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.

Connect the power cord to the proper voltage mains (normally this will be 105-120 volts AC, 50-60Hz).

Do not remove the factory lead seal. Amplifiers will not be covered under warranty if the seal is broken. There are NO adjustments within.
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1. DESCRIPTION

The BGW Model 250C is one of the most advanced dual solid state power amplifiers available.

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

A fast acting relay circuit is employed as a safeguard for your speakers. The circuitry controlling the relay constantly monitors the individual outputs of each channel. When any positive or negative DC component of more than +10 volts occurs at the output, the circuit activates the relay which disconnects the speakers from the amplifier. The speed at which the relay responds is approximately 20 milliseconds (see figure 1). The relay circuit also supplies a time delayed connection of the speakers to the amplifier to eliminate unwanted noises at turn on.

On the front panel, the on-off switch, gain controls, and the L.E.D. pilot lamp and clipping indicators are mounted for ready use.

The packaging inside your 250C 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 large 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 amplifier uses the most advanced type of transistors available. These large geometry power devices have large safe operating area along base with extended power bandwidth. All the semiconductors in the output stage are in intimate contact with the heat sink. The bias circuit is also mounted on this isotherm which provides 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 (16 MHz) and a 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 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 ratio of the open loop gain to the closed loop gain. In this case, the open loop gain is about 1,000,000. This extremely accurate signal processing enables the Model 250C 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 250C is almost 115dB.
SPEAKER PROTECTION TIME

D.C. VOLTAGE ON SPEAKER TERMINAL VS. SHUT DOWN TIME.
2. SPECIFICATIONS

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

STEREO MODE - 8 OHMS

POWER OUTPUT:
100 watts average continuous power per channel

TOTAL HARMONIC DISTORTION:
Less than 0.1% from .25-105 watts per channel

POWER BAND: 20 Hz - 20 kHz

INPUT SENSITIVITY:
Approximately 1.5 volts required for full output

DAMPING FACTOR:
Greater than 300 at low frequencies

STEREO MODE - 4 OHMS

POWER OUTPUT:
126 watts average continuous power per channel

TOTAL HARMONIC DISTORTION:
Less than 0.15% from .25-120 watts per channel

POWER BAND: 20 Hz - 20 kHz

INPUT SENSITIVITY:
Approximately 1.35 volts required for full output

DAMPING FACTOR:
Greater than 500 at low frequencies

STEREO MODE - ANY IMPEDANCE

GAIN:
24dB (20x)

OUTPUT IMPEDANCE:
Designed for any load impedance greater than 1 ohms

MONO MODE - 15 OHMS

POWER OUTPUT:
139 watts average continuous power

TOTAL HARMONIC DISTORTION:
Less than 1.1% from .25-210 watts per channel

POWER BAND: 20 Hz - 20 kHz
INPUT SENSITIVITY:
Approximately .75 volts required for full output

MONO MODE - 8 OHMS

POWER OUTPUT:
251 watts average continuous power

TOTAL HARMONIC DISTORTION:
Less than .15% from .25-360 watts per channel

POWER BAND:
20 Hz - 20 kHz

INPUT SENSITIVITY:
Approximately .80 volts required for full output

MONO MODE - ANY IMPEDANCE

GAIN:
32dB (40x)

OUTPUT IMPEDANCE:
Designed for any load impedance greater than 14 ohms

ANY MODE

FREQUENCY RESPONSE:
+0, -.25dB 20Hz to 20kHz
+0, -1dB 2Hz to 8kHz

IM DISTORTION:
(60 and 7 kHz 4:1)
Less than .02% at rated power

INPUT IMPEDANCE:
=7,000 ohms

RISE TIME:
5 microseconds - indicating a bandwidth of 65 kHz

HUM AND NOISE (20Hz - 10kHz)
105 dB below rated power

POWER REQUIREMENT:
115-120 volts 50-60Hz at 5 amps maximum or 210-240 volts at 2.8 amps maximum.

TURN ON:
Time delay relay turn on, no switching transients or thump will appear at output.

5.
OUTPUT PROTECTION:
Each channel is protected against shorts, open circuit operation, mismatched loads, etc.

LOAD PROTECTION:
A unique relay circuit protects speakers against malfunction.

OVERALL PROTECTION:
Power line is protected with fast acting 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 amp 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 set close to the front panel to allow rack mounting without the use of guide rails or supports.

CONNECTORS:
Output: Standard 3/4" spacing, 6 way binding posts for outputs (color coded for easy identification).
Input: 1/4" phone jack, 3 pin female audio connector.
AC Line: Three wire grounded male connector on five foot min. cable.

MODULES:
Three plug-in modules contain 95% of the circuitry. Modules consist of two heat sink channel assemblies and one relay circuit board.

CIRCUIT BOARDS:
Flame retardant glass epoxy boards per mil spec.
DIMENSIONS:
Panel 19" W x 5¼" H x 11-3/4" D - black anodized-grained aluminum. The notching is standard E.I.A./Western Electric.

WEIGHT:
27 pounds net weight.
35 pounds packaged weight.
Shipping container: a unique double boxed system providing maximum safety for the unit.
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/or materials. If malfunction does occur, the product will be repaired or replaced (at our option) without charge for materials or labor, if returned prepaid to BGW. The warranty does not cover equipment damaged due to negligence, misuse, shipping damage or accident, or if the serial number is defaced, altered or removed. Furthermore, units that are altered, modified or improperly serviced, in any instance, will not be repaired under terms of warranty.

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, in order to prevent damage in transit. Units will be returned by freight collect.

5. INSTALLATION

UNPACKING:
Your BGW power amplifier is shipped in an advanced double boxed container. The container should be saved in event the unit is moved or shipped at some future date. Replacement containers are available from BGW Systems.

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 shipper to inspect.

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 as long as provisions for unrestricted air flow are 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. The 15DC is designed to operate in either the Stereo (2-channel) mode or Monaural (bridged) mode. A slide switch located on the rear of the unit switches from one mode to the other. Select the mode required, then follow the directions below.
Shielded output cables from the preamplifier should be connected to the two input jacks on the amplifier. On the Model 250C the input jacks require standard 1/4" diameter phone plugs; (the input lines should be unbalanced) or three-pin, male audio connectors (such as the Cannon XL Series, or Switchcraft A3 Series). To use the Model 250C with high impedance, unbalanced input lines, use the jumper plug provided in the transformer socket and connect the input cables as follows:

![Diagram of input connections for stereo mode]

**NOTE:** SHIELD NOT CONNECTED TO ANYTHING AT SIGNAL SOURCE.

To use the Model 250C with balanced input lines, remove the jumper plugs from the transformer sockets and replace them with transformers of the desired impedance. Connect the input cables as follows:

![Diagram of input connections for balanced mode]

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 preamps, ground loop problems may arise).

The source must be capable of delivering 1.25 volts for full output from the amplifier.
For maximum signal to noise ratio driving source impedance should be less than 5,000 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.

1.8 K

500 OHM SOURCE AMP

.003uF

5mH (JW Miller 6304)

6dB/octave rolloff above 20kHz.

8000OHM SOURCE AMP

.018uF

12dB/octave rolloff above 20kHz

INPUT CONNECTIONS - BRIDGE MODE:
Follow the same procedure as outlined for Stereo Mode but use only one shielded cable plugged into channel 1. Do not connect anything to the input of channel 2.

OUTPUT CONNECTIONS - STEREO MODE:
Connect the left speaker to the binding posts marked CH 1 and the right speakers to the binding posts marked CH 2. Observe the phasing of the speakers. Most connectors on speaker cabinets are either color coded or marked +, - . Connect the black or minus (-) terminal on the speaker cabinet to the black binding posts on the amplifier. Connect the other speaker terminal to the red binding post.
The wires used for the speaker leads should be of the largest gauge possible in order to retain the highest damping factor possible. The chart provided shows the relation between wire size and damping factor.

To find the damping factor of a particular configuration of wire size and length and speaker impedance, take a ruler and line up the length of two-conductor-cable used with the wire gauge used and mark the resulting source resistance. Then line up this value with the resistance of the load and read off the resulting damping factor. For dynamic moving coil speakers, the load resistance should be that measured with an ohmmeter across the speaker terminals, not the manufacturer's stated impedance value. For electrostatic speakers, the manufacturer's value should be used. For best results, choose a configuration of wire size and length that will result in a damping factor of 50 or greater. Ideally, the output leads should be connected to the amplifier with standard banana plugs; however, the five-way action of the binding posts permits the use of tinned wires or spade lugs.

OUTPUT CONNECTIONS - BRIDGE MODE:

Follow the same procedure as outlined for Stereo mode but connect the single output across the two red binding posts of Channels 1 and 2. Do not connect anything to the Channel 1 or Channel 2 ground binding posts.

CONNECTING POWER MAINS:

The 250C is furnished with a three wire cord and a ground plug. Defeating the grounding provision may create hazardous conditions. The amplifier should be plugged in only when it has been established that it is wired for the correct power mains voltage and after all other connections to the amplifier have been made.

The mains (AC line) voltage is indicated on the serial number label on the rear of the amplifier. Amplifiers supplied for use in the United States are factory wired for 120 volts. Only the indicated mains voltage should be used. If the mains voltage must be changed, see the next page.
CHANGING THE MAINS VOLTAGE:
The mains voltage may be changed in the field by following procedure:

1. Remove the amplifier cover.

2. Change the transformer wires going to the mains barrier strip to match the appropriate column of the chart below:

<table>
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<tr>
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<th>120V</th>
<th>240V</th>
</tr>
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<tbody>
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</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
<td>Brown</td>
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</tr>
<tr>
<td>5</td>
<td>Red</td>
<td></td>
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<tr>
<td>6</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

3. Change the circuit breaker on the front panel as follows:

   For 100 and 120 volt operation, use 6 amp.
   For 240 volt operation, use 3 amp.

Replacement breakers are available from BGW Systems for $10.00 each, postpaid. Include the serial number and model of your unit when you order.
EXAMPLE: $R_L = 8 \Omega$, $R_S = 0.04 \Omega$ OR D.F. = 200
CABLE LENGTH OF 20 FT. ANSWER: #10 WIRE

FIGURE 2
SOURCE RESISTANCE AND DAMPING FACTOR VS. LENGTH AND SIZE OF OUTPUT LEADS
6. **OPERATION**

**TURN ON:**

The Model 250C is free from thumps or transients during turn on. Often, turn-on transients originate in the preamp 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 250C.

1. The fast acting magnetic circuit breaker shuts the unit down whenever the unit draws excessive current.

2. The fast acting relay circuit instantaneously disconnects the amp outputs from the speakers if any condition exists that will 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 85 degrees Centigrade and will turn on again when the temperature drops. Activation of the thermal switches usually means that insufficient air circulation is being allowed.
<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DESCRIPTION</th>
<th>QTY.</th>
<th>PART NUMBER</th>
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<td>4050-0330R</td>
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**COMPLETED ASSEMBLY**

- 1000-1260 Heatsink Module
- 1100-1260 Harness
- 9017-1250 Crowbar

**PACKING CONTAINER**

- 9700-1260 Manual
- 9851-1250 Outer Box
- 9850-1250 Inner Box
- 9852-1250 Rail Block
- 9854-0150 Corner Block

**METAL**

- 9002-1260 Chassis 250C
- 9000-1252 Front Panel
- 9008-1260 Cover

**MISCELLANEOUS**

- P2 8706-0183 Line Cord
- S3 0611-0191 Switch dpdt.
- 9999-0019 Tie Wrap
- 1235-0001 Clamp Cap.
- 1235-6034 Clamp Strain Rel
- 0650-0602 Switch Rocker
- 0721-0312 Barrier fish paper

16.
WARRANTY REGISTRATION

Please fill out and return this card within 2 weeks from date of purchase.

NAME: ___________________________ DATE PURCHASED: _____

ADDRESS: ___________________________ PHONE: ______

CITY: __________________ STATE: ______ ZIP: ______

PURCHASED FROM: _____________________________
Dealer

Address

City State Zip

MODEL NUMBER: ______________

SERIAL NUMBER: ______________

PURCHASE PRICE: ______________

For What Purpose Is The Unit Intended?

Home ______
Studio ______
Sound Reinforcement ______
Other (explain) ______

Is this amplifier a replacement for an existing unit?

If yes, what kind?

Why did you choose a BGW power amplifier?

Dealer Recommendation ______ Magazine Advertisement ______
Sound Quality ______ Technical Design ______
Friend's Recommendation ______ Other ______

COMMENTS:
SERVICE AUTHORIZATION FORM

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

NAME: ________________________________ PHONE: ____________

ADDRESS: ____________________________________________ (City) (State) (Zip)

UNIT: ________________________ SERIAL NUMBER

1. Describe symptoms:

2. Which channel(s) exhibits the problems?

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 awhile _____
   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 expedient 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 $14.00. Factory authorized warranty repair stations are located throughout the U.S. Call your dealer or the factory for the location of the service station nearest you.
POLARITY
INSERTION LOSS
FREQUENCY RESPONSE

0900-9250
BRIDGING TRANSFORMER
15K-15K

TESTED BY
600 OHM DRIVER
15K NOM. LOAD
0dB REF.

20-20K RESPONSE

FREQUENCY IN CYCLES PER SECOND

dB
0
5
10

Frequency in cycles per second