

# Medium Voltage Pad-Mounted Harmonic Filter Banks

## General

Northeast Power Systems, Inc. (NEPSI's) medium voltage pad-mounted harmonic filter banks are typically utilized for underground utility distribution systems in areas that are accessible to the public and where harmonic generating loads are present. These filter banks are low profile, tamper-proof, and are painted green to blend in with the surrounding environment. They are designed, constructed, and tested to meet or exceed ANSI C57.12.28 Pad-Mount Enclosure Standard. Fully engineered, tuned, multi-tuned, partially tuned, and de-tuned harmonic filters are available.



**Figure: 600-00-1**

The incoming compartment is typically provided with 200 amp bushing wells, stainless steel parking stands, and a hinged Lexan barrier to allow for viewing and removal of harmonic filter bank fuses.

## Product Scope

- Single Stage and two stage harmonic filter banks from 600 kvar to 3000 kvar in voltages to 34.5kV.
- Banks remove system resonance concerns, reduce voltage distortion, and allows for IEEE 519 compliance.
- The filter banks can be customized and engineered to meet utility system conditions and performance requirements.
- Standardized low-profile compact design comes fully assembled and ready for interconnection.
- Easy to install and maintain on underground distribution system using standard 200 amp and 600 amp separable connectors.
- Provides loss reduction and voltage support on systems largely composed of cable.
- Meets requirements of ANSI C57.12.28 and the original Western Underground Committee Guide 2.13 for enclosure integrity.
- Provides loss reduction and voltage support on systems largely composed of cable.

## Standard Features

### Enclosure

Single self-supporting unit designed to meet or exceed the requirements of ANSI C57.12.28 for enclosure integrity. Enclosure is constructed of 11 gauge galvaneal steel and is painted Munsell Green No. 7GY3.29/1.5. The base of the enclosure, as well as the capacitor and switch supports consists of C4 x 5.4 structural steel channel for rigidity and skidding into place. The roof is cross-kinked for added strength and water shedding. Removable lifting plates are provided on each corner of the enclosure for easy placement by a crane. The doors have 3-point pad lockable latching door handles and a recessed pent-head bolt. Rear doors contain tamperproof louvers for ventilation. All doors are equipped with door retainers to secure doors in an open position. Enclosure is marked and labeled in accordance with applicable IEEE and NEMA standards and has a permanently stamped non-corrosive nameplate affixed to the enclosure indicating key equipment data.

### Vacuum Switches

Low maintenance, long life, group operated vacuum switches (oil switches are available upon request) are provided to switch the bank on and off. The vacuum switches have a 200 amp capacitive switching current rating.



**Figure: 600-00-2**

*Control compartment is completely compartmentalized and isolated from the capacitor compartment and incoming compartment.*

### Main Incoming Compartment

Each filter bank is equipped with a main incoming "radial feed" dead front compartment for supply termination. ("Feed-through" designs are available on request). The compartment is equipped with ANSI Standard 200 amp bushing wells (600 amp bushing wells are available upon request) and stainless steel parking stands welded to the enclosure wall. A hinged Lexan window is provided for viewing the status of the main incoming fuses.

### Harmonic Filter Rated Capacitors

Low loss, double bushing harmonic filter-rated capacitors that meet or exceed IEC 871, IEEE 18 and CSA standards. Capacitors are connected ungrounded-wye as standard. Internal discharge resistors reduce the residual voltage to less than 50 volts within 5 minutes of de-energization. The dielectric fluid is environmentally friendly, biodegradable, non PCB, with low toxicity. Internally fused capacitors are available upon request.

### Harmonic Filter Reactors

Iron-Core harmonic filter reactors provide the necessary reactance to tune the capacitor bank to the desired frequency. In addition to tuning, these reactors significantly reduce the frequency and magnitude of inrush currents from back-to-back capacitor bank switching.

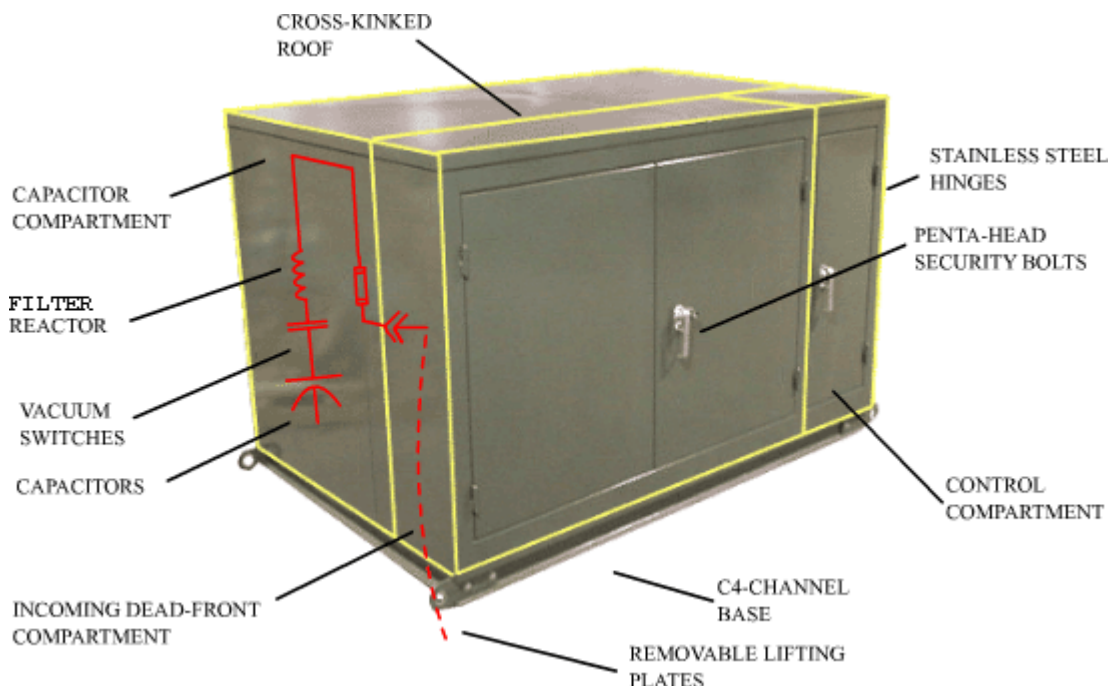
### Ground Bus

All bus bars, phase and ground, are silver-plated for maximum conductivity and corrosion resistance. The phase bus is rated for at least 135% of the bank current. The ground bus is provided in both the capacitor compartment as well as the Main-Incoming Compartment through the entire width of the enclosure.

### Control Power Transformer

A line-to-ground connected control power transformer is supplied with each bank for internal controls of the filter bank (i.e. heaters, convenience outlet, switches, etc.) and power factor, var, and voltage sensing.

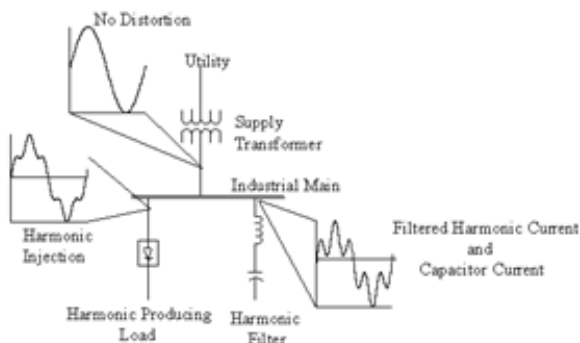
Medium Voltage Pad-Mounted Harmonic Filter Banks



**Figure: 600-00-3**

*Typical One-Stage Pad-Mounted Harmonic Filter Bank Showing Location of Isolated Compartments and Bank Features*

**Optional Accessories**



**Figure: 600-00-4**

*Harmonic Filters reduce harmonic voltage and current distortion while correcting power factor*

**Surge Arresters**

Heavy Duty Distribution Class Lightning Arresters can be provided for transient voltage protection of the filter bank.

**Thermostatically Controlled Fan**

A thermostatically controlled fan can be provided for ambient control of the filter bank.

**Automatic Controller**

A Fisher Pierce Series 4400 POWERFLEX AutoCap™ Adaptive Capacitor Bank Controller (contact NEPSI for other types and manufacturers) can be installed in the pad-mounted capacitor bank prior to shipment. This controller will automatically switch the bank based on var, temperature, time, voltage, and/or current.



**Figure: 600-00-5**

*The Live-front compartment allows for view and maintenance of vacuum switches, CPT, iron-core reactors, and double-bushing capacitors.*

## Medium Voltage Pad-Mounted Harmonic Filter Banks

### Convenience Outlet

A 15 amp GFI convenience outlet can be provided in the control compartment for local power.

### Fisher Pierce Meter Socket

Each filter bank is equipped with a four or six terminal Meter Socket for accepting standard socket style capacitor bank controllers.

### Other Options

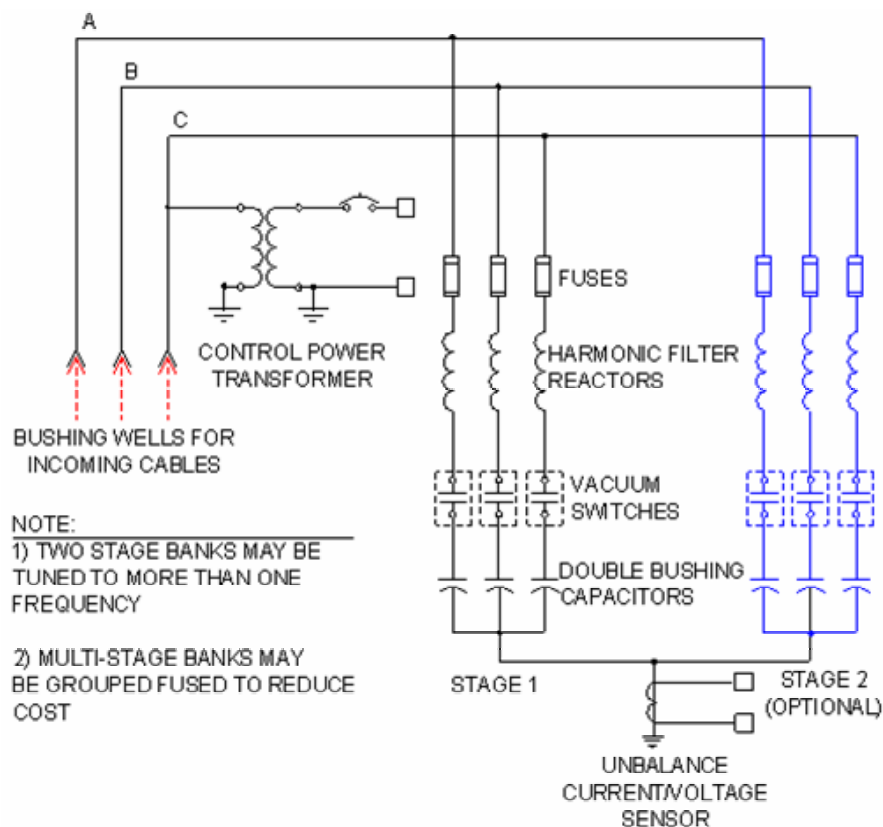
Stainless steel or aluminum construction, special finishes, single stage or multi-stage, insulated bus, mimic bus, deadfront or livefront design, air-disconnect switch, hinged compartment barriers, ground switch.

### Enclosure Lights

Enclosure lights can be provided for high visibility during maintenance, and to allow for viewing of fuses through the hinged Lexan window.

### Blown Fuse Detection System

Each bank can be equipped with a blown fuse detection system (also known as *neutral voltage/current unbalance detection system*) that will alert plant personnel of a blown fuse. It consists of a over voltage/current relay and a neutral voltage/current sensor. The relay has an adjustable set point to trip or alarm upon detection of a blown fuse.



**Figure: 600-00-6** Typical Three-Line Diagram. Ratings, Specific Bank Configuration, and Components are Dependent Upon Voltage Rating and Customer requirements

## Pad-Mounted Harmonic Filter Bank Ordering Guide

NEPSI's pad-mounted harmonic filter banks are built in accordance with the standard and optional features as previously listed. Alternate designs that meet your specific requirements and site conditions can easily be accommodated. Feel free to contact NEPSI for a quote or to discuss your specific application.

For a price quote, please fax or call NEPSI with the following information:

System Voltage (kV) _____	One or Two Steps ? _____	
Total kvar requirements _____	Grounded or Ungrounded? _____	
Three-Phase System Short Circuit Level (Symmetrical Amps) _____	Vacuum or Oil Switches _____	
Desired Tuning Frequency _____		
Optional Features:	<input type="checkbox"/> Fisher Pierce Controller	<input type="checkbox"/> Inrush Reactors
	<input type="checkbox"/> Lightning Arrest- ers	<input type="checkbox"/> Exhaust Fan
	<input type="checkbox"/> 200 Amp Bush- ing Inserts	<input type="checkbox"/> Feed-Through Bushing Inserts
		<input type="checkbox"/> S&C Fuses. CL are Standard
		<input type="checkbox"/> Stainless Steel Con- struction
		<input type="checkbox"/> Spare Fuses

Other requirements or constraints such:

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Fax or email above information to NEPSI for a quote. Firm quotes are returned within one business day. Budgetary quotes can be provided verbally on request.

See our website for more technical information on our pad-mounted harmonic filter banks. The following is a short list of what you will find.

- Guide form specifications.
- Elevation and Pad drawings in DXF and Autocad format.
- Budgetary pricing, weights, and dimensions.
- Instruction manuals and cut-sheets for major components.

Pad-mounted harmonic filter banks URL: <http://www.nepsi.com/padmoutedfilterbank.htm>