Single preamplifier/isolator drives If and vlf receivers

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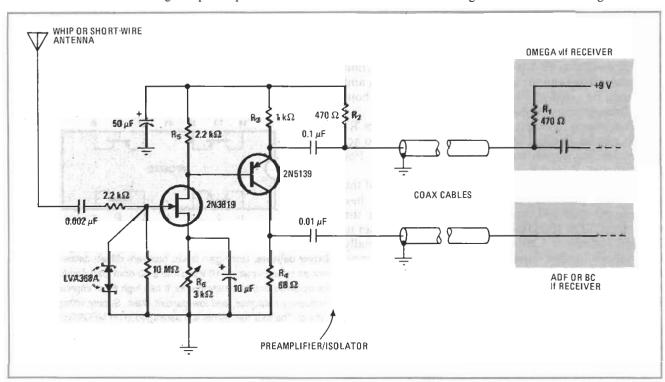
Some rf front-end circuitry proposed for Omega receivers [Electronics, Sept. 5, 1974, p. 98] has now been used in several flight tests of simplified vlf navigation for general aviation. The results showed that the first-stage MOSFET occasionally burned out in the presence of very close lightning discharges, and that a common antenna, such as the automatic direction finder sense whip, should be used for both the Omega navigation receiver and the ADF receiver.

Corrections for both problems are made in the circuit of Fig. 1. The MOSFET has been replaced by a low-cost junction FET that provides a gain of 2 or 3 and adequate low-noise performance over the frequency range from 5 to 1,500 kHz. An expensive wideband line-isolating transformer used in the original preamplifier has been

eliminated by using a simple resistor divider string (R₁, R₂) to carry power to the preamplifier and signal output to the Omega receiver over a single cable. A small resistor in the collector lead of the 2N5139 output emitterfollower provides a unity-gain buffer output for driving an ADF or broadcast-band receiver from the preamplifier at a low impedance level through a separate cable. Isolation between the vlf receiver (10–100 kHz and the ADF/broadcast-band receiver (200–1,500 kHz) is completely satisfactory.

The 2N3819 JFET is much less likely than a MOSFET to burn out with static charges, and the back-to-back zener diodes give gross protection from high-level short-duration burst interference. The atmospheric 5–1,500-kHz noise level is usually a limiting factor in high-out-put-impedance preamplifiers of this sort, so an ultra-low-noise MOSFET is not required.

Adjustment of source-bias resistor R_6 centers the operating point for equal positive and negative peak clipping on large signals. The circuit can handle input signal levels up to 0.1 volt rms before round-off distortion of the output waveform begins. For unity gain at the lf terminal, the ratio of R_4/R_3 is approximately $B \times A$, where B is the current gain of the 2N5139 stage and A is



Dual-purpose front end. Preamplifier/isolator circuit, fed by a single antenna, drives a vlf navigation receiver and an lf broadcast-band or automatic-direction-finder receiver. The two receivers are connected to the preamp by separate coaxial cables that can be as long as 100 feet. Circuit is designed for small general-aviation aircraft, so size, weight, and cost are minimized and ruggedness is emphasized.

the gain of the 2N3819 stage. A gain of 2 or 3 at the vlf output is desirable to drive the additional filters and

limiting amplifiers in the Omega receiver. This isolating preamplifier can also be used in ground-station monitors with a single wire antenna

driving two receivers, such as a WWVB 60-kHz time ref-

C, and so forth. One of the receivers must supply power

to the preamplifier, as shown in the figure. The upper

erence plus 100-kHz Loran C, or an Omega plus Loran

frequency is limited to 1,500 kHz by the low-cost JFETs; somewhat higher-frequency performance might be achieved with JFETs such as the 2N4416.