CDU COOLING CABINET
Technical Specification

Unit type: CD6A

260kW nominal cooling capacity

REVISION CONTROL INFORMATION

REV.	Date	Action	Name
1.0	29/03/11	First release	D.Morgan
1.1	13/04/11	Primary flow limit revised	D.Morgan

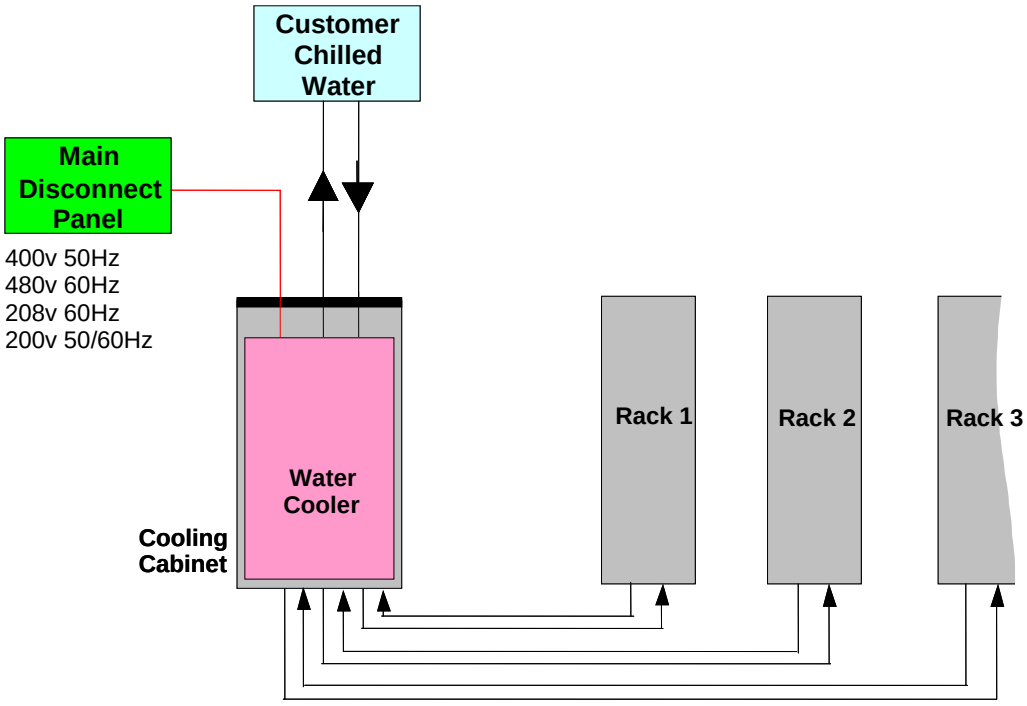
SCOPE

This is the technical specification document for the new CD6 range of a data centre indoor CDU cabinets. A single loop liquid-to-liquid heat exchanger is used to circulate cooled water through multiple data rack rear door heat exchangers within a data centre. This product controls and monitors all associated parameters and incorporates an operator interface.

1 GENERAL

1.1 Definition

The CD6 cooling cabinet is designed to provide cooled water to multiple equipment racks at specific temperatures and flow rates. The water is used as a means of removing heat form high density areas generated during operation of a data centre. The heated water returned to the cooling cabinet is cooled to the specific temperatures using customer-supplied chilled water.



2 COOLING CABINET POWER

2.1 Electrical

- The cooling cabinet receives power via a three-wire and earth supply configuration hardwired from the data centre main disconnect panel (MDP).
- The cooling cabinet requires no more than 7 kVA (maximum continuous power).
- The cooling cabinet is able to accept three-phase delta input power 400v 50Hz, 480v 60Hz, 208v 60Hz or 200v 50/60Hz when specified at ordering stage.
- The cooling cabinet meets all requirements with the following voltage and frequency variations:
    - **Voltage:** ± 10% daily variation.
    - **Frequency:** ± 3 Hz variation.
- Pump(s) in the cooling cabinet are driven in a manner to provide similar performance at 50 and 60 Hz operations through the use of an inverter drive.
- All electrical connections can be made through either the top or bottom of the cooling cabinet, with a 25mm cable gland provided for power cable entry.

2.2 Power Switch

- A main power isolator with lockout out capabilities is provided for isolating the unit.
- The CD6 unit also has an automatic restart function that allows the cooling cabinet to restart when power is restored to the facility after a power outage without any operator actions required.
- The pump(s) have a soft starting sequence to avoid pressure surges in the system & high inrush currents that may exceed the maximum breaker rating.

3 CUSTOMER-SUPPLIED CHILLED WATER (PRIMARY CIRCUIT)

3.1 Water Characteristics

- The customer shall provide cooling water with 0% to 30% propylene- or ethylene-glycol by volume for intake by the cooling cabinet under the following conditions:
    - **PH:** 6 to 8
    - **Hardness:** Less than 200 ppm calcium carbonate
    - **Suspended matter:** Less than 10 mg/L; less than 500-micron particle size
    - **Temperature:** 5 to 10°C [41 to 50°F]
    - **Maximum Flow Rate:** 360 L/min [95.1 gpm]
    - **Maximum Supply Pressure:** 10 bar [145 psi].

- **Maximum Pressure Drop:** 2.5 bar [36.3 psi] including connections.
- **Propylene/Ethylene Glycol Content:** 0 to 30% by volume.

- If the customer-supplied chilled water exceeds the safe operating limits of the cooling cabinet, the cooling cabinet will generate alarm.
- Internal condensation in the cooling cabinet is prohibited by the use of insulation. A drip tray with flood detection is provided within the cabinet in the event of any leakage with alarm generation.
- The cooling cabinet is provided with the means to monitor customer supplied water flow rate and temperature.
- An optional 300 micron cartridge filter can be installed in the cooling water inlet of the cooling cabinet if required.
- Filter differential pressure is monitored to indicate when flushing/filter screen replacement is required.

3.2 Connections

- The chilled water connections for the cooling cabinet are 2" / 54mm sweat copper tails, with isolation ball valves provided. The return ball valve is geared with 360° travel to give a degree of flow control.
- Customer will have optional connection points located at either the top or bottom of the cooling cabinet.

4 MONITORS/ALARMS

4.1 Alarm and Control Display Panel

- A display mounted on the cooling cabinet front shows the following:
  - Customer Supplied Chilled Water:
    - Coolant supply temperature [°C]
    - Coolant flow rate [L/min]
    - Coolant pressure
  - Equipment Rack Coolant:
    - Coolant supply temperature [°C]
    - Coolant return temperature [°C]
    - Coolant supply flow rate [L/min]
    - Temperature set point [°C]
    - System static pressure [bar]

- Pump operation [hours]
- Temperature offset set point [°C] – dew point control
- CDU cabinet ambient relative humidity [%] & temperature [°C]
- Pump speed
- Control valve position
- Dewpoint
- Control valve operation (hours)

- Alarms – Primary chilled water
  - Low flow
  - No flow
  - High coolant temperature
  - Low coolant temperature
  - Flow control valve fault
  - Filter dirty (optional – if fitted)
  - Temperature sensor fault
  - Pressure sensor fault
- Alarms – Equipment rack cooling loops
  - Low flow
  - Low coolant temperature [2°C – below / floating with setpoint]
  - High coolant temperature [2°C – above / floating with setpoint]
  - Coolant temperature <1°C or >3°C of dew point
  - System over/under pressure
  - Insufficient water
  - Water level low
  - Pump fault (pump 1 or pump 2)
  - Inverter fault
  - Leak detection
  - Temperature sensor fault
  - Pressure sensor fault
  - Room RH / Temperature sensor fault
  - Underfloor leak detection (optional – if fitted)
- Software Revision level

4.2 Protection Devices

- Coolant static pressure in the system is monitored at all times.
- The CD6 unit registers a warning when the system pressure falls below the specified alarm level.
- The CD6 unit will shut down the pump(s) when the system pressure falls below the specified shut-off level and after automatic make container has been exhausted.
- The CD6 unit provides the means for controlling, detecting and reporting a leak event before shutting down the cabinet.

4.3 Set Point Control / System Configuration

- The following set points can be set and stored on the CD6 unit controller:
    - Coolant temperature to equipment racks [°C]
    - Flow rate to equipment racks [l/min]
    - Date/time
    - Pump duty sharing change over time
    - 3 Modes of operation:
        - Fixed setpoint
        - Fixed setpoint with dewpoint override (default)
        - Dewpoint tracking

5 PERFORMANCE CHARACTERISTICS

5.1 Coolant Temperature

5.1.1 Equipment Rack Cooling Loops

- The CD6 unit provides liquid coolant at a temperature within ±1°C of the set point temperature.
- The CD6 unit provides liquid coolant at a temperature at least 1°C, but no more than 3°C above dew point under all specified operating conditions.
- The desired coolant temperature can be set within the CD6 controller.
- The normal coolant temperature is set to 18°C, adjustable within lower and upper limits of 15°C to 20°C.
- The CD6 unit is designed such that it maintains the set point temperature under all specified operating conditions.
- Maximum cooling capacity of the equipment rack cooling loops is 260kW at 18°C set point, with a minimum of 8°C differential to the chilled water supply temperature.

- Room relative humidity & temperature is monitored at the CD6 unit, or adjacent to the equipment racks (remote mounting).
- The desired temperature offset (relative to dew point) can be set within the cabinet controller.
- The minimum coolant temperature and cooling duty is dependent on the customer supplied cooling water temperature (a minimum 8°C differential is required for maximum duty).
- The cooling cabinet is designed such that it maintains the temperature offset under all specified operating conditions.

5.2 Coolant Flow

5.2.1 Equipment Rack Cooling Loops

- The cooling cabinet can pump liquid coolant through an optional internal 8-way distribution manifold to provide each rack with a minimum flow rate of 40 L/min @ 2.5 bar [10.6 gpm @ 36 psi], measured at the outlet of the cooling cabinet, at both 50 and 60 Hz operation. Max. total flow will be 360 L/min.
- Feed pressure of the cooling cabinet shall not exceed 5.0 bar [72.5 psi]. A pressure sensor shall be used to prevent the output of the cooling cabinet from exceeding this pressure and will ramp down the pump speed accordingly. Pressure reading will be displayed on the control panel.
- Supply and return equipment rack hoses may enter through the bottom or top of the CD6 unit cabinet.
- The coolant connections onto the distribution manifolds are 8 x ¾" hose unions .
- Plain discharge and return 2" flexible tails can also be incorporated for connection to under floor manifold systems.
- Hose sets can be shipped with the cooling cabinet as optional extras in multiples of 1m lengths up to 20m max.

5.3 Coolant Characteristics and Quality

5.3.1 Equipment Rack Cooling Loops

- Coolant can be plain tap water, or distilled or de-ionized water treated with corrosion inhibitor and biocide.
- An optional 300 micron cartridge filter can be fitted to this circuit if required.
- The cooling loops do not utilize any parts that may introduce ferrous particles into the coolant.

6 PHYSICAL CHARACTERISTICS

6.1 Characteristics

- All components are located in a single cabinet that conforms to EIA-310D standard for equipment racks.
- The cooling cabinet footprint is 600mm wide x 1000mm deep to match typical data room racks.
- The cooling cabinet height is 37U (1885mm).
- The standard cabinet colour is black.
- Internal metalwork is either painted of galvanized finish.
- Wetted parts on both the chilled water and the equipment rack cooling loops are non-ferrous – either stainless steel, copper, brass or plastic.

6.2 Weight and Center of Gravity

- The dry weight of the CD6 unit does not exceed TBD kg [TBD lb].
- The nominal center of gravity (for operating and shipping conditions filled or unfilled) is in the lower half of the unit for ease of movement.

6.3 Service Access

- For any necessary field adjustments, field calibrations, and/or periodic maintenance, service access is limited to the front and rear of the cooling cabinet with side panels also removable if installation allows.
- All service, test, and monitoring points are located at the front or rear of the cooling cabinet.
- The CD6 unit provides the means to fill the system to a specified static pressure using an inbuilt priming pump.
- The CD6 unit provides the means to empty, flush, and refill the equipment rack cooling loops with gravity being sufficient to empty the coolant.
- Trapped air is automatically vented from the system during the filling process.

6.4 Mobility

- The cooling cabinet is provided with heavy duty castors giving the ability to roll, thus allowing relocation along any flat or slightly inclined surface (10° incline).
- Once in position, the cabinet can be permanently installed on the jacking feet included.

7 ENVIRONMENTAL CONDITIONS

7.1 Non-Operating

- The cooling cabinet will function and meet all performance requirements after exposure to any combination of the following environments:
    - **Ambient Temperature:** –40 to 70°C with a maximum rate of change of 20°C/hour.
    - **Humidity:** Between 5% and 95%, with the maximum allowable rate of change of 30% per hour.
    - **Altitude:** 30.5 m below sea level to 5200 m above sea level. Non-operating conditions cover air transport for the CD6 unit.
- The cooling cabinet shall not corrode under normal operation, shipping, or storage conditions.

7.2 Operating

- The cooling cabinet will meet all performance requirements during exposure to any combination of the following indoor environments:
    - **Ambient Temperature:** 10-40°C, with a maximum rate of change of 10°C/hour. Maximum allowable temperatures may be reduced for high altitude operation (greater than sea level) by a factor of 1.5 °C per 1000 m.
    - **Humidity:** Between 30% and 75%, non-condensing, with the maximum allowable rate of change of 5% per hour.
    - **Altitude:** 30.5 m below sea level to 2500 m above sea level.
    - **Elevation:** Cooling cabinet & equipment racks to always be on the same floor level.

8 DESIGN AND CONSTRUCTION

8.1 Redundancy

- Dual pumps are provided for redundancy in the event of a component failure. Change over will occur automatically controlled via software, also generating associated alarms/warnings.
- Duty sharing of pumps is handled automatically with change over once a week.

8.2 Corrosion

- Metals are corrosion resistant type or suitably processed to resist corrosion.

- The use of any protective coatings that may crack, chip or scale with normal use, aging or extremes of environment specified herein, have been avoided.
- All material used in the cooling cabinet is compatible with the coolant used.

8.3 Electromagnetic Compatibility

- The cabinet is fully tested & certified to European standards.

8.4 Shock and Vibration

- The cooling cabinet meets guidelines for shipping.

8.5 Electrical

8.5.1 Construction

- All mains components, power distribution, and major electrical subassemblies are UL recognized.

8.5.2 Insulation, Barriers and Protective Earthing

- Live parts representing a risk of electric shock are enclosed or guarded so as to prevent unintentional contact.
- No live parts are accessible without the use of a tool.
- Adequate warning is provided where service personnel must gain access to hazardous live parts.

8.5.3 Components

- Mains components - components connected in the mains supply circuit are UL recognized, CSA certified, or CE certified.
- Components not in the mains supply circuit, but not in low voltage, limited energy circuits, are UL recognized.
- Plastic materials used for insulation, enclosures, or support of live parts are UL recognized, and have flammability rating, electrical characteristics and mechanical characteristics that are acceptable for the application.
- Required flammability ratings:
    - - Enclosure materials: 94V-0
    - - Insulating materials: 94V-2 or better
    - - Materials supporting live parts: 94V-2 or better

8.6 Mechanical

8.6.1 Mechanical Integrity

- For fasteners, integrity will be maintained by:

- Fastener selection appropriate for load and application
- Use of torque specs, lock washers, or other means to resist loosening where needed.

8.6.2 Sharp Edges

- All corners and edges shall be rounded or chamfered to avoid personal injury.

8.7 Electromagnetic Compatibility (EMC)

- The cooling cabinet conforms to the requirements for radiated, conducted, harmonic and flicker emission and to immunity from electrostatic discharge (ESD), radiated & conducted E-fields, electrical fast (line) transients, surge, magnetic field immunity and mains voltage sag and drop out.

8.8 Operator/Service Manual

- A service manual/document is available to support the servicing of the cooling cabinet.
- Documentation will be in a PDF format.

9 SUPPLEMENTARY

9.1 Electrical

- The enclosure is labeled with input voltage, input current and frequency in close proximity to the power connection.

9.2 Piping Leakage Tests

- The CD6 unit piping and related elements is supplied pre-tested to a hydrostatic gauge pressure test of 10 bar [150 psi] on the Primary circuit and 10 bar [150 psi] on the Secondary circuit.

9.3 Dielectric Withstand Test

- All electrical components that are rated for greater than 30V are tested for dielectric breakdown by applying a voltage (equal to 1000V plus two times the rated voltage of the component) between the component and ground for at least one minute.

10 SAFETY REQUIREMENTS

10.1 National Recognized Testing Laboratory

- The cooling cabinet has been certified by a National Recognized Testing Laboratory (NRTL) to comply with the applicable UL, CSA, CE, and IEC standards for the device.

10.2 Acoustic Noise

- The cooling cabinet does not generate sound pressure levels (SPL) above 55 dBA measured 3 metres in any direction from its external surfaces under normal operating conditions.

11 RELIABILITY

11.1 Requirement

- The cooling cabinet has a mean time between failure (MBTF) of >20,000 hours.
- A failure is defined as any adjustment or repair action requiring a service engineer to return the unit to satisfactory operating status, other than for periodic maintenance.

11.2 Warranty

- All parts are 100% covered by the vendor for a period of 18 months from date of delivery or 12 months from date of installation.
- Replacement parts will be shipped direct to end users.
- Root cause information shall be logged and made available to Eaton-Williams upon request.

12 SERVICE REQUIREMENTS

12.1 Access

- Access cover(s) / door(s) located on either the front, rear or top are provided for maintenance access.
- Cabinet design supports access from the front of the cabinet for installation, calibration and replacement/maintenance activities.
- All operational displays and indicators are viewable without the removal of covers.
- Potential pinch points or entrapment points have been minimized.
- To minimize floor space requirements all operator access is at the front of the cabinet.

12.2 Periodic Maintenance

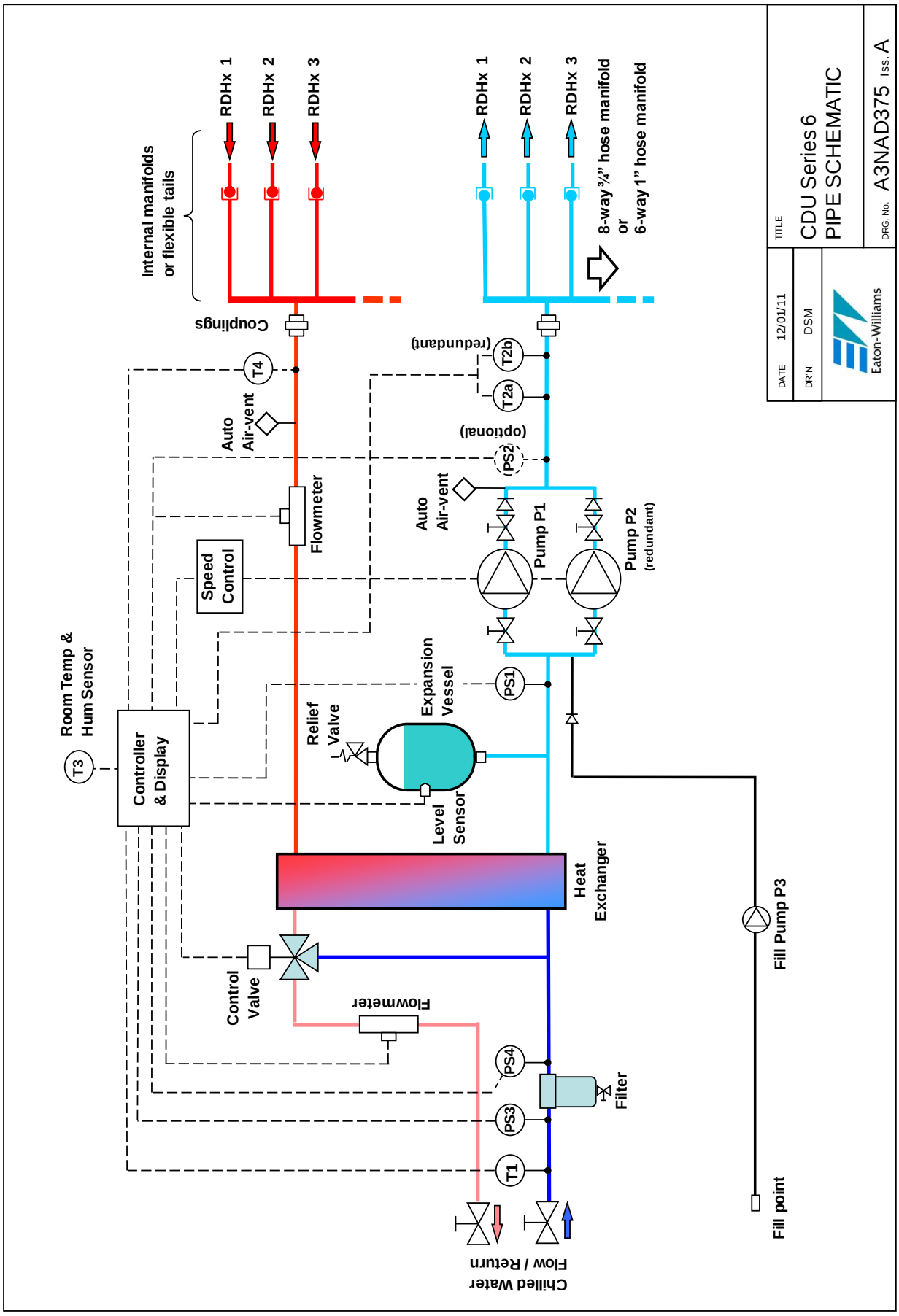
- Periodic maintenance (PM) intervals and procedures are specified in the Operating & Maintenance Manuals.
- No more than two PM's per year are required for correctly installed systems.
- Pumps are field replaceable within 1 hour.

12.3 Fasteners

- Fasteners that require special or unusual tools have been avoided.
- Commonality in fastener head size and type have been used to reduce the number of tools required to perform actual service on the unit.
- Fasteners are metric.

13 OPTIONAL EXTRAS

- Web server communications.
- In-cabinet manifold kit (for up to 8 x ways).
- Under floor manifold kit.
- Under floor leak detection kit.
- Hose kits.


RDHx 1
RDHx 2
RDHx 3
Internal manifolds or flexible tails
RDHx 1
RDHx 2
RDHx 3
8-way ¾" hose manifold or 6-way 1" hose manifold
Couplings
T4
Auto Air-vent
T2b
(redundant)
T2a
(optional)
PS2
Auto Air-vent
Flowmeter
Speed Control
Pump P1
Pump P2 (redundant)
Room Temp & Hum Sensor
T3
Controller & Display
Relief Valve
Expansion Vessel
PS1
Level Sensor
Heat Exchanger
Fill Pump P3
Control Valve
Flowmeter
PS4
Filter
PS3
T1
Fill point
Chilled Water Flow / Return
TITLE
CDU Series 6 PIPE SCHEMATIC
DRG. No. A3NAD375 Iss. A
DATE 12/01/11
DR'N DSM
Eaton-Williams