MICROSTAR

Portable Load Bank

SIMPLEX Insight Onsite

Operation and Installation Manual

Last Revision Date: June 8, 2021

For the most up-to-date information for this product and others,
please contact Simplex, Inc. at (800) 637-8603 or
visit us on the web at http://www.simplexdirect.com.

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I. WARNINGS AND CAUTIONS

I-A. Safety Information Symbols

The following images indicate important safety information:


This General warning symbol points out important information that, if not followed, could endanger personal safety and/or property.


This Explosion warning symbol points out potential explosion hazards.


This Fire warning symbol points out potential fire hazards.


This Electrical warning symbol points out potential electrical shock hazards.

I-B. Warnings

This load bank is high-powered, technical, industrial equipment operating at dangerous voltages and temperatures. It is capable of damaging itself, property or personnel if improperly used. It is not a consumer product.

It must be installed, connected and operated by personnel properly trained and experienced in its use. An operator's manual is supplied with each load bank and available online at www. simplexdirect.com. The operator must be familiar with its contents and have access to it during operation.

- **High Voltage**: Turn off and disconnect power source before opening this equipment
- **High Temperature**: Allow hardware to cool before servicing or opening this equipment.
- **Rotating Equipment:** Ensure that the fans have stopped before opening this unit.
- **For Operator Safety:** Make sure this equipment is properly grounded when in use.

All compression-type connections on fuse blocks, load blocks, and contactors should be checked for tightness frequently. This check should be established as part of routine maintenance.

The following cautions should be observed before and during operation:

- Check intake and exhaust screens as well as fan and load elements for foreign objects.
- Position and install the load bank with consideration given to large cubic airflow requirements, exhaust temperature, and velocity. Do not point exhaust at any nearby surface or object that may be adversely affected by high temperature. This includes but is not limited to painted surfaces, tar

paper and asphalt roofs, water sprinkler heads, fire alarms, and volatile material.

- Do not use in confined spaces. The load bank may have to compete with cooling air requirements of a nearby running engine generator set where cooling air intake to a confined space may not be adequate for both engine and load bank. Be especially careful not to bounce hot exhaust air off nearby obstructions for re-circulation through the load bank.
- Verify that all control switch positions are set correctly for your intended usage before connecting the load bank to the source to be tested.
- The load cables carry high amperage. Be constantly aware of possibility of inductively heating adjacent ferrous objects to temperatures sufficient to damage cable insulation.
- Always connect the safety ground cable to a proper ground. Do not rely on a possible grounded neutral somewhere else in the system.
- Do not let the load bank run unattended for long periods of time.
- Do not store or operate in rain unless adequate protection is provided.
- Routinely inspect all components and electrical connections for tightness and integrity.
- Repair any damaged or degraded components and wiring without delay.
- If technical assistance, service, or parts are needed, please call 800-637-8603 (24 Hours).
- All hardware covered by this manual have dangerous electrical voltages and can cause fatal electrical shock. Avoid contact with bare wires, terminals, connections, etc. Ensure all appropriate covers, guards, grounds, and barriers are in place before operating the equipment. If work must be done around an operating unit, stand on an insulated dry surface to reduce the risk of electrocution.

- Do not handle any kind of electrical device while standing in water, while barefoot, or while your hands or feet are wet.
- If people must stand on metal or concrete while installing, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the equipment only while standing on such insulative mats.
- The National Electrical Code (NEC), Article 250 requires the frame to be connected to an approved earth ground and/or grounding rods. This grounding will help prevent dangerous electrical shock that might be caused by a ground fault condition or by static electricity. Never disconnect the ground wire while the load bank is in use.
- Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current (ampacity) to which they will be subjected.
- Before installing or servicing this (and related) equipment, ensure that all power voltage supplies are completely turned off at their source. Failure to do so can result in hazardous and possibly fatal electrical shock.
- In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim

from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a dry rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and seek immediate medical attention.

- Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock or may get caught in moving components causing injury.
- Keep a fire extinguisher near the hardware at all times. Do NOT use any carbon tetra-chloride type extinguisher. Its fumes are toxic, and the liquid can deteriorate wiring insulation. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, please consult the local fire department.

- The illustrations in this manual are examples only and may differ from your load bank.
- Load Bank warranty is void if incorrectly cooled.

II. DESCRIPTION AND SPECIFICATION

II-A. Overview

The Simplex Microstar Load Bank is a precision test instrument specifically designed to apply discrete, selectable heat loads to a cooling source. The load bank unit also allows for routine maintenance to assure long-term reliability of the product and readiness of the building cooling systems. The unit fits a 19-inch server rack of nearly all types including square or round holes, either non-threaded or threaded (#10, #12, M6) and is 10U (17.5 inches) tall.

The cabinet on the unit is rated Environmental Type 1, and the unit is rated for operation in conditions up to but not exceeding 40˚C (104˚F).
The unit tests the building cooling source by applying resistive load steps to generate predetermined amounts of heat (KW). Adjusting the fan speed with the Fan Control knob will control temperature rises.

Consult the fuse replacement chart on the rear of the load bank for further details.

The unit is controlled by the array of switches on the front of the unit. The control system is composed of 24VDC components. Common serviceable components include control fuses and load application fuses. Lamps on the face panel of the load bank indicate its operating status.

The local control panel contains the following components:

- A Green Light indicating “Cooling Active”
- A Red Light indicating “Over Temperature”
- An On/Off Switch
- A Fan Speed Potentiometer
- Seven load step switches

The “Cooling Active” lamp, a green light, illuminates when control power is “On” or active, and the load may be applied.

Sensors protect the load bank against cooling failure (high exhaust air temperature, which could damage the Load Bank or present a safety hazard to the operator). When a cooling failure occurs, the automatic safety feature in the control system immediately removes all load. The operator must correct the malfunction. After correcting the issue, the operator must reset the system by powering down the load bank and turning the unit back on. Because of the capacitive nature of the DC power supply, you must hold the load bank in the “Off ” position for a couple of seconds. The unit will retain power otherwise.

II-B. Control System

The control system of the unit allows the operator to apply a desired load to the test source and measure the response of the test source to the load. This system also contains the circuitry utilized to disconnect the Load Bank from the test source in the event of cooling failure and/or improperly positioned operating controls.
The DC power supply via the load source supplies control power (24VDC). The fan starts with the power "On" switch. The fan speed is controlled via a TRIAC fan speed controller in conjunction with a current transformer located on the load wires. As the current transformer detects a high enough amp draw, the potentiometer's minimum is increased.

II-C. Cooling System

A forced air system consisting of one fan (208-240VAC) cools the elements in the load bank. The "On" switch on the control panel, protected by control fuses, energize the fan motor.

II-D. Load System

The Load System consists of independently controlled resistive load elements specifically designed for the unit. 200,000 AIC, 600VAC fuses protect each load step. Simplex, Inc. conservatively selects resistive load elements to provide long life.
See "Table 5 Load Bank Parts" on page 18 for specific elements used.
High-temperature, ceramic-clad, stainless-steel rods rigidly support the elements. An air gap created by the way the support rods are suspended eliminates element-to-element short circuits.

II-E. Specifications

Model	Capacity	Max amps	Amps per section
Microstar	**208VAC:** 13.1 KW	**208V:** 63A	**Section1:** 14.2A
	230VAC: 16.2 KW	**230V:** 70.4A	**Sections 2-4:** 10.4A
	240VAC: 17.5 KW	**240V**: 73A	**Sections 5-6:** 14.6A

"Table 2 Temperature rises" on page 8 shows temperature rises at various fan speeds and voltage ratings. The highlighted numbers show all values at or below 40°F. Values 40°F and below are desired, but not required, for optimal operation.

240V Ratings			230V Ratings			208V Ratings		
Load applied (KW)	At min. fan speed	At max. fan speed	Load applied (KW)	At min. fan speed	At max. fan speed	Load applied (KW)	At min. fan speed	At max. fan speed
1.5	11.9°F	3.1°F	1.4	11.1°F	2.9°F	1.1	8.7°F	2.3°F
2.5	19.8°F	5.2°F	2.3	18.2°F	4.8°F	1.9	15.0°F	4.0°F
3.0	23.8°F	6.2°F	2.8	21.9°F	5.7°F	2.3	18.2°F	4.8°F
4.0	31.7°F	8.3°F	3.7	29.1°F	7.6°F	3.0	23.8°F	6.2°F
5.0	39.6°F	10.4°F	4.6	36.4°F	9.5°F	3.8	30.1°F	7.9°F
5.5	43.6°F	11.4°F	5.1	40.0°F	10.5°F	4.1	32.5°F	8.5°F
6.5	51.5°F	13.5°F	6.0	47.3°F	12.4°F	4.9	38.8°F	10.2°F
7.0	55.4°F	14.6°F	6.4	50.9°F	13.4°F	5.3	42.0°F	11.0°F
7.5	59.4°F	15.6°F	6.9	54.6°F	14.3°F	5.6	44.4°F	11.6°F
8.0	63.4°F	16.6 F	7.4	58.2°F	15.3°F	6.0	47.5°F	12.5°F
8.5	67.3°F	17.7°F	7.8	61.9°F	16.2°F	6.4	50.7°F	13.3°F
9.0	71.3°F	18.7°F	8.3	65.5°F	17.2°F	6.8	53.9°F	14.1°F
9.5	75.2°F	19.8°F	8.7	69.1°F	18.1°F	7.1	56.2°F	14.8°F
10.0	79.2°F	20.8°F	9.2	72.7°F	19.1°F	7.5	59.4°F	15.6°F
10.5	83.2°F	21.8°F	9.6	76.3°F	20.0°F	7.9	62.6°F	16.4°F
11.0	87.1°F	22.9°F	10.1	80.0°F	21.0°F	8.3	65.7°F	17.3°F
11.5	91.1°F	23.9°F	10.6	83.6°F	22.0°F	8.6	68.1°F	17.9°F
12.0	95.0°F	24.9°F	11.0	87.3°F	22.9°F	9.0	71.3°F	18.7°F
12.5	99.0°F	26.0°F	11.5	90.9°F	23.9°F	9.4	74.4°F	19.5°F
13.0	103.0°F	27.0°F	11.9	94.6°F	24.8°F	9.8	77.6°F	20.4°F
13.5	106.9°F	28.1°F	12.4	98.2°F	25.8°F	10.1	80.0°F	21.0°F
14.0	110.9°F	29.1°F	12.9	101.8°F	26.7°F	10.5	83.2°F	21.8°F
14.5	114.8°F	30.1°F	13.3	105.5°F	27.7°F	10.9	86.3°F	22.7°F
15.0	118.8°F	31.2°F	13.8	109.1°F	28.6°F	11.3	89.5°F	23.5°F
16.0	126.7°F	33.3°F	14.7	116.3°F	30.5°F	12.0	95.0°F	24.9°F
17.5	138.6°F	36.4°F	16.1	127.3°F	33.4°F	13.1	103.7°F	27.2°F

III. UNPACKING

III-A. Included Components and Parts

The following items are included with your load bank. If any of the following are not included, please contact your Simplex representative or call Simplex Direct, Inc., at 800-637-8603.

1. Load bank
2. Manual

III-B. Primary Inspection

Preventative visual inspection of the shipping crate and the load bank is advised. Physical or electrical problems due to handling and vibration may occur. Never apply power to a load bank before performing this procedure. The following five-point inspection is recommended before installation and as part of a 6-month maintenance schedule or as a load bank is relocated:

1. If the crate shows any signs of damage, examine the load bank in the corresponding areas for signs of initial problems.

2. Check the entire outside of the cabinet for any visual damage, which could cause internal electrical or mechanical problems due to reduced clearance.

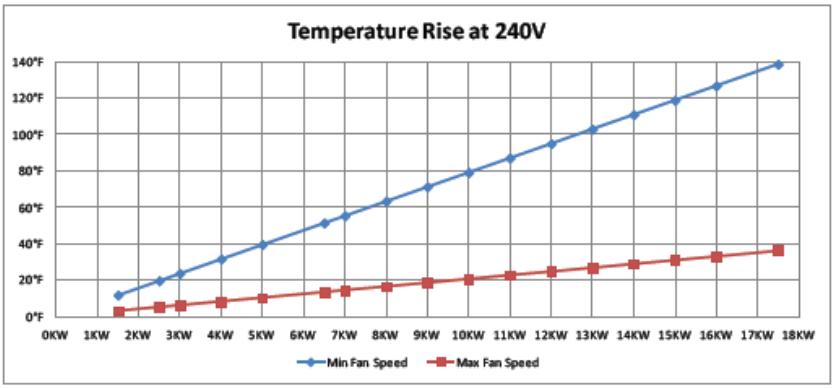
3. Inspect all relays and control modules. Make sure all components are secure in their bases and safety bails are in place. Spot check electrical connections for tightness. If any loose connections are found, inspect and tighten all remaining connections.

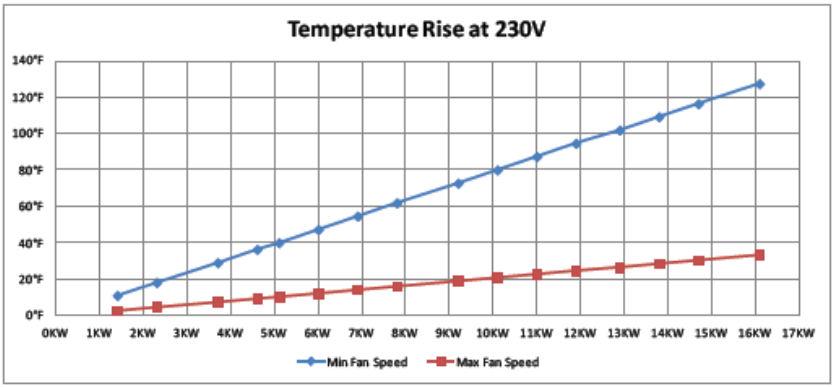
4. Examine all accessible internal electrical components such as fuses, contactors, and relays. Check lugged wires at these components.

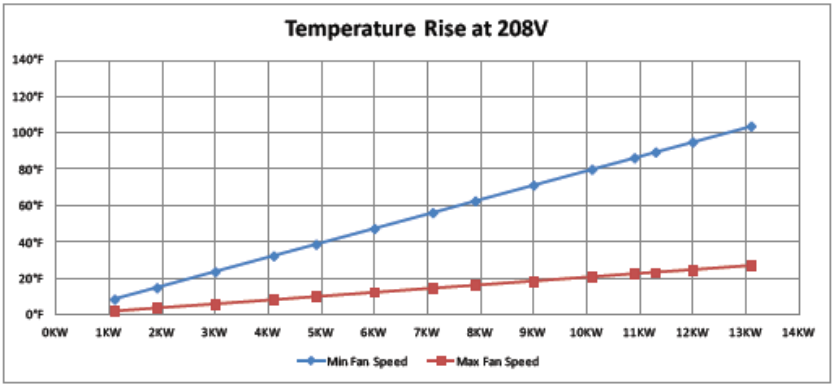
5. Visually inspect the element chamber for foreign objects, broken ceramic insulators, and mechanical damage.

If any problems are observed during primary inspection, call Simplex 24 hours a day at 800-637-8603

III-C. Temperature Rise



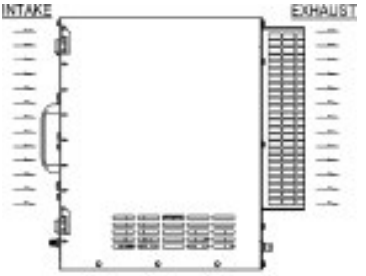




IV. INSTALLATION

IV-A. Load Bank Placement

The load bank is designed to be installed within a server room in a 19-inch server rack. There must be a minimum of two feet on the inlet and outlet of the load bank. Failure to properly install the unit will risk damage to the unit due to overheating as well as damaging adjacent equipment. With the Microstar Standard Precision Heater, use 250V, 16A-rated C13/C14 cables when applying power. A forced air system that takes air in the front and discharges through the rear of the device cools the load elements (see Figure 2).



When installing the load bank into a server rack, line up the adapter pins with the corresponding holes on the server rack. These may be square or round holes, either non-threaded or threaded (#10, #12, M6) in the rack. Use the quarter-turn Cam-Lok keys to lock the load bank into position.

Balance the phase legs used to power multiple load banks.

IV-B. Setup

Consult NEC for proper wire size for all connections unless stated within this manual or on a drawing.

1. Ensure that the test source is properly grounded, and ensure that the power cable for the load bank is bundled with a ground.
2. Confirm all switches on the local control panel are in the “Off ” position.
3. Connect the load source to the unit.
   - **Plug 1:** Control Power (fan/other), steps 1 and 2 (1.5KW each)
   - **Plug 2:** Step 3 (2.5KW)
   - **Plug 3:** Step 4 (2.5KW)
   - **Plug 4:** Step 5 (2.5KW)
   - **Plug 5:** Step 6 (3.5KW)
   - **Plug 6:** Step 7 (3.5KW)
4. Connect load dump contacts, as shown.
5. Start the test source and begin analysis.

Load is disengaged when 24VDC is applied to load dump contacts

IV-C. Local Control

This load bank contains a load dump feature which de-energizes all applied load when customer supplied contacts have a 24VDC supply provided. The contacts, tied to a normally closed relay, are rated for 2A @ 24VDC and should be wired to TB-A-4-5. When these contacts are energized, all applied load will be de-energized, and the load section will be disabled. After being de-energized, the fan will continue to operate. If desired, the customer may install automatic transfer switch contacts, a manual push button, or circuit breaker for this use.
When the load bank is turned on it will default to the highest fan speed setting for a few seconds, then reduce speed to the selected level.

V. OPERATING INSTRUCTIONS

V-A. General Handling Information

When moving the load bank, please keep the device upright and do not transport on its side. If the unit needs to be lifted, only lift the unit using the handles on the front or lifting from the bottom of the unit. Do not insert any lifting tools in the fan grating. Avoid dropping the unit in general. While the metal casing is quite strong, avoid dropping anything heavy on the unit.

V-B. After-Operation Handling

Because of the nature of the load bank's operation, the unit will be extremely hot. To prevent burns, allow the fan to run for a few minutes without an applied load at the end of operation.

V-C. Startup

1. When wired appropriately, the unit is ready to apply a load to a test source.

2. Flip the toggle switch to "On" for the Control Power selection. If the system is operating properly, you will hear the fan start and the Green Cooling Active lamp will illuminate.

V-D. Applying a Load

Flip any load step switches (1-7 relating to desired KW) to "On." (See Table 3 for load step values.) This step will begin applying your load to the source as each load step is activated.

1. Once the load has been applied, use the "Fan Speed" knob to precisely set the fan speed as desired. Please refer to page 8 for a desired temperature rise table.
2. When your operation has completed, it is best to switch all load steps (1-7) to "Off " and allow the elements to cool. Once cooled, you can shut the load bank down by switching the "Control Power" toggle switch to "Off."
3. The unit is now off.

Step 1: 1.5 KW
Step 2: 1.5KW
Step 3: 2.5KW
Step 4: 2.5KW
Step 5: 2.5KW
Step 6: 3.5KW
Step 7: 3.5KW

VI. ALARMS AND WARNINGS

VI-A. Over Temperature

When the load bank safety switch hits a certain temperature (175°F), the temperature sensor will trip, and the load will be disabled. If the over-temperature trip occurred due to poor airflow, then the fans will continue to run. However, the over temperature scenario may be due to the fans failing. If this is the case, address the fan issue before restarting.

To clear this over temperature trip, power off the device and then turn it back on. Due to the capacitive nature of the DC power supply, you must leave the device powered off for a couple of seconds.

VI-B. Failure Detection

If a failure occurs, the corresponding status indicator will be present, and the load will be de-energized. Before reapplying a load, the failure must be corrected, and the system must be reset by turning the load bank “Off ” then “On”. As mentioned, due to the capacitive nature of the DC power supply, the unit must be turned off and remain off for at least one second before reapplying power.

This is a permissive/energize-to-run circuit in which all safety sensors must energize their control relays on normal operation before load can be applied. This system will include a thermo switch, set at 175˚ F, tied to a relay that will open all magnetic load contactors if over temperature is achieved.

Unresolved cooling issues may result in damage to the load bank.

VII. MAINTENANCE/TROUBLESHOOTING

VII-A. General Maintenance

The air intake and exhaust screens must be checked for any obstructions or foreign objects. Check fan blades for stress fractures. Due to the high volume of air circulated, paper and other items can be drawn into the air intake. During load bank operation ensure that the air is exiting from the exhaust vent.

The load branches should be checked for blown fuses or opened load resistors. To check the fuses or load resistors, operate the load bank from a single-phase source. If your fuse is blown on any branch, you will detect no current. In addition, if the fuses are checked, you will not have continuity.

Check the tightness of the electrical connections. The expansion and contraction caused by heat from the load bank operation may result in loose connections. The vibrations caused by the cooling fan may also loosen electrical connections. If the load bank is transported "over the road", the electrical connection should be checked for tightness at a shorter-than normal time interval. See page 9 for an inspection guide.

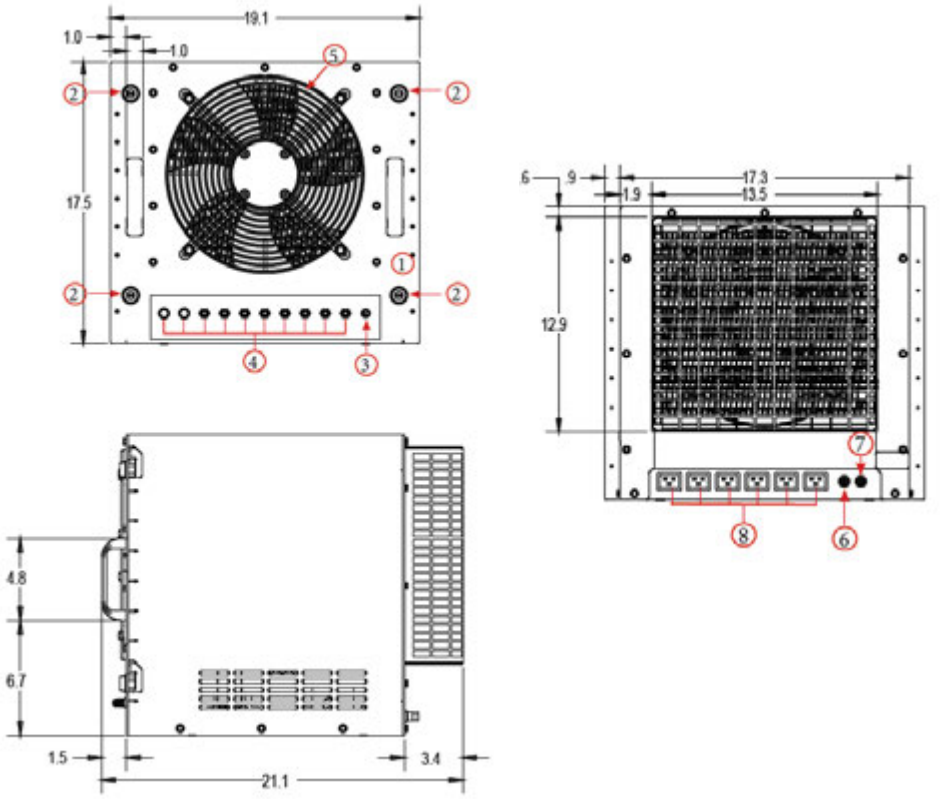
Remove all power before servicing the load bank. Never operate or service a load bank that is not grounded.

VII-B. Troubleshooting

This section is designed to aid the electrical technician in basic load bank system troubleshooting. All of the problems listed can be verified with a basic test meter and/or continuity tester. For safety reason, when troubleshooting load banks systems, always remove power, fan/control power, etc.

Problem	Solution
Cooling Fan Motor Will Not Operate	Fan/Control power not available/incorrect Inoperative fan motor or control power Fan switch is "Off " or not functioning Restriction of air (intake or exhaust)
Cooling failure indicated element chamber temperature has exceeded 175˚F	Over temperature sensor failure Fan failure Air Restriction (intake or exhaust) Over-voltage condition present
Some Load Steps Cannot Be Energized	Open load step resistor(s) Inoperative load step switches Inoperative load step contactors Open load step fuses

VII-C. Load Bank Parts



Reference Number	Part Number	Description
1	15369075	Handle, Nylon
2	15453053	Key Cam-Lok Latch
3	25118505	Potentiometer Knob
4	25297625	Toggle Switch
5	13850025	208-240V Fan
6	25594500	Binding Post - Black
7	25594550	Binding Post - White
8	25618250	IEC C20 Plug

Contact Simplex
for all your Load Bank and Fuel Supply needs.

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5300 Rising Moon Road
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800-637-8603
www.simplexdirect.com