

one channel and calibrated to read peak watts disclosed that the absolutely clean sound filling the room reached electrical outputs of 75 watts.

Performance quality was limited only by components external to the amplifier: loudspeaker systems and signal sources. The amplifier imparted no muddiness whatsoever. Attack time was minimal and precise (see tone bursts, Fig. 7, and square-wave response, Fig. 8). No amount of loud listening could induce the least bit of "fatigue"—a subtle measure of an amplifier's distortionless qualities. This will doubtlessly induce owners to play music "loud," thus obviating the need for tonal adjustments to compensate for the Fletcher-Munson effect at low listening levels.

In summary, let the prospective purchaser beware! If you plan to purchase the AR amplifier, you had best look to your loudspeaker systems and signal sources such as tuner, cartridge, turntable, and tape machine. The AR stereo amplifier will reveal many deficiencies in allied equipment that are hidden by lesser-quality amplifiers. For example, what was thought to be some form of low-frequency instability during quiet musical passages turned out to be a fair amount of low-frequency rumble (doubled and tripled by the loudspeakers, making it audible) emanating from our highly respected turntable. To combat this deficiency in auxiliary equipment, an "outboard" rumble filter with a cut-off frequency of about 30 Hz was installed. From that point on, nothing marred flawless reproduction. The variable cross-over tone controls enabled us to properly equalize some older recordings (pre-RIAA) which we prize for their dynamic range and recording quality.

In our estimation, the AR stereo integrated amplifier has no peer in its price category insofar as performance is concerned. And it outperforms most units of its type that cost much more than it does. The only area where it falls down is in providing operating frills such as a stereo headphone jack, a rumble filter, and a loudness control, among others. The need for these can be circumvented, of course, but it would be a minor nuisance to do so. This is an insignificant deterrent to one who wishes to own a magnificent piece of equipment, however. For where else can you get an integrated amplifier at \$225 that could flaunt 150 watts of music power (if AR wanted to use music power ratings instead of rms power ratings) with such immaculate amplifying ability? At this writing, AR has wrapped up this class for themselves.

Check Reader Service No. 54

Garrard Synchro-Lab 95 Automatic Turntable

The Garrard line of automatic turntables over the past few years has employed the Volkswagen philosophy of incorporating advances into its machines without changing physical appearances (or model numbers, in this instance). However, there comes a time when the improvements—and the requirements—outgrow the earlier models, and a new unit is born.

Such is the case with the SL-95, the current Garrard "top-of-the-line" unit. Mounted in the usual fashion on a stamped steel base plate measuring 12 $\frac{3}{8}$ x 14 in. and supported on four damped spring mounts, the unit is literally full of innovations.

To begin with, a new "Synchro-Lab" motor is used to maintain a constant speed over a wide range of line voltages, and yet still have sufficient power to insure a fast start when first turned on. The motor is a combination of an induction motor—such as are used in most turntables—and a synchronous section. While a large synchronous motor can serve satisfactorily for both starting and running, this is an uneconomical solution, since the synchronous motor is expensive to build, and if it is to have sufficient power, it becomes relatively heavy. By combining the two sections, sufficient starting torque is provided, and in addition the advantages of the synchronous motor are retained. These advantages are quite well known, but to the novice, there is no harm in restating them. This type of motor has the advantage of running at a speed which is entirely dependent on the frequency of the line power rather than on the voltage of the supply. In many localities there is likely to be a variation in the line voltage during the day, yet all—or nearly all—domestic electric power is maintained at an exact frequency of 60 Hz/sec so that electric clocks, which use small synchronous motors, will keep exact time.

Fig. 2—Closeup of tone arm shows adjustable sliding counterweight (rear of tone arm), calibrated stylus-force gauge (circular dial underneath tone arm) and anti-skating control (foreground).

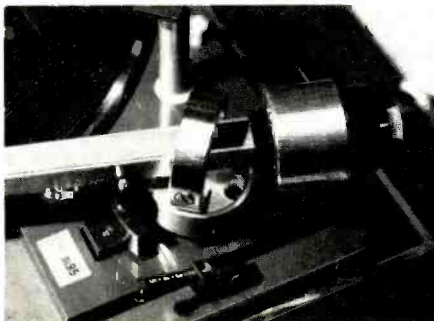


Fig. 1—Garrard's top-of-the-line SL-95. "automatic transcription turntable"

Old timers will remember the Crock-er-Wheeler motor which was used in early motion picture theatres in the Western Electric 208A Non-Synchronous Reproducer Sets to provide sound during intermissions or whenever sound was being presented to the audience without originating on the sound track of the film itself or from a synchronized Vitaphone record. These Reproducer Sets consisted of a heavy—35-pound—turntable/motor which used an induction disc section to bring the turntable up to speed and a synchronous section to hold the speed to the desired 78.26 rpm. These motors were superb for their purpose, and many an early hi-fi buff secured one of them for his record playing facility. They did have one disadvantage for those days—they had a strong hum field which practically ruled out magnetic pickups.

Garrard has adopted a similar arrangement for the SL-95 motor (which is also used on the SL-75, SL-65, and SL-55) and it performs just as well as claimed. Over a voltage range from our available 140 down to 35, the turntable speed remained constant, and while playing a piano record, we varied the line voltage from maximum down to 35 volts with nary a wow. This is an important consideration in the choice of a turntable.

The drive method consists of a stepped motor pulley and an idler.

Another feature is the tone arm and its miscellaneous advantages. In the

Fig. 3—Garrard's record platform rises into position for automatic play when the button next to it is pressed. The platform is retracted out of the way for convenient manual use.

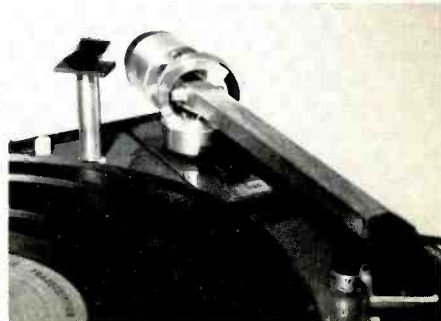


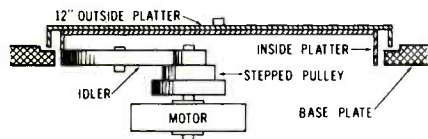


Fig. 4—Combined speed and record-size selector. (The SL-95 has 33 $\frac{1}{3}$ rpm, 45 rpm and 78 rpm speeds.)

first place, it is constructed of a combination of a low-resonance wood—afroormosia, they call it—and an aluminum frame. It is light, and without apparent resonance in the audible spectrum. The head is integral with the arm, and the cartridge is mounted on a slide which slips into the head readily. The counterbalance permits the use of cartridges ranging in weight from 0 to 22 grams—yes, the arm *will* balance with no cartridge installed—which covers the entire current range of cartridge weights which extends from 1.5 to 18.5 grams. The stylus force is adjustable by a small dial on the underside of the arm from 0 to 5 $\frac{1}{2}$ grams. (See Fig. 2). This dial is calibrated in $\frac{1}{2}$ -gram divisions, and further provided with $\frac{1}{4}$ -gram click stops. At the left of the arm pivot is a record platform which is used for automatic playing. The platform can be depressed for manual playing simply by pressing down on its top; it rises by depressing a white button adjacent to the base of the platform.

Anti-skating correction is provided by a small arm which carries a sliding weight over a calibrated scale. The arm

Fig. 6—Dual platter construction is illustrated, with a 12-in. aluminum turntable platter and a 10 $\frac{1}{4}$ -in. drive section. The entire platter assembly weighs 3 $\frac{1}{4}$ lbs.



rises as the arm moves toward the center of the record, thus compensating for the lesser amount of correction needed toward the center of the disc. This type of anti-skating compensation maintains a fairly correct force because of the reduction of the length of the lever arm as the arm moves across the record. At the outside where the most correction is needed, the lever arm is longest. At the center, it is shortest, as it should be to reduce the amount of corrective force applied.

The SL-95 operates at three speeds, and the speed and record diameter are set by a single selector lever. This lever is set at one of five positions—12-in. 78, 7-in. 45, and 12-, 10-, and 7-in. 33 $\frac{1}{3}$. Thus it will not intermix 12- and 10-in.



Fig. 5—Combined manual-cueing-pause control is shown at left; automatic control lever at right.

records, but this is of little importance since the 10-in. record is now a rarity, and the absence of the interchangeable automatic play should be missed only by the rare individual who has a large collection which contains many records of both diameters. It will also be noted that the SL-95 does not operate at 16 $\frac{2}{3}$ rpm, but few users have them anyhow.

The operating controls are centered at the right front of the base plate, and consist of two selector levers similar in appearance to the speed/diameter selector. One lever is for automatic operation, and starts, rejects, and stops the automatic operation. The other lever is for manual operation, and has three positions—PLAY, LIFT, and STOP. When the lever is thrown to LIFT, the arm rises and remains up until the lever is returned to the PLAY position, when the arm lowers to a position about four grooves ahead of where it lifted, thus replaying a few seconds of the record. The STOP position returns the arm to its rest and stops the motor, with the idler retracted from the motor pulley. A small lever at the base of the arm rest serves to lock the arm to the post. The usual locking screws are provided to hold the unit solidly against the motor board while the turntable is being transported.

The turntable mat is provided with grooves at the three set-down positions so that in case the arm is lowered to the turntable when no record is there, the stylus simply rides in the grooves, rather than being thrown off the platter and possibly damaging the stylus.

The turntable platter is of stamped aluminum, and is relatively "dead" so as to transmit no resonances to the stylus. It is composed of two separate sections, with the inner one serving as the driven surface which is contacted by the idler.

The platter consists of two "pans" which are attached to a die-cast center section which contains the actuating pinion gear. The outside diameter is 12 in., and the inner driven pan is 10 $\frac{1}{4}$ " in diameter. This is the rim which is driven by the idler wheel making simultaneous contact between the motor pulley and the rim of the inner "pan." The entire platter assembly weighs 3 $\frac{1}{4}$ lbs. The reason for the double-pan construction is that the visible portion is

outside the base plate, whereas the deeper section of the driven pan provides for the up and down movement of the idler wheel.

A base is available as an accessory when the unit is to be used on a table or shelf. This base is a molded plastic simulating ebony and walnut, with silver trim. Another similar unit is available with a lighted rocker switch mounted on the front apron to permit "Power-Matic" operation so as to turn off the entire system when the last record is finished. Both bases are also available with molded accessory trays which accommodate both long and short spindles and the 45 adapter. The cover keeps the accessories dust-free, yet immediately accessible.

The automatic spindle permits handling six records automatically, with gentle changing. The single-play spindle is in two parts—the upper section rotates with the record.

Performance

Measured cycling time for the SL-95 shows that set-down occurs 10 sec. after actuating the start lever, and that record changing takes only 14 sec. from the last note on one record to the first note on the next. This is relatively fast for 33 $\frac{1}{3}$ records, but is exceeded at 45 by only three seconds, and by five at 78 rpm. At this higher speed, the arm action is rather abrupt, and the stylus is apt to bounce once or twice on set-down.

Tone arm resonance is below 10 Hz. Tracking error does not exceed 1.5% at maximum and minimum diameters.

Changing is initiated by the run-in groove, and is effective down to stylus forces as low as $\frac{1}{2}$ gram. Suitable operation is obtained with stylus forces of as low as 1 gram (using a Shure V-15 cartridge) although for optimum performance, a force of 1 $\frac{1}{2}$ gms. is recommended.

Rumble was measured at 32 dB below 3.54 cm/sec on stereo, and 36 dB below on mono, with the principal energy content in the vicinity of 3 Hz, which corresponds to the rotational speed of the idler, which is approximately 170 rpm. Wow and flutter were between 0.20 and 0.25 per cent, all occurring in the frequency range from 0.5 to 6 Hz, since the range from 6 to 500 Hz showed practically no flutter at all. In all, the performance is quite acceptable for any but truly professional studio equipment. The SL-95 is priced at \$129.95, and the co-ordinated base at \$5.95. The Power-Matic base is \$15.95 with the accessory tray, \$14.95 without. A dust cover of clear styrene is available at \$5.95.

Check No. 57 on Reader Service Card