

Application Note 2036: Condensate Management

Table of Contents

INTRODUCTION	3
CODE CONSIDERATIONS.....	3
PKFY – WALL MOUNTED – CONDENSATE CONSIDERATIONS.....	5
Blue Diamond Pumps.....	6
PLFY – 4 WAY CASSETTE – CONDENSATE CONSIDERATIONS.....	9
PMFY – ONE WAY CASSETTE – CONDENSATE CONSIDERATIONS.....	10
PCFY – CEILING SUSPENDED – CONDENSATE CONSIDERATIONS.....	11
PEFY – HORIZONTAL DUCTED – CONDENSATE CONSIDERATIONS.....	12
PFFY – FLOOR STANDING – CONDENSATE CONSIDERATIONS	14
PVfy – VERTICAL UNIT – CONDENSATE CONSIDERATIONS.....	15
PVFY- Available Condensate Safeties	15
BC Controller	16
ACCESSORIES	17
SS610E Drain Pan Level Sensor.....	17
CONTROLS - MITSUBISHI BUILT-IN CONDENSATE ALARMS AND SEQUENCES	18
CN4F, Contacts 1 and 2 – Built in float switch	18
CN4F, 3 and 4 – Third Party Float Switches (NC).....	19
CN31, 1 and 3, with Built-in Drain Sensor (NC)	20
CN31, 1 and 3, with Built-in Drain sensor + Third Party sensor (NC)	21
CN31, 1 and 2 Third Party Sensor Only (NC)	21
CN20 and Indoor Units with no Dedicated Condensate Safety Terminal.....	22
WIRING DIAGRAMS.....	22
Maxi Blue Pump with City Multi Indoor unit.....	22
Sauermann Example Wiring Diagram with City Multi Indoor Unit.....	23

INTRODUCTION

The following serves as a quick reference guide for condensate management with City Multi fan coil units. It includes:

1. **Code considerations** driving the need for condensate management.
2. **Common accessories** and **best practices** used with each fan coil unit,
3. This document lists the **safety connectors** on each indoor unit responsible for shutting off the fan coil in the case of a condensate overflow.
4. It will also describe the **sequence of operation** for each safety connector.
5. Wiring diagrams for common condensate pumps.

CODE CONSIDERATIONS

2019 California Mechanical Code (CMC) and 2018 International Mechanical Code (IMC) requires additional safeties when equipment or appliances are installed in a space where condensate overflow may cause damage to the building.

City Multi indoor units offer the following features that can be used to address the code requirement:

1. Built-in Safety switches and sequences.
Some indoor unit models include built-in float switches and sensors that stop the indoor unit from cooling when a high level of condensate is detected.
2. Condensate safety connectors such as CN4F and CN31 are available for connection to 3rd party float switches and alarm switches
3. A secondary drain outlet that is higher than the primary drain outlet is available on some PEFY and PVFY units.

310.2 Condensate Control

Where an equipment or appliance is installed in a space where damage is capable of resulting from condensate overflow, other than damage to replaceable lay-in ceiling tiles, a drain line shall be provided and shall be drained in accordance with Section 310.1. An additional protection method for condensate overflow shall be provided in accordance with one of the following:

- (1) A water level detecting device that will shut off the equipment or appliance in the event the primary drain is blocked.
- (2) An additional watertight pan of corrosion-resistant material, with a separate drain line, installed beneath the cooling coil, unit, or the appliance to catch the overflow condensate due to a clogged primary condensate drain.
- (3) An additional drain line at a level that is higher than the primary drain line connection of the drain pan.
- (4) An additional watertight pan of corrosion-resistant material with a water level detection device installed beneath the cooling coil, unit, or the appliance to catch the overflow condensate due to a clogged primary condensate drain and to shut off the equipment.

The additional pan or the additional drain line connection shall be provided with a drain pipe of not less than $\frac{3}{4}$ of an inch (20 mm) nominal pipe size, discharging at a point that is readily observed.

310.2.1 Protection of Appurtenances

Where insulation or appurtenances are installed where damage is capable of resulting from a condensate drain pan overflow, such installations shall occur above the rim of the drain pan with supports. Where the supports are in contact with the condensate waste, the supports shall be of approved corrosion-resistant material.

2019 California Mechanical Code shows additional protection methods to protect against condensate overflow.

307.2.3 Auxiliary and secondary drain systems. In addition to the requirements of Section 307.2.1, where damage to any building components could occur as a result of overflow from the *equipment* primary condensate removal system, one of the following auxiliary protection methods shall be provided for each cooling coil or fuel-fired *appliance* that produces condensate:

1. An auxiliary drain pan with a separate drain shall be provided under the coils on which condensation will occur. The auxiliary pan drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The pan shall have a minimum depth of $1\frac{1}{2}$ inches (38 mm), shall be not less than 3 inches (76 mm) larger than the unit, or the coil dimensions in width and length and shall be constructed of corrosion-resistant material. Galvanized sheet steel pans shall have a minimum thickness of not less than 0.0236 inch (0.6010 mm) (No. 24 gage). Nonmetallic pans shall have a minimum thickness of not less than 0.0625 inch (1.6 mm).

2. A separate overflow drain line shall be connected to the drain pan provided with the *equipment*. Such overflow drain shall discharge to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drain. The overflow drain line shall connect to the drain pan at a higher level than the primary drain connection.

3. An auxiliary drain pan without a separate drain line shall be provided under the coils on which condensate will occur. Such pan shall be equipped with a water-level detection device conforming to UL 508 that will shut off the *equipment* served prior to overflow of the pan. The auxiliary drain pan shall be constructed in accordance with Item 1 of this section.

4. A water-level detection device conforming to UL 508 shall be provided that will shut off the *equipment* served in the event that the primary drain is blocked. The device shall be installed in the primary drain line, the overflow drain line, or in the equipment-supplied drain pan, located at a point higher than the primary drain line connection and below the overflow rim of such pan.

2018 International Mechanical Code, Section 307.2.3 lays out the additional measures that must be taken for condensate overflow detection.

PKFY – WALL MOUNTED – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PKFY unit.

Indoor Unit Model	Built in lift? [height of lift, inches]	Built in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PKFY-P-NBMU-E2	None	None	None	Blue Diamond X85-003	Connect SS610E accessory to CN20
PKFY-P-NHMu-E2	None	None	None	Blue Diamond X85-003	CN4F
PKFY-P-NKMu-E2	None	None	None	Blue Diamond X85-003	CN4F
PKFY-P-NLMU-E	None	None	None	Blue Diamond X85-003	CN4F

Notes:

The PKFY units do not have built in condensate lifts or Mitsubishi accessory condensate lifts.

The PKFY units do not have optional kits made by Mitsubishi.

Condensate management must be done with a gravity drain or third-party pump. Currently, Mitsubishi carries the Blue Diamond line for this purpose.

The Blue Diamond X85-003 can be installed in the rear cavity of all PKFY wall mounted units. If installed in this configuration, the refrigerant piping will not be able to fit in the same space.

When using a larger Blue Diamond condensate pump the reservoir is installed in the back cavity of the PKFY unit with the pump in a remote location such as above the ceiling.

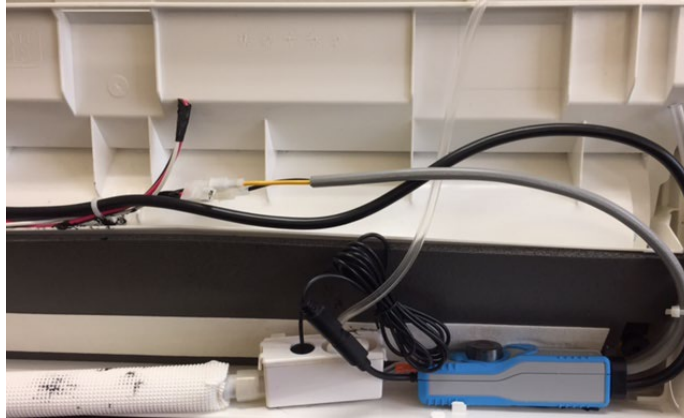
For more accessibility, a T18-016 fascia kit is available for installing the MicroBlue X85-003 pump kit in the occupied space below the unit, rather than in the unit or in the ceiling.

Blue Diamond Pumps

Blue Diamond condensate pumps are a good option for ductless wall mounted units as well as indoor units that do not have a built in lift.

		
<i>Blue Diamond MicroBlue X85-003</i>	<i>Blue Diamond MaxiBlue X87-711 or X87-721</i>	<i>Blue Diamond MegaBlue X87-831 or X87-835</i>
		
<i>Fascia Kit for MicroBlue T18-016</i>		

Name	Model	Voltage	Flow Rate [gal/hr]	Max Head [ft]	Max Suction Lift [ft]	Link
Blue Diamond MicroBlue	X85-003	110V or 208-230V	1.3	16	6	http://mylinkdrive.com/USA/Accessories/Condensate/Blue_Diamond_Pumps_and_Tanks/X85_003?product
Blue Diamond MaxiBlue	X87-711	110V	3.2	23	16.5	http://mylinkdrive.com/USA/Accessories/Condensate/Blue_Diamond_Pumps_and_Tanks/X87_721?product
	X87-721	208 - 230V	3.2	23	16.5	http://meus1.mylinkdrive.com/item/X87-721.html
Blue Diamond MegaBlue	X87-831	110V	13.2	66.5	23	http://mylinkdrive.com/USA/Accessories/Condensate/Blue_Diamond_Pumps_and_Tanks/X87_835?product
	X87-835	208 - 230V	13.2	66.5	23	http://meus1.mylinkdrive.com/item/X87-835.html



The above image shows the X85-003 hidden behind the unit.



The above image shows the X85-003 hidden behind the unit. If hidden behind the unit, the refrigerant piping will not be able to be run in the same area as the pump.



The interior arrangement of the T18-016 Fascia Kit for MicroBlue Pump is shown in the photo above. A cover is installed to hide all components.

PLFY – 4 WAY CASSETTE – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PLFY unit.

Indoor Unit Model	Built in lift? [height of lift, inches]	Built in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PLFY-EP-NEMU-E	Yes 33 7/16"	Float Switch	None	None	CN4F
PLFY-P-NFMU-E	Yes 33"	Float Switch	None	None	CN4F
PLFY-P-NBMU-E	Yes 33 7/16"	Float Switch	None	None	CN4F
PLFY-P-NCMU-E	Yes 19 11/16"	Drain Sensor	None	None	CN31

The PLFY series has a built-in condensate lift. It is recommended that only the built-in lifts and safety sequences are utilized.

The PLFY units have either a float switch or drain sensor. When a high level of condensate is detected for more than 3 minutes, the unit goes into thermo-off and error code 2502 is shown on the local or central controller.

If needed, an auxiliary drain sensor can be connected to CN4F, 3-4. On PLFY-NCMU models, the existing wires for the drain sensor can be broken and a normally closed auxiliary switch can be placed in series with the drain sensor.

PMFY – ONE WAY CASSETTE – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PMFY unit.

Indoor Unit Model	Built in lift? [height of lift, inches]	Built in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PMFY-P-NBMU-ER5	Yes 23 5/8"	Drain Sensor	None	None	CN31
PMFY-P-NBMU-E	Yes 19 11/16"	Drain Sensor	None	None	CN31

The PMFY series has a built-in condensate lift. It is recommended that only the built-in lifts and safety sequences are utilized.

PMFY units have built in drain sensors connected to CN31. When a high level of condensate is detected for more than 3 minutes, the error code 2502 is shown on the local and central controller.

The PMFY does not have a CN4F for condensate alarms, but a safety switch can be connected in series with the built-in drain sensor, on CN31.

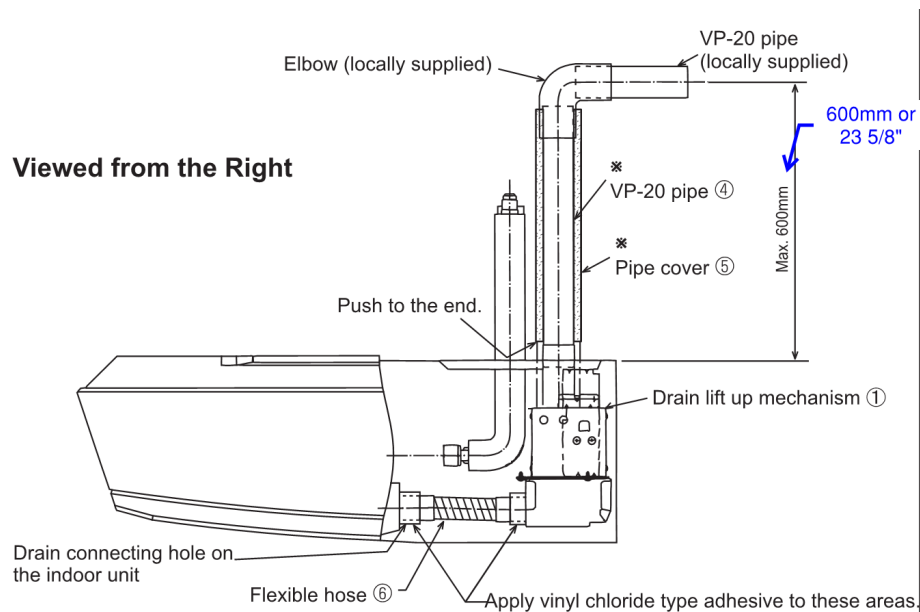
PCFY – CEILING SUSPENDED – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PCFY unit.

Indoor Unit Model	Built-in lift? [height of lift, inches]	Built-in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PCFY-P-NKMU-ER1	None	None	P15: PAC-SH83DM-E, [23 5/8"] P24, 30, 36: PAC-SH84DM-E, [23 5/8"]	Blue Diamond X87-721	CN4F
PCFY-P-NKMU-E	None	None	P15: PAC-SH83DM-E, 23 5/8" P24, 30, 36: PAC-SH84DM-E, 23 5/8"	Blue Diamond X87-721	CN4F

The PCFY unit does not have factory-mounted condensate lifts or safety switches. Instead, a factory drain lift accessory can be added inside the unit. 3rd party devices can also be added.

Auxiliary drain switches can be attached to CN4F, 3-4.



Example of factory drain lift accessory for PCFY.

PEFY – HORIZONTAL DUCTED – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PEFY unit.

Indoor Unit Model	Built-in lift? [height of lift, inches]	Built-in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PEFY-P-NMSU-ER2	Yes 21 21/32"	Float Switch	None	None	CN4F
PEFY-P-NMAU-E3	Yes 27 9/16"	Float Switch	None	None	CN4F
PEFY-P-NMHU-E2	Yes 27 9/16"	Drain Sensor	None	None	CN31
PEFY-P-NMHSU-E	None	None	PAC-KE05DM-F 27 1/2"	None	CN4F

For PEFY fan coil units, there are built in lifts and alarms except for the PEFY-NMHSU-E series. For the NMHSU-E series, an optional Mitsubishi PAC-KE05DEM-F kit can be installed inside the unit. This allows the unit to have the same alarm sequence as the other PEFY units.

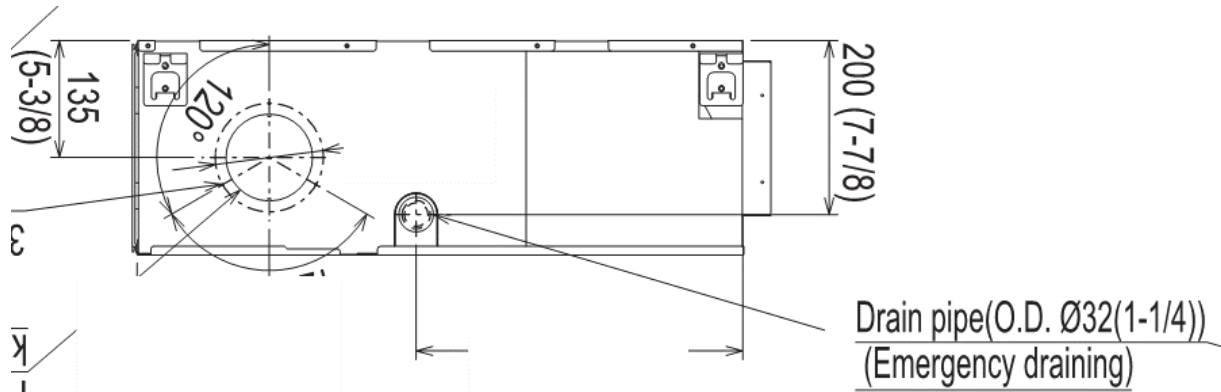
For PEFY ducted fan coils in general, if gravity drain is needed, the built-in lift can be disabled by disconnecting the pump from CNP on the control board. The drain pipe can then be connected to the appropriate gravity drain.

For PEFY-NMAU-**E4** models specifically, the built-in lift *must remain connected*. If CNP is disconnected on an -E4 model, the unit will cease operating and output an error code.

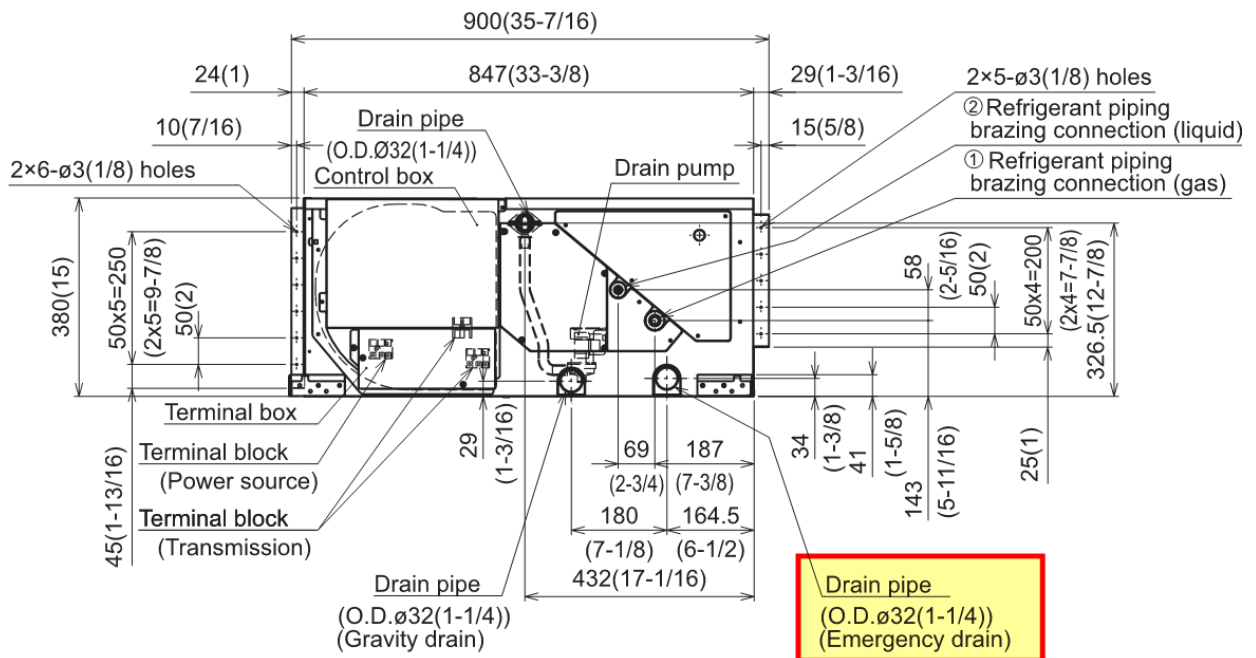
For the PEFY-NMSU and -NMAU, a secondary drain connection (labeled as “Emergency drain”) higher than the primary drain can be found on the opposite side of the unit of the primary drain.

For the PEFY-NMHU, a secondary drain connection (labeled as “Emergency drain”) higher than the primary drain is located on the same side of the unit of the primary drain.

There are no dedicated secondary drain connections on the PEFY-NMHSU-E unit, as both drain connections are at the same elevation.



PEFY-NMAU and NMSU Emergency Drain (left view)



PEFY-NMHU-E2 Secondary Drain highlighted

PFFY – FLOOR STANDING – CONDENSATE CONSIDERATIONS

The following shows all available features for condensate safety and disposal that are available on the PFFY unit.

Indoor Unit Model	Built in lift? [height of lift, inches]	Built in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
PFFY-P-NEMU-E	None	None	None	Blue Diamond X87-721	CN31
PFFY-P-NRMU-E	None	None	None	Blue Diamond X87-721	CN31

For PFFY units, it is recommended that a gravity drain or a 3rd party kit be used for drainage.

It is recommended that the alarm wires of the 3rd party pump kit be wired to CN31.



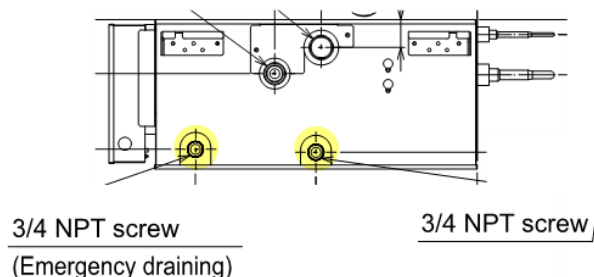
Example of PFFY condensate reservoir installation

BC Controller

BC Controller Model	Built in lift? [height of lift, inches]	Built in float switch or drain sensor?	Optional Mitsubishi Kit, Lift [inches]	Recommended Pump Kit by others	CN4F or other safety switch available?
CMB-P****NU-JA1 CMB-P****NU-KA1 CMB-P****NU-JB1 CMB-P****NU-J1	None	None	None	Blue Diamond X87-721	CN13

The BC controller does not contain built in lifts and float switches but does provide primary and secondary drain connections.

The BC Controller control board also contains CN13, a 2-pin connector that is a normally closed and will shut off refrigerant to all connected indoor units when open. When CN13 is open, each connected indoor unit will display a 2502 at the local controller. Indoor fans will continue to run while the 2502 error is active. After the condensate issue is resolved, the error must be reset on each indoor unit for the indoor unit to resume operation.



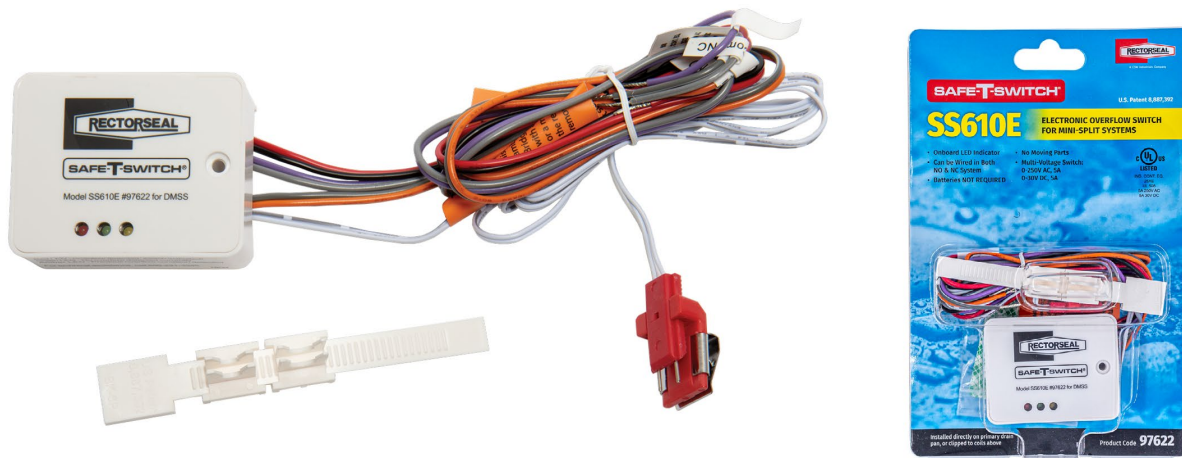
A side view of the BC Controller shows that there is a primary drain and secondary drain connection on the side of the BC controller. There is an approximately 5mm elevation difference between the primary and secondary drain.



CN13 on the BC controller comes with a jumper connected. The jumper can be cut and a normally closed switch can be wired to the connector.

ACCESSORIES

SS610E Drain Pan Level Sensor



The SS610E drain pan level sensor is a water level detecting device used for shutting off indoor units when a high level of water is detected in the condensate drain pan. It has normally open (NO) and normally closed (NC) wires that can connect to CN4F, CN31, or CN20 of indoor units.

CONTROLS - MITSUBISHI BUILT-IN CONDENSATE ALARMS AND SEQUENCES

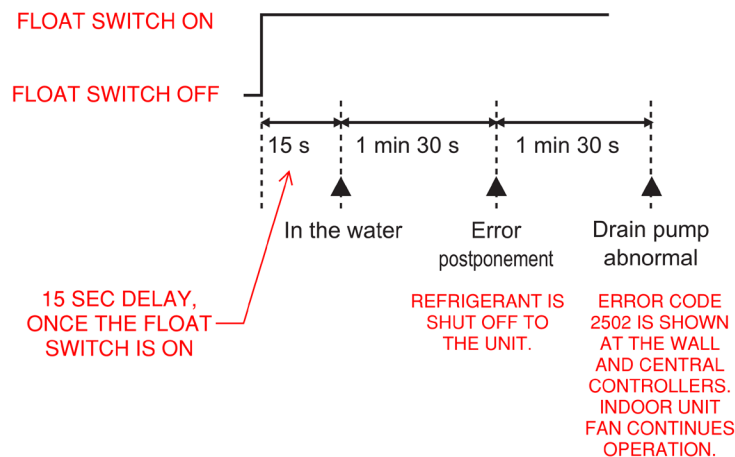
The following is a brief summary of the controls sequences that are built into Mitsubishi fan coil units.

CN4F, Contacts 1 and 2 – Built in float switch

For units with built-in float switches, the switch is factory connected to CN4F, contacts 1 and 2, which are normally open contacts.

The sequence for a built-in float switch is as follows:

1. If the float switch is in the condensate for 1 min 30 seconds or greater, the refrigerant flow to the unit is shut off, in order to prevent further condensation. (LEV position to minimum, putting the unit in a thermo-off state).
2. After the float switch is ON for 3 minutes and 15 seconds, a 2502 error code is displayed at both the remote controller and the central controller.
3. The fan continues to run even when the indoor unit is in error.
4. The error can be reset by turning the indoor unit on/off. This can be accomplished via the local wall controller or the central controller.



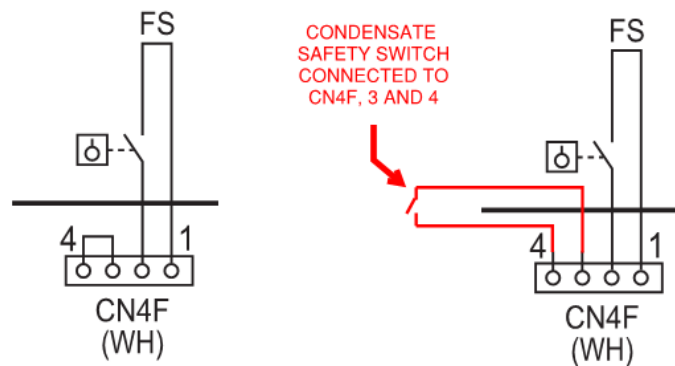
Float or sensor switch sequence, shown graphically.

If the unit is still producing condensate after the error – i.e. If a large temperature difference between TH23 (leaving refrigerant/coil temp) and TH21 (RA thermistor) is detected (18 degrees) is detected, and the switch is still detecting condensate for another 30 minutes, then it shuts off the outdoor unit. This is rare.

CN4F, 3 and 4 – Third Party Float Switches (NC)

A 3rd party condensate safety switch can be field connected to CN4F, contacts 3 and 4, which is normally closed. The factory-installed jumper is required to be cut before a switch is connected. The sequence of operation for CN4F, 3-4 is as follows:

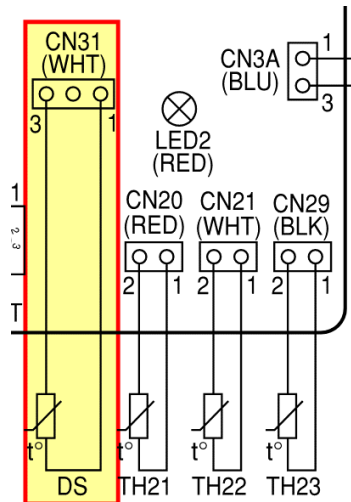
1. Upon the CN4F circuit opening (it's normally closed) the unit closes its LEV and posts 5701 error code within 3 minutes.
2. The indoor fan keeps running while the unit goes into a thermo-off state.
3. This connector does not have a documented sequence where it will stop the outdoor unit.



If needed, a Normally Closed condensate safety switch can be field-connected to CN4F, 3 and 4, after cutting the factory jumper.

CN31, 1 and 3, with Built-in Drain Sensor (NC)

For indoor units with drain sensors (such as the PLFY-NCMU and the PEFY-NHMu-E2), the sensor is connected to CN31, contacts 1 and 3. The drain sensor operates differently from the float switch but the timing in which it detects condensate is the same. Every 90 seconds, the drain sensor energizes (self-heats) for 30 seconds and stands by for 60 seconds. Immediately before and after energizing, the temperature of the drain sensor is measured, in order to determine if the drain sensor is in condensate. After two consecutive cycles of detecting condensate, totaling to 3 minutes, error code 2502 is shown and refrigerant to the indoor unit is stopped.

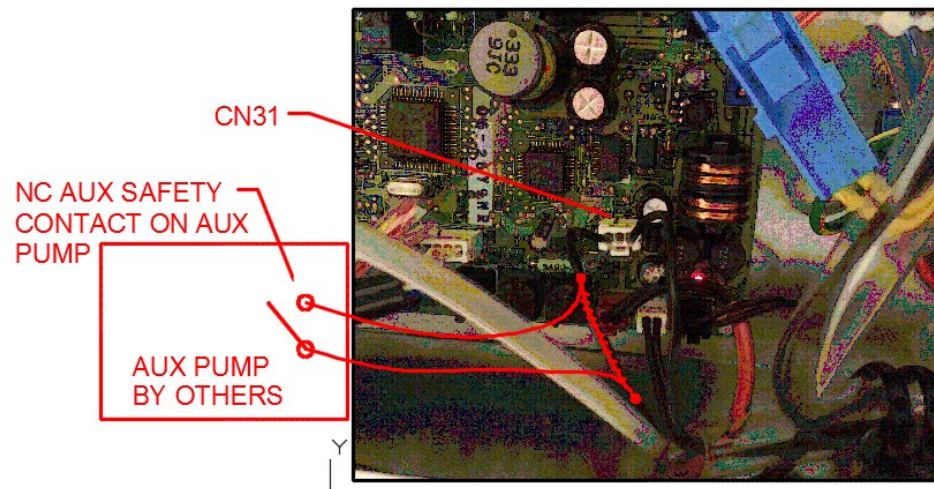


Example wiring diagram of a drain sensor connected to CN31, 1 and 3.

CN31, 1 and 3, with Built-in Drain sensor + Third Party sensor (NC)

An additional feature of CN31 is that it can be modified to provide an additional alarm in cases where a drain sensor is already factory installed. The CN31, 1-3 wire should be broken and an auxiliary switch can be installed in series with the existing drain sensor.

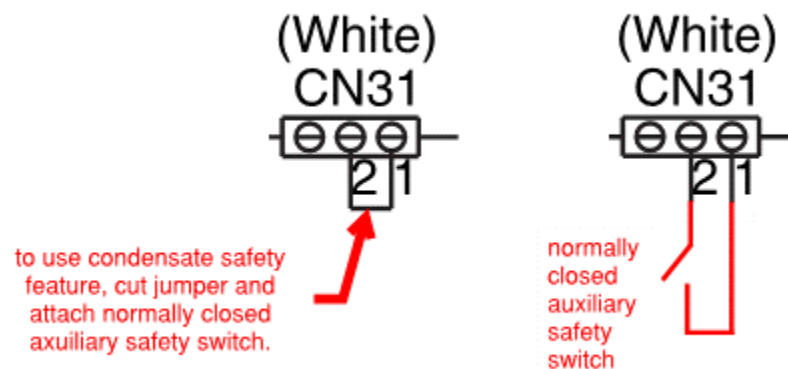
When the CN31, 1-3 circuit is broken (open), the indoor unit goes into a thermo-off state and error code 2503 is displayed on the remote and central controller.



CN31 and example of an auxiliary safety switch connected in series with factory drain sensor.

CN31, 1 and 2 Third Party Sensor Only (NC)

A third possibility with CN31 is in the case of a PFFY where there are no factory devices attached. In this case, an auxiliary switch can be connected to CN31, 1-2. When the switch is open, the unit goes into thermo-off and error code 2503 is displayed.



Example of auxiliary switch connected to normally closed CN31, 1-2.

CN20 and Indoor Units with no Dedicated Condensate Safety Terminal

For indoor units that do not have a CN4F or other auxiliary connectors, a condensate safety switch can be spliced into CN20. When condensate is detected by the DPLS2 for 3 minutes, the refrigerant flow to the unit is shut off, and error code 5101 is shown on the remote controller and central controller.

WIRING DIAGRAMS

Maxi Blue Pump with City Multi Indoor unit

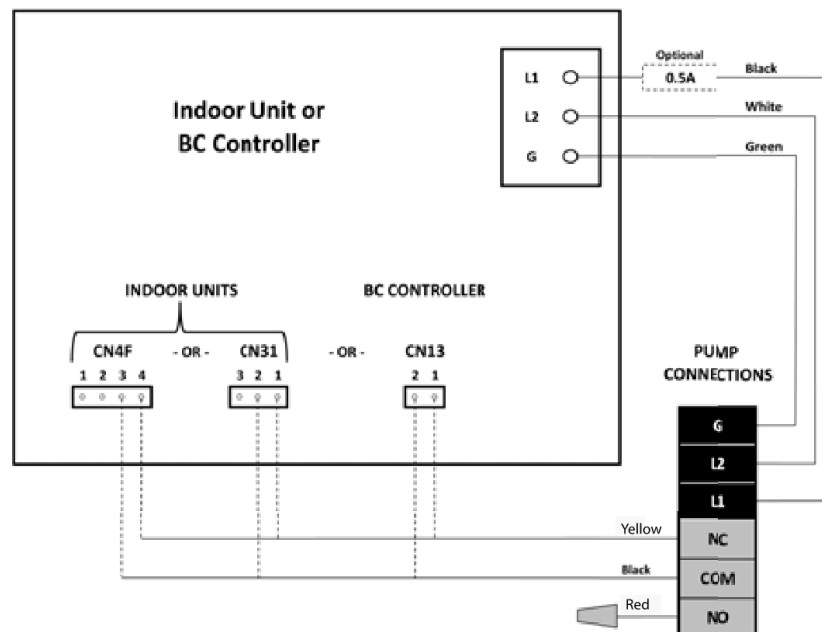
See below for wiring diagram from Blue Diamond Installation Manual.

CITY MULTI 230 volt models - Maxi Blue Pump

Verify pump voltage before installation

The installation below will require the black plug be removed from the pump power cable.

CITY MULTI indoor units will have either a CN4F or CN31 drain safety connector. Identify which is present and wire according to the diagram below. If installing the pump on a BC controller, wire to CN13 connector as shown.



Sauermann Example Wiring Diagram with City Multi Indoor Unit

