

# Equipment Profile

## SOLID-STATE KNIGHT-KITS— KG-895 INTEGRATED AMPLIFIER KG-790 AM-FM TUNER

Those who have followed the kit market cannot help but notice the increasingly higher quality of recent models. In the case of Knight-Kits, the introduction of the KG-415 Tape Recorder was a turning point—no one will deny that the electronics of the 415 are excellent, and the combination of the established Viking transport with the well-designed electronic chassis results in a great instrument.

We mention the 415 because of the similarity of some of the elements of it with those of the KG-895, since the preamps in the latter appear to be identical to those in the recorder. Furthermore, the over-all appearance of the panels of the recorder and the amplifier are sufficiently similar as to make them an ideal matching combination. The KG-790 tuner panel is a perfect match for the amplifier—same size, same design, and same type of knobs. If we sound enthusiastic over these units, it is because we are.

### The KG-790 Tuner

Of the two units, the tuner is the easier to construct because the entire FM-front-end-and-i.f. section is completely factory-wired, and simply mounts in a cutout on the chassis. The builder has only to construct the AM section, the multiplex section, and the chassis wiring, and the job is complete. The instructions are superbly detailed and we found absolutely no errors in them, nor did we find any steps which we would consider

Fig. 1. The Knight-Kit KG 790 tuner shown in its optional walnut enclosure.



out of order to make the job easier to complete. This is in itself unusual, and of course the ideal condition, for kits are designed not for the experienced builder, but for the novice, and while an experienced builder might have no trouble even if there were errors or out-of-order steps, it is likely to frighten the novice if he finds some step difficult or almost impossible.

The circuit employs 22 transistors and 13 diodes, three of the latter in the power supply section. Both AM and FM sections have r.f. amplifiers, and four i.f. stages are used for FM, only two being required for AM. In the FM circuit, a.g.c. voltage is fed to the r.f. amplifier from the first i.f. stage, and a.f.c. is provided by a d.c. feedback loop from the ratio detector to the oscillator in the front end. The multiplex section is reasonably conventional for a solid-state tuner, except that the switching of the 19-kHz doubler is effected by a pair of transistors actuated by the a.g.c. voltage. Thus unless there is adequate signal, the set remains in the mono mode; not only does the 19-kHz pilot signal have to be present, but the over-all signal level

has to be at a preset value. The 38-kHz switching signal is derived directly from the pilot through a doubler, and no 38-kHz oscillator is employed. Two other transistors are used in the muting circuit, and in the presence of a low level of signal, they cut off the collector voltage supply to the last i.f. stage and the first multiplex stage. These muting transistors are controlled by the third i.f. stage. In this circuit, all of the i.f. stages act as limiters, and consequently there is a control voltage available from any one of them. The muting level is settable by a panel control, and one panel-mounted switch controls a.f.c., while another switch controls on the stereo indicator light, and separate output stages are provided for the right and left channels, of course.

Two outputs are provided for each channel—one for the normal amplifier input and one for a tape recorder. In addition to separate level controls for the two output channels, there is another level-set control for AM. A rotary function switch with four positions—off, AM, FM, FM Stereo controls the circuitry and indicator lights show which position it is in.

In performance, the KG-790 leaves little to be desired. Its IHF usable sensitivity is approximately 2.5  $\mu\text{V}$ , with i.f. rejection of greater than 80 dB, and AM rejection of 37 dB. Audio output measured approximately 1.0 V, both on AM and FM. AM sensitivity for 20 dB quieting measured at 3.4  $\mu\text{V}$ . Both circuits are relatively wide-band, and the 10-kHz rejection filter in the AM side is needed because of the response. FM i.f. bandwidth is about 300 kHz at 6 dB down, and the detector bandwidth, peak to peak, is slightly over 600 kHz. Stereo separation measured 43 dB, and 19- and 38-kHz suppression was better than 50 dB.

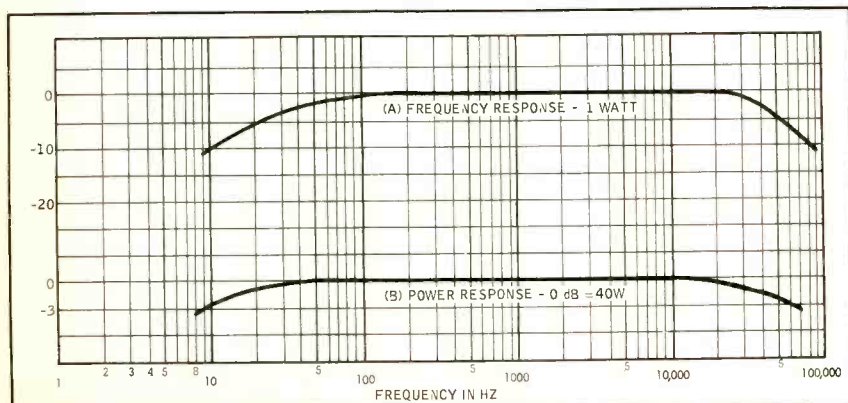


Fig. 2. The Knight-Kit KG-895 amplifier's power and normal-listening-level response.

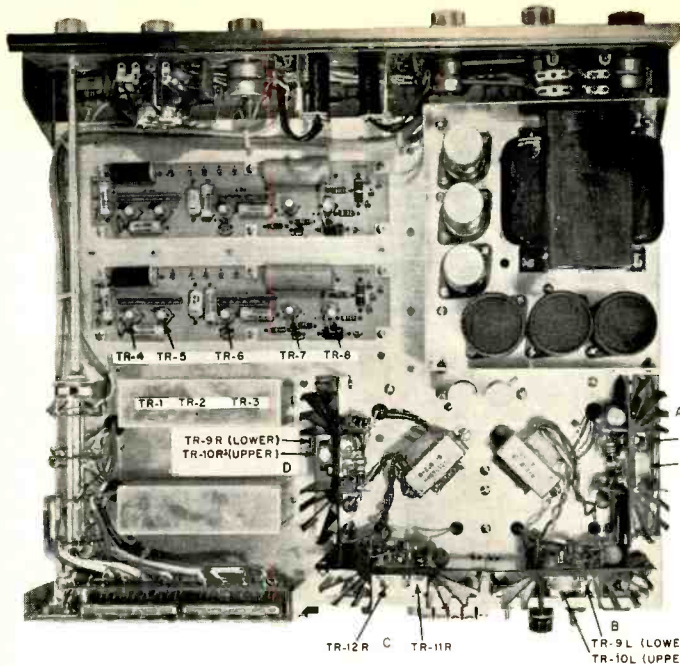


Fig. 3. A topside view of the KG 895 showing the circuit layout. The preamp circuit boards and power supply are evident. The lower right corner shows the array of heat sinks that hold the power transistors.

### Construction

As previously noted, construction is relatively simple. Both the multiplex section and the AM tuner are constructed on printed-circuit boards, and the chassis is well laid out and easy to wire. One innovation is the use of Nylon cable clamps (which we first saw in the KG-415) that keep the wiring neat and almost professional in appearance. As there is no alignment of the FM front end or the i.f. strip, getting the tuner in operation is a cinch. The AM section aligns quite simply, requiring only the adjustment of one coil and three trimmers to ensure dial calibration. There are four coil adjustments and one potentiometer setting in the multiplex section, and these are aided by a test switch. Sliding the switch to position "A" enables one to adjust two coils for maximum indication on the tuning meter, showing the correct alignment of the 19-kHz circuits; then with the switch in the "B" position, two other coils are similarly adjusted, still using the tuning meter for indication of optimum setting. The potentiometer is then adjusted on a stereo station so that the indicator light just goes on. This should be done on a station of medium signal strength.

On the whole, this tuner represents a good value at \$139.95. Another \$19.95 gets you an oiled-walnut wood case.

### The KG-895 Integrated Amplifier

Here is a kit amplifier which includes most of the features usually found only on the more elaborate factory-built units—illuminated windows to indicate the signal source, loudness control of the contour-switch type, speaker switch which cuts off all speakers for headphone listening, remote/main speaker switch, high-cut and lo-cut filter switches, tape-monitor switch, and even a speaker-reversing switch for one channel to correct phasing. And with all of this, a

total of 120 watts music power—40-watts continuous sine-wave power output per channel, and all for \$149.95.

Referring to Fig. 4, across the top are the balance control, dual concentric bass and treble tone controls, the six indicator-light windows, level control, loudness switch, and selector—a six position switch with no stops so it can be rotated continuously. On the lower row are the phone jack, speaker on/off switch, remote/main speaker switch, stereo/mono switch, power switch, channel reverse switch, hi-cut and lo-cut switches, and the tape monitor switch. The phase-reversing switch is on the rear apron, and on the input panel on the rear are separate input level-set controls, one for each channel on phono, tuner, and the aux inputs. Also provided are two convenience outlets, normally with one switched and one "hot" although instructions are



Fig. 4. The Knight-Kit KG 895 Integrated Amplifier shown in its optional walnut enclosure.

given for making a simple change which will make both receptacles hot. Separate input pin jacks are furnished for feeding a recorder and accepting its output wired to the monitor switch.

The unit employs a total of 26 transistors—eight of them power types—and eight diodes. Input switching and equalization changing take place around the input module, which consists of three transistors (the same module as in the

KG-415) followed by a driver panel on which are five more transistors per channel. Four power transistors per channel are used in the output stages, with each pair on a separate heat sink. These sinks are mounted over appropriate openings in the chassis for ventilation. The output circuit is similar to that used previously in Knight-Kit amplifiers, and uses a transformer between the driver and output stages. One half of each output stage is positive with respect to ground and the other half is negative, the junction between them being essentially at 0 potential for d.c., but at the speaker signal level for a.c. There are no output coupling capacitors, (which introduce a comparatively high impedance in series with the speakers at low frequencies), but instead are two 2-amp. circuit breakers, one in each channel. In case of a shorted speaker line, or a too-great signal, these circuit breakers open up for about three seconds and then close again. If the short still exists, or if the high signal is still present, the breakers will open again. We have kept them opening and closing for several minutes with no apparent damage, both with the speaker line shorted (accidentally, we admit) and with an excessive signal level.

The loudness-control circuit is interesting in that it permits the user to set it at 5, 10, or 15 dB below normal high listening level when it is desired to listen continually to the lower levels. Thus the degree of compensation is not dependent on the setting of the volume control, but only on the setting of the loudness switch. This is a desirable feature, in our opinion, because the user is likely to listen for a long period at the lower level—such as late at night—and would want everything compensated for the lower level, rather than being dependent on the volume-control setting.

In performance, the KG-895 is consistent. It doesn't make much difference whether both channels are putting out

the maximum signal or only one—the distortion remains about the same. With both channels fully driven, the power output per channel is about 1 dB less than with only one channel operating. The half-power points are at 9 Hz and 65 kHz, which is excellent. Frequency and power response are shown in Fig. 2, the former at 1 watt. Both channels measured within ½ dB of each other, in high-level and low-level positions,

with volume-control tracking within 2 dB throughout (to -40 dB). Loudness-control bass boost measured 3, 5½, and 7 dB at 50 Hz for the +5, +10, and +15 settings of the switch. Specifications claim a harmonic distortion of 0.7 per cent at 40 watts output with both channels operating. This figure was met easily, and the figure remained at that value down to about 10 watts, then lowered to 0.5 per cent at 1 watt. IM distortion 0.9 per cent at 40 watts output per channel, with both channels operating.

Hum and noise measured 67 dB down on phono, referred to a 10-mV input signal; the high-level inputs ranged between 70 and 75 dB; tape head was 62. Separation at 1000 Hz was 57 dB, and the output for a tape recorder was just over 0.5 volts.

As a general purpose amplifier for stereo use, the KG-895 offers excellent value; as a companion for the KG-790 tuner, it is a perfect match. It was not difficult to build, and from the first time it was turned on, it worked and tested as indicated.

Check 1

### Shure V-15 II Stereo Cartridge

As phono cartridges get better and better, we find ourselves with less and less to say. Perhaps ultimately we will get to one-sentence reviews. This report is short because we find this new version of a cartridge we already liked a significant improvement.

We refer you to James Kogen's articles in November and December 1966 for a complete discussion of the technical development of the V-15II. The frequency response and channel separation shown in Fig. 6 is self-explanatory.

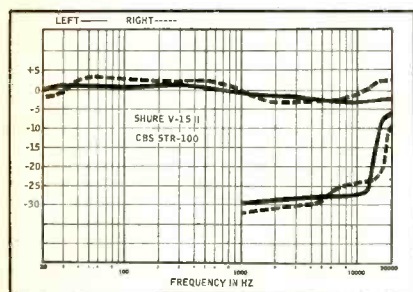


Fig. 6. Frequency response and channel separation of the Shure V-15 II. The test record is the CBS STR-100.

So are our other measurements:

Dynamic compliance— $6.5 \times 10^{-6}$  cm/dyne vertical or lateral.

IM Distortion, CBS-STR111—

- + 6 dB is 1.3 per cent
- + 9 dB is 1.8 per cent
- + 12 dB is 2.5 per cent
- + 15 dB is 4.2 per cent

Output—Left channel is 4.2 mV; right channel is 3.8 mV, referred to 3.54 cm/sec. recorded velocity at 1000 Hz.

These are fine figures. Add to them a square wave that confirms the above

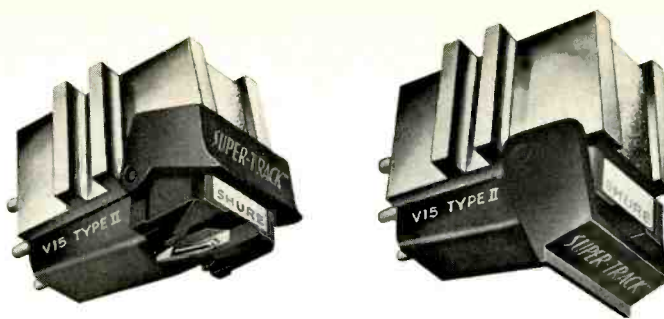


Fig. 5. The Shure V-15 II Stereo cartridge. The two photos show the built in "flip-action" stylus guard in playing or protecting positions.

20-kHz resonance that is apparent on the frequency-response curve and you come up with a first-class cartridge.

This gives only a hint to the superb sound that this cartridge extracts from a disc. The fact is that we are hearing things more clearly than we have heard before. And that is what an improved model is supposed to do.

The biggest audible improvement is on the higher frequencies. Where the older cartridge tended to touch a bit of *edginess*; there is no such case here. The V-15II is as sweet as you could want.

That says a lot and it says all that  
Check 2

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Purchasers of the Shure V-15 II are entitled to send away for a free 12-in. record designed to test the tracking capabilities of a cartridge. The record contains a series of musical samples, instruments selected to display specific tracking problems. Within each series there are several bands of progressively increasing loudness. The object here is to see if your cartridge will track all the bands successfully. The design of the record is such that small tracking errors will show themselves readily.

Our Shure V-15 II sailed through the record with near perfection. Of several other cartridges tried, one other also did so; some others revealed one or more slight deficiencies.

We believe that this is an impartial and valuable tool. With this record, any number of cartridge faults may be isolated. (And identification is the first step to cure.) V-15 II owners get the record free as we said. Non-Shure purchasers may have the record for \$3.95. Order it directly from Shure Bros., 222 Hartrey Ave., Chicago, Illinois.

### IMC Boxer Fan

Do we have to tell you that even in this age of cool-running (relatively) transistor gear, proper ventilation of audio equipment is necessary?

But this is not always possible. The demands of decor, particularly when promoted by the hobbyist's distaff side, can be quite overwhelming. So the alternative soon becomes some form of forced-air cooling.

No one has ever discovered a method for moving air violently without making some sound. But careful design of the parameters of blade pitch and motor/blade balance can make significant strides over the usual kind of fan. Then too, the common household fan is simply more than is needed for discrete cooling.

This Boxer fan from IMC Magnetics is a specific product made to do a specific job. It will not cool a room; it's not meant to. But it can be placed in an enclosed cabinet where it will exhaust warm air (improving tuner stability, amplifier power output, and general component reliability). And it will do this with a minimum of noise and vibration. We were frankly surprised at the degree of quietness possible.

We do not have proper facilities to measure the cfm output of the fan. But it seems to us that it will be quite sufficient for a hi-fi cabinet or a television set. And installed properly with the mounting accessories supplied, it will produce very little noise. In fact our installation on the back of a Heath color-TV produces so little sound that it has proved no problem at all.

Check 3

Fig. 7. In addition to these parts the accessories included with the IMC Magnetics' Boxer Fan include an adhesive strip of sponge-type rubber.

