

The
Authoritative
Magazine
About
High Fidelity

Audio

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DIGITAL AUDIO
RECORDER
TECHNICS' SV-P100

TAPE RECORDER MAINTENANCE

INTERVIEW

JIMMY MILLER
PRODUCER OF
THE ROLLING
STONES

REVIEWED

**MITSUBISHI
RECEIVER
CROWN
TUNER
TANDBERG
PREAMP**



460350 MXW 67226099 AY 9 JUL82
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The linear tracking tonearm is without question the ideal way to recover information from a disc. It can virtually reduce horizontal tracking error to zero, eliminate crossmodulation and significantly minimize stylus and record wear.

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Pioneer's new PL-L800 has changed all of that.

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Unlike other linear tracking tonearms that are driven by vibration-producing rollers, worm screws or pulleys, the PL-L800's tonearm is driven by Pioneer's exclusive linear induction motor. Through a process known as electromagnetic repulsion, a magnetic field is set up that gently propels the tonearm, allowing it to track perfectly with no mechanical linkages to degrade performance.

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THE PIONEER LINEAR TRACKING

NG FINALLY GETS LE IT DESERVES.



and motor from the rest of the turntable; vibrations that reach the cabinet are absorbed by the spring-coupled insulators before they can harm the reproduction process.

THE STABLE HANGING ROTOR DESIGN REDUCES WOW AND FLUTTER.

The most advanced turntable platter motor wasn't advanced enough for the PL-L800. So we came up with a new direct drive system called the Stable Hanging Rotor. The problem with the design of conventional motors is that the fulcrum is at the base of the motor, making it impossible for the platter motor's center of gravity to coincide with the fulcrum. And that results in a wobbling of the platter, known as wow and flutter.

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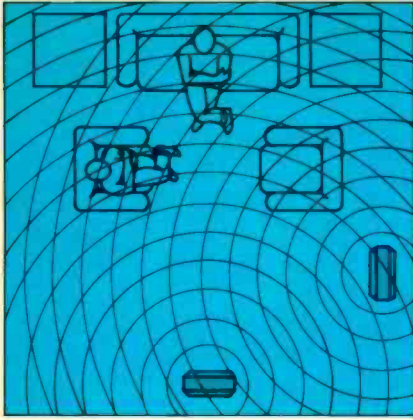
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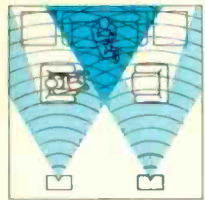
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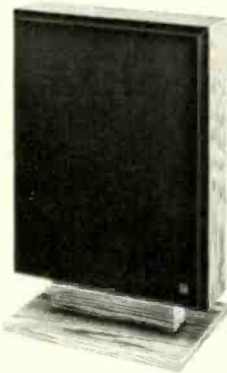
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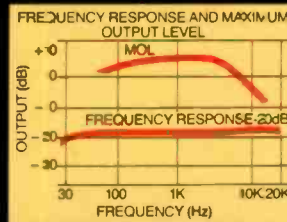
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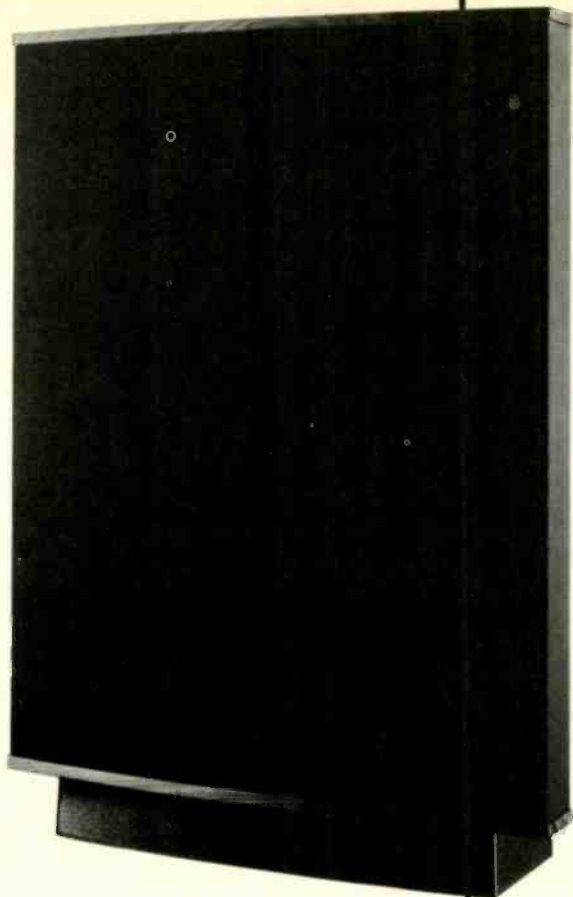
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...and then came the SE-9.

35 years ago, to satisfy listening preferences, serious music lovers had to redesign their listening rooms. Remove the drapes. Add a rug here. Rearrange the upholstered sofa there. Get rid of that crystal chandelier!

Bass and treble tone controls came later, and they helped—but only a little. When you needed a boost in that lowest bass region, you had to accept boosted upper bass and mid-range tones as well—whether you needed them or not.

By 1958, the first equalizers appeared. They allowed you to alter specific bands of tones to suit the needs of the listening room—and the music program. With special mics, a pink noise generator, and a real-time

analyzer, you could electronically adjust your system to your listening preference. If—that is—you didn't mind spending several thousand dollars and a half hour adjusting and readjusting controls to enjoy a half hour of listening.

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VIDEO SCENES

BERT WHYTE



JVC's HR-7650U videocassette recorder.

Video in all its various manifestations was the dominant factor at the 1982 Winter Consumer Electronics Show in Las Vegas. While there were many new video products demonstrated and put on display, most were "new" in the sense of updates and refinements rather than true technological advances. To be sure, there were many evolutionary and even some revolutionary new video developments behind the scenes in various hotel suites, but most of these were for private viewing and it will be some time before such products have an impact on the video scene. I will report on some of the more interesting new products, but at a show of this type there are developments, trends and ideas that often are as important as the new products, and I will bring them to your attention.

It would appear, quite surprisingly, that the fierce competition between the various videodisc formats has abated somewhat. This is not to say that any of the participants has thrown in the towel, but none seem as vociferous in their claims of superiority for their particular systems as they were during 1980 and 1981. Of course, the VHD system is not yet on the market, and in fact its introduction to the United States has been further delayed and is

now scheduled for June of this year. Thus it is the Philips laser-type videodiscs, represented in this country by Pioneer and Magnavox, and RCA's CED SelectaVision videodisc system which have had their baptism of fire in the marketplace, and both system types have come away somewhat scorched. In the case of the early laser discs, poor quality control in manufacturing resulted in a high percentage of defective discs which consumers quickly rejected. In RCA's case, there were some initial troubles with both players and discs, but these apparently were quickly rectified. The main problem simply is a matter of sales, with RCA's goal of 200,000 CED players to be sold during 1981 falling short by almost half this amount. Disco-Vision Associates, the manufacturer of the laser discs, couldn't seem to improve the quality of their products even with the assistance of IBM. Although 3M decided to manufacture laser discs, that effort apparently has been delayed since their pressing plant is not yet on stream. Faced with these problems, Pioneer decided to open a special plant in Japan to manufacture their own laser discs. I have heard from several people whose opinions I value that the discs are of excellent quality and have a very low

rejection rate. These Pioneer discs should be arriving in the United States soon, and undoubtedly will give their videodisc player a much-needed boost. At the WCES, Pioneer's display of their videodisc players was fairly modest in comparison to last year, and it did not feature their updated player which includes CX noise reduction. The new player with CX was on view in Pioneer's suite. No reason was given for the delay in introducing the new model to the U.S. market.

RCA is supposed to have a new SelectaVision model, also to be equipped with CX noise reduction as well as with the capability of stereophonic sound. There are some odd aspects to this RCA situation. One source says that the stereo-equipped player will soon be on the market, while another source reports the stereo model being "downgraded" in priority and subject to considerable delay. Still another source tells me the RCA discs are selling well, yet RCA recently laid off about 300 workers from their Indiana CED pressing plant.

I'm sure you remember how surprised we all were when CBS, the traditional arch rival of RCA, said they would adopt the RCA CED SelectaVision videodisc and would be producing videodiscs in that format. I have been promised CBS CED discs for some months now, and they are not yet forthcoming. Recently I learned that CBS will not produce the CED discs in house, but will have them pressed by RCA. It is a muddled situation, and we'll just have to await further developments.

VHS and Beta videocassette recorders have become ever more sophisticated with subsequently higher prices. JVC stole a march on the industry with the introduction of their Model HR-7650U, probably the most advanced VCR currently on the market. It features full-function wireless remote control and has the capability of stereo sound with Dolby B noise reduction. The unit is front-loading and uses the JVC four-head design for better resolution with extended play tapes. This VCR can play back two-, four-, or six-hour cassettes and record two- or six-hour cassettes. The HR-7650U has a 14-day, 8-event programming timer, and controls are of the soft-touch vari-

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ety. All these goodies will set you back \$1,595.00.


You will note this JVC VCR has provisions for stereo sound, making it the only other VCR besides the Akai Activation so equipped. Other VCRs will probably offer stereo sound before long, due to the fact that among the major videocassette duplicating companies (such as CBS/MGM, Warners, 20th Century-Fox Video, and Paramount) there are close to 250 stereo videocassette titles available. Most of these are movies recorded with Dolby cinema stereo sound. Depending on the type of Dolby print the videocas-

sette was duplicated from, if the audio output of the VCR is channeled through a Tate-type quadraphonic decoder you might manage to obtain "surround sound" effects. Some owners of Audionics Tate decoders say they have succeeded in doing this with Dolby stereo soundtrack record albums. It is certainly a nice prospect, in any case.

Panasonic and JVC can be likened to GM's Buick and Oldsmobile in that while they are really under one corporate banner, Matsushita, they are also autonomous and highly competitive with each other. Thus, while their prod-

ucts are different there are also some familial similarities. Such is the case with the new Panasonic PV-1770 Omnivision videocassette deck, which has the same type of wireless remote control as the JVC HR-7650U. However, the Panasonic VCR also features "Om-nifex," a special motion-control function which permits "Omnisearch," slow motion, double speed, still frame and frame-by-frame advance, and this function can be activated by the wireless remote control. The four record-head system pioneered by sister JVC also appears in this deck and affords the same capabilities and benefits. The PV-1770 can record and play back in the two-, four-, or six-hour mode, and it too has a 14-day/8-event programmable tuner/timer. For use with cable, the PV-1770 has 105-channel capability and is priced around \$1,500.

It is fairly well-known that Matsushita is the OEM supplier of videocassette decks to RCA and many other companies. JVC is also an OEM supplier of VCRs on a lesser scale. For example, Sansui has a new VCR, the SV-R5000, which features the four-head technology introduced by JVC and other similar features. (It is interesting that while this deck and other JVC OEM decks offer two-, four-, or six-hour record and playback capability, JVC continues to offer just two- and six-hour record capability in their own models because they believe it results in a higher quality picture with their particular type of four-head recording.) Here, too, there is a 14-day/8-event programmable tuner/timer. This \$1,200 Sansui VCR has its own bag of special effects which include bidirectional speed search, freeze frame, and frame advance. To round out the package, there is a 10-function remote control.

There were other new VHS and Beta VCRs at the WCES from the likes of Fisher, Sanyo, Magnavox, Zenith and others, all reflecting updating and refinement, and all variations on the OEM theme. The VCR decks I have covered are top-of-the-line models and are obviously priced accordingly. Some industry observers are predicting and looking for much lower priced VCRs, hoping that with the usual discounting some decks can be sold at the magic figure of below \$500. They feel that if this occurs it will set off a veritable boom in VCR sales and that the availability of VCRs in this price range will have a devastating effect on videodisc sales. Their thinking is that if a videodisc system and a VCR are similarly priced, the VCR will win out because of its recording capability. 



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JENSEN

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AUDIO ETC

Continued from page 92

Now, since I am not a digital engineer, I will leave additional comment to others, except for one more solid quote. "Traditional filter or equalizer circuits (use) coils, capacitors, resistors. Because the ADSP does not require such components, and has no pre-set filter bands or adjustments, it can synthesize countless (different) filters. Conventional circuits with even a fraction of ADSP's capability would require thousands of components. . . . The ADSP, on the other hand, is entirely automatic. If required, it can produce a filter with an extremely sharp notch, only a few Hz wide. In typical music system correction, the ADSP is called upon to provide filters with more than 50 peaks and dips within a 1000 Hz bandwidth."

It remains to take a look at the musical consequences of this AR signal processor. How come we all have enjoyed our home hi-fi these many years, mostly without adjustments for the listening room? Other than the room itself, furniture, sound absorbing areas and the like, plus speaker placement. It is largely because we are adaptable. We get to know our listening places.

Our own inner computers, more sophisticated than AR's (though not, I'm thinking, by very much), are able to tune out the room effects, just as we tune out and do not consciously hear such noises as blowers, refrigerators, furnaces, not to mention other interferences. I have never presumed to judge anybody's hi-fi system outright on a quick hearing. It takes, for me, a couple of evenings of listening, preferably more, before I become aware of the system and the music as they really are. The adjustment is always noticeable and often dramatic.

This profound human ability to adjust is, I think, still much underrated by our fraternity. It is as great as, for example, our well-known ability to adjust for color balance between daylight and indoor electric light. Or red light in a dark room, which in time becomes almost gray as our eyes adjust. We can learn to live with all sorts of wildly different acoustic situations, reducing them to an approximate balance just as we do with colors. After a time, thus, we are able to hear our systems

and judge our music and its fit with objective accuracy; we simply tune out the room faults automatically.

Are room equalizers of any kind, then, of real use? Definitely. It is one thing to adapt as well as possible to so-so acoustics and quite another to achieve a real and measurable improvement — we can adjust to that, too, and it is much less of an effort. Better, after all, is better. There are two caveats. The first and most important is, of course, that if you are used to a bumpy, peaky listening space, a dead and dull room, an overly live room — take your choice — then when adjustments for the better are made, *you will probably not like the "new" sound at first*. You must give your inner computer sufficient time to change its listening parameters.

The other caveat, more in line with AR's innovation, is that even the most sophisticated of present equalizers may not really do the right job for you. Sorry, manufacturers, and this is only my opinion. But I tried extensive experiments with the first generation of frequency-band equalizers and wasn't happy. I went through the whole procedure, band by band (CBS pink noise disc), resetting levels to adjust for room peaks and valleys (which were, as expected, startlingly big) until I surely had made some improvement. I could hear it, I thought. And yet I soon found myself back to familiar settings, all controls at "zero." I liked it better that way.

I think I prefer my own ear's fine computations to the band-by-band adjustments of current equalizers, and I think the reason is plain. Those fixed bandwidths, plateaus arbitrarily wide, are too angular, full of too many "sonic corners" from band to band, perhaps introducing more than they remove.

But an "instant" synthesized filter shape, a feedback sort of directly-matched correction that can simultaneously smooth out 50 or more detailed peaks and valleys in your room sound, from where you sit, is something else again. A quantum jump into digital usage. We will shortly find out if this gadget works as it ought to. Maybe the initial cost will be huge? Maybe there'll be bugs? No matter, for something new is launched here and we will not ignore it.

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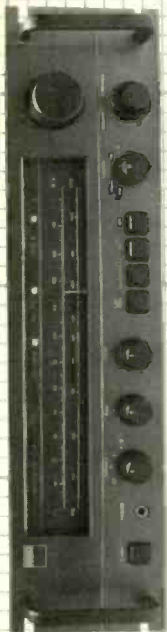


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TAPE GUIDE

HERMAN BURSTEIN

Terrible (Type) IIs

Q. My cassette deck records successfully when I use ferric oxide tape. But when I use chromium-dioxide or cobalt-modified tapes, there is a 10 to 12 dB loss in the treble range with the switch in the CrO₂ position. — Steve Harris, Conway, Ark.

A. It appears that the problem does lie in your cassette deck inasmuch as there is no problem with ferric oxide tape. The problem could be due to excess bias and/or faulty equalization when the tape switch is in the chrome position. You will need the help of an authorized service shop and can get the names of such shops from your dealer or from the manufacturer.

Source, Tape, and Listen

Q. When monitoring a recording, are you listening to the sound already recorded, or are you listening to the sound a split second before it is recorded? — Bob Hoffman, Worth, Ill.

A. If you are using a tape deck with three heads, which permits simultaneous recording and playback, in the monitor (or tape) position of the monitoring switch you are listening to the tape which has just been recorded. In the source position, you are listening to the signal which is about to be recorded.

Manual Aid

Q. I am having a problem obtaining the service manuals for my cassette deck and receiver, both made by the same company. I wrote to the firm a couple of months ago but received no response. Please help me. — Daniel Pinero, Juncos, Puerto Rico

A. Unfortunately, there is no way in which I can be of direct help. I suggest that you write again, this time to the Service Manager, with a copy to Customer Relations and another copy to the president of the company, stating that you had no answer to your first request. Do not expect to get the manuals free. They could possibly cost \$5.00 or more each.

Another possibility would be to try an authorized service shop. It is unlikely that it can sell you manuals, but the shop *might* be willing to inform you how to buy them, or it *might* be willing to order them for you, probably for a small fee.

GIGO?

Q. I have a chance to buy open-reel tape costing \$1.00 for 1200 feet. It is cut down from 1/2-inch computer tape, and it has been erased. Is this a good buy? — Tony Iacovelli, Framingham Ct., Mass.

A. The frequency response characteristics and bias requirements of computer tape usually differ from those of audio tape. If you use computer tape, it is possible, although not certain, that you will find performance inadequate in terms of frequency response and distortion.

Another problem concerns the accuracy of slitting. Accurate slitting requires very precise and expensive equipment. Improperly slit tape tends to raise problems. If the tape is too wide, it tends to stick in the tape guides; if it is too narrow, it tends to weave in the tape guides, resulting in variations in frequency response or output.

On the other hand, for a risk of only \$1.00, you might try a reel.

Combined Heads

Q. My cassette deck has a combined record/playback head. Is my preamp's monitor switch of any use to me when recording?—Joseph Cuifo, Utica, N.Y.

A. No. Such a switch is useful when using a tape deck with separate record and playback heads in order to compare the just-recorded signal with the source signal.

Mix Master

Q. My cassette deck has a line/mike mixer. I would like to use this to mix the signals from two turntables when recording, one through the line inputs and the other through the mike inputs. — Jean LeTourneau, St. Jean, P.Q., Canada

A. Unless you make fairly extensive modifications to the record electronics of your tape deck, you cannot use it to mix the signals taken directly from turntables that employ magnetic phono cartridges. What you require is an external mixer which can accept the cartridge signals and feed the combined signal to your line inputs.

The signal delivered by a magnetic phono cartridge requires bass boost and treble cut in order to achieve flat

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response. It also requires a substantial amount of amplification overall. If such a signal is fed to the mike input of your deck, it will receive the necessary amplification but not the necessary bass boost and treble cut. If it is fed to the line input, it will receive neither the required amplification nor the required equalization. A suitable external mixer can meet these requirements.

Bar Some

Q. In taping a disc of Also Sprach Zarathustra, my cassette deck produces distortion during the opening bars of the trumpets; the level setting causes only a few rare swings above 0 VU. The distortion consists of a fluttery kind of warbling, and it occurs with two high-quality tapes but not with a cheaper tape of the same brand. I do not get this distortion when taping with my open-reel deck. What is the problem? — Fred Schmidt, Livonia, Mich.

A. It appears that the tape is being overloaded. The amount of signal that a tape can handle without noticeable distortion varies from one brand to another and from one type to another. Try a lower recording level, or stay with the particular tape which gives you best results.

Head Demagnetization

Q. How effective is a head demagnetizer, and how does the user know when the heads are demagnetized?—William Dickerson, McChord AFB, Wash.

A. Head demagnetizers vary in strength, as may their effectiveness. A magnetometer, such as the one made by the R.B. Annis Co., Indianapolis, Ind., can measure residual magnetism in the heads (and in other metallic parts contacted by the tape, such as guides). From my experience with head demagnetizers and with the magnetometer, it appears difficult or impossible to reduce magnetization to absolute zero. Nevertheless, it may be important to periodically demagnetize the heads and other parts to the extent that is possible. A

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.



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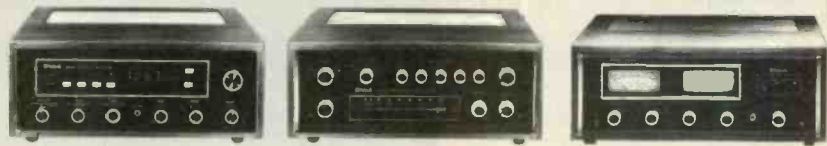
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WHAT'S NEW IN VIDEO °

Quasar Video Switcher

The Model VE581U Video Controller offers five inputs from various elements of a home entertainment system and three outputs. A built-in amplifier will improve the picture quality of weak or

snowy images, and use of the switcher will reduce the confusion of "cable clutter" and eliminate the need to make last-minute cable connections before taping a program. Price: \$119.95. Enter No. 100 on Reader Service Card



Kloss Video Projection Monitor

The Novabeam Model Two produces a clear, five-foot color TV image directly to any flat white wall without a special curved projection screen. The picture appears four feet from the projector and can be watched at full brightness

from any point in a darkened room. The 60-lb. portable unit is smaller than most 19-inch TV sets, and it has video and audio inputs for use with VCRs, component TV tuners, and videodisc players. Price: \$2,000.00, including remote control.

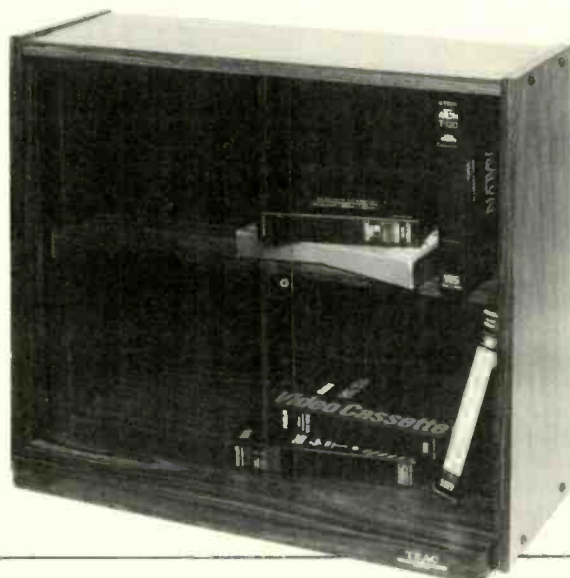
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Sony Video Recorder

The SL-5000 offers increased ease-of-use in a Betamax design at a more affordable price. All operating controls and cassette loading are on the front panel, with recording controls to the left and playback to the right. The clock, 24-hour timer and 14-pushbutton channel-selector are also up front. Other features include a remote pause control jack for use with a video camera, video and audio line input and output terminals, and a microphone jack. Price: \$895.00.

Enter No. 101 on Reader Service Card



TEAC Videocassette Storage Cabinet

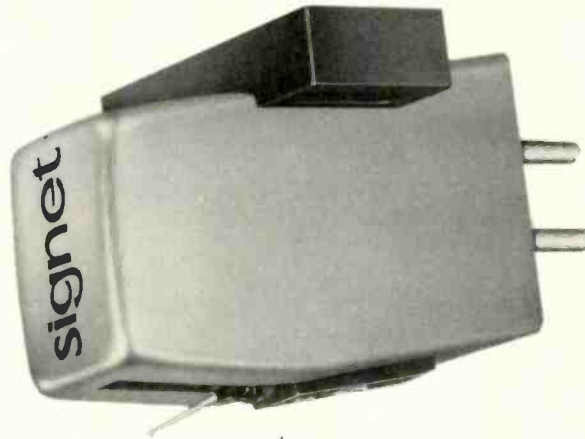
The CS34VU is an upright-type cabinet with a rosewood veneer finish. Sliding glass doors help protect video tapes from dust, and storage capacity is up to 34 cassettes. The two-level design is suitable for both VHS and Beta formats. Price: \$60.00.

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Signet Phono Cartridge

The TK100LC is a moving-magnet cartridge with response from 10 Hz to 15 kHz, ± 0.5 dB. Ruby was chosen for the tapered hollow shaft of the cantilever to obtain rigidity, freedom from resonance, and low mass. A laser is used to drill lengthwise through a ruby uni-crystal to manufacture the cantilever; another laser cut is made through its end to fix a nude diamond stylus, and the stylus is later polished to a Straight Line Contact configuration to trace high frequencies accurately. Price: \$1,200.00; user-replaceable stylus, \$500.00.

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Mesa Electronics Turntable

The Model 70 is a two-speed, semi-automatic turntable with critical parts made of metal for long life and precision performance. The single-play unit is designed for accuracy as well as simplicity of operation. Other features include an anti-skating mechanism and a detachable headshell.

Included with the unit is an Audio-Technica AT-70 cartridge. Price: \$79.95.

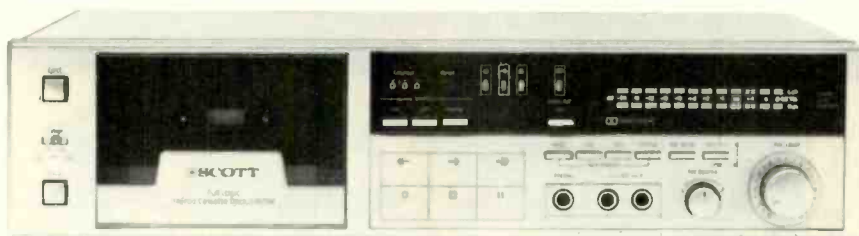
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The RTA 12B Reference Monitor System is a floor-standing unit designed with the use of a digital sampling FFT computer testing procedure. One tweeter, two midranges, and one woofer cover the range from 25 Hz to 21 kHz, ± 2 dB, and a "dual isophase" crossover network is optimized in the time domain for greater transparency and realism of sound. Price: \$500.00 each.

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H. H. Scott Cassette Deck

Model 658DM is a two-head cassette deck with metal-tape capability. Features include

fluorescent peak-hold meters, Dolby B and C noise reduction, timer standby for recording and playback, tape memory rewind and replay,

microprocessor-controlled logic transport, Sendust and ferrite heads, and feather-touch controls. Price: \$299.95.

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THAT'S THE WAY IT WAS

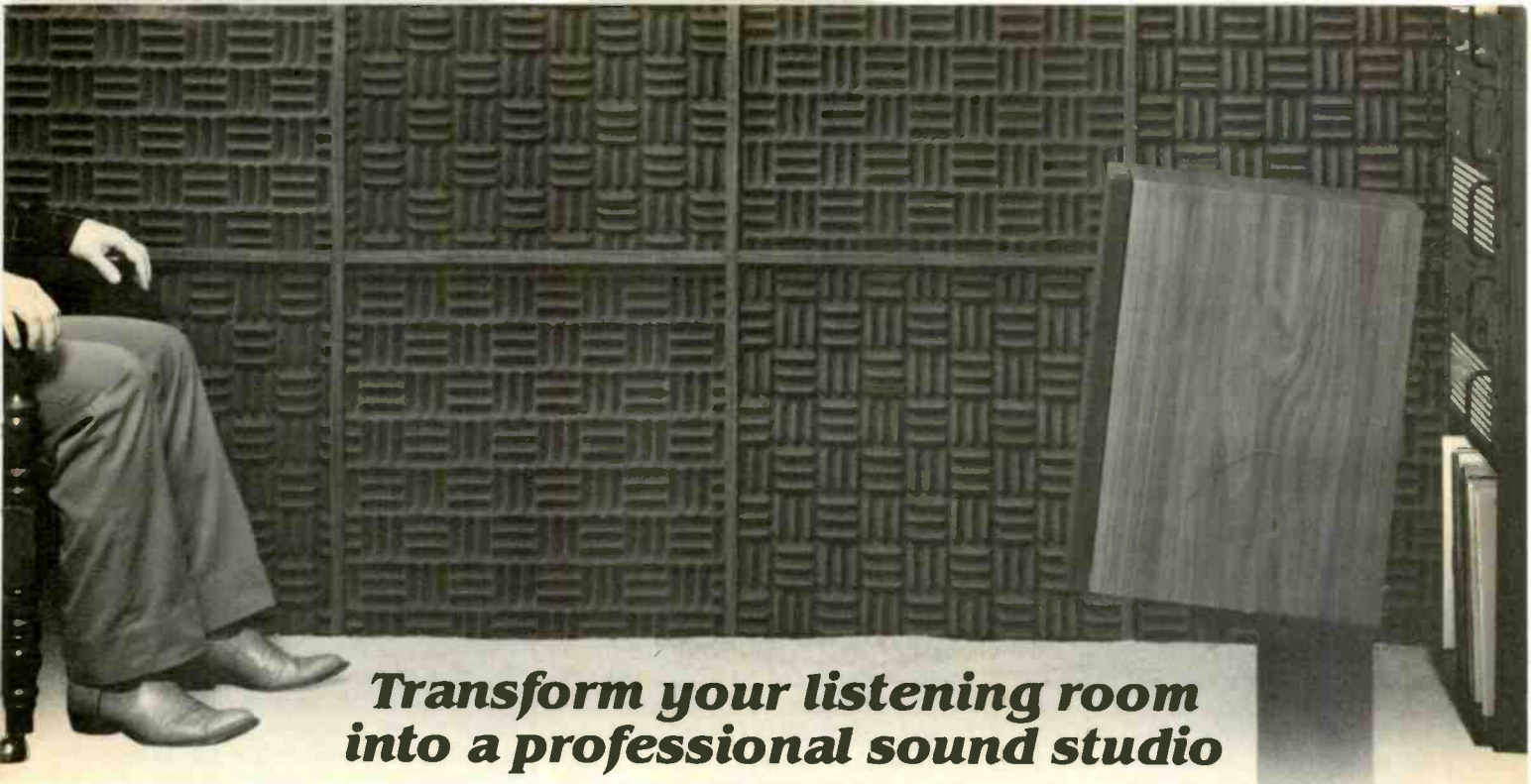
WALTER I. SEIGAL



Sunday, October 30th, 1938, was the day that *The War of the Worlds* broke out when Martians landed about five miles from Princeton, N.J.—according to Orson Welles' famous Mercury Theatre adaptation of the H. G. Wells classic. Here, Orson gives the press an interview on the morning after the panic-inducing broadcast which went over a coast-to-coast network, while the closeup photo shows him at the studio mikes during December of the same year.



Interview Photo: Bert Lawson



Transform your listening room into a professional sound studio

Now available for the first time to the home audiophile, SONEX was originally developed for use in professional sound studios to help engineers create the best possible recordings. SONEX has also been used by many major component manufacturers for the development and evaluation of their products. In fact, several loudspeaker manufacturers incorporate SONEX in the design of their speaker systems.

SONEX is an acoustical treatment material designed to help you achieve the finest sound quality possible from your audio system. SONEX is highly attractive, very durable, easy to install, and can be placed virtually anywhere. And, unlike many other audio components, you can begin with just a few sections of SONEX, gradually building your listening room into a truly professional sound studio.

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"I highly recommend SONEX for home use. It has been instrumental in helping our salesmen properly demonstrate loudspeakers in our sound rooms." Geoff Court, Owner, Audio Auditions, Minneapolis, MN.

"I recommend SONEX to all of my customers that have room problems. SONEX can improve the sound of systems ranging in cost from several hun-

dred to several thousand dollars." Mike Shotts, Owner, The Soundtrack, Auburn, AL.

"SONEX has been the missing link in home audio reproduction. It is the one product desperately needed by home audio enthusiasts. We recommend it highly." Doug Johnson, Executive Vice President, Sound Connections Intl., Tampa, FL.

"SONEX is extensively used in our engineering soundroom. It is invaluable for the testing and listening evaluation of our state-of-the-art electronic components." Rich Larson, Chief Engineer, Audio Research Corp., Minneapolis, MN.

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Also Sprach Giovanelli

Each and every letter sent to "Audioclinic" is answered individually. The fact that both Herman Burstein ("Tape Guide") and I are willing (or crazy) enough to take on such a task is part of what makes Audio unique.

Even though each letter is answered personally, space and other considerations limit the number of letters which appear in print each month. Therefore, some of you who write in may be disappointed if your letters are not published or if they appear after a considerable amount of time. Although it may be expedient in some instances to rush a reply, it is only fair that I answer all letters in the order in which they are received.

It may be helpful for you to know that when I do plan to use a given question for this column, I state this in my answer. I also ask the reader if he wants his name published; if he does not, I request that he write me back immediately, and the name will be withheld. While this imposes a somewhat greater amount of correspondence, I think it makes it less confusing for everyone.

When writing, please note that I cannot become involved with questions related to the merits of specific products. Because this type of judgment is subjective, I prefer more general, objective questions. A lot of basic product information is contained in our Annual Equipment Directory issue in October; many comparisons can be made from an examination of the individual product specifications submitted by the manufacturers. You will also gain added information about a number of products from Audio's Equipment Profiles.

Every once in a while I receive a letter telling me that I did hit the nail on the head in diagnosing a piece of equipment I have never seen. As you can imagine, such diagnosis by long distance has to be based somewhat on guesswork (scientific, but still a guess), and I always wonder how well things have worked out. It's nice, too, to hear from someone who finds that an item published here could have had an added touch to make it a better answer. I appreciate these letters, and from time to time, I incorporate them in "Audioclinic." We can all learn something that way. — J.G.

War on Warp

Q. What is the best way to store phonograph records? I have found that some of the albums I have not played for awhile are warped. — Joseph Topp, Shorewood, Wisc.

A. The best way to store records is to keep them in an upright position without allowing them to lean over at an angle. The shrink-wrap should be removed from the jackets as soon as you buy the discs. Sometimes this plastic material can be so tight that the jackets and discs warp. But, most particularly, discs should never be stored near sources of heat, such as radiators, because heat can also cause discs to warp.

The Facts of (Recording) Life

Q. I have purchased a number of highly touted digital recordings from different manufacturers. Although each of these is impressive in many respects, I have yet to find even one with totally silent surfaces, as well as the 90-dB dynamic range claimed by manufacturers of these recordings. Silence is total absence of any sound or noise according to my dictionary, but these recordings have background noise and even print-through. Why? — Brian E. Newman, Burgettstown, Pa.

A. Digital tape recordings can have signal-to-noise ratios of 90 dB. Such recordings, however, are ultimately made with conventional disc mastering and mass production techniques. Therefore, the dynamic range and certainly the signal-to-noise ratio is limited by the discs themselves and the care taken in producing them. The maximum S/N of a disc is 65 dB, but only if everything is done correctly.

Recordings for the mass market often are produced with mediocre playback equipment in mind. This will often result in other problems in addition to the noise about which you have written. Equalization may be employed which will make the music sound strident when heard on many of our better systems. Unfortunately, there are just too few really good systems around — even now — to justify the routine production of the highest possible quality disc. While the quality of pressings can be improved in many instances, this would ultimately result in a much higher price per disc, very likely lower-

ing sales at a time when the industry is already suffering from declining sales.

Stacked Speakers and Volume Loss — II

In response to Mr. Ervin's question, printed in "Audioclinic," March, 1981: One possible reason for the volume loss when both speakers are connected "A plus B" is caused, at least in some cases, by the speakers' being connected in series instead of in parallel. Thus, the amplifier is delivering half the power to two speakers than it delivers to just one speaker. When the equipment is connected in the "A plus B" mode, each speaker receives one quarter the power it would receive in the "A" or "B" mode. This accounts for the loss in volume that you hear.

The parallel connection would correct this volume loss. The series connection, however, affords the amplifier the protection from overheating which could arise because of high power operation into very low impedances. — Kevin A. Barrett, Plainfield, N.J.

Buzz Words

Q. If I try to use the AM section of my tuner with my external power amplifier turned on, a buzzing noise occurs which disappears when the amplifier is turned off. Could this problem be connected with patch cords, or is the power supply from the external amplifier causing it? The second, or external, amplifier sits on top of the receiver, and both the power transformer and interconnecting patch cords are close to the AM antenna. Would moving the amplifier help or would an external AM antenna be more beneficial?—Gerald A. Larson, Bozeman, Mont.

A. The buzzing produced in your AM tuner is probably not created by patch cords; I believe it is related to diode switching in the power supply of your external amplifier. This sound will likely disappear if the two units are separated from one another a bit further than they are now.

You may need to bypass each diode

If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

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with 0.01- μ F capacitors. The capacitor should be connected right across the diode and not from either side of the diode to chassis ground. The voltage rating of the capacitor should be three times the power-supply voltage.

If you are getting satisfactory AM reception using the receiver's internal antenna, I do not suggest that you connect an external antenna to the receiver. The use of such an antenna could result in overloads and spurious responses which would degrade the AM reception.

Oldies Still Goodies

Q. Is it safe to play my 30-year-old mono record collection (which is in very good condition) on my new stereo system?—Helen Stambor, Lima, Ohio

A. You will be happy to learn that you can play your old mono records on your stereo system; your cartridge will not know or care. The only thing that is likely to happen is that you will


hear better sound from those old discs than you heard when you first bought them, assuming that they are indeed in good condition.

While there may be a tendency for the stylus to ride closer to the bottoms of the grooves than was true in the days of the 1-mil stylus tip, this will not cause problems. In fact, it will actually be an advantage because this portion of the groove wall will probably not have been abused by the high tracking forces so common to old monophonic cartridges.

Keep It Simple

Q. I recently added a second power amplifier to my system. My present receiver has provisions for separating the preamplifier section from its power amplifier section. I'm using the power amplifier section of the receiver to drive one pair of speakers and the new amplifier to drive another pair of speakers. Sometimes, the right speak-

er driven from one of the power amplifiers fails to operate after turn-on. If I wiggle the patch cords, it will finally work. Have I isolated the problem or do I need to look further?—Gerald A. Larson, Bozeman, Mont.

A. It would appear that you have isolated the problem of your intermittent right channel to either the patch cords themselves or to the connectors associated with them. A defective, molded plug could cause the problem. The same problem could also be the result of oxidation in the female connector on your patch board or a poorly soldered connection. It is always possible that the jiggling of the patch-cord shock excites some other component into operation. Try the cords first, however, because they are the most likely source of this problem and also the simplest items to repair or change. I always recommend that, in any trouble-shooting situation, you try the simplest remedies first. 

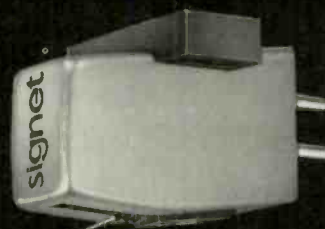
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NEW TK100LC



MICHAEL TEARSON
JON & SALLY TIVEN

Farewell Song: Janis Joplin
Columbia FC 37359, stereo, \$8.98.

Sound: D+ Performance: B+

That an album of previously unreleased Janis Joplin performances can surface, particularly after this much time, has to give me pause for concern. Will it be gussied up shreds and shards or will it be pearls?

What it is is a very mixed bag that serves as a miniature morality tale about how too much success can destroy a great talent.

Six of the nine tracks are with her original band, that fabled garage unit,

Big Brother and the Holding Company. Five of these are leftovers from the session and in-concert recordings for the landmark *Cheap Thrills* album of 1968. One is a live recording from the Matrix in San Francisco a year earlier, one was cut live with the Kozmic Blues Band in Germany, and one comes from the Full Tilt Boogie Band's participation in the 1970 Canadian Festival Express Tour. The last is a one-off backed by the 1970 edition of the Paul Butterfield Blues Band.

Recording quality is far from state of the art, even considering when it was cut, but Janis' performances are pure gut. The real strength of Big Brother,

however limited they were, was their empathy for Joplin. And it shows, especially on the Matrix track, an astonishing medley of "Amazing Grace/Hi Heel Sneakers." When Janis got seduced away from her band she irretrievably lost her focus. "Tell Mamma" with the Full Tilters is driven and energetic as hell, but forced; the Kozmic track "Raise Your Hand" is simply unconvincing. However, the Butterfield track "One Night Stand" is special. Here was a song she could identify with and a band who understood her and her base in the blues.

Farewell Song is by far not the best Janis Joplin on record, but it is a valuable and valid addition. Especially with Country Joe McDonald's intimate and extensive liner notes which really illuminate what Janis was like up close and at home. And what it was like to watch her get ground down under the weight of stardom. *Michael Tearson*

Everybody Needs It: Ellen McIlwaine
Blind Pig BP 1081, stereo, \$8.98.

Sound: B Performance: A

That Ellen McIlwaine's enormous talents have never been properly showcased on record is one of the more mysterious riddles of the last decade. She is a powerhouse vocalist and a more than superb guitarist who has stopped me dead in my tracks with her slide playing many times.

The mystery has been solved. *Everybody Needs It* is one of those special albums, the "one the artist has always had in her" type of affair. Never before has Ellen made an album with the focus and assurance she displays here, both vocally and instrumentally. Excitement positively crackles from the grooves, and I can tell you one big reason why. His name is Jack Bruce, legendary bass player of Cream and perhaps Ellen's Number 1 musical hero. She has always wanted to record with him, and now she has.

The material is evenly split between covers and McIlwaine originals. Of the covers a standout is "Hang on to a Dream" by the late Tim Hardin to whom, along with the late Roy "Professor Longhair" Byrd, the album is dedicated. It starts softly with piano and bass and builds, taking off after a love-

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Never before has Ellen McIlwaine made an album with the focus and assurance she displays on *Everybody Needs It*.



Ellen McIlwaine

ly bass solo by Bruce. Among the others, Ellen totally claims Eric Kaz's "Temptation Took Control" and delights with Percy Mayfield's bluesy "Danger Zone." Her own songs stand up favorably to the covers. "I Want Whacha Got" and the title song glow with Ellen's newly found security.

A big, bright sound powers the record, clearly a result of Ellen's self-production. She is and always has been a strong-willed artist who has had problems getting the sound in her head down onto vinyl. That problem's solution is the key to the excellence of *Everybody Needs It*. *Michael Tearson*

Heart on a Wall: Jimmy Destri
Chrysalis CHR 1368, stereo, \$8.98.

Sound: A Performance: A-

Blondie's keyboard player James Destri hasn't written any of the most famed tunes by said group, so you wouldn't expect his solo album to be anything startling. In fact, not only is *Heart on a Wall* infinitely more interesting than Debby Harry's *KooKoo*, it's a powerful and moving collection of songs delivered much in the style (both vocally and instrumentally) associated with David Bowie. Not that it's a blatant rip, mind you, and considering that Destri (and half of the backing musicians on this album) at one time backed up Bowie it's not altogether

astonishing. But of all the people in the world to emulate, it's somewhat odd at this stage of the game for Destri. After all, Bowie is semi-retired, barely commercial, and far more involved in the visual side of things. It's sort of like some young actor picking Kris Kristofferson to pattern his acting style after.

But enough of that side of things, and on to Destri himself, who comes off as quite the impressive singer. No one would have known of his pipes if he forever stayed in Ms. Harry's shadow, and he really emotes well—his voice totally suits the kind of spacey songs he writes. The guitars of Carlos Alomar, Earl Slick, and Tommy Morrongiello contribute to the atmosphere of the music, and Clem Burke plays in an uncharacteristically restrained style which is far more impressive than his previous work. Destri's voice, however, is what carries the album—sort of an updated Jim Morrison/John Cale tone with the delivery of a—we hate to say it—Bowie. Oh well, he'll live down the comparisons someday, but for now he'll have to stand by them. As it is, this is a highly successful debut album by a rock musician from whom one wouldn't expect such greatness.

Jon & Sally Tiven

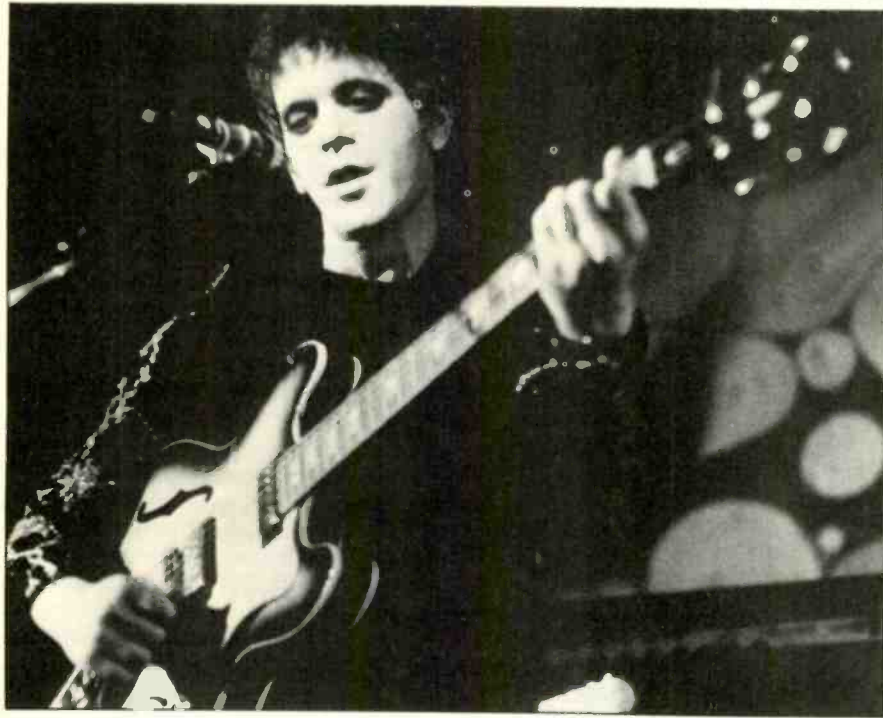
Wasn't Tomorrow Wonderful?: The Waitresses

Ze/Polydor PD-1-6346, stereo, \$8.98.

Sound: B Performance: A

Fast, sometimes funny, more often biting and, best of all, great fun—that's the long-awaited debut Waitresses album. Anxiously anticipated ever since their 1980 single, "I Know What Boys Like" backed with "No Guilt" (both included here), the originally Akron-based group's songs aim right for the jugular with telling acid observations on girl/boy politics in the '80s. Things like getting-along-very-well-thank-you after the breakup ("No Guilt," "Go On") and actually applying the lessons and options learned in liberation ("Wasn't Tomorrow Wonderful?" "Jimmy Tomorrow," "Heat Night"). Then there's the bawdy "Pussy Strut" about that awful power women know they can have over men. It is a detailed how-to course in the age-old tease which I suspect will shortly join "I

Lou Reed's *The Blue Mask* appears to be an accurate account of how placid life can be in the suburbs of hell.



Lou Reed

Know What Boys Like" as a top favorite on the bump-and-grind circuits.

The drums ride up high in the mix and bounce the album along. More punch in the reeds and leads might have brightened the album, but *Wasn't Tomorrow Wonderful?* is actually a pretty well-crafted album. By turns biting, ironic and outrageous, *The Waitresses* breathe some very welcome freshness into the stale state of '80s pop.

Michael Tearson

The Blue Mask: Lou Reed
RCA AFL1-4221, stereo, \$8.98.

If the first Lou Reed album in two years wasn't something of a surprise I'd have been surprised. The shocker is just how subdued and simplistic the music is. His poetry is as gritty, perplexing, and provocative as ever. Clearly, the relatively stable home life he has enjoyed since his marriage to Sylvia Reed has had a major effect. Songs like "Women" and "Our House" and "Average Guy" at once radiate in equal doses a pure serenity and such a bent irony that it is hard to distinguish the two. Is he being straight or coy? Or is he being both at the same

time? Such is the central charm of *The Blue Mask*.

But then there is the turbulence of the title song and "Waves of Fear," the only two songs in which the band (Reed on guitar, Fernando Saunders on bass, Richard Quine on guitar and Doane Perry on drums) get to work up a real sweat. These are as scary and penetrating as anything Lou Reed has written going all the way back to "Heroin." And there's the disquieting quiet horror of "The Gun" ("Stay away from him/He's got a gun") and "The Day John Kennedy Died." Lou Reed is not a man to be limited by expectations.

The ultimate riddle is the album's cover, a simple head shot toned in blue in virtually an identical pose to the cover shot on the classic *Transformer* album David Bowie produced. The man seems unchanged; only everything else is different.

The production is uncommonly simple: Virtually all played live with only voices dubbed.

But that's Lou Reed's world. And *The Blue Mask*, with all its built-in contradictions, appears to be an accurate account of how placid life can be in the suburbs of hell. Michael Tearson

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EDWARD TATNALL CANBY



Mahler: Fourth Symphony. Judith Raskin; Cleveland Symphony, Szell. **CBS MY 37225**, stereo, \$8.98.

This is number 24 of CBS' "Great Performance" series, the nth time that older recordings in the CBS "vaults" have been recut and/or updated for release. Nothing new in the idea, then, but there is plenty in terms of quality. I was amazed, frankly, that a recording that dates back to the early stereo years could come through, as re-cut from the original tapes, with such impact as this one. The new CBS surfaces — for this "low price" line — are astonishingly good. The music seems to have a wide and absolutely contemporary dynamic range, taking excellent advantage of these super-quiet surfaces to bring out a very considerable part of the enormous dynamic range inherent in a big Mahler work

like this. (Once, I could hear sudden compression at an extremely loud entrance.) The more or less typical CBS recording technique, no doubt with, already, a fair number of mikes, is to my mind perfect for Mahler's marvelously detailed instrumental sounds.

Only one element gave away the recording's age. The louder string segments, always difficult, showed the old slightly metallic edge that used to be standard in virtually all recording. Strings betray every sort of strain and unease that recording equipment (and playback) can suffer! They aren't bad at all here, and nothing to complain about.

This disc will stand for 23 others, for the moment, all re-issues. I hope to dig out some of the original pressings, just for kicks, and make a comparison, though I know pretty much what I will find. Updating gets better and better.

Tchaikovsky: Piano Concerto No. 1. Franck: Variations Symphoniques.

John Ogdon; Philharmonia Orch., Barbirolli.

Arabesque-dbx SS-3032, encoded stereo, \$9.00.

Offenbach-Rosenthal: Gaité Parisienne. Strauss-Dorati: Graduation Ball. Philharmonia Orch., Mackerras.

Arabesque-dbx SS-3020, encoded stereo, \$9.00.

Super-rehabilitation continues unabated out of the notable tapes of yesterday. Alongside the straightforward efforts of RCA ("5") and CBS ("Great Performances") stand those courageous and interesting coded releases of outstanding older recordings, from many labels, issued in the dbx formula. These two are late examples, both from British EMI. Both are excellent, top-rate if you wish, from the musical viewpoint, which has not always been true of the dbx choices. Nothing wrong here! Though Sir John Barbirolli was not one of the more forceful conductors of recent times, his mildly flabby Tchaikovsky (always accurate and well phrased, however) is balanced by two-ton Ogdon, in his early career, the man with the trip-hammer hands. This too-familiar old piece needs just that — not surprising that it is the standard "piano contest" work. Big drama, or else.

As for the pair of refashioned ballet scores, one made from Offenbach operas, the other from assorted Johann Strauss tidbits, they go together beautifully, one so French, the other so Austrian. The effervescent performances are by England's Arthur Fiedler, with a similar ability to enhance the best light music, Sir Charles Mackerras. He deserved the "sir."

In dbx decoding, of course, these sport the original dynamic range, and they are superbly quiet (some remnant tape hiss in the very high end?). Even after several years, every dbx disc I play is a startling experience. If only all the performances were as good as these. . . .

Interesting to note, from the technical viewpoint, that though these recordings were copyrighted in 1961 and 1964 respectively, there is now — in the dbx version — not a trace of the metallic edginess in loud string pas-

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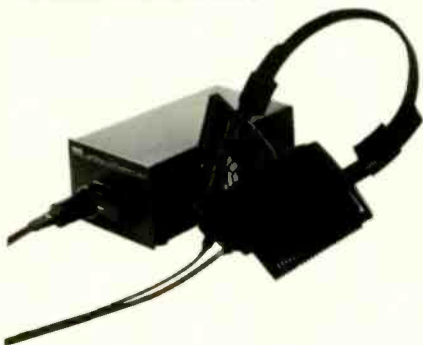
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sages that was common in many recordings of that period. These are remarkably clean. The recording technique is rather typical EMI, somewhat distant and bathed in enormous reverb, clearly without "accent mikes," stereo or otherwise. (You can always add reverb but you can't take it away.)

These re-issue recordings, dbx and others, bring out interesting aspects concerning the "weak points," the weakest links in the chain, which in earlier issuings were disguised, and, conversely, the strong points as well. We did some remarkable things in those days, and earlier, too.

Philip Jones Brass Ensemble—in Switzerland.

Claves DPf 600, stereo, \$12.38.
(Available from Brilly, 155 N. San Vicente Blvd., Beverly Hills, Cal. 90211.)

Sound: A Recording: A Surfaces: A

Not very Swiss, but VERY continental, this oddball English brass record from one of the most insidiously expert ensembles in Europe (and a worthy contrast to the Canadian Brass!). Their big blats and powerhouse projection are saved for unexpected moments—most of the music is a suave, polished Noel Coward-sort of sound, often reminiscent of "Facade," a real smoothie. Quite unlike any brass group I've heard so far.

The recording is nothing less than sensational, or as the French say, "sensass," with absolutely marvelous surfaces. A dynamic range which will fool you, blow you out of the room if you start with too much volume. And such cleanliness! Even more than that, a superb recording technique, sharp definition but in a gorgeous big space and with various tricks of distance and nearness to add to the impact. Though the group is English, a good part of the processing of the disc is Swiss; guess they had to put in a few Swiss ditties here and there. Don't miss the variations on "The Carnival of Venice" (that's Venice, Switzerland, of course).

Fandango—Music of Padre Antonio Soler. Igor Kipnis, harpsichord.

Nonesuch D-79010, digital, stereo, \$11.98.

Sound: A Recording: B Surfaces: A-

If you know a few of the hundreds of sprightly little one-movement harpsichord sonatas by Domenico Scarlatti, you will find the same style in the Spanish padre's music. And if you have heard Igor Kipnis, the prolific recorder, the fleet-of-finger, you will know all about the sound of this re-

cord—rewarding. The title piece, Soler's "Fandango," is an exception; it is a long set of quite remarkable variations in the manner of the guitar fandango of the 18th century. Kipnis has also grouped some of the short Soler works into a number of "trptyches," his own idea, to provide better continuity. Good system.

Digital? Merely state-of-the-art recording worth lavishing on the harpsichord even though this instrument does not need 90 dB dynamic range. What counts for more is the rather close-up microphoning, which accentuates the mechanical sounds of the harpsichord and brings out more bass than is really normal for harpsichord "live" listening. On the tubby side, down at the bottom.

Mendelssohn: Piano Trios No. 1, Op. 49, No. 2, Op. 66. Istomin Stern Rose Trio.

CBS 35835, stereo.

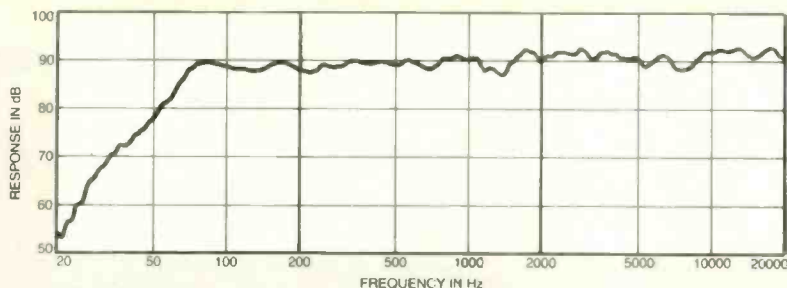
This is one of many recent CBS reissues of older celebrity discs and it is scratchy. The problem is not entirely in the recording, though present-day CBS has not been able to clear up the original problems, such as the engineering of the time—essentially unalterable except by too much filtering. The main trouble is with the performers.

This is a typical big-time performers' trio, three very well-known soloists, playing together instead of as separate stars. It takes a special kind of playing to project as one of the great solo performers. Such artists are geared to the biggest concert halls and the largest audiences, and they do not play with electronic sound reinforcement. They must throw out not only a forceful sound but an almost exaggerated kind of personal presence if they are to reach so many people at once in such large places. Multiply any of these big shots by three—any three you choose—and you do *not* have chamber music, which is what Mendelssohn composed here; music for relatively small and intimate places.

No wonder that, in particular, Isaac Stern's fiddle fairly screeches at you from the close proximity (relatively speaking) of the microphone. His instrument has the bad luck to play in the maximum-distortion range, both as to musical pitch and coloration. Too much!

The history of the recording art is one long attempt to cope with situations like this. We do move on, bravely; we have conquered again and again. But the casualties lie by the wayside. Or are resurrected for their musical power.

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Finesse: John Klemmer
Nautilus NR-22, direct-to-disc,
 \$18.00.

This record, produced under license from Elektra Records, presents the mellifluous and sometimes hypnotic tenor saxophone of John Klemmer against a background of rhythm, bass, keyboard, and percussion. It is a direct-to-disc production done with all the simplicity this technique asks for, and the sound is gorgeous in all respects.

Musically, there is, for my taste, too much sameness from one cut to the next, and one side of the disc suffices at one sitting. Within these constraints, the playing of Klemmer's back-up men is absolutely first-rate. Russell Ferrante demonstrates the wide variety and essential musicality of today's keyboard-based synthesizers, and his harmonic vocabulary is rich but subtle. Bob Magnusson's acoustic bass provides a varied rhythmic underpinning which keeps the music flowing. These two players can be credited with providing the elements of variety without which this music would quickly pall.

There is only one very minor annoyance in this otherwise well-engineered and produced album: Klemmer over-

uses a repetitive echo device which repeats at intervals of 600 milliseconds. When his saxophone is exposed, it is clearly evident; it is a little crude in the company of such lovely sounds as are generally to be found on this record.

The levels on the disc are well within reasonable bounds, allowing percussive detail to come through beautifully. The pressings, by KM of Los Angeles, are first-rate. *John M. Eargle*

Blondes Have More Fun: Rod Stewart
Mobile Fidelity MFSL 1-054, stereo,
 \$14.98.

Sound: A Performance: B

This album has got to be a classic in the simulated rock vein — the best players money can buy, a singer with distinctive and ostensibly great pipes, and enough musical variety to keep everybody happy. The only thing missing is a soulful performance. There's a disco cut for those who judge their records by the beats-per-minute ("Do Ya Think I'm Sexy?"), a couple of ballads ("Ain't Love a Bitch" the most well-known), and even a rocker or two (the best being the title track). But they

all sound like rewrites of either Stewart's own earlier compositions or Rolling Stones tunes, which is fine as long as you want one Rod Stewart album in your collection and no more.

Mobile Fidelity has done a fine job with this one. Andy Johns' superb engineering leads itself toward the wide dynamic range provided; the original mastering job made the guitars sound too thin and lacked the depth to Carmine Appice's kick and toms that's extremely noticeable here. However, Rod Stewart's finest work was done with Ron Wood and Martin Quittendon by his side, and a remastering job on *Gasoline Alley* or *Every Picture Tells a Story* would be infinitely more listenable than this. *Jon & Sally Tiven*

Days of Future Passed: The Moody Blues
Mobile Fidelity MFSL 1-042, stereo,
 \$16.98.

Sound: A Performance: B+

It's fortunate for the listening public that Mobile Fidelity allows a "second opinion" on record mastering, as a cursory listen of the original version of this album would lead one to believe that it was recorded primitively. Actually, it seems to have been a fairly high-quality recording, but the tinniness that characterized this record's previous incarnation was primarily the fault of the mastering process of London Records. The labs of 1967 obviously couldn't strike a proper balance between the London Festival Orchestra's lush arrangements and the attack of the Moodies but, fortunately for those fans who wish to go that extra mile, *Days of Future Passed* can now be played on most stereo systems and not sound years out of date.

The quiet transitions between tunes at last have the true dynamic that was intended to fall there, rather than the crackle that was found between tracks. Even the silences are clean, a true test of the precision Mobile Fidelity offers. And in case you were wondering, "Nights in White Satin" sounds virtually *transformed* — the cymbals have real definition rather than just being a tone in the high end.

Of course, if you're no big fan of this group or this piece of music, you'd be

best off letting this one slide right by — no amount of sonic reproduction makes suffering through a piece of drivel worthwhile. But if you like The Moody Blues of 1981 (and we know there are a few of you out there) or you're primarily a listener of symphonic stuff who wants one or two records of the rock variety to enhance your collection, then *Days of Future Passed* should not be overlooked.

Jon & Sally Tiven



The Moody Blues

The Gambler: Kenny Rogers
Mobile Fidelity Sound Lab MFSL
1-044, \$17.00.

Performance: A Recording: B
 Processing: A

Greatest Hits: Kenny Rogers
Mobile Fidelity Sound Lab MFSL
1-049, \$17.00; cassette C-049, \$18.00.

Performance: A Recording: B
 Processing: A

What can one say about Kenny Rogers: If you like him, you love him, and if you don't. . . . No one, however, can deny his success which in part is due to his very carefully picked and thoroughly tested repertoire. He is also one of the few performers whose "live" charisma projects all the way through the phonographic chain.

On comparison with the original Liberty issue of *The Gambler*, there is no question about the superiority of the Mobile Fidelity version. The high-frequency information is superbly clean. The balances between instruments appear much better due to the lower distortion, and instrumental clarity is outstanding. This is a highly recommended purchase for anyone even remotely

interested in this type of music. This record, incidentally, seems to have been cut at a higher level than *Greatest Hits*. The surfaces are impeccable.

Greatest Hits unfortunately was cut from a tape not quite as satisfactory as *The Gambler*. Since "The Gambler" is one of the featured songs in the *Great-*

est Hits collection, a direct comparison is possible, and there's no question that different processing and equalization were employed in the two originals. The sibilants are just too pronounced on the master tape, and some taming of the treble is necessary for a completely satisfactory playback.

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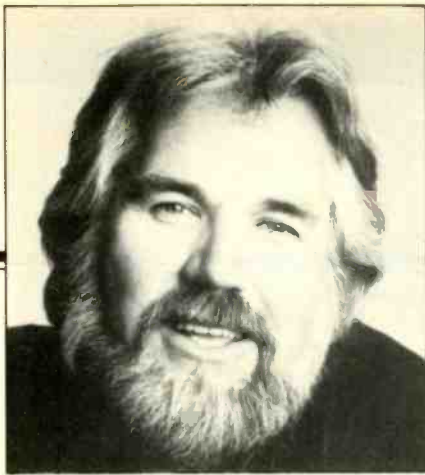
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The rhythm section, however, is presented here with an absolutely solid bottom, and the cymbals are very clean with no "splattering." The fact that the selections on the album were sourced from different dates with different producers and engineers is also evident in the differing low ends in the cuts — some have deeper bass than others. Again, instrumental clarity is outstanding, there is no recorded rumble on the record, and, as with *The Gambler*, it is perfectly flat — not even the slightest hint of warp. Oddly, there is very little stereo information in this record, and *The Gambler* seems to have been mixed more with a stereo perspective than *Greatest Hits*. Just

about all the above comments apply to the cassette version of *Greatest Hits*, but there is clear high-frequency roll-off on the cassette copy which is substantial when compared to the disc version. Playback on several machines with verified performance confirmed the fact.

C. Victor Campos

City to City: Gerry Rafferty
Mobile Fidelity MFSL 1-058, stereo,
 \$14.98.

Sound: A Performance: A

It's a rarity when a record made by a relative unknown artist with a minimal budget attains the kind of critical recognition and commercial success that *City to City* enjoyed, and it's a wise move for a company like Mobile Fidelity to reissue it in their enhanced version. The spaciousness of the reverb, sweeps of the organ, and separation of the instruments were somewhat lost in the original version, and this one

reproduces the studio tapes with the kind of accuracy the record deserves. Just about every track has been heard repeatedly by many FM radio listeners, but even so you'll be surprised by what leaps out of the speakers on this audiophile pressing.

Rafferty is sort of a more-souful McCartney, with a Dylan touch to the vocals thrown in for good measure. *City to City* was produced with a strong dose of honesty despite the lush string/keyboard textures the album relies so heavily upon. Chipping Norton Studios (where the majority of the album was done) is a very humble and unpretentious recording facility, yet this album is evidence that it doesn't take a \$200.00-an-hour studio to make a great sounding record. His fans may anxiously await his next, and with good reason — Rafferty is a major talent just hitting his stride — but in the meantime, there's plenty of meat to gnaw on with this issuance of sonic beauty.

Jon & Sally Tiven

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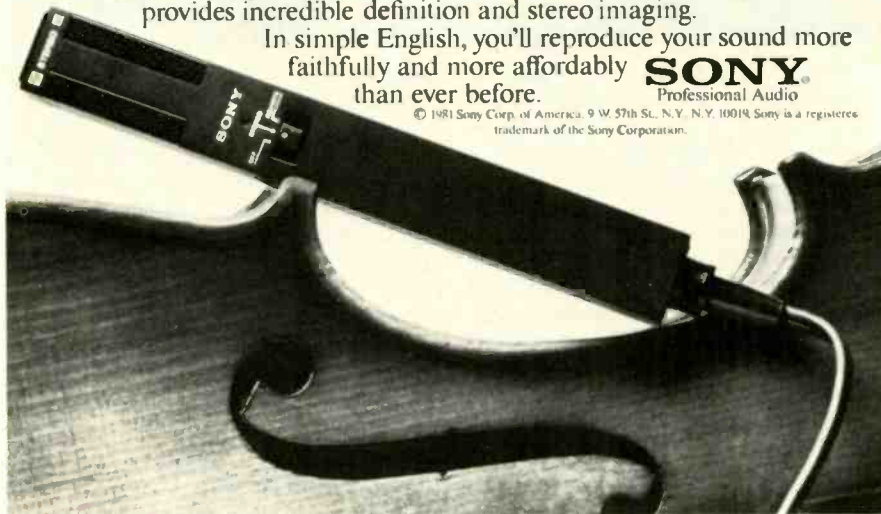
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TAPE RECORDER MAINTENANCE

Howard A. Roberson



Just as with the purchase of a home, a car, or a major appliance, your responsibility as an owner of audio equipment does not end with your selection of components. To get the maximum pleasure from your system for the maximum number of years, you must periodically check its condition and perform routine maintenance tasks. The techniques and tools for proper care of open-reel recorder heads will be covered here, and much of this can be directly applied to cassette decks.

Photographer: Robert Lewis

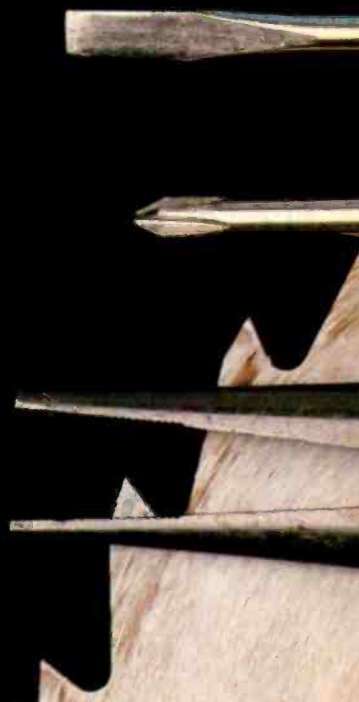




Fig. 1—Worn and dirty quarter-track record head.

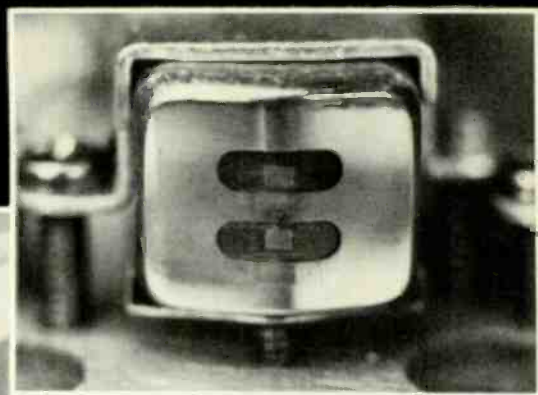


Fig. 2—Partial removal of Aud Vid Com "A" coating.

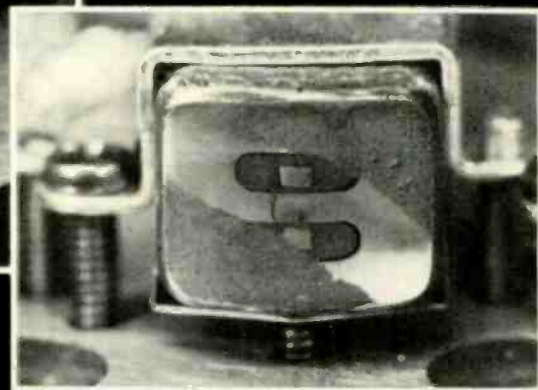
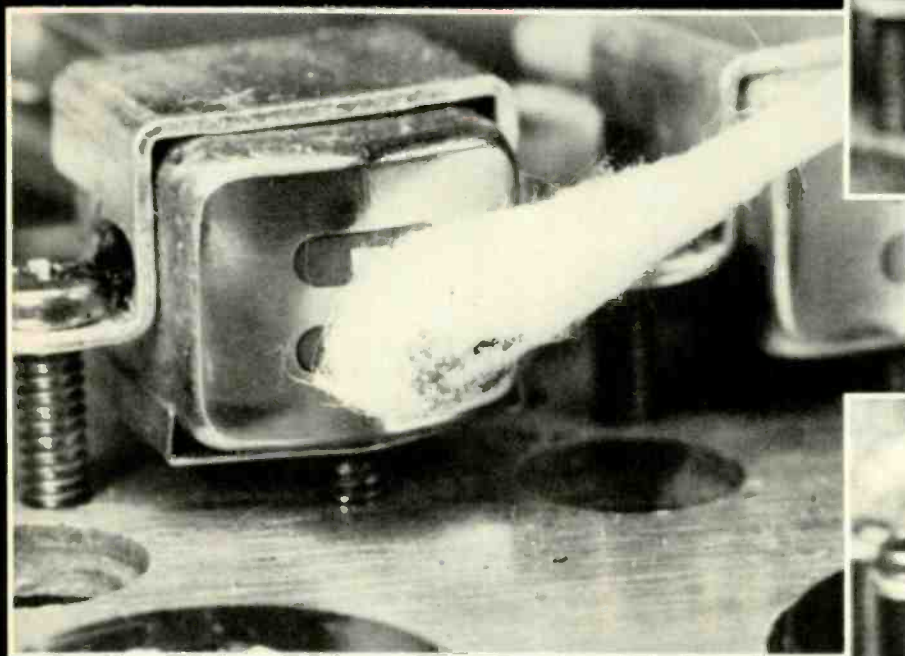


Fig. 3—Dirt removed by rotating a cotton swab.

Keeping Heads Clean

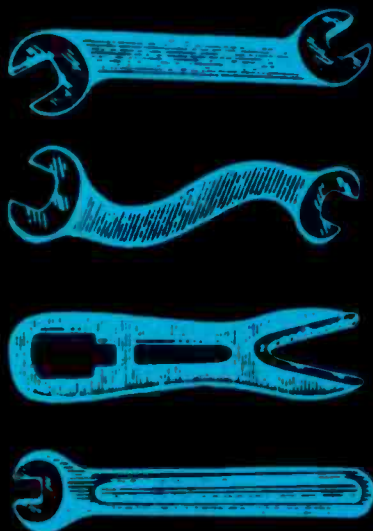
Maintaining clean heads on a recorder demands that the entire tape path be kept clean. If you take a good look at the route the tape follows from the supply reel all the way to the take-up reel, you'll find tape-tension/tape-break arms, guides and posts, the capstan, the pinch roller, perhaps a pressure pad, and a lamp-detector assembly to sense tape run-out. Any of these points is a potential source of scraping the tape surfaces or edges and a potential site for build-up of debris. Figure 1 is a close-up picture of a quarter-track head that is both dirty and worn.

Cleaning Products: Many different types of cleaners have appeared on the market, but most of the present formulations are based upon isopropyl alcohol or TCF (trichlorotrifluoroethane). The advantage of the alcohol is that it is inexpensive and readily available at a drug store. You must be certain, however, that you do not buy rubbing alcohol, which may have such harmful ingredients as lanolin added to the alcohol base. The desired product

should be clearly labeled "91% isopropyl alcohol," as is Stericol from Berkeley Drug Co. Alcohol will probably not leave any residue on the heads, but it can be damaging to rubber pinch rollers over the course of time. There is no such disadvantage with TCF, which also will not attack plastics.

I evaluated tape-head cleaners made by Aud Vid Com, Chemtronics, Miller-Stephenson and NoTronics, as well as Stericol. Each product was rated for the ease with which it cleaned the deposits on the head and the extent to which it left the head completely clean. A few unnamed isopropyl-based cleaners did a good job of removing the tape residue, but they left behind a thin layer of something white and streaky. There was no similar deposit from Stericol, available at a fraction of the cost. TCF products, in spray cans from Chemtronics and Miller-Stephenson and in bottle/cans from Miller-Stephenson and NoTronics, all did the task in excellent fashion with no detectable residue.

Aud Vid Com is a two-fluid type of cleaner which the manufacturer claims



will polish as well as clean heads. The "A" fluid is applied, allowed to dry, and then (Fig. 2) wiped off. The "B" fluid is used for the final conditioning. The two-step process made for good cleaning, but no better than any of the TCF cleaners, which involve only one step and cost less. Examination of both old and new heads under a microscope showed that Aud Vid Com did fill in some minor scratches in one or two cases, but in most cases there was no observable improvement.

There was little difference among the top cleaners, but my favorite was the Miller-Stephenson, followed very closely by Nortronics, and then by Chemtronics.

Tools and Techniques: I have a number of head-cleaning kits, and they do perform well. Those with angled-handle fells are particularly good for recorders with recessed heads, such as the Revox A77. For most recorders, however, I use cotton swabs, the Chesebrough-Ponds Q-tips, which are well made and won't keep dropping fibers while you clean. Although I occasionally use a spray can, I really prefer to use the liquid TCF in a small, pump-spray (empty Sound Guard) bottle so that I can spray the exact amount I want directly on the Q-tip.

Most manufacturers of cleaners tell the user to "scrub" the head, but *don't* do that: You might scratch the head if hard particles are present. Let the cleaner do its work—loosening the debris for easy removal. Move the Q-tip across all parts of the head while rotating the swab (Fig. 3), as this will lift the dirt off the head and remove it. Many times it is best to use the first swab for rough cleaning of all the surfaces, including the guides and pinch roller. Use as many Q-tips as necessary to make certain that you are not re-depositing dirt already removed.

Demagnetization

Despite improved circuitry in recorders the past few years, it is still possible that there might be some residual magnetism which could be detrimental to an important recording. Demagnetize after every 20 hours of use, before attempting any important recording, and before ever playing an alignment tape, if you wish to be absolutely safe. Specific recommendations

by the recorder manufacturer should be followed faithfully.

Demagnetizers: Figure 4 shows two Nortronics demagnetizers with bent-tip rods, an old and inexpensive flat-pole-piece unit from Lafayette, and the rugged Annis Handi-Mag. All but the Lafayette have the ends covered with plastic, which is essential to ensure that the heads are not scratched during demagnetization. The Handi-Mag put out the highest flux level, making it my first choice, particularly when there are guides that would benefit from such attention. The large size of its pole pieces, however, prevent its use with recorders with limited head access. In such cases, the Nortronics units can induce more flux into the heads since direct contact can be made.

Demagnetizing Techniques: It is important to realize that demagnetizers will also work on VU meter pole pieces and alignment tapes, so don't be careless. The meters will *not* be damaged by the demagnetizer if used in normal fashion. Make it a practice to turn the unit on and off at least four feet from the recorder. After turn-on, bring the demagnetizer to the head (or guide) slowly, make gentle contact, and then move it slowly away. Do each element in turn, including separate track pole pieces if need be, always moving the demagnetizer smoothly. If you need to turn it off before finishing, move it away first. If you accidentally turn it off at a short distance, do all the demagnetizing over—again referring to the manufacturer's instructions.

Head Alignment

For the serious audiophile or semiprofessional, head alignment can be a prime concern, particularly if the heads need to be replaced. When all of the heads are in perfect alignment, their gaps are perpendicular to the reference mounting plane and the line of tape travel (azimuth), and the head faces are also perpendicular to the plane (zenith). Immediately, a reader may well wonder where that reference plane is on his recorder. Sometimes it is very obvious for there is a flat, metal plate providing support for everything involved in the tape path. With other recorders, there may be just a small plate supporting the head assemblies.



Fig. 4—Head demagnetizers.



Fig. 5—An assortment of tools for head alignment.



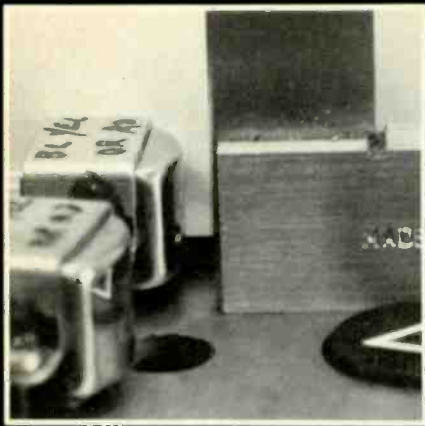


Fig. 6—Using the machinist's square to make the play head face perpendicular to the mounting plate.



Fig. 7—Using the Nortronic PF-720 height gauge.

What we do know is that the playback head should be in alignment with a standard test tape, the record head should be in alignment with the playback head, and the erase head should match as well. We can all agree on the basic approach, but let's take a look at the tools and techniques.

Tools and Instruments: Figure 5 shows a collection of tools and other aids for head alignment. Going clockwise from the lower left, we see an Ivie IE-20B pink-noise generator, nail polish, a small machinist's square, Nortronic Magview, a flashlight, head cleaner, a Magnetic Reference Laboratory test tape, an Ivie IE-30A 1/3-octave RTA, a pull scale, eraser pencils, and, finally, a steel scale with graduations for each 1/100 inch.

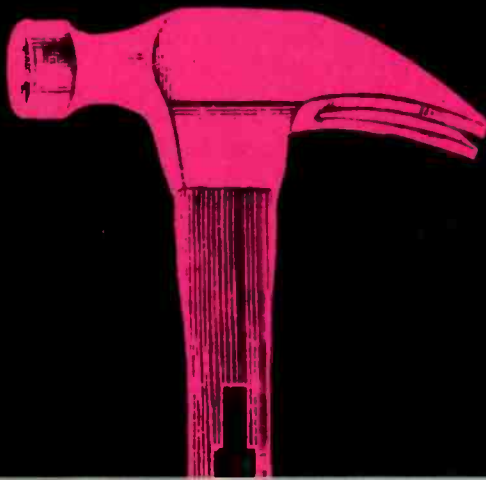
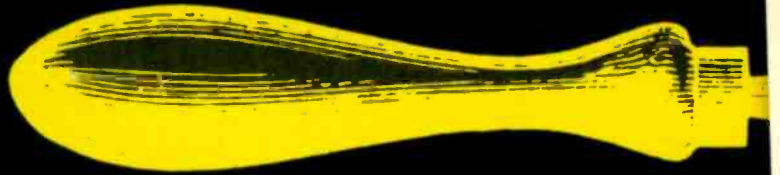
There are other things that will be used, of course, including an oscilloscope and audio monitor, jeweler's loupes, to say nothing of a sine-wave source. If the entire head assembly is removable, some work might be most easily accomplished on a Pana-Vise surface plate. Various heights can be checked and transferred with a Nortronic PF-720 height gauge. Additional tools may be helpful at times, but it's time to discuss the procedure for doing the alignment, including what must be done if heads need replacing.

Checking Head Alignment: The first steps are to clean and demagnetize the tape path and to make any adjustments needed on tape tensions. Look for any rough or sharp edges which might call for repair work before

putting an alignment tape in your recorder. Clean any pressure pads with light brushing; do not use cleaner. Replace any pads that are hardened and/or packed with oxide. The MRL swept-sinusoid test tapes are my favorites for two reasons: The swept response that is shown on the scope can be used for both playback equalization and head azimuth adjustments, and their length of several minutes gives plenty of time for both of these tasks. Use the azimuth adjusting screw to get the maximum output at the highest frequency. Alternatively, make the adjustment for exact (as possible) phase correspondence between tracks, using a two-channel scope. (I am assuming the reader is most interested in two-channel stereo, with quarter-track recording format preferred.)

After playback head alignment, the record head needs to be checked. I prefer to use a pink-noise source at -10 to -20 VU, with the playback fed to the 1/3-octave RTA. The azimuth peaking is done to get the maximum response from the 20-kHz filter, gently centering the adjustment between the initial fall-off points. The RTA display also allows making bias and record EQ adjustments at the same time for the best overall response. Discrete tones can be used, of course, with a low frequency for a rough azimuth setting, shifting to a higher frequency for better resolution. At the same time that all of the alignment checks are being made, observe the stability of the outputs as well as the amount of the high-frequency roll-off. What you see will indicate how soon you might have to replace one or more of the heads.

Replacement of Heads: When there is unacceptable high-frequency roll-off after alignment, and it can't be corrected with bias or EQ adjustments, and/or the levels are bouncing up and down, it is time to think about changing the heads. Take a good look at each head face, aided by plenty of light and perhaps some sort of magnifier. See if there is a definite area that has worn away, perhaps on the order of 1/8 inch wide or more. If so, there will be little shoulders where the top and bottom edges of the tape would normally be. These are points where the tape can be lifted away from the head gap(s) by the unworn shoulder when the tape



shifts slightly up or down. Look at the wear areas of all heads very carefully. The edge of the wear pattern should match the upper (or outer) end of the track 1 (left channel) pole pieces and their gaps.

Many times it makes sense to replace all of the heads, even though one may show little wear. The advantage of replacing them all is that the tape path will then be determined by a smooth flow across the new head faces and not by the shoulders in a somewhat worn head. Before removing old heads, make notes on all wiring and its color coding. Carefully clean all terminals of the new heads using the pencil erasers. If possible, do not loosen any screws that affect the head height. Do note the location and purpose of each screw associated with the head assemblies and write down the number of turns given to any of the screws and determine their pitches (threads per inch).

When a new head is placed in its support carrier (or holder), make certain that it has the same in-out, left-right position as before to ensure getting the correct wrap of the tape on the face. Return all screws to their original positions, adjusting the azimuth screws to make the gaps perpendicular, perhaps aided by a small square. Then, as shown in Fig. 6, use the square to make certain that the face surface is perpendicular to the plate—placing a white card behind the head will help you see exact verticality when the square is right up to the face. The Nortronics height gauge, preset to match the older heads, can verify that the height is still correct after any head tilting in zenith to match the square (Fig. 7).

The next step is to find out how the tape actually lies on the heads as far as height is concerned. First, record a high-level (+3 VU), low-frequency (400-Hz) tone on a bulk-erased (or new) tape on all four tracks at one end of the reel. Pull out a section that is recorded and spray it with Magview, oxide side, of course. When the fluid evaporates, there will be a pattern on the tape showing the location of the recorded tracks. If you have been careful, and maybe a little lucky, the pattern will look like Fig. 3, which shows three equal spaces among the four recorded

tracks. If the spaces are quite different, you will need to move the record head: Up, if the space in the center is larger, and down, if the space in the center is smaller. It is possible to measure the actual spaces directly with magnification and an excellent scale, but it is tricky.

Fortunately, there is a much easier method. Look to see what the ratio is between the outer spaces and the middle space, and then refer to Fig. 9 to determine how much the head should be shifted. For example, if the top (and bottom) space appears to be twice as wide as the middle space ($TS/MS = 2$), the head should be moved down 0.005 inch to put it at the correct height. If the height-positioning screws have 4-40 threads, a full turn would mean a shift of 0.025 inch. We want, therefore, to turn the height-adjusting screws just one-fifth of a revolution. Turn them exactly the same amount to keep the head face zenith setting correct. Recheck with Magview, and do any trimming required to adjust the height exactly.

Record high-level tones on each of the four tracks on bulk-erased tape. With both scope and audio monitors, check for proper erasing, one track at a time. Check the separation between channels, but pay special attention to any crosstalk between tracks 2 and 3 (right channel with opposite play directions). Disconnect the source while these tests in playback are being made to prevent any source-to-tape leak-through from appearing as a head-height problem. If erasure is poor or if there is crosstalk, examine the erase and/or playback head heights with the tape running. Shift the head(s) involved to make the tape-edge/end-of-gap alignment more exact, and rerun tests. When completed, perform playback and record alignments as discussed earlier, after demagnetizing the heads. Finally, apply a spot of nail polish to lock all azimuth adjusting screws in place.

The instructions and guidelines described here should not involve an inordinate amount of your time. But by following these basic steps, you will prolong the useful life and fidelity of your open-reel recorders and cassette decks, and I hope that the information I've provided will serve you well. Δ

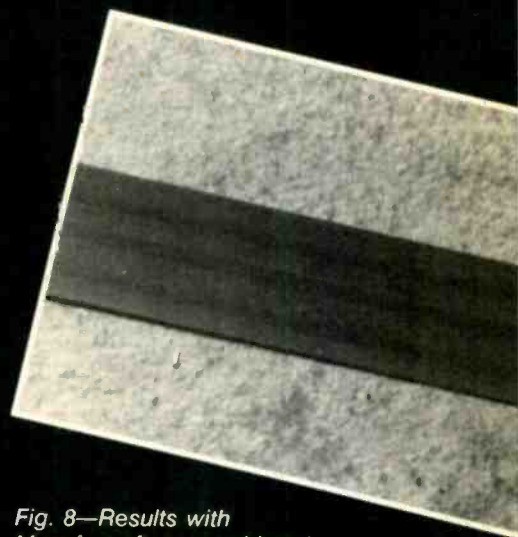


Fig. 8—Results with Magview after record-head height adjustments.



Fig. 9—Intertrack spacing as a function of vertical head position.

THE AUDIO INTERVIEW

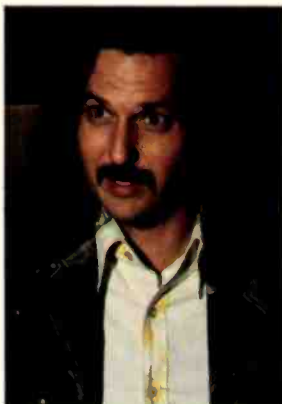
PAUL LAURENCE

JIMMY MILLER

Producer of the classic
Rolling Stones albums



I worked hard and told myself I would make it, that this is what I wanted to do and this was my chance.



The sound of a record comes about through the relationship that's built between the producer and the engineer.



I am aware that I have a taste in sound, and it does appear when listening to albums that I've done.

I first met Mick Jagger in the hall at Olympic, where I was producing The Spencer Davis Group. The Stones were hassling with Satanic at the time.



Jimmy Miller is a name unknown to most rock fans—save those who habitually read album credits—but his rise to the top was faster than Horatio Alger's. And he got to the very top—the only true producer for The Rolling Stones, arguably the best rock 'n' roll band of all, during the height of their career.

Miller's first four years as a producer were spent in New York—in varying degrees of obscurity and poverty—and he terms most of his productions from the period "Secret Service releases" because they were so unsuccessful that you'd have to hire the Secret Service to determine whether they'd been released.

Miller arrived in England on September 1, 1966, and promptly had a flurry of hits, working with artists such as The Spencer Davis Group, Spooky Tooth, Jimmy Cliff, and Traffic. Within months

he had become England's top producer, and that he was an American and just 25 years old made it all the more exotic. Shortly after Christmas of 1967 he was asked to produce The Rolling Stones.

In five years, through 1973, Miller produced five albums, nine U.S. singles, and five U.K. singles. With Beggar's Banquet in 1968, Let It Bleed the following year, and Sticky Fingers in 1971, he produced, consecutively, three of the finest rock albums ever made. While many critics feel that Exile on Main Street, though uneven, has high points as good as anything on the previous three albums, the next LP, Goat's Head Soup, was not as well received.

Perhaps Miller's biggest record was the Blind Faith LP of 1969, which he was called in to salvage at the last minute. The only album the group ever

I remember Mick asking, "What do you do when you've done everything so many times, and you want to progress? Where do you go when you're tired of just being redundant and want to take it somewhere?"



followed The Beatles very closely. A friend previewed "A Day in the Life" before its release, and all I could say was "Wow!"



made, it turned out to be a bestseller for Atlantic. He then followed Eric Clapton into Delaney & Bonnie and Friends, and his most recent work has been with The Plasmatics.

Performing in nearly every possible artistic capacity in the record making chain, Miller was artist-vocalist on "Woman or Child," which Columbia released during the winter of 1962-3. He has co-written more than a dozen songs, the most successful of which was "I'm a Man" with Stevie Winwood and covered later by Chicago. He has often played drums and other percussion instruments, particularly with The Stones, and he has even done some engineering. But it will be as a producer for The Rolling Stones that Miller will be best known.

This present interview is culled from about 12 hours of tape—some 65 pages in transcription—done between 1974 and 1977 by Paul Laurence, who has also had interviews with Les Paul and George Martin in Audio. Our thanks to Paul for a monumental effort.—E.P.

Did you always intend to be a record producer?

No. I didn't know what I wanted to be. It was some way connected to show business—that general field or area. Either acting or singing, cabaret. My dad had been a nightclub owner and I had grown up in that environment. All through college, where I was taking pre-law, I knew I wasn't really going to go on to be a lawyer. So I went to acting school after that, told my father he should save his bread and my time. The acting school was in New York, and from there I started singing, and working some gigs in the Catskill Mountains.

So you'd been drumming all along, right?

Yeah, I had played gigs on weekends—mostly Bar Mitzvahs and private parties in Miami Beach, playing drums and singing. We ran the gamut from rock music, when we were working "sweet 16" parties, to very middle-of-the-road standards.

Did you aspire to be a singer mostly?

Yeah. I would have loved to have been a rock & roll idol. I envied them, thought "Oh, yes, that's the life," you know?

And when did your brief career with Columbia happen?

Bob Mersey was the A&R man. He was responsible for Andy Williams during those years, and Andy was very hot. He had his TV show at that time—so consequently Bob Mersey was very powerful at Columbia then. I recorded four sides as a singer.

How competent, in retrospect, do you think you were back then? In choosing songs, let's say.

Terrible.

How about as a singer?

Oh, I wasn't really approaching it as an art at all at that point, I was just bastardizing it. I met this arranger, Larry Fallon. He was primarily a jazz enthusiast and performer, and he played excellent jazz piano. And he was hungry and starving, too. Larry and I, as co-producers, formed the first production company that I ever had. We got into R&B.

This is 1962 you're talking about?

Yeah, it started about '62, and lasted till '66, when I went to England. Yeah, it was those years—'62 to '66.

These were the years when you made masters for \$500 and sold them for \$550, right?

Yeah. We tried to get a thousand if we could, but we were happy just to get \$500 and be able to pay Larry's uncle back, or whoever had put up the money for the session.

Do you remember your first release as a producer?

It was a record called "Incense," by a group from Norfolk, Virginia—a black group. That was released, first on a little label in New Jersey, then later Hewitt Abner at Constellation Records purchased it and released it; so it was released nationally. It got a lot of airplay in a lot of markets and it sold a few. It wasn't a big hit, but it was interesting—it made a lot of noise. That was fun to live through. And more importantly, Chris Blackwell released it in England. It was one of the tracks that he heard when I first met him, and I was playing him work that I had done and he loved it.

How did you two meet?

Through a mutual friend. A man in New York who was a mentor to me—sort of a second father. He gave Larry and me office space free in his suite. He kept telling me, "Oh, I must introduce

you kids to Chris Blackwell," who was just starting Island Records, in England. He asked Stanley Borden where a new label should be opened, in the United States or England. Stanley told him he thought he should do it in England, but everyone in England said "You're crazy. You know there're only major labels here." That was very true, EMI, Decca—that's how it was over there. He was sort of the first maverick in a way, in England. But Chris loved "Incense." He really loved the record—he asked if he could release it in England, and he was going to pay us \$1,000 in advance and we were just knocked out. He asked me to come there for a short time, to produce some sides for him. Chris, at that point, was certainly nowhere near the operation that he had later. I mean, he wasn't hungry, but I must say, although he was from a wealthy family, he really did build the business up from virtually nothing. From riding a bicycle to West Indian shops and giving them records on consignment, to what the Island thing was. And so Chris asked me to come over for about six weeks. He had told me about Stevie Winwood—this great 15-year-old genius that he had.

Had you done anything like The Spencer Davis Group before?

No, I had only produced with Larry, who was in charge of the musicians on the floor, having written the charts. I would work with the engineer in the control room and get into that side of it. Spencer Davis already had "Keep on Running" and then "Somebody Help Me," but neither record had happened in America. I think Chris thought he should get an American producer so they might happen in the States. After we had done the overdubs for the U.S. version . . .

Those are the backing vocals? The cowbell?

Yeah, I remember Chris saying to me "You know what I think? The American version is perfect for America and the British version perfect for here." That they were each the best version for that particular market. It was a much simpler version for England, and he reckoned it was more commercial for England, and the other one was just a little bit funkier, for America.

So you became the staff producer for all the Island acts?

I was the only producer up there, and I was there every day—I sort of worked a 9-to-5 day up at Island Records and then if I was recording, I'd record at night. So I worked hard—I said "I'm going to make it. This is what I want to do and now here's my chance." And England was at its best; it was really "Swinging London" then. That next summer was the "Sgt. Pepper" summer, an incredible time and incredible place to be.

Did you follow The Beatles closely, or did you figure they were another league?

No, I followed them very closely. Especially *Sgt. Pepper* because I had been previewed to it. I was at a photographer's and he asked me if I wanted to hear a cut off the next Beatles album. Then he played "A Day in The Life." And I just went "Wow!"

But you had never met George Martin or Geoff Emerick, correct?

No, never. EMI was up in the northern part of town—up the Edgware Road to Abbey Road. The things we were doing were on the southern extreme end of town. There were things being done simultaneously but we never attended each other's sessions.

How did you first meet Jagger?

I just would run into Mick occasionally at Olympic. Nobody ever really officially introduced us, but I guess he would ask the engineer there who I was or something. And he would be in the other studio—like he'd be in A and I'd be in B. Or he would see that I was in with The Spencer Davis Group, and he would know I was the producer, so he would say "Hello" when we met in the hall. And I would say "Hello, how's it going?" and he'd answer "Awww, gets kinda hard sometimes." He was complaining all the time. They were hassling with *Satanic* then, and I remember Mick saying "Well, I mean, we're going through that thing, like what do you do when you've done everything so many times, and you want to progress? Where do you go when you're tired of just being redundant and want to take it somewhere?" He was kind of hung up on that, and I would just give kind of comforting words, or cheer.

So you never actively tried to . . .

Not at all. No, I mean, I was trying to



Chris Blackwell literally built up Island Records by riding a bicycle to record shops and giving them records to sell which were on consignment.





keep my composure *speaking* to him. I was in such awe of him, of meeting Mick Jagger. My God. I had lived through "Satisfaction" and all that in the States as a struggling producer. They were already giants in the business, and here I am standing in London talking to him—it was very exciting for me, just to meet him in the hall like that. And then suddenly, one night he rang my flat and said "Would you be able to come by my place tonight? I'd like to talk to you about something." And I said "Sure, where?" He gave me the address and I hung up the phone, turned to my wife and said . . . "Wow, I know Jagger's going to ask me to produce them." I just had that feeling. I went over there and he didn't take long. We sat down and he said "Here's the thing, man. We don't have a producer since we split with Andrew Oldham, and I like what you've been doing with Stevie. I've listened to them and I've liked the things you've been doing and would you like to produce us?" "You want to try an album?" And it always was like that, through the years, it was always on an album-to-album kind of basis.

I was somehow under the impression that "Flash" was kind of a tryout for you.

Maybe it was, but not to my knowl-

edge. I mean, Mick definitely said, "Would you like to work on an album with us?" I remember not saying yes right away, trying to be cool and sort of asking questions first—as if it would influence my decision! Saying things like, "Well, where's Brian (Jones) at in relation to the group right now? What's his scene going to be?"

Where was Brian at?

Well, Mick said, "There's no problem with Brian—we've sorted it all out." Mick acted as if Brian would be playing a lot, and everything would be fine. Brian just never showed up—hardly ever. He would come to about every third or fourth session. And want to play. He had no idea what the song was or anything, and he'd sometimes be very stoned, and lots of times we'd just give him a mike to let him play and get it out. It was kind of hopeless, Brian just was no longer a member of The Stones, and it just had not been officially announced. Brian was happy after it had been finally announced. He said to me, "Oh, I feel so free now, to go and just do my own music now."

So he was almost not a Stone when you were doing Beggar's Banquet?

Right. And then when he would show up for a session, it would be totally unexpected—"Wow, here's Brian after two weeks."

Let's talk about the "cassette" tracks. Okay, I remember those nights. We would get together at Mick's enormous house on Chester Square. We would just sit in one of the empty rooms—on the carpet—and run a cassette. Keith would play acoustic guitar, and Mick and Keith would sing the song that they had just written to me—they'd sort of be showing me the material. And I would inevitably start pounding on some table or make some percussion contribution, and we would record it on cassette. Keith would often remark on the playback, "Oooh, doesn't that sound good? That's really a good sound." You know how a cassette distorts so easily. It's got a small mike and small speakers, and you can so easily distort it, and yet it's such a good, ripping, tearing sound. Keith would say, "That's such a good sound, that's a shame the master can't sound like that." And I remember one night just saying, "What if we recorded that and just transferred the cassette—of the acoustic—transferred it onto the 4-track?"

What kind of mike did you use?

One of these little mikes that come when you buy a cassette recorder. Before they all had built-in mikes, they used to give you these little mikes.

So you did that on "Street Fighting Man."

Yeah, the basic track was done on a cassette—that's why it has that sound. The original track was done with a toy kit of drums—a little thing, like a toy. We sat around in a circle, and Charlie was playing the toy drums, Keith was playing acoustic guitar and I played scraper. We sat around on a carpet just like we did at home and we ran the cassette. The only difference was we found out you couldn't do it with batteries. Too much fluctuation, flutter and wow. We had to use the a.c. adaptor and make sure the cassette was plugged in and running off the mains. *Keith said that you "Really got Beggar's Banquet together." What sorts of things do you think he was talking about? Certainly the drum sounds took a nice healthy jump right there.*

Yeah, they were happy with that, and they would look to me for the rhythms. Like to get back to Mick's initial problem during the *Satanic Majesties* days of "What do you do after you've played

blues for so many albums?" They were getting into different rhythms. Lots of times Mick would come up and say "This track isn't happening, man. What kind of rhythm do you feel, what kind of beat do you feel to it?"

So Andy was right when he said that you had a particular strength with the drums?

Yeah—from being a drummer, really. Mick told me once, "You know, I think when you are in the booth, you really only hear the bass and drums."

Any things you could say about their performances in the studio? Did you invariably have to direct them in a certain way?

I always felt like they *needed* help down there, keeping the time and keeping it cooking and keeping the groove. I always felt that a lot of tracks were on the verge—on the verge—of not quite making it. To the point of frustration, where I'd say "Well, if I go down there with a scraper or with a tambourine or something, I know I can get this thing happening." And once down there, everybody would start hearing that extra thing in the cans—that tambourine or that cowbell or whatever—and it would really help generate it. Lots of times the early takes would not have that on it, and I would jump down and ask whoever was engineering to set me up quickly with a mike, and it would help.

About how many takes did you have to spend to get a basic track? You shot for one tune a night?

I was very happy if we got one basic track a night because of the way we usually worked. They'd play it and play it and play it the first night we worked on it. We were letting the tapes run, doing takes, and so consequently we did a lot of takes, you know. But psychologically it gets you down when you hear somebody say "Take 31," so we usually just started saying "Retake 1." When we got up to about 12 or something like that, we just said, "Okay, we got a new reel on, this'll be Retake 1." But then the next night, when we were trying to really catch it fresh, *if* we were going to, we did it in about four or five serious takes. And if we had to kind of slug away at it again *that* night, but then *did* get it after a lot of takes, then it was usually about 15 to 20 takes.

Do you find that beyond a certain point your takes start to degrade, and there's a point after which you're not going to get a good take?

Sometimes you get to a point where you don't know if it's getting better or worse. You know that the mistakes aren't being made anymore, but sometimes you have to say, "Why don't we stop and listen to that early take that we liked?" Often you're surprised at how good that earlier one really was; it's hard to tell whether it's getting better or worse.

What's a song where the magic really happened?

Oh, "Honky Tonk Women," "Sympathy for the Devil," and "Monkey Man." There's been a few where you know you've really got an outstanding basic track.

Is "Brown Sugar" one?

I missed the basic track of "Brown Sugar." I wasn't there that night. Mick brought me a cassette of it, that was the first time I heard it. But then I got back involved again on all the overdubs and everything. "Gimme Shelter" was another one of those basic tracks where it was really happening.

How about writing? Did Mick and Keith collaborate to a great extent on each



The songs where I feel the magic really happened were "Honky Tonk Women," "Sympathy for the Devil" and "Monkey Man," where you know there's an outstanding basic track.

other's compositions? Were any tunes originating with both of them?

Well, not really. They independently each had their cassette of songs, and then they played it to each other. At some point, it was maybe 50% finished or 75% or 90%, the other one heard it and helped finish it. Quite often, the contribution was very small. I mean, it may just have been Mick writing the





“Jumpin’ Jack Flash” was the first track I did with them, and it put them back where they should have been. They were ready to do it, so that was sort of fortunate for me.

verses, you know, because Keith had a whole song and even had the chorus, which contained the title, and the story, and what was needed were some of Mick’s really nice visual lyrics for the verses.

What percentage of all the Stones’ songs, when you were working with them, were written in the studio? That’s one of the things you hear all the time—“Oh, they just go in the studio, get bombed, and write songs and do ‘em that night.”

I can’t think offhand of any that were. *Exile* was kind of like that, though. But usually they always existed in some form. Sometimes very, very basic form—you know, maybe just a riff, but a riff that was strong enough and important enough to be a basis for a whole track. And quite often fully com-

pleted, perhaps just a couple of verses lyrically needed.

Certainly naming all these American towns all the time is part of Mick’s visual lyrics, grabbing the American audience.

Sure. And even to the point of using the American form of the word where there was a different form in the U.K. A lot of English acts would say “Kentucky Darby Day,” ‘cause they call it “darby” there, not derby. No, Mick would never ever say “darby”—he’d use the American form. And yet in speaking he’d say “Do you want to come see the darby at Ascot?”

Do you do a lot of limiting?

English engineers do use a lot of limiters—they’ll automatically limit guitars, bass, piano. One main difference between an English studio and an American studio has to do with acoustical design and engineering. In most American studios, the group goes out and they set up and start playing, and you lift the fader, and you’ve got quite a decent sound. In England, when people build or buy studios, they buy an old church or a pub or something that in the beginning really had nothing to do with acoustical work, and then they spend a lot of money on the electronics. And usually, you lift the fader and that’s just horrible, and then you have to start cooking the sound together. So they’ve come to rely a lot more on EQ and compressors and limiters to create the sound, more so than in America.

Have you any pet limiters, have you any preference as far as limiters?

There used to be a Pye limiter in the desk at Olympic that was broken, and it was just sucking like crazy. Anything put through it would sound backwards—you could really wind it up and really make the thing suck so much that you’d swear it was backward tape running.

What tune did you use it on?

The bass drum in “Hole in My Shoe.” Then one day we went into the studio and there was a big hole in the desk—no Pye limiter. And I asked the maintenance guy, “Where’s the Pye limiter?” “Oh, we’re fixing it—finally. Wait till you hear it. You can’t hear it working at all!” And it was like that, you *couldn’t* hear it working at all. It was totally useless after that. ‘Cause as a limiter, it’s



nowhere near as good as a Universal, for example. But just when it was broken, it was great, as a "device." *What was it like working with Clapton? He's one of the more speculated about people.*

It was great for me. I had never worked with him before that. I always loved his playing. And even when everybody was raving about Hendrix, I always thought that all things considered...

Luckily, they didn't try to do too similar a thing. Hendrix dealt more with pure sounds and Clapton dealt with a more refined kind of technique, I always felt. I think it's good to see him re-emerge. He's still one of those people there seem to be so many of and who seem to be doing about a tenth of what you wish they were doing, or what you always feel they have the ability to do.

But the 461 Ocean Boulevard album disappointed all the people who wanted to hear the "King of the Blues Guitar," that's for sure.

Yeah, but at least he got an album together, after all that time.

How do you see yourself as a record producer?

I'm not your most technical sort of expert, because I've always had the good fortune of working with such good engineers. Glyn Johns had been working with The Stones long before I ever got involved, so much so I left it up to him because he had it sweated out already. You know, just in certain cases where we were after something special. And that's when you get the best, 'cause they have egos too. If I'm praised on sound, I suppose they get a little offended, thinking "Well, I did it." So you've got to have a good working relationship with them and the best way is to give them their head and compliment them and then when you want something special, they'll break their ass to make you happy.

I think you've struck upon one of the central aspects of the relationship between the engineer and the producer. Definitely. I mean, I am aware that I have a taste in sound, and it can be reflected in listening to albums that I've done, where the same engineer might have done other things and yet they'll sound different. But it comes about through that relationship that's built between the producer and the engi-

neer, where I do kind of get my mark in there as well as he does. And yet, if he's not the right cat, I'm stuck—there's nothing I can do really. You know, I've had sessions, in some studios, where I couldn't really get in there and touch the desk, or even if I could, I'm not that familiar with it to know *really* what I can get out of it, so I'm dependent on the engineer. And he may not be getting a *good* sound to begin with, or he may not be getting my *kind* of sound, and there's nothing you can do, which is frustrating.

What is "your sound?" What, to you, characterizes a good sound versus a not-so-good sound? Because The Rolling Stones have had so many different sounds just in the period of time you were associated with them.

It's hard to say, 'cause a lot of technical specialists would say The Stones get a really bad sound, you know. But yet, The Stones would not sound good if they had a *good* sound, by the standards of some people. Certainly, the people who don't want to let the needle even touch the red could never really record The Stones properly. It's a hard question to answer. Andy would always say, "Generally speaking, I try to get with a rock & roll band as much level onto the tape as is possible," because, of course, you go so far and then you reach distortion level, and the sound starts going the other way, it starts getting thin again. It's trying to get it as fat as you can. Like drums, sometimes, when you just can't get a drum sound, if you take the main mike gain knob—which at Olympic on the desk was in steps of 10 dB—and just hit it, flick it one more switch over so that you're just touching distortion, the drums will be just on that marginal point, just about breaking up. Lots of times if you do that, everything else being the same—the EQ and everything—it'll make all the difference.

Why, in light of all the clamoring, didn't you release "Gimme Shelter" as a single? Or "Sympathy" for that matter? Once they're out on the album, you just don't have that single enthusiasm anymore.

How would you rank the five albums that you did with them?

Almost like a mountain. *Banquet*, and then higher up on the graph for *Let It Bleed*, and then maybe, as high as

Banquet was on the left, on the *other* side would be *Sticky Fingers*—maybe a little bit higher, maybe equal. I don't know. I remember listening to *Beggar's Banquet* a couple years ago and thinking, "Hey, that was really a nice album." I had forgotten it was that good. But generally speaking, that whole period seems to have peaked on *Let It Bleed*, and then *Sticky Fingers* was still good but the start of the descent. *Exile* was like an exile for me, which was really like pulling teeth, to get that album finished. I respect some tracks on *Exile*. I believe if *Exile* had been a single album, and the best half used, I would have thought better of it. *What's your favorite Stones track?*

I guess "Honky Tonk Women" is my favorite, all things considered, 'cause I thought it was so perfect a single. "Jumpin' Jack Flash" too, because it was the first track I ever did with them, and because it kind of put them back into where they should have been at. They had it ready—they would have done it whether I had been producing it or not—but people can't help but say, you know, "Well, as soon as Jimmy started working with them, they went back into where they should be." So that was just sort of fortunate for me. And yet, so much of life is that, really. A

I t was great for me working with Clapton. I always loved his playing. And even when everybody was raving about Hendrix, I always thought that all things considered

1

TECHNICS SV-P100 DIGITAL AUDIO CASSETTE RECORDER

Manufacturer's Specifications

Frequency Response: 2 Hz to 20 kHz, +0, -2.5 dB.

Total Harmonic Distortion: 0.01% or less.

PCM Standard: EIAJ.

Quantization: Linear, 14-bit.

Tape Type: VHS format videocassette.

Maximum Recording Time: Two hours.

Audio Channels: Two.

Input Levels: Line, 80 mV; mike, 1.5 mV.

Digital Input/Output Level: 1.0 V p-p.

Line Output Level: 400 mV.

Power Consumption: 80 watts.

Dimensions: 16.9 in. (42.92 cm) W x 10.94 in. (27.78 cm) H x 13.62 in. (34.59 cm) D.

Weight: 46.2 lbs. (20.79 kg).

Price: \$3,000.00.





It appears there will be two distinct approaches to PCM (digital) tape recording for home use. For the March 1982 issue of *Audio*, I tested the Sony PCM-F1—a PCM audio processor which is intended to work in conjunction with a videocassette recorder. While Technics has experimented with this approach in producing the Model SH-P1 PCM processor, they presently seem to favor an all-in-one or "dedicated" digital audio recorder which would contain the required digital record/play electronics as well as a complete videocassette tape-transport mechanism. Since Matsushita Electric Company, the parent of Technics and Panasonic, subscribes to the VHS format of videocassette taping developed by its sister company, JVC (there is no end to the intercorporate relationships of Japanese industrial giants), it comes as no surprise that the SV-P100 utilizes VHS-style videocassettes as its digital program storage medium.

One of the chief differences between Beta and VHS video tape formats is the fact that VHS tapes are disengaged ("unthreaded") from the fast-rotating record/play head drum whenever the tape transport's stop button is depressed, whereas Beta tapes remain "threaded up" and ready to go. To compensate for this difference in tape-transport mechanisms, Technics has developed a wide variety of locating and editing features for the SV-P100 digital audio cassette recorder. The deck will, for example, shift into play mode automatically from fast-forward, rewind, or search if the play key is pressed while holding down the fast-forward, rewind, or search key. Holding down the play key while pressing the fast-forward key, on the other hand, causes the tape to progress at approximately eight times normal speed while maintaining head contact to allow headphone monitoring and cueing. Holding down the play key while pressing the rewind key makes the tape rewind at eight times normal speed while also allowing headphone monitoring and cueing.

Special circuits combined with use of the SV-P100's digital tape counter offer additional editing facilities and convenience features. For example, pressing the *Jump Mark* lever on the front panel during recording or playback causes a "jump mark" to be recorded on one of the auxiliary tape tracks that have been provided for in the EIAJ Digital Tape Standard. When such a jump mark code is encountered during playback, this section of the tape is skipped over at eight times normal speed. Normal speed playback is resumed when the end of the jump mark is reached. This proves to be a very convenient way of editing out unwanted material. Search marks may also be recorded onto a tape during recording or playback. Later, during playback, if the front-panel search key is pressed, the tape advances to the beginning of the nearest search mark and stops. If the play key is pressed at the same time as the search key, play begins automatically after the beginning of the search mark has been reached.

The tape counter reading can be placed into the "memory" of the recorder by pressing the memory button during recording or playback. The tape will then stop at the memorized setting or location during fast forward or rewind. After locating the desired setting, the tape will stop, but if the play key is also depressed while the fast-forward or rewind

The Technics SV-P100 contains digital record/play electronics as well as a complete videocassette tape-transport mechanism.

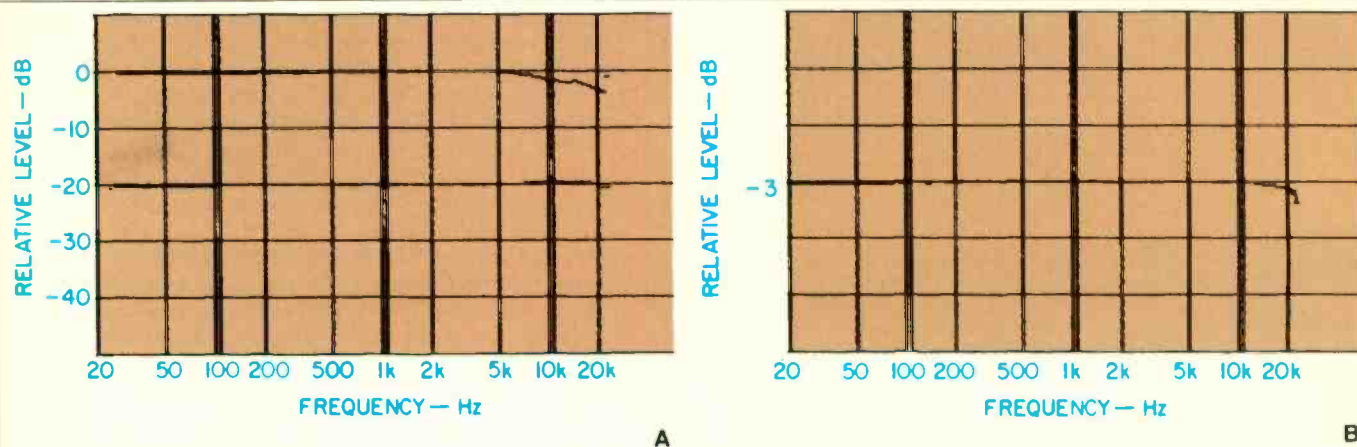


Fig. 1—Record/play response of Technics SV-P100 PCM recorder at 0 and -20 dB levels (A) and at -3 dB level (B).

key is held down, the tape will automatically shift to playback.

Physically, the SV-P100 is about the size of a very large stereo cassette deck or one of the late, lamented Elcaset recorders of yesteryear. When you consider the amount of circuitry (not to mention the precision VHS tape-transport mechanism) that had to be incorporated into this unit, its dimensions and weight have been kept within remarkably reasonable bounds. According to Technics, the recording digital-signal processor chip, an LSI known as MN-6601, has the equivalent of about 10,000 conventional components, yet the chip size is a mere 6.08 x 5.58 millimeters. The reproducer LSI, MN-6602, measures only 6.46 x 6.18 millimeters but has the equivalent of around 15,000 components! The MN-6601 LSI serves to add error detection code, correction code and data interleave processing to the A/D converted data, and it supplies a composite video-format video output signal. The MN-6602 decodes the digital signal, carries out error correction and data interleave processing, and provides a resulting signal to the D/A converter as serial data. The D/A converter developed for this unit is known as an MD-6192 and is a 14-bit linear converter.

Control Layout

Aside from the various specialized editing functions described, controls associated with timer-activated recording, and a few indicator lights specifically associated with the VHS type of video tape-transport mechanism, the other controls of the SV-P100 will be fairly familiar to most users of home cassette recorders. Major logic-type transport touch buttons include keys for search, pause, rewind, stop, play, fast forward, and record. The cassette compartment is opened and closed by a separate button, but the compartment will also close smoothly and automatically when a cassette is properly inserted into the holder. The forward

edge of the recorder has headphone and microphone jacks, the main power switch, and a remote control jack for connection of a soon-to-be-available wired remote control unit which will duplicate the recorder's transport operating functions. The front sloping horizontal surface of the deck, in addition to housing the transport touch buttons, features a novel fader or master level control whose rotation span is only 150°—enabling you to accomplish a complete, smooth fade in one motion. Individual channel level controls are found on the main vertical surface of the deck, as are the meter level indicators which double as a metering system for checking tape playback quality and data and as a peak-hold indicator. Other indicators in this area include those for dew, digital input, rewind-reset, tape counting, and level selection. Controls associated with the editing and memory functions are also located in the vicinity of the display panel.

The rear panel, in addition to housing the line input and output jacks, contains digital input and output terminals (for direct digital-to-digital copying or dubbing), a tracking adjustment screw, a timer recording switch (which actually turns on an hour before you want recording to begin, so as to evaporate any moisture which may be present on the head assembly), and an edit switch which can be turned off if the editing features are not going to be used.

Measurements

Once again, my Sound Technology Model 1500 tape tester was taxed to, and beyond, its limits in attempting to measure all of the performance parameters of this digital tape recorder. While the test instrument's own residual noise and distortion are normally far lower than what one would expect to measure for any analog tape recorder, when the 1500 is called upon to measure a digital recording system such as the Technics SV-P100, it is not always good enough. Frequency response measurement was, of course,

Technics developed a variety of locating and editing features to adapt the VHS tape-transport mechanism to audio requirements.

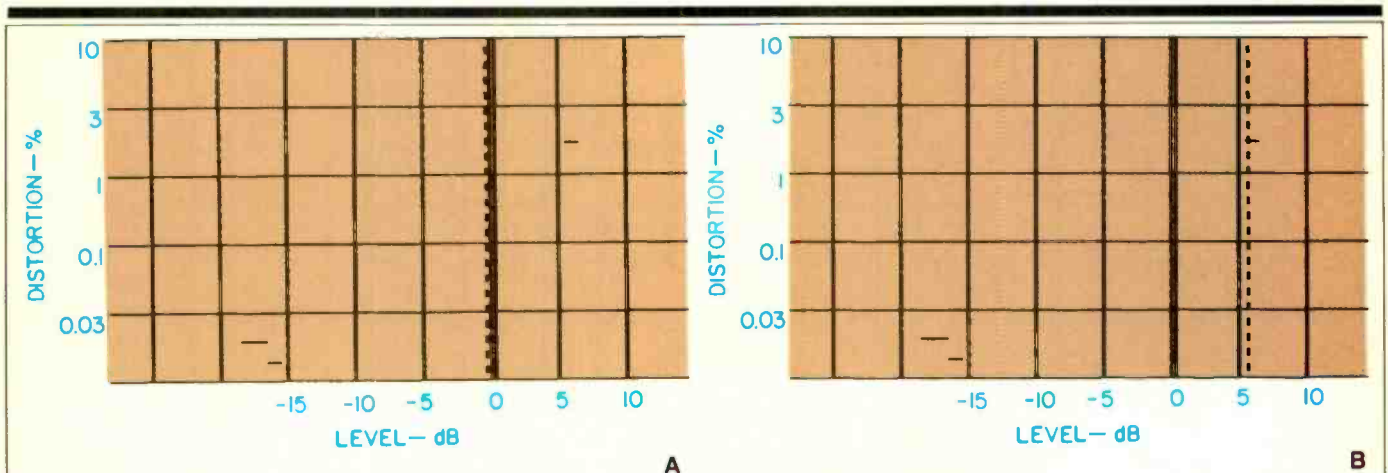


Fig. 2—At 0-dB record level, third-order distortion is less than residual harmonic distortion of test

instrument (A). Meter calibration allowed recording up to +6 dB before rapid rise in distortion took place (B).

no problem. Unlike the case with analog tape decks, the concept of signal saturation does not exist for a digital PCM recorder, and the usual problem of high-frequency dynamic range limitation is also nonexistent. Still, I did note some small amount of high-frequency attenuation in the upper response curve of Fig. 1, measured at 0-dB record level. I suspect that the built-in pre-emphasis time constant may have had something to do with this slight roll-off at 20 kHz (-3.3 dB), in that the pre-emphasis may well have boosted actual recording amplitudes up to well beyond the 0-dB limits for recording on a PCM unit. Under music program conditions (where the amplitudes of highs never approach those of mid-frequencies), even this slight amount of high-frequency roll-off would not be likely to occur. Nevertheless, when I backed off to a -20 dB record level (lower plot of Fig. 1), response was now absolutely flat (well, within 0.1 dB, if you care to quibble) all the way out to 20 kHz. To further study this effect, I next made a response plot at a record level of -3.0 dB and, sure enough, attenuation at 20 kHz was now only 1.3 dB (Fig. 1B).

If you read the Sony PCM-F1 digital audio processor "Equipment Profile," you may recall that exceeding 0-dB record level even by a dB or two caused havoc as far as distortion was concerned. The designers of the Technics SV-P100 have wisely chosen to calibrate the level meters so that there is still some headroom at 0 dB before major "breakup" and distortion occurs. I suspect that this calibration was decided upon in deference to those recordists who are accustomed to letting the "needles" go above 0 dB on analog recorders for short peaks of program material without expecting to get ruined recording. In a digital recorder, the designer can, of course, arrange to have "0 dB" on the device's metering system wherever he thinks best. In Fig. 2, therefore, we see that for a recorded mid-frequency tone at the 0-dB level, third-order distortion measured 0.01%. It may, in fact, have been even a bit lower, since 0.01% third-

order distortion is the lowest figure my test instrument can register (Fig. 2A). Note, however, that even at +6 dB (Fig. 2B), third-order distortion was still less than 3%, measuring 1.6%. When I attempted to increase level by just one more dB, however, third-order distortion ran off the scale of the display, which means that it was in excess of 10%! Such are the ways of digital recording—and we'd better all get used to them if our lot in life includes the setting of music recording levels.

More for my own amusement than for any practical purpose, I plotted channel separation between the two channels of the SV-P100 versus frequency. The 70.1 dB observed at 1 kHz is probably the result of a minute amount of capacitive leakage between channels at the input to the measuring instrument, rather than actual crosstalk between digitally encoded information channels. Results, however meaningful they may or may not be, are displayed in Fig. 3.

Signal-to-noise ratio was measured with respect to the previously determined maximum record level (+6 dB), using the CCIR/ARM weighting curve. The reading obtained was an astounding 90.9 dB (see Fig. 4). According to simplified digital information theory, a 14-bit digital system should provide a dynamic range of some 84 dB (14×6). That, however, does not take into account the pre-emphasis and de-emphasis which have been incorporated at the audio stages of this machine.

The brief message at the top of the display of Fig. 5 tells us all we need to know about the wow and flutter signal produced by the Technics SV-P100: "Signal too low." In other words, wow and flutter was unmeasurable!

For some reason I have not been able to determine, the line input sensitivity and line out levels did not correspond with published specifications. Perhaps the owner's manual, which was supplied in preliminary form, needs to be rechecked. In any event, I measured 140 mV as the required line input figure to reach a 0-dB record level, and

Considering the amount of circuitry incorporated in the SV-P100, its size and weight have been kept within remarkably reasonable bounds.

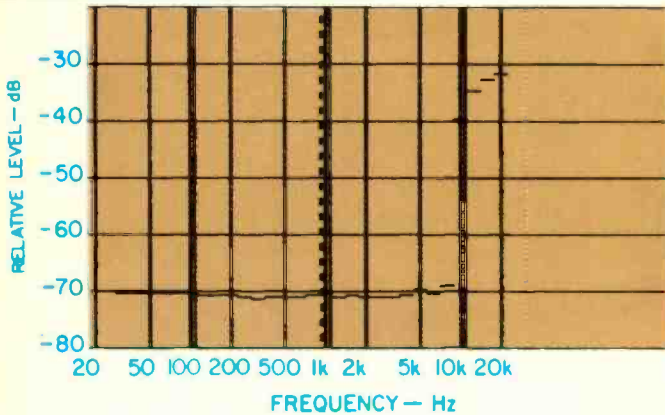


Fig. 3—Channel separation exceeded 70 dB at all frequencies up to around 10 kHz.

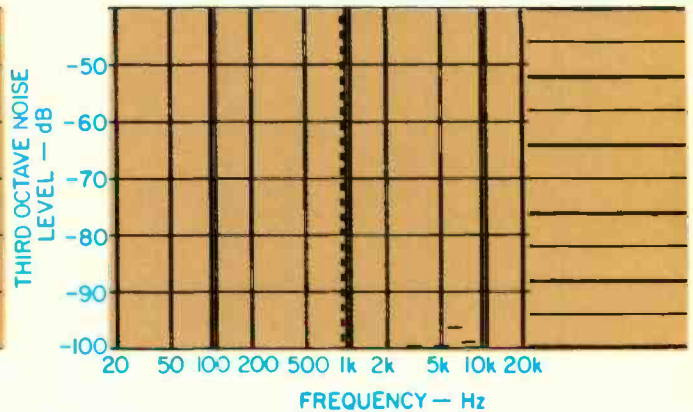


Fig. 4—CCIR/ARM weighted S/N exceeded 90 dB, referred to maximum (3% harmonic distortion) record level.



Fig. 5—The message at the top of this display tells all we need to know about wow and flutter on a PCM tape recorder such as the Technics SV-P100!

Use and Listening Tests

To date, sound quality of the PCM/digital processors or complete PCM recorders I have experimented with have all been superb, and the SV-P100 is no exception in this regard. In fact, it has been difficult to find program material good enough to truly challenge these systems. This being the case, all that remains is to access the SV-P100's ease of use as compared with other recording systems. Quite frankly, I found the unit a bit complicated to operate and understand at first. The deck requires the user to spend a reasonable amount of time in becoming familiar with its many features and controls. The memory and search functions involve a fair amount of "hunting" or overshoot as the microprocessor-controlled transport mechanism tries to zero in precisely to the required starting point or specified counter digit. In this respect, Technics has done a remarkable job getting the machine to cue exactly, despite the inherent cueing limitations of the VHS threading and tape-transport system. In doing so, however, they have had to incorporate tape-transport actions which slow down the cueing and editing process. To the home recordist this may be unimportant; to a semi-pro or professional recordist trying to enter the world of digital recording at what has to be a bargain price (compared with professional multitrack stationary-head digital recording systems), the "slow" transport action may be a bit disconcerting. But none of this detracts in the slightest from the fact that Technics has managed to come up with a compact all-in-one PCM cassette deck that costs considerably less than the best PCM audio processors of a year or two ago. It should be stressed that the \$3,000 price tag is for a recording system complete in one unit. I would guess there are enough serious recordists to gobble up every SV-P100 that Technics will be able to bring into this country in the coming months.

Leonard Feldman

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line output voltage corresponding to 0 dB on the metering system measured a full 2.0 volts! Output from the headphone monitoring jacks, with 8-ohm loads connected, measured 388 mV for 0 dB on the meters. The sample SV-P100 consumed a maximum power input of 83 watts. Fast winding modes (rewind or fast forward) each took 2 minutes and 40 seconds to completely wind or rewind a T-120 (two-hour) VHS video tape.

2

CROWN FM
TWO TUNER**Manufacturer's Specifications**

Usable Sensitivity: Mono, 9.31 dBf.
Fifty-dB Quieting Sensitivity: Mono,
 11.2 dBf; stereo, 36.0 dBf.

S/N: Mono, 80 dB; stereo, 75 dB.

Hum and Noise: 75 dB.

THD at 1 kHz: Mono, 0.05%; stereo,
 0.05%.

Capture Ratio: 1.5 dB.

Selectivity: 75 dB.

Frequency Response: 30 Hz to 15
 kHz, ± 0.5 dB.

**Image, I.f. and Spurious Response
 Rejection:** Greater than 114 dB.

AM Suppression: 80 dB.

R.f. Intermodulation: 65 dB.

SCA and Subcarrier Product Rejection: 70 dB.

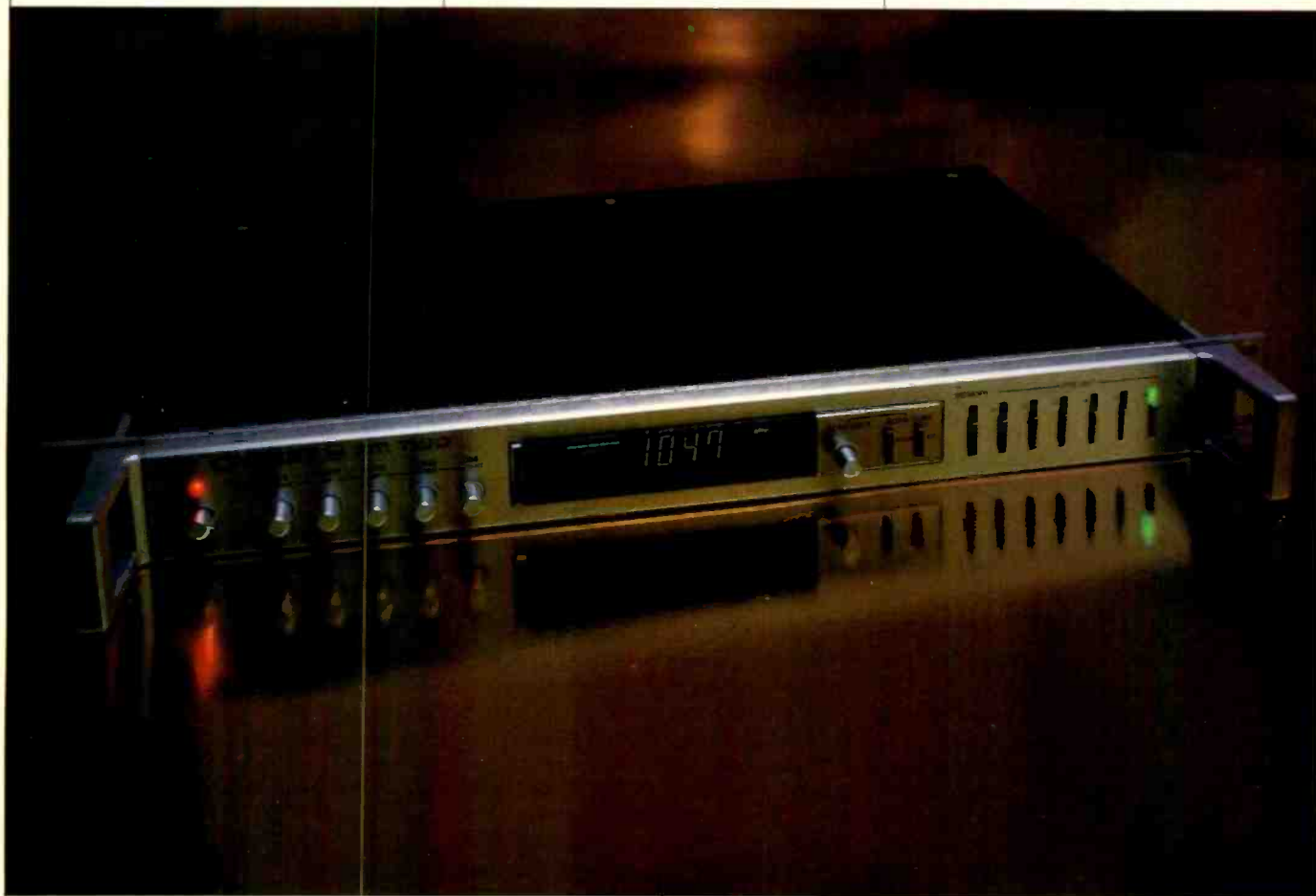
Stereo Separation: 60 dB at 1 kHz, 45
 dB at 10 kHz.

Power Requirements: 120 V, 50/60
 Hz, 10 watts.

Dimensions: 19 in. (48.26 cm) W x
 1 $\frac{3}{4}$ in. (4.44 cm) H x 11 $\frac{3}{4}$ in. (29.84
 cm) D.

Weight: 9 $\frac{1}{2}$ lbs. (4.27 kg).

Price: \$699.00.



Crown International audio equipment has always impressed me as having a professional air while retaining a highly practical and intelligent layout which will not intimidate the less technically oriented music lover who simply wants to assemble a superb home sound system. Crown's new FM Two tuner maintains this tradition. Having learned a

bit about its design and circuit innovations, I am impressed with the reasonableness of its suggested price and its outstanding performance. The performance, by the way, stands out not so much in typical use under optimum r.f. signal input conditions, but in situations where incoming signals are less than ideal.

It's almost as though this tuner is able to eliminate some of the undesired and undefined forms of distortion which elude measurement.

The slim-looking tuner is rack-mountable but is less than two inches high. Control layout, beginning at the left, includes a power switch and associated LED indicator, push-buttons for 75/25 microsecond de-emphasis selection, stereo noise filter activation, fixed level interstation muting, and selection of stereo/mono and dim/bright display. The display area at the center of the panel not only incorporates a digital frequency readout but also includes a five-segment signal-strength display and a stereo indicator light. When turning on the unit, the last station tuned prior to shutting off power will appear on the display. While U.S. versions of the FM Two tune in increments of 200 kHz, it is able, with minor modifications, to tune and display increments of 50 kHz to accommodate European FM radio practice.

To the right of the display are additional buttons, including a Scan Lock button which provides either push-by-push and rapid up/down frequency selection or automatic scanning action. In the latter case (with this button depressed), touching the nearby up or down buttons causes the unit to scan and sample each station strong enough to defeat the internal muting threshold point. When a desired program is encountered, the button is released by the user and the scanning ceases. To the right of the up/down buttons are a memory program switch which functions in conjunction with the six preset buttons nearby that store favorite station frequencies for instant recall. When the memory switch is depressed, the user has approximately five seconds to "enter" a desired station frequency into one of the six available memory slots. When a frequency is recalled using the preset buttons, a green indicator light above the button illuminates. Memories are retained indefinitely so long as the power cord is plugged into a source of power; in the event of a power failure or inadvertent disconnection of the tuner from an active a.c. outlet, memories will be retained for five days.

The rear panel of the FM Two is equipped with separate left- and-right-channel output level controls, associated output jacks, and a 75-ohm coaxial antenna terminal. If the user insists upon using 300-ohm (twin-lead) transmission line from antenna to tuner, a separate balun transformer (supplied as an accessory with the tuner) would have to be employed.

Circuit Highlights

The FM Two is a crystal controlled *dual conversion* tuner featuring a pulse-count digital detector circuit which eliminates detector alignment problems. Overmodulation, often a problem with ratio detectors or discriminators (and frequently encountered in FM broadcasting these days), is easily accommodated by this type of detection circuitry. The new cascode J-FET front-end design contains no fewer than seven tuned circuits and is highly immune to r.f. intermodulation without sacrificing basic r.f. sensitivity. Constant group-delay (linear phase) ceramic filters are used in the i.f. section, and the first i.f. stage has been designed to improve selectivity by avoiding premature limiting.

Measurements

The graphs of Fig. 1 show the mono and stereo quieting and 1-kHz harmonic distortion characteristics of this tuner.

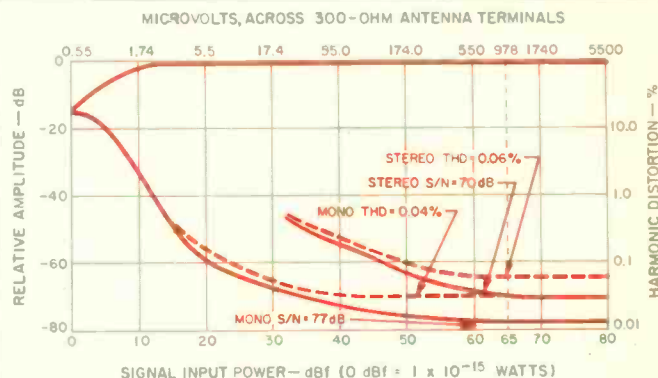


Fig. 1—Mono and stereo quieting and distortion characteristics, FM

section, Crown FM Two tuner.

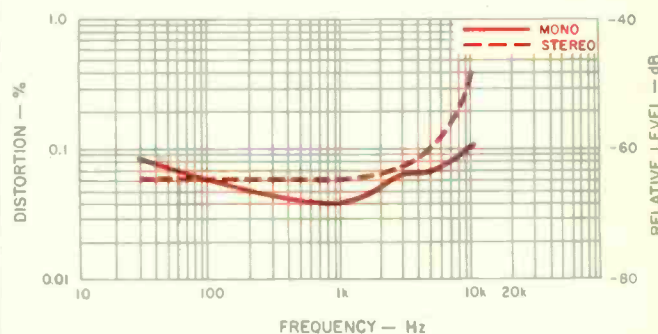


Fig. 2—Distortion vs. frequency, Crown FM Two tuner.

Usable sensitivity in mono measured just under 10 dBf (0.9 μ V, referred to 75-ohm input impedance), while 50-dB quieting for mono was a very low 11.2 dBf, exactly as claimed by Crown. In stereo, usable sensitivity was limited not by the r.f. circuitry but by the factory-set mono/stereo switching arrangement, which does not swing over to stereo until signal strength is around 30 dBf. By the time that switching does occur, signal-to-noise is almost 50 dB, so I would have preferred the tuner to have "allowed" stereophonic listening even if the signal were a bit weaker—especially since there is the option of activating the stereo noise filter.

S/N ratio for mono at 65 dBf was 77 dB, while for stereo, at the same strong signal level, it measured 70 dB. Mono THD, for a 1-kHz signal, measured only 0.04%; even more amazingly, in stereo the THD reading was only a slightly higher 0.06%. Harmonic distortion at other test frequencies are shown for both mono and stereo operation in Fig. 2.

I couldn't quite equal the 60 dB of stereo FM separation claimed for the FM Two, but that may well have been due to

Continued on page 91

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3

MITSUBISHI DA-R35 AM/FM RECEIVER

Manufacturer's Specifications

FM Tuner Section

Usable Sensitivity: 10.3 dBf.

50-dB Quieting: Mono, 15.0 dBf; stereo, 36.8 dBf (auto-blend off).

S/N Ratio: Mono, 82 dB; stereo, 74 dB.

THD at 1 kHz: Mono, 0.08% wide, 0.15% narrow; stereo, 0.1% wide, 0.2% narrow.

Selectivity: Wide, 55 dB; narrow, 75 dB.

Capture Ratio: 1.5 dB.

AM Suppression: 60 dB.

I.f. and Spurious Response Rejection: 100 dB.

Image Rejection: 85 dB.

Subcarrier Rejection: 60 dB.

Stereo Separation: Wide, 46 dB at 1 kHz, 42 dB at 100 Hz, and 43 dB at 10 kHz; narrow, 40 dB at 1 kHz, 36 dB at 100 Hz, and 40 dB at 10 kHz; with high blend, 20 dB at 1 kHz, 37 dB at 100 Hz.

Frequency Response: 50 Hz to 15 kHz, ± 0.5 dB.

AM Tuner Section

Usable Sensitivity: Internal loop, 300 μ V/M.

Selectivity: 40 dB.

Image Rejection: 40 dB.

I.f. Rejection: 50 dB.

S/N Ratio: 52 dB.

THD: 0.5%.

Amplifier Section

Power Output: 85 watts, 8 ohms, 20 Hz to 20 kHz; 110 watts, 4 ohms, 20 Hz to 20 kHz.

THD: 0.01%, 8 ohms; 0.05%, 4 ohms.

SMPTE IM: 0.005% at half power.

Damping Factor: 130.

Dynamic Headroom: 2.0 dB.

Slew Rate: 100 V/ μ S.

Input Sensitivity: MM phono, 2.5 mV; MC phono, 0.1 mV; high level, 150 mV; main amp in, 1.0 V.

Maximum Phono Input Level: MM, 250 mV; MC, 20 mV.

Frequency Response: MM phono, RIAA ± 0.2 dB; MC phono, RIAA ± 0.3 dB; high level, 1 Hz to 100 kHz, -2 dB.

S/N Ratio: MM phono, 78 dB; MC phono, 75 dB; high level, 87 dB; main in, 95 dB.

Tone Control Range: ± 10 dB at 100 Hz and 10 kHz.

Filter Cut-Off Points: 18 Hz and 8 kHz at 12 dB/octave.

General Specifications

Power Consumption: 230 watts.

Dimensions: 18½ in. (47 cm) W x 5⅝ in. (13.65 cm) H x 17⅞ in. (43.21 cm) D.

Weight: 31¼ lbs. (14.1 kg).

Price: \$650.00.



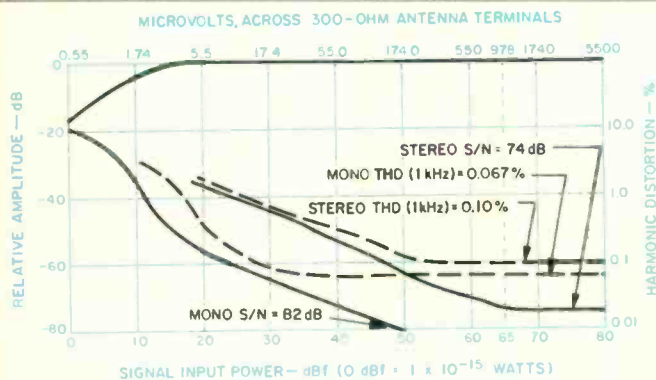


Fig. 1 — Mono and stereo quieting and distortion characteristics, FM section.

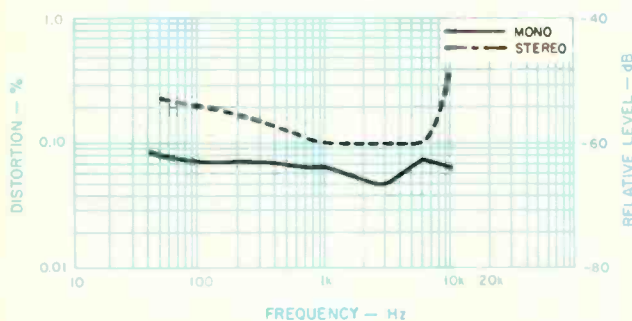


Fig. 2 — Distortion vs. frequency, FM tuner section.

Mitsubishi's top-of-the-line DA-R35 receiver incorporates just about every feature and convenience found in that company's separate component tuners and amplifiers. As you might expect, the tuner section employs quartz-controlled frequency synthesis and, as is true of recent synthesized tuners from companies such as Sony and Pioneer, Mitsubishi has managed to overcome one of the objections to this accurate form of tuning; there is no sacrifice of signal-to-noise ratio in obtaining the benefits of true frequency synthesis. The DA-R35 incorporates a number of computerized, automatic features, such as automatic determination of when to switch from wide to narrow i.f. bandwidth and when to engage the stereo FM auto-blend. While it is possible to override both of these automated functions, the override works only in one direction. That is, you can select wide-band (as opposed to automatic) and you can choose to defeat auto-blend even when the internal computer circuits say that it should be "on." I rather wish that Mitsubishi had given us both options in each of the auto-defeat modes, but I am undoubtedly influenced by the needs of the lab test bench rather than the needs of the stereo FM listener in the real world of signal interferences and weak signal reception.

A main power switch, two individual speaker switches, high and low filter switches, and a mode switch (mono/

stereo) are arranged at the upper left of the front panel of this receiver. To their right are a separate record-selector switch and a program selector which permits the user to listen to one program source while taping another. A phono MM/MC pushbutton is located between these two rotary selector knobs, while below are a balance control, separate loudness control, treble and bass controls, and the usual stereo headphone jack. A tone control defeat pushbutton is located between the two tone controls.

The right half of the panel is dominated by the digital frequency readout display, above which are a pair of peak-level indicators (one per channel) which illuminate when power output approaches or exceeds rated value, the high-blend indicator, and wide and narrow i.f. indicator lights.

Below the display are seven station preset buttons and a "memory" set button. These combine to memorize seven AM *plus* seven FM station frequencies for instant recall. Further to the right are five LEDs which normally show relative incoming signal strength but which, at the touch of a button, will also display levels of multipath interference. "Up" and "down" manual tuning buttons are just to the right of the digital display, while further to the right is the master volume control.

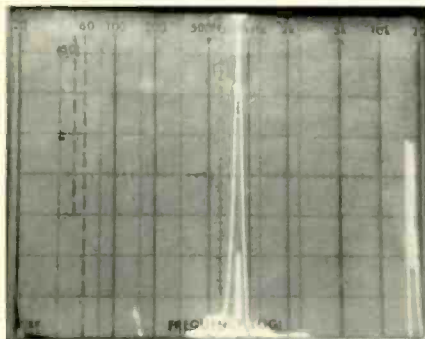
The lower right corner of the panel contains six pushbuttons. These select signal strength or multipath indication, "auto" or wide i.f., AM or FM reception, muting on/off (with muting off, only mono will be received), high-blend "auto" or "off" and manual or "auto" tuning. In the "auto" tuning mode, touching the "up" or "down" tuning buttons will cause tuning to move in the designated frequency direction until an acceptable signal is encountered. In the "manual" mode, touching the buttons advances tuning in 200-kHz increments on FM and in 10-kHz increments on AM.

The rear panel is equipped with a mini-loop AM antenna which must be connected by the user. FM antenna terminals are provided for 75-ohm coaxial or 300-ohm twin-lead transmission lines. A ground terminal is located near the phono jacks, adjacent to which are high-level inputs and tape jacks for two complete tape monitor circuits. The preamp-out/main amp-in jacks are of a type which will automatically "break" the signal path when an external component is connected to the "main amp in" jacks, so that no switch or wire jumper pair is needed in connection with this feature. The center of the panel has a recessed area which accepts three "AA" batteries (supplied) that must be installed if station preset information is to be retained in the receiver's "memory" even when a.c. power is off. While there is, of course, nothing wrong with seeing the batteries mounted in this exposed opening, I would have preferred some sort of rudimentary cover over the batteries. (Mitsubishi will no doubt tell me that no one looks at the back of a receiver, to which I will reply that I do. . . .) Two sets of spring-key speaker terminals and three convenience a.c. outlets (two switched, one unswitched) complete the rear panel layout.

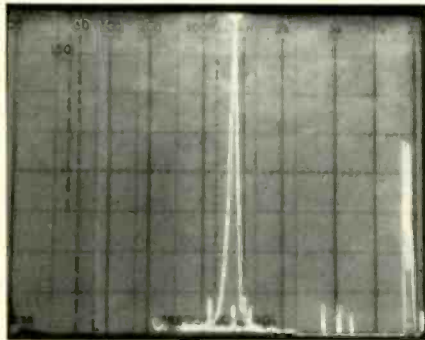
Circuit Highlights

A system Mitsubishi calls a "pulse swallow" counter circuit raises the reference frequency used in their special prescaler circuits that are involved in the frequency synthe-

In the DA-R35, Mitsubishi has not sacrificed S/N ratio in obtaining the benefits of true frequency synthesis.

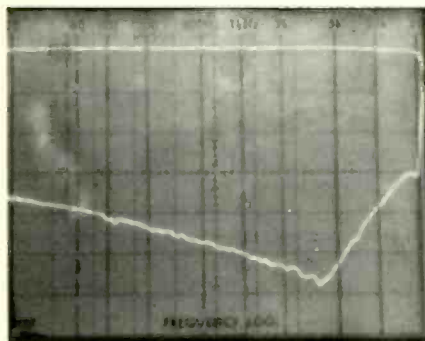


A

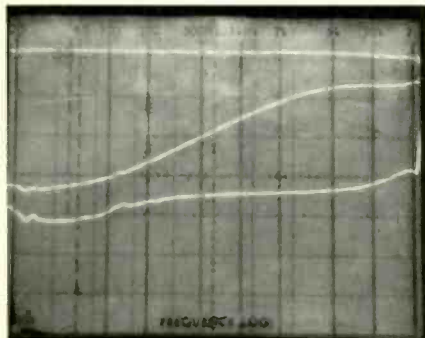


B

Fig. 3 — FM IM distortion measurements in wide (A) and narrow (B) i.f. modes.



A



B

Fig. 4 — Stereo FM response and separation in wide (A) and narrow (B) i.f. modes. Center curve in (B) shows effect of automatic blend control.

sis process so that it does not fall within the audio band, thereby achieving S/N ratios in FM comparable to those achieved with the very best analog tuning schemes. The equalizer amplifier (phono) section of this receiver utilizes a dual-FET first stage, with differential amplification for low distortion and high signal-to-noise ratio, and the extra amplification needed for direct connection of an MC cartridge is provided. The power amplifier circuitry uses a minimal amount of loop negative feedback, with direct (d.c.) coupling between stages as well as between the output and the speaker terminals. In addition, the tone and power amplifier sections employ d.c. servo circuitry for added low-frequency stability. Like so many other recent receiver and amplifier designs, the DA-R35 also employs what Mitsubishi calls "linear switching" — a form of Class B operation which offers some of the benefits of Class A without a loss of efficiency.

Tuner Measurements

Usable mono sensitivity of the FM tuner section measured 11.2 dBf, exactly as claimed. Fifty-dB quieting in mono required an input signal of 15 dBf; in stereo the required signal strength was 37 dBf. The S/N in mono, for 65-dBf input signals, was a high 82 dB, while in stereo I measured 74 dB for the same input signal level. Selectivity in the narrow mode measured 75 dB, as claimed, decreasing to 58 dB in the wide i.f. mode. Capture ratio fell a bit short of claims, with a reading of 1.6 dB. Distortion for a 1-kHz signal measured 0.067% in mono and 0.10% in stereo (in the wide i.f. mode). Quieting and mid-frequency (1-kHz) distortion characteristics versus input signal strength are plotted in Fig. 1 for mono and stereo modes, in the wide i.f. bandwidth position. Distortion at other audio frequencies is shown for both mono and stereo reception in Fig. 2. Even with a 100% 10-kHz stereo modulation signal, harmonic distortion of this excellent FM tuner section did not exceed 0.4%. IM distortion in stereo, using the twin-tone test method (14 and 15 kHz), measured 0.12% in the wide mode. Figure 3 shows spectrum analysis displays of this form of IM distortion measurement. In Fig. 3A the tuner was operated in the wide mode. The center, tall spike is a reference 100% modulation level of 1 kHz. The shorter spike within it is the 1-kHz "beat" signal resulting from the IM generated between the 14 kHz and 15 kHz signals seen at the right of the sweep. Vertical sensitivity in this and all other spectrum analyzer scope photos is 10 dB per division.

Figures 4A and 4B show stereo FM frequency response (upper traces) and separation in both i.f. bandwidth modes. Separation measured 47 dB, 42 dB and 37 dB at 1 kHz, 100 Hz and 10 kHz respectively in the wide mode; in the narrow mode (Fig. 4B), separation decreased to 36 dB at 1 kHz, 37 dB at 100 Hz and 31 dB at 10 kHz. The middle trace in Fig. 4B shows the further decrease in separation at high frequencies when the auto-blend circuit functions under weaker signal conditions.

Figures 5A and 5B show the crosstalk components observed at the output of the unmodulated channel when a 5-kHz signal (tall spike at left of each display shown for reference level) is used to modulate the opposite channel. Note the additional crosstalk components generated when

The DA-R35 incorporates computerized features such as automatic determination of when to switch from wide to narrow i.f. bandwidth.

the tuner is forced to operate in the "narrow" i.f. bandwidth mode (Fig. 5B).

AM suppression measured 62 dB for our sample, while i.f. and spurious response rejection were both in excess of 100 dB. Image rejection measured 85 dB, as claimed. Stereo and muting threshold were both set at approximately 21 dBf on our sample (just over 6 μ V referred to a 300-ohm input impedance). Subcarrier product rejection measured 65 dB (as against 60 dB claimed), while SCA subcarrier rejection was a very satisfactory 72 dB.

AM frequency response was no better than that normally observed on most "high fidelity" receivers. Results of these response measurements are plotted in Fig. 6, and even if one wanted to apply very generous tolerances of ± 6 dB, response could not be legitimately claimed beyond 4 kHz or thereabouts.

Amplifier Measurements

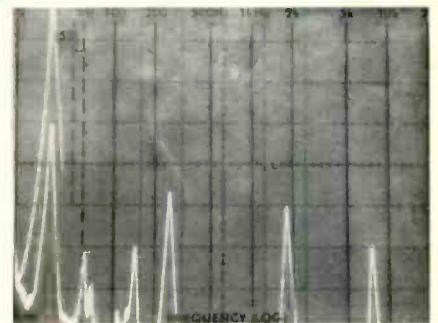
Using 8-ohm loads, the amplifier section delivered well over its rated power level: 102 watts per channel for 0.01% THD for a 1-kHz input test signal applied via the AUX jacks. At rated power (85 watts per channel), THD measured 0.0035% at mid-frequencies, and 0.005% at 20 Hz and 20 kHz. SMPTE-IM distortion measured 0.008% at rated output. Figure 7 is a plot of THD versus power output for these three key test frequencies using 8-ohm loads.

I checked the amplifier's power output capabilities using 4-ohm loads as well, and it delivered 142 watts at mid-band for 0.05% THD. At .110 watts per channel, for a 1-kHz test signal, THD measured only 0.021%. Damping factor, measured for a 50-Hz test signal, was a bit more than the 130 claimed, while dynamic headroom fell a bit short of the claimed 2.0 dB, measuring 1.6 dB. Since dynamic headroom is not a qualitative test, I would not criticize Mitsubishi too strongly for not quite coming up to their published figure for this specification.

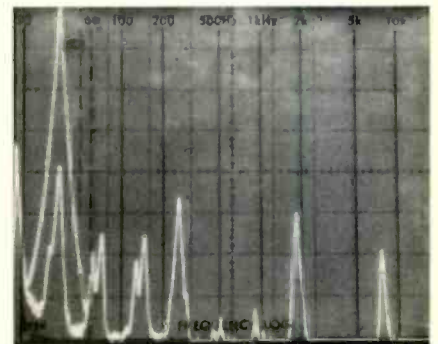
I also measured CCIF IM distortion using the twin-tone, equal amplitude test signals at frequencies ranging from 9 and 10 kHz to 19 and 20 kHz. The worst-case results were a CCIF IM reading of 0.016%. Using the same twin-tone technique, I also calculated the IHF IM distortion using spectrum analysis display of IM components in the audio range. These calculations yielded an IHF IM of 0.10%.

Input sensitivities for the phono equalizer sections, referred to 1-watt output, were 0.26 millivolt for the MM inputs and 0.011 mV for the MC inputs. High-level inputs (AUX, tape) required 17 millivolts to deliver the reference 1-watt output with volume control at maximum. Signal-to-noise ratio for the MM phono, using a 5-mV input with the master gain control adjusted to produce 1-watt output, was 82 dB, "A" weighted, while for the MC phono input, using 0.5-mV input, the S/N was 78 dB. Both of these results were significantly better than the published specifications. The S/N for the high-level inputs was 88 dB, while residual hum and noise with the master volume control set to minimum was 89 dB below 1 watt (109 dB below full rated output). RIAA was off by +0.2 dB at the bass extreme and by -0.2 dB at 15 kHz. The subsonic filter had a -3 dB cut-off point of 19 Hz. Action of the bass and treble tone controls is shown in Fig. 8, together with the response of the high-cut filter which had

Fig. 5 — Stereo FM 5-kHz crosstalk characteristics in wide (A) and narrow (B) modes.



A



B

Fig. 6 — AM frequency response.

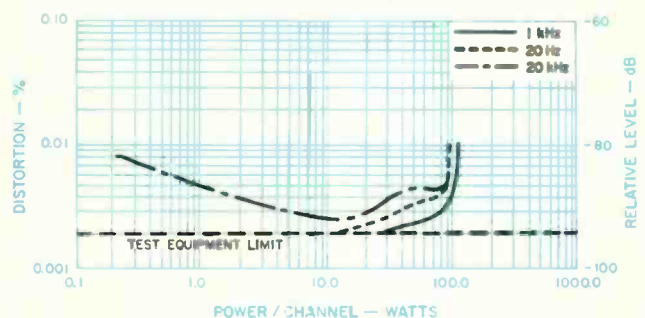
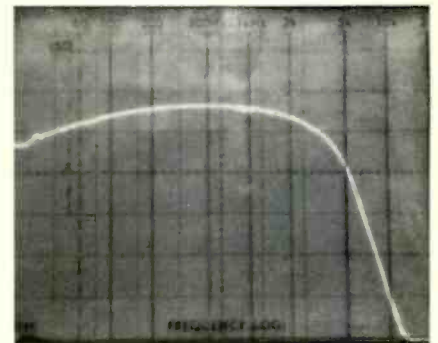


Fig. 7 — Distortion vs. power output.

There's more to this receiver than just good looks; all of its controls do exactly as they were intended in an effortless manner.

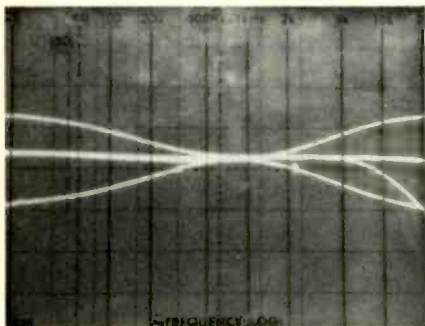


Fig. 8 — Tone control and high-cut filter response.

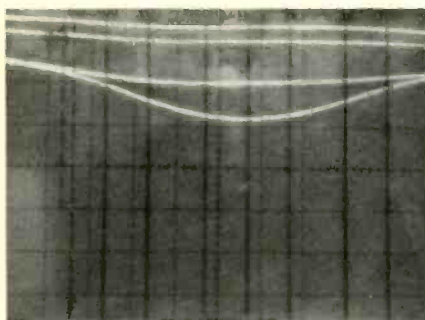


Fig. 9 — Action of separate loudness control.

its -3 dB point at 7 kHz. The separate, continuously variable loudness control (which, as far as I am concerned, is the only truly useful form of loudness compensation control) covers a range of 20 dB, and its action at various settings is depicted in the multiple traces shown in Fig. 9.

Use and Listening Tests

Ever since Mitsubishi entered the U.S. market with receivers and components a few years ago, I have felt that this

company had a great sense of style in control layouts — in short, good human engineering. That tradition is clearly in evidence in the DA-R35, but there's much more to this receiver than just good looks. All of its controls do exactly what they were intended to do in an effortless manner suggestive of the conservatism that's inherent in this design and the reserve power that's available at the output of the receiver. I do wonder why the "peak indicator" lights illuminate well before actual clipping levels are reached. True, the owner's manual does reassure the user that occasional flashing of these lights need be of no concern, but caring users are apt to "back off" on power.

As for sound quality, most of the receivers that I've tested lately sound as good, if not better, than some of the separate high-priced amplifiers I used to test three and four years ago, and it's really hard to rate sound quality when audible differences between well-built receivers are so minimal. Suffice it to say that I could detect no strident sounds in any of the reproduced program sources. I know of few speaker systems that would require more power than is delivered by the combined continuous power rating plus the dynamic headroom of this receiver. FM performance was excellent, not just in terms of low distortion, but in terms of the number of listenable signals received in my area, which was higher than usual. Although I personally resent the "loss of control" which arises from automation of the wide/narrow bandwidth and the auto-blend selection, I have to admit that the auto-blend came on only for those situations when I would have turned it on myself, and for those instances when the set switched over to "narrow," I would have selected that mode had there been a choice too. So, while the high level of automation is perhaps an ego-deflation feature for such as this reviewer, it does work — and well, too!

Leonard Feldman

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4

TANDBERG TCA 3002 PREAMP

Manufacturer's Specifications

Frequency Response: MM and MC phono, 20 Hz to 20 kHz, ± 0.2 dB; high level, 20 Hz to 20 kHz, +0, -0.1 dB.

Maximum Output Voltage, Preamp Out: 10 V at clipping level.

THD: Less than 0.004% with all program source inputs.

Input Sensitivity: MM phono, 1 mV; MC phono, 80 μ V; high level, 70 mV, all referenced to 0.5-V out.

S/N Ratio: MM phono, 5 mV in, 80 dB; MC phono, 0.5 mV in, 74 dB; high level, 0.5 V in, 97 dB, all A weighted for 0.5-V out.

Maximum Input Voltage at 1 kHz: MM phono, 290 mV; MC phono, 22 mV; high level, 11 V.

Input Impedance: MM phono, selectable, 33/47/100 kilohms; MC phono, 1 kilohm; high level, 47 kilohms.

Output Impedance: Preamp, 560 ohms; headphones, 470 ohms, 4-ohm minimum loads.

Bass and Treble Control Range: ± 10 dB at 50 Hz and 10 kHz.

Subsonic Filter: -3 dB at 15 Hz, 12 dB/octave slope.

Crosstalk: Better than 70 dB, any source to any other source.

Stereo Separation: Phono, better than 53 dB; high level, better than 58 dB.

TIM: Unmeasurable.

Power Requirements: 120 V, 60 Hz, 30 watts.

Dimensions: 17 $\frac{1}{8}$ in. (43.49 cm) W x 3 $\frac{1}{4}$ in. (8.25 cm) H x 13 $\frac{3}{4}$ in. (34.92 cm) D.

Weight: 12 $\frac{1}{2}$ lbs. (5.62 kg).

Price: \$795.00.



I had the good fortune to visit the Tandberg plant in Oslo, Norway nearly three years ago, when their new 3000 series components (including the TCA 3000 preamplifier) were in their first prototype stages. I was extremely impressed with the tentative design of the preamp; I am even more impressed with the finished product as it finally evolved. There may be those who will argue that Tandberg has not followed the "straight wire with gain" approach espoused by many purists, while others will maintain that they would have preferred *more* control features and facilities. Be that as it

may, I can tell you that after living with the Tandberg TCA 3002 for several months, I believe it is one of the best designed and most intelligently constructed preamp/control chassis I have ever had in my laboratory or listening room. A quick look at the control layout first reveals the high level of human engineering employed in this design. At the extreme left we find a pushbutton power switch with an indicator light above it. A headphone jack with its independent output level control comes next, followed by a pair of tape monitor switches and a pair of tape copy (dubbing) switch-

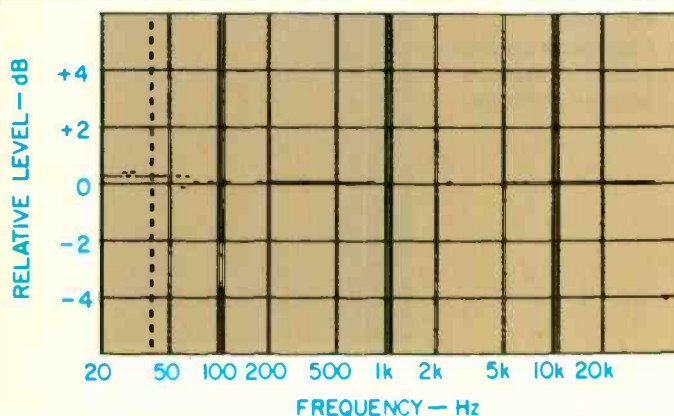


Fig. 1—Using the inverse of an RIAA playback curve, maximum deviation from perfect RIAA equalization with the Tandberg TCA 3002 was +0.3 dB at 40 Hz.

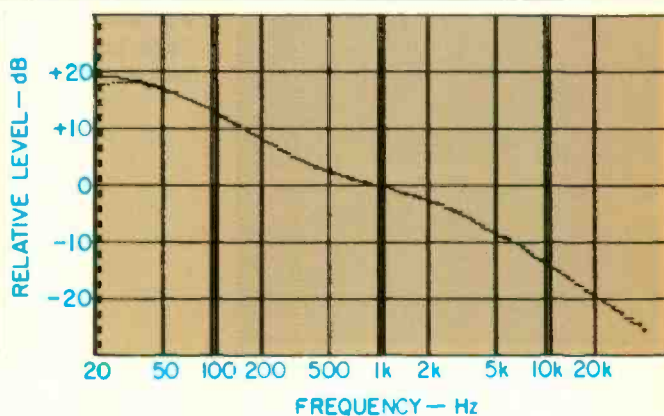


Fig. 2—RIAA playback curve shown with and without subsonic filter activated. Bass boost at 21 Hz was +19.2 dB without filter and +17.6 dB with filter.

es, all with tiny indicator lights above them. A subsonic filter switch is followed by a tone defeat switch, rotary bass and treble control knobs, mono/stereo and loudness switches, a rotary program selector switch (with settings for tuner, MC and MM phono, and AUX), a rotary balance control, and a large rotary main volume control.

The rear panel of the TCA 3002 has three switched and one unswitched convenience a.c. receptacles, a fuse-holder, a recessed switch by means of which the unit's operating voltage can be changed from 115 to 230 volts or vice versa, the requisite number of input and output jacks, and a chassis ground terminal. Near the MM and MC phono input jacks are a pair of three-position toggle switches. The first of these selects resistance loading of moving-magnet cartridges of 33, 47, or 100 kilohms, while the second switch adds 20, 120, or 350 pF to the capacitance already offered by the audio connecting cables from the turntable system.

Circuit Description

The TCA 3002 has 16 push-pull stages with 14 constant-current sources. Phono preamps for moving-magnet and moving-coil cartridges are completely independent of each other. Each phono preamp has 11 transistors and a linear buffer stage before RIAA equalization in a full, discrete, symmetrical design. The linear buffer stages, according to Tandberg, have a slew rate of more than 300 V/ μ S so that transients are not altered at the phono input section. Instead of incorporating the entire RIAA equalization characteristic in a negative feedback loop (as is done with many phono preamplifier circuits), Tandberg used a passive 75- μ S treble cut for the high-end portion of the RIAA curve and an active bass-boost circuit for the low end. Components of 1% tolerance are used to achieve a high level of RIAA accuracy over the entire audio range.

High-level signals (tape, tuner, AUX) are each fed into

their own input amplifiers. The amps used are two-stage, constant-current types with excellent linearity and low distortion. The subsonic filter circuit is an active two-pole high-pass filter designed as a push-pull stage with symmetrical input. In its high-level amplification circuits, the TCA 3002 uses specially designed 9-dB-per-octave compensation circuits which extend open-loop frequency response for increased stability and high-speed waveform response. Tone controls are of the low-impedance type and are fed from a constant-current source. A five-transistor amplifier stage with push-pull output and constant current is used to drive the feedback circuit in the tone controls.

Aside from the elegance of the circuitry itself (no ICs are used and there are a total of 24 amplifier stages with no fewer than 116 transistors), I have always admired Tandberg's chassis layouts. With its clean layout and minimal wiring, the inside of the TCA 3002 is no exception. For example, all input jacks are wired directly to the main p.c. board, and the MC amplifier circuitry is as far away from the main power transformer as it could physically be in a chassis of these dimensions.

Measurements

Tandberg is one of the few companies that has completely converted its published specifications to fully conform to the latest IHF (now an EIA subdivision) standards for amplifier and preamplifier measurements. Since I have been measuring equipment in accordance with those standards for a couple of years now, it was nice to test a unit and get direct correlation between what I measure and what the manufacturer claims. For example, input sensitivity (which, in the new standard, is referred to a 0.5-volt output) for MM phono was almost precisely 1.0 mV as claimed; using the MC input, a signal of 75 μ V (at 1 kHz) was required to produce reference output as against Tandberg's published

The Tandberg TCA 3002 is one of the best designed and most intelligently constructed preamps I have ever auditioned.

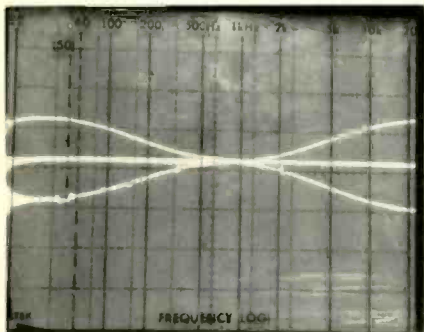


Fig. 3—
Tone control
range.

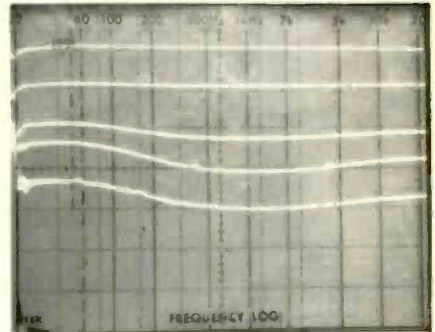


Fig. 4—
Loudness control
action at various
volume settings.

value of $80 \mu\text{V}$. High-level inputs needed 72 mV to produce the reference 0.5-volt output level as against 70 mV claimed. These differences are, of course, negligible.

I was fully prepared to find a poorer S/N figure in phono than the 80 dB claimed by Tandberg (for the MM phono input), keeping in mind that this measurement is once again referred to an output voltage of 0.5 volt and that the reference input is 5 mV (not the 10 mV so many manufacturers continue to use in order to make their S/N numbers look better). Imagine my surprise, therefore, when I obtained an A-weighted measurement of 88 dB for the moving-magnet input and 81 dB for the moving-coil input (as against Tandberg's claimed 74 dB for the MC phono input). As for the high-level inputs, my S/N readings (again, referred to 0.5-volt output with a referenced input of 0.5 volt) was more like 100 dB rather than the 97 dB claimed by Tandberg. Phono overload measured 300 mV for MM and 24 mV for MC. The moving-coil inputs, incidentally, provided an additional gain (compared with the MM inputs) of approximately 21.5 dB.

Figure 1 is a plot of the frequency response of the phono equalizer/preamp section of this unit. An *inverse* RIAA input signal was fed to the MM phono inputs, and, using a Sound Technology 1500A tester, a video printout was produced. Deviations from flat response are seen at the extreme bass end (the plot is logarithmic, from 20 Hz to 20 kHz, and vertical amplitude is 2 dB per division). The dotted line cursor has been set to read the greatest deviation from perfect RIAA response, which measured +0.3 dB at 40 Hz. Note that since there are virtually no negative (-) deviations, the Tandberg claim of " ± 0.2 dB" is easily met.

Even that minute deviation from perfect RIAA response is offset if you activate the subsonic filter. Under these circumstances, there is enough in-band attenuation at the bass end to pull the bass boost at 21 Hz down from +19.2 to +17.6 dB, as shown in the two RIAA curves reproduced in Fig. 2 (this time using a constant input signal instead of an inverse RIAA signal). In Fig. 2, vertical sensitivity was 10 dB per division so that the entire playback equalization curve could be displayed in the graph.

The range of bass and treble controls of the Tandberg TCA 3002 is shown in the multiple spectrum analyzer plots of Fig. 3. Here, too, the plot is logarithmic from 20 Hz to 20 kHz, and vertical sensitivity of the display is 10 dB per division. The moderate action of the loudness control circuit

is shown in the multiple curves of Fig. 4. Notice that even when the main volume control is rotated for a full 40 dB of attenuation relative to maximum volume, bass boost is limited to around +7 dB while treble emphasis is no more than +3 dB. If one can't have a truly continuous variable loudness control (as is found in some Yamaha amps and receivers), I suppose this is the next best thing.

Frequency response for the high-level inputs of this control unit extended from around 3.5 Hz to 85 kHz for a -1.0 dB roll-off and out to 155 kHz for the -3 dB point. The main volume control, incidentally, tracked remarkably well—so well in fact that at the -80 dB level (referenced to maximum volume control setting) there was less than a 0.5 dB discrepancy in gain between channels! That's what I call accurate dual control tracking.

Use and Listening Tests

The Tandberg TCA 3002 proved to be an incredibly quiet and distortion-free preamp control unit. I conducted listening tests with both moving-coil and moving-magnet cartridges. With a moving-coil cartridge, I was particularly impressed by the total absence of background hiss and hum which so often has accompanied other preamplifier circuits I have auditioned. If you favor a moving-coil cartridge, you won't need to accept any signal-to-noise compromises when it's hooked up to the TCA 3002.

Regardless of which type of cartridge I used, the preamp itself had plenty of dynamic range and delivered an open and clean output signal to the reference power amplifier and speakers. With the tone controls set to their flat positions, I could detect no change in gain or coloration when the tone defeat switch was pushed in or out. The small built-in headphone amplifier was able to deliver plenty of drive voltage to low-impedance phones (it produces 0.465 V into 8 ohms when the main output jacks are set to reference voltage of 0.5 V and its own level control is at maximum).

While Tandberg's TCA 3002 is not the least expensive preamplifier/control amplifier available, it should be noted that designing and producing a unit with the level of sophistication embodied here cannot be done cheaply. In any case, the price is at a level where most knowledgeable audio enthusiasts can enjoy its sonic and engineering excellence.

Leonard Feldman

Enter No. 93 on Reader Service Card

5

M & K SATELLITE-1A and VOLKSWOOFER-A LOUDSPEAKERS

Volkwoofer-A

Manufacturer's Specifications

Internal Amplifier Power: 60 watts.

Input Impedance: 200 ohms.

Frequency Response: 18 to 100 Hz,
± 3 dB, in calibrated position.

Driver: 12-inch dual voice-coil.

Cabinet Finish: Walnut with black
grille.

Power Requirements: 120 V a.c., 50/
60 Hz; idle current consumption, 15
watts; full power consumption, 80
watts.

Dimensions: 17¾ in. (45.08 cm) ×
18¾ in. (47.62 cm) × 15¾ in. (40
cm).

Price: \$555.00 each.

Satellite-1A

Manufacturer's Specifications

Input Impedance: 4 ohms.

Frequency Response: 55 to 22 kHz,
± 3 dB.

Drivers: Two 1-inch domes and two 5-
inch cones.

Minimum Power: 7.5 watts per chan-
nel.

Maximum Power: 200 watts with un-
clipped peaks up to 400 watts.

Dimensions: 21 in. (53.34 cm) × 7¾
in. (19.68 cm) × 7¾ in. (19.36 cm).

Price: \$270.00 each.



Strong points of M & K's Satellite and Volkwoofer combination are good power-handling ability together with moderate distortion.

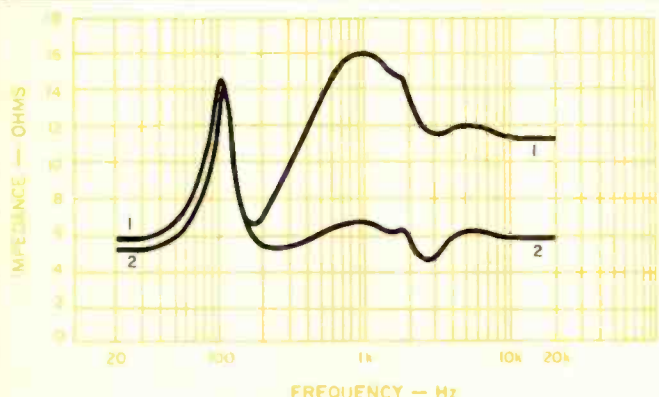


Fig. 1—Terminal impedance for (1) "English" position and (2) two-ohm "German" position.

The Satellite-Volkwoofer System, introduced by Miller & Kreisel Corporation, consists of a subwoofer physically separated from a pair of smaller satellite stereo speaker systems. Each Satellite uses four driver elements, two tweeters and two midrange units, to cover frequencies above 100 Hz. The subwoofers, called Volkwoofers, carry the range from 100 Hz down to 18 Hz. The Satellites thus carry the directional aspects of stereo imaging, while the Volkwoofer handles the deep bass.

The Volkwoofer tested has an internal power amplifier which contains a feedback circuit to correct for subwoofer nonlinearity and to control response down to subsonic frequencies. A two-meter line cord powers the self-contained amplifier from an a.c. outlet. Main-system power-amplifier signals are routed to the Volkwoofer, which distributes the Satellites' higher frequency components through a built-in crossover network.

A number of modes are available for listening to the Miller & Kreisel Satellite system. The back plate of each Satellite contains four speaker terminals, two positive and two negative, rather than the usual pair. The extra set of terminals, together with a supplied kit of resistors, allows the user to select 14 possible response equalizations. Changing from one equalized position to another involves a minor rewiring to the speaker terminals.

The Volkwoofer is supplied in a separate enclosure which has four input terminals, four output terminals, a three-position bass equalization switch, a level control, and a line cord to supply power to the self-contained amplifier. There are separate operation manuals for the Satellite speakers and the subwoofer. Even in the case of the Volkwoofer, M & K recommends several possible combinations of external patching capacitors for hookup to main speakers other than the Satellites. In short, the Satellite-1A and Volkwoofer-A involve some fairly complicated setting up, rather than a quick conventional hookup.

It is mandatory that the operation manual(s) be thorough-

ly read and understood before connecting a single wire from the power amplifier. In addition, although the operation manuals specifically detail which of the multiple connections are to be used for each speaker, the possibility exists for improper connections—either miswiring or frayed ends—which may damage either or both the speaker and the owner's power amplifier. I hope that future versions of this excellent system provide greater ease of hookup along with a higher margin of safety against misconnection.

Measurements

The four drivers in each Satellite-1A may be interconnected to provide 14 distinct timbral balances through the use of external resistors and jumpers. There are four terminals on the back of each Satellite, and the particular combination of terminals to which the amplifier is connected (and across which the resistors are placed) determines the degree of midbass or treble emphasis which the user may prefer. It sounds complicated, and is complicated. Although the 14 combinations are briefly described on a metallic plate placed on the rear of each Satellite speaker, the user would be hopelessly lost without recourse to the more complete hookup explanation provided in the operation manual. This is not a loudspeaker system which should be hooked up without reading the owner's manual.

Figure 1 shows the measured speaker impedance for the "English" and the "German" setups; these are M & K's terminology for the particular sonic balances which result from use of the highest (English) and lowest (German) value of resistors. These represent the extremes of impedance which a power amplifier must drive; other resistor combinations generally fall somewhere between the extremes of these curves.

The full complex impedance plot for the 2-ohm configuration is shown in Fig. 2. While the net impedance above 150 Hz lies between 4.5 and 6.5 ohms, the phase angle is quite small over the entire frequency range. Any good power amplifier should be able to drive the Satellite-1A to the full output rating of the amplifier without difficulty. As with any low-impedance speaker system, care should be taken to minimize wire loss between the amplifier and speaker. This is particularly true in the English position, where the dip in impedance in the octave below Middle C could cause discernible timbre changes with high cable loss.

The one-meter anechoic frequency response is shown in Fig. 3, while the corresponding phase response can be seen in Fig. 4. The 2-ohm configuration was used for these measurements. As a direct quote from Miller & Kreisel's description, this position "gives a sound very similar to the German position with slightly less midrange brightness and efficiency." The German position, to quote further from M & K, "gives a bright forward sound with great efficiency and a very wide dynamic range. Particularly useful for low-powered amplifiers required to produce high sound-power levels. Similar to the sound of the best wide-range German-manufactured speakers."

The microphone was positioned one meter in front of the face of the enclosure for these measurements. The measured air-path delay from the physical location of the microphone diaphragm to the motor of each driver was as fol-

M & K's Volkswoofer offers accurate sound, delivering a solid low bass from almost any reasonable room location.

lows: Upper tweeter, 3.1286 mS; lower tweeter, 3.1010 mS; upper bass, 3.055 mS, and lower bass, 3.092 mS. The phase measurement of Fig. 4 was made in two parts: One corrected for an observed bass time delay of 3.5053 mS, and the other for an observed tweeter time delay of 3.1742 mS. The actual acoustic crossover of 2200 Hz accounts for 0.455-mS time delay, which, when combined with the mean average physical delay of the bass units, gives the necessary 3.51 mS for proper bass loudspeaker phase measurement. A similar situation prevails for the proper tweeter phase measurement.

The dip in response at 17 kHz is an interference notch caused by a difference in time delay from the two tweeters for this particular microphone location. This notch moves downward in frequency with increasing vertical listening misalignment, and a lower frequency notch comes into play due to the vertical bass drivers. The Satellites should definitely have their vertical plane aligned to point to the preferred listening area in order to provide the most uniform timbral balance for direct sound.

The Satellite-1A is moderately efficient, delivering an SPL in the high 80-dB range for one average watt of drive power (into an assumed resistive load). And, except for the interference notch, the frequency response does lie within the ± 3 dB limits cited by M & K.

Since it is possible to purchase the Volkswoofer and use it with other systems, I measured its response separately from that of the Satellite, and this is plotted in Fig. 5. Three separate low-frequency cutoffs can be selected by switch positions on the rear of the subwoofer. The "Flat" position is indeed flat, right down to 18 Hz. "Variation A" cuts off frequencies below 30 Hz but introduces a bump at 60 Hz. "Variation B" has a steeper low-frequency roll-off and a couple of dB higher 60-Hz bump. All equalizer positions roll off uniformly at around 6 dB per octave above approximately 120 Hz.

The subwoofer is internally powered by a high-input-impedance amplifier, and a gain potentiometer is mounted on the rear of the enclosure. The response in Fig. 5 was made on a relative SPL basis, rather than absolute SPL, because the gain may be selected by the user. Suffice it to say that the variation in gain provided by M & K is great enough that an 8-volt peak-to-peak drive signal (corresponding to an average power of one watt into 8 ohms) is sufficient to provide acoustic sub-bass match for any speaker system to which this unit might be matched. If the Volkswoofer is used with speaker systems other than the Miller & Kreisel Satellites, care should be taken to filter or equalize those systems so they do not reproduce the same bass frequencies as the subwoofer. Failure to do this could cause severe bass imbalance, which would be particularly noticeable with the Volkswoofer due to the large amount of gain control made available to the user. The bass response of almost any passive speaker system can be overpowered by this subwoofer to give a false sense of uniform low bass, but phase interferences might cause bad notches and peaks in the mid and upper bass regions where the Volkswoofer begins to fall off. And, as with spices added to a fine dinner, add just enough subwoofer power to give true sonic, deep bass balance. Too much bass may shake the

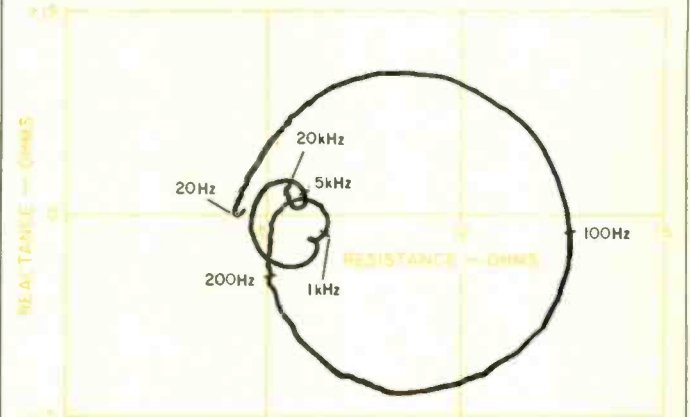


Fig. 2—Complex impedance for two-ohm "German" position.

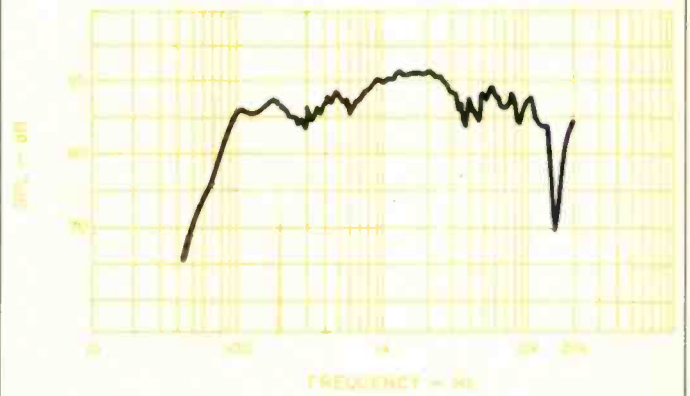


Fig. 3—One-meter anechoic response for constant voltage level corresponding to one average watt into 4 ohms for 2-ohm "English" position.



Fig. 4—One-meter anechoic phase response corrected for air-path delay of (A) 3.5053 mS and (B) 3.1742 mS.

Overall, the combination delivered excellent stereo imaging, and it could handle enormous peaks without breakup of sound.

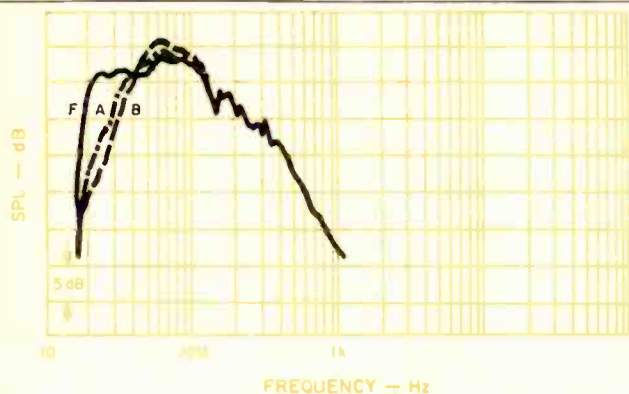


Fig. 5—Volkwoofer frequency response for "Flat" (F), "Variation A" (A), and "Variation B" (B) positions.

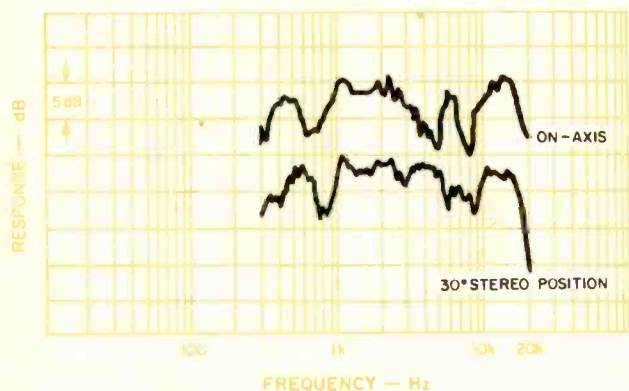


Fig. 6—Three-meter room response.

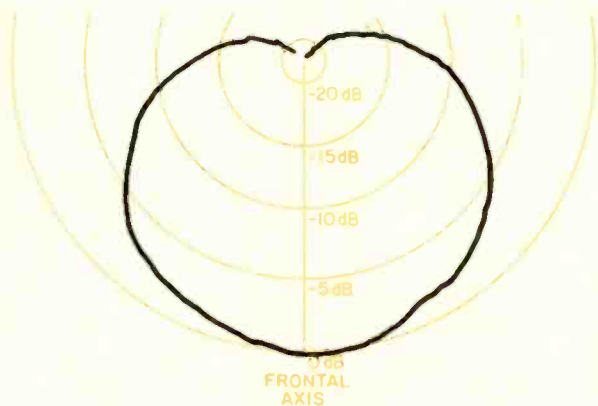


Fig. 7—Horizontal polar energy response.

house and impress the neighbors but contribute nothing to the accurate reproduction of a performance. The proper balance is often low enough that you may think the subwoofer is not functioning—until you cut it out and realize the deep bass foundation it truly provides.

The measured three-meter room response is shown in Fig. 6. The speaker was elevated one meter above the floor so that the intersection of the two cabinet sections was at nominal listening height. Measurement was made at a listening distance of three meters, and the response in Fig. 6 corresponds to the frequency spectrum of the first 13 mS of sound which reached the listening position. An on-axis and a 30° left-channel stereo position were measured, and the two curves are displaced 10 dB apart for clarity of presentation.

The stereo position provides a moderately good spectral balance for room listening, although some upper midrange brightness can be expected, according to this measurement. The Satellites should not be toed in toward the nominal listening position; an off-axis stereo location provides more uniform direct sound in a room. The room response shows the same small emphasis in the 800 Hz to 4 kHz range as the anechoic response. Conventional tone controls will be unable to smooth this bump, though either parametric or narrow bandwidth equalizers could be used to tame this small defect.

Horizontal and vertical dispersion of sound is shown in the polar energy plots of Figs. 7 and 8 respectively. Horizontal (left-right) uniformity of sound was quite good within 30° of the frontal axis of the Satellites, indicating that lateralization should be quite good in stereo imaging. Because of the wide angular dispersion of sound, the Satellites should not be placed next to walls or other substantial objects which could reflect sound back toward the listening area. Vertical (up-down) dispersion showed lobing due to the physical geometry of drivers used in the Satellite system. Some change of timbre will be noted as one moves up and down relative to the vertical plane of the Satellites, so they should not be placed with their front axes pointed significantly above or below the nominal listening position, and under no circumstance should the two Satellites be mounted at different heights relative to each other. Because there is a significant amount of sound launched upward, the Satellite speakers should not be placed directly beneath shelves or overhanging objects which can reflect sound back down to the listening location.

The Satellite systems handle frequencies above 100 Hz, while the subwoofer reproduces the lower bass tones. Harmonic distortion for fundamental tones of E_1 (41.2 Hz), A_2 (110 Hz) and A_4 (440 Hz) is plotted in Fig. 9. The A_2 and A_4 measurements were made on the Satellites, while E_1 was made on the Volkwoofer.

The harmonic distortion properties of the Satellite are unusual. Second and third harmonic components are essentially the same for A_2 , rising uniformly with increasing drive power, while the distortion components of A_4 , although alike, remain constant up to the maximum test level. This suggests apparent changes of timbre and loudness for A_2 relative to A_4 for a change in drive power. For example, a 10-dB increase in power level will approximately double the

Additional terminals on the back of the Satellite-1A and a supplied kit of resistors allow the user to select 14 possible response equalizations.

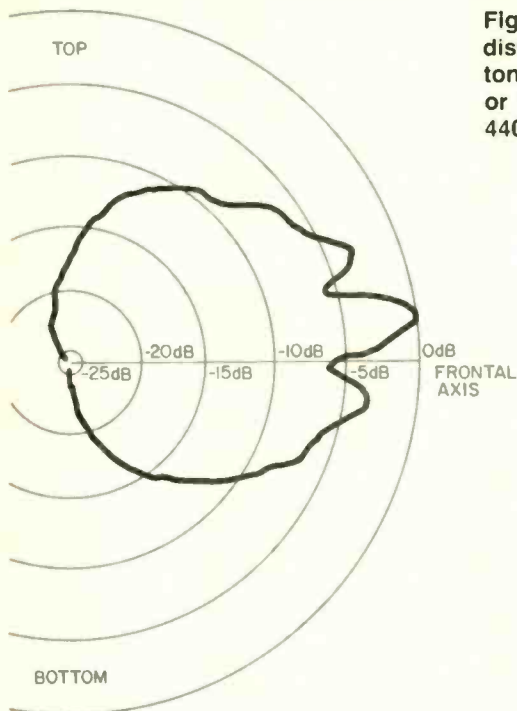
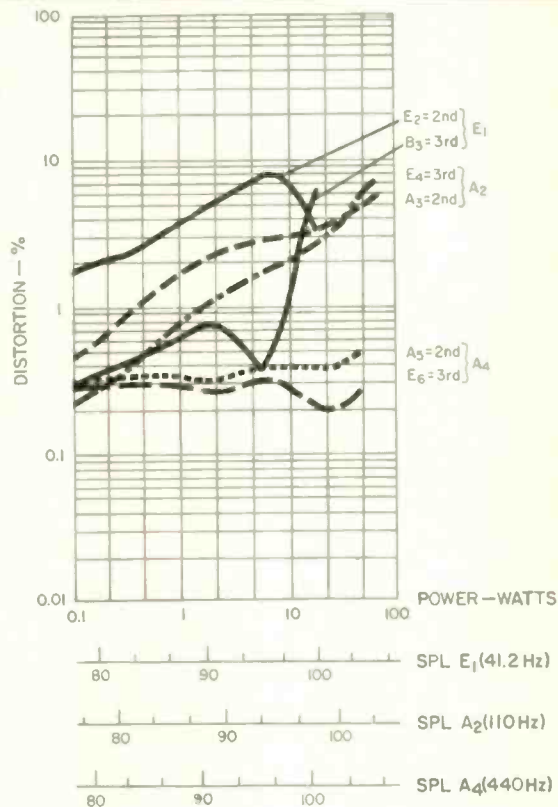


Fig. 8—Vertical polar energy response.

Fig. 9—Harmonic distortion for the musical tones of E_1 or 41.2 Hz, A_2 or 110 Hz, and A_4 or 440 Hz.



percentage of second and third harmonic of A_2 , but will produce no change in partials for A_4 . This sonic effect has no name, but it may constitute a minor veiling distortion on an otherwise clean performance.

Volkwoofer harmonic distortion was plotted on the same average power scale as Satellite distortion, which is a bit misleading since the Volkwoofer is driven from a self-contained power amplifier. In order to make the measurement, I connected the entire system as a working unit and adjusted the one-meter, free-field 41.2-Hz sound pressure level by the control on the rear of the Volkwoofer to match that of the Satellite at 440 Hz. The resultant measurement represents a complete system with amplifier drive voltage corresponding to the equivalent average watts into a 4-ohm resistor. Sonic stress began to occur at around 95 dB for the Volkwoofer due to the high excursion of the cone required to produce this pressure level.

Intermodulation distortion measurements for the Satellite system are plotted in Fig. 10. Since tones below approximately 90 Hz are handled by the subwoofer, the low tone used for this test was E_2 or 82.6 Hz. This low tone was then added to A_4 (440 Hz), and the modulation of A_4 produced by E_2 was measured as a function of drive power. The Satellite has an IM composed of both phase and amplitude modulation of A_4 by E_2 . At 10 average watts, there was approximately 2% peak-to-peak amplitude modulation and 3° peak-to-peak phase modulation. This increased uniformly to about 5% and 5°, respectively, at 100 average watts.

The IM is modest at high power levels, but at lower listening levels it is a little higher than I would prefer to see in such an otherwise high-quality system.

The Satellite acoustic transfer gain, which is the ratio of the change in sound pressure produced by a change in drive voltage, remained steady at all levels for the test tones of Middle C (262 Hz) and A_4 (440 Hz). The tone of A_2 , however, produced slightly less than a 1-dB increase in sound level for a 1-dB increase in drive voltage; starting from a relative base of 10 mW, the 10-watt sound pressure level was down by 0.5 dB. This implies a slight compression of lower bass tones relative to upper partials for loud passages, but the amount of compression is so small as to remain essentially inaudible.

The Satellite performed extremely well in the crescendo test. A sudden burst of wide-bandwidth incoherent noise did not reduce the level of a single tone, even when the tone had an average level 20 dB below that of the noise burst. Test tones of A_2 (110 Hz), Middle C (262 Hz), and A_4 (440 Hz) evidenced no change even up to combined signal-plus-noise peaks of 600 watts. Therefore, sudden trumpet bursts or cymbal crashes will not produce timbral changes or stereo shifting of unrelated solo instruments in the stereo field.

The energy-time response of the Satellite system is shown in Fig. 11. This is a measure of the total energy density of the sound pressure at a one-meter axial location caused by a perfect electrical impulse fed to the loud-

I can genuinely recommend using the Volkwoofers for low bass augmentation on even the very finest loudspeaker systems.

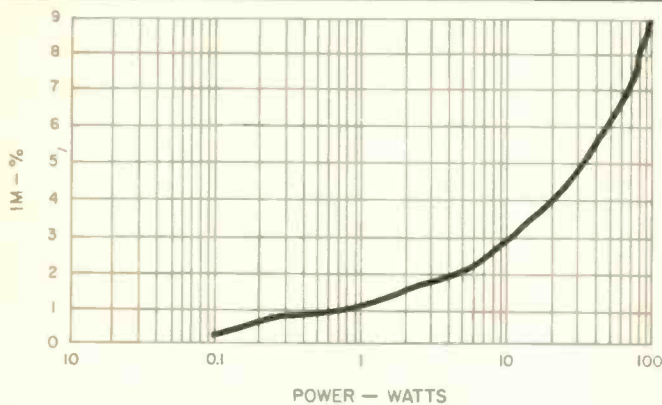


Fig. 10—IM distortion for the tones of E₂ (82.6 Hz) and A₄ (440 Hz) mixed in a one-to-one ratio.

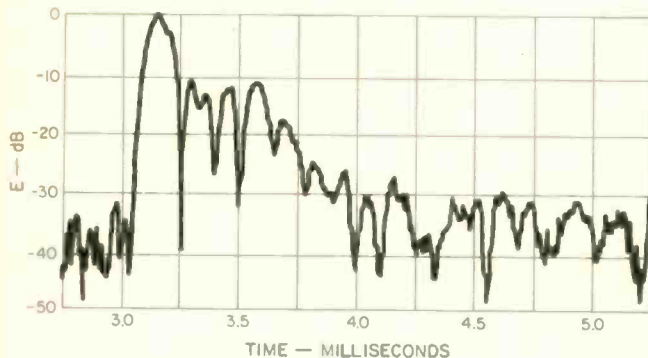


Fig. 11—Energy-time response.

speaker terminals. The first sound peak at 3.15 mS is due to the tweeters; subsequent peaks are due to internal reflections within the grille assembly. The main peak of the lower frequency driver's response occurred at around 3.5 mS. The impulse response quickly damped to a low value by the end of 4 mS and remained at this level with only a few internal acoustic reverberations in evidence thereafter. This is a moderately good impulse response, even taking into account a time spread of 0.5 mS due to arrival time differences between tweeter and midrange units. The percussive properties of impulsive sounds may suffer a small coloration in the 2 to 10 kHz range because of the discrete energy peaks separated in the 0.5 to 0.1 mS intervals shown in this test.

Use and Listening Tests

Some experimentation was necessary to provide proper room placement for auditioning the Satellite and Volkwoofer combination. I used two Volkwoofers for the listening test and also attempted each of the combinations of Satellite equalization. The equalization I finally used is that which M & K refers to as "high-efficiency low-tweeter level

subdued 'German Dome' sound." Esoteric description to the contrary, this gave the most accurate sound to my ears. The Volkwoofers were placed directly beneath the Satellite-1As, which were mounted one meter off the floor.

My overall impression of the complete system, Satellite and Volkwoofer, is that the Volkwoofer is really the star performer of the two in terms of uniformity and accuracy of sound. To my ears at least, I could not get completely accurate timbral balance for the upper midrange and treble portions of the spectrum. The sound was clear, overall stereo imaging was excellent, and the system handled enormous peaks without breakup, but piano and human vocal didn't present a strong illusion of sonic presence, in my opinion. However, these last two tests are among the most difficult for a speaker.

Part of this relates to a change of instrumental timbre with listening position relative to the Satellite speakers. There is a preferred listening position, as M & K points out in their brochure, and when one is in this specific position, the sound can be equalized to be reasonably accurate. Moving away from this position, particularly up or down, alters the tonal balance.

The Volkwoofers, on the other hand, do not need to be so carefully positioned. They deliver accurate sound, within their tonal range, from almost any reasonable room location, and go right downstairs to deliver solid low bass. This deep response together with, say, a low organ pedal note on a warped record or someone walking past a poorly mounted turntable, can drive the cone to its excursion limits and perhaps beyond, so that a user should be aware of this possibility.

An electric fan is the only transducer capable of reproducing d.c., but the Volkwoofer made a valiant effort a couple of times when I was playing old records and turned the volume up to high levels. Noticing a strange burbling sound coming from the subwoofers, I pulled the grille off, which revealed a cone just about ready to jump into the room. The poor Volkwoofer was vainly trying to be an electric fan. This was stopped by switching the rear-mounted equalizer out of the "Flat" position, though this was the position which seemed to me to produce the most accurate sound.

I was able to improve the sonic accuracy of another fine loudspeaker system by using the Volkwoofers as add-on subwoofers. In this role the Volkwoofers stand on their own very well, and I can genuinely recommend using the Volkwoofers for low bass augmentation on even the very finest loudspeaker systems.

Richard C. Heyser

(Editor's Note: M & K informs us that they will shortly be offering a new Satellite-1B incorporating two six-position rotary switches which will allow quick selection of 42 sonic characteristics. These switches will replace the external resistor kit and add additional flexibility. The system also will use new proprietary polypropylene drivers and have new push-type input terminals, which will accept the heaviest gauge wires as well as standard banana plugs. In addition, a newly designed Volkwoofer-B will incorporate a 400-watt amplifier as well as additional line-level inputs, which will allow the subwoofer to be driven from a preamp.—E.P.)

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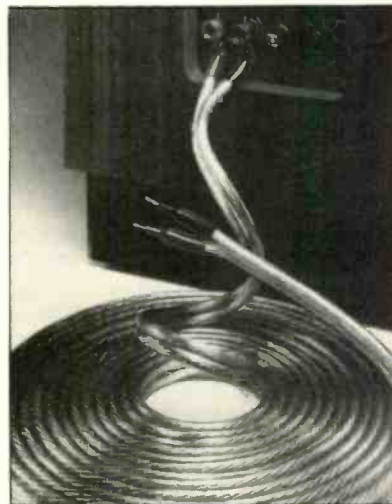
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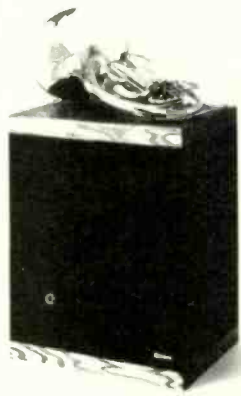
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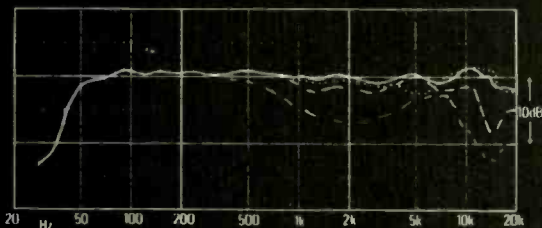
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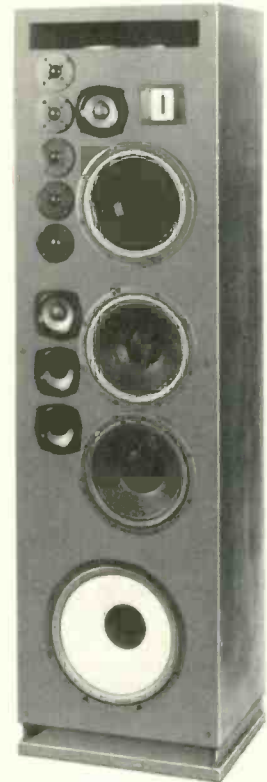
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GNP LOUDSPEAKERS OUR GROWTH CONTINUES

We would like to begin this column by thanking all of you who have expressed an interest in our GNP products. Your desire to hear, and possibly purchase one of our loudspeaker systems, is a most encouraging response to those of us who seek to enhance the experience of music in the home. We have already sent information to all who requested more data on our products, and we are more than willing to speak personally with all callers who require some further background or technical data. (Incidentally, several individuals forgot to enclose a mailing address in their initial correspondence, so please don't be upset if you have not heard from GNP. Simply send us a second letter and we will immediately forward the requested literature to you. We have carefully filed all of the names and addresses we have received to date, so that we can provide you with additional material as it becomes available.)

This column is being written just after our return from the Winter CES in Las Vegas. Our appearance at this show marked our first step in distributing our loudspeakers nationwide, and we were very pleased with the highly favorable reaction our products received—especially our contribution to the state-of-the-art, the LEAD CYLINDER (Pat. Pend.). Frankly, we expected visitors to our demonstration room to be polite but reserved in their comments on what they heard. But as dedicated engineers, always open to new ideas and constructive advice in a ceaseless effort to improve our products, we were more than a little curious to learn what others thought of our loudspeakers. And so several of us removed our manufacturer's identification badges and anonymously passed through the halls outside our exhibit, in order to hear for ourselves. In spontaneous conversation, what was REALLY being said about our products. And time and time again, one comment repeatedly was heard: GNP's demonstration room was "... one of the best sounding exhibits at the show."

We find ourselves almost embarrassed to report this to you, since we have never been inclined to resort to excessive verbiage or hyperbole in order to convince you of the worth of our products. Rather, we believe that the unique properties of our products ... once known ... speak for themselves. But nevertheless there is no doubting the comments that we heard.

In point of fact, a number of other manufacturers voluntarily visited our room (on the word-of-mouth recommendations of their professional colleagues) in order to hear for themselves the superiority of our loudspeakers. We were even visited by several noted "underground" audio journalists, all of whom found our speakers to be so innovatively different and sonically promising (from brief listening sessions) as to merit a more extensive and exhaustive evaluation while under formal review.

By the conclusion of the show we had received a sizable number of applications from prospective dealers across the country. We hope that by the time you read this column, a local dealer may have our loudspeakers available for you to personally audition.

And so upon returning from the show, it is pleasing to know that there is a large group of audiophiles who can appreciate the innovative and imaginative engineering that underlies the development of all of our GNP products.

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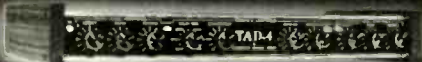
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The 1982 Winter Consumer Electronics Show was held January 7th through 10th in an unusually cold and blustery Las Vegas. Along with the inclement weather, attendees were also aware of a similar economic climate which made them approach this show very warily. Amid widespread cries of "gloom and doom" about the condition of the consumer electronics industry (and most especially audio components), many feared they would be attending an industry wake. Happily, and much to everyone's surprise, the show was heavily attended. A pervasive optimism in the future of the consumer electronics industry was supported by reports of encouraging dealer-buying activity in almost every component category. However, it should not be construed from this cheerful note that all is well within the industry. Many voices of caution were raised about the recession and the continuing high cost of credit, with oft-repeated admonitions of "Let's see how we make out in the second quarter of this year."

The show itself must be considered a transitional event. While there was a generous sprinkling of new product introductions in most categories, many manufacturers were withholding or delaying major product updating and introductions until the June CES in Chicago. The transitional aspects of the show were more fully expressed by those who are eagerly awaiting the arrival of the digital disc and related digital technologies, which they feel will be a sort of "electronic Moses" that will lead them out of the present economic wilderness.

Perhaps the optimism was stimulated by the appearance of a considerable number of prototype models of digital compact disc players as well as other digital audio products. Without meaning to interject a sour note, I must tell you that most of the CD players were non-operational, which probably stemmed more from a lack of software than from electronic or mechanical difficulties. While all the manufacturers of CD players are licensed to use the Sony/Philips DAD technology, there is nothing standard about the players' tracking format or appearance; they vary in size and shape from brand to brand. Prototype CD players shown by

Denon's DAD-1000 digital compact disc player.



Denon, Sony, Aiwa, Yamaha, Sansui, Fisher, Toshiba, and Sanyo have a target-date introduction said to be by early fall in Japan and late fall or early 1983 in the United States. These dates can be met or even moved forward if the compact discs themselves become available on schedule, and CBS/Sony, Denon, and Polygram anticipate having discs by mid-summer. You can be sure the companies involved will move very cautiously in the matter of software, making certain that the laser-read CDs will be reliable and glitch-free. Above all, they want to avoid the problems encountered with the laser videodiscs, which suffered from lapses in quality control.

We have reported previously (*Audio*, April/June, 1981) on the Technics SV-P100 digital audio cassette recorder, which combines PCM LSI chip circuitry with a standard VHS videocassette recorder in a single unit. Hitachi has a recorder similar to the Technics unit. In the January 1982 *Audio*, I reported on JVC's digital audio cassette recorder. These three recorders are all intended for the audio consumer and semi-professional markets. The Technics recorder is slated for delivery in the

spring of this year, while there are no firm dates for the Hitachi and JVC units.

At this WCES, Sony introduced their PCM-F1 digital audio processor, claiming it makes "the consumer digital age become a reality." (See "Equipment Profile" in our March issue.) Since Sony introduced their PCM-1 digital audio processor back in the mid-'70s, this claim for the PCM-F1 might sound somewhat unusual. But the PCM-F1 is indeed a unique product. It is the world's smallest (8½ x 3½ x 12 inches) and lightest (under 9 lbs.) digital processor. It is also a truly practical system for typical audiophile recording situations, and its price is a far more practical \$1,900.00 than the stratospheric \$5,000 to \$6,000 of the previous PCM units.

The PCM-F1 processor works with any standard NTSC video recorder — U-Matic, VHS or Beta — but is specifically intended for use with the Sony SL-2000 Betapak portable video recorder. Both the Betapak and the F1 have shoulder straps, and together they weigh in at a remarkably low 18 lbs. For portable recording, the system can be powered by rechargeable

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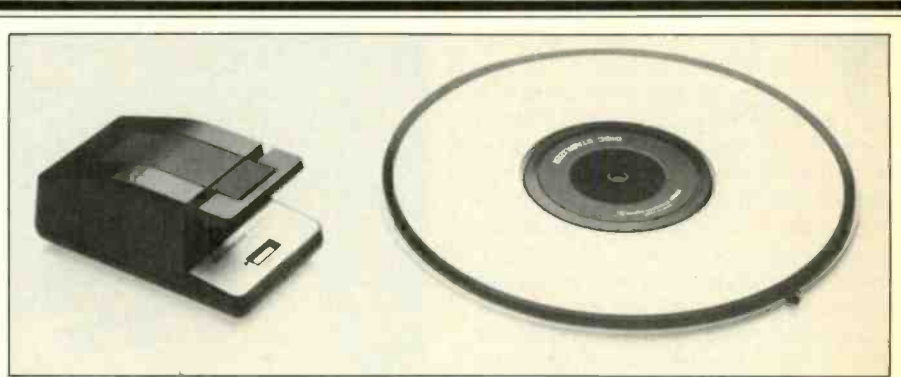
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Audio-Technica's AT666 Disc Stabilizer.

nickel-cadmium batteries. A quick charger and a.c. adaptor unit is available, as are provisions for powering the system via plug-in to a cigarette lighter on car or boat. Beta 500 video-cassettes permit up to two hours of digital recording in extended play mode. The small size and weight of the F1 is made possible by LSI chips for PCM recording and playback, jointly developed by Sony, Sanyo and Toshiba. (The same LSI playback chip will be used in the digital compact disc player.) The F1 uses the EIAJ 14-bit linear quantization, but it can also be switched to 16-bit linear encoding for compatibility with professional digital recorders. Sampling rate is 44.056 kHz/S, which seems strange to incorporate in a new product in light of the 44.1 kHz/S sampling rate proposed as a standard at the 70th AES Convention. Apparently Sony wishes to ensure compatibility with their earlier PCM processors; consider also that Sony's compact disc has a 44.1 kHz/S sampling rate. Perhaps there will be switchable sampling rates in the production model or in an updated version. There are many other features on the F1, not the least of which is a rear-panel output which will permit interfacing with EIAJ or 16-bit professional recorders for digital-to-digital copying.

Needless to say, in spite of the digital excitement, analog audio still is our predominant technology and will remain so for quite awhile. Consider, for example, innovative products designed for even more accurate retrieval of the music signals engraved on the venerable LP record.

I have previously reported on the Luxman PD555 turntable, which features a turntable platter with a vacuum

suction device that firmly bonds vinyl records to the platter. This vacuum "clamping" thereby removes all warps (whether they be of the "dish" or "pinch" variety) and at the same time eliminates the problem of vinyl resonance. A nifty idea indeed, but at nearly \$3,000 hardly a mass-market product. In 1981, Luxman introduced a \$695 vacuum platter turntable in which the vacuum was established with a manual pump rather than the elaborate electric pump used on the PD555. At the WCES, Luxman introduced yet another vacuum platter turntable, the PD300, which again uses a manual pump but has a heavy high-inertia platter. It is priced at \$1,000 and, while cheaper than the PD555, will still be beyond the reach of many audiophiles who recognize the virtues of the vacuum system.

Well, take heart friends. Audio-Technica has devised what has to be the ultimate turntable accessory for any dyed-in-the-wool audiophile. To wit—a vacuum record clamping system! This is in the form of a finely machined duralumin platter which has rubber vacuum seals around what would be the periphery of the record label and outer edges of the disc. Air channels lead from the vacuum seals to an outlet connection on the rim of the platter, and rubber tubing connects the platter outlet to a hand-operated vacuum pump. On another section of the vacuum platter rim is a small relief valve to "break" the vacuum so that the record may be removed after playback. In use, the original mat (usually rubber) is removed from the turntable's platter, and the vacuum Disc Stabilizer is placed on the spindle of the turntable is

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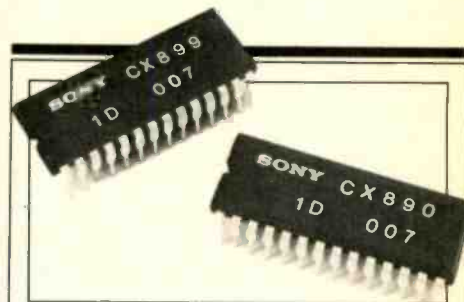
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In spite of the digital excitement, analog audio is still our predominant technology and will remain so for quite awhile.



LSI chips used in Sony's PCM-F1.

approximately $\frac{3}{8}$ of an inch in thickness and weighs 5 lbs. A few strokes of the vacuum pump are sufficient to establish the vacuum and suck down the record, removing all warpage and the vinyl resonance. Audio-Technica claims the vacuum clamping is equivalent to placing a 550-lb. weight on the record. The vacuum is said to clamp the record in place for an hour, obviously more than sufficient for any standard recording. The AT666 Disc Stabilizer can be used with most turntables, but there are some which have highly compliant suspensions that may be incapable of accepting its 5-lb. weight; there are also some other turntables whose bearings might be damaged by the additional weight. Audio-Technica conducted a clever test in which light, wooden mallets were mechanically tapped on the surface of two vinyl records. One record was placed on a regular turntable platter, and the second record was placed on the AT666 Disc Stabilizer which had been mounted on another similar platter. A contact pickup wire from each turntable was fed into an oscilloscope. With the standard turntable platter, the tapping of the mallet on the record produced a violent spike on the oscilloscope signal due to vinyl resonance. The turntable equipped with the vacuum Disc Stabilizer showed no spike in the signal when similarly treated, thus establishing the absence of vinyl resonance. The Disc Stabilizer has to be one of the most clever and useful contributions to the improvement of record playback quality in years. Best of all, it retails for \$275.00 complete with vacuum pump, tubing, and a vacuum surface cleaner.

As usual, I could fill pages with reports on new products that caught my eye at the WCES. Next month, I will detail the workings of some of the more interesting items.



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The FM Two's performance stands out not so much in typical use but in situations where incoming signals are less than ideal.

CROWN FM TWO TUNER

Continued from page 52

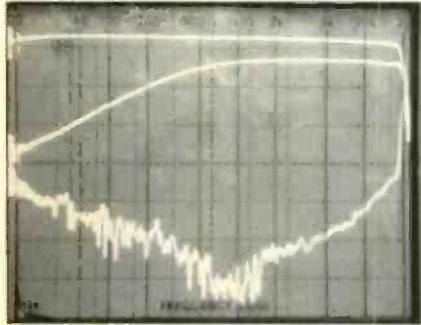


Fig. 3—Upper trace, frequency response (20 Hz to 20 kHz); middle trace, separation with the

noise filter activated; bottom trace, separation without the use of the noise filter.

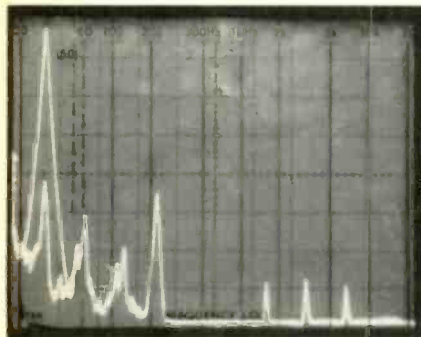


Fig. 4—Crosstalk characteristics.

the limitations of my FM signal generator. As things were, I measured 56 dB of separation at 1 kHz and 42 dB at 10 kHz. Frequency response is shown in the upper trace of Fig. 3 (from 20 Hz to 20 kHz sweep), while the lower trace shows separation without the noise filter used, and the middle trace shows what happens to separation when the noise filter is activated. Loss of separation is rather extreme under such circumstances, decreasing to less than 10 dB over much of the audio band. During the listening tests, however, I rarely found use of this filter advantageous since any signal received in stereo was strong enough to push the background noise down to tolerable levels.

Using a 5-kHz modulating signal, I measured the crosstalk and harmonic distortion components that show up in the unmodulated channel's output; these results are depicted in Fig. 4.

Capture ratio measured 1.2 dB as opposed to 1.5 dB claimed, selectivity measured 80 dB against 75 dB claimed, and r.f. IM was down nearly 75 dB as against 65 dB claimed. I.f., image, and spurious rejection were all too low for the test equipment to verify (in excess of 100 dB

down). Frequency response was within 0.3 dB of flat from 30 Hz to 15 kHz. AM suppression was excellent, which accounts in part for this tuner's resistance to the multipath effects I often encounter when tuning to some stations in my location (some 20 miles from mid-Manhattan).

Use and Listening Tests

There is a kind of transparency to the sound reproduced by the Crown FM Two. It's almost as though this tuner is able to eliminate some of the undesired and undefined forms of distortion which elude test bench measurements but which we all know exist in the "real world" of FM—away from the test bench. I've been informed that the independent consultant Crown used in the initial design of this fine tuner: was none other than Larry Schotz, formerly of Draco Labs. Anyone who remembers the very first frequency synthesized tuner which was designed by Mr. Schotz a few years ago (and which was about three years ahead of its time) will realize that the Crown FM Two is not just another tuner: It's a superior product in just about every way. Crown is to be commended not only for asking this fine engineer to work with them in its design and production, but for letting him incorporate the circuitry in what is, after all, not all that costly a tuner by today's standards. *Leonard Feldman*

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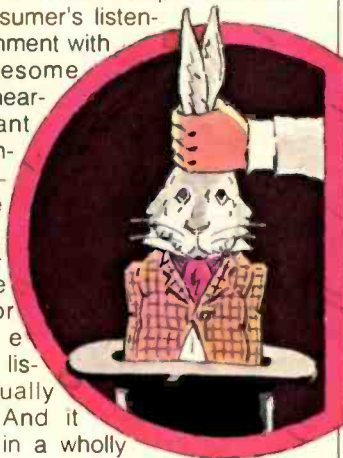
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EDWARD TATNALL CANBY

It took me a while to react to AR's (Teledyne Acoustic Research) voluminous publicity kit concerning a new device called ADSP, short for Adaptive Digital Signal Processor, a still unmarketed corrective unit (forecast: late 1982) that is specifically intended for home listening. One gets used to these occasional, large bundles of self-promotion, as if by sheer weight and hundreds of pages one could indicate product importance! But I'm careful. I never throw them out, unperused. AR bowled me over.

This is a "home equalizer," to use a popular but inadequate term, like none that has ever been before, or is at present. Outwardly, it does one of the same jobs, compensating for the effects of the listening room (or other area) on signal accuracy as heard by the ear. But, even sight unseen and sound unheard, I can predict that the offshoots of this AR thinking will fundamentally change our listening. It is the first true corrective microcomputer to tackle the consumer's listening environment with the awesome power of nearly instant digital computation — to alter the sound in minute detail in the room or space where the listener actually hears it. And it does this in a wholly new way, entirely without the familiar frequency bands of present and past "analog" home equalizers. There are no bands. The ADSP, as is usual in digital, is time splitting, not frequency splitting. It operates continuously and adaptively over the lower half of the frequency spectrum (where, AR has determined, virtually all of the room-space aberrations occur), and its adjustments are limited as to detail only by the stream of digital information itself, the digital parameters. As in the best pro digital recorders, the ADSP setup is 16-bit and samplings of the signal are prodigiously fast, many thousands per second.

Let me give you an idea of the sort



of thinking here. I am somewhat "The ADSP has no fixed frequency characteristics . . . instead, it adaptively designs itself according to the needs of the loudspeakers and the room it is correcting. ADSP operates in time, not frequency . . . The ADSP chops the program into fragments thousands of times a second, adds error correction to each fragment, then reassembles the music.

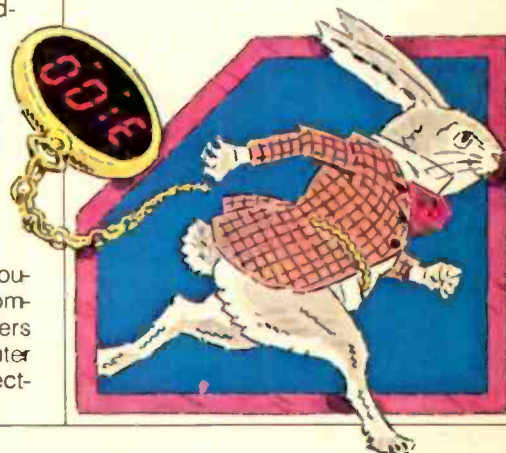
"The ADSP creates the necessary correction filter without first measuring the frequency response of the system. Instead (it) analyzes the system in a way new to high fidelity audio: In terms of order and disorder (or entropy and information). Because these are time-domain properties, and the ADSP operates in the time domain, frequency analysis is unnecessary." I had to gulp when I read that one. But those familiar with logic as used in computer operations will understand immediately. It's the wave of the future, coming to hi-fi.

The account of the working procedure for ADSP is easier. This gives a good notion as to what might be involved for you. "To activate the ADSP while listening to music, the user presses a button on a small, handheld module. At this command, the music is interrupted and the computer in the ADSP converts a series of numbers in its memory into a test signal played through each loudspeaker for several seconds. The sound, received by a microphone in the user's module, is relayed to the ADSP, where it is converted to a sequence of several thousand numbers and stored in the computer's memory. Next, these numbers are analyzed, as the ADSP computer searches through them for any detectable mathematical order. . . ."

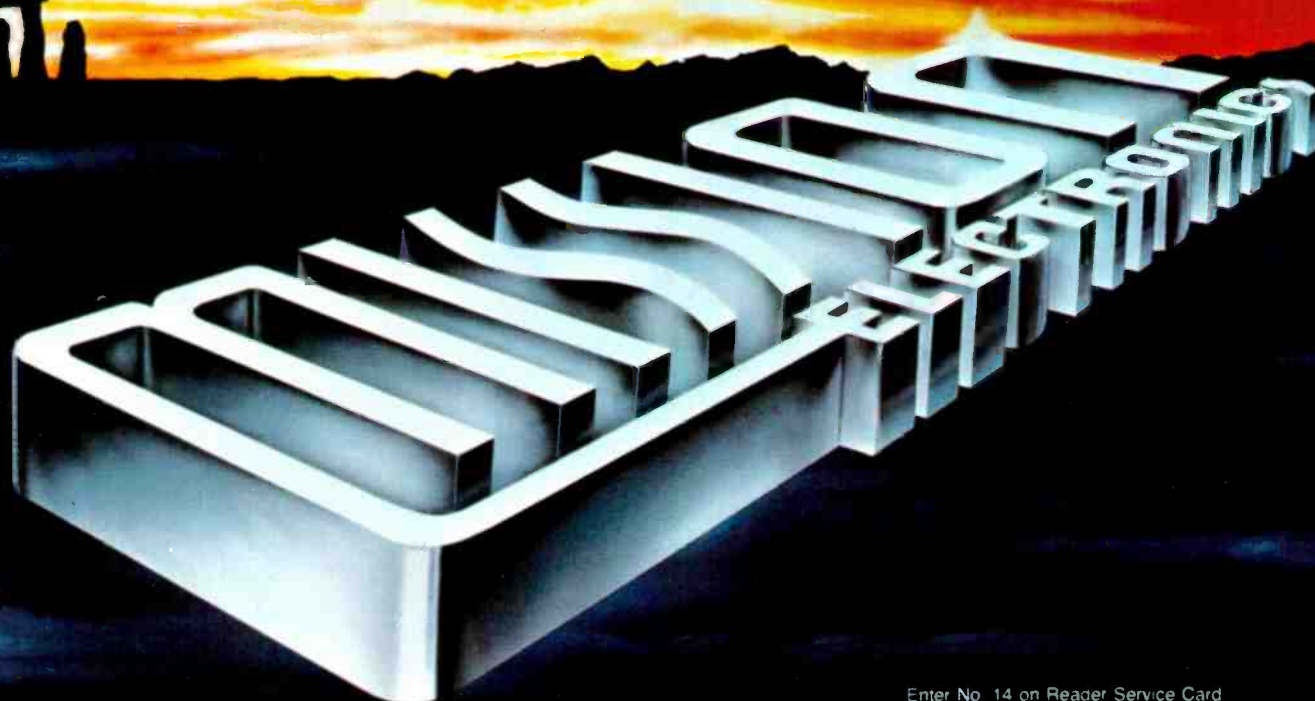
Note that all this happens within seconds. The signal is "whiter than white" noise, generated out of those numbers, and it is brief. Then the more-than-100 IC elements of AR's hardware get to work and produce a pattern — they "converge on a pattern," as AR puts it. This is not merely a copy of the detected errors; it is an exact mirror image, which the ADSP proceeds to add to each separate slice of the musical signal. It is indeed a type of "inverse feedback" correction, but utterly unrelated in its technology to that once vital analog electronic circuit device. With this feedback, added right into the digital samplings, "The sound reaching the listener is a more faithful reproduction of the recording or broadcast than would otherwise be possible."

There are some interesting implications here. No mention is made of the equipment which produces the fi. Instead, AR speaks of "the recording or broadcast." The assumption is that your equipment is relatively perfect — and in fact, relatively speaking, this is the case because the aberrations caused by listening room acoustics are enormously larger than most of those we hear in the way of system or recording/broadcast distortion. Not that the usual measurements of distortion aren't meaningful. Of course they are. But the effects of the room are over and above and beyond all that, on a different scale, measured in huge humps and peaks and valleys, nulls, standing waves — another world, in which we necessarily immerse ourselves unless we resort to headphones.

Continued on page 11



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