

**AVTRON MODEL LPH100
AC LOAD BANK
Part Number LPH100D34963**

100 kW @ 480V, 3-Phase, 60 Hz
93.75 kW @ 240V, 3-Phase, 60 Hz

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Cleveland, Ohio

June 10, 2003
Rev. Feb. 16, 2005

PROPRIETARY NOTE

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WARRANTY

The last page of this document contains an express limited warranty. The provisions of this warranty cover any and all rights extended to holders of Avtron equipment.

AVTRON MANUFACTURING, INC.
Cleveland, Ohio

AVTRON MODEL LPH100
AC LOAD BANK
Part Number LPH100D34963

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
I SAFETY CONSIDERATIONS.....	1-1
II DESCRIPTION	2-1
III INSTALLATION	3-1
IV OPERATION.....	4-1
V MAINTENANCE.....	5-1
VI REPLACEMENT PARTS LIST.....	6-1

APPENDIX - Avtron Load Bank Troubleshooting Guide

DRAWINGS

SB3192	Outline Drawing, Load Bank
D34965	Schematic
B28571	Cable Set - 20 Ft. (Option 1)
LPH100D34963	Load Bank, Portable, Indoor

VENDOR DATA

Cooper Crouse-Hinds Molded Products	Cam-lok7 Assembly Instructions, Series E1016 & E1018 SAW254, 9/26/01
Multitek	MultiDin M801-MD*, M802-MD* Operating Manual, Revision 4, 10/9/2003

**AVTRON MODEL LPH100
AC LOAD BANK
Part Number LPH100D34963**

**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 LPH100 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 may be 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.

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 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.
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 POWER ON/OFF switch will disconnect both load steps and fan motor. The power source EMERGENCY OFF switch should be located near the load system.
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 LPH100 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 depends on voltage. At 480 volts, 3-phase, 60 Hz, the total load is 100 kW with fixed load steps of 5, 10, 10, 25, and 50 kW. At 240 volts, 3-phase, 60 Hz, the total loading capability is 93.75 kW with fixed load steps of 3.75, 7.5, 7.5, 25, and 50 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, 5 amp power source is required for the fan and control circuits. This power is derived from the control power receptacle located on the side of the unit.

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. POWER ON/OFF switch - Applies power to the Load Bank and starts the blowers. The CONTROL POWER indicator lights when power is applied.
2. OVER TEMP indicator - Indicates an air failure condition OR insufficient cooling airflow.
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.
6. VOLTAGE SELECT switch - Configures load resistor circuit for 240V or 480V application.

ENCLOSURE

The outside dimensions of the Model LPH100 Load Bank are shown on Outline Drawing SB3192. The Load Bank is fabricated of aluminized steel, assembled with SST hardware, and mounted on four casters. Handles are provided for lifting the Load Bank 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 blowers (approximately 75 dBA at 3 ft.) which provide the necessary cooling air for the load elements. Exhaust temperature sensors are provided to monitor the flow of cooling air. These switches are electrically interlocked with the load application. If the blower is not working properly, the OVER TEMP light comes on and the load steps are disabled.

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

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 300 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 LPH100 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 120°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 120°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, 5 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 side 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.

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. POWER ON/OFF switch - Turns on the cooling fans and powers remainder of control circuit. CONTROL POWER light shows ON.
2. OVER TEMP indicator - This lamp should momentarily light when power switch is turned on. This shows the air safety circuit is working. The purpose of the OVER TEMP lamp is to warn the operator to remove the load from the Load Bank in case of improper cooling of the load elements.
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.
6. VOLTAGE SELECT switch - Configures load resistor circuit for 240V or 480V application.

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 POWER switch ON. This also energizes the cooling fans. Upon energizing the unit, the red OVER TEMP lamp will light momentarily. If, at any time,

there is insufficient cooling air to the elements, temperature switch(es) will disconnect the load and the red OVER TEMP lamp will light.

After the OVER TEMP lamp goes off, applying the appropriate switch will energize that 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. If OVER TEMP indicator light comes on and stays on for more than a few seconds without the load dropping out, shut off the power switch at once. Remove all power to the unit and check for proper operation of fan safety circuit. 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 POWER and MASTER LOAD switches in the OFF position, start the generator.
7. Position the load VOLTAGE SELECT 240/480 switch to the voltage to be applied.
8. Place the POWER switch in the ON position. Verify that the red OVER TEMP lamp momentarily lights. The CONTROL 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.

W A R N I N G

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

DO NOT allow objects to enter or block screens.

13. Place the 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.

SINGLE PHASE LOAD BANK OPERATION

The LPH100 Load Bank can be used to test single phase AC sources.

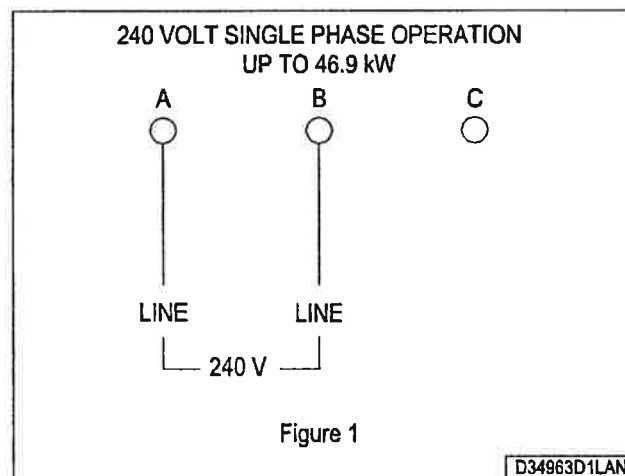
- A. For 240 volt, single phase operation up to 46.9 kW, connect to Load Bank as shown below.

NOTE

Place VOLTAGE SELECT switch in the 240V mode.

WARNING

"C" bus and any attached wiring are electrically hot when operating Load Bank in single phase, per Figure 1.



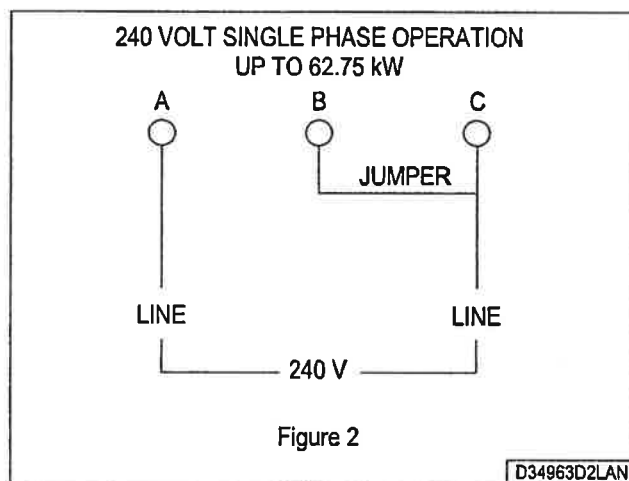
Load Step Rating:

<u>3-Phase (240V)</u>	<u>1-Phase (240V)</u>
3.75 kW	1.875 kW
7.5 kW	3.75 kW
7.5 kW	3.75 kW
25 kW	12.5 kW
50 kW	25 kW

- B. For 240 volt single phase operation up to 62.75 kW, connect to Load Bank as shown below.

NOTE

Place VOLTAGE SELECT switch in the 240V mode.



Load Step Rating:

<u>3-Phase (240V)</u>	<u>1-Phase (240V)</u>
3.75 kW	2.5 kW
7.5 kW	5.0 kW
7.5 kW	5.0 kW
25 kW	16.75 kW
50 kW	33.5 kW

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.

W A R N I N G

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

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.
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 unit with clean, dry compressed air (not to exceed 40 PSI). Eye protection should be worn when cleaning the Load Bank with compressed air.
8. Inspect all the wiring for any sign of insulation failure.
9. Replace all access panels and screens. Tighten all the fastening hardware securely.
10. Check the indicator lamps 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 and 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 LPH100 LOAD BANK, PORTABLE, INDOOR		LPH100- D34963	
K6,K7,K8	.SCHEMATIC		D34965	REF
K9,K10	.RELAY		B14795	3
R100	.RELAY		B14796	2
	.RESISTOR, 100K, 1/2W, 10%	RCR20G104KS	110048	1
	.CONNECTOR, RECEPTACLE	HUBBELL	313832	1
P1	.CONNECTOR, RECEPTACLE	1547		
B1-B4	.FAN	HUBBELL	314431	1
B5	.FAN	HBL5278C		
F103	.FUSE, 5A, 600V	EBM INDUSTRIES	322186	4
XF103	.FUSEHOLDER	W2E200-HH86-01		
F1,F2,F3	.FUSE, 300A	DAYTON ELECTRIC	322212	1
F100-F102	.FUSE, 1A	4WT40		
XF100-XF102	.FUSEBLOCK	LITTELFUSE	324475	1
DS1	.LAMP, INDICATOR	KLDR-5		
DS2	.LAMP, INDICATOR	BUSSMANN	324985	1
M1	.METER	HPS-RR		
K100,K101	.RELAY	LITTELFUSE	324386	3
K480	.RELAY, VOLT SENSE	JJLS-300		
K1-K5	.RELAY	LITTELFUSE	324449	3
S60-S63	.SWITCH, TEMP	KLDR-1		
S1,S3-S8	.SWITCH, TOGGLE	LITTELFUSE	324615	1
S2	.SWITCH, TOGGLE	BM6033SQ		
CT1,CT2	.TRANSFORMER, CURRENT	DIALIGHT	329681	3
	.CASTER	249-7841-1433-574		
		DILAIGHT	329682	1
		249-7841-1431-574		
		MULTITEK	336992	1
		M801-MD4-VE		
		POTTER & BRUMFIELD	350539	2
		T92S11A22-120		
		CROUZET	351653	1
		84-893-106		
		DELTRON	350982	5
		21009-84-375TM-		
		3PST-NO-3A-120VAC		
		SELCO	491021	4
		SE-L250		
		CARLINGSWITCH	360589	7
		2GK51-73		
		EATON	360747	1
		7992K10		
		INSTRUMENT	371220	2
		TRANSFORMERS		
		AL-251		
		W. W. GRAINGER	417074	4
		3A001		

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">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.	<ul style="list-style-type: none">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.)	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.	<ul style="list-style-type: none"> 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.*

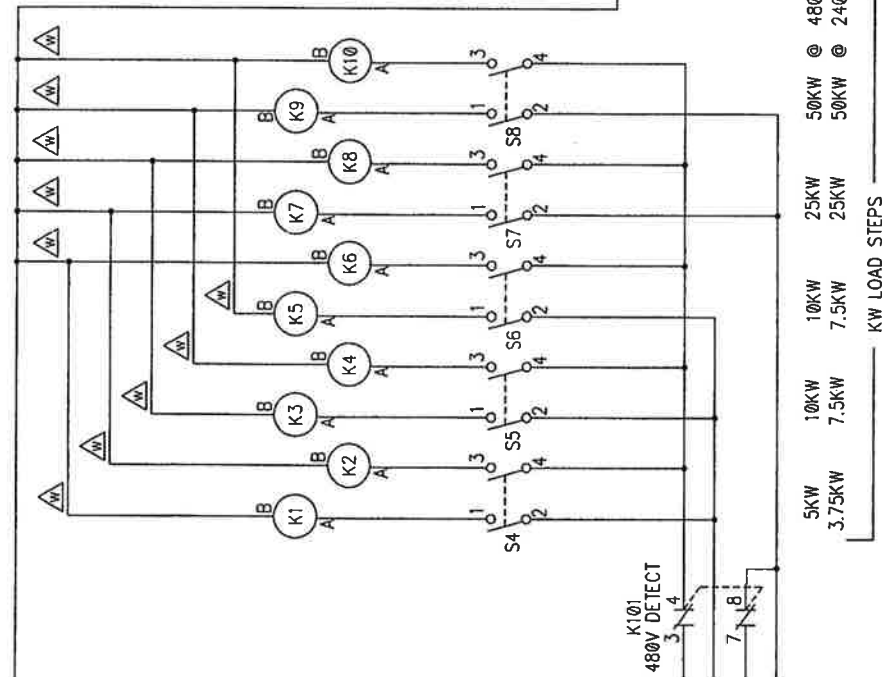
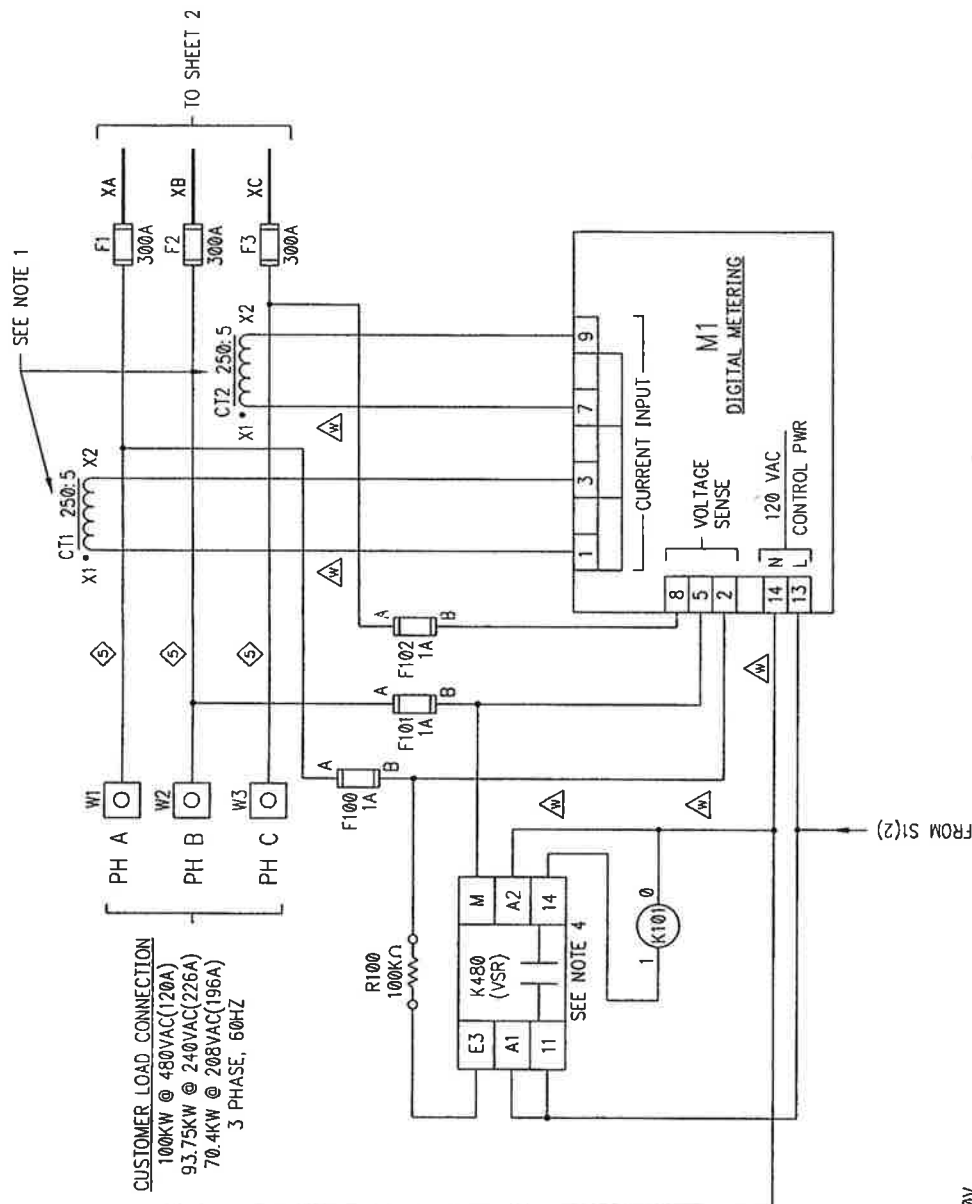
- * When checking fuses for continuity, be sure to remove all fuses from clips (in fuseblock or Disconnect Switch). Test each fuse individually, out of circuit. (If tested in circuit, there is the possibility of feedback which causes false readings. A blown fuse may still check out OK.)

RAWINGS

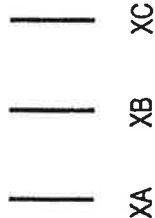
PROPRIETARY NOTE

ams and schematics which follow
tion PROPRIETARY to Avtron
.; are furnished solely to provide
ient for instruction, operation,
tion, and testing of the equipment
e not to be used for manufacturing
are not to be disclosed to anyone
n the Division, or the Company, or
the case may be, responsible for
this document without the express
of Avtron Manufacturing, Inc.

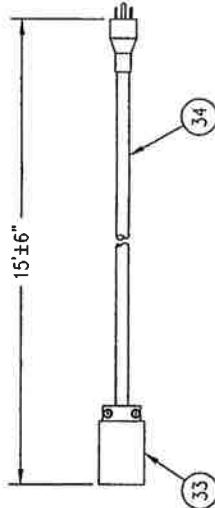
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→



XA XB XC



LINE CORD

MAKE LINE CORD AS SHOWN AND
SHIP LOOSE WITH LOAD BANK

REVISIONS

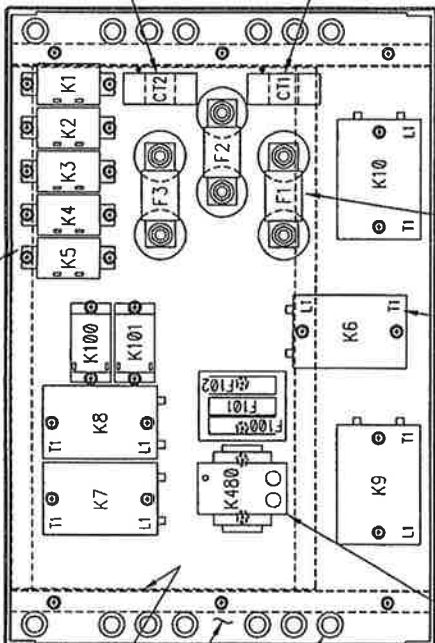
ECN NO.	REV	DESCRIPTION	DATE	APPROVED
CD410	A	REVISED SHEET 3 PER ECN	6/30/03	J. HUDSON
CD698	B	REVISED NOTE 3 PER ECN. SEE SH 2 & 3. JFLAUTO	5-17-04	J. HUDSON
AN830	C	ITEM 31 WAS 660135	8/12/04	J. PALINKAS
CD809	D	ADD "240/480V" TO TITLE BLK; REV SHTS 2&3	10/01/04	J. HUDSON

K1-K5	50	5	350982	RELAY	
K480	49	1	351653	RELAY, VOLT. SENSE	
K100, K101	48	2	350539	RELAY	
M1	47	1	336992	METER	
DS2	46	1	329682	LAMP, INDICATOR	
DS1	45	1	329681	LAMP, INDICATOR	
XF100-XF102	44	1	324615	FUSEBLOCK	
F100-F102	43	3	324449	FUSE, 1A	
F1F2,F3	42	3	324386	FUSE, 300A	
XF103	41	1	324985	FUSEHOLDER	
F103	40	1	324475	FUSE, 5A, 600V	
B5	39	1	322212	FAN	
B1-B4	38	4	322186	FAN	
XW1,XW2,XW3	37	3	315001	CONNECTOR, FEMALE	SHIPPED LOOSE
W1,W2,W3	36	3	314900	CONNECTOR, MALE STUD	
P1	35	1	314431	CONNECTOR, RECEPTACLE	
	34	1	390819	CABLE ASSY, LINE CORD	SHIPPED LOOSE
	33	1	313832	CONNECTOR, RECEPTACLE	SHIPPED LOOSE
R100	32	1	110048	RESISTOR, 100K, 1/2W	
	31	6	510011	STUD, 3/8-16 X 2.50	
	30				
	29	15	A17912	BUS BAR	
	28	54	A21179	BUSHING, SUPPORT ROD	
	27	1	A29405	PLATE, IDENTIFICATION	
	26	27	A27897	SUPPORT ROD, ELEMENT	
	25	18	A27896-6	RESISTANCE ELEMENT (25 KW)	
	24				
	23	6	A27896-5	RESISTANCE ELEMENT (10 KW)	
	22	3	A27896-1	RESISTANCE ELEMENT (5 KW)	
	21				
	20	2	B15905	LABEL, INSTRUCTION, WARNING	
	19	2	B15896	LABEL, INSTRUCTION, WARNING	
	18	1	B15871	PLATE, INSTRUCTION, WARNING	
K9,K10	17	2	B14796	RELAY	
K6,K7,K8	16	3	B14795	RELAY	
	15				
	14	1	C25804	PANEL, CONTROL	
	13	1	C25303	PANEL, CONNECTION	
	12	2	C25302	PANEL, ACCESS	
	11	1	C25301	SUPPORT, COMPONENT	
	10	1	C25300	HEAT SHIELD	
	9				
	8	1	D33080	HEAT SHIELD, FAN	
	7	1	D34965	SCHEMATIC	
	6	1	D32803	COVER, TOP	
	5	1	D37807	PANEL, EXHAUST	

80	AR	905396	TAPE, TRANSFER, DOUBLE FACED	
79	2	905120	POLYESTER FILM, .015 THK (12.5" X 18")	
78				
77	4	540215	RIVET, BLIND, 1/8	
76	12	540212	RIVET, BLIND, 3/16	
75	3	532732	WASHER, BELLEVILLE, #1/2	
74	54	530076	WASHER, FLAT #3/8	
73	54	530075	WASHER, FLAT #5/16	
72	108	530073	WASHER, FLAT #10	
71	3	516022	NUT, HEX, 1/2-13	
70	6	505036	SCREW, OVAL HD, 82, 10-24 X .88	
69	108	523205	NUT, ASSEMBLED WASHER	
68	54	473042	SPRING, COMPRESSION	
67	1	469004	GROMMET	
66	54	461159	PIN, SPRING CLIP	
65	2	440108	HANDLE	
64	4	417074	CASTER	
63	6	411505	INSULATOR, STANDOFF	
62	14	411270	BUSHING, SNAP IN	
61	108	411182	TUBE, INSULATOR	
60	54	411181	TUBE, INSULATOR	
59	27	411145	TUBE, INSULATOR	
58	216	411141	TUBE, INSULATOR	
57	3.5"	408189	WIRE, ELECTRICAL, 1/0 AWG	
56	3FT	390025	TRANSFORMER, CURRENT	
55	2	371220		

REVISIONS			DATE	APPROVED
ECN NO.	REV	DESCRIPTION		
CD698	B	RELOCATED "SEE NOTE 3"	J.FLAUTO 5-17-04	J. HUDSON
CD809	D	ADDED "240/480V" IN TITLE BLK	MJ 10/01/04	J. HUDSON

ALL COMPONENTS ARE MOUNTED TO SUPPORT (ITEM 11) WITH 8-32 HDW UNLESS OTHERWISE SPECIFIED.



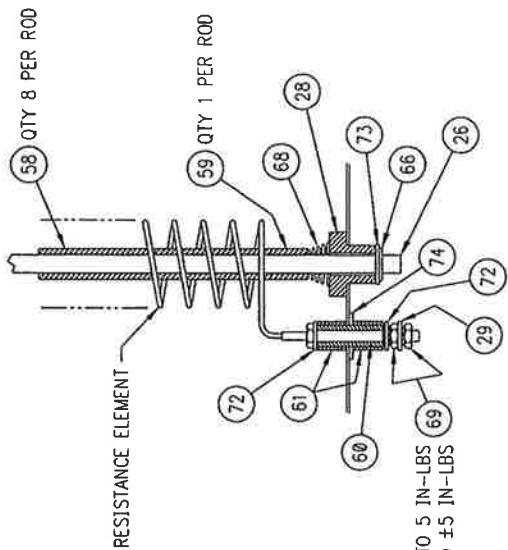
SEE DETAIL A

SEE NOTE 6

ATTENTION

MOUNT OVER CABLE CONNECTING F3-W3 WITH POLARITY DOT FACING W3 (SEE SCHEMATIC)

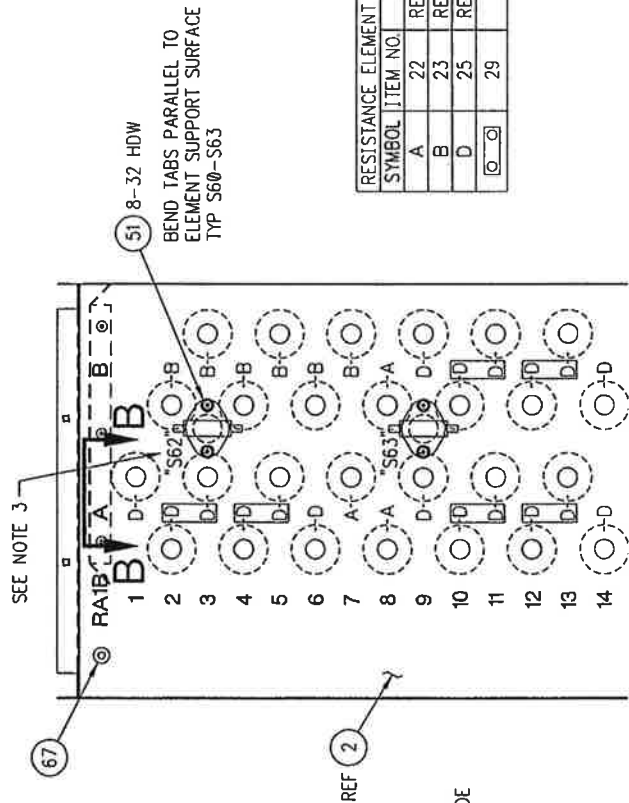
MOUNT OVER CABLE CONNECTING F1-W1 WITH POLARITY DOT FACING W1 (SEE SCHEMATIC)



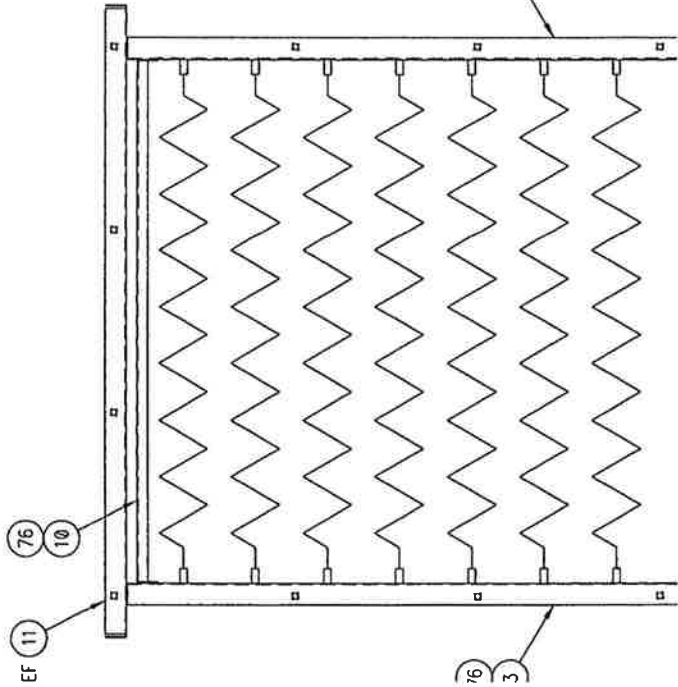
TORQUE INSIDE NUT UP TO 5 IN.-LBS
TORQUE OUTSIDE NUT TO 30 ± 5 IN.-LBS

SECTION B-B

SCALE: 5/8



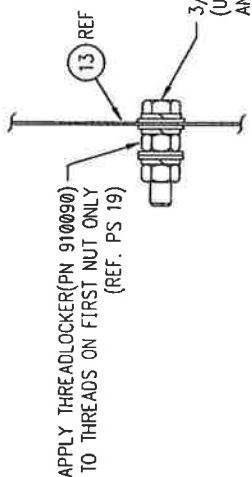
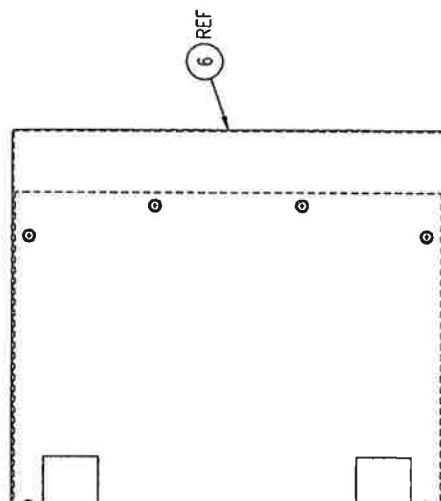
SOURCE ELEMENT AND BUS BAR CODE	SYMBOL	ITEM NO.	DESCRIPTION
A	22	RESISTANCE ELEMENT	
B	23	RESISTANCE ELEMENT	
D	25	RESISTANCE ELEMENT	
	29	BUS BAR	



RIVET TO BASE 2 FROM BOTTOM SIDE

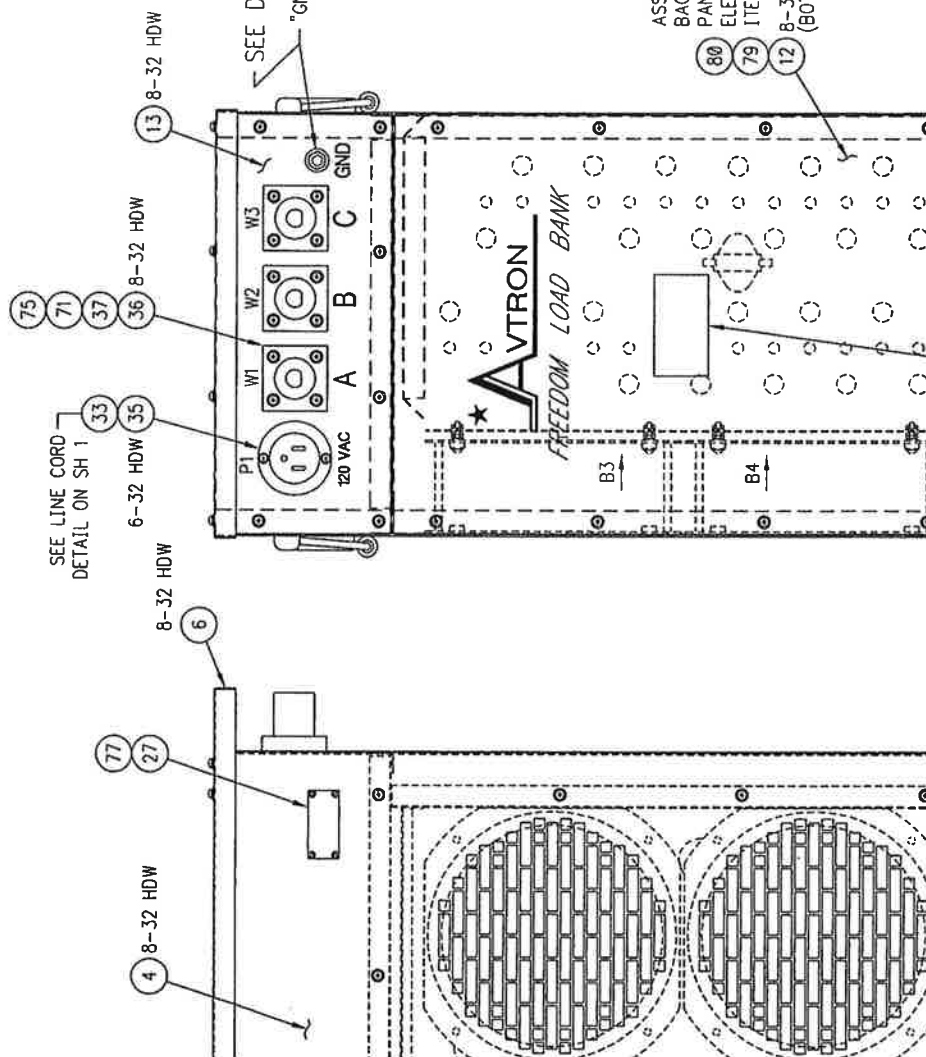
REVISIONS

ECN NO.	REV	DESCRIPTION	DATE	APPROVED
CD410	A	REVISED DETAIL D PER ECN	6/30/03	J. HUDSON
CD696	B	REVISED GND PICTORIAL ON RIGHT SIDE VIEW	5-17-04	J. HUDSON
CD809	D	REV "REF 8" IN DETAIL C; REV PICTORIAL & TITLE BLK W/ CHNG EFFECT SN. 169,170,173 & ABOVE	10/01/04	J. HUDSON

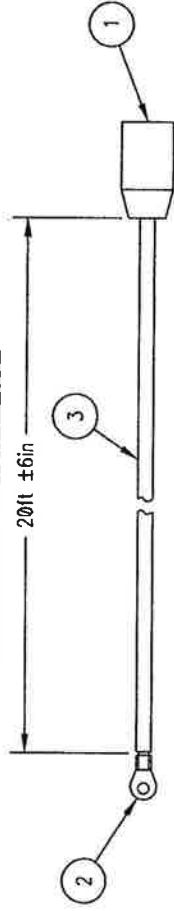


DETAIL D

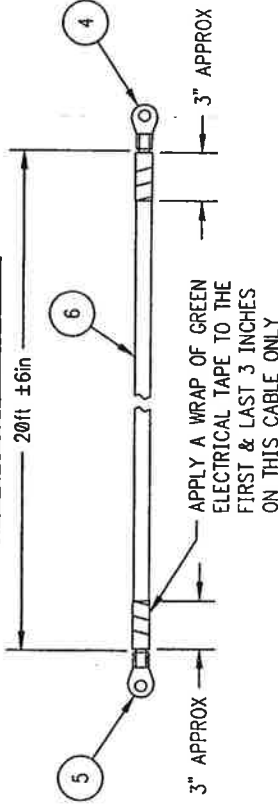
SCALE 5/8



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	CHECKED	DATE
		J. FLAUTO	J. FLAUTO	1/4/02
TOLERANCES:		J. FLAUTO	J. FLAUTO	1-7-02
DECIMALS .XXX± .015		J. HUDSON	J. HUDSON	1-7-02
ANGLES ±1° XX± .03		A. VYSOTSKY	A. VYSOTSKY	1/8/02
FINISH		NO REQ'D		
PAINT PER PS				
ZINC PLATE PER				
COAT PER PS				
ANODIZE PER				
OTHER				

★ AVTRON		MANUFACTURING, INC.	
7580 E. PLEASANT VALLEY ROAD INDEPENDENCE, OH 44131-5529		CABLE SET-20 FT (OPTION 1)	
IMF <input type="checkbox"/> PSF <input type="checkbox"/> PSF <input checked="" type="checkbox"/>		REV. L.W.	
SIZE	CAGE NO.	DRAWING NO.	
B	01014	B28571	
SCALE 1/1		MODEL LPH 105	SHEET 1 OF 1

AVTRON
7988 E. PLEASANT VALLEY ROAD
INDEPENDENCE, OH 44131-5529

CABLE SET-20 FT (OPTION 1)	SIZE	CAGE NO.	DRAWING NO.	REV. LTR.
	B	01014	B28571	
SCALE	1/1	MODEL	LPH 105	SHEET 1 OF 1

- REF: THIS CABLE SET IS FOR USE WITH THE LPH 105 LOAD BANK.
- PACKAGE ALL 4 CABLES TOGETHER AND PART MARK .12 MIN HIGH ON OUTSIDE OF PACKAGE.
- UNLESS OTHERWISE SPECIFIED THE ABOVE NOTES APPLY.

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION OF AVTRON MFG. INC. AND MAY NOT BE DISCLOSED TO OTHERS OR USED FOR MANUFACTURING PURPOSES WITHOUT THE WRITTEN CONSENT OF AVTRON MFG.

P/N 315001

P.S. #27054 m21

(12)

cam-lok®
ASSEMBLY INSTRUCTIONS
Series E1016 & E1018

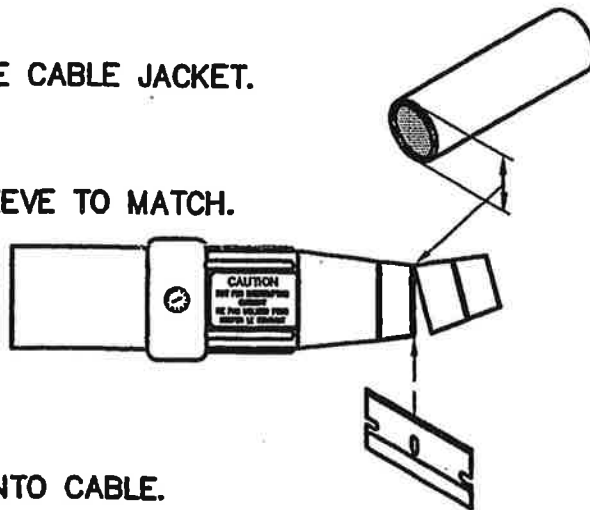
EB 9

Page 1

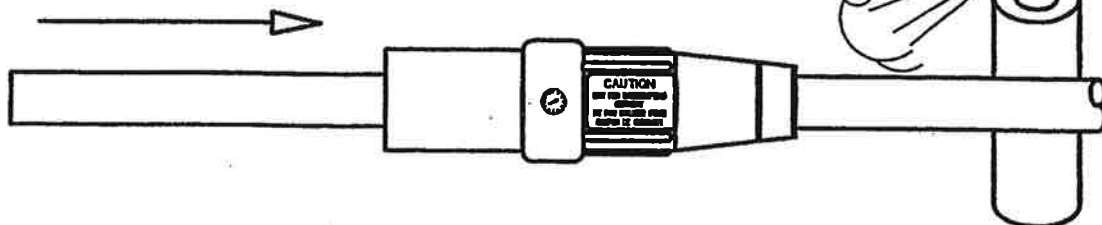
**NOTE: USE COPPER (CU)
CONDUCTORS ONLY.**

1. MEASURE CABLE JACKET.

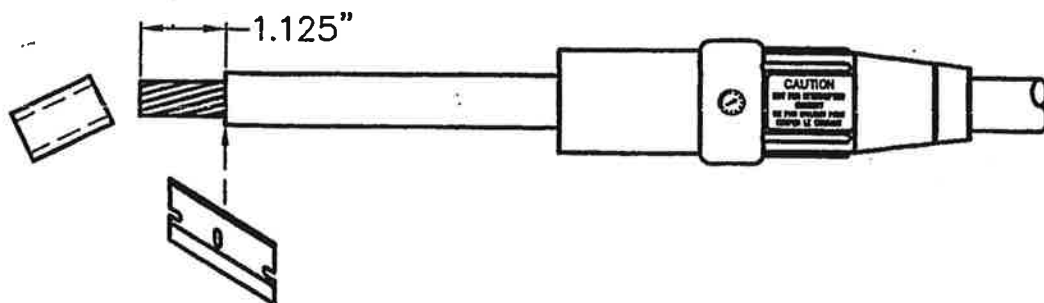
2. CUT SLEEVE TO MATCH.



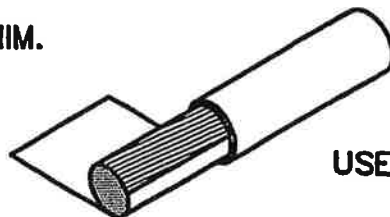
3. SLIDE ONTO CABLE.



4. REMOVE JACKET.



5. WRAP COPPER SHIM.



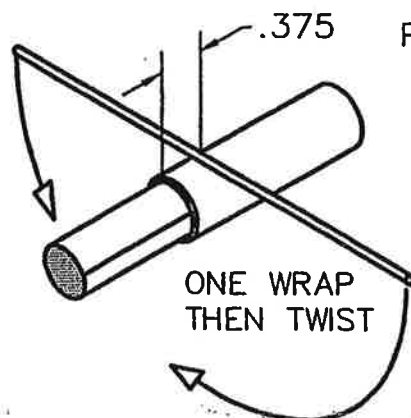
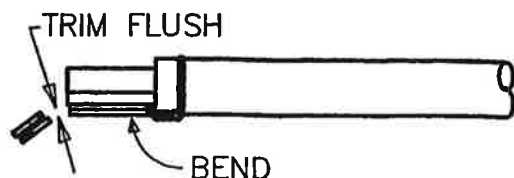
USE TWO FOR SMALLER CABLES.

cam-lok® ASSEMBLY INSTRUCTIONS Series E1016 & E1018

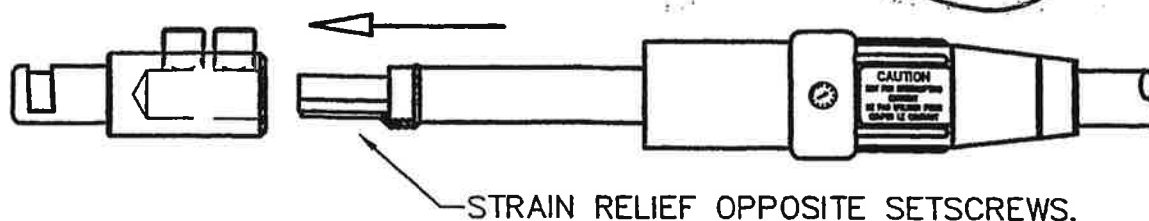
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Page 2

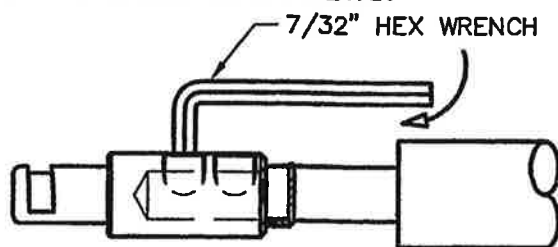
6. WRAP STRAIN RELIEF WIRE.



7. INSERT INTO CONTACT.



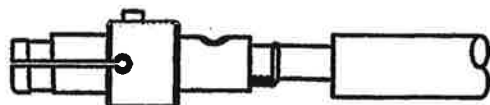
8A. TIGHTEN SETSCREWS.



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

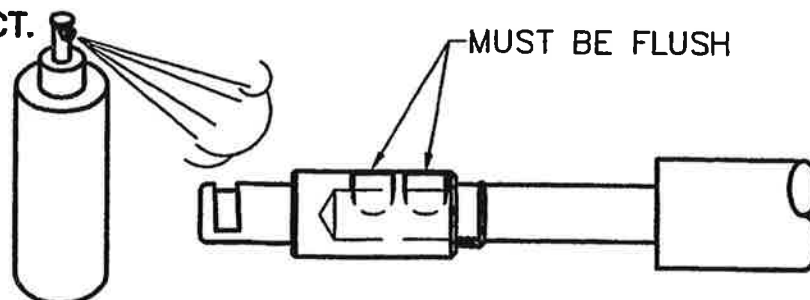
OR

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.

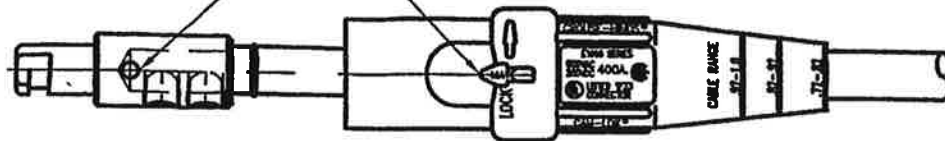


cam-lok® ASSEMBLY INSTRUCTIONS Series E1016 & E1018

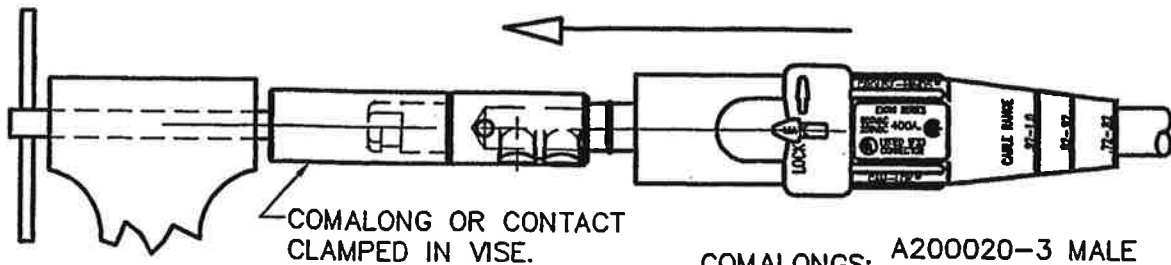
EB 9

Page 3

10. LINE UP PIN WITH ARROW.

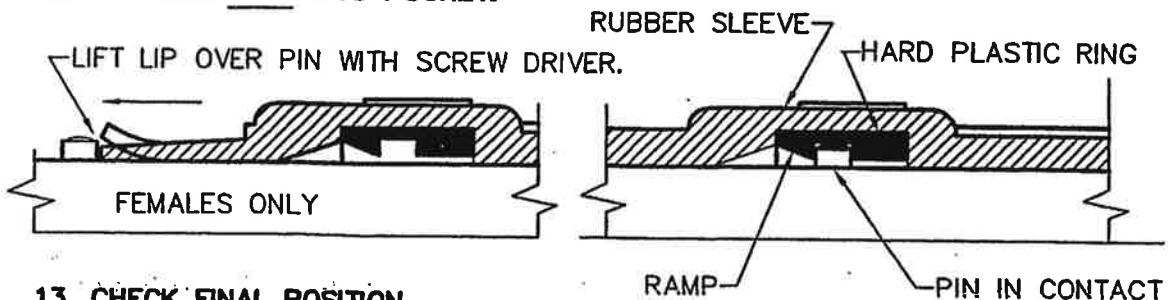


11. PUSH SLEEVE OVER CONTACT.

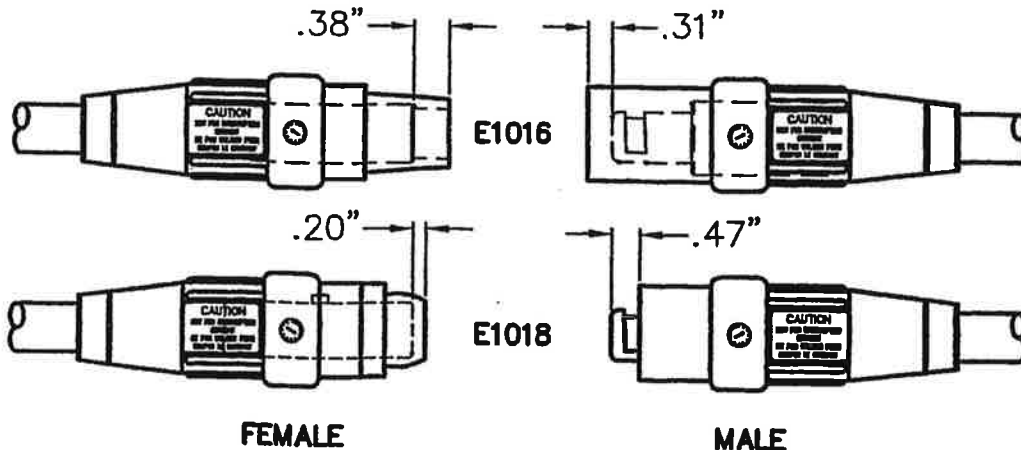


COMALONGS: A200020-3 MALE
A200020-4 FEMALE

12. PIN MUST POP INTO POCKET.



13. CHECK FINAL POSITION.



cam-lok®
ASSEMBLY INSTRUCTIONS
Series E1016 & E1018

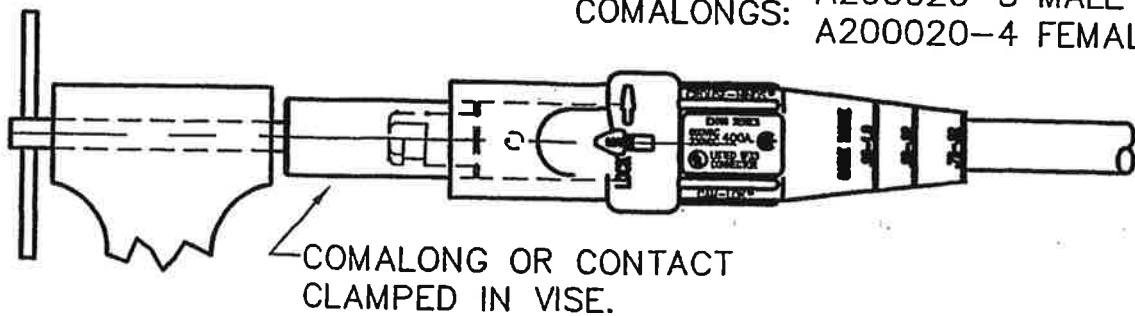
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Page 4

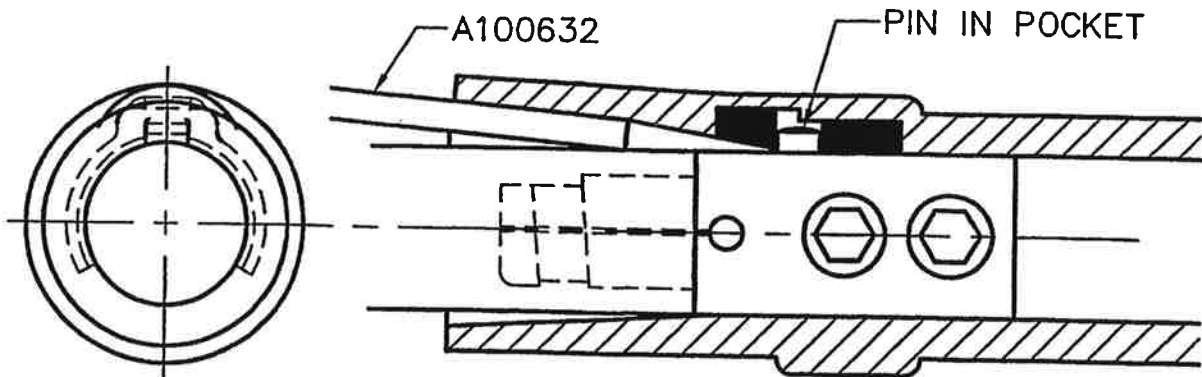
SLEEVE REMOVAL PROCEDURE

1. MATE WITH COMALONG OR CONTACT.

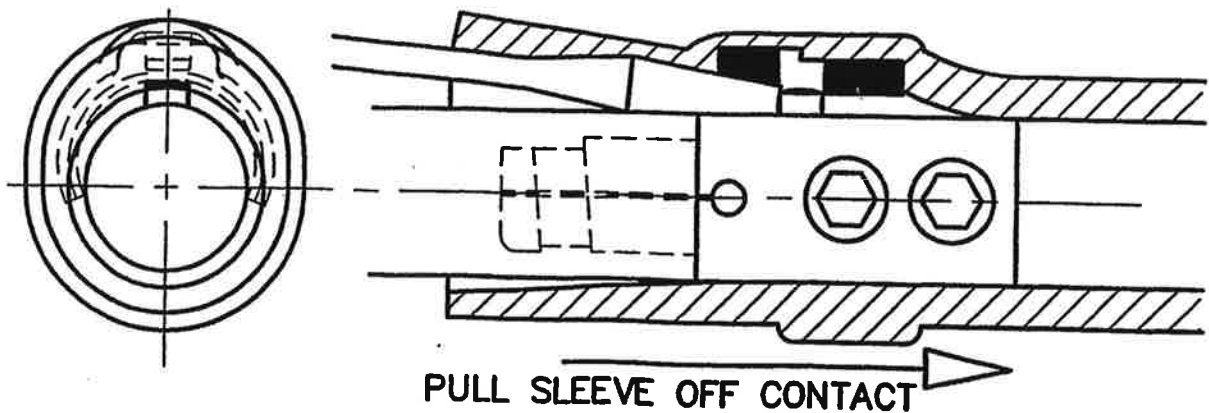
COMALONGS: A200020-3 MALE
A200020-4 FEMALE



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



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



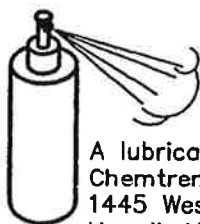
cam-lok® ASSEMBLY INSTRUCTIONS Series E1016 & E1018

EB 9

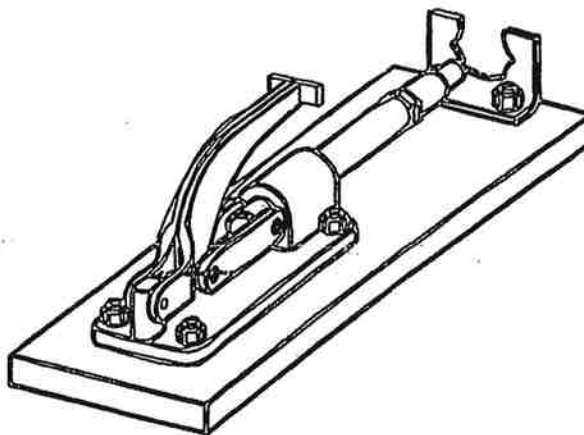
Page 5

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 instructions 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 28561
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 Avtron, 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.

