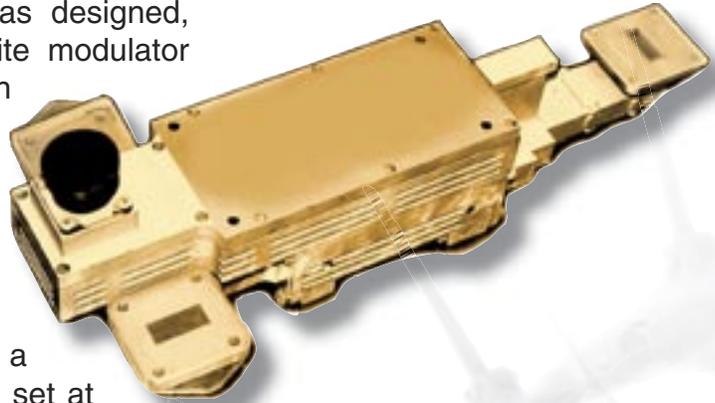


# Roll Resolvers

## Product Information

### Waveguide Ferrite Modulator Control Devices

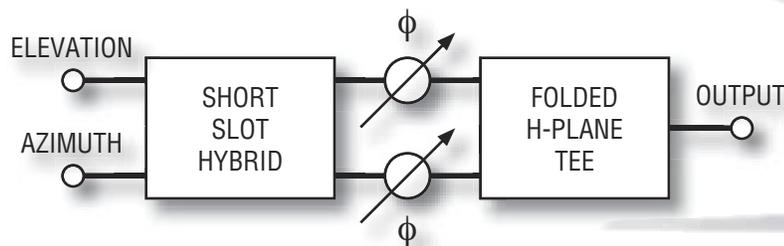
Microwave Applications Group (MAG) has designed, produced, and delivered waveguide ferrite modulator control devices to compensate for motion while an aircraft is in flight and its radar system is in use. Commonly referred to as a “Roll Resolver,” these units are in service currently on two well-known platforms.



The Roll Resolver functions by performing a rotation of coordinates from the reference set at the input of the network to a rotated set at the output of the network. This is accomplished using the circuit shown below. When one phase shifter is set to angle  $\phi$  and the other to the angle  $-\phi$ , the output of the circuit (OUT) expressed in terms of the input at the elevation port (EL) and the input at the azimuth port (AZ) may be shown to be

$$\text{OUT} = \text{EL} \cos(\phi) - \text{AZ} \sin(\phi).$$

This is the true vertical signal from the monopulse antenna, which has undergone a roll of  $\phi$  degrees. The true horizontal signal may be found by setting the phase shifters to command angles  $\pm\phi \pm \pi/2$ .



The phase shifters shown in the schematic diagram are realized using MAG designed and produced Rotary-Field phase shifters. This type of ferrite phase shifter has very good phase accuracy and exhibits low

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insertion loss and insertion loss modulation. A matched set of phase shifters and the electronic circuitry required to control the phase shifters are assembled into an aluminum housing. The short slot hybrid and the folded H-plane tee are bolted to the housing to form a rugged assembly shown in the photograph on the front page. The depicted unit is representative of the Roll Resolvers which continue to operate successfully on board the U.S. Air Force's B-1B bombers. A similar device is in use with the Air Force's B-2 bomber fleet.



Microwave Applications Group has a proven record of creativity and innovation in microwave component and subsystem design for government, military, and commercial applications. MAG has been at the forefront of electronically-steered radar technology, especially in the area of ferrite-based devices. Programs utilizing MAG designed and produced products over the last 30 years are well-known and continue to operate successfully. Examples of products developed and supplied by MAG are:

- *Precise analog ferrite phase shifters for use at high peak and average power levels;*
- *Reciprocal, latching, ferrite phase shifters with weight and size parameters compatible for use in phased array antennas;*
- *Compact, high performance phase shifters for use in sequential lobing of array antennas;*
- *High performance waveguide isolators, variable power dividers, and polarization controllers;*
- *Ferrite switches that achieve a unique combination of high isolation, wide temperature range, and reciprocal operation at high power levels;*
- *Electronic drivers, function generators and interface equipment for real-time computer control of processes;*
- *Planar phased array antennas and linear array modules, complete with phase shifters, drivers, antenna controller, radiating elements and feed assembly;*
- *Multi-channel driver packages with the capability to drive a set of phase shifters.*

MAG continues to develop new products using proven ferrite technology, and looks forward to advancing the state of the art of microwave components and subsystems.

