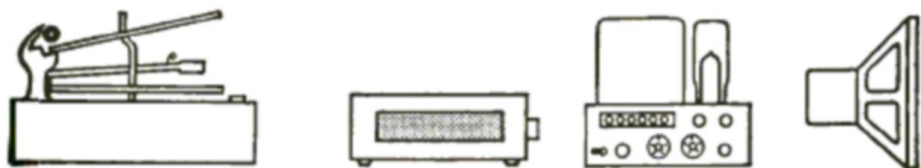


# EQUIPMENT



# PROFILE

## BOGEN SOLID-STATE FM-STEREO RECEIVER, MODEL RT-6000

The name Bogen has graced many fine high fidelity instruments over the years, extending back to the origins of high fidelity. Throughout this period they have been known as a maker of well-designed and well-engineered products. When Bogen literature specified performance characteristics, you could be sure that the product you bought would perform that well, if not better.

The RT-6000 is no exception; it performs exceedingly well, as claimed.

The RT-6000 is an FM-stereo tuner a stereo control center, and a 50-watt rms stereo amplifier, all on one 16" x 14" chassis which is 5½" high.

We should restate that slightly: The RT-6000 is a *completely solid-state* FM-stereo tuner, control center, . . .

Only a few months ago there was nary a completely solid-state receiver to be found. Without going into a lengthy discussion of the subject we must point out that it is much more difficult to make a completely solid-state tuner perform at component high fidelity standards than a tube unit. The Bogen RT-6000 is evidence that the problem can be solved.

Also, at the amplifier end of the instrument, the RT-6000 demonstrates a refinement of performance as compared to previous solid-state amplifiers with a similar output configuration. This we would expect. After all circuits of this

kind have been available for several years now and so have the devices.

### Control Center

The RT-6000 incorporates inputs and controls for accepting signals from a stereo tape head, a stereo magnetic cartridge, and a stereo high-level source, in addition to the built-in tuner. Outputs are provided for stereo recording and monitoring the recording. A headphone jack is provided on the front panel and slide switches are provided to select speaker or phone output as well as the monitor mode.

In addition to the usual tuning, volume balance, bass, and treble controls slide switches are provided for a.f.c. defeat, loudness defeat, stereo or mono mode selector, and stereo reverse. The source selector also permits selection of FM Mono or FM Auto.

In the FM Auto position of the selector, the set is automatically switched between the mono and stereo modes of FM reception depending on the availability of an FM-stereo source. Switching is completely silent and undetectable audibly.

A meter is provided to indicate FM signal strength.

Before leaving the front panel, it should be noted that the styling is quite handsome. The entire front panel is brushed gold and the knobs are also gold-colored. Its a pity the slide switches aren't gold too, instead of the usual dark brown.

The slide-rule tuning dial is of the new

"expanded" persuasion, measuring almost 7-in. in length. In addition, a logging scale is provided just below the megacycle scale. Very convenient for explaining the location of stations to the non-technical user. Certainly 4 is easier to use than 96.3 mc.

### FM Circuit

Viewing this solid-state FM circuit and comparing it with tube FM circuits, one is struck by the basic similarity. Except for some circuit constants related to tubes or transistors as devices, one could superimpose tubes in place of transistors throughout. If one takes off the bottom plate and examines the underchassis, it is very difficult to tell whether there are tubes or transistors on the top side except for the absence of tube sockets. The same rats nest of point-to-point wiring exists as has existed for many years.

Thus we note a common base (grounded grid in tubes) r.f. stage, straightforward mixer and oscillator. Following are four i.f. stages with a tap at the last stage to drive the meter circuit. A.f.c. voltage is taken from the output of the ratio detector.

The multiplex circuit is also straightforward and reflects the latest thinking. A circuit is included which decides when there is sufficient 19 kc pilot signal present to indicate a stereo program (some 19 kc is almost always present as harmonics of the audio signal or from other sources, but much lower in level than the pilot signal). If there is not enough pilot signal, the circuit "switches" the output to mono. The switching is electronic, which accounts for its speed and quietness.

### Amplifier Circuit

The amplifier circuit is also quite usual, employing feedback networks to achieve tape and phono equalization as well as bass and treble compensation. The phono input is loaded with 47k which is quite usual. The aux input is divided down to make it less sensitive rather than have it enter the circuit past the preamplifier stages. Thus if a sensitive uncompensated input is required, a microphone input for example, all one need do is remove some resistors.

The first two preamplifier stages are a 2N2613 and a 2N591 in that order. An output is then taken for the tape output which has another stage of amplification, a 2N408. The gauged volume control (all basic controls such as volume, bass, and treble are gauged) and the loudness compensation circuit precede the next amplifier stage, a 2N408. The following tone driver stage is also a 2N408.

The power amplifier section follows, with the signal going through a 2N2614



Fig. 1. Bogen RT-6000 solid-state FM-Stereo Receiver.

and a 2N408 to reach the driver transistor, a 2N2148. This is a rather husky driver section and is undoubtedly an important reason for the good performance of this circuit. The driver transistor feeds a transformer which acts as a driver to the push-pull output stage, consisting of a pair of 2N2147 transistors. A positive and negative supply of 22 volts is provided the output stage by a bridge rectifier in the power supply. Both supplies are fused as are the speaker output leads. There is no coupling capacitor to the speakers, thus eliminating a possible trouble spot.

The power supply for the remainder of the circuit is provided by a rectifier consisting of two diodes and then through a 40050 transistor in emitter follower configuration which supplies -38 volts, and then through two 2N408 transistors, also emitter followers, which supply -25 volts.

The amplifier circuit is designed to provide optimum power at 4 ohms, as we will note in the performance characteristics.

#### Performance

Starting with the tuner section we found sensitivity to be 2.7  $\mu\text{v}$  (IHF), crossmodulation index 65 db, selectivity (alternate channel) 37 db, capture ratio 4 db, AM rejection 55 db, and excellent pulse noise rejection. The RT-6000 pulled in 34 stations loud and clear on our standard antenna.

The amplifier section exhibited a very smooth response, being only 2 db down at 15 cps, rising to 0-db at 1000 cps and continuing smoothly to a level of 1 db at 10,000 cps, returning gradually to the 0 level at 20,000 cps, and then going down 1 db at 50,000 cps. This response was obtained at 20 watts rms at an impedance of 5 ohms. Power output at 5 ohms was 24 watts rms at a distortion of 0.7 per cent. At 8 ohms the output was less by about 20 per cent. Power bandwidth was 20 to 20,000 cps. IM distortion was just under 1 per cent with a 60 and 7000 cps signal mixed 4-to-1 at an equivalent output of 20 watts.

Altogether, the Bogen RT-6000 is a fine performer at a surprisingly low price. As far as we know its the first solid-state component-quality receiver at less than \$400. Circle 211