

Audio

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • NOVEMBER 1977 \$1.00

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Scenes-
Spinoffs from
Quadraphonics

Miking
The Pro
Way-
Interview
with
Maynard
Ferguson's
Sound Man

Greiner-
Amp Design
and Overload

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DGN L HUNTER
2608 CENTRAL BLVD
EUGENE OR 97403

SENTS ACT II. AND MADE THEM BETTER.

to let you get everything out of your tuner. Perfectly.

Our output stage, for example, features a new parallel push-pull circuit that reduces total harmonic distortion to less than 0.1%. Again, well below anything you can possibly hear.

To all but eliminate cross-talk, the SA9500II comes with a separate power transformer for each channel, instead of the usual single transformer for both.

And where some amps give you two, or three tone controls, the SA9500II gives you four. Two for regular treble and bass, and two for extended treble and bass. They're calibrated in 2 decibel click stops, which means you have a virtually endless variety of ways to get the most out of your music.

But that's only the beginning. To get the most out of your cartridge, the 9500II has a switch that lets you "tune" the amplifier to the cartridge manufacturer's optimum capacitance. And to get the most out of your records, our three-stage phono equalizer features an incredibly high phono overload level of 300 millivolts. With no more than 0.2 dB variation from the RIAA curve. So even the most complicated passage on one of today's highly engineered records will sound exactly the way it was recorded in the studio.

Obviously, both the SA9500II and the TX9500II are very sophisticated pieces of equipment. But all of the engineering skill that went into making them has also gone into every other tuner and amplifier in our new series II. No matter what the price, no matter what the specifications.

And that's something you don't have to be an expert to appreciate.

	SA9500II TX9500II	SA8500II TX8500II	SA7500II	SA6500II TX6500II	SA5500II TX5500II
POWER MIN. RMS, 20 TO 20,000 HZ	80	60	45	30	15
TOTAL HARMONIC DISTORTION	0.1%	0.1%	0.1%	0.1%	0.5%
PHONO OVERLOAD LEVEL	300mV	250mV	200mV	200mV	130mV
INPUT: PHONO/AUX/ TAPE	2/1/2	2/1/2	1/1/2	1/1/2	1/1/1
SIGNAL TO NOISE RATIO	95dB	95dB	95dB	93dB	87dB
FM SENSITIVITY (1HF*58)	1.5uV	1.8uV	not applicable	1.9uV	1.9uV
SELECTIVITY	(wide) 35dB (narrow) 85dB	(wide) 35dB (narrow) 80dB	not applicable	60dB	60dB
CAPTURE RATIO	(wide) 0.8dB (narrow) 2.0dB	(wide) 0.8dB (narrow) 2.0dB	not applicable	1.0dB	1.0dB

U.S. Pioneer Electronics Corp., 75 Oxford Drive, Moonachie, New Jersey 07074.

* Minimum RMS continuous power output at 8 ohms, from 20 to 20,000Hz, with no more than 0.1% total harmonic distortion.

TX9500II
SA9500II

High Fidelity Components
PIONEER
WE BRING IT BACK ALIVE.

TX6500II
SA7500II

NEW PIONEER AMPS AND TUNERS.

PIONEER PRE WE STARTED WITH THE BEST

Last year, the experts paid Pioneer's integrated amps and tuners some of the highest compliments ever.

The challenge was obvious: to build even better amps and tuners. Amps and tuners that would not only surpass anything we'd ever built before, but anything anyone ever built before.

Here's how we did it.

THE NEW PIONEER TX9500II TUNER: EVEN CLOSER TO PERFECT.

When Popular Electronics said our TX9500 tuner was as "near to perfect" as they'd encountered, they obviously hadn't encountered our TX9500II. It features technology so advanced, some of it wasn't even perfected until this year.

Our front end, for example, features three newly developed MOS FETs that work with our 5-gang variable capacitor to give the TX9500II an incredible FM sensitivity of 8.8dBf. In mono. In English, this means you can pull in beautiful FM reception no matter how far you live from the transmitter.

Where most tuners give you one band width for all FM stations, the TX9500II gives you two. A wide band with a surface acoustic wave filter to take advantage of strong stations, and a narrow band

with five ceramic filters to remove all the interference and noise from weaker ones. (Distortion: measured in stereo at one kilohertz is an incredibly low 0.07% in the wide band; and 0.25% in the narrow band. Both well below the threshold of human hearing.)

Where conventional multiplex circuits cut out some of the frequencies that add depth and presence to music, the multiplex circuit in the TX9500II doesn't. It features an exclusive integrated circuit that's far more accurate than anything else around. Plus a multipath switch that lets you align your antenna perfectly without an oscilloscope.

And where you simply have to guess about the proper recording levels off most tuners, the TX9500II provides you with a tone generator that lets you preset the recording levels on your tape deck before the broadcast starts.

So your tapes can sound just as clear and beautiful as your tuner.

THE NEW SA9500II AMPLIFIER: HOW TO GET THE MOST OUT OF THE BEST.

After building one of the world's best tuners, we had no choice but to create an amplifier that could match it.

The result is the new SA9500II. An 80-watt integrated amp that was designed



TX8500II
SA9500II

THE M TYPE II A

LAST YEAR'S REVIEWS PRESENTED US WITH A TOUGH ACT TO FOLLOW.

"IT CANNOT BE FAULTED."

SA9500 — Stereo Review

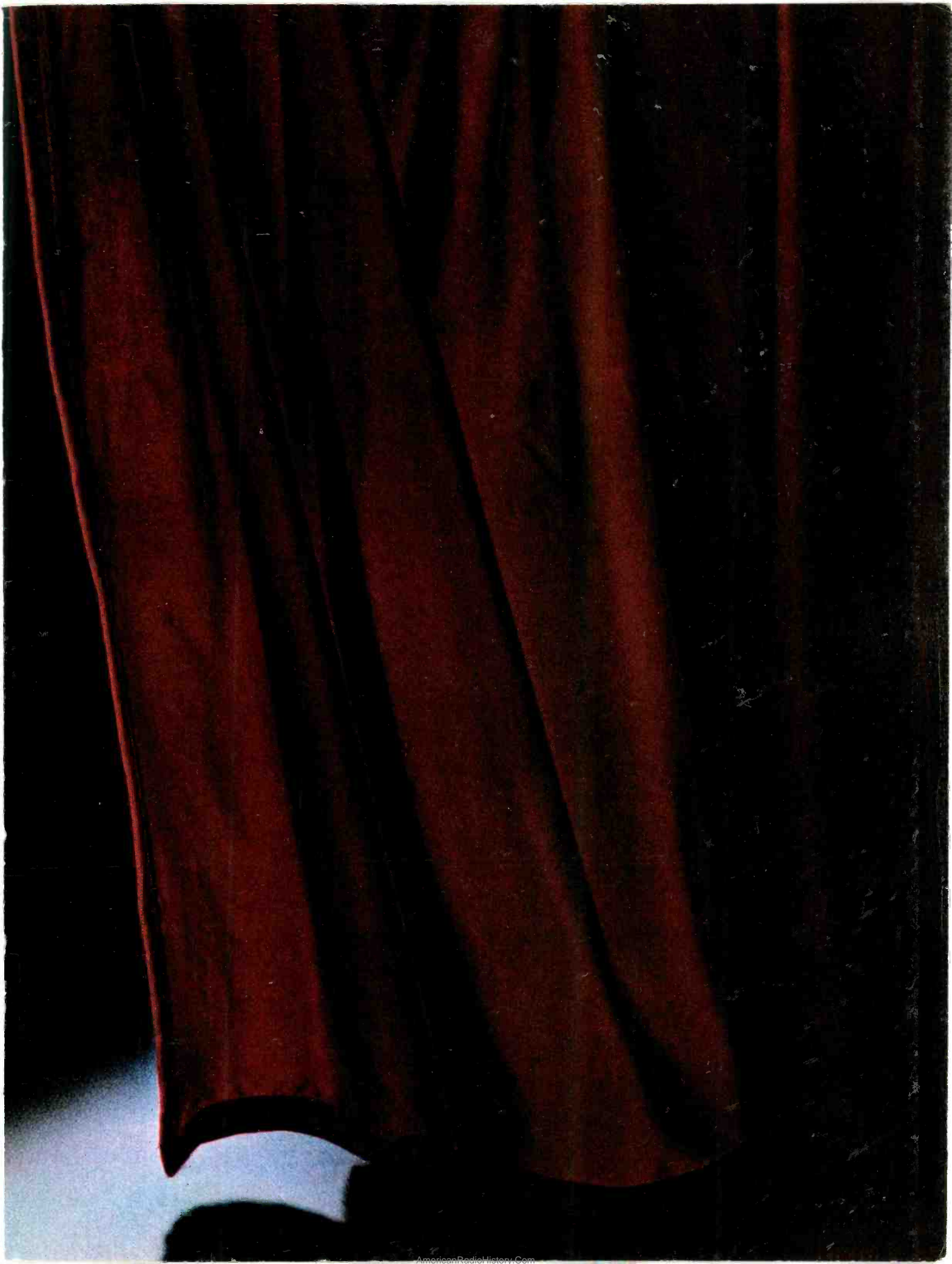
**"AS NEAR TO PERFECT
AS WE'VE ENCOUNTERED."**

TX9500 — Popular Electronics

**"CERTAINLY ONE OF THE BEST...
AT ANY PRICE."**

TX9500 — Modern Hi Fi







DiscTraker™

—a revolutionary tonearm damper from Discwasher

Discraker is a precision damping device that improves the performance of tonearm/cartridge systems by adding a protective cushion between the record and the tracking stylus.

- reduces low frequency resonance that colors the sound of even the best tonearm/cartridge systems on all records.
- reduces record-warp resonance—as witnessed by a dramatic reduction of woofer-flutter.
- permits accurate tracking of even badly warped records.
- reduces record wear and stylus damage from warps.
- reduces distortion caused by high velocity groove overload, mistracking and intermodulation.
- adaptable to most tonearms.

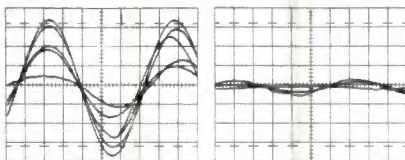
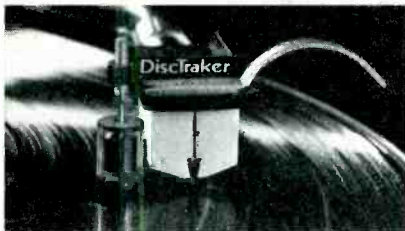


Figure 1 shows the amplitude of low frequency resonance in a typical tonearm/cartridge system using a "flat" record. Figure 2 shows the identical conditions with the Discraker damping system on the tonearm.

discwasher, inc.
1407 N. Providence Rd.
Columbia, Missouri 65201

Audio

November 1977

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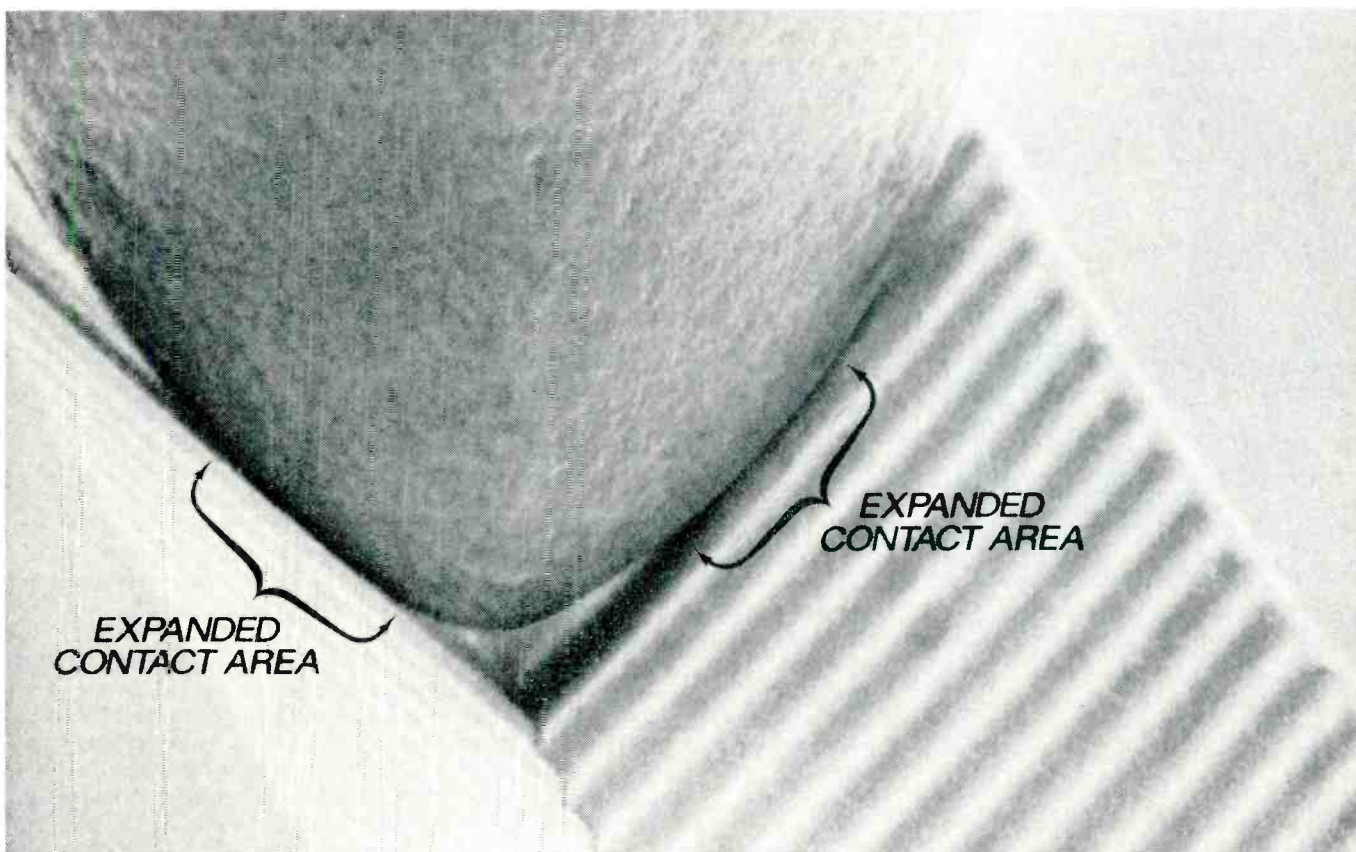
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Leader
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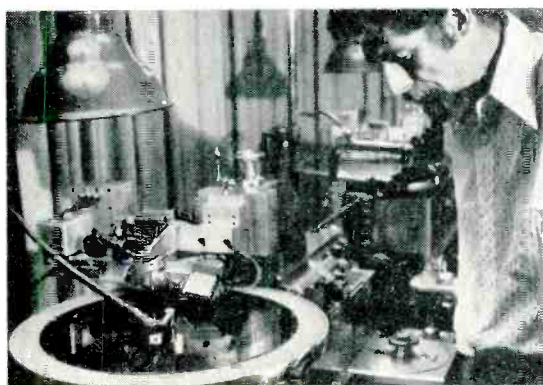
Better stereo records are the result of better playback pick-ups



© Stanton Magretics, Inc., 1977

Scanning Electron Beam Microscope photo of Stereohedron Stylus; 2000 times magnification. Brackets point out wider contact area.

Enter the New Professional Calibration Standard, Stanton's 881S



Mike Reese of the famous Mastering Lab in Los Angeles says: "While maintaining the Calibration Standard, the 881S sets new levels for tracking and high frequency response. It's an audible improvement. We use the 881S exclusively for calibration and evaluation in our operation."

The recording engineer can only produce a product as good as his ability to analyze it. Such analysis is best accomplished through the use of a playback pick-up. Hence, better records are the result of better playback pick-up. Naturally, a calibrated pick-up is essential.

There is an additional dimension to Stanton's new Professional Calibration Standard cartridges. They are designed for maximum record protection. This requires a brand new tip shape, the Stereohedron®, which was developed for not only better sound characteristics but also the gentlest possible treatment of the record groove. This cartridge possesses a revolutionary new magnet made of an exotic rare earth compound which, because of its enormous power, is far smaller than ordinary magnets.

Stanton guarantees each 881S to meet the specifications within exacting limits. The most meaningful warranty possible, individual calibration test results, come packed with each unit.

Whether your usage involves recording, broadcasting or home entertainment, your choice should be the choice of the professionals... the STANTON 881S.



For further information write to Stanton Magretics, Terminal Drive, Plainview, New York 11803

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**CLEAN YOUR
RECORDS THE
PROPER
WAY.**



DRY CLEAN THEM.

Some of the widely advertised record cleaners would have you believe that you must use a liquid or chemical preparation to clean your records properly. What they don't like to talk about is the contaminants that are left behind.

Now, at last, there's Pixoff. It can't leave behind any contaminants because it works effectively without liquid or chemical cleaners. Pixoff's specially formulated and patented cleaning surface creates a force so much greater than static force that it actually lifts dust and dirt from the bottom of even the deepest grooves. And Pixoff does it gently and safely!

But what's even more important, you can hear the remarkable difference in reduced pops, crackles and distortion after a Pixoff cleaning. The original sound comes through because the stylus is not road-blocked by pollutants, and can track the grooves precisely. And as a bonus: your stylus lasts longer.

Restore the original brilliant sound of your records—the Pixoff dry cleaning way. Write today for your nearest dealer.

Sonic Research, Inc.,
Sugar Hollow Rd., Danbury, Conn. 06810.



PIXOFF™

The International Award-Winning
Record Cleaning System

Enter No. 66 on Reader Service Card

Audioclinic

Joseph Giovanelli

Volume Expanders

Q. I recently purchased a dynamic range processor which can expand the program source from 6 to 14 dB. At the 14 dB gain, the processor not only expands the signal level to a level of 14 dB, but also boosts the volume to where it seems twice as loud as normal. With this large gain in volume, is my amplifier delivering more power at a lower volume setting than it would without the processor?—Steve Roginski, Hazlet, N.J.

A. Whether your amp is delivering more power with the expander engaged than with it out depends on the particular circuitry of the expander. Some expanders work downwards, making low level signals even lower, while others only work upwards, expanding only above a certain sensitivity. If yours is one of the latter, then your amp will deliver more power. If it's one of the former, then it depends on the setting of the unit's sensitivity control, that is whether it's been set to the middle of the range of incoming signal voltages.

Incidentally, 14 dB more signal coming into an amp is quite a bit more. If the amp has been running close to its limits previously and a hot spike comes along, the amp will be overdriven, resulting in poor sound quality and possible damage to the amp and/or speakers.

Passive and Active Networks

Q. What is the meaning of a "passive crossover" and an "active crossover" as applied to loudspeakers? — Eli Sammett, Fresh Meadows, N.Y.

A passive network is a set of components that do not contain devices to amplify the signal. Components that might be found in such networks would be inductors, capacitors, resistors, and diodes. In the case of a crossover network used in a loudspeaker system, usually one finds inductors and capacitors, with resistors only used occasionally.

An active network may contain any or all of the above components, and in addition there may also be vacuum tubes, transistors, and/or integrated circuits which are capable of ampli-

fying signals. This also implies that feedback can be used, and the nature of the resulting response can be shaped by the passive components used in conjunction with the active ones.

Speaker Hum

Q. I own a pair of electrostatic loudspeakers which are placed in a small room, and the 60 Hz hum I hear while the speakers are plugged into a.c. is quite obnoxious. Is there anything that can be done short of disconnecting the speakers? The manufacturer recommends that they remain plugged in at all times. Is this the normal situation with electrostatic speakers? — Name withheld by request.

A. The fact that you hear hum in your electrostatic loudspeakers doesn't convey a complete set of information. Is the hum present even when the amplifier is turned off? If the hum is still present, then we know that it has something to do with the speaker system.

Could it be that the hum is mechanical in nature, caused by vibrations of the power transformer laminations in one or both speakers? This condition might be made less audible by shock mounting the speakers so they cannot use the floor on which they sit as a sounding board.

The polarizing voltage which makes the electrostatics operate must be filtered, just as any other d.c. voltage must be filtered. These filters deteriorate with age, and this causes some hum in the speaker system.

If the hum isn't present except when the amplifier is turned on, then the hum is not coming from the speakers themselves, but is associated with problems with the amplifier which can be the result from defective filtering (again), hum associated with grounding, or other problems.

If you have a problem or question on audio, write to Mr. Joseph Giovanelli, at AUDIO, 401 North Broad Street, Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.

AUDIO • November 1977

Soundcraftsmen new class **VARI-PORTIONAL**® 250 w. amplifier

SOUNDCRAFTSMEN'S NEW CLASS AMPLIFIER WAS INVENTED AND DESIGNED TO PROVIDE THE BEST PERFORMANCE, MOST-NEEDED FEATURES, GREATEST RELIABILITY AND ENERGY-SAVING EFFICIENCY, PLUS STATE-OF-THE-ART AUDIO REPRODUCTION. LIKE OUR PE 2217 PRE-AMP, THE MA5002 IS A MASTERPIECE OF COST-CONSCIOUS ENGINEERING—A \$1,000 VALUE FOR UNDER \$700.

Condensed Information Manual — MA5002

INPUT LEVEL CONTROLS: The input level controls are designed to assist in system operation by providing input voltage control from 0 to full. This capability is particularly valuable in public address, sound reinforcement, and amplified musical instrument applications, where many long cables are in use and where ground loops and other unwanted conditions might exist.

CLIPPING INDICATORS: The red L.E.D.'s, indicating clipping, are able to respond to signals much faster than meters can, and the clipping lights will flash dimly as clipping begins. When the clipping lights are bright, the amplifier is exceeding its rated power output. (Clipping will occur at varying power levels, from somewhat over 250 watts at 8 ohms, to over 360 watts at 4 ohms.)

METER RANGE: When the meter range "times 1" (X1) button is depressed, the meter will indicate approximate power output in percentage (100% = 250 watts, assuming an 8 ohm load at the speaker output terminals). The meter reading will vary substantially with Hz and impedance variances, therefore, the meter reading will always be an approximation. The "times 10" (X10) and "times 100" (X100) buttons will, in effect, increase the meter sensitivity so that at low power levels, the fluctuations of the meter may be seen more easily.



"AUTO-CROWBAR"® INSTANTANEOUS OVERLOAD PROTECTION:

This Soundcraftsmen AUTO-CROWBAR® protection circuitry is unique among amplifiers. It uses no relays, no circuit breakers. It is all-solid-state, and is instantaneous-acting in triggering an SCR (silicon controlled rectifier) which discharges the amplifier's DC power supply in a few micro-seconds, simultaneously the AC power is de-coupled by a TRIAC, leaving the amp with no power applied. (An auxiliary low voltage (12VDC) power supply used for meter lights and L.E.D.'s, remains activated. This supply turns on the overload L.E.D. and also resets the full AUTO-CROWBAR® circuit after approximately one or two seconds delay.) When the overload is minor, such as over-driving or shorted speaker wiring, the AUTO-CROWBAR® circuit will automatically and continuously attempt to reset itself every second or two, until the overloaded condition is removed. This same AUTO-CROWBAR® protection circuit will also cut off the amplifier's output when an overheating condition exists. (This is extremely unlikely, because the VARI-PORTIONAL® SYSTEM enables the Soundcraftsmen amp to operate so efficiently that it is barely warm to the touch, even when operating at very loud music levels.)

VARI-PORTIONAL® L.E.D.'s: When either channel's output level reaches approximately 50% of total power, the green L.E.D. will start to flash. It is indicating that the ANALOG LOGIC CIRCUITRY is actuating the second power supply, a VARIABLE high voltage supply, and the A.L.C. is controlling that supply's voltage IN ANTICIPATION of a potentially higher output level requirement. The L.E.D. will glow proportionally brighter, showing the voltage supply increasing, as the metered power output rises above approximately 50%. When the green L.E.D. is NOT ON, the low voltage power supply is in continuous operation, and the amplifier is operating in its most efficient mode, drawing very little AC line current and therefore saving energy costs (for example, you save approximately 1 kilowatt every 5 hours over a conventional Class B or AB amp, both operating at 1/2 power.)

"SPEAKER 1" AND "SPEAKER 2" SELECTORS:

The speaker system selector switches are high-level switching devices, and since the full amplified signal is being routed through each switch, it may be desirable to lower the level controls prior to switching speaker systems on or off. EITHER speaker systems 1, 2 or BOTH, may be selected for operation. Since the impedance drops to 4 ohms when two 8-ohm speaker systems are operating, the amp output before clipping increases to approximately 360 watts, and will drive the two sets of speaker systems quite easily. The Soundcraftsmen amp is capable of excellent performance with any speaker system from 2 ohms to 32 ohms.

SPECIAL FEATURES

VARI-PORTIONAL® CIRCUITRY-BENEFITS:

- a. enables 360 watts at 4 ohms, 250 watts at 8 ohms, at very low cost.
- b. reduces AC line current requirement to save 1 kilowatt every 5 hours, yet provide full power whenever needed for high level output.
- c. combined with ultra-fast output circuitry, provides extremely low T.I.M. for clean undistorted sound, with a SLEW RATE of better than 50 volts per microsecond, far exceeding most other amplifier circuits.

CERTIFICATE OF INSPECTION: Actual measurements of each unit are enclosed with each unit to show actual measured rms output per channel, actual measured distortion per channel, actual measured slew rate per channel, etc.

REMOTE TURN-ON TRIAC-ACTUATED delay circuit eliminates turn-on surge at time of switch closure, enables REMOTE AC turn-on plug-in for switching from your preamp.

NON-LIMITING CIRCUITRY protects speakers from limiter-caused distortion that results from overdriving in amplifiers that use current-limiting circuitry.

DIRECT-COUPLED output.

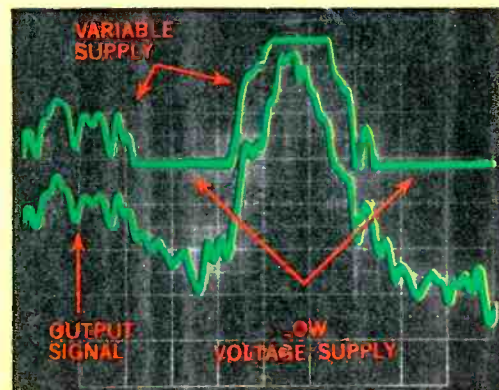
SPEAKER-PROTECTING input circuitry with automatic blocking of input below 1 Hz. This prevents DC from any input source from blowing out speaker cones.

GENUINE WALNUT-VENEER removable end cases to complement any decor.

SOUNDS GREAT: Natural, transparent, open, spacious, undistorted listening is provided by a combination of high slew rate, low distortion, and non-limiting circuitry.

VARI-PORTIONAL SYSTEM®—TECHNICAL DESCRIPTION: A brief explanation of the VARI-PORTIONAL® SYSTEM is that its computer-like ANALOG LOGIC CIRCUITRY senses and calculates the amount of voltage required in accordance with the amplifier's rising or falling output power level, and it then directs the power supply to make available precisely the amount of voltage required, with no wasted energy. The scope photo illustrates this Patent Pending system by showing a loud rock music signal penetrating the upper voltage supply, and also showing the supply VARIABLY increasing AHEAD of the signal.

Enter No. 50 on Reader Service Card



250 WATTS RMS PER CHANNEL, 20 Hz — 20 KHz, BOTH CHANNELS DRIVEN INTO 8 OHMS, LESS THAN 0.1% THD

CIRCLE READER CARD FOR ENGINEERING BULLETIN AND TEST REPORTS

Soundcraftsmen

1721 Newport Circle, Santa Ana, California 92705

Behind the scenes

Bert Whyte

No matter what one may feel about quadrasonic sound, there is no denying that in the development of four-channel disc technology, a number of the "spin-offs" of this research have resulted in significant improvements in record playback and in the records as well.

I hope my friends in the SQ and QS camps will forgive me, if I point out that most of these "spin-offs" were derived from the technology involved with CD-4 quadrasonic sound. The complexities of this system with its 30 kHz carrier, and the necessity for playback response to 45 kHz, spawned a great deal of research from phono cartridge manufacturers. In a remarkably short time, these manufacturers produced the ultra wide range cartridges with the special Shibata stylus, or some variant of it, needed to track such high frequencies. Currently, even though quadrasonic sound has a very low profile indeed, new generations of stereo cartridges are benefiting from the research done on the CD-4 styli, and are utilizing the various stylus configurations with wide bearing areas as compared to the normal stereo styli. As most audiophiles are aware, in order to record the 30 kHz carrier, CD-4 discs were cut at half the normal 33 1/3 rpm speed. Presently, very few CD-4 records are being cut, but this very specialized half speed disc cutting technique is now being

used for stereo disc cutting. It is probably safe to say that this half speed technique is the premier method of cutting stereo discs today, and the results are absolutely superb. For a sample, listen to the Stanley Clarke recording *School Days* (Nemperor Records NE439).

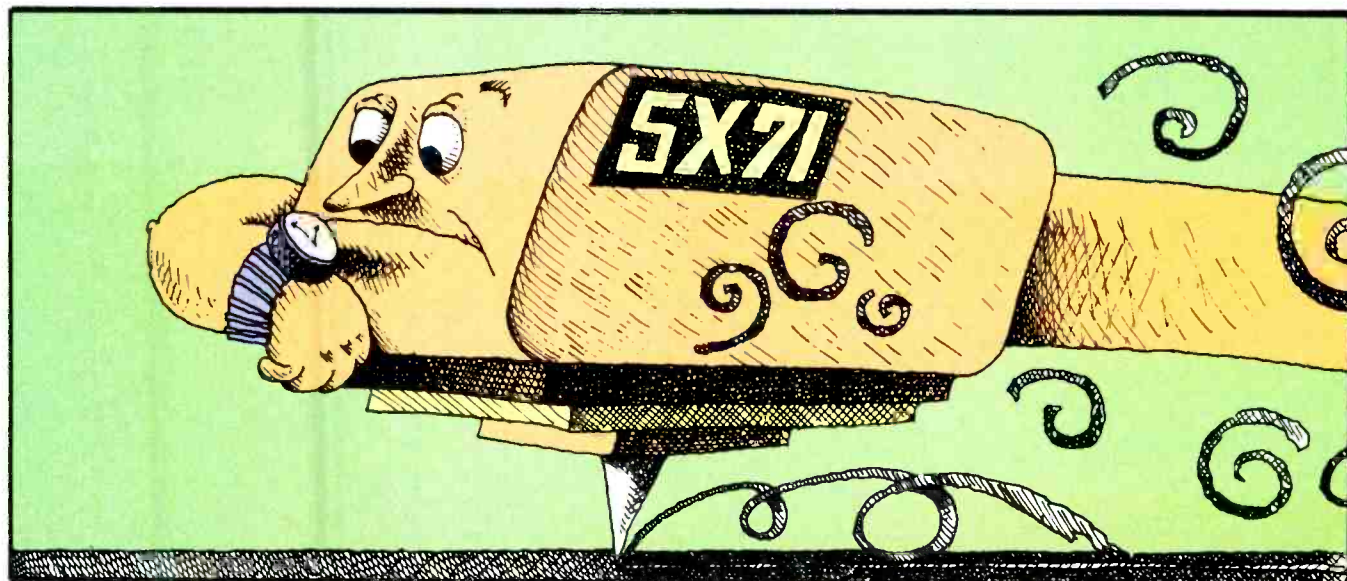
Victor Company of Japan set up the JVC Cutting Center in Hollywood during the heyday of the CD-4 disc, as an aid to companies wanting to produce records in this format. The Center was equipped with the latest Neumann lathe and Neumann SX 74 cutterhead, along with the specialized electronics and ancillary equipment for half-speed (16-2/3 rpm) cutting. Nowadays, quality conscious producers are using the JVC Cutting Center to have their stereo tape masters processed into lacquers cut with the half speed technique.

I have visited the Center a number of times, and this past spring I was there again. On this visit I was aware of the increased activity in half speed stereo disc cutting, and I had the opportunity to delve into some details of this technique. Presiding over the cutting lab operations is Mr. Tom Nishida, with Jim Kawada (who was my gracious host in Japan a few years ago) as CD-4 specialist, and the redoubtable Stan Ricker as cutting engineer. Stan is a man of many parts . . . one of the foremost disc cutting experts in this country, a musician and

authority on brass bands, a sometimes tinkerer and restorer of classic cars, and an audio enthusiast with "purist" inclinations. I had asked Stan to give me some straight talk on the advantages and problems of half speed stereo disc cutting, and he was kind enough to "walk" me through the process in the cutting room, from tape playback, to cutting, to reference lacquer inspection and evaluation. Most of what follows is the result of these chats with Stan and subsequent correspondence in writing and on cassette, with many of his remarks verbatim.

Half Speed Advantages

According to Stan, the half speed technique is not exactly new. Decca of England used the technique in the early days of stereo to achieve the overall level and frequency response of their *ffrr* recordings, and they continued to use it until 1968 when the Neumann SX 68 cutterhead was introduced. In the U.S., RCA used half speed cutting as a "problem solver"; for example, coping with the high frequency energy in the sibilants of Harry Belafonte's voice. Stan lists the following reasons for using the half speed cutting technique: Most accurate high frequency phase response . . . Best transient response . . . Least possible high frequency crosstalk . . . Lowest



Tom Barrett

Now you can have something in common with FM stations. This Technics turntable.



Introducing Technics SL-1000MK I. The advanced player system with the professional direct-drive system of the Technics SP-10MKII.

It's expensive. Because the combination of materials, craftsmanship and technology is rare. And, until now, unavailable. Like the obsidian lava base. One of the highest density materials known to man. And one of the best solutions known to feedback.

Or the world's first nitrogen-hardened titanium tonearm. The same rigid titanium nitride developed for aerospace. It's less than 85% the weight of aluminum. With far better vibration characteristics.

Another impressive achievement in tonearm design is the ultra-sensitive suspension. Five ruby ball bearings in four anti-shock pivots. With one-fifth the friction of conventional ball bearings. And with Technics unique variable damping you can customize the tonearm to virtually any cartridge.

The heart of the SL-1000MK I is the quartz-locked direct-drive system of the SP-10MKII. The system used by many of America's leading classical FM stations. Because of its unsurpassed accuracy, unrivaled torque

and incredibly fast stop/start action. And you can turn on this performance from your listening position. With Technics "black box" remote control.

Technics SL-1000MK I. A unique combination of technology for the audiophile who demands the ultimate in turntable performance. Compare specifications and you'll see why there's no comparison for Technics SL-1000MK I.

MOTOR: Brushless DC motor, quartz phase locked servo circuit. TORQUE: 5.2 lbs. in. STARTING TIME: 0.25 sec. (25° rotation), to 33 1/3 rpm. BRAKING TIME: 0.3 sec. (30° rotation), from 33 1/3 rpm. LOAD FLUCTUATION: 0% up to 4.3 lbs. in. SPEED DRIFT: ±0.002%. WOW AND FLUTTER: 0.025% WRMS (JIS C5521). RUMBLE: -73 dB (DIN B). TONEARM TYPE: Variable dynamic damping universal. FRICTION: 5 mg. (lateral and vertical). EFFECTIVE MASS: 22 gm. with 6.5 gm. cartridge and 1.25 gm. tracking force. SUGGESTED RETAIL PRICE \$1,300*.

Technics SL-1000MK I. A rare combination of audio technology. A new standard of audio excellence.

*Technics recommended price, but actual retail price will be set by dealers.

Technics Professional Series
by Panasonic

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New PAT-5 BI-FET™

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possible distortion from the transfer system . . . Permits use of CD-4 cutter stylus with one micron tip radius, two micron burnishing facets; and 35 degree back angle (instead of the usual stereo real-time 45 degree angle) . . . and this gives: Smoothest possible groove cutting and best possible electroplating . . . Least noise and best high frequency response at smaller disc diameters.

The Neumann SX 74 cutterhead is of the dynamic motional feedback variety . . . each channel has a drive coil and a feedback coil. Much in the same manner of similar motional feedback circuits in loudspeakers (Philips) and servo motor systems, the feedback coil senses the motion of the stylus, compares it to the input signal as to deviations in amplitude and phase, any errors "seen" by the feedback circuitry are corrected and fed to the drive coil. While this seems fairly straightforward, it is important to realize that the amount of feedback control is not uniform at all frequencies. Feedback control at the primary resonance (about 1 kHz) is in excess of 35 dB, but there is quite a bit less at the higher frequencies, for example only 0.6 dB at 15 kHz, and 5.5 dB at 8 kHz. Now consider the high frequency boost of the RIAA recording curve, and you compound the problem. Obviously in the higher frequencies of music signals, less feedback control will be exerted. Bringing the music signals down an octave, by using half speed cutting, and there will be more feedback control. A closely miked soprano voice may have sibilants with great high frequency energy peaks around 8 kHz. Trying to cut this in normal fashion in real-time, will probably trip all the circuit breakers in the cutting system. In real-time, the alternative is to lower the level so the sibilance can be cut . . . but if this is done, the overall level will be unsatisfactory. The usual solution is to use program peak limiters in the transfer console, and high frequency or acceleration limiters in the cutter system itself. Either singly or in combination, this limiting provides less than optimum transfer. At 8 kHz in real-time cutting, there would be 5.5 dB of feedback control. By cutting at half speed, this 8 kHz sibilance would be shifted down one octave, and at 4 kHz the feedback control would be a much more useful 12 dB. Needless to say, by using the half speed technique more of the total music spectrum will be in the area where there is the most feedback control over the cutterhead stylus motion. It is this fact which accounts for the first three advantages outlined by Stan, inasmuch as high fre-

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quency response and phase accuracy are a function of feedback control. Getting back to the RIAA recording pre-emphasis, consider that at 10 kHz the high frequency boost is 13.7 dB compared to the 1 kHz zero reference level. This begins to cause power problems, since every time you go up 3 dB the power requirement doubles. In real time, the normal cutting system starts to run out of power.

With a tape machine and lathe running at half speed, it obviously is going

to take twice as long to cut a given piece of program . . . 36 minutes to cut an 18 minute side. But by taking twice as long, it requires but one-quarter the power necessary in real time. In half speed cutting, stylus acceleration is but one-quarter of its real time counterpart. Thus using the 600 watt per channel Neumann SAL 74 cutter drive amplifier is equal to using a 2400 watt/channel amplifier in real time. More than equal in fact, because the phase accuracy at half speed is better.

Quadraphonic Carryover

Stan pointed out that the use of the special CD-4 cutting styli has significant benefits in half speed stereo disc cutting. Early on in the CD-4 technique, it was found that the normal stereo cutting styli were simply too large at the cutting edge (burnishing facets) to engrave the very short wavelengths of the 30 kHz carrier which at the RIAA minimum diameter of 4 3/4 inches for a 12 inch/ 33 1/3 rpm records is 0.000285 inch! For this reason, a new cutting stylus was developed with a tip of radius of one micron and an average burnishing facet width of two microns. The length of the CD-4 cutting stylus is 1.17 mm, as compared to 2.1 mm for normal stereo cutting stylus. This is a reduction in length of some 44 per cent, which greatly reduces cross-talk in the carrier range of CD-4 records, partly due to less mass to accelerate, and partly due to less "whipping action" at the stylus tip. As a result of this cutting stylus re-engineering, and the parallel development of the Shibata playback stylus, the high frequency limits, especially at inside diameters, are 3 dB higher, than if cut with a standard stereo cutting stylus at the same level and diameter. Stan states that with the CD-4 cutting stylus, half speed stereo cutting really shows its mettle in the production of 7 inch/45 rpm records with high density signal information. Of course, these records are cut at 22.5 rpm.

Stan told me that due to the greater precision and accuracy in the manufacture of CD-4 cutting styli, that this in combination with the slow rate of cutting gives a much smoother groove wall, which ultimately translates into less noise in electroplating and pressing. He also pointed out that the cutter system itself is not the only part of the transfer chain to benefit from half speed operation. From the special glass ferrite playback head, through the custom-built amplifiers and equalizers, rise-time information is cut in half, and power demands at all points within the system are greatly reduced.

As you can see, Stan Ricker has put forth some very cogent reasons for cutting stereo records at half speed. On the negative side, I asked Stan about the notion that seems to be generally held that half speed cutting entails a loss in bass response. He said this was just not true, and said that if anyone knew the specifications of the Neumann SAL/SX 74 cutting system, they would dismiss this so-called loss of bass as a myth. He states that the low frequency output of the Neumann

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system is flat to 7 Hz, and his unit is down only 3 dB at 4.5 Hz! At half speed cutting these numbers translate to 14 Hz and 9 Hz respectively, and most certainly is more than adequate to cope with the low frequencies found in music. Stan also pointed out that the rest of the transfer system . . . the tape repro head, repro amplifiers, graphic equalizers, and transfer console, taken totally as a unit, are down 3 dB at 11 Hz (due to some transformers in the chain) which becomes 22 Hz at real time playback. Again, this places

no practical restrictions on bass response.

Quantity vs. Quality

I questioned Stan about the low per unit time of lacquer production, and he admitted this was a problem. The only solution he could see was the use of multiple lathes operating together. He said it would require 3 lathes at half speed operation to equal in product output what one engineer and one real time cutting system could do in a

typical working day. Stan feels its the old story of quantity versus quality. He asserted that in today's record business it is not uncommon for four months of time and \$85,000 and more to be invested in the final two track, quarter-inch stereo master, and when such a tape is handed to the cutting engineer, it deserves more than a cursory 45 minutes of his time and attention.

Despite the drawback of slow production, half speed stereo disc cutting has a growing reputation for high quality results and such record companies as A&M, Arista, RCA, Warner Bros., Epic, and others are opting for this technique. Obviously encouraged by the response to their mastering operation, the JVC Cutting Center is slated to become an executive branch office for the entire music division of Victor Company of Japan. The mastering facilities are being expanded, and will include real time cutting for those who want it. The Center will sell the special CD-4 cutting styli developed by Victor and the Adamant Kogyo Co. of Japan, to other mastering studios. They already number among their customers such studios as A&M, ABC, Allen Zentz, and Mastering Lab (that is the Sheffield folks). The Center will also sell Japan Victor Company test records, currently being used by Stanton, Shure, ADC, Audio Technica, and other cartridge manufacturers. Plans are to offer the records to audio dealers and audiophiles as well. A new Evaluation Room is to be built at the Cutting Center for listening to reference lacquers, test pressings, etc. The room will be set up to demonstrate the new Q-Biphonic sound. The Center will be able to accept orders for pressing in Japan. Of great interest to audiophiles is the fact the Center will import Victor Company records (you'll probably be able to buy the album **Jaws** again) as well as records from RVC (RCA Japan), Nippon Phonogram, and others. Lastly, the Center is to undertake original music recording here and will produce records for release in the U.S., Japan, and possibly world wide. The Center will continue to sell to audiophiles on a direct basis their super CD-4 demodulator, the CD-4/50. I have been using one of these units, and with its phase locked loop circuitry and noise gates, CD-4 recordings are as quiet as normal stereo productions. Separation is superb and distortion is very low. Stability is very good and the CD-4/50 is able to clean up the sound of quite a few CD-4 "problem" records to a remarkable degree. Price of the CD-4/50 demodulator is \$350.00. A

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Old Timer

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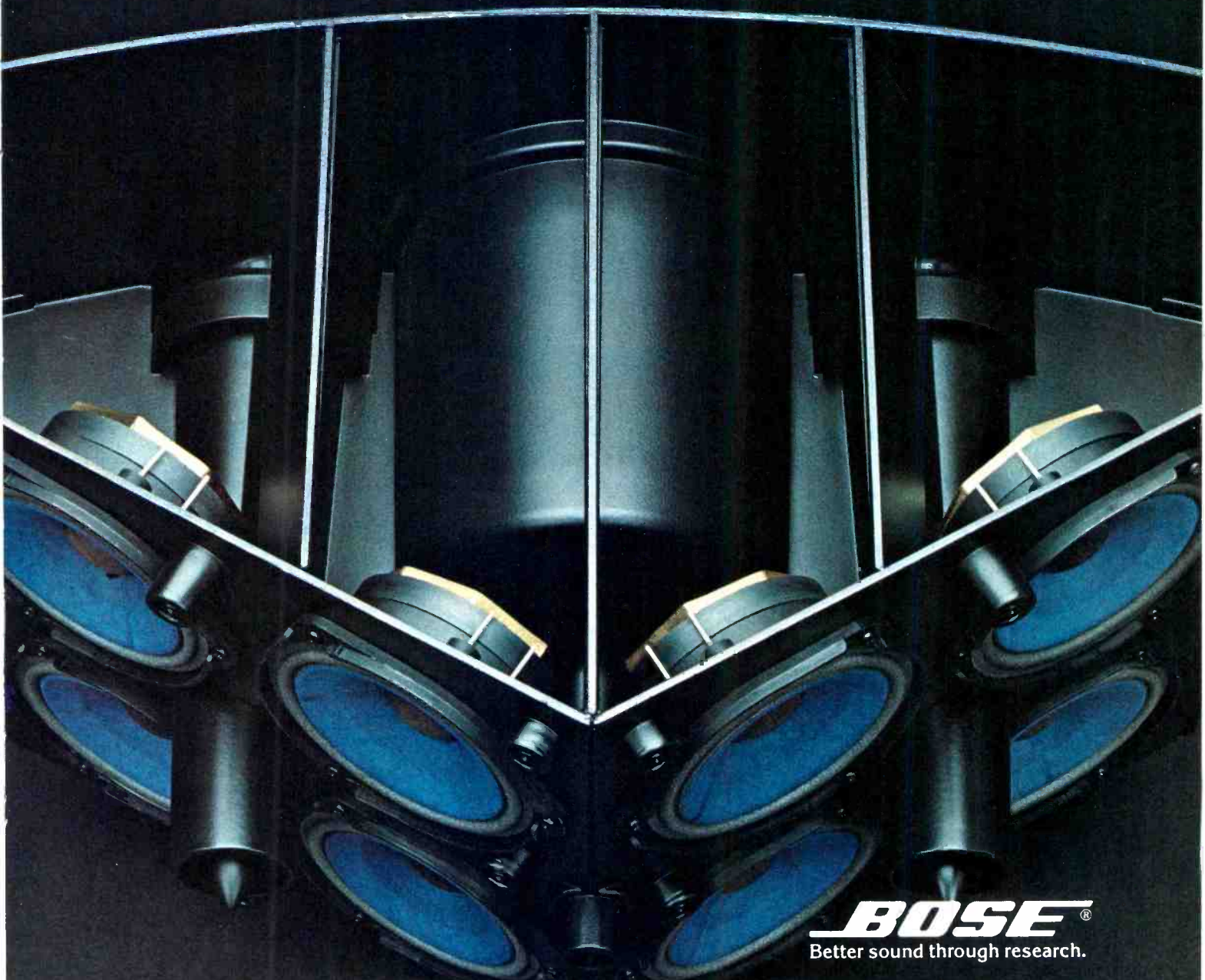
That was five years ago. After cleaning and adjustment, it went right back to work, to provide more years of trouble-free, professional service.

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Audio etc.

Edward Tatnall Canby

The best way to keep abreast of the hi-fi world, I find, is to run in cycles. Like the daily news, endless repetition tends to generate creeping paralysis of the mind rather than updatedness. The way I keep up with the news is to buy a paper once a week and avoid TV. In hi fi, it's not so different. Stay away for awhile and you really find out what's new. It's been only a coupla years in the cycle I'm now about to take up again—but a lot has happened.

Remember Ispy?

Ispy was that solemn plastic head from Sennheiser in Germany which when equipped with microphone ears (Sennheiser) could take down what seemed to be the ultimate in binaural sound, two-channel for headphone playback. I couldn't resist giving Ispy a moustache, two eyes and eyebrows to match, plus a floppy hat to cover his baldness—he was a sight. The Sennheiser people in New York were not amused when I took Ispy back to return him to his forefathers. But Ispy did a good job. And the cause of binaural recording, that unique

and different medium, was thereby advanced.

So Ispy departed and I went on to other cycles. Then came JVC, the Victor Co. of Japan. Last year, JVC America in New York put on a splendid all-day press seminar, not merely a press demo party but an all-day session of technical lectures going into the theory and practice behind JVC's recent innovations. Excellent idea, and I might note that it has been very successful elsewhere too; Shure Brothers did a fine job some years back in a similar way and, more recently, Nakamichi. The press, I might

say, is honored to be treated to the best brains a good company can muster up to explain the company's technicalities first hand.

So JVC was taking up the cudgels for binaural! At long last, were people really getting into my favorite hobby since 1952? I reported on some of that material, including the curious development of binaural recording for *loudspeakers*—an idea that, to give credit where credit is due, goes back to

I've beaten Sennheiser and JVC at their own game. Via JVC's own binaural equipment, I CAN HEAR OUT FRONT. Wow! I did it! But, I'll admit, in rather special circumstances which throw an interesting light on the whole matter of what I might call integrated perception—perception involving all the senses plus that lightning computer we have in our heads, with instant memory far beyond IBM.

The beginning of this cycle came via

another dummy head—JVC this time. And another JVC innovation, a remarkable set of headphones that include in their outer casing a pair of imbedded microphones (electrets) in a good simulation of the outer ears. Put them on your head and you have synthetic recording ears. Put them on the dummy and he has ears—the phones neatly fitting into hollows on each side. At the JVC seminar, each of us was presented with a pair of these plus a dummy head, to go home and play with.

Splendid idea, but how about a recorder? I briefly set up the head in my

studio, hooked it to my ten ton stationary monster (it feels that way when I try to move it) and started muttering things like woof, woof, testing, one two three, four five six. Yep, the dummy took these words of wisdom down in binaural sound and played them back to me via the phones. How boring. Obviously, I had to be portable. Really portable—to get those mikes out where there was plenty of noise and lots of sonic interest. It was the dead of winter—brrrr. So I went on to other cycles, and the other shoe didn't drop. Not for a long time.



B. B. Bauer a good many years ago. Also on JVC's development, at last, of a headphone that provided out-in-front binaural sound. Alas, Sennheiser, too, had made that unlikely claim. My ears said no to Sennheiser. I heard the sound as usual, to the sides and over the top of my head, but not out in front. JVC's phones, with little satellite speakers perched in front of your chin, looked like a good bet—but no, not for me. It just didn't work. Though the sound itself was lovely.

Audio Innovation

So what's new in this binaural cycle?

Why Micro-Acoustics 2002-e owners enjoy music more than you do.

If you're listening to music with any of the other high-quality stereo phono cartridges on the market today, there's a very good chance you're missing something. Something that's earned us unanimous praise from 2002-e owners: a significant improvement in sound quality which can only come from major advances in cartridge design.

Twin-pivot dual-bearings. Perhaps the most unique feature of the 2002-e is its direct-coupled transducing system, which was granted U. S. Patent No. 3952171. Unlike conventional single-pivot cartridges, which can only be optimized for tracking or transient ability, our unique twin-pivot/dual-bearing design is optimized for both characteristics — which are equally vital for precise reproduction.

Twin pivots insure superior transient ability, enabling the 2002-e to accurately follow even the most complex waveforms. And dual bearings maximize tracking ability, so that even difficult high-level passages can be accurately tracked at very low stylus forces.

Beryllium cantilever. The 2002-e's precisely formed cantilever is made of beryllium — an exotic space-age substance that is 35% lower in mass than conventional stylus bars. As a result, the cartridge boasts far lower moving mass, contributing further to its superior transient ability and unusually 'transparent' sound. By dramatically reducing moving mass, the 2002-e also reduces record wear to vanishingly low levels.

Low cartridge body weight. More and more tone arm designers are discovering the importance of cartridge weight, especially in tracking warped

records. Since over 95% of today's records are warped to some degree, a lighter cartridge means more effective tracking at lower stylus forces. At less than half the weight of most high-end cartridges, the 2002-e enables you to enjoy records that couldn't be tracked by other cartridges.

The mismatch problem: solved. Until now, an exact match between phono cartridge and preamp (or receiver) input impedance was required for flat frequency response. The 2002-e's built-in passive microcircuit eliminates mismatch problems by automatically controlling output impedance. This microcircuit also makes the cartridge immune from the effects of cable capacitance, so the 2002-e may be used with all types of tone arms — even those lacking low-capacitance cables.

Critical acclaim/popular acceptance. Few contemporary high-fidelity products have received such unanimous critical acclaim. And no other stereo phono cartridge has been so successful in satisfying the critical demands of today's sophisticated, dedicated music lovers.

But don't take our word about why 2002-e owners enjoy music more than you do: the proof is waiting at your Micro-Acoustics dealer. Or contact us for more information.

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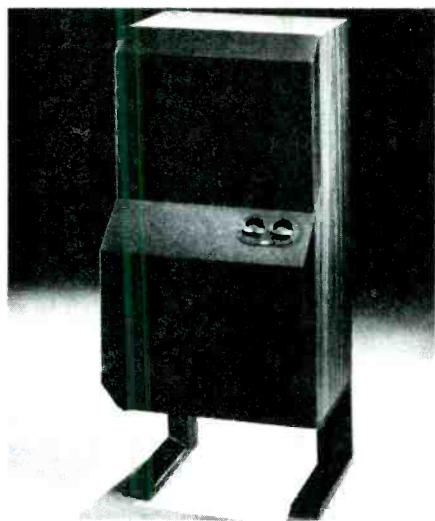
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All of a sudden, it did. The last portable recorder I had used was a bravely pioneer reel-to-reel battery model that could barely keep itself turning at $3\frac{1}{4}$ ips (at $7\frac{1}{2}$ it just went slower and slower), which weighed, if not a ton, too much for carrying in one hand. It died, more or less. Served its time, and well. So one day last summer I took to staring at that useless JVC dummy, and on an impulse grabbed the phone and called the Company. Of course! JVC has several portable two-channel battery recorders, tape decks, rather. And for cassettes! Now that would be something. A coreless d.c. motor and featherweight parts to turn, effortlessly, for a really extended recording time—no more husbanding of sick and tiring batteries, no more painful slow downs (speed-ups in playback), and a lot less bulk to carry around on the hip. AND those phones for the head, with the mikes built inside! You could listen to the sound coming in, and record it too. And play it back right on the spot with the flip of a switch. All in all, this promised to be a new day for easy field recording of the sort I find so enjoyable.

It pays to stick with one manufacturer. The JVC dummy and phones fitted the Model KD-2J recorder like hand in glove, the hookup done in so many seconds. One thickish cable with three phone plugs, two for mikes and one for the phones, everything neatly labeled and handy to the hands. In no time I had the recorder slung over one shoulder and the phones on my own head and I was off for the great outdoors—but wait. That dummy.

Dummy Paraphernalia

The first priority, and only fair, was a name for him. And after that, a moustache, red lips, leering eyes and Ispy's rakish hat with the visor. He, too, was a sight to see! Since he was Japanese, I decided to call him Ito. Thus dressed up, Ito was a worthy successor to Ispy.

Now about that hearing-in-front. As those who have tried know, binaural recording is startlingly realistic in all except one aspect. Recordings that obviously should be right there in front of you, since that is where the sound came from, inexplicably jump back to the rear, or somewhere over the top of your head. I had put Ispy, for instance, on a dining room table with four people on its four sides, talking. Yet in the playback of the recording, those people were all clumped on one half of the table, the half behind you. Nobody up front. That's the problem, and immense amounts of learned investigation still have not entirely resolved the why of it.

Generally speaking, though, it is not hard to explain. Your senses, in this curious recording, are confronted with something totally new and not envisioned by the good Lord who gave us ears. The space your ears are hearing simply will not relate to the space you are in—the place that you see, and feel, and smell, the location where you KNOW YOU ARE. You are getting contradictory signals—and the result is a floundering. Your ears have lost their sync with reality—and they gently go berserk.

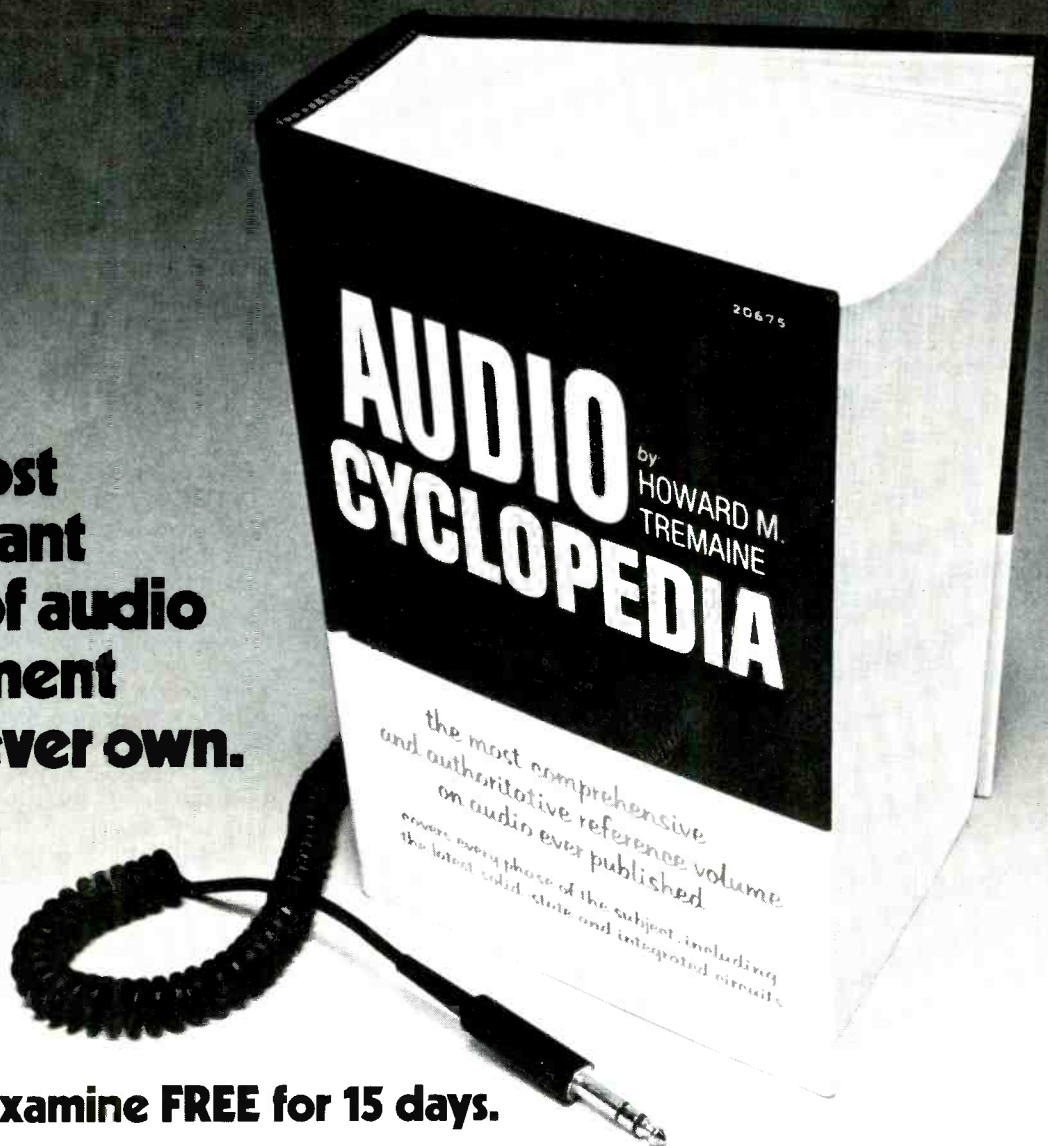
Binaural hearing in the flesh is one of those sensory miracles, incredibly subtle and highly subjective; very heavily dependent not only on the other senses, notably the eyes, but very much on that astonishing computer and instant-recall memory bank in the brain which can flash recognition and compensation factors of enormous complexity within microseconds to help relate the factual signals from ears and eyes. How else do you suppose we keep ourselves sonically oriented in a complex world? We do! Via the millions of instant clues we are able to keep the outside world from whirling dizzily around us each time we turn our heads. Our computer says no—that sound is NOT moving, it is ourselves. And we take this miracle for granted a million times a day.

So, significantly, if you record via JVC's mike/phones on your own head, you will find that in playback you have lost this very ability. No clues. Turn yourself ever so slightly and the earth turns. Sounds jump. Jet planes, cruising normally across the sonic field, suddenly jump forward hundreds of miles. Weird sensation! You only moved your head an inch or so.

So I went forth without Ito, phones on my own head, and proceeded to outwit my own senses. Here's what you do, and you can try it if you wish. You lay out a course, in right angles. You walk with the recorder going, keeping your head very stiff, looking straight. And you talk yourself strict directional cues. (You can do that. The headphone mikes pick up your own voice to perfection, right in your head.) Now I am walking south, out the side door (clunk, it closes) and to the edge of the lawn. Now I turn 90 degrees right, Rrrrrr (that being a clue for sync), and I'm walking west, looking over the wall. Rrrrr, turned north, walking down the driveway. . . .

You make any additional noise clues you can, like doors, windows, turning on faucets (and even flushing the toilet—how realistic in playback!), tapping on kitchen pots, any old noise that is available to help provide sync clues. You get the idea?

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Sonic Recall

Then you go back and play the recording through your phones (flip of a switch), while retracing precisely every move you made in the first place. Just do it all over again, only this time *let the recording provide the sound*. Uncanny. The toilet flushes itself, the doors close, all precisely as before—assuming, of course, that you have equalized the levels. (Very low volume, it turns out. We tend, again, to jack up playback volume, another ef-

fect of sensory disorientation.) Everything is the same, except for the recorded sound. A most curious *double entendre*, a time warp positively Einsteinian. But maybe you haven't noticed the best of it.

Provided you stay in sync, and especially with your head, all the sounds take on their normal directionality, in front, behind, sidewise, anyway. It works. You have restored the necessary cues from other areas and from the brain—YOU ARE THERE

(if in delayed time) and the ears are satisfied, reorientated, and again accurate. Really a memorable effect and you can play your own endless variations on the theme.

Two items delighted me in this particular experiment. First was that bulldozer. It was digging somewhere off to the Southwest, caddy-corner to my compass orientations, maybe a half mile distant. In the flesh, of course, its steady roaring remained exactly *in situ*, on the spot, no matter which way I happened to be facing. Now what would happen in the playback of the recording, when I suddenly turned from, say, west to north?


In normal playback, i.e. not in my special sync, the dozer would suddenly jump through the air some 90 degrees. In binaural playback, you are always yourself stationary. The rest of the world moves around you. Well, I turned rrrrrt, from west to north as the playback went into my ears via JVC recorder and headphones, and by golly, the dozer stayed put! There it was, still in the southwest. A jet plane happened along, too, flying across the southern horizon. I turned, rrrrrt. It stayed put. No jump.

Catbird Cacophony

Then there was that catbird. A gentle complaining squaaaawk, his alarm call, and there he was on a branch of a lilac only about 10 feet from me in front. That is, during the initial recording. His nest was nearby. Well, I played him back again some 24 hours later. I stared right at the same lilac limb, he squawked again precisely from the same spot—and just at that very moment the same bird reappeared, on the same limb. But this time he was silent. Just sat there a moment and allowed my recording to be his voice. It was. I heard him straight in front of me, just as I saw him.

Then suddenly, I noticed the bulldozer, still dozing away out there—but no. I took off the phones; no dozer! Put them on, there it was. Uncanny. For a moment I wasn't sure which sound was reality.

What happens when you just play your test recording, in the house, sitting in your usual listening chair? It's all gone. The sound is fine but the world whirls around you in 90-degree jumps. The whole illusion (is it illusion?) is vanished. Loss of sync.

That JVC recorder, the KD-2J, is a lot more than a mere binaural accessory so, as part of a different cycle, I'll get back to its abilities in more detail in a later effort. Meanwhile, have fun in your own time. warp. 

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In terms of craftsmanship, in terms of style, Lenco turntables are beautiful. Lenco gives you a choice of belt or direct drive, manual or fully automatic operation. And all four models come with: base and dust cover, precision ball bearing tone arm, shock absorbing viscously-damped tone arm lift, and anti-skating device.

Look for Lenco turntables. Prices from \$129.95 to \$299.95. So even if you don't have a Swiss bank account, you can still afford them. See your Lenco dealer today or write.



Model L-133

Model L-236

Model L-830DD

Model L-833DD



Lenco

Available from
Neosoric Corporation of America, 180 Miller Place, Hicksville, New York 11801.

Para - Power

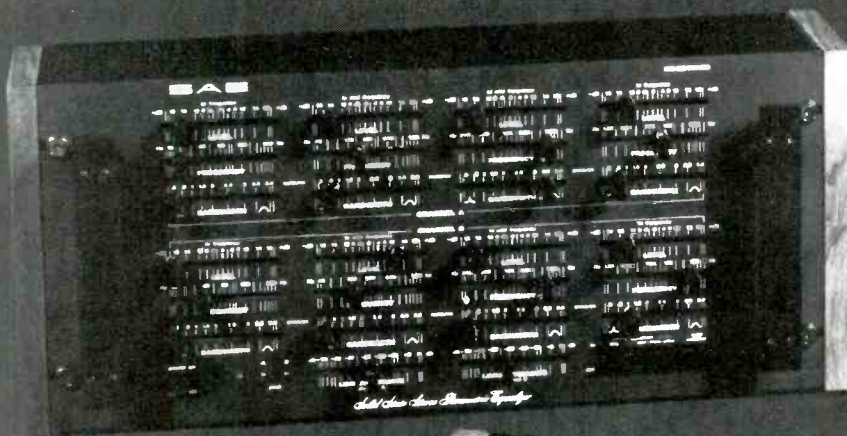
(Parametric Equalizers by SAE)

SAE has long been involved in the field of tone equalization. From our pioneering efforts in variable turn over tone controls to our more recent advancements in graphic equalizers, we have continually searched for and developed more flexible and responsive tone networks. From these efforts comes a new powerful tool in tone equalization — the Parametric Equalizer. Now you have the power of precise control.

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Enter No. 45 on Reader Service Card

What's new

Accuphase Disc-Equalizer

The Model C-220 has a built-in head amplifier using a Class A, symmetrical push-pull circuit with a ring emitter transistor, and accepts inputs from any brand moving-coil cartridge. The stated frequency response is 20 to 20,000 Hz ± 0.2 dB, with a THD of 0.01 per cent at the rated output level, 20 to 20,000 Hz, and a S/N ratio of 85 dB against an input of 2 mV. Price: \$900.00.

Enter No. 70 on Reader Service Card

MXR Dynamic Processor

The MXR Dynamic Processor incorporates a wide-band linear expander and an impulse suppression circuit. The expander section provides a



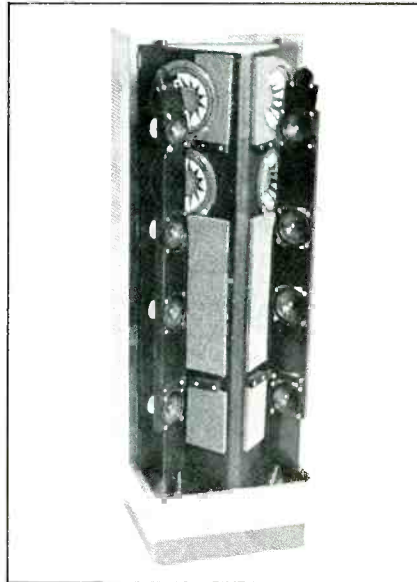
continuously variable expansion ratio from 1 to 1.5, and up to 20 dB of dynamic range enhancement. The impulse suppression circuit is used for the removal of pops and clicks from scratched or damaged records. Price: \$199.95.

Enter No. 71 on Reader Service Card

TEAC Cassette Deck

The Model A-640 front-load cassette deck has two motors, a phase-locked-loop, servo-controlled motor for capstan, and a mechanical governed d.c. motor for the reel. The stated specifications are wow and flutter of 0.06 per cent, with a frequency response of 30 to 16,000 Hz with CrO₂ and FeCr tapes, and a signal-to-noise ratio of 67 dB at 5 kHz with Dolby. Price: \$500.00.

Enter No. 72 on Reader Service Card



Power Research Speaker System

The System III-C is a four-way speaker system with a 12-in. sub-woofer, four six-in. woofers, eight three-in. midranges, and four piezoelectric tweeters. Stated frequency response is 26 Hz to 22 kHz ± 4 dB, with crossover frequencies at 65, 400, and 8000 Hz. Price: \$840.00.

Enter No. 73 on Reader Service Card

Sound Concepts Time Delay System

The Model SD-550 time delay system has continuously variable delay controls with a range of 5 to 100 mS to allow tuning for optimum room ambience, and a continuously variable reverberation control of 0 to 90 per cent to allow only the amount of reverberation desired without affecting the tonal balance. The high frequency rolloff control can flatten the response at various delay settings to match the performance hall. CCD IC analog shift registers are used for the delay function, with a 2:1 decibel compander surrounding them to provide a S/N of 90 dBA. There is an operating switch for the selection of mono, stereo, or quadraphonic sources. Price: \$675.00.

Enter No. 74 on Reader Service Card

Analogue Engineering Preamplifier

The Analogue 520 is a modular stereo preamp with a specified frequency response of 20 Hz to 25 kHz $+0, -0.5$ dB; an unweighted S/N ratio of 80 dB; a THD of 0.005 per cent @ 2.5 V output; IM and transient distortion of 0.005 per cent. The unit has two tape monitor circuits, a loudness compensation circuit, and a hi-cut filter of non-ringing design. Price: \$590.00.

Enter No. 75 on Reader Service Card

Hafler Preamplifier

The Model DH-101 is a stereo preamplifier and control unit in an all push-pull design with a claimed distortion of 0.001 per cent in the tone control section, and 0.0006 per cent @ 1



kHz and three volts out in the phono preamp section. The frequency response in the phono preamp section conforms to the September 1976 revised RIAA specification from 2 Hz to 20 kHz ± 0.5 dB and in the control section 20 Hz to 20 kHz $+0, -0.25$ dB. Price: \$299.95, \$199.95 kit.

Enter No. 76 on Reader Service Card

dbx Dynamic Range Expander

The 3BX three-band program expander splits the audio frequency into three separate frequency bands, and each band is then expanded linearly in decibels according to the energy content within that band. Thirty front panel LEDs give a continuous display of the upward and downward expansion occurring in a band. The unit also reduces record surface noise, tape hiss, and broadcast background noise. The unit measuring 18 in. x 4 in. x 10 in., weighs 9 lbs. Price: \$650.00.

Enter No. 77 on Reader Service Card

Not many tonearms can pass this simple but very revealing test.

Pivot bearing friction is one of the most important elements of tonearm design. It is the major source of resistance encountered by the stylus as it traces the record groove. And it directly affects the way your records sound and how long they last.

While most tests of tonearm performance require sophisticated laboratory equipment, a remarkably precise test of bearing friction can be made with only a $\frac{5}{8}$ " square of paper, such as the corner of a collar pill.

That piece of paper, placed on the head of a carefully balanced free-floating tonearm, will cause the tonearm to lower—or it won't. It depends on whether the bearing friction of the tonearm pivot is significantly lower than the 25-milligram weight of the paper.

A good place to make this test is at your high fidelity dealer. You can try it on any turntable you may be considering. We believe you'll be surprised how few—even very high-priced ones—can pass this simple test.

We encourage this test with confidence, since even our lowest-priced model, the 1237, has vertical bearing friction well below the test condition.

While making this test, you might examine tonearms in other ways. For example, are they straight (good) or curved (not so good)? Curving the tonearm adds more mass and makes the arm prone to lateral imbalance.

Also, note how smoothly you can balance the arm, the sense of precision you get as you set tracking force and anti-skating and the overall sense of quality in the materials and finish.

Then you'll know why Dual wants you to know more about tonearms. And why others may not.



Dual

For the life of your records

United Audio, 120 So. Columbus Ave., Mt. Vernon, NY 10553

Enter No. 17 on Reader Service Card

Dear editor

Eight-Track Update

Dear Sir:

I would like to comment about the 8-track format, which is generally regarded as a lowly medium best left to the owners of inexpensive non-component systems. However, it is my experience that 8-track is more desirable than cassette for some applications. Moreover, since the 8-track tape speed is twice as fast as the cassette, there is no reason why it should not be superior to the cassette. It also has the advantage of never ending, which I find particularly desirable in a car where constant fiddling to turn the cassette over is a nuisance, and also dangerous if one is driving.

Two disadvantages of the 8-track are the constant slipping of the tape over itself and the fact that, to a large extent, the shell determines the quality, as with the cassette. The solution to these problems is better coatings on the tape and a better design of the mechanical holding devices. I have heard complaints of tape jamming and wearing out, but I have played Memorex 90-minute 8-track tapes hundreds of times with no problems. Besides, by the time the tape is worn out, I am tired of the music anyway.

Here's a new idea . . . combine the 8-track and Elcaset formats. Use the endless loop of the 8-track, but pull the tape out of the front like the Elcaset. This way wow and flutter would be drastically reduced, and the frequency response and dynamic range would be comparable to the open reel. Call it Elremenloop for "Large remote endless loop."

I have not purchased pre-recorded 8-track tapes for years; I can make better quality recordings with none of the long silent gaps between songs. When will the manufacturers of 8-track tapes improve the quality with the same diligence they have put into the cassette?

Glen R. Neal
Sayre, Okla.

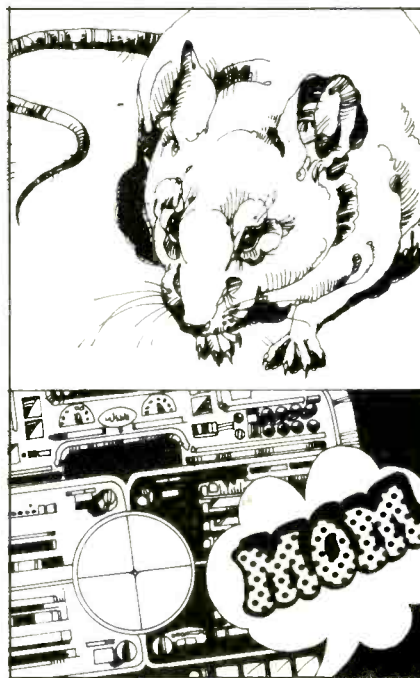
Mises Mice

Dear Sir:

During late 1974 and early 1975 I had a subscription to *Audio* and thus had the opportunity to read your

ecstatic Equipment Profile of the Elekt-O-Fonie FU-100 Octaphonic Receiver (April 1975, pg. 54). Since you reported that it was a direct lineal descendent of the fabulous Ultima-One receiver, I was immediately "sold" and decided without delay to junk my hand-wound phono and morning glory horn and get the FU-100.

For some time I tried to get one directly from abroad but, after much red tape, was denied an export license. But I would not give up. Through my clandestine connections with the Centrifugal Ignorance Agency I arranged



to have the labs of the manufacturer in Bucharest plumbed. In a short time my efforts were well rewarded with a full set of plans for the FU-100 that were fished out of a Bucharest septic tank. They were immediately strapped under the wing of a vampire—there is no export quota on vampires—that was being shipped to this country. Thus, the plans came to my hands undamaged, if perhaps a little soggy. I immediately built my FU-100 and was utterly delighted with it. And my delight with *Audio* for bringing the FU-100 to my attention was boundless, at least for a time!

But that very fall I became disenchanted both with the FU-100 and also with *Audio*, and all my trouble was *Audio's* fault. It is your fault because you could, and should, have avoided it by having at least one rat pup as a member of every listening panel for the Equipment Profiles.

You engineers must certainly know that mother rats for a short time after the birth of their sightless pups emit a 40-kHz (± 0.5 hz) signal so that the pups can home in for feeding purposes. So if *Audio* had rat pups on its listener panels you could find out whether the equipment it was testing had any spurious emissions in this band.

Well, the fall rodent-bearing season arrived in our 150-year-old house. It is a season we ordinarily enjoy because it is cute to watch the rat pups going back home for food. But that fall, the fall of FU-100, all was different. There was a constant, three abreast, stream of rat pups continually parading across our living room floor in the direction of the FU-100. And the really wreaked havoc on it. Within a couple of days all its 116 knobs, including the eight auxiliary useless ones, had been chewed away. The pups even chewed up the *On/Off* switch.

As a world authority on socio-acoustics, I wondered why these cute little critters were homing in on the FU-100 instead of on their mothers. Of course, I had an hypothesis. So I went up to my socioacoustics lab and brought home some test equipment. And, of course, I was right. The FU-100 was emitting a frequency, even when it was turned off, of 40,000.127 Hz. And it was emitting this frequency at a level of +37.2 dB re 1.0 macrowatt.

No wonder the cute little rat pups were homing in on the FU-100 rather than on their mothers. The signal strength from the FU-100 was 2793 db (± 0.37 dB) stronger than the rms value of the mother's signals.

However, I was getting a little tired of the procession of little rat pups and, since the FU-100's *On/Off* switch had been chewed away, I decided to disconnect the unit from the house current. But still it continued to draw the pups towards it. At first I thought that

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Thus, unlike the typical "new" brand, LUX had available a wide array of integrated and power amplifiers, preamplifiers and tuners. Eighteen models in all. Our problem was deciding which to introduce first.

We chose our top of the line power amplifier, the M-6000. Its enthusiastic reception encouraged us to follow with our other state-of-the-art products, such as the L-100 integrated amplifier and the C-1000 preamplifier.

These superb components combined performance, styling and precision in a manner new to the U.S. audiophile. They prompted one audio publication to state: "Almost overnight, the name 'LUX Audio' has earned itself a place of

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That was fine. Not so fine, however, was our resulting reputation for being very expensive. Thus, many audiophiles were deprived of enjoying LUX quality and performance simply because they were unaware of our less expensive products.

We're now rectifying that. The units shown below are representative of our more moderately priced components. The differences between them and our top models are more a matter of power or flexibility than any variation in quality. You'll see that even our lowest priced units have specifications any manufacturer of fine components would be proud of.

So, if some of the engineering "indulgences" of our top units aren't really necessary to you, you can still enjoy the sonic excellence that distinguishes LUX components... because now you know about our moderate-priced components. Your LUX Audio dealer will be happy to spend as much time as you need helping you to appreciate them.



Luxman T-88V AM/FM stereo tuner. Our least expensive tuner, yet includes FET front end with four-section tuning capacitor. Linear-phase ceramic filters in IF section. Features include FM interstation-noise muting, variable output level control and oscilloscope jacks for viewing multipath distortion, etc. Usable FM sensitivity; 2 microvolts (11.2 dBf) IHF and 2.8 microvolts (14.1 dBf) for 50 dB quieting. Stereo separation: 43 dB at 1,000 Hz. \$345.00



Luxman L-80V integrated stereo amplifier. 50 watts minimum continuous power per channel, with total harmonic distortion no more than 0.08 per cent, both channels driven simultaneously into 8 ohms, 20 to 20,000 Hz. Frequency response, 10-50,000 Hz, within 1 dB. Phono S/N better than 77 dB (re. 10 mV input). Bass and treble controls each have 3 turnover frequencies; high and low filters each have 2 cut-off frequencies. \$475. (Luxman L-85V, similar except 80 watts per channel, \$765.)

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the rats had just been imprinted to it but as a socioacoustician, I immediately rejected that thought and concluded that the FU-100 must be able to emit the supersonic frequency all by itself. So I just threw the FU-100 out the window and my hypothesis was immediately verified. The cute little rat pups had not been imprinted to the knobs of the receiver at all for they followed it outside—just as their ancestors had followed the Pied Piper. So they deinfested the house and were swarming all around outside. It wasn't long before the FU-100 was all gone,

vacuum tube after vacuum tube, capacitor after capacitor, and wire after wire.

While I was cleaning up and vacuuming the living room after the *Ultima te affaire*, I got more and more angry with *Audio* for the biased sample of subjects it includes on its listener panels for the Equipment Profiles. So I let my subscription lapse.

However, time brings wisdom and I started to miss *Audio*. Thus, early this year I entered a new subscription. Only now am I discovering what I missed during the lapse.

In reading recent *Dear Editor* letters, I gather that in the April, 1977, issue of *Audio* there was an *Equipment Profile* on a new, probably n-th generation state-of-the-art, descendant of the fabulous Ultima One, the Lirpa I unit. Since Professor Lirpa was the Equipment Profiler for the FU-100, it seems quite reasonable that he too might have liberated a copy of the specs for it from the Bucharest septic tank. It is possible, then, that the new Lirpa I design reflects design principles pirated from the original design? Of course, I do hope that Professor Lirpa has recognized the spurious 40,000.127 Hz emission that was inherent in the prototype, and that he has inserted a 100-dB-per-dodecoctave filter to eliminate it.

I might mention that I do truly fear you may be getting yourselves into a bundle of trouble by not having newborn rat pups on your listeners' panels. Haven't you heard about the Presidential Commissions on Fair Employment Practices? Are you sure you can be "in compliance" without having at least one token rat pup on your panels?

Dr. Mises
Geehrter Professor der Socioakoustik
Outterberry College, Vt.

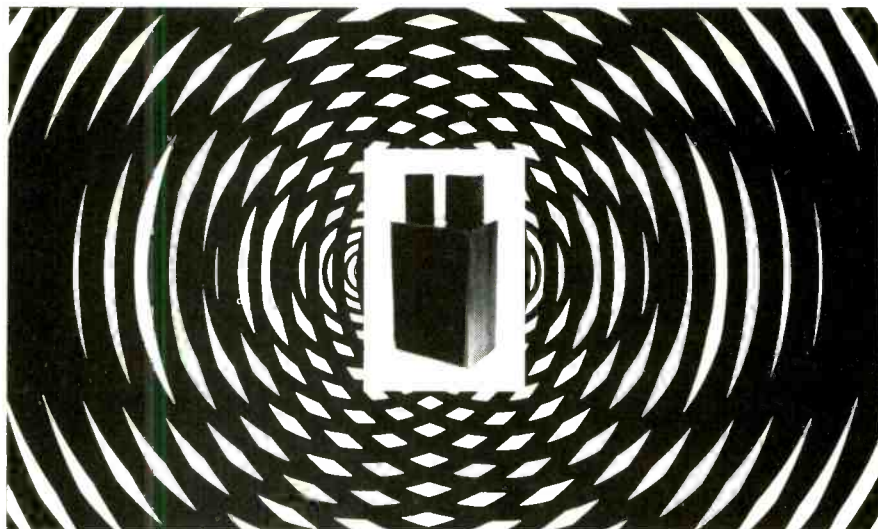
(*Editor's Note:* I am sorry not to have answered your letter more quickly but we have been quite busy getting the 437 volumes of Prof. Lirpa's diary prepared for the printer. They make fascinating reading, as they detail the good professor's painstaking crossing of rat strains to produce the ultimate highbred pup. Herr Doktor Lirpa named this hybrid the Ultima One and when he found out about the mother's homing frequency, he decided to build a signal source so that all those cute little rat pups wouldn't stray. Thus, the Lirpa I receiver was born. The device was later used to keep the rat pups from being stolen, since the new hybrid was much in demand and the Professor did not wish to sell them. Today we have to thank Herr Doktor Lirpa for cleverly disguising his homing beacon as a receiver and ushering in a new era in hi-fi reproduction.

FDA Bans Lirpa

Dear Sir:

In respect to all the rave reviews of the Lirpa I receiver, I would like to submit to the readers a few noteworthy incidents during my confrontation with it.

I received my Lirpa (Model No. 769215) as a consolation for buying a damaged bale of hay (for you city people, hay = cow food) at my local feed and seed store. The proprietor men-



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So, when I heard that B·I·C turntables perform as well as the finest manuals but can change records too, I decided to find out for myself.

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The program panel actually gives me 28 possible record playing combinations. I love that... even though the decisions can sometimes be agonizing.

B·I·C taught me a lesson, Celeste.

I’ll never say never again.”

B·I·CTM



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tioned that I might be surprised with the performance of the Lirpa as I loaded it and the hay into the back of my "Rolls." I didn't take him seriously as I, a true sound cono-sewer, have heard many superlatives used to describe new-fangled equipment.

It was only when I reached my destination that I realized how perceptive the dealer was because the Lirpa had *apparently eaten* the bale of hay! Not to be discouraged I immediately attempted to connect the Lirpa to my other equipment to see if it would in-

terface, as they say in our exclusive circles. As my other equipment was in compliance with the current Food & Drug Administration standards, it uses standard baling wire and phoney plugs. But the Lirpa was a horse-of-a-different color, that is to say the sockets looked like the back end of a horse. I overcame this obstacle by fashioning some adapters that I will market under the name of "Fully articulated, hydro-stator, non-resonating, spring-loaded, alligator, strip-the-wire and wrap-it kit."

This being done, I proceeded to make arrangements for the tests (subjective and scientific). For this critical part I chose a tenth generation, gamed, 8-track tape copy of Gene Autry and the squealing pigs and mooing cows from "1930 Over-the-Hill Records." For live orchestration, I received on/and from a local farm squealing pigs and mooing cows. Thus, I was able to A-B between live and reproduced. I failed to negotiate a deal with the musical unions for Mr. Autry and guitar. (There was some prejudice involved here as they indicated that I should stick the Lirpa in my ear. But being an uncompromising sound cono-sewer, I concluded that I would compromise and test without Mr. Autry.)

One minor malfunction I noticed was that the gain control of the Lirpa was slightly over frictioned for a smooth feel. I found that a 24-inch pipe wrench and a three-foot length of cheater pipe would overcome this problem efficiently. I now offer this as a modification kit.

Consequently, when sound emerged from the speakers, my first impression was unbelievable, *straight wire with gain*, an accurate reproduction of squealing pigs at 150 dB SPL.

But after the initial excitement, I found that the Lirpa was somehow modulating a real pig of an orchestra via some feedback networks through spark-gap transmission. As you may have guessed, the pigs and cows stampeded from the area. That ended the B mode of the test, but I still had A to work with.

I only wish I could conclude the report with the news that a zenith of sound reproduction equipment had been obtained, but after considerable effort putting the Lirpa into operation, I immediately stampeded from the area never to return.

I must warn the readers that these reactions were reported to FDA which, after exhaustive tests and examinations of the Lirpa's strange power over animals (mice in particular), has concluded that the Lirpa is a major cause of the common headache.

It is expected that President Carter will make an important announcement over the major networks concerning the damage the Lirpa has done to society, ecology, and the peanut crop. There is speculation, by the news media, that at this time the President may declare martial law and order that anyone in the vicinity of a Lirpa be shot on sight. Well, patriotic Americans and music lovers, those are the facts.

Remember that your future is in the hands of people of the type who design

A \$100 wine from a paper cup?

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And an expensive stereo system can't be appreciated fully without the addition of one, small component.

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If you've spent say, \$1000 to \$2000 for your system and you haven't yet invested in The Subwoofer, you're missing a lot of what you paid for in the first place.

The Subwoofer gives you bass like you've never had it before. Whatever the music The Subwoofer works with your speakers to develop a depth and

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The Subwoofer, by RH LABS.

The Live Performer.



RH LABS

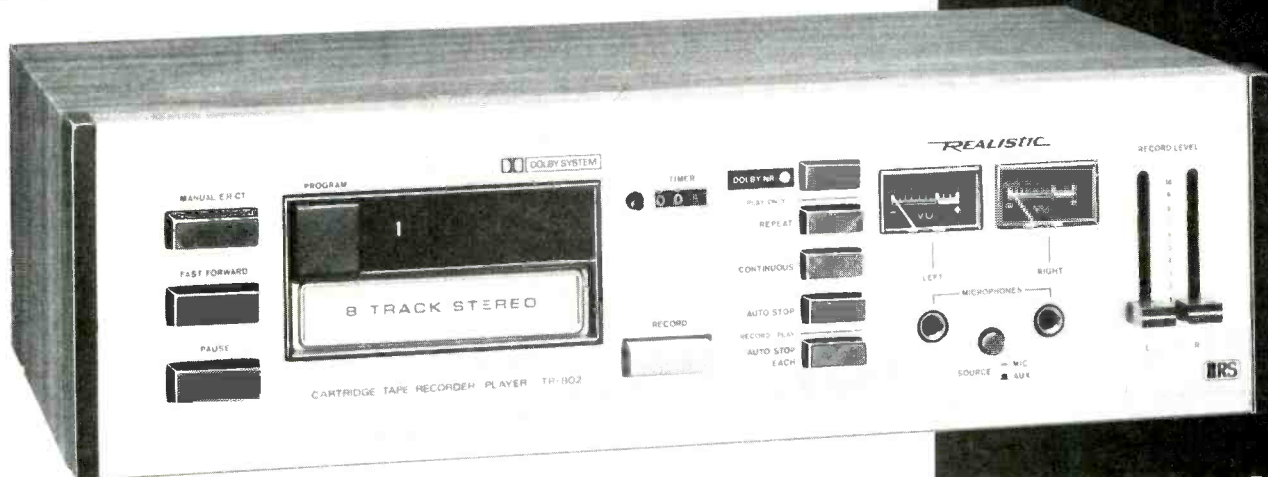
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Our new SCT-15 deck sets new standards for stereo cassette recording at a moderate price. Integrated-circuit Dolby reduces tape hiss, preserves treble response, and extends dynamic range. Separate bias and EQ selectors for use with the latest tape formulas, including CrO₂. Convenient front-load design with large VU meters, digital tape counter, and dual mike inputs. Six function controls. 199.95.

DOLBY* TIMES TWO

31



The new TR-802 gives you total record/play convenience plus Dolby sound — and the Dolby's switchable so you can still make standard tapes for your car's player. Large VU meters, Glide-Path[®] level controls, and a precise minutes-and-seconds timer for recording ease. Pushbutton pause, program-repeat, continuous-play, and Auto-Stop after each program (record only). Check out the TR-802 at your nearby Radio Shack — 8-track never sounded so good! 179.95.

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and test Lirpas. After all, their motto is "Chink bonk biak ringworm fit," which means "cheap American labor and Arabic oil."

Doug Johnson
Highlands, Tex.

Record Degeneration

Dear Sir:

Normally an open-reel tape buyer, I was forced to purchase the movie soundtrack from "Star Wars" in the record-album format. I must say that I

was shocked and disheartened to discover the depths to which general record quality has descended.

The material from which this set of records was made is so bad that constant "snap, crackle, and pop" ruins the listening pleasure. No amount of or kind of record cleaning helps—the overall defect is, apparently, the inherently inferior vinyl employed by Twentieth Century Records. Add this to the ever-present hiss from the master tape and you have an extremely disappointing purchase.

It seems that this level of quality is acceptable to the mass market, but to the audiophile it is unbearable. I would gladly pay five times as much for a high quality recording of this major work. I desperately hope that the resurgence of open-reel, pre-recorded tape will, at least, give us a choice... for this may be the salvation of high fidelity.

Richard B. Sims
Boston, Mass.

Car Stereo Commentary

Dear Sir:

As a recent subscriber to *Audio*, I was very pleased to see that your July issue took on car stereos in a reasonably comprehensive manner, particularly the test reports. The testing of car stereos seems to have eluded the consumer magazines, allowing, I think, a lot of schlock onto the marketplace where, generally, the unsuspecting consumer is at a loss to make meaningful comparisons.

Although your reports go a long way towards remedying this situation, I think you should consider some additional parameters in future reports. You might call this a "road test" as it would consist of actually installing the units to be tested in a particular (standardized) car and then making evaluations on such things as sensitivity to vibration and road shock in the tape transport, suppression of high and low voltage electrical noise in the tuner section (AM and FM), operation in temperature extremes, nighttime illumination, etc. I suggest these additional tests since I have been disappointed by the *moving* performance of some units as compared to their *static*, or bench tested, performance. Testing car stereos in the environment for which they are intended should yield information to the consumer as useful as the frequency graphs when it comes time for him to purchase his ultimate boulevard stereo system.

Bob Muenchausen
Hemet, Cal.

(Editor's Reply: Thanks for your comments. It has seemed to us that there is no longer any good excuse for putting up with poor sound in one's car, particularly when many audiophiles spend more time in their cars than they do in their listening rooms.

We have been working on some "installed" tests, but so far we can't seem to come up with a definitive, yet standard test. These units don't all fit into the same car, temperatures vary from day to day, road surfaces from year to year, etc. However, we've got some ideas and will keep on the problem.

What neither the hi-fi slicks nor the "undergrounds" will tell you.

Consider the dilemma of the serious audio enthusiast looking for sophisticated guidance and tough, non-nonsense equipment reviews.

The big, commercial hi-fi magazines can't afford to offend their advertisers. Most of their reviewers are ultraconservative company men who never met an amplifier they didn't like. And, in the rare case where a bright and outspoken technologist is doing the testing, the editor watches him like a hawk perched on a blue pencil.

The so-called underground audiophile reviews are somewhat more helpful, since they at least report truthfully what they heard from where they were sitting. Unfortunately, most of them are untutored in physics, mathematics and electrical engineering, so that they're unable to deflate technical mumbo jumbo or to distinguish defective design from defective operation. (One of them recently reported a 16,000 Hz peak in a *power amplifier!*) Furthermore, even though they don't accept manufacturers' advertising, they all run dealer advertising—lots of it. And some of those dealers aren't exactly shrinking violets.

Only when *The Audio Critic* appeared on the scene early in 1977 did a satisfactory alternative become available. Six times a year, *The Audio Critic* lays it right on the line, both subjectively and objectively. It still gives top priority to listening tests but firmly believes in verifying its conclusions in its own well-equipped laboratory. Its staff is equally at ease with Mozart, Pink Floyd, spectrum analyzers and the difference between Butterworth and Chebyshev filter response. And it's 100% noncommercial, accepting

advertising neither from manufacturers nor from dealers. So no one can inhibit or influence its reviews. Some of these are already classics—the first to point out little-known products of great merit, and to demolish sacred cows, pretentious hypes and downright frauds.

For example, in Volume 1, Number 4 there's an article that explains why virtually all phono cartridge, tone arm and turntable reviews published anywhere are fundamentally naive and likely to be totally wrong in their conclusions. The article goes on to provide specific, numerical instructions for improving the performance of your present phono system by a startlingly audible margin, without spending a nickel. Tone arm and turntable reviews by brand name are also included, with cartridge reviews to follow in Number 5.

But the main feature of Number 4 is the speaker survey, which tells the truth for the first time about some of the world's costliest speaker systems and also has some good news for those with only hundreds rather than thousands to spend.

One year's subscription to *The Audio Critic* (six issues) costs \$28, first-class mail only. (No Canadian dollars, please!) For overseas airmail, add \$5. No single copies are sold for any reason whatsoever, but the unused portion of canceled subscriptions is refundable on request.

We strongly suggest that you begin your subscription with Volume 1, Number 1, in order to own a complete set and be thoroughly familiar with our approach.

Send your \$28 for the first six issues today to *The Audio Critic*, Box 392, Bronxville, New York 10708.

**The
Audio
Critic**

AR DOES IT AGAIN. INTRODUCING THE LIQUID COOLED SPEAKER.



Designing a great loudspeaker system is truly an engineering challenge. Solutions don't come easily.

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And that's been AR's secret; a quarter-century of innovation and engineering concepts which have influenced speaker design world-wide. Acoustic suspension. The dome high-range speaker. And now, the liquid-cooled, high-range speaker.

The problem: High-range speakers are relatively small and

AR generate a lot of heat. The entire system's power-handling capacity depends in part on whether or not this heat can be dissipated.

Too much heat. Pop goes your system.

The AR solution: Suspend the voice coil in an exotic magnetic liquid, (it costs nearly \$3000 per gallon) to position the voice coil precisely and act as a heat transfer agent.

The result: Greater power-handling capacity for every one of the seven-speaker systems in the new AR range.

You'll find them all in fine high fidelity stores, from about \$65 to about \$450.

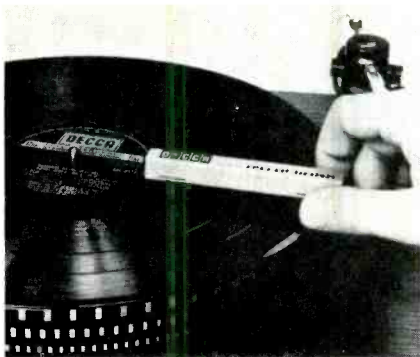
Listen to them before you buy anything, and define "truth in listening" once and for all.

For information and "specs" pick up our new catalog from your high fidelity dealer or write to us at the address below.

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Decca Record Brush:



No Side Effects

Most record cleaners use liquids. They do the job. But not without side effects which reduce the life of your records.

To see why, imagine you are examining a record groove through a microscope while various liquid cleaners are tried. All the cleaners remove a lot of dust, but even the best ones leave some behind. Since liquid was applied, this soft dust dries into hard grit. While the stylus could have pushed a few soft dust particles out of its way, it must now track hard grit particles like they are part of your record. The result: distortion. Not to mention stylus wear caused by the new bumps and grinds it must now traverse.

Decca's research into these liquid side effects, resulted in their pioneering of a new, electrically conductive, carbon micro-fiber - the bristles of the Decca Record Brush. Each Decca Record Brush contains one million of these ultra-thin conductive bristles - 1000 enter each groove removing dust, dirt - and draining off static for lower surface noise and expanded dynamic range.

Decca Record Brush. No fluids, no side effects. Just keeps your records sounding like the first time.

Decca Record Brush available at quality dealers across the U.S. Sugg. list \$14.95

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Fudge Factor Omission

Dear Sir:

Mrs. Edsel Murphy has asked me to thank you for the kind mention of her Fudge Shop & Speaker Works. However, she points out that someone has

erred in omitting the fudge factor K from Equation 6 in the article "The Search for an Optimum Transmission Line Speaker" (*Audio*, Aug. 1977). Equation 6 should read:

$$T(s) = \frac{K_s}{s^2 + \left(\frac{2\pi f_s}{Q_{TS}} + \frac{R_{AT} S_D}{M_{MS}} \right) s + 4(\alpha + 1)^2 f_s^2}$$

Investigation into the cause of the missing K found a wee beastie lurking in Mrs. Murphy's shipping department. This creature had apparently eaten the K off the manuscript before it could be sent to you. Such action tends to decrease the information content of the paper and increase its entropy, we feel certain that is must be the dread Maxwell's Daemon. We trapped it in in one of Mrs. Murphy's cookie jars, and I have enclosed it for your examination. We feel that with your great experience in these matters, you can properly identify the creature.

I have heard many good remarks

about the artwork for the article, particularly the "talented illustrator's" rendering of my search. While searching for an honest loudspeaker is often more difficult than searching for an honest man (it's more like searching for an honest politician), modern equipment does help. I didn't use a lantern, I used a five-cell flashlight. Also, I would like to point out that I am only *mumblety-mumble* years old. My whiskers are not quite as grey as pictured, and I still have most of my hair.

W.J.J. Hoge
Boy Wonder

Honest Critic

Dear Sir:

Despite the fact that I love the Beach Boys and subscribe to their fan magazine *Pet Sounds*, I was glad to see Michael Tearson's review of their album, **The Beach Boys Love You**, in the July issue. The album was a real disappointment and Michael Tearson was the only record reviewer who *told it like it is*. It took guts.

Mac Dean
Richmond, Cal.

Laudable Lorpa

Dear Sir:

Your report on the Lirpa I receiver (*Audio*, April, 1977) bears out what I've long been told about equipment testing in the magazines that accept advertising. That is, one never sees a critical report published.

It's very apparent that you chose the Lorpa as a perfect way to prove that you do indeed publish reviews that are other than laudable. It's also apparent that you did so because Lorpa is not (yet) one of the major manufacturers, does not produce an impressive line, does not have extensive distribution and is not likely to have any substantial impact on the industry. At least, not the impact that one normally expects from a new brand name, however innovative a company Sirpa evidently is... so far.

Of course, your approach to this report is itself innovative, as I don't

recall any designer being given the privilege (?) of reviewing his own product. Perhaps you suspected, in your editorial wisdom, that this product called for something other than the conventional testing and reporting procedures, by your own array of experts.

On the plus side, the Birpa I was evidently conceived with human engineering uppermost in the creator's mind. Nowhere evident is the jargon—or other terminology—of the hi-fi aficionado with respect to the operating features and controls. For the first time, the average music lover knows exactly what he is getting.

Lest you think that I am being superficial or did not read your report with great care, let me point out the typographic error on page 61, first column, nine lines from the bottom, where the manufacturer's name, no less, is spelled "Lipra". Is that your subliminal way of advising the manufacturer that you'd prefer one or two minor details having been handled somewhat differently?

But enough of significant comment. I believe my point has been made sufficiently well. And I look forward to additional products from the Slurpa company... especially to further equipment reports of these products in the once-esteemed pages of *Audio* magazine.

Joe Lesly
Lesly Assoc.
New York, N.Y.



Our new AD cassette takes the normal bias position to extremes.

We made a name for ourselves by creating the world's first non-chrome, "high" (CrO₂) bias/EQ cassette tape, TDK Super Avilyn (SA). The state-of-the-art tape that has quickly become the standard of reference for cassette tape performance.

Our latest innovation is called AD (ay-dee), and we predict it will soon become the standard of performance and economy in the "normal" bias/EQ position.

We produced the first high fidelity ferric oxide cassette tape some ten years ago, and we've been perfecting the formulation ever since. Our new AD delivers superior performance, especially at the critical high-frequency range (7kHz to 20kHz), where many mid-priced cassette decks and even premium-priced cassettes tend to fall off too quickly.

AD is our ultimate ferric oxide tape designed for the "normal" bias/EQ position. Overall, it provides the lowest noise, highest frequency response and widest dynamic range of any pure ferric oxide cassette tape. In 45, 60, 90 and 120 minute lengths, AD has the same super-precision cassette mechanism found in TDK SA, in a new blue-gray shell.

And AD brings its audible benefits to all cassette decks, with and without switchable bias/EQ, including those found in cars, portables and home stereo systems. So the music you love can travel with you, with all of the clear, crisp, brilliant sounds that make music so enjoyable.

AD is the finest pure ferric oxide cassette tape you can buy at any price. And it has TDK's full life time warranty. Give our new high-fidelity, moderately-priced AD a try—it's anything but normal.

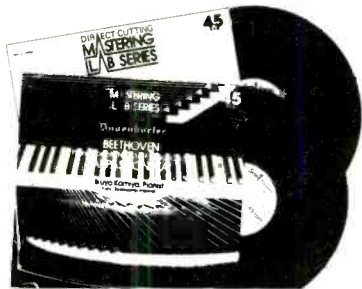
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The machine for your machine.



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DIRECT TO DISC NEW JAZZ AND CLASSICS



DIRECT TO YOU LEW TABACKIN QUARTET BEETHOVEN "APPASSIONATA"

Now! From Specs Corporation, a new name dedicated to sound like you've never before heard. These two exclusive performances from Specs are mastered at 45 rpm without compression; pressed on virgin vinyl. Their clarity, presence, and dynamic range will indeed take your breath away. Both have appeal that transcends musical preference. Both are collector's items, limited in quantity to fewer than there are record stores in America. Small wonder this is likely to be your only chance to obtain either!

The Lew Tabackin Quartet session features Toshiko Akiyoshi, Bob Daugherty, and Shelly Manne. Includes great new impressions of favorites like "I'm All Smiles" and "Summertime"; plus Ellington's "Cotton Tail" and title cut "Trackin'" by Tabackin himself. Flute, sax, piano, bass, and drums in rare harmony on a field of silence. A truly super, sonic joyride!

The superbly disciplined reading of Beethoven's Piano Sonata #23 in F Minor is performed on the Bosendorfer Imperial; monarch of grand pianos. We believe you'll feel, as we do, that it's well worth the price to hear it but once. For we know of no other recording of such soaring grandeur.

All orders will be promptly filled with guaranteed perfect pressings, rushed to you via UPS. The Specs Newsletter will be enclosed free, with exciting first notice of additional proof-quality Direct Disc titles, similar in interest and artistry. Equal in rarity.

We suggest you anticipate your needs as you order, as a sell-out is inevitable.

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Records: \$14 ea. including Newsletter, shipping, & handling.
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#RDC-4 Please send me the Specs Newsletter alone.

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My check or money-order is enclosed.

Use my Visa/BAC or Master Charge

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Mail to Specs, 130 Fallen Leaf Dr., Hillsborough, Ca. 94010
Dealer inquiries invited.

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WHAT'S NEW

TEAC Cassette Deck

The Model A-640 front-load cassette deck has two motors, a phase-locked-loop, servo-controlled motor for capstan, and a mechanical governed d.c. motor for the reel. The stated specifi-



cations are wow and flutter of 0.06 per cent, with a frequency response of 30 to 16,000 Hz with CrO₂ and FeCr tapes, and a signal-to-noise ratio of 67 dB at 5 kHz with Dolby. Price: \$500.00.

Enter No. 78 on Reader Service Card

Rotel Amplifier

Model RB-5000, a 500 W per side amplifier, has a THD of 0.009 per cent at 1 watt, all channels driven into 8 ohms, from 20 to 20 kHz, a frequency response of d.c. to 100,000 Hz, hum and noise of -120 dB, and an input sensitivity of 1V. It features a triple power supply with three transformers; adjustable calibration on direct-reading average power meters; LED peak readouts; 3 automatic speaker switches; 2 dB per step, stepped controls; left and right volume; input lever on/off; a three-position filter switch; a meter calibration switch, and a power limiter for 1/4, 1/2, or full power. Price: \$2,250.00.

Enter No. 79 on Reader Service Card

White Real Time Analyzer

Model 142A Spectrum Monitor peak-reading real-time analyzer provides a 28 by 11 LED matrix which displays 27 one-third octave channels from 40 Hz to 16 kHz plus one broadband channel. A front panel switch selects display ranges of 10 dB or 30 dB, the input is calibrated in 10 dB steps from -40 dBm to +10 dBm or 50 dB SPL to 100 dB SPL, and each one-third octave channel is peak reading with a decay time of 1/2 second. Two memory registers store display information for as long as the unit is turned on. In the Sample mode "snap shots" of program material can be stored in either memory for later viewing and comparisons, while in the Accumulate mode, either memory can be used to register the highest peak readings during any segment of program material and viewed later. It requires 115 or 230 V a.c. power at 15 watts. Price: \$2500.00.

Enter No. 80 on Reader Service Card

Stanton Cartridge

The 881S Cartridge combines a large contact area with long, narrow tracing edges and a low dynamic tip mass of 0.2 mg. It has a recommended tracking force of 1 gram \pm 1/4; setting with the integral brush is 2 \pm 1/4, resulting operational tracking is 1 \pm 1/4. Frequency response is 10 Hz to 25 kHz (individually calibrated to 20 kHz), output is 0.9 mV/cm/sec, channel balance is \pm 1 dB maximum @ 1 kHz, channel separation is 35 dB. Price: \$150.00.

Enter No. 81 on Reader Service Card

Cerwin Vega Loudspeaker

The Cerwin-Vega Model S-1 loudspeaker features 6th order Butterworth vent tuning, an active equalizer filter, and Thermo Vapor suspension. A soft, inert gas-vapor, more compressible than air, is used in the cabinet to advance the performance-to-



size ratio, and achieve a lower system response, lower distortion and better control of damping. The claimed frequency response is 28-20K \pm 4 dB, with a power handling capacity of 200 W rms. Crossover from the 12-in. bass unit is at 300 Hz to a 6-in. midrange driver. Frequencies above 4kHz are handled by a dhorm. Price: \$350.00.

Enter No. 82 on Reader Service Card

Sansui Amplifier

The Sansui AU-717 integrated amplifier has a frequency response of 0 Hz (d.c.) to 200 kHz, +0, -3 dB (from Main-In); a rise time of 1.8 microseconds; THD of 0.025 per cent; and a power output of 85 watts/channel, min. rms, both channels driven into 8 ohms from 20 Hz to 20,000 Hz. The phono section offers a RIAA accuracy of \pm 0.2 dB, a S/N ratio of 78 dB, and a 350 mV overload point and 120 dB dynamic range. Price: \$450.00.

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“SPECTACULAR”

and other comments from audio critics about the new Ohm L:

From The Complete Buyer's Guide To Stereo/Hifi Equipment:

“Ohm Acoustics is an adventurous speaker company known for turning mathematical theory into fine sound. They perfected the Walsh driver, and the resulting speaker is one of the finest available at any price.

On a more conventional level, Ohm was among the first companies to take advantage of A.N. Thiele's research into vented loudspeakers, with some pretty spectacular results. The “L” is the latest, most compact, and least costly Ohm Speaker to utilize the Thiele mathematics.

In listening to the Ohm L, the immediate reaction is one of surprise at the openness of the sound. We compared the sound of the “L” with that of several larger and costlier systems, and in no case could we say that the larger systems have a “bigger” sound.

So in this respect, the Ohm L is an unqualified success. In addition, the frequency response of the speaker is exemplary. And the midrange, which is often a weak point in speakers of this size and price is very

good. There is no sense of strain, and voices sound utterly natural.

The Ohm L is more suitable for use in larger rooms than its dimensions might indicate, and we recommend it highly.”

From Stereo Review:

“In summary, the Ohm L...is easily good enough to meet the sort of critical standards usually applied to much larger and considerably more expensive speaker systems.”

“The upper mid-range and high frequencies were virtually perfect.”

“The balance between lows and highs was excellent. The Ohm L, though diminutive beside many of the floor-standing or oversize “bookshelf” speakers we have seen, sounded in every way like a full-size system. Blindfolded, one would never guess its compact dimensions.”

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OHM

You can get a free 28-page brochure and complete reprints of Ohm reviews at any Ohm dealer, or by writing us at:
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What the listeners want.

... I am behind you 100%. I want quality radio...

... Until now I doubted that Dolby could significantly improve FM. But the incredible brilliance and clarity and the extended dynamic range of (San Francisco station) is fantastic proof...

... hi-fi enthusiasts ... will readily acknowledge the advantages of Dolby FM...

... To say the least I was impressed... I have a Dolby tape deck and I am looking for a Dolby receiver...

... I am convinced of the great improvement Dolby can make to FM broadcasting...

... Good luck on your efforts to increase dynamic range on FM...

... We have been enjoying the benefits of the Dolbyized FM programs of (New York station) for a long time. We noticed at the outset the richer and cleaner sound especially in the high frequencies...

... Bravo on your campaign...

... I feel this is a step forward in FM broadcasting...

... I could not believe what I heard: The sound was clear, clean, brilliantly defined. After several hours' listening, I am still awestruck...

... I now listen to Dolby FM broadcasting on (Buffalo station). The difference in sound quality between (this station) and other FM stereo stations is remarkable...

... I've heard Dolby-decoded FM on a friend's equipment from several local stations. I was quite impressed!...

... All audiophiles owe you much for making cassettes such a wonderful source of music. I trust that your positive campaign to improve FM sound quality will bear equally impressive results...

... I've been looking forward to Dolby FM and now my favorite (Pennsylvania station) is installing it...

... I made it a point to own a Dolby receiver...

Dolby FM

The quotes above are selected and shortened from letters received on the subject of Dolby FM during the past year. Of 3,000 letters, only 5 have taken us to task — sample: "... (Dolby FM) smacks of nothing more than plain old commercialism."

August 1977 Dolby FM statistics: In U.S.A., FM stations in 10 metropolitan areas plus 101 other cities

with Dolby FM encoders; 14 in Canada; 17 in other countries; 24 manufacturers with 62 different tuner and receiver models incorporating Dolby FM decoder circuits. Write us for technical details, lists of products and Dolby FM stations.

 **Dolby**[®]

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Cable Dolbylabs

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How to prove Dolby FM to yourself.

Remember the first cassette recorders with the Dolby system, back in the early 70's? The advantages were easy to prove to yourself. You flipped the Dolby NR switch. Now you heard it; now you didn't. You were impressed.

A few years later and along comes Dolby FM, which you'd like to be just as convinced about. The same 10 dB's are still there. But, unfortunately for demonstration purposes, they are used in a more subtle way. Let's face it, the effect is hard to

hear most of the time (that's compatibility for you). To make a convincing test is tough; you can't get your hands at the controls of the local FM station the way you'd like to (Dolby FM is an encode-decode process).

Well, here's how to overcome these problems and make a quick test that will enable you to hear one of the main effects of Dolby FM. The demo is artificial, but technically valid.

1. Using a receiver with full Dolby FM capability, defeat the inter-station muting switch.
2. Tune to a vacant place on the dial to get pure high-level hiss as a test signal (the extreme ends of the dial are usually good for this).
3. Switch back and forth between Dolby FM and conventional FM.
4. Listen to the increased high-frequency content in the Dolby FM mode. The difference should be very obvious.

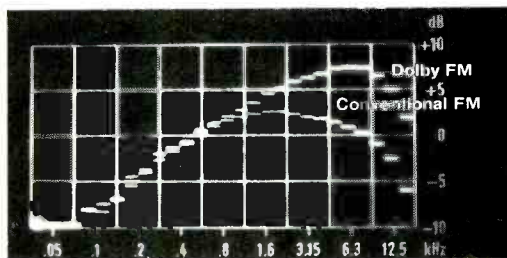
In the Dolby FM position the test signal will have a wide-range, open quality. The conventional FM hiss will be muffled. This is the high-frequency, high-level capability difference between Dolby FM and conventional FM. All the highs on the record at the station can actually get through. This allows the rest of the receiver to do its job properly; the other specs on the unit become more meaningful.

Low-level noise reduction, the other half of Dolby FM, is harder to demonstrate at will. Needless to say, most stations transmit silence as rarely as possible. In any event, you have heard low-level noise reduction before; Dolby FM gives 5 dB worth.

This should help you get a better handle on Dolby FM. Not only a theoretical improvement, but one you can prove to yourself.

Technical Note

The use of wideband noise is becoming increasingly popular in testing audio equipment and acoustical characteristics. Interstation noise is equivalent to an FM carrier which is modulated with high-level white noise. This is a suitable signal for checking the high-level, high-frequency capability difference between Dolby FM and conventional FM. Relating the test result to actual listening, the difference shows how conventional FM muffles loud musical signals containing significant amounts of steady-state or transient high-frequency energy (for example, the steep waveforms of percussion and brasses).



Real-time analysis of Dolby FM receiver output when tuned to interstation noise, using Altec Hewlett-Packard 8050A analyzer. In a "perfect" FM system the trace would be a continuously rising straight line. Thus the results show that highly modulated high-frequencies can be reproduced with significantly improved accuracy using Dolby FM.

August 1977 Dolby FM statistics: In U.S.A., FM stations in 10 metropolitan areas plus 101 other cities with Dolby FM encoders; 14 in Canada; 17 in other countries. 24 manufacturers with 62

different tuner and receiver models incorporating Dolby FM decoder circuits.

Write us for technical details, lists of products and Dolby FM stations.

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MIKING THE PRO WAY

Interview with Maynard Ferguson's sound man

Howard A. Roberson

When asked about getting material for a story on the experiences of a sound technician, I had an immediate interest. That was heightened by the fact that Tony Romano, the subject of this article, was doing sound for the Maynard Ferguson Orchestra. I hadn't heard Maynard play in quite some time, and I looked forward to getting my ears brought up to date.

The interview with Tony was directed with the end purpose of gaining an understanding of his particular job, and how his particular experience might benefit our readers who "do sound." Band personnel included Maynard Ferguson, of course, a versatile performer on trumpet, flugelhorn and other brass, including the superbone, a combination slide and valve trombone. On trumpet were Stan Mark, Dennis Noday, Ron Tooley, and Loon Mosello, who also doubles on congas. Randy Purcell and Roger Homefield play trombones, and Mike Migliore, Bobby Militello, and Mark Colby are on saxes. Gordon Johnson plays bass, Biff Hannon keyboard, and Peter Erskine ties it together on drums. The orchestra played a program of considerable variety to match the wide age span of the audience, from very young to middle aged. The program included numbers from current Columbia record releases.

The typical one-nighter demands a lot from all of the personnel, and from the time they arrive at the concert site every minute is important. Almost before the bus stopped rolling in front of the Somerset (Mass.) high school, local students were aiding in the transfer of instruments and equipment to the stage of the auditorium. Advance arrangements had been made for the positioning of risers for the band and hanging of lighting from some fly rails. Then ensued the set-up of equipment and instruments, adjustments of lighting, etc., through the cooperative efforts of the Ferguson group and the local school personnel. Romano ran a snake to the booth at the back of the auditorium where he had placed his control equipment. After he had completed connections and the final check-out, we had a short time to talk before the concert.

Tony Romano has been with Maynard since September 1975 and spends about 40 weeks per year on the road. He is 24 years old and still calls Buffalo, N.Y., his home. When he was 16 years old, he played guitar in various bands. After high school he attended more pop and jazz concerts, developing his own concepts on what the sound should be and how he would do the job. He played both acoustic and electric guitar with The New Wave, a

UPGRADE YOUR HI-FI SYSTEM FOR ONLY \$4.25.

Most people think they have to buy expensive equipment to improve their hi-fi systems.

But no matter how good the components in any system are, it's impossible for the sound you have recorded to be any better than the tape you record it on.

So before you invest hundreds of dollars in new

equipment, invest \$4.25 in a Maxell cassette.

Maxell is recognized as the premier quality recording tape the world over. It's used by more audio critics who evaluate hi-fi equipment than any other brand. Among people with expensive sound systems, we're also the most popular tape. But this doesn't mean we can't make a medium

quality system a better sounding system.

Buy just one Maxell cassette and see how much better it sounds than the tape you're using now.

At \$4.25, you can think of us as expensive tape. Or the cheapest way in the world to get a better sounding hi-fi system.



maxell

Maxell Corporation of America, Moonachie, N.J.

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Make a standard practice of miking close, each and every source of sound you may want someone to hear

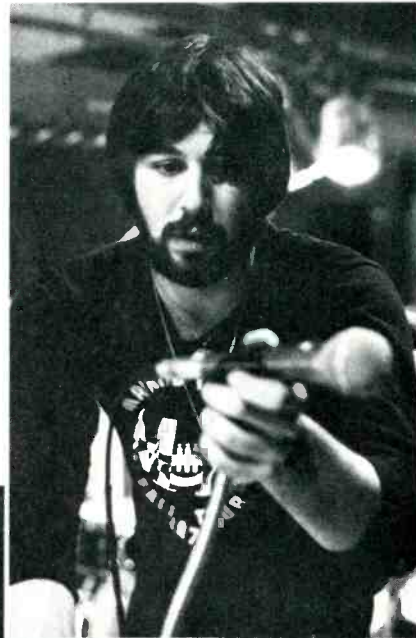
jazz sextet, for two years. He found, however, that he was doing more sound and less playing, and at one time he was the sound technician at Mulligan's Night Club in Buffalo. Although Tony had a musician's background, he did take a number of electronics courses at the University of Buffalo. His education degree in history prepared him to be a teacher, but his involvement in sound and music had increased during college years, lessening the desire to teach. Tony had done studio work in Buffalo, and was hired directly to be the sound technician for the touring Maynard Ferguson Orchestra.

Sound Background

I asked Tony for some thoughts on what sort of experience would be helpful to those hoping to become sound technicians. His music background was an obvious aid to him. He suggested that a lot can be done in the home with a good tape deck. "There are a variety of things you can do pretty much on your own. Start fairly

simply with such things as a four-channel mixer and a few microphones, borrowing as you can. Experiment with microphone placement (and types, if you can) with various instruments. Keep working at it as it takes a long time to gain expertise, particularly for

Tony Romano uses many close-up mikes for the Maynard Ferguson band to avoid losing the weaker instruments.



the challenging situation such as doing sound in an over-live gym."

The particular approach that Tony regularly takes with his tasks with the Ferguson band can be applied where any sound man is working with the same group and needs to keep set-up time to a minimum. "First of all, the band should have personnel in the same position at each performance. Make a standard practice of miking close, each and every source of sound you may want someone to hear. If you have been using mikes at some distance, perhaps picking up more than one instrument, you could very well find that you cannot operate such a set-up at a location where it is much more reverberant. Another advantage of miking close is that you can fill in any holes that might appear during the performance, as soon as they are detected."

Tony has all of his stage mike cables to exact length in what could be called mini-snakes. This scheme saves a great deal of set-up time, and mistakes are eliminated in the connections, with clues both from the length and at-



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The sound man must be personable to get things done, and it helps to make the concert what it should be, fun.

tached labels. The system also speeds up break down, important in a situation such as Tony's, where there is just one sound technician, and other people have their jobs to do. Another advantage of the standard set-up with exact lengths and labels is that, in case of emergency, someone else could make the necessary connections with a minimum of confusion.

Sonic Standardization

The equipment was pretty much Shure throughout, including mikes and

sound for inside locations without compression or limiting, and that effects should be subtle and used with discretion, not *all* the time. Everything, band personnel and equipment, has to fit on one bus, placing a limit on how much gear can be carried on their series of one-nighters. It was apparent that advance planning and communication with Somerset school personnel had ensured the efficient setting up I observed.

Tony felt that the challenge of working inside locations was trying to make

stalled, well-engineered system, including locations for seating. Sound reinforcement for Ferguson is bi-amped most of the time, with infrequent tri-amping for that 'something extra.' Inside, the sound man must deal with the acoustics of the room, while outside there is substantially no liveness. For the outdoor scene, there is much more dependence on the amplifier /speaker system, and how good it is. When the Ferguson orchestra is going to do an outdoor festival, advance contact is made to make certain that there is a good sound system installed at the performance site. I do prefer to use my own boards and mikes which I have been using day-in and day-out."

Traveling Diplomacy

When we discussed the personality needs for a job such as his, Tony pointed out that throwing orders at local people was a bad approach and that everything went much smoother when good communication is established right at the start. "The sound man must be personable to get things done, and it helps to make the concert what it should be, fun. There are bound to be frustrations, but keep your patience in any case. Coming into a new town with new people, *you* have to make the effort to keep cool. For them it's a new experience; they don't know what happened the night before or on the trip that might have you on edge. You want to keep this in mind, make *their* experience a pleasurable one. Bring along a friendly attitude, and treat them with respect. Then, things just get done, they fall into place.

"It's good to have our personnel in consistent dress, such as our Maynard Ferguson T-shirts, to aid in immediate identification when we arrive. From an appearance standpoint, it makes sense to dress nicely, no jeans, but clothes have to be able to take the wear and tear of set-up and break-down. The orchestra does not try to put on a stage act with any form of costume, and the kimonos they wear in the second half of the program were picked up on our tour in Japan, where in 16 days we gave concerts in 14 cities."



Romano at work with the Shure M67 Mixer and the M610 Feedback Controller to get a proper acoustic balance in the auditorium.

SR amps, speakers, and boards. The stage monitors for the two solo mikes were two small Vocalmaster speakers, and control was provided by a Shure M67 mixer, used in conjunction with a M610 Feedback Controller.

The only signal processing was provided by an MXR auto phaser used with a separate drum mixer and the occasional use of a Maestro Echoplex. Tony stated that he preferred the

the audience appreciate the music in its purest form. "The attempt should not be made to generate very high sound levels, only what is necessary for the music. The basic show is a mono feed which works well in most cases, plus the fact that stereo reinforcement is touchy and it is difficult to get good sound except for people in the center. It is possible to do good stereo sound in a club that has an in-

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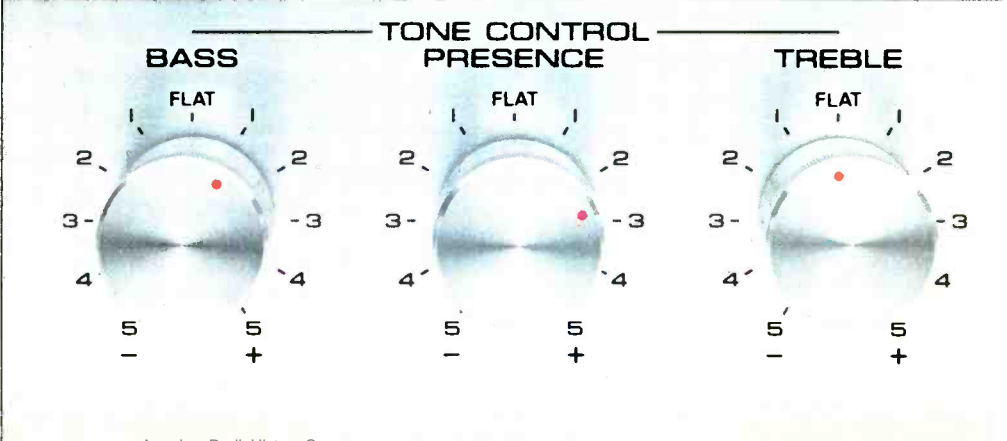
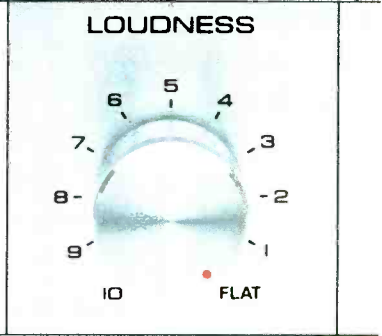
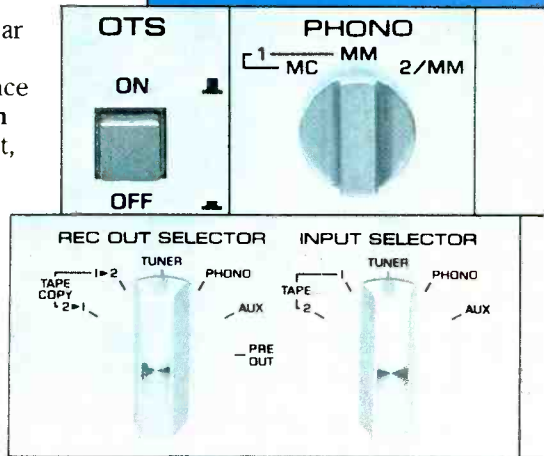
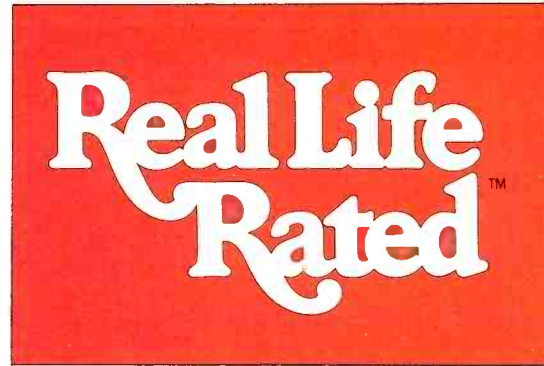
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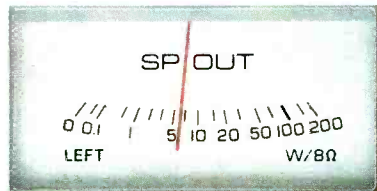
Built-In Moving Coil Head Amp. Today, more and more people are discovering the superior performance of the moving coil phono cartridge. While



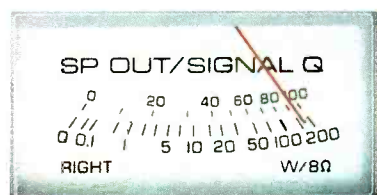
start playing catch-up. Again.

other receivers require an expensive preamplifier or step-up transformer, which can compromise sound quality, the CR-2020 already provides for it—the same solid-state device first developed for our superlative C-2 preamplifier.

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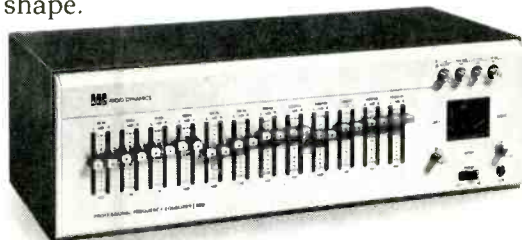
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Tony agreed that good health is required for a job such as his, with some extra energy needed for the collection of one-nighters. "We'll be packing up tonight to head off for New York City, getting there about 4 or 5 in the morning. Many think that the road life is lots of fun, but it's very demanding. Others believe that there is a lot of glamour and a lot of time for getting kicks, but there is little chance to do extra things when on the road. The band has had a full schedule with relatively few open nights, and usually they were needed for travel."

So much for the philosophy, how about the results? There hadn't been time for a sound check before the concert, but Romano touched up the balances very quickly in the first number without any detectable miscues. The brass needed very little reinforcement in the fairly live auditorium, and the individual, close miking permitted getting a good solid sound without loss of any of the low-level instruments. Tony obviously enjoyed the music itself and was continually attentive to the sound, even though he must have heard the tunes many times before. The program was filled with consistently good performances, but *Pagliacci* from the recent Columbia record, **Primal Scream**, certainly was a highlight. Bobby Militello gave what must be classified as a virtuoso performance on flute, and Tony added effects with the use of the Echoplex. It would have been possible, of course, to have such a device on all the time, but its use for special effects only generated an excitement that would not have occurred with "echo overkill." The setting of delay and level was very effectively done, greatly adding to and enhancing the talented performance of Militello. I don't think that most of the audience knew how it all came about, but there was no doubt about their excitement and pleasure from such a musical experience.

I made some notes on my impressions of the performance of the last numbers, including the standing-ovation encore. At the end where many groups tend to start goofing off, the band was still "disciplined, spirited, exuberant, and precise with good attacks." For me it was one of the most exciting evenings of music in quite some time, and I thank Maynard Ferguson, his orchestra, and Tony Romano, their sound technician, for that. The emphasis that they all put on satisfying the audience and working cooperatively with local people is one that should be taken to heart by all bands and their sound technicians. 

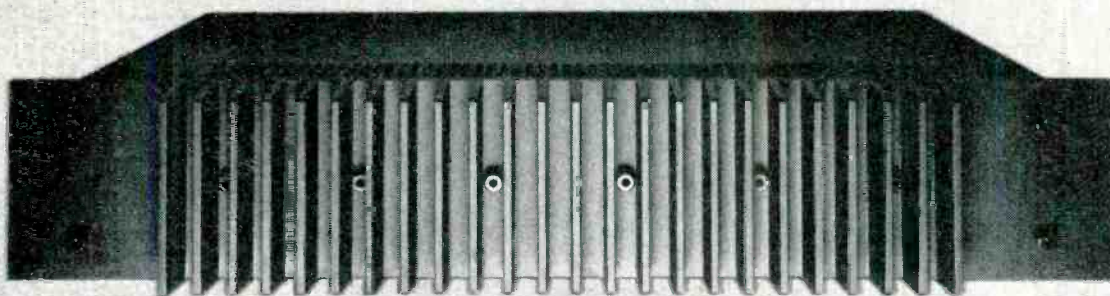
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This article should be of use to readers who are interested in the attack that has been made over the past 10 years or so on limitations in the quality of the electronics associated with every high fidelity system. For many years, the quality of the electronic parts of a high fidelity system has been much better in terms of distortion than any of the electro-mechanical parts such as the pickups and loudspeakers. This is still the case in a well designed system. Nevertheless it is possible, even with distortion in the poorer links of the system, to hear any defects that might exist in the best parts of the system. In the past 10 years, the reasons for these defects have been slowly tracked down. There are currently two main areas of study. One is the phono preamp, where the newest pickup cartridges and record cutting techniques have placed greater and greater demands upon the low level electronics. The second is in the power amplifier area, where high quality and very low efficiency speakers have placed very high power output demands on the power amplifiers. (This is to say nothing about the bone crushing loudness levels which are now demanded for the full enjoyment of modern popular music.)

Interestingly enough, it may be the very same design problems that plague both the preamplifier and the power amplifier. The study of one type of

amplifier has yielded insights into the problems with the other. In this article some historical perspective on the efforts that are being made to understand the electronic limitations and the strides that have been made to overcome them will be presented. Some unifying thoughts about the relationships among electronic problems of signal overload, slew rate limiting, quasi-linear and non-linear distortion, and the application of feedback in amplifying circuits will be considered.

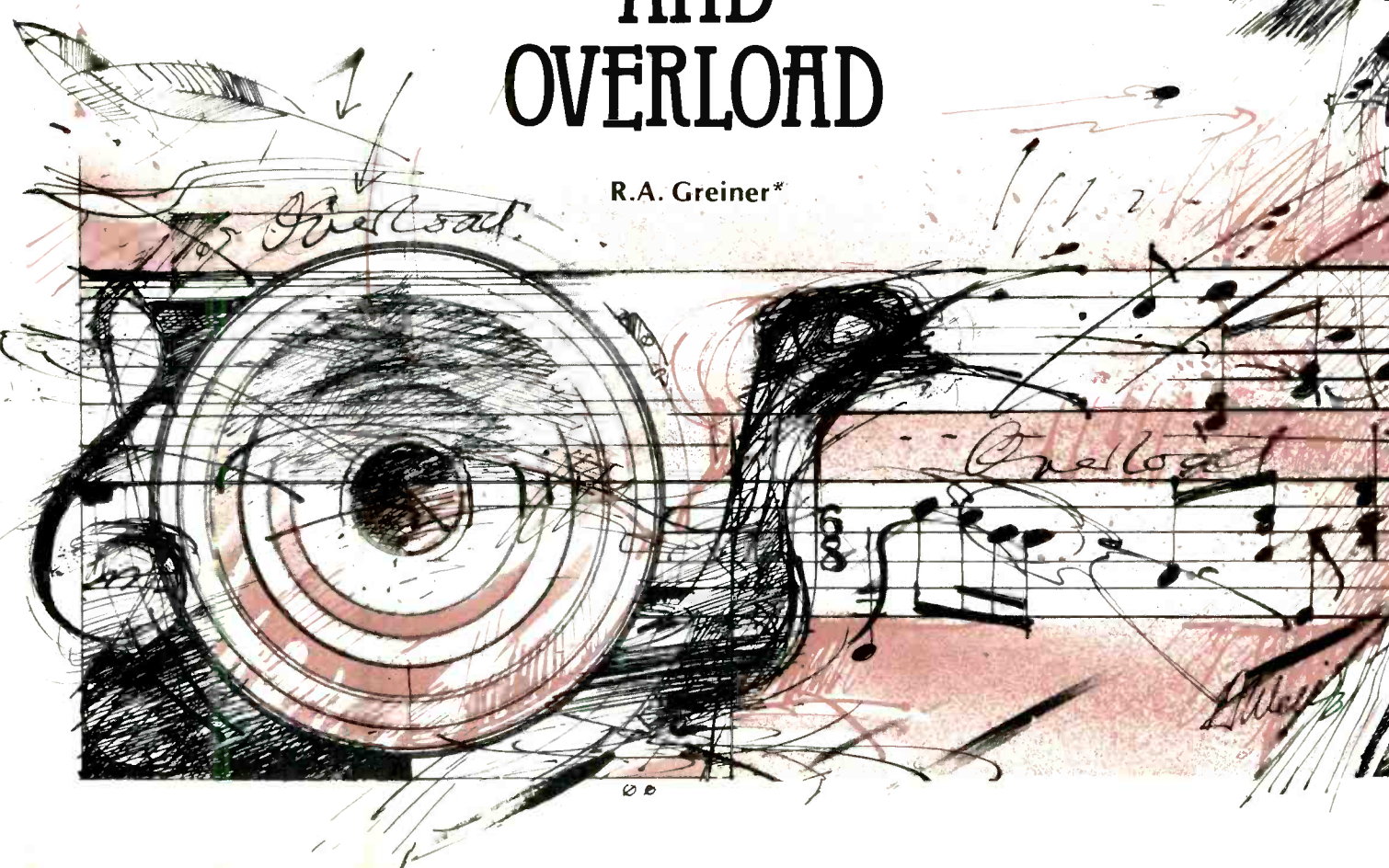
To set the historical perspective for this discussion, I quote four short statements from the literature on power amplifier design. Two of them are from Leach (1). "Basically it (TIM) is an *overload phenomenon* that is caused by heavy feedback in the amplifier." Later in this discussion reasons for qualifying this comment will be presented which argue that it should read,—We are dealing with an

overload phenomenon which is caused by something going wrong in the amplifier that can be greatly exacerbated by heavy feedback. Again quoting from Leach (1), "In summary, the two major design objectives for the prevention of TIM distortion are to design the "open-loop" amplifier for maximum linearity and to design it so that the *open-loop bandwidth is at least as wide as the audio frequency spectrum.*" The third quote is from a 1966 article by Daugherty and Greiner (2). It states, "For high quality audio power amplification, the crucial frequency specification is that the *open-loop response be at least 20 to 20,000 Hz.* Meeting this requirement enables the amplifier to deliver full power at the extremes of the signal spectrum without experiencing *transient overloading.*" Finally, a paraphrase from the same article, "It is shown for the high frequency case that if this criterion is not satisfied, *transient overloading will occur inside the feedback loop.*"

The excellent article by Leach has brought to the attention of amplifier designers and the audio public both, the work of Otala (3) and some other principles of design that should have been better known for many years. Why so many designers have ignored the basic rules of design for so long is a

AMP DESIGN AND OVERLOAD

R.A. Greiner*



little hard to understand. The recent Ojala and Leach publications are certainly very important and should be mandatory reading for all persons interested in amplifier design and applications.

Amplifier Design

As the title of this article indicates, I hope to set down some *unifying* thoughts about the old principles of amplifier design as they relate to the new principles. There are unifying concepts that connect the criteria mentioned above with current thoughts about amplitude and frequency overload and in particular the way these relate to feedback. This discussion will concentrate on power amplifiers, but the concepts are applicable to all types, including preamplifiers, transistor amplifiers, tube amplifiers, FET amplifiers, or any other type of amplifier.

It must be recognized that the signal being dealt with, sound, has a statistical nature. It has a great range of amplitudes and a broad range of fre-

quencies. As it occurs in nature, it will from time to time exhibit peaks in amplitude and/or ranges in frequency that simply cannot be handled by the electronics or any other component in a system, no matter how conservative the design. Thus from time to time some component in the system may overload, either due to a signal that is too large or too fast for the system. With proper system design this does not happen very often. Unfortunately, when it does happen, the overload can be very troublesome. The ability of the ear/brain to perceive even infrequent overloads seems to be very good, probably better than we would like for full listening pleasure.

This may sound a bit pessimistic. Fortunately we do not have to deal with signals directly as they occur in nature (except with microphones). When we are trying to reproduce a signal from a recorded source such as a record or tape, the source material has been pre-limited for us. This may not have been done intentionally, such as with a limiter, but it will always occur because of the natural overload limits of the tape material or the geometry of the record groove. A fine

treatment of these limits as they occur in records can be found in recent articles by Holman (8, 9, 10). His discussion of the problem is essential to anyone planning to design a preamplifier. The preamplifier must be designed to handle any signal that the pickup might possibly generate without either amplitude or frequency overload. The signal is, of course, greatly amplified by the preamplifier and the power amplifier. The demands upon the electronics both in amplitude and slew rate increase in proportion to the voltage gain necessary to drive the loudspeaker system. These requirements from the pickup to the gain control can be established and remain fixed. From the gain control to the loudspeakers the demand depends on the listener. Every adjustment in loudness that appears to the listener to be about "twice as loud" actually requires almost a 10 dB increase in level. This means that demands on the amplifiers in both amplitude and slew rate increase about three times for each such increase in loudness demanded by the listener. It is almost always possible to turn the control so that the demands made are too great for the system and distortion sets in. This may occur in either the amplifiers or the loudspeakers. This is why, in a complete design, attention must be paid to

*open loop response
20 to 20,000 Hz*

*Prof. of Electrical Engineering
Univ. of Wisconsin
Madison, Wis.

PANAL



establishing the loudness levels desired. A balanced design will then take into account the size of the room, the efficiency of the loudspeakers, and the headroom desired in the electronics. In an ideal design, the only limiting that will take place will be in the program material itself. The amount of headroom necessary is surprisingly large with high quality program material. Appropriate design criteria will be discussed further below.

Overload Distortion

Gross forms of overload distortion are readily measurable and have been studied for over 15 years. The photographs in Fig. 1 show three examples of amplifiers which have been overloaded with tone bursts. This technique is described in Reference 4 in some detail. In the cases shown, each amplifier has been overloaded by 5 dB above its clipping point for a brief period and then returned abruptly to a normal level of operation. This is a severe form of overload which can upset bias conditions within the amplifier and cause the power supply to sag considerably. The amplifier output shown in the top trace is very good. The other two show serious distortion of the waveform following overload. The bottom amplifier recovers with a thump and crash that is totally unacceptable. Just as these amplifiers behave quite differently for tone burst overload, they will likely show different forms of single cycle and short transient overload. Improvements in amplifier design, particularly direct coupling and complementary symmetry designs, have produced some amplifiers which are greatly improved in terms of the gross overload problems shown here. There are unfortunately many power amplifiers and preamplifiers which do not do well on these tests even though the solutions to such design problems are well known.

The main discussions in the present article are directed to the much more subtle types of distortion related to momentary internal amplitude or slew rate overloading. As has been pointed out, occasional overload might take place because of the statistical nature of the musical signal being reproduced.

Reference 2 describes several criteria that must be met in order that the electronics in a system will perform without substantial audible defect. One of these criteria is that the headroom of the electronics, i.e. the peak signal handling ability of the amplifier with reference to the average signal level demanded of the amplifier, should be at least 17 dB. This result

was derived from data that measured the amplitude distribution of live program sources. This criteria is still valid. The need for headroom is widely recognized by professionals. Unfortunately some professionals do not allow enough headroom and many high fidelity enthusiasts simply ignore the problem. The greatest fault I have heard with systems I have been asked to audition has been that they are played too loudly for their abilities. A

second criterion was set down in the paper which is just as important but which has gone largely ignored until recently. It is that the frequency range of the signals applied to the power amplifier (or any feedback amplifier) should not be in excess of the *open-loop* frequency capability of the amplifier. The reason for this criterion is so that internal overload of the amplifier does not take place either due to amplitude or frequency overload (slew rate overload). Notice that the statement of this rule allows either the selection of an adequate amplifier or the limiting of the bandwidth of the signal. It is usually not the choice to do the latter. This rule implies that each amplifier in the electronic chain must have a bandwidth greater than the previous one in the chain. Many high fidelity systems are a catastrophe because this rule is broken.

The amplitude overload criterion stated above is based on the principle that while an amplifier might be allowed to overload occasionally when driven by a typical statistical (music) signal, that this should happen only a very small percentage of the time. There is a rather detailed analysis to justify the ratio of 17 dB in Reference 2. For the present it is sufficient to note that 17 dB of headroom guarantees that the amplifier will overload less than 0.1 percent of the time even with the best possible program material. In fact the amplifier will overload even less often if the headroom anywhere earlier in the reproduction chain is less than this amount. This is often the case and thus the amplifier never overloads at all. This principle should be used to select the proper sized amplifier after the loudness level desired, the loudspeaker efficiency, and the room size are all known.

It is not only protecting the amplifier from overload that is important but also selecting an amplifier that recovers well from overload when it occurs. With most amplifiers designed to drive an 8 ohm load the most common form of overload is voltage limiting. This is usually a well-behaved type of limiting that results in chopping off the tops of the peaks in a clean fashion. Many designs do very well in this mode of limiting and recover immediately. In a few cases the amplifier may go into brief oscillation. Amplifiers that do this should be avoided. At lower impedance levels such as 4 ohms, or in particular with electrostatic loudspeakers where the load may become capacitive, it is more usual for current limiting to take place. Very often current limiting in an

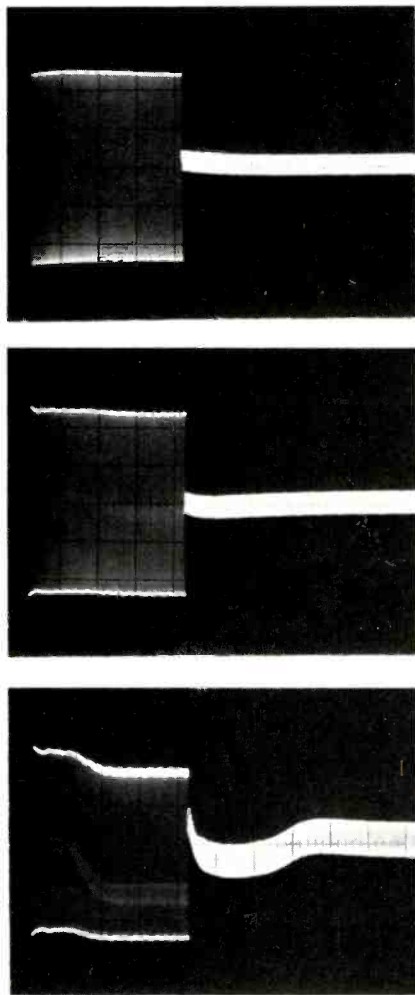


Fig.1— These three photographs show that different amplifiers overload in quite different ways even though they are presented with the very same overload conditions. The traces shown are done with the tone burst techniques described in Reference 4. Note that the top amplifier, with 5 dB overload, recovers without much difficulty. The other two amplifiers however have considerable problems and will badly distort the sounds they are supposed to amplify.

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Tiny, invisible dust particles hide in delicate record grooves and can be ground into the vinyl. Only a slanted (directional) fiber using special ultra-small fiber tips can scoop up, rather than rearrange, this micro-dust contamination.

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Our new Master III is for the ferri-chrome setting. It's formulated with the most advanced technology available, giving a 3 dB output improvement at low frequencies and 2 dB at high frequency. And the unique dual layer construction increases both low and high frequency sensitivity over chromium dioxide and ferric oxides.

All this, plus unique inner workings you can actually see. Our new Master line has a special bonus feature. A precision molded clear shell that allows you to monitor the inner workings of the cassettes. You can actually see the recorder head penetration and the unique roller guides in action. Look closely at the transparent shell and you'll see the water wheels which were specially designed to move the tape evenly across the head, reducing friction and noise. And two radially creased shims insure smoother wind, improved mechanical reliability and reduced wow and flutter.

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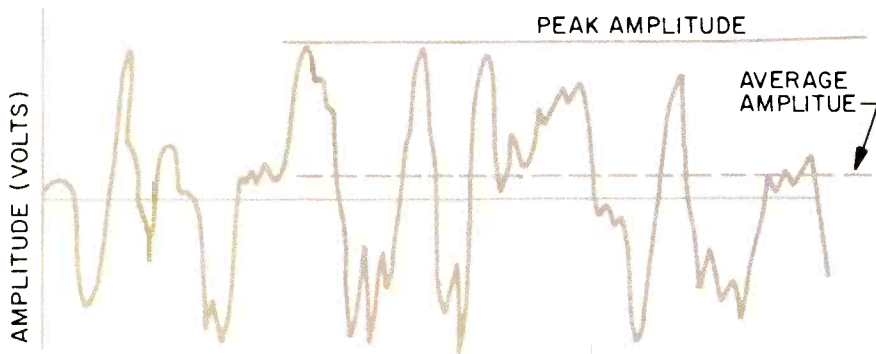


Fig. 2—A complex audio signal might look like the one drawn here. Note that the peak-to-average values might be as large as seven-to-one for the voltage waveform. This corresponds to almost a 50 to 1 for the power ratio, or about 17 dB.

amplifier is accomplished with complex current detection circuits within the amplifier. These are difficult to design and can cause complex overload distortions as well as delays in recovery from overload. Some amplifiers are much better than others. Possible waveform distortion is shown in Fig. 3. A particularly annoying defect in overload limiting (current protection) is known as chattering. This can not only be heard but it can burn out tweeters because of the burst of high frequency energy delivered to the loudspeaker. Low impedance loads and current limiting should be avoided if at all possible. Individual amplifiers should be checked for good recovery from both voltage and current overload. Complex equipment is needed to do the job but the amplifier manufacturer seldom delivers the necessary bad news about his equipment. Test reports should certainly do this for the consumer and some do.

Frequency Limitation

The frequency limitation criterion is based on a problem which any feedback system experiences. That is, whenever the output signal differs appreciably from the input signal, the difference signal can get quite large. This actually occurs when there is an amplitude or frequency overload anywhere in the feedback loop. This in turn happens when the input signal is either too big or too fast for the loop response. The further into the amplifier that the overload occurs, the worse the overload situation becomes. If the limiting comes in the very first stage most of the amplifier is not overdriven. Ideally, frequency and amplitude limiting elements will be placed just ahead of the first stage. Large amounts of feedback can make the overdrive caused by limiting more severe. It should be emphasized that feedback does not cause the problem, it only exacerbates it. Recognition of this problem has eluded many designers because, even

though the closed-loop response might be quite large, the open-loop response is often quite marginal to cover the audio frequency range in high power amplifying devices. The term used for this type of distortion in 1966 was *transient overloading* or transient intermodulation distortion. The term TIM was not common because it described a special measurement scheme rather than a mechanism of distortion. It might be most appropriate to call this form of overload distortion simply "frequency overload." It must be recognized that frequency overload can be caused by two distinct internal overload mechanisms. One of these is

internal amplitude overload and the other is a slew rate limiting. Also, either one of these mechanisms can be triggered by a single signal. No intermodulation test method is needed. How these various distortions relate and possible solutions are described further below.

The recent excellent work of Ojala (3) and Leach (1) has shown that overload caused by fast changing waveforms in high gain feedback amplifiers is more common now than in years past. This is partly due to the development of very high gain operational amplifiers. Because of the need for heavy frequency compensation and the limited current output capacity of these microcircuits, they exhibited severe slew rate limiting. While any amplifier has a slew rate limit, it was difficult to get enough gain and feedback to get into serious trouble 10 years ago.

During the period when the amplifier is slewing as fast as it can, it is in effect overloaded and thus can not pass small signals. The limiting can take place for high amplitude, high frequency signals, as well as for transient signals which are like step functions. It also occurs for a single signal and in an amplifier that might have only one stage and no feedback at all. Thus the term transient intermodulation distortion is not a very good one. It is also not correct to say that transient distortion is caused by feedback but rather that when it is about to occur that feedback can make it much worse. A very good way to measure for the existence of transient overload in an amplifier is given by Ojala and Leach (Fig. 4). This method does not give a very quantitative measure of the distortion. The methods shown by Jung (7) use steady state signals and more traditional measurement techniques. They seem to give more quantitative results for operational amplifiers and seem to indicate fairly well which amplifiers are best. However, they are quasi-

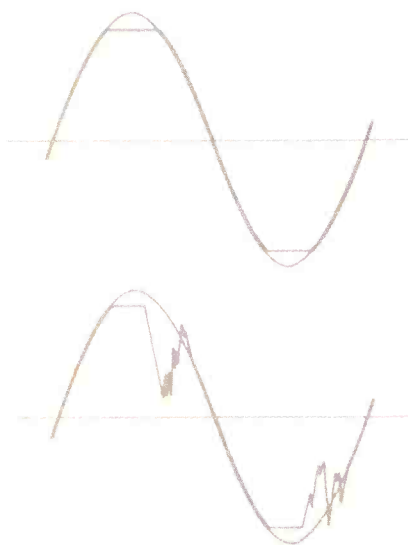
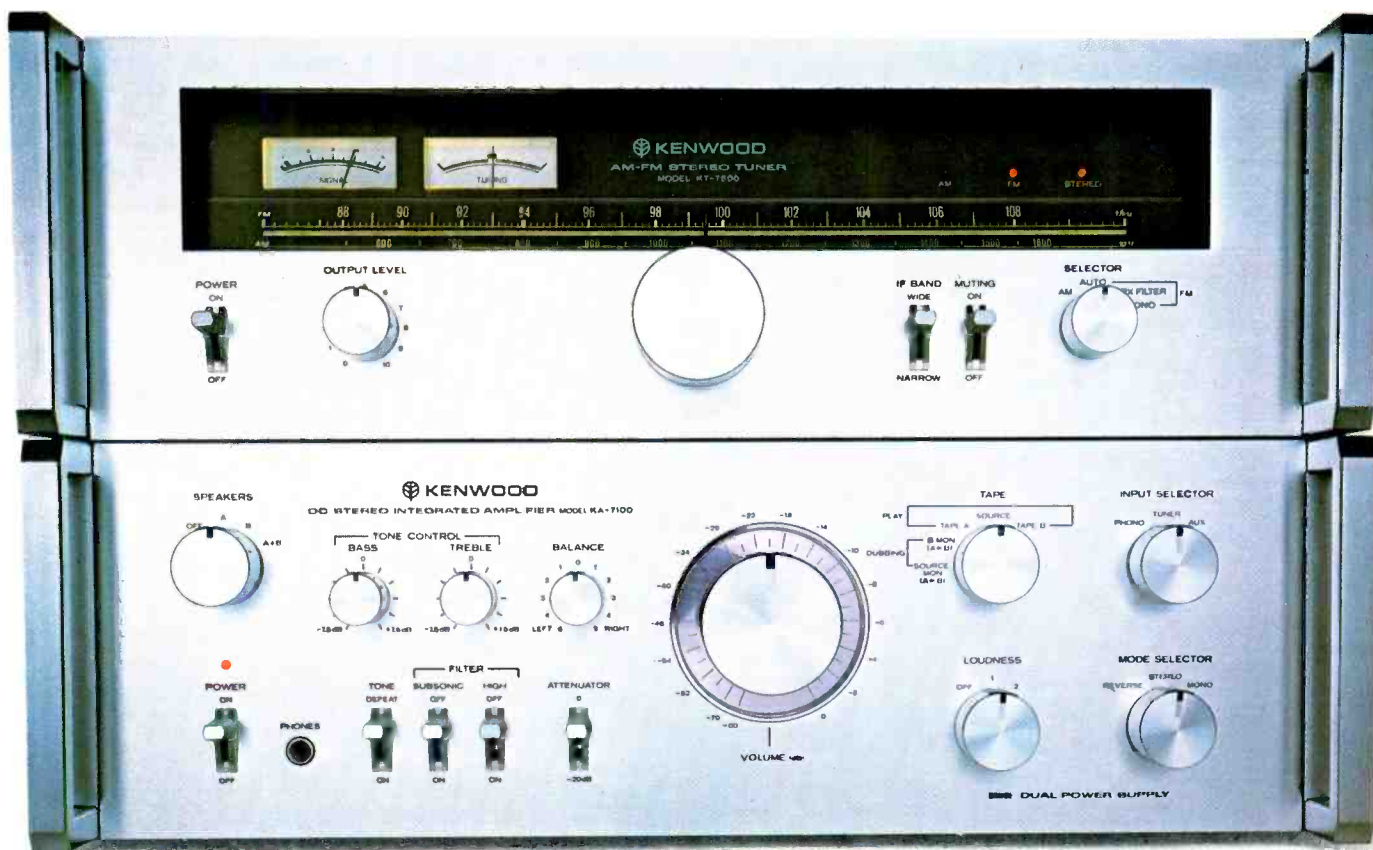


Fig. 3—Amplitude overload can look relatively good as in the top figure, or it can look quite bad as in the bottom figure. These representations are for two different amplifiers under similar overload conditions. The bottom example is close to chattering, which is a condition that should be avoided if at all possible. The overload condition should show clean and slightly rounded waveforms, and quick recovery.



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No. We're not kidding. By 1980, the kind of performance these new Kenwoods deliver will be considered commonplace. Here's a summary:

1. The KA-7100 is an integrated DC amplifier with dual power supplies delivering 60 watts per channel, minimum RMS at 8 ohms from 20-20k Hz, with no more than 0.02% total harmonic distortion. Not only is that the lowest THD of *any* integrated amp, the KA-7100 is the lowest priced DC integrated amp on the market. (\$300*)

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frequency beat distortion (that is, swishing noises) thought to be inherent in stereo FM broadcast. Even we're impressed that it costs only \$275*

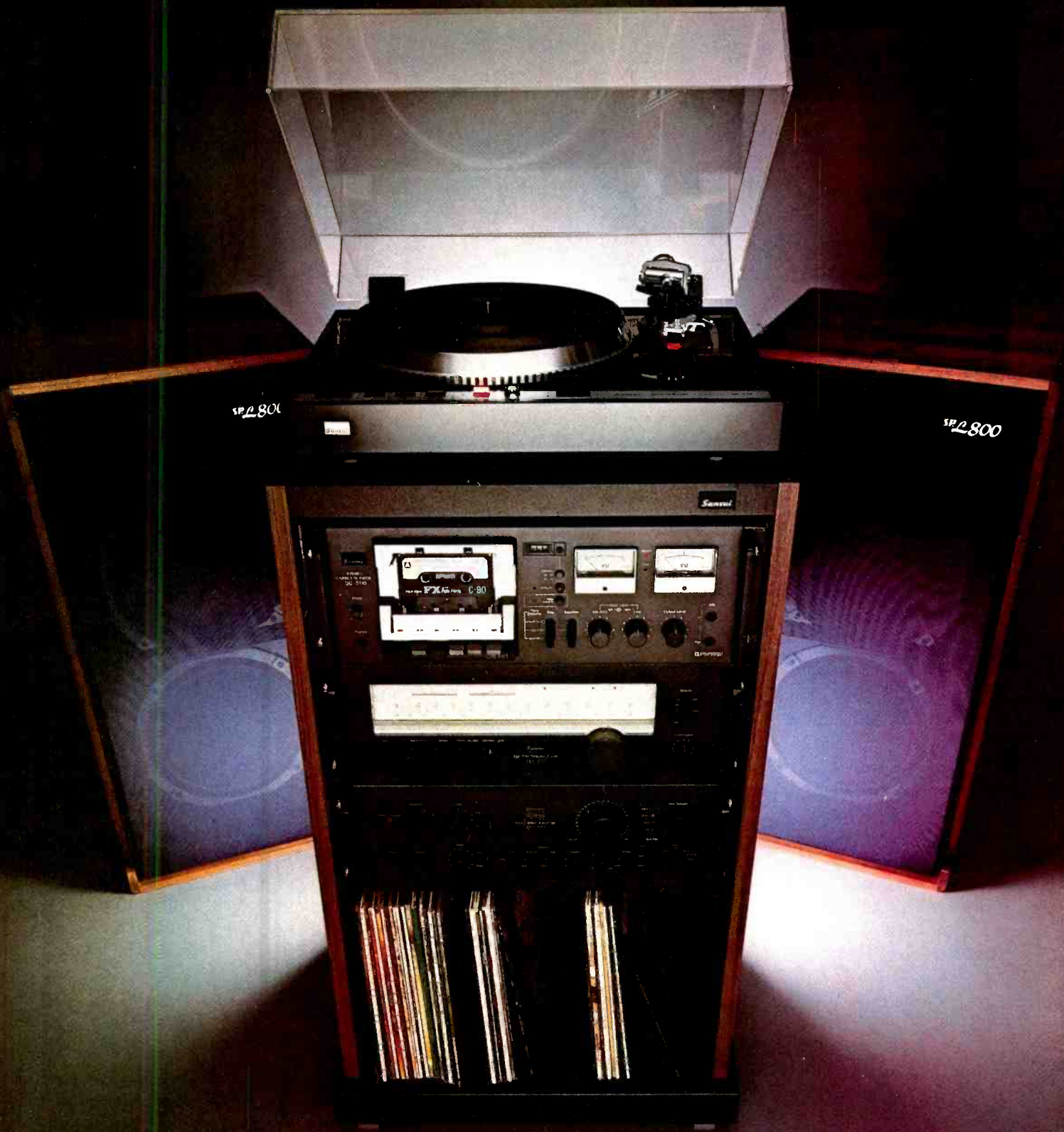
This combination of separate amp and tuner not only gives you performance unheard of in other separate components, it gives you performance that will remain elusive in receivers for quite a while.

The Kenwood KA-7100 and KT-7500. Solid evidence that the breakthroughs occurred ahead of schedule, and available to you now for a truly remarkable price. \$575* for the pair.

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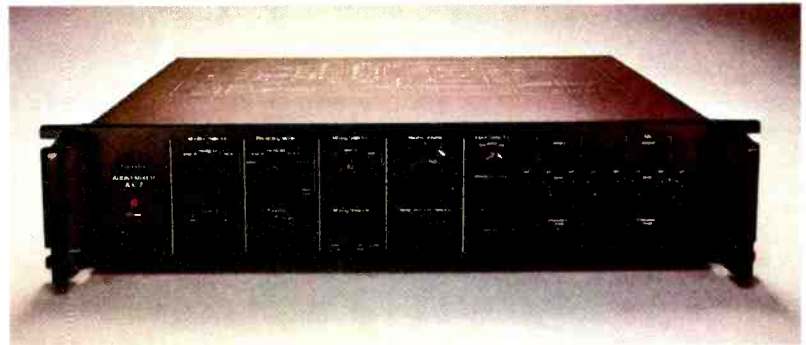
And, of course, if you want to preserve these treasured sounds for years — as clean and pure as they were the very first time you heard them — it's all possible with the **SC-3110 cassette deck**, our rack-mountable version of the SC-3100, already well-known for its superior performance and ultraconvenience including Sansui exclusive Direct-O- Matic loading.

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linear measurements and there is some danger in extending the conclusions to what are certainly non-linear overload effects such as described here. Typical distortion-vs-frequency curves are shown in Fig. 5. Some of the curves seem to rise abruptly and some much more slowly. This would seem to correlate with a soft limiting and hard limiting of the overload mechanism. It is too early to tell which mechanism is the most desirable. I would speculate that the softer limiting causes some distortion all the time, while the hard mechanism distorts very little up to the limit. Thus when the hard limiting mechanism persists, it is even more important to design the system with adequate headroom. Whichever method is used to measure the distortion, it is clear that progress is being made in both understanding the design problem better and in actually creating better amplifiers.

Design Differences

Different designs behave quite differently when they are frequency overloaded, just as is the case for amplitude overloading. Some amplifiers recover quickly and some have a hard time of it. Each individual design must be checked for these overload problems. A good testing laboratory could provide the needed data to the consumer. There are two questions to consider. One is how to design an amplifier that overloads gracefully and recovers quickly. The consumer has little control over this. The second is how to select an amplifier for a given application that will overload as seldom as possible.

Fortunately the consumer is not helpless in making meaningful decisions regarding the latter consideration. In the case of power overload, we need to know the peak voltage or current overload point of the amplifier. For frequency overload we need to know the maximum slew rate of the amplifier. If we never exceed the voltage or current limits of the amplifier there will be essentially no amplitude distortion. If we never exceed the slew rate of the amplifier there will be no transient overloading. Regardless of what you call it, TIM, SID, SRL, TOD, or whatever, we must design the system to prevent or minimize overloading and in particular, overloading of circuits that do not overload "gracefully."

In order to establish some perspective on rules for system design involving any amplifiers and power amplifiers in particular, I will review in summary form some of the statements

made in Reference 2. "The design of an audio amplifier capable of high-quality performance requires first that proper design objectives and principles be established. To determine these objectives and principles it is necessary to treat the amplifier as part of a complete transmission system intended for a specific purpose. This implies considering the nature of the source, the program to be transmitted, the load, and also comparing the amplifier transmission characteristics with those of the other links in the system. By this

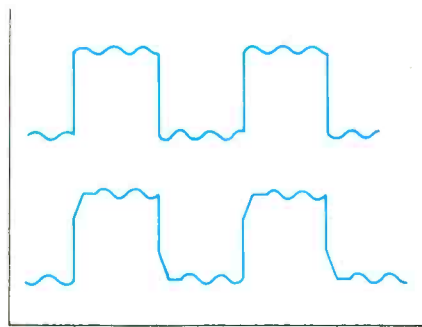


Fig. 4—The test signal devised by Otala shows dramatically when there is any internal overload of the amplifier. Internal amplitude or slew rate limiting could be the cause. Comparisons among amplifiers can be made, but it is very hard to make quantitative measurements with this technique.

means, the working conditions and operating requirements of the amplifier can be derived and design objectives and principles can be developed. Three important areas for which treatment is required are: 1) steady state and transient frequency response, 2) power levels and overload response, and 3) nonlinear distortion." Four additional short quotes are appropriate here. "The open-loop response must be at least equal to the overall response of the portion of the transmission system preceding the power amplifier. . . . (if this) condition is not satisfied, transient overloading will occur inside the feedback loop. This transient overloading will cause appreciable distortion if the amplifier recovers slowly due to capacitor charging or transistor saturation." and ". . . it is likewise impossible to say that W watts of amplifier power will always be adequate. The best one can do is to say that the orchestra will probably produce less than X watts/meter² P per cent of the time. If P is

sufficiently close to 100 per cent of the time, clipping will be infrequent and clipping distortion will therefore be negligible. Thus it is evident that the amplifier power requirement must be based on statistical considerations." and ". . . we find that for 0.333 per cent of the time the signal exceeds a level of 17 or 18 dB above the rms. Thus a clipping margin of at least 17 dB is required (for this case)." and finally, "As noted in the discussion on frequency response, slow recovery from amplifier overload can cause overload distortion to become intolerably large. Thus, for the above overload margin to be applicable, it is required that the amplifier recover very quickly when driven to the point of clipping."

Basic Rules

In somewhat more modern terminology the following set of basic rules should be followed when choosing an amplifier:

1—The instantaneous peak voltage or current capability of the amplifier with the given load connected must not be exceeded by the demands of the program material. (Within the limits set by the desired probability of overload as determined from the statistics of the signal.)

2—The maximum rate of change of the voltage that the power amplifier can deliver to the given load must not be exceeded by the demands of the program material at any combination of frequency and peak output voltage required. (This rule is related to frequency overload.)

3—Rule No. 2 can be restated in terms of frequency response or slew rate as follows: a) the closed-loop slew rate of the amplifier must be greater than the demands of the program material, or b) The open-loop bandwidth of the amplifier must be greater than that of the program material. (Both statements under the same level and load restrictions as in Rules No. 1 and 2.)

4—If both types of overload are minimized, as they will be in a well-designed system, then the distortion levels can be made as low as needed by application of sufficient feedback. The actual amount of feedback is not a major factor as long as a good stability margin is maintained and overload minimized.

5—If it is expected that either amplitude or frequency overload will occur, then one or more of the following solutions should be pursued.

a) Select an amplifier which will better meet the required criteria.

b) Select an amplifier that will overload in a "well behaved" manner and

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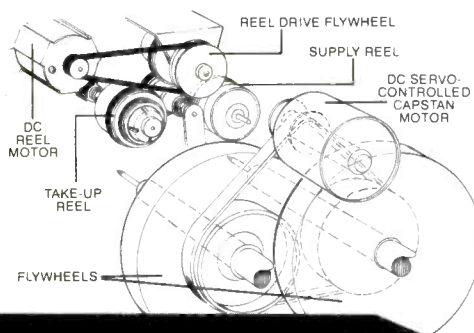
4-micron record head for high output with an incredible 64dB signal-to-noise ratio...and a playback head having a very narrow gap (1.6 micron) for extended frequency response—30 to 18,000 Hz, ± 3 dB. The result is sound recorded on

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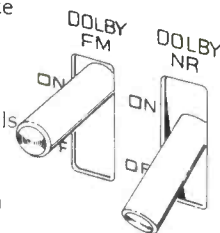
The CR5120 provides a tape/source monitor switch for instantaneous comparison while listening.

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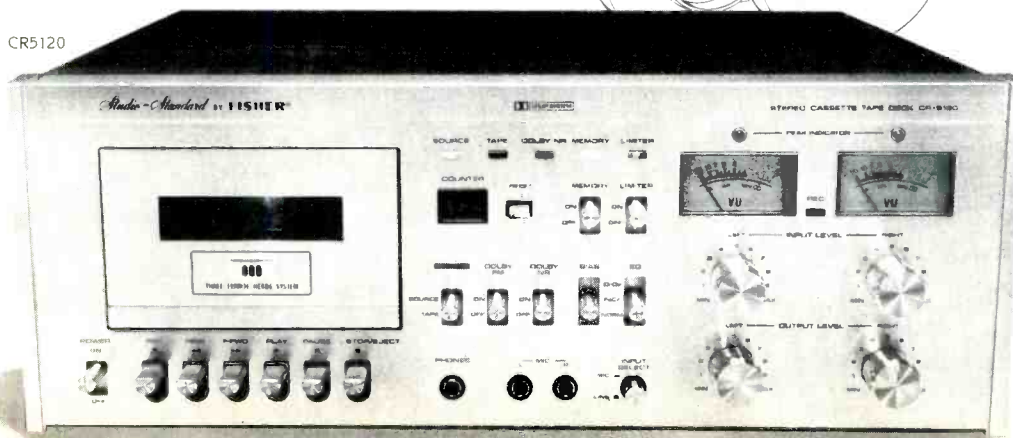
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Specifications

Frequency Response (record/playback)	
Standard Tape	30-15,000 Hz, ± 3 dB
CrO ₂ Tape	30-18,000 Hz, ± 3 dB
Wow & Flutter	0.04% WRMS
Signal to Noise Ratio	64dB
Dimensions (HxWxD)	6 $\frac{1}{4}$ " x 17 $\frac{1}{2}$ " x 12 $\frac{1}{2}$ "

which will recover quickly from any overload.

c) Limit the program material in frequency range and amplitude so the above criteria are satisfied.

6—All of the elements needed to evaluate the above criteria can be measured in an absolute or statistical manner for both the program material and the amplifier so that a design solution is possible.

7—Discussion of the details of the amplifier design for application in a system are not of much consequence unless at the same time all of the above criteria are addressed.

The application of Rule 1, on voltage and current overload, is covered in several places including Reference 4. Simply stated, the rule requires, for highest quality reproduction, that the amplifier never be called upon to deliver an average power level higher than 17 dB below its peak capability or 14 dB below its average capability as measured by standard sinusoidal steady state techniques. This is a very severe requirement. If the amplifier in question has average reading meters, and they are calibrated to read full output at +3 VU, then they should never read higher than -11 VU average to satisfy this requirement. If the amplifier has peak overload lights, they should essentially never go on. One must conclude after seeing many home, rock, and reinforcement systems that this requirement for good design is often broken. It is no wonder that amplifiers sound different when they are often overloading. Even in a home system a surprisingly large amplifier is required, particularly with inefficient loudspeakers. Caution in trusting typical amplifier meters and overload lights should be taken. In many cases, particularly with low impedance and highly reactive loads, the amplifier metering circuits will not give a true picture of the overload condition of the amplifier. Often an external oscilloscope measurement scheme is necessary. The meters are usually most reliable with 8 ohm voice coil type systems.

The application of Rule 2 or 3 (whichever form you prefer) is somewhat more complex. Frequency overload distortion, which is caused by slew rate limiting, depends not only upon the frequencies involved but upon their amplitude as well. Slew rate depends directly on the product of the amplitude and frequency. In order to apply the overload criterion we have to make some estimate of the peak amplitude that we expect at the highest frequency demanded and then find the worst case of the product of these

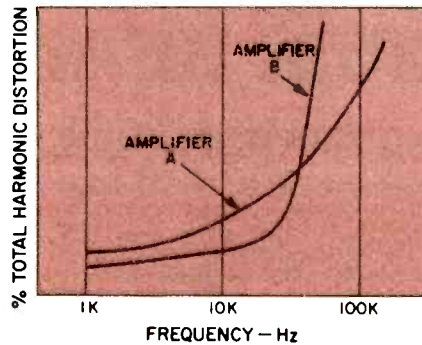



Fig. 5—The shape of the curve showing the onset of distortion may give some indication of the susceptibility of the amplifier to transient types of distortion. There is some danger in extending conclusions drawn from steady state measurements to the prediction of non-linear transient phenomena. Jung's writings on this topic are quite convincing as they relate to operational amplifiers, but it is yet to be seen if amplifier A or B is the better in the case of power amplifiers.

two values. At the same time we must recognize that the slew rate size distribution for a random signal will be similar to the peak amplitude distribution for the same signal at a given frequency. Thus we should really evaluate the slew rate overload problem statistically just as was done for the amplitude overload case. We can then be assured that in a given design that the slew rate will not be exceeded for a certain small per cent of the time. If we apply the same statistics to the slew rate size distribution as to the amplitude distribution we will again find that about 17 dB of slewing headroom is required between the peak slew rate and the average slew rate of the signal. The highest slew rate for the power amplifier will be for a signal of maximum undistorted power at the high band edge of the amplifier. For example, if we require an amplifier of 100 watts rating into a load of 8 ohms and at a frequency of 20,000 Hz, we have a peak voltage of about 40 volts and a slew rate of 5 volts per microsecond. If the system has been designed correctly, the maximum average power required from the amplifier will be 14 dB below the specified average power capability (17 dB below the peak) which will then be 4 watts average. Since the same statistics apply to the slew rate, we find that as long as the power headroom is large enough, the slew rate headroom will be large enough as well. Note that we have

assumed here that the amplifier will deliver full power without distortion at the highest frequency required. This is not always the case for amplifiers. The work of Jung (7) shows that distortion can set in well below the highest frequency that the amplifier might be expected to pass. More investigation of this problem is required. It is essential that amplifier test reports give slew rate information. In fact it should be given for various loads.

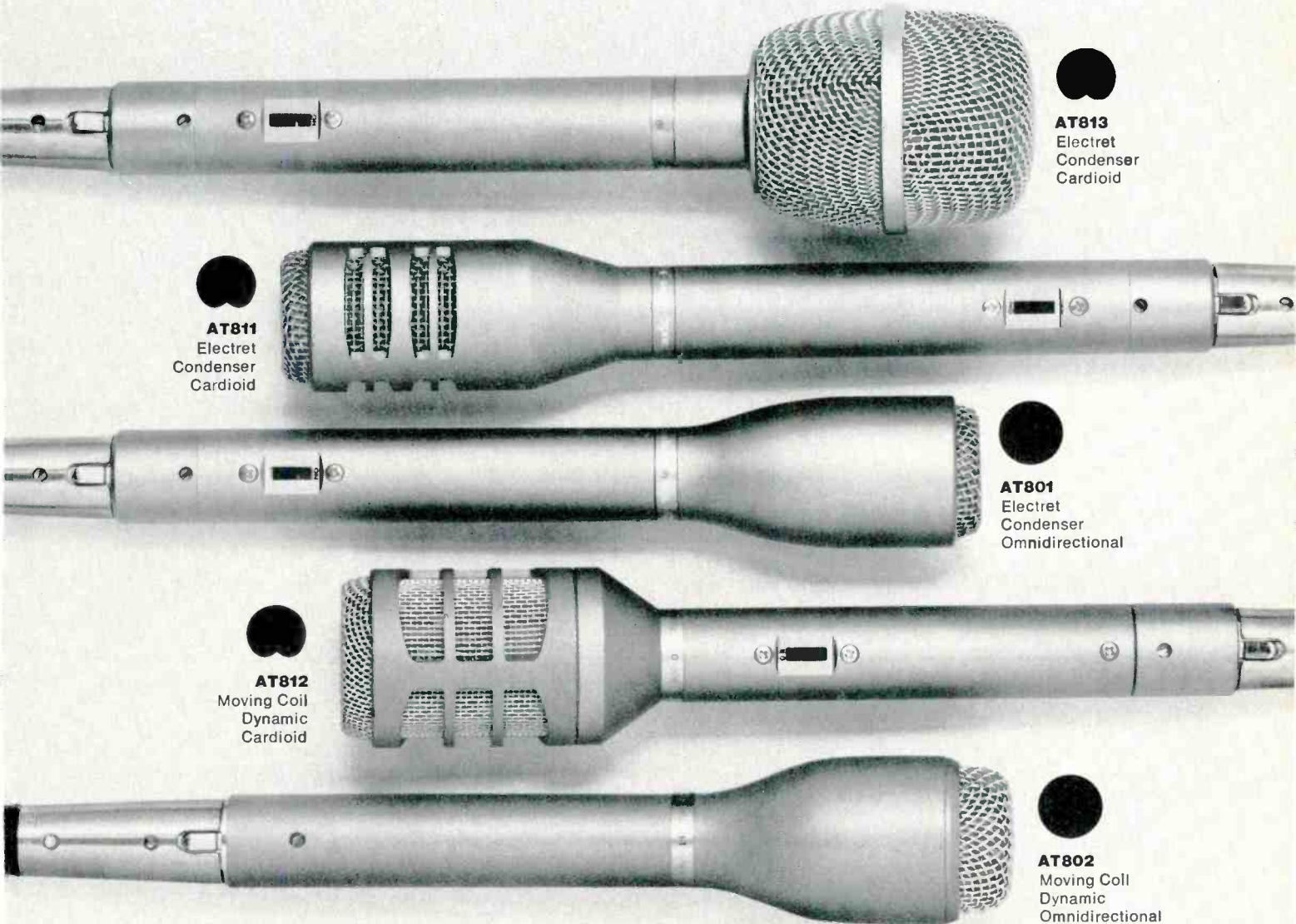
The very same principles apply to preamplifiers, microphone amplifiers, control amplifiers, and the like. All amplifiers can be selected on the basis of their voltage and current overload capability and their slew rate capability. Final judgment about the quality of an amplifier will often depend upon the way it recovers from overload in those rare conditions that it does in fact overload. Unfortunately, with high quality program material and low impedance loads there are conditions where the amplifier can overload more often than might be indicated by casual metering of the power levels. The most sensitive monitoring technique is with an X-Y oscilloscope applied to the input-output amplifier signals. This technique should be used more often than it seems to be in the equipment test reports.

I believe we are again reaching a point where the electronics in a well designed system will again be considered essentially perfect compared to the other elements in the chain of reproduction. Some additional improvements will come when every designer of amplifiers and systems applies the well known rules. 

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Equipment profiles

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Maximum Output: 12 volts.

Phono Input Sensitivity: 1.5 to 18 mV.

High Level Input Sensitivity: 200 mV.

THD (At Rated Output): 0.01 per cent.

IMD (At Rated Output): 0.01 per cent.

Phono Overload: 750 mV.

Frequency Response: Phono, RIAA +0, -0.5 dB; High Level, 10 Hz to 45 kHz, -1.0 dB.

S/N Ratio: Phono, 75 dB, "A" Weighting, re: 1.5 mV in.; High Level, 90 dB, "A" Weighting.

Bass Control Range: ± 10 dB @ 50 Hz.

Treble Control Range: ± 10 dB @ 10 kHz.

High Cut Filter: -9 dB @ 10 kHz.

Low Cut Filter: -9 dB @ 50 Hz.

Audio Muting: -20 dB.

General Specifications

Power Requirements: 120 V, 50/60 Hz, 22 watts.

Dimensions: 18 in. (45.7 cm) W x 5 1/2 in. (14 cm) D x 13 1/2 in. (34.3 cm).

Weight: 22 lbs. (10 kg).

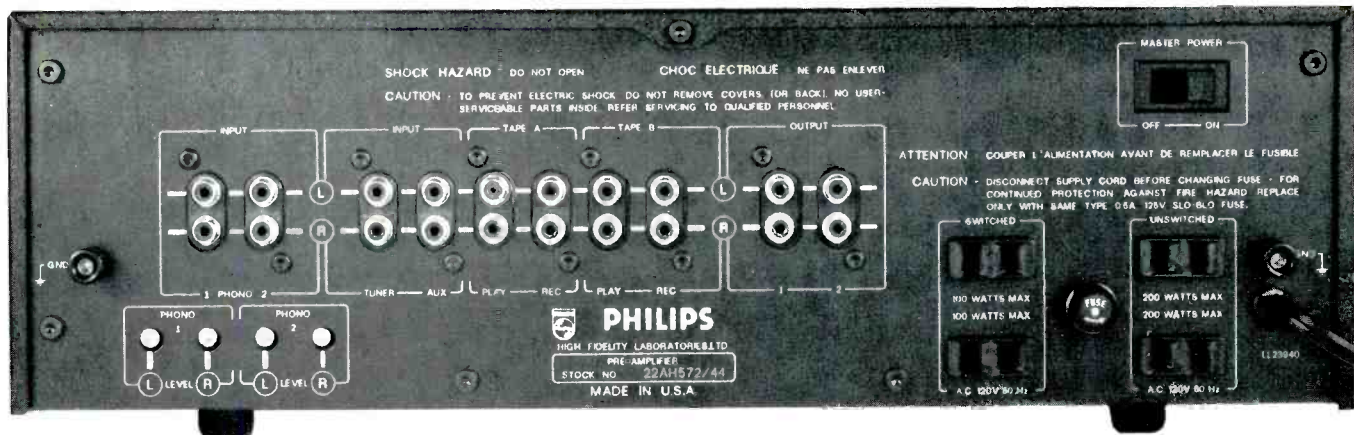
Price: \$599.95.

Philips High Fidelity Laboratories introduced a complete line of high-fidelity component products nearly a year ago, and that in itself is quite an accomplishment when you consider the fact that initially introduced products included a tuner, a separate preamplifier (the subject of this report), and a basic power amplifier—all these in addition to their previously introduced turntable systems and motion feedback speakers. For those who aren't aware of recent corporate changes in the Philips setup, it should be noted that Philips High Fidelity Laboratories was organized as an independent company, part of Magnavox Electronics Company in January 1976. Magnavox, in turn, is totally owned by the North American Philips Co., which suggests that the Philips Laboratory line can avail itself of all the technical know-how of the giant Philips company of the Netherlands, a highly reputed, international electronics organization.

Certainly, from the looks of the front panel of the AH-572, this is not a "me-too" design. The entire upper left section of the panel is devoted to an illuminated graphic representation of the "block diagram" or signal-flow chart of the circuitry inside. Selected program source inputs, tape monitoring choices, listening mode, and even output selected (there are

two output jack sets) are indicated in an easy-to-understand illuminated signal-flow display. Next to this innovative graphic display is the four-position program selector switch (two phonos, tuner, and AUX), center-detented balance control, and a step-detented calibrated master volume control. The dB notations are in 2-dB steps all the way down to -34 dB, with greater dB increments from that point down to "infinite" attenuation.

The lower section of the panel is distinguished by a series of "hand capacitance" type, non-mechanical switches. The touch of a finger across the surface of these switches activates the switch and, at the same time, causes illumination of an LED light contained in each switch element. Switches of this type are used to turn on power, select either of two main outputs, defeat the tone control circuitry, activate low and high filters, the audio muting circuit, the loudness circuit, and tape monitoring. Conventional rotary switches, interspersed between the touch-switches, determine listening mode (stereo, reverse, Mono L+R, L only; or R only), and monitoring or dubbing from and to either of the two tape decks which may be connected to this preamplifier-control unit. Detent-step bass and treble controls are also located in this lower section of the panel, as are a headphone jack and

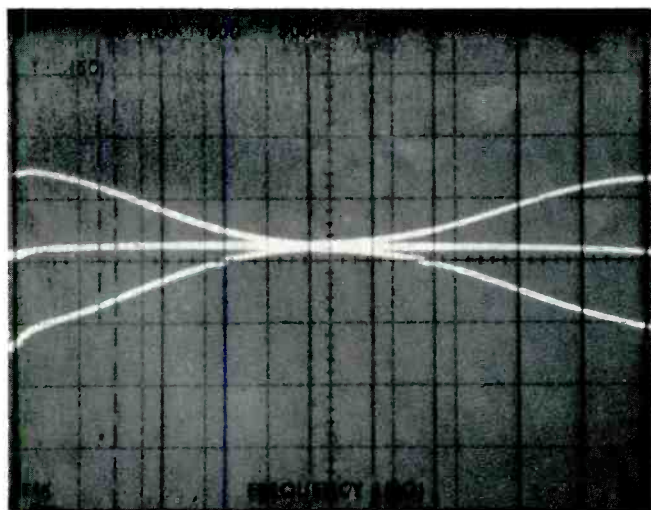


tape-out/tape-in phone jacks which duplicate the second tape monitor circuit located on the rear panel.

In case you are wondering how an electronic touch-switch can be used to turn on power to the unit (since its action depends upon power being applied to the switch in the first place), the mystery is solved when you examine the rear panel. Here, we find a master power switch which must, of course, be turned on in order for the front panel touch-switch to do its job. With the master power switch activated, power is applied only to the circuits which are needed to make the front-panel power switch operative via a second, small transformer and auxiliary power supply. Other supply voltages to the preamp circuits proper are only turned on when the front-panel touch switch is activated. The arrangement is not unlike the "vacation switch" provided on some "instant picture" TV sets.

Below the twin sets of phono inputs on the rear panel are four individual input level controls, two for each set of phono input terminals. This arrangement is superior, even, to those which provide a single input level control for each phono input since having a separate control for left and right phono channels permits the user to precisely balance the stereo phono channels to compensate for even the most minute channel unbalance present in the phono cartridge with which the preamp is used. The rest of the rear panel is taken up by the required high-level input and tape-out jacks, the aforementioned dual sets of output jacks, a pair of chassis ground terminals, two switched and two unswitched a.c. receptacles, and a line fuseholder.

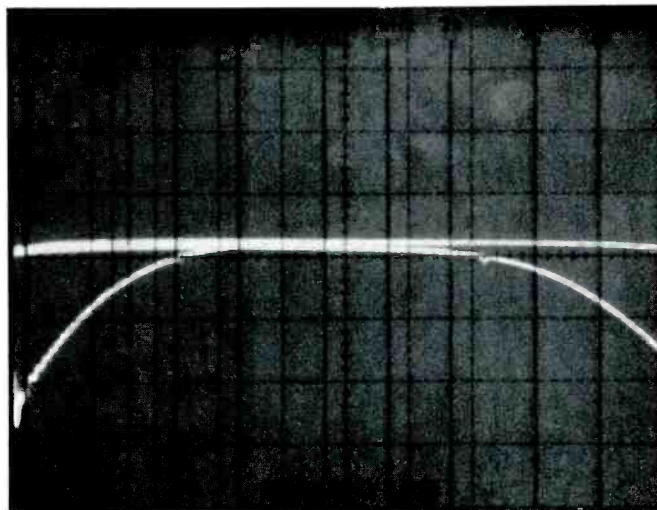
Fig. 1—Bass and treble control range of the Philips AH-572 Pre-amplifier.



Circuit Highlights

There are several circuit features which distinguish this well-designed control center from many other preamp-control units. For one thing, each "tape play" input jack as well as each of the other high level inputs is followed by its own buffering emitter-follower stage. The low-impedance emitter output circuits of these individual stages helps insure against program cross-talk from unused program sources (tuner, for example), even if those connected program sources are delivering signals although not chosen by the program selector switch. Each phono preamp-equalizer circuit (for the *Phono 1* and *Phono 2* inputs) is separate, for a total of four completely independent five-transistor sections, each utilizing a differential-input pair of transistors. This admittedly more costly arrangement has the obvious advantage of not requiring any low-level switching (between *Phono 1* and *Phono 2* inputs), thereby reducing the possibility of hum and noise pickup. Besides the input/phono preamp circuit board modules, there are separate, well laid out p.c. boards for tape monitor/mode circuits, volume and filter circuits, tone control circuits, headphone and output amplifier circuits, power supply circuits, touch switch control circuits, and the touch switch module itself. The touch control module employs no less than eight Darlington-configured transistor packages, six ICs and eight bi-polar transistors, adding quite a bit of cost for this front panel elegance and signal-flow illuminated display and the touch switches with their built-in LEDs are undoubtedly a significant addition to the cost of the bill-of-materials of the AH-572 preamplifier.

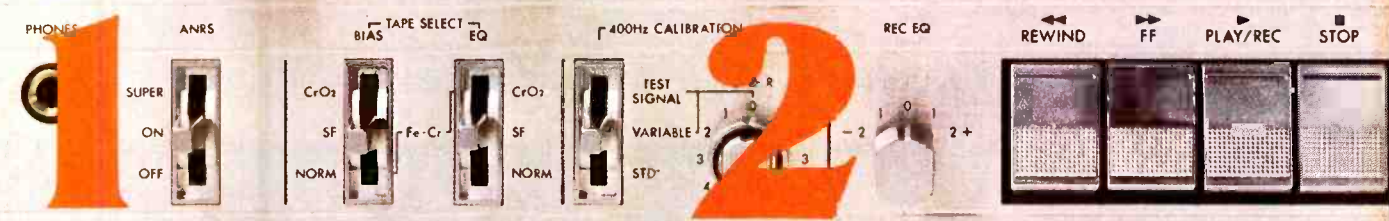
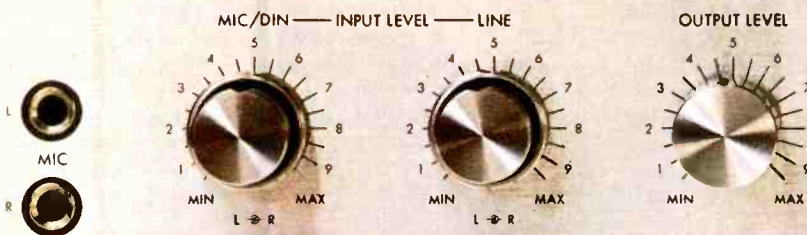
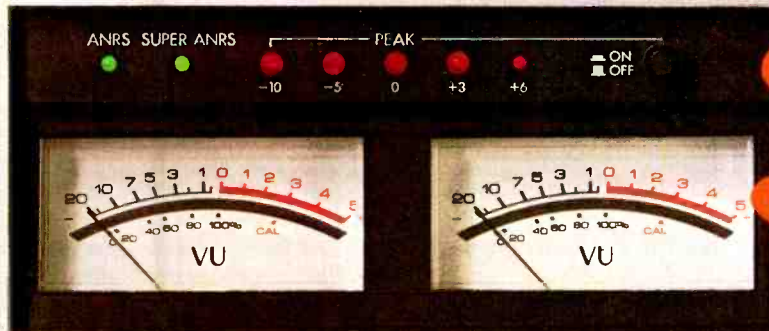
Fig. 2—High- and low-cut filter range.



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Super ANRS KD-95 STEREO CASSETTE DECK



KD 95



CD-S200

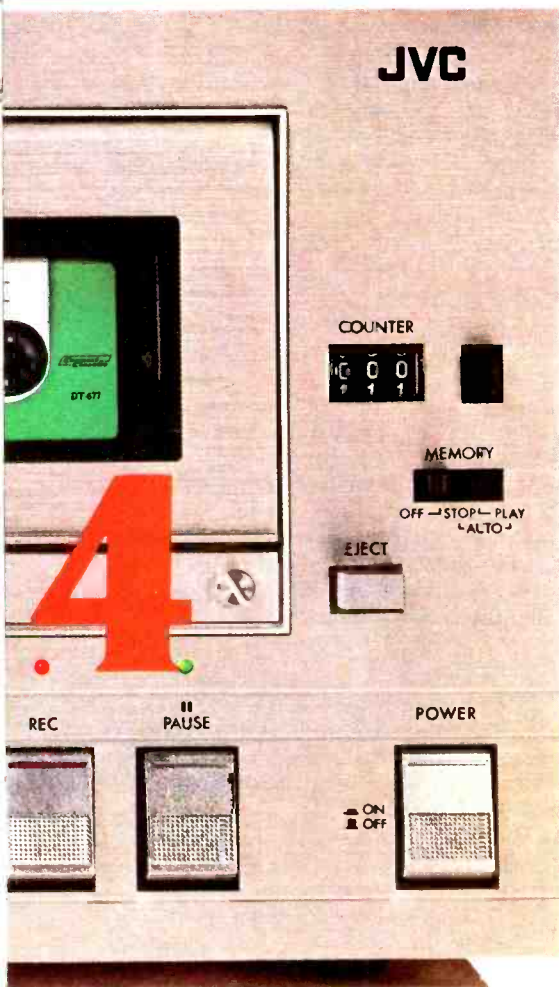


KD-75



KD-35

in what leave out.



Only JVC gives you improved recording with Super ANRS, Recording/EQ switch, 5 Peak Reading LED's and SA heads.*

The measure of fine cassette deck performance is the sound of the recordings you make. JVC's extensive line of high fidelity decks features these exclusive contributions to cassette deck technology.

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3 The entertaining LED's you see on our decks actually help you make better recordings. They're easier to read than VU meters by themselves, so you can record at higher levels without fear of tape saturation.

4 And our SA (Sen-Alloy) heads offer the sensitive performance of permalloy, plus the long life of ferrite in one design. These heads are so excellent in their performance and durability that other manufacturers are buying them from us to use in their decks.

There are a variety of other features to simplify your cassette recording. And our specifications are equal to or better than machines that cost much more.

Once you've seen the things we build in, you'll wonder why the others leave them out.

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For your nearest JVC dealer, call toll-free (outside N.Y.) 800-221-7502.

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*Not all features in all decks.



KD-15



CD-1770

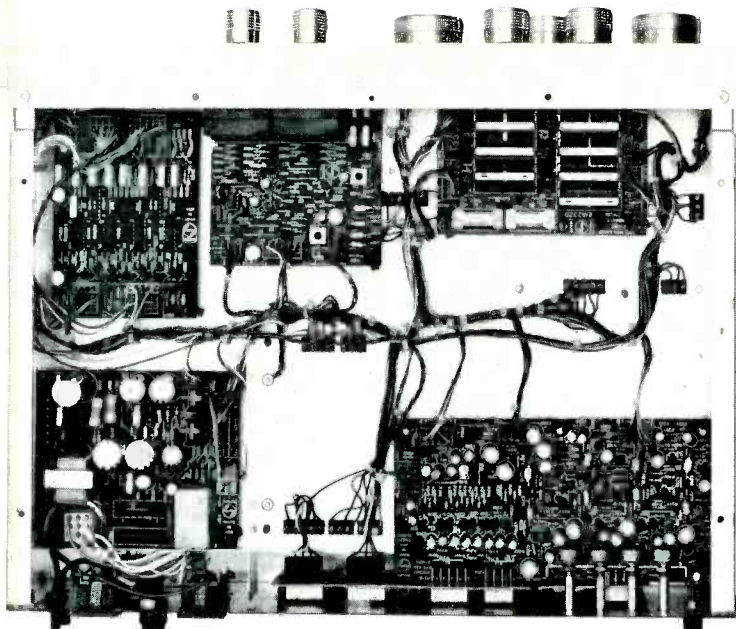


CD-1636



KD-2

JVC



If measured performance were anything but excellent on this unit, we would be inclined to say that Philips has, perhaps, sacrificed audible performance qualities in favor of front panel "gimmicks," but as it turns out, measured and audible performance were virtually beyond reproach, so we are inclined to forgive the makers of this preamp for having their "field day" with an unusual front panel design.

Laboratory Measurements

As calibrated by Philips, the *Phono 1* and *Phono 2* inputs were set for 1.9 mV and 10 mV input sensitivities, respectively. After checking the available range of input sensitivities using the four controls on the rear panel, we restored the settings to these levels and the rest of our phono measurements were based upon those input sensitivities. Overload in phono (based upon 0.1 per cent THD at 1 kHz) occurred with input signals of 180 mV and 870 mV for *Phono 1* and *Phono 2* respectively. Signal-to-noise ratio in phono was 74 dB and 83 dB, unweighted, and referred to the respective input sensitivity figures. Accuracy of RIAA equalization was an impressive ± 0.1 dB from one end of the audio frequency range to the other. THD in phono measured 0.02 per cent at 1 kHz, 0.015 per cent at 500 Hz and 0.015 per cent at 5 kHz, all for rated output (2.0 volts) at the main output terminals.

At rated output, with signals applied to the high level inputs, THD measured 0.01 per cent, much of which was noise. At 20 Hz, THD was 0.006 per cent, while at 20 kHz, the reading for THD was 0.0055 per cent. IM distortion measured 0.0035 per cent for a 2.0 volt equivalent output. Overall clipping occurred at 14.0 volts output. Frequency response via the high-level inputs extended from below 10 Hz to 45 kHz,

for the -1.0 dB roll-off points, and out to 54 kHz for a -3 dB reading. Hum and noise for the high level inputs measured 87.5 dB relative to a 2.0 volt output, unweighted.

The -3 dB cut-off points for the low- and high-cut filters occurred at 110 Hz and 4 kHz respectively—a bit too far within the important musical frequency range, in our opinion; both filters do employ a 12 dB/octave slope. Tone control range of the bass and treble controls is plotted in the 'scope photo of Fig. 1, while filter responses are shown in Fig. 2. Figure 3 illustrates the action of the loudness control circuits from 0 dB to -50 dB settings in 10 dB steps on the master volume control. These traces also serve to show the calibration accuracy of that control, since we set the control for different sweeps shown strictly on the basis of the stepped calibration marks surrounding that control of the front panel. (Each vertical division in the 'scope display represents an amplitude of 10 dB.)

Eliminating the switching circuits at the phono inputs results in excellent channel separation, too, and we measured phono separation of 61 dB at 1 kHz and 43 dB at 10 kHz—well beyond the capabilities of any phono cartridge we know of.

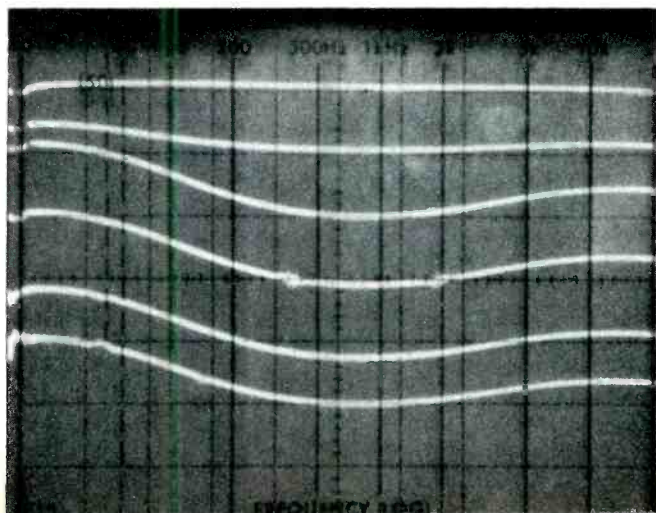
Use and Listening Tests

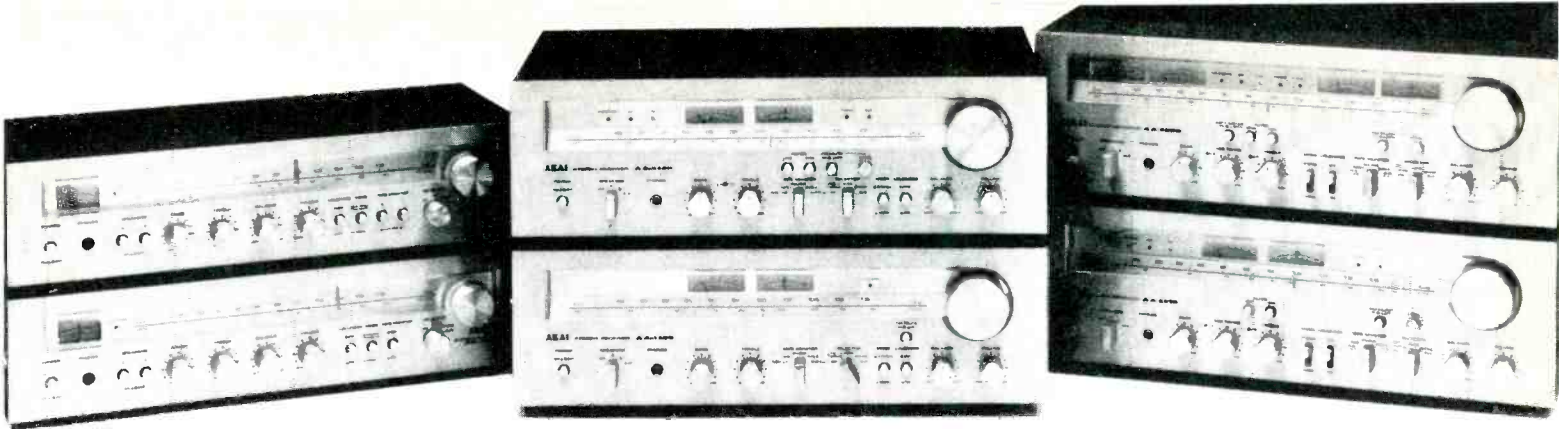
We must admit that even though we were keenly aware of the superfluity of those touch switches and signal-flow lights, we did enjoy using the former and observing the latter. So, too, will a great number of involved audiophiles who appreciate such graphic and easy-to-use extras. To our way of thinking, there is nothing wrong with adding a lot of control flexibility to a preamp control unit *providing* that those extras do not detract from overall sonic performance. In the case of the Philips AH-572, audio performance is excellent. Transient response in phono was especially free of edginess while bass and mid-range reproduction was full-bodied and completely transparent. Obviously, the designers of the AH-572 were concerned first with sound and we suspect that the rest of the frills were added later, more for their eye-appeal on the dealer's shelf than for any contribution they might make to the unit's audio reproduction capabilities. That's fine with us, for the moment. But we would hope that if and when Philips expands their introductory high fidelity component line, they might give thought to producing a similar preamp/control unit minus the lights and touch switches at considerably lower retail cost. More of us might then be able to afford this well-engineered product.

Leonard Feldman

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Fig. 3—Loudness control characteristics.





AKAI introduces just what the doctor ordered to improve your hearing: six great-sounding receivers that put real heart into your system, whether you listen to tape, records or FM.

Choose from six power ranges—15 to 120 watts per channel—with suggested retail prices from \$189.95 to \$649.95. So now, no matter what receiver you want—a good basic unit or a unit with all the features

an audiophile demands—AKAI's for you. You can feel confident that dollar for dollar, spec for spec, you're getting the true-to-life sound you expect from the name AKAI. And a receiver that delivers better tuner sensitivity and less distortion at all volume levels is what a good receiver is all about.

Compare performance, features, design and value at your AKAI

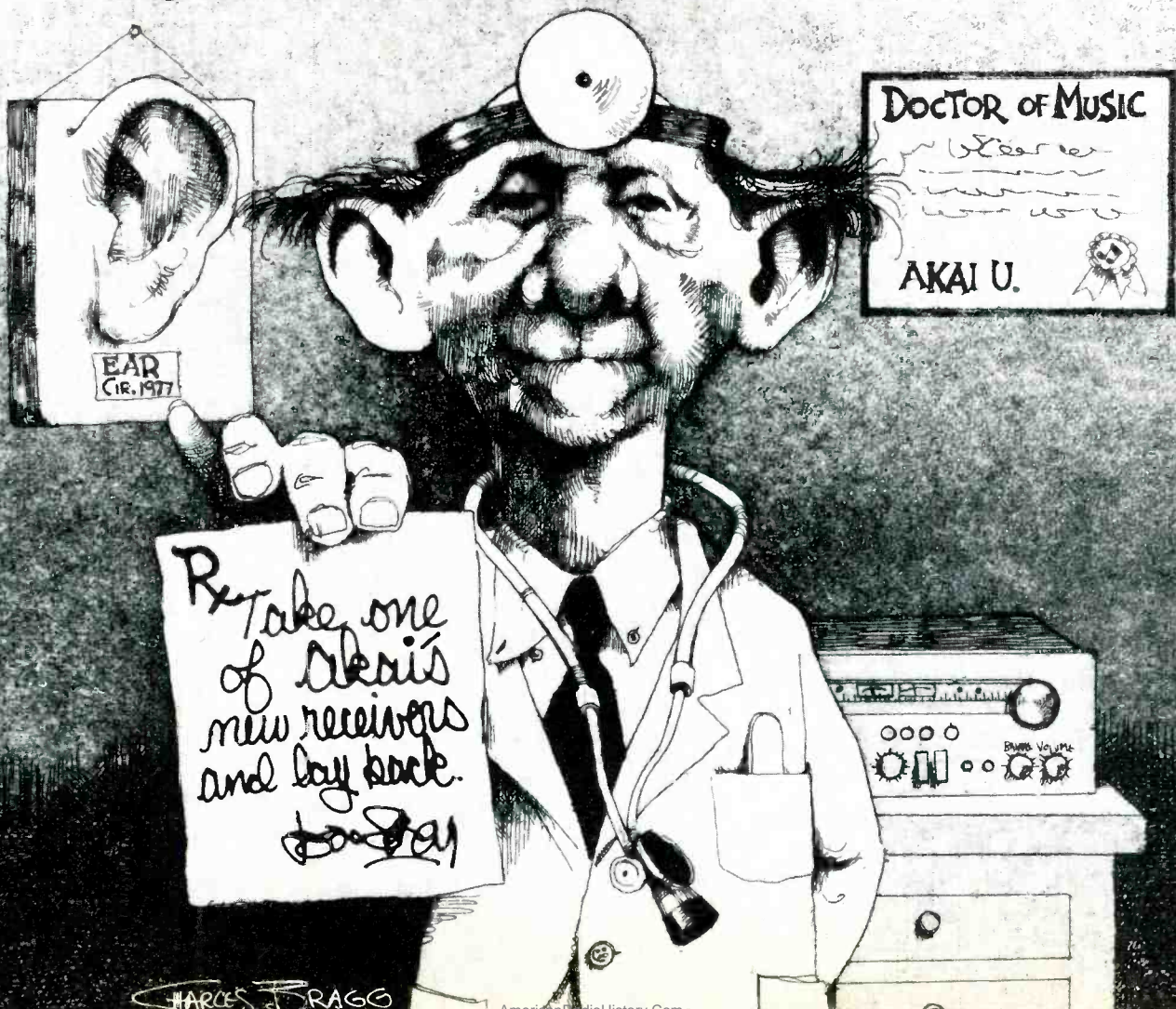
dealer. And start hearing what you've been missing.

Model	Watts/RMS	OHMS	Power Band Width	Total Harmonic Distortion
AA-1115	15	8	40-20,000 Hz	no more than 0.5%
AA-1125	25	8	20-20,000 Hz	no more than 0.3%
AA-1135	35	8	20-20,000 Hz	no more than 0.2%
AA-1150	50	8	20-20,000 Hz	no more than 0.1%
AA-1175	75	8	20-20,000 Hz	no more than 0.08%
AA-1200	120	8	20-20,000 Hz	no more than 0.08%

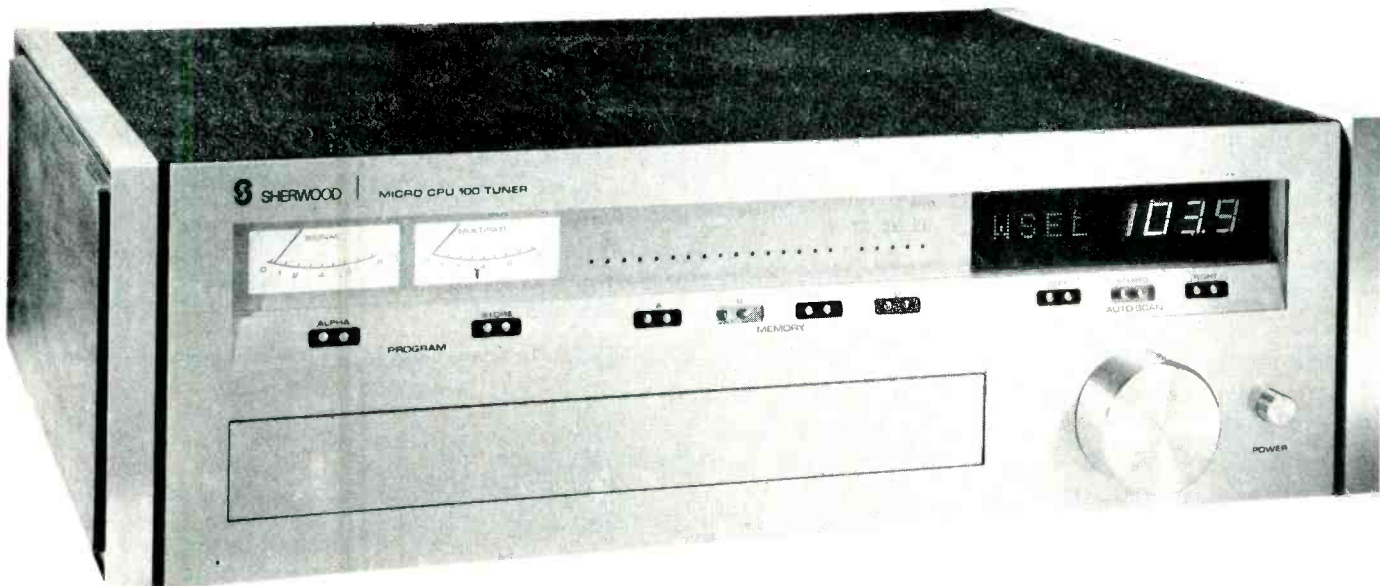


For an 18" x 24" poster of this Charles Bragg etching, send \$2 to AKAI, Dept. A, P.O. Box 6010, Compton, CA 90224. ATTN: Doctor

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CHARLES BRAGG



Sherwood Model Micro/CPU 100 Stereo FM Tuner

MANUFACTURER'S SPECIFICATIONS

IHF Usable Sensitivity: Normal, 1.7 μV (9.84 dBf); Wide, 1.7 μV (9.84 dBf).

50 dB Quieting: Normal, 2.1 μV (11.7 dBf); Wide, 2.6 μV (13.5 dBf).

50 dB Quieting Stereo: Normal, 25 μV (33.2 dBf); Wide, 30 μV (34.7 dBf).

THD Mono: Normal, 0.1 per cent @ 100 Hz and 1 kHz, 0.15 per cent @ 6

kHz; Wide, 0.07 per cent @ 100 Hz and 1 kHz, 0.1 per cent @ 6 kHz.

THD Stereo: Normal, 0.2 per cent @ 100 and 1 kHz, 0.25 per cent @ 6 kHz; Wide, 0.15 per cent @ 100 Hz and 1 kHz, 0.15 per cent @ 6 kHz.

S/N Ratio: Mono, 75 dB; Stereo, 72 dB.

Capture Ratio: Normal, 1.0 dB; Wide, 0.5 dB.

Selectivity: Normal, 80 dB; Wide, 18 dB.

Spurious and Image Rejection: 130 dB.

I.F. Rejection: 120 dB.

Muting Threshold: 3.0 μV to 1000 μV .

Stereo Threshold: 4.0 μV (17.3 dBf).

Noise Filter Threshold: 15 μV .

Frequency Response: Mono and Stereo, 20 Hz to 15 kHz, ± 0.5 dB.

19 kHz and 38 kHz Rejection: 80 dB.

Stereo Separation: Normal, 40 dB @ 100 Hz, 45 dB @ 1 kHz, and 35 dB @ 15 kHz; Wide, 45 dB @ 100 Hz, 50 dB @ 1 kHz, and 40 dB @ 15 kHz.

Output Voltage: 1.0 V fixed; 0 to 1.5 V variable.

General Specifications:

Power Requirements: 120 V a.c., 50/60 Hz, 30 watts.

Dimensions: 20 in. (50.8 cm) H x 14 15/16 (38 cm) D x 6 3/8 in. (16.2 cm) H.

Weight: 34 lbs. (15.4 kg).

Price: \$2000.00.

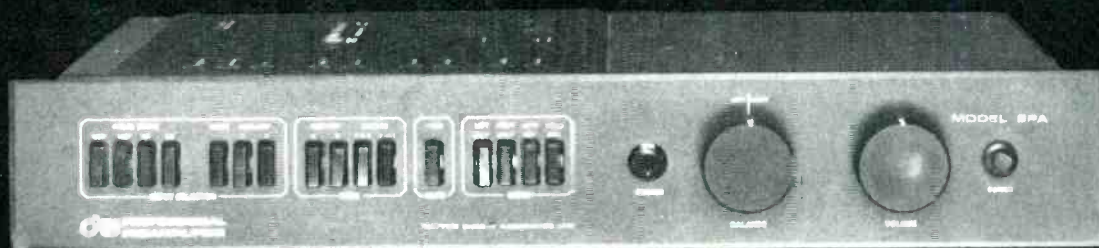
We have just measured what is probably the world's greatest FM tuner! The "probably" qualifier is used simply because we know that many of the measurements we tried to make were limited by the capabilities of our test equipment. Since distortion measurements, for example, were below the stated residuals of our Sound Technology Model 1000A FM Generator, we have no way of knowing whether they are test equipment limited, a combination of product and equipment readings (which may be additive, subtractive, or anything in between) or a true reading of the THD of the product under test. We suspect the latter.

The Sherwood Micro/CPU 100 puts to bed another long-held myth. Until now, it has been generally thought that frequency synthesized tuners cannot exhibit the kind of r.f. performance which is obtainable from conventional, variable capacitor tuned FM tuners. Reasons given have included the higher noise characteristics which were thought to be "inherent" in varactor diodes when they are used as tuning devices, the tendency to skimp on r.f. and i.f. design so as to be able to incorporate all those lovely "memory" buttons, auto-scan tuning, digital read out of frequency, and more. You can forget about that generalization in the case of this "computerized" tuner, too. Not only haven't its designers skimped on basic tuner performance, they have literally outdone themselves!

The front panel of this tuner is completely "uncluttered" in appearance, thanks to the use of a series of electronic "touch" switches and a hinged panel flap behind which are

an assortment of secondary controls that we'll get to in a moment. Above what appears to be a conventional tuning knob (it is much more) are three touch switches, one for tuning down in frequency in an automatic scan mode (scanning stops each time a station is received with signal strength determined by the user), another for up-scale tuning, and a third which sees to it that only stereo signals will be intercepted during the scanning mode, if you so desire. Above these three electronic touch switches is a four-digit display of frequency to which the tuner is tuned *plus* a four letter alpha display which can be used (among other things) to display the call letters of as many as 48 stations in any given area. How does the set know which call letters belong to which frequencies in your area? Why, you simply tell it! Over at the left are two more touch switches, one identified as "Alpha," the other as "Store." To program in a set of call letters, the user touches the Alpha button and presto, the large tuning knob becomes an alpha selector. As you spin it, the first letter display runs through the complete alphabet, plus all the other symbols on a typewriter keyboard. You simply stop when you get to the first of the station's four call letters (usually W or K in this country). Touch the "store" button and you are ready to "dial up" the next call letter, and so forth, until all four station call letters associated with the frequency to which you are then tuned are displayed. When you press the store button after the fourth letter has been displayed, the tuning knob becomes a tuning knob once more, and you are ready to manually tune to the next frequency of interest. It goes

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is this**



No one has yet attained the classical "straight wire with gain," but that's the goal we set for ourselves. What we did accomplish in our new SPA preamplifier is a wide band width, very fast rise time with low T.I.K. The results are low distortion (typically under .001%), clear unmuted musical detail, wide frequency response and very low noise level. The SPA incorporates a separate power supply and features a cascode class "A" differential amplifier with a two input moving coil pre-preamplifier (optional), full compliment tape dubbing and 120/240 volt switching.

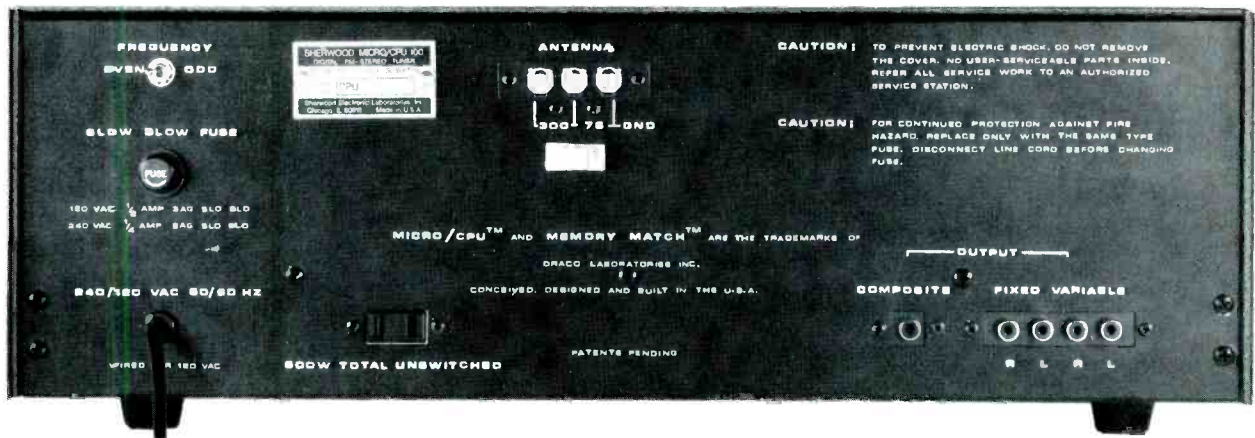
If you want more information, detailed specifications are available on request. But if you're really interested you'll have to spend time at a Dayton Wright dealer. We didn't create the mythical "straight wire" but we did accomplish something worth listening to.



DAYTON WRIGHT ASSOCIATES LIMITED

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without saying that you can, if you are in a playful mood, "program in" any four-letter words you choose and assign them to any frequency . . .

What looks like a conventional "dial scale" at upper center of the panel is, in reality, a series of 20 LED indicator lights, appropriately labelled from 88 MHz to 108 MHz. While somewhat of a redundancy, in view of the direct frequency readout at the right, this "dial" arrangement was included as a psychologically comforting feature for those FM buffs who are too conditioned to a left-to-right dial scale to easily adopt to the newer frequency readout. The meter at the left is a signal-strength meter but, unlike most such meters which often reach peak readings when just a few microvolts of signal are applied to the antenna terminals (rendering them all but useless for accurate antenna orientation), this signal strength meter reads "1" at around 5.0 μV (19.2 dBf), "2" at 100 μV (45 dBf or so), "3" at 1000 μV (around 65 dBf), "4" at 2 mV, "5" at around 7 mV and "6" at around 30 mV.

Since a crystal controlled frequency synthesized tuner such as this does not require a center-of-channel tuning meter (tuning accuracy is better than 0.0024 per cent), the second meter at the upper right of the panel is a multipath indicating meter. The user then orients the antenna for least indication on this meter, which we found to be an extremely sensitive indicator of multipath phenomena.

A gentle push on the hinged flap below opens it to disclose seven more controls and switches. At the left is an output level control (useful in setting tuner output levels to match other program source levels, such as phono and tape), adjacent to which is a wide range muting threshold control. The setting of this control not only determines which stations will be heard during manual tuning, but which will cause the auto-scanning circuits to stop during that tuning mode. A muting switch near the threshold knob defeats muting if you want to do a bit of FM-DX'ing. Next comes one of the more important switches, a selectivity switch. Two completely separate i.f. sections in the tuner provide both a "normal" bandwidth for high selectivity and an extra-wide bandwidth for lowest possible distortion. Choice of bandwidth is determined by local listening conditions and FM station crowding of the dial in your area. An auto-stereo filter switch comes next, and deserves a bit of explanation. Not unlike the "MPX blend" switches we have encountered on other high quality tuners, this one "knows" when to reduce audible noise when weak-signal stereo reception is encountered. In other words, even if the filter switch is "on," if signal strength of a received station exceeds a predetermined level (around 15 μV) such that noise will no longer mar the program, the circuit quietly leaves the scene—automatically.

A mode switch (*Mono/Stereo*) comes next, and finally there is a de-emphasis switch which selects either 75 or 25 micro-second de-emphasis, the latter for Dolby FM broadcast recep-

tion using an outboard Dolby decoder. The main power *On/Off* switch is located just to the right of the tuning/alpha selection knob at the lower right, and, before you ask, let us assure you that *all* of the programmable data which can be entered into the memory circuits of the Micro/CPU 100 is non-volatile. That is, all the call letters, the four favorite station assignments (stored by depressing the A, B, C or D touch switches below the "dial" and the "store" button) are retained in the "memories", even if you unplug the line cord from the wall outlet for up to one year. A small battery takes care of that problem inside the tuner. Of course, the usual stereo indicator light has not been forgotten. It appears above those dial-calibration LED's at the upper center of the panel.

In addition to the usual 75- and 300-ohm antenna terminals, the two sets of output jacks (one pair fixed level, the other for variable output level), a composite or detector output jack, a line fuseholder, and an auxiliary a.c. receptacle, the rear panel of the Sherwood Micro /CPU 100 tuner is equipped with a tiny, two position toggle switch. The purpose of this switch is to select "odd" or "even" frequency increments. In the United States, all FM stations broadcast at frequencies ending in an odd decimal fraction of a Megahertz (e.g. 101.1, 101.3, 101.5, etc.) while in some other countries (notably Europe), even decimal increments are used (e.g. 101.2, 101.4 etc). In some instances, we understand that certain cable-FM operators, who supply FM via their already installed Cable-TV service at extra cost, also re-transmit some FM programs using "even" frequency increments, so the Sherwood unit will work in such cases as well.

As you can probably judge from the internal view of the Sherwood Micro/CPU 100, it contains an enormous amount of sophisticated circuitry. An entire circuit board running the full front-to-back dimension of the unit and mounted vertically along the right side of the chassis contains the needed digital electronic circuitry, including the microprocessor which is directly responsible for many of the "computer like" functions of the tuner. The tuner circuits themselves are contained on the horizontally mounted circuit boards visible in the photo of the chassis interior. All circuit boards are constructed of highest quality glass-epoxy military grade material and extensive metal shielding is used for the front end as well as for the i.f. sections.

While we would have liked to discuss some of the actual circuitry of the Micro/CPU 100 in greater detail, such discussion would more than likely double the length of this test report and would center more on the computer-circuit elements of the design than on the tuner circuitry which was, after all, what we were most concerned with. Those interested in the circuit arrangement will have to content themselves with a careful study of the rather detailed block diagram of the tuner presented in Fig. 1.

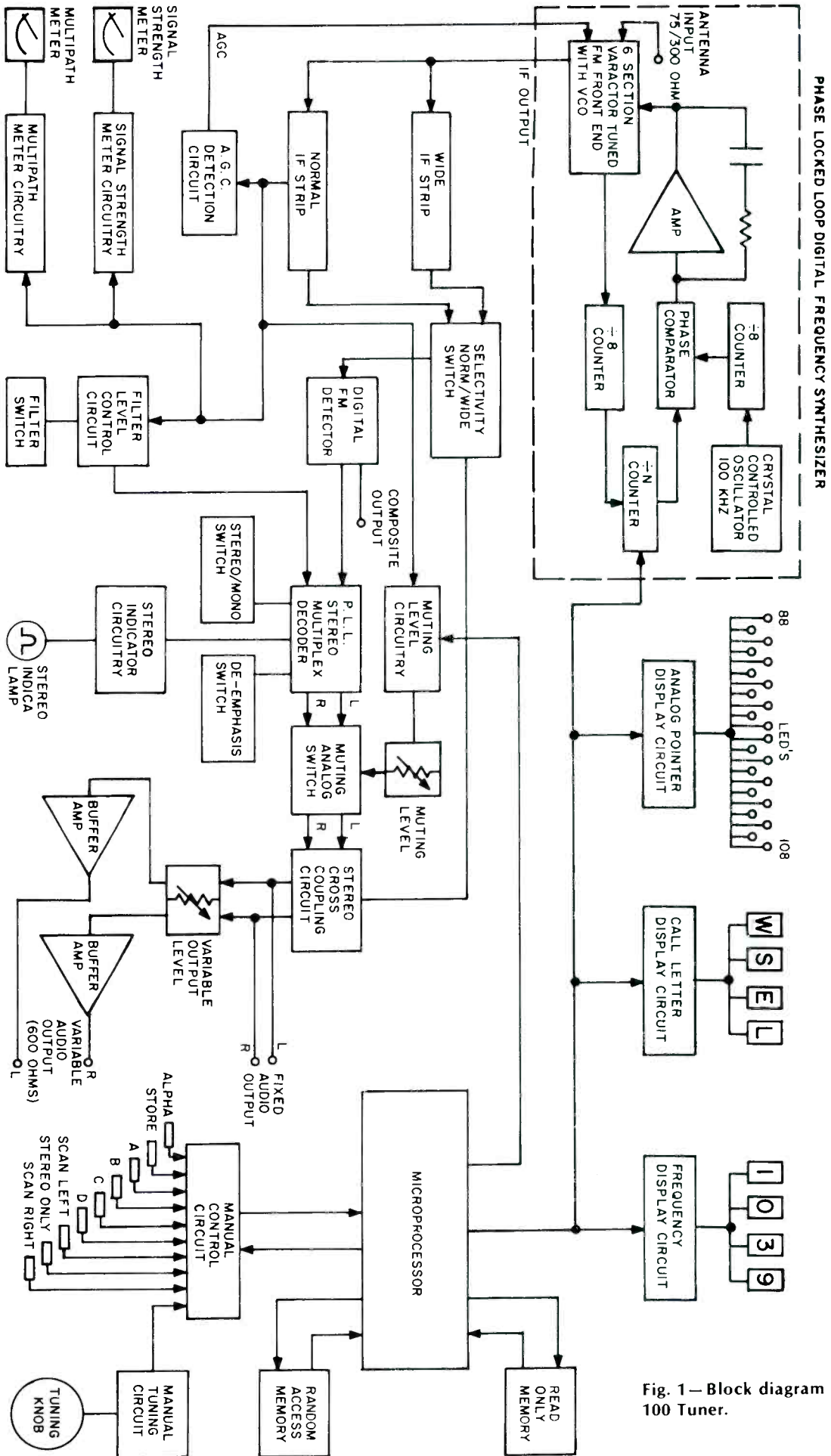


Fig. 1 — Block diagram of the Micro/CPU 100 Tuner.

Channel A



Citation Sixteen

**You've been
putting up with
compromises
all these years,
but now you're
ready for the
ultimate.**



Citation 16s Power Amplifier. Professional version, without instant-reading LED displays.



Citation 17 Preamplifier. Frequency response from below 3Hz to beyond 270,000Hz, -3dB. Less than 0.001% THD, phono preamp less than 0.002% THD.



Citation 19 Power Amplifier. 100W min. RMS per channel into 8 ohms from 20Hz to 20kHz, with less than 0.08% THD. Frequency response from below 5Hz to beyond 140kHz, -3dB.



Citation 17s Preamplifier. Same performance specifications as Citation 17, without active equalizer.



Citation 18 FM Tuner. 50dB Quieting Sensitivity, better than 17 dBf. Audio frequency response, 10Hz—50kHz. Patented Quieting Meter.

You've spent a long time developing your listening sense.

To the point where what's super for most people, for you is just compromise.

You're ready for the ultimate.

Which we call Citation.



The Citations you see here are all brand-new.

Designed to new understandings.

New understandings about transient intermodulation distortion (TIM). About crossover distortion. About FM signal processing and phono preamp design.

The new Citations answer these concerns with features like fast slew rate, low-level negative feedback, discrete components in place of integrated circuits, extended Class A operation, an FM external processor loop, and phono equalization to within ± 0.25 dB of the RIAA curve.

In addition, they all feature the ultra-wideband design pioneered by our first state-of-the-art Citations in 1959. Ultra-wideband design extends flat frequency response well beyond the conventional

20-20,000Hz range. To insure phase linearity and outstanding transient response.

The benefit is an incredibly open, accurate sound. The spacious stereo imaging and the far greater musical detail you've been longing to hear.

Citation components are in use throughout the world. By professionals in their reference systems, by rock bands on stage, and by symphony orchestras in their listening facilities.

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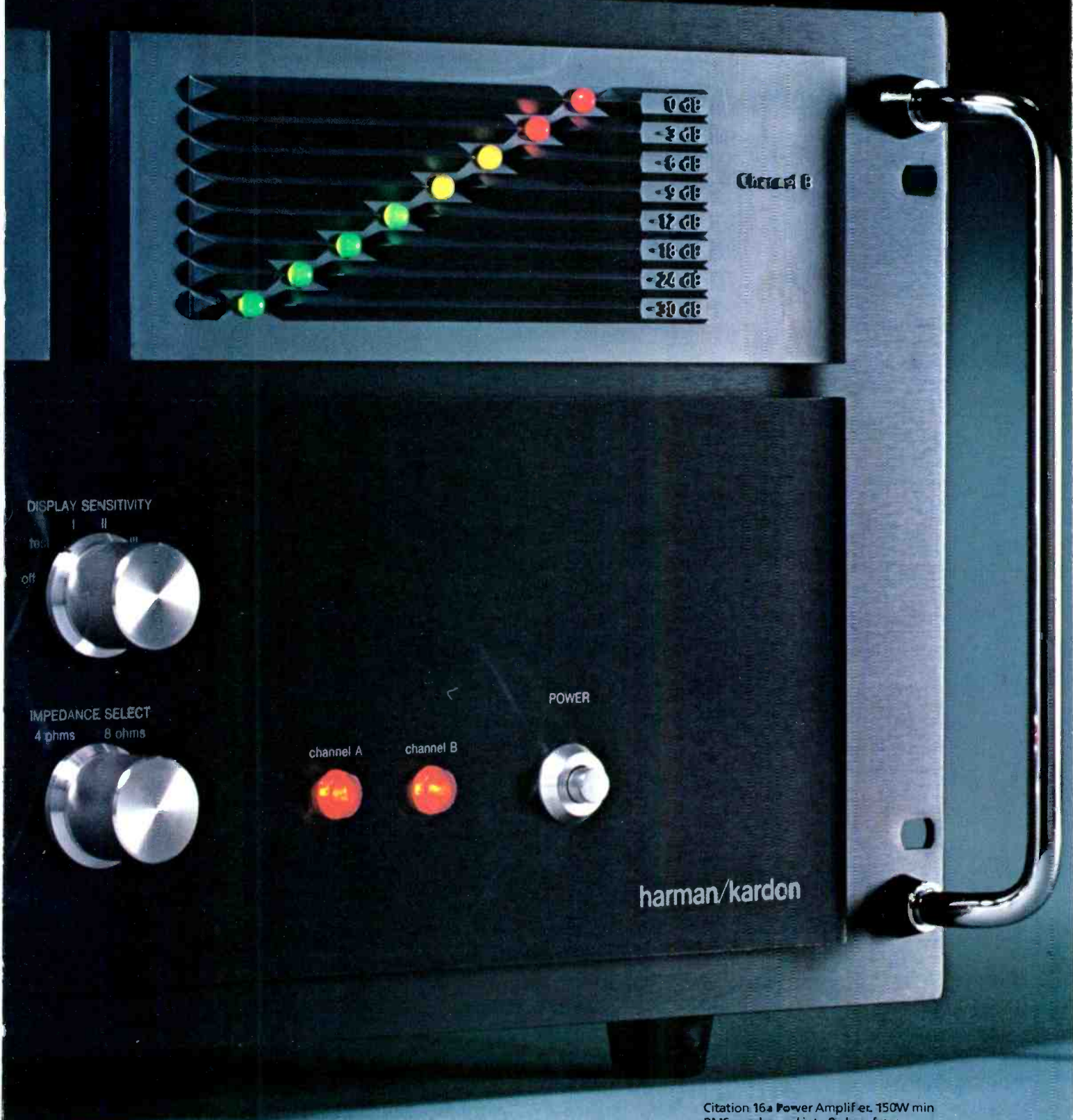
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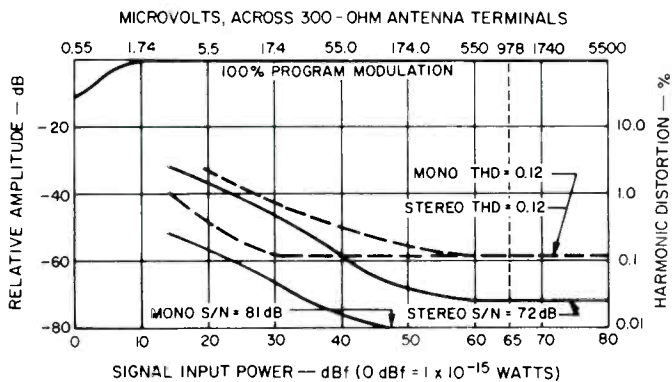


Fig. 2—Mono and stereo quieting and distortion characteristics of the Sherwood Micro/CPU 100 tuner in the Normal i.f. bandwidth.

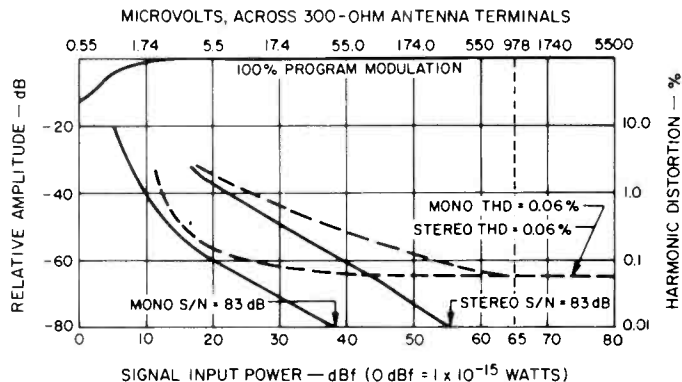


Fig. 3—Mono and stereo quieting and distortion characteristics in the Wide i.f. bandwidth.

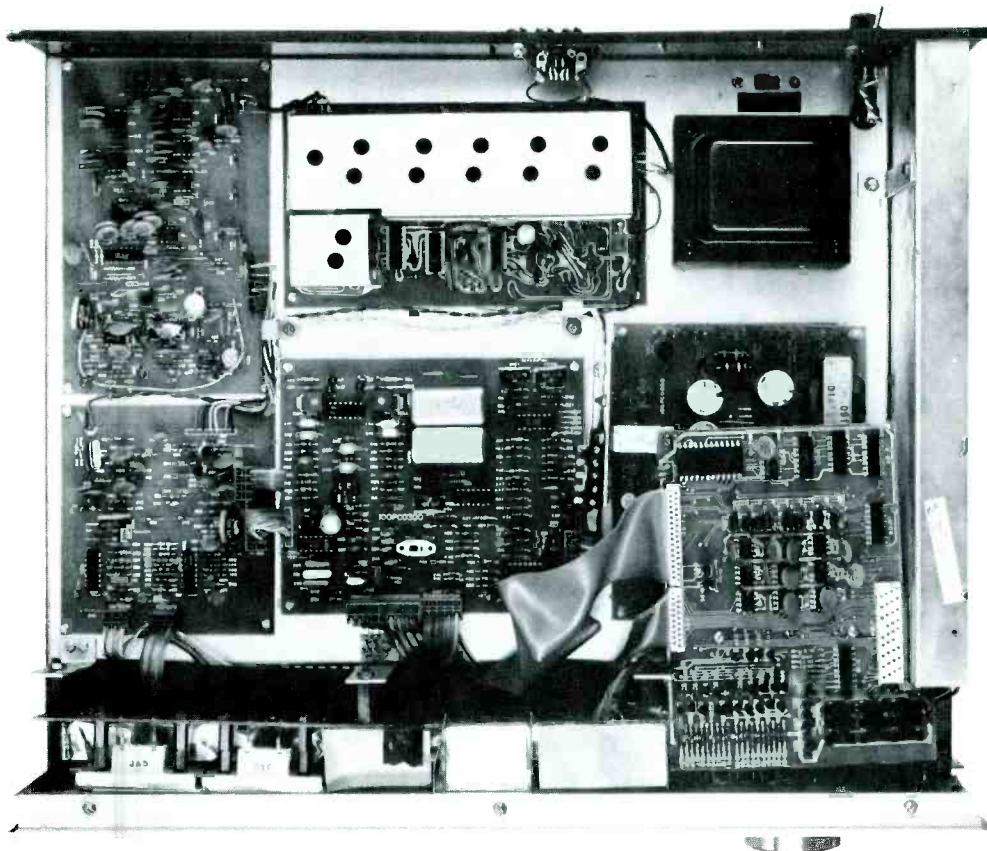
Laboratory Measurements

Many of the basic measurements for the Sherwood Micro/CPU 100 tuner had to be made using both the "Normal" and "Wide" bandwidth positions of selectivity, since bandwidth affects such things as S/N, THD, capture ratio, stereo separation and, of course, selectivity itself. Usable sensitivity in mono measured $1.6 \mu\text{V}$ (9.3 dBf) in the "Wide" i.f. mode; $1.8 \mu\text{V}$ (10.3 dBf) in the "Normal" mode. Fifty dB quieting for mono occurred with signal inputs of $2.1 \mu\text{V}$ (11.6 dBf) for "Wide"; $2.5 \mu\text{V}$ (13.2 dBf) for "Normal". For 50 dB quieting in stereo, we measured signal strengths of $27.0 \mu\text{V}$ in the "Normal" i.f. mode, and $21.0 \mu\text{V}$ (31.6 dBf) in the "Wide" i.f. mode (the lowest, by the way, ever measured on any set for this parameter). Best S/N in mono measured 81 dB and 83 dB using the "Normal" i.f. mode and "Wide" modes respec-

tively. In stereo, best S/N measured 72 and 83 dB for the "Normal" and "Wide" i.f. modes. We were somewhat amused to note that after conferring with the Editor of *Audio Magazine* not too long ago and coming up with new "standard" charts for displaying the quieting and THD characteristics of modern tuners (taking into account the new dBf notations, etc.), the "new" charts (see Figs. 2 and 3) were not good enough for this tuner, and the noise curves run off the bottom of the graph!

Mono and Stereo quieting and distortion (with a 1 kHz modulation signal) are plotted in Fig. 2 for the "Normal" i.f. setting and in Fig. 3 for the "Wide" i.f. setting.

Stereo separation and distortion versus frequency are plotted for the "Normal" bandwidth position in Fig. 4 and for the "Wide" i.f. setting in Fig. 5. Stereo separation measured



54 dB at mid-frequencies in the "Wide" mode and was still a very high 38 dB at 15 kHz and 48 dB at 50 Hz. Frequency response in both mono and stereo (using the 75 microsecond de-emphasis setting) was accurate to within ± 0.1 dB from 30 Hz to 15 kHz. The unusual accuracy of response at the high end is attributable to the fact that a multi-pole low-pass filter is incorporated in the audio signal chain rather than the more common "notch" filter often employed for sub-carrier product suppression. Using this technique, Sherwood was able to maintain flat response all the way out to 15 kHz and yet suppress unwanted 19 kHz and 38 kHz output by more than 80 dB relative to 100 per cent modulation levels!

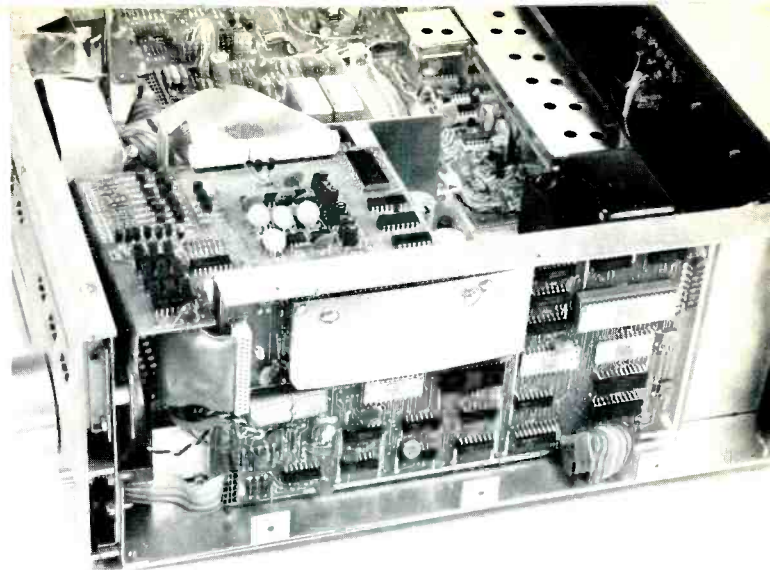
Stereo switching level occurred at $3.0 \mu\text{V}$ (14.7 dBf) in our sample, while muting threshold was adjustable from a low $4.0 \mu\text{V}$ (17.3 dBf) all the way up to $10,000 \mu\text{V}$ (85.2 dBf). We do wonder why such a high muting threshold was provided for, since when we set the muting control to that high level, no stations at all were received either in the scanning mode or in manual tuning. A small point that could probably easily be modified in future production and which would then afford more accurate vernier control at lower muting threshold levels.

Most of the rejection specifications could not be measured accurately, since our test equipment is limited to readings of around 100 dB for i.f., image and spurious rejection and the Sherwood Micro/CPU 100 always did that well (or, most probably better) according to our instrumentation. We were able to confirm a capture ratio of 0.5 dB in the "Wide" i.f. mode and 1.0 dB for the alternate i.f. bandwidth. Selectivity in the "Normal" mode measured 83 dB, a bit better than claimed.

Interesting Sidelights

There is really not much point in discussing the listening quality of the Sherwood Micro/CPU 100. Given a clean signal (and that is the responsibility of the FM broadcaster), the tuner can deliver absolutely flawless audio, with not an audible trace of noise or distortion. To confirm this, we set up a closed circuit transmission facility and used master tape recordings of known high quality to "modulate" our little FM "station" generator. This enabled us to make A-B comparisons between the program reproduced via the tuner and the same program fed directly to the tape inputs of our standard component setup. The two were completely indistinguishable from each other. The fact that we had to resort to this sort of closed-circuit testing is rather a sad commentary on the state of the FM art as it is practiced by most of the stations (with one or two exceptions) in our area!

Living with the Sherwood Micro/CPU 100 for a while, we discovered just how "clever" it really is. As an example, when you wish to "scan" in search of stations, if you start downward in frequency from, say 94.1 MHz, the scanning will



proceed down to 87.5 automatically and then, if you have not settled for a signal in that frequency range, it will hop right up to 94.1 MHz and proceed upwards in frequency, up to 108.5, almost as if it didn't want to waste your time by repeating the scan over previously surveyed frequencies. If you are still not happy, it will simply come to rest back at 94.1, the frequency at which you first commanded it to start scanning!

Some time after we completed our initial bench tests of the Sherwood Micro CPU/100 tuner, its designers were kind enough to send us a "defective" IC component along with a programmed "service" IC which, when plugged into a specific socket on the digital circuitry board actually analyzed the condition of all of the IC's involved in the tuner's computer circuits and quickly displayed the schematic symbol of the "defective" IC which we had deliberately substituted in one of the IC sockets. In other words, the tuner can literally trouble shoot itself! From the looks of it, this program shouldn't have to be run very often. One word of caution: If you have more than 48 listenable stations in your area you will have to content yourself with programming in the call letters of "only" your favorite 48 stations. Should you try to add another set of call letters, the alpha display will quickly flash the word "full." We discovered this feature when, as you might have guessed, we had programmed in that many sets of call letters ourselves and were attempting to enter station number 49! There are probably more things to discover about the Sherwood Micro/CPU 100 that we would have found out about if we had held on to the unit a bit longer, but since we had already been using it longer than we have ever kept any other sample sent to us for evaluation, we reluctantly returned it to Sherwood—along with our heartiest congratulations on a superb design and production accomplishment.

Leonard Feldman

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Fig. 4—Separation and distortion vs. frequency in the Normal i.f. bandwidth.

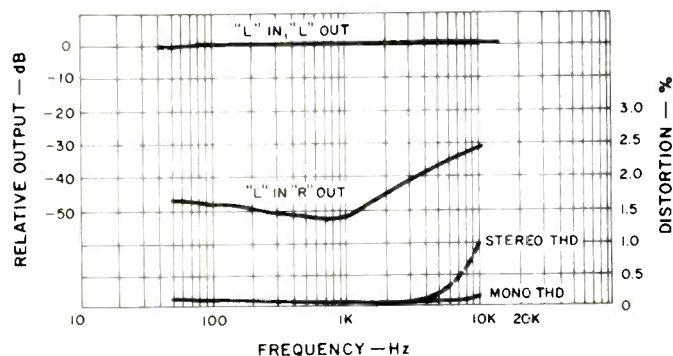
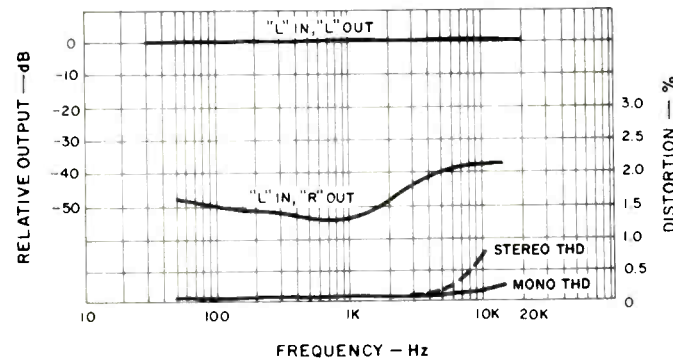
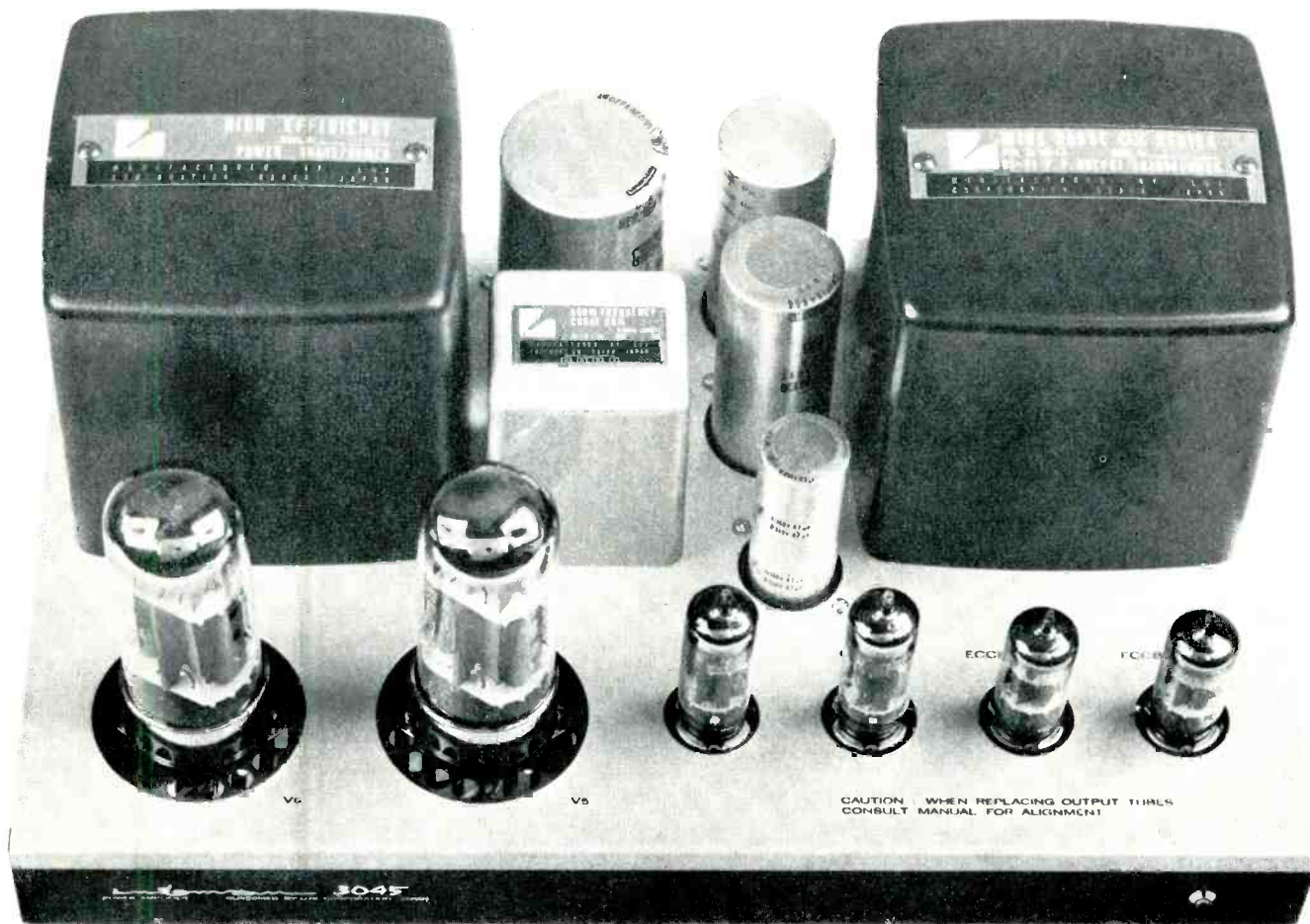


Fig. 5—Separation and distortion vs. frequency in the Wide i.f. bandwidth.





Lux Audio MB-3045 Power Amplifier

MANUFACTURER'S SPECIFICATIONS

Power Output: 50 watts average into 8 ohms. (Note: This is a mono unit; a stereo pair was tested.)

THD: 0.3 per cent.

IM Distortion: 0.3 per cent.

Frequency Response: 10 Hz to 40 kHz, -1 dB.

S/N: 95 dB.

Damping Factor: 16 at 1 kHz, 8 ohms.

Input Sensitivity: 0.7 V

Dimensions: 14½ in. (36.83 cm) W x 9½ in. (24.13 cm) D x 6¼ in. (17.15 cm) H.

Weight: 33.4 lbs. (15.18 kg).

Price: \$495.00.

The Lux MB-3045 is a mono tube power amplifier rated at 50 watts into 4, 8, or 16 ohms. Built in the classic vacuum-tube amplifier style, it's apparent that great emphasis has been placed on the sonic and electrical performance.

A strong steel chassis supports all major components (the MB-3045 weighs 33.4 pounds). Viewed from the front of the unit, the unusually massive power and output transformers sit at the right and left rear corners of the chassis. Between them are three large aluminum, electrolytic capacitors and the power supply filter choke. Directly in front is the row of tubes, which consists of two miniature types, two larger size drivers, and the output pair, which are seated in sockets surrounded by a circular ring of vent holes. A sturdy metal cage covers the top of the unit to protect the amplifier and the user from tube breakage and burns, respectively, while maintaining good ventilation. All circuitry, mounted on two printed circuit boards, and wiring is concealed below the chassis. The semi-fixed d.c. bias, balance, and hum balance controls are also mounted below the surface of the chassis which deters excessive tampering with the controls though making adjustments somewhat inconvenient. A power switch, a.c. socket, and fuse post are mounted on the rear panel along with the input and output connectors and the input level control. The only component visible on the front panel is the small, but bright neon pilot light.

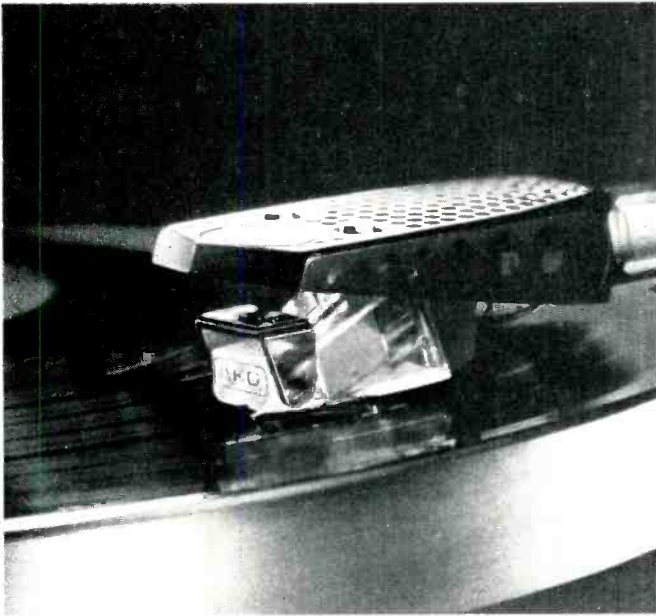
Circuitry

Since the introduction of audio power amplifiers, audiophiles have heard about esoteric tube circuits designed by some high powered engineer for his home system—that surpassed all others. Circuits for such amplifiers seen by this reviewer have tended to use more sophisticated and complicated techniques to allow the designer to simultaneously optimize the greatest number of variables, such as power output, linearity, and response at the extremes of the audio band. However, the Lux MB-3045 appears to be the last word in tube power-amp circuit design, and little expense has been spared to make it so.

Figure 1 shows the circuitry to be fancy indeed. Two stages of differential amplifiers provide a good deal of voltage gain and supply the out-of-phase signals required to drive the output transformer in the usual push-pull fashion. Next, a high voltage differential-driver and cathode-follower stage is employed to provide the very large signal required to drive the grids of the output tubes. (Lux comments that 200 volts, rms, are required at the power tube grids for full power.) The cathode followers are direct coupled to the single pair of output triodes that controls virtually all the signal power.

Most engineers familiar with such vacuum-tube design will probably be wondering at this point what sort of triodes Lux has found that are capable of such relatively high power out-

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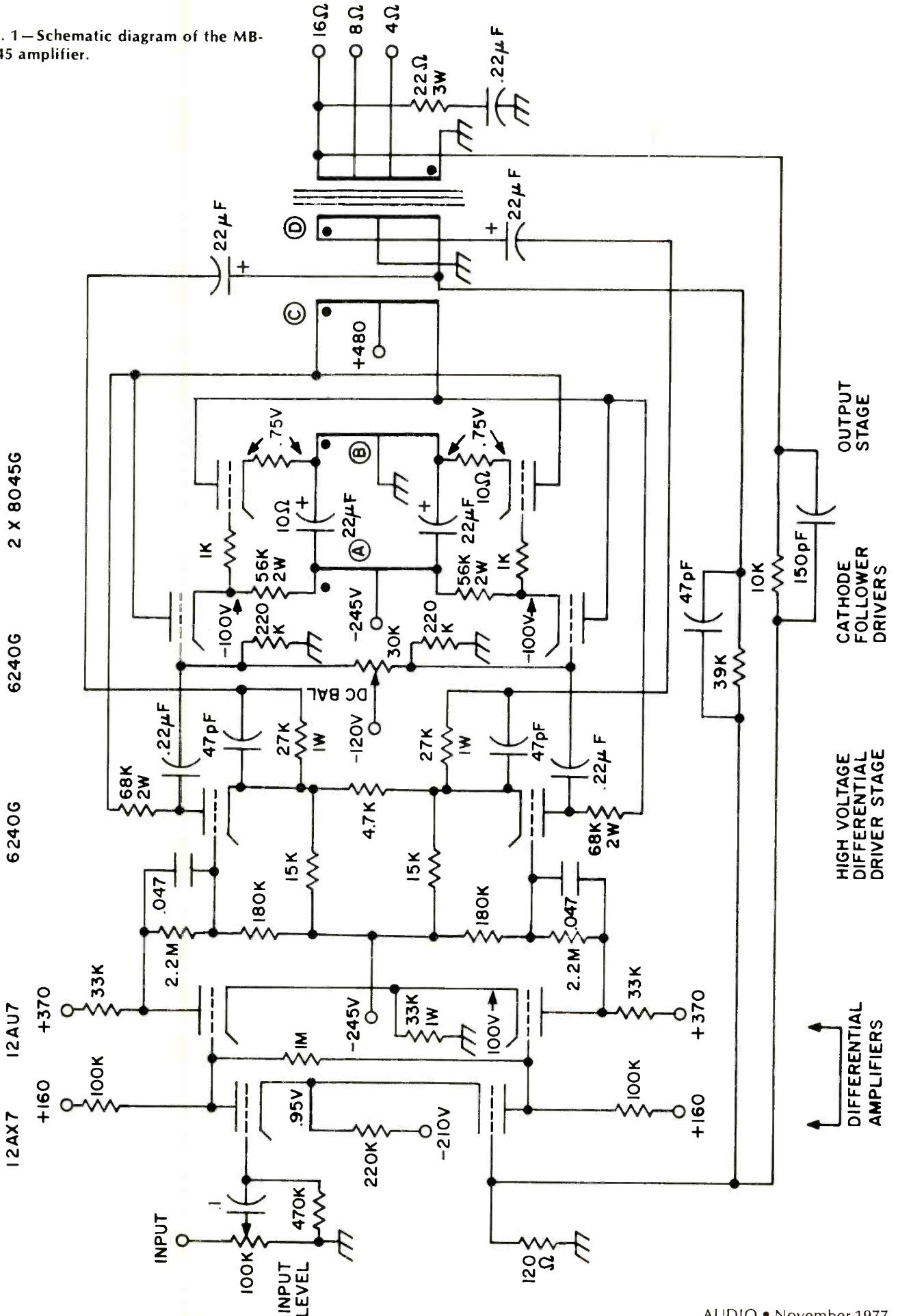


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Fig. 1—Schematic diagram of the MB-3045 amplifier.



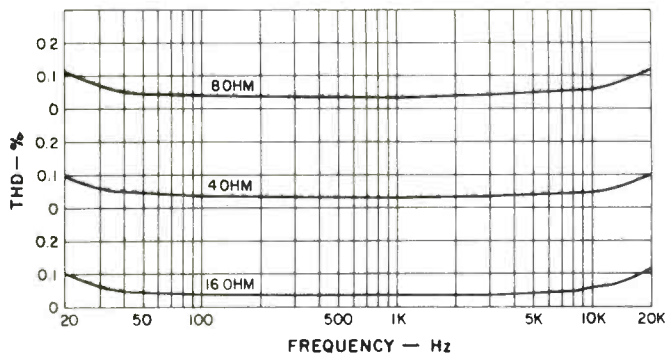


Fig. 2—THD versus frequency for 4-, 8-, and 16-ohm loads at 50-watts output.

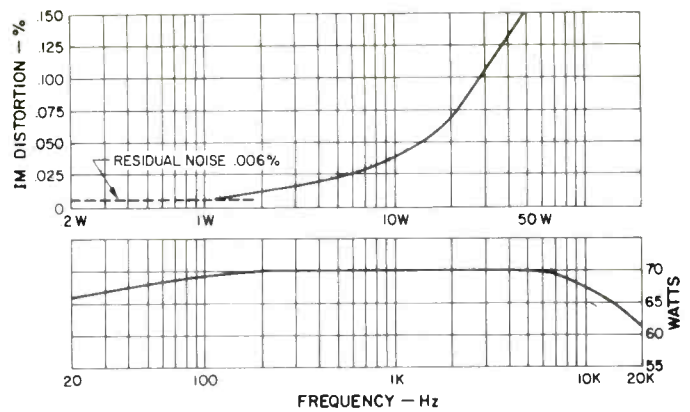


Fig. 3—The MB-3045's power characteristics. Top, SMPTE IM versus output, 8-ohm loads; Bottom, bandwidth for 1.0 per cent THD, 8-ohm loads.

puts with acceptable linearity. In fact, they did not find any, so in cooperation with another Japanese firm (NEC) they designed and manufactured their own 8045G output triode and special 6240G high voltage driver. In addition, a special transformer has been designed to get the best match between the new tubes and the load, which employs amongst other things, quadrafilar wound "primaries."

It is most likely that Lux has chosen to use the triode output tubes for two reasons. Not necessarily in order of importance, they are 1) inherently lower output impedance than pentodes, and 2) inherently better linearity than pentodes. By realizing these two goals, the amplifier will then by nature drive complicated loads such as speakers more gracefully and generate less distortion, with all other things being equal.

The ratios employed in the output transformer were not measured, but if it can be assumed that all four primaries are in a 1:1:1:1 ratio from the knowledge that all four primaries were quadrafilar wound, then perhaps some insight can be had on the operation of the output and driver stages. The first conclusion from this assumption is that the entire output stage is operated near unity voltage gain due to the localized feedback through winding B. Winding A then provides a d.c. current path for the cathode followers and simultaneously operates them closer to constant current operation. Meanwhile, the appropriate phase of winding C tends to maintain the cathode follower's plate-cathode voltage signal swing to

a minimum. Reducing the signal modulation of both current and voltage then should result in improved linearity in this stage. However, the entire 200-volt signal must still be provided by the first 6240G. By bootstrapping the 68-kilohm plate-load resistor from this stage to winding C again, the tube's operating current change with signal is reduced. In this case, the connection to the C winding yields better large signal linearity and increased voltage gain.

The input stages are straightforward differential amplifiers similar to those used in other tube power amplifiers. One noticeable distinction is the use of winding D to apply local differential feedback to the second stage cathodes through the 27-kilohm resistors and the 47-pF capacitors. A summation of signals from winding D and the 16-ohm tap are used for the overall loop feedback, which when divided down by the 120 ohm resistor, is conveniently applied to the inverting input of the first stage differential amplifier. No a.c. balance control was deemed necessary in this circuit, as the inherent balance in the differential amplifiers and the various local feedback loops serve to maintain symmetrical drive to the output transformer.

D.c. bias and balance are provided by the usual voltage divider arrangements, but in this amplifier bias voltage must be applied to the grids of the driver tubes instead of the output tube grids. Within the power supply is the bias voltage divider, which varies the potential on the point marked with



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FM circuitry found usually in separates appears in the 7800.

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You'll receive power. And the means to control it.

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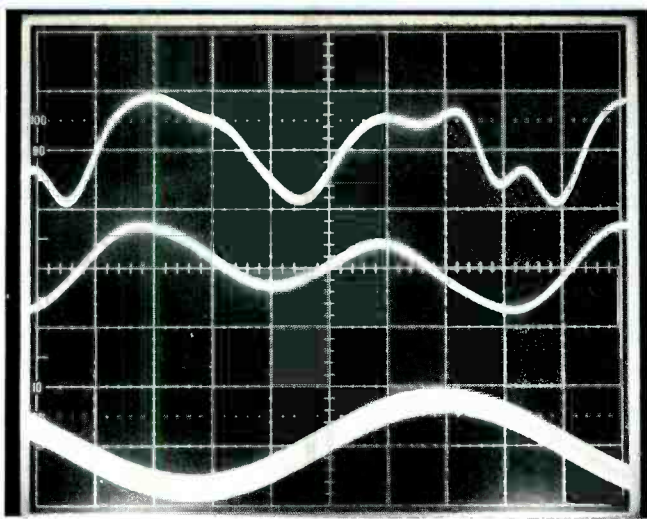


Fig. 4—MB-3045's SMPTM IM residual at 50 watts, Top; and 15.8 watts, Center; with input at bottom.

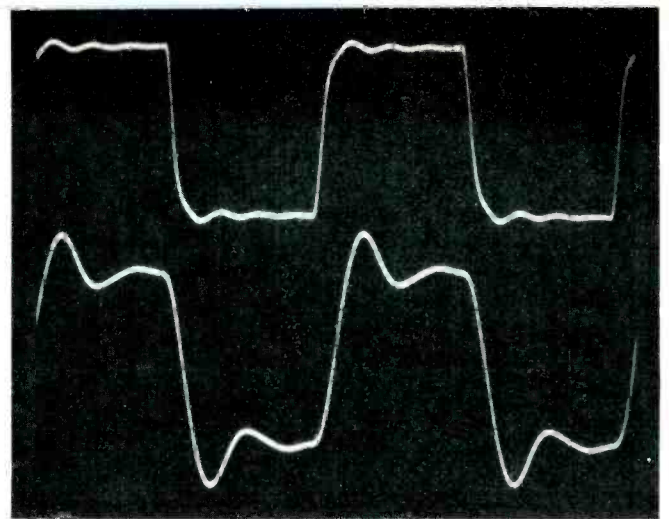


Fig. 6—Response of the MB-3045 to a 10 kHz square wave into an 8 ohm load (Top), and into an 8 ohm load paralleled by 2 μ F. Scale is 10V/div.

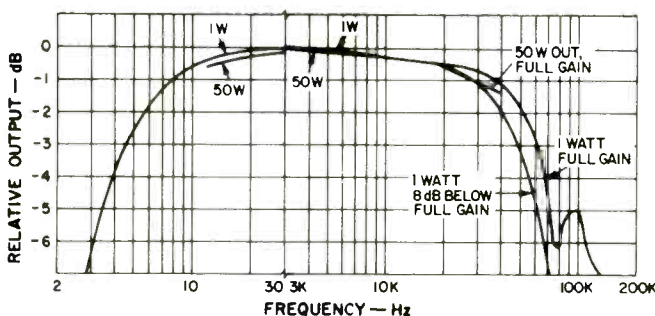
an asterisk; it is nominally -120 volts. The 30-kilohm balance pot gives the necessary range of adjustment to compensate for the variations in tubes and resistors so the unbalanced d.c. current in the output transformer can be reduced to a minimum. Due to the two stages (cathode follower and output tube) and the miniscule degeneration from the 10-ohm cathode resistors, this design has less bias stability than most other tube power amplifiers. Lux recommends that the bias and balance be adjusted whenever replacing output tubes. In the opinion of this reviewer, the best performance will be obtained if they are occasionally adjusted as the tubes age (perhaps every 1000 hours) and also in the unlikely event that the 6240C (V4) tube must be replaced singly.

Measurements

THD measurements are shown in Fig. 2 for 50 watts into 4, 8, and 16 ohm resistive loads. As can be seen from the curves, distortion was almost independent of load resistance. SMPTM IM distortion is shown in Fig. 3 as a function of output power for the 8 ohm load. The Lux curves for this measurement show a gradual rise below 0.3 watt, which was not detected in either unit tested. At powers above 50 watts, distortion rose gradually until clipping occurred. For a 50 watt output, Lux claims a blanket 0.3% maximum THD or IM, and the amplifiers had no trouble staying well below this figure even after many hours use.

Figure 4 is an oscilloscope photo of the IM distortion residual at 50 and 15.8 watts, with the input signal for reference, on the top, center, and bottom traces, respectively. Keeping in mind the delay in the distortion analyzer, the negative going peaks in the residual correspond to the

Fig. 5—MB-3045's frequency response at 1 and 50 watts. (Note break in curves at 30 Hz and 3 kHz.)



negative and positive signal peaks, which can be considered third harmonic distortion. The center trace also shows some evidence of circuit imbalance or second harmonic. Although the distortion gets more complicated at higher power levels, this general sort of residual does not show any strong discontinuity in the behavior, as crossover distortion might cause.

The lower curve in Fig. 3 shows the power bandwidth capabilities of the amplifier. Notice that the roll off at the low frequency end is quite gradual. The 1- and 50-watt frequency responses in Fig. 5 show that this unit actually put out 50 watts at 12 Hz with only modest distortion visible on the 'scope. This is outstanding performance for a tube amplifier and could only be achieved by using a very good output transformer with lots of muscle behind it. At the 1-watt power level, the response is within ± 0.5 dB from 8 to 20 kHz.

These tests are performed with a high quality function generator having a constant 50-ohm output impedance. With this low impedance source and with the input level control full up, 1 dB peaking is apparent at 100 kHz. Since only a handful of preamps present a power amplifier a source impedance this low at 100 kHz, this peak will probably never be excited in normal use. However, all types of behavior such as this should be kept in mind if any problems arise.

Transient phenomena in the MB-3045 tended to be somewhat trying to measure since the observed effects could not be easily isolated. For example, the amp did not exhibit a well-defined slew-rate limitation. Without applying an input signal of larger magnitude than that required to clip the amplifier at 1 kHz, increasing the test frequency to the point of slew-like distortion showed a slew rate of 6-10 volts/microsec. However, the 10 kHz square wave response shown in the upper trace of Fig. 6 shows the output signal exceeding 25 volts/microsec! There should, therefore, be no obvious problem with musical program material.

The lower curve in Fig. 6 shows the same 10 kHz square-wave test, but with the additional load of 2 microfarads in parallel with the 8-ohm load resistor. This ringing is similar to that observed under the same conditions with most transistor amps, but in this case is probably caused by some tuning with the leakage inductance of the output transformer.

Clipping into resistive loads was graceful, like most tube amplifiers. However, the manner in which this amplifier clipped into reactive loads was really outstanding. The waveform took the appearance of very soft peak compression and limiting, and only with very large input overloads did any asymmetry occur.

For the record, the damping factor was measured to be an even 30, which held up surprisingly well through the audio midrange. Gain at 1 kHz was found to be exactly 27.5X or 28.8 dB. This is slightly higher than most amplifiers in this power range and may be useful in some systems.

Listening Tests

A ten-year-old trend in speaker manufacturing, trading efficiency for other improvements such as size and price, has been matched by the large increases in amplifier power ratings. With only one exception, the wave of amplifiers over 100 watts per channel has been limited exclusively to transistor designs by financial considerations and consumer acceptance. It would be natural to expect that for this reason alone the MB-3045 would be rather disadvantaged in the modern audio environment. It is a pleasure to report that this is not so.

Driving a pair of low-efficiency, 8-ohm loudspeakers in a small- to medium-size room actually gave the impression of power. Classical recordings with good dynamic range and rock records were regularly and cleanly reproduced at high volume. One transistor amplifier capable of 100 watts/channel into 8 ohms was incapable of achieving the same subjective levels. But there is obviously more to sound reproduction than just power.

Articulation and depth of imaging from a pair of these Lux amps was very good. Very complicated symphonic passages could be torn apart instrument by instrument from the listener's seat with surprising ease.

The pleasing but unrealistic bass often associated with tube power amplifiers has been replaced in these units with the extended and commanding low end that one has come to expect only from the modern "super" transistor power amps. But the upper midrange and high end silkiness of some older

tube units has remained. Reproduction of music is accomplished with the best of both worlds.

Conclusion

Over some months of operation, the initial irritation from the bulk and inconvenience of two separate, heavy power amps has faded into fascination and respect; they will be missed when they are returned to Lux at the conclusion of this test. But these amps are not for everyone. Their price, at \$495 each, is high for their power. Tube replacement will set one back another \$45 every 3,000 to 5,000 hours (figures supplied by Lux). In addition, there may be the service charge of the technician required to reset the adjustments, and the inconvenience of obtaining the driver and output tubes from the single source—Lux Audio in New York.

Of course, tubes are more rugged than their transistor counterparts when overloaded electrically, but the tubes have other disadvantages too. Much more heat is generated and this requires just as much or more free air to keep temperatures down and component longevity up. As the amplifiers warmed, a slight odor of phenolic arose which may be a little objectionable. And finally, there will always be the old bugaboo of gradual deterioration in performance after the first few hours are put on the tubes.

For the readers thinking about buying a pair of MB-3045s, there is one last item to consider: speaker impedances. Electrostatic (capacitive load!) or 16-ohm dynamic loudspeakers will sway some toward the Lux pair, while others may need the extra power available in transistor jobs when driving 4-ohm loads.

In any case, those who listen to the MB-3045 pair (highly recommended) and appreciate the reproduction, will probably not be able to find a transistor amplifier yet that has all the desirable sonic qualities that these do. *George Pontis.*

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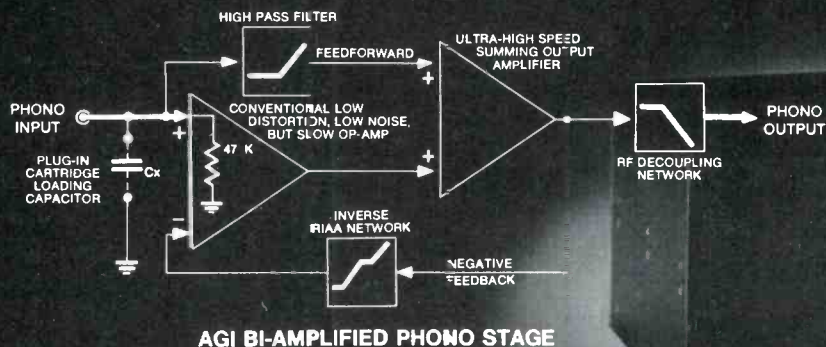
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Noise: 110 dB below maximum output.
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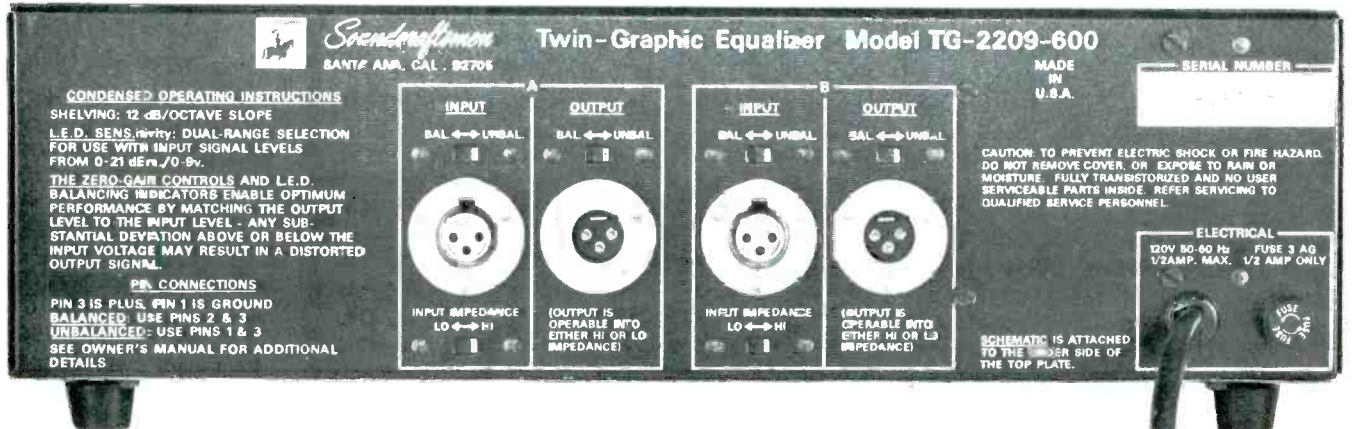
Input Impedance: 600 ohms; switchable, greater than 100 kilohms.
EQ Center Frequencies: 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, and 15,360 Hz.
Boost/Cut Range: ±12 dB at octave center frequencies.
Shelving: Low, 100 Hz @ 12 dB/Octave rolloff; High, 10 kHz @ 12 dB/Octave rolloff.

General Specifications
Dimensions: 19 in. (48.3 cm) W x 5 1/4 in. (13.3 cm) H x 9 in. (22.9 cm) D, notched for rack mounting.
Weight: 18 lbs. (8.16 kg).
Price: \$550.00.

Graphic equalizers have become important sound tailoring tools in both the home audio market and the professional sound field. While the basic functions of an equalizer are essentially the same for both applications, the pro user might find it a bit awkward to use an equalizer intended for home entertainment systems in his sound reinforcement or studio applications. For this reason, Soundcraftsmen offers their Model 2209-600 Equalizer—a unit designed with the professional user in mind.

Examining the brushed, black-anodized aluminum front

panel of the 2209 we find the usual 10 slider controls for each of two channels. Each control is calibrated in 2 dB steps from -12 dB to +12 dB, and each is marked with its center frequency, as indicated in the specifications shown above. There are no detent "stops" at the "flat" positions so a little care must be taken when desiring to set a control at its exact central position. Centered between the two banks of slider controls are a pair of overall-gain slider controls, above and below which are LED indicators for each channel. These controls permit the user to adjust input and output levels for



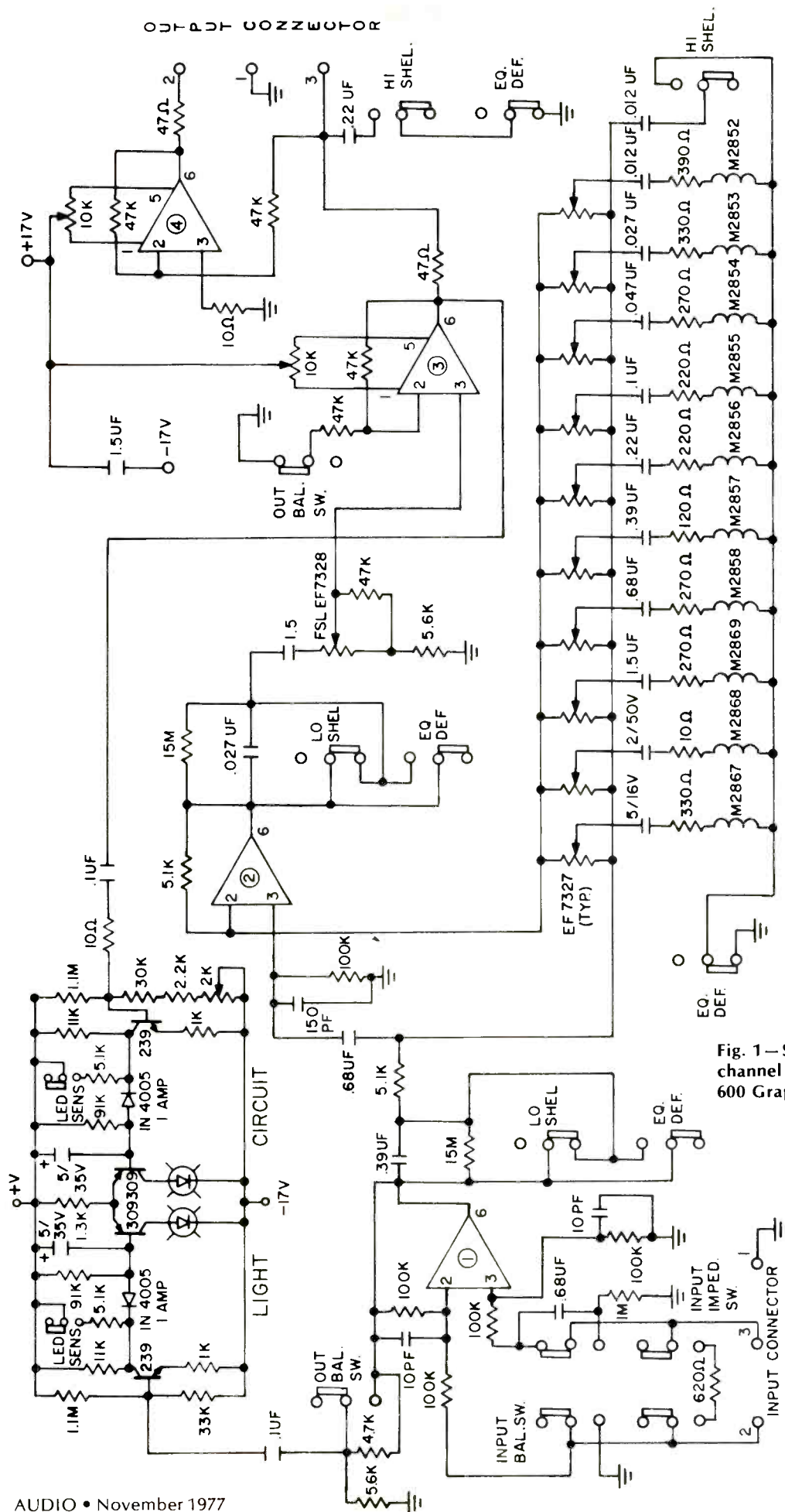
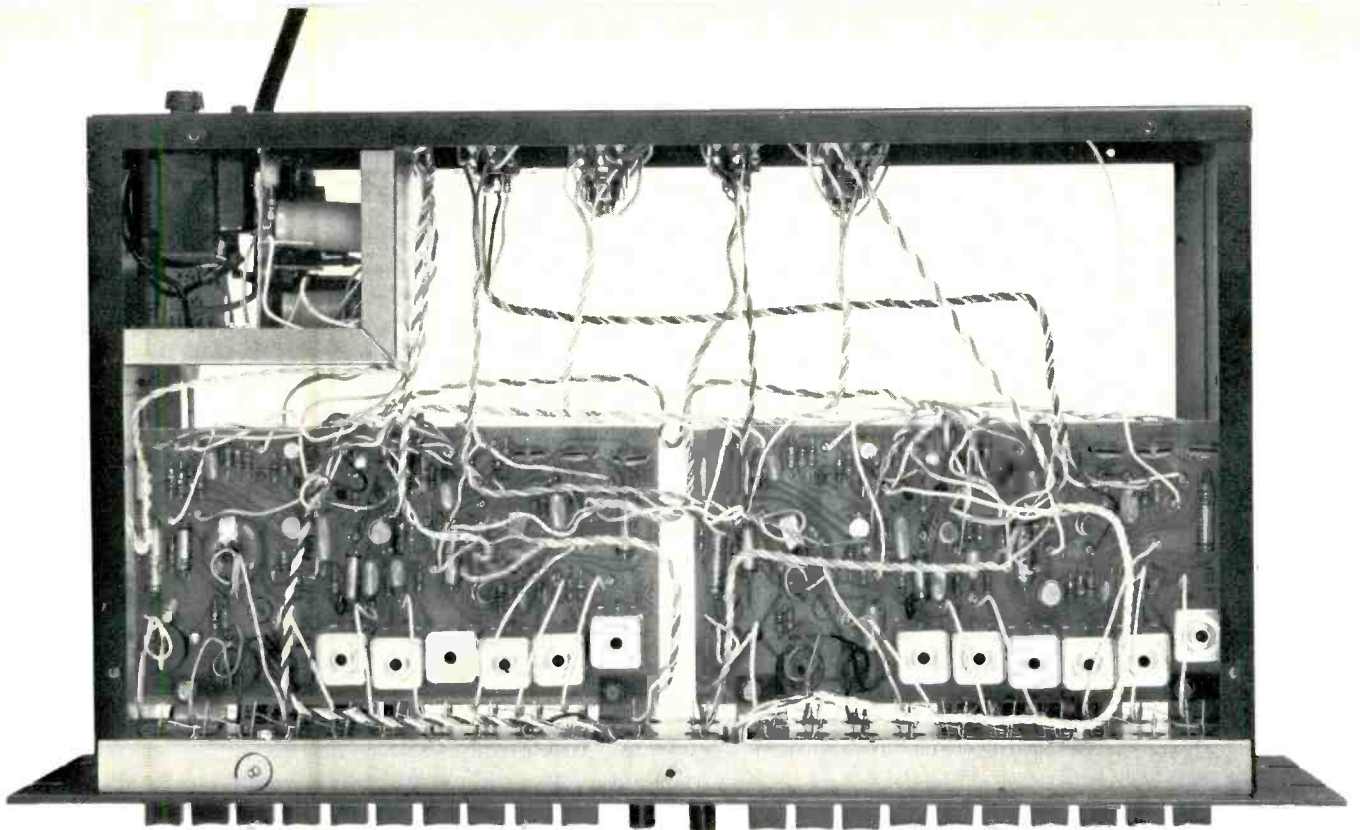


Fig. 1 - Schematic diagram of one channel of the Soundcraftsmen TG-2209-600 Graphic Equalizer.

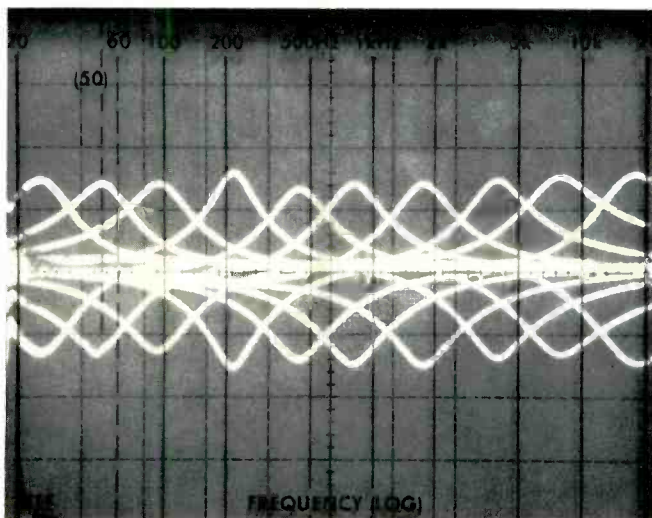


unity gain after equalization settings have been made. The controls are moved until, with signals applied, upper and lower LED indicators flash at the same light intensity.

At the lower left of the panel is a power *On/Off* switch surmounted by a power/on indicator light. Symmetrically positioned beneath each bank of octave controls are four push buttons for each channel. The first of these alters the sensitivity of the unity-gain LEDs. With these buttons out, input levels of 10 dBm or less will provide proper LED indications. If input levels exceed 10 dBm, the buttons are depressed for accurate indications. The second button is an equalization defeat switch which permits instant comparison between equalized and non-equalized (direct) sound. The remaining two buttons per channel provide low-frequency and high-frequency shelving beginning at 100 Hz and 10 kHz, or roll-off below those corner frequencies at a rate of 12 dB per octave.

Examination of the rear panel of the TG-2209 shows up the major differences between a "home" equalizer and a

Fig. 2—Composite display of the octave-by-octave boost and cut range.



professional unit such as this. To begin with, input and output connectors are three-terminal XLR (Cannon) types, female for inputs, male for outputs. Standard wiring is used, with pin 3 being positive, and Pin 1 grounded. For balanced input and output connections, pins 2 and 3 are used, while for unbalanced operation, pins 1 and 3 are selected. Below each input connector is an input impedance slide switch which alters impedance from 600 ohms to high impedance. Above each input connector is another slide switch which selects proper gain of the system for balanced or unbalanced operation (effectively compensating for the 6-dB signal loss which results when unbalanced input signals are applied to the input connectors). The rear panel also has a convenience a.c. receptacle and a line fuseholder containing a half-ampere fuse.

Circuit boards used in the TG-2209 and visible in the photo of the insides of the unit are made of military-grade G-10 glass epoxy material. In addition to the individual LC filters used for each octave, low-noise carbon film resistors are used in critical circuits and the switch contacts are gold plated. Wiring employs solderless wire-wrap technique throughout. Inductances used in the octave filters are either toroidal or ferrite core, depending upon the center-frequency of the filter in which they are used. Op-amps are used at the input and output circuits. An electronically regulated power supply provides the required plus and minus 17 volts d.c. for the active op-amp circuits. A complete schematic diagram of the TG-2209 (one channel only), is reproduced in Fig. 1.

Laboratory Measurements

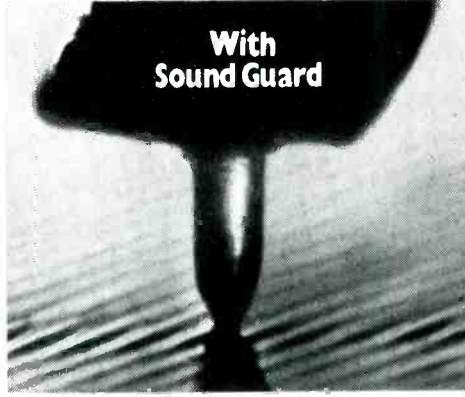
With all octave controls set to their flat position and the equalizer in the circuit, frequency response measured flat from 15 Hz to 25 kHz within ± 1.0 dB. Under the same test conditions, total harmonic distortion at any frequency within the audio range measured no more than 0.03 per cent. Even with all controls set to their maximum "boost" position, harmonic distortion increased only to 0.075 per cent. Overload occurred with an input or output of approximately 10 volts (providing the gain adjust controls were adjusted for unity gain under all conditions of measurement).

Figure 2 illustrates the maximum adjustment range for

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Same magnification shows no record wear.

You can see how the picture has changed.

Independent tests* show that records treated regularly with Sound Guard preservative keep the same full amplitude at all frequencies, the same absence of surface noise and harmonic distortion as records played just once in mint condition.

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Total Record Care System puts Sound Guard record preservative and Sound Guard record cleaner in one package—for the best possible total care for all of your records.

Available in audio and record outlets.

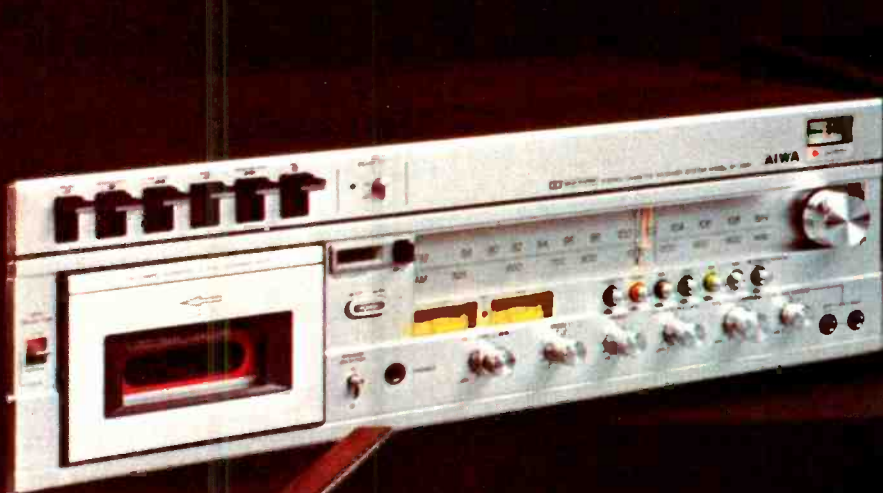
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AF-3030



AD-6300



AD-6550

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record. Consider too, the many other advanced features in the AD-6800: double needle metering combines the VU level and peak level into a single meter, a Peak Hold button locks the peak metering system preventing distortion-causing peak pulses, and an extraordinarily low wow and flutter of 0.05%.

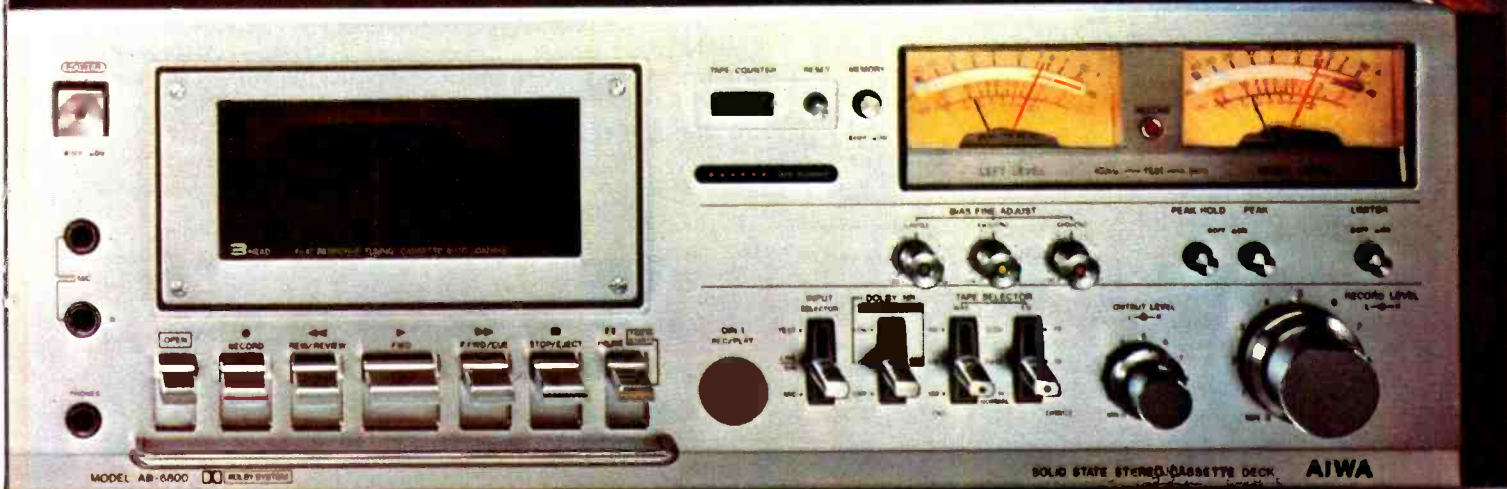
The AD-6550 has a Bias Fine Adjustment knob to give optimum performance with any brand of LH tape on the market, a Remaining Tape Time Meter that shows



AD-6500



AD-1250



AD-6800

is a flatter response

exactly how many minutes remain on the tape when you record, and an outstandingly low wow and flutter of 0.05%.

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Side panels optional with AD-6500 and AD-6300.

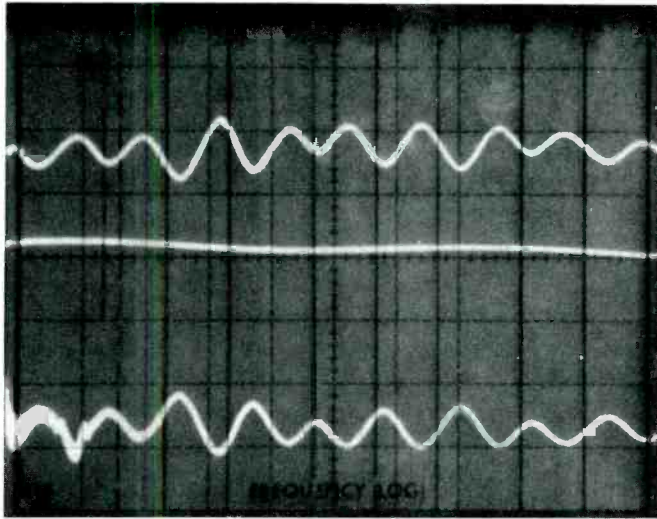


Fig. 3—The upper trace shows the response with all controls at maximum boost; lower trace at maximum cut, and the center trace shows controls set at the mid or "0" position.

each of the octave controls of a single channel on the TG-2209. Center frequencies were calibrated extremely accurately.

Figure 3 illustrates what happens if all octave controls are set either to their maximum boost or maximum cut positions (the straight line in the center of this display represents the reference level when all controls are set to their mid-positions) and helps to explain the importance of the "gain

adjust" controls and the LED indicators. Note, too, that with all controls set to minimum (greatest cut), the overall gain loss is greater than the increase in gain when all controls are set for maximum boost. It is this characteristic of the filters which, no doubt, prompted the designers to provide an asymmetrical range of gain adjustment (+6 db to -12 dB) for readjustment of the system to unity gain.

Use and Performance Tests

As Soundcraftsmen rightly points out in the last paragraph of their well-written instruction booklet, obtaining gain in an audio system "is Not the function of an equalizer. It is not an amplifier; it is designed only to tailor an incoming signal voltage to the desired curve and to put out a modified curve at exactly the same voltage." This, the TG-2209 does very well indeed. One test we always employ during check-out of a graphic equalizer is to set all controls flat and listen to music, alternately depressing and releasing the equalizer-defeat switch. If we can detect no audible difference, we are reasonably convinced that the equalizer under test is not contributing any form of distortion of its own, and that is exactly what happened with the TG-2209. While there is a fair amount of interaction between adjacent controls of this unit, we had no trouble equalizing the playback monitor system in our newly constructed "home" recording studio with the aid of the test record (pink noise, in octave segments) supplied with the TG-2209 and a calibrated microphone/sound pressure meter which we own. As we said earlier, the chief difference between this model and other 10-band equalizers offered by Soundcraftsmen is its emphasis on professional interface—an important difference if you are involved with pro audio equipment and want a reasonably priced octave equalizer as part of your installation. *Leonard Feldman*

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Z's 1 to 4 are the four passive components which interconnect the current dumpers, (the output transistors which supply the power), to the small high quality amplifier which provides the error signal, so that when the above condition is met the current in the load, the loud-speaker, is independent of the current in the dumpers and hence distortion is solely dependent on the quality of the error amplifier, which because it is small can be very good

Wonderful indeed.

For further details on current dumping and other Quad products write to Dept. A

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* Elektor Electronics Magazine No. 8, Dec. 1975

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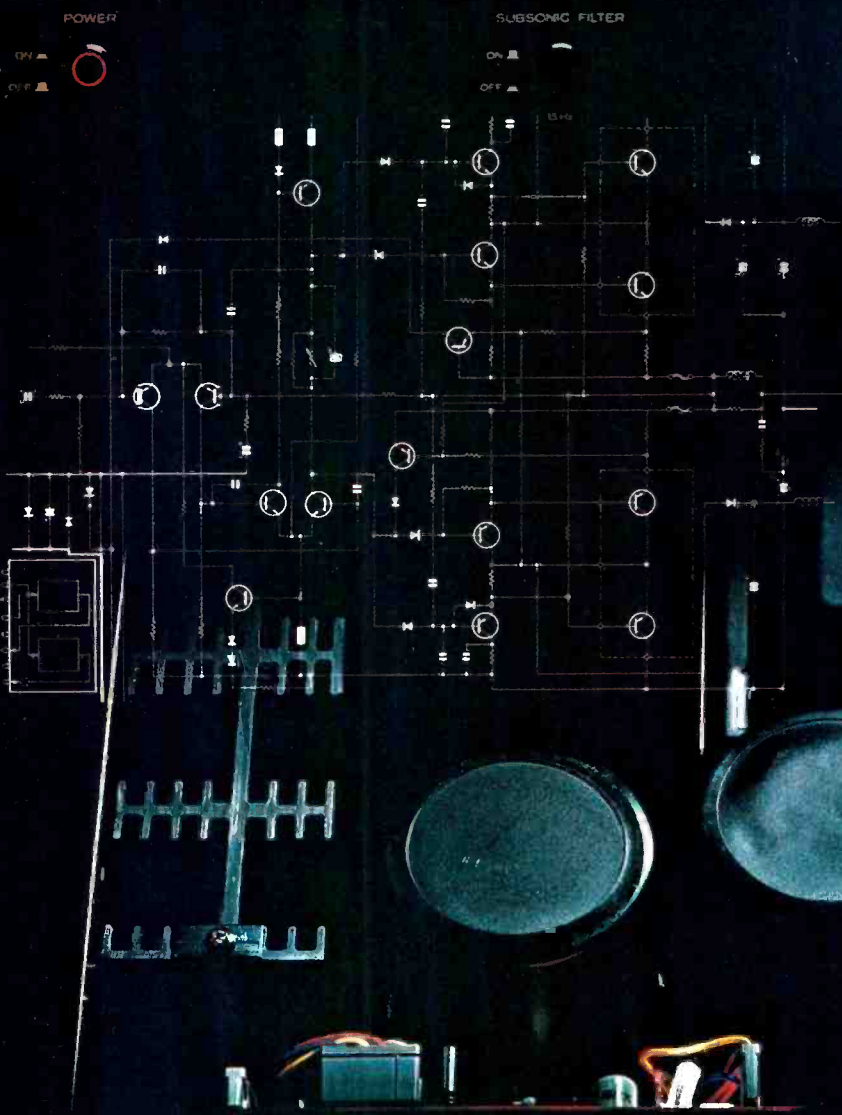


LEFT CHANNEL



RIGHT CHANNEL

PEAK LEVEL METER



Dynaharmony

RMS output power per channel
(both channels driven into 8 ohms
20Hz - 20,000Hz C.1%THD) 200 watts

Transient Music Power
(within rated distortion) 400 watts

Frequency Response 5 - 80,000Hz (+0, -1dB)

S/N Ratio (IHF A Network) 110 dB

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Hitachi's Class G is one of the most incredible cost/performance amplifiers ever created.

It is about three times as efficient as the conventional Class B amplifier. And it looks as sophisticated as it sounds.

Simply expressed, Class G is two amps in one. During the musical "downs" and "averages" the primary amp works on the low-voltage amplifier. But let one of those musical peaks come along and the standby

high-voltage amplifier cuts in for clear, powerful sound without clipping distortion.

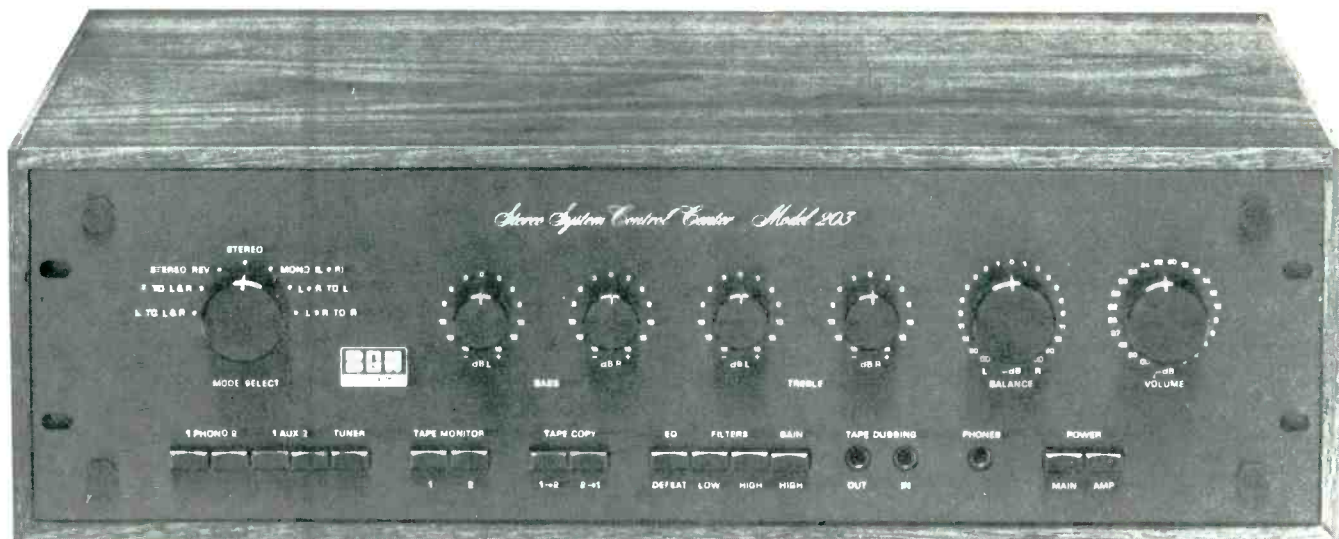
Technically the standby amp consists of additional power transistors which are activated only when the signal peak demands it. But practically it means we can offer more usable power at a lower price.

Or in other words you're not only getting a little extra, you're getting about twice the amplification for the price of one amplifier.



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it shows.

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BGW Systems Model 203 Stereo Preamplifier-Control Center

MANUFACTURER'S SPECIFICATIONS

Rated Output: 4.0 volts.

Gain: Phono to Tape Out, 42 dB; High Level Inputs to Line Out, 22 dB or 10 dB (selectable).

Phono Overload: 100 mV.

Maximum Output Voltage: 8V into 600 ohms, line out.

THD: Less than 0.01 per cent at rated output, Hz to 20 kHz, **S/N Ratio:** **Phono**, 82 dB below rated output (unweighted); High Level, 90 dB (re: low gain setting), 80 dB (re: high gain setting) referred to rated output.

Tone Control Range: ± 18 dB @ 50 Hz and 15 kHz, in 3 dB steps.

High & Low Cut Filter Cutoff: 20 Hz

and 12 kHz, 18 dB/octave.

Frequency Response: Phono, RIAA ± 0.25 dB; High Level, 20 Hz to 20 kHz, ± 0.2 dB.

General Specifications

Power Requirements: 10 watts @ 120 V a.c. or 240 V a.c., 50-400 Hz.

Dimensions: 19 in. (48.3 cm) W x 5 1/4 in. (13.3 cm) H x 10 3/4 in. (27.3 cm) D.

Weight: 18 lbs. (8.16 kg).

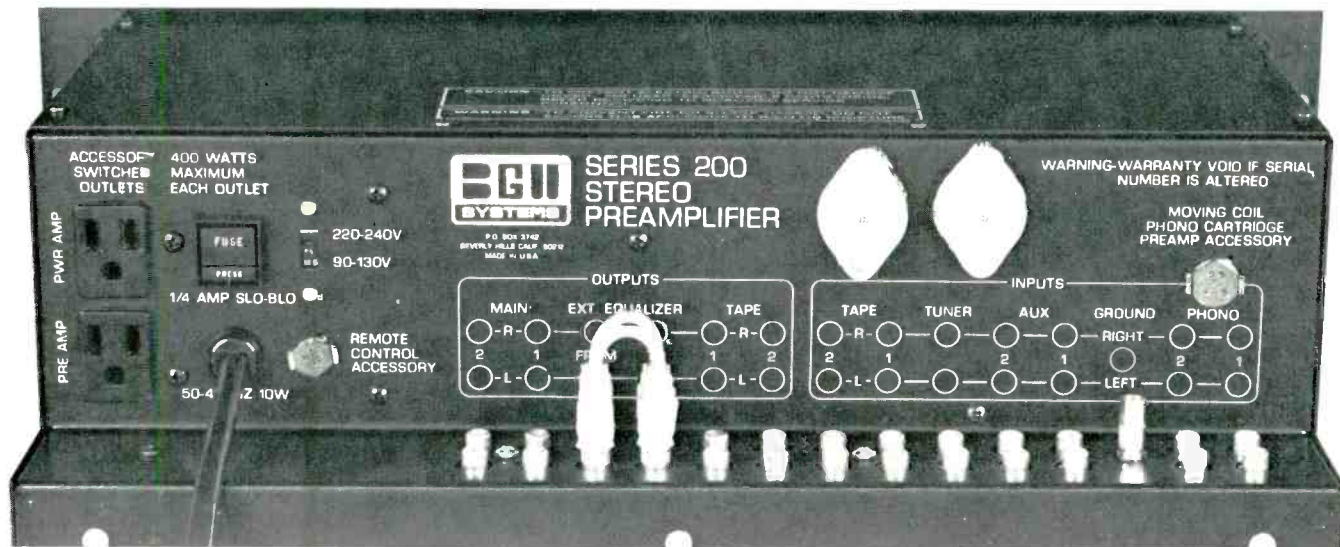
Price: \$649.00.

96

Typical of some of the newer preamplifier-control centers to appear recently, this rack-mountable unit from BGW Systems emphasizes precision control and flexibility that will appeal to audio enthusiasts who prefer "separates" for just those reasons and are less interested in "gimmick" controls than in uncolored sound. The all-black front panel of the 203, with its contrasting white control designations, lends an air of professional quality to the appearance of this unit. A large rotary switch at the upper left selects operational mode, including every possible combination of mono or stereo feed to left and right outputs, singly or jointly. Separate bass and treble rotary switch controls are provided for each channel, and these controls are *not* mechanically detented potentiometers, but rather actual step switches which pick off fixed

resistor/voltage divider networks so as to provide 3 dB increments of boost or cut. A detented rotary control, calibrated in dB, serves as a balance control and a similarly calibrated 22-step, master gain control is located at the upper right of the panel.

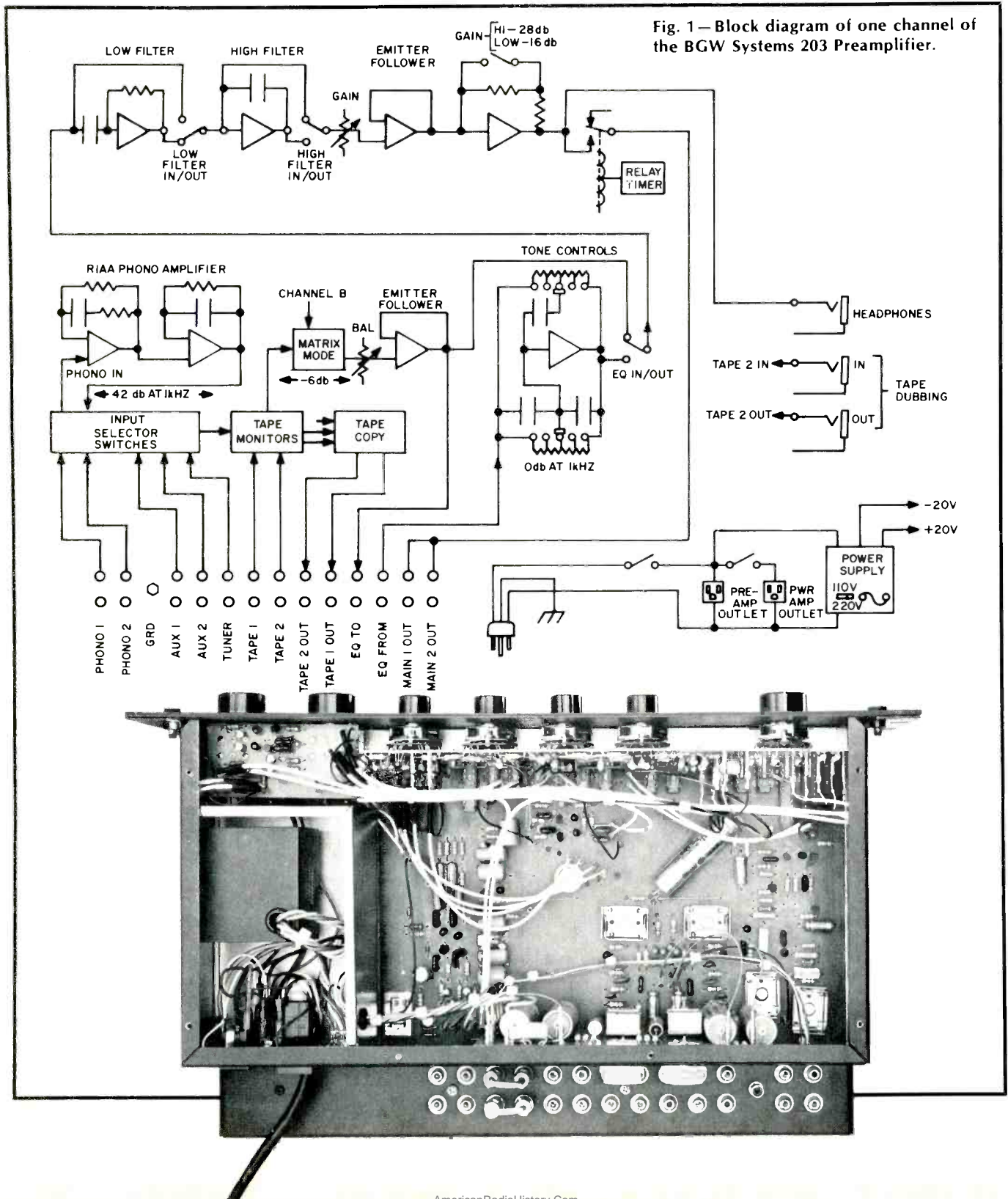
Five interlocking pushbuttons at the lower left select program sources (which include two phono input pairs, two sets of auxiliary inputs, and tuner inputs). Two tape monitor pushbuttons come next, followed by two *Tape Copy* switches. Separating these functions in this way permits the user to copy programs from one deck to another while continuing to enjoy other program sources, so long as the monitor switches are not depressed. The next bank of pushbuttons includes an *Equalizer-Defeat* switch (special input and output jacks for



connection of an external equalizer are provided on the rear panel and are interconnected by means of supplied jumpers which are removed if an external equalizer is added to the system), low- and high-cut filter buttons, and a gain-determining button which alters high-level input gain from 10 dB to 22 dB. *Tape-out/tape-in* phone jacks come next, duplicating the *Tape 2* jacks on the rear panel. Adjacent to them is a headphone jack which is effectively in parallel with the line out-signal (though signals are delivered to it even when the preamp-out or line-out circuitry is interrupted by a relay associated with the dual power switches). Headphones must be of a high impedance type to work with this control

unit directly. A two-part power switch pushbutton arrangement permits separate powering of the preamp itself and any associated power amp connected to the appropriate rear panel a.c. receptacle.

Rear panel input, output, equalizer in/out jacks, and chassis ground terminal are all located on a horizontally oriented platform section which makes cable connection extremely convenient. Terminal nomenclature is screened on a vertical wall behind the various jacks, and this same vertical surface contains the convenience a.c. receptacles (one of which is switchable, as mentioned, by one section of the front-panel power switch and is therefore suitable for con-



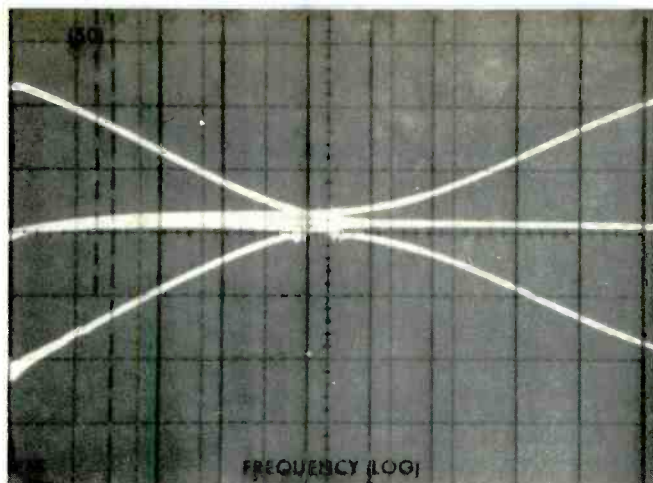


Fig. 2—Bass and treble control range.

nection of the power amplifier line cord), a multiple-pin socket for connection of a head-amp accessory for use with moving-coil cartridges, and another socket that accepts a remote control accessory also available from BGW.

Internal Construction and Circuit Features

The power supply section of the 203 is contained in a fully shielded compartment, far removed from the low-level phono-equalizer circuitry, and includes a differential amplifier input stage, an emitter-follower, along with a dual-transistor, compound voltage-amplifier stage, plus a second differential-amplifier pair and compound voltage-amplifier pair. In this manner, required low frequency RIAA boost and treble cut are provided by two separate and isolated circuit sections. A voltage-follower stage comes next, acting as an impedance converter to feed the three-pole active high- and low-pass filters. The output of the master gain control feeds an operational amplifier which in turn feeds the variable gain channel of the 203 is shown in Fig. 1.

The major circuit board of the unit occupies nearly the entire "floor" of the chassis, while a vertically oriented board module supports the four tone control switches and mode selector switch which are directly soldered to it. A third, smaller board retains the master gain control and balance control as well as their associated fixed components. Interconnections between these p.c. board modules are made by means of slip-on terminals and posts which permit easy removal of any module for servicing, if required. All push-button switches along the lower edge of the panel have their contacts directly soldered to the main or "mother" board.

Laboratory Measurements

RIAA equalization in the sample we tested was highly accurate from 100 Hz to 15 kHz (within 0.2 dB of the prescribed playback curve), but there was a shelving effect which occurred at the extreme low end which caused the 30 Hz response to be "down" nearly 2.0 dB compared with the required boost at that frequency. Preamp-equalizer and high-level section gains were exactly as specified, so that a 1.0 volt output from the main line outputs was obtained with a phono input signal of only 0.75 mV when the preamp is operated in its high-gain mode; 3.0 mV for the low gain mode. Spot measurements of total harmonic distortion for rated output of 4.0 volts (much more than would normally be required by any power amplifier) yielded results of 0.01 per cent at 20 Hz, 0.008 per cent at 1 kHz, and 0.025 per cent at 20 kHz with controls set for flat response. Phono overload capability fell a bit short of the 100 mV claimed, with an input of 88 mV at 1 kHz causing first-section distortion. IM distortion of the entire system (from phono input to output) measured a very low 0.006 per cent. Overall frequency response through the

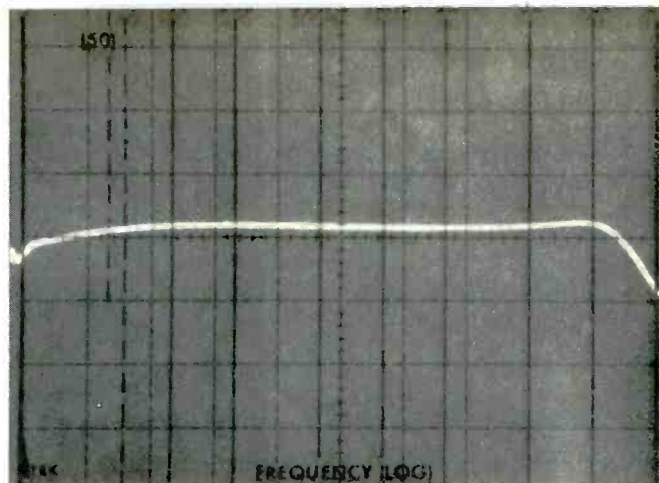


Fig. 3—High-cut filter response.

high level inputs was flat from 20 Hz to 20 kHz within 0.5 dB. (Editor's Note: BGW informs us that some preproduction units, of which the unit tested was one, showed the shelving characteristic at the low end of the RIAA response. This was traced to a particular capacitor, which was changed in production, so that units actually on the market should track the RIAA curve within 0.2 dB.)

The maximum range of the bass and treble tone controls is plotted in the 'scope photo of Fig. 2, and turnover frequency for both controls is set at around 550 Hz. The action of the steep-cutting low-pass filter is clearly seen in the photo of Fig. 3, but the low-cut filter action does not show up in this sweep because the cut-off point is set at 20 Hz, the lower limit of our sweep as displayed on the spectrum analyzer 'scope face. Separate point-by-point metering of the output at frequencies below 20 Hz confirmed the 18-dB slope of this filter as well as its cut-off point as specified by the manufacturer.

Use and Listening Tests

The alternate choices of overall gain provided by the 203 are useful, particularly when trying to optimally match various program source levels with convenient master gain settings for specific power amplifiers with which the BGW preamp-control unit is likely to be used. Of course, the gain chosen then applies to all input program material and may, occasionally, have to be altered when switching from one program source to another. This feature is therefore not quite as flexible as would be the individual input level controls found on some other high-priced preamplifier control units.

The ultra-low noise characteristics of the phono equalizer section (82 dB below rated output, unweighted, as claimed) translate to extremely noise- and hum-free phono reproduction even at very loud listening levels and, even at the 88 mV overload limitation, the dynamic range of the phono section translates to around 100 dB—a good deal higher than one is likely to encounter with any present-day musical recording.

Control action of the 203 is smooth and precise; and we particularly appreciated the precision of those step-type tone controls and the fact that it was possible to control left and right channels separately (something that many preamp manufacturers have abandoned in recent years). The slight bass roll-off because of the shelved RIAA low-end equalization is easily corrected by simply cranking each bass control up by a single step position, and that still leaves enough bass boost available (more than enough, in fact) for any tonal compensation needed to take care of other program source or speaker deficiencies. All in all, the 203 is a well-executed, thoughtful design that, for its price, merits serious consideration and auditioning by audio perfectionists who crave this type of component.

Leonard Feldman

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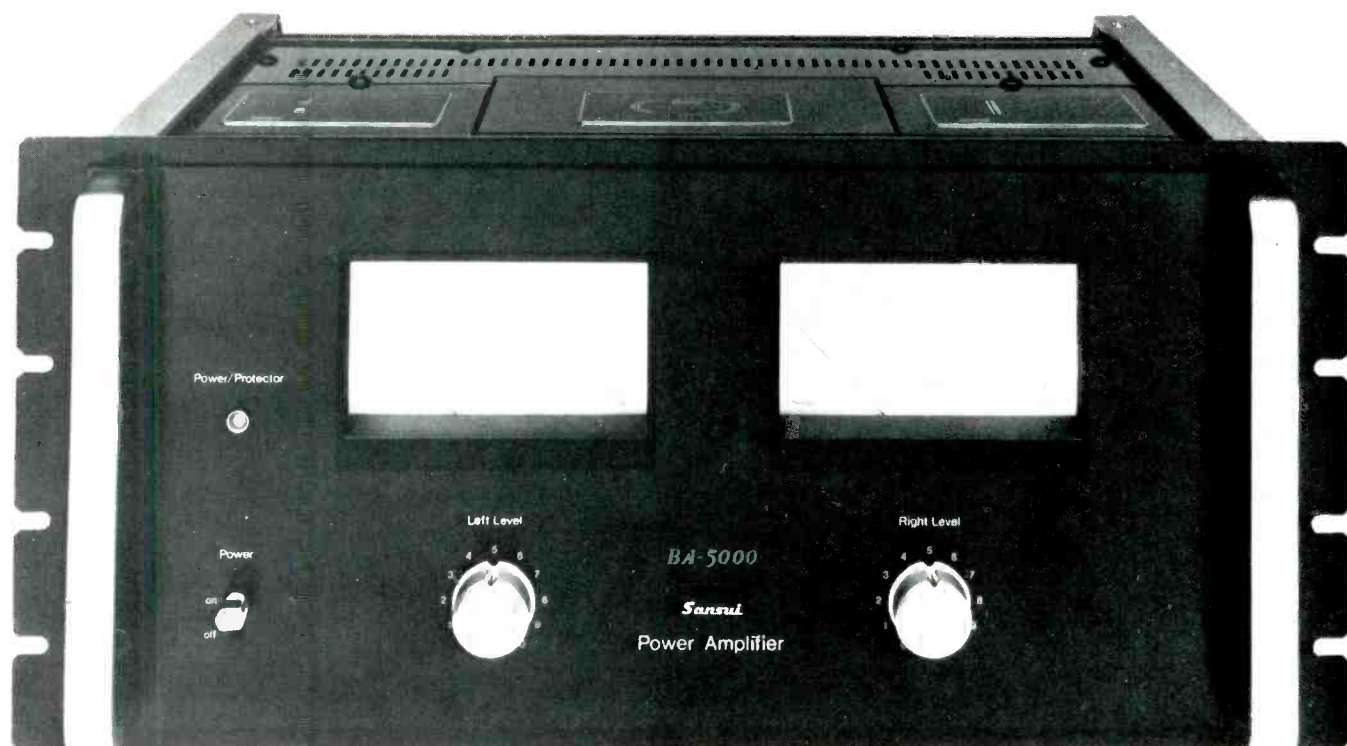
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401 No. Broad St., Philadelphia, PA 19108

Sansui Model BA-5000 Stereo Power Amplifier



MANUFACTURER'S SPECIFICATIONS

Power Output: Stereo, 300 watts per channel into 2, 4, and 8 ohms, from 20 to 20,000 Hz with no more than 0.1 per cent THD; Mono, 600 watts into 4, 8, and 16 ohms from 20 to 20,000 Hz with no more than 0.1 per cent THD.

Load Impedance: Stereo, 2, 4, or 8 ohms; Mono, 4, 8, or 16 ohms.

Output Voltage: 25 volts stereo, 70 volts mono.

THD: Less than 0.1 per cent.

IM Distortion: Less than 0.1 per cent.

Frequency Response @ 1 watt: 15 to 30,000 Hz, +0, -2 dB.

Damping Factor: Approx. 10 @ 8 ohm load.

Input Sensitivity & Impedance: 700 mV, 50 kilohms.

Power Consumption: 490 watts.

General Dimensions

Dimensions: 19 in. (48.2 cm) W x 8 3/4 in. (22.2 cm) H x 18 11/32 (46.6 cm) D.

Weight: 108 lbs. (49 kg).

Price: \$1300.00.

Lately we have seen several examples of high powered amplifiers geared for the professional market. Sansui has entered that market with their BA 5000 stereo amplifier which promises to be an exceptionally strong contender. The Japanese have an advanced machine tool industry that allows them to build elegant packages with lots of parts at modest prices and this amplifier is an example of that. It is a superb package, very well engineered, and extremely rugged. The internal partitions are all of girder-type construction. The metal parts all have a lot of mass to them—front panels nearly 1/2 in. thick, side rub-rails that are so heavy they appear to be cast, very heavy-duty heat sinks, and all well braced. The front panel is well laid out with excellent level controls for each channel, two heavy-duty rack handles, and two power meters. These peak responding meters, which are rather good looking, have their own driver amplifiers, and are accurate from 20 Hz to 15 kHz.

There is a massive heat-sink extrusion near the back of the amplifier that is fan cooled; the fan blows into the extrusion at the center and exhausts out the sides, providing excellent heat dissipation ability. The back, which holds the cooling fans, folds down after the removal of four machine screws, making the output transistors easily accessible. The output transistors are all mounted on sockets, so in case one did blow it would be easy to replace. We would like to praise the manufacturers for their use of the heavy-duty banana-jack type terminals for the output connection. However, we

prefer the standard telephone jacks for input use rather than the RCA pin-jacks that are supplied with the amp.

The actual printed circuit cards that hold the first stages mount in holders for easy removal. The cards themselves show the addition of small capacitors after assembly, probably for stabilization (more about this later) and these capacitors are not up to the over-all quality of the rest of the amplifier. The whole unit is just incredible from a mechanical point of view, probably the most rugged amplifier package I have ever seen. The output stage differs from most consumer amps in that it has auto-formers in the output. This allows the amp to deliver its rated power into various load impedances. In most transistor amplifiers, the power output increases as the load impedance decreases. The BA-5000 is basically a two-ohm amplifier, and because of the auto-former it will deliver its rated output power into 2, 4, or 8 ohms; and, if you bridge both amplifiers in the "mono" configuration, it will deliver twice the power into 4, 8, or 16 ohms. When you use the two-ohm tap, you direct couple the load to the output devices.

The power supply furnishes regulated power for everything except the output and driver devices—very hip. It is a superb power supply, well laid out, and all the wiring is done to big terminal strips. It has a massive toroidal power transformer with a very low external magnetic field and very low internal resistance, helping to make the power supply very stiff. This is important to the sound of an amplifier be-

cause it allows the amplifier to be driven into overload without a severe voltage drop. The power transformer case appears to be well potted and hermetically sealed. Large high quality electrolytic capacitors are used—very low internal impedance. The electrolytic capacitors are connected by copper bus-bars. This improves their high frequency performance. The power supply is so good it's just outrageous!

Circuit Description

The Japanese semi-conductor industry has for some time been putting a lot of R & D into developing output transistors with a greater safe operating area. The output transistors Sansui uses in this amplifier are very strong—large safe areas and also fairly fast. They are regular transistors, but these are some of the strongest transistors I've seen. Eight output devices and two drivers per channel; the rail voltages measured plus and minus 53 volts.

The circuit itself is a complementary amplifier. First, there is an input and buffer amplifier consisting of a differential pair direct coupled into a common-emitter amplifier—its function is to allow the main amplifier to be hooked up in bridge configuration (i.e., you can get both in-phase and out-of-phase outputs from the buffer amplifier). It also supplies a little voltage gain and a higher input impedance. (However, it's my opinion that the amplifier would sound better without this amplifier; this is an added circuit which obviously is going to detract from the sound to some degree.) The buffer amplifier is coupled to a "P" type differential amplifier, which is direct coupled to an "N" type differential amplifier. This shifts the d.c. level of the signal back to "0." One side of the "N" type differential amplifier is tied to ground; the other side goes through a bias regulator with a current source as its load. This current source drives a pair of pre-driver transistors separated by the bias regulator which are "Darlingtoned" onto the driver transistors. These devices drive the output stage which is a complementary output stage acting as followers. All three devices—the pre-drivers, the drivers, and the output stage—are hooked up in the uni-follower configuration. There are some current-limiting transistors that clamp the bases of the driver transistors if it ever becomes necessary to limit the current flowing through them because of some overload condition. A fairly

Table I—THD with both channels operating at 300 watts into 4-ohm load.

Freq., Hz.	Left, %	Right, %
20	0.037	0.04
50	0.029	0.025
1k	0.032	0.0225
10k	0.04	0.0285
20k	0.06	0.02

simple circuit, but in my opinion, the amplifier is not well stabilized; when you drive it into clipping, it oscillates. I believe this is due to the fact that the second differential amplifier's and the pre-drivers' f_t 's occur at the same frequency which produces a phase shift in the open loop response of the amplifier and makes it difficult to stabilize. However, it is not bad and doesn't seem to have any noticeable effect on the sound.

Another possible problem is that the circuit uses 100 per cent d.c. feedback. The reason this is necessary is that there is an auto-former in the output and any small d.c. off-set may cause excessive current to flow through the auto-former because the auto-former has a very low resistance at d.c. and saturates its core. The 100 per cent feedback requires the use of a blocking capacitor in the shunt leg of the feedback loop. When you impress a non-symmetrical, uni-directional signal across the blocking capacitor, it develops a

Table II—Harmonics of 1 kHz, in percent, measured with wave analyzer.

Harmonic	Left, %	Right, %
2nd	0.031	0.019
3rd	0.0042	0.0022
5th	0.0004	0.0022
6th	0.00058	0.0023
7th	0.0002	0.0013
9th	0.00018	0.0008
13th	0.0002	0.00014

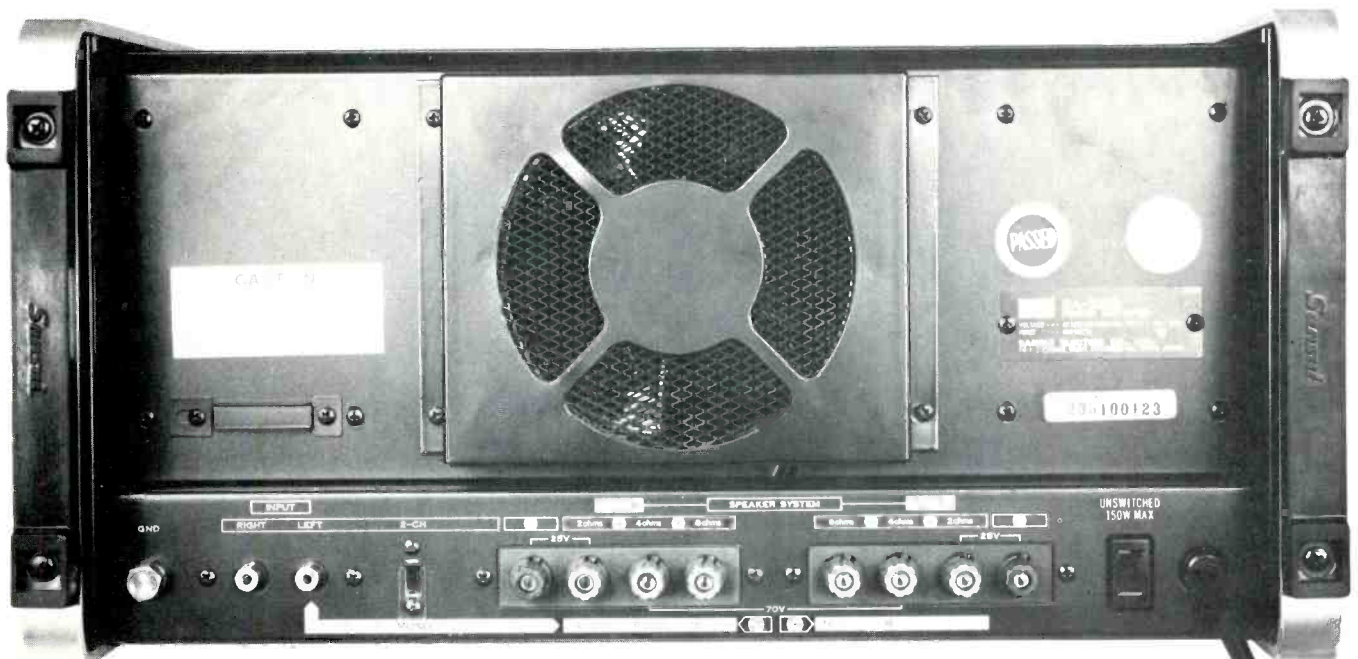


Table III—IM distortion of 60 Hz and 6 kHz; total of right channel is 0.056 per cent, left channel is 0.11 per cent.

IM Product	Left Ch.	Right Ch.
2nd	0.11	0.064
3rd	0.02	0.027
4th	0.0026	0.0064
5th	0.00028	0.001
6th	0.004	0.004
7th	0.0024	0.002
8th	0.0009	0.0005
9th	0.0007	0.001
10th		0.0007
11th		0.00015
13th		0.00004

charge. When this happens, it pulls the input of the negative side of that differential amplifier to ground, causing the output of the amplifier to swing positive. Every time this happens, the feedback tries to catch it, and this causes a pulse inside the amplifier. The bias points are no longer fixed but wander around. Only totally direct-coupled amplifiers are free from this. But that's pretty esoteric.

Table IV—Power output vs. frequency, one channel at a time just before clipping, 4-ohm load and 4-ohm amp tap, a.c. 120 volts.

Freq., Hz	L Ch. Watts/Volts	R Ch. Watts/Volts
10	38/361	342/37
20	380.25/39	361/38
1K	400/40	400/40
20k	342/37	333.06/36.5

Both channels operating, 4-ohm load and 4-ohm tap; both measured:

Freq., Hz	Watts/Volts
20	351.56/37.5
1K	380.25/39
10K	351.56/37.5
20K	324.00/36

We took lots of distortion measurements on this amplifier (for those of you who are interested in distortion measurements). The author believes that distortion measurements have little meaning below a 0.5 per cent or so. But it's interesting to note that the distortion residuals contained mostly simple even-order harmonics except at the extreme low frequencies where the transfer characteristic of the autoformer was visible. There is no noticeable cross-over distortion present, as this amplifier has very low cross-over distortion. We have included the distortion harmonics for those of you who are interested. These may possibly have more meaning than straight total distortion, but nobody's been able to supply a correlation between measurements and sound quality yet, but we keep hoping.

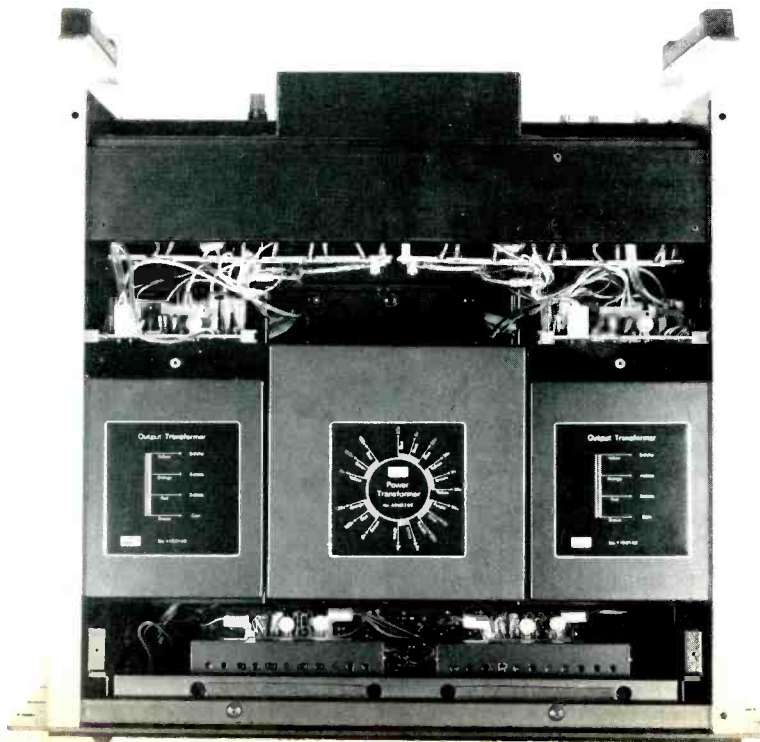
On the back of the amplifier is a switch which converts the amplifier from stereo to monaural. When in the monaural mode, the amplifier delivered in excess of 700 watts continuously without any strain. The superb heat sink in this amplifier requires special mention. During the testing procedure, the amplifier was subjected to long periods of time at full power output. The fan came on rarely, and the amplifier itself never over-heated.

Evaluation

From using the Sansui BA 5000 amplifiers on many sound jobs, I would say they are rock-stable as far as overload, power, and all that, but they are a little more sensitive to grounds because of the way they are stabilized. In every other respect, you can turn them on and forget them. They have never given me any problems in the field; they work flawlessly. They are very versatile; they are the industrial amps for anyone who needs a combination of high power and high quality. When listening to them, you will find the mid-range is very articulate but lacks space; the high end is more open, also very articulate; the bass is good, slightly exaggerated. They definitely have a transistor sound, but probably one of the least offensive of the present high-powered transistor amplifiers; however, they are not as good as some of the very best home hi-fi amplifiers. Supreme reliability, superb packaging, and beauty are the BA-5000's strong points. For a band, recording studio or wherever you need a high quality heavy-duty industrial amplifier, it is the amplifier. It will deliver the goods with no regrets.

Geoffrey T. Cook

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Today, the exciting new Koss Theory of loudspeaker design has created another revolution. By developing a complex series of audio engineering formulas and by utilizing the precise knowledge of modern computer science, Koss engineers have created a breakthrough in loudspeaker technology of such significance that it heralds the second major revolution in loudspeaker design technology. For the first time, it's now possible to scientifically derive and produce the optimum system parameters for any loudspeaker.

By computerizing the Koss Theory and by first selecting the number of bandpasses desired in the system, the system's desired efficiency, the f_3 , low bass cutoff, and the desired cabinet size; Koss engineers are able to derive specific design parameters for every component in the total system. In fact, the Koss Theory is so sophisticated that even the structural design of the cabinet and the precise positioning of the components in the cabinet for optimum dispersion and phase coherency are specified.

Of course, what's really important is not the Koss Theory itself but the sound of the three new Koss speakers

that prove it. Indeed, with current technology, there are no speakers available at similar prices that can match the Koss CM 1010 two bandpass loudspeaker, the Koss CM 1020 three bandpass loudspeaker or the Koss CM 1030 four bandpass loudspeaker in low distortion, high efficiency, and broadband frequency response.

But then, the incredible sound of these three new speakers isn't surprising when you consider some of the revolutionary new features they offer:

Take for example, the CM 1010's unique mass aligned 10-inch passive radiator that enhances the lower 2 octaves of the bass and allows for the use of a specially designed 8-inch woofer to reproduce the critical midrange up to 2.5 kHz. With the alignment mass in place, the CM 1010 reproduces a maximally flat response from an f_3 of 35 Hz on outward. However, by

removing the alignment mass, those who prefer more acoustic energy in the 50 to 80 Hz range can create an f_3 of 40 Hz and a low bass ripple of $1\frac{3}{4}$ dB centering on 60 Hz.

Or take the CM 1020's dual port design that provides an optimal cross sectional port area for proper cabinet tuning. Or the unique parallel midrange design of the CM 1030. By utilizing two $4\frac{1}{2}$ -inch drivers operating in parallel, Koss engineers were able to decrease the excursion of each driver thus creating a dramatic decrease in potential driver distortion and an equally exciting increase in the overall brilliance and presence of the midrange response. Then again there's the Koss high bandpass 1-inch dome tweeter and unique acoustic transformer that creates an incredible 6 dB increase in headroom.

And, of course, there's also the patented quasi second-order crossover network that provides a smooth, acoustically invisible transition from bandpass to bandpass.

But those are just some of the revolutionary features offered by the new Koss CM loudspeakers. Why not prove the Koss Theory of loudspeaker design to yourself by asking your Audio Dealer to give you a full demonstration of the beautiful Sound of Koss. Or write to Fred Forbes, c/o the Koss Corporation, for our free, full color CM loudspeaker brochure. Once you've heard these revolutionary new loudspeakers, we think you'll agree: hearing is believing.





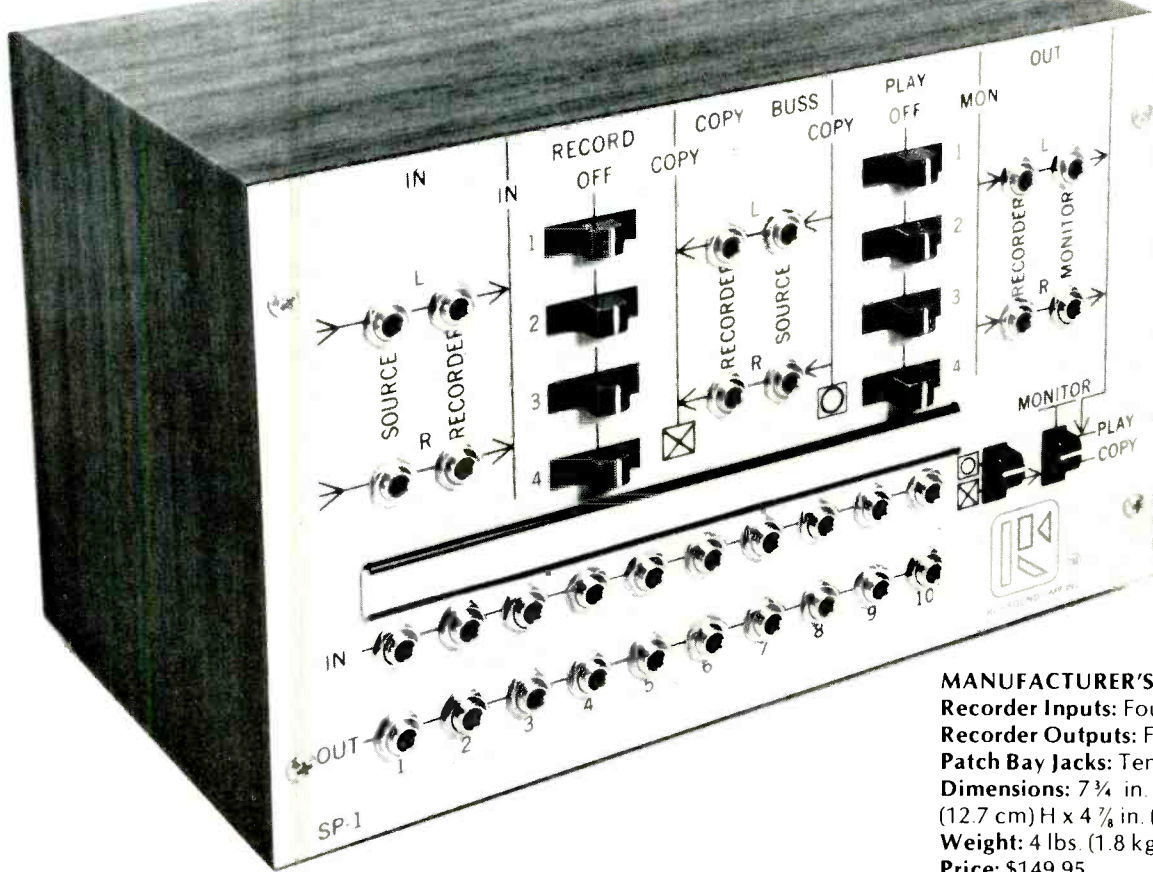
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MANUFACTURER'S SPECIFICATIONS
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Recorder Outputs: Four sets.
Patch Bay Jacks: Ten sets.
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Weight: 4 lbs. (1.8 kg).
Price: \$149.95

112

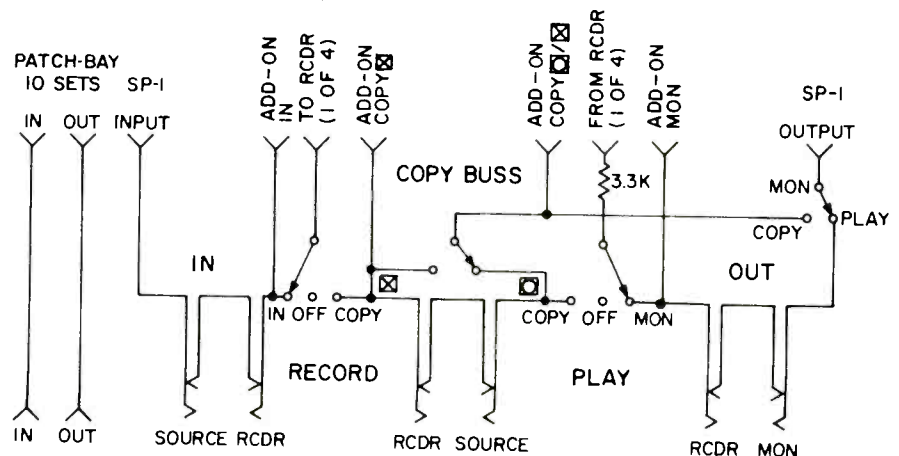
The Russound/FMP SP-1 is one of a few accessories offered for solving interconnection and switching problems. Although some of the present-day preamps offer quite a bit of flexibility in system interconnection, a serious audiophile can find that plugging and unplugging is required much too frequently. The SP-1 is designed to eliminate this continual annoyance and time waster with a well thought-out combination of jacks and switches.

This switching and patching unit is designed to be inserted into the tape monitor loop of the preamp (or receiver). On the back of the device are a total of 48 phono jacks, 24 stereo pairs. There are, of course, the two sets for connection into the tape monitor loop. There are also jacks for connecting the inputs and outputs of up to four tape recorders. In addition, there are 10 patch-bay input/output sets, all connected to front-panel jacks. Finally, there are four sets of "add-on" jacks, used for adding other switching/patching units in parallel to increase the number of inputs/outputs. On the front panel are the tape

recorder record and play selector switches, monitor switches, 20 patch-bay tini jacks and 12 tini jacks which permit inserting external signal processing into the signal flow at various points. There is a designation strip above the patch-bay jacks for labeling to match the connected devices. Twelve tini-plug patch cords are supplied for making any required front-panel connections.

The schematic (Fig. 1) shows one of the stereo channels; the connections for just one of the four recorders possible, and one of the 10 sets of patch-bay jacks. Back-panel phono jacks are at the top of the schematic, and front-panel tini jacks are at the bottom. The SP-1 itself is laid out with basic signal flow indicated on the front panel from left to right. The two channel flow lines are separate with

Fig. 1—Schematic of the SP-1, one channel shown.

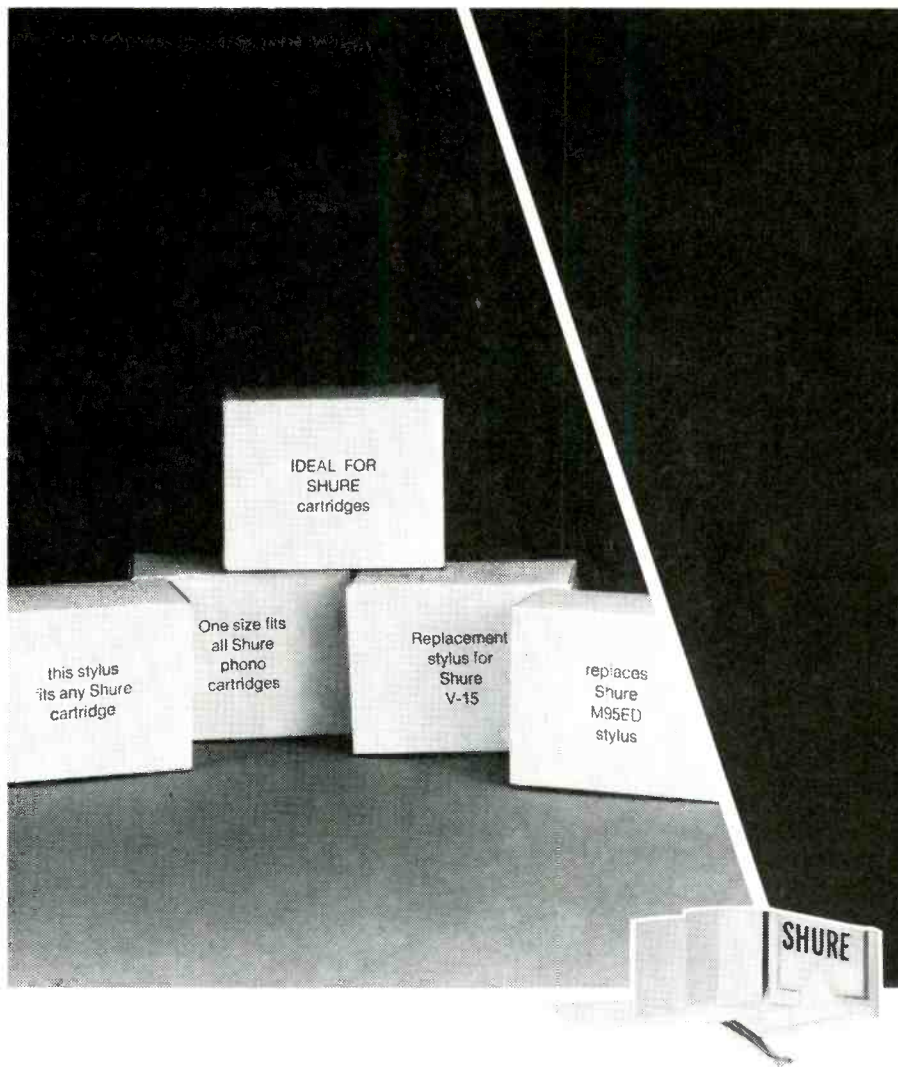


the insert jacks located physically on the appropriate signal line. The SP-1 input, from the preamp tape out, is normalized through the *Source* and *Recorder* jacks to the *In* buss. Any combination of up to four recorders can be switch connected to this buss for recording. The outputs of the recorders are fed through 3.3 Kilohm isolation resistors to the *Play* selector switches. If set to *Mon*, the output is normalized through the *Recorder* and *Monitor* jacks. The output of the monitor select switch feeds the preamp tape monitor via the SP-1 output jacks. If a recorder output is switched to *Copy*, the signal feeds through the *Source* and *Recorder* jacks to the record copy buss. Then, any of the other recorders can have their inputs switched to *Copy* as desired. The monitoring can be switched to *Copy*, before or after any external processing that might be inserted using the *Recorder* and *Source* jacks. Corresponding sets of jacks permit similar action in the *In* and *Out* lines. Thus, external noise reduction units, graphic equalizers, etc., can be added as needed. With such devices connected to the back-panel jacks of the patch bay, all connections are made with the patch cords between the front-panel bay and the desired insert points.

The combination of jacks and switches makes it quite easy to set up many varieties of a system and to make changes quickly. Recently, a comparison was made between a Dolby B system and a dbx 128. By connecting both units to the patching jacks on the rear of the SP-1, it was possible to make quite rapid interconnection changes of the eight connections per unit. And the jack field still had room for a graphic equalizer. The possible combinations are very great, and the excellent 20-page instruction manual provides a good basis for understanding the unit's flexibility. Printed forms of the front-panel layout are provided for marking out your own special connections. Russound/FMP even provides extra paper for the designation strip. Performance of the unit was without fault, including much usage of the tin-plug patch cords. The one minor criticism is that some of the back panel jacks are too close for easy connect/disconnect with some molded phono plugs. For anyone caught in the fight and frustration of interconnections, the SP-1 can very well be one of the better values around. (The Model QT-1 is available for four channels at \$249.95.)

Howard A. Roberson

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Needle in the hi-fi haystack.

Even we were astounded at how difficult it is to find an adequate other-brand replacement stylus for a Shure cartridge. We recently purchased 241 random styli that were not manufactured by Shure, but were being sold as replacements for our cartridges. Only ONE of these 241 styli could pass the same basic production line performance tests that ALL genuine Shure styli must pass. But don't simply accept what we say here. Send for the

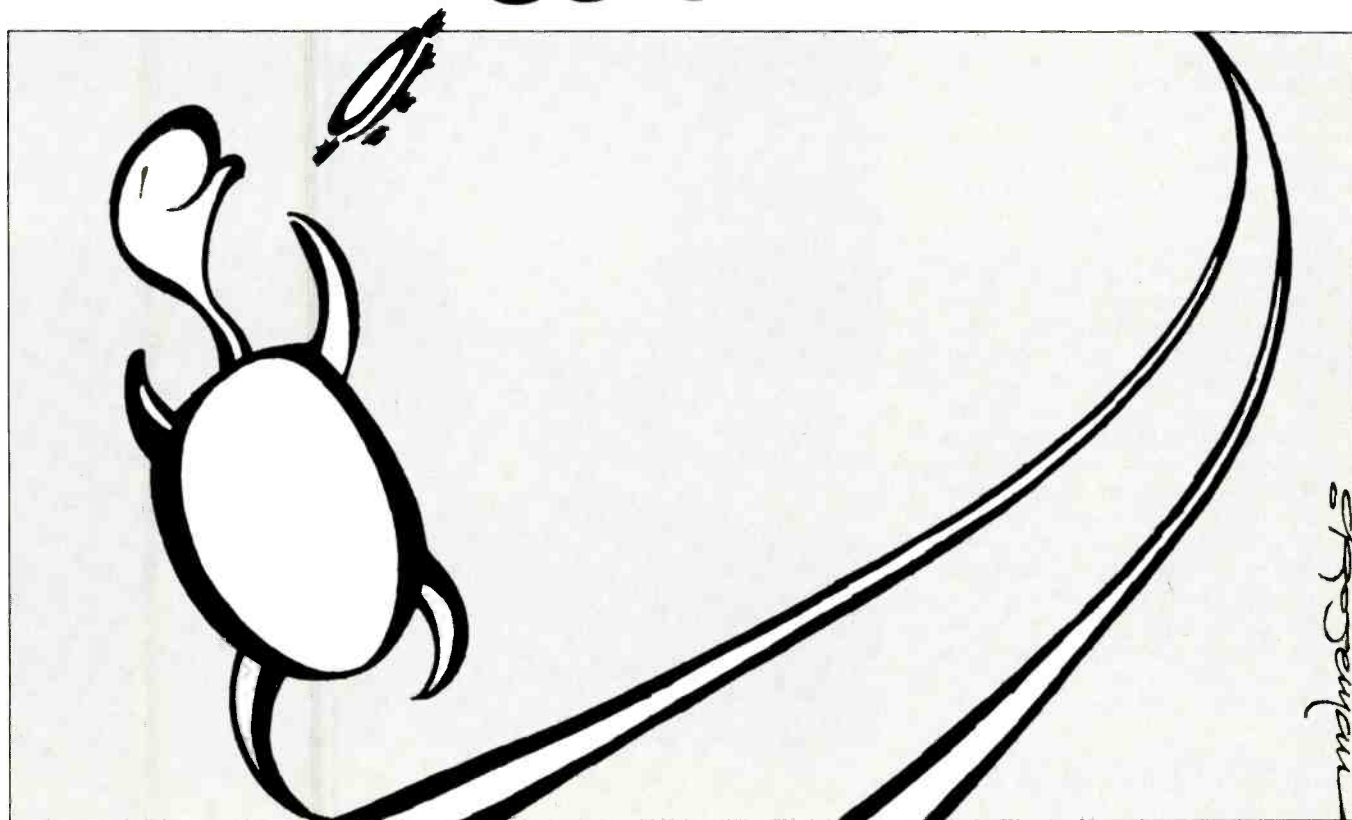
documented test results we've compiled for you in data booklet #AL548. Insist on a genuine Shure stylus so that your cartridge will retain its original performance capability—and at the same time protect your records.

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The column



114

Terrapin Station: Grateful Dead Arista AL 7001, stereo, \$7.98.

This new Grateful Dead record is like none before it. First, it is the best recorded work they've ever done. This is mostly due to the presence of an outside producer for the first time, who turns out to be Keith Olsen, the producer of **Fleetwood Mac**. Olsen is also a long time friend of the Dead and an original member of the Charlatans, one of the very first San Francisco bands of the historic 60s. One very apparent effect Olsen has had is in the band's preparation for recording. This is the first Dead album to be carefully arranged both vocally and instrumentally before they got to the microphones. **Terrapin Station** clearly was not just thrown together in the studio; they went in to make a commercial album, but one that won't disappoint Dead heads.

Simultaneously the group has ended their business experiment with Grateful Dead Records and the affiliated Round Records, and they have signed with Arista which is very aggressive promotionally. Everyone seems to think the Dead deserve to be multi-

million sellers. On all levels **Terrapin Station** is back from the ozone to somewhere at least squarely on the road, and if not at the middle certainly somewhere respectable.

The album opens with Bob Weir's *Estimated Prophet*, a paean to the California lifestyle. The song brings the deliberateness of *Wharf Rat* from the **Skull & Roses** album. Tom Scott's very presence on sax signals that this Grateful Dead is something fresh. The version of *Dancing in the Streets* that follows is like a bucket of cold water. Some of my friends jokingly call the track Disco Dead, but that's just a bit off. *Dancing* has been a warhorse in the Dead's live show for well past a decade, always a dance number. Still this version is surprising. Donna Godchaux' lead vocal is mixed way, way up so that the harmonies with Bob Weir are most startling. The congas are another un-Dead-like touch. Phil Lesh's *Passanger* is next. With its twin lead voices, it sounds uncannily like Jefferson Starship's recent work. The guitars are Quicksilver tangy, very San Francisco, and very effective. *Samson and Delilah* was known as *If I Had my Way*

when Peter, Paul, and Mary, and even earlier Rev. Gary Davis did it. It, too, is played surprisingly hot for the Grateful Dead.

But nothing yet is as unlikely as Donna Godchaux' *Sunrise* which closes the side. This one could have slipped on Renaissance's **Novella** album. The added orchestra (yes, an orchestra symphony-style, on a Dead album) just works. Donna's vocal is enough like Annie Haslam's to give you pause. It is a very pretty piece.

The first side is the song side, some very clearly Dead material, some from various parts of left field. What unifies the side is the crystal sound Olsen has brought along, his trademark. If there is a serious flaw, it is in the side's pacing. Obviously as similar as *Samson and Delilah* and *Dancing in the Streets* are, they could not be placed consecutively on the side. The down-tempo *Sunrise* is the obvious closer, so there was little anyone could do to resequence the side once the material was set. Perhaps one of the two sound-alikes should have been replaced with something else.

The other obvious oddity of the first

side is Jerry Garcia's vocal invisibility. He doesn't sing until side two which is completely covered with *Terrapin Station*. Sidelong suites are nothing new to the Dead. Their second album **Anthem of the Sun** was a forerunner of that form in a rock context, and they've done it often since then. *Terrapin* is perhaps the best, certainly the most coherent they've ever done:

"Let my inspiration flow

In token rhyme, suggesting rhythm

That will not forsake me

Till my tale is told and done."

These words open the suite. It weaves kaleidoscopically through a pair of interlocking stories, both illustrated by the music. The music itself is a tapestry that gets ever grander, growing from a standard Dead opening to gradually introduce the full orchestra and choir, brilliantly arranged by Paul Buckmaster, and conducted by Martyn Ford.

Terrapin Station is very strong and a serious departure even for so unpredictable and volatile a unit as the Dead. That the side *works* so very well, even under the strain of a real diversity in the course of the side is a triumph. That I've been listening to it over and over at home and not yet getting bored says even more. *Terrapin* is challenging and fresh, ambitious, confident, and proud. Aggressive, too.

One small nit to pick: *Terrapin Station* fades out after a brilliant side of music. I would prefer an ending. But then the Grateful Dead has always been into fades.

The album is must listening in the easy listening year of 1977. *M.T.*

Sound: A Performance: A —

El Mirage: Jimmy Webb
Atlantic SD 18218, stereo, \$6.98.

Back in the 60s I thought I might never forgive Jimmy Webb such unctuous song hits as *Up, Up and Away*, *MacArthur's Park* and the Glen Campbell "geographical" series that included *Galveston* and *Wichita Lineman*. But later Webb made an album called **Letters** which opened with a stunning restatement of *Galveston* that could not be ignored. The next song was *Love Hurts*, the Everly Brothers song it seemed everybody else recorded soon after. That was my introduction to the song. Later the same side in a song called *Simile* Joni Mitchell added vocals, as she did again on Webb's **Land's End** album, and dramatically pointed up the influence each has had on the other. In reassessment I grudgingly have really come to admire Webb's ability as a songsmith. He can wed

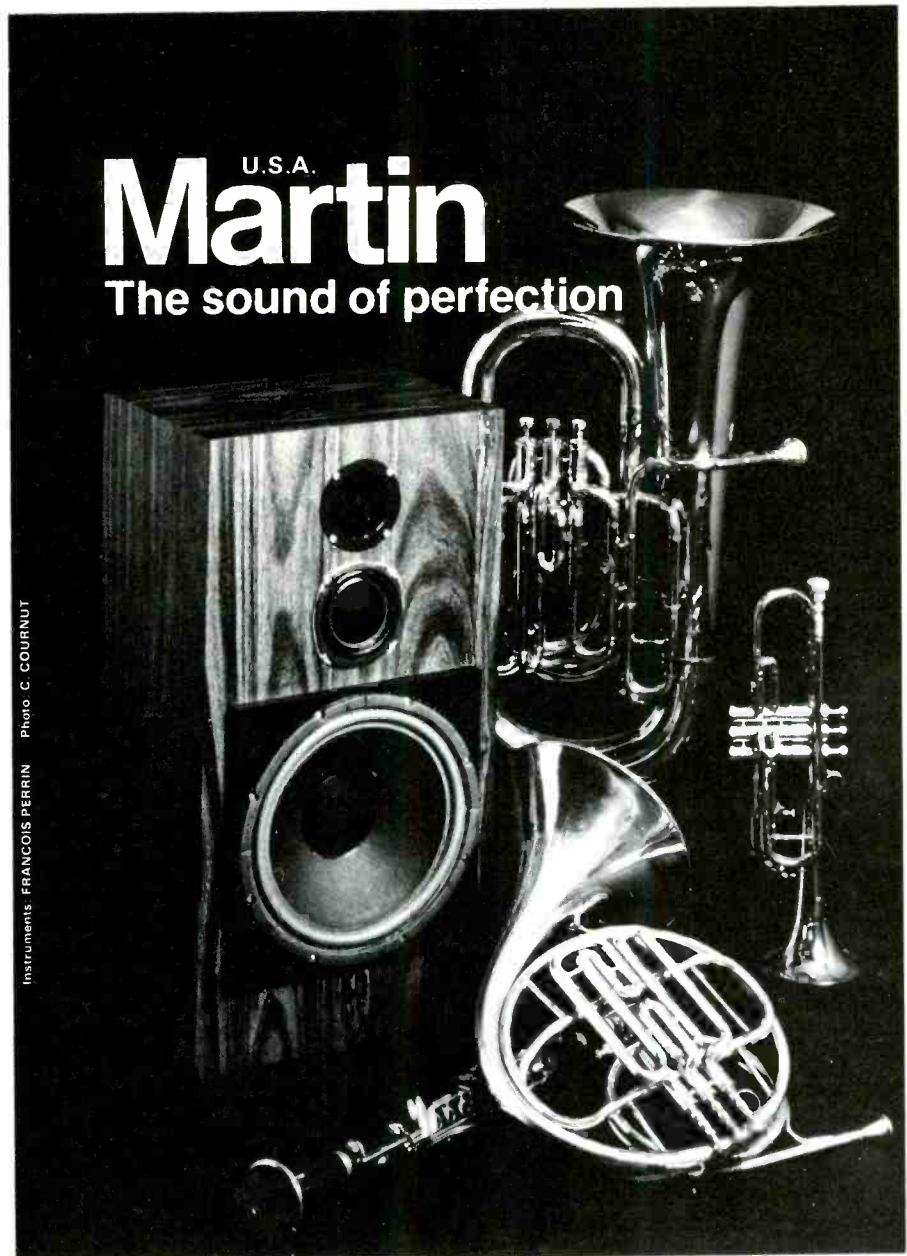
words and melody better than anyone when he's at his best.

For **El Mirage** Webb has contracted an outside producer for the first time, and George Martin of Beatle and more recently America fame, no less. Martin crafts the roundest sound Jimmy Webb has ever had. And he needs it, for while he has been growing as a singer, he is still very limited vocally.

The collaboration with Martin is successful. **El Mirage** is the best album Jimmy Webb has yet recorded. He has improved as a singer, and the support is as good as he or anyone is ever likely to get. Some songs fall flat, but most work out very well. **El Mirage** helps create what you might call progressive middle of the road music. *M.T.*

Sound: A

Performance: B



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Original Masters, The Steeleye Span Story

Chrysalis CH2 1136, stereo, \$9.98.

The King of Elfland's Daughter: Peter Knight & Bob Johnson

Chrysalis CHR 1137, stereo, \$6.98.

Steeleye Span is dead. Long live Steeleye Span!

Original Masters, the 10th Steeleye Span album, is a retrospective of the prior nine. It has been lovingly assembled and sequenced with grace and care. Of special note are a pair of previously unissued tracks, the mournful *Bonnie Moorhen* and *Gaudete*, presented here in the form it appeared in as a single, that is minus the gimmicky mix used on **Below the Salt**, the album it appeared on earlier.

Through the four sides you'll find nary a false note. The collection is an excellent primer on a most fascinating band that has been through several changes. The only real quibble is the lack of clear credits listing who plays what and where.

Unfortunately **Original Masters** also marks the end of an era for Steeleye, for upon the collection's release, members fiddler Peter Knight and lead guitarist Bob Johnson released their own album and announced their departure from the band after six albums together with Steeleye (Knight has

been on eight; he joined a bit earlier). Their album is based on Lord Dunsany's fantasy classic **The King of Elfland's Daughter**. They wrote and produced, and one or both played on most cuts. The story is told episodically through songs sung by the characters joined together by narration rendered by Christopher Lee who also plays the King. Other cast members include Frankie Miller as the rough-and-ready Alveric (Our Hero) and Mary Hopkin brilliantly cast as the daughter (Our Heroine) plus such luminaries as Alexis Korner, P.P. Arnold, and Chris Farlowe.

The album is very pleasant. Clearly it works best taken as a whole story. This will make it somewhat difficult for the radio people of America to make head or tail out of the album, but a couple individual songs are outstanding. Frankie Miller liked *Just Another Day of Searching* so much he rerecorded it for his most recent album **Full House** (Chrysalis CHR 1128). Mary Hopkin is purely radiant on the final anthem *Beyond the Fields We Know*.

One serious failing of the album in its U.S. release is the lack of the lyric sheet that also lists who plays on the album. This is included in the English release, and in the case of as literary a record as this, it is dearly needed in

order to make the continuity totally clear.

As for the future of Steeleye Span, do not panic. Just before deadline I learned that two replacements have been named in former member and brilliant soloist Martin Carthy and outstanding concertina player and morris dance fancier John Kirkpatrick. With this pair of staunch English traditionalists in the band, I would expect Steeleye to veer somewhat away from its more recent Mike Batt produced pop-oriented efforts to something "purer."

To all of them, Bob and Peter, Steeles past and present, good friends all, I salute you. For vision and faith and perseverance and for making some of my very favorite music of the decade.

M.T.

Masters

Presentation: A —

Elfland's Daughter:

Sound: B

Performance: B

Max: The Rumour

Mercury SRM-1-1174, stereo, \$6.98

The Rumour without Graham Parker is still a fine show. They may not have another Parker hidden in their midst,



but they don't let it trouble them. The Band seems to be the Rumour's model. They resemble the Band in the multiple lead singers (credits are missing as to who sings what) and in their use of horns, which is out of the same punchy, percussive New Orleans vein The Band tapped when Allan Toussaint did the charts for the **Rock of Ages** live album. Even more importantly, The Rumor adheres to a similar kind of musical economy as the Band, a philosophy which rules out jamming on record for its own sake, playing instead for effect.

Their material is adequate if not earthshaking. Still their treatment of Duke Ellington's classic *Do Nothing Till You Hear From Me* is simply ingenious. Parker-producer Nick Lowe contributed the opener, the rousing *Mess with Love*. Their own *Airplane Tonight* is a pretty ballad, a second cousin to *Unfaithful Servant*.

Max is fun. It's no masterpiece, but it doesn't pretend to be. It's better recorded than **Music from Big Pink**, but not that much better. The band is tight and sharp with attractive rough-hewn edges, though the focus Parker gave them is noticeably missing. **Max** may not be meat and potatoes, but it's a tasty salad. *M.T.*

Sound: C+ Performance: B

- Book of Dreams:** Steve Miller
Capitol SO-11630, stereo, \$7.98.
- CSN:** Crosby, Stills, and Nash
Atlantic SD 19104, stereo, \$7.98.
- JT:** James Taylor
Columbia JC 34811, stereo, \$7.98.
- American Stars 'n' Bars;** Neil Young
Reprise MSK 2261, stereo, \$7.98.

Ah, the state of the modern troubadour, American variety. He comes in all sorts of masks.

Steve Miller is the undisputed king of masks. The gangster of love, the space cowboy, Maurice the slickster, the Joker; these have all been devices to expand Miller's base. Gradually he has absorbed the progressives, the rockers, the balladeers, even the R & B audience with a calculated series of lifted riffs and stolen lines. Though Miller finally got his breakthrough hit with *The Joker*, it was the *Fly Like an Eagle* album that burst him through to mega-sales on the order of **Fleetwood Mac**.

Book of Dreams is shaped just like the **Eagle** album. There's a smash hit song in *Jet Airliner* (easily one of 1977's classic summer songs), the soundalike successor in *Swingtown*, a solid rocker in the Joe Walsh graven image *The*

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Stake, the album's "Progressive" number in *The Sacrifice* which guitarist Les Dudek first recorded on his debut album of a year ago, plus Miller's usual compliment of gratuitous spacy minute-or-so long segues that link improbably related songs irrelevantly but well.

As ever, Miller's production is seamless and clean. The production and packaging (which nowhere includes a picture of Miller or anyone humanoid) are the album's real stars. It is a classy album that for most artists would be a triumph. For Steve Miller it will forever stand in the shadow of the album before it.

CSN is a follow-up album, too, but the one it follows came out eight years earlier. That album made legends out of its principles, Stephen Stills, David Crosby, and Graham Nash. The interim has seen all of these guys involved in some justly legendary music that spans the dismal and the delicious.

One thing is clear in front. Whatever they do, they will never recapture that initial buzz of having it all happening fresh. What matters most is that the forms that they clicked with in 1969 are not only still valid, they are nearly omnipresent. But these guys still do it as well as ever.

CSN is a finely crafted album of substance and fluff deftly interwoven. All of these guys work best when they are sharing the material chores with others. They are all writers who happen to complement each other well, and the company of others is a nearly sure cure for blahs, the repetitiousness each alone can be accused of. Together individual limits seem to vanish among their respective strengths.

Stills' *Dark Star* and *Fair Game* are both strong pieces of material. Crosby's *Anything at All* is one of his best ever, an unabashedly honest song—"Anything you want to know, just ask me/I'm the world's most opinionated man." *In My Dreams* is standard Crosby, a bit reminiscent of *Laughing*, but a strong piece as is *Shadow Captain* written with keyboardist Craig Doerge. Nash's material covers quite a range. His *Cathedral* is just masterful; it is probably the best number on the album. It's also a far different thing than the album's first single, Graham's *Just a Song Before I Go*.

CSN plays well as an album. It's full of good if not often monumental stuff, but you never really have the right to expect or demand monuments. Human nature and artistic temperament just don't work that way. Another excellent example of the maxim is the new release by CSN's erstwhile fourth wheel,

Neil Young, whose *American Stars 'n' Bars* appeared just prior to his ex-mates new effort.

Young has been one of the great erratics. Whenever you may feel that you've got a bead on the kid, he'll release something so odd its only purpose seems to be defusing your expectations. Thus his albums have run the gamut from exquisite (*Everybody Knows This is Nowhere* and *After the Gold Rush*) to a quintessential pop album in *Harvest*, which he followed with some purely dismal work (*On the Beach* and then *Tonight's the Night*). The *Zuma* album of late '75 was something of a comeback with his best work in years. The new *American Stars 'n' Bars* is calculated to be unnerving. Some of it is brilliant. *Star of Bethlehem* sung with Emmylou Harris is a beauty. *Hold Back the Tears* and *Bite the Bullet* are chunky, solid numbers. The giant *Like a Hurricane* is a raging catharsis of a song. However, some quite frankly slipshod material at least partially brings down the album. *Homegrown*, for instance, only defuses the tension that *Hurricane* just before it established.

Young's production is predictably rough edged. He conspicuously dangles loose ends while the sound quality can change drastically from cut to cut. The home-recorded *Will to Love* besides needing an edit of a minute-and-a-half to two minutes has a nasty hiss. Generally Young wears his off-handed production as casually as bluejeans, as if it is just another way to demystify himself. Thus, *American Stars 'n' Bars* is occasionally amazing, more often tepid and even dismal in a spot or two, but it is ever fascinating as pop pathology.

James Taylor, who is as responsible as anyone for the tight-lipped, thin-blooded school of 70s songwriting, has gradually exposed a more funky side. With his new album *JT* he leaves Warner Brothers for Columbia. The new set is as much as anything else an attempt to make the big crossover to mainstream once and for all. The cover art is a small indication. The design and photo are strictly 50s style, like Johnnie Ray or Guy Mitchell might have used.

JT is not Taylor's best. Nor his second best. Last year's *In the Pocket* had spark and verve. *JT*'s aura is more a self-contented glow that is as much complacency as contentment. Most of the songs are wistful love songs. He steps out from this theme on the C & W ballad *Bartender's Blues*, which is about how unpleasant bartending is, and on the joined pair of songs *Terra Nova* written with wife Carly Simon

about sailboating followed by the a capella *Traffic Jam*, which is both witty and cute. The album's most thumping number is *Honey, Don't Leave L.A.* which Taylor tellingly didn't write.

JT is aimed squarely at the road's middle stripe and the soft-core audience that brings along. All too sadly it lacks fire and sounds watery. M.T.

Miller:

Sound: A Performance: B

CSN:

Sound: B+ Performance: B+

Young:

Sound: C- Performance: D+ to A-

Taylor:

Sound: B- Performance: C

Miriam: Jessi Colter

Capitol ST-11583, stereo, \$6.98.

Jessi Colter has been impressively maturing as an artist through her last several albums. With *Miriam* she leaves the Nashville sweetening behind and makes an album centered on her voice, piano, and songs, with no more additional help than is needed. Follow-



ing the lead of the torrid title cut on *Diamond in the Rough*, her previous album, the spare, uncluttered Jessi gets closer to you than on any of her earlier and retrospectively more tentative discs. Her writing has made strides comparable to her growth as a performer, unashamedly and unabashedly baring emotion.

With *Miriam* Jessi Colter finally sounds poised to make the big jump in public attention she has been threatening. All the ingredients have been there, and on *Miriam* it all coalesces. M.T.

Sound: B+ Performance: A-

Richard Hell: Richard Hell
Ork 81976, stereo EP, \$3.00.

Forget about the fact that there's a New York Scene with the Televisions On, the Talking Heads, or even the Ramming Ons. And you can forget about side one of this extended play record, because it's not very good, but you better remember to send away your three bucks to Ork Records, P.O. Box 159, Cooper Station, New York City 10003, because side two is rather incredible and you're not likely to find this in your neighborhood record store. I'd venture to say that *You Gotta Lose* is a classic, despite the recording's sound—Hell delivers a great vocal, and the bass riff is incomparable. Nice cover photos as well.

By the way, I thought I might take this space to alert you to the fact that most New York bands would make terrific managers because they think better than they play. That's all. *J.T.*

Sound: C

Performance: B (inconsistent)

Esoteric Value: A

IZITSO: Cat Stevens

A & M SP-4702, stereo, \$7.98.

Reviewing **IZITSO** is not the easiest of jobs. It is a fine album, but like

everything after **Catch Bull at Four**, Stevens' work has stood in its own shadow as he gradually retreated from the mystic/cosmic/childlike stance and moved closer to the purely tangible. Thus songs like (*Remember the Days of the Old Schoolyard* and (*I Never Wanted*) *To Be a Star* draw directly on the first person, and I must admit to taking the sentiments of the latter tune with a grain of salt. However both are catchy, clever tunes. The album contains two instrumentals, *Kypros* and *Was Dog a Doughnut*, which are interesting excursions into the peculiar world of dub, but can only be considered filler.

The album is beautifully recorded, no flaws there at all, and extravagantly packaged down to a plastic lined inner sleeve. **IZITSO** has a lot going for it, but it just isn't essential Cat Stevens.

M.T.

Sound: A

Performance: B—

Come Hell or Waters High: Omaha Sheriff

RCA APLI-2022, stereo, \$6.98.

Omaha Sheriff's debut is not a staggering monument, but I like it. One thing, they don't really sound like anyone else.

Paul Muggleton and Bob Noble are the band's songwriting core. Their songs are stories that occur away from hectic noise. *Quiet Please* sets the tone right at the start and the mental attitude it establishes is consistent throughout the album. Musically the album really takes off with the terrific break in the middle of that first song and never looks back. Certainly a good deal of the credit for the unexpected flourishes and twists in the inventive arrangements must go to producer Tony Visconti who has never, in a long career of making other people's records, been afraid of taking risks.

Waltzing in the Rhododendrons, Me and Bob Seymour, and One Nightingale's Song abound with dynamic shifts and melodic thrusts at once catchy and complex. *What's It All For* has a fire unexpected for such a bucolic band.

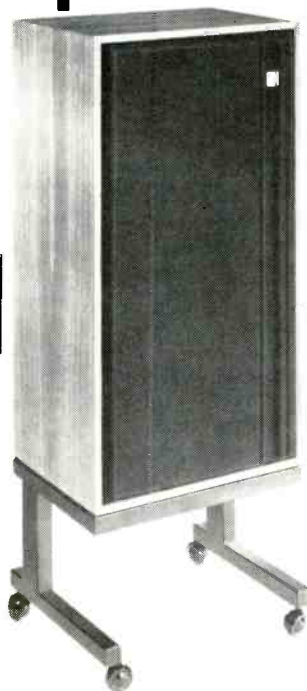
Omaha Sheriff is not an obvious band, but they will challenge you on the road to delight. Although the record could use a slightly hotter sound, they are a welcome and refreshing change of pace from the standard two guitars, bass, and drums that make up most bands. *M.T.*

Sound: B

Performance: B+ 119

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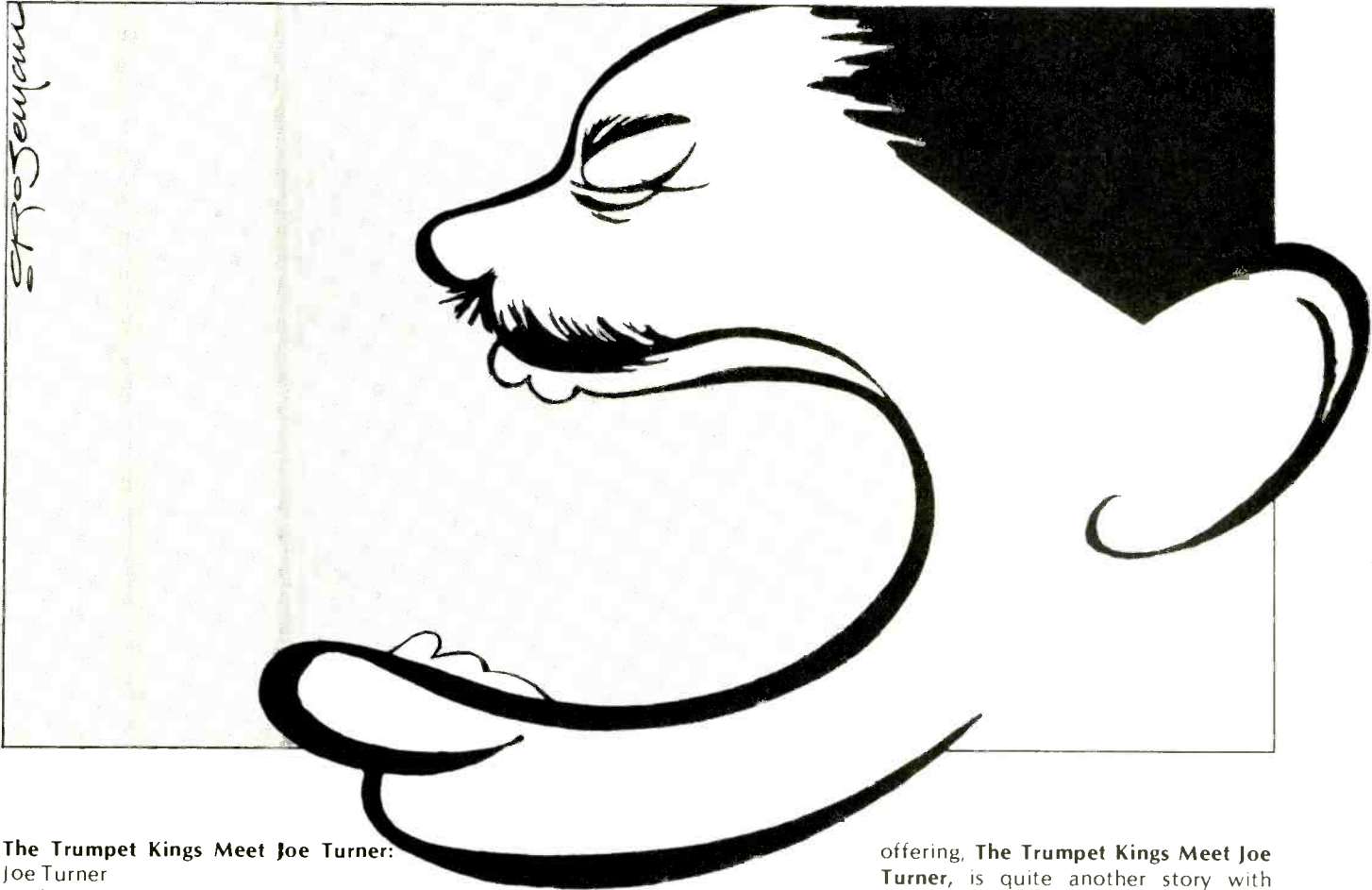


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Jazz & blues



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The Trumpet Kings Meet Joe Turner:

Joe Turner

Pablo 2310-717, stereo, \$7.98.

In The Evening: Joe Turner

Pablo 2310-776, stereo, \$7.98.

Bull-voiced Big Joe Turner, originally a singing bartender out of Kansas City and sometimes known as "The Boss of the Blues," is one of the two great Kansas City blues shouters closely associated with jazz (the late Jimmy Rushing, a Count Basie mainstay during the Swing Era, is the other). In the late 30s and through the 40s, Turner was esteemed by a handful of collectors and buffs for his performances and recordings with jazz musicians Frankie Newton, Hot Lips Page, Pete Johnson, Don Byas, and Art Tatum. In the early and mid-50s, Turner broadened his appeal, achieving some commercial success with such R & B hits as *Chains of Love* and *Shake, Rattle, and Roll* which sold briskly to the emerging rock and roll audience. Quickly

eclipsed by the diluted and debauched versions of R&B offered by the white rock and roll performers, Turner returned to his jazz surroundings and recorded a classic Atlantic LP in 1956, **The Boss of the Blues**.

In recent years Turner has not been able to approach the quality of **The Boss of the Blues** and another recording made for Atlantic, **Big Joe Rides Again**. Jazz producers like Bob Thiele, and even the tasteful Norman Granz on his Pablo label, have tried to enter Turner in the B.B. King/Albert King sweepstakes by giving him heavy wah-wah guitar, fuzztone backup, the kind of slogging accompaniment inappropriate to Turner's driving, lifting style. Turner's first Pablo release, **Nobody in Mind**, replete with triplet back-beat figures and shuffle rhythms, was a stupendous bore. But his second Pablo

offering, **The Trumpet Kings Meet Joe Turner**, is quite another story with Turner roaring and swinging lustily against the combined talents of trumpeters Dizzy Gillespie, Roy Eldridge, Harry Sweets Edison, and Clark Terry.

The backing on **The Trumpet Kings Meet Joe Turner** is by Big Joe's own rhythm section which includes blues guitarist Pee Wee Crayton. Turner shouts with authority and power on such numbers as *TV Momma* and *Taint Nobody's Business If I Do*, and the impressive quintet of horn men provide tasteful obbligati as well as some brilliant solos of their own. The album is indeed an effective marriage of jazz and blues.

Turner's latest Pablo disc, **In The Evening**, is not on a par with his Atlantic classics, nor is it as good as **The Trumpet Kings Meet Joe Turner**. Now in his late 60s, Joe is not singing as stoutly as in his prime, yet there are

good moments here as on his old hit, *Chains of Love*, with Joe's voice emerging big and juicy, preaching, with instrumental, blues-like phrases. The backup here is basically R & B with accompaniment consisting of two guitars, alto sax, piano, bass, and drums. There are good solos by Pee Wee Crayton's bluesy guitar and Bob Smith's bright-toned reedy alto. The inclusion of numbers like *Summertime* and *Sweet Lorraine* is a drawback as Joe sings them rather awkwardly; much better is the title track and *Corinna*, *Corinna* where Big Joe is on home ground. Both albums, taped by Granz in Los Angeles, are well recorded.

John Lissner

Trumpet Kings Meet Joe Turner

Sound: A Performance: A

In The Evening

Sound: A Performance: B

Another Epic Stride Piano: Joe Turner Pablo 2310-763, stereo, \$7.98

Not to be confused with the blues singer, this is the other Joe Turner, a lively, swinging stride pianist in the James P. Johnson and Fats Waller tradition. Johnson's playing is grounded in his early experience in the Harlem jazz bands of the 20s and with Louis Armstrong in the 30s. He later toured Europe with Adelaide Hall, and after World War II settled in France where he has made a living playing in various European cafes and bars. Recently unearthed by Norman Granz, who recorded half of these sides in London during November of 1975 and taped the other half in the New York RCA studios in February of 1976 during a brief Turner engagement in New York City, this is the first Turner recording available in the States in over 40 years. It seems a pity that Turner has had so little exposure in all the years he has been away.

Those who like the Harlem school of piano, indeed, those who enjoy lively, sprightly, inventive jazz piano will derive much pleasure from this release. Turner has authoritative command of the stride idiom, but he is not a revivalist or neo-classicist. He was part of the period, a younger disciple of Walker and Johnson. These are 16 vigorous sides, a rollicking salute to a truly classic piano style by an authentic survivor. As Bennie Green points out in his liner text, Turner's years spent as a soloist in European *boites* has resulted in an extremely catholic repertoire. As with many barroom keyboard men, he has learned to accede to every corny request from

goulash operetta to *Bill Bailey Won't You Please Come Home*. In this delightful collection, he explores the stride possibilities of such unlikely tunes as Friml's *Song of the Vagabonds* and a pop standard, *Gone With The Wind*. He also treats us to vigorous, striding interpretations of Monk's *Well You Needn't* and Ellington's *Caravan* as well as a rousing version of Earl Hines *Rosetta* plus a finely syncopated salute to Fats Waller which includes the master's *Viper Drag*, *Squeeze Me*, *Smashing Thirds*, and a Waller-ish performance of *I'm Gonna Sit Right Down and Write Myself a Letter*. There are also several original pieces including a sprightly *Salute to Willie the Lion*.

In a world brimming with abrasiveness and anger, much of it reflected in the shrill, harsh sounds of contemporary pop and jazz, Turner's music, conceived in another era, has a happy, joyous ring to it. John Lissner

Sound: A Performance: A

The Lee Konitz Nonet

Roulette SR 5006, stereo, \$7.98.

Though he has recorded more in the past few years than in the preceding decade, this is Konitz's first U.S. release since 1975. It seems to be this splendid saxophonist's fate to find more appreciation abroad than at home.

Nonetheless, the nonet is a domestic phenomenon, though it was organized for an Italian tour which failed to come off. In existence for two years at this writing, it has become a cherished part of the New York jazz scene, performing at least two nights a week when the leader is in town.

Aside from the rhythm section, the group (two trumpets, two trombones, two saxes [Konitz's soprano and alto, Kenny Berger's soprano and baritone], piano, bass, and drums) has maintained a stable personnel and was more than ready to record by last October. The Italian promoter who requested nine pieces (Konitz asked if he would settle for three trios) no doubt had in mind the model of the famous Miles Davis Nonet of 1949, of which Konitz was an essential part, but this is no recreation of music past.

To the contrary, what Konitz and his gifted associates have wrought is a refreshingly new sound and conception. The arrangements (five by Sy Johnson; one each by Berger and Konitz) strike a fine balance between notation and spontaneity, and the ensemble playing is often brilliant (as on *Matrix*, where Johnson transcribed six choruses of composer Chick

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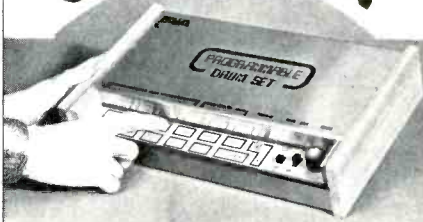
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Corea's piano improvisations, with Burt Collins's piccolo trumpet in the lead, and on Konitz's marvelous arrangement of *Without A Song*, with its shifting melodic lead and exciting passages for the massed horns without rhythm accompaniment). Berger's setting of Wayne Shorter's *Nefertiti* is outstanding.

The chief solo voice, justly, is the leader's, and his soprano playing is as personal and delightful as his customary alto. For years, he has been heard in intimate settings; the full ensemble sound seems to inspire him. There are also impressive bits by trombonist Jimmy Knepper and trumpeter Collins, and fine work by youngsters Berger and Andy Laverne, the latter on acoustic and electric piano. Bassist Rufus Reid and drummer Billy Hart provide strong rhythmic support.

Lee Konitz is always rewarding, but this setting is special. The nonet has more to offer; its repertoire is extensive. This album may be hard to find, but it's worth the effort.

Dan Morgenstern

Sound: A- Performance: A

122 Clarinet Gumbo: Barney Bigard & Orchestra

RCA APLI-1744, stereo, \$6.98.

Barney Bigard, the last of the great New Orleans jazz clarinetists, is now in semi-retirement on the west coast. Like the other classic Crescent City clarinetists, particularly Johnny Dodds and Sidney Bechet, Bigard's work is deeply rooted in the blues idiom, full of fresh, inventive melodic lines and masterly technique. Duke Ellington authority Stanley Dance, in a memorable phrase, writing about Bigard's most productive years when he was a member of the Ellington orchestra, compared Bigard to "a falcon soaring against cliffs of brass." Indeed, the decorative element in Bigard's playing, the wide, looping phrases and the filigree swoops and runs, all made a perfect foil for the rich, shifting textures of the Ellington ensemble.

RCA's jazz A&R man Frank Diggs has recorded Bigard with a small combo under the direction of the multi-talented west coast jazz musician Dick Carey, and the results on the whole are quite pleasing. This is an easy-going, often exuberant jazz outing, played with polish and subtlety by Carey on alto horn and trumpet; Ray Sherman, piano; Eddie Safranski, bass, and Nick Fatool, drums. Age has taken its toll of Bigard's playing skills, but he is still capable of producing the dark,

supple sounds, the soaring, wailing phrasing that gives him a unique identity among clarinetists.

Interestingly, Bigard is probably the last clarinetist to employ the old Albert method of fingering, the true Creole clarinet style in which the sub-tones or *chalumeau* registers of the instrument are totally employed. This sound is particularly effective on Bigard's luxuriant blues playing on such quasi-Creole tunes as *Memoir de Bayou* and *Clarinet Gumbo*. This is a very good album from a jazz master now in the autumn of his career. *John Lissner*

Sound: A Performance: A-

Soprano Summit in Concert: Bob Wilber-Kenny Davern

Concord Jazz CJ-29, stereo, \$6.98.

Soprano Summit is a unique and delightful band, and this, its third LP, is their best work on record so far.

Co-leaders Wilber and Davern, along with guitarist-vocalist Marty Grosz came to the Concord, California, Jazz Festival without a bassist and drummer. The estimable George Duvivier was not able to make the trip, and the drum chair was vacant. Producer Carl Jefferson teamed the three fifths of the Summit with two notable summit inhabitants in their own right, bassist Ray Brown and drummer Jake Hanna.

It was an inspired choice, and the "live" recording provided another creative impetus (the group's studio recordings tended toward perfectionism).

Soprano Summit is unique for two main reasons. First, the co-leaders, who both double on soprano sax and clarinet, share a common tradition and general outlook, but are sufficiently individualistic to provide interesting contrast and, perhaps most significantly, egg each other on. Second, the group has a brilliant arranger in Wilber, and a repertoire all its own, combining eclecticism and originality in a wholly refreshing blend.

Thus, they are able to revitalize classic pieces from the jazz past (Duke Ellington's *Stompy Jones*; Armstrong's *Swing That Music*; the 1928 hit *Doin' the New Lowdown*, among the samples herein) and create new music in the tradition (Wilber's tribute to Johnny Hodges and Billy Strayhorn, *The Golden Rooster*; the two-clarinet blues, *The Grapes Are Ready*, in the Dodds-Noone-Bechet mold).

None of this material, it must be noted, is approached in a museum

spirit. These men *play*, and the music is nothing if not vital and immediate. On *Swing That Music*, for example, they give new validity to that old cliché, "blowing up a storm." And their blues are living blues.

Grosz, a confirmed practitioner of the unamplified guitar, is more than a mere adjunct. His approach, in this age of electronics, is almost revelatory, reaffirming the beauty of the natural guitar sound, and the delightful rhythmic feeling of the 4/4 strum (kept alive in an entirely different climate by Basie's Freddie Green). He is a nimble and tasteful soloist, and his Fats Waller-flavored singing adds a further dimension to the band.

Soprano Summit transcends categories. Its music is accessible to any open pair of ears, and in the process, might open some eyes to the permanent truths of the music called jazz.

Dan Morgenstern

Sound: A Performance: A

Images: Phil Woods and Michel Legrand and Orchestra

Musicians: Phil Woods, alto sax; Michel Legrand, piano, arranger, conductor; Derek Watkins, lead trumpet; Don Lusher, lead trombone; Roy Willox, principal woodwinds; Ron Mathewson, bass; Kenny Clare, drums; Jud Proctor, lead guitar; Armand Magiani, bass saxophone and "too many marvelous musicians for the space allowed" on the album jacket.

Songs: *The Windmills of Your Mind*, *A Song for You*, *Nicole*, *The Summer Knows*, *We've Only Just Begun*, *I Was Born in Love With You*, *Clair de lune*, *Images*.

RCA BGL1-1027, Stereo, \$6.98.

While **Images** features Phil Woods in what would superficially appear to be a more commercial setting than his own recent quartet dates (**Musique Du Bois**, Muse 5037; **European Rhythm Machine**, MGM SE-4695; **E.R.M. at Frankfurt Jazz Festival**, Embryo SD 530), his alto flights are as enticing, if not more so. Michel Legrand's arrangements are extremely sympathetic to Woods' playing, they sound as if they were divinely conceived for one another.

Windmills opens as an under-spoken spring-like ballad. As the buds of spring grow into the green leaves of summer, *Windmills* bursts into a vitalized swinging showcase for the band to coax the alto man to play. This particular Legrand arrangement is reminiscent of a series of arrange-

ments Manny Albam wrote for an album called *Soul of The City* (Solid State SM 17009). Again it was Woods temperamental, but sentimental, alto featured in a garden of strings with a big band.

Phil Woods articulate alto cadenzas add a personal touch to the opening and closing of *Song for You*. Grooving over swinging brassy ensembles, his scale runs and intonation are notably impeccable. Woods' sound on his own releases was never quite as captivating as on *Images*. This has to be a result of better orchestrations and the inspiration of better accompanists.

Woods claims that the album's conception warranted a "relatively low key opening, building, through the use of contemporary and familiar material, to the Suite (*Images*), which was to be a jazz *tour de force*. It is modest of him to leave to the listener the evaluation of this attempt. To this listener, Phil, success is an understatement. *Images* is the *piece de resistance* of the ensemble's and soloists' efforts. Changing tempos, varying instrumental combinations and densities without losing the individuality of key players, such as Woods and Legrand, is creditable to keen insight and sharp writing.

The last movement of *Images* is preceded by some dark piano rumblings by Legrand—quiet thunder before the storm. Suddenly, a biting wind—Woods' alto—and the storm whips its way through town. Carrying on at an unbelievably blistering tempo, with gusts of fierce, punchy brass ensembles, the suite climaxes with a musical discussion between Woods and Legrand moving at just about the speed of light, as Clare alone maintains the tempo in the upper stratosphere.

Kenny Clare has graced the rhythm sections of everybody from Tony Bennett to the Kenny Clarke-Francy Boland Big Band (as the brush drummer in that rhythm section). He has once again gone above and beyond the call of duty in interpreting Legrand's charts just the way they ought to sound. Beyond sharp timekeeping, and dead-accurate anticipations, he inflates the rhythm section with a drumnastically big rock sound on *Nicole* and *We've Only Just Begun*. Compliments also to bassist Ron Mathewson; interesting lines and flawless articulations make the bass one of the outstanding things to listen for on the recording.

Woods is a veritable master of the alto sax whose playing on *Images* shows us a galaxy of his brightest

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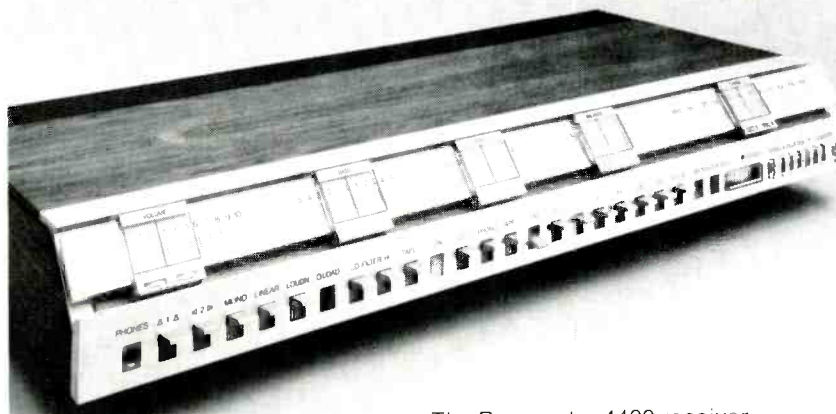


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ideas. The LP hardly fits the cliché of matching jazzman and hit tunes, backed by strings, to sell records. With all the new writing and the creativity applied to the established tunes, **Images** is eons beyond being just a rework of commercial successes. The recording is well-mixed and reproduces cleanly, unlike too many other RCA discs I've had the displeasure to purchase and/or review. The recording was done in England, which probably accounts for its superiority over records done in the continental U.S.

Images is a stunning jazz production which I urge you not to miss.

Eric Henry

Sound: A — Performance: A

C.J.'s Roots of Chicago Blues, Vols. 1&2.

Blue Flame BLP-101 & 2, \$6.00 ea.

It's Carter the Peanut Man/Please Come Back: C.J. Record

Colt Country 672, 45 rpm, stereo, single, \$1.25.

Blues and Women/Men Are Kicking On Me: Carl Jones

C.J. 673, 45 rpm, stereo, single, \$1.25.

124 Carl Jones has been steadily operating his C.J. and subsidiary record labels business on a part-time basis since the 78 rpm era, with few (if any) commercial rewards for his efforts. The two albums on Jones' Blue Flame label are excellent anthologies of material originally issued on C.J. 45s, showing how varied and valuable his output of about 75 singles has been. Though little of the music could properly be termed "roots" (indeed, a few tracks aren't even blues), these sets very effectively point out that in the past 20-odd years Chicago has been home to a wide range of diverse blues styles, not just the homogeneous music most observers think of as "Chicago blues."

Volume 1 includes three "name" artists, most notably Hound Dog Taylor, whose *Christine* and *Alley Music* (recorded in 1962, with Lafayette Leake on piano) are quite similar to the Elmore James-inspired riffing of his later Alligator albums, though Dog was using far less fuzz distortion 15 years ago. Earl Hooker's sharp-toned staccato guitar picking is spotlighted on a great 1966 rockin' r&b-jam instrumental *Wild Moments* and a good-jump-novelty, *Chicken*. Betty Everett, who would go on to fame as a soul singer (with such hits as *You're No Good*, *Shoop Shoop Song*, *There'll Come A Time*, etc.), opens up and

wails on *Why Did You Have To Go*, with Al Perkins' band.

Other highlights include *Set A Date*, with a propulsive shuffle beat provided by Lazy Bill Lucas on piano and Hound Dog Taylor on bass guitar; two emotional blues-ballads by the sorely under-rated Lee Jackson, and the intense, Junior Parker-flavored vocals and harp of Little Mack Simons, whose 1959 *Come Back* (featuring clipped-note guitarist Eddie King) is the album's earliest cut.

Vol. 2 opens with Andre "Voice" Odam, a blatant B. B. King imitator, though Odam's vocals shout and the guitarist bites with a white-hot fervor B.B. seems incapable of generating these days. Jimmy Rogers—best known for his *That's All Right*, cut in 1950 while he was a member of Muddy Waters' band—brings back the early 50s Chicago sound with his recent *Blues Falling and Broken Heart*.

The rest of Vol. 2 abandons pure blues to varying degrees. Betty Everett's *Happy I Long To Be* is a fine example of early-60s r&b developing into soul, with a nicely-integrated vocal group backdrop. Freddie Hall's *Love and Affection* is a first-rate blend of a blues-rooted vocal and guitar with a marvelous 50s-style doo-wop vocal group, the Night Rockers. On the other hand, Pattie Lenoir & her High Stands' *Try It, You'll Like It* (mis-labeled *I'm On The Run*) is an irritating fifth-rate soul cut with no redeeming features.

Also included are two of C. J.'s rare ventures into jazz, featuring the hard-bop trumpet of Bill Howell. His acrid tone and sputtering rhythm deserve a longer showcase than these two single-length tracks, which hardly allow for sufficient solo development. Howell's quintet also spotlights a meaty tenor and a solid rhythm section.

The sound varies considerably from track to track. Some have virtually no presence and questionable clarity, while others are fairly respectable, though even these seem more suited to barroom jukeboxes than to hi-fi component setups. The Odam and Jones' cuts on 102 are in a stereo which crowds the band into the right channel, while the vocals come out of the left. The rest of the cuts are mono. The packaging is extremely amateurish, but the music is too vital to overlook.

While the Blue Flame albums sample C. J.'s past, Carl Jones carries on with two new releases by himself, as he attempts to hit the big time with a relatively commercial topical novel-

ty cut and a totally non-commercial blues single. Recorded under the pseudonym, C.J. Record, Jones' *It's Carter The Peanut Man* has a perky New Orleans-r&b arrangement and a bouncy rhythm. The flip is the Al Perkins instrumental backing to a Betty Everett vocal that has been edited out, though you'd hardly miss it.

The other single, *Blues and Women*, is more substantial, a superb Roosevelt Sykes-type wailer over a thoughtful down-home piano counter-melody and a brassy trumpet-and-tenor line. *Men Are Kicking On Me* is more of the same, but with a looser rhythmic feel.

All four records are available from C. J. Records, 4827 S. Prairie Ave., Chicago, IL 60615. *Tom Bingham*

Vol. 1

Sound: D to C

Performance: B+ to A

Vol. 2

Sound: C- to C+

Performance: Lenoir F; rest B- to A

C. J. Record single

Sound: C

Performance: B+

Carl Jones single

Sound: C+

Performance: A

The Dave Brubeck Quartet 25th Anniversary Reunion

Horizon 15, stereo, \$6.98

There's an element of poignancy and tragedy in this 25th reunion of the Dave Brubeck Quartet; drummer Joe Morello virtually lost what was left of his sight during the Quartet's 1976 tour, and several months later alto saxist Paul Desmond discovered he had lung cancer, the disease which killed him last Memorial Day.

Much has been written pro and con about this most successful of all jazz combos; all of it is true. Brubeck's stiff, plodding, heavy-handed pianistics, which has drawn the scorn of jazz critics and connoisseurs, is present here. He pummels notes unmercifully during certain passages on the *St. Louis Blues*, *Three to Get Ready*, and *Take Five*, then manages to veer off into straight-ahead swinging passages, riding easily and gracefully through the melody and chord changes.

Desmond never loses his cool, the vibrato-less, limpid, crystalline tone (Desmond once said in describing his sound, "I think I had it in the back of my mind that I wanted to sound like a dry martini") soars through the air lazily and effortlessly, brilliantly exploring the melodies. Until the very end,

Desmond remained a fount of graceful, melodic fluency; his tone had thickened somewhat over the years, but his melodic embellishments remained as skillful as ever.

Brubeck and Desmond always collaborated beautifully on ballads (one of Brubeck's outstanding musical attributes has been his chordal support); on *Don't Worry About Me*, they are heard improvising together with facility and empathy, with Desmond hovering gently over the melodic line, plotting his moves like a thoughtful chess player, floating in and around Brubeck's supporting choruses.

Rhythmically, bassist Gene Wright and drummer Joe Morello are outstanding; Wright contributes a floating lift to numbers like *Take Five*. (On the rather pretentious *African Tunes Suite*, Wright has a technically excellent but tedious double bass solo.) Morello, despite his affliction, performs with gutsy swing; his playing skills and percussive inspiration remains undimmed. Indeed, his work on *Take Five*, *St. Louis Blues*, and *Three to Get Ready* is just as sharp and incisive as it was in the Quartet's hey day.

The recording quality on this Horizon release (Horizon is A&M's jazz label) is first class. Apart from the bursts of applause, you'd never know it was a "live" album.

John Lissner

Sound: A Performance: A-

Nothin' But the Blues: Johnny Winter
Blue Sky PZ 34813, stereo, \$6.98.

If you liked Muddy Waters' recent collaboration with Johnny Winter and James Cotton, **Hard Again** (see *Audio May*, 1977), don't miss **Nothin' But the Blues** which features the same cast, but with the focus plainly on Mr. Winter. What results is Johnny's best album ever under his own name. Like the title says, the album is 100 per cent natural blues.

Nothin' was obviously every bit as much fun to make as **Hard Again**. In fact, I would not be a bit surprised to learn that the albums were recorded in tandem. Muddy appears on one cut, his old song *Walkin' Thru the Park*, and it is an album highlight. Winter dedicated the album to Muddy, leaving no doubt as to where his heart lies. The music speaks for itself. It clearly is the real thing, and that has got to reach you. **Nothin' But The Blues** has got it in the grooves.

Michael Tearson

Sound: A- Performance: A



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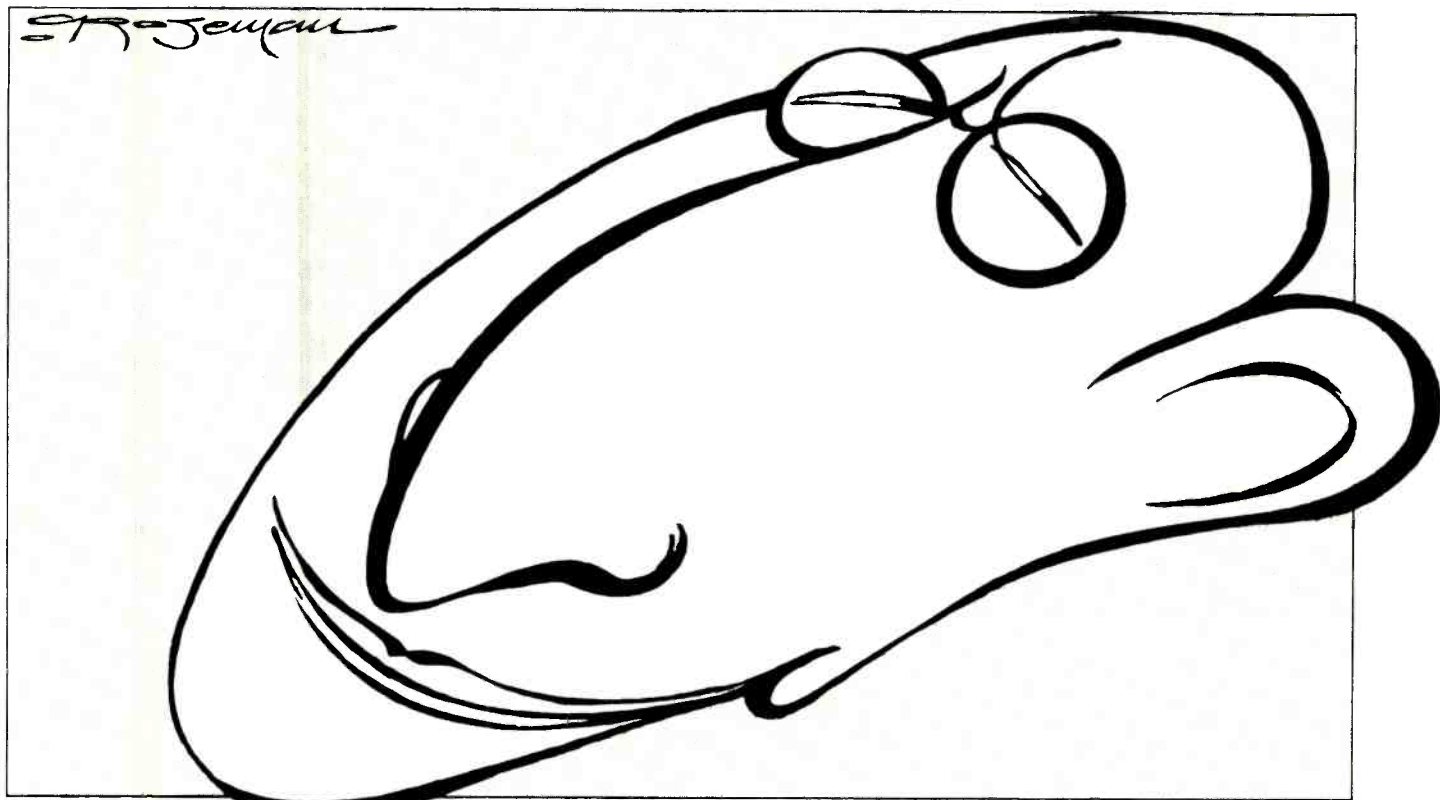
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Classical reviews

Edward Tatnall Canby



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Stravinsky: *L'Histoire du Soldat* (1918). Original version with text. Madeleine Milhaus, narrator; Jean Pierre Aumont, the Soldier; Martial Singher, the Devil. Instr. Ensemble, Leopold Stokowski. **Vanguard Cardinal VCS 10121**, stereo, \$3.98.

This zesty, highly communicative version of the complete *L'Histoire* is a splendid release, a re-release, if I am right, sensibly excerpted from the two-disc album of several years back which included both an English and a French version, with the same trio of speaking voices. The English version was a lot less effective than the natural French original as spoken by French nationals; the English itself was stilted and stuffy, the strong French accents didn't help it. Now, the better of the two discs is out on its own at the low Cardinal price, and it is a superb bargain, even without any knowledge of French. If you know three words of French, you can guess the rest with the help of the notes! For those who have only heard the all-instrumental Suite, this much longer and fuller presentation is a marvelous surprise. (The original was also a stage presentation, but very little is lost minus the visual element.)

Madeleine Milhaus, wife of the composer, is irrepresible, wonderfully clear in her diction and full of glinting humor— she loves every moment of it and relishes the whole act. The Soldier, an innocent *poilu* of WW I, is excellent and as for the Devil, that old Devil of a singer, Singher, is so wily a creature you'll laugh at his every appearance— especially as an old woman, super-falsetto! The music? Stokowski at his best, one of the finest performances of the jazzy, blatty, squeaky, epoch-making little score I've heard by anyone, including Stravinsky himself. And such lovely recording!

Sibelius: Symphony No. 1; Finlandia. Boston Symphony Orch., Colin Davis. **Philips 9500 140**, stereo, \$7.95.

I'll have to say it again—I am not impressed with Colin Davis' Sibelius. I do not think he understands the music, as it was once played with electric impact by such as the Boston Symphony under Koussevitsky; nor is the present Boston orchestra, the younger members at least, able to cope with its sense as their predecessors did. They play the notes, they follow the (inadequate) directions in the score—but not

even a Sibelius can guarantee a real performance via the mere printed note and Italian directions! It's a tradition. It has to be heard and felt and passed on.

For those of us who have memories of the real Sibelius, back when the old man was the great modernist (so they all thought) as well as the ultimate Romantic composer, this Davis performance is like a reading of a foreign language. The points of climax, the big drama, the tense pauses, and pregnant rhythms are missing. It's shapeless under Davis, not as to notes but in emotional sweep. Too bad. Made me squirm all the way through.

Just try the Hungarian State Orchestra and Jussi Jalas on London. Or Eugene Ormandy and the Philly on Columbia—he knows how. It's an art, and Davis doesn't have it.

Schoenberg conducts "Pierrot Lunaire." Instruments, Erika Stiedry-Wagner, recitation. **Columbia Odyssey Y 33791**, mono, \$3.98.

Natch, Columbia doesn't give the date of this performance, out of the 1930s if I remember rightly, and merely notes that it has already appeared

twice before on LP, regular-line and then Odyssey. It is an enduring classic of performance, if a very, very out-dated 78 recording by now.

The recording was made at the time of a live performance, or performances, in New York—and I was there. I will not forget it. As the composer himself started conducting, the audience began to walk out, crudely and officiously, simply ignoring his presence. I was outraged and furious that an audience in the good old U.S. could be so impolite—why it was like, er, France! But at least these people showed exactly what they thought. Barbarous modernism. That woman, Erika Stiedry-Wagner, actually shouted, not singing at all! So she did and this was the first *Sprechstimme*, halfway between singing and speaking. I found it horrifying but also fascinating, and I still delight in it each time I hear it well done—as in other more modern recordings. The music dates from 1912 but it still shocked in 1930 and later.

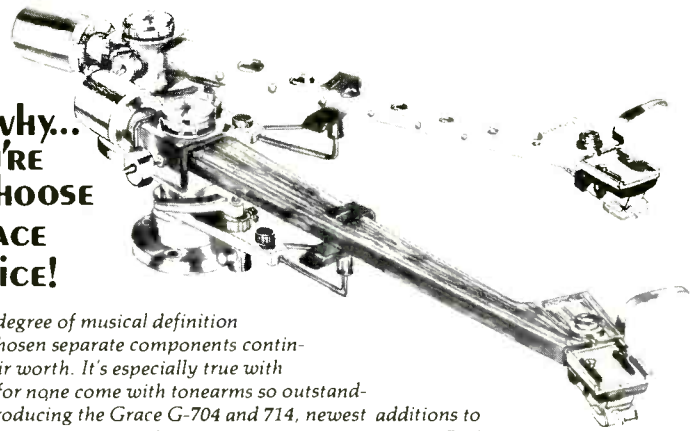
Does it now? Well, if you can hear through the fog of limited sonics (evidently one mike, the singer/speaker much too faint against the instruments, the tonal range abysmal) you will, if you are reasonably young, be anything but shocked. It all sounds nice and old-fashioned, even to me. Of course, we do have our neanderthals, musically, and so some of you will *still* be shocked. Well, your privilege! This is one of my favorite Schoenberg works, pre-serial, and probably because, based on a French text translated, it has a lot of the French economy of means, each little song only minutes long. Most Schoenberg knows no bounds of that sort! He was Germanic, after all.

Mozart: Piano Concerto in C ("Lützow"), K. 246. **Haydn: Piano Concerto in D**, H. XVIII, No. 11. Ana-Maria Vera; Rotterdam Philharmonic, Edo de Waart. Philips 6833 199, stereo, \$7.98.

This little gal was 11 years old when she made these two concerto recordings a short while ago. She is Dutch-Bolivian, out of Washington, D.C.; her American-based training has been more continental than not, as witness the choice of music. In Holland they did *not* make her play the Tchaikovsky Concerto No. 1! Instead, these two works, vastly more suitable for a young mind with fluent fingers. They give her a chance to show what an 11 year old ought to show, not originality nor deep romantic thought but simply an unflappable, impeccable technique, perfectly poised and absolutely faithful to what her (very good)

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teachers have taught her—so far. No personality whatsoever, at least in the playing. Or let's say, a modesty in applying the principles of good musicianship. Thank the Lord! With such a beginning, she may well grow up a huge success and a mature artist.

So buy the record forewarned. It's not exactly exciting, even though Edo de Waart, the finest of the younger Dutch conductors, gives her an impeccable accompaniment in both works. He knows better than to push too hard' so he matches her playing perfectly.

Sir Adrian Boult Conducts Beethoven. Symphonies Nos. 3,5,6,7; Overtures Leonore #3, Coriolan, Fidelio, Egmont. Philharmonic Promenade Orch of London. **Vanguard Everyman 359/62**, four discs, stereo, \$15.98.

Now you wouldn't think that this cheapie, low-price-line release, with a

"Promenade" orchestra, equivalent of our pops orch, would be very much of a monument to Beethoven. You would be utterly wrong. This is the greatest Beethoven orchestral playing I have heard since . . . well, since Toscanini, and for my musical ear it is even better and just as exciting. This old Englishman, who has been modestly around a very long time and made 78 records when I was a kid, and founded the BBC's classical orchestra, is without a doubt—along with his dedicated English players—well ahead of ALL the much acclaimed and expensive famous names, both old and young, on records.

A lot to say? It's my opinion but I've tried it on other musicians. Wow! Just everything is musically near-ideal, every phrase, every Beethoven trick, beautifully understood and projected (no ME, ME in Sir Adrian), with the most impeccably accurate playing

and, much more than that, an enthusiasm and intensity that, say, at the end of the *Seventh Symphony*, is just plain hair-raising. For anyone who really goes for Beethoven, this album just has to be a collection of sensational experiences. I still can't believe it—so many things RIGHT, such perfect taste, such understanding. 'Nuff said, I'm getting maudlin.

Engineering and recording are acoustically perfect for the music, too, notably in the horn parts and other brass, which come through with an urgency I have never heard before. What Beethoven can do with one, single pitch, no more! The sonic quality is mostly very good too (I do not know how much of this is technically reissue or repackaging), and the only fault I find is, so to speak, local. One side on my copy, had masses of clicks and pops, though the other side was clean. Better check this.

Joan Tower: Hexachords for the Flute; Breakfast Rhythms. Elias Tanenbaum: Rituals and Reactions. (ACA Awards). Soloists, DaCapo Chamber Players, Chorus, Instr. Ens. Manhattan School of Music, Shulman, Paget. **CRI SD 354**, stereo, \$6.95.

CRI (Composers Recordings, Inc.) is an exasperatingly enterprising organization. Year after year they send us *all* their productions—enough to fill every page of our record reviews, classical, pop, and everything else. I admire, but what can I do? What I do is every so often to pick up a CRI record, arbitrarily, and just play it. Nine out of 10 times, though I am unfamiliar with most of the contemporary music people in a personal way, I find myself amused, interested, and stimulated—if sometimes to negative reactions. So much the better!

CRI has learned one enormous lesson that should impress us. Where all too many modern music groups in the past have scorned audio technology and put forth the most outrageously bad recordings from a technical viewpoint—after all, they are merely canned music—CRI has for many years hired the very best audio they can get and, as pure sound, most CRI recordings are a pleasure and a pride for most of us in audio to hear, music irregardless. I am almost always pleasingly surprised, somehow expecting the worst. Like the Library of Congress in the old days.

This one is typical. On side one a feminine composer of awesomely modern ability, first a piece for flute alone, then, merging, a pair of works



for clarinet and five accompanying instruments, all sounding very much like her, a toweringly definite style. Stretching the bounds of technique—of course. Don't we all, in audio as well? Shrill shrieks, wild leaps, steam-pipe exhaust sounds, high power compressed air whistles—this is the flute today, and it is beautifully recorded (David Hancock) to the last steamy whistle. Forget the music—just think of it as audio sonics. I found the stuff a bit austere but nevertheless always interesting, especially as good audio. That never fails! I think you will enjoy it if only as pure sound—and Joan Tower will be happy to have you as a listener.

Side two, *Tanenbaum* (Christmas tree in German), is one of those neo-happenings on a large and enthusiastic scale. I really had to laugh. Instruments and chorus on stage. Chorus in the middle of the audience. Tapes pre-recorded. It's a theater piece. The "Rituals" are fully written out, the "reactions" are free responses ad lib—by the musicians to the tape and to each other. It's one of those things where all sorts of old groans and sighs, whistles and chants are heard from an obviously involved and amused audience, everybody doing their thing, if I may use an outdated phrase. It happened at the youthful Manhattan School of Music in Manhattan and it sounds that way, with all sorts of unexpected shenanigans going on right and left. Well—that's us, that's the late 20th century and no doubt about it! Again, excellent audio by David Hancock, enough to pull the whole thing together for the hi-fi listener.

The ACA (American Composers Alliance) Recording Award won by these two composers is not for a recording but, oppositely, for a work in performance that is given a recording as the award, and these are then the recordings.

Mozart: Piano Concerto in B flat, K. 456; Mozart/Haydn: Symphony in G, K. 444. The Earl's Court Orchestra, Baird Hastings, Beveridge Webster, piano. **Educo 4032, \$5.50.**

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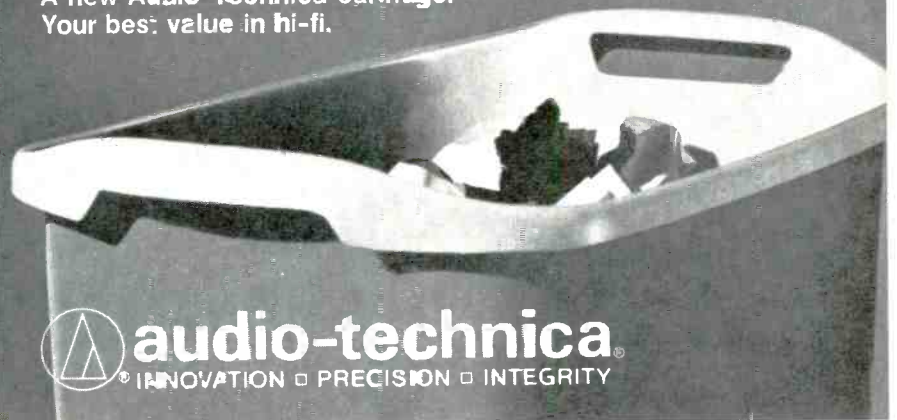
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away too, far off-mike. We seem to be somewhere in a back seat of the auditorium, maybe with a hand-held portable cassette in our lap, surrounded by the all-too-audible "assistance," as the French call an audience. The record jacket says nothing, but the sound is very, very mono. To be charitable, let's say it might be one per cent stereo. Howcome all this? Why? No jacket liner notes, no explanation.

Well, Beveridge Webster, the pianist, was born in 1908 and in the early years of the 1930s had a high reputation as one of the finest American pianists on the scene; a documentary of his recent playing, in his sixties, might perhaps be important. But in this curiously inept form? I do not even know whether he is alive—this might possibly be an *in memoriam* to a great artist? Doesn't say so. And even musically it would not make a good one. Baird Hastings, the conductor, leads the orchestra with such a rigid, metronome beat that Beveridge W. rushes through the Mozart as though to get out the other end as fast as possible, surely not an example of his best playing. The two men seemed to have worked together before—too bad. Is the Earl's Court Orchestra English? Earl's Court, for sure, is in London, but this doesn't really sound like a well-behaved British audience. The record comes from California.

The Symphony by Mozart/Haydn is an interesting piece of music and well worth a recording since it does not appear in the current Schwann. Mozart and Michael Haydn (younger brother of "the" Haydn, Franz Josef) were colleagues at Salzburg and often helped each other out on late musical deadlines. This Symphony is by Michael Haydn, all but the slow introduction at the start, which is by Mozart. Pleasant enough music, as it was meant to be, and played a bit more relaxedly than the Concerto, which helps. Unfortunately, the same recording ground rules apply here—the Mozart introduction is almost drowned in audience noise and by the time the audience gets itself in hand, the Mozart segment is finished. The rest, despite coughs and rustles and breathings, seems better defined than the Concerto—maybe the cassette machine holder changed seats? By the way, I can hear him, or her, breathing heavily throughout both pieces a foot or so away. Crazy.

If you are inclined to make your own live concert recordings, you had better take a salutary moment to listen to this one before you go too far! It has absolutely everything, negatively speaking.

AUDIO • November 1977

Dvorak: Piano Quintet in A, Op. 81; Five Bagatelles, Op. 47. Juilliard Quartet, Rudolph Firkusny, piano, harmonium. Columbia M 34515, stereo, \$6.98.

Here's a good example of the impact microphone placement has upon the effectiveness of music in recording. It can make or break ... in this case it's a draw.

The big late-Romantic Quintet, like so many of its sort, tends to emphasize the virtuoso piano, sometimes to the point where the strings seem mainly an accompaniment, though to be sure there is plenty of interest for them. The piano simply dominates. In Rudolph Firkusny, Columbia has a first-rate Dvorak pianist, energetic and communicative, which pretty much guarantees a satisfying musical performance even though the Juilliard plays with its customary detachment, not very exciting. So the music as such is well presented. As is the group of *Bagatelles*, featuring of all things an old-fashioned wheeze box, a parlor organ with foot pumps.

The harmonium is one of those things our grandfathers had in their homes to play hymns on Sunday. In the thirties you could buy them at auctions for five bucks, and college students snapped them up and played Bach on them. Now those that still work are prized antiques—I played on one only weeks ago in a fancy Connecticut home. You keep forgetting to pump up the air with your feet and the sound keeps dying out. Dvorak has written exactly the right music for the wheeze box—nice, easy background harmonies against which a few solo strings play sweetly. So if you know of a working harmonium, you'd better investigate. Real music.

OK—now the recording. The wheeze box pieces are fine. No complaint. In the big Quintet, there are problems. The piano is excellent, as is most Columbia piano recording these days. But the four stringed instruments are somehow placed ultra-close to the mike or mikes, coming through as though about a foot from your nose and all wiry and scratchy. What else? Not even the finest mike could take down anything else at such a range. After awhile, this gets to be really annoying—the music desperately needs *distance*, spaciousness, and a mellow blending of the strings and piano, as indeed it gets in most European recordings of such music. Scratch, scratch! Mind you, this wiry sound is not a matter of audio distortion. Though to be sure, it is acutely sensitive to any distortion that might

be present. That isn't the problem. It's poor judgment in the mike placing, considering the music's normal impact.

Kurt Weill: Mahagonny Songspiel.

Soloists, Jerusalem Symphony, Foss.

Kurt Weill: Kleine Dreigroschenmusik (Suite from "Three Penny Opera").

Music for Westchester Orch., Landau.

Vox Turnabout TV 34675, stereo, \$3.98.

There is another recording of this *Songspiel*, with a batch of Weill's other early works, on D-C. I must report that this one, on the bottom-price Vox label, is excellent, and so is the second

side—though one is out of Jerusalem and the other from Westchester County, N.Y.

The *Songspiel* (from the German *Singspiel* for a pop sort of opera) is a curious piece, a preliminary "cantata," composed before the famed *Three Penny Opera*, done as a sketch for the larger opera *Mahagonny*, which was worked up after *Three Penny*. In Weill, the sequence of dissonance is in reverse—his earliest works are his most dissonant and most classical; his later, going on to U.S. musicals, his most melodiously undisonant. So this piece, a year before *Three Penny*, is much like it but more dissonant, more

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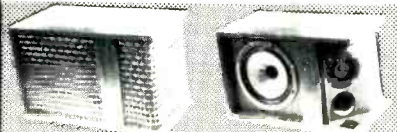
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sardonic. I found it fascinating. Very much of the Twenties, and the voices—as per the authentic original recordings of that day for a number of Weill works—are just right.

The more familiar *Little Suite* came after *Three Penny*, a condensation of its tunes set for orchestra alone but in the blatty, squawky style of the opera itself. The Westchester people have got it down nicely.

Carl Ruggles: Men & Mountains. Mozart: Symphony No. 35 (Haffner). Telemann: Concerto in D. Vivaldi: Piccolo Concerto in C. Soloists, New Hampshire Music Festival Orch., Thomas Neel.

Hammar SD 150, stereo, (Sonar Records, Box 455 Kingsbridge Station, Bronx, NY 10463)

This uninhibited mixture of all sorts of things is not a bad record for listening—the sound is good (and evidently well managed if there was an audience), the selections offer exhilarating variety, to put it mildly. But what is most interesting is simply the typical U.S. professional verve and know-how—you could spot this in a second as an American performance! Crusty Vermonter Carl Ruggles' pioneer "loner" music of the 1930s is precisely played in all its acute dissonance, the Mozart races like no Mozart from Europe—but never with inaccuracy—and the Baroque remainder is sturdy and competent if not precisely of the "authentic" variety now in vogue elsewhere. These relatively local Festivals are able to recruit first rate pros for both orchestra and solo parts and in this case the conductor—based in California—is the sort who has guest conducted all over the U.S. That's just the way he sounds.

Russian Liturgical Chants. Nicolai Gedda; Choir of the Russian Cathedral of Paris, Eugen Evetz. **Philips 6504 135, stereo, \$7.98.**

My first-ever experience of the glory of Russian Orthodox singing came via a single 78 imported disc back in the 1930s, as sung by this very choir, or its predecessor. I worshipped that record and played it to death.

This new one is a somewhat mixed blessing. True, Nicolai Gedda has Russian blood as well as Swedish (and not Italian!). But I would say the intent here, at least on the part of the recording people, is to incorporate a famous international name for better sales. He

appears prominently as soloist against the choir background.

True, too, he works hard at projecting a Russian-tenor style of singing and quite often makes it. Nevertheless, I was bothered all the way through by this slight "international celebrity" aspect, and I found it detracted from some of the music. However, for many listeners it will be exactly the opposite—a desirable sound amidst unfamiliar music. OK! Now you know it both ways.

Tchaikovsky: Piano Concerto No 2 in G (original version). Sylvia Kersenbaum; Orch. Nat. de L'O.R.T.F., Martinou. **Connoisseur Society CS 2076, stereo/SQ, \$6.98.**

In contrast to the famous First, the Second of Tchaikovsky's Piano Concertos is remarkably little known, and that in a doubtfully truncated version. It is indeed a less focussed, more sprawling kind of music, without the lean purposefulness we all know in No. 1, the showpiece of all time. And in the (somewhat) shortened version usually heard, it doesn't impress too much. Sometimes half a loaf is a lot less than the whole.

This version, from the 1955 restored original, is really quite an ear opener. Instead of cutting back and compressing, apologetically, these performers go triumphantly all-out—and let the big work sprawl as far as it will, both the orchestra and the piano. It does indeed, and there is an awful lot of connective tissue that connects to more connective tissue; the big themes are magnificent sprawls instead of taut, tight tunes, and thus it goes, wide open and in no hurry whatsoever! I think this is the key to the music. It works. Though it takes time and lots of it.

This, incidentally, is one of the many EMI-related recordings coded in SQ, and I found it well worth the trouble. The sound sprawls, too, big and blowsy, but the SQ distribution of some of it to the rear definitely adds to clarity and realism, even via a non-fancy decoder. If you still believe in this, as I do, better check the EMI imports and the home-country catalogue; also Electrola in Germany. Gratifying quantities of good SQ/Stereo, and wouldn't it be nice if Columbia would bring in a few on its own?

Somewhat distant recording, European-style, a good deal of hall ambience—and one unfortunate groove pre-echo, right at the beginning, where the groove cut starts some turns before the big opening chord.

Folk bag

Tom Bingham



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The Best of Floyd Tillman Columbia KC 34334, mono, \$5.98.

Floyd Tillman is one of the most important figures in country music history, but these 10 tracks from the late 40s and early 50s are the first Tillman material to be made available in many years. At that, we have Tillman's recent comeback (he's now 63) and the revival of Texas' country heritage in general to thank for this record, quite possibly the most valuable country album of the past year.

Tillman came from a Western Swing background, but his concentration on dirge tempos and dejected lost-love lyrics (he pioneered the "cheating song") helped usher in the "honky-tonk" era. But Tillman was not simply a transition figure linking Bob Wills and Hank Williams. He was a brilliant songwriter, an innovative singer, and a first-rate bandleader in his own right. Among the many artists who

owe an incalculable debt to Floyd Tillman is Willie Nelson, who—while hardly an imitator—derived both his singing and writing (*Crazy*, *Night Life*, and *Touch Me*, among others) styles in large part from Tillman's groundbreaking efforts.

Included on this album is Tillman's biggest hit, *Slipping Around*, which became a pop smash for Margaret Whiting and Jimmy Wakely. Their duet version was bouncy and rather optimistic. To Tillman, adultery was a more somber affair; when he sings of living in constant fear, you swear he's recounting his own private hell. But *Slipping Around* is almost cheerful compared to songs like *I Love You So Much It Hurts*, *It Had To Be That Way*, *This Cold War With You*, *A Small Little Town*, which take melancholia to new extremes, songs in which hope is endlessly thwarted by loneliness, heartbreak, and misery. Oddly

enough though, Tillman's intransigent despondency is too unsentimental to be maudlin.

His unique vocal style is the perfect vehicle for this overwhelming sense of despair. He swooped down on notes with a tormented, pleading Texas drawl, toying with his melodies' natural flow, and phrasing with the smokey backroom inflections of a jazz singer. He's probably the only vocal stylist who can *simultaneously* conjure up images of Ernest Tubb, Billie Holiday, and Dean Martin(!?!), yet his haunting, almost paranoid style is so distinctly a product of his own inner desolation, it's almost scary.

Though Tillman never used horns, his string-band arrangements (featuring fiddles, steel guitar, and mandolin) approximated the fullness and sophistication of a 40s big-band. His rhythm section, featuring a booming bass line, cocktail-lounge piano, and



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lightly brushed drums, gave a jazzy tinge even to his most earthy country laments.

The music was ill-served by the original engineers. While Tillman's voice comes through loud and clear, the backgrounds are ill-defined, jumbled, and far from distinct. In other words, these are typical major-label country recordings of the 40s and the transfers seem quite clean under the circumstances.

Tom Bingham

Sound: C- Performance: A+

The High Part of the Road: Tommy Peoples and Paul Brady Shanachie 29003, stereo, \$4.95.

This is an amazing album by two astonishing musicians, Donegal fiddler Tommy Peoples and guitarist Paul Brady.

As the artist credit makes clear, this is not a recording of fiddle backed by an elementary guitar rhythm, as is usually the case in strict Irish traditional music. Rather, it is a collaborative effort, in which the guitar accompaniment plays a contrapuntal role in many respects equal to the fiddle lead.

Nowhere on this record is there evidence of the simplistic oom-pah chordal backgrounds which too often stifle rather than support the fiddler, by supplying stiff-rhythmed constraints that box in the fiddler's natural melodic flow. On reels, Brady provides tastefully trim strummed groundworks that are expressive, consistent, and flexible, as *The Nine Points of Roguery/Bean An It Ar Lar* will easily demonstrate. On the jigs, however, he plays a creative counter-melody dotted with bold syncopated accents, yet always keeping the rhythmic pulse in mind even when straying far from it. Hear in particular the jig sets *The Kid On The Mountain/O'Farrell's Welcome To Limerick, Port Shean Tseain/The Queen of the Fair, and The Silver Slipper/The Old Hag In The Kiln*. At all times, Brady pays careful attention to Peoples' fiddling; even during his most far-flung flights of fancy (specifically, his seemingly independent lines on the reel medley, *The Wheels of the World/Toss the Feathers*, Brady's work always integrates into the fiddle patterns, framing Peoples to fullest advantage.

People's headstrong fiddling style is one of the most uncommon I've ever encountered, decidedly innovative in its ornamentation, yet remaining

staunchly traditional in its no-nonsense melodic propulsion, rhythmic sturdiness, and time-honored repertoire. Much of his unique ornamentation derives from a technique generally used by uilleann pipers called "cranning." In Peoples' hands, this becomes a sort of stammered somersault, hear *Ard An Brothair/Port An Brathar* and *Port Shean Tseain/The Queen of the Fair* for particularly good examples, in which he skirts around a note two or three times in rapid bursts before actually articulating it. Equally noteworthy are his tightly snapped single-pitch triplets which sound as if they were furiously torn out of his fiddle. When combined with his forcefully thrusting short bow strokes and an assortment of rolls, trills, smears, slurs, and droning double-stops, these effects are quite stunning, indeed not a little upsetting on first hearing. *The Oak Tree/The Pinch of Snuff and Farewell to Ireland* are excellent demonstrations of his varied embellishing techniques.

The recording is superb, with a thick, genuine fiddle sound that very explicitly preserves Peoples' cranning, triplets, and other ornaments. Brady's guitar is so carefully miked; you can hear the pick hit the strings. The surface has a few crackles, but nothing damaging.

Besides its own label, Shanachie handles a full line of traditional Celtic albums, imports and domestic, at low prices. A catalog and the "Shanachie Newsletter" are available from 1375 Crosby Ave., Bronx, N.Y. 10461.

Sound: A Performance: A+

Camey Doucet/Jimmy Thibodeaux et Musique Swallow LP 6024, stereo, \$6.98.

After a quarter-century as the most prominent form of ethnic popular music in the Louisiana bayous, the hard, electric Cajun dancehall style pioneered by Nathan Abshire and Iry LeJone is mutating into a lighter, more contemporary sound. One of the musicians responsible for this change is singer-drummer-disc jockey Camey Doucet.

While still employing the standard front line accordion, fiddle, and steel guitar, Doucet has shifted the rhythm section's emphasis from steadily pounding drums to Charles Andrepont's forward-moving, full-bodied bass line. Consequently, the front-line instruments can more readily

bounce off the bass' foundation, that results in a looser, more flexible rhythmic feel which is closer to upbeat country music.

In his late 30s, Doucet has a strong country voice and an ingratiating manner which gives his music a youthful-sounding vitality diametrically opposed to the tense, high-pitched strain associated with hard-core Cajun music. Similarly, whereas earlier Cajun steel guitarists modeled their solo styles after bayou fiddlers, "Tee-Boy" Broussard is more heavily influenced by East Texas country music. Check out *Quand Je T'ai Vu Pour La Premier Fois* and *Laché Pas La Patate* (a popular country-Cajun tune which translates into "Don't Turn Loose The Potato," a slang expression for "hang in there"). Tee-Boy sings *La Valse de Crise de Larmes*, while Jimmy Thibodeaux's nasal stridency on *La Valse Pour Tout Le Monde* is classic Acadian.

Doucet maintains strong ties to Cajun tradition even on the most modern tracks. Accordionist Jimmy Thibodeaux and fiddler L. J. Broussard assure that the dancehall sound is always up-front. Thibodeaux's melodeon work has a sharp tone and a sprightly syncopated touch, without the rigidity common to many earlier accordionists. L. J. (the oldest member of the band) has roots in the string-band fiddling of the 30s, with a thin tone reminiscent of the Hackberry Ramblers' Luderin Darbone (hear *La Valse de Broussard*, for example). Their knowledge of both the old and new ways is especially evident on the hard-driving instrumental *Le Two Step a Adalus*, a traditional favorite recorded by Nathan Abshire under the more prosaic title *Cajun Two Step*.

But Doucet's eclecticism, like his rhythmic approach and country-rock melodies, extends far beyond one's preconceived expectations of Cajun music. *J'Étais A La Riviere* sounds like a rock'n'rollin' Jimmie Rodgers in French, complete with "blue yodel." (The liner notes are in error when they claim this as the first yodeling on a Cajun record; the Guidry Brothers yodeled on their *Valse du Mariage* about 45 years ago). *A M'Appeler Honey* is nothing less than *Cielito Lindo* with new French lyrics.

The whole album is excellent, and perhaps the most accessible "ethnic" album the non-Cajun listener can hope to find. Available from Swallow Record Co., P. O. Drawer 10, Villa Platte, LA 70586.

Sound: B — Performance: A —

AUDIO • November 1977

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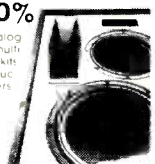
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The Model 2500 includes virtually the most sophisticated amplifier section on the market today: a **full complementary symmetry direct-coupled output**. The result is the highest possible day-in, day-out operating reliability and lowest Total Harmonic Distortion: **no more than 0.05%**.

The Model 2500 also includes the most impressive performance feature package ever engineered into one receiver. You get a **built-in oscilloscope**, for precise signal display.

Plug-in optional Dolby* FM noise reduction circuitry for lowest noise possible with FM reception. And the most advanced noise filtering system ever developed. First, the **18 dB per octave Bessel-derived high filter**—the most advanced in audio—reduces high frequency noise with a more natural, less colored sound. The **18 dB per octave 15 Hz sub-sonic Butterworth low filter** assures that all your power is used to reproduce only actual program material, not wasted on unwanted noise or rumble. **2 LED peak power indicators** let you know when transients drive the amplifier to full output. **5-gang FM tuning capacitor**, and **dual-gate MOS FET FM front end** ensure superior linearity and rejection of spurious signals with an IHF usable sensitivity of 1.5 microvolts and a 50 dB "quieting sensitivity" figure in stereo of **25 microvolts**—the finest such specification ever obtained in a receiver—or even a separate tuner.

For music lovers who will accept nothing less than the very finest... and are willing to spend a little more to get it... the Model 2500 is the most significant receiver ever developed.

marantz®
We sound better.

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THAT NEW BLACK MAGIC.



So it's got an expensive new lock that separates it from every deck in its class. Nice. But is that reason enough to call it magic?

No.

But this is: generally speaking, over a quarter century of TEAC engineering is wrapped up in the A-103. Specifically speaking, the A-103 boasts an innovative design that replaces a maze of wires and circuit boards with a single circuit board. That's one reason.

When you press the Eject button, your cassette doesn't pop out at you like a deranged toaster. It's cushioned, and works slowly and smoothly for longer deck life. That's two reasons.

Built-in Dolby* circuitry, High Density Permaflux head, frequency-generated servo-controlled DC motor, separate level controls, wide dynamic range, and switchable

bias/equalization. Reasons three through eight.

But how do we offer all these things (and more) in a deck that costs as little as the A-103?

That's the real magic!

*Dolby is a registered trademark of Dolby Laboratories, Inc.

SPECIFICATIONS (conservatively rated)

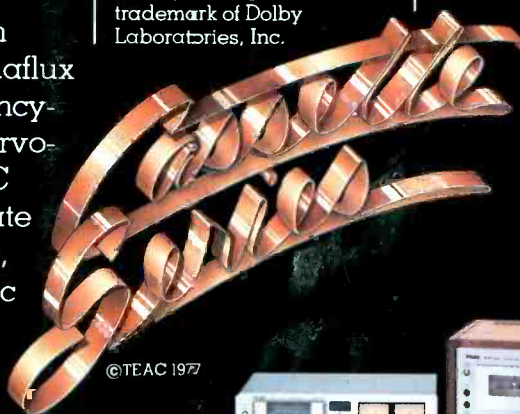
Signal-to-Noise Ratio:
50dB (without Dolby)
55dB (with Dolby at 1kHz)

Frequency Response:
30-14,000Hz (CrO₂/FeCr)
30-11,000Hz (Normal)

Wow & Flutter: 0.10%
(NAB Weighted)

TEAC®

First. Because they last.



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