



4810 Load Bank

User Manual

P/N: D29440-4, 3-17

ASCO[®]

**AVTRON MODEL K875A
OUTDOOR LOAD BANK
Part Number K875AD29440-4**

1000 KW @ 480 VAC, 3-Phase, 60 Hz
50, 50, 100, 100, 200, and 500 KW

**ASCO SERIES 4800
OUTDOOR LOAD BANK**

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Cleveland, Ohio**

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PROPRIETARY NOTE

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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.



ASCO POWER TECHNOLOGIES, INC.
Cleveland, Ohio

ASCO SERIES 4800
OUTDOOR LOAD BANK

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APPENDIX - Load Bank Troubleshooting Guide

DRAWINGS

See tables on the following two pages. See column 1 for the part number purchased. Drawings are provided at the end of this manual based on the specific Load Bank purchased.

OPTION DRAWING(S) AND INSTRUCTIONS

Option drawings are provided for options purchased. A list of option drawings begins after page iii.

VENDOR MANUALS (Provided Separately)

Electro Industries	SHARK100 Installation and Operation Manual – CD-ROM, E145420 (Provided only when Metering Option is purchased.)
Electro Industries	Quick Start Guide for SHARK Series Meters, E145703 (Provided only when Metering Option is purchased.)

				DRAWINGS		
Part No.	kW	Volts	Load Steps	O/L Dwg.	Schem.	Interconn.
D28042-4	2500	480	50, 50, 100, 100, 200, 500, 500, 500, 500	SB2770 ¹	D30049	D30349
D28042-5	3000	480	50, 50, 100, 100, 200, 500, 500, 500, 500, 500	SB2770 ¹	D30051	D30350
D28042-6	3000	480	50, 50, 100, 100, 200, 500, 500, 500, 500, 500	SB2770 ¹	D31135	D31136
D28042-7	2500	480	5, 10, 10, 25, 50, 100, 100, 200, 500, 500, 500, 500	SB2770 ¹	D38361	D38362
D28042-8	3000	480	5, 10, 10, 25, 50, 100, 100, 200, 500, 500, 500, 500, 500	SB2770 ¹	D42596	D42595
D29440-2	750	480	50, 100, 200, 200, 200	SB2793 ²	D29809	D29810
D29440-3	750	480	5, 10, 10, 25, 50, 50, 100, 100, 200, 200	SB2793 ²	D29811	D29812
D29440-4	1000	480	50, 50, 100, 100, 200, 500	SB2793 ²	D29813	D29814
D29440-5	1000	480	5, 10, 10, 25, 50, 100, 100, 200, 500	SB2793 ²	D29815	D29816
D29440-6	1000	480	5, 10, 10, 25, 50, 100, 100, 200, 500	SB2793 ²	D30417	D30416
D29440-10	750	480	25, 25, 50, 50, 100, 100, 200, 200	SB2793 ²	D42645	D42646
D29461-1	750	240/480	5, 10, 10, 25, 50, 50, 100, 100, 200, 200	SB2793 ²	D29826	D29827
D29461-2	1000	240/480	50, 50, 100, 100, 200, 500	SB2793 ²	D29828	D29829
D29461-3	750	240/480	50, 100, 200, 200, 200	SB2793 ²	D29822	D29823
D29461-4	1000	240/480	5, 10, 10, 25, 50, 100, 100, 200, 500	SB2793 ²	D29824	D29825
D29461-5	1000 700	480 240	5, 10, 10, 25, 50, 100, 200, 200, 400 5, 10, 10, 25, 50, 100, 100, 200, 200	SB2793 ²	D31287	D31288
D29650-3	1500	480	5, 10, 10, 25, 50, 100, 100, 200, 500, 500	SB2827 ³	D30041	D30278
D29650-4	1500	480	50, 50, 100, 100, 200, 500, 500	SB2827 ³	D30042	D30125
D29650-5	1500	240/480	5, 10, 10, 25, 50, 100, 100, 200, 500, 500	SB2827 ³	D30043	D30126
D29650-6	1500	240/480	50, 50, 100, 100, 200, 500, 500	SB2827 ³	D30044	D30127
D29650-7	2000	480	5, 10, 10, 25, 50, 100, 100, 200, 500, 500, 500	SB2827 ³	D30088	D30089
D29650-8	2000	480	50, 50, 100, 100, 200, 500, 500, 500	SB2827 ³	D30047	D30296
D29650-9	2000	480	50, 50, 100, 100, 200, 500, 500, 500	SB2827 ³	D30047	D30296
D29650-14	1250	480	50, 100, 100, 100, 200, 200, 500	SB2827 ³	D35454	D35453
D36922-1	1250	480	5, 10, 10, 25, 50, 50, 100, 100, 200, 200, 500	SB2827 ³	D36923	D36924
D29650-16	1750	480	50, 100, 100, 200, 300, 500, 500	SB2827 ³	1272929	1272931

			DRAWINGS	
Part No.	No. of Stacks	Control Panel	O/L Dwg., Control Panel	Resistor Assemblies
D28042-4	Three	D29743-17	SB2950	D27553-1, D27555-1
D28042-5	Three	D29743-18	SB2950	D27555-1, D28438-2
D28042-6	Three	D31297	--	D28438-2, D27555-1
D28042-7	Three	D29743-30	SB2950	D28438-2, D27555-1, D27554-1, D27552-1
D28042-8	Three	D29743-33	SB2950	D27552-1, D27553-1, D27555-1
D29440-2	One	D29743-5	SB2950	D27553-1, D27555-1
D29440-3	One	D29743-6	SB2950	D27552-1, D27553-1, D27555-1
D29440-4	One	D29743-7	SB2950	D27555-1, D28438-2
D29440-5	One	D29743-8	SB2950	D27552-1, D27553-1, D27555-1
D29440-6	One	D30415	SB2988	D27552-1, D27555-1
D29440-10	One	D29743-34	SB2950	D27553-1, D27555-1, D34941
D29461-1	One	D29743-9	SB2950	D27552-2, D27553-2, D27555-2, D29645
D29461-2	One	D29743-10	SB2950	D27553-2, D27555-2, D29589-1
D29461-3	One	D29743-3	SB2950	D27553-2, D27555-2, D29645, D29851
D29461-4	One	D29743-4	SB2950	D27552-2, D27553-2, D27555-2
D29461-5	One	D29743-22	SB2950	D27552-2, D27553-2, D27555-2, D27555-4
D29650-3	Two	D29743-12	SB2950	D27552-1, D27553-1, D27554-1, D27555-1
D29650-4	Two	D29743-11	SB2950	D27553-1, D27555-1
D29650-5	Two	D29743-13	SB2950	D27552-2, D27553-2, D27554-2, D27555-2, D29645, D29851
D29650-6	Two	D29743-14	SB2950	D27553-2, D27555-1, D29645, D29851
D29650-7	Two	D29743-15	SB2950	D27552-1, D27553-1, D27555-1
D29650-8	Two	D29743-19	SB2950	D27555-1, D28438-2
D29650-9	Two	D29743-19	SB2950	D27555-1, D28438-2
D29650-14	Two	D29743-26	SB2950	D27553-1, D27554-1, D27555-1
D36922-1	Two	D36925-1	SB2950	D27555-1, D28438-2, D27552-1
D29650-16	Two	D29743-48	SB2950	D27553-1, D27554-1, D27555-1

¹ For Load Banks equipped with Option 75, use Outline Drawing SB3147.

² For Load Banks equipped with Option 73, use Outline Drawing SB3145.

³ For Load Banks equipped with Option 74, use Outline Drawing SB3146.

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OPTIONS - Refer to Section VI (K875A OPTIONS LIST) of this manual. The following drawings apply to the various options. Only drawings for the options provided have been included in this manual. Not all options can be installed in the same unit.

<u>Drawing</u>	<u>Option</u>	<u>Description</u>
SB2196	17	Control/Meter Enclosure, Wallmount (Outline)
1192769	23	Automatic Load Controller Option (Schematic)
1192769	24	Automatic Load Controller Option (Schematic)
B27730	36	Remote Monitoring Contacts
D27683-9	51	Control Transformer Option, 208/115V
D37723-3	64	Digital Power Metering Option (DW Style) (V, A, F, KW, KVAR, PF, KVA) CT Ratio: 1500:5
D37723-4	65	Digital Power Metering Option (DW Style) (V, A, F, KW, KVAR, PF, KVA) CT Ratio: 2000:5
A32404	71	Control Unit, Mounted (Front)
*A32573-1	73	Gravity Hood Replacement, Single Stack
A32573-2	74	Gravity Hood Replacement, Two Stack
A33333-1	76	Hinged Access Panel, Single Stack
A34920-1	80	Aluminum Hood Replacement with Stainless Steel Screen (1 Stack Units)
B32580-1	83	Overhead Lift, Single Stack
B32580-2	84	Overhead Lift, Two Stack
A37255	86	Bus Bar, Customer Connection, Replacement
A37594	87	Local Control/Metering Unit, Mounted (Right Side)
B33795-1	88	Elevating Stand (One Bay)

*Load Banks equipped with Option 73 should be supplied with special Outline Drawing SB3145.

ASCO SERIES 4800 OUTDOOR LOAD BANK

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 ASCO 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 ASCO equipment.

The Load Bank is an industrial test unit designed to be used outdoors safely with an exhaust hood. (The unit should not be installed indoors.) However, because the function of the Load Bank is to dissipate electrical energy, there are inherent dangers to operators and equipment. These dangers are outlined in this section.

Electrical energy is transformed into heat by the resistors. This heat must be removed from the Load Bank by the cooling fans/blowers. If there is any restriction or stoppage of airflow, the Load Bank will overheat and may start a fire. It is recommended that:

1. The operator should read the manual before using the Load Bank.
2. Run an approved ground wire from the Load Bank ground lug(s) to the generator frame. Run an approved ground wire from the generator frame to a good earth ground. Size ground wire in accordance with National Electrical Code and any local codes.
3. Do not bypass the airflow safety switch or exhaust over-temperature switch to prevent nuisance tripping.

4. Replace any burned out bulbs on the control panel. Each lamp is an indication that a system is active or has failed and is important to the operation of the Load Bank and safety of the operator.
5. Maintenance personnel must always exercise caution when the access panels or intake screens are removed. Personal injury from electrical shock or from the rotating fan blades may result if all sources of power are not disconnected before servicing. Maintenance work must be done only by qualified personnel.
6. The Load Bank must be used in a cool, well ventilated area as described in the INSTALLATION section of this manual. Do not allow exhaust air to recirculate through the Load Bank. This causes a constant rise in cooling air temperature and may cause the Load Bank to overheat.
7. Install the factory-provided exhaust hood(s) as soon as possible. This protects the open resistor element section from debris and environmental conditions such as freezing rain. Failure to install hoods in a timely fashion may void warranty.
8. 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 definite hazard. The Load Banks should be used in a cool, well ventilated area. This Load Bank is specifically designed for outdoor use with an exhaust hood. Load Banks are not intended for indoor operation.
9. 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 guard operating personnel from possible burn injuries.
10. 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.
11. Do not allow objects to enter or block the air intake or exhaust of the Load Bank. A blockage can 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/or fire hazards.
12. Operators must not operate the Load Bank with the access panels or screens removed. To do so exposes the operator and other persons to possible personal injury from electrical shock or from the moving fan blades.
13. Emergency Shutdown Procedure
 - A. In an emergency, turn off the MASTER LOAD switch, then the generator. The MASTER LOAD switch will allow disconnection of all load steps and still allow for the motor to run, cooling any heated elements.

- B. The power ON/OFF switch will disconnect both load steps and the fan motor. The Generator Emergency "OFF" switch should be located near the load system.
14. An approved electrical fire extinguisher should be on hand at all times.
 15. 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.
 16. Read and heed all **WARNING** and **CAUTION** statements in the manual.

SECTION II

DESCRIPTION

The Resistive Load Bank is a vertical airflow unit designed to provide a balanced resistive load of unity power factor, at a specified 3-phase voltage. The total load capability and load steps provided in a given 4800 Load Bank are listed in the Table of Contents. The standard Load Bank step resolution is either 5 kW or 50 kW; 1 kW resolution is available as an option. D29440-10 has a Load Step Resolution of 25 kW. Using the toggle switches on the control panel, any combination of the available load steps may be selected to achieve a desired load.

Depending on the total kW capability, the 4800 Load Bank consists of one, two, or three stacks. Each stack contains a blower with a 3-phase, 480 VAC, 60 Hz, 10 H.P. 1750 RPM fan motor which provides the necessary cooling air for the load elements. The fan motor is controlled by a motor starter contactor. Overcurrent protection is provided for the motor by three fuses and an overload relay. The overload relay assembly does not have an automatic reset provision and must be reset manually. When required, the Load Bank may be furnished with blower motor(s) sized to operate at voltages different from standard. The fan free air delivery is nominally 20,000 CFM.

CAUTION

The Load Bank should never be used without the fan motor(s) operating. Inadequate cooling airflow will result in resistor elements causing overheating and a definite fire hazard.

An airflow switch (one per stack) is provided to monitor the flow of cooling air. This differential pressure switch is electrically interlocked with the load application controls to prevent load application if a fan is not working properly (AIR FAILURE light comes on).

An overtemperature switch (one per stack) is provided to monitor exhaust air temperature. This switch is electrically interlocked with the load application controls to prevent load application if a resistor stack temperature exceeds 375°F.

The control panel contains a POWER ON-OFF switch with a CONTROL POWER light, a BLOWER POWER light, blower power START and STOP pushbutton switches, an AIR FAILURE light, a Load Bank OVER TEMP light, a MASTER LOAD ON-OFF switch, a VOLTAGE SELECT switch for Load Banks with dual voltage capability, and individual KW LOAD STEP switches. All load step switches are the toggle type with metal levers. The control panel also contains a FUSE for protection of the control circuit.

Also, for Load Banks equipped with the Load Control option, the control panel will contain an AUTO/MANUAL selector switch and an AUTO light. Various digital metering packages are optionally available and are packaged as part of the control panel.

Sized for mounting in a 19-inch rack enclosure, the control panel has a vertical height of 14 inches and requires a minimum of 8 inches of clearance behind the panel.

A control panel enclosure, for control panels with or without metering, is available as an option. It can be supplied mounted directly to the Load Bank or loose for mounting in a remote location.

The Load Bank is fabricated using heavy-gauge aluminized sheet steel, making a rigid structure. Mounted within the structure are the load element resistor assemblies, load contactors, and the cooling fan(s)/blower(s). The resistive elements are porcupine type, fully supported along their length. Mounted on separate panels are the motor starter, motor overload relay, fuses, and customer connection terminals. The cooling air is drawn in from the sides and the back intake screens, forced across the resistor elements, and exhausted out the top. The panel includes a temperature controlled heater, which may be used to prevent condensation from hindering operation of the Load Bank.

The Load Bank is equipped with screens mounted at the inlet openings and exhaust hoods. The Load Bank uses a welded fabricated base to facilitate handling by a forklift truck. Bolt holes are also supplied in the base to permit permanent mounting to a concrete pad or metal foundation.

WARNING

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

Do not apply DC voltages as the contactors do not have arc blowout magnets.

SECTION III

INSTALLATION

INSTALLATION CHECKOUT PROCEDURE - TO BE DONE PRIOR TO OPERATION

This Installation Checkout Procedure is intended to be used upon initial receipt of equipment and following any relocation of a permanent mounted Load Bank. These procedures apply to Load Banks in general and may include steps not relevant to the specific unit being installed. Disregard those procedures which do not apply.

W A R N I N G

THE FOLLOWING TESTS ARE TO BE ACCOMPLISHED BY A QUALIFIED ELECTRICIAN OR TECHNICIAN USING EXTREME CAUTION AS POTENTIALLY LETHAL VOLTAGES AND DANGEROUS ROTATING COMPONENTS ARE PRESENT. IF ASSISTANCE IS REQUIRED, ASCO CAN PROVIDE START UP SERVICE AT A NOMINAL CHARGE. ASCO ALSO WILL PROVIDE TELEPHONE ASSISTANCE IF REQUIRED BY CALLING (216) 573-7600.

1. Verify the Load Bank placement meets the installation requirements found in the INSTALLATION section of the instruction manual:
 - A. Check the clearance from both intake and exhaust to any obstruction.
 - B. If the location has a prevailing wind, make the wind aid in the cooling of the resistor elements.

- C. Follow these steps to mount hoods on exhaust (top) of Load Bank.
- 1) Hoist hoods by installing two heavy rods (5/8" or 3/4" dia.) completely through unit.
 - 2) Make sure at least 6" projects beyond sides.
 - 3) Then attach minimum 6' long four-chain/cable sling to rod ends.
 - 4) Anchor hoisting device.
 - 5) Verify device with attachments will safely hoist hoods.
 - 6) Lift hoods and seat over full perimeter flange (curb) on roof (top) of Load Bank.
 - 7) Mounting can be directed toward front or rear of Load Bank.
 - 8) Secure. Use 3/8-16 S/S fasteners provided. (Fasteners are shipped screwed into hood mounting flange on top of unit.)
2. Check the mechanical integrity of all customer-supplied interconnection wiring:
- A. Ensure lugs are properly crimped.
 - B. Ensure terminations are properly torqued.
 - C. Verify proper phase to phase clearance on main bus bars, load wiring, and mounting hardware.
3. Utilize system schematics to ohm out customer-supplied interconnection control wiring and safety circuits:
- A. If control wiring is all the same color, ohm out each individual wire to confirm proper labeling and placement.

CAUTION

Control wiring must be a minimum of 14 AWG for wire runs under 50 feet. Consult ASCO factory for wire sizing when wire run exceeds 50 feet.

- B. Confirm the correct wire gauge has been used for interconnection wiring. Control wiring should be a minimum of 14 AWG for control panel to Load Bank lengths of 50 feet or less. For lengths of greater than 50 feet, consult the factory.

4. Energize the source of control power only:
 - A. Check the control voltage and confirm it is within 10% of the required voltage.

W A R N I N G

Control power is present on terminal block in steps 4 through 6.

- B. Operate the safety circuitry with a jumper across the air switch contact at its termination at the terminal block.
5. Verify the proper relays energize with each individual load switch.
 - A. Turn on each load step individually and observe that each relay or relays pulls in without chatter or hesitation.
 - B. Turn off the master load switch. Turn on all the load steps. Turn the master load on and observe the pull in of all the contactors. If chatter or hesitation is observed, locate the cause of the voltage drop causing the problem.
6. While the load relays are energized, remove the jumper across the air switch. All the load contactors should drop. **Leave the jumper off the air switch(es).**
7. Apply the rated fan voltage. Start fans/blowers and verify that air is exiting the resistor assembly end (top of exhaust hood).

The air switches must be checked and/or field adjusted. This adjustment must be made after installation and during full operation of any supplemental equipment, which may influence the air-handling system. Follow these steps to verify and/or adjust:

- A. Stop fan(s)/blower(s) and remove all sources of power from the Load Bank.
- B. Remove the front access panel to gain entry to the control area.
- C. Verify each air switch individually by removing the control wiring from the switch terminals.
- D. Connect an ohmmeter across the air switch normally open terminals.

- E. Run ohmmeter wiring outside of the unit and temporarily install access panel.
- F. Reapply fan/blower voltage and control power.
- G. Start fan(s), allowing them to come up to speed, approximately 10 seconds. The normally open contacts should close. If more than one fan/blower, all must be operating before continuing.
- H. Press fan/blower stop button. Count down the number of seconds before switch opens. It should take 3-5 seconds. If not, adjust the air switch by turning the screw on the air switch out to increase time. (Turning in decreases time.)
- I. Once 3-5 seconds have been established, repeat for the other air switch(es) if applicable.
- J. Stop fan(s) and remove all sources of power from the Load Bank.
- K. Remove access panel, remove ohmmeter wiring, and replace factory wiring. Replace access panel.

This checkout procedure is intended to be a guide to Load Bank installations in general. Special installation considerations not addressed herein may be necessary due to installation site or environment. Any questions or concerns regarding Load Bank installation should be directed to field service at (216) 573-7600.

WARNING

It is vitally important to install the Load Bank properly. Installation errors may result in a catastrophic failure. The airflow switch, a protective device 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 AIRFLOW SWITCH.** This causes a safety hazard and voids our warranty. Verify proper phase to phase clearances on all load wiring, bus bar, and mounting hardware. The following installation instructions are critical to the safe operation of the Load Bank. Refer to the **SAFETY CONSIDERATIONS** section of this manual.

LOCATION

Do not install the Load Bank in any area where standing water can pool or accumulate. Do not install near: a drainage basin, surface/ground or roof runoff, sewer collection, or any location where water can back up or collect. If flooding can occur, we recommend a different location or a raised platform sufficiently above high water level. Do not operate if any portion of the Load Bank is submerged. Always install above grade.

The Load Bank must be used in a cool, well ventilated area. It must be installed where cool air is continually available and where hot exhaust air will not be recirculated through the Load Bank. The Load Bank must not be operated in a closed space. Exhaust temperature may exceed 400°F over ambient, under full load conditions.

The Load Bank should be positioned so that there is a minimum of 36 inches of clearance on all sides to provide room for intake air flow and maintenance. A minimum of twelve feet of clearance from the exhaust is required for proper airflow. (Refer to the appropriate Outline Drawing.)

The exhaust air may exceed 400°F above ambient under full load conditions. The unit must not be installed near any equipment, wiring, or plumbing which may be damaged by high air temperatures or which may constitute a fire hazard.

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 elements. A Load Bank should not be installed so close to any surface as to reflect the exhausted air back to the air intake.
2. **Restriction of Cooling Air** - Any obstruction located within five (5) feet of the inlet and twelve (12) feet of the exhaust hood will restrict the Load Bank's airflow. Airflow is also restricted when two or more Load Banks have air inlets positioned close to each other. This competition for cooling air causes a low pressure area, restricting adequate airflow. It is recommended that the factory exhaust hoods be used.

NOTE

If exhaust hoods are not used, contact the factory for specific site review prior to installation and operation. The following three items are for review.

- a. If the exhaust hoods are not used, the Load Banks are designed to tolerate up to 0.12" water gage additional system airflow resistance. This includes air intake resistance and resistance due to exhaust duct/louvers/screen. The exhaust must be screened to keep debris from entering unit. The screen must be a minimum 75% open area and/or exceed Load Bank duct area by a minimum of 50%.
- b. If exhaust duct exits through motorized louvers, the design must be interlocked to assure full open prior to operation. Consideration must also be given for louver design and actuator to prevent heat problems.
- c. Each fan/blower is designed to move 20,000 CFM per resistor stack. The entire unit then moves (20,000 CFM times number of stacks).

Consult the factory if hoods are not used or if strong prevailing winds exist. Failure to obtain written factory approval for special intake or exhaust conditions voids warranty.

ADDITIONAL AIRFLOW CONSIDERATIONS

1. Load Banks mounted into a channel, trough, hollow, well, pit, surrounded completely by a parapet wall or backed into a full corner require special considerations even if the other conditions are met. In these cases, provide detailed site layout drawings to ASCO for inspection and comments.
2. Locations which have full or partial perimeter fence necessitate a review. The fencing material should have at least 75% open area. The minimum clearances still apply. Overhead fencing or grating is not recommended.
3. Do not install Load Banks or other air handling devices within the same area. Any high velocity air stream near the Load Bank air flow can disrupt the cooling. This is critical if the other equipment is a source of heat. Any thermal rise on Load Bank intake air can create a potential hazard.
4. The Load Bank cooling system cannot be used for any purpose other than cooling the Load Bank.
5. In northern climates with snow depths exceeding 6 inches or blowing and drifting snow, a physical inspection of the Load Bank intake and exhaust is required prior to operation. Any significant snow drifts or snow depths must be cleared prior to operation.
6. Standard Load Banks are designed for operation between sea level and 2,000 feet maximum altitudes. Operation at altitudes over 2,000 feet above sea level requires special consideration. As the altitude increases, the effective cooling air diminishes. Contact ASCO for assistance.

SPECIAL NOTE FOR THREE STACK LOAD BANKS (P/N D28042-)

These higher capacity three stack (bays/modules) units require special airflow consideration. The center stack must pull in cool intake air from the back and bottom of the stack. Do NOT block or restrict the back or lower (base) screened intake areas. Although the center stack is typically used for primary load connection, the contractor installed and fabricated wire way/duct run/conduit must be clear of these center stack intakes.

CONTROL CONNECTIONS

The control panel is designed for mounting in a 19-inch rack-type enclosure. If required, connect terminals of the control panel to terminals of the Load Bank and conduit/wire way as shown on the appropriate interconnection diagram. The control circuit operates on a customer-supplied 120 VAC, 60 Hz, single phase, 20 amp power source. On three stack designs, verify conduit/wire way does not impede airflow to center stack.

As an option, the control circuit voltage is obtained from the main load bus using the appropriate control transformer assembly.

ENCLOSURE HEATERS

A 100 watt strip heater is located inside the Load Bank enclosure (one per stack) on the control/blower panel. It is controlled by a temperature switch and is factory calibrated to 50°F. The heater is used to control condensation problems. This heater should also be energized if the Load Bank is stored outdoors prior to installation. Refer to schematic diagram for connection instructions.

FAN/BLOWER MOTOR CONNECTIONS

The fan/blower circuit consists of fuses, a motor starter contactor, an overload relay, and the fan motor (one per stack). The input power connections are directly wired to the main Load Bank bus.

Required power for each fan/blower motor is 480V, 3-phase, 60 Hz, 14 amps/phase.

Make sure that the correct phase rotation is wired to the fan motor(s). Improper phase rotation will cause the fan to run in the reverse direction. The cooling air should be pushed from the fan, across the resistor elements, and out the top exhaust hood. This phase rotation check is mandatory each time the source or fan connections are changed. If fan rotation is incorrect, shut down the Load Bank and remove all power from the Load Bank. Switch any two load cables at the Load Bank load bus.

If external 480 volt power is provided, safe practice dictates that the fan power be wired through a safety disconnect switch that can be locked out.

LOAD CONNECTIONS

Load connections are made to the 3-phase bus bars located in the Load Bank. For dual stack Load Banks, this location will be in the left section of the Load Bank. For three stack Load Banks, this location will be in the center section of the Load Bank. (Refer to the appropriate Outline Drawing.) The connections are marked A, B, and C. Cables to the Load Bank should be of adequate size to handle maximum rated load according to the National Electrical Code and any local codes.

The ampacities of these load connections are shown on the appropriate Load Bank schematic diagram.

After installation/connections are complete, verify proper phase to phase clearances on all load wiring, bus bar, and hardware. Adjust or insulate to suit if required.

As previously noted, on three stack Load Banks, the center section is designed for load connections. If the center bay is not adequate for all load cables, there are provisions to install a limited number of cables in each of stack one and stack three. Do not run more than 20% of the conductors up into stack one or three. The main load bus bar in stack one or three will not carry the high current required to distribute power to resistor sections if more than 20% of load conductors are in these stacks. Contact ASCO if there are special installation requirements or if the above cannot be followed.

For three stack designs, all three stacks have a sheet metal cover at base. Remove this cover and punch/machine/cut clearance holes as required for conduit or wire way. Replace the cover or seal the area between conduit and Load Bank base to establish an air tight closure. This is required for proper cooling of the equipment. These base conduit covers or a suitable alternative must be installed to seal base area at cover plate on all three stack designs.

For three stack designs (D28042-), if skirting the pedestal, this must be 70% open area. The center stack in these draws intake air from the back and bottom. Do not block this bottom intake.

GROUNDING

A permanent ground conductor must be connected to the Load Bank enclosure by an individual ground wire to prevent a potential above ground on the enclosure. There is a ½-13NC ground nut in the base of each Load Bank frame for this connection. This ground conductor should be run with the load power conductors to provide the lowest impedance fault path. The ground nut must be connected to both the power source frame and to a good earth ground. The ground conductor should be sized per the National Electrical Code Table 250.122, if not superseded by local codes.

LOAD CONTROLLER (Optional)

Wire the current transformer into the control circuitry as shown on the provided schematic.

W A R N I N G

Always put a short or shunt across the current transformers when servicing the Load Bank. Primary current flowing through an unshunted current transformer will destroy the transformer with possible harm to personnel.

THEORY OF OPERATION

The automatic operation circuitry of the Load Bank allows the generator to maintain a minimum percentage of its rated output for efficient generator operation. The control range is generally between 60% and 80% of the output rating of the generator.

SECTION IV

OPERATION

WARNING

DO NOT touch the top exhaust hood/duct or cover panel during operation. The hood will become hot from the exhausted heat and will cause a serious burn. Refer to the SAFETY CONSIDERATIONS section of this manual.

DO NOT allow objects to enter or block screens.

CAUTION

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

Do not apply DC voltages as the contactors do not have arc blowout magnets.

PROCEDURE

1. Place all switches on the control panel to the OFF position.
2. Connect the power source to be tested to the Load Bank as described in the INSTALLATION section.
3. Place the VOLTAGE SELECT switch to the correct voltage to test the generator (dual voltage Load Banks only).

CAUTION

DO NOT operate the Load Bank over the rated voltage as this will cause catastrophic failure in the Load Bank.

4. Place the AUTO/MANUAL selector switch to the MANUAL position (Load Banks equipped with Load Control option only).
5. Start the generator under test.
6. Place the control power ON/OFF switch to the ON position. The CONTROL POWER light will be energized, indicating control power is present.
7. Push the BLOWER START pushbutton. Note that the AIR FAILURE indicator will flash on momentarily. When the blower motor(s) has reached proper speed, the AIR FAILURE lamp will be de-energized. Load voltage will not be connected to Load Bank resistance elements unless the airflow switch(es) is closed and the load dump relay (K99) has been interlocked. Check for correct exhaust airflow direction.

CAUTION

The operation of all of the blowers is vital to the safe operation of this Load Bank. When the BLOWER START switch is pressed, the AIR FAILURE light will come on momentarily until the blowers accelerate up to their operating speed and K99 has been interlocked. If the load elements are energized when the blowers are not operating, the Load Bank will burn up. If the AIR FAILURE indicator light stays on for more than a few seconds, shut down the Load Bank, and do not operate the unit until the problem is corrected. Refer to the SAFETY CONSIDERATIONS section of this manual.

8. With the MASTER LOAD switch in the OFF position, energize power source under test. Check for proper phase sequence.

9. The resistive loading is selected by toggle switches, using any one or combination of the toggle switches to make up a given load.
10. By placing the MASTER LOAD switch to the ON position, the preselected load will be applied to the power source.
11. Any load switch can be added or removed as required while the MASTER LOAD switch is closed (ON).
12. To remove the load, open the MASTER LOAD switch by placing it in the OFF position.

SHUTDOWN

1. Place the MASTER LOAD switch to the OFF position.

NOTE

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

2. Place the control power ON/OFF switch to the OFF position, and other switches on the control panel should be turned OFF.
3. Shut down the power source/sources.
4. Disconnect the Load Bank from the power sources.

AUTOMATIC OPERATION (for 4800 Load Banks with Load Controller option)

1. Place all switches on the control panel to the OFF position.
2. Connect the generator or other power source to be tested to the Load Bank as described in the INSTALLATION section.
3. Place the POWER switch to the ON position. The CONTROL POWER light (DS1) will be energized, indicating control power is present.

4. Place AUTO/MANUAL switch to AUTO.
5. Start the generator under test.
6. When the Auto/Transfer Contact is closed, the Auto Load Controller will be active. The Auto Load Controller will automatically start the blower and apply load steps. As the load on the generator lessens, the Load Controller will automatically apply load steps until the overall generator load exceeds the minimum setpoint. The Load Controller automatically removes load steps when the generator load exceeds the maximum setpoint. When the Auto/Transfer Contact is opened, the Auto Load Controller will be inactive and the blower will be stopped automatically.

OPTIONAL CONTROLLER OPERATION AND ADJUSTMENTS

NOTE

The current setpoints for the Load Controller option have been preset by the factory. Adjustments can be made as follows:

W A R N I N G

Always put a short or shunt across the current transformer when servicing the Automatic Load Controller. Primary current flowing through an unshunted current transformer will destroy the transformer with possible harm to personnel.

Before the current setpoint(s) can be adjusted, the operator must determine the maximum load the Controller should maintain (generally 60% to 80% of the total generator KVA).

SYSTEM SETPOINT CALCULATION (Example)

System Ratings

Generator Resistive Rating = 2000 kW @ 480 VAC, 3 PH.

Load Bank Controller Capacity: 1000 kW @ 480 VAC, 3 PH.

Load Steps: 50, 50, 100, 100, 200, and 500 kW

Actual Generator Output = Load Bank Load + Building Load.

<u>Trip</u> <u>Point</u>	<u>BUILDING LOAD</u>	<u>LOAD BANK</u> <u>LOAD</u>	<u>ACTUAL</u> <u>GENERATOR</u> <u>OUTPUT</u>	<u>% OF</u> <u>GENERATOR</u>
	0-<600 kW	1000 kW	1200-1600 kW	(60%-80%)
TP.1	>=600-<1100 kW	500 kW	1200-1600 kW	(60%-80%)
TP.2	>=1100-<1300 kW	300 kW	1200-1600 kW	(60%-80%)
TP.3	>=1300-<1400 kW	200 kW	1200-1600 kW	(60%-80%)
TP.4	>=1400-<1500 kW	100 kW	1200-1600 kW	(60%-80%)
TP.5	>=1500-<1550 kW	50 kW	1200-1600 kW	(60%-80%)
TP.6	>=1550 kW	0 kW	Building Load	(>=73%)

At 0 kW building load, the Load Bank will provide 1000 kW worth of load. Actual generator output will be 1200 kW (60%), after a preset time-delayed ramp up period.

As the building load increases and the actual generator output approaches 1600 kW (80%), the controller disables one load step; in this example, the last 500 kW load step “sheds”.

This load control continues as the building load continues to increase. If the building load decreases, causing the actual generator load to fall below 60%, the controller will add the appropriate load step(s) to maintain the desired range of control.

TRIP POINT ADJUSTMENTS

In the system example detailed above, a current transformer having a ratio of 3000:5 will be used to monitor the building load. (Refer to the Load Controller schematic.) As the actual generator output reaches 1600 kW, the controller “sheds” a load step. The current flowing to the building load at this point will be called the current trip point. This “trip point” value can be determined using the following formula:

$$\text{LINE CURRENT}(I(\text{line})) = (\text{kW} * 577) / \text{VOLTAGE}(\text{LINE-to-LINE}).$$

$$\begin{aligned} \text{In this example } I(\text{line}) &= (600 * 577) / 480, \\ &= 721 \text{ amps} \end{aligned}$$

Secondary Current Calculation

The controller senses the current (I_{sense}), delivered from the current transformer that is monitoring the building load. This value can be determined using the following formula:

$$I(\text{sense}) = I(\text{line}) / \text{CT Ratio.}$$

In this example, the CT Ratio = 3000/5 or 600.

For TP.1	$I(\text{sense}) = 721/600$	or 1.20 amps.	(600 kW)
For TP.2	$I(\text{sense}) = 1322/600$	or 2.20 amps.	(1100 kW)
For TP.3	$I(\text{sense}) = 1563/600$	or 2.60 amps.	(1300 kW)
For TP.4	$I(\text{sense}) = 1683/600$	or 2.80 amps.	(1400 kW)
For TP.5	$I(\text{sense}) = 1803/600$	or 3.01 amps.	(1500 kW)
For TP.6	$I(\text{sense}) = 1863/600$	or 3.11 amps.	(1550 kW)

Adjustments can be made to the PC board controller(s) via the adjustable resistor potentiometers found on the PC board(s). (Reference resistors labeled R73, R60, R47, R34, and R21.)

NOTE

If more than five load steps are required, there will be one additional PC board (A102). The resistor potentiometers are labeled identically to the first PC board (A101).

NOTE

R73 controls the last load step circuit. [i.e., if the Load Bank has five load steps, R73 controls the fifth load step; if the Load Bank has six load steps, R21 (on the second PC board) controls the sixth load step.]

The potentiometers should be adjusted such that the last load step is the first step to be “shed”.

	<u>PCB A101</u>	<u>PCB A102</u>
In this example,	R73 = TP.2 R60 = TP.3 R47 = TP.4 R34 = TP.5 R21 = TP.6	R21 = TP.1

The “trip point” value = $I(\text{sense})$ can be applied to the controller terminals J1 and J2, using a separate current source.

There are two methods of field adjusting the trip point of the current sensing relays:

Method 1 - Using a separate (0-5 Amp) current source without the current transformer

Method 2 - Rough adjustment (Approximation Method)

Method 1 - Using a separate (0-5 Amp) Current Source without Current Transformer

1. Disconnect all sources of power to the Automatic Load Controller. (Control voltage and current sense input)

W A R N I N G

When disconnecting the current transformer, the secondary terminals must be shorted. The secondary of an unshorted current transformer can exceed several thousand volts.

2. Apply 120 VAC, 60 Hz control power J1(10-12) (see schematic).

W A R N I N G

There is lethal high voltage within the control enclosure.

3. Using a controlled current source, apply the setpoint current (from secondary current calculation) to Controller terminals J1(1) and J1(2).
4. Turn the relay knob labeled THRESHOLD past the trip point; then decrease until the relay trips on, indicated by LED illuminating.
5. Reconnect all wires previously removed.

Method 2 - Rough Adjustment**NOTE**

Adjustable potentiometers on the controller board have a % scale reference that directly relates to the current, (Isense), delivered from the current transformer used to monitor the building load. Refer to **Secondary Current Calculation**, in **Trip Point Section** of this manual. The scale is based upon a 5 amp input.

.5 amp	= 10% Dial Setting
1.25 amp	= 25% Dial Setting
2.5 amp	= 50% Dial Setting
3.75 amp	= 75% Dial Setting
5.0 amp	= 100% Dial Setting

With all power removed from the Load Bank, calculate each desired Trip Point and adjust the potentiometers (R21, R34, R47, R60, R73) in order to achieve a rough adjustment controller setting.

NOTE

The current sense relay settings must be set sequentially. It is extremely important that the sequence be correct because the current sense relays are interlocked by the previous relay. Consult the factory at 216-573-7600 if unsure of proper adjustment.



ESD PRECAUTIONARY GUIDELINES

CAUTION

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 performed only by qualified personnel.

W A R N I N G

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

Eye protection should be worn when cleaning the unit with compressed air.

DAILY

1. Remove any restrictions to the airflow through the Load Bank.
2. Check the screens to make sure that no objects have blocked or entered the openings. If freezing conditions exist (below 32°F or 0°C) and freezing rain, sleet, or snow block the exhaust hood/duct/louver, the following special precautions must be taken. Clear area around exhaust opening. Do not use a shovel or heavy sharp object or damage to the screen may occur. If exhaust hood/duct/louver is blocked by ice or snow and manual clearing is not possible, limited use of the Load Bank to melt the blockage is possible. Run the Load Bank at a reduced load of approximately 500 kW for one-minute intervals (1 minute on, 10 minutes off). The exhaust heat will slowly melt the blockage. Continue cycling for

10-minute intervals until exhaust is clear. Do not apply continuous full load until both intake and exhaust openings are clear.

3. Verify that the airflow is in the proper direction.
4. Assure that there is no recirculation of the exhaust air through the Load Bank.

THREE MONTHS

1. Remove the access panels and screens, and inspect the load resistors for mechanical breakdown which is demonstrated by excessive sagging of the elements. Replace worn resistor elements with new resistor elements as required.
2. Inspect for broken ceramic insulators. Replace any broken or cracked insulator with a new ceramic insulator.
3. Inspect for loose hardware or loose connections. Tighten where required.
4. Inspect all connections for oxidation or corrosion. Clean the connection or replace the hardware where required.
5. Verify that the airflow switch works properly.
6. Inspect all magnetic contactors to make sure that the contacts are not severely pitted or corroded. The contacts must move freely and be properly seated.
7. Clean all dirt and debris out of the Load Bank. This can be accomplished by blowing the inside of the units 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.
10. Check the indicator lamps on the control panel.

ANNUALLY

The fan/blower motor(s) should be lubricated if required per the motor manufacturer's requirements and specifications on the motor nameplate.

Inspect exhaust hood and screen.

SECTION VI

K875A OPTIONS LIST

These options are available for ASCO Model K875A Load Banks. Not all options can be installed in the same unit. Installed options are marked on the identification tag.

<u>Option Drawing No.</u>	<u>Option</u>	<u>Description</u>
A24744	17	Control/Meter Enclosure, Wallmount
D27685-2	23	Automatic Load Controller Option, Schematic 1192769
D27685-3	24	Automatic Load Controller Option, Schematic 1192769
B27730	36	Remote Monitoring Contacts
D27683-9	51	Control Transformer Option, 208/115V (for 500 to 2000 kW Load Banks)
D37723-3	64	Digital Power Metering Option (DW Style) (V, A, F, KW, KVAR, PF, KVA) CT Ratio: 1500:5
D37723-4	65	Digital Power Metering Option (DW Style) (V, A, F, KW, KVAR, PF, KVA) CT Ratio: 2000:5
A32404	71	Control Unit, Mounted (Front)
A32573-1	73	Gravity Hood Replacement, Single Stack
A32573-2	74	Gravity Hood Replacement, Two Stack
A33333-1	76	Hinged Access Panel, Single Stack
A34920-1	80	Aluminum Hood Replacement with Stainless Steel Screen (1 Stack Units)
B32580-1	83	Overhead Lift, Single Stack
B32580-2	84	Overhead Lift, Two Stack

<u>Option Drawing No.</u>	<u>Option</u>	<u>Description</u>
A37255	86	Bus Bar, Customer Connection, Replacement
A37594	87	Local Control/Metering Unit, Mounted (Right Side)
B33795-1	88	Elevating Stand (One Bay)

REPLACEMENT PARTS LIST

INTRODUCTION

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

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, 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	ASCO P/N	QTY/ UNIT
	<u>OPTION #20: CONTROL TRANSFORMER</u>	D27683-7	
XF210-212	.FUSEBLOCK 3 POLE	324496	1
F212	.FUSE, CARTRIDGE, 9 AMP, 600V, TIME DELAY, CLASS RK-5	324431	1
F210,211	.FUSE, 5 AMP, 600V, TIME DELAY CLASS RK-5	324394	2
T1	.TRANSF, CONT: 850 VA, 380/440/550 VAC, 50/60 HZ. SECONDARY	370940	1
	<u>OPTION #21: DUAL VOLT CONTROL TRANSFORMER</u>	D29476-1	
CB1	.CIRCUIT BREAKER; 16A, 480V, 2 POLE	310336	1
XF212	.FUSEBLOCK 3 POLE	324496	1
F212	.FUSE, CARTRIDGE, 9 AMP, 600V, TIME DELAY, CLASS RK-5	324431	1
XF300	.FUSEKIT, TRANSFORMER SECONDARY	324964	1
F300	.FUSE CARTRIDGE 0.5A 250V	324005	1
S100	.SWITCH, PUSH MOM	361662	1
S101	.SWITCH, PUSHBUTTON RED	361661	1
S102	.SWITCH, TOGGLE 125 VAC, 28 VDC	360785	1
K100,240	.RELAY; 3P, 25A, 600 VAC IND, 35A, 600 VAC RES, 110/120V, 50/60 HZ	350833	2
K481	.RELAY, VOLTAGE SENSING; 180-276V PICKUP	350740	1
XK481	.RELAY SOCKET DIN RAIL MOUNT	358280	1
XK481	.CLIP, RETAINER	467522	2
K480	.RELAY; 3P, 25A, 208/240V, 60 HZ, 2-SPDT AUX, DIN RAIL MT	351924	1
T2	.TRANSF, CONT; 50 VA, 440/460/480V PRI, 220/230/240V SEC, 50/60 HZ	370528	1
T1	.TRANSF, CONT: 850 VA, 240/480 VAC PRI, 120 VAC SEC, 50/60 HZ	371148	1
	<u>OPTION #23: LOAD CONTROLLER</u>	D27685-2	
K50,51	.RELAY, 3PDT, 120 VAC COIL	351060	2
XK50,51	.RELAY SOCKET DIN RAIL MOUNT	358280	2
XK50,51	.HOLDDOWN SPRING	467550	2
A101,102	.PRINTED CIRCUIT BOARD ASSY	A22829	2
	..SCHEMATIC	D26034	REF.
DS30	.LAMP, INDICATOR, NEON, PANEL MNT, 110/125 VAC, AMBER, .375 MTG. HOLE	329681	1
S30	.SWITCH, TOGGLE DPDT, 6 TERM, ON-NONE-ON	360747	1
K71 (AUX2)	.CONTACT, AUX, SPDT	312361	2
R30	.RESISTOR, 12K OHM, 2W, 5%	119311	1

SCHEMATIC REFERENCE	DESCRIPTION	AVTRON P/N	QTY/ UNIT
	<u>OPTION #24: LOAD CONTROLLER</u>	D27685-3	
K50,51	.RELAY, 3PDT, 120 VAC COIL	351060	2
XK50,51	.RELAY SOCKET DIN RAIL MOUNT	358280	2
XK50,51	.HOLDDOWN SPRING	467550	2
A101	.PRINTED CIRCUIT BOARD ASSY	A22829	1
	..SCHEMATIC	D26034	REF.
DS30	.LAMP, INDICATOR, NEON, PANEL MNT, 110/125 VAC, AMBER, .375 MTG. HOLE	329681	1
S30	.SWITCH, TOGGLE DPDT, 6 TERM, ON-NONE-ON	360747	1
K71 (AUX2)	.CONTACT, AUX, SPDT	312361	1
R30	.RESISTOR, 12K OHM, 2W, 5%	119311	1
	<u>OPTION #36: REMOTE MONITORING CONTACTS</u>	B27730	
K101-103	.RELAY, 3PDT	351060	3
XK101-103	.SOCKET, RELAY	358280	3
XK101-103	.SPRING, HOLD DOWN	467550	3
	<u>OPTION #51: CONTROL TRANSFORMER</u>	D27683-9	
XF210-212	.FUSEBLOCK 3 POLE	324496	1
F212	.FUSE, CARTRIDGE, 15 AMP, 600V TIME DELAY, CLASS RK-5	324346	1
F210,211	.FUSE, 20 AMP, 600V, TIME DELAY CLASS RK-5	324143	2
T1	.TRANSFORMER: 1500 VA, 1 PH, 50/60 HZ	371319	1
	<u>OPTION #64: DIGITAL METERING UNIT</u> (DW Style), CT Ratio 1500:5, RS485	D37723-3	
CT1,CT2	.Transformer, Current, 1500:5	370159	2
F100-102	.Fuse, 1 Amp, 600V, Time Delay	324449	3
XF100-102	.Fuseblock	324998	1
M1	.Meter, Digital	338344	1
	<u>OPTION #65: DIGITAL METERING UNIT</u> (DW Style), CT Ratio 2000:5, RS485	D37723-4	
CT1,CT2	.Transformer, Current, 2000:5	370157	2
F100-102	.Fuse, 1 Amp, 600V, Time Delay	324449	3
XF100-102	.Fuseblock	324998	1
M1	.Meter, Digital	338344	1
	<u>OPTION #76: HINGED ACCESS PANEL, SINGLE STACK</u>	A33333-1	1
	.Panel, Machining (Top)	D32672	1
	.Hinge	B28406	1
	.Latch, Spring, Flush Head	442595	3
	.Handle	B27422	1
	.Label, Warning	B15868	1
	.Panel, Machining (Bottom)	D33312	1

SECTION VII

REPLACEMENT PARTS LIST

INTRODUCTION

The parts list in this section contains the description, quantity required, and ASCO 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 ASCO 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, ASCO part number, and the schematic reference designator number if one is available. Also include the series and serial number of the equipment.

FEDERAL CODE NUMBER LIST

01121	Allen-Bradley Co. 1201 S. Second St. Milwaukee, WI 53204	550 Condit St. P.O. Box 366 Huntington, IN 46750-2506
02295	General Electric Co. Bloomington, IL	54407 Power-One DC Power Supplies 740 Calle Plano Dr. Camarillo, CA 93010-8555
02570	Crawford Fitting Co. 29500 Solon Rd. Solon, OH 44139-3449	59270 Selco Products Inc. 7580 Stage Rd. Buena Park, CA 90621-1224
08275	Cleveland Controls Inc. Cleveland, OH	6P125 Potter and Brumfield Div. of AMF Inc. Princeton, IN 47670
10023	Chromalox Instruments Interchange City Industrial Park 1382 Neil-Quaker Blvd. Laverne, TN 37086	6T923 Crouzet Controls Inc. Carrollton, TX 75006
14971	Tylok International 1061 E. 260th St. Euclid, OH	71400 Cooper Industries Inc. Bussmann Div. 114 Old State Rd. Ballwin, MO 63021-5942
15605	Eaton Corporation Administrative & Technical Center 4201 N. 27th St. Milwaukee, WI 53216	72619 REPLACED BY: 83330 Dialight Corp. Manasquan Div. 1913 Atlantic Ave. Manasquan, NJ 08736-1005
23826	Furnas Electric Co. Batavia, IL	73559 Carlingswitch Inc. 60 Johnson Ave. Plainville, CT 06062-1156
25795	Grainger, W. W. Inc. 5959 W. Howard St. Chicago, IL 60648	75915 Littelfuse Inc. 800 E. Northwest Highway Des Plaines, IL 60016-3049
27193	Eaton Corp. Aerospace/Commercial Controls Div. Milwaukee, WI 53200	77342 Potter & Brumfield Inc. 200 S. Richland Creek Dr. Princeton, IN 47671-0001
3N065	Telemecanique Inc. 2525 S. Clearbrook Dr. Arlington Hts., IL 60005-4623	
30487	Huntington Electric Inc.	

REPLACEMENT PARTS LIST

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/ UNIT
	AVTRON MODEL K375A LOAD BANK, OUTDOOR SCHEMATIC, LOAD BANK INTERCONNECTION DIAGRAM		K375A- D29440-4	
PAL	RESISTOR ASSEMBLY		D29913	ERR
K1B	RELAY; 3P, 90A, 600V TND, 120A, 600V FRS, 110/120V, 50/60HZ, SC TERM	(23826) C26E15AP551A	D29914 D2E438 2 251883	REF 1 1
K1A, 2A	RELAY; 3P, 50A, 110/120V, 50/60 HZ COLL		A14796	2
F1-3,7-9	FUSE, 60 AMP, 600V, VERY FAST ACTING	(71400) 109-90	234420	6
F4-6	FUSE 150A 600V, VERY FAST ACTING, CLASS T	(71400) 109-150	324463	3
	RESISTANCE ELEMENT, 50 KW		A24759	12
	INSULATOR; .530"±.005 OD X .1840" ±.005 ID X 2.100"±.003 LONG		411149	108
	INSULATOR; .530"±.005 OD X .1840" ±.005 ID X 1.500"±.010 LG		411188	24
	INSULATOR; L3, .062±.005"OD, .089±.005"ID, 1.183±.010"LG		411146	24
	INSULATOR; L3, .078±.010"OD, .078±.005"ID, 1.500±.010"LG		411147	48
R42-5	RESISTOR ASSEMBLY		D27553-1	4
K1A, 2A	RELAY; 3P, 90A, 600V TND, 120A, 600V FRS, 110/120V, 50/60HZ, SC TERM	(23826) C26E15AP551A	251883	2
F1-3,7-9	FUSE 150A 600V, VERY FAST ACTING, CLASS T	(71400) 109-150	324463	6
	RESISTANCE ELEMENT, 100 KW		A23914	12
	INSULATOR; .530"±.005 OD X .1840" ±.005 ID X 2.100"±.003 LONG		411149	108
	INSULATOR; .530"±.005 OD X .1840" ±.005 ID X 1.500±.010 LG		411188	24
	INSULATOR; L3, .062±.005"OD, .089±.005"ID, 1.183±.010"LG		411146	24
	INSULATOR; L3, .078±.010"OD, .078±.005"ID, 1.500±.010"LG		411147	48
	CONTROL/DISCONNECT ASSEMBLY		D27881-3	1
R1	HEATING ELEMENT, 100W	(15023) EN510 EGN1303 6	352226	1
S1	TEMPERATURE SWITCH; OPENS @ 90F, CLOSES @ 50F	(58273) GR-80	363095	1
S2	SWITCH, SENSING, RANGE 0.5 ±0.02 IN W.C. - 2.0 IN W.C., 200 VA, 115-270 VAC, INCLUDES TEMP MAT AND THERM COIL CONNECTORS	(103270) AES 271 AIR MISC	160772	1

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	ASTROM P/N	QTY/ UNIT
XF203-205	..FUSEHOLDER 3P 30A 600V FOR CLASS J FUSE	(71400) JP60033-27R	324957	1
F203-205	..FUSE, CARTRIDGE, 20 AMP, 600V, TIME DELAY CLASS J	(71400) LPJ-20SF	324283	3
K72	..OVERLOAD RELAY*	(23020) 3R1026-2Q50	350580*	1
XK72	..BRACKET, PANEL MTE	(23026) 3R1026-3A701	408304*	1
K72	..RELAY; 3 POLE, 25 AMP, 110/120V, 50/60HZ COIL		B17839	1
K71	..RELAY; 3P, 30A (110/120V, 50/60HZ COIL) W/AUX. CONTACT		B14711	1
B3	..TEMP. CONTRL; K THERMOCOUPLE INPUT RELAY CONT OUTPUT, 120/240V	TENSOR INC. CONTROL TC3B4RE52	481377	1
X83	..SOCKET; 8 PIN, DIN FAIL OR BASEMOUNT	TENSOR INC. CONTROL 500-2-0012	356311	1
	..CONTROL PANEL		D29742-7	1
	..SCHEMATIC, LOAD BANK		D29813	REF.
DB1,3	..LAMP, INDICATOR, NEON, PANEL MNT, 110/125VAC, AMBER, .375 INCH BULB	(72619) 249-7841-1433-574	323661	2
DB2,4	..LAMP, INDICATOR, NEON, PANEL MNT, 110/125VAC, RED, .375 INCH BULB	(72619) 249-7841-1431-574	323652	2
X21	..FUSEHOLDER FOR 15/32 X 1 1/2 FUSE	(71400) HPS-RR	324985	1
F	..FUSE 25 AMP COMB	(75915) COMB-25	324734	1
X05	..RELAY; 30A, 240VAC, DPST-NO, 120VAC COIL, IMMERSION CLEANABLE	(77342) T8237A22120	350525	1
SB-12,15, 18,20	..SWITCH, TOGGLE DPST, 4 TERM ON-OFF-OFF	(78559) 26K51-72	360589	3
322	..PUSHBUTTON CONTROL	(02295) CR104PB031K2	381681	1
323	..SWITCH, PUSHBUTTON, MOMENTARY CONTACT, FLUSH HEAD, BLACK	(02295) CR104PB01051	381682	1
	..MOTOR; 10HP, 1725RPM NEMA, 215T FR TYPE, 208-230/460V, 3PH, 60HZ	(25795) 3N374	341143	1
	..IMPELLER, FAN; 29.9", 3 BLADE, 1750RPM, ROSS/INTAKE, BSHG/EXHIST	CROWLEY 29.9-9-42-AL-40-2-2	406260	1
	..ADAPTER BULKHEAD FEMALE 1/4" PIPE TO 1/4" TUBING BRASS	(14971) B4-18HTP 4	434501	1
	..ADAPTER STRAIGHT THERMO	(02570) SS400-1-6-BT	434575	1

APPENDIX

LOAD BANK TROUBLESHOOTING GUIDE

NOTE

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

WARNING

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

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



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.



California Proposition 65 Warning—DINP and DIDP

Advertencia de la Proposición 65 de California—DINP y DIDP

Avertissement concernant la Proposition 65 de Californie—DINP et DIDP

 **WARNING:** This product can expose you to chemicals including DINP, which is known to the State of California to cause cancer, and DIDP which is known to the State of California to cause birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.

 **ADVERTENCIA:** Este producto puede exponerle a químicos incluyendo DINP, que es (son) conocido(s) por el Estado de California como causante(s) de cáncer y DIDP, que es (son) conocido(s) por el Estado de California como causante(s) de defectos de nacimiento u otros daños reproductivos. Para mayor información, visite : www.P65Warnings.ca.gov.

 **AVERTISSEMENT:** Ce produit peut vous exposer à des agents chimiques, y compris DINP, identifiés par l'État de Californie comme pouvant causer le cancer et DIDP, identifiés par l'État de Californie comme pouvant causer des malformations congénitales ou autres troubles de l'appareil reproducteur. Pour de plus amples informations, prière de consulter: www.P65Warnings.ca.gov.

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800-565-6699
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California Proposition 65 Warning—Lead and Lead Compounds

Advertencia de la Proposición 65 de California—Plomo y compuestos de plomo

Avertissement concernant la Proposition 65 de Californie—Plomb et composés de plomb



WARNING: This product can expose you to chemicals including lead and lead compounds, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to: www.P65Warnings.ca.gov.



ADVERTENCIA: Este producto puede exponerle a químicos incluyendo plomo y compuestos de plomo, que es (son) conocido(s) por el Estado de California como causante(s) de cáncer y defectos de nacimiento u otros daños reproductivos. Para mayor información, visite : www.P65Warnings.ca.gov.



AVERTISSEMENT: Ce produit peut vous exposer à des agents chimiques, y compris plomb et composés de plomb, identifiés par l'État de Californie comme pouvant causer le cancer et des malformations congénitales ou autres troubles de l'appareil reproducteur. Pour de plus amples informations, prière de consulter: www.P65Warnings.ca.gov.

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