

What is a Load Bank?

A **Load Bank** is a device which **develops** an electrical load, **applies** the load to an electrical power source and **converts** or dissipates, the resultant power output of the source. A load bank is intended to accurately mimic the operational or “real” load which a power source will see in actual application. However, unlike the “real” load, which is likely to be dispersed, unpredictable and random in value, a load bank provides a contained, organized and fully controllable load. Consequently, a load bank can be further defined as a self-contained, unitized, systematic device which includes both load elements with control and accessory devices required for operation. Where the “real” load is served by the power source and uses the energy output of the source for some productive purpose, the load bank serves the power source, using its energy output to test, support or protect the power source.

A load bank may be permanently installed as an integral component of an electrical generating system or it may be portable, brought into use when needed or applied to several separate systems.

A resistive load bank, the most common type, proves equivalent loading of both generator and prime mover. That is, for each kilowatt (or horsepower) of load applied to the generator by the load bank, an equal amount of load is applied to the prime mover by the generator. A resistive load bank, therefore, removes energy from the complete system: load bank from generator—generator from prime mover—prime mover from fuel. Additional energy is removed as a consequence of resistive load bank operation: waste heat from coolant, exhaust and generator losses and energy consumed by accessory devices. **A resistive load bank impacts upon all aspects of a generating system.**

The “load” of a resistive load bank is created by the conversion of electrical energy to heat by power resistors. This heat must be dissipated from the load bank, either by air or by water, by forced means or convection.

In a testing system, a resistive load simulates real-life resistive loads, such as lighting and heating loads as well as the resistive or unity power factor component of magnetic (motors, transformers) loads.

A “reactive” load includes inductive (lagging power factor) and/or capacitive (leading power factor) loads. Inductive loads, the more common type, consist of iron-core reactive elements which, when used in conjunction with a resistive load bank, create a lagging power factor load. Typically, the inductive load will be rated at a numeric value 75%

that of the corresponding resistive load such that when applied together, a resultant 0.8 power factor load is provided. That is to say, for each 100KW of resistive load, 75KVAR of inductive load is provided. Other ratios are possible to obtain other power factor ratings. Inductive loads are used to simulate real-life mixed commercial loads consisting of lighting, heating, motors, transformers, etc. With a resistive/inductive load bank, full power system testing is possible given the impact of reactive currents on generator/voltage regulator performance as well as effects on conductors and switchgear.

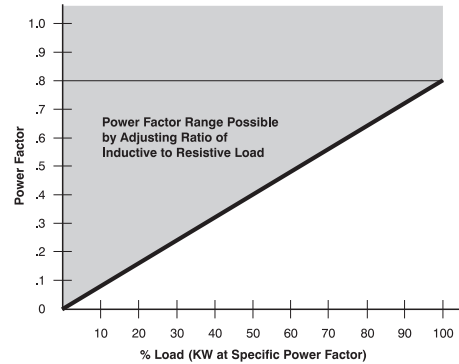


SIMPLX®

A capacitive load bank is similar to a reactive load bank in rating and purpose, except leading power factor loads are created. These loads simulate certain electronic or non-linear loads typical of telecommunications, computer or UPS industries.

Simplex manufactures a broad line of load banks, including:

- Stationary, resistive engine radiator airflow cooled (LBD Series)
- Stationary, resistive, resistive/reactive, freestanding forced air cooled (LBS Series)
- Stationary, resistive, freestanding, water-cooled (LBW Series)
- Portable, resistive, resistive/reactive, forced air cooled.



Variable power factor loading is possible with a resistive/reactive load bank by adjusting the ratio of resistive to inductive load.

Applications

Automatic

- Generator exercise, control from remote control contacts
- Automatic exercise/test via programmable microprocessor control
- Automatic load leveling/load regulation to maintain preset load on generator by sensing of total load and automatic addition or subtraction of load bank component.

- Reverse power/regenerative power protection of generator by sensing power direction and magnitude and automatic addition of load bank component to act as a power sink.

Manual

- Generator exercise and testing via local or remote manual control
- Minimum loading of generators

Features

Malfunction Detection

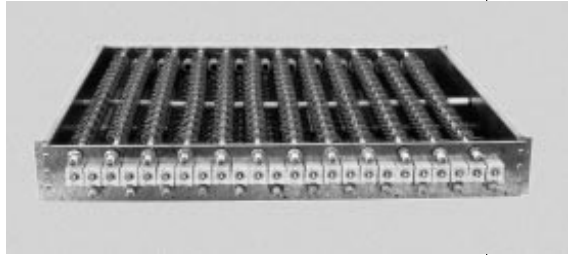
Simplex Load Banks are equipped with a malfunction detection system which provides automatic load disconnect and alarm on sensing of an abnormal operating condition. The system includes the following:

- Cooling air intake temperature switch, set at 120°F, to sense recirculation of load bank hot exhaust air or an ambient temperature above the rating of the load bank
- Cooling air exhaust temperature switch, set 75°F above maximum rise at maximum ambient, to sense restricted cooling airflow, recirculating air, loss of airflow.
- Air pressure switch to sense for positive cooling airflow
- Overvoltage, dual/multi-voltage load banks
- Automatic load disconnect/lockout circuit
- Remote alarm contacts

Cooling System

Simplex Load Banks are equipped with an integral forced air cooling system consisting of the following:

- Motor drive propeller fan
- Fan blade, shrouded for high efficiency
- Motor control contactor
- Motor circuit breaker
- Fan motors normally operate at load bank line voltage
- Motors for outdoor load banks are totally enclosed
- Motors for indoor load banks are open-drip-proof



Specifications

- Alloy: FeCrAl
- Maximum continuous temperature rating: 1920°F
- Maximum operating temperature as applied in Load Bank: 1080° F
- Cool down time from operating to ambient temperature is 10 seconds.

Powr-Web Resistive Load Element

Description

The Simplex "Powr-Web" load resistor is an advanced design, air-cooled power resistor specifically designed for application to load bank systems. The "Powr-Web" is conservatively operated at half the maximum temperature rating of the alloy and features a short-circuit-safe design based on continuous mechanical support of the resistor by high temperature, ceramic clad stainless steel rods. The "Power Webs" are assembled into discrete trays which are assembled in a vertical "stack." Each tray in the "stack" is independently serviceable without disturbing adjacent trays.

Construction

- Precision calibrated to specific ohmic value
- Welded lugs each end
- All load elements are continuously supported by vibration resistant, ceramic clad, stainless steel throughrods.



Ratings

- 3333W at 120V
- 4170W at 139V
- 8333 watt 240/480V
- 16,777 watt at 480V



The Simplex inductive load banks consist of discrete iron-core load elements. These are non-saturable, air gap calibrated, air cooled devices and are field replaceable. Standard elements have a temperature sensor embedded in the windings to detect element overheating and through the module malfunction detection system, disconnect the load elements and activate an alarm. Standard elements are varnish coated; epoxy coatings are available for severe environments.

Inductive Load Elements

Specifications

Tolerance:	5%
Maximum Harmonic Distortion:	1%
Power Factor:	.05
Insulation:	220°C
Cooling:	Air



What is a Load Bank?

Design Profile

APPLICATIONS	Engine Generators, Battery Systems, UPS Systems, Inverters, Ground Power Units, Auxiliary Power Units, Aircraft Power Generators, Wind Generators, and Hydro Generators are used to test, prove and maintain AC or DC generators and power supplies
PURPOSE	<p>Test - Precision testing instrument which applies a discrete, selectable electrical load to a power generator and measures the response of the generator to the applied load. Measurements of response stability and endurance can be made and corresponding calibrations and adjustment can be effected while a precise load is maintained on the power source</p> <p>Exercise - Exercise load banks assure the long term reliability and readiness of standby generators by providing a means for routine maintenance exercise of the generator under load. Exercise load banks eliminate the detrimental effects of unloaded operation of diesel engine contractual performance specifications</p> <p>Demonstration - A sophisticated engineering tool for demonstrating product performance and capability to buyers and users and for fulfilling contractual performance specifications</p>
TYPE	<p>Resistive - Dissipates energy output of generator and prime mover as heat. Unity power factor loading of generator. KVA load applied to generator equals KW load applied to prime mover. Provides equivalent of commercial lighting, heating loads</p> <p>Inductive - Used in parallel with resistive load bank to obtain lagging power factor, increase KVA load on generator; does not increase KW load on prime mover. Provides equivalent of commercial motor, transformer loads</p> <p>Capacitive - Used in parallel with resistive load bank to obtain leading power factor, increases KVA load on generator; does not increase KW load on prime mover. Provides equivalent of commercial electronic, fluorescent light loads</p>
CAPACITY	<p>Single Block - Entire capacity of load bank applied, on/off, in one step increment</p> <p>Multiple Steps - Load bank capacity is divided into discrete increments for application in steps; defined in terms of <i>load step resolution</i>, which is the smallest step increment of load control. Steps can be coarse (50%, 33%, 25%) or fine (5KW, 1KW)</p> <p>Single Voltage - Designed for a specific voltage, typical of exercise load banks to 15KV.</p> <p>Multiple Voltage - Capable of dual or quad voltages. Typical of test systems. (Typical voltages—60HZ: 120/240, 208-240, 416-480; 50HZ: 190-220, 380-420; DC: 12-60, 125, 250) to 15KV.</p> <p>Single Frequency - Designed for a specific frequency</p> <p>Multiple Frequency - Capable of multiple frequency or AC/DC operation (Typical frequencies: 50-60-400HZ, DC)</p>
COOLING	<p>Natural Convection Air - 20 KW Maximum</p> <p>Integral Fan - Cooling fan included in load bank; up to 3000 KW.</p> <p>Radiator Airflow - Load bank installed in radiator fan airflow; up to 1000 KW</p> <p>Water - Cooling via heat transfer to water flow; water does not conduct electrical current. Open flow using commercial/natural water or closed loop using heat exchanger up to 1200 KW.</p>
ENCLOSURE	<p>Portable - For factory, shop, field use, self-contained</p> <p>Stationary - For permanent installation at a specific site</p> <p>Duct Mounting - For permanent installation in radiator airflow</p> <p>Indoor - NEMA 1 enclosures</p> <p>Outdoor - NEMA 3R enclosures</p>
CONTROL	<p>Local - Control panel self-contained in load bank</p> <p>Remote - Control panel for remote operation</p> <p>Automatic - Wide variety of auto control available including <i>auto on-off, auto load regulation, KW or reverse power response, computer control</i></p>
CONNECTION	<p>Cable Set - Connection cable included with load bank. Typical of portable units</p> <p>Terminal Block - Power terminals for connection of building cables. Typical of stationary and duct mounted units.</p> <p>Plugs - To match commercial wiring devices, aircraft plugs, MIL-SPEC plugs, cam-lock connections.</p>
FEATURES	<p>Short Circuit Protection - Load element branch circuit fuse or circuit breaker protection</p> <p>System Protection - Protected against running failures (<i>fan fail, overtemp, overvolt, etc.</i>)</p> <p>Control - Self-contained load control devices (contactors, relays, circuit breakers)</p> <p>Handling - Forklift channels, lifting eyes, casters on portable units.</p> <p>Instrumentation - Full instrumentation available: analog or digital; data acquisition systems</p> <p>Options - Many options available</p>
<p>Simplex will also custom design load banks to your special requirements. Use the general specifications as a guide.</p>	