



PowerMod Technology Breakthrough Brings High Availability to High Power Electronics

## **PowerMod™** Radar Modernization



**This solid-state cathode modulator** assembly replaced the entire mod-anode modulator and crowbar circuit for the AN/SPQ-9A radar.

DTI designs and manufactures complete transmitter systems and modular retrofit kits to meet the most demanding military and commercial requirements. DTI's solutions are fully solid-state, encompassing breakthrough high performance power supplies, pulse modulators, voltage regulators, and state of the art control systems.

DTI's solid-state, high voltage switches work as high-power cathode modulators for a variety of vacuum electron devices (VEDs) such as klystrons, CFAs or magnetrons, and as low-power modulators for tubes that use modulating anodes, grids, or control electrodes. DTI's high-efficiency modulators are inherently pulse-width agile, and can open in less than a microsecond, often eliminating the need for a conventional crowbar. PowerMod switches are perfect for retrofits, test sets and new designs.

### **New Transmitter Designs**

Turn-key systems typically include all electronics between the power source and the VED or RF output device. Recent installations of solid state, X-band and S-band transmitter systems supporting the U.S. Air Force Cobra Judy precision data collection radar on board the USNS Observation Island included switching power supplies, series opening switches, modulators, and controls driving TWTs and phased-array radar. Similar transmitter systems, including power supplies, RF modulators, and controls have been delivered for other state-of-the-art, high power S-, X-, and W-band radars.

### **Transmitter Retrofits**

A transmitter upgrade using modern, solid state technology, may be the most cost-effective answer to problems of high failure rates and lengthy repair procedures common



**Shelter interior** showing typical arrangement of transmitter components. DTI recently delivered X-band and S-band solid state, transportable radar transmitters configured in standard 45 foot, weatherproof ISO shelters to the U.S. Government.



**Cobra Judy S-Band transmitter power supplies.**



to transmitters using vacuum switch tubes. A retrofit may encompass a few components or a complete subsystem. In most cases, the modernization is accomplished within the existing structural envelope, whether a typical shipboard cabinet or a transportable shelter. DTI can provide the upgrades as fully MIL-Qualified, field-installable kits ready for installation into ship-mounted cabinets, or in new enclosures.

DTI designed, manufactured and installed upgrade kits for the U.S. Navy's AN/SPQ-9A Surface Surveillance and Tracking Radar. The high resolution, X-band TWT narrow beam system detects sea skimming missiles at the horizon while simultaneously providing detection and tracking of surface targets and beacon responses.

Another kit for the Naval Surface Warfare Center's incorporates DTI's solid-state switch module and switching power supply as an upgrade for the AN/SPG-60 transmitter. The compact 13 kV, 20 A klystron pulsed-modulator delivers up to 35 kHz PRF at .8 – 8  $\mu$ s pulse widths. The upgraded radars have gained tens of thousands of hours of reliability.

The AN/FPQ-17 Multiple Target Instrumentation Radar (MIR) at the Naval Air Warfare Center, was upgraded with a new power supply and a protective opening-switch. The new switching power supply provides adjustable output voltages up to – 51 kV at 750 mA, and maintains pulse-to-pulse voltage regulation of  $\pm 5$  volts. The solid-state opening switch safely disconnects the TWT's cathode connection upon sensing a fault condition.

DTI has successfully modernized many other radar systems with reliable solid-state electronics.



**AN/SPG-60** radar transmitter enclosure with DTI modulator retrofitted in lower compartment.



**A programmable logic controller (PLC)** is featured on some DTI' transmitters for enhanced operator control, fault handling and diagnostic capabilities. The operator controls the transmitter via this flat-panel touch screen and graphical user interface.

