

# SERVICE MANUAL

Subwoofer Amplifier Model:

SW12-I

SW15-I

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## Specifications

### Model: SW12-I

Input Sensitivity for max Rated Output: Line input 60mVrms @ 30Hz.  
Speaker input 700mVrms @ 30Hz.

Maximum Rated Output: 150 Watts into 8 ohms.

Max. Hum: 3.5mV @ 60Hz.

Max. Distortion: 4% At Full Rated Output.

Freq Response: 27 to 120Hz +/-3dB w/12dB per Octave Rolloff.

Bass Boost: +6dB Boost @ 30Hz.

Low Pass Crossover: Variable from 40 - 120 Hz.  
24 dB/Octave slope above 120 Hz.

High Pass Crossover: Line outputs fixed at 80 Hz, 6dB/Octave slope.  
Speaker outputs fixed at 120 Hz, 6dB/Octave slope.

### Model: SW15-I

Input Sensitivity for Max Rated Output: Line input 33mVrms @ 30Hz.  
Speaker input 900mVrms @ 30Hz.

Maximum Rated Output: 200 Watts into 4 ohms.

Max. Hum: 3.5mV @ 60Hz.

Max. Distortion: 4% At Full Output.

Freq Response: 27 to 120Hz +/-3dB w/12dB per Octave Rolloff.

Bass Boost: +6dB Boost @ 30Hz.

Low Pass Crossover: Variable from 40 - 120 Hz.  
24 dB/Octave slope above 120 Hz.

High Pass Crossover: Line outputs fixed at 80 Hz, 6dB/Octave slope.  
Speaker outputs fixed at 120 Hz, 6dB/Octave slope.

## THEORY OF OPERATION

### SW12, & SW15 Series I Amplifiers

#### INPUTS

There are two types of inputs and passive outputs. Four RCA jacks for LINE LEVEL left and right inputs and outputs and a panel of SPEAKER LEVEL inputs and outputs for left and right stereo channels. The SPEAKER LEVEL inputs have a high pass filter on each channel that allows frequencies above 120 Hz to go directly to the main speakers of the system. Frequencies below 120 Hz go through the subwoofer amplifier and on to the woofer. The LINE LEVEL inputs also use a high pass filter that allows frequencies above 80 Hz to go back out to a system amplifier. Frequencies below 80 Hz go through the subwoofer amplifier and on to the woofer. Both filters have a 6dB per octave rolloff.

#### SIGNAL CONDITIONING

The first op-amp of U1, a quad op-amp IC, is a summing amp for the RCA and SPEAKER level inputs. The LEVEL adjustment is located between the first and second op-amp stages of U1. The second op-amp of U1 is a buffer stage with a gain of 1. The third op-amp of U1 is a High pass filter configuration. The fourth op-amp of U1 is used to adjust phase from 0° to 180°. The next circuit is an adjustable RC filter for low pass filtering from 40Hz to 120Hz consisting of U2 and U4.

#### COMPRESSION

The compression circuit consists of U5, U6, and Q28 and is adjusted via R30. If adjusted correctly, this circuit will limit the amplitude of the signal so the minimum amount of distortion in the form of clipping will occur at the output of the amplifier. R34 is used to set the maximum output level for the amplifier so it doesn't underamplify or clip. Next, the signal goes through a buffer amplifier U2, which provides a gain of 4. Then the signal goes on to the driver circuits.

#### DRIVER CIRCUIT

The driver circuit consists of Q1 through Q12 and is located on the Filter/Driver board. The driver circuit has a DC offset adjustment, R50, which should be set at 0 Vdc +/- 50mVdc. This can be measured across the + and - output wires (white & black respectively) from the amp with power on and no signal applied. The driver circuit is a Class AB amplifier.

#### OUTPUT

The output section of this amplifier uses discrete components Q15 through Q26 to obtain the high power output required. The output amplifier circuit is a Class AB complementary symmetry configuration with three sets of four transistors cascaded. This provides high power output into a low impedance load. The components for the output circuit is located on the Power Board.

#### POWER SUPPLIES

The main power supply circuit is unregulated and supplies +/- 81 Vdc for the output and driver circuits. The +/- 81 Vdc is then divided and regulated by 34V zener diodes to supply +/- 34 Vdc to bias the driver circuit. There is a second power supply which is fed by a second set of taps off of the transformer. This is the regulated +/- 15 Vdc for the op-amps on the filter board.

## **OTHER FEATURES**

This amplifier uses a control circuit to control the operation of the output relay. When power is first applied the circuit provides a delay before activating the relay. This is a protection feature to protect the speaker and amplifier from initial current surges. The circuit also provides protection from over-current conditions by de-activating the relay when excessive output current is sensed. The relay and it's control circuitry is located on the Filter/Driver Board and consists of U11, U12, RLY 1 and R131. R131 is used to set the threshold level for over-current sensing.

**SW12-I AMPLIFIER ALIGNMENT PROCEDURE**

# **CAUTION!**

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



**Only qualified service technicians should attempt to repair or align subwoofer amplifiers.**

Equipment required:

- A signal source capable of supplying a 30Hz sine wave at 300mVrms.
- A true RMS Voltmeter such as the Fluke 8060B.
- A 16 ohm load rated for at least 200 Watts.
- An oscilloscope (optional).

To totally align SW12 series 1 amplifiers, follow this procedure:

1. Disconnect power from the UUT (unit under test).
2. Connect the UUT (unit under test) to a 16 ohm load.
3. Connect a signal generator to the RCA input of the amp.
4. Set all controls on the UUT to their full clockwise position.
5. Set the signal generator for 30Hz and 60mVrms output.  
(be sure and measure the output of the generator for 60mVrms.)
6. Connect the voltmeter leads to the output of the UUT.
7. Apply power to the UUT.
8. Adjust R34 for 33Vrms. Range is from 32.1 Vrms to 34 Vrms.
9. Change signal level to 1.5mVrms @ 30Hz .
10. Measure the output voltage. Should be between .94 Vrms and 1.06Vrms.  
Adjust R30 if necessary.

\* NOTE: Some interaction between adjustments is common. Recheck steps 8 and 10 for proper voltages.

11. Alignment of the UUT is now complete. Disconnect power and other connections from the UUT.

## SW15-I AMPLIFIER ALIGNMENT PROCEDURE

# CAUTION!

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



**Only qualified service technicians should attempt to repair or align subwoofer amplifiers.**

Equipment required:

- A signal source capable of supplying a 30Hz sine wave at 300mVrms.
- A true RMS Voltmeter such as the Fluke 8060B.
- A 16 ohm load rated for at least 300 Watts.
- An oscilloscope (optional).

To totally align SW15 series 1 amplifiers, follow this procedure:

1. Disconnect power from the UUT (unit under test).
2. Connect the UUT (unit under test) to a 16 ohm load.
3. Connect a signal generator to the RCA input of the amp.
4. Set all controls on the UUT to their full clockwise position.
5. Set the signal generator for 30Hz and 33mVrms output.  
(be sure and measure the output of the generator for 33mVrms.)
6. Connect the voltmeter leads to the output of the UUT.
7. Apply power to the UUT.
8. Adjust R34 for 29.5Vrms. Range is from 29.1Vrms to 30.1Vrms.
9. Change signal level to 1.5mVrms @ 30Hz .
10. Measure the output voltage. Should be between 1.19 Vrms and 1.33Vrms.  
Adjust R30 if necessary.

\* NOTE: Some interaction between adjustments is common. Recheck steps 8 and 10 for proper voltages.

11. Alignment of the UUT is now complete. Disconnect power and other connections from the UUT.

**TROUBLE SHOOTING GUIDE**

**CAUTION!**

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



**Only qualified service technicians should attempt to repair or align subwoofer amplifiers.**

**PROBLEM**

**POSSIBLE CAUSE**

<p>1 Blows fuse with nothing connected to the output.</p>	<p>1 Check output transistors on power board. Replace transistors that are shorted.</p> <p>2 Check driver transistors on filter/driver board. Replace transistors that are shorted.</p> <p>3 Check U7 and U9 for shorts.</p> <p>4 Check bridge rectifier in power supply circuit.</p> <p>5 Check transformer.</p> <p>6 Check filter capacitors. C21,C22, C23, C24, C44, C45, C46, and C47.</p> <p>7 Check for pinched wires going to and coming from the transformer.</p>
<p>2 Low output level using speaker level inputs.</p>	<p>1 Check inputs for correct polarity from source. If polarity is not correct, the signals will be 180° out of phase and will cancel each other out causing a low output.</p> <p>2 Check R79 and R80. Should read 91KΩ.</p> <p>3 Check U13.</p> <p>4 Check for proper signal flow using schematic.</p>



**TROUBLE SHOOTING GUIDE**(continued)

<b><u>PROBLEM</u></b>	<b><u>POSSIBLE CAUSE</u></b>
3 Causing popping sound.	<p>1 Connect amplifier output to a 16 ohm load. Apply a 60mVrms 30Hz signal to one RCA jack. The voltage across the load should be between 32.1 Vrms and 34 Vrms for SW12. 29.1 Vrms and 30 Vrms for SW15.</p> <p>For the THX amp., apply a 3Vrms 70Hz signal to one RCA jack. The voltage across the load should be between 35.1 Vrms and 36 Vrms.</p> <p>If this is correct, connect an oscilloscope to the output signal and look for clipping.</p> <p>If the voltage was too high, re-align amplifier per procedure on page 5, 6, or 7.</p> <p>If the signal was clipped, re-adjust the amplifier per alignment procedure on page 5, 6, or 7.</p>
4 Excessive hum.	<p>1 Check all ground connections.</p> <p>2 Check all filter capacitors. C21, C22, C23, C24, C44, C45, C46, and C47.</p>
5 Amplifier quits working after a short period of time.	<p>1 Check for excessive heat on heat sink. This indicates a bad output device or a bad thermal switch.</p> <p>2 Check output relay (RLY1).</p> <p>3 Check U11 and U12.</p>

**SW12-I PARTS LIST**

<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
LEVEL CONTROL	10K VARIABLE	
LOWPASS ADJUST	50K VARIABLE, DUAL	
PHASE ADJUST	100K VARIABLE	
R1, R2, R3, R128, R137, R138	15K	
R12, R11	47K	
R13, R35, R36, R133, R134	22K	
R132	2.2 Meg	
R139	39K	
R14, R21	6.65K	
R15	20K	
R16, R18, R19, R40, R41, R127	10K	
R17	5.23K	
R20	2K	
R22	30.1K	
R28, R29	220K	
R30, R34, R50	10K VARIABLE	
R31, R32, R37	100K	
R33, R42, R68, R71	100 $\Omega$	
R38	43K 2%	
R39	180K 2%	
R43, R44	10K 2%	
R6, R8, R46	4.7K	
R47, R53	4.3K 3WATT	
R9	0 $\Omega$	
R49	33.2K	
R51, R67	1K	
R54, R62	1.1K	
R55, R63	300 $\Omega$	
R56, R61	11.5K	
R57, R58, R59, R60	220 $\Omega$	
R6, R8	510 $\Omega$ 2WATT	
R64, R69	511 $\Omega$	
R65, R70, R73, R75	22.1 $\Omega$	
R66	39.2K	
R72, R74	2.7K 3WATT	
R10	91K	
R45	1M $\Omega$	
R7	47 $\Omega$	
R4, R5	300K	
C1, C2	.22 $\mu$ F	
C10, C27, C30	.1 $\mu$ F	
C11	.12 $\mu$ F	
C15, C53	.047 $\mu$ F	
C16, C17, C19	1 $\mu$ F 25V Electrolytic	
C20	.01 $\mu$ F	
C5	.001 $\mu$ F	
C29	2.2 $\mu$ F	
C3, C4	150 $\mu$ F 100V NON-POLAR	
C32, C33	470 $\mu$ F 50V Electrolytic	
C34, C35	22pF	

**SW12-I PARTS LIST**(continued)

<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
C36, C37, C39, C40	330pF	
C6	4.7 $\mu$ F 25V Electrolytic	
C55	10 $\mu$ F 63V Electrolytic	
C18	10 $\mu$ F 25V Electrolytic	
C7	.0027 $\mu$ F	
C8, C9	1 $\mu$ F	
D18	1N914B	
D5, D6	1N4752A Zener	
U1	MC4741	118744
U2, U4	MC1458N	118743
U5	NE570	118745
U6	LM393	118742
Q1, Q2, Q11	MPS8099	118735
Q28	2N3906	118728
Q3, Q4, Q12	MPS8599	118736
Q5	MPSW56	118738
Q6	MPSW06	118737
Q7, Q9	2SA1306B	118730
Q8, Q10	2SC3298B	118732
R100, R101, R102, R103, R110, R111, R112, R113	.47 $\Omega$ 5WATT	
R114	4.7 $\Omega$ 3WATT	
R115	1 $\Omega$ 3WATT	
R116, R121, R126, R130	10K	
R117, R119	56K	
R118	22K	
R120	390 $\Omega$ 1WATT	
R122, R123	100K	
R125	68 $\Omega$	
R131	10K Variable	
R135	1.8K	
R136	6.8K	
R76, R77	15 $\Omega$ 1WATT	
R82	150 $\Omega$	
R83	100 $\Omega$	
R84	100 $\Omega$ Variable	
R87, R88, R89, R90	1.5K 5WATT	
R91, R92	51 $\Omega$	
R93	22.1 $\Omega$	
R94, R95, R98, R99, R104, R105, R108, R109	1.2 $\Omega$ 1/2WATT	
C21, C22	1000 $\mu$ F 35V Electrolytic	
C23, C24	1 $\mu$ F 25V Electrolytic	
C28, C31	470 $\mu$ F 100V Electrolytic	
C43	100 $\mu$ F 10V Electrolytic	
C44, C45, C46, C47	4700 $\mu$ F 100V Electrolytic	
C48	.1 $\mu$ F	
C49	33 $\mu$ F 50V Electrolytic	
C50	4.7 $\mu$ F 50V Electrolytic	
C52	330 $\mu$ F 16V Electrolytic	

**SW12-I PARTS LIST**(continued)

<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
C54	10 $\mu$ F 25V Electrolytic	
C56	.1 $\mu$ F 125Vac	
D1, D2, D3, D4, D11, D12	1N4002	
D13, D14, D15, D16, D17	1N914	
Q15, Q18	MJF15030	118733
Q16, Q17, Q19, Q20	2SC3281	118731
Q21, Q24	MJF15031	118734
Q22, Q23, Q25, Q26	2SA1302	118729
Q27	MPSA06	
U11	UPC1237	118746
U12	MC1458	118743
U7	7815	118739
U9	7915	118740
L1	2 $\mu$ H	
F2, F3	JUMPER	
RLY1	AROMAT J51E-12 (Relay)	
RCA PANEL		
SPEAKER INPUT JACKS		
TRANSFORMER	PW-6582	118721
SW2 (Power)		
F1	5 Amp 250Vac Slow Blow	118348
TH1 (Thermal protection)	ASAH US-602S	
BR1	GBPC 3502	
DUAL VOLTAGE TRANSFORMER	PW-6661	118725
DUAL VOLTAGE SWITCH 115 to 230		
CAPACITOR (DUAL VOLTAGE MODEL)	.047 $\mu$ F 300V	

**SW15-I PARTS LIST**

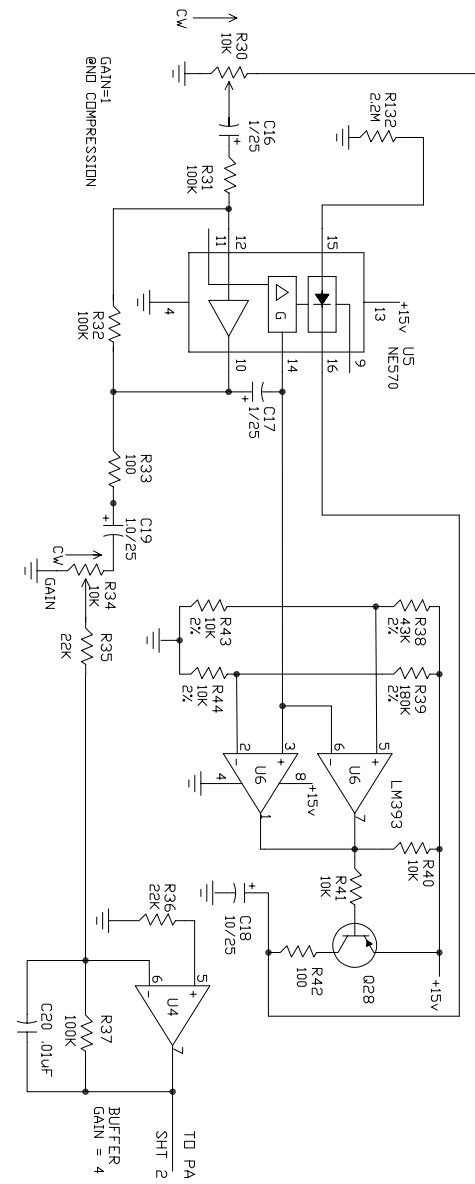
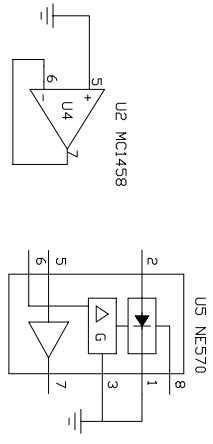
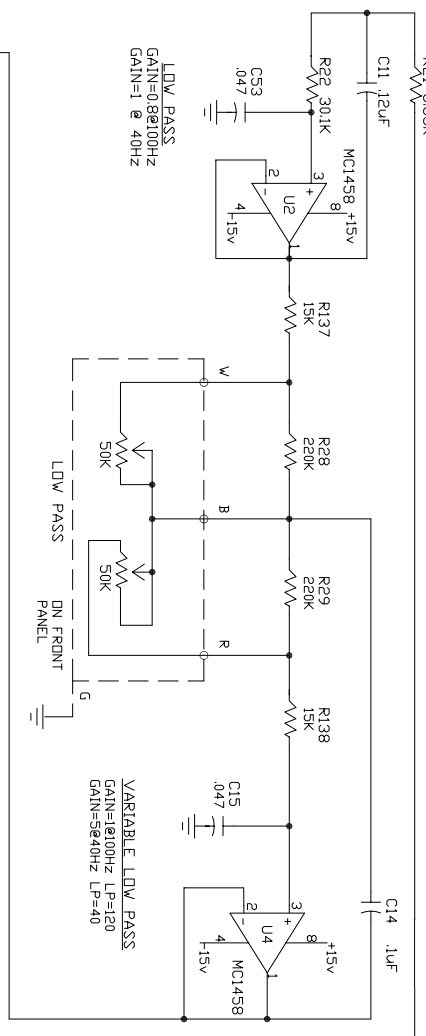
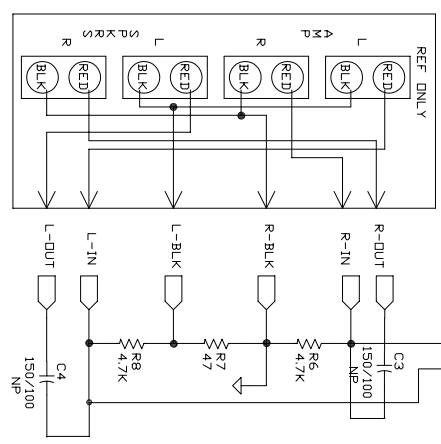
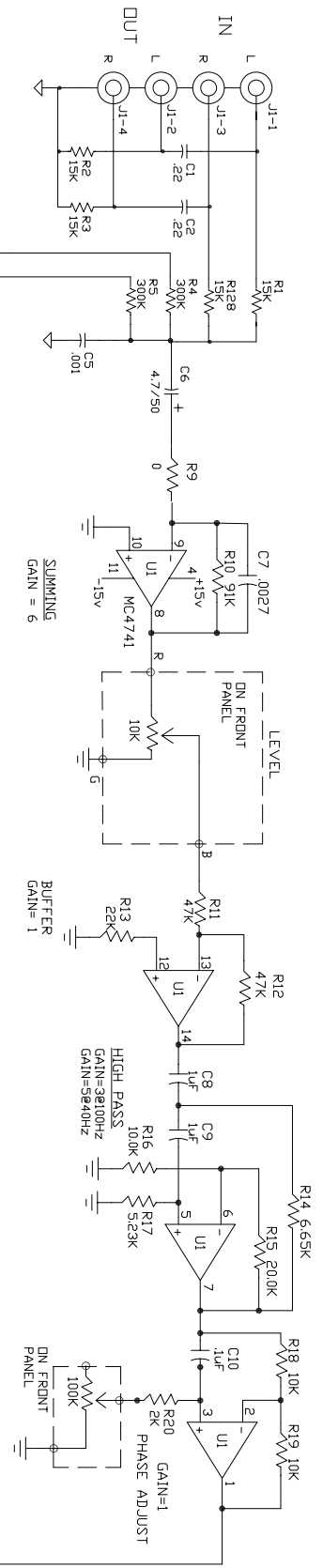
<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
LEVEL CONTROL	10K VARIABLE	
LOWPASS ADJUST	50K VARIABLE, DUAL	
PHASE ADJUST	100K VARIABLE	
R1, R2, R3, R128, R137, R138	15K	
R12, R11	47K	
R13, R35, R36, R133, R134	22K	
R132	2.2 Meg	
R139	39K	
R14, R21	6.65K	
R15	20K	
R16, R18, R19, R40, R41, R127	10K	
R17	5.23K	
R20	2K	
R22	30.1K	
R28, R29	220K	
R30, R34, R50	10K VARIABLE	
R31, R32, R37	100K	
R33, R42, R68, R71	100 $\Omega$	
R38	43K 2%	
R39	180K 2%	
R43, R44	10K 2%	
R6, R8, R46	4.7K	
R47, R53	4.3K 3WATT	
R9	0 $\Omega$	
R49	33.2K	
R51, R67	1K	
R54, R62	1.1K	
R55, R63	300 $\Omega$	
R56, R61	11.5K	
R57, R58, R59, R60	220 $\Omega$	
R6, R8	510 $\Omega$ 2WATT	
R64, R69	511 $\Omega$	
R65, R70, R73, R75	22.1 $\Omega$	
R66	39.2K	
R72, R74	2.7K 3WATT	
R10	120K	
R45	1M $\Omega$	
R7	47 $\Omega$	
R4, R5	300K	
C1, C2	.22 $\mu$ F	
C10, C27, C30	.1 $\mu$ F	
C11	.12 $\mu$ F	
C15, C53	.047 $\mu$ F	
C16, C17, C19	1 $\mu$ F 25V Electrolytic	
C20	.01 $\mu$ F	
C5	.001 $\mu$ F	
C29	2.2 $\mu$ F	
C3, C4	150 $\mu$ F 100V NON-POLAR	
C32, C33	470 $\mu$ F 50V Electrolytic	
C34, C35	22pF	

**SW15-I PARTS LIST**(continued)

<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
C36, C37, C39, C40	330pF	
C6	4.7 $\mu$ F 25V Electrolytic	
C55	10 $\mu$ F 63V Electrolytic	
C18	10 $\mu$ F 25V Electrolytic	
C7	.0027 $\mu$ F	
C8, C9	1 $\mu$ F	
D18	1N914B	
D5, D6	1N4752A Zener	
U1	MC4741	118744
U2, U4	MC1458N	118743
U5	NE570	118745
U6	LM393	118742
Q1, Q2, Q11	MPS8099	118735
Q28	2N3906	118728
Q3, Q4, Q12	MPS8599	118736
Q5	MPSW56	118738
Q6	MPSW06	118737
Q7, Q9	2SA1306B	118730
Q8, Q10	2SC3298B	118732
R100, R101, R102, R103, R110, R111, R112, R113	.47 $\Omega$ 5WATT	
R114	4.7 $\Omega$ 3WATT	
R115	1 $\Omega$ 3WATT	
R116, R121, R126, R130	10K	
R117, R119	56K	
R118	22K	
R120	390 $\Omega$ 1WATT	
R122, R123	100K	
R125	68 $\Omega$	
R131	10K Variable	
R135	1.8K	
R136	6.8K	
R76, R77	15 $\Omega$ 1WATT	
R82	150 $\Omega$	
R83	100 $\Omega$	
R84	100 $\Omega$ Variable	
R87, R88, R89, R90	1.5K 5WATT	
R91, R92	51 $\Omega$	
R93	22.1 $\Omega$	
R94, R95, R98, R99, R104, R105, R108, R109	1.2 $\Omega$ 1/2WATT	
C21, C22	1000 $\mu$ F 35V Electrolytic	
C23, C24	1 $\mu$ F 25V Electrolytic	
C28, C31	470 $\mu$ F 100V Electrolytic	
C43	100 $\mu$ F 10V Electrolytic	
C44, C45, C46, C47	4700 $\mu$ F 100V Electrolytic	
C48	.1 $\mu$ F	
C49	33 $\mu$ F 50V Electrolytic	
C50	4.7 $\mu$ F 50V Electrolytic	
C52	330 $\mu$ F 16V Electrolytic	

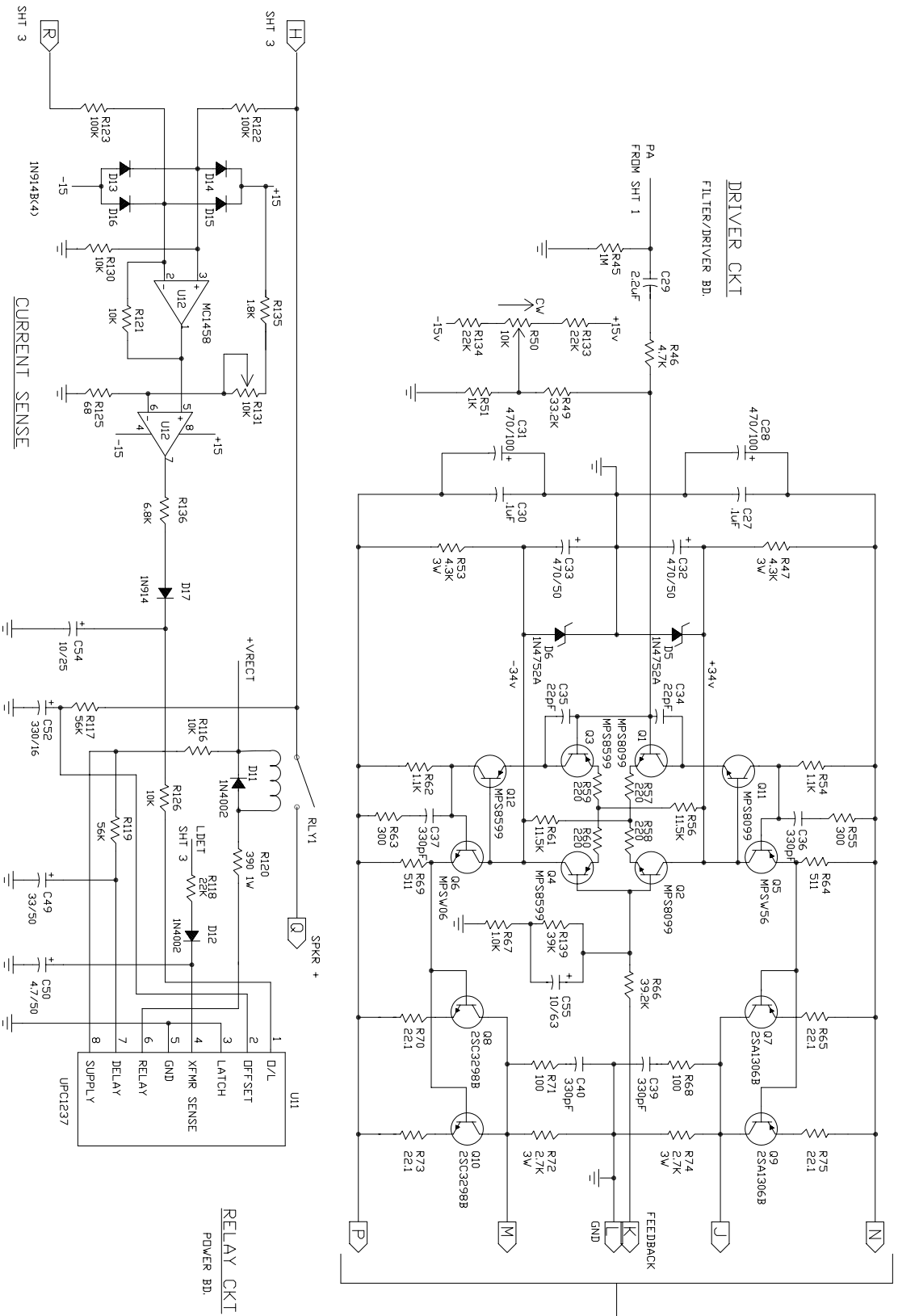
**SW15-I PARTS LIST**(continued)

<b><u>PART</u></b>	<b><u>VALUE/PART NUMBER</u></b>	<b><u>KLIPSCH PART #</u></b>
C54	10 $\mu$ F 25V Electrolytic	
C56	.1 $\mu$ F 125Vac	
D1, D2, D3, D4, D11, D12	1N4002	
D13, D14, D15, D16, D17	1N914	
Q15, Q18	MJF15030	118733
Q16, Q17, Q19, Q20	2SC3281	118731
Q21, Q24	MJF15031	118734
Q22, Q23, Q25, Q26	2SA1302	118729
Q27	MPSA06	
U11	UPC1237	118746
U12	MC1458	118743
U7	7815	118739
U9	7915	118740
L1	2 $\mu$ H	
F2, F3	JUMPER	
RLY1	AROMAT J51E-12 (Relay)	
RCA PANEL		
SPEAKER INPUT JACKS		
TRANSFORMER	PW-6582	118721
SW2 (Power)		
F1	5 Amp 250Vac Slow Blow	118348
TH1 (Thermal protection)	ASAH US-602S	
BR1	GBPC 3502	
DUAL VOLTAGE TRANSFORMER	PW-6661	118725
DUAL VOLTAGE SWITCH 115 to 230		
CAPACITOR (DUAL VOLTAGE MODEL)	.047 $\mu$ F 300V	



SW12 - I  
Sheet 1

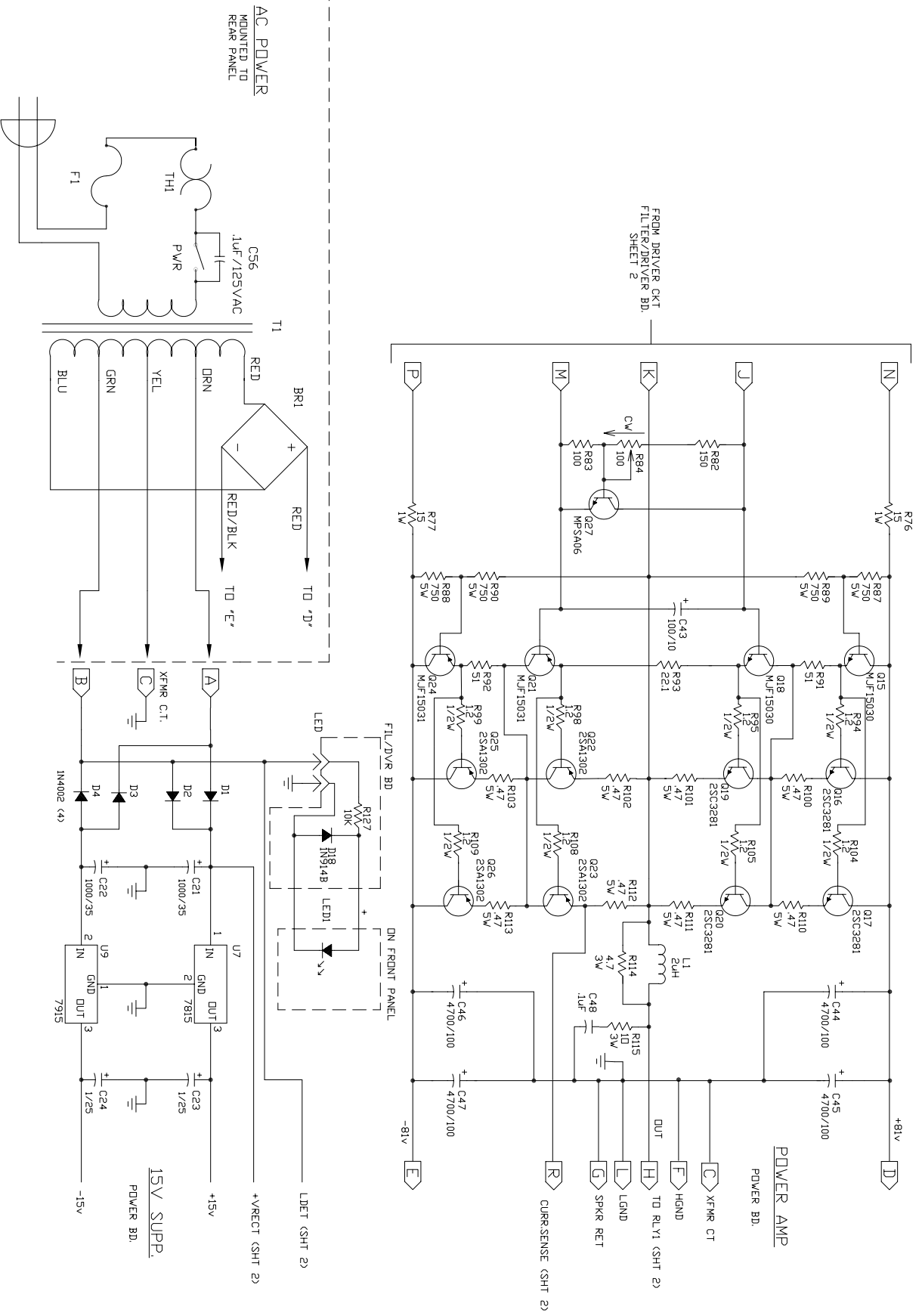


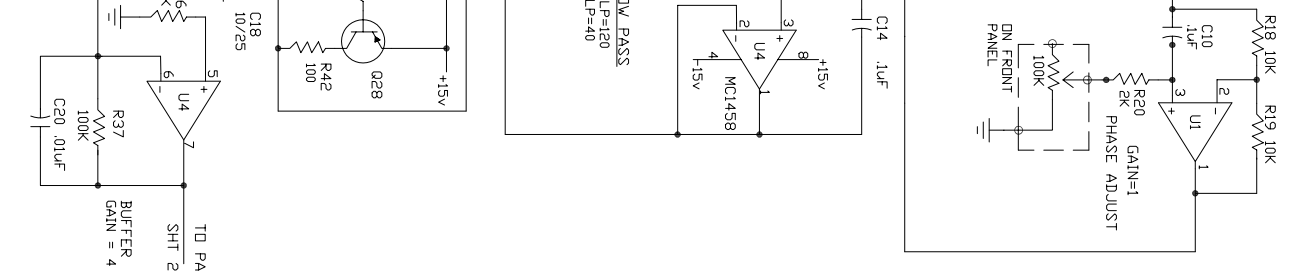
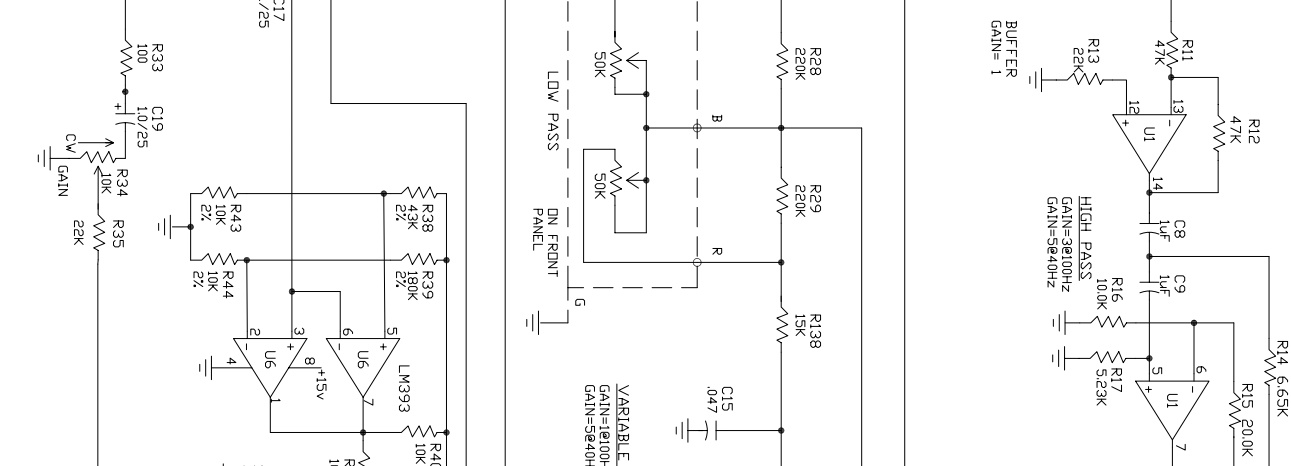
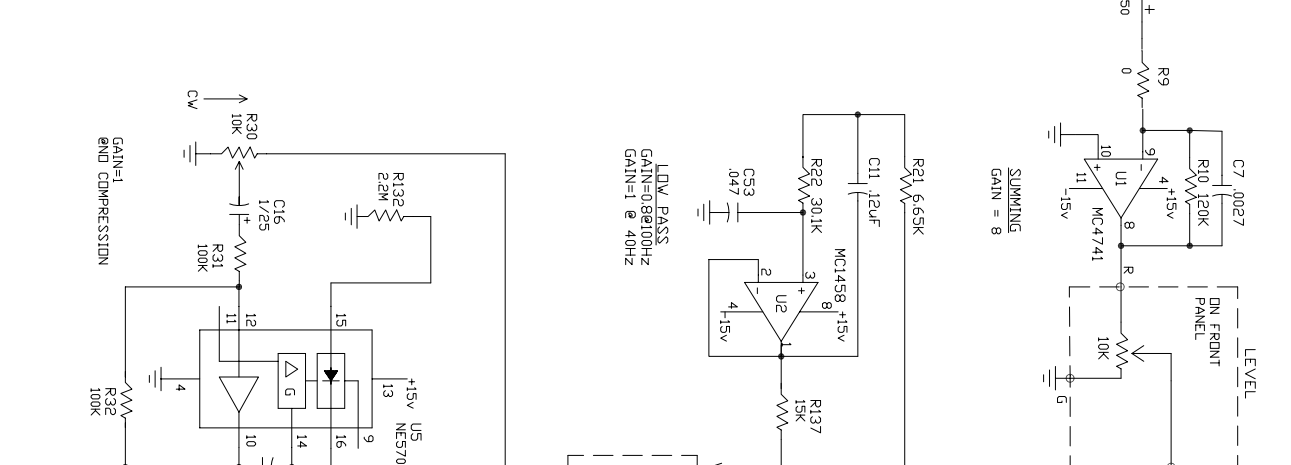
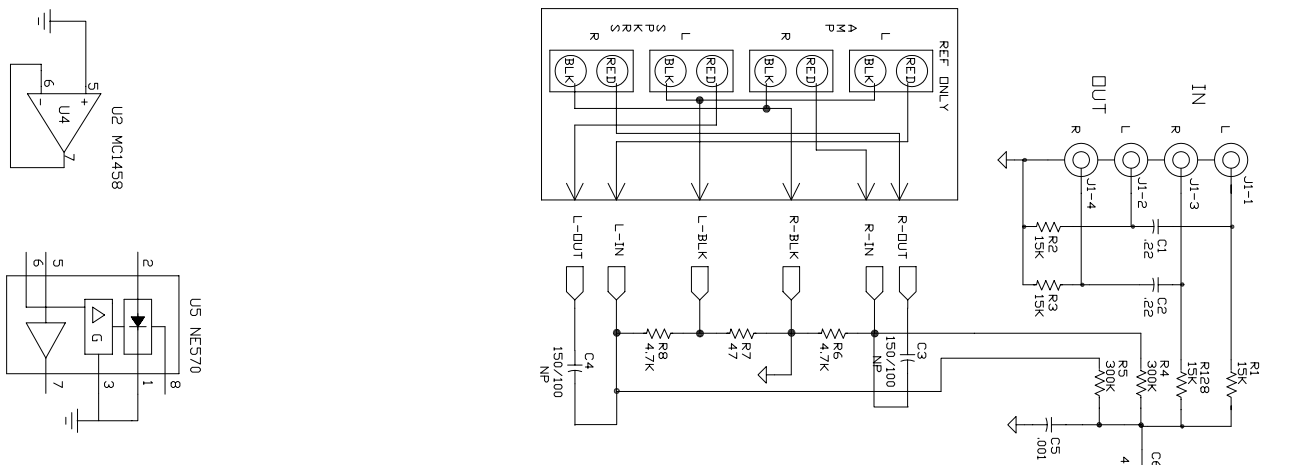


SW12 - 1  
 Sheet 2

# SW12 - I

## Sheet 3

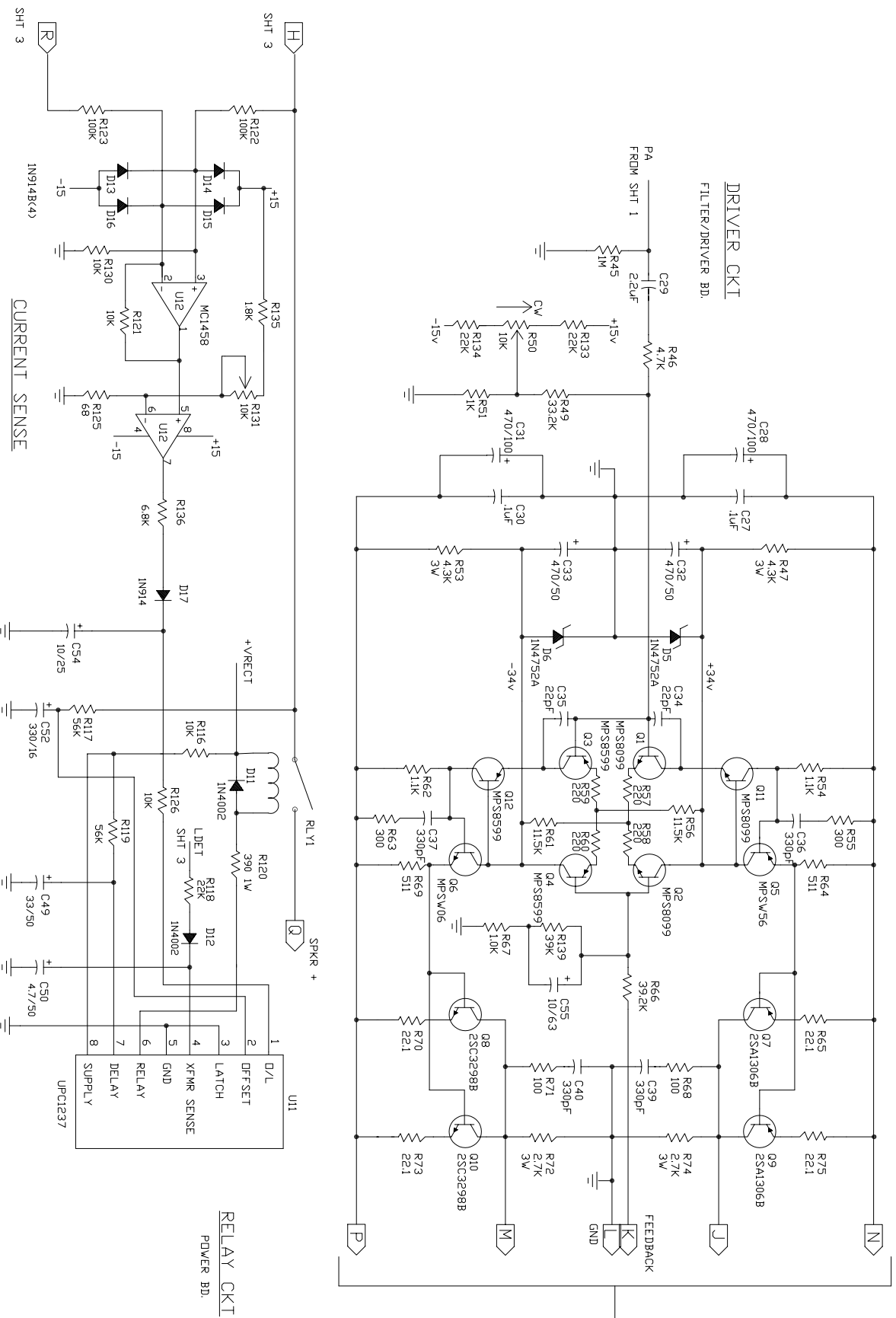




SW15 - I  
Sheet 1

# SW15 - I

## Sheet 2



TD POWER AMP  
POWER BD.  
SHEET 3

# SW15 - I Sheet 3

