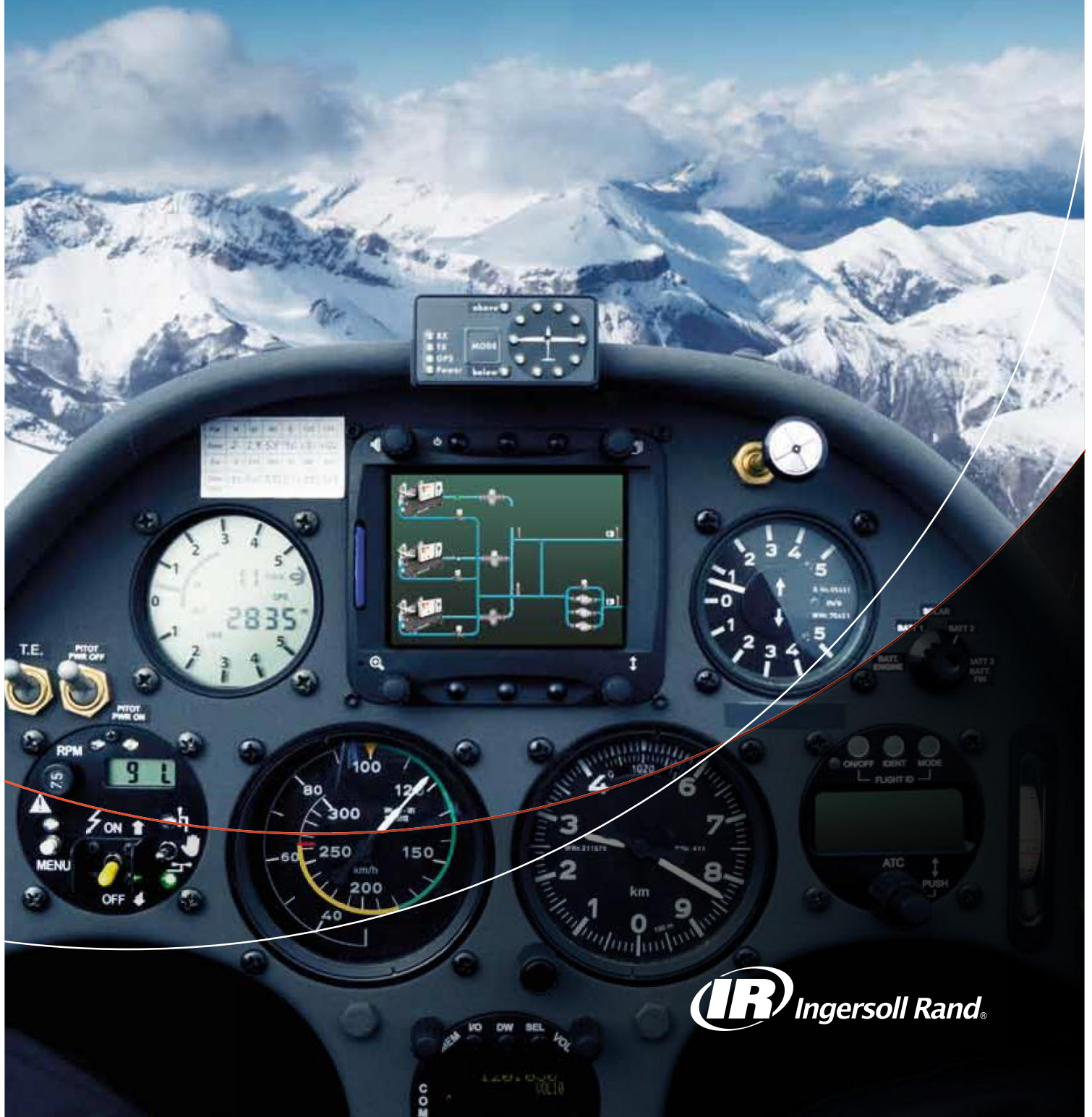




Chiller Plant Controls

Intuitive real-time management



Take control of your chiller plant

Rising energy costs and operational conditions drive companies to seek greater returns from investments; in other words, get more with less. Additional pressures such as environmental and safety regulations force companies to remain vigilant in managing capital, human resources and infrastructure.

According to the European Commission's Joint Research Centre (EC JRC), heating, ventilation and air-conditioning systems constitute 11% of electrical energy consumption in the 27 EU member states. Chiller plants can consume over 7% of typical building energy consumption.

Budget Allocations

Companies working with reduced budgets find it increasingly difficult to approve funding for capital investment projects. In the drive to reduce costs, system maintenance may be cut.

Operating Costs

Running a cooling system is one of the most significant costs on any operating budget. It is extremely challenging to keep this expenditure flat, year on year, when the cost of energy is rising relentlessly.

Performance Targets

Ever-increasing targets demand that facilities operate more efficiently, more effectively and for longer hours. The resultant pressure on the chiller plant may lead to increased operating costs or reduced performance.

Regulations

Environmental initiatives demand sustainable operation. In many sectors such as food or pharmaceuticals, further traceability is a regulatory requirement.





Advancing from control to optimization

With appropriate controls, optimal performance of the chiller plant can be achieved, resulting in increased system efficiency and reduced lifecycle costs. Trane's unparalleled knowledge of commercial cooling systems has produced the following range of advanced control solutions:

Chilled Water Reset

Most chillers produce the same water temperature throughout the year regardless of seasonal changes in cooling load. Trane's solution optimizes chiller performance by tracking these changes and adjusting the chilled water set-point to improve chiller efficiency.

Chiller Plant Sequencer

Where installations use two air-cooled chillers, they often operate at much less than full load, and in some cases at only 50%. Trane Chiller Plant Sequencer will match the number of chillers in operation to the cooling requirements at any given time to substantially reduce run times.

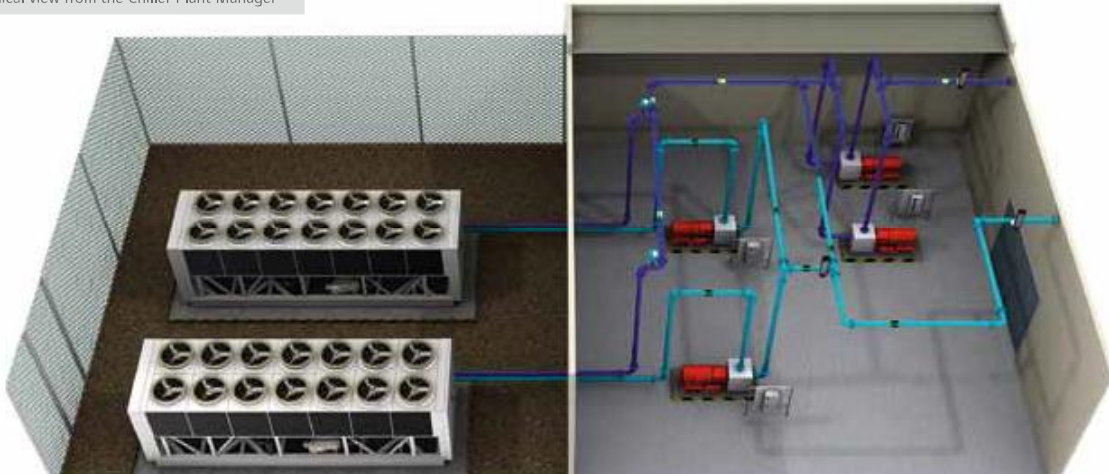
Chiller Plant Manager

Trane Chiller Plant Manager ensures that only the required plant components operate at their most efficient point to minimize run times. Trane's advanced supervisory system will reduce operating costs by balancing component run times and will notify users when scheduled maintenance is required.

Chiller Plant Optimizer

Trane's most advanced controls solution takes a holistic view of the plant, optimizing operation of the complete system. The Chiller Plant Optimizer provides a comprehensive dashboard view enabling control at your fingertips and prompt action to address operational deviations.

Graphical view from the Chiller Plant Manager



Chilled Water Reset

This control solution consists in raising the set-point temperature when the building operates at less than design load conditions. Producing chilled water at a higher temperature lowers the burden on the compressor, which reduces the energy consumption. Up to four chillers can be controlled with this solution. It is ideally suited to deliver comfort in office buildings where dehumidification is not a requirement.

FEATURES	FUNCTION
Chilled Water Reset	Matches plant operation with prevailing conditions, reducing annual energy consumption by 3 to 10%.
Chiller Scheduling (optional)	Initiates chiller operation at a specific time of day to amplify energy savings and reduce compressor wear.

The proof is in the savings

Longer Equipment Lifetime

The Chilled Water Reset solution reduces work for the compressor, reducing wear and increasing component life.

Reduced Operating Costs

Each degree (C°) increase in the chilled water temperature reduces the energy consumption by approximately 3%. Annual consumption can be reduced by up to 10%.

CASE STUDY

Customer Challenge

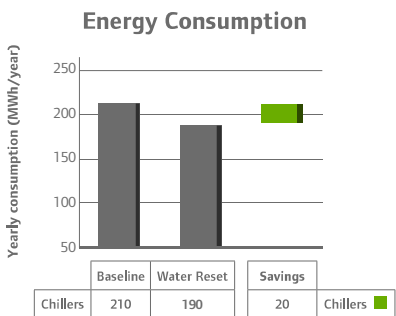
An 8 000m² office in Nice operates two 320kW chillers for eight months a year for air conditioning. Savings in energy consumption and a reduced carbon footprint were sought.

Trane Solution

Trane Chilled Water Reset solution perfectly fitted the needs of the constant flow design application with chillers operating at warmer supply temperature at low load.

Benefits Achieved

- Increased chiller efficiency.
- A 16 500kWh reduction in annual energy consumption.
- Annual utility savings of 9% on chiller usage.



Chiller Plant Sequencer

Trane Chiller Plant Sequencer is the customized control solution for comfort cooling installations with two air-cooled chillers of the same size in small buildings and commercial spaces. Based on the chilled water demand, it will limit chiller operation and its associated auxiliary equipment thus reducing operating costs. A touch screen display allows you to monitor and control key operating parameters.

FEATURES	FUNCTION
Chiller Scheduling	Initiates chiller operation at a specific time of the day to amplify energy savings and reduce compressor wear.
Demand Limiting	Allows user to run no more than one chiller, independent of the load, when current draw needs to be limited.
Soft Start	Prevents excess capacity from being brought online at start up.
Chiller Rotation	Equalizes chiller operating time.
Communication Capability	Allows the sharing of data with Building Management System over BACnet™ MSTP.

The proof is in the savings

Lower Installation Costs

The Sequencer is a set of components that can easily be field mounted.

Increased Reliability

Component life is increased as a result of reduced run times.

Reduced Operating Costs

Less run time means 15% or more reduction in energy consumption and correspondingly reduced operating costs.

Attractive Payback

A rapid return on investment can be achieved in less than two years for an average size office building.

CASE STUDY

Customer Challenge

An international company with offices and integrated server rooms located in London was seeking to reduce operating costs while retaining sufficient year-round cooling capacity.

Trane Solution

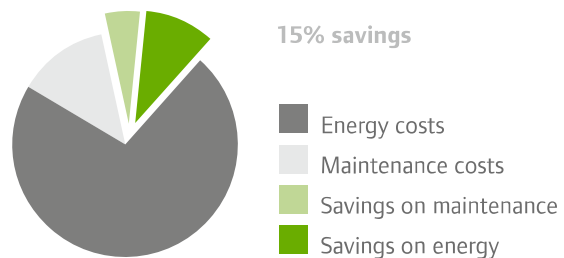
Chiller plant sequencing to limit operation of the chiller and auxiliary equipment based on the chilled water demand.

Benefits Achieved

- A reduction in pump consumption.
- Increased chiller efficiency at low cooling demand.
- Annual operating cost savings of 15%.



Operating Cost Savings



Chiller Plant Manager

Trane Chiller Plant Manager is an advanced control solution recommended for chiller plant applications with multiple chillers. System components must work in harmony to maximize comfort, compliance and performance. In addition to controlling the chillers, the Chiller Plant Manager also controls and sequences all components of the chiller plant.

FEATURES	FUNCTION
Low Ambient Lock-out	Prevents the plant from operating below a preset external ambient temperature.
Failure Recovery Management	Automatically starts the next chiller in the sequence if one in operation fails.
Advanced System Control	Ensures only the required components are operating to meet a system load.
Programmed Maintenance	Advises when maintenance is due, based on elapsed time or run time.
Remote Operation	Provides browser and application support for both tablets and mobile phones.
Remote Alarming	Generates customizable alarms and delivers notification via email.
Data Trending	Displays key trends graphically for rapid interpretation and generates trend logs.

The proof is in the savings

Reduced Energy Costs

By balancing the optimal number of chillers against the load, system efficiency is improved and component run time reduced, resulting in less energy consumption and less operating costs. Savings of up to 20% are typical.

Easy Performance Management

The Chiller Plant Manager allows you to easily control,

operate and maintain your chiller plant management's overall system. With features such as Data Trending, facility managers can track and establish repeatable best practices to manage multiple facilities.

Reduced Downtime

Failure Recovery Management switches operation from a failed chiller or component to the next one in the sequence. Faster response and fault resolution times are achieved with e-mail notification generated by Remote Alarming.

CASE STUDY

Customer Challenge

A Frankfurt based Data Center wanted to reduce the annual energy costs of its three 700kW air cooled chillers.

Trane Solution

After conducting simulation, Trane demonstrated potential savings from Free Cooling capability system upgrade and retrofit of outdated equipment into a comprehensive cooling plant controlled by Trane Chiller Plant Manager.

Benefits Achieved

- More than 20% reduction of the annual operating costs used for cooling
- Complete facility visualization, with a web based interface allowing easy viewing, control and troubleshooting of the system from anywhere.



Chiller Plant Optimizer

Trane Chiller Plant Optimizer is a fully scalable and adaptable control solution that can optimize the performance of the chiller plant. This control solution provides additional management data with customizable management dashboards.

FEATURES	FUNCTION
Chiller/Cooling Tower Optimization	Calculates the optimal condenser water temperature to minimize energy usage.
Pump Pressure Optimization	Calculates the minimum pressure the pumps must deliver to satisfy the most demanding load.
Special Applications	Capable of controlling advanced functions including Free Cooling, Heat Recovery or Thermal Storage.
Scalability	The Optimizer is fully scalable to meet the demands of the most complex installation.
Dashboard	Monitors system performance.

The proof is in the savings

The Chiller Plant Optimizer supports multiple energy saving strategies and provides detailed performance reporting.

Reduced Energy and Operating Costs

Improved system efficiency results from the optimization of system components. Plant performance trending provides continuous monitoring of plant efficiency. In addition to reduced operating hours saving component wear and tear, proactive maintenance reduces costs by scheduling interventions only when required.

Improved Sustainability

The Chiller Plant Optimizer allows you to sustain the performance of the chiller plant infrastructure or of the building lifecycle. The intelligence gained from the system provides ways to manage your environmental footprint.

Demonstrated Performance

Detailed dashboards permit accurate monitoring of system performance and enable proactive maintenance. Faster response and quick resolution times can be achieved with email notification generated by Remote Alarming.

CASE STUDY

Customer Challenge

An international company headquarters located in the centre of Dubai wanted to improve the operation of the building's chiller plant infrastructure. The customer was looking for a solution where reliability and visibility are key.



Trane Solution

The facility's three 8 000kW water cooled chillers controlled with Trane Chiller Plant Optimizer to control and sequence system components with remote control capabilities.

Benefits Achieved

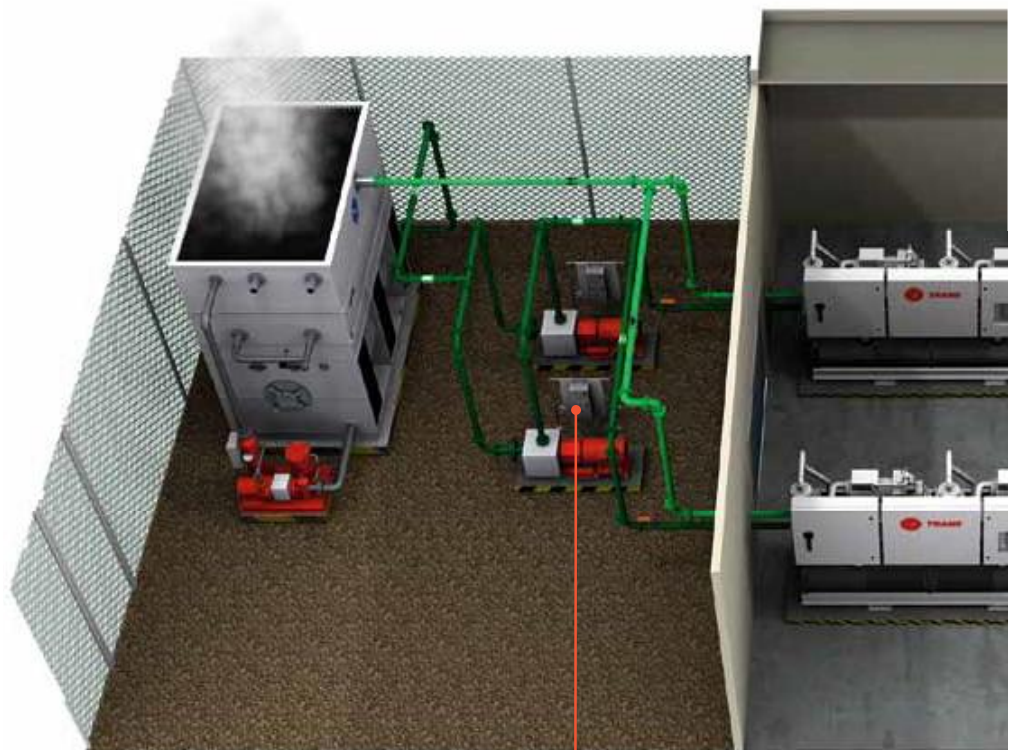
- Operating costs lowered by 25%.
- Full Chiller Plant visibility with customized dashboards to track key performance indicators
- Dynamic trending enables the customer to analyze issues, identify root causes and take actions to avoid downtime
- Remote Operation and Alarming capability via mobile devices.

Trane Chiller Plant Controls Architecture

Trane Chiller Plant Controls architecture is built around core high technology components. Our control technologies are scalable for water-cooled or air-cooled chiller plant infrastructures.



Graphical Control Dashboard



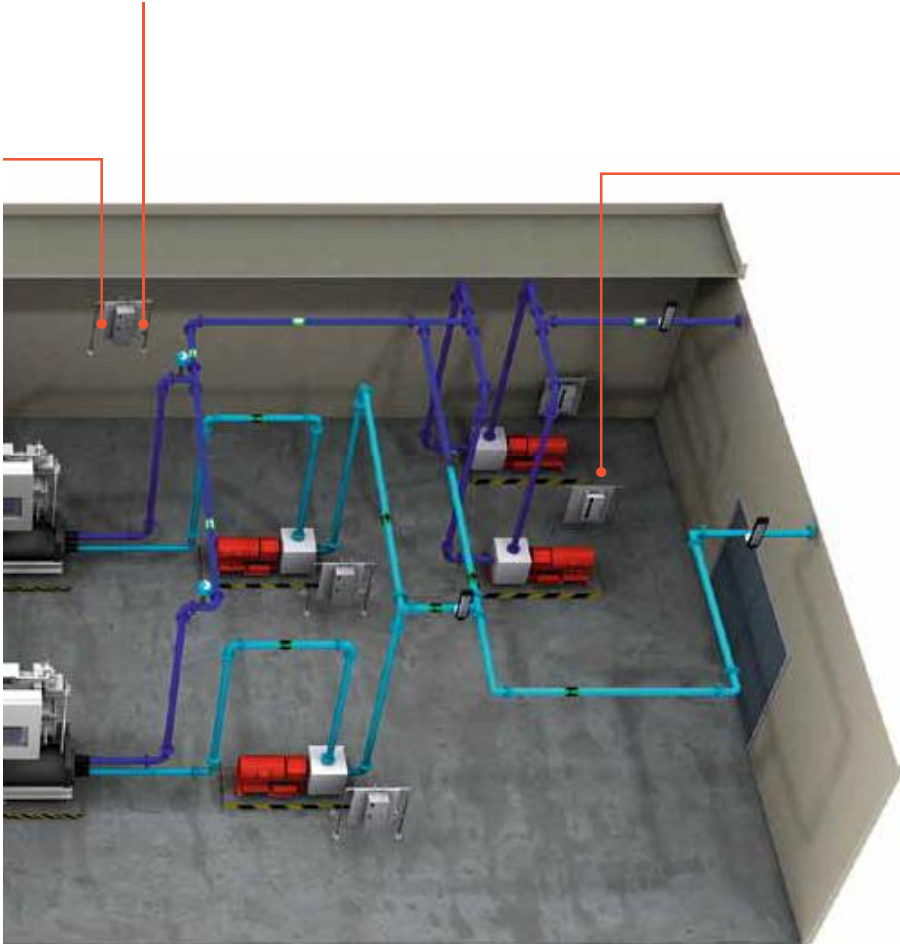
Tracer™ UC600 Programmable Controller

A programmable BACnet unit controller designed to work with the Tracer SC and third-party BACnet MS/TP systems. The UC600 has the I/O and size to meet the controls needs for multiple pump arrangements, cooling towers, dry coolers and central plants.



Tracer™ SC System Controller

Allows you to streamline facility management without reinventing the entire system. Adding Tracer SC to your system provides a flexible, cost effective solution for programming and managing chiller plants that can extend to any HVAC equipment. Accessible from any PC, tablet or connected device, Tracer SC eliminates the need for a dedicated computer and monitor, so you can manage system performance whenever, wherever it is convenient.



Tracer™ UC400 Programmable Controller

Tracer UC400 is an ideal solution when special sequences are required. Standard software applications come preloaded at the factory, simplifying field installation.



Tracer™ TD7 Color Touch Screen Display

A 7 inch diagonal color touch screen designed for both indoor and outdoor use. This visually intuitive solution makes it quicker and easier than ever to access the reliable control offered by the Tracer UC600.

Built on BACnet®

Tracer controls are built on the open BACnet® data communication protocol. Install Trane Tracer controls today, and you're ready for the future integration of additional building automation devices, from both Trane and other suppliers.

Expertise at your fingertips

From initial system design to operation and maintenance, Trane has the expertise to provide the support you need throughout the lifecycle of your building.

The Trane Advantage

Trane is recognized as a world leader in HVAC systems with over 100 years of extensive knowledge of how buildings work. Trane solutions optimize indoor environments with a broad portfolio of energy efficient heating, ventilating and air conditioning systems, building services, parts support and advanced controls.

For Trane, a control solution goes far beyond automation of the chiller plant. It responds to the needs of individual components, addresses inherent anomalies and ensures totally coordinated operation. Optimized system performance results in increased comfort and security, coupled with reduced costs of ownership and operation.

Mobile Control

The Tracer™ BAS Operator Suite provides mobile apps that allow you to monitor and manage buildings from virtually anywhere, giving you greater freedom and peace of mind.

- Monitor equipment and systems performance. Graphics and animations make it easy to assess the state of your systems.
- View active and historic system alarms, assess their severity, determine the cause and add notes for others to see.
- Take action! Respond to hot/cold calls by adjusting set-points and overriding equipment and occupancy.

The Tracer BAS Operator Suite works with iPhone®, iPod touch®, iPad® and Android™ devices.



Peace of mind for optimized building management

Your building is a complex, inter-related set of systems. Over time lots of small changes can cause major shifts in comfort, efficiency and safety levels. Trane maintenance for chiller plant control systems is your strategy to keep everything optimized.



Trane Intelligent Services (TIS)

Day to day, Trane can monitor your building's data and automatically alert your personnel when temperature, pressure or energy use deviate from your desired parameters.

Our technology-enabled services are delivered through a combination of Trane technology, proprietary analytics and our deep industry knowledge. Your building's data, generated and transmitted by Trane or non-Trane controls and conveyed to us via Tracer SC, provides the basis for TIS support.

Our technicians can diagnose and even repair minor issues remotely, before they develop into major events. TIS also features a process for continuous improvement. Trane analysts can use your building's data to identify (and help you prioritize) potential upgrades that will establish and sustain conditions that are energy efficient, cost effective and conducive to productivity—the hallmarks of high performance buildings.

Local Service and Technical Support

Trane delivers chiller plant and building control solutions through our offices around the world. In addition to consultation in system design, project management and commissioning, we can provide local support through the life of your building:

- Technical service in case of an emergency
- Maintenance to keep your system operating reliably
- A full line of replacement parts in local inventory
- Systematic upgrades and improvement.

Data generated by Tracer controls can be used to create reports and other documentation that may be necessary in areas where compliance reporting is a requirement, or to provide proof of sustainability to potential investors.

Install chiller plant controls from Trane. Gain a partner in making your buildings better for life.



High Performance Buildings

Your Mission. Realized.

Efficient Systems

Controls

Services

Turnkey Solutions

Trane Chiller Plant Controls		Reset	Sequencer (*)	Manager	Optimizer
FEATURES					
Interface	Local Operator Display	●	●	○	○
	Graphical Operator Interface			●	●
	Chiller Plant Dashboard			○	●
	Energy Dashboard			○	○
Data	System Temperatures	●	●	●	●
	System Data			●	●
	Plant Performance Data				●
Location	Local Panel	●	●	○	○
	Facility			●	●
	Remote Access			○	●
	Trane Intelligent Services (TIS)			○	○
BENEFITS					
Component	Chiller Run Time Reduction	○	●	●	●
	Chiller Efficiency Increase	●	●	●	●
	Ancillary Run Time Reduction	○		●	●
System	System Efficiency Increase			●	●
	Failure Management		●	●	●
	Real-Time Management			●	●

(*) Two Air Cooled Chillers

○ Option



Ingersoll Rand (NYSE:IR) advances the quality of life by creating and sustaining safe, comfortable and efficient environments. Our people and our family of brands—including Club Car®, Ingersoll Rand®, Thermo King® and Trane®—work together to enhance the quality and comfort of air in homes and buildings; transport and protect food and perishables; and increase industrial productivity and efficiency. We are a \$14 billion global business committed to a world of sustainable progress and enduring results.



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