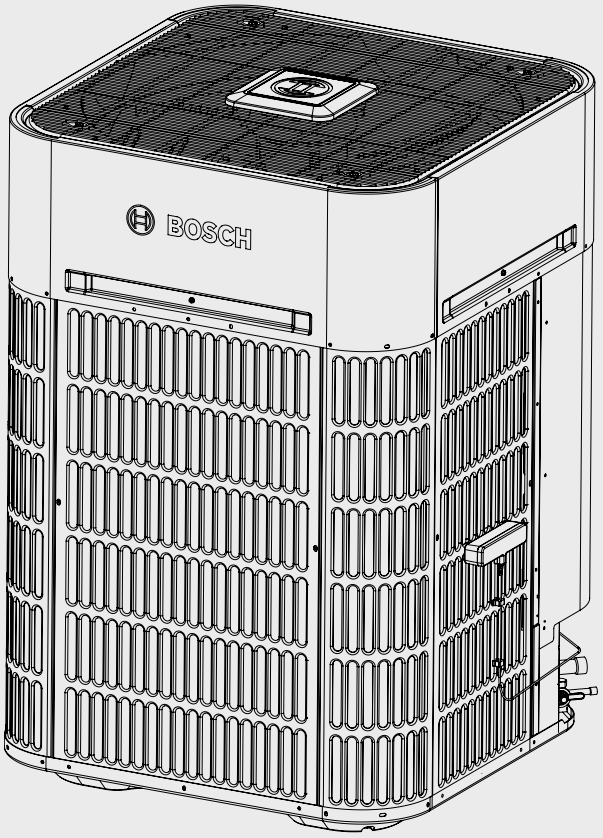
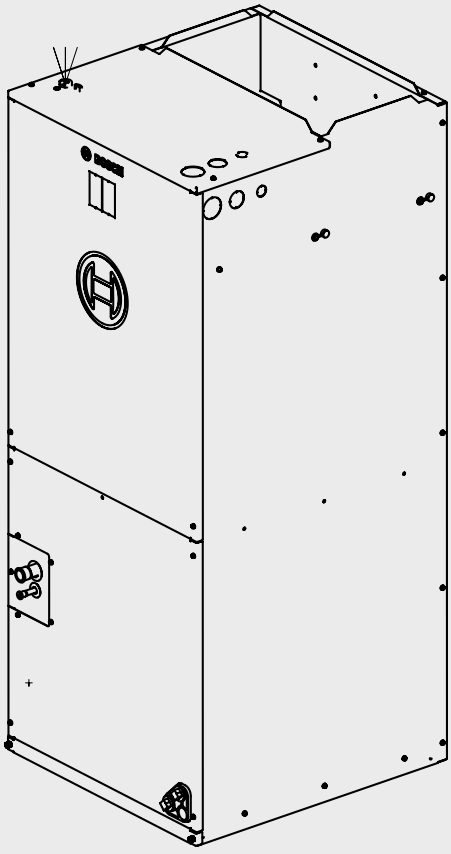
BOSCH

Service Manual

Bosch IDS Heat Pump
Ultra Series

3-5 Ton Capacity | R454B





BTC 762002313 A / 09.2026

AHRI CERTIFIED®
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Unitary Small HP
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

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1 Key to Symbols and Safety Instructions

1.1 Key to Symbols

Warnings

In warnings, signal words at the beginning of a warning are used to indicate the type and seriousness of the ensuing risk if measures for minimizing danger are not taken.

The following keywords are defined and can be used in this document:

DANGER

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.

NOTICE

NOTICE is used to address practices not related to personal injury.

Important information

The info symbol indicates important information where there is no risk to people or property.

1.2 Explanation of Symbols Displayed on the Unit

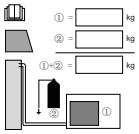
Symbol	
	WARNING This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source, there is a risk of fire.
	WARNING This symbol shows that appliance shall be installed, operated and stored in a room with a floor area not less than the minimum room area.
	CAUTION This symbol shows that the operation manual should be read carefully.
	CAUTION This symbol shows that a service personnel should be handling this equipment with reference to the installation manual.
	CAUTION This symbol shows that information is available such as the operating manual or installation manual.
	CAUTION This symbol shows that when addition of charge is required by the manufacturer installation instructions for completing the REFRIGERATING SYSTEM. Recorded the resulting total REFRIGERANT CHARGE for each REFRIGERATING SYSTEM.

Table 1

1.3 Safety

Please read safety precautions before installation

WARNING

Electrical hazard 380 Volts DC!

Failure to follow this warning could result in property damage, severe personal injury, or death.

WAIT FIVE (5) MINUTES after disconnecting power prior to touching electrical components as they may hold a dangerous charge of 380 VDC,then verify DC Voltage is less than 42VDC at inverter TEST POINTS P-N.

This document is customer property and is to remain with this unit. Please return to service information pack upon completion of work.

These instructions do not cover all variations in systems or provide for every possible contingency to be met in connection with the installation.

Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to your installing dealer or local distributor.

The manufacturer recommends installing only approved matched indoor and outdoor systems. All of the manufacturer's split systems are AHRI rated only with TXV indoor systems. Some of the benefits of installing approved matched indoor and outdoor split systems are maximum efficiency, optimum performance and the best overall system reliability.

This document contains a wiring diagram and service information. This is customer property and is to remain with this unit. Please return to service information pack upon completion of work. installation.

WARNING

Personal injury, product damage!

This information is intended for use by individuals possessing adequate backgrounds of electrical and mechanical experience. Any attempt to repair a central air conditioning product may result in personal injury and/or property damage.

WARNING

Hazardous voltage!

Failure to follow this warning could result in property damage, severe personal injury, or death.

Disconnect all electric power, Including remote disconnects before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized.

WARNING

Refrigerant oil!

Any attempt to repair a central air conditioning product may result in property damage, severe personal injury, or death. These units use R454b refrigerant. Use only R454b approved service equipment. All R454b systems with variable speed compressors use a POE oil (VG75 or equivalent)that readily absorbs moisture from the atmosphere. To limit this 'hygroscopic" action, the system should remain sealed whenever possible. If a system has been open to the atmosphere for more than 4 hours, the compressor oil must be replaced. Never break a vacuum with air and always change the driers when opening the system for component replacement.

WARNING

Hot surface!

May cause minor to severe burning. Failure to follow this Caution could result in property damage or personal injury.

Do not touch high temperature components such as the compressor.

WARNING

Contains refrigerant!

Failure to follow proper procedures can result in personal illness or injury or severe equipment damage.System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening system. Flammable refrigerant used.

WARNING

Contains lead!

This product can expose you to chemicals including Lead and Lead components, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www. P65Warnings.ca.gov.

CAUTION

Grounding required!

Failure to inspect or use proper service tools may result in equipment damage or personal injury. Reconnect all grounding devices. All parts of this product that are capable of conducting electrical current are grounded. If grounding wires, screws, straps, clips, nuts, or washers used to complete a path to ground are removed for service, they must be returned to their original position and properly fastened.

WARNING

Service valves!

Failure to follow this warning will result in abrupt release of system charge and may result in personal injury and/ or property damage. Extreme caution should be exercised when opening the Liquid Line Service valve. Turn valve stem counterclockwise only until the stem contacts the rolled edge.

WARNING

Brazing required!

Failure to inspect lines or use proper service tools may result in equipment damage or personal injury. If using existing refrigerant lines make certain that all joints are brazed, not soldered.

If refrigerant gas leaks during installation, ventilate the area immediately.

Comply with national gas regulations.

WARNING

High current leakage!

Grounding is required before connecting electrical supply. Failure to follow this warning could result in property damage, severe personal injury, or death.

WARNING

Risk of fire!

Mildly flammable refrigerant used.

Follow handling instructions carefully in compliance with national regulations.

DANGER

Fire, explosion!

Store in a well ventilated room without continuously operating flames or other potential ignition.

WARNING

Risk of electric shock!

Can cause injury or death.Disconnect all remote electric power supplies before servicing.

WARNING

Risk of fire!

Flammable refrigerant used. To be repaired only by trained service personnel. Do not puncture refrigerant tubing.

Dispose of properly in accordance with federal or local regulations. Flammable refrigerant used.

Flammable refrigerant used. Consult repair manual/owner's guide before attempting to service this product. All safety precautions must be followed.

Auxiliary devices which may be ignition sources shall not be installed in the ductwork, other than auxiliary devices listed for use with the specific appliance. See instructions.

WARNING

Personal injury!

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or persons who lack experience andknowledge, unless they are supervised or have been given instructions concerning the use of the appliance by a person responsible for their safety.

Children should be supervised to ensure that they do not play with the appliance.

Any person who is involved with working on or opening a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority,which authorizes their competence to handle refrigerants safely in accordance with an industry recognized assessment credential.

Servicing shall only be performed as recommended by the equipment manufacturer.

Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of a person competent in the use of flammable refrigerants.

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to minimize the risk of ignition.

WARNING

Flammable refrigerant!

Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.

The appliance shall be stored in a room that does not have continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).

Do not pierce or burn the unit.

Be aware that refrigerants may not contain an odour.

WARNING

Safe handling of flammable refrigerant!

Be sure the air conditioner is grounded.In order to avoid electric shock, make sure that the unit is grounded and that the earth wire is not connected to a gas or water pipe, lightning conductor or telephone earth wire.

Do not operate the air conditioner with a wet hands.An electric shock may happen.

Do not operate the air conditioner when using a room fumigation - type insecticide. Failure to observe this precaution could cause the chemicals to become deposited in the unit,which could endanger the health of those who are hypersensitive to chemicals.

To avoid oxygen deficiency, ventilate the room sufficiently if equipment with a burner is used together with the air conditioner.

Arrange the drain hose to ensure smooth drainage. Incomplete drainage may cause wetting of thebuilding, furniture, etc.

Never touch the internal parts of the controller.Do not remove the front panel. Some parts inside are dangerous to touch, and machine troubles may occur.

Attention is drawn to the fact that additional transportation regulations may exist with respect to equipment containing flammable gas. The maximum number of pieces of equipment or the configuration of the equipment permitted to be transported together will be determined by the applicable transport regulations.

Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location.

Storage package protection should be constructed such a way that mechanical damage to the equipment inside the package will not cause a leak of the REFRIGERANT CHARGE.

The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

Do not place appliances which produce open flame in places exposed to the air flow from the unit or under the indoor unit. It may cause incomplete combustion or deformation of the unit due to the heat.

Do not install the air conditioner in a location where flammable gas may leak out. If the gas leaks out and stays around the airconditioner, a fire may break out.

WARNING

Flammable refrigerant!

The appliance uses R454B refrigerant.



NOTICE

Indoor unit required!

The indoor units must be matched with R-454B TXV. The model of R-454B TXV can be changed according to the system capacity.

WARNING

Personal Injury, flammable refrigerant!

When repairing the refrigerating system, comply with the following precautions prior to conducting work on the system:

- Work shall be undertaken according to controlled procedures to minimize the risk of the presence of flammable gases or vapors while the work is being performed.
- All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable environment. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed or intrinsically safe.
- If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available and easily accessible. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.
- When carrying out work in relation to a refrigerating system that involves exposing any pipe work, no sources of ignition shall be used in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repair, or removal and disposal of the unit, during which refrigerant can possibly be released into the surrounding space. Prior to beginning work, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be clearly displayed.

WARNING

Personal Injury, flammable refrigerant!

Ensure that the area is in the open or that it is adequately ventilated before opening the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the surroundings.

Where electrical components are being changed, they shall be fit according to their purpose and to the correct specification. At all times the manufacturer’s maintenance and service guidelines shall be followed. If in doubt, consult the manufacturer’s technical department for assistance. The following checks shall be applied to installations using flammable refrigerants:

- The actual refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed.
- The ventilation machinery and outlets are operating adequately and are not obstructed.
- If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant.
- Equipment marking must remain visible and legible. Markings and signs that are illegible shall be corrected.

WARNING

Personal Injury, flammable refrigerant!

Refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substances which may corrode refrigerant containing components, unless the components are constructed of materials that are inherently resistant to corrosion or are suitably protected against corrosion.

Repair and maintenance of electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until the fault has been dealt with.

- That capacitors are discharged: this shall be done in a safe manner to avoid the possibility of sparking.
- That no live electrical components and wiring are exposed while charging, recovering or purging the system.
- That there is continuity of grounding.

WARNING

Flammable refrigerant!

Sealed electrical components shall be replaced.

Intrinsically safe components must be replaced.

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Under no circumstances shall potential sources of ignition be used while searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated for the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.
If a leak is suspected, all naked flames shall be removed/extinguished.

If a leakage of refrigerant which requires brazing is found, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak.

Leak detection fluids are also suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

Examples of leak detection fluids are:

- bubble method,
- fluorescent method agents.

WARNING

Flammable refrigerant!

When breaking into the refrigerant circuit to make repairs or for any other purpose conventional procedures shall be used. However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration. The following procedure shall be adhered to:

- safely remove refrigerant following local and national regulations.
- evacuate.
- purge the circuit with inert gas.
- evacuate.
- continuously flush or purge with inert gas when using flame to open circuit, and.
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimize the amount of refrigerant they contain.

Cylinders shall be kept upright. Ensure that the refrigeration system is grounded prior to charging the system with refrigerant.

Label the system when charging is complete (if it is not already labeled).

Take extreme care not to overfill the refrigeration system.

WARNING

Flammable refrigerant!

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas. The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

a. Become familiar with the equipment and its operation.
b. Isolate system electrically.
c. Before attempting the procedure ensure that:
    - mechanical handling equipment is available, if required, for handling refrigerant cylinders.
    - all personal protective equipment is available and being used correctly.
    - the recovery process is supervised at all times by a competent person.
    - recovery equipment and cylinders conform to the appropriate standards.
d. Pump down refrigerant system, if possible.
e. If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
f. Make sure that the cylinder is situated on the scales before recovery takes place.
g. Start the recovery machine and operate it in accordance with the manufacturer's instructions.
h. Do not overfill cylinders. (No more than 80% volume liquid charge).
i. Do not exceed the maximum working pressure of the cylinder, even temporarily.
j. When the cylinders have been filled correctly and the process has been completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
k. Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

Equipment shall be labeled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

WARNING

Flammable refrigerant!

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

Do not use the air conditioner for other purposes. In order to avoid any quality deterioration, do not use the unit for the cooling of precision instruments, food, plants, animals or works of art. Before cleaning, be sure to stop the operation, turn the breaker off or unplug the supply cord. Otherwise, electric shock and injury may occur.

To avoid electric shock or fire, make sure that a leak detector is installed. Never touch the air outlet or the horizontal blades while the swing flap is in operation. Fingers may be come caught or the unit may break down.

Never put any objects into the air inlet or outlet. Objects touching the fan at high speed can be dangerous. Never inspect or service the unit by yourself. Ask a qualified service person to perform this task.

Do not dispose of this product as unsorted municipal waste. This waste should be collected separately for special treatment. Do not dispose of electrical appliances as unsorted municipal waste. Use separate collection facilities. Contact your local government for information regarding the connection systems available.

If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, hazardous to one's health and well-being.

To prevent refrigerant leak, contact your dealer.

When the system is installed and operates in a small room, it is required to maintain the concentration of the refrigerant below the limit, in case a leak occurs. Otherwise, oxygen in the room may be affected, resulting in a serious accident.

The refrigerant in the air conditioner is safe and normally does not leak.

If the refrigerant leaks into the room and encounters the fire of a burner, a heater or a cooker, a harmful gas could be released.

Turn off any combustible heating devices, ventilate the room, and contact the dealer where the unit was purchased.

Do not use the air conditioner until a service person confirms that the refrigerant leak is repaired.

Keep ventilation openings clear of obstruction.

WARNING

Product damage, personal injury!

This outdoor unit must combine the indoor unit with refrigerant leak detection device.

These instructions are exclusively intended for qualified contractors and authorized installers. Work on the refrigerant circuit with mild flammable refrigerant in safety group A2L may only be carried out by authorized heating contractors. These heating contractors must be trained in accordance with UL 60335-2-40, Section HH. The certificate of competence from an industry accredited body is required.

Work on electrical equipment may only be carried out by a qualified electrician.

Before initial commissioning, all safety – related points must be checked by the particular certified heating contractors. The system must be commissioned by the system installer or a qualified person authorized by the installer.

1.3.1 Gateway Related Warnings

NOTICE

FCC compliance!

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTICE

ISED compliance!

This device contains licence-exempt transmitter(s)/ receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

WARNING

RF exposure!

This equipment complies with FCC/ISED RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 8 inches (20 centimeters) between the antenna and your body.

NOTICE

ISED compliance!

This device contains licence-exempt transmitter(s)/ receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

NOTICE

ICES statement!

CAN ICES-3 (B)/NMB-3 (B).

This Class B digital apparatus complies with Canadian ICES-003.

2 Nomenclature

2.1 Bosch IDS BIVB19 Air Handler

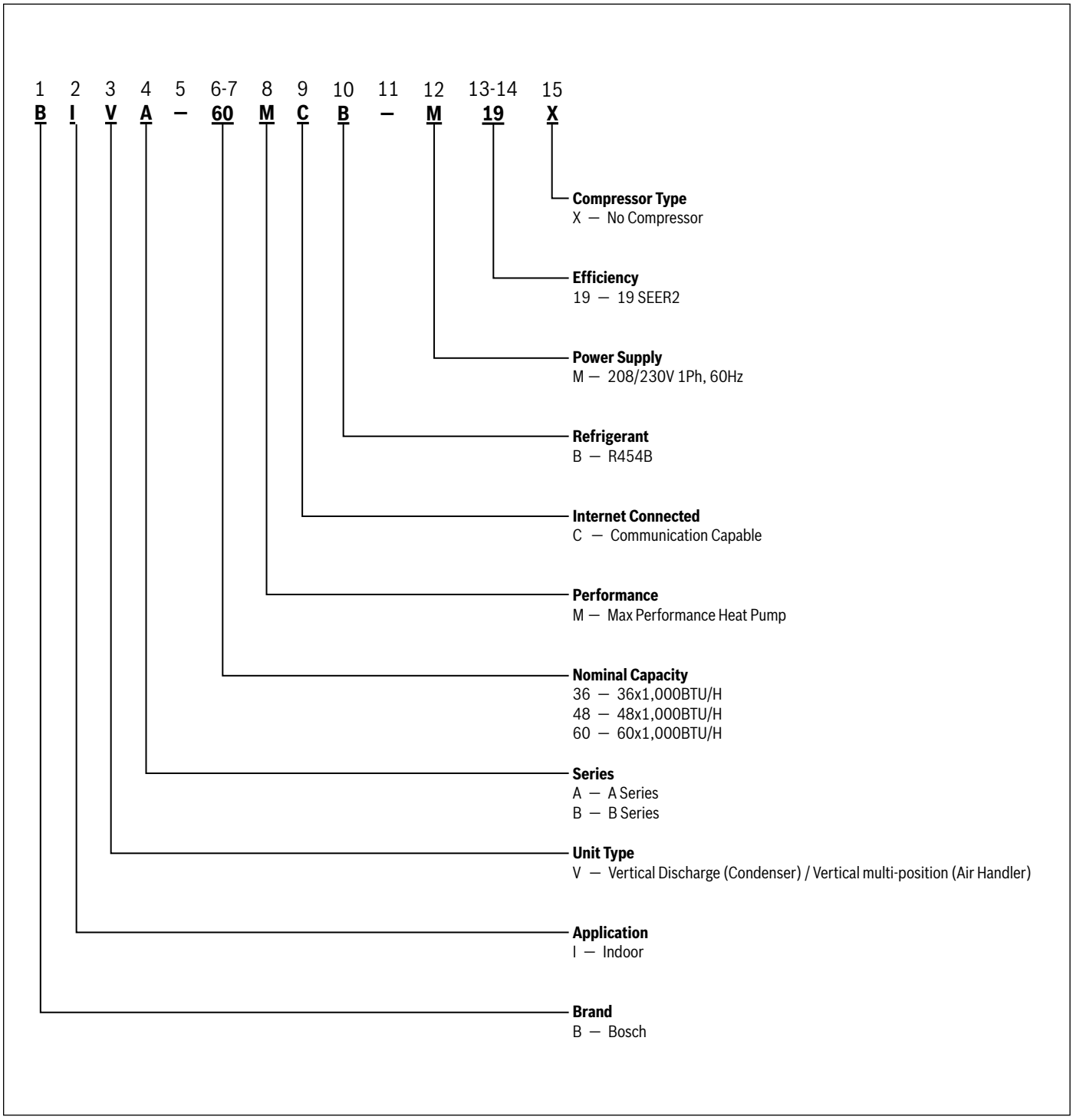


Figure 1

2.2 Bosch IDS BOVB19 Condensing Unit

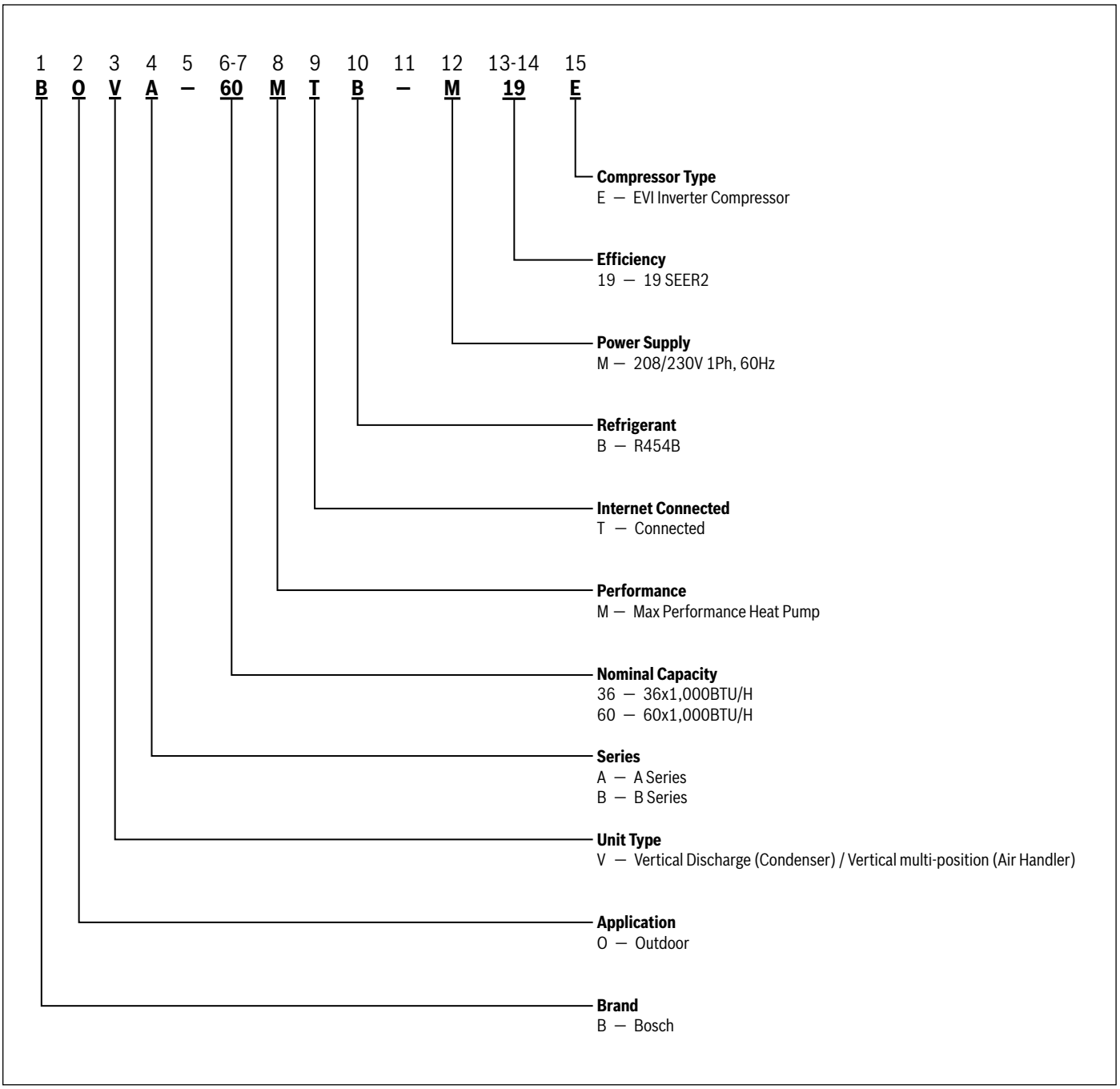


Figure 2

3 Models & Part Numbers

Bosch Part Number	Bosch Model Number
8733958901	BOVB-60MTB-M19E
8733983522	BOVB-36MTB-M19E
8733983523	BIVB-36MCB-M19X
8733958904	BIVB-48MCB-M19X
8733958905	BIVB-60MCB-M19X

Table 2

4 Dimensions

4.1 Bosch IDS BIVB19 Air Handler

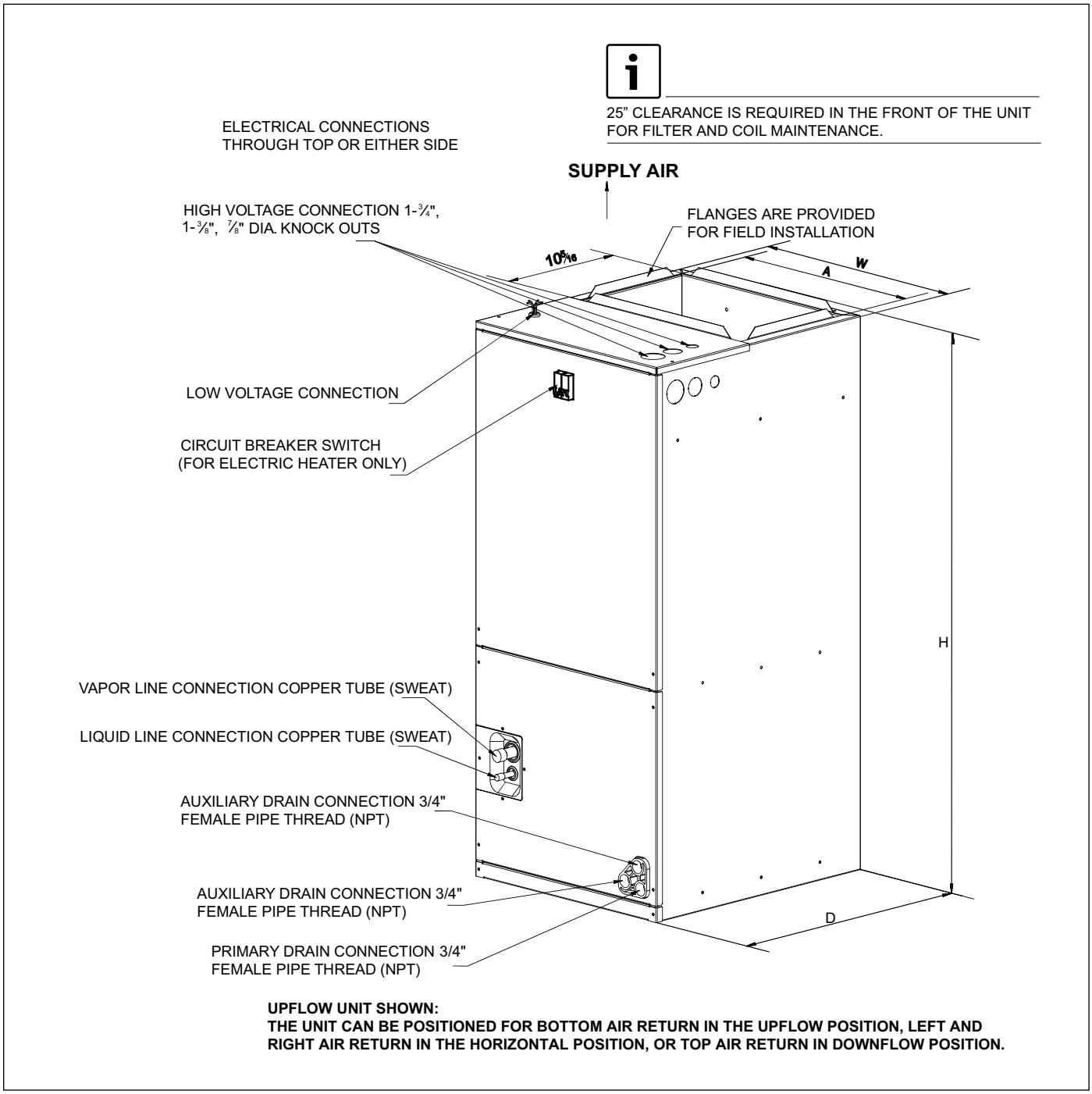


Figure 3

Model Size	Dimensions Inch [mm]				
	Unit Height "H"	Unit Width "W"	Unit Length "D"	Supply Duct "A"	Liquid Line / Vapor Line
36	46-1/2 [1180]	19-5/8 [500]	21-5/8 [550]	18 [456]	3/8 | 3/4 [9.5] | [19]
48	54-1/2 [1385]	22 [560]	24 [610]	19-1/2 [496]	3/8 | 7/8 [9.5] | [22]
60	54-1/2 [1385]	22 [560]	24 [610]	19-1/2 [496]	3/8 | 7/8 [9.5] | [22]

Table 3

4.2 Bosch IDS BOVB19 Condensing Unit

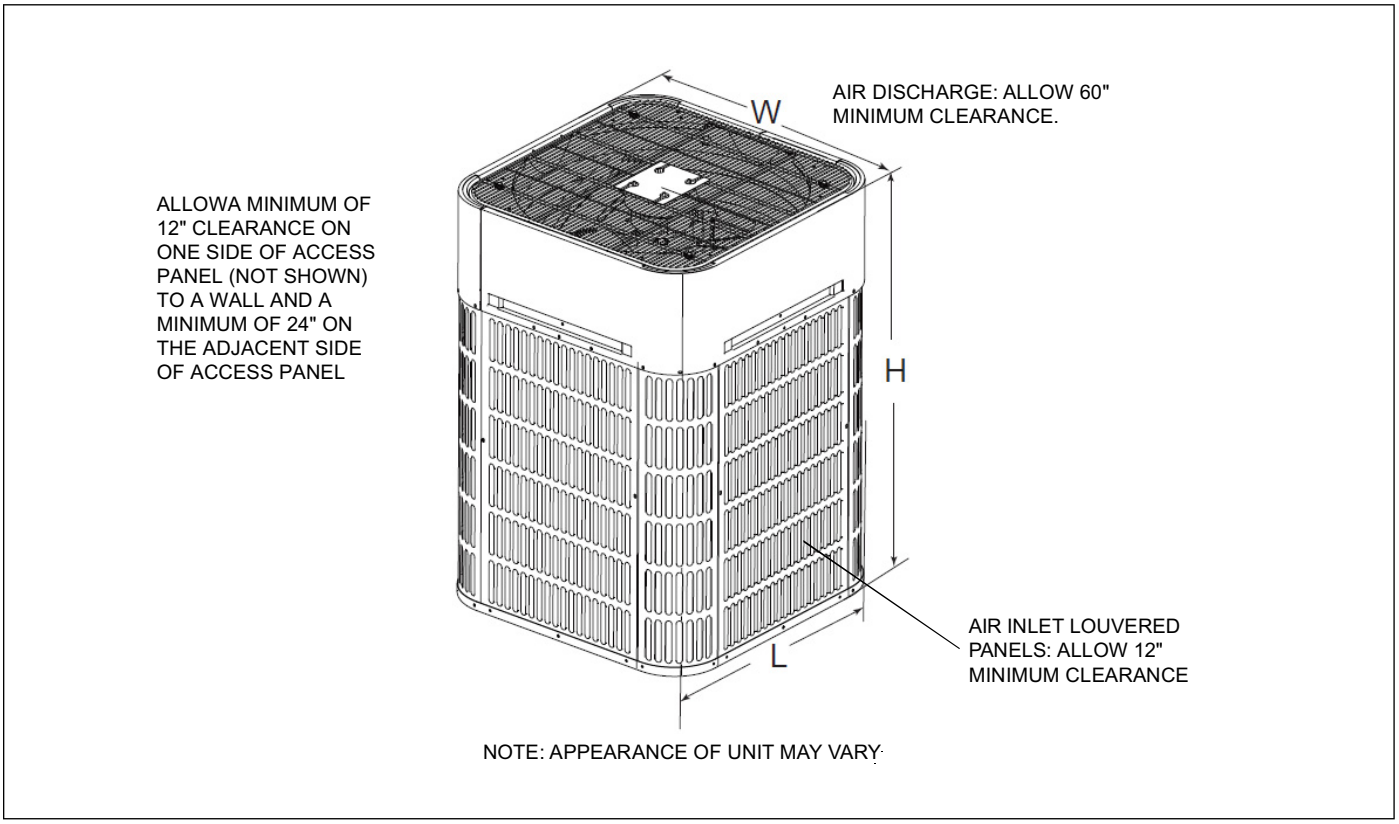


Figure 4

Model Size	Dimensions (Inches)		
Heat Pump	"H" in. [mm]	"W" in. [mm]	"L" in. [mm]
BOVB19-36	43-5/16 [1100]	29-1/8 [740]	29-1/8 [740]
BOVB19-60			

Table 4

5 AHRI 210/240 Performance Data

5.1 SEER2 Data

System Configuration	Outdoor Unit Model	Indoor Unit Model Coils/Air Handlers	Furnace Model	Cooling Capacity (BTU/h)			Cooling CFM (High/Low)	Heating Capacity			Heating CFM (High/Low)	
				Total	EER2[2]	SEER2[1]		Hi	HSPF2[3]	Low[4]		
IDS Ultra Condenser and Air Handler	BOVB-36MTB-M19E	BIVB-36MCB-M19X	/	36400	12.00	19.00	1200/820	36600	10.00	36600	1270/970	❄
	BOVB-60MTB-M19E	BIVB-48MCB-M19X	/	48500	12.00	19.00	1560/1240	48500	10.00	48500	1600/1240	❄
	BOVB-60MTB-M19E	BIVB-60MCB-M19X	/	53500	11.70	19.00	1760/1270	55000	10.00	55000	1820/1270	❄
IDS Ultra with BMAC Cased Coil	BOVB-36MTB-M19E	BMAC3036ABTA	/	32200	10.60	15.20	900/675	34800	9.00	34600	900/675	❄
	BOVB-36MTB-M19E	BMAC3036BBTA	/	32200	11.00	15.20	1000/750	35000	9.00	34600	1000/750	❄
	BOVB-36MTB-M19E	BMAC3036CBTA	/	32200	11.00	15.20	1050/787	35000	9.00	34600	1050/787	❄
	BOVB-36MTB-M19E	BMAC4248BBTA	/	34000	11.20	16.00	1000/750	35200	9.00	34600	1000/750	❄
	BOVB-36MTB-M19E	BMAC4248CBTA	/	34000	11.20	16.00	1000/750	35200	9.00	34800	1000/750	❄
	BOVB-36MTB-M19E	BMAC4248DBTA	/	34000	11.20	16.00	1000/750	35200	9.00	34800	1000/750	❄
	BOVB-60MTB-M19E	BMAC4248BBTA	/	42500	11.20	15.20	1150/1150	45500	8.50	45500	1150/1150	❄
	BOVB-60MTB-M19E	BMAC4248CBTA	/	43500	11.70	15.20	1300/1300	46000	8.50	46000	1300/1300	❄
	BOVB-60MTB-M19E	BMAC4248DBTA	/	43500	11.70	15.20	1300/1300	46000	8.50	46000	1300/1300	❄
	BOVB-60MTB-M19E	BMAC4860CBTA	/	52000	11.20	15.20	1350/1350	55000	8.50	52000	1350/1350	❄
	BOVB-60MTB-M19E	BMAC4860DBTA	/	52000	11.20	15.20	1350/1350	55000	8.50	52000	1350/1350	❄
IDS Ultra with 96% Gas Furnace	BOVB-36MTB-M19E	BMAC3036ABTA	BGH96M060B3C	33400	11.00	17.00	1080/800	35000	9.00	34600	1080/800	❄
	BOVB-36MTB-M19E	BMAC3036ABTA	BGH96M080B3C	33400	11.00	17.00	1080/800	35000	9.00	34600	1080/800	❄
	BOVB-36MTB-M19E	BMAC3036BBTA	BGH96M060B3C	33800	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036BBTA	BGH96M080B3C	34200	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036CBTA	BGH96M080C4C	34200	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036CBTA	BGH96M100C5C	34200	11.00	16.00	1150/1000	35600	9.50	35000	1150/1000	❄
	BOVB-36MTB-M19E	BMAC4248BBTA	BGH96M080B3C	34200	11.70	18.00	1080/790	35400	9.00	34600	1080/790	❄
	BOVB-36MTB-M19E	BMAC4248CBTA	BGH96M100C5C	34400	11.70	17.50	1180/1030	35600	9.00	35000	1180/1030	❄
	BOVB-60MTB-M19E	BMAC4248BBTA	BGH96M080B3C	43000	11.70	16.00	1300/900	46000	9.50	46000	1300/900	❄
	BOVB-60MTB-M19E	BMAC4248CBTA	BGH96M080C4C	43500	11.70	16.00	1300/900	46000	9.50	46000	1300/900	❄
	BOVB-60MTB-M19E	BMAC4248CBTA	BGH96M100C5C	44000	11.70	16.50	1350/1150	47000	9.50	47000	1350/1150	❄
	BOVB-60MTB-M19E	BMAC4248DBTA	BGH96M100D5C	44500	11.70	16.50	1500/1150	47000	9.50	47000	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4248DBTA	BGH96M120D5C	44500	11.70	17.00	1500/1150	47500	9.50	47500	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4860CBTA	BGH96M100C5C	52000	11.70	18.00	1350/1150	55000	9.50	52000	1350/1150	❄
	BOVB-60MTB-M19E	BMAC4860DBTA	BGH96M100D5C	52000	11.70	18.00	1500/1150	55000	9.50	53000	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4860DBTA	BGH96M120D5C	52500	11.70	18.00	1500/1150	55000	9.50	53000	1500/1150	❄
IDS Ultra with 97% Gas Furnace	BOVB-36MTB-M19E	BMAC3036ABTA	BGH97M060B3A	33400	11.00	17.00	1080/800	35000	9.00	34600	1080/800	❄
	BOVB-36MTB-M19E	BMAC3036ABTA	BGH97M080B3A	33400	11.00	17.00	1080/800	35000	9.00	34600	1080/800	❄
	BOVB-36MTB-M19E	BMAC3036BBTA	BGH97M060B3A	33800	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036BBTA	BGH97M080B3A	34200	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036CBTA	BGH97M080C4A	34200	11.20	17.50	1100/800	35200	9.00	34800	1100/800	❄
	BOVB-36MTB-M19E	BMAC3036CBTA	BGH97M100C5A	34200	11.00	16.00	1150/1000	35600	9.50	35000	1150/1000	❄
	BOVB-36MTB-M19E	BMAC4248BBTA	BGH97M080B3A	34200	11.70	18.00	1080/790	35400	9.00	34600	1080/790	❄
	BOVB-36MTB-M19E	BMAC4248CBTA	BGH97M100C5A	34400	11.70	17.50	1180/1030	35600	9.00	35000	1180/1030	❄
	BOVB-60MTB-M19E	BMAC4248BBTA	BGH97M080B3A	43000	11.70	16.00	1300/900	46000	9.50	46000	1300/900	❄
	BOVB-60MTB-M19E	BMAC4248CBTA	BGH97M080C4A	43500	11.70	16.00	1300/900	46000	9.50	46000	1300/900	❄
	BOVB-60MTB-M19E	BMAC4248CBTA	BGH97M100C5A	44000	11.70	16.50	1350/1150	47000	9.50	47000	1350/1150	❄
	BOVB-60MTB-M19E	BMAC4248DBTA	BGH97M100D5A	44500	11.70	16.50	1500/1150	47000	9.50	47000	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4248DBTA	BGH97M120D5A	44500	11.70	17.00	1500/1150	47500	9.50	47500	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4860CBTA	BGH97M100C5A	52000	11.70	18.00	1350/1150	55000	9.50	52000	1350/1150	❄
	BOVB-60MTB-M19E	BMAC4860DBTA	BGH97M100D5A	52000	11.70	18.00	1500/1150	55000	9.50	53000	1500/1150	❄
	BOVB-60MTB-M19E	BMAC4860DBTA	BGH97M120D5A	52500	11.70	18.00	1500/1150	55000	9.50	53000	1500/1150	❄

Table 5

[1] *Seasonal Energy Efficiency Ratio; Certified per AHRI 210/240*
[2] *Energy Efficiency Ratio; Certified per AHRI 210/240*
[3] *HSPF2 = Heating Seasonal Performance Factor 2 (Region IV); Certified per AHRI 210/240*
[4] *Jumper cut or dip switch off*

☐ Items in **bold** boxes meet the requirements for ENERGY STAR v6.1

❄ Denotes combinations that meet ENERGY STAR v6.1 Cold Climate

6 Product specifications

6.1 Bosch IDS BIVB19 Air Handler

	BIVB19-36	BIVB19-48	BIVB19-60
System Capacity[1]			
Nominal Cooling (BTU/h)	36400	48500	53500
Nominal Heating (BTU/h)	36600	48500	55000
Blower			
Diameter (in.)	10	10	10
Width (in.)	10	10	10
Fan Motor			
Horsepower (HP)	1/2	3/4	3/4
Full Load Amps	3.3	6.2	6.2
Refrigeration System			
Refrigerant Line Size			
Liquid Line Size (O.D.)	3/8"	3/8"	3/8"
Suction Line Size (O.D.)	3/4"	7/8"	7/8"
Refrigerant Connection Size			
Liquid Line Size (O.D.)	3/8"	3/8"	3/8"
Suction Line Size (O.D.)	3/4"	7/8"	7/8"
Expansion Device [TXV=Thermal Expansion Valve]		TXV	
Decibels dB(A)			
High Speed	70	78	79
Medium Speed	66	74	75
Low Speed	63	71	72
Electrical Data			
Voltage-Phase-Hz		208/230-1-60	
Minimum Circuit Ampacity [2]	4.2A	7.8A	7.8A
Max. Overcurrent Protection [3]	10A	10A	10A
Min / Max Volts		187V/253V	
Air Filter			
Air Filter Sizes	18" x 20"	20" x 22"	20" x 22"
Weight			
Net Weight (without packaging)(lbs)	123	154	159
Gross Weight (including packaging)(lbs) [4]	151	185	189
Dimensions			
Unit D x W x H (in.)	21-5/8" x 19-5/8" x 46-1/2"	24"×22"×54-1/2"	24"×22"×54-1/2"
Unit D x W x H (in.)(with pallet and packaging)	25-3/8"×22-5/16"×52-9/16"	27-11/16"×24-11/16"×60-5/8"	27-11/16"×24-11/16"×60-5/8"
Indoor Coil			
Net face area-sq.ft.	4.02	5.99	5.99
Tube diameter	9/32" (7 mm)	9/32" (7mm)	9/32" (7mm)
No.of rows	4	4	5
Fins per inch	17	17	17

Table 6

[1] *Tested and rated in accordance with AHRI Standard 210/240.*

[2] *Wire size should be determined in accordance with National Electrical Codes; extensive wire runs will require larger wire sizes.*

[3] *Must use time-delay fuses or HACR-type circuit breakers of the same size as noted.*

[4] *Weight shown includes packaging*

6.2 Bosch IDS BOVB19 Condensing Unit

	BOVB19-36	BOVB19-60
System Capacity[1]		
Nominal Cooling (BTU/h)	36400	53,500
Nominal Heating (BTU/h)	36600	55,000
Decibels([dB(A)]		
Max @ 100% load	70	79
Min @ min load	63	60
Compressor		
RLA	29.2	
Condenser Fan Motor		
Horsepower (HP)	1/3	
FLA	3.0	
Refrigeration System		
Refrigerant Line Size		
Liquid Line Size (OD)	3/8"	3/8"
Suction Line Size (OD)	3/4"	7/8"
Refrigerant Connection Size		
Liquid Valve Size (OD)	3/8"	3/8"
Suction Valve Size (OD)	3/4"	7/8"
Refrigerant Charge (R454B)	8 lbs. 6 oz.	10 lbs. 14 oz.
Expansion Device	EEV	
Maximum Line Length	150 FT	
Maximum Elevation Difference	50 FT	
Operating Range		
Cooling	15 - 125 F	
Heating	-13 - 86 F	
Electrical Data		
Voltage-Phase-Hz	208/230-1-60	
Minimum Circuit Ampacity[2]	29.8	39.5
Max. Overcurrent Protection[3]	51.3	68.7
Max Fuse Size	35	50
Min/Max Volts	187V/253V	
Weight		
Net Weight (without packaging)	223	246
Gross Weight (including packaging)[4]	260	280
Dimensions		
Unit L x W x H (in.)	29-1/8 x 29-1/8 x 43-5/16	
Outdoor Coil		
Net face area - sq.ft. Outer Coil	18.4	18.4
Tube diameter-in.	9/32" (7mm)	9/32" (7mm)
No.of rows	2	3
Fins per inch	19.5	19.5

Table 7

[1] *Tested and rated in accordance with AHRI Standard 210/240.*

[2] *Wire size should be determined in accordance with National Electrical Codes; extensive wire runs will require larger wire sizes.*

[3] *Must use time-delay fuses or HACR-type circuit breakers of the same size as noted.*

[4] *Weight values are estimated.*

7 Layout of Functional Components

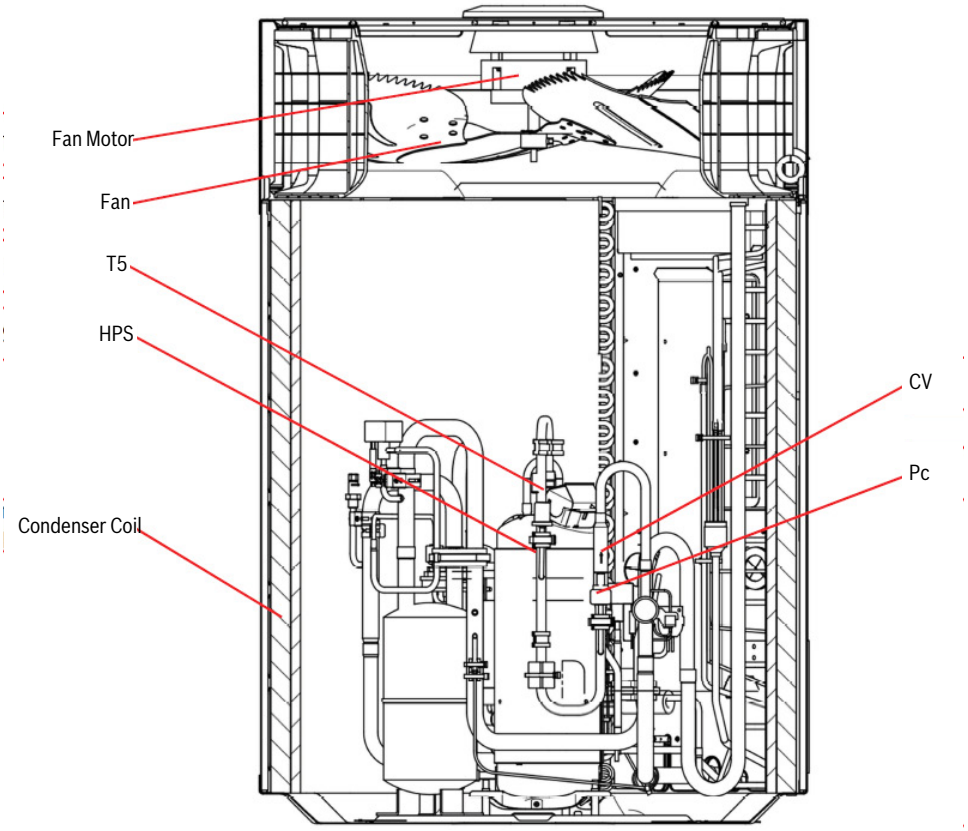


Figure 5

8 Refrigerant Flow Diagrams

8.1 Cooling Operation

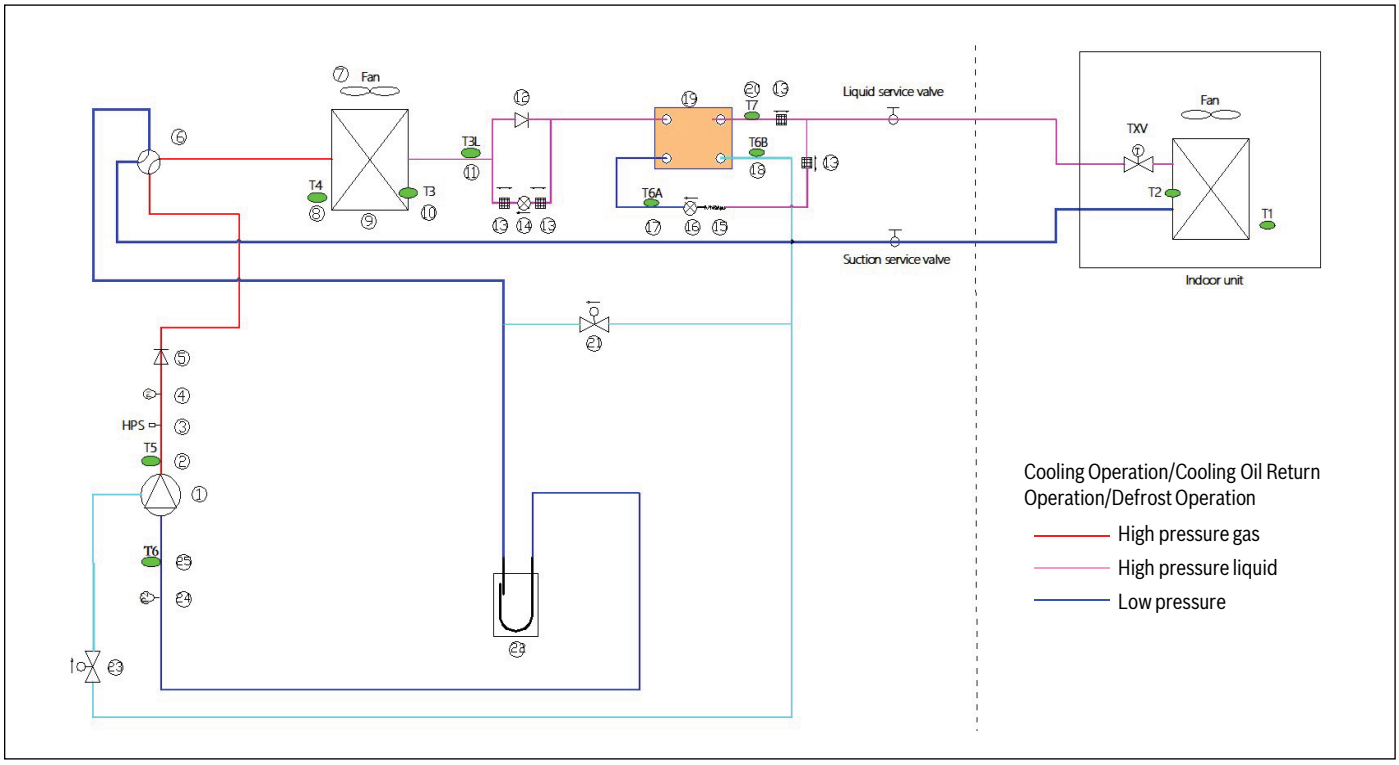


Figure 6

8.2 Heating Operation

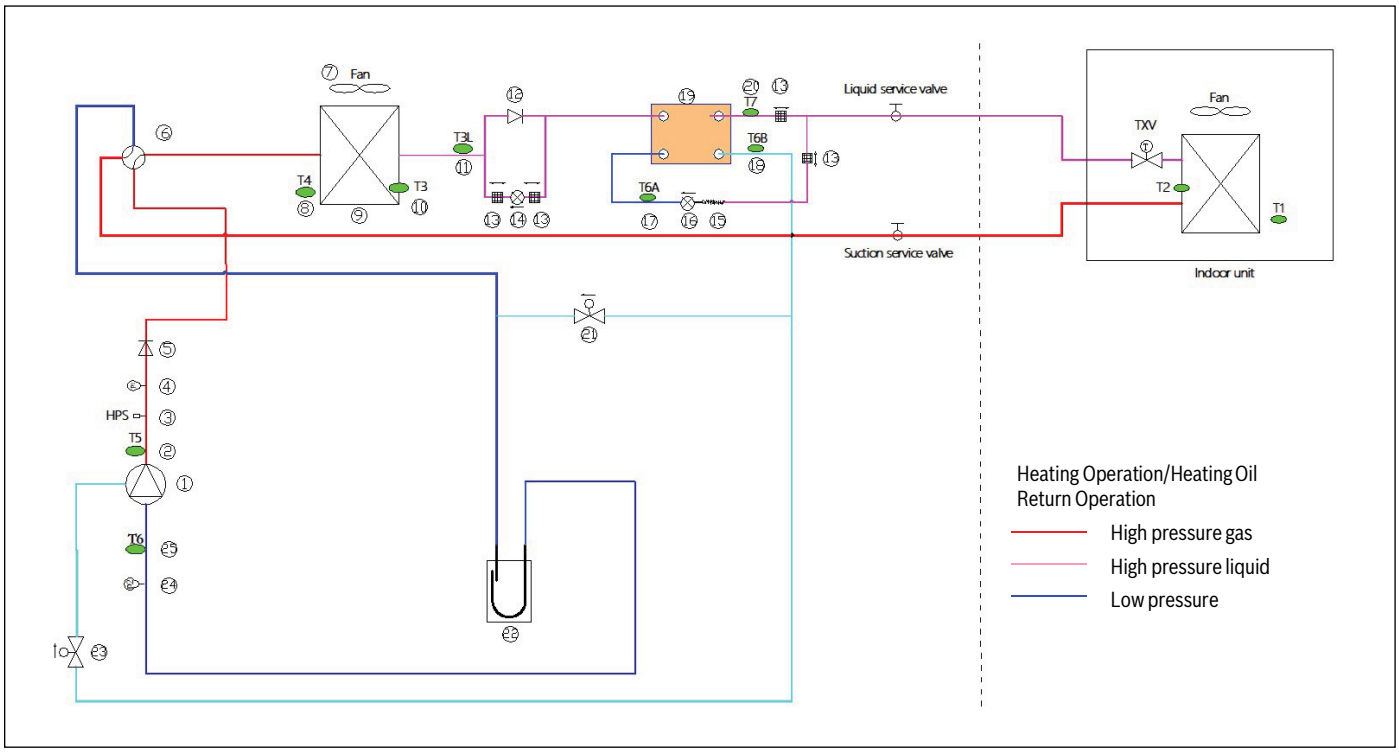


Figure 7

No. in diagram	Abbreviation	Part Description	Major Function
1	INV Comp.	Inverter Compressor	The inverter compressor's speed is controlled based on coil pressures monitored by the unit's pressure transducer (PT)
2	T5	Compressor Discharge Temperature Sensor	Used for compressor discharge temperature protection and EEV control in heating mode
3	HPS	High Pressure Switch	• High Pressure Switch opens at P > 580 PSIG, the compressor and outdoor fan stop. • High Pressure Switch closes at P < 435 PSIG, the compressor and outdoor fan restart.
4	Pc	High Pressure Sensor	Used to measure pressure for compressor control, evaporating pressure during cooling, and condensing pressure during heating.
5	CV	Check Valve	Turn on when the refrigerant discharging from the compressor and turn off by itself if returning to the compressor.
6	RV	Reversing Valve	Used to switch mode between cooling and heating.
7	Fan	Outdoor Fan	Used to help heat exchange using 10-speeds ECM motor.
8	T4	Ambient Temperature Sensor	Used for ambient protection and Fan control in heating mode, and defrost control.
9	CC	Condenser Coil	Exchange heat with outdoor air.
10	T3	Outdoor Coil Temperature Sensor	• Used for discharge temperature protection • Fan control (cooling mode) • Defrost control (heating mode)
11	T3L	Liquid Line Temperature Sensor	Accurate Subcooling measurement.
12	CV	Check Valve	Open during cooling and closed during heating.
13	GLQ	Filter	Filtering impurities in refrigerant circuit
14	EEVA	"A" Electronic Expansion Valve	Fully open during cooling mode and adjusted during heating mode. Controlled in heating mode via compressor discharge superheat.
15	CA	Capillary	Throttle.
16	EEVC	"C" Electronic Expansion Valve	Adjust opening during enhanced vapor injection control.
17	T6A	Injection Inlet of Plate Heat Exchanger Temperature Sensor	Electronic Expansion Valve control (EEVC).
18	T6B	Injection Outlet of Plate Heat Exchanger Temperature Sensor	Electronic Expansion Valve control (EEVC).
19	PHE	Plate Heat Exchanger	Heat exchanger.
20	T7	Liquid Service Valve Temperature Sensor	Accurate Subcooling measurement.
21	SV5	Solenoid Valve 5	Used to balance pressure before compressor starts
22	AC	Accumulator	Prevents liquid refriegerant from entering the compressor.
23	SV8	Solenoid Valve 8	Turns on during enhanced vapor injection control.
24	Pe	Low Pressure Sensor	Used to measure pressure for low pressure protection
25	Th	Compressor Suction Temperature	Accurate Superheating measurement

Table 8

9 Control

9.1 Unit Start-Up Logic

When the unit is powered ON and a Cooling/Heating call is set, the outdoor fan will turn ON. After 3.5min, the compressor will begin to ramp up. The LCD display on the outdoor PCB will show the compressor frequency as it ramps up. In Heating mode, there may be a longer delay to allow the condenser to reach operating temperatures and prevent cold air from being blow inside (See 9.5.6 Indoor Fan Motor Function).

9.1.1 Enhanced Vapor Injection (EVI)

To maintain its heating ability in extremely cold temperatures, this unit uses enhanced vapor injection. It works by directing refrigerant through an expansion valve to a plate heat exchanger, which further heats the refrigerant after it leaves the compressor and moves to the evaporator.

EVI ON:
T4 < 50 °F (EEVC Open)

EVI OFF:
T4 ≥ 50 °F (EEVC Closed)
Or unit in stand by mode

9.2 Compressor Control

The compressor's maximum frequency is dependent on the ambient temperature (T4). The table below shows the maximum operational frequency at certain ambient temperature ranges based on the unit's mode.

Mode	Max Operational Frequency (Hz)		
	3 Ton	4 Ton	5 Ton
Cooling	52	66	76
Heating T4 ≥ 41°F	48	68	76
Heating T4 < 41°F	52	76	86
Heating T4 < 28.4 °F	68	90	100
Heating T4 < 14 °F	84	106	114
Heating T4 < -4°F	82	100	110

Table 9

Compressor Control in Cooling: The compressor speed will be PI controlled by Te and Tes. Te is the measured evaporator temperature from the Pe sensor. Tes is the target evaporating temperature which can be adjusted via dipswitch SW4 (see ODU wiring diagram for details).

Compressor Control in Heating: The compressor speed will be PI controlled by Tc and Tcs. Tc is the measured condensing temperature from the Pc sensor. Tcs is the target condensing temperature which can be adjusted via dipswitch SW4. (See ODU wiring diagram for details.)

9.2.1 Compressor Rated Frequency Range

This is the rated compressor frequency range measured at the rated ambient temperature for each mode. This does not represent the system achievable frequency range, but rather the rated one.

Outdoor Unit Model	Indoor Unit Model	Mode	Min Hz*	Rated Hz	Max Hz**	Percentage Range
BOVB-60MTB-M19E	BIVB-48MCB-M19X	Cooling	20	56	62	36-111%
		Heating	20	56	60	36-107%
BOVB-60MTB-M19E	BIVB-60MCB-M19X	Cooling	20	61	76	33-125%
		Heating	20	61	70	33-115%

Table 10

** Minimum Hz with minimum allowable airflow*
***Maximum Hz with maximum allowable airflow*

Tes/Tcs adjustment for compressor control (communication mode):

In a two-stage (Y1/Y2)and a single-stage (Y1 with Y2 jumped) thermostat set-up, the system will adjust Tes/Tcs based on ambient temperature, Y1/Y2 thermostat signals, and how often the thermostat turns off. If paired with a BCC thermostat and corresponding gateway, the system will adjust Tes/Tcs according to the BCC setpoint and the return air temperature.

If a single-stage (Y1 only) thermostat set-up is used, Tes/Tcs will adjust based on ambient temperature, Y1 thermostat signal, and how often the thermostat turns off. If paired with a BCC thermostat and corresponding gateway, the system will adjust Tes/Tcs according to the BCC setpoint and the return air temperature.

9.3 Outdoor Fan Control

Cooling Outdoor Fan Contol

Fan speed when cooling depends on condensing pressure as shown below.

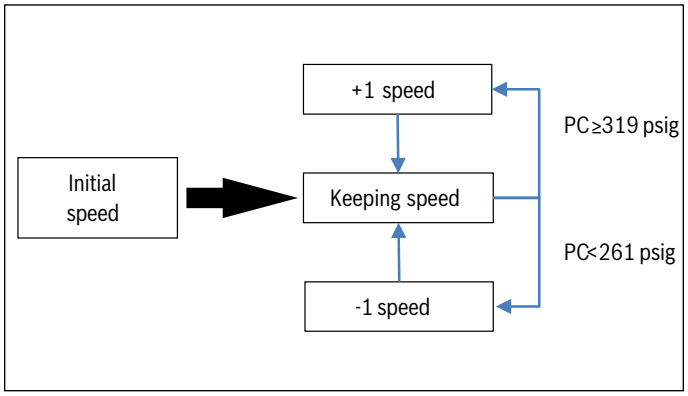


Figure 8
Note: ± 1 speed/25sec,10 speed ECM motor, the motor may stop when Pc is < 217.6 psi.

Heating Outdoor fan control

Fan speed when heating depends on compressor and T4 as shown below.

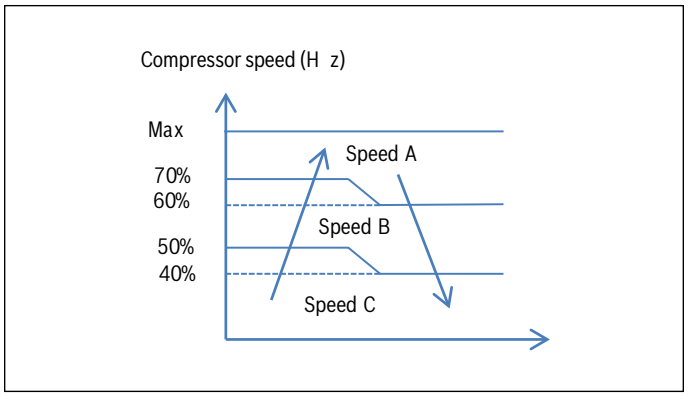


Figure 9

9.4 Compressor Crankcase Heater Control

The crankcase heater only operates when the compressor is OFF (i.e. during standby). Refrigerant migration during the OFF cycle can result in noisy start-ups, therefore a Crankcase Heater (CCH) is used to minimize refrigerant migration thereby minimizing start-up noise and/or compressor damage. Its purpose is to warm the compressor during the OFF cycle, driving refrigerant from compressor. After extended shutdown periods (high voltage power off) in cold weather, it is recommended to allow CCH to be energized for at least 12 hours prior to compressor operation by applying line voltage to heat pump with thermostat OFF.

CCH operation energizes:

1. First time line voltage is applied AND compressor discharge temperature T5 < 53°F.
2. Compressor stops running for 3 hours AND compressor discharge temperature T5 < 53°F).

CCH operation de-energizes:

1. Compressor discharge temperature T5 ≥ 61°F.

9.5 Other Operations

The operations shown in this section are unit operations which occur only under specific conditions.

9.5.1 Defrost Operation

If there is no fault code and the unit is in defrost mode, the LED display will show "dF**" (** shows the frequency of compressor in Hz). The unit can enter defrost mode via logic or manually.

The Demand Defrost Control (DDC) monitors the outdoor unit coil temperature using thermistor (T3). A second thermistor (T4) monitors outdoor ambient temperature. Based on these parameters, as well as accumulative run time and high pressure, the DDC calculates proper initiation of defrost.

Any one of the below three conditions is required to enter defrost:

1. The calculated temperature difference between the outdoor temperature (T4) and the coil temperature (T3) is called Delta T. After Delta T is achieved and continues for 3 minutes.
   - T4 ≥ 36°F, Delta T = 18°F
   - T4 ≥ 30°F, Delta T = 16°F
   - T4 ≥ 19°F, Delta T = 14°F
   - When T4 < 19°F, T3 < 9°F, accumulative compressor run time ≥ 95 minutes.
2. After "Minimum Run Time" (MRT) is achieved. MRT is based on outdoor ambient temperature (T4), for example:
   - MRT is 4 hours when: T4 < 23°F
   - MRT is 2 hours when: 23°F ≤ T4 < 40°F
   - MRT is 50 minutes when: Last defrost cycle lasted 8 minutes
3. After the high pressure saturation temperature drops below 82°F for 20 minutes and 14°F≤T4<29°F.

Defrost will terminate once outdoor coil temperature (T3) reaches 64° F for a period of 1 minute or defrost time reaches 8 minutes.

Defrost Termination Settings (SW5-1/SW5-2) offers different defrost termination options for enhanced defrost for different geographical and outdoor conditions.

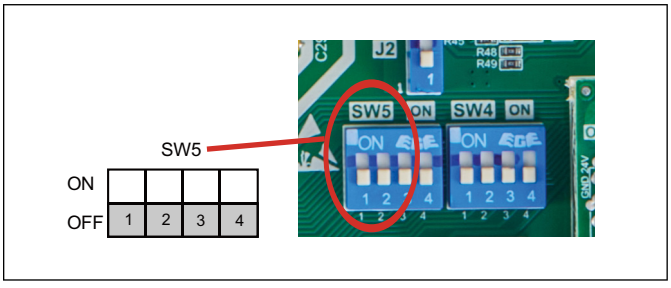


Figure 10

DIP Switch		Description
SW5-1	ON	Defrosting **reduced** by 60 seconds
	OFF	Normal*
SW5-2	ON	Defrosting **extended** for 60 seconds
	OFF	Normal*
SW5-3	ON	Unused
	OFF	Normal*
SW5-4	ON	Reserved
	OFF	Communicating Mode*

Table 11

** Factory Default*

Manual Defrost:

1. System must have a call for heat and have been operating for a minimum of 10 minutes.
2. Press "Force" button on inverter board for 6 seconds to begin manual defrost.
3. Wait approximately 60 seconds for defrost to initiate.
4. Once defrost initiates, the display will indicate "dF".
5. Defrost test will terminate automatically, after which the display will indicate running speed.
6. If a second defrost test is required, repeat steps 2-5 after 5 minutes.

For a DIP switch change to take effect, the unit must be power cycled.

9.5.2 Oil Return Operation

In order to prevent the compressor from operating in a low oil condition, the oil return operation is conducted to recover oil to the compressor. The LED display will show "A**" during oil return operation (** shows the frequency of compressor).

9.5.3 Force Mode Operation

Force mode is also referred to as charge mode in cooling. The LED display will show "⊢**" during force mode (** shows the frequency of compressor). The unit will only go into force mode if manually placed in this mode by the user.

Function: Used in cooling mode to verify superheat/subcooling and charge system.

To Enter Force Mode: Press FORCE button for 1 second (press it while compressor is running. You can verify superheat/subcool once the unit has reached the compressor frequencies on Table 19. If unit fails to enter Force Mode, wait a few minutes and try again).

To Exit Force Mode: Press FORCE button again to quit immediately or it will automatically quit after 2 hours.

Force mode frequency	3T	4T* / 5T	Remark
Cooling	46	60	Charge mode

Table 12 Compressor frequency during force mode

* assumes the J2 dip switch on the outdoor control board is flipped to OFF (forcing unit to 4 ton).

9.5.4 Reversing Valve Operation

Reversing valve energizes during heat mode and de-energizes in cool mode.

During a heat call on first time operation the unit will run about 1 minute in cooling to build up pressure for reversing valve to change.

9.5.5 Basepan Heater Operation

When the ambient temperature is low, the baseplate heater will be automatically turned on to prevent the baseplate from blocked by ice.

- Baseplate heater operation energizes:
  - Outdoor ambient temperature T4<36℉ in heating mode.
- Baseplate heater operation de-energizes:
  - Outdoor ambient temperature T4≥39 ℉ for more than 1 minute
  - Switch to cooling mode

9.5.6 Indoor Fan Motor Function

System operation and function

Autofan Speed

The BIVB 19 series air handlers supports up to four stage fan control depending on the difference between the set point and room temperature when paired with a BCC connected thermostat. Otherwise, an estimated different between room temperature and set point is used.

The X13 ECM motor supports 5 different speeds. Customers can select the desired maximum and minimum fan speeds through adjusting the SW6-1 and SW6-2 dip switches. Refer to the airflow performance tables in the IOM and Figure 14 dip switch settings to determine the best way to configure the blower's speeds.

Two Stage Fan Control Non-Auto Fan Speed

The BIVB 19 series air handler also supports two stage fan control which requires a two stage thermostat (Y1&Y2). When there is a call for Y2, the blower motor will turn to high speed setting. When there is a call for Y1, the blower motor will turn to low speed setting. Unit will run at low speed setting when there is only G call. It will run in high speed setting when there is W/W1/W2 signal (when the electric heat kit is on).

The X13 ECM motor supports 5 speeds. Customer can select the suitable speed by adjusting the SW6-1 and SW6-2 dip switches. Refer to Airflow Performance Tables in the BIVB19 IOM for reference airflow. Refer to Figure 14 for dip switches settings. If 2 stage thermostat is not available, single stage thermostat may be used, please refer to Wiring Diagram section for wiring instructions. If Y1 and Y2 are jumped, the unit will only run in high stage fan speed.

Anti-Cold Air Fan Delay

The Anti-Cold Air Fan Delay function utilizes a temperature sensor (T2) located on the indoor coil and a pressure transducer (Pc) on the outdoor unit, which prevents the blower from turning on until the coil has reached a certain temperature. This feature prevents cold air blow during heating operation.

When SW6-3 dip switch is set to the "OFF" position and the unit is in heating mode, the Anti-Cold Air Fan Delay function will activate based on the following entry conditions (all 3 conditions must be met):

a. Indoor Coil Temperature (T2) < 83℉

b. Electric heat kit is turned off (no W signals)

c. There is a Y1 from the thermostat to the indoor unit

2. This function will deactivate if ONE OF the following exit conditions are met:

a. T2 ≥ 90℉ for more than 2 minutes

b. Electric Heat kit is turned ON (any W signal)

c. The system is NOT running Heat mode

d. There is no longer a Y1 from the thermostat to the indoor unit

e. There is a communication fault between indoor unit and outdoor unit

3. During heating mode, the blower motor will turn on in first stage fan speed if one of the following conditions of Anti-Cold Air is satisfied:

a. T2 ≥ 90F

b. Pc ≥ 435 psi

c. Anti-Cold Air Fan Delay have been activated for 15 minutes

Heating Fan Delay

If SW6-3 dip switch is set to the "ON" position and the unit is in heating mode, the blower will operate with a 90 second delay with the fan speed dictated by Y1 or Y2 signal.

Dehumidification (Optional)

The BIVB19 series air handler has an active dehumidification mode. When the air handler is communicating with a BOVB 19 series condensing unit, a DH call from a thermostat will lower the evaporator temperature and slow down the fan speed to dehumidify the space.

If DH wire is not connected, the unit will still function normally.

9.5.7 Electric Heating Control

There are two electric heating control modes: **Automatic** and **Non-Automatic** (Figure 112 and Figure 113). The system will only operate in Automatic control when the communication between the IDU, ODU, Gateway, and paired BCC is normal. During Automatic Control, the average T1 value of the current cycle - the average T1 value of the previous cycle is denoted by δT1. When the system's gateway is paired to a BCC thermostat, the room temperature value from the thermostat (T1_stat) is used in place of T1. The **Automatic** electric heat staging logic is represented by the following:

EHK Status: OFF

- To Stage 1:
  - Blower speed is at maximum.

  AND
  - W1 or W2 has been active for 5 seconds.
- From Stage 1 to OFF:
  - Blower speed is below maximum.

  OR
  - Both W1 and W2 have been inactive for 5 seconds.

EHK Status: Stage 1 (Electric Heat Stage 1)

- To Stage 2:
  - Blower speed is at maximum.

  AND
  - Electric Heat Stage 1 has been active for 5 seconds.

  AND
  - W2 has been active for 5 seconds.
- From Stage 2 to Stage 1:
  - Blower speed is below maximum.

  OR
  - W2 has been inactive for 5 seconds.

EHK Status: Stage 2 (Electric Heat Stage 2)

- To Stage 3:
  - Blower speed is at maximum.

  AND
  - W2 has been active for 5 seconds.

  AND
  - Electric Heat Stage 2 has been active for 3 minutes.

  AND EITHER:
  - T1 is at or below T1s - 4.86°F for 3 minutes.

  OR
  - T1 is at or below T1s - 1°F for 10 minutes AND δT1 is at or below 32°F.

• From Stage 3 to Stage 2:
  - Blower speed is below maximum

  OR
  - W2 has been inactive for 5 seconds

  OR
  - T1 is more than equal to T1s + 0.36°F for 10 minutes AND δT1 is at or below 32°F

The **Non-Automatic** electric heat staging logic is represented by the following:

EHK Status: OFF

- To Stage 1:
  - The blower is ON.

  AND
  - W1 or W2 has been active for 5 seconds.
- From Stage 1 to OFF:
  - The blower is OFF.

  OR
  - Both W1 and W2 have been inactive for 5 seconds.

EHK Status: Stage 1 (Electric Heat Stage 1)

- To Stage 2:
  - The blower is ON.

  AND
  - Electric Heat Stage 1 has been active for 5 seconds.

  AND
  - W2 has been active for 5 seconds.
- From Stage 2 to Stage 1:
  - The blower is OFF.

  OR
  - W2 has been inactive for 5 seconds.

EHK Status: Stage 2 (Electric Heat Stage 2)

- To Stage 3:
  - The blower is ON.

  AND
  - Electric Heat Stage 2 has been active for 5 minutes.

  AND
  - W2 has been active for 5 seconds
- From Stage 3 to Stage 2:
  - The blower is OFF.

  OR
  - ◦W2 has been inactive for 5 seconds.

EHK during defrost mode or ultra-low ambient temperature

To ensure sufficient heating capacity, the outdoor unit will signal the indoor unit to activate the electric heating strips (W1+W2) until the end of the heating call. During this time, the indoor unit's blower will operate at its highest speed.

- Electric Heat Strips (W1 + W2) will be activated in the indoor unit when:
  - The outdoor unit is currently in defrost mode.
  - OR
  - The outdoor temperature (T4) is below -13°F and the system is operating in heating mode

10 Field Settings

10.1 Initial Unit Preparation and Installation Checklist

WARNING

Personal injury, product damage, improper operation!

This checklist is NOT to be used in place of the Installation, Operation, and Maintenance Manual.. Please refer to Installation, Operation, and Maintenance Manual for specifications and detailed installation requirements.

✓	No.	Setting Up the Unit
	1	Be sure to consider maximum lineset lengths
	2	Ensure proper clearances and location restrictions for outdoor and indoor unit
	3	Ensure outdoor unit is installed on a pad and supported in the center
✓	No.	Check Refrigerant Lines
	1	Ensure proper lineset diameters
	2	Ensure proper insulation and routing
	3	Braze refrigerant lines using proper techniques. When brazing, ensure nitrogen is running through the lines. DO NOT BRAZE WHILE REFRIGERANT IS IN THE LINES.
	4	Perform leak check
	5	Properly evacuate lines
	6	Open service valves, ensure they are fully open
✓	No.	Low Voltage Wiring
	1	Ensure low voltage wiring does not exceed maximum length
	2	Ensure proper gage wire is used
	3	Connect thermostat wiring as shown in wiring diagrams in IOM
✓	No.	High Voltage Wiring
	1	Connect high voltage power supply ensuring proper safety precautions are followed
	2	Install high voltage disconnect switch
	3	Ensure proper grounding on indoor and outdoor units

Table 13

10.2 Initial Start-up Checklist

WARNING

Personal injury, product damage, improper operation!

This checklist is NOT to be used in place of the Installation, Operation, and Maintenance Manual.. Please refer to Installation, Operation, and Maintenance Manual for specifications and detailed installation requirements.

✓	No.	System Start-up
	1	Consider non-default dipswitch positions as needed, refer to section 11.3.2 and 11.3.4
	2	Set thermostat to OFF prior to unit charging
✓	No.	Unit Charging
	1	Determine proper charging method: weigh in method or charge by subcooling. If design superheat and subcooling cannot be achieved, refer to section 11.3 Fault Code Description and Troubleshooting.
	2	After 20 minutes of unit operation, ensure proper drainage of condensate on indoor and outdoor units
	3	Force unit into Manual Defrost to verify functionality.

Table 14

10.3 Dip Switch Settings

10.3.1 Outdoor Unit Dip Switch Settings

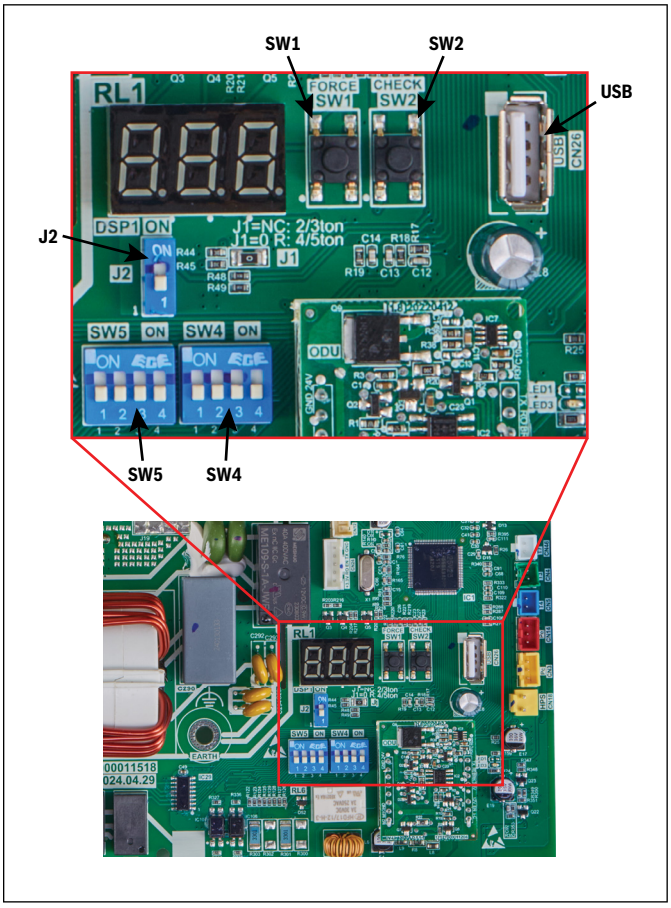


Figure 11 3/5 Ton

Switch	Position	Function
SW1	Push Button	Force mode/Manual defrost
SW2	Push Button	For check point data
SW4-1	ON	Unused
	OFF*	Must be set at "OFF" position
SW4-2	ON	Accelerated cooling/heating 1
	OFF*	Normal cooling/heating
SW4-3	ON	Accelerated cooling/heating 2
	OFF*	Normal cooling/heating
SW4-4	ON	Adaptive capacity output disable
	OFF*	Adaptive capacity output enabled
SW5-1	ON	Defrosting **reduced** by 60 seconds
	OFF*	Normal
SW5-2	ON	Defrosting **extended** for 60 seconds
	OFF*	Normal
SW5-3	ON	Unused
	OFF*	Normal
SW5-4	ON	Reserved
	OFF*	Communicating mode
J2	ON*	3/5 Ton Capacity
	OFF	4 Ton Capacity

Table 15 Outdoor unit dip switch settings

* Default setting

10.3.2 When to Change Outdoor Unit Dip Switch Settings

CAUTION

Electrical hazard!

Power should be turned off when adjusting dip switches.

In most scenarios, it is recommended to keep all outdoor unit board dip switch positions in their manufacturer default positions. There are some specific scenarios when it makes sense to change dip switch settings:

- **SW4-4**: Default is OFF position (enabled), allows for coil/condenser target temperature to drift +/- 4°F based on previous hour of operation in an attempt to optimize run time. If dip switch is changed to ON, software requires a “hard” target for coil temperature and does not drift to optimize runtime.
  Reason to change from default: In zoning applications but only as needed as a result of customer expectations and/or performance.

- **SW4-2 & SW4-3**: Default is OFF position for both, system uses the default target coil temperatures. **BOTH SHOULD NOT BE TURNED ON, ONLY ONE SHOULD BE ON AT A TIME.** If SW4-2 (Accelerated Cooling/Heating 1) dip switch is turned ON, this reduces the target coil temperature by 4°F in cooling and increases the target coil temperature by 4°F in heating. Alternatively, if SW4-3 (Accelerated Cooling/Heating 2) dip switch is turned ON, this reduces the target coil temperature by 5°F in cooling and increases the target coil temperature by 5°F in heating.
  Reason to change from default: Recommended to be used only as needed as a result of customer expectations and/or performance (i.e. not getting enough capacity, or not dehumidifying well enough).

- **SW5-1**: Default is OFF position, uses default defrost operating time (maximum of 8 minutes). If dip switch is changed to ON, default defrost time is reduced by 10%.
  Reason to change from default: Can be used in mild/warm climates, where it may take less time than usual to defrost the outdoor coil.

- **SW5-2**: Default is OFF position, uses default defrost operating time (maximum of 8 minutes). If dip switch is changed to ON, default defrost time is increased by 1 minute.
  Reason to change from default: Can be used in colder climates, where it may take more time than usual to defrost the outdoor coil.

- **J2**: Default is ON, which leaves the compressor capacity at default (3 ton or 5 ton depending on model). Regardless if the matching air handler is 4 ton or 5 ton (when paired with the 5 ton condenser), the J2 jumper can be left at default position. The compressor will ramp to required coil temperature regardless of paired air handler size.
  Reason to change from default: If you want (or need) to minimize maximum condenser capacity from 5 to 4 tons (5 ton condenser model only).

10.3.3 Indoor Unit Dip Switch Settings

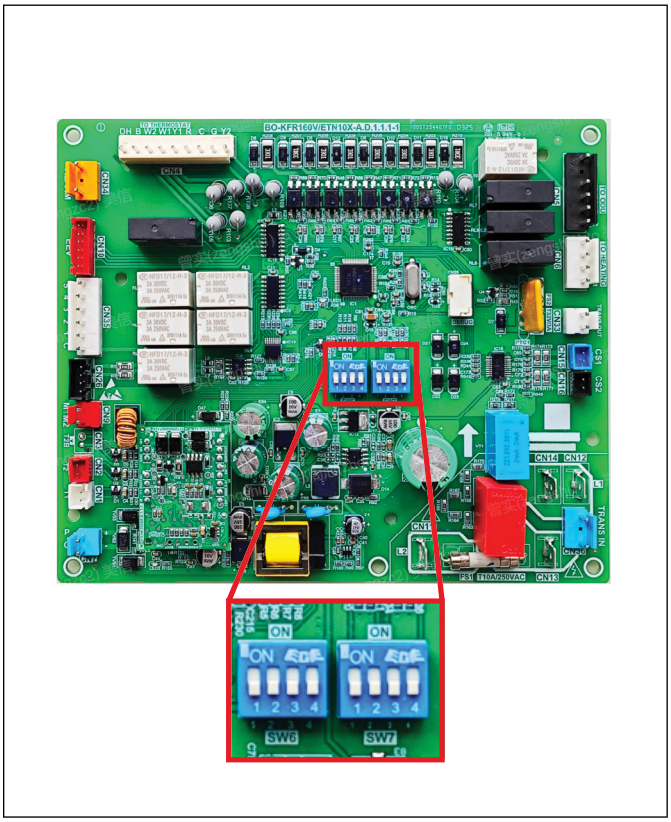


Figure 12 Indoor board dip switches

10.3.4 When to Change Indoor Unit Dipswitch Settings

CAUTION

Electrical hazard!

Power should be turned off when adjusting dip switches.

In most scenarios, it is recommended to keep all indoor unit board dip switch positions in their manufacturer default positions. There are some specific scenarios when it makes sense to change dip switch settings:

- **SW6-1/2**: Default positions vary by air handler size, see Figure 14. Changing the position of these dip switches changes the fan motor speed settings for high and low speed.

  Reason to change from default: The manufacturer recommends 300-450 CFM/ton, the static pressure and speed tap settings influence the CFM. Refer to the air flow performance chart in the IOM to select fan speed settings depending on your application. If an electric heat kit is used, the manufacturer recommends 350-450 CFM/ton.

Autofan Speed Configurations					
Dip Switch Position		Mode	Low Fan Speed	High Fan Speed	Default
SW6-1	OFF	Cool	1	2	
SW6-2	OFF	Heat	1	3	
SW6-1	OFF	Cool	1	3	Default on 48 air handler model
SW6-2	ON	Heat	1	4	
SW6-1	ON	Cool	1	4	Default on 36/60 air handler model
SW6-2	OFF	Heat	2	5	
SW6-1	ON	Cool	2	5	
SW6-2	ON	Heat	2	5	

Table 16 Autofan Speed Configurations

Non-Autofan Speed Configurations					
Dip Switch Position		Mode	Low Fan Speed	High Fan Speed	Default
SW6-1	OFF	Cool	1	2	
SW6-2	OFF	Heat	1	3	
SW6-1	OFF	Cool	1	3	Default on 48 air handler model
SW6-2	ON	Heat	2	4	
SW6-1	ON	Cool	2	4	Default on 36/60 air handler model
SW6-2	OFF	Heat	3	5	
SW6-1	ON	Cool	3	5	
SW6-2	ON	Heat	3	5	

Table 17 Non-Autofan Speed Configurations

- **SW6-3**: Default is OFF position, which turns on the Anti-Cold Air Fan Delay function. This function utilizes a sensor (T2) located on the indoor coil, which prevents the blower from turning on until the coil has reached a temperature of 83℉, at which point it will run in low speed. The blower will exit the Anti-Cold Air Fan Delay function when the coil temperature is above 90℉. This feature prevents cold air blowing into the space during heating operation. If dip switch changes to ON, the fan will operate in heating mode with a 90 second fan delay.

  Reason to change from default: Recommended to be used only as-needed as a result of customer expectations and/or performance. If indoor unit is paired with non-Bosch condenser that energizes the reversing valve in cooling, set dip switch to ON to enable 90 second fan delay.

- **SW6-4**: Default is OFF position, which sets the unit to Auto-Fan Speed. This is only when the unit is set up in Communicating Mode.

  Reason to change from default: Unique field constrains that require fan speeds to be set by customer/contractor.

Dip Switch Position		Description
SW7-1	ON	Reserved
	OFF	Communicating Mode*
SW7-2	ON	Reserved
	OFF	Normal*

Table 18

- **SW7-1**: Default is OFF position which sets the unit to Communicating Mode to enable the indoor unit to transmit data effectively with a paired Bosch outdoor unit.
- ***SW7-3/4:** Ensure the proper unit model is selected. Refer to the wiring diagram on the unit for the switch positions for each available model. The

models are based on the capacity of the indoor unit.

Combinations	Dip Switch Position		IDU Model Selection
1	SW7-3	OFF	Reserved
	SW7-4	OFF	
2	SW7-3	OFF	3T
	SW7-4	ON	
3	SW7-3	ON	4T
	SW7-4	OFF	
4	SW7-3	ON	5T
	SW7-4	ON	

Table 19

10.3.5 Demand Response (DR)

Operation State	Power Consumption Percent	Description
0	~ 0%	"Idle Normal" - No DR event is in effect and unit has no/insignificant energy consumption.
1	100%	"Running Normal" - No DR even is in effect and unit is running normal under local control.
2	70%	"Running Curtailment" - Curtailment type DR is in effect and system is running in General Curtailment mode.
3	40%	"Running Hightened" - Hightened-operation type DR is in effect and system is running in Critical Curtailment mode.
4	0%	"Idle Curtailed" - Curtailment type DR is in effect and system is OFF.
5	~	"SGD Error Condition" Unit is not operating or is disabled in some way.
6	0%	"Idle Heightened" - Hightened-operation type DR is in effect and system is OFF.
11	~0%	"Idle, Opted Out" - Unit opted out of any DR events and is OFF.
12	100%	"Running, Opted Out" - Unit opted out of existing DR event and is running under local control.

Table 20

Demand Response is a functionality that allows electric utility providers to reduce the strain on the local electrical grid by automatically adjusting their customers' heating and cooling equipment settings remotely. Most commonly it is used to reduce the total electrical load during times of local peak energy usage.

To incentive their customers to join their Demand Response programs, providers may offer discounted electrical rates at certain times of day.

These programs are not a product of Bosch, so for full details please contact your electrical utility provider to discuss what they may have available for customers who own heating and cooling products that are capable of Demand Response.

Available programs can be accessed through the EasyAir app.

The IDS Ultra (BOVB and BIVB models) heat pump is compatible with Demand Response. Other series may require installation of a Ducted DR Gateway if the product is not already a connected product.

10.4 Check Point Values

To display system parameters, press the “Check” button on the outdoor board to index through the series of parameters available. The first time you press the “Check” button, it will display the sequence, and after 1 second it will display the value of the parameter. If you press the “Check” button again, it will display the next sequence.

After 20 seconds on the same parameter, display will revert back to normal status.

It is recommended to use the "Check" button to verify outdoor unit capacity (No. 0), operation mode (No. 1), and subcooling (No. 4) prior to leaving the installation site. See IOM for required subcool values.

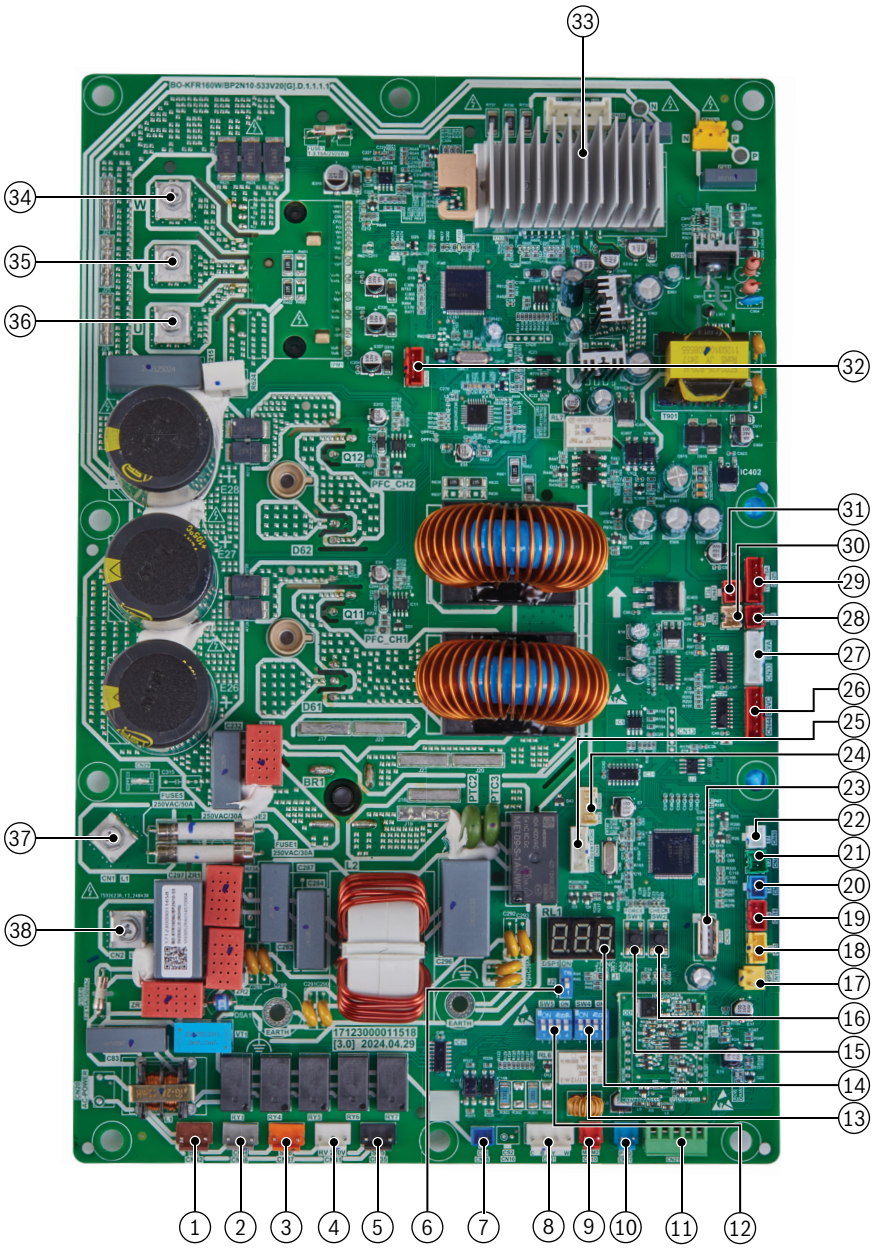
No.	Point check content	Example	Remark
0	Outdoor unit capacity: H5=Heat pump 5 ton	H5	H5=Heat Pump 5 ton
1	Outdoor unit mode: 0-standby, 2-cooling, 3-heating	2	0 standby, 2 cooling, 3 heating
2	Outdoor unit set compressor speed	56	Hz
3	System last fault code	E4	system
4	Liquid valve subcooling (°F)	10	°F
5	Gas valve superheat (°F)	10	°F
6	T3: outdoor coil temp.(°F)	108	°F
7	T3L: outdoor coil outlet temp.(°F)	102	°F
8	T4: outdoor ambient temp.(°F)	95	°F
9	T5: compressor discharge temp.(°F)	140	°F
10	Th: compressor suction temp.(°F)	55	°F
11	T7: outdoor outlet temp.(°F)	55	°F
12	T6A: injection inlet of the plate heat exchanger temp.(°F)	55	°F
13	T6B: injection outlet of the plate heat exchanger temp.(°F)	55	°F
14	Tf: Compressor IPM temp.(°F)	120	°F
15	Pe: evaporating pressure(psig)	130	psig
16	Pc: condensing pressure(psig)	320	psig
17	Tes: target evaporating temp.(°F) (only for cooling mode)	43	°F
18	Te: evaporating temp.(°F)	43	°F
19	Tcs: target condensing temp.(°F)(only for heating mode)	106	°F
20	Tc: condensing temp.(°F)	106	°F
21	Target value of the compressor discharge superheat(°F) (only for heating mode)	36	°F
22	Compressor discharge superheat (°F)	36	°F
23	Compressor Suction superheat (°F)	10	°F
24	Openings of EEVA(P)	200	0-480P
25	Openings of EEVC(P)	200	0-480P
26	Fan speed stage	8	(0-10)
27	Outdoor unit fan current(A)	1	A
28	Compressor current(A)	10	A
29	Outdoor unit input current(A)	10	A
30	Outdoor unit input voltage(V)	230	V
31	Outdoor unit DC bus voltage(V)	380	V
32	Outdoor unit power(*0.1kW)	200	Outdoor unit * 0.1 kW
33	Continuous running time of the compressor(min)	35	minutes/0-999/Maintain at maximum
34	Outdoor unit main control software version	11	11
35	Indoor unit motor power(W)(only for communication mode)	300	W
36	Indoor unit Heat Kit Staging	1	0~3
37	T1: Indoor unit ambient temp.(°F) (only for communication mode)	55	°F
38	T2: indoor unit coil temp.(°F) (only for communication mode)	55	°F
39	Indoor unit software version(only for communication mode)	11	
40	Demand Response Setting	1	1~3
41	reserved	--	--
42	Remark“--”	--	--

Table 21 Parameter check points

11 Diagnosis and Troubleshooting

11.1 Control Board Component Layout

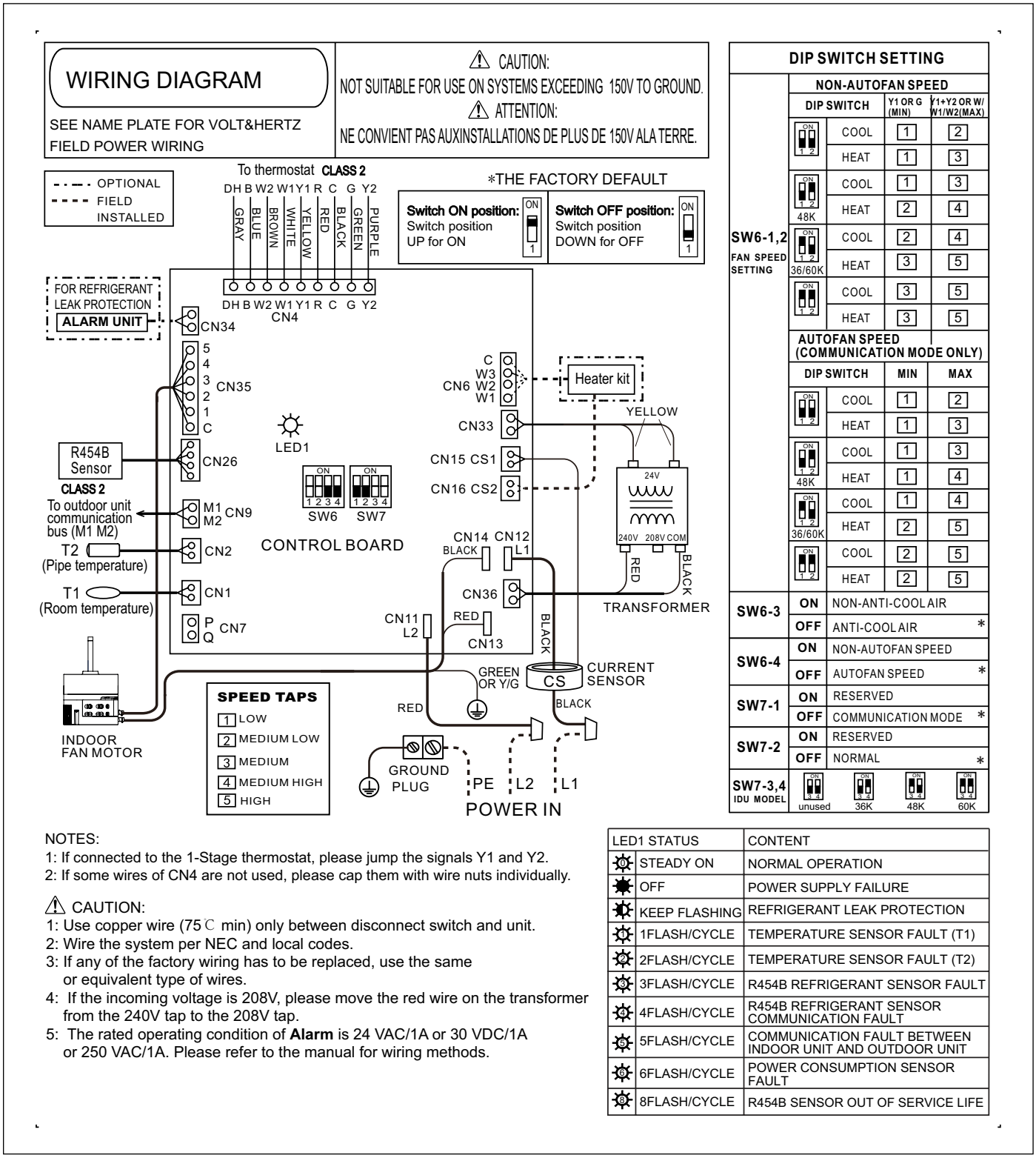
11.1.1 BOVB19 Outdoor Unit Control Board



No.	Description
1.	Baseplate heater port
2.	Compressor crankcase heater port
3.	Solenoid valve port SV8
4.	Reversing valve port
5.	Solenoid valve port SV5
6.	J2 DIP SWITCH: Capacity setting
7.	Current sensor port
8.	Thermostat wire connections
9.	M1M2 communication bus port
10.	PQ communication bus port
11.	Gateway wire connections
12.	SW5 DIP SWITCH: Control logic settings
13.	SW4 DIP SWITCH: Control logic settings
14.	Digital tube
15.	SW1 FORCE BUTTON
16.	SW2 CHECK BUTTON
17.	High pressure switch port
18.	High pressure transducer port
19.	Low pressure transducer port
20.	T4 sensor port
21.	T3 sensor port
22.	T7 sensor port
23.	USB
24.	Reserved
25.	Reserved
26.	EEVC port
27.	EEVA port
28.	T5 sensor port
29.	T6A T6B sensor port
30.	Th sensor port
31.	T3L sensor port
32.	Reserved
33.	Fan motor port
34.	Compressor: W port
35.	Compressor: V port
36.	Compressor: U port
37.	Power input
38.	Power input

Figure 13 Outdoor unit main PCB ports

11.1.2 BIVB19 Indoor Unit Wiring Diagram



DIP SWITCH SETTING				
	NON-AUTOFAN SPEED			
	DIP SWITCH		Y1 OR G (MIN)	Y1+Y2 OR W/ W1/W2(MAX)
SW6-1,2 FAN SPEED SETTING		COOL	1	2
		HEAT	1	3
	48K	COOL	1	3
		HEAT	2	4
	36/60K	COOL	2	4
		HEAT	3	5
		COOL	3	5
		HEAT	3	5
	AUTOFAN SPEED (COMMUNICATION MODE ONLY)			
	DIP SWITCH		MIN	MAX
		COOL	1	2
		HEAT	1	3
	48K	COOL	1	3
		HEAT	1	4
	36/60K	COOL	1	4
		HEAT	2	5
		COOL	2	5
		HEAT	2	5
SW6-3	ON	NON-ANTI-COOL AIR		
	OFF	ANTI-COOL AIR *		
SW6-4	ON	NON-AUTOFAN SPEED		
	OFF	AUTOFAN SPEED *		
SW7-1	ON	RESERVED		
	OFF	COMMUNICATION MODE *		
SW7-2	ON	RESERVED		
	OFF	NORMAL *		
SW7-3,4 IDU MODEL	unused	36K	48K	60K

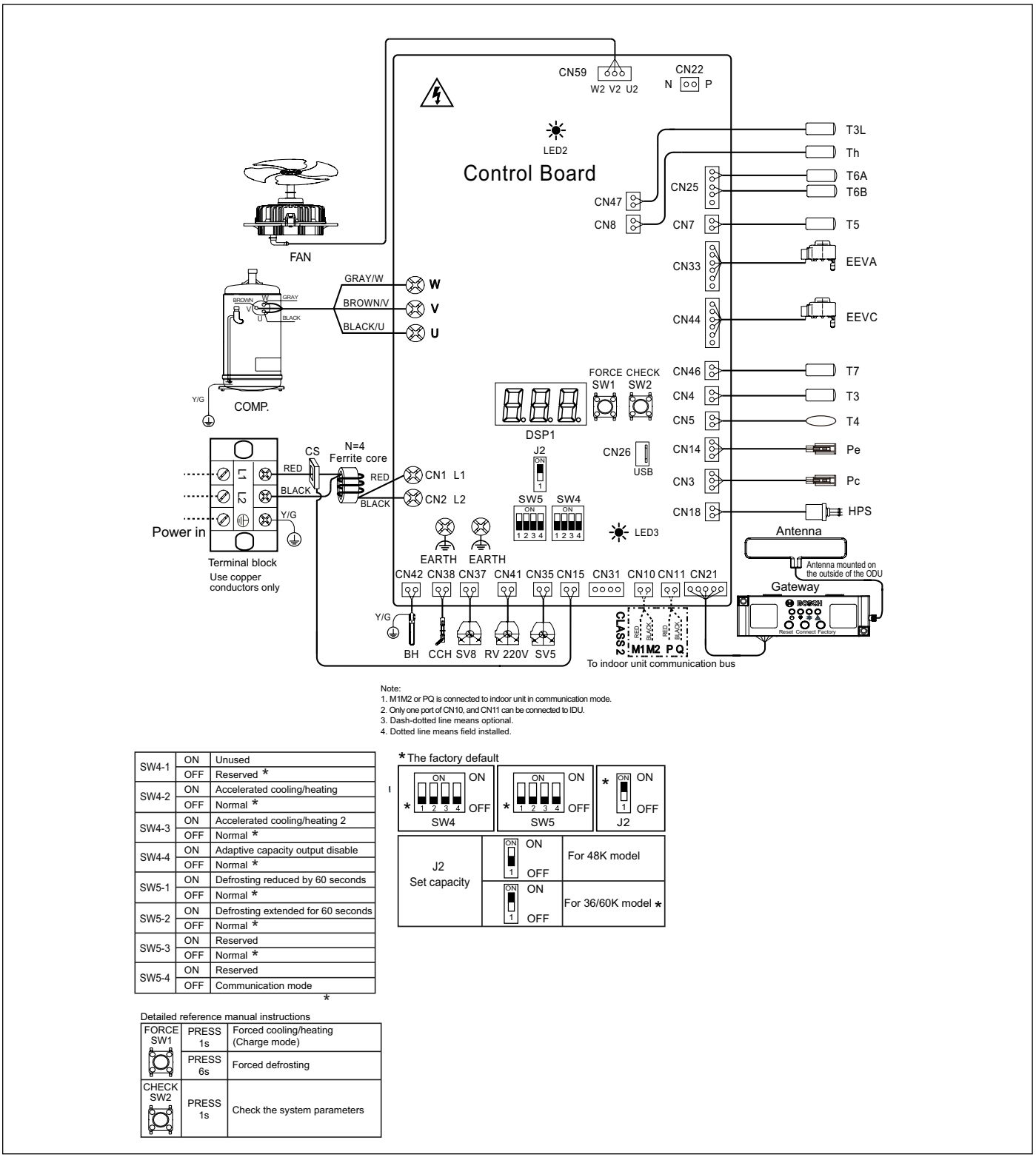
NOTES:
1: If connected to the 1-Stage thermostat, please jump the signals Y1 and Y2.
2: If some wires of CN4 are not used, please cap them with wire nuts individually.

⚠ CAUTION:
1: Use copper wire (75℃ min) only between disconnect switch and unit.
2: Wire the system per NEC and local codes.
3: If any of the factory wiring has to be replaced, use the same or equivalent type of wires.
4: If the incoming voltage is 208V, please move the red wire on the transformer from the 240V tap to the 208V tap.
5: The rated operating condition of **Alarm** is 24 VAC/1A or 30 VDC/1A or 250 VAC/1A. Please refer to the manual for wiring methods.

LED1 STATUS	CONTENT
STEADY ON	NORMAL OPERATION
OFF	POWER SUPPLY FAILURE
KEEP FLASHING	REFRIGERANT LEAK PROTECTION
1FLASH/CYCLE	TEMPERATURE SENSOR FAULT (T1)
2FLASH/CYCLE	TEMPERATURE SENSOR FAULT (T2)
3FLASH/CYCLE	R454B REFRIGERANT SENSOR FAULT
4FLASH/CYCLE	R454B REFRIGERANT SENSOR COMMUNICATION FAULT
5FLASH/CYCLE	COMMUNICATION FAULT BETWEEN INDOOR UNIT AND OUTDOOR UNIT
6FLASH/CYCLE	POWER CONSUMPTION SENSOR FAULT
8FLASH/CYCLE	R454B SENSOR OUT OF SERVICE LIFE

Figure 14 BIVB19 Indoor unit control board

11.1.3 BOVB19 Outdoor Unit Wiring Diagram



Note:
1. M1M2 or PQ is connected to indoor unit in communication mode.
2. Only one port of CN10, and CN11 can be connected to IDU.
3. Dash-dotted line means optional.
4. Dotted line means field installed.

SW4-1	ON	Unused
	OFF	Reserved *
SW4-2	ON	Accelerated cooling/heating
	OFF	Normal *
SW4-3	ON	Accelerated cooling/heating 2
	OFF	Normal *
SW4-4	ON	Adaptive capacity output disable
	OFF	Normal *
SW5-1	ON	Defrosting reduced by 60 seconds
	OFF	Normal *
SW5-2	ON	Defrosting extended for 60 seconds
	OFF	Normal *
SW5-3	ON	Reserved
	OFF	Normal *
SW5-4	ON	Reserved
	OFF	Communication mode *

*The factory default

J2 Set capacity	ON 1 OFF	For 48K model
	ON 1 OFF	For 36/60K model *

Detailed reference manual instructions

FORCE SW1	PRESS 1s	Forced cooling/heating (Charge mode)
	PRESS 6s	Forced defrosting
CHECK SW2	PRESS 1s	Check the system parameters

Figure 15

11.2 Limited Condition Descriptions

Limited Condition Status codes are displayed when a condition exists that could harm the unit. To protect itself, the unit continues to run, but with limited compressor frequency. When these protection codes are visible, the unit is still functioning, just not according to its normal logic. If condition worsens/persists, a fault code will be displayed and the compressor will shut off . For Limited Condition Status codes, no service is required. Service may be recommended for active fault codes, see fault code troubleshooting section for more detail.

Limited Condition Status code	Fault Code	Fault Code Description	Potential Cause
U**	E51	Outdoor unit high/low input voltage protection	• Power supply ≥270V • Power supply <172V • Control board issue
U**	E52	Outdoor unit high/low DC bus voltage protection	• DC Bus Voltage <335VDC • Outdoor fan failed • Compressor failed • Outdoor unit control board failed
__**	P21	Low Pressure Protection in Cooling/Heating (Pe)	• Service valves not open • Poor evaporator heat exchange • Pe sensor failed • Charging leak (Low refrigerant) • TXV or EEVA blocked
	F2	5 times (P21) Protection in 100 minutes, system lockout	• Service valves not open • Poor evaporator heat exchange • Pe sensor failed • Charging leak (Low refrigerant) • TXV or EEVA blocked
	J00-JCF	Compressor drive protection	• Service valves not open • Compressor wired incorrectly • Compressor failure • Outdoor unit control board failure
	n00-nCF	Fan drive protection	• Fan incorrectly wired • Fan failure • Outdoor unit control board failure
F**	P0	Compressor IPM temperature protection	• IPM1 screws are not tight • Radiator air duct is dirty • IPM1 is not coated with thermal paste
L**	P1	Hight pressure switch protection	• Service valves are not open • Poor condenser heat exchange • Abnormal throttle on condenser • HPS incorrectly wired • Refrigerant overcharge
--**	P11	High pressure protection in cooling/heating (Pc)	• Service valves are not open • Poor condenser heat exchange • Pc sensor failure • Refrigerant overcharge • TXV or EEVA blocked

Table 22 Limited condition status table

*** If the first digit shown on the control board LED is one of the following protection codes (followed by two numerical digits which show the current compressor frequency in Hz), the unit will continue to run but in a limited condition. The only exception is when the system is in defrost mode, which only displays "dF" (without any numerical digits following).*

Limited Condition Status code	Fault Code	Fault Code Description	Potential Cause
C**	P31	Outdoor unit input over current protection	• Service valves are not open • Incorrectly wired • Compressor failure • Outdoor unit control board failure
C**	P32	Compressor overcurrent protection	• Service valves not open • Incorrectly wired • Compressor failure • Outdoor unit control board failure
d**	P4	High Compressor discharge temperature protection (T5)	• High discharge temperature and overload • Throttle blockage • Charging leakage (low refrigerant) • T5 failure
	P5	Condenser coil temperature protection in cooling (T3)	• Hight temperature and overload • Poor condenser heat exchange • T3 Failure
	Pb1	Hyper-Link(M1M2) Over current protection	• M1M2 incorrectly wired • Outdoor unit control board failure
	PH	Low discharge superheat protection	• TXV or EEVA failure • Ambient temperature out of range • Abnormal fan • T5 is not properly placed
	AtL	Ambient temperature limited	• Ambient temperature out of range • Additional heat sources near T4
r**	-	Running under compressor ratio limited condition	• Low temperature and low load

Table 23 Limited condition status table (continued)

** *If the first digit shown on the control board LED is one of the following protection codes (followed by two numerical digits which show the current compressor frequency in Hz), the unit will continue to run but in a limited condition. The only exception is when the system is in defrost mode, which only displays "dF" (without any numerical digits following).*

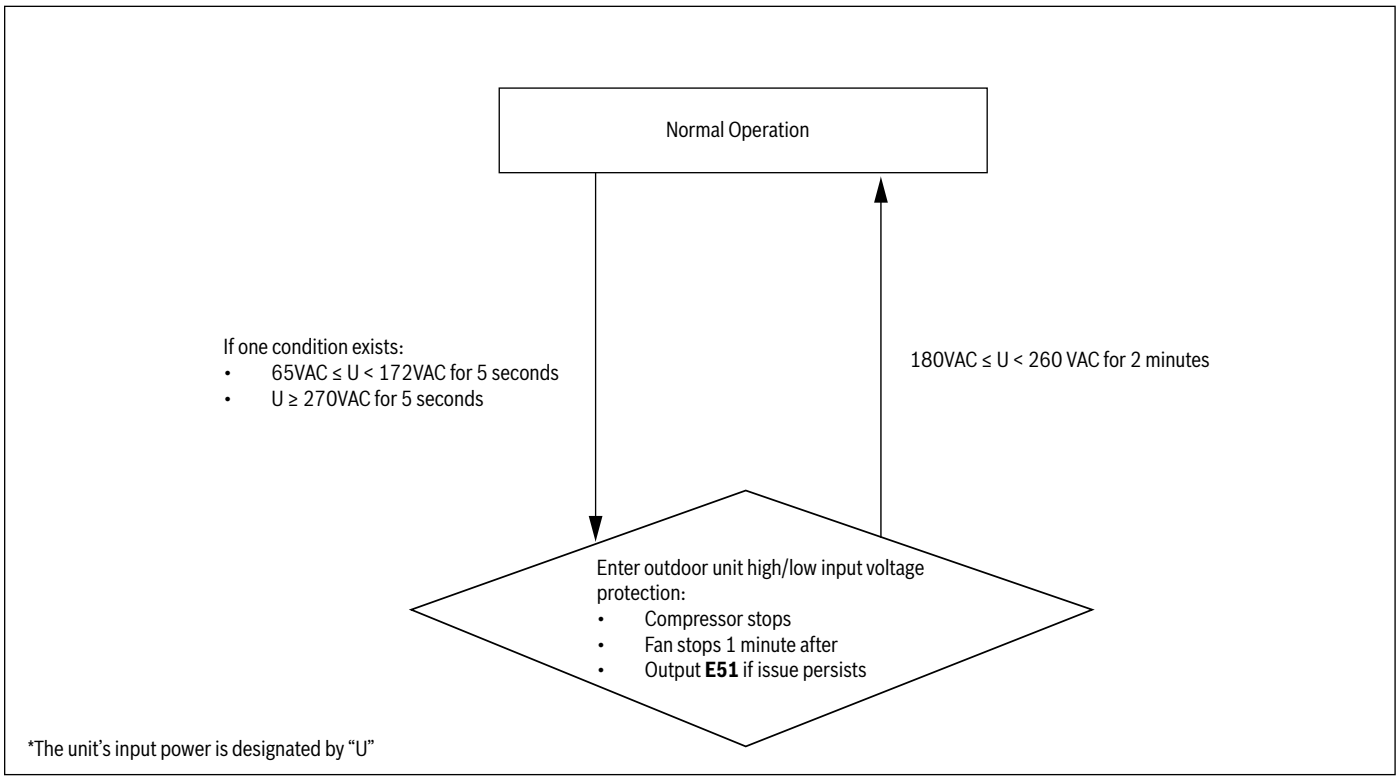


Figure 16 Outdoor unit high/low input voltage protection

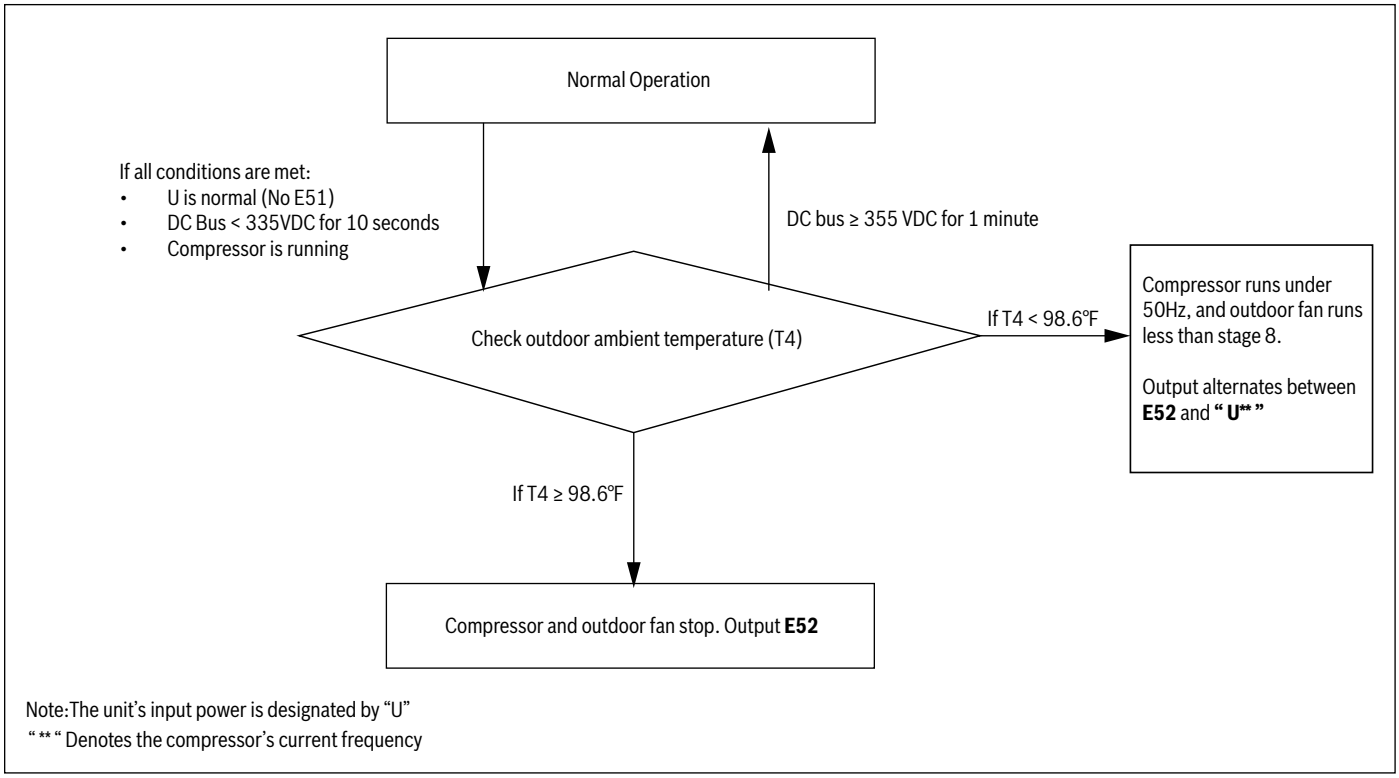
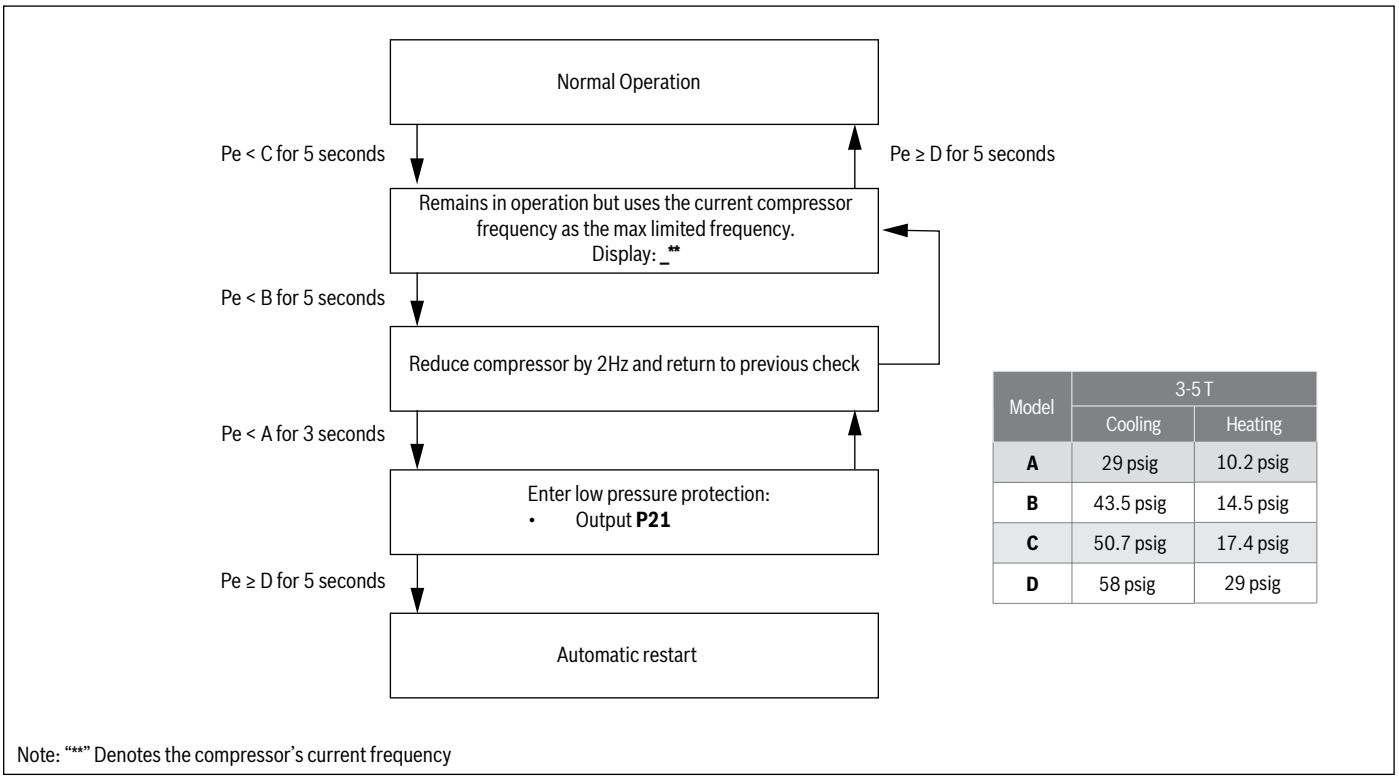


Figure 17 Outdoor unit high/low DC bus voltage protection



Model	3-5 T	
	Cooling	Heating
A	29 psig	10.2 psig
B	43.5 psig	14.5 psig
C	50.7 psig	17.4 psig
D	58 psig	29 psig

Figure 18 Low Pressure Protection in Cooling/Heating (Pe)

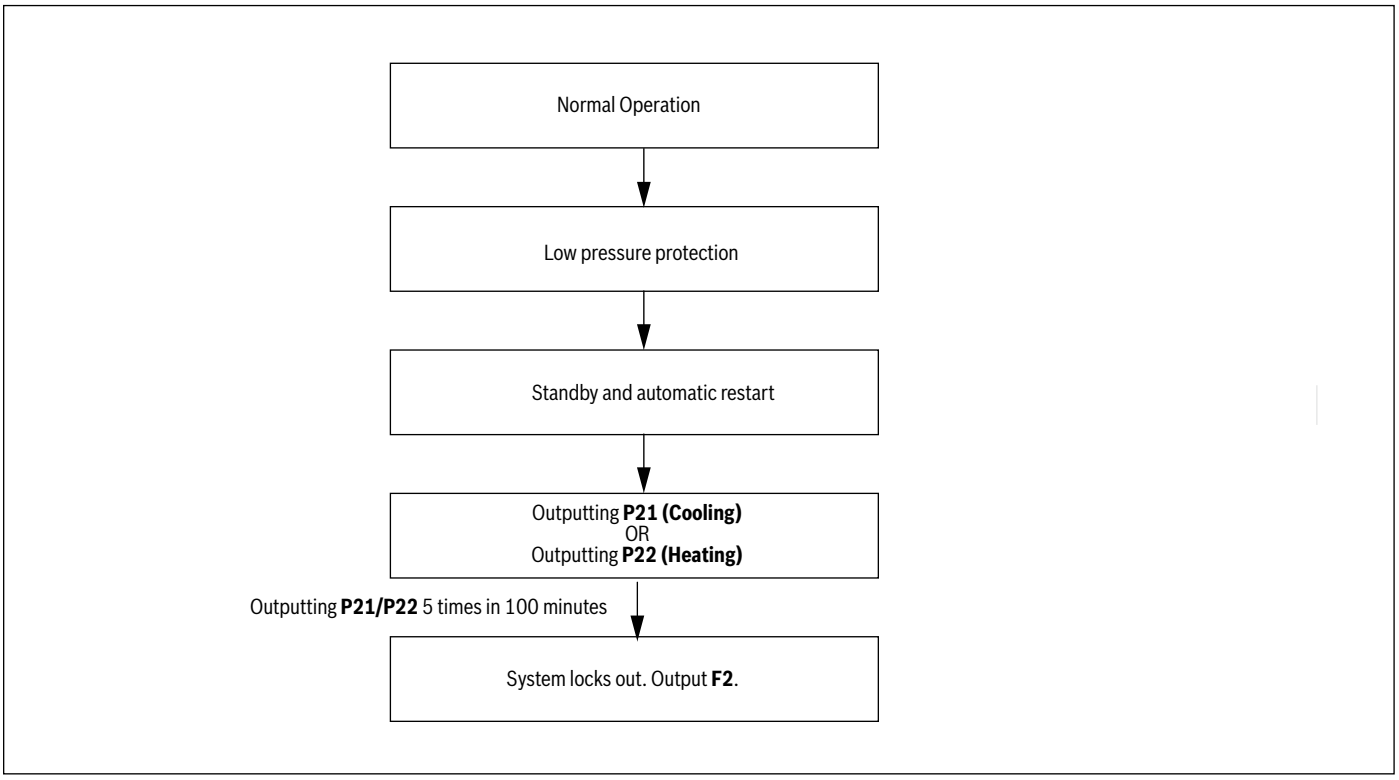


Figure 19 5 times (P21) Protection in 100 minutes, system lockout

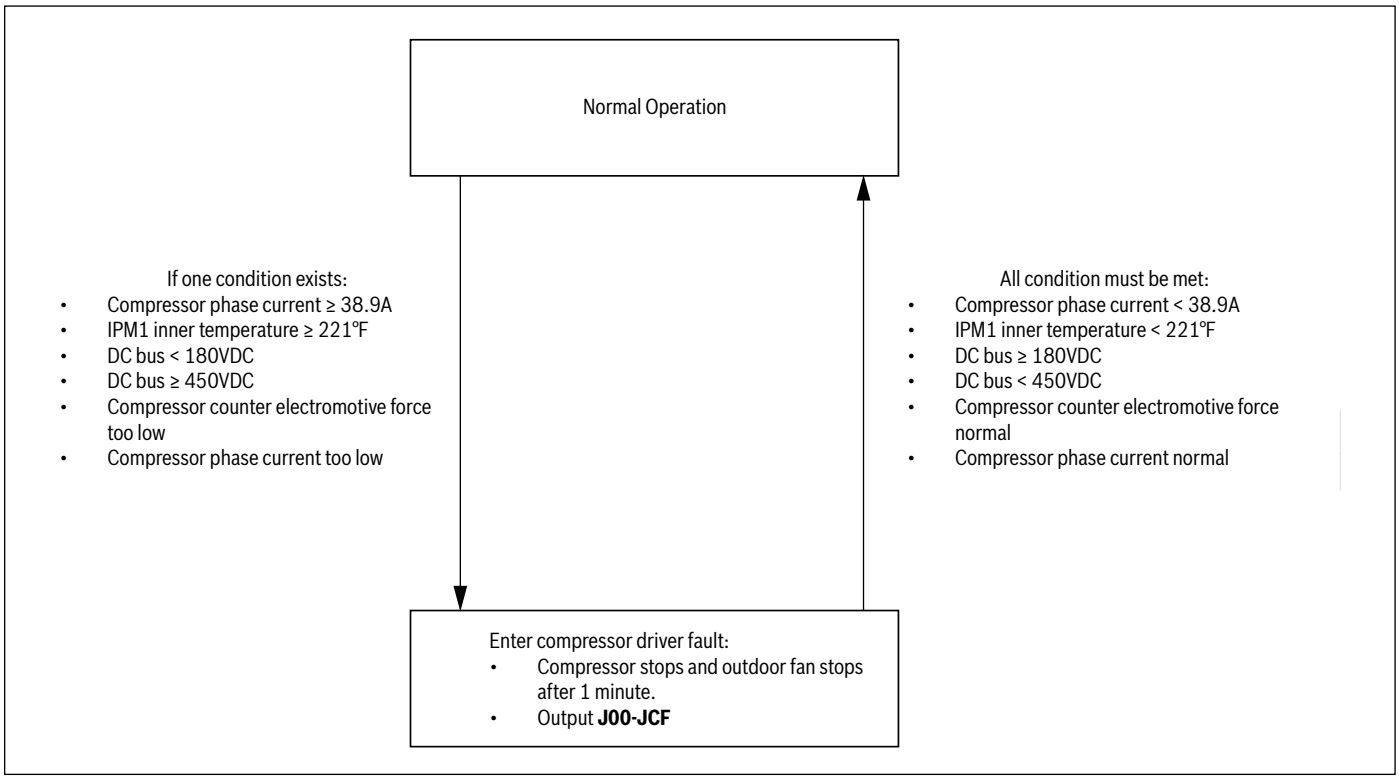


Figure 20 Compressor drive protection

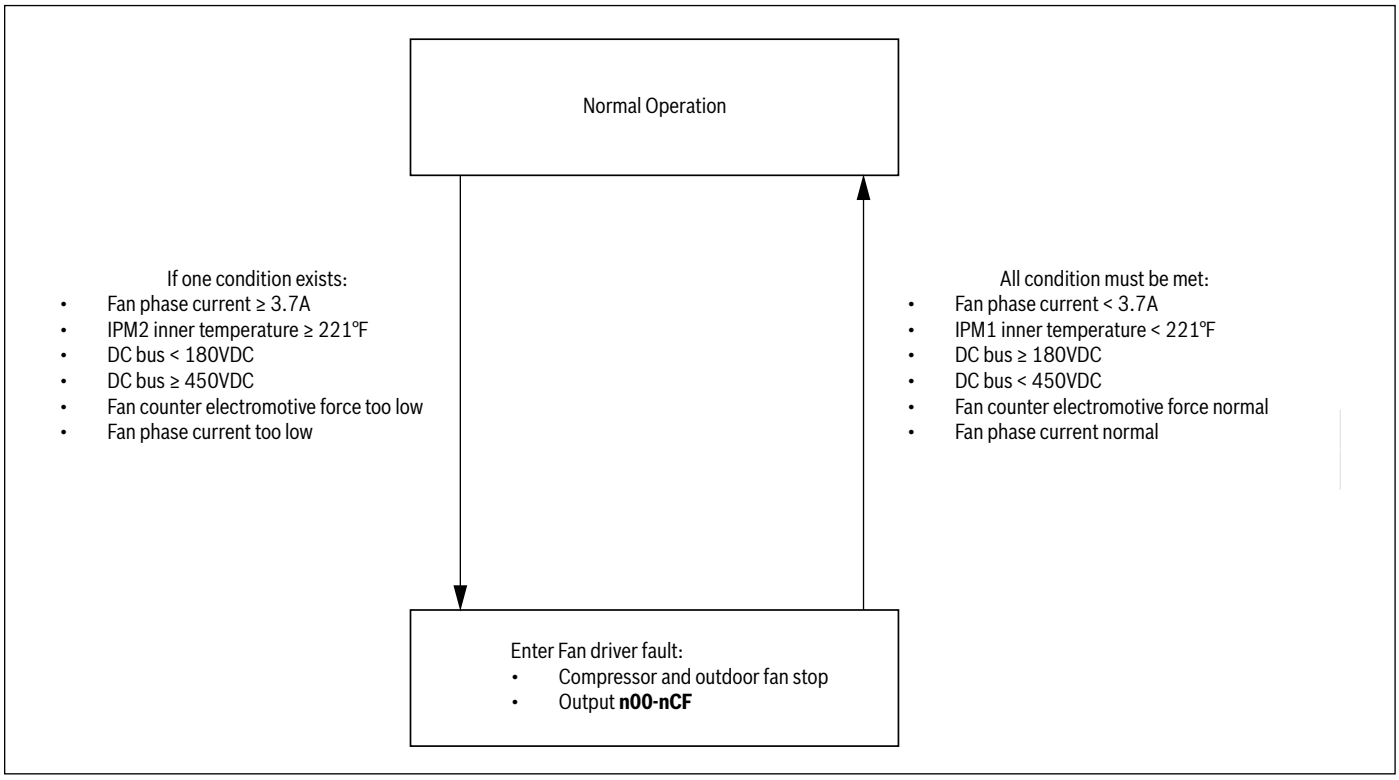


Figure 21 Fan drive protection

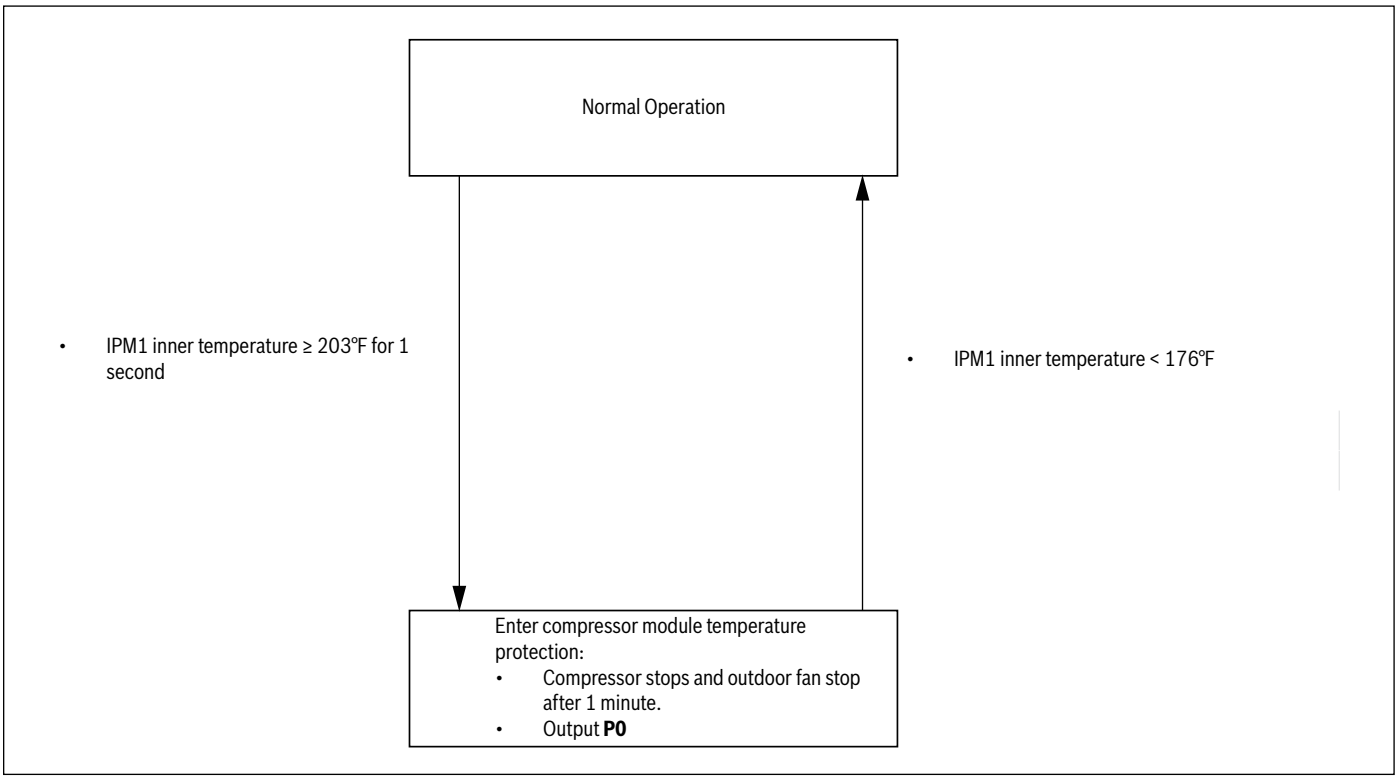


Figure 22 Compressor IPM temperature protection

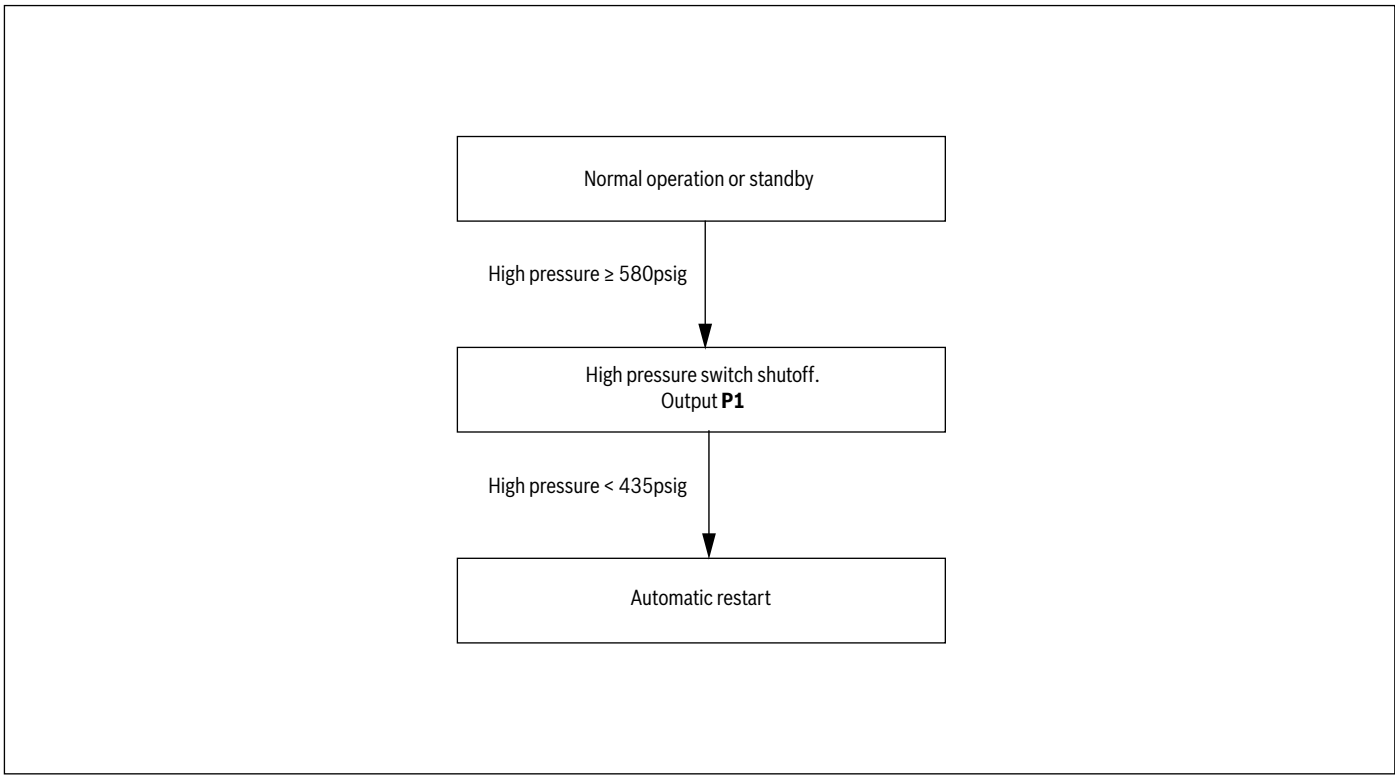
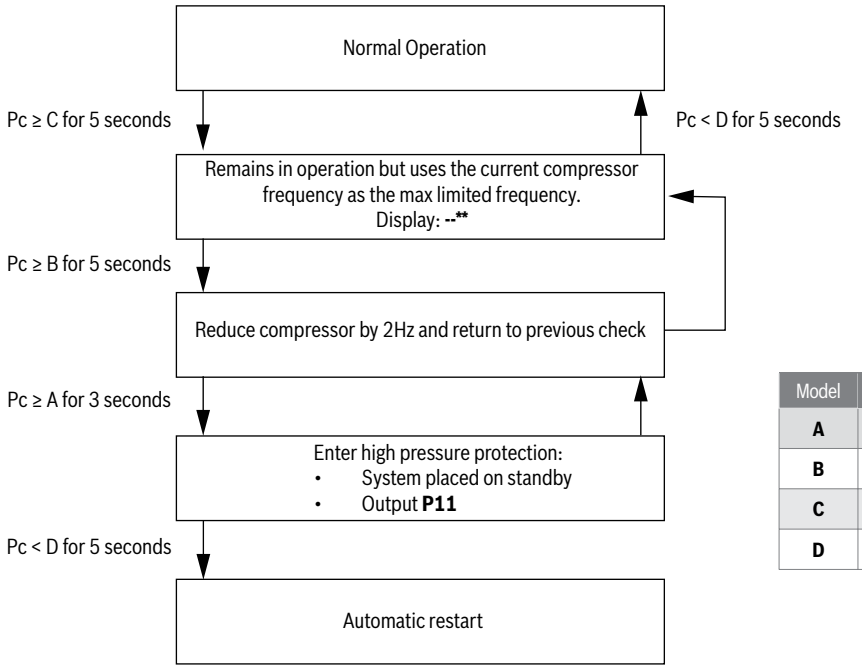


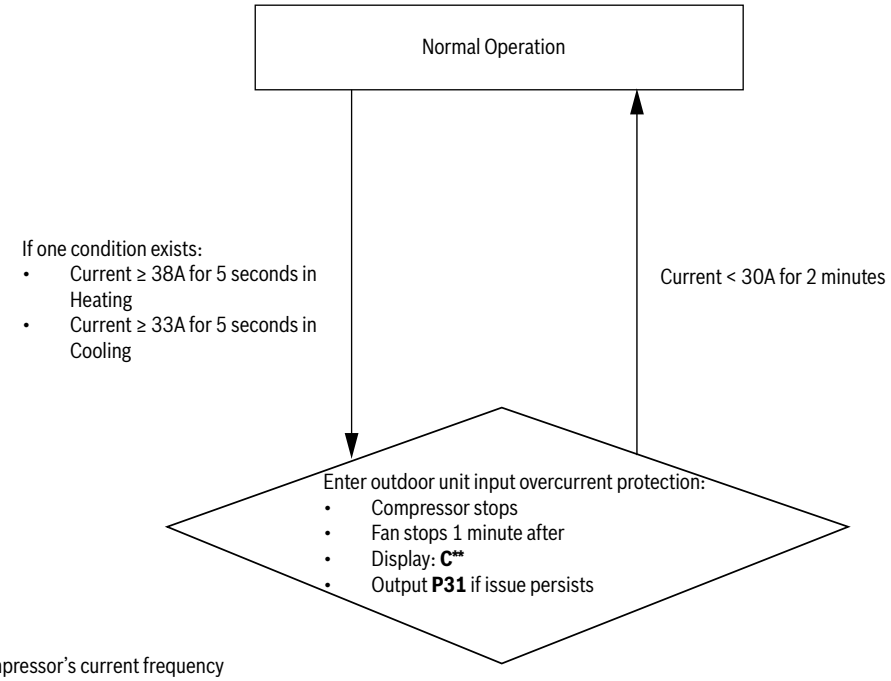
Figure 23 Hight pressure switch protection



Model	3-5 T
A	565.6 psig
B	522.1 psig
C	500.4 psig
D	471.4 psig

Note: "**" Denotes the compressor's current frequency

Figure 24 High pressure protection in cooling/heating (Pc)



Note: " ** " denotes the compressor's current frequency

Figure 25 Outdoor unit input overcurrent protection

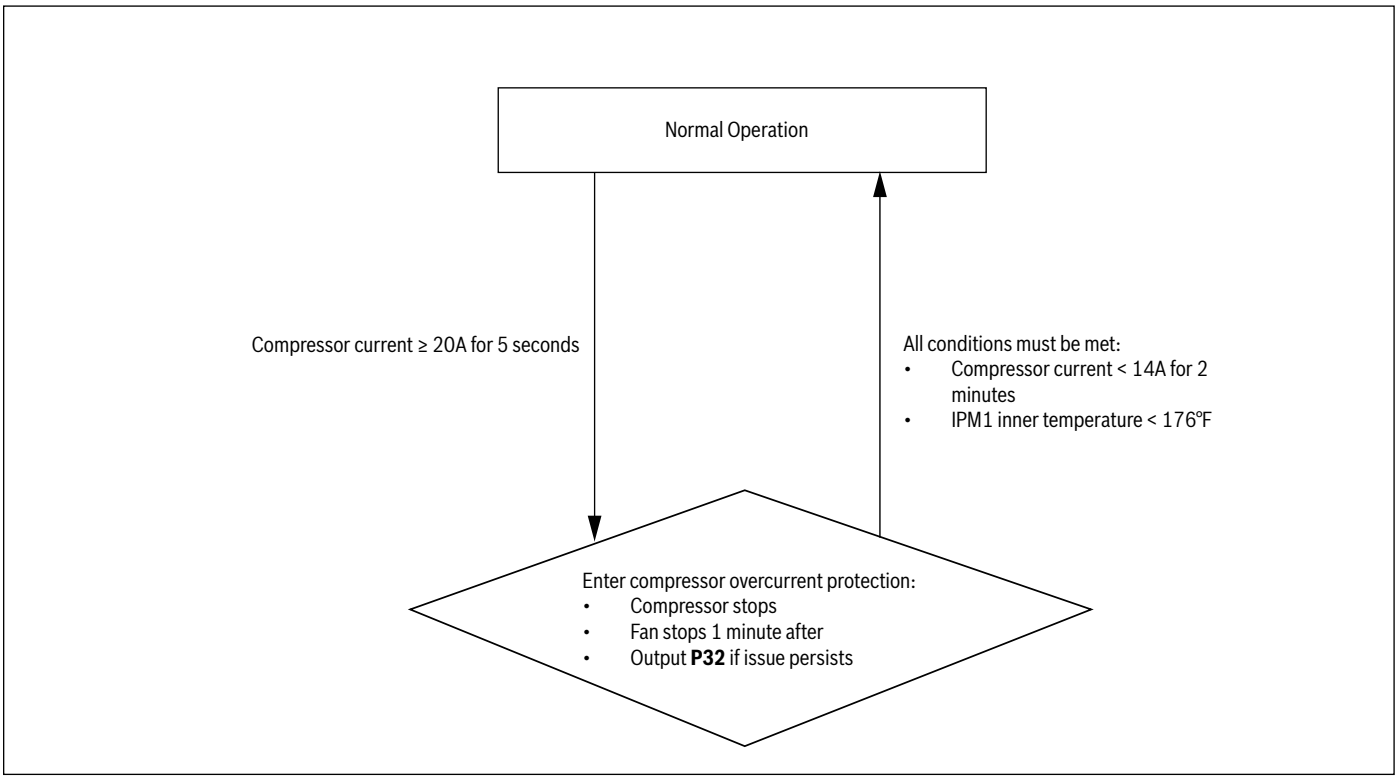
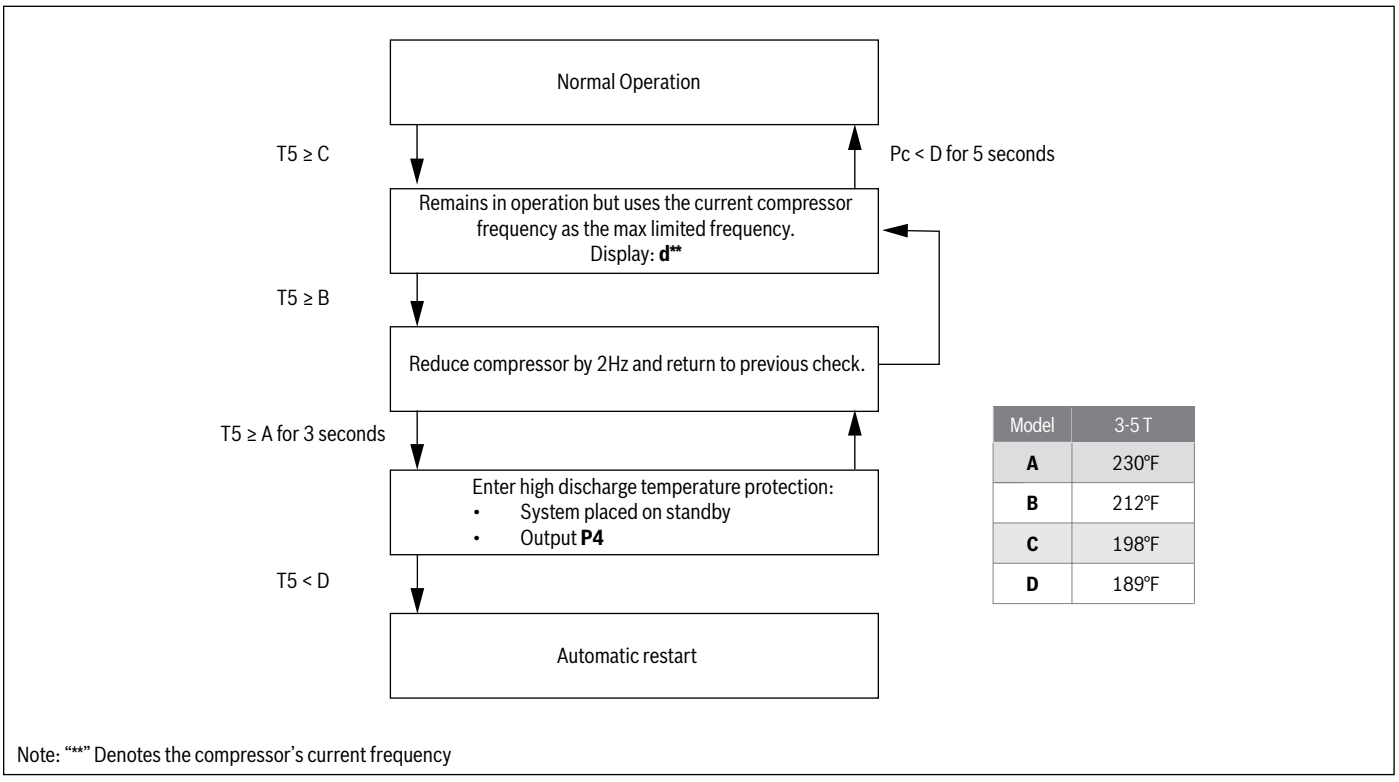


Figure 26 Compressor overcurrent protection



Model	3-5 T
A	230°F
B	212°F
C	198°F
D	189°F

Figure 27 High Compressor discharge temperature protection (T5)

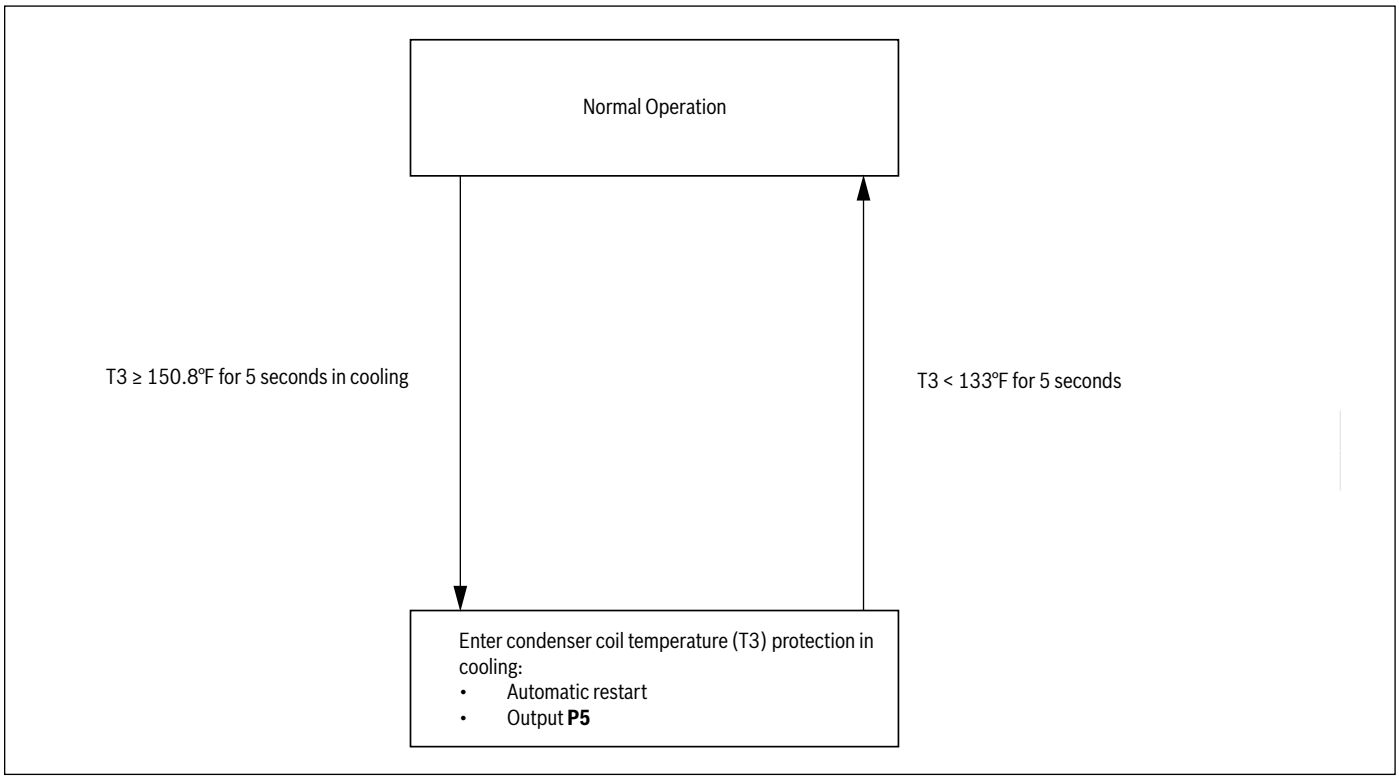


Figure 28 Condenser coil temperature protection in cooling (T3)

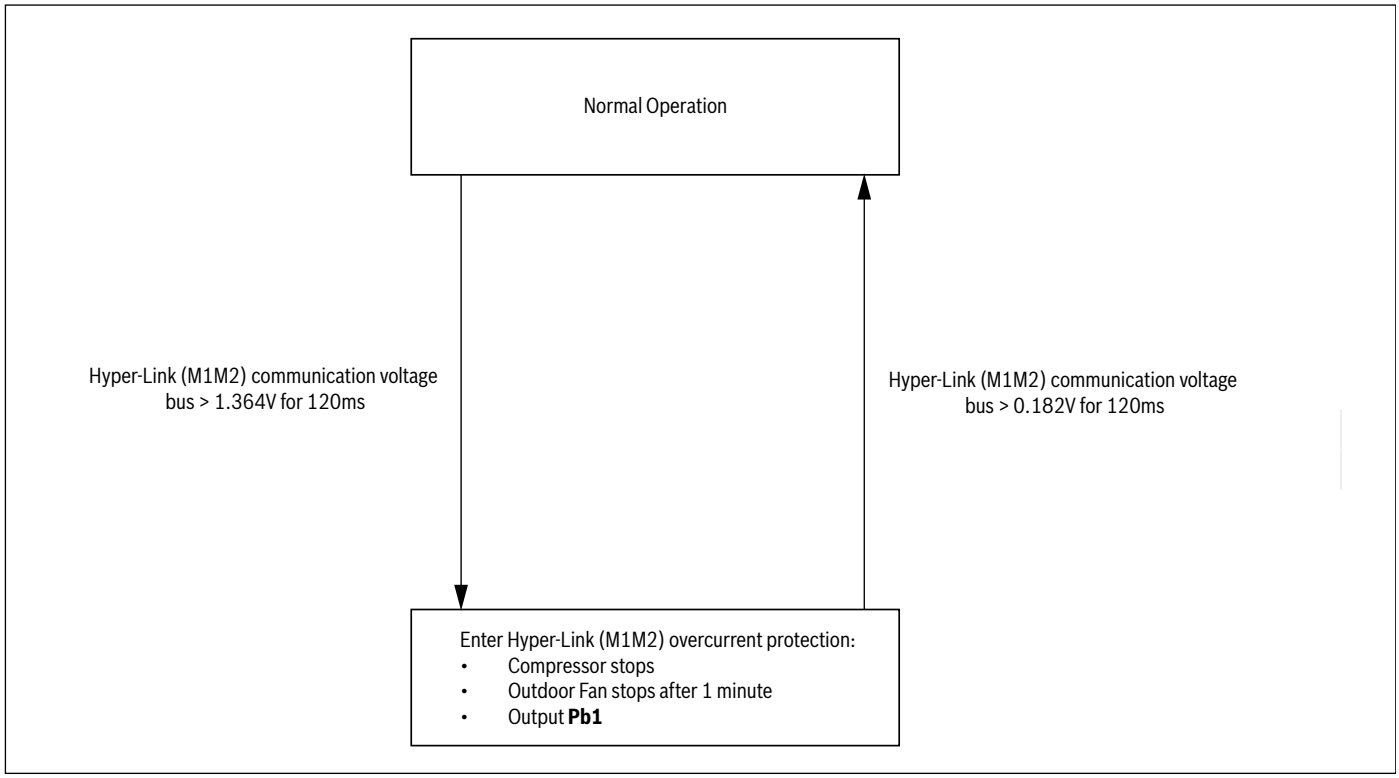


Figure 29 Hyper-Link(M1M2) Over current protection

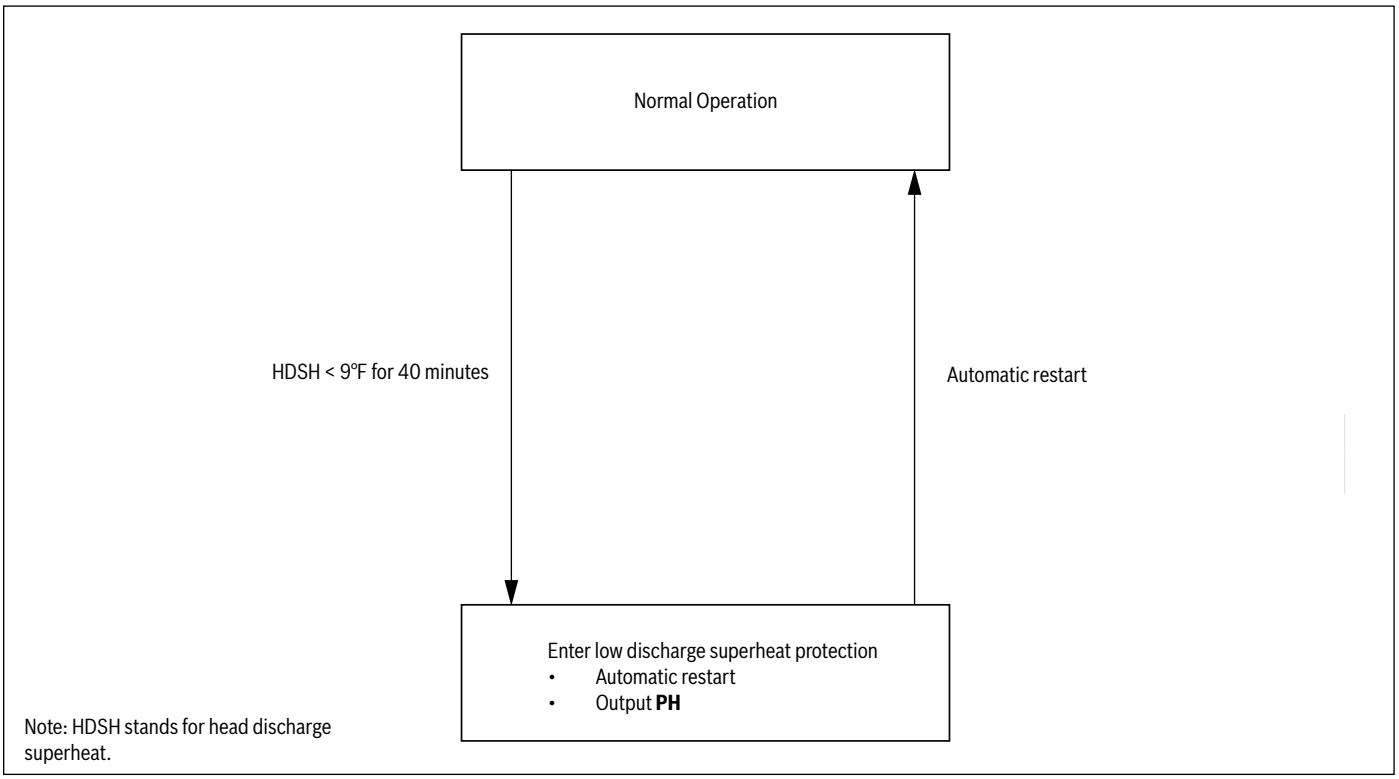


Figure 30 Low discharge superheat protection

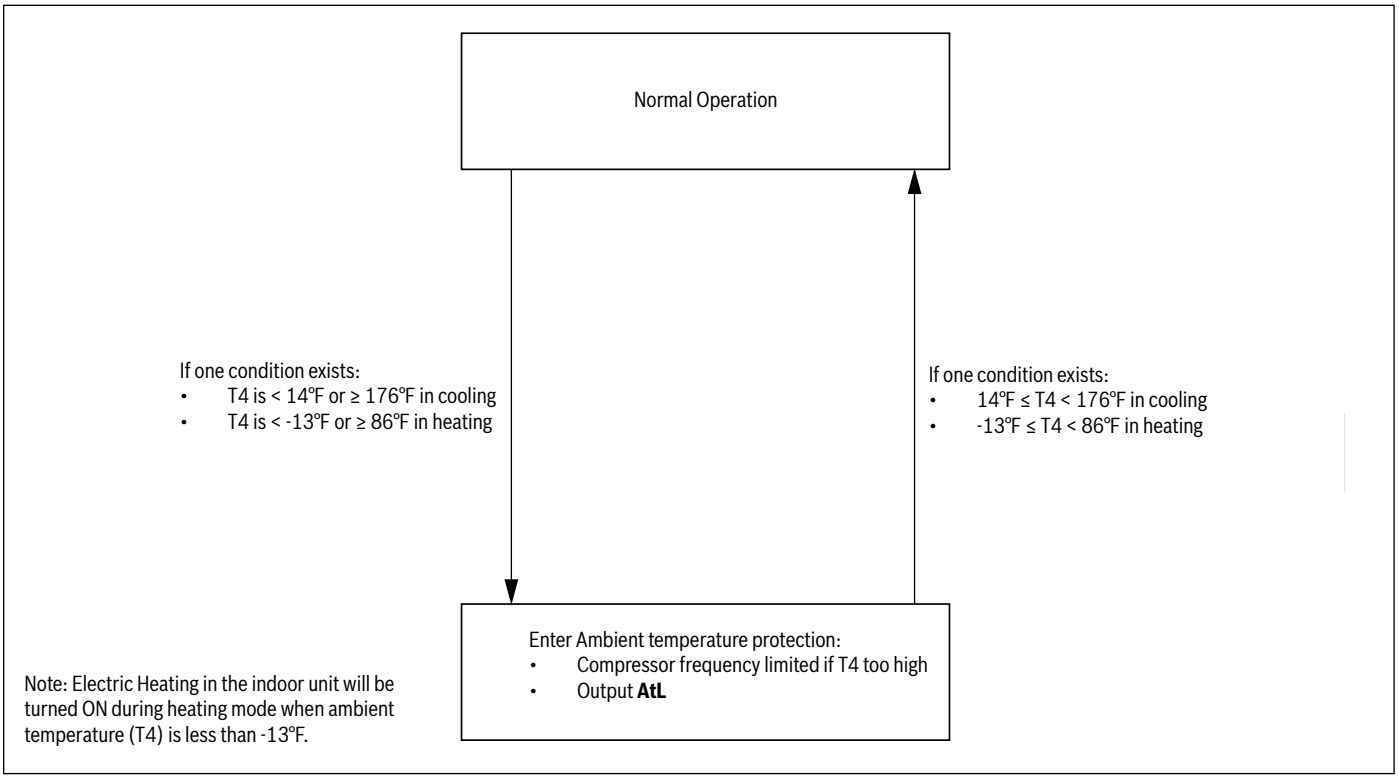


Figure 31 Ambient temperature limited

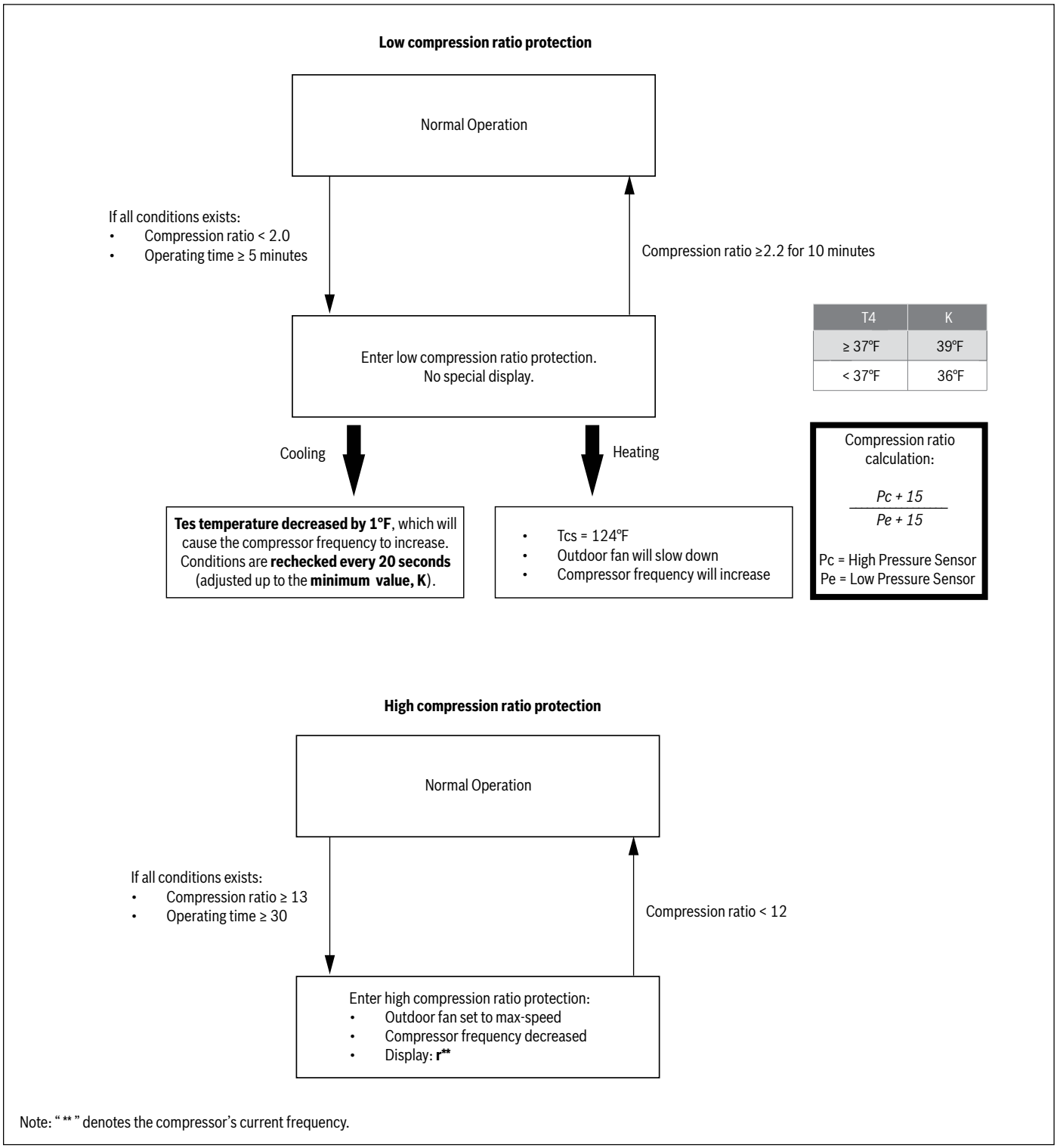


Figure 32 Running under compressor ratio limited condition

11.3 Fault Code Description and Troubleshooting

Fault codes are displayed when an abnormal condition exists that could harm the unit. Fault codes cause the compressor to shut off and force the unit into standby mode until the abnormal condition goes away. When the abnormal condition ceases, the unit will restart and operate as normal. The only exceptions are b9 and F2, which requires a hard restart. Service may be recommended for active fault codes, see fault code troubleshooting section for more detail.

Fault Code	Fault Code Description
AtL	Ambient Temperature Limited (T4)
b1	Temperature sensor fault (T1)
b2	Temperature sensor fault (T2)
b3	R-454B refrigerant sensor fault in indoor unit
b4	R-454B refrigerant sensor communication fault in indoor unit
b5	Communication fault between indoor unit and outdoor unit
b6	Power consumption sensor fault in indoor unit
b7	R-454B Refrigerant leakage fault in indoor unit
b8	R-454B refrigerant sensor over service life in indoor unit
b9	The furnace's refrigerant sensor dipswitch is positioned incorrectly
bF	Furnace blower control module failure
C3	T3 sensor is not reading correctly in cooling
E41	Temperature sensor fault (T3)
E42	Temperature sensor fault (T3L)
E43	Temperature sensor fault (T4)
E44	Temperature sensor fault (T5)
E45	Temperature sensor fault (Th)
E46	Temperature sensor fault (T6A)
E47	Temperature sensor fault (T6B)
E48	Temperature sensor fault (T7)
E49	Baseplate heating fault
E51	Outdoor unit high/low input voltage protection
E52	Outdoor unit DC bus voltage error
E7	T5 sensor is not reading correctly
E81	EEVA Coil Fault
E82	EEVC Coil Fault
EA	Control program does not match drive program in outdoor unit
F1	High Pressure Switch protection (HPS)
F41	High pressure sensor fault (Pc)
F42	Low pressure sensor fault (Pe)
H01	Chip Communication fault in outdoor unit
H04	Chip of power consumption sensor communication fault in outdoor unit
H14	Power consumption sensor fault in outdoor unit
J00-JCF	Compressor drive protection

Table 24 Fault code status table

** If the first digit shown on the control board LED is one of the following protection codes (followed by two numerical digits which show the current compressor frequency in Hz), the unit will continue to run but in a limited condition. The only exception is when the system is in defrost mode, which only displays "dF" (without any numerical digits following).

Fault Code	Fault Code Description
J10	Compressor hardware protection
J11	Compressor phase current instantaneous overcurrent protection
J20	Compressor IPM over temperature protection
J30/n30	Bus voltage too low fault
J31/n31	Bus voltage too high fault
J43	Compressor current sampling bias is abnormal
J45	Compressor motor code does not match
J48/n48	PTC charging is abnormal
J50	Compressor failed to start
J52	Compressor locked-rotor protection
J60	Compressor motor phase loss protection
J65/n65	Compressor/fan IPM short circuit protection
No Display Output	Digital tube display not working
n00-nCF	Fan drive protection
n10	Fan hardware protection
n11	Fan phase current instantaneous overcurrent protection
n20	Fan IPM over-temperature protection
n43	Fan current sampling bias is abnormal
n45	Fan motor code does not match
n50	Fan failed to start
n52	Fan locked-rotor protection
n60	Compressor motor phase loss protection
P0	Compressor IPM temperature protection
P1	High pressure switch protection
P11	High pressure protection in cooling/heating (Pc)
P21	Low Pressure Fault in Cooling Mode
F2	P21 occurs 5 times in 100 min, System lockout
P31	Outdoor unit input over current protection
P32	Compressor overcurrent protection
P4	High Compressor discharge temperature protection (T5)
P5	Condenser coil temperature protection in cooling (T3)
Pb1	Hyper-Link(M1M2) Over current protection
PH	Low discharge superheat protection

Table 25 Fault code status table (continued)

** If the first digit shown on the control board LED is one of the following Limited Condition Status codes (followed by two numerical digits which show the current compressor frequency in Hz), the unit will continue to run but in a limited condition. The only exception is when the system is in defrost mode, which only displays "dF" (without any numerical digits following).

WARNING

Hazardous voltage!

All electrical work must be carried out by competent and suitably qualified, certified and accredited professionals and in accordance with all applicable legislation (all national, local and other laws, standards, codes, rules, regulations and other legislation that apply in a given situation).

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

If equipment is running, turn it off from the thermostat to ensure system goes through regular shut down sequence.

LED display output:	**AtL**
Description:	Ambient Temperature Limited (T4)
Possible Causes:	- Ambient temperature out of range - Other heat sources near T4 sensor - Wrong location of T4 sensor (common cause) - T4 sensor wiring issue - Failed T4 sensor – sensor reading incorrect value (common cause)

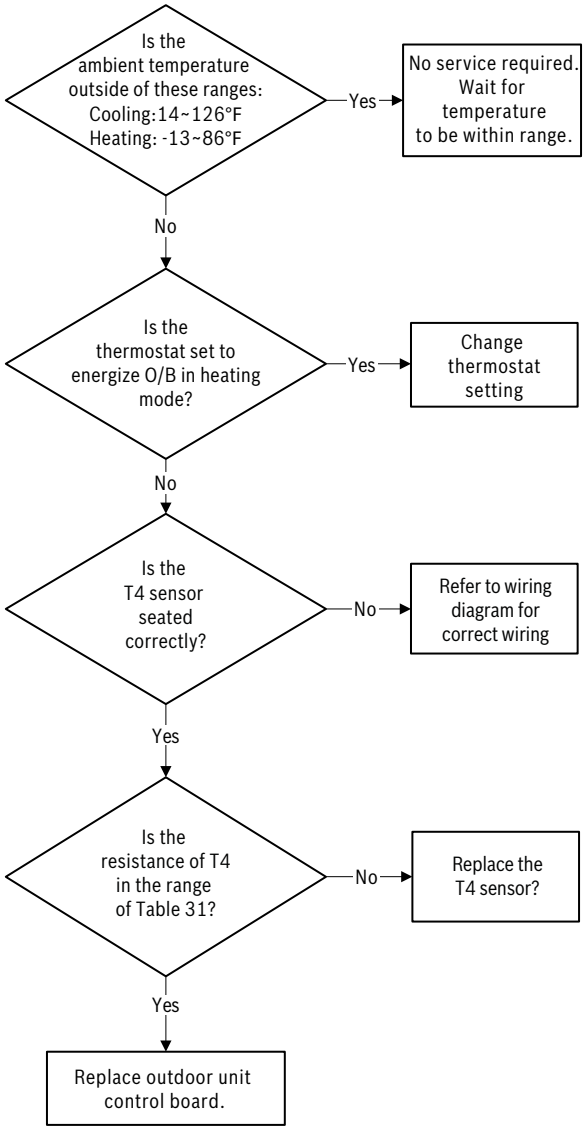


Figure 33

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**b1**
Description:	Temperature sensor fault (T1)
Possible Causes:	- Wrong location of T1 sensor (common cause) - T1 sensor wiring issue - Failed T1 sensor – sensor reading incorrect value (common cause)

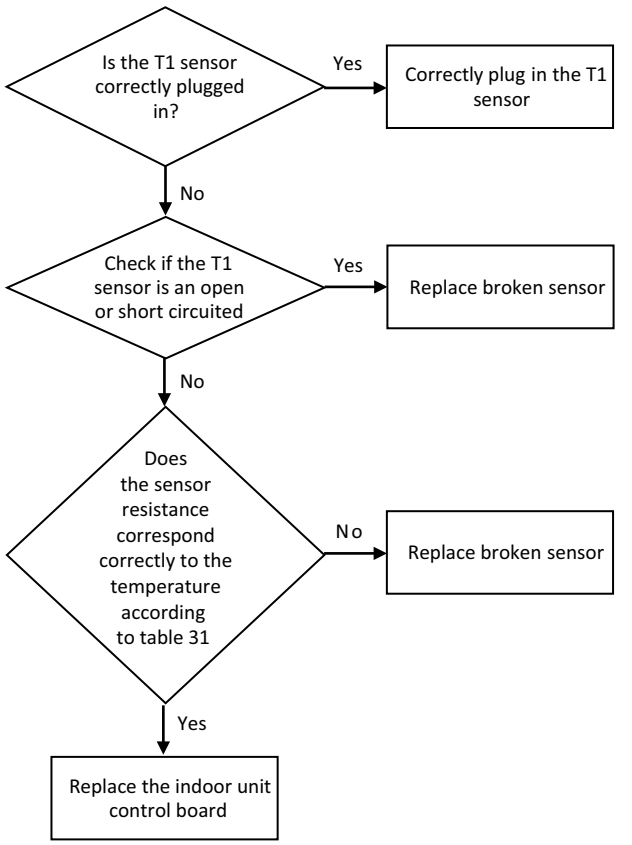


Figure 34

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**b2**
Description:	Temperature sensor fault (T2)
Possible Causes:	- Wrong location of T2 sensor (common cause) - T2 sensor wiring issue - Failed T2 sensor – sensor reading incorrect value (common cause)

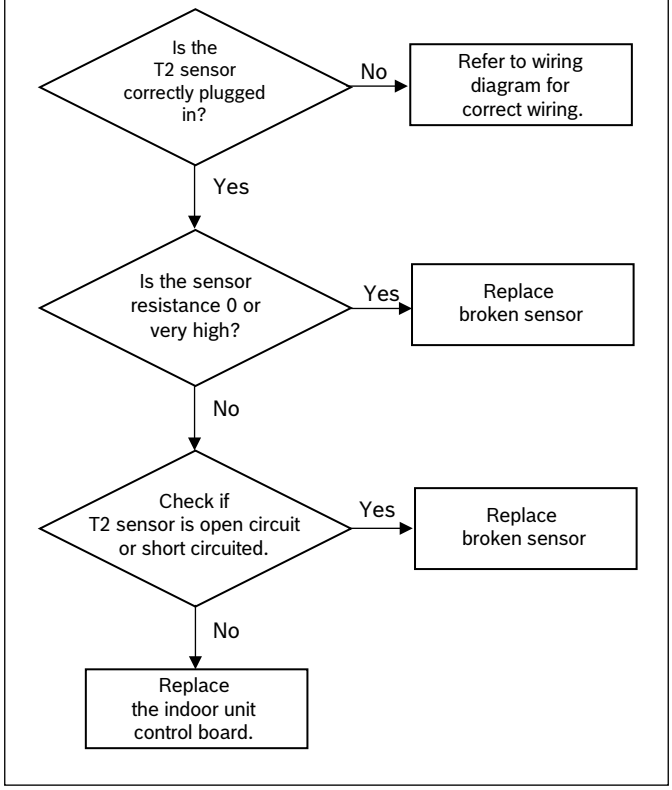


Figure 35

LED display output:	**b3**
Description:	R454B refrigerant sensor fault in indoor unit
Possible Causes:	- A2L sensor failed - A2L sensor damaged

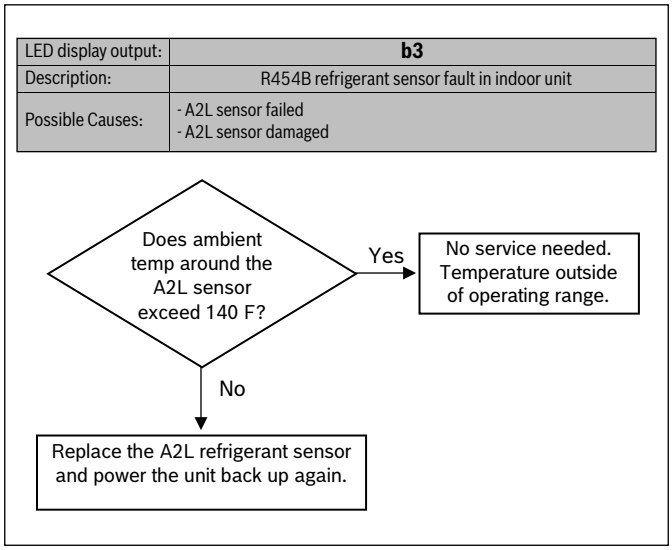


Figure 36

LED display output:	**b4**
Description:	R454B refrigerant sensor communication fault in indoor unit
Possible Causes:	- A2L wiring issue - A2L communication failed

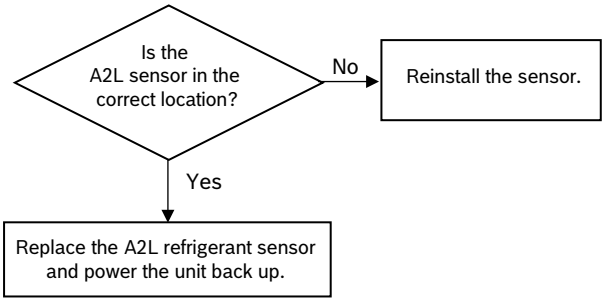


Figure 37

LED display output:	**b5**
Description:	Communication fault between indoor unit and outdoor unit
Possible Causes:	- Wiring issue - Mode collection error - Control board in outdoor or indoor unit failed

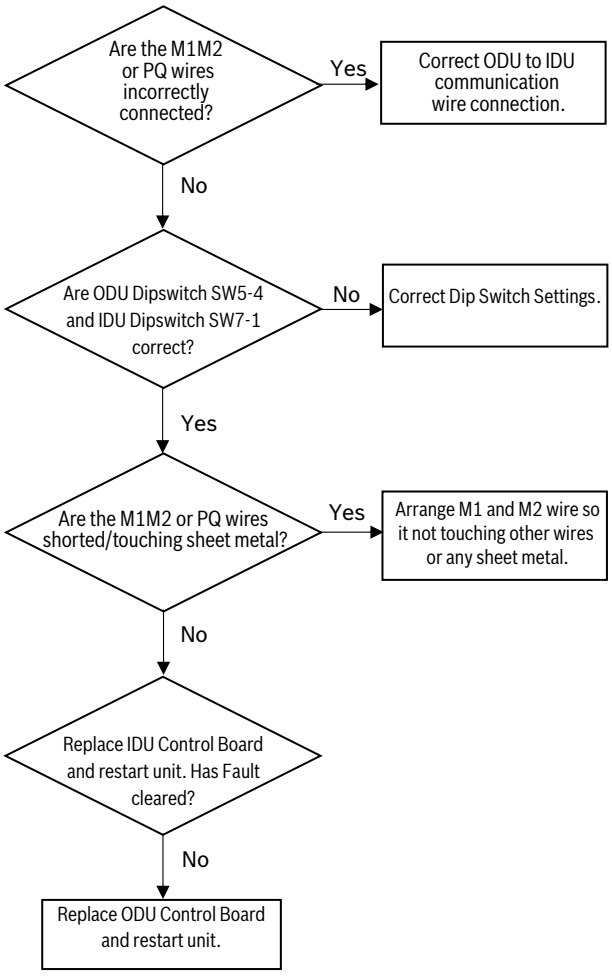


Figure 38

LED display output:	**b6**
Description:	Power consumption sensor fault in indoor unit
Possible Causes:	- ECM motor in indoor unit failed - Current sensor failed - Control board in indoor unit failed

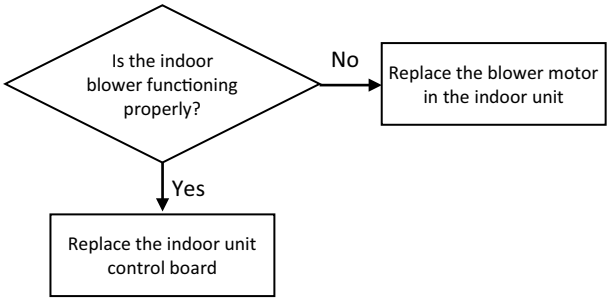


Figure 39

LED display output:	**b7**
Description:	R454B Refrigerant leakage fault in indoor unit
Possible Causes:	- R454 refrigerant leak detected - A2L sensor failed - Other flammable gases around

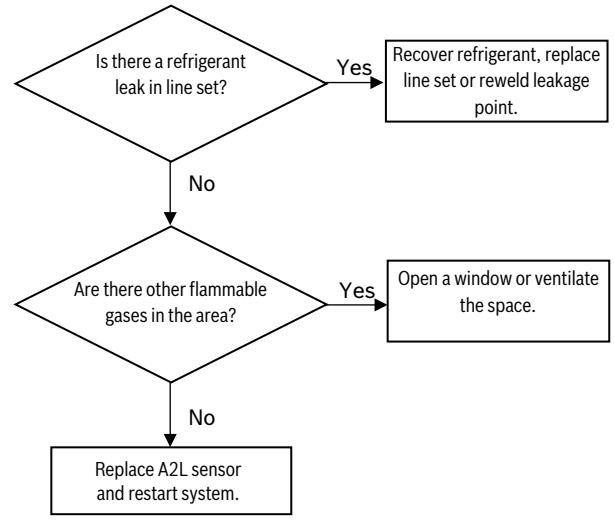


Figure 40

The b9 and bF faults will only be displayed on the outdoor unit when communicating with a BGH96 RevC/BGH97 Furnace or IDS Communication Accessory Kit.

LED display output:	**b8**
Description:	R454B refrigerant sensor over service life in indoor unit
Possible Causes:	- A2L sensor over service life - A2L sensor failed

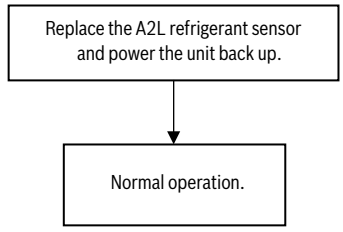


Figure 41

LED display output:	**b9**
Description:	Indoor unit refrigerant sensor dipswitch is positioned incorrectly

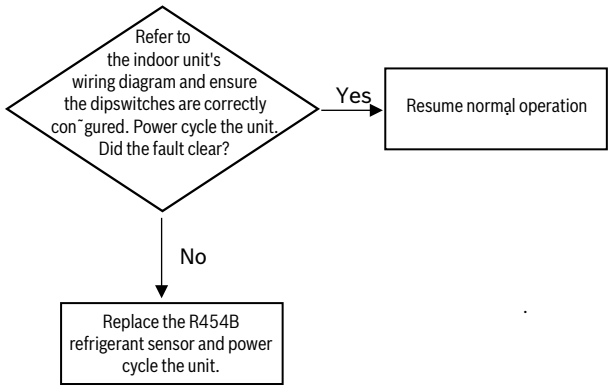


Figure 42

The b9 fault will only be displayed if the indoor unit has a refrigerant sensor dipswitch (BGH96 RevC/BGH97 Furnace, IDS Communication Accessory Kit, 115V Modular Blower, etc).

LED display output:	**bF**
Description:	Fault on the furnace

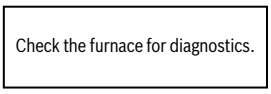


Figure 43

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**C3**
Description:	T3 sensor is not reading correctly in cooling
Possible Causes:	- Wrong location of T3 sensor - T3 sensor failed - T4 sensor failed

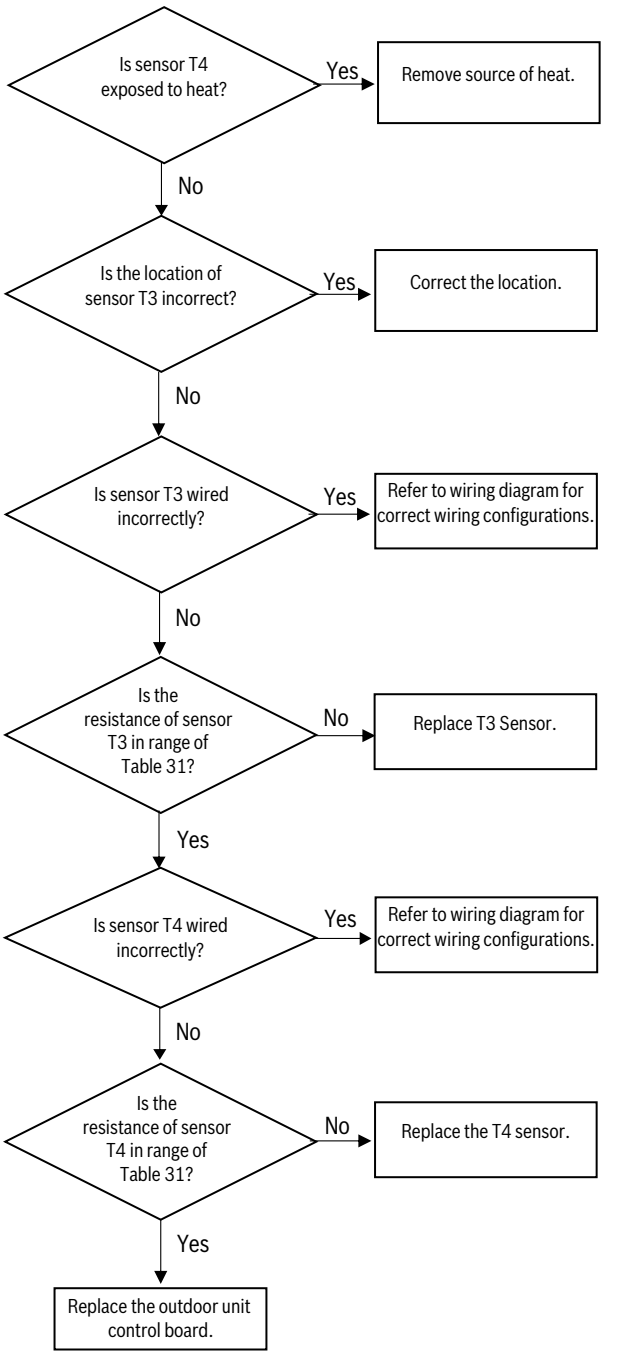


Figure 44

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E41**
Description:	Temperature sensor fault (T3)
Possible Causes:	- T3 sensor failed - T3 wiring issue - Ambient temperature beyond system operation range

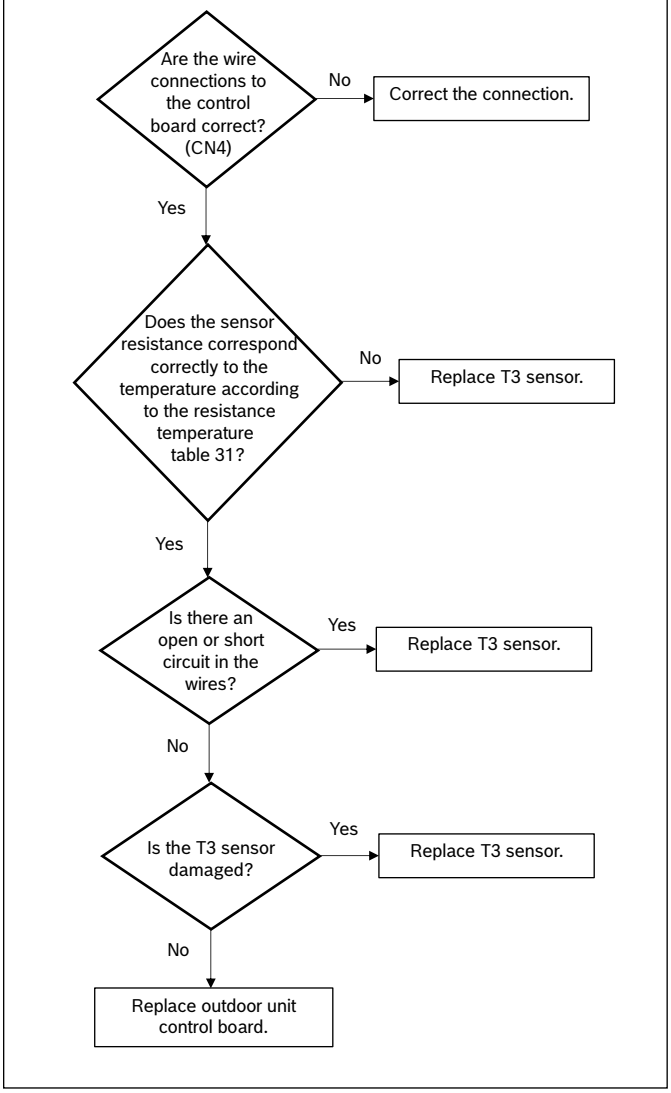


Figure 45

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E42**
Description:	Temperature sensor fault (T3L)
Possible Causes:	- T3L sensor failed - T3L wiring issue - Wrong location of T3L sensor

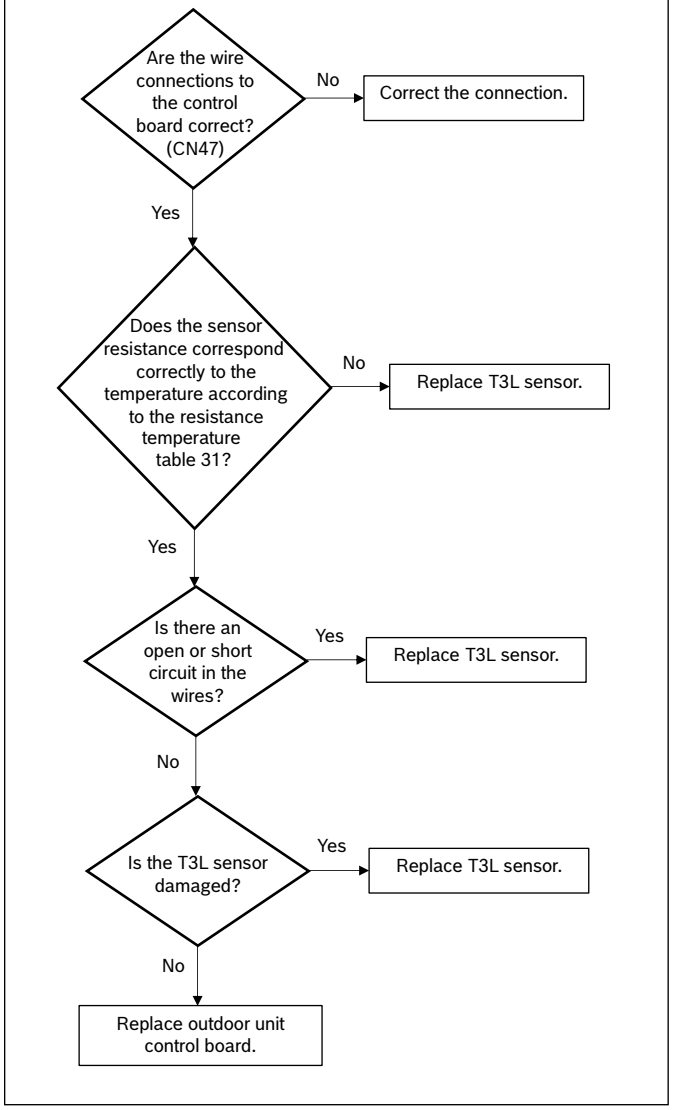


Figure 46

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E43**
Description:	Temperature sensor fault (T4)
Possible Causes:	- T4 sensor failed - T4 wiring issue - Wrong location of T4 sensor

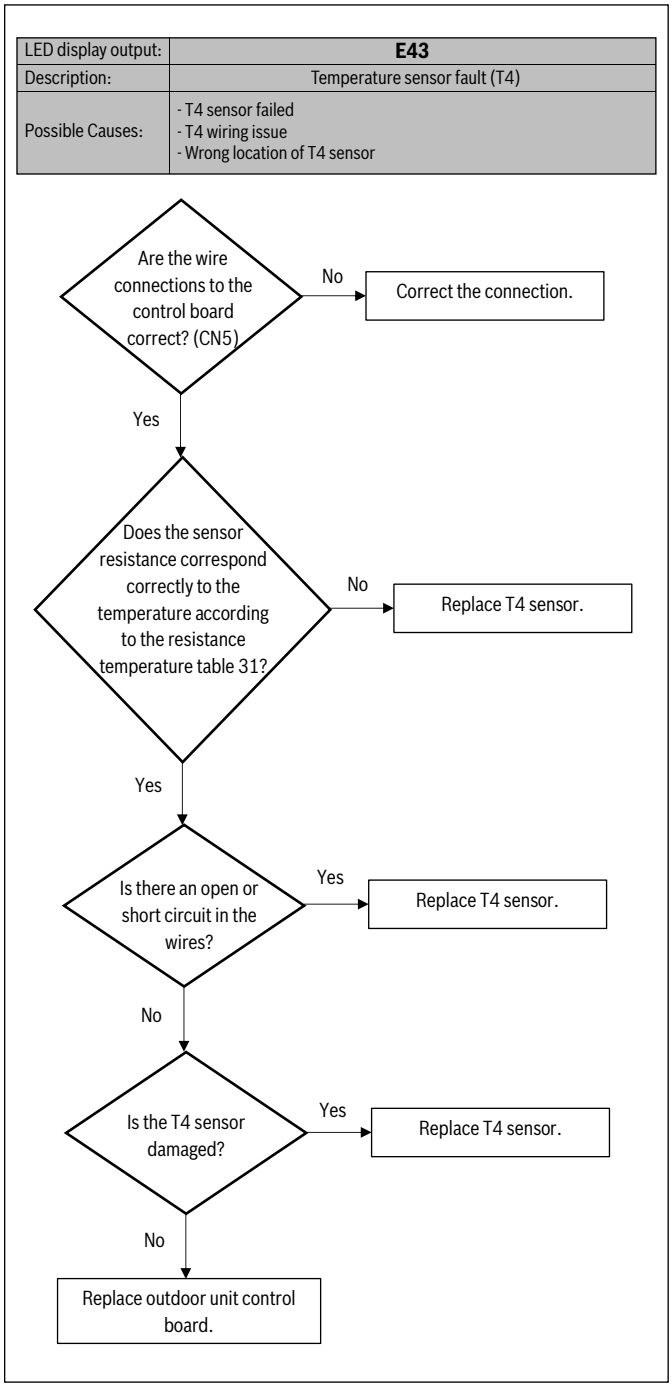


Figure 47

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E44**
Description:	Temperature sensor fault (T5)
Possible Causes:	- T5 sensor failed - T5 wiring issue - Wrong location of T5 sensor

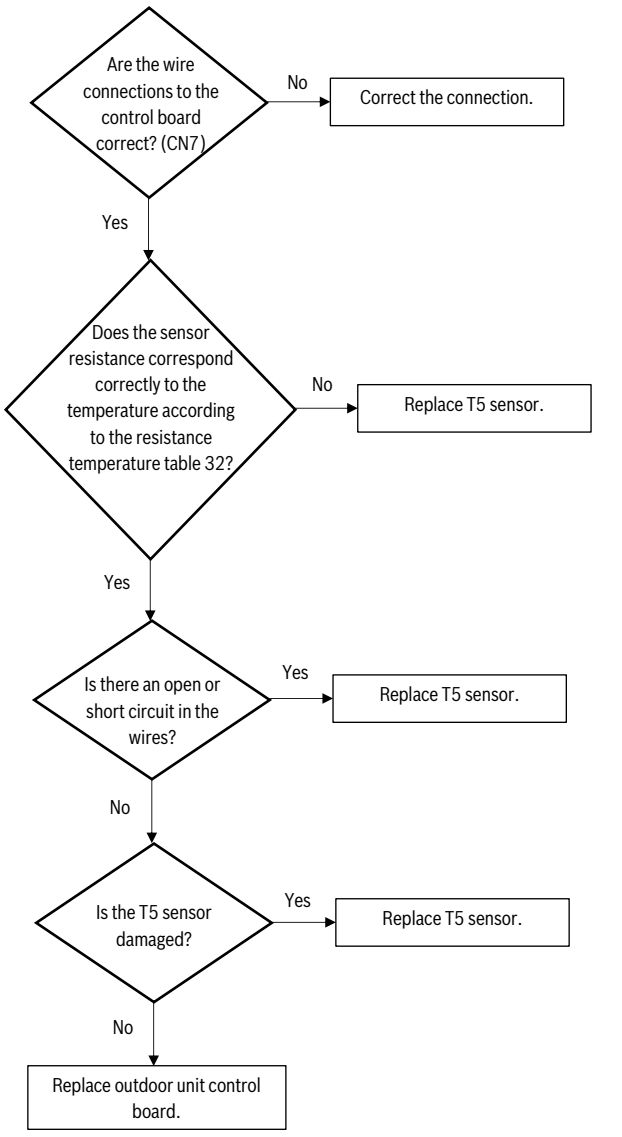


Figure 48

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E45**
Description:	Temperature sensor fault (Th)
Possible Causes:	- Th sensor failed - Th wiring issue - Wrong location of Th sensor

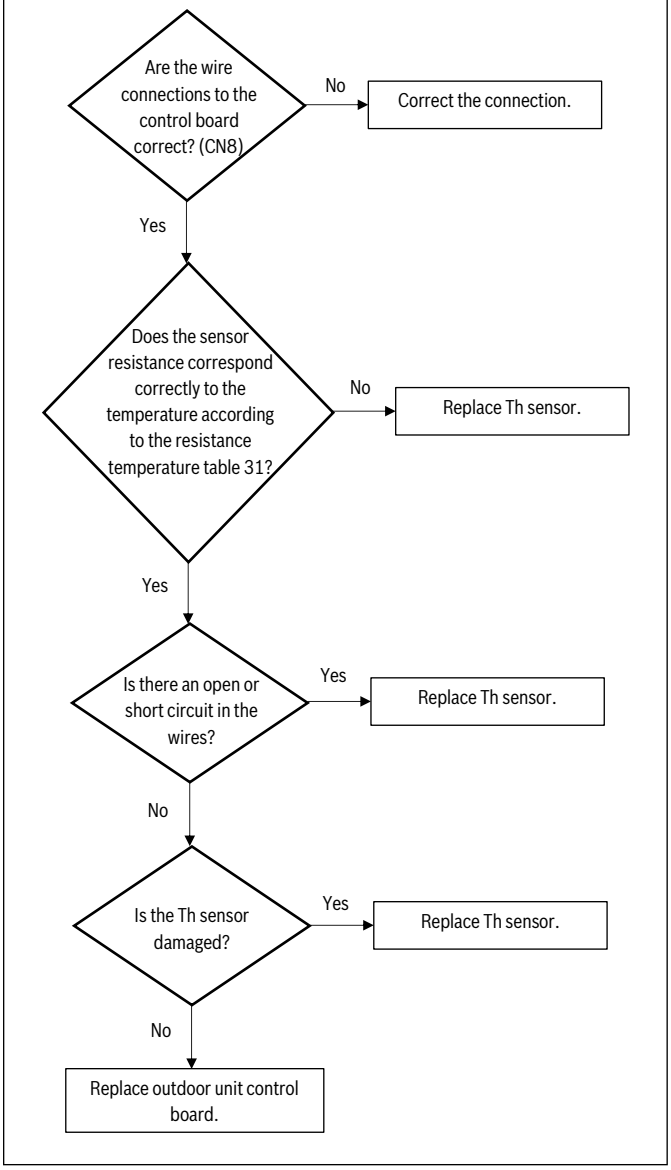


Figure 49

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E46**
Description:	Temperature sensor fault (T6A)
Possible Causes:	- T6A sensor failed - T6A wiring issue - Wrong location of T6A sensor

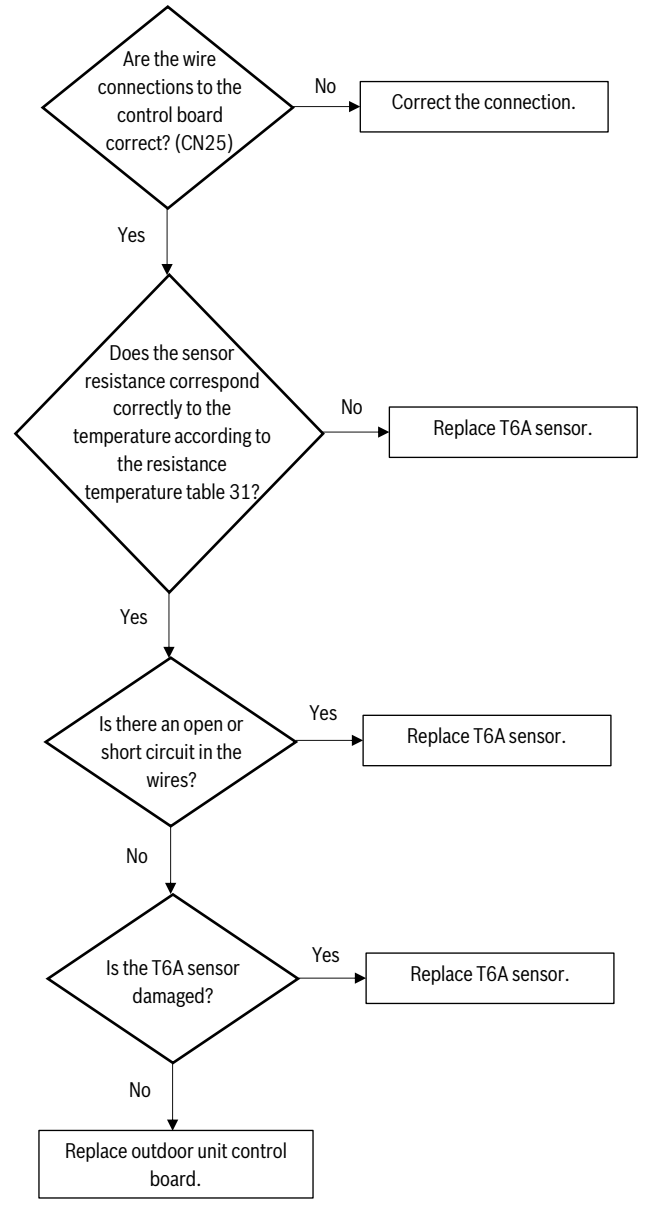


Figure 50

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E47**
Description:	Temperature sensor fault (T6B)
Possible Causes:	- T6B sensor failed - T6B wiring issue - Wrong location of T6B sensor

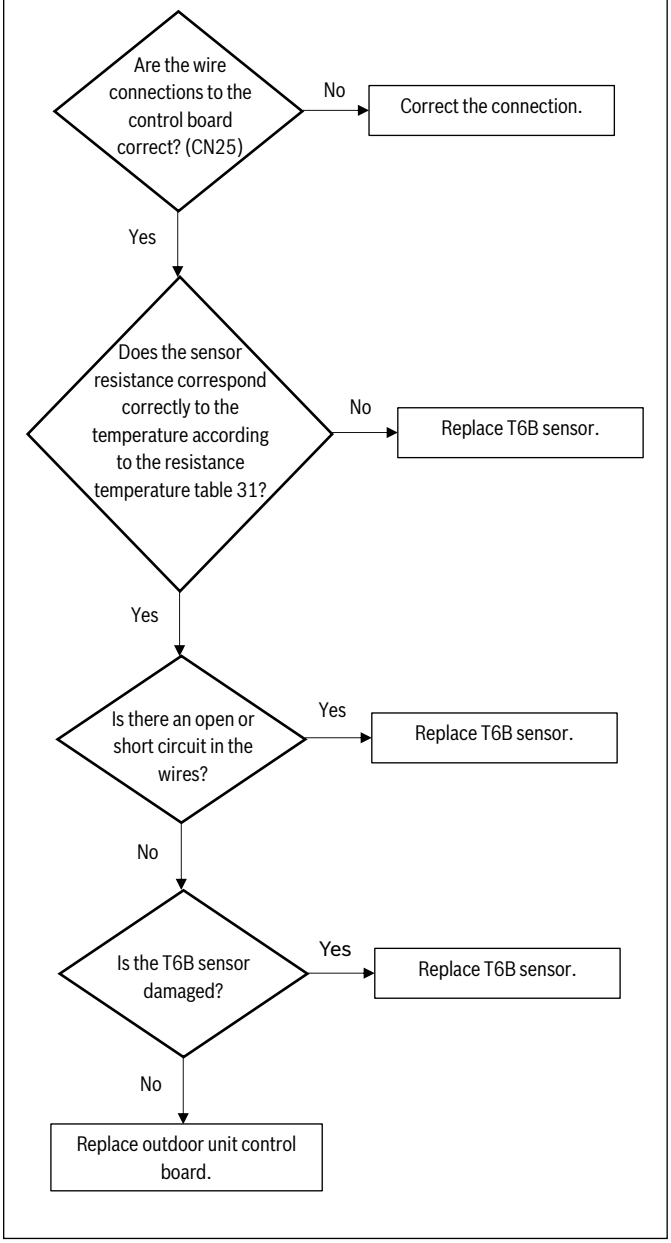


Figure 51

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**E48**
Description:	Temperature sensor fault (T7)
Possible Causes:	- T7 sensor failed - T7 wiring issue - Wrong location of T7 sensor

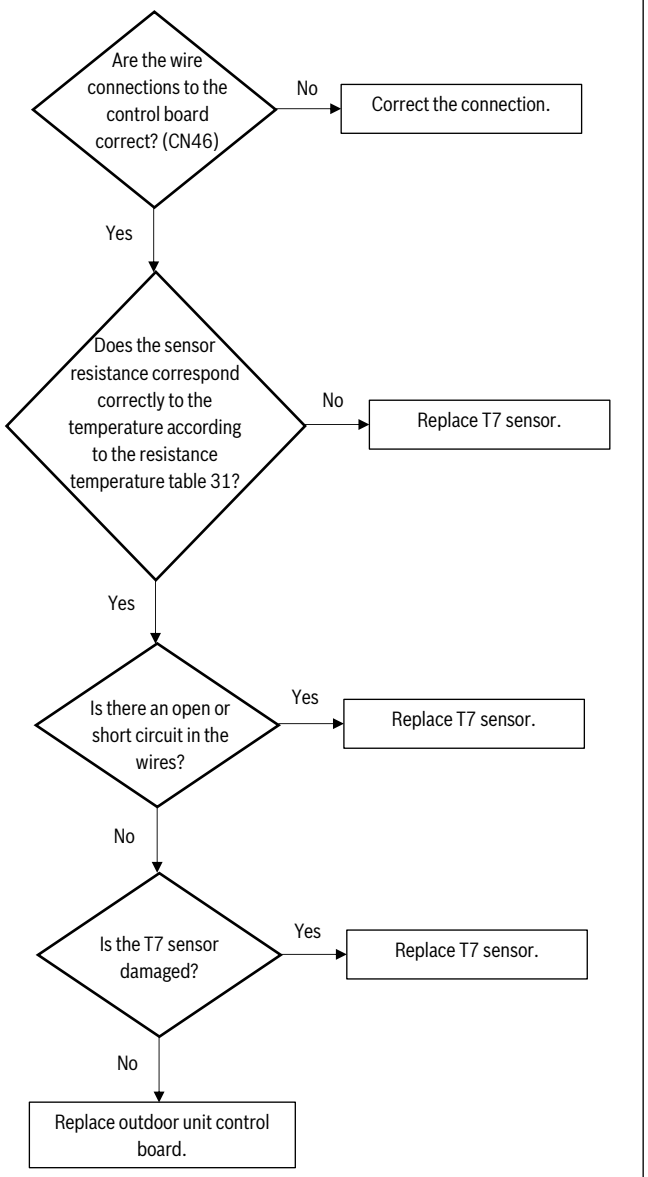


Figure 52

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

When measuring high voltage, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc.

LED display output:	**E49**
Description:	Baseplate heating fault
Possible Causes:	- Baseplate wiring issue - Current sensor failed - Baseplate failed - Control Board of outdoor unit failed

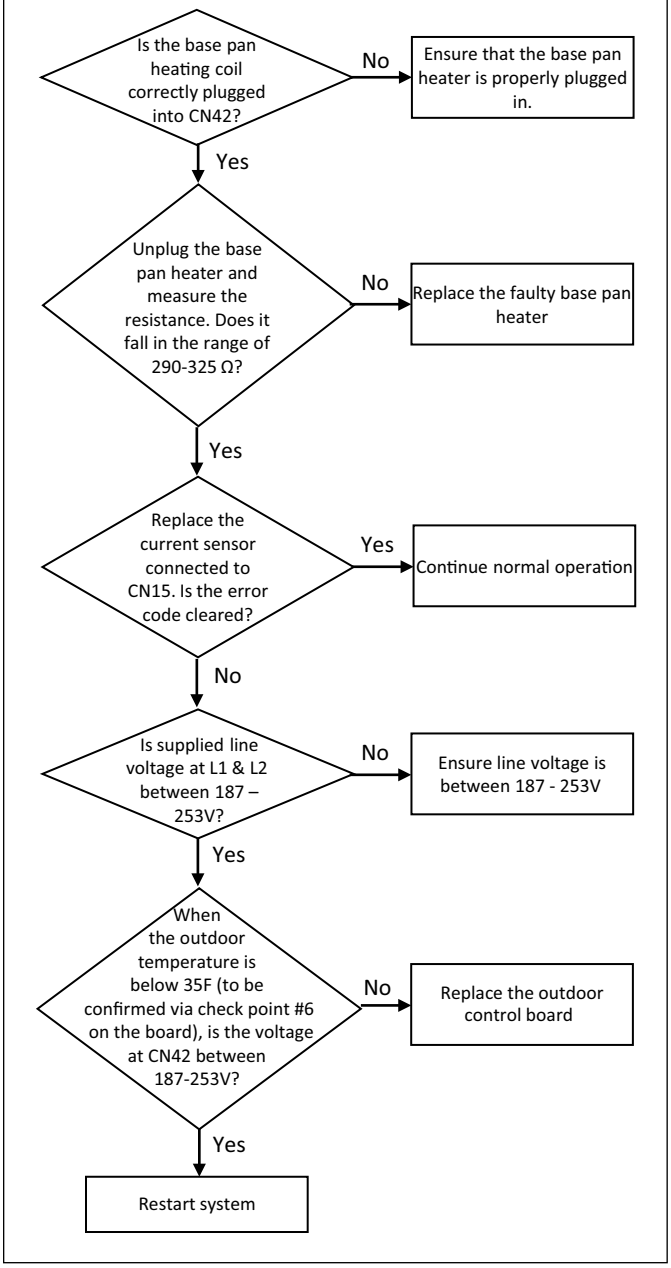


Figure 53

WARNING

Hazardous voltage!

When measuring high voltage, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc.

LED display output:	**E51**
Description:	Outdoor unit high/low input voltage protection
Possible Causes:	- Power supply ≥270V - Power supply <172V - Control board issue

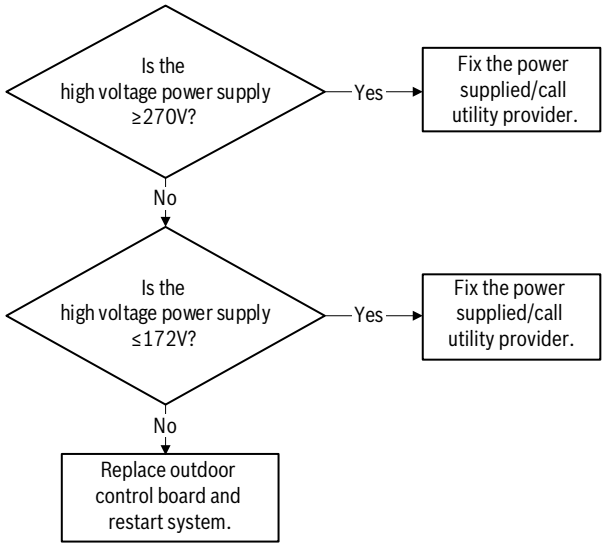


Figure 54

LED display output:	**E52**
Description:	Outdoor unit DC bus voltage error
Possible Causes:	- Unexpected input power supply: wiring or voltage error - Faulty or damaged control outdoor unit control board - ODU Fan damage - Compressor damage

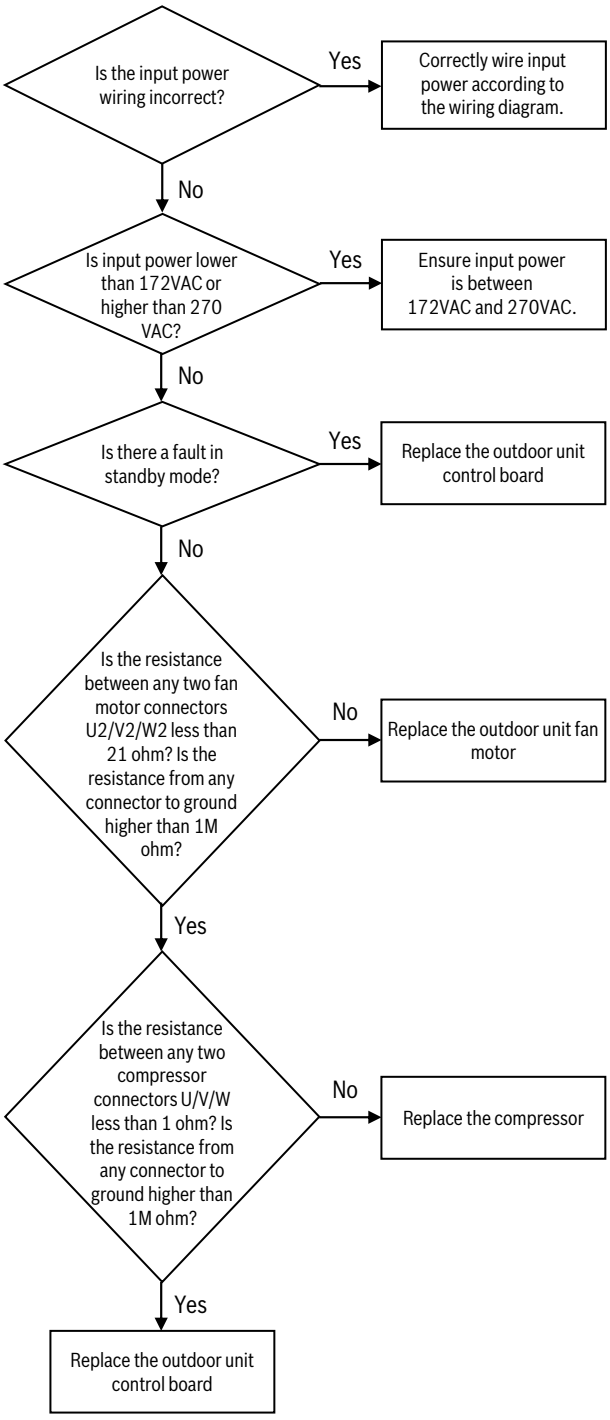


Figure 55

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

When measuring high voltage, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc.

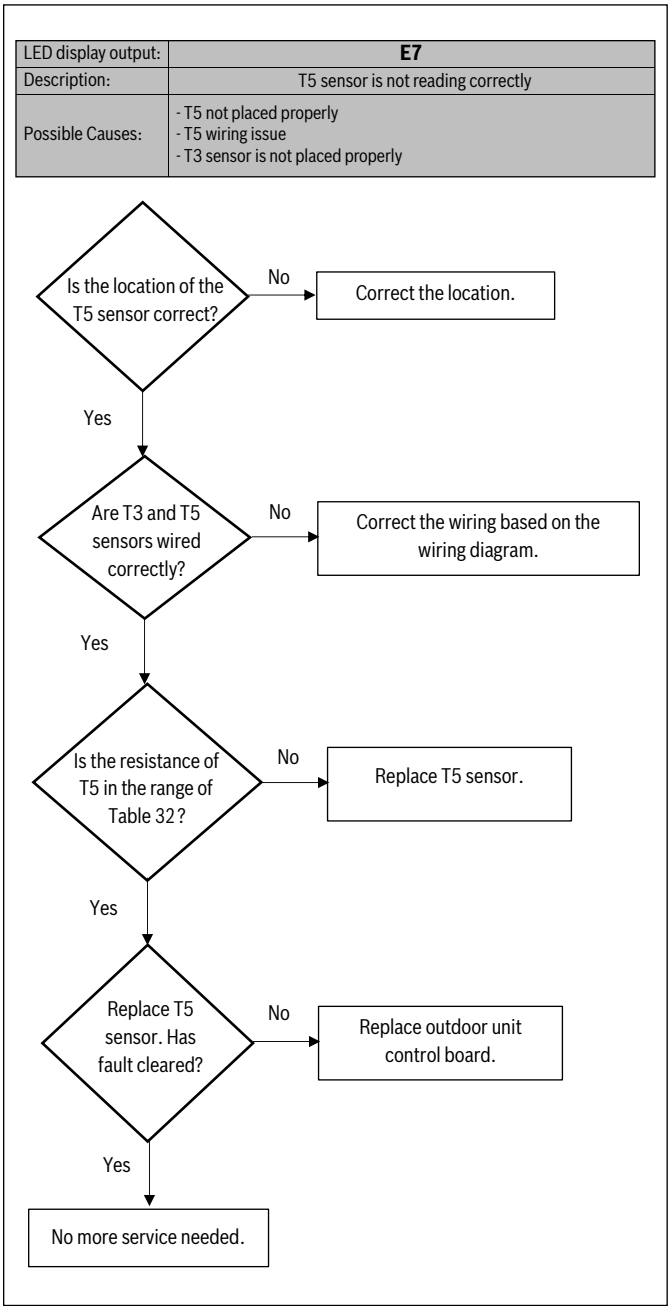


Figure 56

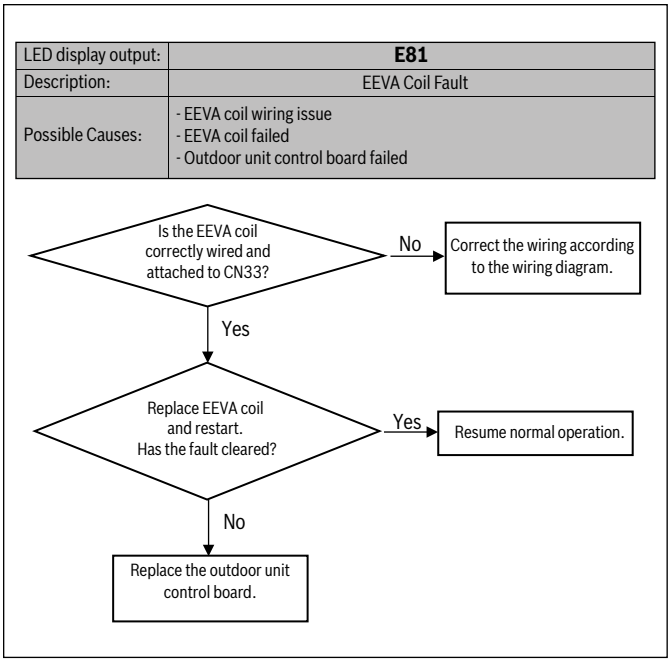


Figure 57

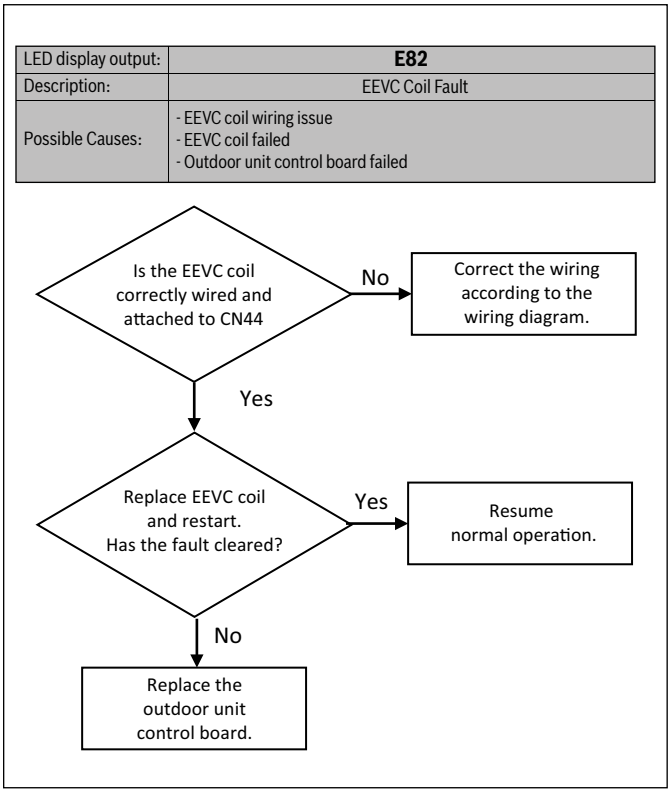


Figure 58

LED display output:	**EA**
Description:	Control program does not match drive program in outdoor unit
Possible Causes:	- Program error - Mismatched programs

Replace the control board in the outdoor unit and restart.

Figure 59

LED display output:	**F1**
Description:	High Pressure Switch protection (HPS)
Possible Causes:	- HPS wiring issue - HPS failed

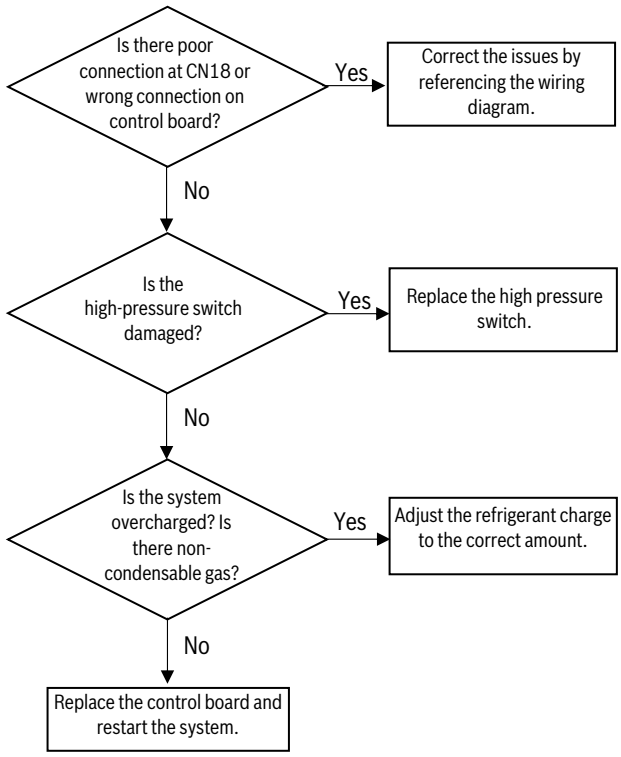


Figure 60

LED display output:	**F41**
Description:	High pressure sensor fault (Pc)
Possible Causes:	- High Pressure Transducer (Pc) wired incorrectly - Pc is shorted or damaged - Outdoor unit control board failed

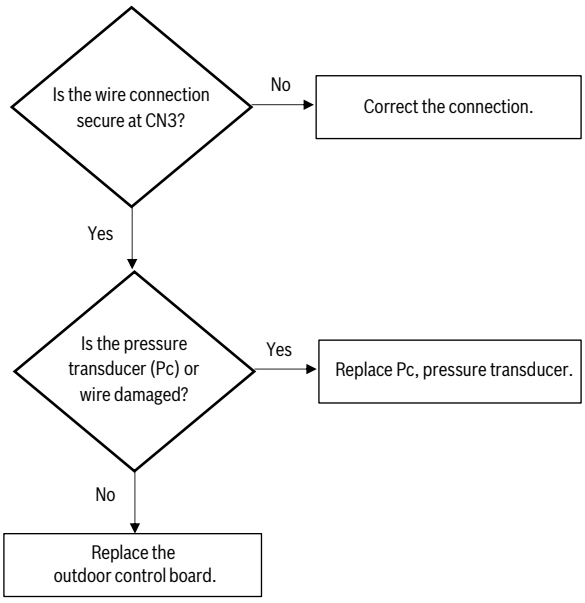


Figure 61

LED display output:	**F42**
Description:	Low pressure sensor fault (Pe)
Possible Causes:	- Low Pressure Transducer (Pe) wired incorrectly - Pe is shorted or damaged - Outdoor unit control board failed

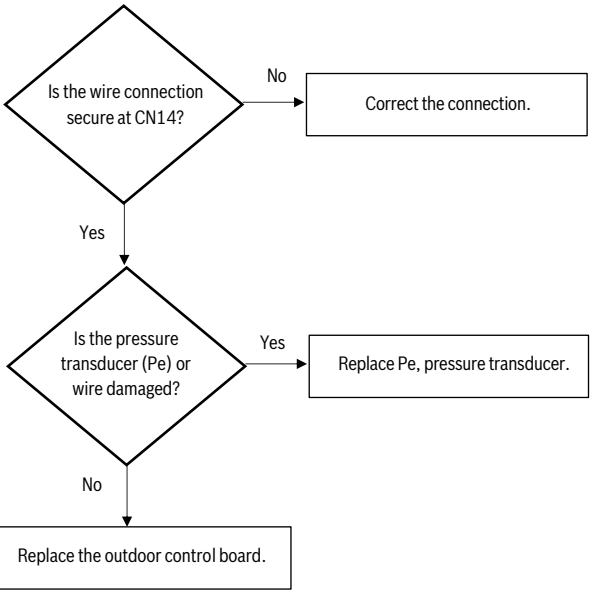


Figure 62

LED display output:	**H01**
Description:	Drive chip communication fault in outdoor unit
Possible Causes:	- Program error - Outdoor control board failure

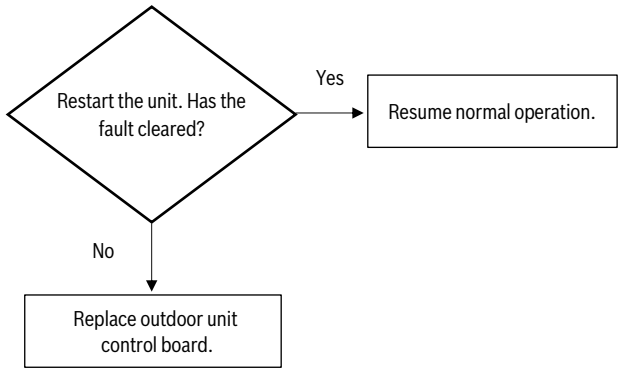


Figure 63

LED display output:	**H04**
Description:	Chip of power consumption sensor communication fault in outdoor unit
Possible Causes:	- Outdoor control board failure

Replace the outdoor control board and restart the system

Figure 64

WARNING

Hazardous voltage!

When measuring input voltage/current, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc..

LED display output:	**H14**
Description:	Power consumption sensor fault in outdoor unit
Possible Causes:	- Wiring error - Current sensor failure - Outdoor control board failure

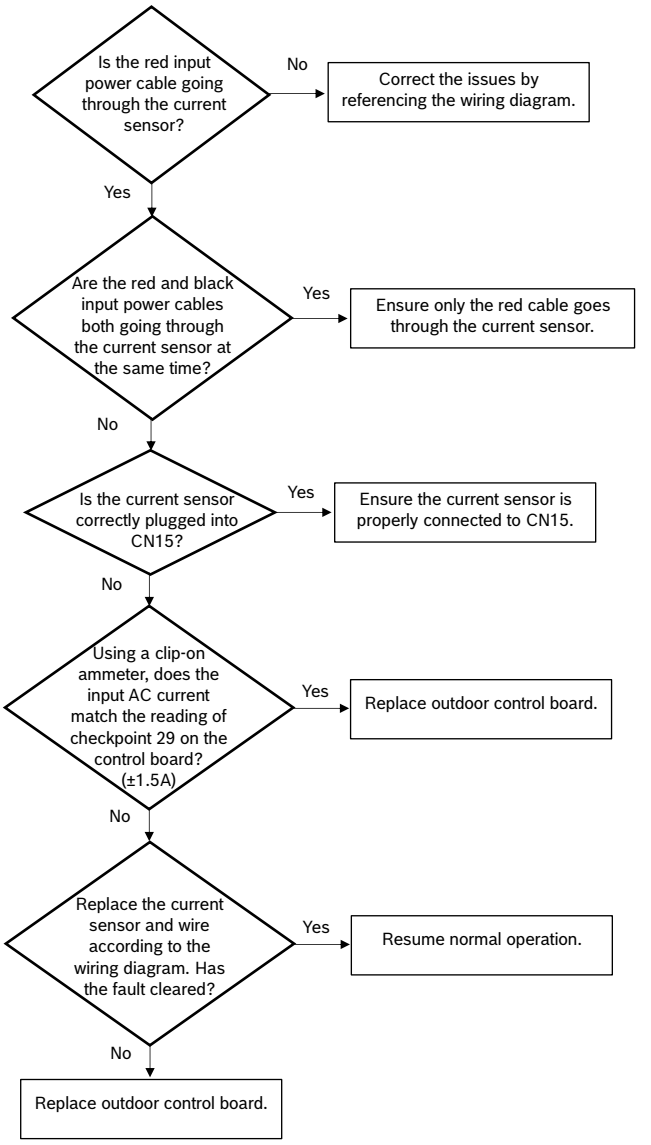


Figure 65

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	J00-JCF
Description:	Compressor drive protection
Possible Causes:	- Service valves closed off - Compressor incorrectly wired - Outdoor unit control board failure

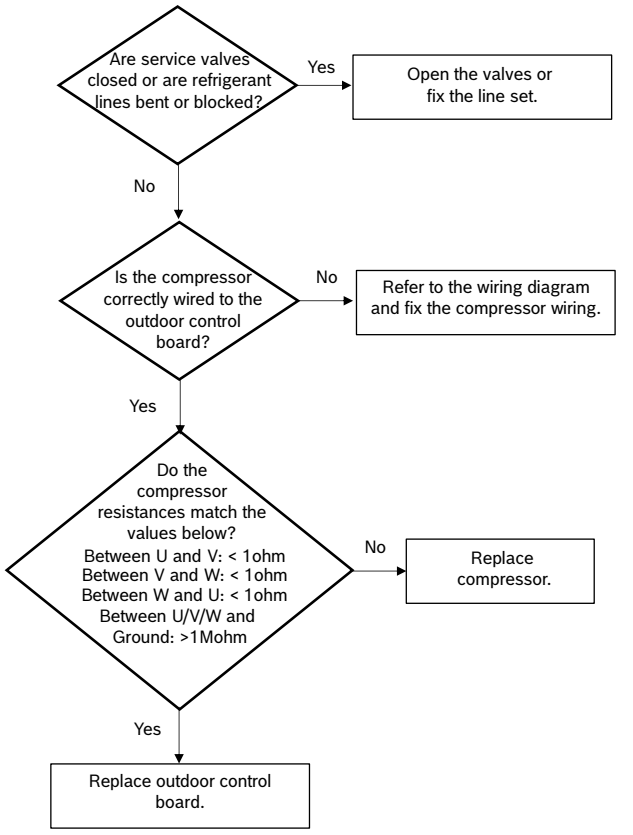


Figure 66

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	J10
Description:	Compressor hardware protection
Possible Causes:	- Service valves closed off - Compressor incorrectly wired - Outdoor unit control board failure - Compressor damaged: locked rotor, short circuit, phase loss - Compressor IPM1 improperly installed to heat sink

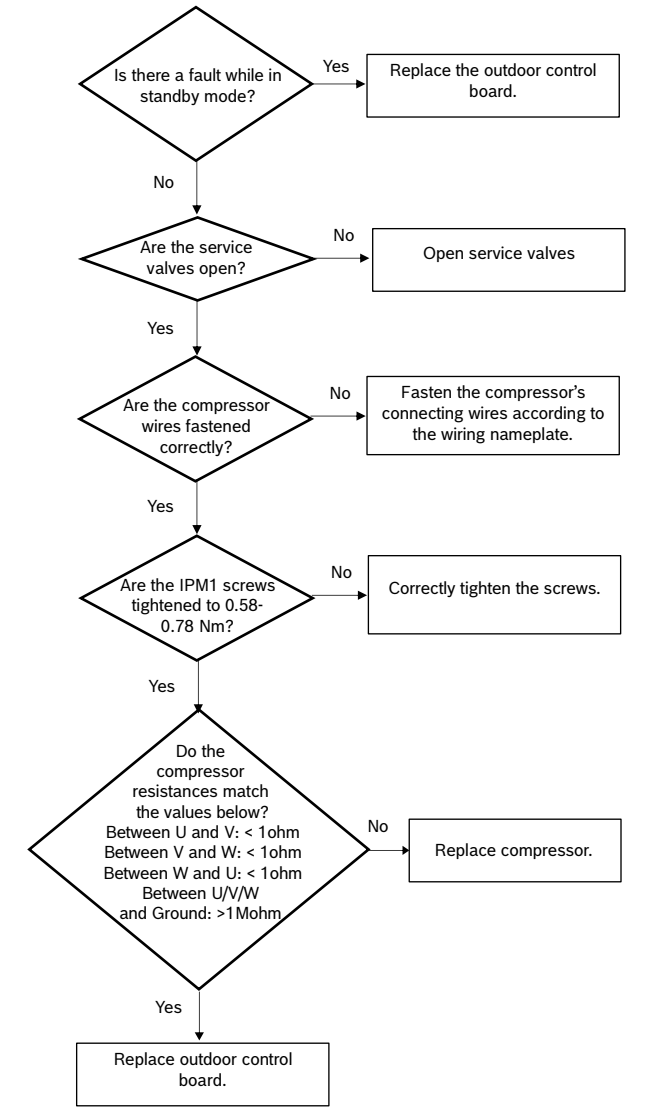


Figure 67

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**J11**
Description:	Compressor phase current instantaneous overcurrent protection
Possible Causes:	- Service valves closed off - Compressor incorrectly wired - Outdoor unit control board failure - Compressor damaged: locked rotor, short circuit, phase loss

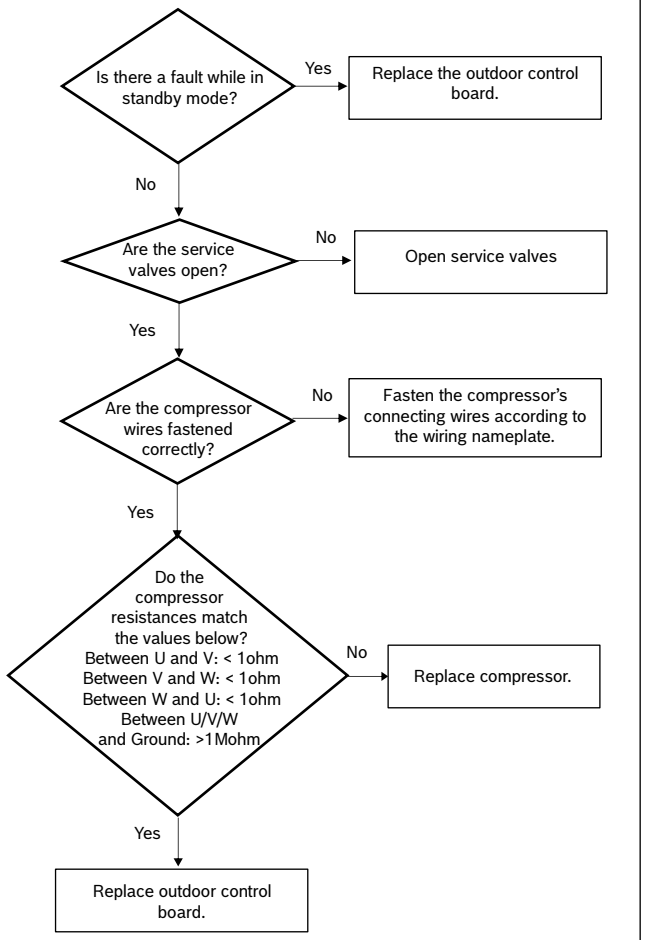


Figure 68

LED display output:	**J20**
Description:	Compressor IPM over temperature protection
Possible Causes:	- Compressor module IPM1 screws not tightened - Radiatior airduct of electric control box is dirty/blocked - IPM1 not coated in thermal paste - Outdoor control board damaged

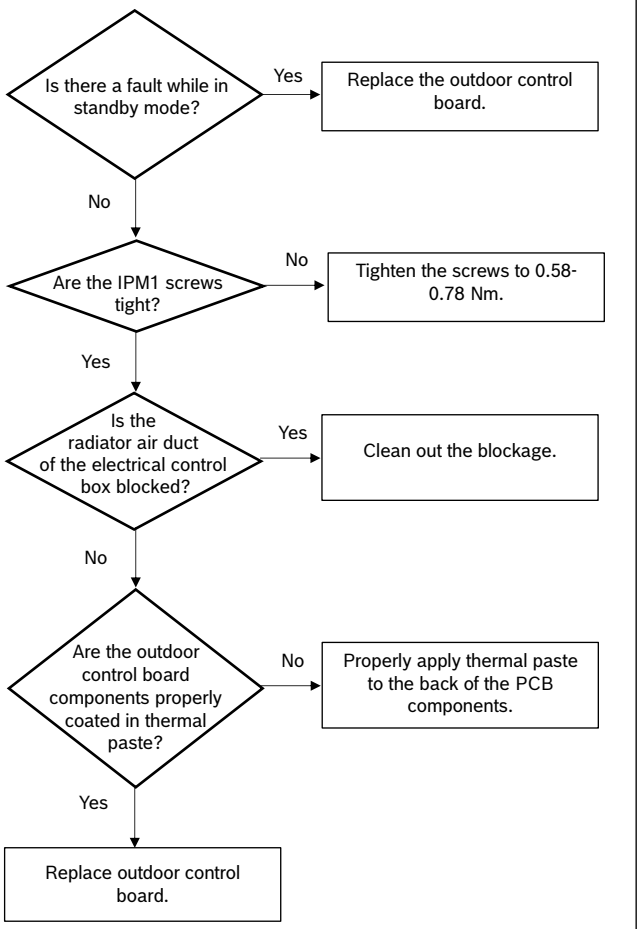


Figure 69

WARNING

Hazardous voltage!

When measuring input voltage/current, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc..

LED display output:	**J30/n30**
Description:	Bus voltage too low fault
Possible Causes:	- Abnormal input power supply: wiring and/or voltage error - Damaged outdoor control board

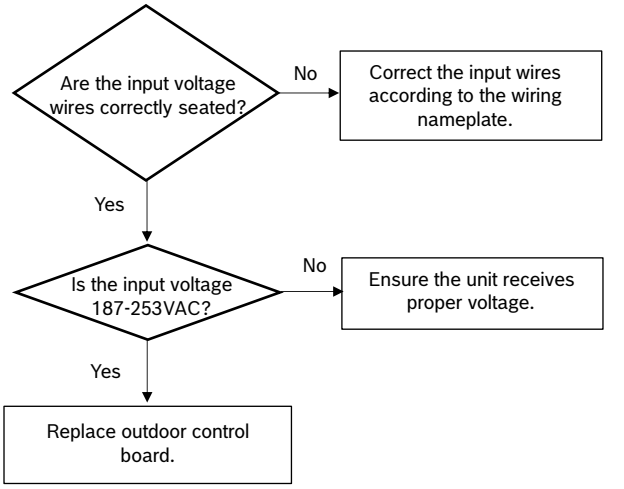


Figure 70

WARNING

Hazardous voltage!

When measuring input voltage/current, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc..

LED display output:	**J31/n31**
Description:	Bus voltage too high fault
Possible Causes:	- Abnormal input power supply: wiring and/or voltage error - Damaged outdoor control board

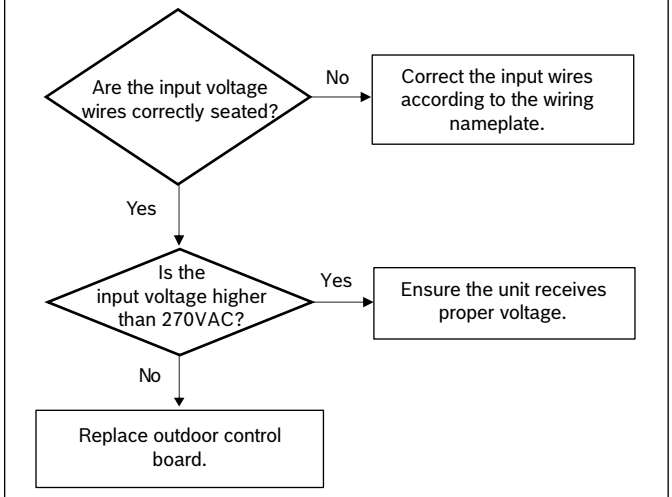


Figure 71

LED display output:	**J43**
Description:	Compressor current sampling bias is abnormal
Possible Causes:	- Outdoor control board damaged

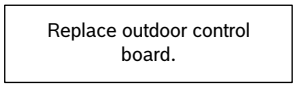


Figure 72

LED display output:	J45
Description:	Compressor motor code does not match
Possible Causes:	- Dip switch setting incorrectly configured - Software version error

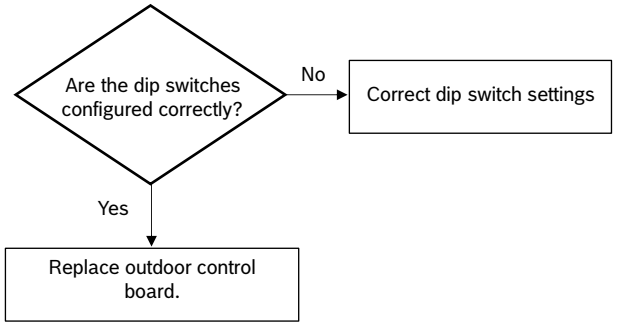


Figure 73

WARNING

Hazardous voltage!

When measuring input voltage/current, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc..

LED display output:	J48/n48
Description:	PTC charging is abnormal
Possible Causes:	- Abnormal input power supply: wiring and/or voltage error - Damaged outdoor control board

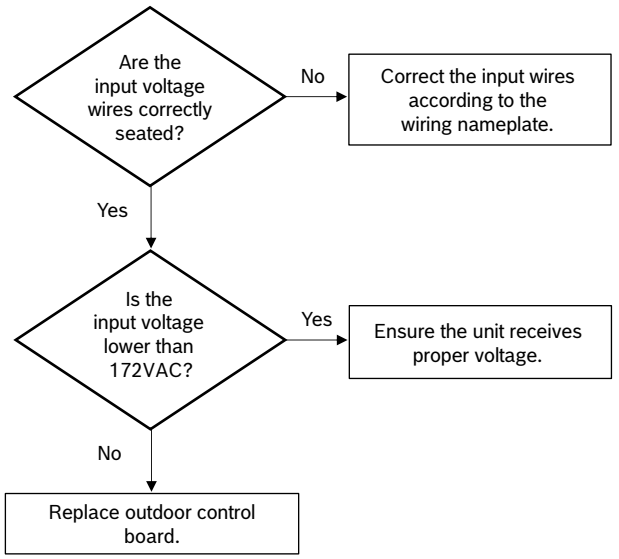


Figure 74

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	J50
Description:	Compressor failed to start
Possible Causes:	-Service valves closed off - Compressor incorrectly wired - Outdoor unit control board damaged - Excessive starting differential pressure of compressor, cylinder sticking, and damage

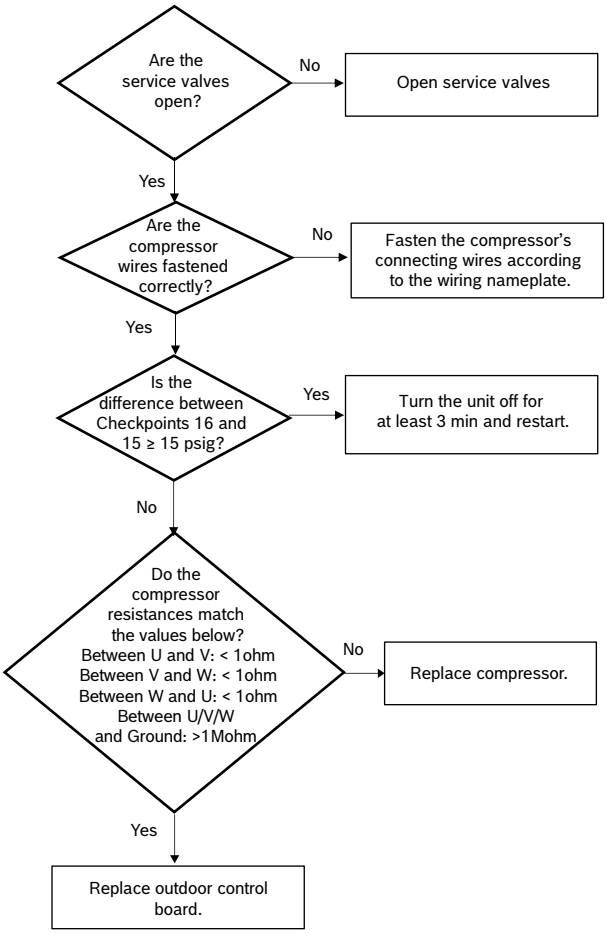


Figure 75

LED display output:	J52
Description:	Compressor locked-rotor protection
Possible Causes:	- Service valves closed off - Stuck rotor and cylinder of compressor - Compressor damaged - Outdoor control board damaged

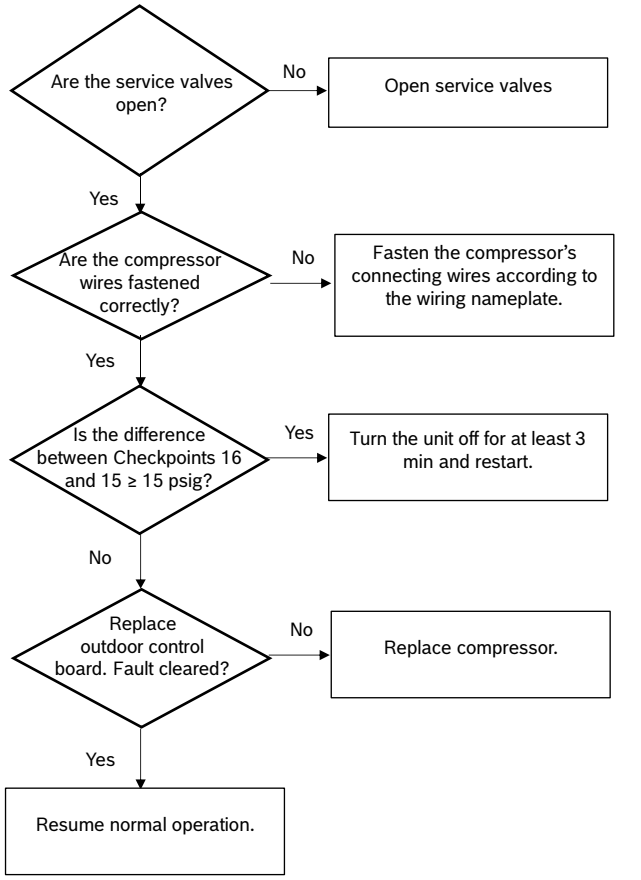


Figure 76

WARNING

Hazardous voltage!

When measuring input voltage/current, make sure to follow proper safety precautions and wear appropriate PPE such as insulated gloves, safety glasses, flame-resistant clothing, etc..

LED display output:	J60
Description:	Compressor motor phase loss protection
Possible Causes:	- Compressor cables are not tighened - Compressor damaged - Outdoor control board damaged

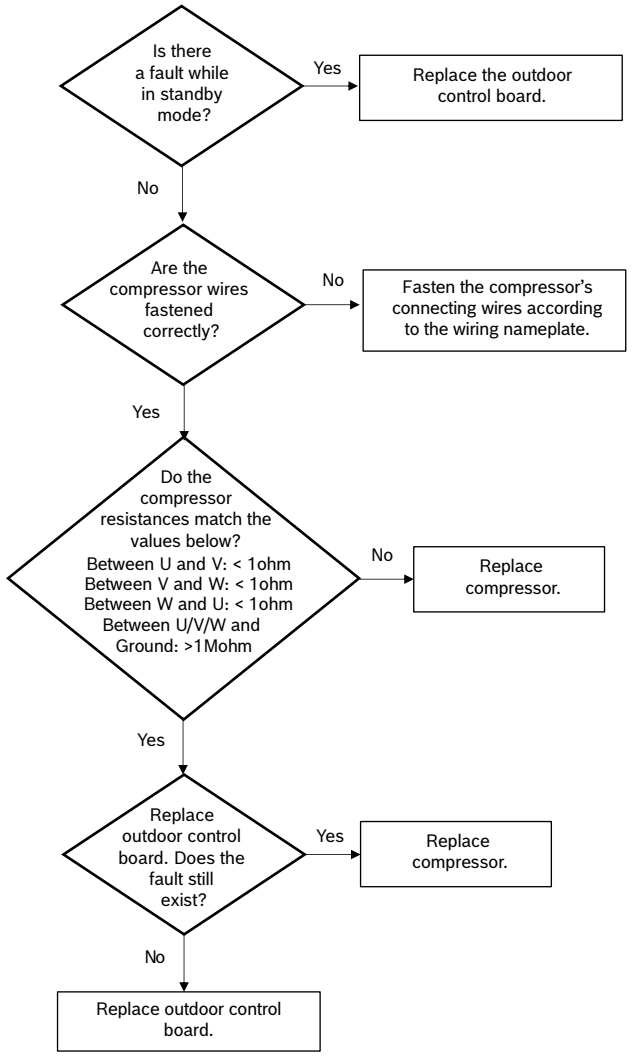


Figure 77

LED display output:	**J65/n65**
Description:	Compressor/fan IPM short circuit protection
Possible Causes:	- Outdoor control board damaged

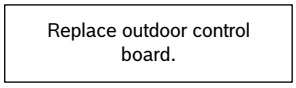


Figure 78

LED display output:	**No display output**
Description:	Digital display tube not working
Possible Causes:	- Electrical component issue - Outdoor unit control board damaged

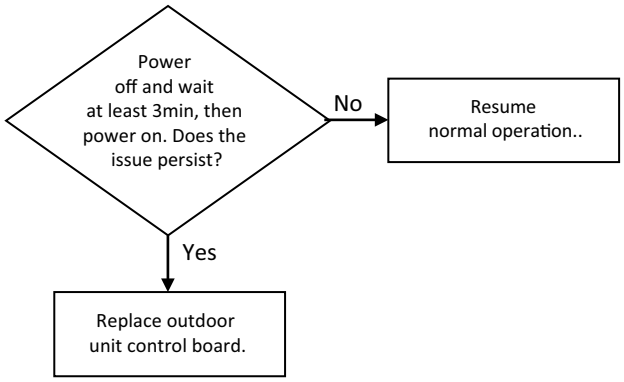


Figure 79

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**n00-nCF**
Description:	Fan drive protection
Possible Causes:	- Fan incorrectly wired - Fan failure - Outdoor unit control board failure

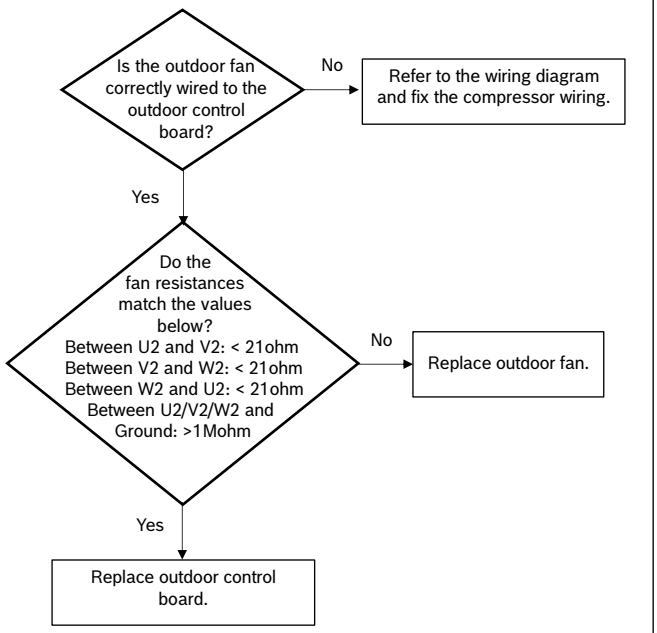


Figure 80

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**n10**
Description:	Fan hardware protection
Possible Causes:	- Motor connector not inserted correctly - Blockage in outdoor heat exchanger - Abnormal fan: stuck, locked rotor, phase loss, short circuit - Outdoor control board damaged

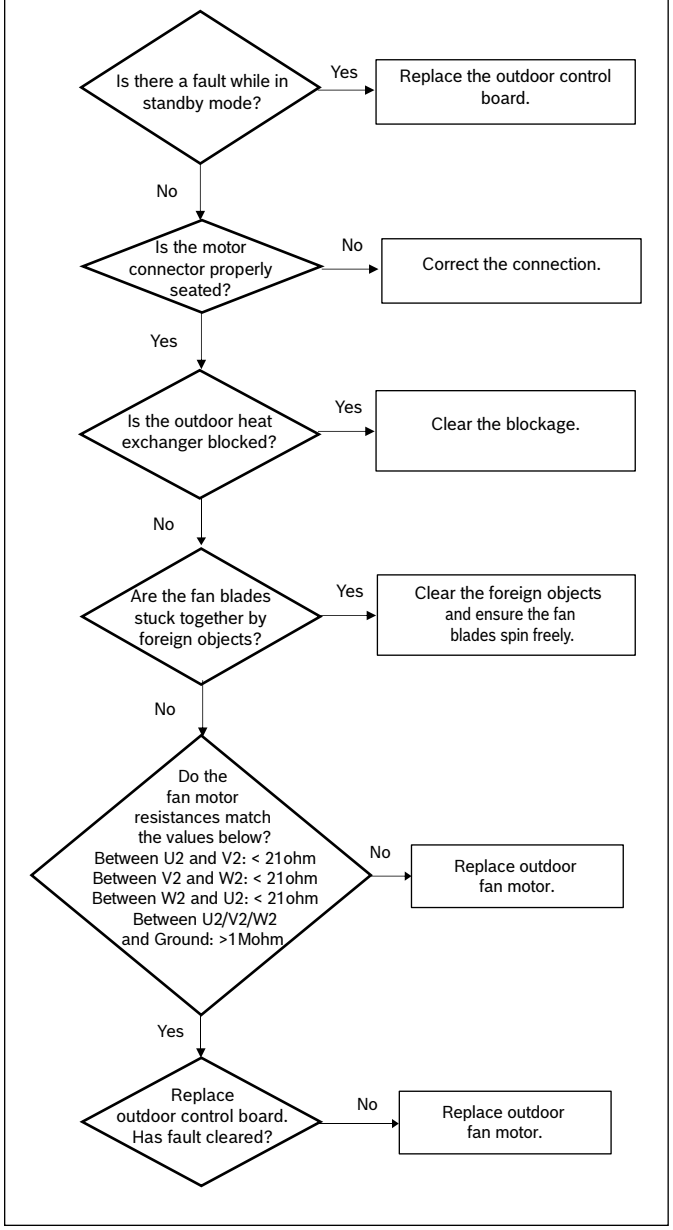


Figure 81

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**n11**
Description:	Fan phase current instantaneous overcurrent protection
Possible Causes:	- Motor connector not inserted correctly - Blockage in outdoor heat exchanger - Abnormal fan: stuck, locked rotor, phase loss, short circuit - Outdoor control board damaged

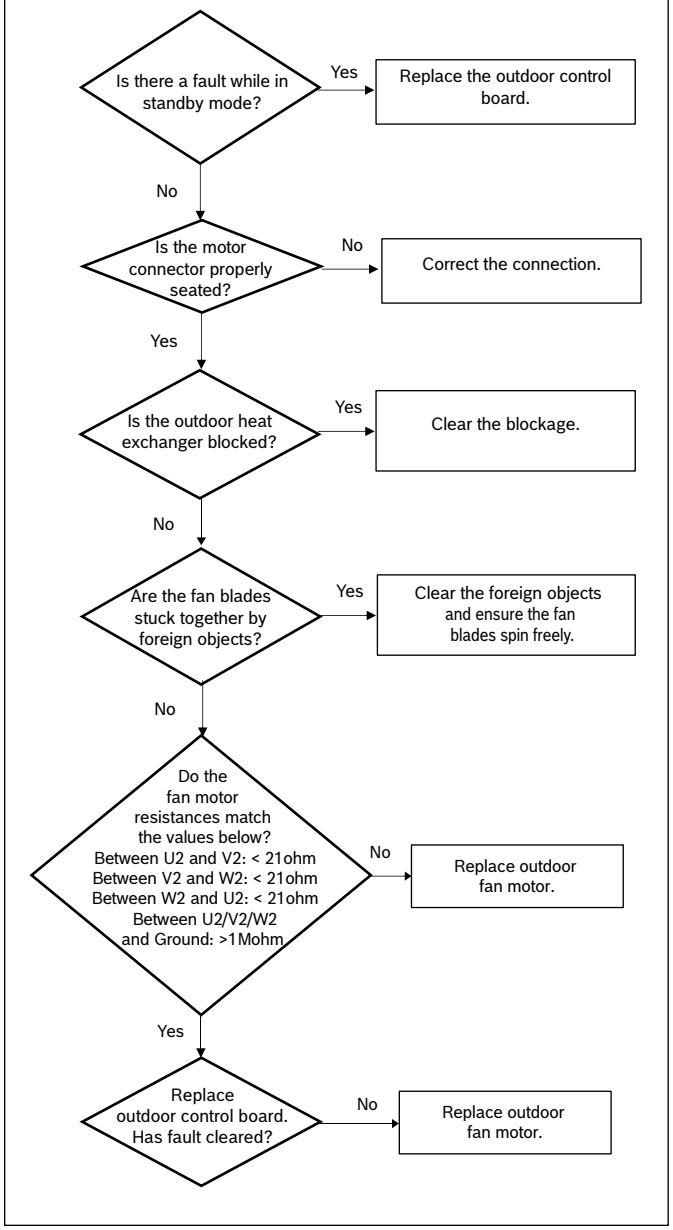


Figure 82

LED display output:	**n20**
Description:	Fan IPM over-temperature protection
Possible Causes:	- Fan module radiator is dirty/blocked - Outdoor control board damaged

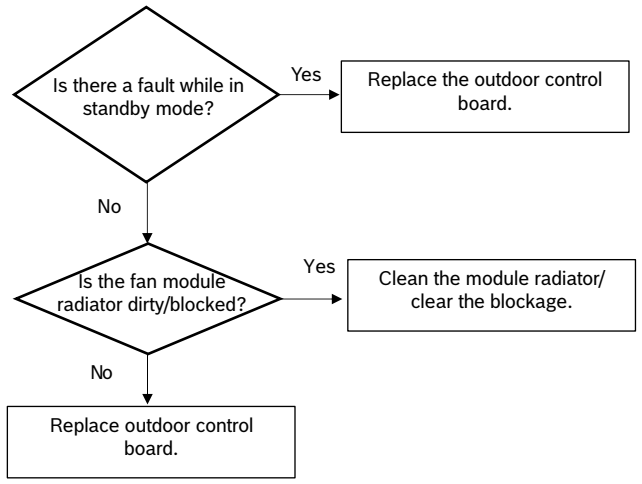


Figure 83

LED display output:	**n43**
Description:	Fan current sampling bias is abnormal
Possible Causes:	- Anormal fan current sampling circuit of control board is damaged - Outdoor control board damaged

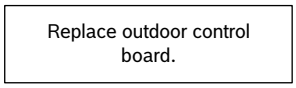


Figure 84

LED display output:	**n45**
Description:	Fan motor code does not match
Possible Causes:	- Dip switches incorrectly configured - Software version error

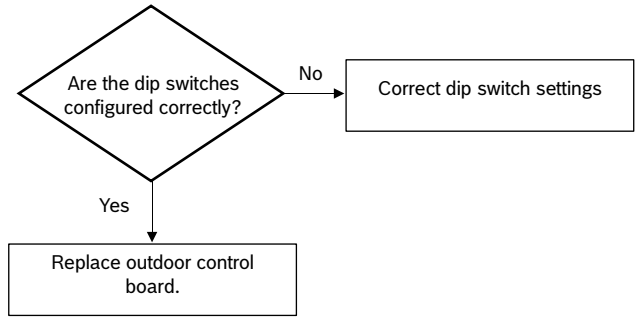


Figure 85

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**n50**
Description:	Fan failed to start
Possible Causes:	- Motor connector not properly seated - Strong wind against fan - Abnormal fan: stuck, locked rotor, phase loss, short-circuit, non-loaded - Outdoor control board damaged

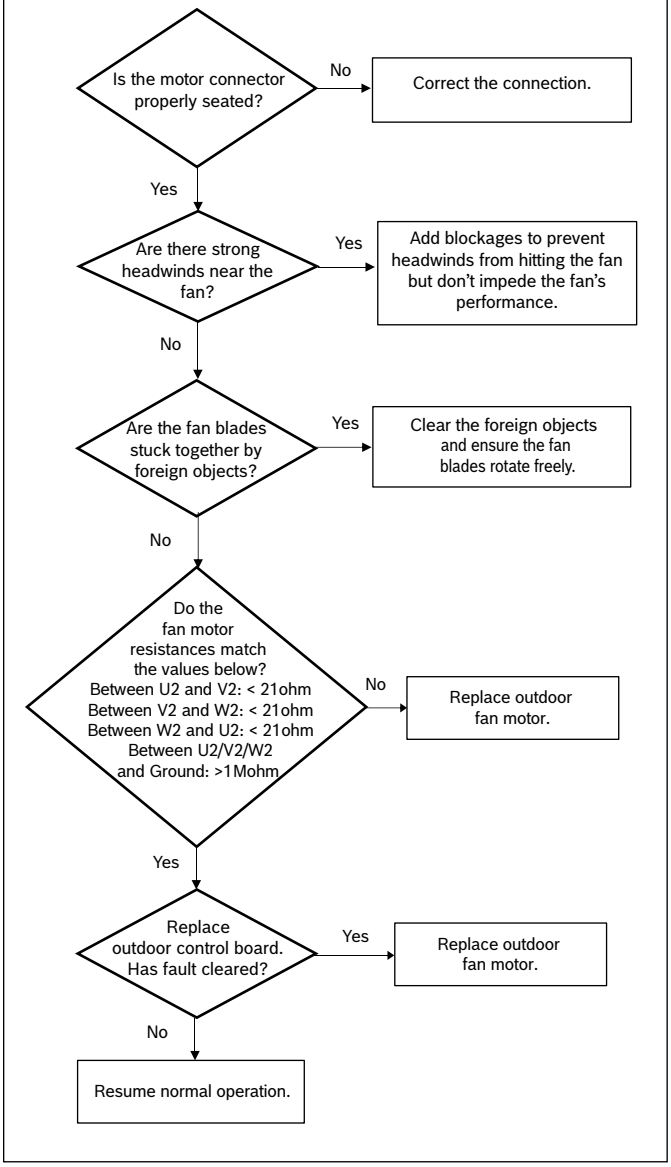


Figure 86

LED display output:	**n52**
Description:	Fan locked-rotor protection
Possible Causes:	- Abnormal fan: stuck, loaded rotor, non-loaded - Outdoor control board damaged

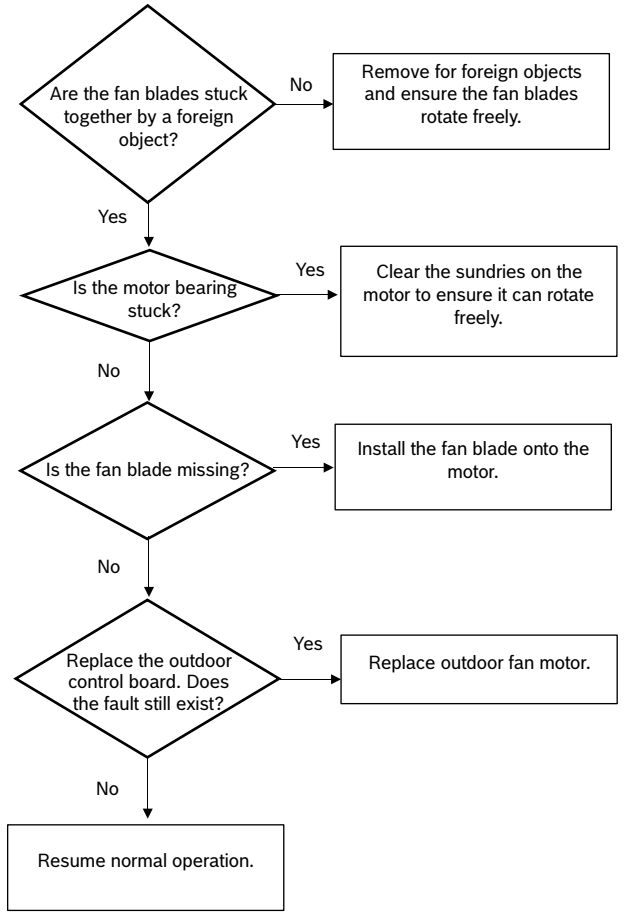


Figure 87

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**n60**
Description:	Compressor motor phase loss protection
Possible Causes:	- Compressor cables are not tighened - Compressor damaged - Outdoor control board damaged

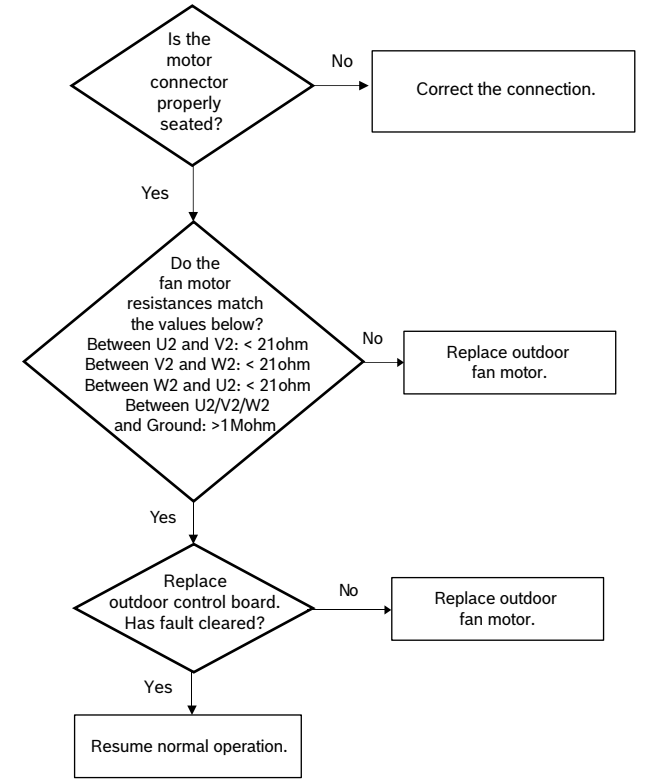


Figure 88

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**P0**
Description:	Compressor IPM temperature protection
Possible Causes:	- IPM1 screws are not tight - Radiator air duct is dirty - IPM1 is not coated with thermal paste

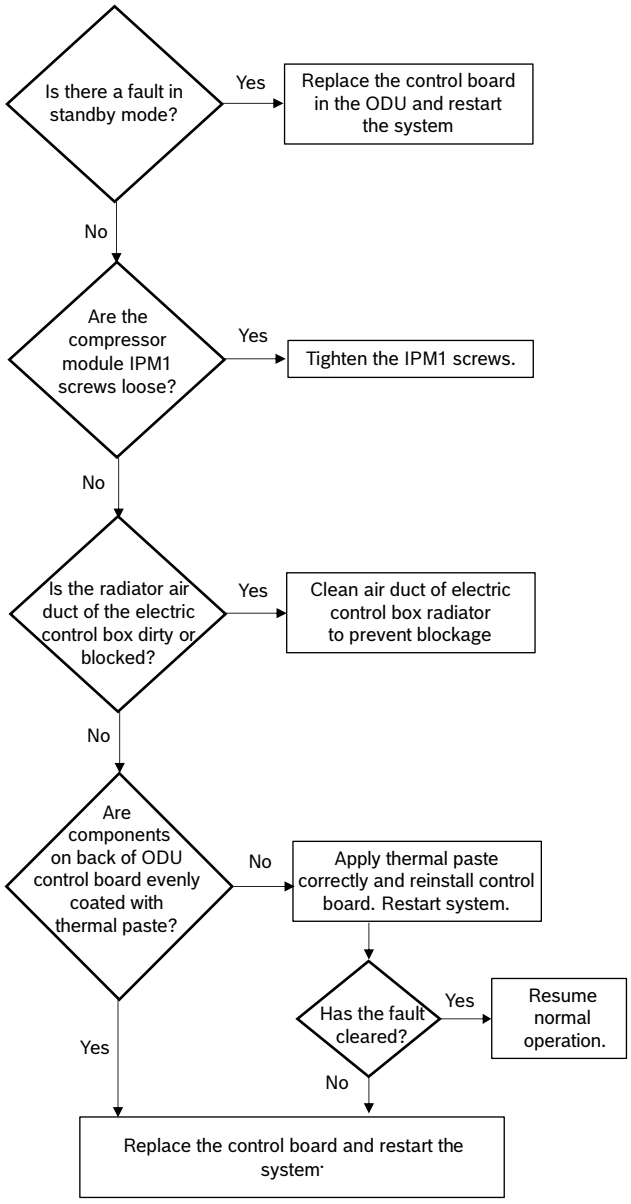


Figure 89

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**P1**
Description:	High pressure switch protection
Possible Causes:	- Service valves are not open - Poor condenser heat exchange - Abnormal throttle on condenser - HPS incorrectly wired - Refrigerant overcharge

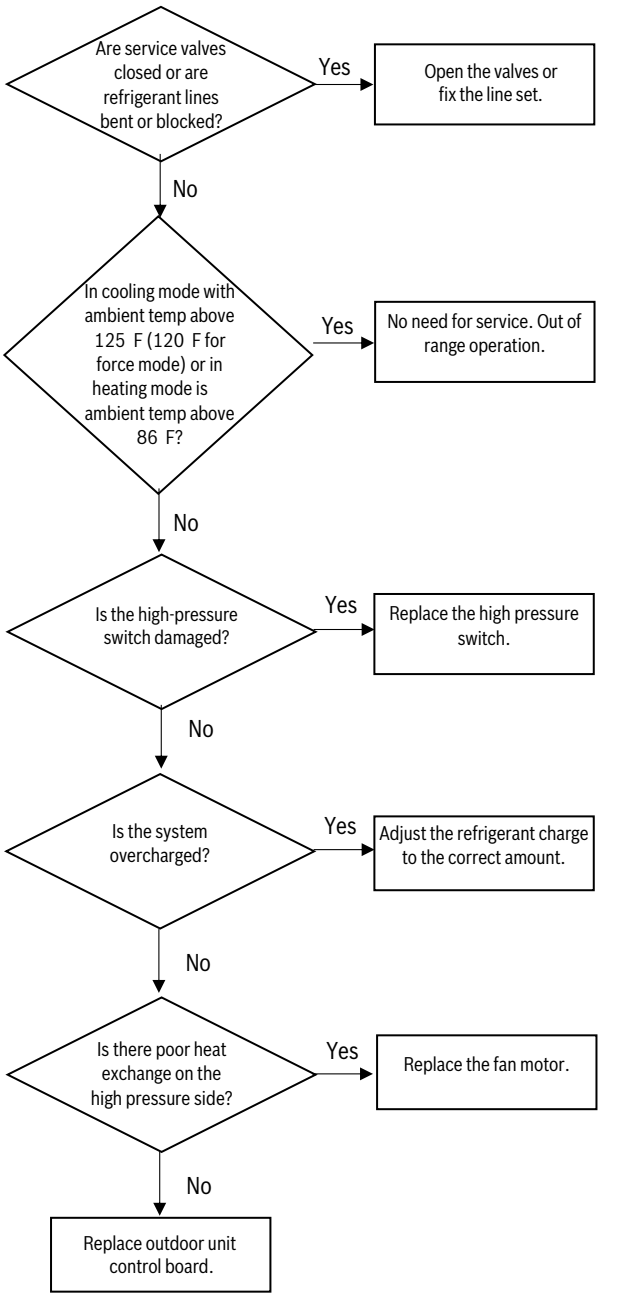


Figure 90

LED display output:	**P11**
Description:	High pressure protection in cooling/heating (Pc)
Possible Causes:	- Service valves are not open - Poor condenser heat exchange - Pc sensor failure - Refrigerant overcharge - TXV or EEVA blocked

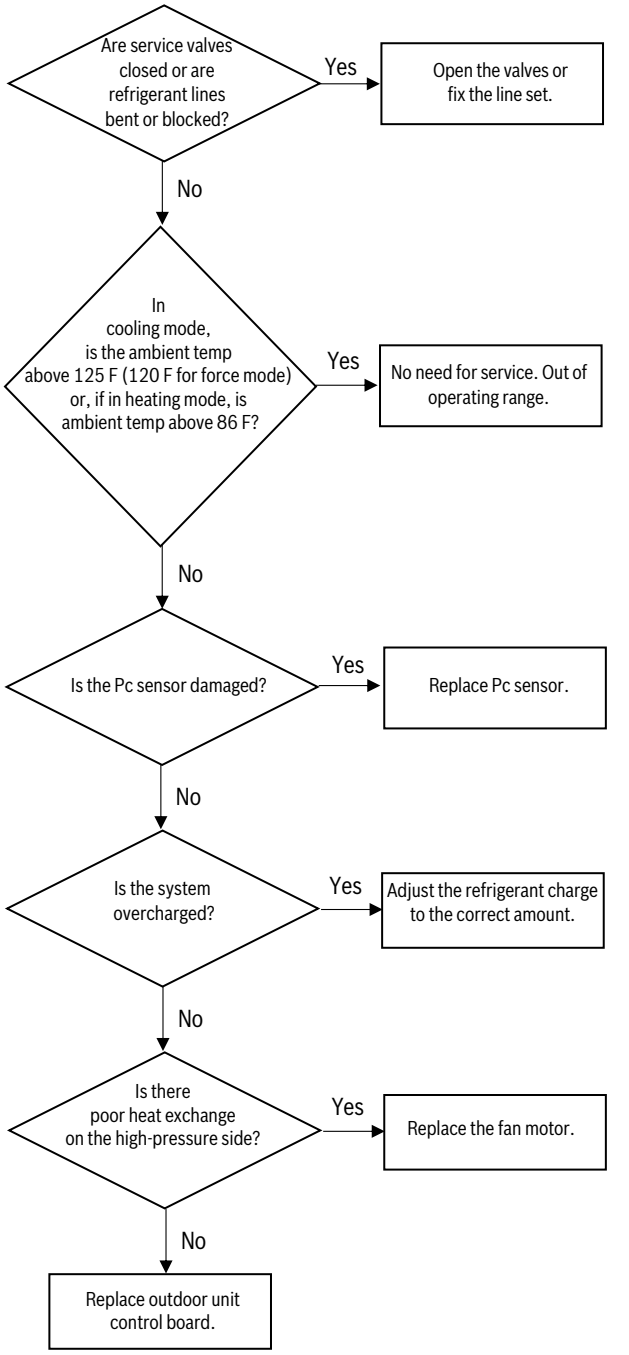


Figure 91

LED display output:	**P21, F2** (System lockout, P21 occurs 5 times in 100 min)
Description:	Low Pressure Fault in Cooling Mode
Possible Causes:	- IDU Blower not running or poor heat transfer - TXV/EEVA/filter drier/indoor coil clogged - Service valves closed - Low refrigerant - Pressure transducer failure (Pe) - Damaged outdoor unit control board

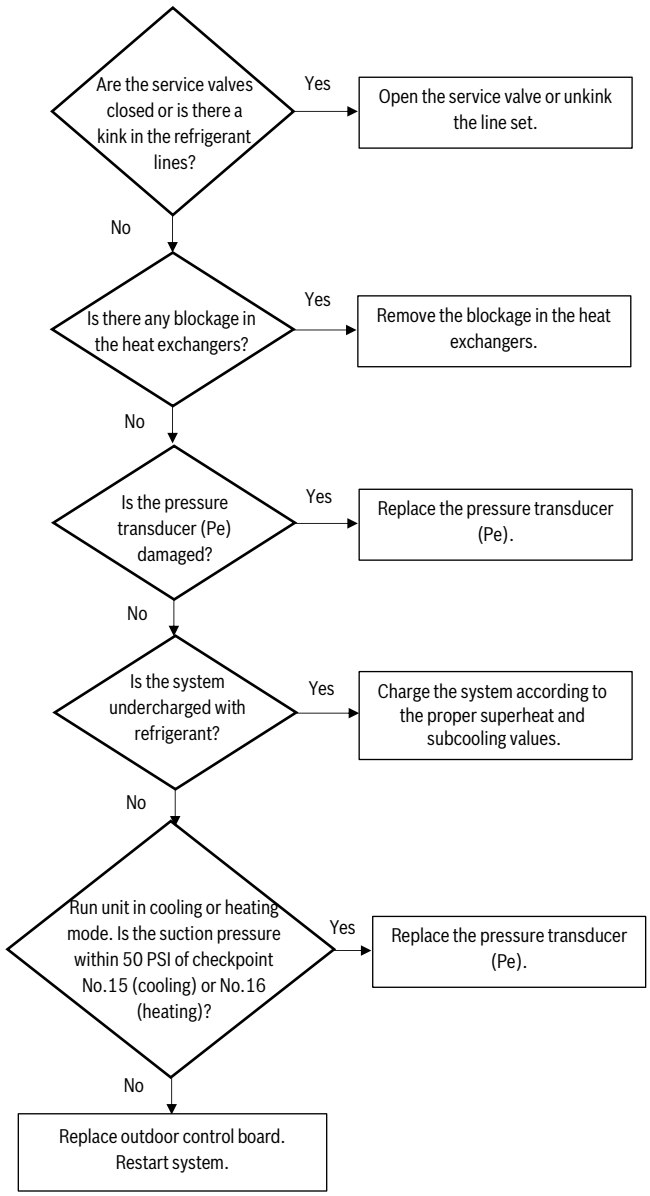


Figure 92

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**P31**
Description:	Outdoor unit input over current protection
Possible Causes:	- Service valves are not open - Incorrectly wired - Compressor failure - Outdoor unit control board failure

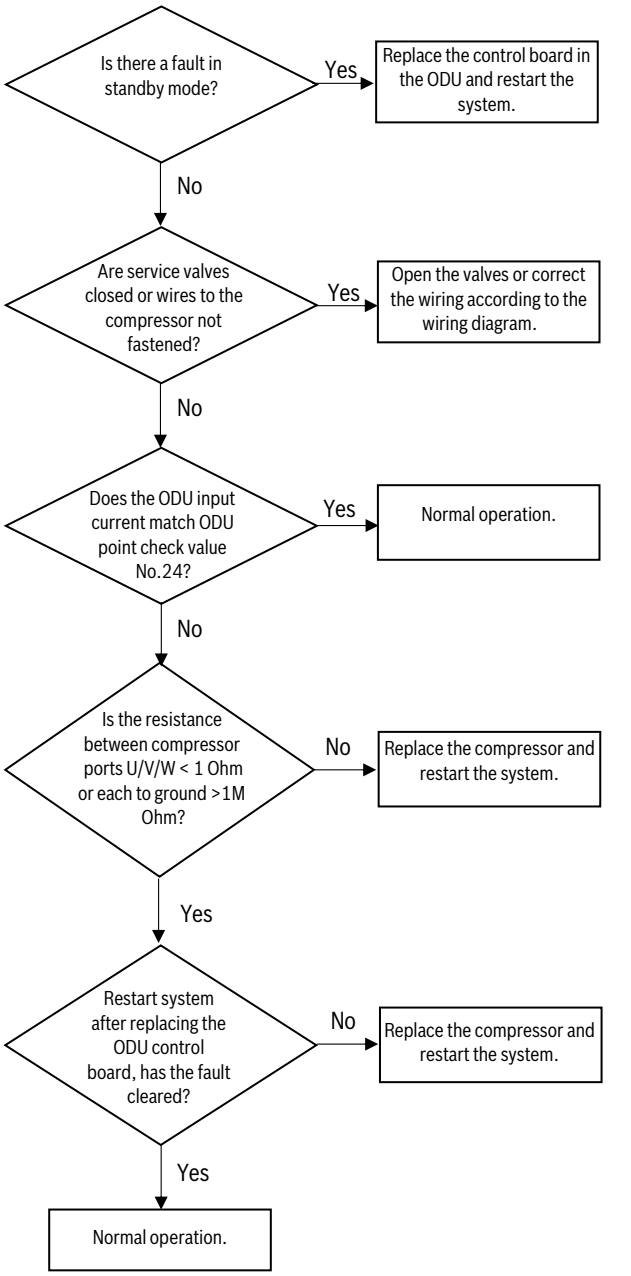


Figure 93

WARNING

Hazardous voltage!

When measuring resistance , make sure the unit is powered off and wait 3 min before taking measurement.

LED display output:	**P32**
Description:	Compressor overcurrent protection
Possible Causes:	- Service valves not open - Incorrectly wired - Compressor failure - Outdoor unit control board failure

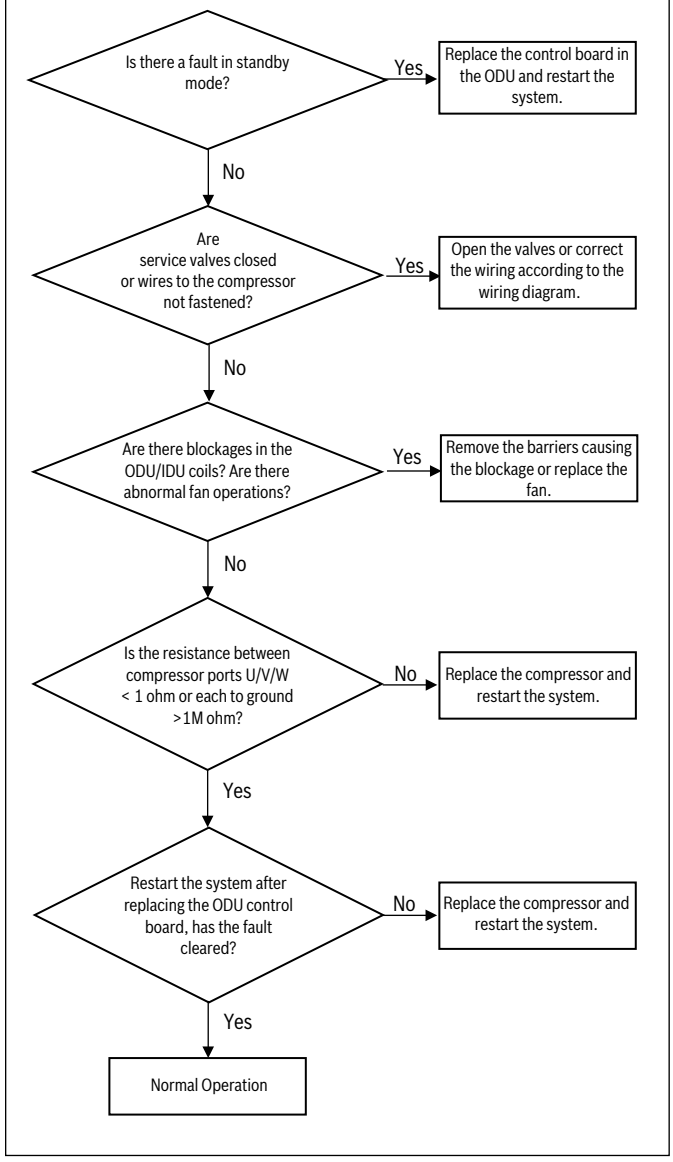


Figure 94

LED display output:	**P4**
Description:	High Compressor discharge temperature protection (T5)
Possible Causes:	- High discharge temperature and overload - Throttle blockage - Charging leakage (low refrigerant) - T5 failure

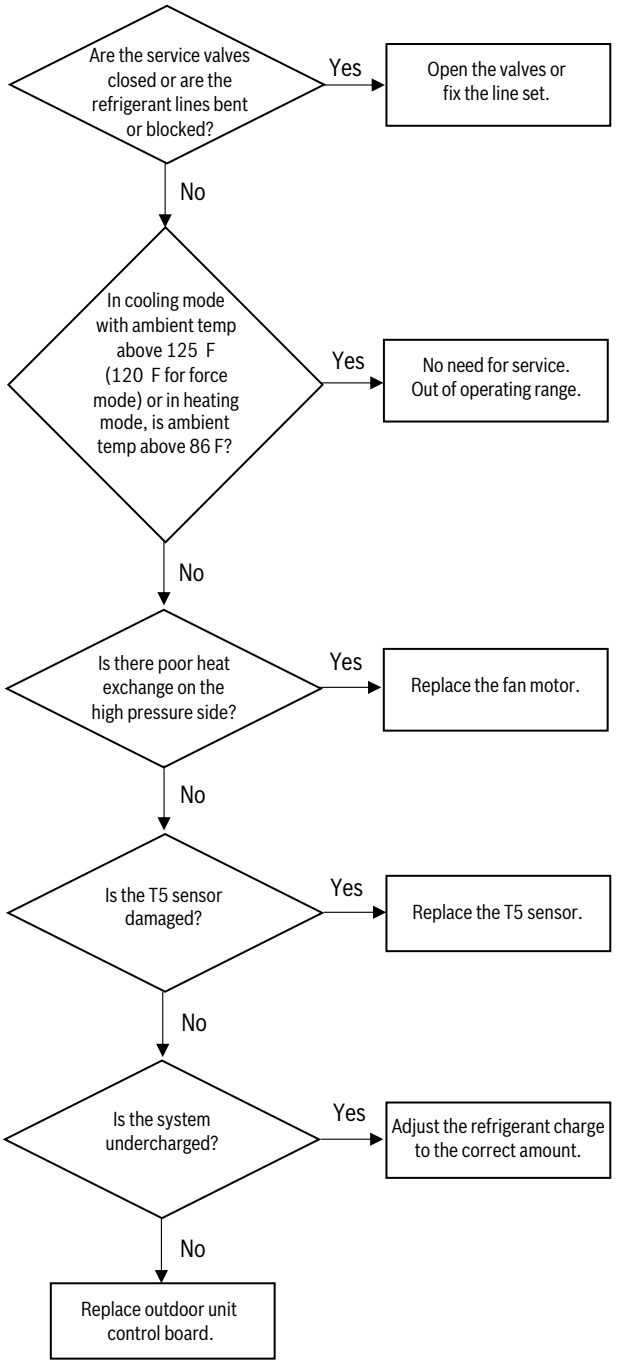


Figure 95

LED display output:	**P5**
Description:	Condenser coil temperature protection in cooling (T3)
Possible Causes:	- High temperature and overload - Poor condenser heat exchange - T3 Failure

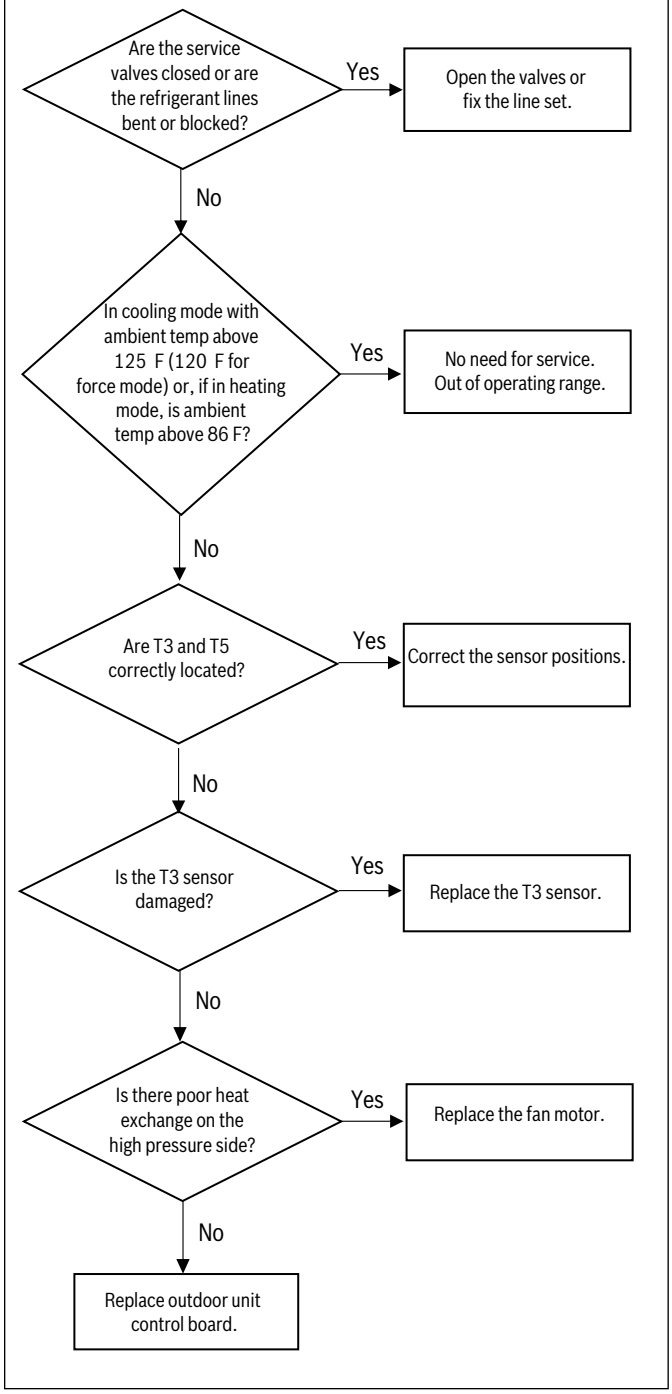


Figure 96

LED display output:	**Pb1**
Description:	Hyper-Link(M1M2) Over current protection
Possible Causes:	- M1M2 incorrectly wired - Outdoor unit control board failure

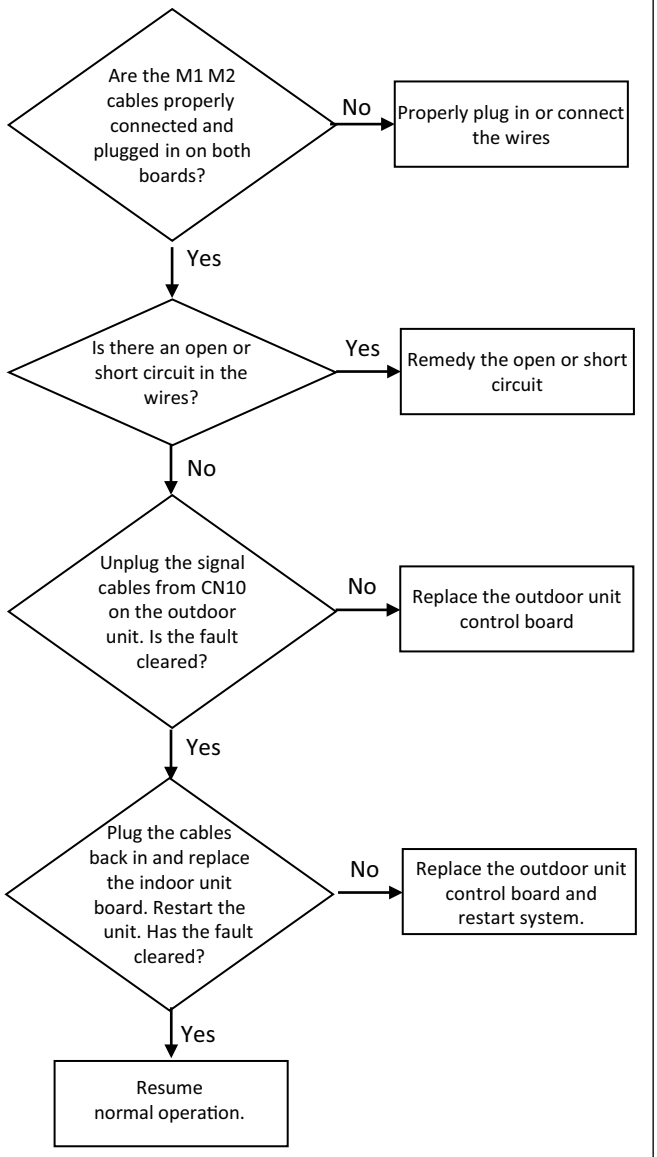


Figure 97

LED display output:	**PH**
Description:	Low discharge superheat protection
Possible Causes:	- TXV or EEVA failure - Ambient temperature out of range - Abnormal fan - T5 is not properly placed

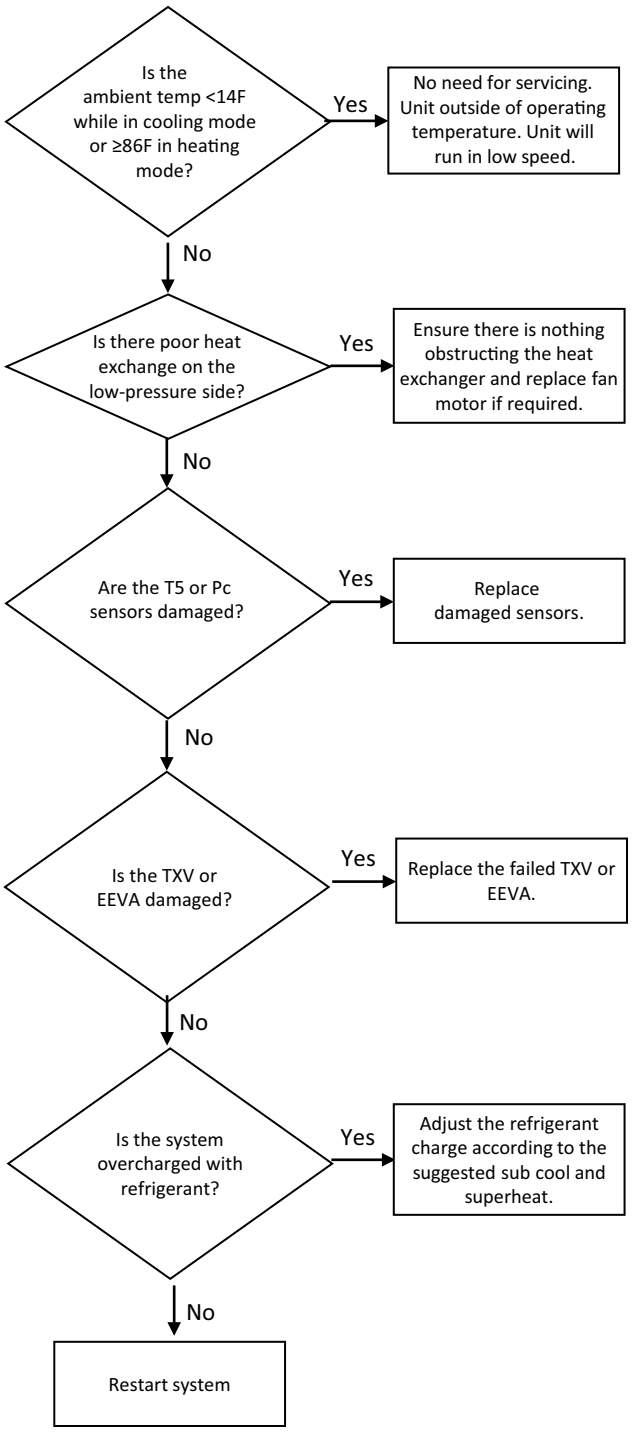


Figure 98

12 Advanced System Check

12.1 Rise in High Pressure

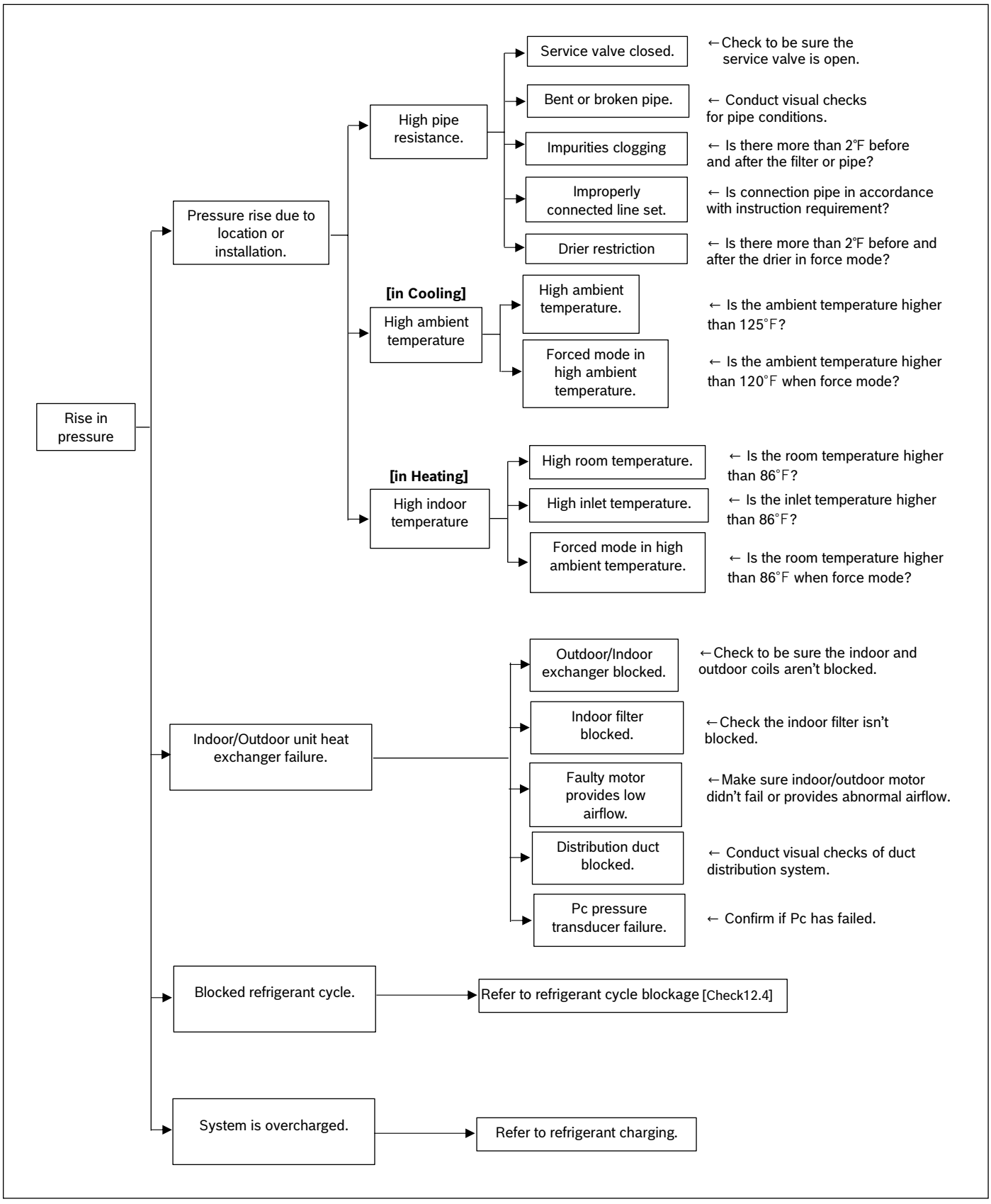


Figure 99

12.2 Dropping Low Pressure in Cooling

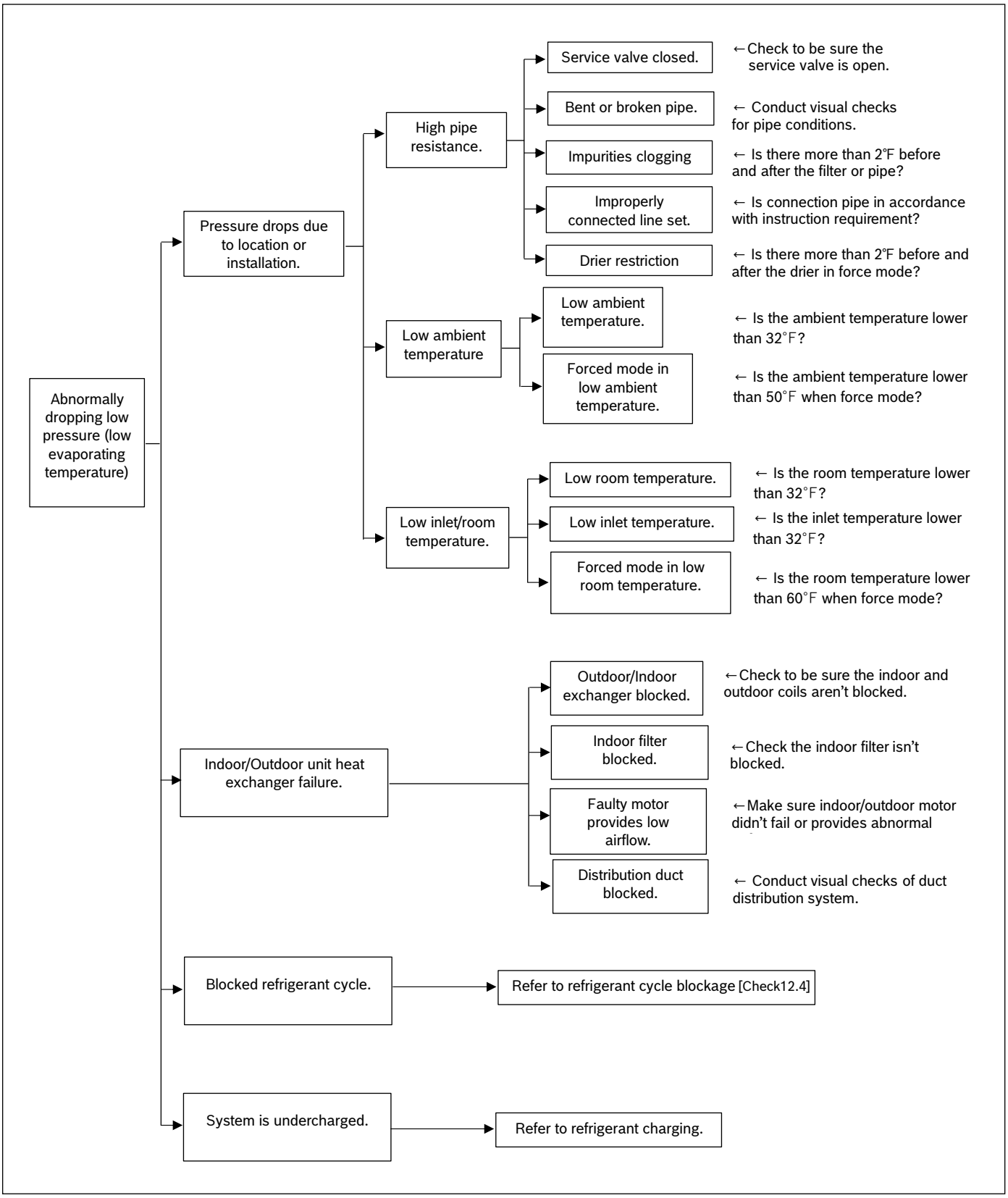


Figure 100

12.3 Dropping Low Pressure in Heating

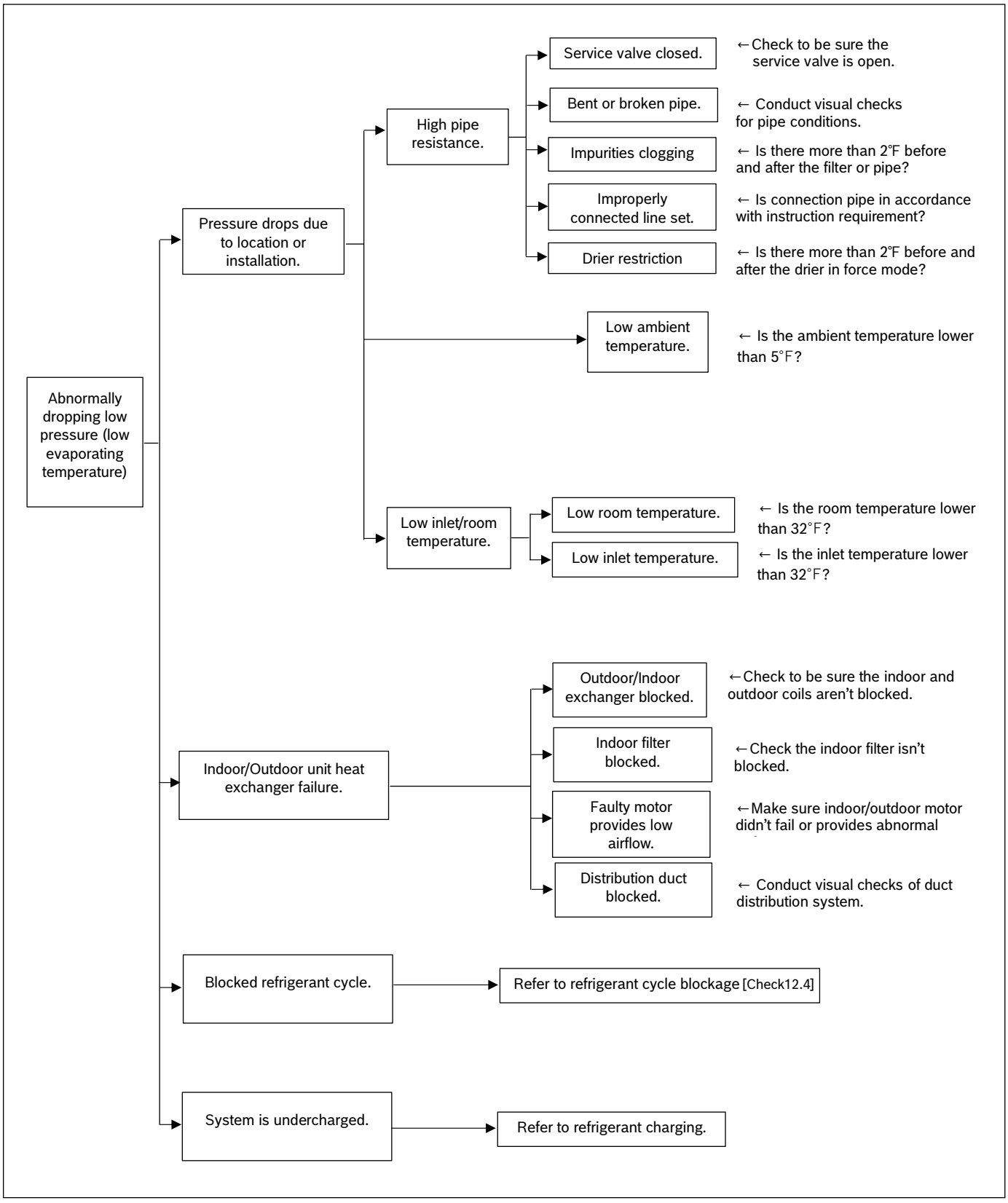


Figure 101

12.4 Refrigerant Cycle Blocked

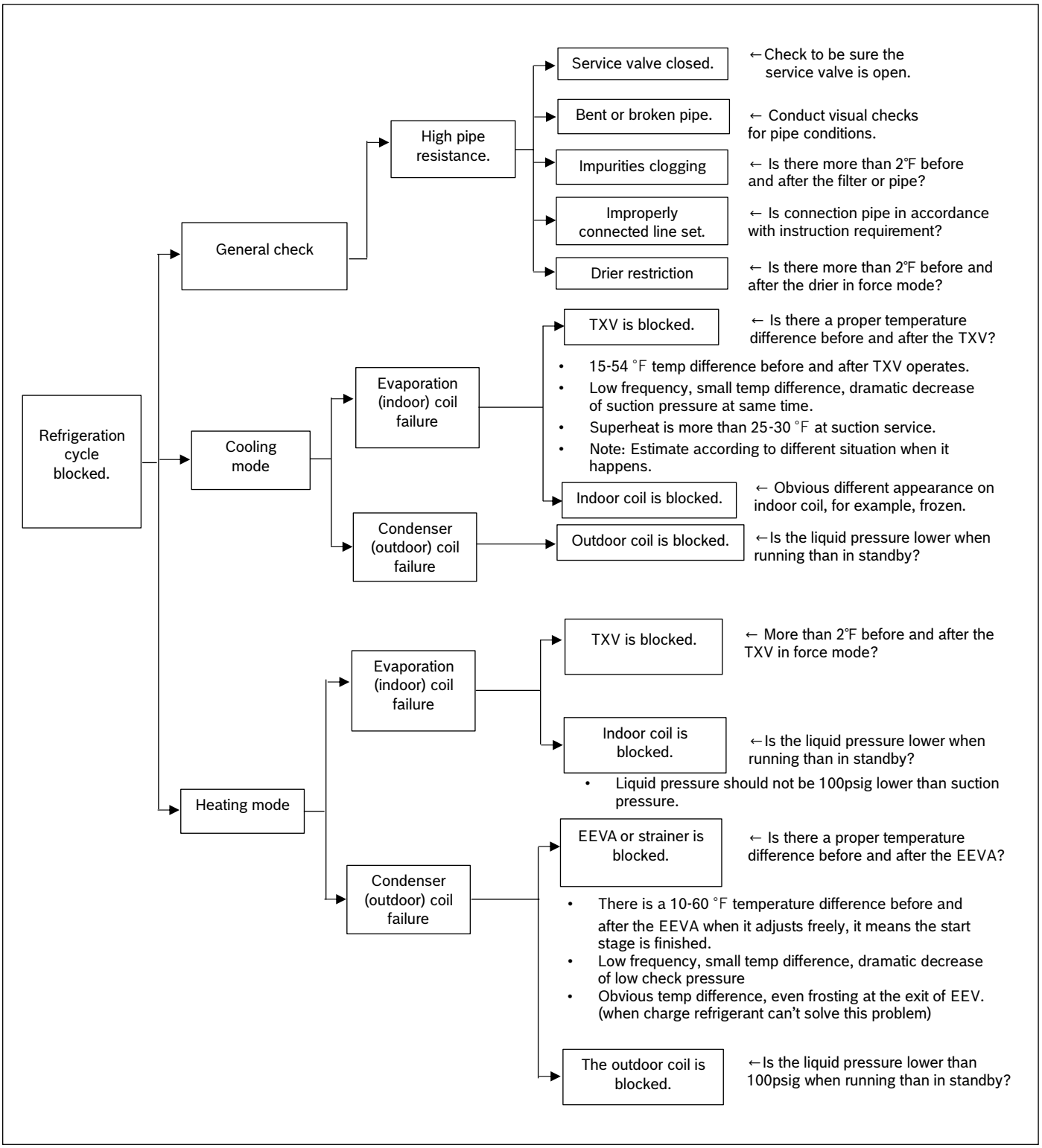


Figure 102

12.5 Pressure Transducer (PT)

Be careful of static electricity when insert and extract, especially in dry weather.

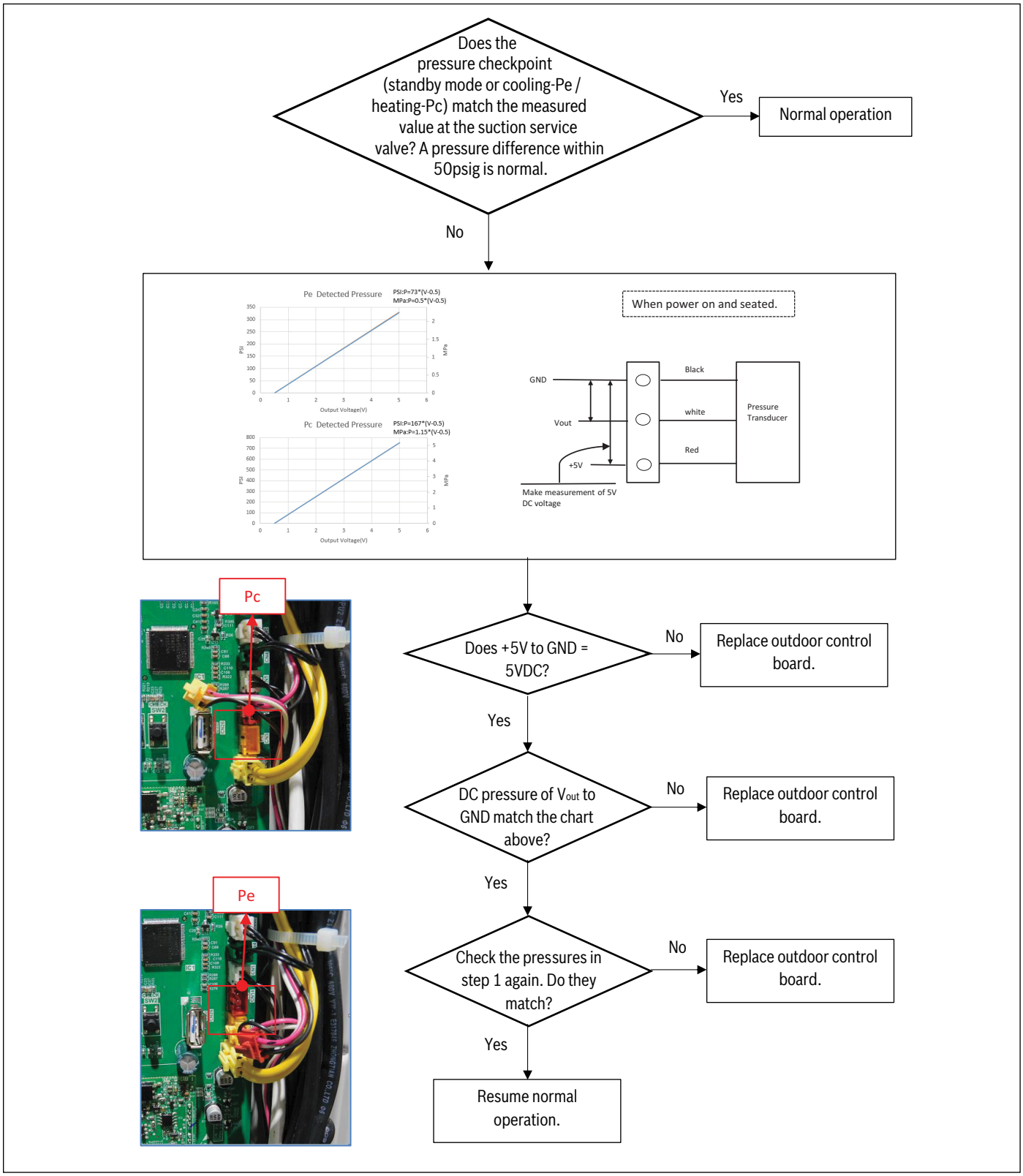


Figure 103

12.6 M1 M2 Voltage Check

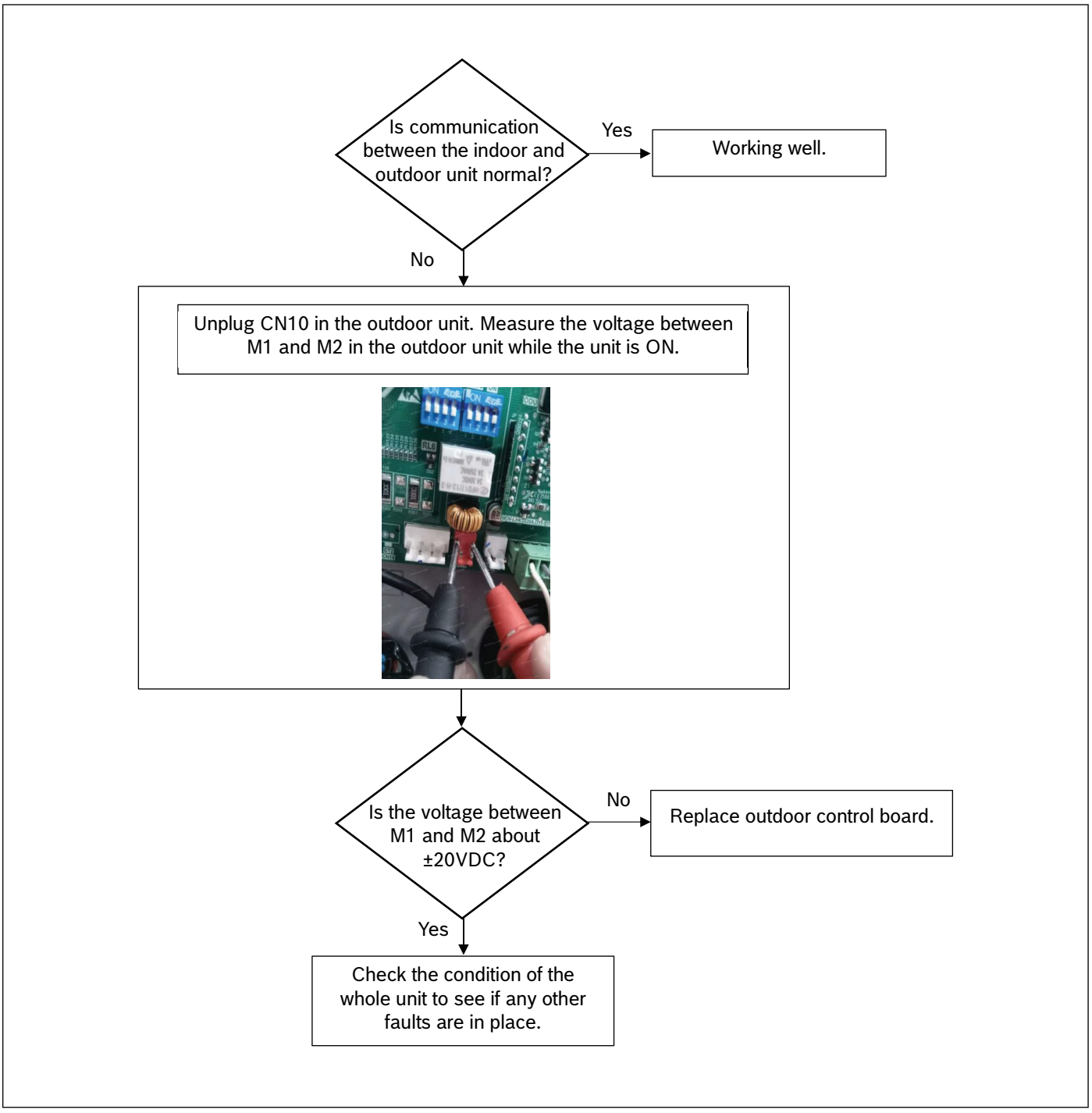


Figure 104

12.7 PQ Voltage Check

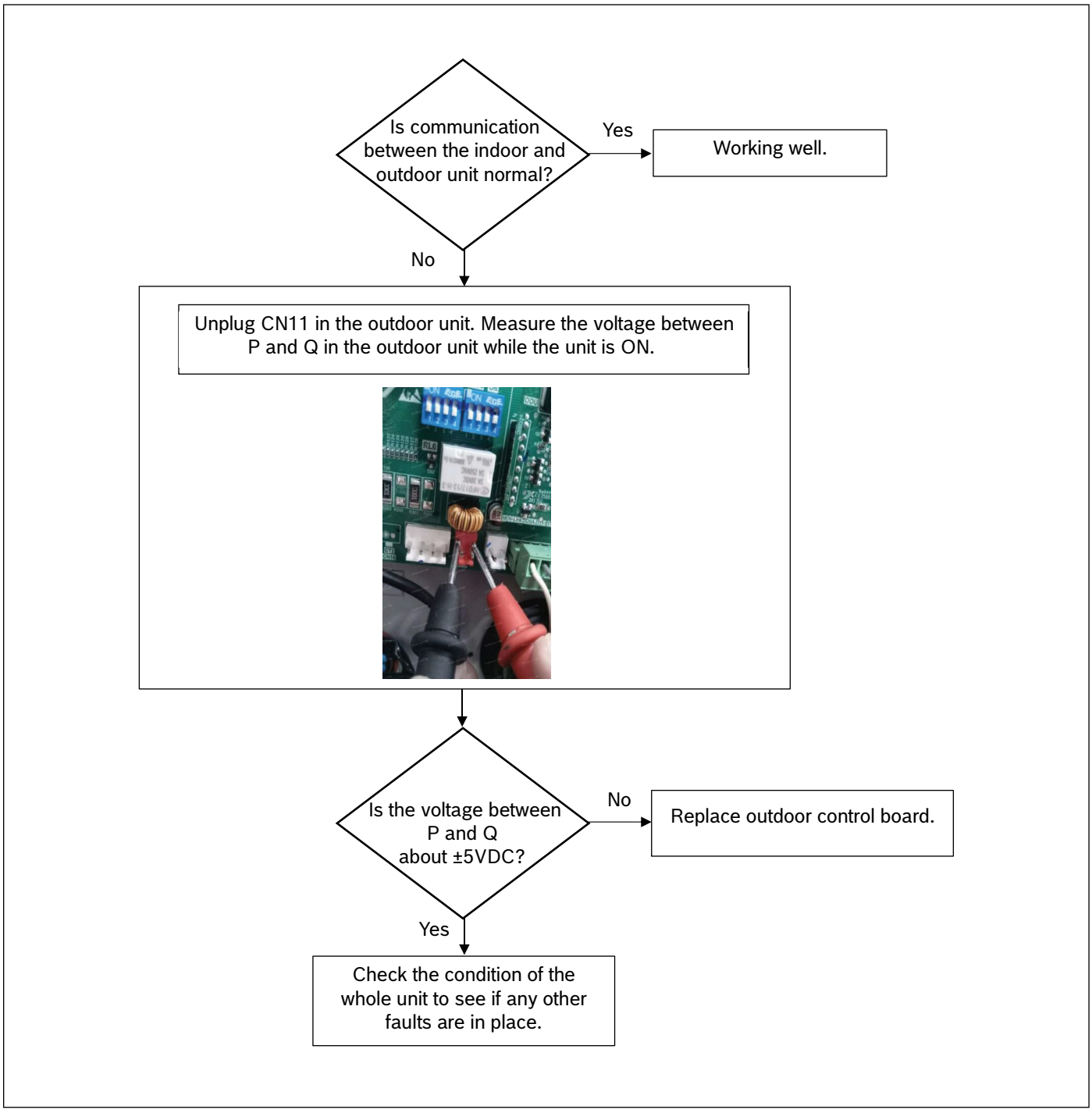


Figure 105

12.8 Temperature Sensor (T3,T4,T5,Th,T3L,Tf)

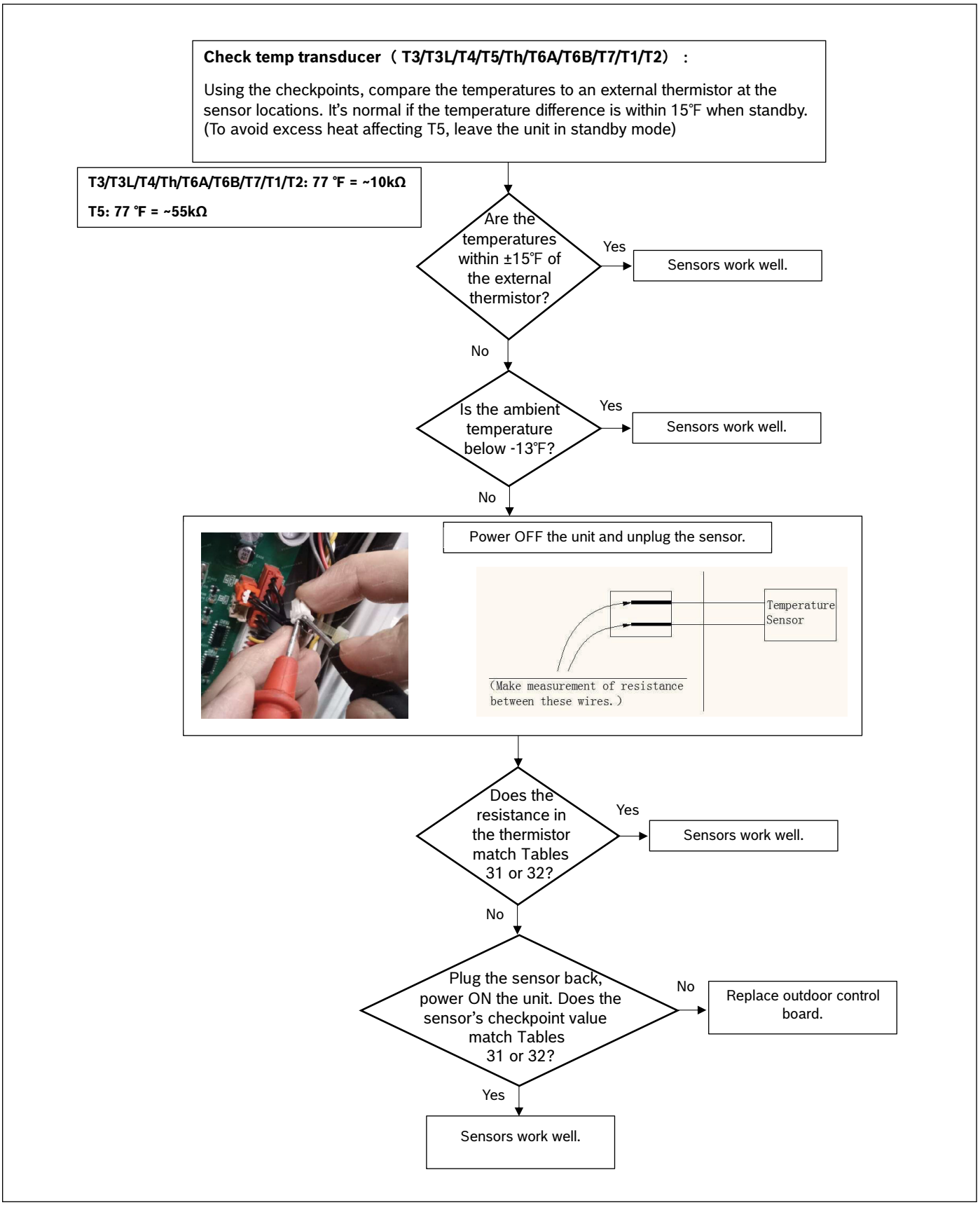


Figure 106

12.9 High Pressure Switch (HPS)

Note:

Normal high-pressure switch opens above 580psig, resets below 435psig.

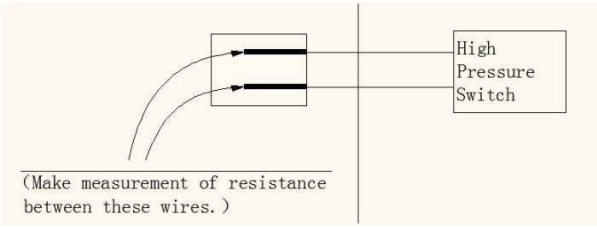
Does the unit start without triggering the high-pressure protection?

Yes → Working normally resume operation.

No



While the unit is powered OFF



Is the resistance <1 Ohm?

No → Replace damaged switch.

Yes

Is the high-pressure switch secured?

No → Place the switch to its proper location.

Yes

Is the high-pressure switch damaged?

Yes → Replace damaged switch.

No

Replace outdoor unit control board.

Figure 107

12.10 Outdoor Fan Motor

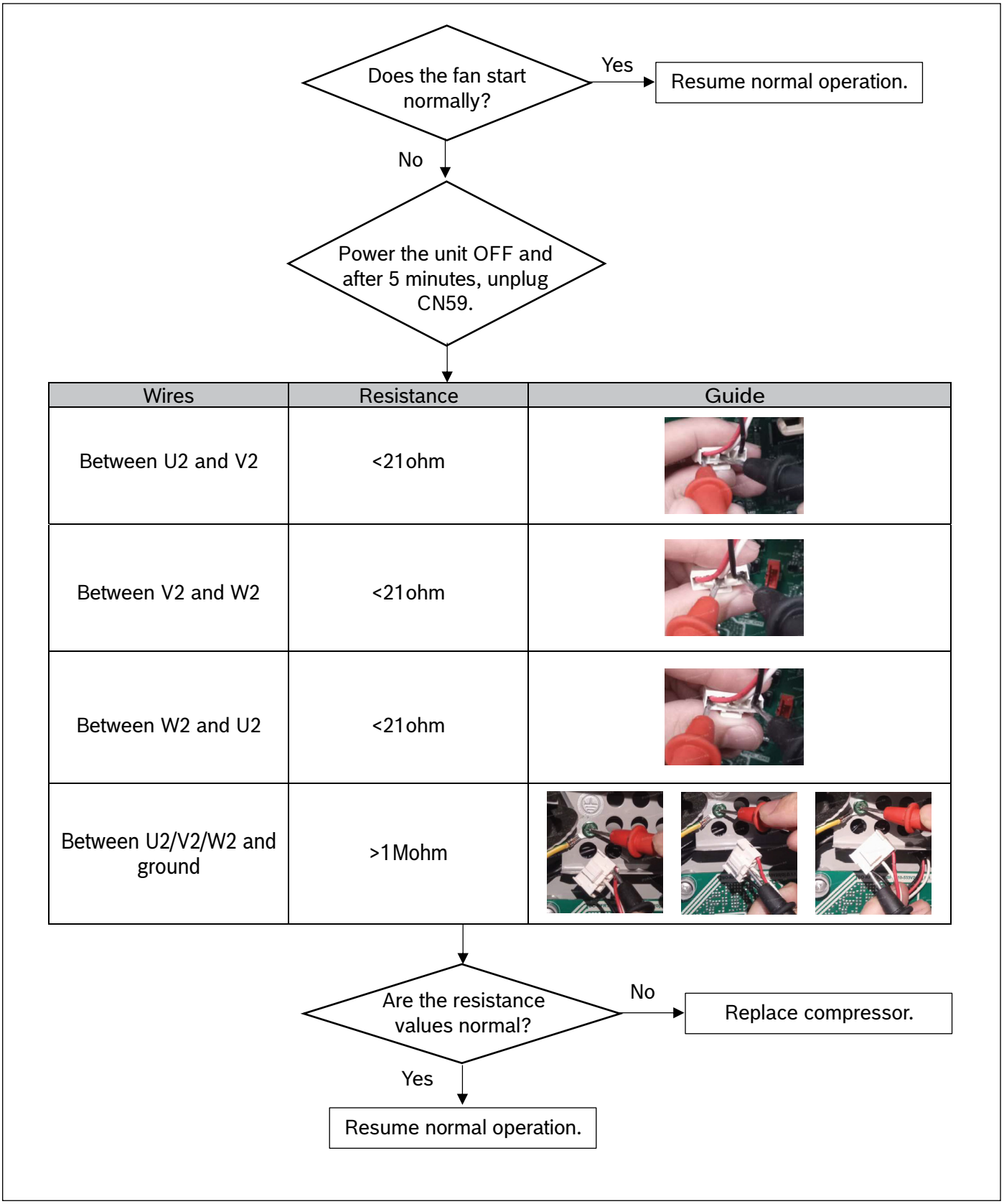


Figure 108

12.11 Indoor Blower Motor

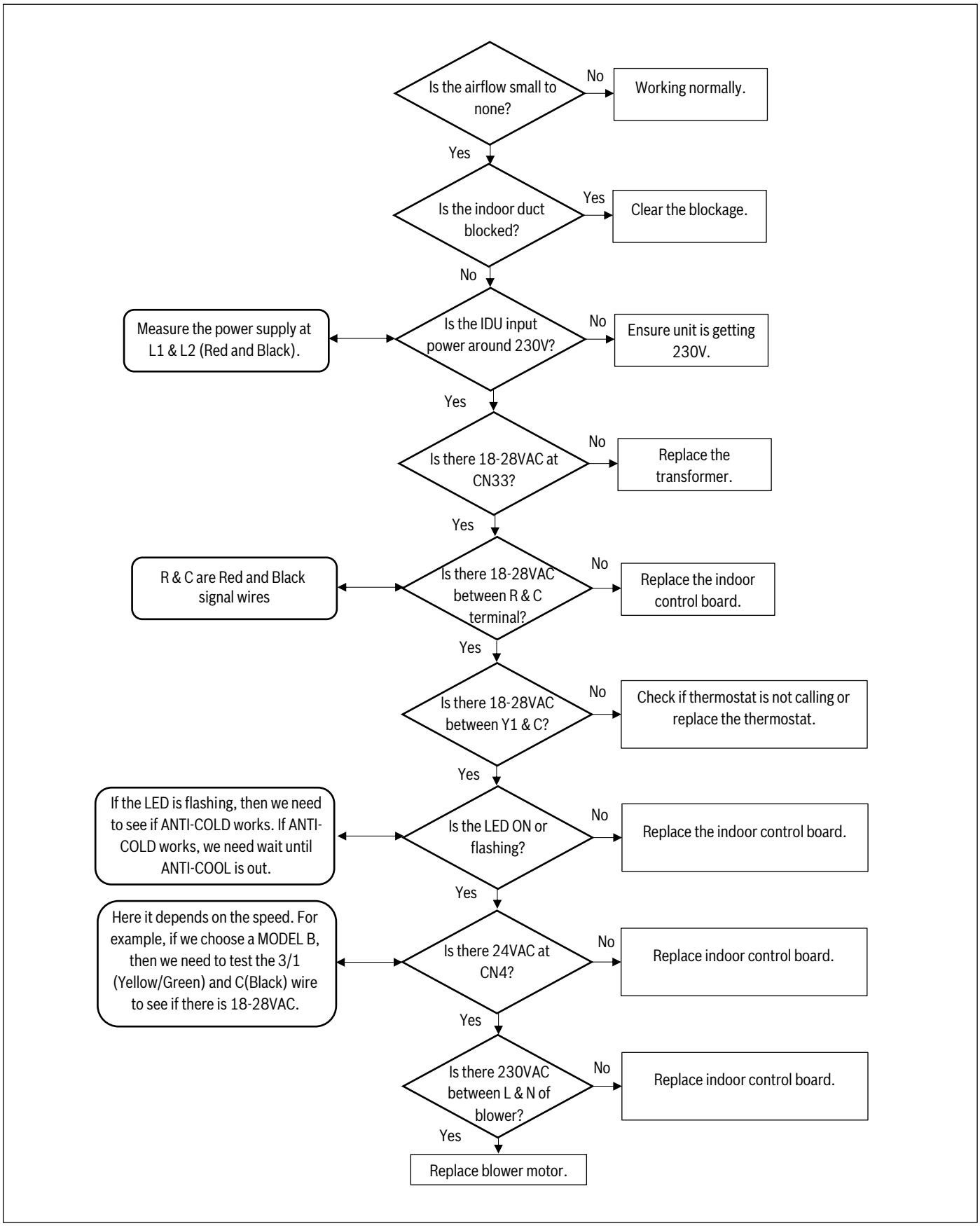


Figure 109

12.12 Compressor

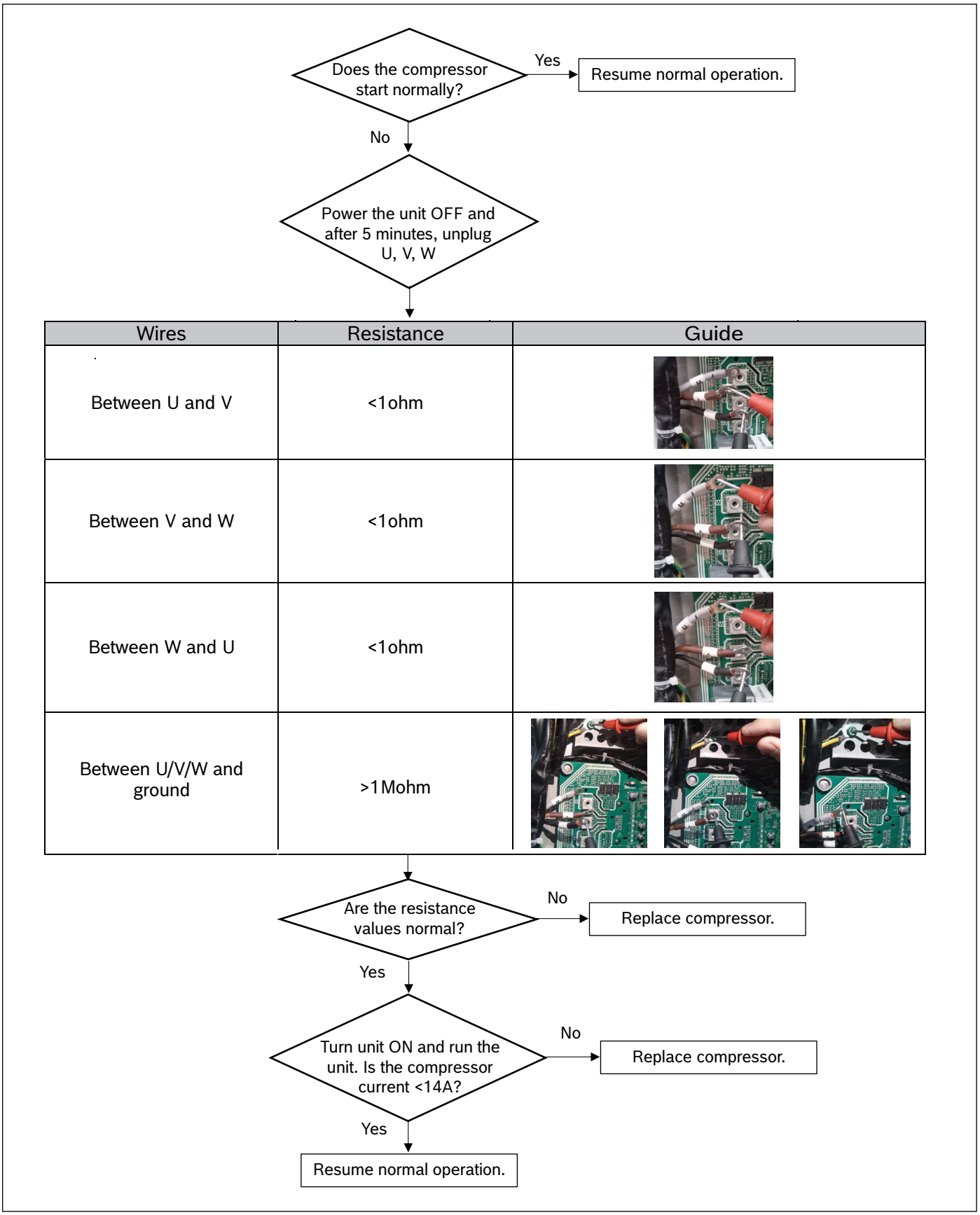


Figure 110

12.13 Unit Power Protection

To protect itself from damage, the unit has protection codes that set operational limits to itself. In the case of a dangerous amperage draw, the unit will limit the compressor frequency. When the ceiling of 20A is reached, the unit will display P31, go to standby, and restart.

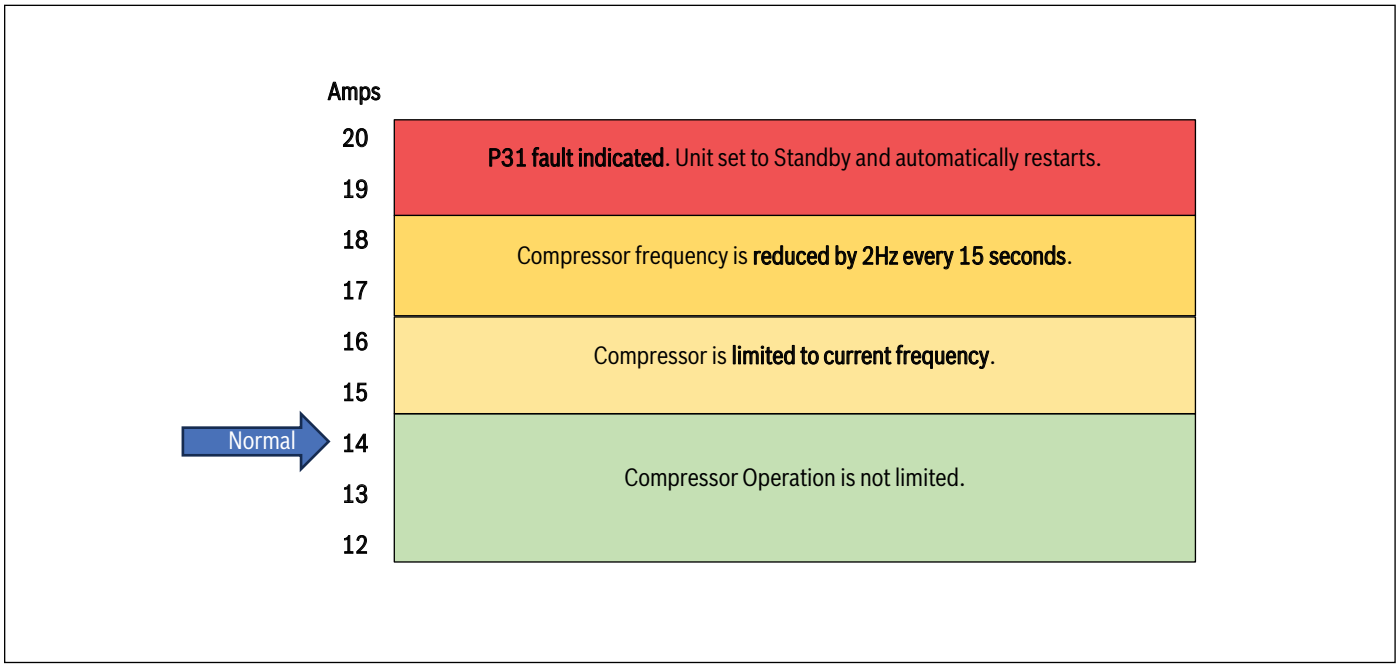


Figure 111

13 Appendix

13.1 Appendix 1 AHU EHK Staging Logic

13.1.1 Automatic EHK Logic

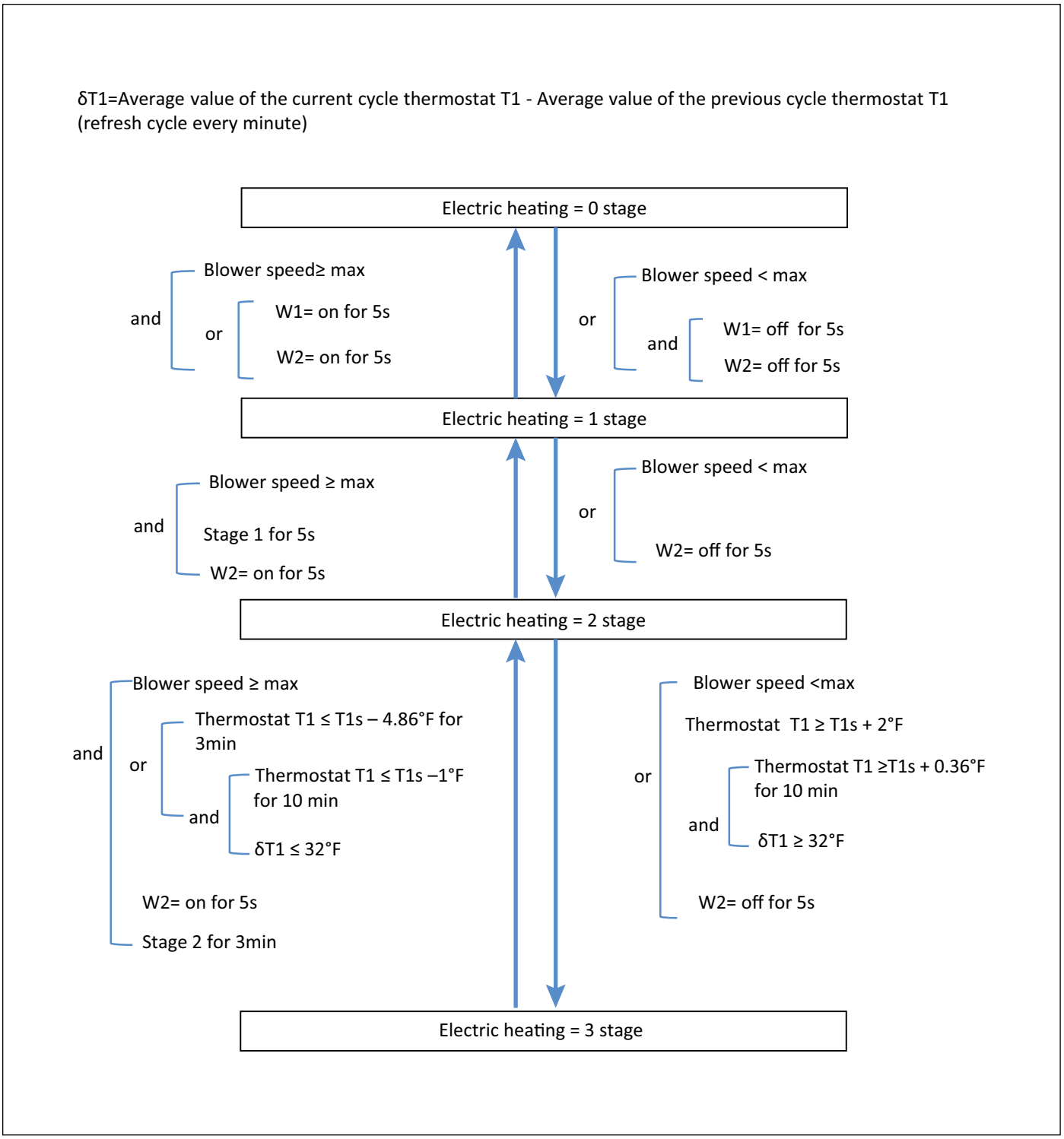


Figure 112

13.1.2 Non-Automatic EHK Logic

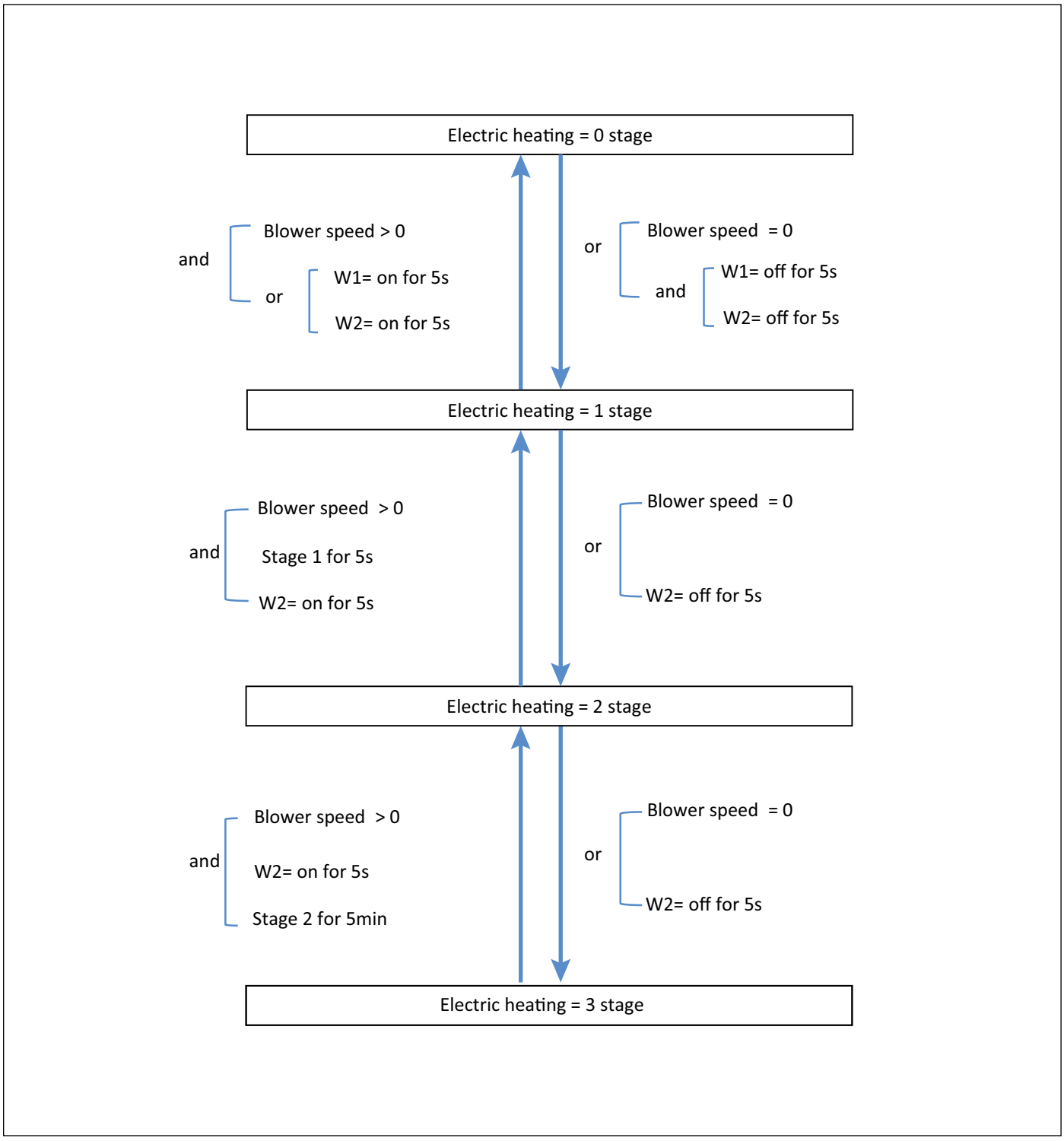


Figure 113

13.2 Appendix 2 Outdoor Unit Control Board

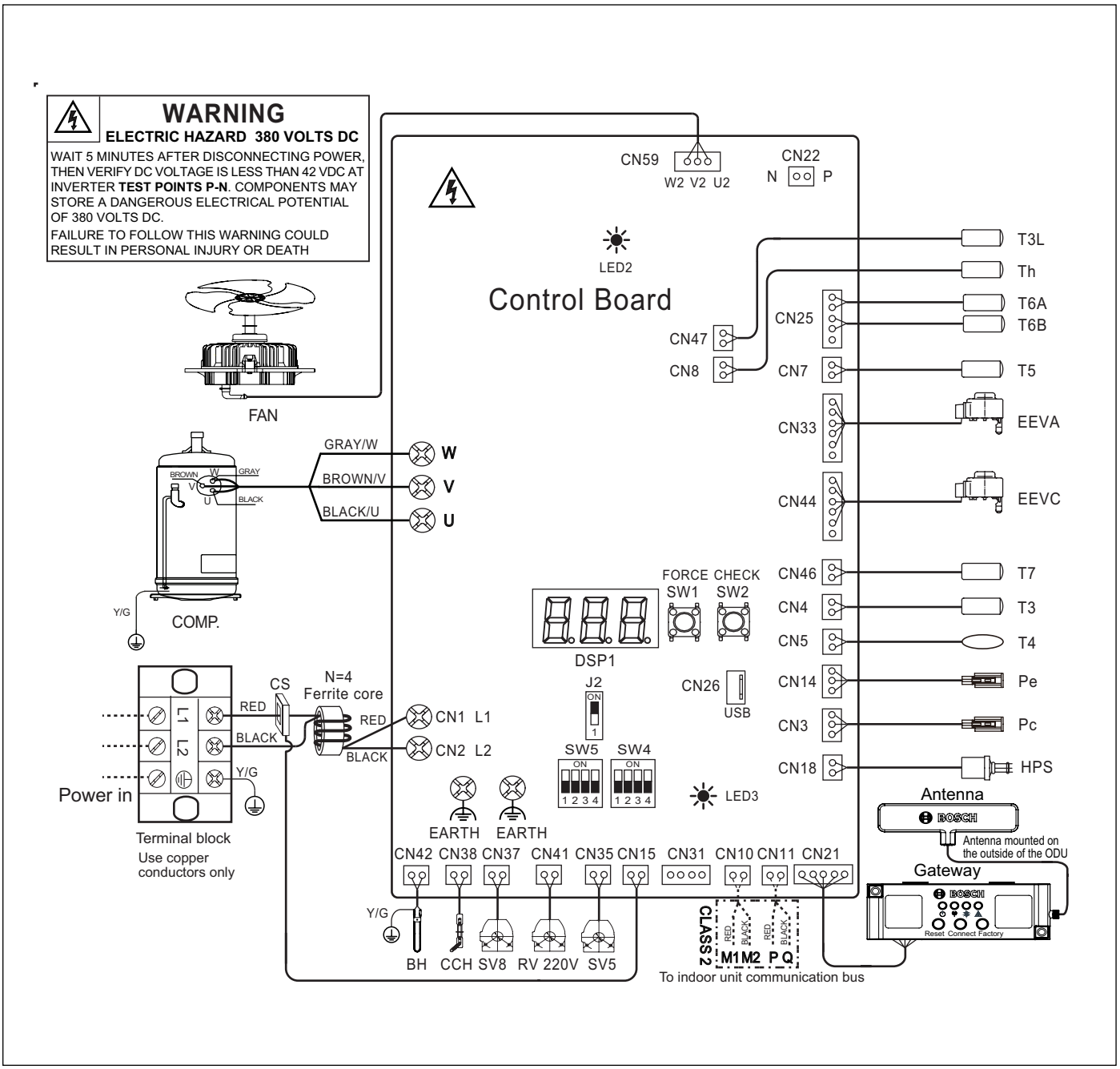


Figure 114

Order	Port	Code	Content	Voltage
1	CN42	BH	Baseplate heater port	0 or 230VAC
2	CN38	CCH	Compressor crankcase heater port	0 or 230VAC
3	CN37	SV8	Solenoid valve port SV8	0 or 230VAC
4	CN41	RV 220V	Reversing valve port	0 or 230VAC
5	CN35	SV5	Solenoid valve port SV5	0 or 230VAC
6	J2	J2	J2 DIP SWITCH: Capacity setting	—
7	CN15	CS	Current sensor port	0-3.3VDC(varying)
8	CN31	C B Y W	Thermostat wire connections	0 or 24VAC
9	CN10	M1 M2	Indoor unit comm. bus port	0 or 24VDC
10	CN11	PQ	Indoor unit comm. bus port	0 or 5VDC
11	CN21	—	Gateway wire connections	0-5VDC(varying)
12	SW5	SW5	SW5 DIP SWITCH: Control logic settings	—
13	SW4	SW4	SW4 DIP SWITCH: Control logic settings	—
14	DSP1	display	Digital tube	—
15	SW1	SW1	SW1 FORCE BUTTON	—
16	SW2	SW2	SW2 CHECK BUTTON	—
17	CN18	HPS	High pressure switch port	0 or 12VDC
18	CN3	Pc	High pressure transducer port	0-3.3VDC(varying)
19	CN14	Pe	Low pressure transducer port	0-3.3VDC(varying)
20	CN5	T4	T4 sensor port	0-3.3VDC(varying)
21	CN4	T3	T3 sensor port	0-3.3VDC(varying)
22	CN46	T7	T7 sensor port	0-3.3VDC(varying)
23	CN26	USB	USB	0-5VDC(varying)
24	CN12	—	Reserved	—
25	CN24	—	Reserved	—
26	CN44	EEVC	EEVC port	0 or 12VDC
27	CN33	EEVA	EEVA port	0 or 12VDC
28	CN7	T5	T5 sensor port	0-3.3VDC(varying)
29	CN25	T6A T6B	T6A T6B sensor port	0-3.3VDC(varying)
30	CN8	Th	Th sensor port	0-3.3VDC(varying)
31	CN47	T3L	T3L sensor port	0-3.3VDC(varying)
32	CN58	—	Reserved	—
33	CN59	Fan(U2/V2/W2)	Fan motor port	0~375VAC
34	W	W	Compressor: W port	0~375VAC
35	U	U	Compressor: V port	0~375VAC
36	V	V	Compressor: U port	0~375VAC
37	CN1	Power	Power input	230VAC to L2
38	CN2	Power	Power input	230VAC to L1

Table 26 Outdoor Board Component Check

13.3 Appendix 3 Indoor Unit Wiring Diagram

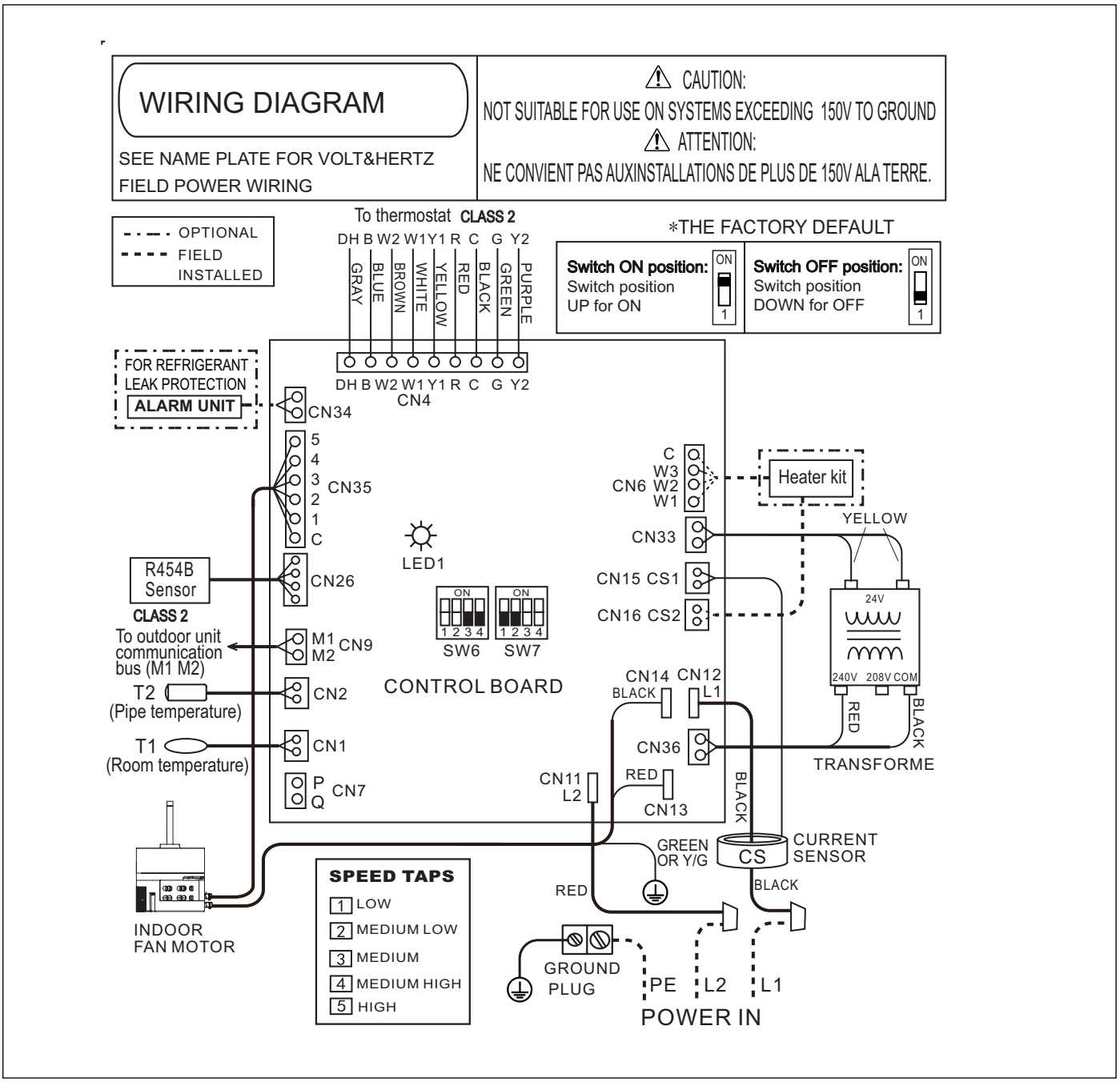


Figure 115

Outdoor unit wire	Indoor unit wire	Outdoor unit DIP switch	Indoor unit DIP switch	Communication	Outdoor unit phenomenon	Indoor unit phenomenon
M1M2	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	CY	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	CY	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
CY	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
CY	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	CB	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	CB	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
CB	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
CB	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	CW	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	CW	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
CW	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
CW	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	BW	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	BW	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
BW	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
BW	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	BY	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	BY	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
BY	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
BY	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	WY	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
M1M2	WY	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
WY	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
WY	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
M1M2	PQ	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Electronic control board may be damaged, LED flashing, communication fault
M1M2	PQ	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Electronic control board may be damaged, operate according to 24V signal
PQ	M1M2	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
PQ	M1M2	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	Normal operation
PQ	PQ	SW5-4=ON	SW7-1=OFF	NG	Shut down, no fault occur	Normal operation, LED flashing, communication fault
PQ	PQ	SW5-4=ON	SW7-1=ON	NG	Shut down, no fault occur	operate according to 24V signal

Table 27 Indoor Board Component Check

13.4 Appendix 4 Temperature and Resistance Relationship Tables

For T3, T3L, T4, T6A, T6B, T7, T1, T2 Sensors

Temp (°F)	Temp (°C)	Resistance (kΩ)
-20	-28.89	218.11
-15	-26.11	154.74
-10	-23.33	129.74
-5	-20.56	107.73
0	-17.78	99.54
10	-12.22	71.80
20	-6.67	49.65
30	-1.11	36.71
40	4.44	27.39
50	10.00	20.61
60	15.56	15.65
70	21.11	11.99
80	26.67	9.27
90	32.22	7.23
100	37.78	5.68
110	43.33	4.51
120	48.89	3.61
130	54.44	2.90
140	60.00	2.35
150	65.67	1.91
160	71.11	1.57
170	76.67	1.28
180	82.22	1.00
190	87.78	0.91
200	93.33	0.76
210	98.89	0.65
220	104.44	0.56

Table 28 for T3, T3L, T4, T6A, T6B, T7, T1, T2 sensors

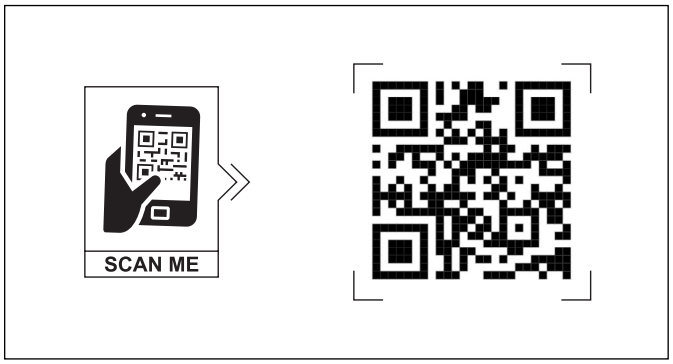
For T5 Sensors

Temp (°F)	Temp (°C)	Resistance (kΩ)
-20	-28.89	862.00
-15	-26.11	725.82
-10	-23.33	612.41
-5	-20.56	600.13
0	-17.78	505.55
10	-12.22	362.74
20	-6.67	265.40
30	-1.11	195.60
40	4.44	146.70
50	10.00	110.71
60	15.56	84.47
70	21.11	65.41
80	26.67	50.90
90	32.22	40.15
100	37.78	31.81
110	43.33	25.51
120	48.89	20.53
130	54.44	16.71
140	60.00	13.64
150	65.67	11.21
160	71.11	9.31
170	76.67	7.75
180	82.22	6.50
190	87.78	5.47
200	93.33	4.65
210	98.89	3.95
220	104.44	3.38

Table 29 for T5

Online Help Resources

Alternatively, please visit our Service & Support webpage to find FAQs, videos, service bulletins, and more; www.bosch-homecomfort.us/service or use your cellphone to scan the code below.



NOTES:

NOTES:

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Bosch Thermotechnology Corp. reserves the right to make changes without notice due to continuing engineering and technological advances.