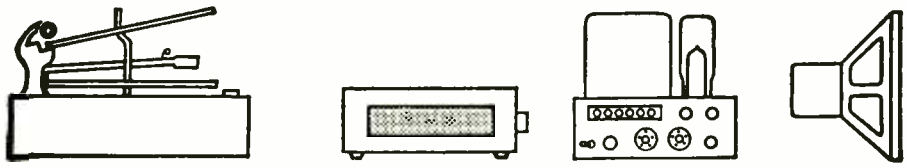
EQUIPMENT PROFILE



McINTOSH FM-STEREO TUNER, MODEL MR 71 and SOLID-STATE STEREO PREAMP, MODEL C 24

The MR 71 FM-Stereo Tuner

In February, 1964, we profiled the McIntosh MR 67 Stereo Tuner, and during the course of the description it was stated that it "is unexcelled by any other tuner we have had occasion to test in recent years." This is no longer true. It is excelled by the MR 71. Of course, it should be, since the MR 71 is essentially the same as its predecessor (in time, since both are now in the line) with minor improvements which are the result of continuing development work.

When one reads the specifications, one finds comparatively little difference between the two models with respect to performance. The MR 71 has a slightly better capture ratio of 1.5 as against 1.7; it employs five i.f. stages instead of four; it has 8 db more suppression of the multiplex products (primarily because of the new, extremely sharp SCA filter), different tuning indication, automatic stereo-mono switching, and three extra pounds of weight. It still uses a 6DS4 Nuvistor combined with ½ of a 12AT7 as a cascode front end, albeit it does use top-end inductor coupling between the first two tuned circuits instead of an inductive link. The principal differences begin with the fourth i.f./first limiter which feeds a first discriminator used to control the muting circuit which acts upon the fifth i.f./second limiter so as to be faster acting when one tunes off a station. The second limiter feeds the signal discriminator in the usual fashion. The multipath distortion indicator now serves only one purpose—meters indicate signal strength and tuning—and does not have to be switched. The recovered composite signal feeds the MX amplifier, with 19 kc appearing in its plate circuit while the audio appears at the cathode, whence it goes through the new SCA filter and thence to the decoder.

The SCA filter is undoubtedly a very complicated device, since its response curve drops at the rate of 275 db per octave beginning at 54 kc, reaching an attenuation of 50 db at 60 kc and remaining flat at –50 db to beyond 74 db where it rises some 10 or 15 db to about 85 kc before falling off gradually. This filter was computer-designed, has no adjustments, and effectively eliminates any SCA interference without affecting the flat transmission of the stereo subcarrier up to the limit at 53 kc. Because of its sharpness, this filter remains in the circuit at all times, thus eliminating one more switching operation required on some tuners. The decoder circuitry remains the same, and the MR 71 retains the dual outputs—one of "fixed" level and one variable, controlled from the front panel.

The 19-kc pilot signal, aided by some audio derived from the first discriminator, actuates the stereo indicator light amplifier which, in turn, drives a transistor which actually turns on the indicator in the presence of a stereo signal. A second light in parallel with the first illuminates a Raysistor in the cathode circuit of the 38-kc oscillator, turning it on or off without any audible sound and without any attention from the user. A front-panel stereo-mono switch disables the switching circuit when it is desired to receive mono exclusively, although the indicator light still functions. The remaining front-panel controls are a variable afc and muting on/off. Sliding the whole chassis forward in its Panloc mounting (so glowingly described in the profile of the MR 67) provides access to a slide switch which controls panel light brightness.

Fig. 1. McIntosh FM-Stereo Tuner, Model MR71.

The rear apron mounts the 300-ohm antenna terminals, 75-ohm coaxial antenna jack, the "fixed" and front-panel-varied audio output phono jacks, the output-adjusting dual pot for the "fixed" outputs, the muting adjustment control, power fuse, a.c. receptacle, and one of the two test points to which the MI 2 Multipath/Tuning Indicator accessory can be connected (the other connecting point is on the top of the chassis). This device employs a cathode-ray tube in an elaborate circuit to permit visual monitoring of stereo signals and multipath interference.

To the casual observer, the MR 71 performs as well as the MR 67, which is saying a lot. In every category—sensitivity, hum, frequency response, channel separation—there does not appear to be a great difference. It is more effective, perhaps, in freedom from noise, but beyond that there is very little difference which is apparent to the ear—and not *very* much on the test bench. Where it does excel, however—and this is apparent to even the non-technical listener—is in the ease of operation. In the profile of the MR 67, credit was given to the unusually high quality of components and construction as being the main factor in making the MR 67 a "superb" product. If there were such a word, we would only say that the MR 71 is "superber." Beside that, it is most attractive with its greenish illumination of dial scales and meters, the green fluorescence of the multipath indicator tube, and the red stereo indicator light. Even the distaff side will thrill over it.

It would be unfair not to mention the high quality of the Owner's Manual which accompanies the MR 71. It is handsomely executed from the graphic arts standpoint—good paper, good printing and so on—it has a table of contents on the front, covers technical description, installation, and operation clearly and simply, and is well illustrated. Three pages of FM Station Log are provided in the back, with spaces for frequency, logging scale, call letters, city and state, antenna direction, and remarks. Last but not least, in our esti-

Fig. 2. McIntosh C24 Solid-State Stereo Preamp.

mation, is the inclusion of a schematic. Though all audiofans do not do their own servicing, it is not likely that any technician called in would have a schematic at hand, and if the owner can supply one, so much the better. We feel that a schematic should *always* be included with any hi fi tuner, amplifier, or receiver.

The C 24 Solid-State Stereo Preamp

This unit is being included with the MR 71 tuner profile because a preamp is generally used in conjunction with a tuner, because it is very similar in appearance, and because its performance is similarly superb.

The McIntosh C 24 employs a total of 18 silicon planar transistors—eight in each of the two channels (which are identical), one in the "center-channel" (L+R) output, and one as a voltage regulator in the power supply section. The phono/tape head preamp employs three transistors, with RIAA or LP equalization selected for phono by a slide switch, followed in turn by the mode-selector switch, loudness control, channel balance, the first section of the volume control, and an emitter-follower which drives a Baxandall-type tone-control circuit. This is followed by two more amplifier stages, the rumble and noise filters, and the output amplifier using two transistors. The second section of the volume control is next, followed by a voltage divider/mixer network feeding the L+R amplifier stage. Two silicon diodes serve as the power rectifier, and the voltage is regulated to 75 volts by the 18th transistor, and further regulated to 10 volts by a zener diode. A four-second time-delay circuit is provided to ensure that the full voltage is not applied to the circuit abruptly, thus allowing the various capacitors to charge up without the usual annoying "thump" which is generally heard when a non-delayed transistor amplifier is first turned on.

So far, nothing particularly new or startling has been said about the C 24, which is as it should be. What is unusual about the over-all philosophy of the C 24 is the channeling of the power amplifier output through the preamp chassis before going to the loudspeakers. This feature is to permit switching of the speakers, as well as to provide a panel-mounted jack for headphones, and to permit reversing the phase of one speaker from the control position, rather than in back of the speaker itself, which is often enough of a chore as to preclude its being done, even when it might improve the listening. (Not all sources—tape, records, or broadcasts—are always perfect in this regard). In less careful design, this proximity of high-level outputs might cause trouble, but in this unit the shielding effectively precludes any trouble from this arrangement.

With the speaker switch, headphone jack, and phase-control switch at the control center of his system, the user has almost every possible flexibility that he might need—or want. This feature has been encountered before in receivers, but so far we have not seen it in a preamplifier/control unit.

Performance

There is little need to state that the C 24 is flat within 0.5 db from 20 to 20,000 cps or that the equalization curves follow the prescribed values within ±2 db throughout the audio spectrum—we have learned to expect that from any good preamp over the past few years—but the distortion figures are somewhat remarkable. The output is rated at 2.5 volts, and at this value the distortion is less than 0.1 per cent from 20 to 20,000 cps. Even at a 10-volt output the distortion measures less than 0.3 per cent over the same range. What is especially important is the amount of phono (or tape head) input this unit will handle without clipping. We have learned by now that this is one figure that should be measured first in any test of transistor amplifiers.

Before describing the phono performance of the C 24 in this respect, let us examine the possible amplitude of the signal from a modern pickup cartridge. We have actually measured stylus amplitudes of more than 40 cm/sec on some phonograph records—not many, we'll admit, but on some. The usual output from a stereo cartridge is in the vicinity of 1.0 to 1.5 mv per cm/sec of stylus velocity—some as much as twice that. We have been told by some record companies that their *peak* recording level was 5 cm/sec, (which we do not believe), and by others that the *average* level was 5 cm/sec. Assuming it is average, and with an estimated increase of peak over storage of 10 db, this would mean a peak level of 16 cm/sec. A clearance of 16 db is usually considered safer as the margin between average and peak program levels, which would imply that peak velocities of 30–35 cm/sec could be reached easily. At an output from the cartridge, of, let us say, 1.1 mv per cm/sec, this would mean that the signal applied to the input of the preamp could reach 33–38 mv. Now if the preamp should clip at an input of 30 mv (we are speaking only of a 1000-cps signal) distortion would certainly result. With the high-frequency boost in modern recording techniques, more efficient microphones in the high-frequency region, and the inclination of A and R men to feature trumpets and strings, overload of the preamp can cause breakup which is extremely unpleasant.

None of this is likely to occur with the C 24 because under the worst combination of volume and loudness control settings, the preamp will not clip (at 1000 cps) until the input signal reaches 100 mv. Under most conditions of settings, the clipping level is 135 mv. Equalization takes care of the high frequencies, and rolloff of the bass in the recording process takes care of the low frequencies. We feel this is a most important problem, and it seems to have been solved in the C 24 quite satisfactorily. At least, we have not ever heard any evidences of clipping on phono. We can not see much application of the 10-volt output capability of the C 24, but if it can supply this much signal with less than 0.3 per cent distortion, it should be able to coast along nicely at the usual 0.25 to 1.0 volts required for normal room levels.

From its Ivory tower, McIntosh modestly claims 99.9 per cent perfection—we'll give 'em only $99\,^{44}/_{100}$ per cent. We would make only one minor change—that of reversing the direction of rotation of the contour control. At present, clockwise rotation increases the amount of equalization, but decreases level. We would prefer it the other way. In the maximum position, there is a boost of approximately 10 db at 30 and 10,000 cps with respect to 1000 cps, which follows general contouring practice.

Tone controls give a range of ±18 db at 20 and 20,000 cps. Lo-cut starts at about 100 cps and its down 11.5 db at 30 cps, 32 db at 10 cps. Hi-cut starts at 3000 cps and is down 7 db at 10,000 cps, 16 db at 20,000. In the flat position of all controls, over-all response is down

only 6 db at 100,000 cps, if that should matter to anyone.

On high-level inputs, noise and hum measured 78 db below rated output with the volume control at maximum. In the minimum position of the volume control, the noise drops to 112 db below rated output—as it should, of course, since one section of the volume control immediately precedes the output jacks. On the phono input, noise measures 64 db below rated output at the maximum setting of the volume control. At a volume control setting which gives an output of 1 volt at a phono input of 10 mv, the noise and hum were down 72 db.

With these impressive performance figures, the C 24 is truly a fitting companion for the "superb" MR 71 stereo tuner. Circle 220

DUAL 1010

The usual trend for automatic turntable manufacturers has been to build up their model inventory by adding a "super" changer. Dual has chosen to reverse that trend. The Model 1010 is a lower-priced version of their "super" unit, the Model 1009. At $69.50 it is $30 under the top-of-the line.

Naturally, this new unit shares much with the 1009. It has the same record changing mechanism, the same heavy-duty four-pole motor, and the same cartridge mount slide. The major differences are that this unit has a lighter platter and a completely different arm.

The Dual 1010 is a four-speed automatic changer/manual player. Record change is accomplished entirely with the center spindle. This spindle has three arms that support a stack of up to eight records. At the correct moment the spindle arms will retract, dropping the lowest record. To prevent the rest of the stack from following suit, the spindle has an expandable collar that grips the stack above the bottom record and lifts it slightly before dropping that bottom disc. All-in-all, a reasonably fool-proof spindle system that is very gentle on record centers. This system is dependent upon record companies that produce discs of standard center hole dimension and thickness. Our tests with a number of contemporary discs revealed no change problems at all.

For manual play, the large spindle can be exchanged for a short one. The automatic spindle has a pin on the bottom that fits a slot in the turntable spindle hole. With the pin in the slot, the record release arms are pulled out and in at the end of each cycle. Thus, this spindle cannot be used for manual play (the record can only go down over the support arms at the beginning of the cycle). This is no problem since most people will use the 1010 for automatic play only, but if you bounce back-and-forth from manual to auto, you may find

Fig. 3. Dual Model 1010 Record Changer.

this system somewhat of a nuisance. Of course, for manual play only, the short spindle, which simply drops in, solves all problems.

A switch on the side of the table selects record size. You cannot intermix sizes in a single stack, but you can play the three popular disc sizes, 7, 10, and 12 inch as long as segregation is practiced. (Note that this is true of all the better changers on the market. Ironically, only the less expensive units can intermix sizes automatically.)

The basic control for automatic or manual play is a slider of unusual smoothness. It is possible to activate the reject mechanism while a disc is playing at a light stylus force, without the slightest upset.

The tone arm is quite basic in principle. In this system, the arm simply hangs from its canted horizontal pivot without a counterbalance weight, and a spring is used to pull back and provide stylus force. A screw with a coin slot located on the side of the arm, near the pivot, is utilized for adjusting stylus force. It has click stops at regular intervals, which are no more than general indicators, since stylus force per click will vary according to the weight of the specific cartridge used.

The spring used is linear throughout most of its range. No more than half a gram variation may be expected from top to bottom of a stack of discs. The spring apparently becomes less reliable below 1.75 grams; thus, this would be the lowest recommended force we would suggest.

Performance

Using a very-high-compliance cartridge we substantiated the 1.75 minimum tracking force. Less than this, which the cartridge could do, caused some mistracking of heavily modulated passages. All subsequent tests were made at 2 grams.

System resonance was at 20 cycles and was slight. At 2 grams there was no mistracking at the resonance. Bass rolloff was rapid below this point. It is worthy of note that the trip mechanism can operate at forces considerably lower than the arm's capabilities, so no problems should ever occur on this score.

Turntable flutter and wow were unusually low for a unit in so modest a price category. Flutter was under 0.1 per cent and wow was 0.35 per cent.

Total rumble was 35 db below a 3.54 cm/sec, 1 kc stereo signal. This figure is very close to what we have measured on top-grade manual tables.

Our sample was 2 per cent fast, under load, at a line voltage of 120v. The drive motor proved extremely immune to minor voltage variations. At 100 volts the 1010 was 1 per cent fast. At 90 volts speed had dropped to −0.5 per cent. A load of several records had no appreciable effect on these speeds. Those who are familiar with the Model 1009 know that this unit has a vernier speed adjustment knob that allows you to correct for speed variation. The 1010 lacks this feature. However, the speed variations quoted are quite acceptable for a good changer.

All-in-all the Dual 1010 impressed us greatly. It must be considered in its price category. As such, it represents very good value indeed. Its performance is close to a good manual table, the changer mechanism *is* of the very best, only the arm falls short of allowing us to suggest this unit for the best systems. Although the 1010 will not get the ultimate from a cartridge, it is not intended for use with the ultimate cartridges either; the 1010 is designed for the moderately-priced system. As such it fulfills its design goals. Circle 221

"NETWORK" SPARK INJECTOR

With the curiosity indigenous to a long-time hi fi enthusiast, this observer was naturally intrigued by the advertisement of this product in the December issue. "High Fidelity" performance from an automobile appeared to be a new category of criteria.

Accordingly we undertook to obtain one for "test," not knowing just exactly how one would measure performance of such a device with the sort of objectivity we attempt to attain with the usual hi fi component.

In the first place, installation is slightly simpler than claimed in the advertisement, since it took just eight minutes to put it in place, connect the four wires, and start the car—a 4600-lb 1961 model. It started off immediately, better, if anything, than usual. Then, before essaying any long-trips, we "broke it in" around town for long enough to have confidence that it would continue to work—no real problem if it hadn't, really, since it is only necessary to move two wires from their usual terminals to a third one, all of which are readily accessible, to restore the normal ignition system to operation.

After sufficient local driving to establish confidence, we went on a couple of 450-mile trips. There was no noticeable