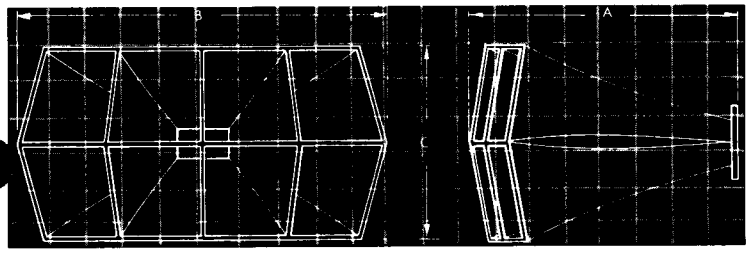

ALTEC ENGINEERING NOTES

TECHNICAL LETTER NO. 226

MEASURING LOUDSPEAKER IMPEDANCE BY THE 'CONSTANT CURRENT' METHOD

General

When checking out a sound system, it is usually desirable to measure the impedance of speaker systems at a number of frequencies. The GR1650B bridge is not useful for locating certain errors in system installation because it measures impedance only at 1000 Hz. Some mistakes become evident only at fairly low or high frequencies. For example, if the line-to-voice coil transformers in a 70-volt distributed system were being used beyond their rated capability, a drastic drop in impedance at low frequencies might be measured, whereas a decrease of nominal impedance value at high frequencies could be caused by faulty components or improper wiring.

The 'Constant Current' method of measuring loudspeaker impedance provides a means of isolating problem sources at all audio frequencies. It is especially useful in applications where maximum loads are to be placed across amplifiers because it quickly reveals an overload condition at any frequency. This method also enables the fundamental resonance frequency of a loudspeaker to be accurately determined because at resonance the speaker's impedance rises to perhaps two or three times its nominal rating, often because of the increase in back EMF from the speaker.

Method

According to Ohm's Law, if a load is driven by a constant current, the voltage across the load is proportional to the load impedance. In Figure 1, an approximate constant-current source is obtained by placing a 1000-ohm resistor (R_L) in series with the amplifier and the speaker load (Z_L). A switch (S) is used to short circuit Z_L while the amplifier output is calibrated to produce a 10-volt drop across R_L. The internal source resistance (R_g) of the amplifier is quite low, so the terminal voltage of the amplifier will not vary appreciably over the impedance range being measured. With the switch open, the current will flow through the speaker load and vary slightly, but rather than monitor the current to maintain a constant level, Figure 2 may be used to derive Z_L.

The voltage ('V') across the unknown Z_L is measured with a VTVM. Note that from 1 to approximately 100 ohms, Z_L is nearly equal to 100 x 'V'; Z_L departs markedly from this factor only in the range between 100 and 1000 ohms.

The 'Constant Current' method for measuring Z_L can be performed with any ALTEC amplifiers capable of producing the necessary output voltage, e.g., 1590, 1593, 1594, 1607 and 1608. This method can also be used with the 1609 biamplifier, measuring HF and LF sections individually. The 8-ohm taps should be used in all measurements.

Litho in USA CP-673-2.5K

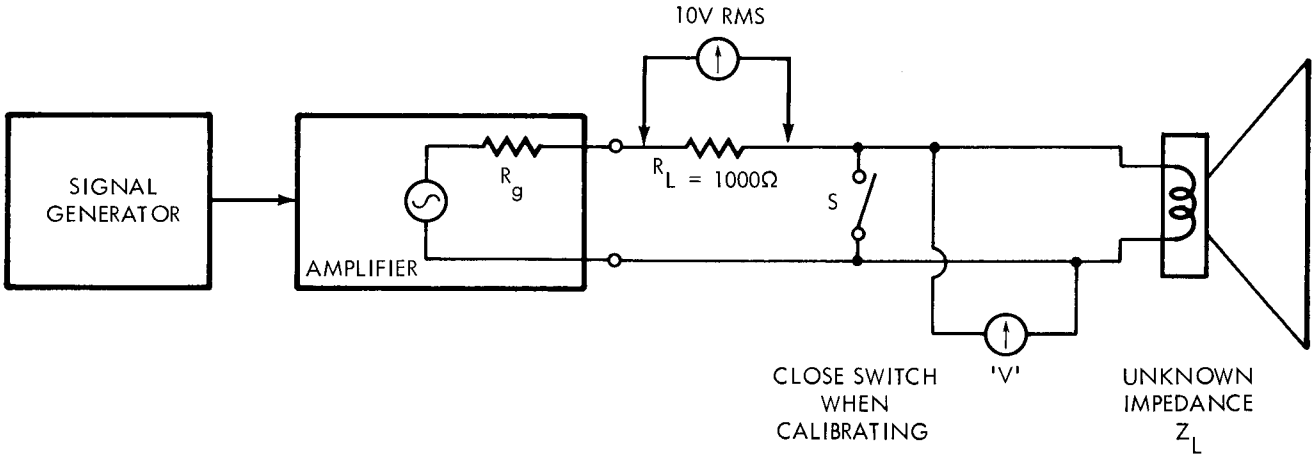

Figure 1

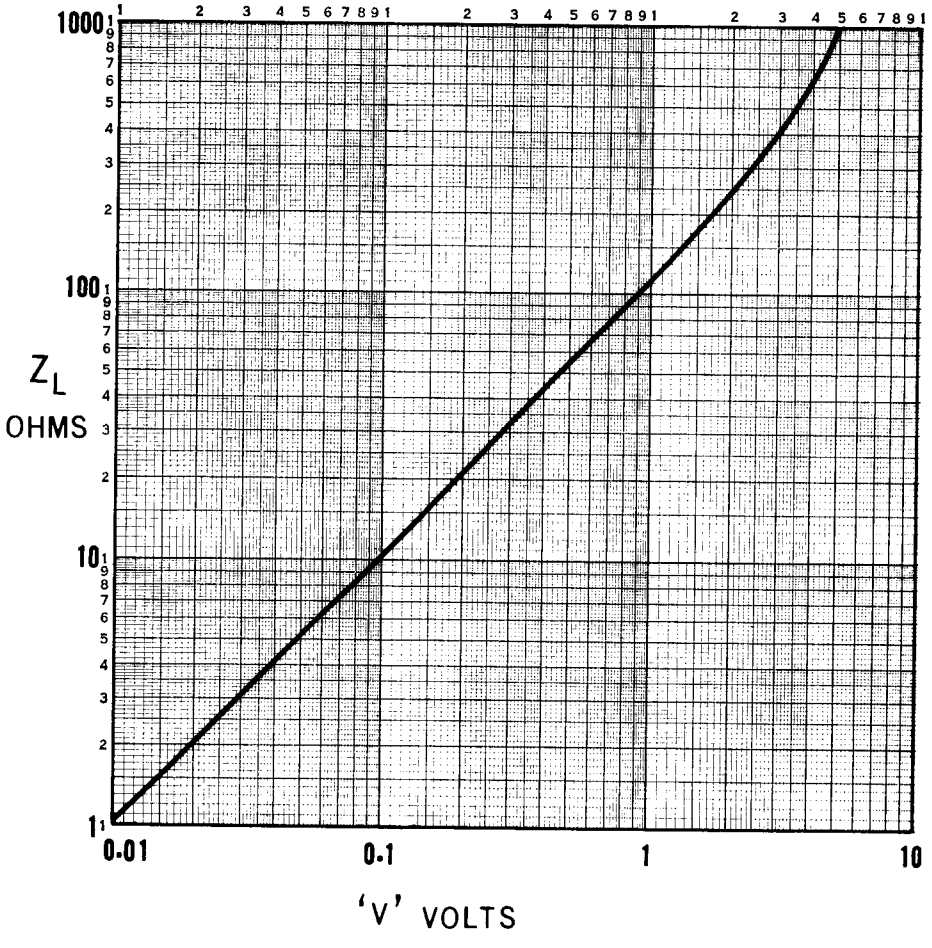

Figure 2