

PHNIX TROUBLESHOOTING GUIDE – HP31005T



HAYWARD®

We Build Better.™

HP31005T



HeatPro Heat Pump, 100,000
BTU, Round Platform,
Heat+Cool

51301743001 REV A

TABLE OF CONTENTS

4. UNIT FEATURES

5. NOTICE TO SERVICER

6. WARNING - ELECTRICAL

7. GROUNDING AND BONDING LOCATIONS

8. GROUNDING AND BONDING INFORMATION

9. UNIT DATA PLATE AND AHRI RATING

10. HEAT PUMP POOL HEATING

11. TYPICAL POOL PAD

12. HP31005T – ROUND UNIT – CONTENT STRUCTURE

13. HP31005T – ROUND UNIT – FEATURES

14. HP31005T – WIRING DIAGRAM

15. HP31005T – INPUT AND OUTPUTS OF BOARD

16. HP31005T – ROUND UNIT – TURN UNIT ON/OFF

17. HP31005T – ROUND UNIT – SETTING TEMPERATURE

18. HP31005T – ROUND UNIT – SET READOUT TO SHOW OUTLET TEMPERATURE

19. HP31005T – ROUND UNIT – CHANGING MODES

20. HP31005T – ROUND UNIT - ACCESS SERVICE MENU

21. HP31005T – ROUND UNIT – OWNER LOCKOUT FEATURE

22. HP31005T – ROUND UNIT – BYPASS MODE INTRO

23. HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 2

24. HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 3

25. HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 4

26. HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 5

27. HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 6

28. HP31005T – ROUND UNIT – OMNI CONTROL

29. HP31005T – ROUND UNIT - ERROR CODES SUMMARY

30. HP31005T -“E01” – HIGH PRESSURE SWITCH – FLOW CHART

31. HP31005T-“E01” – HIGH PRESSURE SWITCH - TROUBLESHOOTING

32. HP31005T-“E02” – LOW PRESSURE SWITCH – FLOW CHART

33. HP31005T- “E02” – LOW PRESSURE SWITCH - TROUBLESHOOTING

34. HP31005T-“E03” – WATER FLOW SWITCH – FLOW CHART

35. HP31005T- “E03” – WATER FLOW SWITCH - TROUBLESHOOTING

36. HP31005T-TROUBLESHOOTING THERMISTORS PART I

37. HP31005T-TROUBLESHOOTING THERMISTORS PART 2

38. HP31005T- THERMISTOR CHARTS – PART 3 – 50k Ω

39. HP31005T- THERMISTOR CHARTS – PART 3 – 5k Ω

40. HP31005T – “E06” ERROR CODE

41. HP31005T – “E07” ANTIFREEZE ERROR

42. HP31005T – “E019/E029” WINTER PROTECTION LEVEL 1/2

TABLE OF CONTENTS – PART 2

[43. HP31005T – “E019/E029” WINTER PROTECTION LEVEL ½](#)
[44. HP31005T-“E08” – COMMS FAILURE BOARD AND USER DISPLAY](#)
[45. HP31005T-“E08” – COMMS FAILURE BOARD AND USER DISPLAY](#)
[46. HP31005T-“E081” – COMMS FAILURE PC1004-G AND FAN INVERTER I](#)
[47. HP31005T-“E081” – COMMS FAILURE PC1004-G AND FAN INVERTER II](#)
[48. HP31005T-“E081” – COMMS FAILURE PC1004-G AND FAN INVERTER III](#)
[49. HP31005T-“PP” – PRESSURE SENSOR FAILURE](#)
[50. HP31005T – SYSTEM LEVEL OVERVIEW](#)
[51. HP31005T – CLOSE-UP OVERVIEW PC-1004G](#)
[52. HP31005T – TEST PC-1004G BOARD](#)
[53. HP31005T – TEST FAN BOARD](#)
[54. HP31005T – COMPRESSOR TROUBLESHOOTING](#)
[55. HP31005T – HEAT EXCHANGERS TROUBLESHOOTING](#)

[56. LEAK DETECTION TECHNIQUES](#)
[57. HANDHELD LEAK DETECTORS](#)
[58. NITROGEN AND BUBBLE SPRAY TECHNIQUE LEAK FINDING](#)
[59. UV DYE LEAK DETECTION](#)
[60. WHAT IS AN EEV – ELECTRONIC EXPANSION VALVE – HOW DOES IT WORK?](#)
[61. EEV TROUBLESHOOTING](#)
[62. FILTER DRIER TROUBLESHOOTING TIPS](#)
[63. HOW IT WORKS - FILTER DRIER](#)
[64. REVERSING VALVE TROUBLESHOOTING TIPS](#)
[65. FAN CAPACITOR AND COMPRESSOR CAPACITOR TROUBLESHOOTING](#)
[66. ACCUMULATOR A.K.A. LIQUID TANK](#)
[67. REFERENCE PRESSURES AND TEMPERATURES](#)
[68. END OF TROUBLESHOOTING GUIDE](#)

UNIT FEATURES



HeatPro Heat Pump, 100,000
BTU, Round Platform,
Heat+Cool

- 1Ph – 220/240VAC – 1 Stage Scroll Compressor
- Variable Speed Fan – Dedicated Fan Board
- PC-1004G Main Board
- User Display: “LED206”

NOTICE TO SERVICER

HAYWARD TECHNICAL SUPPORT HOTLINE: 908-355-7995

- Heat pumps are ONLY be serviced by EPA 608 licensees with HVAC/R training or having completed Hayward technical training for this product line.
- Hayward microchannel heat pumps are designed to operate on 230/240VAC supply only. Only use copper supply wires when connecting power to the contactor line-side.
- For troubleshooting electrical components, during which live energization of the heat pump is required, only qualified service personnel may perform the testing/troubleshooting.
- We recommend discharging the voltage from: the fan capacitor AND compressor capacitor prior to measuring capacitance and ensure the unit breaker is OFF during this process.
- During diagnostic, Hayward recommends technicians shut off power to the breaker, unless unit power must remain for diagnostics like checking line voltage, measuring amp draw.
- When in doubt, stop what you are doing, consult with a professional service technician in your company or call Hayward technical support.

All technicians performing work which involves any refrigerant circuit related access, *shall at minimum require:*

a) EPA 608 Type II Certification

Or

b) EPA 608 Universal Certification



HAYWARD POOL PRODUCTS

NOTICE - When GFCI breakers are required by installation codes, product will operate satisfactorily when using a Siemens second generation GFCI breaker (QFxxxA). This GFCI breaker has been tested and found to not nuisance trip. GFCI nuisance trips are not covered under warranty.



WARNING - ELECTRICAL

All wiring connections to the heater must be made in accordance with the latest edition of the NFPA 70, unless local code requirements specify otherwise.

In **Canada**, all wiring connections must follow CSA C22.1 Canadian Electrical Code, Part 1.

GROUNDING AND BONDING NOTICE

The heater must be electrically grounded and bonded in accordance with local codes or, in the absence of local codes, with National Electrical Code, ANSI/NFPA 70. Wiring connections must be made as shown in the wiring diagram found on the control box mounting bracket.

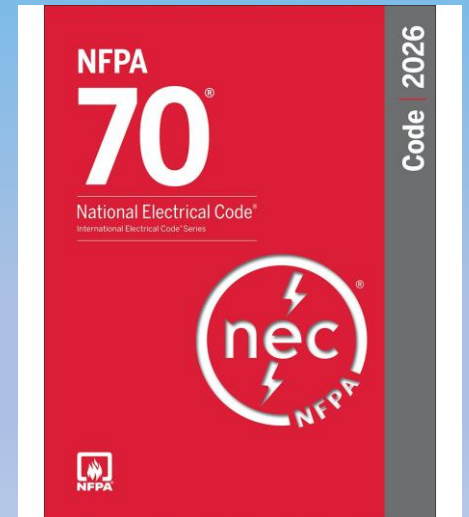
GROUND LUG: Located in electrical enclosure.

BONDING LUG: Connect a No. 8 AWG (8.4 mm²) solid **copper bonding wire to the grounding lug on the heat pump CHASSIS** and to all metal parts of swimming pool or spa, and to all electrical equipment, metal piping (except gas piping), and conduit within 5 ft. (1.5 m) of inside walls of swimming pool or spa.

Reference NEC codes for all wiring standards including, but not limited to, grounding, bonding and other general wiring procedures.



HAYWARD POOL PRODUCTS

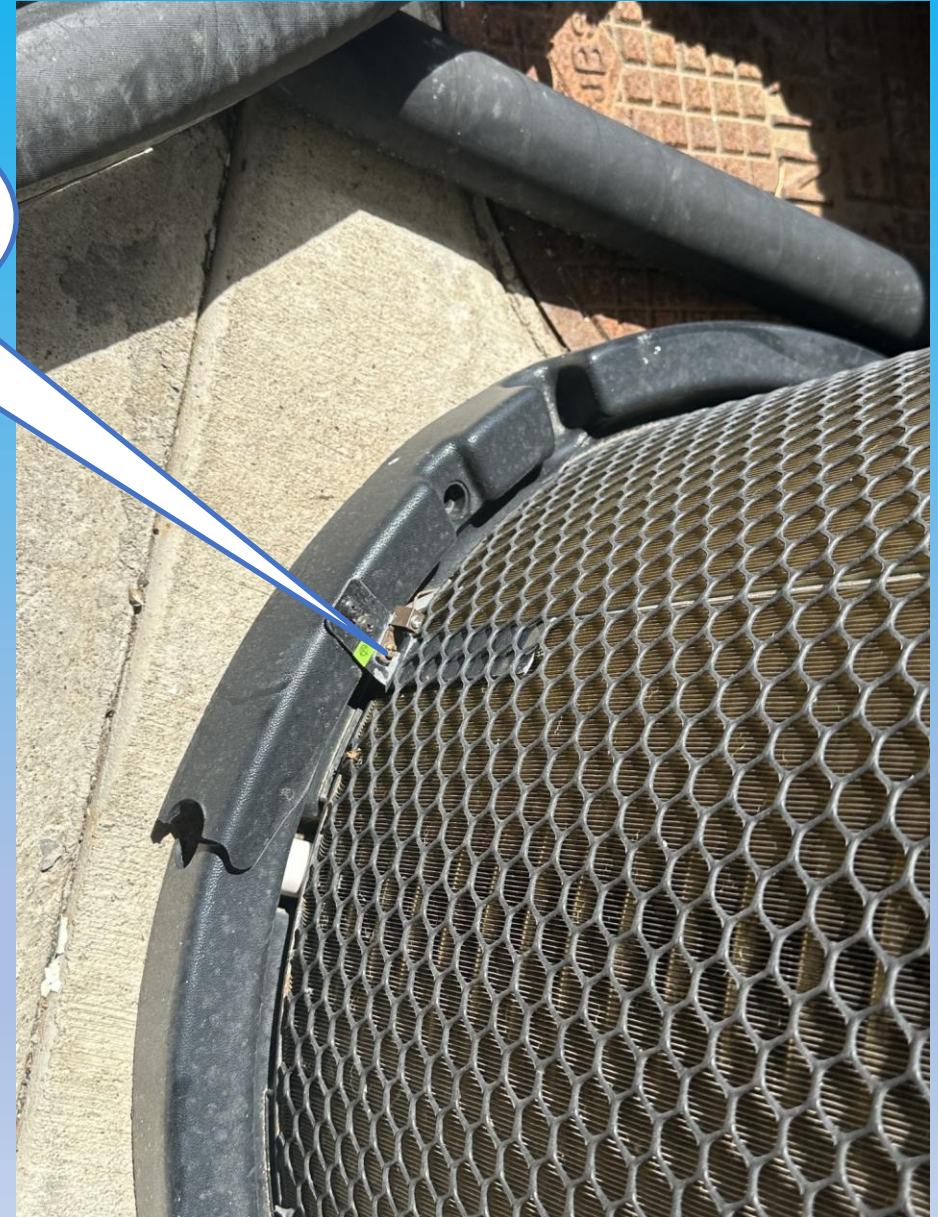


GROUNDING AND BONDING LOCATIONS



Bonding
Lug

Grounding Lug is
already tied to the
electrical hookup
terminal block when
you run the electrical
conduit in: Line 1/Line 2
/Ground



GROUNDING AND BONDING INFORMATION

Equipment bonding is the intentional joining of metal parts to create a continuous electrical path. It ensures that exposed metal surfaces (like equipment housings or junction boxes) remain at the same electrical potential, preventing electric shock and providing a path to safely trip circuit breakers during a fault.

Key Concepts

- **Equalizing Potential:** Bonding connects exposed conductive parts together. If an electrical wire accidentally touches the metal casing of an appliance, the bonding ensures the casing does not become dangerously energized compared to its surroundings.
- **Creating a Fault Path:** By tying all metal parts to a continuous loop, bonding provides an effective path for electricity to flow back to the power source. This ensures that overcurrent devices, like fuses or circuit breakers, immediately trip and shut off the power.
- **Bonding vs. Grounding:** These terms are often used interchangeably but serve different roles.
 - **Bonding:** Connects equipment, enclosures, and metal parts together to establish electrical continuity.
 - **Grounding:** Connects those bonded systems to the earth to neutralize surges and lightning strikes

UNIT DATA PLATE AND AHRI RATING

HEAT PUMPOOL HEATER

MODEL	HP31005T
RATED VOLTAGE/ PHASE/ FREQUENCY	208/230V~/60Hz
MOISTURE RESISTANCE	IPX4
TOTAL LOAD	33.9A
NET WEIGHT	112/kg(247/lb.)
COMPRESSOR RATING LOAD	32.3A
LOCKED ROTOR LOAD	139A
FAN MOTOR RATING LOAD	1.6A
MIN. CIRCUIT AMPACITY	42A
MAX. FUSE	70A
HEATING OPERATING WATER TEMP.	9~40°C(48.2~104°F)
COOLING OPERATING WATER TEMP.	9~30°C(48.2~86°F)
MAX. OPERATING PRESSURE(LOW SIDE)	1.7MPa(246.5PSIG)
MAX. OPERATING PRESSURE(HIGH SIDE)	4.0MPa(580PSIG)
MAX. ALLOWABLE PRESSURE	5.5MPa(797.5PSIG)
DESIGN WATER PRESSURE	1.0MPa(145PSIG)
RECOMMENDED WATER FLOW VOLUME	161.7L/min(42.7gal/min)
WATER PRESSURE DROP	11kPa(1.60PSIG)
REFRIGERANT/ PROPER INPUT	R410A/3500g(7.72lb.)
REFRIGERANT SAFETY GROUP CLASSIFICATION	A1
OUTDOOR USE	
FACTORY NUMBER(ON THE BAR CODE)	
SERIAL NUMBER (ON THE BAR CODE)	
MANUFACTURED DATE(ON THE BAR CODE)	



CONFORMS TO
UL STD. 60335-1
AND 60335-2-40
CERTIFIED TO
CSA STD. C22.2
No.60335-1 AND
60335-2-40

HAYWARD



Certificate of Product Ratings

AHRI Certified Reference Number : 207175087 Date : 07-09-2026 Model Status : Active

Brand Name : HEATPRO

Model Number (For Split System - Air side or for Packaged Unit) : HP31005T

AHRI Type : SPPH-H/C

Refrigerant Type : R-410A

Rated as follows in accordance with AHRI Standard 1160-2022 (I-P), Performance Rating of Heat Pump Pool Heaters and subject to verification of rating accuracy by AHRI-sponsored, independent, third-party testing:

High Air Temperature High Humidity Heating Capacity, btuh : 100000

High Air Temperature High Humidity COP : 6.4

High Air Temperature Mid Humidity Heating Capacity, btuh : 94000

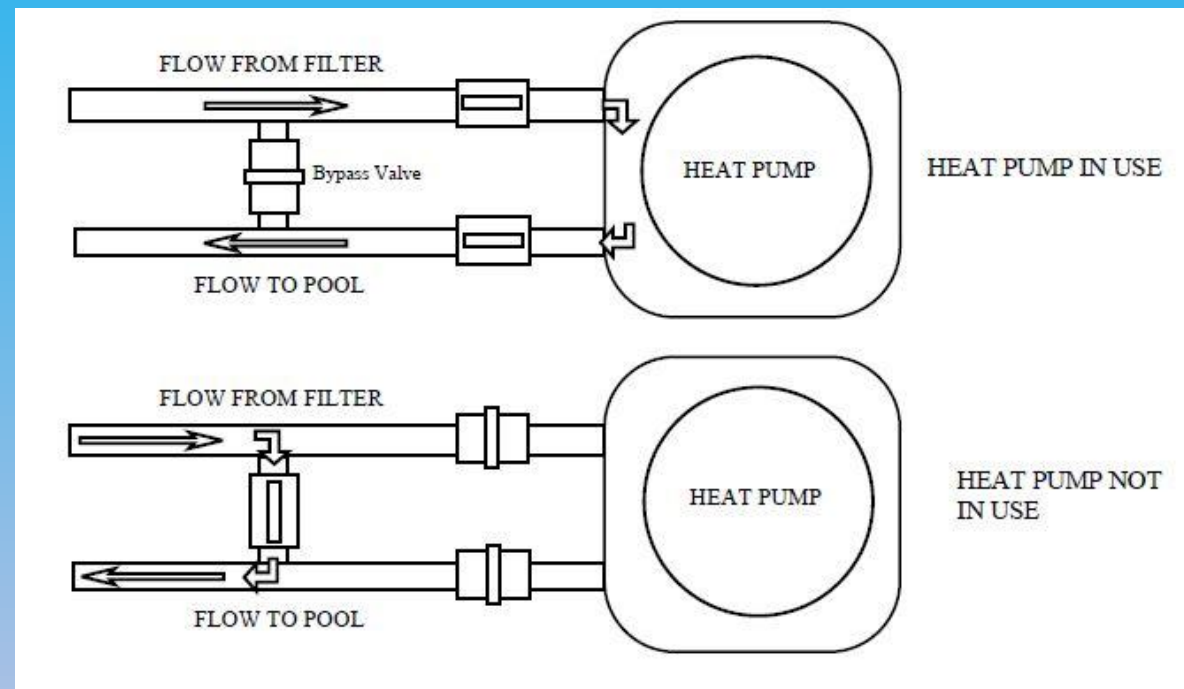
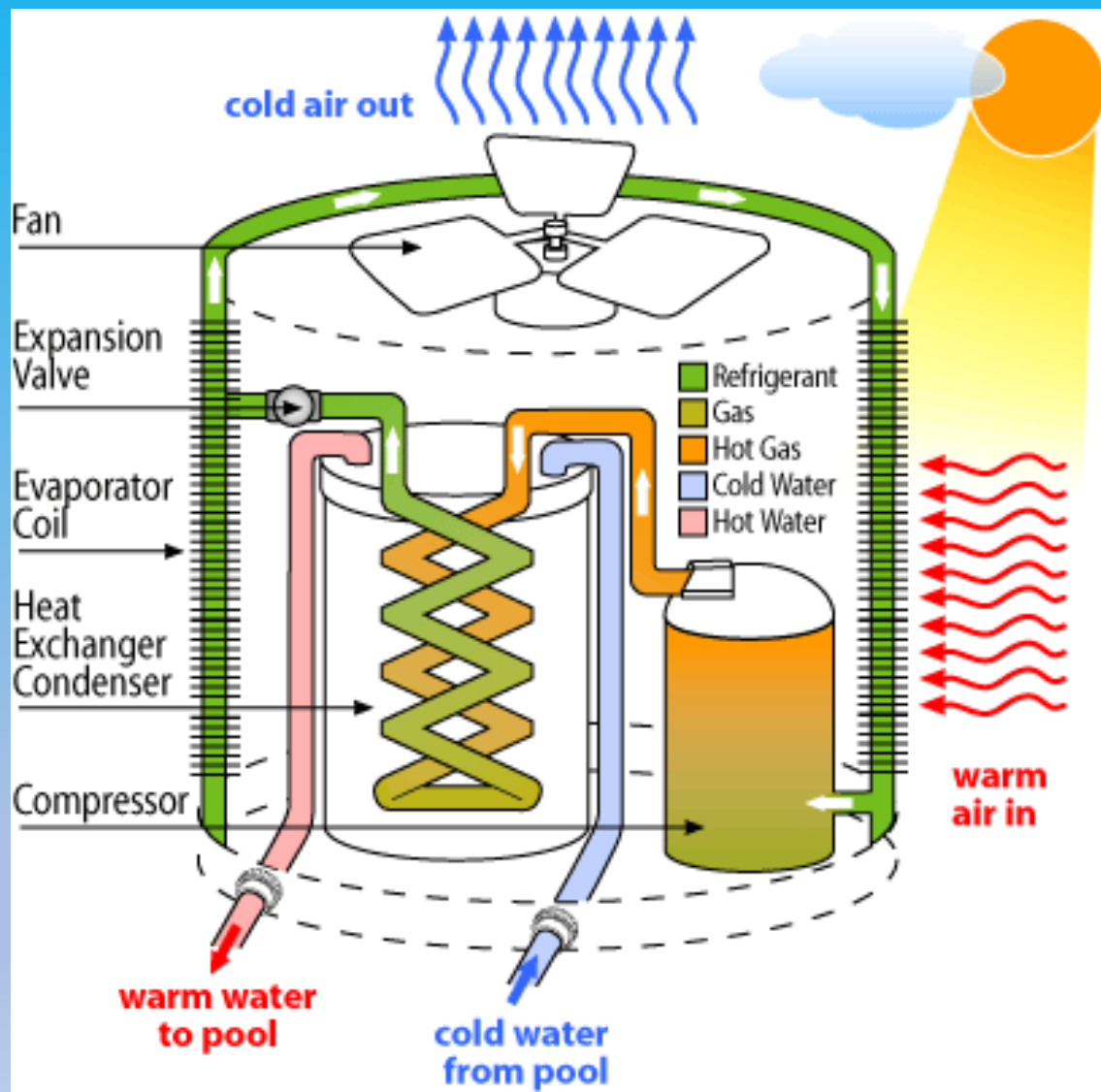
High Air Temperature Mid Humidity COP : 6.2

Low Air Temperature Mid Humidity Heating Capacity, btuh : 61000

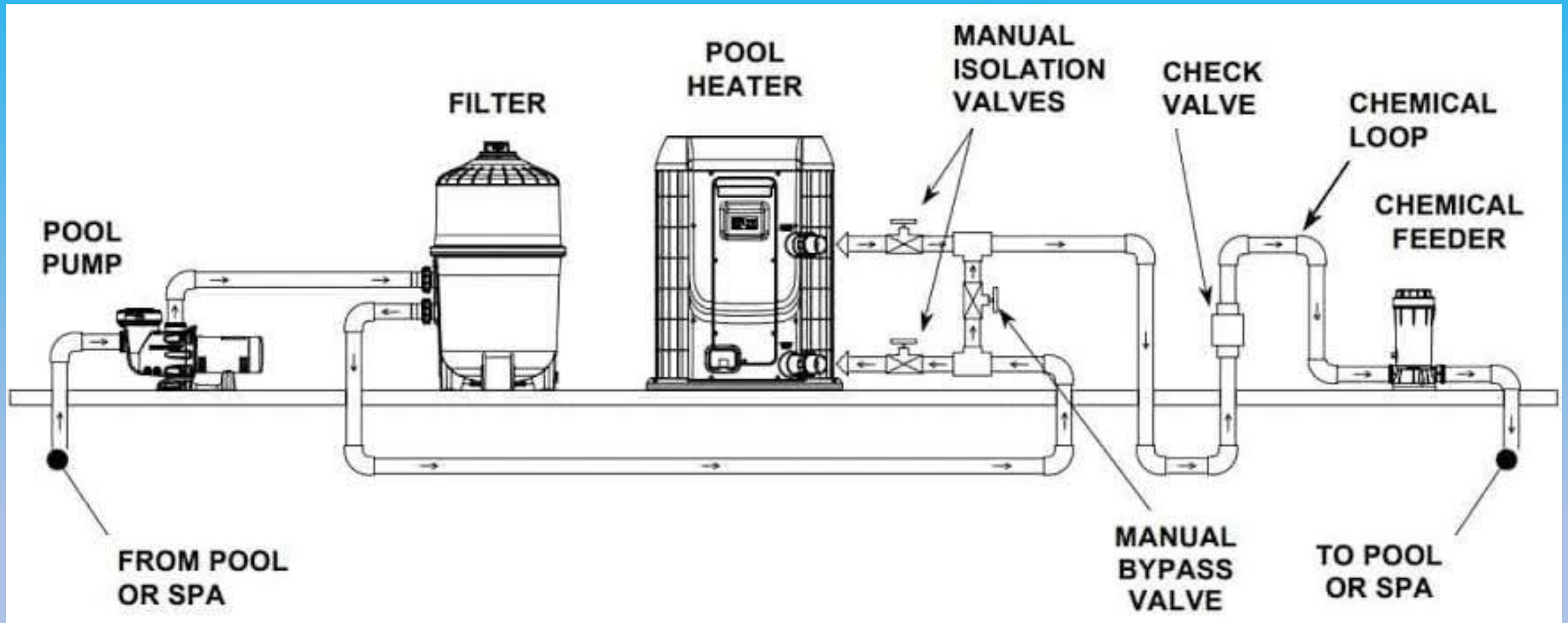
Low Air Temperature Mid Humidity COP : 4.2



HEAT PUMP POOL HEATING



TYPICAL POOL PAD



HP31005T – ROUND UNIT – CONTENT STRUCTURE

- FEATURES LIST/UNIT OVERVIEW
- WIRING DIAGRAM
- INPUT/OUTPUTS DIAGRAM
- SERVICE PARTS LIST AND EXPLODED VIEW
- MENU NAVIGATION/BO MODE/OMNI CONNECTION/LOCKOUT
- ERROR CODE SUMMARY
- SEQUENCE OF ERROR CODES AND FLOW-CHARTS
- HEAT PUMP DIAGRAM OVERVIEW GENERAL
- COMPONENT TROUBLESHOOTING SLIDES

HEAT PUMPPPOOL HEATER

MODEL	HP31005T
RATED VOLTAGE/ PHASE/ FREQUENCY	208/230V~/60Hz
MOISTURE RESISTANCE	IPX4
TOTAL LOAD	33.9A
NET WEIGHT	112/kg(247/lb.)
COMPRESSOR RATING LOAD	32.3A
LOCKED ROTOR LOAD	139A
FAN MOTOR RATING LOAD	1.6A
MIN. CIRCUIT AMPACITY	42A
MAX. FUSE	70A
HEATING OPERATING WATER TEMP.	9~40°C(48.2~104°F)
COOLING OPERATING WATER TEMP.	9~30°C(48.2~86°F)
MAX. OPERATING PRESSURE(LOW SIDE)	1.7MPa(246.5PSIG)
MAX. OPERATING PRESSURE(HIGH SIDE)	4.0MPa(580PSIG)
MAX. ALLOWABLE PRESSURE	5.5MPa(797.5PSIG)
DESIGN WATER PRESSURE	1.0MPa(145PSIG)
RECOMMENDED WATER FLOW VOLUME	161.7L/min(42.7gal/min)
WATER PRESSURE DROP	11kPa(1.60PSIG)
REFRIGERANT/ PROPER INPUT	R410A/3500g(7.72lb.)
REFRIGERANT SAFETY GROUP CLASSIFICATION	A1
OUTDOOR USE	
FACTORY NUMBER(ON THE BAR CODE)	
SERIAL NUMBER (ON THE BAR CODE)	
MANUFACTURED DATE(ON THE BAR CODE)	



CONFORMS TO
UL STD. 60335-1
AND 60335-2-40
CERTIFIED TO
CSA STD. C22.2
No. 60335-1 AND
60335-2-40

HAYWARD

HAYWARD POOL PRODUCTS

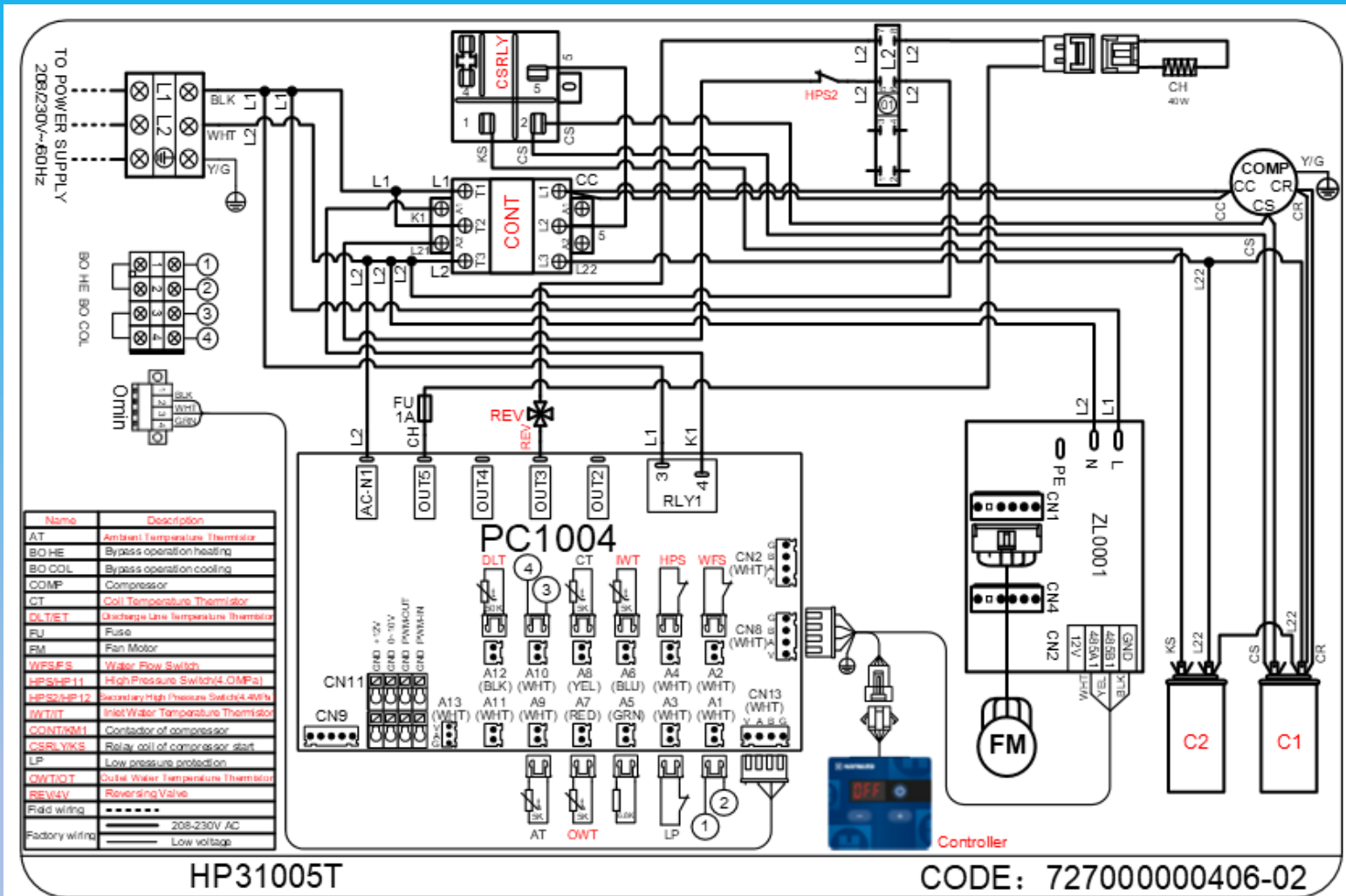
HP31005T – ROUND UNIT – FEATURES

- SINGLE SPEED A/C COMPRESSOR
- VARIABLE SPEED D.C. FAN
- PC-1004G CONTROL BOARD
- FAN INVERTER BOARD
- LED206 USER DISPLAY



HeatPro Heat Pump, 100,000 BTU, Round Platform, Heat+Cool

HP31005T – WIRING DIAGRAM



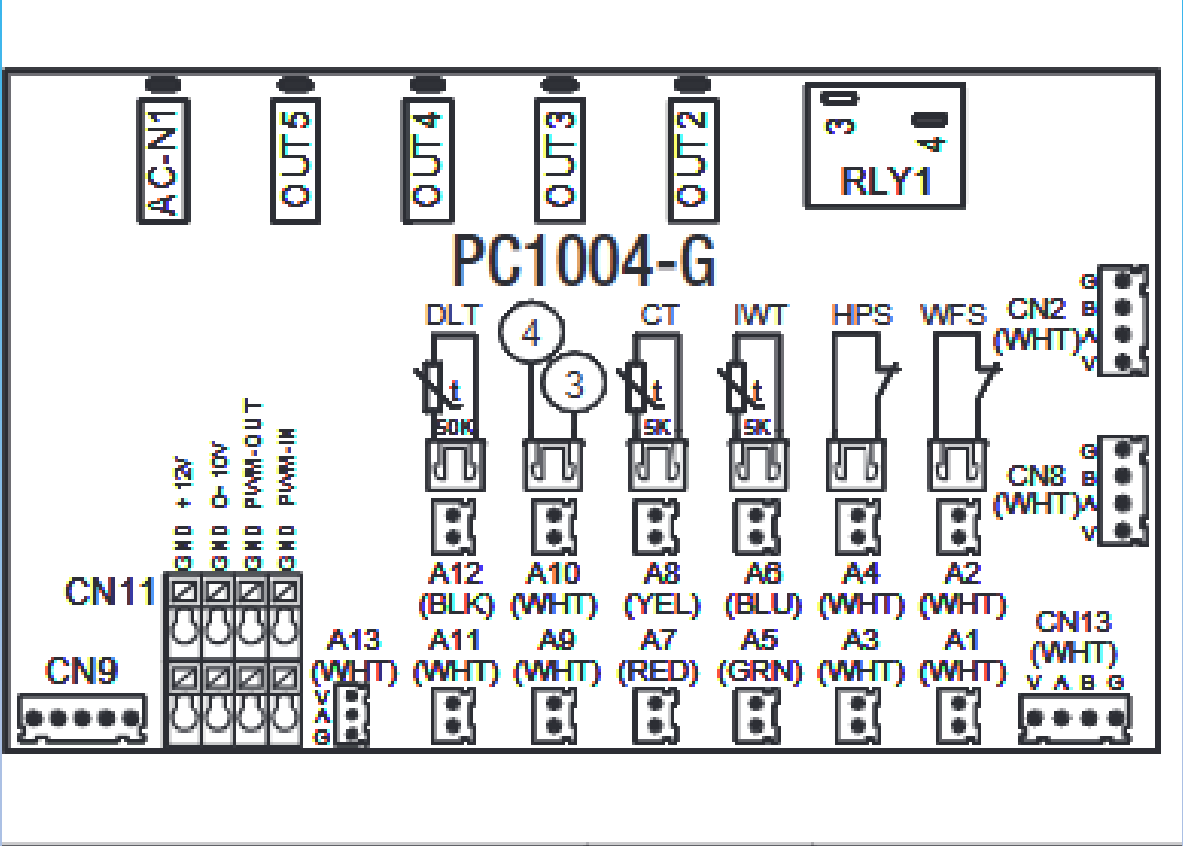
PASRW070-U-P-216D5

HP31005T – INPUT AND OUTPUTS OF BOARD

Sign	Meaning	Sign	Meaning
OUT1	Compressor (output 220-230VAC)	A/DIO9	Ambient temperature thermistor 5kΩ
OUT2	Circulating water pump (output 220-230VAC)	A/DIO10	Bypass operation: Cooling
OUT3	Reversing valve (output 220-230VAC)	A/DIO11	Master-slave switch/Antifreeze Temperature Thermistor
OUT4	High speed of fan (output 220-230VAC)	A/DIO12	Discharge temperature thermistor
OUT5	Low speed of fan (output 220-230VAC)	A/DIO13	Compressor current sensor or Pressure sensor *Certain models only*
AC-L	Live wire (input 220-230VAC)	PWM_IN	Master-slave switch/Feedback signal of EC fan (input)
AC-N	Neutral wire (input 220-230VAC)	PWM_OUT	AC fan control (output)
A/DIO1	Bypass operation: Heating	0_10V_OUT	EC fan control (output)
A/DIO2	Water flow switch (input)	+5V	Reserved (output)
A/DIO3	Low pressure switch	+12V	Reserved (output)
A/DIO4	High pressure switch	CN2	Inverter board communication port
A/DIO5	Suction temperature thermistor 6.8kΩ	CN8	WiFi/Color line controller communication port/DC fan speed regulation module
A/DIO6	Inlet water temperature thermistor 5kΩ	CN9	Electronic expansion valve
A/DIO7	Outlet water temperature thermistor 5kΩ	CN12	Program port
A/DIO8	Coil temperature thermistor 5kΩ	CN13	Centralized control communication port

Wire Control Interface Definition

Sign	Meaning
B	485B
A	485A
V	12V (power +)
NET	Communication signal
G	GND (power -)



HP31005T – ROUND UNIT – TURN UNIT ON/OFF

Heater On/Off

When the unit is off, press the ON/OFF key and hold on for 0.5 seconds to turn on the unit; When the unit is on, press the ON/OFF key and hold on for 0.5 seconds to turn off the unit.



Heater Off - Main Interface

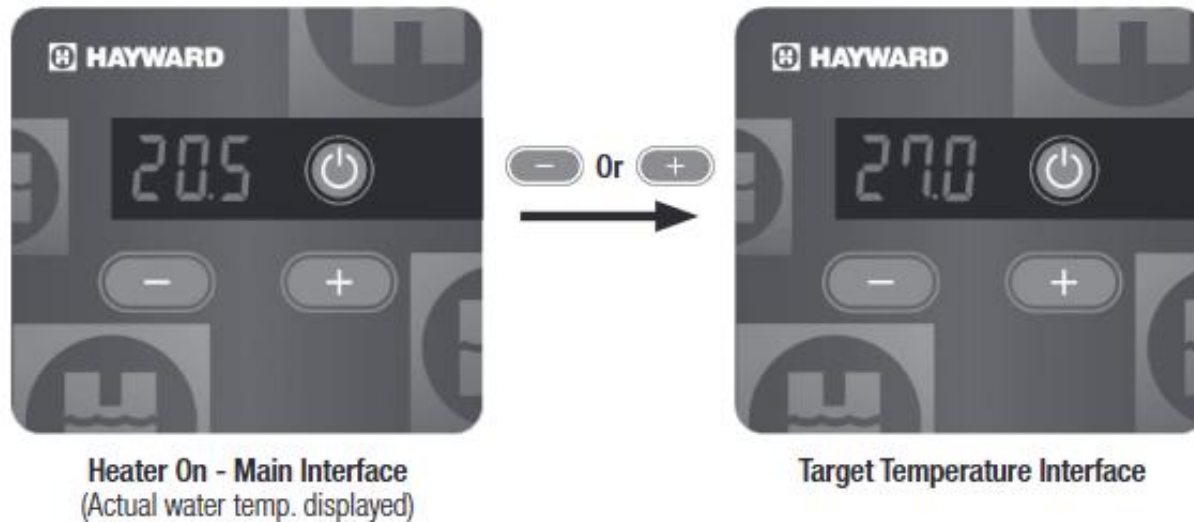


Heater On - Main Interface
(Actual water temp. displayed)

HP31005T – ROUND UNIT – SETTING TEMPERATURE

Setting Temperature

With the heater on, press the UP or DOWN key until the current mode target temperature flashes, then press the UP key to increase the temperature value, or press the DOWN key to decrease it. After 5 seconds of no operation, the unit will save the target temperature setting. Pressing the ON/OFF key will NOT save the target temperature setting, but will return to the main interface.



Temperature Units: To switch between °F and °C, press and hold the ON/OFF and DOWN keys for 5 seconds.

Target Temperature Increments: Pressing the UP or DOWN key for less than 2 seconds will change the target temperature by increments of 0.1°F/°C. Pressing and holding the UP or DOWN key for longer than 2 seconds will change the target temperature by increments of 1°F/°C.

HP31005T – ROUND UNIT – SET READOUT TO SHOW OUTLET TEMPERATURE

automatically be removed.

Display Outlet Water Temperature

With the heater on, press the UP key for 2 seconds. The controller will buzz and the interface will flicker, indicating that the outlet water temperature is displayed. After 10 seconds of no operation or pressing the ON/OFF key, the unit will return to the main interface.



Heater On - Main Interface

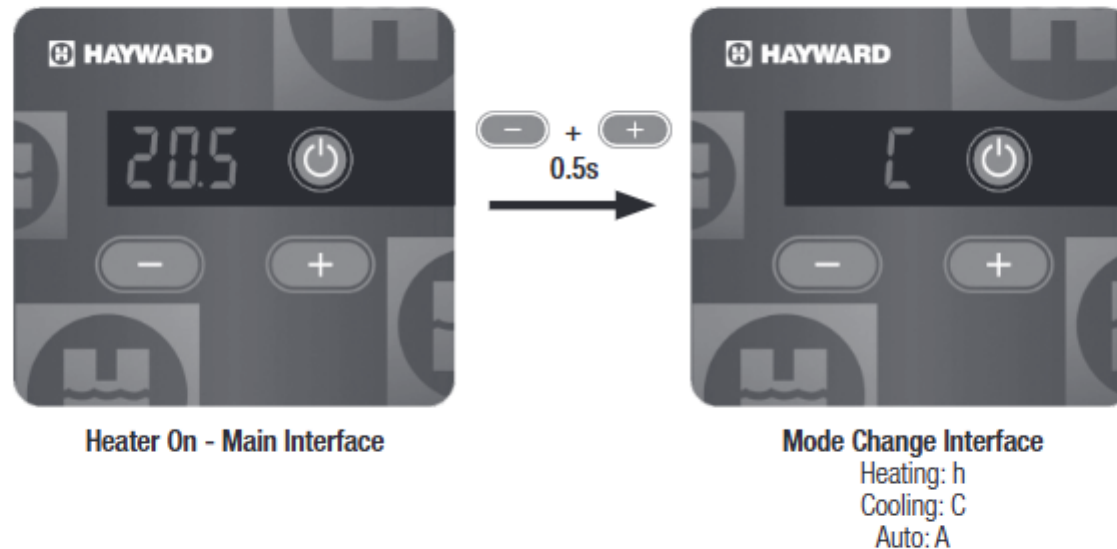


Outlet Temperature Display (flickering)

HP31005T – ROUND UNIT – CHANGING MODES

Change Heating/Cooling Mode

With the heater on, press and hold the UP and DOWN keys for 0.5 seconds to set the mode. Press the UP or DOWN button to switch between heating (h), cooling (C) and auto mode (A). After 5 seconds of no operation, the unit will save the selected mode. Pressing the ON/OFF key will NOT save the selected mode, but will return to the main interface.



Heating Mode: The unit will turn on whenever the actual water temperature drops below the target temperature.

Cooling Mode: The unit will turn on whenever the actual water temperature rises above the target temperature.

Auto Mode: The unit will turn on whenever the actual water temperature drops below OR rises above the target temperature.

HP31005T – ROUND UNIT - ACCESS SERVICE MENU

1. Press and hold the plus and minus keys for 10 seconds.
2. You will see 000, now it is waiting for a password.
3. Enter password "066."
4. Press the plus and minus buttons together for 1 second to enter.
5. Now cycle to any sub-menu. Example, "F" – fan.
6. Press plus and minus buttons together for 1 second to confirm and enter the sub-menu.
7. Now use plus or minus buttons to scroll/change options. Press and hold plus and minus key together to confirm selection.
8. Press the ON/OFF key to exit service menu.

SUBMENUS

F – Fan
U – Model Selection
D – Defrost settings
E – EEV Settings
H – Compressor Settings
R – Temperature Limits

HP31005T – ROUND UNIT – OWNER LOCKOUT FEATURE



Interface Lock

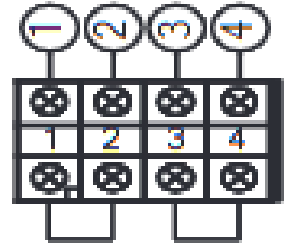
To avoid user errors, the interface can be locked after changing settings. From the main interface, press the ON/OFF key for 5 seconds until the controller buzzes. The interface is now locked. Repeat this operation to unlock the interface. NOTE: when the unit is displaying an error code, the interface lock will automatically be removed.

HP31005T – ROUND UNIT – BYPASS MODE INTRO

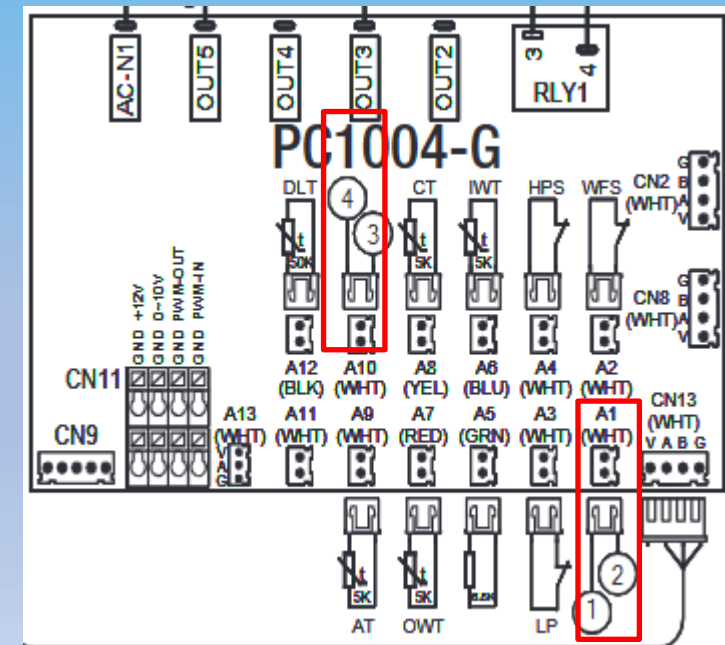
Bypass Operation

The heat pump may be controlled by a remote SWITCH OR THERMOSTAT.

1. Connect the bypass switch or remote t-stat to remote terminals 1-2 for heat. For cool, 3-4 are used.
2. Set the unit to bypass operation mode. See next few slides.

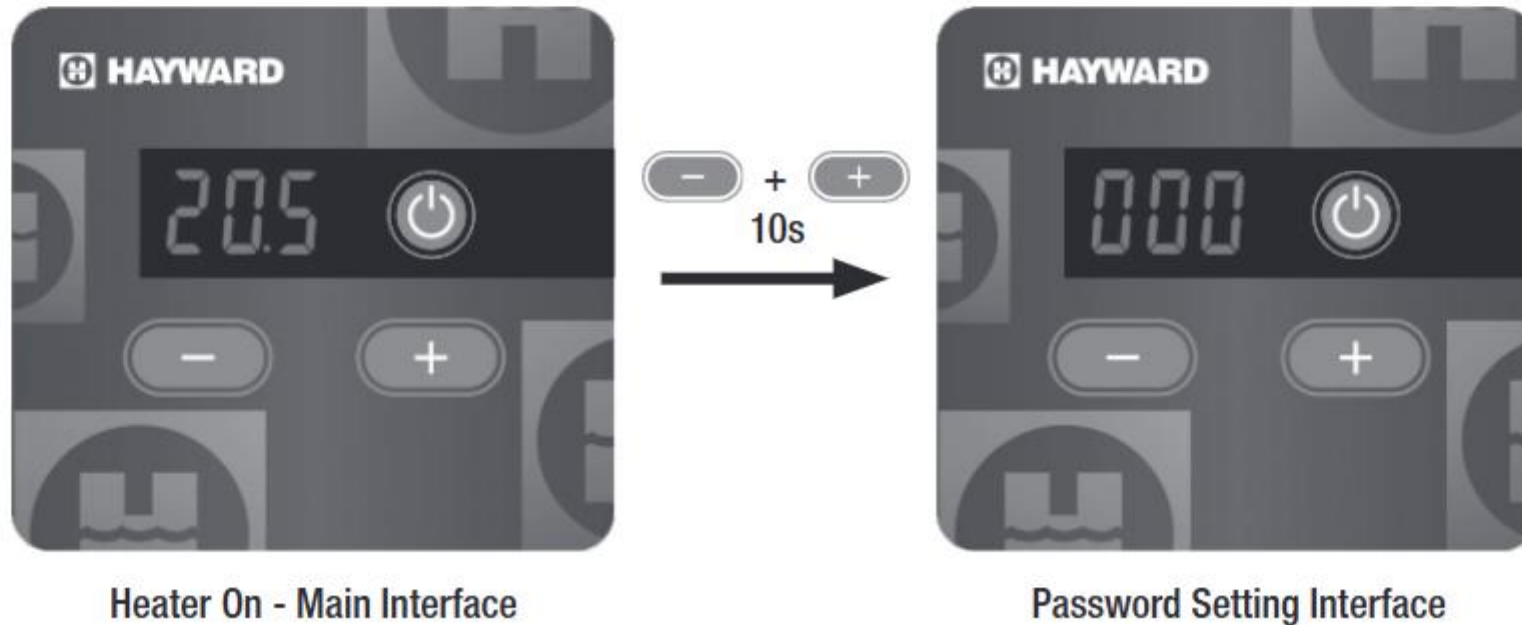


BO HE BO CO L



HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 2

1. From the main interface, press and hold the UP and DOWN keys for 10 seconds to enter the password setting interface.



HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 3

2. Use the UP and DOWN keys to set the password to "022". Wait 2 seconds for the password to save and enter the user setting interface.



Password Setting Interface
(Password "022" entered)

Wait 2s
→



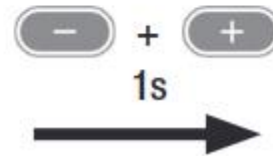
User Setting Interface

HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 4

3. Use the UP and DOWN keys to select the parameter "b". Press and hold the UP and DOWN keys for 1 second to enter the bypass operation setting interface.



User Setting Interface
(Parameter "b" selected)



Bypass Operation Setting Interface

HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 5

4. Use the UP and DOWN keys to select bypass operation mode “0” (bypass operation disabled) or “1” (bypass operation enabled). Once the desired mode is selected, wait 2 seconds for the selection to be saved. NOTE: when bypass operation is enabled, the main interface will display “bo” and no heater operation will occur until bypass operation is disabled. Parameter settings can still be changed.



Bypass Operation Setting Interface

0: Bypass Operation Disabled
1: Bypass Operation Enabled

Wait 2s
→



Main Interface - Bypass Operation

HP31005T – ROUND UNIT – BYPASS MODE INSTRUCTION STEP 6

4. Use the UP and DOWN keys to select bypass operation mode “0” (bypass operation disabled) or “1” (bypass operation enabled). Once the desired mode is selected, wait 2 seconds for the selection to be saved. NOTE: when bypass operation is enabled, the main interface will display “bo” and no heater operation will occur until bypass operation is disabled. Parameter settings can still be changed.



Bypass Operation Setting Interface

0: Bypass Operation Disabled
1: Bypass Operation Enabled

Wait 2s
→



Main Interface - Bypass Operation

HP31005T – ROUND UNIT – OMNI CONTROL

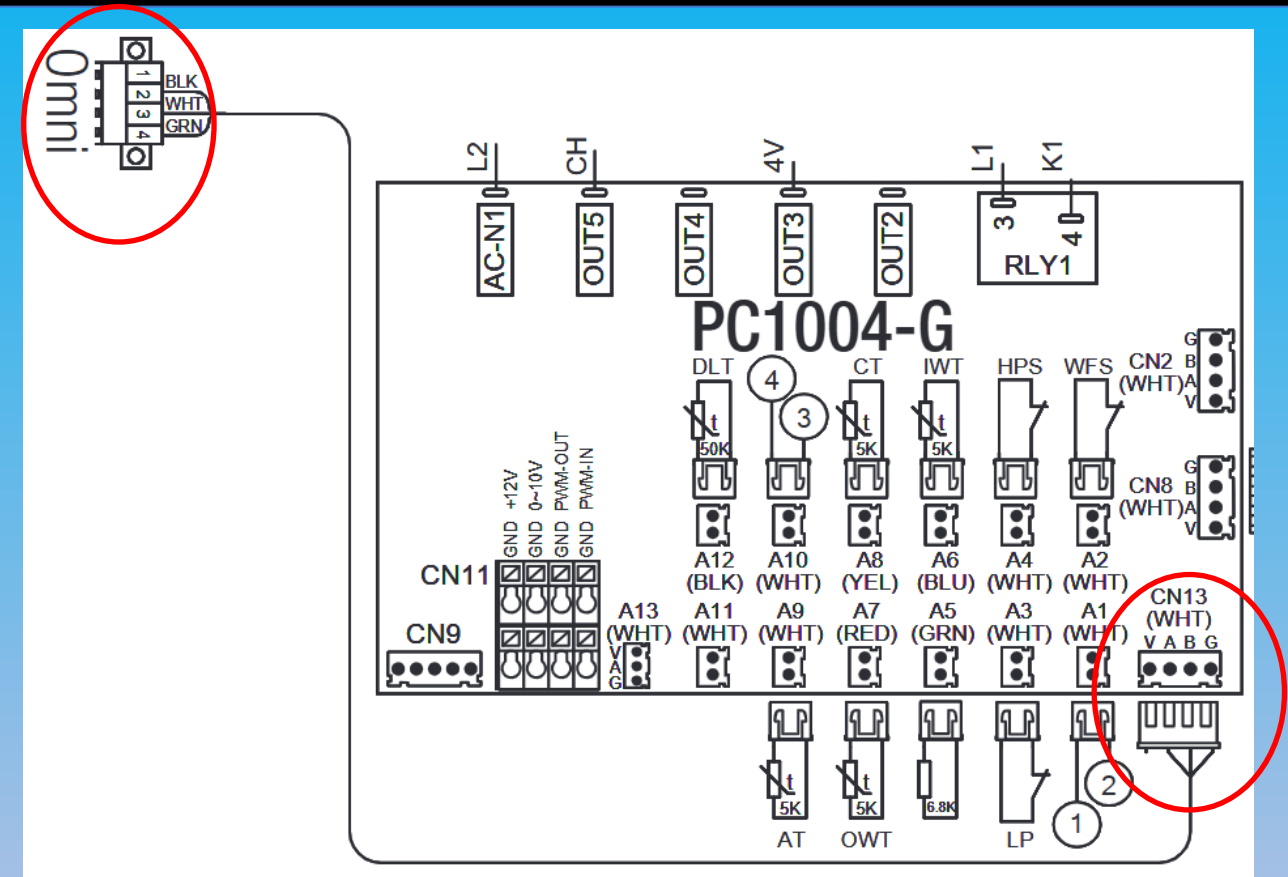
Omni Control

After the Omni system is successfully connected, "rC" is displayed on the heater interface and no manual operations can be performed. When the Omni system is disconnected, the heater will return to manual control. NOTE: If a fault occurs, the error code will be displayed on the heater interface and no operations can be performed. If the fault is cleared, the heater interface will return to the "rC" display.



Remote Control Interface
(Only displayed when connected
to an Omni Control system)

OMNILOGIC side



BOARD SIDE

HP31005T – ROUND UNIT - ERROR CODES SUMMARY



Error codes will be displayed on the controller interface as shown. Refer to TABLE 6 and TABLE 7 below for error code meanings and solutions.



TABLE 6: Electronic Control Fault Error Codes

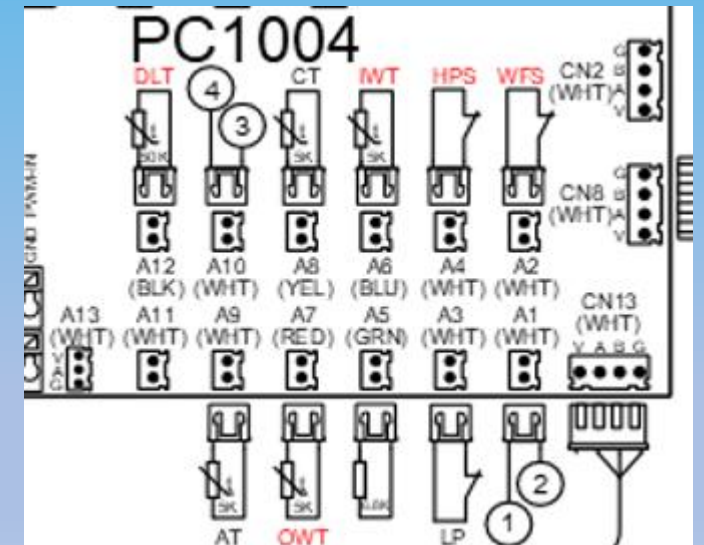
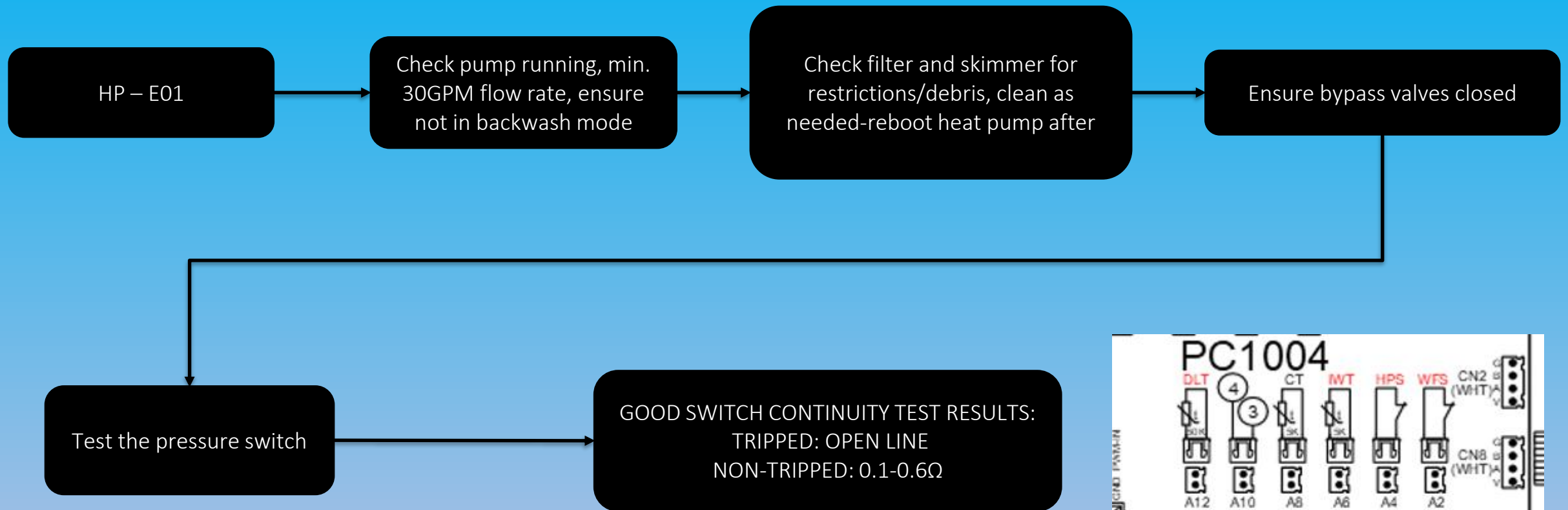
Protection/Fault	Code	Reason	Solution
Inlet Temp. Sensor Fault	P01	Temp. sensor broken or short circuit	Check or change the temp. sensor
Outlet Temp. Sensor Fault	P02	Temp. sensor broken or short circuit	Check or change the temp. sensor
Ambient Temp. Sensor Fault	P04	Temp. sensor broken or short circuit	Check or change the temp. sensor
Coil 1 Temp. Sensor Fault	P05	Temp. sensor broken or short circuit	Check or change the temp. sensor
Coil 2 Temp. Sensor Fault	P15	Temp. sensor broken or short circuit	Check or change the temp. sensor
Suction Temp. Sensor Fault	P07	Temp. sensor broken or short circuit	Check or change the temp. sensor
Discharge Temp. Sensor Fault	P081	Temp. sensor broken or short circuit	Check or change the temp. sensor
Exhaust Air Over Temp. Prot.	P082	Compressor overloaded	Check if the compressor is running normally
Antifreeze Temp. Sensor Fault	P09	Antifreeze temp. sensor is broken or short circuit	Check or change the temp. sensor
Pressure Sensor Fault	PP	Pressure sensor is broken	Check or change the pressure sensor
High Pressure Prot.	E01	High pressure switch is broken	Check the pressure switch and cold circuit
Low Pressure Prot.	E02	Low pressure protection	Check the pressure switch and cold circuit
Flow Switch Prot.	E03	No/Little water in water system	Check the water flow and water pump
Waterway Antifreeze Prot.	E05	Water temp. or ambient temp. too low	Check if water & ambient temp. are too low
Inlet & Outlet Temp. Too High	E06	Water flow too low and low differential pressure	Check the water flow and if system is jammed
Antifreeze Prot.	E07	Water flow too low	Check the water flow and if system is jammed
Primary Antifreeze Prot.	E19	Ambient temp. too low	Check if ambient temp. is too low
Secondary Antifreeze Prot.	E29	Ambient temp. too low	Check if ambient temp. is too low
Comp. Overcurrent Prot.	E051	Compressor overloaded	Check if the compressor is running normally
Communication Fault	E08	Comm. failure between controller and main board	Check connection between controller and main board
Communication Fault (Speed Control Module)	E081	Comm. failure between speed control module and main board	Check connection between speed control module and main board
Low AT Protection	TP	Ambient temp. too low	Check if ambient temp. is too low
EC Fan Feedback Fault	F51	Fan motor issue caused fan motor to stop running	Check if fan motor is broken or locked
Fan Motor 1 Fault	F31	1. Motor is in locked rotor state 2. Wire connection between DC fan motor module and fan motor is in bad contact	1. Install a new fan motor 2. Check the wire connection and make sure they are in good contact
Fan Motor 2 Fault	F32	1. Motor is in locked rotor state 2. Wire connection between DC fan motor module and fan motor is in bad contact	1. Install a new fan motor 2. Check the wire connection and make sure they are in good contact



TABLE 7: Frequency Conversion Board Fault Error Codes

Protection/Fault	Code	Reason	Solution
DRV1 MOP Alarm	F01	MOP drive alarm	Recovery after 150s
Inverter Offline	F02	Communication failure between conversion board and main board	Check communication connection
IPM Protection	F03	IPM modular protection	Recovery after 150s
Comp. Driver Failure	F04	Lack of phase, step or drive hardware damage	Check voltage and frequency conversion board hardware
DC Fan Fault	F05	Motor current feedback open or short circuit	Check if current return wires are connected to motor
IPM Overcurrent	F06	IPM input current to high	Check and adjust the current
Inv. DC Overvoltage	F07	DC bus voltage too high	Check input voltage
Inv. DC Undervoltage	F08	DC bus voltage too low	Check input voltage
Inv. Input Undervoltage	F09	Input voltage too low; Input current too high	Check input voltage
Inv. Input Overvoltage	F010	Input voltage too high (greater than outage protection current RMS)	Check input voltage
Inv. Sampling Voltage	F011	Input voltage sampling fault	Check and adjust the current
Comm. Err DSP-PFC	F012	DSP and PFC connection fault	Check communication connection
Input Overcurrent	F26	Equipment load is too large	Check if unit is overloaded
PFC Fault	F27	PFC circuit protection	Check if the PFC switch tube is short circuited
IPM Overheating	F15	IPM module overheat	Check and adjust the current
Weak Magnetic Warn	F16	Compressor magnetic force too low	Restart the unit after multiple power failures. If fault continues, replace the compressor.
Inv. Input Out Phase	F17	Input voltage lost phase	Check and adjust the voltage
IPM Sampling Current	F18	IPM sampling electricity fault	Check and adjust the current
Inv. Temp. Probe Fail	F19	Sensor short circuit or open circuit	Inspect and replace the sensor
Inv. Overheating	F20	Transducer overheat	Check and adjust the current
Inv. Overheating Warning	F22	Transducer temperature too high	Check and adjust the current
Comp. Overcurrent Warning	F23	Compressor current too high	Check and adjust the current
Input Overcurrent Warning	F24	Input current too high	Check and adjust the current
EEPROM Overcurrent Warning	F25	MCU error	Check if the chip is damaged and replace if necessary
V15V Over/Undervoltage Fault	F28	V15V is overloaded or undervoltage	Check the V15V input voltage (range: 13.5V to 16.5V)

HP31005T - "E01" – HIGH PRESSURE SWITCH – FLOW CHART



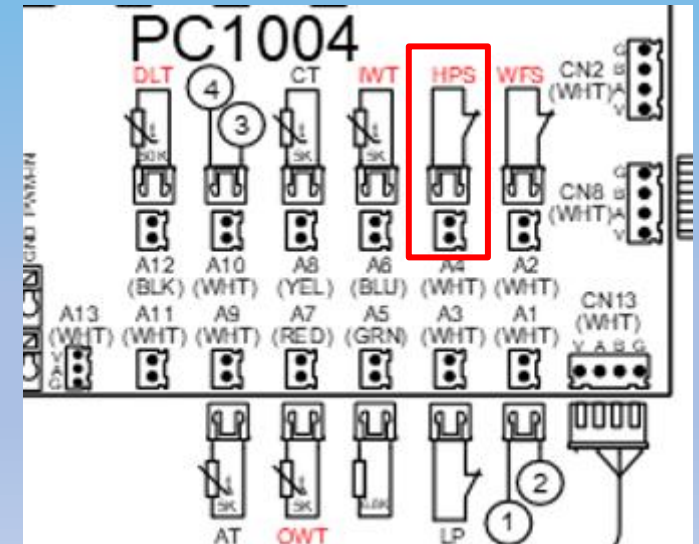
HP31005T-“E01” – HIGH PRESSURE SWITCH - TROUBLESHOOTING



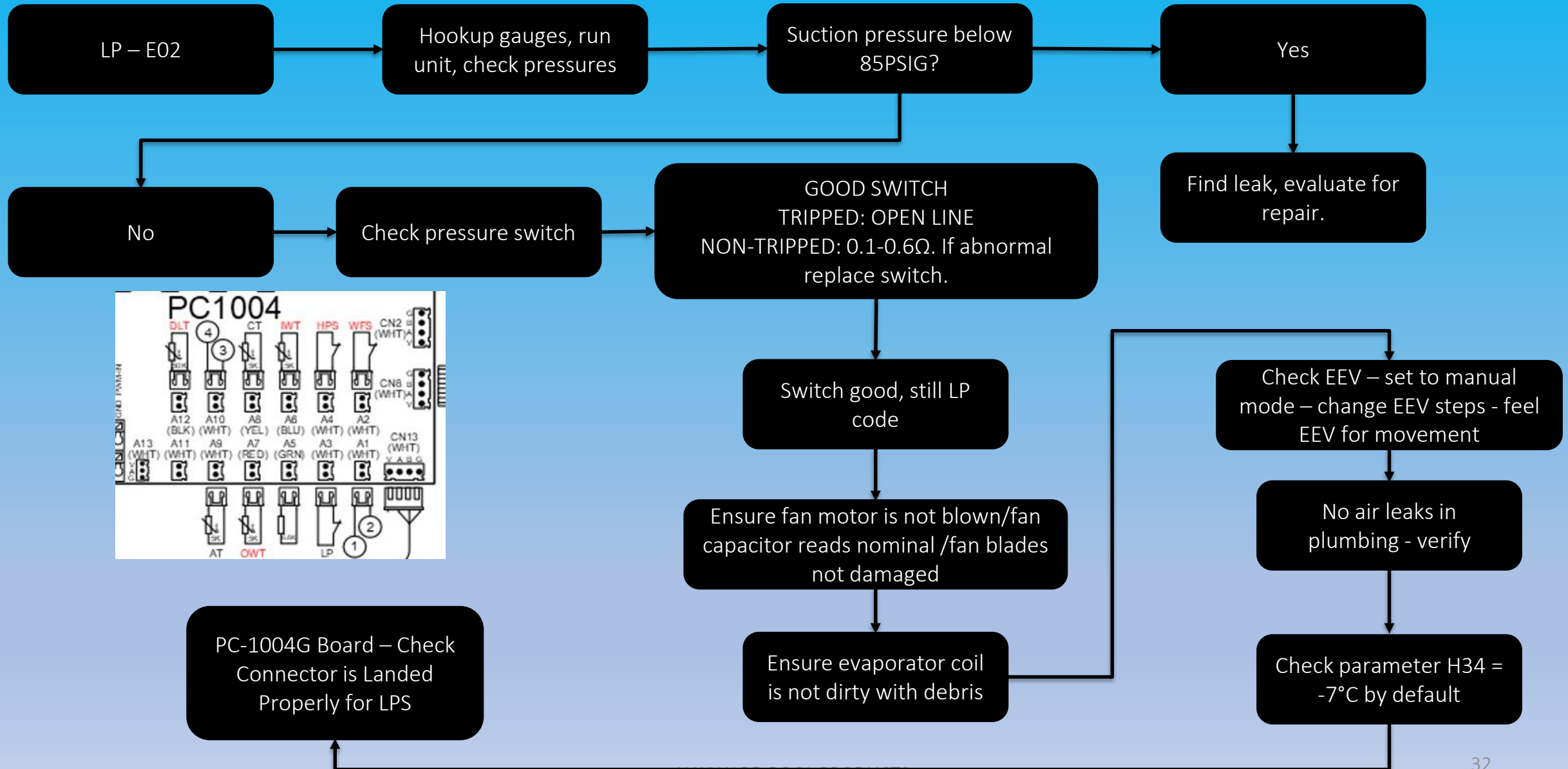
1. Water circulation pump not on.
2. Insufficient water flow.
3. External bypass open.
4. Bad switch: If you already determined the switch is good check board.
5. Bad board: See below

Board Test: You can jump the LP port, then navigate to parameter S02 to see if the board registers closed (CL).

After short connect the port:
PCB normal: Parameter S02 show CL(Close).
PCB failure: Parameter S02 show OP(Open).



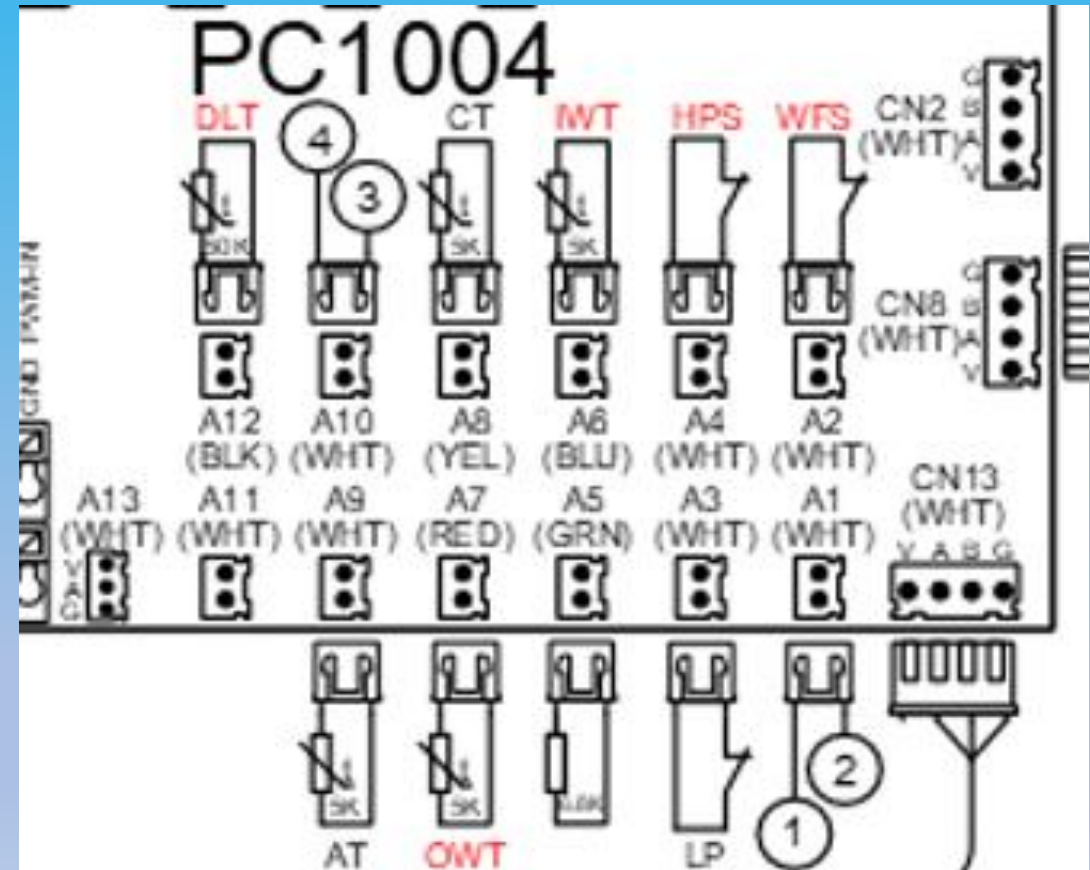
HP31005T-“E02” – LOW PRESSURE SWITCH – FLOW CHART



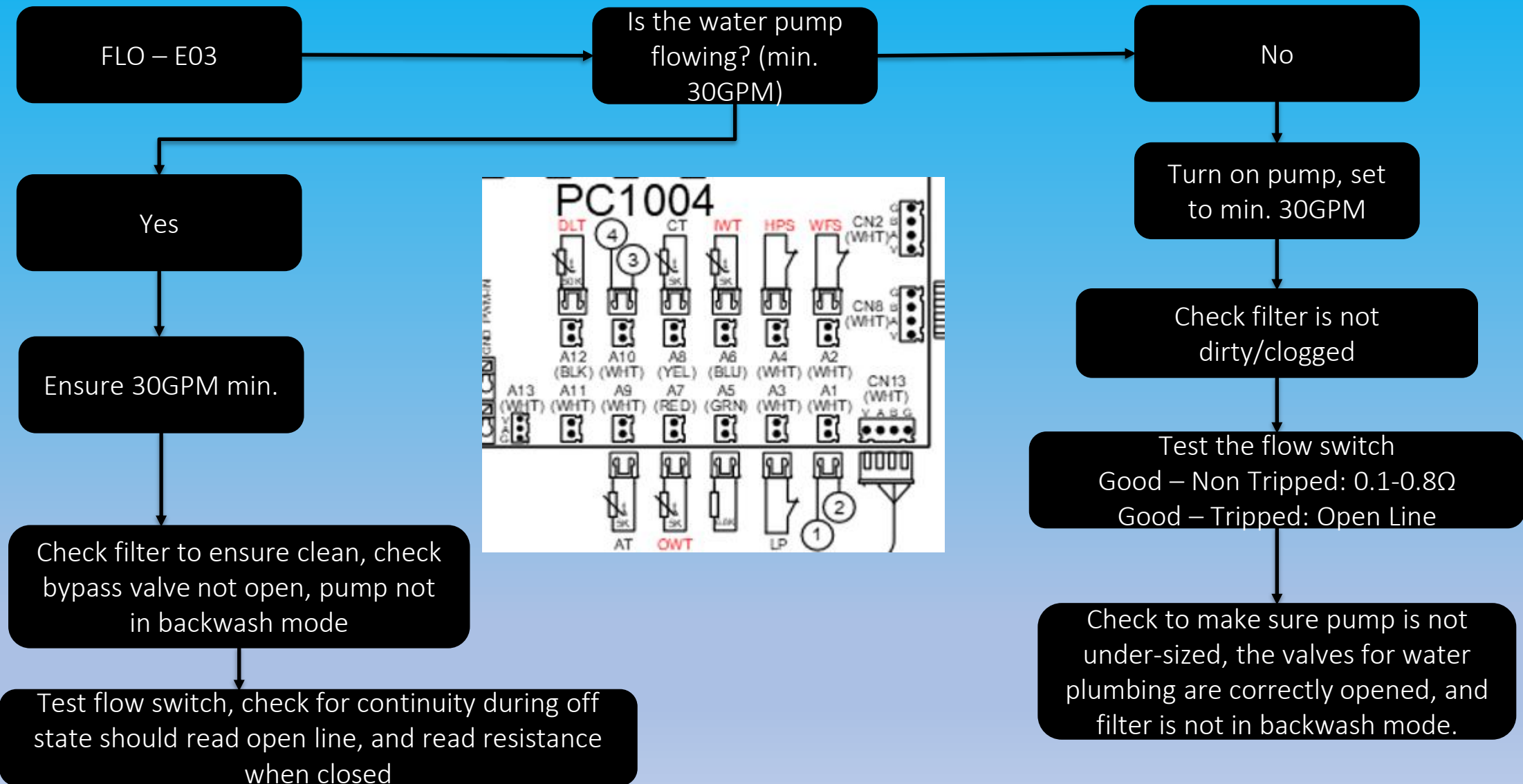
HP31005T- “E02” – LOW PRESSURE SWITCH - TROUBLESHOOTING



1. Evaporator coil is dirty.
2. Fan motor not operational/off.
3. Low refrigerant pressure due to leaks.
4. Defective low-pressure switch.
5. Low outdoor temperature (below 50°F).
6. Check parameter H34, default setting is -7°C.

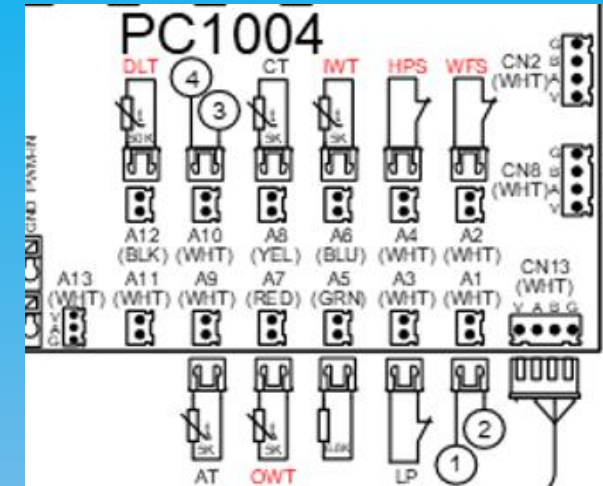


HP31005T-“E03” – WATER FLOW SWITCH – FLOW CHART



HP31005T- “E03” – WATER FLOW SWITCH - TROUBLESHOOTING

1. Check for flow of water.
2. Check for clogs/restrictions in water lines.
3. Check for air leaks in piping causing shortage of water to pump.
4. Undersized water pumps can cause the flow switch to not close.
5. Bypass valves to heat pump must be closed.
6. Filter may be stuck in backwash mode.
7. Maybe the water flow switch is bad, test it via continuity test.



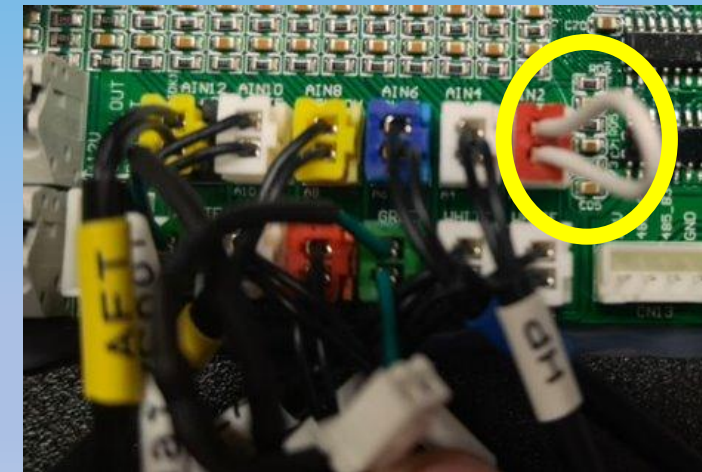
How do I verify the PC1004-G board is not the root cause?

You can unplug the flow switch and SHORT the port using a jumper then check parameter S03.

After causing a short , navigate to the “S” submenu and check S03 parameter.

PCB normal: Parameter S03 show CL(Close). (ideal cause you shorted it)

PCB failure: Parameter S03 show OP(Open), board failed, replace PC1004-G board



HP31005T-TROUBLESHOOTING THERMISTORS PART I

The charts shall be provided on next slides for the 5k Ω and 50k Ω thermistors.

P01: Water inlet thermistor 5k Ω

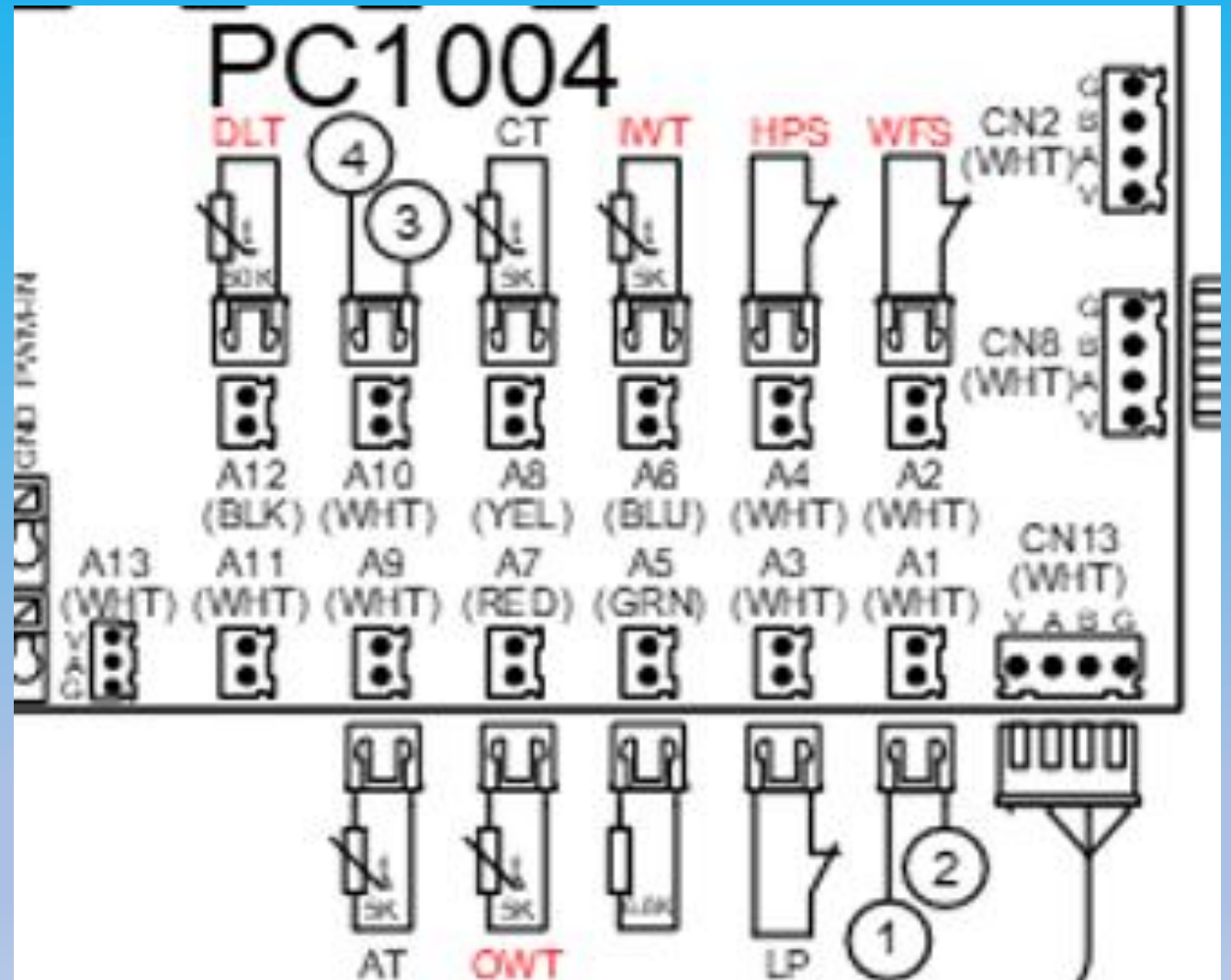
P02: Water outlet thermistor 5k Ω

P04: Ambient thermistor 5k Ω

P05: Coil (defrost) thermistor 5k Ω

P07: Suction line thermistor 6.8k Ω

P081: Discharge line thermistor 50k Ω



HP31005T-TROUBLESHOOTING THERMISTORS PART 2

The charts shall be provided on next slides for the 5k Ω and 50k Ω thermistors.

P01: Water inlet thermistor 5k Ω

P02: Water outlet thermistor 5k Ω

P04: Ambient thermistor 5k Ω

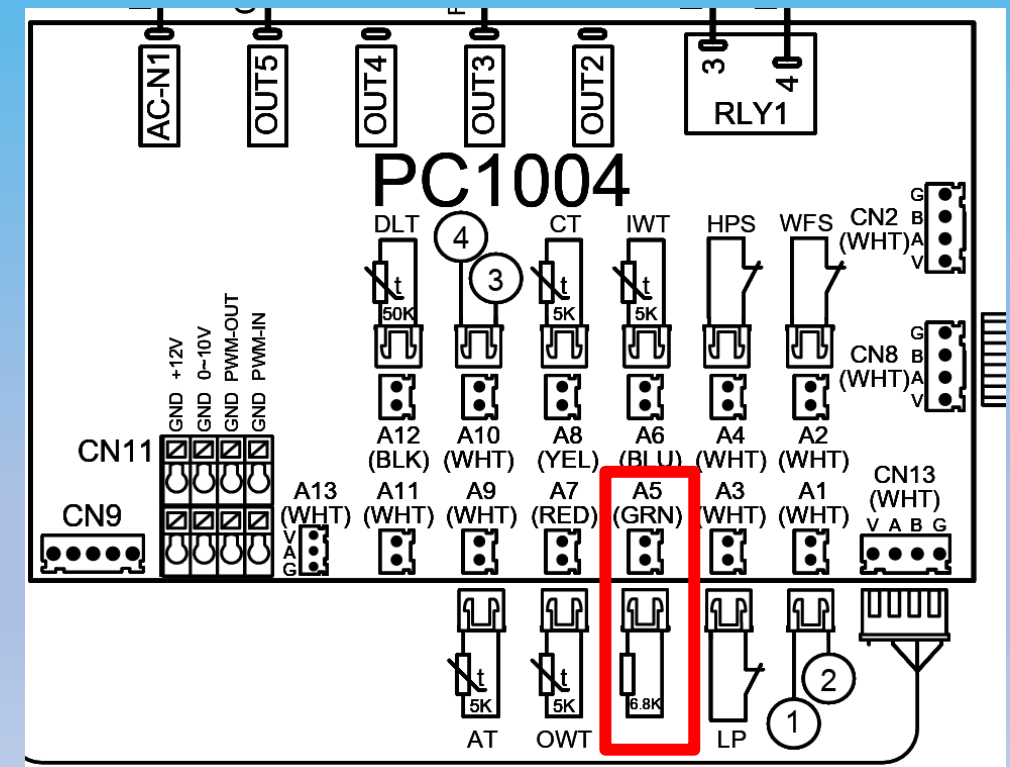
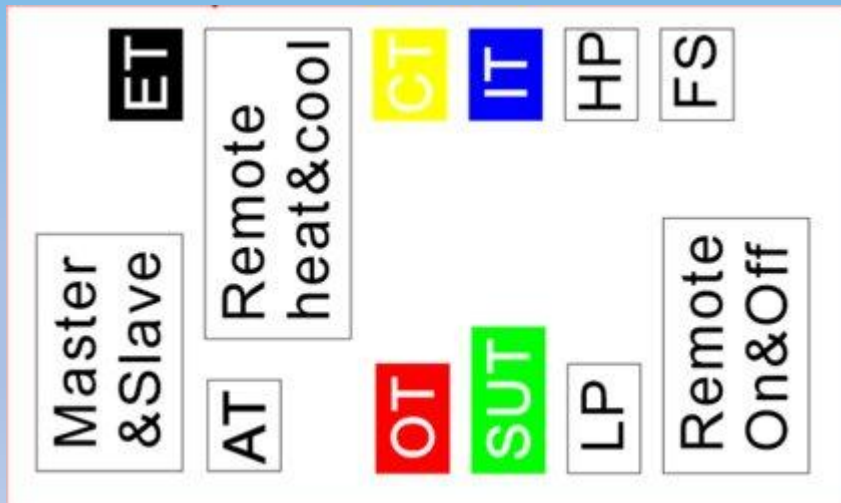
P05: Coil (defrost) thermistor 5k Ω

P07: Suction line thermistor 6.8k Ω

P081: Discharge line thermistor 50k Ω

Thermistor Code?

Check it's plugged securely



HP31005T- THERMISTOR CHARTS – PART 3 – 50kΩ

B25/50=3950K±2%, R25=50kΩ±3%

(°C)	Rmax	Rnor	Rmin	(°C)	Rmax	Rnor	Rmin	(°C)	Rmax	Rnor	Rmin
-30.0	959.307	876.519	793.732	3.0	147.784	140.445	133.106	36.0	32.526	31.279	30.031
-29.0	900.972	824.329	747.685	4.0	140.448	133.613	126.778	37.0	31.240	30.017	28.794
-28.0	846.525	775.549	704.573	5.0	133.516	127.150	120.784	38.0	30.012	28.813	27.614
-27.0	795.690	729.943	664.197	6.0	126.964	121.035	115.106	39.0	28.838	27.663	26.488
-26.0	748.210	687.290	626.370	7.0	120.770	115.248	109.726	40.0	27.717	26.566	25.415
-25.0	703.847	647.383	590.919	8.0	114.911	109.768	104.626	41.0	26.644	25.517	24.390
-24.0	662.381	610.032	557.684	9.0	109.367	104.578	99.789	42.0	25.619	24.516	23.412
-23.0	623.606	575.060	526.513	10.0	104.122	99.662	95.203	43.0	24.640	23.560	22.479
-22.0	587.335	542.302	497.269	11.0	99.156	95.003	90.851	44.0	23.703	22.646	21.588
-21.0	553.392	511.607	469.823	12.0	94.454	90.588	86.722	45.0	22.806	21.772	20.737
-20.0	521.614	482.833	444.053	13.0	90.000	86.401	82.802	46.0	21.948	20.936	19.924
-19.0	491.851	455.850	419.848	14.0	85.780	82.430	79.080	47.0	21.127	20.137	19.147
-18.0	463.965	430.536	397.107	15.0	81.781	78.663	75.545	48.0	20.341	19.373	18.405
-17.0	437.827	406.779	375.731	16.0	77.990	75.088	72.187	49.0	19.588	18.641	17.694
-16.0	413.318	384.474	355.631	17.0	74.395	71.695	68.996	50.0	18.867	17.942	17.016
-15.0	390.324	363.523	336.722	18.0	70.985	68.474	65.964	51.0	18.177	17.272	16.366
-14.0	368.747	343.838	318.930	19.0	67.750	65.416	63.081	52.0	17.515	16.630	15.746
-13.0	348.489	325.335	302.180	20.0	64.680	62.510	60.339	53.0	16.881	16.016	15.151
-12.0	329.461	307.934	286.406	21.0	61.766	59.749	57.731	54.0	16.274	15.429	14.583
-11.0	311.585	291.566	271.547	22.0	58.998	57.124	55.249	55.0	15.691	14.865	14.038
-10.0	294.781	276.162	257.542	23.0	56.369	54.629	52.888	56.0	15.133	14.325	13.518
-9.0	278.980	261.660	244.340	24.0	53.873	52.257	50.640	57.0	14.596	13.807	13.018
-8.0	264.118	248.003	231.889	25.0	51.500	50.000	48.500	58.0	14.081	13.311	12.540
-7.0	250.132	235.137	220.142	26.0	49.332	47.853	46.373	59.0	13.587	12.834	12.081
-6.0	236.966	223.011	209.056	27.0	47.268	45.810	44.351	60.0	13.114	12.378	11.642
-5.0	224.567	211.578	198.590	28.0	45.302	43.865	42.428	61.0	12.658	11.940	11.221
-4.0	212.887	200.796	188.706	29.0	43.427	42.013	40.598	62.0	12.221	11.519	10.817
-3.0	201.879	190.624	179.368	30.0	41.641	40.250	38.858	63.0	11.802	11.116	10.430
-2.0	191.502	181.023	170.543	31.0	39.938	38.570	37.202	64.0	11.398	10.728	10.058
-1.0	181.716	171.959	162.201	32.0	38.313	36.969	35.625	65.0	11.010	10.356	9.701
0.0	172.485	163.399	154.312	33.0	36.763	35.443	34.123	66.0	10.638	9.998	9.359
1.0	163.773	155.312	146.850	34.0	35.285	33.989	32.693	67.0	10.279	9.655	9.030
2.0	155.549	147.669	139.789	35.0	33.873	32.602	31.330	68.0	9.934	9.324	8.714

This chart is for a 5kΩ thermistor.

For example, the ambient thermistor, if you measure the ambient thermistor resistance you can see if it falls within Rmin and Rmax resistance.

The Rmin and Rmax are the tolerance bounds, as long as the resistance falls in that bound, the thermistor is good.

Thermistor Code?

Check it's plugged securely – done – code still there

Unplug it from board, test the resistance and compare. See next slides for Resistance v Temps. Be within 2%.

P01: Water inlet thermistor 5kΩ
P02: Water outlet thermistor 5kΩ
P04: Ambient thermistor 5kΩ
P05: Coil (defrost) thermistor 5kΩ
P07: Suction line thermistor 6.8kΩ
P081: Discharge line thermistor 50kΩ

HP31005T- THERMISTOR CHARTS – PART 3 – 5kΩ

B25/50=3470K±1%, R25=5kΩ±1%

(°C)	Rmax	Rnor	Rmin	(°C)	Rmax	Rnor	Rmin	(°C)	Rmax	Rnor	Rmin
-30	66.740	64.104	61.468	3	12.681	12.422	12.163	36	3.362	3.313	3.264
-29	63.118	60.666	58.214	4	12.126	11.885	11.644	37	3.244	3.195	3.146
-28	59.694	57.413	55.132	5	11.600	11.375	11.150	38	3.130	3.082	3.034
-27	56.477	54.355	52.233	6	11.099	10.889	10.679	39	3.022	2.974	2.926
-26	53.454	51.480	49.506	7	10.623	10.428	10.233	40	2.917	2.870	2.823
-25	50.614	48.776	46.938	8	10.170	9.988	9.806	41	2.817	2.770	2.723
-24	47.943	46.232	44.521	9	9.740	9.570	9.400	42	2.721	2.675	2.629
-23	45.429	43.836	42.243	10	9.330	9.172	9.014	43	2.629	2.583	2.537
-22	43.065	41.581	40.097	11	8.939	8.792	8.645	44	2.539	2.494	2.449
-21	40.838	39.456	38.074	12	8.568	8.431	8.294	45	2.455	2.410	2.365
-20	38.761	37.473	36.185	13	8.214	8.087	7.960	46	2.372	2.328	2.284
-19	36.765	35.565	34.365	14	7.876	7.758	7.640	47	2.294	2.250	2.206
-18	34.903	33.785	32.667	15	7.555	7.445	7.335	48	2.217	2.174	2.131
-17	33.147	32.105	31.063	16	7.249	7.147	7.045	49	2.144	2.102	2.060
-16	31.492	30.520	29.548	17	6.956	6.862	6.768	50	2.074	2.032	1.990
-15	29.929	29.023	28.117	18	6.677	6.590	6.503	51	2.006	1.965	1.924
-14	28.454	27.609	26.764	19	6.412	6.331	6.250	52	1.942	1.901	1.860
-13	27.061	26.273	25.485	20	6.158	6.083	6.008	53	1.879	1.839	1.799
-12	25.745	25.010	24.275	21	5.915	5.846	5.777	54	1.818	1.779	1.740
-11	24.501	23.816	23.131	22	5.684	5.620	5.556	55	1.760	1.721	1.682
-10	23.326	22.687	22.048	23	5.463	5.404	5.345	56	1.704	1.666	1.628
-9	22.214	21.618	21.022	24	5.252	5.198	5.144	57	1.650	1.613	1.576
-8	21.164	20.607	20.050	25	5.050	5.000	4.950	58	1.599	1.562	1.525
-7	20.168	19.649	19.130	26	4.861	4.811	4.761	59	1.548	1.512	1.476
-6	19.226	18.742	18.258	27	4.680	4.630	4.580	60	1.501	1.465	1.429
-5	18.335	17.883	17.431	28	4.508	4.457	4.406	61	1.454	1.419	1.384
-4	17.490	17.068	16.646	29	4.343	4.292	4.241	62	1.408	1.374	1.340
-3	16.689	16.296	15.903	30	4.184	4.133	4.082	63	1.366	1.332	1.298
-2	15.930	15.563	15.196	31	4.032	3.982	3.932	64	1.324	1.291	1.258
-1	15.210	14.868	14.526	32	3.886	3.836	3.786	65	1.284	1.251	1.218
0	14.591	14.270	13.949	33	3.747	3.697	3.647	66	1.245	1.213	1.181
1	13.880	13.582	13.284	34	3.614	3.564	3.514	67	1.208	1.176	1.144
2	13.265	12.987	12.709	35	3.486	3.436	3.386	68	1.171	1.140	1.109

This chart is for a 5kΩ thermistor.
For example, the coil thermistor, if you measure the coil thermistor resistance you can see if it falls within Rmin and Rmax resistance.

The Rmin and Rmax are the tolerance bounds, as long as the resistance falls in that bound, the thermistor is good.

Thermistor Code?

Check it's plugged
securely – done –
code still there

Unplug it from board,
test the resistance and
compare. See next slides
for Resistance v Temps.
Be within 2%.

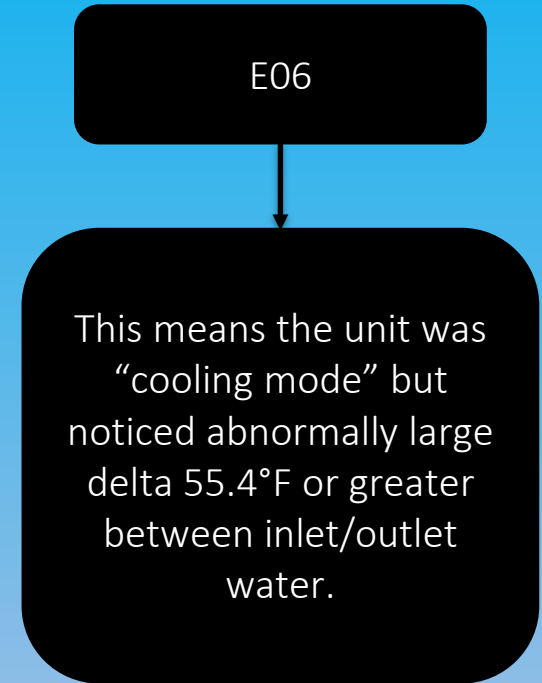
P01: Water inlet thermistor 5kΩ
P02: Water outlet thermistor 5kΩ
P04: Ambient thermistor 5kΩ
P05: Coil (defrost) thermistor 5kΩ
P07: Suction line thermistor 6.8kΩ
P081: Discharge line thermistor 50kΩ

HP31005T – “E06” ERROR CODE

If the heat pump is in **COOLING** mode, and the unit detects a temperature delta GREATER than 13°C or 55.4 °F, the E06 code triggers. It's protection due to TOO large rise in temperature.

The code clears itself, once the delta drops below 3°C or 5.4°F.

If the board senses this 13°C delta across water inlet/outlet three times in 30min, it will lock down the unit and you need to power cycle the breaker.



HP31005T – “E07” ANTIFREEZE ERROR

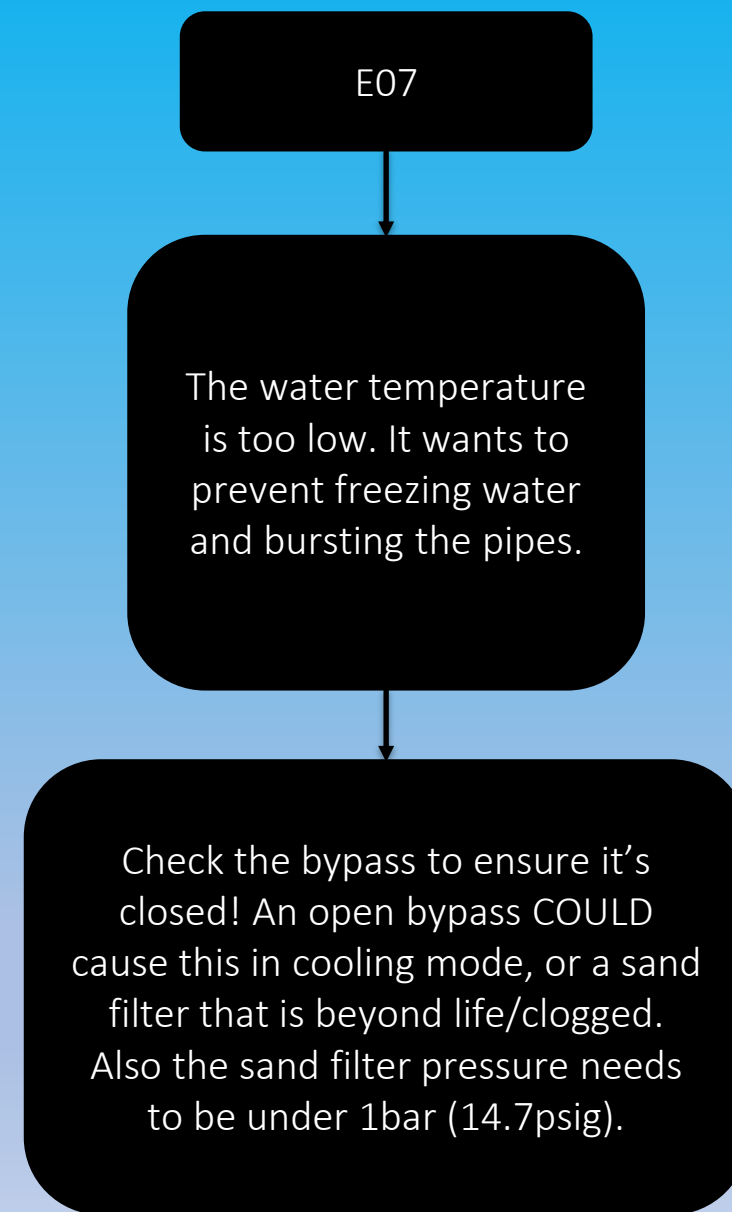
You may be wondering what this code even means?

It's a safety.

When running in COOLING mode, if the outlet water temperature drops below 4°C (39.2°F) for more than 2 seconds, fault code E07 will be shown, and unit goes into freeze protection mode.

Clear: Once the outlet water temperature is $\geq 8^{\circ}\text{C}$ (46.4°F), the code clears.

If this fault happens 3x within 30min, it locks down / shuts off unit. Only a breaker power cycle can re-boot it to remove the lockout.



HP31005T – “E019/E029” WINTER PROTECTION LEVEL 1/2

E19 – Level One Freeze Protection

First level anti-freeze has been enabled. Condition: Unit was in standby, and the DELTA across water ports was between 2°C (3.6°F) and 4°C (7.2°F) and the outdoor temp was $\leq 0^{\circ}\text{C}$ (32°F).

You can adjust the points it enters/exits this in the parameters: T02,T03,T05. T02 and T03 represent the inlet and outlet water temperature, respectively. T05 represents the outdoor ambient temperature.

First level anti-freeze enabled. It will enable the circulation pump (if you have one tied in to the control)
Once the inlet water temperature is $\geq 8^{\circ}\text{C}$ (46.4°F) or ambient outdoor temperature is $> 1^{\circ}\text{C}$ (33.8 °F), the error clears and stops the water pump.

E19 – Level Two Freeze Protection

First level anti-freeze has been enabled. Condition: Unit was in standby, and the DELTA across water ports was between 0° and 2°C (7.2°F) and the outdoor temp was $\leq 0^{\circ}\text{C}$ (32°F).

2nd level anti-freeze has been enabled. Heat Pump will **now run in heat mode to heat water temp**. Once it registers inlet water temperature $T5 \geq 15^{\circ}\text{C}$ (59°F) or ambient is $\geq 33.8^{\circ}\text{F}$, it will clear error and stop the heat pump.

HP31005T-“E08” – COMMS FAILURE BOARD AND USER DISPLAY

E08 Code – Comms Failure

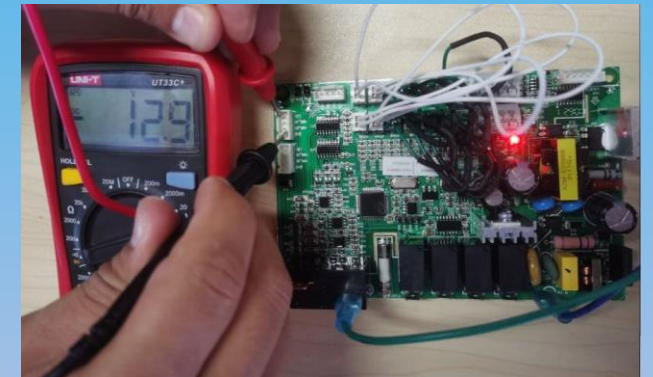
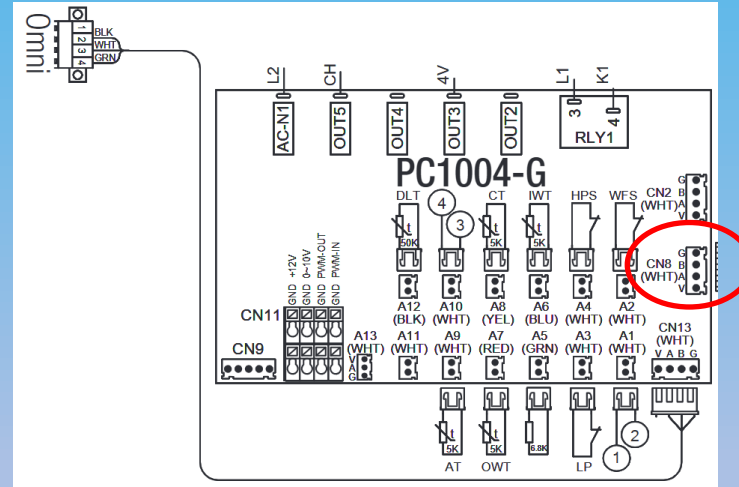
Check cable connection CN8 located on PC1004-G Board

Check if the cable is cut or damaged.

With unit idle –
measure voltage between Red 12VDC
and Black Negative:
Target ~11-14VDC.
(V and G on board) If
not right, replace
board.

Measure between yellow and
white leads on CN8 (A and B)

Red wire: 12VDC,
Black wire: Negative
Yellow wire: RS485B
White wire: RS485A



HP31005T-“E08” – COMMS FAILURE BOARD AND USER DISPLAY

E08 Code – Comms Failure

How to Check Wire Integrity
Run continuity test for each of the 4 wires: if the circuit is OPEN replace harness that goes from CN8 on board to back of display.

Replace wire if bad

Normal



Bad, Abnormal – a wire is knicked/cut/open



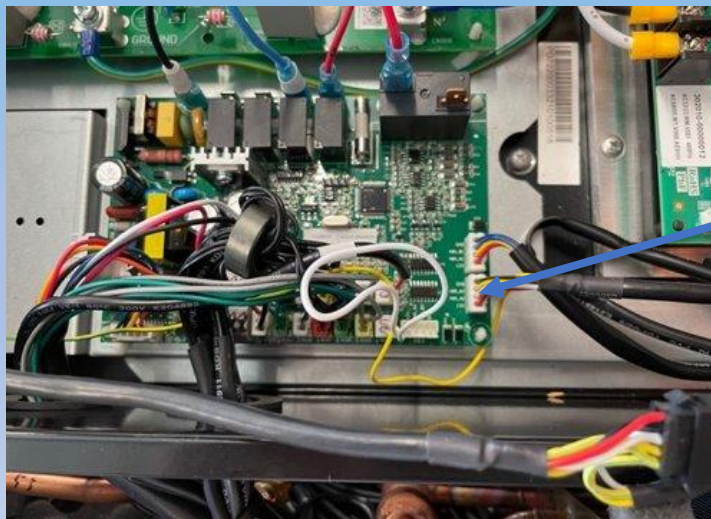
HP31005T-“E081” – COMMS FAILURE PC1004-G AND FAN INVERTER I

E081 Code – Comms Failure
PC1004-G/FAN INVERTER BOARD

Go to fan parameter, F01. Default = 3,
correct setting. Change as needed.

Proceed if issue persists

Test voltages of harness at CN8.



Red wire: 12VDC,
Black wire: Negative
Yellow wire: RS485B
White wire: RS485A

RS485 Cable

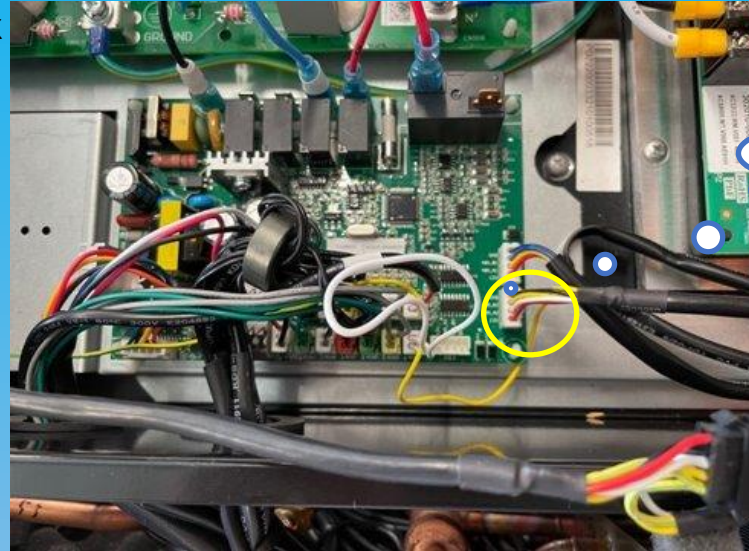


HP31005T-“E081” – COMMS FAILURE PC1004-G AND FAN INVERTER II

To test whether communication is due to the wire, or board, check voltages.

GOOD: Red/Black 11-14VDC

GOOD: Yellow/White Fluctuating 0-6VDC



Red/Black should output 11-14VDC here

Red wire: 12VDC,
Black wire: Negative
Yellow wire: RS485B
White wire: RS485A

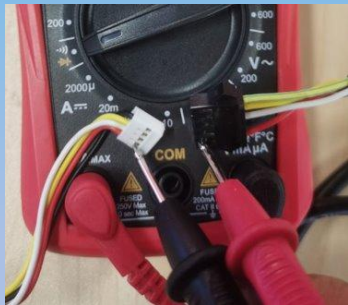


Continuity testing is also important

Good: 0.00 – 0.2 Ohm

Bad: Open Line

Check all wires on the harness for comms between fan board and PC-1004G



Yellow/White here measures a fluctuating 0-6VDC

HP31005T-"E081" – COMMS FAILURE PC1004-G AND FAN INVERTER III



A DC inverter board takes an A/C voltage and rectifies it to a DC output.
A failed board can cause fan motor to stop working.
To root out the inverter board, measure the following below:
You can leave the power dongle plugged in.



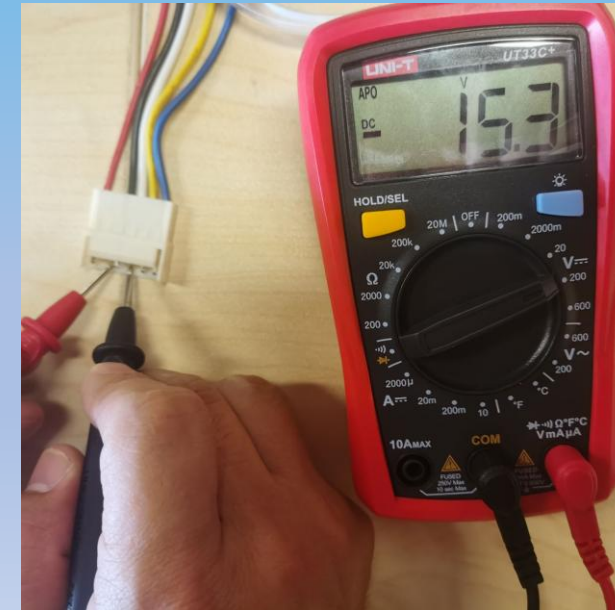
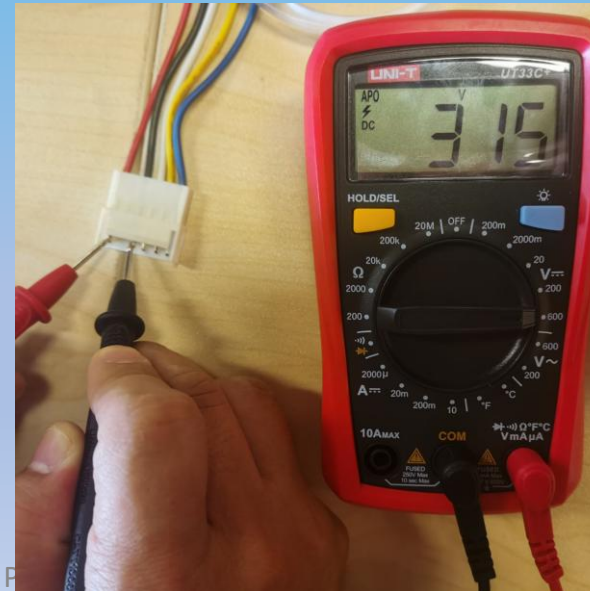
SHOULD
MEASURE
230V AC
HERE.

Good: Yellow/Black 0-6VDC

Good: Red/Black
310-380VDC

Black/White: 15VDC

DC
VOLTAGE
TESTING
HERE



HP31005T-“PP” – PRESSURE SENSOR FAILURE



THE PRESSURE SENSOR TAKES A PRESSURE, CONVERTS TO VOLTAGE, AND OUTPUTS IT TO THE BOARD, WHICH THEN READS YOU THE PRESSURE. IF YOU SEE A PP ERROR CODE, CHECK THE PARAMETER FIRST.

PP CODE

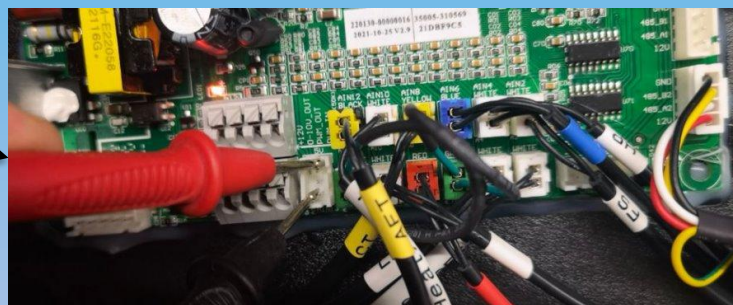
Parameter setting H38: Default is 1, enabled. Ensure not set to 0.

Hold UP and DOWN arrow together, 5 sec. Now navigate to “66”, press enter. Press up or down, navigate to “H” sub-menu, press and hold UP and DOWN for 0.5sec to enter into H menu, then scroll to H38, set to 1. If already set, ignore. To exit, press on/off key and return to main screen

Measure PC1004-G board output for pressure sensor to check if board is okay.

If 0V, replace board

Check pressure switch for open line



Good,
small
resistance



Bad, open
line, pressure
switch bad



Good
5VDC

51300081701 RevF

- Service Parts**
SKU: HP31005T



HP31005T – CLOSE-UP OVERVIEW PC-1004G

This is the main control board – model PC-1004G – Found on all PHNIX heat pumps

Fan Inverter Board



HP31005T – TEST PC-1004G BOARD

How to Test Board Output: Test CN8

Put your meter to DC, set leads on 12v-GND,
Good: ~11-14VDC.

Test between the two RS485 pins, Good: ~0-6VDC
fluctuating is normal

How to Test Board Output: Test CN2

Put your meter to DC, set leads on 12v-GND,
Good: ~11-14VDC.

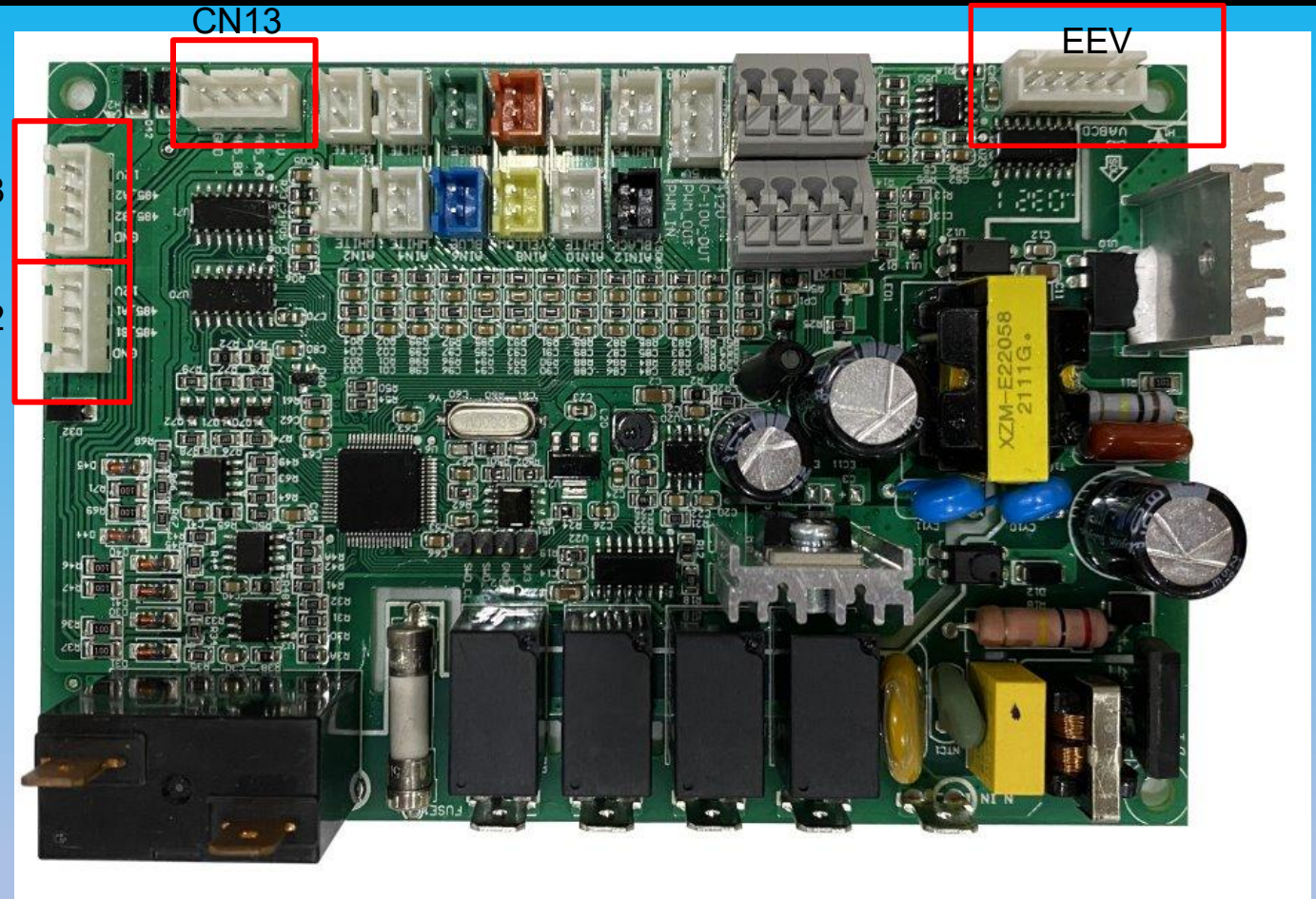
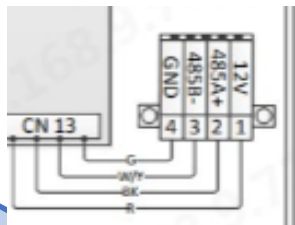
Test between the two RS485 pins, Good: ~0-6VDC
fluctuating is normal

How to Test EEV Port:

Measure 12VDC and GND for ~11-14VDC.

CN13 Information Remote OMNI LOGIC:

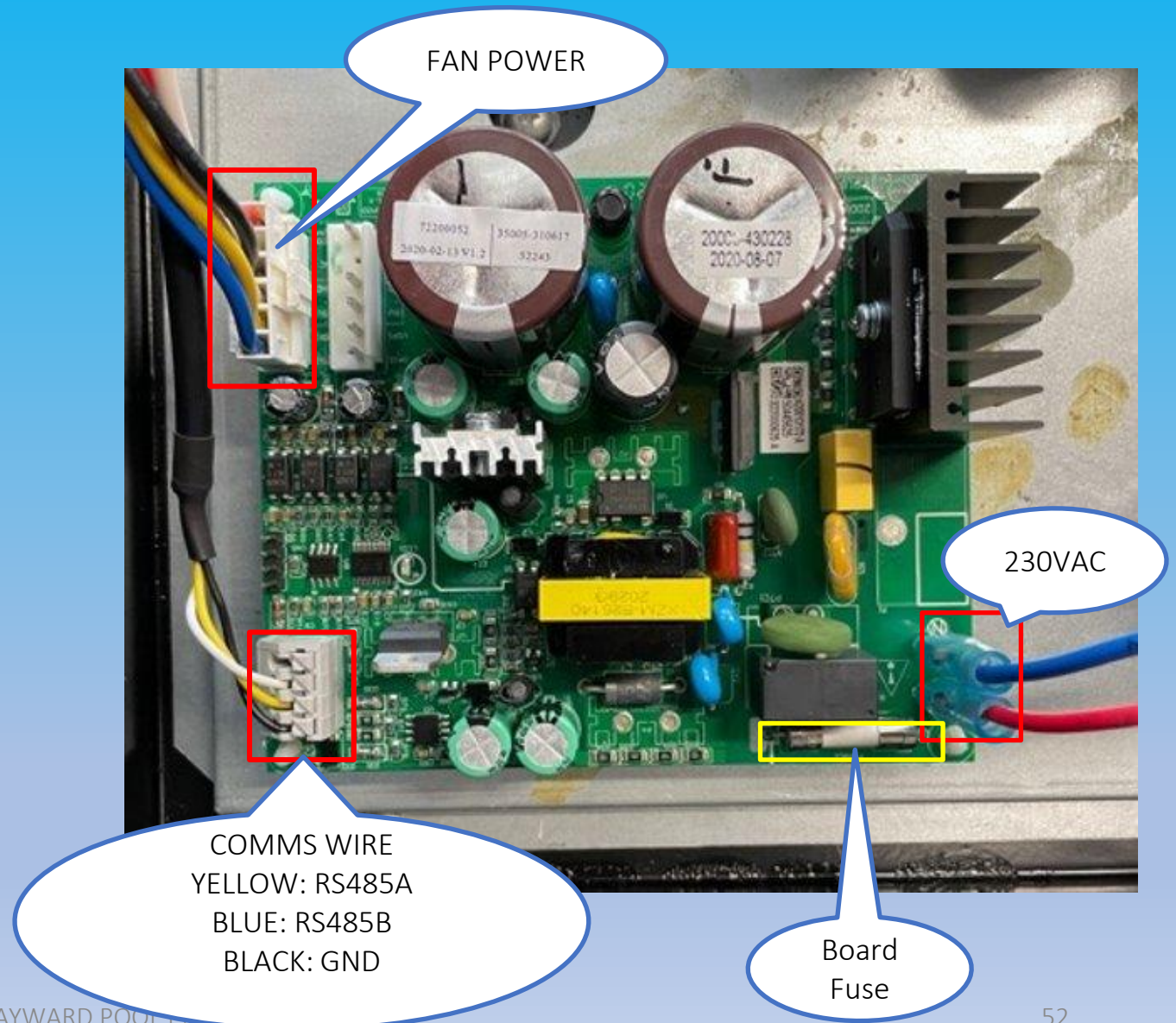
This port connects to the grey terminal block inside the electrical enclosure. It is used for OMNI Logic comms i.e. you'd run a low voltage 18-3 or 22-3 wire shielded, to the OMNI Logic panel. You don't need the 4th ground wire.



HP31005T – TEST FAN BOARD

TESTING FAN BOARD

1. Check for 230VAC: Red/Blue wires – this is power to the inverter board.
 2. Check for power OUTPUT to the fan motor, on FAN POWER terminal.
- Good: Red/Black 310-380VDC, White/Black 15VDC, Yellow/Black fluctuating 0-6VDC
3. Check comms wire, make sure wires are seated properly on the wire with yellow/white/black in bottom left corner. This wire “talks” to the main board. Yellow/White should measure 0-6VDC fluctuating during operation.
 4. Check the board fuse.
 5. Check the comms wire for continuity, ensuring there are no cuts/scrapes/knicks.
 6. Ensure fan parameters are correct. F01 = 3 (fan type). To access service menu, see slide 20: [HP31005T – ROUND UNIT - ACCESS SERVICE MENU](#)



HP31005T – COMPRESSOR TROUBLESHOOTING

Short to Ground Test

Test the Terminals: Place one multimeter probe on a grounded point and the other probe on one of the compressor terminals. Repeat this for all three terminals.

Good Result (OL): If your meter displays OL (Open Line/Over Limit) and no continuity beep is heard, the compressor windings are not shorted to ground.

Bad Result (Short): If your meter shows continuity (beeps) or displays a low resistance value (e.g., 0 to a few Ohms), the compressor is shorted to ground.

Test Windings

Identify the start, common, and run wires.

Measure resistance between COM and RUN

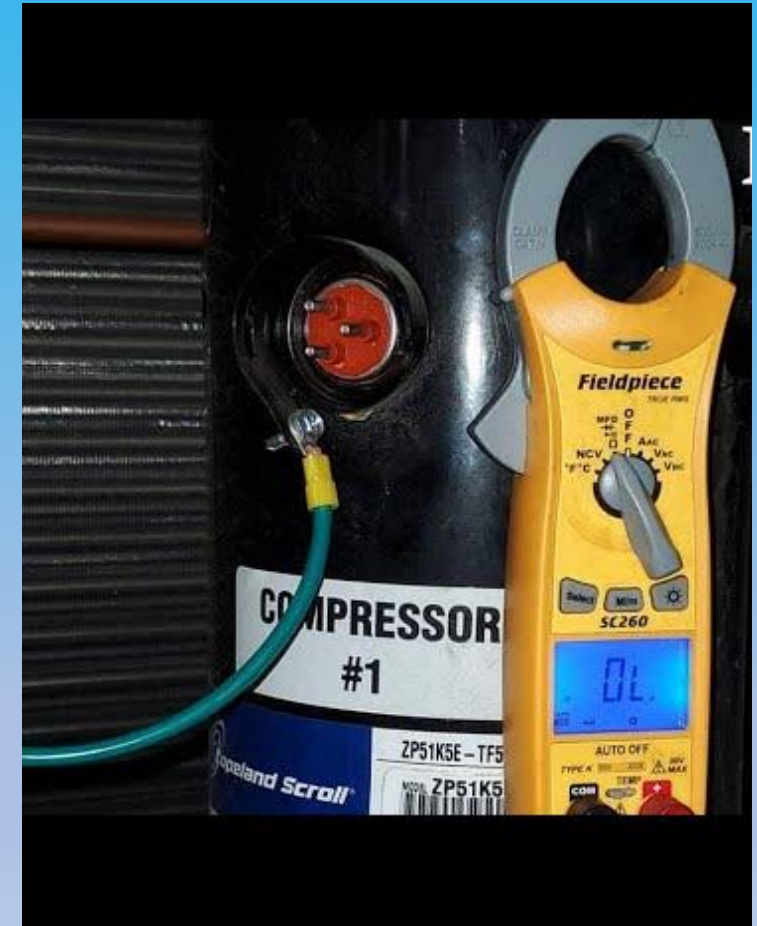
Measure resistance between COM and START

Measure resistance between RUN and START.

• **Good results:** The sum of COM to RUN and COM to START should equal the total resistance between START to RUN

• **BAD/FAILED COMPRESSOR:** If you measure OL on any pair, you have an open winding. If you measure 0 Ω , you have a shorted winding.

[Testing if an HVACR Compressor is Shorted To Ground, Open, or Overload Tripped](#) – YouTube – Guide – by AC Service Tech, LLC



HP31005T – HEAT EXCHANGERS TROUBLESHOOTING



This is a copper fin and tube heat exchanger.

Troubleshooting Copper Fin/Tube HEX:

1. Check for a dirty coil. It will lead to low suction pressure and low discharge pressure.
2. If the LP error code (low pressure) is shown on the display, make sure the coil is not dirty. Similar to residential HVAC it may require a nice foam wash.
3. Leak test using nitrogen/bubble spray or UV dye.



This is a shell and tube heat exchanger.

Troubleshooting Shell/Tube HEX:

Check for pipe leaks of water

1. Ensure there are no damages to piping
2. Check to ensure no refrigerant leaks at copper junctions

Handle with care when replacing, use proper PVC glue during re-plumb. New service kits included flanges and PVC pipe.

REFRIGERANT LEAKS - OVERVIEW

There's several known ways to find a refrigerant leak.

1. Hand-held leak detector
2. Nitrogen + Bubble Spray Detector
3. Fluorescent Dye



DETECTING A REFRIGERANT LEAK IN A SPLIT AC PIPELINE

METHODS



BUBBLE TEST

Apply a soap-water solution to suspected leak points. Bubbles indicate a leak.



PRESSURE TEST

Charge the system with dry nitrogen and monitor pressure. A drop indicates a leak.



ULTRASONIC LEAK DETECTION

Use a handheld ultrasonic leak detector to listen for high-frequency sound emitted by a leak.



DYE TESTING

Inject a fluorescent dye into the system. Use a UV light to detect dye escaping from a leak.

RECOMMENDED DEVICES



ELECTRONIC
REFRIGERANT
LEAK DETECTOR



ULTRASONIC
LEAK
DETECTOR



INFRARED
CAMERA



UV DYE
KIT

HANDHELD LEAK DETECTORS



A handheld leak detector is a quick and easy way to scan suspected components/points of the system for leaks. Use common sense and good judgement calls, scan areas prone to leaks.

- CHECK SERVICE STUBS, AND FOR LEAKING SCHRAEDER VALVES
- CHECK BRAZE JOINTS
- CHECK AREAS ON THE COIL WHERE FINS ARE DAMAGED WHILE UNIT OPERATES
- THESE HAND-HELD DETECTORS ARE GREAT FOR QUICK SCANS, BUT THEY DON'T ALWAYS FIND SMALL LEAKS.

NITROGEN AND BUBBLE SPRAY REFRIGERANT LEAK DETECTION



- A second proven method of finding leaks is to pressurize the system with nitrogen and use a liquid leak detector such as Big Blue to detect leaks.



Recommended pressurization: 300psig

Standing pressure test: 1 hour

UV DYE TO CHECK FOR LEAKS



A third proven method is to inject a fluorescent dye into the system and use an ultraviolet light to detect the leak.

Given the sophistication of today's systems as well as the compact designs we believe that having a dye system leak detector is a requirement in your tool box.

If you do not have a dye injector/ UV light detector kit you will need to purchase one. You should be able to purchase a Spectronics kit that contains the UV light, UV protective glasses, cleaner, and enough dye for at least 2 systems.

WHAT IS AN EEV – ELECTRONIC EXPANSION VALVE – HOW DOES IT WORK?

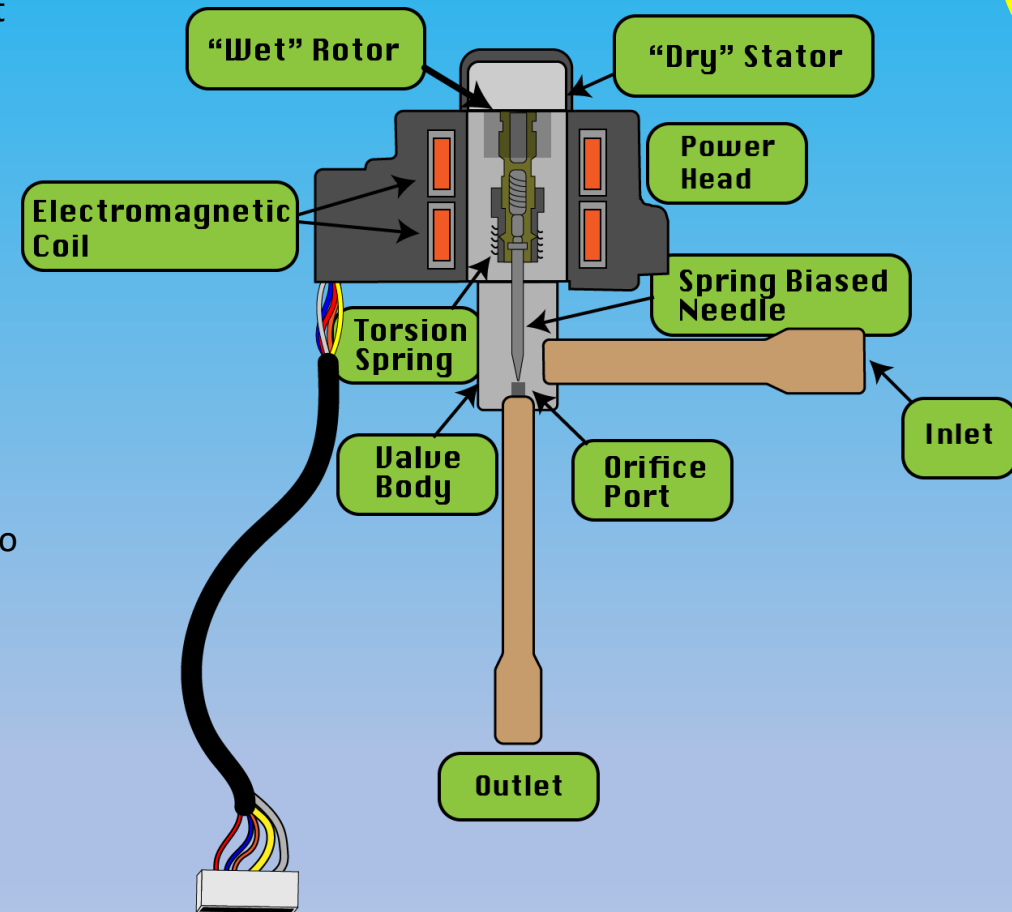
An **EEV** (Electronic Expansion Valve) is a highly precise metering device used in modern HVAC and refrigeration systems to regulate the flow of refrigerant. It acts as an intelligent throttle, dropping the refrigerant's pressure to absorb heat efficiently.

How an EEV Works

Unlike older, mechanical expansion valves that rely on physical springs and bellows, an EEV operates electronically using a motorized system:

1.Sensors: Thermistors and pressure transducers continuously monitor the temperature and pressure of the refrigerant leaving the evaporator.

2.The Brain (Controller): A microcontroller or circuit board processes this data to calculate the "superheat" (the amount of heat added to the refrigerant beyond its boiling point). **The Action (Stepper Motor):** When the controller detects a change in cooling or heating demand, it sends electrical pulses (usually 12-volt signals) to a stepper motor. This motor drives a needle or piston up or down in tiny, precise increments (sometimes thousands of steps) to open or restrict the valve's pathway.



A
JD Kelly
Roman Baugh
Creation

EEV TROUBLESHOOTING



EEVs on PHNIX heat pumps can be tested using an easy method: First check the supply DC voltage to ensure EEV has power (12VDC),

then check the operation by setting the parameter of the EEV to “manual” control (in settings).

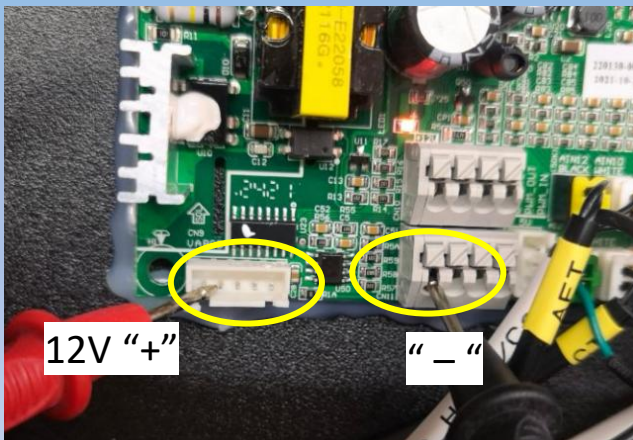
Change the steps of the EEV to arbitrary settings higher or lower, and feel the EEV, does the stepper motor move?

SEE PARAMETER LIST. The parameters are in service menu: On user display, navigate to Parameters from user interface, enter “66” as password, then navigate to the “E” sub-menu. Set the first setting from 0-Auto Control to 1-Manual Control, then you can manually set the “step” the EEV should be at. Then feel with your hand if the EEV motor moves. You will feel it vibrate.



How to check if EEV has power

11-14VDC Target



FILTER DRIER TROUBLESHOOTING TIPS

Common Filter Drier Failures

1. Restricted or Plugged Filter Drier

The most common failure.

Causes

- Compressor burnout contamination
- Excessive moisture
- Debris from brazing
- Metal particles from compressor wear

Symptoms

- High temperature drop across the drier
- Low suction pressure
- Starved evaporator
- Low superheat control
- Reduced system capacity

2. Saturated Desiccant

The desiccant can only absorb a limited amount of moisture.

Causes

- Improper evacuation
- Refrigerant leak repairs
- System left open to atmosphere
- Severe moisture contamination

Symptoms

- Intermittent freezing at the metering device
- Unstable system operation
- Acid formation
- Repeat compressor issues

3. Internal Breakdown

The desiccant or internal components may deteriorate.

Symptoms

- Fine particles circulate through system
- TXV screen plugging
- Recurring restrictions
- Metering device problems

4. Acid Contamination

Usually occurs after a compressor burnout.

Symptoms

- Oil discoloration
- Acid test failure
- Repeated compressor failures
- Winding damage in hermetic compressors

In these situations, a suction-line burnout drier is often installed temporarily



HOW IT WORKS – FILTER DRIER

What Is a Filter Drier?

A filter drier is a component installed in the refrigerant line that performs two critical functions:

1.Filters contaminants such as dirt, metal shavings, carbon, and debris.

1.Removes moisture from the refrigerant using a desiccant material.

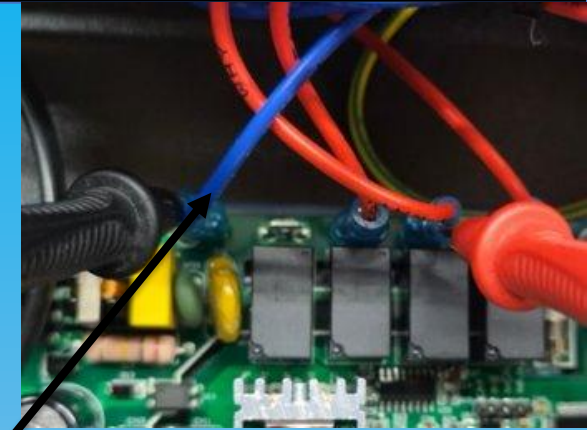
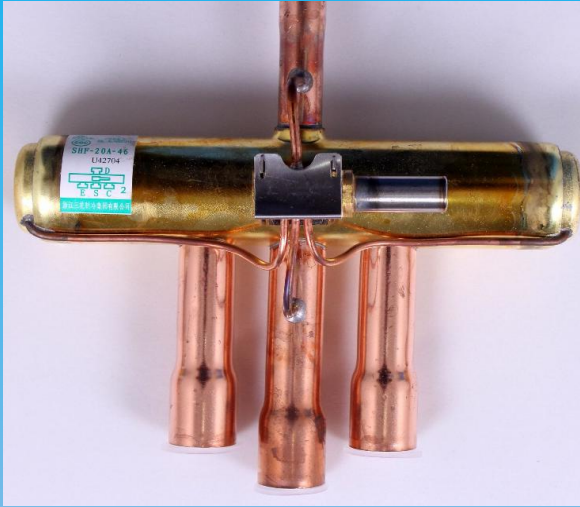
Filter driers are commonly found in:

- Liquid lines (most common location)
- Suction lines (typically after a compressor burnout or major repair)

<u>Symptom</u>	<u>Likely Cause</u>
High superheat	Starved evaporator
Low suction pressure	Restricted refrigerant flow
Frost at drier outlet	Pressure drop across drier
Poor cooling capacity	Insufficient refrigerant flow
Temperature drop across drier	Internal restriction
Intermittent TXV icing	Moisture contamination



REVERSING VALVE TROUBLESHOOTING TIPS



Verify Board Works: OUTPUT 3 AND NEUTRAL should measure 230VAC in cooling mode. Remember, the reversing valve is only energized during call for cool.

Troubleshooting a Reversing Valve

1. Turn off power to the unit.
2. Remove the coil from the 4-way valve.
3. Use a solenoid tester on the valve.
4. While applying and removing the tester, listen for a **knocking or clicking sound** from the 4-way valve.

Results:

• If you hear a **knocking/clicking sound**: The 4-way valve is not stuck. The valve is operating correctly, and the **coil is likely faulty** and should be replaced.

• If you do not hear a **knocking/clicking sound**: The **4-way valve is stuck** and may require repair or replacement.

Note: Always disconnect power before servicing the unit to avoid electrical hazards.

FAN CAPACITOR AND COMPRESSOR CAPACITOR TROUBLESHOOTING

What Capacitors Do

- Provide the electrical boost needed to start and run motors.
- Improve motor efficiency and power factor.
- Commonly used with:
 - Outdoor fan motors
 - Single-phase compressor motors

Heat pumps often use a **dual-run capacitor** serving both the compressor and condenser fan motor. But not PHNIX models.

Common Capacitor Signs of Capacitor Failure

Unit will not start.

Compressor hums but does not run.

Outdoor fan blade spins only when manually pushed.

High amperage draw.

Reduced cooling or heating performance.

Bulging, leaking, or rusted capacitor housing.

Tripped breakers or thermal overloads.

Ratings

Measured in **microfarads (μF)**.

Dual-run capacitors typically have three terminals:

C = Common

FAN = Fan Motor

HERM = Compressor

Voltage ratings commonly:

370 VAC

440 VAC

Diagnostic Steps

1. Verify power is OFF and capacitor is discharged.
2. Visually inspect for:
 1. Swelling
 2. Oil leakage
 3. Burned terminals
3. Measure capacitor value using a capacitance meter. See if it is within tolerance.
4. Compare reading to the capacitor label.
5. Replace if reading is outside manufacturer tolerance (typically $\pm 5\%$).
6. Inspect wiring and terminal connections for damage or overheating.



Technician Tip

Always **discharge** a capacitor prior to testing/handling. You can use an insulated screwdriver and bridge the two terminals for a few seconds.

A failed capacitor is one of the most common causes of a non-starting compressor or condenser fan motor. Always verify capacitor health before condemning a motor or compressor.

ACCUMULATOR A.K.A. LIQUID TANK

What Is an Accumulator?

- A storage vessel installed in the **suction line** between the evaporator and compressor.
- Designed to prevent **liquid refrigerant** from entering the compressor.
- Commonly used in **heat pumps** due to varying operating conditions during heating and cooling modes.

Why Accumulators Are Important

- Protect the compressor from **liquid slugging**.
- Prevent compressor damage caused by **floodback**.
- Improve system reliability and compressor life.
- Return refrigerant and oil to the compressor at a controlled rate.

Symptoms of Accumulator Problems

Compressor noise during startup.

Reduced system capacity.

Excessive compressor wear.

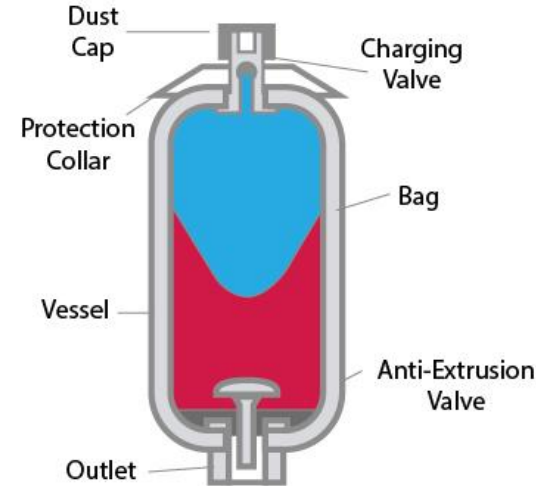
Oil return issues.

Liquid refrigerant reaching the compressor.

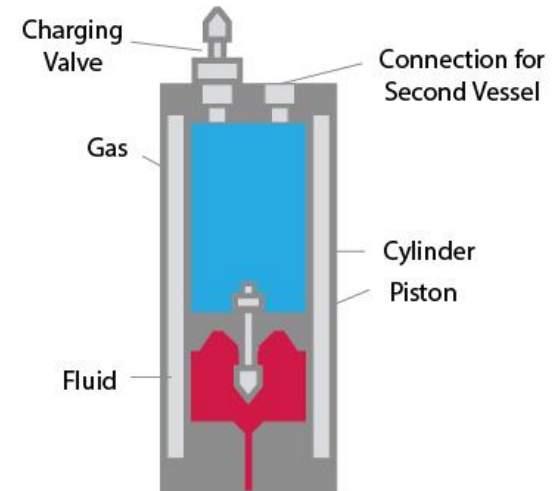
Diagnostic Steps

1. Inspect accumulator body for corrosion, leaks, or physical damage.
2. Check suction pressure and system operating conditions.
3. Look for signs of floodback or compressor slugging.
4. Verify proper superheat at the evaporator outlet.
5. Check for restricted suction-line components.
6. Confirm proper oil return to the compressor.

Anatomy of Accumulators



Bladder Accumulator



Piston Accumulator



REFERENCE PRESSURES AND TEMPERATURES

HP31005T

OPERATING MODE	OUTDOOR TEMPERATURE UNITS: °F	RELATIVE HUMIDITY (%)	SETPOINT ON THE HEAT PUMP – 80°F	SUCTION PRESSURE (PSIG)	LIQUID PRESSURE (PSIG)	RECOMMENDED FLOW RATE FOR PUMP (GPM)	DELTA T – OUTDOOR VERSUS AIR FLOWING OUT FAN TOP	SUPERHEAT	SUBCOOLING
HEATING	50°F	63%	80°F	80-90PSIG	300-315PSIG	30-75 GPM	15-20° F ΔT	4-8°F	12-15°F
HEATING	80°F	63%	80°F	140-145 PSIG	315-325PSIG	30-75 GPM	15-20° F ΔT	12-14°F	10-15°F
HEATING	80°F	80%	80°F	150-155 PSIG	325-330PSIG	30-75 GPM	15-20° F ΔT	15-18 °F	10-18°F
COOLING	95°F	N/A	90°F	150-160PSIG	220-230PSIG	30-75 GPM	15-20° F ΔT	25-30°F	NOT AVAILABLE

END OF TROUBLESHOOTING GUIDE

HAYWARD TECH SUPPORT HOTLINE:
908-355-7995