Natural Refrigerant Training Summit

Building a Sustainable Workforce

Micro Thermo® Alliance Application, Navigation, and On-board Tools

Charlie Cunliffe - MicroThermo
Parker Hannifin, Sporlan Division

NORTH AMERICAN Sustainable Refrigeration Council

NORTH AMERICAN Sustainable Refrigeration Council

Natural Refrigerant Training Summit

Thank you to our sponsors!

Premium Sponsors

AHT a member of DAIKIN group

The Arcticom Group

Bitzer

CAREL

Climate Pros

CoolSys

EMERSON

Hillphoenix A DOVER COMPANY

Parker

SPORLAN

MICRO THERMO TECHNOLOGIES

P.I.P.E. Piping Industry Progress & Education

Basic Sponsors

ARCTIC COOLING SYSTEMS ENGINEERING · CONSTRUCTION · SERVICE

Classic Refrigeration SoCal

M&M CARNOT

KW KYSOR WARREN epta refrigeration

Tecumseh

North American Sustainable Refrigeration Council (NASRC)

Mission Create sustainable future for supermarket refrigeration by removing barriers to natural refrigerant adoption

501c3
Non-Profit Organization

150+
Members

51,000+
Food Retail Locations

Goals

- **Build sustainable workforce**
- Increase funding options
- Increase education & awareness

Natural Refrigerants

Carbon Dioxide
R744

Propane
R290

Ammonia
R717

NORTH AMERICAN Sustainable Refrigeration Council

Need help? Look for NASRC staff!

Danielle Wright
Executive Director

Morgan Smith
Program & Communications Director

Jeanne Ackerman
Membership & Communications Coordinator

NORTH AMERICAN Sustainable Refrigeration Council

SOUTHERN CALIFORNIA EDISON®

YOUR ENERGY EDUCATION STARTS HERE

Our Energy Education Centers in Irwindale and Tulare offer online and in-person classes to help you advance your career in clean energy, and make better energy decisions for your home or business.

Sign up for a free class or join our email list.

Visit us at **sce.com/classes** or scan the QR code.

Before we get started…

- Please make sure you sign in by the door
- To receive an electronic certificate for this training:
  - Complete the survey at the end of the session
  - Share your name and email at the end of the survey

NORTH AMERICAN Sustainable Refrigeration Council

What is Micro Thermo Alliance?

- State-of-the-art facility management software platform
- Control, monitoring, information, historical graphs and data
- More than just control or monitoring…a true management tool
- Windows® based graphical format

© 2023 Sporlan Division, Parker Hannifin Corporation

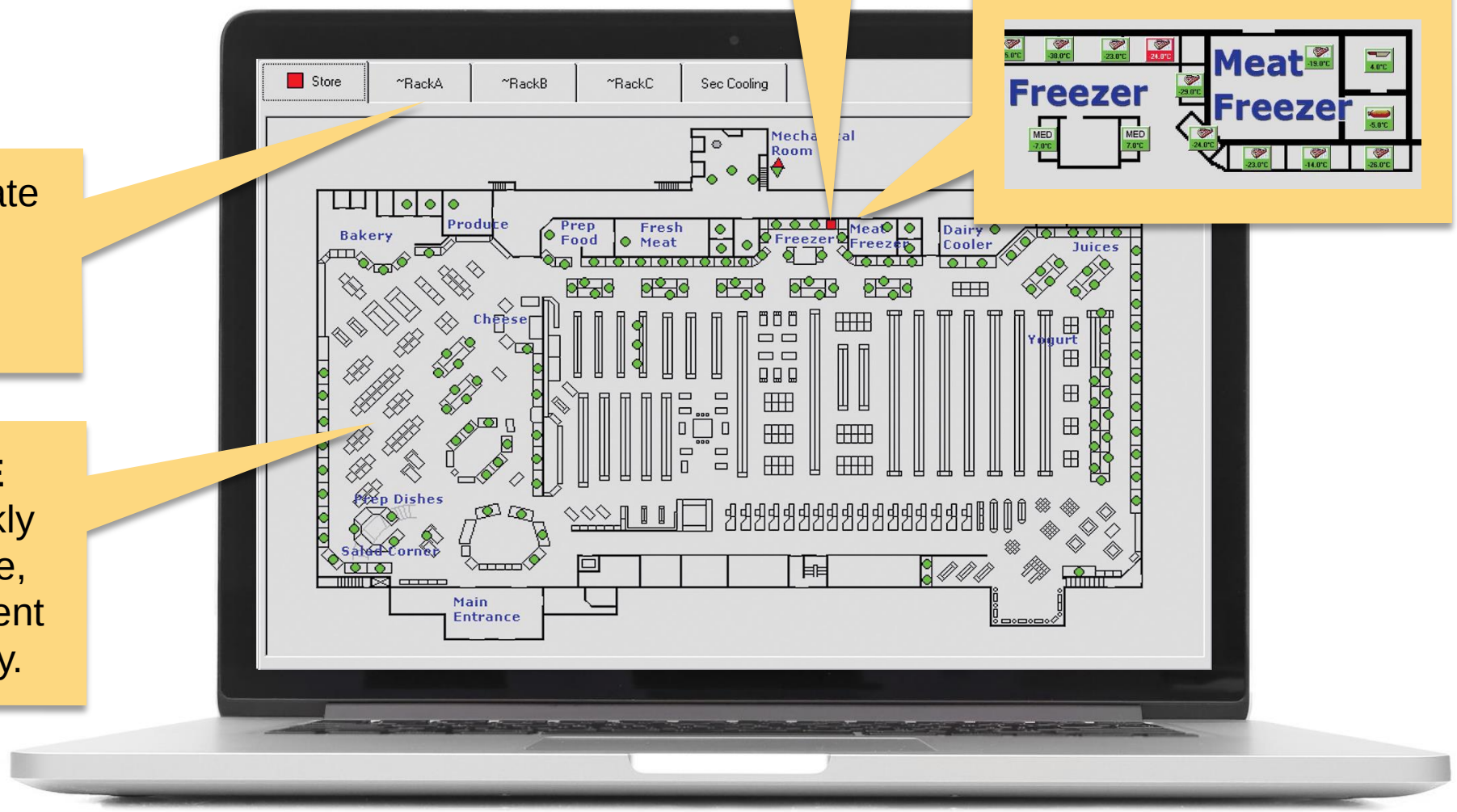
It’s All Connected

MENU TABS - Navigate to other screens to monitor your entire refrigeration system.

COMPREHENSIVE OVERVIEW - Quickly scan the entire store, see that all equipment is operating properly.

COLOR-CODED INDICATORS - Identifies alarm situations.

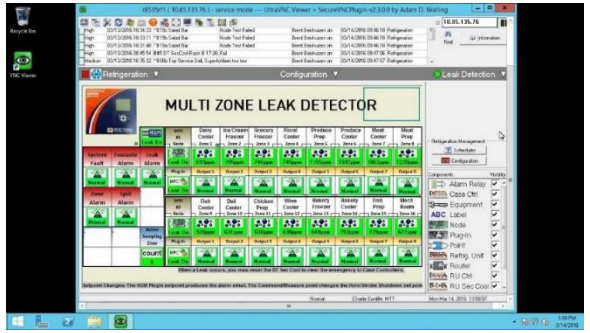
ZOOM IN - For detailed, real-time operating data.

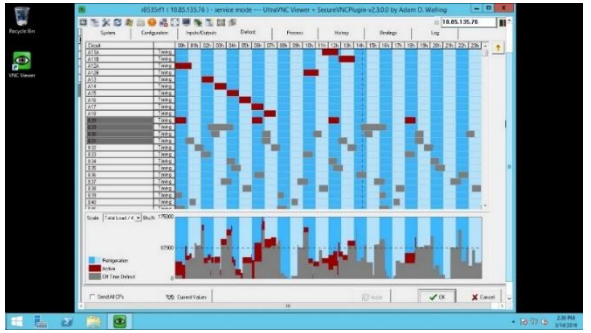


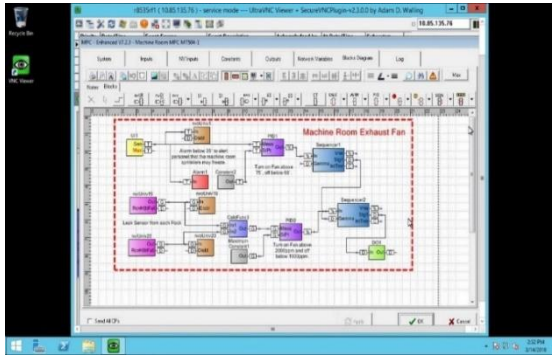
© 2023 Sporlan Division, Parker Hannifin Corporation

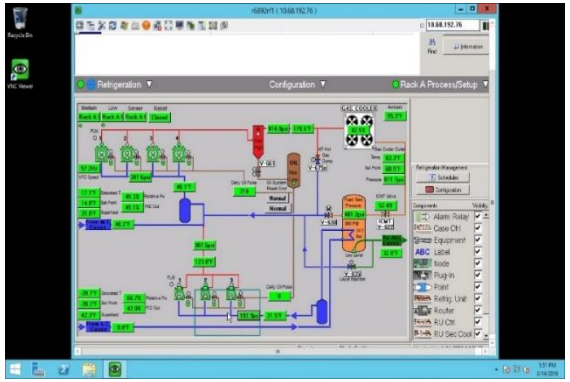
MICRO THERMO ALLIANCE

Subsystem Access





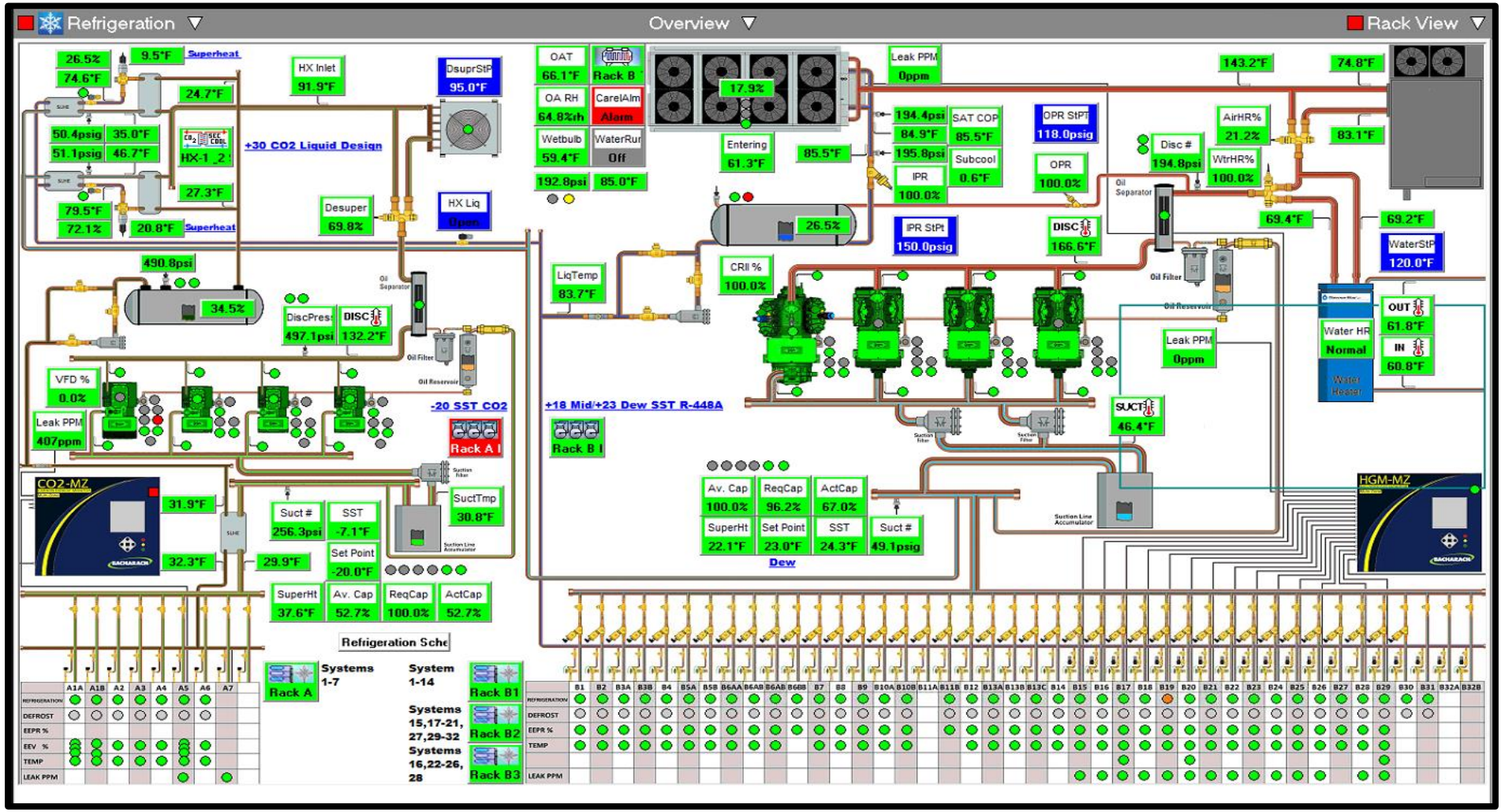




© 2023 Sporlan Division, Parker Hannifin Corporation

Virtual/Interactive View of a Refrigeration System

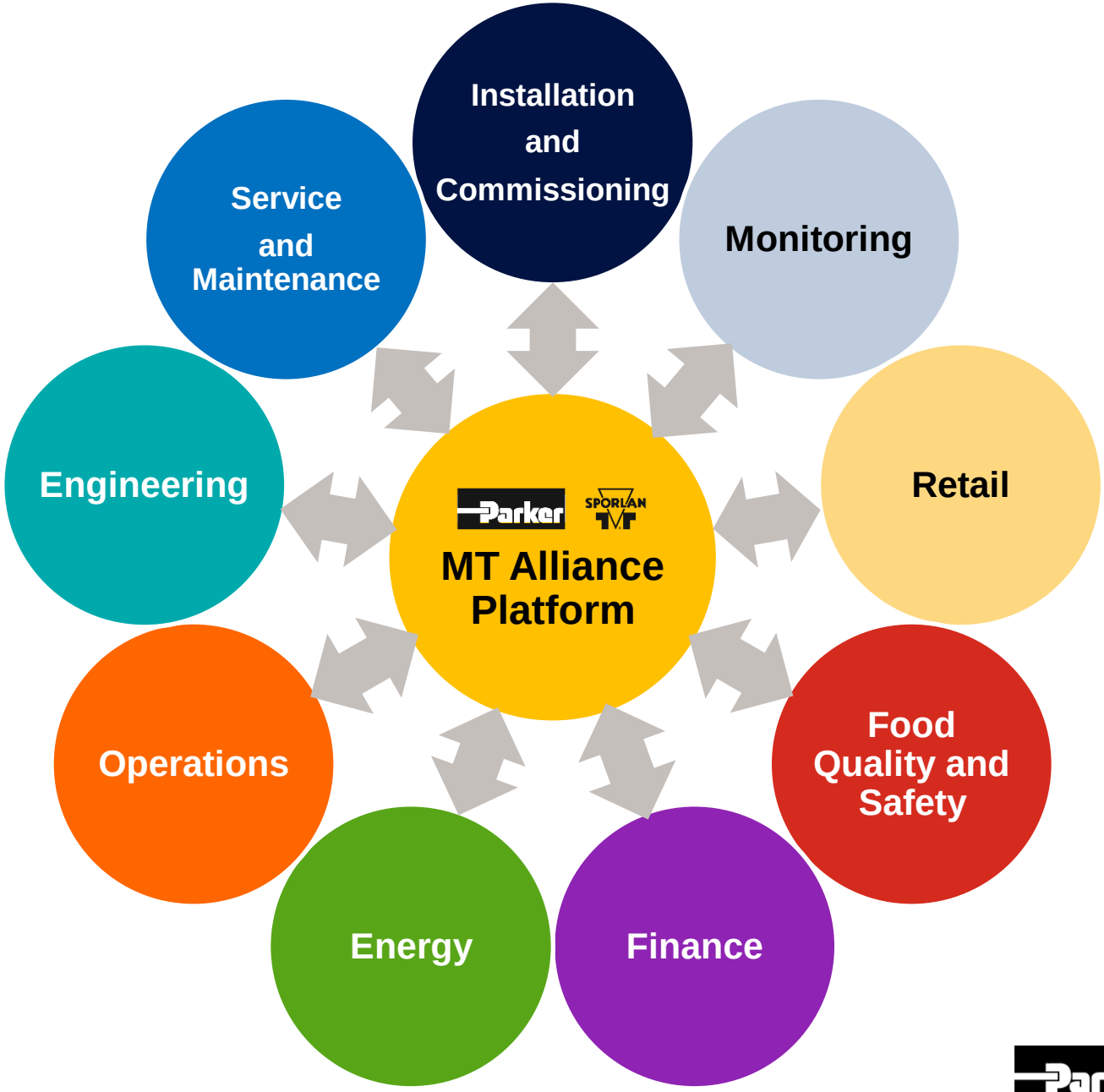
Supermarket…Commercial…Industrial



© 2023 Sporlan Division, Parker Hannifin Corporation

Micro Thermo Alliance

The power of information!



© 2023 Sporlan Division, Parker Hannifin Corporation

FACILITY Control

- Supermarkets
- 300+ CO_2 installations in North America
- Frozen and refrigerated warehouses
- Ice skating rinks
- Marine refrigeration
- Food processing and preparation facilities
- Ice cream processing and production
- Pharmaceutical process and storage

© 2023 Sporlan Division, Parker Hannifin Corporation

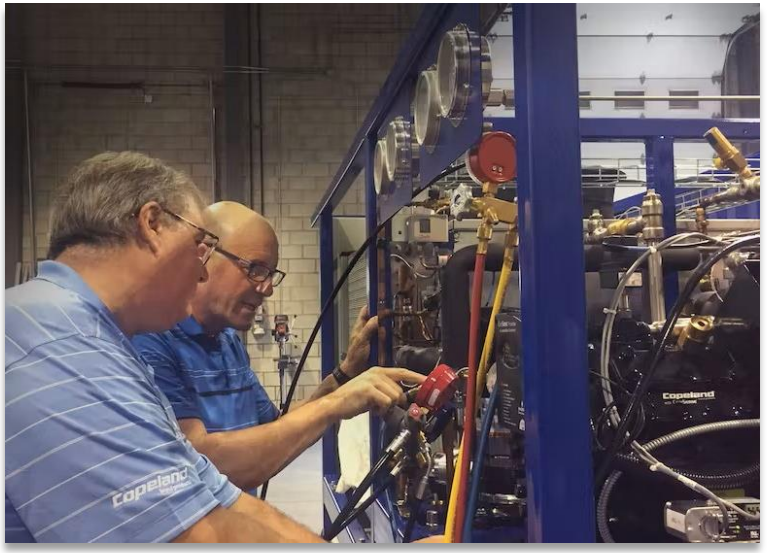
FACILITY Goals & Needs

- Reduce food loss and improving food quality
- Extend product shelf life
- Optimize temperature control
  - Product and environment
- Reduce service costs
- Reduce energy costs
- Reduce management costs
- Reduce facility costs
- Increase profitability

© 2023 Sporlan Division, Parker Hannifin Corporation

CONTRACTOR Goals & Needs

- Real time smart alarm notification via text / email
- 5W's technician accountability
- Virtual / remote troubleshooting
- Remote graphing and analysis
  - 5+ year system history
- Remote system modification and set-point changes
  - Superheat / Suction Pressure / Defrost Schedule / Over-rides
- Electronic service log
- Alarm event triage report
- Reduce labor, service, and energy costs
- Reduce management costs
- Increase profitability



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Graphical User Interface Front End

Information

Subsystems are linked into one platform

Leak Detection

Energy

Refrigeration

Tº Monitoring

VFD

Generation

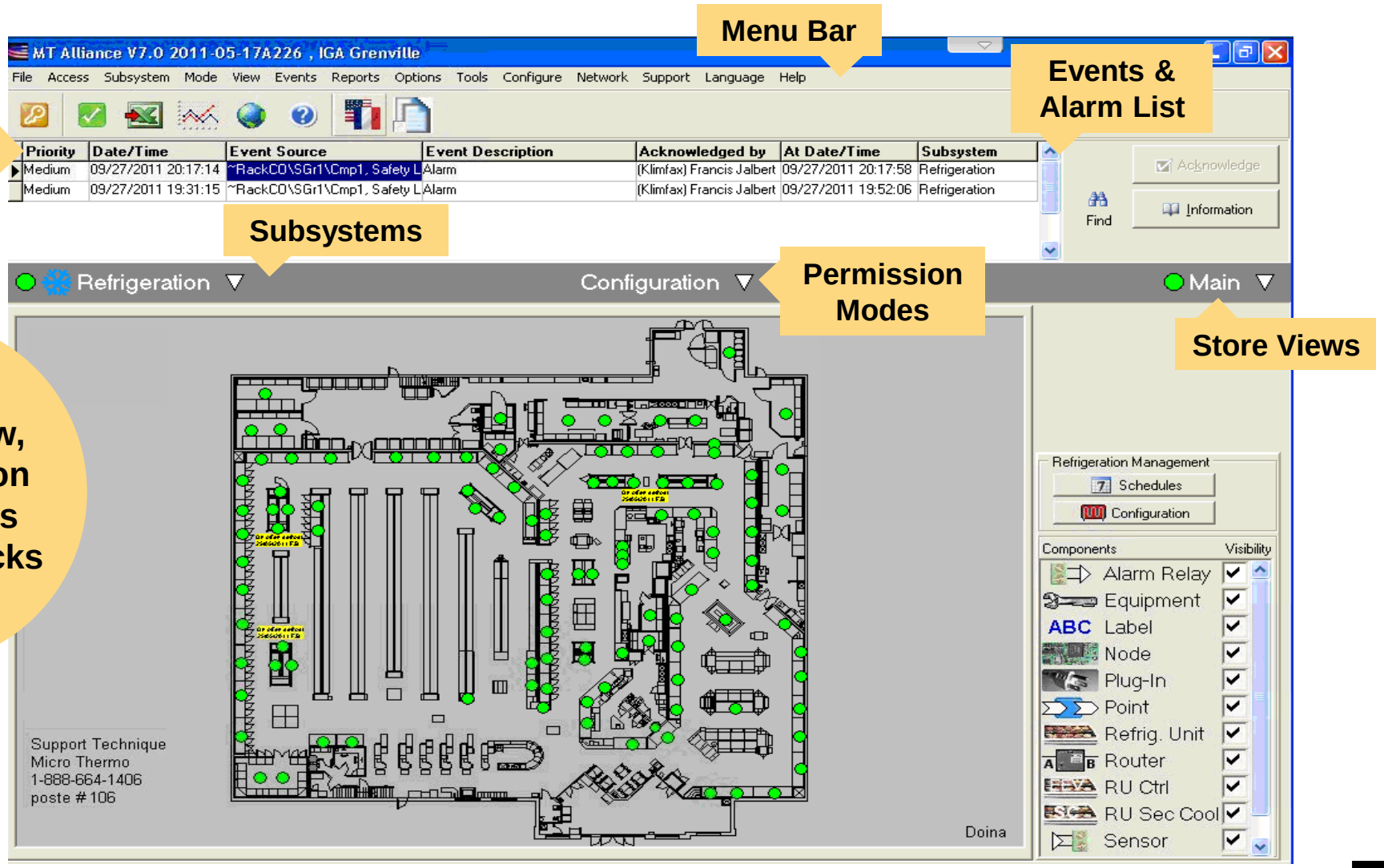
HVAC

Lighting

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Menus



From the main window, every function of Alliance is just a few clicks away!

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

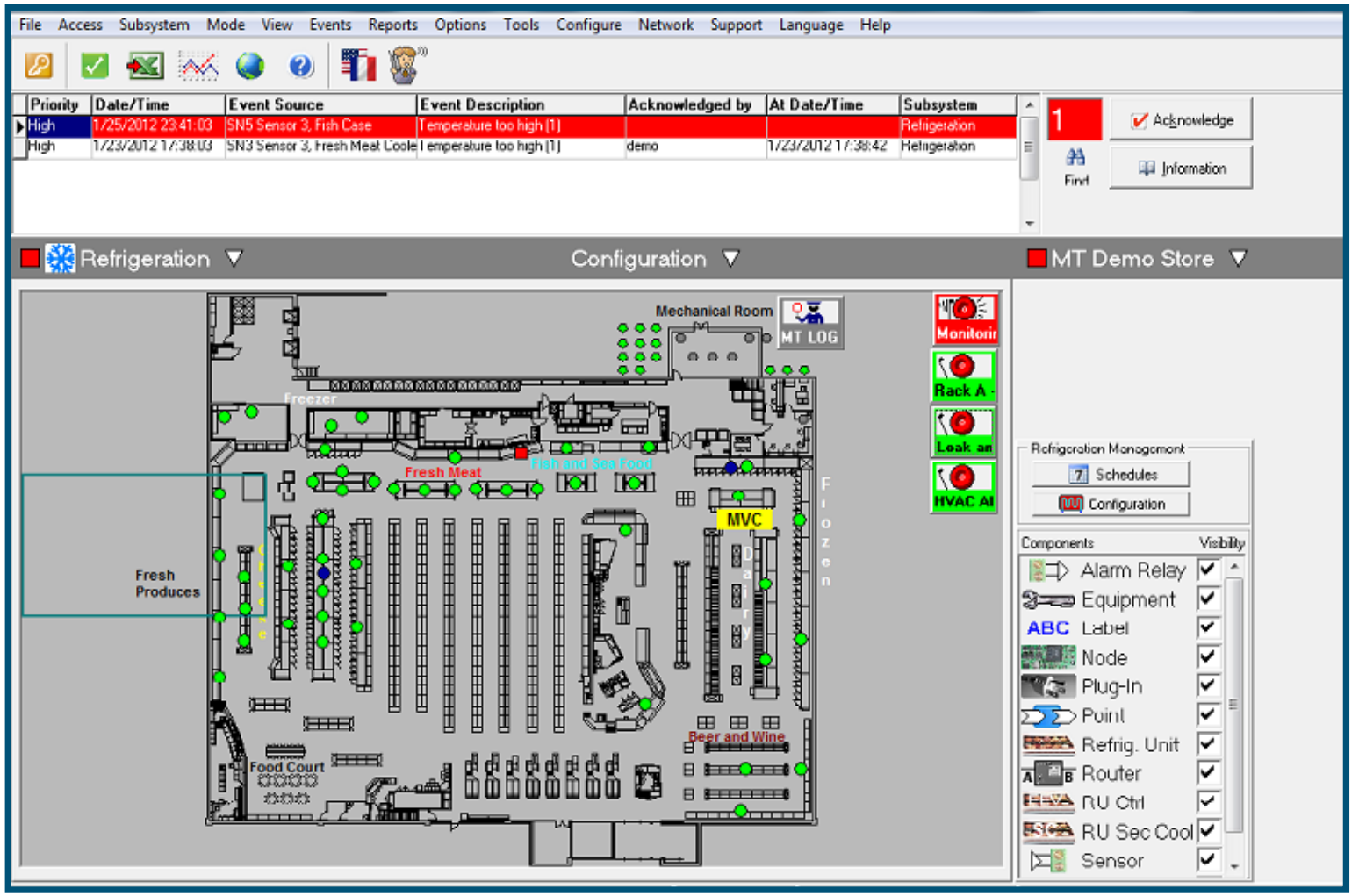
Color Codes

- **RED SQUARE**
  TAKE ACTION
  - Active Alarm
- **YELLOW DIAMOND**
  CAUTION
  - Alarm in Recall
- **GREEN CIRCLE**
  All Systems GO
  - Temps and Nodes OK
- **ORANGE**
  Fixture or Circuit in **DEFROST**
- **TEAL**
  Fixture, Fan, Valve, Compressor in **OVERRIDE**
- **WHITE**
  UNCONFIGURED
  - Not commissioned
- **BLACK**
  Node **OFFLINE**

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

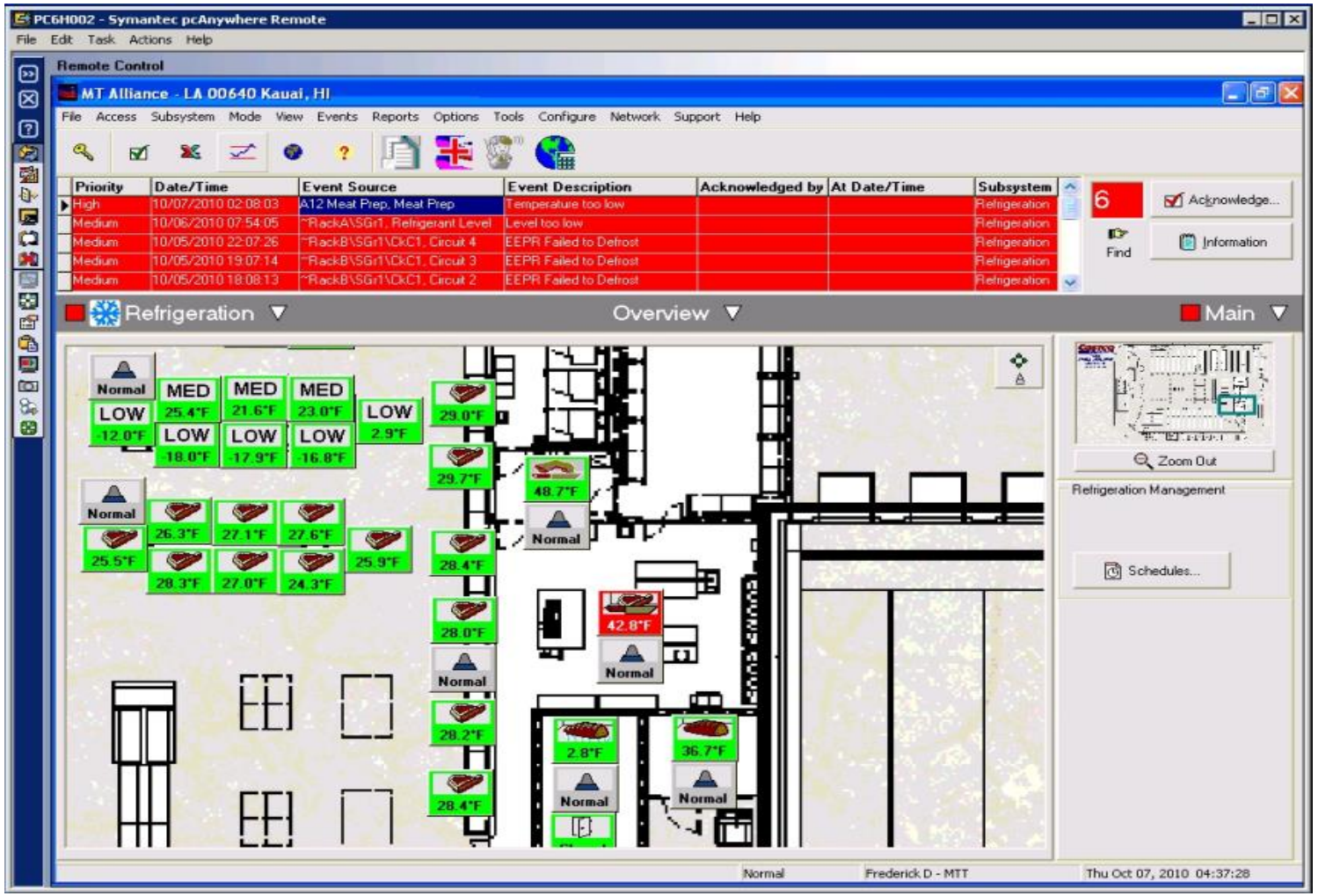
Alarm Acknowledgement and Resolution



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

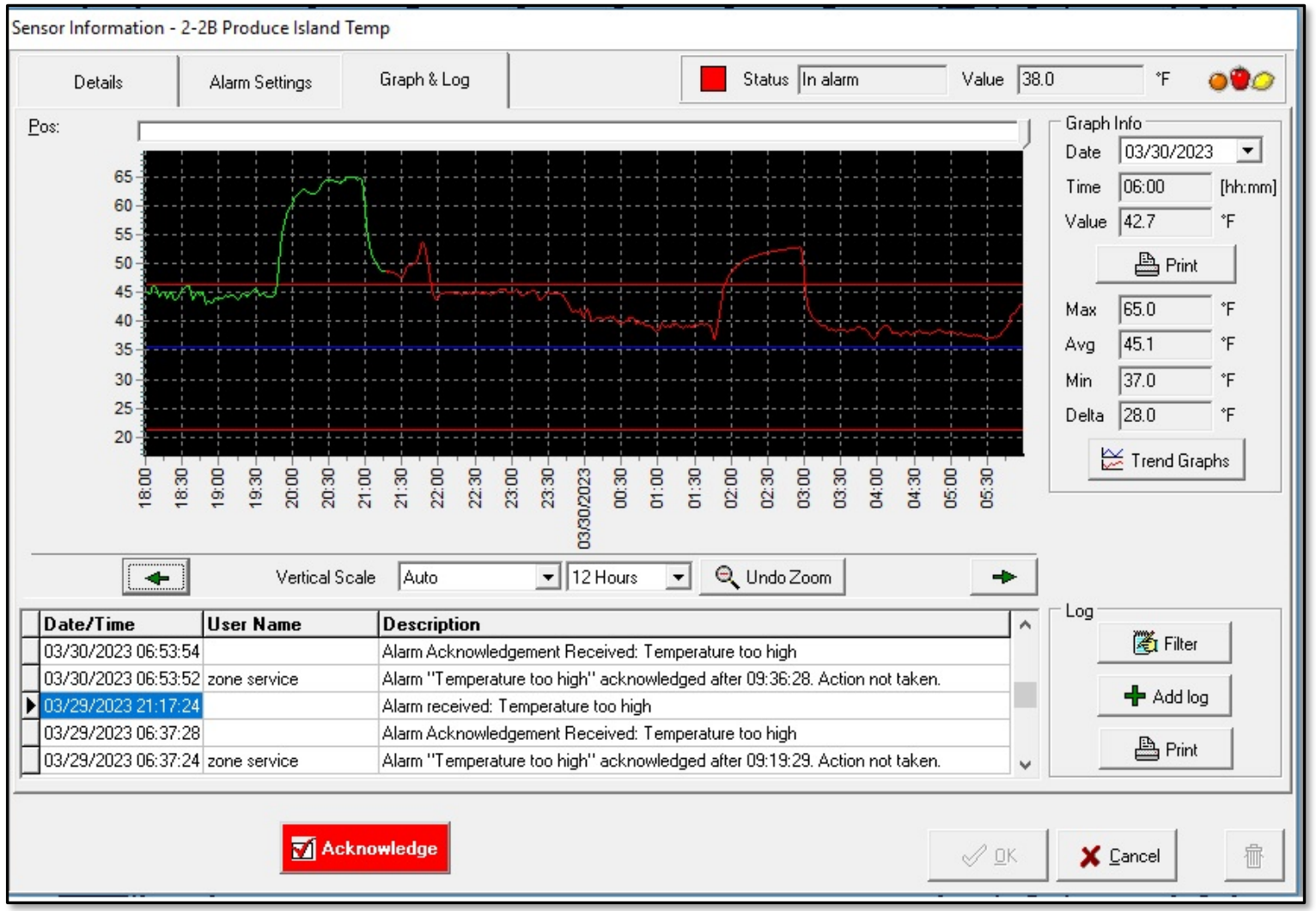
Accountability · Traceability · Security



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Graph and Log View



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

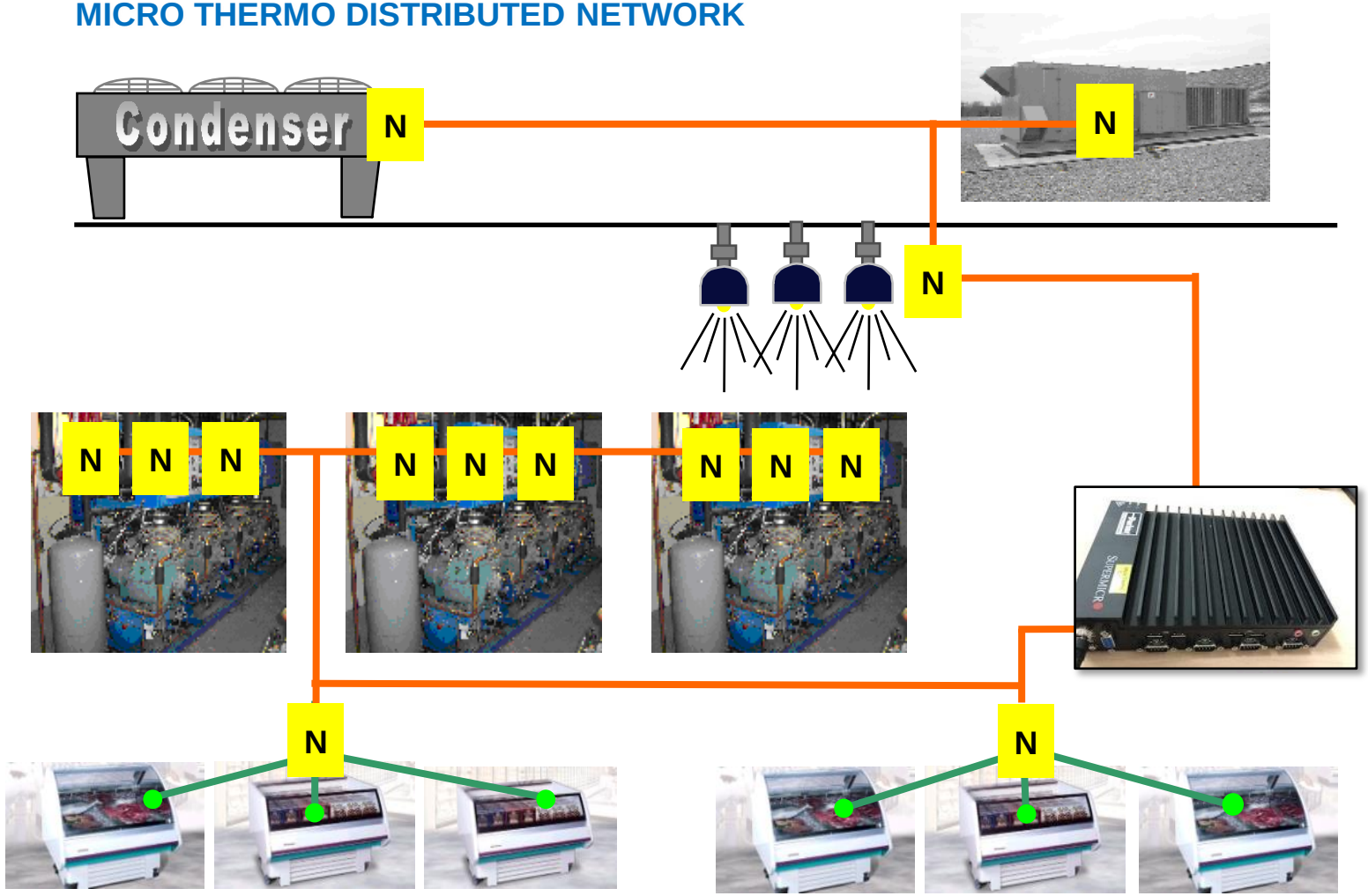
The Power of Information

- ✓ Intelligent Distributed Control
- ✓ Intuitive Windows® based graphical user interface
- ✓ History retains system data up to 5 years
- ✓ CO2 control, both Transcritical & Subcritical; 300+ North America installations in last 8 years
- ✓ Integrated subsystems managed through an integrated front-end
- ✓ Colorful visual indicators enable facility management at-a-glance
- ✓ Customizable icons and templates make set-up and commissioning easy

© 2023 Sporlan Division, Parker Hannifin Corporation

Distributed Control System…with HMI

- *Intelligent LonWorks **Smart Nodes***
- *Open Echelon network*
- *Simplified wiring*
- *Simplified system integration*
- *Simplified 3rd Party Integration*



Facility Management

- If you do not **SEE IT**
- If you do not **MEASURE IT**
- If you do not **ANALYZE IT**…
- **YOU CAN NOT MANAGE IT!**

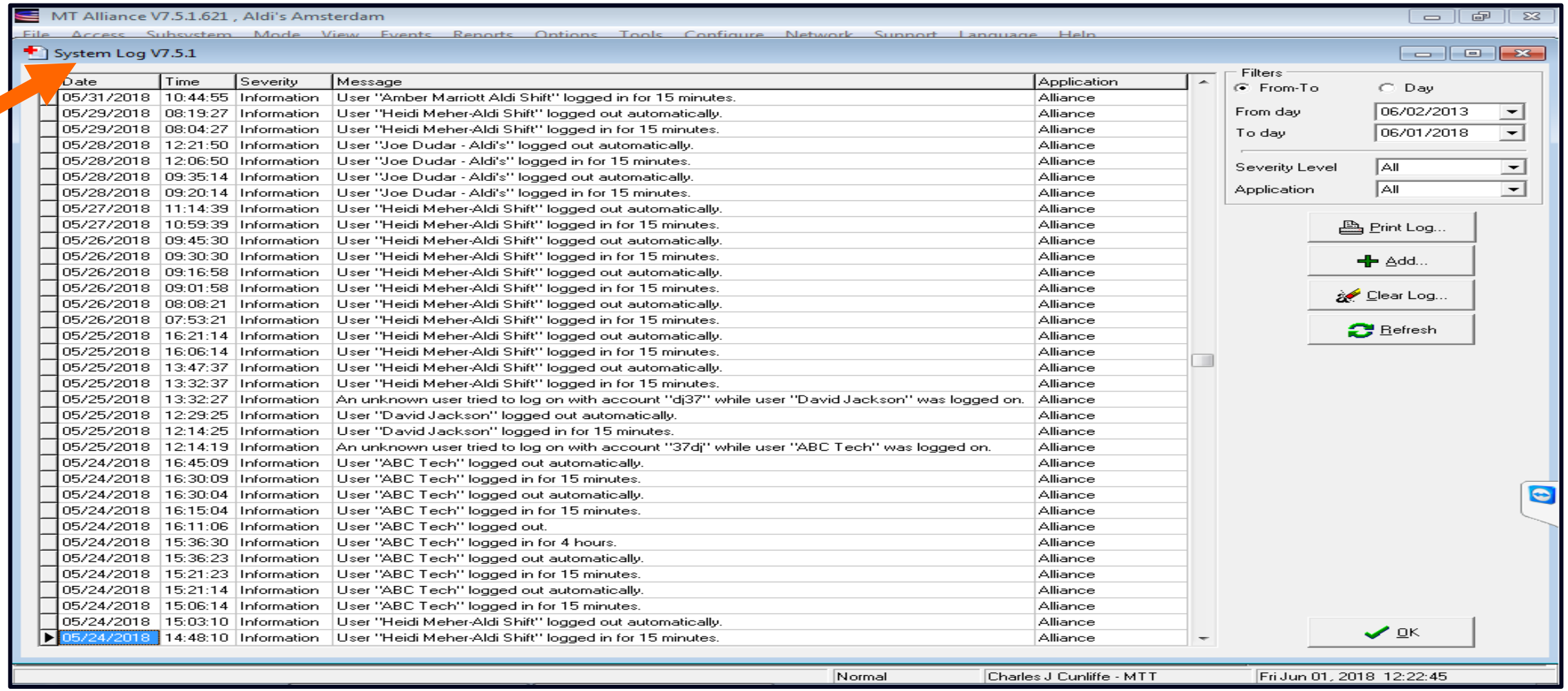
© 2023 Sporlan Division, Parker Hannifin Corporation

ALLIANCE
On-Board Tools & Reports

© 2023 Sporlan Division, Parker Hannifin Corporation

FACILITY MANAGEMENT

System Log (Operating System)

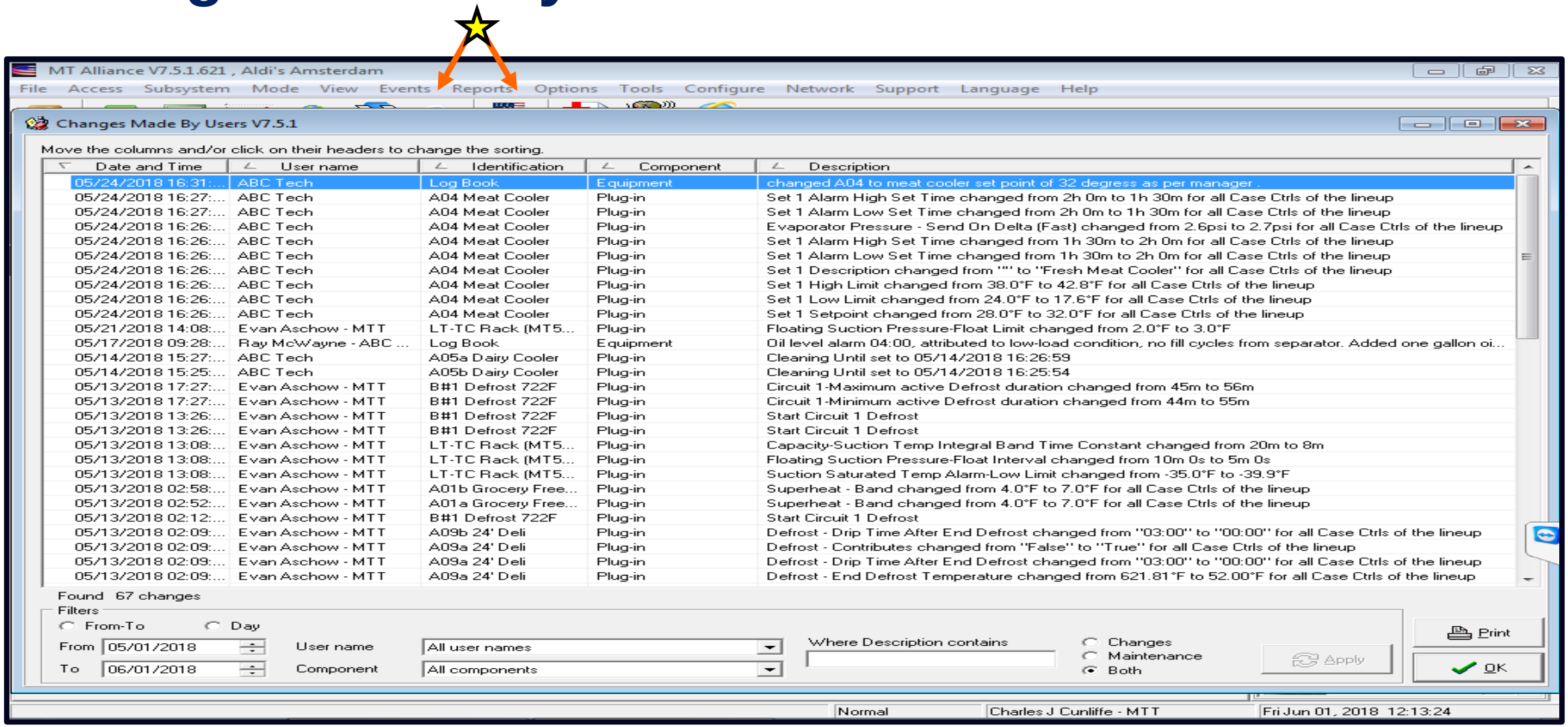


Date	Time	Severity	Message	Application
05/31/2018	10:44:55	Information	User "Amber Marriott Aldi Shift" logged in for 15 minutes.	Alliance
05/29/2018	08:19:27	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/29/2018	08:04:27	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/28/2018	12:21:50	Information	User "Joe Dudar - Aldi's" logged out automatically.	Alliance
05/28/2018	12:06:50	Information	User "Joe Dudar - Aldi's" logged in for 15 minutes.	Alliance
05/28/2018	09:35:14	Information	User "Joe Dudar - Aldi's" logged out automatically.	Alliance
05/28/2018	09:20:14	Information	User "Joe Dudar - Aldi's" logged in for 15 minutes.	Alliance
05/27/2018	11:14:39	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/27/2018	10:59:39	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/26/2018	09:45:30	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/26/2018	09:30:30	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/26/2018	09:16:58	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/26/2018	09:01:58	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/26/2018	08:08:21	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/26/2018	07:53:21	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/25/2018	16:21:14	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/25/2018	16:06:14	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/25/2018	13:47:37	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/25/2018	13:32:37	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance
05/25/2018	13:32:27	Information	An unknown user tried to log on with account "dj37" while user "David Jackson" was logged on.	Alliance
05/25/2018	12:29:25	Information	User "David Jackson" logged out automatically.	Alliance
05/25/2018	12:14:25	Information	User "David Jackson" logged in for 15 minutes.	Alliance
05/25/2018	12:14:19	Information	An unknown user tried to log on with account "37dj" while user "ABC Tech" was logged on.	Alliance
05/24/2018	16:45:09	Information	User "ABC Tech" logged out automatically.	Alliance
05/24/2018	16:30:09	Information	User "ABC Tech" logged in for 15 minutes.	Alliance
05/24/2018	16:30:04	Information	User "ABC Tech" logged out automatically.	Alliance
05/24/2018	16:15:04	Information	User "ABC Tech" logged in for 15 minutes.	Alliance
05/24/2018	16:11:06	Information	User "ABC Tech" logged out.	Alliance
05/24/2018	15:36:30	Information	User "ABC Tech" logged in for 4 hours.	Alliance
05/24/2018	15:36:23	Information	User "ABC Tech" logged out automatically.	Alliance
05/24/2018	15:21:23	Information	User "ABC Tech" logged in for 15 minutes.	Alliance
05/24/2018	15:21:14	Information	User "ABC Tech" logged out automatically.	Alliance
05/24/2018	15:06:14	Information	User "ABC Tech" logged in for 15 minutes.	Alliance
05/24/2018	15:03:10	Information	User "Heidi Meher-Aldi Shift" logged out automatically.	Alliance
05/24/2018	14:48:10	Information	User "Heidi Meher-Aldi Shift" logged in for 15 minutes.	Alliance

© 2023 Sporlan Division, Parker Hannifin Corporation

FACILITY MANAGEMENT

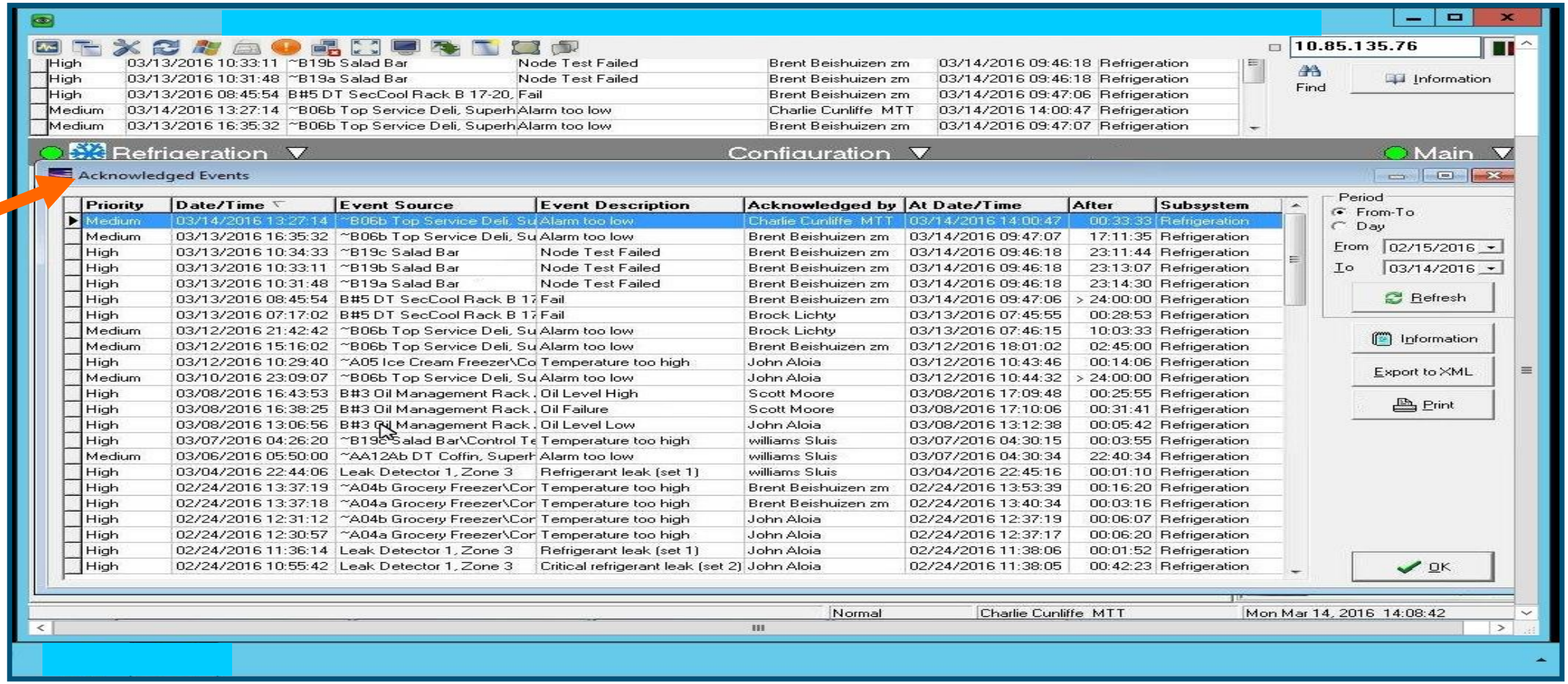
Changes Made by Users



© 2023 Sporlan Division, Parker Hannifin Corporation

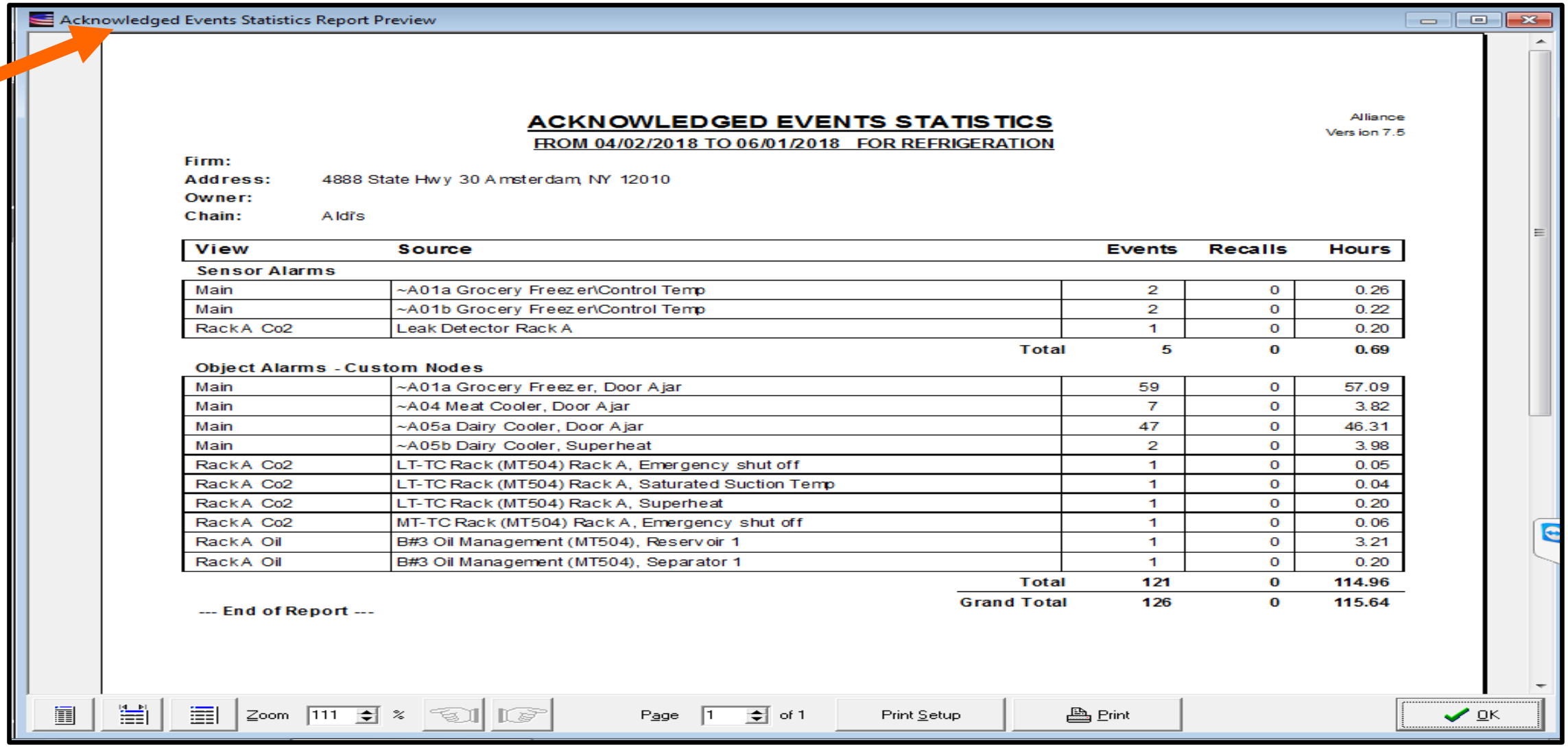
FACILITY MANAGEMENT

Acknowledged Events



© 2023 Sporlan Division, Parker Hannifin Corporation

Acknowledged Events Statistics



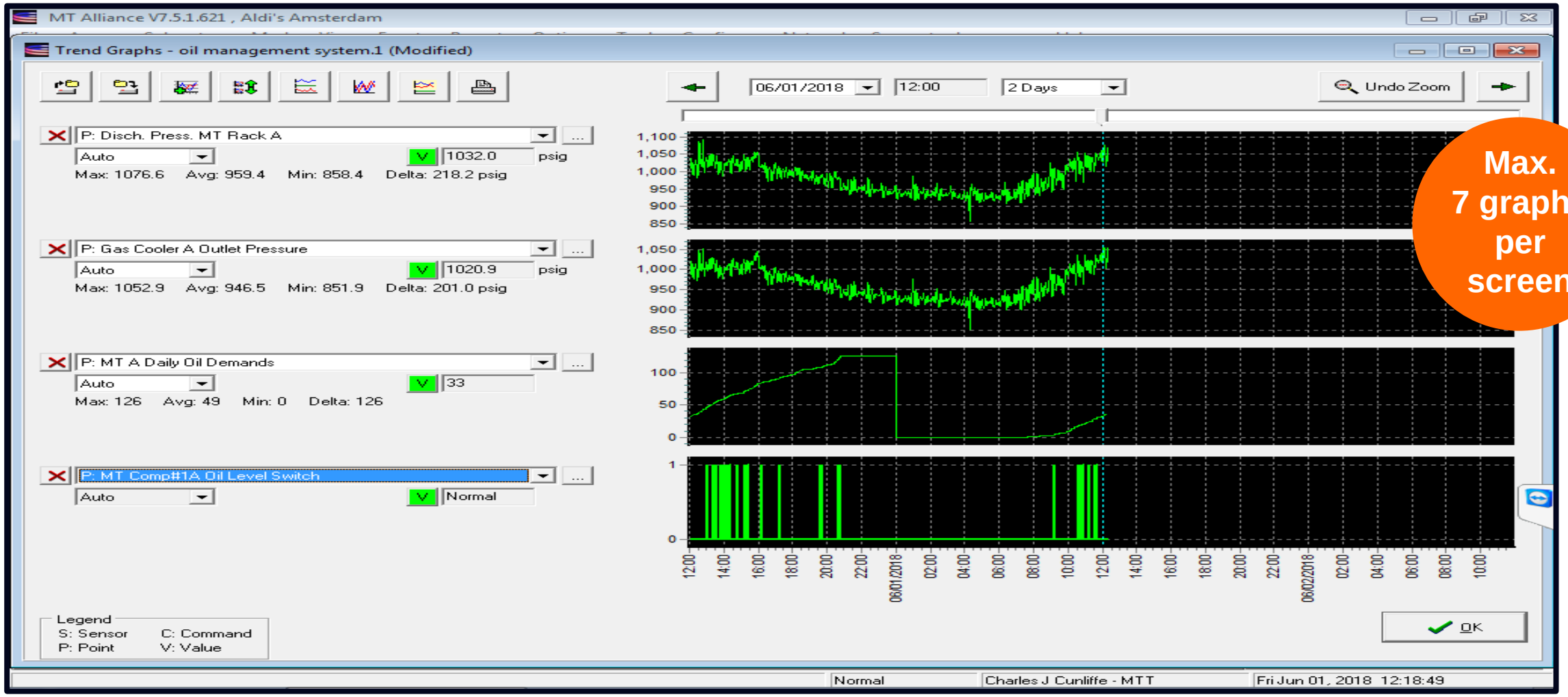
View	Source	Events	Recalls	Hours
Sensor Alarms				
Main	~A01a Grocery Freezer\Control Temp	2	0	0.26
Main	~A01b Grocery Freezer\Control Temp	2	0	0.22
RackA Co2	Leak Detector Rack A	1	0	0.20
	Total	**5**	**0**	**0.69**
Object Alarms - Custom Nodes				
Main	~A01a Grocery Freezer, Door Ajar	59	0	57.09
Main	~A04 Meat Cooler, Door Ajar	7	0	3.82
Main	~A05a Dairy Cooler, Door Ajar	47	0	46.31
Main	~A05b Dairy Cooler, Superheat	2	0	3.98
RackA Co2	LT-TC Rack (MT504) Rack A, Emergency shut off	1	0	0.05
RackA Co2	LT-TC Rack (MT504) Rack A, Saturated Suction Temp	1	0	0.04
RackA Co2	LT-TC Rack (MT504) Rack A, Superheat	1	0	0.20
RackA Co2	MT-TC Rack (MT504) Rack A, Emergency shut off	1	0	0.06
RackA Oil	B#3 Oil Management (MT504), Reservoir 1	1	0	3.21
RackA Oil	B#3 Oil Management (MT504), Separator 1	1	0	0.20
	Total	**121**	**0**	**114.96**
	Grand Total	**126**	**0**	**115.64**

--- End of Report ---

© 2023 Sporlan Division, Parker Hannifin Corporation

FACILITY MANAGEMENT

Trend Graphs



Max. 7 graphs per screen

© 2023 Sporlan Division, Parker Hannifin Corporation

ALLIANCE
Echelon Network

- *Network Quality…bad installation = slow speed poor performance*
- *NOISE…stay away from high voltage*
- *Cable: Belden 8471 16 AWG No Shield 6 twist per foot*

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Echelon Communication Cable

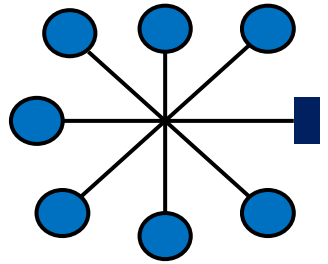
2 Wire Twisted Pair, NO Shield

- **BELDEN - #16 8471**
  - *Use for main Echelon communication drop for each channel home run to Data Logger*
- **BELDEN - #16 8471**
  - *Use for Node to Node Communication within each Echelon Channel*

© 2023 Sporlan Division, Parker Hannifin Corporation

LARGE SUPERMARKETS

Network – Backbone and Channels



Total 315 Nodes
(Inc. PC & RTC)
2.5 Kilometers

53 Ohms — ALR — RTC — H SCH

Special Echelon Network Requirement

- Each network channel will begin with router/repeater
- Each channel will have termination resistor mounted on the router for shipping
- Check resistance at router
- Check resistance at end of each channel
- Resistance must be 53 – 58 ohms
- If high resistance is measured at the end of channel….move termination resistor to best location to balance network resistance

CASE CONTROLLERS

ROUTER — SN 25 — SN xx — SN 63 — 53 — SN 64 — SN xx — SN 125

50 - 60 nodes

1 repeater allowed on the far side of each router

REFRIGERATION SYSTEM (Rack A)

ROUTER — CFC — SPC — CMP 1 — CMP 2 — CMP 3 — 53 — CMP 4 — CKT 1 — CKT 2 — CKT 3

1600 FEET

FTT Network

HVAC SYSTEM

ROUTER — DPU — RTU1 — 53 — RTU2 — RTU3 — RTU4

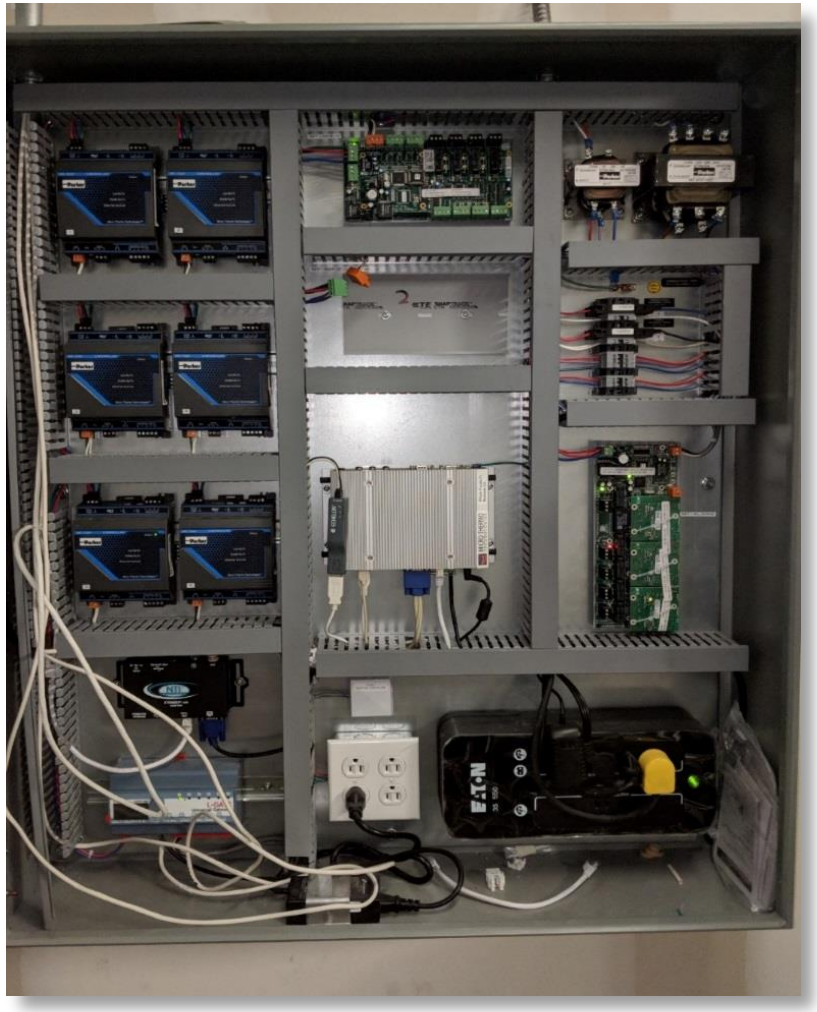
LIGHTING SYSTEM

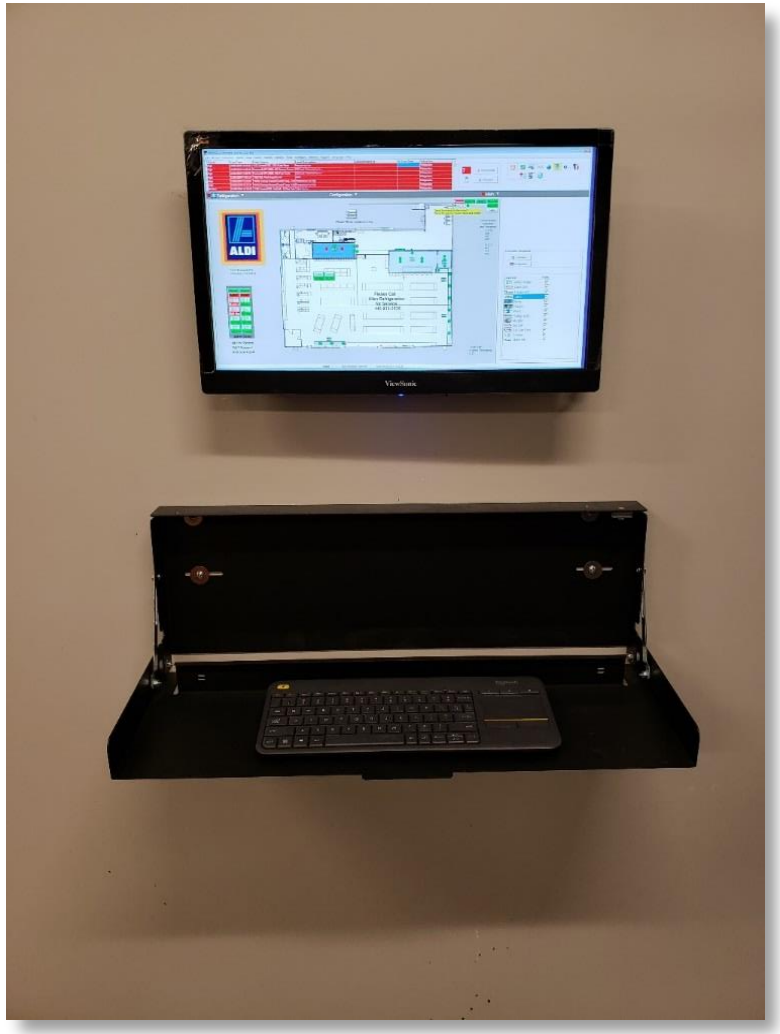
ROUTER — L SCH — LCU 1 — LCU 2 — 53 — LCU 3 — LCU 4

500 Meters

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE





© 2023 Sporlan Division, Parker Hannifin Corporation

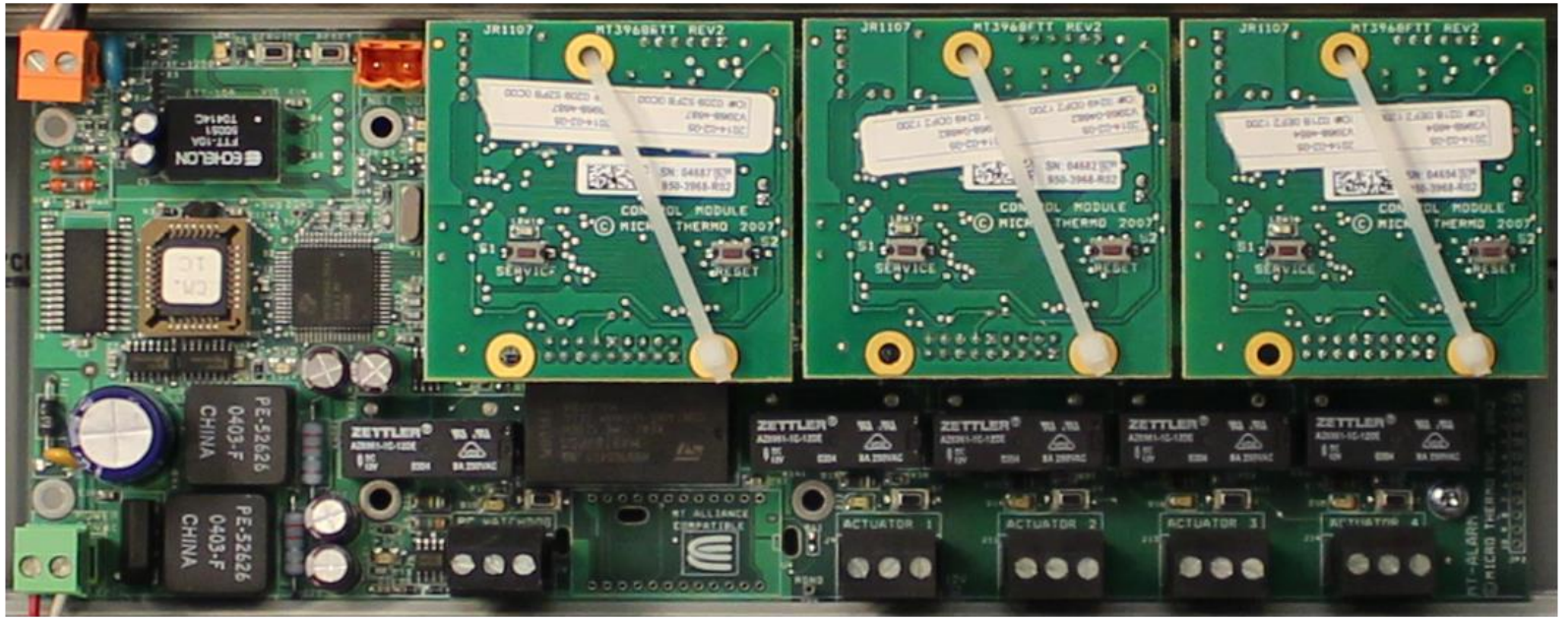
MICRO THERMO ALLIANCE

Industrial Computer

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

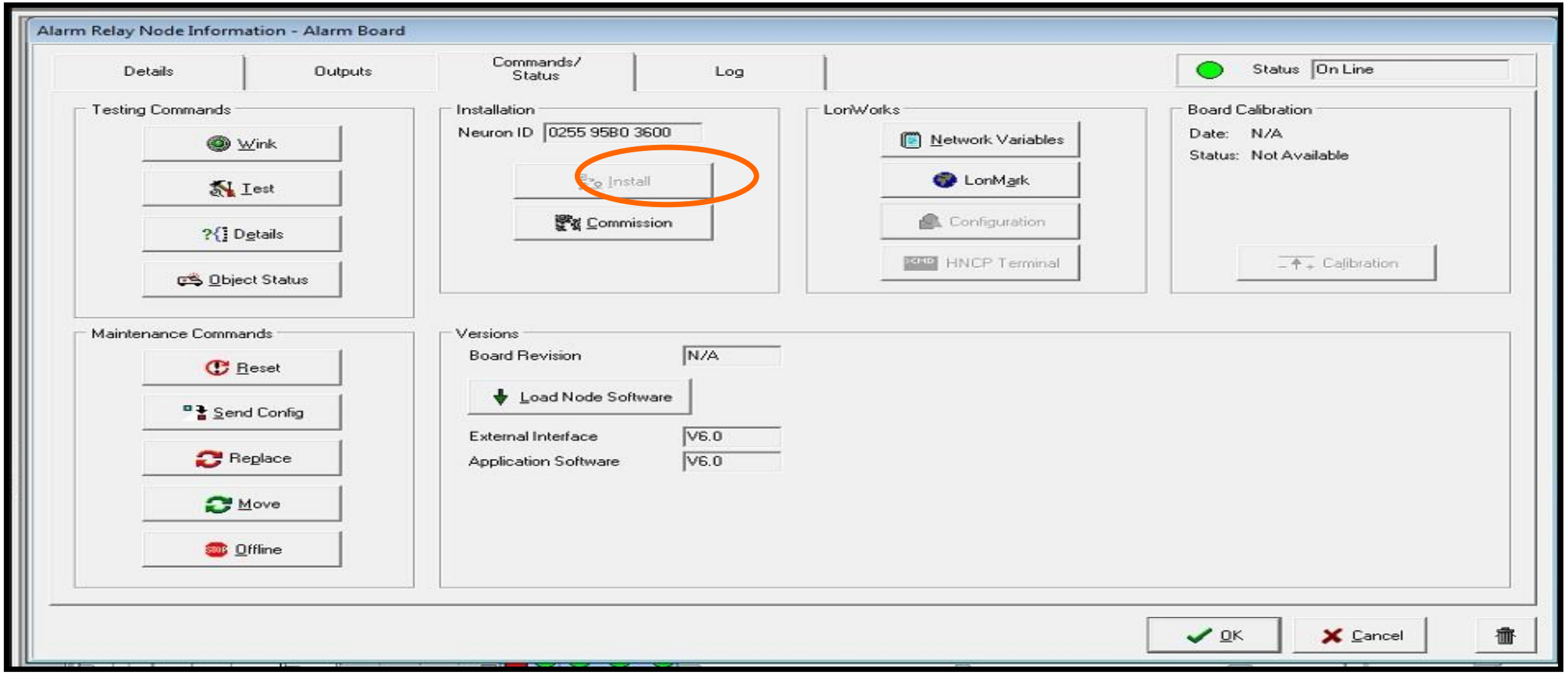
Backbone Components



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Alarm Node Integration

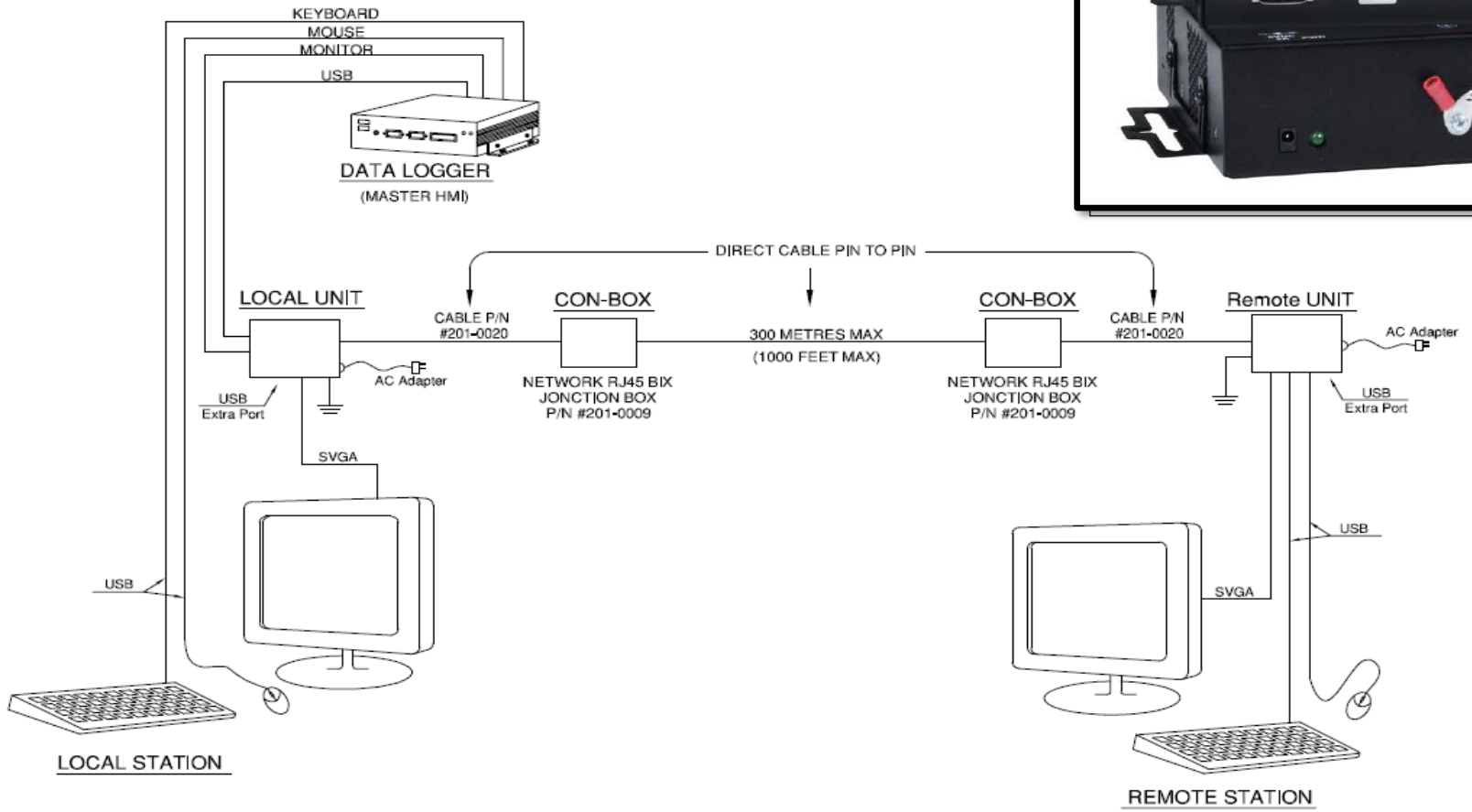


© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Industrial Computer with KVM

up to 8 remote workstations



© 2023 Sporlan Division, Parker Hannifin Corporation

Application of ALLIANCE

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Intelligent Refrigeration Controls

Suction Group Control

- **PID control for suction pressure**
- **Floating suction pressure**
- **Optimized algorithms for reducing compressor cycling**
- **Disregards faulty compressors in refrigeration control strategies**

Compressor Control

- **Fail-safe switch back**
- **Equalized Run Time**
- **Supports 2 un-loaders per compressor**
- **Supports VFD**
- **Digital Discus & Digital Scroll**
- **Inputs**
  - Safety Line Monitoring
  - Proof-of-running
  - Xproof-of-running

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Intelligent Controllers

Condenser/Gas Cooler Control

- PID or Sequential Control
- Air Cooled or Evaporative
- Fixed or Variable Speed Fans
- VFD application
- Split Logic on Outdoor Temp, Heat Reclaim or both
- Automatic fail-safe
- Floating Head strategies adaptable

Circuit Control

- Controls refrigeration, defrost, off-time and drip cycle
- Integrated scheduler for each refrigeration circuits
- Defrost types supported :Hot Gas, Electric, Off Cycle, Pulse, Warm Fluid
- Defrost termination on time or temperature

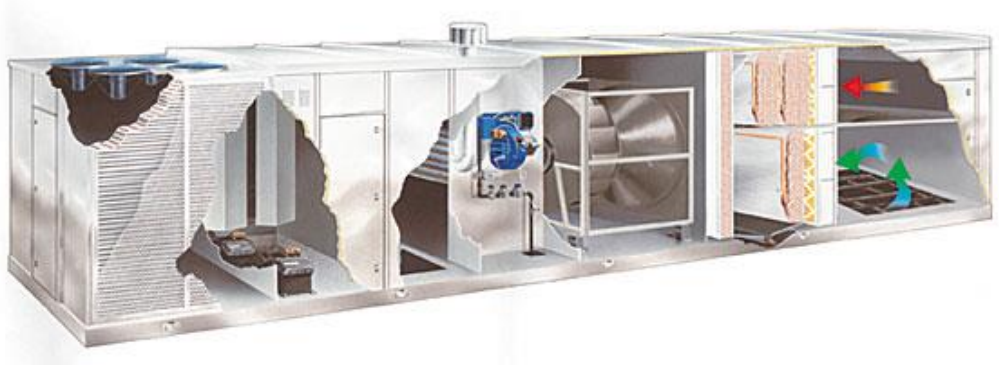
© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Intelligent Controllers

HVAC

- **Controls a wide variety of HVAC units**
  RTU's, AHU's, DPU's, Make-up air, VAV's, Custom applications, connectivity to 3rd Party LON Devices
- **Humidity or Dew Point control**
- **Built-in Load Shed functions**
- **Heat Reclaim**
  - Reheat – Space Heat – Hot water
  - Monitored to prove application



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Anti-Sweat Control

- **Modulation of anti-sweat heaters based on store Dew-point T° or RH%**
- **Built-in Load Shed functions**

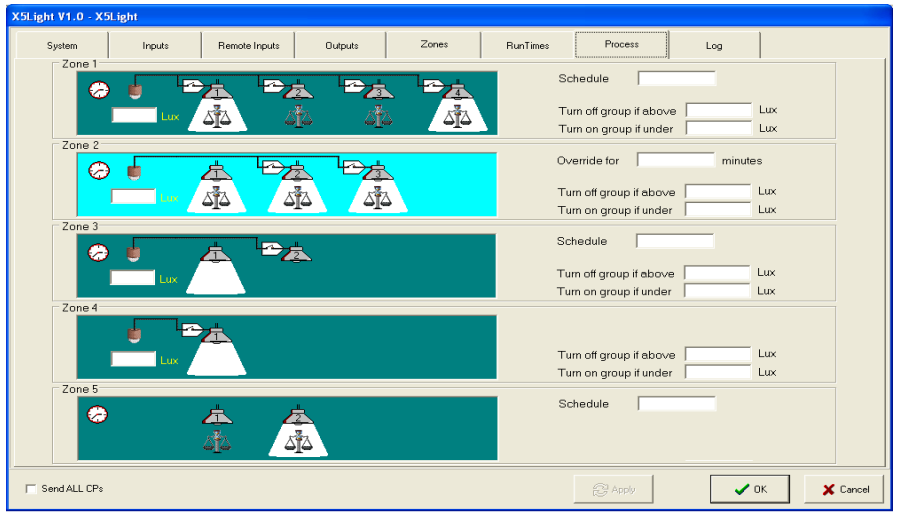
© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Intelligent Controllers

Lighting

- **Controls a wide variety of applications**
  - Dimmable lighting
  - Daylight harvesting
  - Multiple zone controls
- **Corporate scheduling capabilities**
- **Built-in Load Shed functions**
- **Astronomical clock**



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Temperature Monitoring

- **Case Tº Monitoring with alarm capabilities**
- **Multiple sets of alarms from one temperature input point**

SET 1 PRIMARY ALARM – Basic
- High and low set points
- User defined priority

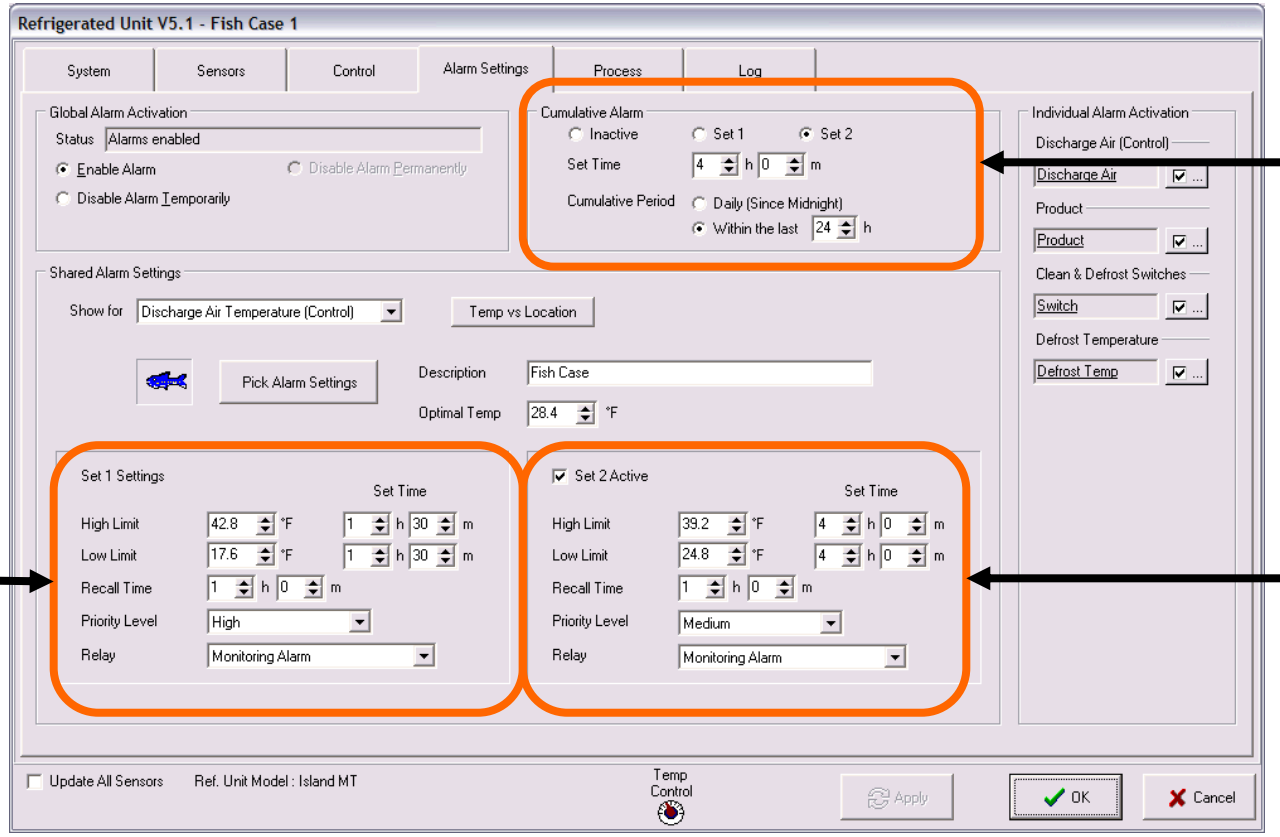
SET 2 SECONDARY ALARM – Efficiency & Food Quality
- High and low set points
- User defined priority

SET 3 CUMULATIVE ALARM – Food Safety
- User defined alarm priority

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Food Safety, Food Quality, and Monitoring



Food Safety with Cumulative Alarm function…

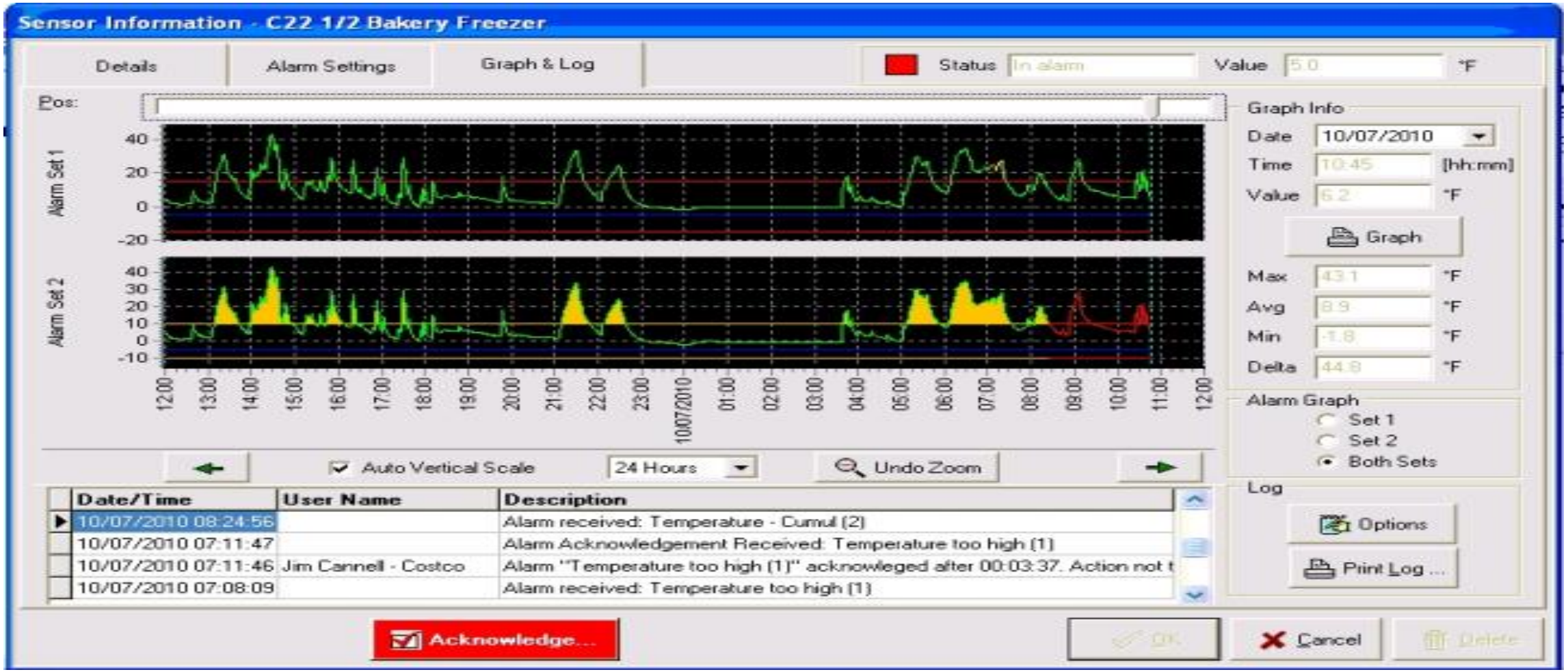
Basic alarming and monitoring capabilities…

Food Quality and process efficiency with second set of alarm function…

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Food Safety



© 2023 Sporlan Division, Parker Hannifin Corporation

ALLIANCE
Smart Nodes – MT-500

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

MT-500 Configurable Smart Nodes

MANY USES: HVAC, Refrigeration, Lighting, Energy

- **Powered by 24 VAC center-tap transformer**
- **Micro Thermo Smart Nodes are self-operating**
- **8 - UI can be configured to support a broad range of sensors**
- **Hardware low pass filter on all inputs**
- **LonWorks Controller Section**
  - Neuron
  - Transceiver
  - Memory
  - Logic

❖ **MT-504**	4DO	8UI	4AO*	
❖ **MT-508**	8DO	8UI	4AO*	4DI
❖ **MT-512**	12DO	8UI	4AO*	8DI

***CONFIGURABLE: 4 – 20ma 0-10V 0 – 5V 2 – 10V 1 – 5V**

MT-504

MT-508

MT-512

© 2023 Sporlan Division, Parker Hannifin Corporation

ALLIANCE
Smart Nodes – MT-700

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

Case Controller – MT-700 Series

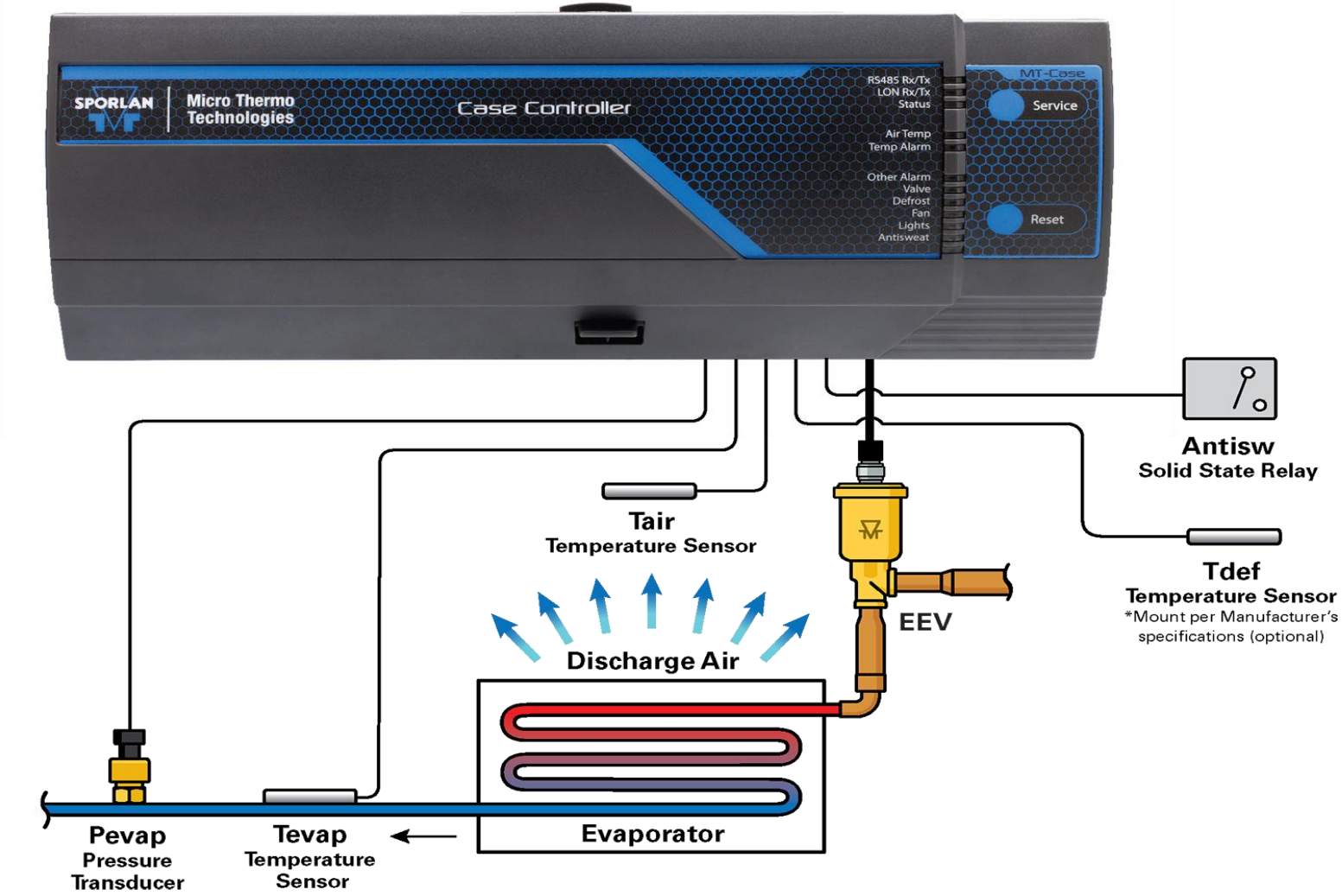
- **Easily configurable from a Windows® based front end**
- **Optimized for CO2 Control**
- **Smart Fan Control**
- **True P/T Superheat Control**

- **Temperature Control with Superheat limit**
- **Superheat Control with temperature limit**
- **Superheat Control priority**
- **Temperature Control priority**

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO CASE CONTROLLER

System Schematic - Example



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

Case Controller

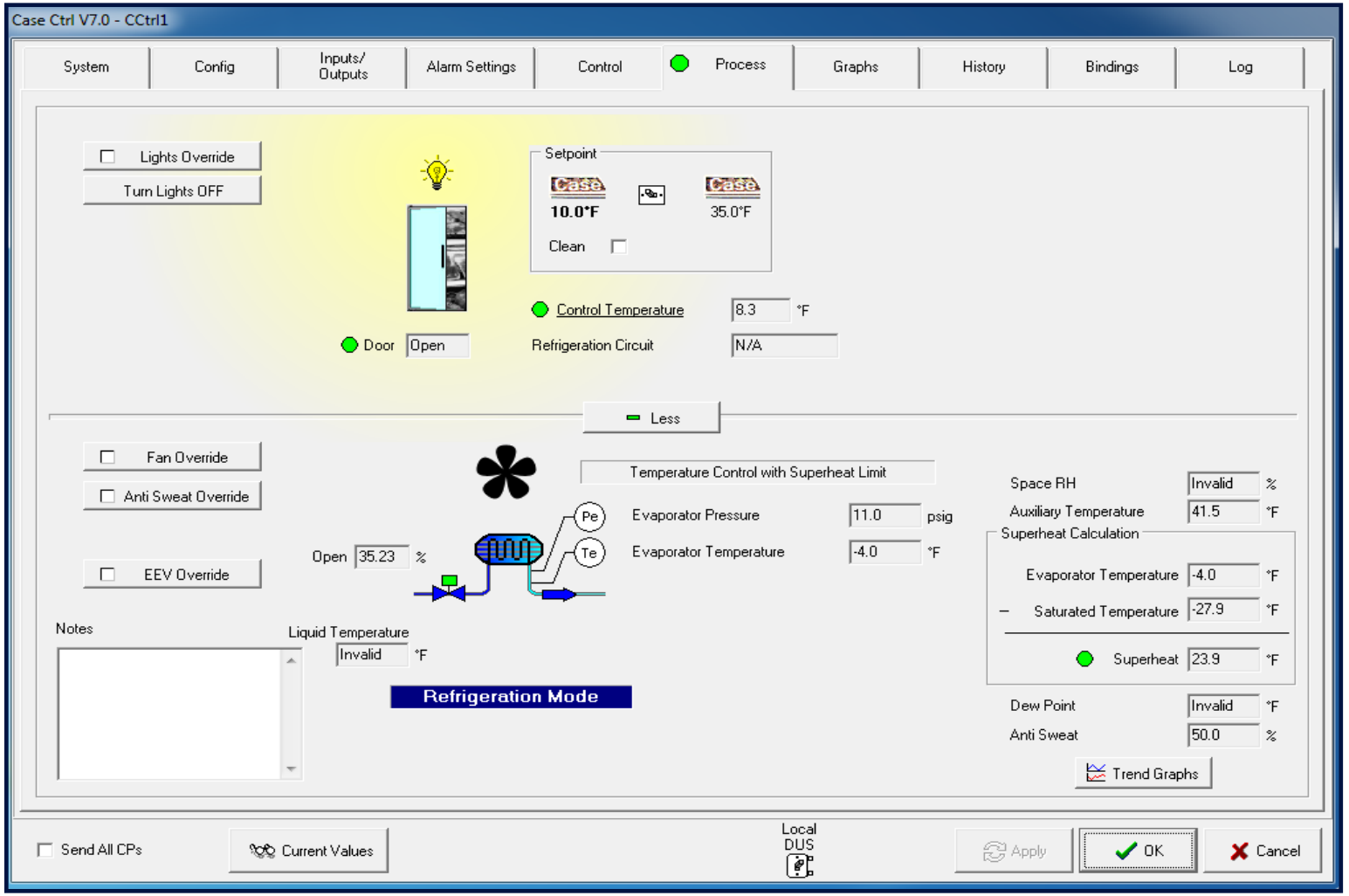
- **3 sets of temperature alarms**
  - Cumulative Alarm for improved food safety and reduced product shrinkage
  - Trend Graphing
- **Smart process model used with custom PID and intelligent algorithm**
  - Controls valve position based on evaporative load and predictive load along with smart fan control

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO CASE CONTROLLER

Integration Tabs

- 10 Integration Tabs
- Customize
- Fine-Tune
- Self-Learning



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

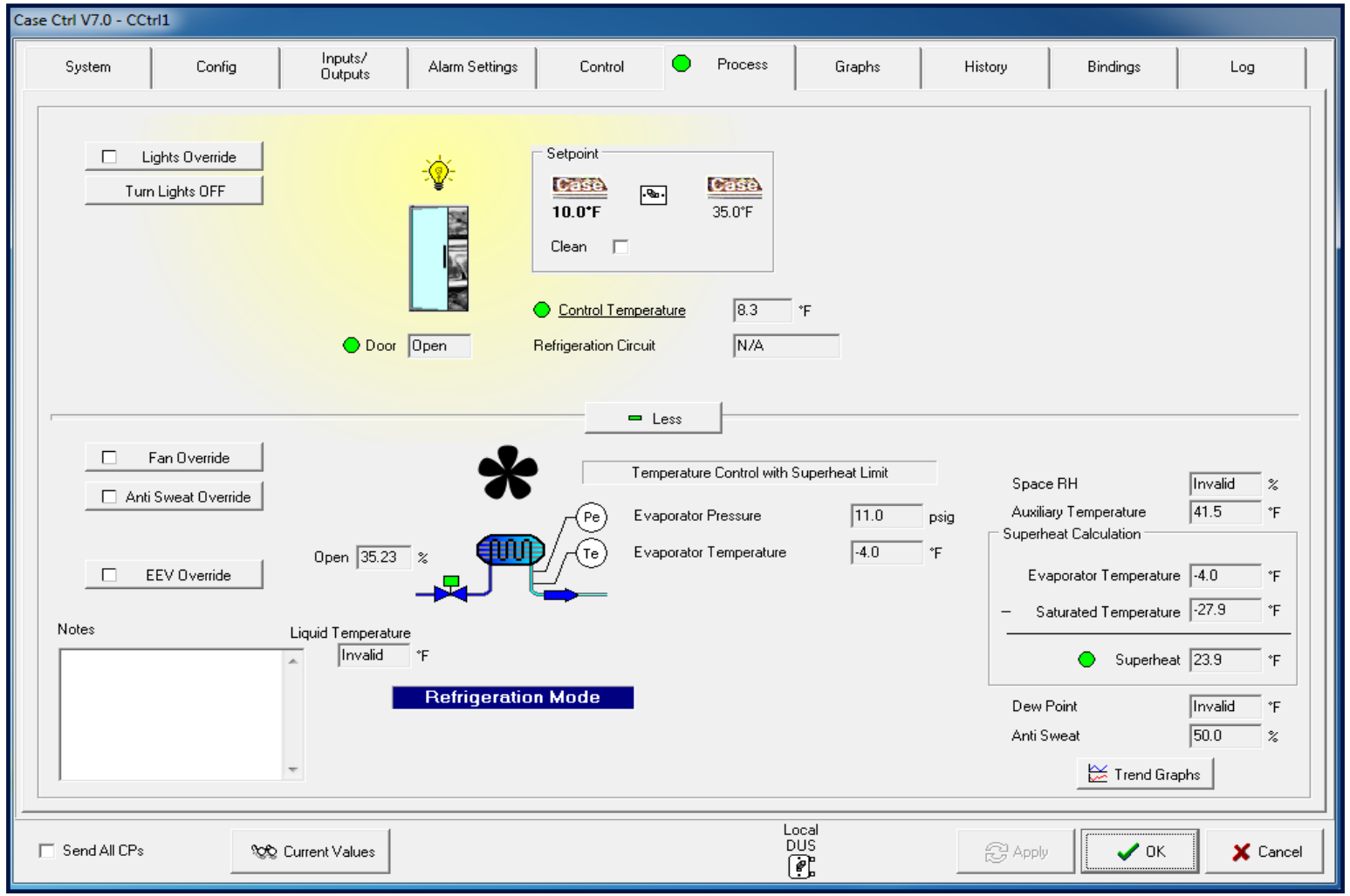
EEV Case Control

- ✓ Optimized for Fixture
- ✓ Optimized by Valve Type
- ✓ Base Value Correction
- ✓ Maximum % OPEN
- ✓ Pulldown Correction
- ✓ Delayed Opening After Defrost
- ✓ Liquid Temperature Correction
- ✓ Pressure Drop Correction
- ✓ Flow Direction Correction…..axial…radial
- ✓ Ambient Correction

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO CASE CONTROLLER

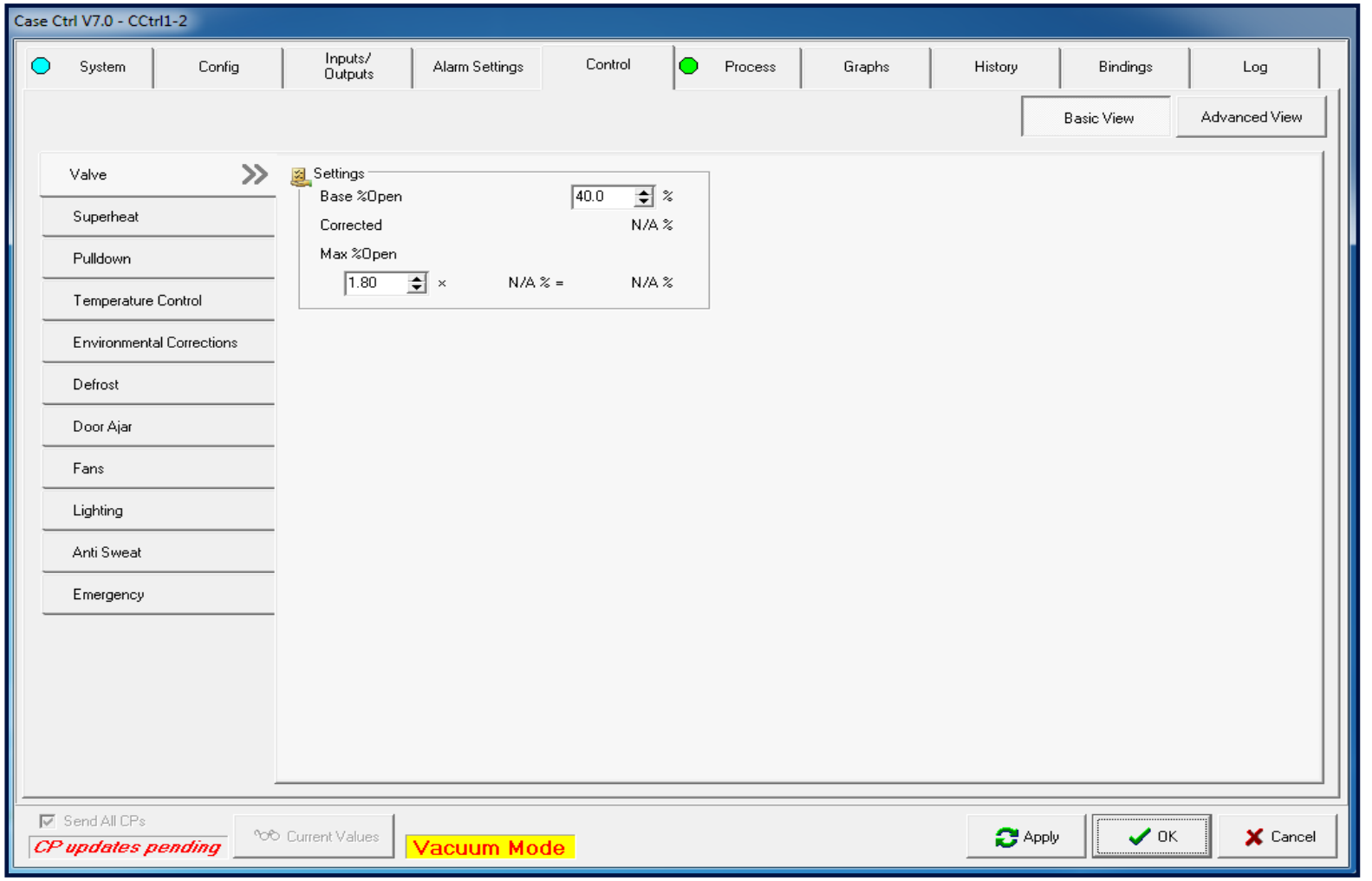
Process Tab



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO CASE CONTROLLER

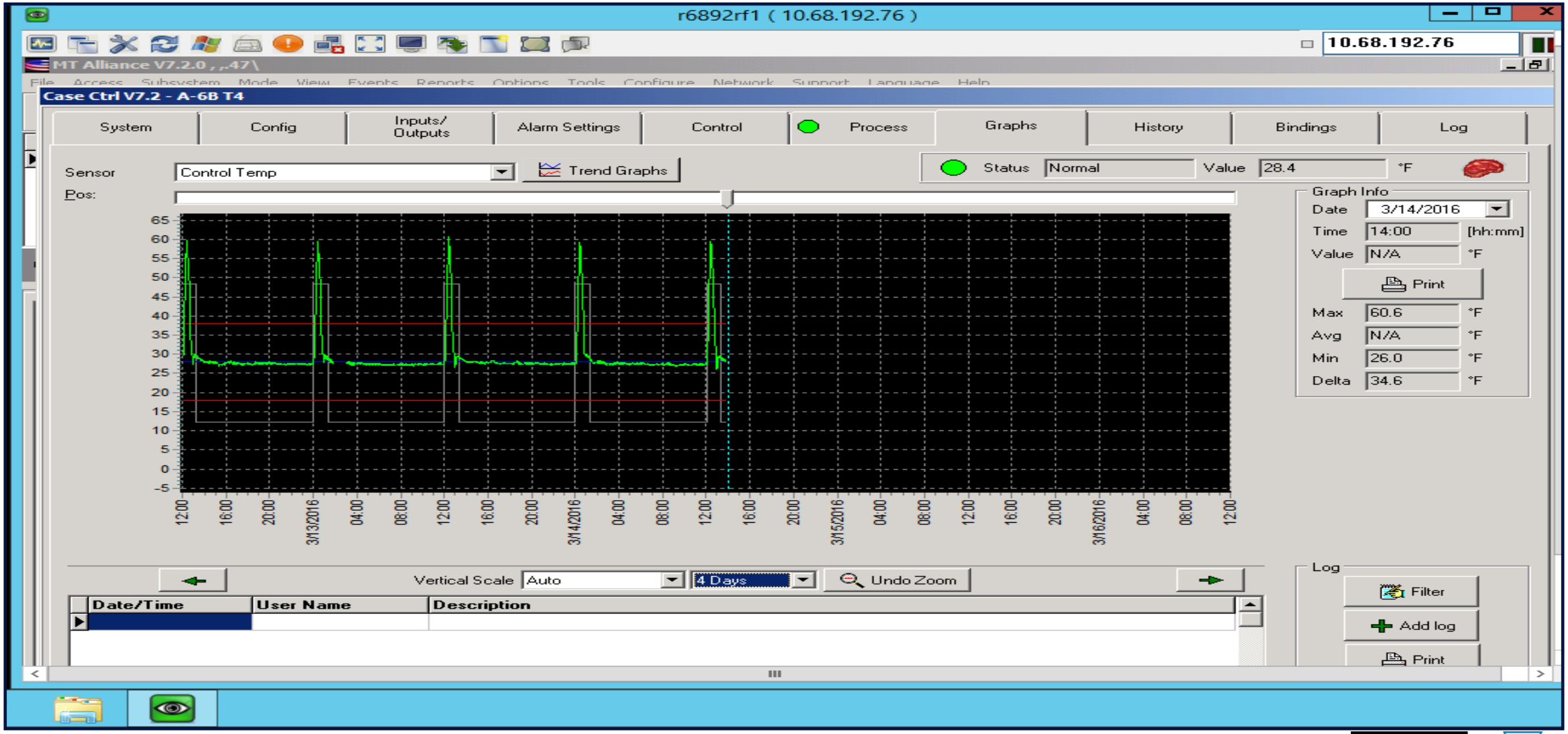
Control Tab



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO CASE CONTROLLER

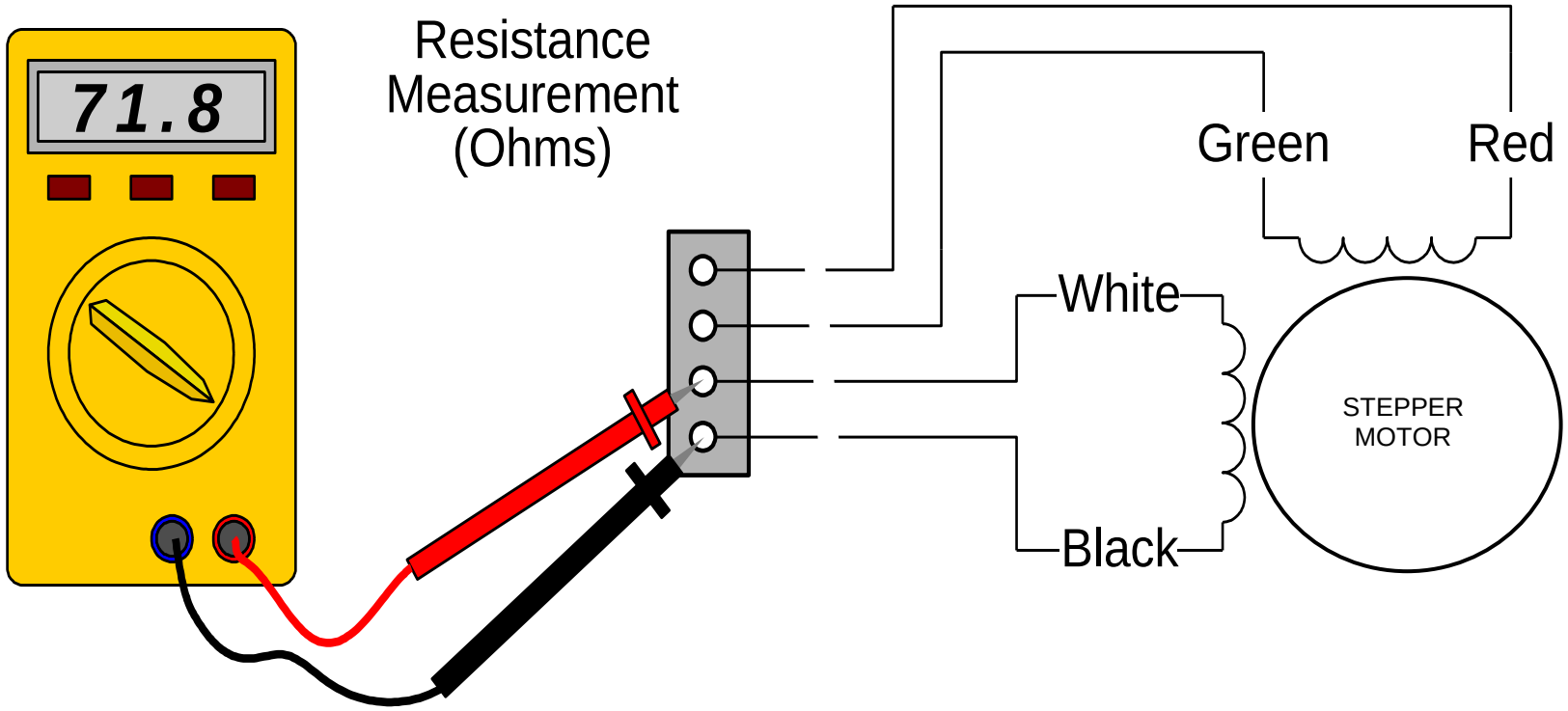
Graphs Tab



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

Checking an Electric Valve



Sporlan (SEI – SER – SEHI) : 75 or 100Ω nominal

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

NEW MT-700 Smart Nodes

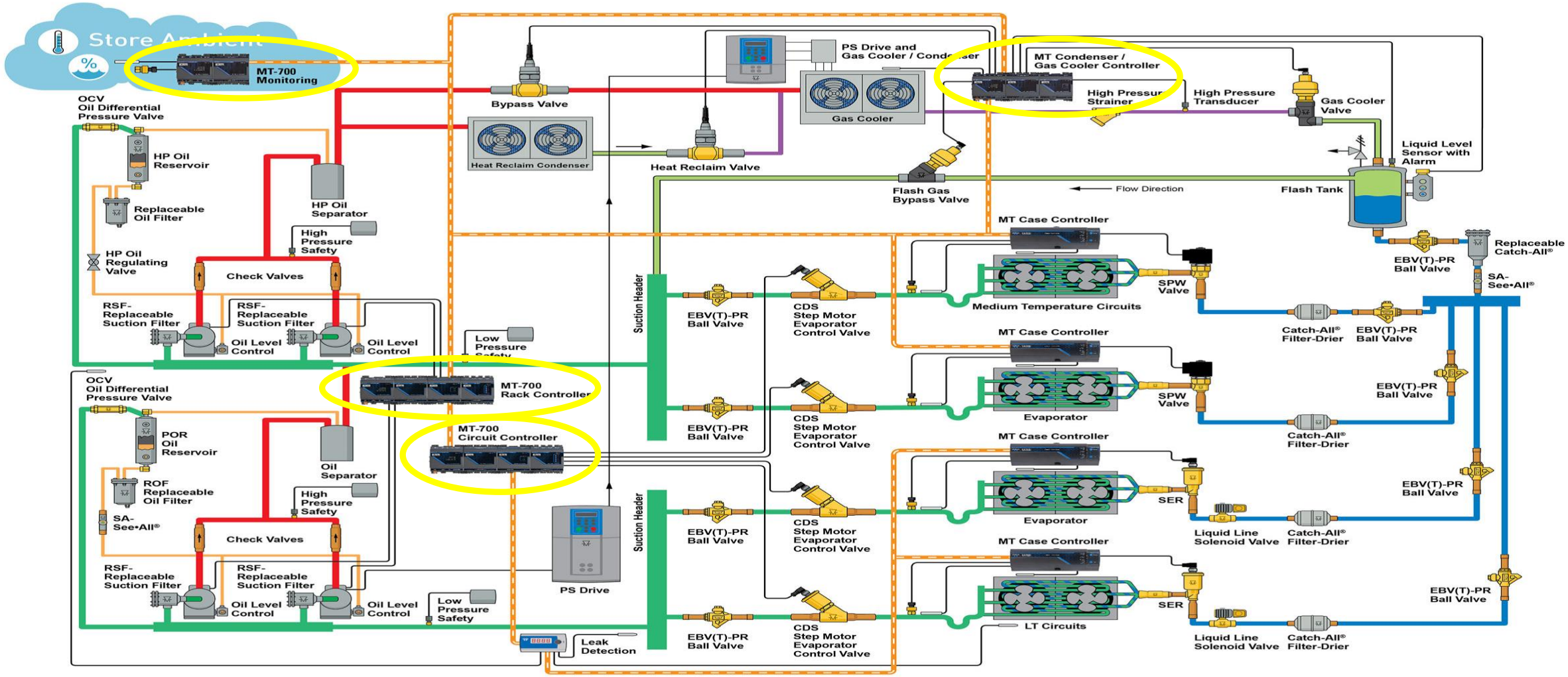
Customizable… adaptable …intelligent

- Each Smart-Train starts with MT-722F Brain
- Connect up to TEN additional Smart Nodes
- MT-784V
- MT-708R
- MT-748A
- MT-766A
- MT-716UI

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

NEW Suction Group and Circuit Controller



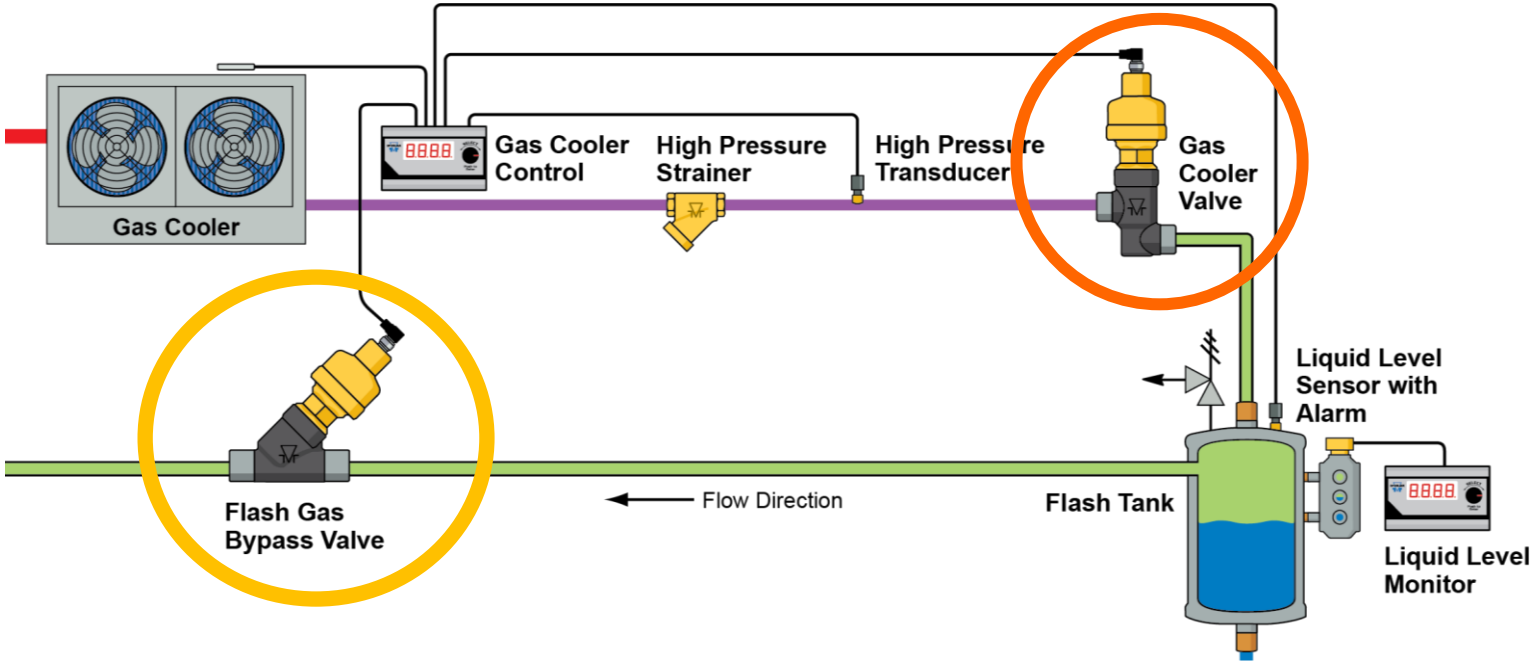
© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

Transcritical CO_2 Flow Controls

GAS COOLER & FGB Valves

- Located on the high-pressure side
- Regulates pressure in the condenser / gas cooler
- CO2 through the valve port drops in pressure …CO2 below Critical point
- FGB Valve maintains flash tank/receiver at an intermediate pressure



© 2023 Sporlan Division, Parker Hannifin Corporation

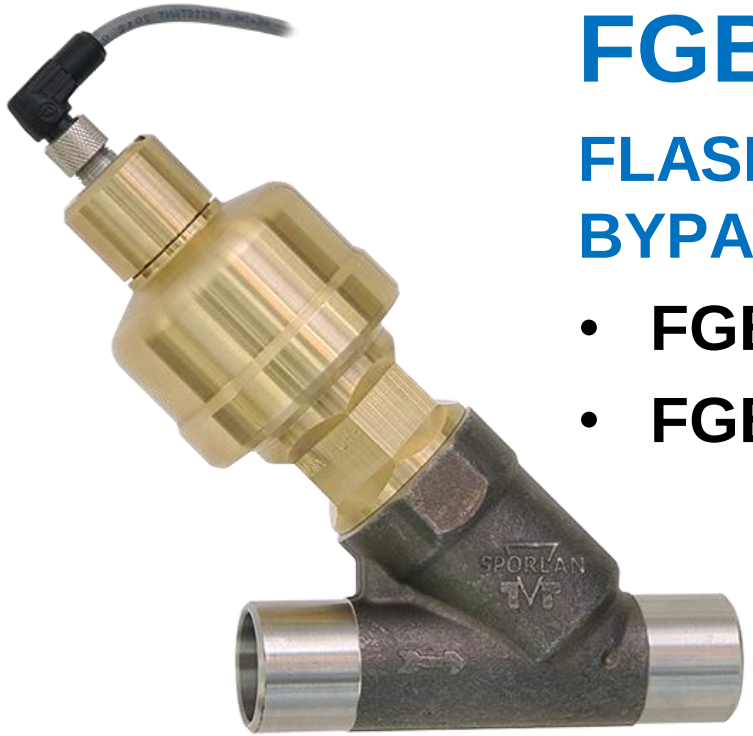
SPORLAN

Transcritical CO_2 Flow Controls

GC

GAS COOLER VALVE

- GC-10
- GC-20
- GC-30
- GC-40
- GC-50



FGB

FLASH GAS BYPASS VALVE

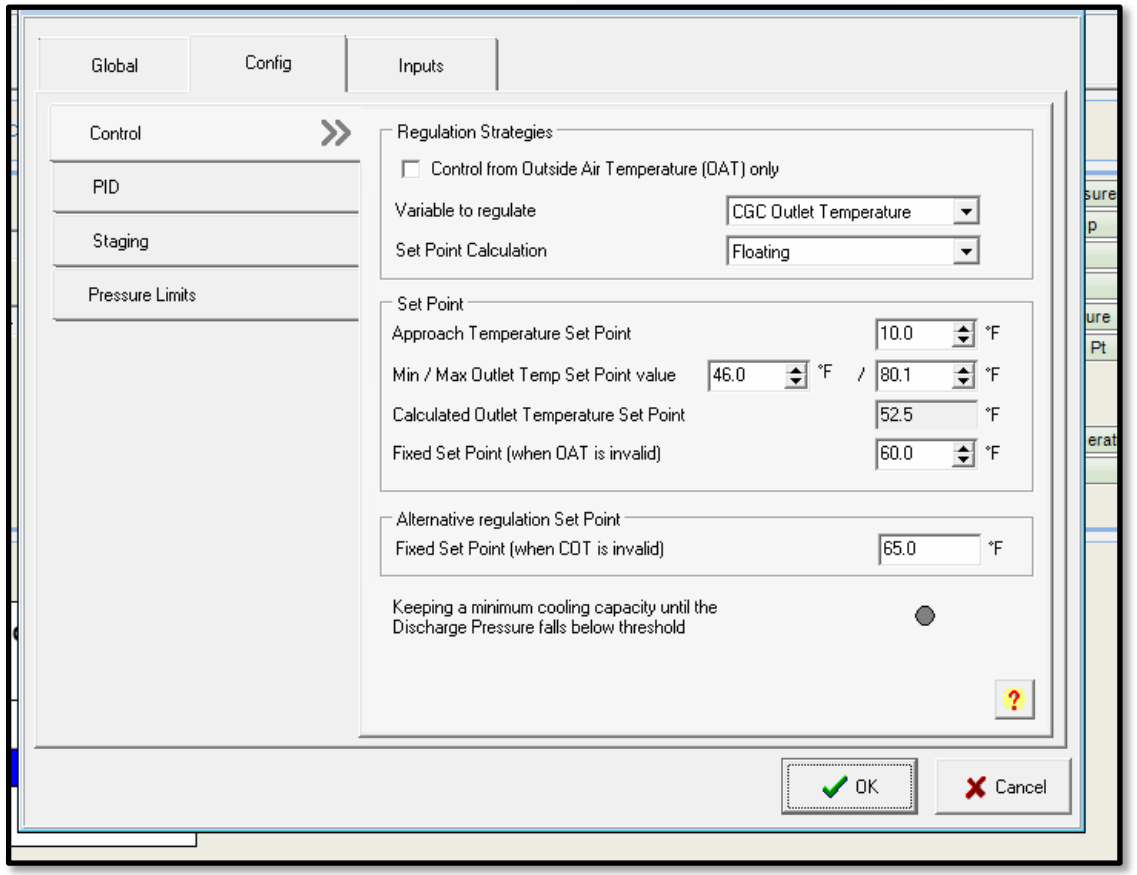
- FGB-60
- FGB-70

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

MT-700 Condenser / Gas Cooler Controller Train

- **3 Plug-In Tabs**
  - Global
  - Configuration
  - Inputs
- **4 Configuration Sub-Tabs**
- **Control**
- **PID**
- **Staging**
- **Pressure Limits**



© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO

MT-700 2 Valve Controller

- Flash Gas Bypass Control
- GC and FGB control
- Main Defrost Valve Control
- Electronic Replacement of A8 and A9 Valves
- CDS Valve Control
- Heat Reclaim Control

© 2023 Sporlan Division, Parker Hannifin Corporation

MICRO THERMO ALLIANCE

Graphical User Interface

Micro Thermo

Manages your entire chain, right from your desktop, laptop, tablet, or smartphone!

Leak Detection

Energy

Refrigeration

Lighting

Tº Monitoring

VFD

Generation

HVAC

© 2023 Sporlan Division, Parker Hannifin Corporation

Share Your Feedback!

To receive an electronic training certificate:

1. Scan or visit nasrc.org/session-surveys
2. Provide your name and email at the end of the survey

Please Note: *You will not receive a certificate unless you share your name on the survey form.*

Micro Thermo Alliance Application, Navigation, and On-board Tools

Charlie Cunliffe

Parker Hannifin, Sporlan Division

NORTH AMERICAN Sustainable Refrigeration Council