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NASA TECH BRIEF

NASA Pasadena Office

Probes for Measuring Noise Current in an Electronic Cable

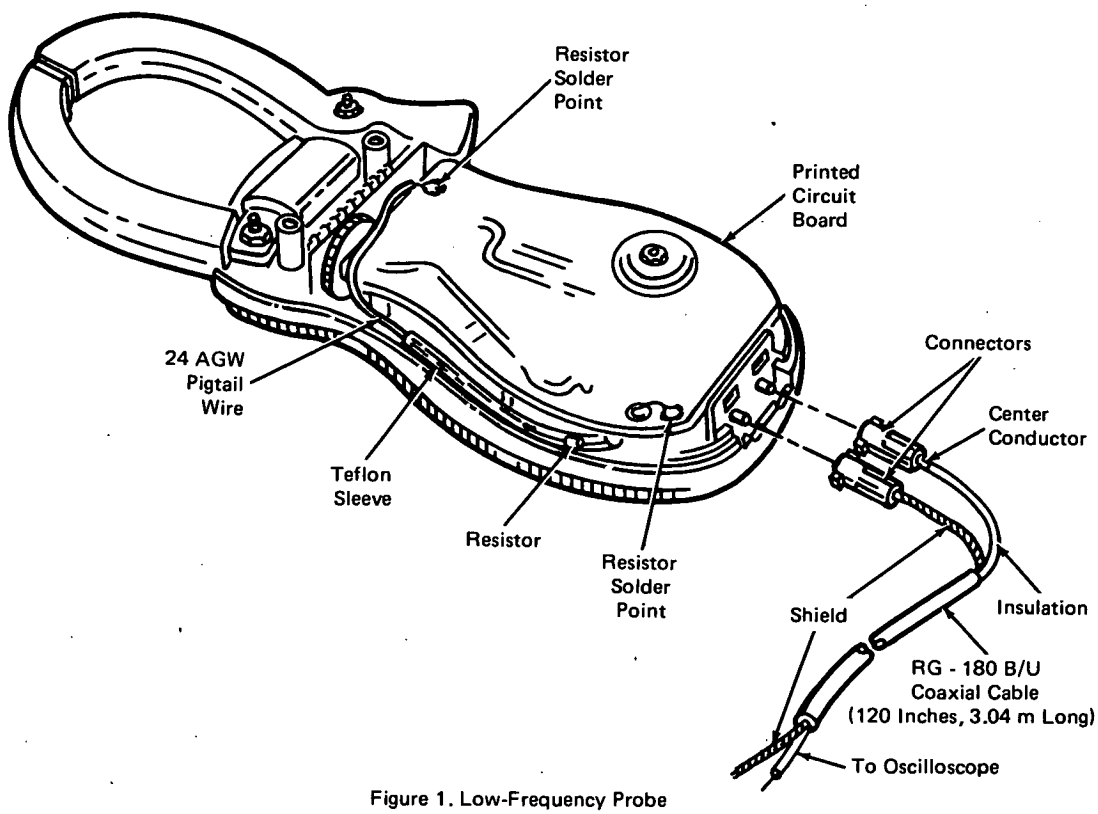

Figure 1. Low-Frequency Probe

The problem:

Electromagnetic interference (EMI) in deep-space network receiver installations is often caused by stray coupling from power lines. These stray signals, particularly from 60- and 400-Hz power sources, create potential differences between ground terminals, which leads to excessive noise in receiver circuits. More often than not, this problem is created because of improper routing of cables.

The solution:

A pair of probes has been developed for detecting and measuring noise currents in conductors. One probe is for low-frequency applications, 60 Hz to 10 kHz, whereas the other is for high-frequency applications, 10 kHz to 1 MHz.

How it's done:

The low-frequency probe is basically a modified Amprobe Model RS-1 with a 100-ohm, 10-percent, 1/8-watt resistor added. The modified meter has an output of about 0.7 volt/ampere and is useful from 10^{-3} to 10^{2} amperes.

To modify the low-frequency probe (see Figure 1), two plastic screws are removed and the back cover is opened. Before the 100-ohm resistor is connected,

(continued overleaf)

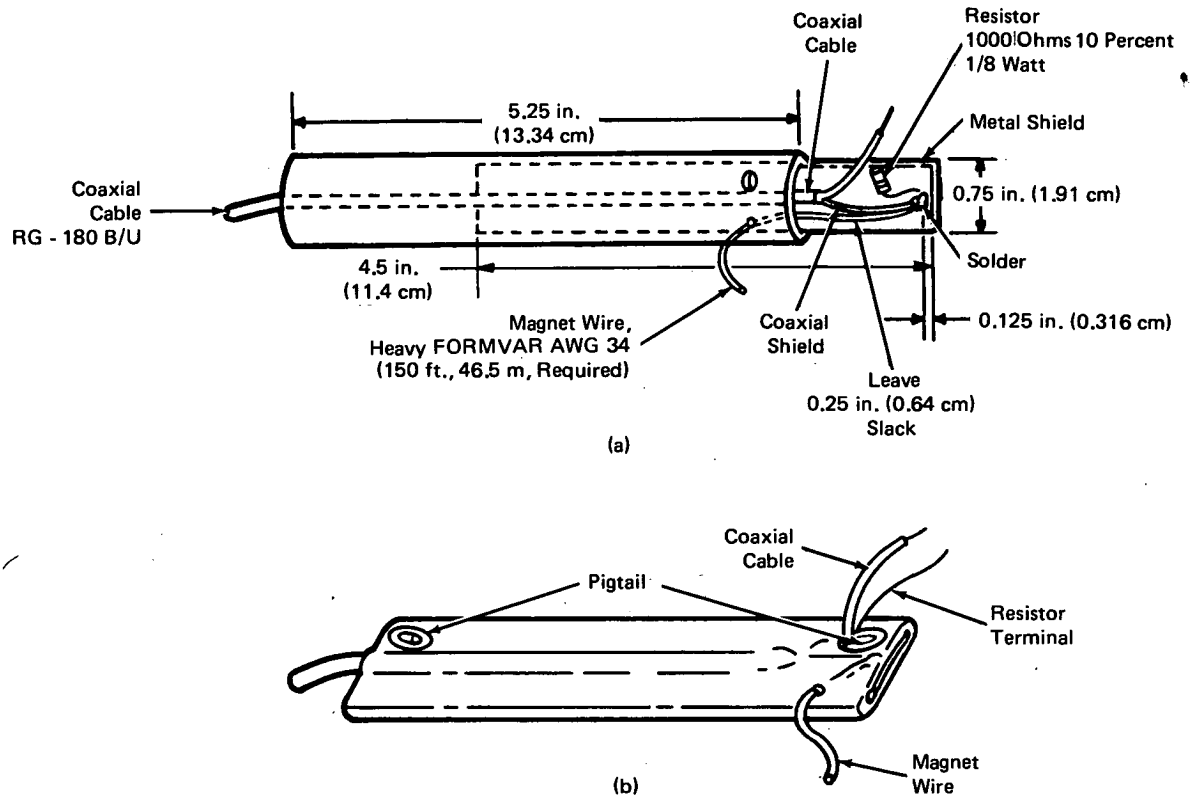

Figure 2. High-Frequency Probe

additional pigtail wire is soldered to one of its terminals to produce an overall length of 5 inches (12.5 cm). With this accomplished, the resistor is inserted into a 3-inch (7.6-cm) Teflon sleeve and is connected as shown. The special connectors from the Amprobe lead wires are removed and are attached to the shield and the inner conductor of a piece of miniature coaxial cable about 10 feet (3.2 m) long. The shield and the conductor then are separated at the other end to make them adaptable to the oscilloscope.

For the high-frequency probe, on the other hand, a piece of soft tinned steel 0.01 inch (0.03 cm) thick is used with the cables; and a 1000-ohm, 10-percent, 1/8-watt resistor is connected, as shown in Figure 2 (a). With all connections fastened to a steel plate, the assembly is inserted into heat-shrinkable tubing, 3/4 inch (1.9 cm) in diameter, with several holes made to pull out some of the cables. The tubing then is heated to shrink, enclosing the assembly as shown in Figure 2 (b), and the assembly is bent into a U shape with the coaxial cable on the outside. This probe also requires an oscilloscope to measure leakage currents from about 1 milliampere to a few amperes over the range of 10 kHz to 1 MHz.

Note:

No further documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
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Patent status:

NASA has decided not to apply for a patent.

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