

# Engineered Solutions



## Richardson Electronics, Ltd.

### Engineered Solutions Overview



# Experience



**50+ years of experience in RF/microwave,  
high voltage, and thermal management.**

**Design, build, test, and supply custom  
power subsystems**

# Technical Expertise



**Our team of over 30 engineers specializes in:**

- **High Power RF & Microwave**
- **High Voltage**
- **High Power Electronics**
- **Liquid Cooling / Thermal Management**
- **Digital Design**
- **Software Engineering**
- **Program Management**



**High Frequency  
High Power**



## **Frequency and Power Range**

**RF Power levels from a few watts to megawatts**

**Frequencies from kHz to GHz**

**High voltage experience from 1kV to 200kV at currents from 10mA CW to 100A peak.**

# Engineered Solutions



## ***Control Electronics***

- Fiber optic communication at high voltage
- Integrated, full system control

## ***Thermal Management***

- Liquid or Air, 3 kW to 200 kW Capacity
- Heat Exchangers / Active Chillers

## ***Tailored Packaging***

- Legacy Form, Fit, Function
- Environmental, EMI, MIL-STD



# Engineered Solutions



## ***High Voltage***

- Linear, Switching Power Supplies
- Converters, Inverters, Amplifiers
- 2kV to 200kV

## ***RF/Microwave Amplifiers and Generators***

- Magnetron, Klystron, IOT, TWT, Solid State
- 100 kHz to 50 GHz
- Pulsed and CW - 10W to 15MW, all bands
- Complete turn-key generators
- Switch mode or Inductive
- Integrated or remote head designs



# Markets



## Typical markets Include:

- Industrial
- Medical
- Commercial Radar
- Research & Development
- Commercial SatCom
- Semiconductor Manufacturing
- Power Conversion



# Engineered Solutions Examples



## Project / Capability Examples





# Solid State Power Amplifier

- Multiple applications
- 10 W – 40 kW CW
- 5 MHz – 40 GHz
- Tailored designs
- Compact modules  
or multi units combined
- Liquid or air cooled
- One-off or high volume



# 300w CW @ 2450 MHz Solid State Power Amplifier (SSPA)

- Industrial applications
- Scalable to higher power
- Tailored solid state design
- Compact and light weight <15lbs
- Liquid cooled
- Prototype in 3 months



# Traveling Wave Tube Amplifier

- Multiple applications
- 200 – 2000 W CW
- 1 – 25 kW pulsed
- 1 – 45 GHz
- Proven rugged design
- Switching HV power supply
- Modular serviceable layout
- Liquid or air cooled
- 4 – 8 month lead times (typ.)



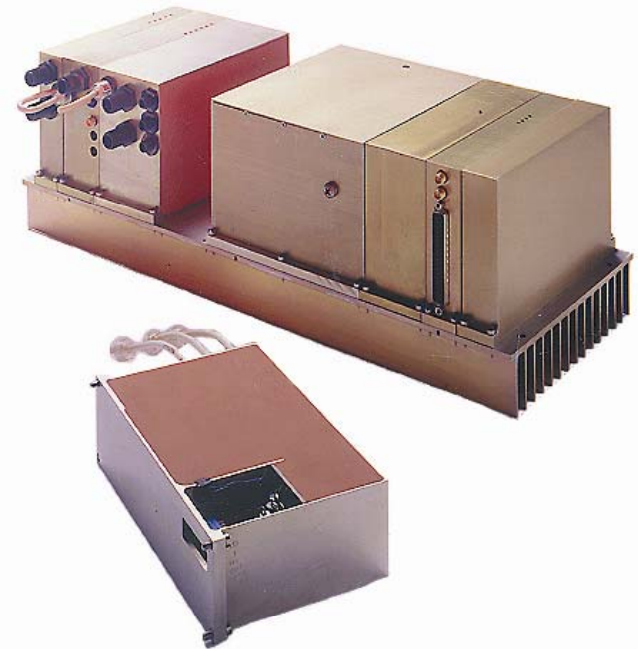
# Klystron Power Amplifier

- Multiple applications
- 2 – 20 kW CW
- 10 kW – 15 MW pulsed
- 1 – 40 GHz
- Proven rugged design
- Switching or linear HVPS
- Modular serviceable layout
- Liquid or air cooled
- 6 – 18 month lead times (typ.)



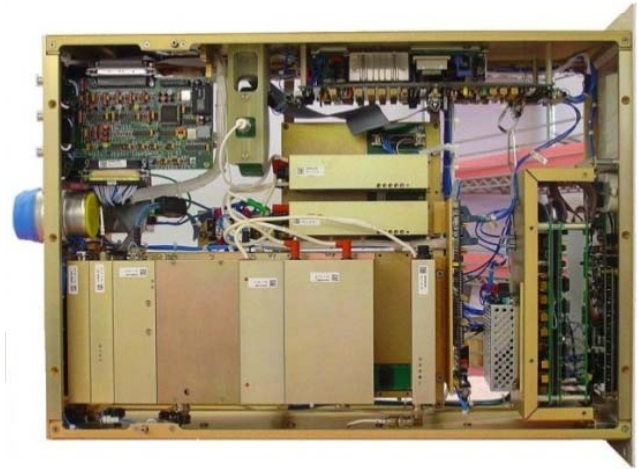
# Modular Switching HVPS

- Any Application
- 2 kW, 3.5 kW, 8 kW designs
- Easy to service and maintain
- Isolated fault finding
- Silicon potted high voltage
- Short replacement lead time
- Integral cooling available
- Rugged for mobile use



# LINAC Gun Driver (HV power supply)

- 20 kV power supply
- Interleaved A/B pulse trains
- Radiation resistant design
- Pulse <math><300\text{ns}</math> rise/fall
- 1-10  $\mu\text{s}$  pulse duration
- Jitter <math><20\text{ nsec}</math>
- <math><2\%</math> ripple, droop
- 400 units per year



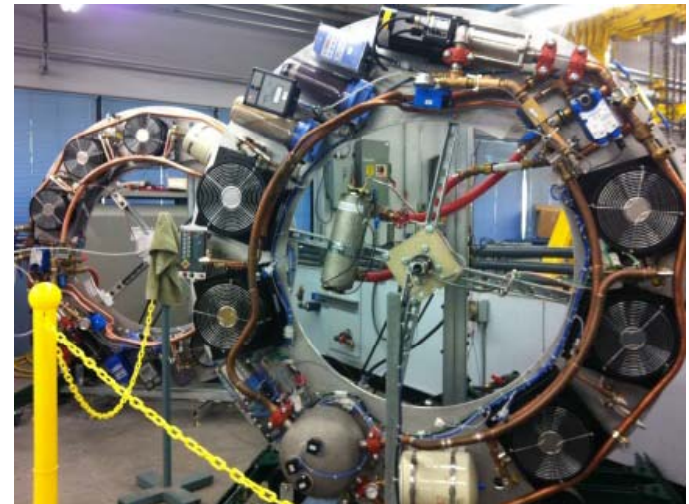
# IOT HV Power Supply

- Industrial, Scientific, EW
- Drives up to 200 kW CW RF
- Supports 460 – 820 MHz
- Modular rack mount design
- Rugged for mobile use
- Liquid cooled



# Tailored Cooling System

- Medical Linac application
- 12kW heat dissipation
- Liquid to air heat exchanger
- 6kW pre-heater
- Built-in PLC
- Managed resistivity
- Extra quiet pump
- 60 units per year





# HV Power & Control System

- Security Linac application
- Integrated system control
- Gun Driver, dual A/B pulses
- Line-type or SS modulator
- Cap charging HVPS
- Solenoid power supply
- RF driver, AFC
- Ion pump PS, vacuum and SF6 control
- 25kW chiller, -40°C to 55°C



For a full listing of our products and services, please visit

[www.rell.com](http://www.rell.com)

The screenshot shows the Richardson Electronics website homepage. At the top is a blue navigation bar with the company logo on the left and links for 'English', '中文', 'Investor Relations', and 'Press Room' on the right. Below the navigation bar is a search bar with the text 'PRODUCT SEARCH' and 'SEARCH' next to it. The main content area features a large banner with the headline 'The Power of Our Business Model' and a quote from Ed Richardson: 'Our highest return on investment will be achieved by leveraging the power of our global infrastructure and capitalizing on the strength of our customer relationships.' Below the banner are two columns of content: 'Product Solutions' and 'Engineered Solutions'. The 'Product Solutions' column includes links for 'Products by Markets', 'View Brands', 'Full Product Catalog', and 'Contact Us to Discuss Your Needs'. The 'Engineered Solutions' column includes links for 'Design and Engineering', 'Manufacturing', 'Assembly', and 'Testing'. On the right side of the page, there are two sections: 'FEATURED PRODUCTS' with links for 'Laser Consumables and Parts', 'Triode', and 'Magnetron'; and 'FEATURED APPLICATIONS' with a link for 'Radar'. At the bottom of the page, there is a 'NEWS HEADLINES' section with a date '01/11/2012 | Fiscal Year 2012 Second Quarter'.

Thank You  
for Your Interest

