

tuner replaces the conventional tunable "local oscillator" with a frequency synthesizer whose frequency (corrected for the 10.7 MHz i.f. frequency) is displayed on a four-digit readout of some kind.

Frequency synthesizers are not new. They have been used for years in communications and laboratory equipment, but, at prices ranging from \$2,000 to \$15,000, they have obviously not appealed to audio-component manufacturers. The development of suitable IC's, manufactured in large quantities for industrial and military users, has completely changed this situation. Furthermore, the prices of numerical displays and their associated IC drivers and decoders have plummeted because of the huge market for small electronic calculators. As a result, a digital tuner, which would have cost thousands of dollars only a few years ago and would have been virtually impossible shortly before that, now costs little more than the better conventional tuners.

Actually, the advances in linear IC's, rather than the on/off digital variety, have had an even greater impact on the industry. The earliest use of IC's in FM tuners was in the i.f. amplifiers, where they offered advantages in gain, stability, and limiting effectiveness. Next, the FM multiplex (stereo) demodulator, with its four to twelve transistors, was replaced by a single IC that out-performed the discrete components it replaced. Most recently, the phase-locked-loop (PLL) IC has been used in some tuners and receivers for superior low-distortion FM detection. The PLL, incidentally, is a basic component of most frequency synthesizers and was in fact

originally developed largely for that application.

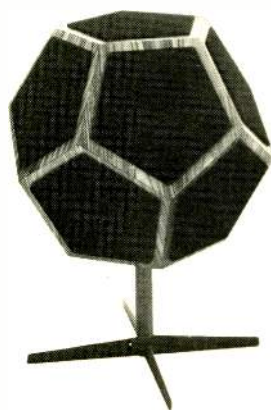
The well-known Dolby "B" noise-reduction system requires the use of a considerable number of transistors and other components, and this is reflected in the relatively high prices of a Dolby-equipped cassette recorder or FM tuner. An IC now in development will contain most of the Dolby circuitry, and should appear shortly in a number of moderately priced FM tuners and tape recorders. The original Electro-Voice quadraphonic decoding matrix was conceived and manufactured as a single IC. The latest full-logic SQ decoders, now made with discrete components, contain more than one hundred semiconductor devices and are therefore rather expensive. New IC's have now been developed that will permit the same job to be done with only three IC's at a correspondingly lower cost. The CD-4 quadraphonic discrete disc system now requires a rather complex demodulator, even with the use of several general-purpose IC's. As the market for these devices grows, we would expect to find them made up entirely of specialized IC's.

Developing a new IC can be so expensive (\$50,000 to \$100,000 is not uncommon) that only the existence or the potential of a mass market can justify it for a consumer application. Some old-time audiophiles tend to bemoan the growing popularity and watering down (as they see it) of their once-exclusive hobby. But it is only the entrance of components into the mass market that has enabled high-fidelity reproduction to reach its present state of technical sophistication.

EQUIPMENT TEST REPORTS

By Hirsch-Houck Laboratories

Design Acoustics D-12 Speaker System



● THE Design Acoustics D-12 is a true omnidirectional speaker system—one of the very few we have seen, and perhaps the only one to cover so effectively the full audio-frequency range. Physically, it is a dodecahedron—a twelve-sided enclosure—containing eleven drivers serv-

ing as a three-way system. The 10-inch woofer, operating in a volume of about $2\frac{1}{2}$ cubic feet, faces downward and covers a frequency range up to approximately 750 Hz. About an octave of mid-range is handled by an upward-facing 5-inch cone driver. Above 1,600 Hz, nine $2\frac{1}{2}$ -inch cone tweeters are arranged to radiate in such a manner that none of them is likely to point directly at a listener. The twelfth surface of the dodecahedron has a vent opening for the woofer cavity.

The D-12 has been designed to radiate a uniform acoustic-power output, integrated over a 360-degree solid angle, over its operating frequency range. With any loudspeaker in a typical home listening environment, most of the sound reaches a normally located listener indirectly after being reflected from one or more room surfaces. In the case of the D-12, practically none of the sound reaches the listener directly. Depending on room dimensions and furnishings, it may be desirable to reduce the high-frequency energy output, and this can be done by removing a jumper wire installed across two terminals near the

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