DUCTLESS ADVANCED SERVICE

"Knowing what you are working on is the first step to troubleshooting"







Heating & Cooling Systems

TABLE OF CONTENTS







Understanding the basic codes on Carrier Ductless systems can help understand what the code it is.

- For example, there are ODU error codes, IDU error codes and even IDU Function codes.
- One may see these IDU function codes among others display during normal operation: (CL) Filter Cleaning reminder, (dF) Defrost Cycle engaging, (SC) Self Clean or (E-C-O) ECO mode.
- Function Codes are not error codes!

INDOOR UNIT FUNCTIONAL CODES

DISPLAY	DESCRIPTION
dF	Defrost
SC	Self clean
CL	Filter cleaning reminder
CL	Active Clean (*model dependent)
nF	Filter replacement reminder
FP	Heating in room temperature under 8°C
FC	Forced cooling
AP	AP mode of WIFI connection
CP	Remote switched off
LL	Remote or Wire controller Lock
On	Time On
Off	Time Off
E-C-0	ECO mode
SD	Power abnormal detection
d1	Receive DR1 signal
d2	Receive DR2 signal
d3	Receive DR3 signal
dE	DR input error signal
FH 0P	AP mode is activated / no WIFI kit installed
FH 0d	See outdoor unit for Error Code information
EH/EC/EL/PC	See outdoor unit for Error Code information

Table 10 - Indoor Unit Functional Codes

LED Light Status Chart

INDOOR UNIT DIAGNOSTIC GUIDES

Table 9 — Indoor Unit Diagnostic Codes					
OPERATION LAMP (TIMES) TIMER LAMP DISPLAY ERROR INFORMATION					
☆1	OFF	EH 00/EH 0A	Indoor unit EEPROM parameter error		
☆2	OFF	EL 01	Indoor/outdoor unit communication error		
☆3	OFF	EH 02	Zero-crossing signal detection error		
☆4	OFF	EH 03	Indoor fan operating outside of the normal range		
☆5	OFF	EC 51	Outdoor unit EEPROM parameter error		
☆5	OFF	EC 52	T3 is in open circuit or has short circuited		
☆5	OFF	EC 53	T4 is in open circuit or has short circuited		
☆5	OFF	EC 54	TP is in open circuit or has short circuited		
☆5	OFF	EC 56	T2B is in open circuit or has short circuited		
☆6 OFF EH 60 T1 is in open circuit or			T1 is in open circuit or has short circuited		
☆6	OFF	EH 61	T2 is in open circuit or has short circuited		
☆12	OFF	EC 07	Outdoor fan operating outside of the normal range		
☆9	OFF	EH 0b	Indoor PCB/Display board communication error		
☆8	OFF	EL 0C	Refrigerant leakage detection		
☆7	FLASH	PC 00	IPM malfunction or IGBT OSCP		
☆2	FLASH	PC 01	Over voltage or over low voltage protection		
☆3	FLASH	PC 02	Compressor or IPM high temp/pressure protection		
☆5	FLASH	PC 04	Inverter compressor drive error		
☆1	FLASH	PC 08	Current overload protection		
☆6	FLASH	PC 40	Communication error between outdoor chip and compressor chip		
☆7	FLASH	PC 03	Low pressure protection		
☆1	ON		Indoor unit mode conflict		
☆9	OFF	EH b1	Indoor board and Multi-function communication error		
☆11	OFF	FH 0d	Ionizer malfunction		

O(on - light) X(off - light) arcsing (flash)

For additional diagnostic information, refer to the service manual.

Highwall 40MAHB High Wall	72	
Display loca	ation on IDUs	8.100.0 ● 10.000 10.0000 10.00000
	12	

40MPHA/619PHA High Wall

40MAQ/619PB & 40MHH High Wall

OPERATION LAMP	TIMER LAMP	DISPLAY	LED	STATUS				
r☆ 1 time	X	E0	Indo	ndoor unit EEPROM error				
☆ 2 times	X	E1	Com	Communication malfunction between indoor and outdoor units				
☆4 times	X	E3	Indo	or fan speed has been o	ut of control			
☆5 times	X	E4	Indo	or room temperature ser	nsor T1 open circuit o	or short circuit		
☆6 times	X	E5	Eva	OPERATION LAMP	TIMER LAMP	DISPLAY	LED STATUS	
☆7 times	X	EC	Refr	r≴1 time	х	E0	Indoor unit EEPROM error	
☆8 times	X	EE	Wate	☆ 2 times	X	E1	Communication malfunction between indoor and outdoor units	
r‡1 time	0	FO	Curr	☆4 times	X	E3	Indoor fan speed has been out of control	
☆2 times	0	F1	Ope	☆5 times	X	E4	Indoor room temperature sensor T1 open circuit or short circuit	
r‡3 times	0	F2	Ope	☆6 times	х	E5	Evaporator coil temperature sensor T2 open circuit or short circuit	
☆4 times	0	F3	Ope	☆7 times	х	EC	Refrigerant leakage detection	
±±5 times	0	F4	Outo	☆8 times	х	EE	Water-level alarm malfunction	
☆6 times	0	F5	Outo	☆1 time	0	F0	Current overload protection	
☆7 times	0	F6	T2B	☆2 times	0	F1	Open circuit or short circuit of outdoor ambient temperature sensor T4	
☆8 times	0	F7	Liftir	☆3 times	0	F2	Open circuit or short circuit of condenser coil temperature sensor T3	
☆9 times	0	F8	Liftir	☆4 times	0	F3	pen circuit or short circuit of Compressor discharge temperature sensor T5	
☆10 times	0	F9	Liftir	☆5 times	0	F4	Outdoor unit EEPROM error	
☆1 time	\$	P0	IPM	☆6 times	0	F5	Outdoor fan speed has been out of control	
☆2 times	\$	P1	Ove	☆7 times	0	F6	T2B sensor error	
r‡3 times	\$	P2	High	☆8 times	0	F7	Lifting-panel communication error	
☆4 times	A	P3	Outo	☆9 times	0	F8	Lifting-panel malfunction	
r‡5 times	\$	P4	Inve	☆10 times	0	F9	Lifting-panel is not closed	
☆6 times	\$	P5	Mod	☆1 time	\$	P0	IPM malfunction	
r‡7 times	Å	P6	Con	☆2 times	\$	P1	Over voltage or over low voltage protection	
r‡8 times	\$	P7	Outo	☆3 times	\$	P2	High temperature protection of compressor top	
	O (light) 3			☆4 times	\$	P3	Outdoor low temperature protection	
- (-g) -			☆5 times	*	P4	Inverter compressor drive error		
or additional diagnostic information, refer to the Service Manual.			☆6 times	\$	P5	Mode conflict		
4004000					\$	P6	Compressor low-pressure protection	
40MBCQ Cassette *8 times * P7 Outdoor IGBT temperature sensor error						Outdoor IGBT temperature sensor error		

Floor Console / Under ceiling



O (light) X (off) \Leftrightarrow (flash) For additional diagnostic information, refer to the Service Manual.

40MBFQ Floor Console / Under Ceiling

- The Cassette and Floor Console/ Under ceiling do not have a digital display.
- You must look at flashing lights!

Cassette

OPERATION LAMP	TIMER LAMP	DISPLAY	LED STATUS
★ 1 time	х	EO	Indoor unit EEPROM parameter error
★ 2 times	х	E3	Indoor / outdoor units communication error
★ 8 times	х	EE	Water level alarm malfunction
★ 9 times	х	Eð	Dual indoor unit (twin model only) communication malfunction
★ 10 times	х	E9	Other twin model malfunction
★ 1 time	0	FO	Overload Protection
★7 times	0	FL	Compressor low-pressure protection
★ 4 times	х	E3	Indoor fan speed is out of control
★ 5 times	х	E4	Indoor room temperature sensor T1 open circuit or short circuit
★ 6 times	х	E5	Evaporator coil temperature sensor T2 open circuit or short circuit
★ 7 times	х	EC	Refrigerant leakage detection
★ 11 times	0	Fa	Indoor unit communication malfunction
★ 2 times	0	F1	Outdoor ambient temperature sensor T4 open circuit or short circuit
★ 3 times	0	F2	Condenser coil temperature sensor T3 open circuit or short circuit
★ 4 times	0	F3	Compressor discharge temperature sensor T5 open circuit or short circuit
★ 5 times	0	F4	Outdoor unit EEPROM parameter error
★ 6 times	0	F5	Outdoor fan speed is out of control
★ 1 time	*	PO	IPM malfunction or IGBT over-strong current protection
★ 2 times	*	Pl	Over voltage or over low voltage protection
★ 3 times	*	P2	High temperature protection of compressor top diagnosis and solution (9K,12K models only)
★ 4 times	*	P3	Outdoor low temperature protection
★ 5 times	*	P4	Inverter compressor drive error
★ 7 times	*	PL	Compressor low-pressure protection
★ 8 times	*	P7	Outdoor IGBT sensor error

O (light) X (off) ★(flash)

For additional diagnostic information, refer to 40MBDQ Ducted Style Ductless System Sizes 09 to 58 - Service Manual SG-40MBDQ.

40MBDQ Ducted

Display location on IDU



Ducted



RUNNING LED	TIMER LED	DISPLAY	ERROR INFORMATION	
		dF	Defrost	
		cF	Warming in heating mode	
		50	Self clean	
		CL	Clean filter	
		nF	Replacing filter	
		FP	Heating in room temperature under 8°C	
		FC	Forced cooling	
		AP	AP mode of WIFI connection	
		CP	Remote start stop contact is open	
		AF	Constant Air Flow (only for Duct)	
		LL	Remote or Wire controller Lock	
		dl	Receive DR1 signal	
		d2	Receive DR2 signal	
		٤b	Receive DR3 signal	
		dE	DR input error signal	
1 time	OFF	EO	Indoor unit EEPROM parameter error	
2 times	OFF	El	Indoor/outdoor unit communication error	
4 times	OFF	E3	The indoor fan speed is operating outside of the normal range	
5 times	OFF	E4	Indoor room temperature sensor T1 is in open circuit or has short circuited	
6 times	OFF	E5	Evaporator coil middle temperature sensor T2 is in open circuit or has short circuited	
7 times	OFF	EC	Refrigerant leakage detection	
8 times	OFF	EE	Water-level alarm malfunction	
9 times	OFF	Eð	Communication error between master and slave unit (for twins system)	
10 times	OFF	E9	Another indoor unit malfunction (for twins system)	
11 times	OFF	Ed	Outdoor unit malfunction	
1 time	ON	FO	Current overload protection	
2 times	ON	Fl	Outdoor room temperature sensor T4 is in open circuit or has short circuited	
3 times	ON	F2	Condenser coil temperature sensor T3 is in open circuit or has short circuited	
4 times	ON	F3	Compressor discharge temperature sensor TP is in open circuit or has short circuited	
5 times	ON	F4	Outdoor unit EEPROM parameter error	
6 times	ON	F5	The outdoor fan speed is operating outside of the normal range	
7 times	ON	FL	Evaporator coil outlet temperature sensor T2B is in open circuit or has short circuited (for free- match indoor units)	
11 times	ON	FA	Communication error between indoor two chips	
1 time	FLASH	PO	IPM malfunction or IGBT over-strong current protection	
2 times	FLASH	Pl	Over voltage or over low voltage protection	
3 times	FLASH	P2	Top temperature protection of compressor	
5 times	FLASH	P4	Inverter compressor drive error	
6 times	FLASH		Indoor units mode conflict (match with multi outdoor unit)	
7 times	FLASH	PL	Low pressure protection	
8 times	FLASH	P7	IGBT temperature sensor TH is in open circuit or has short circuited	

For additional diagnostic information, refer to the indoor unit service manual.

40MBA Air Handler



LED Light Status Chart

	GREEN LED	RED LED	FAILURE MODE		
ł	0	··	0	NO.	PROBLEMS
	On	X	Standby, normal	1	Communication malfunction between indoor and outdoor units
	Х	On	Operation, normal	2	Current overload protection
-				3	Outdoor ambient temperature sensor (T4) malfunction
	On	On	High/Low voltage protection on c	4	Condenser coil temperature sensor (T3) malfunction
	0	+		5	Compressor discharge temperature sensor (T5) malfunction
	On	x	EEPROM error	6	Outdoor unit EEPROM parameter error
	X	4	The compressor speed is out of (7	Outdoor fan speed malfunction
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			8	Inverter module (IPM) malfunction
	\$	On	Zero-crossing signal detection er	9	Over-voltage or under-voltage protection
ł				10	Compressor top high temperature protection (OLP)
	*	X	IGB1 or Module protection	11	Low ambient temperature cut off in HEATING mode
	*	4	Communication error	12	Compressor drive malfunction
	~	A	our and a second	40	Little to see the sector of the sector of the sector of the LIC ATING sector

 ERROR CODE	Problems	LED3 (Green)	LED2 (Red)	IU display		
El		0	V			
FO	standby for normal	0	X			
Fl	Operation normally	X	0			
F2	M molfunction or ICPT over atrong ourrent protection	"A.,	v			
F3	-wi manunction of IGBT over-strong current protection	x	Χ.	90		
F4	Over voltage or too low voltage protection	0	0	Pl		
F5		0	~			
PO	EEPROM parameter error	0	X	£5		
Pl	Inverter compressor drive error	X	☆	P4		
P2						
РЭ	Inverter compressor drive error	\$	0	P4		
P4	Inverter compressor drive error	\$	\$	Pų		
JD		0				
JL						

#### A = Flashing, X = Off

For additional diagnostic information, refer to the service manual.

38MAR

11	Low ambient temperature cut off in HEATING mode	PB
12	Compressor drive malfunction	P4
13	High temperature protection of indoor coil in HEATING mode	JD
14	Outdoor temperature protection of outdoor coil in COOLING	٦٦
15	Temperature protection of compressor discharge	15
16	PFC module protection	εl
17	Communication malfunction between control board and IPM board	J4
18	High pressure protection	J 5
19	Low pressure protection	JL
20	Outdoor IPM module temperature sensor malfunction	P7
21	AC voltage protection	βL

#### O(light) X(off) $\overleftrightarrow$ (2.5Hz flash)

#### 38MHR





38MBR Carrier bryant

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#### 38MGR(Multi-head)

A digital display is featured on the outdoor PCB. The LED displays different codes in the following situations:

- Standby: "- -."
- Compressor operation: the running frequency.
- Defrosting mode: "dF" or alternative displays between running frequency and "dF" (ach appears for 0.5s.)
- Compressor pre-heating: "PH" or alternative displays between running frequency and "PH" (each appears for 0.5s.)
- Oil return process: "RO" or alternative displays between running frequency and "RO" (each appears for 0.5s.)

- Low ambient cooling mode: "LC" or alternative displays between running frequency and "LC" (each appears for 0.5s.)
- Forced cooling mode: the LED displays "FC" or alternative displays between running frequency and "FC" (each appears for 0.5s).
- PFC module protection occurs three times within 15 minutes: "E6" or alternates between displays of running frequency and "E6" (each appears for 0.5s.)

In protection or malfunction, the LED displays an error code or protection code

#### 38MGR(Multi-head)

#### **Diagnostic Guides**

Table 31 — Outdoor Unit Error Display

OUTDOOR UNIT DISPLAY	LED STATUS	INDOOR UNIT DISPLAY
EO	Outdoor EEPROM malfunction	F4
E5	Communication malfunction between indoor and outdoor units	E3
E3	Communication malfunction between IPM board and outdoor main board	
E4	Open or short circuit of outdoor temperature sensor (T3,T4,T5,T2B)	F2/F3/F3/F6
E5	Voltage protection	P1
EL	PFC module protection	
Eð	Outdoor fan speed has been out of control (Only for DC fan motor models)	F5
E¶	Wrong wiring connection of 24K indoor unit	
F3	No A Indoor unit coil outlet temp. sensor or connector of sensor is defective	
F2	No B Indoor unit coil outlet temp. sensor or connector of sensor is defective	
F3	No C Indoor unit coil outlet temp. sensor or connector of sensor is defective	
F4	No D Indoor unit coil outlet temp. sensor or connector of sensor is defective	
F5	No E Indoor unit coil outlet temp. sensor or connector of sensor is defective	
FL	No F Indoor unit coil outlet temp. sensor or connector of sensor is defective	
PO	Temperature protection of compressor top	P2
P3	High pressure protection	P2
P2	Low pressure protection	P2
P3	Current protection of compressor	FO
P4	Temperature protection of compressor discharge	
P5	High temperature protection of condenser	
PL	IPM module protection	PO
LP	Low ambient temperature protection	

Do not assume the code displayed on the IDU is the same code for the ODU

Always consult the Service Manual

# Single head sizes

Let's look at some boards

- 9,000Btu/hr
- 12,000Btu/hr
- 18,000Btu/hr

Inverter & Main PCB combined.

- 24,000Btu/hr
- 30,000Btu/hr
- 36,000Btu/hr

Inverter & Main PCB separate.



### Sizes 9-12 ODU Display

A good tool for getting PCB LED error codes is a small brazing mirror





# Sizes 9-18 (208-230v) ODU Display

A good tool for getting PCB LED error codes is a small brazing mirror





## Sizes 24-36 (208-230v) ODU Display

A good tool for getting PCB LED error codes is a small brazing mirror





### **LED Codes**

#### LED1 (RED): Slow 1Hz = Standby, Fast 3Hz Error

Contents	LED3 (Green)	LED2 (Red)
Normal standby	On	Off
Normal operation	Off	On
DC voltage too high/too low protection	On	On
Compressor driven chip EEPROM error	On	Flash
Compressor speed malfunction	Off	Flash
Zero speed protection of compressor/ outdoor fan or lack of phase of compressor or outdoor fan	Flash	On
IGBT strong current protection	Flash	Off
Communication error between outdoor main chip and compressor driven chip	Flash	Flash



## Multi-head sizes

- 18,000 Two Zone
- 24,000 Three Zone
- 30,000 Four Zone

Smaller Chassis (1-fans) Inverter & Main PCB Separate (2 ODU PCBs)

- 36,000 Four Zone
- 48,000 Five Zone

Larger Chassis (2-fans) Inverter, Fan, & Main PCB Separate (3 ODU PCBs)



# Multi-head equipment

#### 2 & 3 Zone boards





# Multi-head equipment

#### 4 Zone boards (30,000 BTU/hr)





## Multi-head equipment

4 & 5 Zone





### Wired Controller KSACN04/0501AAA Error Display

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.





(Recap) Sensor Thermistors

#### What it does:

Provides indoor unit circuit board different temperatures.

### How to check it:

Read Resistance and compare to temperature/resistance chart in appendix of Service Manual. Always check to ground for OHMS should be OL.

Check voltage normally 5vdc coming out of the board with sensor unplugged

### Findings:

Matches chart in service manual Get charts at Cematraining.com





(Recap) Sensor Thermistors

#### Thermistors MA*R & MG*R

- (T1) Return air temperature.
- (T2) Evaporator coil temperature.
- (T3) Condenser coil temperature.
- (T4) Outdoor air temperature.
- (TP) Discharge temperature.

#### **Thermistor locations**

• (T2B) Evaporator suction temperature. MGR Only



### System Components Return Air Thermistor - T1





### System Components Evaporator Thermistor – T2





### System Components Evaporator Thermistor – Multi-head only T2B





#### System Components Outdoor Air Thermistor – T4







### System Components Condenser Coil Temp – T3





### System Components Discharge Temp – TP(T5)





#### What it does:

The IPM opens and closes the IGBTs at specific intervals to simulate a sine wave.

### How to check it:

Power Off Wait 10 minutes Check resistance between P and UVW Check resistance between N and UVW

### Findings:

CE

Several mega ohm Look for consistency between transistors.



A *fixed speed compressor* is susceptible to electrical damage

#### **DLS Technology**



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







Output from bridge rectifier







IGBT – Insulated-gate Bipolar Transistor ("switch")







#### Inverter and Main PCB Built in




## System Components Reactor

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







## System Components Reactor





#### Compressor

## 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 Wait 10 minutes Check resistance across windings Check resistance from windings to ground

## Findings:

Under 2  $\Omega$  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



## System Components Compressor

#### Resistance check on windings





## System Components Compressor

#### Checking for Short Circuit





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	50 Ω
Red to Yellow	50 Ω
Brown to orange	50 Ω
Brown to White	50 Ω



EEV – Electronic Expansion Valve















6 - Wire

5 - Wire







#### Internal Components





### Manual OPEN/CLOSE







4-way 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 $\Omega$  PCB output is line voltage OL to ground



## System Components 4-way valve

#### 4-Way Valve Coil Test









## System Components 4-way valve

#### 4-Way Valve output test

Cooling Mode = OFF



Heating Mode = ON







## System Components Outdoor Fan

## 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





## System Components Outdoor Fan

MAR & MGR





## System Components Outdoor Fan

### Fan Motor Resistance Check

Blue to Yellow

Blue to Red





Yellow to Red





## System Components Heaters

## What it does:

Prevents ice from forming in the bottom of the unit and also keeps the compressor warm so refrigerant will not migrate to the compressor.



## How to check it:

Ohm resistance test Always check to ground for Ohms

## Findings:

Should have an ohm reading OL to ground



## System Components Heaters

Crankcase heating cable Starts working when T4 < 37 F (3 C), Stops working when T4 > 46 F (8 C). 20W, helps to start compressor in low temp.

Chassis heating cable When compressor is off Starts working when T4 < 37.F (3.C). Stops working when T4 > 46.F (8.C) 85W, help to deice and anti-freezing







## **Wire Schematics**

Understanding what we are looking at.

## Wire Schematics 40MAQ HIGHWALL



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## Wire Schematics 40MBCQ 4 WAY CASSETTE



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## Wire Schematics 40MBDQ DUCTED





### Wire Schematics 230v MA*R 9K-18K BTU





### Wire Schematics 230v MA*R 24K-36K BTU





### Wire Schematics 230v MG*R 18K-30K BTU





### Wire Schematics 230v MG*R 36K-48K BTU





## **Operating Modes**

## PIPING MA*R PIPING COOLING





## PIPING MA*R PIPING HEATING





## PIPING MG*R PIPING COOLING

EEV's individually adjust to the demand requested from each IDU

The ODU operates at the total requested capacity from the IDU's





## PIPING **MG*R PIPING HEATING**

The EEV's for the IDU's with heating capacity requested open 100%, while the remaining EEV's regulate too a closed position around 15%.

The ODU operates at the total requested capacity from the IDU's

**C**E


### **System Inquiry**

Single head & Multi head data Inquiry Mode

### System Inquiry Single head Inquiry Mode





#### System Enquiry Single head Inquiry Mode





#### System Inquiry Single head Inquiry Mode

ENQUIRY INFORMATION	DISPLAYING CODE	MEANING
T1	T1	T1 temp.
T2	T2	T2 temp.
T3	Т3	T3 temp.
T4	T4	T4 temp.
T2B	Tb	T2B temp.
TP	TP	TP (T5) temp.
TH	ТН	TH temp.
Targeted Frequency	FT	Targeted 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 Time	СТ	Compressor Continuous Running Time
Compressor Stop Issues	ST	Compressor Stop Issues

#### Table 11 — Enquiry Information

#### System Inquiry Single head Inquiry Mode – High wall



# System Inquiry

Single head Inquiry Mode - Ducted



## System Inquiry

Single head Inquiry Mode – Wired controller



# System Enquiry

#### Stop Codes

Code	Reasons of compressor stop	Code	Reasons of compressor stop
1	Frequency limit caused by current	24	IPM overcurrent protection
2	Frequency limit caused by T2 in cooling	25	Compressor lack of phase
3	Frequency limit caused by T2 in heating	26	Compressor malfunction
4	Preset temperature reached T1	27	Low voltage protection of 311
5	Frequency limit caused by T4	28	Fan current protection
6	Defrosting	29	Fan lack of phase
7	Mode switching	30	Fan zero speed protection
9	High discharge temperature protection T5	31	PFC module protection
10	High evaporator coil temperature T2 protection	32	High voltage protection of 311
11	Evaporator low temperature T2 protection	33	Zero speed malfunction
12	Condenser high temperature T3 protection	34	PWM malfunction
13	Low indoor room temperature protection in drying mode T1	35	MCE malfunction –Fan Motor Control
14	Low ambient temperature protection T4	36	Compressor overcurrent protection
15	Refrigerant leakage detection	37	Compressor EE malfunction
16	Communication malfunction between indoor and outdoor units	38	Compressor start-up malfunction
17	Communication error between outdoor main chip and compressor driven chip IR311	39	311 fan speed malfunction
18	AC power input voltage protection	40	Low pressure protection
19	Top temperature protection of compressor TH	41	High pressure protection
20	Outdoor EE Malfunction	42	PFC module malfunction
21	Fan speed malfunction	49	Shutdown stop
22	Temperature sensor open or short circuit	50	Electrical disconnect
23	Overcurrent protection	51	DR stop



### System Enquiry MG*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 MG*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



# System Inquiry

#### Multi head Inquiry Mode

#### **Outdoor Unit Point Function**

A check switch is included on the outdoor PCB.

Push SW1 to check the unit's status while running. The digital display displays codes (see Table 32 on page 33) each time the SW1 is pushed.

No. of Presses	Display	Remark		
0	Normal Display	Displays running frequency, running state, or malfunction code		
			Actual Data	
		Display	Number of Indoor Units	
	Quantity of indoor units with working connection	1	1	
1		2	2	
		3	3	
		4	4	
2	Outdoor unit running mode code	Off: 0, Fan only: 1, Cooling: 2, Heating: 3, Forced cooling: 4. Forced defrost: A		
3	Indoor unit A capacity			
4	Indoor unit B capacity	]		
5	Indoor unit C capacity	The capacity unit is ho following: "" (9K-1HP	rse power. If the indoor unit is not connected, the digital display shows the	
6	Indoor unit D capacity	ionowing (SK. IHP	12N.1.211F, 10N.1.011F /	
7	Indoor unit E capacity	1		
-		1	-	



SW1

## System Inquiry

#### Multi head Inquiry Mode

		Table 32 — Out	tdoor PCB			
No. of Presses	Display	Remark				
0	Normal Display	Displays running frequency, running state, or malfunction code				
			Actual Data			
		Display	Number of Ir	ndoor Units		
4	Quantity of indoor units with working connection	1 1				
	quantity of indoor units with working connection	2 2				
		3	3			
		4	4			
2	Outdoor unit running mode code	Off: 0, Fan only: 1, Co	oling: 2, Heating: 3, Forced cooling: 4. For	rced defrost: A		
3	Indoor unit A capacity					
4	Indoor unit B capacity	The concellation is be	the second life the indees with its not second state	ad the disitel display shows the		
5	Indoor unit C capacity	following: "" (9K:1HP	2.12K:1.2HP.18K:1.5HP)	ed, the digital display shows the		
6	Indoor unit D capacity		,,,,,			
7	Indoor unit E capacity					
8	Indoor unit A capacity demand code					
9	Indoor unit B capacity demand code					
10	Indoor unit C capacity demand code	Norm code *HP (9K: 1HP,12K: 1.2HP,18K: 1.5HP)				
11	Indoor unit D capacity demand code					
12	Indoor unit E capacity demand code	]				
13	Outdoor unit amendatory capacity demand code					
14	The frequency corresponding to the total indoor units' amendatory capacity demand					
15	The frequency after the frequency limit					
16	The frequency sending to compressor control chip					
17	Indoor unit A evaporator outlet temperature (T2BA)					
18	Indoor unit B evaporator outlet temperature (T2BB)	Male a la mana de la la	where <b>o</b> ¹ C the dividual disclose the set	o till the terror terror in high earthers 70		
19	Indoor unit C evaporator outlet temperature (T2BC)	°C, the digital displays	shows "70." If the indoor unit is not connect	•9." If the temperature is higher than 70 sted, the digital display shows: ""		
20	Indoor unit D evaporator outlet temperature (T2BD)	e, ne eigne eispie, i		ino digital display choice.		
21	Indoor unit E evaporator outlet temperature (T2BE)					
22	Indoor unit A room temperature (T1A)					
23	Indoor unit B room temperature (T1B)	lá tha tarra aratura ia la	was then 0 °C, the disited display shows *0	" Kika tamparat un in hinhauthan 50 °C		
24	Indoor unit C room temperature (T1C)	the digital display sho	wer than 0°C, the digital display shows "0. ws "50." If the indoor unit is not connected	I, the digital display shows: ""		
25	Indoor unit D room temperature (T1D)			,		
26	Indoor unit E room temperature (T1E)					
27	Indoor unit A evaporator temperature (T2A)					
28	Indoor unit B evaporator temperature (T2B)					
29	Indoor unit C evaporator temperature (T2C)	látha tama aratura ia la	we then 0 °C the disitel display shows "	0 7 Kithe terms areture is higher than 70		
30	Indoor unit D evaporator temperature (T2D)	°C, the digital display s	shows "70." If the indoor unit is not connect	ted, the digital display shows: ""		
31	Indoor unit E evaporator temperature (T2E)	e, all eligital display shorte i e. In the massi and to not connected, the digital display shorte.				
32	Condenser pipe temperature (T3)					
33	Outdoor ambient temperature (T4)					
34	Compressor discharge temperature (TP)	The display value is b "30." If the temperatur example, if the digital	etween 30–129 °C. If the temperature is lov re is higher than 99 °C, the digital display sl display shows "0.5", the compressor disch	ver than 30 °C, the digital display shows hows single and double digits. For harge temperature is 105 °C.		

### System Inquiry Multi head Inquiry Mode



# Excel worksheet can be found on cematraining.com

No. of	Display	Remark				
Presses	Normal Display	Displays running frequency, running state, or malfunction code				
	Termine propries	Actual Data			$\vdash$	
		Diseles Necks of Island				
		Display	Number of line	oor onits	$\left  \right $	
1	Quantity of indoor units with working connection	2	2		H	
		3	3		H	-
		4	4			
2	Outdoor unit running mode code	Off: 0, Fan o	nly: 1, Cooling : 2, Heating : 3, Forced cooling:	4. Forced defrost:A		
3	Indoor unit A capacity	_			$\square$	
4	Indoor unit B capacity	The conscio	unit is horse notice. If the indeer unit is not so	anacted, the digital display shows the	Ц	
5	Indoor unit C capacity	following: " " (3K:1HP,12 K:1.2HP,18 K:1.5HP)			Ц	
6	Indoor unit D capacity				$\square$	
7	Indoor unit E capacity					
8	Indoor unit A capacity demand code	_			Ц	
9	Indoor unit B capacity demand code	Norm code*	HP		Ц	
10	Indoor unit C capacity demand code	(3K: 1HP,12)	(; 1.2HP,18 K; 1.5HP)		$\square$	
11	Indoor unit D capacity demand code	_ · ·			Ц	
12	Indoor unit E capacity demand code					
13	Outdoor unit amendatory capacity demand code					
14	The frequency corresponding to the total indoor units'					
15	amendatory capacity demand				+	
16	The frequency and the compressor control chip				$\vdash$	-
17	Indoor unit & evanorator outlet temperature (T_x &)	If the temper	ature is lower than 15.8 E(+, 8°C), the digital di	isplau shows "+ 3 " If the temperature	$\vdash$	
18	Indoor unit B evanorator outlet temperature (TarB)	is higher than 158 F (70 C), the digital display shows "70." If the indoor unit is not connected, the			H	
13	Indoor unit C evaporator outlet temperature (TwC)	digital displ	ay shows: " "		H	
20	Indoor unit D evaporator outlet temperature (TarD)				H	
21	Indoor unit E evaporator outlet temperature (TarE)				H	
22	Indoor unit A room temperature (TrA)	If the temper	ature is lower than 32'E (0'C), the digital displi-	au shows "0 " If the temperature is	+	
23	Indeer unit Proom temperature (T-B)	higher than 122'F (50'C), the digital display shows "50." If the indoor unit is not connected, the			H	-
24	Indoor unit Broom temperature (T.G)	digital displ	ay shows: " "		H	
25	Indeer unit Broom temperature (T-B)				H	
26	Indoor unit E room temperature (T4E)				H	
27	Indoor unit A evaporator temperature (T_A)	If the temper	ature is lower than 15.8 F(- 3°C), the digital di	isplay shows "- 3." If the temperature	$\left  \right $	
28	Indoor unit B evaporator temperature (TaB)	is higher tha	n 158°F (70°C), the digital display shows "70." I	If the indoor unit is not connected, the	H	
23	Indoor unit G evaporator temperature (TxG)	digital displ	ay shows: " "		H	
30	Indoor unit D evaporator temperature (TxD)	-			H	
31	Indoor unit E evaporator temperature (T+E)	-			H	
32	Condenser pipe temperature (T3)	-			H	
33	Outdoor ambient temperature (T4)	-			H	
	Compressor discharge temperature (TP)	The display	ralue is between 86' F- 264.2'F (30'C-129'C).	If the temperature is lower than 86°F	H	
34		(30 °C), the	digital display shows "30." If the temperature	is higher than 210.2°F (33 °C), the		
**		digital displ	digital display shows single and double digits. For example, if the			
35	AD value of current	The displan	ay shows "U.S", the compressor discharge temp ralue is a hex number. For example, the digital d	isplau tube shows "Cd", it means AD	+	
36	AB value of voltage	value is 205.	and the second se		$\vdash$	
37	EXV open angle for A indoor unit	Actual data/	4. If the value is higher than 33, the dinital disa	lay shows single and double digits	+	
38	EXV open angle for B indoor unit	For example	if the digital display shows "2.0", the EXV op	en angle is 120 × 4= 480p.	$\vdash$	
39	EXV open angle for C indoor unit	- ·			H	
40	EXV open angle for D indoor unit	-			$\vdash$	
41	EXV open angle for E indoor unit	-			$\vdash$	
		Bit?	Erequence limit caused by IGBT radiator	The displau value is a beyadecimal	$\vdash$	
		Disc.	Example in the second by DEC	number. For	$\vdash$	
		Bit5	Frequency limit caused by PFC Frequency limit caused by T4.	example, the digital display show	$\vdash$	
42	Frequency limit symbol	Bit4	Frequency limit caused byT 2.	2A, then Bit5=1,	Ħ	
	1	Dao 1	Example in the internet in T.S.	DRIF AND DRIF. 1	r=1	

# System Inquiry

#### Multi head I OUTDOOR UNIT DISPLAY (CONT) What we saw in the display Table 30—Outdoor PCB No. of Display Remark Presses Displays running frequency, running state, or malfunction code 0 Normal Display Actual Data 2 Display Number of Indoor Units 1 1 1 Quantity of indoor units with working connection 2 2 3 3 4 4

2       Outdoor unit running mode code       Off: 0, Fan only: 1, Cooling : 2, Heating : 3, Forced cooling: 4. Forced defrost:A       2	
3 Indoor unit A capacity 1	
4 Indoor unit B capacity 1.2	
5 Indoor unit C capacity The capacity unit is horse power. If the indoor unit is not connected, the digital display shows the	
6 Indoor unit D capacity	
7 Indoor unit E capacity	
8 Indoor unit A capacity demand code 0.5	
9 Indoor unit B capacity demand code 3.6	
10 Indoor unit C capacity demand code (9K: 1HP 12 K: 1 2HP 18 K: 1 5HP)	
11 Indoor unit D capacity demand code	
12 Indoor unit E capacity demand code This is a gov	od sign no faults limiting
13 Outdoor unit amendatory capacity demand code 4 operation,	if we saw a different
14     The frequency corresponding to the total indoor units' amendatory capacity demand     54     frequency 1	hen there is an issue.
15 The frequency after the frequency limit 54	
16 The frequency sending to compressor control chip 54	
17 Indoor unit A evaporator outlet temperature (T ₂₈ A) If the temperature is lower than 15.8°F(- 9°C), the digital display shows "- 9." If the temperature is 7	44.0 F
18 Indoor unit B evaporator outlet temperature (T ₂₈ B) higher than 158°F (70°C), the digital display shows "70." If the indoor unit is not connected, the digital 10	► 50 F
19 Indoor unit C evaporator outlet temperature (T ₂₈ C)	501
20 Indoor unit D evaporator outlet temperature (T ₂₆ D)	
21 Indoor unit E evaporator outlet temperature (T ₂₈ E)	
22 Indoor unit A room temperature (T,A) If the temperature is lower than 32°F (0°C), the digital display shows "0." If the temperature is higher than 17	🔶 62.6 F
23 Indoor unit Broom temperature (T ₁ B) 122°F (50°C), the digital display shows "50." If the indoor unit is not connected, the digital display shows:	→ 69.8 F
24 Indoor unit Croom temperature (T,C)	
25 Indoor unit D room temperature (T ₁ D)	
26 Indoor unit E room temperature (T ₁ E)	

### System Inquiry Multi head Inquiry Mode

26	Indoor unit E room temperature (T ₁ E)			
27	Indoor unit A evaporator temperature (T ₂ A)	If the temperature is lower than 15.8°F(- 9°C) , the digital display shows "- 9." If the temperature is	7	 44.6 F
28	Indoor unit B evaporator temperature (T2B)	higher than 158°F (70°C), the digital display shows "70." If the indoor unit is not connected, the digital	9	40.2 5
29	Indoor unit C evaporator temperature (T ₂ C)	display snows: " "		48.2 F
30	Indoor unit D evaporator temperature (T2D)			
31	Indoor unit E evaporator temperature (T2E)			
32	Condenser pipe temperature (T3)		28	824F
33	Outdoor ambient temperature (T4)		21	02.41
34	Compressor discharge temperature (TP)	The display value is between 86° F- 264.2°F (30°C-129°C). If the temperature is lower than 86°F (30 °C), the digital display shows "30." If the temperature is higher than 210.2°F (99 °C), the digital display shows single and double digits. For example, if the digital display shows "0.5" the compressor discharge temperature is 221° F(105 °C).	42	69.8 F
35	AD value of current	The display value is a hex number. For example, the digital display tube shows "Cd", it means AD value	19	
36	AD value of voltage	is 205.	91	_
37	EXV open angle for A indoor unit	Actual data/4. If the value is higher than 99, the digital display shows single and double digits. For	38	-
38	EXV open angle for B indoor unit	example, if the digital display shows "2.0", the EXV open angle is 120 X 4= 480p.	86	
39	EXV open angle for C indoor unit			
40	EXV open angle for D indoor unit			
41	EXV open angle for E indoor unit			
42	Frequency limit symbol	Bit?       Frequency limit caused by IGBT radiator       The display value is a hexadecimal number. For example, the digital display show         Bit6       Frequency limit caused by PFC       example, the digital display show         Bit5       Frequency limit caused by T4.       2A, then Bit5=1,         Bit3       Frequency limit caused by T3.       B it 3= 1, and Bit1= .1         Bit2       Frequency limit caused by T5.       This means thata frequency limit and by T4, T3, or the current.         Bit0       Frequency limit caused by voltage       Current.	0	-
43	Average value of T2	(Sum T2 value of all indoor units)/(number of indoor units in good connection)	7	
44	Outdoor unit fan motor state	Off: 0, High speed: 1, Med speed: 2, Low speed: 3, Breeze: 4, Super breeze: 5	3	
45	The last error or protection code	00 means No Malfunction and Protection	0	
46	F indoor unit capacity			
47	F indoor unit capacity demand code			
48	F indoor unit evaporator outlet temperature (T ₂₈ F)			
49	Findoor unit room temperature (1,F)			_
51	EXV open angle for E indoor unit			 -

For fan motor RPM convert your Hexdecial number from the display of the DLS system to a decimal number and then multiple times 10. Example: OF shows 2x on ID the indoor unit 2c = 44 44 X 10 = 440 RPM 14 always 1c for EVX angle

#### 1c = 28 28 X 2 = step 56 out of 475

### System Inquiry Multi head Inquiry Mode

#### Hexadecimals

For fan motor RPM convert your hexadecimal number from the display of the Ductless system to a decimal number and then multiply times 10.

```
Example:
OF in video shows 2C on the ID unit display
2C = 44
44 X 10 = 440 RPM
```

For the EXV angle convert hexadecimal number from the display of the Ductless system to a decimal number and then multiply times 2:

```
LA shows 1C for the EXV angle
1C = 28
28 X 2 = step 56 out of 475
```

Visit cematraining.com for a conversation worksheet

	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal	Hexadecimal	Decimal
	1	1	41	65	81	129	C1	193
	2	2	42	66	82	130	C2	194
	3	3	43	67	83	131	G	195
	4	4 5	24	69	84	132	C5	196
	6	6	45	70	86	134	C6	198
	7	7	47	71	87	135	C7	199
	B	8	48	72	88	136	CB	200
	9	9	49	73	89	137	C9	201
	A	10	4A	74	BA	138	CA	202
	в	12	45	75	86	139	CB	203
	D	13	40	77	8D	141	CD	205
	E	14	4E	78	BE	142	CE	206
	F	15	4F	79	85	143	CF	207
	10	16	50	80	90	144	DO	208
					91	145	D1	209
H	lexadeo	cimal	Decim	nal	93	147	D3	211
					94	148	D4	212
					95	149	DS	213
				_	96	150	D6	214
	28		40		97	151	D7	215
			10		98	152	DB	216
	29		41		99	154	DA	21/
	25				98	155	DB	219
	24		40	_	9C	156	DC	220
ZA		42		9D	157	DD	221	
	20		40	_	98	158	DE	222
	28		43		50	159	DF EQ	223
					AT.	161	EU E1	224
	2C 44			A2	162	E2	226	
					A3	163	E3	227
	2D		45		A4	164	E4	228
					AS	165	ES	229
	2F		46		A5	165	E6	230
					AB	168	EB	232
					A9	169	E9	233
		·	Det	_	AA	170	EA	234
- H	exaded	cimal	Decim	al	AB	171	EB	235
					AC	172	EC	236
					AD	173	ED	237
				_	AF	175	EF	239
	19		25		BD	176	FD	240
					B1	177	F1	241
	1A		26		82	178	F2	242
				_	83	179	FB	243
	1B		27		85	180	F4	244
	10 21			B6	182	F6	246	
	10		28		87	183	F7	247
	i c		20		BB	184	FB	248
	10		20		89	185	F9	249
	U ID		29		BA	185	FA	250
	15		20		BC	188	FC	252
	IE		30		BD	189	FD	253
			-	-	BE	190	FE	254
	ЗF	63	7F	127	BF	191	FF	255
	40	54	.00	120	C0.	102		



7

## **Error Diagnostics**

### WHAT IS TROUBLESHOOTING?

Troubleshooting is a form of problem solving applied to repair failed products or processes.... Start with the obvious and work toward the obscure!















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



#### Code: E1

#### Error E1:

Indoor unit does not receive feedback from outdoor unit in 110 seconds four times continuously.

### Possible Causes:

- Wiring
- External Components
- Internal Components
- IDU Fan Motor Shorted to ground



#### ✓ Digital Multi-meter <u>and Amp</u> Clamp



DLS systems with an inverter compressor and BLDC (brushless DC) motors operate much like a computer utilizing algorithms and logic (data from firmware / software) to operate. A combination multi-meter / amp clamp built into one simply does <u>not</u> have the capability to dial in the appropriate range for servicing and diagnosis such as diodes and transistors within the inverter circuit. Many of the wire connection are completed with molex plugs requiring electronic leads as they are small and will not damage the connecting plug.

Electronic leads will also be needed.



#### Wiring:

- Verify Wiring Gauge
- Verify Wire Type
- Verify to breaks, wire nuts, butt connectors, etc.





#### Wiring:

- Verify Terminated ends
- Verify Length
- Verify Route (Not parallel to other high voltage wires)







#### **External Components:**

- Verify IDU Disconnects
- Verify External Float Switches





#### **Communication Circuit Failure**





#### **E1**

Service flow chart example: See service manual

Error Code	E1
Malfunction decision conditions	Indoor unit does not receive feedback from outdoor unit in 110 seconds, and this condition occurs four times continuously.
Supposed Causes	Indoor and outdoor unit communications fault



#### Internal Components:

Communication Verification





### Code E1 - What is good communication? Can your meter read it?



### Communication Testing Checking for Interference on Signal Wire.

- 1) Shut off power at Outdoor Unit.
- 2) Remove S Wire from both Outdoor and Indoor Terminal.
- 3) Set voltmeter to AC Volts and measure from S wire to ground. (Should be 0 VAC)
- 4) If not zero volts Outside Interference.
- 5) Power Up System and check voltage from S wire to ground. (Should be 0 VAC)
- 6) If not zero volts Transformer effect from 230VAC Power or 120VAC Power from Outdoor to Indoor Unit.

#### Remove the S-wire from the indoor and outdoor units



## Meter set to AC volts Power on or off the voltage to ground should be < 24 volts AC



If higher than 24vac run a new S-wire between the IDU and the ODU

#### Induced voltage to ground should be < 24 volts AC



Results of using twisted wire

## Reconnect your S-wire to the IDU



#### Which board is bad?



#### Error Diagnosis MGR P4

Code: P4

#### Error P4:

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

#### Possible Causes:

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


## No Refrigerant flow

- Restriction
- Check service valve
- Check master valves (MG*R)
- Check Strainers for a temp difference
- Check Valve may be stuck, look for frosting at cap tube
- Kink in lineset





## Thermistor

• Not secured on pipe

## Compressor

- Resistance Check
- Wiring
- Tight bearings

Single Rotary







P6 error on only the 36,000 MA*R means <u>low pressure switch.</u>



## Error Diagnosis MAR P4 / MGR P6

## Error P4/P6:

Inverter Compressor Drive Error (MA*R - P4) IPM Module protection (MG*R - P6)

## Possible Causes:

• Communication between main and inverter PCB

Code: P4 / P6

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



## Communication Reference schematic provided with unit





## Voltage



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



## **Compressor Wiring**

#### **Inverter Board**













## **Board Verification**

• Check IGBT













#### IPM Malfunction or IGBT Over-strong Current Protection Diagnosis and Solution (PO)

Error Code	PO
Malfunction decision conditions	When the voltage signal that IPM sends to the compressor drive chip is abnormal, the LED display displays "PO" and the air conditioner turns off.
Supposed Causes	Wiring mistake     IPM malfunction     Outdoor fan assembly faulty     Compressor malfunction     Outdoor PCB faulty

Troubleshooting:

#### 38MAQ 38MPRA 38MAR



#### <u>GET the Service</u> <u>Manual for your</u> <u>unit and always</u> <u>verify the code</u> <u>for the unit.</u>

#### DIAGNOSIS AND SOLUTION (CONT)

IPM module protection error (P6)

#### 38MGR

ERROR CODE	P6
MALFUNCTION DECISION CONDITIONS	When the voltage signal that IPM send to compressor drive chip is abnormal, the display LED displays "P6" and the AC turns off.
SUPPOSED CAUSES	Wiring mistake     IPM malfunction     Outdoor fan assembly faulty     Compressor malfunction     Outdoor PCB faulty

Troubleshooting



Error Code	PO
Malfunction decision conditions	When the voltage signal that IPM sends to the compressor drive chip is abnormal, the LED display displays "PO" and the air conditioner turns off.
Supposed Causes	<ul> <li>Wiring mistake</li> <li>IPM malfunction</li> <li>Outdoor fan assembly faulty</li> <li>Compressor malfunction</li> <li>Outdoor PCB faulty</li> </ul>

#### IPM Malfunction or IGBT Over-strong Current Protection Diagnosis and Solution (PO)

#### **Troubleshooting:**





IPM Module Protection P4/P6				
$\left\langle \right\rangle$	Check whether the voltage range of P-N on the IPM module is normal. <u>Single head</u> DC310-380V <u>Multi head</u> DC277-356 for 18-24KBtu/h; DC277-410V for 36KBtu/h.			
_	Yes	_		

If no voltage check wires and wire connections. Check incoming voltage make sure to have 208/240VAC coming to the outdoor unit. Check the reactor.



Always check the service manual for your specific unit for the correct range.



Anything more then a 10% difference in the ohm readings and the compressor should be replaced.

#### Compressor Check

Measure the resistance value of each winding by using the tester.



Always check the service manual for your specific unit for the correct readings.

Fig. 68 — Measure the Resistance

How do you know what compressor we have?

Table 36 - Compressor Check

POSITION	RESISTANCE VALUE					
COMPRESSOR	ATM150D23UFZ	ATF235D22UMT	ATF250D22UMT	ATF310D43UMT	ATQ360D1UMU	
BLUE - RED	1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω	

Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.



Anything more then a 10% difference in the ohm readings and the compressor should be replaced.

Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.

			Table 2 — 3	specifications			
	SIZE		18	24	30	36	48
System	OUTDOOR MODEL		38MGRQ18B-3	38MGR024C3	38MGRQ30D3	38MGRQ36D-3	38MGRQ48E-3
	Max Number of Zones		2	3	4	4	5
Operating	Cooling Outdoor DB Min - Max	°F (°C)	-13~122 (-25~50)	-13~122 (-25~50)	-13~122 (-25~50)	-13~122 (-25~50)	-13~122 (-25~50)
Range	Heating Outdoor DB Min - Max	°F (°C)	-22~86 (-30~30)	-22~86 (-30~30)	-22~86 (-30~30)	-22~86 (-30~30)	-22~86 (-30~30)
	Total Piping Length	ft (m)	131 (40)	197 (60)	263 (80)	328 (100)	328 (100)
	Piping to furthest FCU	ft (m)	82 (25)	98 (30)	115 (35)	115 (35)	115 (35)
	Drop (OD above ID)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)	
Piping	Lift (OD below ID)	ft (m)	49 (15)	49 (15)	49 (15)	65 (20)	65 (20)
	Pipe Connection Size - Liquid	in (mm)	1/4*2 (6.35*2)	1/4*3 (6.35*3)	1/4*4 (6.35*4)	1/4*4 (6.35*5)	1/4"5 (6.35"5)
	Pipe Connection Size - Suction	in (mm)	3/8*2 (9.52*2)	3/8*3 (9.52*3)	1/2 *1+ 3/8*3 (12.7*1+9.52*3)	1/2 "1+ 3/8"3 (12.7"1+9.52"3)	1/2 *2+ 3/8*3 (12.7*2+9.52*3)
	Туре		R410A				
Refrigerant	Charge	lbs (kg)	4.41 (2.0)	6.17 (2.8)	6.61 (3.0)	10.13 (4.6)	10.13 (4.6)
	Metering Device		EEV	EEV	EEV	EEV	EEV
	Voltage, Phase, Cycle	V/Ph/Hz		208/23	0-1-60		
Electrical	Power Supply			Indoor unit powere	d from outdoor unit	t	
Lieouroai	MCA	Α.	18	25	30	35	35
	MOCP - Fuse Rating	Α.	25	35	45	50	50
	Туре			Rotary	Inverter		
	Model		ATM150D23UFZ	ATF235D22UMT	ATF310D43UMT	ATQ360D1UMU	ATQ360D1UMU
Compressor	Oil Type			ESTER (	DIL VG74		
	Oil Charge	Fl. Oz.	17.64	23.58	35.27	49.38	49.38
	Rated Current	RLA	10	15	19	21	21
	Unit Width	in (mm)	37.31 (948)	41.22 (1047)	41.22 (1047)	41.15 (1045)	41.15 (1045)
	Unit Height	in (mm)	27.64 (702)	31.88 (810)	31.88 (810)	52.48 (1333)	52.48 (1333)
Outdoor Unit	Unit Depth	in (mm)	14.82 (376)	17.91 (455)	17.91 (455)	17.63 (448)	17.63 (448)
outdoor onit	Net Weight	lbs (kg)	105.8 (48)	149.9 (68)	156.5 (71)	221.6 (100.5)	223.8 (101.5)
	Airflow	CFM	1,390	2,130	2,130	4,500	4,500
	Sound Pressure	dB(A)	62	63	62	64	64

Constitutions

SPECIFICATIONS

Always check the service manual for your specific unit for the correct readings.

Found in the front of the

Service Manual

* Condensing unit above or below the indoor unit.



Anything more then a 10% difference in the ohm readings and the compressor should be replaced.

#### Compressor Check

Measure the resistance value of each winding by using the tester.



Always check the service manual for your specific unit for the correct readings.

Fig. 68 — Measure the Resistance

#### Table 36 — Compressor Check

POSITION	RESISTANCE VALUE				
COMPRESSOR	ATM150D23UFZ	ATF235D22UMT	ATF250D22UMT	ATF310D43UMT	ATQ360D1UMU
BLUE - RED	1.72 Ω	0.75 Ω	0.75 Ω	0.65 Ω	0.37 Ω

Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.



Anything more then a 10% difference in the ohm readings and the compressor should be replaced.



Variable Speed compressors can run grounded but not very well. Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.



Actual Ohm readings may vary. If the Ohm readings between the terminals are not the same, the IPM has most likely failed.

#### **IPM Continuity Check**

Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

DIGITAL TESTER		NORMAL RESISTANCE VALUE	DIGITAL TESTER		NORMAL RESISTANCE VALUE
(+)RED	(-)BLACK		(+)RED	(-)BLACK	
	N		U	- - N	∞ (Several MΩ)
P	U	(Several MΩ)	V		
۲	V		W		
	W		(+)Red		

#### Table 22 — IPM Continuity Check

Leave the compressor disconnected for this check

Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.





Multi head Outdoor unit

## Actual Ohm readings may vary. If the Ohm readings between the terminals are not the same, the IPM has most likely failed.

#### IPM Continuity Check

Turn off the power, let the large capacity electrolytic capacitors discharge completely, and dismount the IPM. Use a digital tester to measure the resistance between P and UVWN; UVW and N.

DIGITAL TESTER		NORMAL RESISTANCE VALUE	DIGITAL TESTER		NORMAL RESISTANCE VALUE
(+)Red	(-)Black		(+)Red	(-)Black	
	N	∞ (Several MΩ)	U		
Р	U		V	N	∞ (Several MO)
F	V		W		
	W		(+)Red		

#### Table 37 — IPM Continuity Check

Leave the compressor disconnected for this check

Make sure to disconnect power before proceeding with this check and it has been OFF for 3 mins.



## Code: E3, F5, E8

## Error E3, F5, E8:

Fan Speed has been out of Control(MA*R – E3) Outdoor fan speed has been out of control(MG*R – E8)

## Possible Causes:

- Wiring mistake
- Fan assembly fault
- Fan motor fault
- PCB fault
- Fan RPM below 300
- Fan RPM over 2400



#### GET the Service Manual for your unit and always verify the code for the unit.

#### Fan Speed has been out of Control Diagnosis and Solution (E3/F5)

Error Code	E3/F5
Malfunction decision conditions	When the indoor fan speed is too slow (300 RPM) for a certain time, the unit stops and the LED displays the failure.
Supposed Causes	Wiring mistake     Fan assembly faulty     Fan motor faulty     PCB faulty

#### Troubleshooting:



#### Outdoor fan speed has been out of control (E8)

ERROR CODE	E8
MALFUNCTION DECISION CONDITIONS	When the outdoor fan speed stays too low (300RPM) or too high (2400RPM) for certain time, the unit stops and the LED displays the failure.
SUPPOSED CAUSES	Wiring mistake     Fan assembly faulty     Fan motor faulty     PCB faulty

#### Troubleshooting



40MAQ High wall

There are typically 2 types of motors a 5-wire and a 3-wire fan motor

The Service Manual calls the troubleshooting paths for the motors as Index 1 & 2

In our example Index 1 is for a 5-wire motor Ohming and Index 2 for a 5-wire board voltages

Always check the service manual for your specific unit for the correct procedures, voltage ranges and ohm readings.

#### Fan Speed has been out of Control Diagnosis and Solution (E3/F5)

1.1		
	Error Code	E3/F5
	Malfunction decision conditions	When the indoor fan speed is too slow (300 RPM) for a certain time, the unit stops and the LED displays the failure.
	Supposed Causes	Wiring mistake     Fan assembly faulty     Fan motor faulty     PCB faulty

Troubleshooting:



#### Index 1:

Indoor or outdoor DC fan motor (control chip is in fan motor) Measure the resistance value of each winding by using the tester. If any resistance value is zero, the fan motor must have problems and needs to be replaced.



Fig. 37 - Fan motor

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#### Index 2:

1 Indoor or Outdoor DC Fan Motor (control chip is in the fan motor). Power on and when the unit is in standby, measure the voltage of pin-1 - pin3, pin4-pin3 in the fan motor connector. If the value of the voltage is not in the range showing in the table below, the PCB has an issue and needs to be replaced.



DC motor voltage input and output

No.	Color	Signal	Voltage
1	Red	Vs/Vm	280V-380V
2			
3	Black	GND	ov
4	White	Vcc	14-14.5V
5	Yellow	Vsp	0~5.6V
6	Blue	FG	14-17.5V



Vsp

FG



#### Outdoor unit

#### Index 1:

#### DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must have problems and need to be replaced.





#### Table 32-DC Motor Voltage Input and Output

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200~380V
2			
3	Black	GND	0V
4	White	Vcc	13.5~16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5~16.5V

The unit is powered on, the mode is off



#### Outdoor unit

#### Index 1:

#### DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must have problems and need to be replaced.





#### Table 32-DC Motor Voltage Input and Output

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200~380V
2			
3	Black	GND	0V
4	White	Vcc	13.5~16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5~16.5V

The unit is powered on, the mode is cooling And the outdoor unit is running



#### Index 1:

#### DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connected not in the range showing in below table, the PCB must have problems and need to be replaced.





Table 32—DC Motor Voltage Input and Output

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200~380V
2			
3	Black	GND	OV
4	White	Vcc	13.5~16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5~16.5V

# <image>

#### The unit is powered on, the mode is off

#### Indoor unit

#### Index 1:

#### DC fan motor (control chip is inside fan motor)

Power on and when the unit is in standby, measure the voltage of pin1-pin3, pin4-pin3 in fan motor connector. If the value of the voltage is not in the range showing in below table, the PCB must have problems and need to be replaced.





#### Table 32—DC Motor Voltage Input and Output

NO.	Color	Signal	Voltage
1	Red	Vs/Vm	200~380V
2			
3	Black	GND	OV
4	White	Vcc	13.5~16.5V
5	Yellow	Vsp	0~6.5V
6	Blue	FG	13.5~16.5V



The unit is powered on, the fan is in the on position and operating.

#### Indoor unit

#### If the voltages are good Ohm the motor

#### AC Fan Motor Use the tester to measure the resistance value of each winding.



Fig. 70 - AC Fan Motor

#### Table 38 — Resistance Value

POSITION	RESISTANCE VALUE							
	RPG	20B	RPG28H					
Black - Red	381Ω±8% (68°F) 342Ω±8% (68°F		183.6Ω±8% (68°F)	180Ω±8% (68°F)				
White - Black	267Ω±8% (68°F)	253Ω±8% (68°F)	206Ω±8% (68°F)	190Ω±8% (68°F)				

Use the tester to measure the resistance value of each winding.



Table 39 — Resistance Value

POSITION	RESISTANCE VALUE								
	YDK70-6FB	YDK180-8GB	Y\$K27-4G	YSK68-4B	YDK45-6B	YSK25-6L	YDK53-6FB(B)		
Black - Red	56Ω±8%	24.5Ω±8%	317Ω±8%	145Ω±8%	345Ω±8%	627Ω±8%	88.5Ω±8%		
	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)		
Red - Yellow	76Ω±8%	19Ω±8%	252Ω±8%	88Ω±8%	150Ω±8%	374.3Ω±8%	138Ω±8%		
	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)		
Yellow - Blue	76Ω±8%	19Ω±8%	252Ω±8%	88Ω±8%	150Ω±8%	374.3Ω±8%	138Ω±8%		
	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)	(68°F)		

E3, F5, E8

Outdoor DC Fan Motor (control chip is in outdoor PCB)
 Power on and check if the fan can run normally, if the fan can run normally, the PCB must have a problem and needs to be replaced,
 If the fan can not run normally, measure the resistance of each pin (two). If the resistance is not equal to each other, the fan motor must
 have a problem and needs to be replaced, otherwise the PCB must has problems and needs to be replaced.

Fig. 23 — Outdoor DC Fan Motor

3. Indoor AC Fan Motor

Power on and set the unit running in FAN mode at the high fan speed. After running for 15 seconds, measure the voltage of pin1 and pin2. If the value of the voltage is less than 100V(208~240V power supply) or 50V(115V power supply), the PCB must has problems and needs to be replaced.



Fig. 24 — Indoor AC Fan Motor

Index 2 (3-wire motor)



## Error EE:

Condensate float switch error

## Possible Causes:

- Not draining properly (pan full)
- Float switch is stuck open
- Board output



## Code: EE



Access Hole



## Not Draining

- Check for debris in line
- Check pitch
- Check for improper traps

## Switch Open

• Ohm Switch out

## Output

• Check between pins on board for DC Voltage



CN5

Float





## Error Diagnosis Large Temperature Swing

## Large Temperature swings:

- Controller Location
- No load calculation was completed
- Turn down was not considered
- OSA introduced into return
- Duct leakage
- External influence on thermistors
- Return thermistor out of holder

Large Temperature Swings



## Error Diagnosis (Recap)Large Temperature Swing

Indoor Model		40MAQB09B1	40MAQB12B1	40MAQB09B3	40MAQB12B3	40MAQB18B3	40MAQB24B3	40MAQB30B3	40MAQB36B3
Energy Star		YES	YES	YES	YES	YES	YES	NO	NO
Cooling Rated Capacity	Btu/h	9,500	12,000	9,000	12,000	17,000	24,000	30,000	36,000
Cooling Cap. Range Min – Max	Btu/h	3500-11000	4000-13000	3500-13000	4000-13800	4500-18800	5500-24500	8000-30500	8000-36200

## MA*R Turn Down

What happens if the load of the space is less than the min turn down?



## Error Diagnosis Large Temperature Swing

## MG*R Turn Down

	HEAT PUMP									
	Size		18	24	30	36	48			
System	Outdoor Model		38MGRQ18B3	38MGRQ24C3	38MGRQ30D3	38MGRQ36D3	38MGRQ48E3			
	Max Number of Zones		2	3	4	4	5			
	Energy Star		YES	YES	YES	YES	YES			
	Cooling System Tons		1.5	2.0	2.5	3.0	4.0			
	Cooling Rated Capacity	Btu/h	18,000	24,000	30,000	36,000	48,000			
	Cooling Cap. Range Min – Max	Btu/h	5810~21940	7880~33510	8090~41470	8560~45020	8560~53160			
	SEER		22.5	23	23.8	21.5	22.4			
	EER		12.5	12.5	12.5	13.5	12.5			
Performance	Heating Rated Capacity (47°F)	Btu/h	19,000	23,000	28,000	36,000	48,000			
Non–Ducted	Heating Rated Capacity (17°F)	Btu/h	12,000	13,600	17,400	23,200	29,600			
	Heating Maximum Capacity (5° F)	Btu/h	13,900	23,000	28,000	36,000	36,000			
	Heating Cap. Range Min – Max	Btu/h	5760~24480	6010~36180	6350~41950	7210~ 50350	7210~55820			
	HSPF		10.3	9.8	10.0	10.5	10.2			
	COP (47° F)	W/W	3.6	3.9	3.8	3.8	3.6			
	COP (17° F)	W/W	2.8	2.7	2.8	2.8	2.7			
	COP (5° F)	W/W	2.2	2.1	2.0	1.8	2.0			

## Error Diagnosis Large Temperature Swing




## Error Diagnosis Large Temperature Swing





## Error Diagnosis Large Temperature Swing

#### **External Influence**





## Error Diagnosis Large Temperature Swing

#### **External Influence**





# **Questions & Quiz?**