# A6000GTi

## Car Audio
## Power Amplifier

# Service Manual



A Harman International Company

137159-1
11/03
Rev. 1

The information furnished in this manual does not include all of the details of design, production, or variations of the equipment. Nor does it cover every possible situation, which may arise during installation, operation or maintenance. If you need special assistance beyond the scope of this manual, please contact the JBL Technical Support Group.



TO PREVENT ELECTRIC SHOCK DO NOT REMOVE TOP OR BOTTOM COVERS. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE!

The exclamation point triangle is used to alert the user to important operating or maintenance instructions.

# Revision History

| Revision Number | Date | Comments |
|---|---|---|
| Rev. 1 | 11-2003 | Initial Draft |

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# 1. Introduction

This manual contains complete service information on the JBL A6000GTi power amplifier. It is designed to be used in conjunction with the A6000GTi Owner's Manual; however, some important information is duplicated in the Service Manual.

**NOTE: THE INFORMATION IN THIS MANUAL IS INTENDED FOR USE BY AN EXPERIENCED TECHNICIAN ONLY!**

## 1.1. The A6000GTi Car Amplifier

The A6000GTi is an extremely high output audio amplifier designed for automotive use, providing high power amplification from 20Hz – 400Hz with minimum distortion. The A6000GTi features Crown's patented, awarded-winning BCA® (Balanced Current Amplifier) engineering, for superior power output, increased efficiency, legendary Crown sound and extraordinary reliability. Other features include parallel mode operation for driving loads below 2 Ohms, selectable 12/24 dB/octave crossover slope, phase adjustment and DBO (Dynamic Bass Optimization).

## 1.2. Scope

This Service Manual is intended to apply to all versions of the A6000GTi amplifier. The Parts Listings include parts specific for all versions. Parts are available from the Crown Parts Department.

## 1.3. Warranty

Each Reference Manual contains basic policies as related to the customer. In addition, it should be stated that this service documentation is meant to be used only by properly trained personnel. All warranty service should be referred to the Crown Factory or JBL Authorized Warranty Service Center. See Figure 1.1 for a copy of the Warranty. To find the location of the nearest Authorized Warranty Service Center or to obtain instructions for receiving Factory Service, please contact the JBL Technical Support Group. If you are an Authorized Warranty Service Center and have questions regarding the warranty of a product, please contact the JBL Technical Support Group.

JBL Technical Support

Phone: (516) 255-4JBL
**Phone: (516) 255-4525**
**Web Page:** http://www.jbl.com

**Cu**stomer Support
**Factory Service**
**Parts Department**

**Mailing Address: P.O. Box 1000, Elkhart, IN 46517**
**Shipping Address: Plant 2 S. W.**
**1718 W. Mishawaka Rd., Elkhart IN 46517**
**Phone: (574) 294-8200**
**Fax: (574) 294-8301**
http://www.crownaudio.com

# LIMITED THREE-YEAR WARRANTY

## JBL GTi Electronics (applies to USA only)

## A valid serial number is required for warranty coverage.

### WHO IS PROTECTED BY THIS WARRANTY?

Your JBL warranty protects the original owner and all subsequent owners for a period of three (3) years (parts and labor) for all electronic components from any failure as a result of an original manufacturing defect so long as: (1) your JBL product was originally purchased within the fifty United States or by military personnel from an authorized military outlet, (2) the dealer from whom the product was purchased was authorized by JBL to sell such products at the time of original purchase and (3) the original, dated Bill of Sale is presented whenever service is required during the warranty period. This warranty is only valid for service within the United States and does not apply to products purchased elsewhere; other purchasers should contact their local JBL distributor for warranty information.

### WHAT DOES THE JBL WARRANTY COVER?

Except as specified below, this warranty covers all defects in original materials and workmanship. The following are not covered: damage caused by accident, misuse, abuse, neglect, product modification; damage occurring during shipment; damage caused by failure to follow instructions in the owner's guide, including failure to perform recommended periodic or routine maintenance; damage resulting from repairs by someone not authorized by JBL; units used for other than car-use; units not used for their intended purpose; claims based upon any misrepresentations by the seller; and any JBL product on which the serial number has been altered, defaced or removed.

### WHO PAYS FOR WHAT?

During the period of this warranty, subject to the above conditions, JBL will pay all of the labor and material expenses to repair a warrantable defect.

### HOW CAN WARRANTY SERVICE BE OBTAINED?

In the event that your JBL product(s) should require service, you should first contact either the JBL dealer from whom the product was purchased or you may write us directly at JBL (ATTN: Customer Service), 250 Crossways Park Drive, Woodbury, NY 11797, or call 800.336.4525. We may direct you to an authorized service center for JBL products or ask you to send the product to us for repair. In either case, you will have to present your original Bill of Sale to establish warranty coverage. Do not send your product to us without prior authorization from our Customer Service Department. You are responsible for transporting your product to the designated authorized service center and for payment of all shipping charges; however, JBL will pay the return shipping charges (in the event you return the product to us) if the repairs are covered by warranty. If you experience difficulty in transporting your product or are in need of packing materials, please advise us and we may be able to suggest alternative procedures and/or provide adequate packing materials.

**LIMITATION OF IMPLIED WARRANTIES:** All implied warranties, including fitness for a particular purpose and merchantability, are limited in duration and length to the warranty period for your product.

**LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES:** JBL is not responsible for incidental or consequential damage of any kind. Our liability is limited to the repair or replacement, at our option, of a defective product.

Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights, which vary, from state to state.

**NOTE:** In the event that there is a difference between this warranty and the provisions in any advertisements, product brochure or packaging cartons, the terms of this warranty will prevail.

JBL continually strives to update and improve existing products, as well as create new ones. The specifications and construction details in this and related JBL publications are, therefore, subject to change without notice.



PLEASE MAKE NOTE OF THE FOLLOWING INFORMATION AND RETAIN FOR YOUR RECORDS

Product Name: ____________ Model Number: ____________

Store Name: ____________ Date of Purchase: ____________

Figure1.1 JBL Warranty

# 2. Specifications

## 2.1. Output Power

**A6000GTi Power Chart**

Maximum power @ 100Hz With 0.1% THD

| | |
|---|---|
| 2 ohm Dual | 3000W |
| 4 ohm Bridged | 6000W |
| 1 ohm Parallel | 6000W |

**Load Impedance:** Safe with all types of loads. Rated for 2 ohms in dual mode, 4 ohms in Bridged and 1 ohm in Parallel.

**Required Battery Voltage:** 10.0-16.0 VDC

**DC Line Current:**
For 6000W: 700A;
At idle: Amp draws 12.0A and no more than 200 watts.

## 2.2. Performance

**Frequency Response:** **±3**dB from 10Hz to 200Hz at 1 watt.

**Phase Response:** 0 to 180 degrees deviation from 20Hz to 320Hz.

**Signal to Noise Ratio, A-Weighted, 20Hz to 320Hz:** Better than 100dB below rated 100Hz power.

**Total Harmonic Distortion (THD):** 100Hz rated power 0.1% or less THD

**Damping Factor:** Greater than 1000 from 10Hz to 400Hz

**Common Mode Rejection (CMR):** Better than 70dB from 20Hz to 100Hz.

## 2.3. Controls & Connectors

**Power:** REM voltage of 5.0VDC will power up the amplifier. REM voltage of less than 3.0VDC will power down the amplifier.

**Mode:** Turn power off before switching. A two-position switch located in the middle of the input panel, when switched to 2CH/BR operates the amplifier either in two “mono” channels or one bridge channel. When switched to PARALLEL, the amplifier joins the two output channels to deliver twice the output current.

**Sensitivity:** A continuously variable rotary level control that when turned to the maximum setting with an input of .250mV RMS the amplifier will deliver maximum output power. When turned to the minimum setting with an input of 8.0Vrms the amplifier will deliver maximum output power.

**Slope:** Two-position switch used to control filter rolloff. Switch in 12 pos yields 12dB per octave rate of rolloff. Switch in 24 pos yields 24dB per octave rate of rolloff.

**LP Freq:** Crossover frequency adjustment from 32Hz to 320Hz.

**DBO:** Dynamic Bass Optimization. Two-position switch turns DBO on and off. Continuous rotary adjustment to increase/decrease bass level. Another adjustment for HP rolloff.

## 2.4. Indicators

**Signal:** A blue LED, which flashes when a very low-level signal is present at input.

**Clip:** A red LED, which turns on when distortion becomes audible in the amplifier output.

**Fault:** Normally off, this red indicator will light if amplifier output stage becomes non-operational.

**Power:** A blue LED that turns on when the amplifier has been turned on and has power.

## 2.5. Input/Output

**Input Connector:** One RCA connector for each channel.

**Input Impedance:** 25k ohms

**Output Connectors:** Custom gold plated terminals with set screws.

**Power Connectors:** Custom gold plated terminals with set screws accepting 0 gauge hookup wire.

**Wiring Diagram:** See A6000GTi Owner’s Manual

## 2.6. Protection

A6000GTi amplifiers are protected against shorted, open or mismatched loads, overloaded power supplies, excessive temperature, input overload damage and high frequency blowups. They also protect loudspeakers from input/output DC, large or dangerous DC offsets and turn-on/turn-off transients.

**Cooling:** 3 fans

**Dimensions:** Width 23.250”, Length 29.350” and Height 6.50”

**Weight:** Net weight is 90lb(40.8kg). Shipping weight is 143 lbs (64.9kg).

# 3. Theory of Operations

## 3.1. Audio Signal Path

### 3.1.1. Input Stage

Signal is presented to the A6000GTi through one of two RCA connectors. Each RCA connector is a balanced input. Each input is immediately treated with a ferrite, to block any high frequency noise. A TVS (Transient Voltage Suppressor) and DC blocking cap are also included to protect the amplifier against high voltage and DC voltage levels. The optoisolator (U103, U203) acts to compress the input level if needed to protect the amplifier from dangerous conditions such as over temperature, clip conditions or DCLF (DC or low frequency). The signal is then converted from balanced to unbalanced in the Balanced Input Stage (U100).

After the two channels have been converted to unbalanced, they are summed together to form a single mono signal that will continue through the amplifier. At this same point in the circuit, the channel one and two signals are also sent to the op amp buffer stage of U104, where some gain is added. The signals are then passed thru the photomos relay K100. When the amplifier is powered on, the relay closes and routes the signal to the pass thru RCA connectors on the input panel.

The signal is then passed through the low pass Butterworth filter. The pot (R131) is used to adjust the signal phase from 0° to 180°. The switch (S100) is used to switch in a second filter stage, making a fourth order filter. After the filter stage, the signal is passed thru the DBO (Dynamic Bass Optimization) stage. In this stage S101 is used to turn DBO on and off, R141 is used to adjust the DBO frequency between 20Hz and 80Hz, and R143 is used to adjust the DBO boost (gain) between +1dB and +12dB.

Following the DBO circuitry, the signal passes thru the VCA control (U105). This is where the remote level control is used to adjust the gain. The VCA is followed by U100, which acts as a buffer/driver and sends the signal to both the channel 1 and channel 2 circuitry on the input card.

For the sake of simplicity, from this point on only channel one of the audio signal path is described.

Inherent in all PWM amplifiers is a rise in gain at higher frequencies. Because of this, a 800Hz $6^{th}$ order Gaussian low pass filter has been included in the input stage of the A6000GTi (on the input PWA). The Gaussian filter-type is unique in that it has minimal ringing and excellent phase response so even a high-order filter such as this one does not adversely affect the sonic excellence of the product. U201-A, -B, -C and –D comprise this filter.

### 3.1.2. Error Amplifier

The signal next enters the main amplifier error amp (U500-D) where it is mixed with a small portion of the output voltage and current in such a way as to control the amplifier's overall output performance. From the error amplifier, the signal is divided and fed to the modulator. Since the modulator circuit is balanced, the drive signal for the positive modulator is inverted by U500-A.

### 3.1.3. Modulator

U502 and U505 are high-speed differential comparators. U502 is the positive comparator and U505 is the negative comparator. The comparator section has two outputs: inverting and non-inverting. The output is therefore balanced. The audio signal is applied to the inverting input of both differential comparators (with the positive modulator receiving the audio out of phase from the negative modulator). The 125kHz triangle wave (described below) is applied to the non-inverting input of both differential comparators. With no audio signal, the bipolar triangle wave is therefore compared to a zero-volt signal and this results in a 125kHz square wave pulse train that is passed to the NAND gate section of the differential comparator.

The balanced output of U502 forms the positive portion of the output waveform (Vp). The output of U505 is also balanced and forms the negative portion of the output waveform (Vn). These two balanced signal lines are routed to the output stage drivers, U301 and U302. If an audio signal is present at the inputs of the modulators, the triangle wave will be compared to a varying signal at the comparators and the outputs of the NAND gates will be a 125kHz pulse train in which the widths of the pulses vary with the audio amplitude.

This operation is described as Pulse Width Modulation (PWM), as used in the BCA amplifier.

### 3.1.4. Triangle Generator

The 125 kHz triangle wave has its origins from the 4MHz crystal oscillator (Y40). A seven-stage counter (U49) is used as a divide by. The output Q3 is a divide by 8 (500kHz), Q4 is a divide by 16 (250kHz) and Q5 is a divide by 32 (125kHz). The clock is then buffered by the NAND gate (U47).

After U509-A divides the 250kHz square wave down to 125kHz, the square wave is sent thru a parallel combination of hex inverters (U505-A thru –F). Multiple inverters are required to provide sufficient drive to the next stage. The transistors Q502 – Q509 form a low noise discrete op amp. This circuit converts the signal from a 0V-5V square wave to a –5V to +5V triangle wave that is extremely accurate. The triangle wave is finally routed to the modulators.

### 3.1.5. Output

The PWM modulated 125kHz signals exit the modulators and enters a voltage translator formed by Q301 – Q310. This string translates the balanced PWM signals into a single ended waveform with increased amplitude for the FET driver (U301 and U302). The FET driver's output is increased by a two transistor discrete amplifier stage for improved fan out capability.

The FET driver (U301) output is referenced to Vp+14 and Vp. The Vp+14 floating supply is derived from +Vcc on the main PWA. Therefore, it is proportional to Vcc and varies as the +/- Vcc levels vary.

We pause now for a qualitative description of output stage operation (refer to Figure 3.1). All parts to the left of "Iout" are positive or "p" side parts and all parts to the right of "Iout" are negative or "n" side parts. The switches Swp and Swn are analogous to the FETs. Quiescent operation will be considered first. At the start of a switching cycle Swp and Swn are both turned on. Current flows from +Vcc, through Swp, through Lp, through Ln, through Swn, and down to –Vcc. The current rises at a controlled rate in the Lp and Ln inductors (see the current diagram to the right in Figure 3.1). Halfway through the cycle, the switches turn off but the inductors have reached a certain current flow (the peaks on the diagram) and now must continue pushing current in the same direction. The current continues to flow in the same direction through the inductors but comes through the diodes because the switches are open. Specifically, current flows from –Vcc through D1, through Lp, through Ln, through D2, and to +Vcc while ramping down. At quiescent, the Lp and Ln currents cancel so the net voltage developed at Iout across the capacitor is zero. For positive voltage output, Swp is left on longer than Swn and for a negative output voltage, the opposite occurs. Note that for any output voltage, the "on" time of both switches will overlap, even if one is on longer than the other.

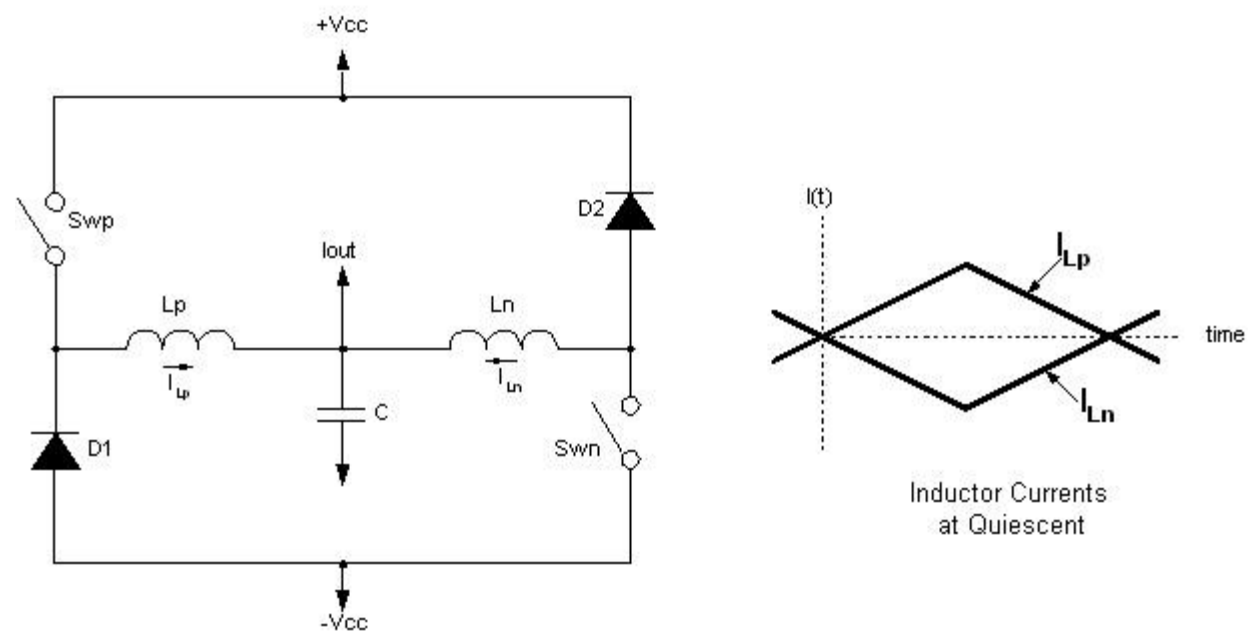



Figure 3.1 BCA Operation

Now, back to the description of output circuit flow: after the FETs, the signal is then routed to the BCA filter inductors (Lp and Ln). The combining point (B1) is then sent to the Output Filter.

With no audio modulation, the PWM pulse train that is sent to the gates of each set of FETs is the same and the duty cycle is approximately 50%. This means that for no audio input, the positive FETs (Q301, Q302, Q303, Q304) turn on and off at the same time as the negative FETs (Q305, Q306, Q307, Q308). As mentioned before, the Lp and Ln inductors control the rate of rise of the current during this time so that this does not act like a short during the couple of microseconds that they are on. The time that the FETs are on ramps current up in the inductors, which stores energy in them. This energy is released through the diodes (D301-A, D301-B, D302-A, D302-B) when the FETs are turned off. The Vp and Vn nodes swing between –Vcc and +Vcc with a duty cycle of approximately 50%.

Operating the output stage in this way causes the current in the Lp and Ln inductors to completely cancel at the B1 node. This drastically reduces the filtering requirements necessary after the output stage.

If an audio signal is present at the input of the amplifier, the widths of the pulses at Vp and Vn change but the amplitude of the pulses stays at 2*Vcc. Positive audio signals will cause the positive side of the output stage to be on more than 50% of the time while the negative side will be on less than 50% of the time. The total “on-time” will add to approximately 100%. Also, the on-time of the two polarities will overlap so that when the negative side is on, the positive side is also. For negative-going signals, the action is reversed (swap positive and negative). The result at the summing junction B1 is an amplified version of the input signal, with some noise superimposed on it. The B1 signal is then routed to the Output Filter.

### 3.1.6. Output Filter

The output filter is made up of two individual filters: a 62.5kHz filter (L800,C823-C831) and a 125kHz filter (L801, C832-C836). The signal passes through these two filters to eliminate both residual 125kHz and 62.5kHz signals. The audio is then sent out the 6-wire cable to the output terminator board. The output terminator board connects the output signal to the amplifier output terminals.

## 3.2. Protection and Control Circuitry

### 3.2.1. Current Monitor

Audio output current levels are monitored by the use of transformer T801. A small primary winding is in series with the output current and the secondary develops a voltage across the input of U512-C. This op amp provides a current monitor signal that is scaled to approximately 5Amps/1Volt. This output current is used for the following purposes:

1. High Frequency Feedback
2. Low Frequency Feedback
3. Current Limit LED

### 3.2.2. Current Limiter

To prevent excessive output current, the A6000GTi incorporates an active current limit circuit for each channel. Resistors (R809-R811, R812-R814) in series with the Lp and Ln output coils are used to sense the output current. The voltage created by the output current thru the resistors is compared to a reference voltage set by R801 & R802. These voltages are compared on U801. If either the Lp or Ln current reaches the maximum permitted output current, the output pin of the comparator goes low, which pulls the I LIMIT signal low thru an optocoupler (U800). This signal goes to the front-end board and is used to turn the channel off. When the current out of the channel fails below the limit, the channel is enabled. This method of current limit allows the amplifier to play thru current limit situations without severely degrading the sound.

### 3.2.3. Display Circuitry

After the input signal leaves the input board, it is routed to the signal detection circuit. With a signal approximately 45 dB below that required for full output, the signal; LED will illuminate. Note that this LED will indicate whether signal is present at the amplifier but not whether it is being output from the amplifier.

The compressor circuit is initiated by either the Input-Output Comparator (IOC) circuit or by the Thermal Limit Control (TLC) circuit. The IOC circuit is on the front-end board, and monitors the error amp signal. If the error amp signal becomes too large, indicating too much distortion on the output, the IOC signal will drop to –15 volts. This will cause the compressor drive circuit on the input board to compress the inputs of the amplifier. U102 on the input board turns on Q100, which causes U103 to become active. U103 shunts the input signals together, thereby limiting the input to the amplifier. IOC will cause the CLIP LED to light only if it occurs long enough to be audible. The TLC circuit lights the THERMAL LED when the audio section is beginning to overheat. The LED can light before the TLC circuit begins to compress. The TLC circuit will be discussed in another section.

The FAULT LED indicates that something catastrophic has happened to the amplifier. When the amplifier senses a fault condition, the audio section and power supply are both disabled, and a crowbar circuit is employed to drain the rail voltage to prevent any further damage.

### 3.2.4. Thermal Limit Control (TLC)

The TLC circuit is used to control the output of the amplifier while monitoring the temperature of the amplifier output devices and of the power supply switching devices. When the devices begin to overheat, the TLC circuit begins to compress the input signal, scaling back the output power until the unit is capable of cooling itself again.

On the input board, U104-C and U104-D form a window comparator with the input signal and two DC voltages created by U110-A and U110-D. As the unit begins to heat up, the window narrows, and when the input signal reaches the upper or lower limit on the window comparator, the compressor drive circuit is activated and the input is compressed in the same manner as IOC.

## 3.3. Power Supply

### 3.3.1. Switching Power Supply Operation

The switching power supply is designed to take 12-volts in and convert it to +/- 150-volts out using a full bridge topology. The ring of mosfets around the transformer in the middle of the supply can be divided into 6 parallel H bridges, with each bridge having 2 mosfets per leg (for a total of 48 mosfets). The low voltage supply is a 48W push-pull. It supplies the large power supply and audio section with +/- 24-volts.

The large power supply is specially designed to handle the high current demand of the audio section. The buss bars provide a low impedance path for the current into the full bridge. The orientation of the power mosfets maintains that low impedance path to maintain high efficiency.

When the REM signal goes high, the low voltage power supply enables and generates the +/-24 volt rails. Once the voltage is about +/- 20 volts, the large power supply is enabled. The 6 parallel H bridges begin switching in unison. The PWM chip for the large power supply has soft start circuitry to decrease the inrush current demands of the amplifier. The H bridges create a 24 volts peak-to-peak square wave at a frequency of approximately 1000 Hz. The transformer has a turns ratio of 12:1, and the output voltage is stepped up to 288 volts peak to peak. The AC voltage is rectified to +/-144 volts DC. These are the rail voltages for the audio section.

### 3.3.2. Switching Power Supply Protection Circuit

The power supply is equipped with crowbar circuitry to disable itself and drain the rails if the amplifier senses DC on the speaker outputs.

The power supply will also protect itself from over voltage and under voltage situations. The power supply is unregulated, so as battery voltage increases, rail voltage increases. For 16 volts in, the rail voltage will be 192 volts. The rail capacitors are only rated for 200 volts, so the power supply will shut down to prevent an over voltage situation. The power supply is also equipped with thermal circuitry to compress the audio section when the power supply is overheating. This decreases the power demand and allows the power supply to cool down.

### 3.3.3. (LVPS) Low Voltage Power Supply Operation

The low voltage power supply is a switch mode power converter that uses a push pull topology. U8 is a SG3525AP pulse width modulator (PWM). The PWM regulates the output voltage to +24 volts by controlling the switching times of Q50 and Q54, which are IRF540N mosfets rated for 100V 33A. The transformer, T2, has a center taped primary and secondary. The PWM alternates the on time of Q50 and Q54 at a frequency of 125kHz, synchronized with the main system clock, to apply voltage to their respective sides of the primary. This alternating voltage is multiplied by the turns ratio of the transformer, then rectified by the diodes on the secondary (D8, D9, D11, D12), and filtered by L7 with C43 and by L8 with C49 to give the +/-24 volt outputs. The +24 volt is monitored by the PWM thru the resistor divider formed by R60 and R59.

The PWM is equipped with soft start circuitry and pulse-by-pulse current limit to prevent the core from saturating. The current limit is accomplished by comparing the voltage across R58, which is a 0.04 ohm resistor, to a set voltage limit of 0.65 volts. U18 is the comparator that performs this function. The output of U18 is tied to the shutdown pin of the PWM and to a 5-volt pull up resistor.

**Note: The supply is designed to operate in continuous current mode (CCM), meaning it always supplies current on both the plus and minus 24-volt rails. If the power supply is operated without the audio section connected thru the ribbon cable, the –24 volt rail goes into discontinuous current mode, and the voltage jumps to –50 volts. The filter capacitors on the negative rail are only rated to 35 volts, so operating in this mode for more then a few seconds will require the replacement of C53 and C54.**

# 4. Maintenance

## 4.1. Where to Begin

Effective repair involves three basic steps:

1) Determine the symptom(s) of the problem
2) Identify the cause(s) of the symptom(s)
3) Repair the unit to eliminate the cause(s)

To determine the symptoms, you will want to get as much information from the user as possible. Get as much information as you can about the system and how the amplifier is used. There is always the possibility that the problem will show up only if used in a specific way.

Once you have all the information about the symptom(s), it is time to inspect the amplifier. A careful visual inspection is valuable for most problems, which you may encounter. To inspect the inside of the amplifier remove the cover as described in Section 4.3.1.

Begin the inspection by looking for anything abnormal, like loose connectors, broken wires and burnt or visibly damaged components. Inspect the printed circuit assemblies for broken traces and loose connections. Be thorough. The time you spend visually inspecting the amp is time well spent.

## 4.2. Surface Mount Technology

The A6000GTi amplifier uses surface mount technology in its design. There are several advantages to using surface mount technology (SMT), including; (1) surface mount devices (SMDs) are much smaller, and are mounted to the surface of the board, so more components can be placed on the board. (2) Components can be attached to both sides of the board, allowing the board size to be reduced. (3) SMT boards are lighter and provide better electrical performance and signal speed.

Of course, there are also things to watch out for with SMT. (1) The placement of the components on the board, not through a hole, makes the components and solder joint more susceptible to damage. (2) Rework of SMDs can often require specialized tools, equipment, or training. (3) SMDs are very small and can be difficult to handle, see, and identify.

Remember that on some of the boards, the SMDs are GLUED to the bottom of the board. This is done for manufacturing purposes. Take care not to damage components while trying to remove them from the surface of the module.

## 4.3. Disassembly for Inspection & Service

The extent of disassembly required will depend upon the extent of inspection and service required.

**Note: To avoid the risk of electric shock, turn off and unplug the amplifier from the +12V power source before disassembly or reassembly is attempted.**

### 4.3.1. Top Cover Removal

1. On a soft surface, turn the amplifier over to view the bottom. Using a T-25 screwdriver, remove the four large Torx-head screws at bottom corners. (Figure 4.1)

2. Turn the amplifier over to view the top. Using a 5 /32 inch Allen wrench, remove the four cap head screws on the clear plexiglas cover. (Figure 4.1)

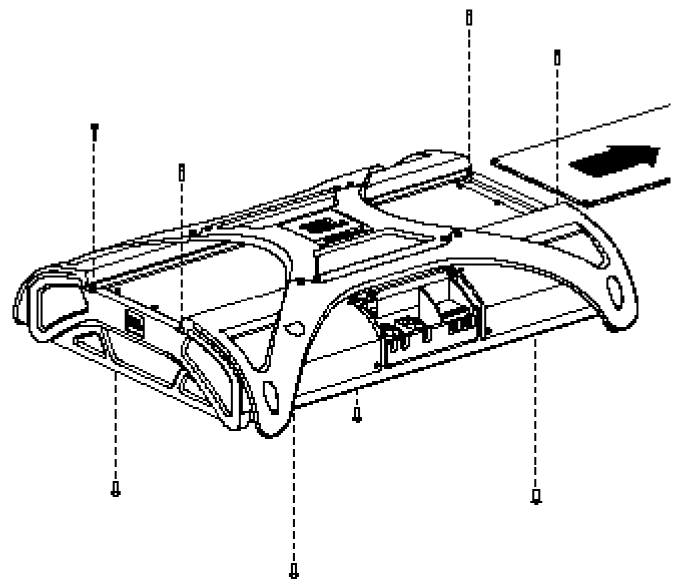


Figure 4.1 Plexiglas Removal.

3. Slide the plexiglas cover out.

4. Using a T-15 screwdriver and remove the input cover and output cover. Each cover is attached with 4 screws. (Covers not shown)

5. Using a T-15 screwdriver, remove the four Torx-head screws in the top cover around the output. (Figure 4.2)

6. Using a T-15 screwdriver, remove the four Torx-head screws in the top cover around the input. (Figure 4.2)

7. Carefully remove the cover

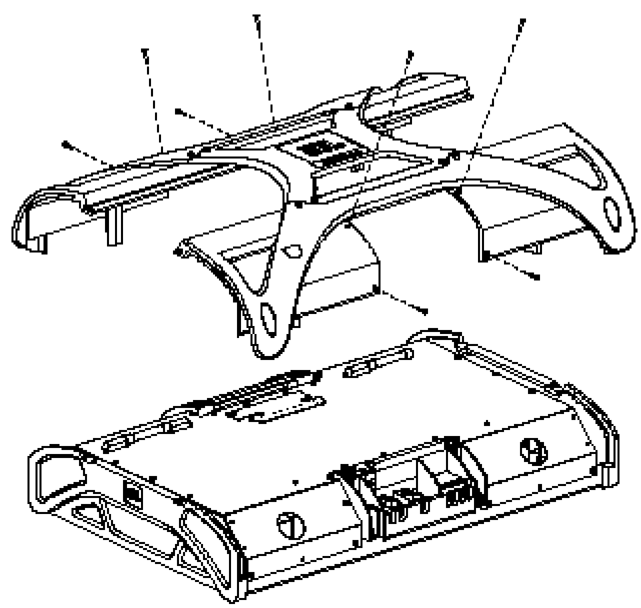


Figure 4.2 Top Cover Removal

8. Using a T-15 screwdriver, remove the two Torx-head screws on the display board. Disconnect the ribbon cable from the back of the display board.

9. Using a T-15 screwdriver, remove the 23 Torx-head screws on the perforated shield.

10. Using a small flat-blade screwdriver, disconnect the wiring for the neon tubes.

11. Remove the perforated shield and sheet metal shield (see Figure 4.3).

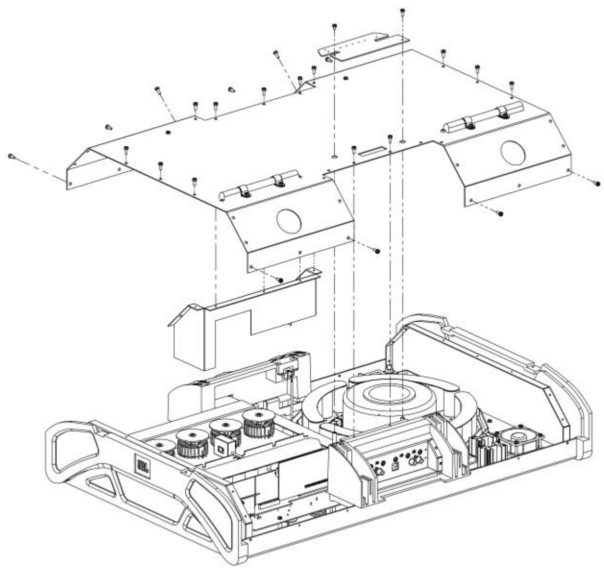


Figure 4.3 Perforated (EMI) Shield

### 4.3.2. Power Supply Discharge

Before any connectors and PWAs (Printed Wire Assemblies, or circuit boards) are removed, the Power Supplies need to be discharged. Follow these simple steps.

1. Make sure the amplifier is disconnected from the +12Volt Power Source.
2. Locate the 6-Wire power cable (See Fig 4.5). The wire colors are red-black-blue-red-black-blue.
3. Disconnect the cable.
4. Connect a 600 Ohm 10 watt resistor as shown in Figure 4.4. Be careful not to touch the leads, as voltages in excess of ±100V could be present.
5. Wait 30 seconds before removing the resistor.

**Caution: The 10-watt resistor will become Hot as the power supplies discharge.**

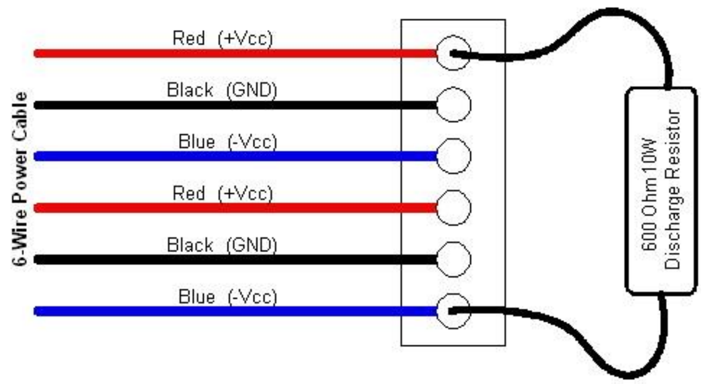



**Figure 4.4 Power Cable and Discharge Resistor**

**Caution: After the 6-wire power cable is unplugged. Do not plug it back in until the rails have been discharged. Failure to do so can result in component failure.**

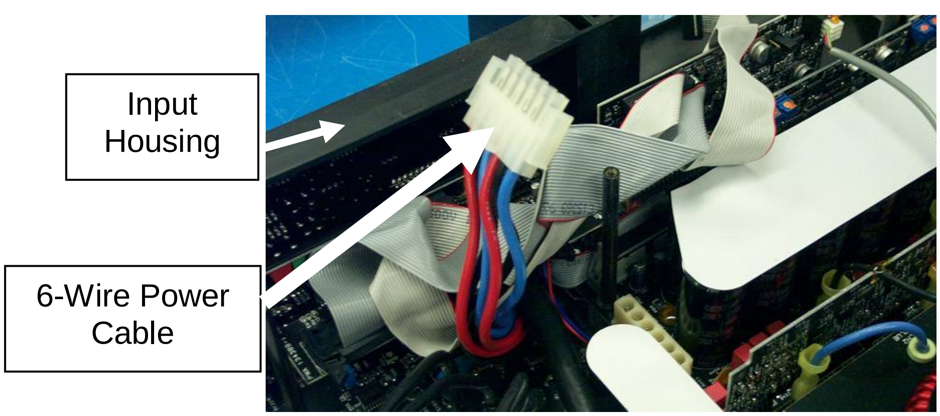



Figure 4.5 6-Wire Power Cable Location

### 4.3.3. Power Connection Housing Removal

1. Peel the rubber pad off bottom of the amp.
2. Using a T-15 screwdriver, remove the four Torx-head screws from the bottom of the amplifier holding the plastic power housing to the chassis.
3. Using a flat-head screwdriver pry off the red and black caps from power connectors.
4. Using a 3/16-inch Allen wrench, remove the two cap head screws in the power connectors. Then remove the two power connectors and washers.
5. Using a T-15 screwdriver, remove the 2 Torx-head screws on the plastic plate on top of the speaker output connectors.
6. Using a T-15 screwdriver, remove the 2 Torx-head screws on the back of the output board.
7. Disconnect cable from REM board.
8. Disconnect Sensor cable from the power supply PWA.
9. Remove plastic power housing (see Figure 4.6).

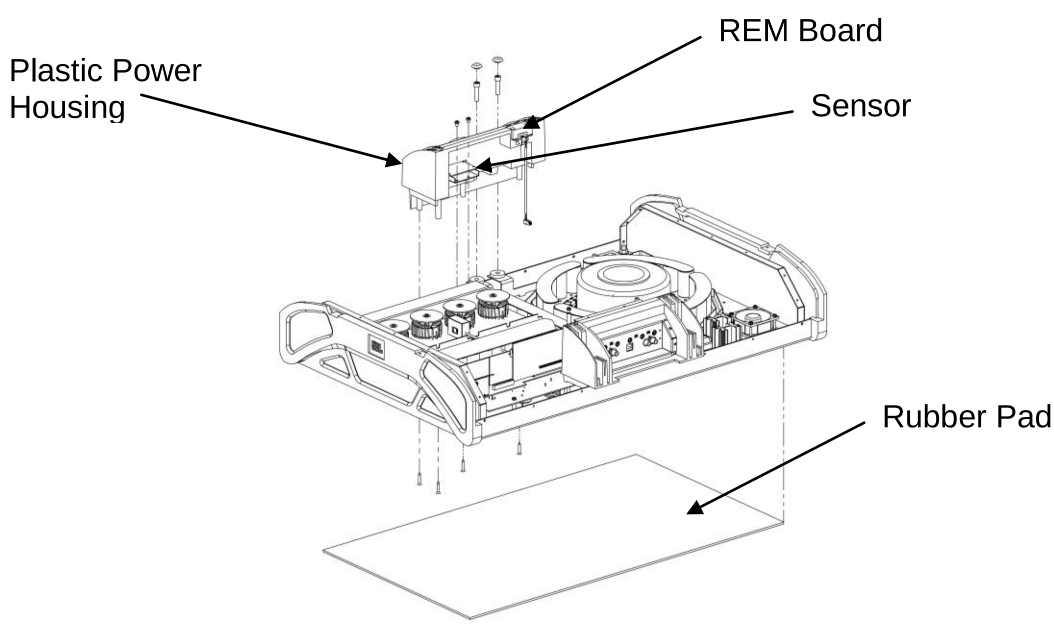



Figure 4.6 Power Connection Housing

### 4.3.4. Pip Assembly Removal

1. Using a T-15 screwdriver, remove the five Torx-head screws from the bottom of the amplifier holding the plastic pip holder to the chassis.
2. Disconnect the two ribbon cables from the pip board. Both of these cable connectors have latches.
3. Remove PIP Assembly (see Figure 4.7).

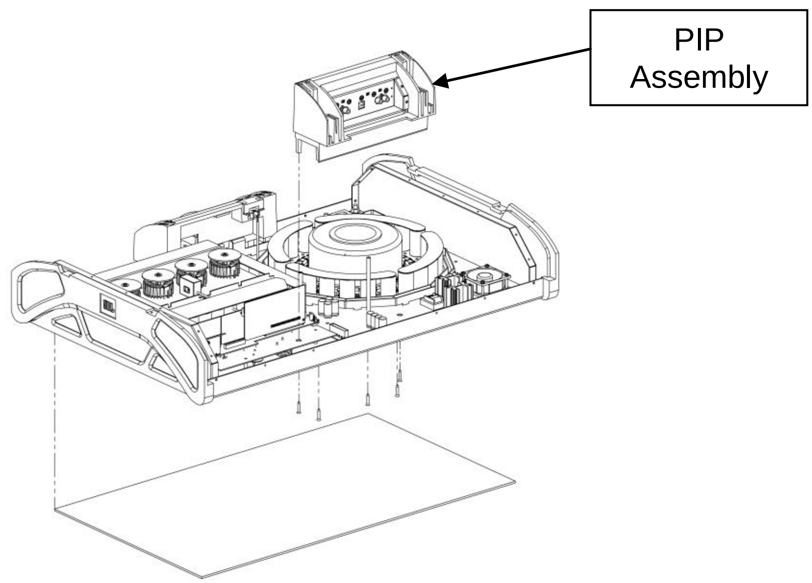



Figure 4.7 Input PIP and Input Housing Assembly Removal.

### 4.3.5. Power Supply Assembly Removal

1. Remove power Connection (see Section 4.3.2 for Power Supply Discharge).
2. Using a T-20 screwdriver, remove the four large Torx-head screws from the bottom of the amplifier.
3. Remove one round standoff (used for the display board) using pliers.
4. Using a T-08 screwdriver, remove one small Torx-head screw from rectifier.
5. Using a T-20 screwdriver, remove the 22 Torx-head screws holding down the PWA.
6. Remove power supply assembly.

**NOTE:** If power supply is difficult to remove, double check to confirm that ALL screws have been removed.

### 4.3.6. BCA Assembly Removal

1. Using a T-15 screwdriver, remove the 12 Torx-head screws from the bottom of the amplifier holding the plastic coil holder to the chassis.
2. Remove one round standoff from Main PWA (see Figure 4.8).
3. Using a T-15 screwdriver, remove the 6 Torx-head screws holding the PWA's from the top side.
4. Remove the BCA assembly from the chassis.


Figure 4.8 BCA Assembly

### 4.3.7 BCA Disassembly

1. Remove BCA assembly from amplifier (see Section 4.3.6).
2. Using a Philips screwdriver, remove four screws holding coils down.
3. Under the four screws just removed there is a plastic cap (large washer). Remove all four caps.
4. Disconnect the current sense cable from the Coil PWA. See Figure 4.8, the other end is connected to the input PWA.
5. Remove eight wires that connect the coil PWA to the Main PWA (2-red, 2-black, 2-blue, 2-black/white) via a faston connection. Carefully remove the hot melt glue around the cable as well.
6. Remove the Coil PWA.
7. Using a T-15 screwdriver, remove 12 Torx-head screws from the spring clips on the FETs.
8. Remove the four spring clips and four heat sinks.
9. Flip assembly over.
10. Using a T-15 screwdriver, remove 6 Torx-head screws from output filter board.
11. Remove output filter board and main board from plastic holder.

## 4.4. Troubleshooting

As mentioned earlier, the three steps to effective repair are: Determine the symptoms; identify the cause of the symptoms; repair the unit to eliminate the cause.
Please troubleshoot based on the order listed below.

### 4.4.1. Power Supply

**Caution: Before plugging the 6-conductor cable into the audio section, always make sure the voltage on the outer pins of the cable and on the audio section is less then 5 volts. Failure to do so will result in irreparable damage to the main board.**

The power supply is equipped with 5 LED's to indicate fault modes and aid in troubleshooting. These LED's are E1-3, and E5-6 on the power supply circuit board.

**FAULT MODES**

- ✓ Battery OV (E1) Voltage greater then 16V
- ✓ Battery UV (E6) Voltage less then 10V
- ✓ LVPS POS (E3) Low voltage power supply positive no good
- ✓ LVPS NEG(E5) Low voltage power supply negative no good
- ✓ ILIM (E2) Power supply over current or audio section fault

**Battery OV:** This LED (E1) indicates the battery voltage is greater than 16V. Check the battery voltage. The circuit should shut the amp down with approximately 16.0V and turn back on with approximately 14.5V.

**Battery UV:** This LED (E6) indicates the battery voltage is less than 8V. Check the battery voltage. The circuit should shut the amp down with approximately 8.0V and turn back on with approximately 9.4V.

**LVPS+/-:** Check voltages at L1 & L4 on the power supply PWA. They should be plus & minus 24 volts respectively. If not, check for shorts to ground. Disconnect the ribbon cable and the 6-conductor cable from amplifier and recheck voltages. The negative voltage will drop to approximately -50 volts when the amplifier is disconnected, which is harmful to the output capacitor on the low voltage power supply (LVPS), so this measurement needs to be made quickly. Plug the ribbon cable back into the amplifier.
If the plus and minus voltages were ok, the problem is in the amplifier, but if they were not, the problem is on the power supply board. If the +24 volts was low, remove the 15 volt regulator (U6 on Power Supply PWA) and check the voltage at L1, if the -24 volts was low, remove the -15 volt regulator (U7 on Power Supply PWA) and check L4; if the voltages are normal, check the regulators (U6 and U7) for shorts to ground on their outputs. If they are not shorted, check individual IC's for undo heating or current draw.

If the voltage is still low, the problem is in the LVPS. Check the gate drive signals into the mosfets Q50 & Q54 (on Power Supply PWA). Verify that the two mosfets are switching. If there is a gate drive signal, but no switching, verify that the two drains are connected to ground thru a 0.04-ohm resistor (R58). If there is still no switching, replace the mosfets and recheck. If there is no gate drive signal from the pulse width modulator chip (PWM)(U8 on Power Supply PWA), check the current limit signal on pin 14 of U18. If this signal is high, there is a problem with the current limit circuit for the LVPS.

**ILIM:** The ILIM light indicates that either the power supply has drawn too much current, or that the amplifier has faulted. To determine which is the case, disconnect the ribbon cable and 6-conductor cable from the amplifier and turn the power supply on by itself. If the power supply turns on, it is fine.

Reconnect the ribbon cable to the audio section. The audio section faults when dc is present on the outputs. Check for shorts between the rails and outputs. The most likely cause of this would be a blown mosfet (Q301-Q308 ch1 and Q401-Q408 ch2) in the audio section. Check for gate to drain shorts on the mosfets as an indication of a blown part. Replace the blown components and the gate drive module. Often, when a mosfet blows, it damages the gate drive, and failure to replace the gate drive will result in more blown mosfets.

If the ILIM light still lights when the power supply is unplugged from the amplifier, reconnect the ribbon cable to the audio section, turn the current limit down to 10 amps on +12 supply powering the unit, and verify the ILIM failure. Check for shorts from the transformer nodes to battery plus and minus. If necessary, remove the large transformer from the board and verify the proper switching at the transformer nodes. You should observe 0 to 12-volt square waves at 500Hz on any of the pads where a transformer lead was connected. If this still causes an ILIM fault, the most likely cause is a bad power supply mosfet (Q1-Q48). Measure gate to drain as an indication of a bad part. Replace the bad mosfets and retest.

### 4.4.2. Audio Section Trouble Shooting

### 4.4.3. Fault Modes

- ✓ **Over Temp** Output devices over 85°C
- ✓ **HF** High Frequency oscillations at output
- ✓ **Low Energy** Loss of +/-24 volts
- ✓ **VCC** Loss of rail voltages
- ✓ **DC/LF** DC on the outputs
- ✓ **High average Current** Too much time in current limit. Holds audio section off for 3 seconds, then re-enables.

**Over Temp:** Verify that the fans are plugged in and that the airflow path out of the unit is not blocked.

**HF:** The amplifier senses high frequency oscillations with frequencies outside of the audio bandwidth. The most likely cause for this fault is that the diodes D801 & D901 on the output filter board are bad. If this does not correct the problem, replace the front-end boards.

**Low Energy:** The audio section has lost the low voltage supply. Check the voltage on the power supply at L1 and L4. You should have +/-24 volts, respectively. If the voltage is wrong on the power supply, disconnect both cables from the power supply to the audio section and recheck the voltages. The negative rail should be around –50 volts when disconnected from the amplifier. If the voltages are ok, the problem is on the audio section. If not, refer to the power supply trouble-shooting guide. If the problem is on the audio section, plug the ribbon cable back in from the power supply, but leave the 6-conductor cable disconnected. Check for shorts on regulators on the main board under the heat sink. If any are faulty, replace them and recheck the voltages. If the regulators are ok, remove the front-end boards and recheck the voltage. If either front-end board is causing the drop in voltage, replace the faulty board. If the problem still persists, check for IC's for heating or shorted pins.

**VCC**: Loss of VCC rail voltage. Check the voltage on the outer pins of the 6-conductor cable while plugged into the audio section. It should be greater then 280 volts dc. Remove the cable from the audio section and check the voltage again. If the voltage is still low, verify that at least 12 volts is present on the power input to the amplifier. Measure the voltage on the secondary of the power transformer; each should be at least 140 volts ac. If these voltages are ok, check the rectifier for shorts or improper operation.

If the problem is not on the power supply, check the shorted rails on the audio section. The most likely cause of shorted rails is a bad mosfet or diode in the switching stage of the audio section.

**DC/LF**: The DC/LF fault will cause the amplifier to crowbar and shut off. The REM voltage must be cycled to turn the unit back on. Check for shorts between the rails and the outputs. If a short is present the most likely cause is a bad mosfet in the switching stage of the audio section. Measure the gate to drain impedance as an indication of a bad part. Replace the blown components and the gate drive module. Often, when a mosfet blows, it damages the gate drive, and failure to replace the gate drive will result in more blown mosfets. If there is no short present, check for the proper voltages on the regulators on the pip and input boards. If either of those boards don't have the proper differential voltage, they will drive the amp to a DC output.

**High Average Current:** This mode is most evident when the amplifier is shorted. The channels are held off for a few seconds then turned back on. In this situation all the signal lights on the display board flash, then the channels cycle off then on. The most likely cause is a component on the output filter board shorted to chassis. This can be measured as a short on the output channel. Disassemble to audio section and look for shorts under the boards.

## 4.5. Required Test Equipment

Due to the complex circuitry utilized in the A6000GTi amplifier, special calibration procedures and the correct test equipment are necessary to insure original factory specifications are achieved.
Below, in Figure 4.9, is a list of test equipment needed to successfully service the amplifier. Recommended models are those used at the factory.

| Device | Requirements | Recommended Model |
|---|---|---|
| Oscilloscope | 500 MHz or greater | LeCroy 9354A |
| Distortion Analyzer | THD measurements | Audio Precision ATS-1 |
| DC Power Suppy | 10-16VDC, 1000A | Sorensen |
| Function Generator | Sine Wave, 0-6Vrms out | Hewlett-Packard HP 33120A |
| AC/DC voltmeter | DB reading capability | Hewlett-Packard HP 34401A |
| Resistive Loads | (1) 4 ohm, 6000 watt; (2) 2 ohm, 3000 watt; (1) 1 ohm, 6000 watt | |

Figure 4.9 Required Test Equipment

## 4.6. Electrical Checkout Procedure

The test procedures in this section are used to verify the operation of the amplifier. You may, however, find these tests helpful in troubleshooting a problem if the problem is not easily identified.

During each test, the follow conditions are assumed, unless otherwise noted:

- Unless otherwise specified, all tests are to be done from 20 to 400Hz with 12.5VDC supply and 2Ohm loads.
- Gain adjusted so a 0.775 volt input signal produces maximum rated output. The input signal to be used is a sine wave of frequency 100Hz.
- DBO turned off, HP Frequency pot adjusted full ccw, Phase adjusted full ccw (0 phase), LP Frequency pot adjusted full cw and DB switch set to 12. Bridge mode.
- All measurements will be done using an Audio Precision System One or ATS-1 and the 22KHz filter enabled.
- When testing the amplifier in Parallel Mono Mode**, insert a jumper** between the Ch1+ and Ch2+ terminals. Then measure across Ch1+ and Ch1-.
- When testing the amplifier in Bridge Mono Mode, measure across Ch1+ to Ch2-.

### 4.6.1. Quiescent Current Draw

**Spec**: 12 amps
**Procedure**: with no load connected, turn amplifier on. Measure the DC current draw of amplifier. It should be approximately 12 amps.

### 4.6.2. Sensitivity

**Spec**: 0.25mV to 8V
**Procedure**: No load. Inject 0.25 mVrms, 100 Hz sine wave into both RCA inputs. Adjust sensitivity pot to full clockwise. Measure output voltage on channel 1. Should measure 77.4Vrms. Adjust sensitivity pot full counter clockwise. Inject 8 Vrms, 100 Hz sine wave into both RCA inputs. Measure output voltage on channel 1. Should measure 77.4Vrms.

### 4.6.3. Bridge Mono Operation

**Spec**: Same voltage on both channels, channel 2 out of phase.
**Procedure**: No load. Switch the unit to bridged mode. Inject a 100 Hz sine wave into one input. Monitor both outputs of the amplifier. They should be the same voltage and 180 degrees out of phase with each other.

### 4.6.4. Frequency Response

**Spec**: ± 3dB from 20 Hz to 200 Hz.
**Procedure**: Load channels with 2 ohms. Inject a 0.1Vrms, 100 Hz sine wave. Measure the output voltage. This is your reference level. Change the input frequency to 20 Hz. Verify that the output is within 3 dB of the reference. Change the input frequency to 200 Hz. Verify that the output is within 3 dB of the reference.

### 4.6.5. Short Circuit Test

**Spec**: Amplifier will protect itself.
**Procedure**: Inject a 100 Hz sine wave. Short the outputs of the amplifier. The signal lights should flash every three seconds. Remove the short. The signal lights should stop flashing.

### 4.6.6. Output Power

| | | |
|---|---|---|
| **Spec**: | Each Channel | 3000 watts into 2 ohms less then 0.1% THD |
| | Bridge Mode | 6000 watts into 4 ohms less then 0.1% THD |
| | Parallel Mode | 6000 watts into 1 ohm less then 0.1% THD |

**Procedure Each Channel**: Load each channel with 2 ohms. Inject a 100 Hz signal. Increase the input until the output reaches 77.5 volts. THD should be less then 0.1 %

**Procedure Bridge Mode**: Load the amplifier with 4 ohms from Ch1+ to Ch2-. Inject a 100 Hz signal. Increase the input until the output reaches 155 volts. THD should be less then 0.1%

**Procedure Parallel Mode**: Load the amplifier with 1 ohm from Ch1+ to Ch1-. Place a jumper from Ch1+ to Ch2-. Inject a 100 Hz signal. Increase the input until the output reaches 77.5 volts. THD should be less then 0.1%.

## 4.7. Calibrations

### 4.7.1. **Amplifier Power up:**

Connect ribbon cable and 6-conductor cable from power supply to audio section (taking care to drain the rail voltages before connecting). Adjust the current limit on the external power supply to 20 amps dc. Disconnect all input signals from the amplifier. Apply 5 volts to the REM terminal. The unit should draw approximately 12 amps when the power supply and audio section are both on and working correctly.

### 4.7.2. DC offset adjustment:

Measure the DC offset on each channel. This level can be adjusted on for channel 1 by turning potentiometer R115 on the input board. For channel 2, use potentiometer R215. Adjust the levels, if necessary, to less then 5mV per channel.

### 4.7.3. Overlap correction:

Connect probes to TP1 & TP3 on the coil board. Center the oscilloscope to measure the lower right portion of square wave. Adjust the time scale to 50ns per division. Adjust R307 for channel 1, and R407 for channel 2. Turn the potentiometer so that the transition zone on the corner of the waveform is less then 10 volts.

### 4.7.4. **Current Monitor adjustment:**

Connect a 2 ohm load to each channel. Inject a 100Hz sine wave into the amplifier. Adjust the sensitivity until the amplifier output is 10Vrms. Adjust R631 on the outer front-end board while monitoring TP306 on the main board. Adjust the potentiometer so that the voltage on TP306 is 1Vrms. Repeat for channel 2 with R361 on the inner front-end board and TP406.

# 5. Parts

## 5.1. General Information

Replacement parts for this amplifier can be ordered from the Crown Parts Department.
**PART PRICES AND AVAILABILITY ARE SUBJECT TO CHANGE WITHOUT NOTICE.**

## 5.2. Ordering and Receiving Parts

When ordering parts, be sure to give the product model, and include a description and part number from the parts listing. Price quotes are available on request.

### 5.2.1. Terms

Normal terms are prepaid. Net-30 Days applies to only those having pre-established accounts with Crown. The Crown Parts Department does accept Visa or Master Card. If prepaying, the order must be packed and weighed before a total bill can be established, after which an amount due will be issued and shipment made upon receipt of payment. New parts returned for credit are subject to a restocking fee, and authorization from the Crown Parts Department must be obtained before returning parts for credit.

### 5.2.2. Shipment

Shipment will normally be made via UPS, or best other method unless you specify otherwise. Shipments are made to and from Elkhart, Indiana USA, only. Established accounts with Crown will receive shipment freight prepaid and will be billed. All others will receive shipment on a C.O.D. or prepayment (check or credit card) basis.

## 5.3. Mechanical Parts

This section includes a mechanical part list for this product. All serviceable parts and assemblies will have a Crown Part Number (CPN) listed in this chapter. The parts listed are current as of the date printed. Crown reserves the right to modify and improve its products for the benefit of its customers.

Customer Service
Factory Service
Parts Department

Mailing Address: P.O. Box 1000, Elkhart IN 46515
Shipping Address: Plant 2 S.W. 1718 W. Mishawaka Rd.
Elkhart, IN 46517
Phone: (574) 294-8000
Toll Free: (800) 342-6939
Fax: (574) 294-8301
http://www.crownaudio.com

## 5.4. Circuit Board Parts

This section includes electrical parts lists for this product. All serviceable parts and assemblies will have a Crown Part Number (CPN) listed in this section. The parts listed are current as of the date printed. Crown reserves the right to modify and improve its products for the benefit of its customers. Please note: where reference designations are listed as “installed on next assembly,” the CPN for the associated part may be found in Section 5.3 Mechanical Parts.

### 5.4.1. Circuit Board and Schematic Part Numbers

The schematics referenced and provided are representative only. There may be slight variations from amplifier to amplifier. These schematics are intended for troubleshooting purposes only.

Note on circuit board designations: Crown circuit boards are referenced with a PWA and/or PWB part number. PWA stands for Printed Wire Assembly. This is the completed circuit board with all components assembled. PWB stands for Printed Wire Board. This is the circuit board only, without components.

A6000GTi Power Supply

PWA Number: 134174-1 (REV. 6) PWA, A6000GTI SW M PWR CONV

Has a flyback low voltage power supply.

PWA Number: 134174-1 (REV. 7) PWA, A6000GTI SW M PWR CONV

Push-pull low voltage power supply on daughter board mounted where the flyback supply used to be. Changes made from REV 7 to REV A- fuse changed from 400A to 600A, added C112 100uF cap to current sense/limit circuit and changed R17 to 7.87K.

PWA Number: 134174-1 (REV. A) PWA, A6000GTI SW M PWR CONV

Changed Q50 and Q54 to 135698-1. Changed R7 to A11368-18241. Changed R19 to A11368-18241. Changed U8 to 136840-1. Changed RT3 to open.

PWA Number: 134174-1 (REV. B) PWA, A6000GTI SW M PWR CONV

Correct a wrong part number on the document. (Document change only)

A6000GTi Main

PWA Number: 134258-1(REV. A) PWA, A6000GTI MAIN

A6000GTI FRONT END (2 PER AMP)

PWA Number: 134254-1(REV. A) PWA, A6000GTI FRONT END

Initial Release

PWA Number: 134254-1(REV. B) PWA, A6000GTI FRONT END

Changed Q500, Q505, Q507 and Q508 to C7448-1. Changed Q501, Q504, Q506 and Q509 to 125798-1.

A6000GTI MPIP
PWA Number: 134389-1(REV. A) PWA, A6000GTI MPIP
Initial Release
PWA Number: 134389-1(REV. B) PWA, A6000GTI MPIP
Replaced C121 and C125 with 125131-1.

A6000GTI INPUT
PWA Number: 134230-1(REV. A) PWA, A6000GTI INPUT
Initial Release

A6000GTI GATE DRIVE (2 PER AMP)
PWA Number: 135041-1(REV. A) PWA, A6000GTI GATE DRIVE
Initial Release
PWA Number: 135041-1(REV. B) PWA, A6000GTI GATE DRIVE
Changed Q309 and Q319 to C7448-1. Changed Q301-Q307, Q310-Q317 and Q320 to 125798-1.

A6000GTI DISPLAY
PWA Number: 134391-1(REV. A) PWA, A6000GTI DISPLAY
Initial Release

A6000GTI COIL
PWA Number: 134532-1(REV. A) PWA, A6000GTI COIL
Initial Release

A6000GTI OUTPUT FILTER
PWA Number: 134176-1(REV. A) PWA, A6000GTI OUTPUT FILTER
Initial Release

# 6. Schematics

The schematics provided are representative only. There may be slight variations between amplifier to amplifier. These schematics are intended to be used for troubleshooting purposes only.

A6000GTi Power Supply
PWA NUMBER: 134174-1
Schematic Sheet:
1
2

A6000GTi Main
PWA NUMBER: 134258-1
Schematic Sheet:
1
2

A6000GTi Front End
PWA NUMBER: 134254-1
Schematic Sheet:
1

A6000GTi MPIP
PWA NUMBER: 134389-1
Schematic Sheet:
1

A6000GTi Input
PWA NUMBER: 134230-1
Schematic Sheet:
1
2
3

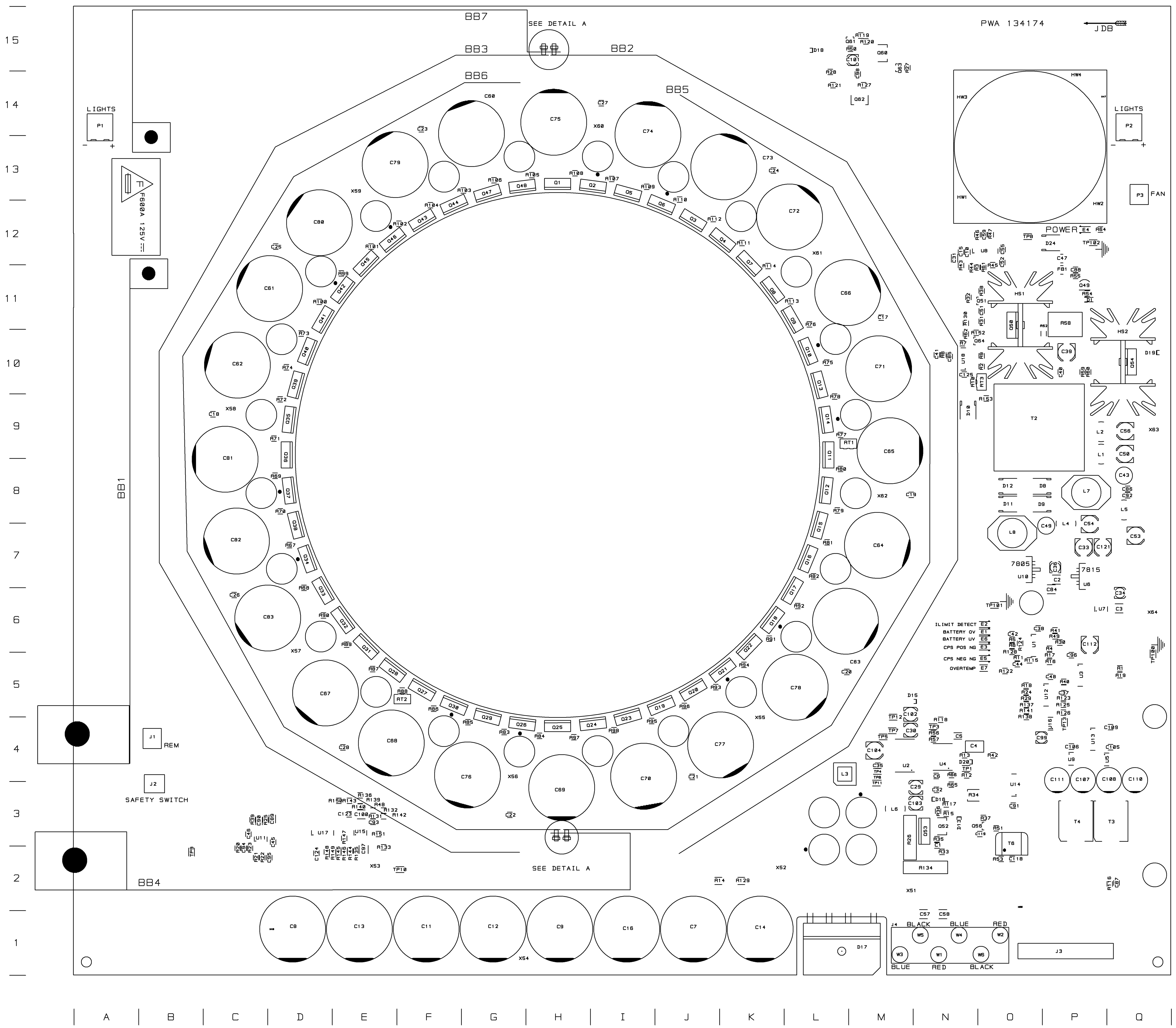
A6000GTi Gate Drive
PWA NUMBER: 135041-1
Schematic Sheet:
1

A6000GTi Display
PWA NUMBER: 134391-1
Schematic Sheet:
1

A6000GTi Coil
PWA NUMBER: 134532-1
Schematic Sheet:
1

A6000GTi Output Filter
PWA NUMBER: 134176-1
Schematic Sheet:
1

# COMPONENT MAP
TOP SIDE

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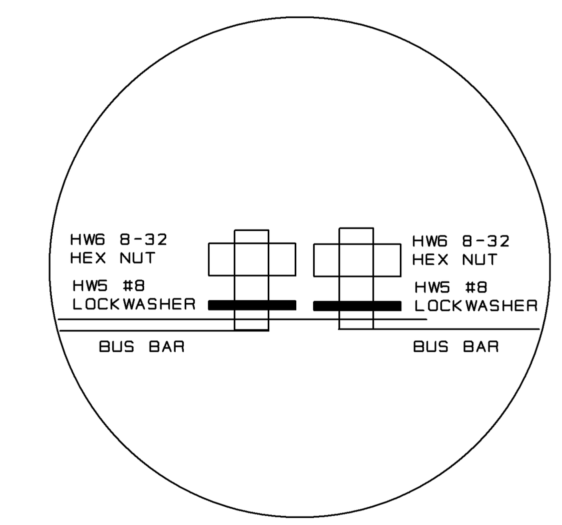


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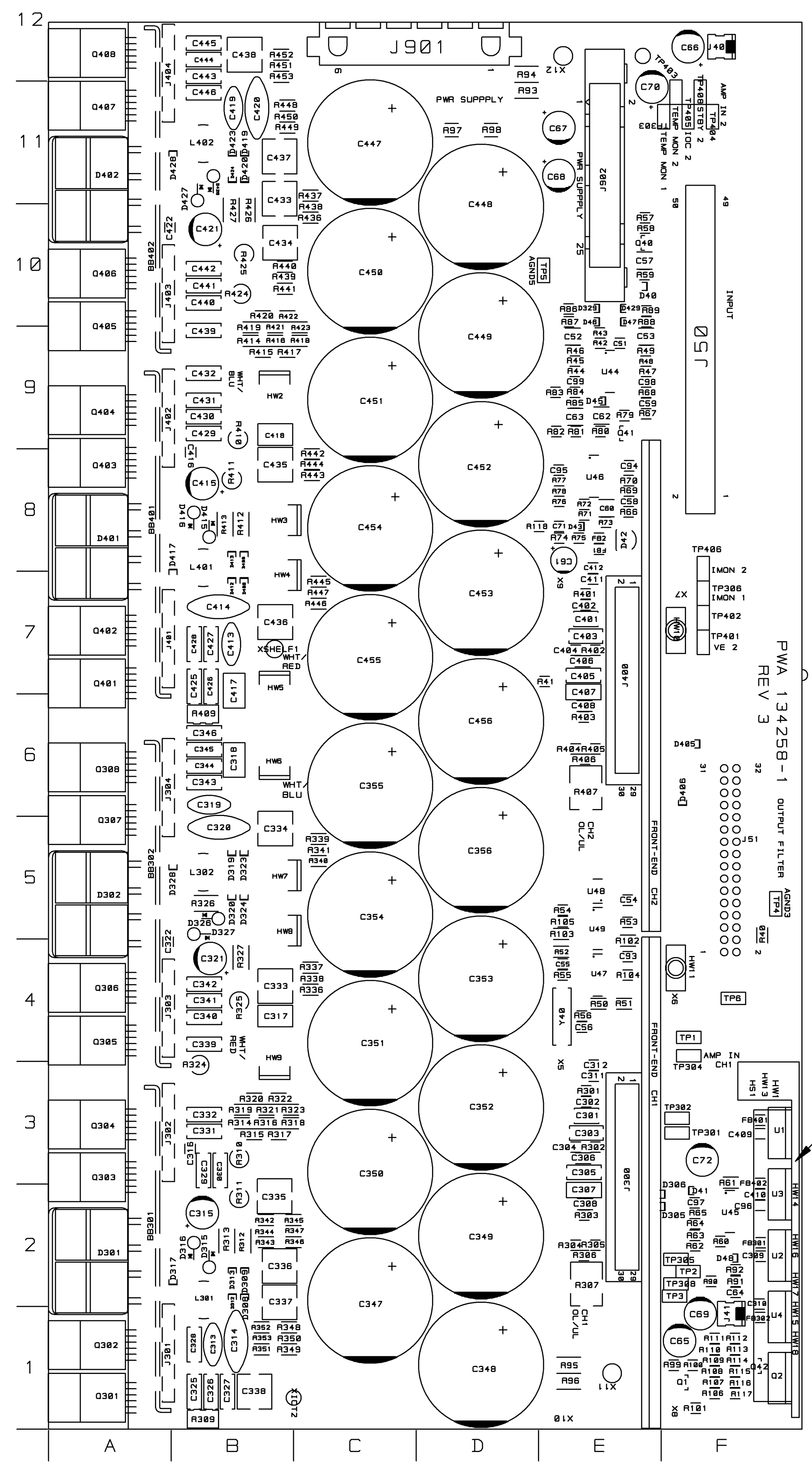
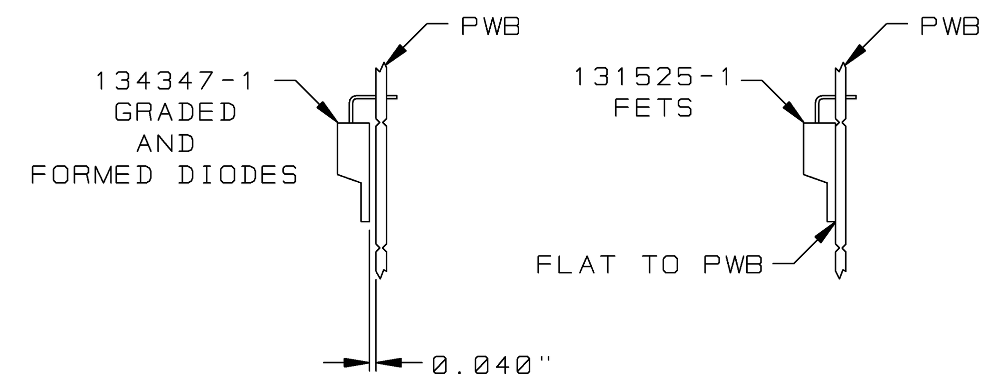
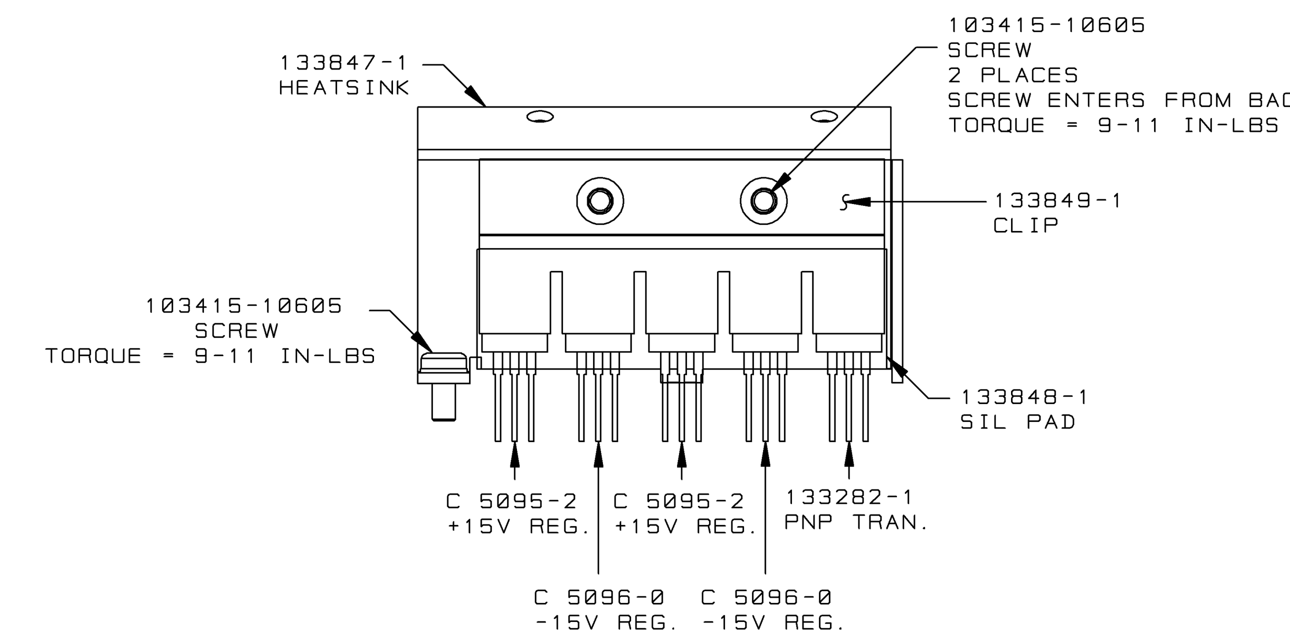
| | | SCALE NONE | PROJ NO. MD463D0 | SHEET 3 OF 3 |

COMPONENT MAP
TOP SIDE




SEE DETAIL "A"




DETAIL "A"
SCALE 1:1

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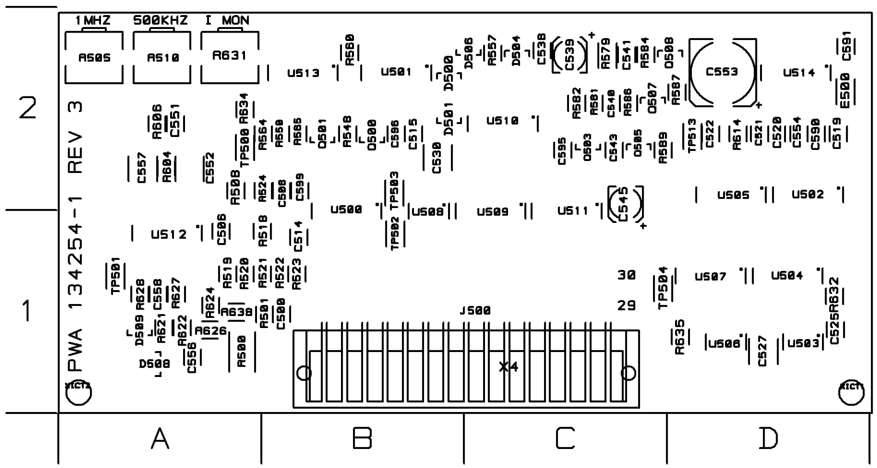
| | | SCALE NONE | PROJ NO. MD463D0 | SHEET 3 OF 3 |

# COMPONENT MAP
## TOP SIDE

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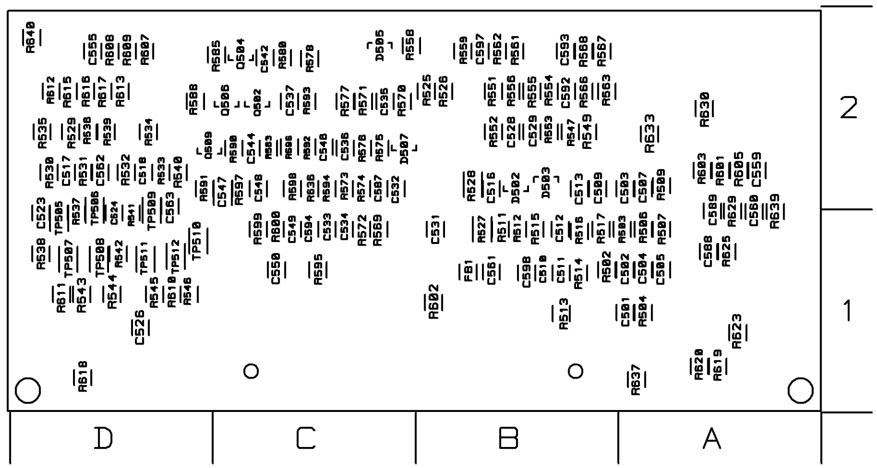
| SIZE | DWG NO. | REV |
|---|---|---|
| A | 134254-1 | B |

| SCALE | NONE | PROJ NO. | MD463D0 | SHEET | 2 OF 3 |
|---|---|---|---|---|---|

# COMPONENT MAP
## BOTTOM SIDE

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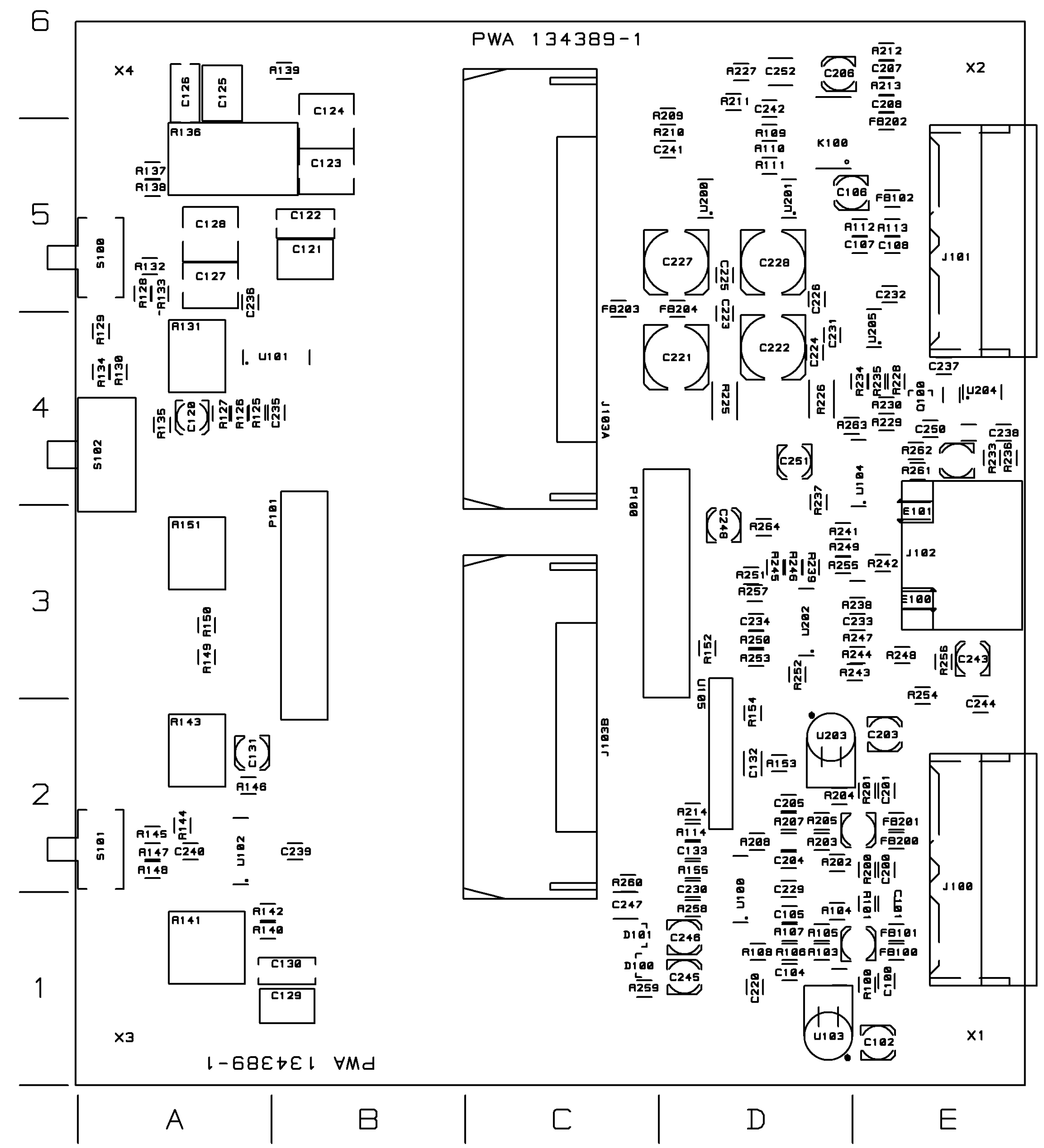
| SIZE | DWG NO. | | REV |
|---|---|---|---|
| A | 134254-1 | | B |
| SCALE NONE | PROJ NO. MD463D0 | SHEET 3 OF 3 | |

# COMPONENT MAP
## TOP SIDE

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| --- | --- | --- | --- | --- |
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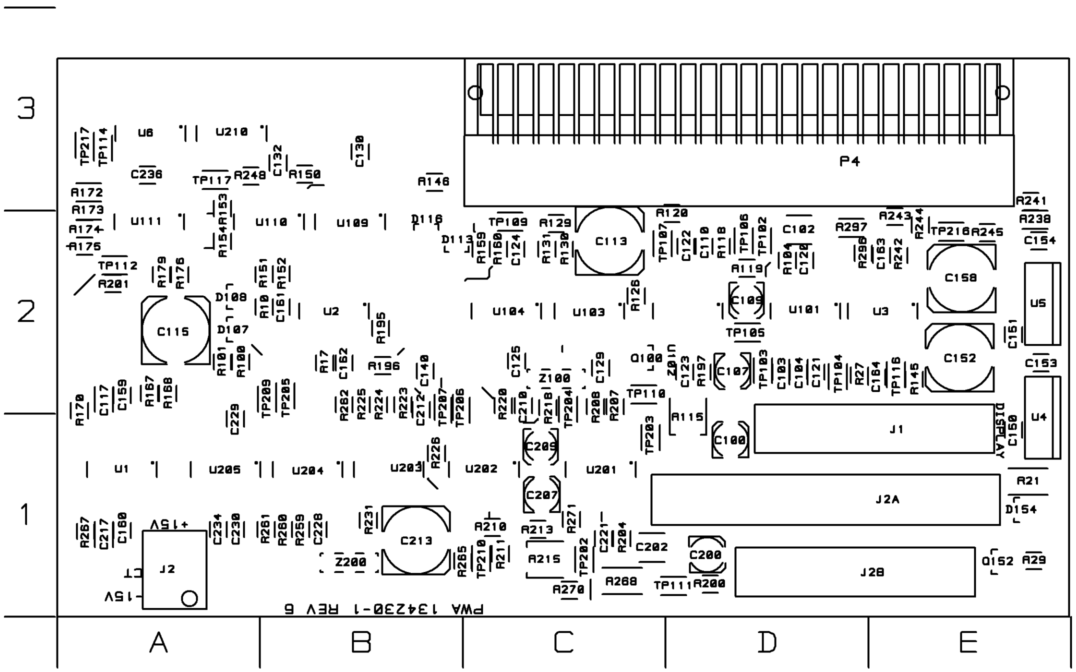
# COMPONENT MAP
## TOP SIDE

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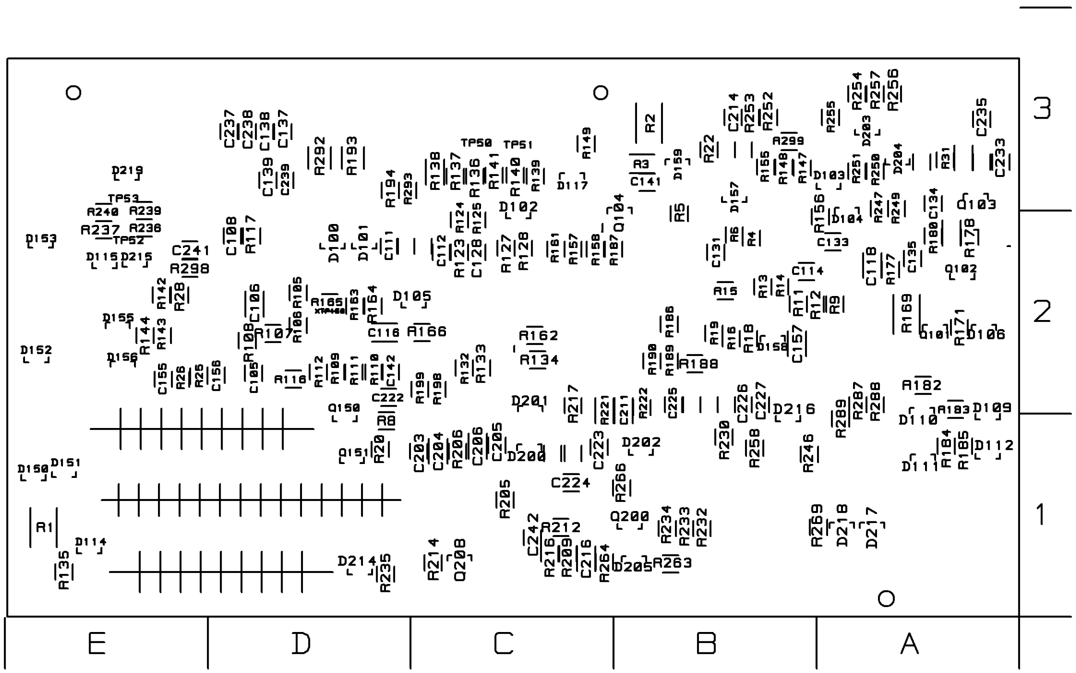
| SIZE | DWG NO. | REV |
|---|---|---|
| A | 134230-1 | B |

| SCALE | PROJ NO. | SHEET |
|---|---|---|
| NONE | MD463D0 | 4 OF 5 |

# COMPONENT MAP

## BOTTOM SIDE

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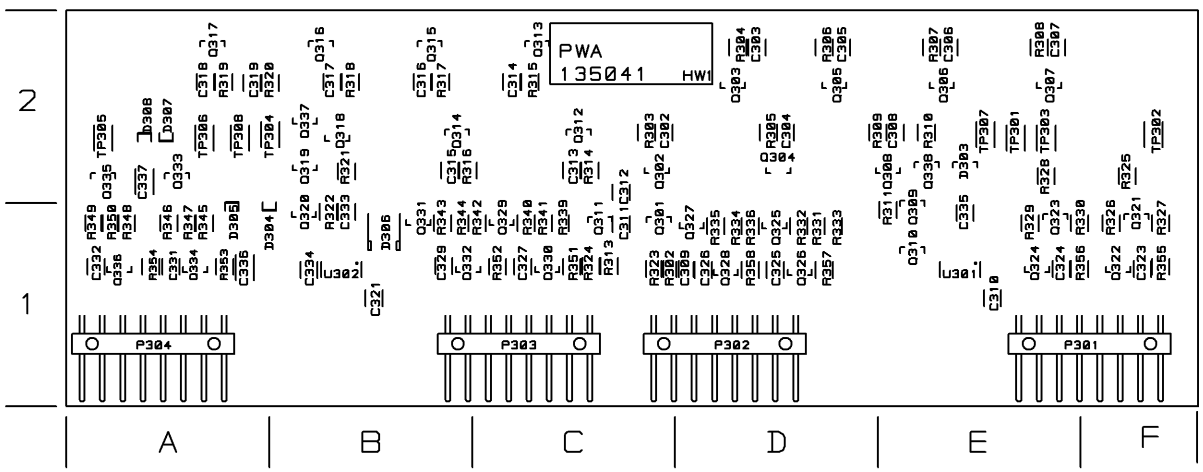
| SIZE | DWG NO. | | REV |
|---|---|---|---|
| A | 134230-1 | | B |
| SCALE NONE | PROJ NO. MD463D0 | SHEET 5 OF 5 | |

# COMPONENT MAP

## TOP SIDE

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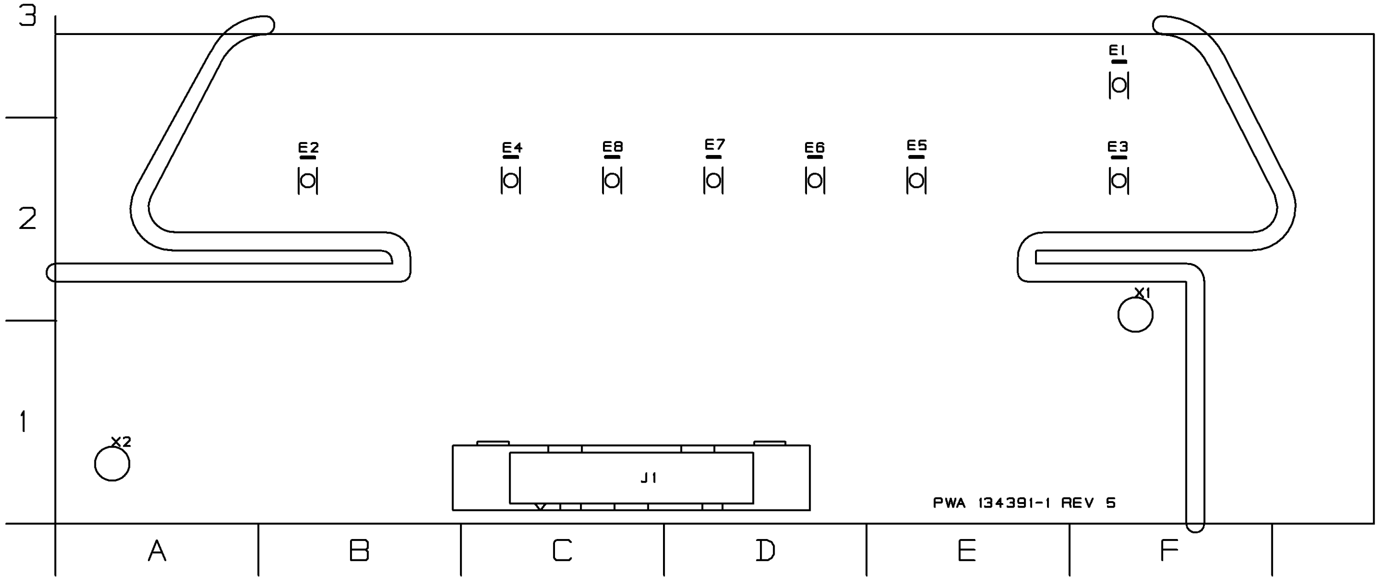
| SIZE | DWG NO. | REV |
|---|---|---|
| A | 135041-1 | B |

| SCALE | PROJ NO. | SHEET |
|---|---|---|
| NONE | MD463D0 | 2 OF 2 |

# COMPONENT MAP
## TOP SIDE

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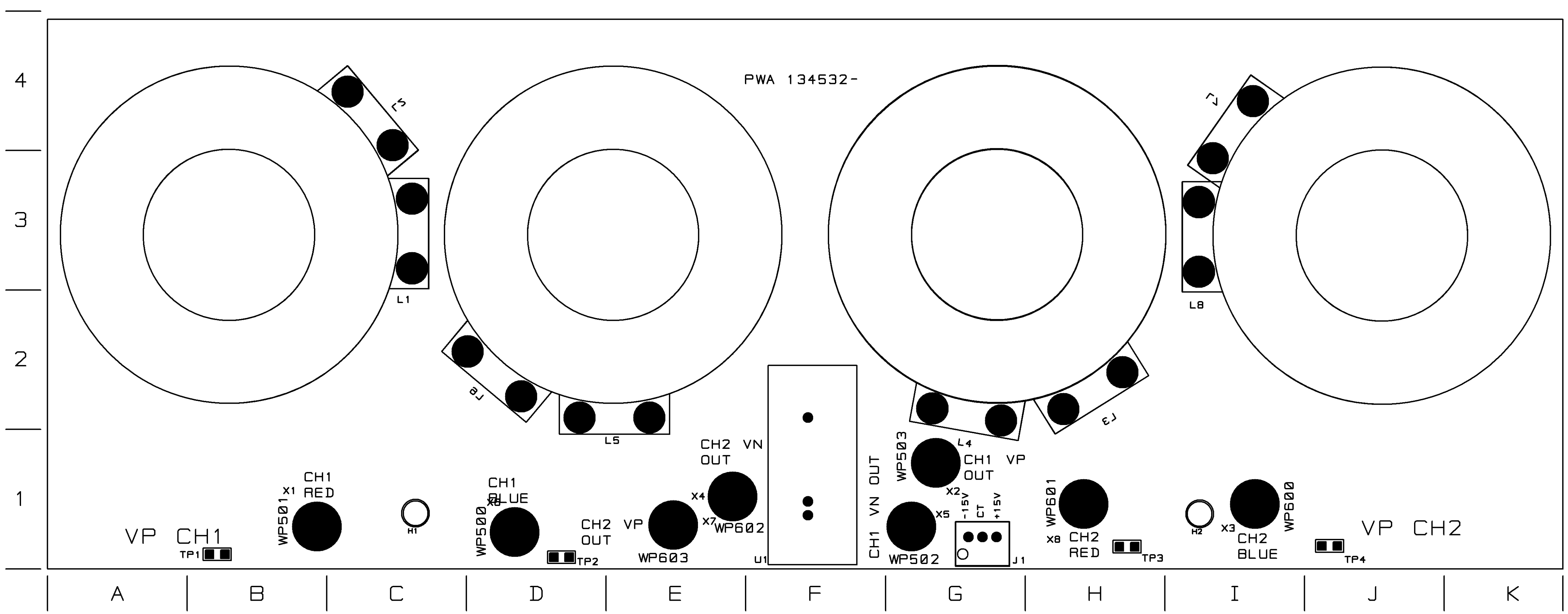
| SIZE | DWG NO. | | REV |
|---|---|---|---|
| A | 134391-1 | | A |
| SCALE | PROJ NO. MD463DO | SHEET 2 OF 2 | |

# COMPONENT MAP
## TOP SIDE




| | | | | |
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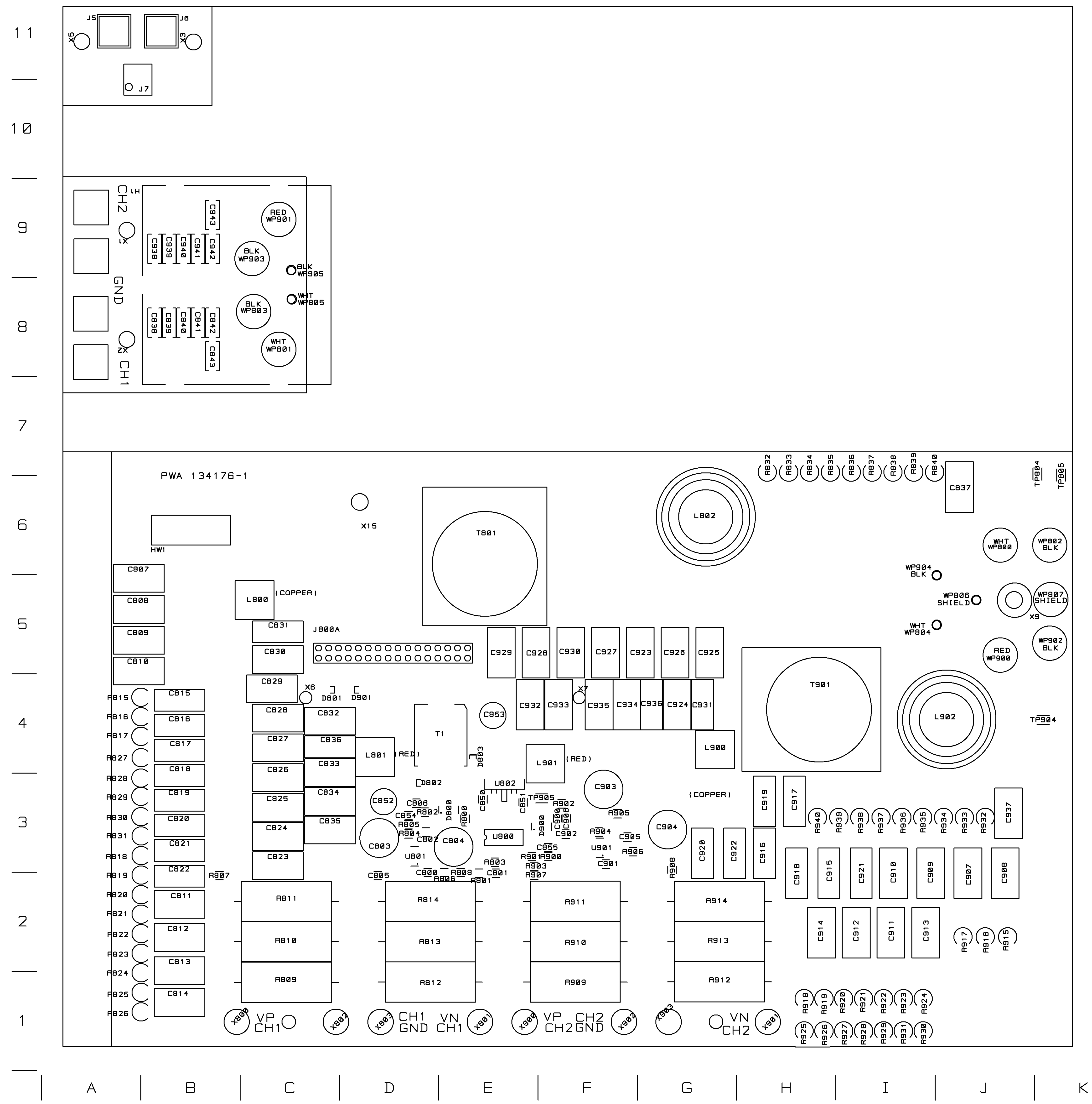
| | | SCALE NONE | PROJ NO. MD4630 | SHEET 2 OF 2 |

# COMPONENT MAP
TOP SIDE

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|---|---|---|---|---|
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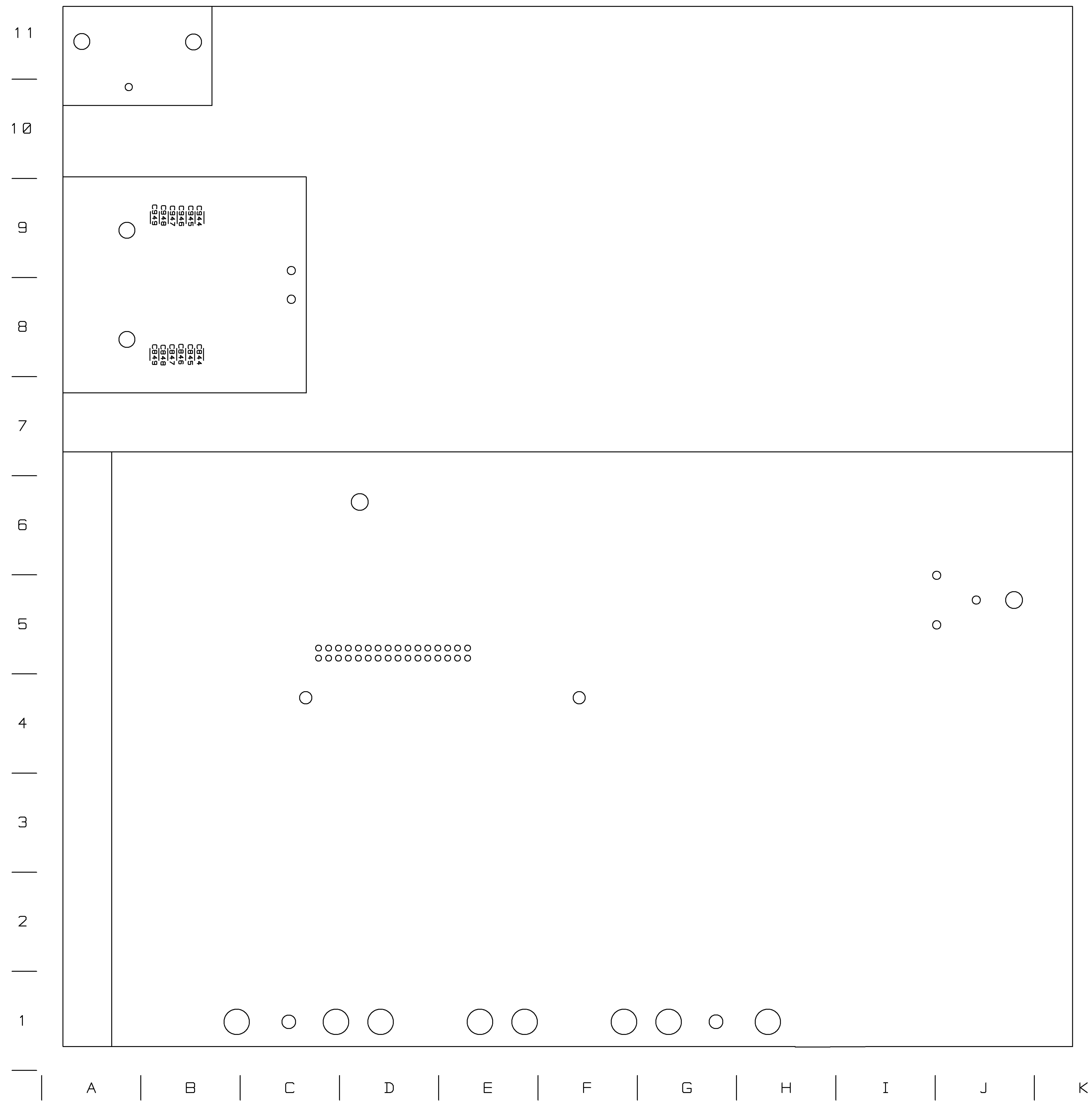
## COMPONENT MAP
TOP SIDE

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| SIZE | DWG NO. | | REV |
|---|---|---|---|
| C | 134176-1 | | A |
| SCALE NONE | PROJ NO. MD463D0 | SHEET 3 OF 3 | |

REVISION HISTORY
E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN CM PE
A | SEE 134174-1_A.XLS FOR REVISION HISTORY. | 10-10-03 | JDB | KZ | JDB
03N0730 | B | SEE 134174-1_B.XLS FOR REVISION HISTORY. | 11-05-03 | DRB | KZ | DRB
BATTERY +12 VDC
BATT GND
CROWBAR DRIVE
135116-1
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DWN JDB 10-10-03
CM KZ 10-27-03
PE JDB 10-10-03
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TITLE PWA, A6000GTI SW M PWR CONV
SIZE D DWG NO. 134174-1 REV B
SCALE NONE PROJ NO. MD463DO SHEET 1 OF 3


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| SIZE | DWG NO. | | REV |
|---|---|---|---|
| D | 134174-1 | | B |
| SCALE NONE | PROJ NO. MD463D0 | SHEET 2 OF 3 | |

REVISION HISTORY

| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | PE | CM |
|---|---|---|---|---|---|---|---|
| | | A | SEE 134258-1_A.XLS FOR REVISION HISTORY. | 07/28/03 | DRB | DRB | DSV |
| 03N0509 | | B | SEE 134258-1_B.XLS FOR REVISION HISTORY. | 08/27/03 | DRB | DRB | DSV |
| 03N0606 | | C | SEE 134258-1_C.XLS FOR REVISION HISTORY. | 09/26/03 | DRB | DRB | KZ |


GROUND LABELS

| VCC GND | ±24V GND | PIP DGND | SIGNAL GND | PIP AGND | MAIN BD DIGITAL GND | SIGNAL GND |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |

LBL, BAR CODE

NOTES:

1. ALL RESISTORS ARE IN OHMS, 0.1W, 1% UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

GLOBAL FIDUCIALS

X13 X14 X15 X16 X17 X18 X19 X20 X21 X22 X23 X24 X25 X26
X27 X28 X29

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|---|---|---|
| DWN | DRB | 07/28/03 |
| PE | DRB | 07/28/03 |
| CM | DSV | 08/01/03 |

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TITLE: PWA, A6000GTI MAIN

SIZE: D | DWG NO.: 134258-1 | REV: C

SCALE NONE | PROJ NO. MD463D0 | SHEET 1 OF 3


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| SIZE | DWG NO. | REV |
|---|---|---|
| D | 134258-1 | C |
| SCALE NONE | PROJ NO. MD4630D | SHEET 2 OF 3 |

| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | PE | CM |
| | | A | SEE 134254-1_A.XLS FOR REVISION HISTORY | 07/30/03 | DRB | DRB | DSV |
| 03N0606 | | B | SEE 134254-1_B.XLS FOR REVISION HISTORY | 09/24/03 | DRB | DRB | KZ |

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|---|---|---|
| DWN | DRB | 07/30/03 |
| PE | DRB | 07/30/03 |
| CM | DSV | 08/01/03 |

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TITLE PWA, A6000GTI FRONT END

SIZE D | DWG NO. 134254-1 | REV B

SCALE NONE | PROJ NO. MD463D0 | SHEET 1 OF 3

| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | CM | PE |
| | | A | SEE 134389-1_A.XLS FOR REVISION HISTORY. | 09/08/03 | DRB | DSV | DRB |
| 03N0731 | | B | SEE 134389-1_B.XLS FOR REVISION HISTORY. | 11/13/03 | DRB | KZ | DRB |


| | | | |
|---|---|---|---|
| DWN | DRB | 09/08/03 | CROWN INTERNATIONAL, INC. |
| CM | DSV | 09/09/03 | 1718 W. MISHAWAKA RD. ELKHART IN. 46517 PHONE 574-294-8000 WWW.CROWNAUDIO.COM |
| PE | DRB | 09/08/03 | |

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TITLE: PWA, A6000GTI MPIP

SIZE: D | DWG NO.: 134389-1 | REV: B

SCALE: NONE | PROJ NO.: MD463DO | SHEET 1 OF 2

| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | PE | CM |
| | | A | SEE 134230-1_A.XLS FOR REVISION HISTORY. | 07/28/03 | DRB | DRB | DSV |
| 03N0602 | | B | SEE 134230-1_B.XLS FOR REVISION HISTORY. | 09/22/03 | DRB | DRB | |


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|---|---|---|
| DWN | DRB | 07/28/03 |
| PE | DRB | 07/28/03 |
| CM | DSV | 08/08/03 |

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TITLE
PWA, A6000GTI INPUT

| SIZE | DWG NO. | REV |
|---|---|---|
| D | 134230-1 | B |

SCALE NONE | PROJ NO. MD463D0 | SHEET 1 OF 5


| | | | | |
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| | | SCALE NONE | PROJ NO. M0463D0 | SHEET 2 OF 5 |


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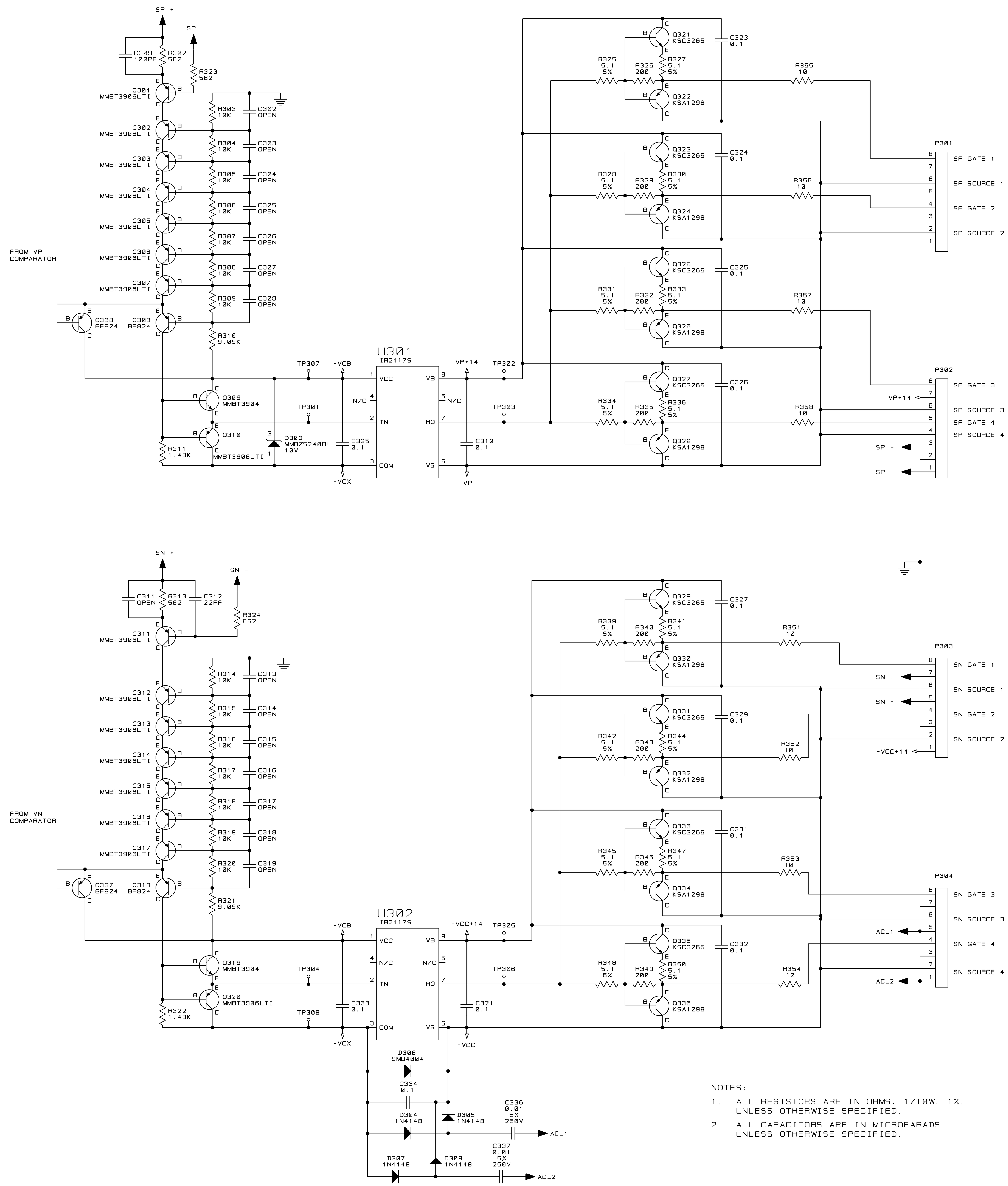
| SIZE | DWG NO. | | REV |
|---|---|---|---|
| D | 134230-1 | | B |
| SCALE NONE | PROJ NO. MD463D0 | SHEET 3 OF 5 | |

REVISION HISTORY

| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | PE | CM |
|---|---|---|---|---|---|---|---|
| | | A | SEE 135041-1_A.XLS FOR REVISION HISTORY. | 07/29/03 | DRB | DRB | KZ |
| 03N0606 | | B | SEE 135041-1_B.XLS FOR REVISION HISTORY. | 09/25/03 | DRB | DRB | KZ |

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FILENAME: 135041-1_B.SCM

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DRILLS = ±.003"

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| | | |
|---|---|---|
| DWN | DRB | 07/29/03 |
| PE | DRB | 07/29/03 |
| CM | KZ | 08/04/03 |


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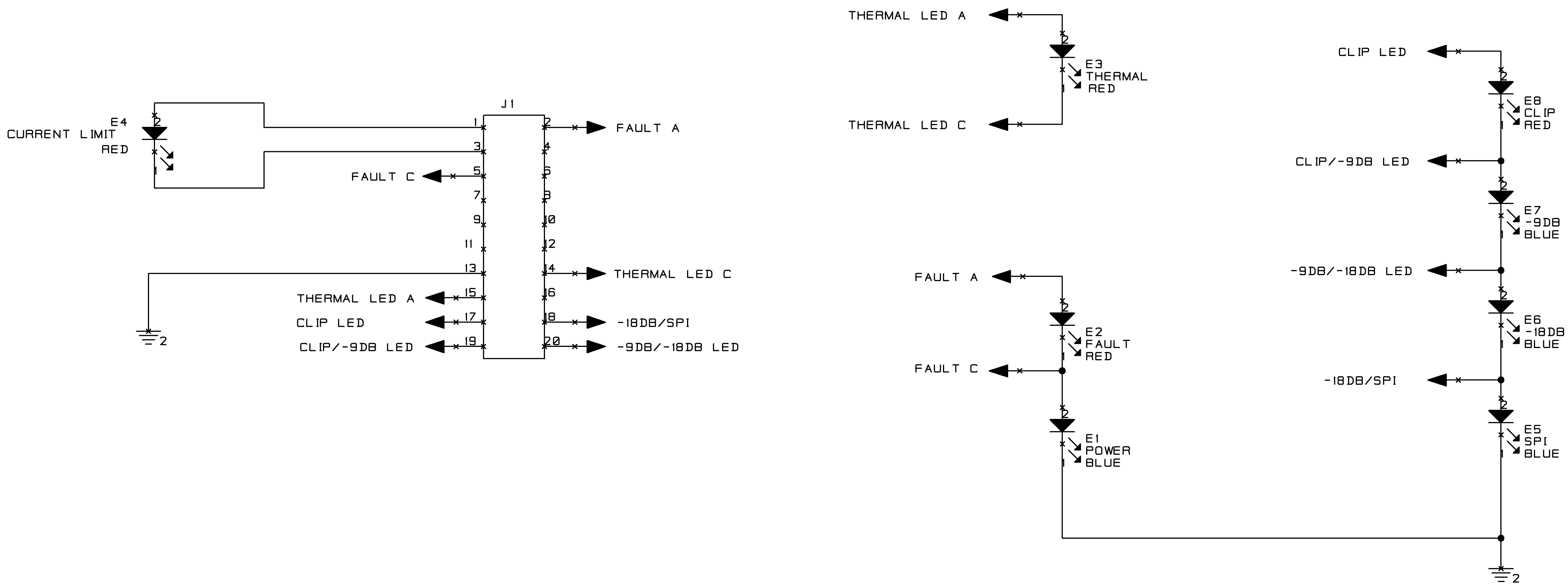
TITLE: PWA, A6000GTI GATE DRIVE

SIZE: D | DWG NO. 135041-1 | REV B

SCALE NONE | PROJ NO. MD463D0 | SHEET 1 OF 2

| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | REV | DESCRIPTION | DATE | APPROVED | | | |
| | | | | DWN | PE | CM | |
| | A | SEE 134391-1_A.XLS FOR REVISION HISTORY. | 07/28/03 | DRB | DRB | DSV | |
| | | | | | | | |




X1 X2

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|---|---|---|---|---|
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| FILENAME 134391-1_A.SCM | DWN | DRB | 07/28/03 | |
| | PE | DRB | 07/28/03 | |
| | CM | DSV | 7-29-03 | |
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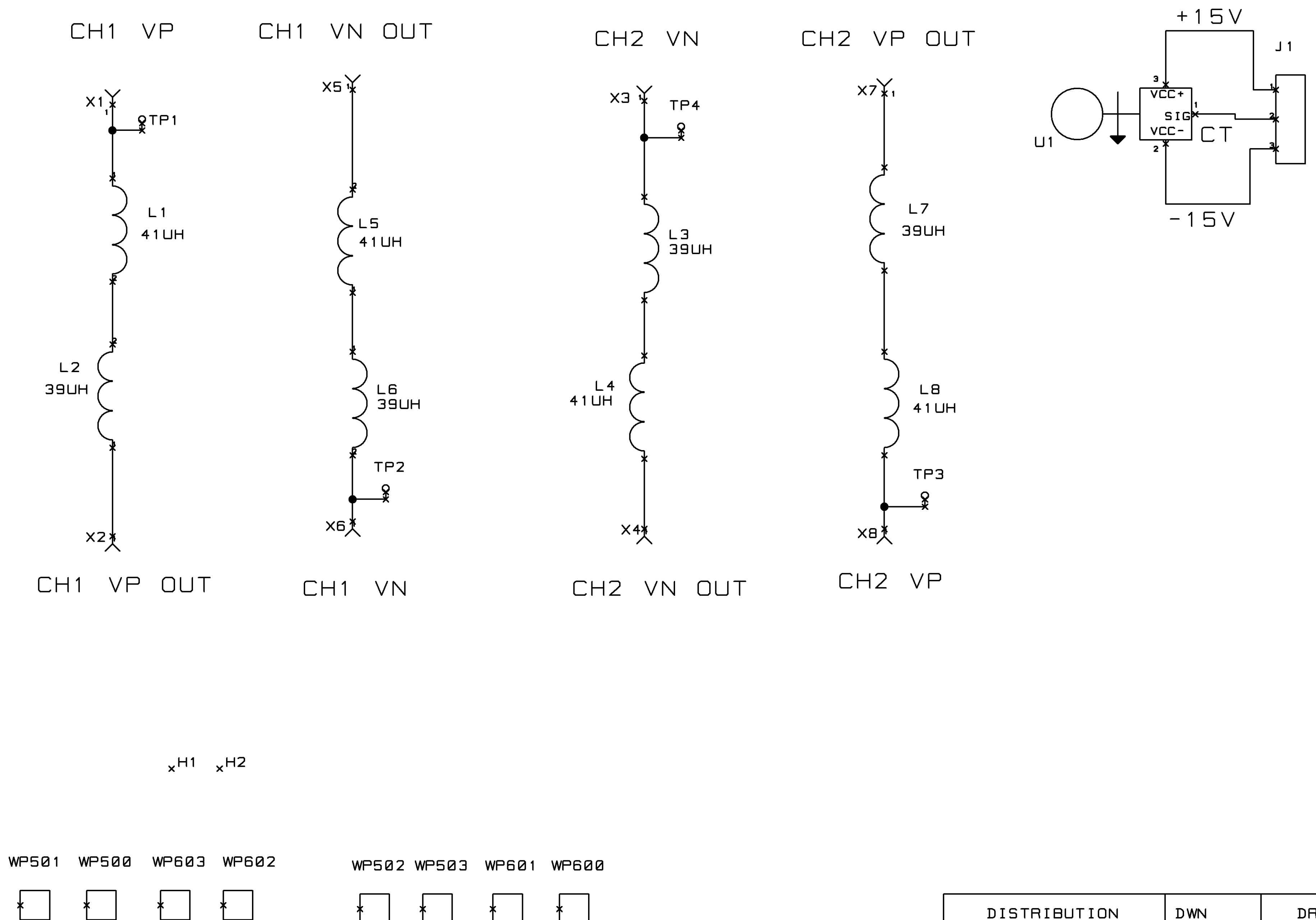
TITLE

# PWA, A6000GTI DISPLAY

| SIZE | DWG NO. | REV |
|---|---|---|
| B | 134391-1 | A |

SCALE NONE | PROJ NO. MD463D0 | SHEET 1 OF 2

| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | REV | DESCRIPTION | DATE | APPROVED | | | |
| | | | | DWN | PE | CM | |
| | A | SEE 134532-1_A.XLS FOR REVISION HISTORY. | 08/04/03 | DRB | DRB | KZ | |
| 03N0603 | B | SEE 134532-1_B.XLS FOR REVISION HISTORY. | 09/25/03 | DRB | DRB | **KZ** | |
| | | | | | | | |




| DISTRIBUTION | | | DWN | DRB | 08/04/03 |
|---|---|---|---|---|---|
| K | | | PE | DRB | 08/04/03 |
| FILENAME 134532-1_B.SCM | | | CM | KZ | 08/08/03 |
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TITLE
# PWA, A6000GTI COIL

| SIZE | DWG NO. | REV |
|---|---|---|
| B | 134532-1 | B |

SCALE NONE | PROJ NO. MD463DO | SHEET 1 OF 2


| REVISION HISTORY | | | | | | | |
|---|---|---|---|---|---|---|---|
| E.C.N. | ZONE | REV | DESCRIPTION | DATE | APPROVED DWN | CM | PE |
| | | A | SEE 134176-1_A.XLS FOR REVISION HISTORY. | 10/03/03 | DRB | KZ | DRB |

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.000 = ±.010"
DRILLS = ±.003"

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| | | |
|---|---|---|
| DWN | DRB | 10/03/03 |
| CM | KZ | 10/7/03 |
| PE | DRB | 10/03/03 |

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TITLE: A6000GTI OUTPUT FILTER BOARD

SIZE: D | DWG NO. 134176-1 | REV: A

SCALE: NONE | PROJ NO. MD46300 | SHEET 1 OF 3