BGW SYSTEMS

13130 SOUTH YUKON AVENUE
PHONE ~~(213)~~ (310) 973-8090

HAWTHORNE, CALIFORNIA 90250
TELEX NO. 66-4494

OWNER'S MANUAL
MODEL 150
PROFESSIONAL POWER AMPLIFIER

TABLE OF CONTENTS

-IMPORTANT-

PLEASE READ THIS PAGE BEFORE OPERATING

YOUR

BGW POWER AMPLIFIER

Your new BGW amplifier is designed to provide years of trouble free performance.

Observing these few precautions will insure proper operation.

- All connections should be made to the power amplifier with the power OFF.
- Speaker fuses should be used to afford maximum speaker protection.
- Never connect the output of one channel to that of another.
- Connect the power cord to the proper voltage mains as indicated on the rear of the amplifier. Conversion to another voltage requires internal rewiring.
- Do not remove the amplifier's cover. Amplifiers may not be covered under warranty if they are tampered with. There are NO adjustments within. Potentially lethal voltages exist within the amplifier. Refer all service work to an authorized BGW service station.

DESCRIPTION

The BGW Model 150 is one of the most advanced solid state, fully complementary, bridgeable, stereo power amplifiers available.

Features of the Model 150 include precision step attenuator level controls, LED metering, separate circuit and chassis grounds, XLR and ¼" input connectors with transformer sockets, and small size.

The front panel includes two vertical rows of four red LED's, one row for each channel. The lower LED in each row is the IDLE indicator or pilot lamp. They will be lit whenever the amplifier is turned on.

The top LED in each row is a clipping indicator and utilizes an exclusive BGW circuit. Whenever either channel of the 150 is driven into clipping, a corresponding indicator lights and remains lit for 0.20 seconds. These indicators, which actually indicate loss of feedback, tell the operator that the amplifier is being overdriven and can be invaluable to the engineer who must be sure that every component in his system is producing a clean, distortion-free signal. An inadvertant short-circuited output (with signal) will cause the LED to remain on until the short is removed.

The middle LED's are connected to a circuit employing integrated circuit to provide an audio level indication of 0.5% and 50% of maximum power output. They provide a valuable tool for total system evaluation in multiple amplifier installations.

Both the circuit and chassis grounds are connected to separate barrier strip terminals on the rear of the amplifier. They are connected together by a removeable link. By removing the link, the circuit grounds of all active units (amplifiers, preamplifiers, mixers, etc.) can be tied to earth ground at a common point. This aids in eliminating ground loops.

Either XLR-type of ¼ inch phone plugs may be used for input connections. If plug-in transformers are used, the XLR-type connectors are connected. If not, jumpers must be employed in the transformer sockets. See sections 03011, 03021, 03031, and 03041 for details.

The size of the Model 150 is convenient for a wide variety of applications. However, please note the following precaution:

1) Do not use the front panel as the sole support for the amplifier. Side rails or rack sheives should be employed (See section 02650).

The output stages of your amplifier use the most advanced type of transistors available. These large geometric, complementary, power devices have large safe operating areas and extended power bandwidth. Electrostatic and other highly reactive speaker systems present no difficulties for the Model 150. The aluminum heat sinks are located so the 150 power amplifiers can be stacked on top of each other and air can be forced through both sides to cool the products.

All of the semiconductors in the output area are in intimate contact with the heat sink. The bias circuit is also mounted on this isotherm to provide rock steady bias stability with temperature.

The voltage gain circuits are also mounted on the same circuit board. A true operational amplifier integrated circuit acts as the front end.

The op-amp is a special unit featuring very low noise, high speed (10MHz). The op-amp stage is followed by a discrete complementary pair acting as an active current source/sink and providing voltage gain. The current source is the ideal way to drive the output stage, which is basically a triple Darlington voltage follower.

This sophisticated circuit design makes for an extremely accurate amplifier. 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 amplifier 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 BGW 150

PROFESSIONAL POWER AMPLIFIER

Exacting design standards and unique features establish the BGW amplifier as the industry leader in power amplifier technology. Features such as all steel chassis and covers, metal-case output transistors and totally modular construction, have set the industry standard in audio power amplifiers.

Delivering a full 50 watts per channel into 8 ohm loads and using the latest in full complementary circuitry techniques, the Model 150 offers reliability and performance unparalleled in the industry.

SPECIFICATIONS: BGW MODEL 150

OUTPUT POWER

50 watts minimum sine wave continuous average power output per channel with both channels driving 8 ohm loads over a power band from 20Hz to 20kHz. The maximum Total Harmonic Distortion at any power level from 250-milliwatts to 50 watts shall be no more than .05%.

75 watts minimum sine wave continuous average power output per channel with both channels driving 4 ohm loads over a power band from 20Hz to 20kHz. The maximum Total Harmonic Distortion at any level from 250-milliwatts to 75 watts shall be no more than .08%.

150 watts minimum sine wave continuous average power output monaural driving an 8 ohm load over a power band from 20Hz to 20kHz. The maximum Total Harmonic Distortion at any power level from 250 milliwatts to 150 watts shall be no more than .08%.

*All specifications and features are subject to change without notice.

SPECIFICATIONS

Intermodulation Distortion:	Less than 0.02% from 250 milliwatts to rated power.
Small Signal Frequency Response:	+0, 3dB, 1Hz to 100kHz, +0, 0.25dB, 20Hz, to 20kHz.
Hum and Noise Level:	Better than 102dB below 50 watts (unweighted, 20Hz to 20kHz).
Input Sensitivity:	1.0 volts for maximum power output. Voltage gain 26dB (20 times).
Input Impedance:	15K ohms.
Damping Factor:	Greater than 400 to 1. Referenced at 8 ohms at 1kHz.
Output Impedance:	Designed for any load impedance equal to or greater than 4 ohms.
Power Requirements:	100, 120, 200, 220 or 240 volts 50-60Hz 350 watts.
Semiconductor Complement:	2 Ultra-low noise Op Amp IC's, 2 level detector IC's, 2 delay timer IC's, 26 transistors, 4 zener diodes, 12 diodes, 8 LED's.
Dimensions:	1 3/4" by 19" standard rack front panel. Depth behind front panel 11½". (4.45cm X 48.26cm X 29.21cm).
Weight:	14 lbs. (6.37 kg) net, 18 lbs (8.18 kg) shipping.

UNPACKING AND SET-UP

Your BGW Power Amplifier is shipped in an advanced packing container.

SAVE THE CONTAINER

AND ALL PACKING MATERIAL!

The container should be saved in the event the unit is moved or shipped at some future date. Replacement containers are available from BGW Systems for $14.00, freight included.

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.

The amplifier's mounting position must be chosen carefully so that the air flow to the sides of the unit is not restricted. Inadequate ventilation may cause the protective heat sensors to shut the unit off. For rack mounting, the four rubber feet on the bottom of the unit may be removed and no hardware will be loosened inside the unit.

DO NOT PLUG THE AMPLIFIER IN YET!

All connections should be made before power is applied.

RACK MOUNTING HINTS

KEEPING IT COOL

A power amplifier draws energy from a primary electrical service, usually a 120 VAC outlet, to drive loudspeaker systems with an audio signal. Typically, only half of the energy can be delivered to the loudspeakers; remaining energy is converted into heat, and must be dissipated (ventilated) into the air.

Air circulating past heat-producing components, absorbs the heat and carries it away. To accomplish this, low and medium power amplifiers rely on natural convection currents, while most high power amplifiers use fans. If the air flow is impeded, the resulting rise in heat may cause an amplifier to stop working or fail.

Circulating air currents must not be cut off when installing power amplifiers in racks. Power amplifiers using convection cooling require spacing between amplifiers to permit air flow between them. Power amplifiers using forced-air cooling, on the other hand, can usually be stacked closer to each other and may not need any blank panel spacing between amplifiers.

To improve natural convection currents within a rack, a chimney can be created by closing the back of the rack and venting the rack at the bottom to let in fresh air, and at the top to exhaust hot air. Vents should be large rectangular slots approximately 19" wide by 4" high.

The rack cabinet will require some type of blower if a large air-flow is required. It is best to exhaust air from the top of the rack rather than to blow it in from the bottom. There will be less dust and dirt in the rack this way, if the bottom vent is sufficiently large.

INSTALLING THE UNITS

Use care when mounting equipment in a rack. Place the heaviest units near the bottom of the rack and fill in all unused rack spaces with blank panels. Equipment cannot always be supported by front panels alone. This is especially true of amplifiers whose depth is more than twice their height. Uniform support can be insured by installing bottom or side rails.

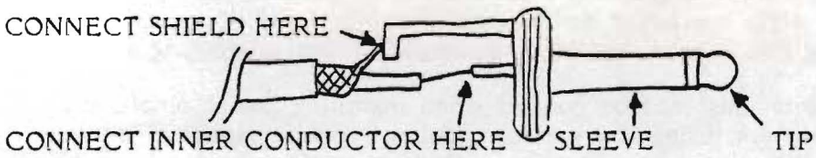
When racks are to be transported or used in a mobile installation, some means of securing the rear of the equipment are required. Angle brackets either attached to the bottom, side rails or rear panel are practical approaches.

STEREO INPUT CONNECTIONS

Three-pin XLR and ¼ in. phone jacks are provided on the rear of the amplifier for input connections. Balanced or unbalanced lines may be used; however if input cables are longer than 8 feet, balanced lines may be necessary to maintain the signal-to-noise ratio and high frequency response.

1/4 INCH PHONE JACKS

The 1/4" phone jacks are for unbalanced lines only (single conductor, shielded) and may be used directly. Simply connect the shield to the outer sleeve of the plug and the inner conductor to the tip, or buy ready-made cables. See diagram below.



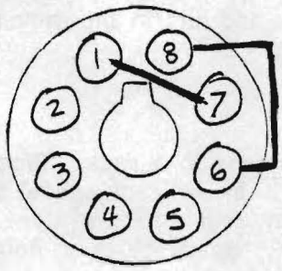
3-PIN XLR CONNECTORS

The 3-pin XLR connectors may be used with balanced (2-conductor, shielded) or unbalanced lines. They are connected to the amplifier's inputs by using the 8-pin transformer socket; they cannot be used directly.

Unbalanced Lines

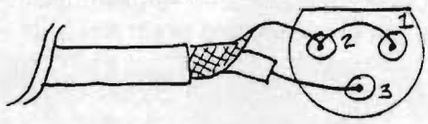
To use the 3-pin XLR connectors with unbalanced lines, a jumper plug (BGW P/N 1350-0108) must be inserted into each transformer socket. The jumper plug connects pin #1 to pin #7, and pin #6 to pin #8 as shown.

JUMPER PLUG MUST BE USED WITH UNBALANCED LINES

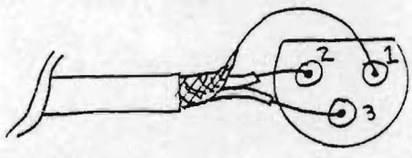


With the jumper plug in place, the 3-pin XLR connector has pin #2 connected to ground, and pin #3 to the input of the amplifier. Note: Rear of plug shown.

When using single conductor shielded cable for unbalanced lines, connect the inner conductor to pin #3 and the shield to pins #1 & #2.



When using 2-conductor shielded cable for unbalanced lines, connect the high level signal wire to pin #3, the low level signal wire to pin #2, and the shield to pin #1.



Note: Shield not connected to anything at signal source.

To achieve a true balanced input, it is necessary to use one transformer for each input. These should be plugged into the octal sockets provided. Depending on the specific application, one of several different transformers may be selected.

Forms are included in this manual to help guide you in your use and selection of transformers. Use the index below to find the appropriate form to match your needs.

CONNECTING ON SOURCE TO ONE AMPLIFIER

Using Balanced Lines: Refer to form #03031

Using Unbalanced Lines: Refer to form #03041

CONNECTING ONE SOURCE TO TWO OR MORE AMPLIFIERS OR DEVICES

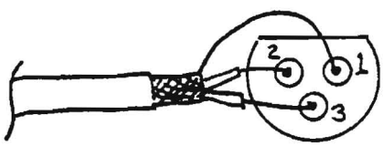
Using Balanced Lines: Refer to form #03011

Using Unbalanced Lines: Refer to form #03021

NOTE: Each amplifier input will be referred to as the "Load" in the above mentioned forms. Only one channel will be shown.

Two conductor shielded cable should be used in a balanced line system. Connect input cables as shown below.

Pin #1 Shield (Ground)
Pin #2 Signal (Minus)
Pin #3 Signal (Plus)

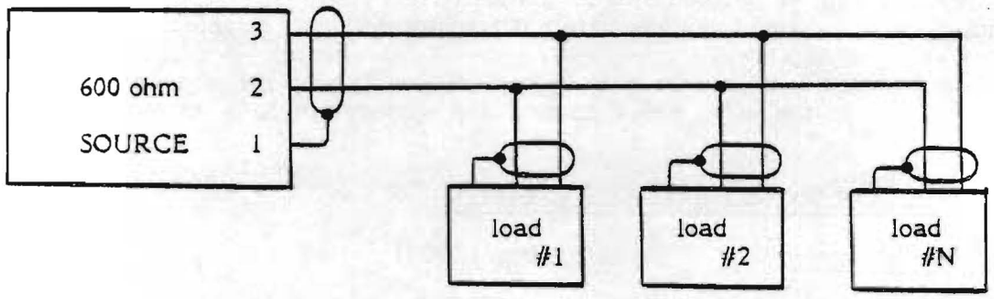


FOR MONO (BRIDGED) OPERATION

To operate the unit as a mono amplifier, use the left channel input only. DO NOT use the right channel input. Remember to place the stereo/mono switch in the mono position.

BRIDGING BALANCED LINE INPUTS

Used only when two or more devices are driven from the same input line.



MAXIMUM NUMBER OF AMPLIFIER 25ea

Input transformers for above

A. Use 1:1 transformer 600 ohms to 600 ohms

B. Nth load must have a terminating resistor added to the secondary of the Input transformer.

One alternative configuration is

C. 1:1 transformer 15K ohms to 15K ohms

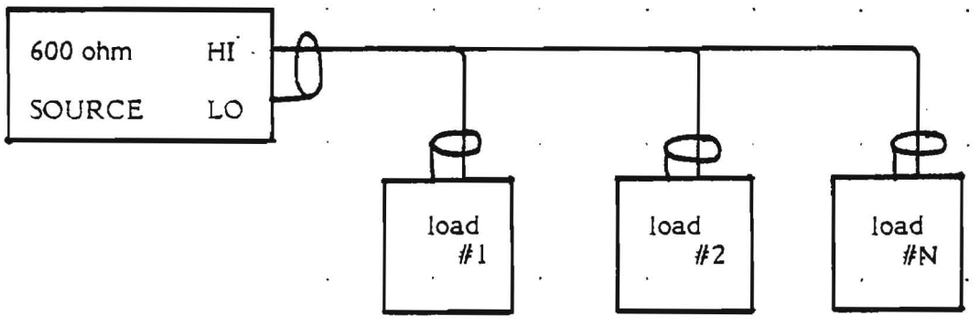
D. Nth load must have a terminating resistor added to the primary of the input transformer.

To find this resistance value see sheet TERMINATING RESISTANCE CHART, MFRM 03051.

NOTE: Terminating resistance is required when source is a transformer. Sources other than a transformer may not need a termination.

BRIDGING UNBALANCED LINE INPUTS

Used only when two or more devices are driven from the same Input line.



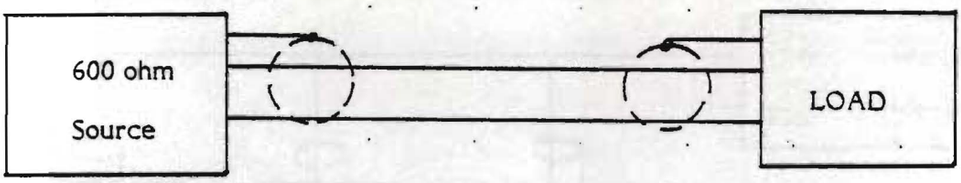
The Nth load should have a terminating resistor added to its octal plug between pin 1 and pin 6.

To find this resistor value see sheet "TERMINATING RESISTANCE CHART", MFRM 03051.

NOTE: Terminating resistance is required when source is a transformer. Sources other than a transformer may not need a termination.

BALANCED LINE INPUT:

Used only when one amplifier is driven from one source.



Input transformer for above

A. Use 1:5 transformer 600 ohms to 15K ohms

NOTE: No 600 ohm TERMINATION IS REQUIRED

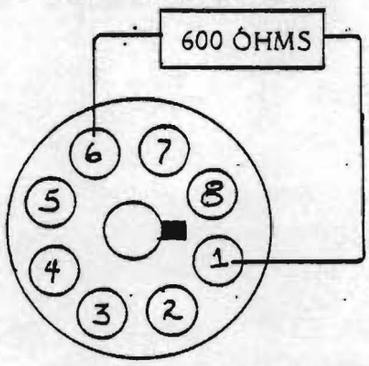
B. Alternate transformer

Use 1:1 transformer 600 ohms to 600 ohms

NOTE: 600 ohms termination is required on the secondary of the transformer

NOTE: Terminating resistance is required when source is a transformer: sources other than a transformer may not need a termination.

600 ohm termination, when required, can be accomplished by soldering the resistor across pins 1 and 6 of the transformer as shown below



or by installing the resistor in a 1/4" phone plug and inserting it into the unused unbalanced input jack.

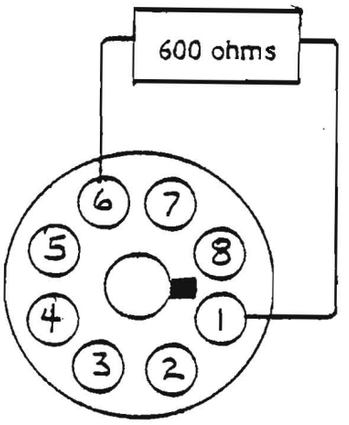
UNBALANCED LINE INPUT

Used only when one amplifier is driven from one source

A 600 ohm terminating resistor must be added to its octal plug.

Between pin 1 and pin 6

NOTE: Terminating resistance is required when source is a transformer. Sources other than a transformer may not need a termination.



TERMINATING RESISTANCE CHART

How to find terminating resistance for balanced or unbalanced 600 ohm lines, driving more than one amplifier.

STEP A $\frac{\text{*Input Impedance of Amplifiers}}{\text{Number of Amplifiers}}$ = Total Load Impedance of Amplifiers

STEP B $\frac{\text{Total Impedance of Amplifiers} - 600}{600}$ = K (Impedance Factor)

STEP C $\left(\frac{1}{K}+1\right) \times 600$ ohms = Load Resistor Required

EXAMPLE:
Input Impedance of Amplifiers = 15,000 ohms
Number of Amplifiers = 4

A $\frac{15{,}000}{4} = 3750$ ohms

B $\frac{3750-600}{600} = 5.25$

C $\frac{1}{5.25}+1 \times 600 = 1.19 \times 600 = 714.29$ ohms

Closest value is 715 ohms 1% metal film resistor.

* Note all amplifiers must have the same input impedance. If not, use formula below:

$$\frac{1}{\frac{1}{Z_1}+\frac{1}{Z_2}+\frac{1}{Z_3}+\frac{1}{Z_4}+\frac{1}{Z_{NTH}}} = \text{Total Load Impedance}$$

EXAMPLE:
Four (4) Amplifiers with input impedance of 15k, 30k, 30k and 7.5k

$$\frac{1}{\frac{1}{15K}+\frac{1}{30K}+\frac{1}{30K}+\frac{1}{7.5K}} = 3750 \text{ ohms}$$

STEREO OUTPUT CONNECTIONS

Two sets of five-way binding posts, on the rear panel, serve as output connectors, with one black and one red binding post for each channel. Left channel leads go to the binding posts marked LEFT; right channel, to those marked RIGHT.

Output leads are best 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.

Make certain that the speakers are properly phased. Connect the black or minus (-) terminal on the speaker cabinet to the appropriate black binding post on the amplifier. Connect the red or plus (+) terminal to the red binding post. Check to see that the stereo-mono switch on the rear of the amplifier is in the stereo position.

SPEAKER PROTECTION

All speakers can be damaged by having too much power applied to them. Fuse protection is an effective and inexpensive way of preventing this from occurring. If your speaker system does not contain a fuse or a circuit breaker, a fuse should be placed in series with each speaker and the wire going to the red terminal on the rear of the amplifier.

Maximum protection can be obtained with fast-acting fuses. Use the value recommended by the manufacturer. If no value is specified, use the chart provided to select the correct value (MFRM-03530).

To use the chart, take a straightedge, such as a ruler, and line up the speaker's impedance with its peak music power rating. The proper fuse value can then be read from the center column. Choose a fuse that is closest to, and below, the value indicated.

WIRE SIZE AND DAMPING FACTOR

The high damping factor of BGW amplifiers results in a very clean bass response. Excessively long, and small diameter speaker wires can lower the damping factor and distort the lower frequencies. A damping factor of at least 50 should be maintained to insure good audio quality.

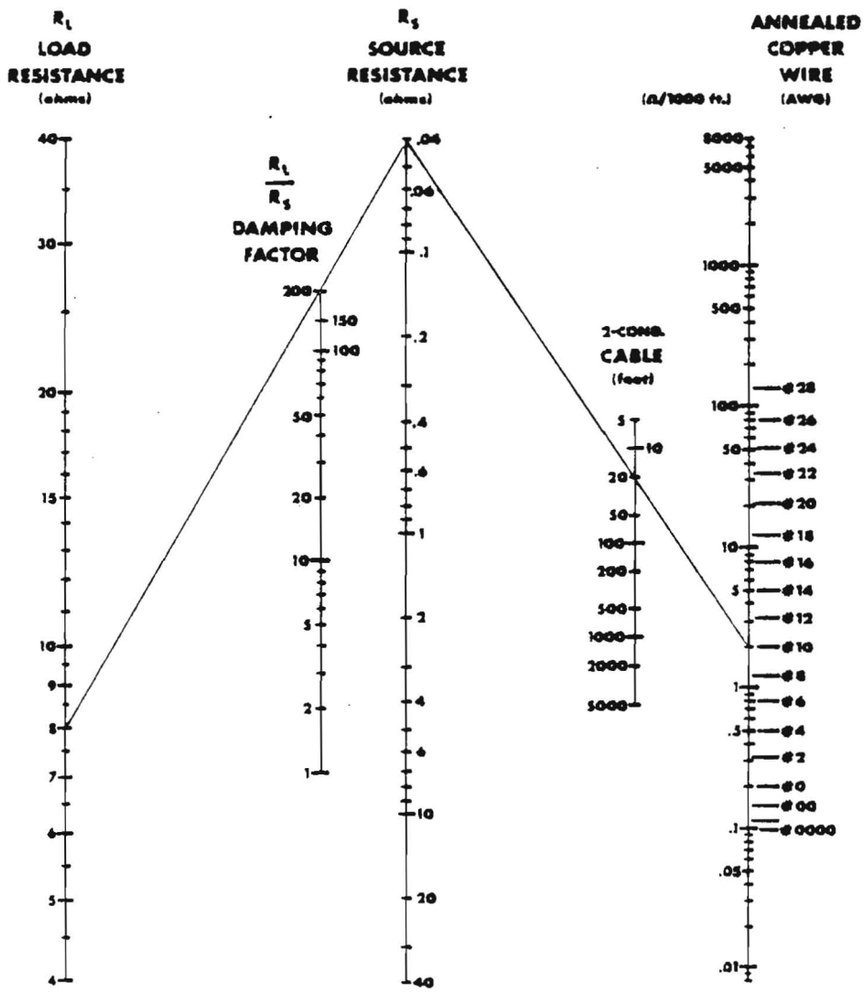
The relationship between wire length and diameter, and damping factor can be calculated using the chart (MFRM-03510) on the following page. Proceed as follows:

1. Using a straight-edge, line up the gauge of the speaker wire with its length. Mark off the resulting source resistance where this line crosses the center column.

2. Line up the source resistance, determined in step #1, with the manufacturer's impedance* of the speaker system. The damping factor can now be read.

*The impedance of a speaker system can be approximated by measuring the resistance across the speaker terminals, with the amplifier disconnected. Multiplying this result by 1.33, gives you the approximate impedance.

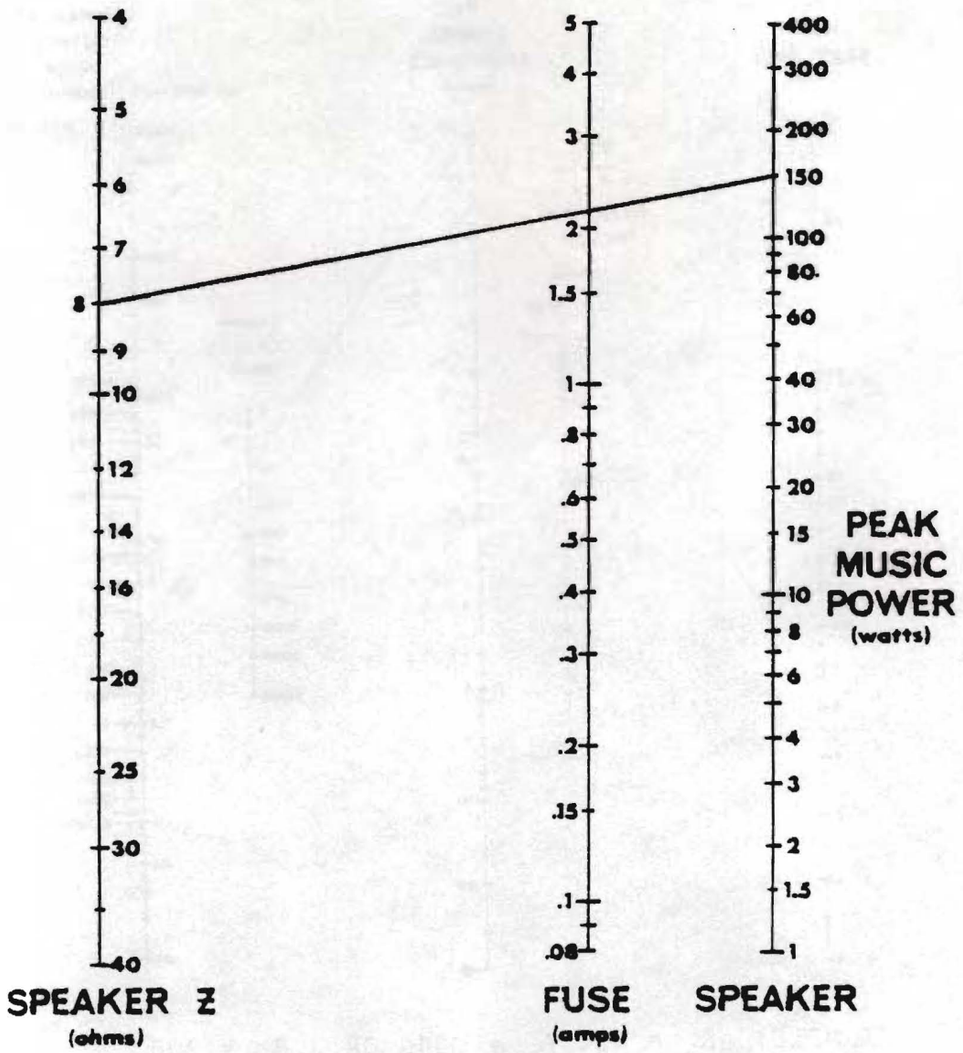
Note: This method cannot be used with electrostatic speakers.



EXAMPLE: R_L = 8Ω, R_S = .04Ω OR D.F. = 200
CABLE LENGTH OF 20 FT. ANSWER: #10 WIRE

SOURCE RESISTANCE AND DAMPING FACTOR VS. LENGTH AND SIZE OF OUTPUT LEADS

MFRM-03510



EXAMPLE: $\not{Z}$ = 8Ω, PEAK POWER = 150W. ANSWER: FUSE = 2 AMPS

FUSE SELECTOR NOMOGRAPH FOR LOUDSPEAKER PROTECTION

MFRM-03530

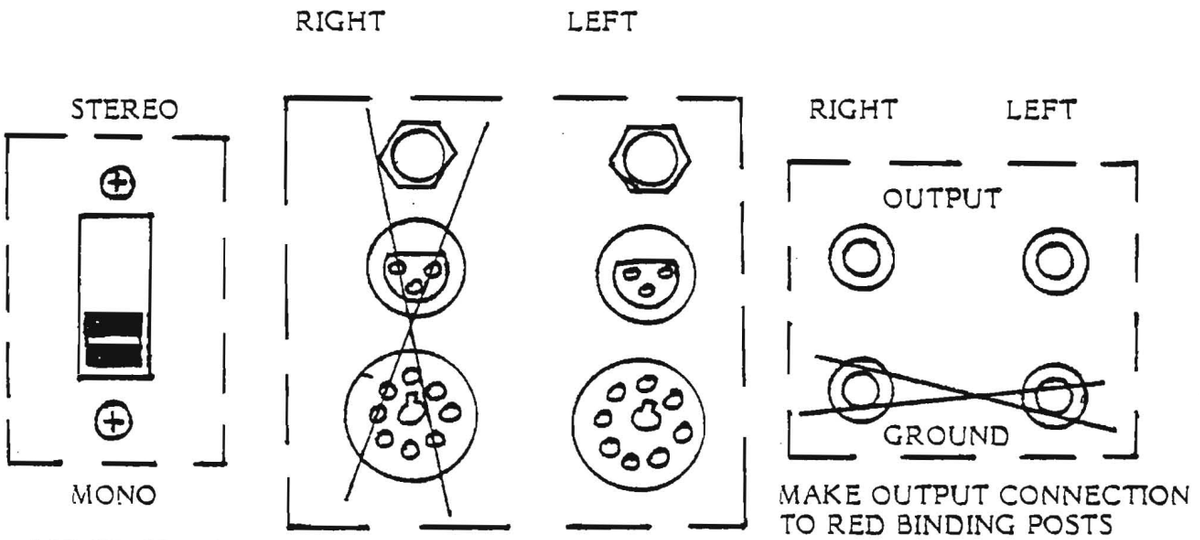
MONO OPERATION

The output power of the amplifier can be increased by operating it in the mono (bridged) mode. The correct procedure for mono operation is as follows:

1. Set Stereo/mono switch to mono position.

2. Use left channel input only. DO NOT use the right channel input.

3. Connect the output across the two red binding posts. DO NOT use the black binding posts. DO NOT reference the load (speaker) to ground. Designate the left channel red binding post (+) and the right channel red binding post minus (-). Fuses, when necessary, should be placed in series with one red binding post.



NOTE: Minimum load impedance for mono operation should be 8 ohms.

CIRCUIT DESCRIPTION

In the mono mode, the output of the left channel is fed into the inverting input of the right channel. The two channels work opposite each other; when one goes positive, the other goes negative, thus doubling the output voltage swing. The single output is referenced between the two red binding posts.

POWER MAINS CONNECTIONS

The unit 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 have been made.

The mains (AC line) voltage is indicated on the label on the rear of the unit. Products supplied for use in the United States and Canada are factory wired for 120 volts. Only the indicated mains voltage should be used. If the mains voltage must be changed, see POWER MAINS VOLTAGE CONVERSION.

A molded, parallel blade, U-ground plug is supplied. This connector is standard in the United States and Canada. For use elsewhere, the plug must be replaced with the correct connector. The color-code of the cord is as follows:

HI (switched Leg) - Brown (or Black)
LO (neutral Leg) - Blue (or White)
EARTH (chassis ground) - Green with Yellow tracer (or Green)

OPERATION

PRECAUTIONS

1. Speaker destruction is often due to improper equipment operation. This often occurs when someone without the proper appreciation for the components of a high power, high quality music system, has the opportunity to change records or adjust levels. The best protection here is caution. Keep the equipment out of reach of untrained adults and children. Make sure the speaker is properly protected with fuses (Output Connections Section).

2. Never parallel the two amplifier outputs together.

3. When driving any load with an impedance of less than 4 ohms, the load should be isolated from the amplifier with a series capacitor, in order to avoid both damage to the load and wasting of output power.

4. If the amplifier continuously blows fuses, something is wrong - do not increase fuse size.

5. Do not connect an input ground lead to an output ground lead; to do so may cause a ground loop and oscillations.

6. Do not operate the amplifier from power mains which exceed the indicated mains voltage by more than 10%.

7. Never connect the output of the amplifier to another power source such as a battery or power main.

8. Do not expose the amplifier to corrosive chemicals such as lye, soft drinks, salt water, etc. Also, never immerse the amplifier in any liquid.

9. Do not remove the amplifier's cover during operations.

10. The amplifier is not intended for high frequency-high power use and should not be used for high power at above 20 kHz.

11. Neither the amplifier nor any of its leads should be exposed to areas likely to be struck by lightning.

PROCEDURES

After all connections have been made to the power amplifier, turn the gain controls fully counter-clockwise. Turn on the preamplifier, then turn on the power amplifier. The LED over the circuit breaker or marked IDLE should light. If it does not, check to see that the amplifier is plugged in to a live power outlet.

With the preamplifer gain controls fully off, advance the left and right power amplifier gain controls about half way clock-wise (slit in knob facing upwards). There ahould be no audible hum; if a hum is heard, check the connections between the power amplifier and preamplifier. Now advance the preamplifier gain controls until the desired maximum volume is achieved. Should the preamplifier gain control be in excess of the 3/4 setting, decrease it to half volume and increase the gain controls of the power amplifier to the desired level.

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 adequate time to stabilize.

150 CIRCUIT DESCRIPTION

Both channels of the amplifier operate in the same manner, and only the left channel will be explained.

POWER SUPPLY

The AC input power from P501 passes through the Circuit breaker CB 301. From CB 301, the AC goes to the power transformer T301.

The output of T301 goes to a full wave bridge rectifier, capacitor input filter circuit consisting of D301, C302 and C303 to give a positive and negative power supply voltages.

AMPLIFIER

The input signal from J301 is applied to the R301 input level control. The output from R301 is applied to the inverting input (pin 2) of op amp IC103 through the coupling network C101, R101, C102 and R104. This network provides a high impedance to the amplifier and filters out DC and radio frequency interference.

Q103 and Q104 divide the signal into positive and negative components respectively. They are connected common emitter and provide voltage gain. Q110 and Q111 are connected common collector to provide the current gain necessary to drive the output stages, Q112 and Q113. The output appears across flyback clipping diodes D103 and D104, then passes through compensation networks L101/R128 and R130/C117 and thermo switch S101, to appear at output jacks J308. Switch S101 opens if the output transistors reach 100 degrees C.

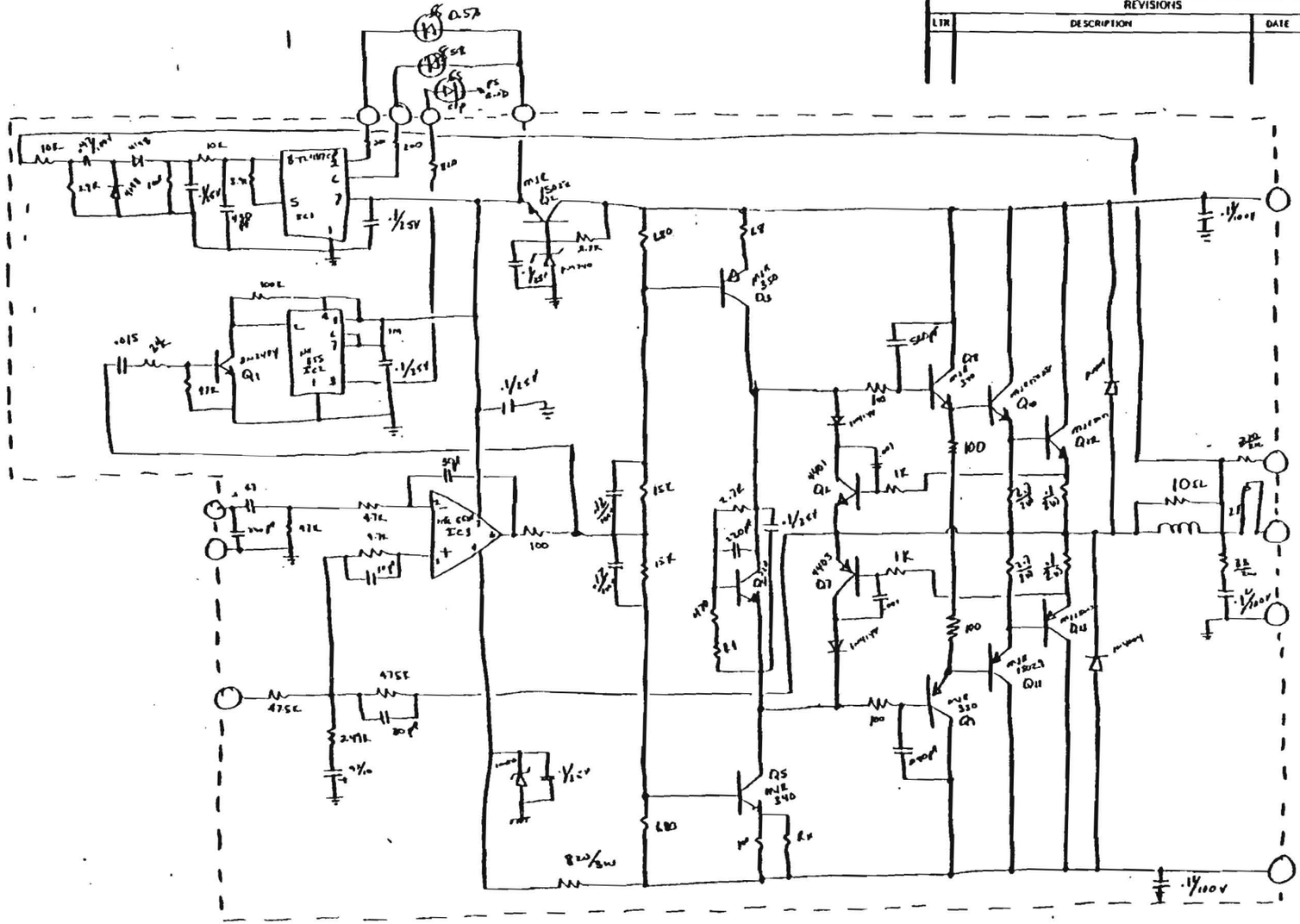
To maintain overall stability, linearity, and low distortion, degenerative feedback is used throughout the amplifier. Voltage divider R103/C106 and R106 applies the correct amount of feedback to the non-inverting input (pin 3) of op amp IC103. Except for the input, the amplifier uses direct coupling throughout. Q106 and Q107 provide the current limiting necessary to protect the output stage.

BRIDGED MODE

When the mono/stereo switch S301 is set to mono, it converts the right channel amplifier to a unity gain inverting power amplifier.

S301 Mono/Stereo switch grounds the normal input to the right channel and connects the output of the left channel amplifier to drive the right channel summing point R102.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



PRELIMINARY DOCUMENT
FOR REFERENCE ONLY

NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

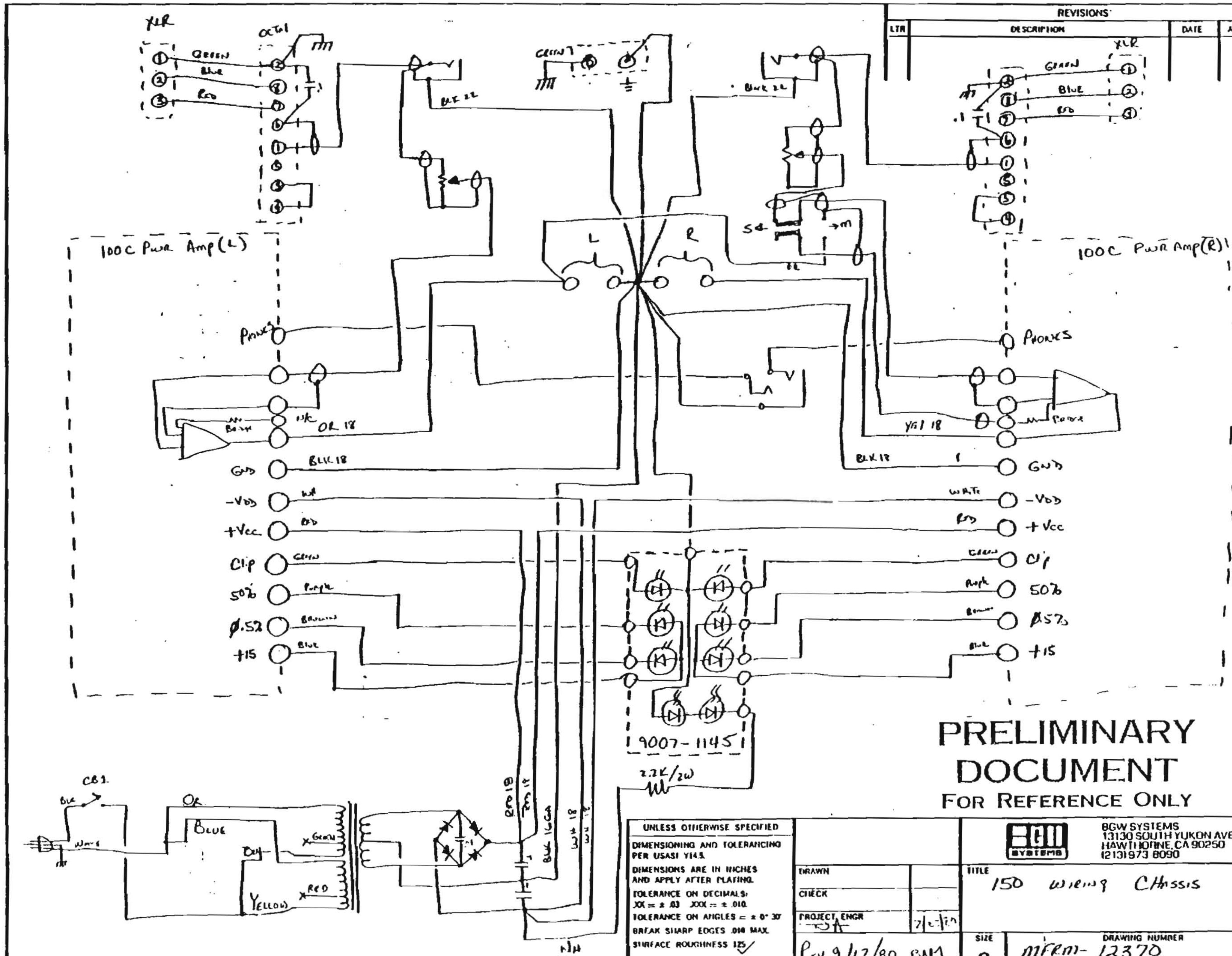
DRAWN
CHECK
PROJECT ENGR 5/1/80
REV. 12/08/80 PAM

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE 150 Schematic Heatsink

SIZE C | DRAWING NUMBER MFRM-12380 | REV

SCALE | SHEET OF



REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

PRELIMINARY
DOCUMENT
FOR REFERENCE ONLY

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: XX = ± .03 XXX = ± .010
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

DRAWN
CHECK
PROJECT ENGR 7/2/80
Rev 9/17/80 BAM

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973 8090

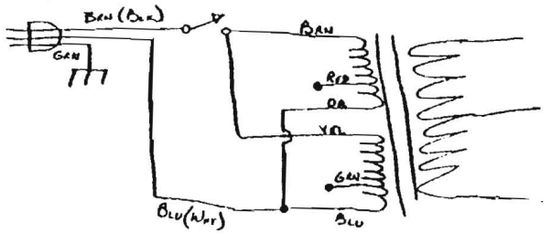
TITLE 150 Wiring Chassis

SIZE C | DRAWING NUMBER MFRM-12370 | REV

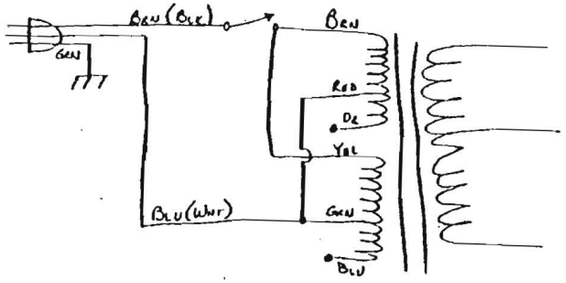
SCALE | SHEET OF

DO NOT SCALE DRAWING

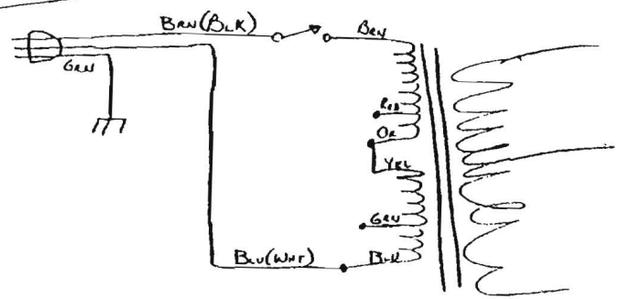
NOTES: UNLESS OTHERWISE SPECIFIED.



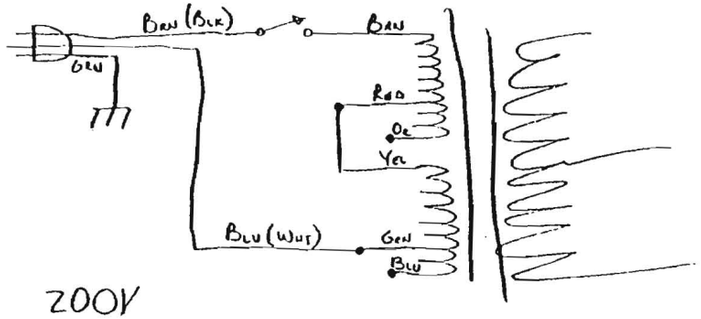
120V



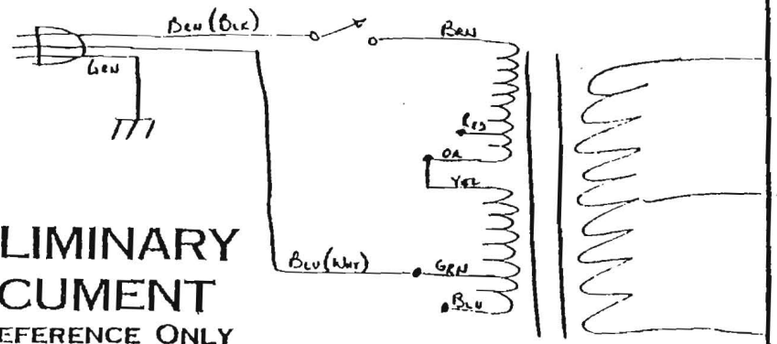
100V



240V



200V



220V

PRELIMINARY DOCUMENT
FOR REFERENCE ONLY

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED

NOTES: UNLESS OTHERWISE SPECIFIED.

DO NOT SCALE DRAWING

UNLESS OTHERWISE SPECIFIED
DIMENSIONING AND TOLERANCING PER USASI Y14.5.
DIMENSIONS ARE IN INCHES AND APPLY AFTER PLATING.
TOLERANCE ON DECIMALS: .XX = ± .03 .XXX = ± .010
TOLERANCE ON ANGLES = ± 0° 30'
BREAK SHARP EDGES .010 MAX.
SURFACE ROUGHNESS 125

DRAWN: BAM 12/22/80
CHECK:
PROJECT ENGR:

BGW SYSTEMS
13130 SOUTH YUKON AVE.
HAWTHORNE, CA 90250
(213) 973-8090

TITLE: 150 WIRING FOR DOMESTIC & FOREIGN VOLTAGES

SIZE: C
DRAWING NUMBER: MFRM-12360
REV:
SCALE:
SHEET: OF

ENG NO	DESCRIPTION	PART NO
**	PARTS LIST 150	** 12390

SCHEMATIC AC WIRING MFRM 12360
SCHEMATIC CHASSIS MFRM 12370
SCHEMATIC HEATSINK MFRM 12380
BLOCK DIAGRAM MFRM 12390

NOTE* ALL COMPONENTS WITH DESIGNATIONS IN THE 200 SERIES ARE RIGHT CHANNEL HEATSINK NUMBERS - REFER TO 100 SERIES NUMBERS EXAMPLE C201 WOULD BE THE SAME AS C101

CAPACITORS

C101	4.7 UF 25V TANTALUM	0226-0005
C102	240PF 500V MICA	0090-0240
C103	10PF 100V MICA	0060-0010
C104	30PF 500V MICA	0060-0030
C105	47UF 10V ELECTROLYTIC	0456-0047
C106	30PF 500V MICA	0060-0030
C107	.12UF 100V METALIZED MYLAR	0363-8003
C108	.12UF 100V METALIZED MYLAR	0363-8003
C109	220PF 500V DISC	0100-0220
C110	.1UF 25V DISC	0129-0100
C111	1000PF 500V DISC	0100-1000
C112	1000PF 500V DISC	0100-1000
C113	560PF 500V MICA	0080-0560
C114	240PF 500V MICA	0090-0240
C115	.12UF 100V METALIZED MYLAR	0363-8003
C116	.12UF 100V METALIZED MYLAR	0363-8003
C117	.12UF 100V METALIZED MYLAR	0363-8003
C118	.1UF 25V DISC	0129-0100
C119	.1UF 25V DISC	0129-0100
C120	.1UF 25V DISC	0129-0100
C121	.015UF 100V MYLAR	0369-0015
C122	.1UF 25V DISC	0129-0100
C123	.47UF 100V METALIZED MYLAR	0363-8000
C124	.1UF 25V DISC	0129-0100
C125	430PF 100V MICA	0060-0430
C126	.1UF 25V DISC	0129-0100
C301	0.1UF 500V DISC	0199-0100
C302	8500UF 50V ELECTROLYTIC	0533-0008
C303	8500UF 50V ELECTROLYTIC	0533-0008
C304	0.1UF 25V DISC	0129-0100
C305	0.1UF 25V DISC	0129-0100

BGW SYSTEMS, INC.

ENG NO	DESCRIPTION	PART NO
	DIODES	
D101	1N4148/1N914 DIODE	1900-4148
D102	1N4148/1N914 DIODE	1900-4148
D103	1N4004 DIODE 1A 400V	1900-4004
D104	1N4004 DIODE 1A 400V	1900-4004
D105	1N4740A 10V ZENER DIODE	1900-4740
D106	1N4740A 10V ZENER DIODE	1900-4740
D107	1N4148/1N914 DIODE	1900-4148
D108	1N4148/1N914 DIODE	1900-4148
D301	BRIDGE RECTIFIER KBH2502	1886-2502
	INTEGRATED CIRCUITS	
IC101	LEVEL DETECTOR TL0487CP	1885-0487
IC102	TIMER NE555	1885-0555
IC103	OP AMP NE5534	1885-5534
	JACKS	
J101	MOLEX 12 PIN CONNECTOR 03-09-2121	1231-2121
J301	INPUT JACK N111	9999-0111
J302	INPUT JACK N111	9999-0111
J303	8 PIN SOCKET	1203-0008
J304	8 PIN SOCKET	1203-0008
J305	3 PIN XLR PC MOUNT	1205-0002
J306	3 PIN XLR PC MOUNT	1205-0002
J307	STEREO PHONE JACK 3/8 BUSHING	1205-0005
J308	CONNECTOR BINDING POST RED	1231-0008
J309	CONNECTOR BINDING POST RED	1231-0008
J310	CONNECTOR BINDING POST BLACK	1231-0009
J311	CONNECTOR BINDING POST BLACK	1231-0009
	INDUCTORS	
L101	1.40UH INDUCTOR 22GA WIRE 8022-0400 SEE R128	1700-0001
	PLUGS	
P301	MOLEX 12 PIN CONNECTOR 03-09-1126	1231-1126
P302	MOLEX 12 PIN CONNECTOR 03-09-1126	1231-1126
	TRANSISTORS	
Q101	2N2484 NPN SILICON LOW SIGNAL TO92	1854-2484
Q102	MJE 15028 TRANSISTOR NPN TO220	1854-5028
Q103	MJE 350 PNP TRANSISTOR	1853-0350
Q104	MJE 340 NPN TRANSISTOR	1854-0340
Q105	MJE 720 NPN TRANSISTOR	1854-0720
Q106	2N4401 NPN SILICON LOW SIGNAL TO92	1854-4401
Q107	2N4403 PNP SILICON LOW SIGNAL TO92	1853-4403

BGW SYSTEMS. INC.

ENG NO	DESCRIPTION	PART NO
Q108	MJE 340 NPN TRANSISTOR	1854-0340
Q109	MJE 350 PNP TRANSISTOR	1853-0350
Q110	MJE 15028 NPN TRANSISTOR TO220	1854-5028
Q111	MJE 15029 PNP TRANSISTOR TO220	1853-5029
Q112	MJ 15022 NPN TRANSISTOR TO3	1854-1522
Q113	MJ 15023 PNP TRANSISTOR TO3	1853-1523
	RESISTORS	
R101	47K 5% 1/2W DEPOSITED CARBON	5005-4703
R102	47.5K 1% METAL FILM	5001-4752
R103	47.5K 1% METAL FILM	5001-4752
R104	4.7K 5% 1/2W DEPOSITED CARBON	5005-4702
R105	4.7K 5% 1/2W DEPOSITED CARBON	5005-4702
R106	2.49K 1% METAL FILM	5001-2491
R107	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R108	15K 5% 1/2W DEPOSITED CARBON	5005-1503
R109	15K 5% 1/2W DEPOSITED CARBON	5005-1503
R110	680R 5% 1/2W DEPOSITED CARBON	5005-6801
R111	680R 5% 1/2W DEPOSITED CARBON	5005-6801
R112	68R 5% 1/2W DEPOSITED CARBON	5005-6800
R113	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R114	FACTORY SELECTED OFFSET ADJUSTMENT	
R115	2.7K 5% 1/2W DEPOSITED CARBON	5005-2702
R116	470R 5% 1/2W DEPOSITED CARBON	5005-4701
R117	FACTORY SELECTED BIAS ADJUSTMENT	
R118	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R119	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R120	1K 5% 1/2W DEPOSITED CARBON	5005-1003
R121	1K 5% 1/2W DEPOSITED CARBON	5005-1003
R122	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R123	100R 5% 1/2W DEPOSITED CARBON	5005-1002
R124	2.7R 5% 2W WIRE WOUND BWH	4025-2070
R125	2.7R 5% 2W WIRE WOUND BWH	4025-2070
R126	0.1R 5% 2W WIRE WOUND BWH	4025-1009
R127	0.1R 5% 2W WIRE WOUND BWH	4025-1009
R128	10R 10% 2W CARBON COMP SEE L101	6020-1001
R129	270R 10% 2W WIRE WOUND BWH	4020-2701
R130	33R 10% 2W WIRE WOUND BWH	4020-3300
R131	820R 3W WIRE WOUND	4030-8201
R132	2.7K 5% 1/2W DEPOSITED CARBON	5005-2702
R133	24K 5% 1/2W DEPOSITED CARBON	5005-2403
R134	47K 5% 1/2W DEPOSITED CARBON	5005-4703
R135	100K 5% 1/2W DEPOSITED CARBON	5005-1005
R136	1M 5% 1/2W DEPOSITED CARBON	5005-1006
R137	820R 5% 1/2W DEPOSITED CARBON	5005-8201
R138	10K 5% 1/2W DEPOSITED CARBON	5005-1004
R139	3.9K 5% 1/2W DEPOSITED CARBON	5005-3902
R140	100K 5% 1/2W DEPOSITED CARBON	5005-1005
R141	10K 5% 1/2W DEPOSITED CARBON	5005-1004
R142	3.9K 5% 1/2W DEPOSITED CARBON	5005-3902

BGW SYSTEMS, INC.

ENG NO	DESCRIPTION	PART NO
R143	200R 5% 1/2W DEPOSITED CARBON	5005-2002
R144	200R 5% 1/2W DEPOSITED CARBON	5005-2002
R145	8.2K 5% 1/4W DEPOSITED CARBON	5065-8202
R146	8.2K 5% 1/4W DEPOSITED CARBON	5065-8202
R301	22K STEP ATTENUATOR NOBLE	7006-2015
R302	22K STEP ATTENUATOR NOBLE	7006-2015
R303	2.7K 5% 2W CARBON COMP	6025-2702
	SWITCHES	
S101	THERMAL SWITCH 200 212F	0630-3445
S301	SLIDE SWITCH, RECESSED HANDLE	0620-6206
	TRANSFORMERS	
T301	TRANSFORMER, TOROID	0900-0124
	TERMINAL STRIPS	
TB301	GROUND BARRIER STRIP W/STRAP	0720-1696
******	**********	*********

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:

PLACE
STAMP
HERE

BGW
SYSTEMS

13130 SOUTH YUKON AVENUE
HAWTHORNE, CALIFORNIA 90250

FOLD HERE

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: ---------- ----------
MODEL SERIAL NUMBER

1. DESCRIBE SYMPTOMS:

2. WHICH CHANNELS (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 PROBLEM TO THE POWER AMP?

7. FURTHER COMMENTS:

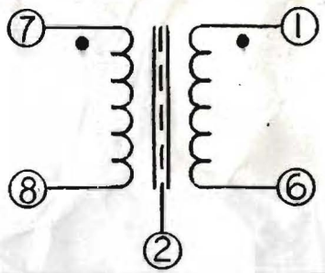
IT IS MORE EXPEDIENT TO CALL YOUR DEALER OR OUR FACTORY EXPLAINING THE NATURE OF YOUR PROBLEM. IN MANY INSTANCES THE PROBLEM CAN BE SOLVED WITHOUT RETURNING THE UNIT TO THE FACTORY. WARNING: THE UNIT MUST BE RETURNED IN AN ORIGINAL FACTORY CONTAINER. IF YOU DO NOT HAVE ONE, WE WILL PROVIDE A REPLACEMENT 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.

PLACE
STAMP
HERE

BGW
SYSTEMS

13130 SOUTH YUKON AVENUE
HAWTHORNE, CALIFORNIA 90250

FOLD HERE



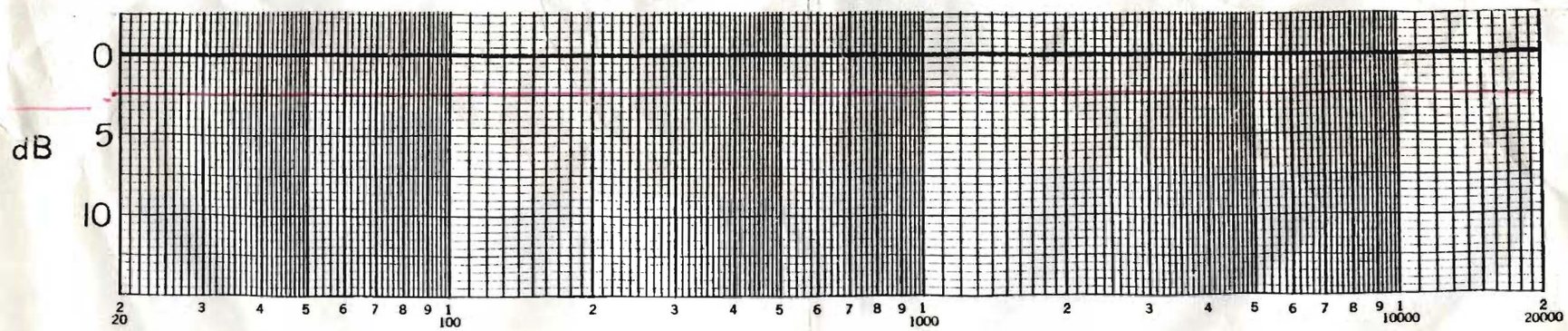
POLARITY
INSERTION LOSS
FREQUENCY RESPONSE

BGW SYSTEMS

0900-9250
BRIDGING TRANSFORMER
15K - 15K

TESTED BY
INSP 7

20 - 20K RESPONSE
600 OHM DRIVER
15K NOM. LOAD
0dB REF.



FREQUENCY IN CYCLES PER SECOND

BGW SYSTEMS

13130 SOUTH YUKON AVENUE
PHONE (213) 973-8090

HAWTHORNE, CALIFORNIA 90250
TELEX NO. 66-4494

50001

MODEL 150 TEST REPORT

DATE: 11-19-87 TECHNICIAN: BILL GONG

SERIAL NO.: 86J 1606

LINE VOLTAGE: 120 V

	CH. 1	CH. 2	MONO
Power at Clip (0.1% THD) 8 ohms - volts out	21.6V	21.5V	36.4V
Power	58W	57W	165W
Power at Clip (0.15% THD) 4 ohms - volts out	18.4V	18.3V	---
Power	84W	83W	
THD 50 Watts - 8 ohms (20.1 Volts)			
20Hz	.006 %	.007 %	
20kHz	.037 %	.028 %	
Small Signal Bandwidth 8 ohms			
-3dB Frequency	90 kHz	89 kHz	
Noise Level Output Noise Voltage 20Hz to 20kHz	.07 mV.	.06 mV.	
Quiescent Power 40 Watts			

10/5/83

50045

BGW Systems - Q. A. Check List

MODEL #	SERIAL NO.	INSPECTOR/SIGNATURE	CHECK
150	8631606	AAO	

1.	Front Panel/chassis free of blemishes	✓
2.	Knobs correctly aligned and tightened	✓
3.	All controls and switches function normally	✓
4.	Check for stripped screw heads	✓
5.	Correct voltage tag	
6.	Five-way binding posts tightened and correctly aligned	✓
7.	Input jacks wired correctly and tightened	✓
8.	Check for correct circuit breaker	✓
9.	Check wire harness for neatness and pinched wires	✓
10.	Check for loose hardware	✓

09/01/83