



Roll Resolvers Waveguide Ferrite Modulator Control Devices

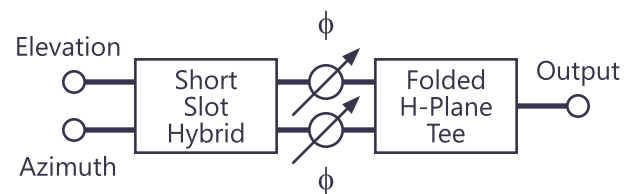
X-Band and Ku-Band

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.

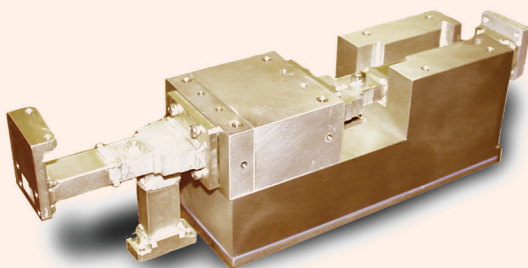
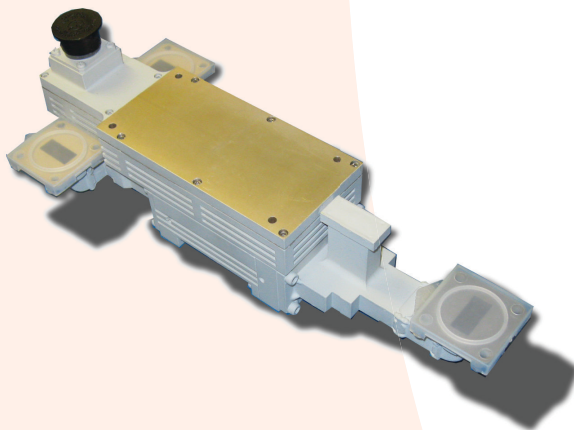
The Roll Resolver functions by performing a rotation of coordinates from the reference set at the input of the network to a rotated set at the output of the network. This is accomplished using the circuit shown below. When one phase shifter is set to angle ϕ and the other to the angle $-\phi$, the output 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 ϕ degrees. The true horizontal signal may be found by setting the phase shifters to command angles $\pm\phi \pm \pi/2$.



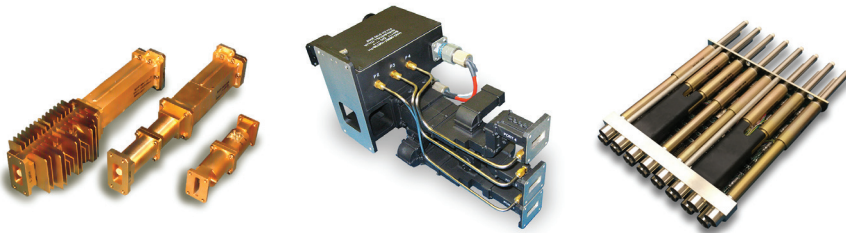
The phase shifters shown in the schematic diagram are realized using MAG designed and produced Rotary-Field phase shifters. This type of ferrite phase shifter has very good phase accuracy and exhibits low insertion loss and insertion loss mod-



Roll Resolvers

ulation. 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.

Microwave Applications Group (MAG) became a California corporation in 1969 to support electronically scanning antennas (ESAs) and other technologies using electronic steering and routing of RF signals. MAG develops ferrite-based components and subsystems, and other RF components and assemblies, to bring ESA systems and other RF devices to reality.



Production-quantity deliveries of components are provided economically, with good repeatability of outcome, optimized for each unique system application. Designs are leveraged to fulfill new needs, while remaining faithful to proven ferrite-based technology. We have also used our experience to fulfill Diminishing Manufacturing Sources and Material Shortages (DMSMS) requirements, and we're equipped to apply our expertise to other RF technologies.



MAG supports many well-known programs deployed on land, on the sea, and in the air, and provides devices and services for military, commercial, aerospace, government, and research applications.

Sample of programs supported by MAG as OEM:

- APQ-164 B-1B ORS
- APQ-181 B-2
- APS-143 CP-140 Imaging
- APY-1/2 E-3 AWACS
- AR320 3D Air Defense
- ARTS-V1 / CLPS
- ARTS-V2
- ASARS-2 Synthetic Aperture
- ARSR-4 FAA Long Range
- ASTOR
- DWSR-2501C Doppler Weather
- Global Hawk Synthetic Aperture
- I-15/23 Reflectarray
- I-30 Simulator
- MPN-14K Landing Control
- PAAS Test Range
- Princeton Plasma Physics Laboratory
- RAC 3D Air Defense
- Skyshield 35 Air Defense
- Smart-L 3D Air Defense
- SPN-35C Approach Control
- SPQ-9B Surveillance / Tracking
- TPAAS Test Range
- TRS-3D Multimode
- TRS22XX 3D Air Defense
- ZPQ-1 Predator TESAR

MAG DMSMS program support:

- MPQ-64 Sentinel SHORAD
- APY-1/2 E-3 AWACS
- BMEWS / PAVE PAWS
- HAWK
- SPN-35C Approach Control
- MSQ-T43 MTE System



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