



Welcome 2023 Ductless Training

*Instructor: Chris Morley & Ron Stokes
Customer Assurance Manager
Carrier Enterprise*



NATE:

- If you are NATE certified email your NATE number CESouthTexasMarketing@carrierenterprise.com
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CE STX Technical Support Team

Tech support number 877-574-0172

187 YEARS COMBINED EXPERIENCE



Glenn Schul
*Customer Assurance
Manager – STX*
San Antonio, TX
43 years experience



Ron Stokes
*Customer Assurance
Manager – STX*
San Antonio, TX
37 years experience



Chris Morley
*Customer Assurance
Manager - STX*
Houston, TX
38 years experience



Wade Dunham
*Customer Assurance
Manager - STX*
Houston, TX
25 years experience



David Bedingfield
*Customer Assurance
Manager – STX*
Houston, TX
44 years experience

Agenda:

- Ductless Benefits
- Controls & Operation
- Load Calculation “Why”
- Installation
- Refrigerant Piping
- Electrical wiring
- Startup
- Advanced Service
- Crossover wiring and operation
- Diagnostics

Ductless Benefits

1. Inverter Technology
2. Efficiency
3. No Leaks
4. Room-By-Room Comfort
5. Flexibility



CE App

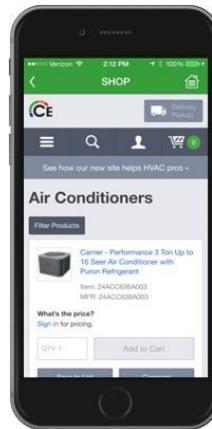
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Our apps make the HVAC professional's life easier. Access product information and easy to use tools while on the go.



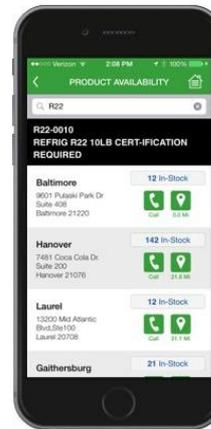
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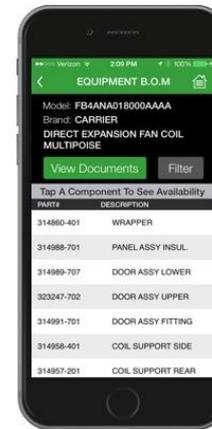
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**NOTICE: HVACpartners Outage -
March 5th - 6th**

HVACpartners will be unavailable beginning on Saturday, March 5th at 5:00 PM ET until Sunday, March 6th at noon to undergo a scheduled database migration.

YOUR BROWSER:

This site requires Microsoft Internet Explorer version 5.5 or greater for complete functionality.

USING ADOBE ACROBAT:

Documents are best viewed with Acrobat by first right-clicking on their links and then choosing "Save Target As..." to download the files to your local drive. After downloading, double-click on the files located on your hard drive to open with Acrobat.

POP-UP BLOCKERS:

You should first disable any "pop-up" blocking software you may be running in order to view all the available content.

info

HVACPartners

- Literature
- PIC – Parts Program replaced EPIC
- Bulletins
- TIC's (Technical Information Communication)
- What's New

Controls

Controls

NEW WIRELESS REMOTE CONTROLLER

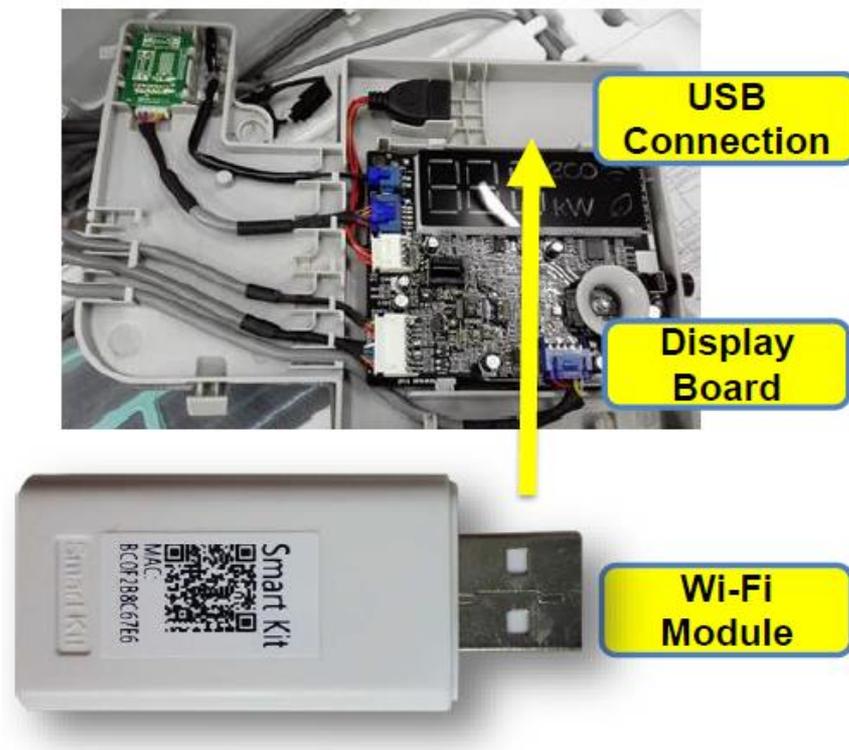


- Available on High Wall, Cassette, Ducted, and Floor Console.
- New display
- Same functionality as previous generation
- Plug and play
- Service tool imbedded
 - Heating temperature compensation
 - Cooling temperature compensation
 - Disable Auto-start function

Wi-Fi Ductless

Wi-Fi For Ductless

- Wi-Fi for the Ductless units
- Only available on Single Zone currently
- Carrier solution – easy installation of accessory on many different indoor units
- Easy to connect on smart phone



Wi-Fi Ductless

Tier	System Type	BUILT-IN	ACCESSORY
High (CBPM)	High Wall	●	
Mid	High Wall		●
	Ducted		●
	Cassette		●
	Console 18-58		●
Entry	High Wall		●



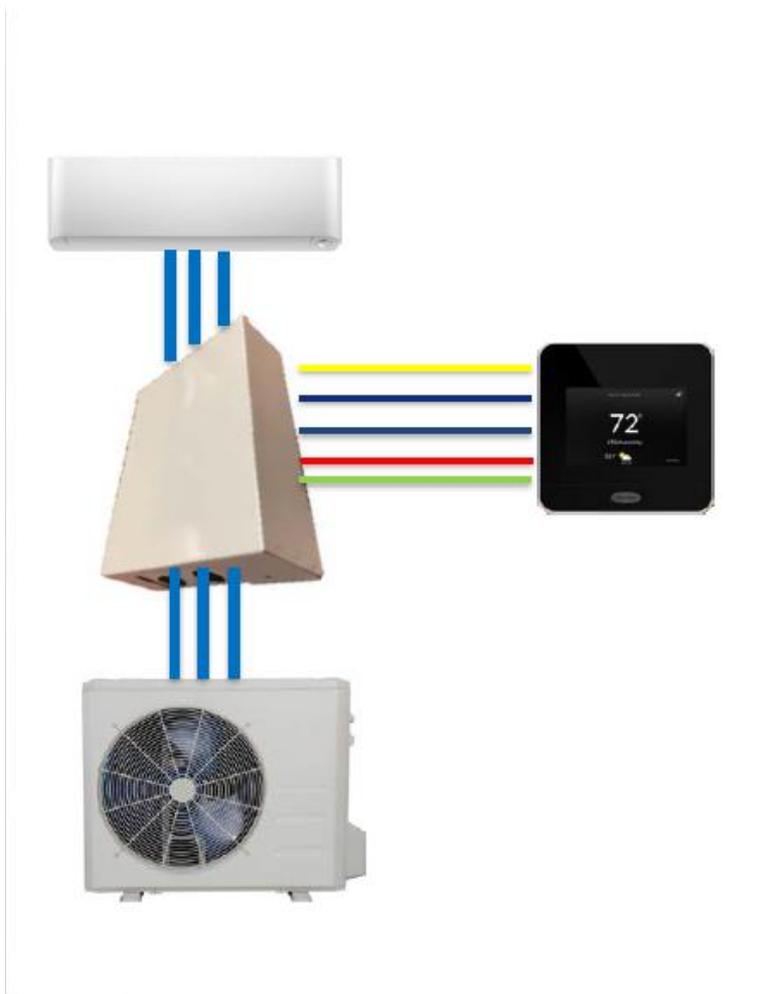
*Floor Console size 12 not compatible with Wi-Fi

24V Interface Features



- 4 Fan control speeds: - Auto, High, Med, Low
- Single Zone Application only
- One 24V INTERFACE KIT per system
- Keeps the Inverter compressor operating as a variable speed system
- Rated for outdoor and indoor mounting
- Dry mode contact for active dehumidification control
- Remote ON/OFF contact
- Auxiliary Heat control through the thermostat
- Diagnostic code displays LED's

24V Interface Features



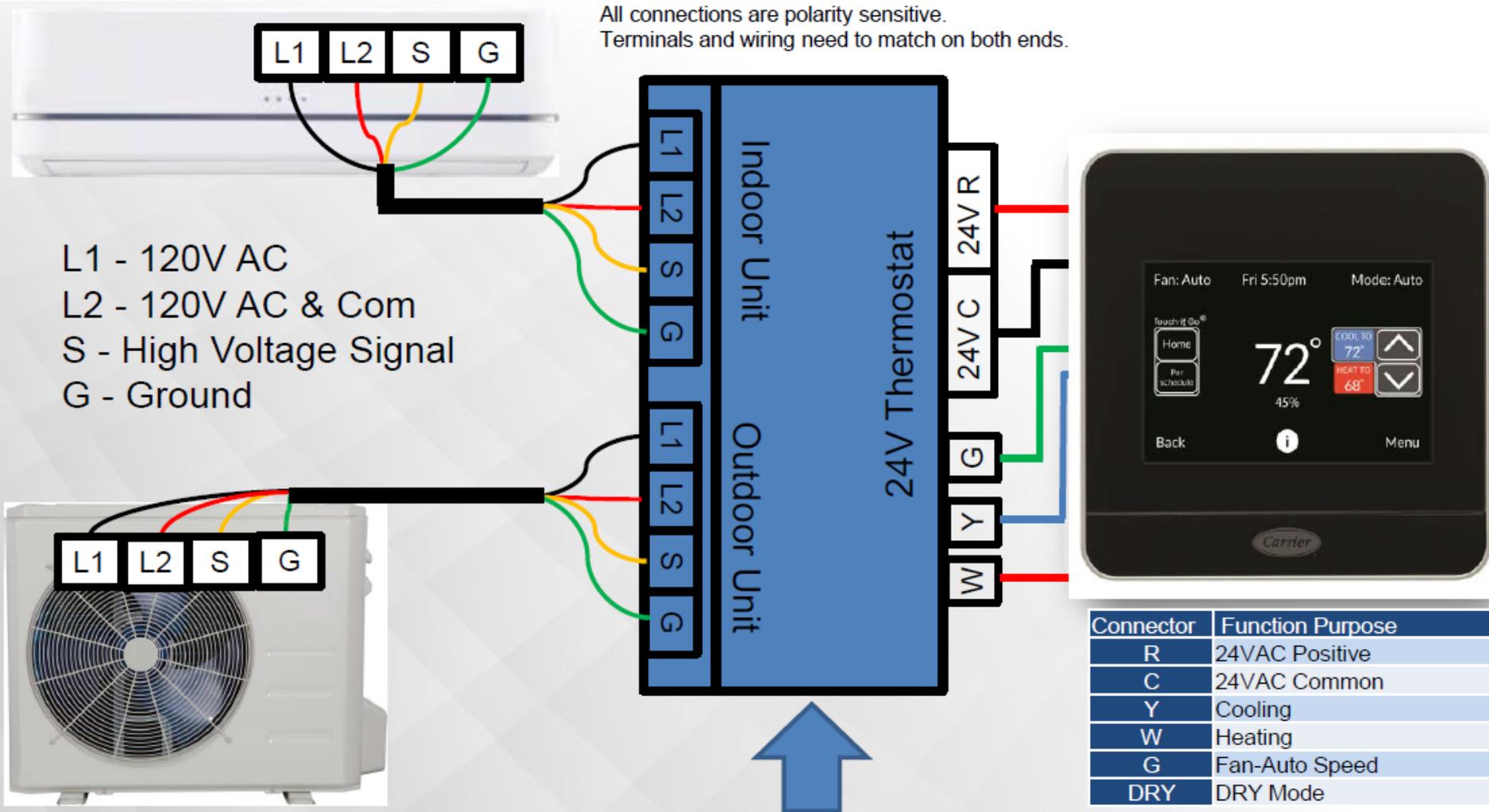
When using the 24V interface:

Always turn the system OFF & On only with the third-party thermostat.

Will not be able to use:

- Relative Humidity Control
- ECO Mode
- Louver Control
- Follow Me

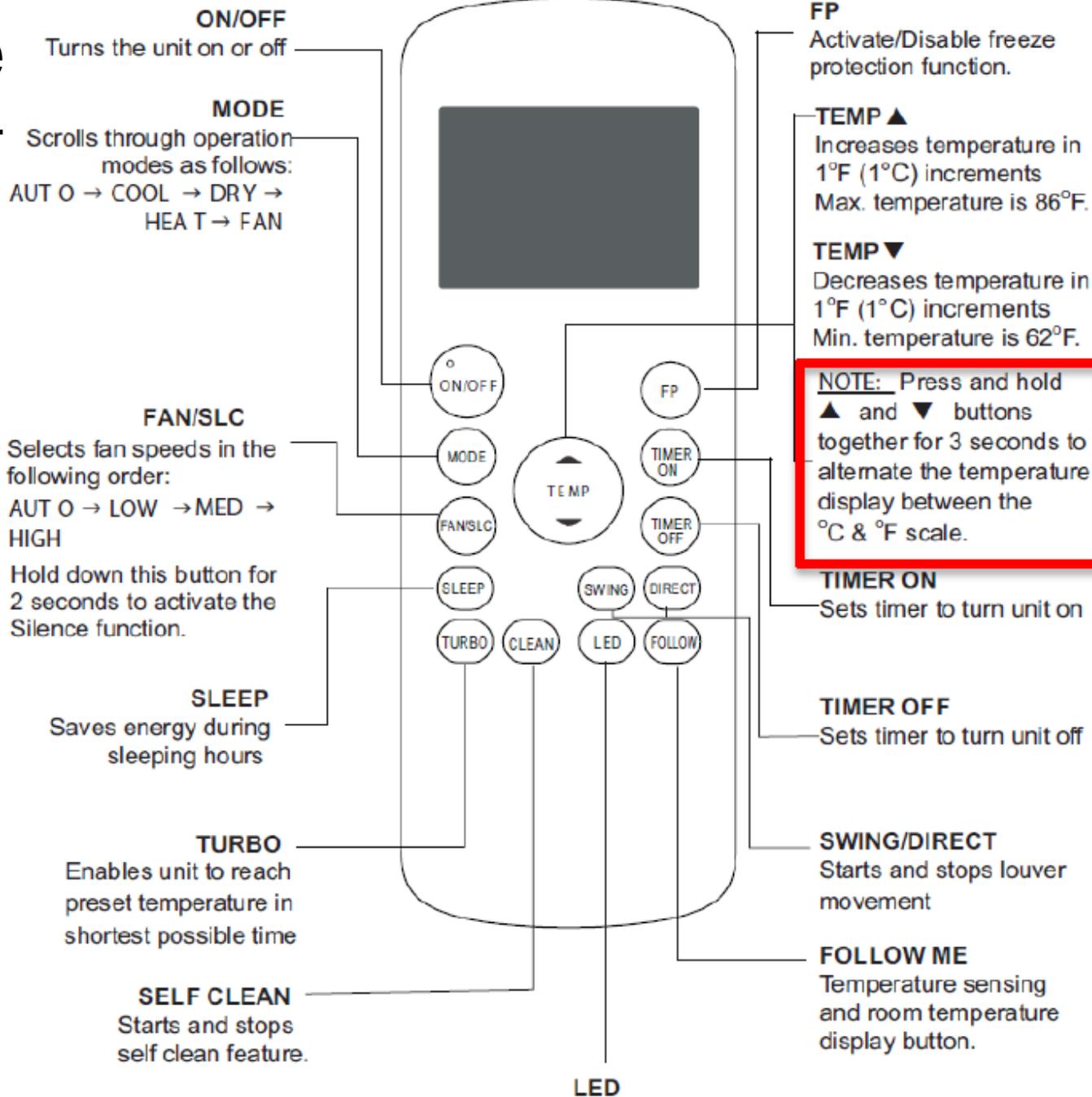
24V Interface Wiring

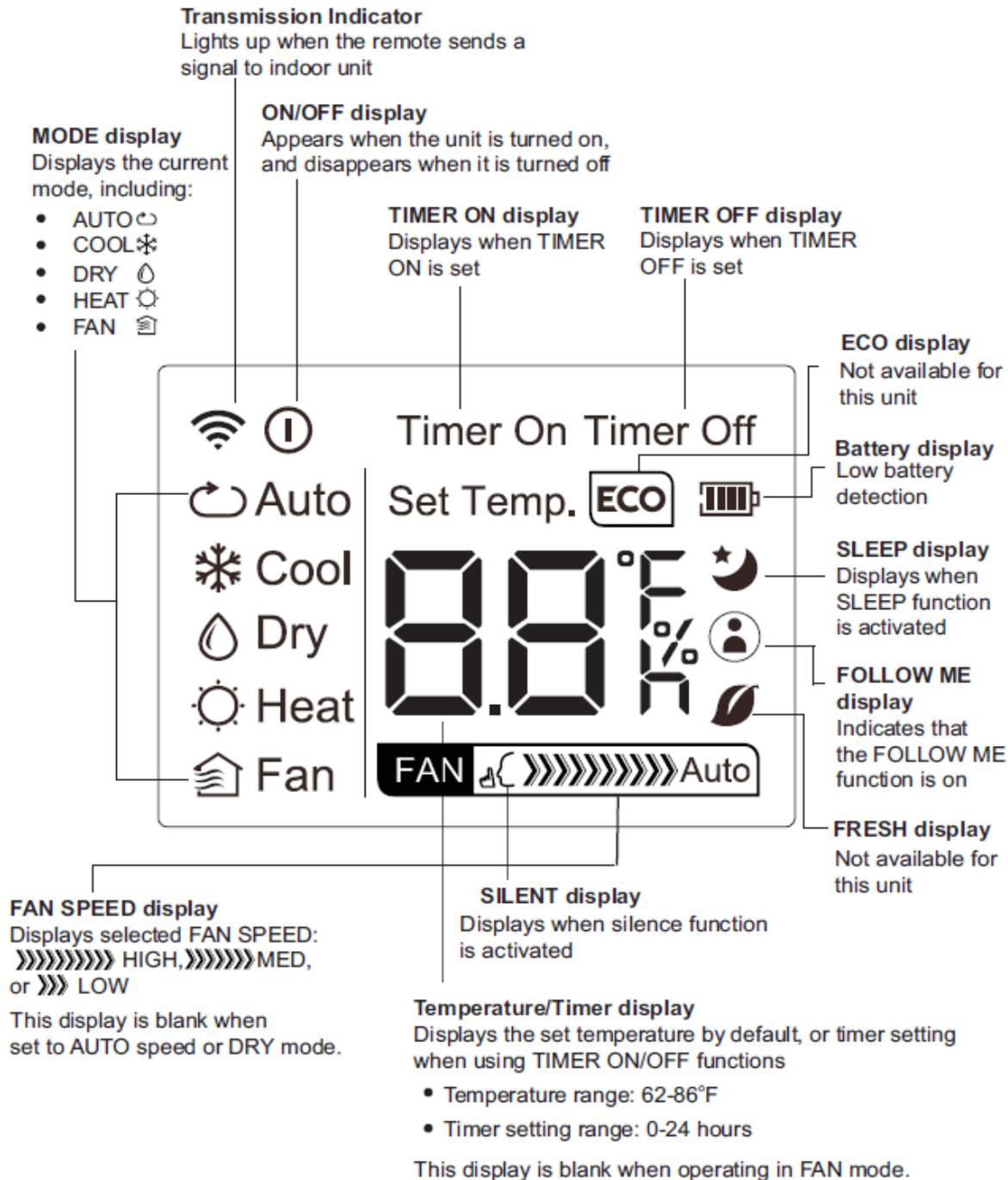


Functions

Wireless Remote

Ge





Self Clean Mode

The Self Clean function will dry the indoor coil to prevent organic growth.

- Press  to activate/deactivate this function.
- Runs for 30 minutes, then deactivates.

Self Clean will not work on a multi-zone. It won't even beep. It puts the unit in heat mode.

Mode/Conflict



Silent Mode

The Silent Mode function reduces IDU and ODU noise.

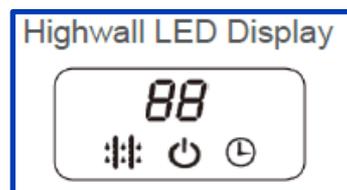
- Hold  for 2 seconds to activate/deactivate.
- Decrease fan speed.
- Decrease compressor speed.
- May result in insufficient capacity.



LED Light

The LED light function turns on/off the IDU display.

- Press the  button to turn the display light on and off.



Turbo Mode

Turbo mode will try to satisfy set point as quick as possible.

- Press  to activate/deactivate.
- Indoor fan is fixed at Turbo fan speed. (Anti-cold-air function is still valid in heating mode)
- The unit will automatically quit turbo mode:
 - 20 minutes runtime.
 - Power off.
 - Mode change.



Follow Me

The Follow Me function allows the unit to sense temperature from the wireless controller.

- Sends temperature every 3 minutes.
- If IDU doesn't see communicated value within 7 minutes follow me is deactivated.



Freeze Protection

Freeze Protection also known as 46F setback. It does not mean freeze protection for the indoor coil.

- Hold  for 2 seconds to activate/deactivate.
- Indoor unit displays “FP”.
- Unit operates at high fan speed.
- Set point 46° F in heat mode
- This mode can also be deactivated by pressing the “On/Off”, “Sleep”, “Mode”, “Fan”, or either of the “Temp” buttons.



Time Delay

If  is pressed too soon after unit stops, the compressor will not start for 3 to 4 minutes. This limits frequent compressor cycling and allows equalization. The unit only emits an audible beep when the signals are received correctly.

Anti Cold Blow Function

If the unit is in HEATING mode, there is a delay when the fan starts. The fan starts only after the coil is warmed up to prevent cold air blowing on occupants.

Auto Restart

If the power fails while the unit is operating, the unit stores the operating condition, and it will start operation automatically under those conditions when the power is restored.

Follow Me will not restart if power is cycled.

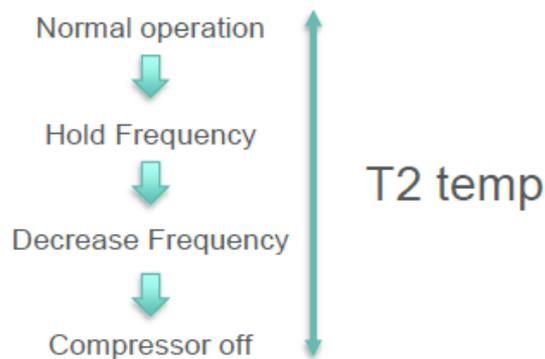
Sensor Protection – Open Circuit

When there is only one malfunctioning temperature sensor, the air conditioner keeps working yet displays the error code, in case of any emergency use. When there is more than one malfunctioning temperature sensor, the air conditioner stops working.

Evaporator Temperature Protection

The evaporator anti-freezing protection will not allow the coil to freeze.

- Monitors the T2 sensor. If lower than 32°F compressor will stop.
- Compressor restarts above 41°F.
- If IDU's are freezing on multi-split, check for cross wire.



Emergency Mode

FORCED AUTO & COOLING MODE

- Tap manual button once for forced auto mode. Hold manual button again for 5 seconds to force cooling mode.



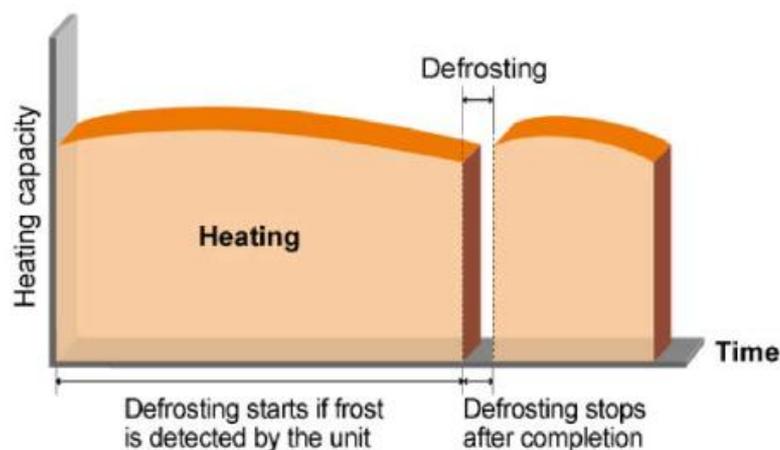
Operating Rules

- Forced auto mode set point is 75F
- Forced cooling sets the compressor speed to F2. IDU runs in the “breeze” mode. After 30 minutes, unit will shift to forced auto.

Defrosting Mode

DEFROSTING

- T3 Temp (Condenser Temp)
- Change in T3 + the compressor running time.
- T4 Temp (Outside Air Temp)

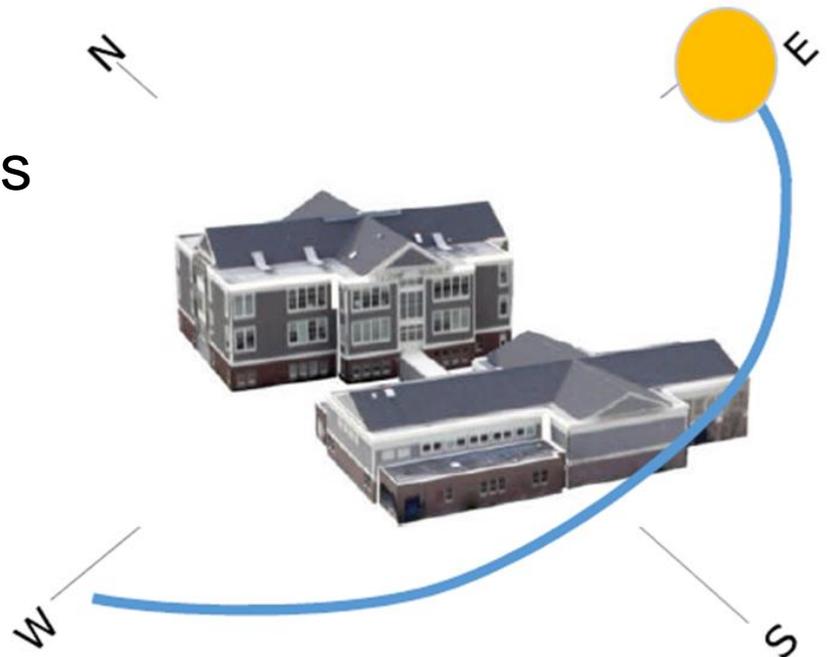


Load Calculations

Load Calculation: Why?

QUESTIONS TO ASK

- Where are you mounting the indoor and outdoor unit?
- How much interstitial space?
- Where are running ductwork?
- Active vs Stationary Occupants
- Diversity



DO NOT PLAN FOR FAILURE!

Load Calculation: WHY?

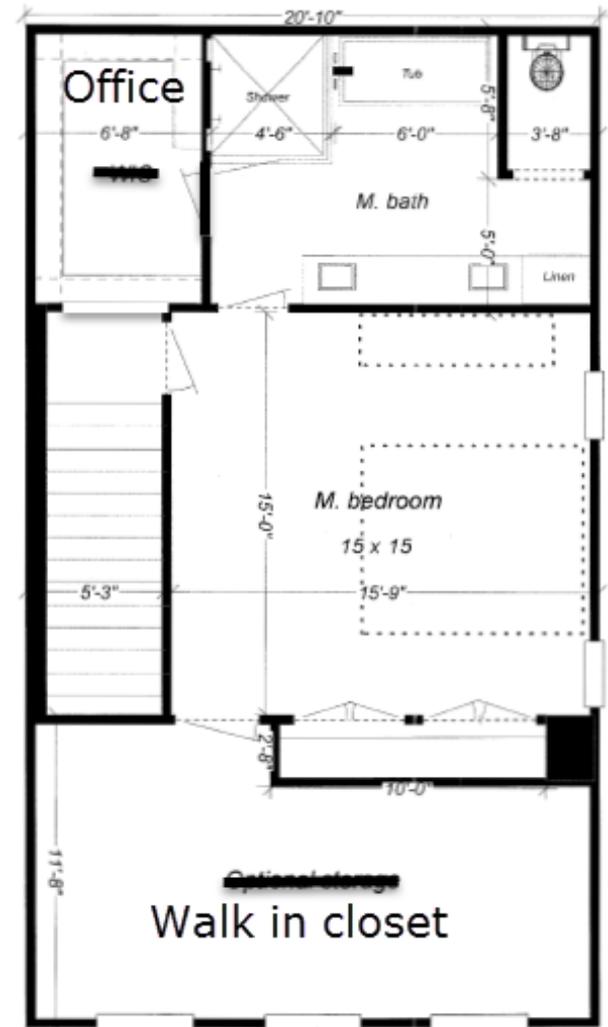
A good load calculation program will provide the designer with the needed BTU's in heating, cooling and the appropriate airflow (cfm) need for a given space.

Note:
The outdoor unit is selected based on the block load

The indoor units "zone(s) are selected based on the zone loads.

Design Conditions: Dallas TX						
<i>Indoor</i>			<i>Outdoor</i>			
Summer		72	Summer		115	
Winter		70	Winter		10	
RH (Relative Humidity)		50	Summer grains of moisture		93	
Building Component		Sensible Gain BTUH	Laitent Gain BTUH	Total Heat Gain BTUH	Total Heat Loss BTUH	CFM
Whole House	667 SQ FT	14,080	2,011	16,091	22,057	688
2nd Level add: Master retreat		14,080	2,011	16,091	22,057	688
Bedroom	236 sq ft	7,089	1,561	8,650	11,994	371
Bathroom	151 sq ft	2,532	230	2,762	3,154	103
Closet	208 sq ft	3,033	220	3,253	4,882	151
Office	71 sq ft	1,426	0	1,426	2,027	63

Always size the equipment based off the largest BTUH loads. In this case our loads indicate the heating as the largest factor. So one should pick the equipment based on the heating loads.



Detailed Capacities

38MGR
Multi-zone Outdoor Unit Ductless System
Sizes 18, 24, 30, 36 and 48



Product Data



Fig. 1 – 18K



Fig. 2 – 24K and 30K



Fig. 3 – 36K and 48K

NOTE: Images for illustration purposes only. Actual models may be slightly different.

INDUSTRY LEADING FEATURES / BENEFITS

A competitively priced and creative solution to design problems.

The 38MGR ductless inverter driven multi-zone system provides individual comfort control for up to 5 separate zones. Two, three, four or five space-saving High Wall, Cassette, Slim Ducted or Floor Console fan coils can be matched with one outdoor heat pump. The indoor fan coils are connected to the outdoor unit by refrigerant tubing and wires.

The different styles of indoor units can be mounted in several locations to accommodate the application. This selection of fan coils permits inexpensive and creative solutions to design problems such as:

- When adding air conditioning to spaces that are heated by hydronic or electric heat and have no ductwork.
- Historical renovations or any application where preserving the look of the original structure is essential.
- Commercial add-on jobs where the existing air conditioning system cannot be stretched.

These compact indoor fan coil units take up very little space in the room and do not obstruct windows. The fan coils are attractively styled to blend with most room decors.

Advanced system components incorporate innovative technology to provide reliable cooling and heating performance at low sound levels.

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COOLING PERFORMANCE NON-DUCTED COMBINATIONS

MODEL	COOLING		OUTDOOR CONDITIONS (DB)												
	Indoor Conditions		-13F	-4F	0F	5F	17F	47F	86F	99F	104F	113F	122F		
	DB	WB	(-25C)	(-20C)	(-17C)	(-15C)	(-8C)	(8C)	(29C)	(36C)	(40C)	(45C)	(50C)		
18	69.8F (21C)	59F (15C)	TC	18.12	18.96	19.66	20.26	18.97	20.69	21.76	19.94	17.92	12.00	11.58	9.89
			SC	15.11	15.49	15.34	15.03	14.72	16.14	17.00	15.95	15.23	12.00	11.58	9.89
	Input		1.37	1.41	1.48	1.53	1.57	1.60	1.63	1.79	1.96	1.47	1.52	1.32	
	75.2F (24C)	62.6F (17C)	TC	20.54	21.45	21.23	20.81	20.38	22.36	23.52	21.54	19.38	12.96	12.51	10.13
			SC	15.35	15.61	15.29	15.40	15.28	16.98	18.35	17.01	15.87	11.53	11.88	9.93
	Input		1.40	1.46	1.53	1.58	1.62	1.65	1.68	1.84	2.01	1.50	1.54	1.35	
80.6F (27C)	66.2F (19C)	TC	21.91	22.46	22.18	22.53	22.85	24.15	25.11	23.85	21.54	14.82	14.22	10.40	
		SC	16.44	16.85	16.64	16.05	17.14	18.11	18.33	17.89	16.16	14.52	14.08	10.40	
Input		1.41	1.45	1.51	1.56	1.62	1.65	1.68	1.88	2.05	1.52	1.57	1.36		
89.6F (32C)	73.4F (23C)	TC	23.89	24.48	24.18	24.56	24.91	26.32	27.37	26.00	23.48	16.15	15.50	11.94	
		SC	17.20	17.63	17.65	18.17	18.68	19.22	22.44	21.84	20.19	15.18	14.88	11.11	
Input		1.46	1.50	1.56	1.63	1.67	1.72	1.73	1.93	2.14	1.57	1.62	1.41		
24	69.8F (21C)	59F (15C)	TC	31.96	32.76	32.56	32.60	32.15	32.75	32.44	26.94	24.46	19.98	17.56	15.45
			SC	22.38	22.94	22.81	22.82	22.51	22.93	25.47	22.82	21.70	19.42	17.21	15.45
	Input		2.26	2.32	2.31	2.34	2.36	2.38	2.41	2.26	2.90	2.39	2.58	2.65	
	75.2F (24C)	62.6F (17C)	TC	34.53	35.39	35.19	35.21	34.72	35.57	35.04	29.10	26.42	21.58	18.96	16.69
			SC	24.17	24.77	24.63	24.65	24.31	24.76	26.26	23.86	22.72	19.42	18.02	16.52
	Input		2.30	2.36	2.35	2.38	2.40	2.42	2.45	2.30	2.54	2.43	2.60	2.66	
80.6F (27C)	66.2F (19C)	TC	36.25	37.15	37.24	37.08	37.51	37.68	37.53	35.39	32.75	24.71	23.96	20.15	
		SC	25.38	26.01	26.07	25.96	26.26	26.38	26.95	26.08	25.06	22.09	23.64	20.05	
Input		2.20	2.25	2.24	2.27	2.29	2.31	2.34	2.17	2.54	2.48	2.62	2.74		
89.6F (32C)	73.4F (23C)	TC	38.78	39.75	39.85	39.68	40.14	40.32	40.16	37.87	35.04	26.44	25.64	21.56	
		SC	27.15	27.83	27.89	27.77	28.09	30.64	32.93	32.19	31.19	24.32	24.61	21.56	
Input		2.26	2.32	2.35	2.38	2.42	2.48	2.54	2.82	3.11	2.55	2.69	2.81		
30	69.8F (21C)	59F (15C)	TC	39.15	40.12	40.28	39.54	39.19	40.81	39.79	37.58	36.16	28.21	26.56	23.46
			SC	27.40	28.08	28.20	27.65	27.43	30.61	31.57	30.73	29.96	26.40	26.18	23.12
	Input		3.08	3.16	3.18	3.12	3.21	3.24	3.28	3.62	3.99	3.13	3.25	2.66	
	75.2F (24C)	62.6F (17C)	TC	40.32	41.32	41.49	40.73	40.36	42.03	41.38	41.02	39.05	30.47	28.68	25.34
			SC	28.23	28.93	29.04	28.51	28.25	31.53	33.93	36.10	35.15	28.03	27.25	24.83
	Input		3.13	3.21	3.23	3.17	3.28	3.29	3.33	3.67	4.04	3.18	3.30	2.71	
80.6F (27C)	66.2F (19C)	TC	41.13	42.15	42.51	42.61	42.10	42.61	42.41	40.63	38.82	32.17	30.47	27.53	
		SC	28.79	29.51	29.76	29.83	29.47	31.96	32.30	31.45	30.57	28.30	30.18	27.25	
Input		3.13	3.21	3.25	3.29	3.31	3.38	3.42	3.67	4.05	3.21	3.31	2.76		
89.6F (32C)	73.4F (23C)	TC	44.41	45.52	45.91	46.02	45.47	46.02	45.80	43.88	41.93	34.74	32.91	29.73	
		SC	31.10	31.87	32.14	32.21	31.83	34.51	37.56	38.61	37.73	31.96	31.28	28.73	
Input		3.19	3.27	3.31	3.35	3.37	3.44	3.48	3.73	4.11	3.27	3.37	2.82		
69.8F (21C)	59F (15C)	TC	37.82	38.76	38.32	38.02	38.41	40.44	40.91	36.89	33.97	27.85	25.60	23.33	
		SC	26.47	27.13	26.82	27.31	28.38	30.33	31.91	30.25	28.88	24.50	23.55	22.40	
Input		2.69	2.76	2.83	2.87	2.91	2.98	3.00	3.39	3.79	2.68	2.76	2.41		
36	75.2F (24C)	62.6F (17C)	TC	42.25	42.25	42.51	41.87	41.24	41.97	41.47	39.32	36.26	32.97	29.54	
			SC	28.86	29.58	29.76	29.31	28.87	30.64	32.24	32.96	32.96	26.58	26.54	
	Input		2.19	2.24	2.28	2.35	2.38	2.41	2.46	2.78	3.11	3.45	3.64	3.08	
	80.6F (27C)	66.2F (19C)	TC	44.52	45.63	45.91	45.22	44.54	45.33	44.79	42.47	39.16	35.61	32.25	28.66
			SC	32.50	33.31	33.51	33.01	32.51	34.90	37.17	36.10	34.07	32.05	32.25	28.66
	Input		2.25	2.31	2.36	2.42	2.45	2.48	2.53	2.86	3.18	3.52	3.71	3.15	
89.6F (32C)	73.4F (23C)	TC	53.80	55.14	54.68	55.31	56.15	56.72	60.26	56.82	53.16	48.95	38.57	35.24	
		SC	40.35	41.36	41.01	42.12	42.11	42.54	46.04	44.49	42.79	37.95	38.57	35.24	
Input		2.99	3.06	3.15	3.25	3.29	3.46	3.94	4.36	4.80	3.79	3.98	3.43		
69.8F (21C)	59F (15C)	TC	56.49	57.90	57.41	58.08	58.96	59.56	63.27	59.66	55.82	43.00	40.50	37.04	
		SC	41.80	42.84	42.69	42.98	43.83	46.45	52.52	51.31	50.24	40.85	40.50	37.04	
Input		3.05	3.13	3.22	3.32	3.36	3.53	4.01	4.43	4.87	3.86	4.05	3.50		

LEGEND
DB – Dry Bulb
WB – Wet Bulb
TC – Total Net Cooling Capacity (1000 Btu/hour)
SC – Sensible Capacity (1000 Btu/hour)
Input – Total Power (kW)

Detailed Capacities

COOLING PERFORMANCE NON-DUCTED COMBINATIONS

MODEL	COOLING		OUTDOOR CONDITIONS (DB)												
	Indoor Conditions			-13F	-4F	0F	5F	17F	47F	77F	86F	95F	104F	113F	122F
	DB	WB		(-25C)	(-20C)	(-17C)	(-15C)	(-8C)	(8C)	(25C)	(30C)	(35C)	(40C)	(45C)	(50C)
18	69.8F (21C)	59F (15C)	TC	19.12	19.86	19.66	19.26	18.87	20.69	21.78	19.94	17.92	12.00	11.58	9.89
			SC	15.11	15.49	15.34	15.03	14.72	16.14	17.00	15.95	15.23	12.00	11.58	9.89
			Input	1.37	1.41	1.48	1.53	1.57	1.60	1.63	1.79	1.96	1.47	1.52	1.32
	75.2F (24C)	62.6F (17C)	TC	20.54	21.45	21.23	20.81	20.38	22.35	23.52	21.54	19.35	12.96	12.51	10.13
			SC	15.35	15.61	15.29	15.40	15.28	16.98	18.35	17.01	15.87	11.53	11.88	9.93
			Input	1.40	1.46	1.53	1.58	1.62	1.65	1.68	1.84	2.01	1.50	1.54	1.35
	80.6F (27C)	66.2F (19C)	TC	21.91	22.46	22.18	22.53	22.85	24.15	25.11	23.85	21.54	14.82	14.22	10.40
			SC	16.44	16.85	16.64	18.05	17.14	18.11	18.33	17.89	16.16	14.52	14.08	10.40
			Input	1.41	1.45	1.51	1.58	1.62	1.65	1.68	1.88	2.05	1.52	1.57	1.36
	89.6F (32C)	73.4F (23C)	TC	23.89	24.48	24.18	24.56	24.91	26.32	27.37	26.00	23.48	16.15	15.50	11.34
			SC	17.20	17.63	17.65	18.17	18.68	19.22	22.44	21.84	20.19	15.18	14.88	11.11
			Input	1.46	1.50	1.56	1.63	1.67	1.72	1.73	1.93	2.14	1.57	1.62	1.41

LEGEND

TC - Total Net Capacity (Btu/hour)

S/T: Sensible Cooling Capacity Ratio

PI: Power Input (kW)

Extrapolated Data

DO NOT PLAN FOR FAILURE!

Load Calculation: WHY? **BIGGER IS NOT BETTER!!!!**

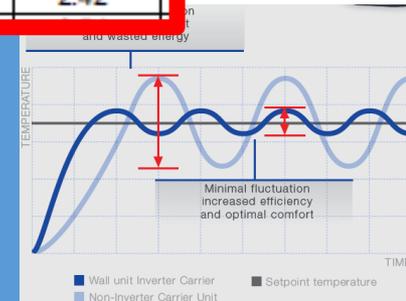
Heating / Cooling output in inverter driven compressors is much higher than that of traditional single speed Heat Pump systems

Now lets look at btu capabilities at certain design conditions:

Model	Heating				Outdoor Cool		
	Indoor Conditions DB	-4F(-20C)	0F(-17C)	5F(-15C)		17F(-8C)	19.4F(-7C)
09(115V)	59F(15C)	TC	5.80	6.21	6.71	8.27	9.11
		Input	0.78	0.79	0.80	0.84	0.90
		COP	2.18	2.30	2.46	2.88	2.97
	64.4F(18C)	TC	4.60	5.02	5.46	8.01	8.84
		Input	0.80	0.81	0.82	0.90	0.94
		COP	1.69	1.82	1.95	2.61	2.76
	69F(20.5C)	TC	4.02	4.11	4.29	7.95	8.55
		Input	0.82	0.83	0.84	0.96	0.98
		COP	1.44	1.45	1.50	2.43	2.56
	71.6F(22C)	TC	3.60	3.86	4.11	7.89	8.41
		Input	0.84	0.84	0.86	0.92	1.02
		COP	1.26	1.35	1.40	2.51	2.42

Heating:

1. Reach set-point faster (if not designed, sized and installed properly risk over-heat in heating / cool and muggy in cooling)
2. If designed, sized and installed properly: maintains set-point tighter than traditional equipment
3. Compressor have a minimum run time at Fmax (Max compressor speed / RPS / Hz): 7 minutes on the high-tier product and a minimum run time of 3 minutes on the mid-tier and comfort series inverter driven equipment.



Load Calculation: Why?

Respondent is assessed an administrative penalty in the amount of \$3,000.

Respondent failed to provide proper installation, service, or mechanical integrity by failing to perform the required Manual J Load calculation, failed to properly install the correct refrigerate tubing flare.

DO NOT PLAN FOR FAILURE!

Installation

MA*R Single Zone HP

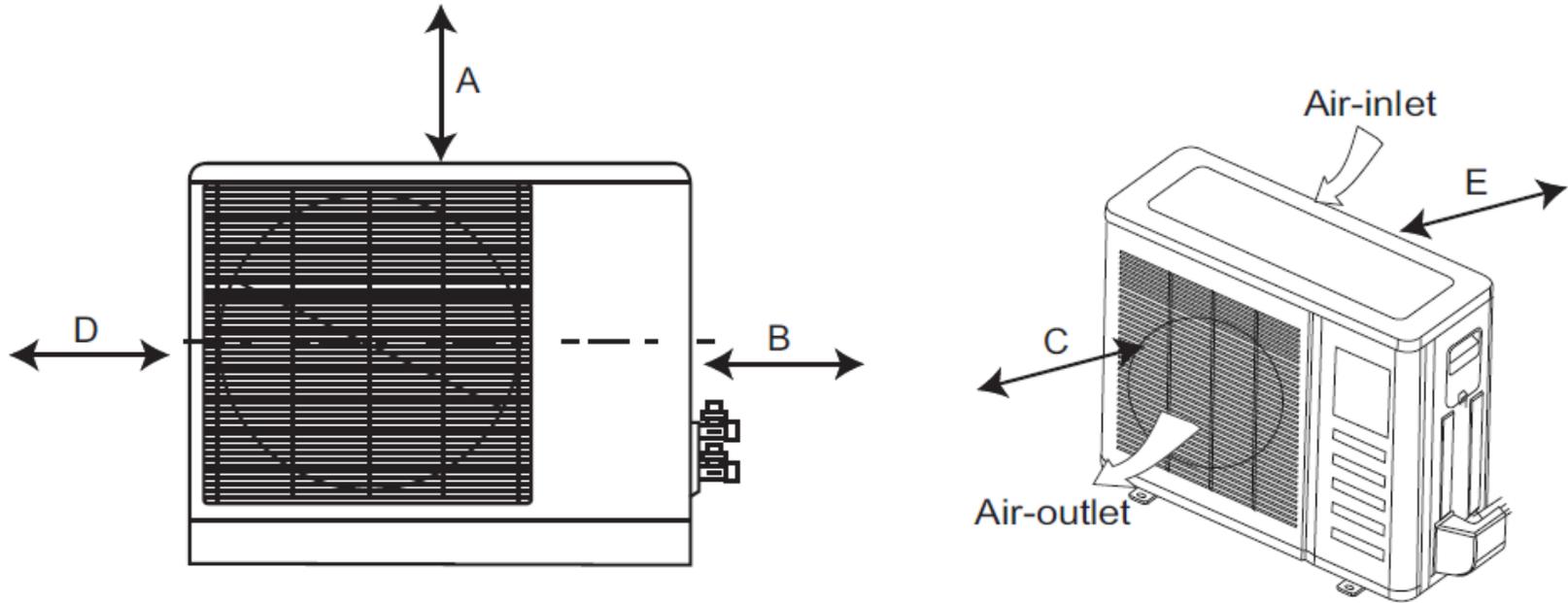
MG*R Multi-Zone HP

What is a quality installation?

- Perform a Manual J Load Calculation
- Read the installation manuals
- Clearances
- Recommended Tools
- Wiring
- Piping (Size, Length, Insulation, Flares)
- Condensate Drain
- Evacuation & Charging
- Homeowner training
- Attention to detail!
- Do not cut corners!

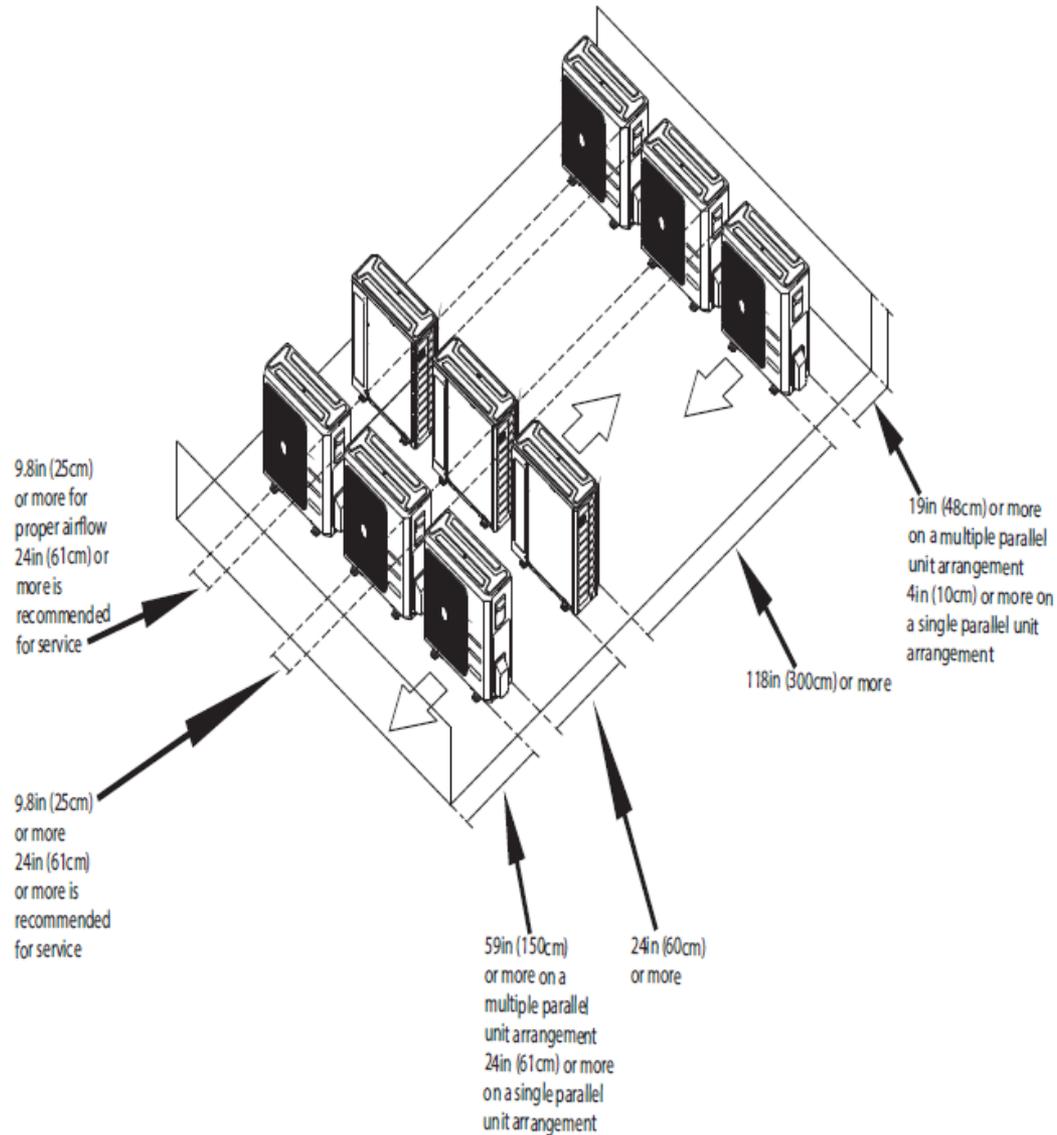
DO NOT PLAN FOR FAILURE!

Clearance 38MA*R



UNIT	MINIMUM VALUE in. (mm)
A	24
B	24
C	24
D	4
E	4

Clearance 38MA*R



What is wrong?



What is Wrong?



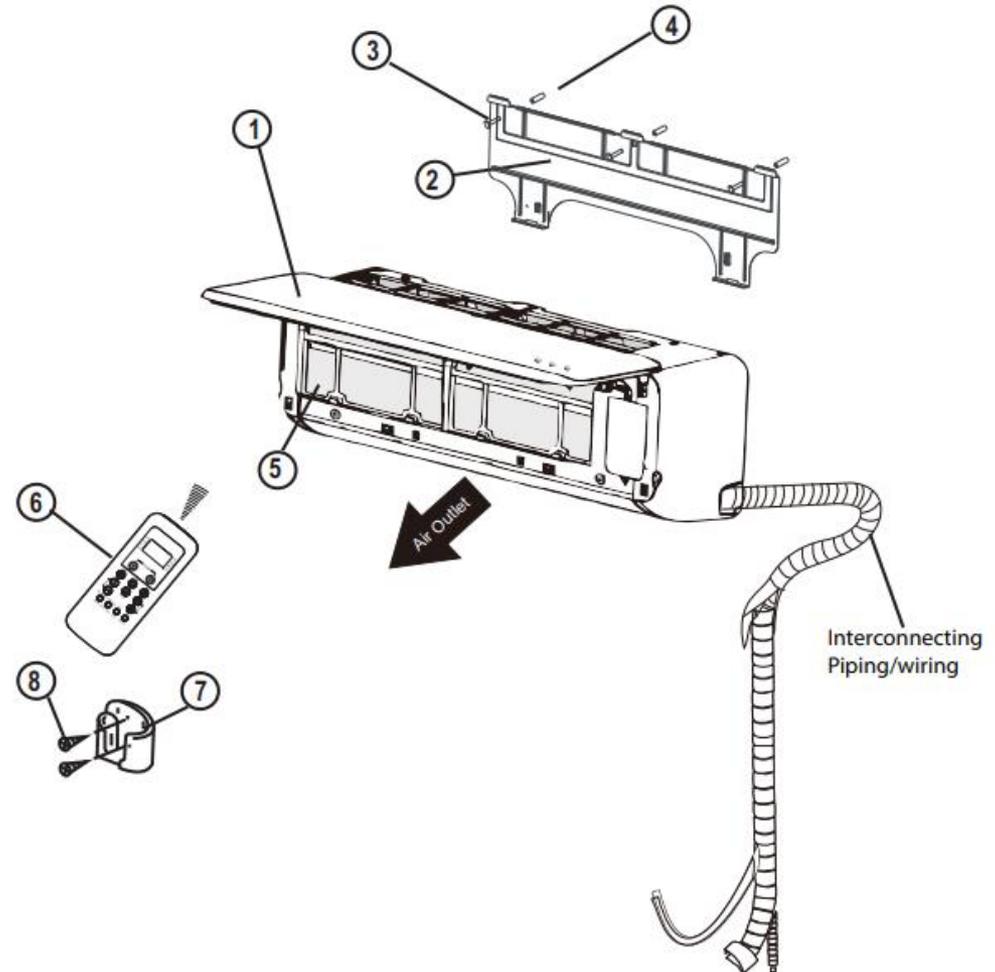
Installation

Highwall

40MAQ Performance High Wall Indoor

Parts List

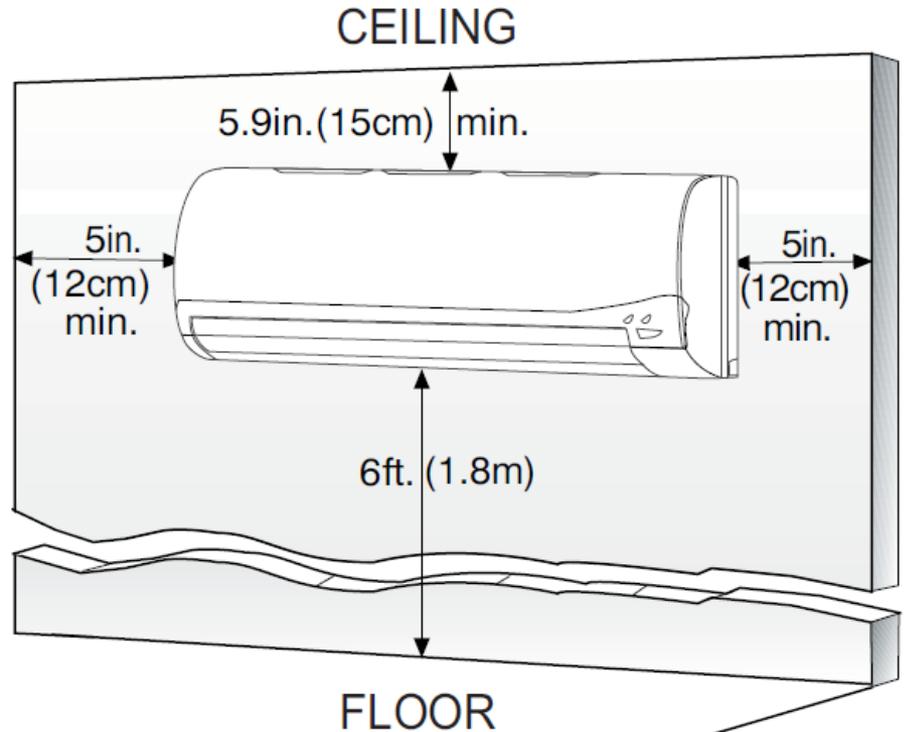
1. Indoor Unit
2. Mounting Plate
3. Five Screws & Anchors
4. Air Filter
5. Wireless Remote Control
6. Flare Nuts for liquid and gas pipes
7. Stencil (Mounting Plate)
8. Installation Instructions
9. Owner's Manual
10. Warranty Card
11. Carbon Filter



Clearance 40MAQ

SELECTING A LOCATION

1. Good air circulation.
2. Drainage
3. Noise will not disturb others.
4. Site will support weight.
5. Locate away from electrical devices (e.g., TV, computers)
6. Do not install near :
 - a. Heat, steam, or combustible gas.
 - b. Curtains or clothing
 - c. Doorways
 - d. Direct sunlight.



SIZE	MAX APPROXIMATE AIR THROW ft. (m)	APPROXIMATE AIR THROW ft. (m) RANGE
9K, 12K	23 (7)	11 (3.5) – 23 (7)
18K	30 (9)	13 (4) – 30 (9)
24K, 30K, 36K	36 (11)	16 (5) – 36 (11)

40MAQ Pipe Sizes

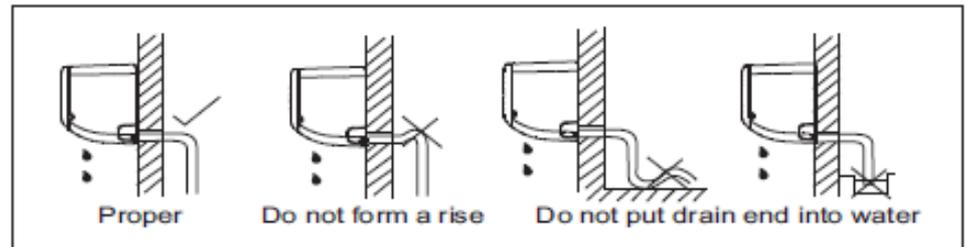
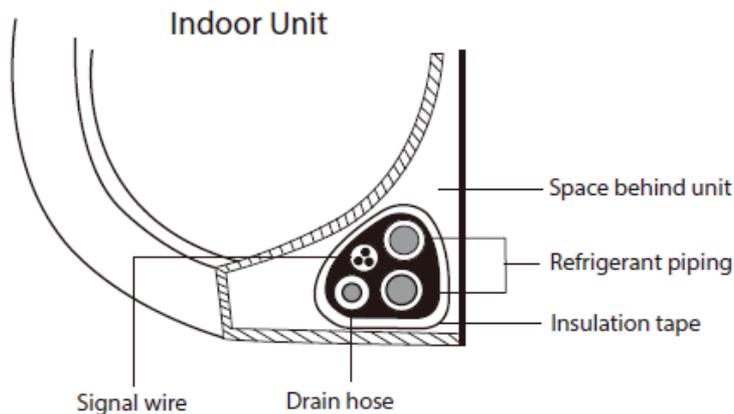
UNIT SIZES		12k (115V)	9K (208/230V)	12K (208/230V)	18K (208/230V)	24K (208/230V)	30K (208/230V)	36K (208/230V)
GAS PIPE	In	1/2	3/8	1/2	1/2	5/8	5/8	5/8
LIQUID PIPE	in	1/4	1/4	1/4	1/4	3/8	3/8	3/8

IMPORTANT: Both refrigerant lines must be insulated separately.

Drain Connections 40MAQ

Connect the drain line. The drain must not have a trap anywhere in its length, must pitch downward, and must be insulated up to the outside wall.

By default, the drain hose is attached to the left-hand side of unit (when facing the back of the unit). However, it can also be attached to the right-hand side.



Terminal Block Location

TERMINAL BLOCK LOCATION

1. Open the indoor unit's front panel.
2. Use a screwdriver to open the wire box cover on the right side of the unit, then open the terminal block cover. This reveals the terminal block.

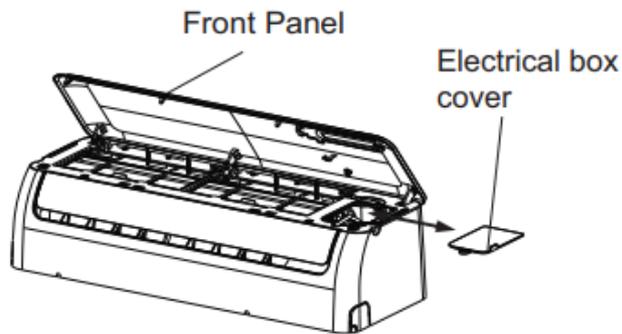


Fig. 13 — Terminal Block Location



Fig. 14 — Control and Power Wiring on Indoor Unit

Recommended Installation Tools

- ✓ Screw Drivers
- ✓ Pliers
- ✓ Wire Strippers, Cutters & Crimpers
- ✓ Hammer
- ✓ Adjustable Wrenches
- ✓ Torque Wrench Set
- ✓ Drill & Bits
- ✓ Hole Saw
- ✓ R-410a Flaring Tool
- ✓ Pipe Cutter/Reamer
- ✓ Utility Knife
- ✓ Drop Cloth
- ✓ 600 PSI nitrogen regulator (min)



- ✓ Dedicated R-410A refrigerant gauge Manifold
- ✓ Good Premium 5/16 Hoses or adaptor fittings
- ✓ Hose Adapters: (Ritchie /Yellow Jacket 19173)
- ✓ Good Quality Digital Charging Scale
- ✓ Refrigerant Recovery Unit & Tank
- ✓ Acetylene Brazing Outfit
- ✓ Vacuum Pump & Fresh Oil
- ✓ Vacuum Micron Gauge
- ✓ Digital Thermometer
- ✓ Electronic Leak Detector
- ✓ Digital Multi-meter and Amp Clamp
- ✓ 15% silver brazing material & Torch
- ✓ Nitrogen tank



DO NOT PLAN FOR FAILURE! 52

Streamline®

Line Sets

DURAGUARD™

SOLAR RESISTANT INSULATION

UV



Streamline® LINE SET FEATURES:



- Made and assembled in the USA
- Copper Tube UL Recognized to 700 PSI MWP
- 10-year limited warranty on copper tube
- R410A Engineered and Tested
- ASTM B1003

Duraguard UV™ INSULATION FEATURES:

- Abrasion and weather resistant polymeric jacket, providing the best protection in the industry
- Offered with ½" wall (R3), ¾" wall (R5), and 1" wall (R7)
- Operating Temperature Range: -70°F to +220°F (ASTM C534)
- Insulating properties of elastomeric foam
- 5-year limited manufacturer warranty on insulation including UV Resistance
- Compliances: ASTM E 84 25/50, 2012/2015 IECC (Res. + Comm.), ASTM G153, UL 94 (fire stop), and CA Title 24, Section 120.3

Refrigerant Line Installation

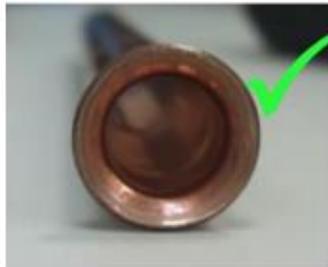
- Always remove inner and outer burrs before flaring and tubing.
- Burrs will act as a metering device causing change in state of the refrigerant resulting in capacity related issues.
- Un-removed burrs can break off and cause serious problems.
- Ream all pipe to the full inside diameter.
- If this rough, inside edge is not removed by reaming, erosion may occur due to local turbulence and increased local flow velocity in the tube. This has the potential to cause restrictions, change state of the refrigerant and increased call backs.
- A correctly reamed pipe will provide an excellent surface for a tight seal and even pressures, velocities and laminar refrigerant flow.



Refrigerant Line Installation



GOOD



VS



BAD



DO NOT PLAN FOR FAILURE!

Refrigerant Line Installation

✓ R-410a Flaring Tool



Why a dedicated R410A Flaring Tool?



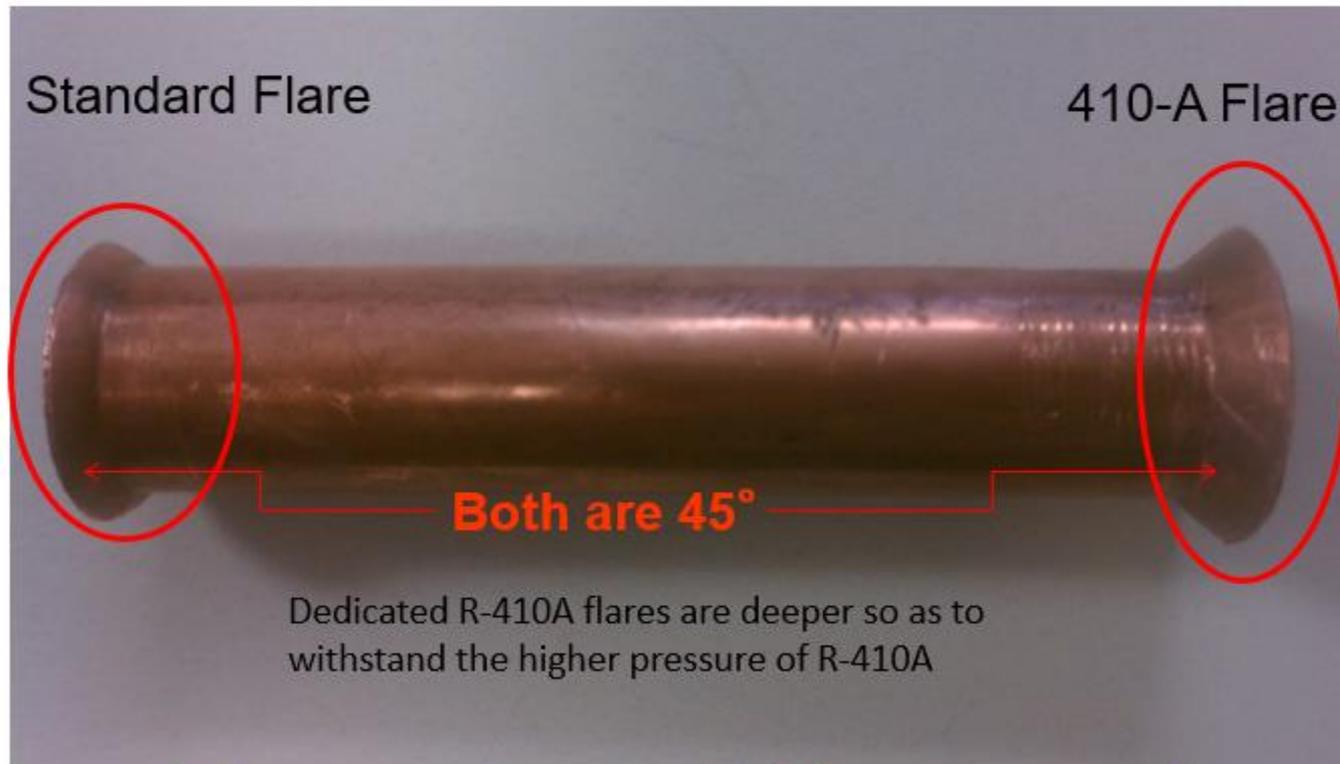
R410A systems operate at high pressures.

- The clutched handle prevents the crushing of the copper tube at the point of the flare. This helps maintain the strength and integrity of the copper tubing so it will withstand the higher operating pressures.
- The concentric cone helps make a uniform flare and reduces the thinning of the tube wall, this also eliminates the need of oil on the inside of the flare which can result in contamination and acid formation within the operating system.

Refrigerant Line Installation

✓R-410a Flaring Tool

Why a dedicated R410A Flaring Tool?



There is a difference!

What is Wrong?



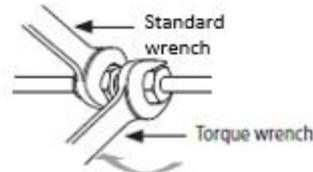
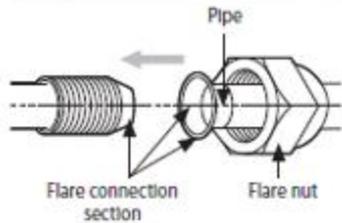
Refrigerant Line Installation

✓ Torque Wrench Set

Preferred Method



Connecting Pipe Outer Dia. (in)	Ft-lbs
Ø1/4"	10 to 13
Ø3/8"	24 to 31
Ø1/2"	37 to 46
Ø5/8"	50 to 60



Installation



VACUUM PUMP OIL



POE OIL



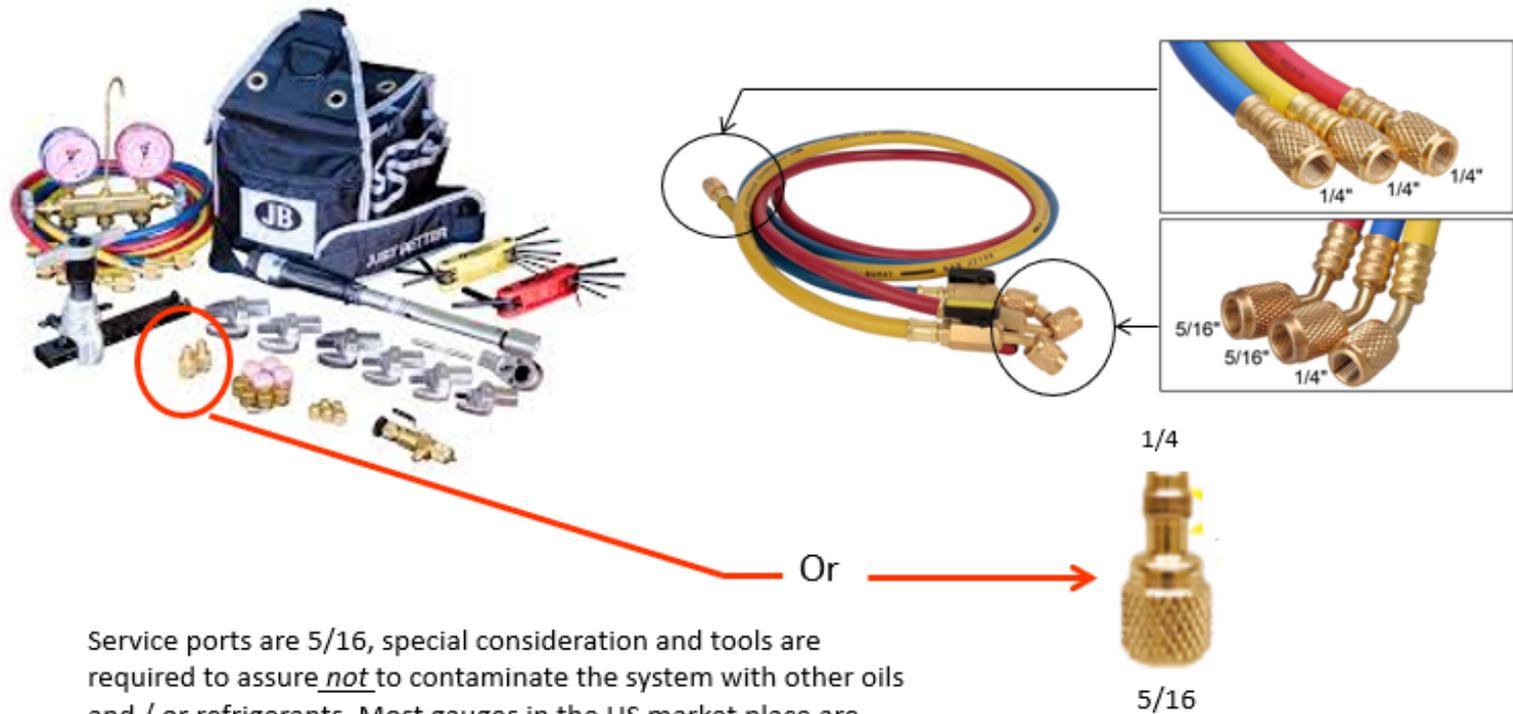
DO NOT PLAN FOR FAILURE!

Installation



Refrigerant Line Installation

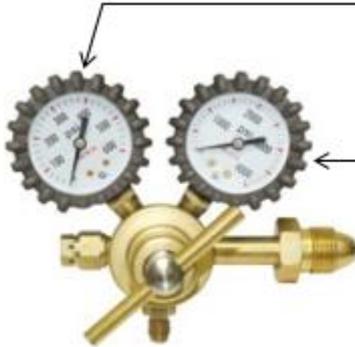
- ✓ Dedicated R-410A refrigerant gauge Manifold
- ✓ Good Premium 5/16 Hoses Highly recommended
or
- ✓ Hose Adapters: (example: Ritchie /Yellow Jacket 19173)



Service ports are 5/16, special consideration and tools are required to assure not to contaminate the system with other oils and / or refrigerants. Most gauges in the US market place are capable of many different refrigerants which use different oils

Refrigerant Line Installation

✓ 600 PSI nitrogen regulator (min)



This is how much pressure is in the bottle



This is output pressure capabilities through the regulator



Carrier Enterprise requires a 500 psi dry nitrogen pressure test on ***all*** DLS system refrigerant piping. *You may find some manuals stating a 150 psi pressure test, this is a cooling only system guideline and should technically still have a 500 psi pressure test.*

It is highly recommended to do a full 24 hr pressure test at the required 500 psi

Refrigerant Line Installation

TECH TIP

The term *dry nitrogen* is not very well defined. Suppliers use their own names for the grades of gas products they sell. All compressed gas contains some level of other substances. The amount is typically measured in parts per million (ppm). The grade of the gas is indicated with two numbers that describe the percentage of purity. The first digit tells how many "9" digits are in the percentage, and the second digit identifies the number after the last "9." A grade 5.6 gas is 99.9996% pure. A 3.0 grade, 99.90% pure, is the minimum acceptable for refrigeration purposes. It is important to ask your gas supplier what the gas grade is you are purchasing and what the level of water is in it.

Source: AHRI Fundamentals of HVACR
Second addition 2013



1500 hour failure test-blockage & moisture

Fatty Acid has formed



POE Oil

Note:

Research grade nitrogen is mandated when performing "med gas" installation. It is highly recommended to install DLS refrigeration piping in the same manner. The final pressure test of 500 psi should be performed using research grade nitrogen. This aids in a cleaner, dryer system that will pull down below 500 microns much easier; many time without the need of triple evacuation.

Refrigerant Line Installation



Carrier ductless systems requires all refrigerant to be weighed into the system prior to the service valves being opened. The amount of refrigerant will vary from system to system. The additional charge needed can be found in the specific products installation manual and is based on oz. per lineal ft. over a predetermined length that the factory charge will handle.

Refrigerant will never need to be removed from a system simply follow the minimum line length guideline.

Refrigerant Line Installation Questions

1. What line size to use?
2. How much vertical separation from indoor to outdoor?
3. What is the minimum piping length?
4. What is the maximum piping length?
5. What is the standard piping length.
6. How much additional refrigerant to charge?



Piping and Refrigerant 38MAR

38MAR SIZE			9K (115V)	12K (115V)	9K (208/230V)	12 (208/230V)	18K (208/230V)	24K (208/230V)	30K (208/230V)	36K (208/230V)
Piping	Min. Piping Length	Ft (m)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)
	Standard Piping Length	Ft (m)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)
	Max. Outdoor indoor height difference	Ft (m)	32 (10)	32 (10)	32 (10)	32 (10)	65 (20)	65 (20)	82 (25)	82 (25)
	Max. Piping Length with no additional refrigerant charge	Ft (m)	26 (8)	26 (8)	26 (8)	26 (8)	26 (8)	26 (8)	26 (8)	26 (8)
	Max. Piping Length	Ft (m)	82 (25)	82 (25)	82 (25)	82 (25)	98 (30)	98 (30)	164 (50)	164 (50)
	Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16 (15)	0.16 (15)	0.16 (15)	0.16 (15)	0.16 (15)	0.32 (30)	0.32 (30)	0.32 (30)
	Gas Pipe	in	3/8	1/2	3/8	1/2	1/2	5/8	5/8	5/8
		(mm)	9.52	12.7	9.52	12.7	12.7	16	16	16
	Liquid Pipe	in	1/4	1/4	1/4	1/4	1/4	3/8	3/8	3/8
		(mm)	6.35	6.35	6.35	6.35	6.35	9.52	9.52	9.52
Refrigerant	Refrigerant Type	–	R410A	R410A	R410A	R410A	R410A	R410A	R410A	R410A
	Heat Pump Models Charge Amount	Lbs (kg)	2.76 (125)	2.76 (125)	3.31 (1.5)	3.31 (1.5)	4.30 (1.95)	5.73 (2.60)	6.06 (2.75)	7.50 (3.40)

IMPORTANT: Both refrigerant lines must be insulated separately.

Indoor Unit Pipe Sizes 38MAR

UNIT SIZES		12K (115V)	9K (208/230V)	12K (208/230V)	18K (208/230V)	24K (208/230V)	30K (208/230V)	36K (208/230V)
GAS PIPE	in	1/2	3/8	1/2	1/2	5/8	5/8	5/8
	(mm)	12.7	9.52	12.7	12.7	16	16	16
LIQUID PIPE	in	1/4	1/4	1/4	1/4	3/8	3/8	3/8
	(mm)	6.35	6.35	6.35	6.35	9.52	9.52	9.52

IMPORTANT: Both refrigerant lines must be insulated separately.

Piping Requirements 38MGR

System Size			18K	24K	30K	36K	48K
Piping	Min. Piping Length per each indoor unit	ft (m)	10 (3)	10 (3)	10 (3)	10 (3)	10 (3)
	Standard Piping Length per each indoor unit	ft (m)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)	25 (7.5)
	Max. outdoor-indoor height difference (OU higher than IU)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)	65 (20)
	Max. outdoor-indoor height difference (IU higher than OU)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)	65 (20)
	Max. height different between indoor units	ft (m)	32 (10)	32 (10)	32 (10)	32 (10)	32 (10)
	Max. Length per each indoor unit	ft (m)	82 (25)	98 (30)	115 (35)	115 (35)	115 (35)
	Max. Piping Length with no additional refrigerant charge per System (Standard Piping length x No. of Zones)	ft (m)	49 (15)	74 (22.5)	98 (30)	123 (37.5)	123 (37.5)
	Total Maximum Piping Length per system	ft (m)	131 (40)	197 (60)	263 (80)	328 (100)	328 (100)
	Additional refrigerant charge (between Standard – Max piping length)	Oz/ft (g/m)	0.16 (15)	0.16 (15)	0.16 (15)	0.16 (15)	0.16 (15)
	Suction Pipe Size	in (mm)	3/8*2 (9.5*2)	3/8*3 (9.5*3)	1/2*1+3/8*3 (12.7*1+9.5*3)	1/2 *2+3/8*2 (12.7*2+9.5*2)	1/2 *2+3/8*3 (12.7*2+9.5*3)
	Liquid Pipe Size	in (mm)	1/4 *2 (6.3*2)	1/4 *3 (6.3*3)	1/4 *4 (6.3*4)	1/4 *4 (6.3*4)	1/4 *5 (6.3*5)
Refrigerant	Refrigerant Type		R410A	R410A	R410A	R410A	R410A
	Charge Amount	Lbs (kg)	4.41 (2.0)	6.17 (2.8)	6.61 (3.0)	10.14 (4.6)	10.14 (4.6)

Refrigerant Piping:

Line sets to be sized based on the connection size of the indoor unit. Each pipe should be insulated individually.

Conversion Joints 38MGR

No. of Zones	Size	Adaptor	Qty.
2 zone	18	3/8"--1/2"	2
3 zone	24	3/8"--1/2"	3
4 zone	30	3/8"--1/2"	3
		1/2"--3/8"	1
		1/4"--3/8"	1
		1/2"--5/8"	1
4 zone 5 zone	36 48	1/2"--3/8"	2
		1/4"--3/8"	2
		1/2"--5/8"	2
		3/8"--1/2"	3



Conversion Joints:

The outdoor unit includes a package of conversion joints to facilitate installation of the various fan coil sizes. The joints are to be connected to the outdoor unit as needed to match the line set size.



Evacuation & Charge

38MG*R Multi-Zone HP

Refrigerant Line Installation

Requirements:

500 micron hold, pump not running for a minimum of 1 hr. No rise!

If the micron level raises and stops: you still have moisture in the system and need to continue to vacuum the system.

If the micron level rises and continues to rise, you have a leak which should have been found during the pressure test portion of the installation, locate and repair the leak. Perform another pressure test followed by a new vacuum with a 500 micron hold.



Refrigerant Line Installation



10 Step – Evacuation

1. Change pump oil with new oil from unopened container.
2. Connect all hoses, valves and micron gauge.
3. Leave all outdoor unit service valves closed.
4. Open manifold and vacuum pump valves, leave ball valve adapters closed.
5. Operate vacuum pump to test your equipment. Gauge should read <math><100</math> microns within one minute if hoses, manifold and valves are leak free (and if oil is not moisture laden). Do not proceed until it does.
6. Open adapter ball valves and pull vacuum on piping and indoor units.

Refrigerant Line Installation

10 Step – Evacuation

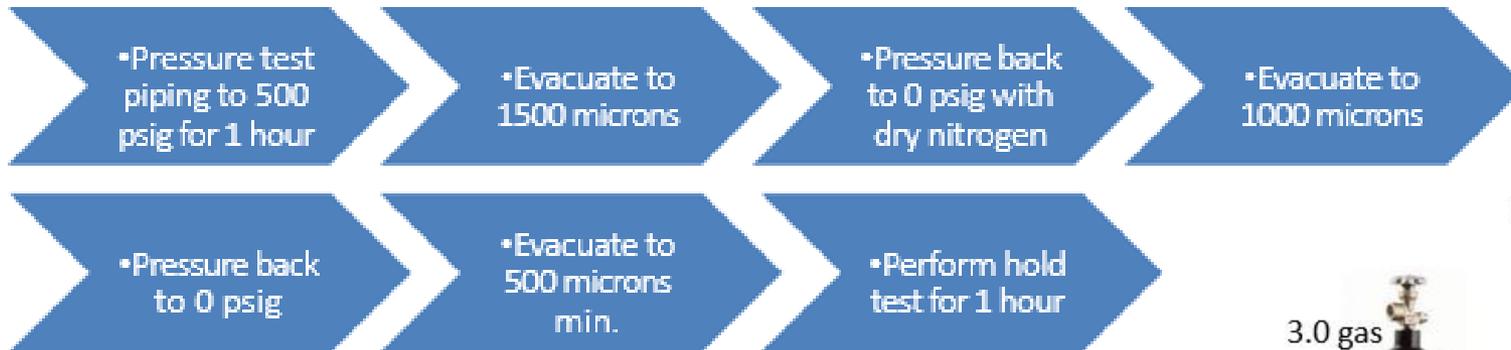


7. When micron gauge reaches 1000, close vacuum pump valve for rise test. Micron level should rise a bit but **MUST** eventually stop rising for 15 minutes.
8. If it does not stop rising, there is a leak. If it stops, re-open pump valve and continue evacuation to lowest micron level possible (this could be as low as 125 microns, depending on where gauge is connected).
9. Close pump valve and read actual system microns when gauge stays steady at one reading for a minimum of 15 minutes. If this happens above 500, continue evacuation until static micron level is 500 microns or less.
10. If vacuum does not rise, but 500 microns cannot be reached, triple evacuation may be necessary.

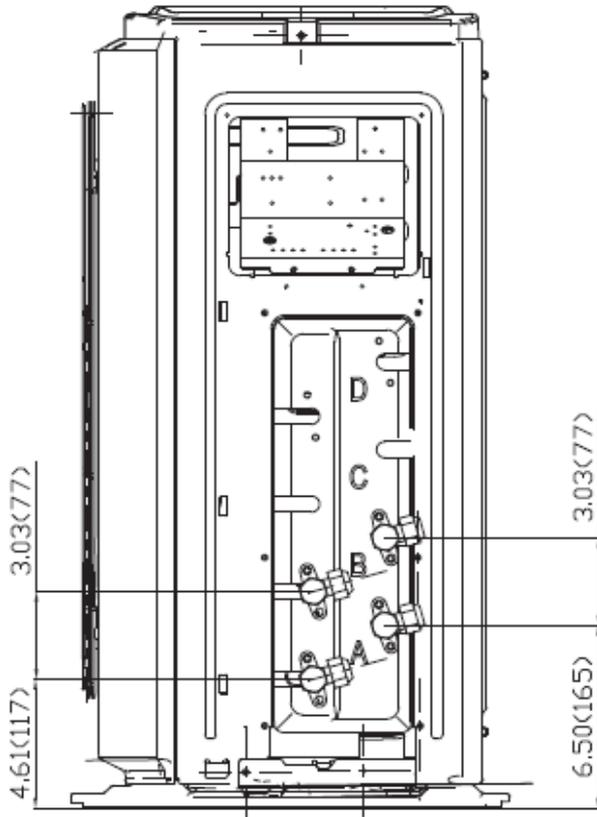
Refrigerant Line Installation



Triple Evacuation if needed

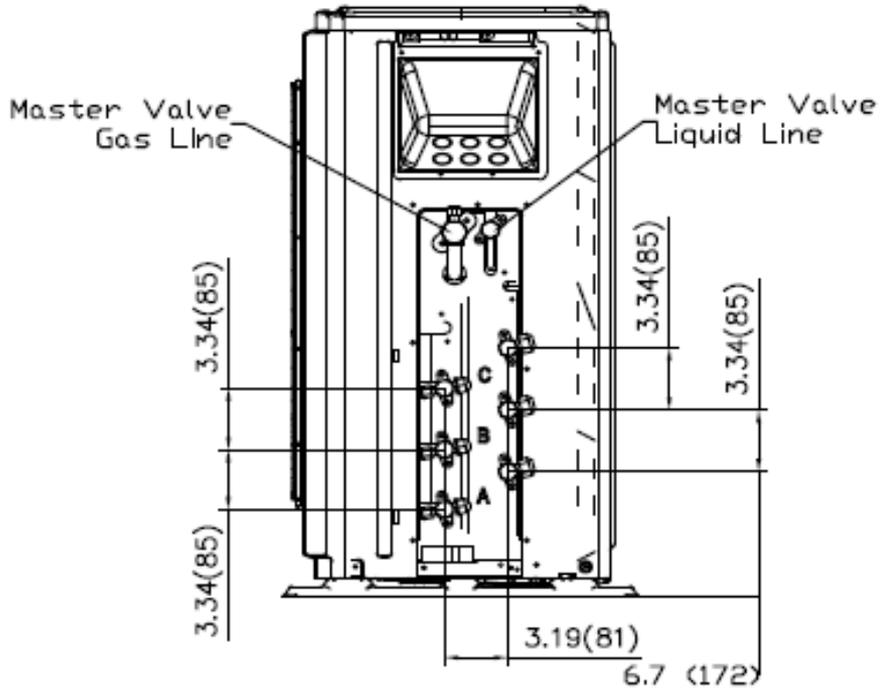


38MGR Size 18K

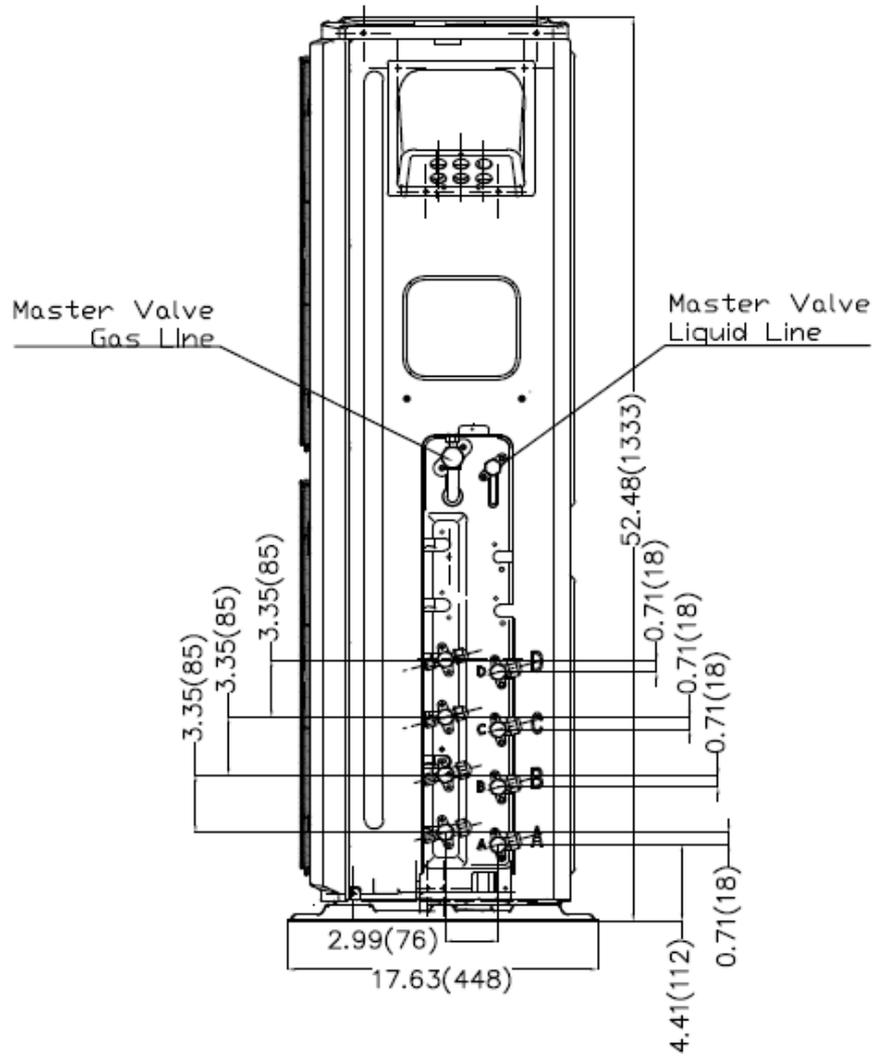


Master valves are not available on the 18K unit.

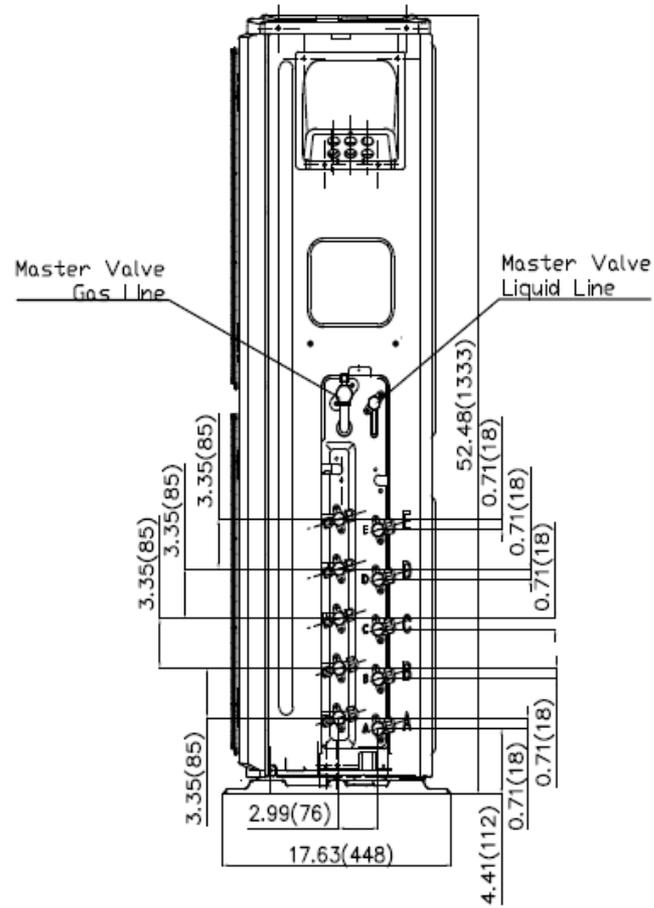
38MGR Size 24K



38MGR Size 36K



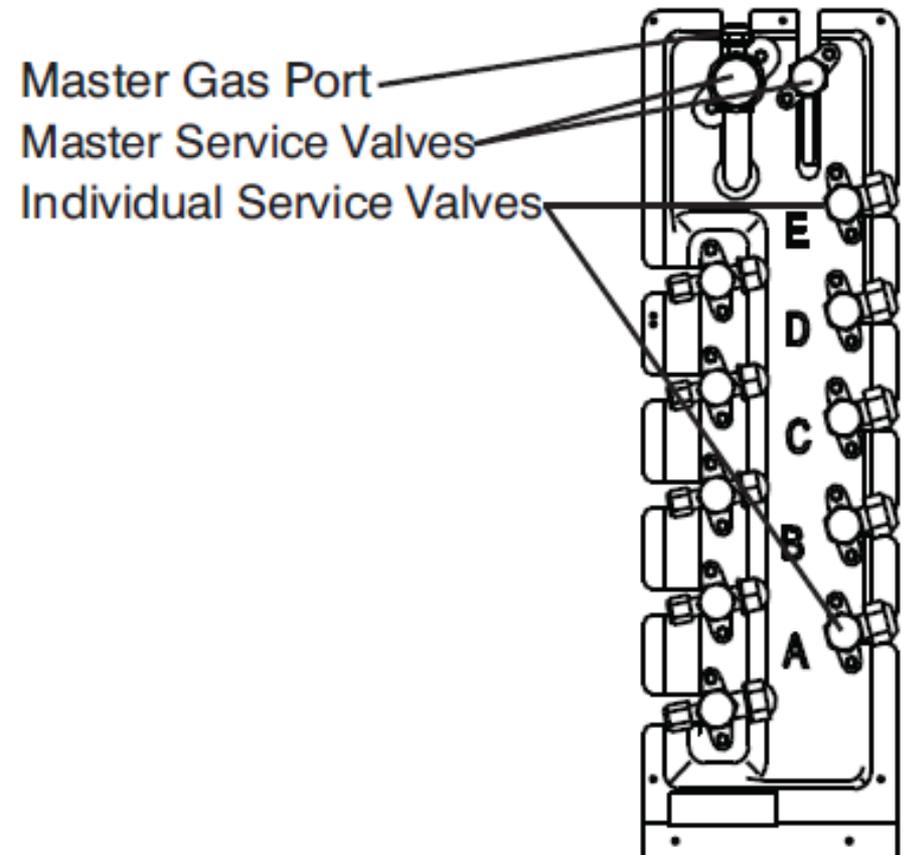
38MGR Size 48K



38MGR Evacuation & Charge

Refrigerant Pipes and indoor unit coils should be evacuated to 500 microns.

All units except the 18,000 BTU model have a Master Suction and Liquid Line Service Valve.



38MGR Evacuation Size 18

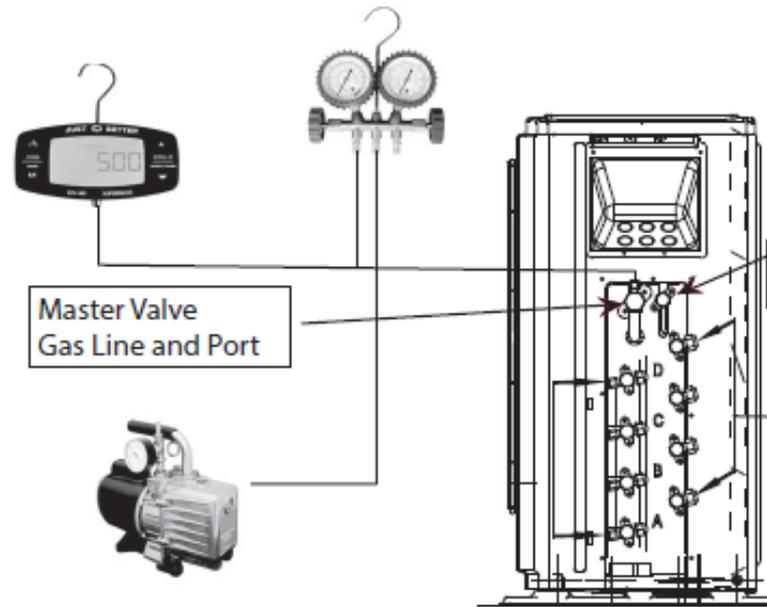
1. Completely tighten the flare nuts of the liquid and gas pipes on the outdoor unit and all indoor fan coils.
2. Pressure test the lines with nitrogen and leak test flare nuts with leak soap.
3. For size 18, DO NOT open the gas or liquid service valves until the evacuation is complete.
4. For size 18, connect the manifold gauge (low side hose using the 5/16" to 1/4" adapter) to the individual service valve to evacuate each of the circuits.

38MGR Evacuation Size 24-48

1. Completely tighten the flare nuts of the liquid and gas pipes on the outdoor unit and all indoor fan coils.
2. Pressure test the lines with nitrogen and leak test flare nuts with leak soap.
3. For sizes 24-48, fully open all the connected individual service valves (with the line set attached). DO NOT open the Master Service Valves until the evacuation is complete.
4. For sizes 24-48, connect the manifold gauge (low side hose) to the Master Service Valve (using the 5/16" to 1/4" adapter) to evacuate all circuits at the same time.

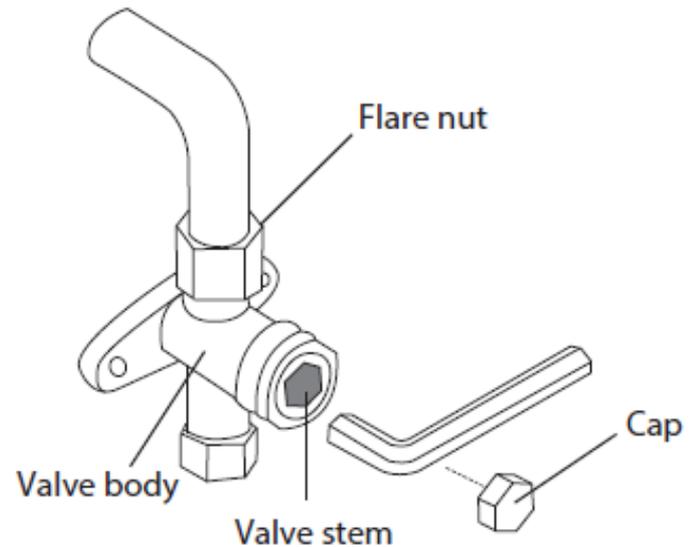
38MGR Evacuation Size 18-48

5. Connect the charge hose to the vacuum pump.
6. Fully open the low-pressure valve on the manifold gauge.
7. Start the vacuum pump.
8. Evacuate to 500 microns.
9. After the evacuation is complete, fully close the low-pressure valve on the manifold gauge and stop the vacuum pump operation.



38MGR Evacuation 18-48

10. Weigh-in additional charge if required.
11. Insert a hexagonal wrench into each Gas side Service valve for size 18 or into the Master Gas Side Service Valve for sizes 24-48 and open the valve by turning the wrench $\frac{1}{4}$ counterclockwise. Listen for gas to exit the system.
12. Fully open all the gas and liquid service valves.



Electrical

Wiring

ALL WIRING MUST BE SIZED PER NEC OR CEC AND LOCAL CODES

Wire Type

- 14/4 600V rated Mini-Split rated
- Typically, THHN or THWN

Not Acceptable:

SJ Cord
SO Cord
SJO Cord
SJOW Cord
SJOOW Cord
BX Cable
Romex



Wiring

POWER WIRING

Inverter systems typically use 14/4



CONTROL WIRING

Stranded and shielded wire only



DO NOT PLAN FOR FAILURE!

Duckt-Strip

Applications

- Duckt-Strip is a Type Universal Hybrid Power and Signal Cable that meets all standards and compliances for a ductless mini-split installation.

Innovations

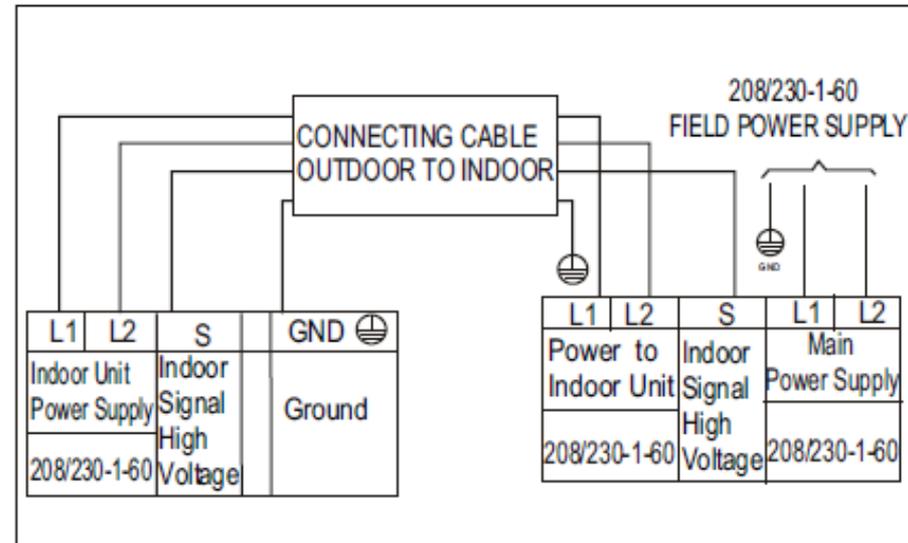
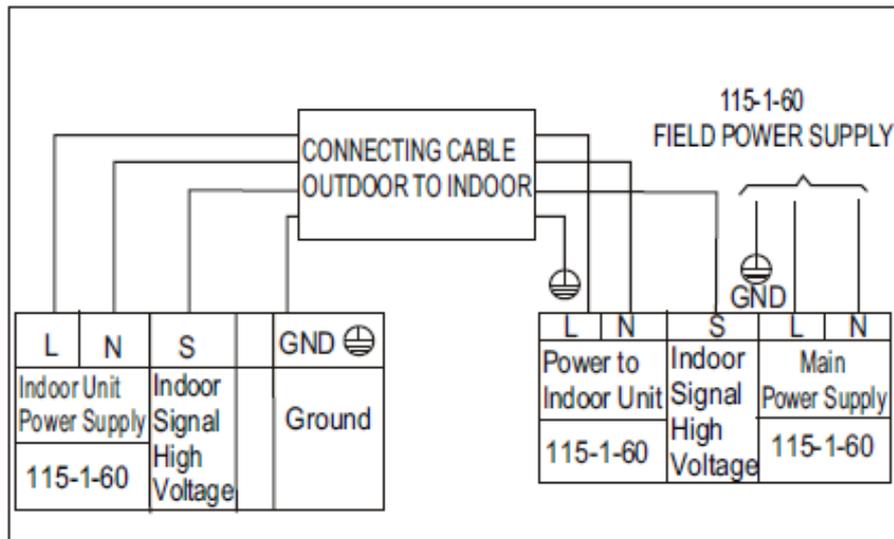
- Innovative Rip-N-Strip technology
- No blade required
- One wire both covers interior/exterior compliance.

Grey & Yellow PVC Jacket

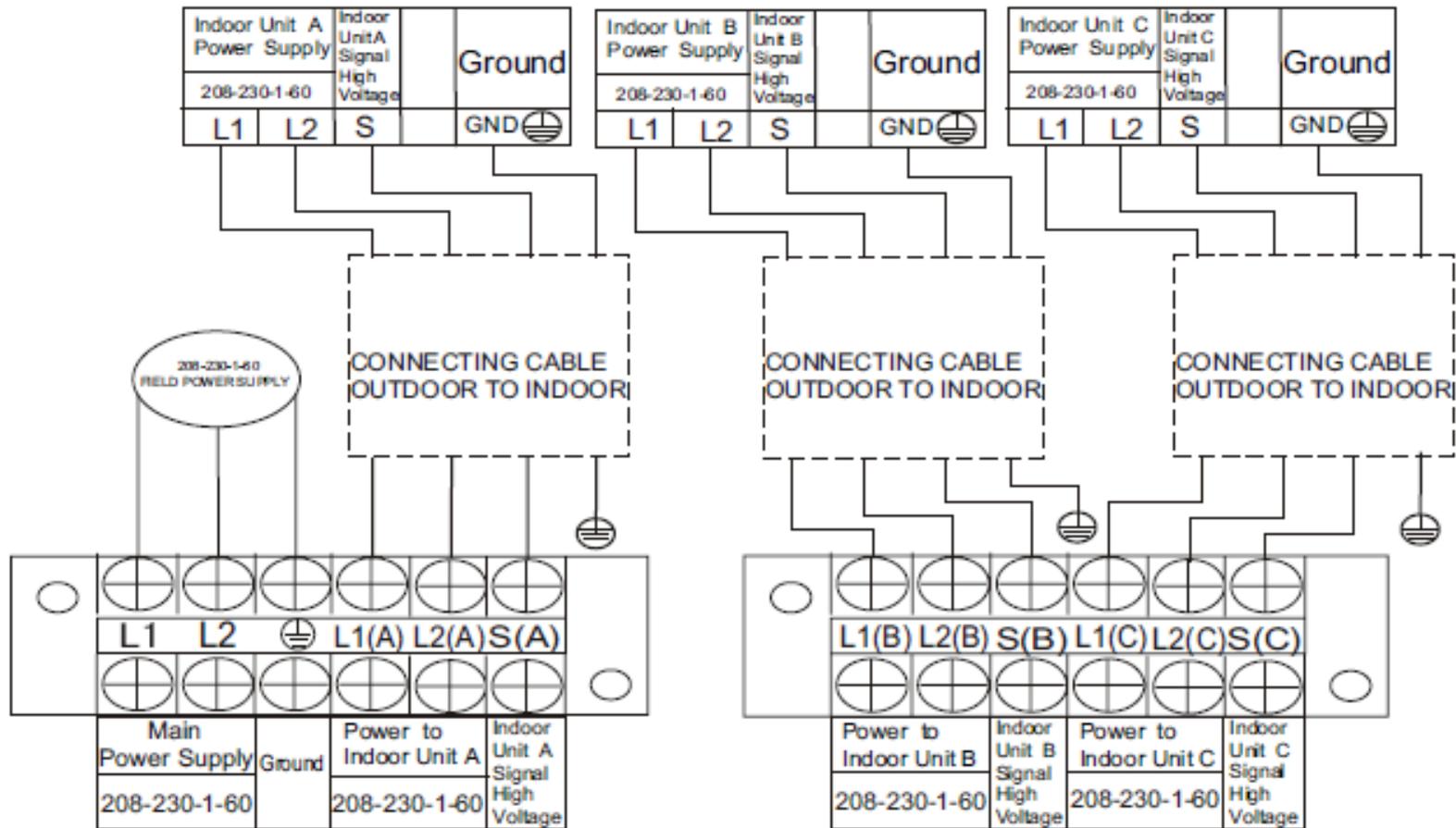
- Sunlight resistant.
- Outdoor rated.
- Direct buried approved.



Connection Diagram



Connection Diagram Multi-Zone



Start-Up

Start-Up

STEP 1  Apply power to the outdoor disconnect from the house electrical breaker panel



STEP 2  Insert the disconnect at the outdoor unit

NOTE: When power is applied you should hear a series of clicking from the outdoor unit. These noises are the board and the electronic valves being energized.



Start-Up

EXAMPLE: 208/230 volt unit needs a supply power of 187-256 AC volts



Start-Up

STEP 3  Check power supply at the indoor unit Terminals L1 and L2. Power will read between 210-240 Volts AC

STEP 4  4-Check the power at the outdoor unit. There should be the same supply voltage to L1 and L2 as power supply to the outdoor unit.

NOTE: Be sure to check between Terminals L1 and L2 and not each leg to the ground

Start-Up

STEP 5  Turn the unit on with the remote by pressing the power button. It will be a large orange button

- The unit will beep to let you know it received the signal from the remote
- The display will come on and the air louvers will open



Start-Up

STEP 6  Set up the unit to one of the following modes:

- Cool (snowflake)
- Heat (sun)

After the indoor unit is turned on there will be a 30 second time delay for the outdoor unit to come on

Wait 5 minutes for the compressor to reach full speed

Start-Up

- STEP 7** Check the TD in “COOL”. If the TD is between 20-30 degrees, your charge is correct
(TD= Temp in – Temp out) Temperature Differential



- STEP 8** Check the TD in “HEAT” mode.
If the TD is between 30-40 degrees, your charge is correct. You will see this when temperature is above 30° F.

Start-Up

STEP 9  Test the unit in both heating and cooling, if weather permits

- After selecting the mode, select the desired room temperature
- For testing purposes: lower the temperature all the way in cooling or raise it all the way for heating
- Set the fan to “High” by pressing the “Fan” Button

Advanced Service

“Understanding what you are working on is the first step to troubleshooting.”

Advanced Service:

- How to find information in HVACPartner's
- Safety
- Thermistors
- Error Code Indication
- System Components
- Wire Schematics
- Inputs/Output Tables
- System Inquiry
- Error Diagnosis

Finding information in HVACPartner's

38MGR
Multi-zone Outdoor Unit Ductless System
Sizes 18, 24, 30, 36 and 48

SERVICE MANUAL

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SAFETY CONSIDERATIONS

Installing, starting up, and servicing air-conditioning equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.).

Only trained, qualified installers and service mechanics should install, start-up, and service this equipment.

Untrained personnel can perform basic maintenance functions such as coil cleaning. All other operations should be performed by trained service personnel.

When working on the equipment, observe precautions in the literature and on tags, stickers, and labels attached to the equipment.

Follow all safety codes. Wear safety glasses and work gloves. Keep a quenching cloth and fire extinguisher nearby when brazing. Use care in handling, rigging, and setting bulky equipment.

Read this manual thoroughly and follow all warnings or cautions included in the literature and attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements. Recognize safety information.

This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: **DANGER**, **WARNING**, and **CAUTION**.

These words are used with the safety-alert symbol. **DANGER** identifies the most serious hazards which **will** result in severe personal injury or death. **WARNING** signifies hazards which **could** result in personal injury or death. **CAUTION** is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. **NOTE** is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.

 **WARNING**

ELECTRICAL SHOCK HAZARD
Failure to follow this warning could result in personal injury or death.
Before installing, modifying, or servicing system, main electrical disconnect switch must be in the OFF position. There may be more than 1 disconnect switch.
Lock out and tag switch with a suitable warning label.

 **WARNING**

EXPLOSION HAZARD
Failure to follow this warning could result in death, serious personal injury, and/or property damage. Never use air or gases containing oxygen for leak testing or operating refrigerant compressors. Pressurized mixtures of air or gases containing oxygen can lead to an explosion.



 **CAUTION**

EQUIPMENT DAMAGE HAZARD
Failure to follow this caution may result in equipment damage or improper operation.
Do not bury more than 36 in. (914 mm) of refrigerant pipe in the ground. If any section of pipe is buried, there must be a 6 in. (152 mm) vertical rise to the valve connections on the outdoor units. If more than the recommended length is buried, refrigerant may migrate to the cooler buried section during extended periods of system shutdown. This causes refrigerant slugging and could possibly damage the compressor at start-up.

INTRODUCTION

This service manual provides the necessary information to service, repair, and maintain the multi-zone family of heat pumps. This manual has an appendix with data required to perform troubleshooting. See "APPENDICES" on page 64. Use the "TABLE of CONTENTS" on page 1 to locate a desired topic.

Safety

Safety

Electricity power is kept in capacitors even if the power supply is shut off.

NOTE: Remember to discharge the electricity power in capacitor.

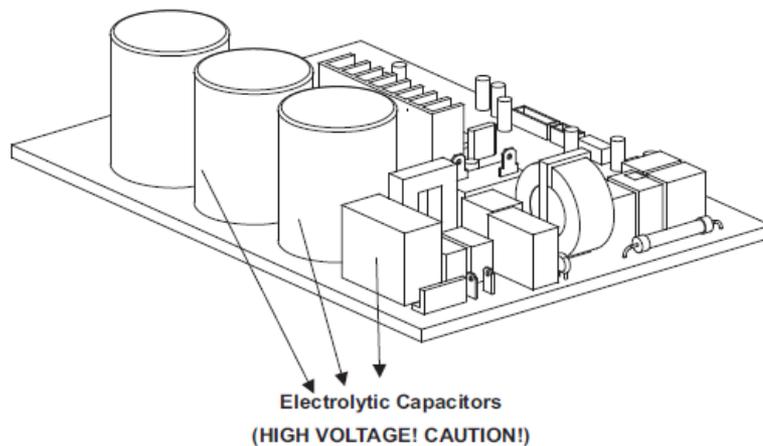


Fig. 26 —Electrolytic Capacitors

For other models, please connect discharge resistance (approximately 100Ω 40W) or a soldering iron (plug) between the +, - terminals of the electrolytic capacitor on the contrary side of the outdoor PCB.

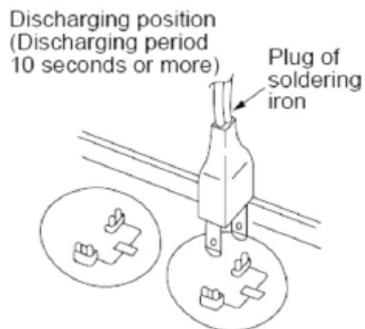


Fig. 27 —Discharge Position

NOTE: Fig. 27 is for reference only. The plug on your unit may differ.

Thermistors

MA*R and MG*R

- T1 - Return Air Temperature 10K
- T2 - Evaporator Coil Temperature 10K
- T3 - Condenser Coil Temperature 10K
- T4 - Outdoor Air Temperature 10K
- T5 - Discharge Temperature 5K @ 90° C

MG*R Light Commercial

- Evaporator Suction Temperature

Thermistors



What it does:

Provides indoor unit circuit board temperature inputs.

How to check it:

- Read resistance and compare to temperature/resistance chart in appendix of Service Manual.
- Check Voltage.

Findings:

- Matches chart in service manual.

Appendix Temp/Resistance Table

APPENDIX 1

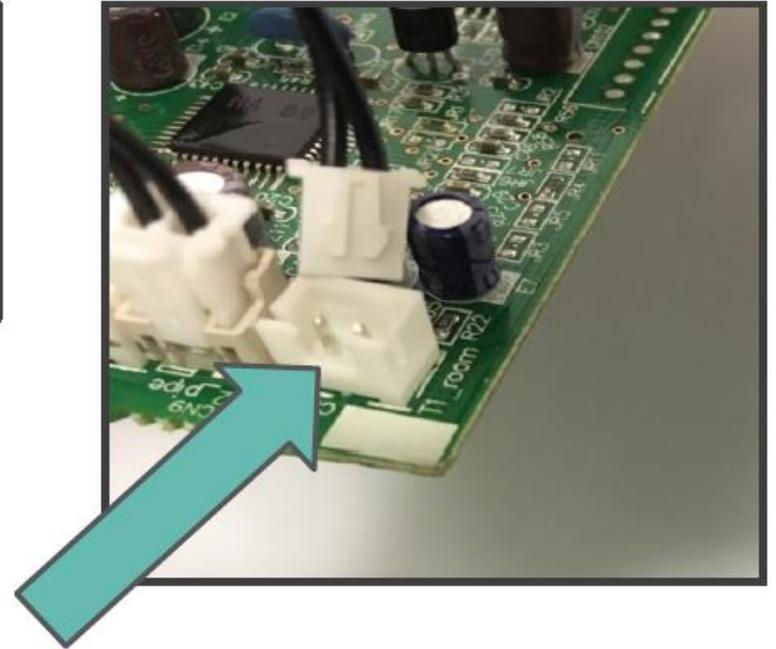
Table 52—Temperature Sensor Resistance Value (°C–K Ohm) T1, T2, T3, T4, T2B

°C	K Ohm	°C	K Ohm	°C	K Ohm	°C	K Ohm
–20	115.266	20	12.6431	60	2.35774	100	0.62973
–19	108.146	21	12.0561	61	2.27249	101	0.61148
–18	101.517	22	11.5000	62	2.19073	102	0.59386
–17	96.3423	23	10.9731	63	2.11241	103	0.57683
–16	89.5865	24	10.4736	64	2.03732	104	0.56038
–15	84.2190	25	10.000	65	1.96532	105	0.54448
–14	79.3110	26	9.55074	66	1.89627	106	0.52912
–13	74.5360	27	9.12445	67	1.83003	107	0.51426
–12	70.1698	28	8.71983	68	1.76647	108	0.49989
–11	66.0898	29	8.33566	69	1.70547	109	0.48600
–10	62.2756	30	7.97078	70	1.64691	110	0.47256
–9	58.7079	31	7.62411	71	1.59068	111	0.45957
–8	56.3694	32	7.29464	72	1.53668	112	0.44699

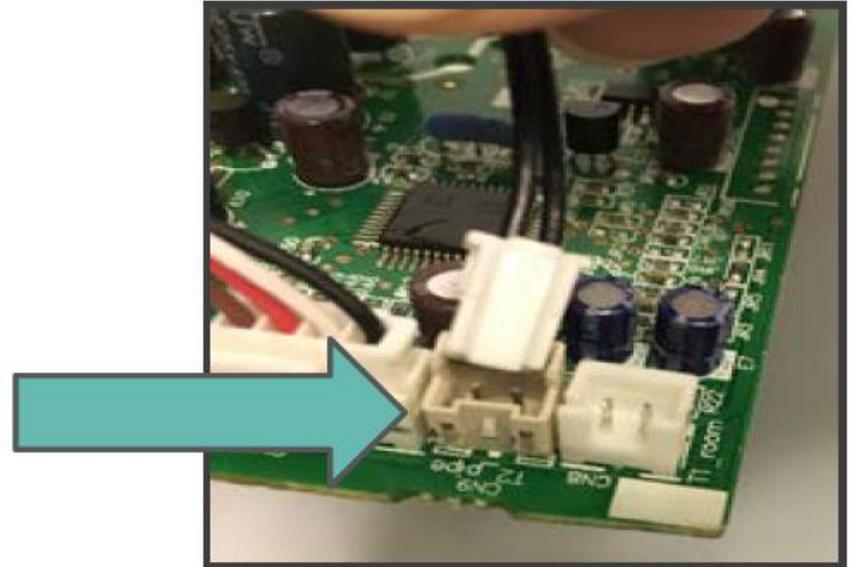
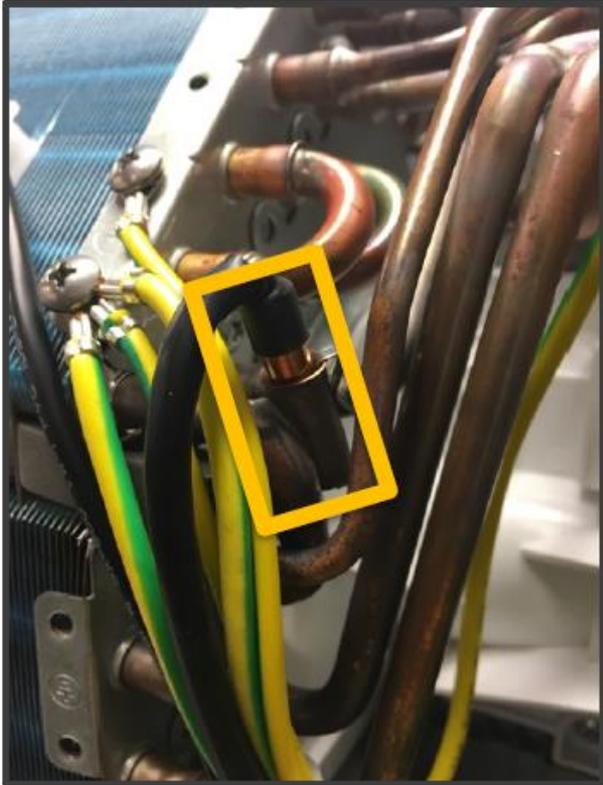
T1 – Return Air Thermistor



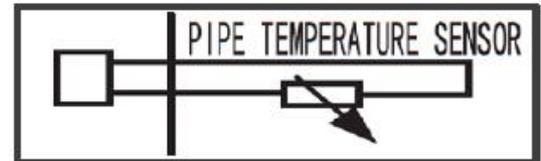
Wire Schematic Label



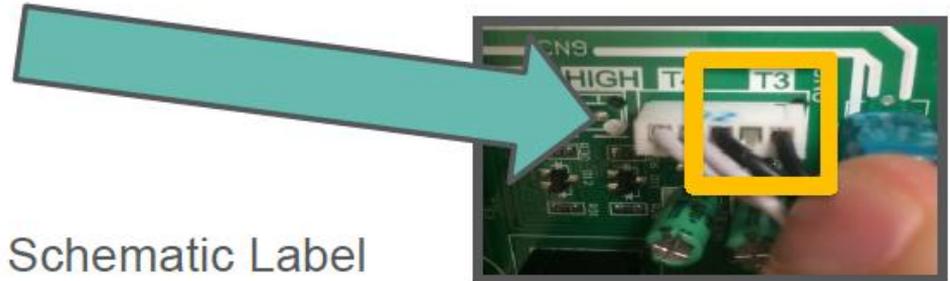
T2 – Evaporator Coil Thermistor



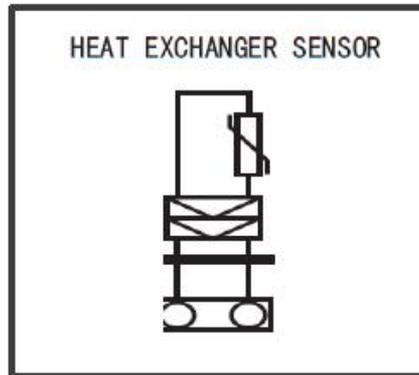
Wire Schematic Label



T3 – Condenser Coil Thermistor



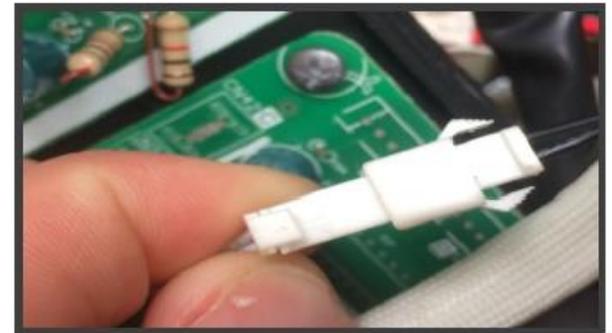
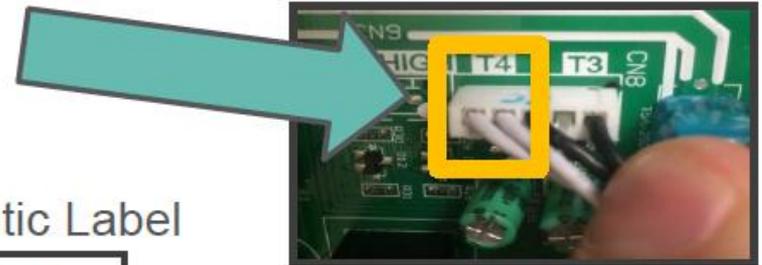
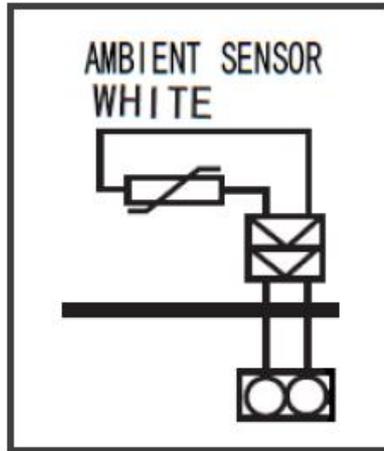
Wire Schematic Label



T4 – Outdoor Air Thermistor



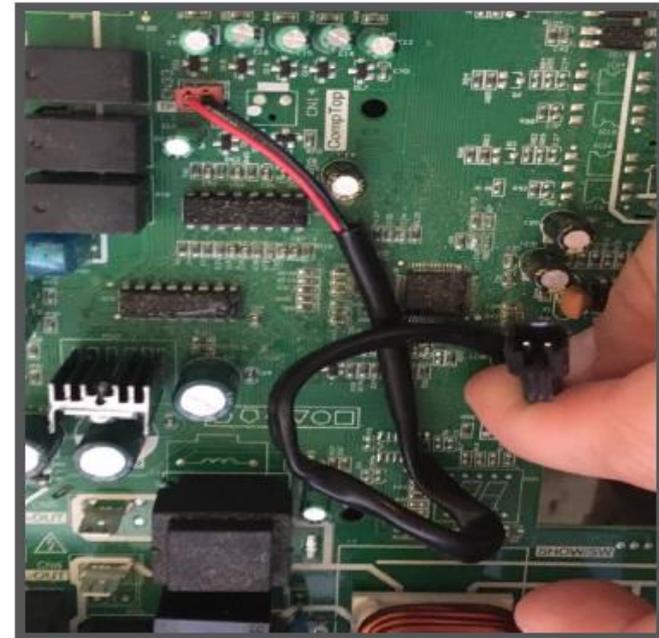
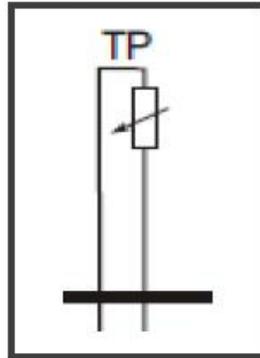
Wire Schematic Label



T5 – Discharge Thermistor



Wire Schematic Label



Error Code Indication

Performance

MA*R Single Zone HP & MG*R Multi-Zone HP



MAR Sizes

- 9,000 Btu
- 12,000 Btu
- 18,000 Btu

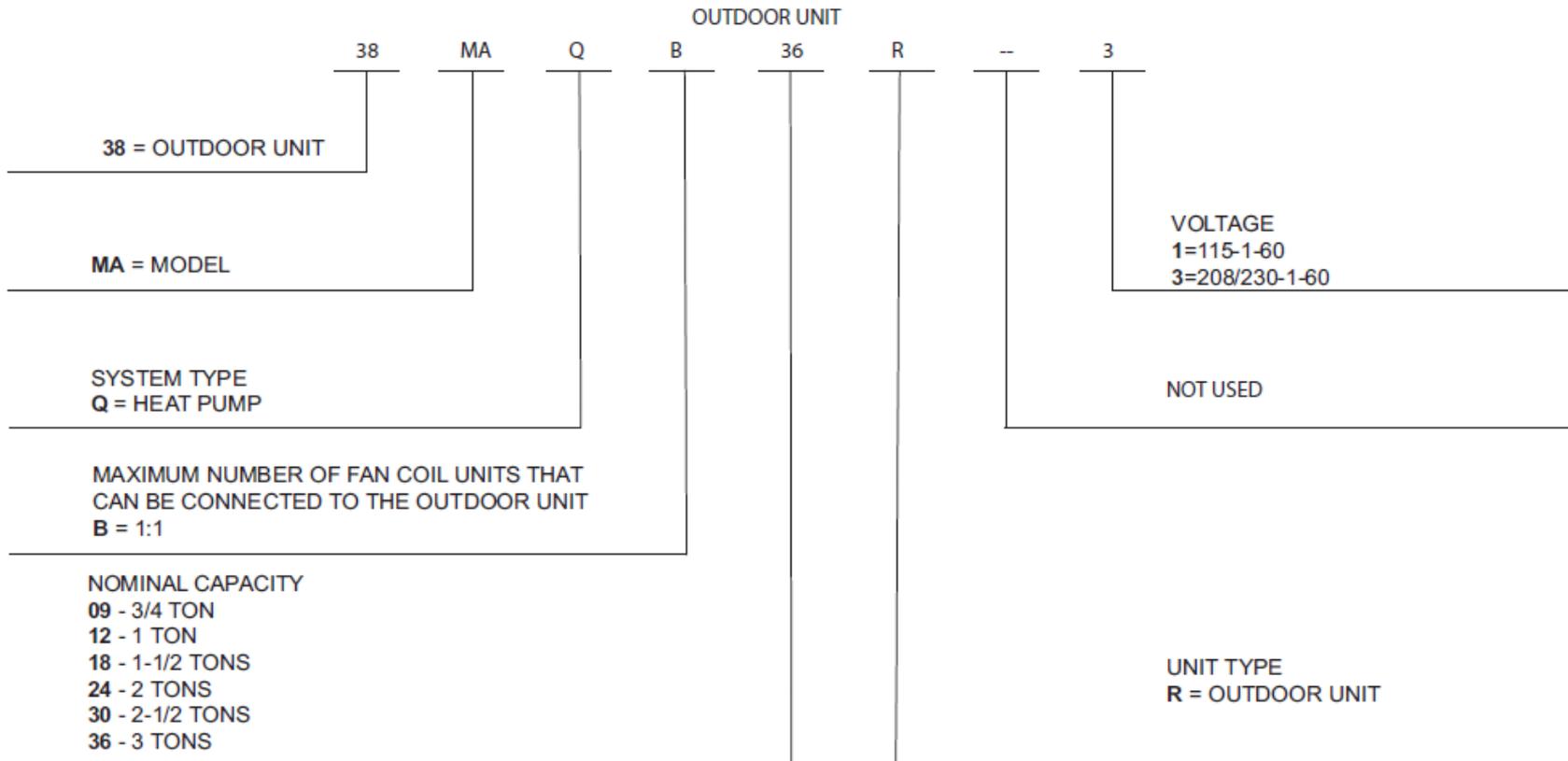
Inverter & Main PCB
Combined

- 24,000 Btu
- 30,000 Btu
- 36,000 Btu

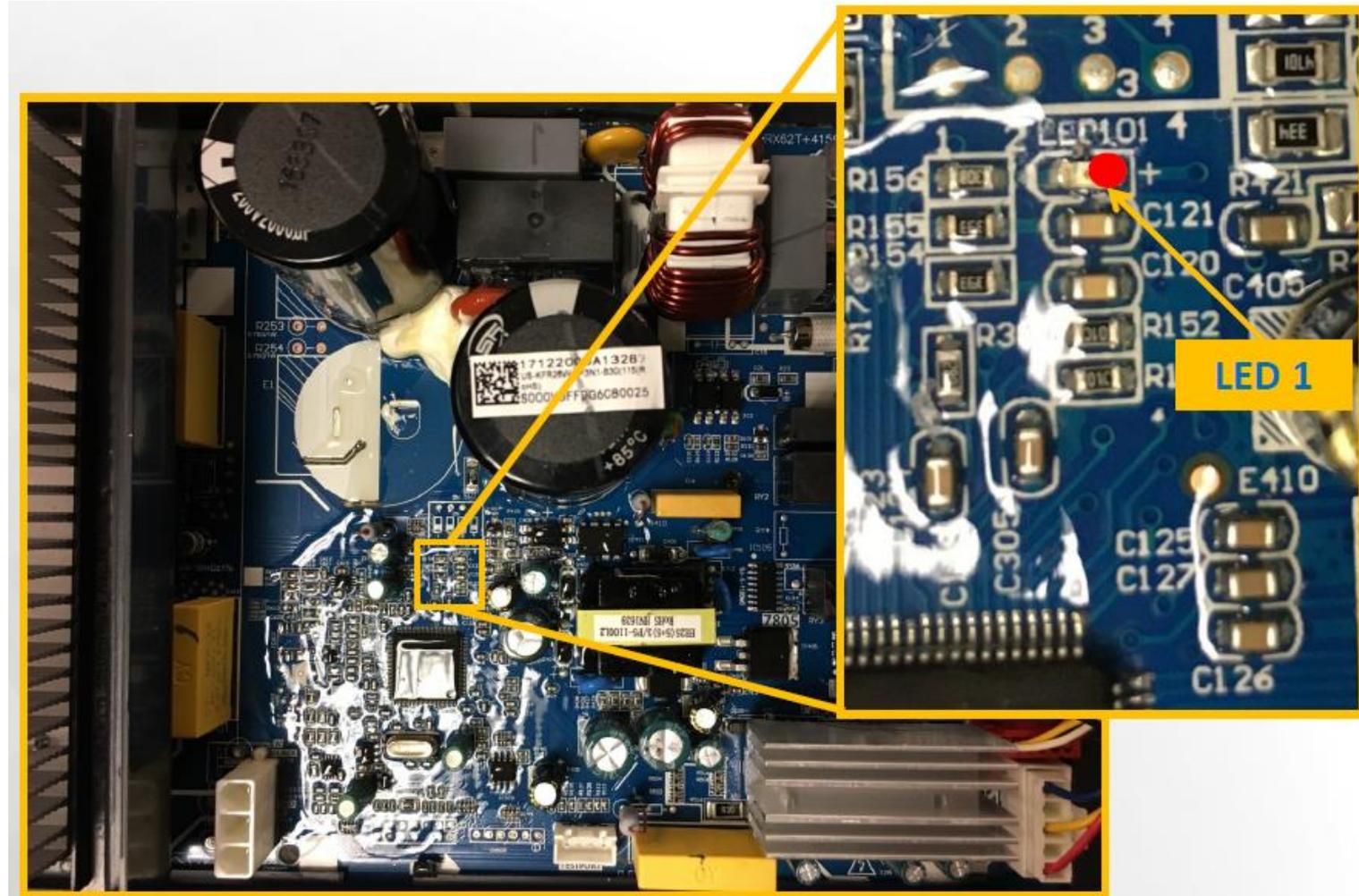
Inverter & Main PCB
Separate

MAR Sizes

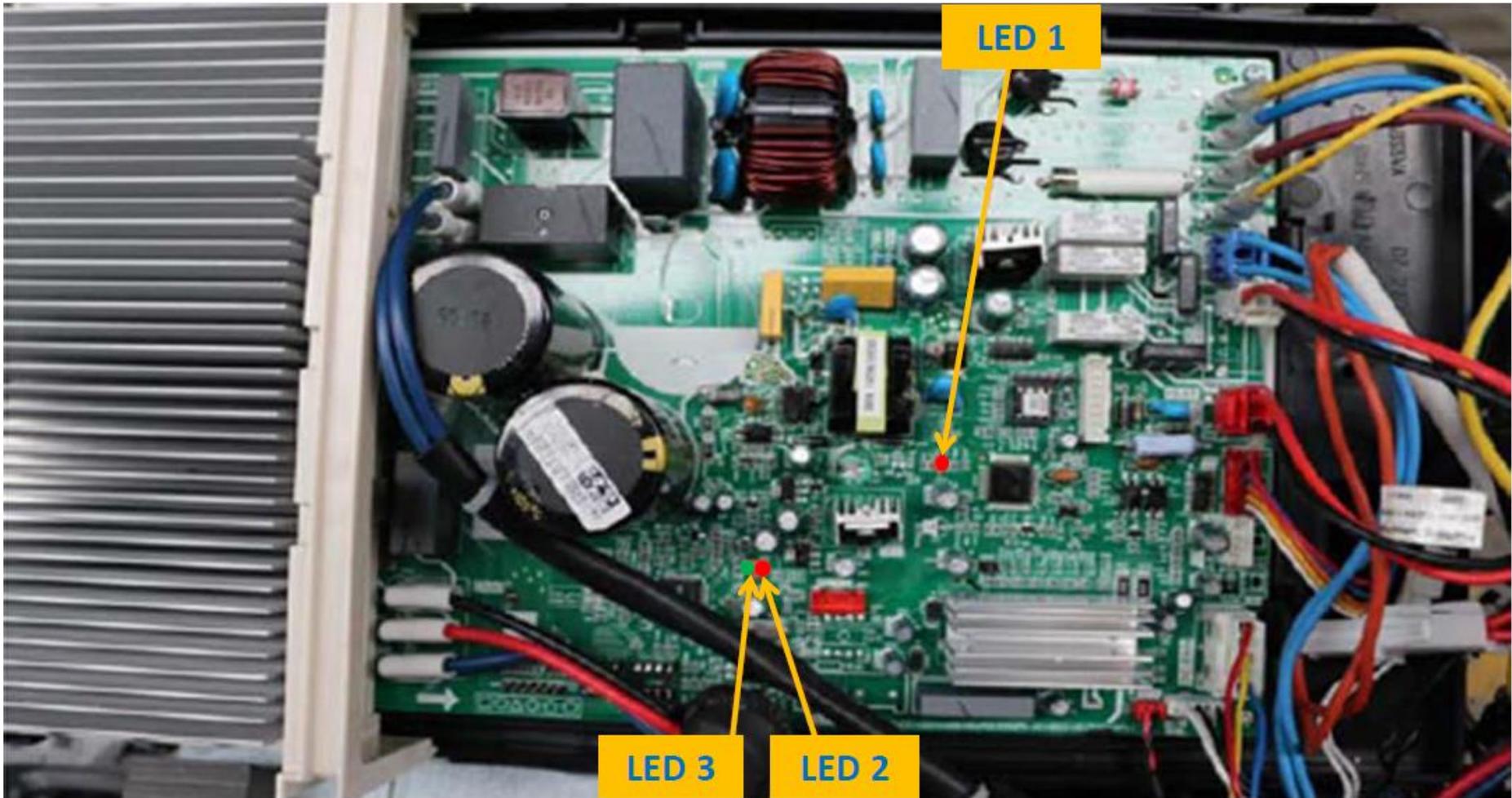
SYSTEM TONS	kBTUh	VOLTAGE	OUTDOOR MODEL
0.75	9,000	115/1/60	38MAQB09R--1
1.00	12,000		38MAQB12R--1
0.75	9,000	208/230-1	38MAQB09R--3
1.00	12,000		38MAQB12R--3
1.50	18,000		38MAQB18R--3
2.00	24,000		38MAQB24R--3
2.50	30,000		38MAQB30R--3
3.00	36,000		38MAQB36R--3



Sizes 9-12 (115V) ODU Display



Sizes 9-18 (230/230V) ODU Display



Diagnostic Table Sizes 9-18

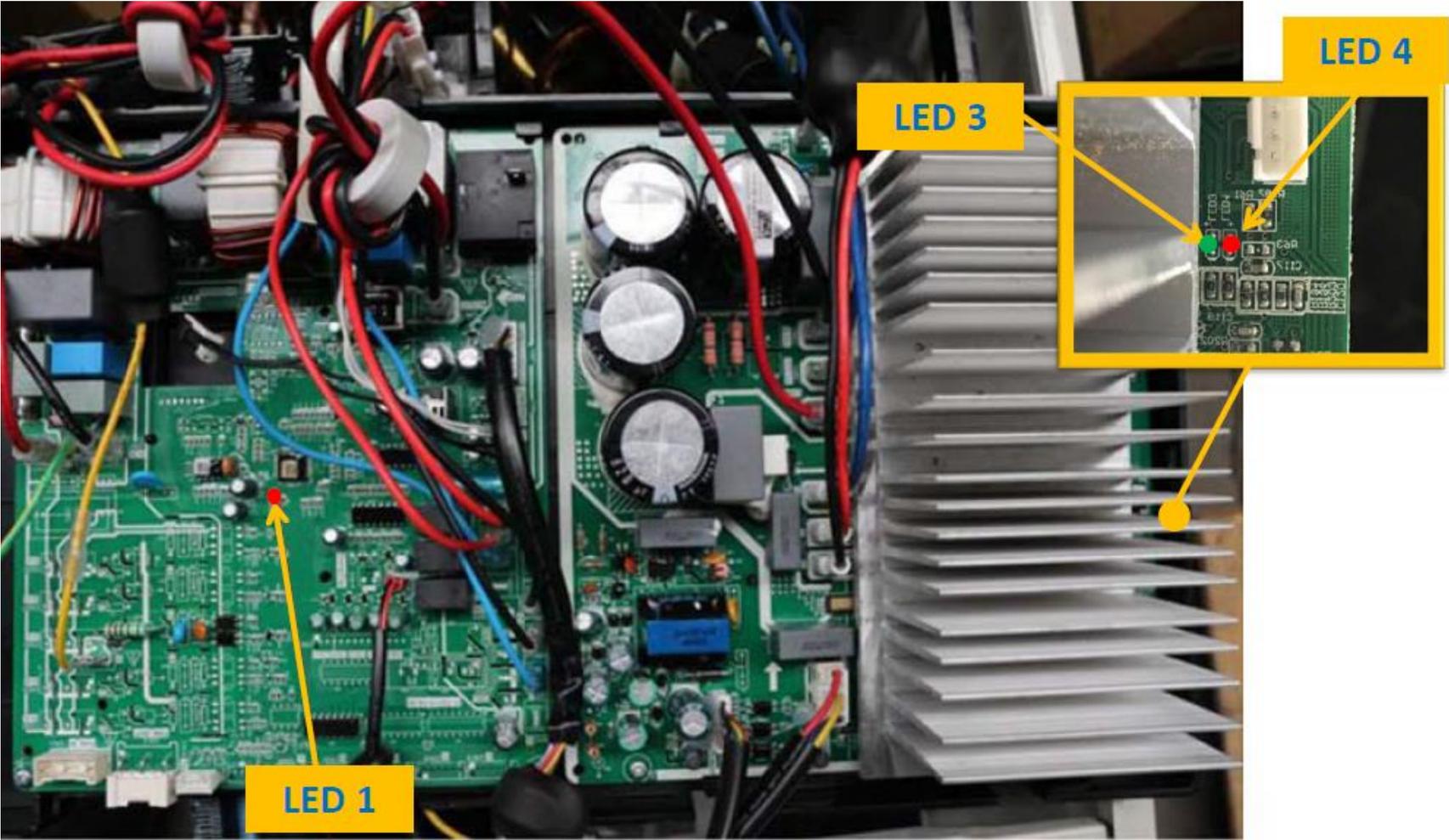
After the power is on, LED1 (blue color) flashes slowly (once per second) when the unit is in standby. The LED flashes quickly (twice per second) if the unit has an issue.

Table 14 — Diagnostic Table Sizes 9K-18K

NO.	PROBLEMS	LED3 (GREEN)	LED2 (RED)	IU DISPLAY	SOLUTION
1	Standby for normal	O	X		
2	Operation normal	X	O		
3	IPM malfunction or IGBT over - strong current protection	★	X	P0	Page 37
4	Over voltage or too low voltage protection	O	O	P1	Page 41
5	EEPROM parameter error	O	★	E5	Page 35
6	Inverter compressor drive error	X	★	P4	Page 43
7	Inverter compressor drive error	★	O	P4	Page 43
8	Inverter compressor drive error	★	★	P4	Page 43

O (light) X (off) ★ (2.5 Hz flash)

Sizes 24-36 (230/230V) ODU Display



Diagnostic Table Sizes 24K-36K

Table 15 — Diagnostic Table Sizes 24K- 36K

NO.	PROBLEMS	LED2 (GREEN)	LED3 (RED)	IU DISPLAY	SOLUTION
1	Standby for normal	O	X		
2	Operation normal	X	O		
3	IPM malfunction or IGBT over - strong current protection	★	X	P0	Page 37
4	Over voltage or too low voltage protection	O	O	P1	Page 41
5	EEPROM parameter error	O	★	E5	Page 35
6	Inverter compressor drive error	X	★	P4	Page 43
7	Inverter compressor drive error	★	O	P4	Page 43
8	Inverter compressor drive error	★	★	P4	Page 43

INDOOR UNIT DIAGNOSTIC GUIDES

Table 13 — Indoor Unit Diagnostic Guide

OPERATION LAMP	TIMER LAMP	DISPLAY	LED STATUS	SOLUTION
★ 1 time	X	E0	Indoor unit EEPROM parameter error	Page 26
★ 2 times	X	E1	Indoor / outdoor units communication error	Page 29
★ 3 times	X	E2	Zero-crossing signal detection error	Page 31
★ 4 times	X	E3	Indoor fan speed is out of control	Page 32
★ 5 times	X	E4	Indoor room temperature sensor T1 open circuit or short circuit	Page 35
★ 6 times	X	E5	Evaporator coil temperature sensor T2 open circuit or short circuit	Page 35
★ 7 times	X	EC	Refrigerant leakage detection	Page 36
★ 1 time	O	F0	Overload current protection	Page 28
★ 2 times	O	F1	Outdoor ambient temperature sensor T4 open circuit or short circuit	Page 35
★ 3 times	O	F2	Condenser coil temperature sensor T3 open circuit or short circuit	Page 35
★ 4 times	O	F3	Compressor discharge temperature sensor TP open circuit or short circuit	Page 35
★ 5 times	O	F4	Outdoor unit EEPROM parameter error	Page 26
★ 6 times	O	F5	Outdoor fan speed is out of control	Page 32
★ 1 time	★	P0	IPM malfunction or IGBT over-strong current protection	Page 37
★ 2 times	★	P1	Over voltage or over low voltage protection	Page 41
★ 3 times	★	P2	High temperature protection of IPM module	Page 42
★ 4 times	★	P3	Outdoor ambient temperature is too low	See Note 1 below
★ 5 times	★	P4	Inverter compressor drive error	Page 43
★ 7 times	★	Pb	Low pressure protection (only for 36K)	See Note 2 below

O(light) X(off) ★(flash)

MGR Sizes

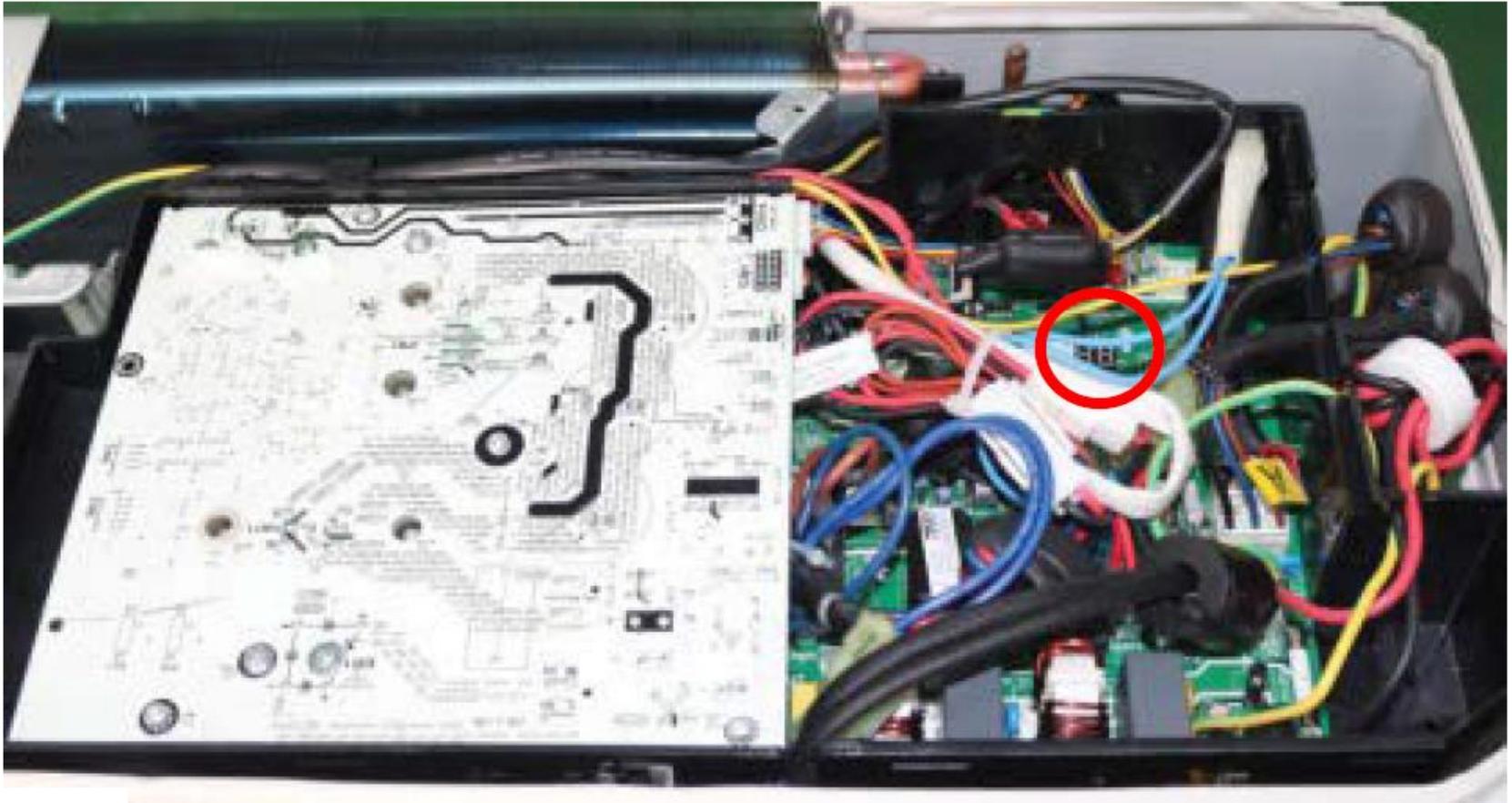
- 18,000 – 2 Zone
- 24,000 – 3 Zone
- 30,000 – 4 Zone

Smaller Chassis (1 fan)
Inverter & Main PCB Separate
(2 ODU PCB's)

- 36,000 – 4 Zone
- 48,000 – 5 Zone

Larger Chassis (2 fans)
Inverter, Fan, & Main PCB
Separate
(3 ODU PCB's)

MGR Multi Zone Equipment



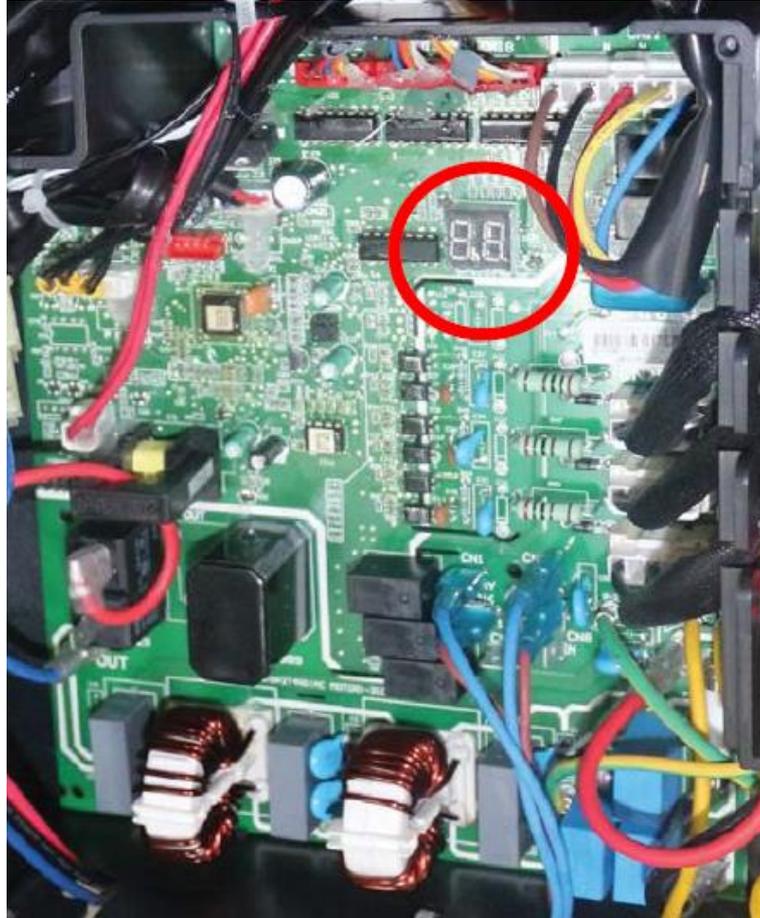
2 & 3 Zone Boards

MGR Multi Zone Equipment



4 Zone Boards (30,000 BTU)

MGR Multi Zone Equipment



4 & 5 Zone

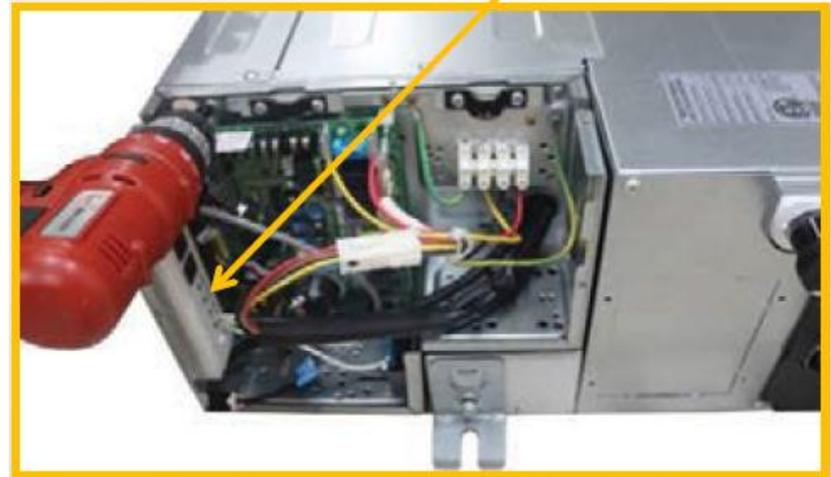
High Wall & Ducted

Highwall



Display location on IDUs

Ducted



4-Way & Floor Console

4-way



Infrared Receiver
NOT a display

Floor Console



Wired Controller Error Display

KSACN04/0501AAA

F0 displayed on the wired controller is a communication fault between the wired controller and the indoor unit. The wired controller will also display any other error codes that are generated by the system at large.





Knowledge Check

Where is the best place to view an error code?

System Components

Performance

MA*R Single Zone HP & MG*R Multi-Zone HP





Knowledge Check

Why is inverter technology becoming so popular and how does it work?

This is not Inverter Technology?



System Components

IPM

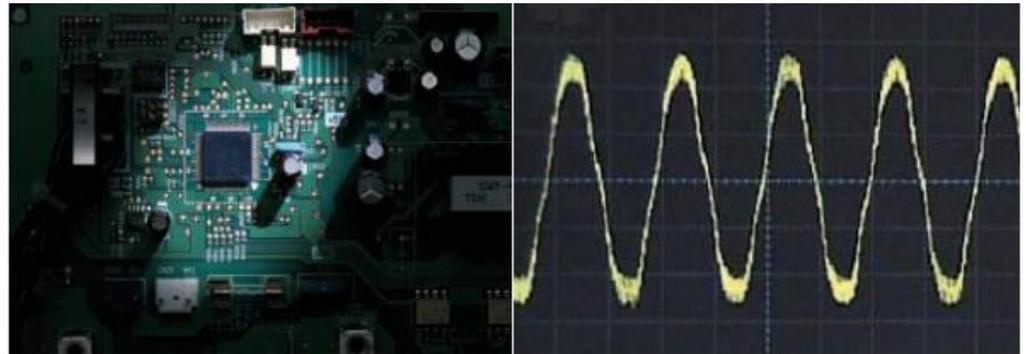
DLS Technology

A *fixed speed compressor* is susceptible to electrical damage



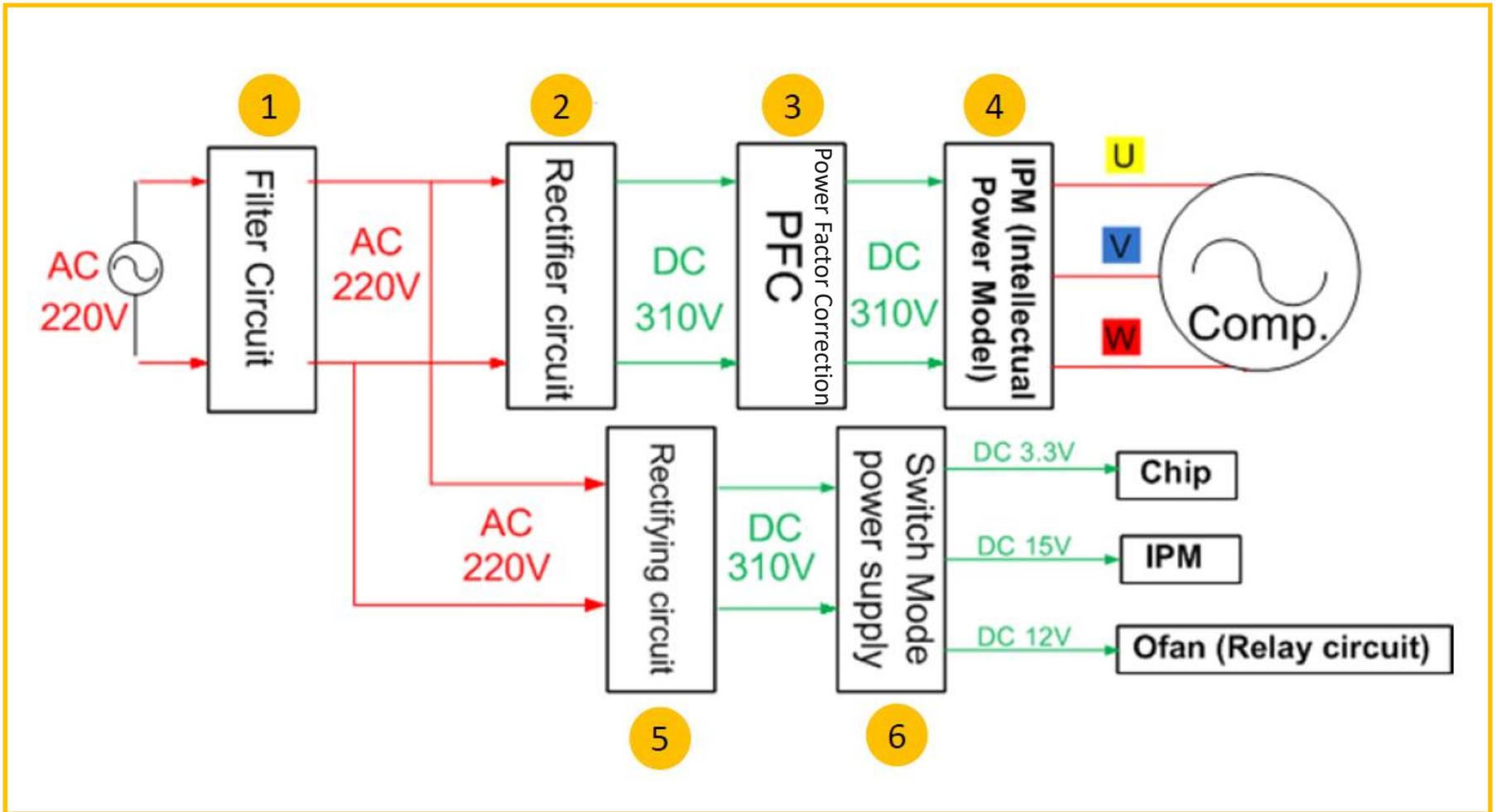
An *inverter-driven compressor* is less likely to fail at start-up because it sees a soft-start, making it

MORE RELIABLE

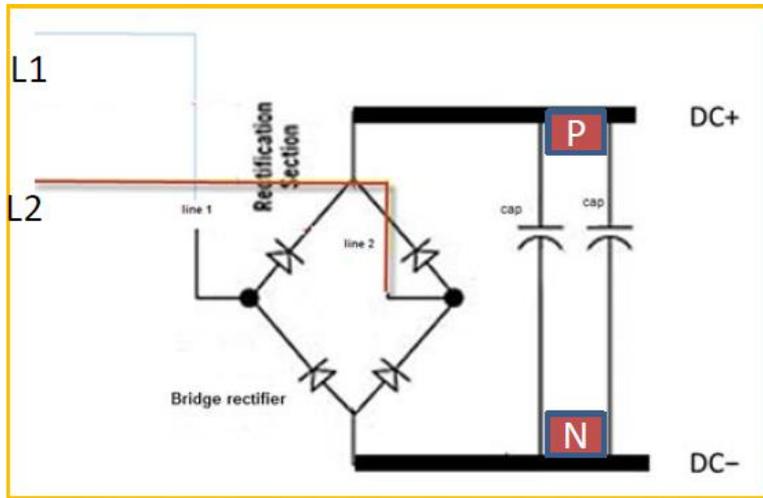


System Components

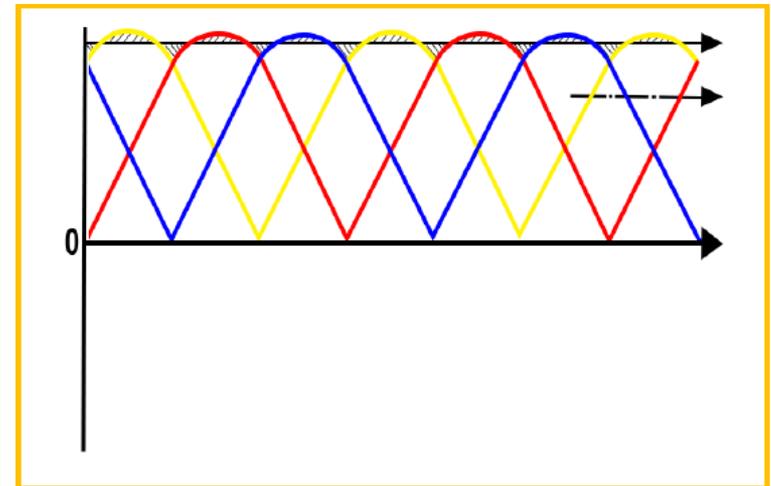
IPM



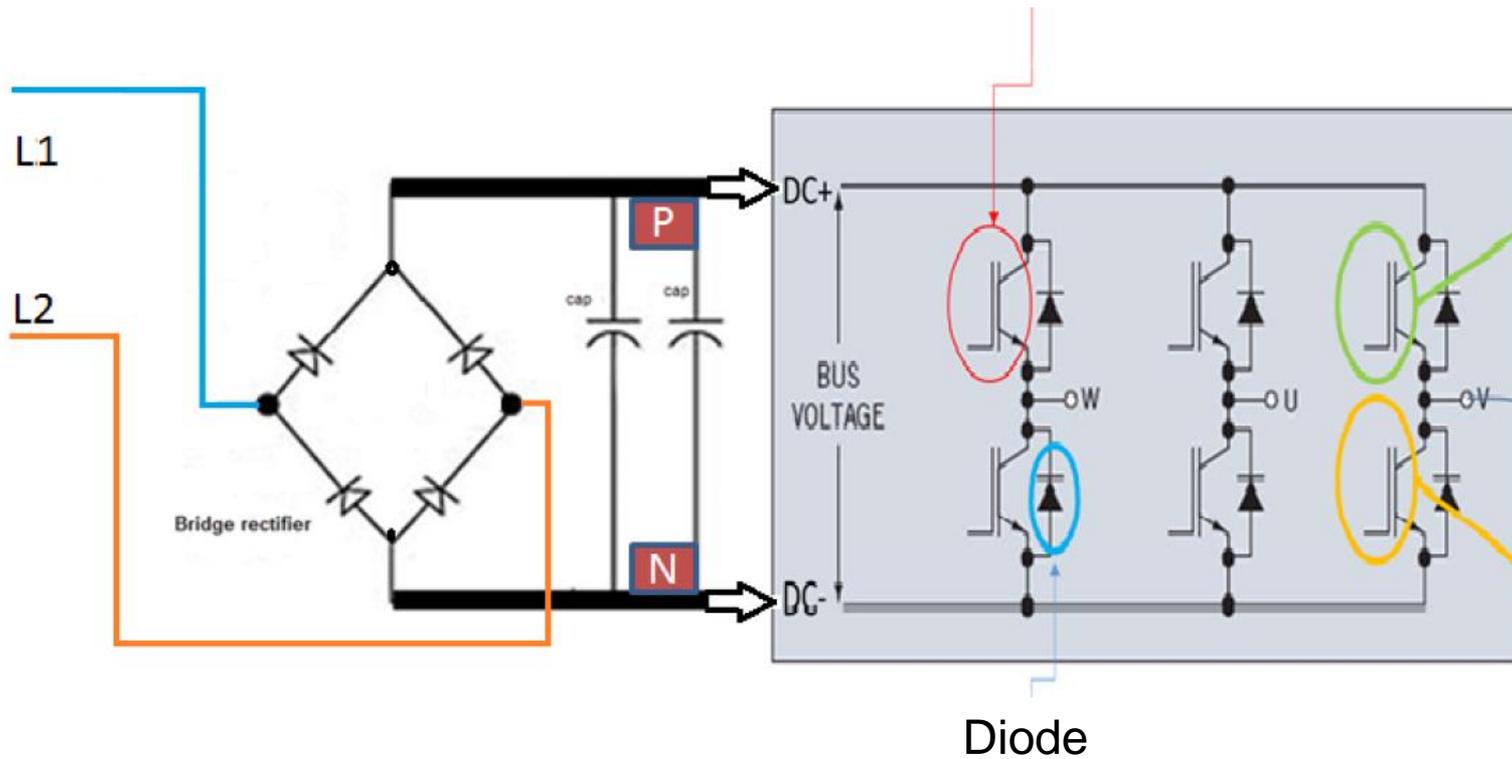
Rectifier



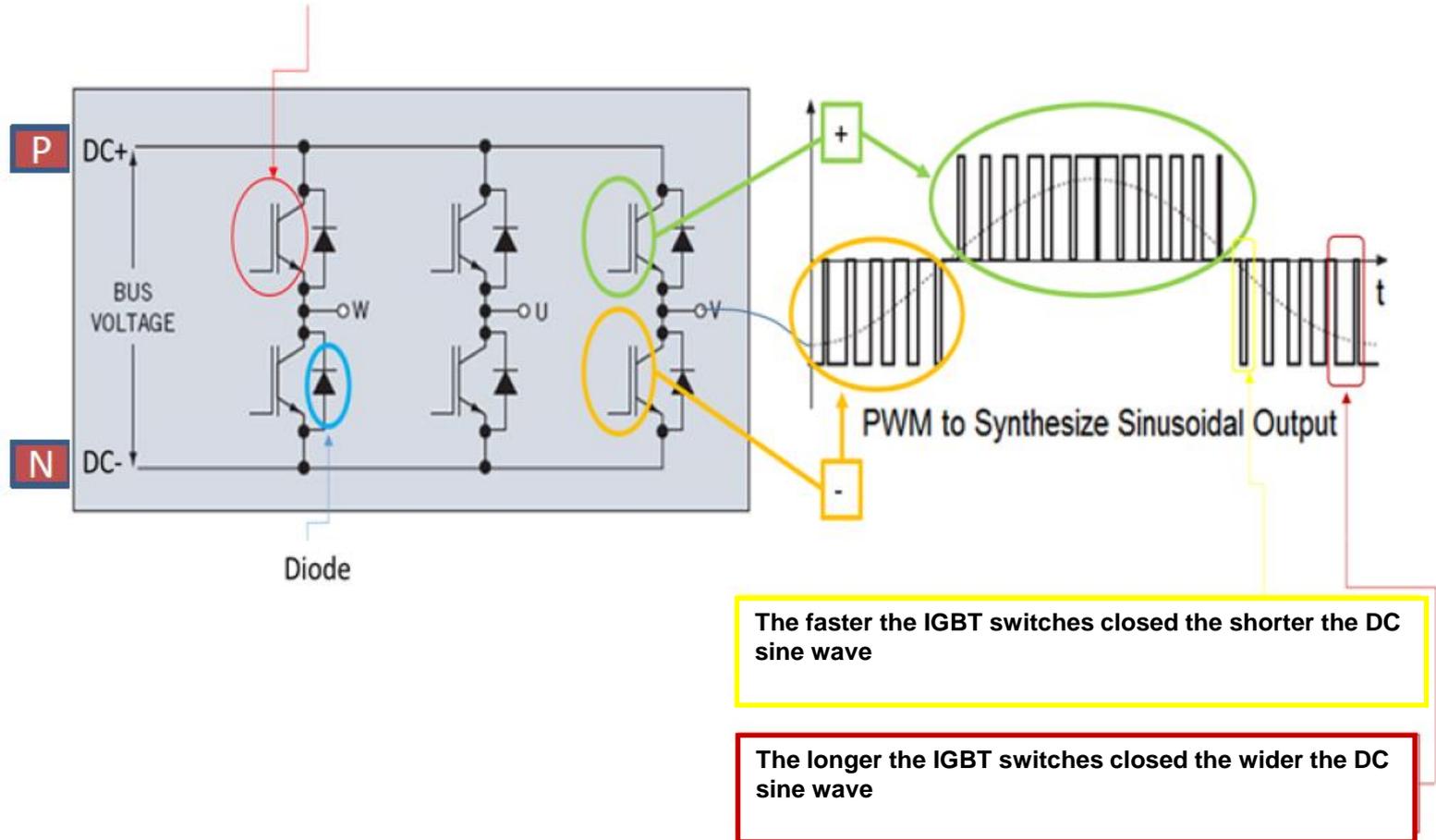
Output from bridge rectifier



IGBT – Insulated-Gate Bipolar Transistor



IGBT – Insulated-Gate Bipolar Transistor



What it does:

The IPM opens and closes the IGBT's at specific intervals to simulate a sine wave.

How to check it:

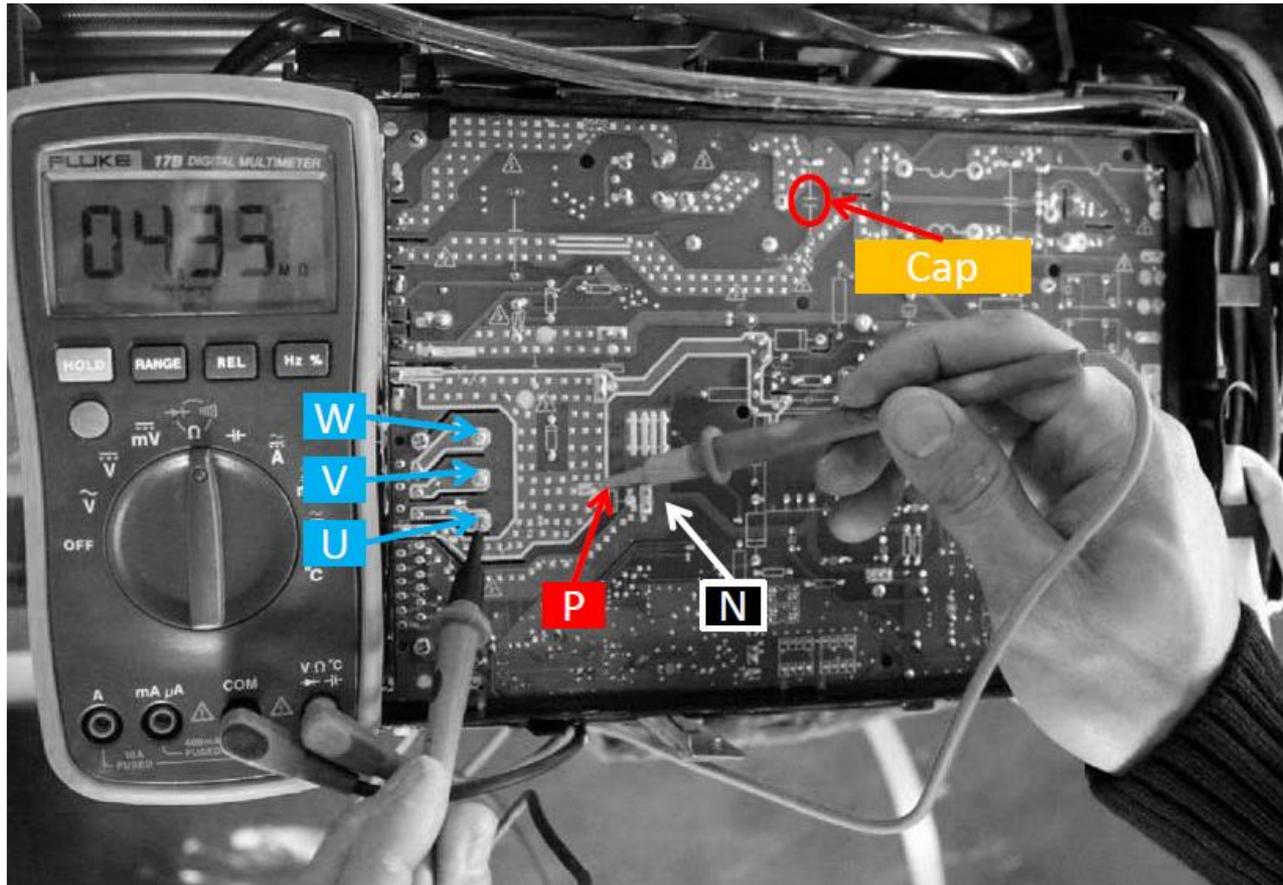
- Power Off and wait 10 minutes
- Check resistance between P and UVW
- Check resistance between N and UVW



Findings:

- Several Mega ohm
- Look for consistency between transistors.

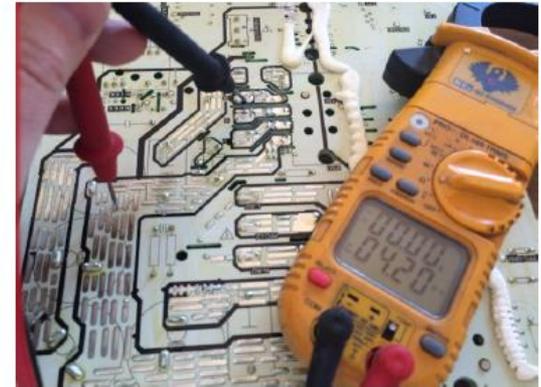
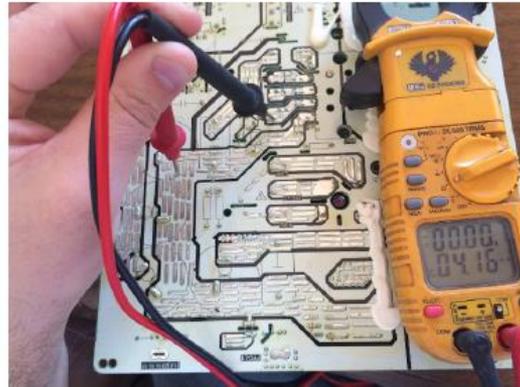
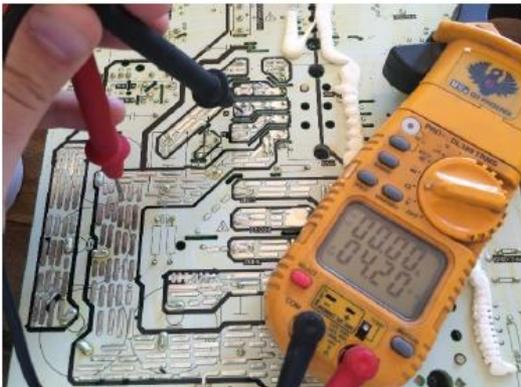
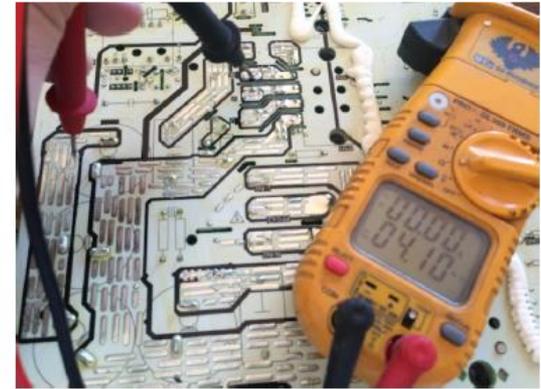
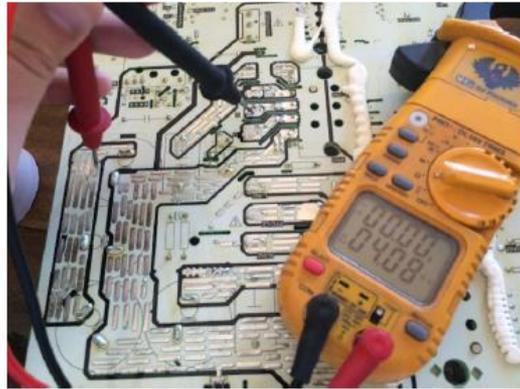
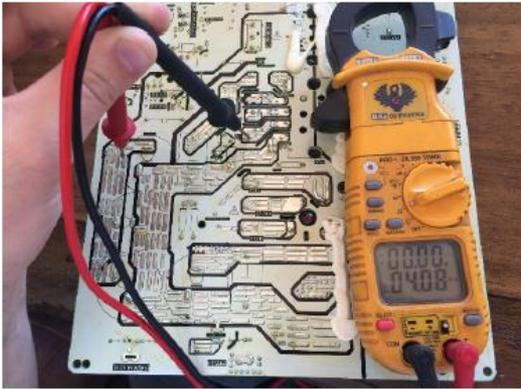
Inverter and Main PCB Built in



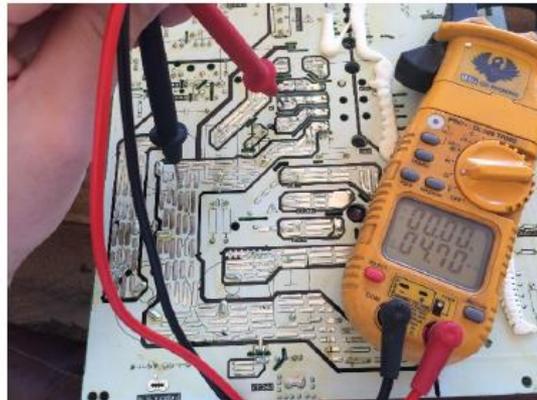
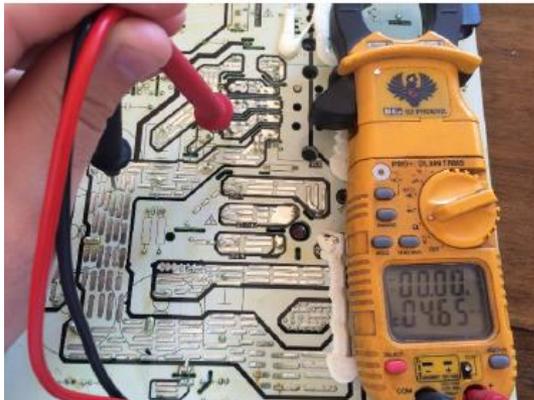
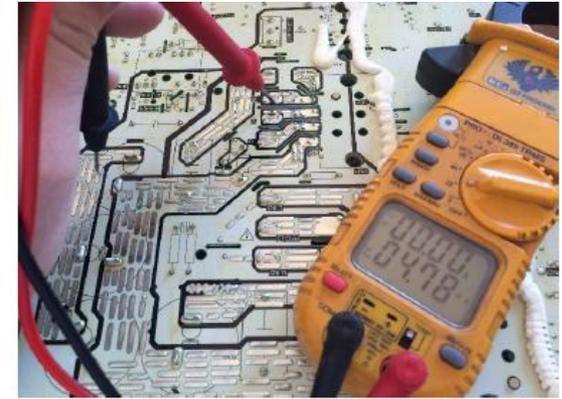
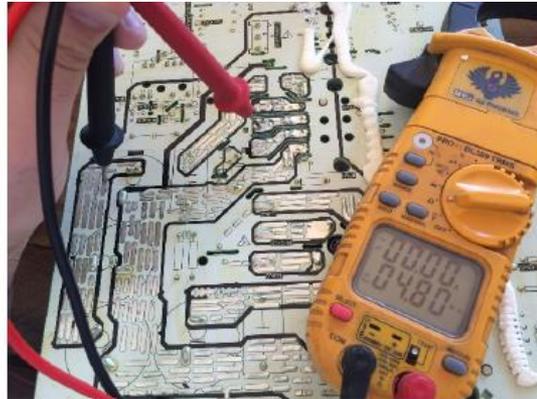
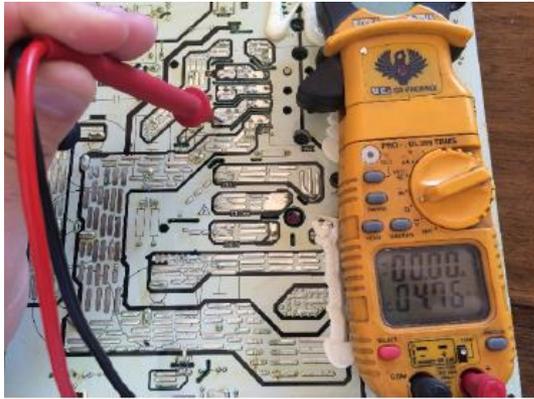
System Components

IPM

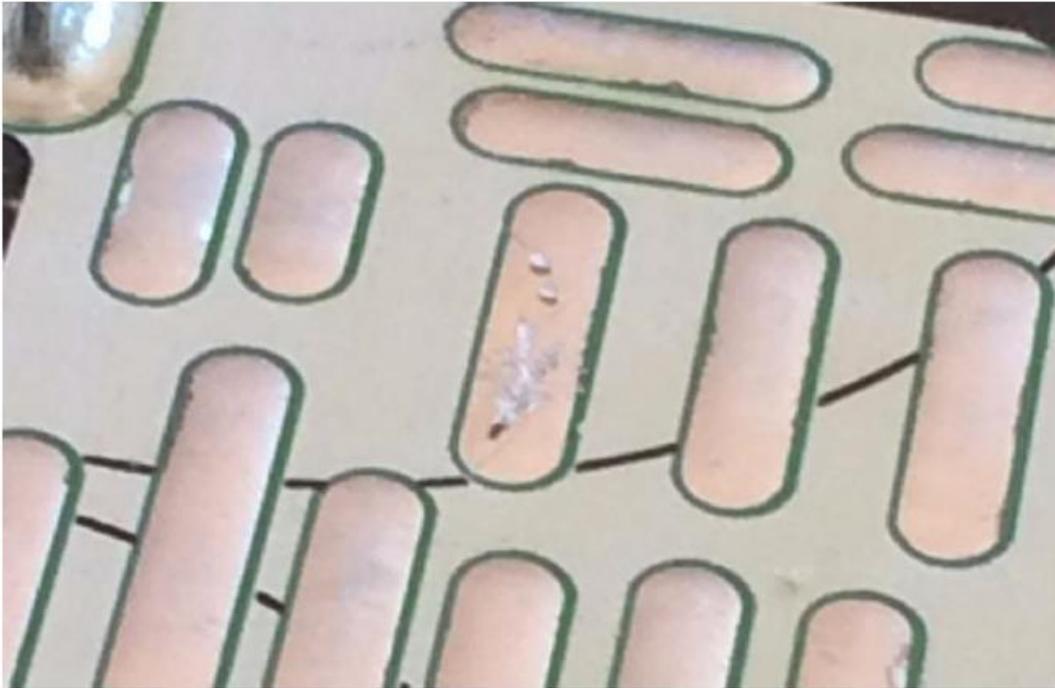
Inverter Separate from Main Board (Red on P & N)



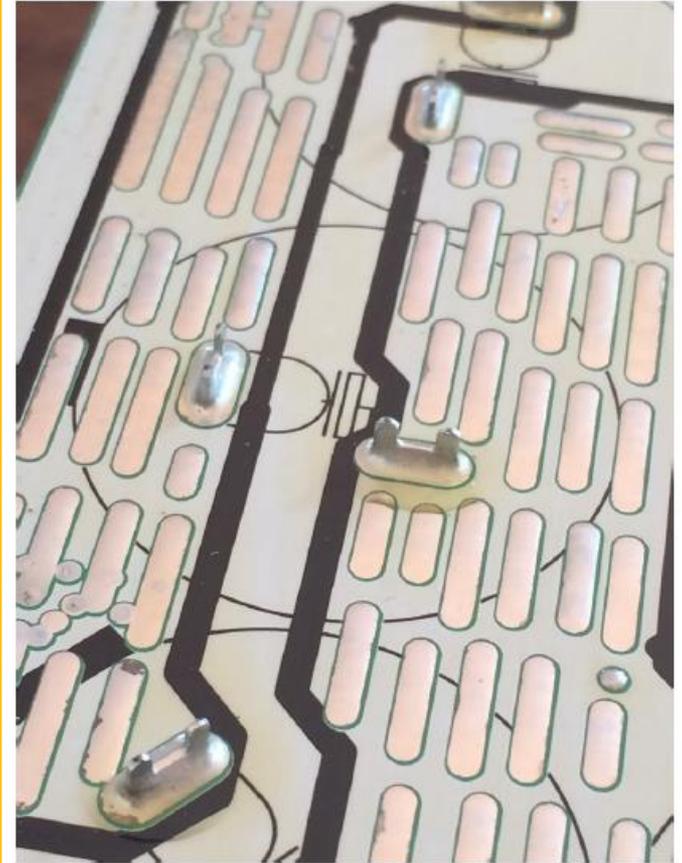
Inverter Separate from Main Board (Black on P & N)



Coating



Capacitor



What it does:

A reactor opposes the change in current.

How to check it:

- Measure resistance.

Findings:

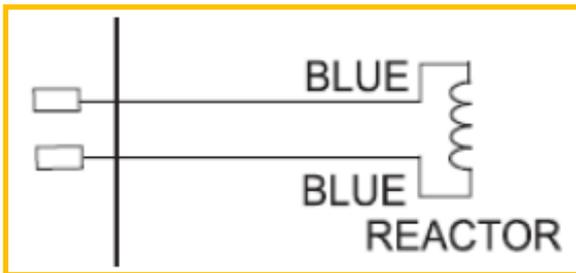
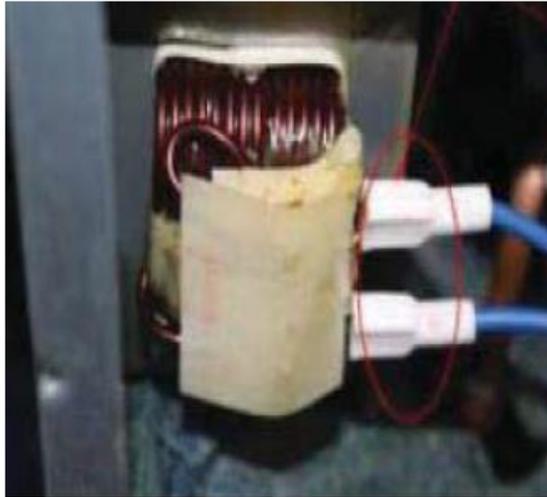
- Typically under 1 ohm.
- Not OL (open load)
- Not 0Ω (shorted)
- No resistance to ground.



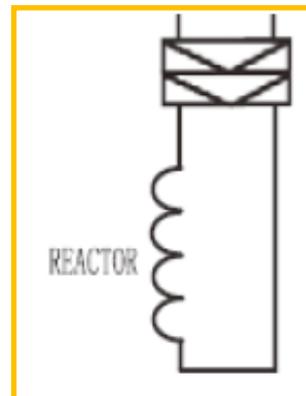
System Components

Reactor

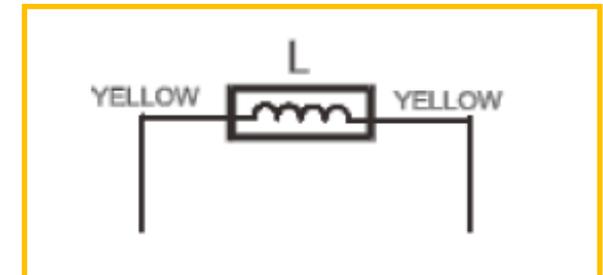
MA*R 2 Zone Reactor



MG*R 2 Zone Reactor



MG*R 5 Zone Reactor



Resistance Check On Windings



What it does:

Provides refrigerant flow through the coils.

Changes speed to meet the capacity of each indoor unit.

How to check it:

- Power off and wait 10 minutes.
- Check resistance across windings.
- Check resistance from windings to ground.

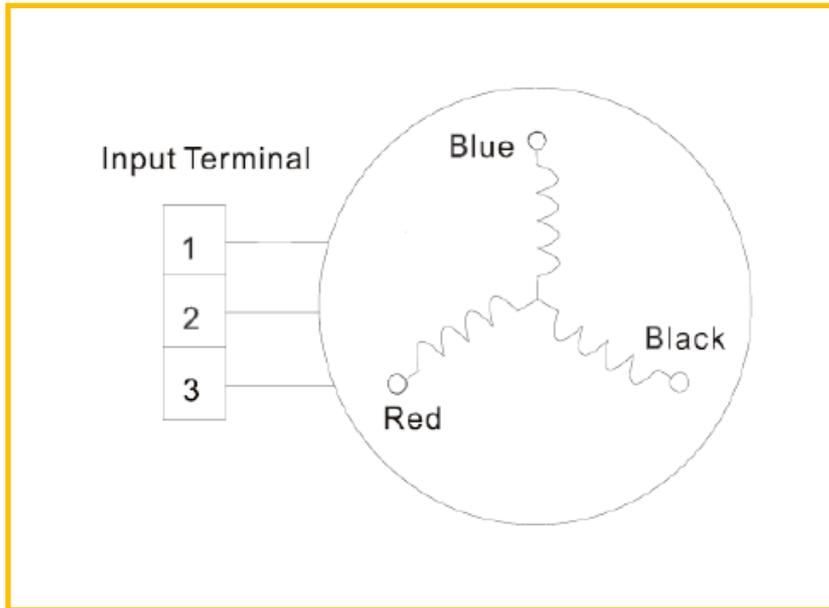


Findings:

- Under 2Ω and all equal.
- OL to ground.

System Components

Compressor



ATM150D23UFZ	ATP235D22UMT	ATP250D22UMT	ATF310D43UMT	ATQ360D1UMU
1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω

Resistance Check On Windings

1 to 2



2 to 3



1 to 3



System Components

Compressor

Checking for short circuit

1 to Gnd



2 to Gnd



1 to Gnd

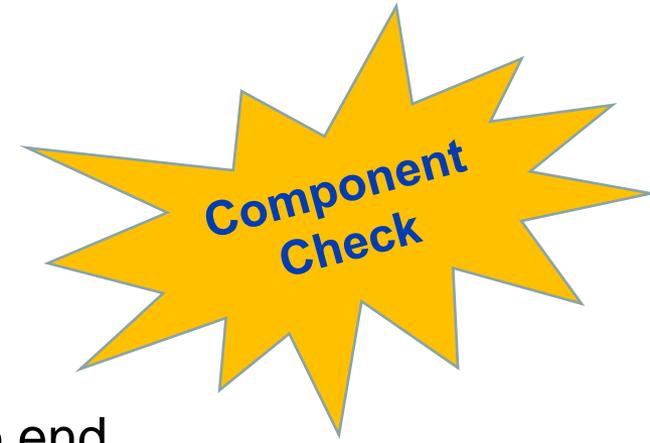


What it does:

Meters refrigerant into IDU

How to check it:

- Ohm out each winding from center tap to end.



Findings:

Wire Color	Resistance
Red to Blue	50Ω
Red to Yellow	50Ω
Brown to Orange	50Ω
Brown to White	50Ω

System Components

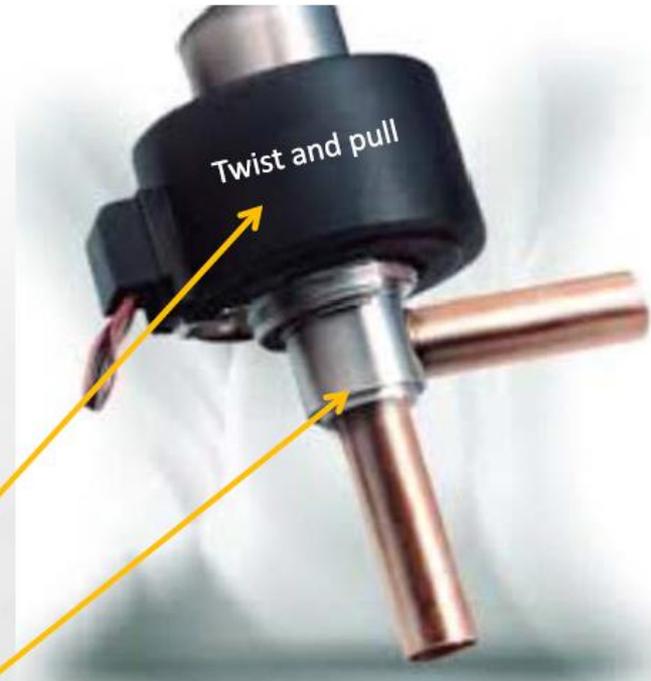
Electronic Expansion Valve

EEV – Electronic Expansion Valve



Detachable
Coils

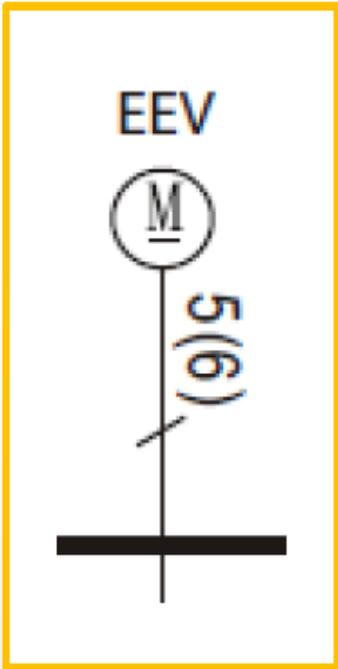
Expansion
Valves



System Components

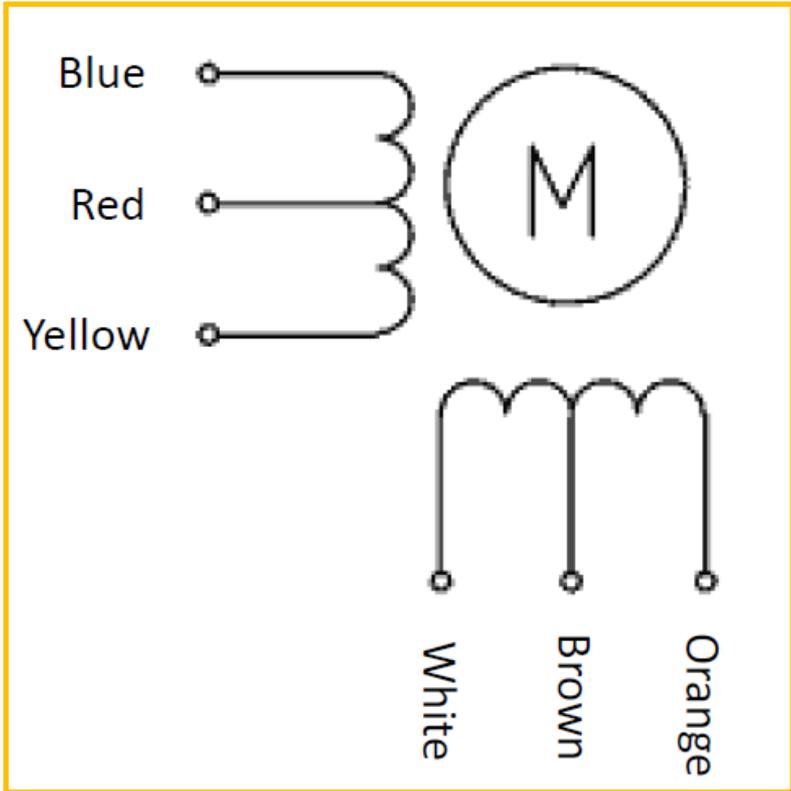
Electronic Expansion Valve

Wire Schematic Label



System Components

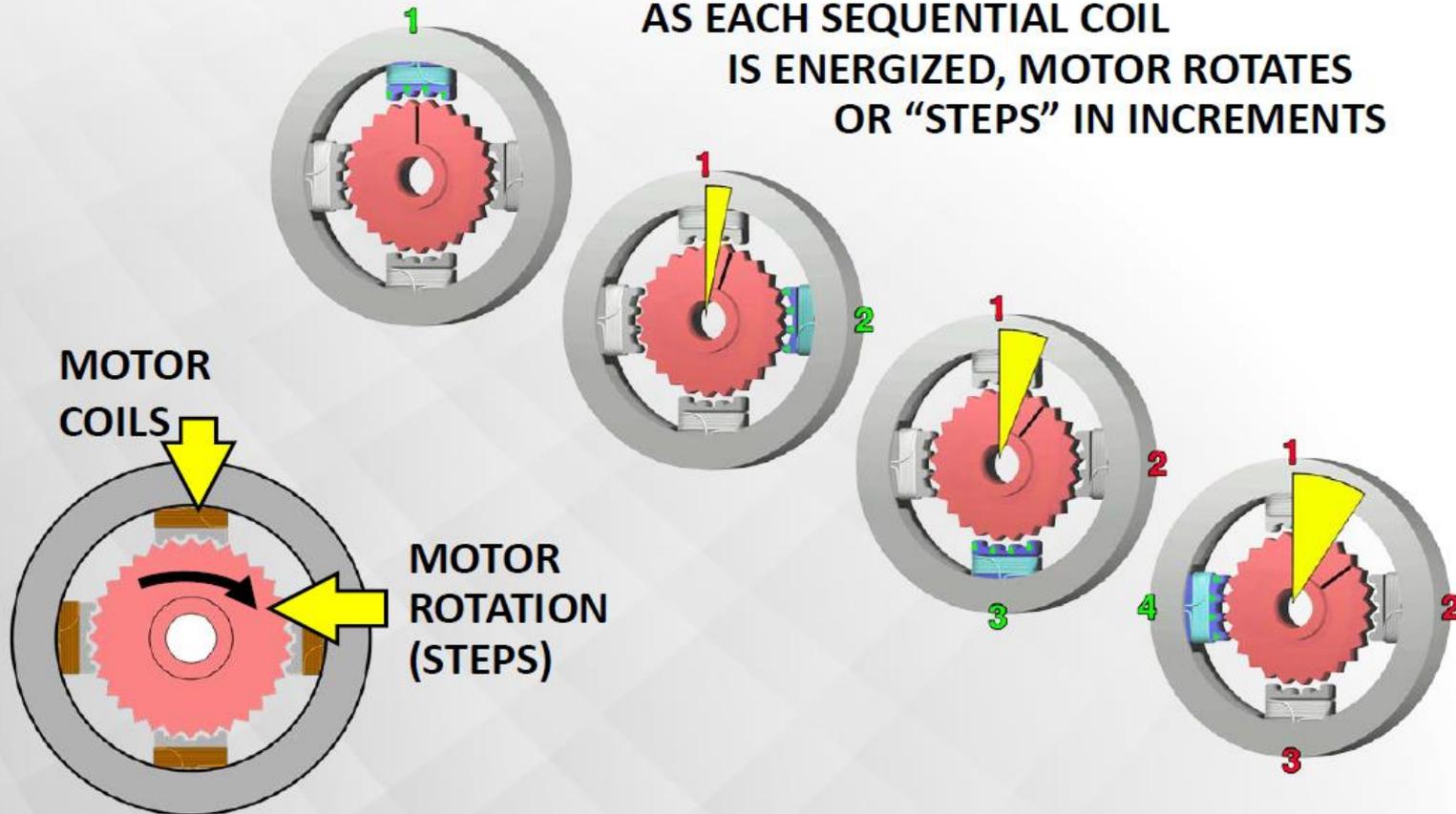
Electronic Expansion Valve



System Components

Electronic Expansion Valve

AS EACH SEQUENTIAL COIL IS ENERGIZED, MOTOR ROTATES OR "STEPS" IN INCREMENTS



System Components

Electronic Expansion Valve



What it does:

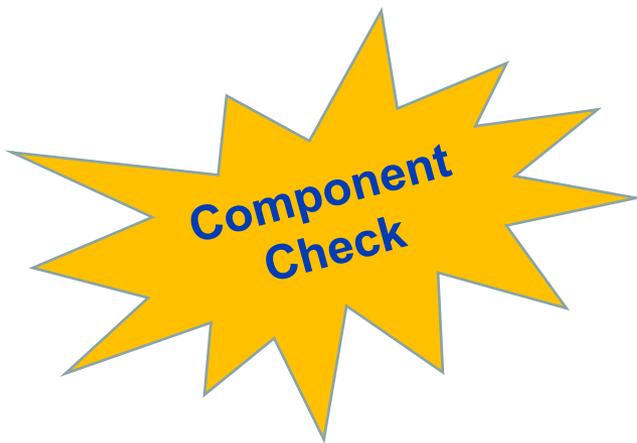
Reverses the refrigerant flow between coils to change Between Heat and Cool mode.

How to check it:

- Coil resistance check.
- Check voltage output from board.

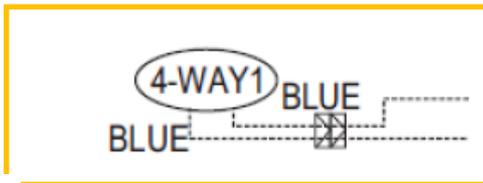
Findings:

- 1.8 to 2.5 K Ω
- PCB output is line voltage
- OL to ground



Component
Check

4-Way Valve Coil Test

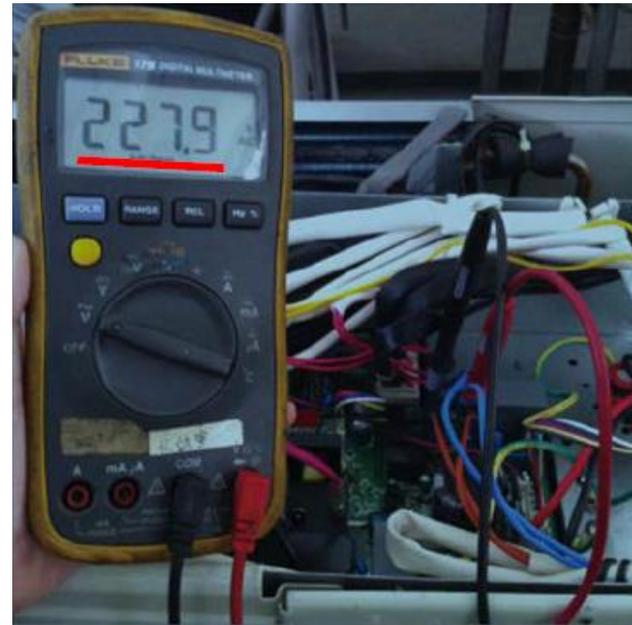


4-Way Valve Output Test

Cooling Mode = OFF



Heating Mode = ON



What it does:

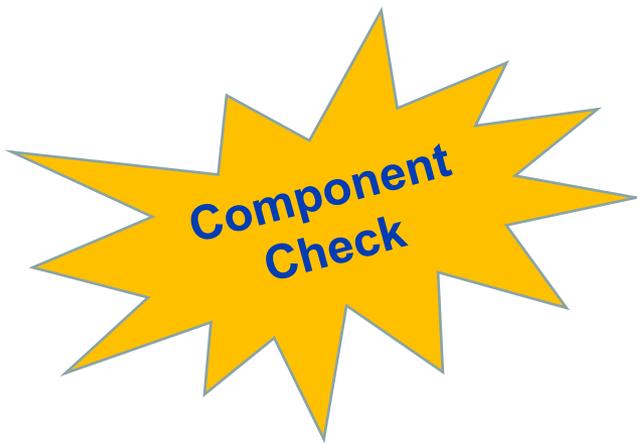
Removes or adds heat to ODU coil.

How to check it:

- Motor winding resistance test.
- Check DC high voltage. (P&N)

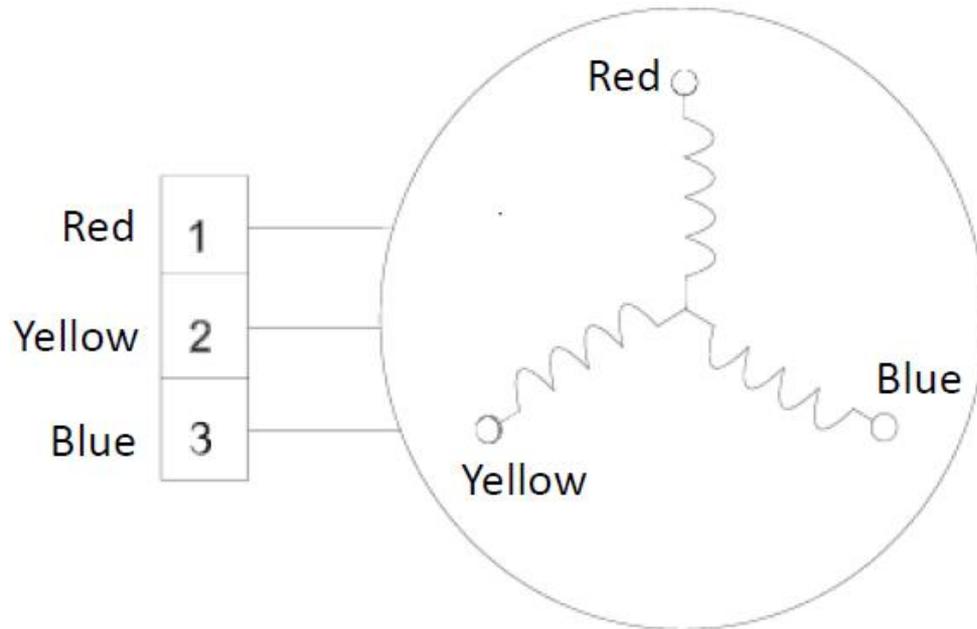
Findings:

- Same resistance among windings.
- No continuity to ground.

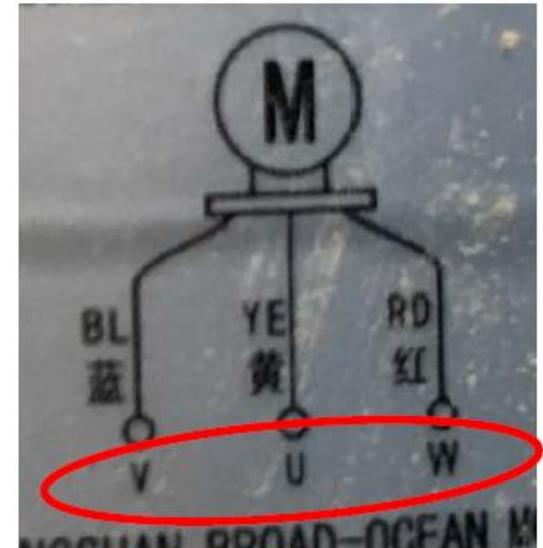


**Component
Check**

MAR & MGR



Motor Tag:



Fan Motor Resistance Check

Blue to Yellow



Blue to Red



Yellow to Red



Wire Schematics

Performance

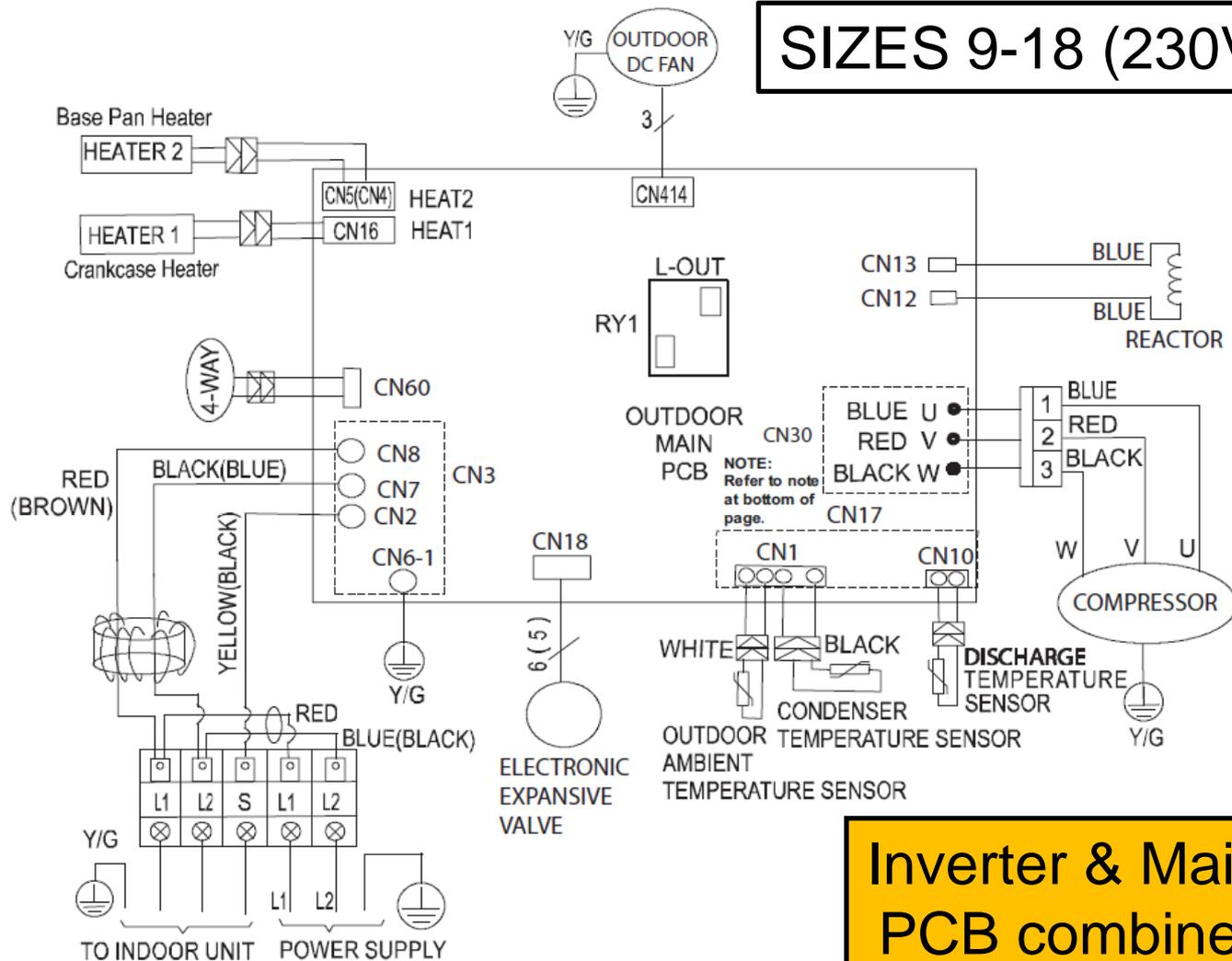
MA*R Single Zone HP & MG*R Multi-Zone HP



Wire Schematics

38MA*R
SINGLE ZONE HP

SIZES 9-18 (230V)



OUTDOOR UNIT

CN2	Output: High voltage signal (to indoor unit)
CN7,8	Input: 220 VAC High voltage (from power supply)
CN60	Output: 220 VAC for 4-way valve control
CN16	Output: 220 VAC High voltage to control crankcase heater
CN414	Output: Pulse (0-320 VDC) to outdoor fan motor
CN5 (CN4)	Output: 220 VAC High voltage to control base pan heater
CN12,13	Output: High voltage to reactor
UVW	Output: Pulse (0-320 VDC) to compressor
CN10	Input: Pin 1 – Pin2 (0-5V) from discharge temperature sensor
CN1	Input: Pin 1, Pin 3, Pin 4, Pin 5 (0-5V) from condenser and outdoor Ambient temperature sensors
CN6-1	Ground connector
CN18	Output: Pin 5&6 (12V) to electronic expansion valve

Inputs/Outputs

38MA*R
SINGLE ZONE HP

SIZES 24-36 (230V)

CODE	PART NAME	CODE	PART NAME
CN1, CN2	Input: 220VAC high voltage(indoor unit)	CN9	Input: Pin1, Pin2, Pin4, Pin5 (0-5V) for high and low pressure switches where applicable
S	Input: High Voltage Signal (indoor unit)	CN10, CN44	Output: 220VAC high voltage for base pan heater
CN3, CN22	Output: 220VAC for 4-way valve control	CN19	Output: Pulse (0-320VDC) for Outdoor DC Fan
CN4, CN40	Output: 220VAC high voltage for crankcase heater	CN20	Output: (Pin5 or 6) to EEV (Pin1, 2, 3, 4). Pulse waveform (0-12V)
CN5, CN6	Output: 220VAC high voltage for power for driver board	CN33	Input: Pin1, Pin2 (0-5V) from exhaust temperature sensor
CN53, CN54	Input: 220VAC high voltage for driver board	CN51, CN52	Output: 220VAC high voltage for PFC inductor
CN7	Output: Pin1-3=12VDC. Pin2-3=5VDC. (other pin for chip communication)	U V W	Output: Pulse (0-320VDC) for Compressor
CN55	Input: Pin1-3=12VDC. Pin2-3=5VDC. (other pin for chip communication)	P-1	Ground Connector
CN8	Input: Pin1, Pin3, Pin4, Pin5 (0-5V) for condenser and outdoor ambient temperature sensors		

System Enquiry

Performance

MA*R Single Zone HP & MG*R Multi-Zone HP



System Enquiry

38MA*R ENQUIRY



2. Swing 3x

1. LED 3x



3. 2 sec buzzer

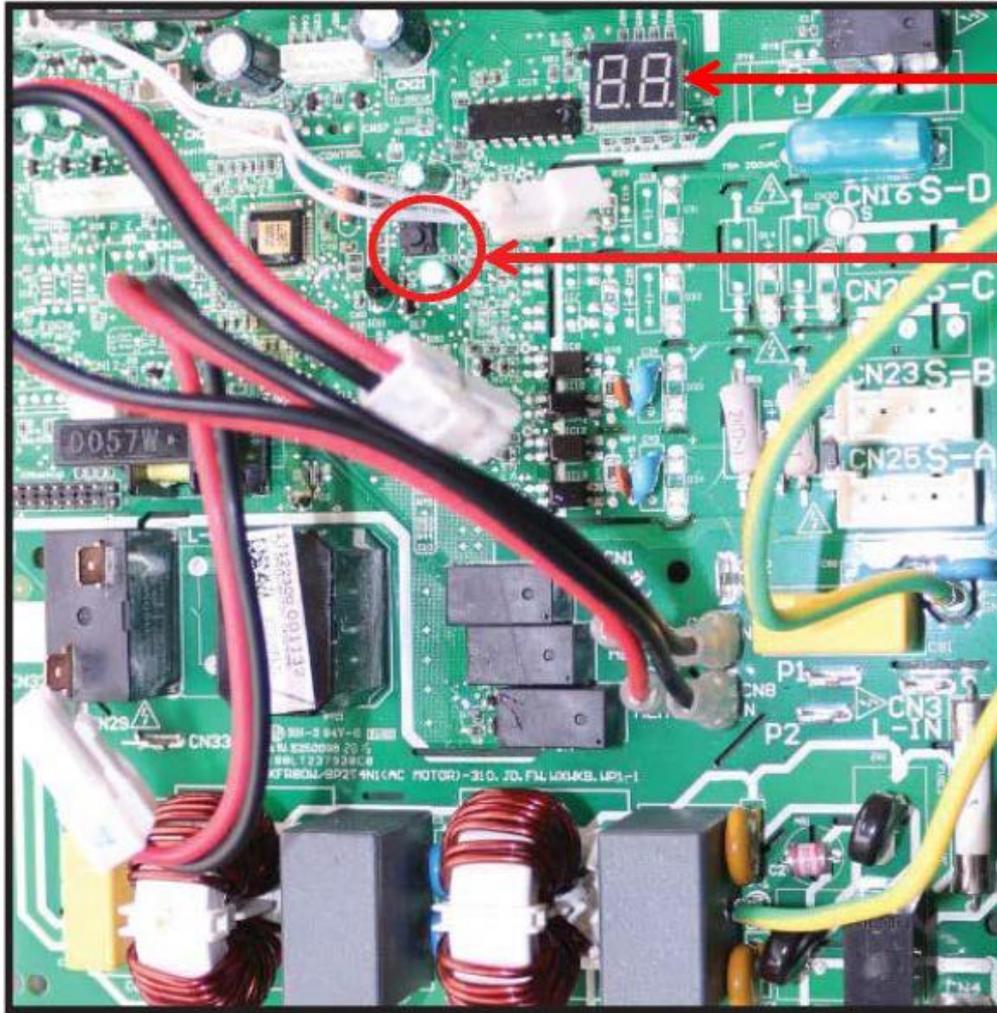
System Enquiry

38MA*R ENQUIRY

Enquiry Information	Display Code	Meaning
T1	T1	Return Air Temp
T2	T2	Evaporator Coil Temp
T3	T3	Condenser Coil Temp
T4	T4	Outdoor Air Temp
TB2 (MG*R)	TB	Evaporator suction Temp
TP	TP	Discharge Temp
TH (MG*R)	TH	IPM Temp (30MBH and greater)
Target Frequency	FT	Target Frequency
Actual Frequency	Fr	Actual Frequency
Indoor Fan Speed	IF	Indoor Fan Speed
Outdoor Fan Speed	OF	Outdoor Fan Speed
EXV Opening Angle	LA	EXV Opening Angle
Compressor Continuous Running timer	CT	From Thermal On Timer
Compressor Stop Issues	ST	Error Codes

System Enquiry

38MG*R ENQUIRY



7 Segment
Display

SW1

System Enquiry

38MG*R ENQUIRY

Number Of Presses	Display
0	Frequency, Running State, Error Code
1	Quantity of Indoor units
2	ODU Mode
3~7	IDU Capacity
8~12	IDU Capacity Request
13	ODU Capacity Demand
14	Frequency Request
15	Frequency after Limits
16	Frequency being sent to IPM
17~21	Evaporator Outlet temp (T2B)

System Enquiry

38MG*R ENQUIRY

Number Of Presses	Display
22~26	Room Temperature (T1)
27~31	Evaporator Temperature (T2)
32	Condenser Pipe Temp (T3)
33	Outdoor Air Temp (T4)
34	Compressor Discharge (TP)
37~41	EEV Angle
42	Frequency Limit Symbol
43	Average of T2
44	ODU Fan Speed
45	Last Error code

Brief Product Overview

40MBAB Single & Multi-Zone Indoor Air Handler



40MBA Air Handler

Compatible with:

- 38MARB (24 only)
- 38MGR (24 only)
- 38MBR/B (36 & 48 only)

Standard Features

- Indoor sizes 24, 36 and 48
 - Size 24 compatible with Single zone and Multi-zone
 - Sizes 36 and 48 compatible only with new single zone outdoor 38MBR/B
- Can only be controlled by 24-Volt thermostat (purchased separately)
- 4-way installation (Up flow, Down flow, Right, Left)
- Constant volume airflow algorithm
- Static Pressure up to 0.8"
- Variable speed ECM motor
- Optional Electric Heater Kits available 5kW, 10kW, 15kW & 20kW



RG57 - MBA
Unit Fan Set Up Use ONLY
Must Use 24-Volt Thermostat

Brief Product Overview

For more Information see
IM for 24-Volt Interface for
approved sizes & match ups.

Ductless Outdoor Unit & Residential Air Handler



Carrier Performance™
Bryant Preferred™
FV4C
FX4D
FB4C



KSAIC0301230
24-Volt Interface

Compatible with Outdoor Units:

- 38MARB ONLY

Standard Features

- All aluminum coils for enhanced corrosion resistance
- Standard 5-wire thermostat approved
- Variable-speed blower for improved comfort and quiet operation
- Sloped, corrosion-free drain pan design helps reduce mold and bacteria build-up
- Air purifier compatible
- Fully insulated cabinet
- Advanced temperature control
- 10-year parts limited warranty to the original purchasing owner upon timely registration



Piping adapter kit – Part #40MD000003

All three must be used together
on Ductless applications

Brief Product Overview

Ductless Outdoor Unit & Residential Furnace & Coil

For more Information see IM for 24-Volt Interface for approved sizes & match ups.

Carrier Performance™
Bryant Preferred™



KSAIC0301230
24-Volt Interface

Choose Coil
Type



Piping adapter kit – Part #40MD000003

Compatible with Outdoor Units:

- 38MARB ONLY

Standard Features

- 80's up to 80% AFUE
- 90's Up to 96.5% AFUE
- Variable-speed ECM operation
- Fully insulated, 20-gauge steel cabinet and doors
- Performance™ Series furnaces include the Comfort Heat Technology®
- Performance™ Series furnaces with SmartEvap™ Technology
- 10-year parts limited warranty to the original purchasing owner upon timely registration

All four must be used together
on Ductless applications

Brief Product Overview

Optional Controls



KSACN0601AAA – **Fits:** High Wall 40MHH & 40MPHA/619PHA, Console 40MBF size 12

- 7 Day Programmable Wired Wall Remote Controller
- Indoor Setting Temperature Range: 62°F~86°F
- Defaulted to Follow Me (Senses Temp at Controller, not indoor unit)
- 20' of control wire included
- Maximum wire length including optional extension wires 66'
- 5 Volts DC

KSACN0701AAA – **Fits:** Cassettes 40MBC, Ducted 40MBD, Console 40MBF sizes 18~58 only

- 7 Day Programmable Wired Wall Remote Controller
- Included with all 40MBDQ ducted models (Starting with serial 2820V10001) Units with serial prior to this will come with KSACN0501AAA
- Indoor Setting Temperature Range: 62°F~86°F
- Defaulted to Follow Me (Senses Temp at Controller, not indoor unit)
- 20' of control wire included
- Maximum wire length including optional extension wires 164'
- 12 Volts DC

KSACN0801AAA – **Fits:** High Wall 40MAHB/619AHB

- 7 Day Programmable Wired Wall Remote Controller
- Indoor Setting Temperature Range: 62°F~86°F
- Defaulted to Follow Me (Senses Temp at Controller, not indoor unit)
- 20' of control wire included
- Maximum wire length including optional extension wires 164'
- 12 Volts DC

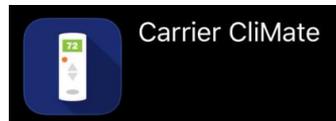
Brief Product Overview

Optional Controls (cont.)



Wi-Fi Kit

- KSAIF0101AAA – 40MHH – High Wall Sizes 9, 12, 24
- KSAIF0201AAA – 40MHH – High Wall Size 18
- KSAIF0401AAA – 40MBC Cassettes, 40MBD Ducted, 40MBF Floor Console/Underceiling 18~58 only
- KSAIF0601AAA – 40MAHB/619AHB High Wall
- 40MPHA – Included with Infinity indoor units
- 619PHA – Included with Evolution indoor units



Note: No Carrier Wi-Fi Kit for 40MBF12 Floor Console, use 24-Volt Interface with Wi-Fi stat.

Brief Product Overview

Optional Controls (cont.)

24-Volt Interface – KSAIC0301230

This allows end user to use a standard 24-Volt thermostat.

Keeps the Inverter Compressor operating as a Variable Speed System.

Dry Mode not available with 24-Volt Interface.



24-Volt Interface

With



or



Or any compatible 24-Volt stat

This is our favorite control choice!
Less learning curve for end user!
Most higher end stats are Wi-Fi!

	Indoor unit type		HIGH WALL				CASSETTE		DUCTED		CONSOLE		AIR HANDLER
			Indoor Family Name	Single Zone / Multi-zone	40MPH A	40MAQ 619PB	40MAH B	40MHH	40MBQB*C	40MBCQ	40MBQB*D	40MBDQ	40MBQB*F
24V INTERFACE*	KSAIC0101115	Single Zone Only	619PH	o 115V	619AH	o 115V							
	KSAIC0101230	Single Zone Only	o 230V	o 230V	o 230V	1	o	1	o 09-58	1	o 12-58 †		
	KSAIC0201230	Single Zone Only											
	KSAIC0301230	Single Zone & Multi-zone	o	o 230V	o 230V	o 230V	1	o	1	o 09-58	1	o 12-58 †	BUILT-IN

PHASED OUT
NOT AVAILABLE / COMPATIBLE
CURRENT MODELS

Notes:

† 7 Day programmable compatible with indoor units starting with Serial Number 0216V10001.

‡ Compatible with indoor units starting with Serial Number 0117V10001.

** Starting with Serial Number 2820V10001 (Week 28, Year 2020) the KSACN0701AAA became the standard controller but is backwards compatible with previous production units

*24V interface compatible with all indoor units starting with Serial Number 4216V10001 unless noted

†-24V Interface compatible with all the sizes except sizes 12 and 58. Starting with Serial Number 1419V10001 the sizes 12 and 58 are shipped with the compatible control board.

Units built prior these serial number would require a Control Board Replacement on the Indoor unit.

1 Require a Control Board Replacement on the Indoor unit for compatibility, consult EPIC for the latest product revision

Board replacement for forward compatibility is not covered as a warranty claim

o	Optional
•	Standard

Brief Product Overview

Optional Controls (end)

DLS BACnet Control
Options

BACnet 24-Volt Thermostats

TB-24-C
ComfortVu™
BACnet®
Standard
Thermostat



Works off it's own settings and offsets

Compatible with any system that works with the 24-Volt Interface



TBPL-24-H-C
ComfortVu™
BACnet® Plus
Thermostat



KSAIC0301230
24-Volt Interface
Required for each

BACnet 1:1 Gateway



9 to 24 sizes only
Must have XYE bus
on indoor
Field Supplied 12V
DC required
Mountable on
DIN rail, wall

Part#
INBACMID0011100

Works off DLS equipment
settings & offsets

Compatible Units:

High Wall 40MHHQ(size 09-24)---3
High Wall 40MPHAQ(size 09-24)XA3
Cassette 40MBCQ(size 09-24)---3
Ducted 40MBDQ(size 09-24)---3
High Wall 40MAQB(size 09-24)B---3 (see * note below)

*The current mid-tier Ductless High Wall 40MAQB**B---3 indoor unit will need to have the display and adaptor board to function with the Intesis BACnet MS/TP gateway. The 40MAQ Adapter Board, P/N 17222000A50275, and Display Board Assembly, P/N 17222000A17852, can be ordered from RC.

Ductless Control Strategies

ecobee & DLS 24-Volt Interface Control Strategies



24-Volt Interface required



ecobee

Default Settings

Heat & Cool Temp Differentials: 0.5°F

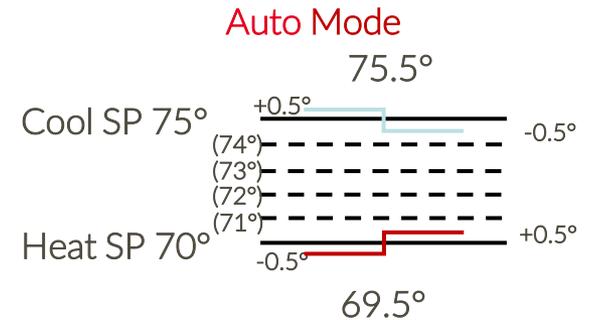
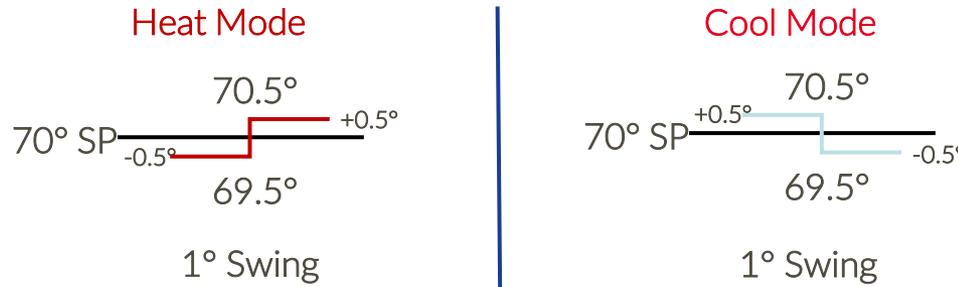
Heat/Cool Delta: 5°F

Configure Stages: Automatic

Heat Stage 2 Temp Delta: Auto

Minimum Outdoor Temp for Compressor Operation: 35°F (conventional systems & H/P's)

Auto Mode for Single Splits Only



Notes:

Auto Mode – Duel Set Point

Fan Speed at Indoor unit is Auto Speed Only for Scenarios 1, 2 & 3

Extremely configurable, all settings should be reviewed at start up

No manual in box on how to configure settings.

On Partners there is a manual that covers all settings at a high level, or go to site below for more in-depth information.

<https://support.ecobee.com/hc/en-us/sections/360001684292-Programming-Your-ecobee-Thermostat>

Ductless Control Strategies

ecobee & DLS 24-Volt Interface Control Strategies



24-Volt Interface required



ecobee

Recommended Settings for Scenarios 1, 2 & 3

Heat & Cool Temp Differentials: 1°F

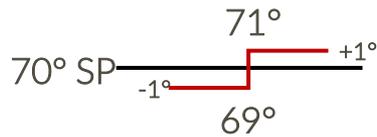
Heat/Cool Delta: 3°F

Configure Stages: Manual

Heat Stage 2 Temp Delta: 2°F

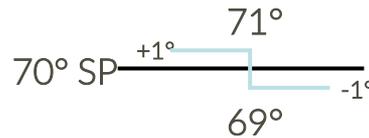
Minimum Outdoor Temp for Compressor Operation: Disable

Heat Mode



2° Swing

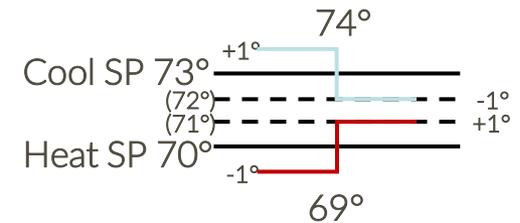
Cool Mode



2° Swing

Auto Mode for Single Splits Only

Auto Mode



2° Swing for each Mode,
5° Top to Bottom

Notes:

Auto Mode – Duel Set Point

Fan Speed at Indoor unit is Auto Speed Only for Scenarios 1, 2 & 3

Extremely configurable, all settings should be reviewed at start up

No manual in box on how to configure settings.

On Partners there is a manual that covers all settings at a high level, or go to site below for more in-depth information.

<https://support.ecobee.com/hc/en-us/sections/360001684292-Programming-Your-ecobee-Thermostat>

Ductless Control Strategies

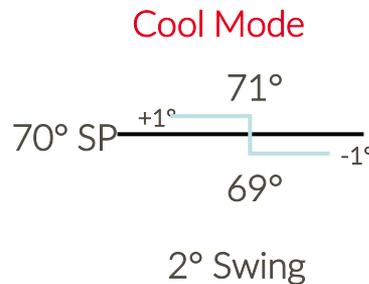
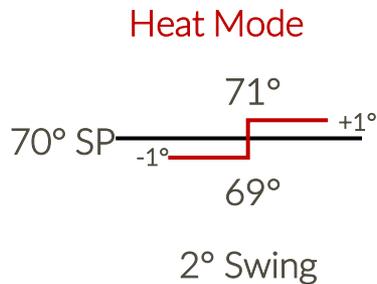
Nest & DLS 24-Volt Interface Control Strategies



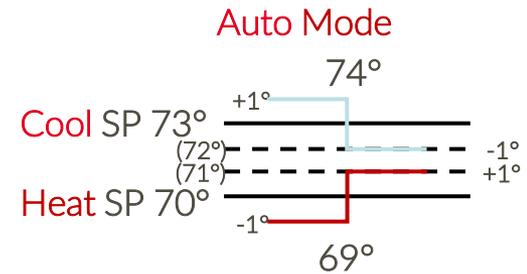
24-Volt Interface required



Nest



Auto Mode for Single Splits Only



2° Swing for each Mode,
5° Top to Bottom

Notes:

- Cleanest display and highest resolution of any control tested
- Least amount of setup required, only need to set up Date, Time and Wi-Fi
- Thinks & acts on change in Fahrenheit
- Auto Mode - Dual Set Point - Heat/Cool Delta 3°F, can be set wider
- Non-Adjustable Temp Swing (all modes)
- 2nd Stage Heat ON, 2°F Differential from 1st Stage (non-adjustable)
- Fan Speed at Indoor unit is Auto Speed Only for Scenarios 1, 2 & 3

Ductless Control Strategies

OK



Good



Use Follow Me
(default 601/701/801)

Better



Use Follow Me
(default 601/701/801)



Better+



24-Volt Interface required

Always keep for
Service Settings
and Diagnostic



End Users should use either
Wireless or the Wired Control,
not both.

Scenarios 1 ~ 3 – Auto Fan Only (L, M or H)

Scenarios 5 & 6 – Fan Speed Based on

Availability/Application

Nest – no configuration needed

Good for Scenarios 1, 2, 3 & 5

ecobee – all settings need to be reviewed

Good for all Scenarios, must be used for Scenario 6

Notes: No Carrier Wi-Fi solution for 40MBF12 Floor Console

Auto Fan uses Low, Med or High Speed

40MBA can only use built-in 24-Volt Interface with 24-Volt stat

Introduction Air Handler 40MBAA Ductless Systems

Ductless is announcing the introduction of the Air Handler 40MBAA Indoor Ductless System. Available as heat pump sizes 24, 36 & 48, these new systems feature an improved performance up to 20 SEER and up to 10.4 HSPF (size dependent).

Features

- Indoor sizes 24, 36 and 48
 - Size 24 compatible with Single zone and Multi-zone
 - Sizes 36 and 48 compatible only with **new** single zone outdoor 38MBRB
- 4-way installation (Up flow, Down flow, Right, Left)
- Constant volume airflow algorithm
- 24V interface built-in for third party thermostat
- Static Pressure up to 0.8 inWG
- Less than 2% air leakage when tested in accordance with ASHRAE standard 193
- Variable speed ECM motor
- Optional Electric Heater Kits available 5kW, 10kW, 15kW & 20kW



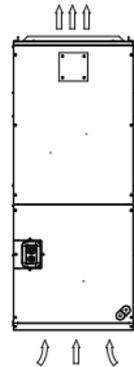
A. Upflow or Horizontal-Right Installation

The units can be installed in a vertical Upflow or horizontal (right) configuration.

NOTE: There is no need to change the direction of the evaporators with Vertical Upflow and Horizontal Right installations.

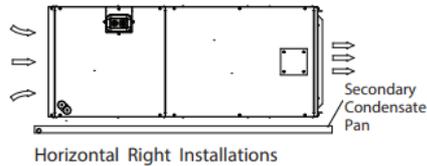
Follow these steps to perform a Vertical Upflow installation and Horizontal Right installation:

1. Open the upper cover.
2. Open the cover of the electronic control box.
3. Connect all necessary wiring according to the wiring diagram.
4. Connect the lineset.
5. Install the drain lines.



Vertical Upflow Installations

Fig. 7 — Vertical Upflow Installations



Horizontal Right Installations

Fig. 8 — Horizontal Right Installations

NOTE: For a horizontal right installation, secondary condensate pan (field supplied) must be installed (refer to local codes).

B. Downflow or Horizontal-Left Installation

For the Horizontal Left installation and the Vertical Downflow installation, the direction of the evaporator should be changed and the drain pan should be removed first.

Use the following steps to remove the drain pan.

1. Remove the filter cover.
2. Remove the filter.

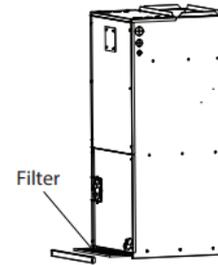


Fig. 9 — Remove the Filter

3. Open the evaporator cover and remove the drain plug.

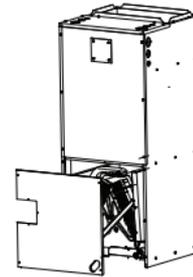
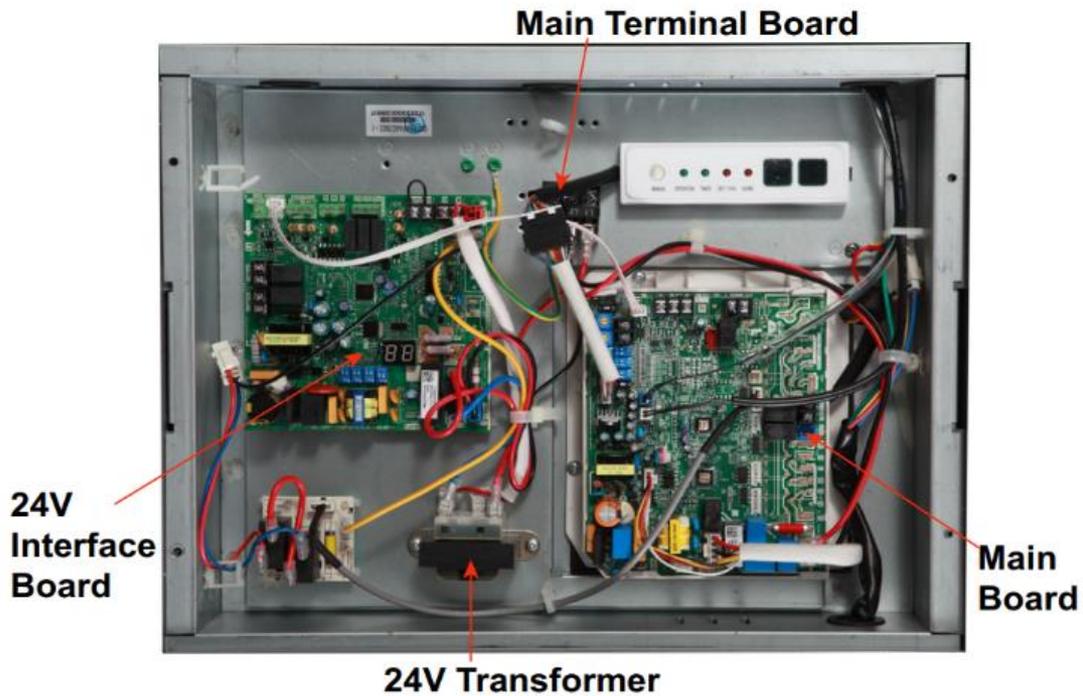


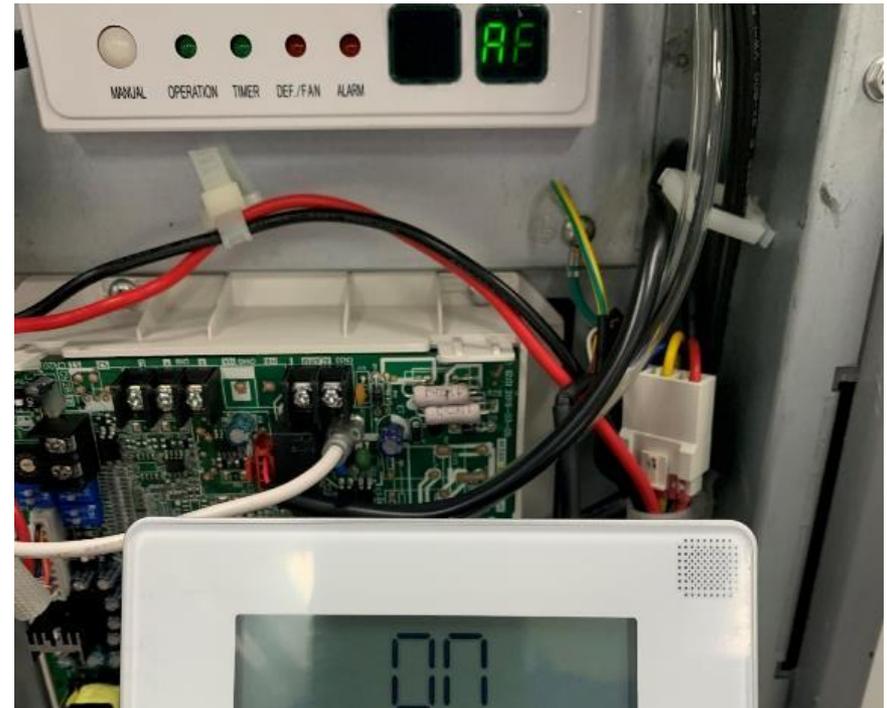
Fig. 10 — Open the evaporator cover and remove the drain plug

40mbab



~~RSMM_2021~~ ~~SETTING~~ STATIC

- Automatic Airflow Adjustment
- Scroll to AF press confirm fan will run for 3-6 minutes
- ON and AF indicator will display on controller
- fan will shut off when the adjustment is complete



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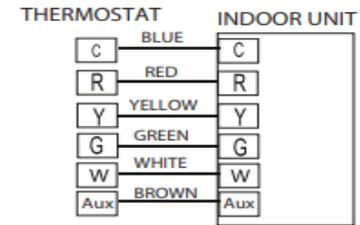
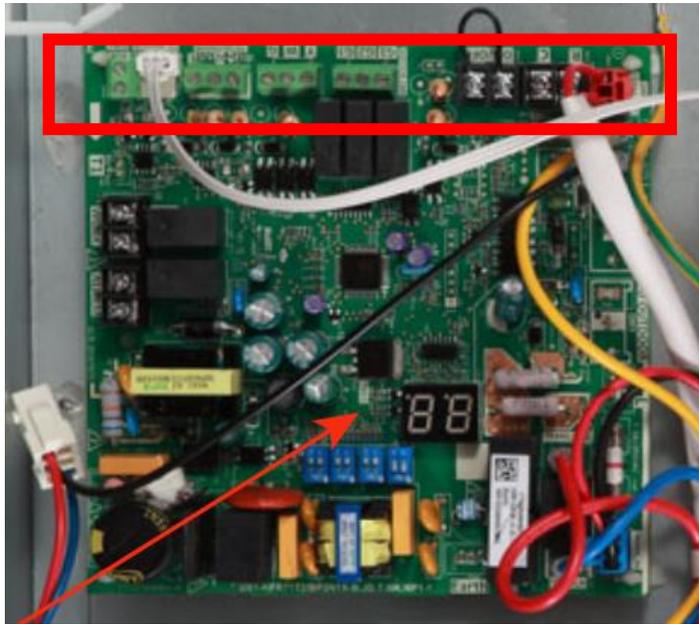


Fig. 63 — Cooling and Heating Units Adopt Electric Heating Device

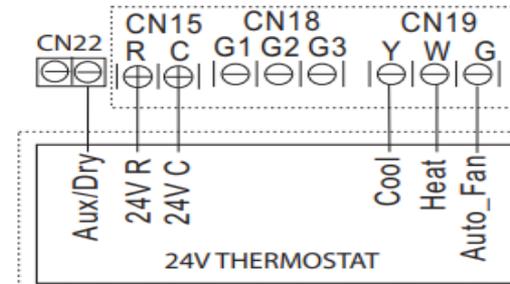


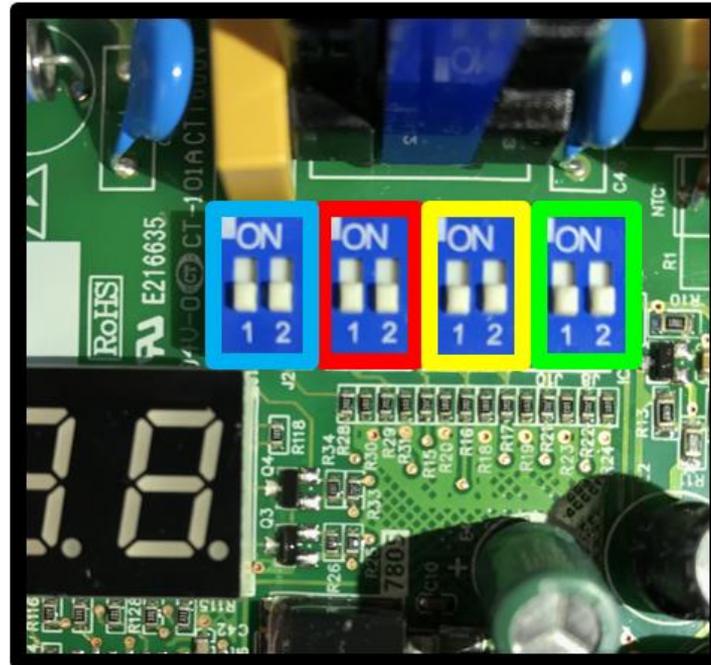
Fig. 64 — 24V Thermostat Wiring Diagram

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The first switch to the left is dip switch SW1-1.

Display tube			Set/outdoor only		
SW1-1	<input type="checkbox"/>	<input type="checkbox"/>	SW1-2	<input type="checkbox"/>	<input type="checkbox"/>
Mode	OFF	ON	Mode	Outdoor only	Set
Factory default		✗	Factory default		✗

Unit type			Anti-cold		
SW2-1	<input type="checkbox"/>	<input type="checkbox"/>	SW2-2	<input type="checkbox"/>	<input type="checkbox"/>
Mode	Heat pump	Cooling only	Mode	YES	NO
Factory default	✗		Factory default	✗	



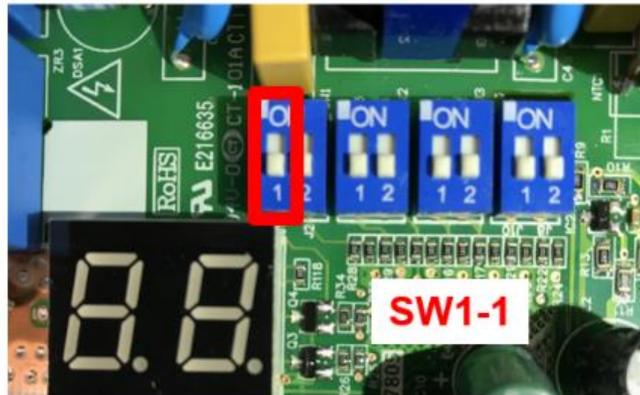
Dry Mode			Frequency Time		
SW3-1	<input type="checkbox"/>	<input type="checkbox"/>	SW3-2	<input type="checkbox"/>	<input type="checkbox"/>
Mode	Aux-heat	Set	Mode	3H	1H
Factory default	✗		Factory default	✗	

Set/indoor only			Indoor control		
SW4-1	<input type="checkbox"/>	<input type="checkbox"/>	SW4-2	<input type="checkbox"/>	<input type="checkbox"/>
Mode	Set/outdoor only	Indoor only	Mode	Fan High	Fan Middle
Factory default	✗		Factory default	✗	

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SW1-1

Display tube		
SW1-1		
Mode	OFF	ON
Factory default		



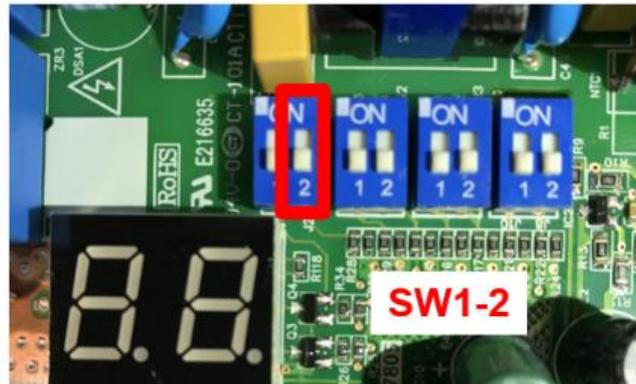
Used to turn ON or OFF the diagnostic code display LED on the control board of the 24V Interface Kit.

SW1-1	Result	Note
ON	Display on	
OFF	Display off	

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SW1-2

Set/outdoor only		
SW1-2		
Mode	Outdoor only	Set
Factory default		✘



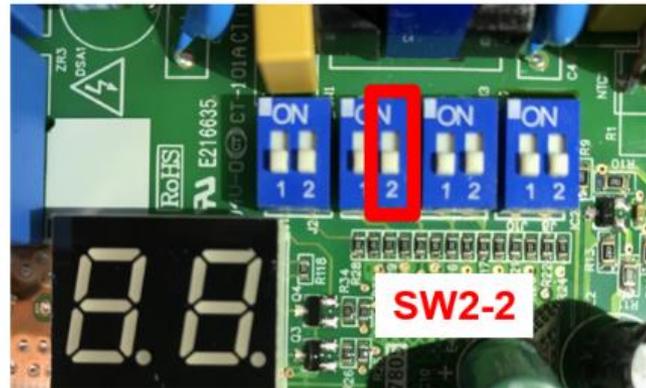
Used for selecting indoor unit type. When using a non-ductless indoor this would be set to the off position.

SW1-2	Result	Note
ON	Sets - Both Ductless Indoor and Outdoor Units (For Scenarios 1-3)	
OFF	Outdoor only (Hybrid Solution) (For Scenario 4) ----- Compatible with other 24V indoor units Fan Coil/Furnace/Cased Coil.	Default (see NOTES* below)

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SW2-2

Anti-cold		
SW2-2	<input type="checkbox"/>	<input type="checkbox"/>
Mode	YES	NO
Factory default	✘	



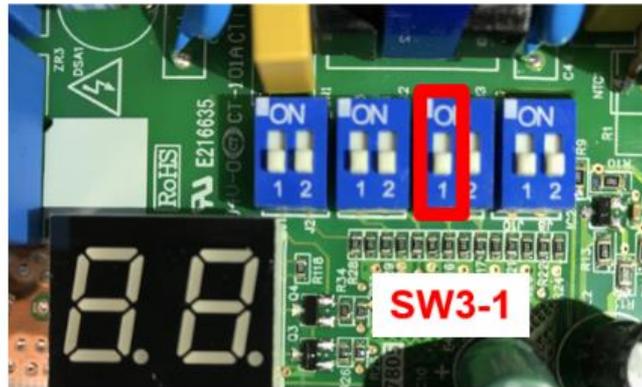
Used for freeze protection of the indoor coil.

SW2-2	Result	Note
ON	Fan does not stop	
OFF	Fan will stop if the indoor coil temperature is low	

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SW3-1

Dry Mode		
SW3-1		
Mode	Aux-heat	Set
Factory default		



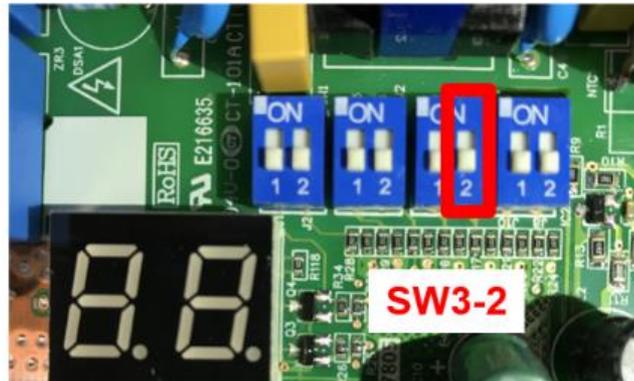
On Ductless Systems, Dry is used with thermostats with a Dry Function output.

SW3-1	Result	Note
ON	Dry Mode	
OFF	Used on future applications	

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SW3-2

Frequency Time		
SW3-2		
Mode	3H	1H
Factory default	X	



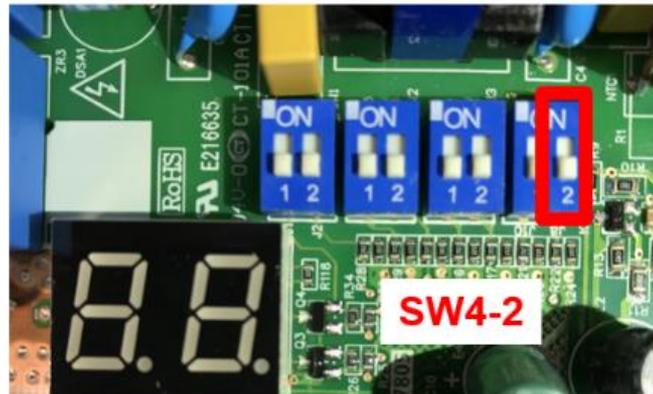
Used to increase the compressor frequency in case the set point has not been reached after 1 hour or 3 hours of operation.

SW3-2	Result	Note
ON	1h	
OFF	3h	

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SW4-2

Indoor control		
SW4-2		
Mode	Fan High	Fan Middle
Factory default	X	



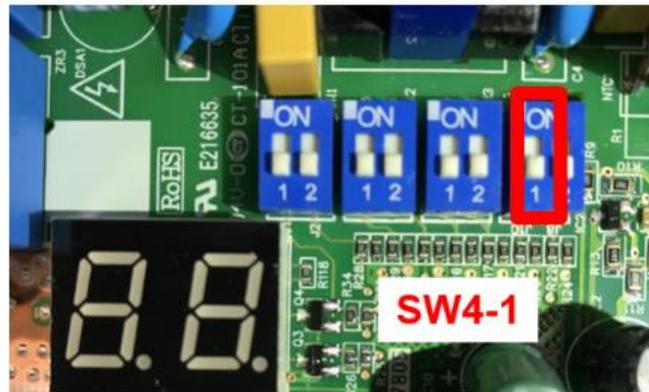
Not required. Used on future applications. Select the indoor unit's fan speed (when selecting DIP switch 4-1).

SW4-2	Result	Note
ON	Medium fan speed	
OFF	High fan speed	

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SW4-1

Set/indoor only		
SW4-1		
Mode	Set/outdoor only	Indoor only
Factory default	X	



Not required. Used on future applications. Select the indoor unit's fan only mode.

SW4-1	Result	Note
ON	The SW4-2 is available under fan only mode	
OFF	The SW1-2 is available	



AHU	FAN COIL BLOWER PERFORMANCE CFM (DRY COIL WITHOUT FILTER OR ELECTRIC HEAT)										
	Model Number	Static Pressure	Speed	EXTERNAL STATIC PRESSURE (in.w.c.)							
				0	0.1	0.2	0.3	0.4	0.5	0.6	0.7
24	SP1	High	1,076	975	853	675	502	200	/	/	/
		Medium	942	822	658	465	184	/	/	/	/
		Low	797	648	437	100	/	/	/	/	/
	SP2	High	1,250	1,175	1,075	965	815	650	475	200	/
		Medium	1,185	1,095	996	855	685	512	291	/	/
		Low	1,100	1,005	892	712	558	322	/	/	/
	SP3	High	1,490	1,415	1,334	1,250	1,156	1,028	880	750	600
		Medium	1,375	1,294	1,206	1,100	988	822	676	500	284
		Low	1,285	1,200	1,105	995	845	685	525	252	/
	SP4	High	1,825	1,756	1,670	1,592	1,515	1,450	1,360	1,250	1,120
		Medium	1,630	1,556	1,480	1,400	1,310	1,215	1,105	950	825
		Low	1,525	1,450	1,372	1,280	1,190	1,074	935	785	650

Remove the batteries from the remote and wait for the screen to clear or press any button and the screen clears





Reinstall the batteries within 30 seconds of replacing batteries, simultaneously press mode and timer on for 5 seconds. This is service function mode and should read F1

Setting Static

- **PRESS THE DOWN BUTTON ON THE CENTER OF THE REMOTE TO DISPLAY “E9”**



Setting Static

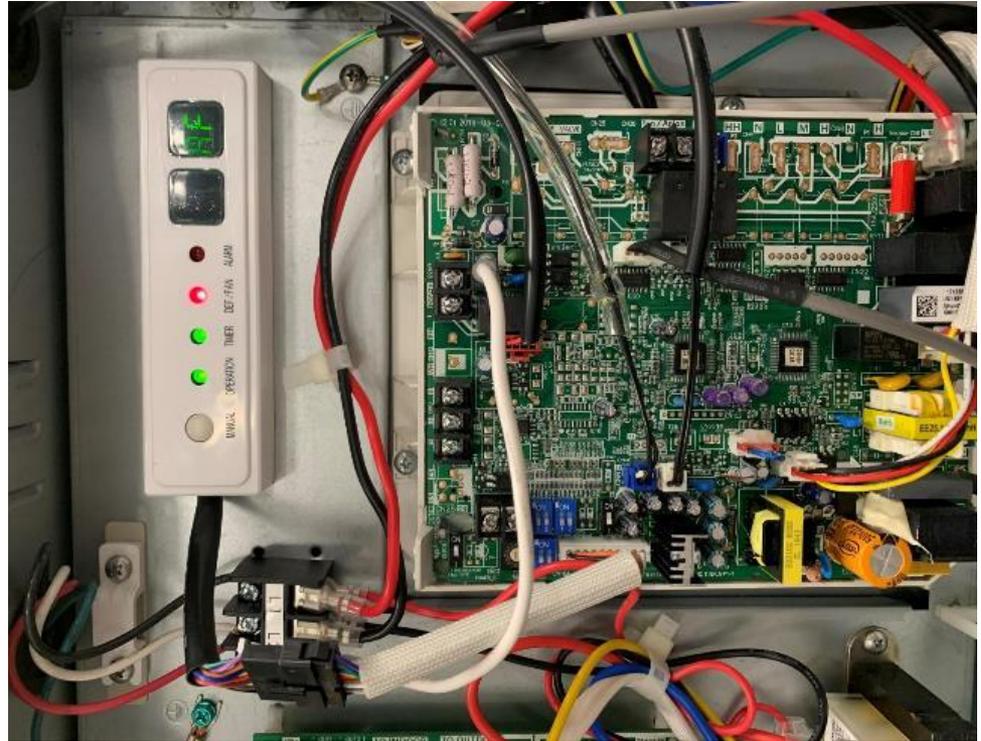
- **PRESS MODE TO SET THE ESP**
- **PRESS TIMER TO CONFIRM**
- **CHECK PERFORMANACE CURVE**
- **POWER CYCLE TO SET CHANGES**





To set Automatic Airflow Adjustment function
Select D4 with arrow up button
Press Timer on to confirm
Wait 10 seconds

AF will appear on the IR Receiver
The fan will run for 3-6 minutes
during the
Automatic Airflow Adjustment and
will stop once complete
Remove the batteries from the
remote to exit Service Function
mode
Power off the unit then power it
back on to retain the setting value





CAUTION

While connecting the wires, strictly follow the wiring diagram.
The refrigerant circuit can become very hot.
Keep the interconnection cable away from the copper tube.

6. Clamp down the cable with the cable clamp. The cable must not be loose or put strain on the fork terminals.
7. Reattach the electric box cover.

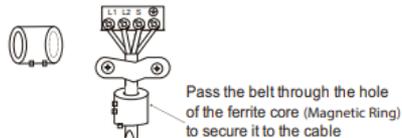


Fig. 52 — Ferrite Core (Magnetic Ring)

The main power is supplied to the outdoor unit. When disconnecting the power of the outdoor unit, the indoor unit would lose power. A disconnect switch is not required on the indoor unit side on the wiring between the outdoor and indoor unit. A 3 pole disconnect (purchased separately) may be used for extra protection between the indoor and outdoor Unit.

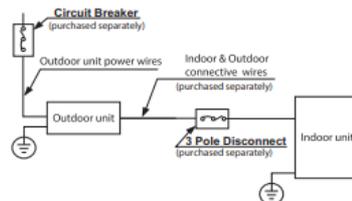


Fig. 53 — Wiring Connection of Indoor Unit

The Auxiliary Heater must have a separate branch electric circuit with a field-supplied disconnect switch located within sight from, and readily accessible from, the unit.

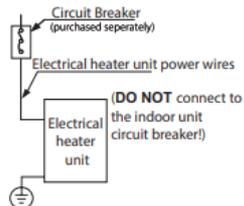


Fig. 54 — Wiring Connection of Electric Heater (optional)

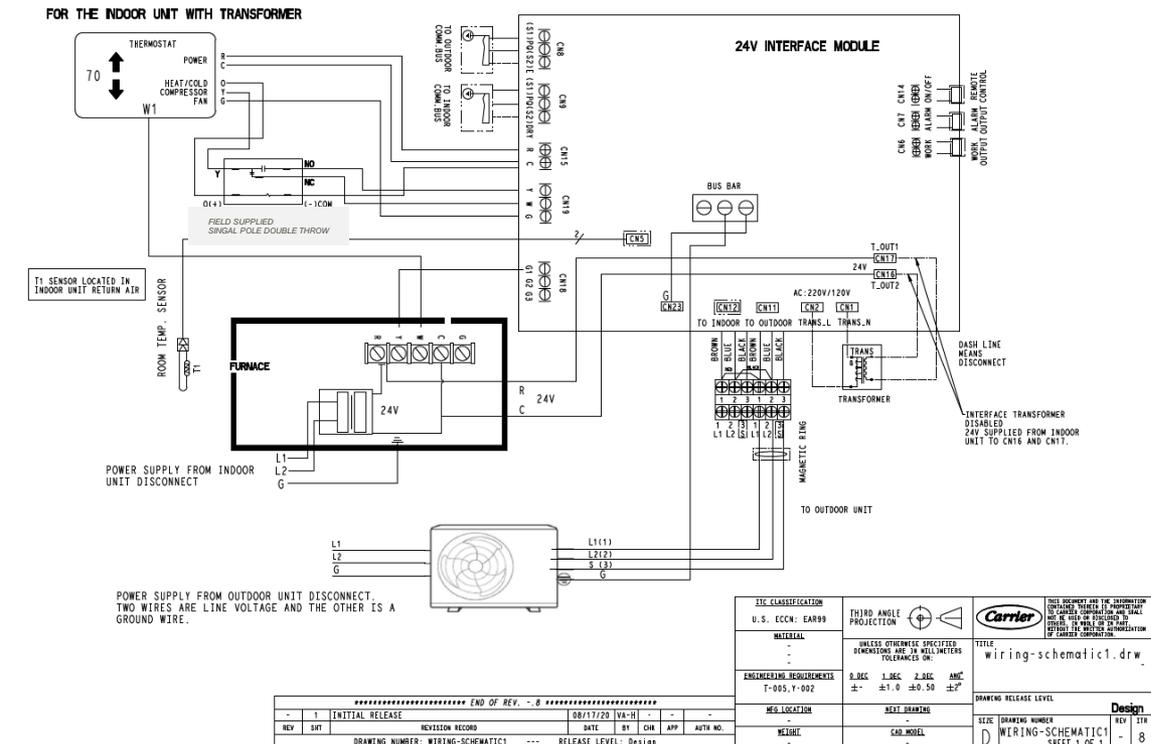
HYBRID WIRING

Ductless Trouble Shooting

24 Volt Wiring – Gas Furnace Combinations

24V Interface Manual – Scenario 6

- Heat Pump thermostat with Dual fuel capabilities must be used. Wi-Fi capable that detects outdoor temperature is required.
- A control relay must be added for proper operation.
- Reference the 24V Interface instructions for proper fan set up based on the Gas Furnace selection.
- The transformer in the 24V Interface is to be disabled. The transformer in the Furnace is used to power the control system.

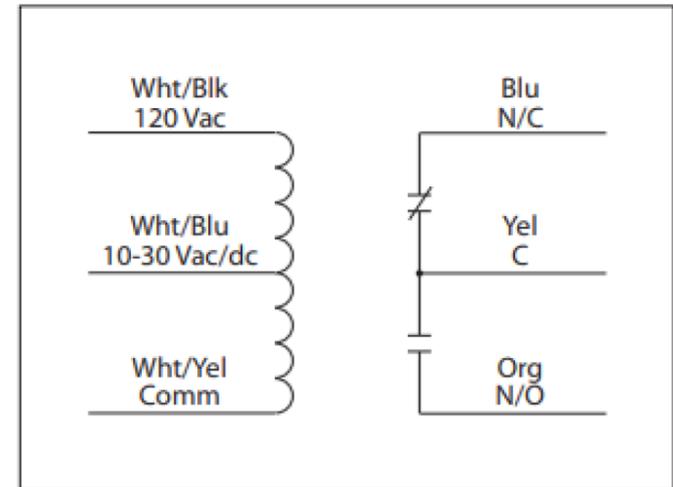


Example Changeover Relay

Fig. 23 —RIBU1C - Enclosed Relay

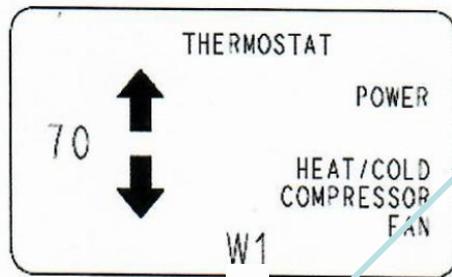


RIBU1C

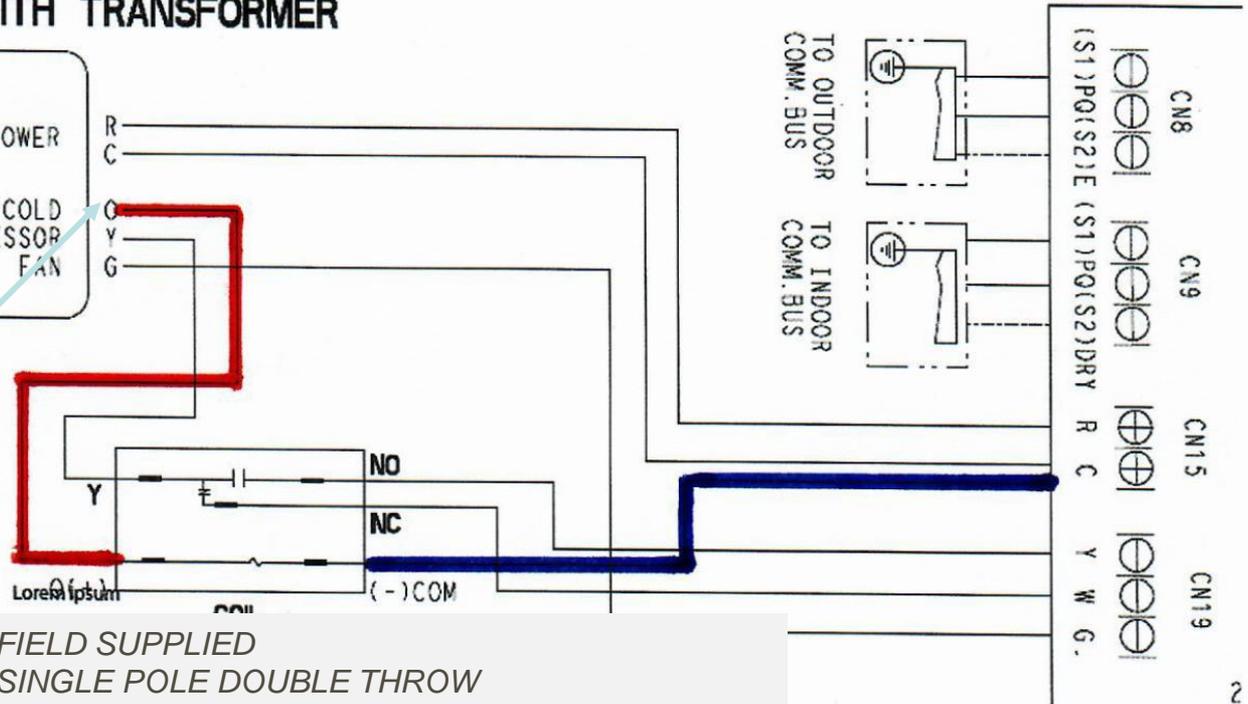


Auxiliary Relay – Why is this needed?

FOR THE INDOOR UNIT WITH TRANSFORMER



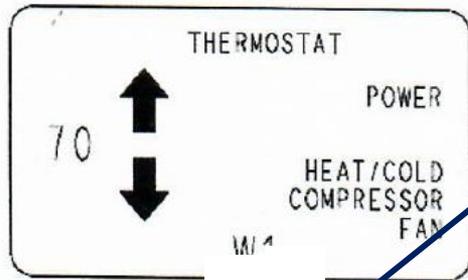
Use of the O Terminal on the Heat Pump thermostat controls the auxiliary relay coil switching the system to the proper mode.



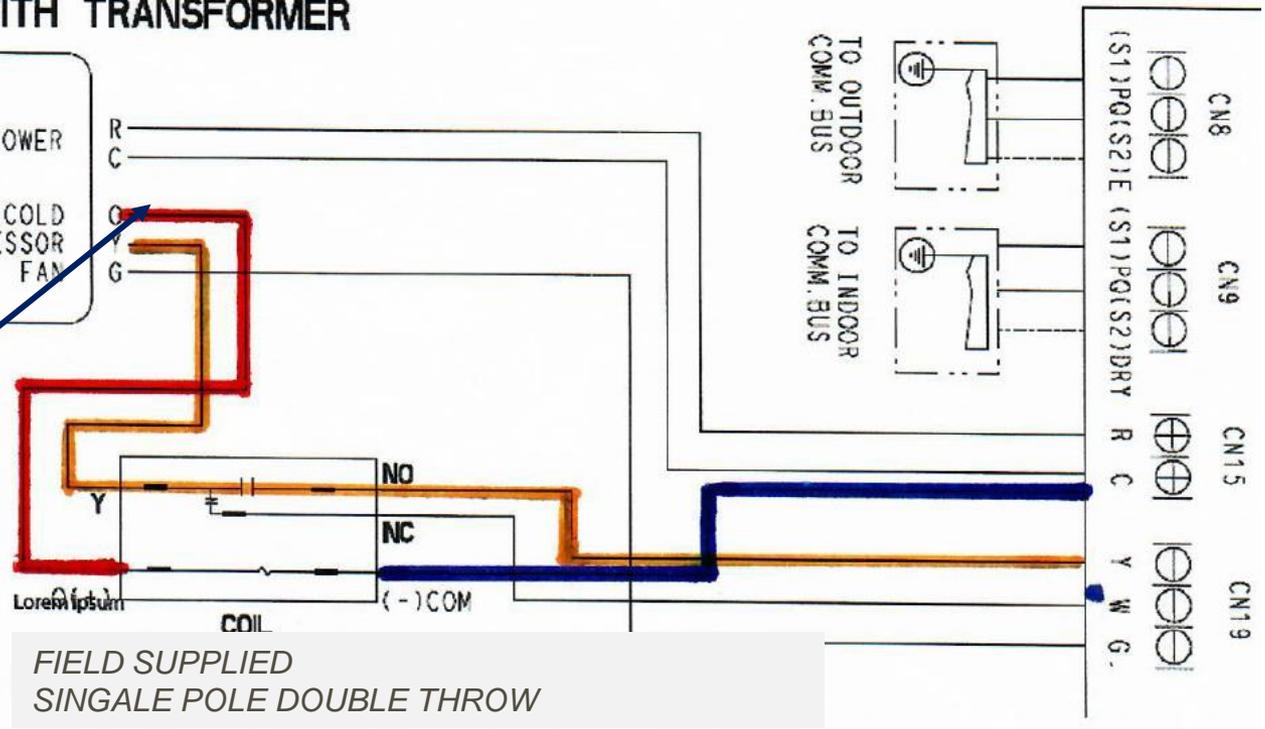
2

Auxiliary Relay – Cooling Mode

FOR THE INDOOR UNIT WITH TRANSFORMER



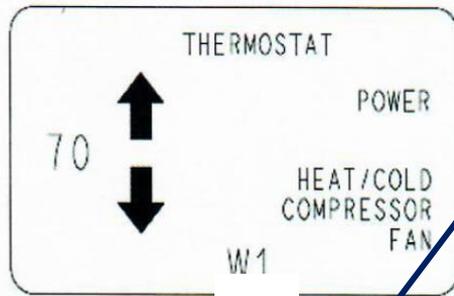
The auxiliary relay changes position to allow the thermostat Y terminal to send 24 volts to the Y terminal on the 24V Interface on a call for cooling.



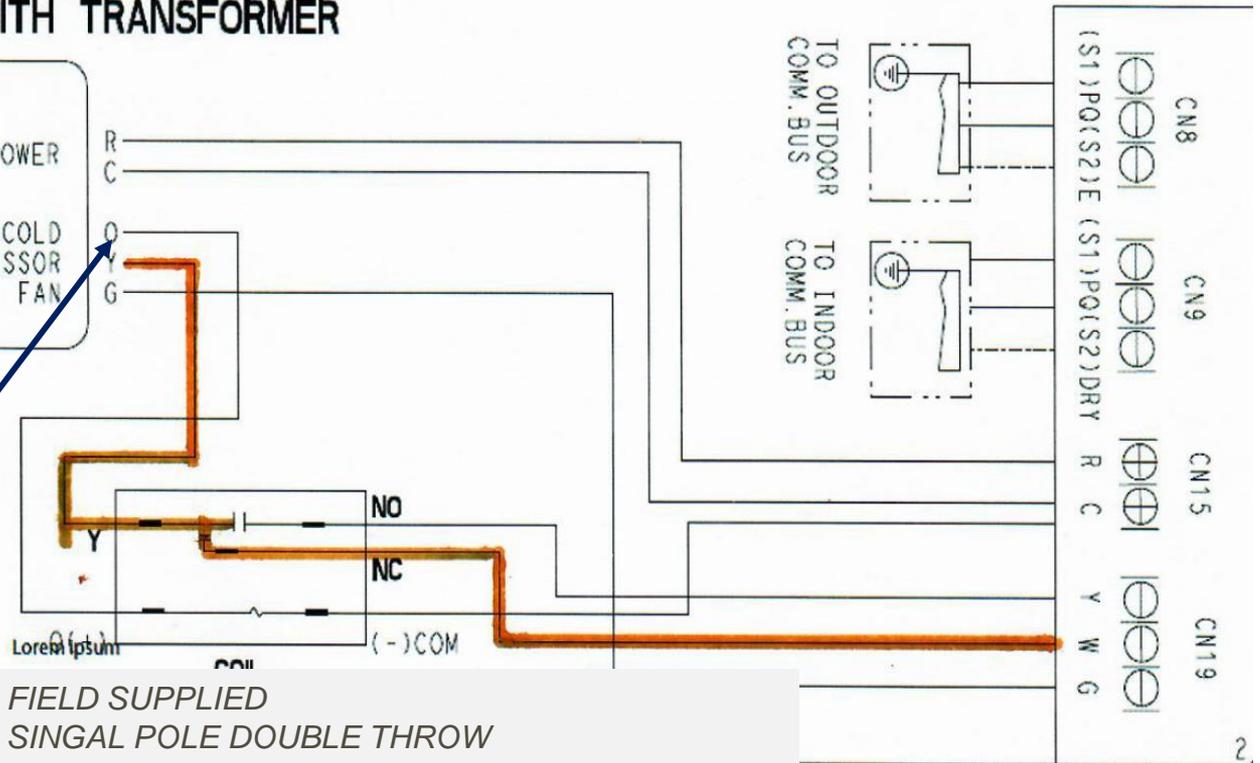
FIELD SUPPLIED
SINGLE POLE DOUBLE THROW

Auxiliary Relay – Heating Mode

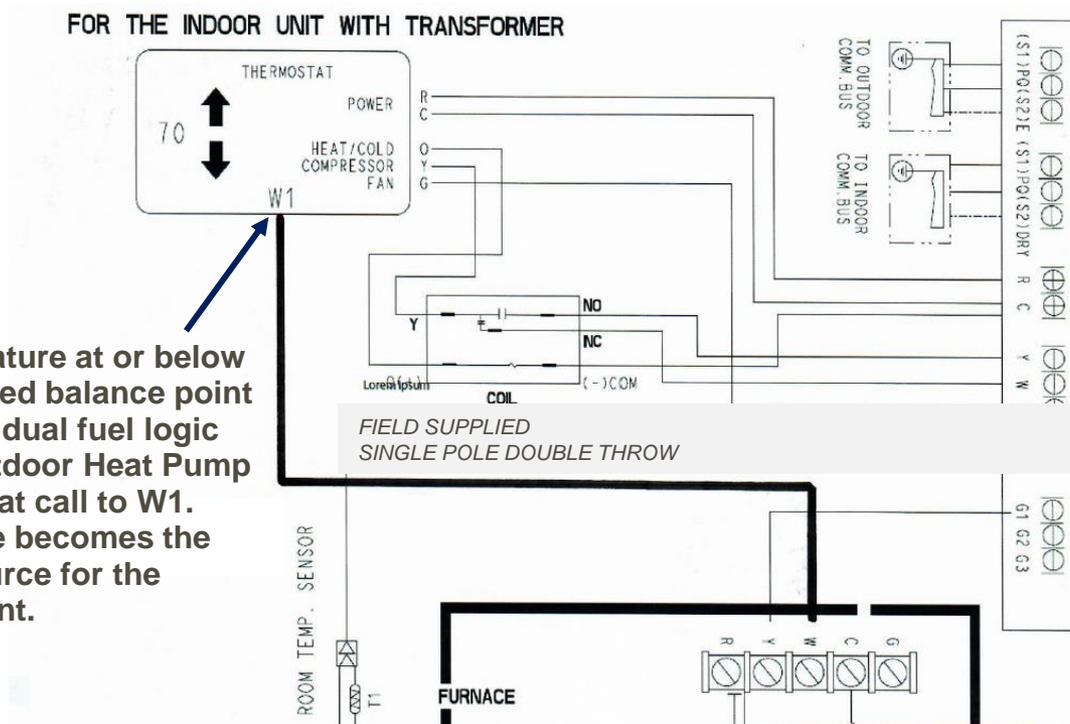
FOR THE INDOOR UNIT WITH TRANSFORMER



A call for heating from the thermostat Y terminal sends 24 volts to the W terminal on the 24V Interface.



Dual Fuel – Auxiliary or Emergency Heat



Outdoor temperature at or below the pre-determined balance point the thermostat's dual fuel logic locks out the outdoor Heat Pump switching the heat call to W1. The Gas Furnace becomes the primary heat source for the space at this point.

EB-state3ltcb-01

 ecobee3^{lite}

SMART
THERMOSTAT
PRO

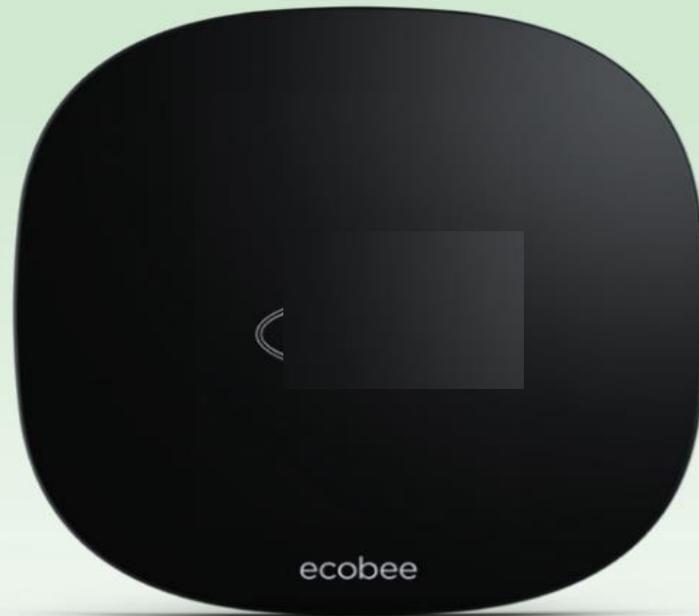


No recharging or power stealing.
5-year Pro install limited warranty.*

5-YEAR PRO INSTALL LIMITED WARRANTY*

Get an extra 2 years of warranty when you professionally purchase and install your ecobee3 lite.

*Requires professional installation. Product must be returned to installing contractor. See warranty certificate for complete details and restrictions.



EB-STATE3LTCB-01

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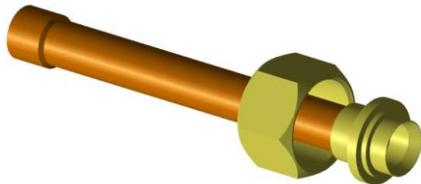
Key Hybrid Configuration Points

- A Wi-Fi connected thermostat that detects outdoor temperature is preferred.
- The T1 (Return Air Temperature) sensor supplied with the 24 Volt Interface Kit must be installed in the airstream of the return air side of the system.
- If the heat pump is to be operated in **COOLING ONLY** mode, a field supplied relay is not needed and the O terminal on the heat-pump thermostat will not be used.
- For the Phase One Hybrid system combinations, the thermostat changeover temperature should be set at 35°F (1.67°C) to reduce the need for the system to enter the defrost mode.

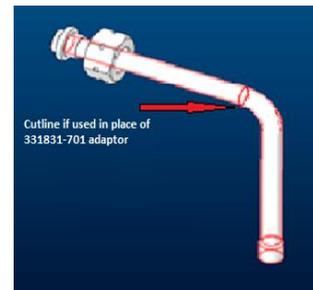
Metering Device (TXV) Removal

- The refrigerant is metered (EEV) in the 38MAR outdoor unit.
- This requires the removal of the factory installed TXV from the indoor unit / cased coil.
- Once the TXV is removed, a Piping Adapter Kit must be used to properly connect the refrigerant circuit.
- The distributor line on the “A” coil has a **mechanical fitting** that will accept a 3/8” male Chatleff fitting with a Teflon gasket (flared fittings **CANNOT** be used).
- The Piping Adapter Kits shown below are sold through RC.
- **NOTE: MUST** flow Nitrogen in the system while brazing the line set adaptor.

331831-701



40MD000003
Available 11-30



Refrigerant Pipe Installation

Refrigerant Line Installation:

- Always remove inner and outer burrs before flaring.
- Burrs will act as a metering device causing change in state of the refrigerant resulting in capacity related issues.
- Un-removed burrs can break off and cause serious problems.
- Ream all pipe to the full inside diameter.
- If this rough, inside edge is not removed by reaming, erosion may occur due to local turbulence and increased local flow velocity in the tube. This has the potential to cause restrictions, change state of the refrigerant and increased call backs.
- A correctly reamed pipe will provide an excellent surface for a tight seal, pressures, velocities and laminar refrigerant flow.



Refrigerant Line Installation:



GOOD



VS

 BAD



Refrigerant Line Installation:

Indoor Unit Piping

NO TRAPS

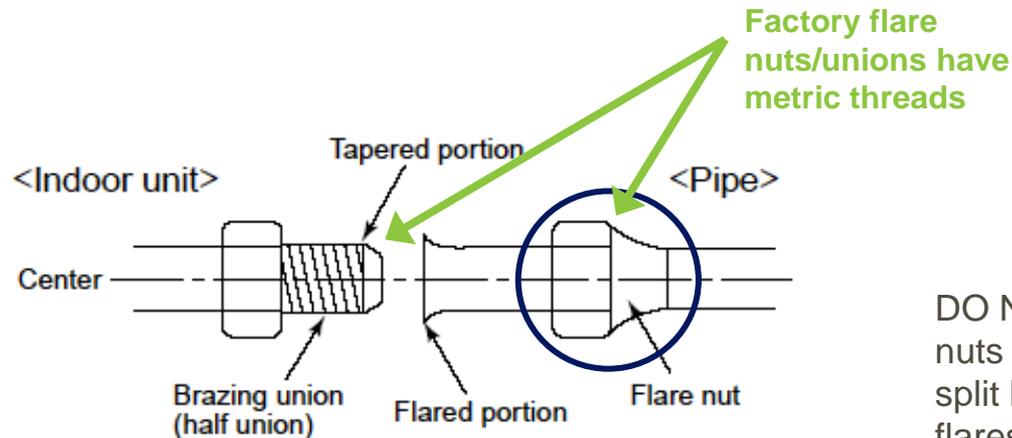


DU's

Refrigerant Line Installation:

Indoor Unit Piping

CONNECTION AND CENTERING



Flare is 45 degree flare used for R-410a

DO NOT USE the Flare nuts from pre-made mini split line-sets: USE the flares provided with the equipment!

Refrigerant Line Installation:

Indoor Unit Piping



Refrigerant Line Installation:

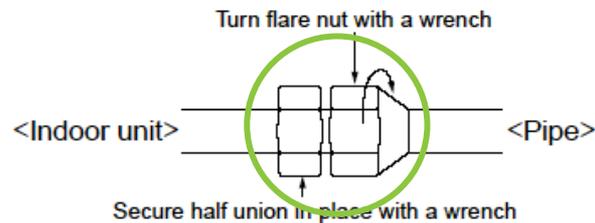
Indoor Unit Piping

TIGHTENING THE FLARE NUT

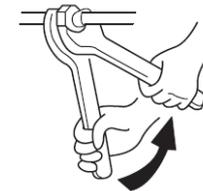
Connecting Pipe Outer Dia. (in)	Ft-lbs
Ø1/4"	10 to 13
Ø3/8"	24 to 31
Ø1/2"	37 to 46
Ø5/8"	50 to 60



Torque wrench



Use a backup wrench



Refrigerant line insulation



Refrigerant Line Installation

Both refrigerant pipes must be insulated separately

Per Local, State or National codes

All refrigerant pipe and fittings are insulated, sealed, and supported.

Per Local, State or National codes

**1 Inch minimum thickness when codes are not present
245° F Closed cell foam pipe insulation
material as specified by local and
national codes.**

Performance series – Multi-zone MGR

START–UP

Test Operation

Perform a test operation after completing a gas leak and electrical safety check. *See the indoor unit installation instructions and owner’s manual for additional start up information.*

SYSTEM CHECKS

1. Conceal the tubing where possible.
2. Ensure the drain tube slopes downward along its entire length.
3. Ensure all tubing and connections are properly insulated.
4. Fasten the tubes to the outside wall, when possible.
5. Seal the hole through which the cables and tubing pass.

OUTDOOR UNIT

1. Are there unusual noises or vibrations during operation?

Job Well Done



Controls

38MURA & Crossover Applications

General Installation Notes:

- Indoor unit is NOT powered from outdoor unit.
- TXV does NOT need to be removed from indoor coil.
- O/B Energized on Heating.
- Y1 Terminal at outdoor unit can be utilized instead of Y2 for slower ramp up rate, diagrams to follow.
- For FV4CN(B,F) applications – Recommend “HP-EFF” setting on Easy Select Board.
- Must use dual fuel thermostat for all furnace combinations. Simultaneous Heat Pump and Furnace operation not permitted.
- No wiring diagrams shown will operate a Furnace during Defrost.
- For Furnace applications – Fan will NOT shut off during Defrost unless a relay is added.



Fan Coils	Furnaces
FV4CN(B,F)	58S(B,C) / 81(0,1)SA
FZ4ANP	58SP(0,1) / 82(0,1)SA
FJ4DN	58SU0 / 830SA
FB4CN	58TP(0,1) / 82(0,1)TA
FX4DN	59SC2 / 912SD
PF4MN	59SC5 / 915SB
FMA4(P,X)	59SP6/ 926SA
FM(C,U)	59TP6 / 926TB
	59SU5 / 935SA
	OVLAAB
	OVMAAB



Attention:
CE recommends ecobee
for Dual Fuel Applications.



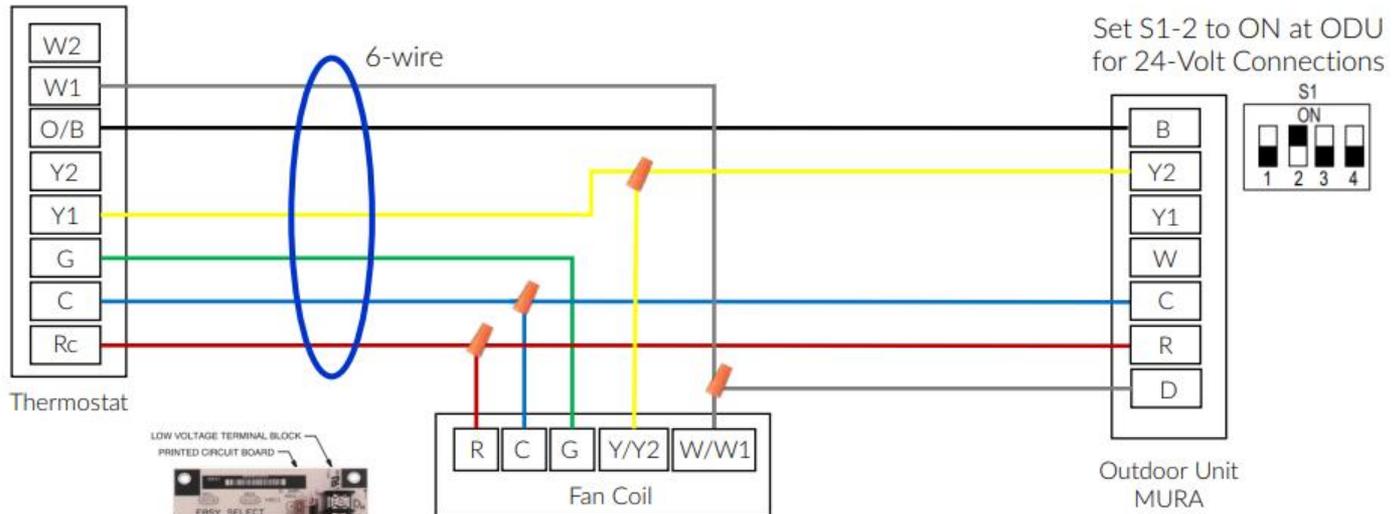
Controls

38MURA & FV4CN(B,F) Fan Coil

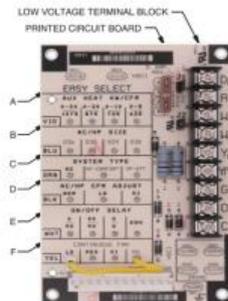
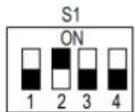


ecobee

2 Stage Heat & 1 Stage Cool
 1 Stage Heat Pump
 1 Stage Electric Heat



Set S1-2 to ON at ODU for 24-Volt Connections



Recommend "HP-EFF" setting on Easy Select Board during initial set up.

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.

Notes:

High Voltage wiring to equipment not shown.
 Fan does NOT shut off during Defrost.
 Electric Heat will operate during Defrost.

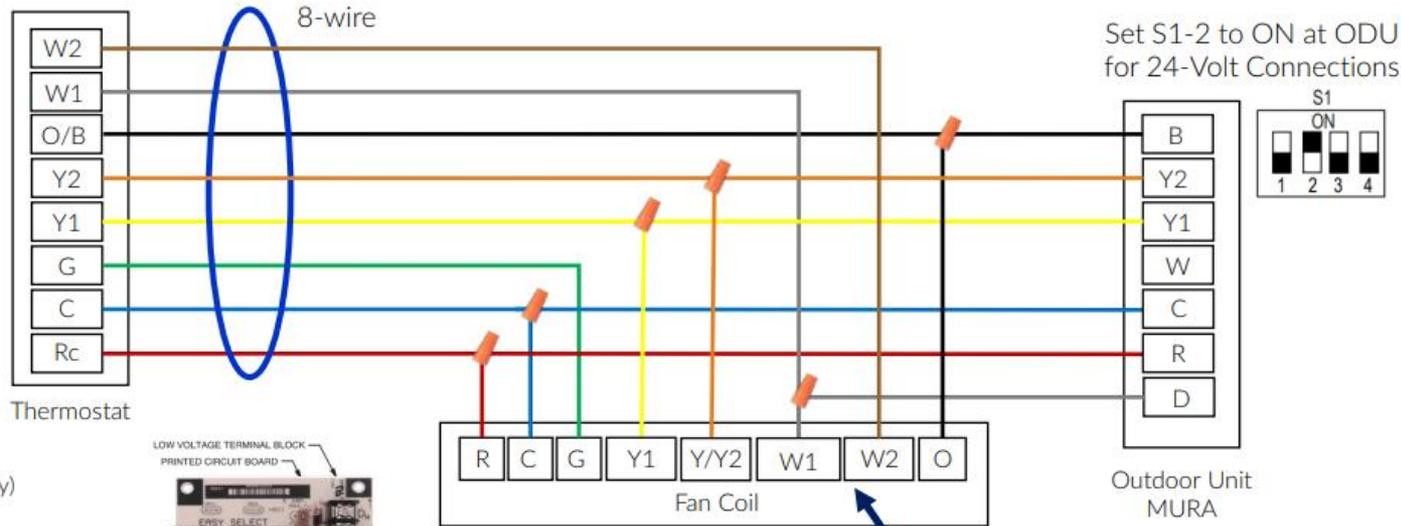
Controls

38MURA & FV4CN(B,F) Fan Coil

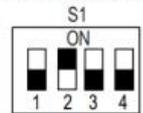


ecobee

4 Stage Heat & 2 Stage Cool
 2 Stage Heat Pump
 2 Stage Electric Heat (for 2 circuit heaters only)

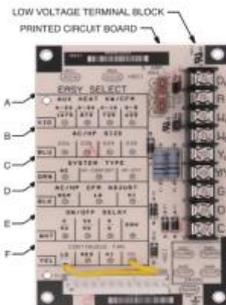


Set S1-2 to ON at ODU for 24-Volt Connections



Outdoor Unit
MURA

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.



Remove factory jumper from W1, W2

Recommend "HP-EFF" setting on Easy Select Board during initial set up.

Notes:
 High Voltage wiring to equipment not shown.
 Fan does NOT shut off during Defrost.
 Electric Heat will operate during Defrost.



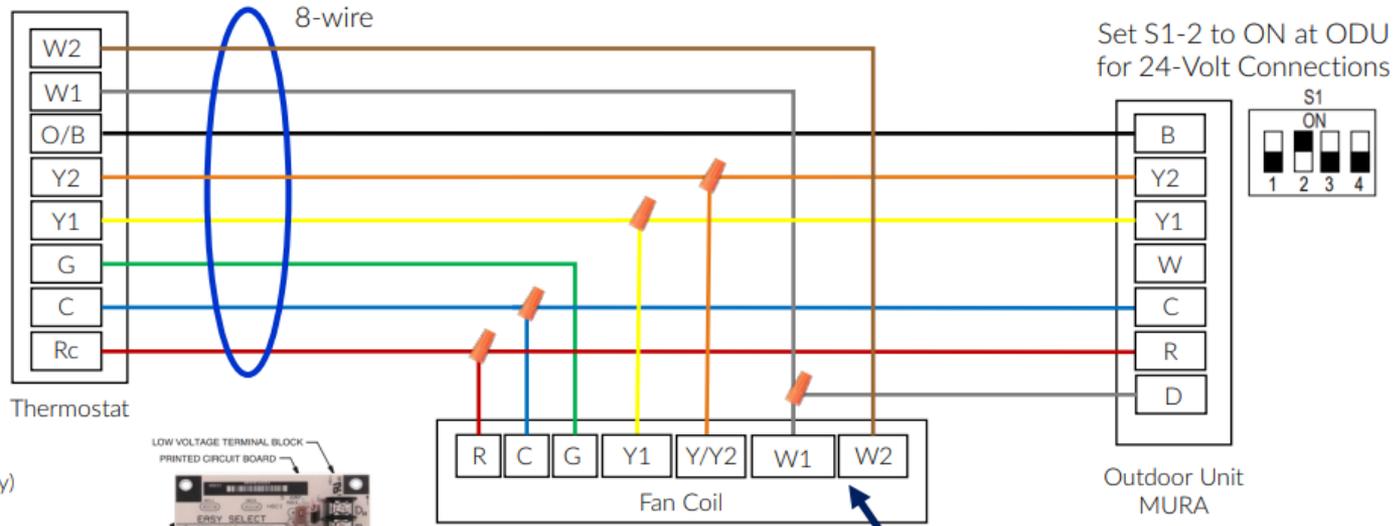
Controls

38MURA & FV4CN(B,F) Fan Coil

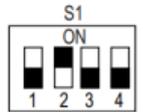


ecobee

- 4 Stage Heat & 2 Stage Cool
- 2 Stage Heat Pump
- 2 Stage Electric Heat (for 2 circuit heaters only)

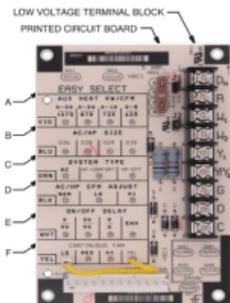


Set S1-2 to ON at ODU for 24-Volt Connections



Outdoor Unit MURA

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.



Remove factory jumper from W1, W2

Recommend "HP-EFF" setting on Easy Select Board during initial set up.

- Notes:
- High Voltage wiring to equipment not shown.
 - Fan does NOT shut off during Defrost.
 - Electric Heat will operate during Defrost.

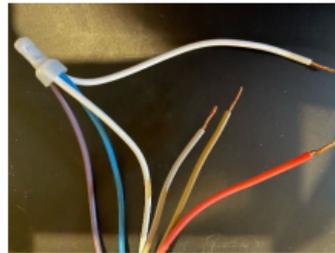
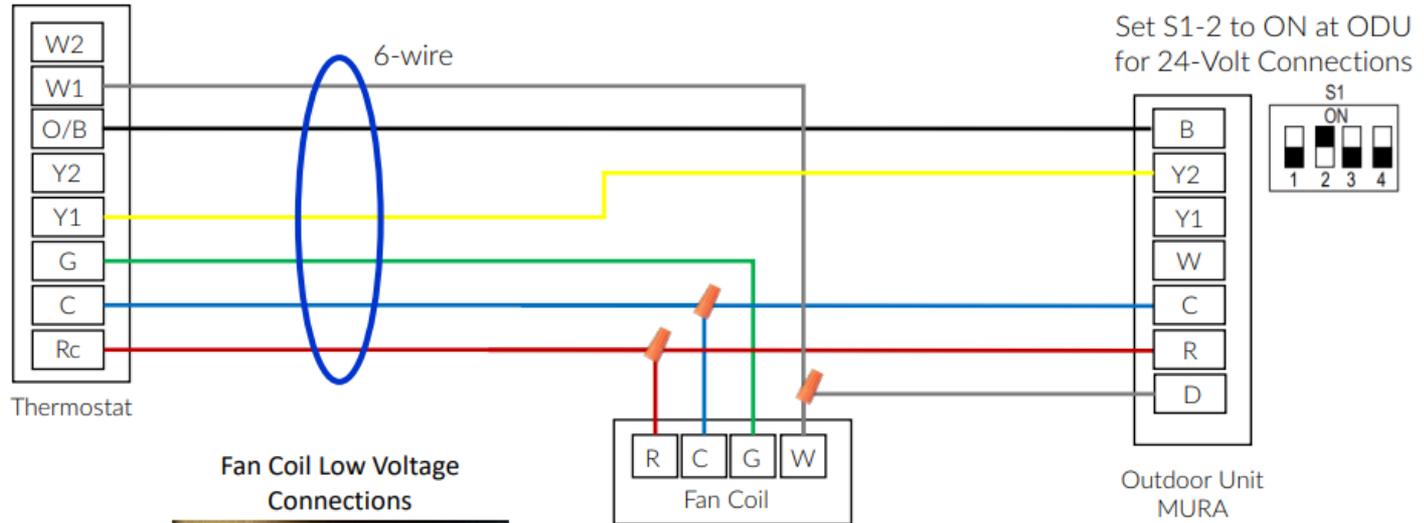
Controls

38MURA & FJ4DN / FB4CN / FX4DN / PF4MN / FZANP Fan Coils



ecobee

2 Stage Heat & 1 Stage Cool
 1 Stage Heat Pump
 1 Stage Electric Heat



Wire to Terminal designations:

Red is R

Gray is G

Brown is C

White is wire crimped to white, blue and violet for the 3 stages of heat

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.

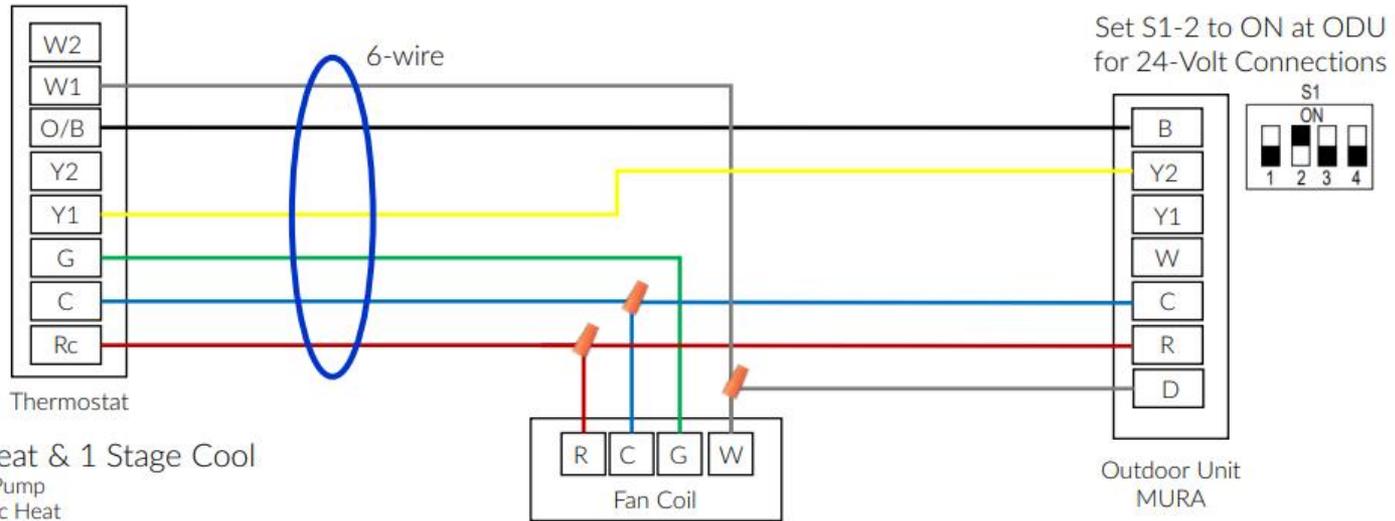
Notes:
 High Voltage wiring to equipment not shown.
 Fan does NOT shut off during Defrost.
 Electric Heat will operate during Defrost.

Controls

38MURA & FMA4(P,X) Fan Coil



ecobee



2 Stage Heat & 1 Stage Cool
 1 Stage Heat Pump
 1 Stage Electric Heat

Set S1-2 to ON at ODU
 for 24-Volt Connections

Y1 Terminal at ODU can
 be utilized instead of Y2
 for slower ramp up rate.

Notes:
 High Voltage wiring to equipment not shown.
 Fan does NOT shut off during Defrost.
 Electric Heat will operate during Defrost.

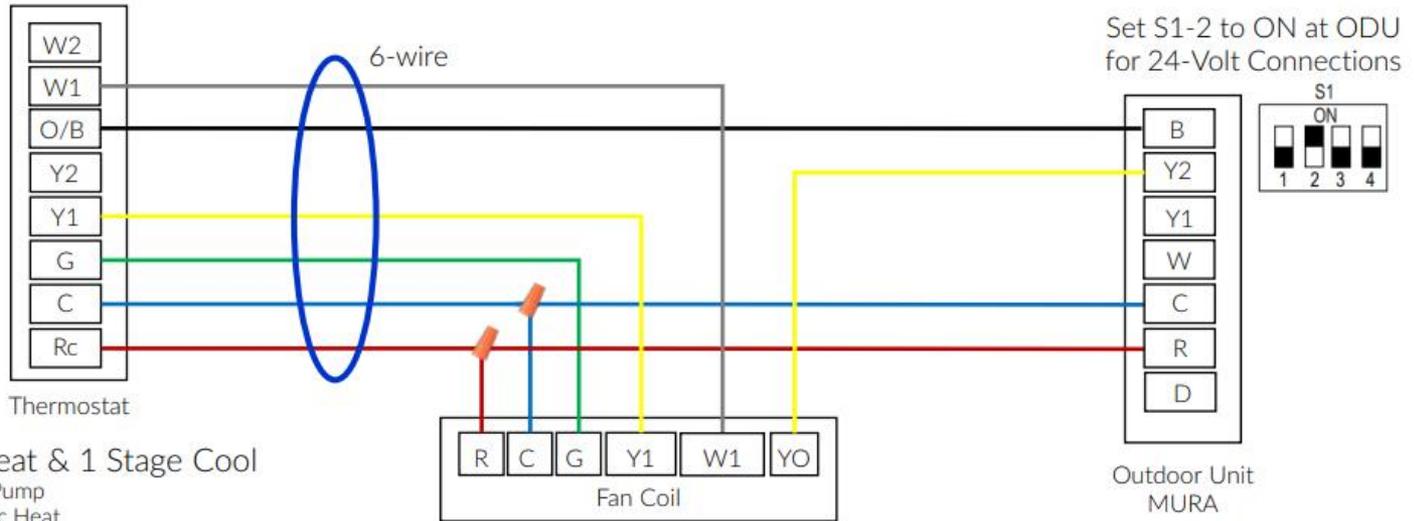


Controls

38MURA & FM(C,U) Fan Coil



ecobee



2 Stage Heat & 1 Stage Cool
 1 Stage Heat Pump
 1 Stage Electric Heat

Notes:
 High Voltage wiring to equipment not shown.
 Fan does NOT shut off during Defrost.
 Electric Heat will NOT operate during Defrost.

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.



Controls



Attention:
CE recommends ecobee
for Dual Fuel Applications.



38MURA & 1-Stage Gas Furnace – Dual Fuel Applications

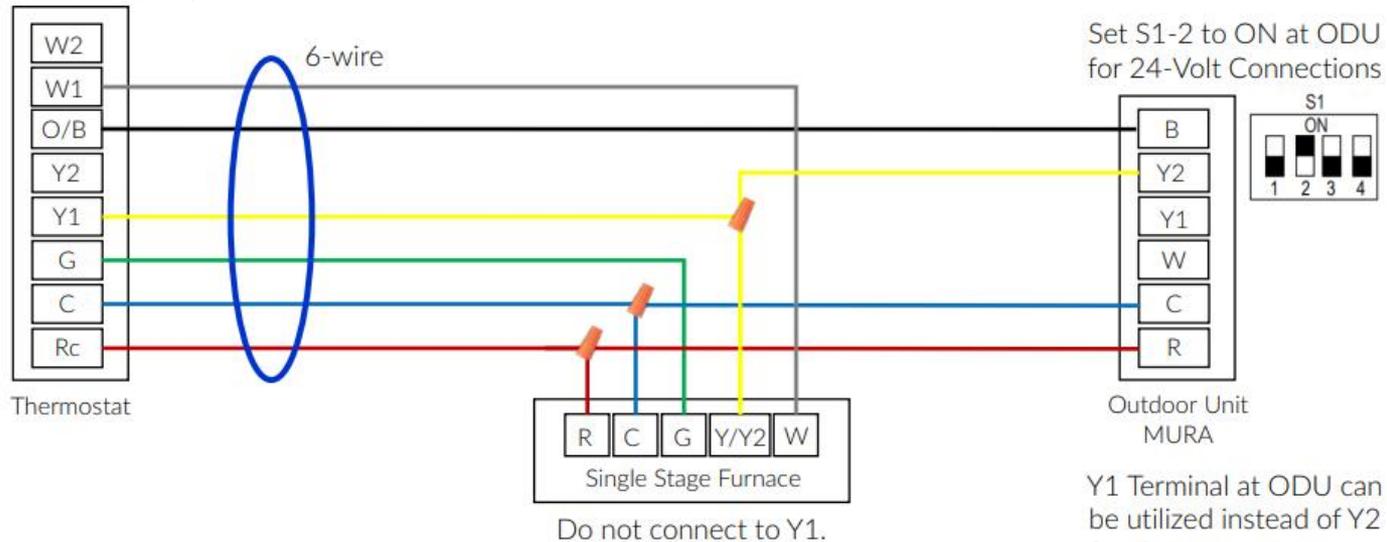
Includes 2-Stage Gas Furnaces utilizing Comfort Heat Technology® or Adaptive Mode.

Make sure when setting up ecobee to disable furnace and heat pump running at same time.
See steps 11 & 12 during initial setup.



ecobee

2 Stage Heat & 1 Stage Cool
1 Stage Heat Pump
1 Stage Gas Furnace



Comfort Heat Technology® - This feature with Adaptive Control is a proprietary function that promotes homeowner comfort through two stages of heating. This furnace offers a patented algorithm that continually monitors and adjusts furnace operation by looking at both current and past conditions to determine the most effective stage of heating and the amount of time to run each stage, every cycle.

Y1 Terminal at ODU can be utilized instead of Y2 for slower ramp up rate.

Notes:
High Voltage wiring to equipment not shown.
Fan does NOT shut off during Defrost.
Furnace will NOT operate during Defrost.



Controls



Attention:
CE recommends ecobee
for Dual Fuel Applications.



Field Supplied
RIB2401D



38MURA & 1-Stage Gas Furnace – Dual Fuel Applications

Includes 2-Stage Gas Furnaces utilizing Comfort Heat Technology® or Adaptive Mode.

2-Stage H/P with 1-Stage Gas Furnace – Field supplied relay required

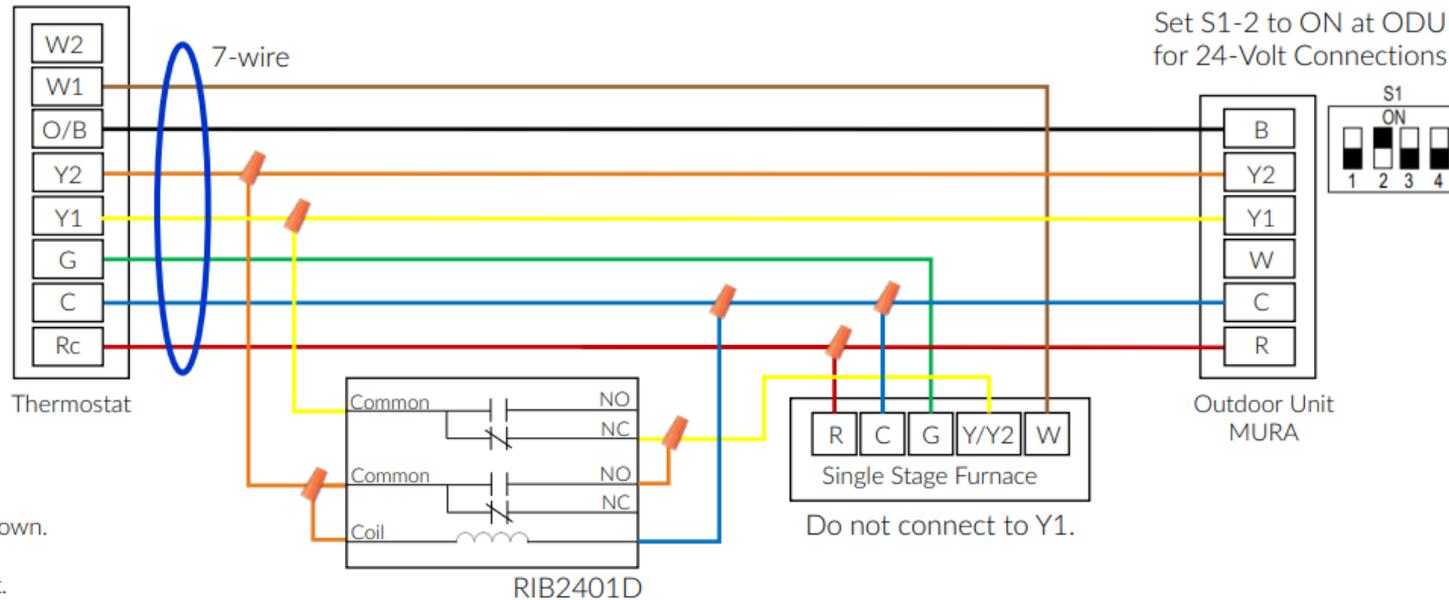
Make sure when setting up ecobee to disable furnace and heat pump running at same time. See steps 11 & 12 during initial setup.



ecobee

3 Stage Heat & 2 Stage Cool
2 Stage Heat Pump
1 Stage Gas Furnace

Notes:
High Voltage wiring to equipment not shown.
Fan does NOT shut off during Defrost.
Furnace will NOT operate during Defrost.
Color of RIB relay's wires are not shown.



Controls



Attention:
CE recommends ecobee
for Dual Fuel Applications.



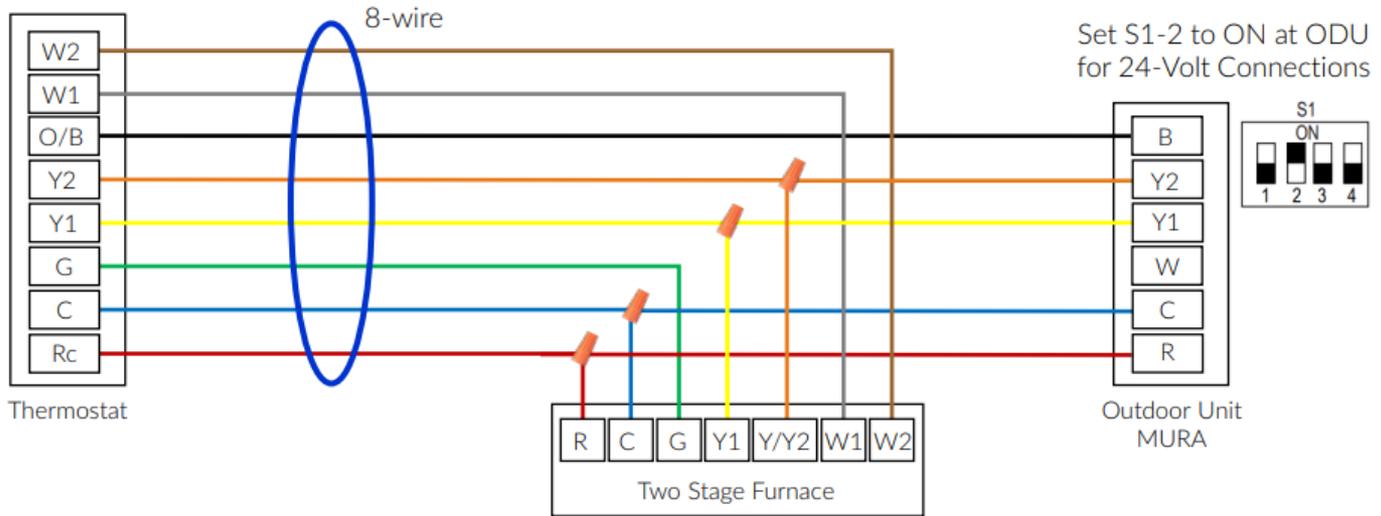
38MURA & 2-Stage Gas Furnace – Dual Fuel Applications

Make sure when setting up ecobee to disable furnace and heat pump running at same time.
See steps 11 & 12 during initial setup.



ecobee

4 Stage Heat & 2 Stage Cool
2 Stage Heat Pump
2 Stage Gas Furnace



Notes:

High Voltage wiring to equipment not shown.

Fan does NOT shut off during Defrost.

Furnace will NOT operate during Defrost.

For two stage thermostat control of the furnace staging, turn SW1-2 ON at the furnace control board (58TP/59TP/82(0,1)TA/926TB)



Controls



Same as previous slide, except fan shuts off during defrost



Field Supplied RIB2401D



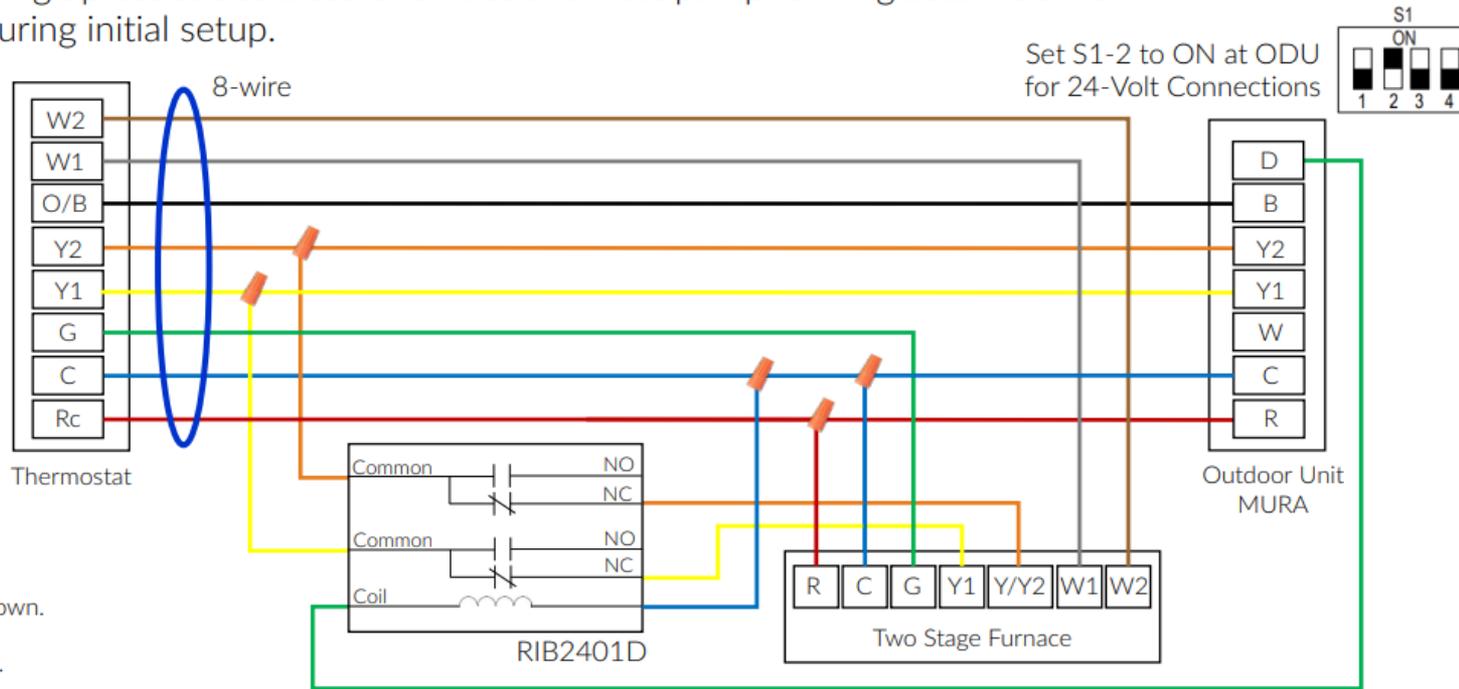
38MURA & 2-Stage Gas Furnace – Fan Shuts OFF during Defrost

Make sure when setting up ecobee to disable furnace and heat pump running at same time. See steps 11 & 12 during initial setup.



ecobee

4 Stage Heat & 2 Stage Cool
2 Stage Heat Pump
2 Stage Gas Furnace
Fan shuts OFF during Defrost



Notes:
High Voltage wiring to equipment not shown.
Fan shuts off during Defrost.
Furnace will NOT operate during Defrost.
Color of RIB relay's wires are not shown.
For two stage thermostat control of the furnace staging, turn SW1-2 ON at the furnace control board (58TP/59TP/82(0,1)TA/926TB)

Error Diagnosis

WHAT IS TROUBLESHOOTING?

Troubleshooting is a form of problem solving, often applied to repair failed products or processes...

Start with the obvious and work toward the obscure?



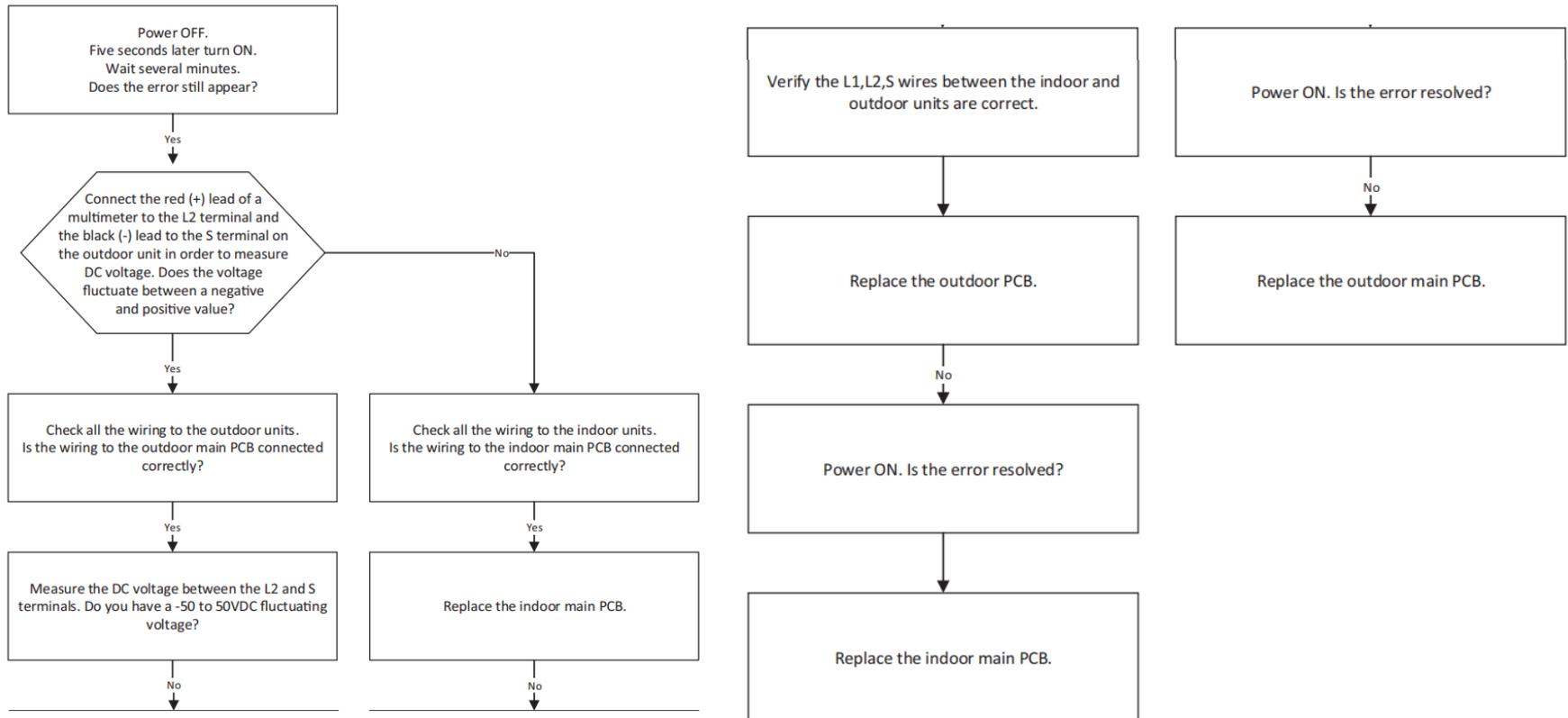


Error Code vs Operation Code

The display on units will show operational code such as DF (defrost) or mix mode (--)

Error Diagnosis

E1 Communication Error



The indoor unit has not received feedback from the outdoor unit for 150 seconds, four consecutive times.

Possible Causes:

- Wiring
- Indoor or Outdoor PCB
- Reactor
- IDU fan Motor Grounded
- External Components

Wiring:

- Verify Wiring Gauge
- Verify Wire Type
- Verify **NO** breaks, wire nuts, butt connectors, etc.
- If you have to splice, use solder & heat shrink

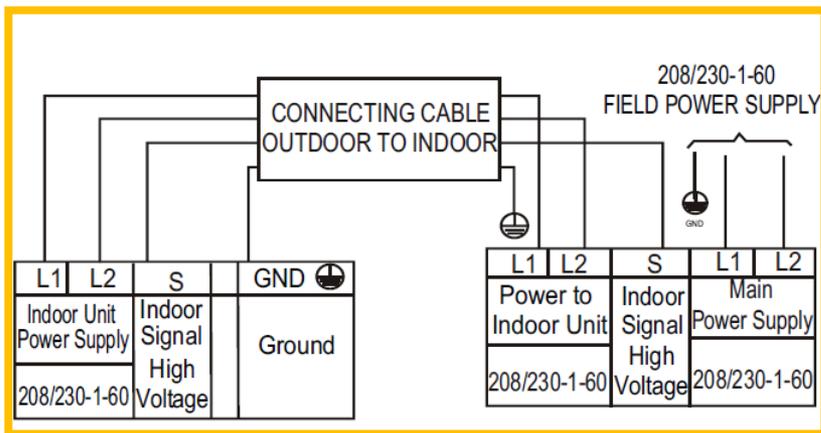


Error Diagnosis

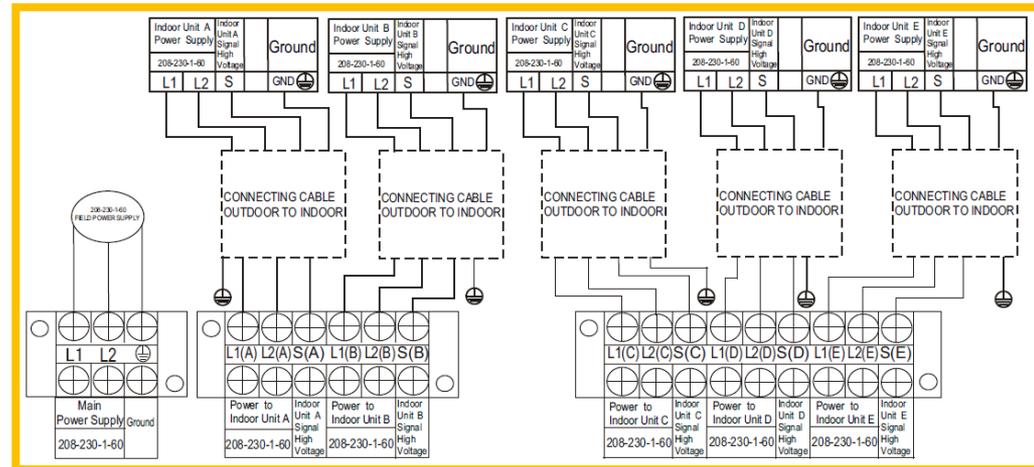
E1 Communication Error

Wiring:

- Verify Polarity (L1 to L1, L2 to L2, S to S)
- Verify Length
- Verify Route (Not parallel to other high voltage wires)

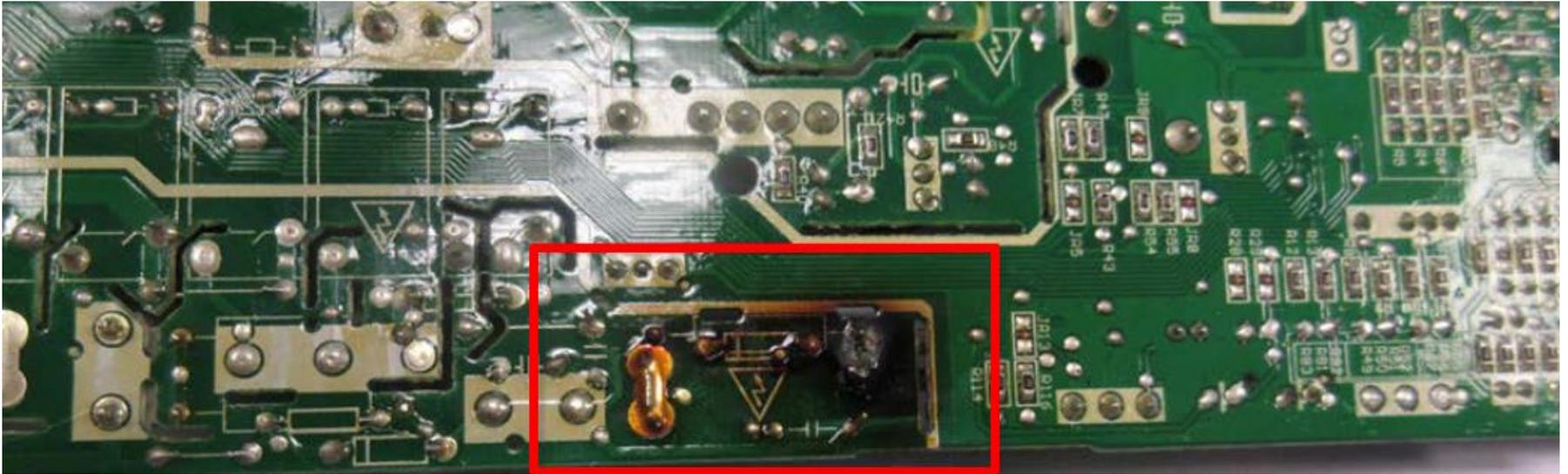


1:1



5 Zone

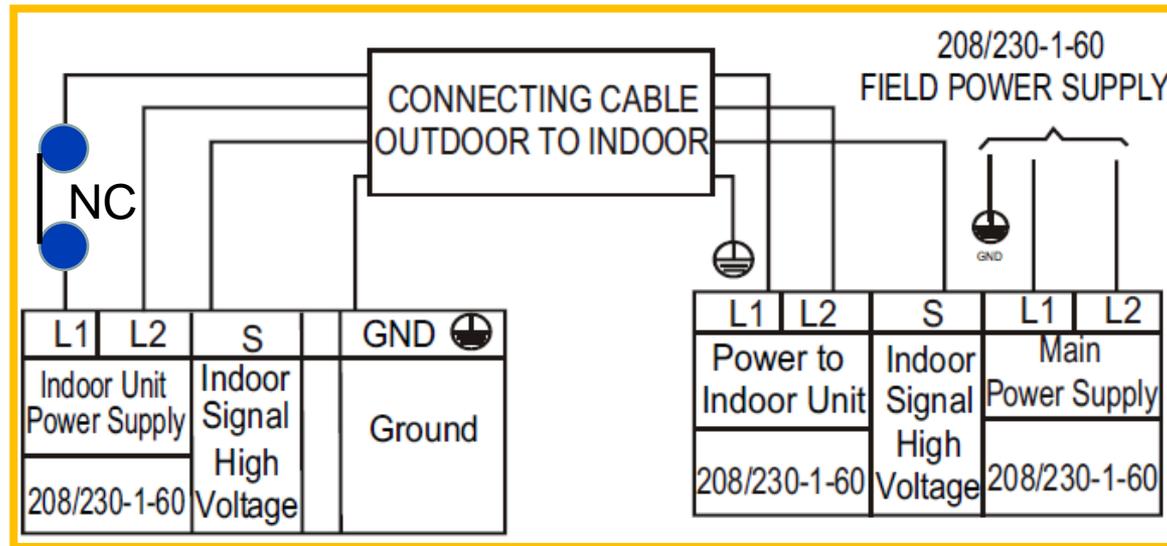
Communication Circuit Failure



External Components:

- Verify IDU Disconnects
- Verify External Float Switches
- Best practice is break L1

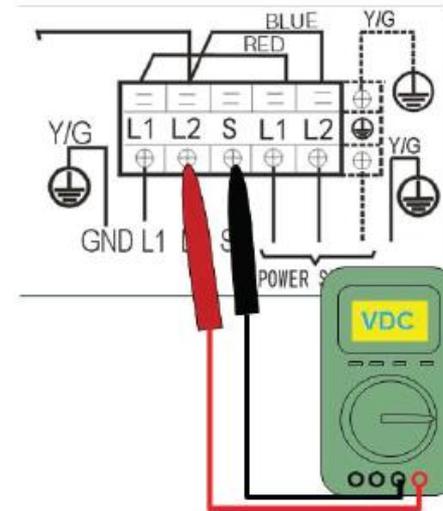
Float Switch



Error Diagnosis

E1 Communication Error

- Use a multimeter to test DC voltage between L2 and S. The black lead connects to S. The red lead connects to L2.
- When running normal, the voltage moves alternately as positive and negative values.
- If the outdoor unit has a malfunction, the voltage will be a positive value.
- If the indoor unit has a malfunction, the voltage is a fixed value.



*S and N
or
L2 and S
Or
2 and 3*

Error Diagnosis

E1 Communication Error

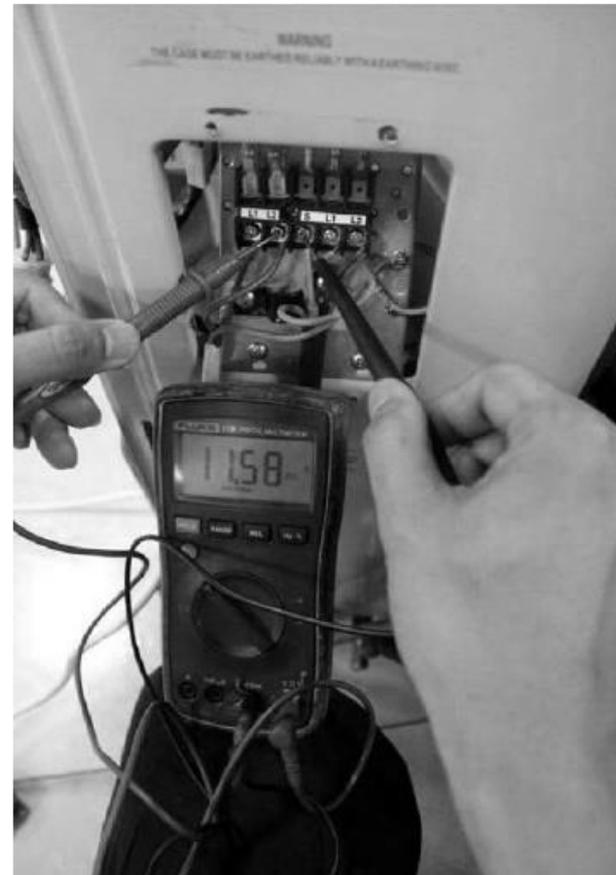
Remark

Use a multimeter to test the DC voltage between the outdoor unit's L2 port and S ports (Fig. 29). The red pin of the multimeter connects with the L2 port while the black pin is for the S port.

When the AC is running normally, the voltage moves alternatively between -50V to 50V .

If the outdoor unit has a malfunction, the voltage moves alternatively with a positive value.

If the indoor unit has a malfunction, the voltage will have a fixed value. Example: $10\text{--}13\text{VDC}$ small fluctuating amount indicates an indoor unit malfunction.



Error Diagnosis

E1 Communication Error

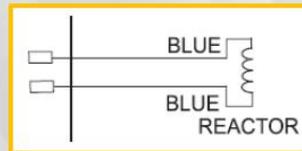
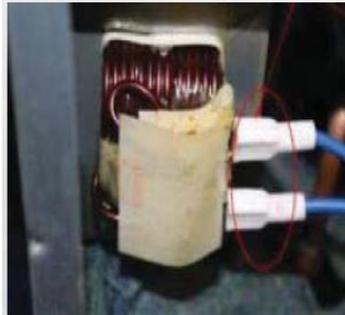
What it does:

A reactor opposes the change in current.

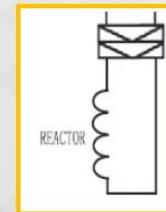
How to check it:

Measure Resistance

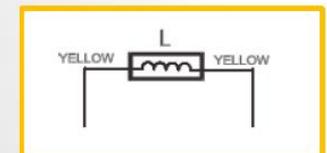
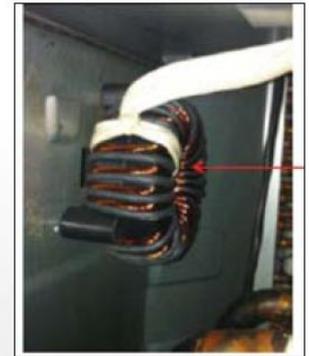
MA*R 2 Zone Reactor



MG*R 2 Zone Reactor



MG*R 5 Zone Reactor



Error Diagnosis

E1 Communication Error

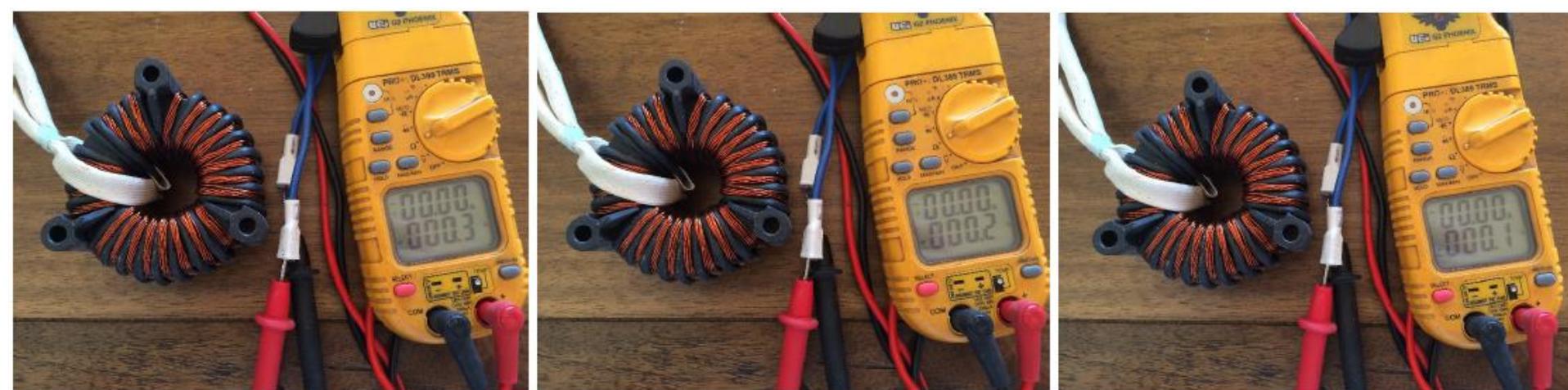
Findings:

Typically under 1 Ohm

Not OL (Open Load)

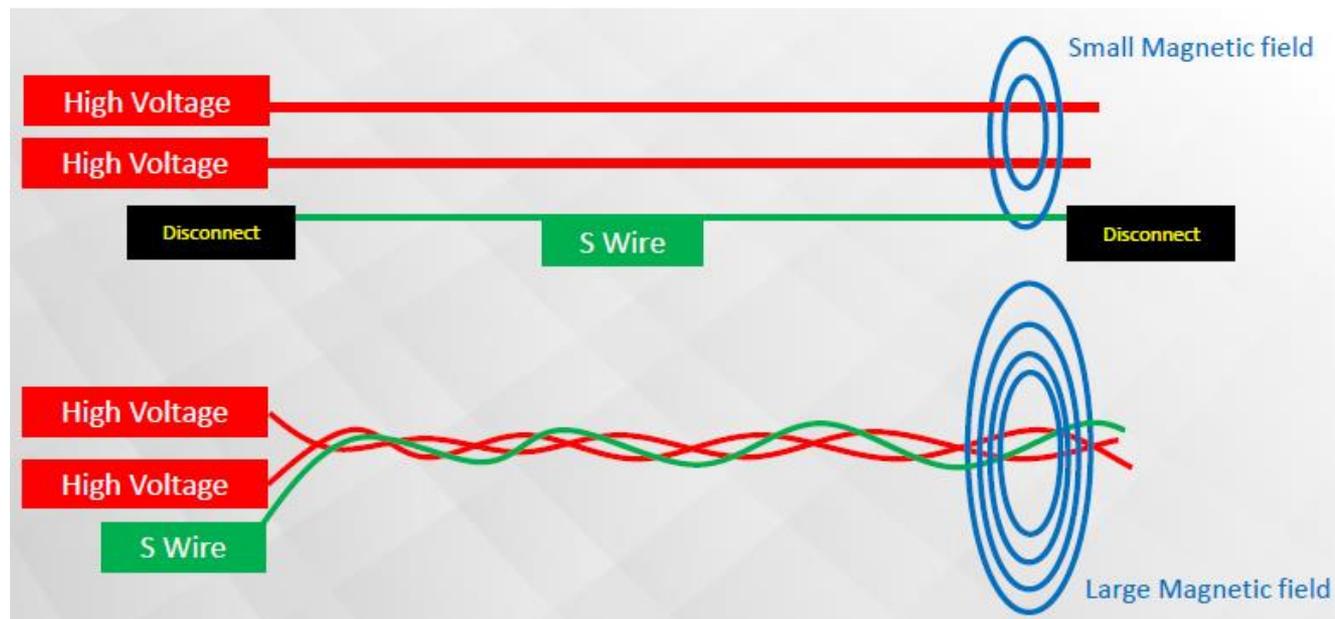
Not 0Ω (Shorted)

No resistance to ground



Wiring:

- Check for induced voltage on (S)
- Run separate temporary wires



Error Diagnosis

E1 Communication Error

Debug Tool:

Part # 17222000A55927





Knowledge Check

Can you tell if a system is performing
Correctly only by the pressures?

Error Diagnosis

MAR-P6 / MGR P4

Code: P4/P6

Compressor discharge temperature protection (TP) (MA*R - P6)

Temperature protection of compressor discharge (MG*R – P4)

Possible Causes:

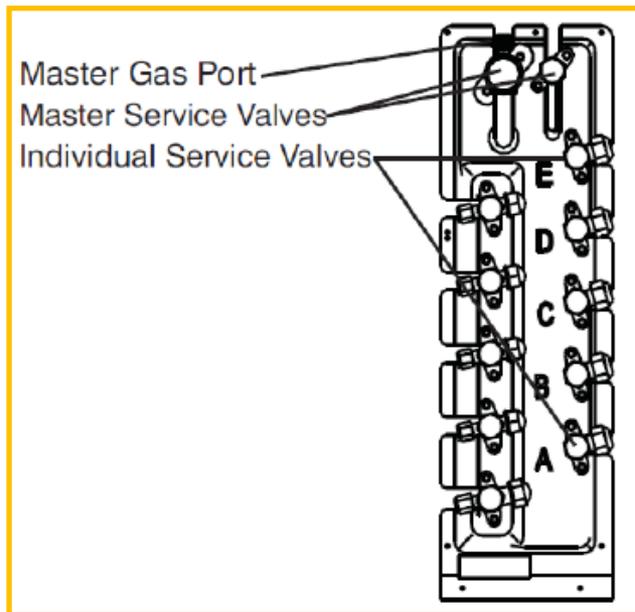
- Refrigerant charge
- No refrigerant flow
- Exceeded max line length
- Thermistor
- Compressor
- Board

Refrigerant Charge Verification

- Evaporator ΔT
- Evaporator Temperature
- Suction Pressure
- Suction Temperature
- Discharge Temperature

No Refrigerant flow

- Check service valve
- Check master Valves (MG*R)



Thermistor

- Not secured on pipe

Compressor

- Resistance Check
- Wiring
- Tight bearings

Single Rotary





P6 Exception

P6 error on only the 36,000 MA*R means
Low pressure switch

MA*R – P4 Inverter Compressor Drive Error

MG*R – P6 IPM Module protection

Possible Causes:

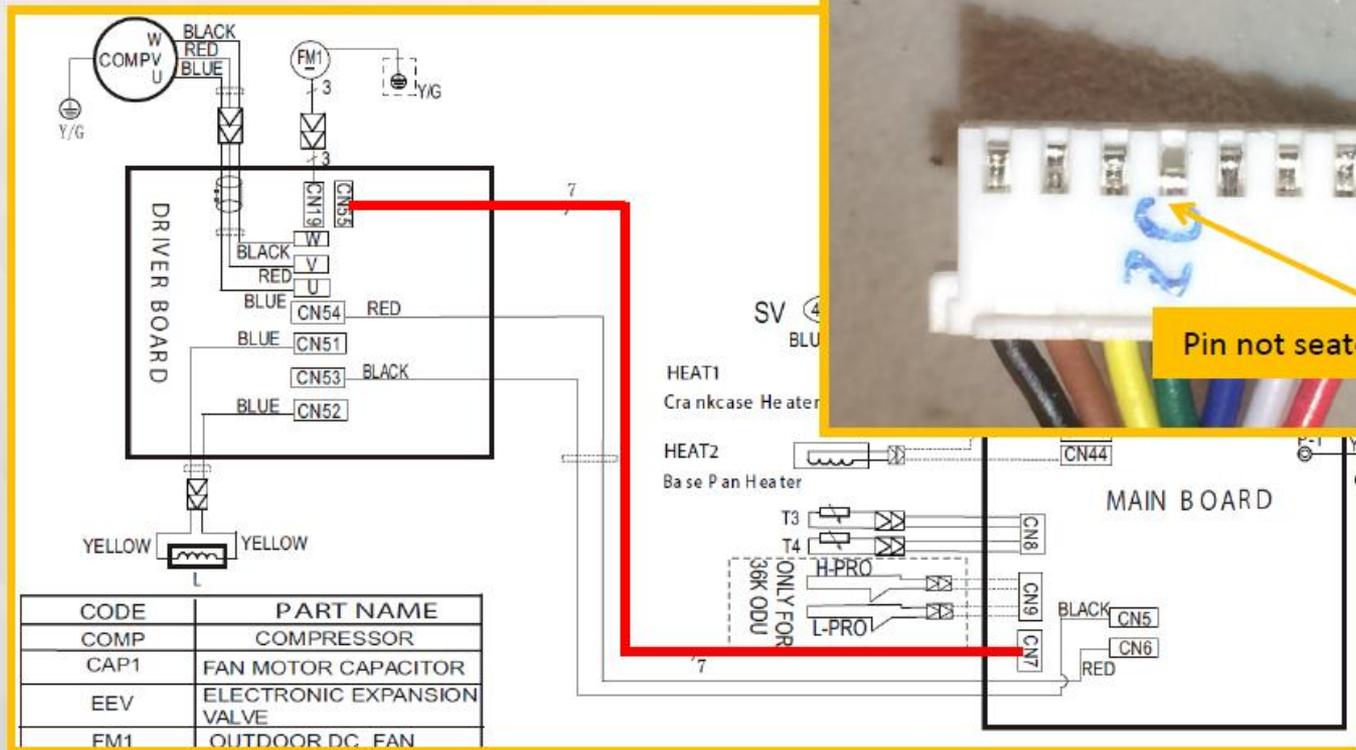
- Communication between main and inverter PCB
- Voltage high, low, imbalance
- Compressor rotation (U,V,W Wiring)
- ODU Fan
- Compressor
- Reactor
- Faulty ODU PCB
- Liquid in oil

Error Diagnosis

Code: P4

Communication

Reference schematic provided with unit



Voltage



Voltage: + / - 10%
Phase imbalance: + / - 2%

Error Diagnosis

Code: P4

Compressor Wiring

Inverter Board



U - V - W

Compressor



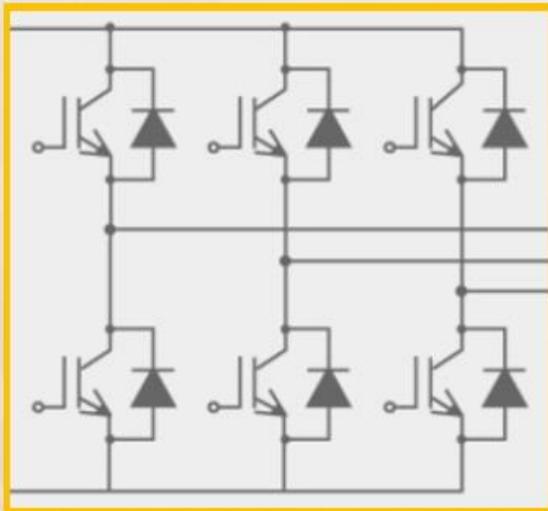
U - V - W



Labeling on cap

Board Verification

- Check IGBT



ODU Fan

- Ohm Fan Windings
- Spins Freely
- Check DC voltage
- Reactor

