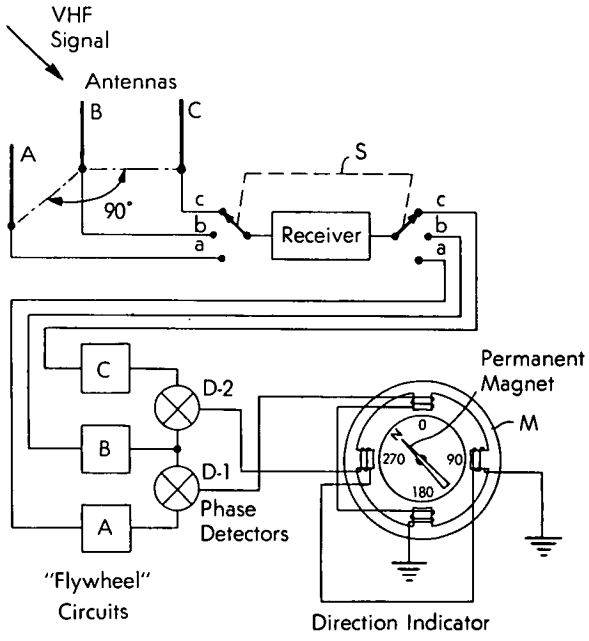
NASA TECH BRIEF

NASA Pasadena Office

Radio Direction Finder

The problem:

Design a simple direction finder for homing on very high frequency (VHF) transmitters.



The solution:

Use a three-antenna interferometric system; sample antenna signals sequentially with a single receiver and hold the receiver output pulses for comparison of signals from the outermost antennas with those of the center antenna.

How it's done:

Three antennas are arranged in two orthogonal planes as indicated in the diagram; the signals received by the three antennas differ in phase depending upon wavelength and direction of arrival of the signal. The radio-wave energy intercepted by each antenna is switched sequentially to a single-channel receiver by means of solid-state switch S; switching signals are provided by a ring counter. The output of the receiver is taken from an intermediate frequency amplifier section (IF) in synchronization with the sampling interval for each antenna, and the sampled outputs from each antenna are fed to separate "flywheel" circuits which maintain output signals constant over the sampling sequence. The flywheel circuits may be narrow-band tracking loops or high-Q resonant combinations of circuit elements; the circuits convert the receiver output from each antenna channel to waves of nearly constant amplitude and of the same phase as the signal received by the antenna.

When the signal received by antenna A and the signal received by antenna B are compared by phase detector D-1, a voltage is produced which corresponds to the phase difference of the two signals; similarly, a second voltage is produced by phase detector D-2 with signals obtained from antenna C and antenna B (the reference). Since the voltages are applied to the windings of meter M, the needle will point to the direction of arrival of the signal relative to the position of the antennas. The meter is similar to the automatic bearing indicators of the very high frequency omnirange devices (VOR) used in commercial and private aircrafts; accordingly, the three-antenna system can be installed as a redundant navigation system for use in case of failure of VOR receivers, and any VHF omnirange station may be used as a beacon. The system can also be used to search for downed aircraft by homing on its communications radio transmitter signal or on a separate beacon carried by the aircraft.

(continued overleaf)

Note:

Requests for additional information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP 72-10508

Patent status:

NASA has decided not to apply for a patent.

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