



MAINTENANCE MANUAL



ER - 230 ER - 460



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Introduction

The ER 230 / ER-460 is an all electric stationary refrigeration unit. It uses 3-phase power and R452a refrigerant for cooling and heating. The ER 230 / ER-460 is a remanufactured reefer with a new scroll compressor, fan motor, and controls. That results in a reliable, quiet, highly efficient, high capacity unit with low maintenance.

Safety

Unit uses high voltage and high pressure refrigerant. The unit may start at any time without warning if turned on. Use caution around moving parts, electrical, and refrigeration components. Only qualified persons should perform maintenance and inspection of unit.

Control

A solid state, totally programmable, control thermostat features separate and adjustable cool and heat set points and adjustable differentials for customizing temperature control. It also is able to display Fahrenheit or Celsius cargo temperature and has an internal "safety lock" switch to prevent tampering with settings.

Defrost

Defrosting of the evaporator coil can be indicated in three ways: 1. Timer - clocks compressor run time. 2. Air differential switch. 3. Manual switch. Defrost is terminated by a temperature switch on the evaporator coil.

Protection Devices

The scroll compressor has a phase detect module that will stop operation if the rotations is backwards (this is a common situation during initial installation/power up) and turn on the fault light. Compressor and fan motor each have overload switches for high amperage prevention. High and Low pressure switches protect the refrigeration system.

Note! Do not operate the scroll compressor in a vacuum during maintenance procedures. Compressor Damage will Result!

Unit Identification

Serial Plate is located on unit frame below control switch

Safety Precautions

General Practices

1. ALWAYS WEAR GOGGLES OR SAFETY GLASSES. Refrigerant liquid can permanently damage the eyes.
2. Never operate the unit with the compressor discharge closed.
3. Keep your hands clear of the fans and belts when the unit is running.
4. Never apply heat to a sealed refrigeration system or container.
5. Fluorocarbon refrigerants, in the presence of an open flame or electrical short, produce toxic gases that are severe respiratory irritants capable of causing death.
6. Use caution when working around exposed coil fins. The fins can cause painful lacerations.
7. Use caution when working with a refrigerant or refrigeration system in any enclosed or confined area with a limited air supply (for example, but not limited to, a trailer, container, or in the hold of a ship). Refrigerant tends to displace air and can cause oxygen depletion which may result in death by suffocation.
8. High Voltage

Although fluorocarbon refrigerants are classified as safe refrigerants, certain precautions must be observed when handling them or servicing a unit in which they are used. When released to the atmosphere from the liquid state, fluorocarbon refrigerants evaporate rapidly, freezing anything they contact.

Avoid refrigeration oil contact with the eyes. Avoid prolonged or repeated contact of refrigeration oil with skin or clothing. Wash thoroughly after handling refrigeration oil to prevent irritation.

This is a small list of the potential hazards – but not an exhaustive list – please be aware and use safe practices when operating or working on equipment.

Specifications/Components

Compressor	Copeland™ Scroll With Phase Detect. Phase Detect Module - 208-230 V.A.C. only Oil Capacity 140 oz. - Thermo King™ Part number 203-0964 ester oil. Liquid Injection*
Refrigerant	18 lbs-R452a
Fan Motor	3HP-208-230 V.A.C. / 460-480 V.A.C. RPMS -1735 Fan cooled. Totally enclosed Motor Rotation - Clockwise Facing Pulley
Defrost Timer	Clock-208-230 V.A.C. / 460-480 V.A.C. Switch - 24 V.A.C. - Adjustable
Voltage	208-230 V.A.C. 3 Phase standard
Optional	460-480 V.A.C. 3 Phase Note: Units cannot be switched for high - low voltage
Control Voltage	24 V.A.C.
High Pressure Cut Out	Normally closed Opens at 470 PSI Reset at 375 PSI
Low Pressure Cut Out	Normally closed Opens at 5 to 11 in vacuum Resets at 4 to 7 psi
Suction Pressure Regulator	35 PSI
Defrost Air Switch	1.0 inches of water column
Supply Power Requirements	208-230 V.A.C. - 60 AMP or 460 V.A.C.-30 AMP
Compressor and Fan Overload Protection	Manual Reset
Pilot Solenoid	24 V.A.C.

Unit Description

The ER 230 / ER-460 is a one piece, self contained, all electric, refrigeration unit. It heats and cools with R452a Refrigerant.

The ER 230 / ER-460 starts and stops automatically to maintain temperature in cargo area.

Temperature control is fully adjustable in cool, heat, and null cycles. -20 degrees to 90 degrees Fahrenheit. Temperature is selectable in Celsius or Fahrenheit.

Phase Detect Module Monitors Compressor rotation and prevents compressor operation if incorrect (phase fault light will come on, fan motor and compressor will not run).

Defrost can be initiated in 3 ways: Manual switch. Air Differential Switch, and Timer. Defrost is terminated by an evaporator temperature switch. Defrost can be initiated only if evaporator temperature is below 37 Deg. F. Defrost timer clocks compressor run time (not time of day).

Fan Motor turns off in defrost cycle to keep heat in evaporator coil and drip pan. Length of defrost cycle is determined by quantity of Ice/Frost on coil and cargo temperature.

Compressor and Fan overload switches work together to: Protect compressor and or fan from high amp situation. Prevent Compressor operation if fan is disabled.

Liquid injection is controlled by feeler bulb in compressor head.

Control Voltage is supplied by a step down transformer in control box.

Control wiring Logic and identification is similar to transport refrigeration units.

Maintenance Schedule

Bi-Monthly Inspection

- Adjust or Replace Fan Belt.
- Visually inspect condenser and evaporator coils for dirt or debris. Clean if necessary.
- Operate in cool for 10 minutes. The ball in the receiver tank sight glass should be floating at the top.
- Listen for unusual noises or vibrations etc.
- If Evaporator is below 35 deg. F (45 deg. F cargo) initiate manual defrost.
- The fan should stop and the defrost light comes on. Let defrost terminate.
- Check Compressor oil level. The oil should be visible in the sight glass. (while running).
- Check indicator lights: cool, defrost, heat, unit-on.
- Check for loose or broken items.
- Inspect Wiring for damage.

6 Month Inspection

- Do Bi-Monthly Inspection.
 - Clean condenser coil.
 - Clean/check defrost drain tubes.
 - While Operating use infrared temp device, check compressor and fan contactors for abnormal temperature.
- *CAUTION! High voltage is present.**
Use proper Procedures! If abnormal, disconnect power to unit and tighten/repair connections.

1 Year Inspection

- Do 6 month inspection
- Check air switch operation and setting - 1.0.
- Install refrigeration service gauges and check operation in cool, heat, and defrost.
- Check suction pressure regulator setting - 35 psi.
- Inspect fan shaft for leakage or bearing noise.

***** Note: do not operate scroll compressor in a vacuum!**

Maintenance General

Use diagnosing and repair procedures common to transport refrigeration units. Only qualified persons should perform maintenance on this unit. Use caution around high voltage and moving parts.

Operating Instructions

To operate the unit turn the on/off switch on, set temperature control thermostat to desired temperature. See decal on unit for proper procedure or refer to the same information following. Unit will operate to set point and cycle off. As the temperature drifts away from set point, the unit will restart (subject to programmed differential).

ER 230 / ER-460 - ELECTRONIC TEMPERATURE CONTROL

WHEN THE SETPOINT NEEDS TO BE CHANGED, THE SETTING FOR HEAT AND FOR COOL BOTH NEED TO BE ADJUSTED. THESE TWO SETTINGS ARE CALLED- S1 (COOL) AND S2 (HEAT).

KEEP DIFFERENTIAL (DIF) SETTING ON COOL AND HEAT (5 DEG.). KEEP THE "STAGE" SETTING- C1 (COOL MODE), AND H2 (HEAT MODE). THE HEAT SET POINT (S2) SHOULD ALWAYS BE 3DEG. LOWER THAN THE COOL SET POINT (S1).

TO CHANGE THE SETPOINTS, SCROLL THRU THE SCREENS USING THE "SET" KEY AS SHOWN BELOW AND CHANGE ONLY THE SI AND S2 SCREENS. NOTE; THERE IS NO "ENTER OR LOAD" BUTTON. MAKE THE CHANGE WITH THE UP OR DOWN KEY AND MOVE TO THE NEXT SCREEN OR STOP AND IT WILL ACCEPT THE CHANGE AND RETURN TO THE "BOX TEMP" SCREEN. THE SECOND SCREEN F/C IS FAHRENHEIT/CELSIUS.

Cooler or refrigerate

BOX TEMP—F—SI—DIF (to 5)—Cl—DI (to 0)—S2—DIF2 (to 5)—H2—D2 (to 0)—BACK TO BOX TEMP

COOL S/P
SELECT

HEAT S/P
SELECT

Example: setpoint of 38 degrees with warm ambient (outside temp)

Set S1 at 38 deg.

Set S2 at 35 deg.

Unit will cool to 38 deg. and cycle off. As the temperature warms up in the trailer, the unit will restart when the cool differential is reached. (5 deg. above setpoint)

If it is a cold ambient, the unit will heat to 35 deg. and cycle off. It will restart when the heat differential is reached. (5 deg. below heat setpoint)

Frozen

Example: setpoint of 0 degrees with warm ambient (outside temp.):

Set S1 at 0

Set S2 at -3

Deep Frozen

Example: setpoint of -10 degrees with warm ambient (outside temp.):

Set S1 at -10

Set S2 at -13

ER 230 / ER-460 WARRANTY POLICY

ONE YEAR WARRANTY ON PARTS FROM DATE OF SALE

1. Thermo King™ parts are reimbursed at 10% over dealer cost.
2. Compressor is warranted through the closest Copeland™ dealer.
3. Grainger™ parts are warranted through the closest Grainger™ dealer.
4. R452a will be reimbursed at a predetermined rate.
5. Electric Reefer Solutions must be advised in advance of repairs that will be invoiced to them. Call 1-888-696-2230 and ask for the service manager.
6. For parts that fail and were not "new" when the unit was assembled, Electric Reefer Solutions may supply a "good used" part for the repair.
7. All repairs must have pictures before contacting Electric Reefer Solutions for authorization

GENERAL WARRANTY

The Manufacturer generally warrants the goods to be free from defects in material and workmanship for a specified period from the date put in service. Such warranty is limited, at Manufacturer's option, to repair or replacement at any authorized Manufacturer's dealer of any part or parts that shall be determined to have failed within the specified period of warranty. Such repair or replacement shall be Buyer's exclusive remedy and correction of defects in the above manner shall constitute complete fulfillment of all obligations and liabilities of Manufacturer with respect to the goods sold, whether based in contract, in tort, or otherwise. MANUFACTURER'S EXPRESS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

GENERAL TERMS OF SALE

SELLER SHALL NOT BE LIABLE, IN CONTRACT OR IN TORT, FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, INJURY OR DAMAGE CAUSED TO PERSONS, CONTAINERS, TRAILERS, CONTENTS OR PRODUCT CARGO BY REASON OF THE POSSESSION, USE, INSTALLATION, MODIFICATION, REPAIR, MAINTENANCE, OR MECHANICAL FAILURE OF ANY GOODS OR SERVICES.

Indemnification: Buyer agrees to indemnify and hold Seller, its agents, employees, successors and assigns harmless from and against any and all claims and causes of action brought against Seller and from any and all damages, losses, expenses, attorneys fees, costs and liabilities sustained by Seller arising out of Buyer's possession or use of the goods or Buyer's breach of the terms and conditions of this quotation. Risk of loss to the goods shall pass to Buyer upon delivery of the goods to Electric Reefer Solutions, regardless of whether freight charges are prepaid.

Patents: Buyer shall indemnify and hold Seller, its agents and employees, harmless from any claim or cause of action arising out of Seller's infringement of a patent, copyright, trademark, trade name, or other proprietary right, or claim of unfair trade or of unfair competition, in connection with Buyer's possession or use of the goods. Buyer also agrees not to infringe upon any patent rights of Manufacturer in connection with the goods and agrees not to contest Manufacturer's patent rights nor the scope of those rights.

Delay and Failure to Deliver: Buyer acknowledges that any specified delivery date is only a good faith estimate of the actual delivery date. Seller shall not be liable in any respect for failure to ship or for delay in shipment where the failure or delay is due in whole or in part to an act of God, fire, action or delay of a governmental entity, shortage or curtailment of material, labor, transportation or utility services, or to any labor or production difficulty in Seller's plant or those of its suppliers, or to any other cause beyond Seller's control. In the event of a delay, the delivery date shall be postponed for a length of time as may be reasonably necessary to compensate for the delay.

Buyer Acknowledgement of Hazards: Buyer acknowledges that the goods may contain CFC-12 or CFC-115, are manufactured with methyl chloroform, which are Hazardous Substances as defined under relevant federal and state environmental laws, and may destroy ozone in the upper atmosphere. Buyer agrees to indemnify and hold Seller and its agents, employees harmless from all claims and liabilities relating to the use or release of these Hazardous Substances.

Miscellaneous: Buyer shall not assign its rights or delegate its duties under this quotation without Seller's prior written consent. The contract evidenced by this quotation may be amended only in writing signed by Seller and Buyer. If any provision of this quotation is invalid or unenforceable, all other provisions of this quotation shall remain in full force and effect. The sale of goods and services in accordance with this quotation shall be governed in all respects by the laws of the State of Michigan. Seller and Buyer agree that any action arising out of the sale of goods or services in accordance with this quotation will be brought, heard and decided in Kent County, in the State of Michigan. The terms of this quotation shall inure to the benefit of and be binding on the successors and assigns of the parties. There are no other agreements, warranties, terms or conditions relating to the goods or services to be provided under this quotation.

LABOR IS COVERED FOR 30 DAYS FROM DATE OF SALE

1. Labor will be reimbursed at a predetermined rate.
2. TK DAC flat rates are to be used for labor billing.
3. Travel time is not covered.

SUMMARY

This is a reconditioned unit with a new compressor and new controls. Some outer body panels may not be new, but are repainted by a professional body shop. 3-way valve is rebuilt, coils are cleaned, and the frame is cleaned, painted, and treated for corrosion. The end user is to supply the a/c power connection to the control box (according to State and Local Code).

Grainger™ Warranty Process:

Bring defective part to the local Grainger™ dealer. Identify the part number. Please give Grainger™ dealer Electric Reefer Solutions's phone number (888-696-2230). Grainger™ dealer will confirm the history of sale and exchange the part at no charge for one year after the Electric Reefer Solutions's unit invoice date.



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208-230 VAC

ELECTRIC REEFER
ELECTRICAL SCHEMATICS

APPROVAL BY	DATE	SCALE
MAB	8/09	

TO: CHAIRMAN-100.000	ANGLE	± 0.30
OTHERWISE SPECIFIED	PL	± .40
	PL	± .40
	PL	± .40

A663-55-020-S01



FOR PARTS:
CALL 800-968-9378, OPTION 1

HAVE YOUR UNITS SERIAL NUMBER!

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