Contents

Contents (continued)

CAUTION: THE EQ PCB ASSEMBLIES CONTAIN NO USER-SERVICEABLE PARTS. TO PREVENT WARRANTY INFRACTIONS, REFER SERVICING TO WARRANTY SERVICE STATIONS OR FACTORY SERVICE.

SAFETY INFORMATION

1. Parts that have special safety characteristics are identified by the ⚠ symbol on schematics or by special notes on the parts list. Use only replacement parts that have critical characteristics recommended by the manufacturer.

2. Make leakage current or resistance measurements to determine that exposed parts are acceptably insulated from the supply circuit before returning the unit to the customer. Refer to Paragraph 84 of UL 1270. Use the following checks to perform these measurements:

   A. **Leakage Current Hot Check**-With the unit completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester or a metering system that complies with American National Standards Institute (ANSI) C101.1 “Leakage Current for Appliances” and Underwriters Laboratories (UL) 1492 (71). With the unit AC switch first in the ON position, then in the OFF position, measure from a known earth ground (metal water pipe, conduit, etc.) to all exposed metal parts of the unit (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the unit power cord plug in the outlet and repeat test. ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE UNIT TO THE CUSTOMER.

   B. **Insulation Resistance Test Cold Check**-(1) Unplug the power supply and connect a jumper wire between the two prongs of the plug. (2) Turn on the power switch of the unit. (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each exposed metallic cabinet part on the unit. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohms. When there is no return path to the chassis, the reading must be “infinite”. If it is not within the limits specified, there is the possibility of a shock hazard, and the unit must be repaired and rechecked before it is returned to the customer.

ELECTROSTATIC DISCHARGE SENSITIVE (ESDS) DEVICE HANDLING

This unit contains ESDS devices. We recommend the following precautions when repairing, replacing, or transporting ESDS devices:

• Perform work at an electrically grounded work station.

• Wear wrist straps that connect to the station or heel straps that connect to conductive floor mats.

• Avoid touching the leads or contacts of ESDS devices or PC boards even if properly grounded. Handle boards by the edges only.

• Transport or store ESDS devices in ESD protective bags, bins, or totes. Do not insert unprotected devices into materials such as plastic, polystyrene foam, clear plastic bags, bubble wrap or plastic trays.

SUPPLEMENT DESCRIPTION

This supplement should be used along with either the 1800V service manual part number 181812 or the 1600 VI/1800 VI service manual part number 199747. The disassembly/assembly procedures, and packing part list should be used along with the information in this manual. The test procedures were included in this manual for your convenience.

This supplement replaces the following supplements: 181812-S2, 181812-S3, 181812-S6 and 181812-S7.

THEORY OF OPERATION

These Equalizer cards are designed to be installed into the AmPlus™ 50 and 100 amplifiers and the Bose® 1600 Series VI and 1800 Series V/VI amplifiers. The EQ cards included in this service manual are as follows; 402® series I and II, 502®A, 502B, 502BEX, 802® series II and III, Model 1B, Model 8, Model 25/32, Panaray® LT series II 3202®, 4402®, 9702®, and FreeSpace® 360 Surface and In Ground.

The FreeSpace 360 loudspeaker requires equalization, and this equalization is a function of the installation. There are two variants of the card that implement EQ curves for these installation situations:

- In Ground (when the FreeSpace 360 loudspeaker is mounted in the ground). The appropriate EQ curve for soft or hard ground is selected with a slide switch on the card. When S1 is in the SOFT position, the Soft Ground EQ is used; when S1 is in the HARD position, the Hard Ground EQ is used.
- In the Surface variant, S1 is omitted and jumpered to the SURFACE position.

Note: Refer to the FreeSpace 360 Surface or In-Ground schematic diagrams, as appropriate, for the following explanation. The designators inside the brackets "[ ]" are the schematic grid coordinates which are provided in order to make it easier to locate components on the schematic sheet indicated in the description. Components shown on the schematic as OPT (optional) are not used in that particular configuration. Also refer to the EQ curves on page 7 of this manual for an overview of the frequency response of each of the 360 applications.

The input signal is applied to these cards at JP1 pin 4. The first section at the input, U2-B [D7], combines a first order high-pass filter with one section of a parametric cut filter. The parametric is set for -15dB at 27 Hz and provides a steep slope below about 80 Hz The equalization is segmented, with one block (U2 and U1), all sections [D1-8] dedicated to bass region equalization. Following the output of this section, U2-A [D1], the signal is presented to two parallel equalization paths, one comprised of U3 [B4-7], U4-B [C3], and dedicated to EQ for mounting in soft ground of the FreeSpace 360 loudspeaker. The other path, comprised of U5 [B4-7], U4-A [B3] provides equalization for the FreeSpace 360 loudspeaker in hard ground installations. In the case of the FreeSpace Surface EQ card, the bottom leg of the equalizer card is not used.

The operation of all three equalizers is similar. Considering the bass equalizer, we see U2-B's [D7] output passed through R8 [D7] and into the non-inverting input of U2-A [D2]. This input is extended as a bus to which EQ sections Bass 1 [D6] and Bass 2 [D5] are connected. These will introduce dips into the audio response to provide bass cut as required. Sections Bass 3 [D4] and Bass 4 [D3] are connected to a bus extended from the inverting input of U2-A [D2] and provide bass boost. See Figures 1,2 and 3 for the EQ curves for the various equalizer cards.

Each of the EQ sections utilizes a gyrator-connected op-amp in conjunction with a series capacitance to simulate an LCR series tuned circuit. The values of the capacitors and resistors are chosen to implement EQ dips and/or peaks at the appropriate frequency, amplitude and Q to realize the desired EQ curves. On the In-Ground EQ card, S1 [B2] selects either the HARD or the SOFT mount EQ curve.

The output signal is taken from JP1 pin 5, and returns to the amplifier. The equalizer cards are sensed by the amplifiers as follows. In the AmPlus 50 and 100 amplifiers, Pin 12 of J1 [B2] is grounded and is sensed by the dynamic EQ circuit on sheet 2 of the AmPlus 50 and 100 schematic diagrams. In the 1600/1800 amplifiers, the input module detects the presence of EQ cards via J7-6 and J6-6. Without the card installed these pins are pulled high (+15V). This logic high signal is also applied to the control pins of the switch ICs which selects the A (unequalized) input. When an EQ is plugged into J7 and/or J6 pin 6, the EQ is detected and pulls the control pin low (+7.5V), turning on the corresponding LED(s) and switching the IC to the B input which will then select the output of the EQ card to be passed on to the amplifier.

THEORY OF OPERATION

The Model 1B EQ card is intended for use in the AmPlus™ 50 and 100 amplifiers as well as the 1800 V, 1600 and 1800 VI professional amplifiers. It accepts a full range (50 Hz to 16 kHz) signal, equalizes it, and passes a full range signal back to the main amplifier signal path.

Refer to the FreeSpace® Model 1B EQ card schematic diagram, sheet 1 of 1 for the following information.

Note: The designators inside the brackets "[ ]" are the schematic grid coordinates which are provided in order to make it easier to locate components on the schematic sheet indicated in the description.

The equalization is segmented, with one block (U2 and U1, all sections [D1-8]) dedicated to bass region equalization for the Model 1B Bass module. Following the output of this section, U2A [D1], the signal is presented to two parallel equalization paths, one comprised of U3 [B4-7], U4A [4-7], U4B [C3], and dedicated to EQ for surface mounted Bose® FreeSpace System satellite speakers (Model 25 and 32). The other path, comprised of U5 [B4-7], U4A [B3] provides equalization for Bose Model 8 flush-mount satellite speakers.

The operation of all three equalizers is similar. Considering the bass equalizer, we see U2B's [D7] output passed through R8 [D7] and the non-inverting input of U2A [D2]. This input is extended as a bus to which EQ sections bass 1 [D6] and Bass 2 [D5] are connected. These will introduce dips into the audio response. Section Bass 3 [D4] is connected to a potentiometer straddling U2A non-inverting and inverting inputs. When the wiper is moved toward the non-inverting input, the section introduces a dip; when moved toward the inverting input, a peak.

Each of the EQ sections utilizes a gyrator-connected op amp in conjunction with a series capacitor to simulate an LCR series tuned circuit. The values of the capacitors and resistors are chosen to implement EQ curves. Each EQ section has optional steering resistors that could allow other curves to be implemented in the future with the same card. There are also some spare sections not currently used.

S1 [B2] selects either the FLUSH or the SURFACE mount EQ curve, while potentiometer R33 [D1] provides a boost/cut range of adjustment of the 90 Hz bass region.

EQUALIZER CARD CURVE DIAGRAMS

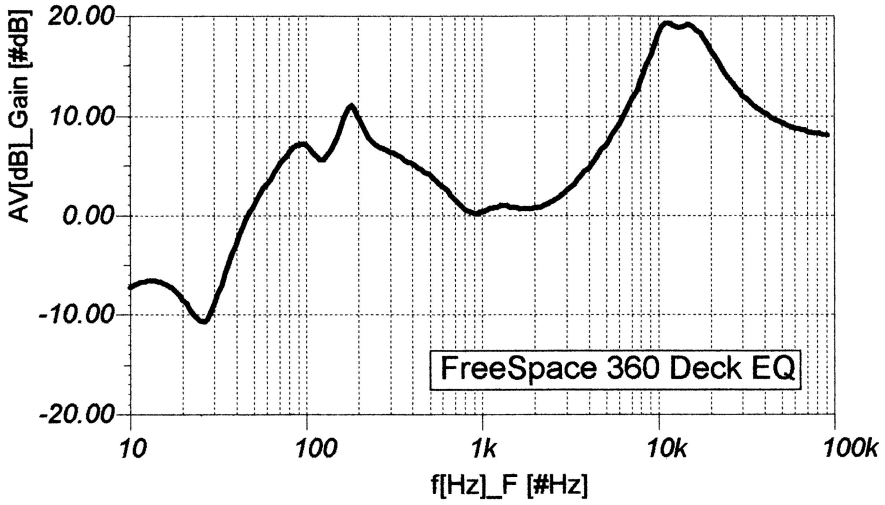


Figure 1. FreeSpace® 360 Surface EQ Curve

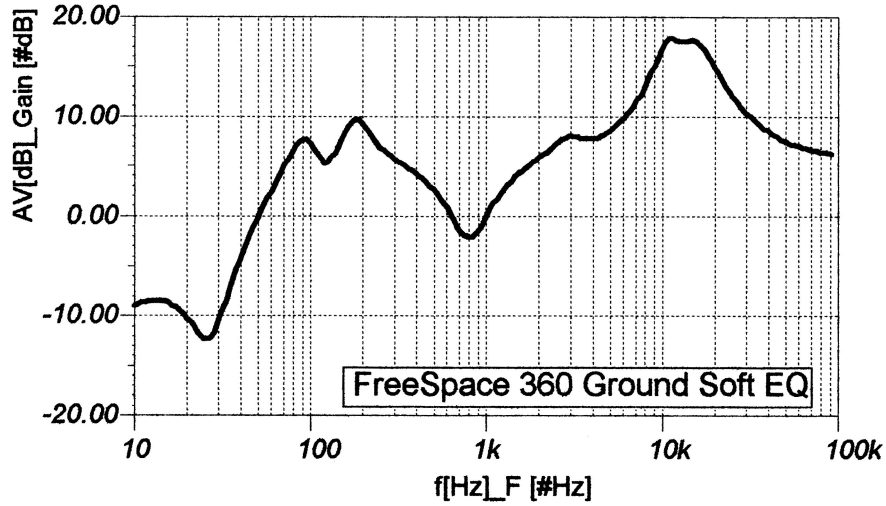


Figure 2. FreeSpace 360 In-Ground Soft Ground EQ Curve

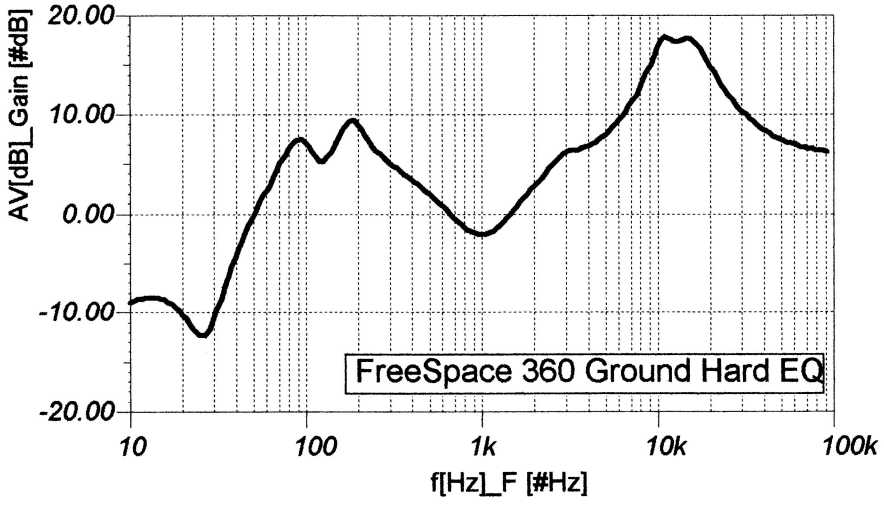


Figure 3. FreeSpace 360 In-Ground Hard Ground EQ Curve

DISASSEMBLY/ASSEMBLY PROCEDURES

1. Input Panel Removal

1.1 Remove the two screws (see figure 4) holding the panel assembly to the chassis.

1.2 Slide the input panel assembly out of the chassis to access the EQ cards.

2. Input Panel Replacement

2.1 Slide the input panel assembly back into the chassis (see figure 5. for proper alignment).

2.2 Secure the input panel to the chassis using the two screws that had been removed in procedure 1.1.

3. EQ Card Placement

Note: Refer to figure 5. for EQ Card placement.

3.1 Perform procedure 1.

3.2 Place the EQ card into the channel 1 or 2 connector. The connector can be inserted in only one direction.

3.3 Perform procedure 2.

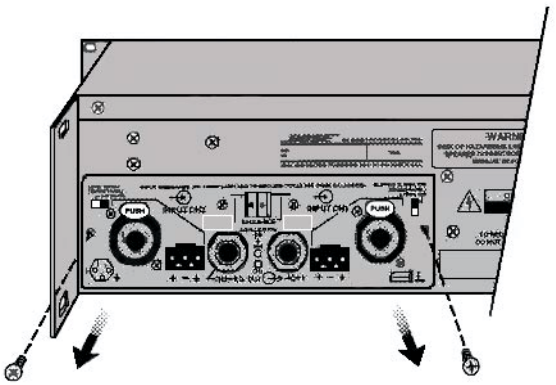


Figure 4. Screw Location

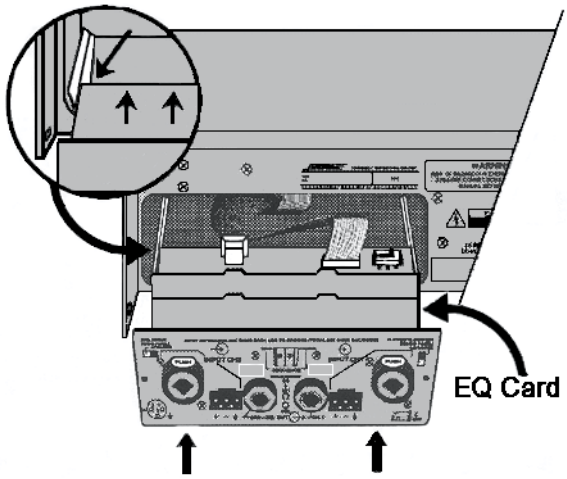


Figure 5. EQ Card Placement

TEST SET UP PROCEDURES

1. Install the equalizer card under test into one of the equalizer card jacks located on the input module of the Bose® 1600 or 1800 series amplifier. Refer to the disassembly/assembly procedures on the previous page.

2. On the amplifier input module, place switch SW1 to the NORM position. Place switch S2 to the FULL BANDWIDTH position.

3. The input voltage shall be the actual input voltage present at the input, not the open circuit generator input.

TEST PROCEDURES

1. Panaray® Series II EQ PCB 3202®, 4402®, 9702®,LT Frequency Response Test

1.1 Apply a 100 mVrms, 700 Hz signal to the input jack of the amplifier channel under test.

1.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

1.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

1.4 Turn on the amplifier and measure the response according to the gain chart listed below.

1.5 Reference a dB meter to the output after step 1.4 and measure the response of the EQ card according to the corresponding chart on this page.

EQ Gain Response

3202 II	+7.0 dB ± 1.0 dB
4402 II	+5.0 dB ± 1.0 dB
9702 II	+2.6 dB ± 1.0 dB
LT II	+2.7 dB ± 1.0 dB

3202 II EQ Frequency Response

Frequency	Output Level
50 Hz	-27 dB ± 3 dB
100 Hz	-6.0 dB ± 1.5 dB
200 Hz	3.0 dB ± 1.5 dB
400 Hz	-1.5 dB ± 1 dB
700 Hz	0 dB Reference
900 Hz	0.5 dB ± 1 dB
3,250 Hz	-6.5 dB ± 1.5 dB
6.4 kHz	-6.5 dB ± 1.5 dB
13 kHz	-4.3 dB ± 1.5 dB
30 kHz	-27 dB ± 3 dB

4402 II EQ Frequency Response

Frequency	Output Level
50 Hz	-27.4 dB ± 3 dB
150 Hz	-2.2 dB ± 1.5 dB
250 Hz	1.7 dB ± 1.5 dB
500 Hz	-0.9 dB ± 1.5 dB
700 Hz	0 dB Reference
1 kHz	1.3 dB ± 1.5 dB
2 kHz	-0.3 dB ± 1 dB
3 kHz	0.6 dB ± 1 dB
7 kHz	-1.5 dB ± 1.5 dB
13 kHz	0 dB ± 1.5 dB
30 kHz	-26 dB ± 3 dB

9702 II EQ Frequency Response

Frequency	Output Level
50 Hz	-23 dB ± 3 dB
100 Hz	-2.4 dB ± 1.5 dB
180 Hz	+5.2 dB ± 2 dB
550 Hz	-1.5 dB ± 1 dB
700 Hz	0 dB Reference
1.1 kHz	+2.3 dB ± 1 dB
1.8 kHz	+3.8 dB ± 1 dB
3 kHz	+4.8 dB ± 1 dB
6.5 kHz	+4.5 dB ± 1.5 dB
11.5 kHz	+3.8 dB ± 1.5 dB
30 kHz	-22 dB ± 3 dB

LT II System EQ Frequency Response

Frequency	Output Level
40 Hz	-31.7 dB ±3 dB
100 Hz	-1.9 dB ±1 dB
190 Hz	7.0 dB ±2dB
300 Hz	2.5 dB ±1 dB
700 Hz	0 dB Reference
2 kHz	-0.4 dB ±1 dB
4 kHz	-2.0 dB ±2 dB
10 kHz	-30.7 dB ±3 dB

TEST PROCEDURES

2. 402® EQ PCB Frequency Response Test

2.1 Apply a 100 mVrms, 850 Hz signal to the input jack of the amplifier channel under test.

2.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

2.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

2.4 Turn on the amplifier and measure the gain. There should be a - 3.4 dB ± 1.0 dB change in gain at the output.

2.5 Reference a dB meter and measure the response of the EQ card according to the 402 EQ Full Range Response chart.

2.6 Shut off the amplifier. Open the input panel and switch (S2) to the high frequency position.

2.7 Measure the response according to the 402 EQ High Frequency Response chart.

402 EQ Full Range Frequency Response

Frequency	Output Level
60 Hz	-3.7 dB ± 1.5 dB
105 Hz	+8.5 dB ± 1.5 dB
220 Hz	+3.5 dB ± 1.5 dB
850 Hz	0 dB Reference
4 kHz	+5.8 dB ± 1.5 dB
14.5 kHz	+13.3 dB ± 1.5 dB

402 EQ High Frequency Response

Frequency	Output Level
60 Hz	-16.4 dB ± 1.5 dB
105 Hz	-5.2 dB ± 1.5 dB
220 Hz	+2.8 dB ± 1.5 dB
850 Hz	0 dB Reference
4 kHz	+5.8 dB ± 1.5 dB
14.5 kHz	+13.3 dB ± 1.5 dB

3. 402 II EQ PCB Frequency Response Test

3.1 Apply a 100 mVrms, 850 Hz signal to the input jack of the amplifier channel under test.

3.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

3.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

3.4 Turn on the amplifier and measure the gain. There should be a - 4.2 dB ± 1.0 dB change in gain at the output.

3.5 Reference a dB meter and measure the response of the EQ card according to the 402 II EQ Full Range Response chart.

3.6 Shut off the amplifier. Open the input panel and switch (S2) to the high frequency position.

3.7 Measure the response according to the 402 II EQ High Frequency Response chart.

402 II EQ Full Range Frequency Response

Frequency	Output Level
60 Hz	+3.2 dB ± 1.5 dB
90 Hz	+10.0 dB ± 1.5 dB
220 Hz	+7.3 dB ± 1.5 dB
600 Hz	-2.4 dB ± 1.5 dB
850 Hz	0 dB Reference
4 kHz	+5.6 dB ± 1.5 dB
13.5 kHz	+15.5 dB ± 1.5 dB

402 II EQ High Frequency Response

Frequency	Output Level
60 Hz	-13.0 dB ± 1.5 dB
90 Hz	-5.6 dB ± 1.5 dB
220 Hz	+6.8 dB ± 1.5 dB
600 Hz	-2.4 dB ± 1.5 dB
850 Hz	0 dB Reference
4 kHz	+5.6 dB ± 1.5 dB
13.5 kHz	+15.5 dB ± 1.5 dB

TEST PROCEDURES

4. 502® A EQ PCB Frequency Response Test

4.1 Apply a 100 mVrms, 600 Hz signal to the input jack of the amplifier channel under test.

4.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

4.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

4.4 Turn on the amplifier and measure the gain. There should be a +2.5 dB ± 1.0 dB change in gain at the output.

4.5 Reference a dB meter and measure the response of the EQ card according to the 502A Full Range Response chart.

4.6 Shut off the amplifier. Open the input panel and switch (S2) to the high frequency position.

4.7 Measure the response according to the 502A High Frequency Response chart.

502A EQ Full Range Frequency Response

Frequency	Output Level
40 Hz	-24.5 dB ± 2.0 dB
140 Hz	+4.3 dB ± 1.5 dB
600 Hz	0 dB Reference
2,2 kHz	+3.5 dB ± 1.5 dB
5 kHz	+12.5 dB ± 1.5 dB
15 kHz	+18.4 dB ± 1.5 dB

502A EQ High Frequency Response

Frequency	Output Level
40 Hz	-28.5 dB ± 2.0 dB
140 Hz	+2.9 dB ± 1.5 dB
600 Hz	0 dB Reference
2.2 kHz	+3.5 dB ± 1.5 dB
5 kHz	+12.5 dB ± 1.5 dB
15 k Hz	+19.0 dB ± 1.5 dB

5. 502B EQ PCB Frequency Response Test

5.1 Apply a 100 mVrms, 80 Hz signal to the input jack of the amplifier channel under test.

5.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

5.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

5.4 Turn on the amplifier and measure the gain. There should be an +8.5 dB ± 1.0 dB change in gain at the output.

5.5 Reference a dB meter and measure the response of the EQ card according to the 502B EQ Response chart.

502B EQ PCB Frequency Response

Frequency	Output Level
40 Hz	-5.8 dB ± 2.0 dB
80 Hz	0 dB Reference
100 Hz	+1.3 dB ± 1.0 dB
300 Hz	-17.5 dB ± 2.0 dB

TEST PROCEDURES

6. 502® BEX EQ PCB Frequency Response Test

6.1 Apply a 200 mVrms, 100 Hz signal to the input jack of the amplifier channel under test.

6.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

6.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

6.4 Turn on the amplifier and measure the gain. There should be an +4.2 dB ± 1.0 dB change in gain at the output.

6.5 Reference a dB meter and measure the response of the EQ card according to the 502B EQ Response chart.

502BEX EQ PCB Frequency Response

Frequency	Output Level
30 Hz	-15.2 dB ± 2.0 dB
55 Hz	+2.3 dB ± 1.4 dB
100 Hz	0 dB Reference
160 Hz	- 6.8 dB ± 1.0 dB
240 Hz	-0.8 dB ± 1.2 dB
500 Hz	-11.6 dB ± 2.0 dB

7. Model 1B EQ PCB Flush Frequency Response Test

7.1 Apply a 200 mVrms, 100 Hz signal to the input jack of the amplifier channel under test.

7.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

7.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

7.4 Place the switch (S1) on the Model 1B EQ PCB to the FLUSH position. Rotate the pot R33 fully CW.

7.5 Turn on the amplifier and measure the gain. There should be an +2.8 dB ± 1.0 dB change in gain at the output.

7.6 Reference a dB meter and measure the response of the EQ card according to the Model 1B Flush EQ Response chart.

Model 1B EQ PCB Flush Frequency Response

Frequency	Output Level
60 Hz	+4.25 dB ± 1.5 dB
100 Hz	+3.3 dB ± 1.5 dB
200 Hz	+0.5 dB ± 1.5 dB
500 Hz	+5.25 dB ± 1.5 dB
1 kHz	0 dB Reference
2 kHz	-1.0 dB ± 1.5 dB
8 kHz	+7.75 dB ± 1.5 dB
10 kHz	+9.5 dB ± 2.5 dB

7.7 Shut off the amplifier and place the switch (S1) on the Model 1B EQ PCB to the SURFACE position.

7.8 Replace the input card into the amplifier and turn the amplifier on.

7.9 Reference a dB meter and measure the response of the EQ card according to the Model 1B EQ Surface Frequency Response chart.

Model 1B EQ Surface Frequency Response

Frequency	Output Level
200 Hz	+0.5 dB ± 1.5 dB
500 Hz	+0.6 dB ± 1.5 dB
1 kHz	0 dB Reference
2 kHz	-1.3 dB ± 1.5 dB
8 kHz	+7.6 dB ± 1.5 dB
10 kHz	+7.8 dB ± 2.5 dB

TEST PROCEDURES

8. 802® EQ PCB Frequency Response Test

8.1 Apply a 100 mVrms, 700 Hz signal to the input jack of the amplifier channel under test.

8.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

8.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

8.4 Turn on the amplifier and measure the gain. There should be a +1. 7 dB ± 1.0 dB change in gain at the output.

8.5 Reference a dB meter and measure the response of the EQ card according to the 802 Full Range Response chart on this page.

8.6 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the high frequency position.

8.7 Measure the response according to the 802 EQ High Frequency Response.

802 EQ PCB Full Range Frequency Response

Frequency	Output Level
40 Hz	+8.0 dB ± 1.5 dB
55 Hz	+13.5 dB ± 1.5 dB
140 Hz	+6.6 dB ± 1.5 dB
700 Hz	0 dB Reference
2.5 kHz	+2.1 dB ± 1.5 dB
6 kHz	+9.6 dB ± 1.5 dB
14.5 kHz	+16.7 dB ± 1.5 dB

802 EQ PCB High Frequency Response

Frequency	Output Level
40 Hz	-21.0 dB ± 1.5 dB
60 Hz	-11.5 dB ± 1.5 dB
700 Hz	0 dB Reference
2.5 kHz	+2.1 dB ± 1.5 dB
6 kHz	+9.6 dB ± 1.5 dB
14.5 kHz	+16.7 dB ± 1.5 dB

9. 802 III EQ PCB Frequency Response Test

9.1 Apply a 100 mVrms, 700 Hz signal to the input jack of the amplifier channel under test.

9.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

9.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

9.4 Turn on the amplifier and measure the gain. There should be a +1. 7 dB ± 1.0 dB change in gain at the output.

9.5 Reference a dB meter and measure the response of the EQ card according to the 802 III Full Range Response chart.

9.6 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the high frequency position.

9.7 Measure the response according to the 802 III EQ High Frequency Response.

802 III EQ PCB Full Range Frequency Response

Frequency	Output Level
40 Hz	+1.9 dB ± 1.5 dB
70 Hz	+13.5 dB ± 1.5 dB
140 Hz	+7.5 dB ± 1.5 dB
700 Hz	0 dB Reference
2.5 kHz	+1.8 dB ± 1.5 dB
6 kHz	+6.9 dB ± 1.5 dB
13 kHz	+13.8 dB ± 1.5 dB

802 III EQ PCB High Frequency Response

Frequency	Output Level
40 Hz	-24.9 dB ± 1.5 dB
70 Hz	-10.6 dB ± 1.5 dB
140 Hz	+5.2 dB ± 1.5 dB
700 Hz	0 dB Reference
2.5 kHz	+1.9 dB ± 1.5 dB
6 kHz	+7.0 dB ± 1.5 dB
13 kHz	+13.9 dB ± 1.5 dB

TEST PROCEDURES

10. Model 8 EQ PCB Frequency Response Test

10.1 Apply a 100 mVrms, 1 kHz signal to the input jack of the amplifier channel under test.

10.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

10.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

10.4 Turn on the amplifier and measure the gain. There should be a -3.5 dB ± 1.0 dB change in gain at the output.

10.5 Reference a dB meter and measure the response of the EQ card according to the Model 8 Full Range Response chart below.

Model 8 Frequency Response

Frequency	Output Level
95 Hz	+11.3 dB ± 1.5 dB
250 Hz	+4.5 dB ± 1.5 dB
1 kHz	0 dB Reference
2 kHz	+3.0 dB ± 1.5 dB
4 kHz	+7.0 dB ± 1.5 dB
8 kHz	+10.5 dB ± 1.5 dB
12.5 kHz	+11.75 dB ± 2.5 dB

11. Model 25/32 EQ PCB Frequency Response Test

11.1 Apply a 100 mVrms, 1 kHz signal to the input jack of the amplifier channel under test.

11.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed..

11.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Insert the EQ card.

11.4 Turn on the amplifier and measure the gain. There should be a -4.8 dB ± 1.0 dB change in gain at the output.

11.5 Reference a dB meter and measure the response of the EQ card according to the Model 25/32 Full Range Response.

Model 25/32 Frequency Response

Frequency	Output Level
95 Hz	+12.3 dB ± 1.5 dB
250 Hz	+4.4 dB ± 1.5 dB
1 kHz	0 dB Reference
2 kHz	+1.7 dB ± 1.5 dB
4 kHz	+7.6 dB ± 1.5 dB
8 kHz	+12.0 dB ± 1.5 dB
12.5 kHz	+15.0 dB ± 2.5 dB

TEST PROCEDURES

12. FreeSpace® 360 In Soft Ground Frequency Response Test

12.1 Apply a 100 mVrms, 1 kHz signal to the input jack of the amplifier channel under test.

12.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

12.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position. Switch the switch on the EQ card to the SOFT position and insert the EQ card.

12.4 Turn on the amplifier and measure the gain. There should be a 0.0 ± 1.0 dB change in gain at the output.

12.5 Reference a dB meter and measure the response of the EQ card according to the In Soft Ground Frequency Response chart.

In Soft Ground Frequency Response

Frequency	Output Level
30 Hz	-10.3 dB ± 1.5 dB
180 Hz	+9.5 dB ± 1.5 dB
190 Hz	+7.8 dB ± 1.5 dB
1 kHz	0 dB Reference
3 kHz	+8.1 dB ± 1.0 dB
4 kHz	+7.8 dB ± 1.0 dB
10 kHz	+16.4 dB ± 2.5 dB

13. FreeSpace 360 In Hard Ground Frequency Response Test.

13.1 Apply a 100 mVrms, 1 kHz signal to the input jack of the amplifier channel under test.

13.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

13.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position.

NOTE: Switch the switch (S1) on the EQ card to the HARD position and insert the EQ card.

13.4 Turn on the amplifier and measure the gain. There should be a -2.1 ± 1.0 dB change in gain at the output.

13.5 Reference a dB meter and measure the response according to the In Hard Ground Frequency Response chart.

In Hard Ground Frequency Response

Frequency	Output Level
30 Hz	-8.3 dB ± 1.5 dB
90 Hz	+9.8 dB ± 1.5 dB
180 Hz	+11.2 dB ± 1.0 dB
800 Hz	+0.8 dB ± 1.0 dB
1 kHz	0 dB Reference
3 kHz	+8.1 dB ± 1.0 dB
4 kHz	+8.7 dB ± 1.0 dB
10 kHz	+18.2 dB ± 2.5 dB

TEST PROCEDURES

14. FreeSpace® 360 Surface EQ PCB Frequency Response Test.

14.1 Apply a 100 mVrms, 1 kHz signal to the input jack of the amplifier channel under test.

14.2 Adjust the amplifier volume controls to maximum and reference a dB meter to the output. No EQ card installed.

14.3 Shut off the amplifier. Open the input panel and switch the high frequency/full range switch (S2) to the full range position.

NOTE: Switch the switch (S1) on the EQ card to the SOFT position and insert the EQ card.

14.4 Turn on the amplifier and measure the gain. There should be a +1.0 ± 1.0 dB change in gain at the output.

14.5 Reference a dB meter and measure the response of the EQ card according to the Surface Frequency Response chart.

360 Surface Frequency Response

Frequency	Output Level
30 Hz	-8.8 dB ± 1.5 dB
90 Hz	+7.2 dB ± 1.5 dB
180 Hz	+11.0 dB ± 1.5 dB
900 Hz	+0.2 dB ± 1.5 dB
1 kHz	0 dB Reference
2 kHz	+0.4 dB ± 1.5 dB
5 kHz	+6.7 dB ± 1.0 dB
10 kHz	+17.9 dB ± 2.5 dB

15. Distortion Test

15.1 Apply a signal from the chart below to the input jack of the amplifier channel under test.

15.2 Measure the distortion level at the output of the amplifier. It should be ≤ 0.1% THD.

Product	Input Level	Frequency
402®	1.4 Vrms	850 Hz
402 II	1.4 Vrms	850 Hz
802® II	750 mVrms	700 Hz
802 III	750 mVrms	700 Hz
502®A	730 mVrms	600 Hz
502B	700 mVrms	80 Hz
502BEX	4.5 Vrms	100 Hz
M 1B	750 mVrms	1 kHz
M 8	750 mVrms	1 kHz
M 25/32	750 mVrms	1 kHz
3202® II	4 Vrms	320 Hz
4402® II	4 Vrms	320 Hz
9702® II	4 Vrms	320 Hz

PART LIST NOTES

1. This part is not normally available from Customer Service. Approval from the Field Service Manager is required before ordering.

2. The individual parts located on the PCBs are listed in the Electrical Part List.

3. ⚠ This part is critical for safety purposes. Failure to use a substitute replacement with the same safety characteristics as the recommended replacement part might create shock, fire and/or other hazards.

4. This connector is used on the 502®B EQ PCB only.

EQ CARD PCB

PART NUMBERS AND PRODUCT CODES

PCB Part Number	Description	Product Code
177333	402® EQ Card	009083
258111	402 II EQ Card	026677
177356	802® II EQ Card	009080
258115	802 III EQ Card	026679
177342	502A EQ Card	009082
177349	502B EQ Card	009081
191921	502BEX EQ Card	019551
183111-001	Panaray® 3302® II EQ Card	011502
183123-001	Panaray 4402® II EQ Card	011504
183105-001	Panaray 9702® II EQ Card	017929
183117-001	Panaray LT II EQ Card	018485
190670-001E	Model 1B EQ Card	019509
184825	Model 8 EQ Card	015134
183744	Model 32 EQ Card	011687
198379-0011E	FreeSpace® 360 Surface	021845
198383-0011E	FreeSpace 360 In-ground	021844

402® SERIES I ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	10.0K, 1206, 1/8W, 1%	124894-1002	
R2	10.0K, 1206, 1/8W, 1%	124894-1002	
R3	3.92K, 1206, 1/8W, 1%	124894-3921	
R4	3.92K, 1206, 1/8W, 1%	124894-3921	
R5	8.25K, 1206, 1/8W, 1%	124894-8251	
R6	1.82K, 1206, 1/8W, 1%	124894-1821	
R7	1.82K, 1206, 1/8W, 1%	124894-1821	
R11	100K, 1206, 1/8W, 1%	124894-1003	
R13	JUMPER, CHIP	124896	
R14	3.92K, 1206, 1/8W, 1%	124894-3921	
R17	5.11K, 1206, 1/8W, 1%	124894-5111	
R19	JUMPER, CHIP	124896	
R20	JUMPER, CHIP	124896	
R21	JUMPER, CHIP	124896	
R27	JUMPER, CHIP	124896	
R30	86.6K, 1206, 1/8W, 1%	124894-8662	
R31	21.5K, 1206, 1/8W, 1%	124894-2152	
R32	78.7K, 1206, 1/8W, 1%	124894-7872	
R33	6.49K, 1206, 1/8W, 1%	124894-6491	
R34	JUMPER, CHIP	124896	
R35	JUMPER, CHIP	124896	
R36	JUMPER, CHIP	124896	
R37	47.0K, 1206, 1/8W, 5%	124895-4735	
R38	47.0K, 1206, 1/8W, 5%	124895-4735	
R39	JUMPER, CHIP	124896	

Capacitors

Reference Designator	Description	Part Number	Note
C2	.1uF, BOX, 85, 50V, 5%	137127-104	
C3	27uF, BOX, 85, 50V, 5%	137127-274	
C4	.0047uF, BOX, 85, 100V, 5%	137127-472	
C5	680pF, CER, 10%, 50V	137269-681	
C6	.0022uF, BOX, 85, 100V, 5%	137127-222	
C7	.047uF, BOX, 85, 63V, 5%	137127-473	
C8	.047uF, BOX, 85, 63V, 5%	137127-473	
C17	.068uF, BOX, 85, 63V, 5%	137127-683	
C19	.068uF, BOX, 85, 63V, 5%	137127-683	
C20	.022uF, BOX, 85, 100V, 5%	137127-223	
C22	.022uF, BOX, 85, 100V, 5%	137127-223	
C24	10000pF, CHIP, 5%	124959-103	
C26	10000pF, CHIP, 5%	124959-103	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

402® SERIES I ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

402® SERIES II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	10.0K, 1206, 1/8W, 1%	124894-1001	
R2	1.00K, 1206, 1/8W, 1%	124894-1001	
R3	2.21K, 1206, 1/8W, 1%	124894-2211	
R4	1.47K, 1206, 1/8W, 1%	124894-1471	
R5	JUMPER, CHIP	124896	
R8	182K, 1206, 1/8W, 1%	124894-1823	
R9	3.83K, 1206, 1/8W, 1%	124894-3831	
R10	25.5K, 1206, 1/8W, 1%	124894-2552	
R12	5.76K, 1206, 1/8W, 1%	124894-5761	
R13	1.00K, 1206, 1/8W, 1%	124894-1001	
R14	2.00K, 1206, 1/8W, 1%	124894-2001	
R17	10.0K, 1206, 1/8W, 1%	124894-1002	
R19	JUMPER, CHIP	124896	
R20	JUMPER, CHIP	124896	
R21	30.1K, 1206, 1/8W, 1%	124894-3012	
R22	JUMPER, CHIP	124896	
R23	5.76K, 1206, 1/8W, 1%	124894-5761	
R24	2.00K, 1206, 1/8W, 1%	124894-2001	
R26	3.01K, 1206, 1/8W, 1%	124894-3011	
R27	634 OHM, 1206, 1/8W, 1%	124894-6340	
R30	75.0K, 1206, 1/8W, 1%	124894-7502	
R31	21.5K, 1206, 1/8W, 1%	124894-2152	
R32	78.7K, 1206, 1/8W, 1%	124894-7872	
R33	7.15K, 1206, 1/8W, 1%	124894-7151	
R35	JUMPER, CHIP	124896	
R36	JUMPER, CHIP	124896	
R37	47.5K, 1206, 1/8W, 1%	124894-4752	
R38	47.5K, 1206, 1/8W, 1%	124894-4752	
R39	JUMPER, CHIP	124896	

402® SERIES II ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C3	.0022uF, BOX, 85, 100V, 5%	137127-222	
C5	.0018uF, BOX, 85, 100V, 5%	137127-182	
C8	.082uF, BOX, 85, 50V, 5%	137127-823	
C10	.01uF, BOX, 85, 100V, 5%	137127-103	
C14	.022uF, BOX, 85, 100V, 5%	137127-223	
C15	.068uF, BOX, 85, 63V, 5%	137127-683	
C16	.047uF, BOX, 85, 63V, 5%	137127-473	
C17	.082uF, BOX, 85, 50V, 5%	137127-823	
C19	.082uF, BOX, 85, 50V, 5%	137127-823	
C20	.022uF, BOX, 85, 100V, 5%	137127-223	
C22	.022uF, BOX, 85, 100V, 5%	137127-223	
C23	.027uF, BOX, 85, 63V, 5%	137127-273	
C24	10000pF, CHIP, 5%	124959-103	
C26	10000pF, CHIP, 5%	124959-103	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

802® SERIES II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.32K, 1206, 1/8W, 1%	124894-3321	
R2	1.00K, 1206, 1/8W, 1%	124894-1001	
R3	1.27K, 1206, 1/8W, 1%	124894-1271	
R4	1.27K, 1206, 1/8W, 1%	124894-1271	
R5	JUMPER, CHIP	124896	
R8	9.09K, 1206, 1/8W, 1%	124894-9091	
R9	6.81K, 1206, 1/8W, 1%	124894-6811	
R10	3.01K, 1206, 1/8W, 1%	124894-3011	
R12	9.09K, 1206, 1/8W, 1%	124894-9091	
R13	5.62K, 1206, 1/8W, 1%	124894-5621	
R14	54.9K, 1206, 1/8W, 1%	124894-5492	
R15	61.9K, 1206, 1/8W, 1%	124894-6192	
R16	2.49K, 1206, 1/8W, 1%	124894-2491	
R19	JUMPER, CHIP	124896	
R20	JUMPER, CHIP	124896	
R22	JUMPER, CHIP	124896	
R26	16.5K, 1206, 1/8W, 1%	124894-1652	
R27	20.0K, 1206, 1/8W, 1%	124894-2002	
R29	1.74K, 1206, 1/8W, 1%	124894-1741	
R30	93.1K, 1206, 1/8W, 1%	124894-9312	
R31	2.00K, 1206, 1/8W, 1%	124894-2001	
R32	34.8K, 1206, 1/8W, 1%	124894-3482	
R33	6.34K, 1206, 1/8W, 1%	124894-6341	
R37	47.5K, 1206, 1/8W, 1%	124894-4752	
R38	47.5K, 1206, 1/8W, 1%	124894-4752	
R39	JUMPER, CHIP	124896	
R40	JUMPER, CHIP	124896	
R41	JUMPER, CHIP	124896	
R44	JUMPER, CHIP	124896	

802® SERIES II ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C3	.0068uF, BOX, 85, 100V, 5%	137127-682	
C5	.0027uF, BOX, 85, 100V, 5%	137127-272	
C8	.12uF, BOX, 85, 50V, 5%	137127-124	
C10	.033uF, BOX, 85, 63V, 5%	137127-333	
C11	.0082uF, BOX, 85, 100V, 5%	137127-822	
C12	.0056uF, BOX, 85, 100V, 5%	137127-562	
C16	.1uF, BOX, 85, 50V, 5%	137127-104	
C18	.1uF, BOX, 85, 50V, 5%	137127-104	
C19	.1uF, BOX, 85, 50V, 5%	137127-104	
C20	.47uF, BOX, 85, 50V, 5%	137127-474	
C21	.15uF, BOX, 85, 50V, 5%	137127-154	
C22	.15uF, BOX, 85, 50V, 5%	137127-154	
C23	.033uF, BOX, 85, 63V, 5%	137127-333	
C24	10000pF, CHIP, 5%	124959-103	
C26	10000pF, CHIP, 5%	124959-103	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059OP, AMP, QUAD	144008	
U2	NJM2059OP, AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

802® SERIES III ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.32K, 1206, 1/8W, 1%	124894-3321	
R2	1.00K, 1206, 1/8W, 1%	124894-1001	
R3	1.27K, 1206, 1/8W, 1%	124894-1271	
R4	1.27K, 1206, 1/8W, 1%	124894-1271	
R5	JUMPER, CHIP	124896	
R8	9.09K, 1206, 1/8W, 1%	124894-9091	
R9	6.81K, 1206, 1/8W, 1%	124894-6811	
R10	3.01K, 1206, 1/8W, 1%	124894-3311	
R12	9.09K, 1206, 1/8W, 1%	124894-9091	
R13	5.62K, 1206, 1/8W, 1%	124894-5621	
R14	54.9K, 1206, 1/8W, 1%	124894-5492	
R15	61.9K, 1206, 1/8W, 1%	124894-6192	
R16	2.49K, 1206, 1/8W, 1%	124894-2491	
R19	JUMPER, CHIP	124896	
R20	JUMPER, CHIP	124896	
R22	JUMPER, CHIP	124896	
R26	16.5K, 1206, 1/8W, 1%	124894-1652	
R27	20.0K, 1206, 1/8W, 1%	124894-2002	
R29	1.74K, 1206, 1/8W, 1%	124894-1741	
R30	93.1K, 1206, 1/8W, 1%	124894-9312	
R31	2.00K, 1206, 1/8W, 1%	124894-2001	
R32	34.8K, 1206, 1/8W, 1%	124894-3482	
R33	6.34K, 1206, 1/8W, 1%	124894-6341	
R37	47.5K, 1206, 1/8W, 1%	124894-4752	
R38	47.5K, 1206, 1/8W, 1%	124894-4752	
R39	JUMPER, CHIP	124896	
R40	JUMPER, CHIP	124896	
R41	JUMPER, CHIP	124896	
R44	JUMPER, CHIP	124896	

802® SERIES III ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C3	.0068uF, BOX, 85, 100V, 5%	137127-682	
C5	.0027uF, BOX, 85, 100V, 5%	137127-272	
C8	.12uF, BOX, 85, 50V, 5%	137127-124	
C10	.033uF, BOX, 85, 63V, 5%	137127-333	
C11	.0082uF, BOX, 85, 100V, 5%	137127-822	
C12	.0056uF, BOX, 85, 100V, 5%	137127-562	
C16	.1uF, BOX, 85, 50V, 5%	137127-104	
C18	.1uF, BOX, 85, 50V, 5%	137127-104	
C19	.1uF, BOX, 85, 50V, 5%	137127-104	
C20	.47uF, BOX, 85, 50V, 5%	137127-474	
C21	.15uF, BOX, 85, 50V, 5%	137127-154	
C22	.15uF, BOX, 85, 50V, 5%	137127-154	
C23	.033uF, BOX, 85, 63V, 5%	137127-333	
C24	10000pF, CHIP, 5%	124959-103	
C26	10000pF, CHIP, 5%	124959-103	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

502®A ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.65K, 1206, 1/8W, 1%	124894-3651	
R2	2.00K, 1206, 1/8W, 1%	124894-2001	
R3	4.02K, 1206, 1/8W, 1%	124894-4021	
R4	4.02K, 1206, 1/8W, 1%	124894-4021	
R5	JUMPER, CHIP	124896	
R8	30.1K, 1206, 1/8W, 1%	124894-3012	
R11	49.9K, 1206, 1/8W, 1%	124894-4992	
R12	2.32K, 1206, 1/8W, 1%	124894-2321	
R13	2.00K, 1206, 1/8W, 1%	124894-2001	
R14	13.0K, 1206, 1/8W, 1%	124894-1302	
R15	20.0K, 1206, 1/8W, 1%	124894-2002	
R16	1.33K, 1206, 1/8W, 1%	124894-1331	
R17	100K, 1206, 1/8W, 1%	124894-1003	
R18	3.16K, 1206, 1/8W, 1%	124894-3161	
R19	511 OHM, 1206, 1/8W, 1%	124894-5110	
R20	JUMPER, CHIP	124896	
R21	18.2K, 1206, 1/8W, 1%	124894-1822	
R22	274 OHM, 1206, 1/8W, 1%	124894-2740	
R23	8.66K, 1206, 1/8W, 1%	124894-8661	
R24	6.34K, 1206, 1/8W, 1%	124894-6341	
R25	274 OHM, 1206, 1/8W, 1%	124894-2740	
R26	1.91K, 1206, 1/8W, 1%	124894-1911	
R27	2.21K, 1206, 1/8W, 1%	124894-2211	
R28	2.43K, 1206, 1/8W, 1%	124894-2431	
R29	2.00K, 1206, 1/8W, 1%	124894-2001	
R30	43.2K, 1206, 1/8W, 1%	124894-4322	
R31	3.01K, 1206, 1/8W, 1%	124894-3011	
R32	41.2K, 1206, 1/8W, 1%	124894-4122	
R33	3.92K, 1206, 1/8W, 1%	124894-3921	
R37	47.0K, 1206, 1/8W, 5%	124895-4735	
R38	47.0K, 1206, 1/8W, 5%	124895-4735	
R39	JUMPER, CHIP	124896	

502®A ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C2	100pF, CER, 10%, 50V	137269-101	
C3	.01uF, BOX, 85, 100V, 5%	137127-103	
C5	680pF, CER, 10%, 50V	137269-681	
C8	.0047uF, BOX, 85, 100V, 5%	137127-472	
C10	.0047uF, BOX, 85, 100V, 5%	137127-472	
C11	.01uF, BOX, 85, 100V, 5%	137127-103	
C12	.01uF, BOX, 85, 100V, 5%	137127-103	
C14	.1uF, BOX, 85, 50V, 5%	137127-104	
C15	.1uF, BOX, 85, 50V, 5%	137127-104	
C16	100pF, CER, 10%, 50V	137269-101	
C17	.47uF, BOX, 85, 50V, 5%	137127-474	
C18	.1uF, BOX, 85, 50V, 5%	137127-104	
C19	.1uF, BOX, 85, 50V, 5%	137127-104	
C20	.47uF, BOX, 85, 50V, 5%	137127-474	
C21	.1uF, BOX, 85, 50V, 5%	137127-104	
C22	.1uF, BOX, 85, 50V, 5%	137127-104	
C23	.01uF, BOX, 85, 100V, 5%	137127-103	
C24	10000pF, CHIP, 5%	124959-103	
C25	.047uF, BOX, 85, 63V, 5%	137127-473	
C26	10000pF, CHIP, 5%	124959-103	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN,HEADER, 12 PIN	149538	

502®B ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R35	6.81K, 1206, 1/8W, 1%	124894-6811	
R36	4.75K, 1206, 1/8W, 1%	124894-4751	
R37	15.4K, 1206, 1/8W, 1%	124894-1542	
R38	4.75K, 1206, 1/8W, 1%	124894-4751	
R39	JUMPER, CHIP	124896	
R40	5.11K, 1206, 1/8W, 1%	124894-5111	
R41	221K, 1206, 1/8W, 1%	124894-2213	
R42	1.10K, 1206, 1/8W, 1%	124894-1101	
R43	49.9K, 1206, 1/8W, 1%	124894-4992	
R44	221K, 1206, 1/8W, 1%	124894-2213	
R45	68.1K, 1206, 1/8W, 1%	124894-6812	
R46	6.98K, 1206, 1/8W, 1%	124894-6981	
R47	1.00K, 1206, 1/8W, 1%	124894-1001	
R48	4.32K, 1206, 1/8W, 1%	124894-4321	
R49	5.49K, 1206, 1/8W, 1%	124894-5491	
R50	14.0K, 1206, 1/8W, 1%	124894-1402	
R51	14.0K, 1206, 1/8W, 1%	124894-1402	
R52	6.81K, 1206, 1/8W, 1%	124894-6811	

Capacitors

Reference Designator	Description	Part Number	Note
C26	100pF, CER, 10%, 50V	137269-101	
C27	100pF, CER, 10%, 50V	137269-101	
C28	.47uF, BOX, 85, 50V, 5%	137127-474	
C29	.22uF, BOX, 85, 50V, 5%	137127-224	
C30	.22uF, BOX, 85, 50V, 5%	137127-224	
C31	.1uF, BOX, 85, 50V, 5%	137127-104	
C32	.1uF, BOX, 85, 50V, 5%	137127-104	
C34	.22uF, BOX, 85, 50V, 5%	137127-224	
C35	.022uF, BOX, 85, 100V, 5%	137127-223	
C36	.18uF, BOX, 85, 50V, 5%	137127-184	
C52	10000pF, CHIP ,5%	124959-103	
C53	10000pF, CHIP ,5%	124959-103	
C54	10000pF, CHIP ,5%	124959-103	
C55	10000pF, CHIP ,5%	124959-103	

502®B ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D7	1N4148, 52MM AXIAL	121501	
D8	1N4148, 52MM AXIAL	121501	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	
J2	CONN, HEADER, 2 POS, MALE	134739-02	

502®BEX ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R35	6.81K, 1206, 1/8W, 1%	124894-6811	
R36	4.75K, 1206, 1/8W, 1%	124894-4751	
R37	4.75K, 1206, 1/8W, 1%	124894-4751	
R38	4.75K, 1206, 1/8W, 1%	124894-4751	
R39	4.75K, 1206, 1/8W, 1%	124894-4751	
R40	5.11K, 1206, 1/8W, 1%	124894-5111	
R41	221K, 1206, 1/8W, 1%	124894-2213	
R42	1.10K, 1206, 1/8W, 1%	124894-1101	
R43	100K, 1206, 1/8W, 1%	124894-1003	
R45	33.2K, 1206, 1/8W, 1%	124894-3322	
R46	1.02K, 1206, 1/8W, 1%	124894-1021	
R47	JUMPER, CHIP	124896	
R49	4.87K, 1206, 1/8W, 1%	124894-4871	
R50	4.87K, 1206, 1/8W, 1%	124894-4871	
R51	4.87K, 1206, 1/8W, 1%	124894-4871	
R52	6.81K, 1206, 1/8W, 1%	124894-6811	

Capacitors

Reference Designator	Description	Part Number	Note
C26	100pF, CER, 10%, 50V	137269-101	
C27	100pF, CER, 10%, 50V	137269-101	
C28	.27uF, BOX, 85, 50V, 5%	137127-274	
C29	.22uF, BOX, 85, 50V, 5%	137127-224	
C30	.22uF, BOX, 85, 50V, 5%	137127-224	
C31	.1uF, BOX, 85, 50V, 5%	137127-104	
C32	.1uF, BOX, 85, 50V, 5%	137127-104	
C34	.15uF, BOX, 85, 50V, 5%	137127-154	
C35	.022uF, BOX, 85, 100V, 5%	137127-223	
C36	.39uF, BOX, 85, 50V, 5%	137127-394	
C52	10000pF, CHIP, 5%	124959-103	
C53	10000pF, CHIP, 5%	124959-103	
C54	10000pF, CHIP, 5%	124959-103	
C55	10000pF, CHIP, 5%	124959-103	

502®BEX ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D7	1N4148, 52MM AXIAL	121501	
D8	1N4148, 52MM AXIAL	121501	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	
J2	CONN, HEADER, 2 POS, MALE	134739-02	

MODEL 1B ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	JUMPER, CHIP	133627	
R2	JUMPER, CHIP	133627	
R3	20.0K, CHIP, 0805, 1%	133625-2002	
R5	JUMPER, CHIP	133627	
R8	24.9K, CHIP, 0805, 1%	133625-2492	
R9	30.1K, CHIP, 0805, 1%	133625-3012	
R10	30.1K, CHIP, 0805, 1%	133625-3012	
R13	32.4K, CHIP, 0805, 1%	133625-3242	
R14	32.4K, CHIP, 0805, 1%	133625-3242	
R15	6.81K, CHIP, 0805, 1%	133625-6811	
R16	6.81K, CHIP, 0805, 1%	133625-6811	
R18	JUMPER, CHIP	133627	
R19	JUMPER, CHIP	133627	
R20	JUMPER, CHIP	133627	
R21	24.9K, CHIP, 0805, 1%	133625-2492	
R26	JUMPER, CHIP	133627	
R30	JUMPER, CHIP	133627	
R50	20.0K, CHIP, 0805, 1%	133625-2002	
R51	16.9K, 0805, 1/10W, 1%	133625-1692	
R52	16.9K, 0805, 1/10W, 1%	133625-1692	
R53	JUMPER, CHIP	133627	
R55	JUMPER, CHIP	133627	
R56	JUMPER, CHIP	133627	
R57	3.32K, CHIP, 0805, 1/10W, 1%	133625-3321	
R58	3.32K, CHIP, 0805, 1/10W, 1%	133625-3321	
R61	16.9K, 0805, 1/10W, 1%	133625-1692	
R62	16.9K, 0805, 1/10W, 1%	133625-1692	
R63	20.0K, CHIP, 0805, 1%	133625-2002	
R64	JUMPER, CHIP	133627	
R80	20.0K, CHIP, 0805, 1%	133625-2002	
R81	20.0K, CHIP, 0805, 1%	133625-2002	
R82	20.0K, CHIP, 0805, 1%	133625-2002	
R84	JUMPER, CHIP	133627	
R85	JUMPER, CHIP	133627	
R86	JUMPER, CHIP	133627	
R87	3.9K, CHIP, 0805, 1/10W, 5%	133626-3925	
R88	3.9K, CHIP, 0805, 1/10W, 5%	133626-3925	
R91	JUMPER, CHIP	133627	
R92	JUMPER, CHIP	133627	
R93	20.0K, CHIP, 0805, 1%	133625-2002	
R94	100 OHM, CHIP, 0805, 1%	133625-1000	

MODEL 1B ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C2	.22uF, BOX, 85, 50V, 5%	137127-224	
C5	.01uF, BOX, 85, 100V, 5%	137127-103	
C6	.47uF, BOX, 85, 50V, 5%	137127-474	
C7	.18uF, BOX, 85, 50V, 5%	137127-184	
C8	.0033uF, BOX, 85, 100V, 5%	137127-332	
C9	.15uF, BOX, 85, 50V, 5%	137127-154	
C10	.012uF, BOX, 85, 100V, 5%	137127-123	
C11	.33uF, BOX, 85, 50V, 5%	137127-334	
C12	.47uF, BOX, 85, 50V, 5%	137127-474	
C13	.12uF, BOX, 85, 50V, 5%	137127-124	
C17	68pF, 0805, COG, 50V, 5%	133622-680	
C50	.0047uF, BOX, 85, 100V, 5%	137127-472	
C51	.039uF, BOX, 85, 63V, 5%	137127-393	
C52	.0033uF, BOX, 85, 100V, 5%	137127-332	
C56	.0015uF, BOX, 85, 100V, 5%	137127-152	
C57	015uF, BOX, 85, 100V, 5%	137127-153	
C58	330pF, DISC, SL, 50V, 10%	137269-331	
C59	.0068uF, BOX, 85, 100V, 5%	137127-682	
C60	.056uF, BOX, 85, 63V, 5%	137127-563	
C61	.0047uF, BOX, 85, 100V, 5%	137127-472	
C62	68pF, 0805, COG, 50V, 5%	133622-680	
C80	.0047uF, BOX, 85, 100V, 5%	137127-472	
C81	.027uF, BOX, 85, 63V, 5%	137127-273	
C86	.0015uF, BOX, 85, 100V, 5%	137127-152	
C87	.012uF, BOX, 85, 100V, 5%	137127-123	
C88	.0015uF, BOX, 85, 100V, 5%	137127-152	
C92	68pF, 0805, COG, 50V, 5%	133622-680	
C98	.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C99	1.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C100	.022uF, 0805, X7R, 50V, 10%	133623-223	
C101	.022uF, 0805, X7R, 50V, 10%	133623-223	
C102	.022uF, 0805, X7R, 50V, 10%	133623-223	
C103	.022uF, 0805, X7R, 50V, 10%	133623-223	
C104	.022uF, 0805, X7R, 50V, 10%	133623-223	
C105	.022uF, 0805, X7R, 50V, 10%	133623-223	
C106	.022uF, 0805, X7R, 50V, 10%	133623-223	
C107	.022uF, 0805, X7R, 50V, 10%	133623-223	
C108	.022uF, 0805, X7R, 50V, 10%	133623-223	
C109	.022uF, 0805, X7R, 50V, 10%	133623-223	

MODEL 1B ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP QUAD, SOIC-14	187472	
U2	NJM4559, OP AMP DUAL, SOIC-8	187473	
U3	NJM2059, OP AMP QUAD, SOIC-14	187472	
U4	NJM4559, OP AMP DUAL, SOIC-8	187473	
U5	NJM2059, OP AMP QUAD, SOIC-14	187472	

Miscellaneous

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	
S1	SWITCH, SPDT, VERTICAL, SLIDE	187481	
R33	50K, 90 DEG, ROTARY, LINEAR	188673-050	

MODEL 8 ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	20.0K, 1206, 1/8W, 1%	124894-2002	
R2	14.0K, 1206, 1/8W, 1%	124894-1402	
R3	4.12K, 1206, 1/8W, 1%	124894-4121	
R5	887 OHM, 1206, 1/8W, 1%	124894-8870	
R9	11.5K, 1206, 1/8W, 1%	124894-1152	
R11	110K, 1206, 1/8W, 1%	124894-1103	
R12	100K, 1206, 1/8W, 1%	124894-1003	
R13	4.12K, 1206, 1/8W, 1%	124894-4121	
R14	16.5K, 1206, 1/8W, 1%	124894-1652	
R16	4.99K, 1206, 1/8W, 1%	124894-4991	
R17	7.15K, 1206, 1/8W, 1%	124894-7151	
R18	6.19K, 1206, 1/8W, 1%	124894-6191	
R19	10.0K, 1206, 1/8W, 1%	124894-1002	
R20	4.99K, 1206, 1/8W, 1%	124894-4991	
R22	7.15K, 1206, 1/8W, 1%	124894-7151	
R25	887 OHM, 1206, 1/8W, 1%	124894-8870	
R26	6.19K, 1206, 1/8W, 1%	124894-6191	
R27	15.0K, 1206, 1/8W, 1%	124894-1502	
R31	21.5K, 1206, 1/8W, 1%	124894-2152	
R32	78.7K, 1206, 1/8W, 1%	124894-7872	
R35	JUMPER, CHIP	124896	
R36	JUMPER, CHIP	124896	
R37	47.0K, 1206, 1/8W, 5%	124895-4735	
R38	47.0K, 1206, 1/8W, 5%	124895-4735	
R40	JUMPER, CHIP	124896	
R41	JUMPER, CHIP	124896	
R42	JUMPER, CHIP	124896	
R43	JUMPER, CHIP	124896	
R44	JUMPER, CHIP	124896	
R45	JUMPER, CHIP	124896	

MODEL 8 ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C2	.047uF, BOX, 85, 63V, 5%	137127-473	
C3	.33uF, BOX, 85, 50V, 5%	137127-334	
C6	.0033uF, BOX, 85, 100V, 5%	137127-332	
C8	.047uF, BOX, 85, 63V, 5%	137127-473	
C10	.047uF, BOX, 85, 63V, 5%	137127-473	
C11	.033uF, BOX, 85, 63V, 5%	137127-333	
C12	.0056uF, BOX, 85, 100V, 5%	137127-562	
C20	.022uF, BOX, 85, 100V, 5%	137127-223	
C22	.022uF, BOX, 85, 100V, 5%	137127-223	
C24	10000pF, CHIP, 5%	124959-103	
C25	.0027uF, BOX, 85, 100V, 5%	137127-272	
C26	10000pF, CHIP, 5%	124959-103	
C27	.0022uF, BOX, 85, 100V, 5%	137127-222	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

MODEL 25/32 ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	20.0K, 1206, 1/8W, 1%	124894-2002	
R2	10.0K, 1206, 1/8W, 1%	124894-1002	
R3	22.1K, 1206, 1/8W, 1%	124894-2212	
R5	8.25K, 1206, 1/8W, 1%	124894-8251	
R9	11.5K, 1206, 1/8W, 1%	124894-1152	
R11	110K, 1206, 1/8W, 1%	124894-1103	
R12	150K, 1206, 1/8W, 1%	124894-1503	
R13	4.99K, 1206, 1/8W, 1%	124894-4991	
R14	22.1K, 1206, 1/8W, 1%	124894-2212	
R16	10.0K, 1206, 1/8W, 1%	124894-1002	
R17	10.0K, 1206, 1/8W, 1%	124894-1002	
R18	4.75K, 1206, 1/8W, 1%	124894-4751	
R19	4.75K, 1206, 1/8W, 1%	124894-4751	
R20	4.99K, 1206, 1/8W, 1%	124894-4991	
R22	3.92K, 1206, 1/8W, 1%	124894-3921	
R25	JUMPER, CHIP	124896	
R26	6.19K, 1206, 1/8W, 1%	124894-6191	
R27	8.25K, 1206, 1/8W, 1%	124894-8251	
R31	21.5K, 1206, 1/8W, 1%	124894-2152	
R32	78.7K, 1206, 1/8W, 1%	124894-7872	
R35	JUMPER, CHIP	124896	
R36	JUMPER, CHIP	124896	
R37	47.0K, 1206, 1/8W, 5%	124895-4735	
R38	47.0K, 1206, 1/8W, 5%	124895-4735	
R40	JUMPER, CHIP	124896	
R41	JUMPER, CHIP	124896	
R42	JUMPER, CHIP	124896	
R43	JUMPER, CHIP	124896	
R44	JUMPER, CHIP	124896	
R45	JUMPER, CHIP	124896	

MODEL 25/32 ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C2	.068uF, BOX, 85, 63V, 5%	137127-683	
C3	.27uF, BOX, 85, 50V, 5%	137127-274	
C8	.047uF, BOX, 85, 63V, 5%	137127-473	
C10	.056uF, BOX, 85, 63V, 5%	137127-563	
C11	.0056uF, BOX, 85, 100V, 5%	137127-562	
C12	.0056uF, BOX, 85, 100V, 5%	137127-562	
C20	.022uF, BOX, 85, 100V, 5%	137127-223	
C22	.022uF, BOX, 85, 100V, 5%	137127-223	
C24	10000pF, CHIP,5%	124959-103	
C25	.0027uF, BOX, 85, 100V, 5%	137127-272	
C26	10000pF, CHIP, 5%	124959-103	
C27	.0027uF, BOX, 85, 100V, 5%	137127-272	
C48	10000pF, CHIP, 5%	124959-103	
C49	10000pF, CHIP, 5%	124959-103	
C50	10000pF, CHIP, 5%	124959-103	
C51	10000pF, CHIP, 5%	124959-103	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD	144008	
U2	NJM2059, OP AMP, QUAD	144008	
U3	BA3128N, SWITCH, ACTIVE, SIP-8	177292	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

FREESPACE® 360 IN GROUND ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	2.00K, CHIP, 0805, 1/10W, 1%	133625-2001	
R2	JUMPER, CHIP	133627	
R3	18.2K, CHIP, 0805, 1/10W, 1%	133625-1822	
R4	2.21K, CHIP, 0805, 1/10W, 1%	133625-2211	
R5	JUMPER, CHIP	133627	
R8	200K, CHIP, 0805, 1/10W, 1%	133625-2003	
R9	392K, CHIP, 0805, 1/10W, 1%	133625-3923	
R10	392K, CHIP, 0805, 1/10W, 1%	133625-3923	
R12	JUMPER, CHIP	133627	
R13	28.7K, CHIP ,0805, 1/10W, 1%	133625-2872	
R14	28.7K, CHIP, 0805, 1/10W, 1%	133625-2872	
R15	127K, CHIP, 0805, 1/10W, 1%	133625-1273	
R16	127K, CHIP, 0805, 1/10W, 1%	133625-1273	
R17	JUMPER, CHIP	133627	
R18	JUMPER, CHIP	133627	
R19	169K, CHIP, 0805, 1/10W, 1%	133625-1693	
R20	169K, CHIP, 0805, 1/10W, 1%	133625-1693	
R21	200K, CHIP, 0805, 1/10W, 1%	133625-2003	
R24	JUMPER, CHIP	133627	
R26	JUMPER, CHIP	133627	
R28	JUMPER, CHIP	133627	
R30	JUMPER, CHIP	133627	
R50	24.9K, CHIP, 0805, 1/10W, 1%	133625-2492	
R51	8.25K, CHIP, 0805, 1/10W, 1%	133625-8251	
R52	8.25K, CHIP, 0805, 1/10W, 1%	133625-8251	
R55	47.5K, CHIP, 0805, 1/10W, 1%	133625-4752	
R56	47.5K, CHIP, 0805, 1/10W, 1%	133625-4752	
R57	6.81K, CHIP, 0805, 1/10W, 1%	133625-6811	
R58	6.81K, CHIP, 0805, 1/10W, 1%	133625-6811	
R59	JUMPER, CHIP	133627	
R61	4.87K, CHIP, 0805, 1/10W, 1%	133625-4871	
R62	4.87K, CHIP, 0805, 1/10W, 1%	133625-4871	
R63	24.9K, CHIP, 0805, 1/10W, 1%	133625-2492	
R64	JUMPER, CHIP	133627	
R80	24.9K, CHIP, 0805, 1/10W, 1%	133625-2492	
R81	8.25K, CHIP, 0805, 1/10W, 1%	133625-8251	
R82	8.25K, CHIP, 0805, 1/10W, 1%	133625-8251	
R83	JUMPER, CHIP	133627	
R85	66.5K, CHIP, 0805, 1/10W, 1%	133625-6652	
R86	66.5K, CHIP, 0805, 1/10W, 1%	133625-6652	
R87	6.81K, CHIP, 0805, 1/10W, 1%	133625-6811	
R88	6.81K, CHIP, 0805, 1/10W, 1%	133625-6811	
R89	JUMPER, CHIP	133627	
R91	4.87K, CHIP, 0805, 1/10W, 1%	133625-4871	
R92	4.87K, CHIP, 0805, 1/10W, 1%	133625-4871	
R93	24.9K, CHIP, 0805, 1/10W, 1%	133625-2492	
R94	100 OHM, CHIP, 0805, 1/10W, 1%	133625-1000	

FREESPACE® 360 IN GROUND ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C2	.22uF, BOX, 85, 50V, 5%	137127-224	
C5	390pF, MONO, COG, 50V, 5%	140564-391	
C6	.018uF, BOX, 85, 100V, 5%	137127-183	
C7	.0068uF, BOX, 85, 100V, 5%	137127-682	
C8	.047uF, BOX, 85, 63V, 5%	137127-473	
C9	.47uF, BOX, 85, 50V, 5%	137127-474	
C10	.47uF, BOX, 85, 50V, 5%	137127-474	
C11	.0015uF, BOX, 85, 100V, 5%	137127-152	
C12	.015uF, BOX, 85, 100V, 5%	137127-153	
C13	.022uF, BOX, 85, 100V, 5%	137127-223	
C14	.0027uF, BOX, 85, 100V, 5%	137127-272	
C15	.033uF, BOX, 85, 63V, 5%	137127-333	
C16	.01uF, BOX, 85, 100V, 5%	137127-103	
C17	18pF, 0805, 50V, 5%	133622-180	
C50	.0056uF, BOX, 85, 100V, 5%	137127-562	
C51	.033uF, BOX, 85, 63V, 5%	137127-333	
C52	.068uF, BOX, 85, 63V, 5%	137127-683	
C53	270pF, MONO, COG, 50V, 5%	140564-271	
C54	.0039uF, BOX, 85, 100V, 5%	137127-392	
C55	390pF, MONO, COG, 50V, 5%	140564-391	
C56	330pF, MONO, COG, 50V, 5%	140564-331	
C57	.0068uF, BOX, 85, 100V, 5%	137127-682	
C58	.0056uF, BOX, 85, 100V, 5%	137127-562	
C59	560pF, MONO, COG, 50V, 5%	140564-561	
C60	.0047uF, BOX, 85, 100V, 5%	137127-472	
C61	.0033uF, BOX, 85, 100V, 5%	137127-332	
C62	68pF, 0805, COG, 50V, 5%	133622-680	
C80	.0082uF, BOX, 85, 100V, 5%	137127-822	
C81	.022uF, BOX, 85, 100V, 5%	137127-223	
C82	.022uF, BOX, 85, 100V, 5%	137127-223	
C83	220pF, MONO, 5%	140564-221	
C84	.0022uF, BOX, 85, 100V, 5%	137127-222	
C85	820pF, MONO, COG, 50V, 5%	140564-821	
C86	330pF, MONO, COG, 50V, 5%	140564-331	
C87	.0068uF, BOX, 85, 100V, 5%	137127-682	
C88	.0056uF, BOX, 85, 100V, 5%	137127-562	
C89	560pF, MONO, COG, 50V, 5%	140564-561	
C90	.0047uF, BOX, 85, 100V, 5%	137127-472	
C91	.0033uF, BOX, 85, 100V, 5%	137127-332	
C92	68pF, 0805, COG, 50V, 5%	133622-680	
C98	.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C99	.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C100	.022uF, 0805, X7R, 50V, 10%	133623-223	
C101	.022uF, 0805, X7R, 50V, 10%	133623-223	
C102	.022uF, 0805, X7R, 50V, 10%	133623-223	
C103	.022uF, 0805, X7R, 50V, 10%	133623-223	

FREESPACE® 360 IN GROUND ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C104	.022uF, 0805, X7R, 50V, 10%	133623-223	
C105	.022uF, 0805, X7R, 50V, 10%	133623-223	
C106	.022uF, 0805, X7R, 50V, 10%	133623-223	
C107	.022uF, 0805, X7R, 50V, 10%	133623-223	
C108	.022uF, 0805, X7R, 50V, 10%	133623-223	
C109	.022uF, 0805, X7R, 50V, 10%	133623-223	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD, SOIC-14	187472	
U2	NJM4559, OP AMP, DUAL, SOIC-8	187473	
U3	NJM2059, OP AMP, QUAD, SOIC-14	187472	
U4	NJM4559, OP AMP, DUAL, SOIC-8	187473	
U5	NJM2059, OP AMP, QUAD, SOIC-14	187472	

Miscellaneous

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	
S1	SWITCH, SPDT, VERTICAL, SLIDE	187481	

FREESPACE® 360 SURFACE ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	2.00K, CHIP, 0805, 1%	133625-2001	
R2	JUMPER, CHIP	133627	
R3	18.2K, CHIP, 0805, 1%	133625-1822	
R4	1.50K, 0805, 1/10W, 1%	133625-1501	
R5	JUMPER, CHIP	133627	
R8	200K, 0805, 1/10W, 1%	133625-2003	
R9	392K, 0805, 1/10W, 1%	133625-3923	
R10	392K, 0805, 1/10W, 1%	133625-3923	
R12	JUMPER, CHIP	133627	
R13	28.7K, 0805, 1/10W, 1%	133625-2872	
R14	28.7K, 0805, 1/10W, 1%	133625-2872	
R15	127K, 0805, 1/10W, 1%	133625-1273	
R16	127K, 0805, 1/10W, 1%	133625-1273	
R17	JUMPER, CHIP	133627	
R18	JUMPER, CHIP	133627	
R19	392K, 0805, 1/10W, 1%	133625-3923	
R20	392K, 0805, 1/10W, 1%	133625-3923	
R21	200K, 0805, 1/10W, 1%	133625-2003	
R23	JUMPER, CHIP	133627	
R26	JUMPER, CHIP	133627	
R50	24.9K, CHIP, 0805, 1%	133625-2492	
R51	16.5K, CHIP, 0805, 1%	133625-1652	
R52	16.5K, CHIP, 0805, 1%	133625-1652	
R55	10.0K, CHIP, 0805, 1%	133625-1002	
R56	10.0K, CHIP, 0805, 1%	133625-1002	
R57	5.76K, CHIP, 0805, 1%	133625-5761	
R58	5.76K, CHIP, 0805, 1%	133625-5761	
R59	JUMPER, CHIP	133627	
R61	4.87K, CHIP, 0805, 1%	133625-4871	
R62	4.87K, CHIP, 0805, 1%	133625-4871	
R63	24.9K, CHIP, 0805, 1%	133625-2492	
R64	JUMPER, CHIP	133627	
R80	24.9K, CHIP, 0805, 1%	133625-2492	
R93	24.9K, CHIP, 0805, 1%	133625-2492	
R94	100 OHM, CHIP, 0805, 1%	133625-1000	
S1	JUMPER, CHIP	133627	

Capacitors

Reference Designator	Description	Part Number	Note
C2	.22uF, BOX, 85, 50V, 5%	137127-224	
C5	390pF, MONO, COG, 50V, 5%	140564-391	
C6	.018uF, BOX, 85, 100V, 5%	137127-183	
C7	.0068uF, BOX, 85, 100V, 5%	137127-682	
C8	.047uF, BOX, 85, 63V, 5%	137127-473	
C9	.47uF, BOX, 85, 50V, 5%	137127-474	
C10	.47uF, BOX, 85, 50V, 5%	137127-474	

FREESPACE® 360 SURFACE ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C11	820pF, MONO, COG, 50V, 5%	140564-821	
C12	.056uF, BOX, 85, 63V, 5%	137127-563	
C13	.0018uF, BOX, 85, 100V, 5%	137127-182	
C14	.001uF, BOX, 85, 100V, 5%	137127-102	
C15	.033uF, BOX, 85, 63V, 5%	137127-333	
C16	.01uF, BOX, 85, 100V, 5%	137127-103	
C17	18pF, 0805, 50V, 5%	133622-180	
C50	.0033uF, BOX, 85, 100V, 5%	137127-332	
C51	.033uF, BOX, 85, 63V, 5%	137127-333	
C52	.0047uF, BOX, 85, 100V, 5%	137127-472	
C53	.0056uF, BOX, 85, 100V, 5%	137127-562	
C54	.0082uF, BOX, 85, 100V, 5%	137127-822	
C55	.0027uF, BOX, 85, 100V, 5%	137127-272	
C56	390pF, MONO, COG, 50V, 5%	140564-391	
C57	.0082uF, BOX, 85, 100V, 5%	137127-822	
C58	.0082uF, BOX, 85, 100V, 5%	137127-822	
C59	560pF, MONO, COG, 50V, 5%	140564-561	
C60	.0047uF, BOX, 85, 100V, 5%	137127-472	
C61	.0033uF, BOX, 85, 100V, 5%	137127-332	
C62	68pF, 0805, COG, 50V, 5%	133622-680	
C92	68pF, 0805, COG, 50V, 5%	133622-680	
C98	.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C99	.1uF, 1206, Z5U, 50V, 20%	124958-1041	
C100	.022uF, 0805, X7R, 50V, 10%	133623-223	
C101	.022uF, 0805, X7R, 50V, 10%	133623-223	
C102	.022uF, 0805, X7R, 50V, 10%	133623-223	
C103	.022uF, 0805, X7R, 50V, 10%	133623-223	
C104	.022uF, 0805, X7R, 50V, 10%	133623-223	
C105	.022uF, 0805, X7R, 50V, 10%	133623-223	
C108	.022uF, 0805, X7R, 50V, 10%	133623-223	
C109	.022uF, 0805, X7R, 50V, 10%	133623-223	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	NJM2059, OP AMP, QUAD, SOIC-14	187472	
U2	NJM4559, OP AMP, DUAL, SOIC-8	187473	
U3	NJM2059, OP AMP, QUAD, SOIC-14	187472	
U4	NJM4559, OP AMP, DUAL, SOIC-8	187473	
U5	NJM2059, OP AMP, QUAD, SOIC-14	187472	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

PANARAY® 3202® II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R2	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R4	4.32K, CHIP, 0805, 1/10W, 1%	133625-4321	
R5	1.30K, CHIP, 0805, 1/10W, 1%	133625-1301	
R6	8.87K, CHIP, 0805, 1/10W, 1%	133625-8871	
R7	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R8	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R9	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R10	12.7K, CHIP, 0805, 1/10W, 1%	133625-1272	
R11	12.7K, CHIP, 0805, 1/10W, 1%	133625-1272	
R12	JUMPER, CHIP	133627	
R13	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R14	JUMPER, CHIP	133627	
R19	JUMPER, CHIP	133627	
R20	JUMPER, CHIP	133627	
R21	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R22	15.4K, CHIP, 0805, 1/10W, 1%	133625-1542	
R24	JUMPER, CHIP	133627	
R27	JUMPER, CHIP	133627	
R28	20.0K, CHIP, 0805, 1%	133625-2002	
R29	JUMPER, CHIP	133627	
R30	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R33	20.0K, CHIP, 0805, 1%	133625-2002	
R34	JUMPER, CHIP	133627	
R35	JUMPER, CHIP	133627	
R36	22.6K, CHIP, 0805, 1/10W, 1%	133625-2262	
R37	22.6K, CHIP, 0805, 1/10W, 1%	133625-2262	
R41	64.9K, CHIP, 0805, 1/10W, 1%	133625-6492	
R42	64.9K, CHIP, 0805, 1/10W, 1%	133625-6492	
R43	27.4K, CHIP, 0805, 1/10W, 1%	133625-2742	
R44	27.4K, CHIP, 0805, 1/10W, 1%	133625-2742	
R45	40.2K, CHIP, 0805, 1/10W, 1%	133625-4022	
R46	40.2K, CHIP, 0805, 1/10W, 1%	133625-4022	

PANARAY® 3202® II ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C1	.47uF BOX, 85, 50V, 5%	137127-474	
C2	.47uF BOX, 85, 50V, 5%	137127-474	
C3	.47uF BOX, 85, 50V, 5%	137127-474	
C4	.1uF, BOX, 85, 50V, 5%	137127-104	
C5	.47uF BOX, 85, 50V, 5%	137127-474	
C6	.0082uF, BOX, 85, 100V, 5%	137127-822	
C7	.0012uF, BOX, 85, 100V, 5%	137127-122	
C8	.0039uF, BOX, 85, 100V, 5%	137127-392	
C9	.027uF, BOX, 85, 63V, 5%	137127-273	
C11	.0068uF, BOX, 85, 100V, 5%	137127-682	
C15	.1uF, BOX, 85, 50V, 5%	137127-104	
C17	.0033uF, BOX, 85, 100V, 5%	137127-332	
C18	27pF, DISC, SL, 50V, 10%	137269-270	
C20	JUMPER, 0 OHM	139942	
C23	100pF, CER, 10%, 50V	137269-101	
C25	.0012uF, BOX, 85, 100V, 5%	137127-122	
C27	.0047uF, BOX, 85, 100V, 5%	137127-472	
C29	680pF, CER, 10%, 50V	137269-681	
C30	150pF, DISC, SL, 50V, 10%	137269-151	
C31	.0022uF, BOX, 85, 100V, 5%	137127-222	
C32	220pF, DISC, SL, 50V, 10%	137269-221	
C33	47pF, 0805, COG, 50V, 5%	133622-470	
C34	.022uF, 0805, X7R, 50V, 10%	133623-223	
C35	.022uF, 0805, X7R, 50V, 10%	133623-223	
C36	.022uF, 0805, X7R, 50V, 10%	133623-223	
C37	.022uF, 0805, X7R, 50V, 10%	133623-223	
C38	.10uF, 0805, Y5V, 25V, 80%	133624	
C39	.10uF, 0805, Y5V, 25V, 80%	133624	
C40	.022uF, 0805, X7R, 50V, 10%	133623-223	
C41	.022uF, 0805, X7R, 50V, 10%	133623-223	
C42	.022uF, 0805, X7R, 50V, 10%	133623-223	
C43	.022uF, 0805, X7R, 50V, 10%	133623-223	
C44	.022uF, 0805, X7R, 50V, 10%	133623-223	
C45	.022uF, 0805, X7R, 50V, 10%	133623-223	
C46	.022uF, 0805, X7R, 50V, 10%	133623-223	
C47	.022uF, 0805, X7R, 50V, 10%	133623-223	

PANARAY® 3202® II ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated circuits

Reference Designator	Description	Part Number	Note
U1	RC4559, OP AMP, DUAL, DIP-8	108568	
U2	RC4559, OP AMP, DUAL, DIP-8	108568	
U3	RC4559, OP AMP, DUAL, DIP-8	108568	
U4	RC4559, OP AMP, DUAL, DIP-8	108568	
U5	RC4559, OP AMP, DUAL, DIP-8	108568	
U6	RC4559, OP AMP, DUAL, DIP-8	108568	

Connector

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

PANARAY® 4402® II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R2	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R4	2.87K, CHIP, 0805, 1/10W, 1%	133625-2871	
R5	1.30K, CHIP, 0805, 1/10W, 1%	133625-1301	
R6	8.87K, CHIP, 0805, 1/10W, 1%	133625-8871	
R7	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R8	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R9	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R10	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R11	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R12	JUMPER, CHIP	133627	
R13	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R14	JUMPER, CHIP	133627	
R15	JUMPER, CHIP	133627	
R19	33.2K, CHIP, 0805, 1/10W, 1%	133625-3322	
R20	33.2K, CHIP, 0805, 1/10W, 1%	133625-3322	
R21	2.87K, CHIP, 0805, 1/10W, 1%	133625-2871	
R22	13.7K, CHIP, 0805, 1/10W, 1%	133625-1372	
R24	JUMPER, CHIP	133627	
R27	JUMPER, CHIP	133627	
R28	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R29	JUMPER, CHIP	133627	
R30	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R31	JUMPER, CHIP	133627	
R32	JUMPER, CHIP	133627	
R33	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R36	21.5K, CHIP, 0805, 1/10W, 1%	133625-2152	
R37	49.9K, CHIP, 0805, 1/10W, 1%	133625-4992	
R41	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	
R42	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	
R43	52.3K, CHIP, 0805, 1/10W, 1%	133625-5232	
R44	52.3K, CHIP, 0805, 1/10W, 1%	133625-5232	
R45	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	
R46	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	

PANARAY® 4402® II ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C1	.47uF, BOX, 85, 50V, 5%	137127-474	
C2	.47uF, BOX, 85, 50V, 5%	137127-474	
C3	.47uF, BOX, 85, 50V, 5%	137127-474	
C4	.1uF, BOX, 85, 50V, 5%	137127-104	
C5	.47uF, BOX, 85, 0V, 5%	137127-474	
C6	.0082uF, BOX, 85, 100V, 5%	137127-822	
C7	.0012uF, BOX, 85, 100V, 5%	137127-122	
C8	.0039uF, BOX, 85, 100V, 5%	137127-392	
C9	.0082uF, BOX, 85, 100V, 5%	137127-822	
C10	680pF, CER, 10%, 50V	137269-681	
C11	680pF, CER, 10%, 50V	137269-681	
C12	.0022uF, BOX, 85, 100V, 5%	137127-222	
C13	.012uF, BOX, 85, 100V, 5%	137127-123	
C14	0018uF, BOX, 85, 100V, 5%	137127-182	
C15	.1uF, BOX, 85, 50V, 5%	137127-104	
C17	.0033uF, BOX, 85, 100V, 5%	137127-332	
C18	120pF, DISC, SL, 50V, 10%	137269-121	
C20	0 OHM, JUMPER	139942	
C23	220pF, DISC, SL, 50V, 10%	137269-221	
C25	.0033uF, BOX, 85, 100V, 5%	137127-332	
C26	330pF, DISC, SL, 50V, 10%	137269-331	
C27	470pF, CER, 10%, 50V	137269-471	
C28	390pF, DISC, SL, 50V, 10%	137269-391	
C29	150pF, DISC, SL, 50V, 10%	137269-151	
C30	.0027uF, BOX, 85, 100V, 5%	137127-272	
C31	.015uF, BOX, 85, 100V, 5%	137127-153	
C32	.0018uF, BOX, 85, 100V, 5%	137127-182	
C33	47pF, 0805, COG, 50V, 5%	133622-470	
C34	.022uF, 0805, X7R, 50V, 10%	133623-223	
C35	.022uF, 0805, X7R, 50V, 10%	133623-223	
C36	.022uF, 0805, X7R, 50V, 10%	133623-223	
C37	.022uF, 0805, X7R, 50V, 10%	133623-223	
C38	.10uF, 0805, Y5V, 25V, 80%	133624	
C39	.10uF, 0805, Y5V, 25V, 80%	133624	
C40	.022uF, 0805, X7R, 50V, 10%	133623-223	
C41	.022uF, 0805, X7R, 50V, 10%	133623-223	
C42	.022uF, 0805, X7R, 50V, 10%	133623-223	
C43	.022uF, 0805, X7R, 50V, 10%	133623-223	
C44	.022uF, 0805, X7R, 50V, 10%	133623-223	
C45	.022uF, 0805, X7R, 50V, 10%	133623-223	
C46	.022uF, 0805, X7R, 50V, 10%	133623-223	
C47	.022uF, 0805, X7R, 50V, 10%	133623-223	

PANARAY® 4402® II ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	RC4559, OP AMP, DUAL, DIP-8	108568	
U2	RC4559, OP AMP, DUAL, DIP-8	108568	
U3	RC4559, OP AMP, DUAL, DIP-8	108568	
U4	RC4559, OP AMP, DUAL, DIP-8	108568	
U5	RC4559, OP AMP, DUAL, DIP-8	108568	
U6	RC4559, OP AMP, DUAL, DIP-8	108568	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

PANARAY® 9702® II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R2	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R4	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R5	1.30K, CHIP, 0805, 1/10W, 1%	133625-1301	
R6	8.87K, CHIP, 0805, 1/10W, 1%	133625-8871	
R7	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R8	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R9	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R10	22.6K, CHIP, 0805, 1/10W, 1%	133625-2262	
R11	22.6K, CHIP, 0805, 1/10W, 1%	133625-2262	
R13	20.0K, CHIP, 0805, 1/10W 1%	133625-2002	
R17	JUMPER, CHIP	133627	
R18	JUMPER, CHIP	133627	
R19	90.9K, CHIP, 0805, 1/10W, 1%	133625-9092	
R20	90.9K, CHIP, 0805, 1/10W, 1%	133625-9092	
R21	2.80K, CHIP, 0805, 1/10W, 1%	133625-2801	
R22	14.7K, CHIP, 0805, 1/10W, 1%	133625-1472	
R24	JUMPER, CHIP	133627	
R27	40.2K, CHIP, 0805, 1/10W, 1%	133625-4022	
R28	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R29	JUMPER, CHIP	133627	
R30	2.74K, CHIP, 0805, 1/10W, 1%	133625-2741	
R33	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R35	JUMPER, CHIP	133627	
R36	26.1K, CHIP, 0805, 1/10W, 1%	133625-2612	
R37	15.0K, CHIP, 0805, 1/10W, 1%	133625-1502	
R40	40.2K, CHIP, 0805, 1/10W, 1%	133625-4022	
R43	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	
R44	16.9K, CHIP, 0805, 1/10W, 1%	133625-1692	
R45	90.9K, CHIP, 0805, 1/10W, 1%	133625-9092	
R46	90.9K, CHIP, 0805, 1/10W, 1%	133625-9092	

PANARAY® 9702® II ELECTRICAL PART LIST

Capacitors

Reference Designator	Description	Part Number	Note
C1	.47uF, BOX, 85, 50V, 5%	137127-474	
C2	.47uF, BOX, 85, 50V, 5%	137127-474	
C3	.47uF, BOX, 85, 50V, 5%	137127-474	
C4	.1uF, BOX, 85, 50V, 5%	137127-104	
C5	.47uF, BOX, 85, 50V, 5%	137127-474	
C6	.0082uF, BOX, 85, 100V, 5%	137127-822	
C7	.0012uF, BOX, 85, 100V, 5%	137127-122	
C8	.0039uF, BOX, 85, 100V, 5%	137127-392	
C9	.027uF, BOX, 85, 63V, 5%	137127-273	
C10	.027uF, BOX, 85, 63V, 5%	137127-273	
C11	.0033uF, BOX, 85, 100V, 5%	137127-332	
C12	820pF, DISC, SL, 50V, 10%	137269-820	
C13	.0012uF, BOX, 85, 100V, 5%	137127-122	
C14	120pF, DISC, SL, 50V, 10%	37269-121	
C15	.1uF, BOX, 85, 50V, 5%	137127-104	
C17	.0033uF, BOX, 85, 100V, 5%	137127-332	
C20	0 OHM, JUMPER	139942	
C23	220pF, DISC, SL, 50V, 10%	137269-221	
C24	.0022uF, BOX, 85, 100V, 5%	137127-222	
C27	.0018uF, BOX, 85, 100V, 5%	137127-182	
C28	.0082uF, B OX, 85, 100V, 5%	137127-822	
C29	120pF, DISC, SL, 50V, 10%	37269-121	
C30	820pF, DISC, SL, 50V, 10%	137269-820	
C31	330pF, DISC, SL, 50V, 10%	137269-331	
C33	47pF, 0805, COG, 50V, 5%	133622-470	
C34	.022uF, 0805, X7R, 50V, 10%	133623-223	
C35	.022uF, 0805, X7R, 50V, 10%	133623-223	
C36	.022uF, 0805, X7R, 50V, 10%	133623-223	
C37	.022uF, 0805, X7R, 50V, 10%	133623-223	
C38	.10uF, 0805, Y5V, 25V, 80%	133624	
C39	.10uF, 0805, Y5V, 25V, 80%	133624	
C40	.022uF, 0805, X7R, 50V, 10%	133623-223	
C41	.022uF, 0805, X7R, 50V, 10%	133623-223	
C42	.022uF, 0805, X7R, 50V, 10%	133623-223	
C43	.022uF, 0805, X7R, 50V, 10%	133623-223	
C44	.022uF, 0805, X7R, 50V, 10%	133623-223	
C45	.022uF, 0805, X7R, 50V, 10%	133623-223	
C46	.022uF, 0805, X7R, 50V, 10%	133623-223	
C47	.022uF, 0805, X7R, 50V, 10%	133623-223	

PANARAY® 9702®II ELECTRICAL PART LIST

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	RC4559, OP AMP, DUAL, DIP-8	108568	
U2	RC4559, OP AMP, DUAL, DIP-8	108568	
U3	RC4559, OP AMP, DUAL, DIP-8	108568	
U4	RC4559, OP AMP, DUAL, DIP-8	108568	
U5	RC4559, OP AMP, DUAL, DIP-8	108568	
U6	RC4559, OP AMP, DUAL, DIP-8	108568	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

PANARAY® LT II ELECTRICAL PART LIST

Resistors

Reference Designator	Description	Part Number	Note
R1	3.16K, CHIP, 0805, 1/10W, 1%	133625-3161	
R2	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R4	4.32K, CHIP, 0805, 1/10W, 1%	133625-4321	
R5	1.30K, CHIP, 0805, 1/10W, 1%	133625-1301	
R6	8.87K, CHIP, 0805, 1/10W, 1%	133625-8871	
R7	12.1K, CHIP, 0805, 1/10W, 1%	133625-1212	
R8	12.1K, CHIP, 0805, 1/10W, 1%	133625-1212	
R9	11.3K, CHIP, 0805, 1/10W, 1%	133625-1132	
R13	20.0K, CHIP, 0805, 1/10W 1%	133625-2002	
R21	3.65K, CHIP, 0805, 1/10W, 1%	133625-3651	
R22	15.4K, CHIP, 0805, 1/10W, 1%	133625-1542	
R24	JUMPER, CHIP	133627	
R27	JUMPER, CHIP	133627	
R28	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R29	JUMPER, CHIP	133627	
R30	11.3K, CHIP, 0805, 1/10W, 1%	133625-1132	
R33	20.0K, CHIP, 0805, 1/10W, 1%	133625-2002	
R36	22.6K, CHIP, 0805, 1/10W, 1%	133625-2612	
R37	22.6K, CHIP, 0805, 1/10W, 1%	133625-2612	
R43	JUMPER, CHIP	133627	
R44	JUMPER, CHIP	133627	

Capacitors

Reference Designator	Description	Part Number	Note
C1	.47uF, BOX, 85, 50V, 5%	137127-474	
C2	.47uF, BOX, 85, 50V, 5%	137127-474	
C3	.47uF, BOX, 85, 50V, 5%	137127-474	
C4	.1uF, BOX, 85, 50V, 5%	137127-104	
C5	.47uF, BOX, 85, 50V, 5%	137127-474	
C6	.0082uF, BOX, 85, 100V, 5%	137127-822	
C7	.0012uF, BOX, 85, 100V, 5%	137127-122	
C8	.0039uF, BOX, 85, 100V, 5%	137127-392	
C9	.027uF, BOX, 85, 63V, 5%	137127-273	
C15	.1uF, BOX, 85, 50V, 5%	137127-104	
C17	.0033uF, BOX, 85, 100V, 5%	137127-332	
C20	0 OHM, JUMPER	139942	
C33	47pF, 0805, COG, 50V, 5%	133622-470	
C34	.022uF, 0805, X7R, 50V, 10%	133623-223	
C35	.022uF, 0805, X7R, 50V, 10%	133623-223	
C36	.022uF, 0805, X7R, 50V, 10%	133623-223	
C37	.022uF, 0805, X7R, 50V, 10%	133623-223	
C38	.1uF, 0805, Y5V, 25V, 80%	133624	

PANARAY® LT II ELECTRICAL PART LIST

Capacitors (continued)

Reference Designator	Description	Part Number	Note
C39	.1uF, 0805, Y5V, 25V, 80%	133624	
C40	.022uF, 0805, X7R, 50V, 10%	133623-223	
C41	.022uF, 0805, X7R, 50V, 10%	133623-223	
C42	.022uF, 0805, X7R, 50V, 10%	133623-223	
C43	.022uF, 0805, X7R, 50V, 10%	133623-223	
C44	.022uF, 0805, X7R, 50V, 10%	133623-223	
C45	.022uF, 0805, X7R, 50V, 10%	133623-223	
C46	.022uF, 805, X7R, 50V, 10%	133623-223	
C47	.022uF, 0805, X7R, 50V, 10%	133623-223	

Diodes

Reference Designator	Description	Part Number	Note
D1	1N4148, 52MM AXIAL	121501	
D2	1N4148, 52MM AXIAL	121501	
D3	1N4148, 52MM AXIAL	121501	
D4	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	
D5	1N4148, 52MM AXIAL	121501	
D6	1N4746, ZEN, 18V, 1W, 5%	116995-4746A	

Integrated Circuits

Reference Designator	Description	Part Number	Note
U1	RC4559, OP AMP, DUAL, DIP-8	108568	
U2	RC4559, OP AMP, DUAL, DIP-8	108568	
U3	RC4559, OP AMP, DUAL, DIP-8	108568	
U4	RC4559, OP AMP, DUAL, DIP-8	108568	
U5	RC4559, OP AMP, DUAL, DIP-8	108568	
U6	RC4559, OP AMP, DUAL, DIP-8	108568	

Connectors

Reference Designator	Description	Part Number	Note
J1	CONN, HEADER, 12 PIN	149538	

PACKAGING PART LIST

Item Number	Description	Part Number	Qty.	Note
1	TUBE, PACKING, ROUND, PLUG-SEAL	184177	1	
2	LIT KIT, PRO EQ CARDS, 1800-V/VI	184815	1	
3	PCB ASSY, EQ CARD	178865	1	4
3	BAG, ANTISTAT, 4 x 7.5	177761	1	
4	HARNESS ASSY, 502B EQ	180137	1	
5	CARTON, RSC, 9.63 x 7.88 x 6.63	178853	1	

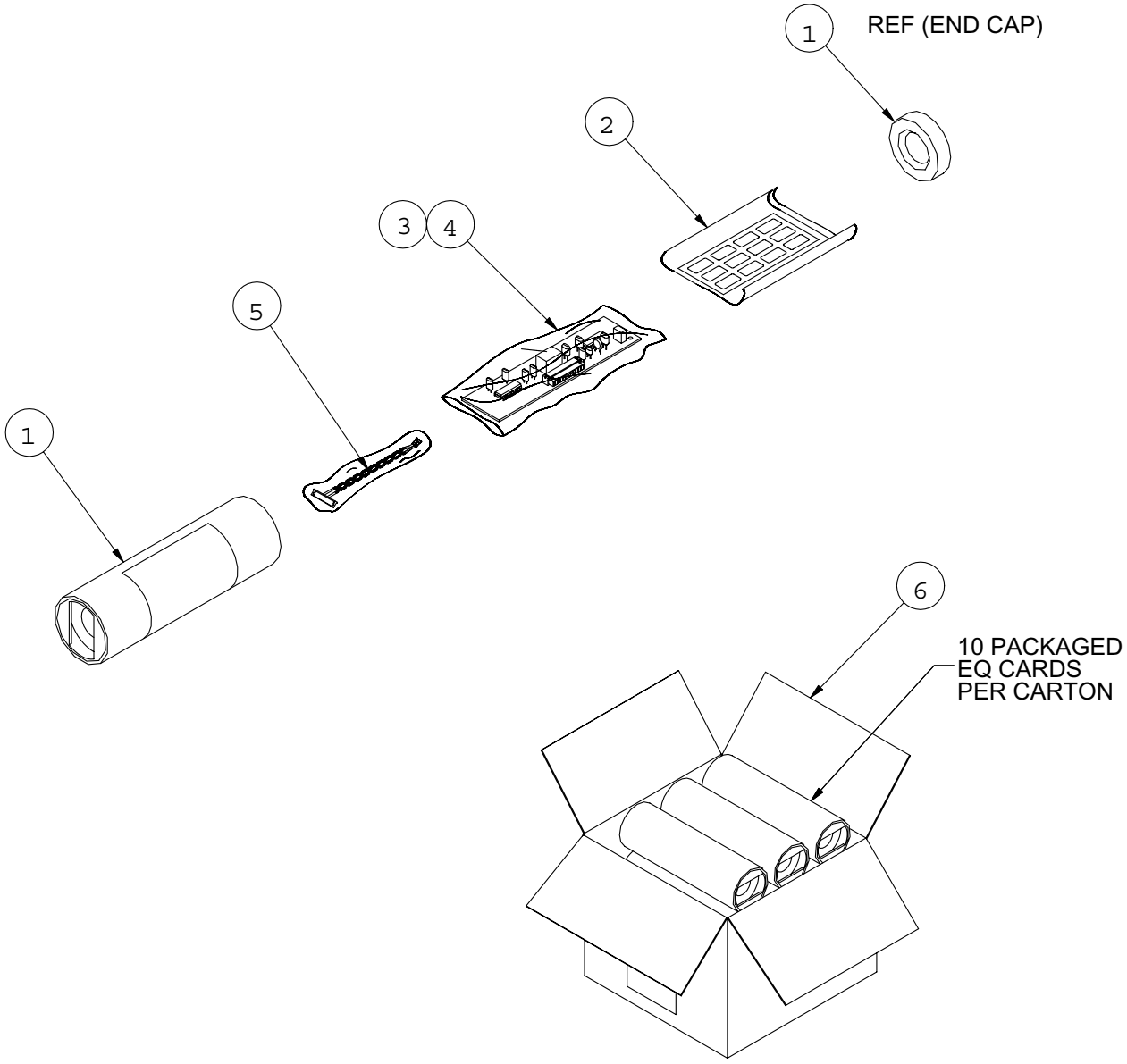


Figure 6. Packaging Exploded View

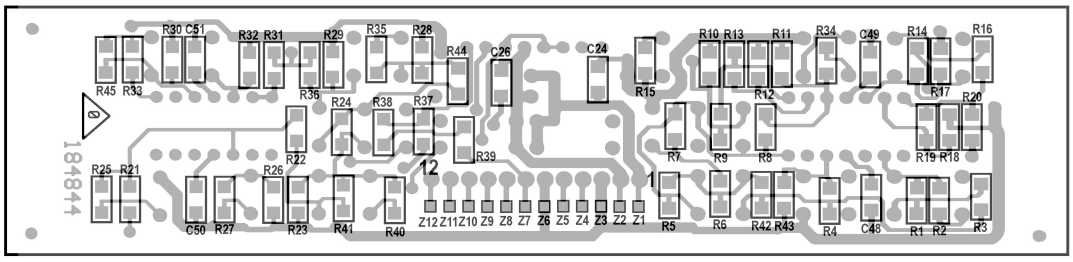


Figure 7. Bottom Side PCB Part Number 184844

(Used with the Model 8/25/32, 402®, 502®A and 802®)

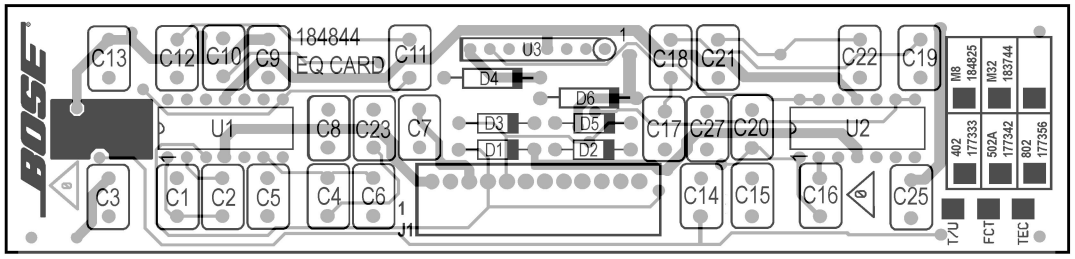


Figure 8. Top Side PCB Part Number 184844

(Used with the Model 8/25/32, 402, 502A and 802)

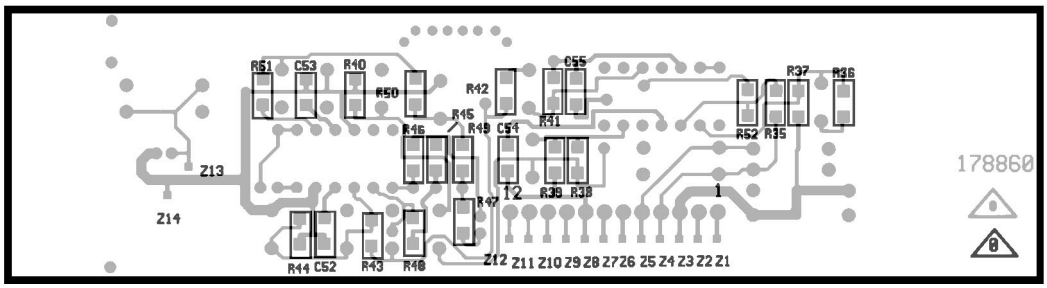


Figure 9. Bottom Side PCB Part Number 178860

(Used with the 502®B and 502BEX)

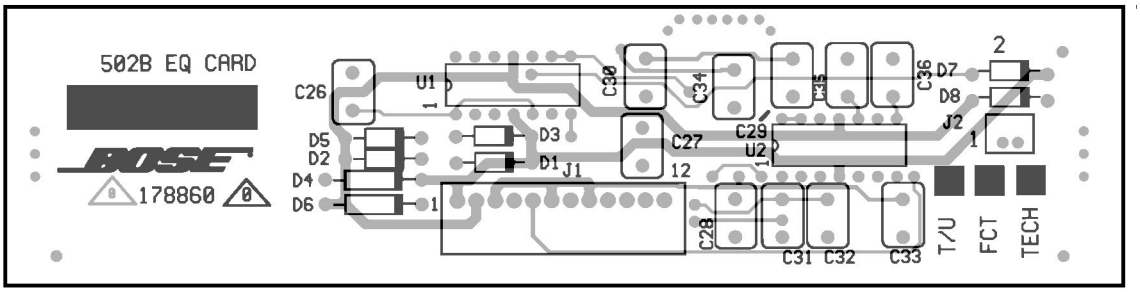


Figure 10. Top Side PCB Part Number 178860

(Used with the 502B and 502BEX)

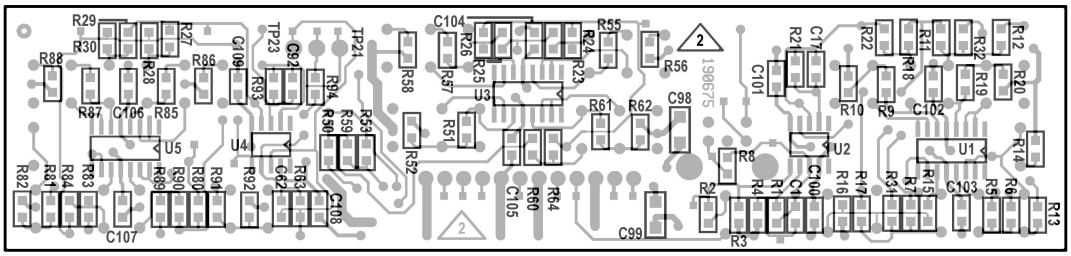


Figure 11. Bottom Side PCB Part Number 190675

(Used with the Model 1B and FreeSpace® 360)

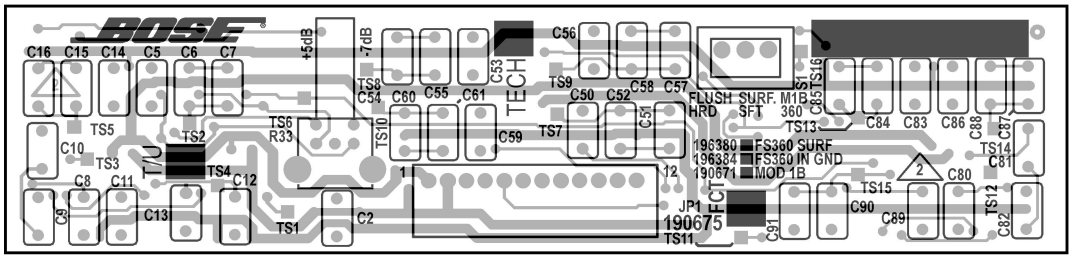


Figure 12. Top Side PCB Part Number 190675

(Used with the Model 1B and FreeSpace 360)

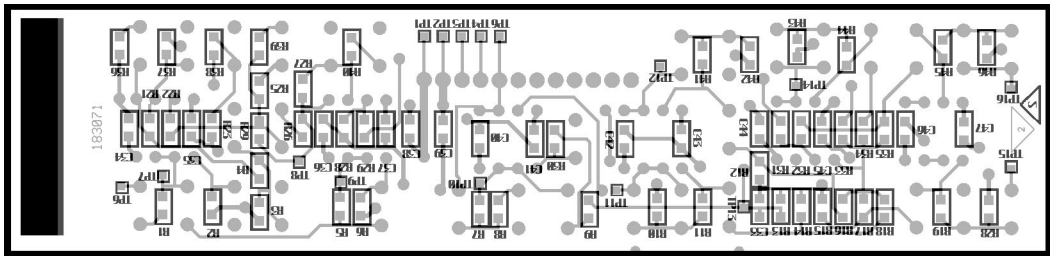


Figure 13. Bottom Side PCB Part Number 183071

(Used with the Panaray® 3202®, 4402®,and 9702® LT II)

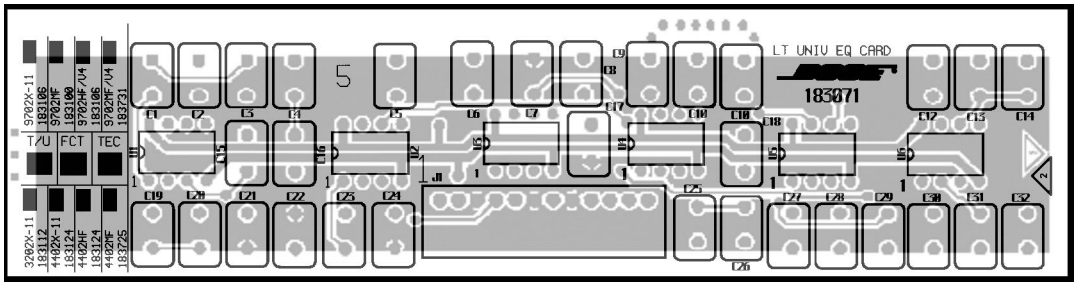


Figure 14. Top Side PCB Part Number 183071

(Used with the Panaray 3202, 4402,and 9702 LT II)

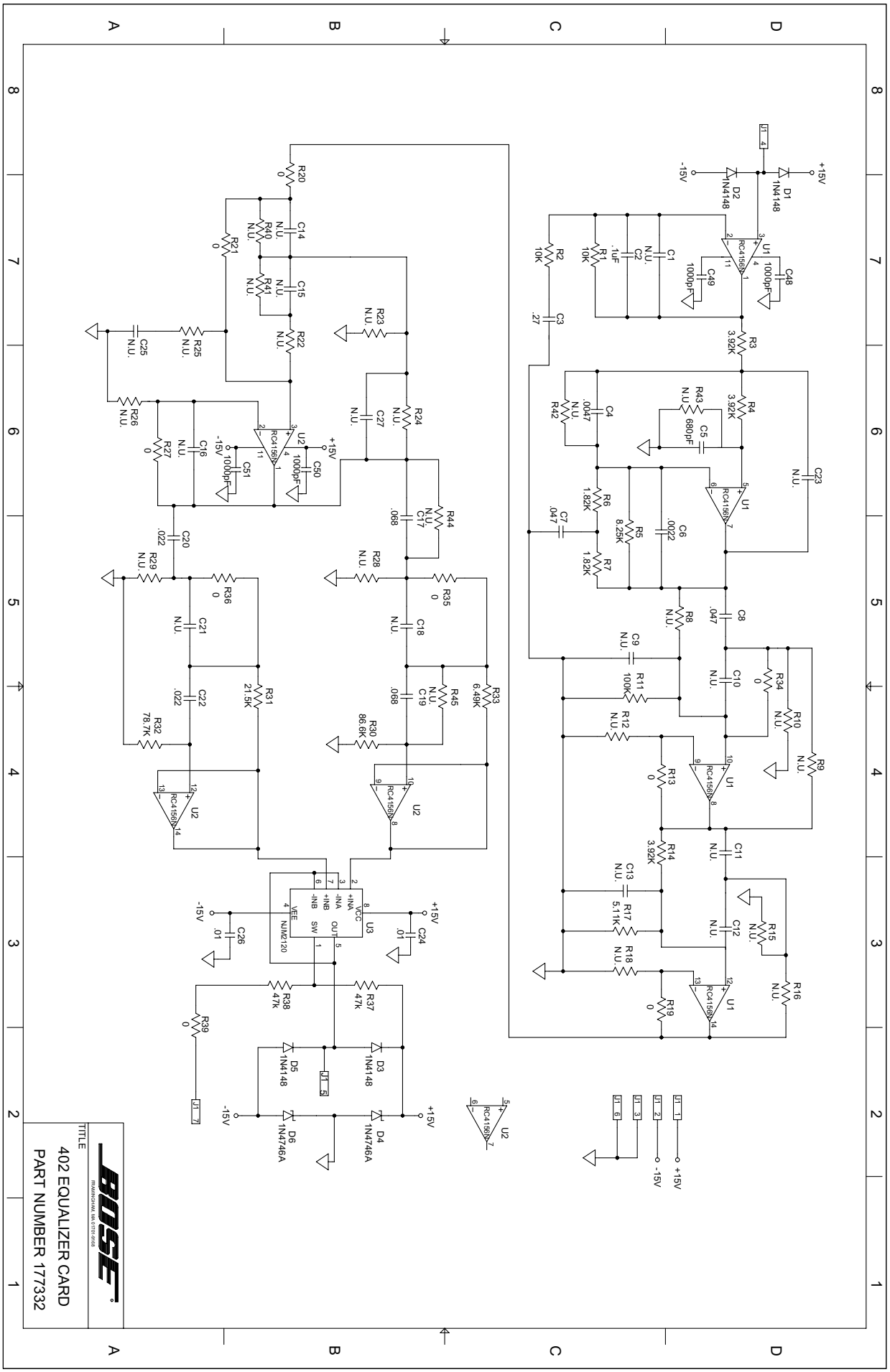


Figure 15. 402® Series I Schematic Diagram

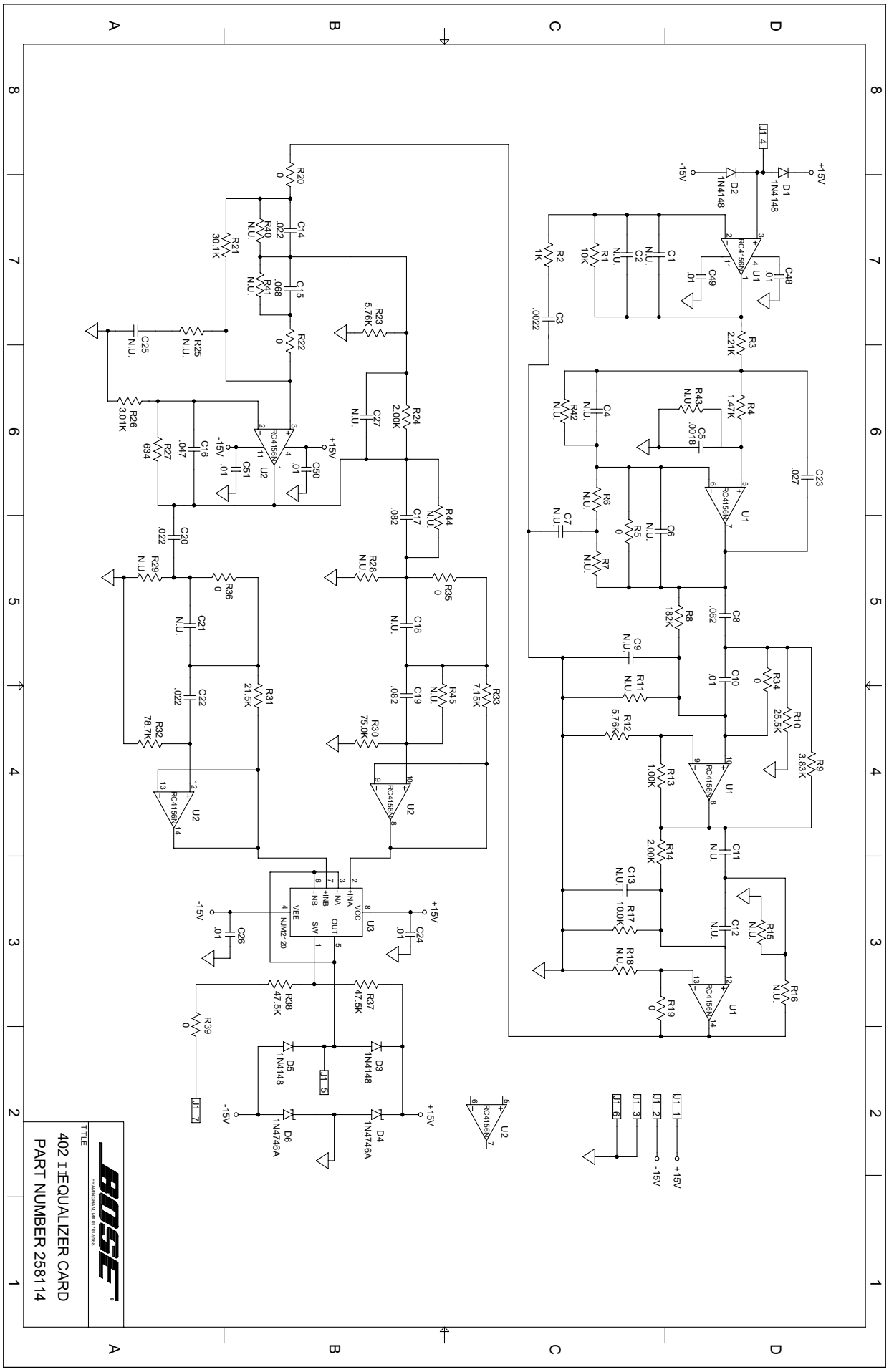


Figure 16. 402® Series II Schematic Diagram

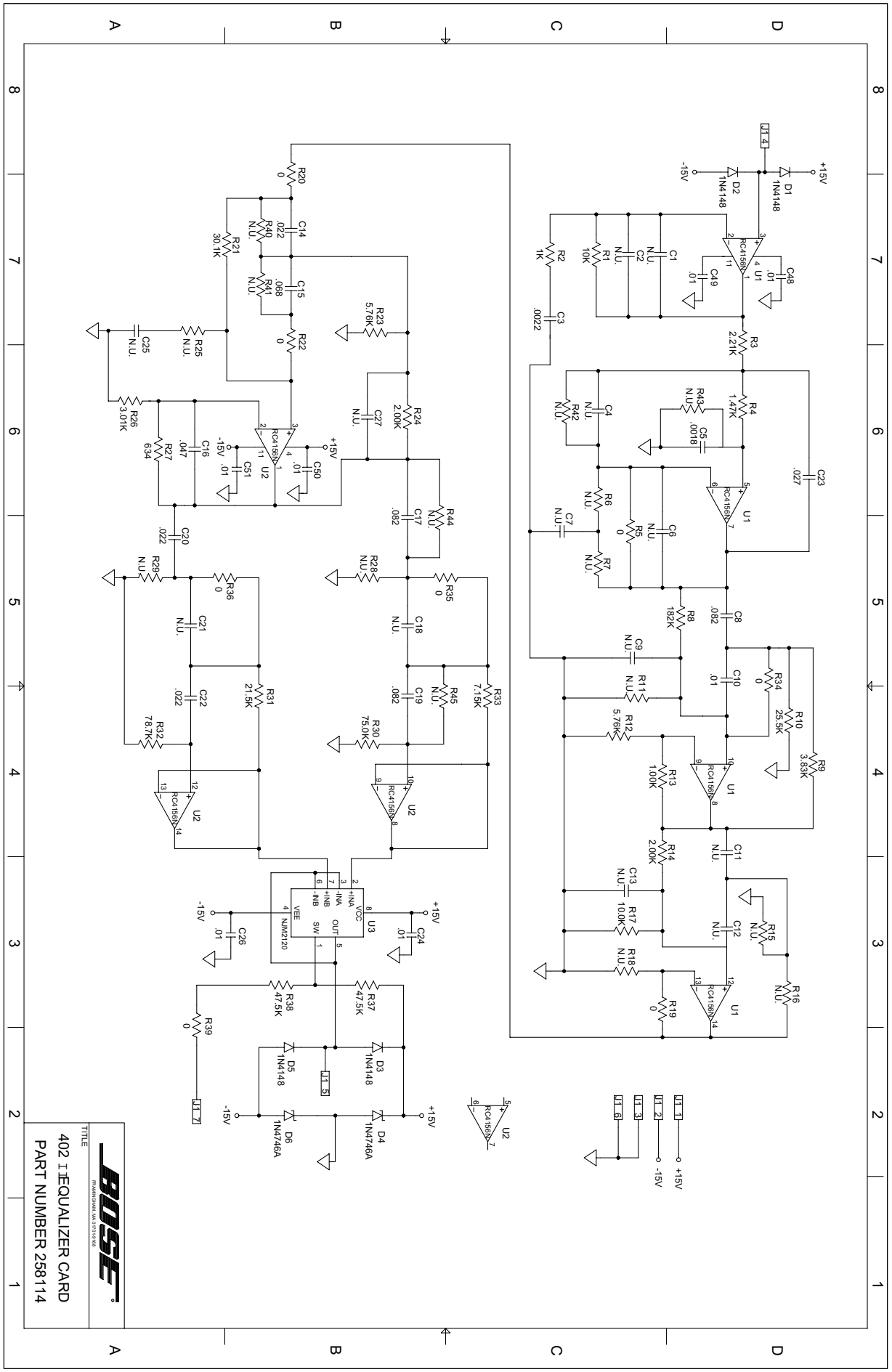


Figure 17. 802® Series II Schematic Diagram

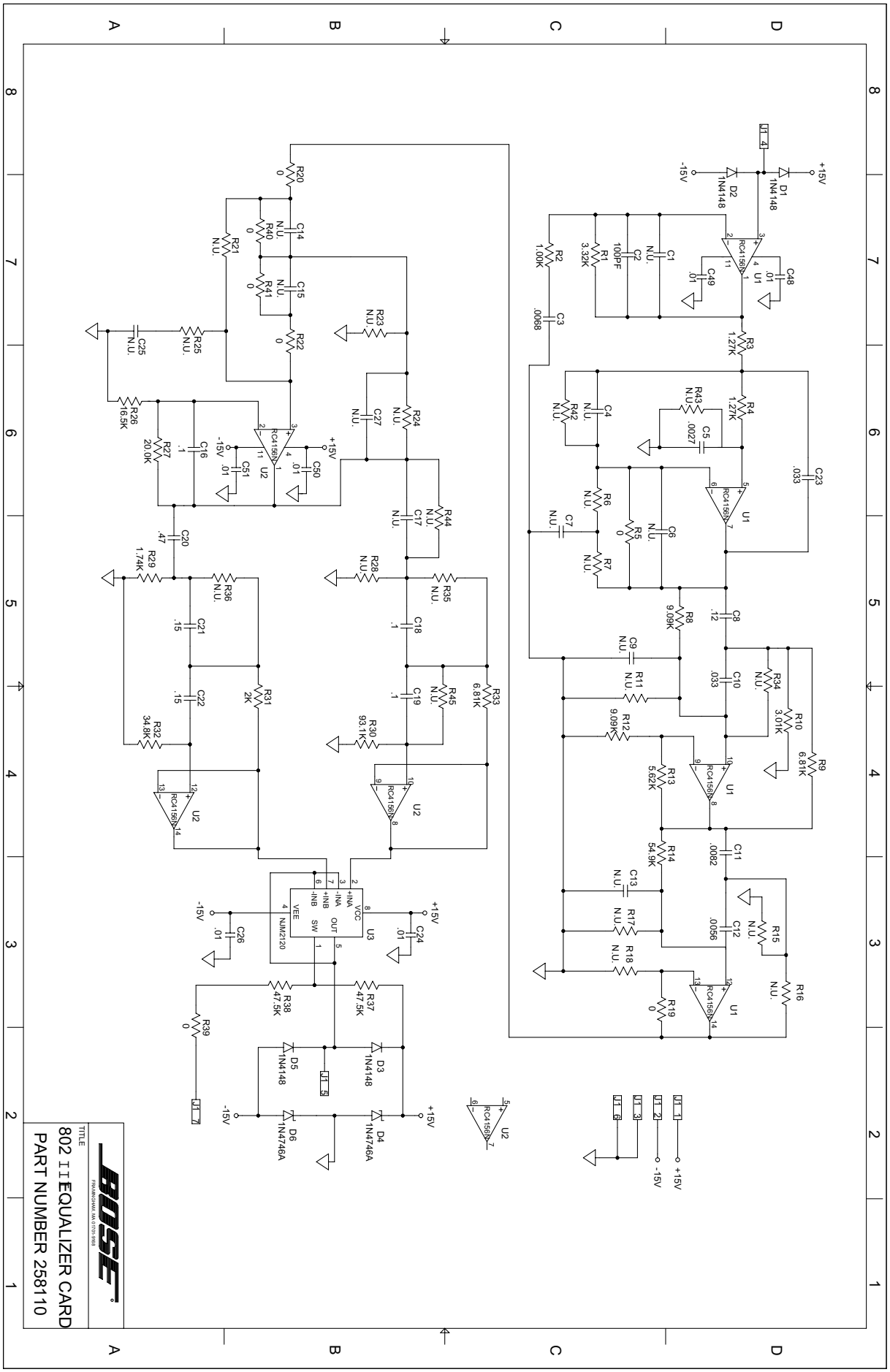


Figure 18. 802® Series III Schematic Diagram

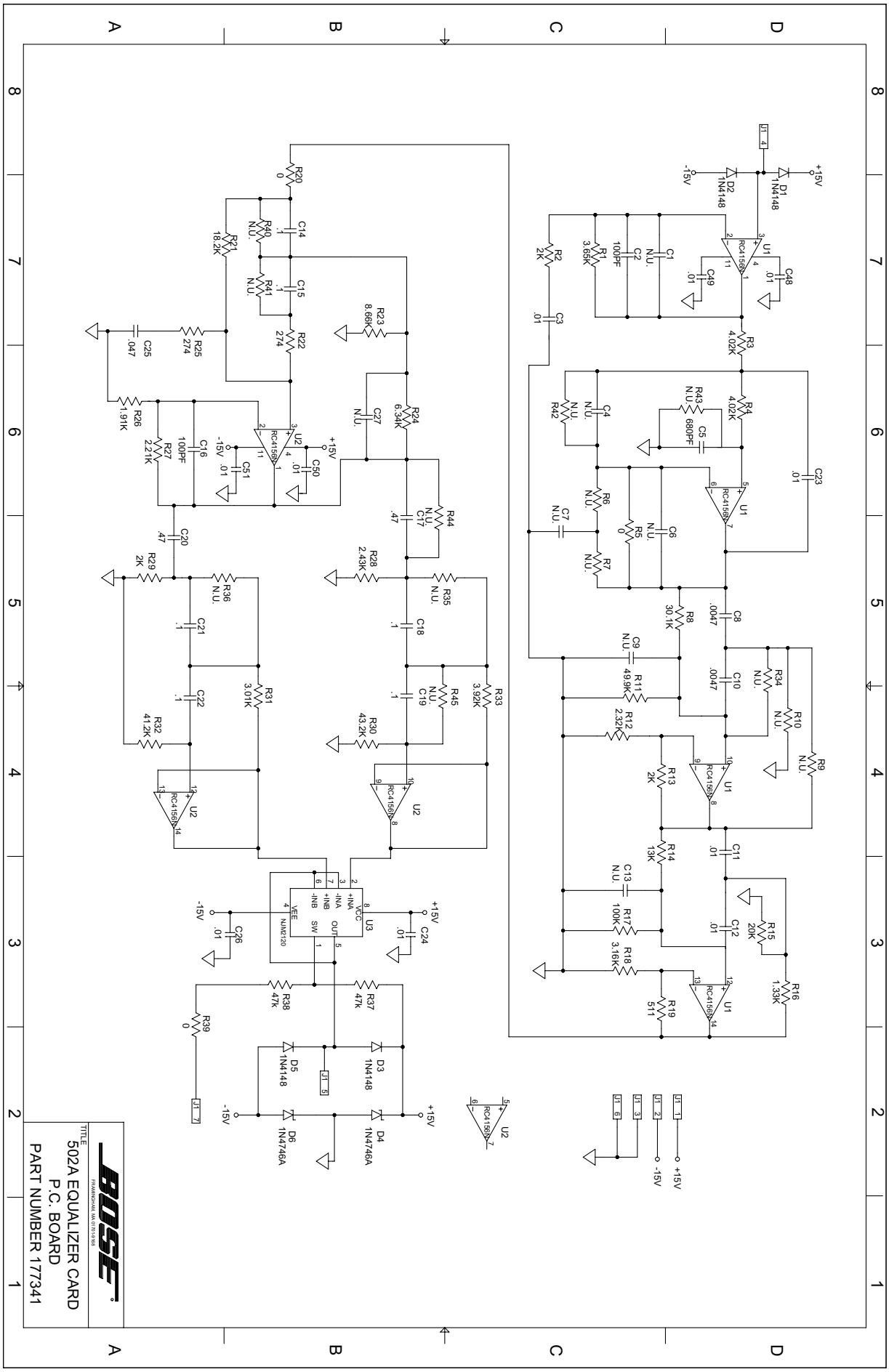


Figure 19. 502®A Schematic Diagram

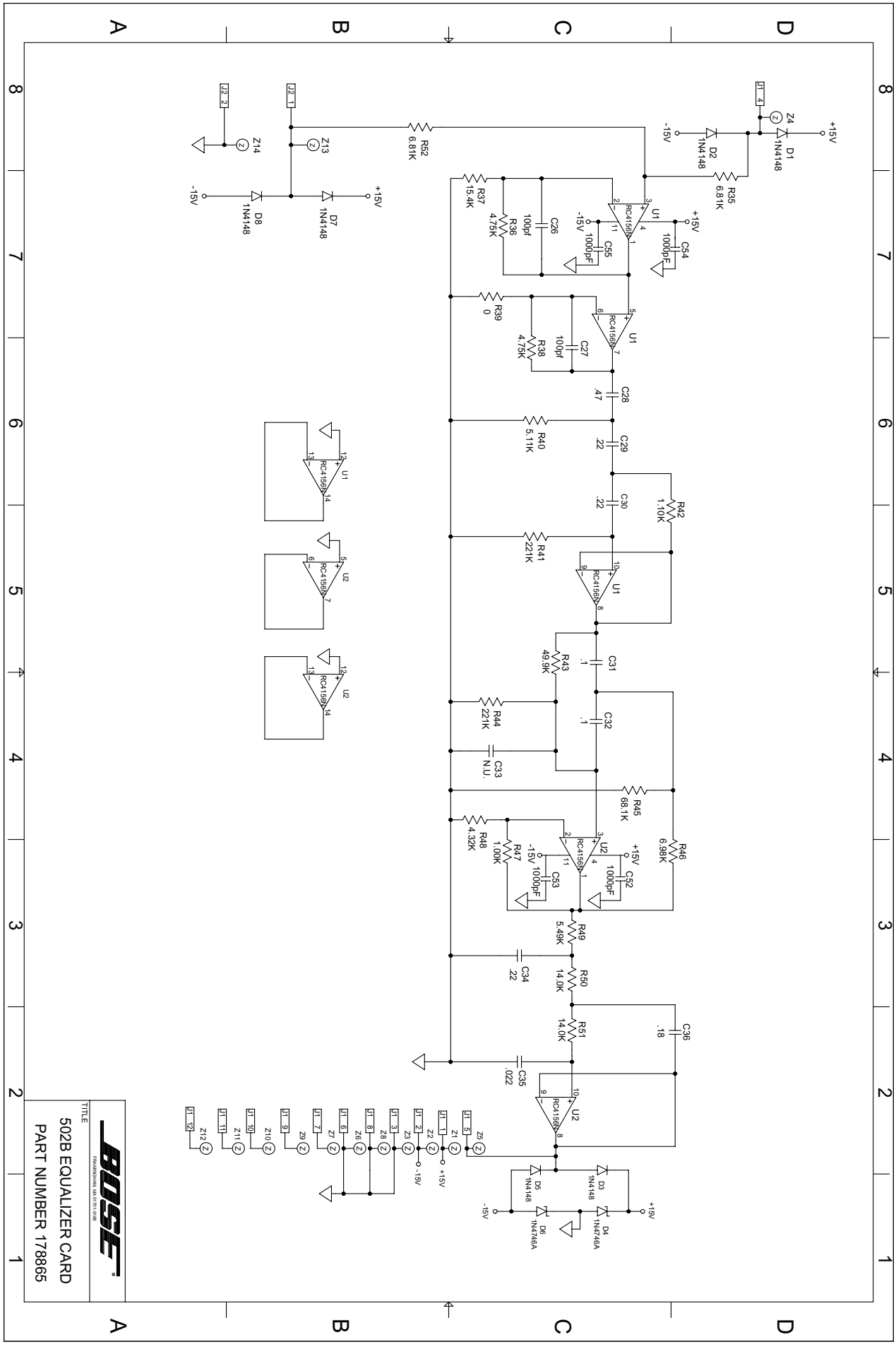


Figure 20. 502®B Schematic Diagram

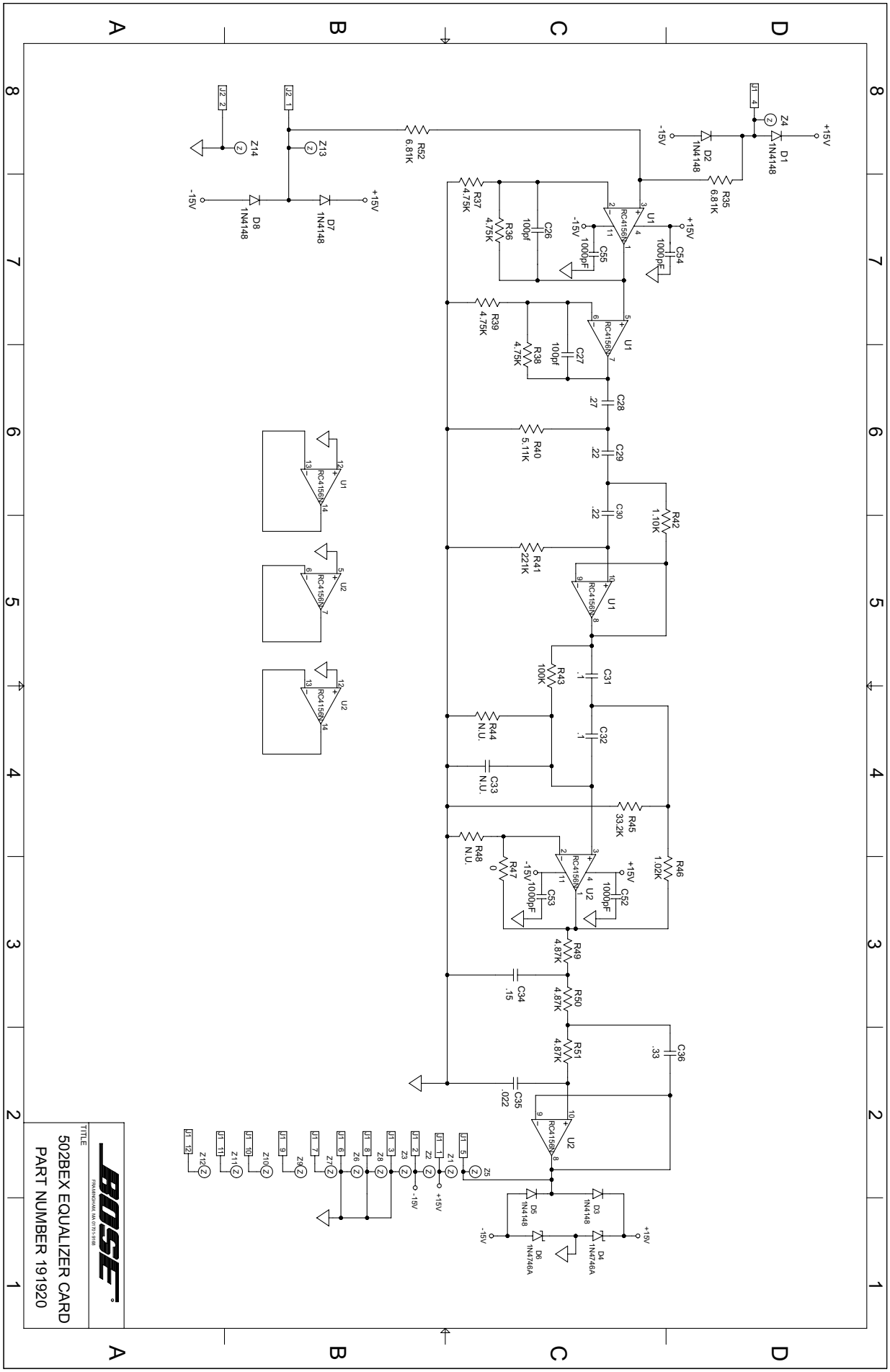


Figure 21. 502®BEX Schematic Diagram

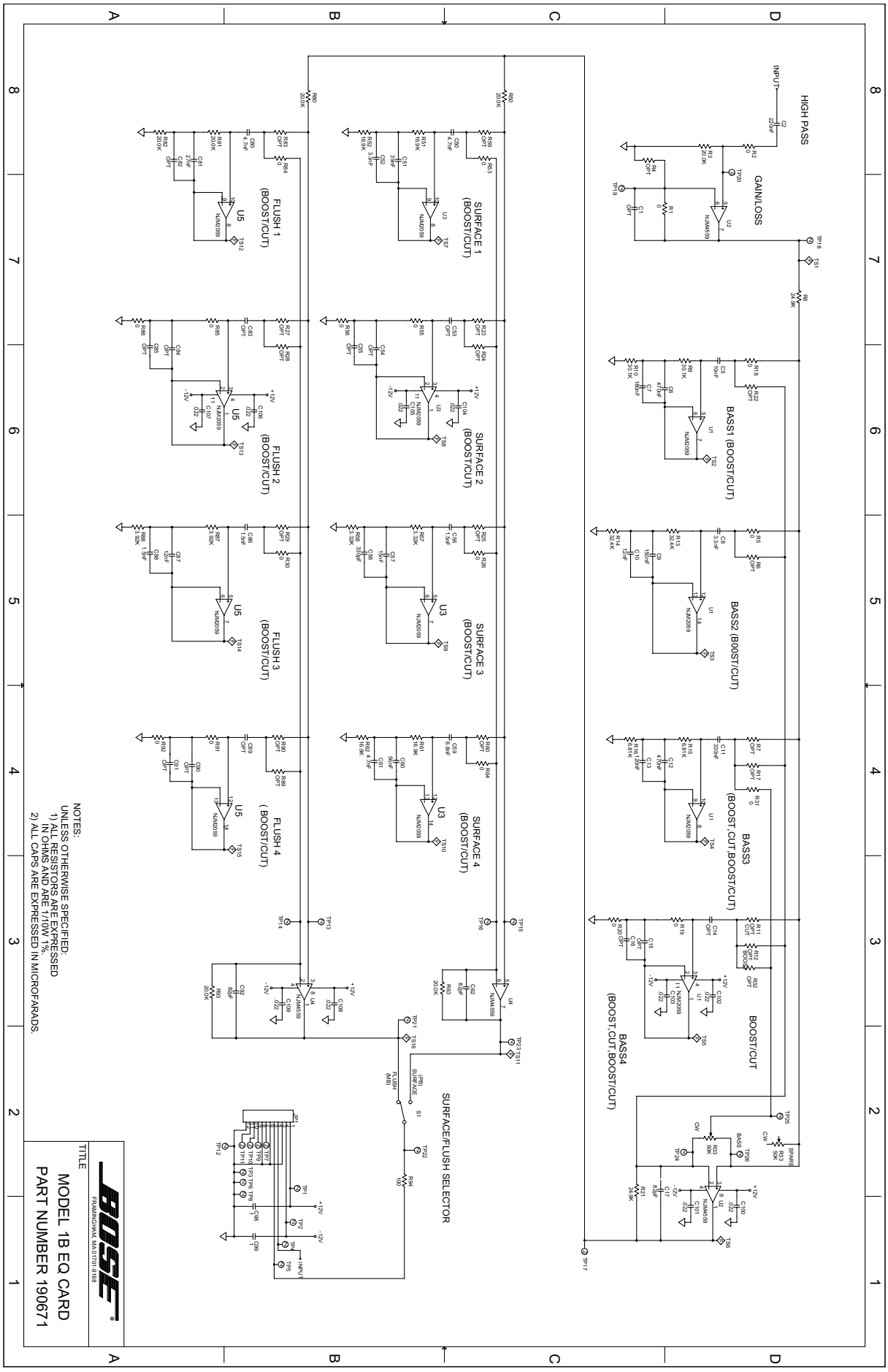


Figure 22. Model 1B Schematic Diagram

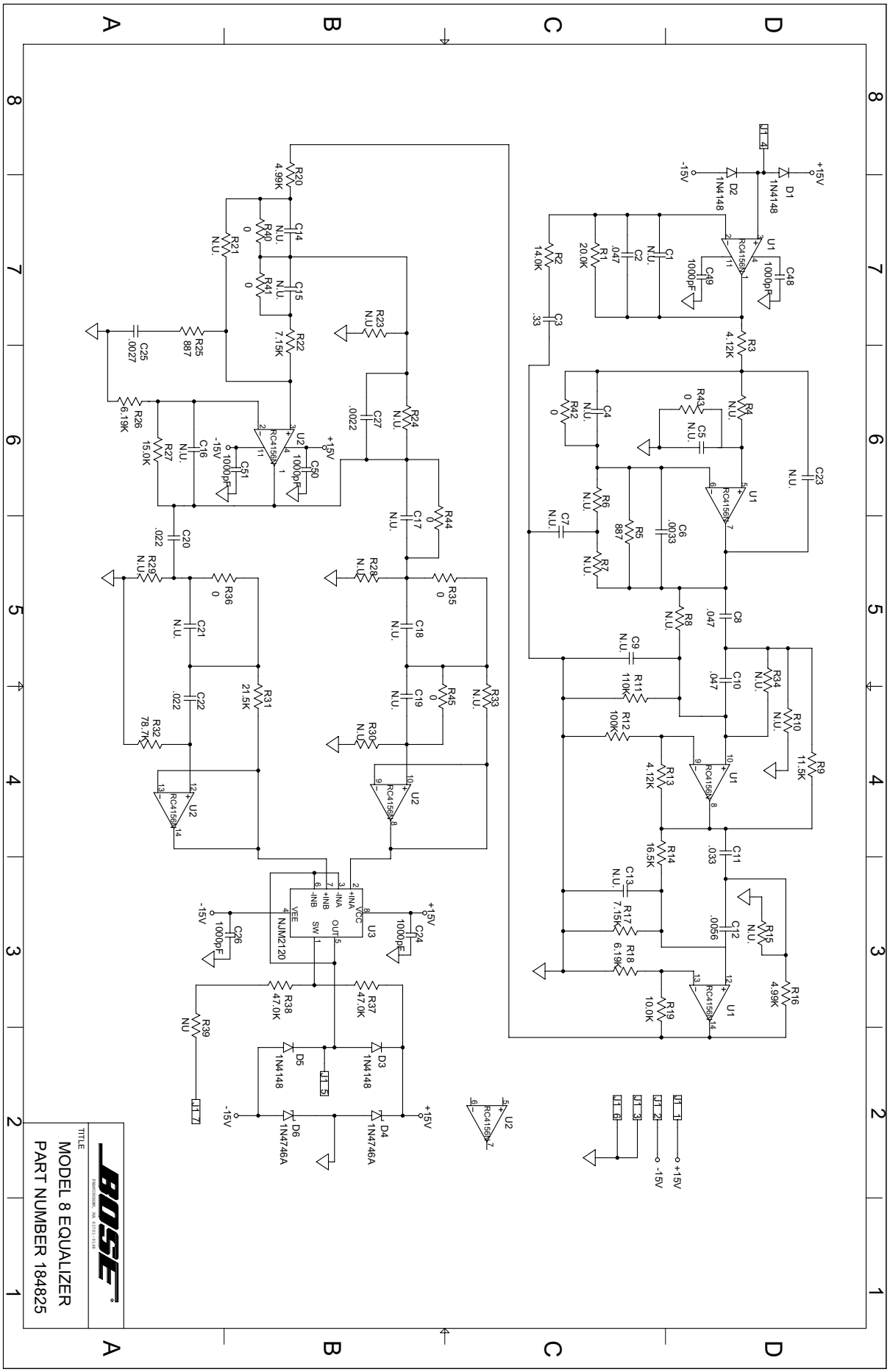


Figure 23. Model 8 Schematic Diagram

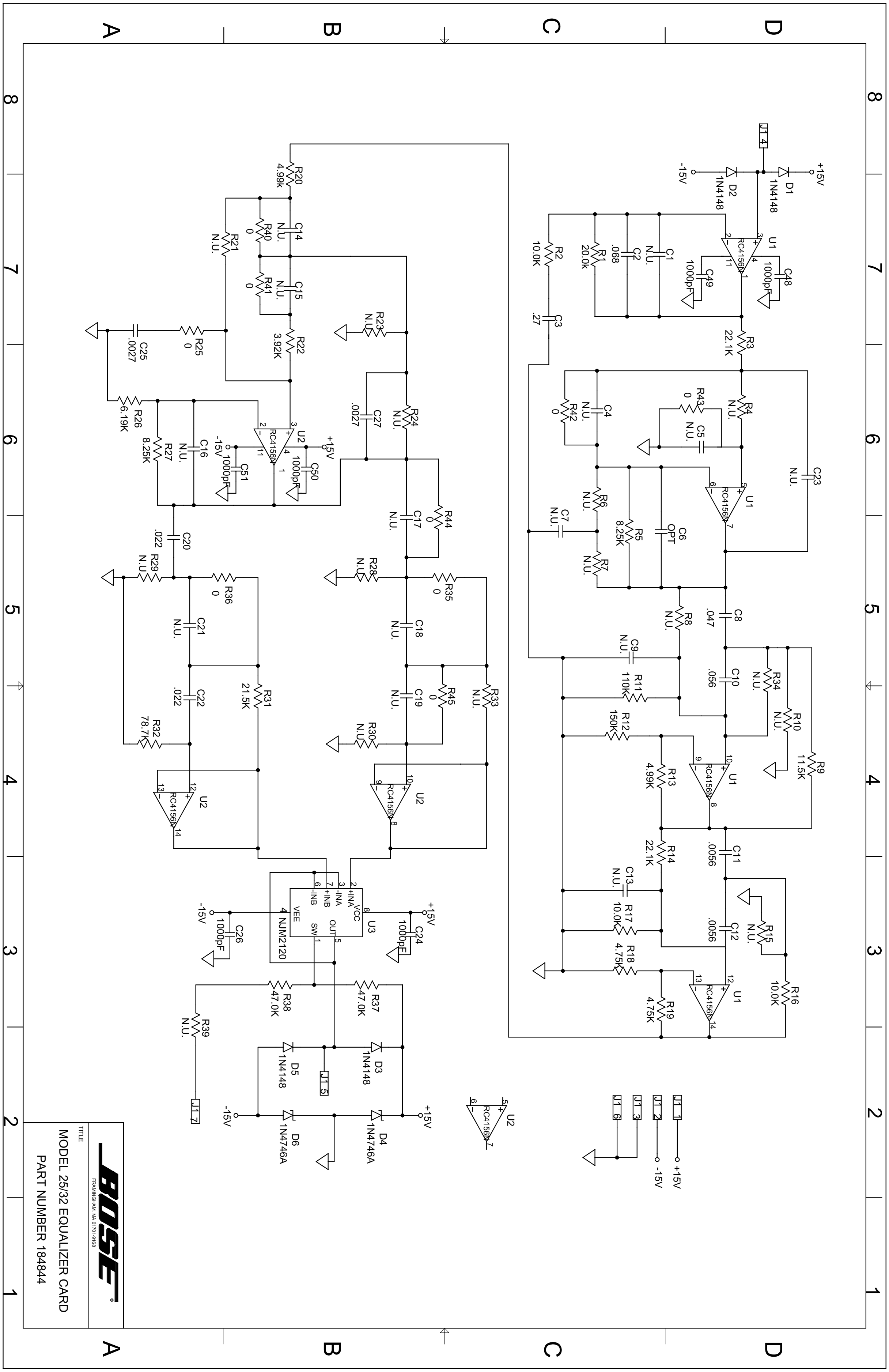


Figure 24. Model 25/32 Schematic Diagram

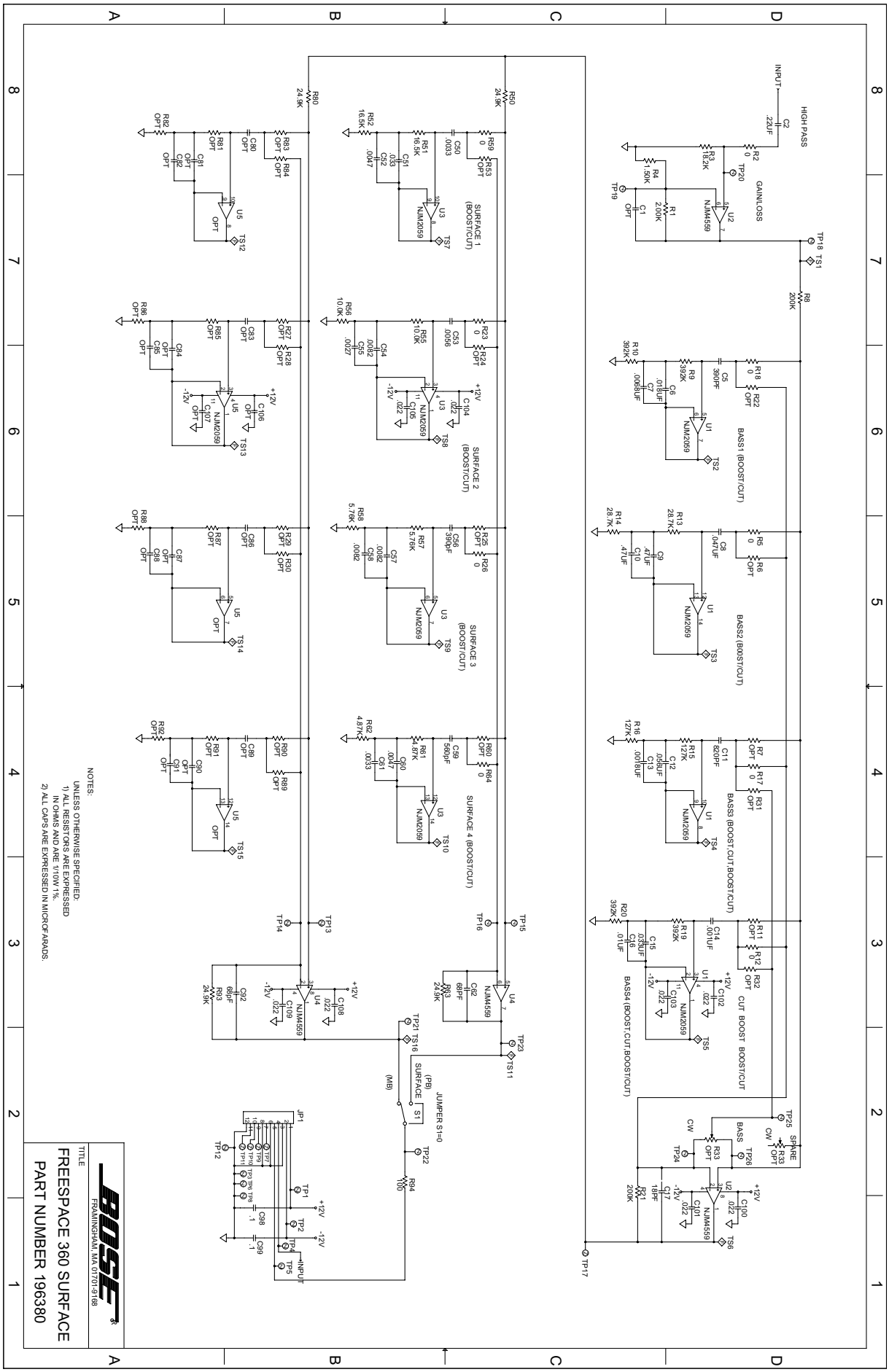


Figure 25. FreeSpace® 360 Surface Schematic Diagram

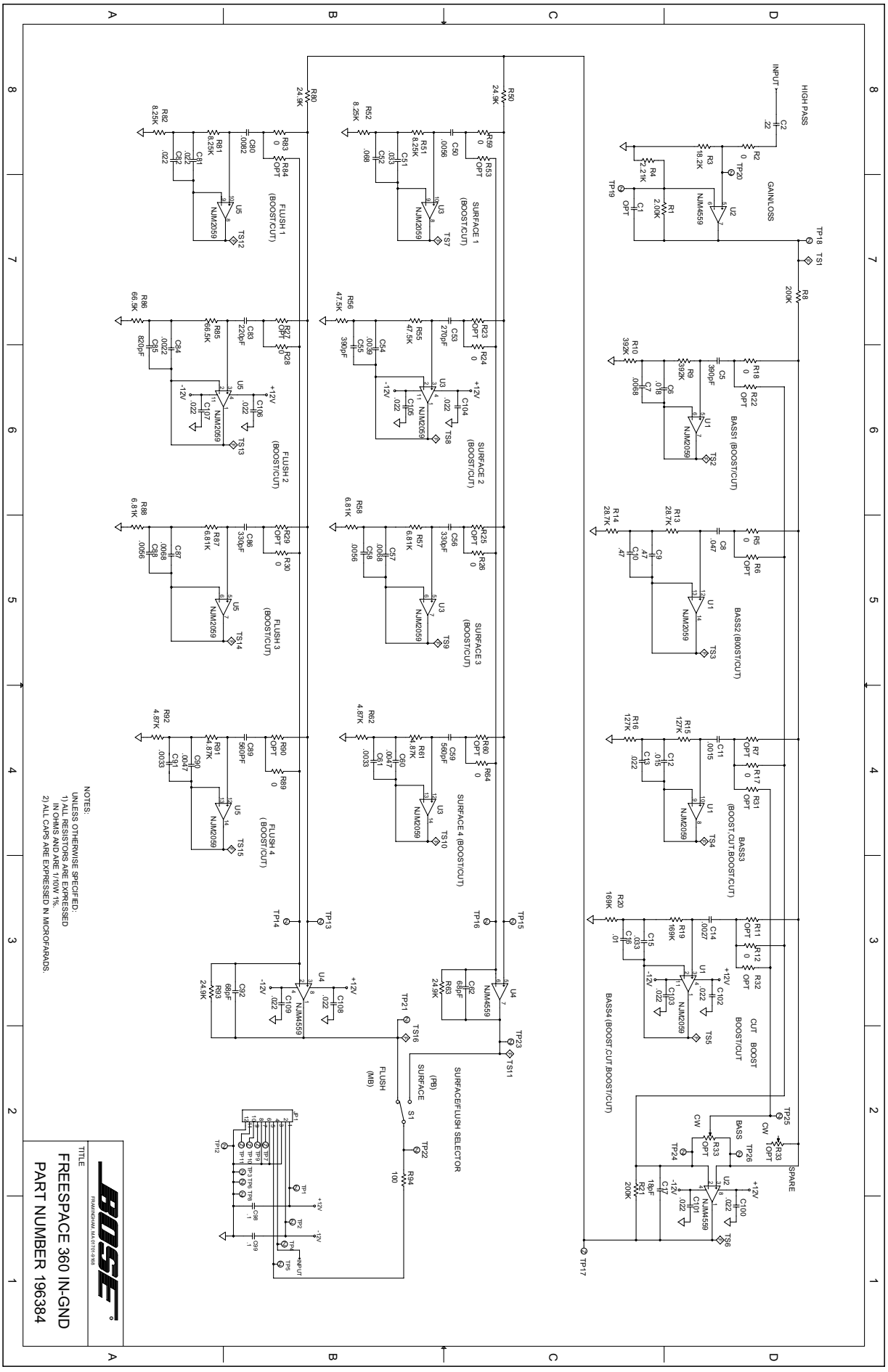


Figure 26. FreeSpace® 360 In Ground Schematic Diagram

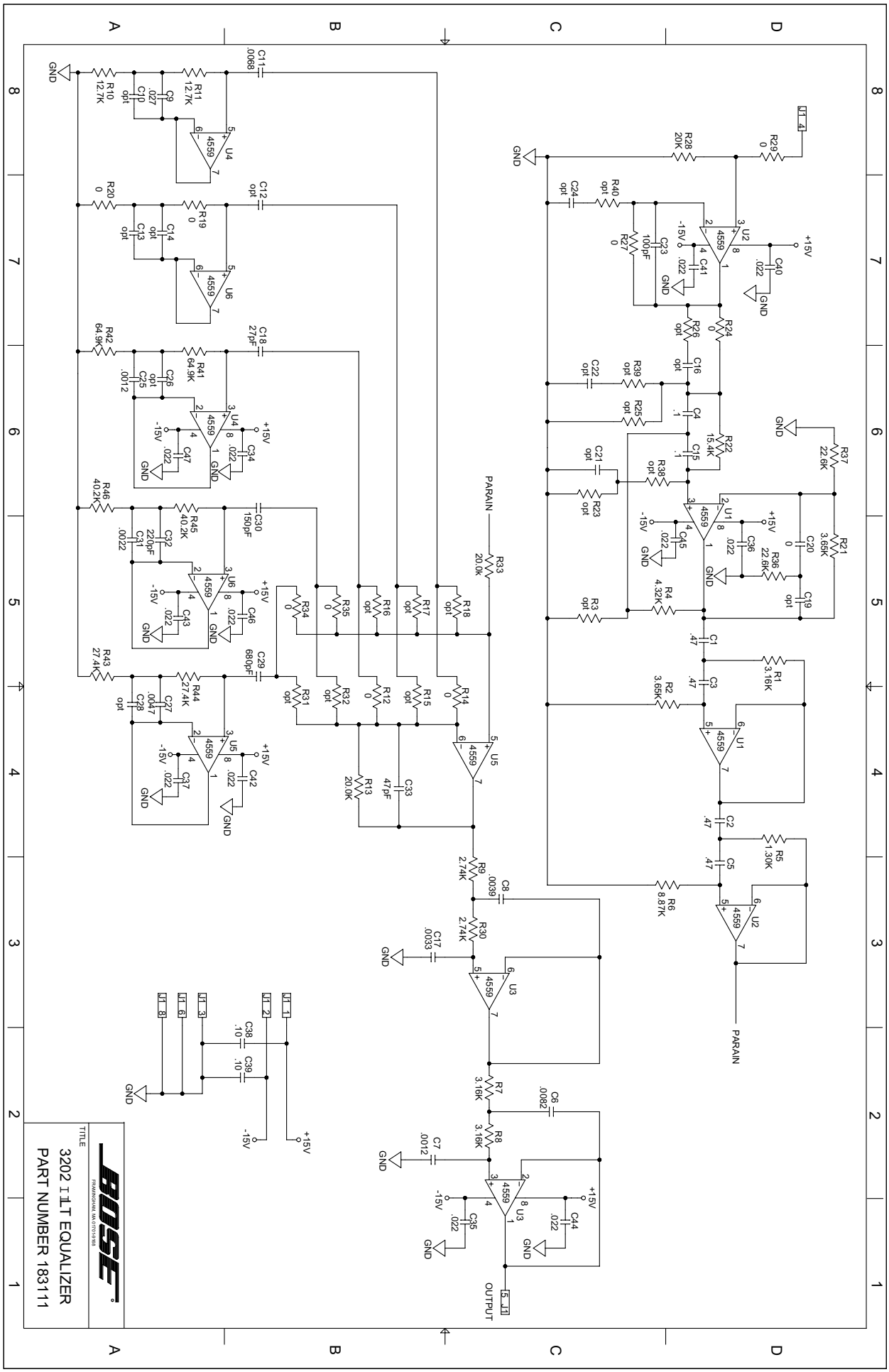


Figure 27. Panaray® 3202® LT II Schematic Diagram

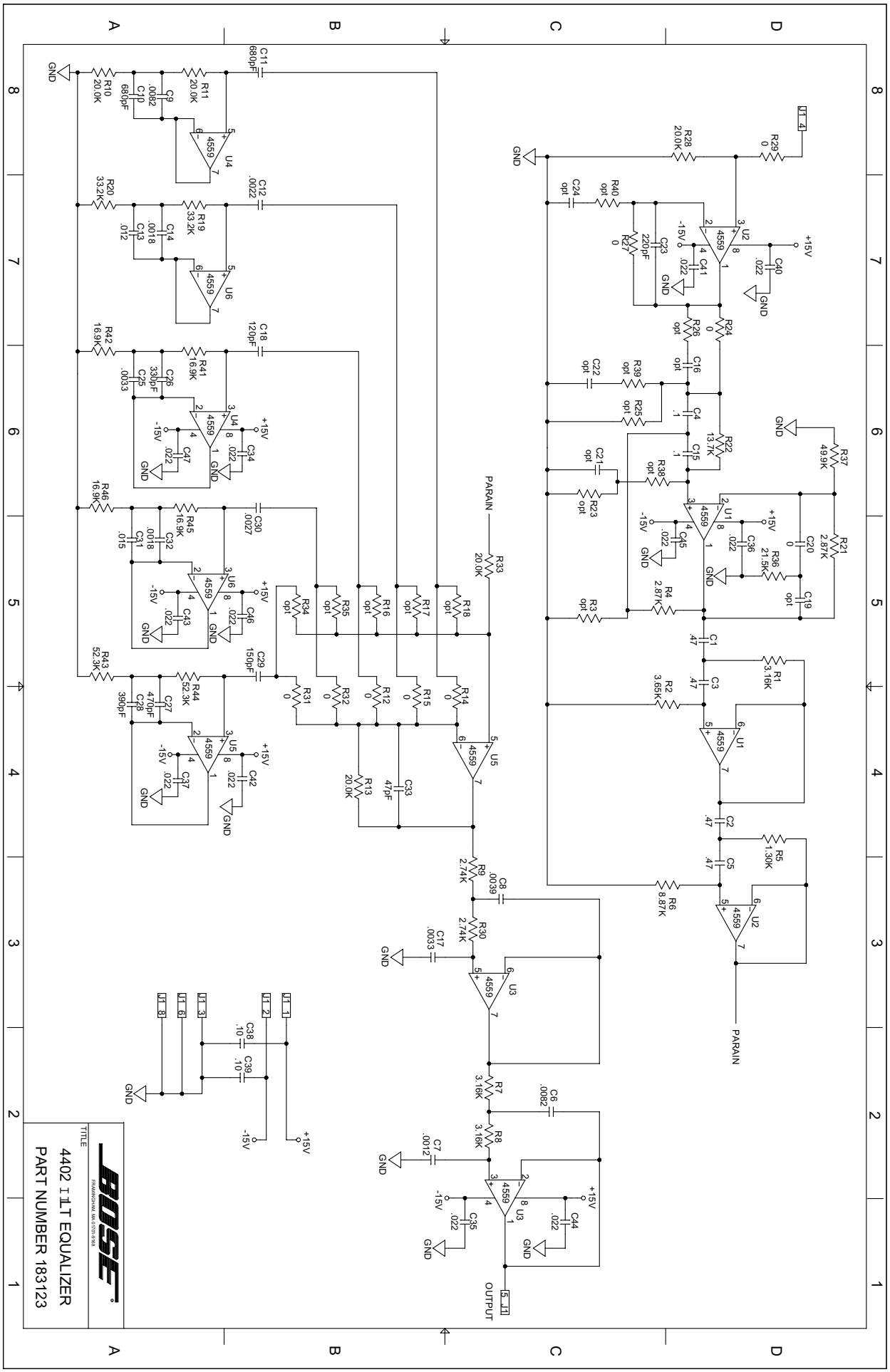


Figure 28. Panaray® 4402® LT II Schematic Diagram

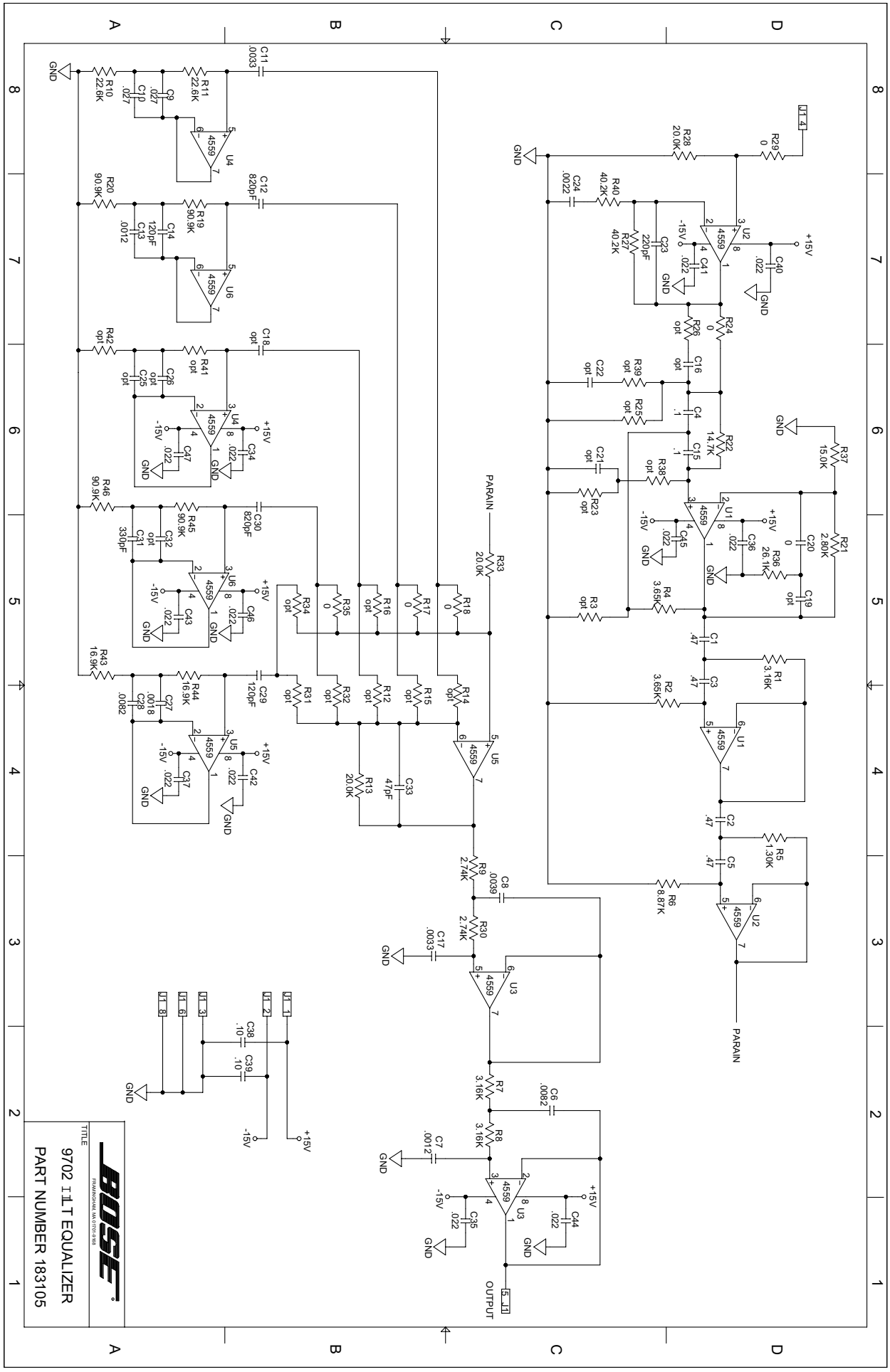


Figure 29. Panaray® 9702® LT II Schematic Diagram

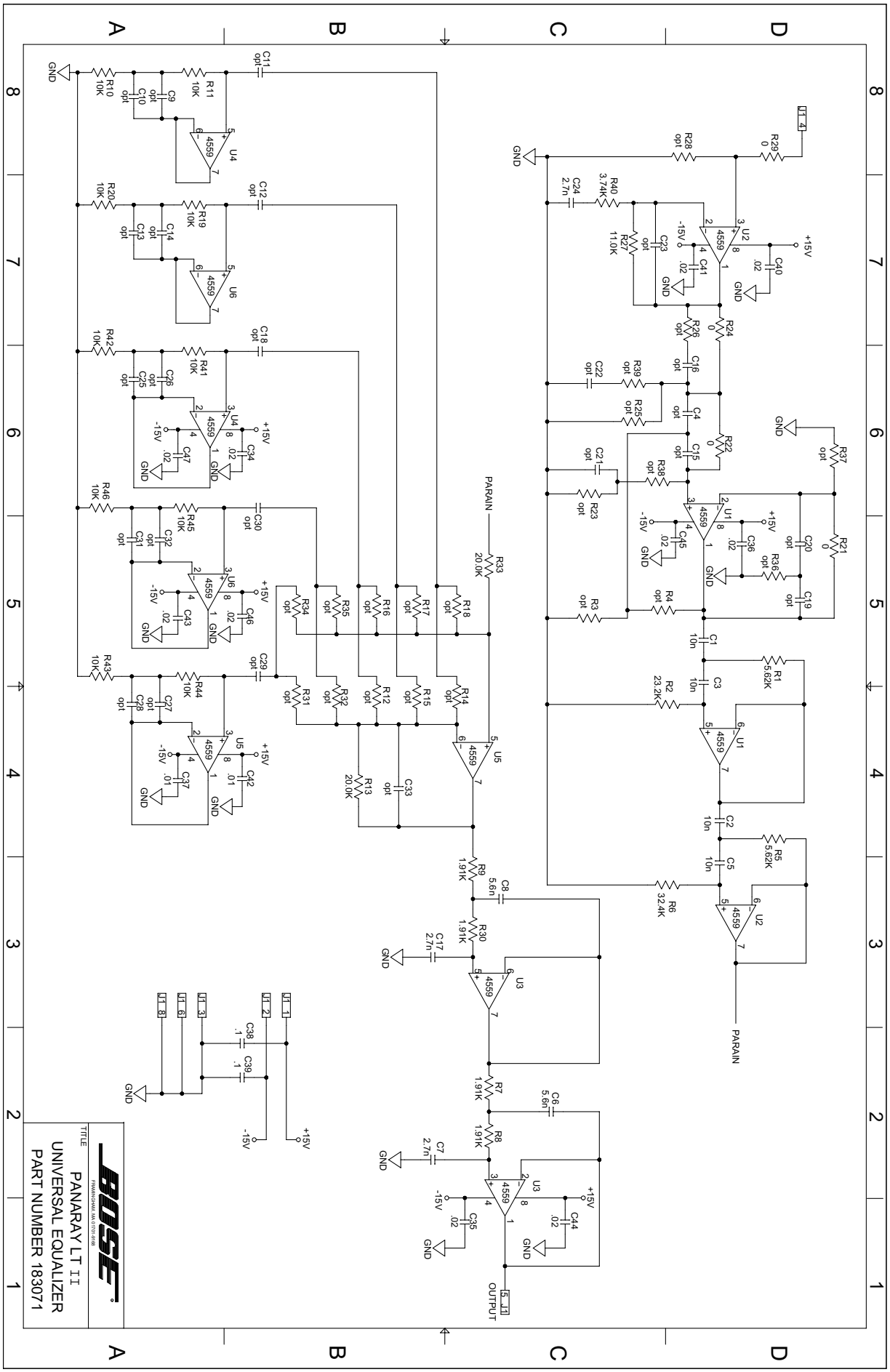
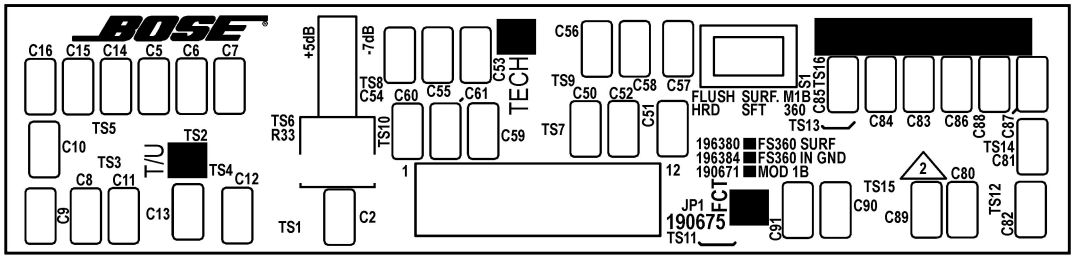


Figure 30. Panaray® LT II Schematic Diagram

Model 1800 V/VI
Professional Stereo Power Amplifier
EQ PCB Assemblies



Note: Some of these equalizer PCB assemblies are also used in the AmPlus™ 50 and 100 amplifiers. Refer to the service manual part number 194101-S2 for equalizer PCB assembly test procedures used with the AmPlus 50 and 100 amplifiers.

Supplement

Service Manual

Part Number 181812-S2 Rev 01

SPECIFICATIONS AND FEATURES SUBJECT TO CHANGE WITHOUT NOTICE

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