INTEGRATED CONTROLS FOR ASHPs

Ductless Heat Pump Mini-Splits Session Sept. 12, 2019

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NEHVAC Programs

INTEGRATED CONTROLS
For Mini Split Heat Pumps and Central Heat Pumps

- For Central Heat Pumps? Established Technology

  Dual Fuel Thermostat or Zone Control Panel, with multiple OEM applications

- For MSHPs? A Brave New World

  Must connect 12-volt DC MSHP to 24-volt AC Central Heating system

2019 MASS SAVE H&C PROGRAM OBJECTIVE

Reduce Green House Gas (GHG) emissions by at least 20% by using Mini Split Heat Pumps (and Central Heat Pumps) as First Stage Heating down to at least 40F

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INTEGRATED CONTROLS
For Mini Split Heat Pumps

The Common Goal:

Use Air Source Heat Pump for First Stage Heat

Use Conventional Heating System in Colder Weather

The Connectivity Issue:

Like Cars, All MSHPs perform the same function

But like Cars, the parts are not interchangeable

EVERY BRAND OF MSHP WILL REQUIRE A FACTORY APPROVED CONTROL SYSTEM

Must maintain Consumer Product Warranty and Protect Program Sponsors from Liability

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Types of Integrated Controls on IC QPL

Dual Fuel Thermostat

Qualification:

- Must be 3 Stage Heat / 2 Stage Cool Dual Fuel thermostats
- Balance Point / Outdoor Sensing via wired or wireless sensor, or WIFI

Target HP Application:

- Conventional Central Heat Pump with Furnace or Air Handler
- MSHP Air Handler or Single Head MSHP with IC QPL listed 24-volt thermostat adapter

THE CHALLENGE….

SO MANY DIFFERENT TYPES CENTRAL HEATING SYSTEMS

Forced Hot Air

Single or Multi Zone

Hot Water Boilers

Single or Multi Zone

Steam Boilers

Radiant Heat

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IC Qualified Product List
Dual Fuel Thermostats

Dual Fuel Thermostats Qualify as Integrated Controls with eligible Heat Pump/Furnace combinations						
Manufacturer	**Model Name**	**Model #**	**24v (Y/N)**	**Communicating (Y/N)**	**WiFi Enabled (Y/N)**	**Notes**
Aprilaire	8446, 8448	8446, 8448	Y			Non-Programmable
Aprilaire	8465, 8466, 8476	8476	Y			Programmable 5/2 or 5/1/1
Aprilaire	8600, 8620, 8910	8600, 8620, 8910	Y			Programmable 7-Day
Aprilaire	8476W, 8620W, 8910W, 8920W	8476W, 8620W, 8910W, 8920W	Y		Y	Programmable 7-Day
Aprilaire	8800	8800	Y	Y		Programmable 7-Day
Aprilaire	8810, 8820, 8830, 8840	8810, 8820, 8830, 8840	Y	Y	Y	Programmable 7-Day
Bosch	Bosch Connected Control BCC100 Thermostat	BCC100	Y	N	Y	Uses local weather for outdoor temperature and balance point
Bryant	Evolution System Control	SYSTXBBECC01	Y	Y	Y	
Bryant	COR	T6-WEM01-A	Y	N	Y	
Bryant	COR 5C	TSTWHA01	Y	N	Y	
Bryant	COR 7C	TSTWRH01	Y	N	Y	
Building36	Intelligent Thermostat	B36-T10	OPTIONAL	Y	N	Up to 4 heat 2 cool, 24v or battery operated, Cellular enabled
Carrier	COR	TP-WEM01-A	Y	N	Y	Uses local weather for outdoor Temperature and Change over
Carrier	COR 5C	TSTWHA01	Y	N	Y	Uses local weather for outdoor Temperature and Change over
Carrier	COR 7C	TSTWRH01	Y	N	Y	Uses local weather for outdoor Temperature and Change over
Carrier	Infinity System Control	SYSTXCCITC01-B	N	Y	Y	
Ecobee	Ecobee 3 lite	EB-STATE3LTP-02	Y		Y	
Ecobee	Ecobee 4	EB-STATE4P-01	Y		Y	
Honeywell Home	Prestige IAQ	YTHX9421R5085WW	Y		Y	Requires THM6000R7001 Internet Gateway
Honeywell Home	Prestige IAQ	YTHX9421R5101WW	Y		Y	Requires THM6000R7001 Internet Gateway
Honeywell Home	Smart Round	TH8732WFH 5002	Y	Y	Y	Use with C7089U Wired Outdoor Sensor
Honeywell Home	T6 Pro	TH6320U 2008	Y	N	N	Use with C7089U Wired Outdoor Sensor
Honeywell Home	T6 Pro Smart	TH6320WF 2003	Y	Y	Y	Two options: 1) Use with C7089U Wired Outdoor Sensor or 2) Use local weather thru WiFi for outdoor temp and changeover.
Honeywell Home	VisionPro 8000 Smart	TH8320R 1003	Y	Y	N/Y	Use with C7089R Wireless Outdoor Sensor. Needs HW Thm6000R 7001 Gateway For Wi-Fi
Honeywell Home	VisionPro 8000 Smart	TH8321R 1001	Y	Y	N/Y	Use with C7089R Wireless Outdoor Sensor. Needs HW Thm6000R 7001 Gateway For Wi-Fi
Honeywell Home	WiFi 8000	TH8321WF 1001	Y		Y	
Lennox Industries Inc.	iComfort E30	E30	Y	N	Y	Universal Smart
Lennox Industries Inc.	iComfort M30	M30	Y	N	Y	Universal Smart
Lennox Industries Inc.	iComfort S30	S30	Y	Y	Y	Communicating Smart Thermostat
Lennox Industries Inc.	iComfort WiFi	WIFI	Y	Y	Y	Communicating Smart Thermostat
LG Electronics	Thermostat	PREMTVBC0	Y	Y	N	2 Set point Heating and Cooling 7-Day. Can act as Integrated Control for entire hot water zone if connected to largest indoor unit of Multihead MSHP system.
LG Electronics	Thermostat	PREMTBVC1	Y	Y	N	2 Set point Heating and Cooling 7-Day/Humid Sensor OPT-ZIGBY OCC Sensors. Can act as Integrated Control for entire hot water zone if connected to largest indoor unit of Multihead MSHP system.
Nest	Nest Third Gen	T3008US, T3016US, T3017US, T3021US	Y		Y	Nest Learning Thermostat Pro - 3rd Generation (Stainless Steel, Carbon Blk, White, Copper)
Nexia	Trane/American Standard/Service First	ACONT824AS52D* TCONT824AS52D*	Y	N	Y	Remote wired outdoor temp sensor BAYSENS01ATEMPA. **NOT** currently compatible with boiler systems.
Nexia	Trane/American Standard/Service First	ACONT724AS42D* TCONT724AS42D*	Y	N	Y	Remote wired outdoor temp sensor BAYSENS01ATEMPA. Remote wired indoor temp sensor ZZSENSAL0400AA. Z-Wave connectivity with Nexia Bridge (purchased seperately). **COMPATIBLE** with conventional boiler systems.
Nexia	Trane/American Standard/Service First	ACONT624AS42D* TCONT624AS42D*	Y	N	Y	Remote Wired Outdoor Temp Sensor BAYSENS01ATEMPA. **NOT** Currently Compatible With Boiler Systems
Nexia	Trane/American Standard/Service First	AZON1050AC52Z* TZON1050AC52Z*	Y	Y	Y	Remote Wired Outdoor Temp Sensor BAYSENS01ATEMPA. **NOT** Currently Compatible With Boiler Systems.
Nexia	Trane/American Standard/Service First	ACONT850AC52U* TCONT850AC52U*	Y	Y	Y	Remote Wired Outdoor Temp Sensor BAYSENS01ATEMPA. **NOT** Currently Compatible With Boiler Systems
Robertshaw	Robertshaw	972592	Y		Y	972592 Programmable Thermostat (3 Heat - 2 Cool)
Robertshaw	Robertshaw	982592	Y		Y	982592 Programmable Thermostat (3 Heat - 2 Cool)
Tekmar	Invita	564	Y	N	Y	2 wire stat with equipment interface
Tekmar	Invita	564B	Y	N	Y	same but black finish
Tekmar		557	Y	Y	Y	Wifi only with additional Gateway control
Tekmar		563	Y	N	Y	Stand alone with Wifi

This list is updated approximately every two weeks. For most current list, visit MassSave.com/CentralAC

For questions regarding qualified products and eligible installations, email HVAC@CLEAResult.com or call 844.615.8315

SMART THERMOSTATS

ALSO EARN $100 REBATE

Energy Star Certified Smart Thermostats on IC QPL by

Bryant

Carrier

Ecobee

Honeywell Home

NEST

Nexia (American Standard/TRANE)

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Types of Integrated Controls on IC QPL

IC Packages for MSHPs

- **Integrated Control Package:**

  IC for MSHPs and boilers or furnaces

  OEM documentation to protect warranty

  May require use of a Dual Fuel Thermostat from QPL

Current IC listings for most MSHP brands:

Carrier----Daikin---- Fujitsu---- Haier---- LG----

Mitsubishi---- Panasonic---- Samsung MSHPs

Hot Air Zone Control panels for CHP applications:

Honeywell----EWC

THE CHALLENGE….

SO MANY DIFFERENT TYPES CENTRAL HEATING SYSTEMS

Forced Hot Air

Single or Multi Zone

Hot Water Boilers

Single or Multi Zone

Steam Boilers

Radiant Heat

All MSHP OEMs sell Conventional Air Handlers, as well

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IC Qualified Products List
Integrated Control Packages

mass save
Savings through energy efficiency

MSHP MANUFACTURERS CONTROL PACKAGES

(JANUARY 2019 TO PRESENT)

Product Development to Capture MSHP Market Share

IC QPL updated regularly based on submission by OEMs

Integrated Controls Package

Manufacturer	Model Name	Model #	24v (Y/N)	Communicating (Y/N)	WIFI Enabled (Y/N)	Notes
Carrier	24V Interface	KSAIC0301230	Y	Y	Y*	Requires one 24V Interface Kit, one Third Party Thermostat and Double Pole Double Throw (DPDT) relay per indoor unit. *Wi-Fi Enabled based on the Thermostat selected. www.utcccs-cdn.com/hvac/docs/1009/Public/05/MASS_SAVE_Controls_Solution_Carrier_2019.pdf
CMNA ICP-MIDEA	24V Interface	KSAIC0401230	Y	Y	Y*	Requires one 24V Interface Kit, one Third Party Thermostat and Double Pole Double Throw (DPDT) relay per indoor unit. *Wi-Fi Enabled based on the Thermostat selected. www.utcccs-cdn.com/hvac/docs/1009/Public/0D/MASS_SAVE_Controls_Solution_ICP_CMNA_2019.pdf
Daikin	ENVI	DACA-TSI-1	Y	N	Y	Thermostat Kit including auxiliary heat relay, balance point or droop operation. Can act as Integrated Control for entire hot water zone if connectrd to largest indoor unit of Multihead MSHP system.
Fujitsu	Wired Remote Controller (Touch Panel)	UTY-RNRUZ2	N	Y	N	J Series only - The existing heat source is energized is to be operated through a 3rd party control circuit, via a 12 VDC external output signal from the indoor unit PC board. Primary Heat lockout or secondary heat lockout based on outdoor temperature is available.
Fujitsu	Novus N2020	8202011300	Y	N	N	https://fujitsugeneral.zendesk.com/hc/en-us/articles/360021752413--053-Integrated-Controller-Installation-Operation
Fujitsu	Thermostat Converter	UTY-TTRX	Y	N	N	Required installation includes a Thermostat Converter and 24 volt transformer (one UTY-TTRX can connect up to 16 indoor units), plus a dual fuel thermostat from QPL. Best as IC solution for single head, multihead, or air handler installations. Dual Fuel thermostat replaces existing central heat thermostat. Indoor units connected to each adapter (plus dual fuel themostat) acts as Single Zone.
Haier	IFTTT	QAWF01A	N	Y	Y	Requires Ecobee Thermostat integration with Haier WiFi via IFTTT Applets. Proper understanding and installation of the Ecobee thermostat is a prerequisite.
LG Electronics	Third Party Tstst Method L Model Series IDU	PDRYCB300	Y	N	OPTIONAL	LG Option 1: PDRYCB300 + 24 V Trans. + Thermostat (1 Per IDU)
LG Electronics	Aux Heater Kit Highwall Multi	PRARS1	Y	Y	N	LG Option 2: Wall Units Multi Zone Idu Aux Htr Relay Prars1 (1 Per IDU)
LG Electronics	Aux Heater Kit All Ducted/Cassette	PRARH0	Y	Y	N	LG Option 3: Aux Htr Relay Prarh0 Ducted, Cassette Idu (1 Per IDU)
LG Electronics	Third Party Tstst Method A Model Series IDU	PDRYCB300	Y	N	OPTIONAL	LG Option 4: Arnu Series IDU PDRYCB300+ 24 V Trans. + Thermostat (1Per IDU)
LG Electronics	A Series Idu Model - Dry Contact Built In	ALL "A" SERIES IDU	Y	Y	Y	LG Option 5: Arnu Series IDU + 2 Stage Tsat With Wired/Wireless/Internet Odt Sensing Wired Through Relay To Cn-Ext Of Any (1) IDU
Mitsubishi Electric	Kumo Station Outdoor Temperature Sensor Kumo Cloud	PAC-WHS01HC-E C7089U1006/U PAC-USWHS002-WF-1	N	N	Y	Requires an outdoor temperature sensor and each unit needs a Kumo Cloud interface
Mitsubishi Electric	T-Stat Interface Transformer	PAC-US444CN-1 VPL24-210	Y	Y*	Y*	Requires a T-Stat interface and transformer for each indoor unit, and a 2 stage thermostat by any manufacturer. ACTS AS IC WITH QPL LISTED THERMOSTAT. To operate the indoor unit via Thermostat Interface (PAC-US444CN-1) using a 24VAC thermostat in the heat pump configuration (using O/B with Y1 & Y2 output) requires a double pole-double throw relay, see Application Note 3044. *Depends on Thermostat Selected.
Panasonic	IFTTT Connect	PICDF19	N	Y	N	IFTTT App connects a Honeywell D6 integrated with a Panasonic mini-split and a T9 integrated with an auxiliary heat system. Installation contractors shall complete Panasonic training and be authorized to install Panasonic residential mini-split heat pumps. Installation instruction may be fount at: https://us.panasonic.com/lcsolutions

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Integrated Control Strategies: Product Specific

<u>Balance Point (BP) Changeover</u>

- ASHP operates above selected outdoor temperature (35-40F)
- Switches to Conventional system below chosen BP temperature

<u>Simultaneous Operation (aka “Droop”)</u>

- ASHP provides heat above 40-45F
- ASHP set 2-3F higher than Conventional Heat from 40 to 15F
- Conventional system only below 15F

<u>Lead/Lag with both systems always ON</u>

- ASHP set 2-4F higher (Lead) than Conventional system above Balance Point
- Conventional set to Lead below BP, ASHP in Lag position as backup

IC STRATEGY BY OEM

Balance Point

Carrier, Daikin, Fujitsu, Panasonic, Samsung; EWC and Honeywell Zone Control Systems

Simultaneous/Droop .

LG, Mitsubishi

Lead/Lag

Haier

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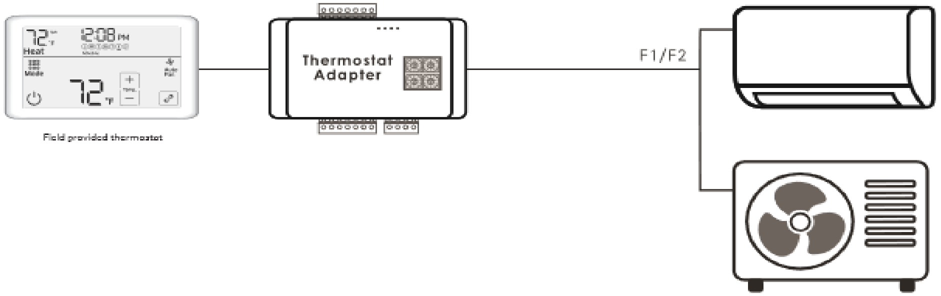
Example of IC on QPL

Courtesy of SAMSUNG HVAC

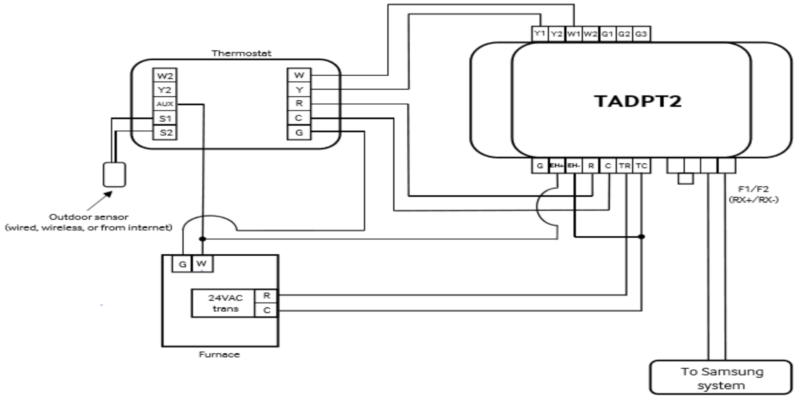
Factory Documentation and Wiring Schematics Required to Maintain Warranty

Typical configuration of Samsung system with TADPT2 thermostat adaptor and 3rd party thermostat



Wiring diagram example 1

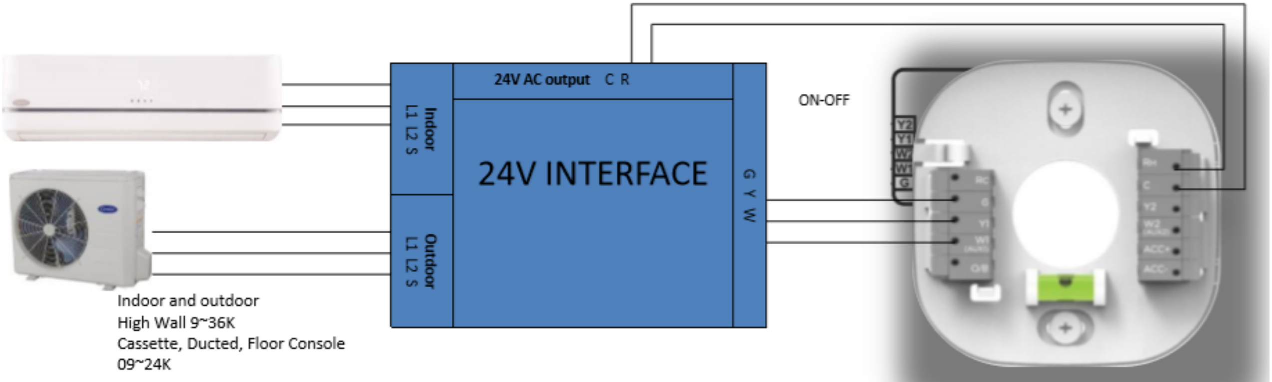
Samsung system: Non-ducted, ducted (without hydronic coil in ducted unit supply air stream)
Auxiliary heating: Furnace



Example of IC on QPL

Courtesy of United Technologies Corporation

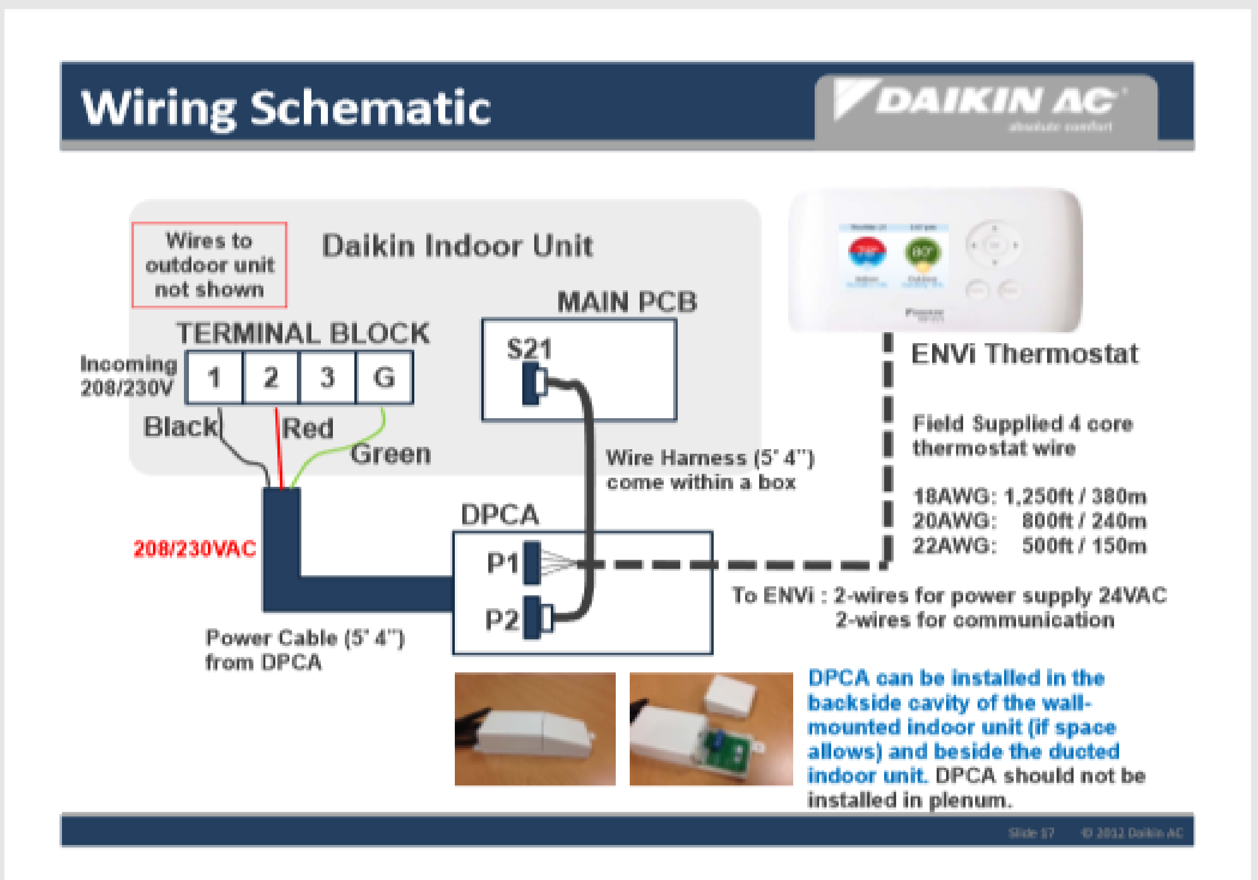
24V INTERFACE WIRING

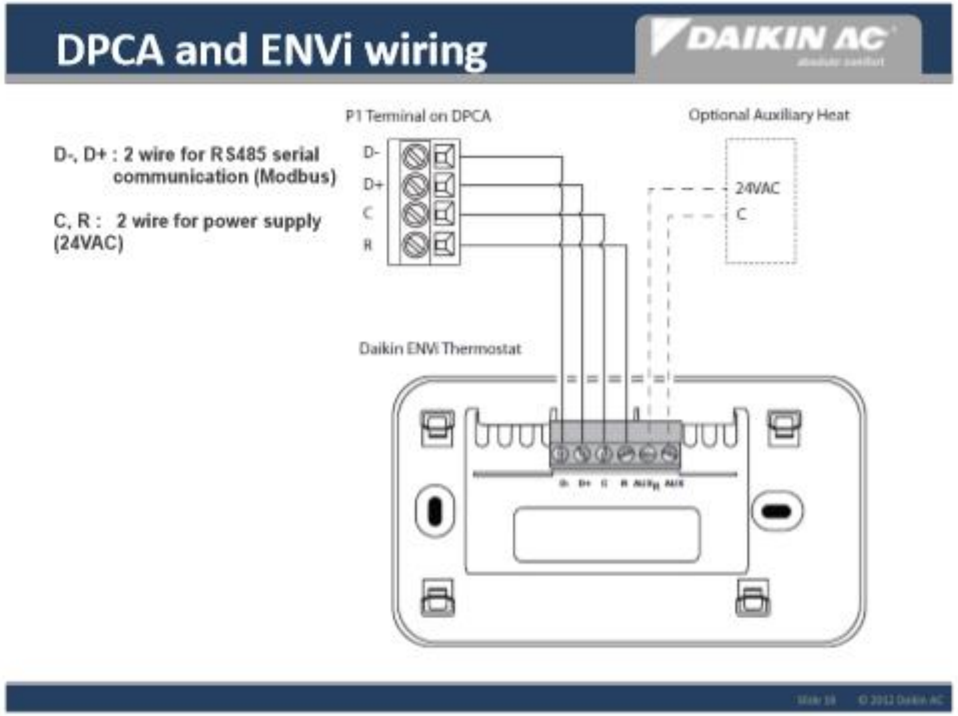


Connector	Function
R/C	24VAC Output
Y	Cooling
W	Heating
G	Fan-Auto speed

Example of IC on QPL

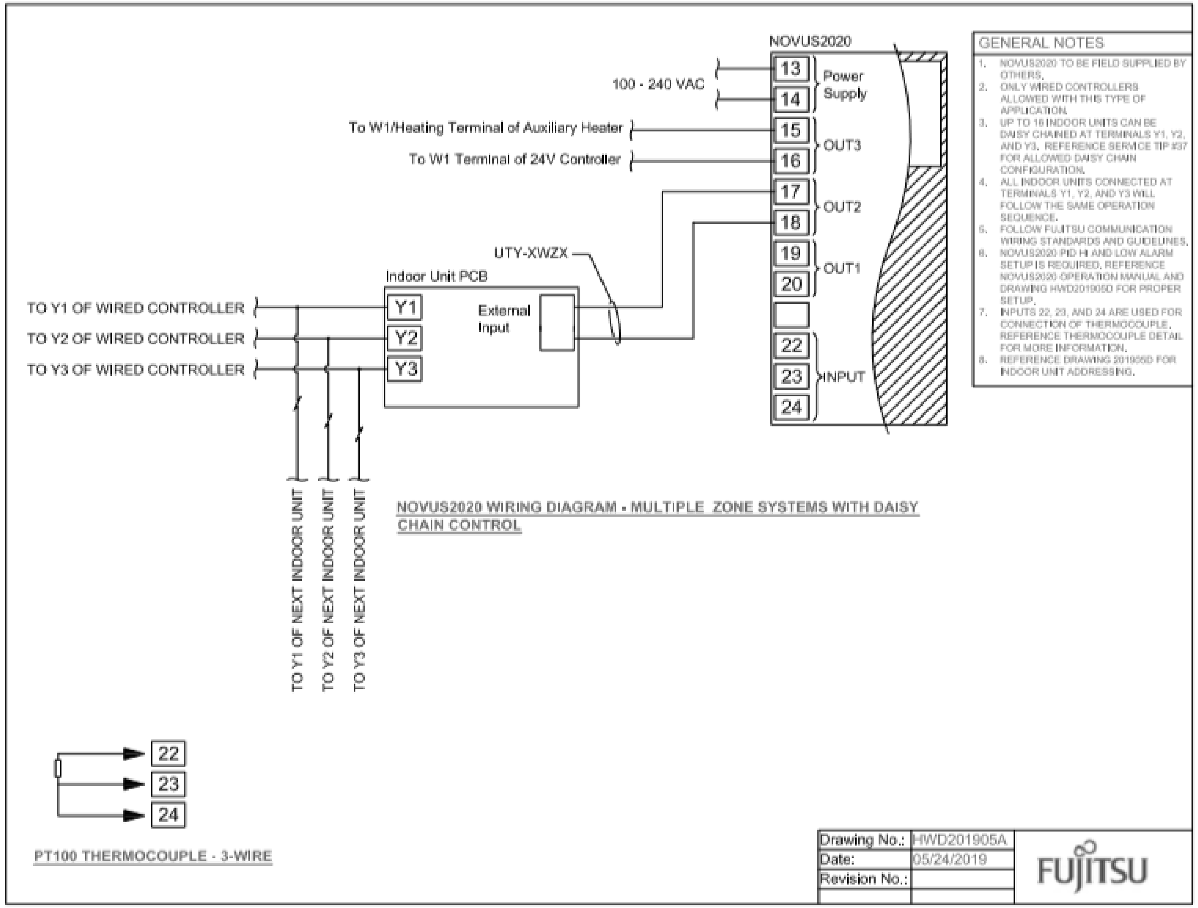
Courtesy of Daikin (Daikin ONE to replace ENVI Fall 2019)

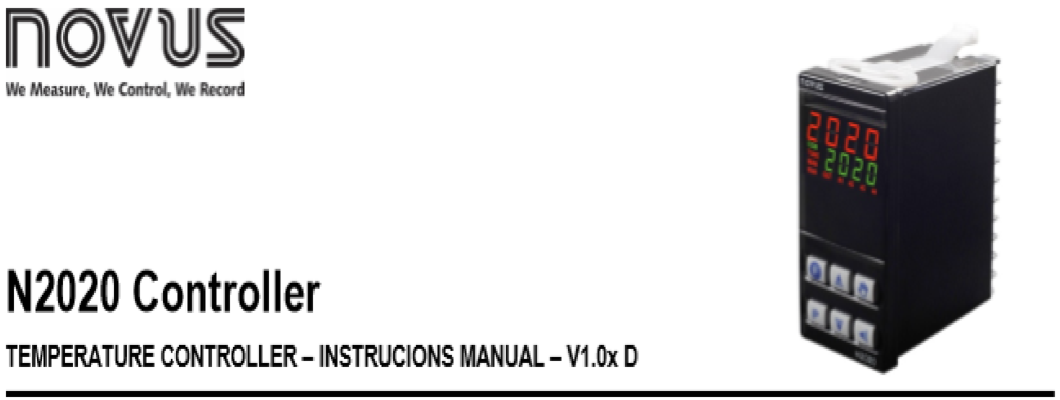




Example of IC on QPL

Courtesy of Fujitsu General America Inc.





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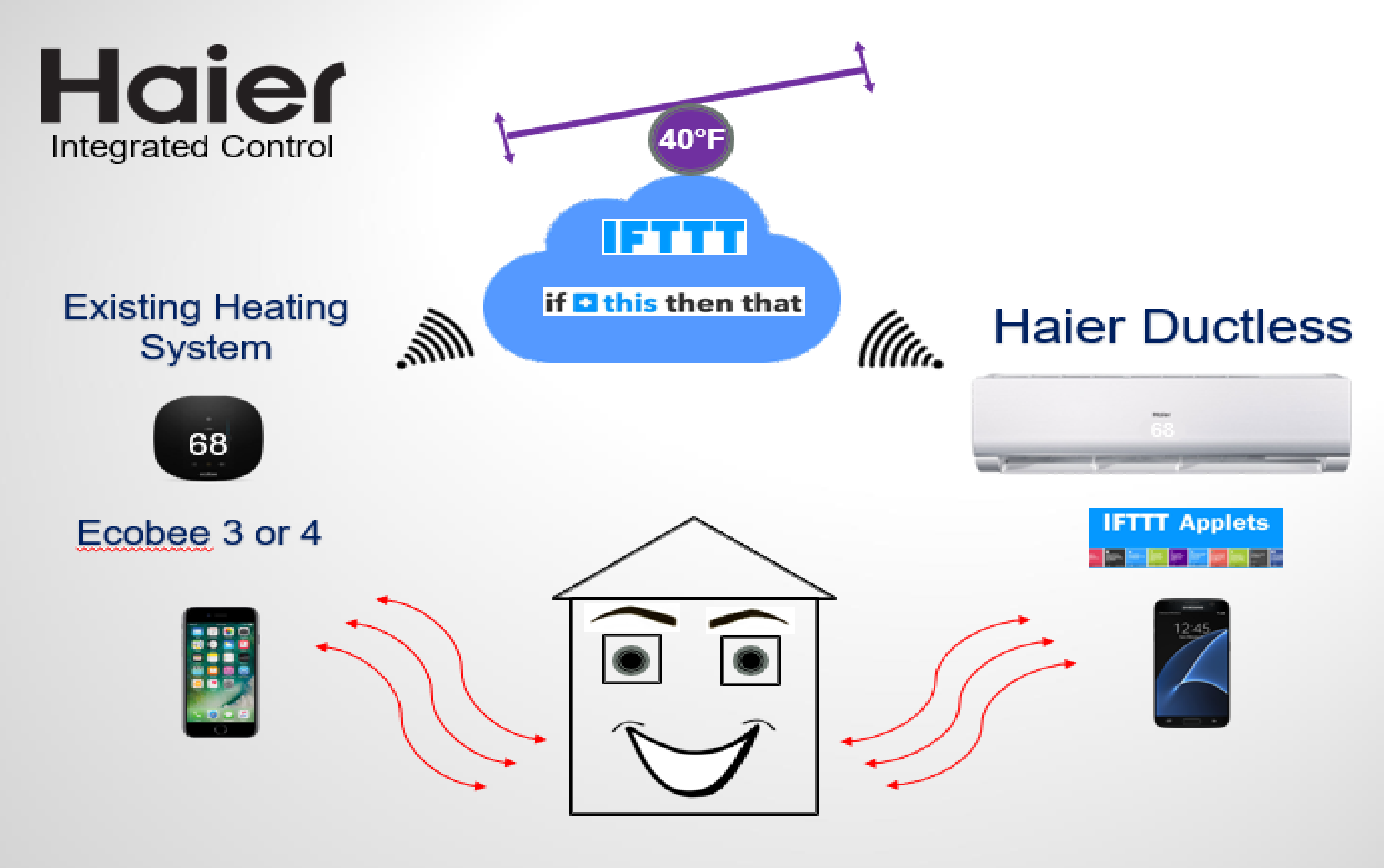
Example of IC on QPL

Courtesy of Haier



Example of IC on QPL

Courtesy of LG Electronics

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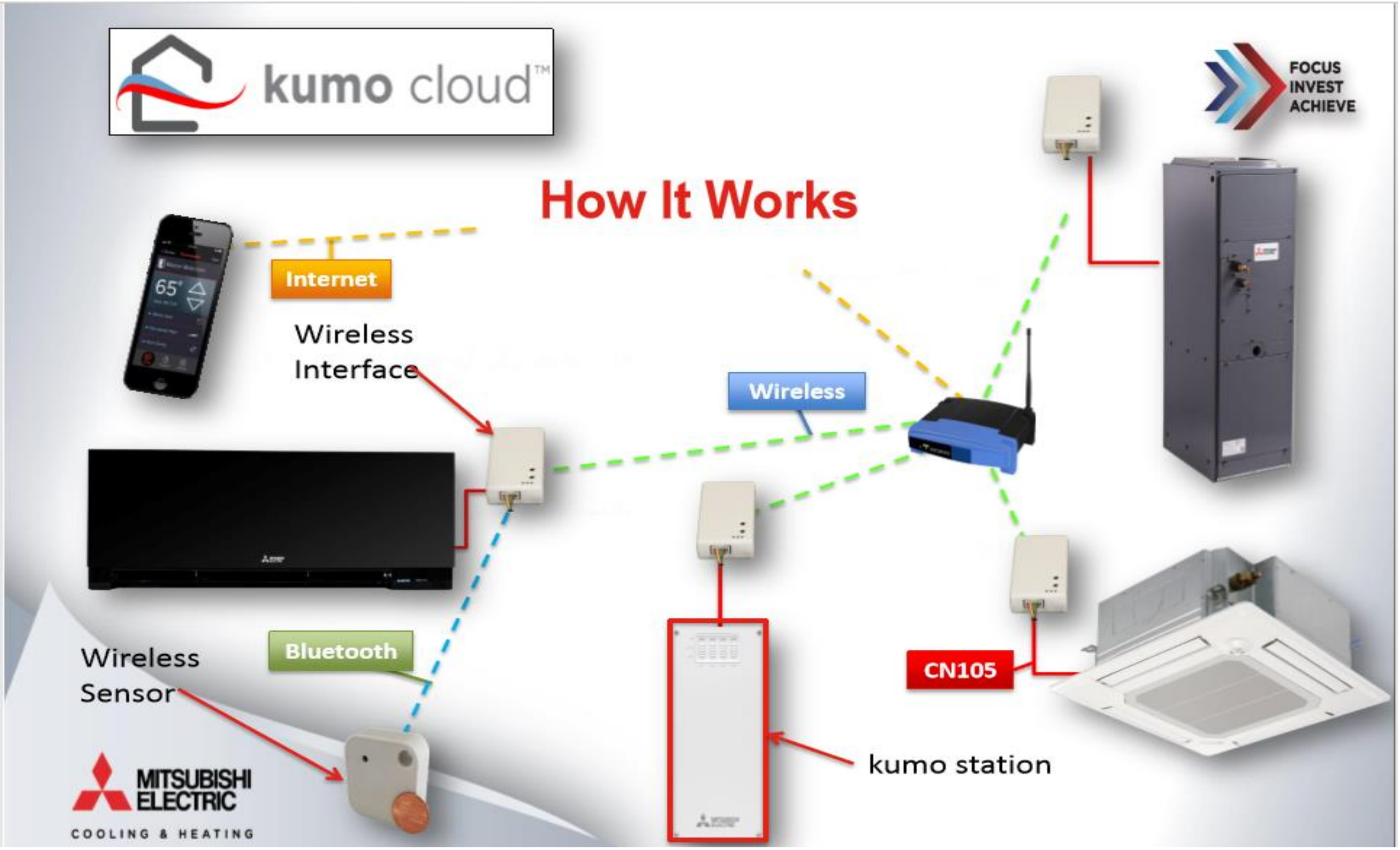
Example of IC on QPL

Courtesy of Mitsubishi Electric



Example of IC on QPL

Panasonic

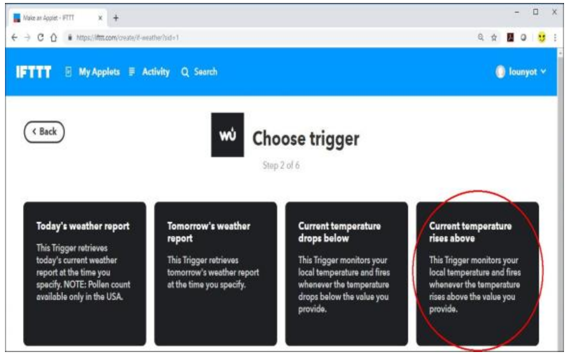
Integrated Control Solution

Panasonic Ducted & Non-Ducted ASHP

IR

Honeywell
D6

Switches HP to FF when below 40F
Switches FF to HP when ≥ 40F



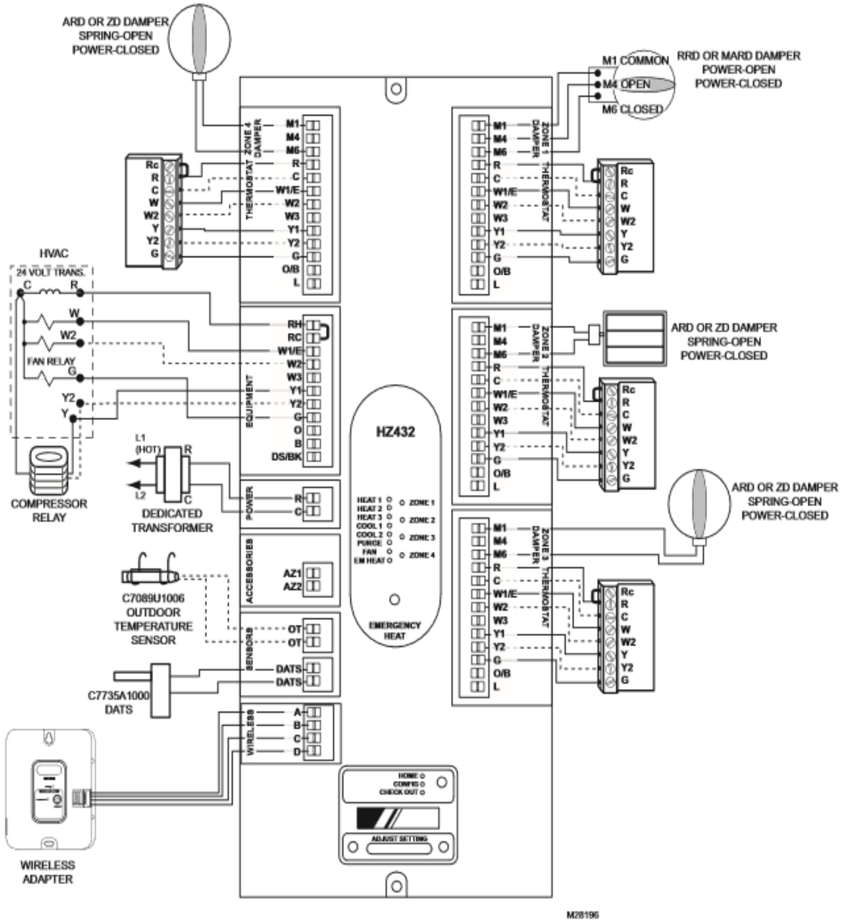
Honeywell
Lyric/T9

Example of IC on QPL

Courtesy of Honeywell-Resideo

HZ432 TrueZONE

Honeywell



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Example of IC on QPL

Courtesy of E-W-C

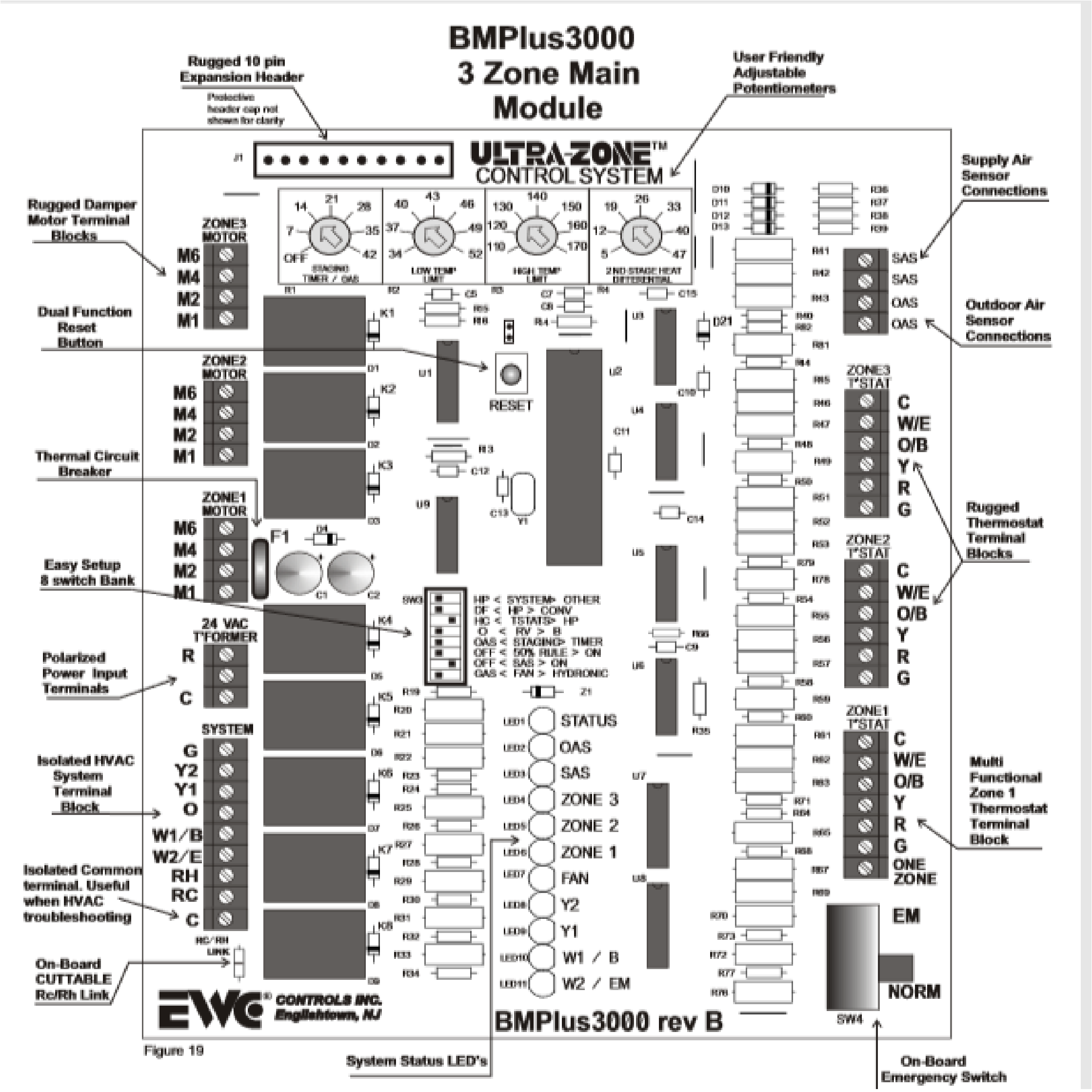
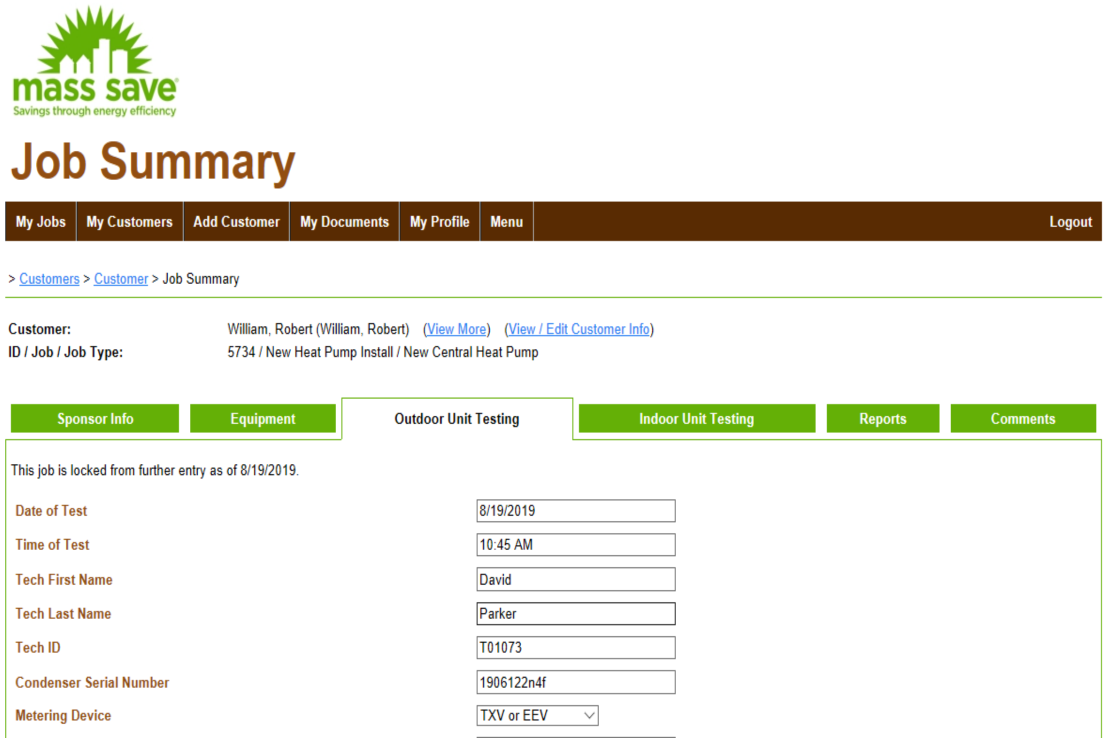


Figure 19

MS Check Diagnostic Matrix and *HVAC Check* Reporting Software

Status	Superheat	Amps (% of AHRI)	Typical Causes
Correctly Installed	< 5 degrees F	< =110%	Correct installation
Undercharged	> 5 F (often >10)	N/A	Leaky flare connection No charge adjustment made
Overcharged	Fluctuating, 5-10F	> 110%	Too much refrigerant added
Line set contamination	Approx. 5F	> 110%	Incorrect vacuum applied/ moisture in line

Amperage from published AHRI rated conditions of 95/80/67F at 230 volts



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