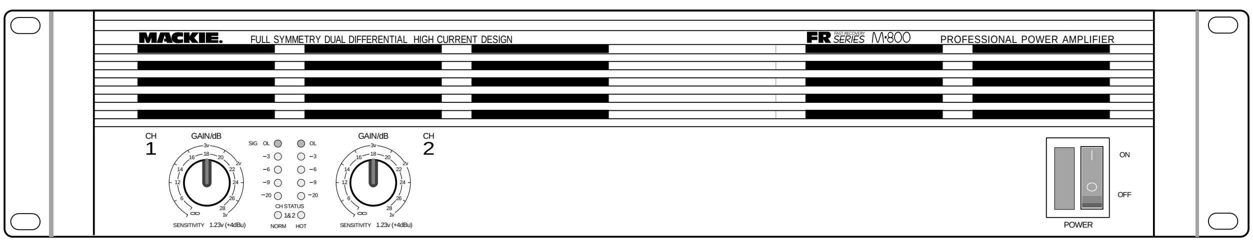
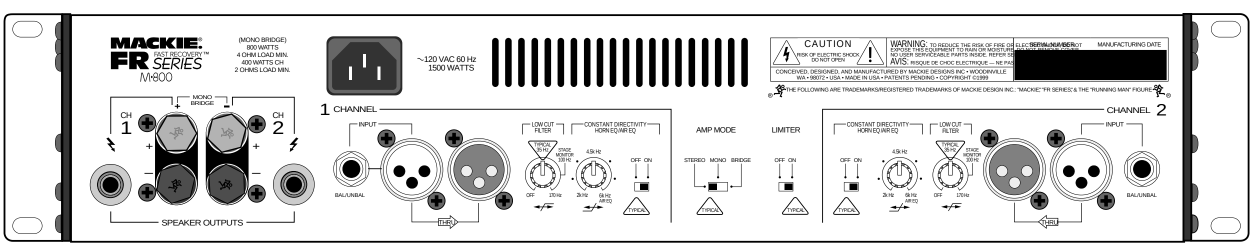
MACKIE®

M800

FR series power amplifier





SERVICE MANUAL

820-215-00

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CONFIER L'ENTRETIEN AU PERSONNEL QUALIFIE

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CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK DO NOT REMOVE THE COVER (OR BACK) NO USER SERVICEABLE PARTS INSIDE REFER SERVICING TO QUALIFIED PERSONNEL

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This apparatus does not exceed the Class A/Class B (whichever is applicable) limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

ATTENTION :Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant las limites applicables aux appareils numériques de class A/de class B (selon le cas) prescrites dans le réglement sur le brouillage radioélectrique édicté par les ministere des communications du Canada.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio energy and, if not installed properly and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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.

Le symbole éclair avec point de flèche à l'intérieur d'un triangle équilatéral est utilisé pour alerter l'utilisateur de la présence à l'intérieur du coffret de "voltage dangereux" non isolé d'ampleur suffisante pour constituer un risque d'éléctrocution.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Le point d'exclamation à l'intérieur d'un triangle équilatéral est employé pour alerter les utilisateurs de la présence d'instructions importantes pour le fonctionnement et l'entretien (service) dans le livret d'instruction accompagnant l'appareil.

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INTRODUCTION

SERVICE ON THIS EQUIPMENT IS TO BE PERFORMED BY
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This manual contains basic service information. It is essential that you have a copy of the user's manual as this contains the complete operating instructions.

SERVICE TECHNICAL ASSISTANCE

Mackie Designs, Service Technical Assistance, is available 8AM - 5PM PST, Monday through Friday for Authorized Mackie Service Centers, at 1-800-258-6883. Feel free to call with any questions and speak with a carefully-calibrated technician. If one is not available, leave a detailed message and a qualified Mackoid will return your call asap.

DISCLAIMER

Click on an item to open that page

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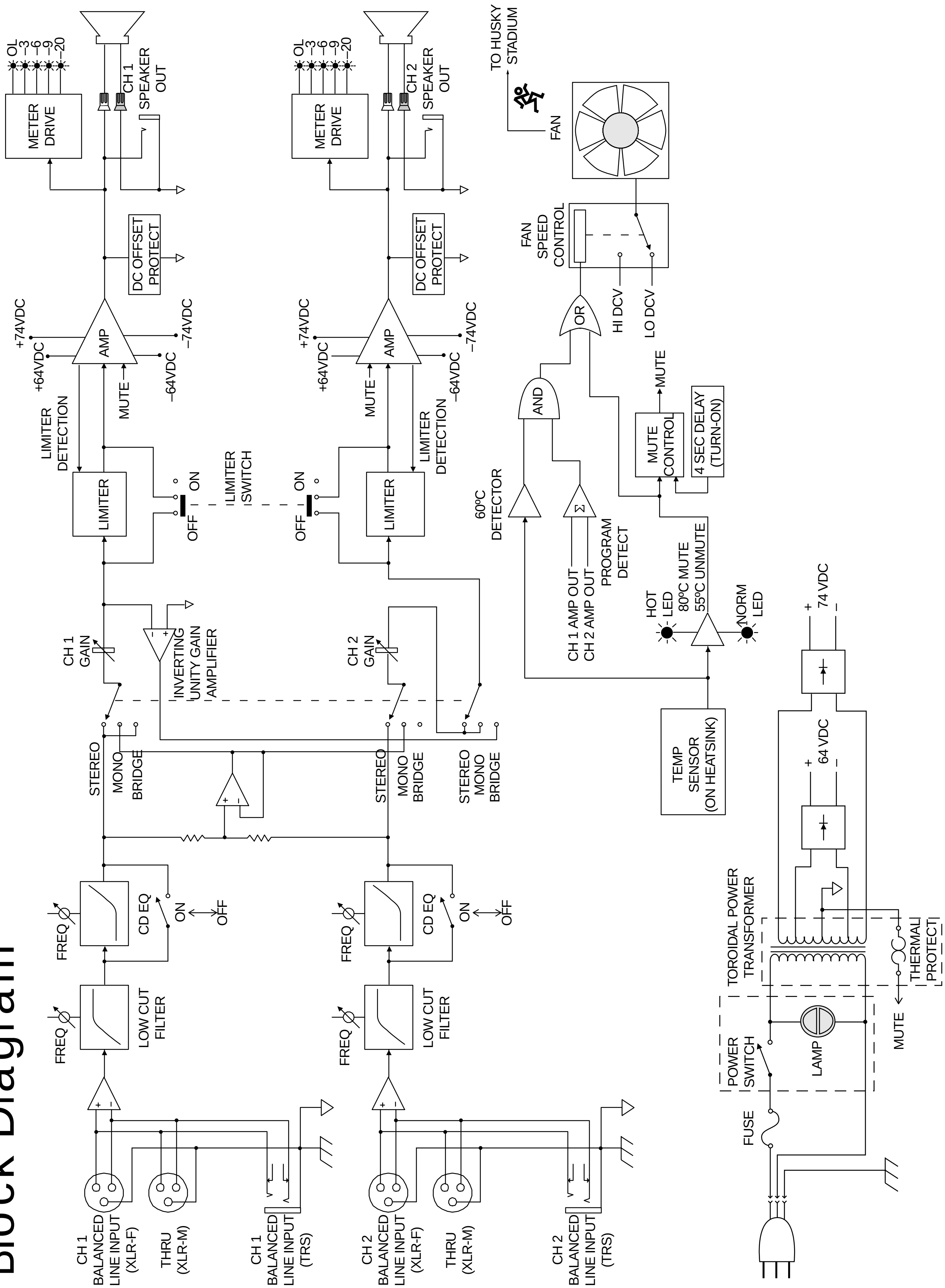
Block Diagram



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Specifications

Maximum Power, mid band:

175 watts per channel into 8 Ω
275 watts per channel into 4 Ω
400 watts per channel into 2 Ω
550 watts into 8 Ω bridged
800 watts into 4 Ω bridged

Note: Power ratings are specified at 120VAC line voltages.

The M•800 power amplifier draws large amounts of current from the AC line with continuous sine wave testing. Accurate measurement of power requires a steady and stable AC supply. This means the line impedance must be very low to insure that the peak AC line voltage does not sag to less than 97% of its value.

If driving highly reactive loads, we recommend that the limiter circuit be engaged.

Continuous sine wave average output power, both channels driven:

150 watts per channel into 8 Ω from 40Hz to 20kHz, with no more than 0.025 % THD

225 watts per channel into 4 Ω from 40Hz to 20kHz, with no more than 0.05 % THD

280 watts per channel into 2 Ω from 40Hz to 20kHz, with no more than 0.1 % THD

Bridged mono operation:

450 watts into 8 Ω from 40Hz to 20kHz, with no more than 0.05 % THD

560 watts into 4 ohms from 40Hz to 20kHz, with no more than 0.1% THD

Power Bandwidth:

20Hz to 70kHz (+0, –3 dB)

Frequency Response:

20Hz to 40kHz (+0, –1 dB)
10Hz to 70kHz (+0, –3 dB)

Distortion:

SMPTE IMD, TIM (250mW to rated power)
< 0.025% @ 8 Ω
< 0.05% @ 4 Ω
< 0.15% @ 2 Ω

Signal-to-Noise Ratio:

> 104 dB below rated power, 4 Ω

Channel Separation:

> 70 dB @ 1kHz

Damping Factor:

> 250 @ 400Hz

Input Impedance:

20kΩ balanced bridging

Input Sensitivity:

1.23 volts (+4 dBu) for rated power into 4 Ω

Voltage Gain:

28.0 dB

Maximum Input Level:

9.75 volts (+22 dBu)

Rise Time:

< 5µs

Slew Rate:

Voltage Slew Rate
> 40V/µs
> 80V/µs bridged

Current Slew Rate
> 20A/µs at 2 Ω

CMRR:

> 40 dB, 20Hz to 20kHz

Load Angle:

8(±jx) time independent at 8 Ω
4(±jx) time dependent, T > 6 min. at 4Ω
2(1±jx) time dependent, T > 2 min. at 2Ω

Transient Recovery:

< 1µs for 20 dB overdrive @ 1kHz

High Frequency Overload and Latching:

No latch up at any frequency or level.

High Frequency Stability:

Unconditionally stable driving any reactive or capacitive load.

Turn On Delay:

3-4 seconds

Variable Low-Cut Filter:

10Hz (Off) to 170Hz, 2nd Order Bessel

Constant Directivity High Frequency Boost:

2kHz to 5.5kHz (+3 dB points)
6 dB/octave high-frequency shelving filter, (shelving occurs at approximately 30kHz)

Limiter Section:

Complementary Positive and Negative Peak Detecting

Indicators:

5 meter LEDs per channel
–20, –9, –6, –3, OL (Overload)

TEMP STATUS
NORMAL/HOT LEDs

continued.

specifications continued.

Power Consumption:

55 watts	at idle
400 watts	with musical program fully loaded (4 Ω per side, or 8 Ω bridged)
600 watts	with musical program fully loaded (2 Ω per side, or 4 Ω bridged)
550 watts	at rated power into 8 Ω (continuous sine wave)
950 watts	at rated power into 4 Ω (continuous sine wave)
1500 watts	at rated power into 2 Ω (continuous sine wave)

AC Drop-out Voltage:

At approximately 65% of rated line voltage

Physical:

Height	3.5 inches (89mm)
Width	19.0 inches (483mm)
Depth	15.25 inches (387mm)
Overall Depth	16.25 inches (413mm)
Weight	28 pounds (12.7kg)

Disclaimer

Since we are always striving to make our products better by incorporating new and improved materials, components, and manufacturing methods, we reserve the right to change these specifications at any time without notice.

Owner's manual addendum

NOTE: The specifications are from the owner's manual addendum, and not from the initial release of the owner's manual. Since the owner's manual was produced, there have been a few other changes as follows:

Bridge Mode

The amplifier can accept inputs from Channel 1 and from Channel 2. If you do this, the two inputs will be summed and the result sent to the Bridge Mono output. Only Channel 1's gain pot will control the overall volume. However, you must adjust the CD-EQ and Low-Cut Filter correctly on each input used.

The Meters

The meters indicate the power level referenced to the clipping point of the amplifier, not to the rated power.

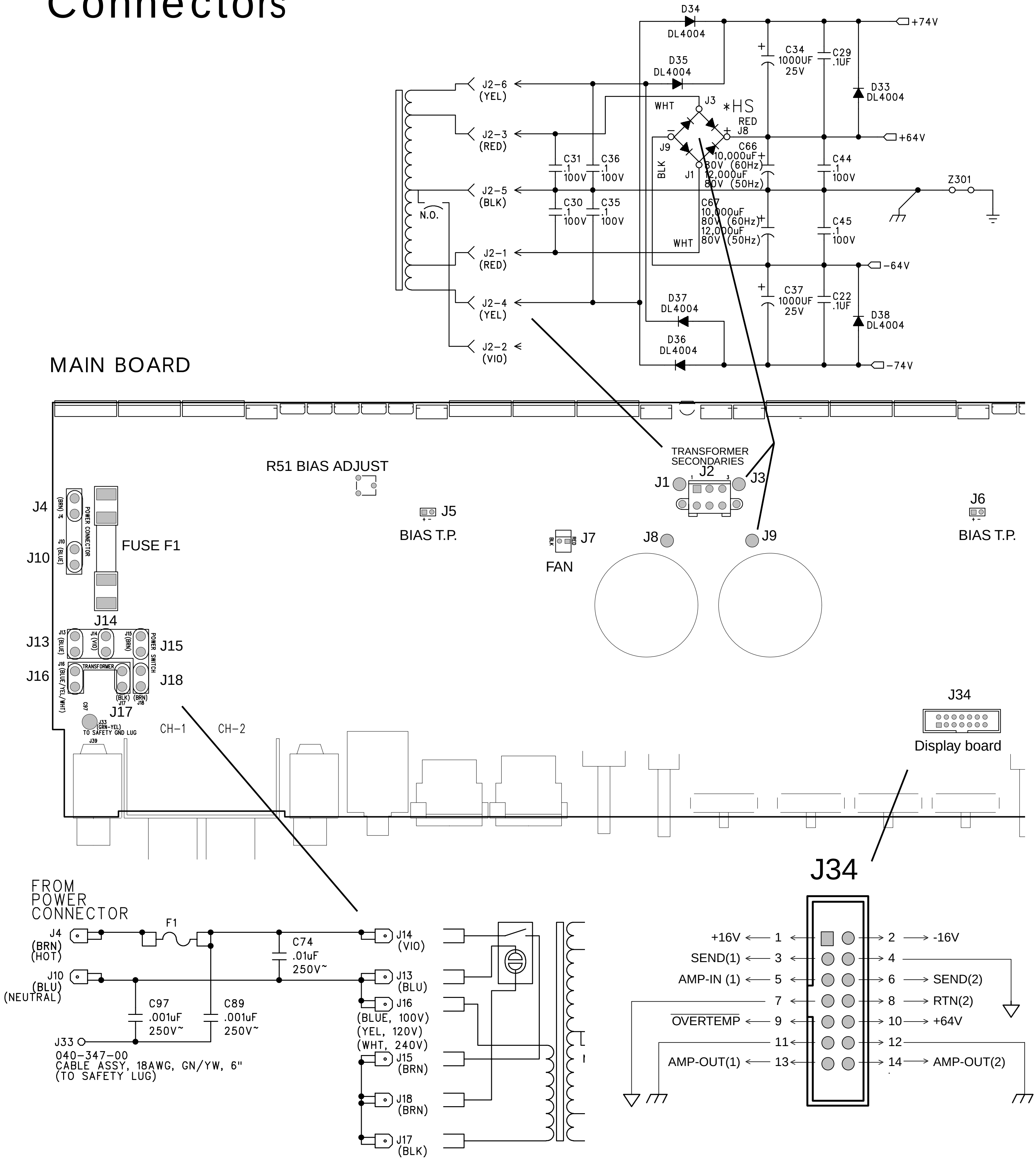
AC Power Considerations

The amplifier will continue to operate down to 65% of the rated line voltage, and will mute if the line drops lower than this.

The table below shows the average and peak current draw from a 120VAC line for various speaker loads. For example, if you are running the amplifier in stereo using 2 Ω speakers, the average current draw from the 120VAC line is 7 amps.

Amplifier Loading	Average Current Required	Peak Current Required
2 Ω per side or 4 Ω bridged	7 A	16 A
4 Ω per side or 8 Ω bridged	4.5 A	11 A
8 Ω per side or 16 Ω bridged	3 A	6.5 A

Connectors



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Troubleshooting tips - output failures

After a catastrophic failure, it is likely that the main supply fuse will be blown. Replace the fuse and ***very slowly*** bring up the Variac while monitoring line consumption. It is likely that substantial line current will be pulled due to shorted output parts.

Remove the main board from the unit and check for shorted output transistors. If one bad output transistor is found, replace all six in the channel. When an output device shorts it can place high current stresses on the other output parts. These output parts can fail over time. Since long term reliability is paramount, please replace all the outputs.

All six of the 5W 0.51Ω emitter resistors must be verified for proper value. Any off-tolerance, or open parts, need to be replaced. An off tolerance (higher resistance) emitter resistor will prevent its related output transistor from “doing its share” and will place more stress on its mates in the output section. Also verify the 6 base drive resistors (2.2Ω, 1/4W, fusible) are all OK. Verify that the drivers and pre-drivers are not shorted. If one driver is shorted, replace it’s mate. Do the same with the pre-drivers. Also check all the resistors surrounding the drivers and pre-drivers. Note: if you change any fusible resistors, you must use identical replacement parts.

Check the VI limiters and detectors. It is not uncommon to damage these parts when the amplifier fails in a spectacular way! Look for shorts on Q32, Q35, Q36 and Q39. Verify proper value on the resistors that go to the bases of these devices. It is critical that these sections are working correctly. Shorted transistors can cause some odd asymmetrical clipping problems. Open parts will not allow the current limiting to operate effectively. If problems exist in these sections the amplifier might fail into a short, or might clip prematurely when loaded to 2Ω.

All of the above trouble shooting (not including part replacement) takes perhaps 15 to 20 minutes to do. If you take the time, and do all that is indicated above, it will allow 99% of the amplifiers to come up the first time! Trying to hurry, and skipping what is suggested, can lead to a frustrating and time consuming repair.

Slowly bring up the supply and verify that line consumption isn’t excessive and that the output is centered (no DC offset). It might be desirable to defeat the amplifier muting (connect U4-14 & 12 together) temporarily so the amplifiers are active even when the supplies are still very low. If the amp stays centered, verify that it will pass a nice clean sine wave. Remove any test jumpers, and proceed to the safety test and the “bias and test procedure” section on the next pages.

Safety test

You must perform the following leakage test before returning the unit to your customer. Take every safety precaution to protect yourself while doing this test.

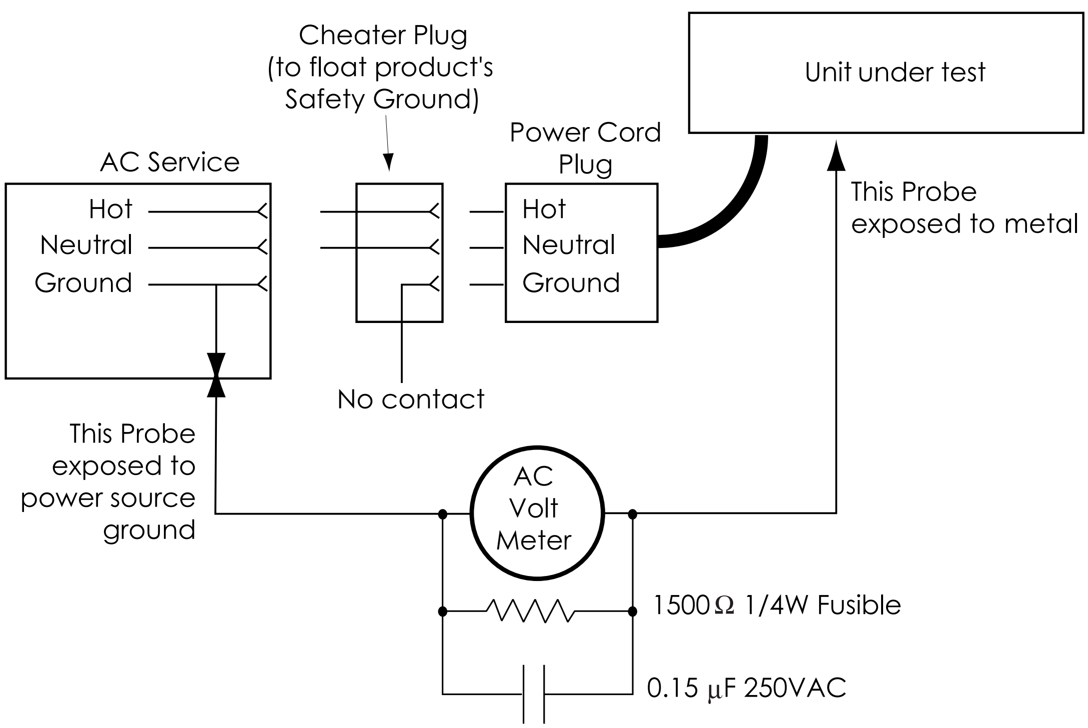
1. Make a small loading RC circuit as shown in the diagram below, and connect the AC volt meter between the AC power source ground and any exposed metal on the unit under test.

2. Connect the unit under test to an AC power source using a ground-lift adaptor, leaving the unit's safety ground floating. Turn the unit on.

3. The meter reading should be less than 750mVAC (note: this is equivalent to 0.5mA of leakage current).

4. Flip the plug over in the receptical so the hot and neutral are swapped.
   Verify that the reading is still less then 750mVAC.

5. If either reading is greater than 750mVAC, then you must investigate and repair the unit before returning it to your customer.



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Bias and test procedure

After the unit has been repaired, the following should be done to assure long term reliable operation. If a distortion analyzer is present, distortion specifications should be verified.

1. Adjusts bias in both channels (R51 & R60) for 30mV +/- 2mV at bias test points (J5 & J6) after unit has idled for a few minutes. With Full AC line voltage applied to unit, it will pull around 55W from the line (700mA at 120V). Measure for DC offset on both output connectors. DC offset should be less than +/- 50mV.

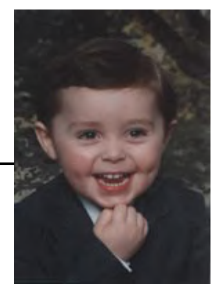
2. Apply a 1KHz sine wave to the inputs and verify that the unloaded outputs have a waveform that is symmetrical and undistorted. Drive the outputs into clipping and verify symmetrical "flat-topping" on the waveform.

3. Reduce output levels, install the 0.1uF capacitor jumper from the output to ground connections, and verify that clipping behavior is proper. Verify that no high frequency oscillation occurs near and at clipping (parasitic oscillation).

4. Remove capacitive loading and minimize sine output. Verify and re-adjust bias if required. Note that the bias will not drift appreciably in a unit that is functioning properly.

5. Connect the amplifier directly to the AC line and connect an 8Ω dummy load to both channels. Bring sine wave level up on both channels and verify symmetrical clipping. The output will clip somewhere between 90V - 110V pk/pk depending on how stiff the line is. Clipping should be as described above. Add the 0.1uF capacitive loading and verify clipping is still well behaved.

6. Individually load Channel 1 and Channel 2 with 2Ω. Clipping should be symmetrical, well behaved , and occur somewhere around 60V - 80V pk/pk. Verify that clipping is well behaved after adding the 0.1uF capacitive loading. My boss told me that I should include a picture of "well behaved," so here is a picture of my boy Joe.
I hope this clears up any misunderstanding.



7. Remove loading and reduce output level to 20V pk/pk and short first channel one and then channel two. When one channel is shorted the product should pull around 250W from the AC line. If the power pulled from the line is substantially higher (290W or more) look for failed parts in the VI limiters. ***Immediately*** remove the short when the power consumption is excessive to prevent re-damaging the output stage!

8. Place amplifier in bridge mode and connect 4Ω loading to bridge outputs (across both "+" output binding posts). Slip some card stock between the heatsink-outlets and chassis sides. Monitor one of the outputs, and adjust for a 45V pk/pk sine output (250W of output power bridged). After a few minutes the fan will begin running fast (heatsink at 60°C) and a short time later the amplifier will mute (heatsink at 86°C). The "Hot" LED will come on. Remove card stock and after a few minutes the amplifier will come out of mute mode and the "cold" LED will return.

9. Disconnect loading and remove drive. Reconnect amplifier to Variac and confirm that the idle consumption is roughly 55W or 700mA, as before. Connect the amplifier to speakers and verify that it sounds OK with music.

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Circuit Theory

Much of the circuitry in the M•800 is self explanatory from the schematics. This section will explain the unique circuits and architecture. Samples in this section will refer to Channel-1 for circuitry that is identical on both channels.

INPUT CIRCUITRY

The signal path begins at the 1/4" TRS and XLR input jacks. Following Channel-1's input, signal is fed to a unity gain differential op-amp, U6A. The signal is next sent to U6B which serves as both HPF, and CD horn EQ. The output of U6B is sent to mode switch, SW2, and also to Summing amplifier U8A. The output of SW2 feed both front panel volume controls, R2 and R25, which in turn feed unity gain buffers, U1A & B, (all on the display board) before returning to the main board. In stereo mode, the signals on the channel-1 and 2 inputs are routed through the front panel level controls, directly to their respective power amplifiers. U8A's summed signal is used to drive both front panel level controls in dual mono mode, with these signals being routed to both power amplifier inputs. In bridge mode, U8A's summed signal is fed to the channel-1 level control , and the output of the level control feeds both the channel-1 power amplifier, and unity gain inverter U8B. The output of inverter U8B feeds the channel-2 power amplifier.

POWER AMPLIFIER CIRCUITRY

The M•800 use a class AB triple darlington output stage, with complementary output devices. The output stage has a voltage gain of slightly less than 1 and extremely high current gain. The high current "output" parts (Q1-Q3 & Q11 - Q13) pull current from the +/- 64V supplies. Drivers (Q4 & Q10), Pre-drivers (Q5 & Q9), as well as the voltage-amp, are powered from the +/- 74V supplies. Powering theses stages from the higher +/-74V rails results in lower output stage saturation voltages (less dissipation on the heatsink, so the amp is more efficient and runs cooler) and improved linearity (intrinsically lower distortion). In the event of a catastrophic amplifier failure, the triple darlington output stage is peppered with several fusible resistors to minimize damage.

Q6 and Q8 are the outputs of the second stage of voltage amplification, and can be thought of as current sources. These current sources are prevented from turning both positive and negative current amplifiers on hard by the bias network. The bias network consisting of V-BE multiplier Q7, and Buffer Q30, adjusts the voltage across C14 to a point where the output stage just begins to conduct current (adjusted by the technician for 30mV across J5 the bias test points). This "bias" current is needed to eliminate the conduction dead-zone that would otherwise exist close to zero volts. This dead-zone is also referred to as crossover distortion. This bias voltage across C14 needs to decrease as the output stage temperature increases. This is why V-BE multiplier transistor Q7 is mounted to the heatsink. Without this thermal tracking, the output stage would conduct more and more current as it heated-up, resulting in eventual amplifier failure. This undesirable condition is commonly referred to as thermal run away.

Given the very high current gain of the output stage, if asked to, this stage can deliver enough current to the load to destroy itself. To protect against this, VI limiting is employed. Simply stated: if the output stage try's to supply unsafe amounts of power, Q32 and Q35 divert drive current from the output of the voltage amp (Q6 and Q8) that was meant for the pre-drivers. Near zero crossing, if the voltage drop across either emitter resistor (R14, R53) gets greater than .6V, then Q32 or Q35 conduct, limiting the output stage current. As the output stage gets closer to the supply rails it is capable of sinking more current, so the drop across the emitter resistors is divided down by R26, R27, R28, D21 and R75, R74, R73, D26. Also included in this VI limiter is energy sensing, which is a fancy way of saying that for a short time (I.E. a musical

continued.

transient) the output stage is allowed to drive even higher amounts of current. This is accomplished by AC dividers consisting of R26, R76, C16 and R75, R87, C21. C17 and C20 provide for high frequency stability of the limiter, and D22 and D25 isolate this stage from the rest of the amp, when not being used.

It's important that the output stage never saturates. When an output stage saturates, it slows down, resulting in higher distortion (bad) and common mode conduction (real bad because this can blow-up a power amp). Common mode conduction is where both the positive and negative half of the darlington conduct at the same time, not a good thing! To prevent saturation, a Baker clamp is employed. For positive going signals, as the amplifier clips, Q52 and D1 conduct and hold the Voltage at the collector of Q6, 2 diode drops above the +64V supply. D6, D5, D23, the drop across Q5-BE, and Q4-BE, result in the voltage on the base of the output parts being three diode drops (1.8V) below the +64V rail. Since the base of the outputs can never be any greater than 1.8V below the collector, the output stage can not saturate. The negative Baker clamp functions the same way.

The second stage voltage gain is set via R104, R105, R80, R79, R81, and R82. The gain is somewhat less than the simple ratio of these parts due to the limited transconductance of Q42 and Q43. On the positive half, Q41 acts as a unity gain buffer and it's output drives Q42. The output of Q42 feeds common base amp Q6 forming a cascode, with D7, C10 R2 and R50 being biasing and decoupling elements. The negative half, made up of Q44, Q43 and Q8, is a mirror of the positive half. The topology of this stage has intrinsically lower distortion, better high frequency response, and substantially better defined voltage gain, than many other commonly used topologies. The quiescent current in both of these stages is determined by the voltage drop across R100 and R109. D41 -D44 allow the second stage quiescent current to remain constant, as temperature changes.

The first stage is fully complimentary and differential in design. Overall input to the system, and all feedback for the amplifier occurs in this stage. Differential pairs Q56, Q57, Q58 and Q59 are cascode coupled to the second stage via Q40 and Q45. The gain of the first stage is determined by the transconductance of the differential pairs, R121, R122, R126, R127, R100 and R109. Current to this stage is provided by constant current sources Q66 and Q65. The current sources can be switched on and off in tandem via Q67, which allows the amp to be turned on or muted silently (no pop presented to speaker outputs). D65 and D64 linearize these current sources with temperature. Again this first stage of the amplifier is quite linear, has good frequency response, has well defined gain, and has excellent common mode and power supply rejection. All these things are quite important, as negative feedback can only provide optimum correction if it is summed in a very linear stage.

Open loop pole number one is determined by C18, C19, and R79-82. The second open loop pole is determined by C32, R102, R100, C33, R107, and R109. The open loop zero is determined by C32, R102, C33, and R107. The final loop compensation is the feedback zero composed of C49 and R145. Closed loop gain of the amp is 27 and is set by R123 and R145. C48 and R123 roll-off the amplifier's gain at low frequencies. At DC, the amp has a closed loop gain of 1.

The amplifier has well defined open loop gain. The loop compensation is dominated by the above mentioned parts, and is not sensitive to circuit parasitics. The voltage amp has intrinsically low distortion. The high current gain of the output stage effectively isolates the load from the voltage amplifier. Consequently Mackie can get nice low distortion numbers, with less negative feedback than the competition. Less feedback, and good frequency response, results in a very stable amplifier (it won't oscillate).

To further insure stability of the amplifier, the output node is de-coupled from the load via L5, R187-R189. The values of these parts have also been selected to ensure good transient response (i.e. square waves look like square waves, so the amplifier doesn't sound unnaturally bright). The output stage also sees a defined load at high frequencies, made up of R181 and C75. D17 and D18 protect the output stage from situations when energy from the speaker (counter-EMF in the speaker's voice coil) might try and drive the output note above the +64V supply or below the -64V supply. These parts are referred to as flyback diodes.

All things above, meld together to make for a better sounding amplifier when not driven into clipping. When driven into clipping, the above mentioned Baker clamps, and the smaller amount of negative feedback, also allows the amplifier to sound better than the competition. After coming out of clipping the amp immediately returns to normal operation, faithfully following the musical input signal. Other amps, of more conventional design, take a finite amount of time to "catch up" before they begin to follow the input signal again. Mackie refers to this phenomenon as "latching". The "FR-Fast Recovery series" isn't just marketing buzzwords: It really does result in a more reliable, and better sounding product, with "good" performance numbers.

The power amp's limiter circuit is implemented with an LED / LDR (Light dependant resistor) opto-coupler, and the Baker clamps. Referring to the positive Baker clamp: when the amplifier clips, D1 and Q52 forward bias. This current originating at the collector of Q6 also flows out the collector of Q52. The current flows through the LED in the opto. (U2A) which in turn decreases the LDR's resistance (U2B). Since R146 and U2B form a voltage divider, as U2B's resistance decreases, the drive to the power amp decreases (limited). Negative clipping activates the LED in the same fashion through Q53. The limiter is defeated by shorting together LIM1(1) and LIM1(2) at SW3 which shorts across the U2A LED.

In the event that the power amplifier does fail, Crow-bars protect the speakers connected to the output terminals. Referring to Page-3 of the 212 schematic: Q74 is turned on a few hundred milliseconds after DC is present on the output line. When DC is present, R140 and R169 begin to charge C68. When the voltage across C68 gets to around 10V, silicon bilateral switch Q72 turns on, dumping current through R183 to the Gate of Q74, turning on Q74, and shorting the output line to ground.

THERMAL MANAGEMENT

The M•800 T-Design Heatsink/Fan cools output devices evenly, and does not collect dust on the circuitry. The fan operates at two speeds, controlled by the amplifier. An LM35DZ, mounted in the center of the heatsink, provides temperature information to the fan control and overtemp circuits. There is also a thermal breaker in the power transformer.

FAN CONTROL CIRCUIT

The fan runs at two different speeds. When running fast, around 27V is across the fan. Voltage is supplied to the fan by follower Q14 and the reference for this follower is derived from D59, D46 and R137. When running slow, around 15V is on the fan. In slow mode Q60 turns-on, acting as a saturated switch, shorting out D59.

The fan speed increases in the following instances:

- At turn on. To give the Fan an extra "goose" to get it spinning. At turn on Pin-11 of U5 (non inverting input) is lower that pin-10 (inverting). This makes the output (Pin-13) low and Q60 turns off. The fan runs fast. A half second later, C82 charges enough to allow pin-13 to go high, turning on Q60 and making the fan run slow.

continued.

fan control continued.

The fan speed increases in the following instances:

- When the heatsink is above 86°C. Comparator U5B's output switches low when the heatsink-mounted temperature sensor's output voltage increases to 860mV (86°C). The output of U5B is coupled to the fan controller via D80. Note: hysteresis for the overtemp detector is supplied by R177 and R179, so that the heatsink temperature must decrease to 61°C (610mV) before the circuit resets and the fan begins to run slow.

- When the amplifier is playing loud enough *and* the heatsink temperature is above 60°C. When the temperature is above 60°C, the voltage at U4-7 is above 600mV. This "opens" output U4-1. When program material is sufficient to drive U4-5 above 5V (D75 and D76 charging C70 through R193) output pin U4-2 also opens, and R174 is allowed to pull this line high. With U4-10 high, the output of U4-13 goes low, allowing the fan to run fast.

AMPLIFIER MUTING

The amplifier is muted in the following instances:

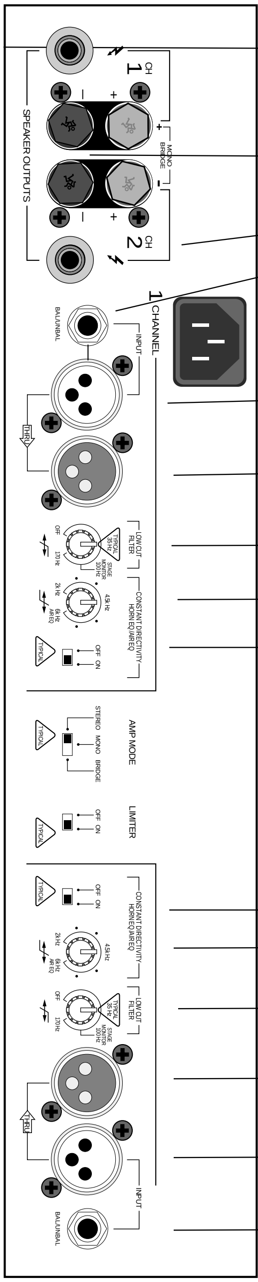
- At turn on. C79 is low at turn on and is charged by R195. When U4-8 goes above U4-9 (after about 4 seconds) output pin U4-14 goes low, turning on the power amps.

- When the heatsink rises above 86°C. U5-2 goes low and this is coupled to C79 Via D79. 4 seconds after the heatsink cools to 61°C, C79 charges enough to again un-mute the amps.

- When the AC supply voltage goes below 65% of nominal. At high voltage levels D67 is able to charge C60 enough to reverse bias Q68. As the AC input voltage is reduced to 65% or less, R155 is no longer able to offset the current through R154. This turns on Q68 which again resets C79 and mutes the amps.

- When the power transformer's core gets above 130°C. A thermostat in the transformer shorts to ground (J2-2). With J2-2 at ground potential, Current flows through R156 which turns on Q68 and mutes the amps.

Quick Parts



1/4" JACK, MONO 400-118-00

QUAD CONNECTOR400-237-00

1/4" JACK, MONO 400-118-00

1/4" JACK, STEREO 400-287-00

IEC SUB ASSY 080-135-00

XLR FEMALE 400-131-00

XLR MALE 400-175-00

POT 130-073-00, KNOB 760-110-00

POT 130-072-00, KNOB 760-110-00

ALL SWITCHES 500-042-00

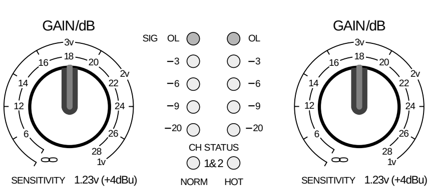
POT 130-072-00, KNOB 760-110-00

POT 130-073-00, KNOB 760-110-00

XLR MALE 400-175-00

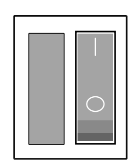
XLR FEMALE 400-131-00

1/4" JACK, STEREO 400-287-00



POT 130-070-00
KNOB 760-061-00

LED RED 304-070-00 (OL, HOT)
LED GREEN 304-071-00



SWITCH 500-022-00

HOME

M800 PARTS LIST

Parts Numbering guide

040- Cables
055- Finished PCB Assy
100- Pots and resistors
200- Capacitors
300- Semiconductors
400- Jacks/Connectors
500- Switches
510- Fuses
550- Chassis Metalwork
600- Transformers
601- Inductors
610- Wires and Cables
640- AC line cords
700- Hardware
760- Knobs/Plastic
770- Fans
790- Misc./Packing
800- Printed Material
860- EPROM

Click on any item to open that page

Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.

HOME

Master Parts List

Part #	Description	Rev	Qty	Notes
090-107-00	M800 AMP 120V	A3 A1	1	
090-107-01	M800 AMP 230V	A1	1	
090-107-02	M800 AMP 100V	A2	1	
070-107-XX	BOMSHELL M800	A	1	
040-240-00	RIB 28GA 14C .100 16IN	A	1	
040-242-00	DIS 18G 1010 GRYL 5IN LQD	A	1	
040-312-00	DIS 18GA 1010 BRN 7.75 QK	A	1	
040-313-00	DIS 18GA 1010 BLU 7.75 QK	A	1	
055-218-00-01	PCB ASSY DISPLAY M800	A A1	1	See page A-6
080-035-00	PWR SW HARNESS - AMP	A	1	
080-105-00	SA HEATSINK M800	A1 A1	1	See next page
080-135-00	SA IEC ASSY M800	A	1	
500-022-00	SW RCKR ILLUMINATED	A	1	
550-249-00	PLATE XFMR .335IDX4.528OD	1	AR	
550-380-00	SCR CHASSIS M800 AMP	A	1	
550-381-00	PNT LEFT SIDE M800	A	1	
550-382-00	PNT TOP COVER M800 AMP	A	1	
550-560-00	PNT RT SIDE M800	A	1	
550-562-00	BRKT PLENUM M800	A	1	
551-029-50	EXTR SCRN DSPLY BZL M800	D	1	
700-005-00	SEMS 8-32X1/2 PHP BLKZC	A	4	
700-011-00	MCH 4-40X1/4 BTNSKT BLKOX	A	4	
700-028-01	SEMS 6-32X5/16 PHP BLKZC	B	24	
700-033-04	TF 8-32X3/8 PHP BLKZC	A	4	
700-041-04	MCH 6-32X3/8 FL 100DG BLK	A	7	
700-085-03	SCR PHP M3X6 STL BLK ZC	A	4	
700-086-00	TF 6-32X3/8 FL 100DG BLK	A	4	
700-106-00	BOLT HEX 5/16X23/4 ZC GD5	A	1	
701-016-00	5-20X5/16 PHPII TYP B BLK	A	8	
705-001-00	KEPNUT 6-32	A	6	
705-008-00	NUT LOCK 8-32	A	4	
705-015-00	NUT SLOT NCKL	A	2	
705-019-00	NUT STOVER LOCK 5/16X18	A	1	
705-029-00	NUT HEX W/400-287-00	A	AR	
710-001-00	WASH STAR 3/8 OD .02 THK	A	2	
710-019-00	WASH FIBRE BLK	A	2	
710-024-00	WASH FLAT 5/16 HARD (USS)	A	2	
710-046-00	WASH FLAT W/400-287-00	A	AR	
720-014-00	TAPE ELEPHANT SKIN 1.25X2	A	1	
720-015-00	TAPE ELEPHANT SKIN.75X2.5	A	1	
730-016-00	LOCTITE 242	A	AR	
730-025-00	LOCTITE 222	A	AR	
740-003-00	TYRAP 8IN BLK	A	1	
750-001-00	BUMPON ROUND BLK .63X.31	A	4	
760-061-00	KNOB VOLUME AMPS	A	2	
760-110-00	KNOB 9MM BLU/LIGHT GREY	A	4	
770-005-00	FAN 80MM 24VDC	A	1	
780-111-00	WASH RUB (W/TRANSFORMER)	A	2	
790-002-00	BAG POLY 12 X 18 2MIL	A	1	
790-022-00	POLY-SHEET 52CF X 26 4MIL	A	1	
800-092-00	BOX M800	A	1	
800-133-00	SLEEVE M800	A	1	
810-056-00	INST TOP/BOTTOM - AMP		2	
820-079-02	OWN MANUAL M800 ADDENDUM		1	

Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.

Part #	Description	Rev	Qty	Notes
080-139-00	SA XFMR M800 120V/60HZ	C2	1	120v units
080-139-01	SA XFMR M800 240V/50HZ	C1	1	240v units
080-139-02	SA XFMR M800 100V/50HZ	C1	1	100v units
510-028-00	FUSE SB 10A 3AB 1/4X1-1/4	A	1	120v units
510-057-00	FUSE SB 3AG 5AMP	A	1	230v units
510-018-00	FUSE SB 15A 3AB 1/4X1-1/4	A	1	100v units
640-001-00	LC IEC SJT 10A/125V 6FT	D	1	120v units
820-079-00	OWN MANUAL M800		1	

080-105-00 Heatsink subassembly

Part #	Description	Rev	Qty	Notes
080-105-00	SA HEATSINK M800	A1 A1	1	
055-212-00-02	PCB ASSY M800	C3 C2	1	See page A-4
301-022-00	DIO PWR BRIDGE 25A 400V Q	A	1	
410-016-00	SILPAD DIECUT K6 M800	A	1	
550-396-00	BRKT TO-92 VERT M800	A	1	
550-563-00	BRKT XSTR CLIP M800	A	2	
551-066-00	EXTR FAB HEATSINK M800	A1	1	
700-035-04	TF 6-32X3/8 PHP CLRZC	A	6	
700-087-00	TF 4-40X5/8 TORX 1/4 WASH	A	4	
700-088-00	TF 4-40X5/8 TORX 3/8 WASH	A	12	
700-117-00	TF 10-32-3/4 PANHD TORX	A	1	
710-005-00	WASHER INT STAR NO.6 BLK	A	6	
710-036-00	WASH FLT STL NO.4 .030THK	A	3	
730-001-00	THERMAL JOINT COMPOUND	A	AR (as required)	
730-003-00	ADHESIVE INDSTRL 3M 4799	A	AR	

Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.

055-212-00 Rev C Main pcb assembly

PART NO.	DESCRIPTION	VALUE		REFERENCE DESIGNATORS
040-295-00	WIRE 18AWG WHT TERM/QD			J1 J3
040-296-00	WIRE 18AWG RED TERM/QD			J8
040-297-00	WIRE 18AWG BLK TERM/QD			J9
040-347-00	CABLE ASSY, 18AWG, GN/YW, 6			J33
100-017-00	RESISTOR CF	47	5%	R183-184
110-060-00	RES CF .25W 5% 3K OHM	3K	5%	R27-28 R36-37 R69-70 R73-74
110-065-00	RES CF .25W 5% 4K7 OHM	4K7	5%	R140-141 R169-170
110-079-00	RES CF .25W 5% 18K OHM	18K	5%	R193
115-427-00	RESISTOR CF	24K9	1%	R145 R165
123-045-00	RES MO 3W 5% 6.8 OHM	6.8	5%	R187-192
123-056-00	RESISTOR MOF	20	5%	R181-182
123-112-00	MO 3W 5% 4.3K	4.3K	5%	R137-139
125-032-00	RES WW 5W 5% .51 OHMS RAD	.51	5%	R12-17 R53-58
130-053-00	POT TRIM 200OHM 6MM HORIZ	200		R51 R60
130-072-00	POT, ROT TRA 9MM MONO	10KC		R227 R229
130-073-00	POT, ROT RTA 50KC 12MM DUAL	50KC		R223 R225
140-025-00	RESISTOR TF SMT	10	5%	R78 R83 R92 R97
140-051-00	RESISTOR TF SMT	120	5%	R185
140-064-00	RESISTOR TF SMT	430	5%	R197
140-066-00	RES TF SM .1W 5% 510 OHM	510	5%	R3 R8 R19 R22
140-074-00	RES TF SM .1W 5% 1K1 OHM	1K1	5%	R171 R186 R198
140-078-00	RESISTOR TF SMT	1K6	5%	R199 R201 R207 R230
140-082-00	RES TF SM .1W 5% 2K4 OHM	2K4	5%	R212 R214
140-085-00	RESISTOR TF SMT	3K3	5%	R176
140-087-00	RES TF SM .1W 5% 3K9 OHM	3K9	5%	R20-21
140-089-00	RESISTOR TF SMT	4K7	5%	R203 R205 R218 R220 R224 R228 R231-233
140-095-00	RES TF SM .1W 5% 8K2 OHM	8K2	5%	R172 R208 R210
140-096-00	RESISTOR TF SMT	9K1	5%	R180
140-101-00	RES TF SM .1W 5% 15K OHM	15K	5%	R18 R23 R79-82 R85 R90 R93-96
140-104-00	RESISTOR TF SMT	20K	5%	R151 R159 R173
140-111-00	RESISTOR TF SMT	36K	5%	R152 R158 R174-175 R179 R196
140-118-00	RESISTOR TF SMT	68K	5%	R178
140-119-00	RES TF SM .1W 5% 75K	75K	5%	R154
140-123-00	RES TF SM .1W 5% 100K OHM	100K	5%	R50 R52 R59 R61 R150 R153 R155 R157 R160 R194
140-137-00	RESISTOR TF SMT	390K	5%	R177 R195
140-147-00	RESISTOR TF SMT	1M	5%	R216-217
145-115-00	RES MF SM .1W 1% 15R4 OHM	15R4	1%	R121-122 R126-127 R129-130 R134-135
145-182-00	RES MF SM .1W 1% 76R8 OHM	76.8	1%	R102 R107 R112 R117
145-226-00	RES MF SM .1W 1% 221 OHM	221	1%	R76-77 R86-89 R98-99 R104-105 R114 R116 R125 R131
145-239-00	RES MF SM .1W 1% 301 OHM	301	1%	R2 R5-6 R9 R84 R91 R101 R108 R111 R118
145-285-00	RESISTOR MF SMT	909	1%	R123 R133
145-318-00	RES MF SM .1W 1% 2K00 OHM	2K00	1%	R1 R219 R221-222 R226
145-331-00	RESISTOR MF SMT	2K49	1%	R100 R103 R106 R109-110 R113 R115 R119-120 R136 R142 R146-147 R163-164 R168
145-389-00	RES MF SM .1W 1% 10K0 OHM	10K0	1%	R128 R143-144 R148-149 R156 R161-162 R166-167 R209 R211 R213 R215
145-397-00	RES MF SM .1W 1% 12K1 OHM	12K1	1%	R4 R7 R200 R202 R204 R206
145-427-00	RESISTOR MF SMT	24K9	1%	R124 R132
150-009-00	RESISTOR, FUSABLE, 1/4W	2.2	5%	R11 R24-25 R34-35 R39 R63-67 R71
150-025-00	RES FUS .25W 5% 10 OHM	10	5%	R10 R31
150-037-00	RES FUS .25W 5% 33 OHM	33	5%	R29 R32 R40-41 R43 R46 R48-49 R62 R72
150-045-00	RES FUS .25W 5% 68 OHM	68	5%	R30 R33 R44 R47
150-066-00	RES FUS .25W 5% 510 OHM	510	5%	R26 R38 R42 R45 R68 R75

Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.

PART NO.	DESCRIPTION	VALUE		REFERENCE DESIGNATORS
200-007-02	CAPACITOR MYLAR T&R	0.01		C8 C46
200-015-02	CAPACITOR MYLAR T&R	0.0047		C91 C94
200-023-00	CAPACITOR, POLY BOX	.001uF	20%	C89 C97
200-024-00	CAPACITOR, POLY BOX	.01uF	20%	C74
200-025-02	CAPACITOR MYLAR T&R	0.56		C90 C100-101 C114
200-027-02	PLY .1UF 5% 100V TR	0.1	5%	C30-31 C35-36 C40-45
200-041-00	PLY/FL .01UF 10% 250V	0.01	10%	C75 C78
200-046-02	PLY FILM 180PF 5% 630V TR	180pF	5%	C18-19 C25-26
212-001-00	CAPACITOR CERAMIC SMT	0.01	10%	C1-2 C5 C9-10 C13 C17 C20 C24 C27 C71-72 C81 C83 C86 C88 C98-99 C103 C112
212-002-00	CER 22PF 5% 100V COG SM	22PF	5%	C49 C54
212-004-00	CAPACITOR CERAMIC SMT	220PF	5%	C92 C95 C102 C104 C107-109 C113
212-006-00	CAPACITOR CERAMIC SMT	470PF	5%	C50 C53
212-009-00	CER 47PF 5% 50V NPO SM	47PF	5%	C85 C87 C93 C96
212-020-00	CER 750PF 5% 50V NPO SM	750PF		C32-33 C38-39
212-023-00	CER .001UF 10% 50V NPO SM	0.001	10%	C3 C6 C11-12 C57 C59 C63 C65
212-025-00	CAP CER .1UF 50V 10% X7R	.1UF	10%	C4 C7 C22 C29 C47 C51-52 C56 C76-77 C80 C84
220-002-02	LYT 47UF 20% 25V RAD TR	47UF	20%	C105-106 C110-111
220-004-02	CAPACITOR LYTIC RADIAL T&R	470UF	10%	C48 C55
220-027-02	LYT 10UF 20% 50V RAD TR	10UF	10%	C14-15 C58 C61-62 C64 C70 C73 C79 C82
(large caps) 220-033-00	LYT 10000UF 20% 80V RAD	B	2	C66, C67 (on main board for 120v units)
220-035-00	LYT 12000UF 20% 80V RAD	A	2	C66, C67 (for 230v and 100v units)
220-034-00	CAPACITOR LYTIC RADIAL	0.47UF	20%	C60
220-039-00	CAPACITOR LYTIC RADIAL	1000UF	20%	C34 C37
220-049-02	LYT 100UF 10V 20% RAD BIP	100uF	20%	C16 C21 C23 C28 C68-69
300-003-00	DIODE SIGNAL SMD	DL4148		D5-6 D8-9 D11-12 D14-15 D21-32 D40-45 D48-58 D60-66 D68-69 D74 D77-88
300-010-00	DIODE SIGNAL SMD	RLS245		D1-4 D67 D75-76
301-010-00	DIODE POWER	1N5404		D17-20
301-017-00	THY MBS4992	MBS4992		Q72-73
301-021-00	DIO PWR DL4004 SM	DL4004		D33-39 D47
301-026-00	TRIAC 200V 40A	MAC224A4		Q74-75
302-003-03	DIO ZEN DL4745 16V 1W	DL4745A		D70-73
302-013-03	DIO ZEN DL5242 12V SM	DL5242B		D59
302-016-03	DIO ZEN DL5234B 6.2V SM	DL5234B		D7 D10 D13 D16
302-022-03	DIO ZEN DL4744 15V 1W	DL4744A		D46
310-028-00	TRANSISTOR PNP	2SB940A		Q16
310-029-00	TRANSISTOR NPN	2SD1264A		Q14-15
310-033-00	TRANSISTOR PNP	MJL21193		Q11-13 Q17-19
310-034-00	TRANSISTOR NPN	MJL21194		Q1-3 Q27-29
310-035-00	TRANSISTOR PNP	2SA1478		Q6 Q9 Q21 Q24
310-036-00	TRANSISTOR NPN	2SC3788		Q5 Q8 Q22 Q25
310-042-00	TRANSISTOR NPN	MJE15032		Q4 Q26
310-043-00	TRANSISTOR PNP	MJE15033		Q10 Q20
310-049-00	TRANSISTOR PNP	2SA794A		Q7 Q23
311-001-00	XSTR NPN IMBT4401 SM	IMBT4401		Q30-32 Q39 Q60 Q65 Q68 Q71
311-002-00	X-SISTOR PNP SMD	IMBT4403		Q35-36 Q66-67 Q69-70
311-007-00	XSTR PNP 2SA1415	2SA1415		Q33 Q38 Q42 Q49
311-008-00	TRANSISTOR NPN SMD	2SC3645		Q34 Q37 Q43 Q48
311-009-00	TRANSISTOR PNP SMD	2SA1552		Q52 Q55
311-010-00	XSTR NPN 2SC4027-FA	2SC4027		Q53-54
311-019-00	TRANSISTOR PNP SMD	2SB792		Q41 Q45-46 Q50 Q58-59 Q61-62
311-020-00	TRANSISTOR NPN SMD	2SD814		Q40 Q44 Q47 Q51 Q56-57 Q63-64
320-012-00	OPAMP NJM4560M	NJM4560M		U6-8
323-002-00	I.C. QUAD COMPARATOR SMD	LM339		U4-5

Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.

212c

PART NO.	DESCRIPTION	VALUE		REFERENCE DESIGNATORS	
329-012-00	OPTO-ISOLATOR,LED/CDS	VTL5C10		U2-3	
329-014-00	IC, DEG C TEMPERATURE SENSOR	LM35DZ		U1	
400-061-00	CONNECTOR HDR STR 2P .100 X 1			J7	
400-079-00	CONNECTOR STR LCK SHRD 14P .100 X 2			J34	
400-118-00	CONNECTOR JACK 1/4 HORIZ PC MOUNT SLIM			J39 J41	
400-129-00	FUSE CLIP PC MT .25 DIA			Z306-307	
400-131-00	CON XLR PC MTG HORIZ FML SML NC3FAH1O			J42 J45	
400-133-00	HEADER, 2X3, MATE-N-LOCK	11A	600V	J2	
400-143-00	CONN, HDR, 3-PIN, UN-SHROUDED,			J11-12	
400-171-00	HDR 2P .100X1 STR			J5-6	(bias test points)
400-173-00	CONN QUICK DISC .250 W/STABLE-LOK TABS			J4 J10 J13-18	
400-175-00	CONN XLR 3PIN MALE RTA, A-SERIES			J43-44	
400-237-00	CONNECTOR, QUAD BANANA			J40	
400-287-00	CONNECTOR JACK 1/4 RTA STEREO PC MOUNT			J37-38	
450-212-00	PCB, MAIN, M-800			Z304	
500-042-00	SWITCH, SLIDE	4P3T		SW1-4	
550-392-00	SHIELD, GROUND M800			M1	
601-006-00	INDUCTOR, AIR CORE	1uH	10%	L5-6	
601-008-00	INDUCTOR	10uH		L1-4	
730-038-00	JET MELT 3M 3779-Q	A		AR	

218a 055-218-00 REV A Display pcb assembly

PART NO.	DESCRIPTION	VALUE		REFERENCE DESIGNATORS	
130-070-00	POT RTY 5K LIN 9MM 21DET	5KB	20%	R2 R25	(gain pots)
140-065-00	RESISTOR CF	470	5%	R26 R31	
140-068-00	RESISTOR TF SMT	620	5%	R7 R17	
140-076-00	RESISTOR CF	1K3	5%	R19	
140-081-00	RESISTOR CF	2K2	5%	R1 R24	
140-083-00	RESISTOR TF SMT	2K7	5%	R13-14	
140-087-00	RESISTOR CF	3K9	5%	R11	
140-092-00	RESISTOR CF	6K2	5%	R10	
140-094-00	RESISTOR CF	7K5	5%	R12	
145-338-00	RESISTOR MF SMT	2K94	1%	R8	
145-389-00	RESISTOR MF SMT	10K0	1%	R5 R16 R18 R23	
145-443-00	RES MF SM .1W 1% 36K5 OHM	36K5	1%	R6 R22	
145-454-00	RESISTOR MF SMT	47K5	1%	R28 R30 R32-33	
145-458-00	RES MF SM .1W 1% 52K3 OHM	52K3	1%	R15	
145-485-00	RESISTOR MF	100K	1%	R3 R21	
145-505-00	RES MF SM .1W 1% 162K OHM	162K	1%	R9	
145-522-00	RES MF SM .1W 1% 243K OHM	243K	1%	R27 R29	
145-547-00	RESISTOR MF SMT	442K	1%	R4 R20	
212-001-00	CAPACITOR CERAMIC SMT	0.01	10%	C1 C3 C6 C9-11 C17-18	
212-010-00	CAPACITOR CERAMIC SMT	.1UF	-400	C7-8 C12-14	
220-002-02	CAPACITOR LYTIC RADIAL T&R	47UF	20%	C2 C4-5 C15	
220-014-00	CAPACITOR LYTIC RADIAL KS	2.2UF	10%	C16 C19	
300-003-00	DIODE SIGNAL SMD	DL4148		D1 D8-9 D16-20	
304-070-00 ⚠	LED RED T1 W/.550 SPCR	RED		D2 D10 D15	(OL and TEMP LEDS)
304-071-00 ⚠	LED GRN T1 W/.550 SPCR	GRN		D3-7 D11-14	(-20.-9,-6,-3,and NORM)
311-002-00	X-SISTOR PNP SMD	IMBT4403		Q1-2	
320-012-00	OPAMP NJM4560M	NJM4560M		U1 U5	
323-002-00	I.C. QUAD COMPARATOR SMD	LM339		U2-4	
400-079-00	CONNECTOR STR LCK SHRD 14P .100 X 2			J1	
450-218-00	PCB, M800 DISPLAY			Z8	
706-033-08	STANDOFF, SWAGE, 4-40 X .665L			H1-4	

⚠ Components noted with this symbol shall be replaced only by the component specified. This is required to maintain product safety.