

## **Solid State IGBT Modulator Description**

Radtec's Solid State IGBT modulator technology is used in Radtec's RDR series magnetron radars, and is also available as an upgrade for other manufacturer's radars. There are models of the Solid State IGBT modulator available for many models of EEC radars, and for other radars as well. Please contact Radtec for upgrade information for a specific model of radar.

Radtec IGBT technology has been proven in numerous installations of Radtec radars, EEC radars and other radars over a period of several years. IGBT's provide faster switching time and higher current capacity over previous solid state modulator technology, such as Field Effect Transistors (FET). Radtec currently produces Solid State IGBT modulators in sizes from 28 kW to 1 MW.

The Radtec Solid State IGBT modulator provides the following benefits:

- *Improved reliability-* Less downtime is the result of a conservative, fully solid state design. The high power circuits are designed in such a way that they operate at lower voltages than previous designs. That reduces the potential for failures. In addition, the replacement of thyatron tubes is eliminated, because the thyatron tubes are eliminated.
- *Lower operating cost-* Replacement of thyatrons and expensive downtime is eliminated.
- *Improved accuracy of radar data-* Radtec's high voltage power supply is tightly regulated, and the Solid State IGBT modulator produces clean, square pulses. Each pulse is exactly like the previous pulse. Magnetron stability is improved, and the RF output is at stable frequency and power level, even with complex pulse sequences such as those required for velocity unfolding. The end result is radar operation, with a magnetron, that approaches the stability and accuracy of a fully coherent Klystron.
- *Programmable pulse widths and pulse rates-* Radtec Solid State IGBT modulators can produce pulses of any width, limited only by the duty cycle of the components involved. Pulse widths are programmed electronically, and are not dependent on time constants of component values as they are with in Pulse Forming Network (PFN) type modulators. The end result is that radar operation can be easily adjusted to get the best possible image from the current weather conditions.

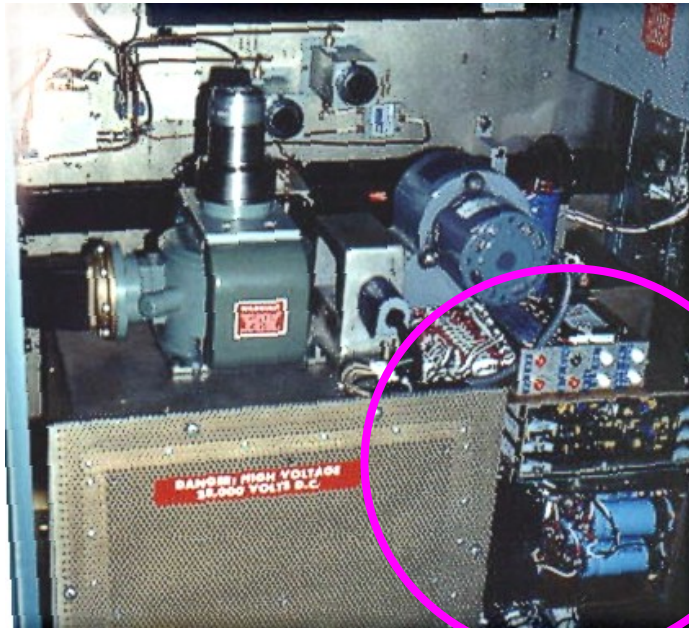
Technical Features:

- *Regulated high voltage power supply-* Produces stable, consistent voltage under all operating conditions, pulse rates and pulse widths, as well as with changes in input line voltage. Includes high quality, low leakage capacitors for high voltage filtering. Fully protected for safety.

- *Programmable magnetron filament power-* The filament power for the magnetron tube is automatically adjusted for the duty cycle. Thus, the magnetron's filament is automatically maintained at the proper temperature for any mode of operation from the lowest to the highest duty cycles. This maintains stable magnetron operation, and assures maximum magnetron life.
- *The pulse transformer is inside of a sealed oil tank-* This protects the highest voltages from moisture, and provides a self healing dielectric.
- *Unique, precision pulse transformer-* The pulse transformer is made with winding techniques and an exotic core material that make it unique in the industry. This technology assures low leakage inductance and low capacitance which provide extremely square pulses with high definition, and a very symmetrical spectrum.
- *Local or remote control-* The modulator may be controlled either locally from its front panel or from a remote source, such as the radar's control processor.
- *Fault indicators-* The following fault indicators are provided:
  - Interlock Fault
  - Cooling Fault
  - High Voltage Over-current
  - Magnetron Over-current
  - High Voltage Under-voltage
  - Filament Drive Fault

Operating Summary:

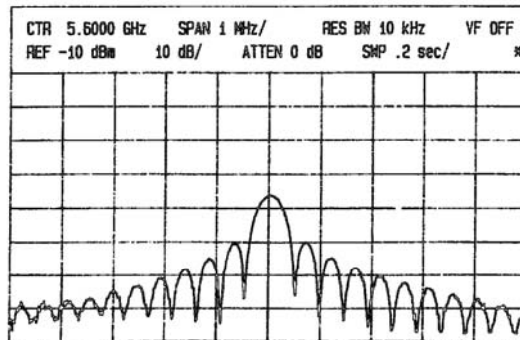
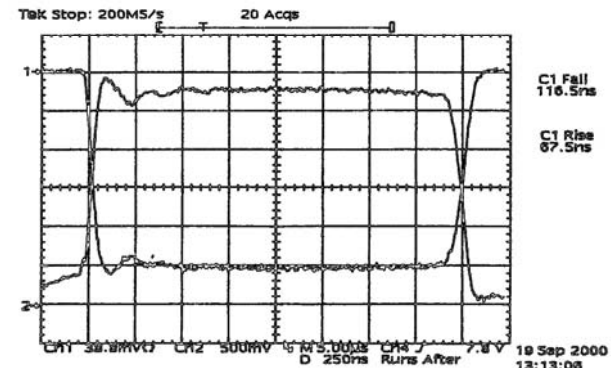
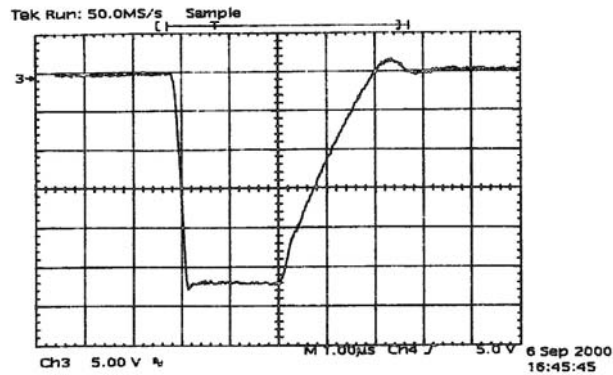
- At power-on, an automatic warm-up period of 5 minutes begins. This assures that the magnetron is at normal operating temperature before high voltage is applied.
- At the completion of the warm-up, the high voltage is ramped up to its normal operating value over a 10 second period. This ramping up of the magnetron voltage and current enhances the magnetron's reliability.
- Pulse trigger data is normally supplied by the radar system's signal processor.
- Pulse width commands are normally supplied by the radar system's signal processing computer.



**SST-350 Solid State Modulator  
Installed In EEC Radar System**

<b>Specifications</b>	
<p><b>Modulator technology:</b> Pulse transformer driven by Insulated Gate Bipolar Transistors (IGBT)</p> <p><b>Magnetron supported:</b> Available for most commonly used magnetrons</p> <p><b>Pulse widths:</b> Three programmable widths, selectable by external control. Default values are 0.4, 0.8 and 2.0 microseconds.</p> <p><b>Fault Indicators:</b> Interlock fault Cooling fault High voltage overcurrent Magnetron overcurrent High voltage under voltage Filament drive power supply</p>	<p><b>Magnetron protection:</b> Automatic 5 minute warmup cycle  Automatic 10 second high voltage application cycle  Automatic arc protection  Filament power automatically programmed based on duty cycle  Automatic duty cycle limitation, programmable to pre-set value</p> <p>Proprietary design low capacitance, low leakage inductance pulse transformer sealed in dielectric oil tank.</p> <p><b>Power requirement:</b> 220 VAC, 50/60 Hz, single phase</p>

## IGBT Modulator Waveforms - EEC Modulator Upgrade



Enterprise "C" Band Modulator  
ATP Waveforms

Radtec Engineering Inc.  
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