

Application Note: 1040

MXZ Sequence of Operations

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Introduction

The purpose of this document is to explain the sequence of operations for each mode on MXZ Branch Box systems. The sequences described apply to the following models:

- MXZ-4C36NAHZ
- MXZ-4C36NAHZ-U1
- MXZ-4C36NAHZ2-U1
- MXZ-5C42NAHZ
- MXZ-5C42NAHZ-U1
- MXZ-5C42NAHZ2-U1
- MXZ-8C48NA
- MXZ-8C48NA-U1
- MXZ-8C48NA2-U1
- MXZ-8C48NAHZ
- MXZ-8C48NAHZ-U1
- MXZ-8C48NAHZ2-U1

Resources

For more information on MXZ-C systems, please refer to any of the following links:

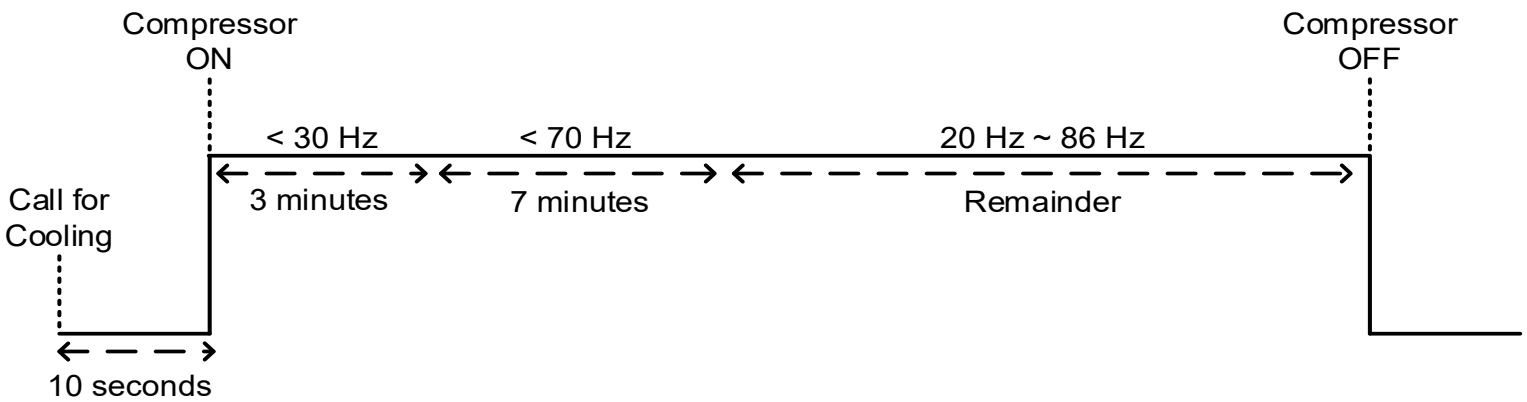
- [Install Manual](#)
- [Service Manual](#)
- [Engineering Manual](#)
- [Combination Tables](#)
- [Pocket Reference Guide](#)
- [App Note 1036 – MXZ Applications](#)
- [App Note 1037 – Variable Evaporator Temperature](#)

Cool & Dry Mode

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Sequence of Operations

Upon a call for cooling, the system will wait for a minimum of ten seconds before energizing the compressor. It will then modulate the compressor speed between 20~30 Hz for the first three minutes of operation, and between 20~70 Hz for the next seven minutes of operation. After approximately ten minutes of operation, the compressor speed will modulate between 20~86 Hz based on demand, and stop when there is no longer a calling for cooling.



Component Status

Reversing Valve (21S4)

OFF

Solenoid Valve 2 (SV2)

Open

Outdoor Fan Motor

ON when the compressor turns on

OFF when the compressor turns off

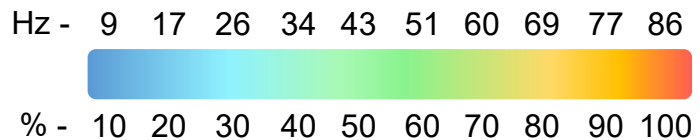
SV1 – Bypass Valve

Liquid Floodback Protection

Opens when all of the following conditions have been satisfied:

- Outdoor temperature is less than 90°F
- Compressor has been operating for at least 15 minutes
- Compressor is operating at the minimum frequency of 20 Hz
- At least three minutes have passed since SV1 was last turned OFF
- Difference between low pressure and high pressure is greater than 131 PSI
- Indoor coil temperature(s) have fallen 2°F below the target temperature (default is 48°F)

Compressor Speed

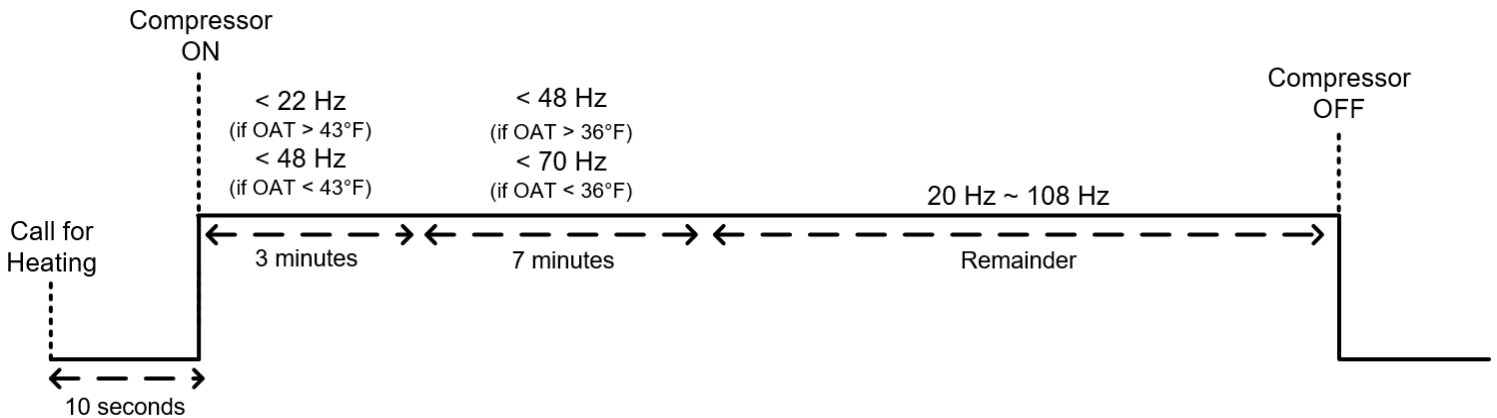


Heat Mode

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Overview

Upon a call for heating, the system will wait for a minimum of ten seconds before energizing the compressor. Depending on the outside ambient temperature (OAT), it will then modulate the compressor speed between 20~22 Hz, or 20~48 Hz for the first three minutes of operation; and between 20~48 Hz, or 20~70 Hz for the next seven minutes of operation. After approximately ten minutes of operation, the compressor speed will modulate between 20~125 Hz based on demand, and stop when there is no longer a call for heating.



Component Status

Solenoid Valve 2 (SV2)

Closed

Outdoor Fan Motor

ON when the compressor turns on

OFF when the indoor units stop calling for Heat

Reversing Valve (21S4)

ON when the indoor unit sends a call for Heat

OFF ten minutes after the indoor units stop calling for Heat

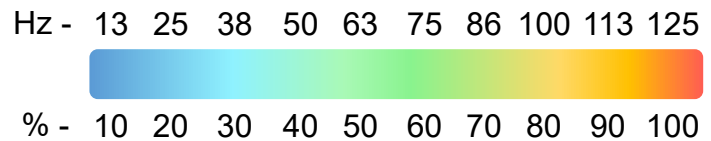
SV1 – Bypass Valve

Overheat Protection

Opens when all of the following conditions have been satisfied:

- High pressure is greater than 518 PSI
- Compressor has been operating for at least 30 seconds
- Compressor is operating at the minimum frequency of 20 Hz

Compressor Speed



Defrost Mode

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Sequence of Operations

During heating operation, the system will intermittently enter Defrost mode whenever it detects frost on the outdoor heat exchanger; and after either 15 minutes of defrost operation, or after all defrost conditions have been satisfied, the system will revert back to Heat mode.

Operating Conditions

Defrost operation will start when either of the following conditions has been met:

Light Frost

- TH3 reads less than or equal to 28°F for at least seven consecutive minutes.
- The compressor has been operating for at least 20 minutes.

Heavy Frost

- TH3 reads less than or equal to 23°F for at least 3 consecutive minutes.
- The compressor has been operating for at least 20 minutes.

Operation Details

Defrost operation will stop when any of the following conditions has been met:

- The system has been in defrost operation for 15 minutes.
- TH3 reaches 68°F or higher within the first two minutes of defrost operation
- TH3 reaches 46°F or higher after at least two minutes of defrost operation

Important Notes

- The TH3 sensor measures the temperature of the liquid pipe at the outdoor unit.
- The indoor LEV will open to 60 pulses on units that have already met set point.
- Defrost operation cannot be canceled by any controller command.
- The indoor unit controller(s) will display “Standby” when defrost operation has begun.
- All indoor unit function settings are locked until the defrost cycle is complete.

Component Status

Indoor Vane Position

Horizontal

Reversing Valve (21S4)

OFF

Outdoor Fan Motor

OFF

Indoor Fan Motor

OFF

Refrigerant Recovery Mode

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Sequence of Operations

During normal operation, small amounts of refrigerant will remain in each indoor unit's heat exchanger after meeting set point and closing the indoor LEV; and during periods where multiple indoor units are calling, these small amounts may accumulate and potentially starve the compressor of refrigerant. To avoid damaging the compressor, the system will enter Refrigerant Recovery Mode in an attempt to bring refrigerant back to the outdoor unit.

Operating Conditions

Refrigerant Recovery Mode will begin when all of the following conditions have been met:

- 3 minutes have passed since the compressor began operating.
- 10 minutes have passed since the system was last restarted.
- 20 minutes have passed since the last refrigerant recovery operation was performed.

...and when either of the additional conditions below has been met:

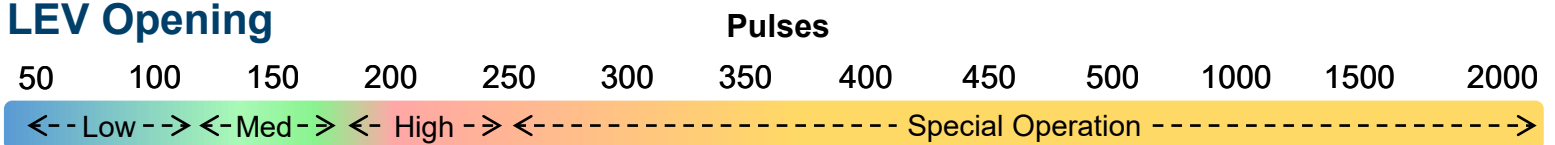
- The compressor discharge pipe temperature is greater than 230°F.
- The high pressure is less than 334 PSI, and the discharge superheat is greater than 90°F.

Operation Details

For approximately one minute, the following operations will occur:

- The indoor fan(s) will stop.
- The indoor LEV(s) will open to 250 pulses on units that are actively cooling or heating.
- The indoor LEV(s) will open to 500 pulses on units that have met set point in Heat Mode.

LEV Opening



Important Notes

- The indoor unit controller(s) will not notify you when this operation has begun.
- The only way to monitor this mode is by connecting a laptop to an [MN Converter](#), and recording the system's operation with the [Maintenance Tool](#) program.

Oil Recovery Mode

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Sequence of Operations

During long periods of low frequency operation, small amounts of compressor oil will begin to accumulate in the pipes; and after approximately four hours of low frequency operation, the system will enter Oil Recovery Mode in an effort to recover the remaining oil from the pipes.

Operating Conditions

Oil Recovery Mode will begin when all of the following conditions have been met:

- The compressor has been operating at less than 49 Hz for at least 4 hours.
- At least 10 minutes have passed since the system was last restarted.
- At least 4 hours have passed since the last mode change.
- At least 4 hours have passed since the last defrost cycle [Heat Mode].

Operation Details

Cool Mode

For approximately two minutes, the following operations will occur:

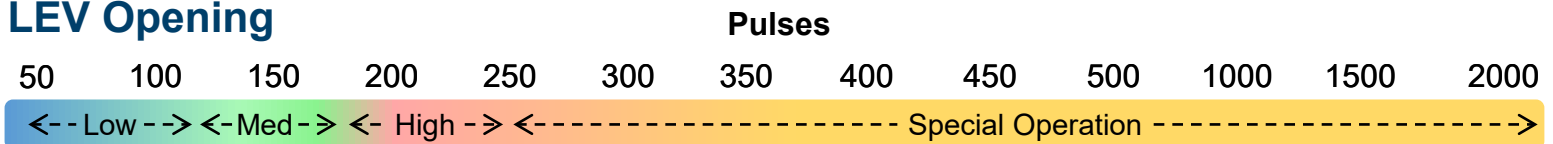
- The compressor frequency will be set to 62 Hz.
- The indoor LEV(s) will open to 1000 pulses on units that are actively cooling.

Heat Mode

For approximately two minutes, the following operations will occur:

- The compressor frequency will be set to 71 Hz.
- The indoor LEV(s) will open an extra 200 pulses on units that are actively heating.
- The indoor LEV(s) will open to 500 pulses on units that are not actively heating.

LEV Opening



Important Notes

- The indoor unit controller(s) will not notify you when this operation has begun.
- The only way to reset the 4 hour timer is by changing the mode, or increasing demand. Meeting set point, or turning the unit off manually will not reset the timer.
- The only way to monitor this mode is by connecting a laptop to an [MN Converter](#), and recording the system's operation with the [Maintenance Tool](#) program.

Cold Start Prevention

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Sequence of Operations

During heating operation, small amounts of liquid refrigerant may accumulate in the outdoor unit; and to prevent liquid refrigerant from entering the compressor, the system will temporarily operate in Cool Mode to discharge the liquid refrigerant from the outdoor unit.

Operating Conditions

The system will perform this operation when either of the following conditions have been met:

Condition 1

- The outdoor air temperature is less than 5°F.
- The compressor has been OFF for less than 30 minutes

Condition 2

- The outdoor air temperature is 6°F ~ 86°F.
- The compressor has been OFF for at least 30 minutes
- The outdoor unit has been powered OFF within the last 30 minutes

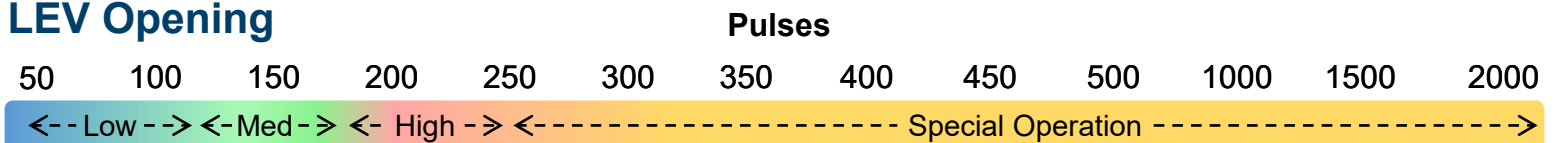
Operation Details

Heat Mode

For approximately two minutes, the following operations will occur:

- The indoor LEV(s) will open to 1000 pulses.
- The outdoor unit fan motor will stop operating.
- The outdoor unit will open LEV-A to 480 pulses, and close LEV-B down to 5 pulses.

LEV Opening



Important Notes

- The indoor fan will turn off if not actively cooling, drying, or heating the space.
- The indoor unit controller(s) will not notify you when this operation has begun.
- The only way to monitor this mode is by connecting a laptop to an [MN Converter](#), and recording the system's operation with the [Maintenance Tool](#) program.