CONTROLS

Quantum™ HD Unity

System Controller and Energy Management Solution

Frick®
INDUSTRIAL REFRIGERATION

Quantum™ HD Unity.

System Controller And Energy Management Solution

The Quantum HD Unity System Controller and Energy Management Solution is your 24/7 Virtual Refrigeration Operator.

The Quantum HD Unity System Controller incorporates best refrigeration control practices with proven hardware and software for a reliable, easy-to-use central control system for Cold Storage and other similar refrigeration processes.

It's all in the name, "Unity!"

The Quantum HD Unity concept unifies multiple controllers to one display or multiple displays to one controller. Easily navigate from Engine Room control to Evaporator control to Condenser, Vessel or Compressor control from any one networked HMI. Quantum HD Unity easily integrates with any control system using standard industry communication protocols, and is scalable from a single item to system-wide control.

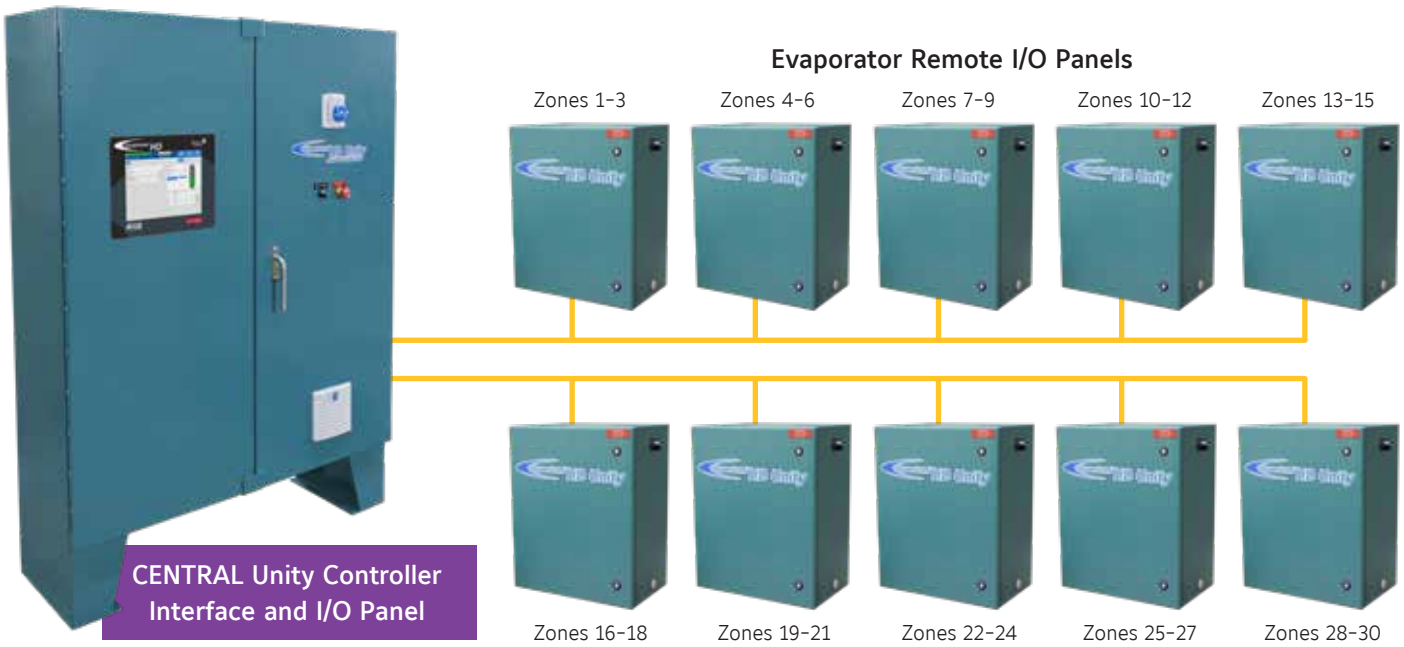
Frick understands the need for flexibility and offers this unique system control in both a centralized and a distributed approach.

This unique system control is offered in a **centralized** and a **distributed** approach.

Central Approach

In the **Central Approach**, the controllers for Evaporator, Condenser/Vessel and Engine room control along with the analog and digital I/O for the Condenser, Vessel and Engine Room Control are all located in the main Quantum HD Unity System Controller.

Due to the distributed nature of evaporators within a facility, the analog and digital I/O for the evaporators are in smaller remote mounted enclosures.



CENTRAL Unity Controller Interface and I/O Panel

Distributed Approach

In the **Distributed Approach**, the controllers for the evaporator, condenser/vessel and engine room control are located in a smaller interface panel.

The analog and digital boards for the evaporator, condenser, vessel and engine room control are located in dedicated remote I/O enclosures.

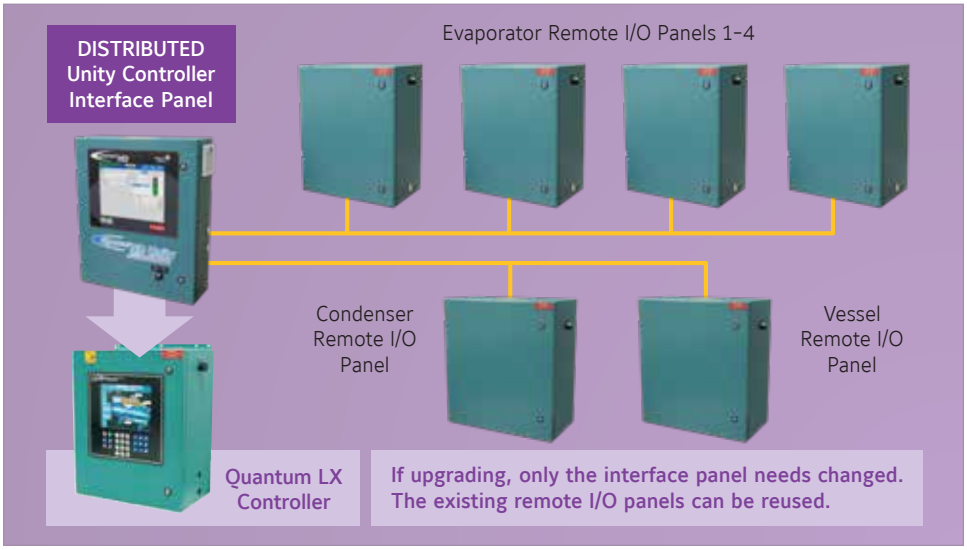
The distributed approach makes the application of the Quantum HD Unity system control more flexible under the following circumstances.

- Customer wants to build the system as needed over time
- Not enough space for the large Central panel
- Upgrading existing Quantum LX Q-net to Quantum HD Unity System Control

Retrofit Upgrade

Upgrade your existing **Quantum LX Q-Net systems** to **Quantum HD Unity system controls!**

Simply reuse the existing remote I/O panels and replace the existing Quantum LX interface panel(s) with the corresponding Quantum HD Unity Distributed Controller/ Interface.



CENTRAL APPROACH

Evaporator Remote Zones 1-3

Up to 30 evaporator controls zones using up to 10 remote evaporator panels.

Evaporator Remote Zones 4-6

Compressor panels are viewable from the main HMI.

Remote Access Via The World Wide Web

Multi-user remote access allows remote users to view any page of any controller independently of the local HMI screens.

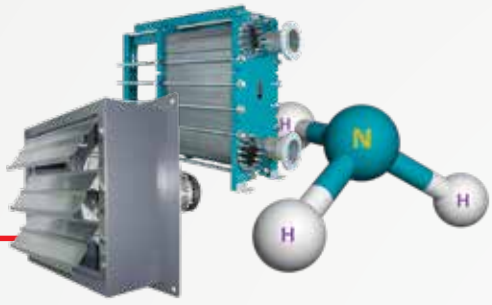
Quantum™ HD Unity
SYSTEM CONTROLLER

Up to 16 steps of control with 8 steps for VFD fan operation.

KEY

- Digital-Analog I/O
- Serial Comms
- Ethernet Comms

Up to 3 vessels with up to 4 pumps each. Level monitoring of 2 additional vessels available.



Engine room refrigerant detection, ventilation and underfloor warming.

DISTRIBUTED APPROACH

Evaporator Remote
Zones 1-3

Up to 30 evaporator controls zones using up to 10 remote evaporator panels.

Evaporator Remote
Zones 4-6

Remote Access Via
The World Wide Web

KEY

- Digital-Analog I/O
- Serial Comms
- Ethernet Comms

Quantum™ HD Unity
SYSTEM CONTROLLER

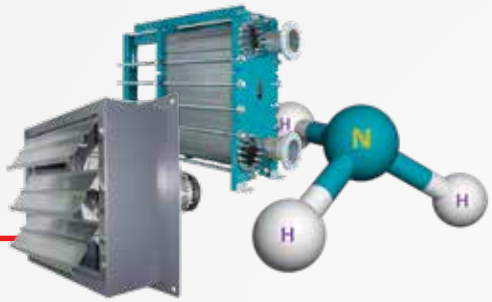
Condenser Remote

Up to 16 steps of control with 8 steps for VFD fan operation.

Vessel Remote

Up to 3 vessels with up to 4 pumps each. Level monitoring of 2 additional vessels available.

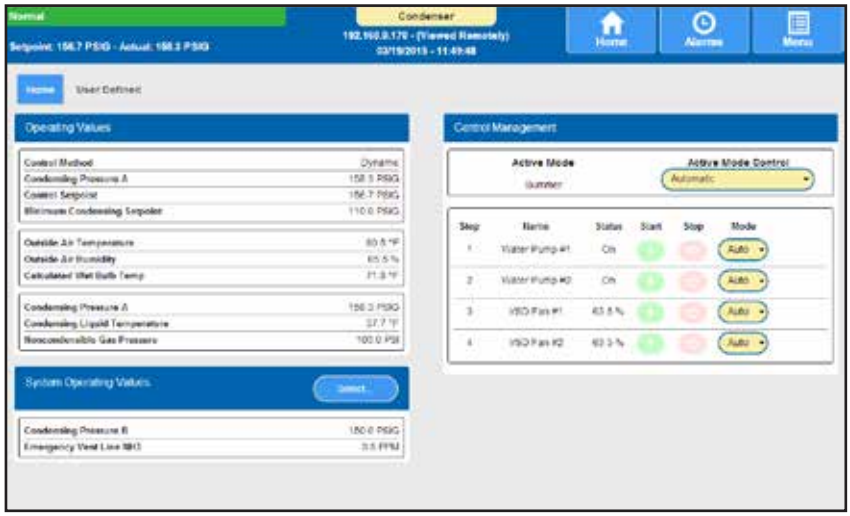
Engine Room Remote



Engine room refrigerant detection, ventilation and underfloor warming.

Condenser Control Features and Operation

- The condenser control allows the system to operate from a fixed setpoint or from an optimized dynamic setpoint that adjusts based on ambient conditions and the approach value of the condenser.
- Minimum Condensing and/or Alternate Pressure Control setpoints ensures adequate hot gas for defrost is always available.
- "Quick Step" setpoints react more quickly to system upset conditions than standard control setpoints.
- VSD fan ramping is selectable between "Ramp After All Steps Are On" or "Ramp After Each Step."
- Condensing Pressure A and Condensing Pressure B ensure seamless transition of control if a pressure sensor failure occurs.
- Non-condensible Gas Warning based on pressure, liquid temperature and refrigerant.



- Bleed Control manages the cycles of concentration or TDS levels in the condenser by periodically bleeding off water at a determined interval and duration.
- Condenser Override settings for High and Low pressure.
- E-stop interrupts all normally closed operation except Alarm and other critical control outputs.
- Field configurable analog and digital I/O expands the condenser control to control other more ancillary items.
- Field configurable Proportional/Integral control for modulating devices.
- HOA switches provided for each step of condenser control (up to 16).

Evaporator Control Features and Operation

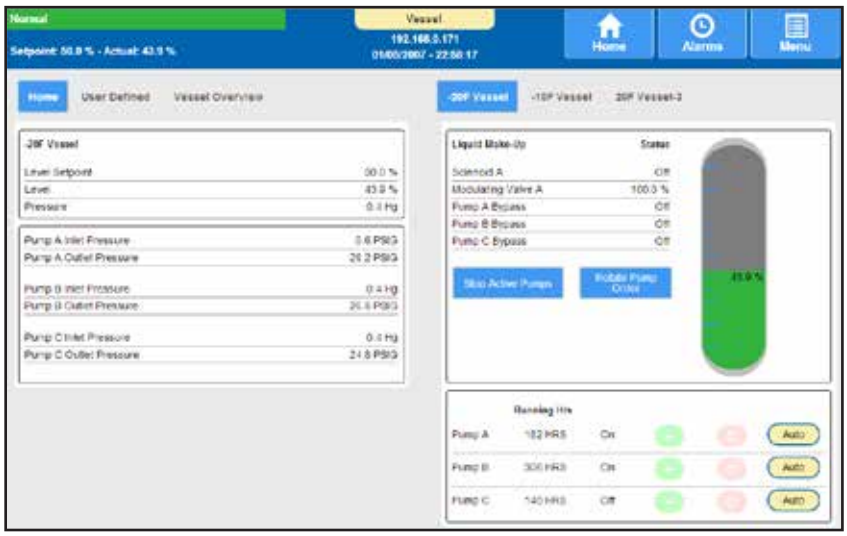
- Control up to 30 zones or valve stations
- Control up to 3 zones from one Remote I/O Panel.
- Evaporator control based on entering temperature, room temperature or a user-defined temperature
- In addition to cooling, other space conditioning features such as Heating, Re-Heat and De-humidification are available. Simply enable that feature
- Modulating control for both liquid and fan operation is included
- In the event of a power outage during defrost, the control always goes to the bleed step when power is returned (avoids possible vapor propelled liquid slugging).
- High and Low Evaporator pressure warnings are active during defrost.
- Defrost groups are available to manage the number of units that are in defrost at any one time.

- Fan cycling prevents stratification in the room by running the fans at a determined interval and duration when otherwise not needed.
- Load Shedding saves energy by turning off units or controlling to a higher temperature control setpoint. This can be configured to occur based on a set schedule, kW limitations, Schedule and kW Limitations or On Demand.
- Hourly operating/temperature reports per zone are generated daily and can be emailed
- The last 30 days of operating reports are always available to download to a USB drive
- HOA switches for each basic valve operation (optional).

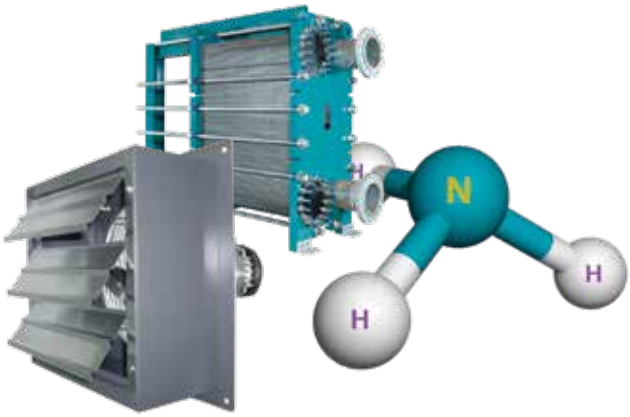
CONTROLS

Vessel Control Features and Operation

- Control for 3 vessels with up to 4 pumps each
- Analog and digital level control
- Modulating, solenoid or combination liquid makeup
- Control for 2 liquid makeup circuits
- High Level Safety from high level float switch
- Pump cavitation protection by monitoring the pump inlet and outlet pressure for low differential.
- Automatic pump restart after low differential shutdown based on a timed parameter. The number of restarts allowed in a 60 minute period is adjustable by the operator.
- Automatic pump bypass for minimum pump flow by monitoring the pump inlet and outlet pressure for high differential.
- Pump operation is selectable between Run With Compressors, Off On High Level or Run Continuously.
- High level control circuit with time delay relay per vessel avoids nuisance shutdowns and manages the stopping of all compressors associated with that vessel.



- Field configurable analog and digital I/O expands the vessel control to control other ancillary items.
- Field configurable Proportional/Integral control for modulating devices.
- E-stop interrupts all normally closed operation except Alarm and other critical control outputs.
- HOA switches provided for each pump.



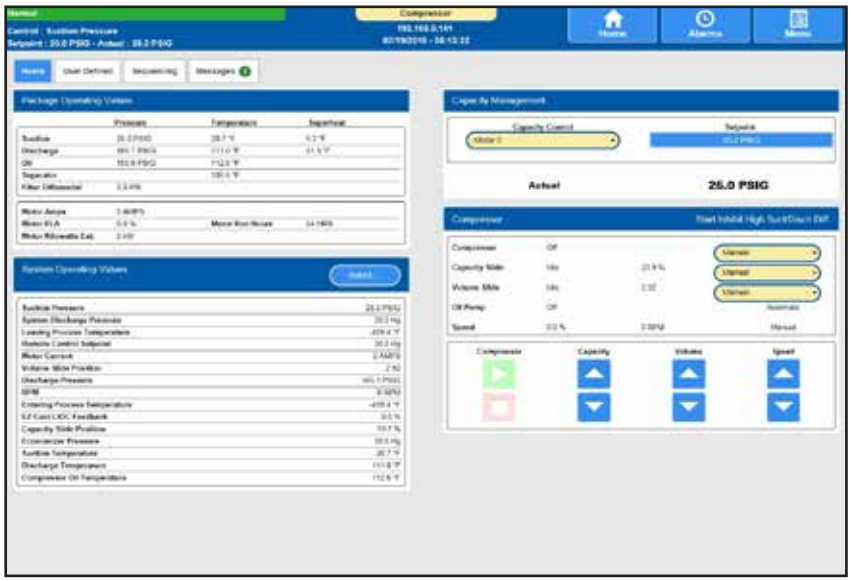
Engine Room Control Features and Operation

- Four (4) ventilation fan outputs for both temperature and air quality (refrigerant leak) control
- Each ventilation fan can be configured for VSD operation
- Four (4) Analog Ammonia (Refrigerant) Detection inputs
- Two (2) digital inputs for Refrigerant Warnings 1 & 2 from external devices
- Ammonia detection is tied directly to the ventilation control for normal and emergency ventilation requirements.
- Floor warming control (pumped glycol, electric or forced air)
- Glycol pump and glycol heating control based on glycol return and floor temperatures respectively.
- Emergency ventilation can be manually initiated and returned to Normal Ventilation with on screen button or digital input.
- HOA switches provided for each ventilation fan.
- Separate “Refrigerant Warning 1” and “Refrigerant Warning 2” alarms manage the level of urgency.

- “Refrigerant Warning 2” initiates emergency ventilation automatically.
- E-stop interrupts all normally closed operation except Ventilation Fans, Alarm and other critical control outputs.
- Control for up to 6 reciprocating compressors using local electro-mechanical safeties (analog inputs available for suction/process temp., discharge pressure and motor amps per compressor)
- Recips can be selected as standalone machines or as part of a system for basic sequencing control.

Compressor Control Features and Operation

- Widest applied compressor controller in Industrial Refrigeration
- Sequence up to 3 temperature levels with up to 8 compressors per level (screws or recips)
- Field configurable for the following
- Compressor Package (manufacturer)
- Compressor Block
- Oil Pump Type
- Refrigerant
- Drive Type
- Capacity Mode Control
- Communications Protocol
- Analog and Digital Auxiliaries
- Digital I/O (board and channel)
- Analog I/O (board, channel, sensor type and range)



Other Features...

- Historical and Real Time Trending
- Compressor Vibration Monitoring
- Motor Temperature Monitoring (stator and bearings)
- Retransmitting Analog Outputs
- User Action Tracking
- Up to 8 Proportional/Integral Control Loops
- Service Reminders
- Capacity Load Profiling
- Reciprocating Compressor Control

The field configurability of the Quantum HD controller makes it the most widely applied retrofit controller in Industrial Refrigeration.

This feature also allows Frick to respond to an emergency breakdown by shipping a replacement panel faster than anyone in the market...most times within 24 hours of receiving the order.

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