

## PROPRIETARY NOTE

This document contains information PROPRIETARY to Avtron Manufacturing, Inc., 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 Avtron Manufacturing, Inc.

## 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 equipment.

Feb. 1995

AVTRON LOADBANK, INC.  
Cleveland, Ohio

AVTRON MODEL K675A  
RESISTIVE LOAD BANK  
Part Number K675AD44739

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APPENDIX - Avtron Load Bank Troubleshooting Guide

DRAWINGS

SB2978      Outline  
D44875      Schematic/Interconnection Diagram  
C26518      Metering Panel

VENDOR MANUALS (Provided Separately)

Electro Industries      SHARK100 Installation and Operation Manual - CD-ROM, E145420  
Electro Industries      Quick Start Guide for SHARK Series Meters, E145703, V1.03

AVTRON MODEL K675A  
RESISTIVE LOAD BANK  
Part Number K675AD44739

**SECTION I**  
**SAFETY CONSIDERATIONS**

Throughout this manual, you will find **WARNING** and **CAUTION** statements. Personal injury to an operator using or repairing the equipment may occur 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 Avtron 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 tested 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 Avtron equipment.

The Model K675A Load Bank is an industrial test unit designed to be used outdoors safely. 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 blower. If there is any restriction or stoppage of airflow, the Load Bank may overheat and may even 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 to the generator frame. Run an approved ground wire from the generator frame to a good earth ground.
3. Do not bypass the airflow safety switch to prevent nuisance tripping. The switch drops out if insufficient air is reaching the load elements.
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.

Safety Considerations

5. Maintenance personnel must always exercise caution when the access panels are removed. Personal injury from electrical shock or from the moving blower blade 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.
7. 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 Banks should be used in a cool, well ventilated area.
8. 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.
9. 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 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 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/or fire hazards.
12. Operators must not operate the Load Bank with the access panels or screens removed and doors open. To do so would expose the operator and other persons to possible personal injury from electrical shock or from the moving fan blade.
13. Emergency shutdown procedure:
  - A. In an emergency, shut down 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. This unit is designed specifically for low temperature operation. When unit is in storage and prior to operation, an external source of power (120 VAC, single phase, 60 Hz) must be connected to the heaters. This will energize heaters to prevent icing and condensation problems. In extreme cold, it is advised to apply 120 VAC, single phase, 60 Hz external control power (per D44875) to TB1(9) and (10) for one hour prior to applying load or starting fan.
17. Read and heed all **WARNING** and **CAUTION** statements in the manual.

**SECTION II**  
**DESCRIPTION**

The Avtron Model K675A Load Bank is an outdoor unit designed to absorb a balanced resistive load of unity power factor, at a specified 3-phase voltage. The total load capability is 500 kW @ 300 or 600 VAC, 3-phase, 60 Hz. Load steps are 5, 10, 10, 25, 50, 100, 100, and 200 kW. Using the toggle switches on the control panel, any combination of the available load steps may be selected to achieve a desired load.

The K675A Load Bank is equipped with a Digital Meter mounted in a NEMA enclosure on the roof of the Load Bank. The control panel is mounted in a separate NEMA enclosure on the roof of the Load Bank. Refer to the supplemental meter manual for application and operation instructions for the Metering Unit.

\*\*\*\*\*

**CAUTION**

Only 60 Hz, 3-phase, 300V or 600V power should be connected to the load bus terminals. Other frequencies or voltages may cause severe damage to the Load Bank.

\*\*\*\*\*

The K675AD44739 Load Bank contains a 5 HP blower motor that operates from either 208 or 575 volts, 3-phase, 60 Hz, and provides the necessary cooling air for the load elements. The blower motor is controlled by a motor starter contactor. Overcurrent protection is provided by fuses and overload relays. The blower motor is automatically configured using relays, for 208 or 575 volt operation as selected by the DUAL VOLTAGE MOTOR POWER selector switch. This switch is separate from the LOAD VOLTAGE 300/600 select switch on the control panel, which is used to select the LOAD voltage of the device under test. When an external source is used for blower and control power, its voltage may be independent of the LOAD voltage of the generator under test. The blower air delivery is 14,250 CFM at 3/4 inch of static pressure.

\*\*\*\*\*

CAUTION

This Load Bank should never be used without the Fan Blower Motor operating. Inadequate cooling airflow will result in resistor elements overheating and a definite fire hazard.

\*\*\*\*\*

An AIRFLOW switch 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 the blower is not working properly (AIR FAILURE light comes on).

An overtemperature switch is provided to monitor the exhaust cooling air. The switch is electrically interlocked with the load application controls to prevent load application in the event of an overtemperature condition.

Blower and Control Power are obtained from the unit under test or may be obtained from an external source. The DUAL VOLTAGE MOTOR POWER selector switch and the CONTROL POWER "ON" pushbutton, both on the control panel, are used to configure the system for proper voltage. The "OFF" pushbutton deactivates the control/blower circuit. For external blower power sources, refer to the INSTALLATION section of the manual, BLOWER MOTOR CONNECTIONS.

The control panel contains CONTROL POWER ON and OFF switches and CONTROL POWER 208/575 switch, a CONTROL POWER light, BLOWER START-STOP pushbutton switches, a BLOWER POWER light, an AIR FAILURE light, a MASTER LOAD ON-OFF switch, a LOAD VOLTAGE SELECT 300/600 switch, a DUAL VOLTAGE MOTOR POWER Selector switch, a FAN ROTATION ABC/CBA switch, and individual load step switches. All load step switches are the toggle type with metal levers. The control panel also contains a fuse for the control circuit.

Sized for mounting in a 19-inch rack enclosure, the control panel has a vertical height of 8.75 inches, and requires a minimum of 3 inches of clearance behind the panel. The control and metering panels are each mounted in a separate enclosure, installed and permanently wired to the Load Bank.

The K675A Load Bank is fabricated using heavy-gauge aluminized sheet steel, making a rigid structure. Mounted within the structure are the load element resistor assemblies and the cooling blower. The resistive elements are porcupine type, fully supported along their length. Mounted within the enclosure are the necessary load step contactors, motor starter, motor overload relay, fuses, and customer connection terminals. The cooling air is drawn in from one end, forced across the resistor elements, and exhausted out the opposite end. The control section has temperature controlled heaters that may be used to prevent condensation from hindering operation of the Load Bank.

The units are equipped with louvers mounted on the inlet and exhaust openings that provide protection for the motor and resistor assembly from the weather. The Load Bank utilizes a formed sheet metal base to facilitate handling by a forklift truck. Bolt holes are also supplied in the base to permit permanent mounting to a pad.

\*\*\*\*\*

**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.

\*\*\*\*\*

Lower voltages and different frequencies may be applied to the load circuit of the Load Bank. Frequency change causes no derating of the load; however, the applied kW with a lower voltage is computed with the following formula:

$$kW_{Applied} = kW_{Rated} \times \frac{(Voltage Applied)^2}{(Voltage Rated)^2}$$



**SECTION III**  
**INSTALLATION**

**BEFORE INSTALLATION**

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

\*\*\*\*\*

**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 will cause a safety hazard and will void 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.

\*\*\*\*\*

**LOCATION**

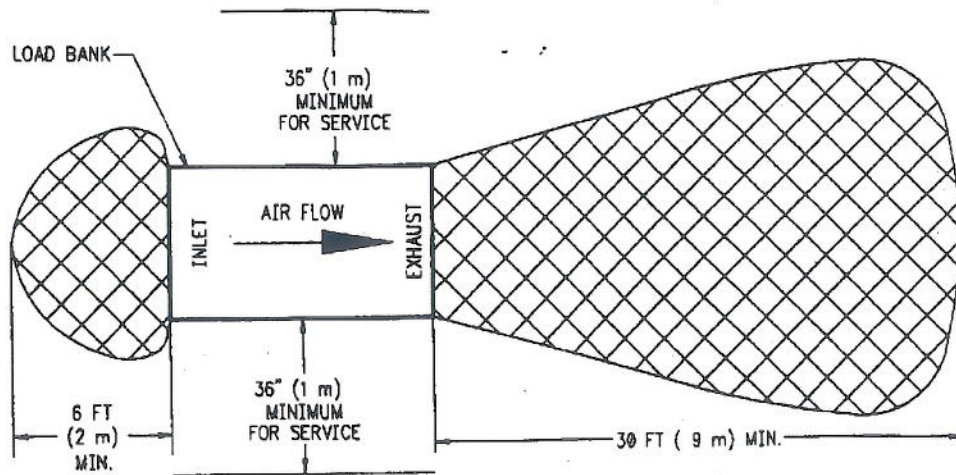
The Load Bank must be used in a cool, well-ventilated area. It must be installed where cool air is continually available and where hot exhaust air will not be recirculated through the Load Bank. If the Load Bank is operated in a closed space, ventilation of 10,000 CFM or greater is required. Exhaust temperature can exceed 250°F in approximately 3 minutes without the proper ventilation.

The exhaust air may be in excess of 250°F 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. Care should also be taken so as not to set off a sprinkler system by exposing it to hot exhaust air.

The Load Bank should be mounted outdoors in a free field. A prerequisite to approval of site location is to read the next section titled AIRFLOW CONSIDERATIONS. If the installation dictates mounting in close proximity to any external or adjacent device, transformer, generator set, building, structure or protuberance, follow these guidelines:

1. Position the Load Bank with a minimum of 36 inches of clearance on both sides. This is in line with the airflow to allow access for service (Figure 3-1).
2. The inlet requires a free unobstructed hemispherical zone. The radius of this sphere must be at least 6 feet. Refer to Figure 3-1. If a unit is backed into a corner, the 6 feet is no longer sufficient. Consult Avtron Engineering to review prior to installation. The intake must not ingest heated air from another source. The maximum ambient intake air temperature is 120°F.
3. Provide a minimum of 8 feet from any obstruction for exhaust clearance to prevent air restrictions and to limit air recirculation. For thermal considerations, provide a minimum clearance of 30 feet from any temperature sensitive object. The heated exhaust air stream will damage temperature sensitive items if they are positioned within the 30 foot clearance area. Refer to Figure 3-1.
4. Load Banks mounted into a channel, trough, hollow, well, pit, or exhausting into a full wall or corner require special considerations even if the above conditions are met. In these cases, provide detailed site layout drawings to Avtron for inspection and comments.
5. Locations which have full or partial perimeter fence necessitate a review. The fencing material should have at least 75% open area. The 36" minimum side clearances shown in Figure 3-1 still apply. Clearance on intake and exhaust can be adjusted only after approval by an authorized Avtron representative. Painted or plated metal chain link fence is the preferred material. All nonmetallic fencing materials are not recommended.



HATCHED SECTION IS REQUIRED FREE FIELD

D6505C1LAN

Figure 3-1. Load Bank Installation Airflow Clearance Requirements

#### ADDITIONAL LOCATION NOTES

1. Do not stack, tier, or layer Load Banks without Avtron approval, as air recirculation will occur.
2. Indoor installations will always require review. Make up air must be by a supplemental air moving device. The Load Bank cooling system cannot be used for any purpose other than cooling the Load Bank.
3. In northern climates with snow depths exceeding 6 inches, 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.
4. 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. Contact Avtron for assistance.
5. In general, these guidelines also apply to portable or trailer mounted Load Banks.

FAILURE TO FOLLOW THESE GUIDELINES WILL VOID THE WARRANTY.

## 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. 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. If a Load Bank is to be mounted on a raised structure, a shield must be incorporated in the structure to prevent exhaust air from being drawn back under the unit.
2. **Restriction of Cooling Air** - Any obstruction located within the outlined parameters listed in the previous LOCATION section of the manual will restrict the Load Bank's airflow. Do not modify louvers or screens on intake and exhaust. Ducting or diverting of airflow will increase system airflow resistance and will void the warranty. If ducting is mandatory, obtain written approval from Avtron prior to installation. 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.

When operating a Load Bank outdoors, the wind can work for or against the Load Bank cooling system. If the Load Bank is positioned with the prevailing wind opposing the airflow from the blower, inadequate cooling may result and damage to the Load Bank can occur. Improper positioning may also result in the air switch being deactivated, thus dropping the load.

## CONTROL CONNECTIONS

All control connections are permanently wired.

For remote load dump capability, remove the jumper from Control Panel TB1(8) and TB1(9), and replace with normally closed contacts.

Control power is obtained from a dual voltage 208/575:120 volt, 60 Hz AC, 1.0 KVA transformer mounted on the Load Bank. Refer to the schematic for details. Connect FS20 at TB20(1) and TB20(2) for internal control power obtained from the load bus. Connect FS20 to TB20(5) and TB20(6) for external control power obtained from the external blower power source.

**ENCLOSURE HEATERS**

The Load Bank contains five independent heaters. The first three are 100 watt strip heaters which are located in each control enclosure, mounted to the top of the Load Bank, and one in the Load Bank enclosure on the control/blower panel. The main control/contacter heater is an 800 watt, thermostatically-controlled, fan-driven electric heater. There are also two heaters imbedded in the winding of the blower motor. These heaters require an external, 120 volt, single-phase, 60 Hz supply. The 100 watt strip heaters are controlled by temperature switches which are factory-calibrated to 50°F. These heaters are used to control condensation and icing problems. These heaters must also be energized if the Load Bank is stored outdoors prior to installation or use. Refer to schematic/interconnection diagram D44875 for connections. Power heaters for at least one hour prior to operation if temperatures are below 0°C (32°F).

**BLOWER MOTOR CONNECTIONS**

All blower motor connections are permanently wired to the load bus so that blower and control power are obtained from the 300 or 600 volt source under test. Should a separate blower power source be required, place the DUAL VOLTAGE MOTOR POWER selector switch to the external (EXT 208 or EXT 575) position, and connect a suitable 208 or 575 volt, 3-phase, 60 Hz source to TB12 (1,2,3) as shown on the schematic.

\*\*\*\*\*

**CAUTION**

Only 60 Hz, 3-phase, 300V or 600V power should be connected to the load terminals. Other frequencies or voltages may cause severe damage to the Load Bank.

\*\*\*\*\*

The blower circuit consists of fuses, overload relays, blower motor, motor starter contactor, and voltage configuration relays. Required power for the blower motor is 575V ±10%, 3-phase, 60 Hz at 6.1A per phase or 208V ±10%, 3-phase, 60 Hz at 16.7A per phase. The correct BLOWER VOLTAGE must be selected with the selector switch on the control panel.

The FAN ROTATION ABC/CBA switch allows reversal of the motor rotation without changing the wiring.

Improper phase rotation will cause the blower to run in the reverse direction. The cooling air should be pushed from the blower, across the resistor elements, and out the exhaust screen. This phase rotation check is mandatory every time the source or blower connections are changed.

When an external source of blower power is connected, the DUAL VOLTAGE MOTOR POWER selector and the LOAD VOLTAGE SELECT 300/600 switch operate independently of each other. It is vitally important that the LOAD VOLTAGE SELECT 300/600 switch matches the voltage of the generator under test. The DUAL VOLTAGE MOTOR POWER selector must match the blower voltage source. When blower power is obtained internally from the load bus, these two selectors must agree with each other or the Load Bank will not operate.

### LOAD CONNECTIONS

Interlocking connectors (Cam-Lok) are mounted to the side of the Load Bank enclosure. These connectors are wired to the Load Bank power bus. Three connectors per phase are provided. Each connector is rated 400 amps maximum. Care must be taken not to exceed this limit when operating the unit. The connectors are color coded (Brown, Orange and Yellow). Loose color coded cable connectors are provided for connection to the Load Bank.

\*\*\*\*\*

### WARNING

Interlocking connectors (Cam-Lok) are installed on the Load Bank and are wired internally to the load bus. If not all connections are used, any unused connectors will be live. It is important for safety that the protective cap be mounted on any unused interlocking connectors (Cam-Lok). Any broken cap must be replaced immediately. Failure to follow this warning may result in death or injury to personnel.

\*\*\*\*\*

### GROUNDING

A ground conductor must be connected to the Load Bank enclosure to prevent a potential above ground on the enclosure. There is a ground stud in the Load Bank that is wired to the green interlocking connectors (Cam-Lok) which are mounted to the side of the Load Bank. Matching color coded connectors are provided for connection to the Load Bank. This ground conductor should be run with the load power conductors to provide the lowest impedance fault path. The ground stud must be connected to both the power source frame and to a good earth ground. The ground conductor should be sized per the National Electric Code Table 250.122, if not superseded by local codes.

**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.

\*\*\*\*\*

**WARNING**

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, AVTRON CAN PROVIDE START UP SERVICE AT A NOMINAL CHARGE. AVTRON 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. If the Load Bank is elevated, a plate under the Load Bank will be needed to block hot exhaust from returning to the intake.
  
2. Check the mechanical integrity of all customer-supplied interconnection wiring:
  - A. Check lugs that they are properly crimped.
  - B. Check terminations that they are properly torqued.

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 Avtron Loadbank, Inc., 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 greater than 50 feet, consult Avtron Loadbank, Inc.
- C. If a Control Transformer is the source of control power, disconnect the control transformer before proceeding.

**CAUTION**

When control power is supplied by a transformer within the Load Bank, it must be disconnected before running this installation checkout procedure. Failure to disconnect the control transformer may damage the Load Bank.



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

\*\*\*\*\*

**WARNING**

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. Turn on the POWER switch and verify the proper relays energize with each individual load switch as follows:
  - A. Turn on the MASTER LOAD switch. 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 on the MASTER LOAD switch 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 out as soon as the jumper is removed. Leave the jumper off the air switch.
7. Apply the rated fan voltage. Start blower and verify that air is exiting the resistor assembly end.

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 Avtron Field Service at (216) 573-7600.

**SECTION IV**  
**OPERATION**

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**WARNING**

DO NOT touch the top 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.

\*\*\*\*\*

NOTE

Lower voltages and different frequencies may be applied to the load circuit of the Load Bank. When the blower motor is connected to the load circuit, varying voltages and frequencies are not permitted. Frequency change causes no derating of the load; however, the applied kW with a lower voltage is computed with the following formula:

$$kW_{\text{Applied}} = kW_{\text{Rated}} \times \frac{(\text{Voltage Applied})^2}{(\text{Voltage Rated})^2}$$

\*\*\*\*\*

**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. Start the generator under test.
4. Place the LOAD VOLTAGE SELECT 300/600 switch to the correct voltage to test the generator. Place the DUAL VOLTAGE MOTOR POWER INT 208/EXT 208/INT 575/EXT 575 switch to the correct blower input voltage. When the blower input power is taken internally from the load bus, as shipped, both selectors must be set for the same voltage.

\*\*\*\*\*

**CAUTION**

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

DO make sure that the LOAD VOLTAGE SELECT 300/600 switch is in the proper position before applying load.

\*\*\*\*\*

5. Set the CONTROL POWER source to 208V or 575V to match the voltage of the generator under test. This setting must also match the LOAD VOLTAGE SELECT 300/600 switch setting.

6. Press the CONTROL POWER ON pushbutton. The CONTROL POWER light (DS20) will be energized, indicating control power is present.
7. Push the BLOWER START pushbutton. Note that the BLOWER POWER light turns on and the AIR FAILURE indicator flashes ON momentarily. When the blower motor 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 has closed.
8. Check for proper blower motor rotation. If rotation is incorrect, shut down the blower and allow blower to coast to a stop. Use the FAN ROTATION ABC/CBA switch to change blower motor rotation. Proper blower rotation is evidenced by airflow moving across the resistor elements and out through the exhaust louvers of the Load Bank. Press BLOWER START pushbutton switch to start the blower operation.

\*\*\*\*\*

### CAUTION

The operation of the blower is vital to the safe operation of this Load Bank. When the BLOWER switch is turned on, the AIR FAILURE light will come on momentarily until the blower accelerates up to its operating speed, at which time the light will go off. If the load elements are energized when this blower is 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.

\*\*\*\*\*

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 ON/OFF 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 with the MASTER LOAD ON/OFF switch closed (ON).
12. To remove the load, open the MASTER LOAD ON/OFF 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 load is removed. This procedure is not required for maintaining Load Bank integrity, but it may guard operating personnel from possible burn injuries.

2. Press the BLOWER STOP pushbutton switch.
3. Press the CONTROL POWER OFF pushbutton switch. Other switches on the control panel should be turned OFF.
4. Shut down the power source/sources.
5. Disconnect the Load Bank from the power source(s).



## 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 are examples of scheduled maintenance procedures. These examples 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 by qualified personnel only.

\*\*\*\*\*

**WARNING**

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.
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.
11. Verify ALL heaters are functioning properly.

**ANNUALLY**

The blower motor should be lubricated per the motor manufacturer's requirements and specifications on the motor nameplate.



**SECTION VI**  
**REPLACEMENT PARTS LIST**

**INTRODUCTION**

The parts list in this section contains the description, quantity required, and Avtron part numbers for each listed part. The list also includes, where appropriate, the manufacturer's name and part number, as well as 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 Avtron 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, Avtron part number, and the schematic reference designator number if one is available.

## REPLACEMENT PARTS LIST

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/UNIT
	AVTRON MODEL K675A OUTDOOR RESISTIVE LOAD BANK		K675A-D44739	
	..SCHEMATIC/INTERCONNECTION DIAG		D44875	REF
	..CONTROL PANEL		D44874	1
	..SCHEMATIC/INTERCONNECTION DIAG		D44875	REF
XDS20-XDS22	..LAMP, INCANDESCENT	GENERAL ELECTRIC 66S6/115-125V	333011	3
DS20, DS22	..LIGHT, INDICATOR (AMBER) LENS CAP P/N: 031-0113-300, BASE P/N: 031-4001-01-101	DIALIGHT CORP PER DESCRIPTION	329138	2
DS21	..LIGHT, INDICATOR (RED) P/N 0310111300 (LENS) P/N 031400101101 (BASE)	DIALIGHT CORP PER DESCRIPTION	329136	1
F1	..FUSE, CARTRIDGE	BUSSMANN COOPER KTK-R-10	324128	1
XF1	..FUSE HOLDER	BUSSMANN COOPER HPS-RR	324985	1
K99	..RELAY	POTTER BRUMFIELD T92S11A22-120	350539	1
S102	..SWITCH, TOGGLE	EATON CORP 7992K10	360747	1
S23	..SWITCH, PUSHBUTTON (RED)	ALLEN-BRADLEY CO 800T-B6D2	361873	1
S22	..SWITCH, PUSHBUTTON (BLK)	ALLEN-BRADLEY CO 800T-A2D1	361874	1
S1-5, 7-9, 21	..SWITCH, TOGGLE	CARLINGSWITCH INC 2GK51-73	360589	9
S13, S24	..SWITCH, TOGGLE	CARLINGSWITCH INC 2GL54-73	360591	2
S100	..SWITCH, PUSHBUTTON (BLK)	OTTO ENGINEERING P3-32112	360309	1
S101	..SWITCH, PUSHBUTTON (RED)	OTTO ENGINEERING P3-32211	360308	1
S14	..SWITCH, ROTARY (BLOWER SELECT)		620288	1
K7-10, K17-20	..RELAY, 120 AMP 3 POLE, 90 AMP, 600V INDUCTIVE, 120 AMP, 600V RESISTIVE, 110/120V, 50/60 HZ COIL, SCREW TERMINAL. POLE FACES TO BE COATED WITH RUST PREVENTATIVE (DARP OR EQUIVALENT)	400-NX19-M PER DESCRIPTION	351885	8
K5, 15	..RELAY, 62 AMP	ALLEN-BRADLEY CO 400-NX18	B14796	2
K1-4, 11-14, 575, 100	..RELAY, 35 AMP	ALLEN-BRADLEY CO 400-NX17	B14795	10
K23-29, 50-53	..RELAY	ALLEN-BRADLEY CO 100-C23D10	351946	11
	..RESISTANCE ELEMENT		606398	6
	..RESISTANCE ELEMENT		606388	12
	..RESISTANCE ELEMENT		606459	6
	..RESISTANCE ELEMENT		606562	54

Replacement Parts List

Avtron Model K675A Resistive Load Bank  
Part Number K675AD44739

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/ UNIT
	.TUBE, INSULATOR	SAXONBURG CERAMICS STEATITE 0.500 OD	411182	312
	.TUBE, INSULATOR	SAXONBURG CERAMICS STEATITE 0.370 OD	411181	156
	.TUBE, INSULATOR	SAXONBURG CERAMICS STEATITE 0.530 OD	411141	1170
	.TUBE, INSULATOR	SAXONBURG CERAMICS STEATITE 0.006 OD	411145	78
S60	.SWITCH, TEMP	EMERSON ELECTRIC 60T-13 203546	360379	1
S62-64	.SWITCH, TEMPERATURE	SELCO MFG CORP OA-80	363099	3
HR1-3	.RESISTOR, 150 OHM, 100W	HUNTINGTON FST-100-150-QC-BKTS	156015	3
K21	.RELAY, OVERLOAD	SIEMENS CORP 3RB2026-2QB0*	350980*	1
XX21,22	.BRACKET, PANEL MOUNTING	SIEMENS CORP 3RB2923-0AA1*	408304*	2
S61	.SWITCH, SENSING RANGE 0.5±.02IN W.C. - 2.0 IN W.C. - 2.0 IN W.C. 300VA, 115-277VAC INCLUDES LINE NUT & FERRULE CONNECTORS	CLEVELAND CONTROLS AFS-271 PER DESCRIPTION	360772	1
	.IMPELLER, FAN	AIR TURBINE X-30-9HD	406026	1
F2-F4, 8-10	.FUSE, CARTRIDGE	BUSSMANN COOPER LPJ-25SP	324819	6
XF2-XF4, 8-10	.FUSEHOLDER	BUSSMANN COOPER JP60030-3PR	324997	2
J1-J3	.CONNECTOR, RECEPTACLE (BROWN)	ADVANCED DEVICES CL40MRSB-FX	315577	3
J4-J6	.CONNECTOR, RECEPTACLE (ORANGE)	ADVANCED DEVICES CL40MRSB-GX	315576	3
J7-J9	.CONNECTOR, RECEPTACLE (YELLOW)	ADVANCED DEVICES CL40MRSB-HX	315575	3
J10-J11	.CONNECTOR, RECEPTACLE (GREEN)	ADVANCED DEVICES CL40MRSB-EX	315064	2
	.CONNECTOR, INLINE, FEMALE (BROWN)	ADVANCED DEVICES CLS40FB-F	315725	3
	.CONNECTOR, INLINE, FEMALE (ORANGE)	ADVANCED DEVICES CLS40FB-G	315726	3
	.CONNECTOR, INLINE, FEMALE (YELLOW)	ADVANCED DEVICES CLS40FB-H	315727	3
	.CONNECTOR, INLINE, FEMALE (GREEN)	ADVANCED DEVICES CLS40FB-E	315068	2
K22	.RELAY, OVERLOADS	SIEMENS CORP 3RB2026-2SB0	350573	1
M101	.METERING PANEL		C26518	1
M101	.METER, DIGITAL SHARK100-60-10-V3-D2-485P-M68- CAB6490	ELECTRO INDUSTRIES PER DESCRIPTION	338344	1
	.SWITCH, TOGGLE	CARLINGSWITCH INC 2GK51-73	360589	1

\*If relay fails, replace both relay and mounting bracket.

Replacement Parts List

Avtron Model K675A Resistive Load Bank  
Part Number K675AD44739

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/UNIT
T1	.TRANSFORMER	ACME ELECTRIC CORP TB-54524	370709	1
XF5	.FUSEBLOCK	BUSSMANN COOPER R60030-1SR	324956	1
F5	.FUSE	BUSSMANN COOPER FRS-R-15	324346	1
K101	.RELAY, VOLT SENSE	CROUZET CORP DSR110	352047	1
T40	.TRANSFORMER	SQUARE D CO 9070T50D50	371323	1
F440	.FUSE	BUSSMANN COOPER AGC-2	324023	1
XF440	.FUSEBLOCK	BUSSMANN COOPER S-8002-1	324523	1
XF100-102	.FUSEHOLDER	BUSSMANN COOPER BC6033SQ	324998	1
F100-102	.FUSE, 1 AMP	BUSSMANN COOPER FNQ-R-1	324449	3
CB1	.CIRCUIT BREAKER	ABB CONTROL INC S502-C10	310546	1
K208	.RELAY	ABB CONTROL INC A9-30-10-83	352048	1
XF11-22,41-52	.FUSEHOLDER, 1-30 AMP	BUSSMANN COOPER T60030-3CR	324977	8
F11-13, F41-43	.FUSE, 6 AMP	BUSSMANN COOPER JJS-6	324479	6
F14-19, F44-49	.FUSE, 15 AMP	BUSSMANN COOPER JJS-15	324481	12
F20-22, F50-52	.FUSE, 30 AMP	BUSSMANN COOPER JJS-30	324742	6
F23-25, F53-55	.FUSE, 70 AMP	BUSSMANN COOPER JJS-70	324486	6
F29-40, F59-70	.FUSE, 125 AMP	BUSSMANN COOPER JJS-125	324736	24
CT1, CT2	.CURRENT TRANSFORMER	INSTRUMENT TRANSFORMERS 567TL102	371052	2
HR4	.HEATER, ELECTRIC	HOFFMAN ENCLOSURE DAH8001B	352540	1

# APPENDIX

## LOAD BANK TROUBLESHOOTING GUIDE

### NOTE

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

\*\*\*\*\*

### W A R N I N G

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.	<ul style="list-style-type: none"> <li>a. Main switch or circuit breaker is not closed.</li> <li>b. Unit is not connected according to the Schematic/Interconnection Diagram.</li> <li>c. Terminals were damaged during shipment.</li> <li>d. Fuses are blown. (Check and replace as required.)*</li> <li>e. Fuse is blown in Load Bank control circuit. (Check and replace as required.)*</li> <li>f. Dirty or loose connection at Main Power Switch.</li> </ul>
2. Blower motor does not operate.	<ul style="list-style-type: none"> <li>a. Main switch or circuit breaker is not closed.</li> <li>b. Power is not connected to Load Bank blower circuit.</li> <li>c. External power source is inadequate.</li> <li>d. Motor fuses are blown. (Check and replace as required.)*</li> </ul>

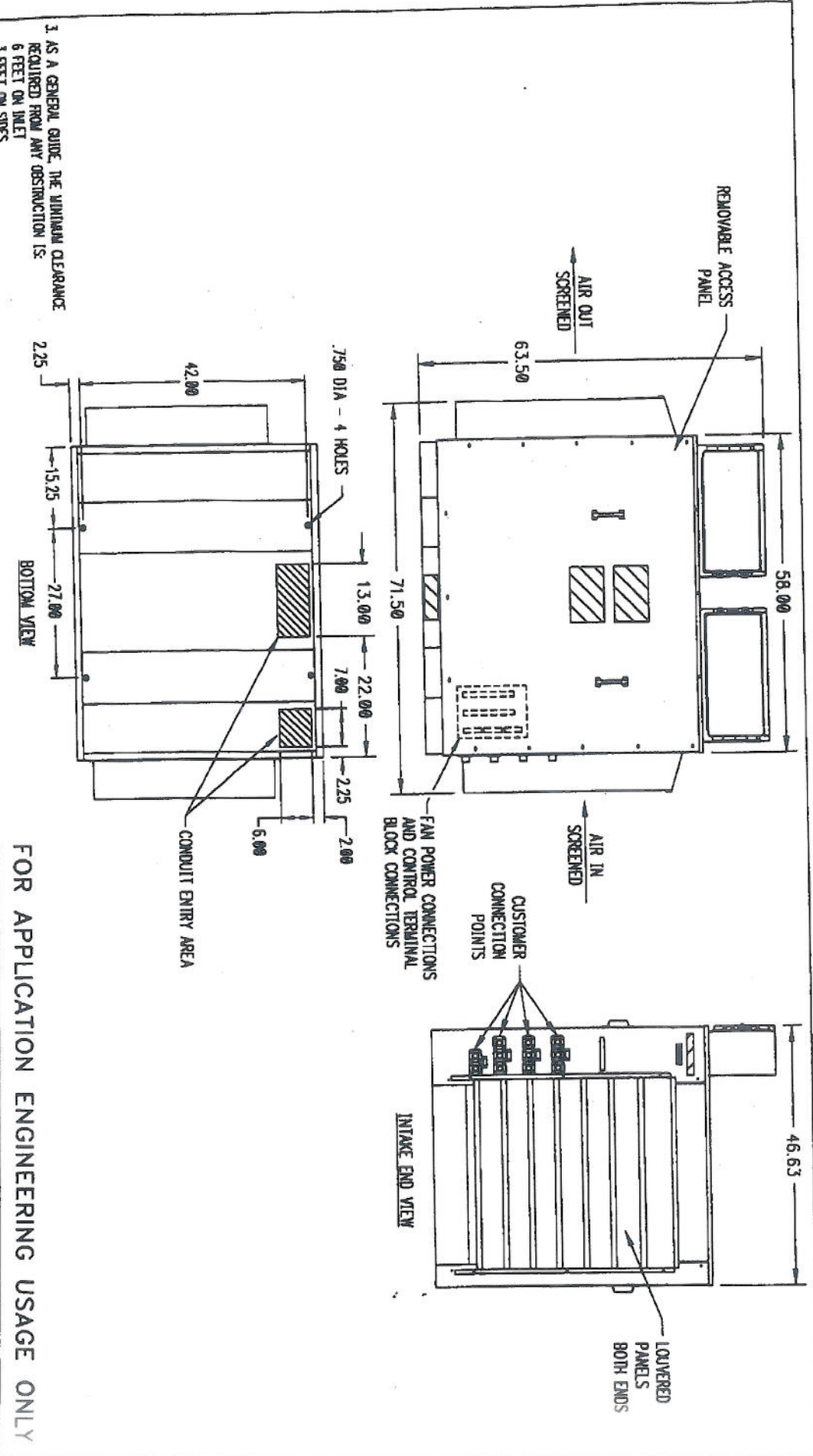
\* When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

PROBLEM	POSSIBLE CAUSES/REMEDIES
<p>2. Blower motor does not operate. (Cont.)</p>	<ul style="list-style-type: none"> <li>e. Motor overload is tripped.</li> <li>f. Motor start is malfunctioning.</li> <li>g. Main Power Switch is inoperative.</li> <li>h. Connections are broken or loose.</li> <li>i. Motor shaft does not turn due to improper lubrication. (Replace or repair as necessary.)</li> </ul>
<p>3. BLOWER FAILURE indicator lights, yet blower is operating.</p>	<ul style="list-style-type: none"> <li>a. Airflow restrictions present at Load Bank intake or exhaust.</li> <li>b. Improper fan blade rotation or phase reversal. (Check fan motor power connections for proper phase sequence.)</li> <li>c. Air Differential Pressure Switch is malfunctioning.</li> <li>d. Blower Fail Relay is malfunctioning.</li> </ul>
<p>4. Fan blade is broken or not turning.</p>	<ul style="list-style-type: none"> <li>a. Fan blade motion is obstructed.</li> <li>b. Fan blade is loose at hub or is not keyed properly.</li> </ul>
<p>5. Load step(s) cannot be energized.</p>	<ul style="list-style-type: none"> <li>a. A blower failure exists. (See problem 2.)</li> <li>b. MASTER LOAD Switch is inoperative.</li> <li>c. Control power is inadequate.</li> <li>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.)*</li> <li>e. Blower Fail Relay is malfunctioning.</li> <li>f. Load step switch is inoperative.</li> <li>g. Load step contactor is inoperative.</li> <li>h. Magnetic contactor has an open coil.</li> <li>i. Load step resistor is open.</li> </ul>

\* 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
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).
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.)



1. AS A GENERAL GUIDE, THE MINIMUM CLEARANCE REQUIRED FROM ANY OBSTRUCTION IS:
  - 3 FEET ON INLET
  - 6 FEET ON SIDES
  - 8 FEET ON EXHAUST
2. ALL DIMENSIONS ARE APPROX.
3. WEIGHT:

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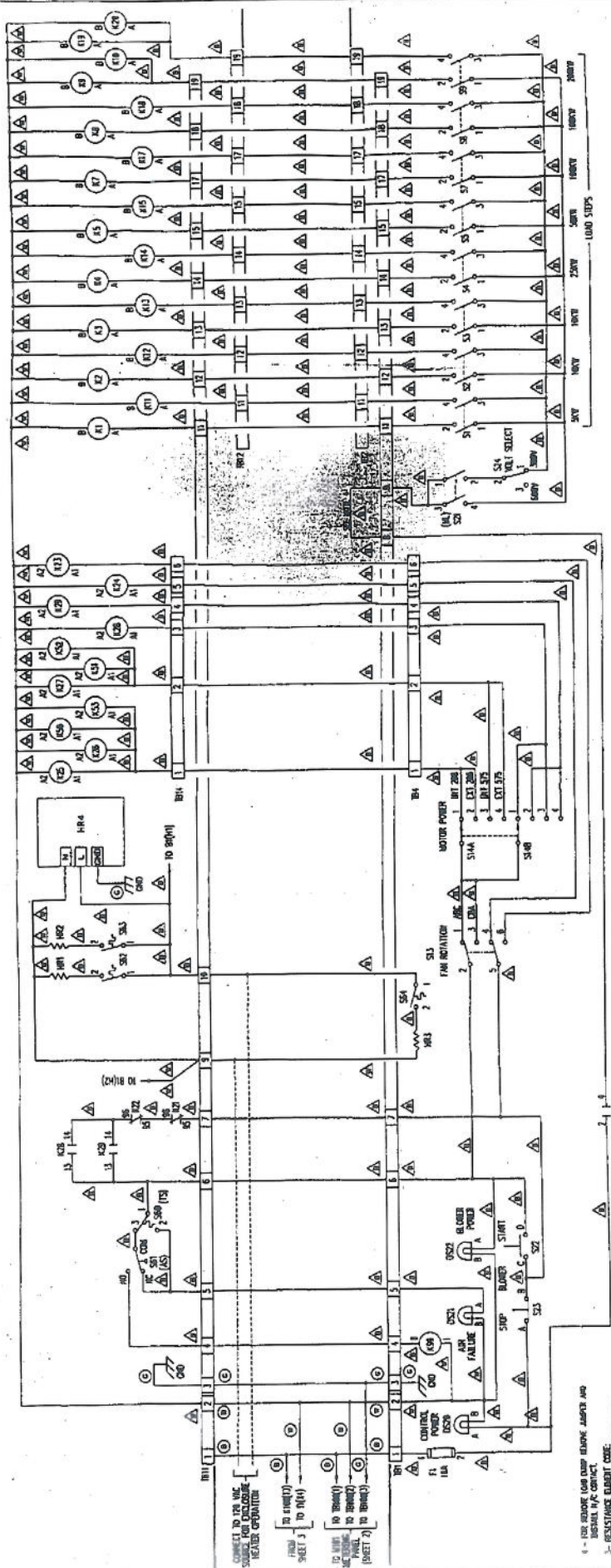
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DESIGN	JFLAUTO	10-8-99	 AVTRON MANUFACTURING, INC. 10000 W. 10TH AVENUE DENVER, CO 80231	DRAWING NUMBER <b>SB2978</b>
ORDERED	JFLAUTO	10-8-99		
APPROVED	JHUDSON	1/16		
MODEL	K675A		LOAD BANK, OUTDOOR	OUTLINE DRAWING



LOAD BANK PN K675AD44739

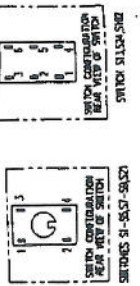
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REVISED 7/1/78	REVIEW FOR ENR. SEE SHEET 3	D.001/P



CONTROL PANEL PN D44874

- DESIGNATION CODE
- AS - REMOVES AIRFLOW SWITCH (S4)
  - IL - REMOVES MASTER LOAD (S1)
  - IS - REMOVES MOTOR STARTER (S2)
  - LS - REMOVES OVERHAUL HOLD (S3)
  - TS - REMOVES OVERHAUL SWITCH (S4)

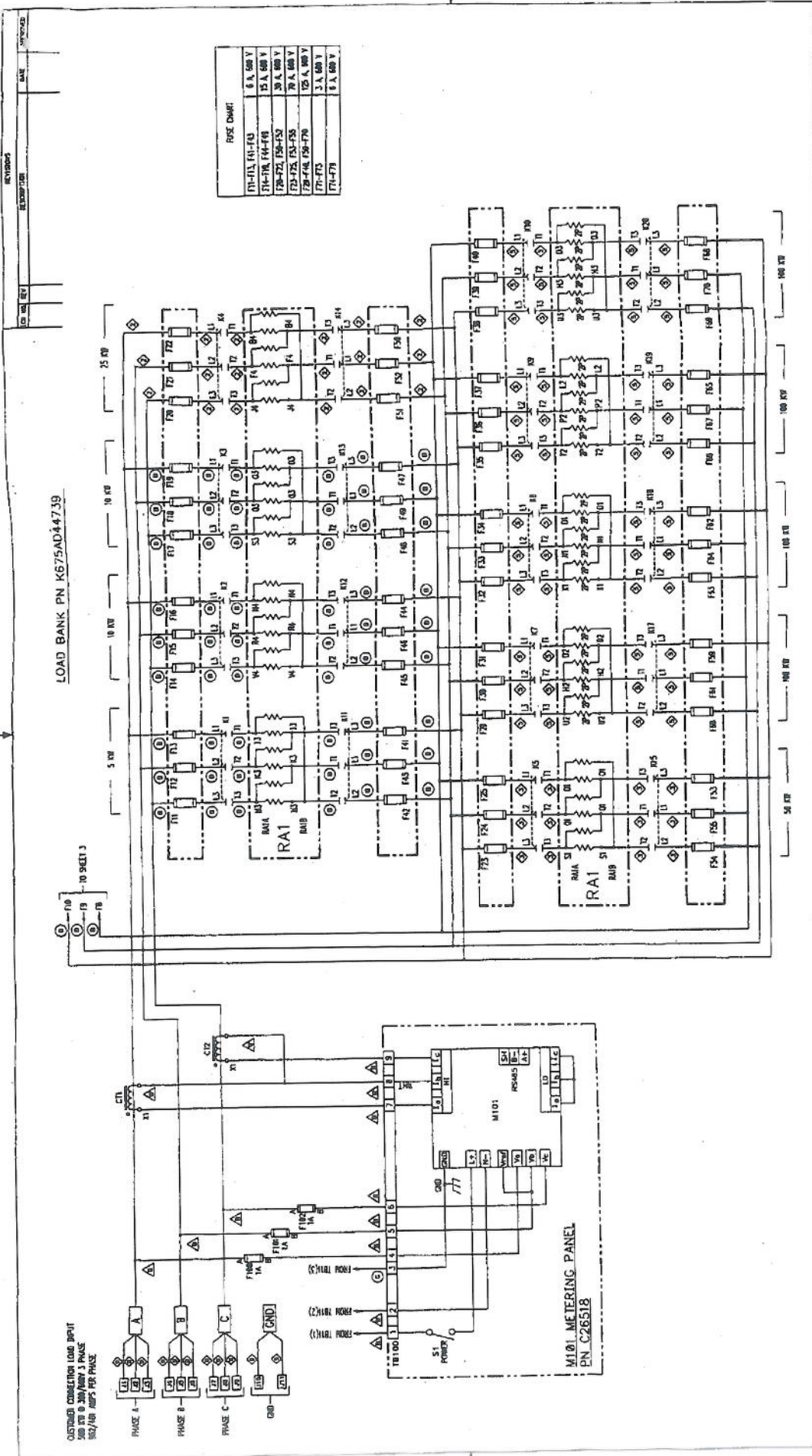
- 1 - WIRE CODE
- 2 - INDICATES WIRE TO BE BLACK #22 AWG (PN 300001)
- 3 - INDICATES WIRE TO BE BLACK #16 AWG (PN 300002)
- 4 - INDICATES WIRE TO BE WHITE #16 AWG (PN 300003)
- 5 - INDICATES WIRE TO BE GREEN #14 AWG (PN 300011)
- 6 - INDICATES WIRE TO BE WHITE #14 AWG (PN 300011)
- 7 - INDICATES WIRE TO BE BLACK #14 AWG (PN 300011)
- 8 - INDICATES WIRE TO BE BLACK #12 AWG (PN 300014)
- 9 - INDICATES WIRE TO BE BLACK #10 AWG (PN 300019)
- 10 - INDICATES WIRE TO BE BLACK #8 AWG (PN 300028)
- 11 - INDICATES WIRE TO BE BLACK #6 AWG (PN 300072)
- 12 - INDICATES WIRE TO BE BLACK #4 AWG (PN 300099)



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REVISED	DATE	BY	CHKD BY
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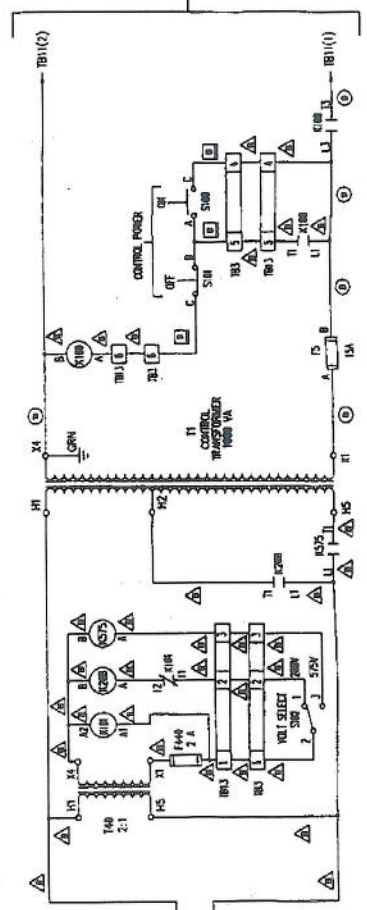
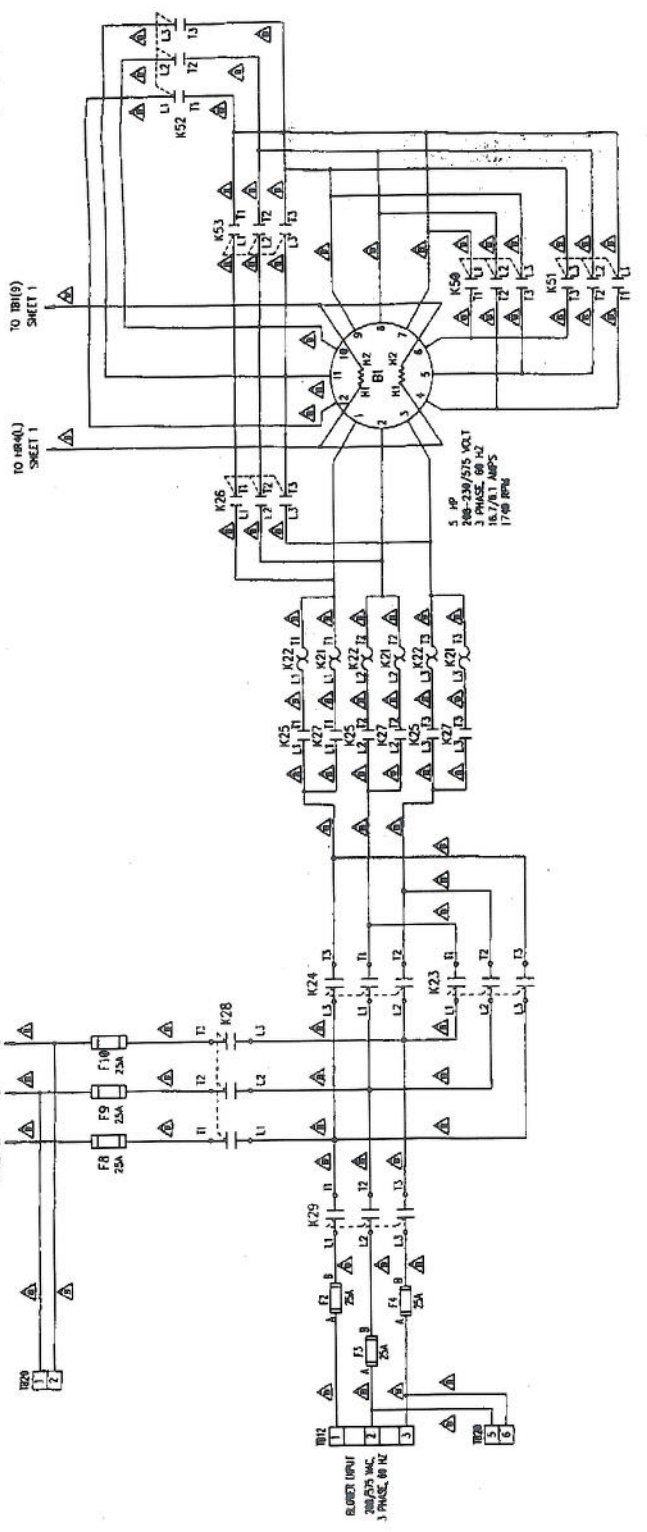
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DIAGRAM**

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2	B	REVISION	3/7/88	D. OLIVE



CONNECT F8 TO BROWN (12)  
 SHEET FOR INTERNAL CONTROL  
 POWER OBTAINED FROM THE (1000 BPS)  
 CONNECT F9 TO BROWN (10) FOR  
 CONTROL POWER  
 OBTAINED FROM THE BROWN SOURCE

SET STOP STOP OUT  
 AT STOP AND  
 PICK UP AT STOP

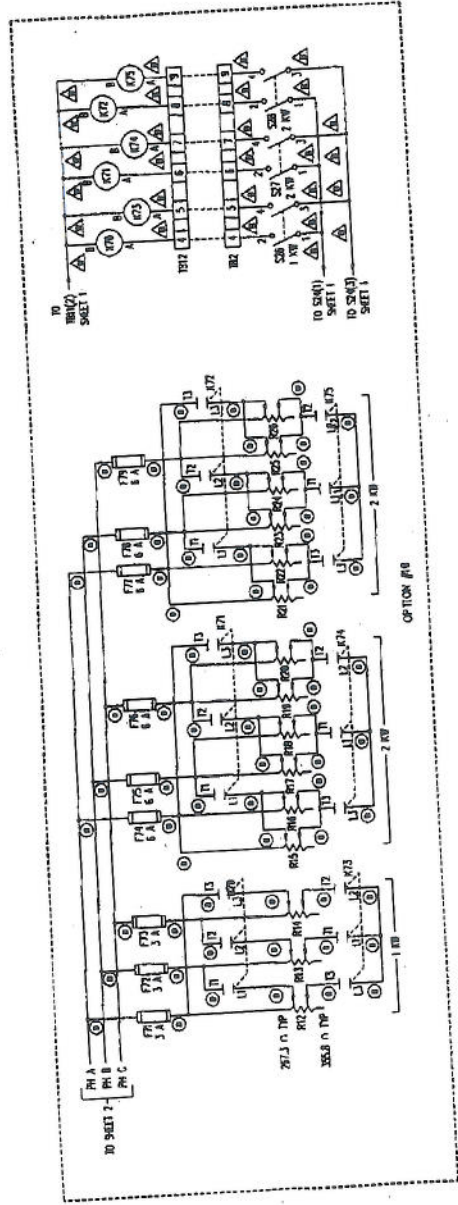
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