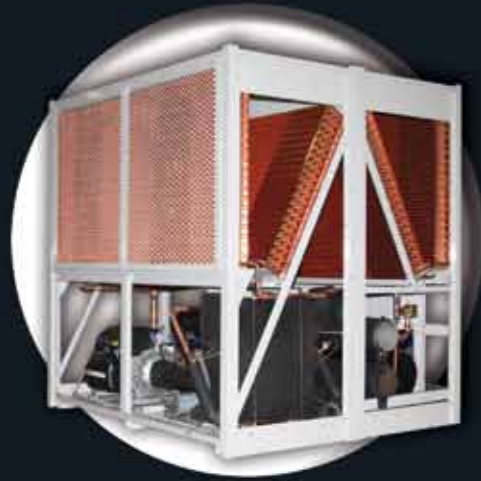


# |||<sup>®</sup> MULTISTACK<sup>®</sup>

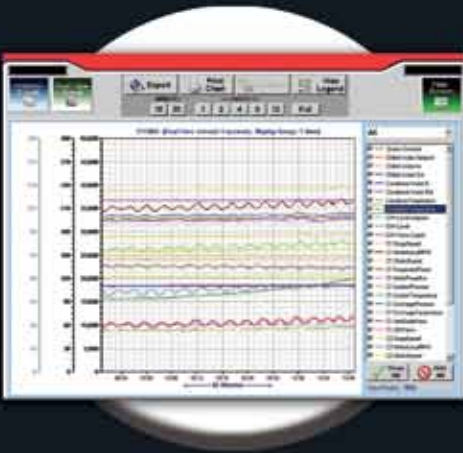
## FlexSys Controller



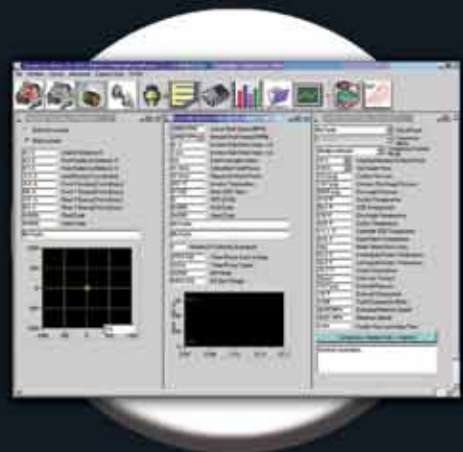
Originators. Innovators. Never the Imitators.<sup>SM</sup>



FlexSys Main Screen



FlexSys Trend Graphs



FlexSys DTC Monitoring Software

## Vision

In the new world of multiple compressor operation, the ability to adapt and tune both the compressors and the system is critical to achieving optimized performance in a broad spectrum of operating environments. To reach that goal has taken Multistack® four (4) years, a dedicated team of hardware, software, HVAC and MagLev™ Turbocor specialists to develop a flexible multiple compressor control capability that we call FlexSys.

The Multistack® vision for MagLev™ technology has not been limited to traditional flooded chillers but extends MagLev™ centrifugal technology to a variety of non-traditional Retrofit and OEM applications that are successfully addressing the energy and environmental demands of the 21st Century. FlexSys is a centerpiece component that is rapidly moving the Multistack® vision to reality.

## FlexSys Control

Flexible System Control (FlexSys) means that the same multiple compressor controller can be applied to Water-Cooled Flooded Chillers, Water-Cooled DX Chillers, Air-Cooled Flooded Chillers, Air Cooled DX Chillers, DX-Built-Up Systems, Modular Chillers, Dedicated Heat Recovery and a host of innovative applications that were never before possible. Flexible System Control also means that FlexSys can be engineered into Multistack® OEM products and cost effectively applied to in-field retrofit projects by specialty contractors affiliated with the Multistack® MagLev™ Retrofit Solutions Division.

## Picture This

Whether you are an on-site operator or Field Service Technician, the MagLev™ FlexSys control gives you finger tip access to all of the important operating and system information through a simplified, integrated 15" SVGA full color touch screen. No laptop computers, special programs or cables are needed to field commission, complete system tuning or initiate compressor and system diagnostics for either the system or the equipment to which FlexSys has been applied. **Picture This** . . . color coded alarm and fault notification with finger tip access to explanations, instantaneous or time lapse trending with finger tip access to user defined compressor and/or system graphing.

You'll have on-site finger tip access to Operations and Maintenance manuals, Service Manuals, wiring as well as your company's system schematics which can be loaded on to the FlexSys controller. **Picture This** . . . fault logging that features a calendar mode with the ability to sort by alarm type, time stamp or by individual compressor. Advanced trend graphing of over 200 system points to quickly and efficiently evaluate system performance.

## First-In-Class

The MagLev™ FlexSys Controller is built with first class components beginning with a high-resolution industrial grade PC, a windows based operating system, dual hard drive design, DC power, battery back-up, modular I/O design, LED indicator lights for all inputs and outputs, spring capture wire connections and dedicated Ethernet communication to all system compressors. All FlexSys enclosures are UL rated and built to NEMA 3R standard to allow for both indoor and outdoor applications. Dedicated RS-232 & RS-485 to each compressor, on-board industrial grade hard drives for data and built-in EXV drivers.

## BAS Flexibility

The MagLev FlexSys controller is open to all interactive BAS communications protocols including Modbus®, LonWorks® and BacNet®. These modules allow for easy, low cost connection to the building automation system of choice.

## MagLev™ EXV Control

Whether it's new, innovative Multistack® HVACR equipment or a new design/build retrofit project, precision refrigerant management is essential to reliable, peak system performance. The MagLev™ FlexSys controller introduces an EXV control option that is the new gold standard for controlling electronic expansion valves. Centralized touch-screen command allows the user to balance flow, meet start-up demands and supervise variable flow for up to 24 EXV's. Here are some key feature of this new, integrated approach to refrigerant management:

- Touch-Screen Configuration
- EXV's Linked via Ethernet Cable
- Pre-Fab Panel Controls Up To Four (4) Valves
- Kit Includes Four (4) Temp Sensors and Four (4) Transducers
- DC Power Means No Individual Transformers
- Functional With Danfoss or Sporlan Valves
- Level Sensor Kits are Available
- Control Using Superheat or Refrigerant Level

## 1-to-1 Technology

It is said that the best way to learn is 1-to-1 instruction . . . the same is true for controlling a computer that thinks it is a compressor. Multistack® has developed 1-to-1 technology—a means of isolating each compressor's communications, interlocks and safeties— while providing individualized compressor control. The MagLev Compressor Hub is the gateway to simplified, efficient service, field diagnostics and multiple compressor control. In the event that a system or compressor malfunction surfaces, compressor hubs prevent entire system “shutdowns” generated by common safeties or interlocks. This feature extends the value of multiple compressor redundancy to a new level of reliability. Our 1-to-1 technology permits automated compensation for differences in mass flow, manufacturing and software variances allowing FlexSys to locate individual compressor “sweet spots” to fully optimize efficiencies.

## Exceptional Energy Savings

Documented, sustainable energy savings and reductions in a facility's “carbon footprint” are deliverables that have been incorporated into our 21st century controller. A color coded “energy” bar continuously monitors compressor performance while both historical and instantaneous graphics are available to document compressor performance. FlexSys 1-to-1 technology now introduces the capability of blending individual compressors and their VFD performance into a “fine tuned” Multistack® unit or MagLev™ Retrofit Solution. Documented field studies have shown an additional energy savings of nearly 20% when compared to other Turbocor MagLev control systems.



FlexSys BAS Server



FlexSys EXV Controller



FlexSys Hub/EXV Enclosure





# Features

Multistack® has combined its industry leading experience with TurboCor MagLev technology to develop a control system that breaks down the barriers to fully optimizing the performance potential of this heralded MagLev technology. No other control system has successfully merged the fine tuning, communications and information management capabilities that are embedded in this controller. From its touch-screen interface, to its ground breaking service tools the Multistack® FlexSys controller fully de-mystifies the TurboCor MagLev technology for both equipment operators and field service technicians. Listed below are some of the key hardware and software features that set the Multistack® FlexSys controller in class by itself:

## Features—Software

The MagLev™ FlexSys Controller includes these unique software features:

- Control of up to eight (8) MagLev TurboCor compressors of varying capacities using either single or multiple circuits.
- On-site individual compressor and system “fine tuning” using the MagLev™ FlexSys touch-screen display panel.
- Proprietary MagLev™ FlexSys optimization logic maintains energy balances for all systems maximizing energy and operational performance.
- One (1) year data log, trend graphing in one-second intervals, as well as exportable images.
- Fault logging features a calendar mode with the ability to sort by alarm type, time stamp or by individual compressor.
- MagLev™ FlexSys can be reconfigured via the touch-screen for custom system integration of the compressors.
- MagLev™ FlexSys features on-board manuals, wiring diagrams and support data that are all accessible through the touch-screen panel.
- Built-in web interface provides full remote control including fault notification via e-mail.
- On-board DTC software eliminates the need for a service technician to carry a portable computing device.
- Full BAS connectivity including Modbus®, BacNet® and Lon®.
- MagLev™ FlexSys controller can manage up to 24 electronic expansion valves.

## Features—Hardware

Multistack® selected high-end, fail-safe hardware features:

- Windows based, on-board high resolution PC for maximum reliability and performance
- Dual hard drive design insures redundancy, reliability and eliminates the need for partitioning.
- Hard drives have no moving parts, eliminating the possibility of mechanical failure.
- 15-inch touch-screen display has 1024 x 768 resolution and an interface that eliminates the need for on-site laptop connectivity.
- DC Power ensures resistance to on-site EMI and RFI noise.
- On-board industrial grade battery back-up for power outage protection.
- Modular I/O design simplifies troubleshooting by utilizing LED indicators for all inputs and outputs
- Wiring uses spring capture technology assuring positive connections eliminating traditional terminal blocks.
- MagLev™ Hub System provides dedicated Ethernet communication to all system compressors ensuring fast, reliable communication.

# Control System Comparison



For purposes of comparison, we have outlined the capabilities of the two most common control systems in use today to control the operation of Turbocor MagLev compressors. In a side-by-side comparison here is how the Multistack® FlexSys Controller stacks up.

Control System Comparison			
Hardware Comparison			
Features	MagLev™ FlexSys Controller	Kiltech Controller	McQuay Microtech II
Modular I/O For Ease of Expansion	√	X	X
LED Indicators For Status Of All Inputs & Outputs	√	X	X
Computer Based Controller (As Opposed To PLC)	√	√	X
Intel Processor On Board	√	X	X
All Hardware DC Power (Less Susceptibility To EMI Noise)	√	X	X
Split Industrial Grade Hard Drives (2 GB Minimum)	√	X	X
Trend Data, Fault Logs, Alarms Can Be Downloaded Via USB	√	√	√
All Hardware CE And UL Approved	√	X	√
NEMA 3R Panels Standard	√	X	X
15 Inch Touch Screen	√	X	√
Built In EXV Drivers	√	√	X
Dedicated Ethernet Connection To Each Compressor	√	X	X
Dedicated RS-232 & RS-485 To Each Compressor	√	X	X
If Touch Screen Is Disconnected Or Fails, System Will Continue To Run	√	X	√
Compressor Hub Feature To Simplify Compressor Interfacing	√	X	X
Each Hub Has Independent HP/LP Mechanical Safeties (External of Comp Software)	√	X	X
Each Hub Has Its Own Interlock Circuit With Proof From Compressor	√	X	X
All Controller Hardware Features Spring Captured Terminals (No Loose Connections)	√	X	X

Software Comparison			
Features	MagLev™ FlexSys Controller	Kiltech Controller	McQuay Microtech II
FlexSys I/O Layout For Simplistic Customization (I/O Functionality)	√	X	X
System Runs Turbocor Software On-Board To Each Compressor	√	X	X
Capable of Controlling Mis-Matched Compressor Sizes	√	X	X
Capable of Controlling Different Refrigerant Types Simultaneously	√	X	X
Adaptive Compressor Logic Allows For Maximum System Reliability & Energy Savings	√	X	X
Able to Control up to 8 Compressors	√	X	X
Web control Standard On All Control Systems (Requires DSL or Mobile Broadband) No Authorization Required	√	X	X
User Selectable Interface For Main Screen, I/O, & Trend Graphing	√	X	X
All Trends, Faults And Alarms Can Be Remotely Downloaded	√	X	X
User Selectable I/O Function For Control	√	X	X
Tower Control Standard (Without Authorization Code)	√	X	√
Operating Manuals & Technical Documentation Stored In Controller	√	X	√
1 Year Of Trend Data Stored At 5 Second Intervals With Calender Recall Feature	√	X	X
Modbus TCP/IP Or RTU Server Standard For Bas Integration (No Authorization Required)	√	X	X
Compatible With Lon & BAC Net	√	√	√
Controller Logs Every Time A Setting Is Changed & Stores Data To Event Log	√	X	X
Controller Logs Over 200 Data Points (20 Points Per Compressor)	√	X	X
Controls Up To 24 EXV's From Touch Screen (Requires Maglev EXV Controller)	√	X	X
Color Coded Interface (Green = Good; Yellow = Alarm; Red = Fault) For Ease Of Troubleshooting	√	X	X
Control Settings & Can Be Saved, Recalled & Transferred	√	X	X
Ability To Give Specific Names To Controller, Compressor, Valves, I/O Points	√	√	√

√= Included

X= Not Available

# Applications



## Water Cooled

OEM Chiller



Retrofit

## Air Cooled

OEM Chiller



Retrofit

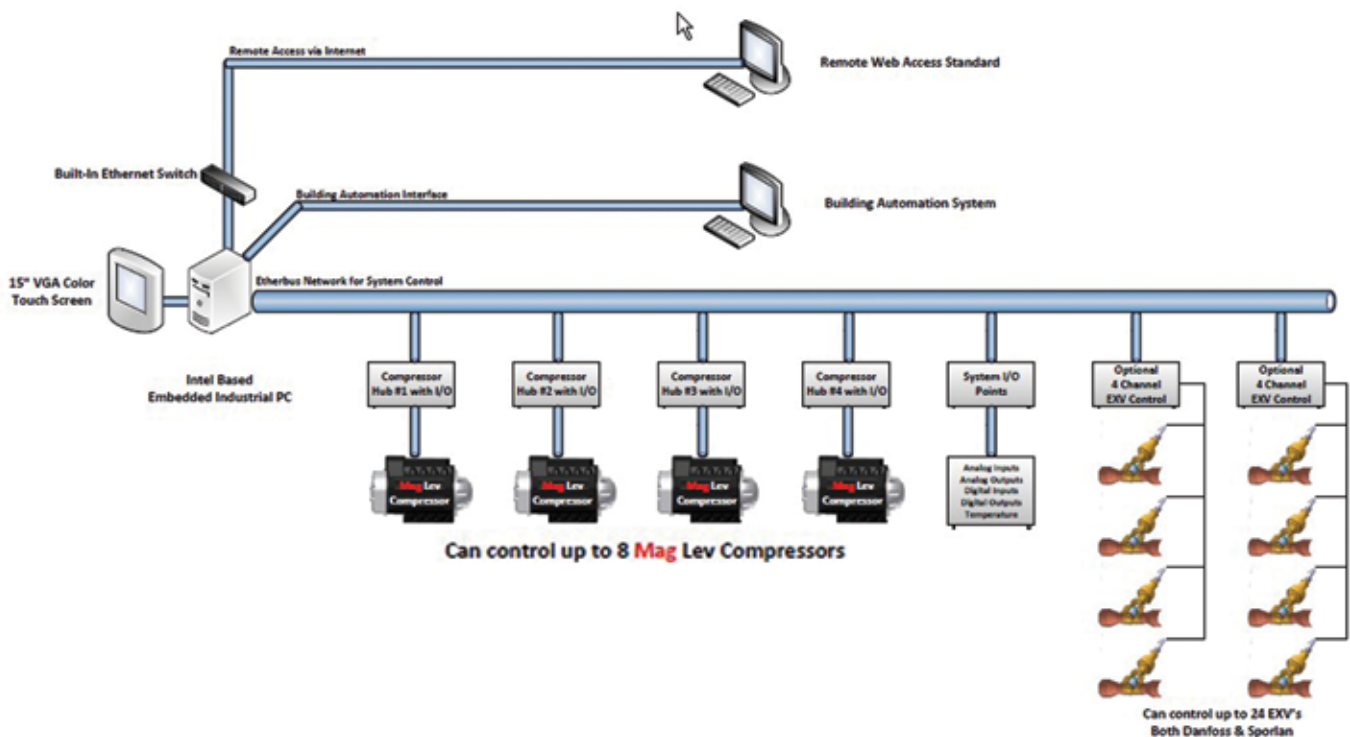
## DX Chillers Built-Up DX OEM/Retrofit



MagLev FlexSys will be a cornerstone technology for the Next Generation of 21st Century HVACR OEM equipment and Retrofit applications to include:

- Large Tonnage VRF
- Liquid Overfeed
- Simultaneous Heating and cooling
- Large Tonnage Package Cooling Unit

## MagLev FlexSys Controller - Typical System Architecture



# First-in-Class Enclosures



- 15" SVGA Touch - Screen
- Windows™ based Operating System
- Color Coded Operating Status
- Finger-tip Accessible Trend Graphing



- Industrial Grade PC
- LED Lights for I/O's
- Industrial Grade Hard Drives
- Full Ethernet Communications



- All Enclosures are NEMA 3R Rated
- Fully Separated HUB and Power Panel
- Industrial Grade Battery Back-Up



- Fully Vented Power Panel
- Plug and Play Field Installation
- Modular Designed Enclosures



In the new world of multiple compressor operation, the ability to adapt and tune both the compressors and the system is critical to achieving optimized performance in a broad spectrum of operating environments. Flexible System Control (FlexSys) means that the same multiple compressor controller can be applied to Water-Cooled Flooded Chillers, DX Chillers, Air-Cooled Chillers, Packaged Units, DX Built-Up Systems as well as a host of innovative applications never before possible. Flexible System Control also means that MagLev™ FlexSys control can be engineered into Multistack® OEM products and cost effectively applied to in-field retrofit projects by specialty contractors affiliated with the Multistack® MagLev™ Retrofit Solutions Division.

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#101-01 Equipment Values							
Alarm Shutdown	0.0	1	0.0	100.0	0.0	Digital Input	0.000
Emergency Stop	0.0	2	0.0	100.0	0.0	Digital Input	0.000
Air Flow Panel Circuit #1	0.0	3	0.0	100.0	0.0	Digital Input	0.000
Air Flow Panel Circuit #2	0.0	4	0.0	100.0	0.0	Digital Input	0.000
Circuit #1 VFD Status	0.0	5	0.0	100.0	0.0	Digital Input	0.000
Circuit #2 VFD Status	0.0	6	0.0	100.0	0.0	Digital Input	0.000
Circuit #1 VFD Fault	0.0	7	0.0	100.0	0.0	Digital Input	0.000
Circuit #2 VFD Fault	0.0	8	0.0	100.0	0.0	Digital Input	0.000
Change #1 Low Pressure	0.0	9	0.0	100.0	0.0	Digital Input	0.000
Change #1 High Pressure	0.0	10	0.0	100.0	0.0	Digital Input	0.000
Alarm	0.0	11	0.0	100.0	0.0	Digital Input	0.000
Reset	0.0	12	0.0	100.0	0.0	Digital Input	0.000
Change #2 Low Pressure	0.0	13	0.0	100.0	0.0	Digital Input	0.000

Time	Value	Unit	Status
01/01/2010 10:00:00	100.0	Hz	OK
01/01/2010 10:00:01	100.0	Hz	OK
01/01/2010 10:00:02	100.0	Hz	OK
01/01/2010 10:00:03	100.0	Hz	OK
01/01/2010 10:00:04	100.0	Hz	OK
01/01/2010 10:00:05	100.0	Hz	OK
01/01/2010 10:00:06	100.0	Hz	OK
01/01/2010 10:00:07	100.0	Hz	OK
01/01/2010 10:00:08	100.0	Hz	OK
01/01/2010 10:00:09	100.0	Hz	OK
01/01/2010 10:00:10	100.0	Hz	OK

Time	Message	Priority
01/01/2010 10:00:00	System Start	Info
01/01/2010 10:00:01	Compressor #1 Start	Info
01/01/2010 10:00:02	Compressor #2 Start	Info
01/01/2010 10:00:03	System Pressure Normal	Info
01/01/2010 10:00:04	Compressor #1 Stop	Info
01/01/2010 10:00:05	Compressor #2 Stop	Info
01/01/2010 10:00:06	System Pressure Low	Warn
01/01/2010 10:00:07	Compressor #1 Start	Info
01/01/2010 10:00:08	Compressor #2 Start	Info
01/01/2010 10:00:09	System Pressure Normal	Info
01/01/2010 10:00:10	System Stop	Info



M100PDC0809

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