Part Number: 31E08006
Date: May 10, 1993 Rev: C
Supersedes: February 12, 1992

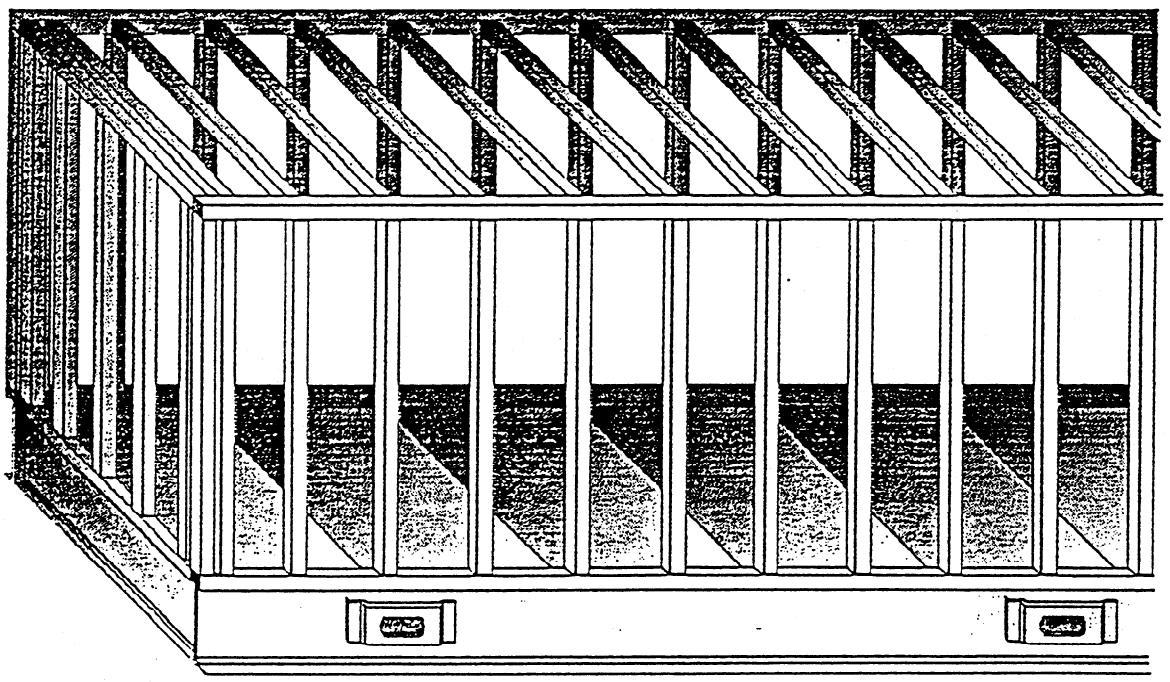
KYSOR/WARREN®

Division of Kysor Industrial Corporation

The Leading Edge of Technology

INSTALLATION & OPERATION MANUAL

MODEL: PACKAGED MECHANICAL SYSTEMS



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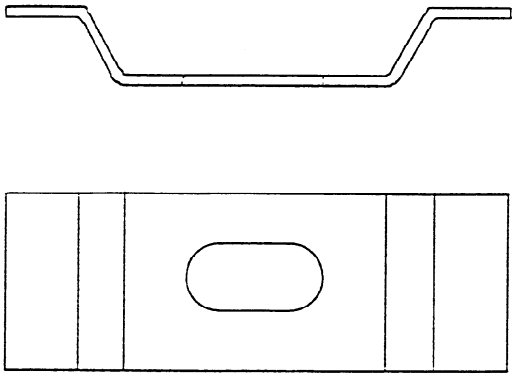
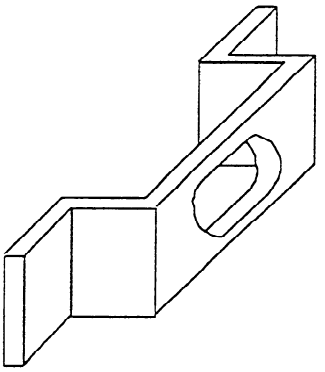
Model Description

Model	Serial Code	Description
PMS-AC	798	Air Conditioning equipment only ie. blower, coil(s), etc. These units may have compressor units and condensers on roof or built-in condensers.
PMS-H	799	Heating equipment only ie. blower, heat reclaim coil(s), supplemental heat etc.
PMS-HAC	800	Heating and Air Conditioning equipment ie. blower, coil(s), supplemental heat, etc. These units may have Air Conditioning compressor units and condensers on roof or built-in condensers.
PMS-R	801	Refrigeration and/or Air Conditioning compressor units. May have condensers on roof or built-in condensers.
PMS-HACR	802	Heating and Air Conditioning equipment ie. blower, coil(s), supplemental heat, etc. and Refrigeration and/or Air Conditioning compressor units. May have condensers on roof. Due to the length of the unit built-in condensers are not normally available.
PMS-JV	803	Joining Vestibule for joining two PMS units.
PMS-RSY	965	Refrigeration system with split compressor and piping rack(s). Normally curb mounted it usually includes integral condensers.

Rigging





General
Use all lifting lugs to lift a PMS unit. While the unit is rather rigid, failure to use all lugs provided will put the unit under considerable stress. Piping and electrical conduit etc. are anchored to the PMS unit. Undue flexing of the base and wall structure can result in unseen damage.

The center of gravity of the PMS unit is never in the center of the unit. One end, one side or both will be heavier. The rigger should test the cable lengths by lifting the unit an inch or so off the truck before making a full lift.

Factory installed bird screens on the intake damper and exhaust fans may need to be removed before lifting the unit. These can easily be removed with a 5/16 socket.

Spreader Bars
Failure to use spreader bars will probably cause damage to the roof of a PMS unit.

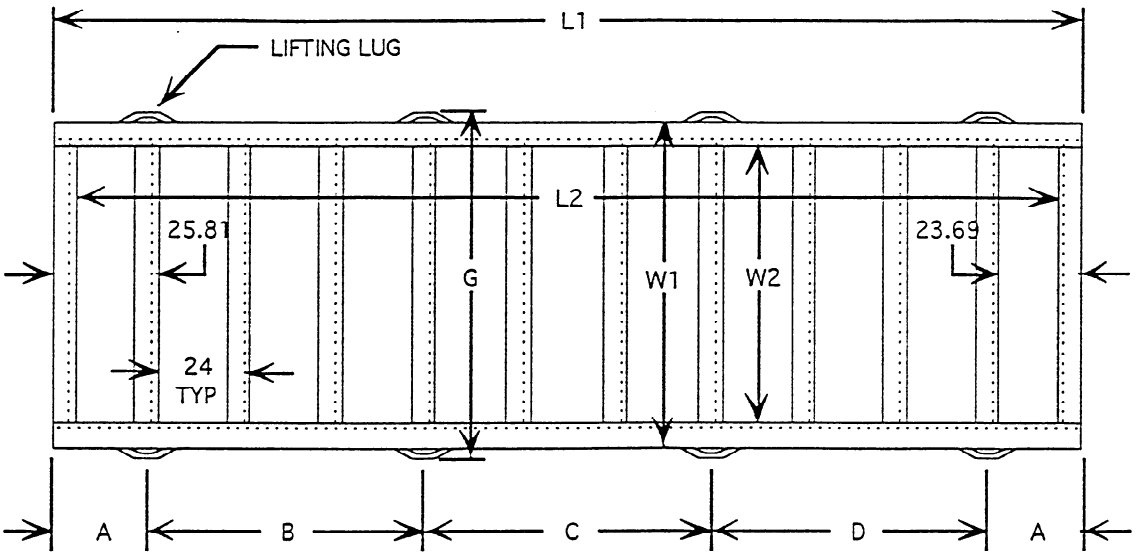
Lug Locations
The lifting lugs illustrated above are welded onto the base of each PMS unit. Typical locations and quantities are shown in the section on the unit base. A base drawing for a specific order is available from our Application Engineering Department about 2 weeks after the order has been entered by our Order Entry Department.

Lifting Lug
Each lug is formed from 1/2 inch plate steel. The laser cut 2.5 x 5.0 inch obround slot is centered in the lug. The inside flat of the lug face is 7.063 inches. The lug has been designed to be suitable for hooks or lifting straps.

Base

Welded Assemblies
All bases are welded assemblies with the interior channel or tubing flush at the top. A standard base is suitable for slab, platform or curb mounting. Bases for special mounting requirements with full height interior channel or tubing is available at an additional cost.

Corrosion Protection
The entire base is primed and the perimeter is painted for corrosion protection.



NL	=	Nominal Length in Feet
NW	=	Nominal Width in Feet
G	=	NW + 5.75"
W1	=	NW + 1.5"
W2	=	NW - 3.5"

NL	L1	L2	A	B	C	D	No. of Lugs
20	241.5	236.5	48.75	144	NA	NA	4
22	265.5	260.5		168			
24	289.5	289.4	24.75	120	120		6
26	313.5	308.5		132	132		
28	337.5	332.5		144	144		
30	361.5	355.5		156	156		
32	385.5	380.5	36.75				
34	409.5	404.5		168	168		
36	433.5	428.5	48.75				
38	457.5	452.5		180	180		
40	481.5	476.5	24.75	144	144	144	8
42	505.5	500.5	36.75				
44	529.5	524.5	48.75				
46	553.5	548.5	24.75	168	168	168	
48	577.5	572.5	36.75				
50	601.5	596.5	48.75				

Typical Base Materials

The following structural channels are used in typical PMS units.

C8 x 18.75 Channel

8 inch channel is used for the perimeter of the base and optionally for the interior of the base. This channel weighs approximately 18.75 pounds per foot. It has a web thickness of 0.500 inch and a flange width of 2.500 inches.

C6 x 13.0 Channel
6 inch channel is used for the interior of the base. This channel weighs approximately 13 pounds per foot. It has a web thickness of 0.313 inch and a flange width of 2.125 inches.

Misc. Base Materials
The following structural materials are used in addition to or in place of the typical materials listed above. These are used on PMS units which have special equipment requirements.

C5 x 9.0 Channel
5 inch channel weighs approximately 9.0 pounds per foot. It has a web thickness of 0.313 inch and a flange width of 1.875 inches.

C4 x 7.25 Channel
4 inch channel weighs approximately 7.25 pounds per foot. It has a web thickness of 0.313 inch and a flange width of 1.750 inches.

C10 x 25.0 Channel
10 inch channel is used for the perimeter of the base and optionally for the interior of the base. This channel weighs approximately 25 pounds per foot. It has a web thickness of 0.500 inch and a flange width of 2.875 inches.

8 x 4 x 0.250 Steel Tubing
This rectangular structural steel tubing weighs approximately 19.02 pounds per foot. It has a wall thickness of 0.250 inch.

8 x 3 x 0.250 Steel Tubing
This rectangular structural steel tubing weighs approximately 17.32 pounds per foot. It has a wall thickness of 0.250 inch.

6 x 4 x 0.250 Steel Tubing
This rectangular structural steel tubing weighs approximately 15.62 pounds per foot. It has a wall thickness of 0.250 inch.

6 x 3 x 0.250 Steel Tubing
This rectangular structural steel tubing weighs approximately 13.91 pounds per foot. It has a wall thickness of 0.250 inch.

Curb

Shipping
The curb is shipped loose for field assembly. Nuts, bolts and washers are packed with the curb pieces. A drawing giving assembly instructions is shipped with each curb.

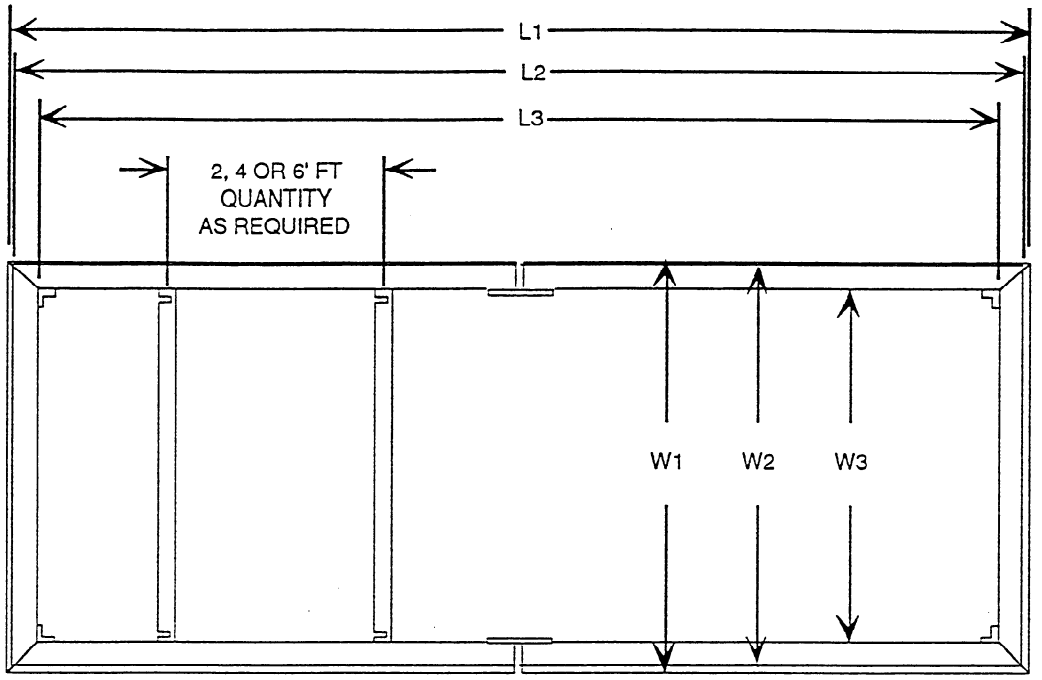
Assembly
Do not begin assembly of curb without reading and comprehending the assembly instruction drawing. If the drawing can not be located contact Kysor//Warren immediately. The curbs are often not symmetrical, without the drawing it is possible to assemble the parts incorrectly.

Materials
The formed curb parts are constructed from 0.099 inch thick G90 galvanized steel.

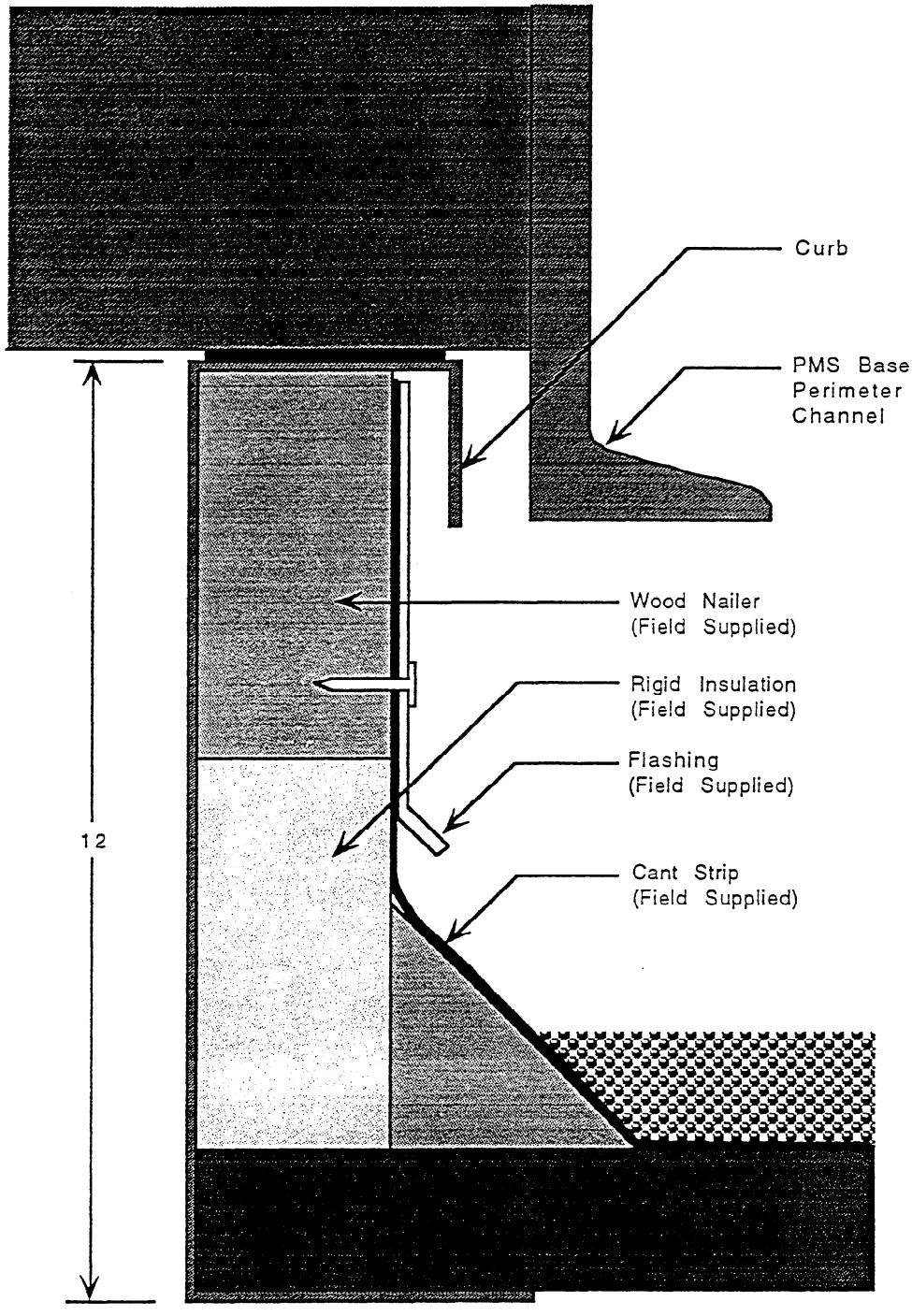
Weather Seal
As can be seen in the curb cut-away drawing, the base to curb arrangement provides for a 2 inch offset from the bottom of the base to the top of the curb.

Air Seal

The curb in itself can not provide an air seal as the only contact the curb has with the base is at the base intermediate channels. If an air seal arrangement is required the base of the PMS must have special factory modifications. This option must be called for at time of order entry.

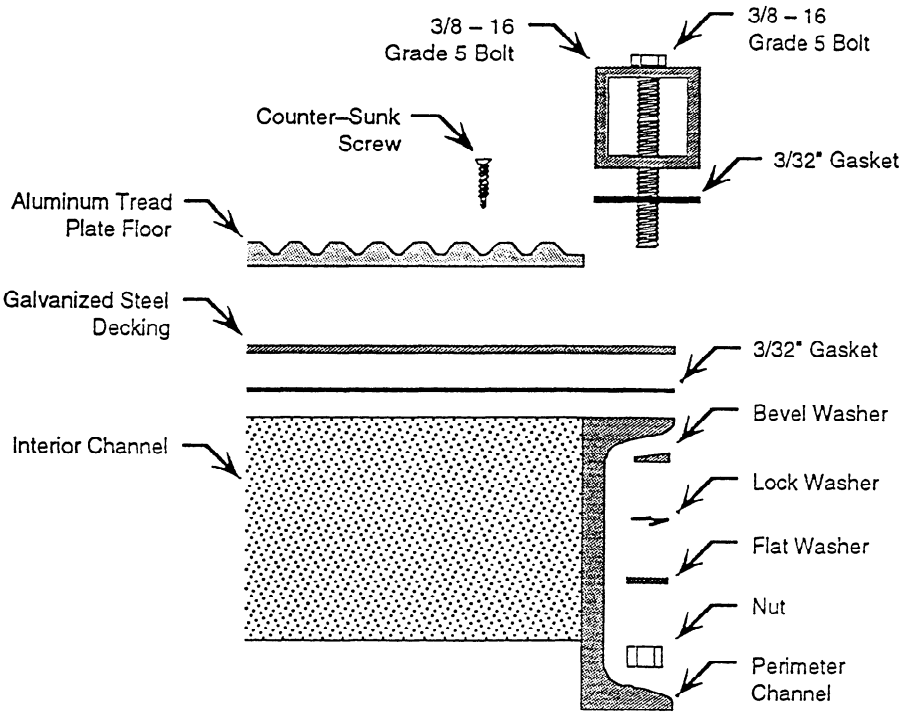


L1	=	NL - 2.5"
L2	=	NL - 4.5"
L3	=	NL - 8.5"
W1	=	NW - 2.5"
W2	=	NW - 4.5"
W3	=	NW - 8.5"



Curb Cut-Away View

Floor



Compressor Sections
The floor detail shown above is typical for all Compressor Sections. It is not water tight.

HVAC Sections
The floor in HVAC Sections is similar to the Compressor Section floor shown above except as follows:

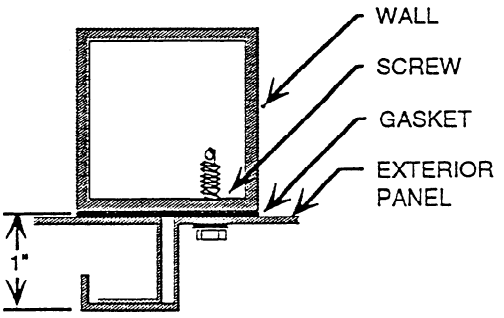
1) The aluminum tread plate is deleted.
2) Each decking piece has one side with a offset flange to overlap the adjacent piece. The offset is gasketed with a 3/32 inch thick gasket.
3) Hex Head Teks® screws are employed instead of the countersunk shown.

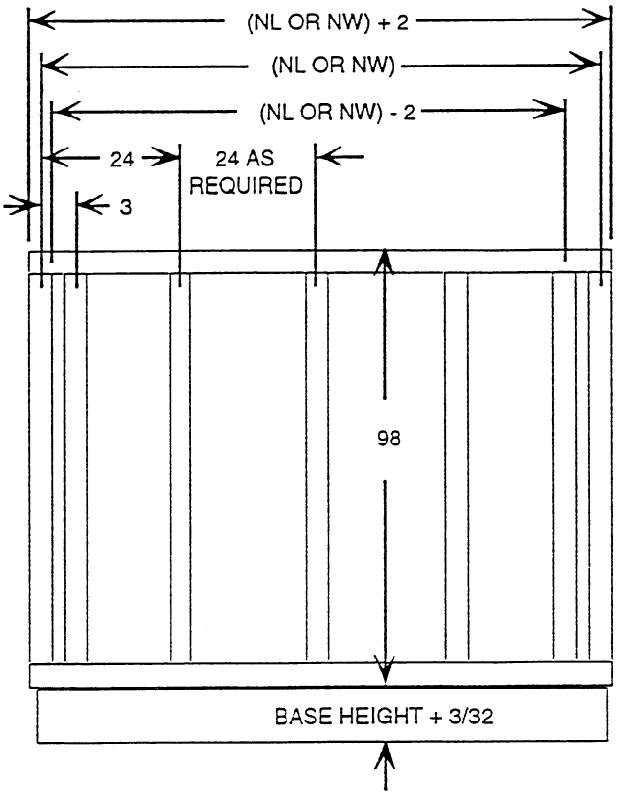
Condenser Sections
The floor in a PMS-RSY condenser section is sloped 1 inch from the center of the base (or divider wall) to the outside. The floor is a standing seam design that is water tight.

Walls

Material
Depending on the load supported, wall studs are either 11 or 16 gage 2 X 2 inch galvanized steel mechanical tubing .

Welded Assembly
The wall is welded into individual sections up to 24 nominal feet long before being mounted on the base. All weld joints are spray coated with a cold galvanizing compound for corrosion protection.





Removable Studs
Some vertical studs may optionally be screwed into the wall section with angle gussets so that large equipment may be more readily removed from the unit. This option generally applies to HVAC equipment such as the blower or large heating equipment. The studs to be removed must not be supporting heavy loads such as condensers mounted on the roof of the PMS. The order must note that removable studs are desired, what equipment and location(s) are needed.

Mounting To Base
Wall sections are bolted to the base (see section on the floor) every 24 inches except at doors and ventilation intake dampers.

Exterior Panels
The panels are screwed onto the gasketed wall section. The screws have a neoprene backed stainless steel sealing washer to assure a weather tight seal. The panels are made of patterned 0.040 inch thick aluminum providing an attractive, long life maintenance free surface.

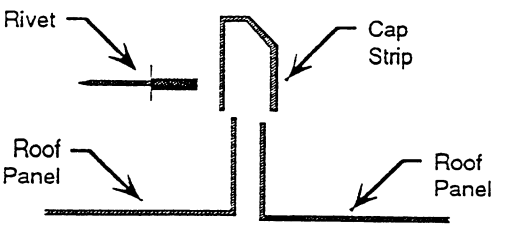
Roof

Standing Seam
The roof is a standing seam design with a crown of 1 inch sloping from the center to both sides.

Materials
The roof panels and cap strip are constructed of 0.040 inch patterned aluminum. The roof supports and flashing are constructed of heavy gage galvanized steel. Exterior grade plywood is employed.

Fasteners
The cap strip is filled with a caulking compound then bonded to the roof panels and anchor angle with stainless steel rivets. The roof flashing and plywood are held in place with plated elevator

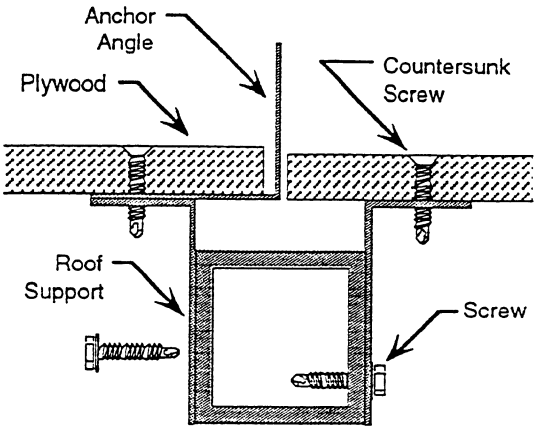
bolts and self-locking nuts. Teks® screws with a neoprene sealing washer bonded to a stainless steel washer are used to attach the roof panels to the roof flashing.

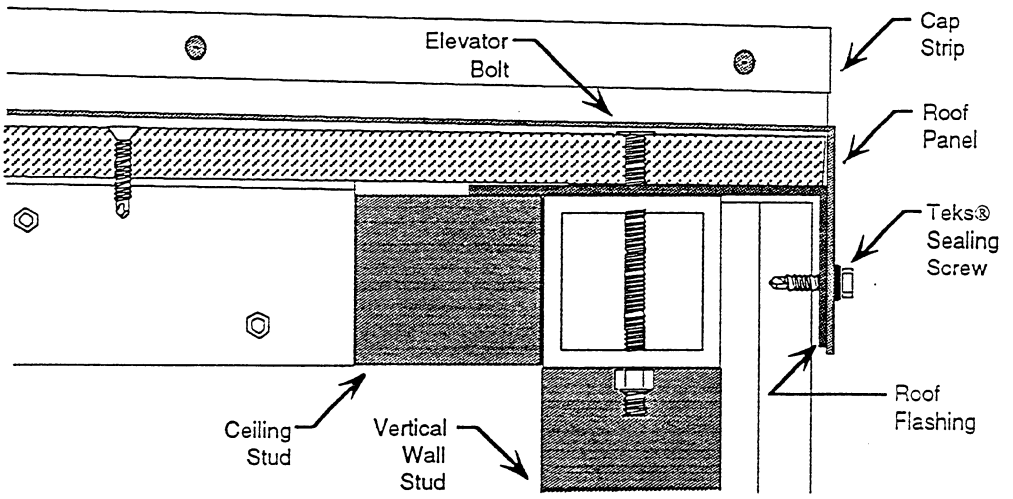


Dimensions

Roof dimensions in the table include screw heads.

Length	=	NL + 4.5"
Width	=	NW + 4.5"
Height	=	109.1"





Doors

Hinge

Doors have a stainless steel heavy duty continuous hinge. The door can be hinged on either side. Unless otherwise stated on the order the door will be hinged on the left when looking at the door from the outside.

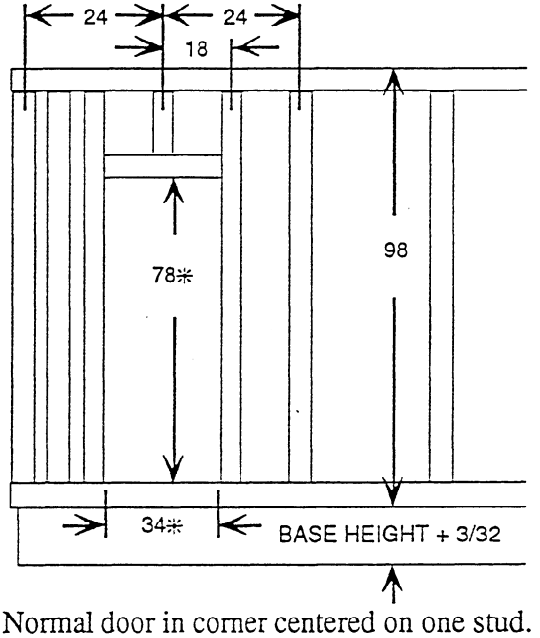
Materials
The door is constructed of an 11 gage 1 X 1 galvanized steel mechanical tubing frame with an exterior panel of 0.040 inch patterned aluminum and an interior panel of 0.030 inch galvanized steel.

Hardware
The door is standard with two Ventlok® 333 handles and one Ventlok® 222 locking handle with key. All Ventlok® 222 handles are keyed the same. Optionally the Ventlok® 222 may be deleted with a Ventlok® 333 and a heavy duty tamper-proof hasp installed in its place.

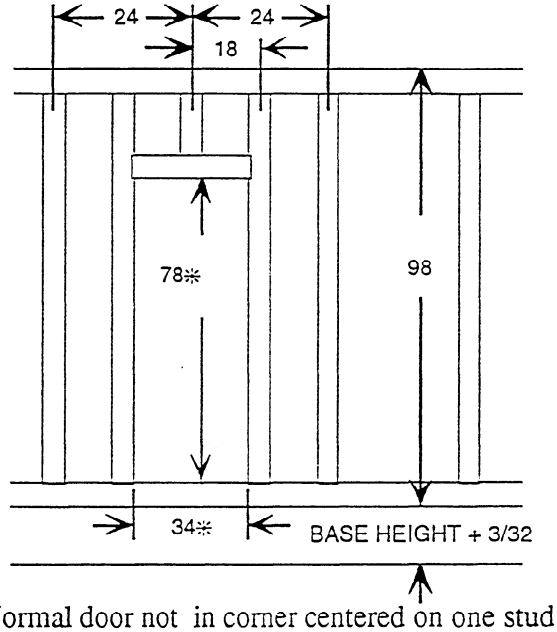
Jamb
The door is completely gasketed. The jamb the gasket sets against is approximately 1.25 inches wide. The jamb is screwed into place with hex head Teks® screws. The jamb may be removed to yield the maximum opening of 34 X 78 inches.

Location
The door may be located on any vertical stud unless the PMS has condensers mounted on the roof. The door then can not be centered on a stud that supports the condenser. These studs are normally 48 inches apart starting with the corner.

Special Width Door
A wider than normal door may be optionally ordered. This door can not be located in a corner. It has a maximum opening of 42 X 78 inches with the jambs removed.



Normal door in corner centered on one stud.



Normal door not in corner centered on one stud.

* Maximum opening with door jambs removed.

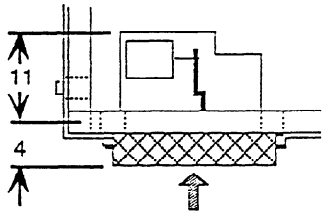
Ventilation

Table 1 - Service Parts

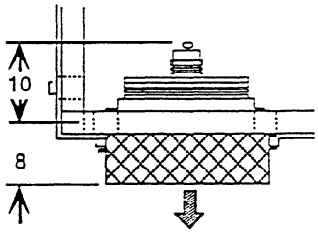
Description	Part No.
Contactor - 2 Pole	08E10087
Damper Actuator	09C10036
Damper Linkage	09A12040
Fan Blade - 16"	09B10053
Guard - 16" Fan	09C11012
Motor 1/4 HP (open on shaft end)	09A12027
Motor 1/4 HP (closed on shaft end)	09A12046
Thermostat - 1 Stage	08A11027
Thermostat - 2 Stage	08A11043

Table 2 - Fan Selection

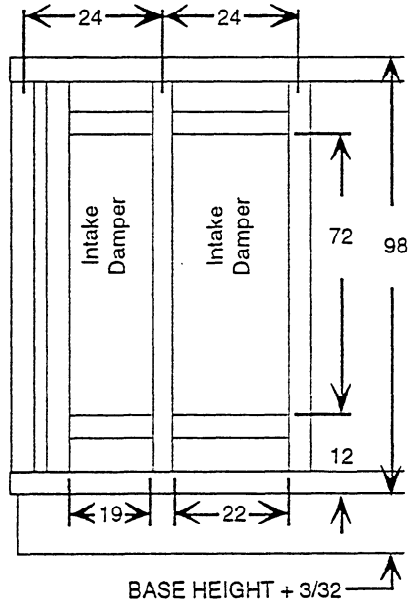
			Compressor HP @ CFM/HP				
Fans	Amps	CFM	120	100	80	60	40
2	3.0	5,200	43	52	65	87	130
3	4.5	7,800	65	78	98	130	195
4	6.0	10,400	87	104	130	173	260
6	9.0	15,600	130	156	195	260	390
8	12.0	20,800	173	208	260	347	520



Intake Air Flow



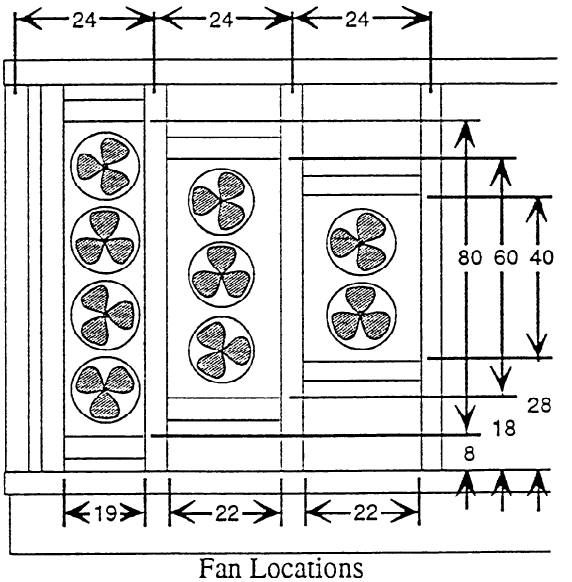
Exhaust Air Flow



Damper Locations

Intake Damper

The ventilation intake damper is constructed of galvanized steel. A nominal 19 x 72 inch damper is available for corner installation as well as a 22 x 72 inch damper for non-corner applications. Under most conditions only one intake damper is required. However, if there are a lot of restrictions to airflow two dampers should be considered. The damper is thermostatically controlled to open 5°F prior to the fans coming on. The damper actuator is 120V/1PH/60HZ.



Fan Locations

Exhaust Fans

A propeller type fan blade is used for exhuast. It is 16" in diameter and has 3 aluminum petals mechanically secured to a steel spider and hub.

Fan Motors

A 1/4 HP permanent split capacitor ball bearing motor powers the exhaust fans. It is rated 208-230V/1PH/50-60HZ with an FLA of 1.5 amperes. Two different motors are listed in the service parts table. Part number 09A12027 has openings in the end shield on the shaft end. This motor was used on all PMS equipment prior to March 1989. Part number 09A12046 has no openings in the end shield and does not have a conduit connector permanently installed. It will normally be used for all applications after March 1989. Both motors are acceptable as service replacements.

Fan Guard

The combination fan guard motor mount is a welded wire design plated for corrosion protection. The spacing of the wire rings complies with UL Standard 303.

Bird Screen

Constucted of 0.045 inch thick expanded aluminum with open dimensions of 0.328 x 1.000 inch, a bird screen is provided on both the intake damper and exhaust fans. The screen is mounted to the PMS with Teks® screws. The screens are often shipped loose for field installation to reduce the shipping size of the PMS.

Exhaust Damper

An aluminum back draft damper is provided on the exhaust fan outlet.

Controls

Standard constrols consist of a two stage thermostat with the first stage controlling the intake damper motor and the second stage controlling a fan motor contactor. The differential between stages should be about 5°F.

Optional fan cycling is available when 4 or more fans are required. Control of the intake damper is then provided by a single stage thermostat. The fan motors are split into two groups with each group being powered from a contactor. The contactors are controlled by a two stage thermostat.

Locations

It is best to locate the fans and the intake damper in diagonally opposed corners of the PMS. This provides a good air flow pattern thru the unit thereby avoiding stagnant areas. It is also prefferred that the intake damper be closer to the door than the exhaust fans to reduce short cycling of the air when the door is open.

The surroundings of the PMS will often dictate what locations can be used. It is important that adequate free air space be left around the intake and exhaust of the PMS. Building walls, coolers etc. should be at least three (3) feet from the unit.

Service Parts

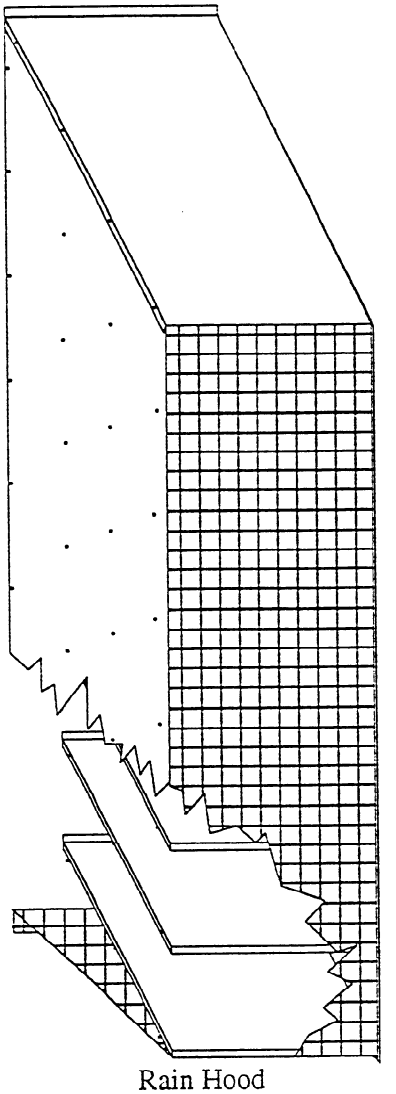
A list of ventilation service parts is provided in TABLE 1 - SERVICE PARTS.

Fan Selection

TABLE 2 - FAN SELECTION is used to determine the number of fans required to cool the compressors and electrical gear in the PMS. The number of fans required is based on the total compressor horsepower in the unit and the CFM/HP. The column showing 100 CFM/HP is recommended and will be used unless a different selection is specified on the order. The other columns are shown for comparison with competition.

Rain Hood

An optional rain hood in lieu of bird screens is available for the intake damper and the exhaust fans. It is constructed of 0.040 textured aluminum with an 0.045 inch thick expanded aluminum with open dimensions of 0.328 x 1.000 inch, bird screen covering the front and bottom. The rain hood is a riveted assembly. The hood assembly is to be mounted to the PMS with Teks® screws. These assemblies are shipped loose for field installation to reduce the shipping size of the PMS.



Rain Hood

Rack Locations

Service Aisle

We require two aisles with a minimum width of 18" clear be left between a rack(s) and the side wall in order to have easy service access to the back of the rack. It is highly recommended that when four racks or three long racks are installed in one PMS that at least one other aisles between racks be figured into the length required.

Normal Minimum Spacing

The illustration shows the minimum spacing of the compressor racks to the front and rear walls of the PMS. The 18 inch dimension from the rack to the inside of the side wall and the 4 inch dimension from rack to rack is the minimum spacing required.

Restrictions

It is required that more than the minimum spacing be used under the conditions that follow:

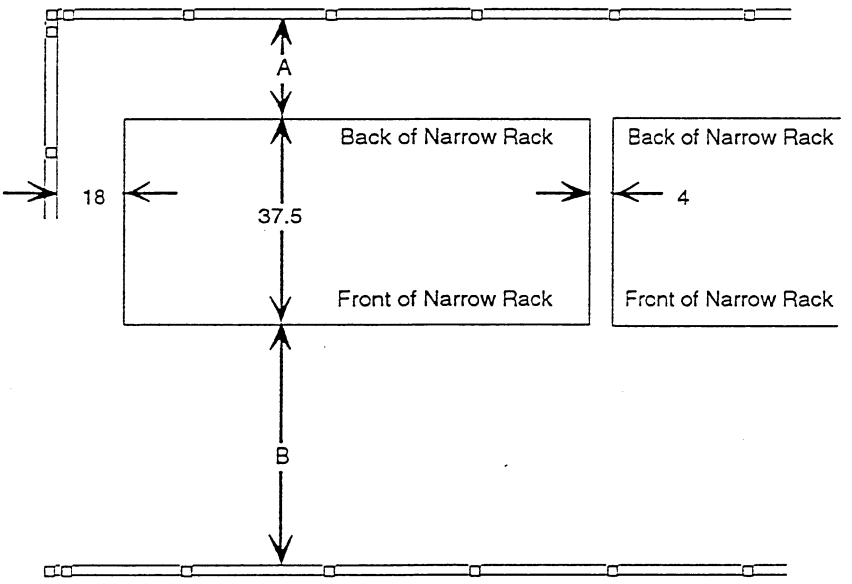
1) The number of circuits on the rack are greater than the maximum available circuits for the rack length minus 2 (ie 10 circuits on a 107 inch rack is OK but with 11 circuits do not use the minimum).

2) Piping is to go thru the floor of a roof mounted PMS.

3) Piping is to go thru the wall behind the rack and air cooled condensers are to go on the roof of the PMS.

In all three of the preceding situations at least 8 inch clearance should be figured between racks. These restrictions are required to facilitate field piping to the racks with a minimum number of elbows in the suction line. If unused circuits are not available on a rack and the additional space is not included (so that a circuit or two may be skipped on the header or the rack repositioned a couple of inches), piping within the PMS is complicated.

NW	A	B
8'	18	38.5
10'	18	64.5
10'	24	56.5



Rack Location

Condensate Pans

General

Drip pans are optional on all PMS units that have compressors. They are a required option on all curb mounted PMS units that have compressors.

On all PMS units (except PMS-RSY) when condensate pans are installed under a narrow rack the base of the rack frame is constructed differently from a normal narrow rack. The rack base has an additional one inch offset at the bottom.

Due to the different construction of the racks it is impossible to retrofit an existing unit for condensate pans.

When condensate pans are ordered for installation on single compressor units or stacked single compressor units, the compressor unit base sits on top of the pan.

Drain Location

Unless indicated on the order the drain lines will come out the base of the PMS unit on the side which faces the front of the narrow rack control box (side opposite of the piping).

On a PMS-RSY unit the special split compressor rack sits inside the drain pan. The drain lines come out the base on the side of the compressor rack.

It is not practical to combine (under the PMS) the discharge of several pans along the length of the PMS, because of the intermediate channels in the base.

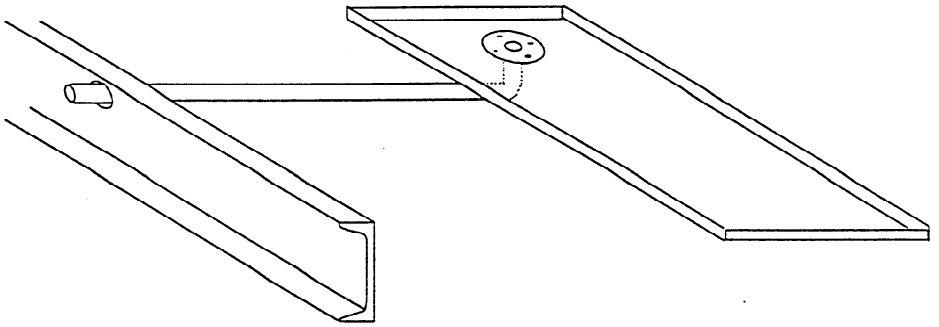
The drain line is supported at least every 4 feet.

Materials

PMS-RSY pans are constructed of galvanized steel. All others are constructed of aluminum with a minimum thickness of 0.040 inches.

The drain fitting is cast aluminum.

The drain line is 1 inch PVC pipe.

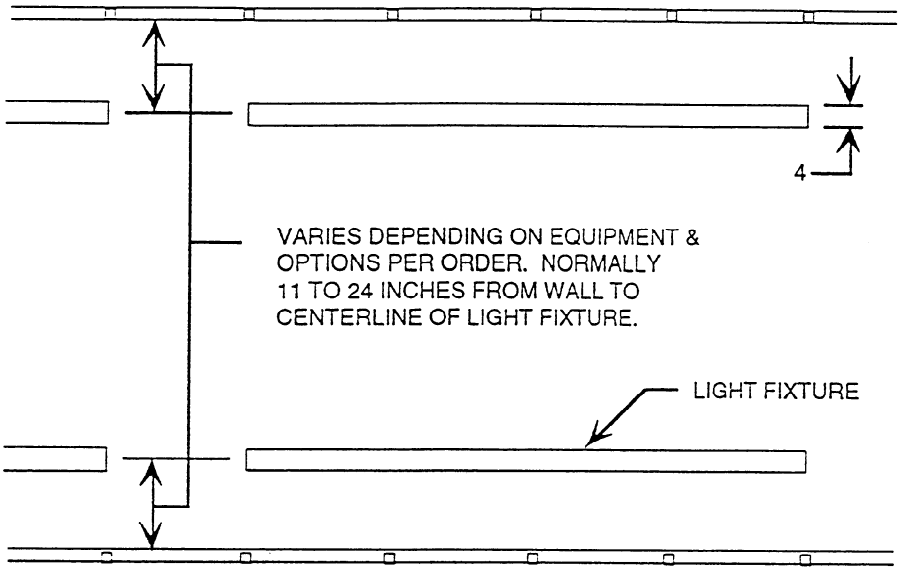


Lighting

General

All lighting and receptacles are 120V/1PH/60HZ. The table below illustrates the quantity of lights, receptacles, electrical circuits, combination light switch/receptacles and standard light switches in various lengths of compressor sections. The table assumes only one door is in the compressor section. A light switch is located inside each section close to the door. When there is more than one door in a section then 3-way switches are used at each door. Each circuit is protected by a separate 15 amp circuit breaker.

Typical Compressor Section					
NL	No. of Lights	No. of Recept.	No. of Circuits	No. of Comb. Switch & Recept.	No. of Std. Light Switch
20 thru 24	4	2	1	1	0
26 thru 30	4	3	2	1	0
32 thru 36	6	3	2	1	0
38 thru 40	6	4	2	1	0
42 thru 44	8	4	2	0	1
46 thru 50	8	5	2	0	1



Flourescent Lamps

The lighting fixture normally used holds an 8' flourescent lamp. A 4' lamp fixture is occasionally used in combination with the 8' fixtures. These flourescent lamps are standard in the compressor section of the PMS. The number of fixtures employed is given in the accompaning table. The 8' lamps are F96T12 Cool White Single Pin 75 Watt. The 4' lamps are F48T12 Cool White Single Pin 38.5 Watt.

Incandescent Lamps

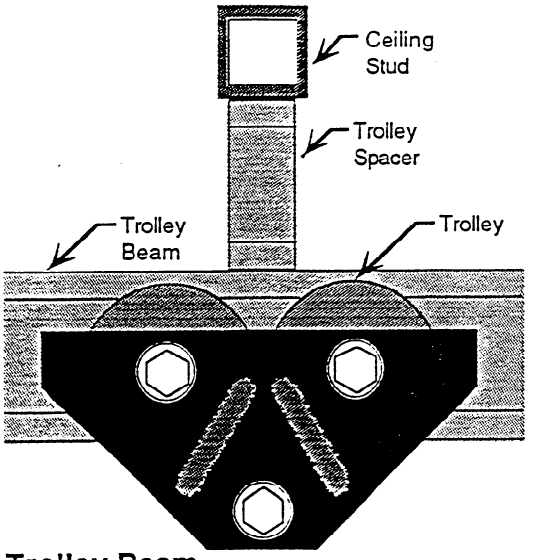
Vapor tight incandescent fixtures are employed in HVAC and Built-In Condenser sections. The fixture contains one 100 Watt lamp. Each HVAC section has one fixture. Built-In Condenser sections normally have two fixtures each.

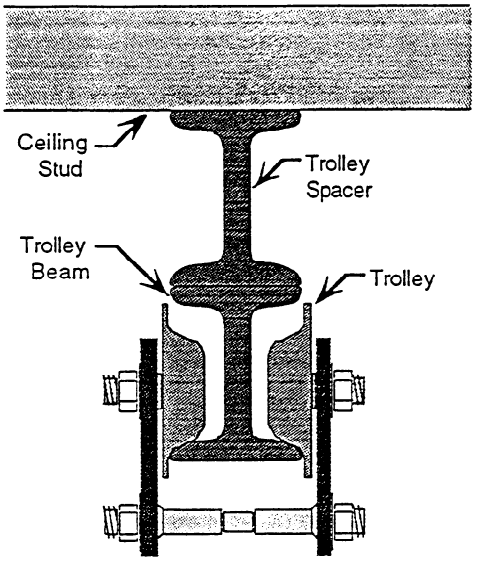
Trolley Rail & Trolley

Trolley

The free wheeling trolley has a lift capacity of 1/2 ton. Hardened pressed steel wheels have carburized treads to resist wear and run on ball bearings for smooth operation. The trolley is factory installed on the trolley beam.

Warning - These are not suitable for moving people and are unsafe for that purpose.





Trolley Beam
A standard flange S4 x 9.5 I-Beam is welded to the trolley spacers. The beam has welded stops so the trolley will not slide off the end.

Spacers
Constructed of S4 x 9.5 I-Beam, the spacers are welded to each ceiling member that the trolley passes under.

Location
The trolley is installed 8 to 20" in front of the rack so that compressors may be lifted off the rack and moved down to the door or thru an optional hatch in the floor.

Optional
The beam and trolley system is optional for a PMS. Because of the change in gage of the ceiling members that support the trolley beam and the way the trolley spacers must go thru the ceiling cutouts this option can not be field installed, nor can it be retrofit cheaply while the PMS is still at the factory. If you want the trolley, be sure to include it on the initial order.

Other Optional Accessories
An 8' lift chain hand hoist for compressor removal is available. An open lift hand hoist for up to 45' lifts is also available for roof mounted units. The hoist is located above a floor hatch so that a compressor may be moved to the building floor below.

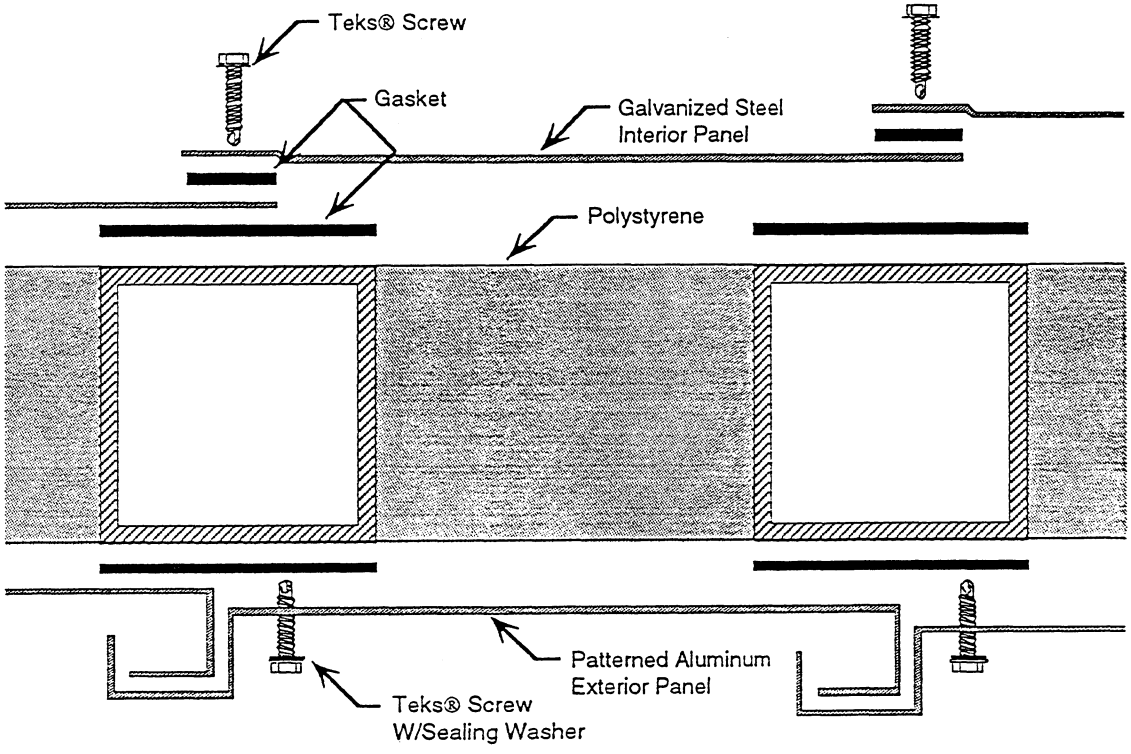
Insulation

Availability
Insulation is optionally available in the floor, ceiling and walls of any PMS unit. It is standard in HVAC climate controlled sections only (not in compressor or gas heat sections). It is required in the floor of any curb mounted PMS.

Recommendation
It is recommended that whenever noise dampening is needed (ie residential areas) the optional insulation be used.

Materials

The insulation material used is 2 inch polystyrene. All wall and ceiling panels have a 3/32 inch closed cell adhesive backed gasket. The interior panels are a minimum of 0.030 inch thick G90 galvanized steel.



Power Entrance

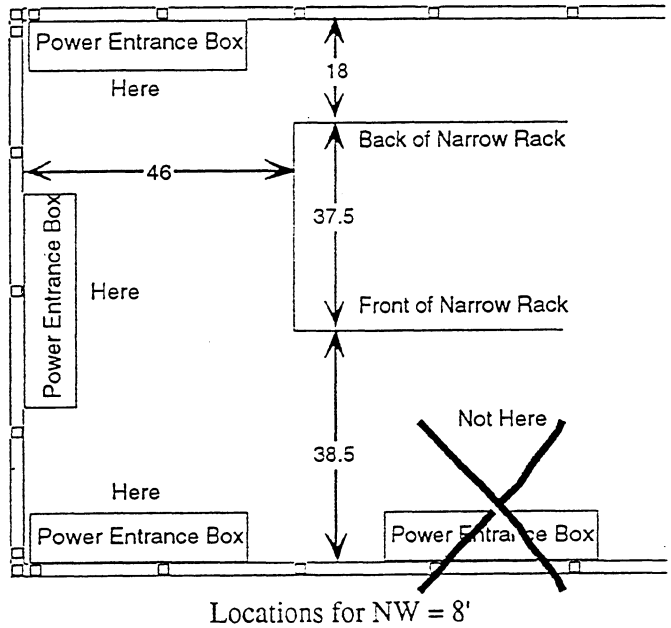
Panelboards

Square D Company I-LINE® circuit breaker panelboards are used for power entrance and distribution. These panelboards are type HCN, HCM, HCW, HCWM or HCWM-U.

Panel Sizing

The panels are sized for the specific power requirements of the equipment contained in the PMS unit. It is extremely important to designate on the order if remote loads or additional capacity is required so that the panelboards may be properly sized.

Unless otherwise instructed on the order no additional electrical capacity or breaker locations are sized into the power entrance equipment.



Locations for NW = 8'

Location Restrictions
A minimum of 3 feet must be clear in front of the panelboard. Therefore on an 8 foot PMS unit the panel board can not be located on the wall facing the racks unless the rack is set to one side of the panelboard. It is usually a good idea to located the panel board on one end on the PMS with the door beside it. This would provide easy access to the panelboard and not create a "fire trap" situation.

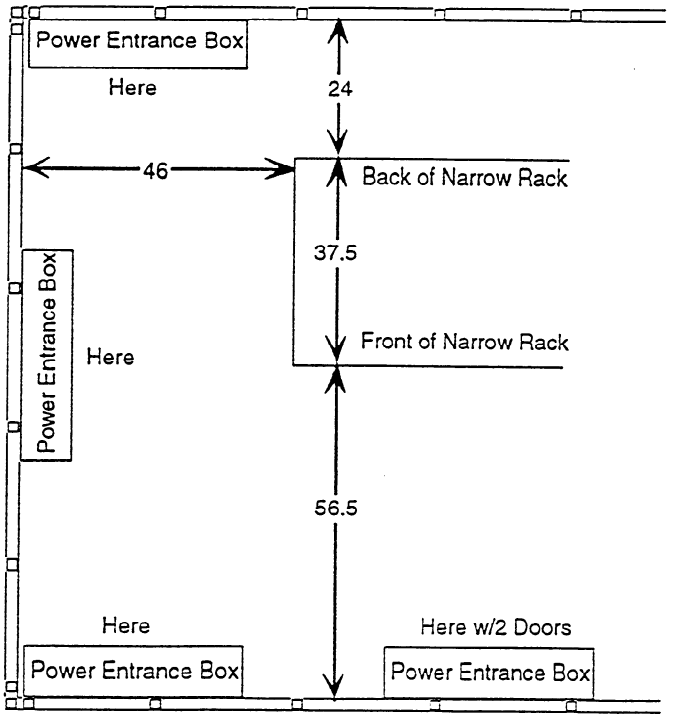
Main Circuit Breaker
Panelboards are available with main circuit breakers rated up to 1200 amperes. Unless specified on the order the rating of the main circuit breaker will be equal to the panelboard rating.

Main Lugs Only
Panelboards are available with main lugs only rated up to 1200 amperes.

Solid Neutral Assemblies
Solid neutral assemblies sized for the neutral loads present are provided in the panelboard as standard.

Ground Bar
A ground bar kit is installed in the panelboard as standard.

Mounting
All panel boards are securely mounted to a wall of the PMS unit. The taller panel-boards are mounted flush to the floor. The shorter panelboards are mounted off the floor so all breakers are at a better operator height. Contact factory for specific information.



Locations for NW = 10'

Panel Dimensions			
Model	Width	Depth	Height
HCN	26	6.5	52 to 92
HCM	32	8.5	48 to 91
HCW	42	9.5	50 to 86
HCWM	42	9.5	50 to 86
HCWMU	42	9.5	86

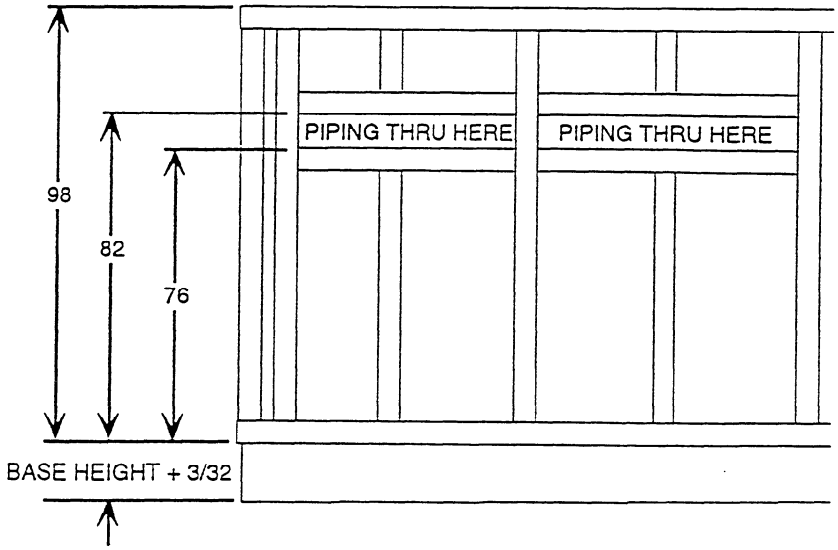
Field Connection
Feeder, solid neutral and ground connections are all in the bottom of these panelboards. If entrance thru the floor (instead of wall) of the PMS is required and indicated on the order we will eliminate the treadplate directly under the box.

Piping

Insulation
All suction line runs inside the PMS are insulated to within a few inches of the field connection point. If the equipment employs mechanical subcooling, the subcooled liquid lines are also insulated.

Piping To Aisle

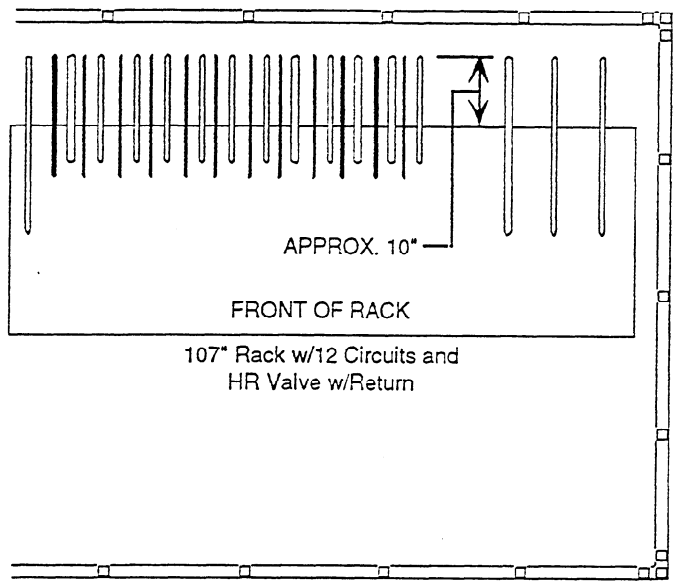
The standard arrangement (shown on the previous page) for all units except PMS-RSY is to pipe the refrigeration circuits, heat reclaim and condenser connections to the aisle behind the narrow racks. Connection is then easily made at that point, with the field piping routed thru access holes in the piping plate located on the long wall behind the narrow racks. This arrangement allows 8 foot NW PMS units to ship without overwidth load permits in most states. This also allows most units to be positioned closer to a building wall as the connections are inside.



Typical Piping Elevation Thru Long Wall At End

Piping Through Long Wall

This arrangement (available on all units except PMS-RSY) is similiar to above except that the tubing is brought through the wall so that the field connection points are outside the PMS unit. The tubing is terminated approximately 6 to 8 inches beyond the PMS exterior skin. This arrangement causes even 8 foot nominal width PMS units to be overwidth shipping loads.

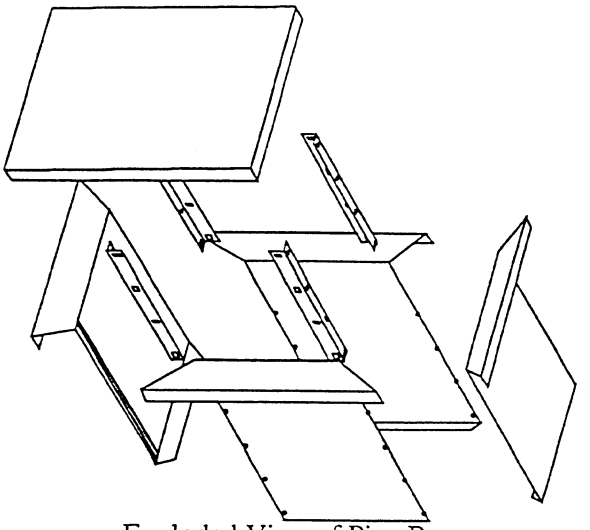


Typical Piping Plan Thru Long Wall (Piped To Aisle)

Piping Through Floor

On all units except PMS-RSY this arrangement is accomplished by bringing the piping to the exterior wall, then down the wall to a point approximately 48 inches above the floor (a convenient brazing height). Field piping is brought through piping slots in the floor between the intermediate beams in the PMS base. The distance off the wall can be varied a little for each order, but keep in mind that inside an 8 foot NW PMS space is at a premium so normally piping is kept as close to the wall as possible. It is strongly recommended that 10 foot nominal PMS units be considered for this application. For further information concerning a specific piping situation contact our Application Engineering Department.

On PMS-RSY units, with their split compressor and piping racks, the piping is brought thru the floor towards the center of the PMS. Locations for piping for specific orders of these units are shown on the Base drawing and Plan View drawing available from our Application Engineering Department.



Exploded View of Pipe Box

Piping Through End Wall

It is possible to bring a limited number of circuits through an end wall of a unit (except PMS-RSY). A rough rule-of-thumb would be that a maximum of 18 pairs of pipes (liquid and suction) can exit this way on an 8 foot NW PMS and 24 pairs on a 10 foot NW PMS unit. This arrangement must be checked for each application, and severely limits other options that are normally available in a PMS unit.

Piping Through Roof

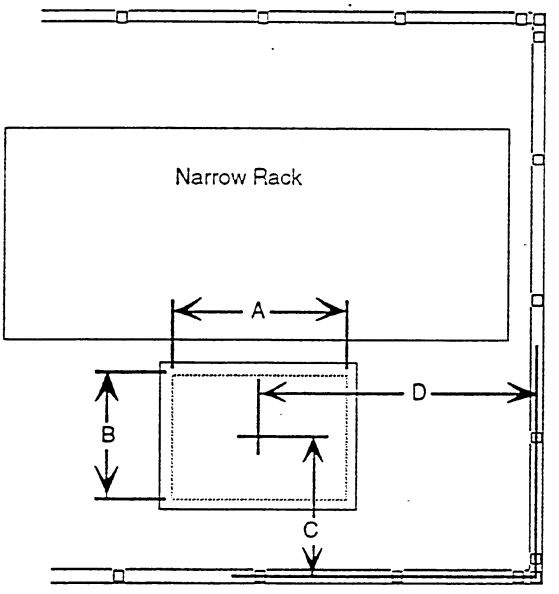
It is possible to bring a limited number of pipes through the roof of a unit. These are normally limited to condenser and heat reclaim connections. A pipe box will be provided for field installation at each roof penetration

Hatches

NW	8'	10'
A (max)	34"	34"
B (max)	25"	43"
C	23"	41"
D (min)	48"	48"

Hatch Opening

The dimensions of a hatch are given as "A" x "B" with "A" always in the direction of PMS Nominal Length (NL) and "B" in direction of Nominal Width (NW). The maximum "A" value shown in the table is independent of hatch location in the PMS. The maximum "B" value shown is for a location in front of a narrow rack. "B" can be much larger if the hatch is not in front of a rack.

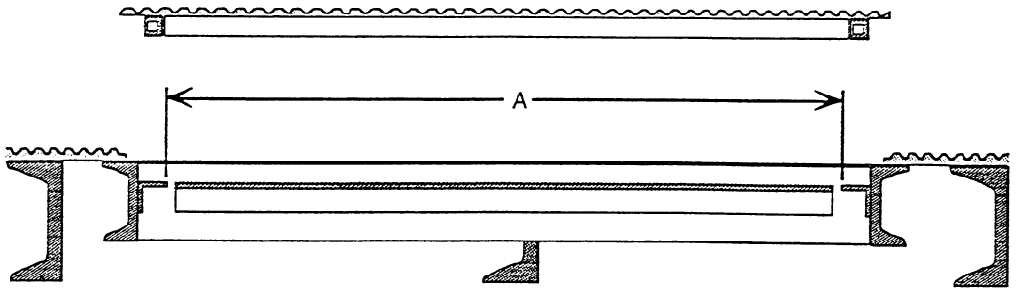


Hatch Location

"C" is the distance in the direction of nominal width (NW) that the center of the hatch may be located from the centerline of a long wall. The values shown are for a position in front of a narrow rack. If the hatch is not in front of a rack the value of "C" may be increased to half the nominal width (or NW/2).

"D" is the distance in the direction of nominal length (NL) that the center of the hatch may be located from the centerline of a short wall. It is normally best to keep the hatch centered on an intermediate beam in the base. Therefore "D" can

increase in increments of 24 inches.



Hatch Access

Unless otherwise noted on the order the hatch is designed to be opened only from inside the PMS unit.

Hot Water

General

Hot water heaters (both heat reclaim and electric) and hot loop circulation pumps are optional in all PMS units.

Part No.	Mfg. No.	Description
10K15001	EGS18-85-G	Rheem 85 gallon, 18 KW electric water heater.
10K15002	93773	Mueller D105 Fre-Heater®, 105 gallon, 2 circuit, 1.6 thru 6.6 (R502) tons per circuit @ -30° SST.
10K15003	8802674	Mueller D105 Fre-Heater®, 105 gallon, 2 circuit, 3.4 thru 12 (R502) tons per circuit @ -30° SST.
08A11047		Mueller Immersion Aquastat for Fre-Heaters
09A14013		Mueller water pump flange kit.
09A14014	880191	Mueller (Grundfos) 1/12 hp water circulation pump.
07E10033		Water shutoff valve 1-1/8.
07E10034		Water check valve 1-1/8.
SPECIAL	4018395	Thermastore TSII-1 reclaim water heater, 119 gallon, 1 circuit, 45 tons.
SPECIAL	4016000	Thermastore TSII-2 reclaim water heater, 119 gallon, 2 circuit, 10 tons per circuit.
SPECIAL	4016547	Thermastore TSIII-2 reclaim water heater, 119 gallon, 2 circuit, 10 tons per circuit, 4.5 KW electric backup w/thermostat.
SPECIAL	4016850	Thermastore storage tank, 120 gallon.
SPECIAL		Honeywell aquastat and well for Thermastore heater.

Heat Reclaim Water Heater

Besides those heaters listed below we can also provide a ZELOS™ waste heat recovery system. The recovery unit is mounted and pipied into the compressor discharge line within the PMS unit. The storage tanks are best located within the building, not in the PMS unit.

Other heat reclaim type water heaters can be installed per customer request.

Water Circulating Pump
A hot water loop circulating pump is optionally available. It can be mounted in the PMS unit and powered through the PMS power entrance panel. The pump keeps the hot water circulating thru the hot water lines so that hot water is always available when you turn on the tap.

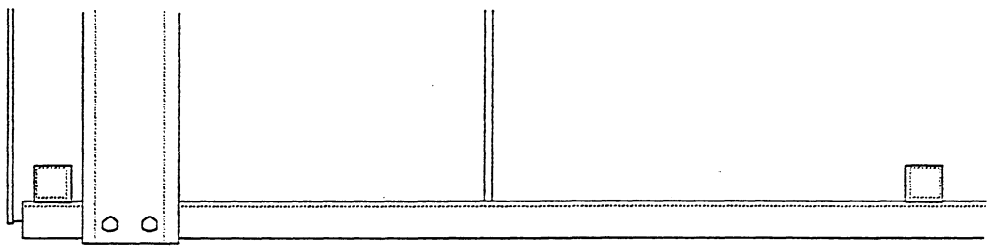
Electric Water Heater
A Rheem EGS18-85-G commercial electric water heater is available. It is most often used in association with the heat reclaim type water heaters. It can be installed in the PMS unit and powered thru the power entrance panel of the PMS unit.

Location
Water heaters can not be located directly in front or behind a narrow rack even in a 10 foot nominal width PMS unit. They should be located either between racks or at the end of the racks. It is generally preferable to locate the low temp rack close to the reclaim water tanks to reduce the piping between them. The tanks require about 3 feet of PMS unit length.

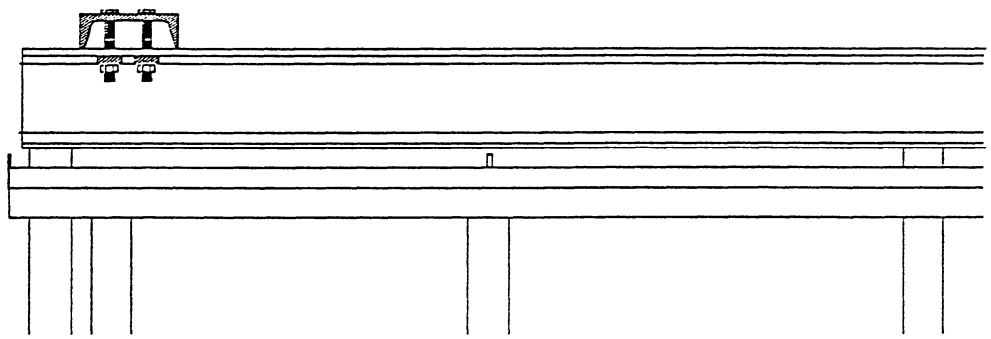
Roof Mounted Condensers

General
The drawings below depict the typical arrangement of the condenser support rails for a PMS with a nominal width (NW) of 8 feet. The arrangement for a NW of 10 feet is slightly different in that the long rail channel is turned to the inside of the PMS unit. This means that normally none of the railing for a 10 foot NW PMS will hang over the side of the roof perimeter.

Cross Rail To Long Rail Assembly

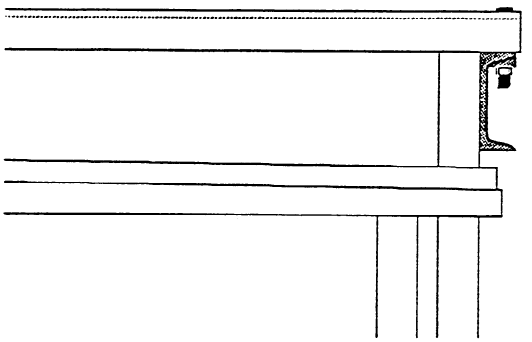


Top View



Side View

Optional
Mounting of remote condensers on the roof is optionally available on all PMS units except PMS-RSY. This option must be designated on the order when initially placed. Due to mechanical changes made in the wall structure this option can not be inexpensively retrofit even at the factory. Retrofit would require tearing down most of the PMS unit and starting over. If you want it, be sure and order it.



End View

KAC Remote Condensers
Any KAC remote condenser may be mounted on the roof (as long as the length of the PMS exceeds the length of the condenser). Multiple condensers may also be mounted as long as there is enough roof area.

Shipped Loose
The cross rails, assembly instructions and mounting hardware to assemble the cross rails to the factory installed long rail are bundled together and shipped loose.

Field Assembly
Each of the cross rails (the channel that the condenser actually bolts to) is labeled. There will be a drawing (packed with the ship loose parts) that shows how the cross rails should be assembled to the long rails, the condenser orientation and location on the roof. Do not attempt to assemble the parts without this drawing. These parts are quite similar but are made to be assembled in a specific position. If the drawing can not be found, contact Kysor//Warren immediately.

C5 x 9.0 Channel
The long rails and the cross rails are C5 x 9.0 channel. The 5 inch channel weighs approximately 9.0 pounds per foot. It has a web thickness of 0.313 inch and a flange width of 1.875 inches.

Special Walls
The long walls of a PMS with condensers on the roof are different from those normally used. These special walls have extended 11 gage galvanized 2 x 2 tubing (usually every 4 feet) in place of the normal 16 gage tubing. These extended tubes go through the roof of the PMS. They are capped so water can not enter through the exposed end. The long rails are factory welded to these tubes. The weld joints are coated with a cold galvanizing compound and then painted.

Maintenance
The hole in the roof where the extended tubing goes through the roof is caulked to keep water from leaking into the PMS. Due to expansion and contraction from summer to winter this area needs to be checked about every 6 months. Part of the roof substructure is plywood. It is therefore important to recaulk this area as needed.

Space Considerations
Ample space (normally 3 feet, check local codes) must the allowed in front of the condenser control panel. Condensers can be ordered with the control panel located either on the header end or either side (at the header end) of the condenser. Double wide KAC condensers can be built with different coil rows and fins per inch on each side. Basically this provides two individual condensers in one housing. Ample space should be provided at the non-header end of the condenser to make any leak repairs that should arise over time.

Optional Catwalk
An optional catwalk, including safety railing, can be provided. This catwalk may overhang the edge of the PMS roof a maximum of 3 feet if necessary. The catwalk, mounting hardware and

hand railing are shipped loose for field assembly. Assembly instructions are included on a drawing packed with the parts.

Built-In Condensers

General
Rather than locating the remote condensers on the roof of a PMS unit or building it is possible to make the condenser an integral part of the PMS unit.

The built-in condenser section is normally divided down the middle of the PMS into two condenser sections or sides. Each side has its own fans and controls and is piped to one rack system. This option is limited to a maximum of two condensers.

Optional
Built-in condensers are available on all 10 foot NW PMS units. They can also be used on 8 foot NW units, but the applications are more limited.

Advantages
1) As an integral part of the PMS fewer crane lifts are required.
2) Fewer roof penetrations are required for roof installations.
3) Installation time is reduced because the condenser controls, power and piping between the compressor rack and condenser is done at the factory.
4) Since each condenser is custom designed to meet your exact specifications you pay only for the capacity and features you want.

Fan Blade
The fan blade is an adjustable pitch cast aluminum airfoil design. It is securely attached to a heavy cast aluminum hub.

Fan Motor
General Electric totally enclosed fan cooled (TEFC) Energy Saver™ 1140 RPM ball bearing motors with horsepower ratings of 1, 1.5 and 2 are employed. These motors are GE "off-the-shelf" so a service replacement is easy to find.

Dampers
An aluminum backdraft damper is employed on each fan. This eliminates short cycling of the air when a fan has cycled off.

Capacity Tables
On the pages that follow are R22 capacity tables for only one side of the unit. The THR/°TD shown has units of measure of BTU per HR per °F. The number of fans in a side, the finned length of the coil, the coil rows and fins per inch and the nominal length (NL) required for the section, make up the column headings. As the two sides are independent of each other, the coils can be selected for the specific capacity required. However, the NL of the smaller capacity system must equal the NL of the larger system. It is also recommended, but not a requirement, that the number of fans be the same on both sides.

The capacity shown is for 2 stacked coils. Each are 28 tubes high. If lower capacity is required the number of tubes high may also be reduced.

R22 CONDENSER WITH 1 HP FANS
THR/°TD per Side

FANS	COIL	4R10F	4R8F	3R10F	3R8F	2R10F	2R8F	NL
2	76	15120	13784	12694	11441	9579	8510	8
	88	15980	14663	13595	12300	10383	9238	9
	100	16763	15455	14404	13072	11111	9896	10
3	76	18580	17105	15584	13950	11375	10053	10
	88	20330	18486	16828	15051	12390	10975	10
	100	21556	19555	17894	15043	13340	11835	10
	112	22529	20522	18881	17011	14226	12636	11
	124	23415	21423	19808	17894	15052	13386	12
	136	24242	22270	20671	18719	15828	14084	13
	148	25020	23056	21478	19487	16551	14739	14
4	76	19672	18405	16917	15453	12689	11242	14
	88	22259	20705	18963	17141	13950	12309	14
	100	24544	22622	20619	18468	15049	13297	14
	112	26419	24101	21924	19595	16080	14233	14
	124	27850	25272	23044	20643	17058	15122	14
	136	28971	26297	24084	21634	17990	15963	14
	148	29936	27260	25069	22579	18872	16761	14
	160	30836	28171	26009	23476	19712	17520	15
	172	31690	29043	26901	24326	20506	18245	16
	184	32500	29873	27746	25135	21270	18929	17
5	100	25703	24010	22047	20075	16422	14516	17
	112	28229	26232	24010	21672	17628	15555	17
	124	30504	28134	25652	22985	18722	16541	17
	136	32453	29681	27001	24130	19764	17485	17
	148	34041	30940	28170	25201	20759	18391	17
	160	35309	32025	29246	26224	21718	19258	17
	172	36383	33035	30274	27203	22638	20090	17
	184	37342	33996	31256	28147	23518	20887	17
	196	38251	34919	32203	29053	24365	21652	18
	208	39121	35802	33113	29918	25176	22392	19
	220	39951	36656	33986	30750	25955	23095	20
	232	40758	37476	34820	31549	26709	23772	22
6	172	40158	36568	33275	29749	24453	21652	21
	184	41565	37726	34385	30794	25429	22538	21
	196	42751	38774	35444	31802	26373	23391	21
	208	43794	39772	36462	32772	27285	24217	21
	220	44748	40732	37447	33715	28164	25011	21
	232	45663	41660	38395	34625	29016	25783	22
	244	46545	42553	39317	35505	29835	26525	22

For capacity of R22 multiply by 1.00
For capacity of R502 multiply by 0.98
For capacity of R12 multiply by 0.95

R22 CONDENSER WITH 1.5 HP FANS
THR/°TD per Side

FANS	COIL	4R10F	4R8F	3R10F	3R8F	2R10F	2R8F	NL
2	76	15579	14386	13302	12060	10103	8991	8
	88	16836	15557	14433	13093	11022	9808	9
	100	17915	16574	15425	14006	11845	10546	10
3	76	18163	16809	15439	14017	11623	10367	10
	88	9835	18508	17030	15445	12847	11445	10
	100	21681	20015	18458	16734	13964	12434	10
	112	23142	21367	19749	17905	14991	13343	11
	124	4053	22587	20923	18975	15933	14184	12
	136	5235	23694	21996	19958	16818	14967	13
	148	26704	24701	22982	20864	17636	15703	14
4	76	19483	18137	16643	15181	12555	11235	14
	88	21856	20281	18612	16930	14011	12513	14
	100	23993	22209	20396	18521	15354	13697	14
	112	25918	23954	22026	19981	16602	14796	14
	124	27661	25543	23523	21331	17765	15823	14
	136	29247	27000	24909	22583	18855	16787	14
	148	30702	28347	26195	23749	19879	17693	14
	160	32043	29591	27391	24839	20842	18549	15
	172	33281	30748	28509	25860	21752	19357	16
	184	34427	31824	29556	26819	22611	20123	17
5	100	25376	23597	21653	19729	16317	14591	17
	112	27693	25688	23575	21437	17745	15846	17
	124	29823	27609	25353	23024	19084	17026	17
	136	31781	29380	27007	24504	20347	18138	17
	148	33585	31024	28550	25893	21540	19190	17
	160	35258	32553	29995	27198	22671	20189	17
	172	36812	33982	31358	28429	23744	21138	17
	184	38260	35326	32640	29592	24765	22043	17
	196	39621	36586	33851	30694	25739	22906	18
	208	40894	37773	34996	31739	26667	23729	19
	220	42090	38894	36081	32733	27555	24521	20
	232	43216	39952	37113	33678	28403	25278	22
6	172	39480	36479	33554	30435	25301	22545	21
	184	41214	38060	35044	31779	26460	23569	21
	196	42841	39552	36460	33057	27569	24549	21
	208	44373	40962	37804	34274	28631	25489	21
	220	45819	42305	39084	35435	29651	26393	21
	232	47187	43575	40305	36546	30631	27262	22
	244	48490	44784	50650	37607	31573	28095	22

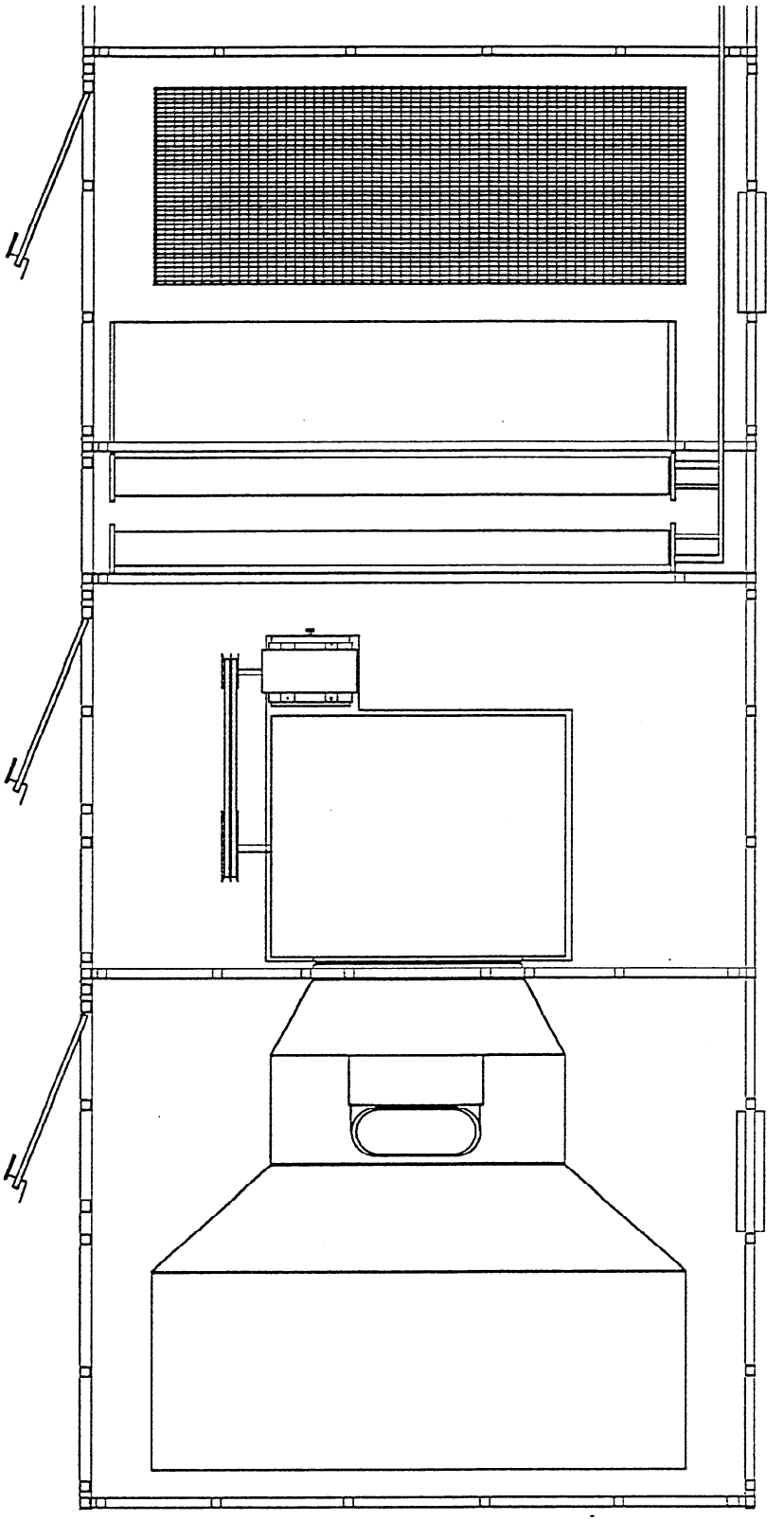
For capacity of R22 multiply by 1.00
For capacity of R502 multiply by 0.98
For capacity of R12 multiply by 0.95

R22 CONDENSER WITH 2 HP FANS
THR/°TD per Side

FANS	COIL	4R10F	4R8F	3R10F	3R8F	2R10F	2R8F	NL
2	76	16474	15206	14022	12712	10607	9443	8
	88	17907	16533	15291	13863	11619	10340	9
	100	19151	17693	16413	14888	12532	11152	10
3	76	18891	17496	16045	14582	12066	10774	10
	88	20346	19372	17791	16147	13391	11941	10
	100	22798	21054	19369	17566	14607	13014	10
	112	24451	22571	20807	18863	15730	14007	11
	124	25943	23950	22121	20053	16773	14929	12
	136	27297	25206	23328	21152	17744	15791	13
	148	28530	26358	24441	22169	18652	16597	14
4	76	20110	18716	17144	15651	12927	11587	14
	88	22633	21009	19251	17531	14486	12957	14
	100	24944	23106	21187	19260	15933	14229	14
	112	27060	25027	22970	20857	17282	15417	14
	124	29646	26793	24623	22338	18547	16531	14
	136	30781	28423	26157	23720	19735	17580	14
	148	32427	29933	27589	25011	20854	18569	14
	160	33950	31340	28927	26223	21912	19504	15
	172	35362	32649	30181	27362	22914	20393	16
	184	36681	33873	31360	28436	23866	21236	17
5	100	26219	24378	22334	20369	16826	15069	17
	112	28690	26624	24398	22213	18356	16415	17
	124	30995	28715	26328	23935	19799	17684	17
	136	33144	30663	28136	25553	21164	18886	17
	148	35143	32483	29835	27075	22458	20026	17
	160	37012	34188	31433	28511	23688	21110	17
	172	38762	35789	32942	29872	24859	22143	17
	184	40402	37294	34368	31160	25976	23131	17
	196	41943	38715	35723	32384	27044	24075	18
	208	43395	40062	37007	33549	28066	24981	19
	220	44768	41332	38228	34659	29047	25850	20
	232	46062	42538	39389	35717	29986	26682	22
6	172	41257	38148	35023	31792	26355	23507	21
	184	43187	39910	36668	33268	27615	24617	21
	196	45011	41572	38233	34675	28823	25683	21
	208	46738	43152	39725	36022	29984	26707	21
	220	48376	44656	41149	37309	31100	27692	21
	232	49930	46088	42515	38541	32174	28643	22
	244	51408	47458	43819	39723	33209	29560	22

For capacity of R22 multiply by 1.00
For capacity of R502 multiply by 0.98
For capacity of R12 multiply by 0.95

HVAC


Compressor Section
Return Air
Outside Air Damper
Filter Section
A/C Coil
Heat Reclaim Coil
Blower Section
Gas Heat Section
Combustion Air Intake
Supply Air

General
HVAC equipment is available for roof top platform, curb or ground slab mounting. For a brief model number vs. equipment rundown see page 1.

Return Air Section
Return air sections normally require a minimum length of 4 nominal feet. The return air section must have a door in it to gain access to the filter section. The return air duct connections may be located either in the floor or on an end or side wall. When the return air is brought through the floor a galvanized steel grate is welded into the opening. This grate serves a couple of purposes. It allows a person to stand in the return air stream and change filters and will not permit access to the building via the return air duct.

Return Air Damper
An optional return air damper may be specified. This damper may be specified for system balancing or as a fire damper which can be closed under the control of a smoke detector system.

Outside Air Damper
An optional outside air damper is available in a number of sizes and types. The most common is a manually adjustable type. An optional weather hood is available for this damper.

Filter Section
This section requires a minimum length of 2 nominal feet. The filter rack is normally designed for a 20 x 25 x 2 throw-away filter. Other filter types, sizes and ratings may be optionally specified.

Coil Section
The coil section requires a minimum length of 2 nominal feet. This section may contain cooling coil(s), heat reclaim coil(s), removable drain pan and intermediate drain pans (when required). This section is accessible for service by removing the outside panels.

Cooling Coil
Cooling coil(s) are custom engineered to your performance specifications. Practically any combination of rows deep, fins per inch, finned length, finned height, bypass (optional bypass damper is available), and circuiting is available to meet your sensible heat ratio needs.

Heat Reclaim Coil
Custom designed heat reclaim coil(s) are matched to the system(s) specified. Typically the coil is 3 or 4 rows deep with 10 fins per inch. The finned length, finned height and circuiting are custom matched for each application. If the unit also has cooling the heat reclaim coil(s) will be installed in the reheat position.

Blower Section
The blower section typically requires a minimum length of 6 or 8 nominal feet. The blower section must have a door in it. The length depends on the size of the blower required, the motor size and what is down stream from the blower. If a gas heater is down stream a divider wall is located between the blower and the heater. The blower and motor assemblies are mounted on spring isolators.

Blower
Typically a double width double inlet airfoil fan is used. The fans are selected for each specific job with the objective being to find a balance between first cost and operational cost. The airfoil fans are normally selected to run at 1000 to 1500 rpm. This usually assures a quiet, low operational cost system. A number of bearing combinations with different B10 lifes may be chosen.

Blower Motor
The blower motor is typically an open drip proof design operating at 1750 rpm. Either a standard or high efficiency motor may be specified. The motor sits on an adjustable motor base, making belt tightening easy.

Drives
Browning sheaves are currently used in the drive selection. Typically the drives have an adjustable motor sheave with multiple B section gripnotch belts rated at a minimum of 120% of load (higher ratings available). A removable belt guard is standard.

Supplemental Heat Section
This optional section requires a minimum length of 4 nominal feet. It may contain gas or electric heat.

Gas Heat
A variety of duct heater capacities and controls are available. A fixed intake damper and double wall exhaust are included for combustion air. The gas heat section must have a door in it to gain access the heater.

Electric Heat
A variety of heater KW ratings, steps and control schemes are available. Give us your specifications and we can probably provide it.

Supply Air Section
Supply air sections normally require a minimum length of 4 nominal feet. The supply air duct connections may be located either in the floor or on an end or side wall.

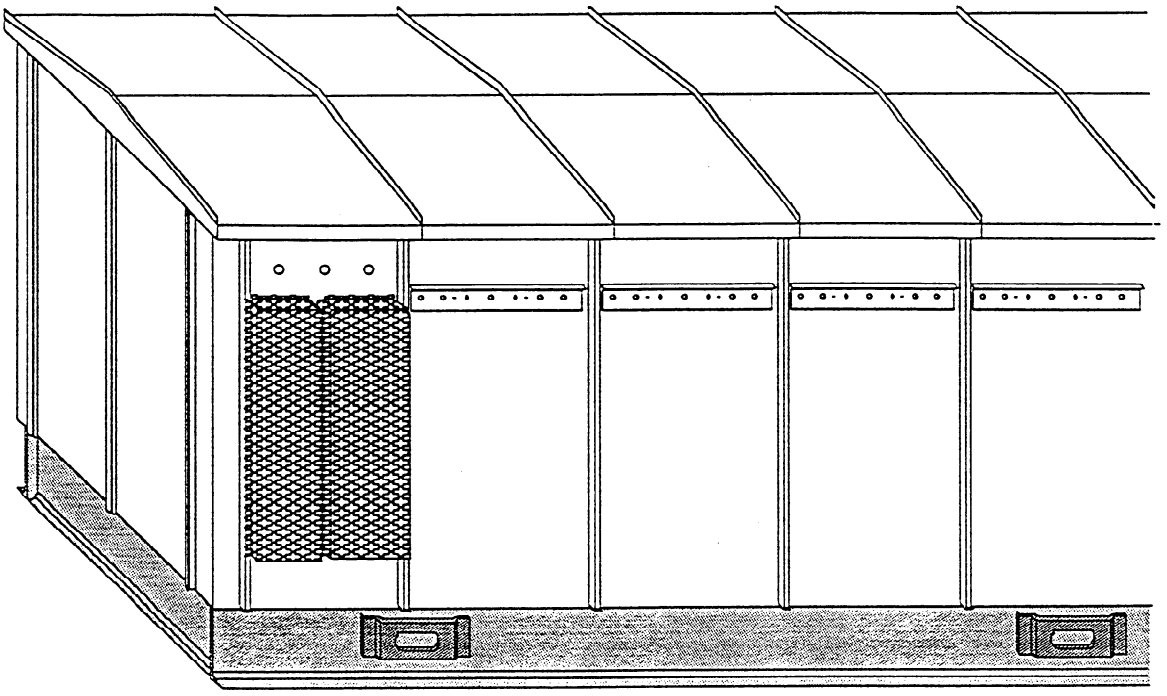
Supply Air Damper
An optional supply air damper may be specified. This damper may be specified for system balancing or as a fire damper which can be closed under the control of a smoke detector system.

Smoke Detector
Simplex® or Fire Control Inst.®, UL listed, ionizing type, duct mounted smoke detector is optional on HVAC units. Mounted in the supply air duct just before the exiting the PMS, the system may include visual and audible alarms as well as local and remote test stations.

Component		Part No.
Smoke Detector		28H12010
Housing		28H12022
REM Indicator		28H12020
REM Test/Indicator		28H12019
Wiring Kit (120V)		28H12021
Sampling Tube	26"	28H12011
	44"	28H12012
	74"	28H12013
	120"	28H12014

Custom Designed
Each section and component in our HVAC unit are custom designed and selected for your specific job. The preceeding is only brief description of the more typical sections and components. If you have a specific requirement not mentioned here we can still probably provide the equipment you need.

Notes:



PMS units are custom designed and manufactured in Columbus, GA. USA.

For further information or quotation please contact the Application Engineering Department in Conyers, GA., your local Kysor//Warren Representative or Kysor//Warren Zone Manager.

For service information contact our Service Department in Conyers, GA.

Kysor//Warren
Service Department
1600 Rockdale Industrial Blvd.
Conyers, GA. USA
30207

404-483-5600

KYSOR//WARREN®
Division Of Kysor Industrial Corporation

IN THE CONSTANT EFFORT TO IMPROVE OUR PRODUCTS, WE RESERVE THE RIGHT TO CHANGE AT ANY TIME SPECIFICATIONS, DESIGN, OR PRICES WITHOUT INCURRING OBLIGATION.

KYSOR/WARREN

DIVISION OF KYSOR INDUSTRIAL CORPORATION

P.O. Box C
1600 Industrial Blvd.
Conyers, Georgia 30207
404 483-5600

ONE-YEAR WARRANTY

KYSOR/WARREN warrants to the original purchaser this new equipment and all parts thereof, to be free from defects in material and workmanship under normal use and service. If any part or parts of the equipment should prove defective during the period of one year from installation date (not to exceed one year and thirty days from the date of original shipment from the factory), KYSOR/WARREN hereby guarantees to replace or repair, without charge (F.O.B. CONYERS, GEORGIA), such part or parts as prove defective, and which KYSOR/WARREN's examination discloses to its satisfaction to be thus defective, with a new or functionally operative part. The liability of KYSOR/WARREN under this warranty shall be limited to claims made by the original purchaser to KYSOR/WARREN or its local distributor within the warranty period.

GLAZING: Glass is not guaranteed against breakage. If this refrigerator is equipped with a glazing assembly carrying the manufacturer's brand name (Thermopane, Twindow, etc.), the manufacturer's glazing warranty in effect at the time of this shipment is extended to that assembly. It is void outside the continential United States.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR FITNESS, AND ALL OTHER OBLIGATIONS OR LIABILITIES OF KYSOR/WARREN.

THIS WARRANTY SHALL NOT APPLY:

1. To the condensing unit used with refrigerated equipment unless same was sold and shipped by KYSOR/WARREN.
2. When this equipment or any part thereof is damaged by fire, flood, act of God, or when the original model and serial—number plate has been altered, defaced, or removed.
3. When this equipment or any part thereof is subject to accident, alteration, abuse, misuse, tampering, operation on low or improper voltages, or is put to a use other than recommended by KYSOR/WARREN.
4. When this equipment or any part thereof is damaged, or when operation is impaired, due to failure to follow installation manual (improper installation is the responsibility of the installer).
5. Outside the continental United States.
6. To labor cost for replacement of parts, or for freight or shipping expenses.
7. If the Warranty holder fails to comply with all the provisions, terms and conditions of this Warranty.

Parts replaced under this Warranty are warranted only through the remainder of the original Warranty. KYSOR/WARREN may, at its option and in its discretion, elect to honor this Warranty and to disregard the original purchaser's noncompliance with any of the provisions, terms and conditions of this Warranty.

THIS WARRANTY DOES NOT COVER CONSEQUENTIAL DAMAGES.

KYSOR/WARREN shall not be liable under any circumstances for any consequential damages, including loss of profits, additional labor costs, loss of refrigerant or food products, or injury to person or property caused by defective material or parts or for any delay in the performance of this Warranty due to causes beyond its control. The foregoing shall constitute the sole and exclusive remedy of any purchaser and the sole and exclusive liability of KYSOR/WARREN in connection with this product.