Trilogy Troubleshooting Guide

Version 1

RP976

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CLIMATEMASTER®

This guide is to help the technician better troubleshoot problems on QE and VE models always remember the basics do we have enough waterflow and enough airflow a lot of issues stem from the basics.

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How to Retrieve Fault Codes and Sub Fault Codes

Most cause with unit online you and the homeowner will be getting an e-mail with the fault or the WARNING. Be sure to look at the list of faults and warnings so in some cases you may not need to rush right over and check the unit out if it is a warning also you can let the homeowner know it is just a warning and ease there mind you are on their issue.

Faults can be looked up a few ways with the contractor portal, on the thermostat, and with the service tool onsite.

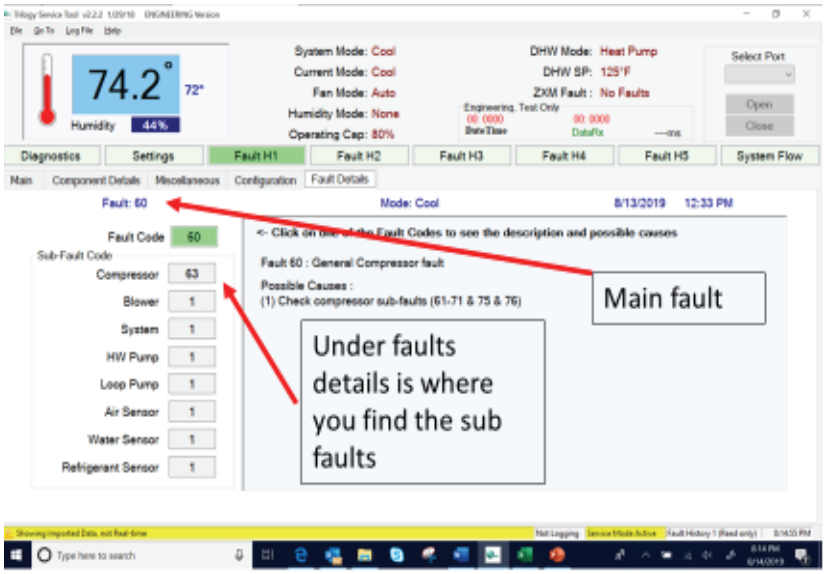
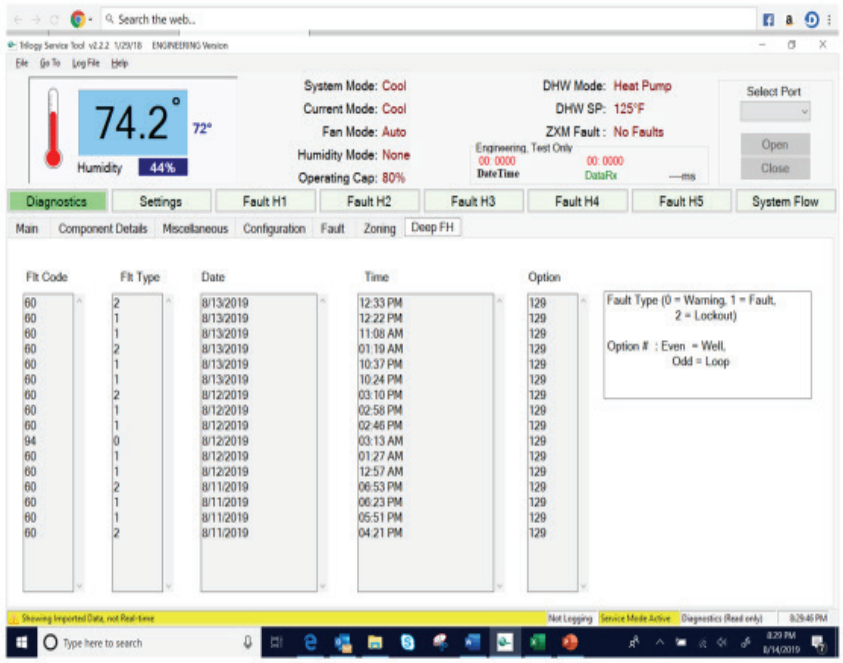


Figure 1Using the service tool



With the service tool latest version there is a deep fault history which will show even more then the last 5 faults and it will show under fault type if it is a warning or a fault and if it is locked out.

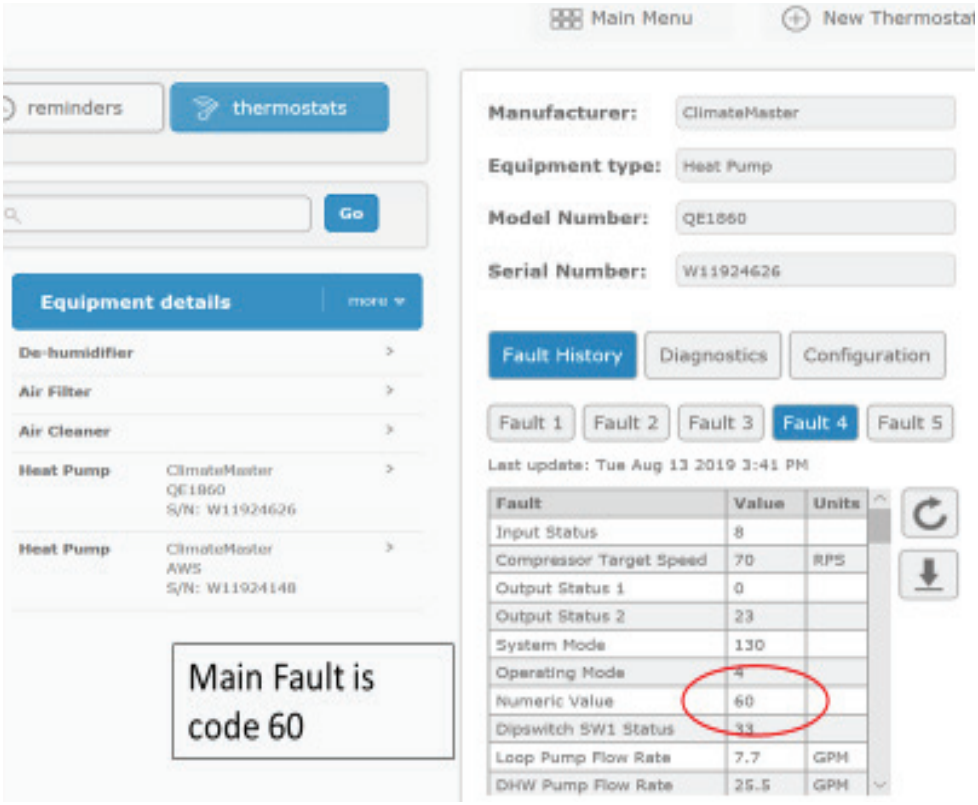
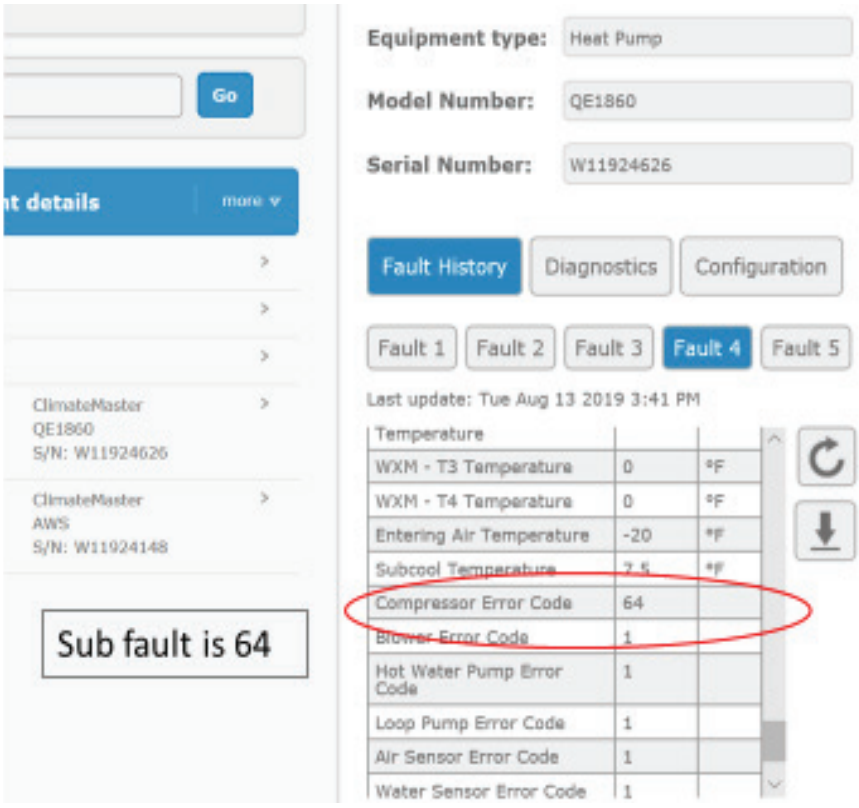
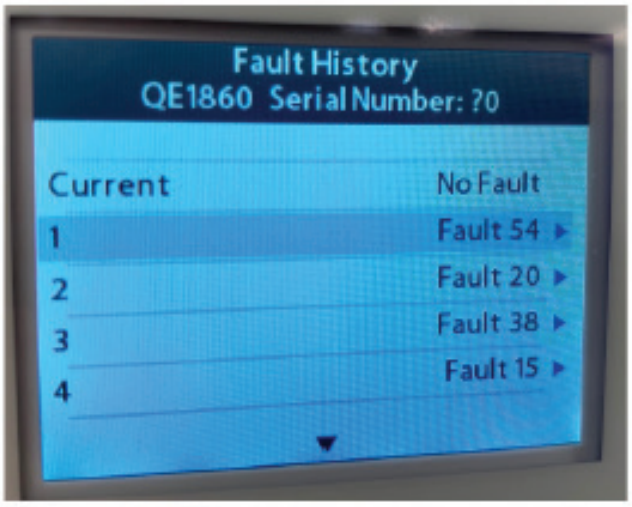


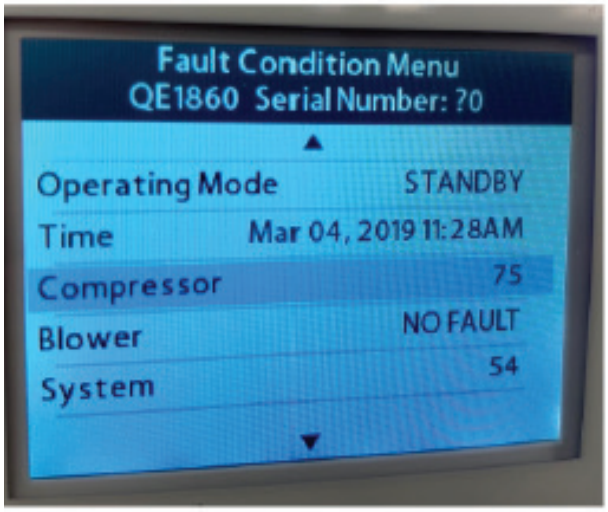
Figure 2 Using the Contractor Portal



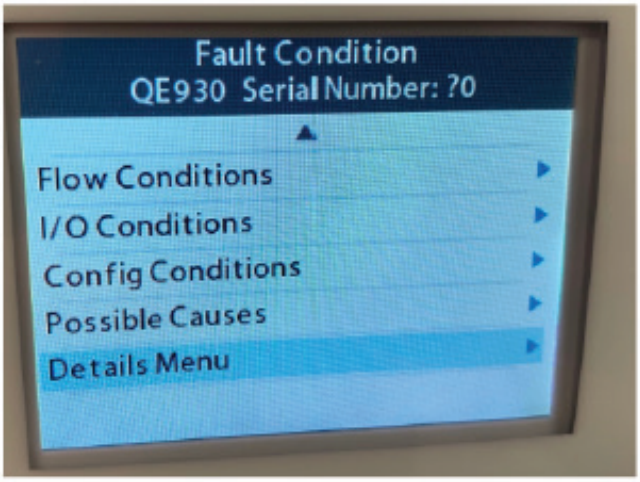
Using the service tool getting sub faults



From the thermostat under settings you can look at fault history on the I Gate thermostat.



Fault details to get Sub Faults.



List of Faults and Warnings

Note: Below the ones in Green print are warnings not hard lock outs or faults

Fault code 2 High Discharge pressure

- 600psi

Fault code 3 Low suction pressure

- 95 psi cooling and cooling at hot water 95psi if not antifreeze heating and hot water if set to antifreeze then 50psi in heating and hot water.

Fault code 6 Condensate overflow

Fault code 7 Over under voltage

- 19-32 volts

Fault code 10 ECM blower low RPM

- Bellow 100RPM

Fault code 12 Loss of U2 communications

Fault code 13 Low flow on variable speed pump

- Less then 1gpm

Fault code 14 High discharge temperature

- 0930=239 degrees and 1860=248degrees

Fault code 15 Discharge pressure sensor

Fault code 16 Suction pressure sensor

Fault code 17 Space temp sensor

Fault code 18 Humidity sensor (Warning)

Fault code 19 Low differential pressure

Fault code 20 ECM configuration

Fault code 21 ECM static pressure (Warning)

- Future not used at this time

Fault code 22 Grundfos Flow Sensor

Fault code 23 Grundfos Pressure Sensor

Fault code 24 Leaving air Temperature (Warning)

Fault code 25 High Entering water temperature (Warning)

- 110 degrees or higher

Fault code 26 Low Entering Water Temperature (Warning)

- 22 degrees with antifreeze or 40 degree without

Fault code 27 Low Cabinet Temperature (Warning)

Fault code 28 Low loop Pump Feedback (Warning)

Fault code 29 Loop Pump Low Voltage (Warning)

Fault code 30 Loop Pump Locked Rotor

Fault code 31 Loop Pump Low Voltage

Fault code 32 Loop Pump Sensor

Fault code 33 Hot Water Pump Feedback (warning)

Fault code 34 Hot Water Pump Voltage (Warning)

Fault code 35 Hot Water Pump Locked Rotor

Fault code 36 Hot Water Pump Low Voltage shutdown

Fault code 37 Hot Water Pump Sensor

Fault code 38 Suction Temperature sensor

Fault code 39 Discharge temperature Sensor

Fault code 40 Entering Hot Water Temperature sensor

Fault code 41 Leaving Hot water Temperature sensor

Fault code 42 Air Coil Liquid Temperature sensor

Fault code 43 Air Coil Vapor Temperature sensor

Fault code 44 Water coil Vapor Temperature sensor

Fault code 45 Water Coil Liquid Temperature sensor

Fault code 46 Hot Water Liquid Temperature sensor

Fault code 48 Lower Hot Water Tank Sensor (Warning)

Fault code 49 Upper Hot Water Tank Sensor (Warning)

Fault code 50 Reduced Hot Water Setpoint (Warning)

Fault code 51 High Suction Pressure Limiting (Warning)

- 170psi

Fault code 52 Low Suction Pressure Limiting (Warning)

- 106 psi with no antifreeze 61 psi with antifreeze has to see for greater 120 sec.

Fault code 53 Low Discharge Pressure Limiting (Warning)

- 186psi cooling and 236 psi heating

Fault code 54 Loss WXM Communications

- Will not interrupt heat and cooling operation

Fault code 55 WXM High Temperature

Fault code 56 Reduced Hot Water Heat Exchanger Performance (warning)

Fault code 57 Low Discharge Super Heat (warning)

Fault code 58 Low Suction Super Heat (warning)

- Less then 4 degrees for more then 10 mins

Fault code 59 High Suction Super Heat (warning)

Fault code 60 General compressor (Check sub faults61-74)

Fault code 61 High Temp shutdown

Fault code 62 High current at startup

Fault code 63 High current at shutdown

Fault code 64 High DC voltage at shutdown

Fault code 65 Current sensor warning

Fault code 66 Heat sink thermistor error

Fault code 67 Current sensor error

Fault code 68 Lack of inverter communication initiation

Fault code 69 Low voltage shutdown inverter

Fault code 70 Power supply sync warning

Fault code 71 Converter over current shutdown

Fault code 72 Compressor Current (Warning)

Fault code 73 Heat Sink Temperature (Warning)

- 201degrees

Fault code 74 Inverter Current (Warning)

Fault code 75 Lack of MIM communications

Fault code 76 Low voltage

- Between the MIM and the inverter board

Fault code 77 Low Leaving Air Temperature (warning)

- Future not used currently

Fault code 78 High Leaving Air Temperature (warning)

- Future not used currently

Fault code 79 Low Sub Cooling (Warning)

- Less then 1 degree for more then 10 mins

Fault code 80 ECM Blower Fault (Check sub faults 81-91)

Fault code 81 ECN lost rotor fault

- Possible issue set screw on blower wheel

Fault code 82 ECM current trip fault

Fault code 83 ECM temperature limit

Fault code 84 ECM Locked rotor

Fault code 85 ECM high voltage

- if higher then 20% then nominal 240V

Fault code 86 ECM low voltage

- if lower then 20% of nominal 240V

Fault code 87 ECM Blocked Inlet

Fault code 88 ECM power Limit

Fault code 89 ECM Temperature limit (Warning)

Fault code 91 ECM Power configuration (Warning)

Fault code 93 Heating check valve (warning)

Fault code 94 Cooling check valve (warning)

Fault code 95 Hot water check valve (warning)

Fault code 96 Low Hot water delta T (warning)

Fault code 97 Pressure sensor error

Fault code 98 Loop Flow at idle

- greater then 1 GPM

Fault code 99 Mode Transitions Timeout

- time to reach 400psi is 10 minutes

Fault code 100 Low loop pressure (Warning)

- 5psi

Fault code 200 Loss zone damper power

- Secondary transformer also check fuse on the ZXM board

Fault code 201 Thermostat configuration (warning)

Fault code 202 Loss of zone thermostat communications (warning)

Fault code 203 Loss ZXM communications (ZXM is the zone board)

Fault code 205 ZXM configuration

Some Fault and Warning Details

Fault #2 High Pressure lockout
This occurs when the high side reaches 600psi

Typical reasons this may happen

In Heating not enough airflow caused from dirty filter or other blockages

In Cooling from not moving water or enough on the loop side could also be air in the loop causing the pump to cavitate

In the Hot water mode or Cooling and hot water mode from not moving enough domestic hot water or air locked pump. Also, the default HW delta T is 8 degrees I would not raise this as that can lead to HP faults especially in the hot water setpoint is higher than 125 degrees

Fault #3 low pressure lockout
This occurs when the low side hits 95 psi in cooling, Cooling Hot water, heating with no antifreeze.

If the unit has proper antifreeze protection it needs to be between 10 and 12 degrees freeze protection and the unit is configured for antifreeze, then the low side cutout is 50 psi in heating and in hot water mode.

Possible causes.

Not enough antifreeze as stated above 10-12 degree protection is needed. ***Please verify it with hydrometer or digital refractometer***.

Heating delta T set to high this will cause the leaving water leaving the braze plate heat exchanger to be even colder and the Water coil liquid line will be colder there by dropping the suction pressure as well.

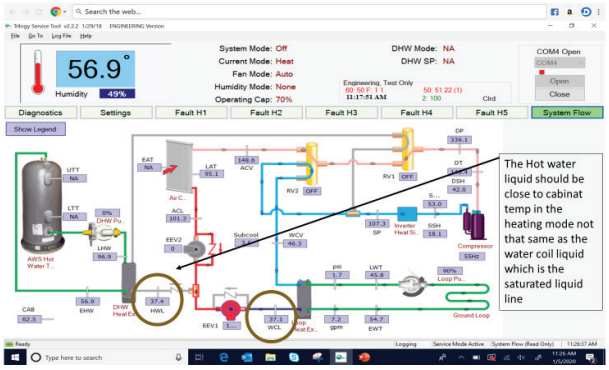
Typical setting is 6 degrees default if lowest EWT in the winter drops to 30 degrees or maybe slightly lower do not raise it above 6. Range 4-12 .

Air trapped in the braze plate we have seen cause nuisance low pressure lockouts. Downflow models especially with the braze plate being at the top of the unit.

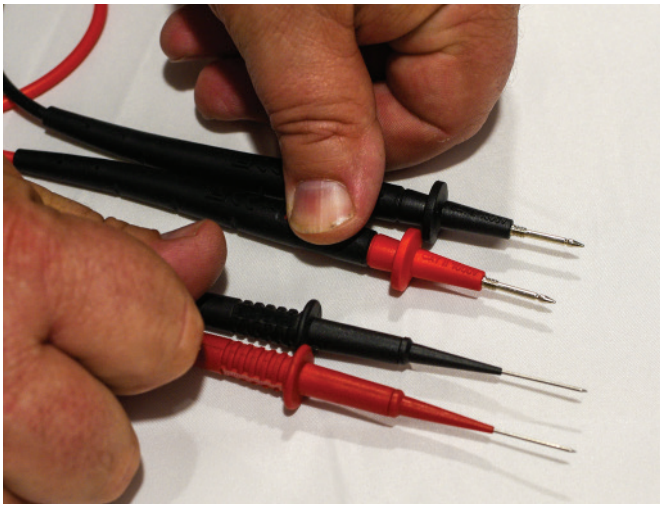
Not having proper EEV operation can also cause low pressure faults the EEV maintains suction superheat and uses the suction transducer to calculate suction saturation temperature and uses the suction line thermistor to read suction line temp to calculate this so if either of these are not reading accurately this can cause low pressure lockouts as well as capacity issues. EEV #1 in heating (Lower Valve) EEV#2 in cooling (upper valve) Software version 2.05 on the EXM board and higher has changes that have quicker reaction to low suction pressure conditions having EEV 1 react quicker. (also see section on how to check EEV's)

Have also seen RV#2 sometimes not sliding all the way over cause the unit to pump down and will get a low-pressure lockout fairly quickly. (also see section on troubleshooting 4 way valves)
In the cooling mode if the entering air temp is to cold it can cause low suction pressure faults if return air temp is bellow 70 you will need to raise the minimum and the maximum cooling airflow. The lowest this unit can run down to reliable is 67 degrees return air temp bellow that there is a good chance of low suction pressure faults.

Also a leaky hot water check valve can cause low suction pressure faults some time it may be random faults and then it will stay high enough on the suction side to run. How you can start to see this issue is the Hot water liquid line will be much colder then what is should be in the heating mode or cooling mode this will be a indication that the Hot water check valve did not seal well and is acting like a metering device. On a cold start up this can be a significant charge in the hot water circuit so it will be for a short while like it is low on charge and then may lock out especially when not set to antifreeze in those applications. THIS COULD ALSO UNDER LOW LOOP TEMPS FREEZE THE HOT WATER HEAT EXCHANGER IN THE HEATING MODE
See screen on next page.



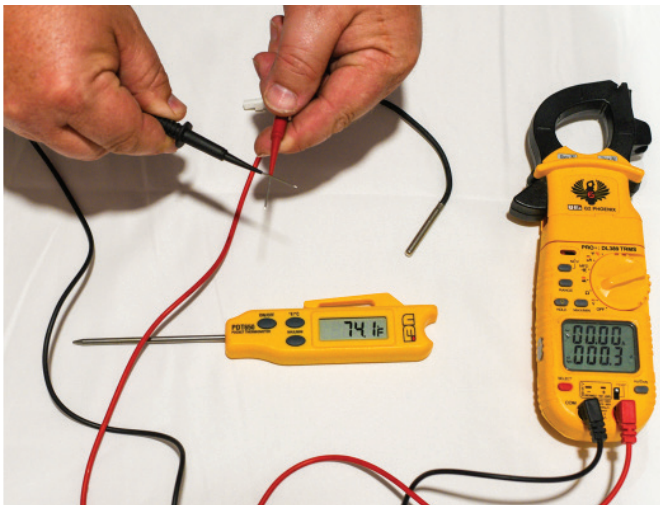
In this screen shot normally when the check valve is not leaking the HWL line in the heating mode is around the cabinet temperature this is another clue that this valve is leaking.



Fault #19 Low Refrigerant pressure differential

When there is less then 20psi difference from suction pressure and discharge pressure and if suction temperature is greater then 10 degrees. The compressor will keep trying to speed up to get out of this if it does not it will time out in 2 minutes after 3 of these in a row it will lock out.

This could happen if a RV valve did not properly shift causing the unit not to build pressure difference and the suction temperature could be high. (look at Troubleshooting RV valves)



Faults #38-#49 these are temperature sensor faults.

These you should look up which one it is referring to and then verify the thermistor using the chart bellow clamp on with a calibrated sensor next to the thermistor and then measure the resistance of that sensor if outside of 10% of the chart then replace the sensor. (See pics on right) You will need thin pin leads for your volt meter to get into the ends of the thermistor plugs

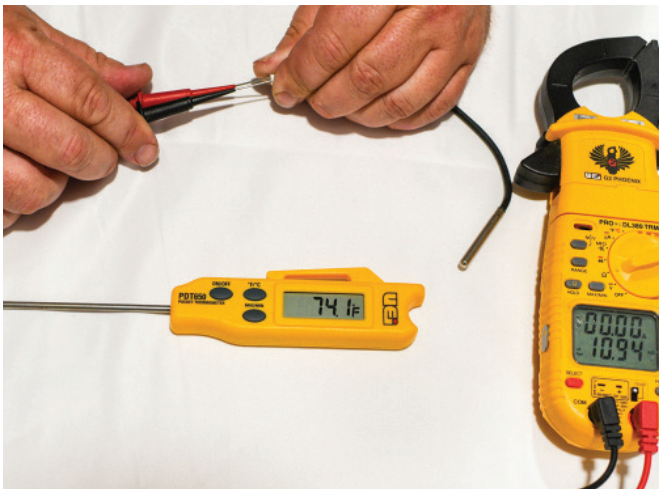


Table 4: Nominal Resistance at Various Temperatur

Temp (°C)	Temp (°F)	Resistance (kOhm)	Temp (°C)	Temp (°F)	Resistance (kOhm)
-17.8	0.0	85.41	55	131.0	2.99
-17.5	0.5	84.16	56	132.8	2.88
-16.9	1.5	81.43	57	134.6	2.77
-12	10.4	61.70	58	136.4	2.67
-11	12.2	58.40	59	138.2	2.58
-10	14.0	55.30	60	140.0	2.49
-9	15.8	52.40	61	141.8	2.40
-8	17.6	49.60	62	143.6	2.32
-7	19.4	47.00	63	145.4	2.23
-6	21.2	44.60	64	147.2	2.16
-5	23.0	42.30	65	149.0	2.08
-4	24.8	40.10	66	150.8	2.01
-3	26.6	38.10	67	152.6	1.94
-2	28.4	36.10	68	154.4	1.88
-1	30.2	34.30	69	156.2	1.81
0	32.0	32.60	70	158.0	1.75
1	33.8	31.00	71	159.8	1.69
2	35.6	29.40	72	161.6	1.64
3	37.4	28.00	73	163.4	1.58
4	39.2	26.60	74	165.2	1.53
5	41.0	25.30	75	167.0	1.48
6	42.8	24.10	76	168.8	1.43
7	44.6	23.00	77	170.6	1.38
8	46.4	21.90	78	172.4	1.34
9	48.2	20.80	79	174.2	1.30
10	50.0	19.90	80	176.0	1.26
11	51.8	18.97	81	177.8	1.22
12	53.6	18.09	82	179.6	1.18
13	55.4	17.25	83	181.4	1.14
14	57.2	16.46	84	183.2	1.10
15	59.0	15.71	85	185.0	1.07
16	60.8	15.00	86	186.8	1.04
17	62.6	14.32	87	188.6	1.00
18	64.4	13.68	88	190.4	0.97
19	66.2	13.07	89	192.2	0.94
20	68.0	12.49	90	194.0	0.92
21	69.8	11.94	91	195.8	0.89
22	71.6	11.42	92	197.6	0.86
23	73.4	10.92	93	199.4	0.84
24	75.2	10.45	94	201.2	0.81

Warning #57 Low discharge Superheat.

Have seen this warning a few times can happen in season changes such as end of the heating season going into cooling will usually have a colder loop which will drop the head pressure down in turn the discharge Superheat can be low. 18 degrees is the min number of DSH to flag this warning.

Verify discharge thermistor is reading correctly and is mounted well to the compressor discharge line also verify discharge pressure sensor is reading correctly if the thermistor checks out. Also need to verify the suction line thermistor and the WCV and or ACV thermistors are reading correct as well as the suction transducer if they are off that can throw the SSH off and drive the DSH to be off as well.

Occasionally in northern climates with cooler loops in the cooling mode you may need to increase the min capacity to 40% from 30% has helped.

Warning #53 Low discharge pressure warning

This can occur when going from the heating season to the cooling season and loop temps are usually a bit low in the 40-50 degree EWT this will reduce the head pressure.

Sometimes increasing the cooling delta T in a northern climate can help make this go away default is 10 degrees increasing it to 12-15 degrees usually is enough to get past this period of time.

Fault #54 Loss of WXM communications

This occurs when there is a loss of communication on the WXM board usually a wire connection between the EXM board and the WXM board on the water tank.

Tug on all 4 wires between the two on the EXM you will have the wires doubled up from the thermostat or the ZXM (Zone Board) which sometimes is tough to have all tight under the terminal strip. NO SPLICES

Warning #56 Hot Water heat exchanger reduced performance

The QE units when making hot water look at the first 4 times it makes hot water and looks at the heat exchanger temps and hot water temps and if after that the heat exchanger temp difference is greater then 5 degrees this message will flag.

This could occur when the heat exchanger is getting fouled and may need cleaned.

This can be reset by toggling the dipswitch number 6 off then back on.

Fault #60 General compressor fault

You must get the sub fault as there are several sub faults here are some of the ones we have seen and what to look for.

62 and 63

Are high current and start up or shutdown there is a kit developed that has resolved most of these faults as they were not real just electrical noise on the inverter board Part#S11S0192N01

If you get this and you have already installed this kit (Units built in 2019 or later have this kit installed from the factory) Then it may be a real fault and current will need to be measured and maybe there is a compressor issue board issue you will need a AMP clamp that can measure peak amps (Inrush) because it will be to quick to just see it on the amp meter. If you measure high amps (1860=28.5 0930=21.4) them next OHM the compressor windings at the compressor need a good volt meter that is true RMS If it checks out then change the inverter board and then re check amp draw. I would install a new inverter board with one of these faults before ever replacing the compressor also be sure there is a surge protector on the unit as well

Sub fault 68

Is loss communications with the MIM board check the lights on the MIM board they should be flashing

Check communication at the MIM board:

- At power-up, both RED and GREEN LEDs should flash rapidly for a few moments while communications are being established. Once communication is established, RED and GREEN LEDs will each flash at 5 second intervals, indicating that MIM is powered, and in communication with the EXM and inverter boards, and that the inverter board has been initialized and is ready for operation.

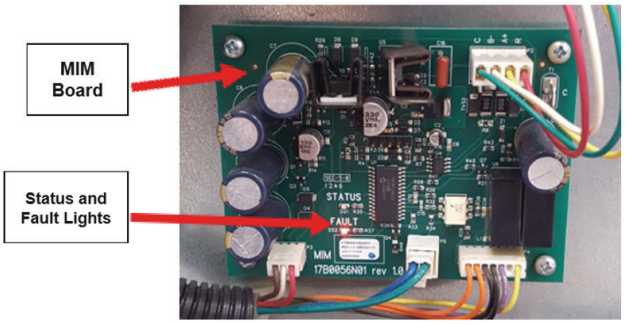
- If RED LED remains ON continuously, MIM is unable to communicate with Inverter.

- If GREEN LED remains ON continuously, MIM is unable to communicate with EXM.

MIM LED Conditions Fault RED LED Status GREEN LED Description ON - MIM powered but no inverter communication - ON MIM is powered but no EXM communication FAST FLASH - MIM communicating with inverter but initialization not complete - SLOW FLASH MIM communicating with EXM (GOOD!) SLOW FLASH - MIM communicating with initialized inverter (GOOD!) OFF OFF MIM not operational If no inverter communication has been verified, replace the Inverter or MIM board (inverter is the most likely problem). If communication has been verified, proceed to next step.

MIM LED Conditions		
Fault RED LED	**Status GREEN LED**	**Description**
ON	-	MIM powered but no **inverter** communication
-	ON	MIM is powered but no **EXM** communication
FAST FLASH	-	MIM communicating with **inverter** but initialization not complete
-	SLOW FLASH	MIM communicating with **EXM (GOOD!)**
SLOW FLASH	-	MIM communicating with initialized **inverter (GOOD!)**
OFF	OFF	MIM not operational

If no inverter communication has been verified, **replace the Inverter or MIM board** (inverter is the most likely problem). If communication has been verified, proceed to next step.



Voltage Checks on the MIM Board

ALL	Faulty 5 V power supply on MIM	Check C and OUT for 4.75-5.25 VDC
ALL	Faulty 15 V power supply on MIM	Check GND and 15V for 14.25-15.75 VDC
ALL	Faulty 18 V power supply on MIM	Check GND and 18V for 17.50-19.00 VDC

When doing voltage checks you will need thin pin leads for your volt meter see next

When replacing the inverter board please watch the video online . Prior to heading to the jobsite and turn power off and wait min 20 minutes before going near the inverter board.

Sub fault 64

High DC Voltage happens when there is 400 volts DC at the inverter board. Verify in coming voltage is correct if within range then replace the inverter board

Sub fault 69 low voltage shutdown

This occurs when there is 340 Volts DC or less be sure in comingvoltage is within spec (197-253) if incoming voltage within range then replace the inverter board. I have seen some cases when not over 350V DC the compressor not start.

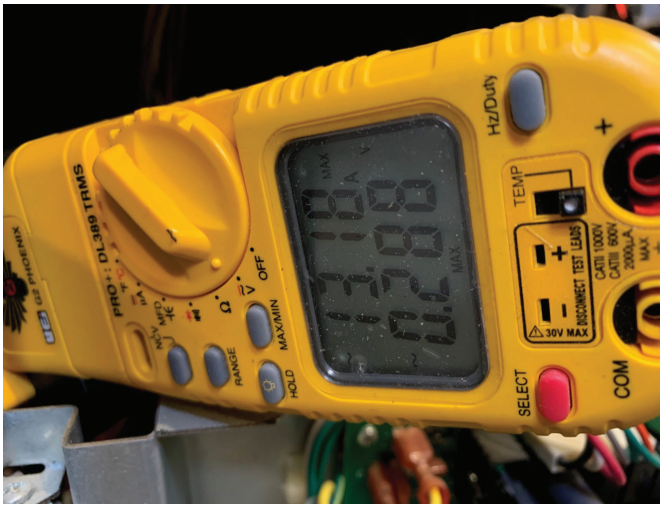
Sub fault 72 High compressor current

This occurs when the compressor current hits or exceeds 28.5 amps (1860 model) or 21.4amps (0930 model) Res set unit and try to start the unit again with amp clamp measuring max amp draw see if you measure something close to the readings listed if the fault reoccurs if so compressor needs to be replaced. In some cases, the invertor board was also damaged when this high amp draw happens and the inverter board may need to be replaced as well I would recommend having one on hand when replacing the compressor under this circumstance.

Sub Fault 74 High Inverter current

This occurs when the current hits or exceeds 28 amps on (1860model) or 20 amps on (0930 model) If this fault occurs measure compressor **max amps (see pic)** if it is bellow 28amps on 1860 model or bellow 21amps on 0930 model replace the inverter board if the fault re occurs upon trying to re start the unit. Must have a good amp clamp meter that can read inrush current like the one in the picture that shows 13.18amps well below the max allows amps for an 1860 model.

Another test that can be done is turn the power off to the unit wait for power to discharge from the inverter board MIN 20 MINUTES then remove the compressor leads from the inverter board (take note where each color of lead lands on the board U V W then re-start the unit (obviously the unit will not start since compressor leads are not attached) if the inverter board is drawing high current it will still do this without the compressor attached.



Inrush Current On a QE1860 13.18 amps on startup in cooling manual mode.

I would not install one of these QE/VE units with out a good Surge protection device

(Example abovedoes not have to be this one) I have seen many times problems with the inverter board Code 60 faults and after installing a surge protector the problems go away. Mike Hammond ClimateMaster.

Fault code 87 Blocked air inlet warning.

This occurs under high static conditions when the ECM blower motor is near peak RPM when the motor is 1250RPM this occurs operation will not be interrupted but this flag will go out on the thermostat and e-mail warning until capacity and blower speed are lowered to go bellow 1250 RPM.

We have seen this in some cases where a unit such as the 1860 model is being used on existing ductwork that can not handle the max airflow and this can cause the warning.

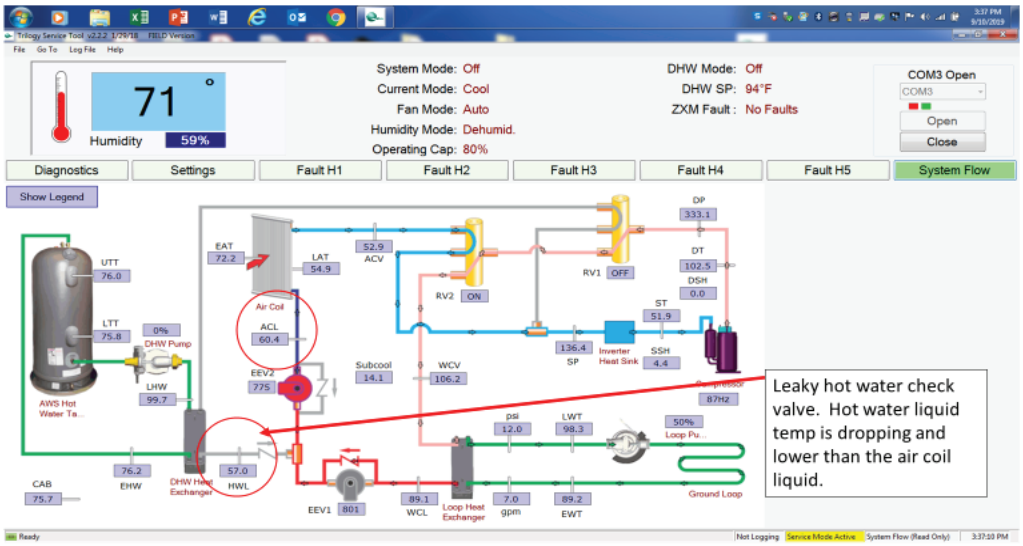
Options to correct would be limit the units max capacity or increase the duct work to handle the airflow and capacity needed to support the structure.

I would suggest measuring both supply and return static pressure to determine which one or both is the higher static pressure so you can add to the side with the highest static pressure to bring it down to a more accepting level.

(Obviously a extreme dirty filter or adding a second filter can also cause this condition)

Fault #93-#95 leaky check valves

(See section on checking for leaking check valves) This can also sometimes look like the unit is under charged as refrigerant is leaking through the check valve and pooling in the un used section of the unit there by subcooling numbers will be lower and Superheat will be high and EEV positions will be at or near max open position which is 1040 steps. Best way to check this is to run the unit in manual mode using the service tool and watch the “system Flow” screen it will really help visualize what is happening.



Hot water check valve is leaking a small amount the hot water liquid line should be around 75 degrees(like the cabinet sensor) under these conditions. So the check valve leaking this small amount is acting like a metering device.

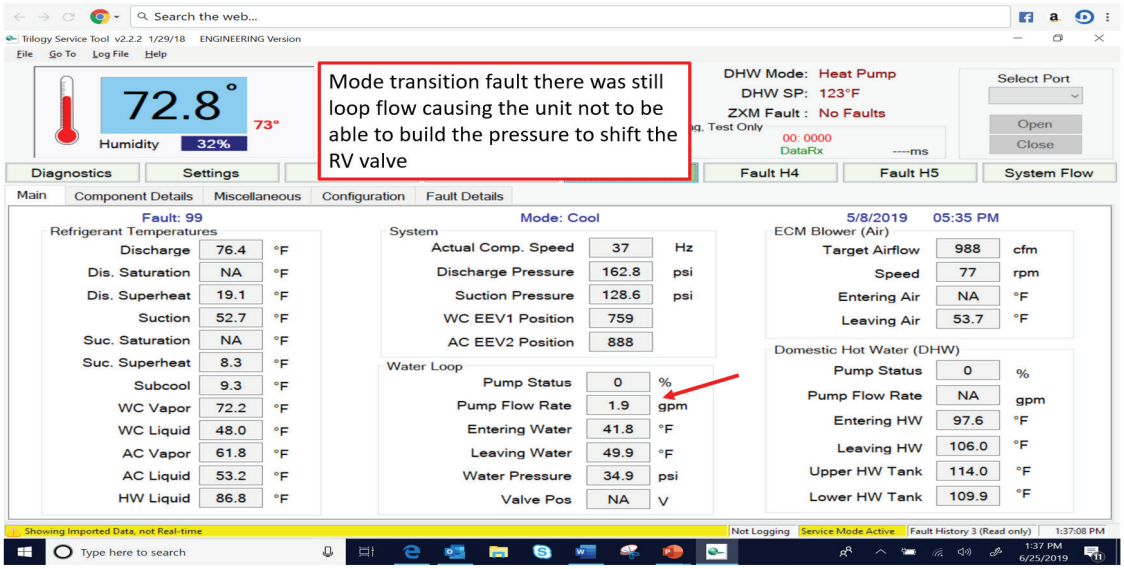
Fault #97 Pressure calibration fault

This occurs when the unit is off and ready to start up and the difference in pressure from the discharge sensor and the suction line sensor is 12psi or greater(under normal operation it is 25 psi when in the service mode operation)

This can occur for instance when the unit is say heating hot water and then fully satisfy and shuts down and then is a short order gets say a heating call it may not have fully equalized pressure default ASCD is 3 minutes range is 2-8 minutes. In most cause this fault can be eliminated by increasing the ASCD to a higher time like 8 minutes. If you have increased the anti short cycle time and this is still occurring check both pressure transducers with a set of refrigerant gauges (Please calibrate the gauges first)

Fault #99 excessive mode transition

This occurs when switching between modes and a 4 way valve needs to shift the unit needs to build 400psi head pressure to be sure to shift the valve this is accomplished by removing flow to the condenser for instance in heating mode will remove airflow to achieve 400psi. In cooling the loop pump will stop (if there is a external pump running may not be able to build head pressure or a stuck open loop pump check valve) the unit will keep ramping the compressor speed during this time trying to increase the head pressure the lockout will occur after 10 minutes once faulted it will wait a ASCD delay and then re start if after 3 in a row occur then it will go into a hard lockout Also external applied accessories such as a ERV or HRV can cause this if there is air moving through the air coil when it is trying to build head pressure See example below



Verifying Grundfos flow and pressure and temperature sensors.

Temperature check.

With unit off go into service mode just run just the pump to 90% speed let it run for 5 minutes then compare on the screen the EWT and the LWT are they reading the same within a degree or less? If so that's good if they are not and over a degree difference next using a calibrated pocket thermometer insert it into the Water In PT port compare that to the EWT on the screen? Next do the same with the LWT which one is off? You can replace this sensor

Another option to replacing the sensor would be for example if the LWT was off 2 degrees(LOW) and the loop heating delta T is set to 6 degrees the real delta T is 8 there by this could under some circumstances cause low pressure lockouts. You could lower using the service tool the heating delta T to 4 degree now the actual would be 6 degree. Just a option

When the sensor is bad it usually read s ridiculous high number like 222 degrees.

Pressure on the DPD sensor

On the leaving water line behind the pump warning 100 is when the sensor is reading at or bellow 5 psi with the pump off what is the static pressure on the screen is service mode? With a pressure gauge with a PT needle insert in one of the ports are they close? (There could be some calibration difference) If there is a huge difference then the DPD could be off and the sensor needs to be replaced. (Note when the pump runs the DPD pressure reading will keep dropping as the pump increases in speed this is on the suction side of the pump. These

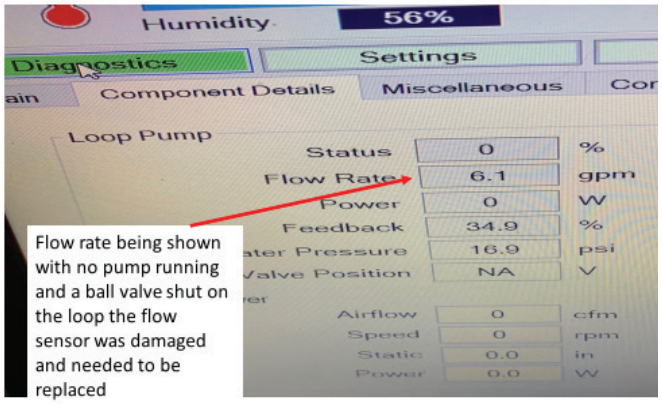
pumps need a minimum of 5 psi to be sure they do not cavitate which can lead to pump failure or other lockouts.)

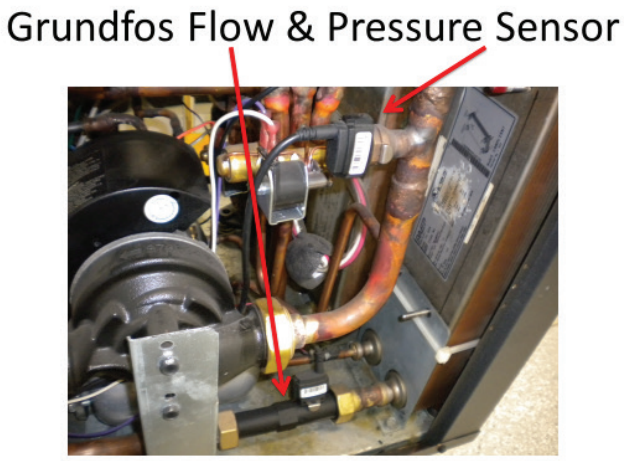
Flow on the VFD sensor

Which is on the entering water line just under the pump in the unit if damaged may not be reading a flow at pump speeds under 50%. This can be tested by under service mode run just the loop pump at say 30% do you then see under diagnostics a loop flow rate? If not then the sensor is bad and will need replaced. A temporary thing that can be done is to configure the unit to parallel pumping this will run the pump to a minimum of 50% which when the pump is 50%-90% it will calculate its flow rate based on the feedback signal from the pump

.

These sensors read two things temperature and either loop pressure (DPD) or flow rate (VFD) if both are not showing up and you replace the sensor and it is still not showing up the problem could be in the harness to the EXM and there are two of them there is a short 4 inch one from the sensor to the main harness part number (11B0039N01)





The sensors have changed from Grundfos physically they look the same but they are different new part numbers are 17B0078N01 for the DPD sensor and 17B0079N01 for the flow sensor you will also need to update or change out the EXM board to a version 2.07 the communication between the sensors and the board is different so the new sensors WILL NOT WORK ON OLDER VERSIONS OF THE EXM 1-1-2020

Troubleshooting EEV valves

On QE models there are two EEV valves on VE models there will just be one EEV.

The job of the EEV is to meter refrigerant into the evaporator and maintain a certain suction superheat most causes around 10 degrees will vary check operating chart in the IOM.

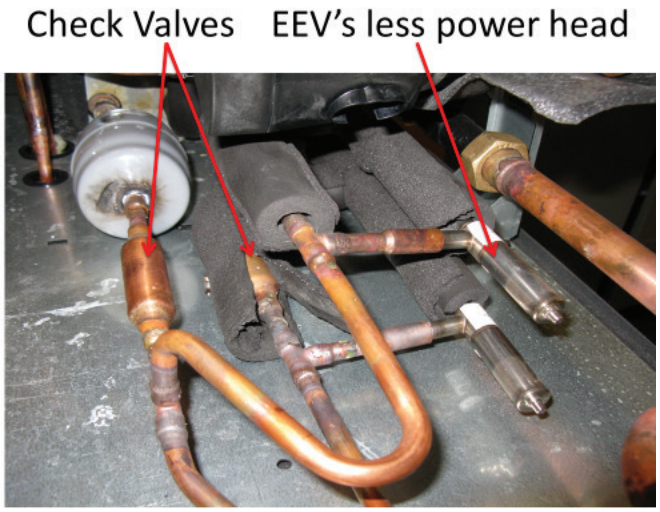
The Carel EEV that ClimateMaster uses in these units range from 0-1040 steps min. operating position is 109 steps but the valve can be driven to completely closed in a QE unit to prevent refrigerant flow.

So when troubleshooting knowing that full open is 1040 steps helps for instance if we have a high superheat number and the valve is fully open we know the evaporator is starving for refrigerant.

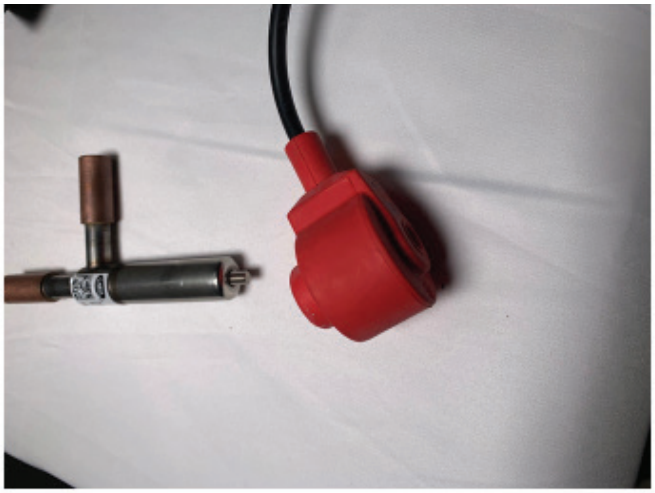
Another thing the valve may show its at 1040 steps is it really fully open? With manual operating knob we can verify EEV movement. 19 turns from full open to full close so each turn is approx. 54 steps. Some rare cases a valve was stuck and moving it back and forth with the manual drive knob freed it and it worked afterwards.

Is the problem in the power head or the valve itself? We can swap power heads on QE models to see if we have a faulty power head. Be sure to mark them so you can return them to the correct spot See Pic below

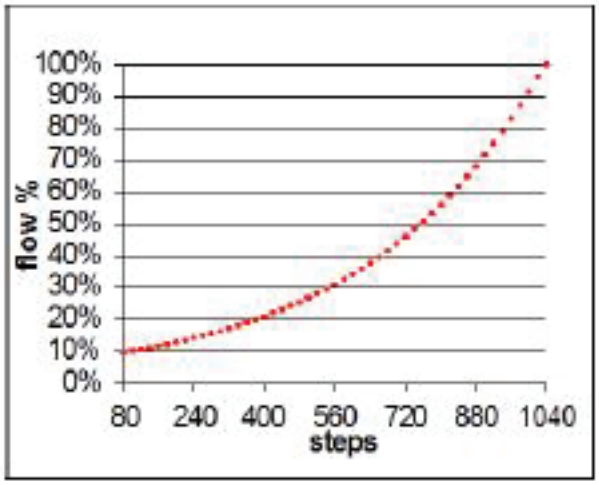
We can also swap EEV 1 and EEV 2 positions on the EXM if we think maybe it's a problem on the EXM and switch modes. (Note may need to remove leads on the RV valve to prevent actual mode change heating to cooling)



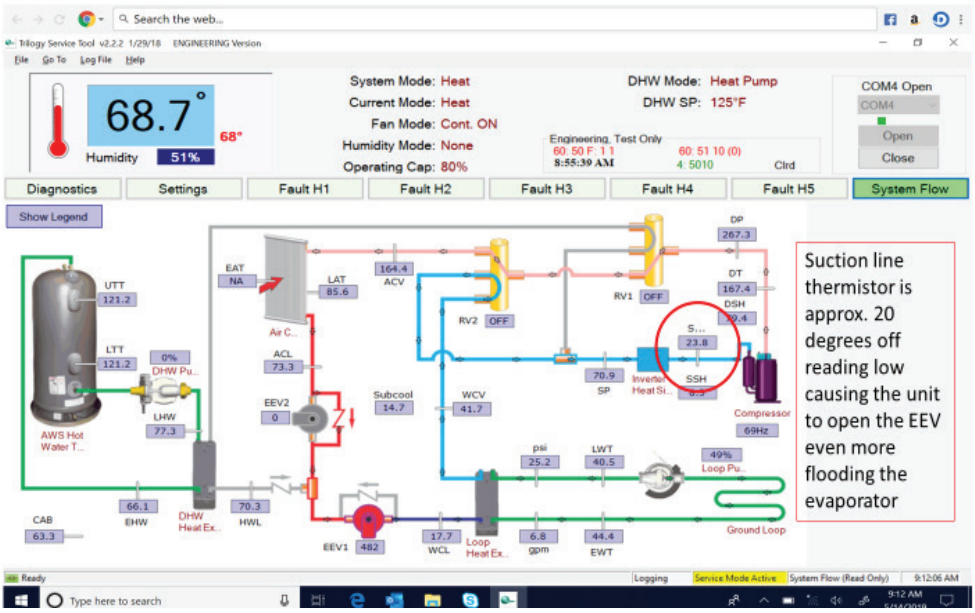
EEV #1 is on the bottom and #2 is on the top on QE units.



Power head removed and you can see it is a short plug to exchange when swapping to verify if one is bad on a QE model.



From fully closed or open it takes 19 full turns to go open or closed depending where you started you will be able to feel when the valve is fully open or close the magnets in the manual tool can no longer move the steeper motor inside the EEV.



Troubleshooting 4 way valves (reversing valve and hot water diverting valve)

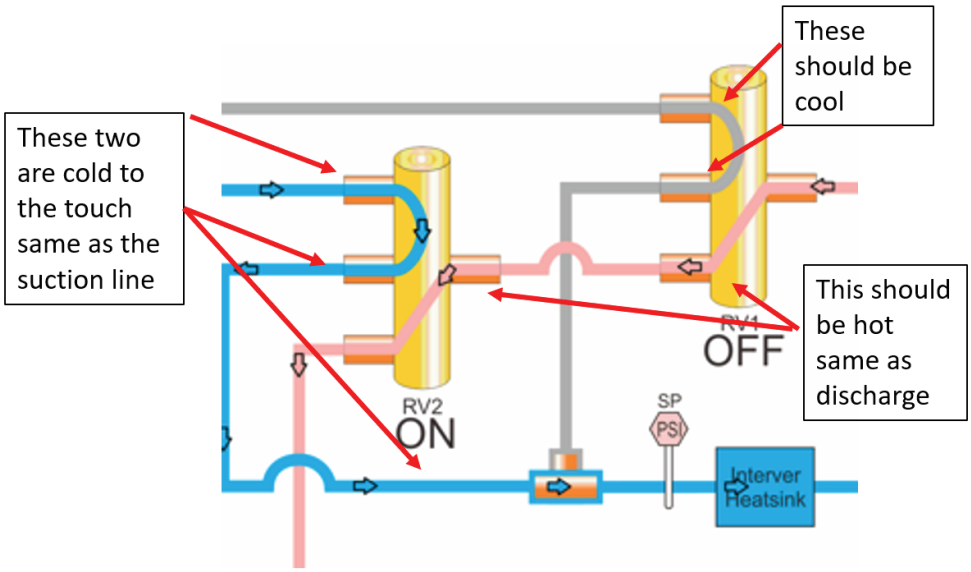
There have been some cases with the hot water diverting valve (See Picture) where it does not shift all the way and the unit can lock out on different faults depending on where the unit was before this valve not moving all the way. For instance if the unit was in Hot water mode and in transition to cooling mode the unit actually switches RV#2 off (Heating mode) and shuts the blower off to build head pressure (400psi) when this happens it switches RV1 and RV2 at the same time if RV1 does not move all the way there may not be enough pressure to move RV2 in the cooling position causing the unit to pump down and lock out on low suction pressure (95psi) When this happens there can also be a loud harmonic sound from the refrigerant velocity.

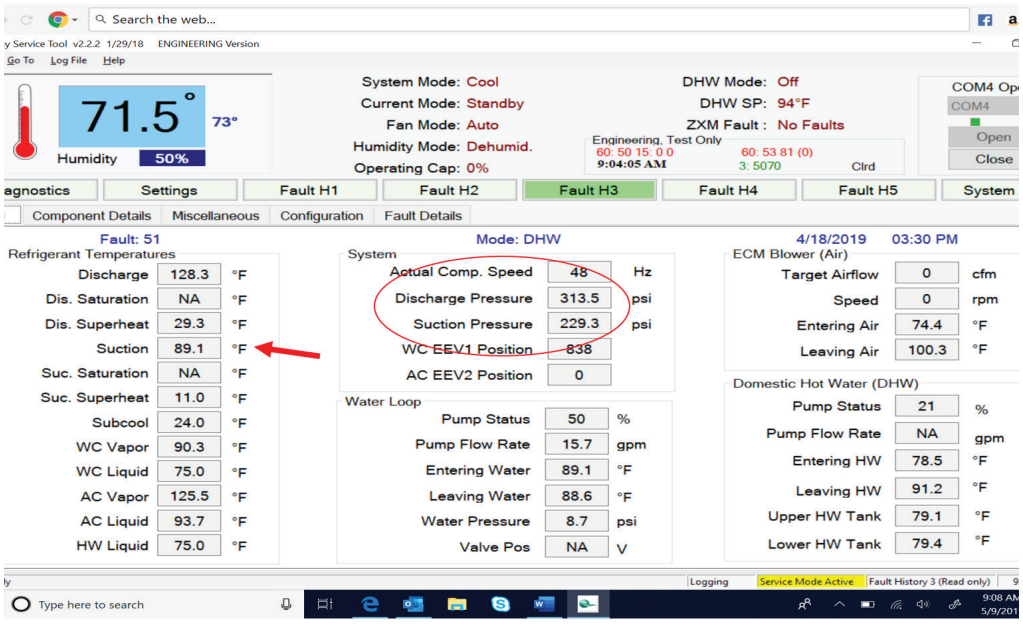
In other cases RV1 not shifting all the way will leak refrigerant in a circuit not used in that mode causing the unit to be low on charge in the mode it is trying to run in and in most causes as it runs you can see the subcooling numbers dropping and the suction Superheat rising and eventually locking out on low suction pressure in most cases.

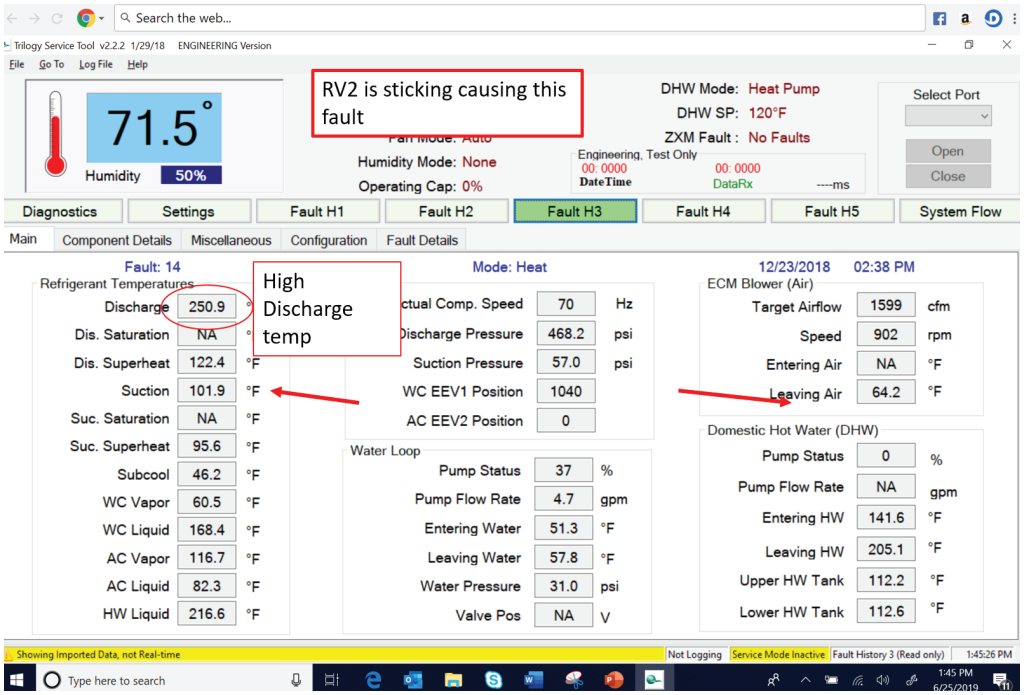
To help diagnose what is going on a simple touch test goes a long way see picture bellow describing what lines should be warm hot or cold in the various modes see pictures

Once you find out what valve you need to try and exercise that valve back and forth to see if you can free it up last resort is replacing that valve. Using the service tool can really help in this since we can shift on the fly under manual mode.

AC Renew has worked many times if the valve is sticky but still moves and is worth a try.


These should be cool
These two are cold to the touch same as the suction line
This should be hot same as discharge
RV1
OFF
RV2
ON
SP
PSI
Interver Heatsink


Search the web...
Service Tool v2.2.2 1/29/18 ENGINEERING Version
Go To Log File Help
71.5°
73°
Humidity 50%
System Mode: Cool
Current Mode: Standby
Fan Mode: Auto
Humidity Mode: Dehumid.
Operating Cap: 0%
DHW Mode: Off
DHW SP: 94°F
ZXM Fault : No Faults
Engineering, Test Only
9:04:05 AM
Diagnostics Settings Fault H1 Fault H2 Fault H3 Fault H4 Fault H5 System
Component Details Miscellaneous Configuration Fault Details
Fault: 51
Mode: DHW
4/18/2019 03:30 PM
Refrigerant Temperatures
Discharge 128.3 °F
Dis. Saturation NA °F
Dis. Superheat 29.3 °F
Suction 89.1 °F
Suc. Saturation NA °F
Suc. Superheat 11.0 °F
Subcool 24.0 °F
WC Vapor 90.3 °F
WC Liquid 75.0 °F
AC Vapor 125.5 °F
AC Liquid 93.7 °F
HW Liquid 75.0 °F
System
Actual Comp. Speed 48 Hz
Discharge Pressure 313.5 psi
Suction Pressure 229.3 psi
WC EEV1 Position 838
AC EEV2 Position 0
Water Loop
Pump Status 50 %
Pump Flow Rate 15.7 gpm
Entering Water 89.1 °F
Leaving Water 88.6 °F
Water Pressure 8.7 psi
Valve Pos NA V
ECM Blower (Air)
Target Airflow 0 cfm
Speed 0 rpm
Entering Air 74.4 °F
Leaving Air 100.3 °F
Domestic Hot Water (DHW)
Pump Status 21 %
Pump Flow Rate NA gpm
Entering HW 78.5 °F
Leaving HW 91.2 °F
Upper HW Tank 79.1 °F
Lower HW Tank 79.4 °F
Logging
Service Mode Active
Fault History 3 (Read only)
Type here to search


Search the web...
Trilogy Service Tool v2.2.2 1/29/18 ENGINEERING Version
File Go To Log File Help
71.5°
Humidity 50%
RV2 is sticking causing this fault
DHW Mode: Heat Pump
DHW SP: 120°F
ZXM Fault : No Faults
Select Port
Open
Close
Humidity Mode: None
Operating Cap: 0%
Engineering, Test Only
00: 0000
DateTime
00: 0000
DataRx
----ms
Diagnostics
Settings
Fault H1
Fault H2
Fault H3
Fault H4
Fault H5
System Flow
Main
Component Details
Miscellaneous
Configuration
Fault Details
Fault: 14
Mode: Heat
12/23/2018 02:38 PM
Refrigerant Temperatures
Discharge 250.9 °F
Dis. Saturation NA °F
Dis. Superheat 122.4 °F
Suction 101.9 °F
Suc. Saturation NA °F
Suc. Superheat 95.6 °F
Subcool 46.2 °F
WC Vapor 60.5 °F
WC Liquid 168.4 °F
AC Vapor 116.7 °F
AC Liquid 82.3 °F
HW Liquid 216.6 °F
High Discharge temp
ctual Comp. Speed 70 Hz
Discharge Pressure 468.2 psi
Suction Pressure 57.0 psi
WC EEV1 Position 1040
AC EEV2 Position 0
Water Loop
Pump Status 37 %
Pump Flow Rate 4.7 gpm
Entering Water 51.3 °F
Leaving Water 57.8 °F
Water Pressure 31.0 psi
Valve Pos NA V
ECM Blower (Air)
Target Airflow 1599 cfm
Speed 902 rpm
Entering Air NA °F
Leaving Air 64.2 °F
Domestic Hot Water (DHW)
Pump Status 0 %
Pump Flow Rate NA gpm
Entering HW 141.6 °F
Leaving HW 205.1 °F
Upper HW Tank 112.2 °F
Lower HW Tank 112.6 °F
Showing Imported Data, not Real-time
Not Logging
Service Mode Inactive
Fault History 3 (Read only)
1:45:26 PM
Type here to search
1:45 PM
6/25/2019

Checking the inverter board

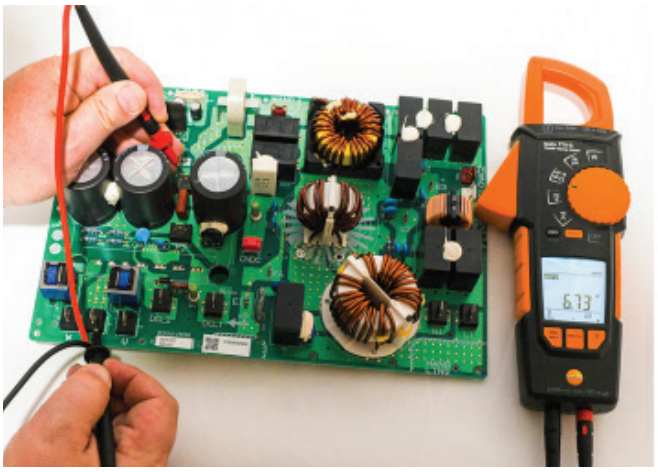
The following pictures and descriptions will show and explain checking the inverter boards Transisters you will need to perform the following 12 resistance checks and all should show a resistance value if any are open then the board needs to be replaced. P2 and N2 are the connections where the off board capacitor are tied into the inverter board.

Positive lead on P2 check Negative lead to U,V,and W

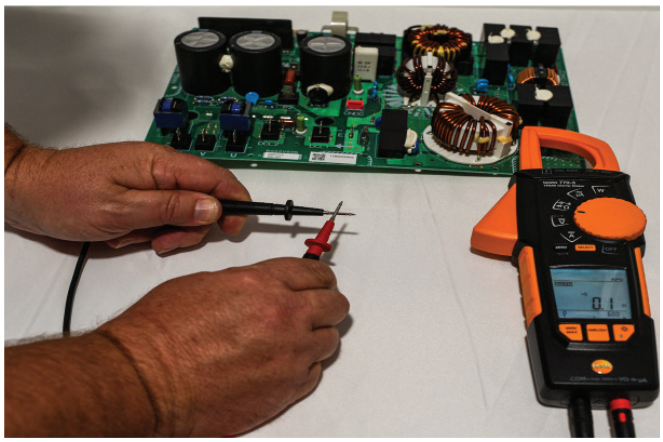
Positive Lead on N2 check negative lead to U,V,and W

Negative lead on P2 check positive lead to U,V,and W

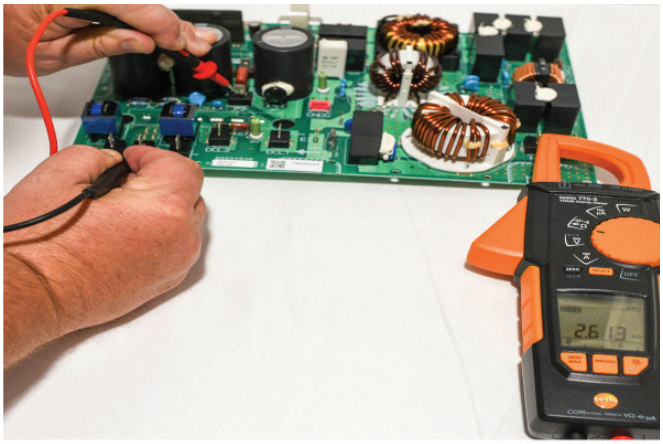
Negative lead on N2 check positive lead to U,V, and W



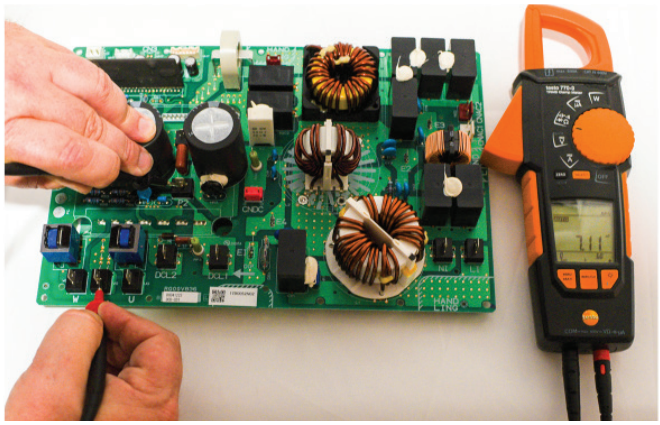
Checking positive lead to N2 and negative lead to V



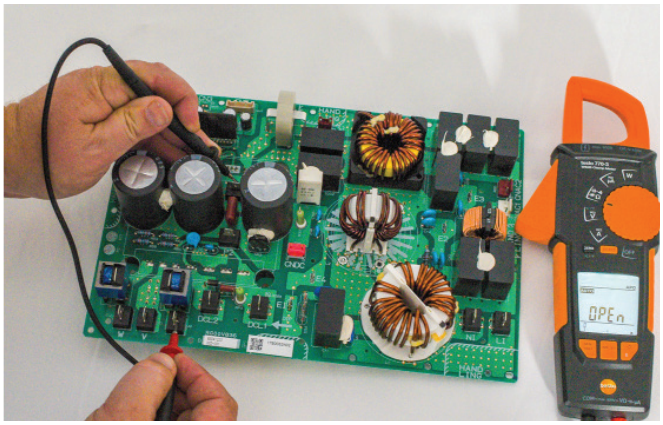
Always first check the resistance of the test leads so that it can be subtracted from what you measure on the board.



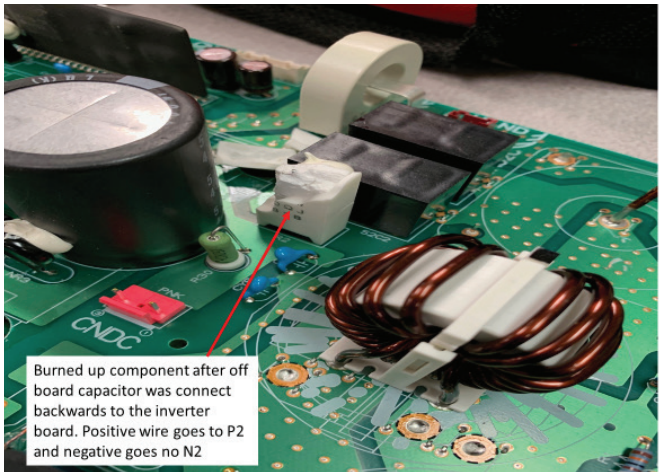
Checking Positive to P2 and negative to U

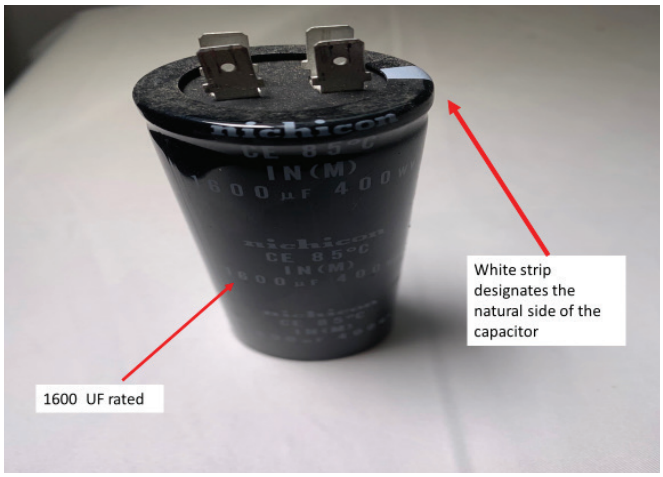


Checking negative lead on P2 and positive lead on V



Bad board if one of these checks shows open no resistance





Very important that the lead from the positive side attaches to the P2 terminal on the inverter board and the negative side to the N2 or the above can happen to the inverter board.

This can also happen if the MIM board is damaged.

Checking the compressor

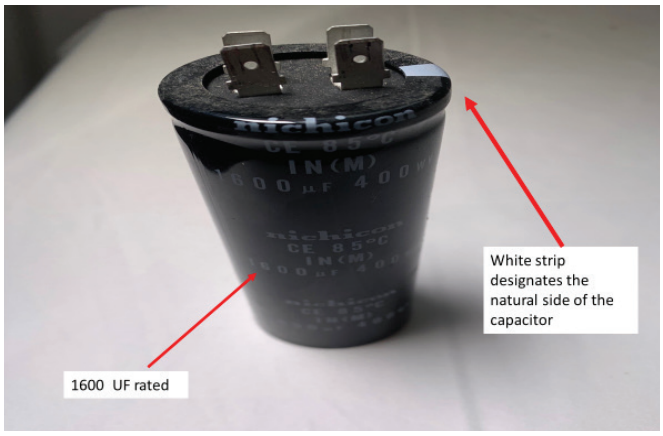
See pics bellow on verifying the compressor

All 3 should be the same resistance.

.3 for the 1860 and .58 for the 0930 @68 degrees.

Using a Megameter the compressor windings should all be 200 Meg ohms or greater

Checking the off board capacitor



How sizing can affect the operation of the unit.

On the QE units if hot water modes are being used proper sizing is critical to the hot water production if the unit is put in to big of a load it may make little to no water with the heat pump and have to use the back up elements. Using GeoDesigner after performing a manual J load calculation is a must to know how the unit is going to perform see bellow two examples one being to large of a load the other being a good load for a QE1860 model. See GeoDesigner example below.

Example project in Champaign IL

The Below Examples may not be the same in all areas of the country you must perform a manual J load on your house you are working on and run it threw GeoDesigner and look at the Operating Bin Data to see how it looks.

Heat load for the above was 81,540 and cooling load of 47960

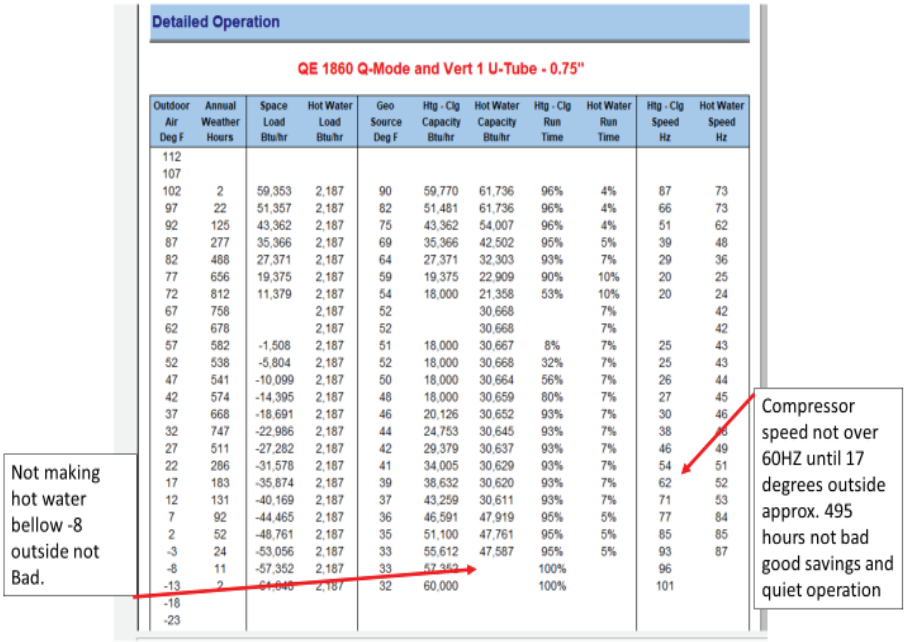
Detailed Operation

QE 1860 Q-Mode and Vert 1 U-Tube - 0.75"

Outdoor Air Deg F	Annual Weather Hours	Space Load Btu/hr	Hot Water Load Btu/hr	Geo Source Deg F	Htg - Clg Capacity Btu/hr	Hot Water Capacity Btu/hr	Htg - Clg Run Time	Hot Water Run Time	Htg - Clg Speed Hz	Hot Water Speed Hz
112										
107										
102	2	60,147	2,187	90	60,000	61,736	96%	4%	87	73
97	22	52,701	2,187	83	52,874	61,736	96%	4%	69	73
92	125	45,256	2,187	76	45,256	57,039	96%	4%	54	66
87	277	37,810	2,187	71	37,810	45,843	95%	5%	42	52
82	488	30,365	2,187	66	30,365	36,011	94%	6%	33	40
77	656	22,920	2,187	61	22,920	26,990	92%	8%	24	30
72	812	15,474	2,187	56	18,000	21,358	76%	10%	20	24
67	758		2,187	52		30,668		7%		42
62	678		2,187	52		30,668		7%		42
57	582	-2,050	2,187	51	18,000	30,666	11%	7%	25	43
52	538	-7,892	2,187	51	18,000	30,666	44%	7%	25	43
47	541	-13,734	2,187	48	18,000	30,660	76%	7%	27	45
42	574	-19,575	2,187	46	21,079	30,651	93%	7%	32	47
37	668	-25,417	2,187	43	27,370	30,641	93%	7%	42	48
32	747	-31,258	2,187	41	33,661	30,630	93%	7%	53	50
27	511	-37,100	2,187	39	39,953	30,619	93%	7%	64	52
22	286	-42,941	2,187	37	44,991	47,990	95%	5%	74	83
17	183	-48,783	2,187	35	51,122	47,785	95%	5%	85	85
12	131	-54,625	2,187	34	54,625		100%		91	
7	92	-60,466	2,187	32	60,000		100%		101	
2	52	-66,308	2,187	32	60,000		100%		101	
-3	24	-72,149	2,187	32	60,000		100%		101	
-8	11	-77,991	2,187	32	60,000		100%		101	
-13	2	-83,832	2,187	32	60,000		100%		101	
-18										
-23										

Not making hot water bellow 17 degrees outside with the GEO

Compressor speed over 60HZ for over 1200 hours.



Detailed Operation

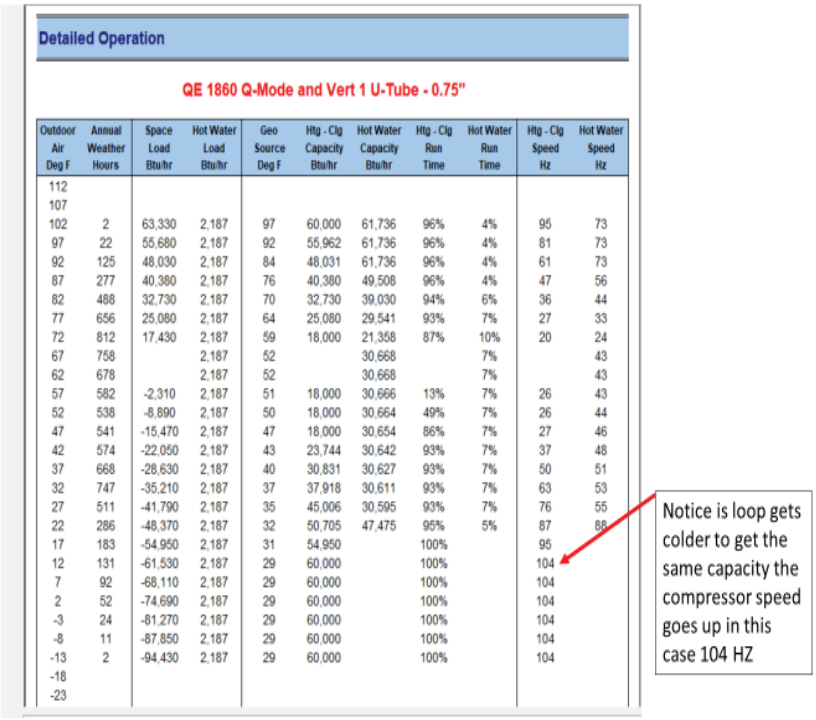
QE 1860 Q-Mode and Vert 1 U-Tube - 0.75"

Outdoor Air Deg F	Annual Weather Hours	Space Load Btu/hr	Hot Water Load Btu/hr	Geo Source Deg F	Htg - Clg Capacity Btu/hr	Hot Water Capacity Btu/hr	Htg - Clg Run Time	Hot Water Run Time	Htg - Clg Speed Hz	Hot Water Speed Hz
112										
107										
102	2	59,353	2,187	90	59,770	61,736	96%	4%	87	73
97	22	51,357	2,187	82	51,481	61,736	96%	4%	66	73
92	125	43,362	2,187	75	43,362	54,007	96%	4%	51	62
87	277	35,366	2,187	69	35,366	42,502	95%	5%	39	48
82	488	27,371	2,187	64	27,371	32,303	93%	7%	29	36
77	656	19,375	2,187	59	19,375	22,909	90%	10%	20	25
72	812	11,379	2,187	54	18,000	21,358	53%	10%	20	24
67	758		2,187	52		30,668		7%		42
62	678		2,187	52		30,668		7%		42
57	582	-1,508	2,187	51	18,000	30,667	8%	7%	25	43
52	538	-5,804	2,187	52	18,000	30,668	32%	7%	25	43
47	541	-10,099	2,187	50	18,000	30,664	56%	7%	26	44
42	574	-14,395	2,187	48	18,000	30,659	80%	7%	27	45
37	668	-18,691	2,187	46	20,126	30,652	93%	7%	30	46
32	747	-22,986	2,187	44	24,753	30,645	93%	7%	38	48
27	511	-27,282	2,187	42	29,379	30,637	93%	7%	46	49
22	286	-31,578	2,187	41	34,005	30,629	93%	7%	54	51
17	183	-35,874	2,187	39	38,632	30,620	93%	7%	62	52
12	131	-40,169	2,187	37	43,259	30,611	93%	7%	71	53
7	92	-44,465	2,187	36	46,591	47,919	95%	5%	77	84
2	52	-48,761	2,187	35	51,100	47,761	95%	5%	85	85
-3	24	-53,056	2,187	33	55,612	47,587	95%	5%	93	87
-8	11	-57,352	2,187	33	57,362		100%		96	
-13	2	-61,648	2,187	32	60,000		100%		101	
-18										
-23										

Not making hot water bellow -8 outside not Bad.

Compressor speed not over 60HZ until 17 degrees outside approx. 495 hours not bad good savings and quiet operation

Heat load for the above was 60,140 and cooling load of 46,560



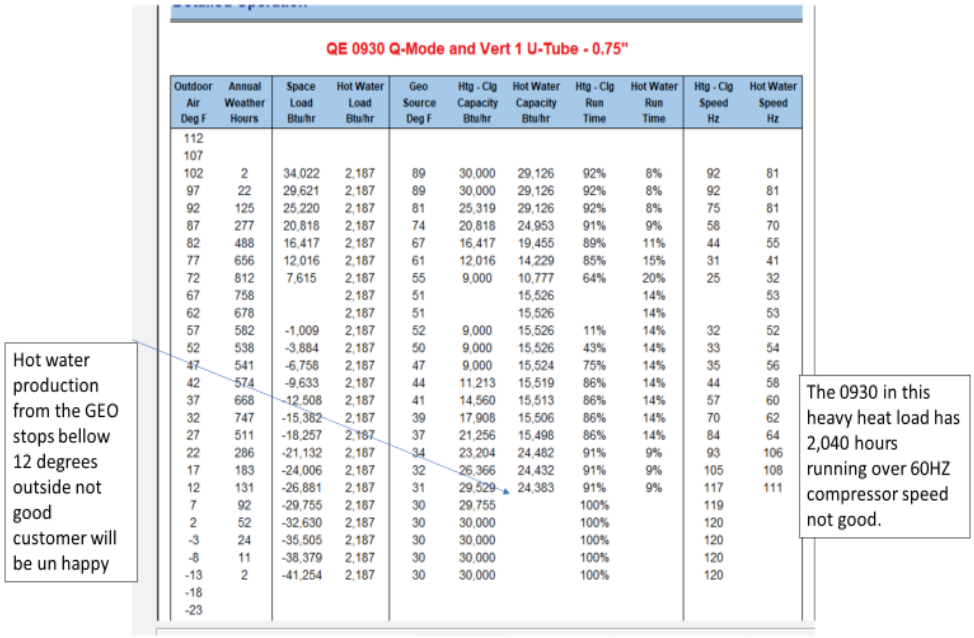
Detailed Operation

QE 1860 Q-Mode and Vert 1 U-Tube - 0.75"

Outdoor Air Deg F	Annual Weather Hours	Space Load Btu/hr	Hot Water Load Btu/hr	Geo Source Deg F	Htg - Clg Capacity Btu/hr	Hot Water Capacity Btu/hr	Htg - Clg Run Time	Hot Water Run Time	Htg - Clg Speed Hz	Hot Water Speed Hz
112										
107										
102	2	63,330	2,187	97	60,000	61,736	96%	4%	95	73
97	22	55,680	2,187	92	55,962	61,736	96%	4%	81	73
92	125	48,030	2,187	84	48,031	61,736	96%	4%	61	73
87	277	40,380	2,187	76	40,380	49,508	96%	4%	47	56
82	488	32,730	2,187	70	32,730	39,030	94%	6%	36	44
77	656	25,080	2,187	64	25,080	29,541	93%	7%	27	33
72	812	17,430	2,187	59	18,000	21,358	87%	10%	20	24
67	758		2,187	52		30,668		7%		43
62	678		2,187	52		30,668		7%		43
57	582	-2,310	2,187	51	18,000	30,666	13%	7%	26	43
52	538	-8,890	2,187	50	18,000	30,664	49%	7%	26	44
47	541	-15,470	2,187	47	18,000	30,654	86%	7%	27	46
42	574	-22,050	2,187	43	23,744	30,642	93%	7%	37	48
37	668	-28,630	2,187	40	30,831	30,627	93%	7%	50	51
32	747	-35,210	2,187	37	37,918	30,611	93%	7%	63	53
27	511	-41,790	2,187	35	45,006	30,595	93%	7%	76	55
22	286	-48,370	2,187	32	50,705	47,475	95%	5%	87	88
17	183	-54,950	2,187	31	54,950		100%		95	
12	131	-61,530	2,187	29	60,000		100%		104	
7	92	-68,110	2,187	29	60,000		100%		104	
2	52	-74,690	2,187	29	60,000		100%		104	
-3	24	-81,270	2,187	29	60,000		100%		104	
-8	11	-87,850	2,187	29	60,000		100%		104	
-13	2	-94,430	2,187	29	60,000		100%		104	
-18										
-23										

Notice is loop gets colder to get the same capacity the compressor speed goes up in this case 104 HZ

This example shows shortening the vertical loop 100' it dropped the EWT and increases compressor speed to still achieve the heating capacity.



QE 0930 Q-Mode and Vert 1 U-Tube - 0.75"

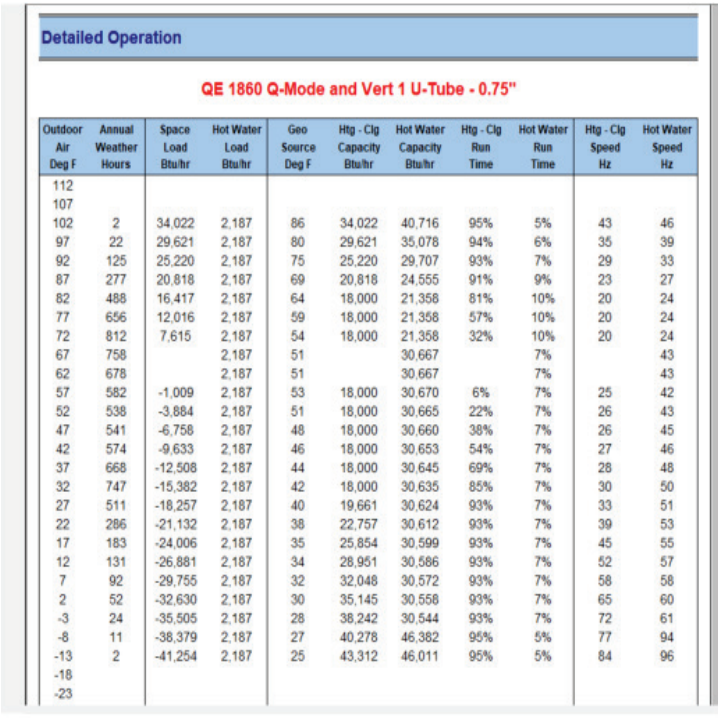
Outdoor Air Deg F	Annual Weather Hours	Space Load Btu/hr	Hot Water Load Btu/hr	Geo Source Deg F	Htg - Clg Capacity Btu/hr	Hot Water Capacity Btu/hr	Htg - Clg Run Time	Hot Water Run Time	Htg - Clg Speed Hz	Hot Water Speed Hz
112										
107										
102	2	34,022	2,187	89	30,000	29,126	92%	8%	92	81
97	22	29,621	2,187	89	30,000	29,126	92%	8%	92	81
92	125	25,220	2,187	81	25,319	29,126	92%	8%	75	81
87	277	20,818	2,187	74	20,818	24,953	91%	9%	58	70
82	488	16,417	2,187	67	16,417	19,455	89%	11%	44	55
77	656	12,016	2,187	61	12,016	14,229	85%	15%	31	41
72	812	7,615	2,187	55	9,000	10,777	64%	20%	25	32
67	758		2,187	51		15,526		14%		53
62	678		2,187	51		15,526		14%		53
57	582	-1,009	2,187	52	9,000	15,526	11%	14%	32	52
52	538	-3,884	2,187	50	9,000	15,526	43%	14%	33	54
47	541	-6,758	2,187	47	9,000	15,524	75%	14%	35	56
42	574	-9,633	2,187	44	11,213	15,519	86%	14%	44	58
37	668	-12,508	2,187	41	14,560	15,513	86%	14%	57	60
32	747	-15,382	2,187	39	17,908	15,506	86%	14%	70	62
27	511	-18,257	2,187	37	21,256	15,498	86%	14%	84	64
22	286	-21,132	2,187	34	23,204	24,482	91%	9%	93	106
17	183	-24,006	2,187	32	26,366	24,432	91%	9%	105	108
12	131	-26,881	2,187	31	29,529	24,383	91%	9%	117	111
7	92	-29,755	2,187	30	29,755		100%		119	
2	52	-32,630	2,187	30	30,000		100%		120	
-3	24	-35,505	2,187	30	30,000		100%		120	
-8	11	-38,379	2,187	30	30,000		100%		120	
-13	2	-41,254	2,187	30	30,000		100%		120	
-18										
-23										

Hot water production from the GEO stops bellow 12 degrees outside not good customer will be un happy

The 0930 in this heavy heat load has 2,040 hours running over 60HZ compressor speed not good.

This example above had a heat load of 40,245 and a cooling load of 26,980 the 0930 is running hard in these conditions and hot water capacity from the GEO is limited.

This is like my car speedometer says 120MPH so why cant I drive there all the time the car wont last well the same for the GEO in this scenario the customer will not see as good of savings and the life of the unit will be shortened.



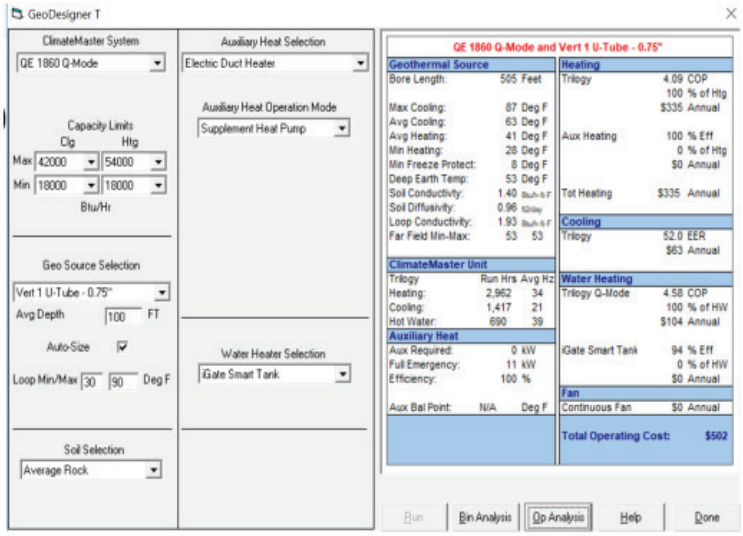
Detailed Operation

QE 1860 Q-Mode and Vert 1 U-Tube - 0.75"

Outdoor Air Deg F	Annual Weather Hours	Space Load Btu/hr	Hot Water Load Btu/hr	Geo Source Deg F	Htg - Clg Capacity Btu/hr	Hot Water Capacity Btu/hr	Htg - Clg Run Time	Hot Water Run Time	Htg - Clg Speed Hz	Hot Water Speed Hz
112										
107										
102	2	34,022	2,187	86	34,022	40,716	95%	5%	43	46
97	22	29,621	2,187	80	29,621	35,078	94%	6%	35	39
92	125	25,220	2,187	75	25,220	29,707	93%	7%	29	33
87	277	20,818	2,187	69	20,818	24,555	91%	9%	23	27
82	488	16,417	2,187	64	18,000	21,358	81%	10%	20	24
77	656	12,016	2,187	59	18,000	21,358	57%	10%	20	24
72	812	7,615	2,187	54	18,000	21,358	32%	10%	20	24
67	758		2,187	51		30,667		7%		43
62	678		2,187	51		30,667		7%		43
57	582	-1,009	2,187	53	18,000	30,670	6%	7%	25	42
52	538	-3,884	2,187	51	18,000	30,665	22%	7%	26	43
47	541	-6,758	2,187	48	18,000	30,660	38%	7%	26	45
42	574	-9,633	2,187	46	18,000	30,653	54%	7%	27	46
37	668	-12,508	2,187	44	18,000	30,645	69%	7%	28	48
32	747	-15,382	2,187	42	18,000	30,635	85%	7%	30	50
27	511	-18,257	2,187	40	19,661	30,624	93%	7%	33	51
22	286	-21,132	2,187	38	22,757	30,612	93%	7%	39	53
17	183	-24,006	2,187	35	25,854	30,599	93%	7%	45	55
12	131	-26,881	2,187	34	28,951	30,586	93%	7%	52	57
7	92	-29,755	2,187	32	32,048	30,572	93%	7%	58	58
2	52	-32,630	2,187	30	35,145	30,558	93%	7%	65	60
-3	24	-35,505	2,187	28	38,242	30,544	93%	7%	72	61
-8	11	-38,379	2,187	27	40,278	46,382	95%	5%	77	94
-13	2	-41,254	2,187	25	43,312	46,011	95%	5%	84	96
-18										
-23										

Using the same loads as the above 0930 example but using a 1860 and limiting its max capacity's this would be a much better fit.

1860 limited cooling and heating capacity

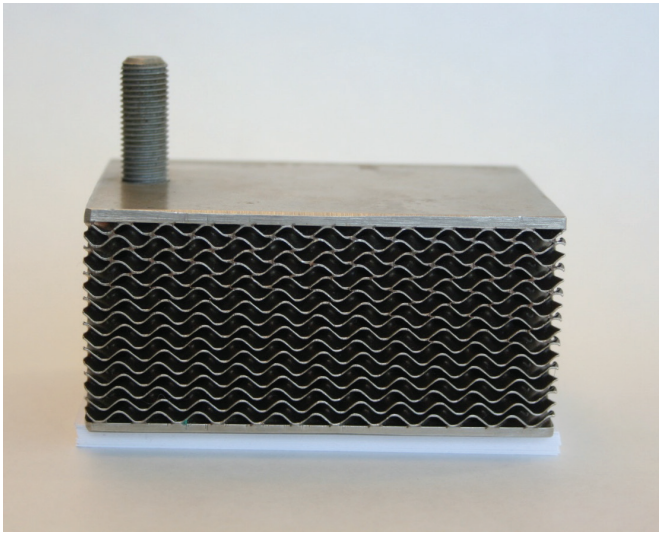


Verifying antifreeze levels

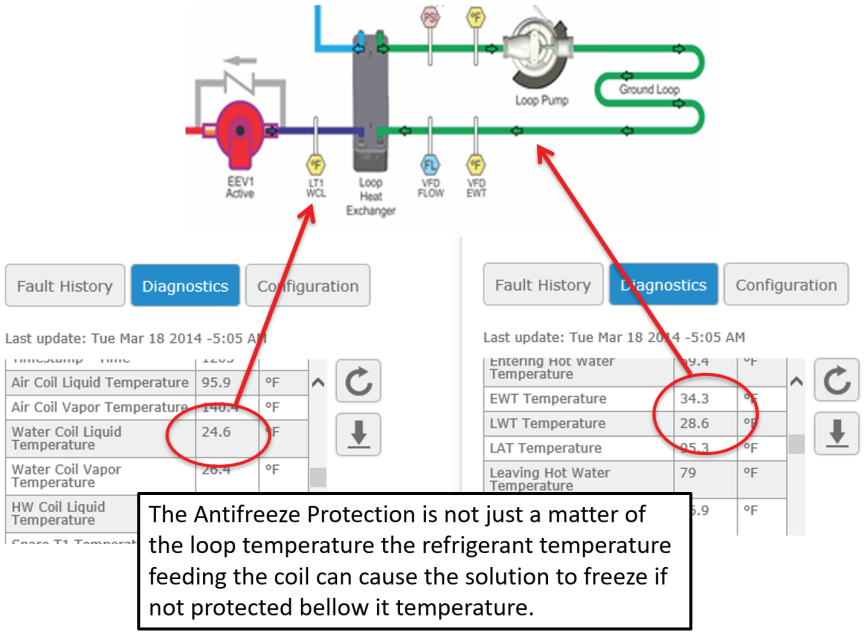
These units use braze plate heat exchangers and the proper antifreeze levels are extremely important or braze plate failure will occur.

Freeze protection should be between 10-12 degrees remember the refrigerant in the braze plate is always colder than the loop fluid right next to it (see braze plate cut picture)

Not having freeze protection in the ranges mentioned above can cause nuisance low pressure lockouts in the heating and hot water modes often many other things are tried and many service calls before the antifreeze level is looked at and then verified or corrected this should be one of the 1st things verified when getting a low suction pressure fault in heating or hot water modes. See pic bellow of relationship of water temp and refrigerant temp.



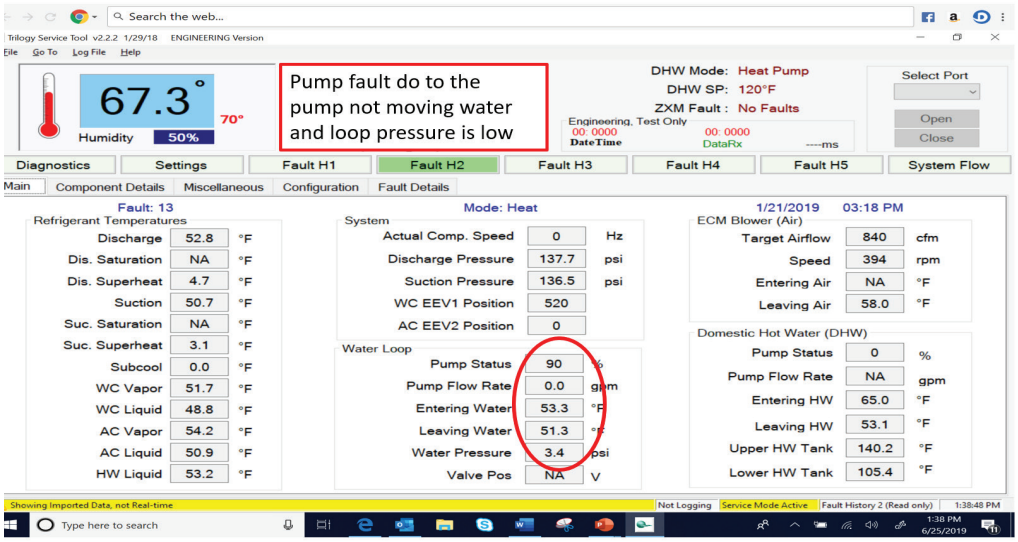
Braze plate cut away shows then passage ways refrigerant and water are close together and proper filtering of the loop fluid is very important you do not want this heat exchanger to be the filter.



Example Test using a digital refractometer from Misco great tool and worth the investment highly accurate and temperature compensating.

Air locked pumps

This can happen when flushing on the closed loop was not completed properly (see video on website) and on the hot water side when not proper burping of the heat exchanger this will take more then a typical desuperheater so provide in the piping a proper way to remove the air.



PUMP FLOW ISSUE that does not let the compressor start

We have seen a few units get hung up and there is no fault or warning with older software versions of the EXM older then 2.05. What happens is the pump starts and there is a low flow but not low enoughto trigger a low flow fault but not over 2.0GPM for the compressor to start. Updating the EXM softwarewill not let this happen again in most cases just turning the unit off and back on gets the unit out of this condition and the unit will run until you can update the EXM.

HOT WATER

We have seen on especially down flow units since the hot water braze plate and the hot water pump is at the top of the unit the pump gets air locked in some cause we have had to have the customer add a robust air eliminator such as a spirotop but always keep in mind it could leak or drip so where it is located be aware of that.

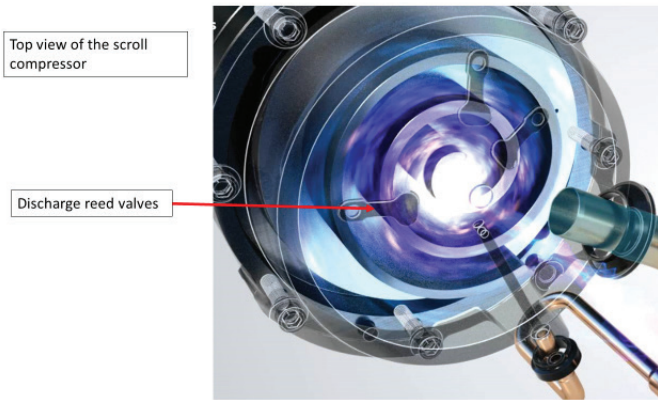
Hot Water Operation

If the lower tank temp is bellow the setpoint by more than the dead band temperature then the unit will start making hot water. If the upper tank is bellow the setpoint by more then ½ the dead band then it will start making hot water.

Now that all being said if the space demand is greater then the following conditions then the electric elements will kick in not the heat pump operation.

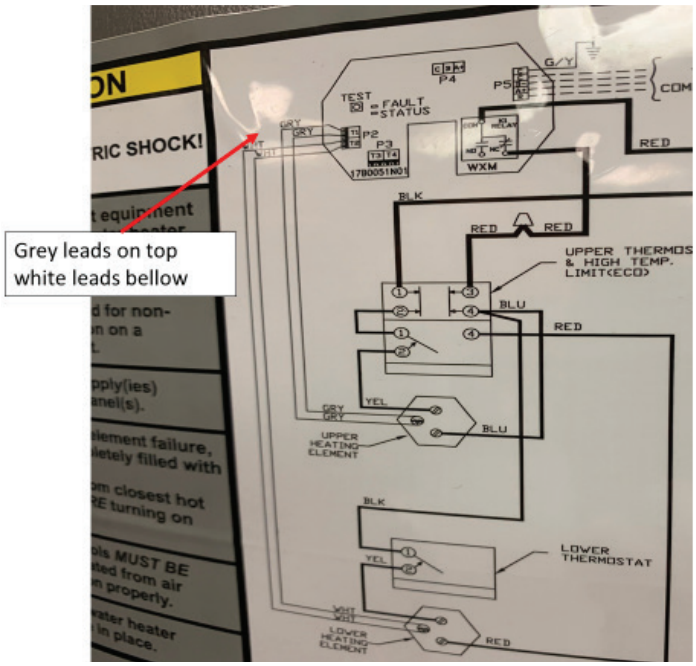
Noise From The Compressor

In the Hot Water mode there are times the compressor will make some chattering noises this is normal it is actually reed valves on the discharge of the compressor chattering.



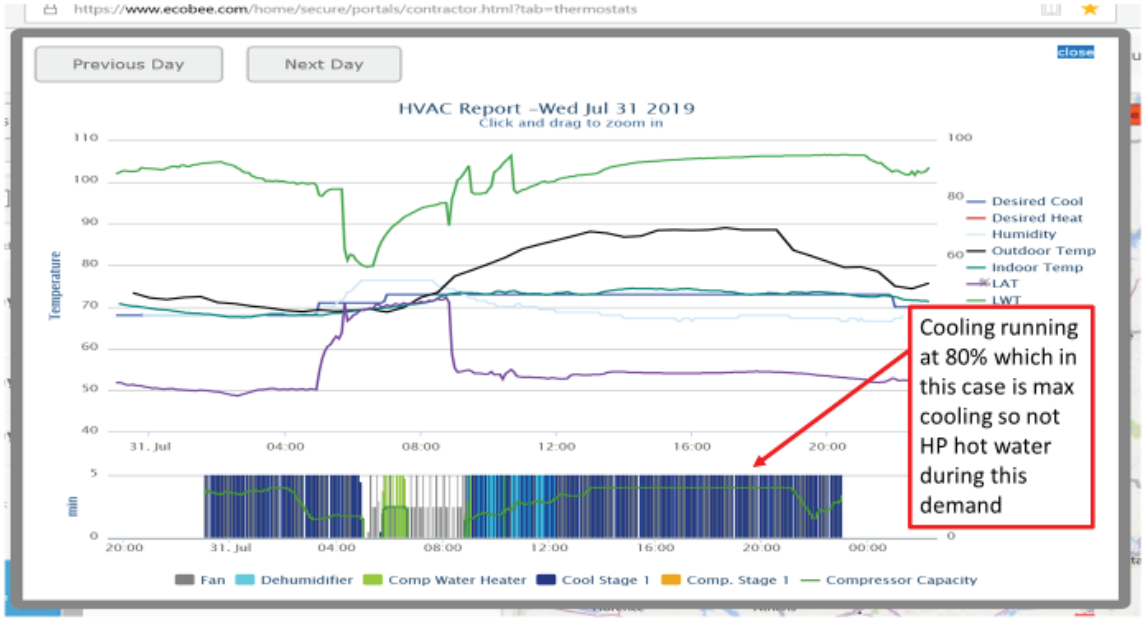
Hot Water tank (Smart Tank)

Swapped thermistors we have seen this a few times you can see this with the service tool looking at the upper tank temperature and the lower tank temperature draw some hot water off in a sink if you see the upper tank temp showing its dropping right away would be a indication of these being swapped you would also see the lower tank not changing right away.



Leaky dip tube this will show up with the upper tank dropping right away along with the lower tank when drawing hot water off.

If the vacuum breaker is tighten in correctly you can damage the o ring seal and cold water can enter the top of the tank.



Fault History | Diagnostics | Configuration

Last update: Thu Aug 01 2019 10:34 AM

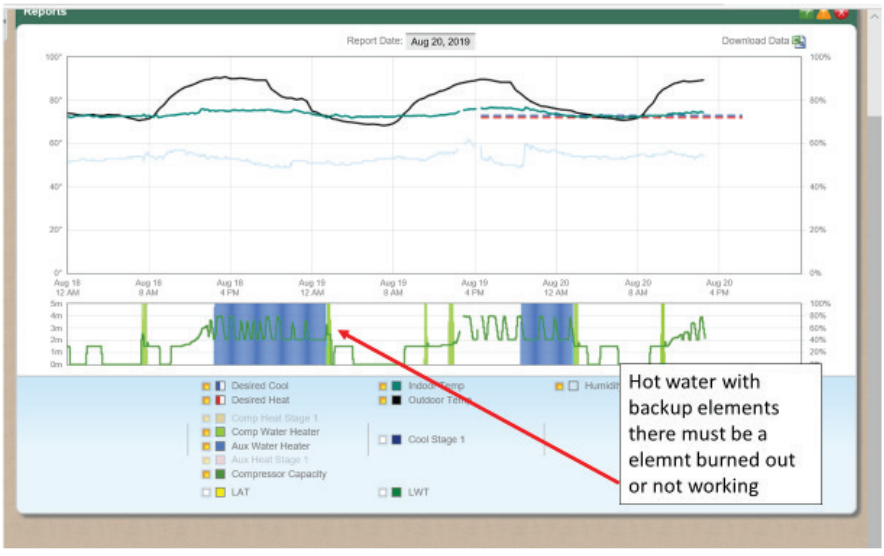
Diagnostic	Value	Units
Current Operating Capacity	50	%
ECM Blower Power	44.5	W
Output Status Flags 1	64	
Output Status Flags 2	23	
ECM Airflow Status	755	CFM
DHW Pump Status	90	%
Loop Pump Status	24	%
DHW Pump Flow Rate	4.4	GPM
Loop Pump Flow Rate	2.4	GPM
Compressor Target Speed	27	RPS

This unit has some hot water issues because of restricted lines between the unit and the tank the piping is 64feet one way from the unit to the tank using 1" PEX!! The inside diameter of the 1" PEX is smaller then 1" copper and remember where the fittings go. Right now the unit at 50% Hot water operation is barely achieving a 9 degree delta T at 90% pump speed and 4.4 GPM. At times when the unit is in Hot water and cooling capacity can be higher then 50% all the way up to 80% when this unit is in Hot water and cooling and runs much above 50% this unit locks out on high pressure because of the low flow rate on the hot water side.

This was a case with a non working element the unit was trying to call for backup hot water but the element was not working. The reason it was trying to use the elements was because the units was set to 80% max cool you can see it was ramping there several times during this hot outside temps.

Setting back temperature of the space can cause not being able to make hot water with the QE unit and needing the back up elements to come on. Think about it when most might set back temperature at night and in the morning bring the temperature back up that is also when a lot of people are taking showers using hot water this will cause the QE to prioritize heating the space because of the large temperature difference and then use the back up elements in the hot water heater.

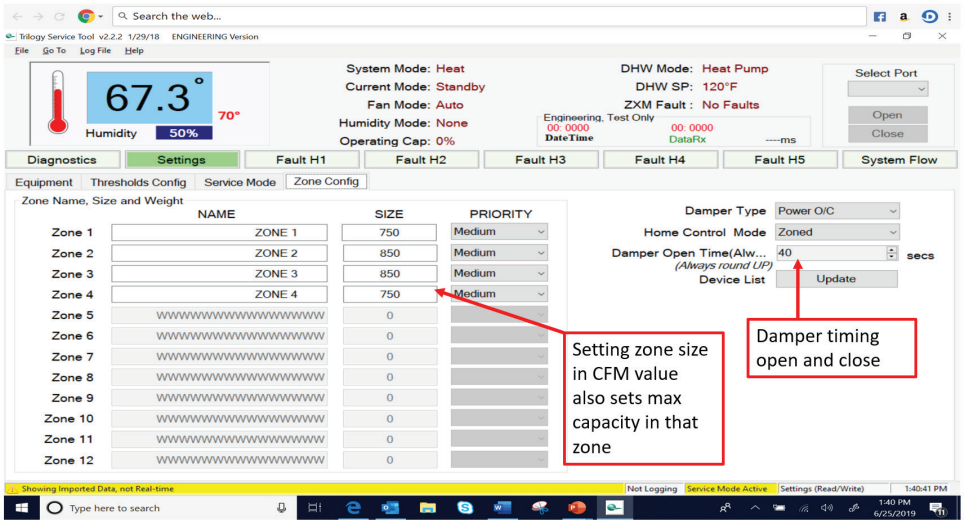
Setting back is not a good idea and if the customer does they need to be aware of this problem and it will more then likely cost them more then if they found a temperature they like and leave it.



Zoning

Some things to think about with zoning that have caused some issues

Not setting the zone capacity properly for instance if you set a zone to say 500 cfm on a (1860) model that will only allow minimum capacity if that is the only zone calling if actually the load in that zone is greater then min capacity in this case 18,000 btu's then the unit will run and run and not satisfy that zone so proper CFM value that also relates to capacity is critical in the setup.



Example

Had a call the other day with a QE0930 with two zones close to the same size. When I received the call the unit was only running at 56% capacity and the complaint was the unit was not keeping up in either zone. After talking with the contractor and going through a few things I asked what was the two zone sizes that were set in the zoning tab he said they where both at 250CFM so the unit would not get over total of 500 CFM limiting the whole unit come to find out the zones could both handle 450CFM each so we moved them both to 450CFM and the unit immediately started to ramp up and then it was able to satisfy the point is it is really important to set these values correctly or this can happen to you and your customer.

Proper timing of the power open and power closed dampers is critical if the timing is off the control may think the damper is fully open but it may not be or not closed when it things it is and in that case it will over heat or cool that zone.

The zone board must have a secondary transformer sized for the number of thermostats and the dampers. The main lights on the ZXM will light up from the unit transformer but the dampers and the thermostats get power from the secondary transformer there is also a fuse on the board for this transformer.

With the original zone board software version in some cases with possible power issue or blips the thermostats will send out loss of communication faults (code 202) this version was 1.00 the latest version 1.01 fixes this issue and can be boot loader the software with the latest service tool version.

Communication errors

The biggest problem we see is poor connections be sure the field wiring to the EXM board where with the QE models we have wires doubled up be sure and do a tug test to be sure they are tight.

NO SPLICES this will cause communication errors

At the factory when the units are run tested on the EXM dipswitch number one is put into the off position for the test. IN the field this switch must be in the on position for communication.

These compressors use PVE oil what is the difference with PVE then POE

The inverter compressors in the QE and VE ClimateMaster product use PVE oil NOT POE oil.

Advantages of PVE (Poly Vinyl Ether Oil)

1. PVE oil is not Hydroscopic meaning it does not absorb water POE does.
2. Unsurpassed lubricity for greater wear protection
3. Compatible with all HFC refrigerants R410A

We do need to be careful and not mix POE oil with PVE oil when performing any refrigerant service on these units.

Sub assembly part numbers if needed for replacement parts.

QE-0930		
S30S0170N01	ASY, RV PRIMARY	QE0930 RV#1
S30S0170N02	ASY, RV SECONDARY	QEV093 RV#2
S33S0197N03	ASY, EEV	QE0930 (Bottom EEV #1)
S33S0197N04	ASY, EEV	QE0930 (Top EEV #2)
S62S0210N01	HX ASSY-SOURCE	QE*0930 (Loop)
S62S0210N02	HX ASSY-HOT WTR	QE*0930

QE-1860		
S30S0172N01	ASY, RV PRIMARY	QE1860 RV#1
S30S0172N02	ASY, RV SECONDARY	QEV1860 RV#2
S33S0197N01	ASY, EEV	QE1860 (Bottom EEV) #1
S33S0197N02	ASY, EEV	QE1860 (Top EEV) #2
S62S0209N01	HX ASSY-SOURCE	QE*1860 (Loop)
S62S0209N02	HX ASSY-HOT WTR	QE*1860

EEV assembly's have the checks valves and copper tubes with some length to protect the components from excessive heat.

Braze plates heat exchanger with copper stubs to make it easier to replace and braze back in place.

Reversing valve assembly have copper tubing attached to make it easier.

Example EEV#2 assembly

How to read the performance charts and the operating charts from the IOM

Table 12b: 1860 Pressure and Temperature

1860		Cooling					
Entering Water Temp °F	DT	Suction Pressure PSIG	Discharge Pressure PSIG	Super heat	Sub cooling	Water Flow GPM	Air Temp Drop °F DB
50	20	127-137	208-228	8-12	7-12	10.8-11.8	17-23
	15	127-137	186-206	12-16	7-12	10.5-11.5	17-23
	10	127-137	163-183	17-21	6-11	10.3-11.3	17-23
70	20	125-135	298-318	8-12	8-13	11.7-12.7	17-23
	15	126-136	275-295	8-12	8-13	11.5-12.5	17-23
	10	126-136	253-273	8-12	7-12	11.2-12.2	17-23
90	20	120-130	387-407	8-12	10-15	12.6-13.6	17-23
	15	122-132	365-385	8-12	10-15	12.4-13.4	17-23
	10	123-133	342-362	8-12	9-14	12.2-13.2	17-23
110	20	112-122	477-497	8-12	12-17	13.6-14.6	17-23
	15	115-125	454-474	8-12	12-17	13.4-14.4	17-23
	10	117-127	432-452	8-12	11-16	13.1-14.1	17-23

1860		Heating					
Entering Water Temp °F	DT	Suction Pressure PSIG	Discharge Pressure PSIG	Super heat	Sub cooling	Water Flow GPM	Air Temp Rise °F DB
30	11	61-71	340-360	8-12	20-25	5.5-6.5	25-31
	8	68-78	337-357	8-12	17-22	8.5-9.5	25-31
	5	73-83	333-353	8-12	14-19	11.5-12.5	25-31
50	12	98-108	333-353	8-12	4-9	5.5-6.5	25-31
	9	105-115	333-353	8-12	3-8	8.5-9.5	25-31
	6	110-120	333-353	8-12	2-7	11.5-12.5	25-31
70	13	135-145	333-353	8-12	1-6	5.5-6.5	25-31
	10	141-151	333-353	8-12	1-6	8.5-9.5	25-31
	7	148-158	333-353	8-12	1-6	11.5-12.5	25-31
90	14	172-182	333-353	8-12	1-6	5.5-6.5	25-31
	11	177-187	333-353	13-17	1-6	8.5-9.5	25-31
	8	184-194	333-353	16-20	1-6	11.5-12.5	25-31

All data based on 80% capacity which when you run the unit manually that is where it will be at unless you have the capacity limited bellow 80%

All Data based on return air temp in heating of 70 degrees and cooling of 80 DB and 67 WB

30% 40% 60% 80% 100% Capacity

Table 13a: Performance Data — Trilogy® QE 0930 - Heating

EWT °F	DT	CFM/T	HC					KW					HE				
20	6	300	9.0	12.0	18.0	24.0	27.6	0.98	1.19	1.77	2.52	3.01	5.6	8.0	12.0	15.4	17.3
	6	400	9.0	12.0	18.0	24.0	27.5	0.87	1.09	1.66	2.37	2.85	6.0	8.3	12.3	15.9	17.8
	6	500	9.0	12.0	18.0	24.0	27.5	0.79	1.00	1.57	2.30	2.81	6.3	8.6	12.7	16.1	17.9
30	12	300	9.0	12.0	18.0	24.0	29.3	0.95	1.13	1.68	2.38	3.07	5.8	8.1	12.3	15.9	18.8
	12	400	9.0	12.0	18.0	24.0	29.5	0.81	1.02	1.55	2.21	2.94	6.2	8.5	12.7	16.5	19.5
	12	500	9.0	12.0	18.0	24.0	29.6	0.75	0.94	1.46	2.15	2.92	6.5	8.8	13.0	16.7	19.6
	6	300	9.0	12.0	18.0	24.0	30.0	0.89	1.06	1.55	2.19	2.90	6.0	8.4	12.7	16.5	20.1
	6	400	9.0	12.0	18.0	24.0	30.0	0.74	0.93	1.40	1.99	2.71	6.5	8.8	13.2	17.2	20.8
	6	500	9.0	12.0	18.0	24.0	30.0	0.68	0.85	1.31	1.93	2.68	6.7	9.1	13.5	17.4	20.8
40	12	300	9.0	12.0	18.0	24.0	30.0	0.85	1.00	1.47	2.07	2.73	6.1	8.6	13.0	16.9	20.7
	12	400	9.0	12.0	18.0	24.0	30.0	0.70	0.87	1.30	1.86	2.52	6.6	9.0	13.5	17.7	21.4
	12	500	9.0	12.0	18.0	24.0	30.0	0.64	0.79	1.23	1.80	2.50	6.8	9.3	13.8	17.8	21.5
	6	300	9.0	12.0	18.0	24.0	30.0	0.79	0.93	1.35	1.90	2.48	6.3	8.8	13.4	17.5	21.5
	6	400	9.0	12.0	18.0	24.0	30.0	0.65	0.80	1.18	1.68	2.27	6.8	9.3	14.0	18.3	22.3
	6	500	9.0	12.0	18.0	24.0	30.0	0.59	0.72	1.11	1.63	2.25	7.0	9.5	14.2	18.5	22.3
50	13	300	9.0	12.0	18.0	24.0	30.0	0.76	0.89	1.29	1.81	2.37	6.4	9.0	13.6	17.8	21.9
	13	400	9.0	12.0	18.0	24.0	30.0	0.62	0.76	1.12	1.59	2.15	6.9	9.4	14.2	18.6	22.6
	13	500	9.0	12.0	18.0	24.0	30.0	0.56	0.69	1.05	1.54	2.14	7.1	9.7	14.4	18.7	22.7
	7	300	9.0	12.0	18.0	24.0	30.0	0.70	0.82	1.18	1.65	2.15	6.6	9.2	14.0	18.4	22.7
	7	400	9.0	12.0	18.0	24.0	30.0	0.58	0.70	1.02	1.44	1.94	7.0	9.6	14.5	19.1	23.4
	7	500	9.0	12.0	18.0	24.0	30.0	0.52	0.63	0.95	1.39	1.92	7.2	9.9	14.8	19.2	23.4

These capacity % carry through all the different boxes KW, HE etc.

When verifying performance be sure to pay attention to the return air temp that you have it may make more since to verify the unit in heating even in the summer if the house is 71 degrees with low humidity. Otherwise in some cases when you compare the units data it may be off and you may begin to do further troubleshooting when the return air temp was the issue. In the product catalog there are conversion factors for different conditions I have also included in this document for reference.

Entering Air Correction Factors

Cooling												
Entering Air WB°F	Total Capacity	Sensible Cooling Capacity Multiplier - Entering DB °F									Power	Heat of Rejection
		65	70	75	80	80.6	85	90	95	100	100	
50	0.734	1.046	*	*	*	*	*	*	*	*	1.017	0.770	0.853
55	0.811	0.871	1.062	1.240	*	*	*	*	*	*	1.017	0.837	0.896
60	0.890	0.666	0.876	1.073	1.257	*	*	*	*	*	1.013	0.906	0.932
65	0.957		0.660	0.876	1.079	1.103	1.269	*	*	*	1.008	0.963	0.979
66.2	0.989		0.604	0.825	1.032	1.056	1.227	*	*	*	1.002	0.990	0.991
67	1.000		0.566	0.789	1.000	1.024	1.197	1.381	*	*	1.000	1.000	1.000
70	1.058			0.650	0.872	0.898	1.081	1.276	*	*	0.989	1.052	1.035
75	1.146				0.635	0.663	0.862	1.077	1.278	1.466	0.969	1.166	1.101

* Sensible capacity equals total capacity.

Heating			
Entering Air DB°F	Heating Capacity	Power	Heat of Extraction
50	1.052	0.806	1.114
55	1.042	0.852	1.090
60	1.030	0.901	1.063
65	1.016	0.951	1.032
70	1.000	1.000	1.000
75	0.983	1.046	0.967
80	0.966	1.087	0.935

AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/66.2°F WB, and Heating - 68°F DB/59°F WB entering air temperature

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Revision Tracking

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