SIMPLEX®

POWERSTAR

Portable Load Bank

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For up-to-date information on this product or others,
please contact Simplex at 800-637-8603 or
visit us on the web at www.simplexdirect.com.

Table of Contents

I. WARNINGS AND CAUTIONS

I-A. Safety Information Symbols:

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. Cautions:

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.

Main disconnect to be provided by installer, rated 600V maximum, sized 150% maximum of rated current.

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 800-837-8603 (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.
- Multiple power sources are provided and each should be dis-connected before servicing.

- 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.
- Main Disconnect to be provided by installer, rated 600V maximum, sized 150% maximum of rated current.

- Load Bank warranty is void if incorrectly cooled.

II. DESCRIPTION AND SPECIFICATION

II-A. Overview of Use

The Simplex Powerstar Portable Load Bank is an ultra-compact, lightweight, and versatile test instrument de-signed for manufacturers, dealers, and users of AC power systems. It is suitable for testing engine generators, wind generators, UPS systems, ground power units, auxiliary power units, static inverters, or virtually any other AC power source in the production line, in the service shop or in the field. The load of the unit can be applied to all common AC voltages. See **section II-D** for a full list of specifications.

The load bank includes test instrumentation, a cooling system, rugged load elements, load-application control devices, and automatic system protection devices. The resistive load elements in the load bank are cooled by a horizontal forced air system. The load system is connected to the test source via the load cables.

II-B. Capabilities

The Powerstar is a digitally controlled load bank with net-work capability. The unit is controlled via a hand-held touch-screen controller that is connected by a supplied RS-232 serial cable. It includes a digital power transducer with meter displays on the touchscreen. Power load is applied via a screen keypad. Using the RS-232 cables, any number of load banks can be connected in a series. To create a load bank chain, connect the RS-232 cables from the “out” connector to the “in” connector of the next unit. Continue this process until the desired number of units are connected. All control and metering is provided from a single hand-held controller. All instrumentation values for the total network are summed and displayed on the master control-ler.

The load bank is highly portable and easily transported to the job site. The load bank includes casters and moving handles. Power connections plug in to Cam-Lok connectors. Control and cooling fan power is obtained from a common 115v, 15A outlet via the included power cord.

II-C. Safety

The load bank is equipped with an automatic system to de-energize the load if conditions could be dangerous to the operator or the hardware. If the load elements aren’t being cooled properly due to a fan failure or high exhaust temperature, the load bank will de-energize any applied load.

After operation, the load bank has an auto cooldown feature to prevent burns and injury during transportation after use.

II-D. General Specifications

Power Factor	1.0
Load Type	Resistive
Frequency	50/60 Hz
Temperature Rating	Maximum Air Intake Temperature: 125˚F Nominal Temperature Rise: 110˚F
Airflow	2400 CFM
Fan/Control Power	External 115VAC, 1-phase, 60Hz, 15A service, 15’ cord with plug provided
Dimensions	15"W x 28.5"H x 26"D
Weight	125 lbs
Capacity	110KW
Full Load Amps	240V, 3-phase: 265A 480V, 3-phase: 132A 240V, 1-phase: 292A
Nominal Voltages	240/480V

II-E. Powerstar Capacity Deratings

	208V	240V	300V	416V
240V	83KW	-	-	-
480V	21KW	28KW	43KW	83KW

When you connect a PowerStar at a voltage less than its nominal voltage rating, the load capacity with be reduced. Above is a table listing derated capacities at common voltages.

II-F. Current Draw at Specified Wattages

3-Phase

	5KW	10KW	20KW	25KW	50KW	110KW
240V	12A	24A	48A	60A	120A	265A
480V	6A	12A	24A	30A	60A	132A

1-Phase

	5KW	10KW	20KW	25KW	50KW	110KW
240V	21A	42A	83A	104A	208A	292A

These measurements are based on ideal numbers. They do not take into account control power draw, power cable resistance, voltage droop, etc.

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 call Simplex Direct at 800-637-8603.

1. Load bank (Figure 1)
2. Human-Machine Interface (HMI) (Figure 2)
3. Power cord (Figure 3)
4. Serial cable (Figure 4)
5. Manual
6. Electrical drawings package

Figure 1: Load Bank

Figure 2: HMI

Figure 3: Power Cord

Figure 4: Serial Cable

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.

Call Simplex if you have any problems during installation.
24-hour contact at 800-637-8603

IV. INSTALLATION

IV-A. Load Bank Placement

Proper placement of the load bank is essential for the operators' safety and maintaining the integrity of the load bank.
The load elements in the load bank are cooled by a horizontal forced air system, which discharges through the front of the cabinet. The location of the load bank is of prime importance and is one of the most critical factors involved in safe operation.

The load bank must be positioned and installed to allow for a 4-foot intake clearance as well as a 20-foot exhaust clearance.

Avoid blocking the air intake and ensure the area around the load bank is clear of debris.

Figure 5: Airflow Diagram

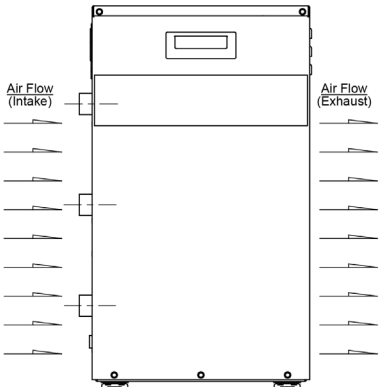
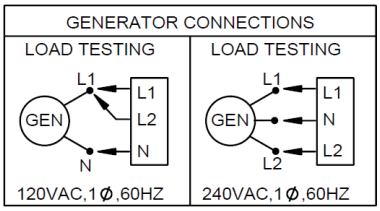


Figure 6: Connection Diagram



- Never point the exhaust at nearby surfaces or objects that may be damaged by high temperatures.
- Never operate the load bank in a confined space without regard for adequate intake of air and provision for exit of high temperature exhaust.
- The load bank and a nearby generator set may have to compete for cooling air.
- Never bounce hot exhaust air off nearby objects and allow it to re-circulate through the cooling system.
- Never operate the load bank near a sprinkler system.

IV-B. Connecting the Load Bank

Connect the load bank to the source under test as indicated in Figure 6.

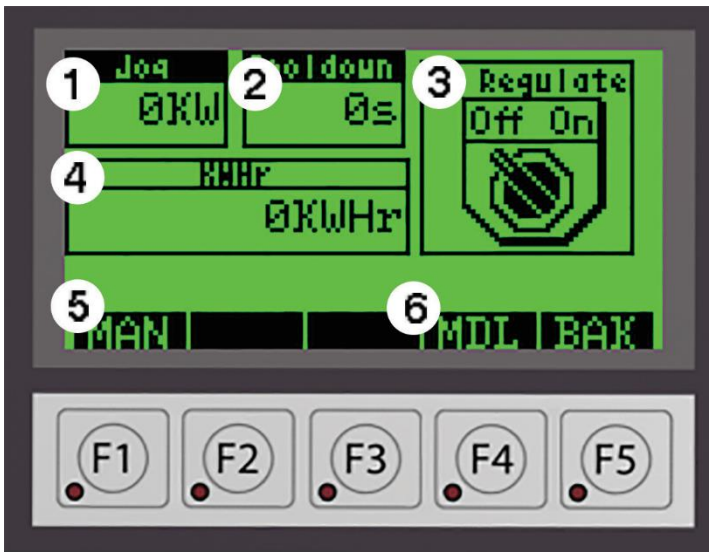
V. SETUP

V-A. Introduction

There are a few features that need to be set up before using the load bank. These settings are located in the Setup menu, shown in Figure 7. From this menu, you will be able to set the "Jog" steps, the "Cooldown" timer, and include manual load steps. From this Setup screen, you can also view the KWHR, which serves as an odometer.

For an explanation of the parts of the Setup menu, please see section V-B.

Figure 7: Setup Screen



V-B. Setup Screen Legend

1. The "Jog" section of the setup screen is where you set the amount that the JG+/JG- will change the value. For example, if the "Jog" is set to 5KW, then pressing JG+ on the number entry screen will increase the entry value by 5. This feature allows for quick value changes. Touching this area will load an entry screen.

2. The Cooldown selection is the amount of time the system will keep the fans running after the "Fan" switch turns to "Off" in order to allow the elements to cool after use. Touching this area will load an entry screen. Simplex suggests using 300 seconds.

3. The "Regulate" function will sample the voltage of the load bank when turned on. When on, the voltage is sampled repeatedly, adjusting the load in response to changes in voltage. If the regulate switch is off, this sampling is only done when the load is changed.

4. The KWHR display serves a running total of service kilowatt-hours, which functions as a kind of odometer for the load bank.

5. Selecting "MAN" will load the manual selection screen. This menu allows for selection of individual steps for testing purposes.

6. Selecting "MDL" will load the model screen. This screen is for Simplex usage only.

V-C. Error Screen

The Error screen (as seen in Figure 8 on page 12) displays any alarms and warnings logged by the load bank.

- If there is a loss of amperage from the cooling fans, then the Cooling Fan Failure indicator will illuminate.

• If the exhaust temperature exceeds a safe temperature, the "High Exhaust Temp" indicator will illuminate.

• If the metering communication is disrupted, then "Metering System Fault" will be indicated for your attention.

• The "Load OK" option will be displayed if the load is within a set range. If it is over or under that desired range, an "Over KW Fault" or "Under KW Warning" will be displayed.

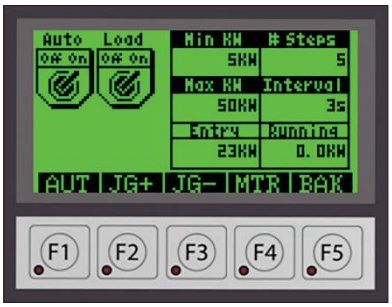
Figure 8: Error Screen

To clear the error, you must address the problem. For possible solutions, please see section **VII. MAINTENANCE/TROUBLESHOOTING**

V-C. Auto Jog Settings

The Powerstar features the Auto Jog function, which allows you to program the unit to automatically increase and decrease the load applied without user input (Figure 10).

Figure 9: Auto-Jog Setup Screen



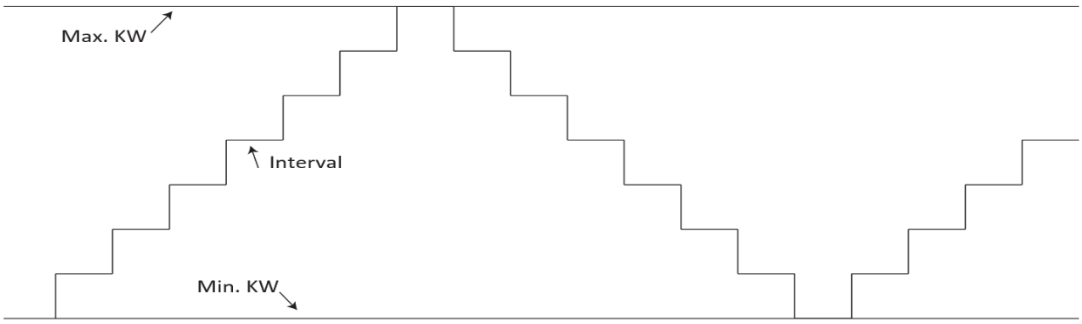
On Auto Jog, the load bank applies the minimum load for a set interval. When that interval expires, the load is increased to the next step. This process is repeated until the, maximum load is reached. The load bank will then remove load in steps until it reaches the minimum load, at which point it repeats the process until stopped.

To access the Auto Jog function, press "SHF" and then select "AJG" from this alternate menu. See Figure 9 for an example of how to set up an auto jog operation.

To set up an Auto Jog operation:

1. Select the "Min. KW" area. A number pad will open. Enter a value less than the available load from the main screen. Press ENT to accept the entry.
2. Select the "Max. KW" area. A number pad will open. Enter a value equal to or less than the available load from the main screen. Press ENT to accept the entry.
3. Select the "# Steps" area. A number pad will open. Enter the desired number of steps for the load bank to go from the minimum to the maximum. Press ENT to accept the entry.
4. Select the "Interval" area. A number pad will open. Enter the desired amount of seconds for the load bank to hold on each interval step.
5. Press "AUT" to initiate the Auto Jog program.
6. The "Entry" value will be what the current step's value will be.
7. The "Running" value will be the current metered value.

Figure 10: Autojog Example



VI. OPERATING INSTRUCTIONS

VI-A. Functions and Controls

The load bank is controlled by the HMI touchscreen. Before using the unit, you should familiarize yourself with the unit's functions and controls. See Figure 11 and Figure 12 and the related Section VI-B for a breakdown of the main screen.

Figure 11: Screen Explanation pt.1

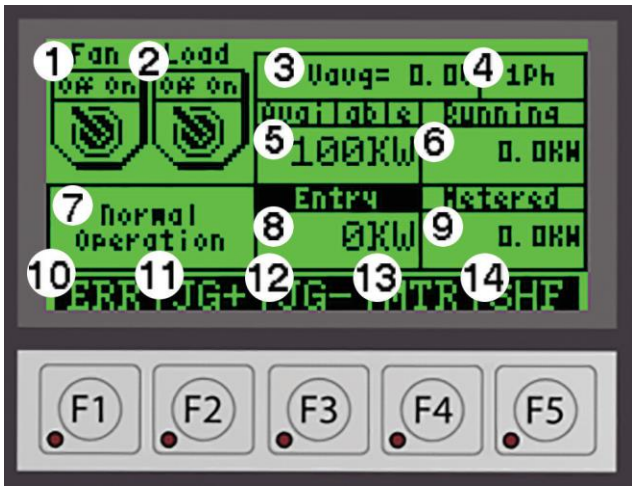
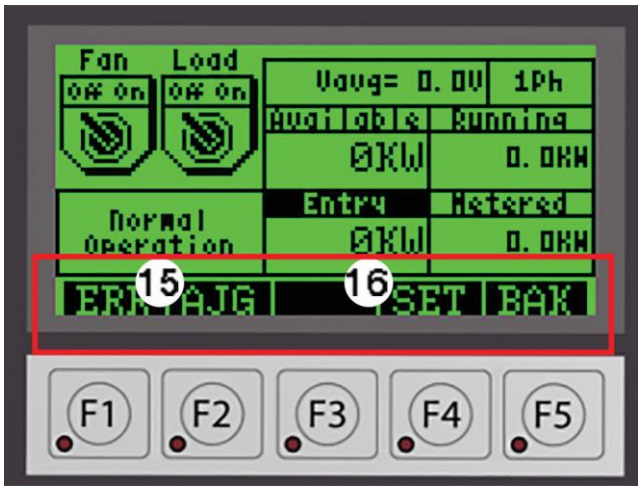


Figure 12: Screen Explanation pt. 2



VI-B. Screen Legend

1. The "Fan" switch will turn the fan and unit on.

2. Applies the set load to the testing source.

3. The "Vavg" is the average voltage of the load.

4. Shows phase of power source.

5. The "Available" section is how much KW is available for use.

6. Amount of KW load bank has attempted to apply.

7. The "Normal Operation" section will remain normal unless an error appears. Touching here, "ERR" (Reference Number 10), or F1 will bring up the error screen.

8. Load to be applied. When touched, a number pad will appear for entering values.

9. The "Metered" section is the amount of KW the load bank has applied as read from the on-board digital meter.

10. The "ERR" selection will load the error screen.
11/12. The JG+ and JG- values are abbreviations for "Jog Up" and "Jog Down," respectively. These will increase or decrease the KW entry by the jog value (see page 12).

13. The "MTR" (Meter) button will display the metering screen.

14. The "SHF" (Shift) button will reveal the "AJG" and "SET" buttons.

15. The "AJG" (Auto-Jog) button will allow you to set the Auto-Jog functions. By using a minimum and maximum value as well as setting the steps and duration to go from the minimum to the maximum, the auto-jog will run in a loop until stopped. For more information, see page 19.

16. The "SET" button will load the setup menu. Please see page 11 for more information.

VI-C. General Handling

When moving the load bank, please keep the device upright; do not transport it on its side. Use the rollers for short distances. If the unit needs to be lifted, only lift the unit using the handles on the sides or from the bottom of the unit. Avoid lifting from the Cam-Lok connections. Do not insert any lifting tools into the fan grating. While the metal casing is quite strong, do not drop anything heavy onto the unit.

Figure 13: Storage Area

VI-D. Powering on the Load Bank

Figure 14: HMI Connection

1. Before starting the load bank, connect it to an independent ground line.
2. Connect the control power cable to the control power outlet.
3. Remove the HMI from the storage area (Figure 13).
4. Connect the HMI (Port 3) to the "In" port (Port 1).
5. Connect the Modbus cable to the Modbus port.
6. Connect the cables from the load source to the Cam-Lok connectors.
7. Plug in the Control Power Cable into a 120V, 15A maximum external receptacle.
8. Turn on the power source.
9. Visually observe for any possible fan obstruction.

Control power draws 4 amps. Do not overload your circuit. Voltage spikes caused by breakers tripping could damage the unit's PLC

Figure 15: Power On

10. The HMI hand-held controller will energize. On the HMI hand-held controller, press the "On" switch for the "Fan." (Figure 15). The fans will start.

11. Make sure the fans are running and investigate any unusual fan-related noises.

12. Check air intake for obstructions and confirm air flow.

13. Verify the "Normal Operation" indicator is shown before proceeding.

Figure 16: Entry Button

VI-E. Applying a Load

The HMI will display "XXXKW" in the "Available" section. This number represents the amount of load available.

1. With the Fan switch set to On, turn the Load switch on. This action will enable the load (See Figure 15).
2. To set the load amount, select the "Entry" section. A number pad to enter your load value will display (See Figure 16). You cannot enter a value larger than the "Available" KW.
3. After entering the amount of load to be applied, press "ENT" to apply the load. Pressing F4 or "MTR" on the HMI controller will bring up the metering screen (See Figure 17).

VI-F. Shutdown

1. To shut down the Load Bank, de-energize the load by switching the "Load" switch to "Off."
2. Turn off the power source.
3. Select the "Fan" switch to "Off." The unit will begin a cooldown phase for a set duration. If desired, the cooldown timer can be set to zero, but Simplex recommends setting the timer for 300 seconds to prevent burn injuries.
4. Disconnect the load bank and store the unit as desired.

Figure 17: Metering Screen

VII. MAINTENANCE/TROUBLESHOOTING

VII-A. Errors

The Powerstar HMI can alert you to four errors:

1. Cooling fan failure
2. High Exhaust Temp
3. Metering System Fault
4. Over/Under KW Fault

See sections VII-(F-I). for information about what these errors mean and how to resolve the corresponding problem.

VII-B. General Maintenance

The load bank has been designed to require minimum maintenance. All components have been chosen for a long, reliable life. Two basic intervals of maintenance are required: each operation and either every 50 hours of use or 6 months, whichever comes first.

VII-C. Each Operation

The air intake screens and louvers, fan and cooling chamber, and exhaust openings must be checked for any obstructions or foreign objects. Due to the high volume of air circulated, paper and other debris can be drawn into the air intake.

During load bank operation, ensure that 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 balanced 3-phase source and check the three-line currents on the metering screen (see page 15). The three current readings should be essentially the same. If there is a sizable difference, one or more load fuses or load resistors may have malfunctioned.

VII-D. Every 50 Hours/6 Months

Check the tightness of the electrical connections. The expansion and contraction caused by 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 long distances, the electrical connections should be checked more frequently. For a detailed inspection guide, see "Primary inspection" on page 9.

VII-E. Troubleshooting

Excessive intake/exhaust temperatures, any reduction in cooling air flow, or a loss of communication from either the HMI or the controlling load bank is indicated by the illumination of the "Error" indicator on the hand-held remote control. Any of the above conditions will result in the load bank entering a failure state. The "Failure" indicator on the hand-held controller will illuminate and the load de-energizes. All load steps are locked out until the problem is corrected. Until the failure is investigated/corrected, and the control system is reset, the load cannot be reapplied.

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

VII-F. Cooling Fan Failure

Problem: Fan has stopped running.

Solution: The unit needs to be serviced. Please call the Simplex service department at 800-637-8603, ext. 4.

VII-G. High Exhaust

Problem: Exhaust space insufficient.

Solution: Move the unit to an area that allows for proper air circulation. See "Load bank placement" on page 10 for more information.

VII-H. Metering System Fault

Problem: Communication failure between PLC and meter.

Solution: Turn the unit off, disconnect all power cables, and wait a couple of seconds. Reapply power and turn the unit on. If the problem persists, please call the Simplex service department at 800-637-8603, ext. 4.

VII-I. Over KW/Under KW

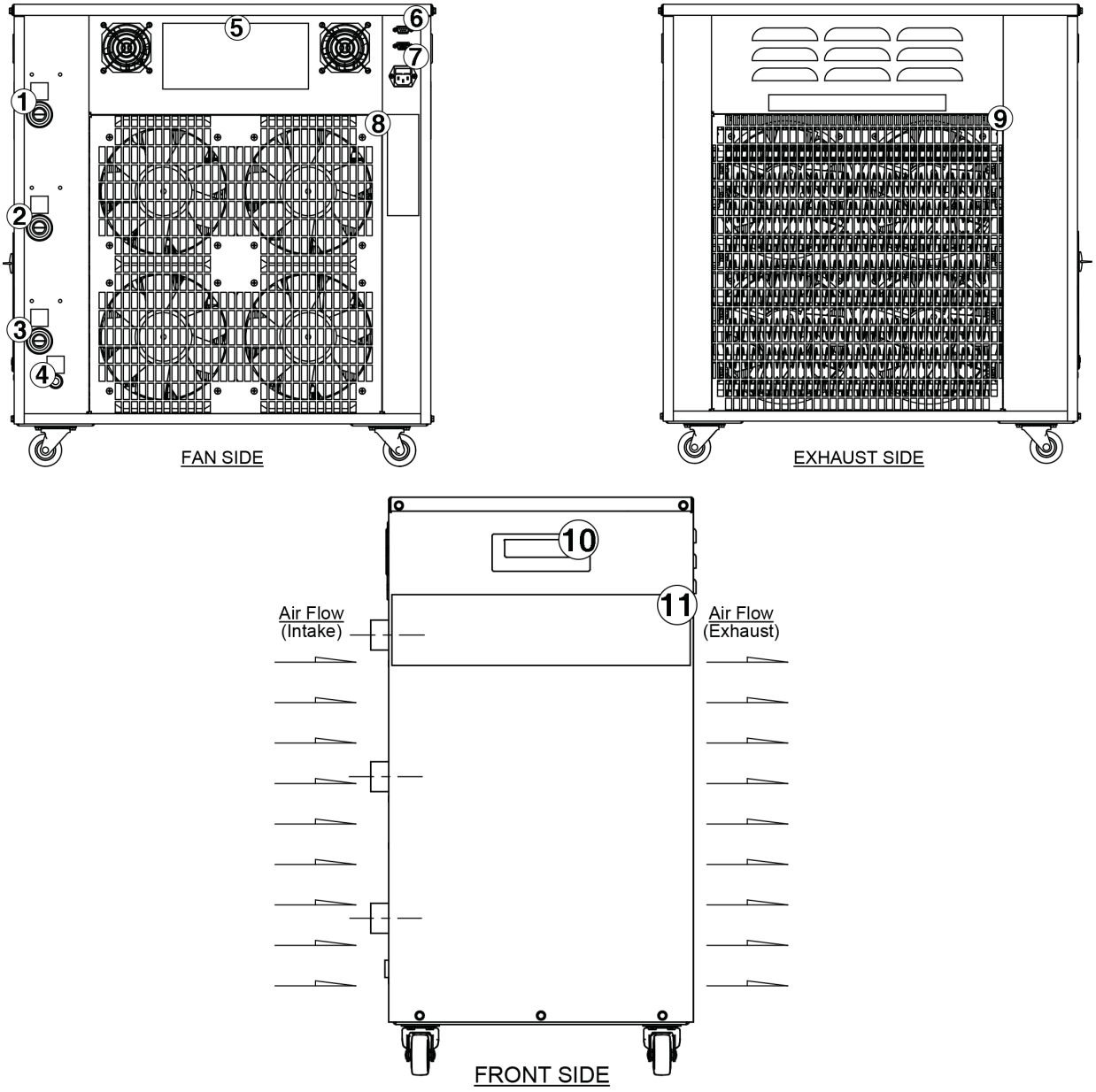
Problem: Metered load does not match expected load.

Solution: Check for blown fuses. Otherwise, the connection may be loose, or a wire may have become disconnected.

VII-J. Slave Failure

When multiple units are chained together, the primary unit will display "Unit [Unit Number] Failure." You must inspect that unit to resolve the failure.

Figure 17: Parts of the Load Bank



VII-K. Parts of the Load Bank Legend

1. Load Connection AØ
2. Load Connection BØ
3. Load Connection CØ
4. Ground Connection
5. Product Info
6. Communication Ports
7. Control Power 120VAC
8. Intake
9. Exhaust
10. Lift Handle
11. Product Label

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

Simplex, Inc.
5300 Rising Moon Road
Springfield, IL 62711

800-637-8603
www.simplexdirect.com