2500 Load Bank

User Manual

P/N: D47179

ASCO®

ASCO MODEL 2500
COMPACT AC LOAD BANK
Part Number D47179

100 KW @ 480V, 3-Phase, 50/60 Hz
100 KW @ 240V, 3-Phase, 50/60 Hz
80 KW @ 208V, 3-Phase, 50/60 Hz
52.8 KW @ 240V, 1-Phase, 50/60 Hz
13.3 KW @ 120V, 1 Phase 50/60 Hz

Cleveland, Ohio

March 26, 2010
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PROPRIETARY NOTE

This document contains information PROPRIETARY TO Avtron Load Bank branded products and systems by ASCO Power Technologies, LP. It is furnished solely to provide information sufficient for instruction, operation, maintenance, evaluation, and testing of the equipment herein disclosed; is not to be used for manufacturing or procurement; and is not to be disclosed to anyone other than persons in the Division, or the Company, or the Government, as the case may be, responsible for action relating to this document without the express written permission of ASCO Power Technologies, LP.

WARRANTY

The last page of this document contains an express limited warranty. The provisions of this warranty cover any and all rights extended to holders of Avtron Load Bank branded products and systems by ASCO Power Technologies, LP.

6255 Halle Drive, Cleveland, OH 44125-4615 - 216.573.7600 - f: 216.573.5953
www.avtronloadbank.com

ASCO POWER TECHNOLOGIES, INC.
Cleveland, Ohio

ASCO MODEL 2500
COMPACT AC LOAD BANK
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SECTION I

SAFETY CONSIDERATIONS

Throughout this manual, you will find **WARNING** and **CAUTION** statements. Personal injury or death may occur to an operator using or repairing the equipment if a **WARNING** statement is ignored. Damage to the equipment and potentially hazardous conditions for personnel may occur if a **CAUTION** statement is ignored.

Each unit is safety checked for opens and shorts, and the insulation is high potential tested to ensure safe operation. All fuses, safety interlocks, and related safety equipment have been proven reliable as part of the testing procedure of each unit.

As part of your safety program, an initial inspection after receiving the unit(s) and periodic preventive maintenance and safety inspections should be conducted to ensure the reliability and safety built into your equipment.

The Load Bank is an industrial test unit designed to be used indoors. However, because the function of the Load Bank is to dissipate electrical energy, there are inherent dangers to the operator and to the equipment. These dangers are outlined in this section.

Electrical energy is transformed into heat by the resistor elements. The heat is removed from the Load Bank by airflow through the resistor elements. If there are any restrictions or stoppage of airflow, the Load Bank may overheat and may even start a fire. The following recommendations are made:

1. Read the manual before operating the Load Bank.

2. Always connect the supplied ground cable from the Load Bank ground connector to the frame of the power source. Ensure the frame of the power source is connected to a known-good earth ground.

3. Do not bypass the temperature sensing switches to prevent nuisance tripping. The switches will drop out the load if insufficient cooling air is reaching the elements.

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W A R N I N G

Personal injury from electrical shock may result if all sources of power are not disconnected before servicing. Maintenance work must be done only by qualified personnel.

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4. Maintenance should be performed with no power on the unit. The majority of troubleshooting can be performed with an ohmmeter. There are multiple sources of power input to the Load Bank. Ensure each is disconnected.

5. Venting the heated air from the exhaust toward overhead cables, sprinkler systems, or into a room with insufficient volume or "Make-Up" air is a potential hazard. The Load Bank should be used in a cool, well-ventilated area.

6. Allow cool room air to pass into the unit to cool the elements. Do not allow the unit to be placed where hot exhaust air can recirculate back through the unit causing a constant rise in cooling air temperature.

7. After running a load test, residual heat may be removed from the Load Bank by allowing the fans to operate for a few minutes after load is removed. This procedure is not required for maintaining Load Bank integrity, but it may protect operating personnel from possible burn injuries.

8. The operator should avoid coming in contact with the resistor elements or surrounding covers during and for some time after operation. These portions of the Load Bank become quite hot and may result in a serious burn should contact be made with them.

9. Do not allow objects to enter or block the air intake or exhaust of the Load Bank. A blockage would cause Load Bank overheating. If an object enters the screens, it will cause damage to the resistor elements, possibly shorting them and causing shock and fire hazards.

10. Emergency Shutdown Procedure

    A. In an emergency, shut down the MASTER LOAD switch, then the power source. The MASTER LOAD switch will allow disconnection of all load steps and still allow for motor to run, cooling any heated elements.

    B. The POWER ON/OFF switch will disconnect both load steps and fan motor. The power source EMERGENCY OFF switch should be located near the load system.

11. An approved electrical fire extinguisher should be on hand at all times.

12. It is the responsibility of the customer to take diligent care in installing the Load Bank. The National Electrical Code (NEC), sound local electrical and safety codes, and the Occupational Safety and Health Act (OSHA) should be followed when installing the equipment to reduce hazards to persons and property.

13. When performing single phase testing, the protective plug (provided) must be installed in the phase C location.

14. Cable plugs must be inserted and rotated 90° to seat and lock.

15. Read and heed all **WARNING** and **CAUTION** statements in the manual.

****

W A R N I N G

When connecting load cables, cable plugs must be inserted and rotated clock-wise 90° to seat and lock. **ALWAYS WORK FROM THE LOAD (LOAD BANK) BACK TO THE POWER SOURCE WHEN CONNECTING POWER CABLES.**

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SECTION II

DESCRIPTION

The Load Bank is designed for electrically loading and testing power sources and is intended for job site use.

The loading capability of the Load Bank depends on voltage. Refer to Table 1-1 below.

TABLE 1-1

		Load Steps					
Voltage	**Phase**	**1**	**2**	**3**	**4**	**5**	**Total kW**
480	3	12.5	12.5	25	25	25	100
240	3	12.5	12.5	25	25	25	100
208	3	10	10	20	20	20	80
240	1	6.6	6.6	13.2	13.2	13.2	52.8
120	1	1.7	1.7	3.3	3.3	3.3	13.3

Using the load step toggle switches on the control panel, any combination of the available load steps may be selected to achieve a desired load.

A 110/120V, single phase, 50/60 Hz, 12 amp power source is required for the fan and control circuits. This power is derived from the control power receptacle located on the side of the unit and connected using a standard 110/120 VAC line cord (supplied).

LOAD BANK FRONT PANEL

The loads described above are controlled from the front control panel. Referring to Figure 1-1, the arrangement of the control panel is as follows:

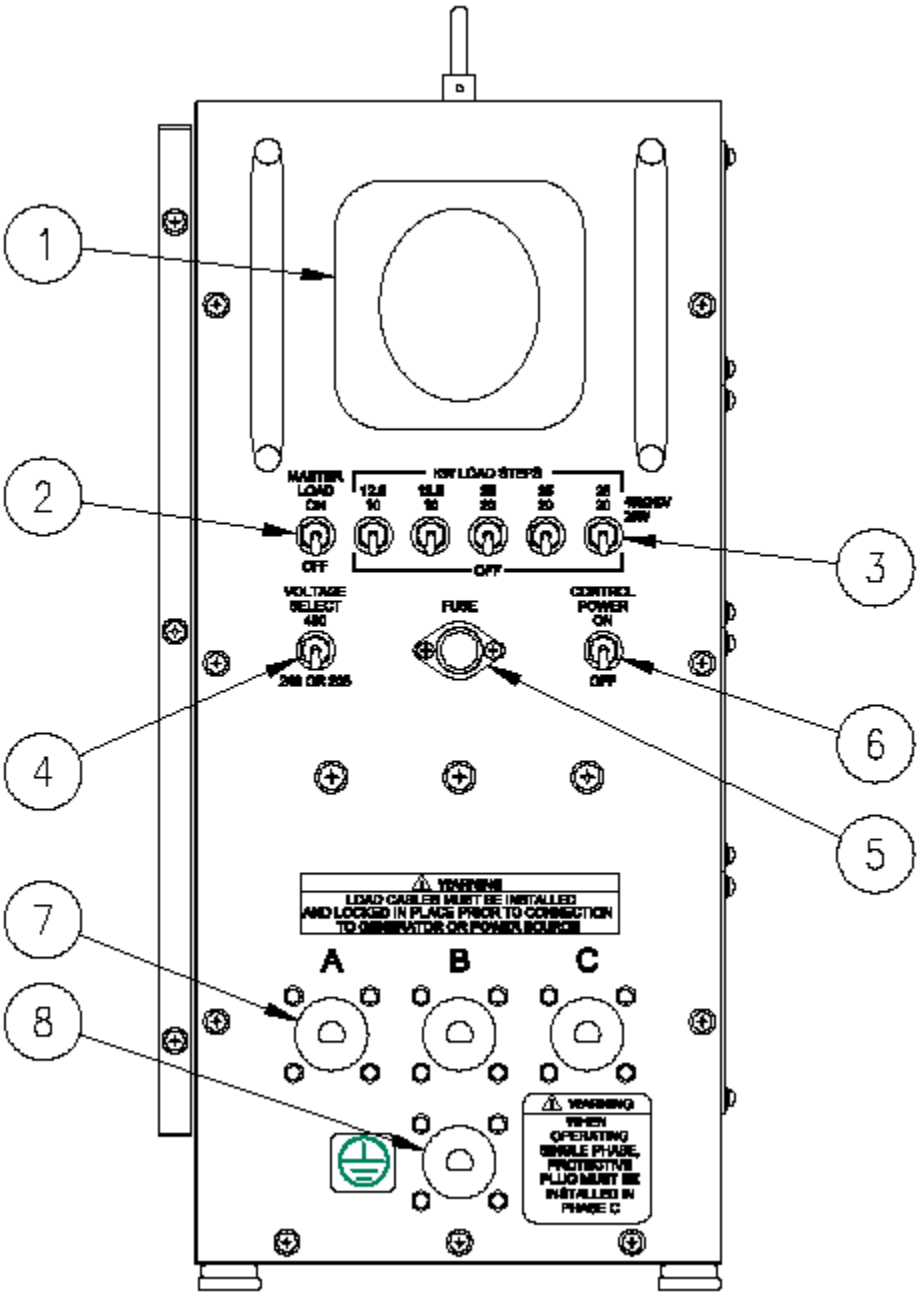

Figure 2-1. 2500 Front Panel

1. Digital Power Meter - Monitors voltage, current, power, and frequency applied to the Load Bank. Refer to supplemental vendor manual for operation details and data-logging.

2. MASTER LOAD ON/OFF Switch - Allows instantaneous connection and disconnection of all switched ON load steps.

3. KW LOAD STEPS Switches - Connects and disconnects load steps. Values are shown above each switch.

4. VOLTAGE SELECT 480/240/208 Switch - Configures the load resistor circuit for either 480V or 240/208V application. When applying load to single-phase 240V or 120V power, the switch remains in the 240V position.

5. FUSE – This is a 12 amp class CCR control power fuse.

6. CONTROL POWER ON/OFF Switch - Applies power to the Load Bank and starts the fans as well as turning on the digital meter.

7. Load Connections A, B, and C – These are the phase A, B, and C power cable connectors. Cables are supplied with the Load Bank.

8. GND Connector – This connector is used to ground the Load Bank to the frame of the power source using the supplied ground cable. The ground cable must always be installed and properly connected.

ENCLOSURE

The outside dimensions of the Load Bank are shown on Outline Drawing. The Load Bank is fabricated of aluminized steel, assembled with SST hardware, and mounted on four metal feet. A folding handle at the top of the unit is provided for lifting the Load Bank when it is being transported.

****

C A U T I O N

Do not allow the Load Bank to be placed where hot exhaust air can recirculate back through the unit causing a constant rise in cooling air temperature.

****

The Load Bank contains fans which provide the necessary cooling air for the load elements. Temperature sensors are provided to monitor the flow of cooling air. These switches are electrically interlocked with the load application. If the fans are not working properly, the load steps are disabled.

Air to cool the load elements enters the screened fans on the intake side of the Load Bank. The air passes over the resistive elements and is then discharged through the screened opening at the other end of the Load Bank.

****

W A R N I N G

Do not operate the Load Bank with any screen or cover removed.
This may expose the operator to high voltage and rotating fan blades.

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SECTION III

INSTALLATION

BEFORE INSTALLATION

Inspect the Load Bank for obvious damage such as broken wires, broken or dented panels, fan guards, or any other component breakage that may have occurred in shipment.

LOCATION

The Load Bank is a portable, and should be used in a cool, well-ventilated area. Cool air must be continually available and the hot exhaust air must be dissipated, not recirculated through the unit. Install the Load Bank so that the inlet and exhaust panels have unrestricted airflow clearance.

****

C A U T I O N

Installation must prevent hot exhaust air from recirculating into the air intake. Inlet air temperatures exceeding 110^{o}F may cause damage to the Load Bank. After installation, test the unit at full load and verify that the inlet air temperature does not exceed 110^{o}F.

****

AIRFLOW CONSIDERATIONS

Even with an ample supply of cooling air, the Load Bank may overheat if it is not properly installed. There are two types of airflow problems that should be avoided:

1. Recirculating Airflow - If the hot, exhausted air is permitted to recirculate through the Load Bank, it will reach such a high temperature and low density that it will no longer cool the resistance elements. A Load Bank should not be installed so close to any surface as to reflect the exhausted air back to the air intake. When two or more Load Banks are being

used, care must be taken in positioning the Load Banks so that the exhausted air of one unit does not feed the air intake of another.

2. Restriction of Cooling Air - Any obstruction located within three (3) feet of the inlet and eight (8) feet of the exhaust screens will restrict the Load Bank's airflow. Airflow is also restricted when two or more Load Banks have air inlets positioned too close to each other. This competition for cooling air causes a low pressure area, restricting adequate airflow.

****

W A R N I N G

It is vitally important to install the Load Bank properly. Installation errors may result in a catastrophic failure. The over-temperature switches in the Load Bank will guard against some of these problems. If protective circuitry prevents application of the load, determine the source of the problem. DO NOT DISABLE THE OVER-TEMPERATURE SWITCHES. This causes a safety hazard and voids our warranty. The following installation instructions are critical to the safe operation of the Load Bank. Refer to the SAFETY CONSIDERATIONS section of this manual.

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POWER REQUIREMENTS

The Load Bank requires a 110/120 volt, single phase, 50/60 Hz, 12 amp source of power for operation of the control circuit. A power cord for control power is provided with the Load Bank. Connect the power cord to a grounded 110/120 VAC source.

Load power is connected to the Load Bank through three receptacles on the front of the Load Bank labeled A, B, and C.

The ground cable (supplied) must always be connected from the GND connector at the bottom of the load-bank, and must always be attached to the earth-grounded frame of the power source.

****

W A R N I N G

Do not energize the Load Bank with the top cover removed.

****

C A U T I O N

Make sure the top cover panel is securely fastened to the frame.

Never exceed the Load Bank rated voltage as this will cause the Load Bank to overheat.

****

SECTION IV

OPERATION

PURPOSE AND USE OF CONTROLS

1. CONTROL POWER ON/OFF switch - Turns on the cooling fans and powers remainder of control circuit, as well as the digital meter.

2. MASTER LOAD ON/OFF switch - The MASTER LOAD switch connects power to all load steps, thus allowing all load steps which are actuated to be applied simultaneously. It also acts as a master load disconnect.

3. KW LOAD STEPS switches - The load in kW is marked above each actuating switch. A load step may be turned ON or OFF before or during a test but will load the unit only when the MASTER LOAD switch is also ON.

4. Digital Power Meter - Monitors load characteristics kW, V, A, and Frequency. Refer to supplemental vendor manual for operation details and data-logging.

5. VOLTAGE SELECT switch - Configures the load resistor circuit for 208/240V or 480V application.

THREE PHASE LOAD BANK OPERATION

Load Bank operation with three phase power provides the following loads as shown in Table 4-1:

TABLE 4-1

		Load Steps					
Voltage	**Phase**	**1**	**2**	**3**	**4**	**5**	**Total kW**
480	3	12.5	12.5	25	25	25	100
240	3	12.5	12.5	25	25	25	100
208	3	10	10	20	20	20	80

****

C A U T I O N

Before energizing any load, verify that load voltage does not exceed the rated voltage of the Load Bank.

****

C A U T I O N

Do not attempt operation if any fan is not running. Fan inlet and exhaust must be unrestricted. The operation of the fans is vital to the safe operation of this Load Bank. Failure to correct cooling air loss conditions may result in damage to the Load Bank. Refer to the SAFETY CONSIDERATIONS section of this manual.

****

OPERATING INSTRUCTIONS

1. All tests start with control panel switches in the OFF position. Place all switches on the control panel to the OFF position.

2. Connect the ground cable from the Load Bank ground connector to power source frame. The ground connector plug must be inserted and rotated 90° to seat and lock.

3. Connect power source frame to a good earth ground.

4. Connect A, B, and C power source cables (provided) to the Load Bank. Cable plugs must be inserted and rotated 90° to seat and lock.

5. Connect the Load Bank to 110/120 volts, single phase, 50/60 Hz control power source.

6. With POWER and MASTER LOAD switches in the OFF position, start the generator.

7. Position the load VOLTAGE SELECT 240/480 switch to the voltage to be applied. 208 V sources use the 240 V switch position.

8. Place the POWER switch in the ON position. Verify that the Digital Power Meter comes on and that all nine fans are running.

9. Position the KW LOAD STEPS switch(es) to the desired load.

10. Turn on the MASTER LOAD switch to apply desired load. Load steps may be added or deleted at any time.

11. Monitor applied load using the digital meter (V, A, Hz, kW). Press and release the arrow down button to change function being monitored. Refer to the supplemental vendor manual for additional information and data logging instructions.

12. After running tests, remove the load by turning off the MASTER LOAD switch.

13. After running a load test, residual heat may be removed from the Load Bank by allowing the fans to operate for a few minutes after load is removed.

****

W A R N I N G

DO NOT touch the exhaust screen during operation. The screen will become hot from the exhausted heat and may cause a serious burn. Refer to the SAFETY CONSIDERATIONS section of this manual.

DO NOT allow objects to enter or block screens.

****

14. Place the POWER switch to the OFF position.

15. Shut down all power sources to the Load Bank.

16. Disconnect the power source cables and the ground connection from the Load Bank.

17. Disconnect the 110/120V source from the Load Bank.

SINGLE PHASE LOAD BANK OPERATION

Load Bank operation with single-phase power provides the following loads as shown in Table 4-2.

TABLE 4-2

		Load Steps					
Voltage	**Phase**	**1**	**2**	**3**	**4**	**5**	**Total kW**
240	1	6.6	6.6	13.2	13.2	13.2	52.8
120	1	1.7	1.7	3.3	3.3	3.3	13.3

****

W A R N I N G

During single-phase operation, the phase C front panel connector is electrically live and any attached wiring to phase C is also electrically live. Therefore, the protective plug for phase C (provided) **MUST** be installed per Figure 4-1 to prevent injury or death. **If the plug is missing, the Load Bank is <u>prohibited</u> from single phase operation.**

****

OPERATING INSTRUCTIONS

1. All tests start with control panel switches in the OFF position. Place all switches on the control panel to the OFF position.

2. Connect the ground cable from the Load Bank ground connector to power source frame. The ground connector plug must be inserted and rotated 90° to seat and lock.

3. Connect power source frame to a good earth ground.

4. Install protective plug in phase C of the Load Bank (See Figure 4-1).

5. Connect A, and B power source cables (provided) to the Load Bank. Cable plugs must be inserted and rotated 90° to seat and lock.

6. Connect the Load Bank to 110/120 volts, single phase, 50/60 Hz control power source.

7. Position the load VOLTAGE SELECT 240/480 switch to the 240V position.

8. With POWER and MASTER LOAD switches in the OFF position, start the generator.

9. Place the POWER switch in the ON position. Verify that the Digital Power Meter comes on and that all nine fans are running.

10. Position the KW LOAD STEPS switch(es) to the desired load.

11. Turn on the MASTER LOAD switch to apply desired load. Load steps may be added or removed at any time.

12. Monitor load applied with digital meter (V, A, Hz, kW). Press and release the arrow down button to change function being monitored. See instructions below for single-phase meter interpretation. Refer to the supplemental vendor manual for additional information and data logging instructions.

13. After running tests, remove the load by turning off the MASTER LOAD switch.

14. After running a load test, residual heat may be removed from the Load Bank by allowing the fans to operate for a few minutes after load is removed.

****

W A R N I N G

DO NOT touch the exhaust screen during operation. The screen will become hot from the exhausted heat and may cause a serious burn. Refer to the SAFETY CONSIDERATIONS section of this manual.

DO NOT allow objects to enter or block screens.

****

15. Place the POWER switch to the OFF position.

16. Shut down all power sources to the Load Bank.

17. Disconnect the power source cables and the ground connection from the Load Bank.

18. Disconnect the 110/120V source to the Load Bank.

Figure 4-1. Single Phase Connections (Protective Plug on Phase C MUST be installed)

SINGLE-PHASE METER INTERPRETATION

The Digital Power Meter is very straightforward when an operator is making three-phase measurements. It is equally capable of making single phase measurements, however, as the various functions are displayed (by using the down arrow); the meter fields have information which must be explained.

As the arrow key is scrolled, the following figures will be used to explain reading the meter data fields.

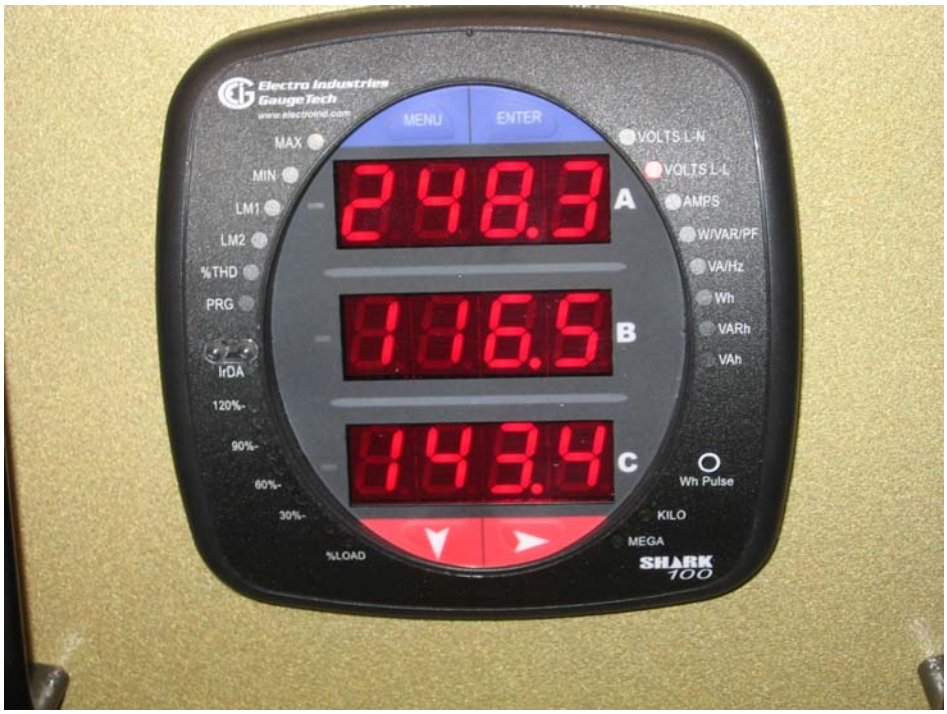

Figure 4-2. L-L Voltage Measurement: Read Phase A only and ignore B and C

Figure 4-3. Current Measurement: Read Phase A or B and ignore C

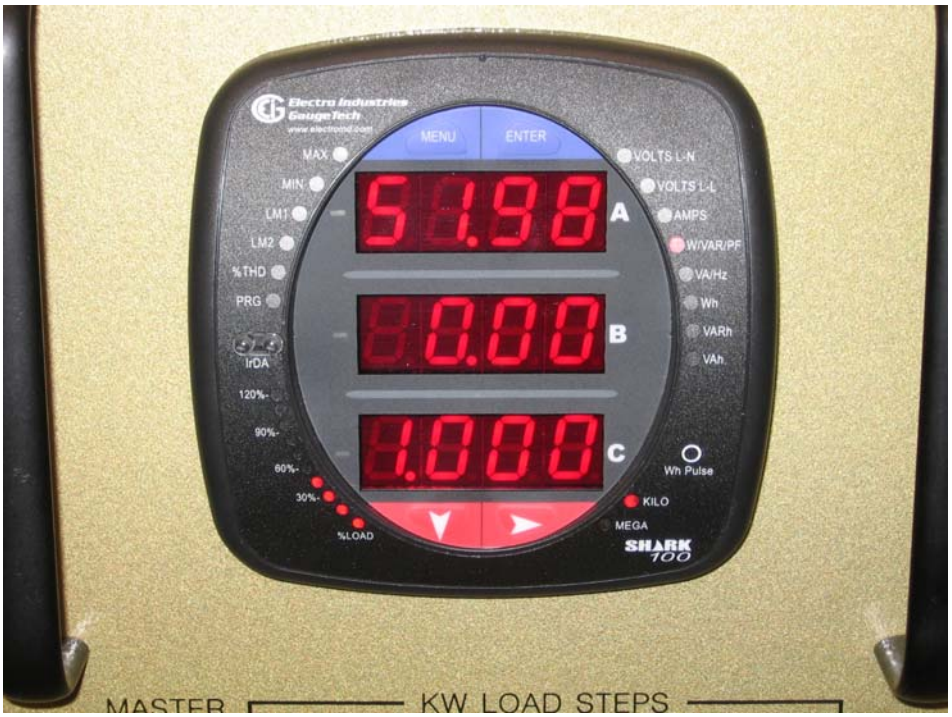

Figure 4-4. kW/Vars/Power Factor are A, B, and C respectively

Figure 4-5. Volt-Amps/Frequency: Read VA on A and Hz on C

ESD PRECAUTIONARY GUIDELINES

C A U T I O N

Certain circuit card assemblies and their components, typically integrated circuits, may be damaged by seemingly undetectable electrostatic discharge (ESD). Care must be exercised during handling/repair of these items. Use electrostatic discharge precautionary procedures.

The following guidelines are not necessarily all inclusive but rather serve as reminders for good shop practices for the handling/ repair of ESD sensitive circuit card assemblies and devices.

- Store ESD sensitive items in their original containers. These items are often marked with the symbol shown at the top of this page.
- Put on a grounded wrist strap before handling any ESD sensitive item.
- Clear work area of Styrofoam®*, plastic, and vinyl items such as coffee cups.
- Handle ESD items by the body, never the open edge connectors.
- Never slide ESD sensitive items over any surface.
- Transport ESD sensitive items in a static shielding container to a static-free work station.
- If a static-free work station is not available, ground the transport container before removing or inserting an ESD item.
- Electric tools used during repair should be grounded. For example, use only anti-static type solder suckers and grounded tip soldering irons. Discharge non-electric tools before use.
- Pack ESD items in static shielding containers before shipping them to Avtron for repair.

* Styrofoam® is a registered trademark of Dow Chemical.

SECTION V

MAINTENANCE

To provide long equipment life and to reduce the chance of electric shock, fires, and personal injury, good maintenance procedures must be used. Before servicing, review the SAFETY CONSIDERATIONS section of this manual.

The following examples of scheduled maintenance procedures are not intended to be all-inclusive, but must be accomplished to maintain the equipment in a good, safe condition. All maintenance work must be done only by qualified personnel.

****

W A R N I N G

Personal injury from electrical shock or from the moving fan blades may result if ALL sources of power are not disconnected. Refer to the SAFETY CONSIDERATIONS section of this manual.

****

DAILY

1. Remove any restrictions to airflow through the Load Bank.
2. Check the screens to make sure that no objects have blocked or entered the openings.
3. Verify that the airflow is in the proper direction; with all nine fans operating.
4. Assure that there is no recirculation of the exhaust air through the Load Bank.

THREE MONTHS OR 500 HOURS

1. Remove access panels and screens.

2. Inspect the load resistors for mechanical breakdown which is demonstrated by excessive sagging of the elements. Replace with new resistor elements as required.

4. Inspect for loose hardware or loose connections. Tighten where required.

5. Inspect all connections for oxidation or corrosion. Clean the connection or replace the hardware where required.

6. Inspect all magnetic contactors to make sure that the contacts are not severely pitted or corroded.

7. Clean all dirt and debris out of the Load Bank. This can be accomplished by blowing the inside of the unit with clean, dry compressed air (not to exceed 40 PSI). Eye protection should be worn when cleaning the Load Bank with compressed air.

8. Inspect all the wiring for any sign of insulation failure.

9. Replace all access panels and screens. Tighten all the fastening hardware securely.

PARTS REPLACEMENT

Access to any component is easily made with the removal of the cover panels. Replaceable components in the unit are listed in the replacement parts list. Manufacturer maintains an inventory of normally used items.

SECTION VI

REPLACEMENT PARTS LIST

INTRODUCTION

The parts list in this section contains the description, quantity required, and part numbers for each listed part. The list also includes schematic reference designators to facilitate parts identification.

NOTE

Every effort has been made to ensure the accuracy of this information. However, changes are sometimes necessary and revisions to the parts list may be made at any time without notice.

REFERENCE DESIGNATORS

Service personnel may use this parts list along with the system schematics to identify and order replaceable parts. The reference designators were carefully selected and matched to those on the schematic diagrams and equipment to simplify the troubleshooting and repair process.

NOTE

When ordering replacement parts, be certain to state the part's description and part number, and the schematic reference designator number if one is available. Also include the model and serial number of the equipment.

REPLACEMENT PARTS LIST

SCHEMATIC REFERENCE	DESCRIPTION	AVTRON P/N	QTY/ UNIT
	ASCO MODEL 2500 COMPACT LOAD BANK	2500-D47179	
	.SCHEMATIC	D47180	REF
A,B,C,GND	.CABLE SET	B32999	1
CT1,CT2	.TRANSFORMER, CURRENT	371220	2
J1-3	.CONNECTOR, RECEPTACLE	314900	3
F1	.FUSE, 12A	324500	1
XF1	.FUSEHOLDER	324985	1
M1	.METER, POWER, DIGITAL	338344	1
S1-7	.SWITCH, TOGGLE	360589	7
S8	.SWITCH, TOGGLE	363220	1
	.HANDLE	440174	2
P6	.CONNECTOR, PLUG, 10 COND	364874	1
J4	.CONNECTOR, RECEPTACLE, GREEN	315064	1
F2-4	.FUSE, 300A	324386	3
R1-48	.RESISTOR ELEMENT, 25.5 OHM	B31904	48
K1-16	.RELAY, 3PDT, 20A	993848	16
K18	.RELAY (POWER MONITOR)	352084	1
TS2-8	.SWITCH, TEMP, 160°	363042	7
PS1	.POWER SUPPLY	346218	1
TS1	.SWITCH, TEMP, 180°	360877	1
A1	.RELAY, VOLTAGE	351653	1
R100	.RESISTOR, 392KΩ	123056	1
J5	.CONNECTOR, RECEPTACLE	314681	1
B1-B9	.FAN	322252	9
P7	.CONNECTOR, PLUG, 10 COND	364874	1

APPENDIX

LOAD BANK
TROUBLESHOOTING GUIDE

NOTE

Servicing should always be done only by trained, qualified service technicians.

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W A R N I N G

Be sure that all sources of power to the Load Bank are disconnected before servicing.

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PROBLEM	POSSIBLE CAUSES/REMEDIES
1. Load Bank main power fails to come on.	a. Main switch or circuit breaker is not closed. b. Unit is not connected according to the Schematic/Interconnection Diagram. c. Terminals were damaged during shipment. d. Fuses are blown. (Check and replace as required.)* e. Fuse is blown in Load Bank control circuit. (Check and replace as required.)* f. Dirty or loose connection at Main Power Switch.

*When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
2. Blower motor does not operate.	a. Main switch or circuit breaker is not closed. b. Power is not connected to Load Bank blower circuit. c. External power source is inadequate. d. Motor fuses are blown. (Check and replace as required.)* e. Motor overload is tripped. f. Motor start is malfunctioning. g. Main Power Switch is inoperative. h. Connections are broken or loose. i. Motor shaft does not turn due to improper lubrication. (Replace or repair as necessary.)
3. BLOWER FAILURE indicator lights, yet blower is operating.	a. Airflow restrictions present at Load Bank intake or exhaust. b. Improper fan blade rotation or phase reversal. (Check fan motor power connections for proper phase sequence.) c. Air Differential Pressure Switch is malfunctioning. d. Blower Fail Relay is malfunctioning.
4. Fan blade is broken or not turning.	a. Fan blade motion is obstructed. b. Fan blade is loose at hub or is not keyed properly.

*When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
5. Load step(s) cannot be energized.	a. A blower failure exists. (See problem 2.) b. MASTER LOAD Switch is inoperative. c. Control power is inadequate. d. Fuse is blown in Load Bank control circuit or individual branch circuit load fuse (if so equipped) is blown. (Check and replace as required.)* e. Blower Fail Relay is malfunctioning. f. Load step switch is inoperative. g. Load step contactor is inoperative. h. Magnetic contactor has an open coil. i. Load step resistor is open.
6. Contactor "chattering" exists.	a. Contacts and/or core are dirty or corroded. b. Connections to contactor coil are loose. c. Control circuit line voltage is too low.
7. Load Bank or load step does not give rated load.	a. Applied load voltage is either derated or inadequate. b. Contactor does not close properly. c. Load step resistor element is open. d. One of the individual load branch circuit fuses is blown (if so equipped).

*When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
8. Disconnect Switch fuses are blown.	a. Fuses are undersized.* b. A short circuit exists in the blower or control circuit.*

*When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

DRAWINGS

PROPRIETARY NOTE

This document contains information PROPRIETARY TO Avtron Load Bank branded products and systems by ASCO Power Technologies, LP. It is furnished solely to provide information sufficient for instruction, operation, maintenance, evaluation, and testing of the equipment herein disclosed; is not to be used for manufacturing or procurement; and is not to be disclosed to anyone other than persons in the Division, or the Company, or the Government, as the case may be, responsible for action relating to this document without the express written permission of ASCO Power Technologies, LP.

Limited Warranty

ASCO Power Technologies®

AVTRON Loadbank Warranty

This Warranty is given ONLY to purchasers who buy for commercial or industrial use in the ordinary course of each purchaser's business.

General:
Avtron Loadbank branded products and systems by ASCO Power Technologies, L.P., are in our opinion the finest available. We take pride in our products and are pleased that you have chosen them. Under certain circumstances we offer with our products the following Two Year Limited Warranty against defects in material and workmanship.

Please read your Warranty carefully. This Warranty sets forth our responsibilities in the unlikely event of defect and tells you how to obtain performance under this Warranty.

TWO YEAR LIMITED WARRANTY
AGAINST DEFECTS IN MATERIAL AND WORKMANSHIP

Terms of Warranty:

As provided herein, the Avtron product is warranted to be free of defects in material and workmanship for a period of two years from the date of shipment. The product shipment date will be determined only from the ASCO bill of lading.

The foregoing Limited Warranty is conditioned upon User's compliance with the following:

1. The Avtron Product is deployed in accordance with Avtron specifications and state and local codes and standards, including installation by an electrician licensed in the state where used if required.

2. The Avtron Product is maintained in accordance with Avtron instructions and used under normal conditions for the purposes intended by Avtron.

All warranty field-related repairs, replacements or adjustments must be made by ASCO Services Inc. or its duly authorized representative.

Warranty Extends to First Purchaser for Use, Non-transferable:
This Warranty is extended to the first person, firm, association or corporation for whom the Avtron product specified herein is originally deployed for use (the "User") in the fifty United States or Canada. This Warranty is not transferable or assignable without the prior written permission of ASCO.

Assignment of Warranties:
ASCO assigns to User any warranties which are made by manufacturers and suppliers of components of, or accessories to, the Avtron product and which are assignable, but ASCO makes NO REPRESENTATIONS as to the effectiveness or extent of such warranties, assumes NO RESPONSIBILITY for any matters which may be warranted by such manufacturers or suppliers and extends no coverage under this Warranty to such components or accessories.

Drawings, Descriptions:
ASCO warrants for the period and on the terms of the Warranty set forth herein that the Avtron product will conform to the descriptions contained in the certified drawings, if any, applicable thereto, to ASCO's final invoices, and to applicable Avtron product brochures and manuals current as of the date of product shipment ("Descriptions"). ASCO does not control the use of any Avtron product. Accordingly, it is understood that the Descriptions are NOT WARRANTIES OF PERFORMANCE and NOT WARRANTIES OF FITNESS FOR A PARTICULAR PURPOSE.

Warranty Claims Procedure:
Within a reasonable time, but in no case to exceed thirty (30) days, after User's discovery of a defect, User shall contact Avtron product service department at **www.avtronloadbank.com** and select the support tab or by phone at **(216) 573-7600.**

Subject to the limitations specified herein, an ASCO Services field service representative will repair the non-conforming ASCO product warranted hereunder, without charge for parts, labor, or travel expenses. Warranty coverage will apply only after ASCO's inspection discloses the claimed defect and shows no signs of treatment or use that would void the coverage of this Warranty. All defective products and component parts replaced under this warranty become the property of ASCO.

Warranty Performance of Component Manufacturers:
It is ASCO's practice, consistent with its desire to remedy Warranty defects in the most prompt and effective manner possible, to cooperate with and utilize the services of component manufacturers and their authorized representatives in the performance of work to correct defects in the product components. Accordingly, ASCO may utilize third parties in the performance of Warranty work, including repair or replacement hereunder, where, in ASCO's opinion, such work can be performed in less time, with less expense, or in closer proximity to the Avtron product.

Items Not Covered By Warranty:
THIS WARRANTY DOES NOT COVER DAMAGE OR DEFECT CAUSED BY misuse, improper application, wrong or inadequate electrical current or connection, negligence, inappropriate on site operating conditions, repair by non-Avtron designated personnel, accident in transit, tampering, alterations, a change in location or operating use, exposure to the elements, water, or other corrosive liquids or gases, Acts of God, theft, installation and/or deployment contrary to ASCO's recommendations or specifications, or in any event if the Avtron serial number has been altered, defaced, or removed.

THIS WARRANTY DOES NOT COVER shipping costs, installation costs, or maintenance or service items and further, except as may be provided herein, does NOT include labor costs or transportation charges arising from the replacement of the Avtron product or any part thereof or charges to remove or reinstall same at any premises of User.

REPAIR OR REPLACEMENT OF A DEFECTIVE PRODUCT OR PART THEREOF DOES NOT EXTEND THE ORIGINAL WARRANTY PERIOD.

THE PRODUCTS LISTED IN THIS WARRANTY ARE NOT FOR USE IN THE CONTROL AREA OR ANY REACTOR CONNECTED OR SAFETY APPLICATIONS OR WITHIN THE CONTAINMENT AREA OF A NUCLEAR FACILITY OR FOR INTEGRATION INTO MEDICAL DEVICES.

Limitations:
THIS WARRANTY IS IN LIEU OF AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

USER'S SOLE AND EXCLUSIVE REMEDY IS REPAIR OR REPLACEMENT OF THE AVTRON PRODUCT AS SET FORTH HEREIN.

IF USER'S REMEDY IS DEEMED TO FAIL OF ITS ESSENTIAL PURPOSE BY A COURT OF COMPETENT JURISDICTION, AVTRON'S RESPONSIBILITY FOR PROPERTY LOSS OR DAMAGE SHALL NOT EXCEED THE NET PRODUCT PURCHASE PRICE.

IN NO EVENT SHALL ASCO ASSUME ANY LIABILITY FOR INDIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR EXEMPLARY DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION LOST PROFITS, BUSINESS INTERRUPTION OR LOSS OF DATA, WHETHER ANY CLAIM IS BASED UPON THEORIES OF CONTRACT, NEGLIGENCE, STRICT LIABILITY, TORT, OR OTHERWISE.

Miscellaneous:
NO SALESPERSON, EMPLOYEE OR AGENT OF ASCO IS AUTHORIZED TO ADD TO OR VARY THE TERMS OF THIS WARRANTY. Warranty terms may be modified, if at all, only in writing signed by an ASCO officer.

ASCO obligations under this Warranty are conditioned upon ASCO timely receipt of full payment of the product purchase price and any other amounts due. ASCO reserves the right to supplement or change the terms of this Warranty in any subsequent warranty offering to User or others.

In the event that any provision of this Warranty should be or becomes invalid and/or unenforceable during the warranty period, the remaining terms and provisions shall continue in full force and effect.

This Warranty shall be governed by, and construed under, the laws of the State of New Jersey, without reference to the conflict of laws principles thereof.

This Warranty represents the entire agreement between ASCO and User with respect to the subject matter herein and supersedes all prior or contemporaneous oral or written communications, representations, understandings or agreements relating to this subject.

ASCO Power Technologies – Avtron Load Bank
6255 Halle Drive
Cleveland, Ohio, U.S.A. 44125
Tel: 216-573-7600
loadbanks.ascopower.com

ASCO. Innovative Solutions.