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INTRODUCTION

Thank you for purchasing Master-Bilt® refrigeration equipment. This manual contains important instructions for installation, use and service. Read this entire manual carefully before installing or servicing your Master-Bilt® equipment.

⚠️ NOTICE

Installation and service of the refrigeration and electrical components must be performed by a refrigeration mechanic or licensed electrician.

⚠️ DANGER

Equipment MUST be properly grounded. Improper or faulty hook-up of electrical components of the refrigeration units can result in severe injury or death. All electrical wiring hook-ups must be done in accordance with all applicable local, regional or national standards.

⚠️ NOTICE

Read this manual before installing your refrigeration equipment. Keep the manual and refer to it before doing any service. Failure to do so could result in personal injury or equipment damage.

The portions of this manual covering refrigeration and electrical components contain technical instructions intended only for persons qualified to perform refrigeration and electrical work. This manual cannot cover every installation, use, or service situation. If you need additional information, call or write us:

Parts and Technical Service Department
Master-Bilt Products
908 Highway 15 North
New Albany, MS 38652
Phone (800) 684-8988
Email: service@master-bilt.com
WARNING LABELS AND SAFETY INSTRUCTIONS

This is the safety-alert symbol. When you see this symbol, be alert to the potential for personal injury or damage to your equipment.

Be sure you understand all safety messages and always follow recommended precautions and safe operating practices.

NOTICE TO EMPLOYERS

You must make sure that everyone who installs, uses, or services your refrigeration equipment is thoroughly familiar with all safety information and procedures.

Important safety information is presented in this section and throughout the manual. The following signal words are used in the warnings and safety messages:

**DANGER:** Severe injury or death WILL occur if you ignore the message.

**WARNING:** Severe injury or death CAN occur if you ignore the message.

**CAUTION:** Minor injury or damage to your refrigeration can occur if you ignore the message.

**NOTICE:** This is important installation, operation or service information. If you ignore the message, you may damage your refrigeration.

The warning and safety labels shown throughout this manual are placed on your Master-Bilt® Products refrigeration at the factory. Follow all warning label instructions. If any warning or safety labels become lost or damaged, call your customer service department at (800) 684-8988 for replacements.

This Label is located on the condensing unit
PS SERIES PARALLEL RACK FEATURES

- Generously sized condenser for high efficiency in high ambient conditions.
- Hermetic, semi-hermetic, and Scroll compressors in any combination the customer chooses.
- Generously sized receivers with isolation valves and liquid level indicator.
- Compressor suction and discharge line service valves with access ports.
- Pre-wired and mounted high and low pressure controls with each compressor.
- Factory leak tested.
- U.L. listed.
- Access for serviceability.
- Pre-wired with single point electrical connection with main disconnect switch and main circuit breaker.
- Circuit breaker for each compressor.
- Crankcase heaters installed for outdoor units.
- Refrigeration lines pre-piped to edge of unit.
- Pre-piped and mounted refrigerant sight glass.
- Flooded head pressure controls standard on each system. Other options available.
- Galvanized steel housing is standard. Stainless steel housing available.
- Engineered refrigeration drawing available for specific projects, or with purchase order. (Contact factory for additional details).
- KE2THERM compressor sequencer controls for maximum energy saving.
- Replaceable core suction and liquid filter driers.
- Oil return system complete with oil separator, oil level controls and oil filter are standard.
- Two suction groups can be controlled within a single frame/cabinet.
- Hot gas defrost, electric defrost, and off cycle defrost available.
- Heat reclaim available.
- Split condenser available.
- Floating head pressure control available
- EVI compressors with sub cooled liquid available.
- Standard alarms include phase loss and oil failure. Various alarms available including compressor failure, liquid level, etc.
PARALLEL RACK NOMENCLATURE

PS  E  A  C  5  2  V  C  -  XXXX

Quote Number

Voltage
A = 115/60/1
B = 208-230/60/1
C = 208-230/60/3
D = 460/60/1
E = 460/60/3
F = 200-220/50/3
G = 380-420/50/3
H = 208/60/1
J = 380/50/1
K = 200-220/50/1 or 220/50/1
L = 575/3/60
M = 200-230/60/3
R = 265/60/1
T = 380/60/3

Refrigerant
Z = R404A; V = R407A; D = R448A/R449A

# Suction Groups
1 to 3

# Compressors
2 to 10

Condenser Location
R = Remote
I = Integrated
C = Mounted on Common Frame

Condensing Method
A = Air Cooled
W = Water Cooled

Frame
I = Interior
E = Exterior

Rack
PS = Standard Rack
GPS = Glycol Rack
PRE-INSTALLATION INSTRUCTIONS

I. GENERAL INFORMATION
Please read this manual prior to installing your Master-Bilt® equipment. This information is based on good refrigeration practice and should be used as a guide for installation and operation.

II. DELIVERY INSPECTION
You are responsible for filling all freight claims with the delivering truck line. Inspect all cartons and crates for damage as soon as they arrive. If damage is noted to shipping crates or cartons or a shortage is found, note this on the bill of lading (all copies) prior to signing.

If damage is discovered when the cabinet arrives, immediately call the delivering truck line and follow up the call with a written report indicating concealed damaged to your shipment. Ask for an immediate inspection of your concealed item. Crating material MUST be retained (if applicable) to show the inspector representing the truck line.

INSTALLATION INSTRUCTIONS

I. HANDLING AND PLACEMENT OF PARALLEL RACK SYSTEM

There should be a minimum of 3 feet around the perimeter of the Rack System that should be unobstructed. This allows for proper servicing of the equipment. Please refer to local and state codes as well at the NEC for additional clearance requirements.

Holes are provided in the base supports for mounting bolts and for bridle lift rods.

For indoor mounting, motor rooms should be provided with fans designed to move 100 CFM of air per one ton of refrigeration capacity.
II. ELECTRICAL SPECIFICATIONS

Electrical power supply must match the rack power requirements indicated on the unit data plate. A WIRING DIAGRAM IS LOCATED ON THE INSIDE ON THE ELECTRICAL BOX COVER. For best results, it is suggested that power supply for PS Rack systems be applied as illustrated below in Figure 1. All field wiring should be done in a professional manner, in accordance with all governing codes. All wiring (including factory terminals) should be double checked before start-up.

Wiring diagrams specific to each installation will be provided by Master-Bilt.

Figure 1: Suggested Field Wiring Location for PS Units.

⚠️ NOTICE!

Systems with scroll compressors must be checked for proper power phasing. Improper power phasing will result in improper compressor rotation causing compressor to pump incorrectly. A phase monitor is standard on PS systems for this purpose.

Three phase scroll compressors are directional dependent, i.e., they will only compress in one rotational direction and will rotate in either direction depending on power phasing. Verification of proper rotational direction is made by observing that suction pressure drops and discharge pressure rises when the compressor is energized. Reverse rotation also results in an elevated sound level over correct rotation, as well as substantially reduced current draw compared to data tag values.

⚠️ NOTICE!

Check phase alignment on all incoming power.
III. REFRIGERANT PIPING

Use only refrigeration grade copper tubing, (ACR), type “L”, bright annealed, dehydrated, and properly sealed against contamination. Soft temper tubing may not be used for field interconnection of refrigeration components. Take extreme care to keep refrigeration tubing clean and dry prior to installation. Use an appropriate size tube cutter. Remove any burring that may occur when cutting the tubing. Use dry nitrogen to purge the system of any foreign objects that may have come about during any pipe cutting.

All suction lines will be insulated with not less than ¾” Armaflex or acceptable substitute as determined by Master-Bilt personnel. Armaflex insulation must be properly glued or taped as approved by insulation manufacturer to prevent refrigeration lines from “sweating”.

Appropriate oil must be added to systems per Compressor manufacturer specifications.

Suction lines should be sloped down ½” for each 10 feet of horizontal run towards the compressor. This will facilitate good oil return to the compressor.

Refrigeration lines will be sized appropriately to facilitate proper oil return to the compressor and reduce refrigerant line pressure drop. Table 1 depicts proper line sizing options. Use this as a guideline for your selection. Any fittings used may be accounted for in the Table to the right.

<table>
<thead>
<tr>
<th>Fitting Size</th>
<th>90° Ell</th>
<th>45° Ell</th>
<th>Tee (Line)</th>
<th>Tee (Branch)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2”</td>
<td>0.9</td>
<td>0.4</td>
<td>0.8</td>
<td>2</td>
</tr>
<tr>
<td>5/8”</td>
<td>1.0</td>
<td>0.5</td>
<td>1.0</td>
<td>2.5</td>
</tr>
<tr>
<td>7/8”</td>
<td>1.5</td>
<td>0.7</td>
<td>1.5</td>
<td>3.5</td>
</tr>
<tr>
<td>1-1/8”</td>
<td>1.8</td>
<td>0.9</td>
<td>1.8</td>
<td>4.5</td>
</tr>
<tr>
<td>1-3/8”</td>
<td>2.4</td>
<td>1.2</td>
<td>2.0</td>
<td>6</td>
</tr>
<tr>
<td>1-5/8”</td>
<td>2.8</td>
<td>1.4</td>
<td>2.0</td>
<td>7</td>
</tr>
<tr>
<td>2-1/8”</td>
<td>3.9</td>
<td>1.8</td>
<td>3.8</td>
<td>10</td>
</tr>
</tbody>
</table>

**TABLE 1: EQUIVALENT FEET**
All vertical risers will have an appropriate “P” trap at the beginning of the riser and every 20 ft above this point. If the total rise is less distance than can be evenly divided by 20, the P-traps will be located at the beginning and in the center of the distance so that the total distance between any two traps does not exceed 20 ft.

Keep the refrigeration lines as short as possible and use as few fittings as practicable, being especially careful not to “kink” the lines. Keep the layout as simple as possible and properly support the piping to absorb vibration and the normal expansion and contraction caused by temperature changes.

Add appropriate amount of oil per compressor manufacturer recommendations to compensate for oil return system volume.

When brazing, dry nitrogen **MUST** be passed through the lines at low pressure to prevent scaling and oxidation inside the tubing and fittings. All flux will be removed from the joints when brazing is complete.

**MINIMIZE** the amount of flux used to prevent internal contamination of the refrigeration system. Silver brazing wire is to be utilized (high temperature alloy of minimum of 5% silver content on all copper connections, and high temperature alloy of 45% silver content on all dissimilar metal connections.

The refrigeration contractor will be responsible for providing and installing the liquid line solenoid valve and coil and evaporator pressure regulator for all loop piping systems unless otherwise requested by the customer. Consult the refrigeration schedule for details.

**V. LEAK CHECK**

When all refrigeration line connections have been made, the complete system, including factory connections, should be checked.

Add the proper refrigerant to 60 psig, and then boost the 150 psig with dry nitrogen. Leak checks should be done on all joints with an electronic leak detector or halide torch. If leaks are found, relieve the pressure and make repairs as necessary and recheck. Verify that all valves have been re-opened and re-pressurize the system to 150 psig as before for at least 12 hours. System pressure should not change during this time. Pressurizing the system above 150 psig may damage the suction pressure transducers. Do not apply pressure above 150 psig to these transducers.

**VI. EVACUATION, DEHYDRATION, AND START-UP**

A vacuum of 500 microns or less must be pulled to properly dehydrate the refrigeration system.

**Do not use the system compressor as a vacuum pump.**

**Do not operate compressor while system is in a vacuum.**
CHARGING PROCEDURES

I. PRELIMINARY

With the system in a vacuum, liquid charge the system by adding refrigerant into the liquid side of the system at a service valve provided. Add as much refrigerant as the system will take up to the holding capacity of the receiver.

II. LOW AMBIENT CHARGING

All standard air cooled condensers on the PS Rack System are equipped with a head pressure control valve to maintain proper head pressure during winter conditions. These valves function by reducing the effective condenser area by flooding or “backing up” refrigerant in the condenser to reduce the amount of surface available for condensing. To operate properly, more charge is required during this flooding condition.

To find the recommended low ambient charge add the recommended pre-charge to the additional refrigerant required for line set length (Table 3) then multiply the pounds of refrigerant by the percent flooding required in Chart A to arrive at the additional charge required.

![Typical Head Pressure Control Valve](Typical Head Pressure Control Valve)
Chart A:
START UP

For startup procedures please refer to the Parallel Startup Guide included with your rack system.

Rack electrical and piping schematics are included in the main control panel of the rack system.

GENERAL MAINTENANCE

Periodic inspection and upkeep is required to ensure reliable operation of the parallel rack system. Due to variability in systems and end user applications Master-Bilt provides only recommended maintenance items. This is not an all-inclusive list.

All refrigeration maintenance must be performed by a qualified refrigeration technician.

The information provided is intended as a minimum guide to maintenance. A detailed maintenance plan should be provided by a qualified refrigeration maintenance company. Service Intervals may vary based on site specific operating conditions.

<table>
<thead>
<tr>
<th>WEEKLY</th>
<th>MONTHLY</th>
<th>QUARTERLY</th>
<th>SEMI-ANNUAL</th>
<th>ANNUALLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Suction Pressure</td>
<td>Check Filter and Drier Cores</td>
<td>Check Sub-cooling</td>
<td>Check and Tighten Compressor Mounts</td>
<td>Clean Condenser Coil</td>
</tr>
<tr>
<td>Check Discharge Pressure</td>
<td>Check Electrical Wiring</td>
<td>Check Superheat</td>
<td>Check and Tighten Line Connections</td>
<td>Check or Replace Fan Blades</td>
</tr>
<tr>
<td>Check Refrigerant Charge</td>
<td>Check Electrical Boxes</td>
<td>Check Pressure Controls</td>
<td>Check and Tighten Electrical Connections</td>
<td>Change Filter-Drier</td>
</tr>
<tr>
<td>Check Oil Levels</td>
<td>Check Fan Motors</td>
<td>Check Compressor Amperage</td>
<td></td>
<td>Change Suction Filters</td>
</tr>
<tr>
<td>Check Contactors</td>
<td>Check Compressor Mounts</td>
<td></td>
<td></td>
<td>Check Oil Quality</td>
</tr>
</tbody>
</table>
## TROUBLESHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compressor hums without starting</td>
<td>Incorrect wiring</td>
</tr>
<tr>
<td></td>
<td>Low voltage</td>
</tr>
<tr>
<td></td>
<td>Locked compressor rotor</td>
</tr>
<tr>
<td></td>
<td>Mechanical compressor damage</td>
</tr>
<tr>
<td>Compressor will not start</td>
<td>Tripped breaker</td>
</tr>
<tr>
<td></td>
<td>Wire disconnected/ broken</td>
</tr>
<tr>
<td></td>
<td>Fuse blown</td>
</tr>
<tr>
<td>Compressor starts and trips breaker</td>
<td>Short in wiring</td>
</tr>
<tr>
<td></td>
<td>High discharge pressure</td>
</tr>
<tr>
<td></td>
<td>Mechanical compressor damage</td>
</tr>
<tr>
<td></td>
<td>Breaker damaged</td>
</tr>
<tr>
<td></td>
<td>Shorted motor windings</td>
</tr>
<tr>
<td>Short cycling</td>
<td>Pressure control not set properly</td>
</tr>
<tr>
<td></td>
<td>Low refrigerant</td>
</tr>
<tr>
<td></td>
<td>High discharge pressure</td>
</tr>
<tr>
<td>High head pressure</td>
<td>Dirty condenser</td>
</tr>
<tr>
<td></td>
<td>Overcharged system</td>
</tr>
<tr>
<td></td>
<td>Condenser fan failure</td>
</tr>
<tr>
<td></td>
<td>Discharge line restriction</td>
</tr>
<tr>
<td>Low head pressure</td>
<td>Low ambient conditions</td>
</tr>
<tr>
<td></td>
<td>Low refrigerant</td>
</tr>
<tr>
<td></td>
<td>Improper head pressure valve setting</td>
</tr>
<tr>
<td>Cooler/ Freezer temperature too high</td>
<td>Non-working fan</td>
</tr>
<tr>
<td></td>
<td>Dirty evaporator coil</td>
</tr>
<tr>
<td></td>
<td>Frozen evaporator coil</td>
</tr>
<tr>
<td></td>
<td>Low refrigerant</td>
</tr>
<tr>
<td></td>
<td>Clogged expansion valve</td>
</tr>
<tr>
<td></td>
<td>Improper adjustment on expansion valve</td>
</tr>
<tr>
<td>Low oil pressure</td>
<td>Oil trapped in system</td>
</tr>
<tr>
<td></td>
<td>Insufficient oil charge</td>
</tr>
<tr>
<td></td>
<td>Liquid refrigerant returning to compressor</td>
</tr>
<tr>
<td></td>
<td>Dirty/ clogged oil filter</td>
</tr>
<tr>
<td></td>
<td>Dirty/ clogged oil separator filter</td>
</tr>
</tbody>
</table>
SALE AND DISPOSAL

If you sell or give away your refrigeration equipment system or components you must make sure that all safety labels and I&O Manuals are included. If you need replacement labels or manuals, contact the parts and technical service department at Master-Bilt at (800) 684-8988.

The customer service department at Master-Bilt should be contacted at the time of sale or disposal of your equipment so records may be kept of its new location.

If you sell or give away your Master-Bilt® cabinet and you evacuate the refrigerant charge before shipping, you must evacuate the refrigerant into an approved recovery and reclaim system in order to satisfy all applicable federal and state regulations regarding release of refrigerant compounds into the atmosphere.

The release of refrigerant compounds into the atmosphere is a source of ozone depletion and regulated by state and federal laws.

LABOR WARRANTY

A. A 90-day labor warranty will be provided on all installer provided labor and installation.
B. A 1 year optional Labor warranty will be quoted separate from the installation.
C. Master-Bilt will provide a one year parts warranty on all parts that fail under normal operation conditions.
APPENDIX A

TYPICAL PS SERIES PIPING SCHEMATIC

Horizontal runs of the refrigeration suction lines shall be sloped at 1/2" in 10 feet in the direction of refrigerant flow. This is for both the inside and outside of the building (from the roof hatch to the condensing unit). See line sizing for piping size.
ROOM EVAPORATOR AND CONDENSATE DRAIN
TYPICAL INSTALLATION

HEATER CABLE TAPED TO
UNDERSIDE OF DRAIN LINE.
WIRE TO EVAP COIL FOR POWER.

CONTINUE HEATER CABLE
ON THE UNDERSIDE OF P-TRAP
ALL THE WAY TO THE END

DRAIN LINE DETAIL
NOT TO SCALE
FREEZER EVAPORATOR WIRING

NOTE:
Controller connect to LDA device
for TCP/IP communication.

*** CHECK SOLENOID VALVE TO MATCH SUPPLY VOLTAGE***

FIELD WIRING
FACTORY WIRING
OPTIMAL WIRING