

POWEROHM INSTRUCTION MANUAL FOR FV1200 BRAKING RESISTOR



IMPORTANT: These instructions should be read thoroughly before installation. All warnings and precautions should be observed for both personal safety and for proper equipment performance and longevity. Failure to follow these instructions could result in equipment failure and/or serious injury to personnel. Braking resistors contain lethal voltages when connected to the inverter. It is very important to remove power to the inverter and the blower motor before installing or servicing this unit. Always allow adequate time after removing inverter power before touching any components.

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SAFETY POINTS

SAFETY PRECAUTIONS

The following instructions are general safety precautions that are not necessarily related to any specific part or procedure, and do not necessarily appear elsewhere in this publication. These precautions must be thoroughly understood and applied to all phases of operation and maintenance.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must at all times observe normal safety regulations. Do not replace components or make adjustments to equipment with inverter power turned on. To avoid casualties, always remove power to the entire drive system.

SHOCK HAZARD

Braking Resistors contain lethal voltages when connected to the inverter or braking module. Power to the inverter must be removed before servicing the braking resistor. Allow adequate time after removing power before servicing or touching any components. Consult your drive manufacturer for adequate discharge times.

DO NOT SERVICE OR ADJUST ALONE

Under no circumstances should any person reach into an enclosure for the purpose of service or adjustment of equipment except in the presence of someone who is capable of rendering aid.

SAFETY EARTH GROUND

An uninterruptible earth ground must be supplied from the main power source. Serious injury or death can occur if this grounding is

not properly supplied. Grounding of this equipment should be done by qualified personnel only and must be installed in accordance with all applicable national and local electrical codes and regulations.

CHEMICAL HAZARD

No chemicals are included in the manufacturing or operation of this resistor unit. There are no chemical hazards to consider.

EMERGENCY AID

Personnel working with or near high voltages should be familiar with modern methods of resuscitation.

SAFETY SYMBOLS

WARNING

Warning notes call attention to a procedure, which if not correctly performed could result in personal injury.

CAUTION

Caution notes call attention to a procedure, which if not correctly performed could result in damage to the resistor unit.



This symbol indicates that a shock hazard exists if the precautions in the instruction manual are not followed.



The caution symbol appears on the equipment indicating there is important information in the instruction manual regarding that particular area.



This symbol indicates that the unit radiates heat and should not be touched while hot.



NOTE: Calls attention to supplemental information.

WARNING STATEMENTS

The following safety warnings appear in the text where there is danger to operating personnel and are repeated here for emphasis.

WARNING

Disconnect unit from control power sources and the DC bus line voltages before any disassembly or service.

WARNING

Do not insert a screwdriver or any thin metal objects through the perforated cooling air grilles while the load is in operation. The fan blade and power within the unit could cause serious injury to personnel and damage to the unit.

WARNING

Do not remove the enclosure covers while resistor unit is in operation or operate with the covers removed. Units will not properly cool without covers and pose a shock hazard to personnel.

WARNING

Do not touch the upper enclosure surfaces while the resistor unit is in operation. Top enclosure surfaces and exhaust hood can reach temperatures in excess of 100°C when full power is applied to the resistor.

WARNING

Do not look into enclosure hood while in operation. Exhaust temperatures may reach 100°C when power is applied to load and debris may be present.

WARNING

Do not position the exhaust hood to blow on other equipment or material susceptible to excessive heat. Never direct exhaust air towards flammable materials.

CAUTION STATEMENTS

The following equipment cautions appear in the text whenever the equipment is in danger of damage and are repeated here for emphasis.

CAUTION

Air enters through louvered grilles at the bottom of the enclosure covers and exhausts through the top mounted exhaust hood. Blocking these openings will cause overheating and unit failure.

CAUTION

Do not apply more than the rated power continuously to the resistor. Excessive power will damage the internal resistor banks.

CAUTION

Confirm all control voltages before operation. Over-voltage will damage control components.

CAUTION

Confirm all resistor, bushing, and bus bar connections are properly tightened to required torque values. Loose connections will result in damage and danger to personnel.

CAUTION

Not using all four mounting holes when anchoring the enclosure will lessen wind load and mechanical integrity and may result in equipment damage or harm to personnel.

LINGUAL SAFETY STATEMENTS

LINGUAL GENERAL SAFETY STATEMENTS



USAGE: ANY USE OF THIS INSTRUMENT IN A MANNER NOT SPECIFIED BY THE MANUFACTURER MAY IMPAIR THE INSTRUMENTS SAFETY PROTECTION.

USO

EL USO DE ESTE INSTRUMENTO DE MANERA NO ESPECIFICADA POR EL FABRICANTE, PUEDE ANULAR LA PROTECCIÓN DE SEGURIDAD DEL INSTRUMENTO.

BENUTZUNG

WIRD DAS GERÄT AUF ANDERE WEISE VERWENDET ALS VOM HERSTELLER BESCHRIEBEN, KANN DIES GERÄTESICHERHEIT BEEINTRÄCHTIGT WERDEN.

UTILISATION

TOUTE UTILISATION DE CET INSTRUMENT QUI N'EST PAS EXPLICITEMENT PRÉVUE PAR LE FABRICANT PEUT ENDOMMAGER LE DISPOSITIF DE PROTECTION DE L'INSTRUMENT.

IMPIEGO

QUALORA QUESTO STRUMENTO VENISSE UTILIZZATO IN MODO DIVERSO DA COME SPECIFICATO DAL PRODUTTORE LA PROZIONE DI SICUREZZA POTREBBE VENIRNE COMPROMESSA.



SERVICE: SERVICING INSTRUCTIONS ARE FOR USE BY SERVICE - TRAINED PERSONNEL ONLY. TO AVOID DANGEROUS ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING UNLESS QUALIFIED TO DO SO.

SERVICIO

LAS INSTRUCCIONES DE SERVICIO SON PARA USO EXCLUSIVO DEL PERSONAL DE SERVICIO CAPACITADO. PARA EVITAR EL PELIGRO DE DESCARGAS ELÉCTRICAS, NO REALICE NINGÚN SERVICIO A MENOS QUE ESTÉ CAPACITADO PARA HACERLO.

WARTUNG

ANWEISUNGEN FÜR DIE WARTUNG DES GERÄTES GELTEN NUR FÜR GESCHULTES FACHPERSONAL. ZUR VERMEIDUNG GEFÄHRLICHE, ELEKTRISCHE SCHOCKS, SIND WARTUNGSARBEITEN AUSSCHLIEßLICH VON QUALIFIZIERTEM SERVICEPERSONAL DURCHZUFÜHREN.

ENTRETIEN

LE'EMPLOI DES INSTRUCTIONS D'ENTRETIEN DOIT ETRE RÉSERVÉ AU PERSONNEL FORMÉ AUX OPÉRATIONS D'ENTRETIEN. POUR PREVENIR UN CHOC ELECTRIQUE DANGEREUX NE PAS EFFECTUER D'ENTRETIEN SI L'ON N'A ÉTÉ QUALIFIÉ POUR CE FAIRE.

ASSISTENZA TECNICA

LE ISTRUZIONI RELATIVE ALL'ASSISTENZA SONO PREVISTE ESCLUSIVAMENTE PER IL PERSONALE OPPORTUNAMENTE ADDESTRATO. PER EVITARE PERICOLOSE SCOSSE ELETTRICHE NON EFFETTUARE ALCUNA RIPARAZIONE A MENO CHE QUALIFICATI A FARLA.

INSPECTION AND UNPACKING

Upon receipt of your Powerohm Braking Resistor, be sure to carefully unpack the unit and inspect the unit carefully for any shipping damage. Check for loose, broken or otherwise damaged parts due to shipping. If damage is noticed, do not unpack the unit. Immediately notify Powerohm Resistors Inc. and report any shipping damage to the freight carrier.

Be sure to verify that the part number and ratings listed on the nameplate match the order specification and the capabilities of the drive system. *The ratings listed on the nameplate are critical – installing and energizing the incorrect part number could damage the resistor and drive system*

If the unit is not damaged, unpack the equipment and remove protective stretch wrap. Remove all covers and inspect all of the components for visual signs of damage. Immediately notify the freight carrier and Powerohm Resistors, Inc. of equipment damage or missing parts.

Reinstall packing materials for storage with exception of stretch wrap. **Do not store the unit outdoors with the protective plastic in place.**



NOTE: Do not reinstall or reapply protective stretch wrap. This material is meant for shipping protection only. Prolonged storage in stretch wrap may cause condensation damage to powder coat, painted, or mill galvanized finishes.

PRODUCT OVERVIEW

AC variable frequency drives are commonly used with general purpose AC induction motors to form reliable variable speed drive systems. Problems with these drive systems can occur when an application requires a deceleration rate faster than what can be managed by the drive alone, or when motor speeds exceed the synchronous speed set by the output frequency of the drive (which is called an overhauling load condition). Both of these conditions create regenerated power which flows from the motor back into the drive, causing its DC Bus to rise. To manage the regenerated power and avoid shutting the drive down due to an over-voltage trip, this power must be dissipated by an external braking resistor.

Powerohm Force Air Cooled Braking Resistors can be used in conjunction with any AC drive and braking module to greatly improve the performance of the drive system. The use of a Powerohm Braking Resistor increases the braking torque capability of a variable frequency drive, allowing faster and more controlled deceleration times.

THEORY OF OPERATION

GENERAL

Powerohm designs are matched to Drive and Braking Module characteristics along with customer specifications, providing the maximum torque needed for energy dissipation resulting from "torsion braking" of the Top Drive Works or the "overhauling braking" of the Draw Works. The braking resistor dissipates the regenerated power to keep the bus voltage from exceeding the rated voltage limit of the drive. The resistance determines the braking torque and thus the deceleration rate of the motor.

EQUIPMENT COOLING

The resistors used in the unit are a series of punched grids situated in a vertical position within their housing. When the unit is in operation, a blower located at the bottom of the unit draws air into the bottom grille openings and directs it over the resistor bank network. The heat, developed in the resistors from dissipation of the regulative braking energy, is carried off by the flow of air over the resistors surface. The hot air is then exhausted through the top mounted exhaust hood.



WARNING

Do not look into enclosure hood while in operation. Exhaust temperatures may reach 100°C when power is applied to load and debris may be present.

Powerohm Series FV1200 is a force air cooled, high powered Braking Resistor designed for outdoor use. The highly efficient design and fan motor assembly provide a relatively low noise solution featuring differential air pressure and thermal monitoring options. Simple to operate, these units should provide years of operation yet are field repairable in the event of failure of the load resistor or other components.

These units are rectangular in shape. They are supported on the bottom by formed angles with integrated fork truck tines. The terminal box cover is removable for accessing power connections and safety circuits. Other side covers can be removed for maintenance and repair access. The top and bottom of the units allow for direct forced air cooling of the resistors. The bottom mounted fan assembly draws air into the side mounted intake louvers, blowing it through the resistor banks, and exhausting through the top mounted hood assembly.

ELECTRICAL AND MECHANICAL RATINGS

Power Rating - Forced Air Cooled

Continuous Duty: 1200 KW

Power Rating – Convection Cooled

Continuous Duty: 100 KW

Blower Ratings

Normal Line Voltage:

380/415VAC, 50HZ for
Powerohm Part No. FV1200-x-B

460VAC (506VAC MAX.), 60HZ for
Powerohm Part No. FV1200-x-C

575VAC (632VAC MAX.) for
Powerohm Part No. FV1200-x-D

Horsepower 10
Phases: 3

Operating Temperature

Ambient Temperature: -20°C to +55°C

Enclosure Data

Dimensions (US Standard): 41" wide x 48" deep x 102" high
Approximate Weight: 2400 lbs
Finish: ANSI 61 for FC1200V-1-x
304SS for FC1200V-2-x
316SS for FC1200V-3-x

Safety Circuit Contact Ratings

Pressure Differential:
Temperature Switch (N.C.)

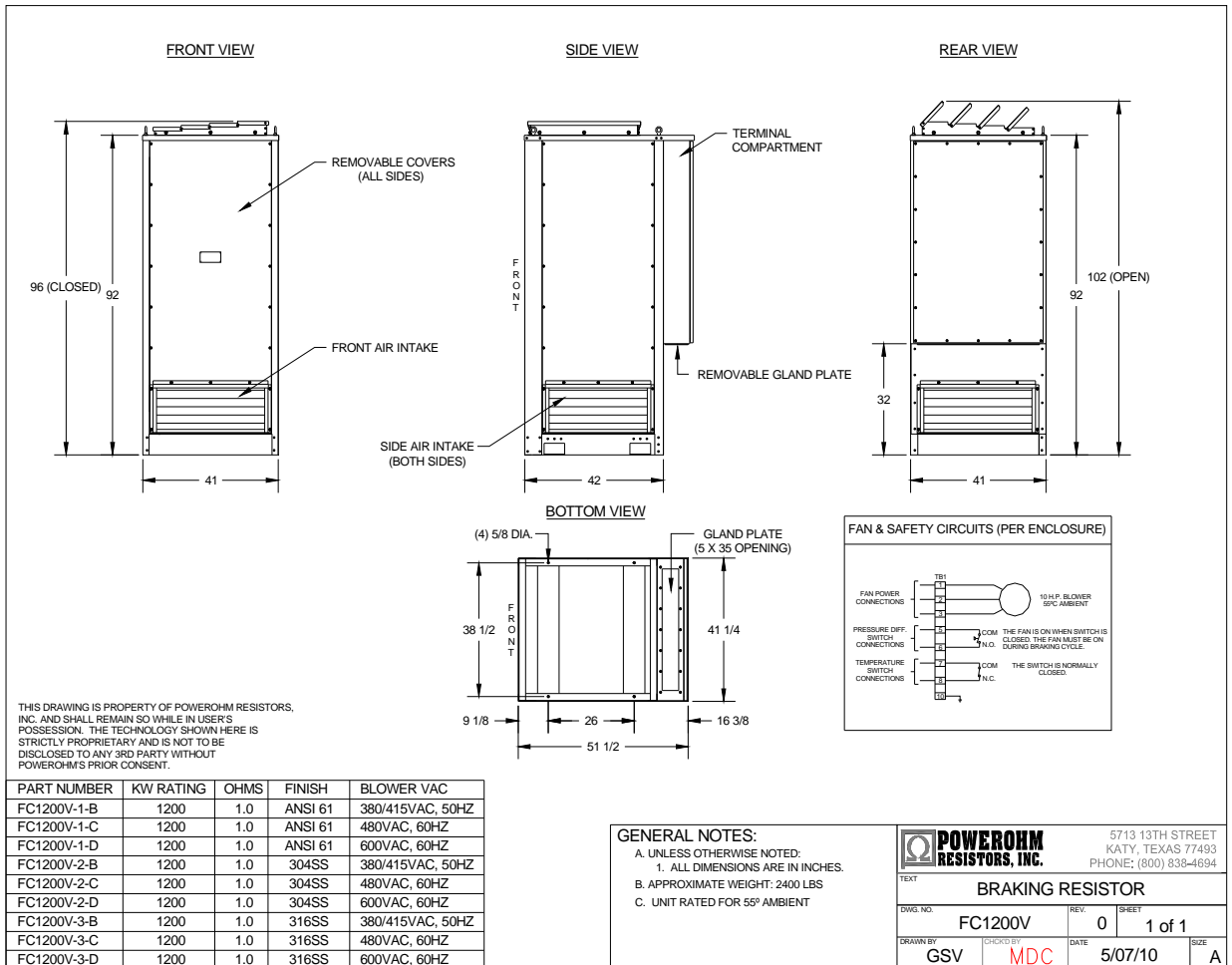
277VAC / 15A maximum
240VAC / 5A maximum

Environmental Parameters

Wind Loading:
Seismic Zone Rating:

120 MPH
Zone 4

EQUIPMENT DRAWING



ENVIRONMENTAL CONDITIONS

Environmental Parameters

Wind Loading:	120 MPH
Seismic Zone Rating:	Zone 4
Ambient Temperature:	-20°C to +45°C

- The equipment is intended for outdoor installation and operation. The surrounding air must be free of contaminants or particles that could be drawn into the air intakes.
- These load resistors are fan cooled have no intermediate dielectric fluids and require no cooling water hookups.
- The unit should be placed where adequate space is available for air circulation. Do not enclose the unit in a small room or within 12 inches of other surfaces that may prohibit proper ventilation. In small rooms or restricted areas, the heat given off by the unit may increase the ambient temperature to an unacceptable level for sufficient cooling of the resistors and surrounding equipment.



WARNING


Do not touch enclosure surfaces while the resistor unit is in operation. Surfaces can reach temperatures in excess of 100°C when power is applied to load.

EQUIPMENT INSTALLATION

EQUIPMENT PLACEMENT

- The enclosure should be mounted on a level and solid surface with a minimum clearance of twelve inches (12") on any side of the enclosure for proper cooling.
- The terminal compartment of the enclosure should face outward for accessibility to controls wiring and resistor terminals with a minimum of thirty inches (30") from any solid surface .
- The top mounted exhaust hood should blow to open air with no restrictions, redirection, or threat to personnel or other equipment.

 NOTE: This load resistor is designed for outdoor use and due to heat produced during operation should not be mounted indoors around other control components.


 NOTE: All clearances are recommended factory minimums. Clearances less than specified should be discussed with the factory before mounting.


CAUTION


Air enters through louvered grilles at the bottom of the enclosure covers and exhausts through the top mounted exhaust hood. Blocking these openings will cause overheating and unit failure.

EQUIPMENT LOCATION

- Do not install top mounted exhaust hood prior to setting and anchoring the enclosure as damage may occur.
- There are four (1-1/2") lifting eyes furnished on the top four corners for setting with a crane.
- Integrated fork truck tine receptacles are located in the bottom of the enclosure for setting with skid loading equipment.

 NOTE: The enclosure is designed to be lifted using all four lifting eyes. Ensure all lifting eyes are utilized.

 NOTE: Insure the fork truck tines are pushed completely through the enclosure to prevent damage to the enclosure bottom.

 NOTE: To avoid damage to the enclosure and internal components, do not lift the enclosure in any manner with covers removed.


EQUIPMENT MOUNTING

- There are four (4) mounting holes located on flanges at the bottom of the enclosure for anchoring to the mounting surface. The (5/8" DIA.) holes are located inside of the fork truck tine receptacles.
- Torque all mounting bolts to a minimum of 50 ft/lb.

CAUTION

Not using all four mounting holes when anchoring the enclosure will lessen wind load and mechanical integrity and may result in equipment damage or harm to personnel.

- After the enclosure is securely mounted, remove covers and ensure all packing materials and any other debris are cleared. Reinstall covers and torque bolts to 30 ft/lb.
- With enclosure securely anchored, install the top mounted exhaust hood. Ensure gasket material is in place before setting hood.
- Insert and hand tightening only all of the provided hood mounting hardware. With all hardware installed and hood aligned properly, torque mounting bolts to 30 ft/lb.

 NOTE: To torque hardware prior to complete installation may cause difficulty installing remaining hardware and aligning hood.

POWER CONNECTION ACCESS

- A removable gland plate is provided on the bottom of the terminal compartment for customer installed knockouts and cable bushings.
- Remove the front cover of the terminal compartment for access to resistor terminals and circuit board for the fan and safety circuits.

 NOTE: Front and side cover removal is not required for power connections.

FAN AND SAFETY CIRCUIT CONNECTION

- A terminal block is provided for connecting the blower motor, pressure differential switch, and temperature switch.
- See the wiring diagram on Page 12 detailing the Fan & Safety Circuits.
- A standard slotted screwdriver is required for connection. Hand-tighten lugs only. Over torque will strip connection lugs and may void termination.



CAUTION

Confirm all control voltages before operation. Over voltage will damage control components.



WARNING

Connecting powered control leads to terminal block may result in component damage or pose a shock hazard to personnel.

RESISTOR CONNECTION

- Resistor terminals are located on the back wall of the termination compartment. The terminal tags (e.g. R1, R2) for customer connection are labeled near the terminations
- All resistor terminals are a standard NEMA 2-hole configuration. Install connector using the furnished stainless steel terminal hardware. Torque bolts to 50 ft/lb.



NOTE: After connecting power leads to marked resistor terminals, use torque wrench to ensure all resistor terminal hardware is properly tightened.



CAUTION

Confirm all resistor, bushing, and bus bar connections are properly tightened to required torque values. Loose connections will result in damage and danger to personnel.



WARNING

Loose resistor terminal connections may promote arching to enclosure, posing a shock hazard.

OPERATING INSTRUCTIONS

GENERAL

- Ensure all connections are properly tightened and all covers are installed.
- Power On/Power Off switching is not required for operation.
- As all components of the braking resistor are controlled remotely, the presence of an operator is not required.
- The following Cautions and Warnings should be strictly enforced:



CAUTION

Operation of the unit with any covers removed will disrupt air flow and allow debris to pass through resistors possibly damaging equipment.



WARNING

Operation of the unit with any covers removed will pose a shock hazard to personnel.



WARNING

Do not look into enclosure hood while in operation. Exhaust temperatures may reach 100°C when power is applied to load and debris may be present.



WARNING

Do not touch upper enclosure surfaces and exhaust hood while the resistor unit is in operation. Surfaces can reach temperatures in excess of 100°C when full power is applied to load.



WARNING

Do not insert a screwdriver or any thin metal objects through the perforated cooling air grilles while the load is in operation. The power within the unit could arc over and will cause serious injury to personnel and damage to the unit.



WARNING

Do not operate under load without fan blower in motion. Immediate equipment damage may result.

MAINTENANCE

TROUBLESHOOTING



WARNING

Disconnect from all power sources prior to any inspection, service, or cleaning. Electric Shock Hazard exists while connected.

For corrections requiring repair or replacement of components, contact the factory immediately for further instruction. Only those functions within the scope of normal maintenance are listed. This manual cannot list all malfunctions that may occur, or corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify the factory.

<u>PROBLEM</u>	<u>POSSIBLE CAUSE</u>	<u>POSSIBLE CORRECTION</u>
Blower not operating	No power to motor	Loose connection at terminal block. Motor power source disconnected.
Resistor Open	Loose Bus Bar	Tighten all bus bars.
	Resistor Element Burned	Replace failed resistor bank.
Temperature Switch Trip	Resistor over temperature	Ensure air intake and exhaust are clear of debris or blockage
		Check blower operation.
Pressure Differential Trip	Loose connections	Check all connections.
	Intake tubing obstruction	Remove and clean tubing.

PREVENTATIVE MAINTENANCE



WARNING

Disconnect from all power sources prior to any inspection, service, or cleaning. Electric Shock Hazard exists while connected.

For optimum performance and service life, preventative maintenance is a key factor. It is recommended that during scheduled inactiveness, reactivation from storage, or unit relocation the following maintenance steps are performed:

1. The outside surface of the unit should be wiped or blown free of dust and dirt. It is safe to pressure wash the enclosure. Ensure air intake and exhaust areas are clean and debris free. Blast or sand any noticeable corrosion areas and cover with a suitable paint or coating.
2. Open terminal compartment and ensure all resistor terminal connections including wire, bus jumper, and bushings are tightened to 50 ft/lb. Inspect bushings and insulators for cracks. Ensure all fan and safety component connections are tight at terminal board. If required, it is safe to blow any dust from this compartment. Reinstall terminal compartment cover before proceeding with enclosure maintenance.
3. If resistor elements are extremely dirty, elements can be pressure washed. Pressures up to 2000 PSI at a distance of two feet or greater may be used when cleaning the resistor elements. Pressure should be reduced to less than 1000 PSI for the connection points and the mica insulators and the distance from the nozzle to any insulator should not be closer than four feet to prevent damage.
4. Clean grey porcelain insulators by removing the four rectangular covers located in the enclosure bottom to insure proper insulation resistance. Upper support insulators should also be cleaned as needed to prevent any tripping of the ground fault monitor.



CAUTION

Do not pressure wash the inside of the terminal compartment as damage may occur to the terminal strip wiring. If splashed, ensure entire compartment is dry before covering.



WARNING

Pressure washing terminal compartment may lead to condensation and promote internal arcing.

5. Remove front and side covers of the resistor enclosure. Inspect air intake screening on the side covers. Blow or brush away any dirt or debris noticeable on the filter screens. Ensure louvers are functional and free of debris.
6. Inspect fan blades and motor, clearing any debris and blowing free of dust. Check all hardware for tightness.
7. Inspect resistor elements ensuring all hardware is tightened and elements are clear of any debris
8. Inspect exhaust hood, clearing any debris. Ensure all rain gutters are intact. Check that hood hardware is tightened to 30ft/lb.
9. Reinstall covers ensuring gasket materials are in place and hardware is properly tightened.

STORAGE

- If the unit is to be unused or stored for any length of time indoors, cover the unit to prevent buildup of dirt. If stored outdoors, do not cover with plastic that may create condensation and enclosure corrosion or staining.
- There is no special preparation for the unit.
- Storage temperatures should remain - 40° to 70°C (-40° to 158°F).

SHIPPING

- Attach the enclosure to a skid constructed with minimum board thickness of two inches (2”) to properly support the weight. Use four (4) lag bolts in the mounting holes provided at the entrance to the integrated fork truck tine receptacles.
- Remove top mounted exhaust hood and store for return usage or, if required, ship on a second skid.

☞ NOTE: Do not ship with hood installed as enclosure damage may occur.

- Secure all loose parts in the bottom of the enclosure and reinstall cover.
- Pack and seal securely in a sturdy wooden crate or equivalent, with sufficient padding to avoid shock damage.
- If returning to the factory, an R.M.A. Number will be required or the shipment will be refused at the dock.
-

CUSTOMER SERVICE

Any maintenance or service procedure beyond scope of those provided in this manual should be referred to a factory engineer. All resistors returned for service must be shipped prepaid and to the attention of the factory engineer in which return and service were discussed.

CONTACT INFORMATION

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