

# Universal Heat Pump Defrost Control 47D01U-843

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March 2020

# Market and Product Overview

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47D01U-843 Universal Defrost Control

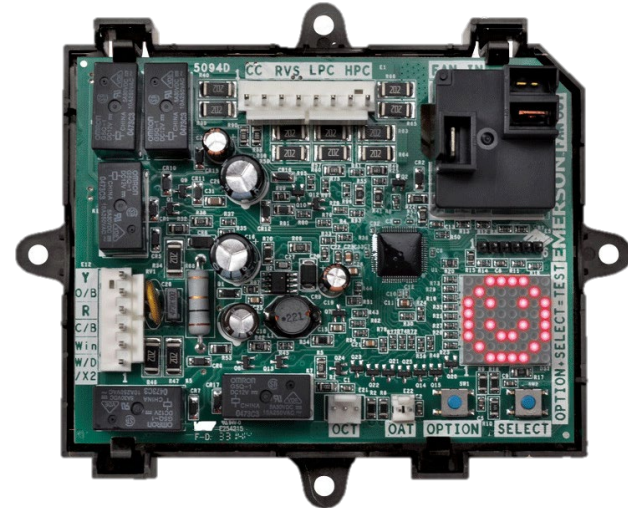
# Introduction

The 47D01U-843 Universal Heat Pump Defrost Control is the first microprocessor-based universal replacement defrost controller intended for single stage heat pump systems.

Supports two defrost modes:

- Demand Defrost: initiates when a set difference between the outside coil and air temperature is reached
- Time/Temp Defrost: based on a field set temperature and run time

Supports both O/B Reversing Valve options (Heating/Cooling)



# Demand Defrost

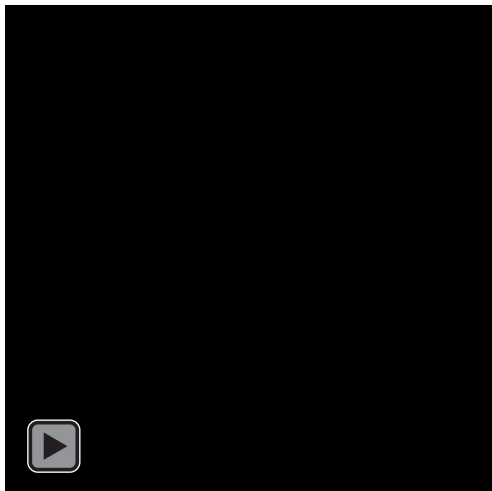
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The White-Rodgers Defrost Timer Control combines an electronic timer with temperature sensors to identify when an outdoor coil is frozen or not providing heat efficiently. This sends the unit into defrost mode to remove frozen water that restricts airflow through the outdoor coil.

## Time Defrost

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- A Timer initiates the Defrost mode every 30 to 120 minutes. If / when the Coil Temperature Sensor is warm enough, it returns to the Heat mode.

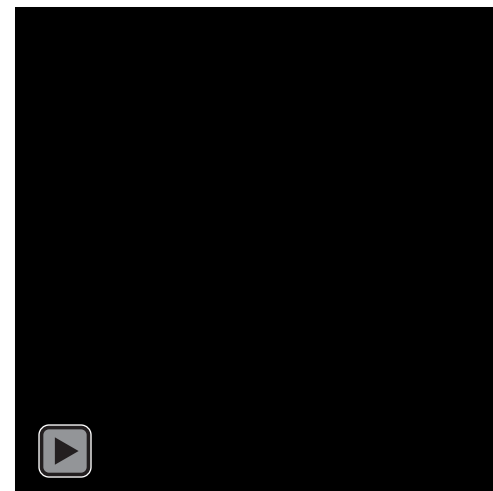


***Defrost  
every ½-2  
hours***

## Demand Defrost

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- An Outdoor Temperature Sensor and Coil Temperature Sensor monitors the system. When it determines there is frost build up, it will initiate the Defrost mode.



***Defrost  
only when  
needed***



# Eliminate Ice Build Up

When the outdoor coil is colder than the air during heating mode, it causes the air going through the coil to give up its heat.

- Moisture in the air condenses on the surface of the coil and freezes over time, restricting airflow through the coil
- As the moisture freezes to ice, the heat-pump becomes more inefficient and cannot properly absorb heat to be released into the conditioned space
- In order to melt the ice and return to proper airflow, the unit goes into “Defrost” mode by running hot refrigerant through the coil
- The frequency of ice build-up depends on outside air temperature and humidity



# Top Line Features and Benefits

This award-winning heat pump control replaces hundreds of OEM defrost controls while offering premium features that benefit both the contractor and the end-user.



## Increase Efficiency

Feature	Function
Demand Defrost Option	Reduces energy usage compared to Time/Temp cycles
AUX Heat Lockout	Limits use above set temperature (No accessory kit needed)*
Low Temp Compressor Lockout	Low Temp Compressor Lockout Limits heat pump usage at inefficient temperatures

## Easy to Install / Service

Feature	Function
Versatile Mounting Tray	One, universal part of all systems
Pre-Configured, Adjustable Settings	Select from OEM pre-sets or customize
Test Mode	Verify operation at any temperature
8x8 Matrix LED Display	Immediate, easy visualization of system status and faults
O/B Reversing Valve	Supports energizing in both heating and cooling

\* Value add for CA Title 24, by locking out AUX heat until below 40°

47D01U-843 Defrost Control

US Patents 9,037,303 • 9,412,328  
9,830,887 • 9,064,345

# 47D01U-843 Competitive Comparison


Feature	White-Rodgers 47D01U-843	Brand X DB7110U
Board Cross References	430+	260
Readable Display	8x8 Matrix	4x7 Segmented LED
Multi-position Display can be rotated in settings	✓	X
Display Shows Status & Fault Codes, has Fault recall	✓	✓
Set-up / Fault Code Label for quick reference	✓	X
Select from OEM pre-sets to match factory	✓	X
Menu configurable for Demand or Timed Defrost	✓	✓ (Demand-enabled)
Menu configurable for Pressure Switch enable/disable	✓	X (non-supplied jumpers required)
Auxiliary Heat & Compressor Lockout can be used in Demand & Timed Defrost	✓	X (demand only)
Wiring flags supplied for wiring ID installation ease	✓	X
Reversing Valve delay for quieter Defrost	✓	✓
Menu Config "O" or "B" Reversing Valve	✓	✓
Air and coil sensors	✓	✓
Strain-proof sensor connectors	✓	X

# Business Case

Universal Heat Pump Defrost Control offers contractors a unique opportunity to deliver a product with direct savings to their customers. By eliminating wasteful run time from traditional time-based defrost controls, this control offers immediate savings to homeowners, and a great sell-in opportunity to technicians.



## Heat Pump Market Potential

25M Units Installed Base	2.9M Units	250K Defrost Controls
Every Unit has a Defrost Control	Heat pump growth market*  <b>20% in 1997</b> <b>35% in 2018</b>	Estimated annual service market

\*percentage of condensing units that are heat pumps



By upgrading to a Demand Defrost Option, homeowners reduce energy usage compared to Time/Temp Defrost Control, saving them \$\$\$.

# What The Pro's Are Saying

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*“Very easy to install and to setup. Make my heat-pump work like a charm.”*

January 20, 2016 – Denis

*“Excellent product if you want to save money on your heat pump that has a dumb timer based defrost. Installed this in under an hour and now have demand defrost on my two year old Goodman unit. Went from hourly defrosts of nearly no build up to a defrost every 4 hours on a dry day and about every 45 minutes during a freezing rain storm. If in doubt... Buy it!”*

January 25, 2017 - S. Begin

*“Extremely easy to install would buy again.”*

December 13, 2018 – D. Miller

*“Programming the settings was simple and I set it for low energy use. It's operating beautifully.”*

January 4, 2019 – U. Huren



# Technical

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47D01U-843 Universal Defrost Control

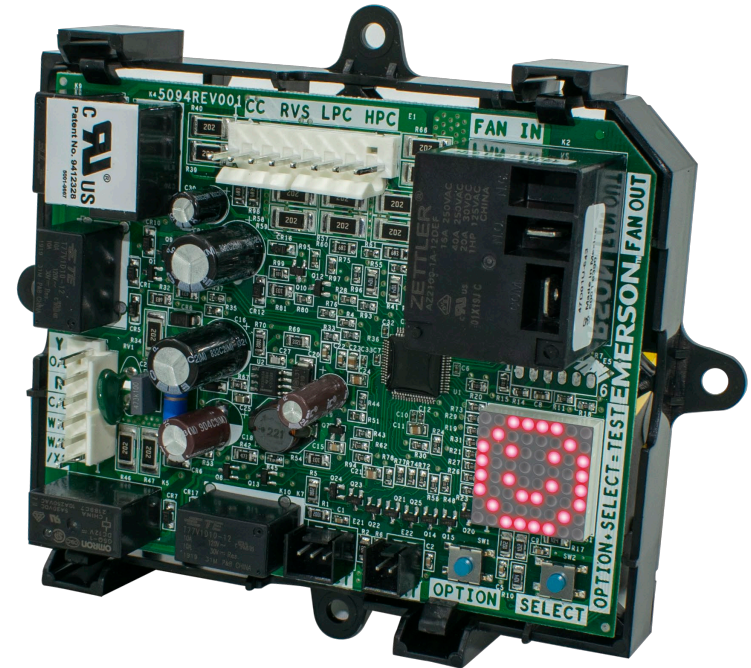


# Introduction

A wide range of existing Time Defrost Controls can be replaced by the White-Rodgers 47D01U-843 Defrost Control, increasing the efficiency of existing systems by shifting system operation from time-based to demand-based.

Defrost Control	Defrost Cycle Timing
Demand Defrost Option	Demand Defrost Option Defrost cycles limited to on-time delivery, based on need*
Time Defrost Option	Defrost cycles generated on pre-set time schedule

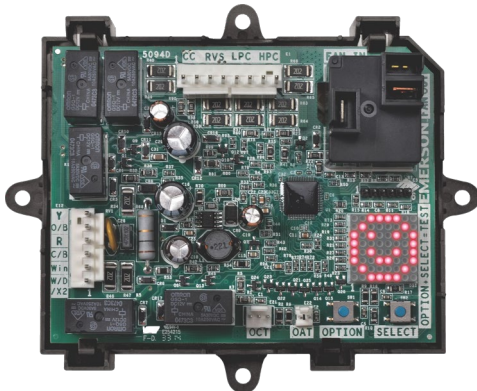
\* Demand defrost WILL run one cycle every 6 hours to ensure that oil viscosity is appropriate to return to compressor.



# Applications

## Single Stage Heat Pump Systems, PSC Condenser Motor

- With or without AUX Heat
- Low Temp compressor lockout
  - 9 compressor temp settings, for compressor shutoff
- Dual fuel compatible
- Selectable Brownout protection with Random Time Start Delay
- Provides AUX heat lockout
  - With outdoor temperature sensor – included in kit



## Selectable / Adjustable Options

- Demand Defrost
  - Non-adjustable 6 hour cycle to ensure that oil viscosity is appropriate to return to compressor
- Time/Temp Defrost
  - 30-120 minute adjustable cycle time\*
- Selectable “O” or “B” reversing valve
- Reversing valve shift delay (0,12,30 seconds)
- Short cycle time (0,3,5 minutes)

\* Upgradable Time/Temp Defrost systems can be upgraded to Demand Defrost, resulting in greater energy efficiency



# Specifications

## INPUT VOLTAGES

208/240 VAC 50/60 Hz (Primary)

24 VAC 50/60 Hz (Secondary)

## INPUT CURRENT OUTDOOR FAN MAX

0.5 HP @ 240 VAC Motor

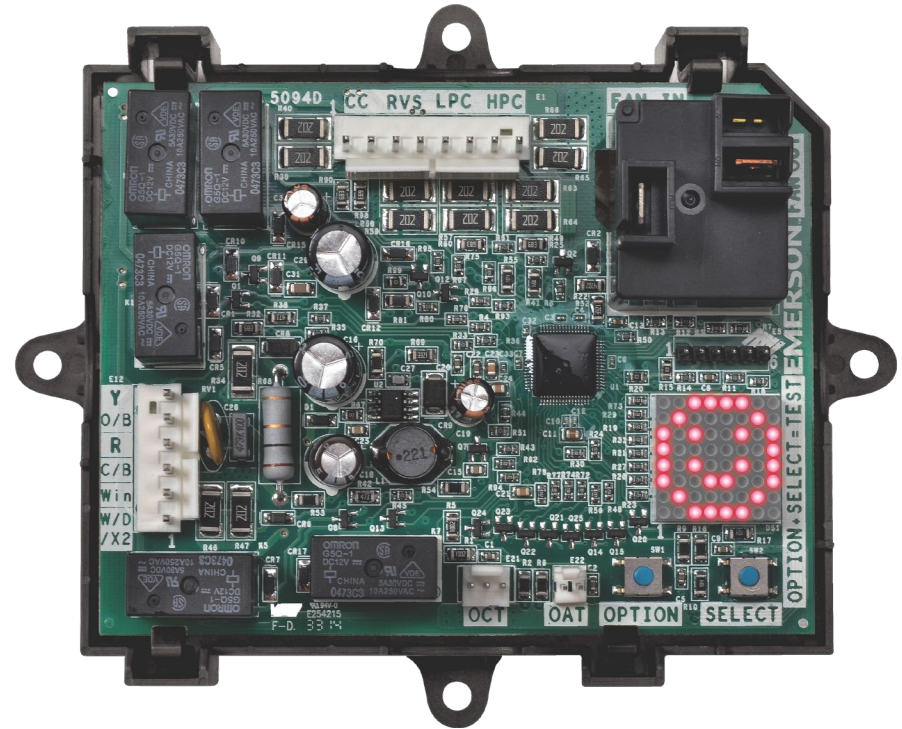
0.125 @ 120 VAC Motor

10mA @ 24 VAC, ECM Motor

## OPERATING RANGE









Temperature, -40°F to +150°F

Humidity, 0 to 95% Rh, non-condensing



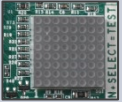
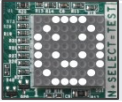
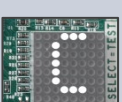
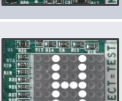
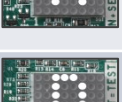
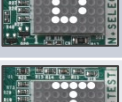

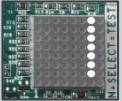
# Compatible with top manufacturer heat pumps

Choose from 8 pre-configured OEM Equipment Brands:

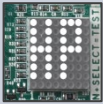
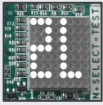
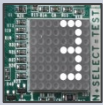
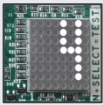
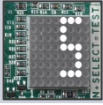
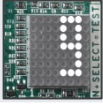
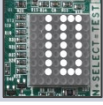
Display	OEM	Defrost Type	Defrost Cycle Time	Short Cycle Time	RV Power	RV Shift Delay	Max Defrost Time	Defrost Enable Coil Temp	Defrost Terminate Coil Temp.
	Carrier	T/T	90 min	5 min	O	0 sec	10 min	30°	65°
	Goodman	T/T	30 min	5 min	O	30 sec	10 min	35°	70°
	Lennox	Demand	n/a	5 min	O	30 sec	14 min	35°	50°
	Trane	Demand	n/a	0 min	O	12 sec	14 min	36°	50°
	Rheem*	Demand	n/a	5 min	B	30 sec	14 min	35°	70°
	York	Demand	n/a	5 min	O	30 sec	8 min	31°	80°
	Nordyne	Demand	n/a	3 min	O	30 sec	14 min	35°	70°
	Factory Default	Demand	30 min	5 min	O	30 sec	14 min	34°	70°

Additional adjustments i.e. setting demand defrost or changing the defrost enable & terminate coil temp are customizable in the options portion of programming that utilizes the 8x8 LED Matrix, the “option”, and “select” buttons.

# Troubleshooting

Display	Condition	Comments for Troubleshooting
	<b>Power Up</b>	Normal Operation During Power up all LED's on the 8 x 8 matrix display will light up
	<b>Standby</b>	Normal operation with power and no active call
	<b>Running in Cooling Mode</b>	Steady on represents an active call for cooling. Blinking represents short cycle or other time delay active with a compressor demand.
	<b>Running in Heating Mode</b>	Steady on represents an active call for heating. Blinking represents short cycle or other time delay active with a compressor demand.
	<b>Running in Defrost Mode</b>	Represents the control in defrost mode
	<b>Field Test Mode</b>	Displayed till the OPTION+SELECT buttons are pressed Applicable to short cycle bypass as well as forced defrost field test mode
	<b>LPS Trip</b>	Low Pressure switch must be connected to the Universal Heat Pump Defrost control and an option selected from the menu. If low pressure switch opens during an active call the system will shut down. Normal operation will resume after switch is closed
	<b>LPS Lockout</b>	If the Low Pressure switch opens 3 times the control will lockout

# Troubleshooting cont.

Display	Condition	Comments for Troubleshooting
	<b>HPS Trip</b>	High Pressure switch must be connected to the Universal Heat Pump Defrost control and an option selected from the menu. The pressure switch is normally closed. An open condition will trigger this error. Normal operation will resume after the switch is closed.
	<b>HPS Lockout</b>	If the High Pressure switch opens 3 times the control will lockout.
	<b>Air Sensor Fault</b>	Outdoor Air Temperature Sensor (OAT) is at fault. Possible bad connection
	<b>Coil Sensor Fault</b>	Outdoor Coil Temperature Sensor (OCT) is at fault. Possible bad connection
	<b>Consecutive Defrost</b>	Two Consecutive Defrosts Terminated on Maximum Defrost Time
	<b>Low Control Voltage</b>	Possible 24 VAC brownout condition
	<b>Control Failure</b>	Replace Control

# Install

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47D01U-843 Universal Defrost Control

# What's In The Box?

## Universal Heat Pump Defrost Control

- Includes universal plastic mounting tray + 4 screws

## Thermostat Harness

- One harness, equipped with spades. Cut, strip, and wire nut if desired (included)

## Heat Pump Harness

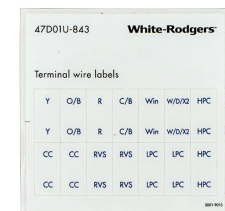
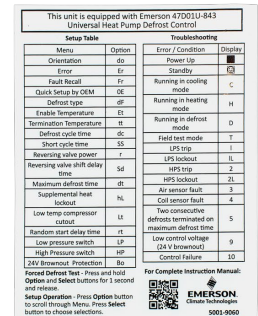
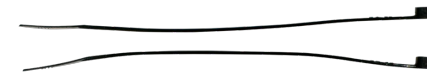
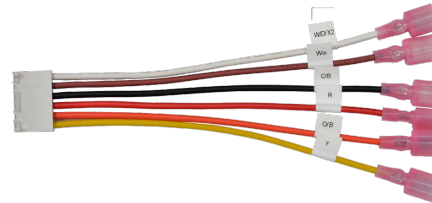
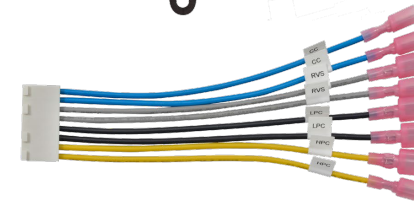
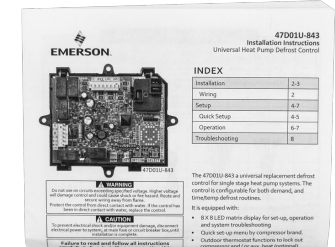
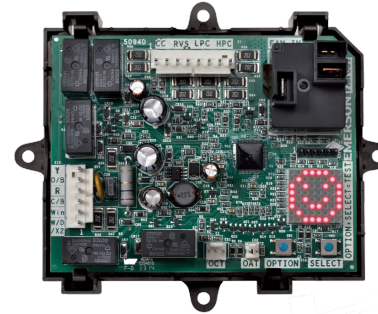
- Connect reversing valve, contactor, low and high pressure switches

## Thermistors

- One to measure coil temp, and one to measure air temp
- Install air temp sensor for selectable lock out settings/ for use of demand defrost

## Additional

- Zip Ties To manage harness locations
- Terminal wire stickers to label existing wires
- Setup and Troubleshooting label



# Integrated Value-added Features

## Defrost Thermostat



- The 47D01U-843 includes a new coil sensor and a new air temperature sensor.
- The old snap-disc coil sensor is upgraded to a thermistor type.

## Outdoor Heat-Pump Thermostat



- A built-in Outdoor Heat-Pump T/stat feature allows for Auxiliary Heat and Compressor Lock-outs.
- States like CA and NC are requiring this control to keep Electric back-up from coming on when it's over 40°F outside.

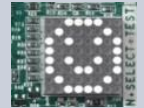


# Quick Set Up Configuration with Matrix LED

## Simple Start-up Walk-through steps

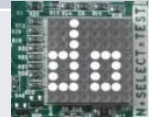
### Normal Status

With Thermostat off, power up the system. The LED will light all segments and then show the standby smile



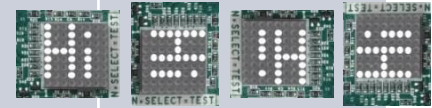
### Select the Display Orientation

Press the OPTION button until you see “do” which stands for “Display Orientation”



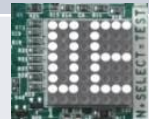
### Adjust Orientation

Press SELECT until the “Hi” characters are in the correct readable position. They move in 90° increments



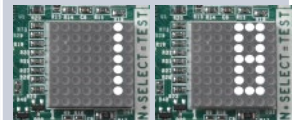
### Choose OEM Configuration

Press the OPTION button 3 more times or until Original Equipment (OE) is displayed



### Choose Pre-Configured OEM Settings

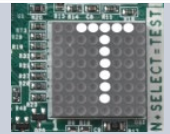
Press SELECT until the correct OEM default number (1 through 8) appears (Reference to the OEM Quick Setup Options)



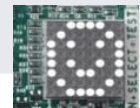
Press **OPTION** to confirm setting

### Test Defrost

Press and hold OPTION and SELECT at the same time for 1 second to initiate a test defrost cycle with forced defrost



Press Option (repeatedly) or wait 30 seconds for the standby smile to appear.

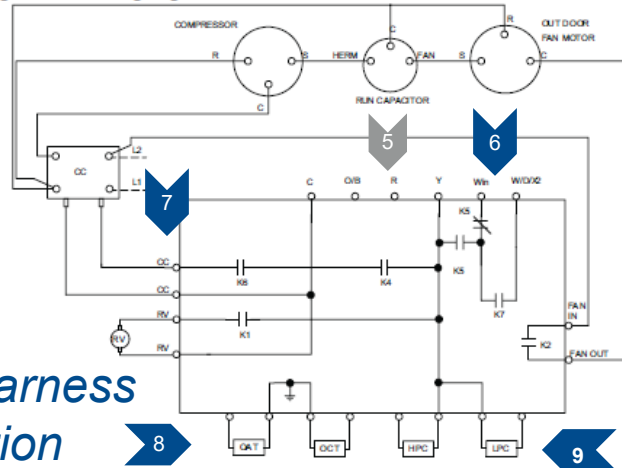




# Installation & Wiring

Refer to equipment manufacturer's instructions for specific system wiring information. Wiring tables shown are for typical systems and describe the standard functions.

Diagram 1: OEM Wiring Diagram



**Verify harness connection**

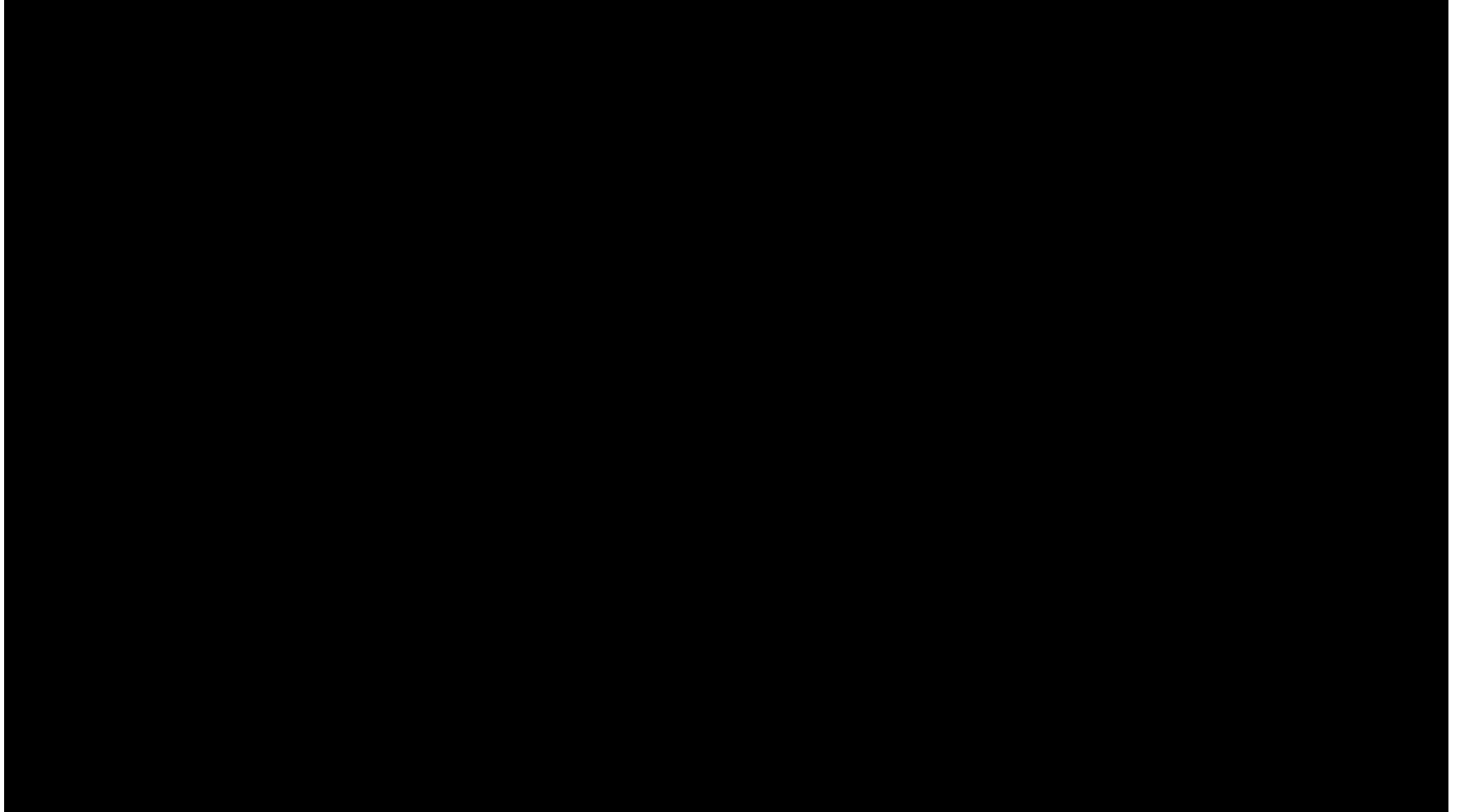
*Please note:*

- Air sensor should not touch unit cabinet.
- Coil sensor needs solid locating, e.g. place where original snap disc was located

1. Disconnect power to unit
2. Label wires & take a picture of the current installation
3. Remove existing control & remove wires
4. Install replacement control secure with provided mounting screws in desired location
5. Connect labeled thermostat wires to Thermostat Harness, then connect harness wires to the control
6. Connect remaining labeled system wires to Heat Pump Harness (#2) and connect harness wires to the control
7. Connect outdoor coil temperature sensor to the control
8. Connect outdoor air temperature sensor to the control
9. Connect high & low pressure switches to the control

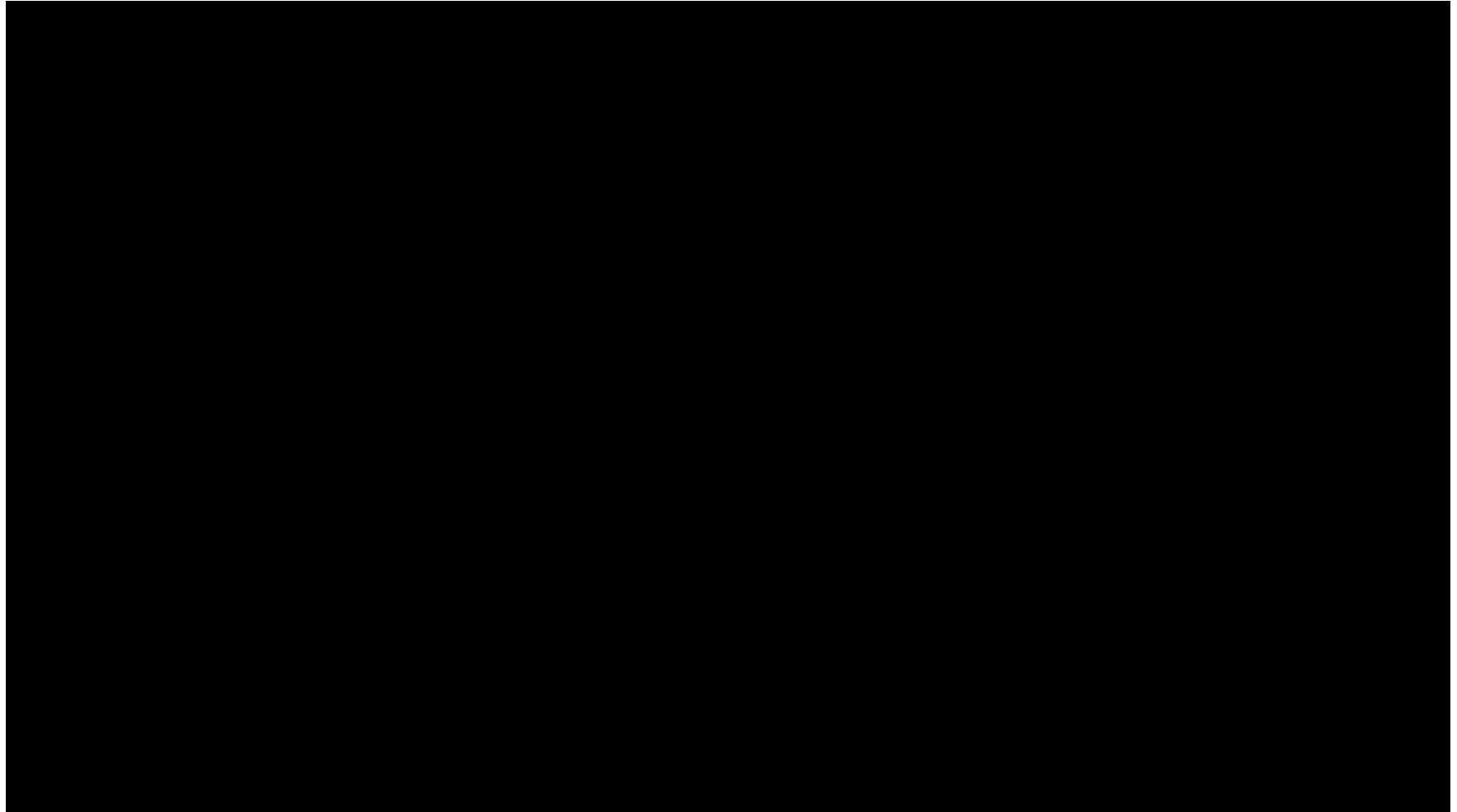
# Learn to install the 47D01U-843 Universal Defrost Control

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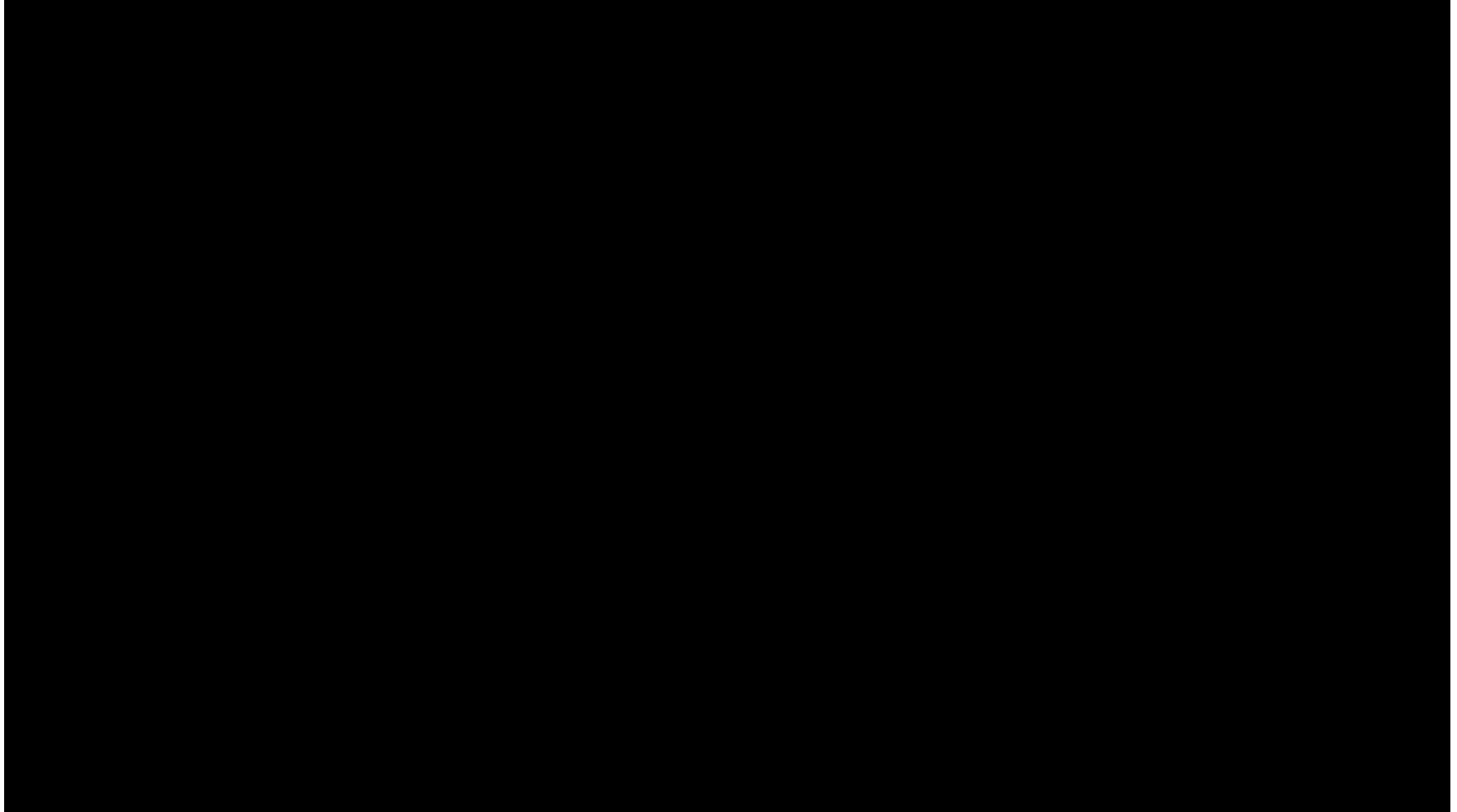
# Tech Tip: High Pressure and Low Pressure Monitoring and Fault Codes

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# Outdoor (OAT) and Coil (OCT) Sensor

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# Troubleshooting

White-Rodgers provides a Set-up & Troubleshooting sticker to place inside the unit for quick reference:

- Status Indicator
- Power up or stand by
  - Heating / cooling / defrosting
  - Test mode
    - Provides a 30sec quick test to verify proper operation
- Troubleshooting
  - Fault conditions present
  - Highest priority and operating condition toggling
  - Remaining errors “ER” menu
  - Correct condition to remove errors
- Recall Historical Data
  - Recall up to last four faults

This unit is equipped with Emerson 47D01U-843  
Universal Heat Pump Defrost Control



Setup Table

Menu	Option
Orientation	do
Error	Er
Fault Recall	Fr
Quick Setup by OEM	OE
Defrost type	dF
Enable Temperature	Et
Termination Temperature	tt
Defrost cycle time	dc
Short cycle time	SS
Reversing valve power	r
Reversing valve shift delay time	Sd
Maximum defrost time	dt
Supplemental heat lockout	hL
Low temp compressor cutout	Lt
Random start delay time	rt
Low pressure switch	LP
High Pressure switch	HP
24V Brownout Protection	Bo

**Forced Defrost Test** - Press and hold **Option** and **Select** buttons for 1 second and release.

**Setup Operation** - Press **Option** button to scroll through Menu. Press **Select** button to choose selections.

Troubleshooting

Error / Condition	Display
Power Up	
Standby	
Running in cooling mode	C
Running in heating mode	H
Running in defrost mode	D
Field test mode	T
LPS trip	I
LPS lockout	IL
HPS trip	2
HPS lockout	2L
Air sensor fault	3
Coil sensor fault	4
Two consecutive defrosts terminated on maximum defrost time	5
Low control voltage (24 V brownout)	9
Control Failure	10

For Complete Instruction Manual:



5001-9060

# Thank you

47D01U-843 Universal Defrost Control

R-5057

