

# INSTALLATION AND COMMISSIONING MANUAL

for

Neos 100S

Integra 20X, 30S, 35X, 40X,  
50X

Direct Drive Refrigeration Units



### ***Electrical Power***

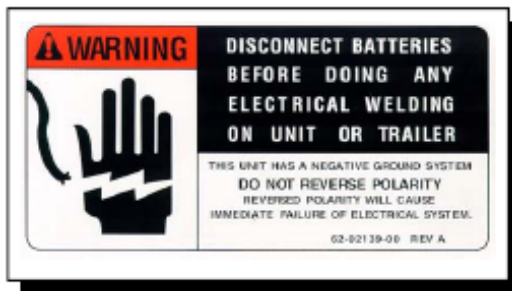
Beware of HIGH VOLTAGE supplied by the main power as the unit may start automatically.

Before working on any unit, make sure that the main Run/Stop switch is in STOP position and the negative battery terminal is disconnected.



### ***Fan Blades***

All refrigeration units are equipped with Automatic Start/Stop and may start at any time without warning. Beware all fan blade, belts, and other moving parts.



### ***Vehicle Battery***

Vehicles are equipped with a lead-acid type battery. The battery normally vents small amounts of flammable hydrogen gas. Keep any flame, lighted object, or source of spark away. A battery explosion can cause serious physical harm and/or blindness



### ***Electrical Connection***

DISCONNECT the battery ground (-) on the vehicle battery.

### ***Personal Protective Equipment***

Always use personal protective equipment while doing anything on this refrigeration unit.

### ***Engine Coolant***

All engines have a pressurized coolant system. Under normal operating conditions, the coolant in the engine and radiator is under high pressure and very hot. Do not remove the cap from a hot radiator. If the cap has to be removed, do so very slowly in order to release pressure without spray.

### ***Refrigerants***

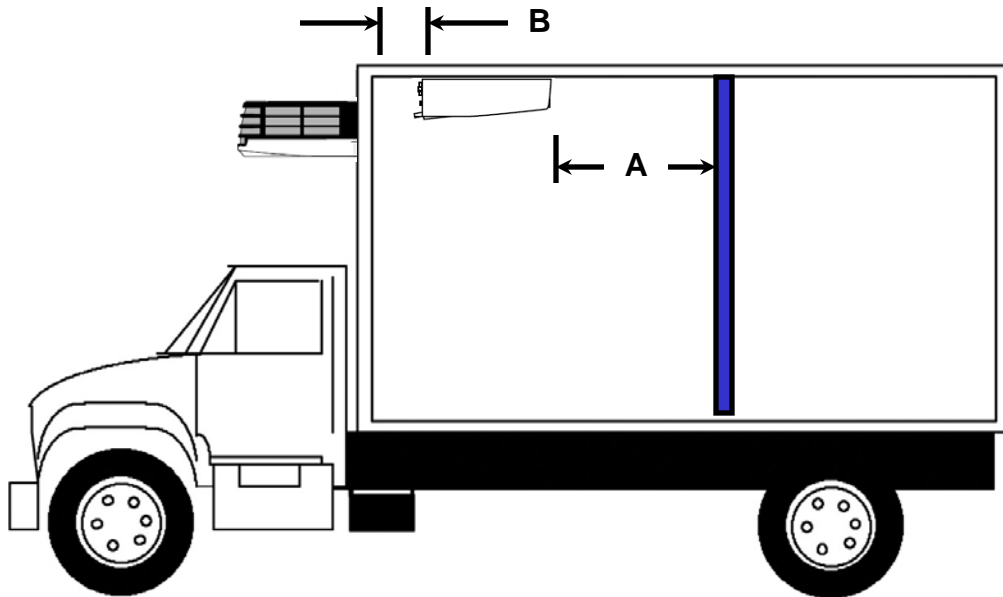
The refrigerant contained in the refrigeration system of the units can cause frostbite, severe burns, or blindness when in direct contact with the skin or eyes.



# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Evaporator Clearances

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Do not obstruct the evaporator fan inlet(s) or outlet

For any movable bulkheads, there must be a MINIMUM distance “A” between the evaporator outlet and any obstruction.

When mounting X Series evaporators, it is recommended to leave a MINIMUM distance “B” for installation and service access.

MODEL	“A” Minimum Distance Inches (millimeters)	“B” Minimum Distance Inches (millimeters)
NEOS 100S, 20X	20.0” (500)	6.0” (150)
30S	32.0” (800)	Not Applicable
35X,40X, 50X	40.0” (1,000)	6.0” (150)

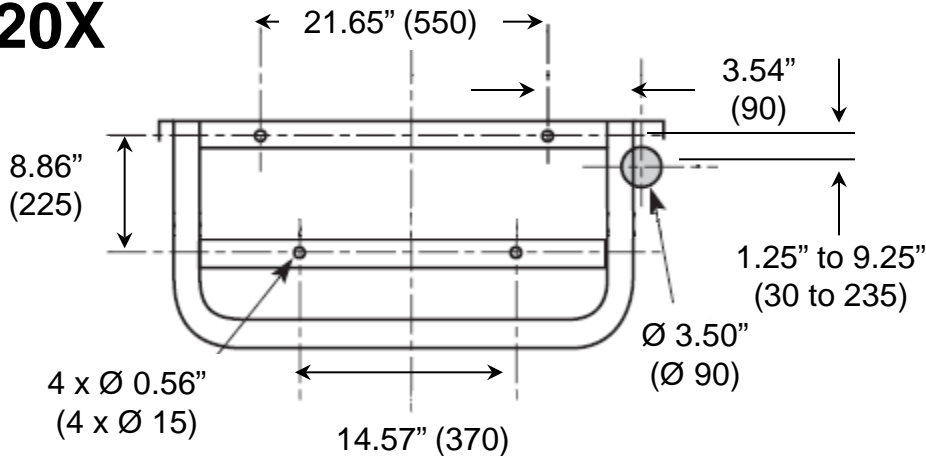
# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Condenser Installation – Roof Top Application

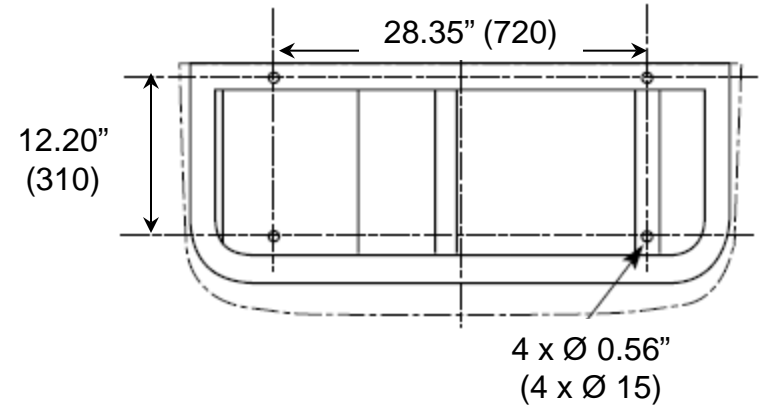
62-11165 Rev D

### NEOS 100S

#### 20X

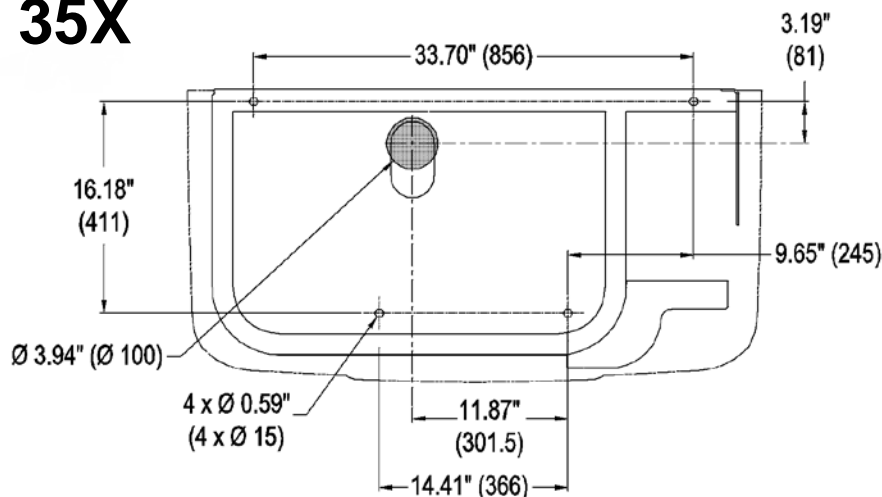


### 30S



**Note:** For 30S, use the black marking on the bottom cover of the unit as a template for drilling the large refrigerant and electrical pass-thru hole.

### 35X



### Roof Top Applications

Mark and drill the four condenser mounting holes, as well as the larger refrigerant and electrical pass-thru hole, as indicated above (depending on unit model)

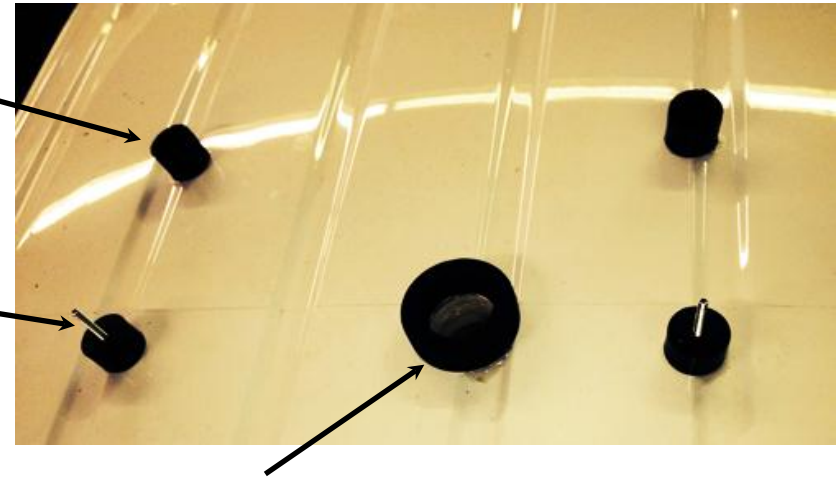
# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Condenser Installation – Roof Top Application

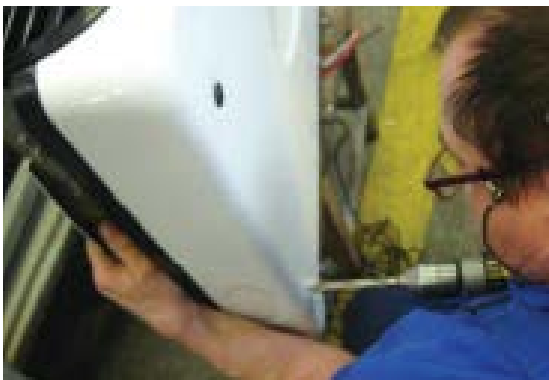
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Install the four condenser mounting pads by first applying waterproof silicone caulk to the bottom cups in each pad.

Apply waterproof silicone caulk to each of the four condenser mounting screws to prevent water entry around the screw.



Apply waterproof silicone caulk to both sides of the center pad, which is used for hoses and wiring, and install the center pad.



Remove the condenser cover. On the bottom cover of the unit, drill the four 0.56" (15mm) mounting holes and the larger electrical/hose hole as per the diagram on page 5.

Mount the condenser on the mounting pads in fasten in place using the hardware supplied in the kit.

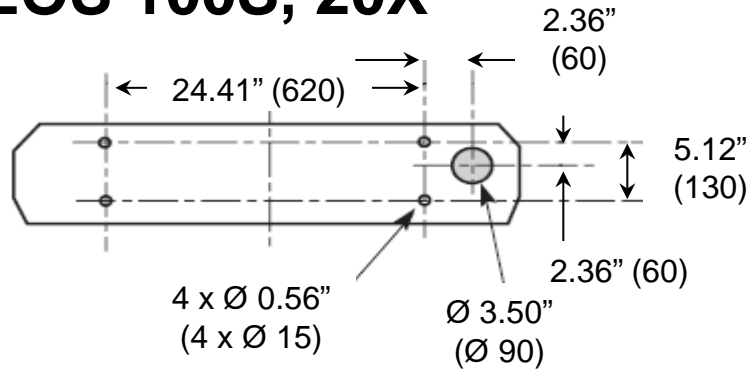
# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



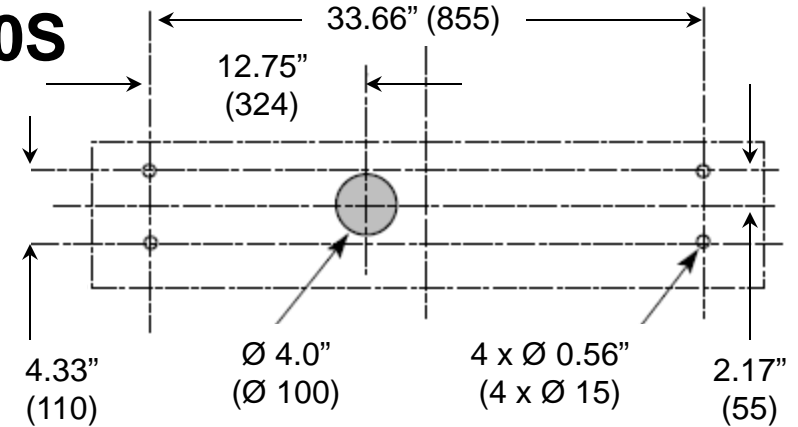
## Condenser Installation – Front Mount Application

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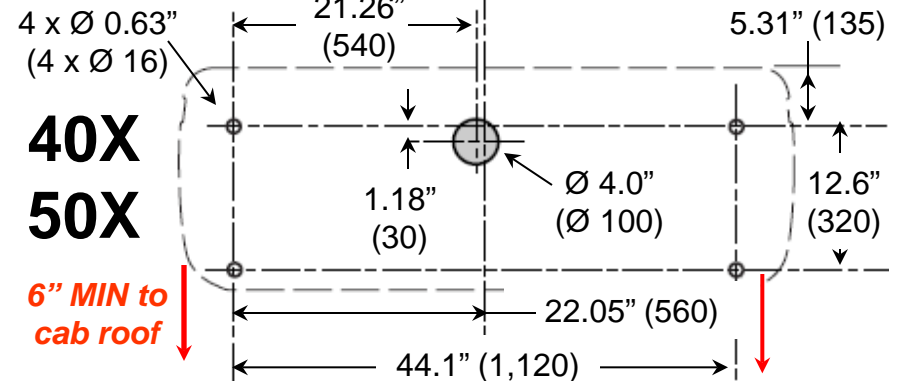
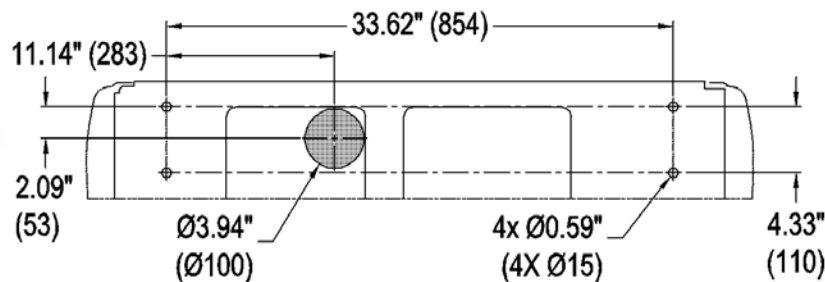
### NEOS 100S, 20X



### 30S



### 35X



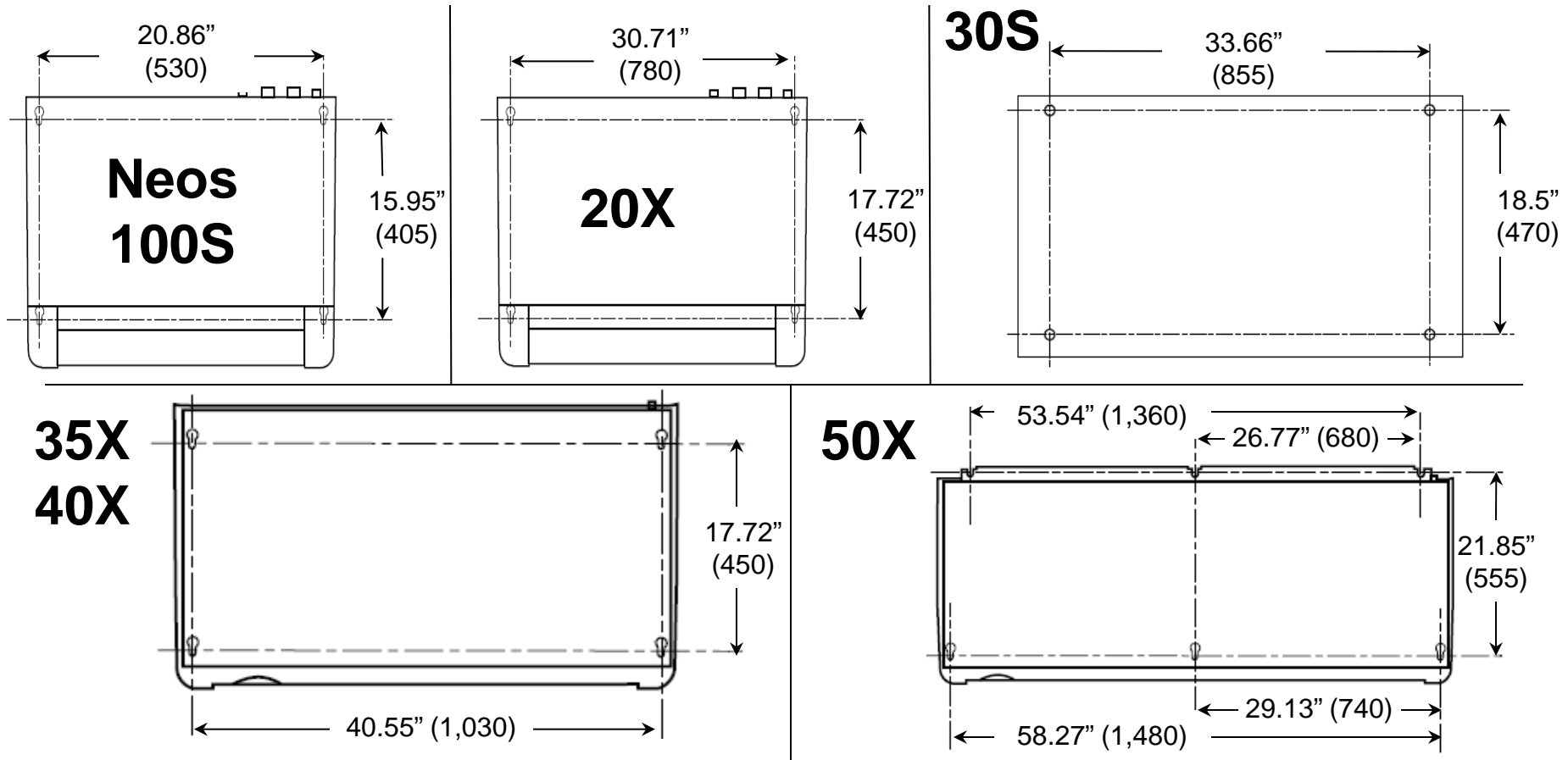
**Front Mount Applications:** Mark and drill the four condenser mounting holes, as well as the larger refrigerant and electrical pass-thru hole, as indicated above (depending on unit model)

Bolt the condensing unit in place using the hardware supplied in the mounting kit.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Evaporator Mounting Preparation

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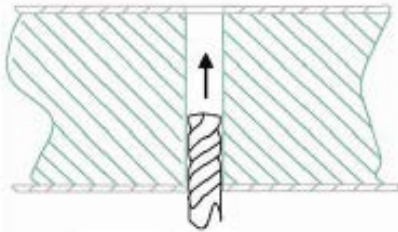
Remove evaporator access panels. If the box has mounting studs, fasten the evaporator using supplied hardware; otherwise, mark the mounting holes as indicated above (depending on unit model). Leave a minimum of 6" (150mm) between the box wall and the rear of the evaporator.



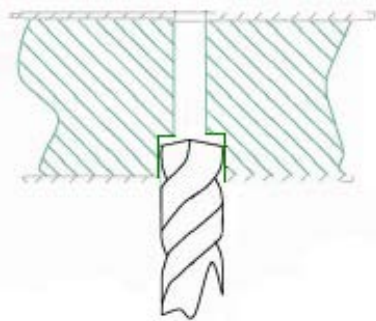
# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Evaporator Mounting Preparation – Mushroom Drilling

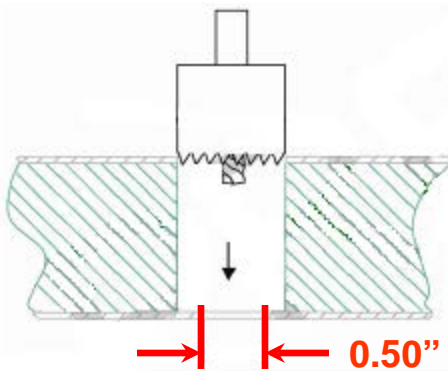
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**From the inside of the box**, drill 4 holes completely through the roof of the vehicle using a 7/32" (5mm) drill bit.



**From the inside of the box**, step drill only through the inside skin of the vehicle using a 1/2" (12.5mm) drill bit.



**From the outside of the box**, use a 7/8" (22mm) hole saw to drill the outer roof of the box and the insulating foam.



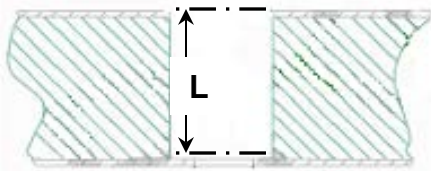
**Make certain NOT to drill all the way through the roof. The 1/2" (12.5mm) hole in the inside skin of the vehicle must remain intact.**

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

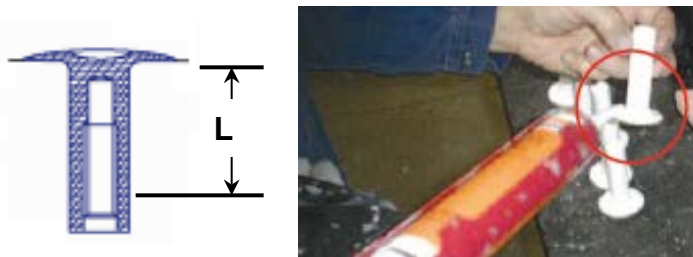


## Evaporator Mounting Preparation – Mushroom Installation

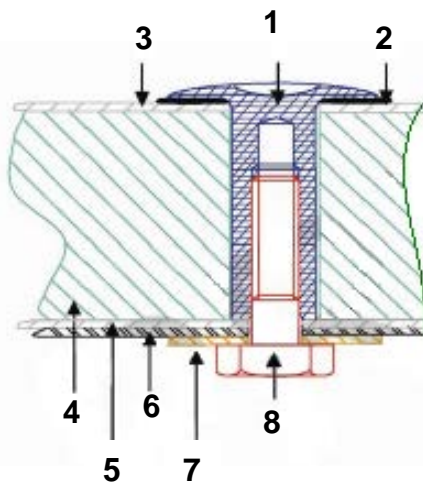
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Measure the roof depth from the outside of the roof to the inside of the inner box skin (distance “L”).



Measure mushrooms from the bottom of the head to end of the mushroom. Mark and cut them to the same length “L”. Apply waterproof silicone caulk to the underside of the mushroom head and tap into the vehicle roof to slightly crush the caulk. Bolt the evaporator in place using the hardware supplied.



The correct bolting arrangement is show with the mushrooms and evaporator in place. Note that the evaporator should not press directly against the mushrooms due to the step drilling.

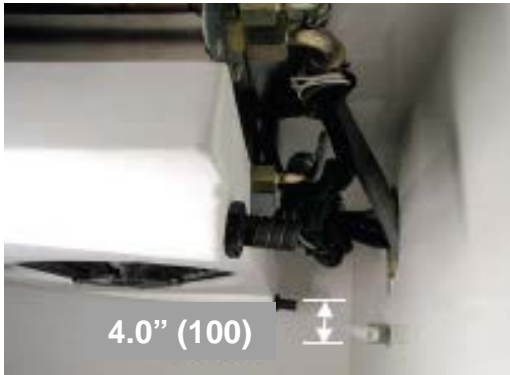
- |                           |                       |
|---------------------------|-----------------------|
| 1) Mushroom (34-01262-00) | 5) Inner box skin     |
| 2) Silicone caulk         | 6) Evaporator housing |
| 3) Vehicle roof           | 7) Washer             |
| 4) Box insulation         | 8) Mounting screw     |

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Evaporator Mounting – Drain Line Installation

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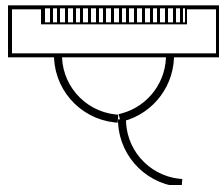
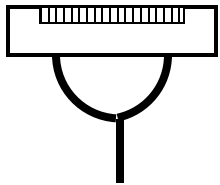
Install the evaporator drain lines.



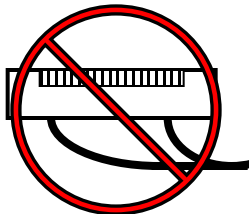
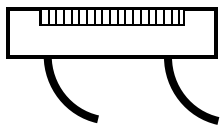
**A MINIMUM drop of 4.0” (100mm)** is recommended between the drain pan outlet and where the drain lines exit the vehicle.



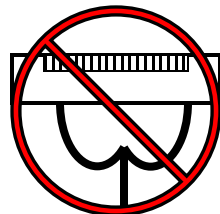
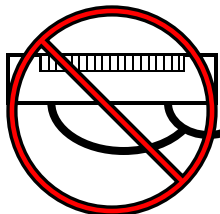
**Note the difference** in drain line recommendations for perishable versus frozen applications



**For perishable applications**, connect the water drain hoses together and route outside the vehicle. Note the diagram showing recommended ways of routing the lines.



**For frozen applications**, do NOT tee drain lines together. It is important for each line to directly exit the vehicle in as short a distance as possible to prevent condensate from freezing.



**Make certain there are no low spots that can trap water in any of the drain line routings.**

Secure drain lines in place using ty-wraps or clamps.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Refrigerant Hose Installation – Handling Recommendations

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**For proper functioning of the refrigeration unit, the hoses must be kept clean and dry**

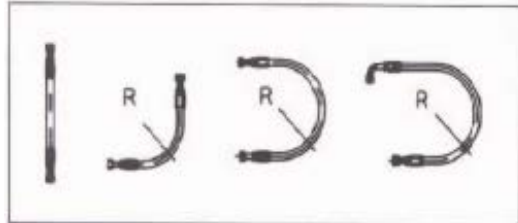


**It is recommended to leave the caps installed on the ends of the hoses while routing them to prevent internal damage or moisture entry.**

Make sure to use the clamps provided in the installation kit to secure the hoses and keep them from vibrating or rubbing.

When securing hoses, note the hoses will slightly change length under pressure. When securing and clamping the hoses, make sure to account for the slight variations in length that will occur.

Use the rubber grommets provided in the installation kit when passing through holes and bulkheads to prevent the hoses and electrical wires from rubbing on any sharp edges.



### Minimum Bend Radius

#6 hose (3/8")	3.5" (90mm)
#8 hose (1/2")	4.0" (100mm)
#10 hose (5/8")	4.5" (115mm)
#12 hose (3/4")	5.25" (135mm)



**As shown in the diagram, do not twist, curve or route the hoses in any manner which will stress the hose.** Use as large a bend radius as possible. Use elbows and fitting as necessary to ease installation and increase hose life.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Refrigerant Hose Installation – Installation Preparation

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Always use the **required** tools as follows:

Hose Cutting / Crimping Kit: 07-60117-00

Fitting Insertion Tool: 07-60177-00



Cut the hose to the required length using the Carrier hose cutting tool.

Lubricate the inside of the hose end with POE oil.

Widen the internal hose clearance using the expanding tool before sliding the double zinc clamp over the hose.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Refrigerant Hose Installation – Installation Preparation

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Lubricate the fitting and O-ring with POE oil.



Insert the connector into the hose.



**To avoid damaging to the O-ring, do NOT twist the fitting during or after insertion into the hose**



Crimp the double zinc clamp using the required crimping tool.

You will need to prepare up to 5 refrigerant lines, as indicated:

- Oil return line (**all units EXCEPT 20X**)
- Discharge line
- Liquid line
- Hot gas line
- Suction line

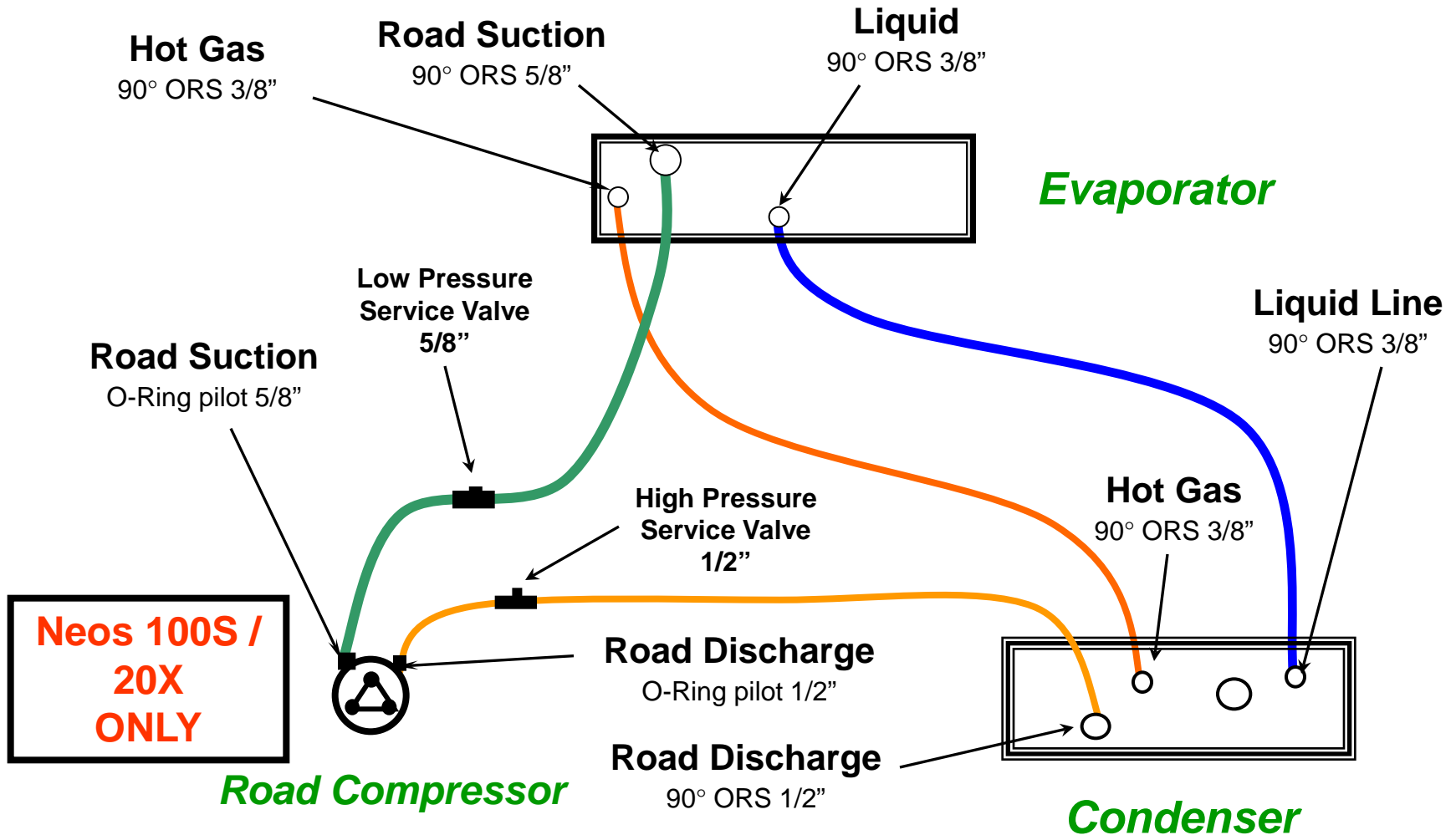


# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Refrigerant Connection Lines – Neos 100S / 20X ONLY

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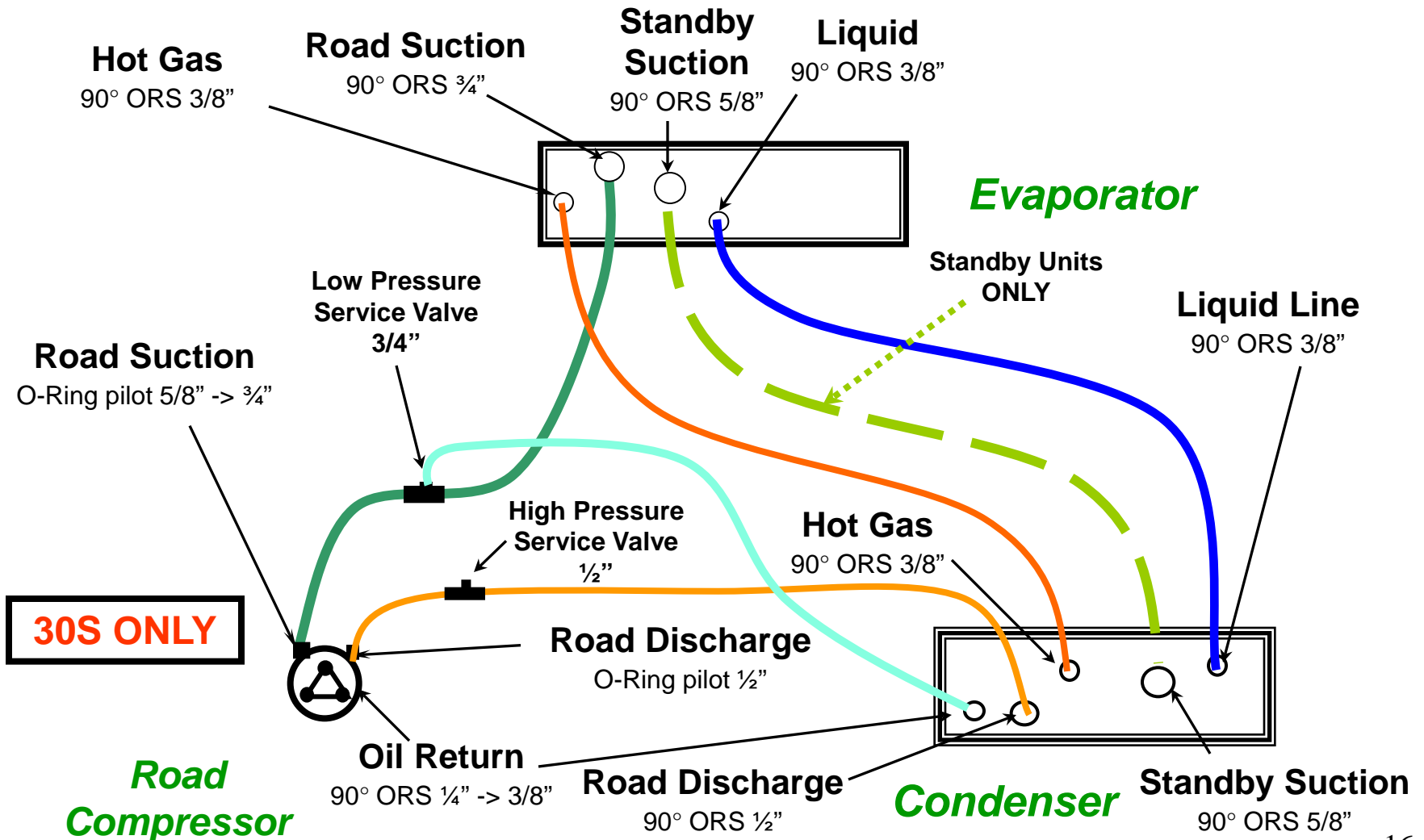


# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Refrigerant Connection Lines – 30S ONLY

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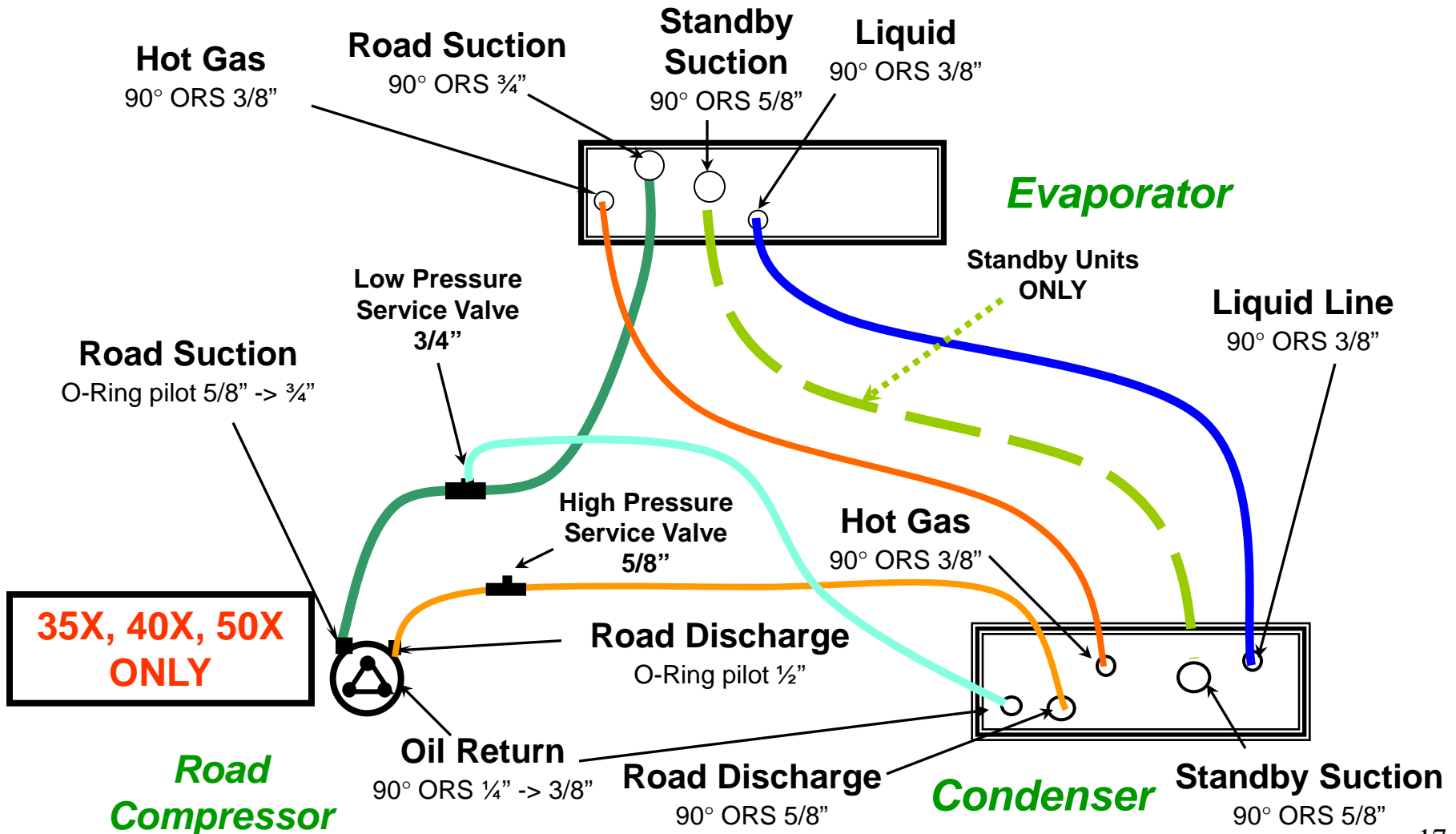


# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



Refrigerant Connection Lines – 35X, 40X, 50X ONLY

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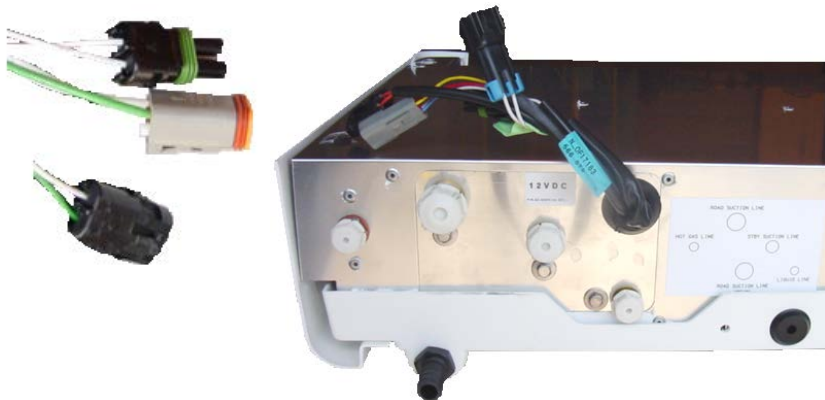
# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Electrical Connections

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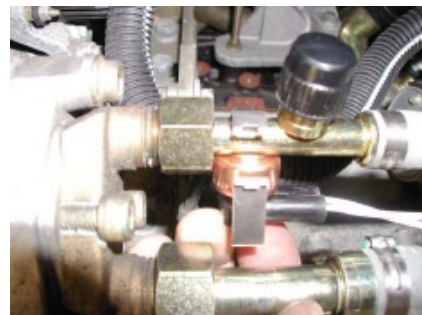
If required, route the Return Air Sensor (RAS) and mount to the evaporator fan inlet.



Make all required electrical connections. Note that most are connectors that are “plug and play”. The required electrical connections are listed as follows:

### Evaporator Connections:

- Evaporator fan motor(s)
- Return Air Sensor (RAS)
- BPV (quench valve)
- Low Pressure switch



### Engine Compartment:

- CLHR (road clutch)
- BBT (quench thermostat)

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Cab Command Installation

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Route the cab command harness to the interior of the vehicle

**Protect the harness from all sharp sheet metal**



**Make sure the harness is not in contact with anything hot**

**Make certain the harness is secured from vibration**



Mount the cab command in a accessible location where it may not be damaged; for example, where the rear view mirror would otherwise be mounted.

**Be careful not to damage any of the vehicle hoses or wires.**



**If it is mounted in the dashboard, keep as far as possible from heating ducts.**

**Maximum exposure temperature: 158°F (70°C).**

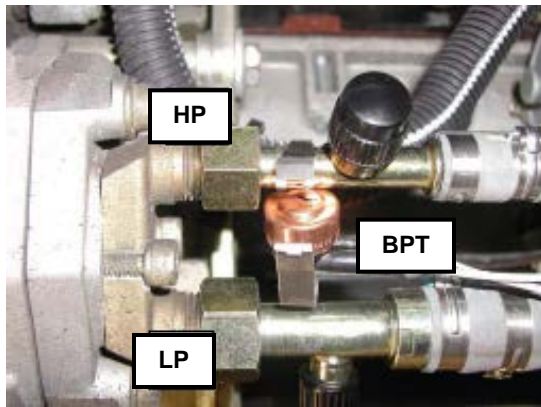
**Do not mount it where it can be exposed to constant, direct sunlight**

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Compressor Mounting

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Install the road compressor on the vehicle following the bracket manufacturer's installation instructions.



Connect the high pressure line (HP) and the larger suction line (LP).

Install the injection thermostat (BPT) on the compressor high pressure line using the supplied clamp.



Make sure the injection thermostat is making good contact with the high pressure line.



Make electrical connections for the injection thermostat and the compressor clutch. Place wires in protective split loop.



After connecting the injection thermostat terminals, insulate the injection thermostat body with the insulating material supplied.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Battery and Ignition Harness Connections

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Route the neiman cable to the vehicle fuse box. Connect the wire to the 1 Amp fuse holder supplied in the mounting kit.

Connect to a +12Volt DC switched circuit (refer to the specific vehicle manufacturer's recommendations).



Cut the battery harness to the required length. Strip back both the positive (+) and negative (-) harness wires, crimp the electrical terminals on, and connect to the corresponding terminals on the fuse holder.



It is recommended to also use soft solder on the terminal connections.



Mount road fuse holder as close as possible to the vehicle battery.

Put electrical grease on fuse holder connections, install the road fuse supplied in the installation kit, and put protective cap on.

Connect the unit ground (-) to the vehicle chassis.

Re-connect the vehicle battery ground (-) to the battery.



# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Evacuation, Leak Checking, and Refrigerant Charging

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The presence of moisture in a refrigeration system can have many undesirable effects, such as sludge formation, “freezing up” of metering devices, and metal corrosion caused by acid formation. Make every effort to keep the system dry.

After performing a pressure leak test, evacuate and dehydrate the system.



Essential tools to properly evacuate and dehydrate a system include a good vacuum pump (5 cfm=8m<sup>3</sup>H displacement, P/N 07-00176-01) and a good vacuum gauge indicator (P/N 07-00414-00).

*NOTE: a compound gauge is NOT recommended*

Keep the ambient temperature above 60°F (16°C) to speed evaporation of moisture. If the ambient is lower than 60°F (16°C), ice may form before moisture removal is complete. If necessary, heat lamps or alternate sources may be used to raise system temperature.

The unit is shipped with a dry nitrogen holding charge. Remove the nitrogen, and then evacuate and dehydrate the system by connecting three hoses (**do not use standard service hoses**) to the vacuum pump and refrigeration unit. Connect an evacuation manifold with evacuation hoses only to the vacuum gauges and refrigerant recovery system.

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## Evacuation, Leak Checking, and Refrigerant Charging

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Check the evacuation system for leaks: Without being connected to the inline service ports, open the vacuum pump and manifold gauge valves and start the pump and draw a deep vacuum. Shut off the pump and check to see that the vacuum holds. Repair if necessary.

Connect the manifold gauge set hoses to the service ports. Open the vacuum pump and manifold gauge valves (if they are not already open) and start the vacuum pump. Evacuate unit until the vacuum gauge indicates 2,000 microns. Close the vacuum gauge and vacuum pump valves. Wait a few minutes to be sure the vacuum holds.

Break the vacuum with clean, dry nitrogen. Raise system pressure to approximately 2 psig

Repeat the steps outlined above one more time.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Evacuation, Leak Checking, and Refrigerant Charging (Final Step) 62-11165 Rev D

Evacuate the unit to 500 microns. Close off the vacuum pump valve and stop the pump. Wait five minutes to see if the vacuum holds. This checks for residual moisture and/or leaks.

With a vacuum still in the unit, the refrigerant charge may be drawn into the system from a refrigerant container on weight scales. The correct amount of refrigerant may be added by monitoring the scales.



**Make sure to use the correct refrigerant for each refrigeration unit.**

When the correct charge has been added, close the unit manifold valves and disconnect the manifold gauges.



MODEL	Refrigerant Type	Refrigerant Charge	
		Pounds	Kilograms
<b>Neos 100S</b>	<b>R134a</b>	<b>2.2 lb.</b>	<b>1 kg</b>
<b>20X</b>	<b>R404a</b>	<b>3.10 lb.</b>	<b>1.4 kg</b>
<b>30S</b>	<b>R134a</b>	<b>4.00 lb.</b>	<b>1.8 kg</b>
<b>35X</b>	<b>R404a</b>	<b>3.30 lb.</b>	<b>1.5 kg</b>
<b>40X</b>	<b>R404a</b>	<b>6.60 lb.</b>	<b>3.0 kg</b>
<b>50X</b>	<b>R404a</b>	<b>7.05 lb.</b>	<b>3.2 kg</b>

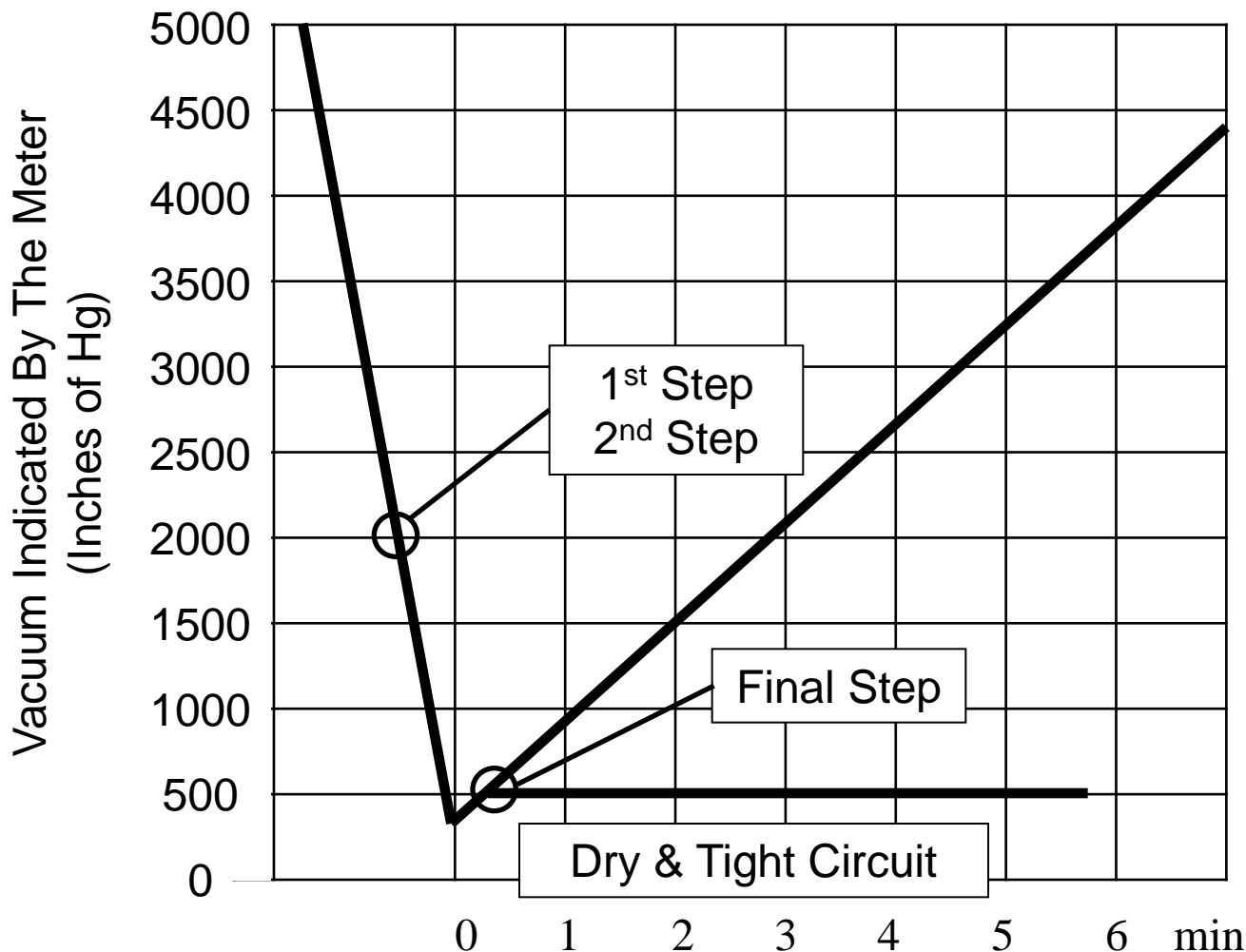


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## Evacuation Process

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## Evaporator CPR Adjustment

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The Compressor Regulation Valve (CPR) is designed to regulate the flow of refrigerant returning to the compressor from the evaporator and ensures the correct capacity of the unit. The CPR also reduces compressor start-up and operation load. It is critical it is set correctly.



**CPR adjustment MUST be done under the following conditions:**

- Road operation at 2,400 compressor RPM
- Heat or Defrost mode

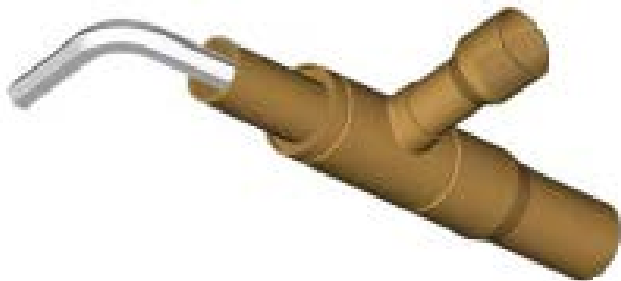


**Connect manifold gauges to the CPR fitting port.** Start the unit in Heating or Defrost mode. Check that the road compressor speed is 2,400 RPM

Remove the cap on the CPR valve.

Adjust the CPR with an 8mm Allen (hex head) wrench to get correct gauge pressure (see next page).

- **To raise the suction pressure, turn the set screw clockwise**
- **To lower the suction pressure, turn the set screw counter-clockwise.**



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## Evaporator CPR Adjustment

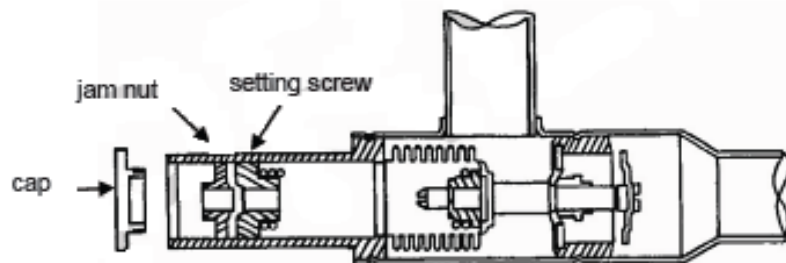
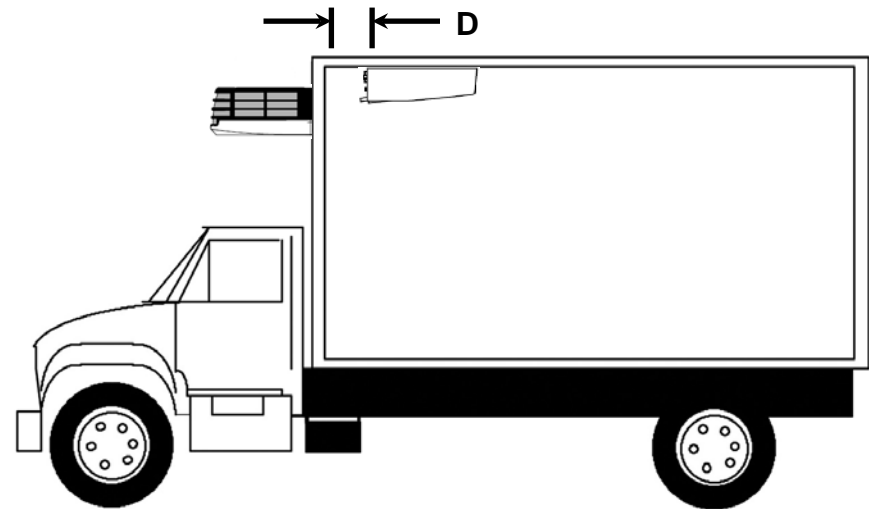
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\* The CPR adjustment must be **INCREASED** by approximately **+0.5 psi** for every **additional foot** (+0.1 bar per meter) that the evaporator is located (distance D minus 6") from the front wall of the vehicle.

MODEL	CPR Setting at CPR Port	
	PSI	BAR
Neos 100S	10.3 psi	.7 bar
20X	27.5 psi	1.9 bar
30S*	18.9 psi	1.3 bar
35X	30.5 psi	2.1 bar
40X	33.4 psi	2.3 bar
50X	37.7 psi	2.6 bar

*\*Only the 115V standby version of the 30S has a CPR.  
No other 30S versions require adjustment.*



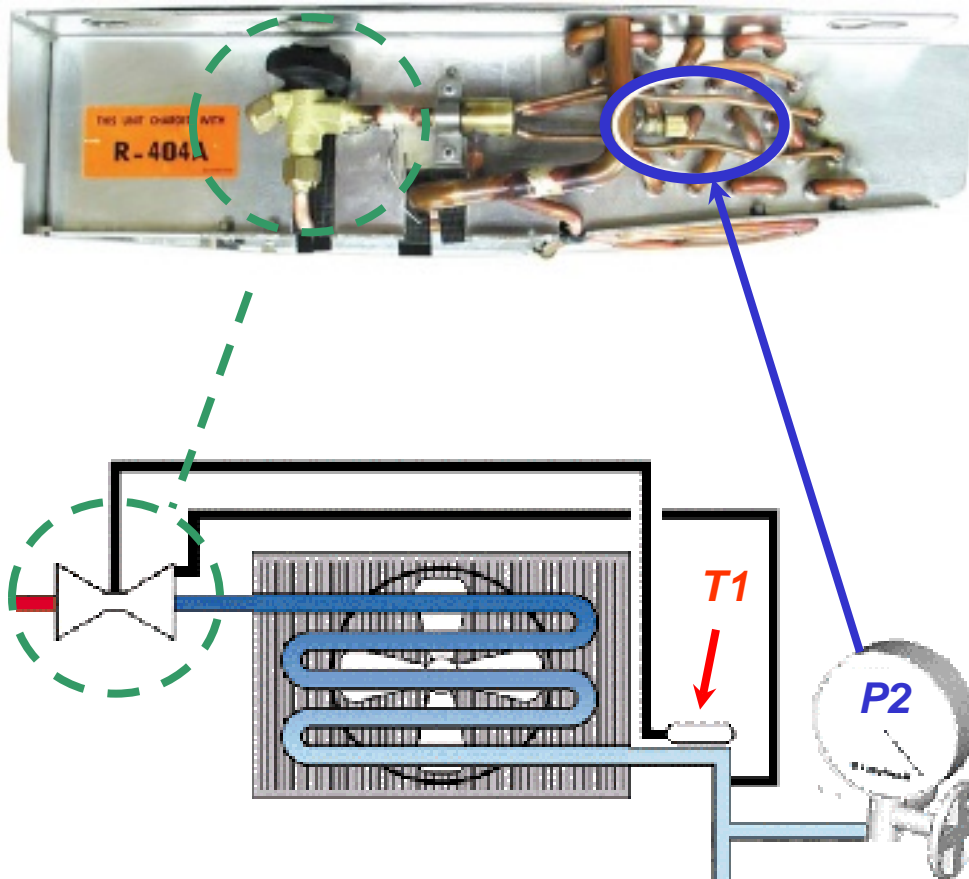
When the setting has been adjusted, tighten the jam nut securely against the setting screw to prevent any vibration of the set screw (and to prevent disruption of the CPR setting).

Replace the CPR cap and remove gauges.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X

## Evaporator TXV Setting

62-11165 Rev D



The Thermo Expansion Valve (TXV) is designed to precisely meter the flow of liquid refrigerant into the evaporator and control the refrigerant gas leaving the evaporator.

The evaporator outlet pressure (P2) must be converted to saturation temperature (T3) using a P/T chart. The superheat is the difference between the temperature at the bulb location (T1) and the evaporator outlet saturation temperature (T3).

Connect a gauge to the evaporator outlet fitting. Put a thermocouple at the expansion valve bulb location and insulate it. Run the unit in Cool mode.

# Installation & Commissioning Manual: Neos 100S, 20X, 30S, 35X, 40X, 50X



## Evaporator TXV Setting 62-11165 Rev D



To **INCREASE** superheat, turn clockwise

To **DECREASE** superheat, turn counter-clockwise



***Repeat process a minimum of 3 times***



**SUPERHEAT = T1 – T3**



MODEL	Superheat at 32°F (0°C) Box		Superheat at 0°F (-20°C) Box	
	ALL	14.5°F	8°C	7°F

To complete the installation, re-install any evaporator panels.

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