TRENT

AIR SOURCE HEAT PUMP WATER HEATER INSTALLATION AND OPERATION MANUAL

C ETL LISTED US
Intertek

C SA® US
NSF/ANSI 372

TRANSOM™

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07/2026

INTRODUCTION

Read Before Proceeding

Hazard Definitions

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product.

⚠ DANGER Indicates an imminently hazardous situation, which if not avoided, WILL result in death, serious injury or substantial property damage.

⚠ WARNING Indicates an imminently hazardous situation, which if not avoided, COULD result in death, serious injury or substantial property damage.

⚠ CAUTION Indicates an imminently hazardous situation, which if not avoided, MAY result in minor injury or property damage.

NOTICE Used to notify of special instructions on installation, operation or maintenance, which are important to equipment, but not related to personal injury hazards.

Failure to comply with these recommendations will void the warranty.

The Trent unit is a fully integrated unit with all the features and functionality selected at the time of purchase set up and factory tested. The unit comes prewired from the factory to provide conditioned water for specific applications based on customer's design.

This Installation, Operation and Maintenance Manual is provided for each Trent unit. It should be kept near the Trent unit at all times to reference when needed. This manual is intended to instruct and guide qualified personnel with the installation, operation, and ongoing maintenance of the product, including electrical and mechanical contractors, maintenance, and management personnel.

It is required that all involved with this product read and familiarize themselves with this manual. Proper care and attention should be paid to the maintenance and operating procedures/schedules to ensure an extended service life, minimum equipment downtime and warranty eligibility.

Should you have any questions, please do not hesitate to contact Transom.

1. By web site: www.transomheatpumps.com

2. By email: info@transomcorporation.com

3. By telephone: Telephone: (705) 717-8010

MODEL NUMBER NOMENCLATURE

T HW 064 - W - A

T&P Relief Valve
A - 125 PSI T&P Relief Valve
B - 150 PSI T&P Relief Valve

Voltage
Y - 575/3/60
V - 460/3/60
W - 208-230/3/60

Model Size
064 Model

Product Type
H - Heat Pump Water Heater

Product Family
Trent Pre-Packaged Module

RECEIVING AND UNPACKING

All Transom units are tested and inspected at the factory before the units are shipped. The units are sent from the factory without damage.

Upon arrival of the delivery truck to your facility, verify that the proper unit has been shipped and compare the information on the nameplate with the ordering and submittal information. Verify that all items listed on the shipping manifest were delivered. Some parts needed for installation shipped separately.

Before accepting the unit, perform a complete exterior visual inspection. If the packaging is damaged, dented, torn, significantly scratched or shows signs of obvious shipping abuse, in anyway, or if any parts are missing, make a “unit damage” notation on the carrier’s delivery documents. If possible, attempt to photo document any damage.

The receiver of the shipment is responsible for documenting or reporting any damage. If the unit is accepted without a documented or noted damage claim, no claims can be filed with the transportation company later.

Remove all packaging material and examine the unit for any concealed damage. Document (photograph) any newly discovered damage immediately and contact the shipping company. Please note that the receiver of the shipment is responsible for having proof that the damage was not caused after delivery.

⚠WARNING Do not install any damaged equipment. Report any damage or missing parts to the shipping company and Transom, immediately. Transom Corporation contact information can be found in the “INTRODUCTION” section of this manual.

Read and review all literature provided with the machine. Do not remove any tags or labels until the unit is installed and operating, and only then by a qualified mechanical or refrigeration technician. All literature, drawings, packaging lists, etc. should be kept close to, or temporarily attached to, the unit. These items will be imperative for the proper installation, operation, and maintenance of the unit.

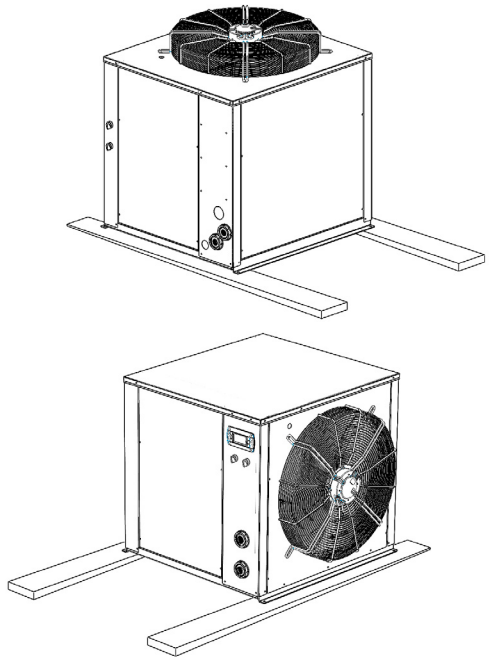
LIFTING UNITS

Prior to lifting any unit, please refer to the “SPECIFICATIONS” table to determine the best and safest way to lift the unit. The unit should always be lifted by a forklift or a pump lift. Never by hand.

When lifting the Trent unit, it must always be supported by the base. When lifting the unit from below with a pump-lift or fork-lift, make sure that the forks are positioned under the base. See figures below for proper location of forks.

⚠CAUTION Care must be taken when positioning the lifts so as not to hit, scratch or damage the unit and cause damage to the plumbing system.

Figure A – Lifting from Below



⚠WARNING The units are shipped with a fully charged refrigeration system. Be careful when moving the heat pump not to hit, scratch or damage the unit in any way. External damage could lead to internal damage that may not be seen right away and could prevent the unit from operating properly.

⚠CAUTION When manipulating the individual Trent units, take care not to topple the units. Take extra precautions when maneuvering over uneven or rough surfaces. If a unit has tipped over, inspect for damage and call factory prior to installation.

SPECIFICATIONS

Table 1

Model	**THW064**
Nom Capacity (BTU / kW)	60000 / 17.58
Refrigerant Type	R513A
System Charge (lb / kg)	7 / 3.2
Heat Exchanger Type	Double-wall Brazed Plate
Fan Speed Control	EC
Entering Water Temp Range (°F / °C)	40 to 130°F / 4.4 to 54°C
Leaving Water Temp Range (°F / °C)	80 to 150°F / 26.7 to 65.5°C
Min Flow (GPM / lps)	2.5 / 0.16
Max Flow (GPM / lps)	8 / 0.50
Max Available External Piping Pressure Drop (ft-hd / kPa)	9.0 / 26.9
Water Connections (mpt - in)	1" MPT
Condensate Drain	3/8" MPT
Length (in / mm)	34.75 / 883
Width (in / mm)	37.75 / 957
Height (in / mm)	32.5 / 820
Shipping Weight (lb / kg)	490 / 222
Operating Weight (lb / kg)	450 / 204

LOCATING THE TRENT

The Trent unit is typically designed for indoor application and must be located in a space where the temperature is 45°F (7.2°C) or above. They must be installed on a solid foundation or support structure with enough strength to support the operating weight of the unit. (i.e., weight of the unit including charged refrigerant piping, filled chilled-water piping, bracing materials, etc.)

The clearances for the Trent unit are provided below. These clearances must be adhered to provide proper operation of the unit. Failure to adhere to the clearances will void the warranty. The following considerations should be taken into account when selecting the location:

- Free access for air flow to the evaporating coils
- Free of any overhang or restrictions causing restriction of discharge air flow or short circuiting of air flow
- Any future Trent units
- Electrical service runs and connections clearances (follow local and federal codes)
- Access for visual inspections or frequent maintenance tasks (see maintenance section of this manual for required maintenance steps and procedures).

When moving the Trent unit with the pipe-header assemblies disconnected, it is recommended that the units be lifted by the base frame.

Once the unit is positioned and levelled, secure each of the two threaded connections to the pipe header assembly.

If desired, a vibration pad can be mounted underneath each of the legs. A vibration pad will be field supplied and must not impact any service panels or the operation of the unit. Failure to comply will result in loss of warranty and potential harm to the unit.

If bolts are used to secure the units to their foundation, ensure that they are properly anchored in order to prevent the unit from displacing or tipping over. Any loose bolts should be removed and re-secured with new bolts and/or anchors. Grout if necessary.

⚠WARNING Caution must be taken when moving the Trent unit on pump lifts. The units are top heavy and are subject to tipping if manipulated recklessly or on badly uneven floors. If the floor is not level or soft and not likely to support the weight of the loaded pump lift, use straps and rigging and lift the unit from above.

⚠CAUTION Please consult local codes for minimum clearance distances for such things as electrical enclosures and fire protection equipment. If the Trent Unit is to be located on a mezzanine, please ensure that the full operating load of this unit and all future units has been taken into consideration. This includes the weight of filled water piping and charged refrigerant lines. In particular, the structural strength and stability of the mezzanine design should be reviewed by a qualified structural engineer.

INSTALLATION

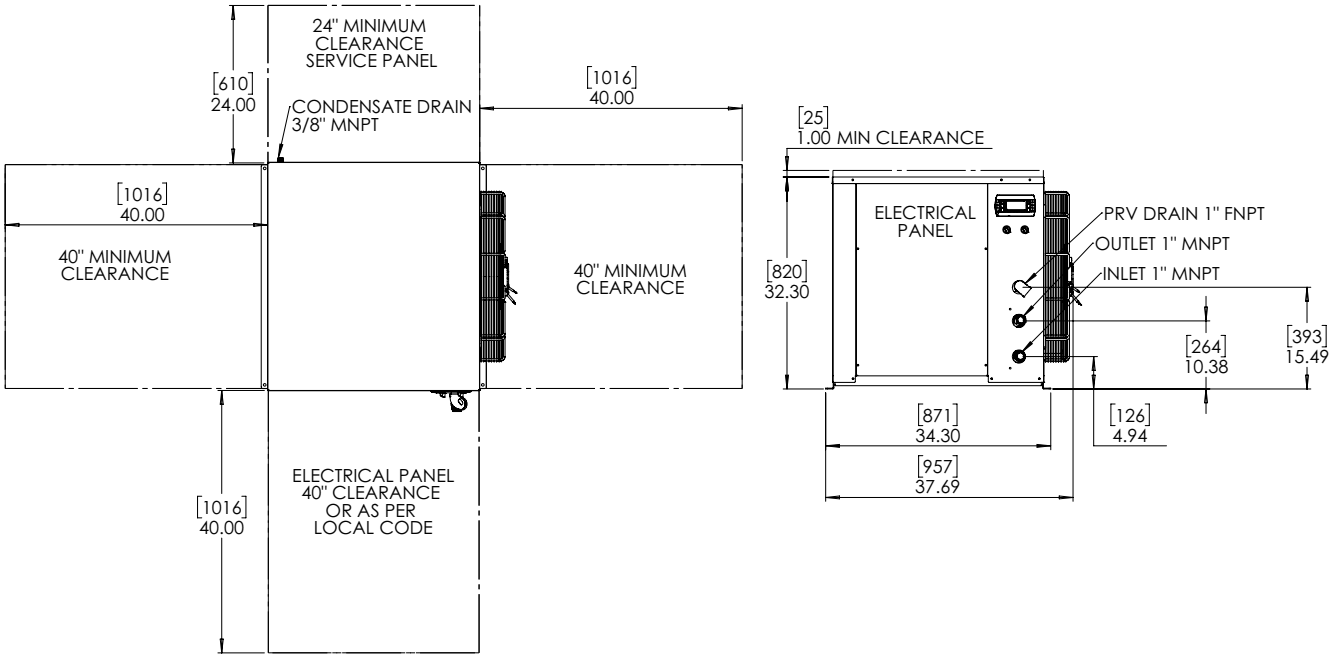
Once the shipped Transom Trent unit has been properly positioned, you can proceed with the installation. Please pay attention to the noted Warnings and Cautions.

Installation Assumptions

Before beginning this section, ensure that the following are true:

1. The Trent unit (s) are properly positioned and secure to their supporting foundations.
2. The unit is located in accordance with the required offsets of walls and other HVAC units.
3. The buildings hydronic system has not been connected to the supply and return pipe ports of the unit.
4. All plumbing, refrigeration and electrical work is performed by a locally licensed qualified technician.
5. If any of these conditions is not true, please consult the previous sections on positioning the Trent unit.

Figure B – Clearances to Obstructions or Other Units



Piping Connections

All plumbing is to be performed by a qualified mechanical contractor. All piping is to be installed in accordance with all relevant codes and standards.

When installing any piping system, you must not allow dirt, scale, sand, or any other foreign matter to enter any part of the system. Since fine particles and grit can act as an abrasive, it is imperative that it does not find its way into the refrigeration or water system. Consequences of foreign matter entering the systems can be severe and can become a menace to seals, valve seats, etc. Scoring of seal faces can occur when the equipment is first operated. Minor scratches can cause seals to leak, and larger debris can cause valves to fail.

Sizing and layout of the buildings hydronic piping is beyond the scope of this manual. Please consult a mechanical engineer or other mechanical professional to ensure the proper piping schematic, piping size, and system pump sizing (if required) are adequate for this unit.

Obtain all components specified in the appropriate piping diagrams. Make sure all components and piping comply with applicable local codes. Confirm charge of expansion tank is 12-15 PSIG (80 - 100 kPa) (with no water or pressure in the system). Install the system piping. DO NOT connect the unit to the system piping until the system has been cleaned. See section Flushing and Cleaning. It is highly recommended hat a strainer and fine-particle filter of 16 Mesh or finer be installed on the inlet of the water header and the condenser water header. This will prevent clogging of the heat exchangers. Basic piping diagrams provided in this manual are to be used as a reference and minimum components required to ensure proper operation of the unit.

⚠CAUTION Refer to and comply with any and all local codes when installing piping. Failure to adhere to local and federal codes can void the unit warranty.

System Volume

To ensure smooth temperature control and minimize cycling of refrigeration system, all installations must have total circulating volumes equal to or greater than 7.5 gallons (30 litres) per nominal ton of the unit performance at minimum capacity (The greater of either heating or cooling produced). In other words, in the case of a five-ton unit the minimum system volume would be 5 x 7.5 = 37.5 gallons (5 x 30 liters = 150 liters). Multiple unit installations that are operating in a staged configuration follow the same rule, so that only a single unit tonnage needs to be considered. Additionally, the system requires an expansion volume (air) to compensate for the change in volume of the glycol mixture as it heats and cools. Note the unit water loop must contain at least 3 to 5 minutes of system volume at design flowrate.

Flushing and Cleaning

After the piping system is complete, it must be cleaned of any debris. All newly installed piping should be thoroughly flushed to remove any particles of dirt or debris that may have accumulated inside the piping during assembly. Evaporators, valves, heat exchangers and pumps will trap debris that may damage the equipment. Such damage is not covered under warranty.

⚠WARNING The Transom Trent's and their pipe header assemblies are flushed of any foreign debris or particles in the factory. They are shipped clean from the factory. When flushing a newly installed hydronic system, the unit and header assemblies must be isolated from the initial flush so that no foreign debris gets introduced into the system heat exchangers.

Pressure Test The System

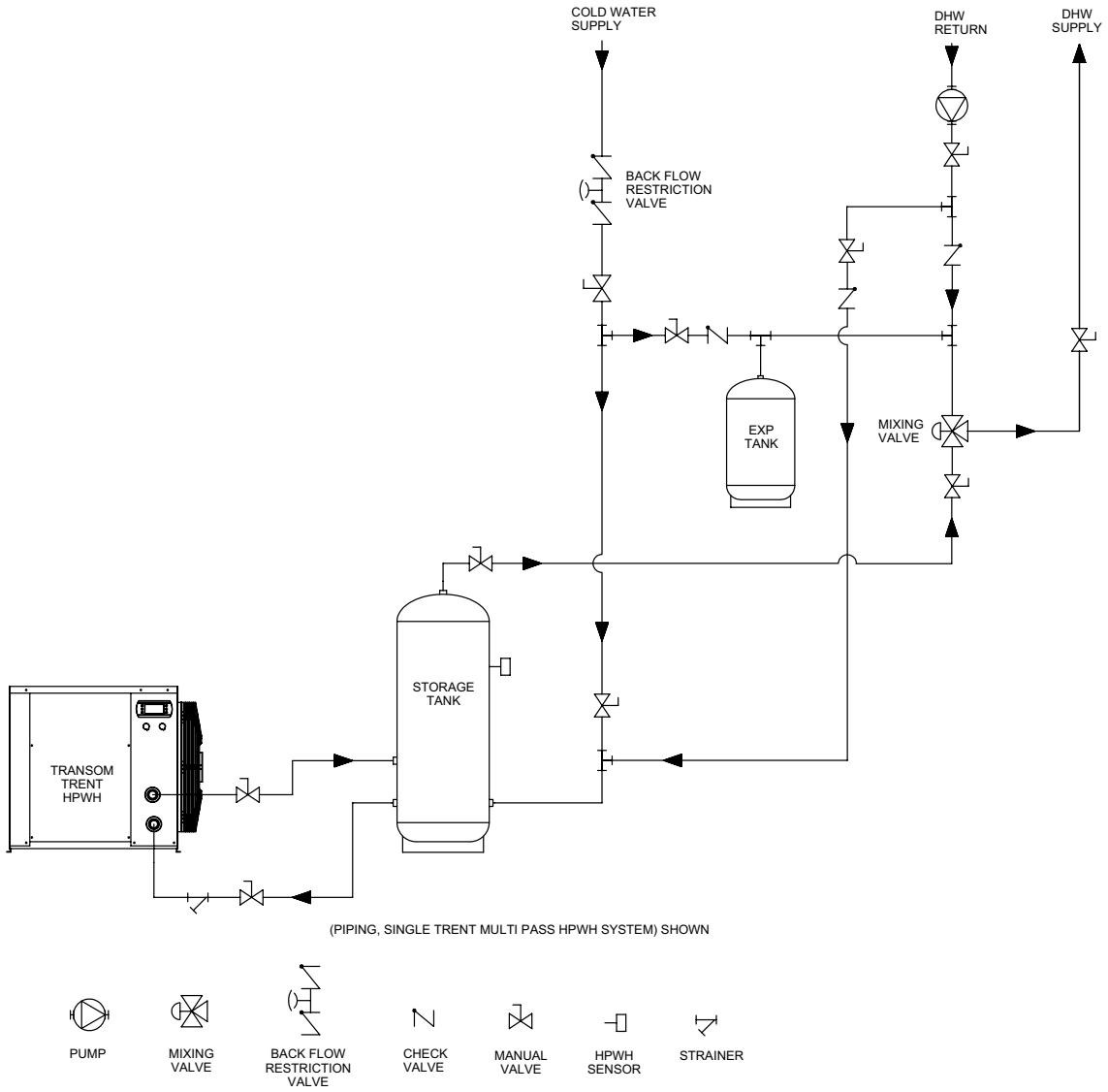
1. Add water to the system as needed to raise the pressure to 25 PSIG (verify that all system components are suitable for this pressure). Verify that the pressure remains constant for at least one hour. Locate and correct any leaks.

2. After successfully testing, drain the system and remove the freshwater hose.

Insulate The Piping

Cold water supply to the unit may generate condensation. The plumbing should be insulating using a vapor barrier insulation to prevent sweating of the pipes and possible damage of the insulation or structure due to water accumulation. Plumbing containing domestic hot water should be insulated to minimize heat losses.

Figure C – Example Heat Pump Water Piping



Water Treatment

Using untreated water in the Trent units may result in fouling of the units and a decrease in the operating efficiency as well as heat exchanger damage. It is recommended that a qualified chemical treatment professional be consulted before operating the system.

As a minimum, at no time should the concentrations of particles and compounds exceed the limits outlined in Table 3.

Table 3 – Concentration Limits

Measurement	Units	Required Range	Concern
pH [25C]	-	6.8 – 8.0	Scale
TDS (EC method) [25C]	μS/cm	≤ 300	Corrosion / Scale
	Ppm	≤ 280	
(Cl-1)	mg/l	≤ 50	Corrosion
(SO4-2)	mg/l	≤ 50	Corrosion
Total (CaCO3)	mg/l	≤ 70	Scale
	Grains per gallon	≤ 4	Scale
SiO2	mg/l	≤ 30	Scale
Fe	mg/l	≤ 0.3	Corrosion / Scale
Cu	mg/l	≤ 0.1	Corrosion
NH4-1	mg/l	≤ 0.1	Corrosion
Free Chlorine	mg/l	≤ 0.3	Corrosion
CO3-2	mg/l	≤ 4.0	Corrosion / Scale

Refrigeration

Transom Trent units are shipped with the proper charge of refrigerant in a sealed system. See the unit nameplate, located on the side of the electrical panel, for the type and recommended amount of refrigerant. Schrader valves and service ports are provided for maintenance, troubleshooting and repair only. If any refrigerant work is to be done on site, only a qualified technician should be completing the work. Failure to comply can void the warranty. Prior to refrigeration work, please contact a transom technician or your local representative.

MAIN POWER ELECTRICAL INSTALLATION

Electrical General

The instruments mounted on every Transom Trent unit come factory assembled and wired. This includes the entering and leaving water temperature sensors. Each unit must have a dedicated power disconnect. Using the MCA and MOPD ratings in this manual, the incoming wire size shall be selected appropriately. All electrical work is to be performed by a licensed and qualified electrician.

⚠CAUTION National and local codes provide specific electrical and mechanical installation requirements and recommendations covering equipment and equipment wiring. These should be followed during the installation of this unit.

Ensure that the voltage supply to the equipment meets the equipment requirements. Characteristics of the supply should correlate to the equipment name-plate value within the tolerances as follows:

- Voltage: - within 10% above or below the value stamped on the nameplate.
- Frequency: - within 5% above or below the value stamped on the nameplate.
- Voltage and frequency together: - within 10% (providing frequency is less than 5%) above or below values stamped on the nameplate.

After you have verified that the supply voltage requirements are correct you can then make the equipment terminal connections. Connections should be made in accordance with the wiring diagram included with the unit and the nameplate located on the side of the panel. **The nameplate shows the required voltage, phase, cycles, full load amperage, heater KW rating and interrupts rating. Transom equipment is built for 10kA interrupt rating except when noted on the nameplate.**

The improper installation of electric equipment is the most common mistake in installations. Most newly installed units have problems with the wiring, the conduit and/or the proper terminations of the conductors within the panel junction box. Safety is the first concern when starting up any new piece of equipment. All electrical connections including those inside the control panel should be checked and tightened as required prior to the start-up by a qualified and licensed electrician fully familiar with the wiring requirements of the national and local electrical codes. Transom equipment is built with fixed screw terminal connections in the control panel for all the power and control wiring.

⚠WARNING Always disconnect the power at the source when installing or servicing this unit.

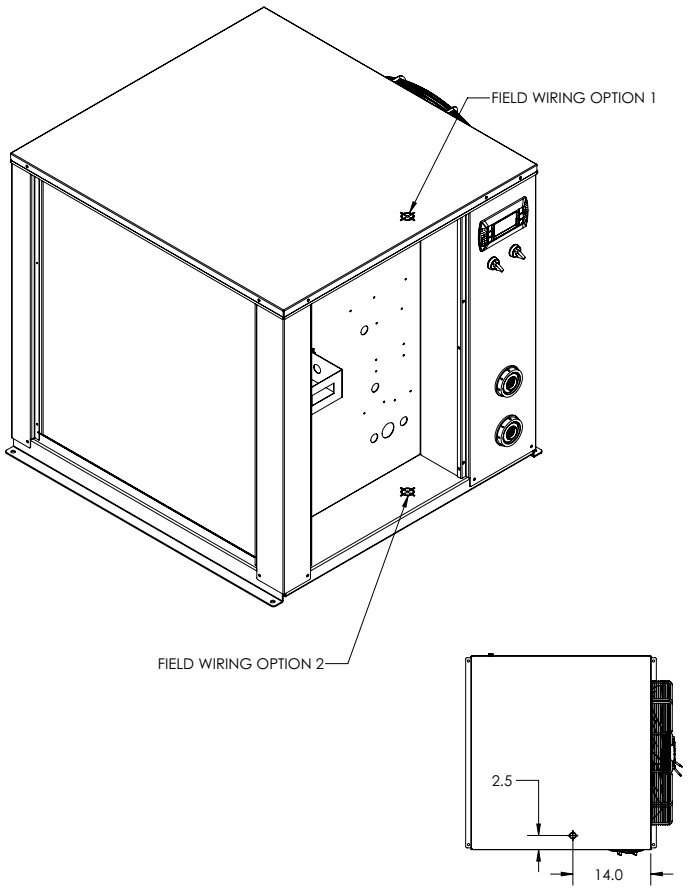
Note: If you cannot find or cannot read the wiring diagram ask your Transom representatives for another copy (email: info@ transomcorporation.com).

Incoming Power Panel Electrical Connections

Branch or feeder-circuit wire size is normally determined in accordance with the local electrical code based on the equipment full-load current (FLA) or the minimum circuit ampacity (MCA) and increased where required to limit voltage drop. The FLA and MCA are listed on the electrical drawing that accompanies the unit. The nameplate shows the required voltage, phase and cycles, full load amperage, total horsepower, total heater KW rating and interrupt rating. Each unit module in the system must have a means of disconnect within sight. Such disconnects, usually a non-fused type, must be provided by the installer, near the unit panel. Consult your local electrical code for proximity and type of disconnect required.

See Figure F for recommended power entry locations for Heat Pump models.

Figure F



⚠WARNING Ensure the breaker has a sufficient interrupting circuit rating for the available fault current. A breaker with an inadequate interrupting current rating could allow equipment destruction from a line-to-line or line-to-ground fault, as well as serious injury or even death. Transom equipment is built for 10kA interrupt rating.

Field Controls Connection

Transom units are factory wired complete with all sensors and safety devices. However, there are some control connections that can be field installed (optional). Identify any auxiliary control devices such as remote on/off, alarm devices, beacons, etc. and connect them to proper circuits. The wiring diagram that accompanied your unit shows the wiring to be completed.

The following connections can be field mounted and connected above and beyond the dedicated power disconnect to the unit:

1. Remote On/Off (optional) – A simple dry contact that closes whenever an alarm condition is reached.
2. Remote alarm (optional) – A simple dry contact that closes whenever an alarm condition is reached.

Remote ON/Off and Remote alarm are supplied by others.

PRE-START UP CHECK

Your installation is now complete. Perform the following final checks before starting-up the Trent Unit.

Piping

1. Ensure that every unit module is level within tolerance and that it is securely anchored to its supporting foundation. Do the same for each pipe-header assembly.
2. Ensure that every unit module is properly secured to its respective pipe-header assembly via the rubber flex connectors.
3. Check all terminal screws in control panel to make sure they are tight.
4. Visually check all water, refrigerant and electrical runs to confirm there is no cross connection of circuits or reversed piping or damage.
5. Check that all water connections and drains are closed after flushing the system. Connection points (such as drain valves) should be plugged or capped.
6. Ensure that the system has been properly purged of trapped air.

Electrical

It is important that proper lock-out, tag-out procedures be followed when servicing or inspecting the electrical components of the unit modules. Perform inspections only after the electrical power is confirmed off.

1. The electrical installation must be inspected by the proper agent with authority in the jurisdiction of the installation to ensure that all work was performed in accordance with local and national codes.
2. Systematically check every terminal screw in the control panel to make sure that they are tight.
3. All field electrical connections should be checked for proper connection.
4. Verify that all installed fuses are of the proper specified size.

Refrigeration

The following work should be performed by a qualified Refrigeration Technician.

1. All refrigeration piping and components should be inspected for damage. In particular, the refrigeration of each of the unit modules should be checked.
2. Place refrigerant gauges on the suction and discharge ports of each refrigeration circuit (each unit module for tandem units) and verify that a refrigeration charge is present. Refer to the serial plate for the correct refrigerant charge.
3. Confirm settings on all pressure gauges.

The Water System

1. Ensure that the system has been properly flushed and re-filled with the proper solution.
2. Verify that the proper water treatment system is installed and operational.
3. Confirm that the water circulating pumps are operational and that water can flow through the chilled-water heat exchanger.
4. Ensure water flow rates through the evaporator by measuring the pressure differential across both heat exchangers and comparing them to the water Pressure Drop curves supplied for the unit modules.

CONTROLS GENERAL DESCRIPTION

The Transom Trent units are built with a single circuit refrigeration system, complete with a scroll compressor, tube/fin evaporator, speed-controlled evaporator fan, high and low-pressure switches, receiver, expansion valve, suction accumulator and brazed plate condenser. On the water side there is a centrifugal pump, complete with check valve, flow switch and entering/leaving water temperature sensors.

When the system is turned on, it will start the pump ensuring there is water flow through the condenser. In "Auto" mode, the pump will remain on while is on to the unit, or until the unit is switched off. Once the flow is established and the flow switch is confirmed, it will allow the compressor to start.

The Trent unit is designed so that twelve (12) units can be mounted together and controlled with by a single microprocessor controller. This central controller monitors the system conditions and controls the staging of the individual compressors and their sequencing. The operator can turn off individual Trent Unit from the central controller.

The individual Trent unit has its own local controller. When a central controller is present, the local controller looks after all the local safety operations. It receives signals from the central controller when and how to turn on each compressor.

When the central controller is not present, each unit module is capable of controlling itself with a locally entered operating temperature set point.

Each controller has three levels of controller access:

1. Operator

2. Supervisor (access to Operator and Supervisor levels)

3. Factory (access to Operator, Supervisor and Factory levels)

Starting Assumptions

Before continuing with this Operation Manual, it is assumed that the Trent units are physically mounted, plumbed, and that power has been run to each of the Trent unit units, all in accordance with the Transom Trent unit Installation Manual and local or national plumbing and electrical codes have been followed. All inlet and discharge air flow are checked for restrictions and possible short circuiting. Furthermore, it is assumed that the cooling system lines have been installed, leak tested, properly flushed and re-filled, ready for operation. In effect, that Trent unit system is ready for operation.

Compressor Control

The compressor control is set with a control band with proportional time logic on the outlet temperature. The smaller the band the steadier the outlet temperature but also increases the number of cycles. Conversely, the bigger the band, the fewer cycles (longer run time) but larger swings in temperature. The set point is set to mediate between the two.

Time Out – At Start Up

The unit is set up to hold off the start of the compressors when the unit is first powered up. This is to allow any input signals to be established without any nuisance alarms.

Even if the controller has received a demand to operate, the compressor will wait for the time cycle to end before starting.

Minimum Run Time

The compressor is turned on when the controller is calling for the demand. Once a compressor starts the minimum run timer will be engaged, to fully distribute the oil inside the compressor. During this time period the Minimum Run time requirement will override the demand from the temperature controller.

So, the compressor will run until the Minimum Run time period is complete even though the demand is not there. This is normal operation.

Minimum Off Time/Anti-Cyling Time

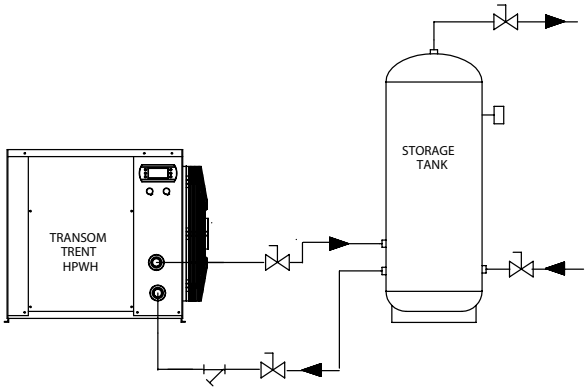
Once the compressor is turned off (from demand being satisfied) the Minimum OFF time cycle is started. The compressor will not turn on even if a new demand is required from the controller, until the time cycle is completed.

CENTRAL CONTROLLER

Central Controller Guidelines

If multiple heat pumps are installed, a central controller is highly recommended to properly stage each unit on and off. Up to 12 modules can run off of one central controller control. This allows for maximum turndown and efficiency.

Figure 7



The Central controller monitors tank, return and supply temperature for optimal staging control of multiple units and turndown requirements. The setpoint temperature should be at the location shown in the tank on Figure 7. When there is no request, all equipment is off including internal pumps to prevent de-stratification of storage tanks.

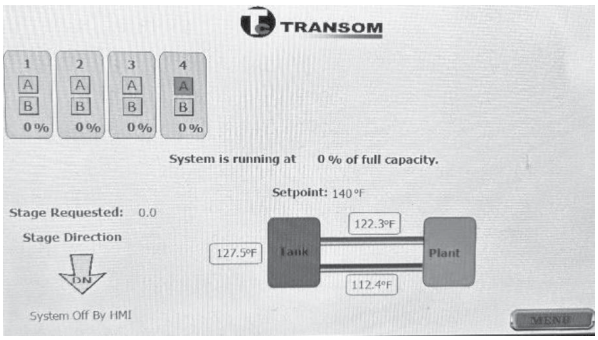
As temperature of the middle tank decreases, the Central Controller will begin to bring on each heat pump based on deadband temperature and time.

Each local controller/heat pump will take care of it's respective in-house functions, such as compressor output, which are based on its own supply temperature, as well as any internal faults/alarms.

The Central controller may also communicate via BMS/BacNet for building communication, or under various related protocols.

When installing Transom's Central Controller with Transom equipment, each heat pump must have comminication wires installed into each module/PLC pLAN on the J14 plug, See Step 2. (Reference figure in "TC-Central Controller Initial Setup docx")

Figure 8



Each module will need to be setup for communication with the central controller and each modules controller/interface must have the proper sequence of addressing. Please address the appriopriate guides/literature for Central controller installation and setup procedures.

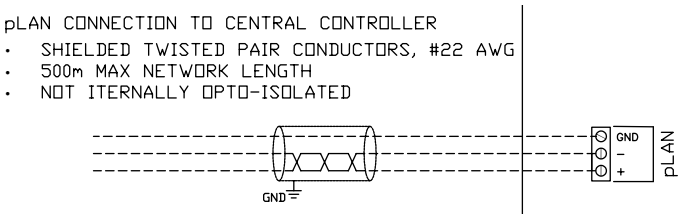
Central Controller Initial Setup

The Central controller and all connected modules require addressing setup to properly function and communicate. Please use this guide to ensure all steps are taken and terminations are complete for central controller and up to 12 module function.

Step 1: Ensure all modules are left "OffByKey" and then de-energized when working with electrical, modules left on will lose their screen functionality until all steps completed. Having the unit OffByKey ensures no function when power is restored.

Step 2: Ensure all modules are wired in a daisy-chain arrangement across individual J14 pLAN ports. If network is longer than 330ft / 100m, add a 120 Ohm, 1/4W termination resistor at the first and last devices.

A) Transom preferred wiring below:



Step 3: Power up each module and ensure modules are left in the AUTO position, it will be noted that all module screens will power up and show no display.

Step 4: Each Carel PCO PLC will need to have its own address set and correlated Carel PGD1 screen address set.

Step 4: Starting with Module/Unit #1 begin addressing each unit (Table on next page):

A) Locate PLC and using a non-metallic tool press the small button beside the PLC status screen:

a. One press shows the current PLC address (See next page)

b. Holding the button until this number flashes will begin the change sequence. Once flashing continue pressing the same button until you locate the correct addressing number. (Unit#1 will be Address 2)

c. Once you land on the correct addressing number, do not touch anything and the small screen will begin flashing faster – This is when the PLC saves the current address and the PLC can be power cycled.

Figure 9

Carel PCO & PGD1 & Central PLC Addressing Table		
Module/Unit	PCO Controller	PGD1 Display
Central Controller	1	32
Unit #1	2	14
Unit #2	3	15
Unit #3	4	16
Unit #4	5	17
Unit #5	6	18
Unit #6	7	19
Unit #7	8	20
Unit #8	9	21
Unit #9	10	22
Unit #10	11	23
Unit #11	12	24
Unit #12	13	25

Step 5: Locate Carel PGD1 terminal screen, and hold (UP)↑(Enter)↵(Down)↓ until the addressing screen is displayed:

Step 6: From this screen we can set the Display address using the table above, the first unit (Unit#1) will be Display address #14 and the last unit (Unit#12) will be Display address #25.

A) Once changed the screen will indicate “Display address changed”, you will need to repeat “step 5” to return and continue.

B) Once back in the addressing screen, the I/O board address must now be changed, this should match the PLC address changed in step 4.

C) Once we input the I/O board address we will land on a screen “Terminal config” Press “enter” to continue.

Step 7: Ensure Trm1 matches the same number used on step 6 display address setting. Press “enter” until “No” is highlighted – Use the up or down arrow to change this to “Yes” and hit enter once more. If all steps have been completed successfully, we will now be brought to the main status page of the Transom product.

If all steps are complete and the PDG1 screen does not return to the main status page – Repeat all steps and ensure all wiring correct to each module and central controller.

Please practice safe working procedures when working around any equipment or electrical.

STARTUP - NEW INSTALLATION

Transom Trent heat pumps are self-contained units and factory tested. The start-up sequence of the modules is a verification of the integrity of the system and any shipping related issues.

HEAT PUMP

- After flushing and aerating the system is complete then the unit can be started up.
- Initially start each module one at a time.
- If the system uses a Master Controller, then change SERVICE setting on the local controller temporarily to “NO Master Controller”
- Open electrical panel
- Move system selection switch to OFF
- Open fuses for compressor
- Check for any loose wiring during the shipment
- Verify piping is to the correct SUPPLY and RETURN connections
- Ensure condenser and evaporator flow is engaged and flowing unhindered through the system
- View controller screen
- Upper left-hand side is alarm indicator. Check if RED. If so, press button to get description of an alarm
- Scroll through the main pages to see the screen set up
- Verify sensor readings
- Condenser EWT and LWT should read the same
- Suction and discharge pressures should read the same
- While compressor fuses are pulled turn the SYSTEM switch to ON
- View default screen and look for stage request change from 0 to 1
- Scroll the compressor A screen. It will show status = OFF
- There are internal timers that will delay the actual turning ON of the compressor
- When status changes from OFF to ON check that the contactor is turned on
- IF above is complete then turn system switch to OFF
- Ensure water flow through both heat exchangers
- Do a “bump” start (approx. 5 sec) of the compressor to ensure the rotation (for scroll compressors)
- Rotation can be verified by the sound of the compressor
- Also, the screen for compressor A shows suction and discharge pressures. If rotation is correct then the discharge pressure goes up and the suction will go down
- If rotation is wrong direction then sound is a hard mechanical sound. Also, the suction and discharge pressures will not change more than a few psi
- If the unit is a two-compressor unit, repeat for second compressor
- If rotation is correct, then proceed
- Next close the fuse holders and make the unit ready to run.
- Turn HMI screen to the compressor A display. Show the screen disapplying the pressures and status of compressor A
- Turn the system switch to ON
- Wait for the compressor status to turn to ON
- When status of compressor A changed to “ON” did compressor start
- View the pressure settings to see that the suction and discharge pressures have changed accordingly
- Check sight glass on liquid line to verify that the viewing glass is clear and has no bubbles
- Check to see the evap and cond LWT and EWT have changed appropriately
- If the system uses a Master Controller, then change SERVICE setting to local controller back to “Master Controller present”

If above is satisfied then move on to the next module until all are complete.

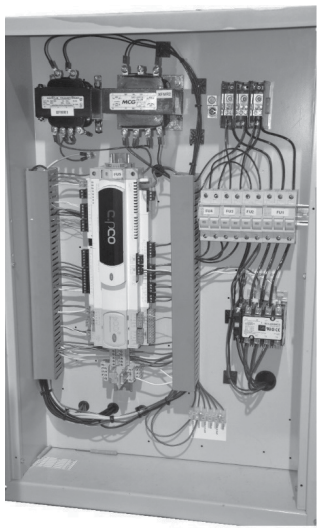
CENTRAL CONTROLLER

- Once all the local controller has been set up then the central controller can be worked on
- Verify that the temperatures are reading on the central controller
- Verify that all the modules appear on the central controller screen
- Turn on central controller and it will stage on the compressors as needed by the staging sequence

⚠CAUTION If preferred the compressor fuses can be removed to just verify the wiring, sensors and controls.

Please note that if your system cycles a lot validate the load on the system. Adjust the dead band and dead band timer so that the cycle times of each compressor is in line with at least the minimum run time and minimum off time.

Figure 10



OPERATION

During the initial start-up phase of the unit a number of parameters can be adjusted to suit the particular installation location. This must be done with a technician that has been trained on the Trent.

Assuming a dual circuited unit with built in centrifugal pumps the operational sequence will be as follows.

Ensure the controller is ready in the OFF position.

There are several ways to turn on the system depending on the options installed.

- Keypad on HMI. Go to the ON/OFF menu and change the setting, then press enter
- Turn local ON/OFF switch to the ON position
- Remote ON/OFF switched ON
- BMS communication turns on the machine

The pumps will start up. If no pumps are installed then pump request signal will be generated for remote pumps.

Controller will establish a positive flow signal confirming flow.

Check the actual temperature vs the set point. If measured value is less than set point then the controller will request stages. This can be seen on the default screen.

There are several timers internal to the controller. Once they have been satisfied then the controller will turn on the compressor.

The controller staging is based on the set point (upper limit). With a dead band (lower limit). A dead band timer rate of change. As well as a stage delay timer to prevent the compressors coming on too quickly.

Depending on the difference between the measured and the set point temperatures you may see more stages requested than actually running compressors, this is normal.

There is also a minimum run time and a minimum off time for each compressor to ensure proper operation of the compressors. To prevent too many starts per hour and proper oil distribution at each start up.

As more compressors are staged on the temperature of the fluid will increase. When the temperature reaches the set point it will stage off one compressor. The dead band timer will start. After the dead band timer is completed the controller will compare the measured temperature to the set point. If it is still above the set point value it will stage off one more compressor. Start the dead band timer again, and so on.

If the after the dead band timer is completed and the measured temperature is below the set point then the controller will keep the current quantity of compressors on to maintain capacity.

NOTICE Comments may refer to one or more compressors and heat exchangers. This depends on which model you have.

If the measured temperature goes bellow the lower dead band then it will add one compressor and then start the dead band timer.

The system will stage up and down to maintain the set point as the load and ambient conditions varies.

The fans are variable speed. They will slow down when the ambient increases so that the system operates within the compressor envelope.

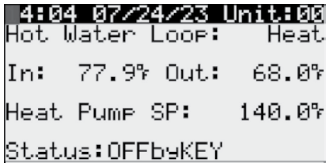
Units equipped with economizers will also vary (stage on and off) based on the ambient temperatures.

When the system is shut off the pumps will remain running for another 2 minutes to flush out any residual heat in the system.

CAREL CONTROLLER QUICK START

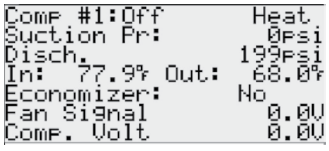
Transom Trent unit comes equipped with an on-board PLC and software to control all heat pump functions. Below are more details that are displayed, as one scrolls through each page.

Main Display Page:

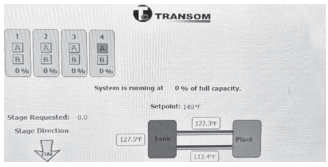


1. Unit: #. (If more than 1; see Central Controller Section for more detail)
2. Water in & out temperatures
   a. Unit controls to this temp
3. Heat Pump SP (User-Changeable)
4. Status / meaning:
   a. Off by Key: Internally off
   b. Off by Din: Auto/Man switch or BMS input
   c. On
   d. Alarm

Status Pages 1 & 2: Compressor Information

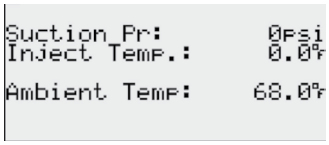


1. Compressor # and Status:
   a. On/Off
   b. Heat (or Cool) Mode
2. Suction Pressure
3. Discharge Pressure
4. Water in & out temperatures



5. Economizer Status: Yes/No
6. Fan Signal: 0-10v (10v = Max speed)
7. Compressor Volts: 0-10v (10v = Max speed)

Status Page #3: Economizer Information



1. Suction Pressure on injection line – from economizer
2. Injection Temp on injection line – from economizer
3. Ambient Temperature

PREVENTIVE MAINTENANCE SCHEDULE

The Transom Trent heat pump is self-contained with several safeties that will catch any issues during the operating cycle. In addition to this Transom recommends the following preventive maintenance schedule.

TC - Heat Pump Maintenance Checklist Quarterly and seasonal startup to be done by trained/licensed service personnel	
Air to DHW Periodic Maintenance Inspection Checklist	1 Year Log Sheet: More avaliable through Transom Corporation
Equipment:	Quarterly (Q) Maintenance by qualified service technician
Model Number:	Daily/weekly/Monthly checks: Done by on-site personnel
Serial Number:	Operational values to be filled in at bottom
This log must be kept with all TC equipment and completed as instruction. It is the resposibility of the end user to have all service, repair and adjustments documented to fulfull Service and Warranty agreements set out by Transom Corporation. Quarterly inspection must be done by a trained HVAC/r technician for commercial equipment	

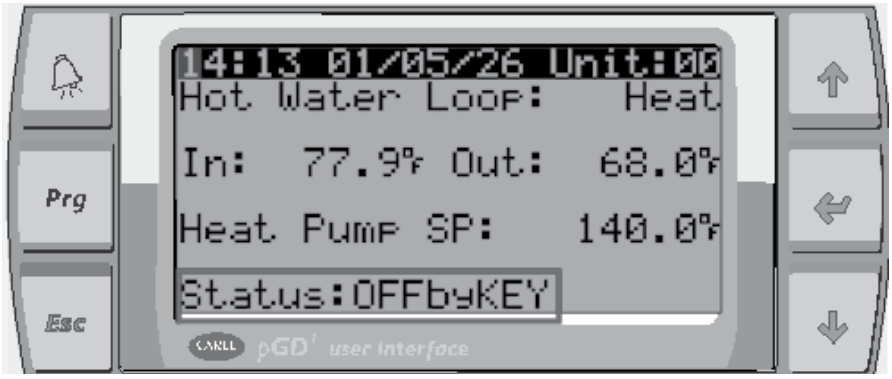
Description	Daily	Weekly	Monthly	Quarterly	Annual	Notes
Unit in normal operation - Audible/Visual						
Unit walk around, confirm setpoints and operation	☐					
Check Alarm status Current/Past		☐		☐		
Signs of heat on electrical connections (safe visual inspection where possible in operation)			☐			
Signs of water leaking in and around unit		☐				
Visually inspect air coils and airflow		☐				
Signs of water leaking in and around unit		☐				
Check air coils for excessive ice/frost buildup		☐				
Listen for any abnormal vibrations or sounds		☐				
Unit shutdown: Following LO/TO Procedures*						
Check for signs of heat on electrical connections Signs of rubbing or cracking on wires/cables				☐		
Electrical connection tightness inspection - Tug test				☐		
High and low voltage electrical connections - Re-torque, tighten or replace				☐		
Inspect contact points within contactors				☐		
Inspect all gauges/probes to ensure correct readings				☐		
Actuate contactors to ensure mechanical function				☐		
Check for oil leaks; unit and refrigerant piping				☐		
Clear any debris from fan areas/moving parts				☐		
Valve off and flush out heat exchangers					☐	
Valve off and clean out in-line strainers					☐	
Clean air coils & fans of any buildup (As required)				☐		
Unit startup: Operational mode & testing						
Compressors, fans and pumps rotation correct				☐		
Transducer pressures reading accurate				☐		
Setpoints within range of unit operation (See IOM)				☐		
Crankcase heater operational				☐		
Confirm operational refrigerant charge (See IOM)				☐		
Compressor oil level within manufacture spec				☐		
Compressor oil testing to be done as required*						☐
Check for any abnormal vibrations within the unit				☐		
Check: Abnormal pressure drop across fluid heat exchangers				☐		
Check temperature drop across filter drier(s)				☐		
Other:						

TC - Heat Pump Maintenance Checklist Heat Pump Periodic Maintenance Inspection continued						
Description	On Startup	Daily	Weekly	Quarterly	Annual	Notes
Electrical operational checks						
Line voltage within specification				☐		
Line voltage imbalance within 1%				☐		
Compressors & Fan amperages close to startup spec				☐		
Voltage drop across contactors/starters less than 2%				☐		
Other:						
Operational Data Points - Give Value (Unit fully loaded). Performed during quarterly/seasonal startup						
Entering water temp						
Leaving water temp						
Suction Pressure						
Suction line temp evaporator outlet						
Suction line temp at compressor						
Evaporator Superheat						
Compressor superheat						
Discharge pressure						
Refrigerant line temp at condenser outlet						
Liquid line temp before evaporator						
Delta T across liquid line filter drier						
Ambient temp						
Notes & Service Documentation:						
Compressor oil to be checked and replaced as required, visual inspection to confirm level and colour is best for standard maintenance. This unit will not require regular oil changes during standard operation.						

APPENDIX "A": ALARM CODES (HEAT PUMPS)

Unit Status

The unit status can be viewed on the HMI screen on the main status page. The unit status can also be accessed through BMS if configured.



BACNet Value	HMI Screen Description	Description
1	**UnitOn**	Unit is enabled and will stage up/down as required by setpoint.
2	**OFFbyALM**	Unit is enabled, but cannot operate due to the presence of one or more alarms. Briefly press the alarm "bell" button at the top-left of the HMI to view active alarms. Use scroll buttons to see if multiple alarms are present. Once condition causing the alarm is resolved, press and hold the alarm "bell" button to reset the alarms.
3	**OFFbyNET**	Unit is ready to operate, but has not been provided a heat demand by the connected Transom Central Controller. Review setpoint and staging delays at the Central Controller if required.
4	**OFFbyBMS**	Unit is ready to operate but has not been provided a heat demand by the connected BMS/BACnet Controller. Set the variable Superv_On_Off to 1 through BACnet to enable the unit.
5	**OFFbySCH**	If a BMS controller is connected through BACnet, review the sequence of operation to confirm that the correct command is being sent to the unit. If the unit is not visible through BACnet, review the communication settings and wiring as required.
6	**OFFbyDIN**	Unit is ready to operate but has not been provided a heat demand by the Digital Input (DIN). To enable the unit: - To generate a heat demand locally (such as during commissioning or service), set the switch on the front of the unit to "Local" position - To generate a heat demand from a remote BMS hard contact, connect a relay output to the #1 and #2 field wiring terminals as indicated on the wiring schematic. Close the relay to enable the unit and open the relay to disable the unit. Leave the switch at the front of the unit in the "Remote" position to allow the relay output to operate the unit - If the above methods are not required by the application, this feature (Digital Input) can be disabled in the On/Off Settings menu [Screen location: Main Menu > Service Menu > On/Off Settings]
7	**OFFbyKEY**	Unit is ready to operate but has not been provided an enable at the local Keypad. The keypad on/off status can be changed in [Screen location: Main Menu > On/Off Menu]. Note, the setting is retained upon loss of power and does not need to be adjusted again after a power cycle.
8	**Lost Master**	The unit is configured to be connected to a Transom Central Controller, but the communication has timed out. Review communication settings and wiring connecting the unit and central controller as required.
9	**-**	This status is not used.
10	**High EWT Warn**	The unit is enabled but is temporarily staged off because the entering water temperature (EWT) has exceeded the allowable operating range. The unit will automatically resume normal heating operation once the EWT has returned to operating range. If the unit is installed as part of a stratified hot water storage system, confirm the piping arrangement matches the recommendations in this manual. If the system is installed as part of a single-pass, stratified hot water storage system, the pump will cycle periodically to sense the system water temperature without disturbing stratification. This pump behaviour can be confirmed by "Pump Cycle Enable" = "Yes" [Screen location: Main Menu > Service Menu > Service Settings > Thermoregulation > Level Settings 6D] If the unit is installed as part of a multipass heating system or where stratification is not required, the pump behaviour can be set "Pump Cycle Enable" = "No" to leave the pump operating continuously in this state.
11	**High Press Warn**	The unit is enabled, but is temporarily staged off because the refrigerant operating pressure has exceeded the allowable operating range. The unit will automatically resume normal heating operation once the pressure has returned to operating range. If condition persists, review the troubleshooting steps for "Intermediate High Pressure" for Heating or Cooling mode as appropriate.
12	**Low Amb. Warn**	The unit is enabled but is temporarily staged off because the ambient temperature is below the allowable operating range. The unit will automatically resume normal heating operation once the temperature has returned to operating range.
13	**Off By Setpoint**	Unit is enabled and has achieved the required temperature setpoint
14	**Off-Cycle Delay**	Unit is enabled, has active heat demand and is waiting for a minimum startup timer to complete.
15	**Flow Est Delay**	Unit is enabled, has active heat demand and is waiting for flow to establish and stabilize. This setting can be adjusted for longer startup times, such as when isolation valves are present [Screen location: Main Menu > Service Menu > Service Settings > Thermoregulation > Level Settings 14]
16	**Alarm**	Unit is enabled but cannot operate due to the presence of one or more alarms. Briefly press the alarm "bell" button at the top-left of the HMI to view active alarms. Use scroll buttons to see if multiple alarms are present. Once condition causing the alarm is resolved, press and hold the alarm "bell" button to reset the alarms.
17	**OFFbyRevTmr**	Unit is enabled but is waiting for a reversing changeover timer to complete. On reversing units, this allows the circuit to equalize before changeover
18	**Defrost A**	Unit is enabled and has active heat demand. Circuit A is currently in a defrost cycle, and circuit will automatically resume heating once complete
19	**Defrost B**	Unit is enabled and has active heat demand. Circuit B is currently in a defrost cycle, and circuit will automatically resume heating once complete
20	**OffbyCentral SP**	Unit is ready to operate, but has not been provided a heat demand by the connected Transom Central Controller as the central setpoint has been satisfied.

Troubleshooting Alarms

The following alarms screens are displayed when the corresponding alarm is present. The alarms can be viewed by pressing the alarm “bell” icon at the top-left side of the unit HMI.

Alarms	Cause	Potential Solutions
Analog Input x Sensor Failure	Analog input value for indicated channel is outside of expected range	Verify the following • Confirm sensor wiring connections are tight at analog input. Note that terminal for each analog input is labelled with “U” on schematic o eg. Analog Input 1 = U1 • Confirm sensor type and range matches electrical schematic. Refer to section “Sensor Scale Reference Charts” to confirm sensor reading matches specification. Compare to service instruments • Confirm sensor wiring for signs of physical damage • For pressure transducers: o Confirm 5VDC supply o Confirm sensor connect is fully seated o Confirm Schraeder core is not binding
Circuit A High Pressure Mechanical Switch	If the discharge pressure of the system exceeds the HP switch rating, the pressure switch will open, and the alarm will be triggered. Consult wiring diagram supplied with unit for HP switch rating.	Verify the following • Check the functionality of the switch (type, rating, connection tightness and 24VAC supply) is correct • Compare switch actuation point to external gauges • Confirm Liquid Line Solenoid functioning correctly. See guide in following section • Expansion valve is functioning correctly • Proceed to diagnosis for “Load No Flow”
Circuit A Intermediate High Pressure	If the compressor discharge pressure sensor reads above the high-pressure setting, an intermediate high-pressure alarm will occur on the circuit. The factory default setting is 300 psig.	Verify the following • Confirm sensor type and range matches electrical schematic. Refer to section “Sensor Scale Reference Charts” to confirm sensor reading matches specification. Compare to service instruments • Confirm sensor wiring for signs of physical damage • For discharge pressure sensor: o Confirm 5VDC supply o Confirm sensor connect is fully seated o Confirm Schraeder core is not binding • Proceed to diagnosis for “High Pressure Mechanical Switch”
Circuit A Low Suction Pressure	If the compressor suction pressure drops below the low suction pressure threshold, a low suction pressure condition will occur. The factory default setting is 24 psig.	Verify the following • Confirm Liquid Line Solenoid functioning correctly. See guide in following section • Expansion valve is functioning correctly. Verify for both main electronic expansion valve and injection expansion valve (if present) • Confirm suction sensor type and range matches electrical schematic. Refer to section “Sensor Scale Reference Charts” to confirm sensor reading matches specification. Compare to service instruments • Confirm suction sensor wiring for signs of physical damage • For suction pressure sensor: o Confirm 5VDC supply o Confirm sensor connect is fully seated o Confirm Schraeder core is not binding • Verify refrigeration circuit is free of leaks and correctly charged • Air coils are free of debris, obstructions and ice buildup. Fans are operating with correct rotation • Proceed to diagnosis for “Source No Flow”
Compressor 1 Motor Protection	The compressor motor protection contact is open, indicating fault at the compressor motor.	Verify the following • Verify correct supply voltage and phasing to equipment • Verify compressor contactor operates smoothly and does not bounce. Check control voltage if operation is inconsistent • Verify overload setting matches provided schematic. Manual reset of overload relay is required before resetting alarm • Verify status of compressor fuses or circuit breakers • Verify 24 VAC is supplied to the device indicating motor status o For Comp 1, the device indicating motor status will be connected to ID7 on the PLC o For Comp 2 (if installed), the device indicating motor status will be connected to ID8 on the PLC • Verify superheat is regulating properly in operation, approximately 8 -12 F, or as set in PLC • Verify other conditions which may cause high compressor loading, such as low flowrates, low ambient temperatures or high entering water temperatures. Follow troubleshooting steps for: o High discharge pressure alarm o High discharge temperature alarm o Low suction pressure alarm

Troubleshooting Alarms (continued)

Load No Flow	If the unit PLC makes a request for flow and the flow switch is not satisfied within the allocated time (Default = 30s), a flow alarm will be registered. The delay for the flow switch is longer at startup (default = 30s) than operation (default = 10s). Flow will be initiated either when the unit is enabled ("System On"), or when a compressor stage is called ("Comp On"). For single-pass water heater applications, it is by "Comp On" as default. For all other applications, it is "System On" as default.	Verify the following • Confirm flow switch function (24 VAC supply, wiring tight, no damage to wires or switch) • Load heat exchanger is not fouled or obstructed. Consult submittal performance sheet or contact factory for expected pressure drop. Check any external strainers and/or isolation valves • Verify the flow switch timer is longer than any isolation valves which open during the unit enable. Update timers as required. Transom-supplied water control valves require a positioning time of 90s • Confirm system water pressure is greater than minimum pressure in specifications section • Confirm water piping is primed and free of air using manual vent valves in the unit • (For units with onboard fixed-speed pump) o Confirm pump contactor operation o Confirm pump fuse/circuit breaker o Confirm phasing and rotation of pump motor o Confirm pump speed setting and capability adequate to overcome external head
Circuit A/B Low Suction Pressure Switch Alarm	If the suction pressure of the system is below the LP switch rating, the pressure switch will open, and the alarm will be triggered. Consult wiring diagram supplied with unit for LP switch rating. Units with multiple refrigerant circuits have independent alarms	Verify the following • Check the functionality of the switch (type, rating, wiring and 24VAC supply) is correct per schematic • For heating mode: Proceed to troubleshooting steps for "Circuit A/B Low Suction Pressure"
Compressor A1 High Discharge Temp Alarm	If the compressor discharge temperature sensor reads above the high-pressure setting, an intermediate high-pressure alarm will occur on the circuit. The factory default setting is 220F measured on the compressor discharge line.	Verify the following • Confirm sensor resistance reading matches specification of 50K NTC Reference Chart in following section. • Confirm Liquid Line Solenoid functioning correctly. See guide in following section • Expansion valve and driver boards (if supplied) are functioning correctly. Verify for both main electronic expansion valve and injection expansion valve (if present) • Verify refrigeration circuit is free of leaks and correctly charged • Air coils are free of debris, obstructions and ice buildup. Fans are operating with correct rotation • Verify other conditions which may cause high compressor loading, such as low flowrates, low ambient temperatures or high entering water temperatures. Follow troubleshooting steps for: o High discharge pressure alarm o High discharge temperature alarm o Low suction pressure alarm
Leaving Water Temp High Limit Alarm	If the leaving water temperature of the heat pump water heater exceeds the setting of the temperature limiting (TL) switch, the TL switch will open, and the alarm will be triggered. Manual reset of the switch within the mechanical cabinet is required.	Verify the following • Verify correct function of the temperature limiting switch, 24VAC power supply and wires are connected • Verify capillary tube of the device has not been damaged. Loss of sensing bulb charge will result in switch reading open permanently • Verify adjustment knob is set to factory setting (210 °F, 99 °C). Lower settings are for testing switch function only • Proceed to diagnosis for "Load No Flow"

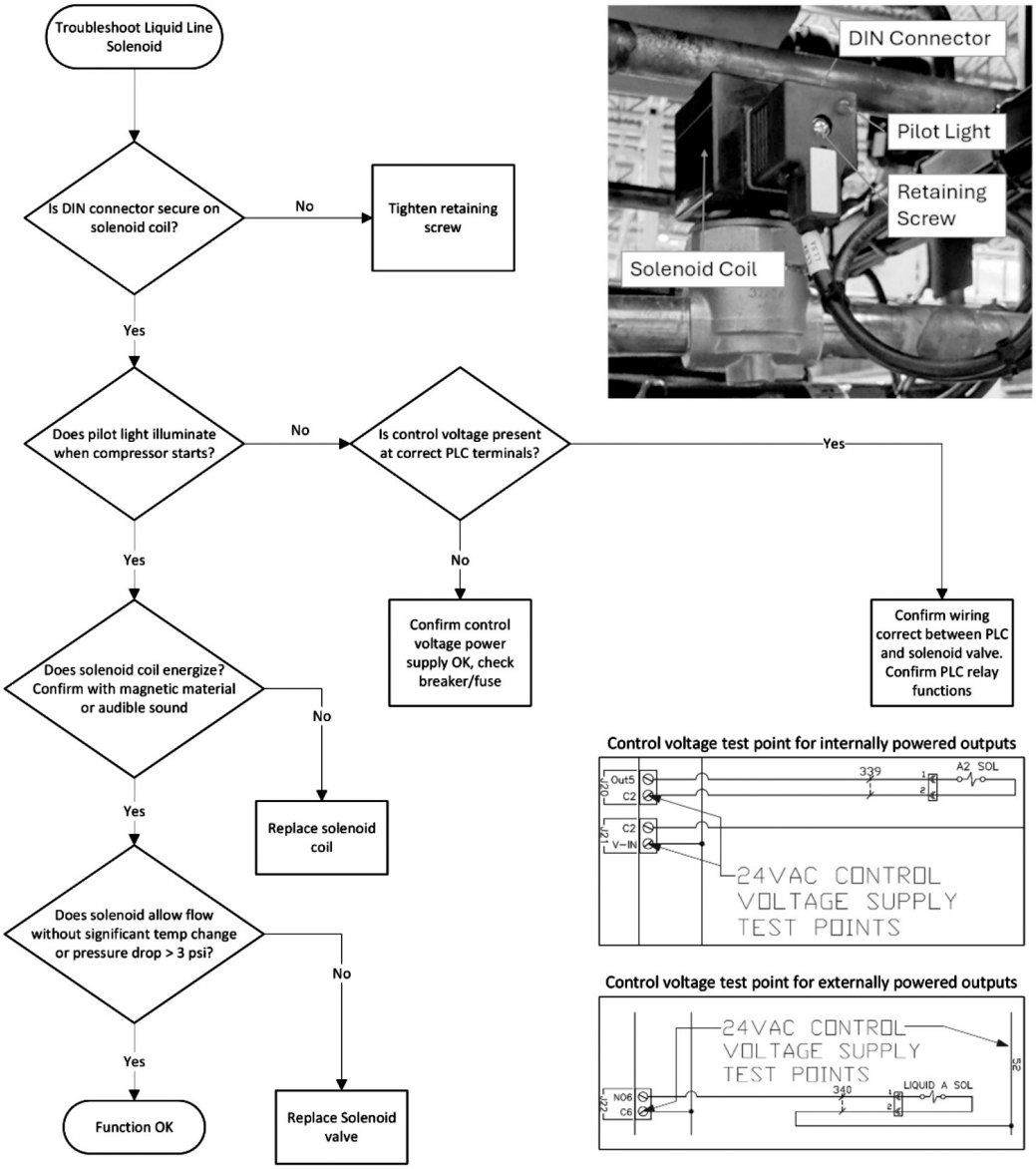
Troubleshooting Warnings

Warnings will be displayed at the alarm page but still allow the unit to operate in a limited capacity.

Warnings	Cause	Potential Solutions
Master Offline	When unit is configured to operate with a “Master” or “Central” controller, this warning will be displayed if connection is lost to the Central controller. If unit is configured to operate from “Master” setpoint, it will continue to use the last communicated setpoint.	Verify the following • Confirm the Central Controller is powered • Confirm if system is intended to be staged by a Transom Central controller. If it is not, or a Central controller is not present, set the “Master Present” setting to “No” on the following page; o Service Menu > Service Settings > Thermoregulation > Level Settings 1 o Note: The sensor readings and status of the individual modules can still be accessed through a Central controller even when the setting is “No”. Changing setting to “Yes” allows the module to be staged by the remote Central Controller • Confirm wiring between each module and the Central Controller is correct per the Central Controller section of the manual • Confirm the addressing of the Central Controller and all connected heat pump modules and screens are correct per Addressing Table in Central Controller section of the manual

Additional troubleshooting workflows:

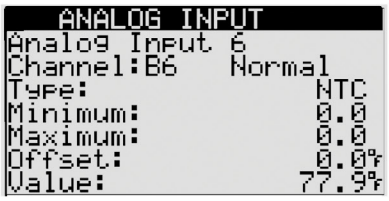
Liquid Line Solenoid Valve:



Sensor Scale Reference Charts:

Standard 10K NTC Temperature Sensor

The standard range temperature sensor is type 10K NTC, ß=3435. This is the sensor type used for most water and refrigerant temperature sensors. The operating range is the PLC is -58 °F to 222 °F (-50 °C to 105 °C)



Standard Temp Sensor Reference Chart - 10K @ 25 °C [77 °F], β = 3435

Temp.		Resistance Value			Temp.		Resistance Value			Temp.		Resistance Value		
		Max.	Typical	Min.			Max.	Typical	Min.			Max.	Typical	Min.
°C	°F	KΩ	KΩ	KΩ	°C	°F	KΩ	KΩ	KΩ	°C	°F	KΩ	KΩ	KΩ
-50	-58	344.6	329.5	314.9	3	37	24.4	23.99	23.5	56	133	3.5	3.43	3.4
-49	-56	325	310.9	297.3	4	39	23.4	23	22.6	57	135	3.39	3.32	3.3
-48	-54	306.6	293.5	280.9	5	41	22.5	22.05	21.7	58	136	3.28	3.22	3.2
-47	-53	289.4	277.2	265.4	6	43	21.5	21.15	20.8	59	138	3.18	3.12	3.1
-46	-51	273.4	262	251	7	45	20.6	20.3	20	60	140	3.09	3.02	3
-45	-49	258.3	247.7	237.4	8	46	19.8	19.48	19.2	61	142	2.99	2.93	2.9
-44	-47	244.2	234.3	224.7	9	48	19	18.7	18.4	62	144	2.9	2.84	2.8
-43	-45	231	221.7	212.8	10	50	18.3	17.96	17.7	63	145	2.82	2.75	2.7
-42	-44	218.6	209.9	201.6	11	52	17.5	17.24	17	64	147	2.73	2.67	2.6
-41	-42	207	198.9	191	12	54	16.8	16.56	16.3	65	149	2.65	2.59	2.5
-40	-40	196	188.5	181.1	13	55	16.1	15.9	15.7	66	151	2.57	2.51	2.5
-39	-38	185.5	178.5	171.6	14	57	15.5	15.28	15.1	67	153	2.5	2.44	2.4
-38	-36	175.6	169	162.6	15	59	14.9	14.69	14.5	68	154	2.42	2.36	2.3
-37	-35	166.3	160.2	154.2	16	61	14.3	14.12	13.9	69	156	2.35	2.3	2.2
-36	-33	157.6	151.9	146.3	17	63	13.8	13.58	13.4	70	158	2.28	2.23	2.2
-35	-31	149.4	144.1	138.8	18	64	13.2	13.06	12.9	71	160	2.22	2.16	2.1
-34	-29	141.7	136.7	131.8	19	66	12.7	12.56	12.4	72	162	2.15	2.1	2.1
-33	-27	134.5	129.8	125.2	20	68	12.2	12.09	11.9	73	163	2.09	2.04	2
-32	-26	127.7	123.3	119	21	70	11.8	11.63	11.5	74	165	2.03	1.98	1.9
-31	-24	121.2	117.1	113.1	22	72	11.3	11.2	11.1	75	167	1.98	1.92	1.9
-30	-22	115.2	111.3	107.5	23	73	10.9	10.78	10.7	76	169	1.92	1.87	1.8
-29	-20	109.4	105.7	102.2	24	75	10.5	10.38	10.3	77	171	1.87	1.82	1.8
-28	-18	103.9	100.5	97.2	25	77	10.1	10	9.9	78	172	1.81	1.77	1.7
-27	-17	98.68	95.52	92.45	26	79	9.73	9.63	9.53	79	174	1.76	1.72	1.7
-26	-15	93.8	90.84	87.97	27	81	9.38	9.28	9.18	80	176	1.72	1.67	1.6
-25	-13	89.2	86.43	83.73	28	82	9.04	8.94	8.84	81	178	1.67	1.62	1.6
-24	-11	84.85	82.26	79.74	29	84	8.72	8.62	8.52	82	180	1.62	1.58	1.5
-23	-9	80.76	78.33	75.96	30	86	8.41	8.31	8.21	83	181	1.58	1.53	1.5
-22	-8	76.89	74.61	72.39	31	88	8.11	8.01	7.92	84	183	1.54	1.49	1.5
-21	-6	73.23	71.1	69.01	32	90	7.83	7.73	7.63	85	185	1.49	1.45	1.4
-20	-4	69.77	67.77	65.82	33	91	7.55	7.45	7.36	86	187	1.45	1.41	1.4
-19	-2	66.44	64.57	62.74	34	93	7.29	7.19	7.1	87	189	1.42	1.37	1.3
-18	0	63.3	61.54	59.83	35	95	7.04	6.94	6.85	88	190	1.38	1.34	1.3
-17	1	60.32	58.68	57.07	36	97	6.79	6.7	6.61	89	192	1.34	1.3	1.3
-16	3	57.51	55.97	54.46	37	99	6.56	6.47	6.37	90	194	1.31	1.27	1.2
-15	5	54.85	53.41	51.99	38	100	6.34	6.25	6.15	91	196	1.27	1.23	1.2
-14	7	52.33	50.98	49.65	39	102	6.12	6.03	5.94	92	198	1.24	1.2	1.2
-13	9	49.95	48.68	47.43	40	104	5.92	5.83	5.74	93	199	1.21	1.17	1.1
-12	10	47.69	46.5	45.32	41	106	5.72	5.63	5.54	94	201	1.17	1.14	1.1
-11	12	45.55	44.43	43.33	42	108	5.53	5.44	5.35	95	203	1.14	1.11	1.1
-10	14	43.52	42.47	41.43	43	109	5.34	5.26	5.17	96	205	1.12	1.08	1
-9	16	41.55	40.57	39.6	44	111	5.17	5.08	4.99	97	207	1.09	1.05	1
-8	18	39.69	38.77	37.86	45	113	5	4.91	4.83	98	208	1.06	1.02	1
-7	19	37.92	37.06	36.21	46	115	4.83	4.75	4.67	99	210	1.03	1	1
-6	21	36.25	35.44	34.64	47	117	4.68	4.59	4.51	100	212	1.01	0.97	0.9
-5	23	34.66	33.9	33.15	48	118	4.52	4.44	4.36	101	214	0.98	0.95	0.9
-4	25	33.15	32.44	31.73	49	120	4.38	4.3	4.22	102	216	0.96	0.92	0.9
-3	27	31.72	31.05	30.39	50	122	4.24	4.16	4.08	103	217	0.93	0.9	0.9
-2	28	30.36	29.73	29.11	51	124	4.1	4.03	3.95	104	219	0.91	0.88	0.9
-1	30	29.06	28.48	27.89	52	126	3.97	3.9	3.82	105	221	0.89	0.86	0.8
0	32	27.83	27.28	26.74	53	127	3.85	3.77	3.7					
1	34	26.65	26.13	25.62	54	129	3.73	3.65	3.58					
2	36	25.52	25.03	24.55	55	131	3.61	3.54	3.46					

High-range 50K NTC Temperature Sensor

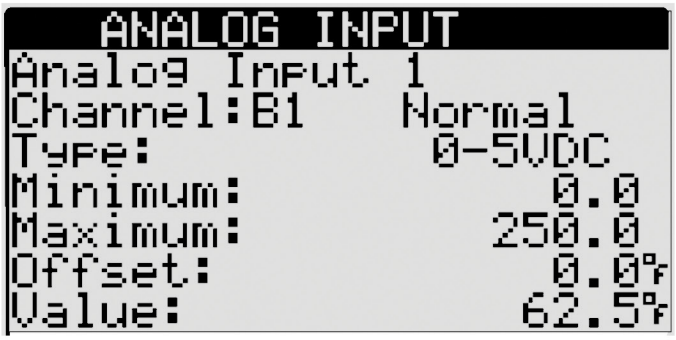
The temperature sensor used for measuring compressor discharge temperatures is type 50K NTC, ϐ=3977. The operating range is the PLC is 32 °F to 302 °F (0 °C to 150 °C)

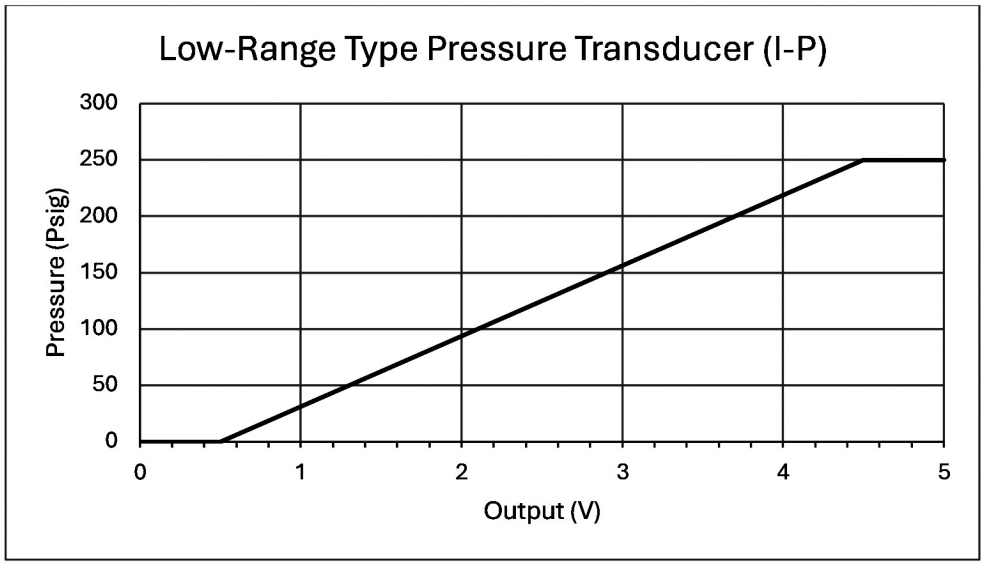
High Temp Sensor Reference Chart - 50K @ 25 °C [77 °F], ϐ = 3977

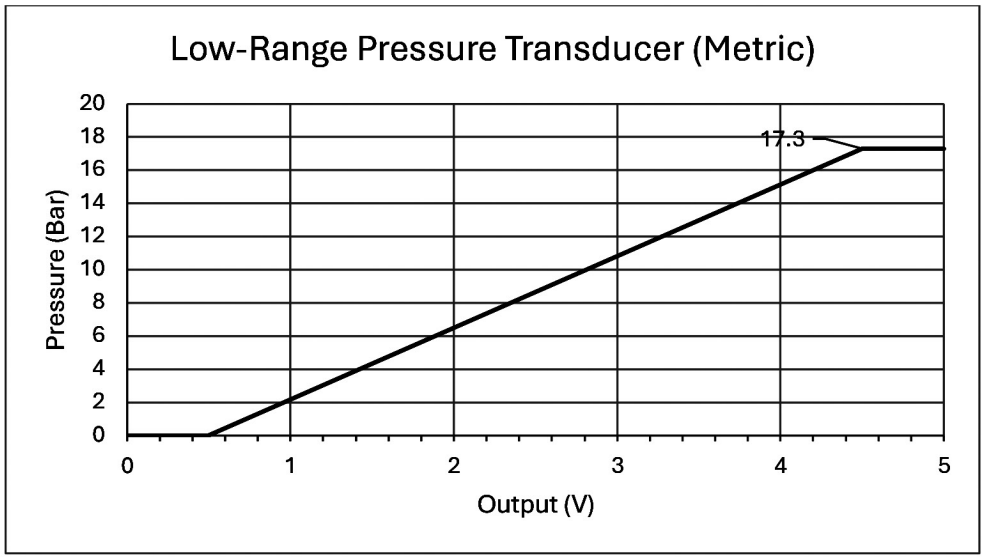
Temp.		Resistance Value			Temp.		Resistance Value			Temp.		Resistance Value		
		Max.	Typical	Min.			Max.	Typical	Min.			Max.	Typical	Min.
°C	°F	Ω	Ω	Ω	°C	°F	Ω	Ω	Ω	°C	°F	Ω	Ω	Ω
0	32	165239	161638	158036	51	124	17760	17401	17042	102	216	3293	3176	3058
1	34	157036	153694	150352	52	126	17109	16757	16405	103	217	3199	3084	2969
2	36	149288	146187	143086	53	127	16485	16140	15795	104	219	3108	2995	2883
3	37	141965	139088	136211	54	129	15887	15549	15211	105	221	3019	2909	2799
4	39	135043	132375	129706	55	131	15314	14982	14651	106	223	2934	2826	2719
5	41	128498	126023	123548	56	133	14764	14439	14114	107	225	2851	2746	2641
6	43	122307	120012	117717	57	135	14236	13918	13600	108	226	2771	2668	2565
7	45	116449	114321	112194	58	136	13730	13418	13107	109	228	2694	2593	2492
8	46	110904	108932	106961	59	138	13244	12939	12634	110	230	2619	2520	2422
9	48	105654	103827	102001	60	140	12778	12479	12181	111	232	2547	2450	2354
10	50	100682	98990	97298	61	142	12330	12038	11746	112	234	2477	2382	2288
11	52	95971	94405	92838	62	144	11901	11615	11329	113	235	2409	2316	2224
12	54	91507	90057	88608	63	145	11488	11208	10928	114	237	2343	2252	2162
13	55	87276	85934	84593	64	147	11092	10818	10544	115	239	2279	2191	2102
14	57	83263	82022	80782	65	149	10711	10443	10175	116	241	2218	2131	2044
15	59	79456	78310	77163	66	151	10345	10083	9821	117	243	2158	2073	1988
16	61	75845	74786	73727	67	153	9993	9737	9481	118	244	2100	2017	1934
17	63	72417	71440	70462	68	154	9655	9405	9154	119	246	2044	1962	1881
18	64	69163	68261	67359	69	156	9330	9085	8840	120	248	1989	1910	1830
19	66	66073	65241	64410	70	158	9018	8778	8538	121	250	1937	1859	1781
20	68	63137	62372	61606	71	160	8717	8483	8248	122	252	1886	1809	1733
21	70	60348	59643	58939	72	162	8428	8199	7969	123	253	1836	1761	1687
22	72	57697	57049	56401	73	163	8150	7926	7701	124	255	1788	1715	1642
23	73	55177	54582	53987	74	165	7882	7663	7443	125	257	1742	1670	1598
24	75	52780	52234	51688	75	167	7625	7410	7195	126	259	1697	1626	1556
25	77	50500	50000	49500	76	169	7377	7167	6957	127	261	1653	1584	1515
26	79	48373	47873	47373	77	171	7138	6933	6727	128	262	1610	1543	1476
27	81	46348	45848	45349	78	172	6908	6707	6506	129	264	1569	1503	1437
28	82	44417	43920	43422	79	174	6686	6490	6294	130	266	1529	1465	1400
29	84	42577	42082	41587	80	176	6473	6281	6089	131	268	1490	1427	1364
30	86	40823	40332	39840	81	178	6267	6080	5892	132	270	1453	1391	1329
31	88	39151	38663	38174	82	180	6069	5886	5702	133	271	1416	1355	1295
32	90	37556	37072	36588	83	181	5878	5699	5520	134	273	1381	1321	1262
33	91	36034	35554	35075	84	183	5694	5519	5343	135	275	1346	1288	1230
34	93	34581	34107	33633	85	185	5517	5345	5174	136	277	1313	1256	1199
35	95	33195	32726	32258	86	187	5346	5178	5010	137	279	1280	1224	1168
36	97	31871	31408	30945	87	189	5181	5017	4853	138	280	1249	1194	1139
37	99	30607	30150	29694	88	190	5022	4861	4701	139	282	1218	1164	1111
38	100	29400	28949	28499	89	192	4868	4711	4554	140	284	1189	1136	1083
39	102	28246	27802	27358	90	194	4720	4566	4413	141	286	1160	1108	1056
40	104	27143	26706	26269	91	196	4577	4427	4277	142	288	1132	1081	1030
41	106	26090	25659	25229	92	198	4439	4292	4145	143	289	1104	1055	1005
42	108	25082	24659	24235	93	199	4306	4162	4019	144	291	1078	1029	980
43	109	24118	23702	23286	94	201	4177	4037	3896	145	293	1052	1004	956
44	111	23197	22787	22378	95	203	4053	3916	3778	146	295	1027	980	933
45	113	22315	21913	21511	96	205	3933	3799	3664	147	297	1003	957	911
46	115	21471	21076	20681	97	207	3817	3686	3554	148	298	979	934	889
47	117	20663	20275	19888	98	208	3705	3577	3448	149	300	956	912	868
48	118	19890	19509	19129	99	210	3597	3471	3346	150	302	933	890	847
49	120	19149	18776	18402	100	212	3492	3369	3246					
50	122	18440	18074	17707	101	214	3391	3271	3151					

Low-Range Pressure Sensor

The 0-250 psig (0-17.3 Bar) range pressure sensor is typically used for refrigerant suction or evaporator pressure measurement. See below for typical program configuration and scaling:

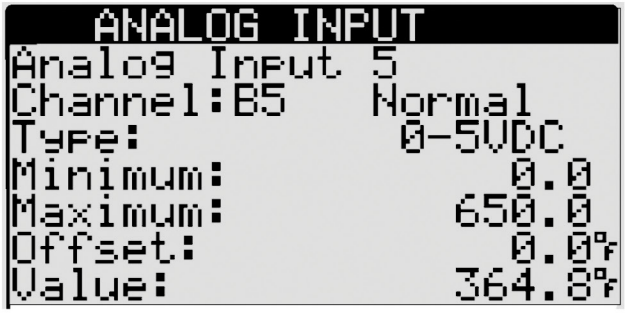


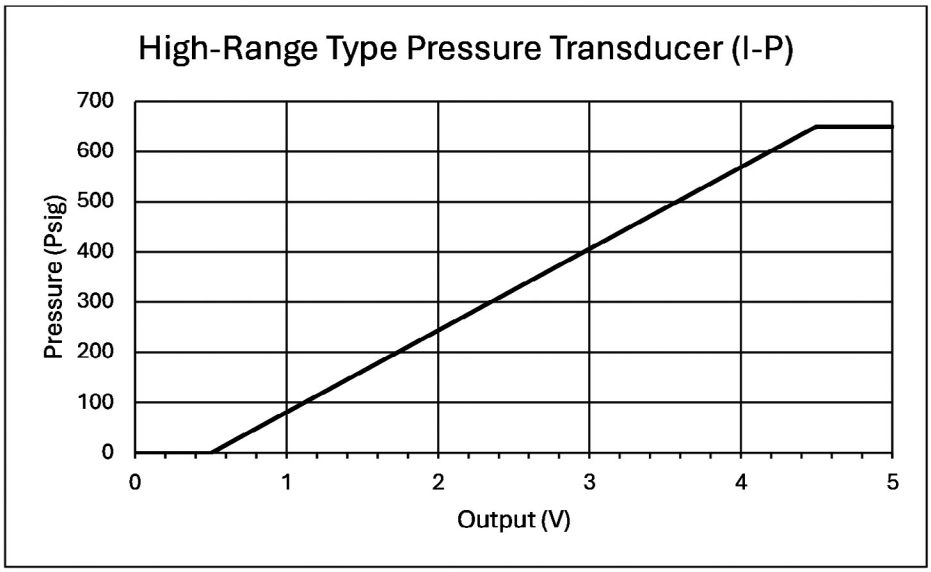


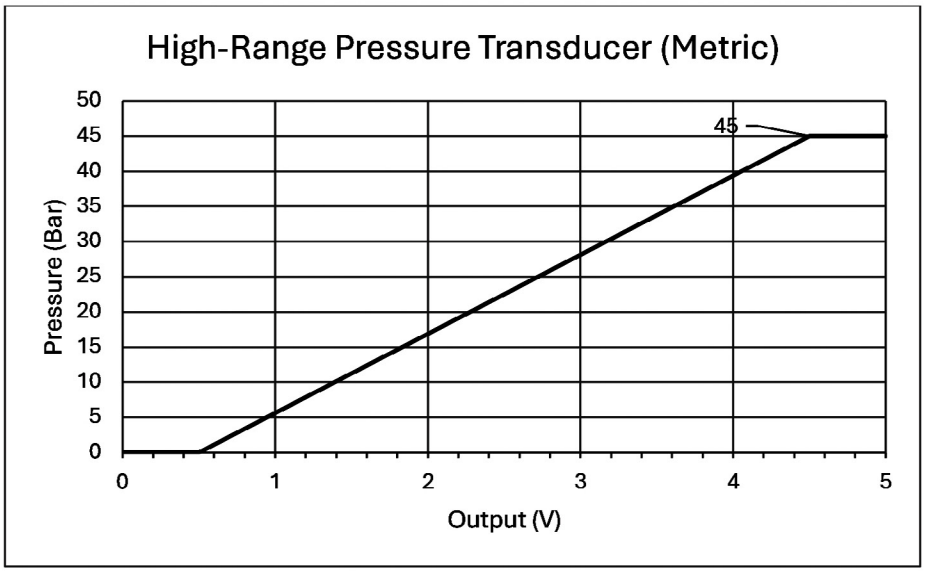


High-Range Pressure Sensor

The 0-650 psig (0-45 Bar) range pressure sensor is typically used for refrigerant discharge pressure measurement. See below for typical program configuration and scaling:



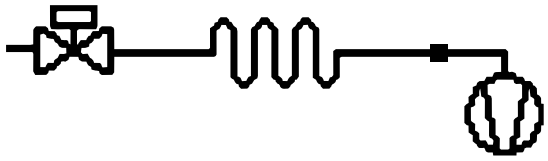




APPENDIX "B": EVD ON BOARD - CAREL (HEAT PUMP)

Transom Trent units come equipped with an onboard Electronic Valve Driver to control the electronic thermostatic expansion valve for the evaporator.

Valve A – In the menus valve A is the evaporator expansion valve.

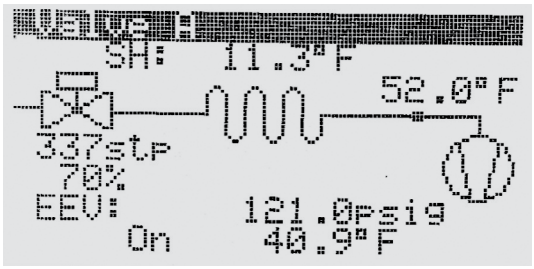


Default values:

Valve A:
Superheat: 8-12°F (4.5 to 6.5 K) depending on unit tuning per location and overall design.
Valve maintains a 50% standby position
Valve opens to 50-80% on unit start and begins to regulate to the required step to maintain set superheat value.

Each valve comes with a preset superheat setting, or finalized setting during unit site startup. If this setting appears inaccurate during unit operation, please contact Transom for assistance in changing the superheat setting.

Superheat, valve position and line temperature from the valve can be read at all times through the “I/O Status” page in the main menu.



It is advised to confirm superheat setpoint during regular maintenance and system review. If any changes are required, please contact your local representative or Transom Corporation.

TRENT PRODUCT LIMITED WARRANTY

The specific company or business unit that manufactured the Transom products purchased ("Manufacturer") warrants exclusively to the original owner at the original installation site (hereinafter "Owner") site that the Compressors and Heat Exchanger of the Industrial, Commercial, and other Non-Residential Use Trent Series Water Heater Heat Pump or components thereof (the "Product" or "Products") will be free from defects in material or workmanship for 12 months from date of start-up or 18 months from date of shipment from Transom or the Manufacturer whichever occurs first. All warranty claims are subject to, and contingent upon, Owner following the terms of the Warranty claim procedure set forth below as well as the specific Product requirements, operation conditions and exclusions set forth below. Failure to do shall void the warranty.

Warranty claim procedure

1. Owner or entity acting on behalf of Owner must first obtain a Return Material Authorization ("RMA") from the Manufacturer before returning any Products.
2. Products must be returned to the Manufacturer at Owner's expense, including packaging, transportation and any applicable VAT, tariffs and import duty costs, and risk of loss or damage until received at the Manufacturer's factory set forth when obtaining the RMA.
3. Manufacturer shall evaluate the returned Products purported to be defective due to defects in material or Manufacturer's workmanship and if upon examination by the Manufacturer the Product is shown in its reasonable and sole discretion to have a defect in material or workmanship during the warranty period, the Manufacturer will repair or replace, at its option, that part of the Product which is shown to be defective.
4. If indeed the Product is determined to be defective due to defects in material or Manufacturer's workmanship, Manufacturer shall either repair or replace, at its option, the Product or the specific portion thereof that is determined to be defective.
5. Repaired or replacement Products shall be returned to Owner on an EXW (Ex Works basis, Incoterms 2020 or current version) at Owner's expense and risk and Owner shall be responsible, at its sole expense, for any tariffs that may be assessed on the Products.
6. The repair or replacement of a Product returned to the Owner shall be warranted only for the remainer of the original warranty effective period and the repair or replacement of Product shall not extend the effective period of the original warranty on the Product.

Product requirements, restrictions and operating conditions

The Heat Pump Water Heater Product is designed to operate scale free, System water fill chemistry must not exceed requirements as stated in the Installation and Maintenance Instructions including and not limited to the following: This Water Heater Product must not contain more than 280 ppm Total Dissolved Solids, must maintain a PH level within a 6.8 – 8.0 range, maintain a maximum 0.3 ppm Free Chlorine and a minimum 20 ppm - maximum 70 ppm Water Hardness. Corrosive chemicals (dry cleaning chemicals, degreasing liquids, chlorine or any chemicals that produce hydrochloric acid) must not be present around the Air-to-Water Heat Pump as it rapidly destroys the Product. Failure to follow any of these requirements will void the warranty.

Exclusions to This Limited Warranty (and all additional, if any, exclusions will be determined in the sole discretion of Manufacturer at the time of evaluation of the Product):

a) Any expenses, including manufacturer's (Owner's or third party) on-site labor or material, incurred during the removal or reinstallation of the product or replacement parts thereof all of which are the responsibility of the Owner.
b) Products that have been subjected to misuse or neglect, have been accidentally or intentionally damaged, have not been installed, maintained or operated in accordance with the manufacturer's furnished written instructions or manuals, or has been altered or modified in any way by any person other than those authorized in writing by the Manufacturer to do so.
c) Damage associated with or caused by corrosive chemicals (dry cleaning chemicals, degreasing liquids, chlorine or any chemicals that produce hydrochloric acid).
d) Products that were not properly installed, maintained (serviced annually) or operated by a qualified contractor in accordance with the Manufacturer's furnished written instructions, or meet the good practice as defined by the industry's accepted authority, or were altered or modified in any way by any person other than those authorized in writing by the Manufacturer to do so.
e) Damage associated with or caused by the installation or use of the Products regardless of whether the installer, provided by the Owner, is considered, or was authorized by Manufacturer, to be a qualified contractor, to perform the installation. The installation contractor is solely and exclusively responsible to the Owner for its own work and the results thereof.
(f) damage resulting from settlement, distortion, collapse, or cracking of any foundation area, beams or pipes surrounding the Product.
(g)Products installed outside the continental United States or Canada.

THIS LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY TO THE PRODUCTS AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, OF ANY KIND AND SUPERSEDES ALL OTHER WARRANTIES, INCLUDING THOSE CONTAINED IN OTHER DOCUMENTS WHICH MIGHT HAVE BEEN INCLUDED WITH THE PRODUCTS AT THE TIME OF SHIPMENT. THE REMEDIES UNDER THIS WARRANTY ARE EXCLUSIVE TO THE ORIGINAL OWNER ("OWNER") AT THE ORIGINAL PLACE OF INSTALLATION AND MANUFACTURER NEITHER ASSUMES NOR AUTHORIZES ANYONE TO OFFER OR ASSUME FOR IT ANY OTHER OBLIGATIONS. THIS WARRANTY GIVES OWNER SPECIFIC LEGAL RIGHTS HOWEVER IN NO EVENT SHALL MANUFACTURER OR TRANSOM BE LIABLE FOR ANY DAMAGES THAT EXCEED THE ORIGINAL SALE PRICE OF THE PRODUCTS SOLD TO OWNER THAT ARE FOUND TO BE DEFECTIVE. IN ADDITION, IN NO EVENT SHALL MANUFACTURER OR TRANSOM BE LIABLE FOR ANY SPECIAL, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES OF ANY KIND, OR ON-SITE LABOR, EXPENSES OF ANY KIND, LOST PROFITS, LOST OPPORTUNITIES, OR SIMILAR DAMAGES OF ANY KIND; SPECIAL, INDIRECT, CONSEQUENTIAL, PUNITIVE OR INCIDENTAL DAMAGES OF ANY KIND, OR ON-SITE LABOR, EXPENSES OF ANY KIND, LOST PROFITS, LOST OPPORTUNITIES, OR SIMILAR DAMAGES OF ANY KIND; AND REGARDLESS OF THE LEGAL THEORY OR CAUSES OF ACTION BY WHICH CLAIMS FOR ANY SUCH DAMAGES AS SET FORTH IN THE ENTIRETY OF THE DOCUMENTS RELATED TO THE SALE OF THE PRODUCT ARE ADVANCED, WHETHER OR NOT MANUFACTURER HAS BEEN ADVISED OF THE POSSIBILITY OF ANY SUCH DAMAGES.

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