	R223,224
110-16752j26	resistor 7.5K 1/6W ± 5% CF 26mm	1	R234
110-16913j26	resistor 91K 1/6W ± 5% CF 26mm	4	R203,204,205,206
115-h503a103	variable resistor RV16AE-20B2-15K-A54-104(A50K)	1	VR201
<i>Capacitors</i>			
129-a224j633	metalize 0.22uF 63V ±5% MSC	1	C218
130-2b221k503	disc capacitor 220P 50V ±10%	12	C200,204,205,207,208,210,211,212,214,220,230,237
130-2b470k503	disc capacitor 47P 50V ±10%	1	C229
130-2f104z503	disc capacitor 0.1U 50V +80/-20%	8	C232,242,244,245,246,252,254,256
132-183j503	mylar capacitor 0.018uF 50V ±5%	1	C223
132-223ja03	mylar capacitor 0.022uF 100V ±5%	1	C215
132-473j503	mylar capacitor 0.047U 50V ±5%	1	C224
132-563j503	mylar capacitor 0.056U 50V ±5%	1	C216
132-823j503	mylar capacitor 0.082U 50V ±5%	1	C217
135-3105m50	electrolytic 1U 50V ±20%	10	C201,202,209,213,219,231,241,243,251,253
135-3107m16	electrolytic 100uF 16V ±20%	1	C234
135-3226m50	electrolytic 22U 50V ±20%	1	C225
135-3227m16	electrolytic 220U 16V ±20%	1	C233
129-a154j633	Mylar capacitor 0.15U 63V ±5% MSC	2	C221,222
<i>Semiconductors</i>			
192-027c1815gr	Transistor 2SC1815GR NPN	3	Q201,206,207,208
197-131n4148	diode 1N4148 26mm	11	D201,202,203,204,205,206,207,208,214,215,216
199-15000335	zenerdiode 3.3V 1/2W 52mm	1	D213
190-06m4558d	I.C. OPA 4558D Dual Op-Amp	1	U203
190-16tl074cn	I.C TL074CN ST Quad Op-Amp	2	U201,202
162-50332003	wire 2PIN 330mm RED	1	D209
<i>Miscellaneous</i>			
174-0rca313v	RCA JACK RCA-313G V/R/W	1	JK201
174-20810360g	JACK SPK JK BP 8PIN SH0810360G US1.35	1	JK202
175-1b08v01	wire connector 8 PIN PITCH=2.0mm	1	
180-tms7210v	SWITCH SLIDE 6PIN MS7210V	3	SW201,202,203

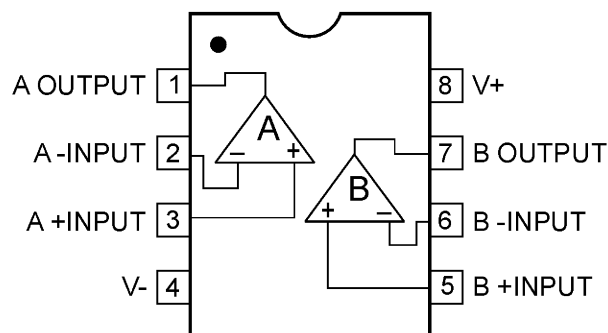
Part number	Description	Qty	Reference Designator
MAIN PCB			
<i>Resistors</i>			
110-14472j26	resistor 4.7K 1/4W ±5% CF 26mm	2	R147,150
110-14681j26	resistor 680Ω1/4W ±5% CF 26mm	1	R148,151
110-16101j26	resistor 100Ω1/6W ±5% CF 26mm	1	R120
110-16102j26	resistor 1K 1/6W ±5% CF 26mm	1	R124
110-16103j26	resistor 10K 1/6W ±5% CF 52mm	1	R134
110-16105j26	resistor 1M 1/6W ±5% CF 26mm	1	R143
110-16123j26	resistor 12K 1/6W ±5% CF 26mm	2	R135,139
110-16152j26	resistor 1.5K 1/6W ±5% CF 26mm	6	R103,123,136,137,141,142
110-16153j26	resistor 15K 1/6W ±5% CF 26mm	4	R118,145,152,154
110-16154j26	resistor 150K 1/6W ±5% CF 26mm	1	R131
110-16181j26	resistor 180Ω1/6W ±5% CF 26mm	2	R111,114
110-16182j26	resistor 1.8K 1/6W ±5% CF 26mm	1	R153
110-16223j26	resistor 22K 1/6W ±5% CF 26mm	3	R128,129,133
110-16332j26	resistor 3.3K 1/6W ±5% CF 26mm	3	R106,107,144
110-16392j26	resistor 3.9K 1/6W ±5% CF 26mm	2	R105,108
110-16393j26	resistor 39K 1/6W ±5% CF 26mm	1	R126
110-16470j26	resistor 47Ω 1/6W ±5% CF 26mm	4	R112,113,115,116
110-16471j26	resistor 470Ω 1/6W ±5% CF 26mm	1	R140
110-16472j26	resistor 4.7K 1/6W ±5% CF 26mm	3	R110,125,130
110-16473j26	resistor 47K 1/6W ±5% CF 26mm	1	R101
110-16560j26	resistor 56Ω1/6W ±5% CF 26mm	1	R117
110-16563j26	resistor 56K 1/6W ± 5% CF 26mm	1	R104
110-16682j26	resistor 6.8K 1/6W ± 5% CF 26mm	1	R109
110-10821jk2	resistor 820Ω 1W ±5% 10mm	1	R132
110-122r2j15	resistor 2.2Ω 1/2W ±5% 15mm	1	R127
110-20331jk2	resistor 330Ω 2W ±5% 5mm	2	R146,149
113-50r10j10	cement resistor 0.1Ω 5W ±5%	2	R121,122
114-03302m0	semi-fixed resistor 3K 0.3W ±20%	1	R138
<i>Capacitors</i>			
130-2b102k503	disc capacitor 1000P 50V ±10%	1	C116
130-2f104z503	disc capacitor 0.1U 50V +80/-20%	4	C108,113,115,119
130-3f473m503	disc capacitor 0.047U 50V ±20%	1	C106
130-sl101k503	disc capacitor 100P 50V ±10%	2	C139,140
132-104j503	mylar capacitor 0.1U 50V ±5%	1	C107
132-223ja03	mylar capacitor 0.022uF 100V ±5%	4	C124,125,126,128
135-3105m50	electrolytic 1U 50V ±20%	2	C105,112
135-3107m16	electrolytic 100uF 16V ±20%	3	C109,117,120
135-3226m50	electrolytic 22U 50V ±20%	2	C114,118
135-3227m10	electrolytic 220U 10V ±20%	2	C129,130
135-3476m25	electrolytic 47U 25V ±20%	1	C103
130-3f472md00	disc capacitor 4700P 400V ± 20%	1	
132-223ja03	mylar capacitor 0.022uF 100V ±5%	2	C123,127
135-3107m16	electrolytic 100uF 16V ±20%	1	C110
135-4688m50	electrolytic 6800U/50V ±20% D25X45mm	2	C121,122
<i>Semiconductors</i>			
192-027c1815gr	Transistor 2SC1815GR NPN	5	Q102,111,112,113,118
192-028a1015gr	Transistor 2SA1015GR PNP	2	Q114,116
192-1672n5551	Transistor 2SN5551 NPN	2	Q103,109
192-1682n5401	Transistor 2SN5401AI-PNP 350V 500mA TO-92	2	Q104,110
197-131n4148	diode 1N4148 26mm	4	D101,103,105,108
199-15000335	zener diode 3.3V 1/2W 52mm	1	D102
199-15000625	zener diode 6.2V 1/2W 52mm	2	D106,107
199-15001605	zener diode 16V 1/2W 52mm	1	D109
190-06m4558d	I.C. OPA 4558D DUAL OP-AMP	1	U101
192-021c1815gr	Transistor 2SC1815GR NPN	2	Q101,115
192-021tip35c	Transistor tip35c NPN	1	Q107
192-02tip36c	Transistor tip36c PNP	1	Q108
192-201d882y	Transistor KSD882Y NPN	1	Q117
192-202b772y	Transistor KSB772Y PNP	1	Q119

Part number	Description	Qty	Reference Designator
MAIN PCB			
192-991d669a	Transistor HI-SINCERITY HSD669A NPN	1	Q106
192-992b649t	Transistor HSB649T PNP	1	Q105
197-00kb1405	diode 4A 500V KBL405	1	D110
197-101n4002	diode 1N4002	1	D104
<i>Miscellaneous</i>			
162-10202001	wire 26AWG 1007 200mm RED 3mm	1	
171-udhss124d	relay 5A 24V UDH-SS124D	1	RY101
175-1c07v01	wire connector 7PIN PITCH=2.5mm	1	P101
175-1d02v01	wire connector 2PIN PITCH=3.96mm	1	P102
175-1d03v01	wire connector 3PIN PITCH=3.96mm	1	P103
193-3m2520	insulator TO-3P 25x20mm	2	Q107,108
150-e8604107	power transformer EI-86 60Hz 120V TT0869906580	1	
152-u602015	line cord SVT FT-2 6FT	1	
154-u25006t0	fuse 2.5A 250V 20mm	1	
155-520020	fuse holder R3-11	1	
162-10082007	WIRE RED 18AWG 80mm 8mm#1015	1	
162-a040d001	WIRE #1015 400mm 991110-00	2	
163-11009	wire tie 100mm	2	
176-wjcel	wire connector PIN CE-1	1	
180-pbr12c11s	switch PUSH BR12C11S	1	
LIMITER PCB			
<i>Resistors</i>			
110-16103j26	resistor 10K 1/6W ± 5% CF 26mm	6	R301,303,304,308,309,314
110-16153j26	resistor 15K 1/6W ± 5% CF 26mm	1	R302
110-16223j26	resistor 22K 1/6W ± 5% CF 26mm	2	R310,312
110-16333j26	resistor 33K 1/6W ± 5% CF 26mm	1	R305
110-16474j26	resistor 470K 1/6W ± 5% CF 26mm	1	R307
110-16751j26	resistor 750K 1/6W ± 5% CF 26mm	2	R311,313
110-16755j26	resistor 7.5M 1/6W ± 5% CF 26mm	1	R306
<i>Capacitors</i>			
130-2f104z503	disc capacitor 0.1U 50V +80/-20%	2	C305,306
132-103j503	mylar capacitor 0.01U 50V ±5%	2	C302,303
135-3226m50	electrolytic 22U 50V ±20%	1	C301
135-3476m25	electrolytic 47U 25V ±20%	1	C304
<i>Semiconductors</i>			
192-027c1815gr	Transistor 2SC1815GR NPN	2	Q301,302
197-131n4148	diode 1N4148 26mm	2	D301,302
190-16tl074cn	*I.C TL074CN ST QUAD OP-AMP	1	U301
<i>Miscellaneous</i>			
162-10059001	wire 50mm WHITE UL1007 AWG26 6:6	1	
162-50159002	wire 7PIN 150mm AWG26 UL 2468	1	P302
175-9f40hr2	wire connector 40PIN PITCH=2.54mm HR2*40	0.15	
MISCELLANEOUS/MECHANICAL			
323-AL-00020	HEAT SINK 65*32*31		
351-AM03014A094	SCREW M3*14 BLK		
352-AM03008D040	SCREW □3*8 B type		
361-FE-00051	Transistor holder 14.2*8.0*5.2		
361-NYL-00054	Transistor Insulator (SW06002)		
150-e8604107	Power Transformer EI-86 60Hz 120V TT0869906580		T1
152-u602015	AC Line cord SVT FT-2		
154-u25006t0	fuse 2.5A 250V 20mm		

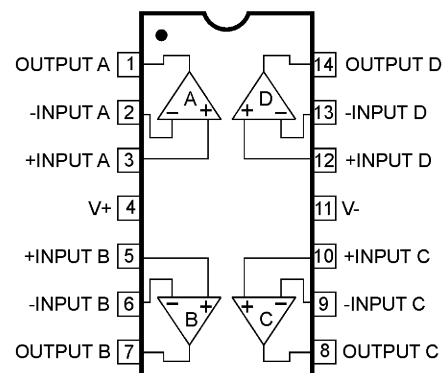
Part number	Description	Qty	Reference Designator
MISCELLANEOUS/MECHANICAL			
155-520020	fuse holder R3-11		
162-10082007	WIRE RED 18AWG 80mm		
162-a040d001	Speaker cable #1015 400mm 991110-00		
176-wjce1	terminal CE-1		
180-pbr12c11s	Power switch PUSH BR12C11S		
302-AL-00435-0BA	Alum. Back panel 270*215*2.5T		
306-ABS-00004	REAR CABINET 268*213*102 A.B.S UL		
311-ABS-00028	knob 46077-W P.V.C.		
320-RUB-00033	Rubber pad 25*21*4t		R-4
333-EVA-00096	EVA (Gasket) 213*15*2.0mm		
333-EVA-00097	EVA (Gasket) 213*15*1.0t		
333-EVA-00132	EVA (Gasket) 238*15*2.0mm		
333-EVA-00133	EVA (Gasket) 238*15*1.0t		
333-EVA-00188	EVA (Gasket) 170x5x1t		
333-EVA-00220	EVA (Gasket) 225*15*1t UL		
350-EM04012D024	SCREW 4□*12 BLK		R/C-4
351-AM03008A079	SCREW M3*8 BLK		BRKT-2,PCB TO BRKT-4
351-HM04016A218	SCREW M4*16		R-4
352-AM03010D063	SCREW □3*10 B type		R/P-6,R/P TO H/S-2
352-AM03010D065	SCREW □3*10 P type		-2,RCA JK-1
354-GM04002	M4 NUT BLK		R-4

Integrated Circuit Diagrams

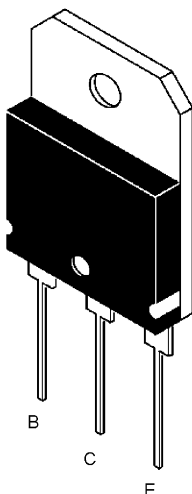
4558 Dual Op Amp
U101,203



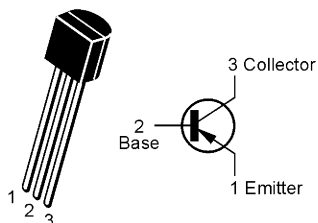
OPAMP, QUAD 14P DIL TL074
U201, 202, 301



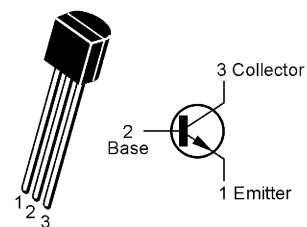
TIP35C, TIP36C
Q107,108



2N5401
Q104, 110



2N5551
Q103, 109



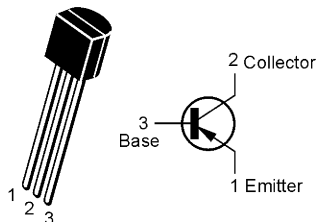
HSD669, HSB649,
KSD772Y, KSD8827

Q106,109,117,119

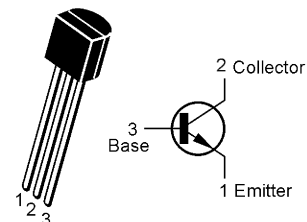


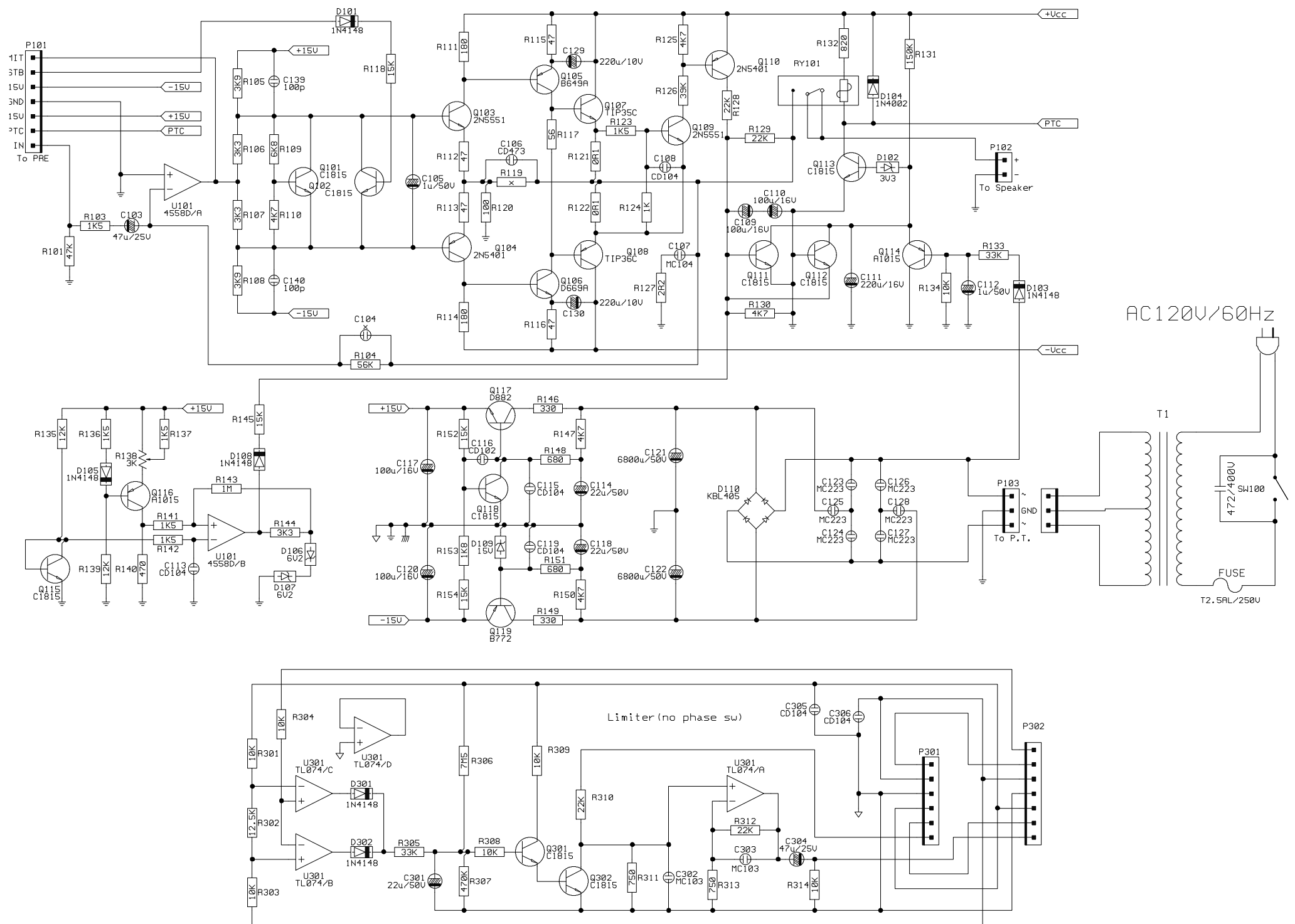
1. Emitter
2. Collector
3. Base

2SA1015
Q114,116,105



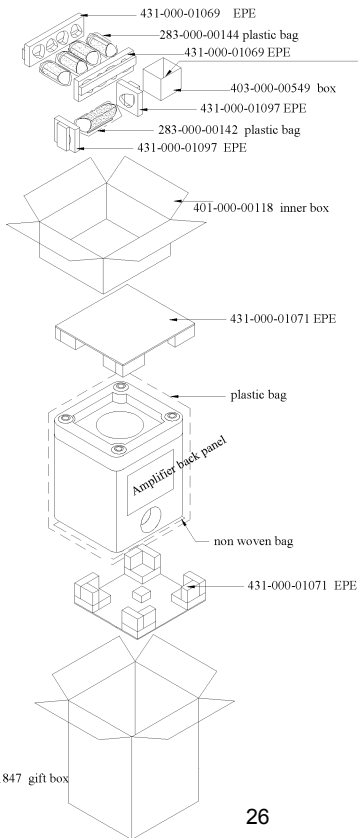
2SC1815
Q101,102,111,112,113,115,118,201,
206,207,208,301,302





Package drawing

Model: HKTS 7



326-ABS-00108 Mounting bracket
 326-FE-00109 Metal plate
 317-PS-00172 Terminal cover
 370-000-00257 green cable
 370-000-00261 white cable
 370-000-00256 red cable
 370-000-00264 grey cable
 370-000-00265 blue cable
 370-000-00092 purple RCA cable
 371-000-00360 screw package

(in a bag in inner box)

398-PAP-00319 color code
 405-000-00333 warranty card
 406-000-00980 owners manual