Vertiv™ Liebert® iCOM™-S
Guide Specification
1.0 GENERAL

1.1 Summary

Liebert® iCOM™-S quickly recognizes, and aggregates connected data from Vertiv thermal and wireless devices. Enhanced tools and views are then wrapped around this data to simplify deployment, configuration and control. Advanced automation algorithms ensure optimal thermal conditions and maximize energy efficiencies. Flexible consumption of advanced aggregated data can be consumed by additional systems through multiple open data connectors. Collapsing the complexity of data consumption and interaction saves time, money and frustration.

Liebert® iCOM™-S can be installed on traditional Liebert unit applications using wired sensors providing increased visibility and data metrics not previously available. Wireless temperature sensors can be seamlessly added to offer even more insight into the data center while offering reduced installation cost and increased flexibility not previously seen. No other system integrates wired and/or wireless sensors so seamlessly into thermal HVAC system control. A single BMS/BAS connection point is also available making all aggregated data collected and calculations available for upstream systems.

1.2 Easy Deployment

Liebert® iCOM™-S offering gives the option to be pre-installed on a panel appliance or installed on a customer provided Server/VM. The software provides an easy to deploy solution by utilizing device auto-discovery mechanisms and user guided wizards. A room editing program shall allow the installing user to visually drag and drop devices onto a user imported floor plan. Once placed on the floor plan, a user will be afforded the capability of alignment and configuration tools making mass threshold changes and control configuration modifications simple. A point configurator program shall also be available. This point configurator program will provide tools and wizards for configuring BMS/BAS Modbus/BACnet IP point properties communicated from Liebert® iCOM™-S to connected upstream systems.

1.3 Highly Integrated

Liebert® iCOM™-S shall provide low level proprietary protocol communication with the connected devices affording the system access to data and capabilities not available to any other system. This integration enables enhanced diagnostics and organized visibility of system-wide control parameter settings. A stand-alone diagnostics program is available that provides easy identification of misconfigured system parameters and networking issues that before consumed time and resources in identifying. A system-wide low-level diagnostics journal and audit log allow visibility into system operations and tracking of system changes.

1.4 Simple Automation

Liebert® iCOM™-S provides integrated control capabilities that allow either wired or wireless sensor values to be used in cross group control calculations. The user can change the aggressiveness of the system in protecting against hot spots in their data center with a single button push on the user interface. Control values are automatically fed back into the thermal control groups in a time dependent nature. Set points for multiple thermal devices can be viewed and changed through a single screen utilizing a mass change tool for predictable management of system operation.

1.5   Visible Optimization

Vertiv™ Liebert® iCOM™-S provides mechanisms and tools to make connected device operational changes while providing the single user interface to validate the changes made are having a positive impact on operational efficiency. Liebert® iCOM™-S also provides a solid platform to validate infrastructure improvements made in the data center are having a positive impact on the customer's thermal system bottom line.

1.6   Design Requirements

Software shall support distributed integrations with segregated data drives in VM hosting environments along with optional SQL Server 2017 (minimum) integration. Contact factory for further details if interested.

1.6.1   Liebert® iCOM™-S Panel Option

Liebert® iCOM™-S control system shall be factory-assembled. Standard 60Hz units are ETL Tested and conforms to ANSI/UL standard 916 and certified to CAN/CSA standard C22.2 No. 205-12.

Liebert® iCOM™-S enclosure shall be designed to operate in the following environments:

- Operation/control ambient dry bulb temperature range: 0°C to 40°C (32°F to 104°F)
- Relative humidity range: 20% to 80% (non-condensing)

1.6.2   Liebert® iCOM™-Software Environments

Liebert® iCOM™-S software supports installations in the following environments:

- OS: Windows 10 Pro, Windows Server 2012R2/2016/2019

1.6.3   Server Minimum Requirements

- Server/VM Minimum Requirements (Traditional Deployments - <75 units, < 8 Gateways)
  - 6 cores/9MB/6T/Up to 3.5GHz
  - 16 GB RAM (2666 MHz)
  - M.2/2.5" SATA Server Class 256 GB SSD

1.6.4   Server/VM Minimum Requirements (Expanded Deployments)

- Dual Xenon (CPU E5-2630 v3 @ 2.4GHz, 8 cores, 16 logical processors)
- 32 GB RAM
- 256 GB SSD

1.7   Submittals

Submittals shall be provided with the proposal and shall include dimensional data; electrical and networking connection drawings.

2.0   PRODUCT

2.1   Vertiv™ Liebert® iCOM™-S

2.1.1 System Description

Liebert® iCOM™-S shall provide an integrated interface between the thermal management units in an Optimized Aisle form of control, wired sensors, wireless architecture, and software allowing a seamless single interface to visualize current and historical data see how changes made in the data center effect the desired goals of the data center. The Liebert Thermal Management Unit iCOM control software is compatible specifically for Liebert® iCOM™-S applications.

2.1.2 Mounting

Liebert® iCOM™-S enclosure shall be designed for indoor use only using the mounting bracket in either a wall mount or desk mount configuration. Liebert® iCOM™-S shall be installed into mounting bracket and locked into place via tray placement and two thumbscrews.

Mounting Bracket

Liebert® iCOM™-S mounting bracket shall be attached to the wall via four screws or bolts. Mounting posts shall be standard stud centered at 16" for mounting to wall. The mounting bracket shall have 2" conduit knockouts on the sides. The mounting bracket shall provide a slide out din rail bar via two thumb screws to support one Vertiv™ Liebert® Wireless Sensor Network (WSN) gateway. The bracket and front cover plate shall be powder coated black.

2.1.3 Controls

This is a licensed feature when the Optimized License Option is selected.

Liebert Thermal Management Units shall be controlled locally by the Liebert® unit iCOM™ controller to utilize enhanced protection and operation algorithms on the unit level while incorporating control signals from Liebert® iCOM™-S to enhance optimization and energy efficiency on a supervisory system level. Liebert® iCOM™-S shall connect directly into the local unit level iCOM control board without the need for additional monitoring/communication cards.

The Liebert Thermal Management Units shall have variable fan speed (centrifugal fan with VFD or EC fan(s)) to realize optimum efficiency and control benefits.

The Liebert Thermal Management Units shall be configured to operate in an Optimized Aisle (Teamwork mode 3) form of control in which a supply air sensor will control the cooling capacity (valve and/or compressor) and the remote wired/wireless sensors will control the unit fan speed. This approach shall best match the locally specific IT equipment's delta T (CFM/kW) requirement based on the dynamic IT operation and infrastructure for raised floor environments. For non-raised floor environments, alternative methods of control shall be available for stable system operation with fan temperature compensation override. If employed, static pressure sensors shall be utilized in the discharge plenum to maintain a minimum static pressure/fan speed.

Liebert® iCOM™-S shall utilize wired sensors connected to Liebert Thermal Management Units and wireless temperature sensors or both communicating through wireless gateways for purposes of control.

In the event of a Liebert® iCOM™-S outage, the connected iCOM controlled thermal management units shall fall back to their standard operation utilizing their locally wired remote temperature sensors. If the remote temperature sensors fail in this scenario, the thermal management units shall fall back to internal temperature sensor operation.

2.1.4 Cabinet Construction

Panel

Vertiv™ Liebert® iCOM™-S enclosure shall be powder-coated anodized aluminum.

Display

Liebert® iCOM™-S shall provide a 21.5" high definition (1920 X 1080, 16:9) multi-touch capacitive screen for user interaction.

Ports

The physical hardware connections are located on the bottom of the Liebert® iCOM™-S panel. The following available connections are presented on a Liebert® iCOM™-S panel appliance:

Quantity	Item
1	Power supply - 110/120VAC, 60 Hz locking plug.
1	Network switch - 23 available ports for private equipment network.
1	HDMI - duplicated remote user interface for display/operation.
2	USB - for keyboard, mouse, USB drives for data extraction/software updates.
1	RJ45 Ethernet - connection to corporate network for remote connectivity.
1	Phoenix Connector - local power source for DIN rail mounted Vertiv™ Liebert® WSN gateway.

Liebert® iCOM™-S enclosure shall be designed for indoor use only using the factory provided mounting bracket in either a wall mount or desk mount configuration.

The data connections between the Liebert® iCOM™-S network switch and connected device networks utilize Ethernet (Cat5/6) cables. Liebert® iCOM™-S PC has Wi-Fi capability but is disabled by default.

2.1.5 Electrical Connections

Liebert® iCOM™-S shall be powered via locking power cable (5-15P) wall outlet plug for 110/120VAC /60 Hz source.

2.1.6 Wireless Gateways

Liebert® iCOM™-S enclosure shall provide a screw terminal phoenix connector for remote powering of a single Liebert® WSN gateway.

2.2 Software Features

The highlighted features and capabilities discussed below are present in Liebert® iCOM™-S, Room Editor, Point Configurator, and Diagnostic Viewer programs.

2.2.1 Software Deployment Options

- Software only: Provides an installation file licensed for a customer provided and supported server or virtual machine.

- Panel appliance: Provides software pre-loaded on a traditional wall or desk mounted Liebert® iCOM™-S Panel hardware.

Licensed Software Modes

There are two licensed software modes with the high-level features listed below that are available for either software deployment option:

1. Monitoring only. This mode includes:

    a. Auto-discovery of connected Vertiv devices

    b. Local or remote desktop/web user interfaces

    c. BMS capability of connected device data and calculated/aggregated supervisory level data

    d. Automated reporting capability

    e. User configurable drag and drop floor plan capability

2. Optimized. This mode includes:

    a. Monitoring-only features

    b. Connected Vertiv thermal device set point changes

    c. Enable control with hot spot protection level selection

    d. Configure cross-group sensor control for multiple connected Vertiv™ Liebert® iCOM™ thermal unit groups

    e. Expanded Vertiv thermal unit BMS data point list

    f. User defined sensor maintenance windows

2.2.2 Control (Optimize Software Licensed Mode Only)

Liebert® iCOM™-S system simplifies control by allowing users to select sensors they want to use for optimized aisle control for an iCOM group of thermal HVAC units. After selecting the sensors, users then select the desired hot spot protection level:

- Best hot spot protection: Most aggressive and protective with highest fan energy.

- Better hot spot protection: Less fan energy but warmer temperatures on average (most common).

- Good hot spot protection: Less fan energy in most circumstances but warmer temperatures on average.

- Optimized aisle control de-couples the fan and cooling control sensors to allow complete flexibility for the thermal system to best match the IT and infrastructure air flow requirements at a given load. Optimized aisle can provide up to 40% improvement in system efficiency over traditional data center cooling control methodologies.

- Wired and wireless temperature sensors can be used in any combination for any connected group's control calculation.

- Multiple redundancy modes based on failure scenario.

- One touch can select all the units in a group for connected device set point manipulation and validation.

- Temporary maintenance windows allow custom defined time windows where sensors are ignored/re-enabled.

2.2.3 Setup/Configuration

- Auto-discovery of Liebert® iCOM-S units, Vertiv™ Liebert® WSN, and Vertiv™ RDU301 gateways.

- RDU Manager Mode – Dynamically builds a networking/data hierarchy diagram as devices are auto-discovered/added.

- Dynamic user guided wizards for Vertiv™ RDU301 setup, multi-unit additions, and BMS customization.

- Vertiv™ Liebert® WSN capability integrated into user interface for improved system synchronization.

- User importing of room images for drag and drop device capability for visualization.

- Multiple device/sensor selection for easy mass monitoring/control/property changes.

- System inventory report provides a connected device inventory including IP/MAC addresses and other properties.

2.2.4 Deployment/Management

- Corporate domain service user account integration for installation and backend service operation.

- User management within software supports multiple levels of system access.

- Single installer program automatically checks for newer software and pulls down required files based on needs.

- Configurable internet connectivity options allow software and/or licensing update notifications and download.

- Desired functionality for RDU301 gateways can be dynamically deployed and managed.

- End device firmware updates can be deployed when supported by end device (Liebert® WSN and RDU301).

- Data drive for DB storage can be split from services installation drive in distributed systems.

- Automated software backups completed on drive and connected drive locations.

Remote System Connectivity

- Desktop application client allows remote user interfaces to be installed and run locally with system access.

- Single desktop application client can connect to multiple Vertiv™ Liebert® iCOM™-S systems with easy switching.

- Remote read-only web interface.

- Remote desktop connectivity.

- Corporate SQL Server integration for single system support, if desired.

BMS Connectivity

- Any device data points and supervisory level calculations/alarms can be enabled and configured for communication.

- Communication is via Modbus and/or BACnet IP (simultaneously).

- Read/write capability for both protocols.

- Protocol options allow user to change either protocol to read only capability if desired.

- Easily import a user modified spreadsheet provided by the system to custom define desired Modbus registers.

- Export final points list in proper formats to a BMS to import for easy integration.

- Customize format of final points list for easy understanding by BMS integrator.

- Configurable data update rates based on connected system requirements.

- Wizards easily renumber Modbus registers and/or BACnet instance ids sequentially or in customized blocks.

2.2.5 Visual Navigation/User Interface

- User selected metrics and prioritization dynamically changes information presented.

- Site to sensor data navigation in two touches.

- Mass configuration change tools allow user to select various subsets of sensors to modify.

- Floor plan coloring schemes come pre-programmed with multiple options but leave user customization possible.

- Full system search capability allows user to group, sort, quick find, and filter all points on system for easy navigation.

- Context sensitive menus change based on current view and applicable actions a user can take.

- Simplification by highlighting important data/metrics for currently selected object with lowest level data one click away.

- Base metrics incorporate altitude and 30K+ rows of equipment performance runs for highly accurate results.

- Available metrics for various levels is shown in Table 1.

Table 1: Visual Navigation/User Interface Summary

Metric	Site	Room	Unit	Vertiv™ Liebert® iCOM™ Group
Capacity (kW)	✓	✓	✓	✓
Capacity Used (%)	✓	✓	✓	✓
CFM	✓	✓	✓	✓
CFM Used (%)	✓	✓	✓	✓
CFM Available	✓	✓	--	✓
CFM/kW	✓	✓	✓	✓
Cold Aisle Temperature	✓	✓	--	✓
Efficiency	✓	✓	✓	✓
Hot Aisle Temperature	✓	✓	--	✓
HVAC Power (kW)	✓	✓	Data Tab	✓
Unit dT – Air Side	--	✓	✓	✓
Unit Return Temperature	--	✓ (enabled)	Data Tab	✓(enabled)
Unit Supply Temperature	--	✓ (enabled)	Data Tab	✓(enabled)

- **Capacity (kW):** Net sensible cooling capacity; best approximation of heat load being cooled. This calculation is altitude specific and based on thousands of rows of measured and validated performance data providing highly accurate metrics throughout the Liebert® iCOM™-S system.

- **Capacity Used (%):** Percentage of total available net sensible kW capacity being utilized.

- **CFM:** Amount of air being distributed in cubic feet per minute.

- **CFM Used (%):** Percentage of total available airflow in cubic feet per minute being utilized.

- **CFM Available:** Total airflow in cubic feet per minute available from units at various system levels.

- **CFM/kW:** The amount of airflow being distributed per given kW of net sensible kW cooling capacity. This airflow effectiveness calculation can be used to baseline and improve the site infrastructure by representing a reduction in air flow required to cover a given load (for example, when containment is implemented).

- **Cold Aisle Temperature:** Average of temperature sensors designated as Location Type = Cold Aisle.

- **Efficiency:** Net sensible mechanical efficiency, which assumes the unit net sensible capacity equals the heat load currently being cooled by a unit. Used for baselining and improvement. (This value only applicable/available when the Liebert kW meters are installed in the units).

- **Hot Aisle Temperature:** Average of temperature sensors designated as Location Type = Hot Aisle.

- **HVAC Power (kW):** Power being consumed by Thermal HVAC units connected to Liebert® iCOM™-S. (This value only applicable/available when the Liebert kW meters are installed in the units.).

- **Unit dT** – Air Side: Weighted average change of air temperature from unit return to supply.

- **Unit Return Temperature:** Weighted average unit return air temperature.

- **Unit Supply Temperature:** Weighted average unit supply air temperature.

2.2.6 Built-In Historical Trending

- Public data points being read from a device or calculated at any level can be displayed.

- Data trends can be viewed full screen and exported directly.

- Various time frames can be viewed with highest resolution data ranges highest for easy oscillation identification.

- Min, max, and current values shown for active time frame.

- If applicable, recommendation lines can be adjusted directly on the trend for quickly noticing anomalies.

2.2.7 Automated Data Export/Reporting

- Highest resolution (raw) data prioritized.

- User defined network drive locations, properties and time schedules.

- Export data options included .CSV and .JSON in either compressed or non-compressed formats.

- Ad hoc reporting allows specific time windows to be defined for direct export (commissioning).

- Instantaneous report capability shows tabular view of entire system allowing user to navigate into more granular visibility.

- Historical report capability shows tabular view of entire system with statistical properties allowing easier identification.

2.2.8 Diagnostics

- Full system report gives status and information on system and connected device properties.

- Connected Vertiv™ Liebert® iCOM™ thermal unit configuration codes, IP addresses, and group/unit IDs displayed.

- System audit log shows activities performed on the system with user and date/time details.

- Operations log provides near real time information about system operation for helpful low-level troubleshooting.

2.3 Wired Connections

2.3.1 System Descriptions

The wired system shall utilize Vertiv™ Liebert® 2T Rack temperature sensors to provide a comprehensive view of the temperature of an area.

2.3.2 2T Rack Temperature Sensors

The Liebert® 2T Rack temperature sensors shall consist of a vented case with two temperature problems. The sensors shall provide real-time, direct feedback to the thermal management unit to optimize the amount of cooling and airflow provided.

2.3.3 Rack Sensor Mounting

Mounting hardware shall be provided with each 2T rack temperature sensor to provide quick and secure mounting of the node and sensor cable. Mounting hardware shall allow node enclosure to be mounted on a rack door with minimal impedance to rack air flow. Hardware shall include, at minimum, tie wrap fasteners.

2.3.4 Liebert® 2T Rack Sensor Communication

The sensor network shall consist of one CAN wire leaving the cooling unit and connecting to a Liebert® 2T Rack temperature sensor. Each remaining 2T rack temperature sensors are connected to the previous sensor.

3.0 EXECUTION

3.1 General

Install Vertiv™ Liebert® iCOM™-S in accordance with the manufacturer's installation instructions. Install units plumb and level, firmly anchored in the indicated locations, and maintain the manufacturer's recommended clearance.

3.2 Electrical Wiring

Install and connect electrical devices furnished by the manufacturer but not specified to be factory mounted. Furnish a copy of the manufacturer's electrical connection diagram submittal to the electrical contractor.

3.3 Field Quality Control

Start up the environmental control units in accordance with the manufacturer's start up instructions. Test controls and demonstrate that they are in compliance with requirements.

3.4 Quality Assurance

The specified system shall be factory-tested before shipment. The system shall be designed and manufactured according to world-class standards. The manufacturer shall be ISO 9001 certified.