

# mCerberus®

## The HVAC Monitoring “WatchDOG” System

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RT Automation Confidential

# Central HVAC Operation and Status

- Homeowners do not know the real time operating state of their HVAC systems.
- Most individuals WAIT until their HVAC system has an issue before calling for service.



# mCerberus® HVAC Monitoring System

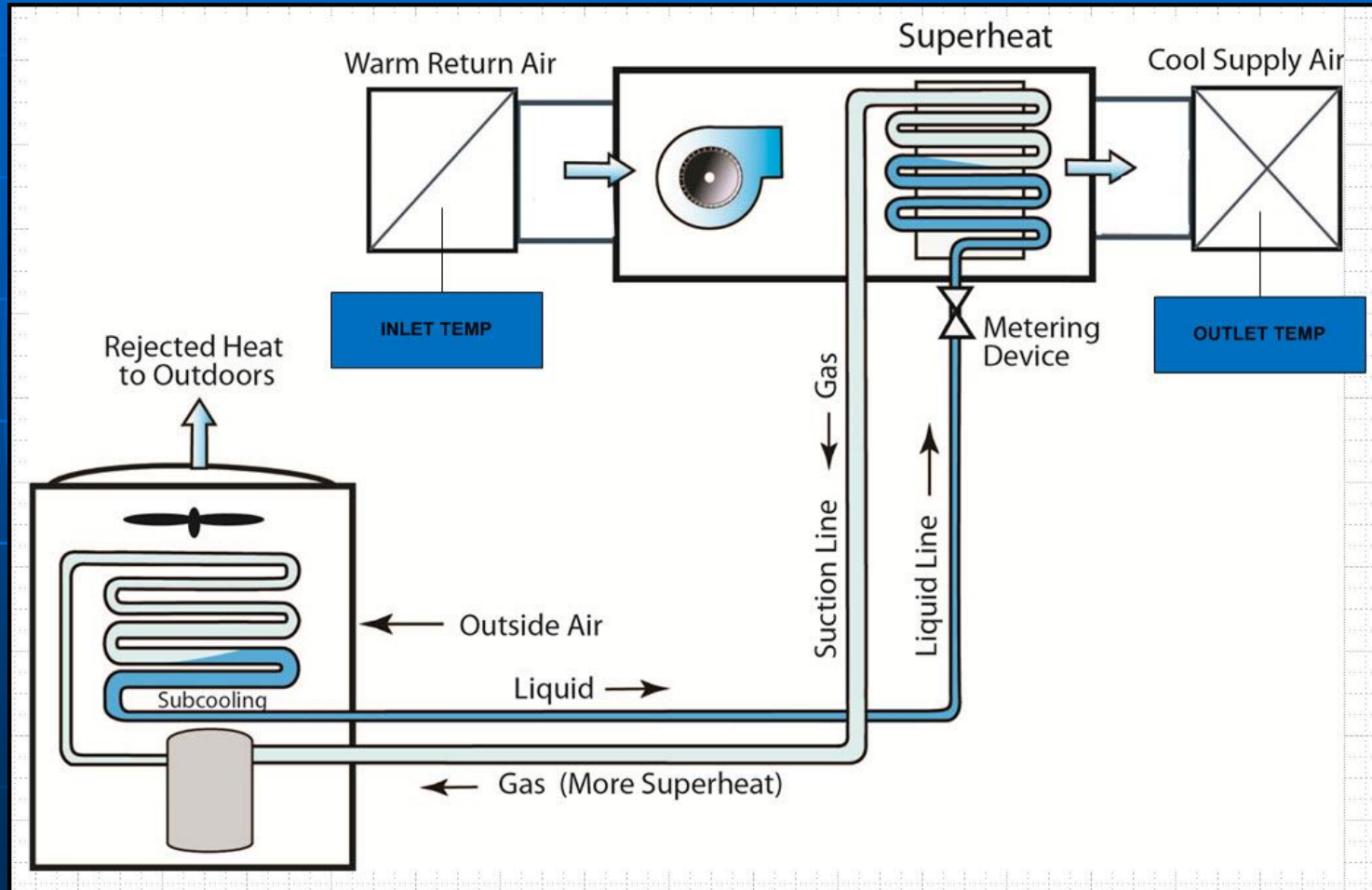
- Continuous monitoring of Central HVAC Units in Residential and Businesses
- Both Air Conditional and Heat Analysis Modes
- Sales price of \$295/each (single unit quantities)
- Determines real-time operational state of equipment via Back office Software Solution
- Net Savings due to lower energy bills as well as minimizing repair costs



# mCerberus® Summary

- The **PRODUCT HARDWARE** may be installed on any Central HVAC unit
  - Microprocessor w/ WiFi capabilities
  - Two temperature sensors
  - One current probe
- The **PRODUCT HARDWARE** Unit takes measurements every 60 seconds and transmit the data to an Internet based MySQL dB
- The **PRODUCT SOFTWARE** analyzes the data and determines the current state of the equipment
  - The **SOFTWARE** is executed by the HVAC Contractor and/or Homeowner
  - The data is evaluated with respect to established “rules” which determine the **Operational State** of the Central HVAC unit
  - The **SOFTWARE** includes automated reports allowing the HVAC Contractor to manage multiple installations

# HVAC Monitoring Schematic





# HVAC Monitoring Operational Schematic

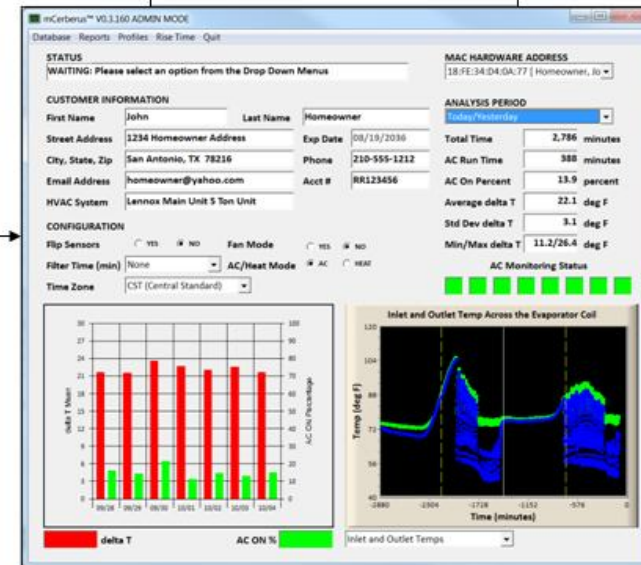
## STORE DATA

fileID	dateTIME	uMAC	uVAL	uON	inletT	outletT	dBm	strV
2194787	2017-05-11 08:17:55	18:FE:34:D4:5C:B8	21	0	74.62	70.2	-65	1.6.0
2194788	2017-05-11 08:17:58	18:FE:34:D4:0A:77	20	0	73.73	65.21	-74	1.6.0
2194789	2017-05-11 08:18:08	5C:CF:7F:0E:30:87	26	0	70.1	75.71	-50	1.6.1
2194790	2017-05-11 08:18:08	18:FE:34:D4:57:31	34	0	71.74	129.55	-74	1.7.0
2194791	2017-05-11 08:18:24	18:FE:34:F4:D4:08	13	0	72.15	73.48	-75	1.6.2
2194792	2017-05-11 08:18:26	5C:CF:7F:0E:2F:8D	25	0	72.56	75.84	-67	1.6.2

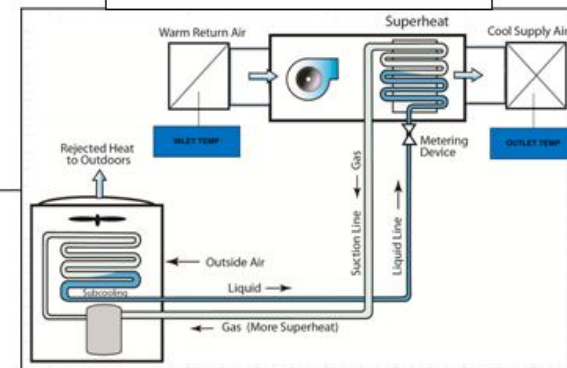
## MONITOR



## ANALYZE DATA



## CENTRAL AIR HVAC SYSTEM



# HARDWARE INSTALLATION



- Configure WiFi
- Install Inlet Temp Sensor
- Install Outlet Temp Sensor
- Install Current Clamp on Air Handler Power
- Connect 120VAC Power

# Back Office Software Package



O/S: Windows and MAC  
Windows emulator mode

AC and Heat Analysis Modes

Computes delta T, Run Time,  
and ON/OFF Cycles over the  
Selected Analysis Period

Monitoring Status Indicators

Contractor Mode: Generates  
an Excel report that identifies  
units with issues

Designed for the HVAC  
Contractor for managing 10,  
100, or even 1,000+ units



# Automatic Report Generation

The SOFTWARE provides the capability to the HVAC Contractor to generate and export a Summary report in Microsoft Excel.

Microsoft Excel - Book1

File Edit View Insert Format Tools Data Window Help

Type a d

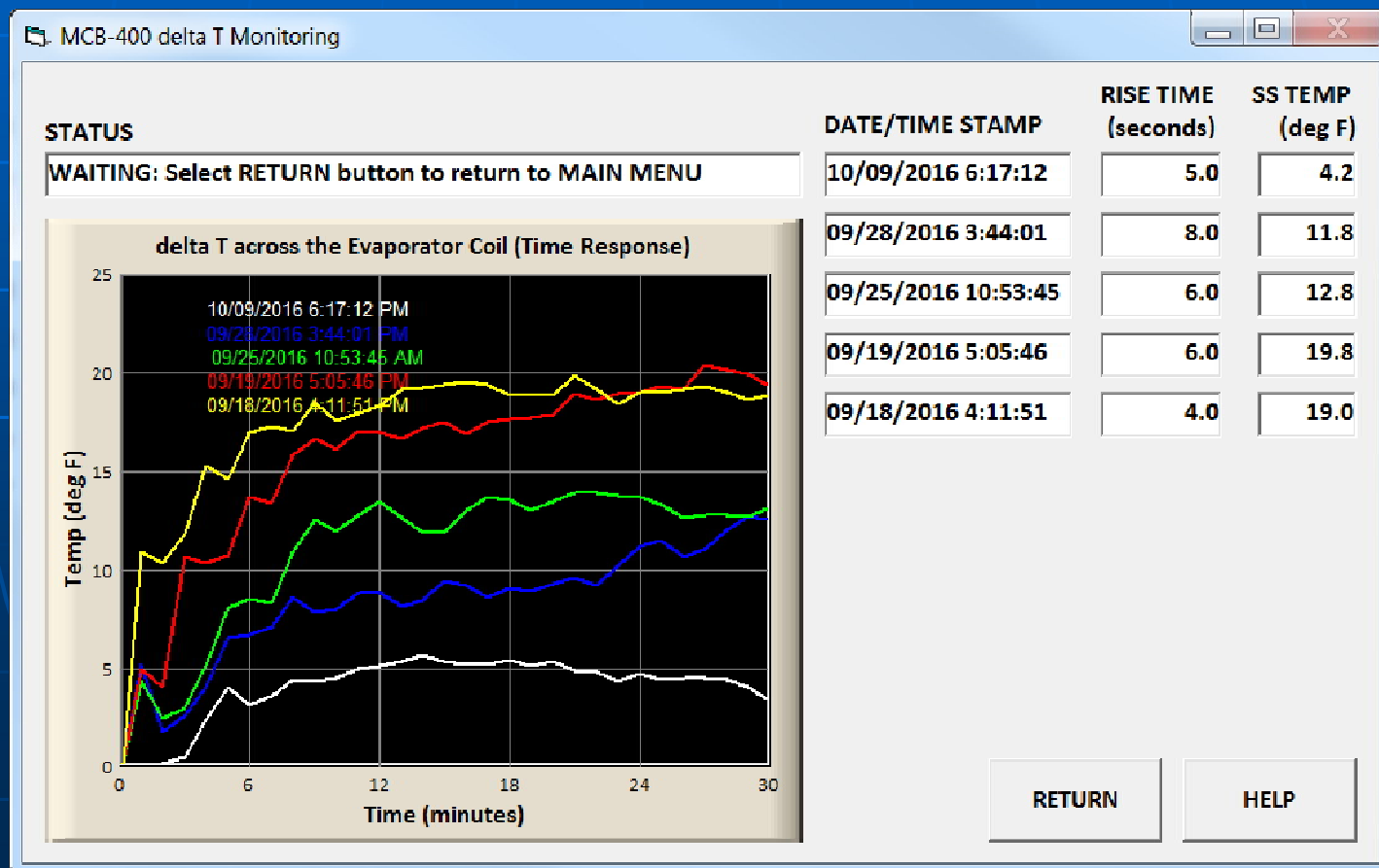
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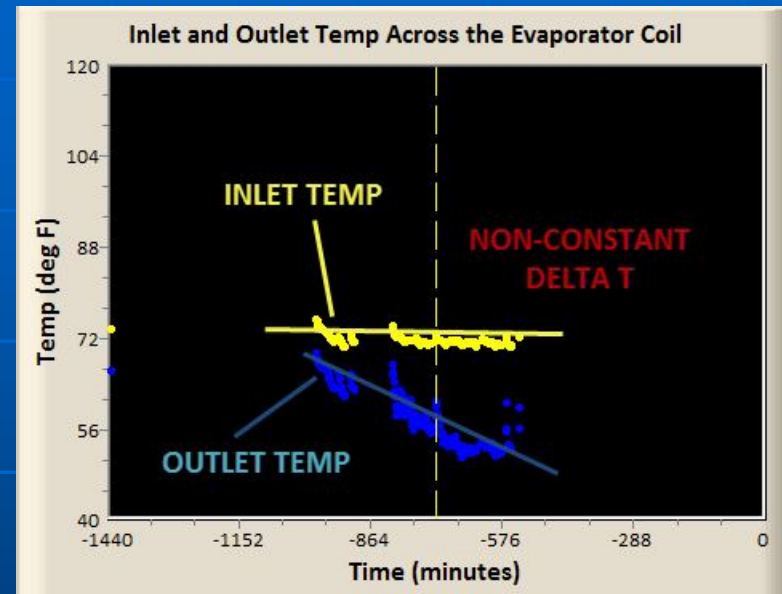
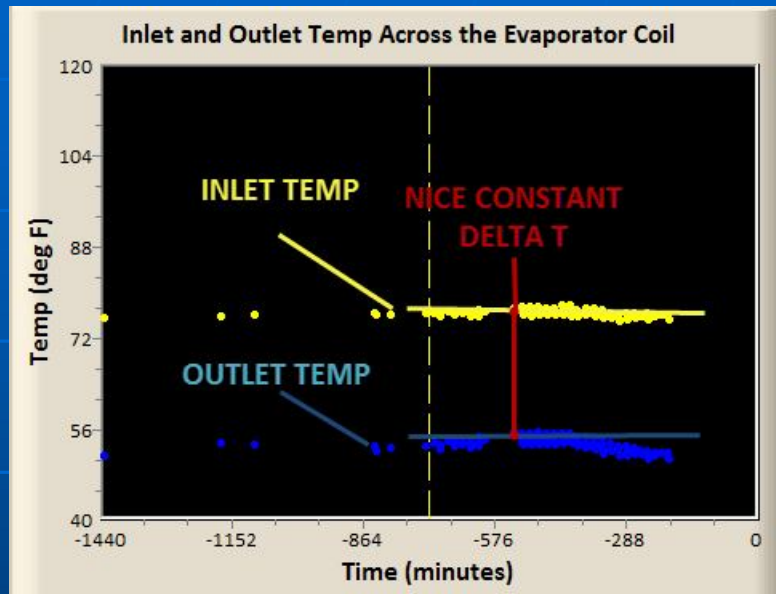
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	CUSTOMER INFORMATION							NOTE: ANALYSIS SUMMARY									
2	CUSTOMER NAME	STREET ADDRESS	HVAC DESCRIPTION	PHONE NUMBER	ACCOUNT NUMBER	EMAIL ADDRESS	AC STATUS SUMMARY	TOTAL TIME (MIN)	AC RUN TIME (MIN)	AC ON (%)	AC DELTA T (DEG F)	MIN DELTA T (DEG F)	MAX DELTA T (DEG F)	DELTA T HIGH	DELTA T (LOW)	AC RUNS TOO MUCH	AC RUNS TOO LITTLE
3	Homeowner, Joe 0	1234 Anywhere Str, Mailbox 0 San Antonio, TX 78216	HVAC Description	210-555-1212		<a href="mailto:john0@emailaddress.com">john0@emailaddress.com</a>	PASSED	9,895	907	9.2	16.1	10.5	20.3	PASSED	PASSED	PASSED	PASSED
4	Homeowner, Joe 1	1234 Anywhere Str, Mailbox 1 San Antonio, TX 78216	HVAC Description	210-555-1212		<a href="mailto:john1@emailaddress.com">john1@emailaddress.com</a>	PASSED	9,374	1,020	10.9	13.3	6.6	19.1	PASSED	PASSED	PASSED	PASSED
5	Homeowner, Joe 2	1234 Anywhere Str, Mailbox 2 San Antonio, TX 78216	HVAC Description	210-555-1212	RR123456	<a href="mailto:john2@emailaddress.com">john2@emailaddress.com</a>	PASSED	9,922	2,704	27.3	21.9	17.0	26.4	PASSED	PASSED	PASSED	PASSED
6	Homeowner, Joe 3	1234 Anywhere Str, Mailbox 3 San Antonio, TX 78250	HVAC Description	210-555-1212	XYZ1234	<a href="mailto:john3@emailaddress.com">john3@emailaddress.com</a>	PASSED	9,399	772	8.2	14.5	6.4	18.5	PASSED	PASSED	PASSED	PASSED
7	Homeowner, Joe 4	1234 Anywhere Str, Mailbox 4 San Antonio, TX 78216	HVAC Description	210-555-1212	RR123456	<a href="mailto:john4@emailaddress.com">john4@emailaddress.com</a>	PASSED	9,931	2,392	24.1	21.3	16.8	27.8	PASSED	PASSED	PASSED	PASSED
8	Homeowner, Joe 5	1234 Anywhere Str, Mailbox 5 Bulverde, TX 78163	HVAC Description	210-555-1212		<a href="mailto:john5@emailaddress.com">john5@emailaddress.com</a>	PASSED	9,839	1,120	11.4	18.4	13.5	21.5	PASSED	PASSED	PASSED	PASSED

# PRODUCT CASE STUDY: Refrigerant Leak Detected

- System Identified Refrigerant Leak within one week of its occurrence
- Homeowner did not notice issue until three weeks
- Our SYSTEM moved the detection date FORWARD by two weeks

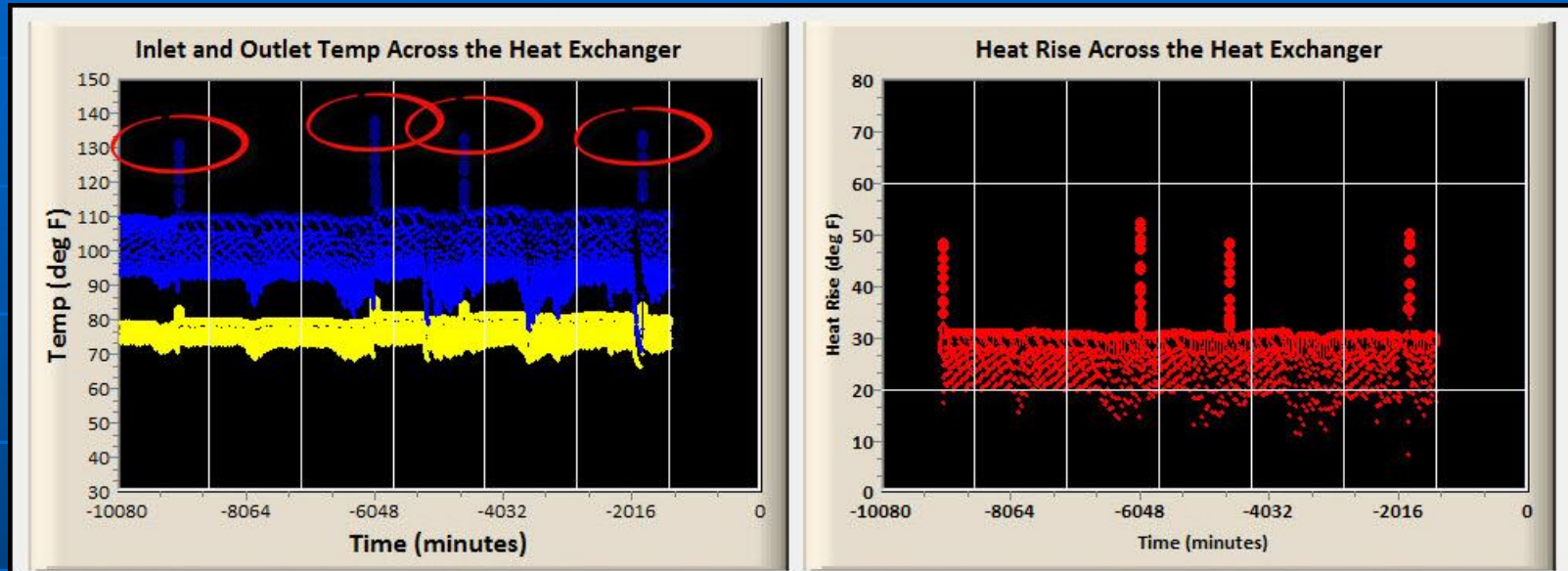


# PRODUCT CASE STUDY: Bad Metering Valve



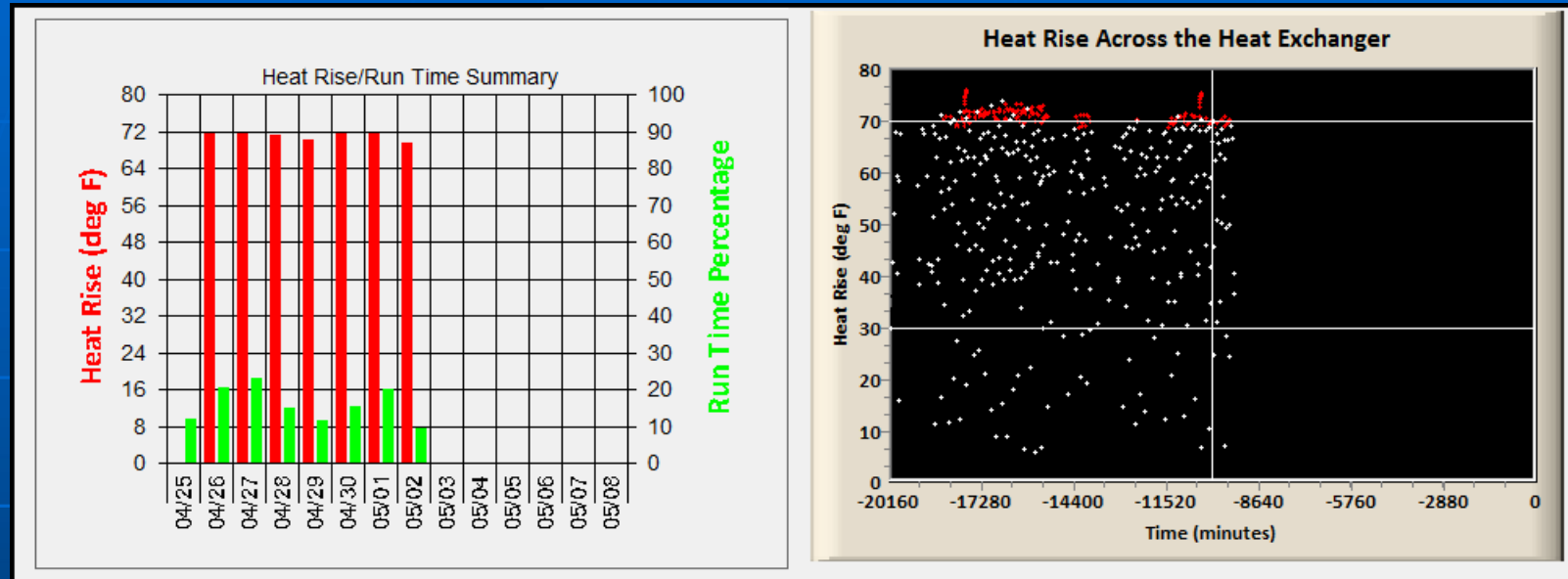
- Bad/sluggish metering valve in Residential AC Unit resulted in non-optimal delta T

# PRODUCT CASE STUDY: Bad Motor Starter Capacitor



- Residential Installation of PRODUCT in Iowa
- Furnace (Heat) Mode
- PRODUCT identified where the FAN would not turn on
- Bad motor starter capacitor identified and replaced

# PRODUCT CASE STUDY: New Furnace Installation



- Installation in Minnesota Residence (New Furnace)
- Manufacturer's Installation Guide stated Heat Rise should be 30–70 deg F (50 deg F recommended)
- Our Product demonstrated that the SS Heat Rise was 72 deg F
- Installation corrected by increasing the Blower Fan Speed



# CONTACT INFO



Dr. Roth received his Ph.D. in Mechanical Engineering from the George W. Woodruff School of Mechanical Engineering at Georgia Tech.

His educational background includes majors in Applied Control Theory, Dynamics/Vibrations, and Optimization Theory and with minors in Electromagnetics, Mechanics of Materials, and Mathematics.

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