

Service Manual

400RB-III Series

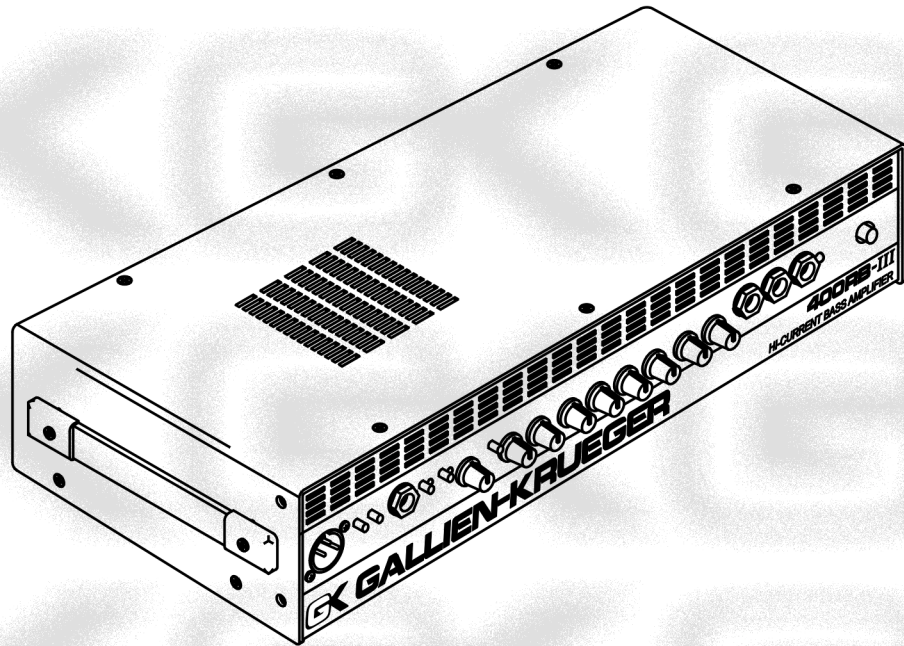
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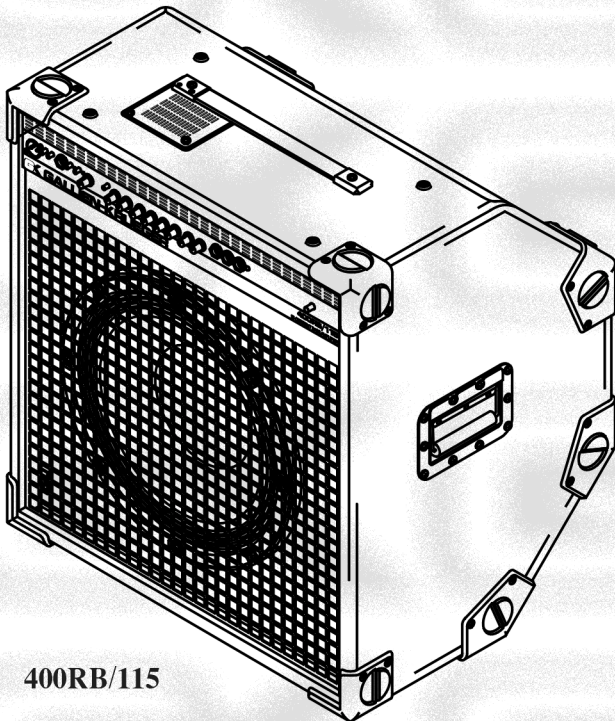
Note: As of 1/99, there are no Engineering Change Orders (ECOs) for this model. New ECOs will be released as they are issued.

400RB Series

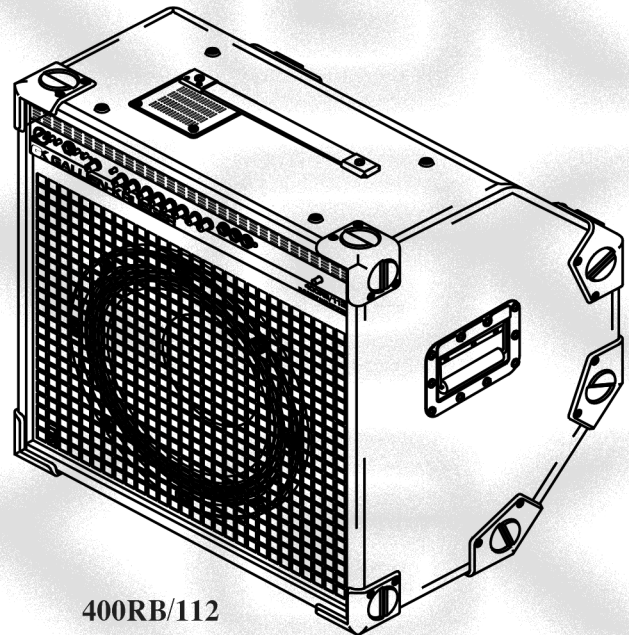
Owner's Manual



400RB-III



400RB/115



400RB/112





GK GALLIEN-KRUEGER

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**All Features and specifications are subject to change without notice*

***This list is subject to change without notice.*

	CAUTION RISK OF ELECTRIC SHOCK DO NOT OPEN	
CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.		
 <p>The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.</p>	 <p>The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.</p>	
WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.		
CAUTION: TO PREVENT ELECTRIC SHOCK, MATCH WIDE BLADE OF PLUG TO WIDE SLOT, FULLY INSERT. ATTENTION: POUR EVITER LES CHOCS ELECTRIQUES, INTRODUIRE LA LAME LA PLUS LARGE DE LA FICHE DANS LA BORNE CORRESPONDANTE DE LA PRISE ET POUSSER JUSQU'AU FOND.		

Gallien-Krueger

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Congratulations

Your purchase of a new Gallien-Krueger 400RB Series product is surely the result of much careful consideration on your part. For our part, we at Gallien-Krueger are pleased that you chose us, and are determined that you will be a satisfied customer. In choosing a 400RB Series product, you own an amplifier with many unique features, that can take you where you have never been before.

To get the most out of your new purchase please take a few minutes to read through this manual. If you are in a hurry, we suggest you at least read through the Quick Start section before setting up your new rig. This will help get you started and give you a few quick tips, but is not a substitute for reading the rest of the manual.

Your amplifier should have come with the following items, please check the contents of the box to ensure that you have everything.

Included with your 400RB Head:

400RB	1
Rack mount ears with hardware	2
Power cord	1
Owner's manual	1
Warranty card	1
Safety instructions sheet	1

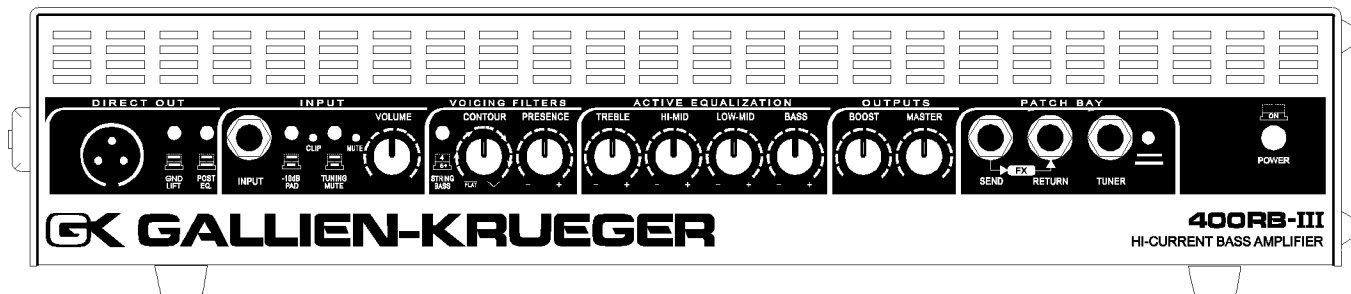
Included with your 400RB Combo:

400RB/112, or /115	1
Power Cord	1
Owner's Manual	1
Warranty Card	1
Safety Instructions Sheet	1

If your 400RB Series amplifier or combo did not come with all the items listed, or if you encounter problems while setting up your new equipment, please contact your local dealer, or us as soon as possible at:

Gallien-Krueger, Inc.
 2240 Paragon Drive
 San Jose, CA 95131
 phone: (408) 441-7970
 fax: (408) 441-8085
 Internet: www.gallien-krueger.com
 Email: sales@gallien.com

We wish you a lifetime of good playing and remember to always have fun!



Always Listening

I have never seen the point in doing things the way others have done them. I also have not been very interested in following the latest fad. I am a Stanford educated engineer who worked his way through school as a musician. Like all musicians, I have lugged amplifiers up stairways and into car trunks, always wondering why these things had to be so heavy, bulky, and hard to handle.

As I am the principal innovator at **GK**, our products reflect my attitudes and life experiences. I don't model my designs after other manufacturer's products (as some of our competitors are proud of reciting).

Instead, I believe new and old problems are best solved with new solutions. Having taken our own path, **GK** products enjoy a unique, unmatched sound, allowing the artist using them every opportunity to make an original statement.

Having supported my products for over thirty years, I have learned from the story they tell. **Gallien-Krueger** is a reflection of that story, and has a commitment to support that legacy. Just as the products I created thirty years ago are still telling their story, the products we create today will be talking to us tomorrow.

We'll be listening,



Robert Gallien

Quick Start

The 400RB Series is designed to be simple to operate. All controls have a well defined purpose and are well behaved. These directions will take you through the basics and give you a good start for setting up your sound.

First:

Set the power switch to Off and connect the supplied power cable from the amplifier AC receptacle to an AC power outlet of proper voltage and power rating (see safety information on page 7 for details).

Next:

Connect your speaker cabinets to the amplifier outputs marked 240W. Be sure not to exceed the recommended speaker load listed below.

Maximum Recommended Speaker Load:

One 4 Ohm, or two 8 Ohm cabinets.

If you are using an RBH series cabinet, set the crossover switch to full range.

Then:

Set all EQ controls and the Boost control to 12 o'clock. The Voicing Filters should be turned all the way down to get a flat response. Set the Volume and Master Volumes at 0. If you have a five string bass, push the button marked String Bass in.

Next:

Using an instrument cable, connect your bass to the Input jack and turn the power switch on and play. If the clip LED flashes, push the button marked **-10db** in. This will prevent you from overdriving the preamp.

Now:

Set the master control to 12 o'clock and slowly bring the Master volume up. Do not turn the Volume control in the input section past 12 o'clock unless you want an overdrive effect. If you have a bass with passive electronics make sure the controls are all the way up. If you have a bass with active electronics, turn all of the EQ controls on the bass to the middle or flat position.

At This Point:

You should be hearing your bass quite well. You can use the Volume and Master to achieve a comfortable sound level. **Remember:** If you need more volume, turn up the Master control first.

Sound Tips

The 400RB Series has several unique features which, if used properly, will obtain that sound you have been searching for.

The Equalizer:

The Equalizer is used to fine tune your sound. When adjusting it, do it just a little at a time. These are active circuits, and small changes can make a big difference in your sound. With a little experimentation you will find that this equalizer is very easy to use, never sounds weird and provides you with a large variety of great sounds, unique to GK.

Contour:

Increasing the Contour level will scoop out mid-range frequencies while boosting the highs and lows. The sound, once again, is unique to GK and unavailable on any other Bass amp.

String Bass:

The way a Bass amp deals with the instrument low string is a critical part of it's sound. In fact, a five string instrument requires an entirely different low end response than a four string instrument. No equalizer can make the necessary adjustments to accommodate both. However, the String Bass button on the 400RB Series does just that. When it is out, the 400RB is voiced like the 800RB (the world's classic four string amp). Push it in and the 400RB is voiced for five string instruments. For some playing styles you may want it in, even with a four string instrument.

Boost/Master:

Turning up the Boost control, will add a little growl to your tone. This is an unmistakable GK trade mark sound, that you will grow to appreciate. Raising the Boost while lowering the Master will add more growl while keeping the sound level the same. Growl is actually a small amount of even order harmonic distortion, that sounds great through a woofer. For most playing situations, the Master is set between 12 & 3 o'clock. The cleanest sound is obtained by setting the Master above 12 o'clock, and going above 3 o'clock for maximum power situations.

Direct Out:

The 400RB provides a low noise, high quality balanced direct out for connection to PA and recording consoles. With the Pre/Post EQ switch set to "Pre" (Out), the direct output signal is fed directly from our low noise, high headroom, FET input stage providing a low noise output superior to external direct boxes and impedance transformers. The Direct Output signal is only effected by the -10dB Pad, and Tuning Mute controls. This allows you to adjust your tone and volume on stage without changing the Direct Out signal level and confusing your sound man.

Changing the Pre/Post EQ switch to "Post" (In), sends the "GK sound" and preamp response to the Direct Out jack. This gives you complete control over the Direct Out's tone and volume. In addition, a Ground (Gnd) Lift switch is included to remove hum and buzz when connecting to equipment powered by a different ground system.

Safety Information

Verify Line Voltage and Amperage Before Use:

Your new 400RB Series Bass Amp has been factory configured for use with:

- 120 Volt/60Hz 20 Amp circuit for USA & Canada.
- 230 Volt/50Hz 10 Amp circuit for Europe & Australia.
- 100 Volt/50Hz 20 Amp circuit for Japan. Proper AC circuit for all other countries.

Connecting the amplifier to a line with specifications other than indicated above can create a safety and fire hazard, and may damage the amplifier. If you have any questions about the voltage requirements for your specific model, or about the line voltage in your area, contact your dealer before plugging the unit into a wall outlet.

Verify AC Circuit Capacity Before Use:

The high power output of your amplifier may require heavy current draw under Full-Load conditions. To insure proper performance and avoid potential safety hazards, we recommend connection to line circuits with Amperage specified "as above". Connecting multiple amplifiers to the same circuit, or connecting the amplifier to the same circuit used by other heavy-power devices, such as high-wattage lights, may cause circuit breakers to trip. It is always a good idea to avoid using any audio equipment on the same AC circuit as equipment with motors, such as air conditioners or refrigerators. This will lessen to possibility of power variation and electrical start-up noise affecting your sound.

Do Not Use Extension Cords:

To avoid safety hazards, use only the power cord supplied with your unit. If a replacement cord is used, make certain that it is of consistent quality and gauge as the original. We do not recommend using extension cords with this product. As with all electrical devices, do not run power cords under rugs or carpets or place heavy objects on them. Damaged power cords should be replaced immediately with cords meeting factory specifications.

Handle The AC Power Cord Gently:

When disconnecting the power cord from an AC outlet, always pull the plug, never pull the cord. If you do not intend to use the amplifier for a considerable length of time, disconnect the plug from the AC outlet.

Do Not Open The Amplifier Enclosure:

There are no user-serviceable components inside this product. Opening the amplifier enclosure may present a shock hazard, and modification to the product will void your warranty. If liquid enters the unit, or any metal object such as a paper clip, wire, or staple accidentally falls inside the enclosure, disconnect the unit from the AC power source immediately and consult an authorized service station.

Unpacking:

The carton and packing materials used in shipping your new amplifier were specially designed to cushion it from the shocks and vibration that occur during transport. We suggest that you save the carton and packing materials for use in shipping, in the event you move, or the amplifier needs repair.

Installation and Maintenance

Installation:

- To insure proper operation and to avoid potential safety hazards, place the unit on a firm, level surface. When installing the unit in a rack, be sure the mounting hardware can support the amplifier's weight. To save space in your rack, the 400RB's feet can be removed using a Philips head screwdriver.
- Make certain that proper space is provided for ventilation. The 400RB Series requires at least ½ inch clearance above for proper ventilation. Never block the fan vent holes in the top or front of the amplifier. If the amplifier will be installed in a rack or other enclosed area, make sure that there is sufficient air movement within the enclosure to allow proper cooling. Consult your dealer for more information.
- Avoid installation in extremely hot or cold locations, and areas that are exposed to direct sunlight, or near heating equipment.
- Avoid moist or humid locations.
- Remember, power amplifiers generate heat. The heat sink fins and ventilation slots that form part of the enclosure are specially designed to remove this heat. Placing other electronic equipment near these heat-dissipation systems may possibly affect the long-term reliability of both your amplifier and the other equipment.

Moving the Unit:

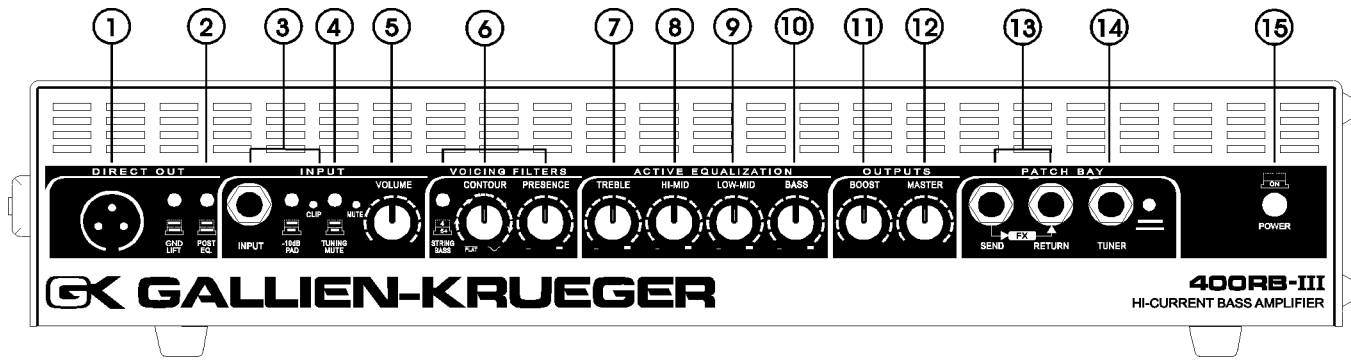
Before moving the unit, be certain to disconnect any interconnection cords with other components, and make sure that you disconnect the unit from the AC outlet.

Cleaning:

When the unit gets dirty, wipe it with a clean, soft and dry cloth. If necessary, first wipe the surface with a soft cloth slightly dampened with mild, soapy water, followed by a fresh cloth with clean water. Wipe immediately with a dry cloth. Never use benzene, thinner, alcohol, or other volatile cleaning agents. Do not use abrasive cleaners, as they may damage the finish of metal parts. Avoid spraying insecticides near the unit.

Maintenance:

Your new amplifier is rugged. It was built to give you a lifetime of trouble-free operation, if it is operated in accordance with the instructions contained in this manual. The only maintenance required is cleaning. If you are going to move your amplifier around frequently, we recommend a road case to protect it from scratches and road wear.



Front Panel Controls

1-Balanced Direct Out:

An electronically balanced output, that you can run to your P.A. system.

2-Pre/Post EQ Button:

Selects the direct out signal from before or after the EQ.

3-Input:

A standard 1/4" input jack and input attenuator button. The button is generally left out, except in rare cases when the clip LED flashes.

4-Tuning Mute Button:

Set this switch to "On" when tuning up. No signal will be sent to the speakers, or the P.A. system.

5-Volume:

Sets pre-amp gain after the input stage. It is used in conjunction with the input pad, to optimize the amplifier's headroom.

6-Voicing Filters:

String Bass:

Setting this button voices the pre-amp for basses with "B" tuning. Leave it out and the amp is voiced like the 800RB, for 4 string basses.

Contour:

Drops the mid-range frequencies while boosting lows & highs.

Presence:

Adds edge and definition to higher frequencies.

Active Equalization:

7-Treble:

Boost and cut at 7kHz±14dB shelving type. Add or remove edge and definition.

8-High Mid:

Boost and cut at 1 kHz +6dB -10dB, "Q Optimized," band pass type. Works on lower string harmonics, and effects the punch of your sound.

9-Low Mid:

Boost and cut at 250Hz +6dB -10dB, "Q Optimized," band pass type. Works on the main body of your sound.

10-Bass:

Boost and cut at 60Hz ±10dB, shelving type. Controls low end push.

Outputs:

11-Boost:

A post EQ gain stage using GIVE technology which adds "growl" as it is turned up.

12-Master:

Controls output level of the amplifier.

13-Effects Loop:

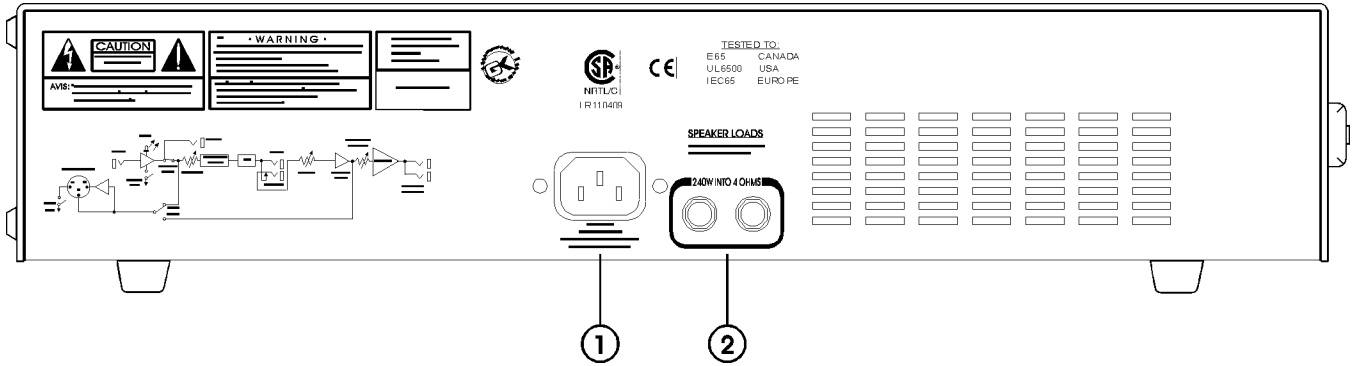
Send and return jacks provided for the insertion of effects after the EQ, but before the boost section. Some effect units have gain, turning the BOOST down, will compensate for this.

14-Tuner Output

Output to tuner.

15-Power Switch

Turns the amplifier on or off. Should a problem occur during operation press this switch out first.



Rear Panel Controls

1- AC Receptacle:

The power cord is detachable and plugs in here.

2- 240W Jacks:

240W power amp output for Full-Range operation only. They deliver 240 watts into 4 Ohms. Lower impedances should not be used. Each jack has a minimum of 8 Ohms each. Higher impedances such as 8 Ohms, 16 Ohms, or No Load are acceptable. No damage will result from operating the amplifier with the speakers disconnected.

400RB Series Combos

The 400RB Series combos deliver the 400RB's unique features and distinct sound by using a variety of internal speaker configurations in compact enclosures.

Speaker Configurations:

400RB/112 One 8 Ohm 12" speaker

400RB/115 One 8 Ohm 15" speaker

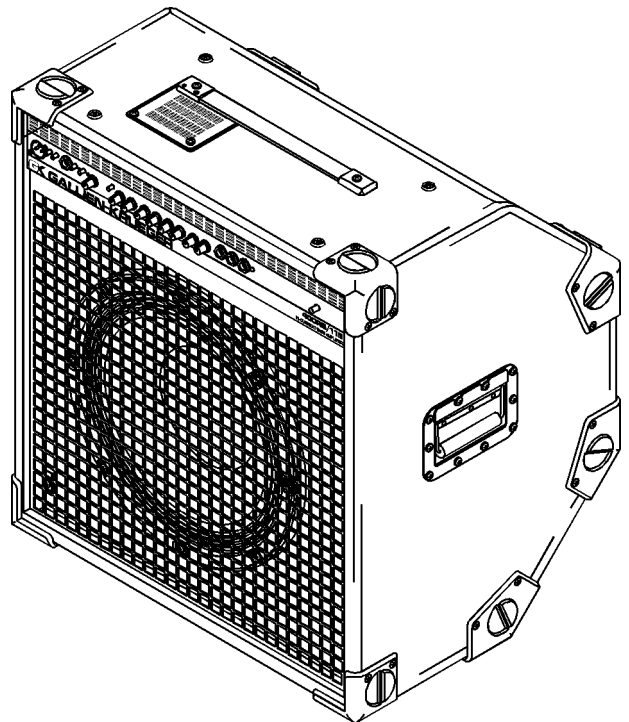
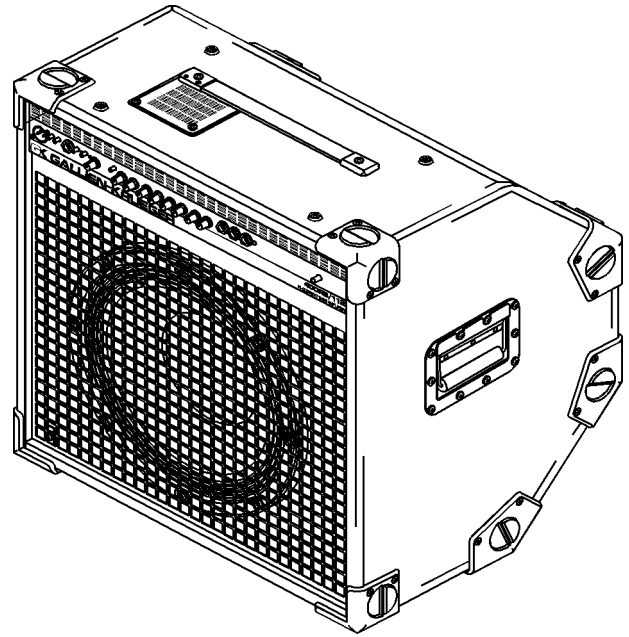
The 400RB combo electronics are identical to the 400RB head and are rated for the same maximum power output and speaker load (240W into 4 Ohms). Maximum power is achieved by connecting one 8 Ohm extension cabinet (such as the 210RBS, 410RBS, or 115RBS) in addition to the combo's internal 8 Ohm speaker load. To drive more than one extension cabinet, the combo's internal speaker can be disconnected by unplugging the speaker cable connected to the combo's back panel. Below is a detailed description of the maximum loads the combos can drive.

Maximum recommended load with the internal speaker connected:

One 8 Ohm cabinet..

Maximum recommended load with the internal speaker disconnected:

One 4 Ohm, or Two 8 Ohm cabinets.



Tech Talk

Characteristics of the 400RB:

The 400RB Series is a flexible state-of-the-art bass amplifier, designed to deliver maximum performance and simple operation. This is accomplished through these important features:

- Extremely high current power supply and power amp circuitry, gets the sound out of your head.
- Four, bass specific bands of active equalization for precise tone control.
- Three voicing filters for shaping and customizing your sound.
- Balanced direct output eliminates the need for a direct box.
- Continuously variable fan cooling.
- Designed and Built in the U.S. for years of reliability and quality service.

Current Output & Bass Response:

When a power amplifier is pushing several speaker cones, and a high-power transient like a string slap comes along, the amp has to tap into a large power reserve to maintain cone control. It's kind of like grabbing a swing at the bottom of its travel and trying to push it the other way - it could knock you over. If the amplifier doesn't have this ability, the sound is unresponsive and less out front. The amp loses its punch and feel at higher playing levels. Instead of responding to your every command, the amplifier simply cuts those transients off, leaving you with the feeling that something is missing in your sound.

Since most amplifiers have limited output current capacity, they need "current limiting circuits" to protect against self-destruction. High-power transients trigger these circuits, which rob the amplifier of its ability to control speaker cones. This creates a mushy, unresponsive feel to your sound. The 400RB Series has an extremely high current capacity, over fifty amps, so it doesn't need current limiting circuits for over-load protection.

There is nothing in the 400RB Series power amp to come between you and your sound except faithful, raw power.

Equalization:

The sound you want is in your head, but you just can't get it. You think it's you, your bass or maybe your amp. Yes, your amp. Standard tone controls and graphic equalizers don't get it. Sure, they give you plenty of variation, but they don't provide what the instrument really needs. The fact is, graphic equalizers are intended for room equalization, and are only put in bass amps because it's a no-brainer for the designer. The equalization in Gallien-Krueger amplifiers reflects 30 years of continuous development and refinement. The GK equalizer is unique to the industry, it's not just a normal four band equalizer, each section is a special circuit optimized to perform a Bass specific job in its range of operation. These sections are wired in Series, so they add to one another creating a tremendously flexible equalizer, that doesn't sound weird at any setting. Now it is possible to obtain the sound you desire.

Tech Talk

Voicing Filters:

Voicing filters are used to completely revoice the amplifier. In the case of the Contour and String Bass controls, the effect is dramatic.

The Contour control tunes between two different shaping circuits, with greatly different response. With the control all the way up, the low end is slightly boosted, the mids are dropped and the high end is pushed up. This is a contour response not available with a normal equalizer, and is only found in GK amplifiers.

The way a Bass amp deals with the instrument low string is a critical part of it's sound. In fact, a five string instrument requires an entirely different low end response than a four string instrument. No equalizer can make the necessary adjustments to accommodate both, however the String Bass button on the 400RB Series does just that. When it is out, the 400RB is voiced like the 800RB (worlds classic four string amp). Push it in and the 400RB is voiced for five string instruments. For some playing styles you may want it in, even with a four string instrument...at least now, you have a choice!

“G.I.V.E.” Technology:

As in all GK pre-amps, the 400RB Series pre-amp incorporates what we call G.I.V.E (Gate Induced Valve Effect) Technology. We use field effect devices with the gate biased in a way that emphasizes the optimum harmonic content of the signal.

Cool Running = Reliability:

To cool the 400RB we've designed a temperature sensitive fan cooling system. When the amp is under a light load, the fan is off or running at a low speed, reducing fan noise. As the amp works harder, the fan speed increases to keep everything cool.

Smart Protection Circuitry:

The 400RB's protection circuitry constantly monitors for unsafe operating conditions such as short circuits, miswired speaker cables, blown speakers, improper ventilation and incorrect speaker configurations. In addition, protection is provided during power up/power down. If the 400RB senses any unsafe operating conditions, the output signal is immediately muted and the power light changes from Green to Red. The amplifier will remain muted until the fault is removed. If the protection circuit activates while playing, turn the amplifier off and check the amplifier speaker output connections. Be sure that you are not exceeding the maximum recommend load described in this manual. If the problem persists, contact GK directly for technical advice.

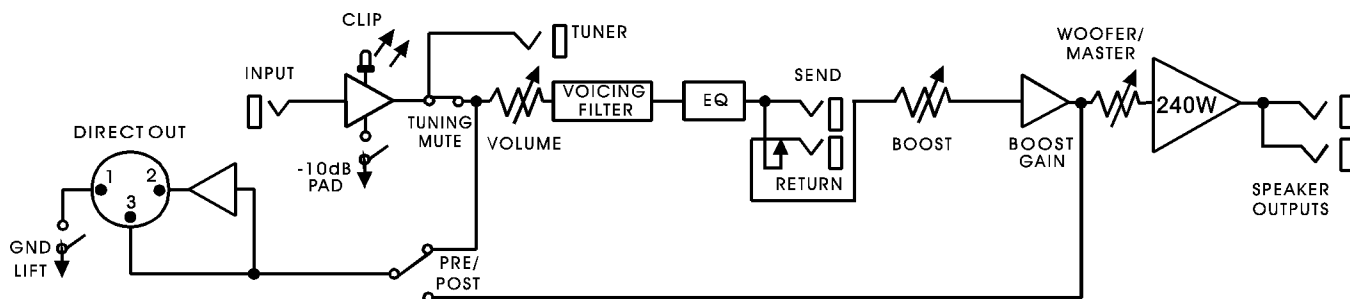
Low Noise Operation:

The 400RB Series uses a high gain, high headroom, low noise input stage. It has such a large dynamic range (60v p-p) that very few instruments can overdrive it. Even most basses with “active” electronics do not need the input attenuator to be set. The benefit to you is less hiss from your horn, and overall, less noise.

In Closing:

You should now have a thorough understanding of how your new 400RB Series amplifier works and what advantages it can offer you in getting “your” sound. We thank you for reading the Owner's Manual and wish you the best of times! Please send us your comments via www.gallien-krueger.com or email us at sales@gallien.com.

Block Diagram



400RB Series Specifications:

Output Power:	
240W Amplifier	150W @ 8 Ohms 240W @ 4 Ohms
Input Section:	
Maximum Input Level	0.6V Rms
With -10dB pad	1.6V Rms
Input Impedance	1M Ohm
Send output impedance	220 Ohm
Return input impedance	50k Ohm
Tuner Output Impedance	10k Ohm
Direct Output Impedance	500 Ohms
Equalizer:	
Bass	$\pm 10\text{db @ } 60\text{Hz}$
Lo-Mid	$+6\text{db}/-10\text{dB @ } 250\text{Hz}$
Hi-Mid	$+6\text{db}/-10\text{dB @ } 1\text{kHz}$
Treble	$\pm 14\text{db @ } 7\text{kHz}$
Voicing Filters:	
String Bass Button	$+11\text{db @ } 20\text{Hz}$
Contour	$+2\text{db @ } 50\text{Hz} /$ $-10\text{db @ } 500\text{Hz} /$ $+3\text{db @ } 7\text{kHz}$
Presence	$+9\text{db @ } 10\text{kHz}$
Noise	-90db referenced to 240W, "A" weighted
Cooling	Continuously Variable-Speed fan
Amplifier Protection:	Full short circuit, thermal, & RF protection. Stable into reactive and mismatched loads. Five second muted warm-up.

Dimensions(HxWxD): 3 1/2" x 17" x 8 1/4"
(2 Rack Spaces)

Weight: 15lbs

Power Requirements:

U.S.A./Canada 120V/60Hz-410W
(at full power)

Europe 230V/50Hz-410W
(at full power)

Japan 100V/50Hz-410W
(at full power)

400RBIII BASS AMPLIFIER

TURN-ON PROCEDURE

SETUP:

1. Variac on zero
2. Top cover of amplifier removed (for easy access to the amplifier outputs)
3. Oscilloscope probe (GND) to chassis ground and (+) to tip of 1/4" output jack.
4. Set the volts/div of the oscilloscope to 20V and the time base to 1ms
5. Turn bias pot R21 on the power amp board all the way down (counter-clockwise)
6. Connect a DMM, set to 20mV scale DC, to the 2-pin BIAS header on the power amp
7. Set the VOICING FILTERS and the main VOLUME to zero, all other controls to 10, and all switches OUT
8. Set the function generator to output a 200 Hz, 5mV (-46 dBV) sine wave

POWER AMP BIAS AND OUTPUT TEST:

1. With the amplifier power switch on, slowly raise the Variac voltage to 60V, the power LED should switch from RED to GREEN. Observe the ammeter for excessive current draw (idle current should not exceed 2A)
2. Raise the Variac to 120V
3. Adjust trim-pot R21 to obtain a steady, 5mV reading on the DMM
4. Connect the amp output to a 4 ohm non-inductive dummy load
5. Connect the function generator to the INPUT jack of the amplifier
6. Raise the main VOLUME for slight clipping on the output, approximately 33Vrms
7. Press the -10 dB switch IN. The output should drop to approximately 13Vrms
8. Press the -10 dB switch OUT. Turn the BOOST to zero. Output should be 3.8Vrms
9. Turn the WOOFER MASTER to zero, output should be 0 volts
10. Turn the main VOLUME back down to zero

TONES AND FILTERS TEST:

1. Set the VOICING FILTERS to zero, all other controls to the center (12 o'clock) and all switches out.
2. Disconnect the load from the amplifier output.
3. Change the 'scope setting to 2V/Div and 1ms time base.
4. Set the function generator to output a 200 Hz square wave at 5mVrms (-46 dBV)
5. Turn the CONTOUR to 10 and compare the output to Figure 3 on the waveforms page. Turn the CONTOUR back to zero
6. Turn the PRESENCE to 10 and compare the output to Figure 4. Turn the PRESENCE back to zero
7. One at a time, turn each ACTIVE EQ knob all the way up and all the way down and compare the output to the corresponding figures on the waveforms page. Remember to reset each knob to its center (12 o'clock) position before proceeding to the next tone control

NOISE TEST:

1. Remove the function generator from the INPUT jack
2. Connect a speaker to the amp output jack
3. Turn all knobs to 10 and leave all switches out
4. Listen for any unusual noise, there should be no pops or crackling sounds
5. Connect an AC voltmeter, set to 1V scale. Amp output noise level <225mV
6. Set the VOICING FILTERS to zero, the noise level should be <210mV
7. Turn the BOOST to zero, the noise level should be <25mV
8. Turn the VOLUME to zero, the noise level should be <1mV

END OF PROCEDURE

200Hz square wave at -46 dBV (5 mVrms) input
VOICING FILTERS at 0, all other knobs at 12 o'clock (halfway)
Look at output with 'scope set on 1ms/div and 2V/div

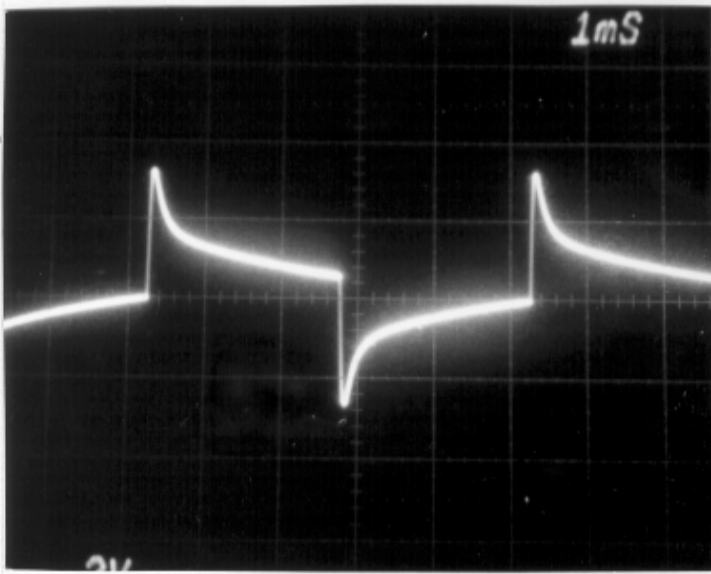


Fig. 1 Tones @ center, filters off

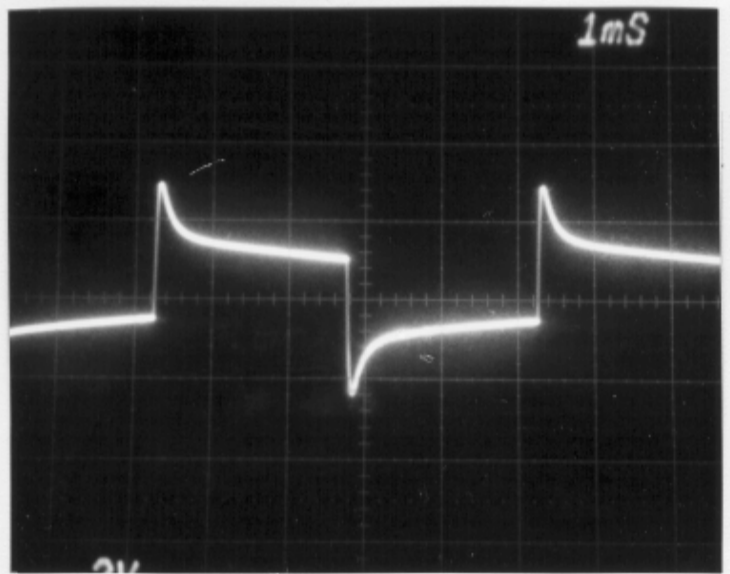


Fig. 2 String Bass IN

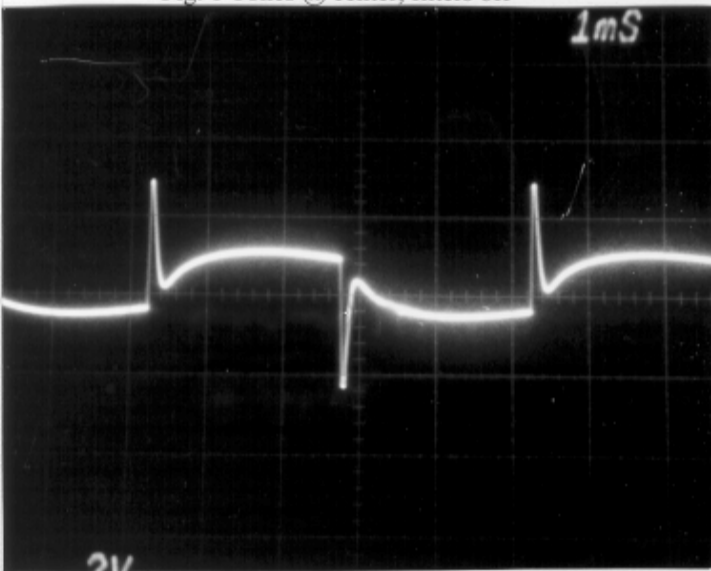


Fig. 3 Contour on 10

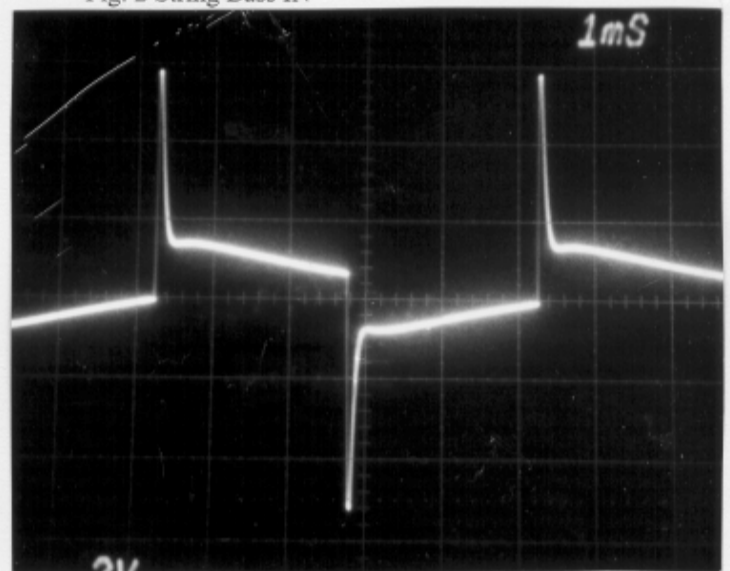


Fig. 4 Presence on 10

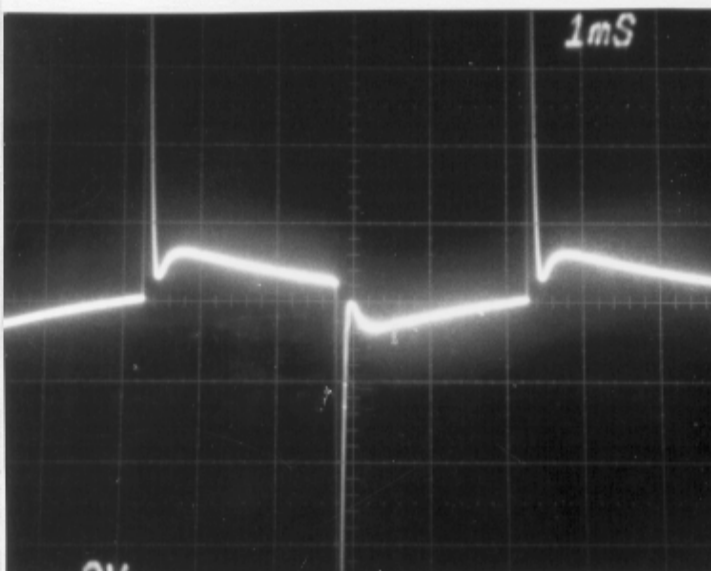


Fig. 5 Treble on 10

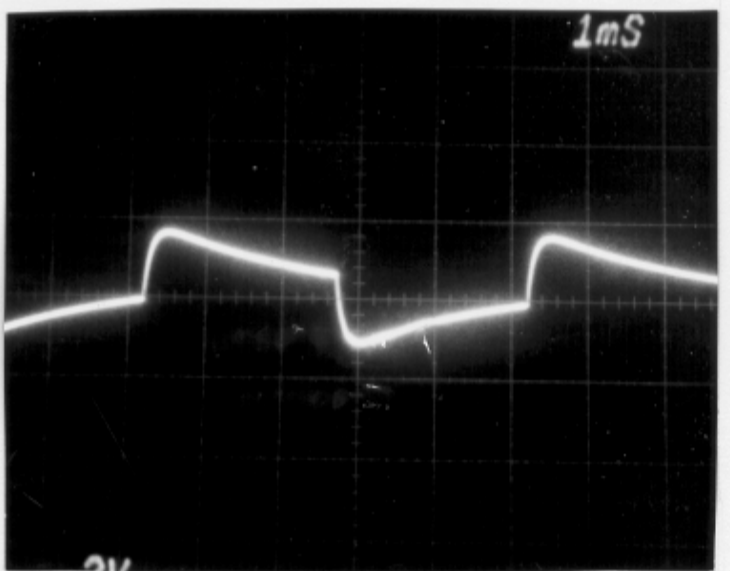


Fig. 6 Treble on 0

200Hz square wave at -46 dBV (5 mVrms) input
VOICING FILTERS at 0, all other knobs at 12 o'clock (halfway)
Look at output with 'scope set on 1ms/div and 2V/div

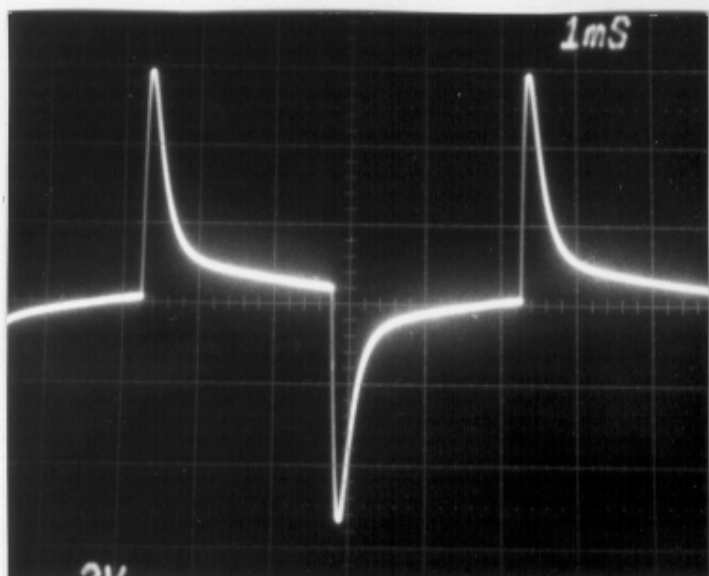


Fig. 7 Hi-mid on 10



Fig. 8 Hi-mid on 0

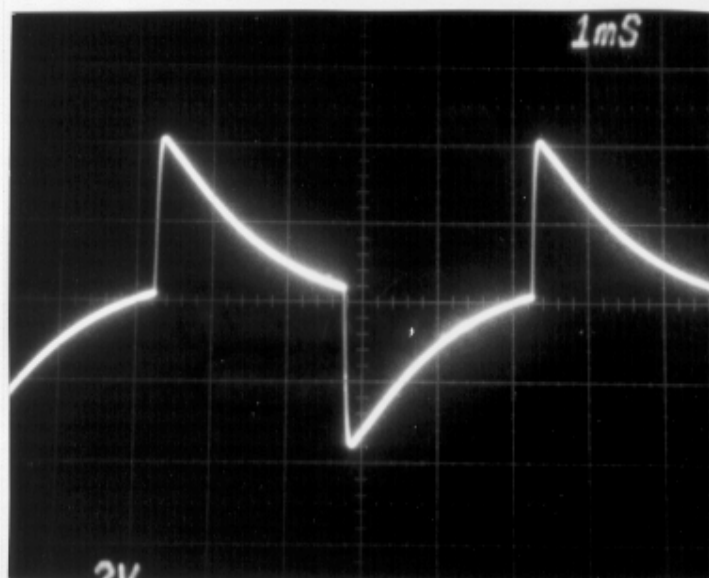


Fig. 9 Low-mid on 10

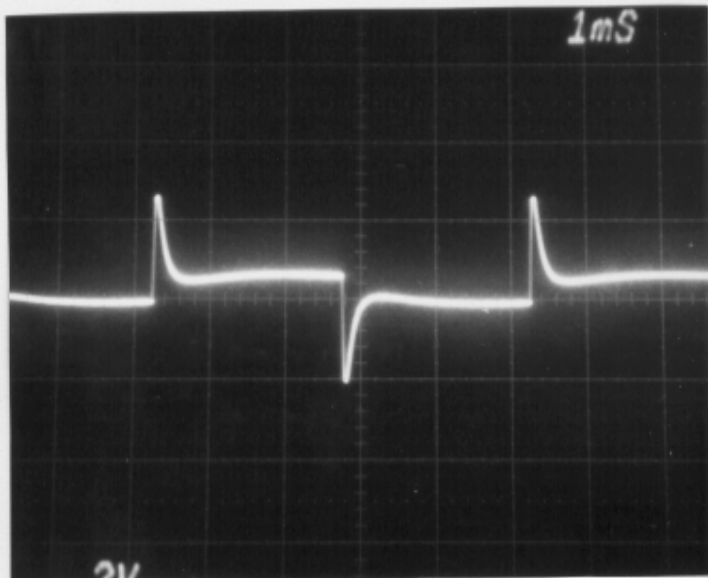


Fig. 10 Low-mid on 0

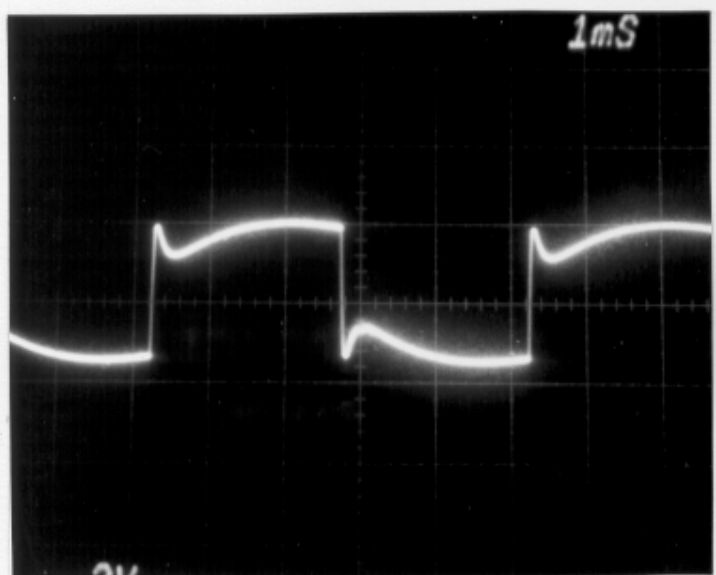


Fig. 11 Bass on 10

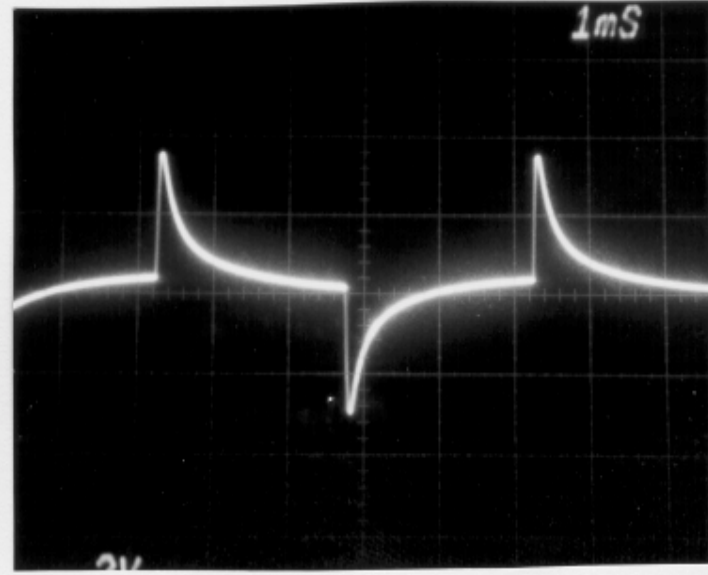
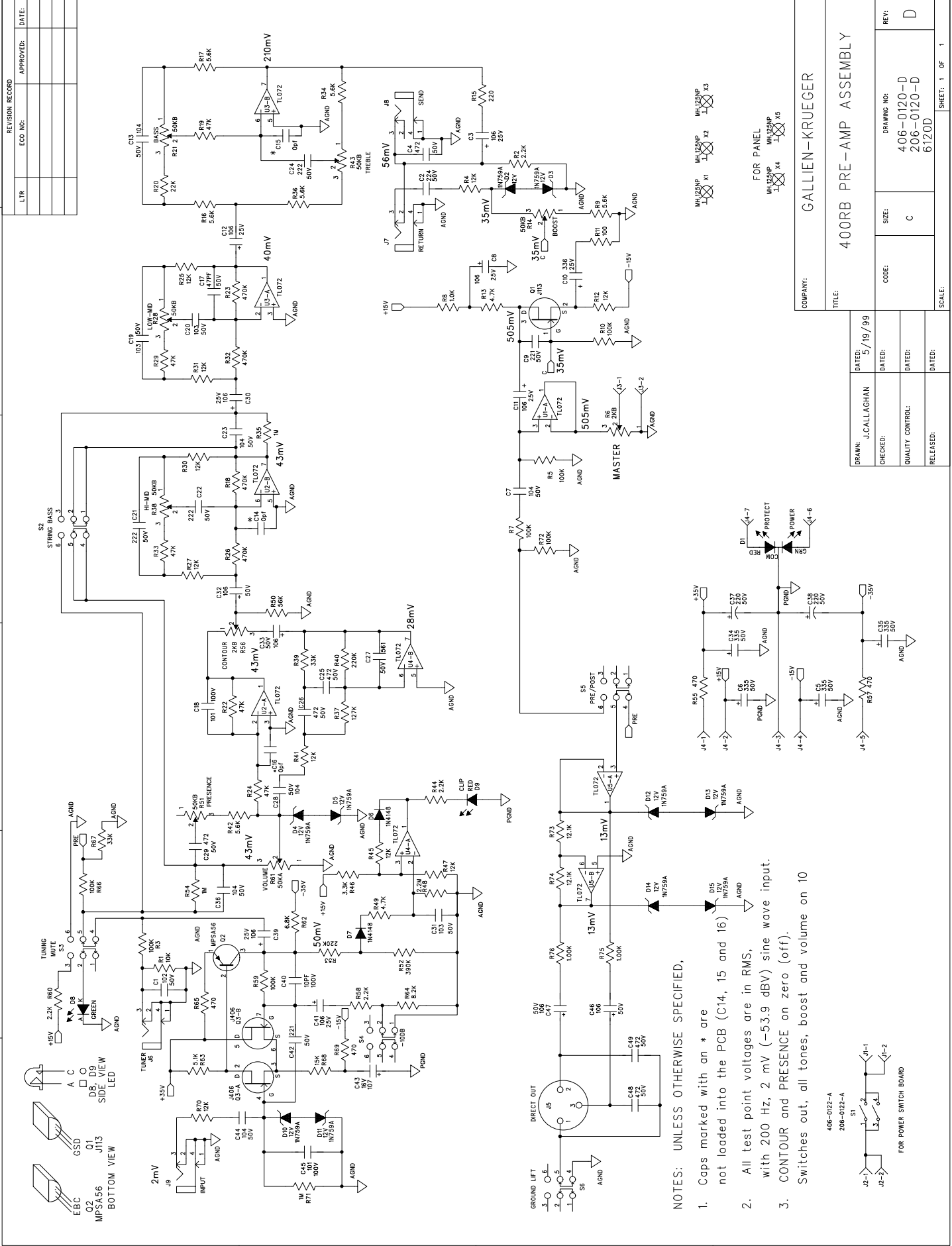


Fig. 12 Bass on 0

1 2 3 4 5 6



REVISION RECORD	
LTR	DATE:
ECO NO:	APPROVED:

COMPANY:	GALLIEN-KRUEGER
TITLE:	400RB PRE-AMP ASSEMBLY
DRAWN:	J.CALLAGHAN
CHECKED:	
QUALITY CONTROL:	
RELEASED:	

DATED:	5/19/99
DATED:	
DATED:	
DATED:	

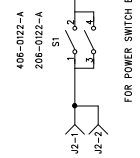
CODE:	C
SIZE:	406-0120-D 206-0120-D 6120D
DRAWING NO:	
REV:	D

SCALE:	SHEET: 1 OF 1
--------	---------------

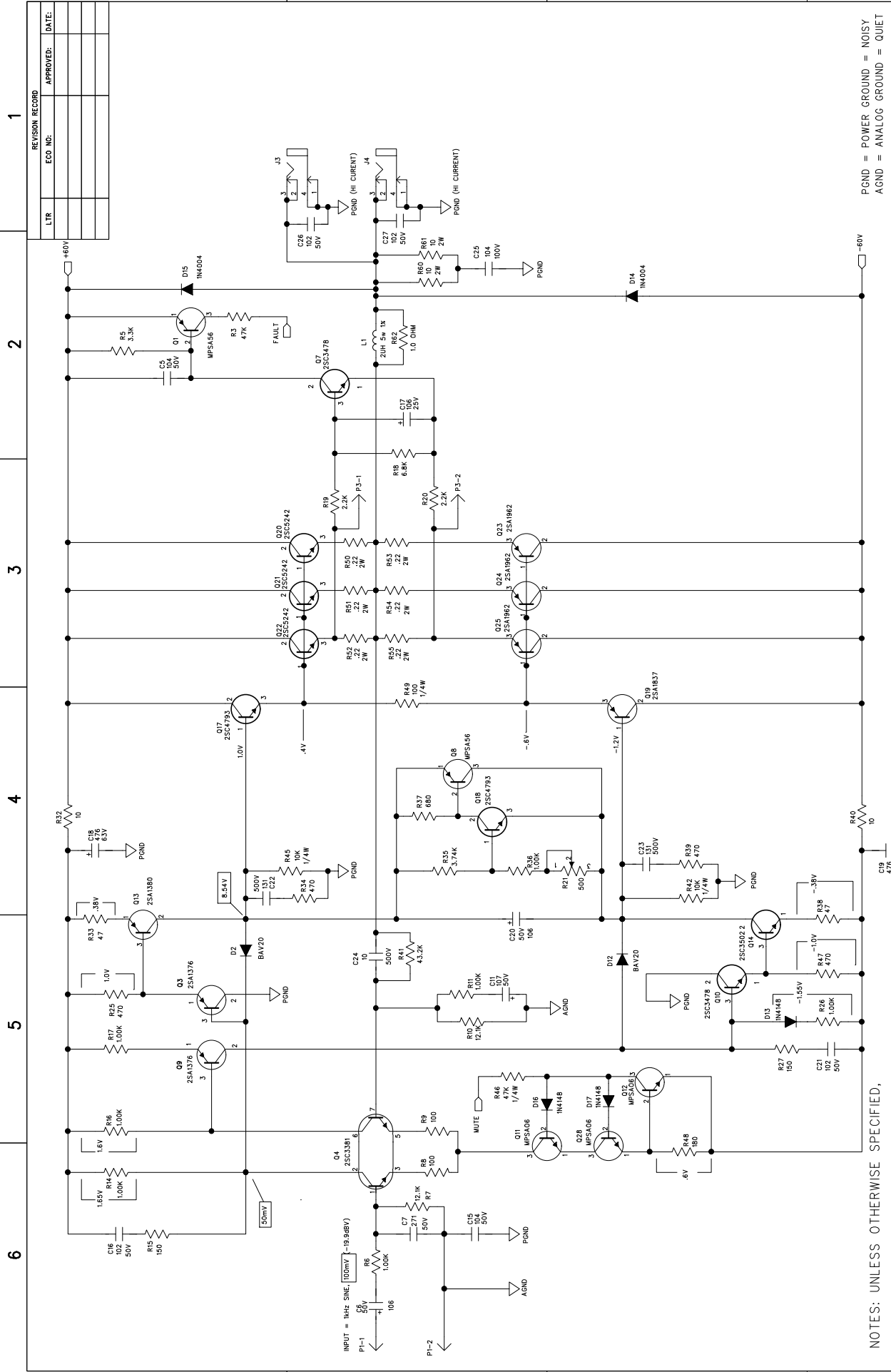
NOTES: UNLESS OTHERWISE SPECIFIED,

1. Caps marked with an * are not loaded into the PCB (C14, 15 and 16)
2. All test point voltages are in RMS, with 200 Hz, 2 mV (-53.9 dBV) sine wave input.
3. CONTOUR and PRESENCE on zero (off).

Switches out, all tones, boost and volume on 10



FOR POWER SWITCH BOARD



REVISION RECORD	
LTR	DATE

COMPANY: 400RB III POWER AMP BOARD
 TITLE: 400RB III POWER AMP BOARD

FOR PANEL	DRAWN:	DATED:
MH125/20	MH125/20	MH125/20
MH125/20	MH125/20	MH125/20
MH125/20	MH125/20	MH125/20
MH125/20	MH125/20	MH125/20

CHECKED:	DATE:

QUALITY CONTROL:	DATE:

RELEASED:	DATE:

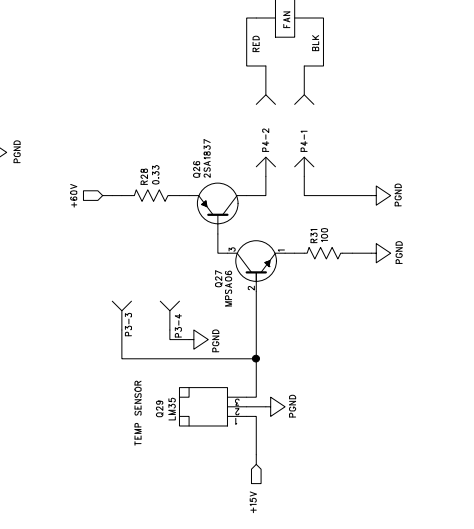
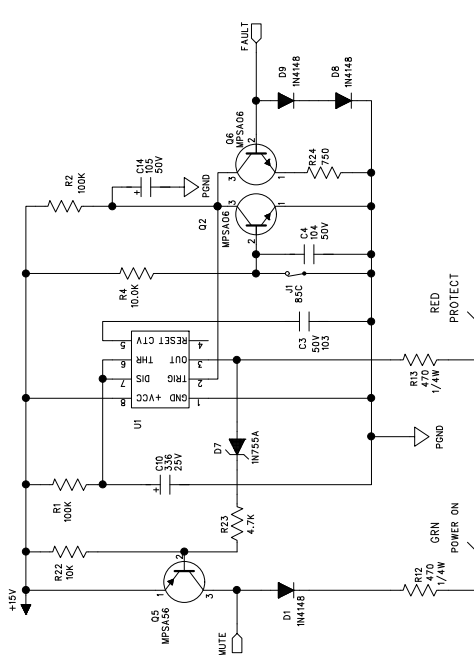
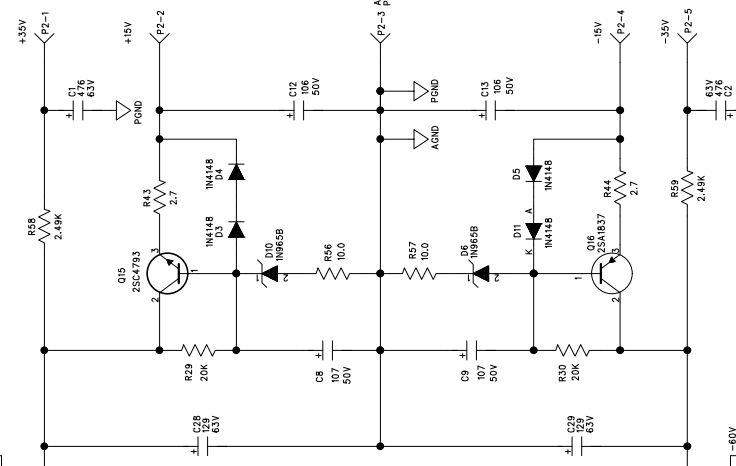
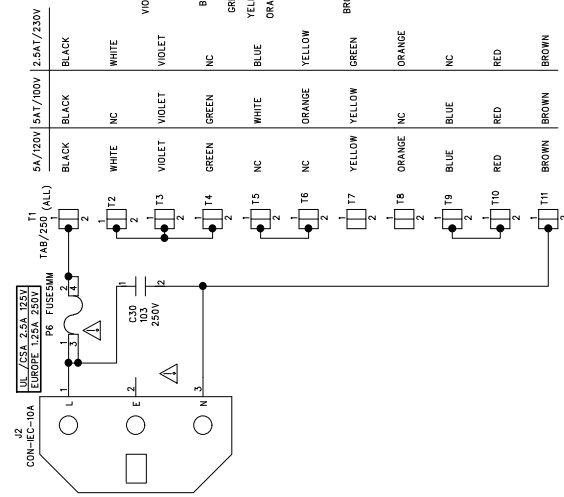
PGND = POWER GROUND = NOISY
 AGND = ANALOG GROUND = QUIET

NOTES: UNLESS OTHERWISE SPECIFIED,
 1. TEST CONDITIONS: 100mV 1kHz SINE DIRECT INPUT (PRE-AMP BYPASSED) NO LOAD
 2. □ DENOTES RMS AC VOLTAGE

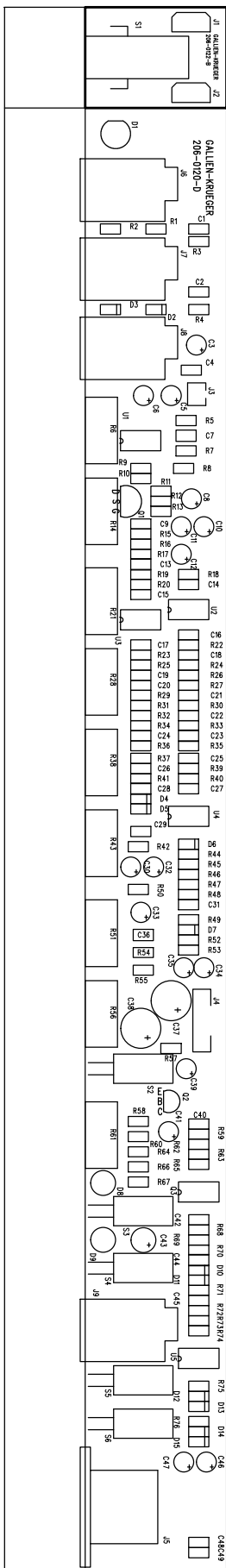
BIAS ADJUSTMENT PROCEDURE:
 WITH POWER OFF, ADJUST POT R21 TO FULL COUNTER-CLOCKWISE POSITION.
 TURN ON POWER AND WAIT 5 SECONDS FOR TURN ON DELAY.
 TURN R21 CLOCKWISE UNTIL VOLTAGE ACROSS P3 READS 5 mVDC.

REVISION RECORD		
LTR	ECD NO:	APPROVED: DATE:

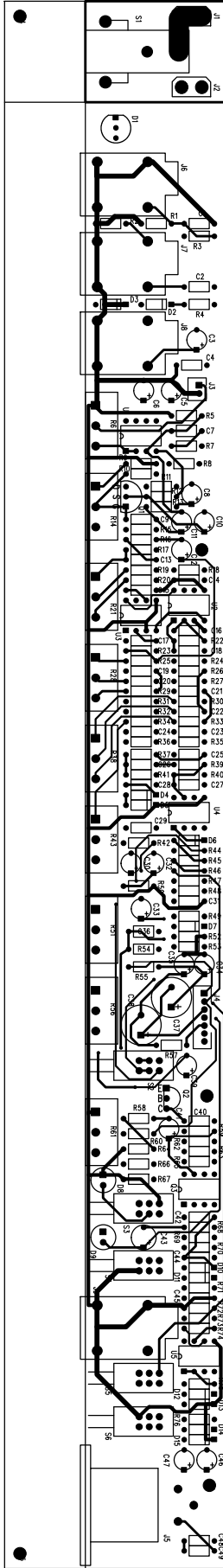
WARNING
 DANGEROUS VOLTAGES
 PRESENT IN THIS AREA.
 REPLACE ONLY WITH
 IDENTICAL REPLACEMENT
 PARTS.



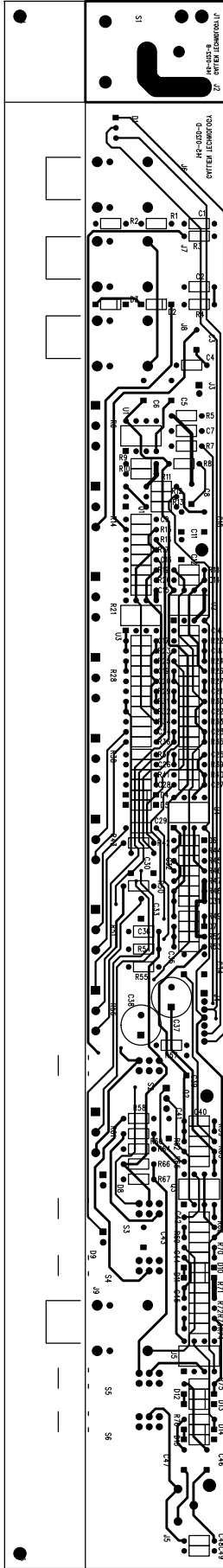
COMPANY: 400RB III POWER AMP BOARD
 TITLE:
 DRAWN: DATED:
 CHECKED: DATED:
 QUALITY CONTROL: DATED:
 RELEASED: DATED:
 CODE: SIZE: DRAWING NO: REV:
 SCALE: SHEET: 2 OF 2



Galien Technology 2240 PARAGON DRIVE SAN JOSE, CA 95131	
APPROVALS: DESIGNED: S.G. 1/16/98 DRAWING: S.C. 1/15/98 ELEC: P.B. 1/15/98 Q/A:	TITLE: 400RB PRE-AMP BD SIZE: DRAWING NO: 405-0120-D PART NO: 145-0120-D REV: D PLENOME: 57200 SCALE:
LAYER DESCRIPTION: TOP SIDE SILKSCREEN GERBER FILE NAME: sst10126.pho	



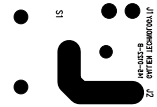
Gerber Technology 2240 PARAGON DRIVE SAN JOSE, CA 95131	
APPROVALS INIT: _____ DATE: _____ DESIGNED: S.B. 1/7/98 DRAWING: S.B. 405-0120-D ELEC: M.B. 6/7/98 MECH: _____ RELEASED: _____	FILE INFORMATION TITLE: 400RB PRE-AMP BD SHEET: B DRAWING NO: 405-0120-D PART NO: 145-0120-D REV: D FILENAME: 51200 SCALE:
LAYER DESCRIPTION: TOP SIDE ROUTING GERBER FILE NAME: art01.pho	

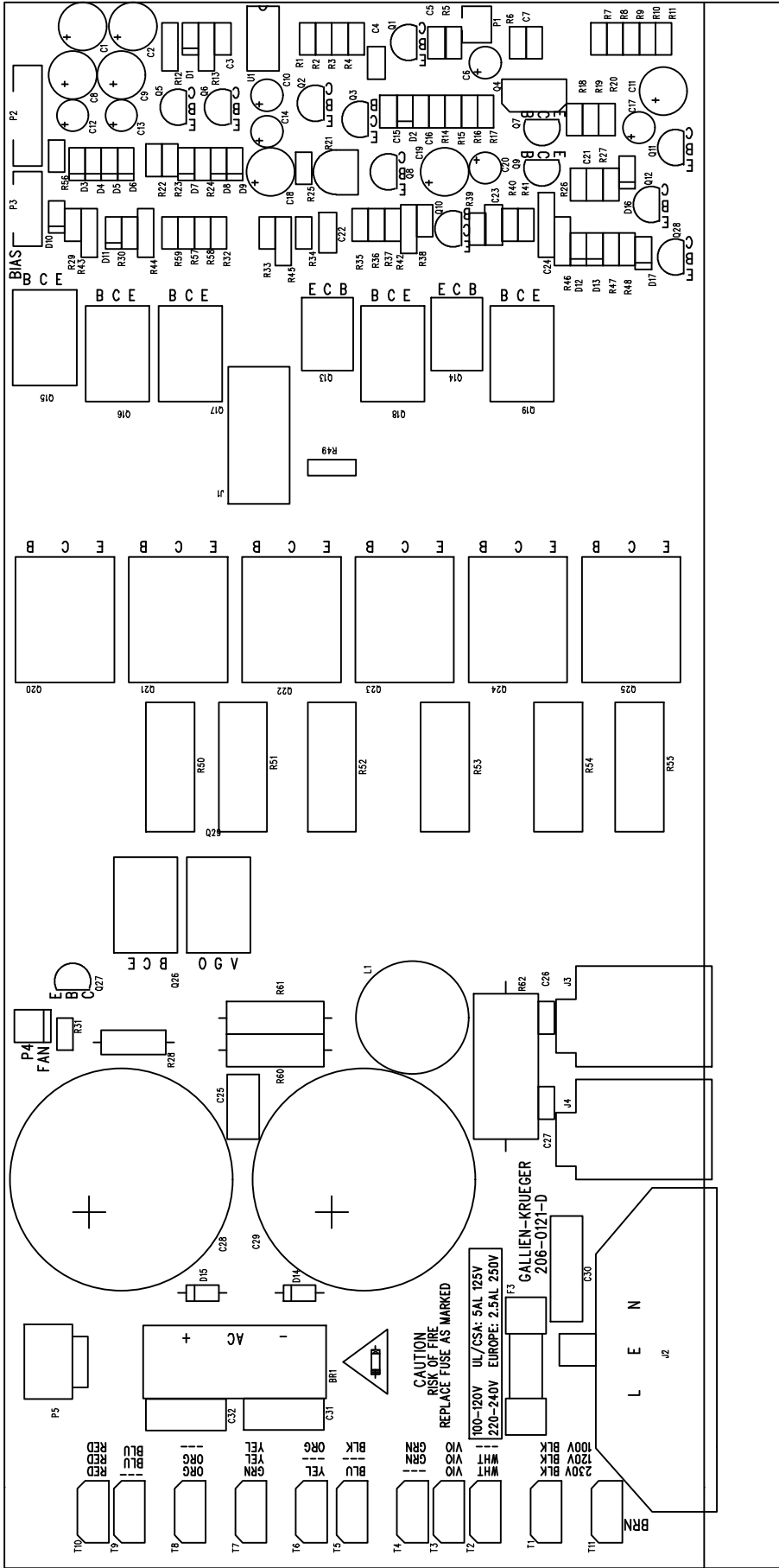


2240 PARAGON DRIVE
 FERRIS TECHNOLOGY SAN JOSE, CA 95131

APPROVALS		DATE	SIZE	DRIVING NO.	REV.
DESIGNED:	R.G. 1/2/98	1/2/98	B	400RB PRE-AMP BD	D
CHK'D:	S.G. 1/2/98	1/2/98	B	145-0120-D	D
DATE:	1/2/98	1/2/98			
WCH:					
Q/A:					
RELEASE:					
					SCALE: 5/1000

LAYER DESCRIPTION:
 BOTTOM SIDE ROUTING
 GERBER FILE NAME: art02.pno



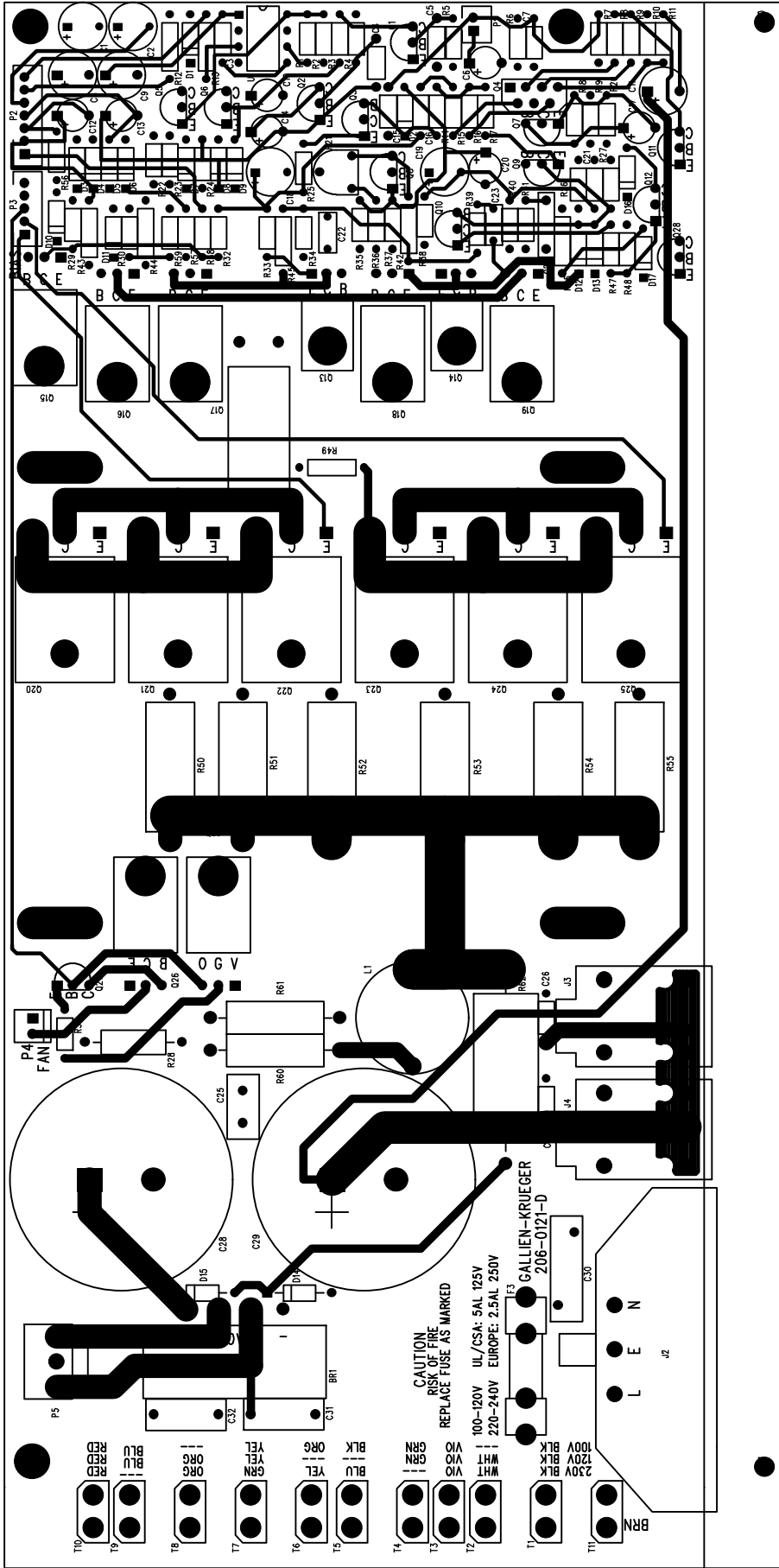


Gallen
TECHNOLOGY
2240 PARAGON DRIVE
SAN JOSE, CA 95131

APPROVALS		DATE
INIT	ML	12/1/99
DESIGNED:	ES	12/1/99
DRAWN:	ML	12/1/99
ELEC:	O/A:	
MECH:	RELEASED:	

LAYER DESCRIPTION:
TOP SIDE SILKSCREEN
GERBER FILE NAME: sst0126.pho

TITLE:	SIZE:	DRAWING NO.:	REV.:
400RB POWER AMP BD	B	405-0121-D	D
FILENAME:	SCALE:		
5121D			

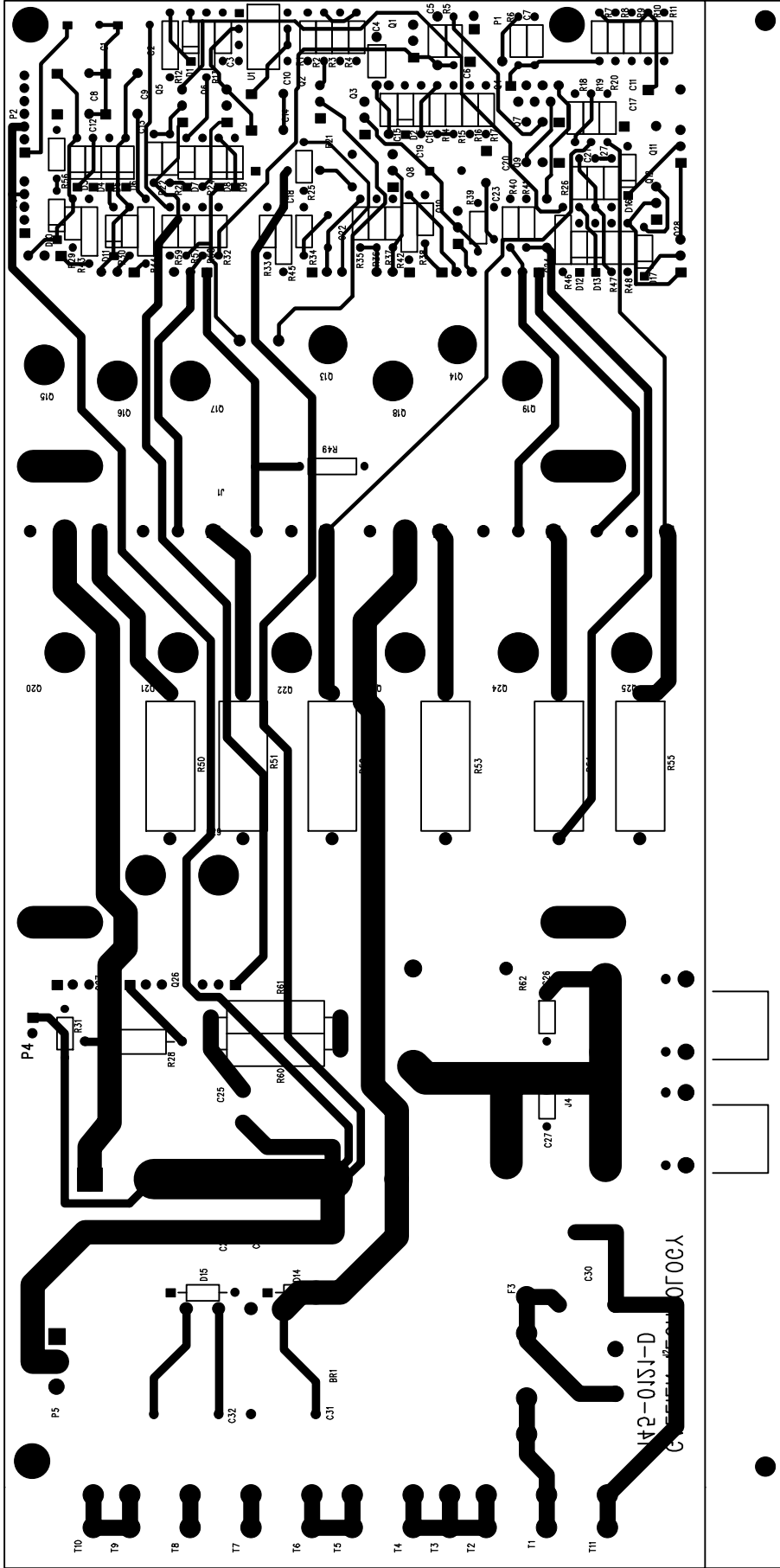


Gallien 2240 PARAGON DRIVE
 TECHNOLOGY SAN JOSE, CA 95131

APPROVALS		DATE
INIT	DESIGNED: ML	12/1/99
	DRAWN: ES	12/1/99
	ELEC: ML	12/1/99
	MECH:	
	O/A:	
	RELEASED:	

LAYER DESCRIPTION:
 TOP SIDE ROUTING
 GERBER FILE NAME: art01.pho

TITLE: 400RB POWER AMP BD	REV.:
SIZE: B	DRAWING NO: 405-0121-D
FILENAME: 5121D	PART NO: 145-0121-D
SCALE:	



Gallen 2240 PARAGON DRIVE
 TECHNOLOGY SAN JOSE, CA 95131

TITLE:	400RB POWER AMP BD
SIZE:	DRAWING NO: 405-0121-D
REV.:	D
FILENAME:	5121D
SCALE:	

APPROVALS	DATE
INIT: ML	12/1/99
DESIGNED: ML	12/1/99
DRAWN: ES	12/1/99
ELEC: ML	12/1/99
MECH:	
Q/A:	
RELEASED:	

LAYER DESCRIPTION:
 BOTTOM SIDE ROUTING
 GERBER FILE NAME: art02.pho

400RB-III INDENTED BILL OF MATERIALS

1/26/00-SW

NOTE: Level 1 refers to main assembly numbers, and level 2 refers to board level components
Main assembly numbers are in bold face, while commonly used parts are italicized.

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
1	080-0043-A	TRANSFORMER 400RB-III,120V	1	
1	091-0008-0	FUSE,5MM,5A,125V,FAST,UL,CSA	1	
1	095-0005-0	CORD,IEC,3X18GA,10A,6',DOM	1	
1	100-0020-0	BUMPER,ROUND RUBBER,1/2"X.14"	4	
1	100-0029-0	BUTTON,CLYIN,BLK CAP PUSH SWITCH	1	pwr switch
1	100-0035-0	CABLE TIE,BLACK,4"-18 LB	5	
1	100-0042-0	HANDLE,RUBBER,6.5"	1	
1	100-0076-0	FOOT,RUBBER,ROUND,5/8DIA. X 5/8"	4	
1	100-0098-0	KNOB,GRAY,6X15MM SPLINE SHAFT	9	
1	100-0126-0	HOLDER,CABLE TIE .75" SQUARE,ADHESIVE BK	2	
1	111-0041-0	BOLT,4-40,1/4,PHP,CAD	3	board-chassis
1	111-0061-0	BOLT,4-40,3/8,PHP,CAD	2	pwr switch
4	111-0101-0	BOLT,4-40,5/8,PHP,CAD.	4	sink-chassis
1	111-4060-0	SCREW,4AB,3/8,FHP 82^,B.Z.	2	xlr,direct out
1	111-6001-0	NUT,4-40,KEP SMALL	1	gnd terminal
1	111-7011-0	WASHER,#4,SPLIT	9	(2)-pwr sw.,(3)bd-chassis,(4)-sink-chassis
1	112-8060-0	TR-BOLT,6-32,3/8,PHP,B.Z.	2	handle
1	112-9060-0	TR-BOLT,6-32,3/8,FHP,B.Z.	10	top cover
1	113-3060-0	SCREW,8AB,3/8,PHP,B.O.	2	pwr cord con.
1	113-8100-0	TR BOLT,8-32,5/16,PHP,B.O.	4	feet
1	115-2220-0	BOLT,5/16-18,2 3/4",CARRIAGE,B.Z.	1	transformer
1	115-6000-0	NUT,5/16-18,HEX,CAD	1	transformer
1	115-7008-0	WASHER,8MM,BELLEVILLE,SPRING STEEL	2	transformer
1	137-0575-C	700RB/400RB RACK EAR	1	
1	137-0593-B	700RB/400RB TOP COVER	1	
1	137-0651-A	400RB CHASSIS	1	
1	150-0001-0	400RB-III CARTON	1	
1	150-0003-0	700RB PACK	1	
1	150-0019-0	BAG,POLY 18X24XC [2 MIL.]	1	
1	150-0023-0	BAG,POLY 10 X 16 1 1/2 MILL	1	
1	152-0002-0	BAG,4"X16",FOR PWR CORD	1	
1	153-0007-0	LABEL,GK SERIAL NO.	1	
1	160-0012-A	400RB-III OWNERS MANUAL	1	

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
1	202-0050-A	WIRE ASSY,26GA,BLK,17",2PIN	1	
1	206-0120-D	400RB-III,PRE AMP BOARD ASSY	1	
1	250-0121-D	400RB-III,POWER AMP MODULE	1	
1	602-0007-0	GK WARRANTY CARD	1	
1	GK160-0000	GK SAFETY SHEET	1	
1	HA202-0004	WIRE ASSY,26GA,BLK,7",7PIN,UL/CSA	1	
1	NI202-0100	WIRE ASSY,18GA,BLK,17.5",.250F/.250F	1	
1	NI202-0101	WIRE ASSY,18GA,WHT,17.5",.250F/.250F	1	

206-0121-D 400RB-III PowerAmp Assembly

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	001-2060-0	LM555CN TIMER	1	U1
2	010-0000-0	2SC3381BL,NPNX2,80V,100MA,2-10M1B	1	Q4
2	010-0001-0	2SC3478,NPN,180V,100MA	2	Q7,10
2	010-0003-0	2SC3502-F,NPN,200V,100MA,TO-126	1	Q14
2	<i>010-0012-0</i>	<i>MPSA06 NPN 80V 500MA TO-92</i>	<i>6</i>	<i>Q2,6,11,12,27,28</i>
2	010-1002-0	2SA1376,PNP,180V,100MA,TO-92	2	Q3,9
2	010-1003-0	2SA1380-F,PNP,200V,100MA,TO-126	1	Q13
2	<i>010-1013-0</i>	<i>MPSA56 PNP 80V 500MA TO-92</i>	<i>3</i>	<i>Q1,5,8</i>
2	012-0002-0	2SC4793 NPN 200V 1.5A 2-10R1A	3	Q15,17,18
2	012-0003-0	2SC5242,NPN,230V,15A,2-16C1A	3	Q20,21,22
2	012-1002-0	2SA1837 PNP 200V 1.5A 2-10R1A	3	Q16,19,26
2	012-1003-0	2SA1962,PNP,230V,15A,2-16C1A	3	Q23,24,25
2	020-0004-0	1N755A,ZENER,7.5V,500MW,DO-35	1	D7
2	020-0150-0	1N965B,ZENER,15V,5%,500MW,DO-35	2	D6,10
2	020-1000-0	1N4148 ,RECT-FAST,200MA,100V,4NS,DO-35	10	D1,3,4,5,8,9,11
2	020-1022-0	BAV20,DIODE RECT,200V	2	D2,12
2	020-2106-0	1N4004,RECT,1A,150V,DO-41	2	D14,15
2	023-0112-0	BRIDGE,25A,200V,VERT,PC,MP25S-02	1	BR1
2	030-2102-0	CAP,CER,AX,102,10%,50V,X7R	4	C16,21,26,27
2	030-2103-0	CAP,CER,AX,103,10%,50V,X7R	1	C3
2	030-2104-0	CAP,CER,AX,104,10%,50V,X7R	3	C4,5,15
2	030-2271-0	CAP,CER AXIAL,271,10%,50V,NPO	1	C7
2	031-0106-1	CAP,ELEC,RAD,106,20%,25V,NP	1	C17
2	031-1336-0	CAP,ELEC,RAD,336,-10%+50%,25V	1	C10
2	031-2105-0	CAP,ELEC,RAD,105,-10/+20%,50V	1	C14
2	031-2106-0	CAP,ELEC,RAD,106,-10%+50%,50V	4	C6,12,13,20
2	031-2107-0	CAP,ELEC,RAD,107,-10%+50%,50V	3	C8,9,11

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	031-3129-0	CAP,ELEC,RAD,129,20%,63V	2	C28,29
2	031-3476-0	CAP,ELEC,RAD,476,20%,63V	4	C1,2,18,19
2	032-4104-0	CAP,PE,104,10%,100V	1	C25
2	032-7104-0	CAP,PE,104,20%,250V	2	C31,32
2	034-7103-0	CAP,CERAMIC DISK,103,10%,X-250V	1	C30
2	035-8100-0	CAP,MICA,10PF,5%,500V	1	C24
2	035-8131-0	CAP,MICA,130PF,5%,500V	2	C22,23
2	050-0101-0	RES,CF,10,1/8W,5%	2	R32,40
2	050-0471-0	RES,CARBON FILM,47 OHM,1/8W,5%	2	R33,38
2	050-1001-0	RES,CARBON FILM,100 OHM,1/8W,5%	2	R8,9
2	050-1003-0	RES,CARBON FILM,10K OHM,1/8W,5%	1	R22
2	050-1004-0	RES,CARBON FILM,100K OHM,1/8W,5%	2	R1,2
2	050-1501-0	RES,CARBON FILM,150 OHM,1/8W,5%	2	R15,27
2	050-1801-0	RES,CARBON FILM,180 OHM,1/8W,5%	1	R48
2	050-2003-0	RES,CARBON FILM,20K OHM,1/8W 5%	2	R29,30
2	050-2202-0	RES,CARBON FILM,2.2K OHM,1/8W,5%	2	R19,20
2	050-3302-0	RES,CARBON FILM,3.3K OHM,1/8W,5%	1	R5
2	050-4701-0	RES,CARBON FILM,470 OHM,1/8W,5%	4	R25,34,39,47
2	050-4702-0	RES,CARBON FILM,4.7K OHM,1/8W,5%	1	R23
2	050-4703-0	RES,CARBON FILM,47K OHM,1/8W,5%	1	R3
2	050-6801-0	RES,CARBON FILM,680 OHM,1/8W,5%	1	R37
2	050-6802-0	RES,CARBON FILM,6.8K OHM,1/8W,5%	1	R18
2	051-0270-0	RES,CARBON FILM,2.7 OHM,1/4W,5%	2	R43,44
2	051-1001-0	RES,CARBON FILM,100 OHM,1/4W,5%	1	R49
2	051-1003-0	RES,CARBON FILM,10K OHM,1/4W,5%	2	R42,45
2	051-4701-0	RES,CARBON FILM,470 OHM,1/4W,5%	2	R12,13
2	051-4703-0	RES,CARBON FILM,47K OHM,1/4W,5%	1	R46
2	054-.330-0	RES,WIRE WOUND,.33 OHM,1W,5%	1	R28
2	055-.220-0	RES,CERAMIC WW,.22 OHM,2W,5%	6	R50,51,52,53,54
2	055-0101-0	RES,METAL OXIDE,10 OHM,2W,5%	2	R60,61
2	056-0100-0	RES,WIRE WOUND,1.0 OHM,5W,10%	1	R62
2	060-1000-0	RES,METAL FILM,10.0 OHM,1/8W,1%	2	R56,57
2	060-1001-0	RES,METAL FILM,100 OHMS,1/8W,1%	1	R31
2	060-1002-0	RES,METAL FILM,1.00K,1/8W,1%	7	R6,11,14,16,17
2	060-1003-0	RES,METAL FILM,10.0K OHM,1/8W,1%	1	R4
2	060-1213-0	RES,METAL FILM,12.1 K OHM,1/8W,1%	2	R7,10
2	060-2492-0	RES,METAL FILM,2.49K,1/8W,1%	2	R58,59

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	060-3742-0	RES,METAL FILM,3.74K OHM,1/8W,1%	1	R35
2	060-4322-0	RES,METAL FILM,43.2K OHM,1/8W,1%	1	R41
2	060-7501-0	RES,METAL FILM,750 OHM,1/8W,1%	1	R24
2	070-0520-0	POT,500 OHM TRIM,VERT	1	R21
2	081-0055-0	INDUCTOR,2UH,20A,AIR CORE	1	L1
2	091-1001-0	THRM BRKR 85C +/-5,0-DIFF,PC	1	J1
2	092-0001-0	CON,IECX3,10A,250V,PC TERM	1	J2
2	092-0066-0	FASTON,M,PC,.250"	11	T1,2,3,4,5,6,7,8,9,10,11
2	092-0082-0	JACK,1/4",MONO,PC,GROUNDING	2	J3,4
2	093-0025-0	HDR,.1X2,VERT,MALE,LOCK,GOLD	1	P4
2	093-0051-0	HDR,2MMX2,VERT,MALE,LOCK	1	P1
2	093-0080-0	HDR,.156X3,VERT,MALE,LOCK,SQR PINS,TIN	1	P5
2	093-2005-0	HDR,2MMX7,VERT,SHROUDED	1	P2
2	094-0004-0	FUSE CLIP,5MM, P.C. MOUNT	2	F3
2	145-0121-D	400RB-III,POWER AMP BOARD RAW	1	

250-0120-D Power Amp Module Assy.

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
1	010-0003-0	2SC3502-F,NPN,200V,100MA,TO-126	1	Q14
1	010-1003-0	2SA1380-F,PNP,200V,100MA,TO-126	1	Q13
1	086-0000-0	FAN, 24V DC, 160MA, 80X80MM, HIGH SPEED	1	
1	093-0506-0	HSG,.1X2,LOCKING,CRIMP 093-0909	1	For fan wires
1	093-0909-0	TERM,CRIMP,.1,22GA,093-0509	2	for 093-0508-0
1	095-0006-0	HEAT SHRINK 3/16 IN	3	Around fan cable
1	105-0001-0	INSULATOR TAPE,1"X7MIL ADHESIVE BACK	0	
1	105-0005-0	INSULATOR,9MIL,TO-126,GRY,GREASLESS	2	Q13,14
1	111-0250-0	BOLT,4-40,1 3/8",PHP,ZINC	4	Fan to heat sink
1	111-7011-0	WASHER,#4,SPLIT	18	(4) fan-heat sink, (14) transistors-bd.
1	111-7021-0	WASHER,#4,FLAT,CAD	4	fan to heat sink
1	111-8061-0	TR-BOLT,4-40,3/8,PHP,CAD	8	
1	111-8081-0	TR-BOLT,4-40,1/2,PHP,CAD	6	output transistors board
1	132-0024-B	700/400RB HEAT SINK	1	
1	153-0105-0	LABEL,BLANK,.9"X.25"	2	
1	202-6000-A	WIRE ASSY,14GA,GRN,3",CHASSIS GROUND	1	to IEC ground terminal
1	207-0121-D	400RB-III,POWER AMP BOARD ASSY	1	

206-0120-D 400RB-III Preamp Assembly

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	001-1030-1	TL072CP, LOW NOISE JFET OPAMP	5	U1,2,3,4,5

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	010-1013-0	MPSA56 PNP 80V 500MA TO-92	1	Q2
2	010-2010-0	J113 N-JFET 35V 2MA TO-92	1	Q1
2	010-2040-0	J406 DUAL N-CH JFET 8PIN DIP	1	Q3
2	020-0120-0	1N759A,ZENER,12V,5%,400MW,DO-35	10	D2,3,4,5,10,11,12
2	020-1000-0	1N4148 ,RECT-FAST,200MA,100V,4NS,DO-35	2	D6,7
2	025-0012-0	LED,RED/GRN,5MM,630NM/560NM,15MCD/15MCD	1	D1
2	025-0101-0	LED,GRN,3MM,565NM,6MCD,10MA,40DEG	1	D8
2	025-0116-0	LED,RED,3MM,635NM,6MCD,10MA,40 DEG	1	D9
2	030-2102-0	CAP,CER,AX,102,10%,50V,X7R	1	C1
2	030-2103-0	CAP,CER,AX,103,10%,50V,X7R	3	C19,20,31
2	030-2104-0	CAP,CER,AX,104,10%,50V,X7R	6	C7,13,23,28,36,44
2	030-2221-0	CAP,CER,AX,221,10%,50V,NP0	2	C9,42
2	030-2222-0	CAP,CER,AX,222,10%,50V,X7R	3	C21,22,24
2	030-2224-0	CAP,CER AXIAL,224,20%,50V,Z5U	1	C2
2	030-2470-0	CAP,CER AXIAL,47 PF,10%,50V,NPO	1	C17
2	030-2472-0	CAP,CER AXIAL,472,10%,50V,X7R	6	C4,25,26,29,48,49
2	030-2561-0	CAP,CER AXIAL,561,10%,50V,X7R	1	C27
2	030-4100-0	CAP,CER AXIAL,10 PF,10%,100V	1	C40
2	030-4101-0	CAP,CER AXIAL,101,5%,100 V,COG	2	C18,45
2	031-0106-1	CAP,ELEC,RAD,106,20%,25V,NP	7	C3,8,11,12,30,39
2	031-0107-0	CAP,ELEC,RAD,107,+/-20%,16V,LOW LEAKAGE	1	C43
2	031-1336-0	CAP,ELEC,RAD,336,-10%+50%,25V	1	C10
2	031-2106-0	CAP,ELEC,RAD,106,-10%+50%,50V	4	C32,33,46,47
2	031-2227-0	CAP,ELEC,RAD,227,-10%+50%,50V	2	C37,38
2	031-2335-0	CAP,ELEC,RAD,335,20%,50V	2	C6,34
2	050-1001-0	RES,CARBON FILM,100 OHM,1/8W,5%	1	R11
2	050-1002-0	RES,CARBON FILM,1K OHM,1/8W,5%	1	R8
2	050-1003-0	RES,CARBON FILM,10K OHM,1/8W,5%	1	R1
2	050-1004-0	RES,CARBON FILM,100K OHM,1/8W,5%	7	R3,5,7,10,59,66,67
2	050-1005-0	RES,CARBON FILM,1M OHM,1/8W,5%	3	R35,54,71
2	050-1203-0	RES,CARBON FILM,12K OHM,1/8W,5%	10	R4,12,25,27,30,31
2	050-1503-0	RES,CARBON FILM,15K OHM,1/8W,5%	1	R68
2	050-2201-0	RES,CARBON FILM,220 OHM,1/8W,5%	1	R15
2	050-2202-0	RES,CARBON FILM,2.2K OHM,1/8W,5%	4	R2,44,58,60
2	050-2203-0	RES,CARBON FILM,22K OHM,1/8W,5%	1	R20
2	050-2204-0	RES,CARBON FILM,220K OHM,1/8W,5%	2	R40,53
2	050-2205-0	RES,CARBON FILM,2.2M OHM,1/8W,5%	1	R48

LVL	PART#	DESCRIPTION	QTY	REF. DESIG.
2	050-3302-0	RES,CARBON FILM,3.3K OHM,1/8W,5%	1	R46
2	050-3303-0	RES,CARBON FILM,33K OHM,1/8W,5%	2	R39,67
2	050-3904-0	RES,CARBON FILM,390K OHM,1/8W,5%	1	R52
2	050-4701-0	RES,CARBON FILM,470 OHM,1/8W,5%	4	R55,57,65,69
2	050-4702-0	RES,CARBON FILM,4.7K OHM,1/8W,5%	2	R13,49
2	050-4703-0	RES,CARBON FILM,47K OHM,1/8W,5%	5	R19,22,24,29,33
2	050-4704-0	RES,CARBON FILM,470K OHM,1/8W,5%	4	R18,23,26,32
2	050-5102-0	RES,CARBON FILM,5.1K OHM,1/8W,5%	1	R63
2	050-5602-0	RES,CARBON FILM,5.6K OHM,1/8W,5%	6	R9,16,17,34,36,42
2	050-5603-0	RES,CARBON FILM,56K OHM,1/8W,5%	1	R50
2	050-6802-0	RES,CARBON FILM,6.8K OHM,1/8W,5%	1	R62
2	050-8202-0	RES,CARBON FILM,8.2K OHM,1/8W,5%	1	R64
2	060-1002-0	RES,METAL FILM,1.00K,1/8W,1%	2	R75,76
2	060-1213-0	RES,METAL FILM,12.1 K OHM,1/8W,1%	2	R73,74
2	060-1274-0	RES,METAL FILM,127K,1/8W,1%	1	R37
2	070-1513-0	POT,50K-15A,7MM,KNURL, .1W	1	R61-volume pot
2	070-1514-0	POT,50KB,7MM,KNURL, .1W	6	R14,21,28,38,43,51-boost, presence, EQ's
2	070-1522-0	POT,2KB,7MM,KNURL, .1W	2	R6,56-master, contour pots
2	090-0007-0	SWITCH,8A/128A,250V,PP,PCB	1	S1- power swich
2	090-0012-0	SWITCH,MINI PP,DPDT,.1A BRK/MAKE,PC TER	5	S2,3,4,5,6-all switches
2	092-0010-0	FASTON,M,PC,.25"	2	J1,2
2	092-0081-0	JACK,1/4",MONO,PC,NON GROUNDING	4	J6,7,8,9-tuner, input, send, return jacks
2	092-0084-0	C0N,XLR,MALE,PC,PL,SCREW MNT	1	J5-direct out jack
2	093-0051-0	HDR,2MMX2,VERT,MALE,LOCK	1	J3
2	093-2005-0	HDR,2MMX7,VERT,SHROUDED	1	J4
2	100-0119-0	SPACER,LED,NYLON,.250"	3	
2	145-0120-D	400RB-III,PRE AMP BOARD RAW	1	