# Rittal Corporation High Density Cooling using Rittal Liquid Cooling Package Plus (LCP+) Cooling System

## GUIDE SPECIFICATIONS FOR 30Kw LCP+ System

PART 1 - GENERAL LCP

1.1 SUMMARY LCP

A. This specification describes the operation and functionality of a closed loop, close coupled, continuous duty, modular chill water based high density cooling system hereafter referred to as the LCP+. All LCP+ systems shall be capable of being deployed in an N+1 redundant, scalable architecture. The LCP+ can be initially deployed as a single stand-alone (SA) unit to support cooling for a single equipment enclosure (rack) or installed with other like systems in a continuous row of standard IT enclosures for higher capacity applications. The LCP+ system can also be deployed in a `one to two' configuration, with one LCP+ supporting two (2) equipment enclosures, each installed on either side of the LCP+. Each LCP+ will employ a master controller, based on the Rittal CMC-TC Basic module, controlling three (3) airflow zone controllers and a separate water group controller. Each LCP+ will also contain six (6) hot swappable / user replaceable air circulation fans, individual front mount LCD interface display, and associated water flow control components.

B. The LCP+ system will be provided in a separate enclosure (Sidecar) for installation in IT spaces. Cold air supply and warm air return will be provided via a grill system installed on both sides, front and rear of the sidecar to allow support of one or two enclosures. Air grills will be installed in the entire height of the sidecar unit to insure consistent and continuous delivery of cold air to the entire stack of installed electronic components in the equipment enclosure(s) and warm air return from the devices.

C. The LCP+ will use a single unit tube and fin heat exchanger installed in the sidecar. There will be no user serviceable components associated with the heat exchanger. A filter screen will be installed in the front of the heat exchanger that may require regular visual inspection. If required, cleaning of the filter will be accomplished from the front of the unit by removing a filler panel installed behind the front door of the unit. No other service will be required.

D. Access to hot swap fans will be provided through the rear door. Access to zone control, water group control and master control modules will also be provided in the rear section of the unit. Other than replacing circulation fans, there will be no user serviceable components in the rear of the unit.

E. The LCP+ shall consist of the following pieces, as required by the project - the LCP+ sidecar with all control modules, six hot swap fans, local LCD readout and other features as described in this specification. LCP+ units shall be

capable of installation with Rittal equipment enclosures of various widths and 48”/1200mm deep x 80”/2000mm tall as described in this specification.

F. The LCP+ system will be suitable for installation on standard IT/Data Center space raised floor surfaces. Recommended minimum raised floor space is 12”/300mm. LCP+ system will be suitable for installation on non-raised floor (slab) surfaces when used in conjunction with Rittal enclosure plinth (cabinet base) components.

G. The LCP+ system can be controlled locally via a touch screen LCD panel installed on the front door. In addition, the LCP+ control module will provide SNMP connectivity for remote monitoring and control of the system. All internal command and control functions will be provided by a factory installed I2C bus with no external connections or maintenance required to be provided by the end user. SNMP communications will be compatible with industry standard web browsing interfaces.

H. The LCP+ shall operate in conjunction with a chill water supply and return system and primary power supply to provide constant and uninterrupted delivery of cold air to active component air intakes for mission critical, electronic equipment loads.

I. All programming and miscellaneous components for a fully operational system as described in this specification shall be available as part of the System.

## 1.2 STANDARDS

A. Where applicable, the LCP+ shall be designed in accordance with publications from the following organizations and committees

1. EN55022 – Information technology Equipment – Radio disturbance characteristics

2. EN60355-1 – TUV Low Voltage Directive 2006/95/EL - Safety for electrical apparatus.

3. LZFE8.E117603 – UL Canada – Heating & Cooling Equipment certified for Canada

4. EN61000 – Various Sections – Electromagnetic compatibility

5. NEMA - National Electrical Manufacturers Association

6. OSHA - Occupational Safety and Health Administration

B. ISO 9001

C. ISO 12100-1 & 2 – Machine Safety

D. ISO 14001

NOTE: Additional references available as required.

## 1.3 LCP+ MODES OF OPERATION

A. Normal: Utilizing facility provided chill water, cold air (in accordance with current industry standards) shall be continuously supplied to active components intakes. Rear mount fans shall remove heat generated from the components, direct it over the air to water heat exchanger for return to component intakes. No heat will be rejected into IT facility room spaces. Fan speeds and water flow control will be regulated to insure air temperatures remain constant, as set by the end user, and do not go below dew point or enter into a super- cooled condition to allow condensate to develop. Air and water flow control will provide 100% sensible cooling as determined by installed component heat load.

B. Loss of Water Flow: Upon loss of water flow, all fans will operate at full speed to provide maximum ride through time. An alarm notification will be sent via SNMP to operator monitoring stations. Additional notifications can be provided via SMS or SMTP capabilities resident in LCP+ software.

C. Loss of Air Flow: Upon loss of a single fan, all remaining fans will operate at full speed to provide maximum airflow to active components. The water flow control valve will open to the full open position (100%). The same operations will occur for loss of additional fans. An alarm notification will be sent via SNMP to operator monitoring stations. Additional notifications can be provided via SMS or SMTP capabilities resident in LCP+ software.

D. Loss of Control Module (CMC-TC Basic Module): Upon loss of power to the control module, or in case of module failure, all fans will operate at full speed. Water flow control valve will cycle to full open position (100% open). An alarm notification will be sent via SNMP to operator monitoring stations.

E. Loss of Power: Upon loss of input supply power to the LCP+, the water flow control valve will cycle to the full open position (100% open). An alarm notification will be sent via SNMP to operator monitoring stations.

F. (OPTIONAL) Automatic Door Opener: Upon occurrence of any alarm condition (as described above), optional automatic door openers, installed on front and rear doors of equipment enclosures supported by LCP+ units will open the doors to provide cool air intake from room spaces and expel heated air into the space. Automatic door opening system will consist of hydraulic pistons, door magnets and associated wiring and will be connected to the input/output relay on the LCP+ control module. One or two (1 or 2) enclosures can be supported from a single control module. An alarm notification will be sent via SNMP to operator monitoring stations.

## 2.1 SUBMITTALS

A. Proposal Submittals:

1. Bid requirement bill of materials.
2. Product catalog sheets or equipment brochures.
3. Product guide specifications.
4. Proposed installation configuration
5. Installation information, including weights and dimensions.
6. Information about locations for water and power connections.
7. Drawings and details for requested optional accessories.

B. Delivery Submittals:

1. Installation and user manual including:
   a. Instructions for storage, handling, examination, preparation, installation, and start-up of LCP+.
   b. Instructions for operating the system.
2. Equipment drawings
   a. Piping Connection Drawings
   b. LCP+ Wiring Diagram
   c. Equipment Outline Drawings

## PART 2 - PRODUCT

### 2.1 DESIGN REQUIREMENTS

A. The LCP+ shall be sized for up to a 30 Kw load to support either one (1) or two (2) equipment enclosures.

### 2.2 SYSTEM CHARACTERISTICS

A. System Capacity: The system shall be rated for full kW output in the following configurations

1. 30 Kw – One LCP+ supporting a single equipment enclosure
2. 15Kw – One LCP+ supporting two (2) equipment enclosures

Please note: Heat load capacity will be affected by chill water supply temperature.

B. Input Specifications:

1. AC Input Nominal Voltage: 208V, 1Phase, 4 wire, 60 Hz.
2. Chill Water Supply Temperature – 45F – 70F.
3. Maximum Water Flow Rate – 26 gpm

C. LCP+ Dimensions:

1. 80”/2000mm (H) x 12”/300mm (W) x 48”/1200mm (D)
2. Weight – 332 Lbs./150 Kg.

D. Additional Parameters

| | | |
|---|---|---|
| 1. | Air Flow Volume – Maximum: | 3000cfm |
| 2. | Cold Air Supply Temperature: | 70F – 85F |
| 3. | Water Delta T – Maximum: | 7F |
| 4. | Water Supply Pressure: | 24.5 - 116 PSI |
| 5. | System Noise: | 58dB(A) (Free field on reflective floor) |

E. Water System Connections:

1. 1” External thread connection, Bottom or Rear Connection Points for both chill water supply and warm water return lines.

F. Water Supply Quality:

1. Purified cooling water. No lime scale or loose debris. Low hardness and low conductivity. Please see LCP+ installation manual for additional water quality parameters.

2.3 LCP+ SYSTEM OPERATIONS:

A. The LCP+ system will provide required heat transfer and removal capacity as determined by heat load of installed components in adjacent equipment enclosure(s). Three (3) climate control zones will be provided by the LCP+. Each independent zone will consist of two (2) fans, air supply and return temperature inputs, fan speed inputs and water supply and return temperature inputs. Each zone will report independently to the master controller, based on a CMC-TC Basic Module. Zone control of fan speed will be based on air supply inlet temperature (as set by end user) and air and water temperature parameters reported by the control system.

B. The LCP+ system will provide water flow control via an independent water group control module, reporting to the unit master controller. Water flow control will be regulated by a motor operated flow control valve with a 0 – 100% range of travel installed in the chill water supply line. Water flow rate will be reported by a separate flow meter installed on the warm water discharge line. Water flow will be regulated based on air supply temperature (as set above), chill water supply and warm water return temperature Delta T, not to exceed required cooling capacity of installed components in equipment enclosure(s) served by the LCP+.

C. All functions of the LCP+ will be managed by a master controller, based on a CMC-TC Basic Module. The Master Controller will receive information and control operations via an I2C bus with connectivity to the three (3) zone controllers and water group controller described above. Local control and information from the Master Controller will be sent to a touch screen LCD readout installed on the front door of the LCP+. Additionally, the Master Controller will provide network connectivity via SNMP operating over the TCP/IP communications protocol. All required software and firmware will be provided with the LCP+.

D. Redundancy: Local redundancy is provided at each LCP+ unit with six (6) fans. The system will be capable of supporting the maximum heat load of the equipment enclosure(s) upon the loss of one (1) fan. Additional redundancy to support N+1 operations can be provided with the installation of an additional LCP+ unit in the row of equipment enclosures (Example – A single row of five (5) equipment enclosures operating at 25 Kw each will be supported by SIX (6) LCP+ units). The additional LCP+ will be available to provide the full system cooling capacity in the event of the complete loss of a single LCP+ unit in the row.

NOTE: Further redundancy, to meet Tier 3 or Tier 4 requirements, can be achieved at the facility level with the installation of separate water supply and return loops to alternate LCP+ units, backup cooling supply (air or water) to facility systems, extra chiller plant capacity, etc.

## 2.4 DISPLAY AND CONTROLS

A. Local Control Interface: A local control interface consisting of a touch screen LCD readout will be provided on the front door of the LCP+ unit. The touch screen will enable to end user to set the cold air supply temperature to active components installed in the equipment enclosure(s). In addition, end users will be able to scroll through the following informational and operational parameters

   a. Cold Air Supply Temperature
   b. Fan Speed (x6)
   c. Air Supply Temperature (x3)
   d. Air Return Temperature (x3)
   e. Chill Water Supply Temperature
   f. Warm Water Return Temperature
   g. Water Flow Rate
   h. Water Flow Control Valve Position (Command & Actual)
   i. Heat Load
   j. Cold Air Supply Temperature Setpoint – Set by end user
   k. IP Address and Software Information

B. System control and information network interconnections

   1. The LCP+ will provide network connectivity via SNMP using TCP/IP communication protocol. Connection to the end user network will be via an RJ-45 jack located on the rear of the Master Controller. Industry standard 10BaseT communications cables can be used for connectivity.

   2. A standard GUI interface will be provided by LCP+ software. The interface will be compatible with commonly used web/internet browser systems. The following information will be provided:

      a. Cold Air Supply Temperature
      b. Cold Air Supply Setpoint
      c. Total System Cooling Capacity
      d. Fan Speed & Fan Speed Step Position (x6)
      e. Air Supply Temperature (x3)
      f. Air Return Temperature (x3)
      g. Chill Water Supply Temperature
      h. Warm Water Return Temperature
      i. Water Flow Rate
      j. Water Flow Control Valve Position (Command & Actual)
      k. System Operational Control – Manual/Automatic
      l. Condensate Pump Operational Cycles
      m. Leak Detection Sensor Status
      n. General Operator Information
      o. Alarm Notification

   3. Additional system controls provided by the user interface will permit setting of various warning and alarm conditions for specific operational parameters. Alarm relays for remote notification and alarm beeper for local alert capabilities will be enabled or disabled from the system

controls. Individual alarm text messages will be set from the control screens.

4. Administration controls will also be provided via the operator interface software. Administrative controls will be password protected to prevent unauthorized access to the system. Administrative controls can be utilized to provide manual override capabilities for specified operational control functions and to verify system performance. System administrative functions, i.e. assignment of new passwords, alarm notification protocols, etc. will be set from this control section.

5. Monitored parameters will be reported in metric or standard units and will be selected by end users as required.

## PART 3 - ENCLOSURE SPECIFICATIONS

### 3.1 MODULAR IT ENCLOSURE OVERVIEW

1. Simple installation/removal of roof
2. Simple installation/removal of sidewalls
3. Simple installation/removal of front and rear doors
4. Complete internal access via any sidewall or door

### 3.2 GENERAL REQUIREMENTS

1. The Enclosure shall be designed to provide a secure, managed environment for computer and networking equipment.
2. The Enclosure shall conform to EIA-310 Standard for Cabinets, Racks, Panel and Associated Equipment and accommodate industry standard 19” rack mount equipment.
3. The Enclosure shall be designed with four (4) adjustable vertical posts to allow installation of typical rack mount equipment.
4. The enclosure posts shall have adjustable top and bottom rails allowing front to back post relocation, as well as side-to-side post movement.
5. The standard enclosure shall be available with a vertical equipment mounting space of 42U (1U=1.75” or 44.45mm).
6. U space markings shall be on the front and rear of each rail to allow easy identification of rack U used when installing equipment.
7. Varying U heights, frame designs, door configurations and other cosmetic changes shall be available as options.
8. The enclosure shall not require any horizontal bracing in the zero U mounting are as to meet the maximum weight ratings of the cabinet, and to comply to IBC zone 4 seismic certification. Areas in the zero U space and the U space outside the IT equipment mounting space shall be available for cable management and power distribution options.

### 3.3 EQUIPMENT ENCLOSURE DIMENSIONS

1. Height – 80”/2000mm, 42RU
2. Width – 24”/600mm, 28”/700mm, 31.5”/800mm
3. Depth – 48”/1200mm

### 3.4 MATERIAL OF CONSTRUCTION

A. General Information

1. Roll formed carbon steel, closed frame members, as to provide a welded, vertical and horizontal structure of symmetrical profile
2. All metal components shall be primer, baked, powder coated, and baked to assure maximum appearance and corrosion resistance. RAL 7035 (beige) shall be available as standard colors.
3. Material Specifications

a. Sidewalls -16 gauge cold rolled carbon steel
b. Front and Rear Door - 14 gauge cold rolled steel
c. Frame -16 gauge cold rolled carbon steel with unlimited mounting options provided by installation holes spaced at 0.98”/25mm intervals

B. Frame – Sidecar & Equipment Enclosure:

1. Enclosure frame shall be symmetrical construction with a multi-fold design and 25mm repetitive hole patterns (round + slotted holes or round + square holes) to allow for installation of various components.
2. Vertical frame section will be constructed from 16 fold hollow sections with holes (round + slotted) on a 25mmDIN pitch pattern
3. Horizontal frame members will be constructed from 9 fold hollow cross sections with dual overlay hole patterns (round + slotted & round + square) on a 25mm DIN pitch pattern.
4. Horizontal frame sections will have an additional protection lip above seal.
5. All metal surfaces shall be free of burrs, and welded joints shall be ground free of weld splatter.
6. The frame shall be fully welded and provide minimum 3200lb static load capacity.
7. The frame shall meet Seismic Zone 3 parameters

C. Frame – Equipment Enclosure Only:

1. Rack mounted equipment shall be installed on four independent vertical mounting rails. Vertical mounting rails will be positioned to support industry standard 19” rack mount component installation with an aperture opening of 17.75”/450mm between mounting rails. Mounting rails will be installed with a dimension of 29 3/16”/742mm between front and rear rails.
2. Vertical frame section will have two (2) depth recessed mounting levels for use with various components (i.e. system rails, mounting brackets).

D. Doors – Sidecar & Equipment Enclosure

1. Sheet cold rolled steel, 14 gauge, with horizontal and vertical door stiffeners as to provide additional rigidity and mounting surfaces.
2. Front door shall be provided with a foamed in place perimeter gasket.
    a. *Equipment Enclosure* - Solid front viewing door with safety glass insert and single piece steel rear door.
    b. *LCP Plus Sidecar* – Solid steel door – Front & Rear.
    c. *LCP+ InLine* – Solid Steel Rear Door, Perforated Front Door
3. Doors provided with 130-degree hinges.
    a. *Equipment Enclosure ONLY* - 180-degree hinges available.
4. Doors shall be hinged and reversible
5. Doors shall have a minimum of three quick release hinges with captive hinge pins. Hinges shall be rated for 66 Lbs. per hinge.
6. Doors shall have minimum 2-point latching/locking for security.
7. Hinge and lock points shall be internal and not accessible from outside cabinet with doors closed.
8. Tubular doorframe stiffens doors with holes on a 25 mm DIN pitch pattern.

9. Comfort Handle with security push button insert provided for all doors

E. Enclosure Roof and Base:

1. Solid roof panels with (4) 4" diameter cable entry points.
2. Grommets provided to seal unused cable entry holes.
3. Roof panel shall be provided with a foamed in place gasket on all mating surfaces.
4. Levelling feet can be installed.
    a. *Equipment Enclosure Only* – Heavy duty castors can be installed

F. Enclosure Sidewalls:

1. Solid sidewalls with foamed in place full perimeter gasket.
2. Sidewalls to be constructed from 16 gauge cold rolled carbon steel in single sheet
3. Sidewalls provided with appropriate fastening hardware.

G. Bonding:

1. All components of the enclosure to have a grounding stud to provide common ground potential with the use of grounding straps. Hardware to be provided to provide enclosure connection to facility grounding components.

H. External Surface Gasket:

1. Closed cell, foam in place, polyurethane gasket applied to all external component mating surfaces.
2. Gasket will be applied in one continuous application.
3. Gasket will be free from bubbles, indentations and other defects.
4. Gasket will be memory free

I. Paint:
1. Frame: Electrophoresis fully immersed primer coat
2. Panels: Electrophoresis fully immersed primer coat
   Polyester powder topcoat
3. Available Colors – Black, RAL7035 Light Gray

J. Vertical Mounting Rails – Additional Information:

1. Depth adjustable multi-fold "Z" shaped server style rails, front and rear that meet EIA-310-D Standards.
2. Vertical mounting rails shall be constructed of 2.5mm/12 gauge steel with equipment mounting holes (round + square) on 25mm pitch.
3. 19" Mounting rails shall be infinitely depth adjustable in the field, with simple tools. Maximum useable depth shall be no less than 2" of overall enclosure depth. (Ex: 38" in 40" deep frame).
4. 19" Mounting rails shall be of a "floating" design with attachment points to top and bottom of frame only. This shall prevent interference of interstitial cable management space from the vertical rails to the sidewalls.

5. 19” Mounting rails shall have each rack unit (U) space identified by a line at the top and bottom of each RU and sequentially numbered. The number RU space shall be marked on the middle hole of each RU. Each U shall consists of three holes and
6. Measures 1.75” or 44.45mm high. The RU space markings shall be ink jet applied, not adhesive backed. The rear side of all 19” mounting rails shall also utilize the same RU space markings.
7. Mounting rail RU spaces will be numbered from bottom to top in ascending order (i.e. 1RU at bottom to 42RU at top).
8. 19” Mounting rails will have two additional sets of mounting holes, shall match hole pattern of the frame and allow for the installation of various accessories, i.e. vertical cable management, horizontal cable management, power strips, etc.
9. Enclosure widths of 28”/700mm & 31.5”/800mm shall allow for 19”, 21”, and 23” rack mounting of components and/or allow for the off setting of 19” rails, left or right, to allow for additional cable management and air plenum space. Placement of rails in extended positions will require no additional installation hardware.

K. Enclosure Baying:

1. Baying of cabinets shall be accomplished without disturbing any installed cables or rack mounted equipment.
2. Baying of cabinets shall be easily accomplished with the use of simple tools.
3. Baying of cabinets shall not compromise cabinet level security.
4. Baying of the cabinets shall not add any additional width to the row.
5. Optional side air flow panels shall be available which will allow baying enclosures together while blocking side to side air flow between adjacent enclosures. These panels shall include areas in the back of the rack allowing cables to pass between enclosures. Use of these panels will eliminate the need for side panels while maintaining proper front to rear air flow for high density computing requirements

3.5 ACCESSORIES

A. Cable management brackets and wire-ways

1. Optional tool-free or tools required cable management brackets shall be available for routing power and communication cables internal to the enclosure.
2. An optional top mounted cable tray shall be available for routing cables at the top of the enclosure down the row of IT enclosures. Optional tray top covers shall be available to meet any requirements of local electrical codes. Trays shall be available for both front and rear cable routing.

B. Additional enclosure options

1. The following is a list of other enclosure options:

a. Tool-free blacking panels

b. Universal mounting plates
c. Tool-free and tool required component shelves
d. Heavy duty support rails
e. Enclosure baying kits
f. Zero U mount cable management components to be installed outside rack mount spaces within enclosure footprint
g. Power Distribution Units (PDU) or similar vertical or horizontal mount power strips. Products to be supplied with various receptacle types, number of receptacles, input power supplies and control and monitoring capabilities.
h. Optional enclosure based monitoring and control system. Such system to be capable of monitoring various environmental parameters within individual equipment enclosures and provide electronic access control to enclosures. System to be SNMP capable provided over TCP/IP communications protocol with operating software. Software to be compatible with LCP+ software.

## PART 4 - SOFTWARE AND CONNECTIVITY

### 4.1 Software Overview

A. The LCP+ manufacturer shall provide all required software to insure smooth and continuous operation of LCP components. Software will be compatible with the following operating systems:

1. Microsoft: Windows 2000 (Server, Advanced Server, Professional) Windows XP Home Windows XP Professional, Windows 2003 Server (Web, Small Business), Windows 2003 Server (Standard, Enterprise), Windows 2003 Server R2 (Standard, Enterprise), Windows Vista (Ultimate, Home Premium, Business), Windows XP on 64-bit architecture

2. Optional data center, Windows®-based client/server software package (RiWatchIT) that provides real-time monitoring of critical conditions for the entire enterprise specifically designed to support multiple systems in the data center.

3. Software capabilities to include:

   a. Real-time, enterprise-wide monitoring analyzes critical cooling conditions and identifies problems
   b. `Drill-down' monitoring of individual LCP status to isolate the issue and speed diagnosis
   c. Monitoring via client (local or remote), server or the Web (computer or PDA) provides easy “anywhere/anytime” access
   d. Scalable architecture (single/multi server) allows network managers the flexibility to monitor conditions from within each LAN or monitor multiple LANs from a centralized, master client
   e. Alarm notification through alphanumeric paging and/or SMTP email
   f. Customizable alarms tailor notification to user needs

g. Powerful data collection, graphing and report writing toolset provides trend analysis and diagnosis of chronic problems.
h. Unique graphical user interface and unparalleled performance analysis tools deliver the information needed to identify dangerous trends; execute corrective action; and, prevent failures.
i. Easily configurable for unique environments, regardless of the complexity, size, or number of distributed sites.
j. Advanced alarm management capabilities, including Alphanumeric paging to ensure that the right personnel are automatically notified of alarms and potential problems.
k. Easy to set-up graphical views to accurately depict site. Authorized users, enterprise-wide, can personalize software views based on individual preference.

## PART 4 - EXECUTION

### 4.1 STANDARD EQUIPMENT WARRANTY

A. Standard equipment warranty shall be twelve (12) months from the date of purchase or eighteen (18) months from date of Product shipment, whichever occurs first.

### 4.2 FACTORY ASSISTED LCP+ STARTUP

A. If an optional factory assisted LCP+ start-up is requested, factory trained service personnel shall perform the following inspections, test procedures, and on-site training:

a. Unpack LCP+ and perform visual inspection
b. Assist with installation in appropriate location in IT spaces.
c. Connect water distribution hoses to facility piping.
d. Power up the unit
e. Verify system operations via local LCD screen
f. Program unit(s) with customer provided IP addresses and insure proper network connectivity and communications.
g. Train customer support staff on operation of the unit
h. Register the warranty if applicable

B. UNPACK

1. Unpack LCP+ unit and accessories.

C. VISUAL INSPECTION

1. Verify that all equipment and accessories listed in User Guide are included
2. Visually inspect all equipment and accessories for signs of damage and/or foreign materials
3. Observe type of ventilation, room cleanliness, use of proper signs and any safety-related items that may be noteworthy

D. CUSTOMER RESPONSIBILITIES

1. Coordinate delivery to facility and to designated IT spaces
2. Insure adequate floor space is available for installation of LCP+ units and associated equipment enclosures
3. Provide suitable connections to chill water supply and warm water return piping or distribution manifold
4. Provide proper electrical connections for each unit
5. Provide all required IP addresses

E. UNIT START UP

1. Insure water connections are secure and with no leaks.
2. Energize LCP+ and verify no alarms are present (or have been corrected and cleared)
3. Configure LCP+ and select appropriate display language
4. Set Date and Time
5. Verify network connectivity and operator interface
6. Set server air inlet temperature
7. Assist with general unit configuration and alarm setpoints.

F. ON-SITE OPERATIONAL TRAINING:

1. Prior to leaving the site, the Customer Support Engineer will familiarize customer personnel in the operation of the UPS. The familiarization takes 1 hour to 8 hours at Rittal Corporation discretion, and depends on site personnel, equipment type and equipment availability. Basic operational training includes:

    a. Key pad operation
    b. LED indicator explanation
    c. Start-up and shutdown procedures
    d. System maintenance bypass operation information
    e. Component familiarization
    f. Alarm and notice familiarization.

4.3 MANUFACTURER FIELD SERVICE

A. Worldwide service: The LCP+ manufacturer shall have a worldwide service organization, consisting of factory trained field service personnel to perform start-up, preventative maintenance, and service of the LCP+ system. The service organization shall offer 24 hours a day, 7 days a week, 365 days a year service support
B. Replacement parts: Parts shall be available through the worldwide service organization 24 hours a day, 7 days a week, and 365 days a year. The worldwide service organization shall be capable of shipping parts within 4 working hours or on the next available flight, so that the parts may be delivered to the customer site within 24 hours

## 4.4 MAINTENANCE CONTRACTS

A. A complete offering of preventative and full service maintenance contracts for the LCP+ system shall be available. All contract work shall be performed by Rittal Corporation authorized trained service personnel
B. Contracts shall be available for both Monday through Friday, normal business hours next day response, and seven days a week, any hour with up to two (2) hour response time.

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