

# SERVICE MANUAL

Subwoofer Amplifier Model:  
RW-12

# **CAUTION!**

**Lethal voltages are present and exposed  
when cover is off of amplifier.**

Only qualified service technicians  
should attempt to repair this product.



## TABLE OF CONTENTS

<b>SPECIFICATIONS .....</b>	<b>3</b>
<i>Model: RW-12 .....</i>	<i>3</i>
<b>THEORY OF OPERATION .....</b>	<b>4</b>
<i>INPUTS.....</i>	<i>4</i>
<i>SIGNAL CONDITIONING .....</i>	<i>4</i>
<i>OUTPUT.....</i>	<i>4</i>
<i>POWER SUPPLY.....</i>	<i>4</i>
<i>OTHER FEATURES .....</i>	<i>5</i>
<b>PARTS LISTS.....</b>	<b>6</b>
<b>SCHEMATIC DIAGRAMS.....</b>	<b>10</b>
<b>BLOCK DIAGRAM.....</b>	<b>13</b>

## SPECIFICATIONS

### Model: RW-12

Rated Power Output	340 Watts Continuous into 4 $\Omega$
Maximum Power Output	825 Watts(peak) into 4 $\Omega$
Frequency Band-width	16 - 115Hz
THD	< 1.0% @ 1 Watt < 2.0% @ Rated Power < 5.0% @ Maximum Power
Signal to Noise	98dB or better
60 Hz Hum	<500 $\mu$ V
Input Sensitivity for Rated Output	Line Input = 150mVrms @ 80Hz Speaker Input = 580mVrms @ 80Hz
Circuit Gain	Line Input = 48dBv @ 80Hz Speaker Input = 25dBv @ 80Hz
Input Impedance	Line Input = 10K $\Omega$ Speaker Input = 200 $\Omega$
Auto-on Sensitivity	Line Input = 10mVrms (20Hz - 2kHz) Speaker Input = 130mVrms(20Hz - 2kHz)
Auto-On Delay	1-2 Seconds
Auto-Off Delay	> 15 minutes
Low Pass	Variable 40 - 120Hz with 24dB/Octave Slope
Phase Control	Variable 0 - 180°

# THEORY OF OPERATION

## RW-12 Amplifier

### INPUTS

This amplifier utilizes two RCA connectors(L & R) for LINE LEVEL signal input. A second RCA connector is LFE input. There is also a set of binding post connections for SPEAKER (HIGH) LEVEL input.

### SIGNAL CONDITIONING

All pre-amplification, filtering, and signal conditioning is accomplished using quad op-amp devices U1, U2, U3, and U4. Op-amp U1B, and U1C are gain stages that performs the necessary buffering and isolation of the input signals. The input signal/s from Line In and Speaker In are fed to summing amp U1B. From there the signal passes through the fixed Low Pass filter U1A, and the variable Low Pass filter U2B. Stage U1C buffers the LFE In signal. The signal from the LFE input bypasses the LowPass filters stages and is summed back into the normal signal path at the volume control stage U2C. From there the signal is split into 2 paths; the high frequency path U2D/U2A and the low frequency path consisting of U3C/U3A/U4D/U4C. U2D is a unity gain buffer stage and U2A is a High Pass filter tuned to approximately 55Hz. U3C is a limiter/compressor, U3A is a unity gain buffer, and U4D and U4C form a Band Pass filter with a bandwidth of approximately 19 - 30Hz. The signals are summed back together at U4B which also provides additional gain. U4A is a variable phase control stage.

### OUTPUT

The Power Amplifier(PA) section of this amplifier is a balanced bridge design. Signal splitter stages U100A and U100B feed pre-amps U100D and U100C which in turn feed the signal to the linear driver stages Q701-704, and Q707-710. The signal is then applied to the power output MOSFET's Q105/Q106, and Q111/Q112. The maximum output capability of the amplifier is determined primarily by the output transistor type, and the DC rail voltage/current supplied by the power supply. The value of feedback resistors R126 and R146 determine the gain of the PA section. Trimmer pots R714 and RP734 establish the DC offsets.

### POWER SUPPLY

The RW-12 utilizes a high current switching power supply with **proprietary** output controller circuitry. This controller circuitry tracks the input signal and continually adjusts the rail voltages to what is needed at the time. This creates a high efficiency amplifier since very little current is flowing when not needed. The power supply also supplies a highly regulated +/- 15Vdc for the op-amps.

### LIMITERS

This amplifier contains Compressor/Limiter circuits for the purpose of controlling the signal so as not to drive the speakers beyond their physical limits. Op-amp stage U3B and JFET Q1 form an overall Compressor/Limiter which limits the output to the speakers to the rated power level. U3D and JFET Q2 form a Compressor/Limiter in the low frequency path limiting the power output only below a specific frequency. In the RW-12 this frequency is approximately 30Hz.

## **OTHER FEATURES**

### **AUTO ON/OFF**

This amplifier features an automatic on/off circuit that allows the user to set up once and forget it. With the power switch in the “AUTO” position, a switching circuit consisting of U1D, U5A, & U5B, senses an input signal. From this switching circuit, JFET Q100 on the power amp board is biased OFF which removes the grounding of the signal. For the protection of the speaker when the amplifier is first plugged in, there is a short delay before JFET Q100 is biased OFF. The sensing circuit will bias Q100 ON after the input signal is absent for approximately 15 minutes or more which shorts the signal path to ground. With the power switch in the “ON” position the signal sensing circuit is bypassed and Q100 is always turned OFF. A bi-color LED indicates the status of the amplifier at any given time. The LED will be GREEN when the control circuit is activated and RED when in sleep mode.

## RW-12 PARTS LIST

PART	DESCRIPTION	KLIPSCH PT #
<b>POWER SUPPLY BOARD</b>		
T400	XFMR, POWER 100V HC TRAN ETD39	
L402	IND, CM CHOKE 1.8mH	
L200	IND, POWER 16T 19.2UH W/BOBBIN	
C430,C431,C433,C434	NOT INSTALLED	
C200,C208	CAP, CA 470PF 100V 5%	
C202	CAP, CA 1000PF 100V 10%	
C204	CAP, CA 2200P 100V 10%	
C205,C206,C209,C407,C421,C422,C424	CAP, CA .1UF 50V 20%	
C207	CAP, CA .01UF 100V 20%	
C413,C414,C435,C436	CAP, C 1UF 100V 20% .2LS	
C417 (120V)	CAP, CY1 1500PF 250V 20% .4LS	
C417 (230V)	CAP, CY1 4700PF 250V 20% .4LS	
C418,C419	CAP, E 47UF 50V 20% 5MMLS	
C427,C428	CAP, E 470UF 200V 20% 22X40	
C426	CAP, E 22UF 50V 20% 5X11 5MMLS	
C412	CAP, E 1000UF 100V 18X40	
C415,C416	CAP, F .1UF 250V 10% 10MMLS	
C400,C432	CAP, FX .22UF 250V 10% 22MMLS	
C203	CAP, F 6.8UF 250V 5% 27.5MMLS	
C403,C429	CAP, F .1UF 250V 10% 5MMLS	
D400	RECT, 6A 400V BRIDGE PRETRIM	
D407	RECT, 16A 200V CATHODE FEP16DT	
D203,D408	RECT, 1A 100V FAST REC 1N4934	
D405,D406	RECT, 1A 600V ULTRAFAST MUR160	
D200	RECT, 15A 200V ULTRA MUR1520	
D201	RECT, 100mA 75V SIGNAL 1N4148T	
Z405	ZENER, 500MW 16V 5% 1N5246B	
R400	SURGISTOR, 10R 2A CL-110	
Z400	VARISTOR, 275V 100J .6W	
Q201	TRANS, PNP 40V .6A TO92 2N4403	
Q403,Q405	TRANS, NPN 40V .6A TO92 2N4401	
Q404	TRANS, NPN 150V 0.6A 2N5551TR	
Q401,Q402	MOSFET, IRF740 TO220AB IR ONLY	
Q200	MOSFET, IRF540 TO220AB IR ONLY	
R422,R423	NOT INSTALLED	
R426	RES, CF 160K 1/4W 5%	
R401,R414	RES, MF 100K 1/4W 1%	
R427,R428	RES, MF 100R 1/4W 1%	
R214	RES, MF 47R5 1/4W 1%	
R412	RES, MF 4K75 1/4W 1%	
R215	RES, MF 90R9 1/4W 1%	
R200	RES, MF 16K5 1/4W 1%	
R416	RES, MF 49K9 1/4W 1%	
R415	RES, MF 8K45 1/4W 1%	
R202	RES, MF 8K66 1/4W 1%	
R413,R421	RES, MF 10R 0.6W 1% FLAMEPROOF	
R209	RES, MF 22R 0.6W 1% FLAMEPROOF	
R201	RES, MF 2K26 1/4W 1%	
R206	RES, MF 100R 0.6W 1% FLAMEPRF	
R211	RES, MO 330R 2W 5%	
R425	RES, MO 47K 1W 5%	

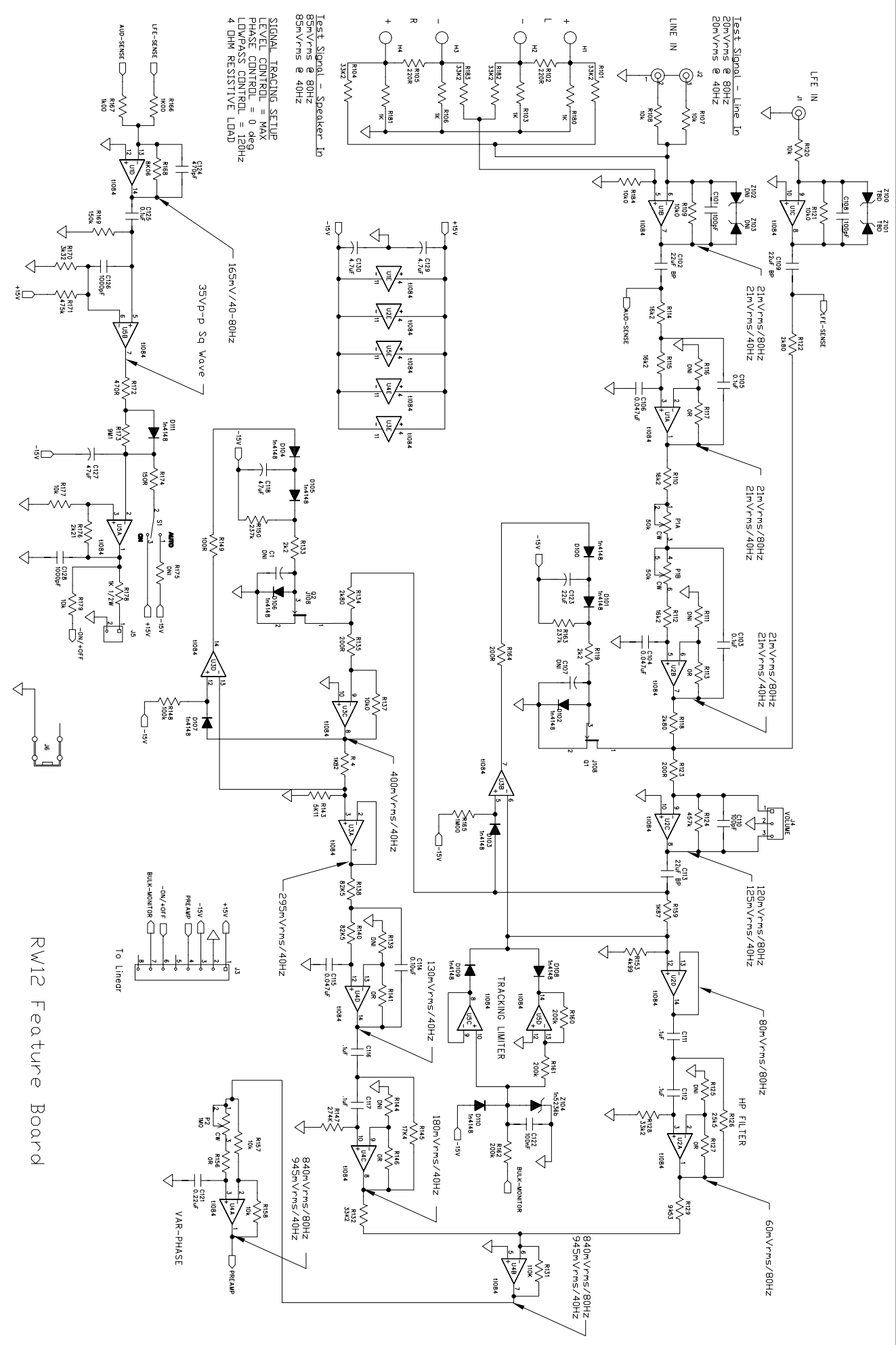
## RW-12 PARTS LIST

PART	DESCRIPTION	KLIPSCH PT #
R203,R204,R210	RES, MO 0R1 2W 5% 1W BODY	
<b>BASH CONTROLLER BOARE</b>		
U200	SUBASSY, BASH CNTRLR MULTI	
C1	CAP, CA 1000PF 100V 10%	
C6	CAP, CA 47PF 50V 10%	
C3	CAP, F 2200PF 100V 5% 5MMLS	
D1,D2,D3,D4	RECT, 100mA 75V SIGNAL 1N4148T	
Q2,Q4	TRANS, NPN 40V .6A TO92 2N4401	
Q1,Q3	TRANS, PNP 150V 0.6A 2N5401TR	
R6,R9	RES, CF 10K 1/8W 5%	
R12	RES, MF 2K32 1/4W 1%	
R2,R3	RES, MF 1K00 1/8W 1%	
R5	RES, MF 1K50 1/8W 1%	
R10,R11	RES, MF 475R 1/8W 1%	
R1	RES, MF 6K81 1/8W 1%	
R4	RES, MF 3K65 1/8W 1%	
U1	PWM, 8PIN DIP UC3842N	
<b>PDC CONTROLLER BOARD</b>		
U402	SUBASSY, PDC CNTRLR 1014	
C11	CAP, CA 4700PF 100V 10%	
C1,C2	CAP, F 3300PF 63V 5% 5MMLS	
D11	RECT, 1A2 60V DIAC HT60TR	
D12	RECT, 100mA 75V SIGNAL 1N4148T	
D13,D14	RECT, 100MA 200V SIGNAL 1N3070	
Z1,Z2	ZENER, 500MW 15V 5% 1N5245B	
Q11	TRANS, PNP TO92 MPSA92TR	
R12	RES, MF 1K00 1/4W 1%	
R1,R4	RES, MF 392R 1/4W 1%	
R2,R3,R5,R6	RES, MF 750R 1/4W 1%	
R11,R13,R14	RES, MF 200K 1/4W 1%	
<b>FEATURE BOARD</b>		
C1,C107	NOT INSTALLED	
C124	CAP, C 470PF 1KV 10% .2LS TR	
C126,C128	CAP, CA 1000PF 100V 10%	
C125	CAP, CA .1UF 100V 20%	
C101,C108,C110,C122	CAP, CA 100PF 100V NPO 10%	
C118,C127	CAP, E 47UF 50V 20% 5MMLS	
C123	CAP, E 22UF 50V 20% 5X11 5MMLS	
C129,C130	CAP, E 4.7UF 50V 85D 5X11 5MML	
C102,C109,C113	CAP, E 22UF 35V BP 8X11 5MMLS	
C103,C105,C111,C112,C114,C116,C117	CAP, F .1UF 63DC 5% 5MMLS	
C121	CAP, F .01UF 100V 5% 5MMLS	
C104,C106,C115	CAP, F .047UF 100V 5% 5MMLS	
D100,D101,D102,D103,D104,D105,D106,D107,D108,D109,D110, D111	RECT, 100mA 75V SIGNAL 1N4148T	
Z100,Z101,Z102,Z103	NOT INSTALLED	
Z104	ZENER, 500MW 7.5V 5% 1N5236B	
Q1,Q2	JFET, N CHAN J108 TO92	
R111,R116,R125,R139,R144,R175	NOT INSTALLED	
R178	RES, CF 1K0 1/2W 5%	
R174	RES, CF 150R 1/4W 5%	
R148	RES, CF 100K 1/4W 5%	









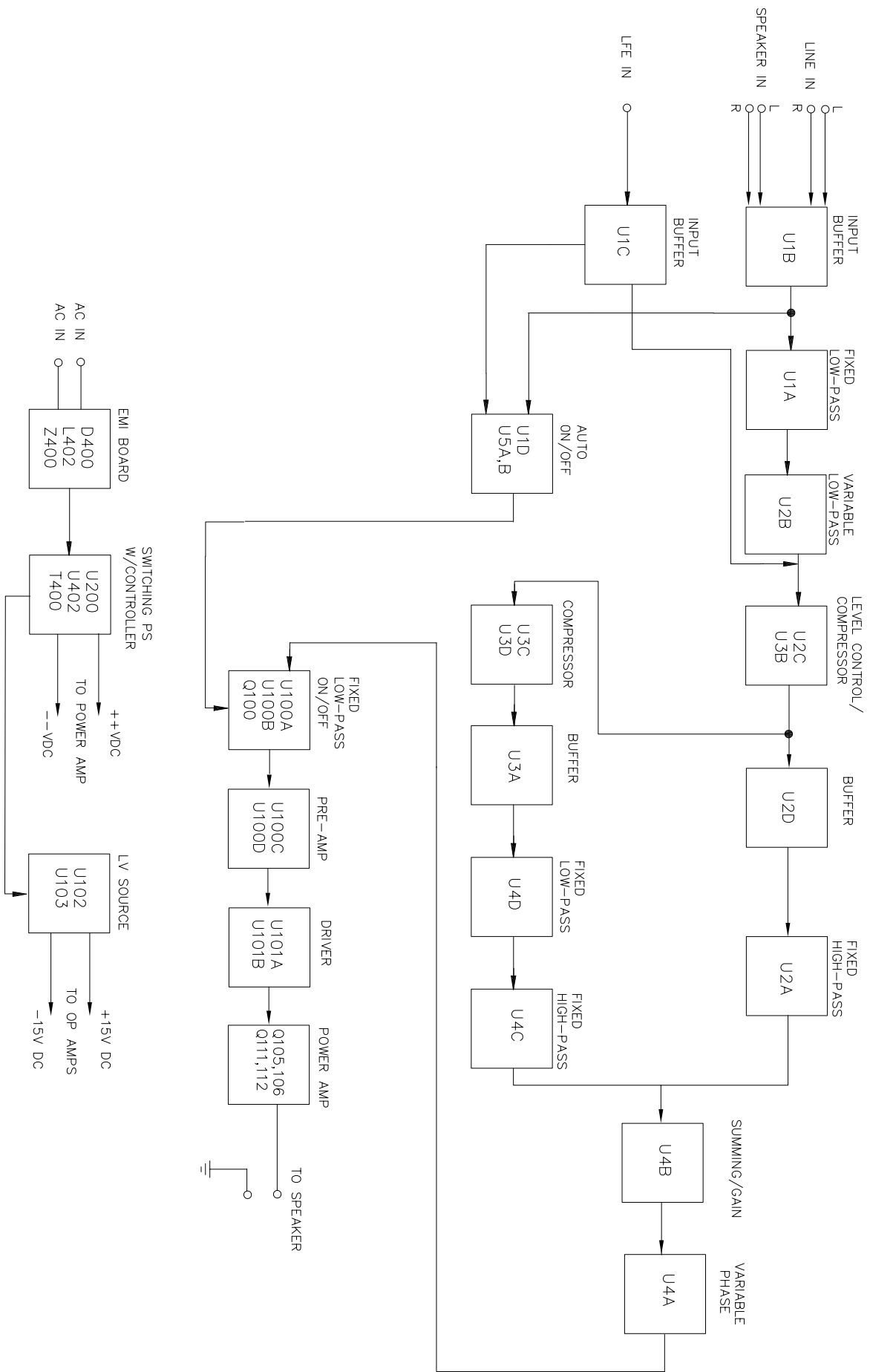
RW12 Feature Board

Test Signal - Speaker Lo  
 85mVrms @ 80Hz  
 85mVrms @ 40Hz

SIGNAL TRACING SETUP  
 LEVEL CONTROL = MAX  
 PHASE CONTROL = 0 deg  
 LOWPASS CONTROL = 120Hz  
 4 OHM RESISTIVE LOAD







RW-12 BLOCK DIAGRAM