AVTRON MODEL LPH55
AC LOAD BANK
Part Number LPH55D37873

55 kW, 240/480V, 3-Phase, 60 Hz

Cleveland, Ohio

May 27, 2005
Rev. Feb. 7, 2006

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 MANUFACTURING, INC.
Cleveland, Ohio

AVTRON MODEL LPH55
AC LOAD BANK
Part Number LPH55D37873

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DRAWINGS

SB3543	Outline Drawing, Load Bank
D37909	Schematic
B28571	Cable Set - 20 Ft. (Option 1)
LPH55D37873	Load Bank, Portable, Indoor (Assembly Dwg.)

VENDOR DATA (Provided Separately)

Cooper Crouse-Hinds Molded Products	Cam-lok® Assembly Instructions, Series E1016 & E1018 SAW254, 9/26/01
Electro Industries/Gauge Tech	SHARK 100 Installation and Operation Manual - CD-ROM, E145420
Electro Industries/Gauge Tech	Quick Start Guide for SHARK Series Meters, E145703

AVTRON MODEL LPH55
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SECTION I

SAFETY CONSIDERATIONS

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

Each 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 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 Avtron equipment.

The Model LPH55 Load Bank is an industrial test unit designed to be used indoors. However, because the function of the Load Bank is to dissipate electrical energy, there are inherent dangers to the operator and to the equipment. These dangers shall be outlined in this section.

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

1. Read the manual before operating the Load Bank.

2. Run an approved ground wire from the Load Bank ground lug located on the customer connection panel to the frame of the power source. Run an approved ground wire from the power source frame to a good earth ground. Size ground wire in accordance with National Electrical Code and any local codes.

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

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 unit and safety of the operator.

****

WARNING

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

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

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

7. 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.

8. 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.

9. 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.

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

11. Emergency Shutdown Procedure

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

    B. The CONTROL/FAN POWER ON/OFF switch will disconnect both load steps and fan motors. The customer-provided power source EMERGENCY OFF switch should be located near the load system.

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

13. 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.

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

SECTION II

DESCRIPTION

The Avtron Model LPH55 Load Bank is designed for electrically loading and testing power sources. The Load Bank is designed for production line and job site use.

The loading capability of the Load Bank is 55 kW, 240/480 volts, 3-phase, 60 Hz with fixed load steps of 5, 10, 20, and 20 kW. Using the toggle switches on the control panel, any combination of the available load steps may be selected to achieve a desired load.

120V, single phase, 60 Hz, 15 amp power source is required for the fan and control circuits. This power is derived from the control power receptacle located on the front of the unit.

CONTROL PANEL

The loads described above are controlled from a single control panel. The control panel is integrally mounted on the side of the Load Bank. The arrangement of the control panel is:

1. CONTROL/FAN POWER ON/OFF switch - Applies power to the Load Bank and starts the fans. The CONTROL/FAN POWER indicator lights when power is applied.

2. VOLTAGE SELECT switch - Configures load resistor circuit for 240V or 480V application.

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

4. KW LOAD STEPS switches - Connect and disconnect load steps. Values are shown above each switch.

5. Digital Meter - Monitors volts, amps, kW, and frequency applied to Load Bank.

ENCLOSURE

The outside dimensions of the Model LPH55 Load Bank are shown on Outline Drawing SB3543. The Load Bank is fabricated of aluminized steel, aluminum, and stainless steel, and mounted on four nylon standoffs. Hand holds are provided for lifting the Load Bank from the top when it is being transported.

****

CAUTION

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

****

The Load Bank contains six fans which provide the necessary cooling air for the load elements. A seventh fan provides control panel cooling. Exhaust temperature sensors are provided to monitor the flow of load element cooling air. These switches are electrically interlocked with the load application. If one or more of the fans are not working properly, the load steps are disabled.

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

The Load Bank also contains fuses for short circuit protection. The control circuit is protected with a 5 amp fuse while the voltage signals to the meter are protected with 1 amp fuses. The load circuit is protected with three 175 amp main line fuses (one per phase).

****

WARNING

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

****

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.

LOCATION

The LPH55 is a portable Load Bank, and should be used in a cool, well-ventilated area. Cool air must be continually available and the hot exhaust air must be dissipated, not recirculated through the unit. Install the Load Bank so that the inlet and exhaust panels have unrestricted airflow clearance.

****

CAUTION

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

****

AIRFLOW CONSIDERATIONS

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

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

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

****

WARNING

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

****

POWER REQUIREMENTS

The Load Bank requires a 120 volt, single phase, 60 Hz, 15 amp source of power for operation of the control circuit. A power cord for control power is provided with the Load Bank. Connect the power cord to a grounded 120 VAC source.

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

****

WARNING

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

****

Cables to the Load Bank should be of adequate size to handle the maximum rated current according to the National Electric Code and any local codes. A ground connection is provided and must be connected to the frame of the power source, which in turn must be connected to a good earth ground. Loose connectors are provided to mate with the load receptacles.

****

CAUTION

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

Never exceed the Load Bank rated voltage as this will cause the Load Bank to overheat. Maximum allowable voltage is 240V or 480V, 3-phase, 60 Hz.

****

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 by using the following formula:

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

SECTION IV

OPERATION

PURPOSE AND USE OF CONTROLS

1. CONTROL/FAN POWER ON/OFF switch - Turns on the cooling fans and powers remainder of control circuit. CONTROL/FAN POWER light shows ON.

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

3. MASTER LOAD ON/OFF switch - The MASTER LOAD switch connects power to all load steps, thus allowing all load steps which are actuated to load at the same time. It is also a master load disconnect.

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

5. Digital Meter - Monitors load characteristics kW, V, A, Hz.

LOAD BANK OPERATION

All tests start with control panel switches in the OFF position.

****

CAUTION

Before energizing any load, verify that load voltage does not exceed rated voltage of load facility.

****

The unit is energized by turning the CONTROL/FAN POWER switch ON. This also energizes the cooling fans. If, at any time, there is insufficient cooling air to the elements, temperature switch(es) will disconnect the load.

****

CAUTION

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

****

OPERATING INSTRUCTIONS

1. Place all switches on the control panel to the OFF position.
2. Connect a wire from the Load Bank frame ground stud to power source frame.
3. Connect power source frame to a good earth ground.
4. Connect appropriate power source leads to Load Bank.
5. Connect Load Bank to 120 volts, single phase, 60 Hz power source.
6. With CONTROL/FAN POWER and MASTER LOAD switches in the OFF position, start the generator.
7. Position the VOLTAGE SELECT 240/480 switch to the voltage to be applied.
8. Place the CONTROL/FAN POWER switch in the ON position. The CONTROL/FAN POWER lamp will light.
9. Position the KW LOAD STEPS switch(es) to the desired load.
10. Turn on the MASTER LOAD switch to apply desired load. Load steps may be added or deleted at any time.
11. Monitor load applied with digital meter (V, A, Hz, kW). Press and release the arrow up and arrow down buttons to change function being monitored.
12. After running tests, remove the load by turning off the MASTER LOAD switch.

    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.

****

WARNING

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

DO NOT allow objects to enter or block screens.

****

13. Place the CONTROL/FAN POWER switch to the OFF position.

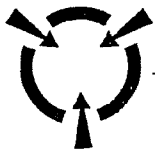
14. Shut down all power sources to the Load Bank.

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

16. Disconnect the 120V source to the Load Bank.

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 by using the following formula:

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



ESD PRECAUTIONARY GUIDELINES

C A U T I O N

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

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

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

* Styrofoam® is a registered trademark of Dow Chemical.

SECTION V

MAINTENANCE

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

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

****

WARNING

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

****

DAILY

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

THREE MONTHS OR 500 HOURS

1. Remove access panels and screens.
2. Inspect the load resistors for mechanical breakdown which is demonstrated by excessive sagging of the elements. Replace with new resistor elements as required.
3. Inspect for broken ceramic insulators. Replace with a new ceramic insulator if any cracks are found.

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

5. Inspect all connections for oxidation or corrosion. Clean the connection or replace the hardware where required. Verify that the load relays properly energize and that the contacts are not severely pitted or corroded. The contacts must move freely and be properly seated.

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

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

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

9. Check the indicator lamp on the control panel.

PARTS REPLACEMENT

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

SECTION VI

REPLACEMENT PARTS LIST

INTRODUCTION

The parts list in this section contains the description, quantity required, and 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. Also include the model and serial number of the equipment.

REPLACEMENT PARTS LIST

SCHEMATIC REFERENCE	DESCRIPTION	MANUFACTURER and PART NO.	AVTRON P/N	QTY/ UNIT
	AVTRON MODEL LPH55		LPH55-	
	LOAD BANK, PORTABLE, INDOOR		D37873	
	.Schematic		D37909	REF
R25-R27	.Resistor Element		A31716-6	3
R13-R18	.Resistor Element		A31716-7	6
R1-R12	.Resistor Element		A31716-8	12
R22-R24	.Resistor Element		A31716-11	3
F5-F7	.Fuse, 1 Amp	Bussmann FNQ-R-1	324449	3
XF5-7	.Fuseholder	Bussmann BC6033SQ	324998	1
P1	.Connector, Receptacle	Belden 17252A-B1	314681	1
J1-J3	.Connector, Receptacle, Black	Crouse-Hinds E1016-1600	314900	3
B1-B6	.Fan	ComAir Rotron 031842	322932	6
F4	.Fuse, 5 Amp, 600 VAC	Bussmann LP-CC-5	325044	1
F1-F3	.Fuse, 175 Amp, 600 VAC	Bussmann JJS-175	324295	3
XF4	.Fuseholder	Bussmann HPS-RR	324985	1
R100	.Resistor, 100 Kohm, 0.5W, 10%		110048	1
DS1	.Light, Indicator, Amber	Dialight 249-7841-1433-574	329681	1
K1-K8	.Relay	Deltrol Corp. 21009-84-375TM-3PST-N0-3A-120VAC	350982	8
K99	.Relay	Potter & Brumfield KUP14A55-120	351170	1
M1	.Meter, Power, Digital	Electro Industries SHARK 100-60-10-V3-485	338344	1
S1-S6	.Switch, Toggle	Carlingswitch 2GK51-73	360589	6
S7	.Switch, Toggle	Eaton Corp. 7992K10	360747	1
S11-S18	.Switch, Thermal	Selco Mfg. 0A-220	363082	8
K101	.Relay	Potter & Brumfield T92S11A22-120	350539	1
CT11,CT12	.Transformer, Current, 150:5	Instrument Trans-Former 16RL-151	371290	2
K480	.Relay, Volt Sense	Crouzet 84-893-106	351653	1
	.Tube, Insulator, 2" Long		411141	144
	.Tube, Insulator, .625" Long		411145	48
	.Tube, Insulator, 1.195" Long		411181	48
	.Tube, Insulator, 0.530" Long		411182	96
B7	.Fan	McMaster Carr 1976K14	322235	1
XP1	.Line Cord	Belden Wire 17500	390874	1

Form No. 277

APPENDIX

LOAD BANK
TROUBLESHOOTING GUIDE

NOTE

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

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W A R N I N G

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

****

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.
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.)*

* 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. (Cont.)	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.
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.

* 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.)

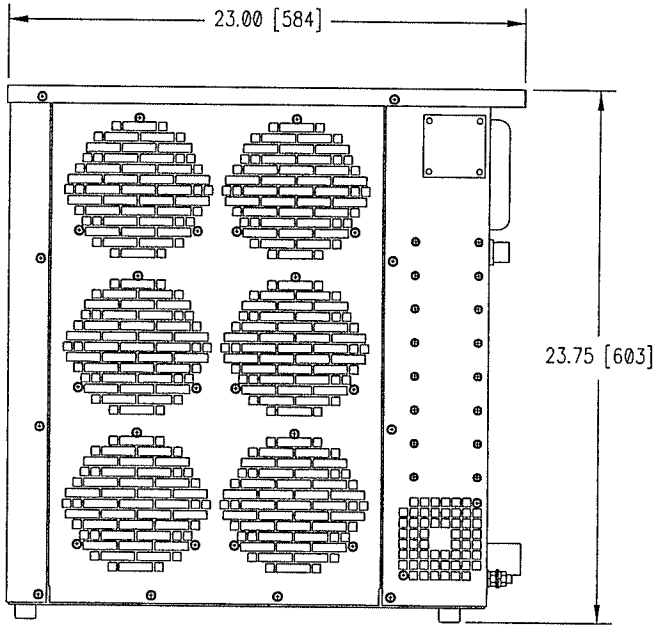
PROBLEM	POSSIBLE CAUSES/REMEDIES
6. Contactor "chattering" exists.	a. Contacts and/or core are dirty or corroded. b. Connections to contactor coil are loose. c. Control circuit line voltage is too low.
7. Load Bank or load step does not give rated load.	a. Applied load voltage is either derated or inadequate. 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.)

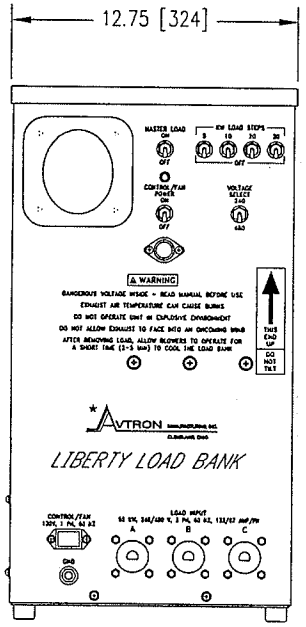
DRAWINGS

PROPRIETARY NOTE

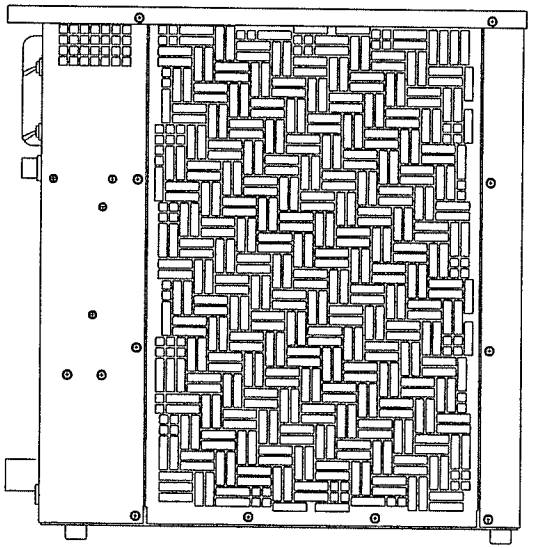
ıg diagrams and schematics which follow
information PROPRIETARY to Avtron
:ing, Inc.; are furnished solely to provide
ın sufficient for instruction, operation,
e, evaluation, and testing of the equipment
:losed; are not to be used for manufacturing
ment; and are not to be disclosed to anyone
persons in the Division, or the Company, or
ıment, as the case may be, responsible for
.ating to this document without the express
rmission of Avtron Manufacturing, Inc.



AIR INTAKE SIDE



AIRFLOW



AIR EXHAUST SIDE

SEE SHEET 2 FOR CASE DIMENSIONS

FOR APPLICATION ENGINEERING USAGE ONLY

NOTES:
1. WEIGHT: APPROX (LOAD BANK) 70 LBS [32 kg].
2. ALL DIMENSIONS ARE APPROX. IN INCHES [mm]

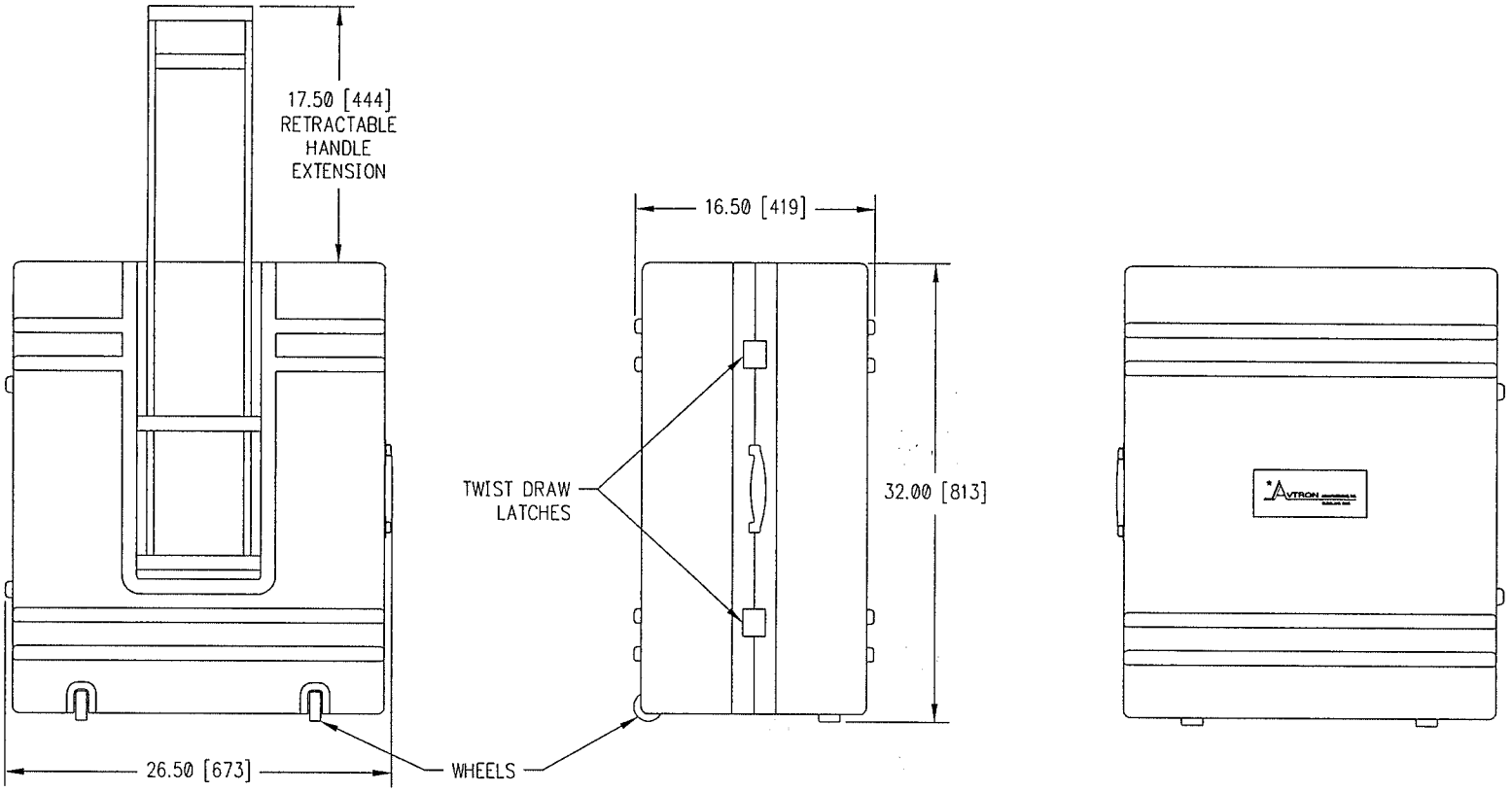
ECN NO.	REV LET.	CHANGE	CHG'D	CHK'D
CE070	A	"CONTROL/FAN" WAS "CONTROL/ BLOWER" (2 PLACES).	J.FLAUTO 5/17/05	D.KOZAR

DRAWN	J.FLAUTO	DATE 5-3-05
CHECKED	J.FLAUTO	5/5/05
APPROVED	D.KOZAR	SCALE 3/16
MODEL LPH55		

AVTRON MANUFACTURING, INC.
INDEPENDENCE, OH

LOAD BANK, PORTABLE, W/CASE
55 KW, 240/480V, 3 PH, 60 HZ

DRAWING NUMBER
SB3543
SHT 1 OF 2
OUTLINE DRAWING



SEE SHEET 1 FOR LOAD BANK DIMENSIONS

FOR APPLICATION ENGINEERING USAGE ONLY

2. ALL DIMENSIONS ARE APPROX. IN INCHES [mm]
1. WEIGHT: APPROX (CASE) 20 LBS [9 kg].
NOTES:

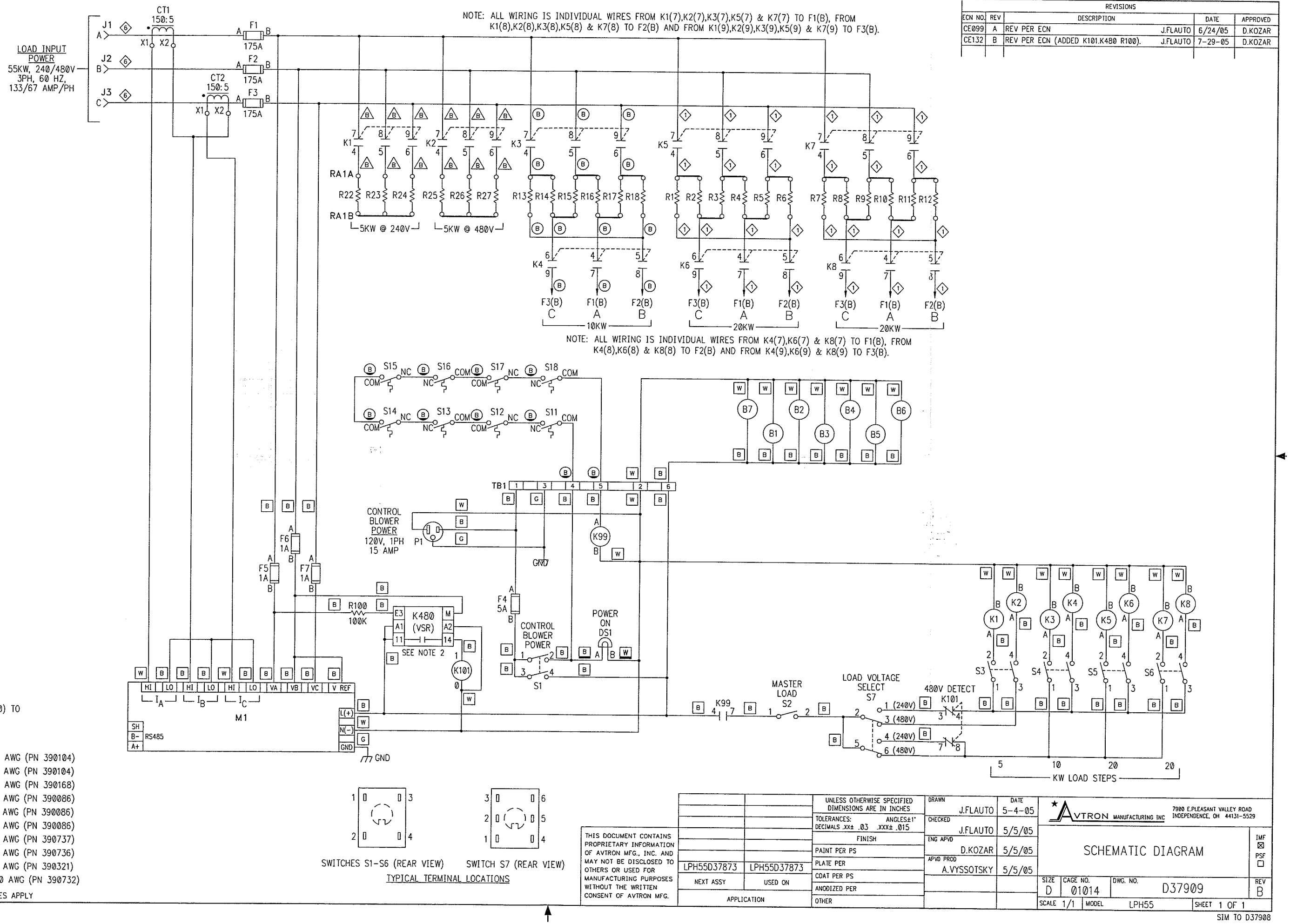
ECN NO.	REV LET.	CHANGE	CHG'D	CHK'D
CE070	A	NO CHANGE THIS SHEET. J.FLAUTO	5/17/05	D.KOZAR

AVTRON MANUFACTURING, INC.
INDEPENDENCE, OH

LOAD BANK, PORTABLE, W/CASE
55 KW, 240/480V, 3 PH, 60 HZ

DRAWING NUMBER
SB3543
SHT 2 OF 2
OUTLINE DRAWING

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
CE099	A	REV PER ECN J.FLAUTO	6/24/05	D.KOZAR
CE132	B	REV PER ECN (ADDED K101.K480 R100). J.FLAUTO	7-29-05	D.KOZAR



2. PRESET VOLTAGE SENSE RELAY (K480) TO 270 V BUSS VOLTS, 0% HYSTERESIS.

1. WIRE CODE:

- [B] INDICATES WIRE TO BE BLACK #22 AWG (PN 390104)
- [W] INDICATES WIRE TO BE WHITE #22 AWG (PN 390104)
- (B) INDICATES WIRE TO BE BLACK #20 AWG (PN 390168)
- [B] INDICATES WIRE TO BE BLACK #18 AWG (PN 390086)
- [W] INDICATES WIRE TO BE WHITE #18 AWG (PN 390086)
- [G] INDICATES WIRE TO BE GREEN #18 AWG (PN 390086)
- /B\ INDICATES WIRE TO BE BLACK #16 AWG (PN 390737)
- (B) INDICATES WIRE TO BE BLACK #14 AWG (PN 390736)
- ◇1 INDICATES WIRE TO BE BLACK #10 AWG (PN 390321)
- ◇6 INDICATES WIRE TO BE BLACK #1/0 AWG (PN 390732)

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

LPH55D37873	LPH55D37873
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1° DECIMALS .XX± .03 .XXX± .015
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

DRAWN	J.FLAUTO	5-4-05
CHECKED	J.FLAUTO	5/5/05
ENG APVD	D.KOZAR	5/5/05
APVD PROD	A.VYSSOTSKY	5/5/05

AVTRON MANUFACTURING INC
7900 E.PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

SCHEMATIC DIAGRAM

IMF ☒ PSF ☐

SIZE	CAGE NO.	DWG. NO.	REV
D	01014	D37909	B
SCALE 1/1	MODEL LPH55	SHEET 1 OF 1	

SIM TO D37908

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
CD068	A	ITEM 27 WAS PN 315297, QTY 3. REMOVED ITEM 27 FROM NOTE 3.	J.FLAUTO 5/20/05	D.KOZAR
CE132	B	ITEM 42 WAS PN 364072. 50 WAS PN 450087. ADDED ITEMS 32, 60, 61, 65, 66. SEE SHEET 2.	J.FLAUTO 7-29-05	D.KOZAR
CE162	C	ITEM 65 WAS QTY 2in, ADDED ITEM 68, FACKELMANN SEE SHEET 2	8/19/05	D.KOZAR
CE324	D	ITEM 33 WAS 329723 FACKELMANN	1/30/06	D.STACK

REF DESIG	ITEM NO.	NO. REQD	PART NO.	DESCRIPTION	MATERIAL
	86				
	85				
	84				
	83				
	82				
	81				
	80				
	79				
	78				
	77	AR	910237	SILICON, HI-TEMP	
	76				
	75	48	530076	WASHER, FLAT, #3/8	
	74	48	530075	WASHER, FLAT, #5/16	
	73	96	530073	WASHER, FLAT, #10	
	72	3	516123	NUT, HEX, JAM, 1/2-13	
XP1	71	1	390874	LINE CORD	SEE NOTE 3
B7	70	1	322235	FAN	
	69	2	A31614-3	BUS LINK	
XK480	68	1	364291	END BRACKET	
	67	15	A31614-1	BUS LINK	
XK480	66	2	411841	STANDOFF, 8-32 x .50	
XK480	65	2.5in	408189	RAIL, MOUNTING	
	64	1	B15905	LABEL	
	63	7	532713	WASHER, LOCK	
	62	7	530052	WASHER, FLAT, 7/16	
K480	61	1	351653	RELAY, VOLT SENSE	
K101	60	1	350539	RELAY	
	59	28	517513	RIVNUT, #8-32	
	58	96	523205	NUT, ASSEMBLED WASHER	
	57	1	A31976	CASE, SHIPPING	SEE NOTE 3
	56	AR	905396	TAPE, DOUBLE-FACED CLEAR TRANSFER	SEE NOTE 1
	55	1	905120	POLYESTER FILM, .015 THK (6.00 x 21.50)	SEE NOTE 1
	54	48	473042	SPRING, TAPERED COMPRESSION	
	53	4	469058	BUMPER, NYLON	
	52	48	461159	PIN, SPRING CLIP	
	51	3	450202	INSULATOR, STANDOFF, 1/4-20 x 1"	

LIST OF MATERIAL

REF DES	ITEM NO.	NO. REQD	PART NO.	DESCRIPTION	MATERIAL
XTB1	50	1	450098	INSULATOR/MARKER STRIP, TB	
	49	96	411182	TUBE, INSULATOR	
	48	48	411181	TUBE, INSULATOR	
	47				
	46	48	411145	TUBE, INSULATOR	
	45	144	411141	TUBE, INSULATOR	
CT1,CT2	44	2	371290	TRANSFORMER, CURRENT, 150:5	
	43				
TB1	42	1	364054	TERMINAL BOARD	
S11-S18	41	8	363082	SWITCH, THERMAL	
S7	40	1	360747	SWITCH, TOGGLE	
S1-S6	39	6	360589	SWITCH, TOGGLE	
	38	2 FT	390732	WIRE, ELECTRICAL, 1/0 AWG	
	37				
M1	36	1	338344	METER, POWER, DIGITAL	
K99	35	1	351170	RELAY	
K1-K8	34	8	350982	RELAY	
DS1	33	1	329681	LIGHT, INDICATOR, AMBER	
R100	32	1	110048	RESISTOR, 100K, 1/2 WATT	
XF4	31	1	324985	FUSEHOLDER	
F1-F3	30	3	324295	FUSE 175A, 600V	
F4	29	1	325044	FUSE 5A, 600V	
B1-B6	28	6	322932	FAN	
	27				
J1,J2,J3	26	3	314900	CONNECTOR, RECEPTACLE, BLACK	
P1	25	1	314681	CONNECTOR, RECEPTACLE	
XF5-7	24	1	324998	FUSEHOLDER	
F5-F7	23	3	324449	FUSE, 1 AMP	
	22				
	21	1	A31715	PLATE, IDENTIFICATION	
	20	24	A31077	ROD, ELEMENT SUPPORT	
	19				
	18	48	A21179	BUSHING, SUPPORT ROD	
	17				
	16	1	B29885	AIR DEFLECTOR HEAT SHIELD	
	15	3	A31953	BUS BAR, LOAD	
R22-R24	14	3	A31716-11	RESISTOR ELEMENT	
R1-R12	13	12	A31716-8	RESISTOR ELEMENT	
R13-R18	12	6	A31716-7	RESISTOR ELEMENT	
R25-R27	11	3	A31716-6	RESISTOR ELEMENT	
	10	1	D37468	COVER, TOP	
	9	1	D37467	COVER, ELEMENT	
	8	1	D36626	PANEL, AIR EXHAUST	
	7	1	D37466	BASE	
	6	1	D37909	SCHEMATIC/INTCON DIAGRAM	
RA1A	5	1	D37465-2	SUPPORT, ELEMENT	
RA1B	4	1	D37465-1	SUPPORT, ELEMENT	
	3	1	D37464	HEAT SHIELD	
	2	1	D37463	PANEL, AIR INTAKE	
	1	1	D37907	PANEL, CONTROL	

LIST OF MATERIAL

3 - PLACE ASSEMBLED LOAD BANK, & LINE CORD (ITEM 71) INTO SHIPPING CASE (ITEM 57).

- USE COMPUTER GENERATED LABELS FOR REF DESIG INSIDE ITEM 1.

1 - ASSEMBLE ITEM 55 ON INSIDE OF ELEMENT COVER (ITEM 9) CENTERED OVER RESISTOR ELEMENT STUDS, USING ITEM 56 TAPE.

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES±1°
DECIMALS .XX± .XXX±
FINISH
PAINT PER PS
PLATE PER
COAT PER PS
ANODIZED PER
OTHER

		DATE
DRAWN	J.FLAUTO	5-4-05
CHECKED	J.FLAUTO	5/5/05
ENG APVD	D.KOZAR	5/5/05
APVD PROD	A.VYSSOTSKY	5/5/05

AVTRON MANUFACTURING INC
7900 E.PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

LOAD BANK, PORTABLE, 55 KW, 240/480V, 3 PH W/CARRYING CASE (OUTLINE DWG SB3543)

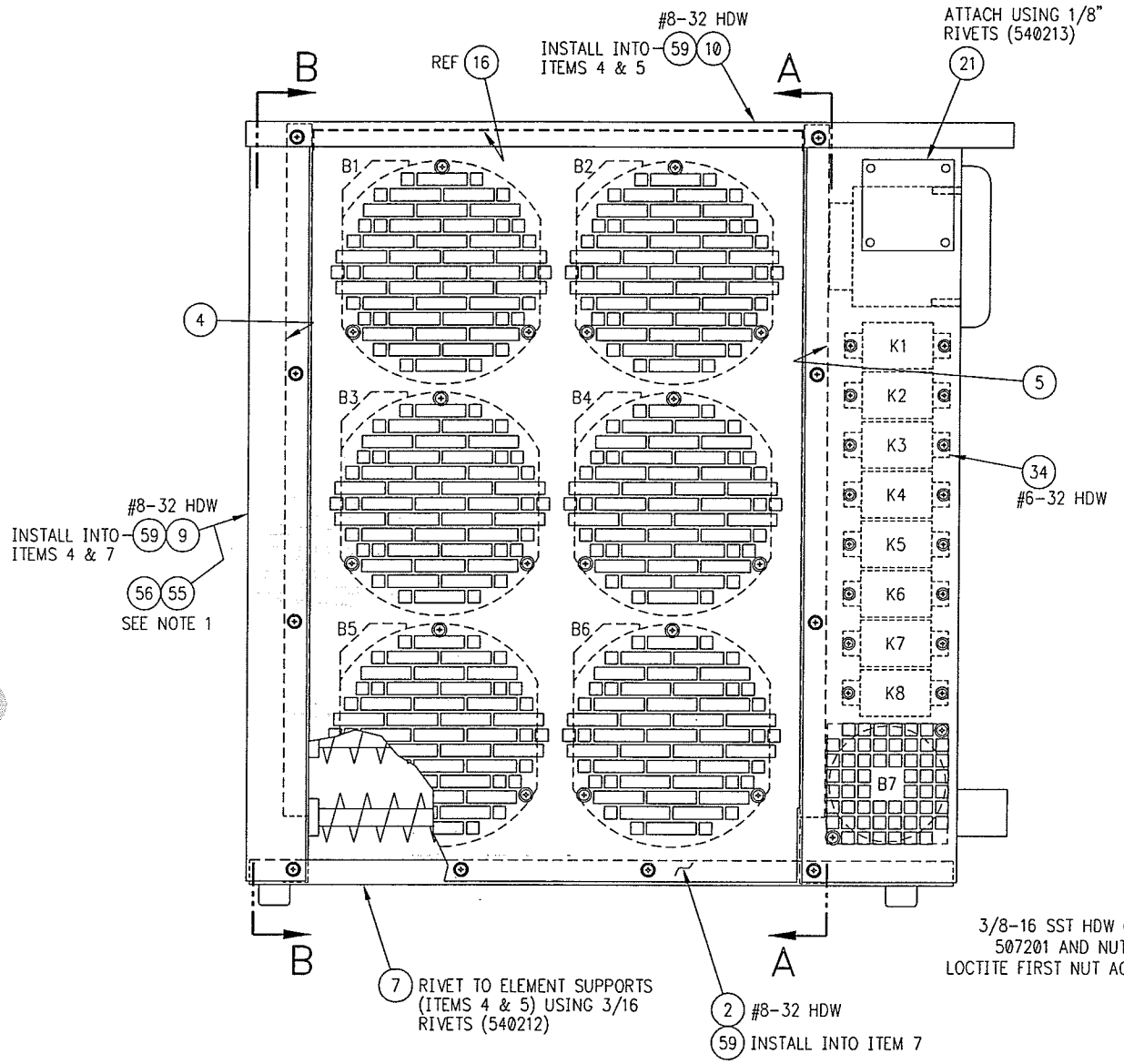
IMF ☐ PSF ☒

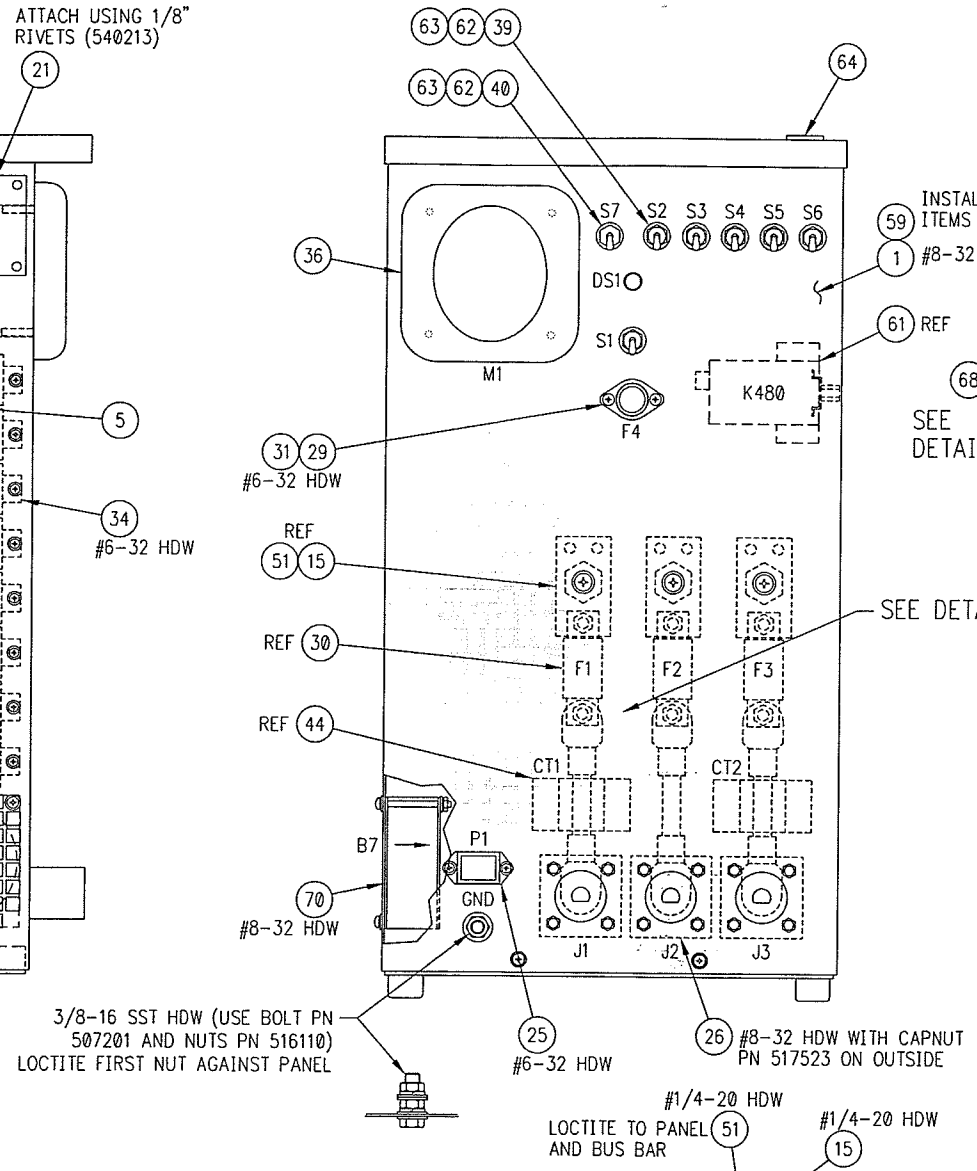
SIZE	CAGE NO.	DWG. NO.	REV
D	01014	LPH55 D37873	D

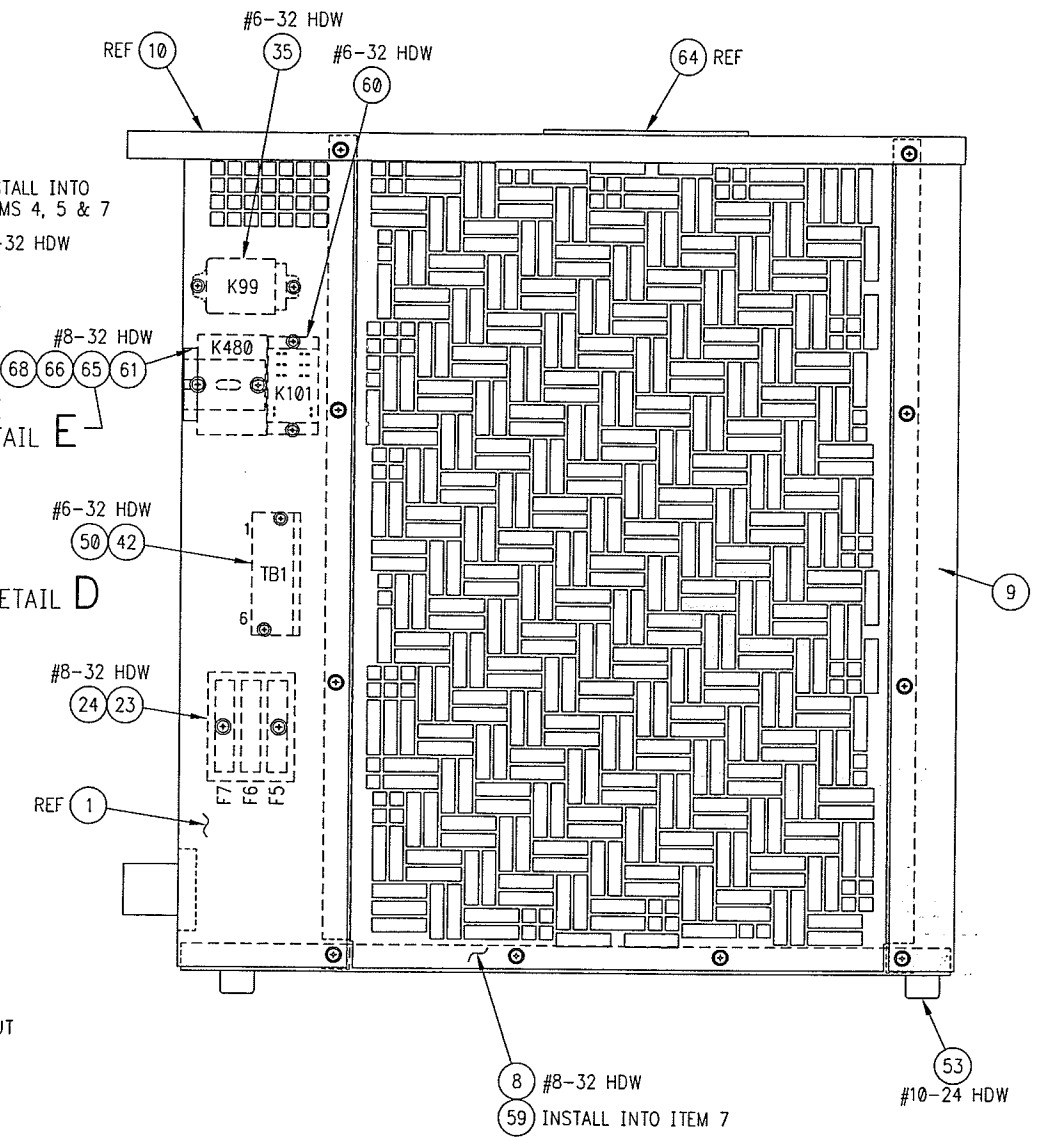
SCALE NONE | MODEL LPH55 | SHEET 1 OF 3

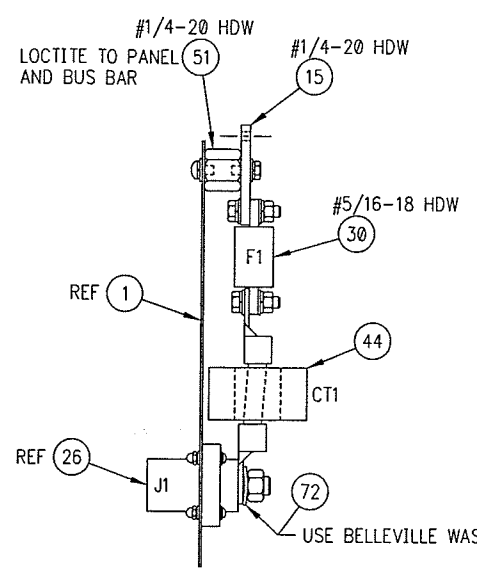
SIM TO D37872

REVISIONS				
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
CE132	B	RELOCATED "F5, F7, K99, S2 & S7". REVISED TB1 PICTORALLY. ADDED ITEMS 60, 61, 65, 66 & DETAIL E.	J.FLAUTO 7/29/05	D.KOZAR
CE162	C	REVISED PICTORIAL OF DETAIL "E", ADDED BUBBLE 68	FACKELMANN 8/19/05	D.KOZAR

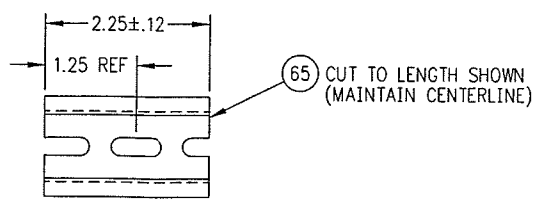








DETAIL D
(SIDE VIEW)



DETAIL E
SCALE: 2/1
(ITEM 65 MOUNTING RAIL)

SEE SHEET 1 FOR NOTES

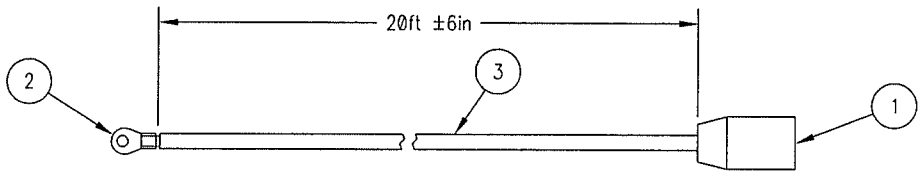
UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY

AVTRON MANUFACTURING INC
7980 E.PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

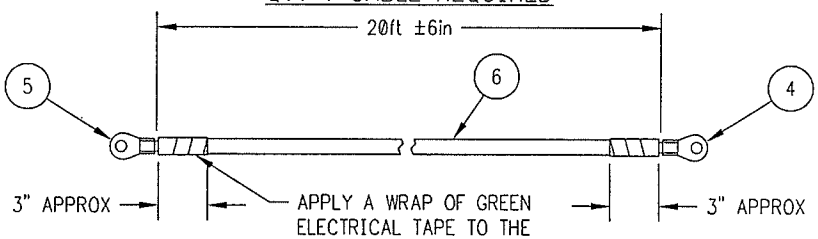
LOAD BANK, PORTABLE, 55 KW, 240/480V, 3 PH
W/CARRYING CASE

SIZE	CAGE NO.	DWG. NO.	REV
D	01014	LPH55 D37873	D
SCALE 3/8	MODEL LPH55	SHEET 2	

QTY 3 CABLES REQUIRED



QTY 1 CABLE REQUIRED



REVISIONS				
ECN NO.	LTR	DESCRIPTION	DATE	APPROVED

ITEM NO.	NO. REQ'D	PART NO.	DESCRIPTION	MATERIAL
6	20' 6"	390022	WIRE, ELECT, #2 AWG	
5	1	366043	TERMINAL, LUG, #2 AWG, 1/2 SCREW	
4	1	366041	TERMINAL, LUG, #2 AWG, 3/8 SCREW	
3	61' 6"	390026	WIRE, ELECT, #2/0 AWG	
2	3	366053	TERMINAL, LUG, #2/0 AWG, 1/2 SCREW	
1	3	315001	CONNECTOR, PLUG,(FEMALE)	

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	DRAWN	J.FLAUTO	DATE 1/4/02
TOLERANCES: DECIMALS .XXX± .015 ANGLES±1° .XX± .03	CHECKED	J.FLAUTO	1-7-02
	ENG APP'D	J.HUDSON	1-7-02
FINISH	APP'D PROD	A.VYSOTSKY	1/8/02
PAINT PER PS	S. O. NO.		NO REQ'D
ZINC PLATE PER			
COAT PER PS			
ANODIZE PER			
OTHER			

AVTRON MANUFACTURING, INC.
7900 E. PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

CABLE SET-20 FT
(OPTION 1)

IMF ☐ PSF ☒

SIZE	CAGE NO.	DRAWING NO.	REV. LTR.
B	01014	B28571	

SCALE 1/1 | MODEL LPH 105 | SHEET 1 OF 1

2. REF: THIS CABLE SET IS FOR USE WITH THE LPH 105 LOAD BANK.
1. PACKAGE ALL 4 CABLES TOGETHER AND PART MARK .12 MIN HIGH ON OUTSIDE OF PACKAGE.

UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY.

LPH 105	LPH 105
NEXT ASSY	USED ON

P/N 315001 (12)
P.S.# 37054 m21

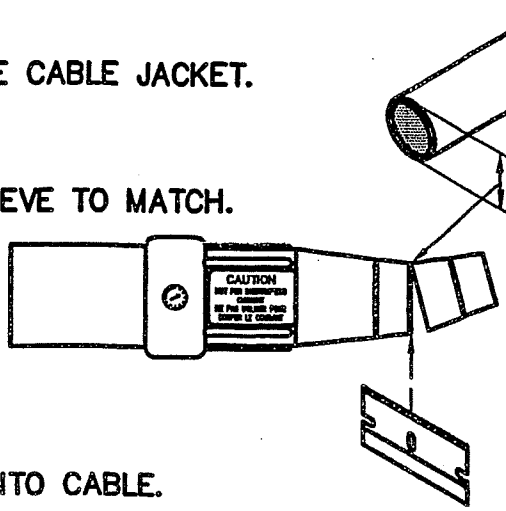
cam-lok®
ASSEMBLY INSTRUCTIONS
Series E1016 & E1018

EB 9

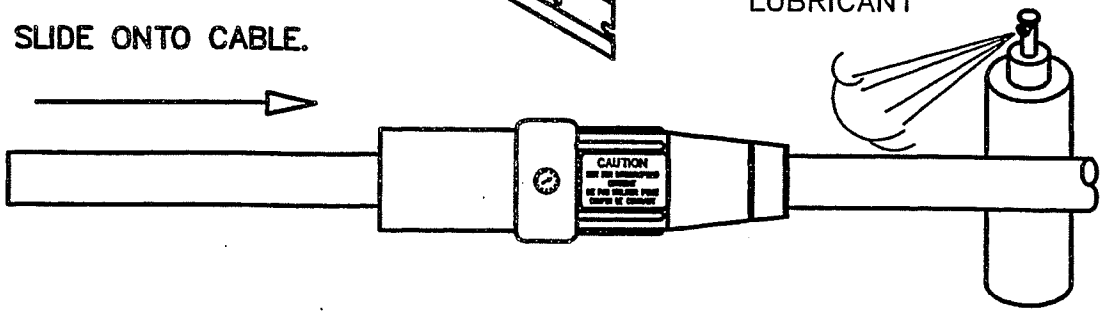
NOTE: USE COPPER (CU) CONDUCTORS ONLY.

1. MEASURE CABLE JACKET.

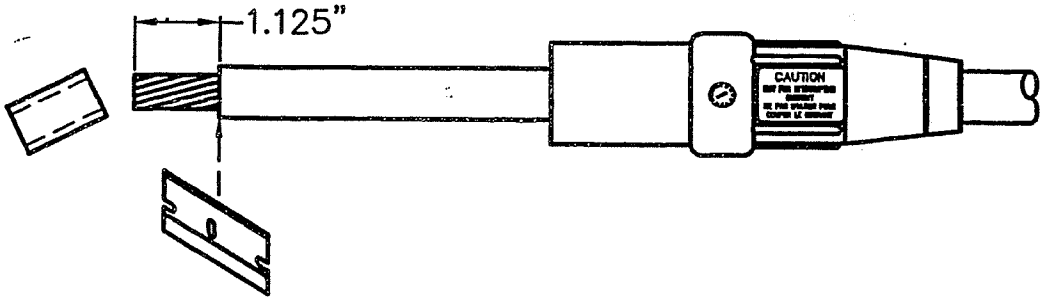
2. CUT SLEEVE TO MATCH.



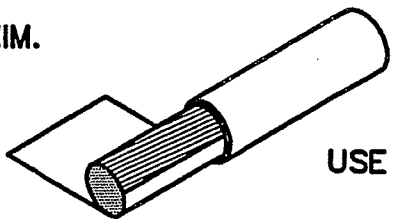
3. SLIDE ONTO CABLE.



4. REMOVE JACKET.

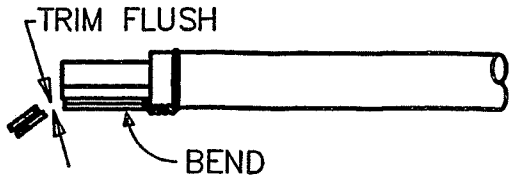


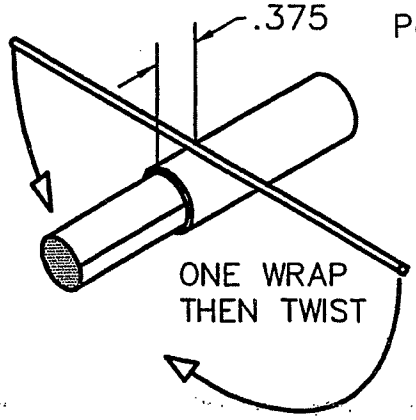
5. WRAP COPPER SHIM.



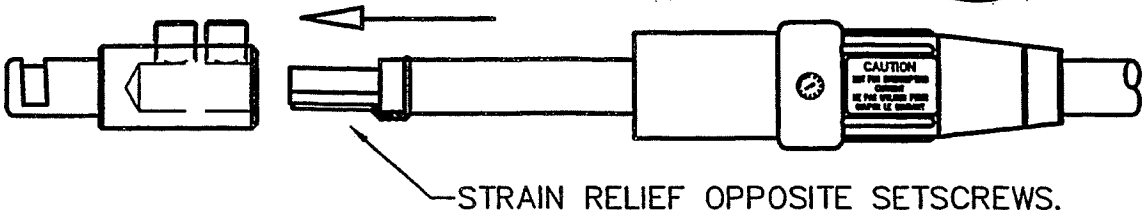
USE TWO FOR SMALLER CABLES.

6. WRAP STRAIN RELIEF WIRE.

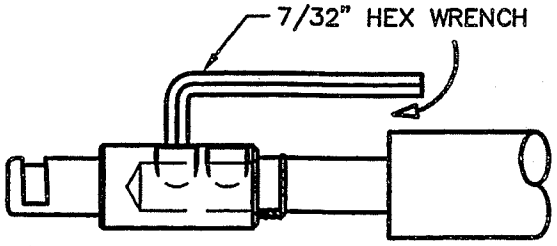




7. INSERT INTO CONTACT.



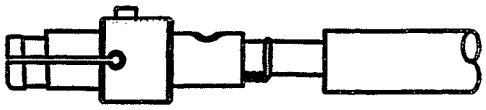
8A. TIGHTEN SETSCREWS.



CABLE SIZE	TORQUE INCH POUNDS
#2 – #1	100
1/0 – 2/0	120
3/0 – 4/0	220

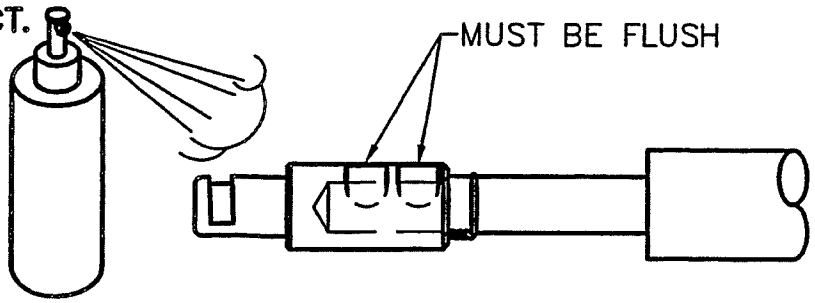
OR

8B. CRIMP CONTACT

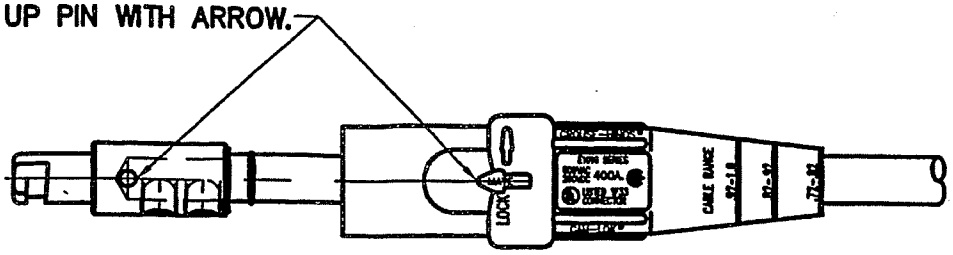


CABLE SIZE	CRIMP NEST	CRIMP PRESS
#2 – #1	100514–3	A200914–3
1/0 – 2/0	100514–4	A200914–4
3/0	100514–5	A200914–5
4/0	100514–6	A200914–6

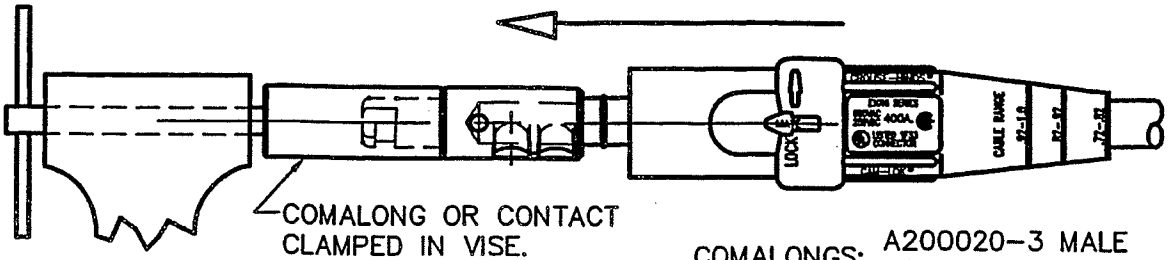
9. LUBRICATE CONTACT.



10. LINE UP PIN WITH ARROW.

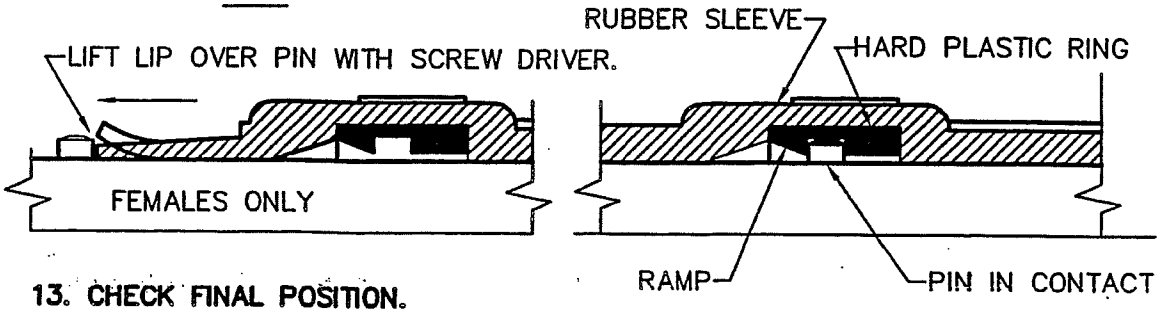


11. PUSH SLEEVE OVER CONTACT.

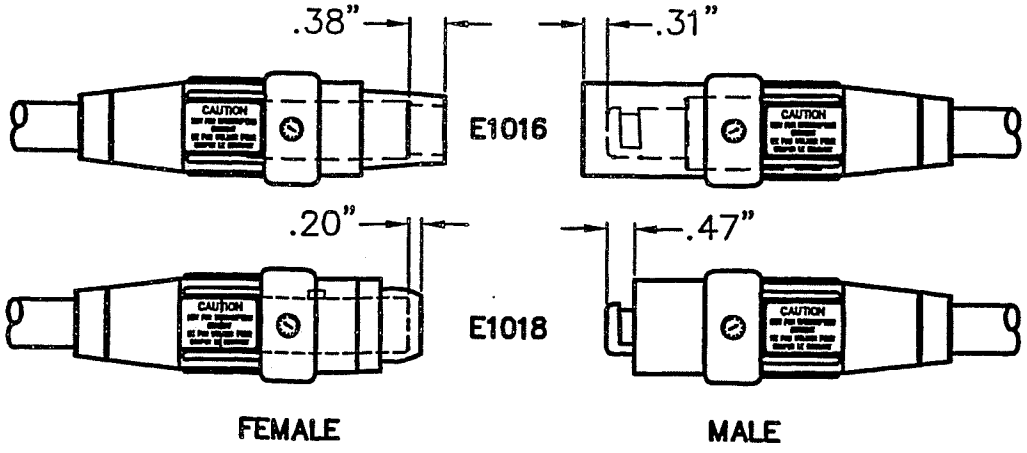


COMALONGS: A200020–3 MALE
A200020–4 FEMALE

12. PIN MUST POP INTO POCKET.



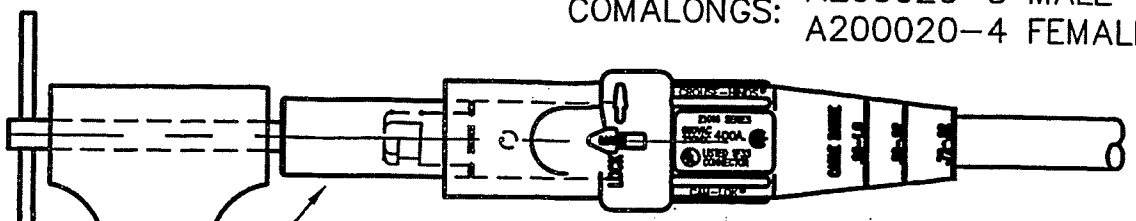
13. CHECK FINAL POSITION.



SLEEVE REMOVAL PROCEDURE

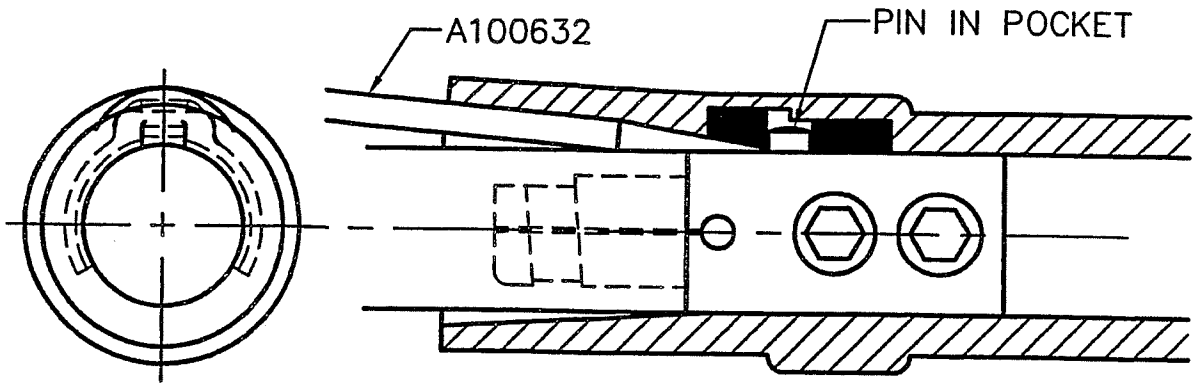
1. MATE WITH COMALONG OR CONTACT.

COMALONGS: A200020–3 MALE
A200020–4 FEMALE

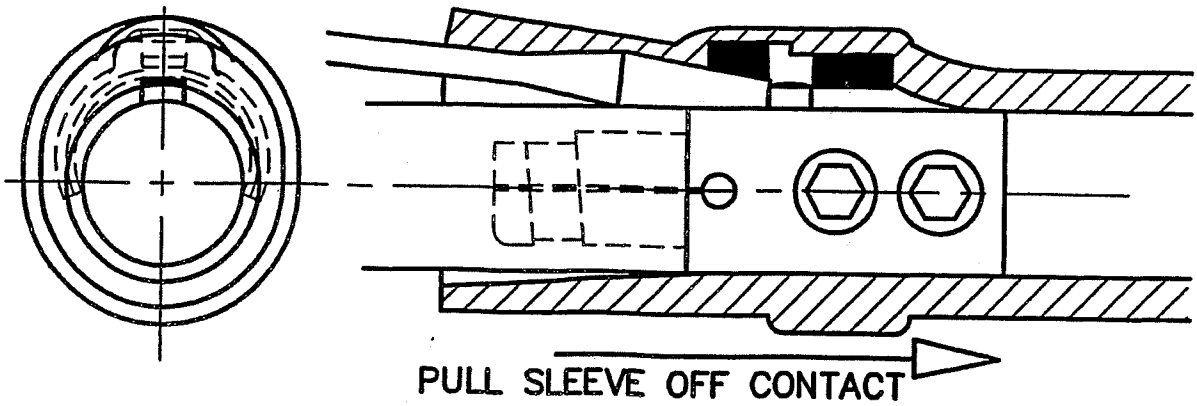


COMALONG OR CONTACT CLAMPED IN VISE.

2. INSERT 1/4" WIDE SCREW–DRIVER INTO KEYWAY.

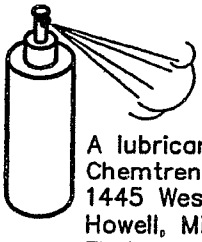


3. ROTATE BLADE 90° TO LIFT RING OFF PIN.

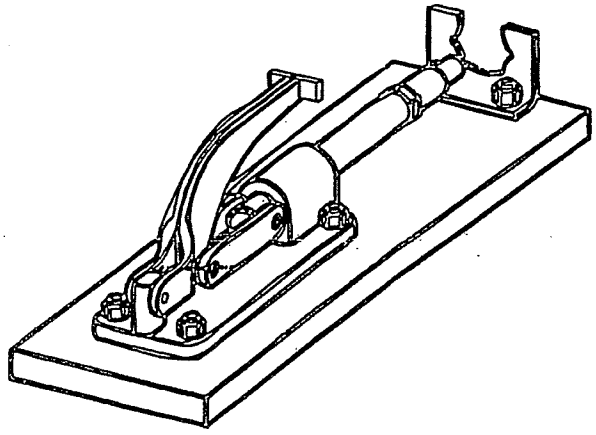


CONTACT AND CONDUCTOR SIZE INFORMATION						
Series	Style	Conductor Size	Continuous Amp Rating	Conductor Entrance Diameter	Contact	
					Male	Female
E1016	CRIMP	#2–#1	170	.402	A200036–18	A200037–23
E1016	CRIMP	1/0–2/0	235	.495	A200036–19	A200037–24
E1016	CRIMP	1/0–2/0 HD	235	.495	A200038–11B	A200035–17B
E1016	CRIMP	3/0–4/0	315	.620	A200038–6B	A200035–14B
E1016	SINGLE SET SCREW	#2–2/0	235	.578	A200065–1	A200067–3
E1016	SINGLE SET SCREW	3/0–4/0	315	.656	A200064–1	A200090–1
E1016	DOUBLE SET SCREW	#2–2/0	235	.578	A200630–1	A200640–3
E1016	DOUBLE SET SCREW	3/0–4/0	400––USE 105°C CABLE	.656	A200639–1	A200641–1
E1018	CRIMP	#2–#1	170	.402	A200036–2	A200037–6
E1018	CRIMP	1/0–2/0	235	.495	A200036–3	A200037–7
E1018	CRIMP	3/0–4/0	400	.620	A200038–2	A200035–4

For high volume or frequent installation, use the Lektralink assembly tool as shown below. The part number is A400001. Complete instrctions for use are included with tool.



A lubricant is available from:
Chemtrend, Inc.
1445 West McPherson Park Drive
Howell, Michigan 48844–0860
Their part number is CT–39F.



COOPER Crouse-Hinds

Crouse-Hinds Molded Products
UNITED STATES:
4758 Washington Street • LaGrange, North Carolina 28551
Phone (252) 566-3014 • FSCM-90129 • FAX (252) 566-9337
CANADA:
Crouse-Hinds Canada Ltd.
5925 McLaughlin Road • Mississauga, Ontario L5R 1B8
Phone (905) 507-4187 • FAX (905) 501-4078

Warranty

Warranty and Duration

For a period of one year after installation, or fifteen (15) months from date of shipment from our plant, whichever is shorter, Avtron warrants the equipment, except as hereinafter provided, to be free from harmful defects in material and workmanship. Notwithstanding any other term or provision in this Warranty, the warranty provided herein shall terminate unless buyer notifies Avtron, in writing, of a breach hereof within the warranty period; any claims not made within such period are waived by Buyer. The warranty provided herein applies only if Buyer complies with all the other terms and provisions of this Warranty.

Uses of Equipment

The warranty provided herein applies only if the equipment has been used in a normal and proper manner under recommended conditions. Notwithstanding any advice or assistance given to the Buyer by Avtron or its suppliers concerning the equipment or its use, Avtron makes no express or implied warranties or representations, except as herein expressly provided, with respect to the equipment or its use, and Avtron shall not be liable in contract, warranty or tort (including, without limitation, for negligence or strict liability) as a result of such advice or assistance. In addition, unless otherwise agreed in writing signed by a duly authorized representative of Avtron, no equipment covered by this warranty is intended to be used in connection with any nuclear facility or activity, and if so used, Avtron disclaims any and all liability for any damage resulting therefrom.

Notification of Breach

When claiming a breach of this Warranty, Buyer must promptly (within 10 days from the date of the discovery of the defect) notify Avtron in writing.

Equipment Disposition

Upon notification of a claimed breach of this Warranty, Avtron, at its discretion, will either authorize the return of the defective equipment or part thereof (transportation costs to be prepaid by Buyer) or provide a suitable replacement or authorize the Buyer in writing to effect repairs at Avtron's expense. In the event that the equipment returned as authorized is found to be defective and Avtron elects to repair or replace said equipment, Avtron will pay the transportation costs associated with the return of said equipment to Buyer. Avtron shall not however be liable for any customs, tariffs, duties or taxes incurred in shipping equipment pursuant to this Warranty. These shall be the responsibility of the Buyer.

Option of Avtron to Repair or Replace Equipment or to Issue Credit

Avtron's sole obligation under this Warranty shall be, at the option of Avtron, to replace or repair any defective equipment or part thereof or to issue a credit with respect to the defective equipment equal to the purchase price thereof less depreciation.

Equipment Excluded From Warranty

The warranty provided herein specifically excludes equipment and components that Avtron purchases and resells as part of a system, product or spare part order. The warranties provided to Avtron by the manufacturers of the foregoing equipment and components will, to the extent possible, be passed on to the Buyer. Copies of such warranties, if on file at Avton, will be made available for inspection upon the request of Buyer. Equipment such as, but not limited to, computers, CRTs, operator interface modules, monitors, etc., normally have a short warranty period and should be covered by a continuous service contract generally available from the original manufacturer at a reasonable cost. Consumable items including, but not limited to, lamps, filters, fuses and motor brushes are excluded from all warranties. Other items or components may be excluded from this warranty if so noted in the governing purchase order or contract.

Resale or Lease of Equipment

In the event that the Buyer resells or leases equipment purchased from Avtron, the Buyer shall obtain the signed written agreement of the purchaser or lessee thereof that Avtron's only liability with respect to said equipment is as set forth in this Warranty. In the event that the Buyer fails to obtain such a signed written agreement, the Buyer agrees to indemnify Avtron against any claims, demands, judgments, suits, costs, liabilities and expenses (including reasonable attorney's fees) incurred by Avtron as a result of such failure.

Unauthorized Repairs

Unless otherwise agreed in writing signed by a duly authorized representative of Avtron, if the Buyer has repairs or modifications made to equipment covered by this Warranty by a person other than an authorized Avtron service representative, Avtron shall not be liable for any expenses incurred in connection therewith and the warranty provided herein shall automatically be terminated.

Governing Law; Saving Clause

This Warranty is part of the terms and conditions of the sale of the equipment covered hereunder and shall be governed by and enforced in accordance with the laws of the State of Ohio. Any provision hereof which is prohibited or unenforceable in any jurisdiction shall, as to such jurisdiction, be ineffective to the extent of such prohibition or unenforceability without invalidating the remaining provisions hereof or affecting the validity or enforceability of such provision in any other jurisdiction.

Limitation of Liability

IN NO EVENT SHALL AVTRON BE LIABLE IN CONTRACT, IN TORT OR OTHERWISE FOR SPECIAL, INCIDENTAL, CONSEQUENTIAL OR PUNITIVE DAMAGES (INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS OR REVENUES, LOSS OF USE OF THE EQUIPMENT OR ANY DAMAGE TO ASSOCIATED EQUIPMENT, DAMAGE OR INJURY TO PERSONS OR PROPERTY, COST OF CAPITAL, COST OF SUBSTITUTE OR TEMPORARY EQUIPMENT, DOWNTIME OR CLAIMS OF CUSTOMERS) ARISING OUT OF OR AS A RESULT OF BREACH OF WARRANTY, DEFECT IN MATERIAL OR WORKMANSHIP OR ANY OTHER OBLIGATION OF AVTRON HEREUNDER.

Disclaimer of All Other Warranties

THIS WARRANTY COMPRISES AVTRON'S SOLE AND ENTIRE WARRANTY OBLIGATION TO BUYER, ITS CUSTOMERS AND ASSIGNS IN CONNECTION WITH EQUIPMENT SOLD, ASSIGNED, LEASED OR OTHERWISE DEALT WITH BY AVTRON. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY AND FITNESS, ARE EXPRESSLY EXCLUDED.

AVTRON MANUFACTURING, INC.
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