crown

INSTRUCTION MANUAL

Serial No. . . .
Issued . . . . . .

IC-150A
INTEGRATED CIRCUIT STEREO CONSOLE

CROWN INTERNATIONAL INC., 1718 W. MISHAWAKA ROAD, ELKHART, INDIANA 46514

crown

WARNING

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

CAUTION

TO PREVENT ELECTRIC SHOCK DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

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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INTRODUCTION

In buying a CROWN IC-150A you have done a nice thing for your ears. The good sound makes it. The unit has been pared down to the essentials needed for tailoring the sounds from the sources you like to your own personal preferences. The design follows two important principles: the first saying that your preferred sounds should be handled without the interference of distortion or noise, and the second saying that you should not have to hock your grandfather's gold watch to buy the IC-150A.

With associated CROWN equipment (tape decks and amplifiers), the IC-150A makes incredibly fine listening. And it helps other audio equipment put out sound that stands two steps closer to reality. Your ears will be audibly grateful.

FIG. 1 - 1

Please inspect the preamplifier for any damage incurred in transit. Since the unit was carefully inspected and tested at the factory, it left the factory unmarred. If damage is found, notify the transportation company immediately. Only the consignee may institute a claim with the carrier for damage during shipment. However, CROWN will cooperate fully in such an event. Be sure to save the carton as evidence of damage for the shipper's inspection.

Even if the unit arrived in perfect condition, as most do, it is advantageous to save the packing materials. They will prove valuable in preventing damage should there ever be an occasion to transport or ship the unit.

CROWN guarantees this equipment to perform as specified. CROWN also warrants the components and workmanship of this equipment to be free from defects for a period of 3 years from date of purchase.

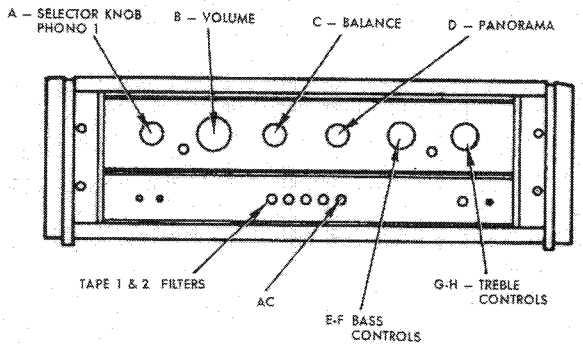
This warranty does not extend to fuses, and/or component or equipment damage due to negligence, misuse, shipping damage or accident; or if the serial number has been defaced, altered or removed.

A copy of the FULL THREE-YEAR WARRANTY is included with this manual. The WARRANTY is subject to the conditions contained therein. Upon receipt of the registration form, CROWN will issue a WARRANTY TITLE. This title applies to the original end-purchaser as well as subsequent purchasers.

You, the purchaser(s), are responsible for accurate, complete records (sales slips, invoices, etc.) for FULL coverage!

FROM BOX - TO - BACH IN 7 MIN., 30 SECS.

Your IC-150A is to be heard! Let's hook-up the unit quickly, but properly (and we'll assume a CROWN D-150A as your power amp).



I. Check your front panel --

Set: A Selector Knob at Phono 1
B Volume to counter clockwise level
C Balance to 12 o'clock NORMAL
D Panorama to counterclockwise NORMAL
EF, GH Bass and Treble to FLAT 12 o'clock
ALL BUTTONS MUST BE IN THE RELEASED POSITION

Now plug in the AC Cord.

II. Connect:

A. your record player to the IC-150A inputs
B. the AC from turntable to the unswitched outlet on the IC-150A
C. your amp-preamp cables (supplied with IC-150A)
D. power amp cord (using a 3-to-2 wire adapter supplied — green wire **not** connected)
E. We trust that your previously connected speakers have **in-line fuses** as shown.

III. Calibration:

A. Turn off the left and right levels of the amp. If you do **not** have input level controls on your power amp, **refer to note on page 4.**
B. Start favorite record on the turntable; push AC on IC-150A.
C. Turn up IC-150A volume to about 3 o'clock.
D. Turn up amp left and right levels until you have normal volume.

IV. Your new "IC-150A Sound" . . . on time.

A. Sit back and enjoy the sound.
B. Get further acquainted and read on!!!

REFER TO NOTE ON PAGE 5.

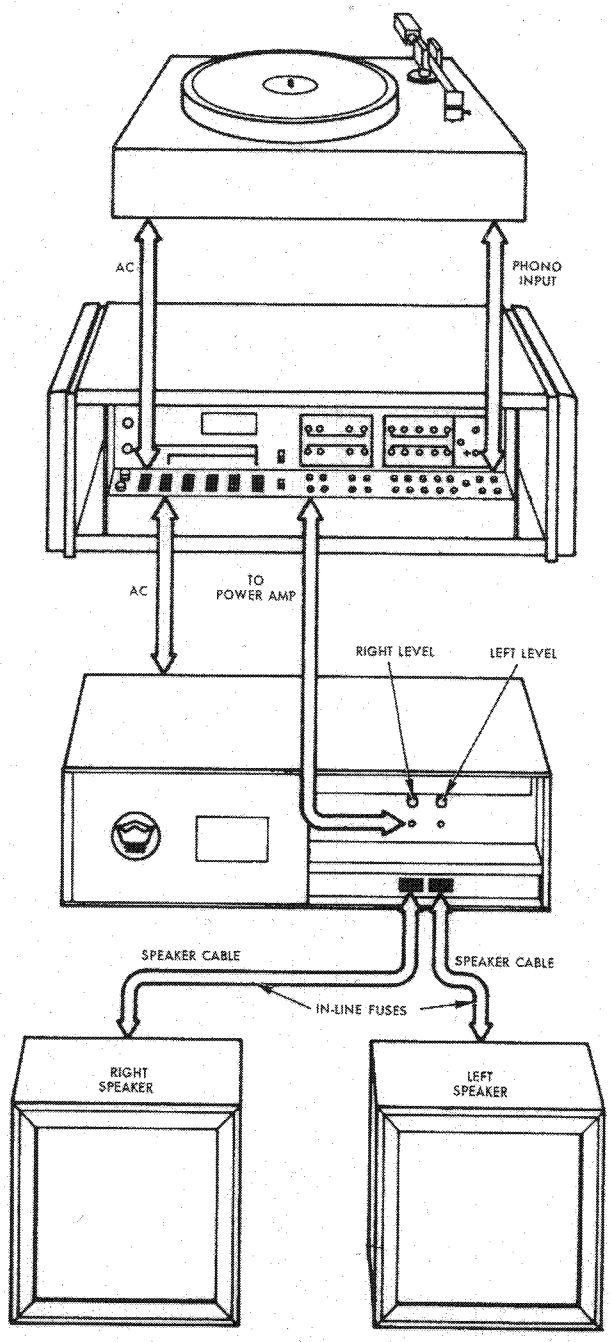


FIG. 1 - 2

QUICKIE TOUR OF FRONT PANEL DISPLAY

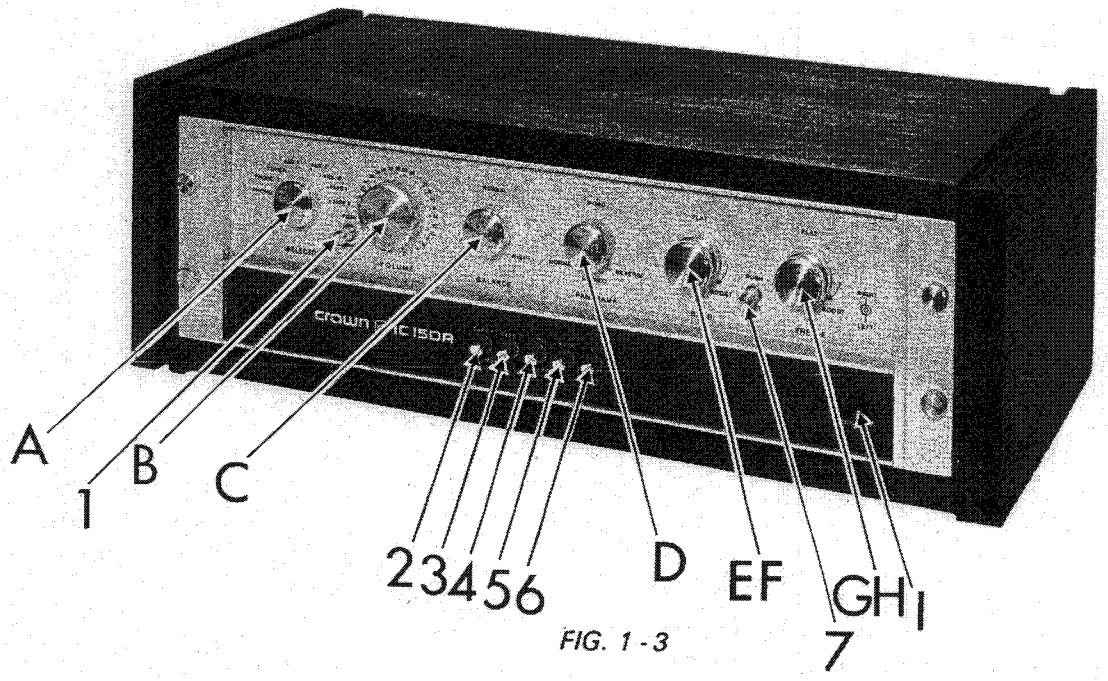


FIG. 1 - 3

A — **Selector knob**
Phono 1 & 2 — for turntables, inputs have 50-70 db gain, 47K ohms impedance and max. sensitivity of 1mv @ 1KHz.

Tuner — for FM Stereo/stereo multiplex or AM/FM Tuner.

AUX 1 & 2 — any device which can be connected to the AUX inputs i.e. guitar amp, additional tuner, additional tape recorder, electric razor, etc.

AUX 3 — front panel input for any source as in "AUX 1 & 2".

Tape 1 & 2 — for tape recorders with 2 or 3 head configuration.

B — **Volume** — Adjust volume for your entire system.

C — **Balance** — Acts as a built-in equalizer for proper balance of your system.

D — **Panorama** — when in "Normal," music plays in stereo. "Mono" — for mono application. Each speaker puts out the same sound. "Reverse" — all signals are switched. Signals which appeared in left channel will appear in right channel and vice versa.

E-F — **Bass Controls** — inner knob controls bass prominence on right channel; outer knob, left channel.

G-H — **Treble Controls** — inner knob -- controls treble prominence on right channel; outer knob, left channel.

I — **Monitor** output for Hi-Z headphones or to 3rd tape recorder inputs.

1. **Push for Loudness** — when engaged adds loudness compensation to volume control; disengaged - response is flat at all volume levels.
2. **Tape 1** — when engaged - monitors previously recorded material on Recorder 1.
3. **Tape 2** — when engaged - monitors previously recorded material on Recorder 2.
4. **Low Filter** — eliminates low frequency noise or rumble when engaged. Disengaged - flat response.
5. **Hi Filter** — eliminates high frequency noise such as record scratches; disengaged - flat.
6. **AC** — turns on the complete system.
7. **Push for Flat** — engaged - cancels all tone control effects for perfectly flat response. It does not cancel scratch or rumble filters.

INPUT CONNECTIONS

(Ref. — pg. 2) Your new IC-150A is designed to match a wide range of power-amplifiers with varying sensitivities, and loudspeakers with efficiencies of 30% down to 0.5% — providing the associated power amplifier(s) incorporate input level controls (as do all CROWN power-amplifiers).

If the associated power-amplifier(s) do not have input level controls, do the following:

1. Switch the "0-10dB" pad to "-10dB" position on the rear of IC-150A.
2. Perform Steps IIIB and C. If normal listening volume is not attained, switch pad back to "0dB" position.
3. If too much volume is realized, even in "-10dB" position, an external pad or amp-input level control should be constructed by a qualified Audio Technician.

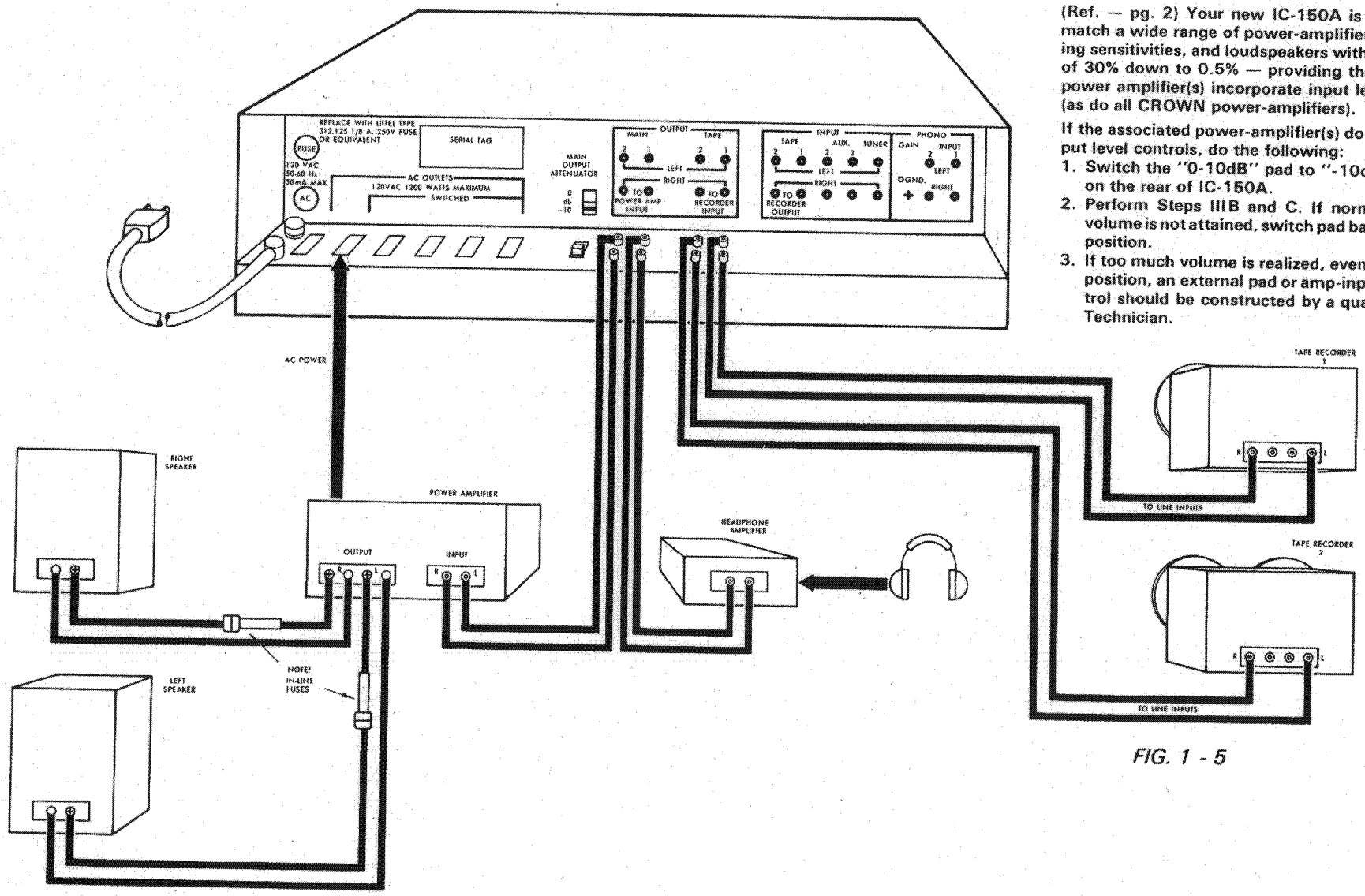


FIG. 1 - 5

OUTPUT CONNECTIONS

(Ref. — pp. 4 & 5) Any associated power amplifier(s) should be powered from the accessory AC sockets on the IC-150A, not the wall socket. Use three-to- two adapter(s) as contained in the IC-150A accessory kit.

CAUTION: DO NOT connect the Green (ground) wire(s) of the adapter(s) to the IC-150A chassis!!!

Reason: The signal (shielded) cables from the IC-150A output(s) to your power amplifier(s) carry the ground(s). Connecting the adapter green-wires will cause "ground-loops" with resulting hum, oscillation and possible amplifier and loudspeaker damage.

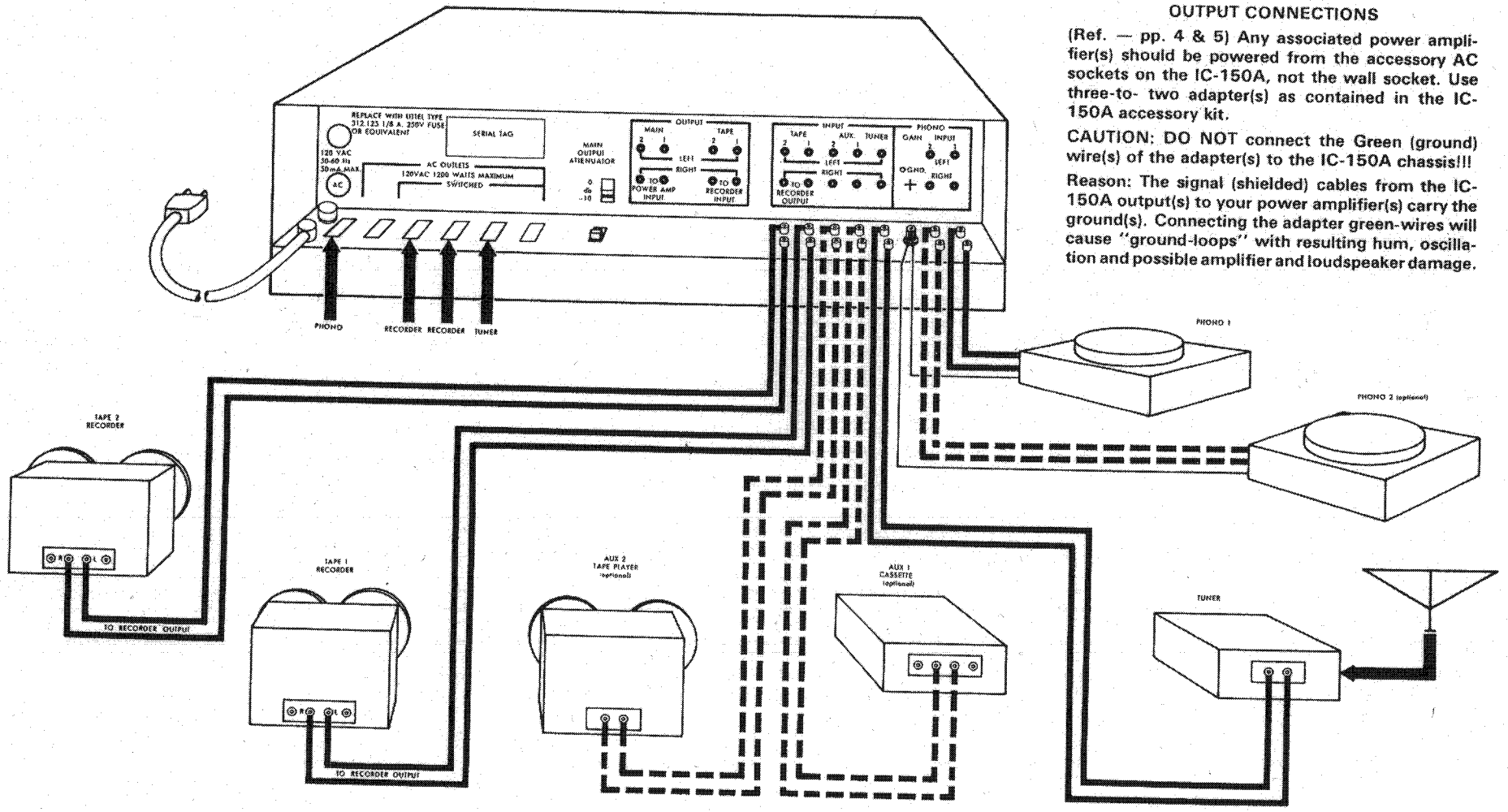


FIG. 1 - 4

DETAILED FUNCTION OF FRONT PANEL CONTROLS

KNOBS

SELECTOR Rotary Eight Position Switch when operated chooses the sound source and recording source from phono, tuner, tape player, or recorder, TV sound, guitar amp, etc.

The precision **VOLUME** attenuator, with 60dB of dynamic range, adjusts listening level of the program through your speakers. It does **not** affect the program fed to tape recorders 1 and 2. Notice the precise channel-to-channel balance ±0.2dB as the volume is raised or lowered.

BALANCE control usually remains at 12 o'clock for equal volume in each speaker. Turn the control toward the weaker channel to correct for unbalanced sound.

PANORAMA control supersedes the conventional mode selector-switch. You may smoothly vary the "stereo-image" from normal full stereo at "7 o'clock", toward mono, at "12 o'clock", then out to reverse-stereo, at "5 o'clock". This control helps reduce "ping-pong" stereo — particularly when using headphones.

BASS controls are continuously variable ± 15db at 30Hz and are normally at 12 o'clock for "flat" response. Turn clockwise for increased low-frequencies, counter-clockwise for decreased bass. (The larger control affects the left channel while the smaller, projecting knob controls the right. Each control is independent but may be easily operated in tandem by grasping both inner and outer knobs.)

TREBLE controls are continuously variable ±15dB at 15KHz and are normally at 12 o'clock for "flat" response. Turn clockwise for increased high-frequencies, counter-clockwise for decreased bass. (The larger control affects the left channel while the smaller, projecting knob controls the right.)

BUTTONS

TAPE MONITOR 1 and **TAPE MONITOR 2** provide instant replay from the "monitor" playhead of one or two typical 3-head recorders. In other words, you can listen to what you just taped.

LOW FILTER Button when depressed will roll off low frequencies at a 6db/octave rate below 25Hz (3db down-point). Sub-audio rumble is therefore reduced, without materially affecting the sound you hear.

HIGH FILTER Button when depressed will decrease the high frequencies at a sharp 12db/octave rate beginning at 5000Hz (3db down-point). Distorted, worn, and scratchy records benefit most with minimum loss of essential response.

ON-AC Button when depressed applies power to the IC-150A and simultaneously powers any component plugged into the switched AC outlets on the rear apron. Additionally, muting of the IC-150A output occurs for about four seconds after turn-on — thus eliminating "thumps" caused by most solid-state components. (NOTE: components **not** switched on by the ON-AC Button may not be muted unless turned on within the four-second period.)

PUSH for LOUDNESS Button when engaged boosts bass and treble tones with respect to midrange tones at low sound levels. The amount of boost increases as the level drops. Disengaged, response remains flat (except for tone control and filter effects) at all sound levels.

PUSH for FLAT Button, when depressed, cancels all boost - or cut-action of both the **BASS** and **TREBLE** controls. Tone controls may therefore be "in" or "out" at a touch.

COMMON USAGE PROCEDURES

Your IC-150A has many versatile capabilities. Of course, we cannot give all the possible combinations which Hi-Fi users can dream up, but the following are a few examples:

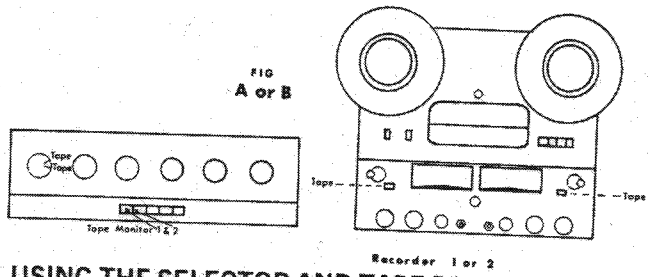


FIG A or B

1. USING THE SELECTOR AND TAPE RECORDER(S).

A. To hear a tape being played on Recorder 1, you may turn the **SELECTOR** to Tape 1 or push **TAPE MONITOR 1**. See Figure A.

B. To hear a tape being played on Recorder 2, you may turn the **SELECTOR** to Tape 2 or push **TAPE MONITOR 2**. See Figure A.

WARNING — Do not leave a Recorder in "Source" then turn IC-150A Selector either to or through that Recorder as oscillation will result.

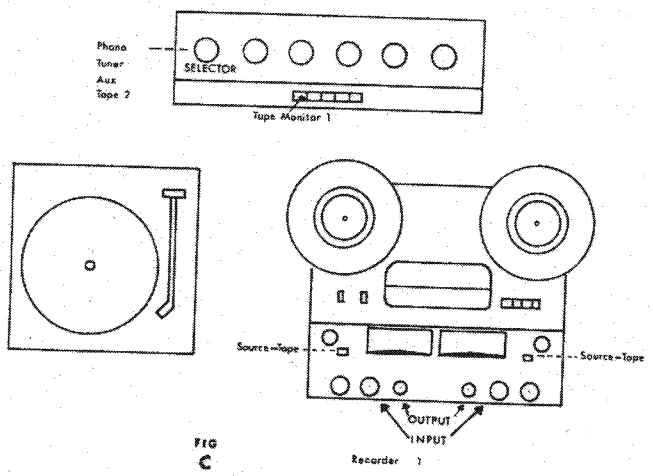


FIG C

C. To record any source onto Recorder 1, turn the **SELECTOR** to that source. As an example, to record a disc being played on Phono 1, turn **SELECTOR** to Phono 1. You can even record the play-back from Recorder 2 by turning the **SELECTOR** to Recorder 2. After setting the selector, please place Recorder 1 in the source mode and push **TAPE MONITOR 1.** Adjust Recorder 1 input levels, then adjust the output levels until volume is unchanged whether **TAPE MONITOR 1** is depressed or not. Begin taping, then switch the source-tape switches of Recorder 1 to **"TAPE."** Releasing and depressing the **TAPE MONITOR 1** will now yield the "Source-Tape" A-B comparison. You can also leave the **TAPE MONITOR 1** depressed and A-B the recording at the machine. See Figure C.

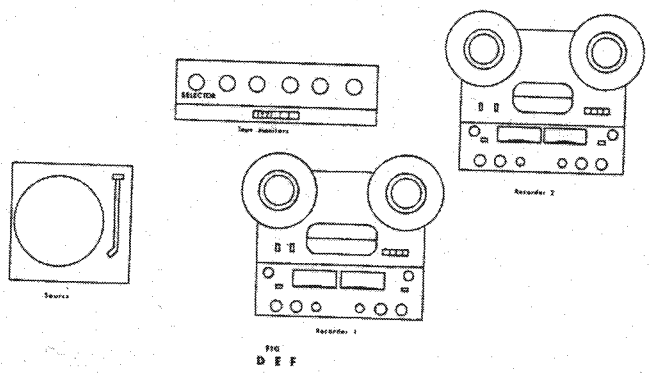


FIG D E F

D. As with Recorder 1 described in C, any source can be taped on Recorder 2, including playback of Recorder 1. Further, any source on the **SELECTOR** (except Recorder 1 or 2) may be taped on both recorders simultaneously and monitored individually using **TAPE MONITOR 1 OR 2** (if 1 and 2 are depressed together, 2 will override 1).

E. While taping on Recorder 1, it is also possible to listen to a completely different tape on Recorder 2 by depressing **TAPE MONITOR 2.**

As **TAPE MONITOR 2** overrides **TAPE MONITOR 1**, for easy monitoring we suggest method E; however, the following method may be used.

F. It is possible to record from any source on the **SELECTOR** with the exception of Tape 2 onto Recorder 2 while listening to Recorder 1. First, set-up Recorder 2 as in C above. Second, to hear Recorder 1 playback, disengage **TAPE MONITOR 2** and engage **TAPE MONITOR 1.**

2. COMBINED FUNCTION OF THE PANORAMA AND BALANCE CONTROL.

An important part of the unusual flexibility of the IC-150A is illustrated in Fig. 1-6. The pictures show the variation in balance (relative source levels of the two channels) and the stereo image (locations from which the sounds seem to be coming) available through use of the **BALANCE** and **PANORAMA** controls. The musical example pictured has a piano (it looks like Peter Nero's) in the left channel, accompanied by a singer (probably Robert Goulet) in the right channel. Starting at the left, both controls are shown in the **NORMAL** position. With this setting it is possible that the musical source, the reproducing equipment, and the surrounding acoustics will together allow the piano and voice to sound balanced (i.e. neither is obscuring the other) and distinctly separated in distance (i.e. perhaps the singer appears to be in the middle of the stage while the piano is off to the left). If this is true, the controls can be left in the **NORMAL** position and life is astonishingly easy. Imagine, however, that a poorly made recording gives you the feeling that the singer is performing on your patio off to the right, while the piano is being played in your neighbor's lawn across the street to the left. This is too much separation. By moving the **PANORAMA** control toward the **MONO** position(see below) you can move the two channels together until you are satisfied with the sound. Moving all the way to the **MONO** position mixes the two channels completely, giving no separation (i.e. the singer will be sitting on the piano a la Dean Martin). If you would rather have the piano on the right and the singer on the left, this can be accomplished by turning the **PANORAMA** control to the **REVERSE** position, as in the third picture.

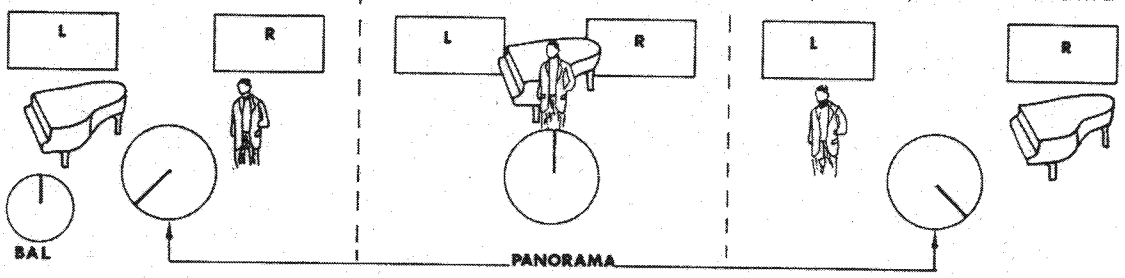


FIG. 1-6A

The next row of pictures illustrates the effect of moving the balance control toward the left position. Suppose that after listening to the music, it seems to you that the singer is dominating the piano too much. By turning the balance control toward the left position you can decrease the vocal contribution from the right channel until you feel satisfied with the relative levels of piano and voice. If you want to hear only the piano, turn the **BALANCE** all the way to the **LEFT** position, at which point the singer (right channel) will be turned off completely, and the piano will continue alone on the left. If you then move the **PANORAMA** control toward the **MONO** position, the piano will seem to move toward the right. At the **MONO** position, the sound of the piano will be coming at equal volume levels from both speakers. If you turn the control toward the **REVERSE** position, the piano will move further to the right, until it appears solely in the right channel. The piano has duplicated its movement in the top row of pictures, but without the vocal accompaniment.

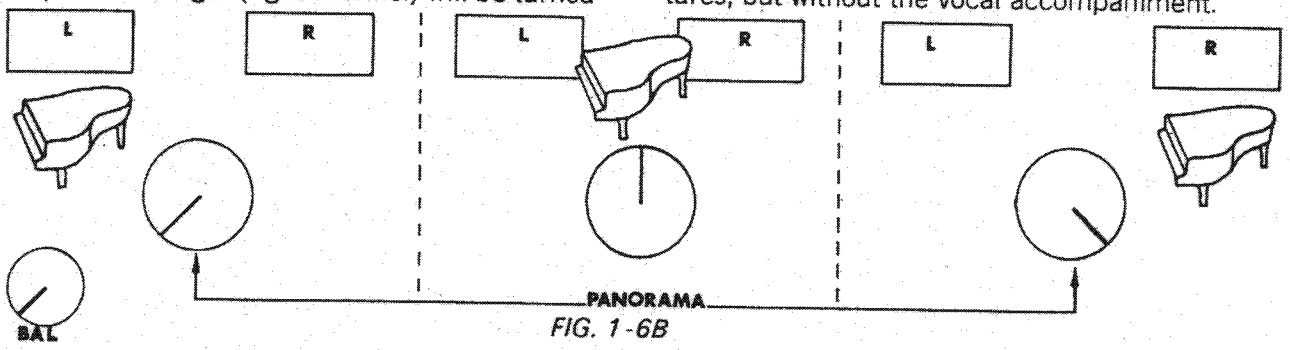


FIG. 1-6B

The last row of pictures shows the same process in the right channel. Perhaps you decide that the singer needs more emphasis. Turning the **BALANCE** control toward the **RIGHT** will decrease the piano volume until the relative levels are satisfactory. At the **RIGHT** position, the piano (left channel) will be completely gone, and the singer will appear alone in the right channel. You can then use the **PANORAMA** control to move the singer to any position between the right and left channels, as shown

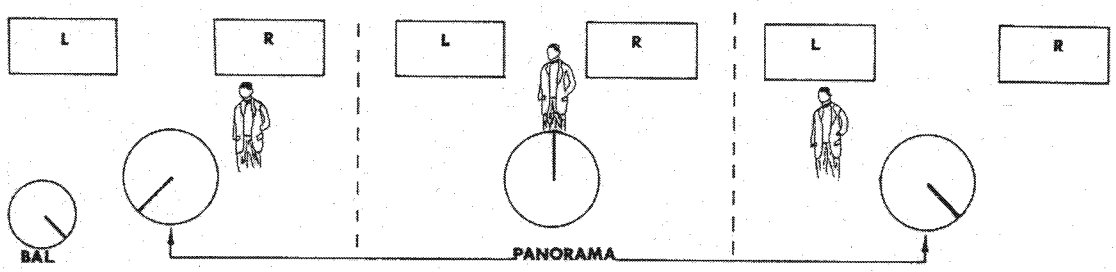


FIG. 1-6C

Notice that in the three pictures showing the **PANORAMA** control in the **MONO** position, that the sound comes from a single location between the speakers regardless of the **BALANCE** control position. This occurs because the **BALANCE** control appears before the **PANORAMA** control in the circuit, an arrangement which means that the **BALANCE** control does not operate on the mixed signal coming from the **PANORAMA** control. It also means that any **BALANCE** change will affect both speakers equally when the **PANORAMA** control is in the **MONO** position. If, for example, you decrease the sound of the piano by turning the **BALANCE** control toward the **RIGHT**, the sound will decrease equally in both speakers. The need for flexibility dictates this design. Using the level controls on your power amplifiers still allows you to vary the sound level from both speakers if you want, while the location of the **BALANCE** control before the **PANORAMA** control allows you to vary the levels of the individual channels before mixing is done by the **PANORAMA** control. This way, the **BALANCE** control and the amplifier level controls do not merely duplicate each other, but accomplish different functions, thereby adding another dimension to your control of the music.

The result of the IC-150A is an unparalleled capability for fitting your music, components, and environment together in a satisfying way.

3. USING THE FRONT PANEL "AUX 3" INPUTS AND "MONITOR" OUTPUT

A pair of ¼" phone-jack inputs are provided for convenient patching-in of a high-level stereo source to the IC-150A. This signal must be selected on the INPUT SELECTOR — turn to AUX 3.

If a (third) tape recorder is jacked into the AUX 3 inputs and the MONITOR output, the AUX 3 position would be used for tape playback through the IC-150A **after** the recording has been completed and the tape has been rewound! Tape-monitor (A-B comparison) facilities are **not** provided on AUX 3 for a 3-head tape-deck.

The MONITOR output jack contains both stereo channels and therefore can be used to:

1. feed the line inputs of above (third) tape recorder — keep in mind that this signal **is** affected by the volume, balance, panorama and tone controls. In this manner, special mixing, balance, tone and variable stereo-image effects may be taped.
2. feed hi-impedance headphones, or even a third power amplifier input. Since the output impedance of the MONITOR jack is 2.2K ohms per channel, headphones **must** be of the hi-sensitivity and hi-Z type (i.e. Sennheiser HD-414 or equivalent). Several 600 ohm phones may operate, but with reduced volume levels.

MOUNTING INSTRUCTIONS

There are four basic ways to display your IC-150A; custom mounted, mounted in the accessory 5-R walnut cabinet, standard 19-inch rack mounted, or free standing in its attractive vinyl "tuxedo."

CUSTOM MOUNTED — A full-size template of the IC-150A is enclosed in the rear of the manual. This template also includes dimensions for the shelf which is recommended.

PREPARATION FOR ACCESSORY CABINET OR RACK MOUNTING:

Parts supplied: (RMB-5A) CPN 41659
(2) angle brackets, CPN 4093
(1) 7/64 Allen tool, CPN 3454
(4) 10-32 panel thumbscrew-washer assy. CPN 20032

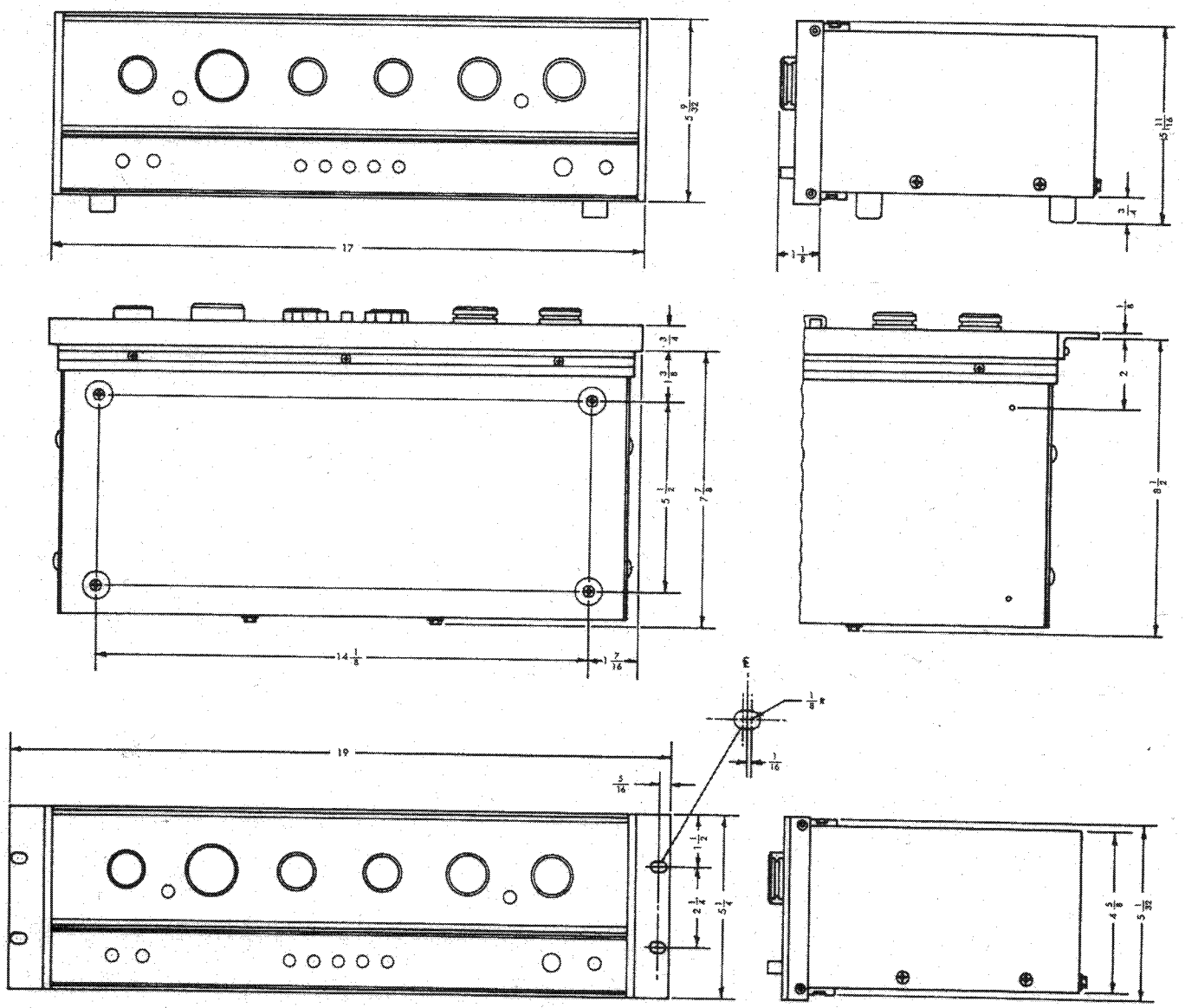


FIG. 1-7

1. Using the 7/64 Allen tool, remove end bars and retain the socket screws.
2. With the IC-150A front facing you, align the angle brackets (beaded side toward you) on the unit to match the holes which held the end bars. Use the 6-32 x ½ socket screws. (Note: socket screws may look as though they are cross-threading, but will straighten halfway through.)
3. Remove the four rubber feet from the bottom cover.

MOUNTING IN OPTIONAL ACCESSORY CABINET

After preparing unit for rack mounting, slide the IC-150A carefully into the **front** opening in the 5-R and secure with the four panel thumbscrew-washer assys. from the RMB-5A packet.

MOUNTING IN 19" RACK

After preparing unit for rack mounting, mount the IC-150A into a standard 19" rack, being certain that the rack has 10-32 threading. Use the four panel thumbscrew-washer assys. from the RMB-5A packet. No supporting shelf is required.

WARNING: DO NOT OVERTIGHTEN SCREWS.

CROWN WILL NOT BE RESPONSIBLE FOR PANEL DAMAGE WHICH WILL OCCUR IF NYLON WASHERS ARE NOT USED WITH EACH PANEL THUMB SCREW!

HI-FI GLOSSARY

A-B Test — Evaluating relative performance of two (or more) components or systems by changing quickly from one to the other. Most high fidelity dealers have A-B test facilities.

Acoustic or Mechanical Feed-back — An annoying low frequency interference created when vibrations from loudspeakers are picked up by the cartridge and amplified by the sound system. Physically separating loudspeakers and record-playing equipment will solve the problem.

Channel — A channel is a complete sound path. A single channel, or monophonic system, has one channel. A stereophonic system has at least two full channels designated as left (A) and right (B). Monophonic material may be played through a stereo system; both channels will carry the same signal. Stereo material, if played on a monophonic system, mixes and emerges as a monophonic sound.

Crossover — A frequency at which other frequencies above and below it are separated. In a two-way speaker system, for instance, the crossover frequency is the point at which woofer and tweeter response are divided.

Crosstalk — Signal leakage between two channels.

Damping — Controlling of vibrations, response, or resonances which if unchecked would cause distortion.

Decibel — A numerical expression of acoustic or electrical ratios, such as the relative intensity of a sound or the relative strength of a signal. One to three decibels (db) is about the smallest change in sound perceptible to the ear.

Distortion Unwanted noise, or sounds which didn't exist in the studio when the original recording was made. Harmonic distortion disturbs the original relationship between a tone and other tones naturally related to it. Intermodulation distortion (IM) introduces new tones caused by mixing of two or more original tones. Phase distortion, or non-linear phase shift, disturbs the natural timing sequence between a tone and its related overtones. Transient distortion disturbs the precise attack and decay of a musical sound. Harmonic and IM distortion are expressed in percentages; phase distortion in degrees; transient distortion is usually judged from oscilloscope patterns, but is best measured as phase distortion.

Equalization Frequency manipulation to meet the requirements of recording, and an inverse manipulation on playback to get uniform response. Also known as compensation.

Flutter Rapid variations in the speed of a turntable or tape transport. When pronounced, flutter causes a wavering of musical pitch.

Hertz As in cycles-per-second, not rental agency.

IHF Music Power this rating expresses the ability of an amplifier to handle short duration power peaks, as opposed to sustained power levels. An amplifier may only be capable of putting out 45 watts if that level is continuous, but it may be able to handle 60 watt peaks (such as might occur in a musical passage), if the peaks do not last too long.

IHF Noise Measurement any of 3 defined ways to measure noise, each of which uses a different filter, or frequency-weighting method, in making the test; usually the IHF "A" weighting is the reference, since this measurement simulates the Fletcher-Munson and I.S.O. loudness curves, and is therefore less sensitive to high and low frequency noise. This method produces the largest signal-to-noise specification.

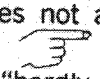
Phon a unit of loudness for steady tones, correlated with the Fletcher-Munson and I.S.O. loudness curves, and referenced to the db level at 1KHz. 100 phons equals 100db at 1KHz, while 100 phons at 100 cycles is about 103db (cf I.S.O. curves shown in discussion of loudness control).

Signal-to-Noise Ratio Often abbreviated as S/N ratio; the proportion of signal to undesired and extraneous noises in any device or its output. The higher the ratio, the better. Expressed in decibels.

SPECIFICATIONS

FREQUENCY RESPONSE	Hi-level: ±0.6dB 3Hz-100KHz with hi-impedance load, ±0.1dB 10Hz-20KHz with IHF load; Phono: ±0.5dB of RIAA
PHASE RESPONSE	Hi-level: typically +1° to -12° 20Hz-20KHz with IHF load; Phono: typically ±5° 20Hz-20KHz additional phase shift
HUM AND NOISE	20Hz-20KHz inputs shorted; Hi-level: 95dB below rated output (typically 105dB with IHF "A" weighted measurement); Phono: 85dB below 10mV input (typically 0.3uV input noise)
DISTORTION IM	Less than .002% at rated output with IHF load (typically under 0.001%)
DISTORTION THD	Less than .0005% @ 1KHz, max. .05% 20Hz-20KHz at rated output with IHF load
INPUTS	Six hi-level inputs (1 tuner, 3 auxiliary, 2 tape), two equalized phonos
INPUT GAIN & IMPEDANCE	Hi-level: 20.8dB ±0.2dB, 100K ohms nominal (25K ohms volume max.); Phono: 50-70dB (adjustable) 47K ohms. Sensitivity: < 1mV @ 1KHz for rated output at maximum gain
PHONO INPUT OVERLOAD	33-330mV at 1KHz, depending on gain (>100mV when set to 60dB total preamp gain)
MAIN OUTPUTS	12V maximum before overload, 2.5V rated, 600 ohms output impedance. Switched 0dB to -10dB pad affects both sets of outputs
PHONO OUTPUT & IMPEDANCE	(Available at tape out jacks with input selector in phono) 600 ohms with typical maximum output of 11V RMS at 1KHz into hi-impedance load
MONITOR OUTPUT	Stereo, 3 circuit ¼" phone output, ahead of 0dB to -10dB pad; output impedance 2.2K ohms each channel
VOLUME CONTROL	Precision switched attenuator of 58dB (and off) dynamic range with calibrated tracking within ±0.2dB
LOUDNESS COMPENSATION	New wide-range design for excellent simulation of I.S.O. curves down to 60 phons; with exclusive dual R/C bass-boost coordinated with volume attenuator
PANORAMA CONTROL	Unique, continuously-variable control for infinite adjustment from stereo to mono to stereo-reverse; replaces conventional stereo-mode switches and blend controls with an intuitive control of stereo spatial dimension
TONE CONTROLS	Continuously variable ±15dB at 30Hz and 15KHz, cancel switch bypasses independent bass and treble control settings to give instant true-flat response in both channels
MUTING	Uses reed relay — removes turn-on transients from IC-150A output, thus protecting speakers
FILTERS	Rumble: -3dB at 24Hz with 6dB-per-octave cut-off (volume attenuator at -20), Scratch: -3dB at 5KHz with 12dB-per-octave cut-off
AC OUTLETS	Five switched with 25A switch, one unswitched
POWER REQUIREMENTS	About 2 watts at 120V or 240V 50-400Hz AC
SEMICONDUCTOR COMPLEMENT	Six integrated circuits (equivalent to 97 bipolar transistors, 2 zeners, 12 diodes and 24 FETS) for a total of 104 bipolar transistors, 25 FETS, 3 zeners and 22 diodes
DIMENSIONS	5¼" H x 17" W; 8⅛" behind panel
WEIGHT	10 lbs., with walnut cabinet 20 lbs.

MURPHY'S LAW

Throughout the design, production, and sale of the IC-150A, consideration has been given to the effects of one Edsel Murphy. Mr. Murphy (or Murphy's law) stated that, "If anything can go wrong, it will." This being the broadest scope of Murphy's law, let's now offer a small sample of the application of the law with regard to the IC-150A. (NOTE: CROWN does not adhere to these below mentioned laws!!)  which is the mathematical symbol for "hardly ever".

I.1 All warranty and guarantee clauses become void upon payment of invoice.

I.2 Dimensions will always be expressed in the least usable terms. Velocity, for example, will be expressed in furlongs per fortnight.

II.1 Identical units tested under identical conditions will not be identical in the field.

II.2 A dropped tool will land where it can do the most damage. (Also known as the law of selective gravitation.)

II.3 The probability of a dimension being omitted from a plan or drawing is directly proportional to its importance.

II.4 Interchangeable parts won't.

II.5 Probability of failure of a component, assembly, subsystem or system is inversely proportional to ease of repair or replacement.

II.6 If a circuit cannot fail, it will.

II.7 A fail-safe circuit will destroy others.

II.8 A transistor protected by a fast-acting fuse will protect the fuse by blowing first.

II.9 A failure will not appear till a unit has passed final inspection.

II.10 A purchased component or instrument will meet its specs long enough, and only long enough, to pass incoming inspection.

III.1 Manufacturers' spec sheets will be incorrect by a factor of 0.5 to 2.0, depending on which multiplier gives the most optimistic value. For salesmen's claims these factors will be 0.1 or 10.0.

III.2 In specifications, Murphy's Law supersedes Ohm's.

SECTION 2
TECHNICAL INFORMATION

The performance specifications for the CROWN IC-150A have hit some new lows: witness in particular the low distortion and low noise. Also in the interest of your audio happiness, the unit has been engineered to provide precise handling of all types of music, and the controls allow you to fit that handling to your own best taste. The following performance now belongs to you.

INPUT AND OUTPUT SPECIFICATIONS

The availability and functions of the different inputs and outputs have been incidentally described in earlier parts of the manual. A few more details with a bit more organization seem to be in order.

Altogether there are eight inputs available covering turntables, tape decks, tuners, and whatever you want in the auxiliary inputs. Particular facts about these inputs include the following:

HI-LEVEL

The six high level inputs (tape, tuner, aux) show an input impedance of 100K ohms. The gain from these inputs to the main outputs is set at 20.8db ± 0.2db (i.e. with the volume control at maximum, 0.5 volts in will get you about 5.5 volts out).

PHONO

The two phono inputs have been equalized to match the RIAA standard response curve. Their input impedance measures 47K ohms. In order to adapt to different turntables and cartridges, the gain of the phono preamp has been made adjustable between approximately 30db and 50db which adds to the main preamp to give a total gain of 50-70db (1KHz). Two small screwdriver-adjusted pots, mounted on the back of the unit next to the phono inputs, provide the means of separately adjusting the gain of each channel.

The phono level controls are set during the final factory check of the IC-150A to give a total preamp gain of 60db. This setting in the middle of the range proves satisfactory for most stereo cartridges. The gain adjustment should not usually have to be altered. Situations which may require gain adjustment include voltage overloading from unusually high voltage cartridges, low tape-output levels from cartridges with unusually low voltages and cartridges with unbalanced channels. The level controls may also be used to balance the volume levels of different inputs to the IC-150A (i.e. to match the level of the turntable to the level of the tuner, etc.).

In general, phono overloading should not be a problem. Depending upon the gain setting, the overload point will vary. If the phono gain is turned to its maximum of 50db, a signal of 33mv will produce about 10 volts out, which is the maximum available. With the gain turned to its minimum of 30db, it takes 330mv in to produce the maximum 10 volts out. The phono overload level therefore varies between these two limits. At the factory setting of approximately 40db, the overload level is about 100mv. To demonstrate the range this gives, consider the case of a fairly standard phono cartridge with an output of 8mv at a needle velocity of 5.5 cm/sec. An LP record may produce peak velocities of about 30 cm/sec., which will in turn produce maximum voltages from the above cartridge in the range of 45mv. At the preset phono gain of 40db, the maximum cartridge output remains substantially below the overload voltage of 100mv.

The comparative signal levels at input and output appear graphically below. The comparative level chart gives some sample signal levels and shows the range of gain available in the phono preamp as well as the main preamp.

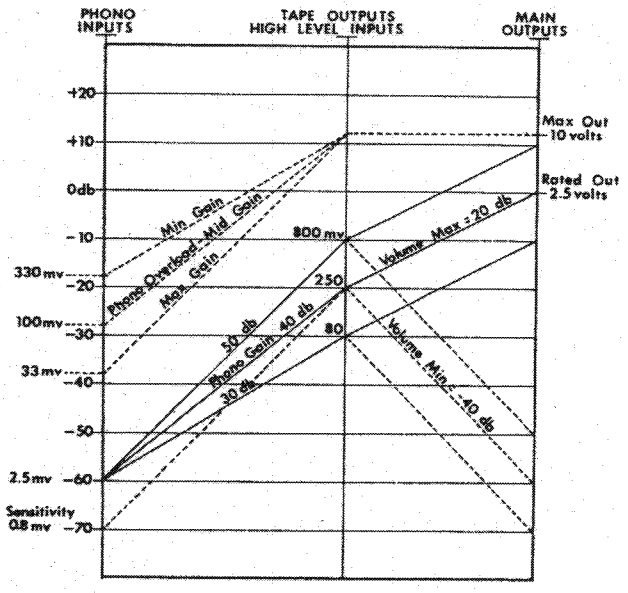


FIG. 2-1
IC-150A COMPARATIVE SIGNAL LEVELS

MAIN OUTPUTS

The main outputs are rated at 2.5 volts, with a maximum output of 10 volts. Output impedance measures 600 ohms. In the event that the IC-150A is employed to drive a 600 ohm load, it will typically produce 5 volts rms into this impedance.

TAPE OUTPUTS

The tape outputs are connected through the tape monitor switches to the input selector switch. In every input selector position, except the two phono positions, the output available at the tape output jacks is the exact same signal fed to the corresponding input jacks.

In the two phono positions, a phono preamp is inserted into the circuit to provide additional gain, so the tape output jacks become the output of the phono preamp. Maximum output of the phono preamp is typically 9-10 volts (rms) at 1KHz into a high impedance load. These outputs also show a 600 ohm output impedance.

FREQUENCY RESPONSE

No electronics equipment gives all frequencies equal treatment. If you look at some frequency response graphs, you will notice that the usual pattern for audio equipment shows deviations from the set level at high and low frequencies - depending on the equipment, there may be other deviations in between. To get the information for these graphs, the test level (usually 1 watt output for power amps, and rated output voltage for preamps) is set at 1KHz (1000Hz). The test signal frequency is varied above and below this frequency, and the resulting changes in output level are graphed according to the frequencies at which they occur. The term "flat" indicates the set level. An amplifier "flat from 20Hz to 20KHz" is one which does not deviate significantly from its set level between the frequencies indicated. Any departure from the flat level simply means that, at the frequency where the departure occurs, the equipment is amplifying the signal either more or less than it is amplifying the 1KHz signal. If the response is

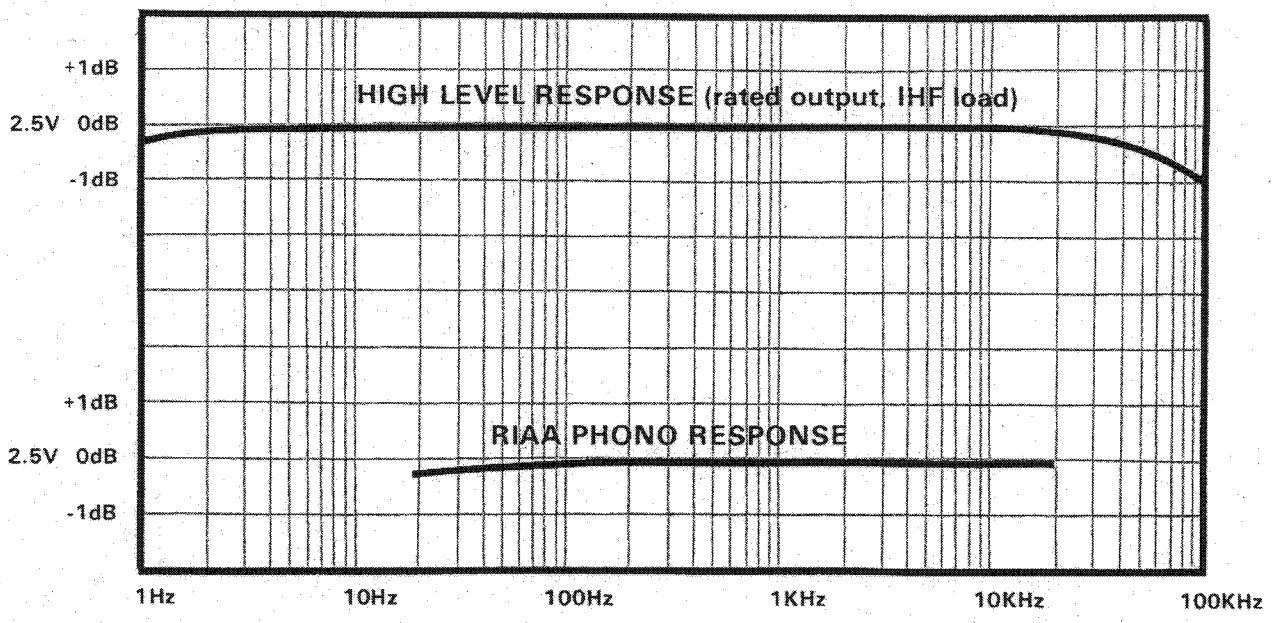


FIG. 2-2
TYPICAL FREQUENCY RESPONSE

down 2db at 50Hz, the 50Hz signal is getting 2db less amplification than the 1KHz signal. Depending on circumstances, you can probably detect a change of from 1 to 3db in sound intensity, which means that a 2db drop in the low frequency range would be noticeable in a production where low frequencies were an important part of the music. The ideal then would be a completely flat response curve over the entire range of audible frequencies of from 20Hz to 20KHz. (See figure 2-2.)

Part of the information on the response graph is the RIAA response of the phono preamp. The title doesn't help much but this is simply a response curve taken through the phono preamp by itself instead of through the main preamp. Because of the way records are cut, they do not have a flat frequency characteristic. In the light of this situation, phono preamps need a special compensating response curve that is not flat. The RIAA (or Record Industries Association of America, the organization that sets up standards for phono response so that everyone's records can be played on everyone else's stereo systems) response indicates what should come out of the preamp when a record is played through it. The response of the preamp should cancel the effects of the record-cutter so that the resulting output is flat with the frequencies balanced as in the original production.

Theoretically, a piece of equipment will retain its frequency response at all levels from the test level to its rated maximum level. In real life, theoretical projections have a way of passing away like the morning dew. And so it happens that some power amplifiers which perform beautifully at 1 watt levels will self-destruct if extreme frequencies (20Hz or 20KHz) are delivered to them at their rated power levels. It is sometimes very worthwhile and informative to look at a power response test as well as the usual frequency response test for amplifiers. Preamps live among similar limitations and a good response curve at the rated output level (for the IC-150A, this is 2.5 volts), may fall apart when the record you are playing through the phono input is trying to push the preamp output to 8 volts at 15KHz. The IC-150A has been designed to maintain its ability to produce clean, high level signals even at the extreme frequencies of the audio range. A maximum response curve of this sort is shown below.

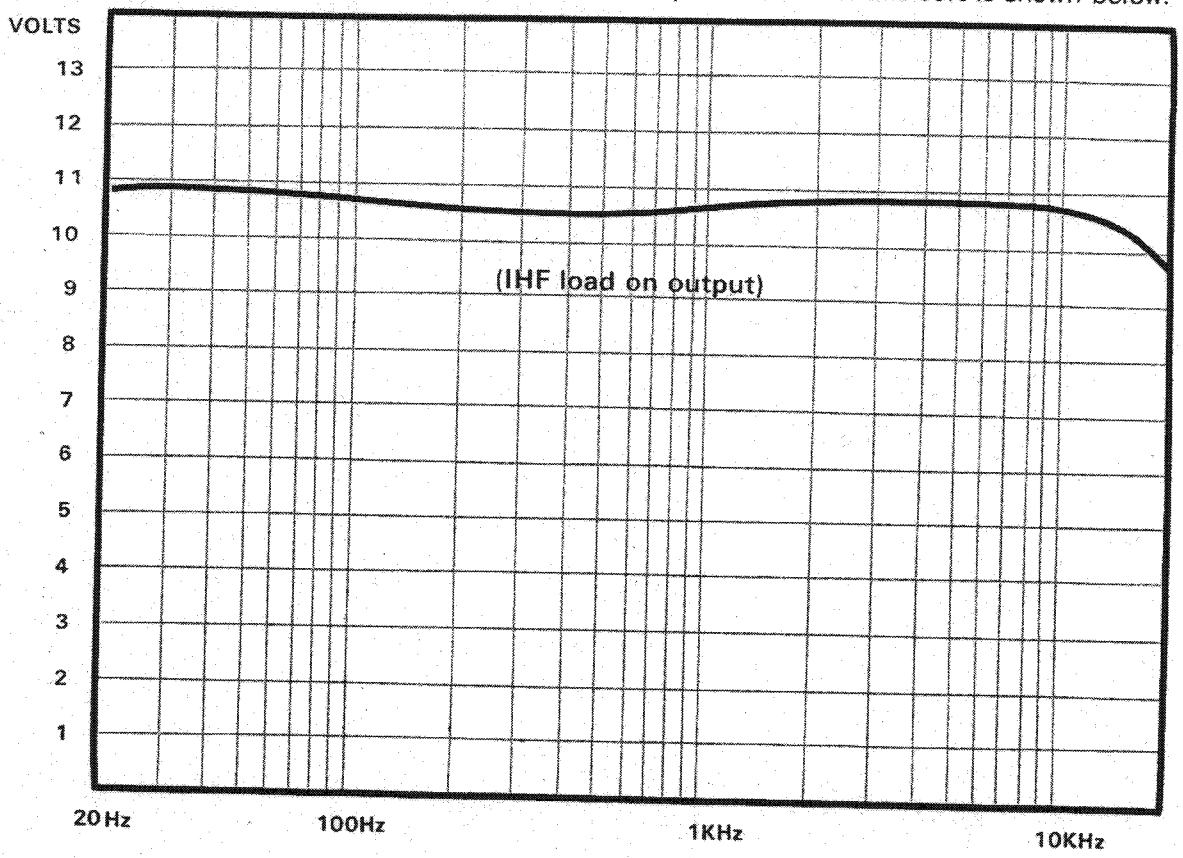


FIG. 2-3
TYPICAL MAXIMUM OUTPUT
RIAA PHONO and HIGH LEVEL

VOLUME CONTROL AND LOUDNESS COMPENSATION

We have just told you that the ideal response curve at which everyone aims is perfectly flat from 20Hz to 20KHz. Now we're going to tell you something different. Unfortunately (and this is why good audio systems may end up with a bewildering array of knobs, switches, buttons, and other special effects), this is not ideally true. In fact, the most desirable response at many sound levels is not flat at all, and your own personal tastes (i.e. do you like drums or piccolos better?) may decree that your desired response will not be flat at any listening level.

But so that you have a good foundation upon which to operate in satisfying your own musical tastes, it is necessary to have a flat response to begin with. From this point, you can move out according to the dictates of your own ears, by using the tone controls and filters. These features are included in most preamps to enable you to adjust the sound to fit your audio equipment, your music, and your tastes.

Another departure from the "perfectly flat" response mentioned earlier is called loudness compensation. Without loudness compensation, all frequencies should be uniformly amplified (curve A, Fig. 2-5) over the entire range of the volume control. In other words, the response should be flat whether you are listening to a high or low volume level. At fairly high levels (comparable to a good seat at a live performance), this is fine because the balance that you hear between the different tones approaches the balance of a live performance. But as you turn the volume down, it becomes evident that the low frequencies and the high frequencies fade from your hearing much faster than do the mid-range frequencies. This phenomenon derives from the non-uniform response of your ears, as proven by psychoacoustical research. (Please don't assume we're insulting your ears.) It is simply true that at low sound levels, you do not hear low and high frequency tones as well as you hear mid-range tones.

Many experiments have been made in which listeners have been asked to rate the apparent loudness of many tones throughout the normal audio range. Under carefully controlled laboratory conditions, these listeners were asked to compare tones of high and low frequencies with a 1KHz reference tone. From this the researchers plotted a set of equal-loudness contour curves.

The work of two research teams has been widely accepted throughout the audio field. The findings of Fletcher and Munson (1933) has been used as a basis for loudness compensation for many years. More recently, the I.S.O. (International Standards Organization) has accepted the work of a second team, Robinson and Dadson (1956), as being more accurate. As a result, the trend in the audio industry is to use the I.S.O. curves as a basis for loudness compensation.

Now that we have scientifically defined your ears, and plotted your hearing response, we have to translate this data into a practical, calibrated volume control circuit, with loudness compensation which does justice to all the hard work of Robinson and Dadson. The starting point is to pick a "normal listening level." A sound pressure level of 100db is widely accepted as this "normal listening level." Now we make the assumption that your hearing is flat at this "normal" level. (This isn't quite true, of course, but remember that your hearing is increasingly uniform at louder levels. 100db is fairly loud.) Now the response curves for the lower listening levels are adjusted with respect to the "flat" 100db curve and a set of normalized loudness contour curves is plotted. These are illustrated in Fig. 2-4. These normalized curves serve as the basis for designing the volume control/loudness compensation in preamplifiers.

As a particular example, observe that the line which crosses the 40db line at the 1KHz frequency climbs to the left until it reaches the 63db level at 20Hz. This indicates that the 20Hz tone would have to be boosted 23db to maintain equal loudness with the

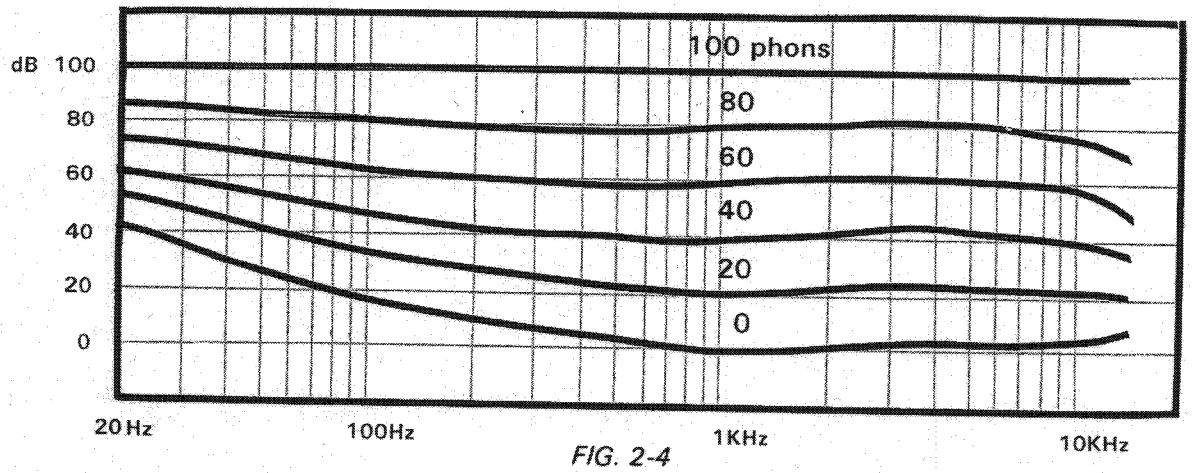


FIG. 2-4

NORMALIZED LOUDNESS CORRECTION CURVES (I.S.O.)

1KHz tone at this sound level. The loudness compensation circuitry of a preamplifier provides this boost in the low (and sometimes the high) frequencies in order to make the loudness of each frequency match the loudness of the 1KHz tone. Not every designer uses the high-frequency emphasis shown in the I.S.O. curves (Fig. 2-4) because of the discrepancy between the findings of Fletcher-Munson and Robinson-Dadson in the high frequencies. Because of this controversy it is questionable whether high frequency emphasis is necessary or desirable. The IC-150A, for example, does not use high frequency emphasis (Fig. 2-5). If the listener wants more highs he can use the treble controls.

When the loudness compensation is engaged in the IC-150A (by pushing the loudness button), the volume control then affects the loudness according to the curves shown in Fig. 2-5, with greater low frequency emphasis occurring as the level is turned down. At low levels, then, the actual response is no longer flat but what you hear will sound flat because you've got human ears. Clever, right?

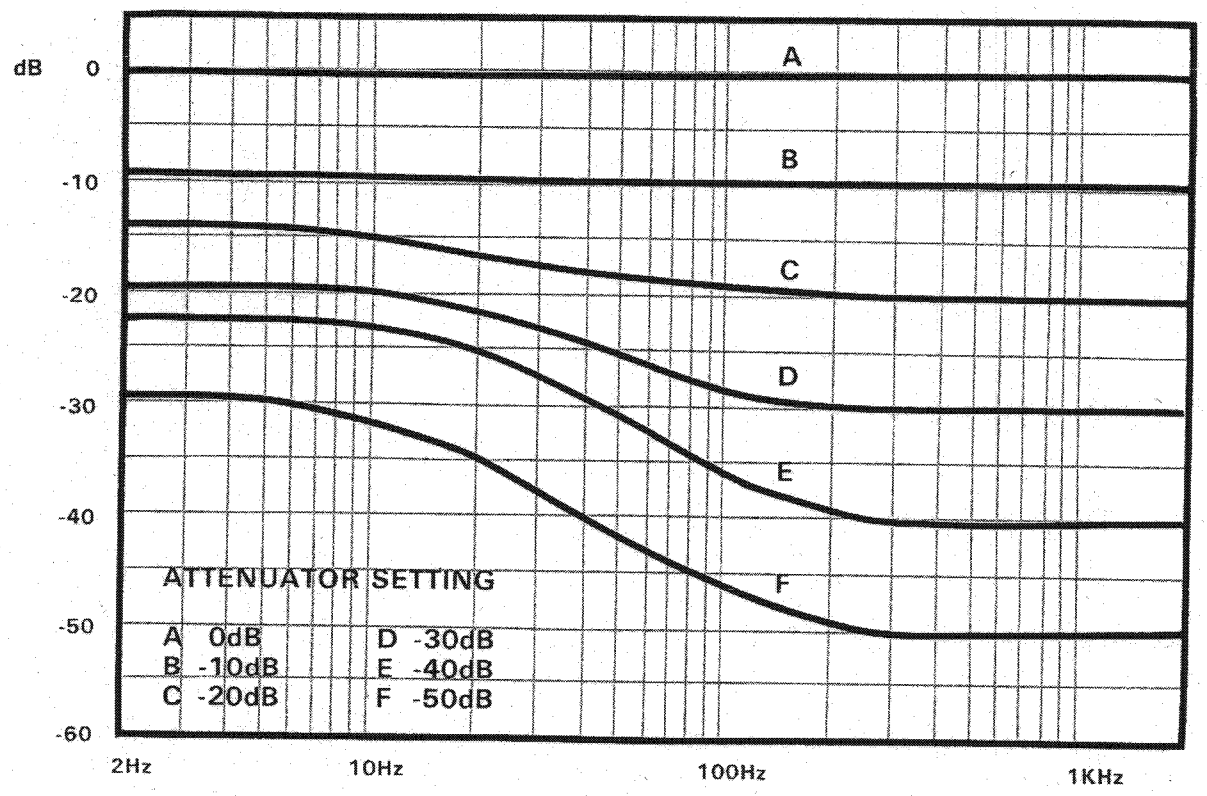


FIG. 2-5
TYPICAL LOUDNESS CONTOURS

TONE CONTROLS AND FILTERS

The loudness control is largely a response to the natural character of everyone's hearing. The tone controls and filters on audio equipment are more personal. They exist to enable you as the listener and final critic to mess around with the sound of your system until you like it. The controls are reasonably named in accordance with their function. The bass control makes it possible for you to increase or decrease the level of bass you are hearing. The treble control similarly handles the treble tones. Besides these controls there are two buttons designed to cut down the bad effects of some system problems. The rumble (low) filter acts to eliminate unwanted low frequencies that may appear in your system (through the turntable mechanism, for instance). The scratch (high) filter acts to eliminate high frequency peculiarities (such as scratches on your records). Use of these filters necessarily cuts down the high and/or low frequency response, but this in some cases sounds much better than listening to the faithful reproduction of turntable indigestion or the results of record torture by bouncing tone arms.

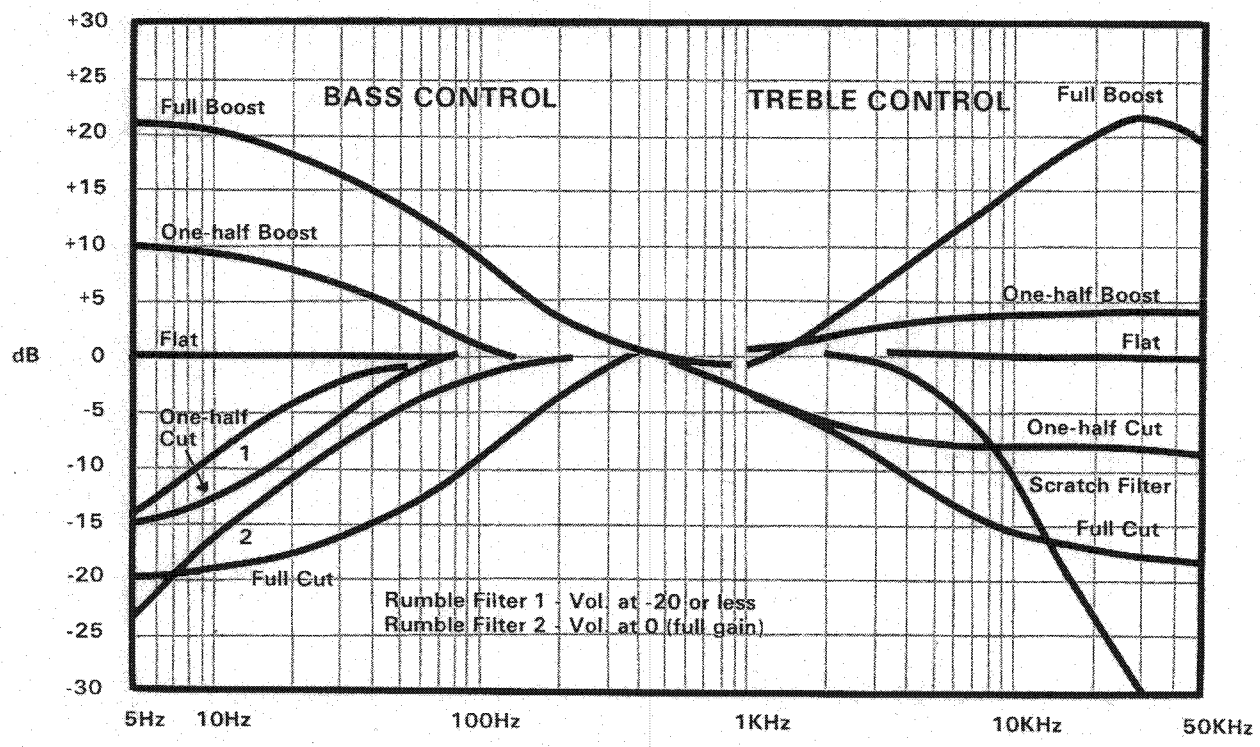


FIG. 2-6
TYPICAL TONE CONTROL & FILTER CURVES

The curves shown for these controls give an idea of their effect on the program being passed through the preamp. The curve labels are intended to show where the control knob should be set to result in a given amount of increase or decrease in sound. Full boost on the bass, for example, means the bass knob will be turned all the way clockwise (to about the 5 o'clock position). This will add 8db to the 100Hz signal. The 50Hz signal will be boosted 13db and the 20Hz signal will be increased by 22db. One-half boost curves apply when the control knob is turned approximately half way between the flat position and the full-boost position. Going the other way, the bass control will lower the volume of the bass end of your program. The treble end can be emphasized or cut back similarly by use of the treble knobs.

Depressing the "PUSH FOR FLAT" button cancels the effects of the tone controls (but not the filters).

The low filter drops the output 3dB below the flat level at about 25Hz, which, as a point of reference, appears at the low end of the range of a pipe organ (ref., Fig. 2-7). (This is affected by the setting of the volume control, with maximum filtering occurring at full volume when unwanted low frequencies are most likely to be audible.) A loss of 3dB in output level represents a fifty percent loss of power (but not necessarily a 50% loss in loudness). The filter then cuts off frequencies below 25Hz at a rate of 6dB per octave, which means that the level drops 6dB each time the frequency goes down by one-half (i.e. there will be a 6dB drop between 20Hz and 10Hz, etc.). A 6dB loss cuts the power by a factor of 4.

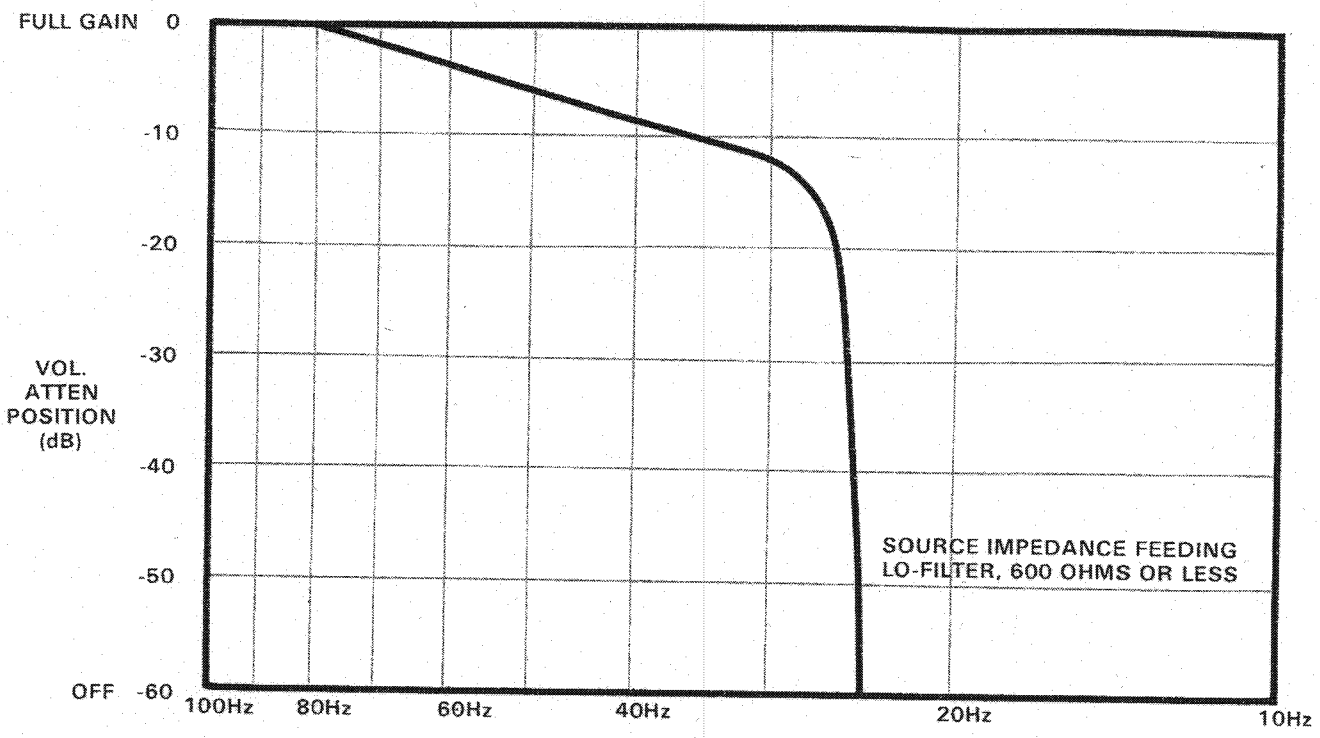


FIG. 2-7
TYPICAL LO-FILTER RESPONSE
VERSUS VOLUME ATTENUATOR SETTING

The high filter hits its 3db down point at 5KHz. For reference, the high end of a piccolo's range is about 4.2KHz. Above this, the filter cuts the signal at a rate of 12db per octave, (i.e. the power will drop by 12db, or a factor of 16, between 6KHz and 12KHz, etc.).

Initially, it may appear that a rising L-F filter turnover frequency (with increasing volume-attenuator setting) would be detrimental to performance. However, considering that the likelihood of acoustical feedback also increases, this characteristic is desirable.

PHASE RESPONSE

This particular characteristic of audio systems has not been much emphasized. Its effect is not easy to describe accurately, since poor phase response does not produce the obvious aberrations heard with high distortion or bad frequency response. The need for good phase response appears with the desire to hear musical instruments sound as they do in the concert hall. Each instrument has its own peculiar sound, made up essentially of the particular note being sounded plus its harmonics. If the middle A on a piano is being sounded, for instance, the fundamental tone (and first harmonic) is 440Hz. The second harmonic is 880Hz, the third is 1320Hz, and so on. The particular sound of each instrument derives from the relative amplitudes of the various harmonics associated with the fundamental tone. For example, if the second harmonic is much louder than the third harmonic, the note will sound different than would the same note with a louder third harmonic. That's why trumpets and piccolos and police whistles don't sound the same, even if they can hit the same note. Any change in the relationship of these harmonic tones to one another and to the fundamental will produce a change in sound. Suppose, for example, there is a 45° phase shift between the 1KHz tone and its fourth harmonic, the 4KHz tone. This would, in effect, slow the 4KHz tone down by ¼ of a cycle, and force a different combination with the fundamental tone and the other harmonics. This would change the waveshape of this particular note, and consequently the sound you heard when the waveform hit your eardrum. In order to preserve as much as pos-

sible the original sounds of the instruments to which you are listening, the total phase distortion of your audio system should be as low as possible. For a given amplifier or preamplifier, it should be less than 15° across the audio bandwidth of 20Hz to 20KHz.

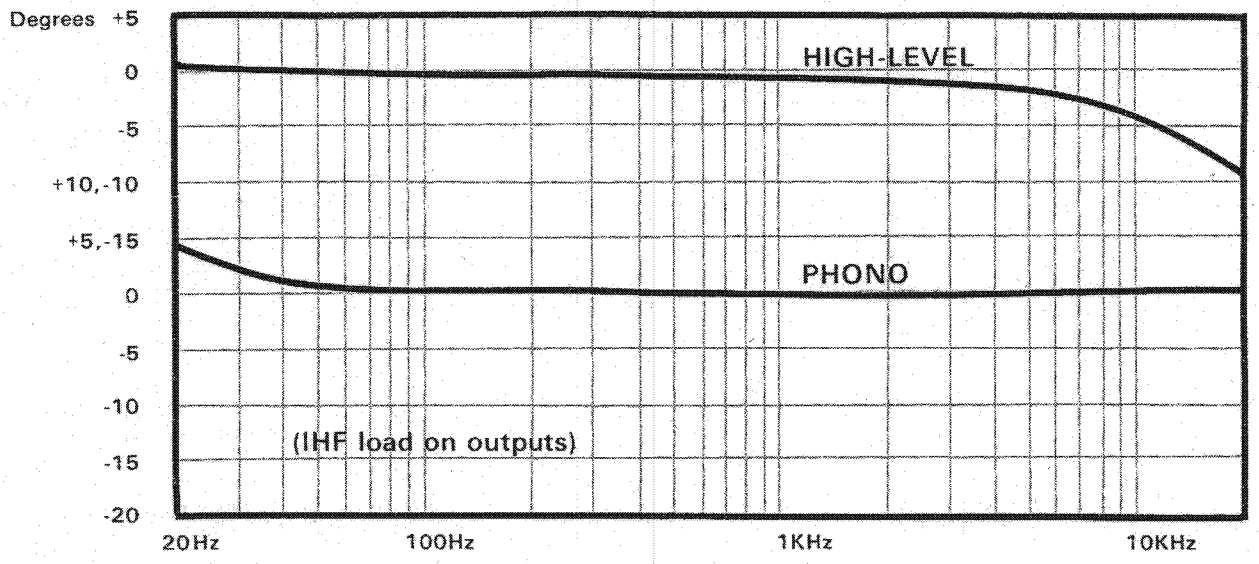


FIG. 2-8
TYPICAL PHASE RESPONSE

DISTORTION

Harmonic distortion measurements have customarily been used to evaluate the performance of audio equipment. The preceding note concerning phase response made reference to the importance of harmonic tones in musical sound. Harmonic distortion figures show the degree to which a piece of audio equipment changes a signal by adding harmonics to it. (To make the test, a signal known to have a very low level of distortion is introduced at the input of the unit under test. The resulting output (usually at the rated output level of the equipment) is then compared to the input to determine what percentage of harmonic tones has been added to the original signal. This test is repeated at several frequencies in the audio band (20Hz - 20KHz), and the amount of harmonic distortion is graphed on a frequency scale.) The drawback to this type of test lies in the fact that such distortion can actually sound pleasant. In the same way that phase distortion can change a sound without making it unpleasant, harmonic distortion can change the harmonic makeup of a tone without offending your ears, since the additions to the original tone arrive in harmonic intervals. Intermodulation distortion is a different breed of cat. Instead of adding harmonious sounds to your music, it deals in sum-and-difference frequencies. For instance, a 100Hz tone from a bass clarinet might modulate a 1000Hz tone from a violin to produce a 900Hz signal (the difference between the two frequencies), and an 1100Hz tone (the sum of the two signals). The resulting sound has all the endearing qualities of a piano smashing contest, and none of the benefits (i.e. piano smashing is good clean fun and it gets rid of some bad pianos). Besides showing up a more unpleasant type of distortion in audio equipment, IM distortion measurements relate more directly to crossover distortion, a problem especially troublesome in transistor amplifiers. On the whole, therefore, IM distortion measurements constitute a more valid means of evaluating audio equipment. In making the IM test, signals of 60Hz and 7000Hz are fed simultaneously to the input of the amplifier under test. Their interaction with each other is measured at the output of the amplifier,

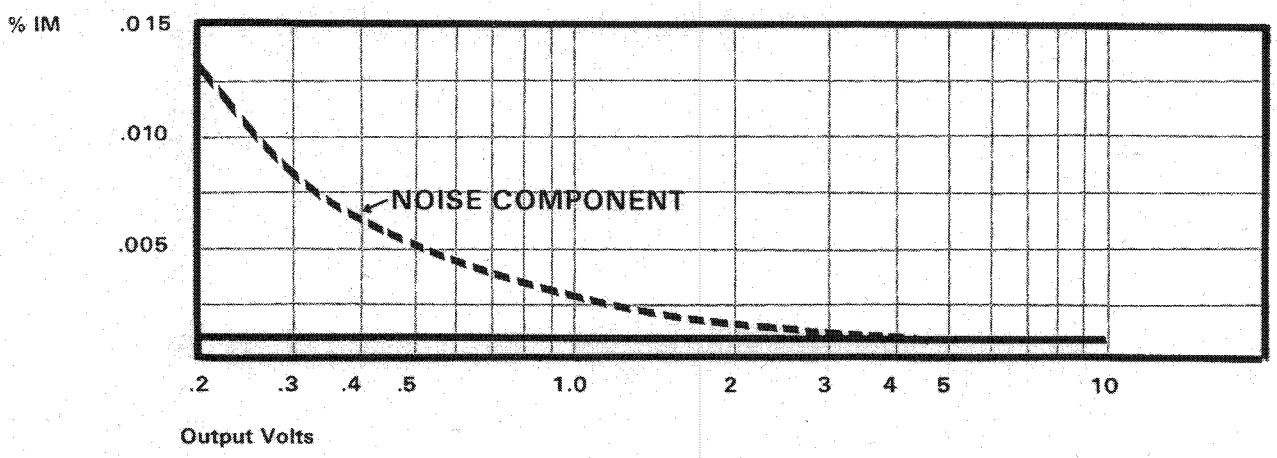


FIG. 2-9
TYPICAL IM DISTORTION

as the test is performed at different output levels. The IM test results are then graphed on a voltage or power scale: voltage output for preamps, and wattage output for power amps. Since harmonic distortion is given as a function of frequency, and intermodulation distortion as a function of output level, there is no direct comparison between the two. Usually, however, in audio equipment of good design, the IM readings are several times higher than the harmonic distortion readings.

HUM AND NOISE

Hum and noise designate an unwanted collection of spurious signals of different frequencies and amplitudes that lurk somewhere around the lowest output levels of your audio system. The chart below indicates the range between the noise levels and the operating levels of the IC-150A. The dynamic range of audio equipment indicates the usable range of output — in other words, the range that lies between noise interference at low levels and distortion or overloading at high levels. The dynamic range of an audio production indicates the difference in volume between its softest and loudest parts. A dynamic range of 60db, for instance, means that the highest signal levels are 60db (1000 times) higher than the lowest signal levels. Noise becomes the limiting factor for most audio media. A very good tape or record may

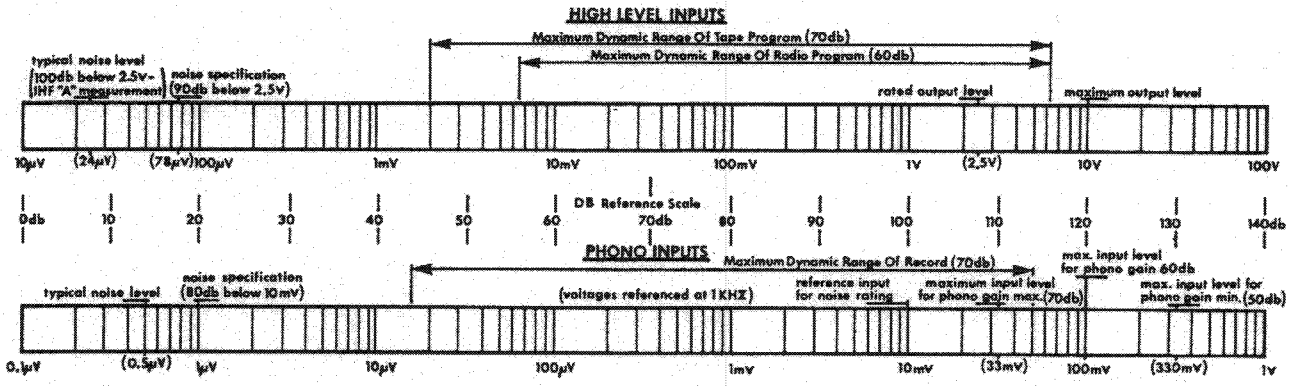


FIG. 2-10
COMPARISON OF NOISE & PROGRAM LEVELS

have a range of about 70db, while a tuner can carry programming with about a 60db range. Trying to expand the range further brings noise into the low levels of the programming. The human ear can safely appreciate a range of about 100db, but any dreams of approaching that range with listening material will remain dreams until the problems of noise and distortion have been further subdued. The relative level chart indicates where the average program range might fall in the operation of an IC-150A preamp. At the levels shown, the softest sounds being played stay well above the noise level. By lowering the volume too far, however, with either the phono gain pots or the main volume control, the program can be turned down far enough to get into the noise region at the low end.

The problem of noise can be compounded by the unfortunate truth that power amplifiers will indiscriminately amplify noise along with everything else. If the final amplifier stage of your audio system adds 30db of gain to the signal, it also increases the noise in the signal by 30db, which may bring the noise up to an annoyingly audible level. To make the best of this situation, it is a good idea to keep your power amp below full gain, and provide as much of the level as possible with the preamp. The diagram below illustrates the point here. By increasing the preamp gain, we get more output signal without more output noise. This makes it practical to set the gain of the power amp at a lower level, and thus to amplify the noise much less. The result is the same signal level at the output, with a lower noise level. Care must be taken however, to keep the amplifier gain high enough to allow full output from the amplifier before the IC-150A overloads at 10V of output.

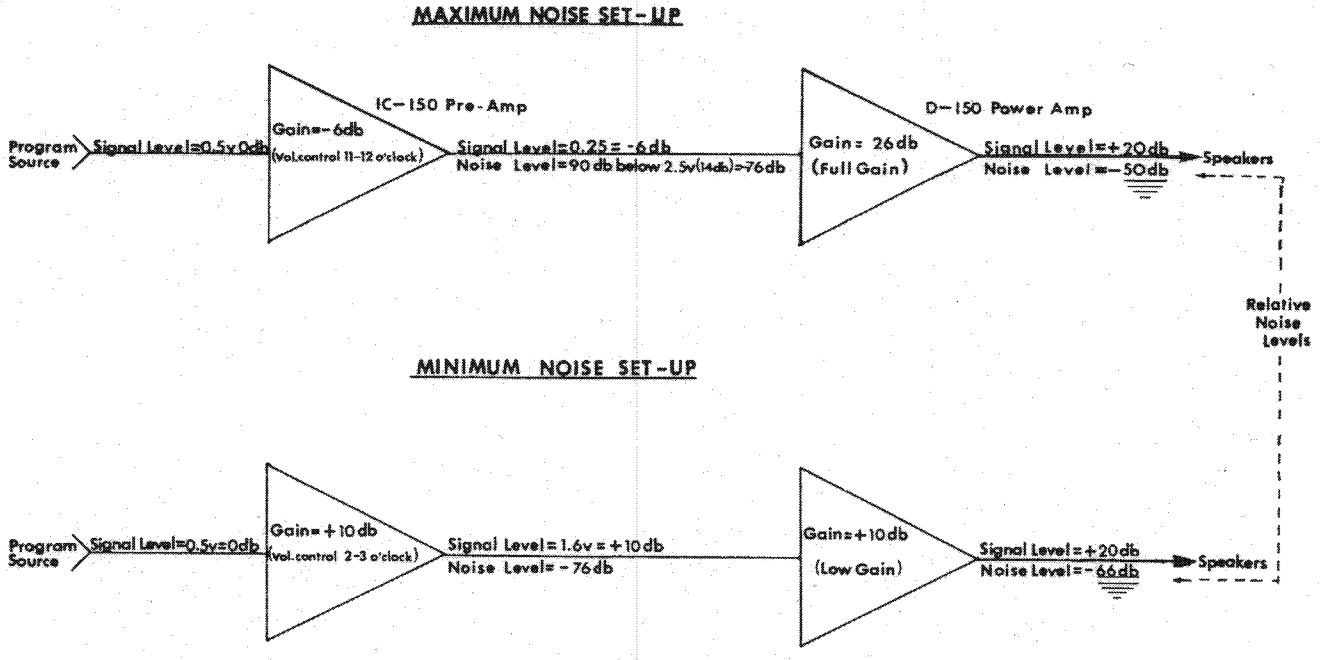
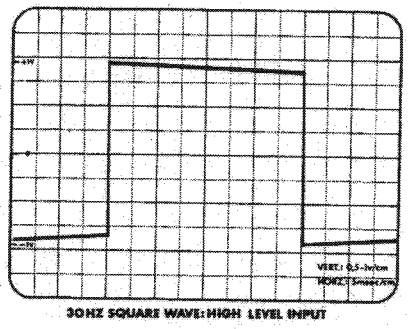
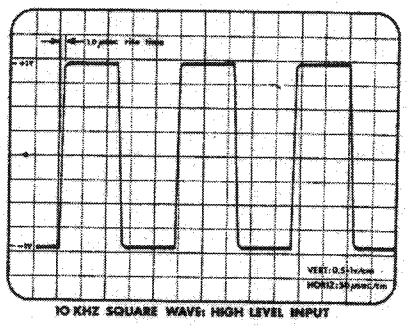


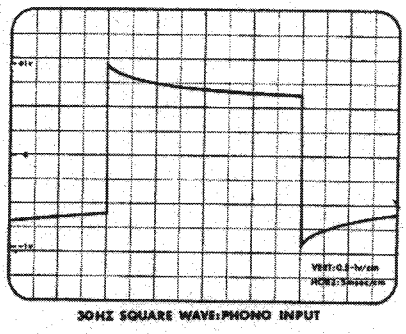
FIG. 2-11
CONTROL SETTINGS FOR MINIMUM NOISE

SQUARE WAVE RESPONSE

The square wave response of any audio equipment indicates the bandwidth of the equipment. High frequency square wave response shows the ability of the equipment to respond quickly to sudden changes in the signal (or to accurately reproduce high frequency signals). The low frequency square wave gives an indication of the degree to which the input coupling circuit (which blocks dc) affects low frequency signals. Square waves work particularly well for demonstrating circuit response speed, because in accurately reproducing the waveform the circuit must switch suddenly back and forth between different levels, while maintaining stability, which is a hard thing to do. The square wave makes a simple visual test because any distortion in this simple waveform is comparatively easy to see. The square wave response of the IC-150A, as shown below for both low and high frequencies, demonstrates the capacity of this unit for clearly amplifying a wide range of frequencies. Another description of response speed is the slewing rate figure, which tells how quickly the preamp can change output levels. The rate of change is expressed as volts per microsecond, meaning that the output level can change so many volts in one millionth of a second. For the IC-150A the slewing rate typically measures 15 volts/microsecond.







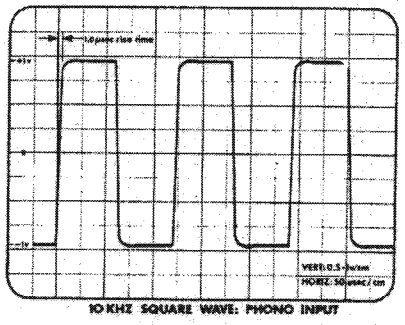


FIG. 2-12
SQUARE WAVE RESPONSE

CROSSTALK

Crosstalk designates any interference of one input with another. For instance, if you leave your tuner turned on while you switch to a phono input to listen to a record, it's super-annoying to hear the tuner output combining with your phono output. In the same way the inputs to the tape and auxiliary terminals are not supposed to combine their efforts, but are to remain separate so that the selector switch can indeed give you a real choice. Several conditions affect the problem of crosstalk. The output impedance of your source (such as a tuner or tape deck) is a factor, with a high impedance output making the problem worse. Frequency is also a factor. As frequency increases, crosstalk generally worsens, although standard procedure is to give crosstalk figures (when they are given at all), only at 1KHz. Inside the preamp, wire dressage is a factor in keeping crosstalk low. Essentially, wires from inputs to switch terminals and then to the amplifying circuitry must be efficiently separated to prevent the signal on one wire from feeding into any other wire. The most conservative way to rate crosstalk is to check all combinations of inputs and pick the worst case as the rating. For the IC-150A, the worst crosstalk at 1KHz (with a 50 ohm generator at 2.45V out and the undriven input terminated with a 5K "source" resistor) is Tape 2 feeding into Tape 1 with the selector on Tape 1. The difference in levels is better than 66db, which means that the unwanted signal is typically more than 2000 times smaller than the desired signal. The crosstalk between the other inputs is generally better, with the Phono inputs, for instance, showing crosstalk down by more than 95db between them at 1KHz. In general the readings are degraded directly by the magnitude of the "source" resistor. That is to say, for a more typical source impedance of 500 ohms the worst case crosstalk would be 86db, a tenfold improvement.

SEPARATION

Separation is the bedfellow of crosstalk, as it designates the degree to which either of the two stereo channels interferes with the other. Again, increasing frequency makes the problem worse. The same method of measurement is followed as was used to rate crosstalk (i.e. find the worst case and use it as the rating). Typically the worst separation in the IC-150A occurs with the left channel feeding into the right channel on the Tape 1 input. The separation is generally worse with the volume control low — with the worst case being about 55db separation at 1KHz (the unwanted signal more than 500 times smaller than the desired signal) when the volume is turned almost all the way down. With the volume control at maximum the separation is typically 65db (a difference in signal levels of better than 1500; this becomes 85db with a 500 ohm source impedance). The separation when other inputs are used is higher, with the Phono inputs, for instance, showing separation of 80db at 1KHz (a difference of 10,000 in signal levels).

OPERATIONAL DESCRIPTION

The IC-150A provides the important basic control center functions in a unit designed for clean sound and uncomplicated operation. Especially noteworthy qualities include the uniquely low distortion and noise levels, and the exceptionally good frequency and phase response. These qualities combine with simple and precise mechanical operation to afford versatile handling of programs from all audio sources.

The electronics of the IC-150A are built around six integrated circuits which provide the equivalent of 97 transistors, 24 FETS, 2 zeners and 12 diodes. Beside these there are 7 bipolar transistors, 1 FET, 1 zener and 10 diodes.

The IC-150A requires about 2 watts for its operation. The power supply can be wired for 120 or 240 volts, and will operate on any frequency from 50Hz-400Hz. On the back of the unit are provided 5 AC outlets for supplying equipment used with the preamp. Four of these are powered by the on-off switch of the IC-150A, while the fifth is wired directly to the power cord before the switch. The unswitched outlet powers your turntable, to avoid turn off in mid-cycle with possible damage.

The output from the IC-150A to the following amplifier is automatically muted for several seconds to protect speakers. When the IC-150A is turned on, a relay keeps the output off long enough to allow normal turn-on transients in other equipment to die down, thus preventing these transients from harming speakers. About 5 seconds after the AC switch is pressed, the muting relay closes to allow normal operation.

A conceptual layout of the operation of the IC-150A appears in the signal flow diagram. For any who want more detail the actual electronic components are shown on the schematic following. The signal flow diagram shows the sequence of operations upon an audio signal as it passes from input to output (moving from left to right on the diagram).

At the extreme left of the chart the selection of inputs appears, all of which feed to the rotary selector switch. If the phono inputs are used, the signal goes through the selector switch to the phono preamp and employs a low-distortion, low-noise complementary design Other features of the phono preamp include the equalization circuitry (to afford precise matching of the RIAA response curve) and the phono level controls. Following the phono preamp the signal is returned to the selector switch.

From the selector switch, the signal (either from the phono preamp or from tape, aux, or tuner inputs) goes to the tape outputs and the tape monitor circuitry. The tape outputs route the signal to your recorder(s), while the pushbutton activated tape monitors provide a means of listening to whatever is coming into the Tape 1 and Tape 2 inputs when the selector switch is set on a different input (you may monitor the tape you are making, comparing the tape with the source you are taping). The next part of the circuit is the low filter, which is normally bypassed. It can be added to the circuit by depressing the low filter button.

Following the low filter come the volume control and loudness circuitry. Depressing the loudness button adds the loudness compensation circuitry to the signal path. When the volume control is turned to maximum, the loudness compensation has no effect. As the volume control is turned down, the compensation prevents the bass and treble tones from attenuating as quickly as the mid range tones. This provides the boost necessary to keep the loudness levels balanced. When the loudness button is out, the loudness circuitry does not affect the signal at all.

The next controls affect the stereo image of your music. The first of these, the balance control, works by attenuating one channel while maintaining the level of the other. At the extreme positions of the knob, one channel is at the level set by the volume control while the other is completely off. In between, the relative volume levels of the two channels may be set in any combination which suits the surroundings of a particular system. At any setting, complete separation is maintained between the two channels.

The pan control allows you to mix the signals of the two channels in any combination from normal stereo to reverse stereo. In the "Normal" position, the left and right channels appear normally,

with complete separation. As the control is turned away from normal, the two channels begin to mix, until at the "Mono" position, the channels are completely mixed and there is no difference between the right and left outputs. Continuing to turn the control increases separation again, but so that the original left channel begins to appear at the right channel output, and the original right channel appears at the left. At the "Reverse" position the two channels have been completely separated in the reverse position. The control thus offers complete freedom to mix the channels to the degree that suits your personal musical tastes.

Immediately following the pan control is the main amplifier section of the IC-150A. Employing a quiet, low-distortion integrated circuit in an operational amplifier configuration, the circuit amplifies signal voltage by 20.8db. The bass and treble controls appear in the feedback circuitry of the main amplifier. These are designed to provide a wide dynamic range, and allow control of the 20Hz and 20KHz frequencies in excess of ± 15db. By depressing the "push-for-flat" button, the tone controls can be completely cancelled, and a flat frequency response obtained regardless of the tone control settings.

The final section of circuitry which helps shape the signal is the high filter. As with the low filter, it is normally bypassed, and only affects the signal when the high filter button is pushed.

The last active circuitry before the output terminals is the muting circuit. When power is initially applied to the IC-150A, the muting relay contacts tie the output to ground. The muting relay remains in a relaxed state until an RC circuit charges and turns on an FET, which in turn energizes the relay and removes the short from the output. This process absorbs approximately 5 seconds, time during which turn-on transients can die out before the speakers are connected to the circuit.

The power supply includes 3 separate dc supplies to operate the IC-150A. Regulated positive and negative 18 volt supplies go to the operational amplifier and the phono preamp. Besides these, a third low-energy supply is provided for the muting circuit.

CARE OF THE IC-150A COVER

If the leatherette case of the IC-150A is scratched, the scratches can be removed with scouring powder, followed by washing with a dishwashing liquid and water. Furniture polish can be used to shine the cover.

WARRANTY SERVICE

Any problem which passes the simple stage and cannot be solved by the "Common System Problems" section should be taken to the dealer who sold the unit, if possible. The dealer will be able to see that the problem is taken care of either by a Warranty Station or CROWN service personnel. In the event this proves impossible, or in some way unsatisfactory, call or write CROWN International, 1718 West Mishawaka Road, Elkhart, Indiana 46514. Your communication will be handled by our Service Department, and information on repair work will be available. All shipping must be done in a factory pack.

LINE VOLTAGE CONVERSION

The IC-150A is normally connected for operation at 120VAC. Conversion for operation at another line voltage requires only a screwdriver, wire cutters, and soldering iron. The following drawings illustrate the five possible configurations.

1. Remove the bottom cover of the IC-150A (held on by 9 screws).
2. With the unit upside down and the rear panel toward you, locate the terminal strip in the far righthand corner. Also identify the two terminal strips mounted on the transformer screws. Notice that the left one has two transformer wires (GRN/WHT and BLK/GRN) soldered to it. (Terminals E and F)
3. Choose the correct line voltage connection, then simply hook the transformer wires and jumpers on the two terminal strips according to the corresponding diagram, Fig. 2-13.

   NOTE: For the 100V, 200V, and 220V connections, the ORG/WHT (AC) wire must be unsoldered from the front terminal strip (A) and soldered to the rear terminal strip (F) with the WHT/GRN wire.

   Also, for the 200V connection the WHT transformer wire must be unsoldered from the front terminal strip (C) and moved to the rear terminal strip (E) with the BLK/GRN wire.

   BE SURE TO CLIP UNUSED JUMPERS AND INSTALL CORRECT ONES.
4. For all connections 200V and above, change the AC fuse to 1/16A, type 3AG.
5. Change the line cord tag to read the correct voltage.

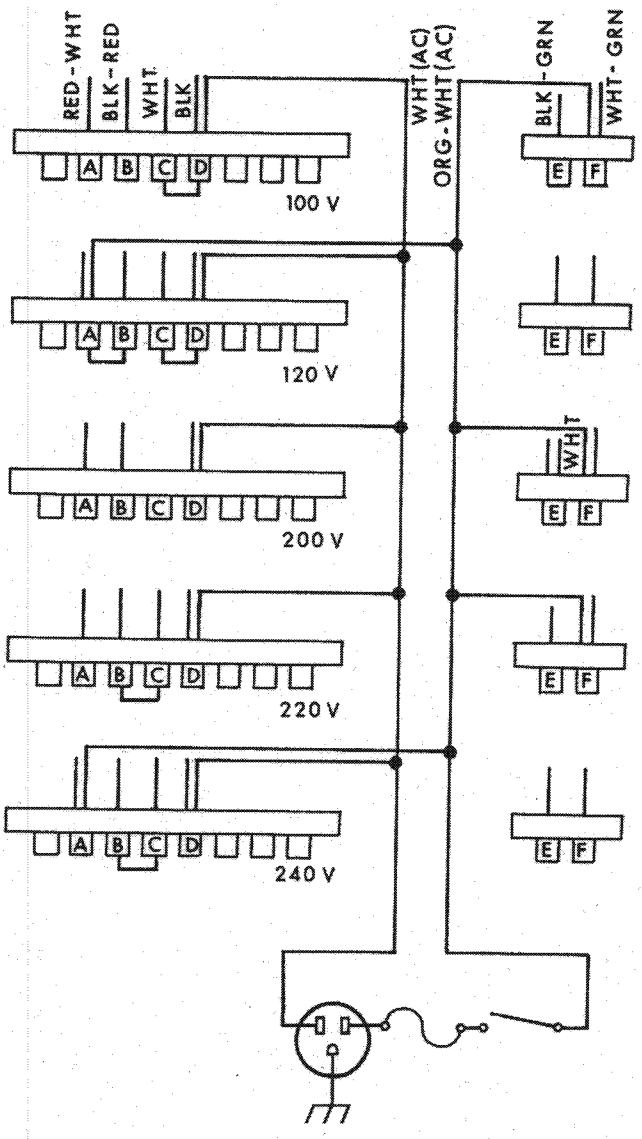


FIG. 2-13
LINE VOLTAGE CONNECTIONS

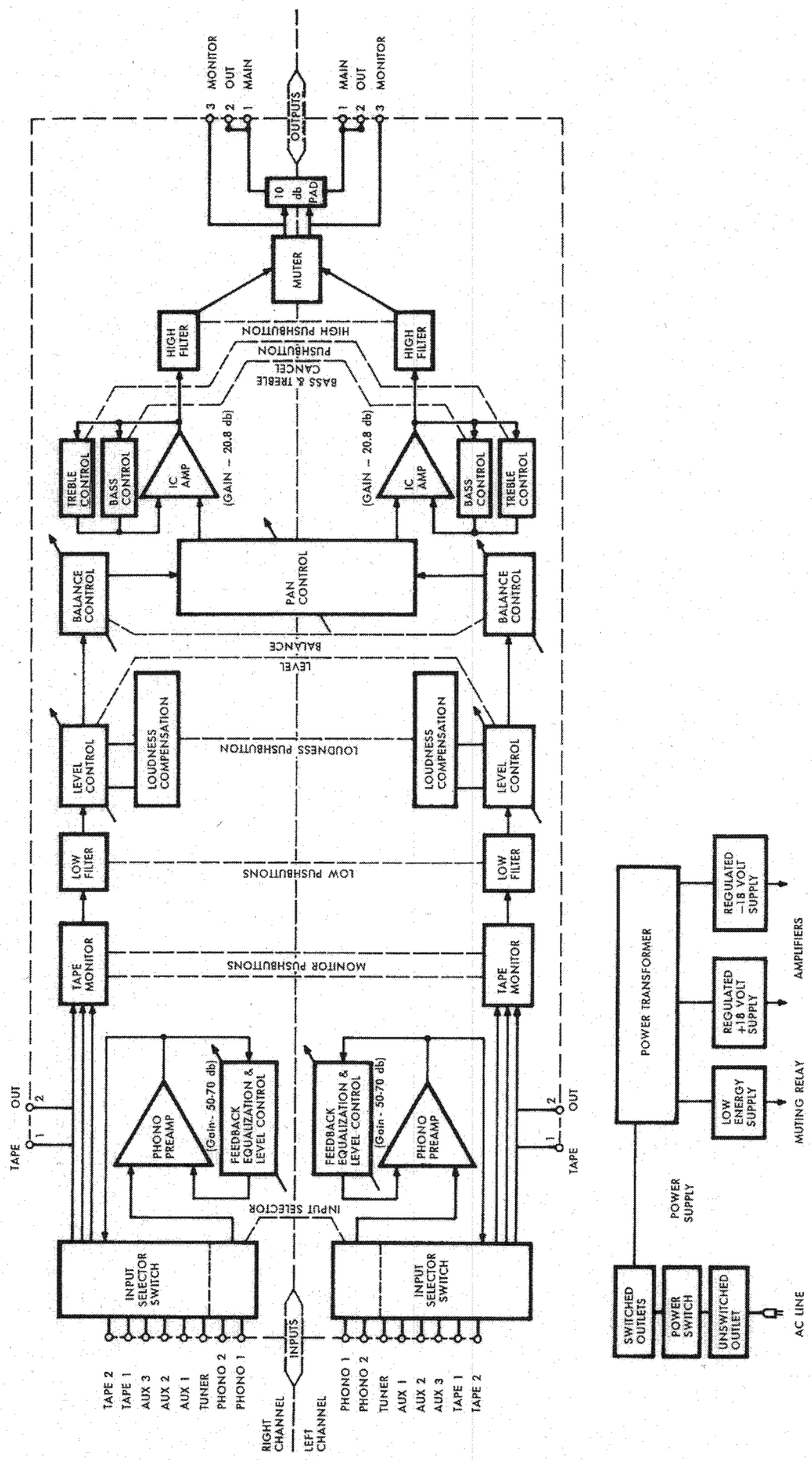


FIG. 2-14
IC-150A SIGNAL FLOW DIAGRAM

COMMON SYSTEM PROBLEMS

PROBLEM	POSSIBLE CAUSES OR CURES
High noise or hum	Power amp turned wide open — adjust amp according to the owner's manual. Poor connection in associated wiring. Ground loop between IC-150A and associated equipment. Open ended input (i.e. shorting plugs removed without having any input from tuner, phono, etc.).
High noise or hum in phono	Above suggestions apply. Gain pots on phono board have been turned up. Turntable not grounded to ground lug of IC-150A. Turntable not properly wired causing clicks, hum, noise, etc. High local RF radiation from TV or radio stations — keep leads short, well dressed.
Scratchy volume or other controls; also pops in switches	Output caps in tuner, tape deck, etc., leaky causing D.C. to appear on volume control, LO filter, loudness button, and Bal & Pan controls. This will also cause pops in the selector switch.
One channel dead	Balance control not set to normal. Broken or shorted cables either coming into or out of IC-150A (try reversing the leads). One or more switches not properly released or depressed. (Try depressing and releasing all switches.)
Both channels inoperative	Suggestions for "One channel dead" apply. Internal muter not activating (listen for internal muting relay to clip a few seconds after turn-on). External (remote) muter switch not turning on — e.g.: turntable muter inoperative may make it impossible to get any signal through the IC-150A. One or both tape monitor switches engaged. Fuse blown. IC-150A or associated equipment not plugged in, turned on, or turned up. Shorting plugs in outputs either "main" or "tape." No input signal or shorting plugs in the input.
Distortion at high listening levels	Possible vibration from speakers being picked up by phono tone arm and amplified by the IC-150A.
High Frequency Oscillation (Power amplifier mysteriously heats)	Power amplifier output is being fed back to IC-150A inputs via poor lead dress, AC mains from electrostatic speakers, etc.
Low Frequency Oscillation	Mechanical feedback between loudspeaker and turntable. Poor AC line voltage regulation causing power amplifier to feedback to unregulated equipment being used as signal source or speaker equalizer ahead of IC-150A.

PARTS LIST, IC-150A Page 1

(Starts SN 23351)

Schematic Designation	Description	Crown Part #	Other Information
	MAIN MODULE	41681	
	Main PC Board	9627	
	Switches		
SW30A,B,C,D SW31A,B,C,D	4 PDT Latching PB	3226	Loudness Control Tone Cancel
	Integrated Circuits		
IC130, 230	LF 356H FET-Op Amp	4127	
IC30	MC78L18ACP +18V	4210	Positive regulator. Starts SN 19201.
IC31	MC79L18ACP -18V	4211	Negative regulator. Starts SN 19201.
IC31	MC79L18ACG -18V	4435	Negative regulator. Starts SN 19201. Used interchangeably and eventually replaced 4211.
	Relay		
K30	5K ohms, DPST, NC, reed	3496	
	Coil		
L130, 230	12 mhy	1661	
	Diodes		
D30, 32 D33, 34 D35, 36	1N4148	3181	
D31	1N961B, 10V, zener	3549	
D37, 38	1N4003	2851	
	Transistors		
Q30	2N3859A, selected	2961	
Q31	2N5459, NCH, JFET	3053	
	Capacitors		
C130, 230	.082 MF 100V	4133	
C131, 231 C133, 233 C134, 234	.47 MF 100V	4119	
C132, 232	.047 MF 200V mylar	3978	
C135, 235	25 MF 15V NP vertical	3186	
C136, 236	.0015 MF 200V filmatic	3089	
C137, 237	.015 MF 200V filmatic	3288	
C138, 238	.068 MF 200V filmatic	3190	
C30	.22 MF 100V filmatic	3218	
C31, 35	4.7 MF 63V vertical	4253	
C32, 33	250 MF 35V vertical	3787	

Schematic Designation	Description	Crown Part #	Other Information
	Resistors		
R130, 230	Selected		
R131, 231	1K ohms ½ watt 1% MF	3194	
R132, 232	10K ohms ¼ watt 5% CF	2631	
R133, 233	10M ohms ¼ watt 5% CF	3221	
R134, 234	10K ohms ½ watt 1% film	2343	
R135, 235	1K ohms ¼ watt 5% CF	2627	
R136, 236 R138, 238	2.7M ohms ¼ watt 5% CF	2634	
R137, 237	604 ohms ½ watt 1% MF	3109	
R139, 239	22.6K ohms ¼ watt 1% MF	4146	
R140, 240	3830 ohms ¼ watt 1% MF	4145	
R30A,B	Balance Control (130K)	4156	Earlier units used 500K, CPN 3238
R31A,B,C	Panorama Control (300K)	4171	Earlier units used 1M, CPN 3239
R32A,B R33A,B	Tone Control (100K cw log)	4308	Earlier units used 4111
R34	3.9K ohms ¼ watt 5% CF	2630	
R35	12K ohms ¼ watt 5% CF	2878	
R36	56M ohms ¼ watt 5% CF	3536	
SA30A,B	Step Level Control	41679	
	Step level control gnd spring	4364	
	Miscellaneous		
	8 pin DIL IC socket	3451	
	Brass spacers	3210	Use on control shafts, inside front panel
	⅜" internal star lockwasher	2188	Use on control shafts
	Bright control washer	2189	Use on control shafts, outside of front panel
	⅜" bright nut	1288	
	Fiber washer	D4208-1	Used on tone, balance, and panorama controls
	Transistor lead PC receptacle	3519	

Schematic Designation	Description	Crown Part #	Other Information
	PHONO PC BOARD	41610	
	PC Board	9607	
	Resistors		
R100, 200 R101, 201	100K ohm ¼ watt 5% CF	2883	
R102, 202 R104, 204	100K ohm ½ watt 5% MF	2324	
R103, 203 R105, 205	200K ohm ½ watt 5% MF	3197	
R106, 206 R107, 207	732K ohm ½ watt 1% film	4125	
R108, 208	100 ohm ¼ watt 5% CF	2872	
R109, 209	1.25K ccw log pot	3241	
R110, 210	27K ohm ½ watt 1% MF	3195	
R111, 211	180 ohm ¼ watt 5% CF	2873	
R112, 212	5.1M ohm ¼ watt 5% CF	4126	
R113, 213	18K ohm ¼ watt 5% CF	2633	
R114, 214	560 ohm ¼ watt 5%	3802	
	Capacitors		
C100, 200	4.7 MF 35V tantalum	4019	
C101, 201 C104, 204	.47 MF 100V	4119	
C102, 202 C103, 203	220 MF 16V	3796	
C105, 205	3 NF 2.5%	3187	
C106, 206	8.8 NF 2.5%	3188	
C107, 207	100 PF mica	3410	
C108, 208	47 PF mica	3409	
C109, 209	.001 MF ceramic disc	2288	
C110, 210 C1, C2	25 MF 50V vertical	3679	
C3	.1 MF 200V filmatic	2938	
	Transistors		
Q100, 200 Q2	PN 4250A	3786	
Q101, 201	TZ-81 Sel.	2962	
Q1	Sel. 2N3859A	2961	

Schematic Designation	Description	Crown Part #	Other Information
	Integrated Circuits		
IC100, 200	LM301AN Op. Amp.	3532	
	Diodes		
D1, D2	1N4148	3181	
	Miscellaneous		
	Transistor socket mpt 3003	3920	
	8 pin DIL IC socket	3451	
	Fiber washers	1646	
	Brass spacers	3209	
	Control nut	3040	
	INPUT SELECTOR SWITCH ASSEMBLY		
SW60A,B,C,D	Selector switch	4326	Starts SN 20551. Earlier units used 4105.
	Bright control washer	2189	
	Bright control nut	1288	
	PUSHBUTTON SWITCH ASSEMBLY	40817	
SW61A,B SW62A,B SW63A,B SW65	5 button PB Assy.	3227	Tape 1 Tape 2 Lo Filter Hi Filter
	Push buttons	4074	
	Push button switch collar	4108	
C160, 260	0.068 mf 200V filmatic	3190	Mounted on switch terminals
	Brass spacer	3212	
	4-40 x ½ RHS screw	1925	
	FRONT PANEL ASSEMBLY		
	IC-150A front panel	4103	
	IC-150A front panel overlay	4102	
	End bars	4092	
	Control knob B	4077	SELECTOR, PANORAMA, BALANCE
	Control knob C	4078	Outer BASS and TREBLE
	Control knob C	4079	Inner BASS and TREBLE (closest to unit)
	Control knob D	4080	VOLUME
	⅜" internal star washer	2188	
	N112B 3 cond. HiD jax	3507	Monitor output
	N112A 2 cond. HiD jax	3631	Aux 3 input

Schematic Designation	Description	Crown Part #	Other Information
	Knurled nut	3495	Mounts the above jacks
	6-32 x ¾ cap screw	1858	Fastens end bars
	Serial number plate	4183	Attached to rear panel
	JACK PANEL ASSEMBLY		
	IC-150A jack plate	3349	With 22 jacks mounted
	#8 solder lug 505	2935	One soldered onto jack plate; one over binding post screw next to hex nut
	8-32 x ⅜ THP screw	2155	Fastens end of jack plate
	220 binding post	3245	Fastens end of jack plate
	#8 internal star washer	1951	Use over 2155 screw
	8-32 hex nut	1986	Use over 3245 binding post
	CHASSIS ASSEMBLY	41646	
	Chassis	9618	
	Top Cover	9551	
	Top Shield	9601	
	#8 x ⅜ SM hex screw	3957	Fastens 3353 to chassis
	6-32 x ⅜ hex screw	3322	Fastens 4103 to chassis
	#6 internal star washer	1823	Used over 3322
	6-32 hex nut	1889	Used over 3322
	Bottom shield	9600	
	#8 x ⅜ SM screw	3957	Fastens 3354
	8-32 x ⅜ THP screw	2155	Fastens T60
	#8 internal star washer	1951	Used over 2155
	8-32 hex nut	1986	Used over 2155
	1-G-2 terminal strip	1266	Used over one screw of T60
	1-G-2 insulator	3599	Used under one 1266
	⅜" snap bushings	2412	
	AC NG receptacle	2432	
	½" W foam tape	2693	Used on top of top shield
SW64	SPDT 25A micro-switch	3222	
	6-32 x 1" BHP screw	2138	Mounts SW64
	6-32 hex nut	1889	Mounts SW64
	Micro-switch spacer	3211	Mounts SW64

Schematic Designation	Description	Crown Part #	Other Information
	250 faston terminal	2956	
	HTA fuseholder	3256	
C60	.1 MF 200V filmatic	2938	Mounted from main board to ground
F60	⅛A 3AG fuse	3228	
F60	1/16A AGC fuse	3707	For use on units converted to 240VAC
	3 AUA terminal strip	1242	Mounted to chassis with eyelet
SW66	DPDT slide switch	4110	Attenuator
	.093 steel eyelet	3529	Mounts slide switch
	Strain relief, right angle	3236	
	HPN power cord	3246	
	G-6-G terminal strip	1273	
	G-6-G insulator	3600	
	#8 x ⅜ SHSM screw	3957	Fastens 1273 terminal strip
	#8 solder lug	2935	One mounts over binding post; two over C60 and C3
	8-32 hex nut	1986	Mounts 3245 to chassis
	#8 x ⅜ SHSM screw	3957	Fastens C3, C60
C61, 62, 63	.01 mf ceramic disc	1751	Mounted on terminal strip 1266
C64	.01 mf 125V film	4443	Mounted on AC receptacles. Starts SN 23351.
I60	Neon lamp NE2H	2500	Mounted on 1273
T60	46P38B transformer	4202	Starts SN 18401. Earlier units used CPN 3224.
R60, 61	15K ohm ½ watt 5% CF	1064	Mounted on 1273
R62	100 ohm ½ watt 5% CF	1007	Mounted on 1273
R160, 260	887 ohm ¼ watt 1% film	4112	
R161, 261	1.3K ohm ½ watt 1% MF	3114	
R162, 262	2.2K ohm ½ watt 5% CF	1036	
	BOTTOM COVER ASSEMBLY	40829	
	Bottom Cover	9581	
	Flush expansion nuts	2543	Mounted in bottom cover
	Rubber feet	2945	
	#8 x 1" SM screw	3959	Mounts rubber feet
	2" x 6" fishpaper	3894	Insulates AC receptacles
	#8 x ⅜ SHSM hex screw	3957	Fastens back of bottom cover
	#8 x ⅜ #6 PHSMT screw	3958	Fastens front of top and bottom covers
	#8-32 x ⅜ THP screw	2155	Fastens sides of top and bottom covers

Schematic Designation	Description	Crown Part #	Other Information
	ACCESSORY KIT (RMB-5A)	41659	
	Rack ears	4093	
	10-32 panel thumbscrew-washer assy.	20032	
	AC 2-3 wire gnd. adapter	2939	
	5x8 zip-lip poly bag	3073	
	Shorting plugs	3230	
	6 pin to pin cable	3338	
	Hex Allen wrench	3454	

COMP 1028
IC150A-050576

CROWN SERVICE BULLETIN

TO: All authorized service centers DATE: May 5, 1976

RE: IC-150A oscillation FROM: Technical Services

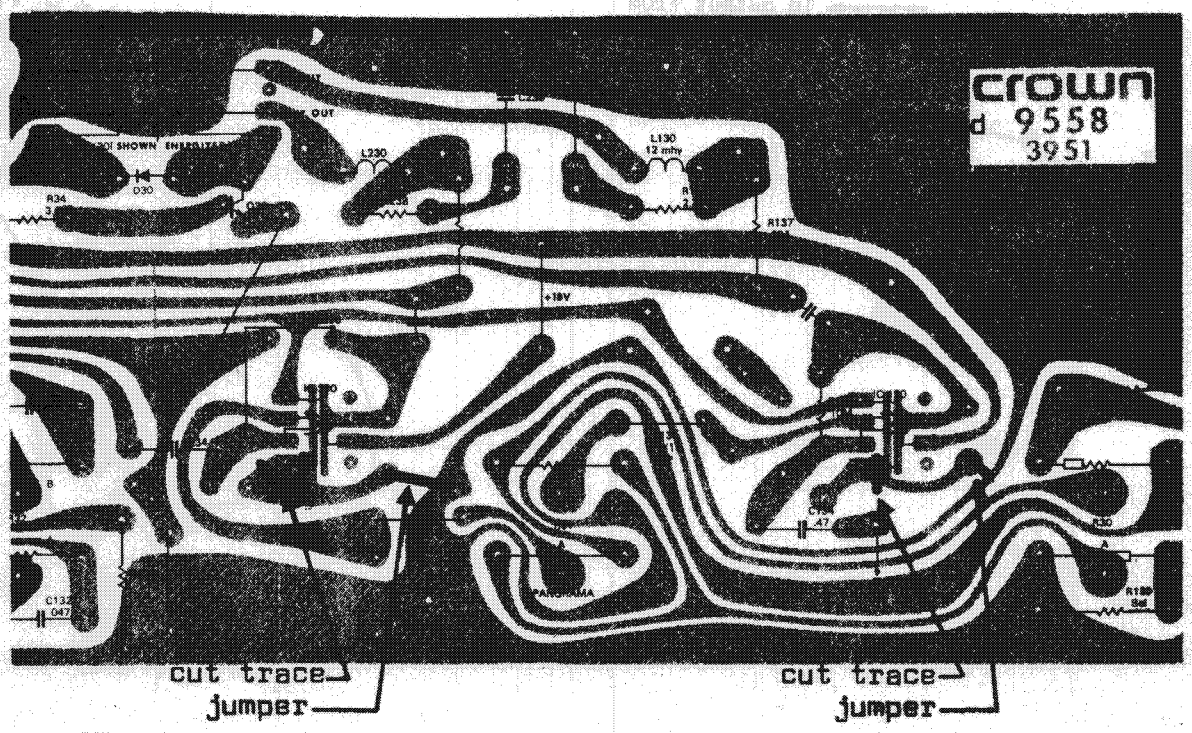
Shortly after IC-150A production began, our QC testing crew discovered that the units oscillate when the Panorama control is in "mono" and Treble controls are set at full boost.

Analysis revealed that the foil trace (IC-130, IC-230, pin 1) on the modified 9558 PC board is unconnected and serves to capacitively couple the output (pin 6) back to the input (pin 3). Under high gain conditions, the circuit frequently oscillates.

The cure is quite simple; ground the unused trace,(illustrated below). First, however, pin 1 of the IC must be isolated. This is done by either cutting the actual foil trace or by removing the pin 1 contact in the IC socket before soldering the socket onto the PC board.

We have recalled several units which were shipped before the problem was discovered. Hopefully, all units have been modified, but we may have missed a few.

The main point is to clarify that pin 1 of the IC is <u>not</u> grounded. It must be isolated before grounding the trace. The new PC module (starting SN 18,401) will not have this problem.



COMP 1030
IC150A-050576

CROWN SERVICE BULLETIN

TO: All authorized service centers DATE: May 5, 1976

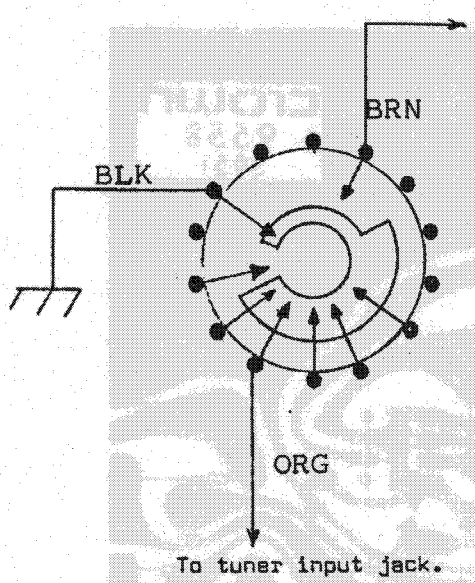
RE: IC-150A input selector switch FROM: Technical Services

The input selector switch on the IC-150A may be the cause of some complaint. We have isolated two problems.

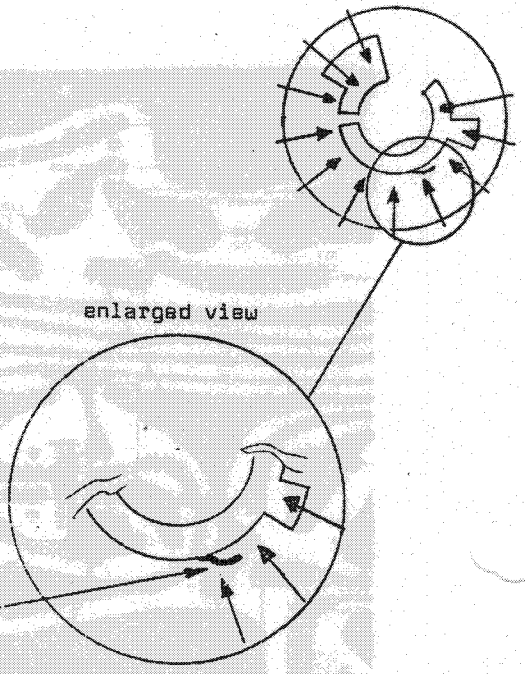
The first is a recurring problem and is evidenced by a pop when switching from Phono 2 to Tuner. Refer to Drawing A enclosed. The pop is a result of the tuner input opening before the phono pre-amp output is grounded. This momentarily feeds the high level tuner signal through the phono pre-amp, causing overload. The cure is simple. Move the switch contact (the wire from the tuner input jack is connected to it) toward the next two contacts to the right, so that the contact will remain grounded as long as possible.

The second problem is the result of a manufacturing fluke. An apparently defective punch left a burr on some of the rotating contacts on the front of the wafers. Refer to Drawing B. This hair-like burr frequently touches other contacts other than the intended one as the switch is rotated. Some rather interesting distortion can result. The cure is **to get rid of the burr.**

A. Switch wafer viewed from rear.



B. Switch wafer viewed from front.



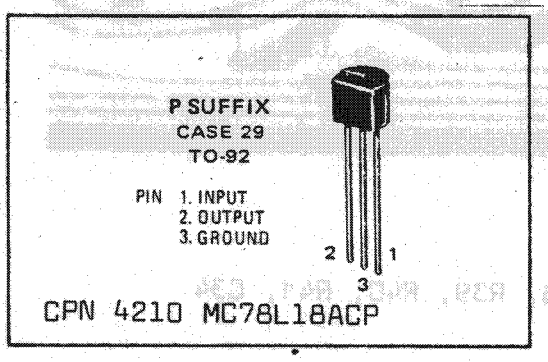
COMP 1031
IC150A-050576

CROWN SERVICE BULLETIN

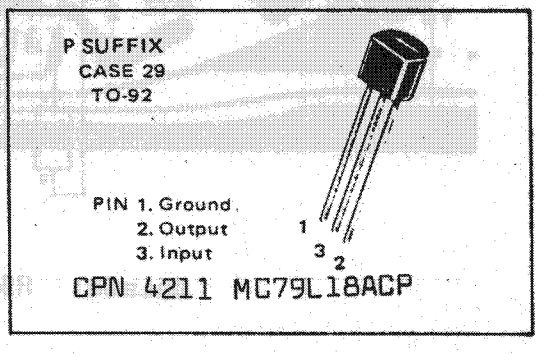
TO: All authorized service centers DATE: May 5, 1976
RE: IC-150A ± power supply regulators FROM: Technical Services

Starting with SN 19201, the RC4195 dual regulator (CPN 3825) will be replaced with two single regulators. The part numbers are as follows: CPN 4210 is the MC78L18ACP positive regulator; and CPN 4211 is the MC79L18ACP negative regulator.

Enclosed is a partial schematic and board layout showing the new devices. In terms of hardware, the 8 pin DIL IC socket (CPN 3451) will be removed. Notice from the base diagrams below that the pin numbering is different on the two devices. This requires a bit of care when replacing devices.



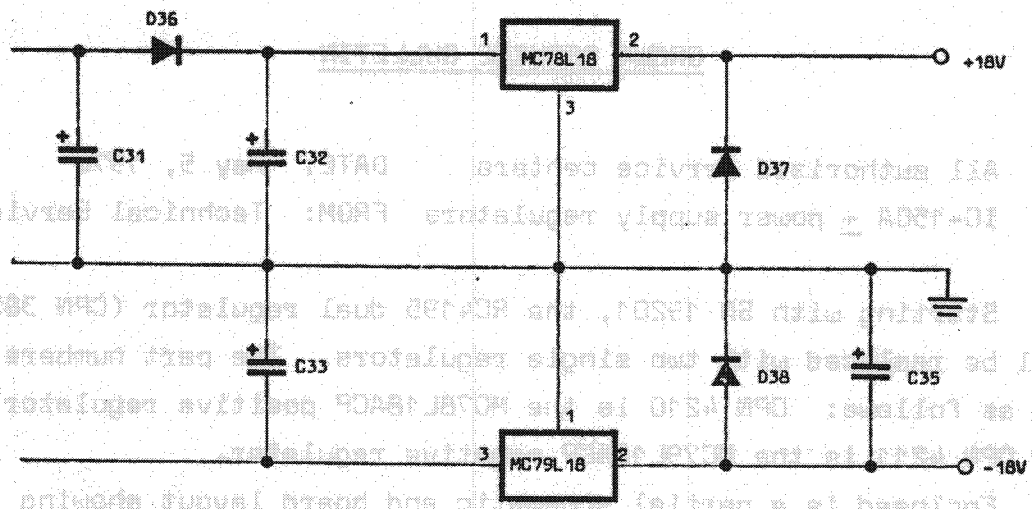
CPN 4210 MC78L18ACP



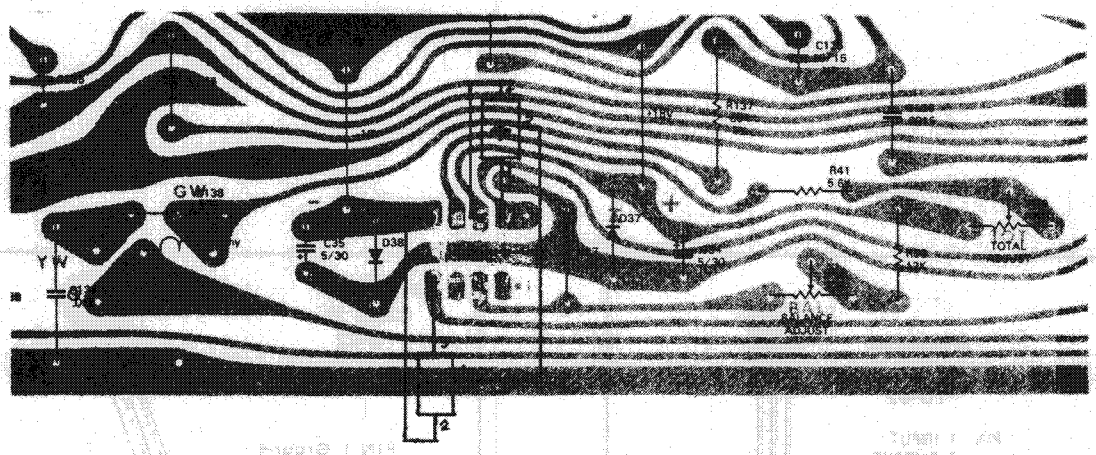
CPN 4211 MC79L18ACP

COMP 1031
IC150a-050576

This is a modification for MI-262A and will start SN 19201.



This is a modification for board #9627 and will start SN 19201.



Delete: R37, R38, R39, R40, R41, C34

SERVICE MEMO

TO: All CROWN service personnel

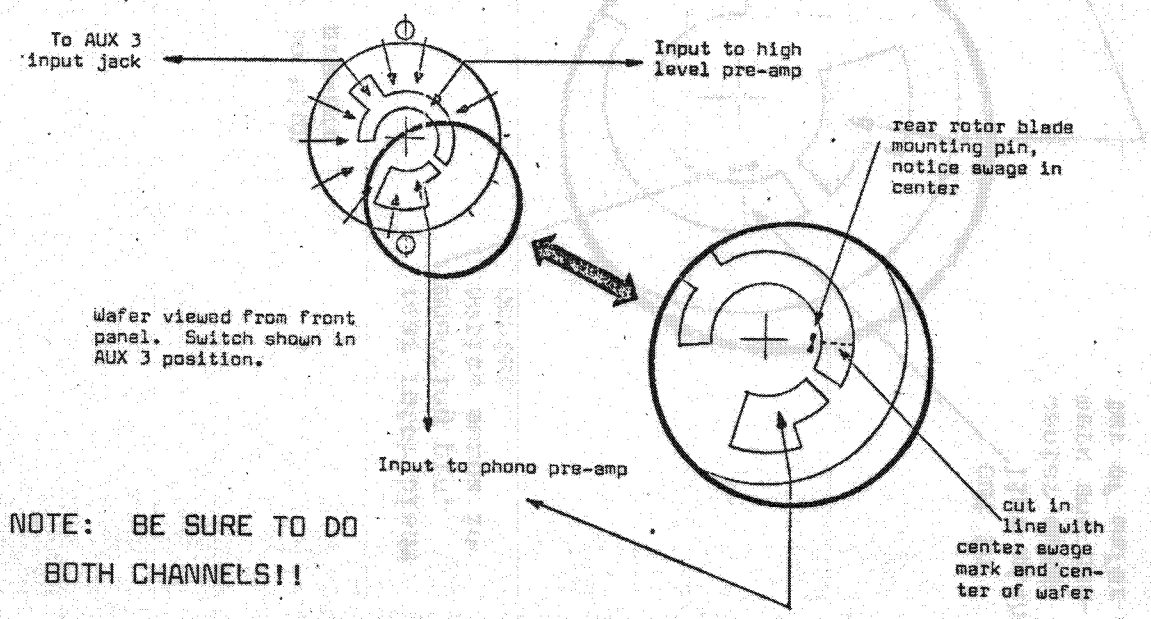
RE: IC-150A source overload

DATE: May 13, 1976

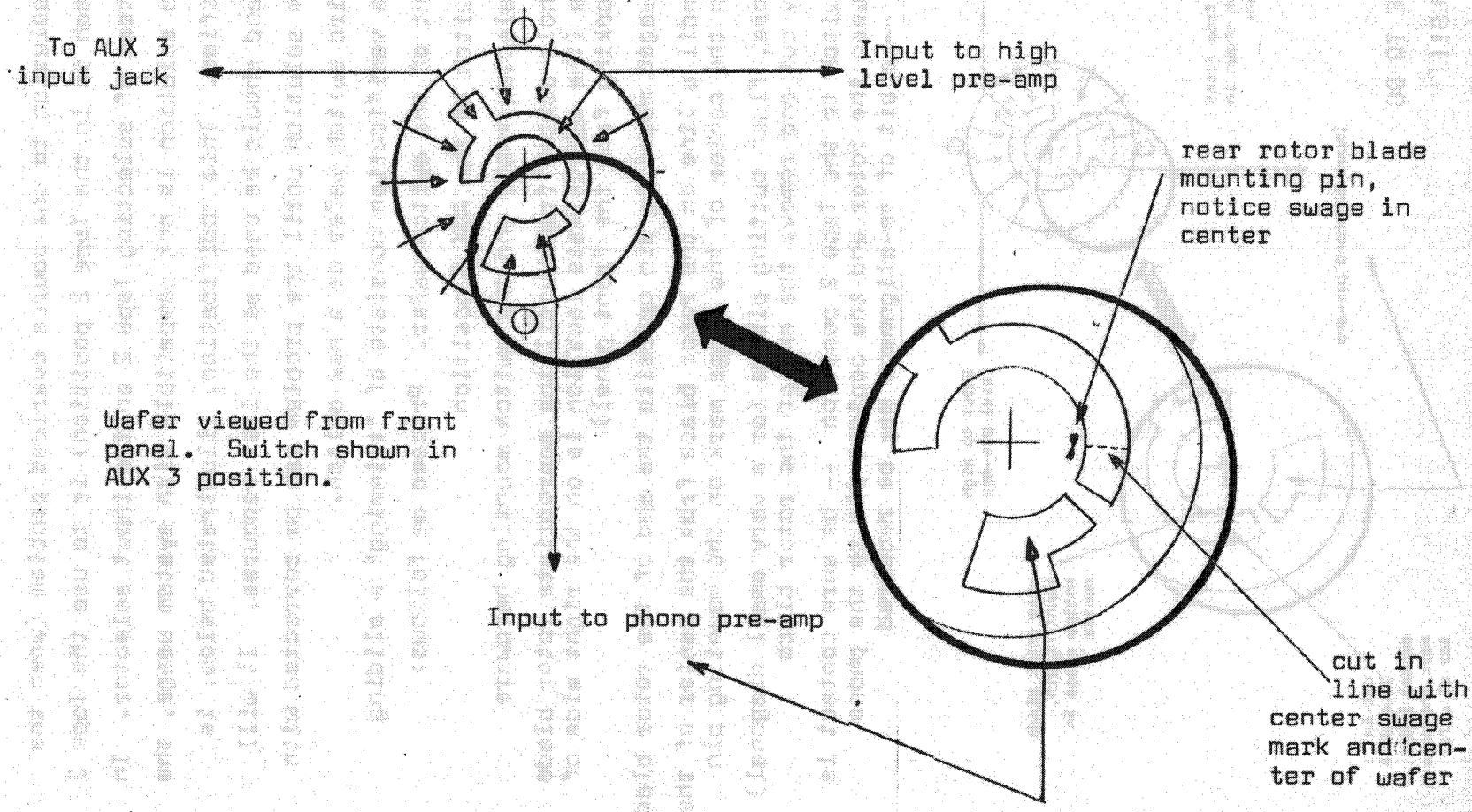
The simplest solution to the source overload problem (when the input selector switch is in the Tape 2 position) is to use the Tape 2 monitor switch instead of selecting Tape 2 on the input selector. In the event that this solution is not compatible with system usage, the switch must be modified. This modification, illustrated below, is somewhat critical and should be used as the last recourse. It will serve as an interim solution until the problem can be corrected with a retrofittable third switch wafer or a new switch.

Basically, the modification consists of "trimming" a sliding contact on the front of the switch wafer. Proceed as follows:

- rotate the switch to the AUX 3 position
- remove the selector knob, and the switch mounting hardware
- rotate the whole switch frame until the appropriate rotor blade is accessible (the approximate location is on the right side of the wafer, looking from the front panel)
- locate the swaged mounting pin opposite the end of the rotor blade
- scribe or pencil a line on the rotor blade from the center of the wafer through the center of the swage mark on the mounting pin
- use a thin-nose, flush cutting pliers (or a very small diagonal) and carefully cut and remove the end of the rotor blade
- rotate the switch to the Tape 2 position -- be sure contact is <u>not</u> made between the rotor and the contact pin to the phono preamp input -- a bit of re-alignment may be required



NOTE: BE SURE TO DO BOTH CHANNELS!!


To AUX 3
input jack
Input to high
level pre-amp
rear rotor blade
mounting pin,
notice swage in
center
Wafer viewed from front
panel. Switch shown in
AUX 3 position.
Input to phono pre-amp
cut in
line with
center swage
mark and cen-
ter of wafer

SERVICE BULLETIN

crown®

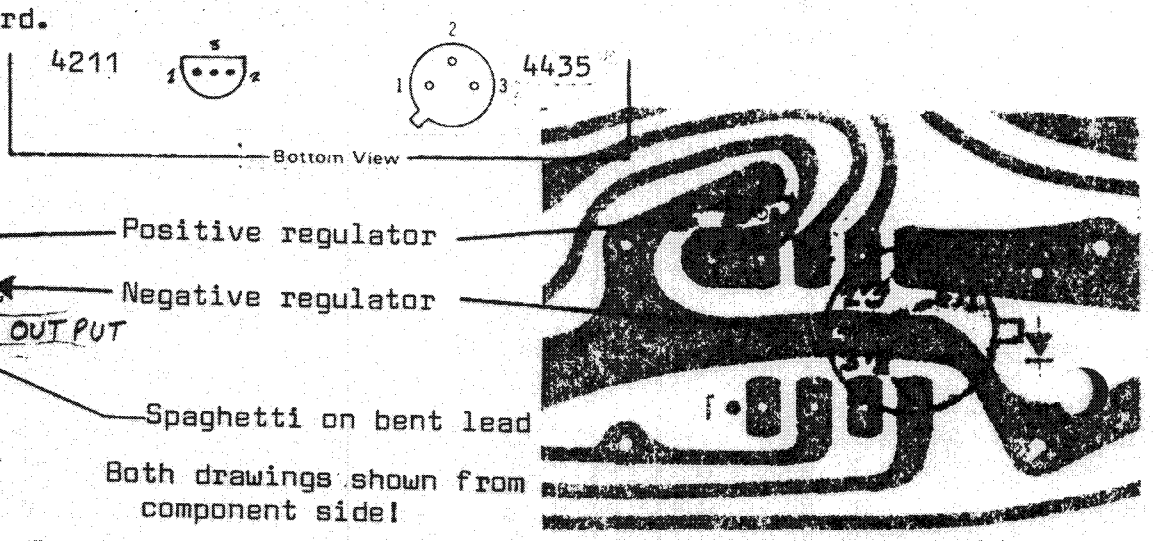
TO: All authorized service centers DATE: March 24, 1977

RE: IC-150A, substitute negative regulator FROM: Technical Services

Recently our QC people noticed an extremely high failure rate in the negative regulator, CPN 4211, type MC79L18AC. Engineering is working with Motorola on the problem, which apparently involves defective packaging and is time and heat related.

Symptoms are low output voltage, (often progressively decreasing with time) accompanied by noise on the dc output waveform. Because of the contaminated dc, the phono pre-amp noise spec is also deteriorated. (This won't be evident in the high-level pre-amp.) To check the regulator, allow the unit to warm up, then check voltage with a 1% accurate voltmeter. The negative output voltage must be greater than 17.1 and less than 18.9 volts, otherwise it is out of spec and must be replaced.

We are substituting a negative regulator packaged in a TO-39 metal case (type MC79L18ACG, CPN 4435) in place of the TO-92 plastic package. This device, while identical, does not exhibit the failure. Please note from the drawings below that the pin-out differs from the CPN 4211. When installing the unit, one lead must be bent through the other two and covered with a 3/8" length of spaghetti. To achieve proper orientation, you may either bend pin 1 through pins 2 and 3 as illustrated, or bend pin 2 through pins 1 and 3. Be sure to check the circuit carefully before inserting the leads in the PC board. Allow enough lead length to keep the case about 1/4" above the board.



SERVICE BULLETIN

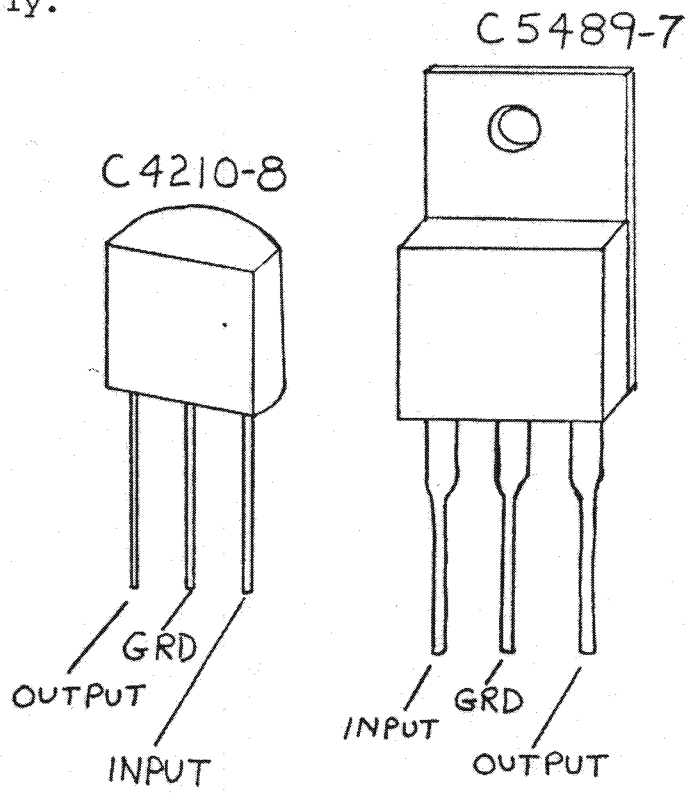
crown®

IC150A082884

SUBJECT: IC-150A

SERIAL NUMBERS AFFECTED: All units

We have recently depleted our stock of C 4210-8 positive voltage regulators. The part that we are now sending out for substitution is a C 5489-7. This is a standard positive 18 volt regulator and the TO-220 style case. The illustration below gives the pin out of both regulators. When replacing the C 4210-8 with C 5489-7 care must be taken that the proper pinout is maintained for proper operation of regulator. It may also become necessary to enlarge the holes so that the leads of the new regulator can be installed properly.



Charles C Hostetler

Charles C. Hostetler
Regional Service Manager

CCH/gjm

COMP 1045
IC150A-091277

CROWN SERVICE BULLETIN

TO: All authorized service centers DATE: September 10, 1977

RE: System oscillation using IC-150A (does not pertain to the IC-150) FROM: Technical Services

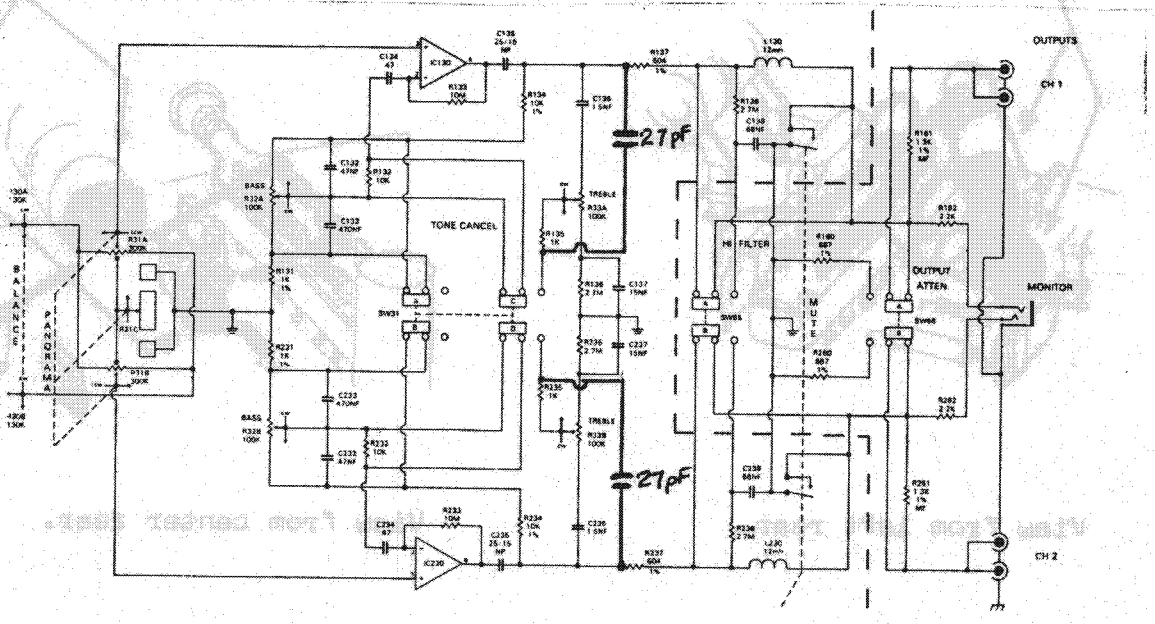
Recently a customer called our attention to a bizarre situation with his IC-150A. He claimed to have an oscillation when he operated his system wide open (hopefully with no input signal) with the treble controls at full boost.

Since we couldn't detect an oscillation on the test bench, we concluded that the oscillation must be a system oscillation. Further investigation confirmed this.

It seems that the gain bandwidth of the IC-150A is too high, and if operated at full high frequency gain the system can oscillate. This is especially true with super-power amplifiers and electrostatic speaker systems.

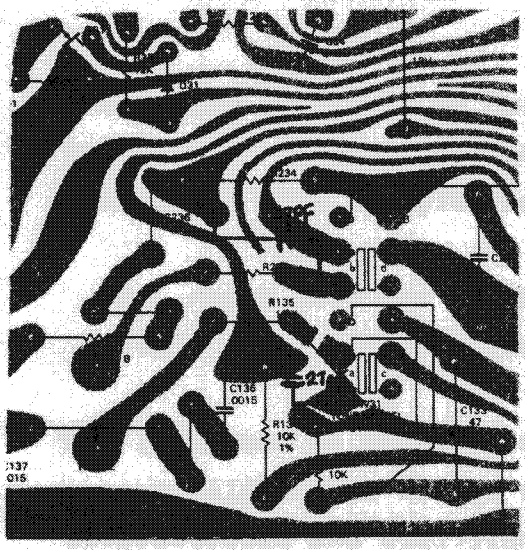
One effective solution is to install a phase-lead feedback capacitor which modifies the treble boost curve slightly, reducing the gain. A 27 pF capacitor will lower the curve about 2 dB at 24 kHz.

Below find a schematic and board layouts illustrating the added capacitor. We have also included component side drawings of both PC modules #4150 and the older modified #9558, showing the addition of the two capacitors. With the #9558 board you can use existing holes; with the #4150 board you will have to drill two new holes (#65 hole). These drawings should help with positioning.

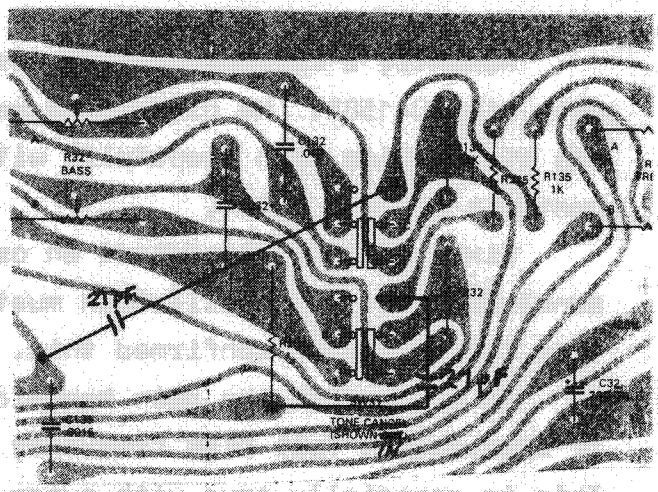


PC board layouts shown from foil side.

#9558 (modified)

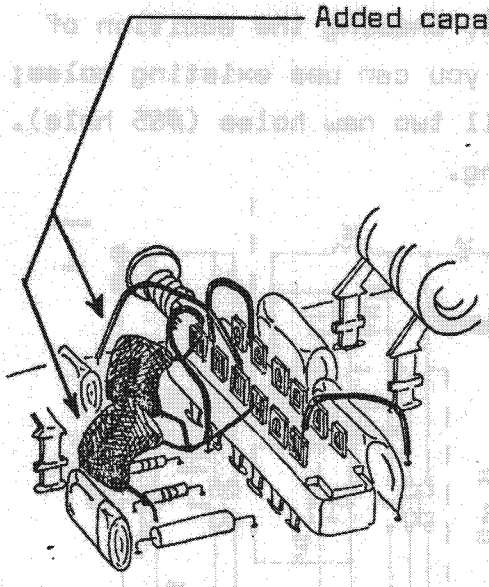


#4150

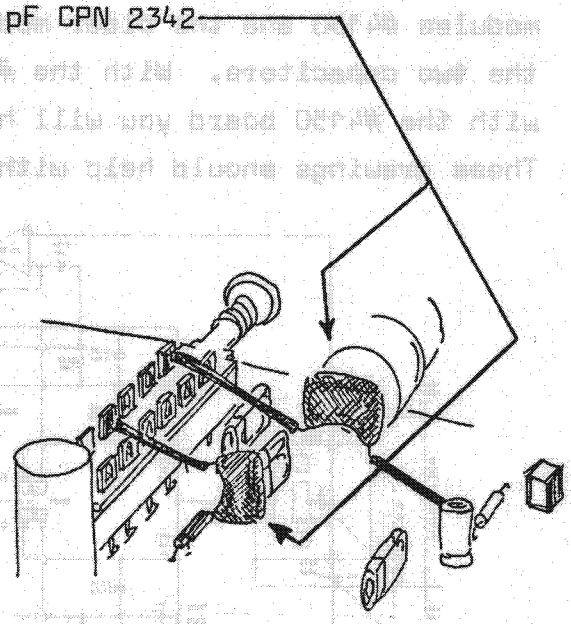


Both PC boards viewed with top cover removed:

Added capacitors, 27 pF CPN 2342



View from left rear.



View from center rear.

IC150A090878

SERVICE BULLETIN

FROM THE CROWN TECHNICAL SERVICE DEPARTMENT

SUBJECT: IC-150A Tone Control Lubrication for "Scratchy" Movement

SERIAL NUMBERS AFFECTED: All IC-150A Preamplifiers

Several IC-150A preamplifiers are plagued with the problem of "scratchy" tone controls. Obviously, this is most evident while altering the position of either the treble or bass control.

Under normal conditions, IC-150A tone control shafts (for treble or bass) are at common ground potential. Not only do they physically rotate around each other, but they are designed to be electrically the same.

Problems arise when dirt and corrosion settle between shafts and produce intermittent contact. Inserting several drops of conductive grease (CPN 61001), insures proper long-lasting contact, thus eliminating the "scratchiness."

LUBRICATION PROCEDURE:

Step 1. Place IC-150A so that front panel faces upright.

Step 2. Remove bass and treble control knobs so shafts are exposed. (Note approximate position of knobs at full cw).

Step 3. Place 2 or 3 drops of conductive grease on each shaft, rotating to insure proper coverage.

Step 4. After several minutes, repeat above procedure.

Step 5. Remove excess grease from shafts.

Step 6. Replace knobs (align at full cw and return to original setting).

CONDUCTIVE GREASE CONTENTS:

a) Nyogel 756C manufactured by William F. Nye Inc. of Newbedford, MA 02742

b) Tri-chlorethane

It is mixed in a sweght ratio of 2 to 1. For example -- 20 grams of Tri-clorethane to 10 grams Nyogel. Crown will supply conductive grease in a 20 ml dropper bottle at no expense.

NOTE: Conductive grease is <u>not</u> intended to do anything for any other controls!