100045
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SERVICE AND APPLICATION NOTES

Mini-Split Point Check Function Diagnostic Guide

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Applicable Units

MLA, MPA and MPB (Single and Multi-Zone Outdoor Units),

MCFA(B), MWMA(B), 3WMB036, M22A, M33A(B) and MMDA(B) (Indoor Units)

Purpose

The Point Check Function (PCF) aids the technician in understanding system operation. This function provides understanding of system operation by checking the sensor status of both the outdoor and indoor unit(s) which all affect system operation.

A PCF can be performed by the technician using the included wireless remote for both single and multi-zone systems at the indoor unit thus allowing the technician to check system sensor values.

On multi-zone systems, the PCF is performed at the outdoor unit control board using the LED display by pressing the **SW1** button. Refer to error codes listed in service manual (Corp1816-L7).

1. **Perform a Baseline/Benchmark PCF with NO demand for either heating or cooling. Record these results on the worksheet forms. See** *"Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form" on page 6*, *"Appendix C - Single Zone / Multi-Zone Outdoor Function/Performance Spot Checks Worksheet Form" on page 8* **and** *"Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form" on page 10* **for further details.**

2. **Then operate the system with a demand and record the new values.**

NOTE: *ALL temperature values displayed during PCF testing are in degrees Celsius.*

System Pre-Check

1. **Upon arrival check for known error codes at the indoor and outdoor unit displays. Determine customer complaint and any error codes observed on indoor display.**

NOTE: *Error codes displayed may differ at the indoor and outdoor units yet will indicate the same fault.*

2. **Complete commissioning and start-up form and determine if there are any installation issues.**

NOTE: *The system* **MUST** *be installed per installation instruction guidelines.*

   a. Determine wire type and length used between indoor and outdoor unit. Wiring must be stranded type with no splices or joints.
   b. Has a condensate pump been installed?
   c. Determine line-set sizes and lengths.
   d. Does it meet minimum and maximum lengths?
   e. Indoor unit location and type. Does it have a good throw? MMDA/B - duct work size and length and the number of registers?
   f. Have PCF worksheets available to note test results, single or multi-zone. See *"Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form" on page 6*, *"Appendix C - Single Zone / Multi-Zone Outdoor Function/Performance Spot Checks Worksheet Form" on page 8* and *"Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form" on page 10* for further details.
   g. Identify application and size of space and load unit is supporting.

3. **Determine what testing procedure to use. Mini-split diagnostic information can be obtained from the following (as determined by unit type, for example single or multi-zone and matched indoor unit type).**

   a. Conduct PCF via remote control at wall mount indoor unit and viewed on display. Worksheets for both single and multi-zone applications are included and should be filled out for reference. See *"Appendix A - Quick Access Instructions and Example of Display Viewed during Point Check Test (PCF)" on page 4* and *"Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form" on page 6* for further details.
   b. Conduct an outdoor spot check on multi-zones units via control board **SW1** and viewed on LED display. Included in this documents are worksheet forms to note values. It is strongly suggested to use this method when testing multi-zone applications.
   c. The Handheld Testing Device (16X78) is available as an option. This tester is connected to either the outdoor or indoor connections. See *"Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form" on page 10* for proper connection of tester. Use the included worksheet form to capture test results.

NOTE: *If the technician does not have this type of testing device, there are other PCF testing options available.*

4. **Testing PCF without Demand (Baseline/Benchmark)**

   a. Set the unit to FAN mode **ONLY** (no demand for heating or cooling) and then set fan speed to **HIGH**. Enter point check mode via remote control at the wall mount indoor unit.
   b. Scroll through all parameters and write them down on the Point Check Form. (Baseline/Benchmark Values with NO Demand). See *"Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form" on page 6*, *"Appendix C - Single Zone / Multi-Zone Outdoor Function/Performance Spot Checks Worksheet Form" on page 8* and *"Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form" on page 10* for further details.
   c. Exit Point Check mode.

NOTE: *System will automatically exit out of PCF if no buttons are pressed for 30 seconds. You may have to wait up to 5 minutes to re-enter PCF mode if this occurs.*

5. Testing PCF with Demand (Baseline/Benchmark)

a. Set the remote to either HEAT or COOL mode then either raise or lower the temperature and set the fan on high (press **TURBO** if applicable).

b. Allow system to operate for at least 5 minutes.

c. Place the indoor unit in Point Check mode again.

d. Scroll through all parameters and write them down on the Point Check Form. See *"Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form" on page 6*, *"Appendix C - Single Zone / Multi-Zone Outdoor Function/Performance Spot Checks Worksheet Form" on page 8* and *"Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form" on page 10* for further details.

e. Exit Point Check mode.

NOTE: *System will automatically exit out of PCF mode if no buttons are pressed for 30 seconds. You may have to wait up to 5 minutes to re-enter PCF mode if this occurs.*

f. Compare operational demand values found to Baseline/Benchmark or NO Demand values.

6. Multi-Zone Outdoor Spot Check testing with SW1 button and Display

a. Carefully remove cabinets and covers to provide access to the outdoor unit control board **SW1** button and display.

NOTE: *Outdoor unit sizes 018 and 030 top cover would have to be removed to access **SW1** and for viewing of LED display*

NOTE: *Outdoor unit sizes 036 and 048 remove vertical side cover to access **SW1** and for viewing LED display.*

b. For best results perform outdoor spot check (PCF) with a non-demand baseline/benchmark and note values in the appropriate column on the worksheet form.

c. With all indoor units operating with a demand for either a heating or cooling. Write down results in the appropriate column on the worksheet form.

7. Using a Handheld Tester 16X78 for diagnostics.

a. Connect the diagnostic module to the outdoor unit per tester installation instruction.

b. Power on the tester.

c. The sync is automatically performed when connected to the unit. Determine if no communication error codes are present.

TIP:	If tester screen shows "No Communication found on both indoor and outdoor unit, then switch supply voltage connections to the tester unit (brown and blue leads). If screen shows no communication is determined on either the indoor or outdoor unit then focus diagnostic attention to that part of the equipment. Ohm testing the devices may be required..

d. With NO demand for cooling or heating, then enter indoor unit inquiry and make note of all sensor values.

e. With NO demand for cooling or heating, then enter outdoor inquiry and make note of all sensor values.

f. Then operate the system in either heating or cooling mode for at least 5 minutes and make note of all sensor values and compressor hertz.

NOTE: *You can scroll through the indoor and outdoor unit inquiries anytime during operation which may assist in determining any abnormal value changes.*

8. Performing an Ohm Test

a. If an ohm test is required, then first turn off power to the system.

b. If a control board is determined to be failed. Conduct an ohm test on all system components on both the indoor and outdoor units (if applicable) before replacing any control boards.

c. Refer to the unit's diagnostic manual for proper ohm values.

d. If sensor is found to be out of range after PCF test, then conduct an ohm test of that sensor and compare to resistance chart in the service manuals. Other system components both resistance and voltage values also can also be found in the service manuals.

Appendix A - Quick Access Instructions and Example of Display Viewed during Point Check Test (PCF)

a. Press the **LED** button on the remote controller three times and then press the **SWING** button three times within ten seconds. The unit will beep for two seconds to indicate it is in the Point Check Mode.

b. The display will enter into information inquiry mode status.

c. Press the **LED** or the **SWING** button to go forward or backwards. You must continue toggling through each display every 2 to 3 seconds or it will exit out of Point Check Mode and you will have to wait 5 minutes to re-enter that mode.

d. This is for wall mounted single zone indoor unit.

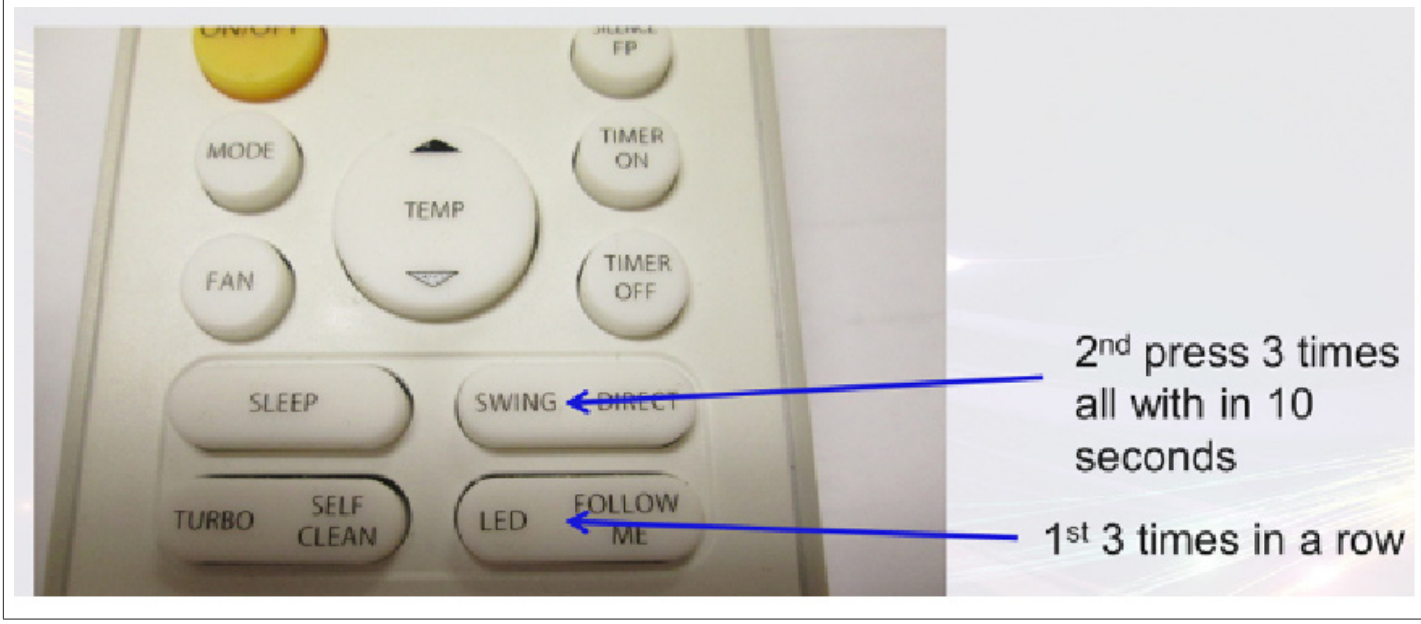


Figure 1. Point Check Function

You may also try pressing the **DIRECT** button three times if pressing the **SWING** button does not work.

Be patient, within 10 seconds you will notice display changes to **r1** which indicates you have successfully entered diagnostic mode. Use **SWING** and **LED** to move through values. See examples on following page for display.

- (R/A) sensor shows up as **r1** on the display.
- **T2** (Indoor coil temp) sensor shows as **r2** on display.

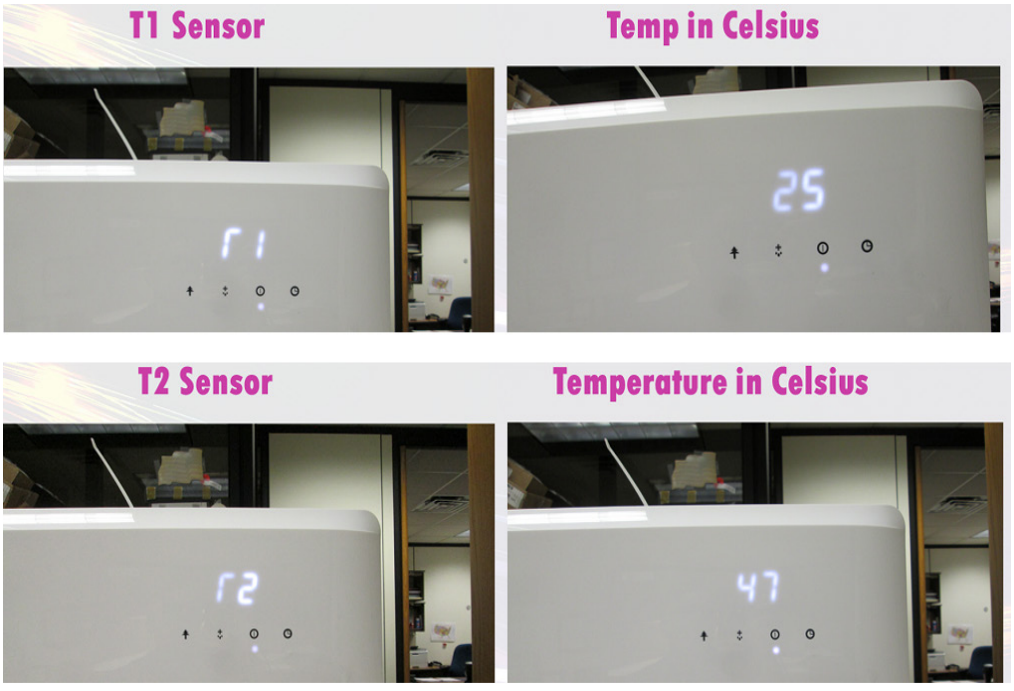


Figure 2. LED Display Examples (T1 and T2 Sensors)

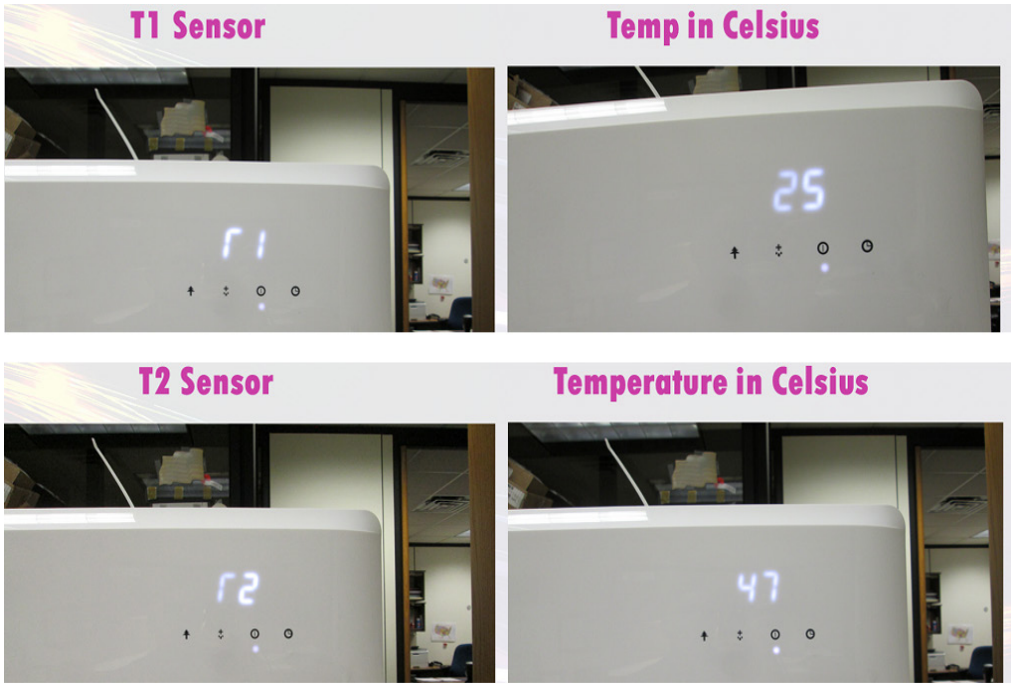


Figure 3. LED Display Examples (T3 and T4 Sensors)

Appendix B - Single Zone / Multi-Zone Indoor Function/Performance Spot Checks Worksheet Form

POINT CHECK FUNCTION WORKSHEET MPB/MLA - Single Zone

Please enter values: Temperature Values in Chart **Degree Celcius.**			***Benchmark/Baseline °C	Unit Demand °C	
Meaning		***Display***	***Display Value***	***Display Value***	
Indoor Unit Location					
Room Temperature (R/A) _____	T1 =	r1			
Indoor Coil Temp.	T2 =	r2			
Outdoor Coil Temp.	T3 =	r3			
Outdoor Ambient Temp. _____	T4 =	r4			
Outlet Temp Of Indoor Coil **(T2b)(MultiiZone only Display -1F**	Tb=	rb			
Discharge Temperature **(T5)**	TP =	rP			
Suction Temperature (Display **00**) **NOT IN USE**	TH =	rH			
Targeted Frequency	FT =	Fr			
Actual Frequency	Fr =	Fr			
Indoor Fan Speed (hexadecimal to decimal x10 = RPM)	IF =	IF			
Outdoor Fan Speed (hexadecimal to decimal x10 = RPM)	OF =	OF			
EXV Opening Steps (hexadecimal to decimal x2)	LA =	LA			
Compressor Continuous Runtime	CT =	Cr			
Causes Of Compressor Stop.	ST =	Sr			
Equipment Information		**DAT °F			
Identify Outdoor Unit Below.		*TR-°F			
Mod# _____		**Model#**		(Indoor)	
Ser# _____		**Serial #**		(Indoor)	
Fault Codes. _____		**Faults**			
Length & Size of connecting Line set?		******			
Outdoor unit location(Facing)					
Remote Controll Setting					
(Mode(Heat/Cool), Temp & Follow Me?)					
**** Indoor Equipment Performance. (If Applicable)		**BTUH's**			
Wiring Length & Type of wire.					
Operating refriigerant Pressure		**PSIG**			

Note: *TR = DAT - R/A tested

Note: **DAT = Air leaving Temp

Note: *** = Benchmark. (No Demand) Hi Fan speed mode on only. Note readings.

****** Indoor Equipment Performance Calculation =**

BTUH's = CFM (HI) x TR x 1.08

BTUH= (_____CFM x _____DF) x 1.08

BTUH = (_____) x 1.08

BTUH's = _____

To activate the "Point Check Function" :

1 - Press LED 3 times

2 - Press SWING 3 times

3 - Wait for 7 seconds

4 - Press LED to see the next values

5 - Press SWING to see the previous values

POINT CHECK FUNCTION WORKSHEET MPB/MLA - Multi-Zone

Please enter values: Temperature Values in Chart **Degree Celcius.**			Zone A		Zone B		Zone C		Zone D		Zone E	
Meaning		Display	Baseline	Demand	Baseline	Demand	Baseline	Demand	Baseline	Demand	Baseline	Demand
Indoor Unit location.												
Room Temperature(R/A)	T1 =	r1										
Indoor Coil Temp.	T2 =	r2										
Outdoor Coil Temp.	T3 =	r3										
Outdoor Ambient Temp.	T4 =	r4										
Outlet Temp Of Indoor Coil. Multi-Zone ONLY	(T2b/TB) =	rb										
Discharge Temperature	(T5/TP) =	rP										
Suction Temperature (Display 00) Not used	TH =	rH										
Targeted Frequency	FT =	Fr										
Actual Frequency	Fr =	Fr										
Indoor Fan Speed (hexadecimal to decimal x10 = RPM)	IF=	IF										
Outdoor Fan Speed (hexadecimal to decimal x10 = RPM)	OF=	OF										
EXV Opening Steps (hexadecimal to decimal x2)	LA =	LA										
Compressor Continuous Runtime	CT =	Cr										
Causes Of Compressor Stop.	ST =	Sr										
Compressor Stop Code Definition												
Equipment Information-												
Disharge Air Temperature: Note: **DAT = Air leaving Temp. ID		DAT										
Temperature Rise: Note: *TR = DAT - R/A tested		TR										
Outdoor Model # :		MOD#										
Outdoor Serial # :		SER#										
Fault Codes. _____		Faults										
Length & Size Ref. pipe between?		****										
Remote Setting (Mode, Temp & Follow Me?)												
* Indoor Equipment Performance (IF Applicable)		BTUH's										
Wiring Length, Size gauge & Type.												
Operating Refrigerant Pressure.		PSIG										
Fan Programmed Change?		Y or N										
Indoor R/A Sensor Relocated		Y or N										

Appendix C - Single Zone / Multi-Zone Outdoor Function/Performance Spot Checks Worksheet Form

Multi-Zone Outdoor Mini-Split Performance Spot Check Form

Outdoor unit Model #		Serial #		Date:	
Reason for visit:					

#	Description	Remarks/Notes			Baseline °C	Demand °C
0	Normal Display	Display running Frequency, running state or malfunction code				
		Actual Data				
			Display	Number of IDU's		
			1	one		
01	Number of Connected IDU's		2	two		
			3	three		
			4	four		
			5	five		
02	Outdoor unit running mode	Off: 0, Fan only: 1, Cooling: 2, Heating: 3, Forced cooling : 4				
03	IDU A Capacity					
04	IDU B Capacity	The Capacity unit is horsepower.				
05	IDU C Capacity	If the IDU is not connected, the digital display wil show " - - "				
06	IDU D Capacity	(9K:1HP, 12K: 1.2HP, 18K: 1.5HP , 24K: 2.5HP)				
07	IDU E Capacity					
08	IDU A Capacity demand code					
09	IDU B Capacity demand code	Norm code*HP				
10	IDU C Capacity demand code	(9K:1HP, 12K: 1.2HP, 18K: 1.5HP)				
11	IDU D Capacity demand code	Capacity Area	a, b, c, d, e, f			
12	IDU E Capacity demand code	Norm Code (N)	3, 2, 1.5, 1, 0.5, 0			
13	Outdoor unit amendatory Capacity Demand Code	Forced Cooling : 7				
14	The Frequency Corresponding to the total IDU's amendatory Capacity Demand Code					
15	The Frequency after the frequency limit.					
16	The Frequency sending to compressor control chip.					
17	IDU A evaporator outlet temp. (T2BA)					
18	IDU B evaporator outlet temp. (T2BB)	If the temperature is lower than -9 degrees, the two digit display will show " -9 ".				
19	IDU C evaporator outlet temp. (T2BC)	If the temperature is higher than 70 degrees, the two digit display will show " 70 ".				
20	IDU D evaporator outlet temp. (T2BD)	If the IDU is not connected, the digital display wil show " - - " Temperature values displayed are in Degree Celcius.				
21	IDU E evaporator outlet temp. (T2BE)					

Figure 4. Part 1

22	IDU **A** room temp. (**T1A**)	If the temperature is lower than 0 degrees, the two digit display			
23	IDU **B** room temp. (**T1B**)	will show " 0 ".	Temperature Values are in Degree Celcius.		
24	IDU **C** room temp. (**T1C**)	If the temperature is higher than 50 degrees, the two digit display			
25	IDU **D** room temp. (**T1D**)	will show " 50 ".	Temperature Values are in Degree Celcius.		
26	IDU **E** room temp. (**T1E**)	If the IDU is not connected, the digital display wil show " - - "			
27	IDU **A** evaporator temp. (**T2A**)	Value displayed is in Degree Celcius.			
28	IDU **B** evaporator temp. (**T2B**)	Value displayed is in Degree Celcius.			
29	IDU **C** evaporator temp. (**T2C**)	Value displayed is in Degree Celcius.			
30	IDU **D** evaporator temp. (**T2D**)	Value displayed is in Degree Celcius.			
31	IDU **E** evaporator temp. (**T2E**)	Value displayed is in Degree Celcius.			
32	Condenser Coil Temp. (**T3**)	Value displayed is in Degree Celcius.			
33	Outdoor Ambient temp. (**T4**)	Value displayed is in Degree Celcius.			
		The display value should be between 30 & 129 Degrees Celcius.			
		If the temp is lower than 30 degrees, te two digit display			
34	Compressor discharge temp.	will show " 30 " **ONLY**			
	(TP) (**T5**)	If the temp is higher than 99 degrees, the two digit display			
		will show single & tens digit.	Note :	Example:	
		2 digit display shows " 0.5 ". Discharge temp is 105 degrees.			
35	AD value of current.	The display value is a Hex number. Note:			
36	AD value of voltage.	Example: two digit display show "Cd", it means AD. Value is 205.			
37	EXV open angle for IDU **A**. (LA)				
38	EXV open angle for IDU **B**. (LA)	Actual data x 4.			
39	EXV open angle for IDU C. (LA)	If value is higher than 99, the two digit display will show			
40	EXV open angle for IDU D. (LA)	single digit and tens digit.	Note : Example:	Display value	
41	EXV open angle for IDU E. (LA)	shows "2.0", it means EXV open angle is 120x4=480p			
		Bit7	Frequency limit caused by IGBT radiator.		
		Bit6	Frequency limit caused by PFC.		
		Bit5	Frequency limit caused by **T4**.		
42	Frequency limit symbol	Bit4	Frequency limit caused by **T2**.		
		Bit3	Frequency limit caused by **T3**.		
		Bit2	Frequency limit caused by **T5**.		
		Bit1	Frequency limit caused by current.		
		Bit0	Frequency caused by voltage		
43	Average value of **T2**	(Sum **T2** value of all IDU's) / (# of IDU's in good connction)			
44	Outdoor unit fan motor state	Off:0, High speed:1, Med speed:2, Low speed:3, Breeze:4, Super Brez:5			
45	The Last Error or protection code.	00 Means no malfunction or protection.			
Display 46 to 51are not used.		For IDU F which is not used.		**N/A**	**N/A**

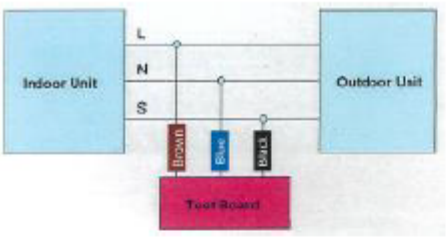
NOTES:

Figure 5. Part 2

Appendix D - Handheld Electronic Inverter Mini-Split Tester (16X78) Worksheet Form

Handheld Testing Device 16X78 Info.

3 Wire High voltage LNS Connection: BROWN: L1 BLUE: L2(N) Black: 3 (S-Comm)



Note: 1. Turn Power off to connect wires as shown.
2. Turn power back on when connections complete.
3. Handheld tester will detect any issues with Comm.
4. Scroll to IDU then ODU inquiries.
5. Allow to operate. Identify values as Below.

IDU - Indoor Unit. *Baseline: Values with no demand.
ODU - Outdoor Unit. **Demand: Values during Operation.

IDU Query:	*Baseline	**Demand
Indoor mode. :		
Target Frequency. :		
Indoor Temp. (T1) :		
Evaporator Temp. (T2) :		
IDU Fan Speed. :		
Setting Temp. :		

ODU Query:		
Outdoor Mode. :		
Run Frequency. (FR) :		
A/C Voltage. :		
Outdoor Temp. (T4) :		
Condenser Temp. (T3) :		
Discharge Temp. (T5, TP) :		
ODU Fan Speed. (OF) :		
PMV Opening. (IF) :		

Appendix E - Indoor Compressor Stop Codes

Codes that can be viewed during Indoor Spot check (ST/Sr)

ST- Point Check Function

Code	Reasons of compressor stop	Code	Reasons of compressor stop
1	Frequency limit caused by current	24	IMP 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	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	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	35	MCE malfunction
14	Low ambient temperature protection	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 IR341	39	311 fan speed has been malfunction
18	AC power input voltage protection	40	Low pressure protection
19	Top temperature protection of compressor	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

Appendix F - FAQ

Q: Why do multi-zone applications in some instances create one or some of my rooms to overshoot the set point temperature in heating mode?

- **a.** In multi-zone system applications refrigerant flows to all connected indoor unit even if there is no demand. Simultaneously fans on the other indoor units will operate at a lower speed which is a normal operation.
- **b.** Sometimes size of (room) space (load) the indoor unit is supporting is on occasionally to small.