D-75

DUAL-CHANNEL
POWER AMPLIFIER
SERVICE MANUAL

CROWN INTERNATIONAL, INC. 1718 W. MISHAWAKA RD. ELKHART, IN 46517-4095

K80186A6
3/89

FULL THREE-YEAR WARRANTY

SUMMARY OF WARRANTY

We, CROWN INTERNATIONAL, INC., 1718 West Mishawaka Road, Elkhart, Indiana 46517-4095 (Warrantor) warrant to you, the ORIGINAL PURCHASER AND ANY SUBSEQUENT OWNER of each NEW Crown product, for a period of three (3) years from the date of purchase by the original purchaser (warranty period) that the product is free of defects in materials or workmanship and will meet or exceed all advertised specifications for such a product.

ITEMS EXCLUDED FROM WARRANTY

We are not responsible for product failure caused by misuse, accident or neglect. This warranty does not extend to any product on which the serial number has been defaced, altered, or removed. It does not cover damage to loudspeakers or any other products resulting from Crown product failure. It does not cover defects or damage caused by your use of unauthorized modifications, parts, or service. It also excludes batteries and damage caused by leaky or defective batteries.

WHAT WE WILL DO

We will remedy any defect in materials or workmanship by repair, replacement, or refund. We may not elect refund unless you agree, or unless we are unable to provide replacement, and repair is not practical or cannot be timely made. If a refund is elected, then you must make the defective or malfunctioning component available to Crown free and clear of all liens or other encumbrances. The refund will be equal to the actual purchase price, not including interest, insurance, closing costs, and other finance charges less a reasonable depreciation on the product from the date of original purchase. Warranty work can only be performed at our authorized service centers or at the Crown factory. We will remedy the defect and ship the product from the service center or Crown factory within a reasonable time after receipt of the defective product at the authorized service center or Crown factory. All expenses in remedying the defect, including surface shipping costs in the United States, will be borne by Crown. (Purchaser must bear the expense of shipping the product between any foreign country and the port of entry in the United States and all taxes, duties, and other custom's fee for such foreign shipments.)

HOW TO OBTAIN WARRANTY SERVICE

You must notify us of your need for warranty service not later than ninety (90) days after expiration of the warranty period. We will give you written notice of the dealer service centers to whom you may deliver the product, or we will give you an authorization to return it for factory service. All components must be shipped in a factory pack, which, if needed, may be obtained from Crown free of charge. Corrective action will be taken within a reasonable time of the date of receipt of the defective product by us or our service center. If the repairs made by Crown or the authorized service center are not satisfactory, notify Crown or the authorized service center immediately.

DISCLAIMER OF CONSEQUENTIAL AND INCIDENTAL DAMAGES

YOU ARE NOT ENTITLED TO RECOVER FROM US ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES RESULTING FROM ANY DEFECT IN OUR PRODUCT. THIS INCLUDES ANY DAMAGE TO ANOTHER PRODUCT OR PRODUCTS RESULTING FROM SUCH A DEFECT. **SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

WARRANTY ALTERATIONS

NO PERSON HAS THE AUTHORITY TO ENLARGE, AMEND, OR MODIFY THIS WARRANTY. THE WARRANTY IS NOT EXTENDED BY THE LENGTH OF TIME WHICH YOU ARE DEPRIVED OF THE USE OF THE PRODUCT. REPAIRS AND REPLACEMENT PARTS PROVIDED UNDER THE TERMS OF THIS WARRANTY SHALL CARRY ONLY THE UNEXPIRED PORTION OF THIS WARRANTY.

DESIGN CHANGES

We reserve the right to change the design of any product from time to time without notice and with no obligation to make corresponding changes in products previously manufactured.

LEGAL REMEDIES OF PURCHASER

THIS WARRRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. No action to enforce this Warranty shall be commenced later than ninety (90) days after expiration of the warranty period.

CROWN INTERNATIONAL, INC.
1718 West Mishawaka Road, Elkhart, Indiana 46517-4095.

THIS STATEMENT OF WARRANTY SUPERSEDES ALL OTHERS CONTAINED IN THIS MANUAL.

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The information furnished in this manual does not include all of the details of design, production, or variations of the equipment. Nor does it cover every possible situation which may arise during installation, operation or maintenance. If you need special assistance, beyond the scope of this manual, please contact the Crown International Customer Services Department.

Crown International, Inc.
1718 West Mishawaka Road
Elkhart, Indiana 46517-4095
Phone: (219) 294-8000
Fax: (219) 294-8FAX
Twx: (810) 294-2160

WARNING

TO PREVENT SHOCK OR FIRE HAZARD, DO NOT EXPOSE TO RAIN OR MOISTURE!

CAUTION

TO PREVENT SHOCK DO NOT USE THE POLARIZED AC PLUG OF THIS UNIT WITH AN UNPOLARIZED EXTENSION CORD, RECEPTACLE OR OTHER OUTLET WHERE THE BLADES CANNOT BE FULLY INSERTED.

ATTENTION

POUR PREVENIR LES CHOCS ELECTRIQUES NE PAS UTILISER CETTE FICHE POLARISEE AVEC UN PROLONGATEUR. UNE PRISE DE COURANT OU UNE AUTRIE SORTIE DE COURANT, SAUF SI LES LAMES PEUVENT ETRE INSEREES A FOND SANS EN LAISSER AUCUNE PARTIE A DECOUVERT.

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Illustration

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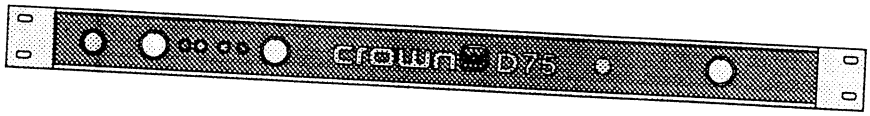

Fig. 1.1 D-75

1 Introduction

This manual contains complete service information on the Crown D-75 power amplifier. It is designed to be used in conjunction with the D-75 Instruction Manual. However, some important information is duplicated in this Service Manual in case the Instruction Manual is not readily available.

NOTE: THE INFORMATION IN THIS MANUAL IS INTENDED FOR USE BY AN EXPERIENCED TECHNICIAN ONLY!

1.1 The D-75

The D-75 amplifier is a compact, audio power amplifier designed for professional use. Providing medium power amplification from 20Hz-20KHz with minimum distortion, the unit features balanced inputs, signal presence and IOC™ indicators, monophonic capability and a means for isolating electrical ground from chassis ground.

1.2 Warranty

Product that is covered by warranty must be serviced by an Authorized Crown Service Center or at the Crown Factory Service Department. Any questions concerning warranty policy should be directed to the attention of Technical Service Department at:

Crown International, Inc.
1718 W. Mishawaka Road
Elkhart, Indiana 46517-4095
Phone: (219) 294-8000
FAX: (219) 294-8329
Twx: (810) 294-2160

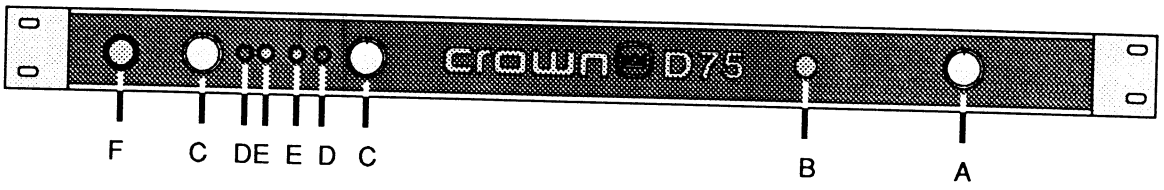

FIG. 2.1 FRONT FACILITIED (D-75)

2 Facilities

A. Power

The AC power switch, mounted at the right-hand corner of the D-75 is a simple 2 position "on/off" control. If the AC power switch is positioned at "on", the power indicator should be on (B).

B. Power Indicator

Amber indicator that the unit is on.

C. Level

The level of each channel is independently controlled by these controls. The control for channel 2 should be turned down and not used when operating in MONO mode.

D. IOC™

An Input/Output Comparator LED is provided for each channel. Illumination may occur at such times as when there is too high an input level, improper load impedance, output stage clipping or even an amplifier based problem.

E. Signal Presence Indication

A signal presence indication LED is provided for each channel to indicate when signal is present. Unlike the "on/off" state of the IOC indicators the SPI LED's will vary with signal level

F. Output Monitor

A standard 1/4 inch stereo jack is provided on the front panel. It is in parallel with the main outputs (G) and can be used to drive headphones.

G. Output Binding Posts

Dual binding postconnectors are provided at the output of each channel. Use dual banana plugs on the speaker cables for connection to the jacks. In bridged-MONO, only the two top jacks (red) are used.

H. Dual-Mono

Slide this switch to the left (ch. 1) for MONO mode and to the right (ch. 2) for Stereo mode operation. In MONO mode the input and level control for channel two should not be used and only balanced (ungrounded) loads should be connected to the output jacks.

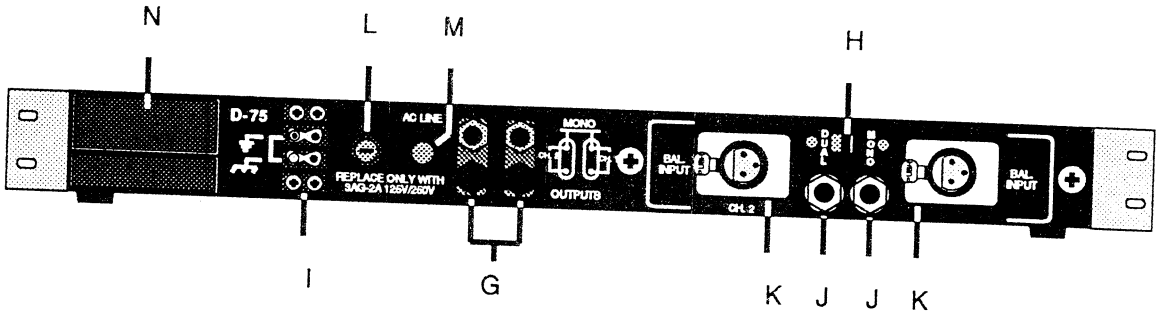

FIG. 2.2 Rear Facilities (D-75)

I. Ground Barrier Strip

Isolation of chassis ground from signal ground is easily accomplished by removing the shorting strap from this terminal strip. This may help remove any hum problems caused by "ground loops." (Circuit ground is isolated from chassis ground by 2.7 ohms.)

J. Input Phone Jack

An unbalanced 1/4 inch phone jack is provided at the input of each channel. Do not use the input jack for channel 2 in MONO mode.

K. Balanced-Input Receptacle

A balanced XLR connector is provided at the input of each channel.

L. Fuse

The AC line is safety fused. If the unit is configured for 100VAC or 120VAC operation, a 2 amp fuse is used and if set up for 200VAC, 220VAC or 240VAC, a 1 amp fuse is used. The use of any other fuse value will invalidate the warranty

M. Power Cord

A standard three-wire (grounded) AC cord with a 15 amp plug are provided

N. Serial Number Sticker

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3 Required Test Equipment

Many of the service and repair problems with the D-75 can be performed with a limited amount of test equipment. However, in order to return the unit to its "factory new" specifications, the following list of required test equipment is recommended. The "Requirements" column provides information to allow intelligent selectin of substitutes if the "Suggested Supplier and Model" is not available or is considered impractical to obtain.

Equipment	Requirements	Application	Suggested Model
Oscilloscope	Capable of displaying a 10MHz signal	Monitoring output during service and testing	Telequipment D54A or equivalent
Volt-Ohmmeter	Low-voltage resistance probe 100mv (range). High-voltage resistance probe (1.5V range)	Check resistance values (low voltage probe). Check semiconductor junctions for opens or shorts (high voltage probe) Check DC voltages	Fluke 8024 or equivalent
Freq. Counter		For accurate general monitoring	Heath SM118A
Signal Generator	Sine/Square wave available; flat frequency responce. THD .1% maximum	Provide test signals for service and checkout	Wavetek 130 -Series or equivalent
Circuit Breaker	15 ampere rating	In AC line to unit; protects circuitry from overload if power supply has shorted	
AC Line Voltage Monitor	Peak reading meter (displays rms equivalent to a sinusoidal peak for any waveform)	Monitor Line voltage	Circuit available from Crown

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4. Maintenance

Effective repair involves three basic steps: 10 Determine the symptom(s) of the problem; 2) Identify the cause(s) of the symptom(s); 3) Repair the unit to eliminate the cause(s). Before proceding through these steps it is highly recommended that you first observe the safety precautions in the next section and conduct a visual inspection of the unit.

4.1 Safety First!

To avoid risking electric shock, turn off and unplug the D-75 from the AC power outlet before attempting to disassemble or reassemble it.

If the unit has been in recent use, the large power supply capacitors will probably have enough power stored within them to present a shock hazard to you and the amplifier circuitry. To safely discharge them, place a 10 ohm, 5 watt resistor across the + and - terminals of each capacitor for several seconds. Use caution when handling the discharge resistor-particularly avoiding skin contact with the leads while discharging the capacitors.

Avoid risk of fire hazard from shorted power supplies by plugging the defective amplifier into an AC outlet which has a 15 amp circuit breaker.

4.2 Inspection

A careful visual inspection is valuable for most problems which you may encounter. To inspect the amplifier, remove the cover panels as described in section 4.3.1

Begin the inspection by looking for anything which appears abnormal, like broken wires and burnt or visibly damaged components. Check wire and component solder joints. Inspect the printed circuit board(s) for broken traces and loose connections. Be thorough- the time you spend visually inspecting the amp is time well spent.

4.3 Disassembly

The extent of disassembly required will depend upon the extent of inspection, service, testing, adjustment and repair to be performed. Illustrations referred to in parenthesis are located in the parts list (Section 9) of this manual.

4.3.1. Cover Removal

A fairly complete visual inspection can be performed by removing the top (91) and bottom (90) covers. To remove these parts, proceed as follows:

1. Remove the eight (four per side) phillips head mounting screws that secure top cover (91). Gently lift cover up and remove.
2. Remove the nine phillips head mounting screws that secure bottom cover (90). Cover will easily be removable upon screw extraction.
3. Remove each rack ear (93) for easier access to front panel components.

4.3.2. Main Board Removal

The D-75 has been specially designed for ease of service. Probably the best example of this is the modular layout of the Main Board. Note that all connections are made through either push-on terminals or through two 9 pin arrays (with the exception of one ground wire which is soldered).

To remove the Main Board proceed as follows:

1. Refer to the component side board layout, Fig. 6.7.
2. Unsolder and remove the black wire marked "ground".
3. Disconnect the 15 color-coded push-on wires located throughout the underside of the main board. Their locations are marked by wire color.
4. Remove the four mounting screws and nylon spacers (33) located on the top side of the board. Gently rock the board up and down until it becomes free.
5. All work needed on this board may now be performed effortlessly.

4.3.3. Output Module Replacement/Repair

The D-75 Output Module should not have to be removed unless the board itself is faulty and needs replacing. If this is the case, refer to the disassembly instructions listed below. All other components on or around the Output Module may be replaced without actual removal of the board. This procedure is also listedbelow, after the disassembly instructions.

1. Replacement

a. Remove the Main Board (See Main Board Removal).

b. Unsolder and remove the four Output transistors (25) by unscrewing the 8 mounting screws (two on each). Note: In order to ease replacement of spacers located beneath each screw/nut combination, leave the D-75 in its normal lying position—flat!!

c. Remove the four driver transistors (24) screws.

d. Gently lift board upward, being careful not to jar the position of spacers located beneath.

e. Remove all external wiring to Output Module and note location for future re-connection.

f. Replace board.

2. Repair

a. All component parts located on the Output Module may be removed by applying standard soldering/ desoldering methods (See Section 7) from the top of the board. Use extra care when working with a part located near the front panel so as not to mar the finish.

b. Front panel controls and LED's may be replaced without removing the Output Module Board (See the following section).

3. Output transistor replacement-Output transistor (25) can be replaced by removing two mounting screws (per output) and unsoldering the two main connecting pins. Note as per exploded view drawing insulating wafer (TO-3, 21), and its position in assembly.

4.3.4. Front Panel Parts Replacement

As previously stated, all front panel component parts can be replaced **without Output Module** removal. Generally, this operation is performed by unsoldering all or part of obstructing components. A detailed instruction format is listed below.

1. **Input level control** removal is accomplished by removing the aluminum knobs (28) and related hardware (20). Channel one pot can be pulled back and slid out the left-hand side when the headphone jack (15) and associated hardware is removed (10, 14) (rack ear (93) should be removed). Channel two input level potentiometer can be remove after the "right" lead of R232 is disconnected and the grounding bus strip is moved away from the working area. The potentiometer may need considerable, but gentle pressure in order for it to come free.

2. **IOC, Signal LED Replacement.** When handling any one of the four panel LED's (22, 23), extreme care is necessary in order to achieve a successful repair. Unsolder leads of LED to be replaced. With a pair of needle-nose pliers, remove the black support ring located behind the LED. Next carefully extract the faulty LED by pulling straight back and removing from the rear. Replace the LED and reverse of above. Note: When installing an LED always observe correct polarity! It may be helpful when inserting the rear black support ring to apply pressure with a 1/4" nut driver allowing the leads to move up the middle of the driver (See Fig. 7.17).

3. **On/Off Switch Replacement.** To replace the front panel on/off switch (35) remove aluminum knob and related hardware (27, 2, 10, 11). With a small flat-head screwdriver, slowly pry off fuse block holder from adhesive. Push switch back until solder lugs are exposed. Remove wire, and slide the switch to the right and out the end. Replacement is the reverse of above. Note: It may be necessary to replace the adhesive strip located beneath the fuse block.

4. **Neon "Off-On" Indicator Replacement.** Because of the special mounting procedure used with the front panel power indicator (42), Crown recommends factory replacement only.

4.3.5. Back Panel Parts Replacement

All component parts located on the back panel of the D-75 can be replaced with relatively little effort (see exploded view drawing, rear panel assembly). Should questions arise contact the Crown Technical Service Department.

4.4 Reassembly

Reassembly is essentially the reverse of disassembly. If in doubt about types and sizes of attaching parts, refer to the appropriate illustration in Section 9

4.5.Troubleshooting

The three steps to effective troubleshooting and repair were mentioned earlier. They can be summarized in the three following questions: What is the problem (effect)? What is causing the problem (cause)? What can be done to eliminate the cause (repair)? The purpose of this section is to help you answer these questions in an orderly manner.

Finding and fixing the problem(s) is not the end of maintenance. The final step is to thoroughly test the amplifier to be certain that it meets the factory specifications after it has been repaired. The test procedures in section 4.5.3 will help you do this as well as aid you in locating the cause of problem(s).

4.5.1 Identifying Symptoms

Why was the amplifier brought in for repair? Can you get it to malfunction again? (Some problems can be intermittant and difficult to find.) If you don't observe anything wrong with the amplifier, tactfully inquire how the owner used it and try to determine if it was misused or some other component in their system could have been at fault. (Appendices A and B contain the installation and operation instructions for the D-75.)

If you lack sufficient information about the problem and there isn't anything obvious wrong skip to the next section and procede directly to the test procedures in section 4.5.2. Using it can determine if the amplifier meets factory specs.If you have any questions regarding warranty coverage, please call Crown's Technical Service Department.

4.5.2 Test Procedures

Test or Adjustment	Input Signal Characteristics	Instructions/Comments
1. Quiescent DC offset	None	±10mV
2. Bias adjustment	None	Positive output, base-emitter junction should be between .3V and .35V. Adjustable by R112, R212.
3. Power (single channel)	1 volt;1KHz sine wave	Into 8 ohms, 20 vrms (50 watts) should be obtainable before signal clip. Into 4 ohms, 17.5 vrms (75 watts) should be obtainable before signal clip.
4. Protection Circuit	1 volt;1KHz sine wave	Into 2 ohms, signal will appear as in Figure 4.1.
5. High Frequency	1 volt;10KHz sq. wave 1 volt;1KHz sq. wave	Into an 8 ohm load, a 25 volt peak to peak square wave signal should exhibit no ringing (see figure 4.2) Into an 8 ohm load, a 19vrms sine wave signal should exhibit no ringing (see Figure 4.3).

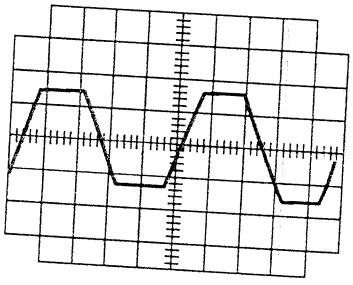

Fig. 4.1 2 Ohm Load Waveform

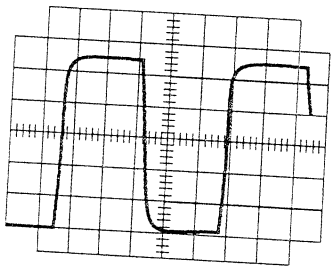

Fig. 4.2 10KHz Sq. Wave

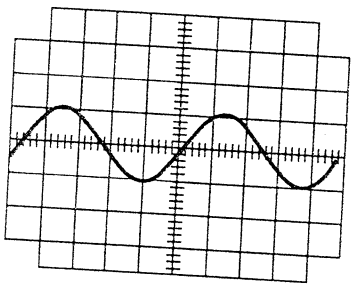

Fig. 4.3 20KHz Sine Wave

Test or Adjustment	Input Signal Characteristics	Instructions/Comments
6. Intermodulation Distortion	.5V +/-2%; 60Hz-7KHz signal summed in 4:1 ratio	(See Fig. 4.4) When using the Crown IMA, typical readings will be as follows: 0dB=.004% -5dB through -25dB=.03% -30dB=.03% -35dB=.03%
7. IOC	2.5V peak-peak .5Hz sq. wave	IOC should illuminate once for every rise time and once for every fall time (twice every full cycle). Test generator rise time must be less than 1.0 microsecond.
8. Signal to Noise		(See Fig. 4.5) Signal to noise should be 106dB below rated output with meter bandwidth of 20Hz to 20KHz.
9. Quiesent AC Power		15 watts at idle as monitored by wattmeter on AC line; 120 watts at full rated output.

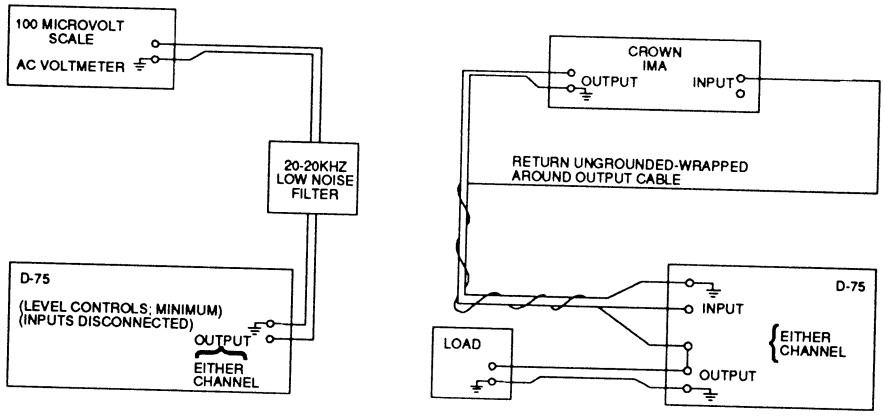

Fig. 4.4 IM Distortion Test Set-up

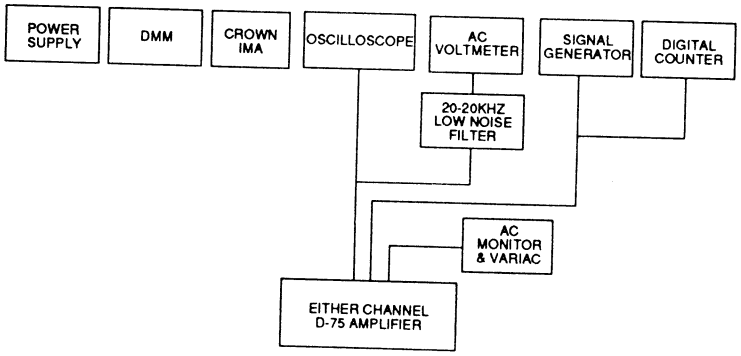

Fig. 4.5 Signal to Noise Test Set-up

5 Voltage Conversion

Often Crown products are purchased in one country and later moved to another requiring an AC mains conversion. For this reason the following chart/explanation as well as a world-wide voltage map is provided.

The D-75 power supply may be connected for any of five voltages. Converting from one to another can be accomplished with a soldering iron and a pair of wire cutters. Follow the table shown with the schematic, and the drawing below.

CAUTION:Because there is a risk of electric shock, only a competent technician should attempt to alter the line voltage configuration.

1. Remove the top cover of the D-75 (held on by 8 screws).
2. With the unit right side up, and the front panel toward you, locate the terminal strip on the front in the near right-hand corner.
3. Make the appropriate change in jumpers for the desired operating voltage. See Fig. 7.30.
4. Replace the 2 amp line fuse with a 1 amp type 3AG fuse, for all connections 200V and above.
5. Change the line cord tage to read the correct voltage.

Note: Use only a 2 amp fuse for 100VAC or 120VAC operation. Use only a 1 amp fuse for 200VAC, 220VAC or 240VAC operation.

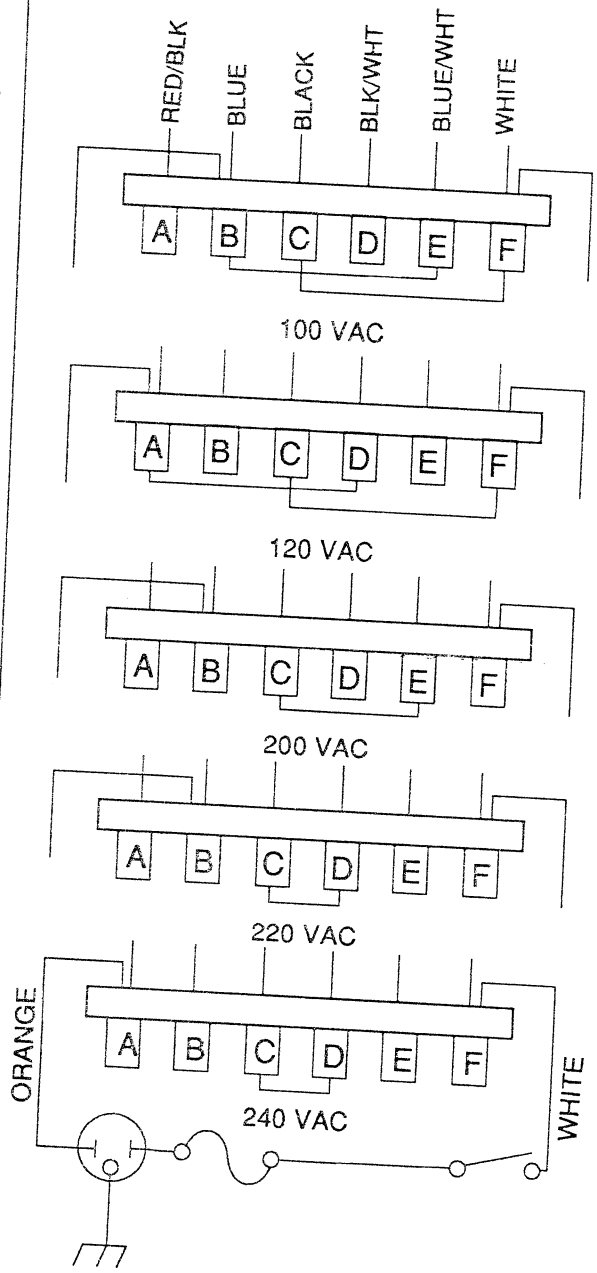

Fig. 5.1 AC Mains Voltage Conversion

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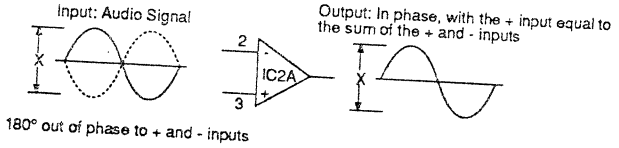
6 Circuit Theory

6.1 Block Diagram Circuit Theory

The following discussion refers to the block diagram in Fig. 6.1.

When using the XLR Balanced Input, two signals, 180° out of phase, will be introduced to the Balanced Input circuitry. Here, the two signals are added together to become the Unbalanced output of the Balanced input circuitry.



This combined signal is then fed to a stage of power amplification where it is boosted to a level of sufficient amplitude to drive an Output Load.

A portion of the output signal is routed to the Signal Presence circuitry. Provided the output signal has an amplitude of at least one volt peak to peak, the green signal presence indicators will light and vary in intensity with the output signal.

The output signal is fed back to and compared with the input signal. Any nonlinearities existing between these two signals will generate a correction signal to the amplifier and the IOC indicators on the front panel.

The Power Supply supplies the proper voltages to the various circuit components within the amplifier.

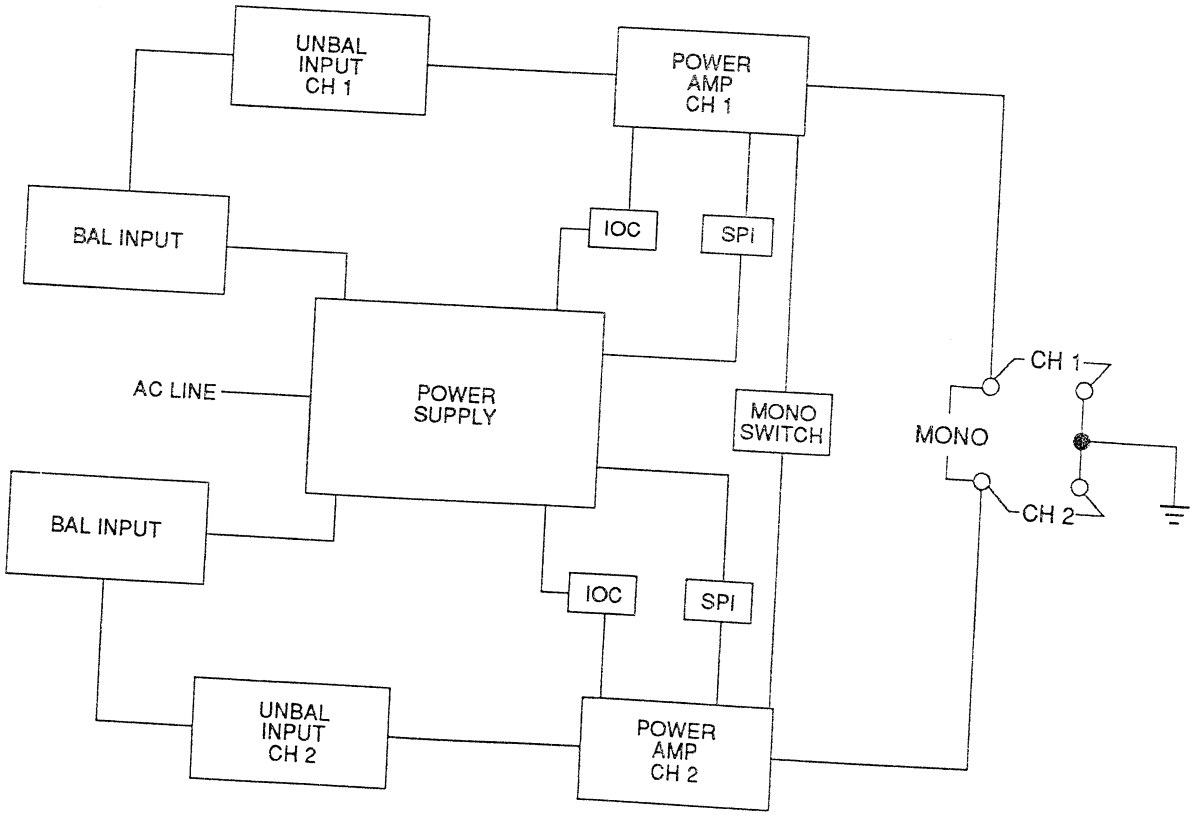


Fig. 6.1 D-75 Block Diagram

The following explanation refers to schematic diagram MI-270b located in the Instruction Manual as well as at the end of Section 9. However, each circuit under discussion is reprinted below in order to aid in circuit familiarization. Only channel 1 is shown for simplicity.

6.2. Balanced/Unbalanced Input Stage

In order to eliminate annoying RF interference, balanced input (as well as unbalanced) stages are incorporated in the D-75. U2A and U2B are the balanced input op amps which provide the correct phase inversion used in balanced input design. As per definition of a balanced input signal, an input from a balanced line is fed to the inverting (-) and non-inverting (+) inputs of U2A (pins 2 and 3). This has the effect of driving the inputs 180 degrees out of phase. The output signal will now be unbalanced and in phase with the signal applied to pin 3, but without any annoying noise that may have been present at the input. The reason for this is because unlike the audio input signal, the noise signal produced (by some external source) will appear on both sides of the balanced line and will cancel each other at the op amp output. Note the following diagram.

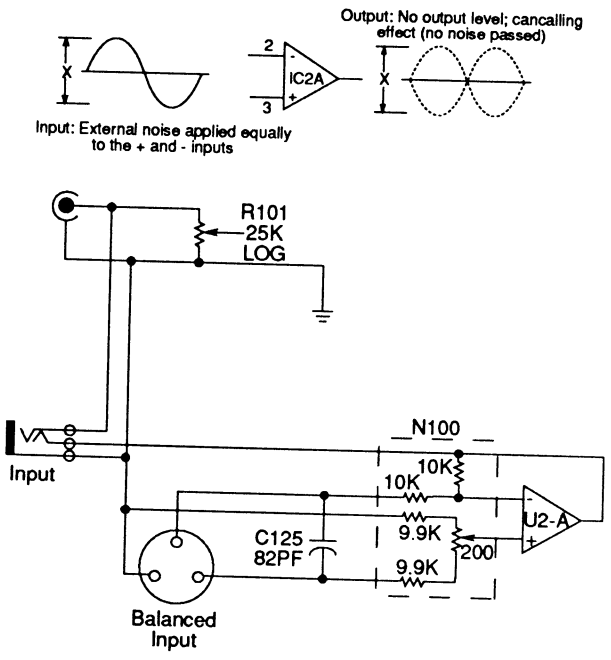


Fig. 6.2 Balanced Input Stage

6.3. Input Operational Amplifier

The input op amp, U100 is a low noise, large gain bandwidth integrated circuit. Under its formal name, LF 357, it acts as an input voltage amplifier producing extremely low distortion by means of several feedback paths. The gain determining components for this stage are two voltage dividing resistors, R103 and R108. Note that they act as a feedback path from the output of U100 (pin 6) to the inverting input of U100 (pin 2). Both signals entering U100 at pin 3 will be in phase with each other because of this feedback path and will thus produce an output (pin 1) of almost zero. The small amount of output signal that is present is there because of the slight difference in ohmic value (with respect to gain) of voltage divider, R108 and R103.

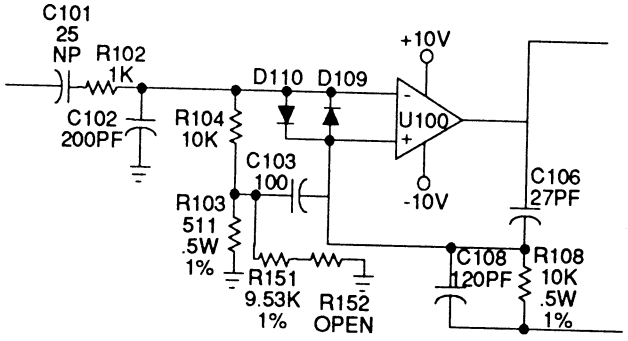


Fig. 6.3 Input Operational Amplifier

The IC op amp will always try to keep a zero potential difference between both inputs. Any type of non-linearity will cause the op amp to produce a large output, and therfore a substantial size correction signal in order to retain the small output level.

6.4. Signal Translator

The operation of the D-75 front-end circuitry (IC op amp through Q102) is to basically provide voltage amplification. However, the signal translator transistor (Q100) provides no voltage amplification itself, but rather converts the ground referenced input signal to a signal with a reference to the negative supply. The result is higher voltage swing capabilities from Q102 (Final Voltage Amplifier).

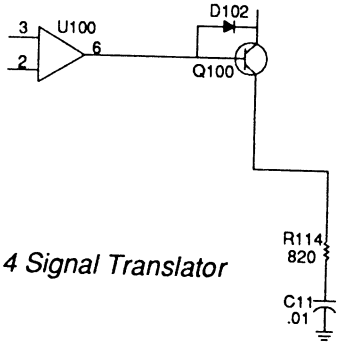


Fig. 6.4 Signal Translator

6.5. Final Voltage Amplifier

The Final Voltage Amplifier transistor (Q102) is the main voltage amplification stage. All signal voltage that appears at the output is developed here. R114 connected to the base circuit of Q102 serves two purposes:
1) it provides collector current for Q100
2) it provides bias voltage as well as signal for Q102

As the collector current of Q100 varies at the frequency and amplitude of the incoming signal, this same variation is placed across the Final Voltage Amplifier transistor base bias resistor and is impressed upon th base of Q102.

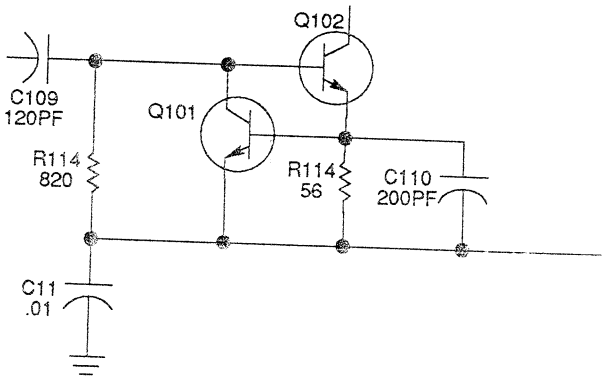


Fig. 6.5 Final Voltage Amplifier

6.6. Bias

The output of the Final Voltage Amplifier provides the signal drive to the predriver (Q110, Q107), driver (Q111, Q108) and output transistors (Q112, Q109) in order to amplify the current for final output power. The correct bias supply (bias transistor Q103) voltage of 2.1V DC is distributed throughout the current amplification stages in the following manner:
1) Base to Emitter junction of Q107 positive predriver (Q107) is .6V
2) Base to Emitter junction of Q108 positive driver is .6V (negative driver Q111 and output transistor Q112 have fixed base emitter bias)
3) Base to Emitter junction of Q109, positive output transistor is .314V (biased to sub turn-on state).

As the amplifier under loaded operating conditions increases in temperature, the bias sensing transistor (Q103) temperature increases proportionally. This condition reduces the base to emitter bias voltage produced by the bias supply which results in prevention of thermal runaway.

6.7. Output Stage

There are several categories or classes in which amplifiers are placed, the most common being class A, B or C. Each class or combination thereof, has a specific amount of bias current applied to the transistor which determines its operating conditions. A class A amplifier, will be biased such that a transistor operates always in the active region (360 degrees) between saturation and cutoff. A class B amplifier is biased at cutoff (180 degrees) and Class C below cutoff. The D-75 output stage is designed in Class AB+B mode of operation where the driver transistors (Q108, Q111) carry the bias current while the output transistors (Q109, Q112) serve only as boosters. The output transistors sense when the driver transistors are developing significant current draw from the load and thus take over and deliver the needed current.

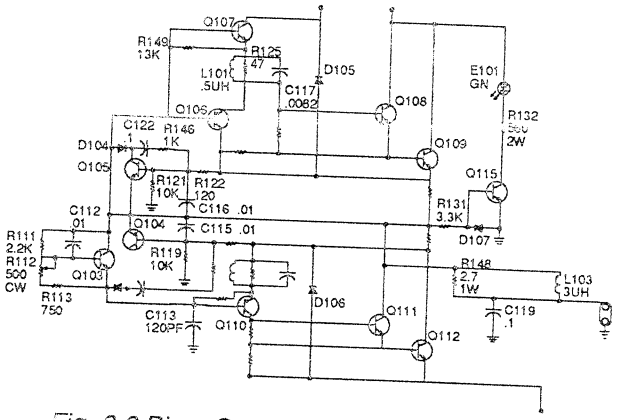


Fig. 6.6 Bias, Output and Protection Stages

The output stage is of a quasi-complementary format using no bias current into the output transistors themselves. The result is maximum efficiency with minimum crossover notch distortion and idling amplifier heat. Also, note that there is no bias current adjustment, as the output stage is not temperature-tolerance critical.

6.8. Protection Circuitry

The D-75 utilizes Voltage-Current limiting for protecting the output stages. V-I limiting is superior to most other forms of protection because it directly senses the overload condition and instantly reacts to relieve the overload, and acts only as long as the overload exists.

Should the output become dangerously high, the voltage induced in the current limiting sense resistors (R128, R129) is fed to the limiting transistors (Q104, Q105). The protection circuitry will then "clamp" a limit on the signal whenever it threatens to push the output stage beyond its

capabilities. The limit point is determined by a combination of the predriver plus limiter current equaling the available current source on the main board. In other words, the signal drive that is fed to the predrivers is limited or clamped.

6.9 IOC™

The front-panel IOC display is actually a window comparator circuit using two operational amplifiers (IC3C,D) and an LED indicator (E 102).

Any small nonlinearity in the amplifier causes an error in the feedback loop to appear at the inverted input of the main IC op amp (U100). This means the main IC output (pin 6) will rise above its normal value in an attempt to correct the problem. This signal is then responsible for raising the bias voltage on IC3 and intum activating Q114 which illuminates E 102.

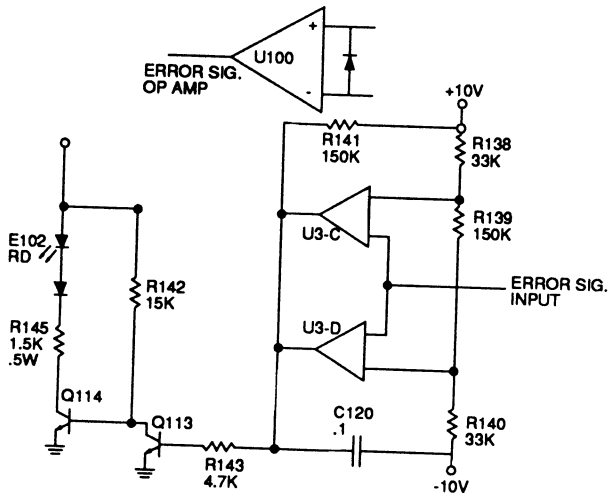


Fig. 6.7 IOC

6.10. Signal Presence Indicator

E 101 is the green front panel indicator which illuminates at any time the output voltage reaches 1 volt peak-peak or above. R131, R132, D107 and Q115 are the components directly involved in the above mentioned process.

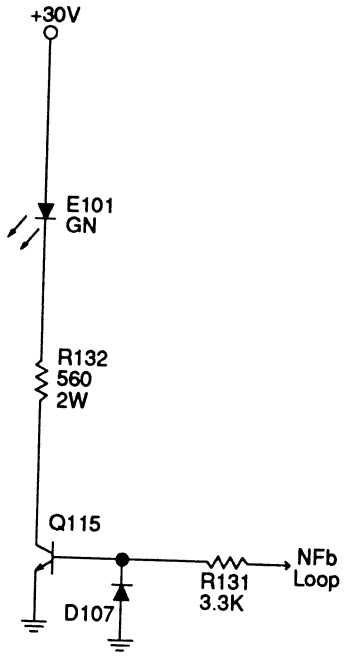


Fig. 6.8 Signal Presence Indicator

7. Specifications

7.1 General Specifications

Hum and Noise: From 20Hz-20KHz the hum and noise level is below 175 microvolts and 106dB below the rated output.

Phase Response: +10 degrees, -15 degrees 20Hz-20KHz at 1 watt.

Input Impedance: (XLR balanced) 20,000 ohms ± 30%, (XLR unbalanced) 10,000 ohms ±30%, (phone jack unbalanced) 25,000 ohms ±30%.

Amplifier Output Protection: Total protection against shorted, mismatched or open outputs. Volt-Ampere limiting circuitry acts instantaneously with no annoying thumps or cutouts.

Overall Protection: AC line fused. The controlled slewing rate of the voltage amplifiers protects the overall amplifier against RF burnout. Input overload protection is furnished by an internal resistance at the amplifier's inputs.

DC Output Offset: (shorted input) ±10 millivolts.

Turn On: Instantaneous, with minimum bass thumps and no program delay.

Circuit: A total of 42 transistors, 18 signal diodes, 2 zener diodes, 4 rectifiers and 3 linear IC's (dual op-amp) are utilized in a wideband multiple feedback loop design.

Power Supply: A specially designed low profile transformer, two regulated supplies for complete isolation and stability plus computer grade filter capacitors serve to power the D-75.

Power Requirements: AC voltages of 100, 120, 200, 220, and 240 volts ±10% at a line-frequency between 50 and 400Hz may be used.

Power Consumption: 15 watts while at idle, 120 watts at the full rated output.

Heat Sinking: The entire amplifier is used as a heat sink. Front-panel extrusion acts as a heat sink along with the chassis covers.

Chassis: Aluminum-chassis construction for maximum heat conduction and minimum weight.

Controls: Two input-level controls and a power switch on the front panel. A mono-stereo switch, located next to the input jacks, on the rear panel.

Indicators: 2 IOC indicators (red), 2 Signal-Presence indicators (green), 1 Power indicator (amber).

Connectors, Input: XLR 3 pin audio connector in which pin 2 is positive. (for a positive output signal), or 1/4" phone jack.

Ground Link: A means for isolating or uniting chassis-ground from or with electrical ground is provided on the rear panel. The grounds are always connected internally by 2.7 ohms.

Outputs: Color-coded binding posts with a 1/4" stereo earphone jack on the front panel.

Dimensions: 19" (48.26cm) long, 9" (22.86cm) deep, and 1 3/4" (4.45cm) high, 8 1/2" (21.59cm) deep from mounting surface. A 19" Western Electric standard rack-mounting system is utilized.

Weight: 10 pounds (4.54Kg) net weight.

Finish: Satinized aluminum front panel with grey suede Lexan insert.

7.2Monaural Specifications

Output Power (8 ohms): 95 watts minimum RMS into an 8 ohm load over a bandwidth of 20Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage.

Output Power (16 ohms): 70 watts minimum RMS into an 16 ohm load over a bandwidth of 20Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage.

Frequency Response: ±0.2dB 20Hz-20KHz, 1 watt, 8 ohms.

1KHz Power: 80 watts RMS into 16 ohms; 110 watts RMS into 8 ohms, (0.1% Total Harmonic Distortion).

I.M. Distortion: Less than 0.05% from 0.01 watts to 0.25 watts, and less than 0.01% from 0.25 watts to 70 watts into 16 ohms.

Slewing Rate: 12 volts per microsecond.

Damping Factor: Greater than 400, DC-400Hz into 16 ohms.

Output Impedance: Less than 30 milliohms in series with less than 6 microhenries.

Load Impedance: Rated for 8 and 16 ohm usage, safely drives any load including completely reactive loads.

Voltage Gain: 41.2 ±2% (or 32.3 ±0.2dB) at maximum gain.

Input Sensitivity: .812 volts ± 2% for 95 watts into 8 ohms.

Output Signal: Balanced, single channel. Channel 1 controls are active, Channel 2 is inactive, but not disabled.

7.3 Stereo Specifications

Output Power (4 ohms): 45 watts per channel minimum RMS (both channels operating) into a 4 ohm load over a bandwidth of 20Hz-20KHz at a rated RMS sum total harmonic distortion of 0.05% of the fundamental output voltage.

Output Power (8 ohms): 35 watts per channel minimum RMS (both channels operating) into an 8 ohm load over a bandwidth of 20Hz-20KHz at a rated RMS sum total harmonic distortion of .05% of the fundamental output voltage.

Frequency Response: ± 0.1dB 20Hz-20KHz at 1 watt into 8 ohms; ± 1.2dB 5Hz-100KHz at 1 watt into 8 ohms.

1KHz Power: 40 watts RMS into 8 ohms per channel, both channels operating; 0.1% total harmonic distortion; 55 watts RMS into 4 ohms, per channel, both channels operating, 0.1% total harmonic distortion.

I.M. Distortion (60Hz-7KHz 4:1): Less than 0.05% from 0.01 watts to 0.25 watts, and less than 0.01% from 0.25 watts to 35 watts into 8 ohms per channel.

Slewing Rate: 6 volts per microsecond.

Damping Factor: Greater than 400, DC-400Hz into 8 ohms.

Output Impedance: Less than 15 milliohms in series with less than 3 microhenries.

Load Impedance: Rated for 8 and 4 ohm usage; safely drives any load including completely reactive loads.

Voltage Gain: 20.6 ± 2% or 26.3 ± 0.2dB at maximum gain.

Input Sensitivity: 0.812 volts ± 2% for 35 watts into 8 ohms.

Output Signal: Unbalanced, dual channel.

Type of Test / Configuration & Load per Ohm		FTC Continuous Average Power at >1% THD (See note 1)		Single Cycle Tone Burst Watts at <0.05% THD (See note 2)	40mS Tone Burst Watts at <0.05% THD (See note 3)	EIA Watts +/-1dB 1% THD (See note 4)
		20Hz-20KHz	1KHz	1KHz	1KHz	1KHz
Stereo per CH. (both ch. powered)	4	45	55	115	70	55
	8	35	40	60	45	40
	16	25	25	30	25	25
Bridged Monaural (Balanced Output)	8	95	110	135	105	
	16	70	80	130	90	75

Fig. 7.1 Power Matrix

Power Specifications

Many manufacturers publish power specifications with a tolerance of ± 1 dB or worse. That means their amplifier can deviate more than 20% in output! A 100 watt amp would meet their spec if it only produced 79.4 watts. Other manufacturers qualify their specs by saying they are "typical" or "subject to manufacturing tolerances," thereby removing any performance guarantee. We take a different approach at Crown - our published specifications are *guaranteed* for three years and can be protected with *Service Plus* for an additional 3 years. Further, because our "in-house" specs are more stringent than our published specs, *every* Crown amplifier will *exceed* its published specs. We believe you should get what you pay for.

Notes:

1. Continuous power in the context of Federal Trade Commission testing is understood to be a minimum of five minutes of operation. Harmonic distortion is measured at the RMS sum total as a percentage of the fundamental output voltage. This applies for all wattages greater than 0.25 watts.
2. A single cycle of sine wave is presented to the amplifier and monitored for non-linear distortion. The average power during the burst is reported. Speakers must be able to withstand this level if they are to be safely used with this amplifier.
3. A 40 millisecond burst or two cycles of sine wave (whichever is of greater duration) is used and the power computed as the average power during the burst. The duty cycle of this test is 10 percent. This power level is a measure of how loud an amplifier is as perceived by the hearing process.
4. EIA standard RS-490 (both channels driven).

7.4 Performance Graphs

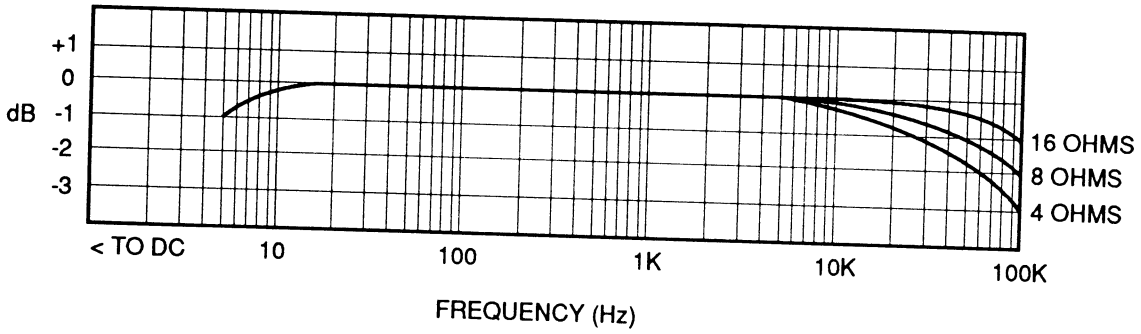


Fig. 7.2 Nominal Frequency Response

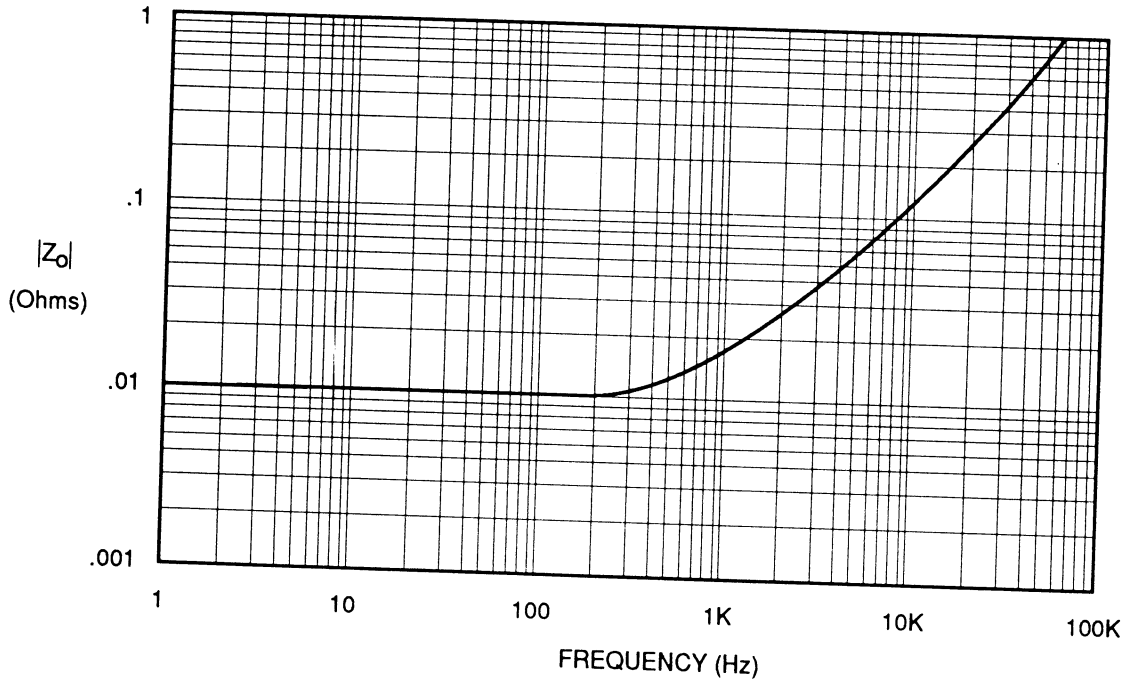


Fig. 7.3 Nominal Output Impedance (Z_o)

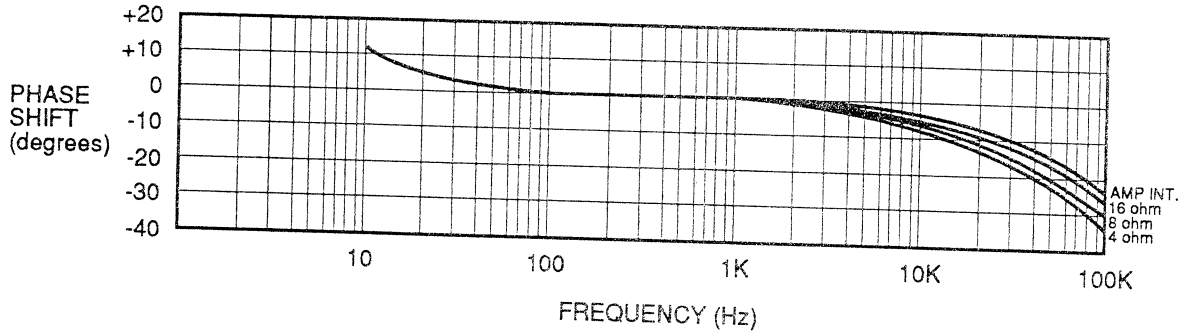


Fig. 7.4 Nominal Phase Response

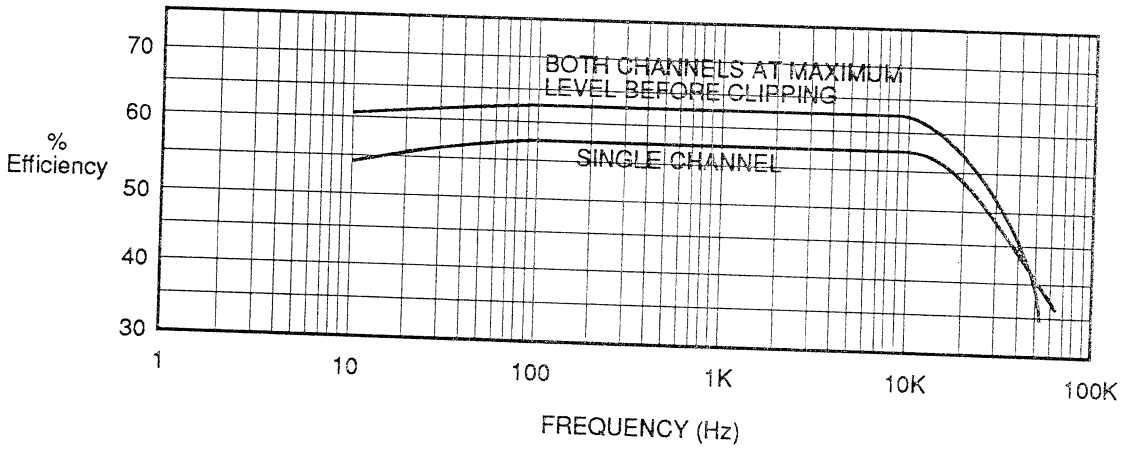


Fig. 7.5 Nominal Power Efficiency (8 ohms)

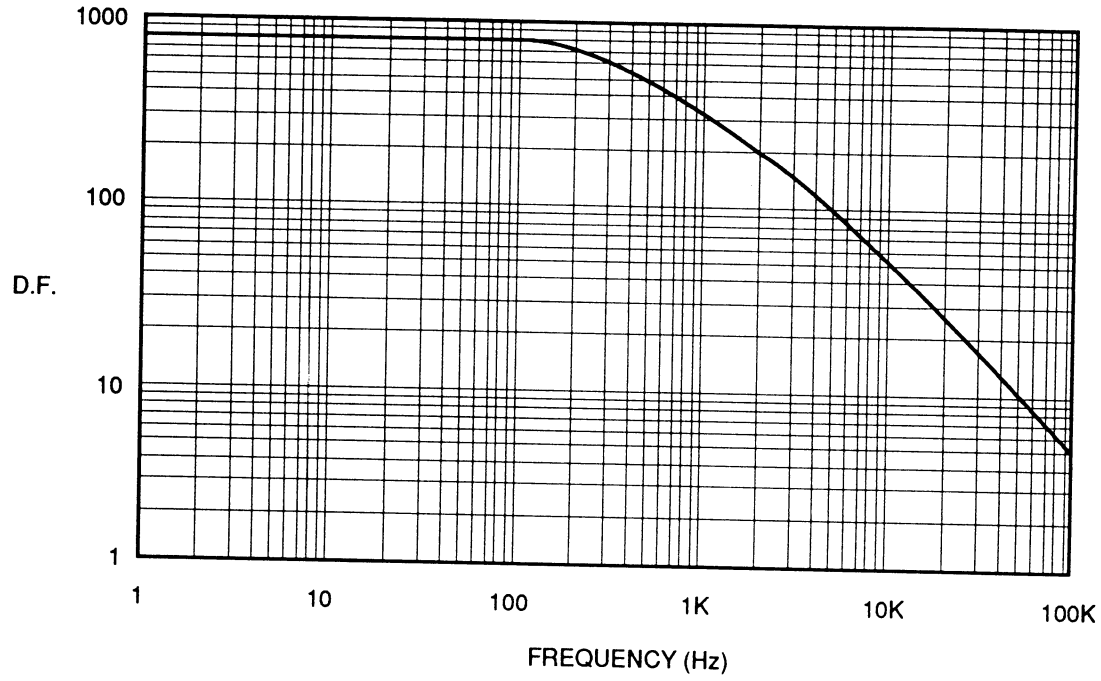


Fig. 7.6 Nominal Damping Factor

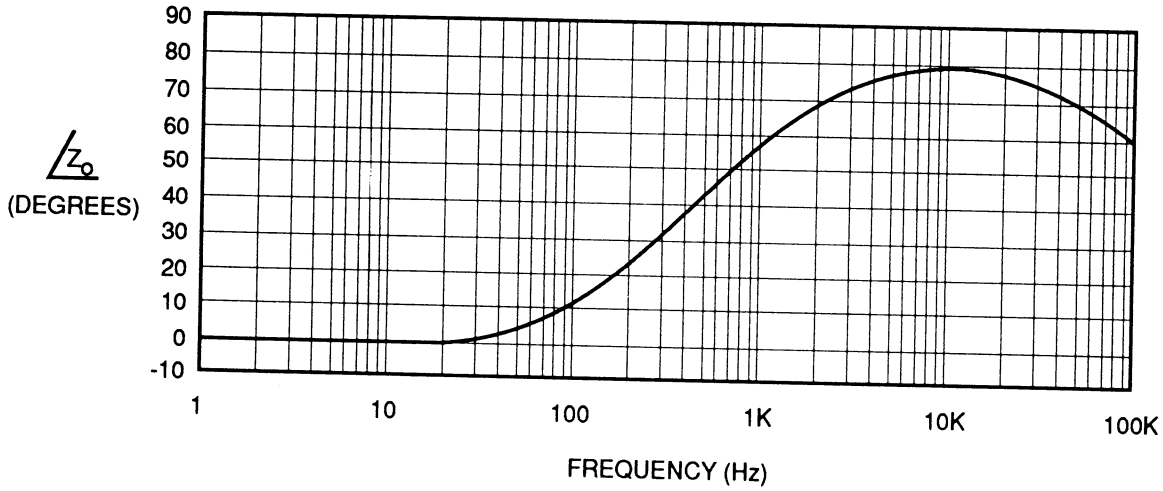


Fig. 7.7 Nominal Output Phase Angle

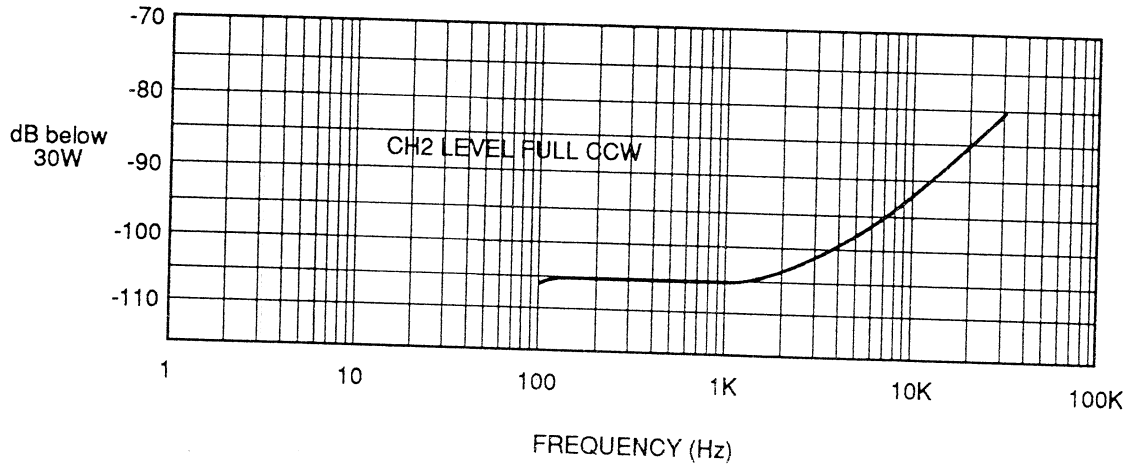


Fig. 7.8 Nominal Crosstalk

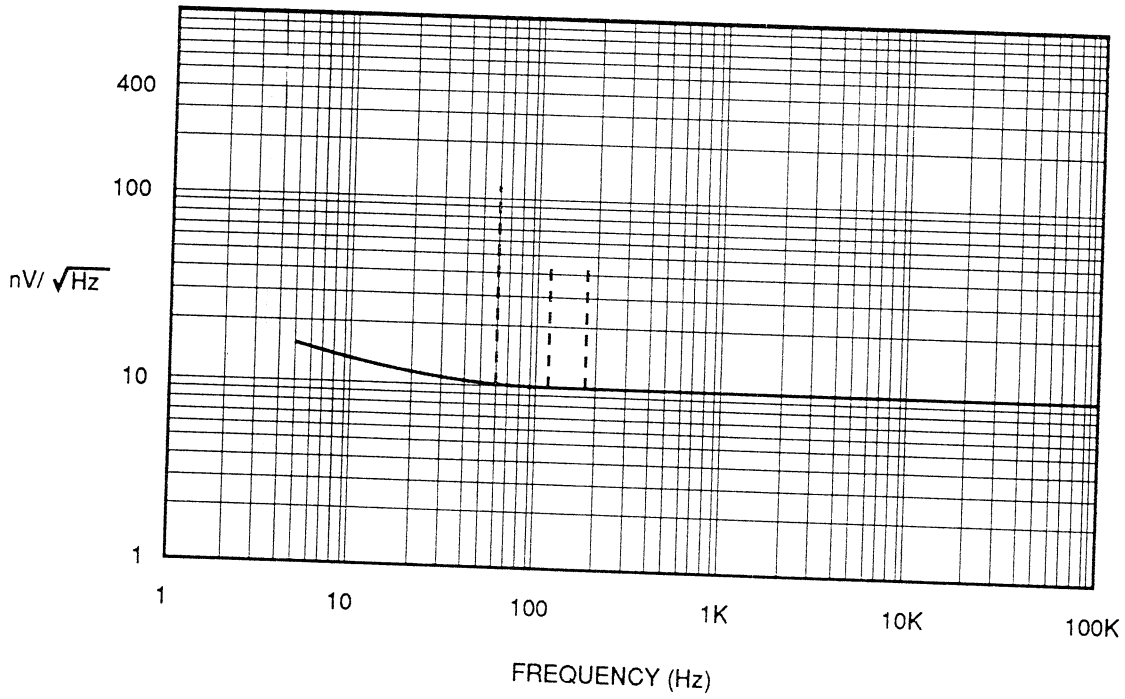


Fig. 7.9 Nominal Noise Spectrum

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