audio record

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INSIDE WFAA

— The story of a modern high-fidelity recording room

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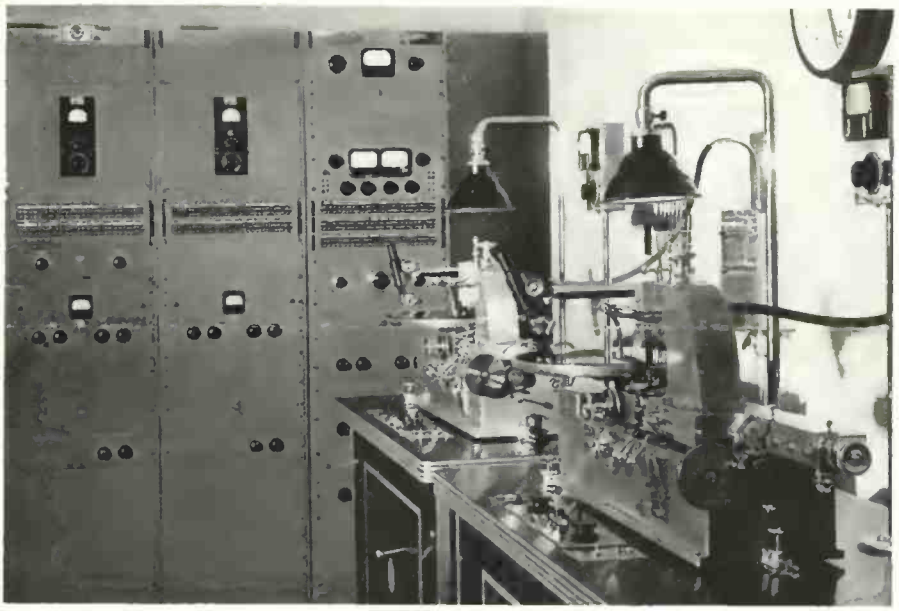

Fig. 1 — General view of WFAA's recording room, showing three of the racks and two of the disc recorders.

In 1946. Station WFAA, Dallas, decided to improve their recording room set-up — to provide the Southwest with the last word in modern high-fidelity sound recording facilities. Plans were drawn and redrawn — ideas exchanged — innumerable conferences held. Here is the cumulative result of more than two years of planning and construction — a room 19′ by 13′, filled to capacity with the most modern recording equipment, including 6 racks, 4 recording machines, 2 dubbing and playback tables and record-storage space.

While the equipment is fairly conventional in itself, the finished layout is of particular interest from the standpoint of appearance, performance and operational features.

The entire system was designed for high quality and high fidelity from beginning to end. Each piece of equipment was thoroughly inspected and tested. Distortion, frequency response, gain, etc., were measured before installation, resulting in overall performance that leaves little to be desired.

Fig. 1 shows a partial view of the equipment from the entrance — including three of the six racks and two of the four disc recorders. The other two recorders are on the opposite side of the room, and the dubbing and playback tables (shown in Fig. 2)

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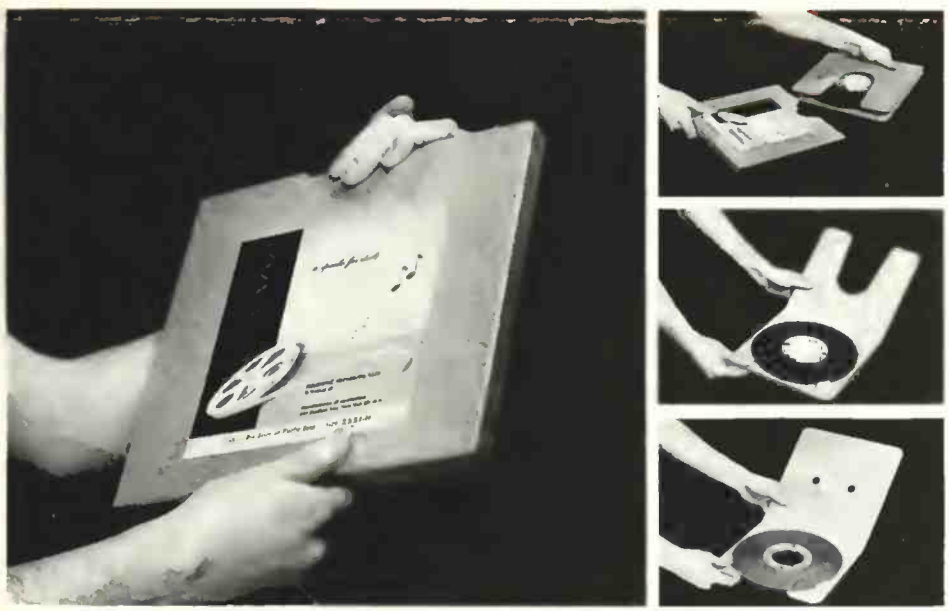
Audiotape Now Available in 2500-foot Rolls



. . . with five important advantages to all professional recordists

Plastic-base, red oxide Audiotape is now available in professional-size, 2500 foot rolls — wound either on standard NAB aluminum hubs, or on complete aluminum reels. This latest addition to the Audiotape "family" offers these five significant advantages.

1. *Exceptionally Low Cost.* Audiotape Type 2551H (on hub only) has a list price of $10.00. Audiotape Type 2551R (on completed reel) has a list price of $12.85. These prices, of course, are subject to the usual discounts to dealers, radio stations, recording studios, schools, and industrial firms. Note that the additional price for the aluminum reel is only $2.85 list.

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Inside WFAA

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are located at the left, adjacent to the entrance. A combination record storage and desk is located at the right of the entrance. The racks are installed over "wells" across the rear of the room, with three feet of space between wall and racks to allow ample room for maintenance work.

The recording room receives its programs from poly-cylindrical studios via a 12-feed, 6-channel master control room.

Fig. 2 — Dubbing and playback tables, mounted on special rubber cups and cork sheeting to eliminate building vibration.

Four program circuits are normalled to the selective switch system located on each recording table. One other program and two phone circuits are available to be patched at will.

Since all recording channels are identical, only one will be described in detail. Across each input is a pre-set master-relay-operated switch system. This feeds a 50,000 ohm-to-line bridging coil — then to the limiting amplifier (only 3 db or less of compression is used). The high bridging-coil impedance is used so that all four recording channels can be placed across one 500-ohm program source without any impedance upsets. The limiter feeds a volume control with a V U meter across the output, located on the recording table for convenience. Next, a relay operated by a cutter switch, also on the control panel, allows program tone to be interrupted to each individual head without affecting any other, should more than one channel be across a single source. The NAB recording filter and head equalizers follow, and feed the 40-watt Altec recording amplifier which feeds the temperature-controlled RCA MI-11850C recording head.

Fig. 3 — One of the four Scully disc recorders, with chip collector in background, and V U meter and attenuator on post at right.

A monitor amplifier and speaker are connected across each recording head, to permit checking circuit continuity, noise, distortion, etc., at the last possible point before it goes on the disc. The frequency response of this amplifier has been modified to complement the recording pre-emphasis. NAB recording standards are used and closely maintained.

Racks 2, 3, 4, and 5 are all identical — like the two left-hand racks shown in Fig. 1. Equipment consists of (top to bottom): recording amplifier, jack strips, band-pass filter, limiting amplifier, bridging coil, recording equalizer, monitor amplifier and relays. Rack 6, at right in Fig. 1, contains (top to bottom) meter for tube checks, utility circuit, pre-amplifiers, transmission measuring set, jack strips, audio oscillator, program amplifiers and power supply for preamps and roving monitor amplifier. This amplifier, together with a 15" Altec 604 high-fidelity speaker, can be switched across any program circuit in the recording room.

Fig. 3 shows a close-up of one of the four Scully recording machines. On table at front (left to right) are the motor start switch, control panel and recording-head heater switch and pilot light. On the post behind the carriage is the channel V U meter and attenuator. The large box on the wall behind the machine houses a metal sack made of #80 mesh brass hardware cloth, to catch the removed cutting thread. Each machine has its own separate thread collector.

A Spencer central suction plant housed in another part of the building furnishes suction for all four machines. A valve located beneath each thread collector controls the suction at the individual machine.

The dubbing channel equipment illustrated in Fig. 2, is interesting in that the turntables are mounted on Neoprene rubber cups set on a 6" platform mounted on 1" cork. This is done to eliminate building vibration. The entire assembly is so constructed that the turntables are waist high, for convenience in operating from a standing position. The dubbing channel circuit,

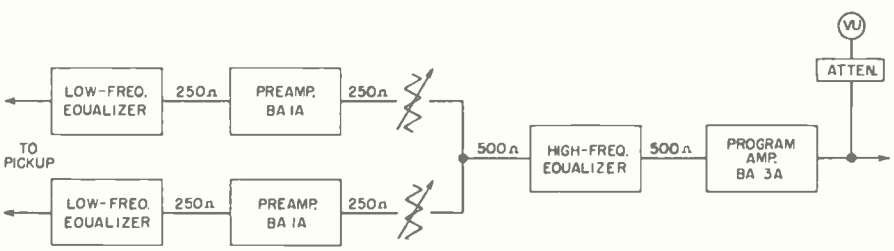

Fig. 4 — Schematic diagram of dubbing channel circuit.

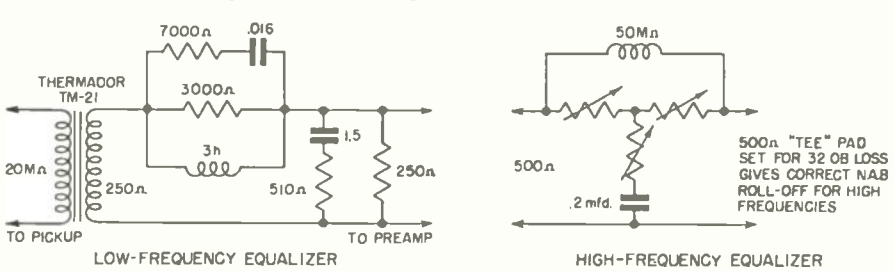

Fig. 5 — Equalizer circuit, with low-frequency portion at left and high-frequency portion at right.

shown in Fig. 4, consists of two pre-amplifiers feeding a two-position mixer and a high-pass filter to further eliminate any possible effect of building vibration on the discs being dubbed. The program amplifier supplies the same signal (+ 8 V U) output as the master control, allowing any or all recording channels to be bridged across it. The heads were selected after exhaustive tests on all leading high-quality pickups on the market. These heads, with a modified arm and an equalizer of our own design, provide reproduction of the NAB recordings within ± 1 db from 30 to 10,000 cycles. The excellent low-frequency response of the pickups led to the extreme steps necessary to eliminate the effects of building vibration.

Amazing even to us, was the fact that the pick-up that gave the best results was a relatively low-priced, high-impedance unit.

However, after equalizing and matching to low-impedance, the output was still within limits as to output (– 63 db).

The equalizer circuit, shown in Fig. 5, excels anything tried, which included every one we had ever seen or heard of — even equalized amplifiers.

After installation was complete and circuit continuity was established, frequency and distortion runs (with pre-emphasis) were made on the complete channels. The overall response is ±2 db, 30-16,000 cycles; and ±1 db, 20-20,000 cycles, without the limiting amplifier. The distortion is less than ½ of 1% over the frequency range. Next, the heads were connected and exhaustive runs were made by actually cutting the frequency runs and checking the resulting cuts by the light pattern method. Equalizers were installed and adjusted until less than ±1 db variation resulted between 800 and 10,000 cycles. The pre-emphasis equalizers were then inserted and frequency runs repeated until the recorded results were well within NAB limits. A frequency run from a resistance capacity oscillator through the recording channel, played back through the dubbing channel and measured on a distortion meter showed a maximum of 1% distortion for all the equipment involved.

Periodic frequency runs and distortion measurements are made, and each needle and disc is noise tested by actually playing and measuring the test cuts on the dubbing channel.

A routine check of the overall system noise level revealed the following: After recording continuously for 9 hours on each of the four recorders, one was picked at random and the playback noise from a test cut, as measured on a G. R. Noise Meter, showed a –50 *db* noise under normal program level of 6 c.m. stylus velocity. Needles used were Audio's Microgroove No. SM 14, and the disc, of course, was a Red Label Audiodisc.

by C. J. LeBel, Vice President, Audio Devices, Inc.

TAPE BASE MATERIAL

C. J. LeBel

As every experienced engineer has found, it is not possible to make a product which is the ultimate in every single respect, because many properties are achieved only at the expense of others. In short, a good design is one in which conflicts have been resolved to yield the best *overall* performance. The cellulose acetate we use for a tape base material is no exception to this rule.

It will be recalled that two years ago we discarded vinyl copolymer base, and adopted cellulose acetate, because the desirable properties of the vinyl were attained at the expense of too many faults. Cellulose acetate seemed to have a better balance of characteristics, and time has verified this judgment.

There are a number of grades of cellulose acetate, differing in the degree of plasticizing. The minimum amount of plasticizer produces a hard, brittle material. Increased amounts increase the flexibility, until finally a very soft, rubbery characteristic is produced.

In choosing our base material it was necessary to conform to NAB standards, and this indirectly fixed the thickness of the base at .0015 inches. Adequate strength had to be provided, in this thickness. Normal recording machine tension would have to produce as little permanent stretch as possible, otherwise the program would take longer to reproduce than it should. At the same time, the material would have to withstand the shock of rapid machine reversal, so that impact strength was also necessary.

These stringent requirements ruled out the heavily plasticized acetate, leaving only the light and medium plasticizing to be compared. Recording-wise, the medium grade was preferable, for its improved flexibility allowed the tape to maintain better contact with the head, a guaranty of better high frequency response and smoother motion through the machine. The question was, would the strength prove adequate?

Upon measuring the permanent stretch with various loads, we were surprised to get the result shown in figure 1. Both minimum and medium degrees of plasticizing produce the same permanent stretch at all loads up to 2.5 lbs., and the curves diverge only above that value. At higher loads the greater resilience of the medium plasticizing allows more stretch. We can better evaluate these results if we recall that normal recorder tape tension is of the order of ¼ to ⅝ lbs. The peak tension during reversal, machine manufacturers tell us, is never over 1¼ lbs. In the normal working range, then, the two acetates stretch identically. At heavy peak loads the medium material can give resiliently, where the light would prove too brittle.

Since the breaking strength for both materials was in the 4½ to 5 lb. range, we standardized on the medium plasticizer content.

It is interesting to note that the breaking strength of tape is seven to twenty times the normal working stress. This is a factor of safety worthy of the bridge builder, and certainly very conservative.

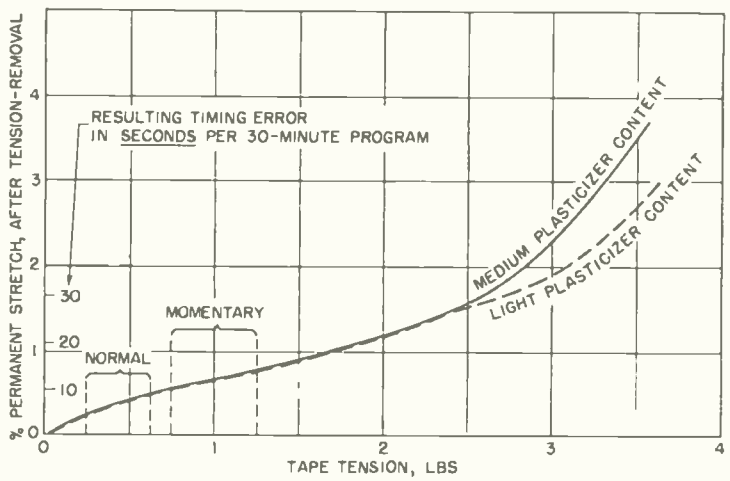

FIG. 1 — Relation between tape tension and permanent stretch after tension is removed. Note extra scale showing corresponding timing error if continued for 30 minutes.

Audiotape Now Available in 2500-foot Rolls

(*Continued from Page 1, Col. 3*)

2. The full measure of 2500 feet gives *4% more tape* than the usual 2400-foot reel.

3. There are absolutely no splices in the entire 2500-foot roll. It's guaranteed to be *all one piece.*

4. Audio Devices also *guarantees* that volume deviation within a 2500-foot reel, at 1,000 cps, is not more than $\pm 1/4$ db — and not more than $\pm 1/2$ db from reel to reel. These are *outside limits* — not averages!

5. A unique, specially-designed package (patent pending) makes handling and storage of the tape much easier and safer than ever before — especially when used or stored on the hub alone.

The new Audiotape package is illustrated in detail in Figures A, B, and C. The outside section of the container is made of stiff, durable cardboard, while the folded-over inner section which holds the tape is of rigid corrugated board to provide extra stiffness for easy handling. One side of the inner section has a wide slot, as shown in Fig. B, while the other side, shown raised up in Fig. C, contains a wooden core which fits snugly into the aluminum hub. To transfer a roll of tape on the hub from the box to the horizontal turntable of a professional recorder, it is only necessary to hold the inner container and tape in the position shown in Fig. C — place it over the turntable hub, and then slide the container out from under the tape. In this way the tape itself is firmly supported at all times, and there is no danger of its slipping from the hub or becoming unwound. After use, the roll of tape on the hub can be easily returned to the container by reversing the above operation. Simply slip the slotted side of the container under the tape, then fold over the other side until the wooden core engages with the hub, and it's all ready to pick up and slide back into the box.

Conversion from hub to reel is also greatly facilitated by this unique container. Side flanges can be screwed onto the hub while it is still in the container, as shown in Fig. D and E. With the slotted portion down, simply place the flange over the hub and drop the bottom halves of the three sleeve screws into place as in Fig. D. Then fold the solid portion of the container down onto the reel. This will hold the sleeve screws in place and the container can be turned over so that the flange is on the bottom of the roll. Then lift up the slotted portion, place the top flange over the hub, and insert the other halves of the sleeve screws, as in Fig. E. There's no danger of dropping the screws, or letting the tape slip from the hub. The side flanges from a complete reel can also be easily removed from the hub while the tape is still in the container.

When the tape is stored on the hub in the container, it hangs from the fixed hub-core so that the tape does not rest on itself. Thus, there is no danger of flattening the bottom of the roll or damaging the edges of the tape. And since reel flanges can be attached to the hub so quickly and easily, it saves the expense of storing tape on the reel, even when complete reels are required for use on a particular machine.

The new Type 2551 Audiotape is packed 5 boxes to a carton, and is now available through local Audiotape and Audiodisc suppliers all over the country.

FIG. A. — Audiotape box for 2500-foot roll, showing inner section, with tape on hub, withdrawn from container.

FIG. B. — Inner section of Audiotape box, with slotted portion raised, showing 2500-foot roll on hub, engaged with wooden hub-core on bottom portion.

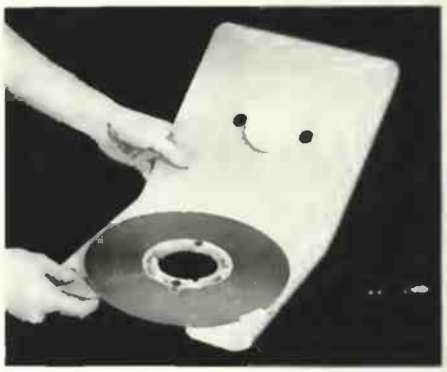

FIG. C.—Inner section of box turned over, with roll of Audiotape on hub resting over slotted portion — in position for placing tape on horizontal turntable of recorder.

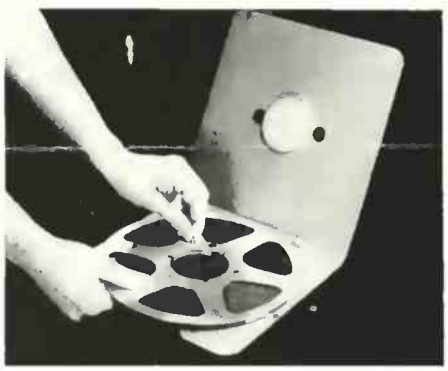

FIG. D. — Inner section of box in same position as Fig. C, showing one reel flange in place and sleeve screws being inserted.

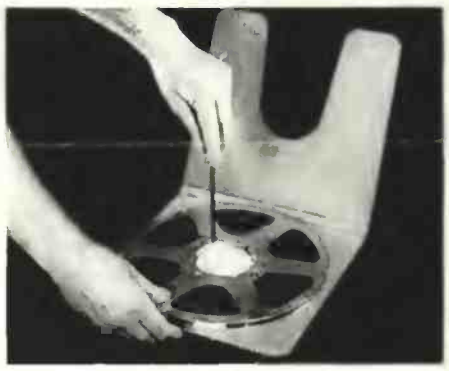

FIG. E. — Inner section of box turned over, with the other reel flange being screwed in place.