

# Power EMI Filter Solutions

Spectrum Control's diagnostic testing capabilities and world-class manufacturing provide power filter solutions to satisfy global EMC standards while meeting unique design parameters.

*Understanding how to best filter the AC or DC power entering your system to prevent radiated or conducted EMI can be challenging enough. Finding a partner capable of developing a custom EMI filter solution that will lower your costs and reduce your time to market can seem unrealistic. Spectrum Control is your answer. Our comprehensive consulting, diagnostic testing, and world class manufacturing will provide you an ideal solution to satisfy global EMC standards while meeting your design/project parameters.*

## EMI Filter Expertise

Spectrum Control has been the leading provider of custom application-specific electromagnetic interference (EMI) filter solutions since 1968. We design and manufacture products to suppress or eliminate EMI and offer the industry's most complete line of filtering products and components. These products help address the mechanical, electrical, and power requirements of your design while offering the most experienced team of EMI focused engineers in the industry.

## EMI Testing

### Finding the Problem

Integral to finding a solution to an EMC problem is the ability to test for compliance. We conduct a wide range of EMC and environmental tests to help us identify potential problems and recommend design solutions. Our extensive in-house test capabilities allow for a faster turnaround of your complete design solution and lower total cost.

- Ambient-free in-house shielded anechoic chamber
- NARTE certified engineering staff
- Highly accurate computer controlled instrumentation accumulates and presents data in multiple formats
- Testing to military and international commercial regulations

## We Understand Power

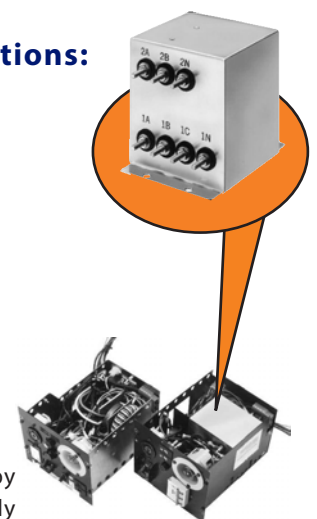
"Follow the power cord" has long been a mantra for the power specialists at Spectrum Control. In conjunction with APITech's Power Conversion and Distribution division, we offer a unique ability to understand and address AC and DC power issues ranging from EMC compliance to transient suppression, low voltage cut-off, circuit breakers, redundant power configurations, power distribution, and remote power system access.

## Custom Application Specific Designs

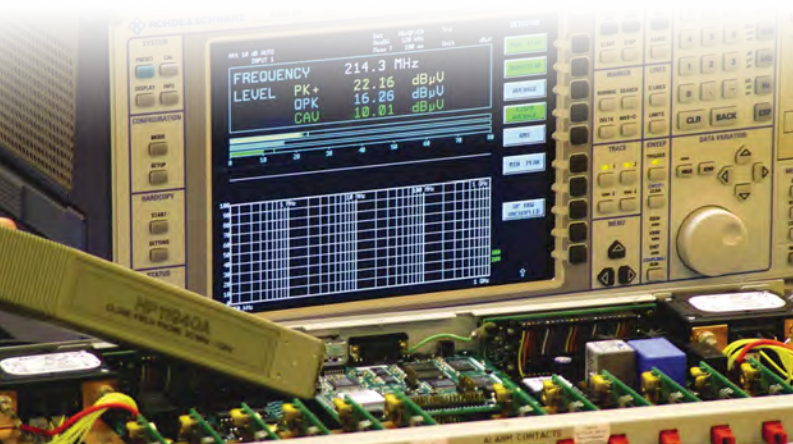
Rarely does a 100% off-the-shelf power filter completely satisfy the mechanical, electrical, and power requirements, and constraints of a sophisticated OEM design. At Spectrum Control, we are focused on providing a complete solution that takes all factors into consideration. Whether modifying an existing power filter design, working from a "clean sheet" approach, or integrating various technologies into a subassembly, the result is a custom solution that will be tailored to your project's design, logistics, and budgetary requirements.

### Application-Specific Options:

- EMI filtering
- Power distribution
- Transient protection
- Indicator lights
- Circuit breaker protection
- Leads or studs
- Voltage cut-off
- Agency approvals
- Reverse polarity



We can "clean up" your system by creating an easy to install assembly that contains all the components and filtering solutions in one compact package.



## Your Vertically Integrated Partner

Spectrum Control is uniquely positioned to offer a complete resource with in-house capabilities ranging from diagnostic testing, to formulating, and producing the ceramics used in many of our filters, to metalworking fabrication to facilitate your mechanical/packaging requirements. It all adds up to a quicker prototype and a more complete/cost-effective solution.

- Comprehensive in-house EMC testing
- EMI filter design and manufacture, including ceramic formulation
- Complete metal fabrication operation
- Quick-turn prototypes
- World class manufacturing in US and Mexico
- Faster time-to-market
- ISO9001 and TS-16949 certifications

## Military & Aerospace

Spectrum Control has a long history of partnering with leading suppliers of the defense industry. Our ability to find solutions to suppress EMI allows us to provide the high reliability filters required for military and aerospace applications. Spectrum Control can design your custom filter with a unique mechanical package for those unusual or tight fitting spaces, higher performance filtering, and the voltage rating you need to address all of your AC and DC power issues.

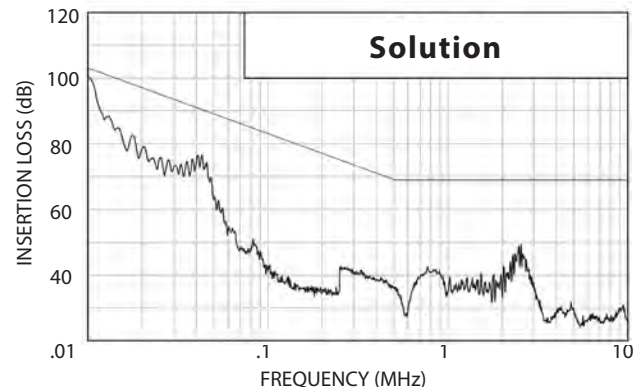
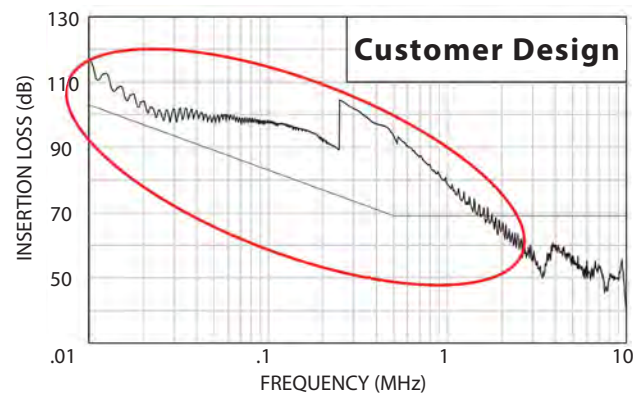
### Applications

- Military aviation – countermeasures, fire control, and communications systems
- Military communications shelters
- Commercial aviation – air traffic control, radar, engine control, and aircraft lighting
- Shipboard systems – radar, communications search, navigation, and guidance systems
- Hardened computers
- Missile systems – smart bombs and air to surface missiles
- Land based vehicles

## MIL Specific Capabilities

No matter how challenging your mechanical or electrical problem, our team of engineers will use their years of experience in working with MIL specifications to design the ideal EMI filter to eliminate unwanted interference from the power entering your system. From a single power filter to a customized and fully integrated assembly, Spectrum Control has the know-how to build the right power filter solution for you.

- Voltage ratings of 115-250VAC up to 800Hz and 400VDC
- Meets MIL-PRF-15733, MIL-STD-461, MIL-STD-1399, MIL-STD-704, and MIL-STD-1275 requirements
- High common and differential mode attenuation
- Standard designs up to 100 Amps
- Meet TEMPEST and FCC requirements
- Rugged construction satisfies MIL-STD environmental conditions
- Custom application-specific filters available
- MIL-STD-790 approved manufacturing facility
- Excellent insertion loss characteristics up to 1GHz
- Designed to meet weight constraints





Unique mechanical packages addressing specific size and space constraints.

## MIL Testing

One of the most considerable advantages of Spectrum Control is our in-house testing service and its role in helping us evaluate, design, and produce products for the effective suppression of EMI. We rigorously test our designs to meet the stringent MIL standards, as well as other global EMC regulations. In addition, our facilities have been audited and qualified to MIL-I-45208 and registered to ISO 9001.

### In-House Environmental Testing

#### MIL-STD-202 Capabilities

Group	Examination	Method
I/A	Voltage Drop Leakage Current Temperature Rise Terminal Strength	Para 4. 6. 8 of MIL-PRF-15733 UL 1283 Para 4. 6. 8 of MIL-PRF-15733 Method 211, Condition A
I/B	Shock Vibration Thermal Shock Humidity	Method 213, Condition G Method 204, Condition A Method 107, Test Condition A Method 107, Condition B
III	Life	Method 108, Condition D

#### MIL-STD-461 A/B/C Capabilities

Group	Examination	Type
CE01-07	Conducted Emissions	Power Leads, Control & Signal Leads, Inverse Filter Method, Antenna Terminal, Tactical Vehicle, Power Leads, Power Lead Switching Transients
CS01-09	Conducted Susceptibility	Power Leads, Two Signal Intermodulation, Undesired Signal Rejection, Cross-Modulation, Power Leads, Squelch Circuits, Structure Current
RE01, 02, 04 & 05	Radiated Emission	Magnetic Field, Electric Field, Vehicles and Engine-driven Equipment
RS01, 02 & 06	Radiated Susceptibility	Magnetic Field, Magnetic Induction Fields, Electromagnetic Field, Switching Pulses (Chattering Relay)

#### MIL-STD-461 D/E/F/G Capabilities

Group	Examination	Type
CE101 & 102	Conducted Emissions	Power Leads
CS101, 103, 104, 105, 109, 114, 115 & 116	Conducted Susceptibility	Power Leads, Intermodulation, Undesired Signal Rejection, Cross-Modulation, Structure Current, Bulk Cable Injection and Impulse Excitation, Damped Sinusoidal Transients, Cables & Power Leads
RE101 & 102	Radiated Emission	Magnetic Field, Electric Field
RS101	Radiated Susceptibility	Magnetic Field



Customized and fully integrated assemblies incorporating filters, circuit components, and connectors.



Custom application-specific filters that meet MIL standard environmental conditions.

## Wireless Communications

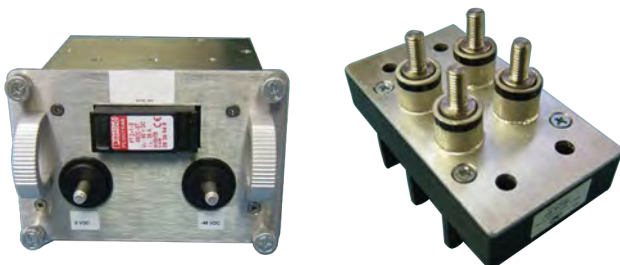
Today's competitive wireless communication marketplace demands system designs that incorporate methods to prevent unwanted interference from entering the system, as well as eliminate emissions that can contaminate your distributed AC & DC power. Spectrum Controls power filter solutions can create an agency-approved product that will filter and condition the power to your wireless communications infrastructure equipment. Our custom power filters will incorporate all the components and the filtering in one complete package to save you space, time and money. As a vertically integrated supplier, Spectrum Control offers global low-cost manufacturing which allows us to produce fast prototypes and a quicker time-to-market.

### Applications

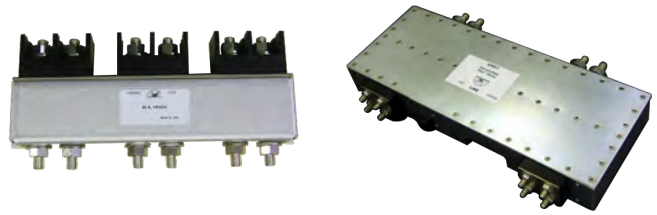
- Cellular base stations
- Traffic control systems
- Communications racks
- IT hubs
- Telephone switching devices
- Data centers

### Wireless Communications Capabilities

- Incorporate filtering and custom circuitry into one easy to install package
- Effective conducted filtering from 10KHz to 1GHz
- Current ratings up to 500Amps
- Maximum voltage ratings up to 400VDC and 240VAC standard
- Various capacitance values and custom voltage ratings available
- Incorporate specified circuit breakers and mounting handles
- Complex, multifunction designs available
- Customized ground plane
- Design for CISPR22/24 and EN55022/24 regulations
- RoHS compliant
- Low cost manufacturing



Designs with selective line filtering, high voltages and agency approvals.

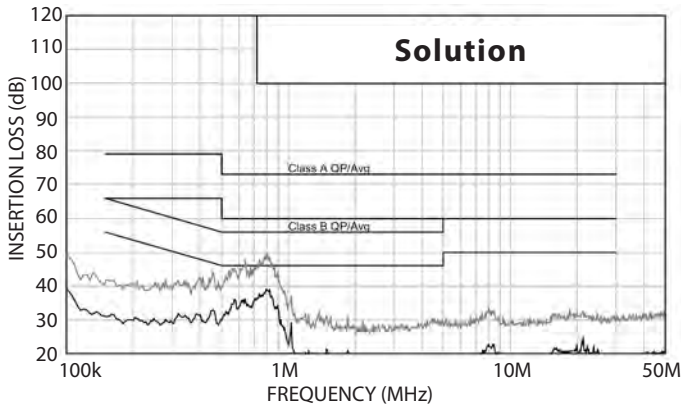
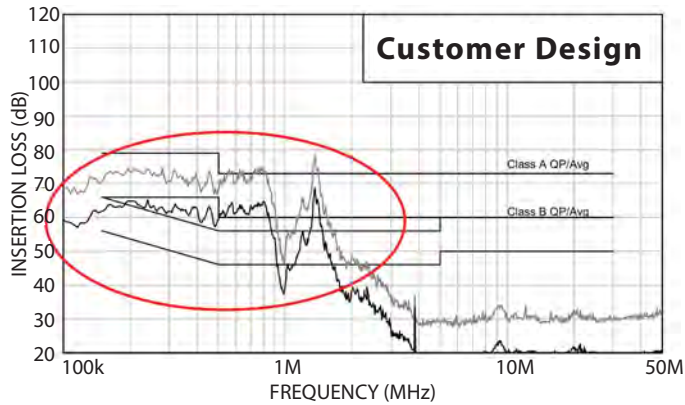


## EMC Testing for Wireless Communications

Spectrum Control's fully equipped EMC test laboratory and NARTE certified engineering staff will test for European emission and immunity regulations, all FCC part 15 regulations as well as define all compliance issues. Our wireless communication systems OEM partners rely on the expertise of our EMC test and design engineers to help identify the problem in your system, develop the solution and verify its compliance...many times resulting in your equipment leaving our lab as a working prototype.

### Test Specifications

FCC Part 15 Emission Testing	CISPR 11, 14, 22 Emission Testing	CISPR 25
Conducted Emissions: 150kHz to 30MHz	Conducted Emissions: 150kHz to 30MHz	Conducted Emissions: 150kHz to 108MHz
100A, 60Hz, Single and Three phase, 120/208/400/480vac	100A, 60Hz, Single and Three phase, 120/208/400/480vac	50A, 0-60Vdc, Class 1/2/3/4/5
Radiated Emissions: 30MHz to 1000MHz (1 to 18GHz as required)	Radiated Emissions: 30MHz to 1000MHz (1 to 18GHz as required)	Radiated Emissions: 150kHz to 30MHz (E-Field) and 30MHz to 1000MHz (Plane Wave)
3 and 5 Meter Semi-Anechoic Chamber, Class A/B, No open field test site capability	3 and 5 Meter Semi-Anechoic Chamber, Class A/B, No open field test site capability	1 Meter distance in Semi-Anechoic Chamber, Class 1/2/3/4/5



## Medical

Our many years of experience in providing EMI/RFI solutions has given us the know-how to design products to meet the specific constraints and requirements of the medical industry. Much of the medical equipment used today requires complete suppression of any and all EMI, as well as low-leakage non-magnetic properties to prevent negatively affecting surrounding equipment. At vertically integrated Spectrum Control, we will design and build a high reliability, high performance custom power filter to meet your system and all EN requirements.

### Applications

- X-ray equipment
- MRI and CAT scan machines
- Portable dialysis machines
- Laboratory equipment
- Heart defibrillators

5 EMI Power Filter Solutions

### Medical Capabilities

- Accommodate non-magnetic requirements
- High performance/high-reliability
- Low leakage
- Effective conducted filtering from 10KHz to 1GHz
- Current ratings up to 10Amps
- Maximum voltage ratings of 400VDC and 240VAC standard, custom voltages available
- Meet EN 55011, EN 55022, and IEC/EN60601-1-2 requirements
- RoHS compliant
- Vertically integrated solutions include packaging, circular connectors, and filter plates

### Shielding Filters

- Provides MRI/RF shielding solutions for medical, commercial, and government applications
- Offers 100 dB insertion loss per MIL-STD 220 from 14KHz to 10GHz
- Options available with or without discharge lights
- Custom configurations are available



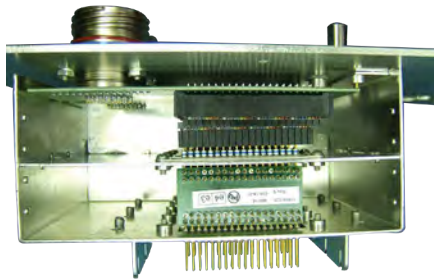
## EMC Testing for Medical

- EN 55011
- EN 55022

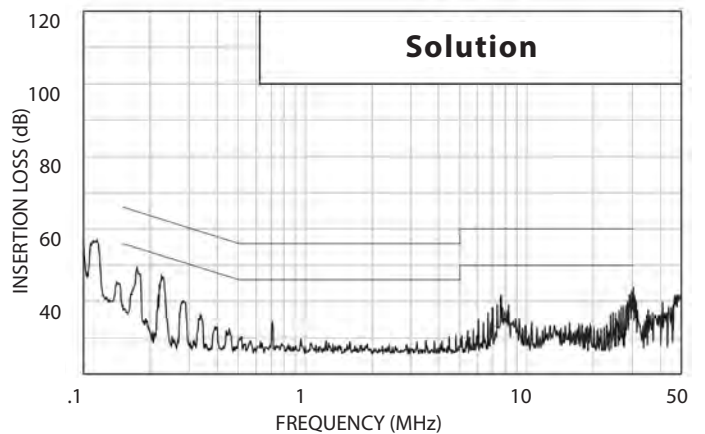
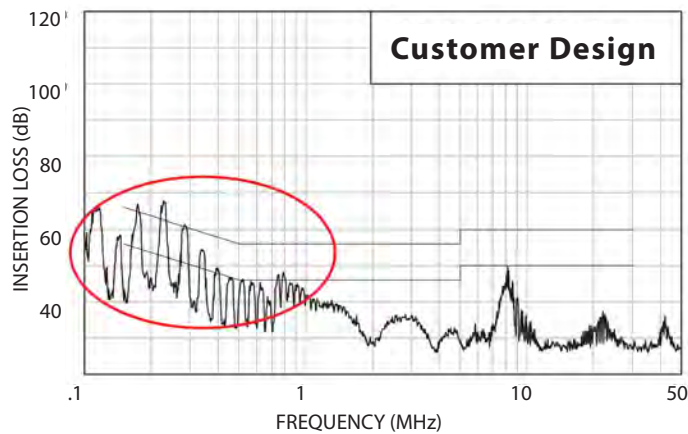
Our EMC NARTE Engineers can perform pre-scans and provide assistance with troubleshooting if your product is found to be non-compliant as well as perform EN 55011, EN 55022 and IEC 1000-4-x requirements below:

### Test Specifications

Number	Name	Levels/Maximums
1000-4-2	Electrostatic Discharge, ESD	Level 1,2,3,4 - 16kV air discharge 8kV contact discharge
1000-4-3	Radiated RF Immunity, RFI	Level 1,2,3, - 10V per meter @ 3 meters, 80-1000MHz, 1kHz 80% AM
1000-4-4	Electrical Fast Transient Burst, EFT	Level 1,2,3,4 - 4kV peak
1000-4-5	Surge	Level 1,2,3,4 - 6kV 1.2x50usec pulse and 6kV 10x700usec pulse
1000-4-6	Conducted RF	Level 1,2,3, - 20V, 150kHz-80MHz, 1kHz 80% AM



High reliability filters with low leakage and non-magnetic options meet EN testing requirements.



## Industrial

At Spectrum Control, we do it all from package design and metalworking to EMI filtering to EMC testing which means a lower cost for you. Our engineers will design and build a custom power filter that will satisfy global EMC regulations, improve speed-to-market times, overcome space constraints and withstand harsh environmental conditions. Our plug-and-play designs cover a range of industrial and instrumentation applications that will address any of your power filtering needs with current ratings as high as 500 Amps.

### Applications

- Process control equipment
- Welders
- Ultrasonic cleaners
- Ruggedized computers
- Industrial washing machines
- Vending machines
- Gaming machines
- Elevators, escalators, moving sidewalks

### Industrial Capabilities

- Effective conducted filtering from 10KHz to 30MHz
- Switched & fused product options
- Current ratings up to 500 Amps
- Maximum voltage ratings of 400VDC and 240VAC standard
- Low leakage IEC inlet
- Circuit breaker protection
- Unique packaging
- Ruggedized construction to withstand harsh conditions
- Design flexibility to meet demanding environmental & performance requirements
- Agency approval available
- Compact, space saving size

## EMC Testing for Industrial

- FCC Part 15 Emissions
- CISPR 11, 14, 22 Emissions
- CISPR 25 Emissions
- IEC 1000-4-x Immunity

Ruggedized construction and design flexibility allow our filters to meet demanding environmental and performance requirements

