

OWNERS MANUAL MODEL 250

STEREO POWER AMPLIFIER

SERIAL NUMBER 741121

BGW SYSTEMS
P.O. BOX 3742
BEVERLY HILLS, CALIF. 90212

IMPORTANT--PLEASE READ THIS PAGE BEFORE OPERATING
YOUR BGW POWER AMPLIFIER

YOUR NEW BGW POWER AMPLIFIER IS DESIGNED TO PROVIDE YEARS OF TROUBLE FREE PERFORMANCE. OBSERVING THESE FEW PRECAUTIONS WILL INSURE PROPER OPERATION.

NEVER CONNECT THE OUTPUT OF ONE CHANNEL WITH THAT OF ANOTHER.

NEVER CONNECT A DIRECT SHORT FROM THE OUTPUT OF ANY CHANNEL TO GROUND.

ONLY CONNECT THE POWER CORD TO THE PROPER MAINS (NORMALLY THIS WILL BE 105-120 VOLTS AC 50-60HZ). SEE SECTION 5E FOR CONVERSION TO 240 VOLT OPERATION.

ONLY MAKE CONNECTIONS TO THE POWER AMPLIFIER WITH THE POWER OFF.

DO NOT REMOVE FACTORY SEAL. AMPLIFIERS WILL NOT BE COVERED UNDER WARRANTY IF SEAL IS BROKEN. THERE ARE NO ADJUSTMENTS WITHIN.

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1-DESCRIPTION:

The BGW 250 is the most advanced dual solid state power amplifier available. The basic design criteria used are those which are applied to present day computers and related equipment.

Unique design features incorporated in the 250 make it virtually "FAIL SAFE" and free from accidental damage caused by human error in audio service.

A fast acting SCR (silicon controlled rectifier) crow bar is employed as a safe guard for your speakers. The sophisticated sensing circuitry for the crow bar constantly samples the individual outputs of each channel. The outputs of each channel are integrated and passed through an absolute value detector. The output of the detector is connected to a comparator which is activated by the presence of a large DC component. If such a voltage is present the comparator in turn triggers a fast discharge pulse circuit which fires the SCR crow bar. The crow bar is essentially a direct short placed across the two power supplies- If activated this causes abnormally high current to flow in the primary circuit and within a fraction of a second the ultra fast acting circuit breaker disconnects the power. The crow bar circuit quickly discharges all energy stored in the power supply internally, not into the speaker; thus protecting the load.

The packaging inside your 250 is unlike ordinary power amplifiers. Each channel assembly is on its own separate module, which simply plugs in or out for quick and easy service. Each of these units is constructed on a tremendous aluminum extrusion. The total radiating surface area of each heat sink is 330 square inches. The heat sinks have mating circuit boards which carry the passive components. Each unit's wiring is identical with the next as the circuits are photo etched. The heat sinks plug in with an 8 pin connector.

The output stage of your 250 uses the most powerful type of transistors available. The large geometry single diffused devices have the largest safe operating area of any type of transistor available. All the semiconductors in the output stage are in intimate contact with the heat sink. The dynamic bias circuit is also mounted on this isotherm providing rock steady bias stability with temperature.

The voltage gain circuits are also mounted on the same circuit card. A true operational amplifier integrated circuit, hermetically sealed in a metal can, acts as the front end. The op amp (as they are called) is a special unit featuring high speed (15MHz) and high slew rate (50 volts/microsecond) yet still having very low noise due to its darlington input stage and careful design. The op amp stage is followed by a discrete complementary pair acting as an active current source/sink and providing additional voltage gain. The current source is the ideal way to drive the output stage which is basically a voltage follower.

This sophisticated circuit design makes for an extremely accurate amplifier. The open loop gain is higher than found in the competitors' products. The accuracy of an amplifier is a function of the difference between the open loop gain and the closed loop gain. In this case the closed loop gain is 26 db (a voltage gain of only 20) while the open loop gain is about 1,000,000. The accuracy of the 250 is so great that conventional audio test equipment is unable to provide meaningful measurements. Harmonic distortion measurements are simply the residual level of the distortion analyzer. This extremely accurate signal processing enables the 250 to drive speakers at very high levels while adding absolutely no coloration of its own. Even at milliwatt levels the output waveform exhibits no sign of crossover distortion. The dynamic range capability of a typical 250 is almost 115 db.

2- SPECIFICATIONS

The following specifications are guaranteed minimum performance levels, not typical or best case numbers measured under ideal conditions. All test procedures used are according to the most conservative techniques in use today.

POWER OUTPUT: 85-watts average continuous power per channel at 8-ohms.

FREQUENCY RESPONSE:
+0-0.25 dB 20Hz to 20KHz
+0-3 dB 2Hz to 65 KHz

HARMONIC DISTORTION:
Less than 0.1% at 85 watts per channel or less into 8 ohms.

IM DISTORTION: (60 & 7kHz 4:1):
Less than .1% at 85 watts per channel or less into 8 ohms.

HUM & NOISE (20-20 kHz):
105 dB below 85 watts into 8 ohms

INPUT SENSITIVITY:
1 volt +2% for 20 volts out (50 watts, 8 ohms)
voltage gain of 26 db (20x), 1.5 volts required for full output.

INPUT IMPEDANCE:
47,000 ohms

DAMPING FACTOR:
Greater than 500 at low frequencies (8 ohms)

OUTPUT LOAD IMPEDANCE:
Designed for any load impedance greater than 2 ohms.
Maximum output power occurs at 2 ohms.

RISE TIME(10-90%):
5 microseconds- indicating a bandwidth of 65 KHz.

POWER BAND:
10 Hz to 20 kHz.

POWER REQUIREMENT:
105-120 volts 50-60Hz at 5 amps maximum or
210-240 volts at 2.5 amps maximum.

TURN ON:
Anti surge turn on, no switching transients or thump will
appear at output.

OUTPUT PROTECTION:
Each channel is protected against shorts, open circuit
operation, mismatched loads, etc.

LOAD PROTECTION:
Exclusive SCR crow bar protects speakers against malfunction.

OVERALL PROTECTION:
Power line is protected with fast acting computer type
circuit breaker. No fuses of any kind are used. Two
thermal switches (one per channel) protect against over
temperature operation. Controlled power bandwidth and
slew rate protect tweeters and amplifier against excessive
high frequency operation. Input overload protection is
afforded op amps by series limiting resistance.

POWER SUPPLY:
A large power transformer with twin primary windings is
used. Computer grade electrolytic capacitors storing
over 22 joules of energy, and a 25 amp bridge rectifier
are employed. Two Zener regulated supplies power each
operational amplifier front end.

POWER REQUIREMENTS:
Unit requires either 105-120V AC or 210-240V 50-60Hz power.
A 5 amp circuit breaker is supplied for units wired for
120V operation or a 2.5 amp breaker for 240V operation.

HEAT SINKING:
Each channel has its own removable heat sink. Each
extrusion has 330 square inches of surface area.

CHASSIS:

A heavy steel chassis forms a protective cage for unmatched mechanical strength. A 3/16" aluminum rack mount panel is supplied. All modules are bolted to the chassis. The power supply is mounted close to the front panel to allow rack mounting without the use of guide rails or supports.

CONNECTORS:

Output- standard 3/4" spacing, 5 way binding posts for outputs (color coded for easy identification).

Input- 1/4" phone jack

AC line- three wire grounded male connector on 5 ft. min. cable.

MODULES:

3 plug in modules contain 95% of the circuitry. Modules consist of 2 heat sink channel assemblies and 1 crow bar trigger circuit board.

CIRCUIT BOARDS:

Flame retardant glass epoxy boards per mil spec.

DIMENSIONS:

Panel 19" W x 5 1/4" H x 11 3/4" D- brushed satin aluminum. Notching is standard Western Electric.

WEIGHT:

27 pounds net

35 pounds packaged

shipping container; unique double boxed system using 8 toro pads (trade mark of Hardigg Corp.) between inner and outer cartons for shock protection in transit.

3- WARRANTY

BGW Systems warrants all power amplifiers for a period of three years from date of manufacture. This warranty covers both defects in workmanship and materials. If malfunction occurs, the product will be repaired or replaced (at our option) without charge for materials or labor; if returned prepaid to BGW Systems. The warranty does not cover equipment damaged due to negligence, misuse, shipping damage or accident, or if the serial number has been defaced, altered or removed. Furthermore, units altered, modified or improperly serviced, in any way, will not be repaired under terms of the warranty.

5- INSTALLATION

a. UNPACKING: Your BGW power amp is shipped in an advanced double boxed container using 8 energy absorption "Toro Pads" between the inner and outer boxes. The container should be saved in event the unit is moved or shipped at some future date. Replacement containers are available from BGW Systems for \$10.00 freight included. Damage; Inspect the unit for damage in transit immediately upon receipt. If damage is found, notify the transportation company immediately. Only the consignee may institute a claim with the carrier for shipping damage. BGW will cooperate fully in such event. Be sure to save the container as evidence of damage for the shippers inspection.

b. MOUNTING: The BGW power amp is supplied with a heavy standard 19" rack panel. The unit may be bolted into a rack by the front panel alone.

Regardless of how the unit is mounted, provisions for unrestricted air flow must be provided. Good ventilation practice will provide for air flow above and below the unit. Inadequate ventilation may cause the protective thermal switches to shut the unit off.

Normal installation- all connections should be made before power is applied!

c. OUTPUT CONNECTIONS: Adequate size wire must be used between the amplifier and the speakers to preserve damping factor.

Wire length up to	WIRE SIZE (damping factor =50)		
	Impedance 4	8	16 ohms
10'	#16	#18	#20
25'	#10	#14	#16
50'	#8	#12	#14

Observe polarity markings when connecting speakers. Speaker fusing is recommended to prevent overpowering and damaging speakers. If fuses are not included in the speaker system they must be connected in series with the lead to the red binding post on the rear of the amplifier. Consult speaker instructions for recommended fuse size and type.

4- FACTORY SERVICE:

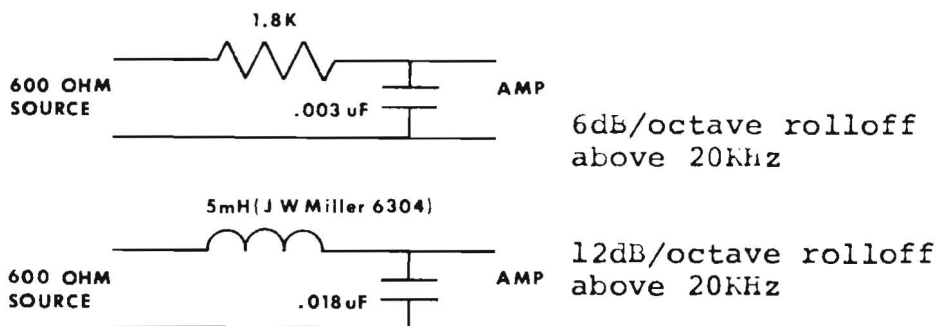
Should service be required please fill out the Service Authorization form and mail it to BGW Systems.

All units must be shipped prepaid in the factory supplied shipping container, to prevent damage in transit. Units will be returned freight collect.

d. CONNECTING INPUT LINES: Input connections should be as short and direct as possible. Shielded cables must be used and both should originate from the same source (i.e. if both channels do not come from the same pre-amps, ground loop problems may arise.)

The source must be capable of delivering 1.5 volts for full output from the amplifier.

For maximum signal to noise ratio driving source impedance should be less than 5000 ohms. Radio frequency interference (RFI), when it occurs, can be reduced or eliminated by employing one of the filters shown below. They should be built in shielded enclosures such as 35mm. aluminum film cans.



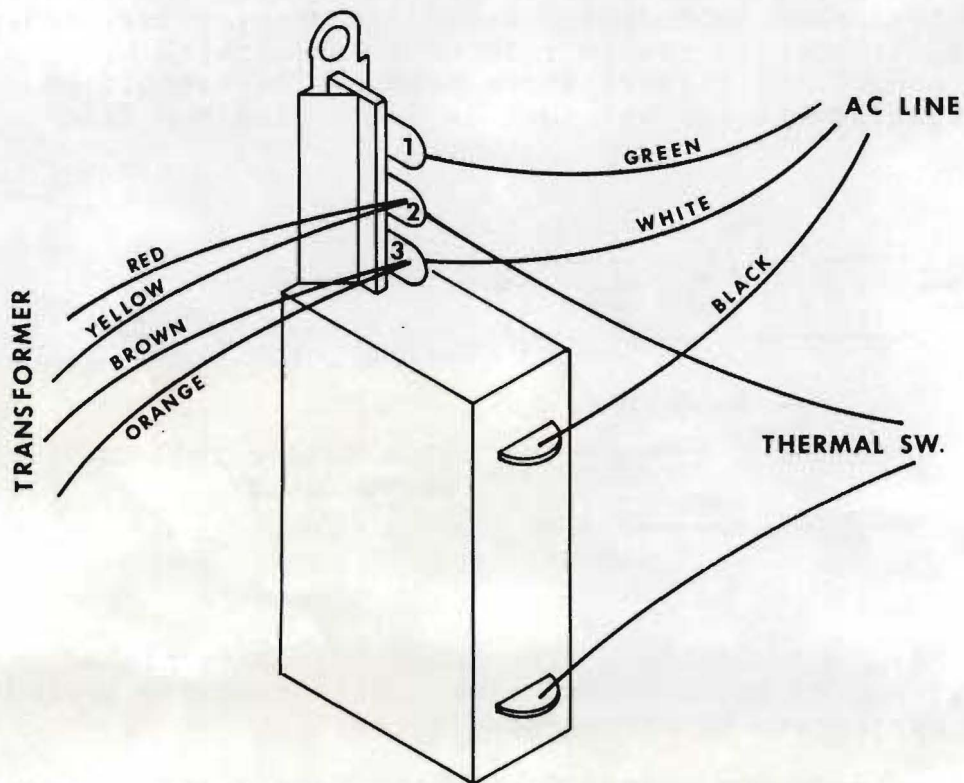
e. A-C MAINS CONNECTIONS: The Model 250 is furnished with a 3 wire cord and a ground plug. Defeating the grounding provision may create hazardous conditions.

Amplifiers sold in the United States and Canada are factory wired for 105-120 volts, 50-60 Hz, 5 amps maximum. Many export amplifiers are factory wired (see rear panel of amplifier) for 210-240 volts, 50-60 Hz, 2.5 amps maximum. Conversion from 120 to 240 volts or 240 to 120 can be done in the field by following the instructions below. The circuit breaker must be replaced. Circuit breakers are available from BGW Systems for \$10.00 each postpaid. Use the following description when ordering:

For 120V- Model 250, 5 amp Circuit breaker.

For 240V- Model 250, 2.5 amp Circuit breaker.

The connections shown below are for 120 volt operation. For 240 volt operation remove the red transformer lead from lug 2 and remove the orange transformer lead from lug 3. Twist the red and orange leads together, solder and tape.



Note- The Model 250 should not be connected to any outlet rated at less than 600 watts.

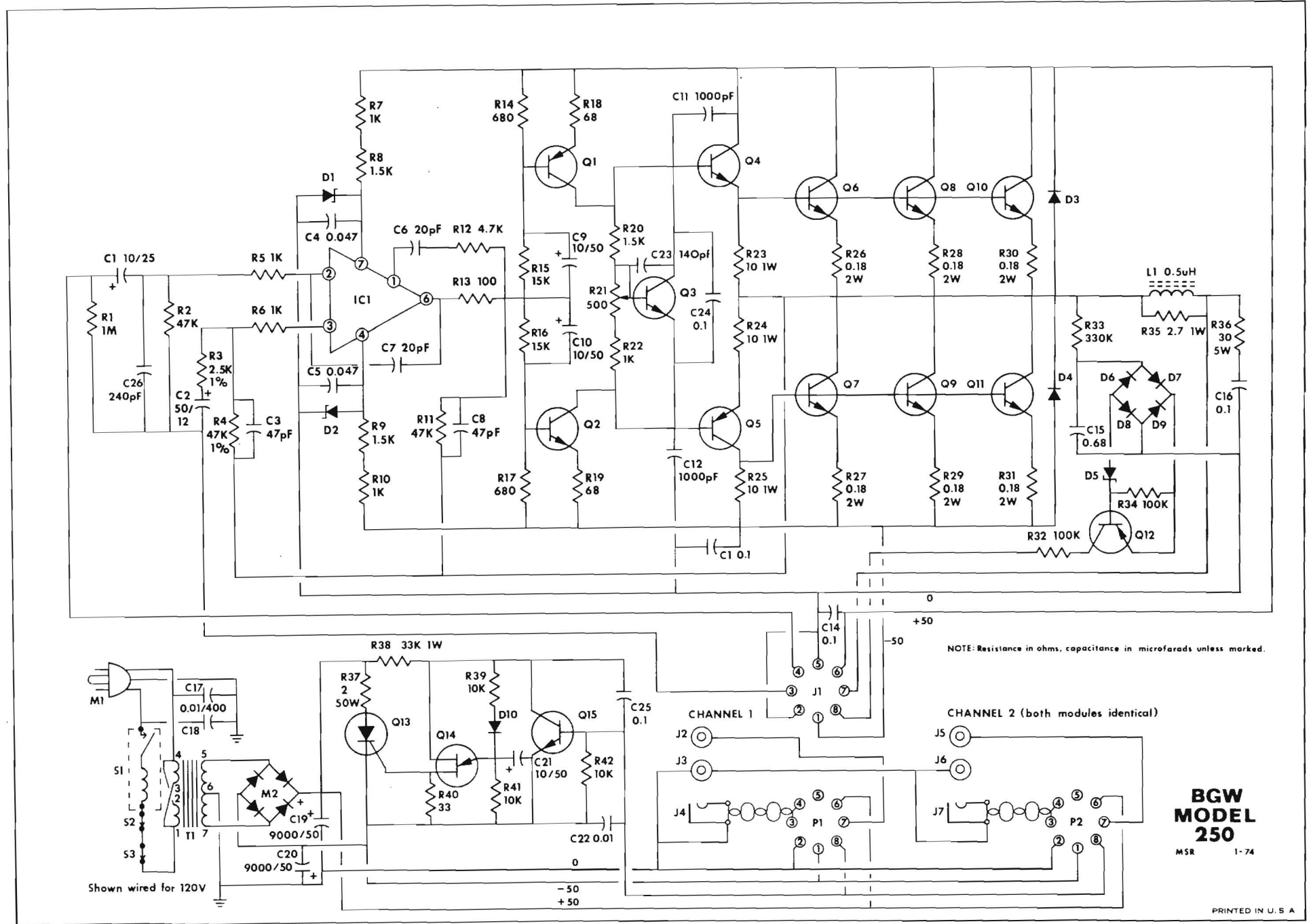
6- OPERATION

TURN ON: The Model 250 is free from thumps or transients during turn on.

Often, turn-on transients originate in the pre-amp or tuner. This is especially true of tube-type units. If this situation arises, turn the amplifier on after the other units have had sufficient time to stabilize.

PROTECTION: Three protection circuits are employed in the Model 250.

1. The fast acting magnetic circuit breaker shuts the unit down whenever the unit draws excessive current.
2. The exclusive BGW SCR crow bar circuit instantaneously discharges the power supply capacitors and triggers the circuit breaker if any conditions exist which could potentially damage the speakers.
3. Thermal switches mounted on each heat sink protect the amplifier from thermal failure. The amplifier will shut off if the heat sink temperature rises above 70 degrees C (158° F) and will turn on again when the temperature drops. Activation of the thermal switches usually means that insufficient air circulation is being allowed.



8- PARTS LIST

CAPACITORS

C1	10uF, 25V electrolytic	.65
C2	50uF, 12V electrolytic	.65
C3	47pF, NPO ceramic	.20
*C4,C5	0.047uF, 25V ceramic	.40
*C6,C7	20pF ceramic	.20
*C8	47pF, NPO ceramic	.20
*C9,C10	10uF, 50v electrolytic	.65
*C11,C12	1000pF dipped mica	.40
*C13,C14	0.1uF, 100V mylar	.40
*C15	0.68uF, 100V mylar	.85
*C16	0.1uF, 100V mylar	.40
C17,C18	0.01, 400V paper	.40
C19,C20	9000uF, 50V electrolytic	9.50
C21	10uF, 50V electrolytic	.65
C22	0.01uF, 100V mylar	.40
C23	140pF dipped mica	.30
*C24,C25	0.1uF, 100V mylar	.40
*C26	240pF dipped mica	.35

DIODES

*D1,D2	1N4745A 16V zener diode	2.87
*D3,D4	1N4003 or 1N4004	.69
*D5	1N4752 33V zener	2.87
*D6-D9,D10	1N4003 or 1N4004	.69

INTEGRATED CIRCUITS

*IC1	LM318H (National Semiconductor)	6.95
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CONNECTORS

*J1	8-pin socket (octal type)	.80
J2,J5	Red 5-way binding post	1.20
J3,J6	Black 5-way binding post	1.20
J4,J7	Open circuit insulated phone jack	1.00

* These parts in each HS250, double for total parts in each 250.

INDUCTORS

*L1 0.5uH output inductor 1.25

MISCELLANEOUS

M1 3-wire line cord and plug 2.25
M2 25 amp, 200P.I.V. bridge rectifier 6.95

PLUGS

P1,P2 8-pin plug (octal type) 1.00

TRANSISTORS, ETC.

*Q1 40410 (RCA) 1.80
*Q2 40409 (RCA) 1.80
*Q3 2N2219A .78
*Q4 2N3583 2.25
*Q5 2N5954 2.85
*Q6-Q11 40636 (RCA) 3.00
*Q12 2N5401 1.26
Q13 2N4442 3.00
Q14 2N4871 or MU10 (Motorola) 1.14
Q15 MPS 3394 (Motorola) .45

RESISTORS

*R1 1 megohm, 5%, 1/2 watt carbon film .20
*R2 47,000 ohms, 5%, 1/2 watt carbon film .20
*R3 2,500 ohms, 1%, 1/2 watt carbon film .60
*R4 47,000 ohms, 1%, 1/2 watt carbon film .60
*R5-R7 1,000 ohms, 5%, 1/2 watt carbon film .20
*R8,R9 1,500 ohms, 5%, 1/2 watt carbon film .20
*R10 1,000 ohms, 5%, 1/2 watt carbon film .20
*R11 47,000 ohms, 5%, 1/2 watt carbon film .20
*R12 4,700 ohms, 5%, 1/2 watt carbon film .20
*R13 100 ohms, 5%, 1/2 watt carbon film .20
*R14 680 ohms, 5%, 1/2 watt .20
*R15,R16 15,000 ohms, 5%, 1/2 watt .20
*R17 680 ohms, 5%, 1/2 watt .20

* These parts in each HS250, double for total parts in each 250.

*R18,R19	68 ohms, 5%, 1/2 watt	.20
*R20	1,500 ohms, 5%, 1/2 watt	.20
*R21	500 ohm potentiometer	1.00
*R22	1,000 ohms, 5%, 1/2 watt (may vary)	.20
*R23-R25	10 ohms, 5%, 1 watt	.40
*R26-R31	0.18 ohms, 2 watts, wirewound	.40
*R32	100,000 ohms, 5%, 1/2 watt	.20
*R33	330,000 ohms, 5%, 1/2 watt	.20
*R34	100,000 ohms, 5%, 1/2 watt	.20
*R35	2.7 ohms, 10%, 1 watt	.40
*R36	30 ohms, 5 watts, wirewound	.95
R37	2 ohms, 50 watts, wirewound	1.00
R38	33,000, 1 watt	.40
R39	10,000 ohms, 5%, 1/2 watt	.20
R40	33 ohms, 5%, 1/2 watt	.20
R41,R42	10,000 ohms, 5%, 1/2 watt	.20

SWITCHES

S1	5 amp, 120V or 2.5 amp, 240V circuit breaker	10.00
S2,S3	Normally closed thermal switch	2.50

TRANSFORMERS

T1	Power transformer	52.50
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SUB ASSEMBLIES

*HS250C	Complete single channel amplifier heat sink	167.00
*CB250	Crowbar trigger module	12.50

MECHANICAL COMPONENTS HS-250

1	heat sink extrusion	15.90
1	printed circuit board	7.90
1	TO-5 mounting clip	.85
8	mica insulators	.20
16	nylon shoulder washers	.10
16	6-32 x 5/8 RH plated steel Phillips machine screw	
16	6-32 x 1/4 plated steel hex nut	
16	#6 internal tooth lock washer	
2	4-40 x 1/4 RH plated steel Phillips machine screw	
2	4-40 x 5/16 flat head Phillips	
6	#4 internal tooth lock washer	
	heat sink compound	

MECHANICAL COMPONENTS CHASSIS

4	10-32 x 1 FH Phillips	
4	10-32 x 1/2 FH Phillips	
8	10-32 x 3/4 Hex socket cap screws	
4	10-32 x 1/2 pan head Phillips	
6	8-32 x 1/2 pan head Phillips	
4	6-32 x 3/4 pan head Phillips	
2	6-32 x 1/4 pan head Phillips	
8	#6 sheet metal screws	
8	10-32 chrome plated cap nuts	
8	10-32 hex nuts	
7	8-32 hex nuts	
6	6-32 hex nuts	
2	#6 x 1/4 spacers	
8	#10 split lockwashers	
8	#10 flat washers	
7	#8 split lockwashers	
6	#6 external tooth lockwashers	
1	Heyco 5P-4 strain relief	
6	flat blade lugs	
5	round lugs	
1	ground strap (back panel)	
1	ground strap (capacitors)	
1	3-lug terminal strip	
1	steel chassis	
1	aluminum cover	
1	aluminum rack panel	
4	feet	

PACKAGING

1	set of cartons	10.00
	1-exterior carton	
	1-interior carton	
	8-Toro-Pads	
1	owners manual	

10-SERVICE AUTHORIZATION FORM

Please complete this form as completely as possible and return to BGW Systems before returning unit.

NAME _____

ADDRESS _____

UNIT _____
 MODEL SERIAL NUMBER

1. Describe symptoms:

2. Which channel(s) exhibits the problem?

3. What other equipment was involved?

	Manufacturer	Model No.
Preamp	_____	_____
Speakers	_____	_____

4. Under what conditions does the problem occur (check those that apply.)
 - a. all the time
 - b. after a while
 - c. at high volume levels
 - d. at high temperatures
 - e. other (explain)

5. How often did the problem occur?

6. What did you do to isolate the problems to the power amp.

7. Further comments:

*It is more expediant to call your dealer or our factory explaining the nature of your problem. In many instances the problem can be solved without returning the unit to the factory. WARNING: the unit must be returned in an original factory container, if you do not have one, we will provide a replacement for \$10.00.

PLACE
STAMP
HERE



P.O. BOX 3742
BEVERLY HILLS, CALIF. 90212

FOLD HERE



BOTH CHANNEL
Driven

CALIBRATION REPORT

MODEL # 250
SERIAL # 791128
DATE 11-19-74

TEST PERFORMED BY: *[Signature]* W.C.

	CH. 1	CH. 2	CH. 3	CH. 4
POWER AT CLIP 8 OHMS-VOLTS OUT <i>-1% THD</i>	27.8V	27.7V		
POWER	96W	95W		
POWER AT CLIP 4 OHMS-VOLTS OUT <i>-1% THD</i>	29.7V	29.5V		
POWER	128W	126W		

FREQUENCY RESPONSE AT 1 WATT 8 OHMS	CH. 1	CH. 2	CH. 3	CH. 4
1 KHZ	0 DB	0 DB	0 DB	0 DB
20 HZ	0	0		
10 KHZ	0	0		
20 KHZ	<i>-0.25</i>	<i>-0.25</i>		
-3 DB FREQ.	70 KHZ	71 KHZ	KHZ	KHZ

THD AT 10 WATTS 8 OHMS	CH. 1	CH. 2	CH. 3	CH. 4
20 HZ	.052 %	.055 %	%	%
1 KHZ	.052 %	.055 %	%	%
10 KHZ	.045 %	.052 %	%	%

THD AT 90 WATTS 8 OHMS = VOLTS OUT <i>36.9</i>	CH. 1	CH. 2	CH. 3	CH. 4
20 HZ	.052 %	.055 %	%	%
1 KHZ	.05 %	.055 %	%	%
10 KHZ	.04 %	.045 %	%	%

SENSITIVITY	CH. 1	CH. 2	CH. 3	CH. 4
V _{in} FOR 3- VOLTS	1.50 VOLTS	1.50 VOLTS	VOLTS	VOLTS
8 OHMS	112 WATTS			

NOISE LEVEL	CH. 1	CH. 2	CH. 3	CH. 4
OUTPUT NOISE VOLTAGE				
20 HZ TO 20 KHZ	.11 MV.	.14 MV.	MV.	MV.