

Refrigerant Distribution Unit (RDU) and Piping



SKU
ACDA901

Technical Data

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Overview

The Refrigerant Distribution Unit (RDU) offers efficient, effective, and economical pumped refrigerant for use with its associated InRow cooling modules (CM).

Precision environmental requirements now reach far beyond the confines of the traditional data center or computer room to encompass a larger suite of applications referred to as technology rooms. Critical environment applications include:

- Computer rooms
- Telecommunication facilities
- Clean rooms
- Power Equipment
- Medical equipment rooms
- Archives
- LAN/WAN environments

A worldwide network of APC representatives is fully qualified to provide engineering, sales, installation, and service for our products. APC warrants all parts for 12 months from start up. Extended warranties are available.

Capacity

The RDU can serve multiple CM units and provide up to 160 kW of heat rejection.

Fluid Distribution

Water or a water/glycol mixture is pumped from a customer-supplied chiller into the primary circuit of a heat exchanger inside the RDU. Heat contained in refrigerant (R-134a) in the secondary circuit of the heat exchanger is removed in this heat exchanger and transferred to the water or water/glycol mixture. The water or water/glycol mixture then returns to the chiller. Refrigerant is then pumped to the cooling modules where heat generated by the IT equipment is collected and carried back to the RDU by the refrigerant.

Compliance Approval

- UL Listed
- C-UL Listed
- CE
- KCC
- C-Tick

Standard Features

- Redundant R134a variable speed circulation pumps, EC BLDC
- Sub-cooler
- Refrigerant loss monitoring
- ISX central integration / network card
- Local user interface
- Top or bottom piping configuration for both refrigerant and chilled water connections
- Dual power supplies
- 0 - 100% capacity modulation
- Field configurable 2-way chilled water valves
- Top or bottom power feed
- Dual power inputs
- No minimum heat load

Accessories

- NetShelter SX 42-U to 48-U height adapters
- NetShelter VX 42-U height adapters
- Refrigerant piping flanges
- Modular piping headers
- Rack door

Scalable Solution for Critical Environments

Refrigerant

Mitigating the risk of fluid leaks is critical to the smooth operation of a technology room. Data centers can be installed where raised floors are not available. This hard floor environment requires that the cooling fluid piping be installed overhead. The fluid used in this modular, pumped refrigerant system is R134a refrigerant. R134a is a non-toxic refrigerant that poses no threat to IT equipment in the event of a leak, and has no ozone depletion potential.

High Density

High density areas are caused by consolidation of servers where there is a lack of space or just moving from multiple clusters of servers to a single larger server. Naturally, this will make the power densities increase, resulting in a higher than average cooling load per rack. The higher cooling demand might require additional cooling units, thus requiring additional fluid lines to be installed.

Leased Facilities

Installing a data center in a leased facility is usually not a big issue since the IT equipment can be removed from the racks. However, the actual valves and piping are typically not moved. The Network Critical Physical Infrastructure (NCPI) must be portable so that it is easily moved to a new location. A raised floor is not typical in leased facilities. Deploying a NCPI without the use of a raised floor eliminates a one-time expenditure.

APC Pumped Refrigerant System, The Right Solution

Highly scalable and flexible, the system is capable of growing with your cooling needs as they increase. Each CM is installed with isolation valves for fluid control.

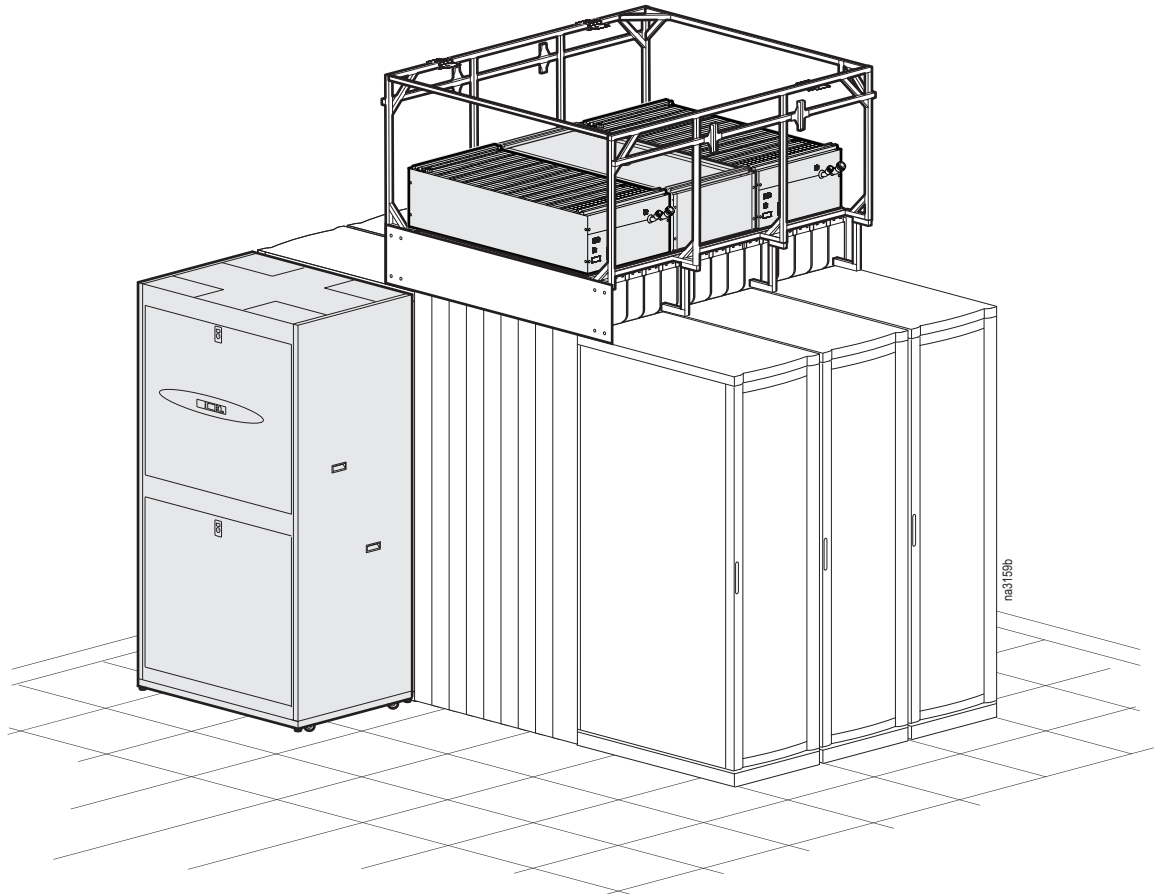
InRow Advantages

The in-row solution improves energy efficiency and cooling ability in a number of ways. First, the CM draws air directly from the hot aisle, allowing the cooling unit to take advantage of higher heat transfer efficiency due to higher temperature differences. The InRow unit never chills the air below its dewpoint. This significantly decreases water consumption and energy use and eliminates heat transfer inefficiencies caused by wet coils.

Scalable for High Density

The predictable performance of the row-based architecture makes it well-suited for high density applications. The focus on heat removal instead of cold air delivery is the key to making this approach scalable. The modular design of the InRow units allows them to be easily added in the row as the demand for cooling increases.

The additional benefit of the row-based architecture is the ability to add hot aisle containment. Containing the hot aisle further reduces any chance of hot and cold air streams mixing. This provides ultimate predictability and allows the cooling capacity to be matched to the IT heat load.



Standard Features

Cabinet



The frame is constructed of 14 gauge formed steel for maximum strength. The cabinet is serviceable from the front. All exterior panels and corner posts on the frame are powder coated for durability and an attractive finish. The front and rear exterior panels are constructed of 18 gauge steel, and the side panels are constructed of 20 gauge steel. The front panels, which include a key latch for safety and security, allow easy access and removal. All internal pipes are insulated with 12.7 mm (1/2 in) closed cell insulation.

Heat Exchanger

The brazed plate heat exchanger is constructed of 316 stainless steel plates. The primary side of the heat exchanger is piped to a chilled water source; the secondary side is piped to the CM.

Redundant Refrigerant Pumps

The two factory-piped and factory-wired pumps are 2N redundant and can automatically adjust the flow of refrigerant for variable capacity of the system.

Each pump may be replaced while the unit is in operation without effecting system performance.

Microprocessor Control

Users can navigate between menus, select items, and input alpha numeric information using control keys.

The microprocessor controller activates a visible and audible alarm in the occurrence of certain events. See "Alarms" on page 6.

2-way/3-way Water Control Valves

The RDU includes a pair of floating point microprocessor-controlled 2-way valves which regulate the amount of chilled water into the heat exchanger to maintain optimal cooling conditions for the system. The valves are user configurable to operate in either two-way or three-way mode.

Top or Bottom Power Feed

Electrical power is supplied to the unit via a locking NEMA or IEC plug connection (top wiring only) suitable for the input power.

Hard-wired electrical power may be supplied to the unit through top or bottom connections.

Dual power feeds allow cooling to remain operational during a power outage to the main power source.

Shutdown Input/Alarm Output

The unit provides one field connection input for remote shutdown and one field connection alarm output.

Selectable Top or Bottom Piping Connections

The unit includes provisions for either top or bottom water piping connections. Piping may be brazed directly to external pipes or to flanges to facilitate ease of disconnecting the RDU.

Network Management Card

The Network Management Card (NMC) allows communication with the Local Area Network (LAN). In addition, the NMC permits multi-level access to monitoring, control, and event notification features over the building network.

Bay Kit-NetShelter SX

Baying kits made of 16 gauge steel are available for baying the RDU to APC NetShelter enclosures.

Insulation Kit

A kit of insulation is provided to prevent condensation from internal piping once the piping is installed and connected.

Optional Features

Flange Kit

As an alternative to brazing, a flange kit is available to provide for more easily disconnecting piping.

Rack Door Kit

This kit will allow your RDU to look like the APC equipment racks in the adjacent row.

Flexible Stainless Steel Hoses

914 mm (3 ft) and 1828 mm (6 ft) flexible stainless steel hoses are available for use in installations where standard piping is impractical or not desired.

The flexible hoses can be used to connect OAs to the modular piping headers.

Network Cable

Various lengths of network cable are available to ship with your cooling system. The network cable is used to interconnect multiple cooling units in a redundant group, as well as to connect the Network Management Card to your LAN.

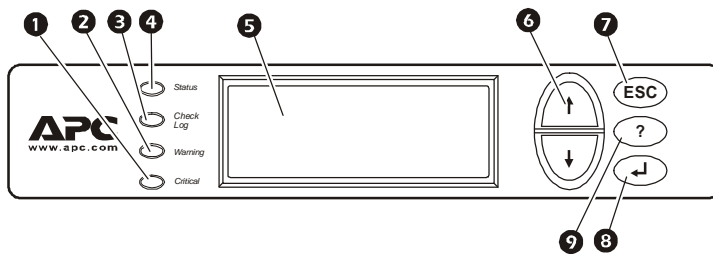
Pipe Clamp Kit

This kit contains clamps, fasteners, and insulation needed to mount refrigerant piping on the mount frames.

1, 2, And 3-port RDU Piping Kits

This kit provides three optional solutions for routing refrigerant to and from the CM. They may be installed directly on the InRow OA mount frames, hung from threaded rod, or attached to support members.

Microprocessor Controller



1	Critical Alarm LED
2	Warning Alarm LED
3	Check Log LED
4	Status LED
5	Liquid Crystal Display (LCD)
6	Scroll keys
7	Escape key
8	Enter key
9	Help key

Microprocessor Controller

The master display allows monitoring and configuring the cooling system through a menu-based control. Functions include status reporting, set-up, and temperature set points. Four LEDs report the operational status of the connected cooling system.

Controls

The ACDA901 comes equipped with control keys to allow the user to navigate between menus, select items, and input alphanumeric information.

Alarms

The microprocessor controller activates a visible alarm upon the occurrence of the following events. The alarm will also be audible if Beep on Alarms is enabled and the beeper is not turned off:

- Bypass valve actuator fault
- Condenser inlet temperature sensor fault
- Condenser outlet pressure sensor fault
- Condenser outlet temperature sensor fault
- Condensing temperature high violation
- Condensing temperature low violation
- CW valve actuator fault
- DC power supply 1 fault
- DC power supply 2 fault
- Discrete input abnormal
- Entering fluid temperature high violation
- Inlet water temperature sensor fault
- Internal communication fault
- Low refrigerant level
- No redundant pump
- No temperature/humidity sensors available
- Outlet water temperature sensor fault
- Persistent pumps vapor locked
- Persistent receiver pumped dry
- Primary power source failure
- Secondary power source failure
- Pump 1 discharge pressure sensor fault
- Pump 1 fault
- Pump 1 high head pressure
- Pump 2 discharge pressure sensor fault
- Pump 2 fault
- Pump 2 high head pressure
- Pumps vapor locked
- RDU communication fault
- Pump outlet temperature sensor fault
- Receiver pumped dry
- Refrigerant loss detected
- Subcooler outlet temperature sensor fault
- System stop
- Temperature/humidity duplicate CAN address
- Unit is in maintenance mode
- Starting conditions not satisfied
- Air filter service interval expired
- Evaporation temperature below dewpoint
- Fan 1 door open
- Fan 1 fault
- Fan 1 missing or wrong type
- Fan 2 door open
- Fan 2 fault
- Fan 2 missing or wrong type
- Fan 3 fault (RA only)
- Fan 4 fault (RA only)
- Fan 5 fault (RA only)
- Fan type not configured
- Group communication fault
- Liquid inlet pressure sensor fault
- Liquid temperature sensor fault
- Primary power source overvoltage
- Secondary power source overvoltage
- Rack temperature sensor fault
- Rack temperature high violation
- RDU communications fault
- Return air high temperature violation
- Return air temperature sensor fault (front)
- Return air temperature sensor fault (middle)
- Return air temperature sensor fault (rear)
- Supply air high temperature violation
- Supply air temperature sensor fault (front)
- Supply air temperature sensor fault (rear)

- Unit ID needs configuration
- Unit personality not configured
- Vapor outlet pressure sensor failure
- Evaporation temperature below dew point

Logging

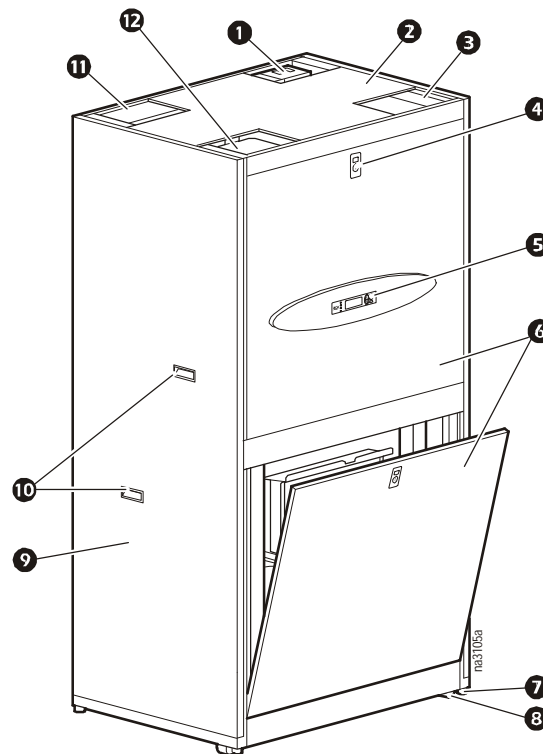
The event log keeps a record of all alarms and events. Each event log contains a time/date stamp as well as operating conditions at the time of occurrence. The controller also displays run time (in hours) for major components.

Display Interface

The backlit, four-line by twenty-character display interface is password configurable.

Component Identification

Exterior



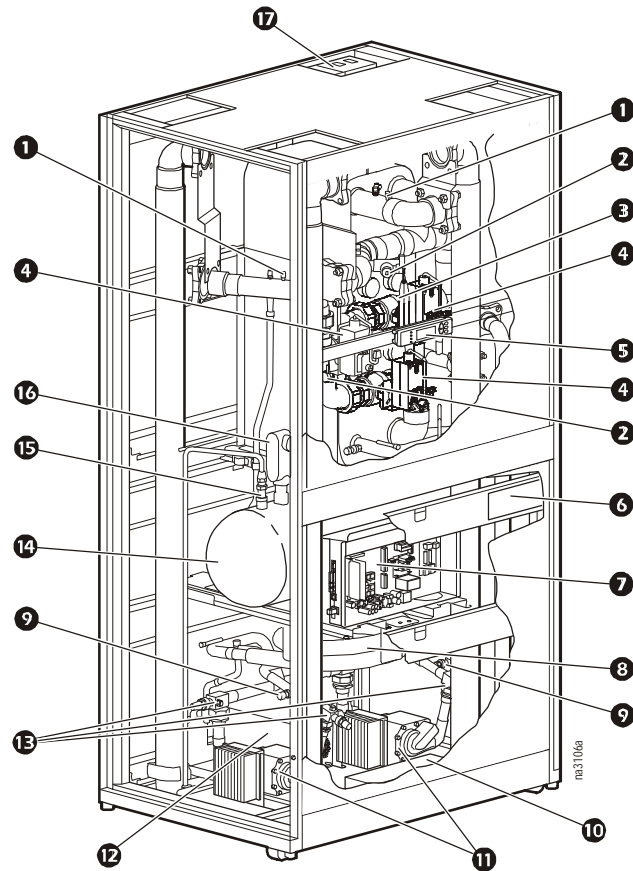
Item	Description
------	-------------

- | | |
|---|--|
| ❶ | Electrical connections (top or bottom configurable) |
| ❷ | Top panel |
| ❸ | Refrigerant supply and return lines (top or bottom configurable) |
| ❹ | Panel lock |
| ❺ | Display interface |
| ❻ | Locking panels |

Item	Description
------	-------------

- | | |
|---|---|
| ❼ | Leveling feet |
| ❽ | Casters |
| ❾ | Side panel |
| ❿ | Panel removal handles |
| ⓫ | Chilled water inlet (top or bottom configurable) |
| ⓬ | Chilled water outlet (top or bottom configurable) |

Interior



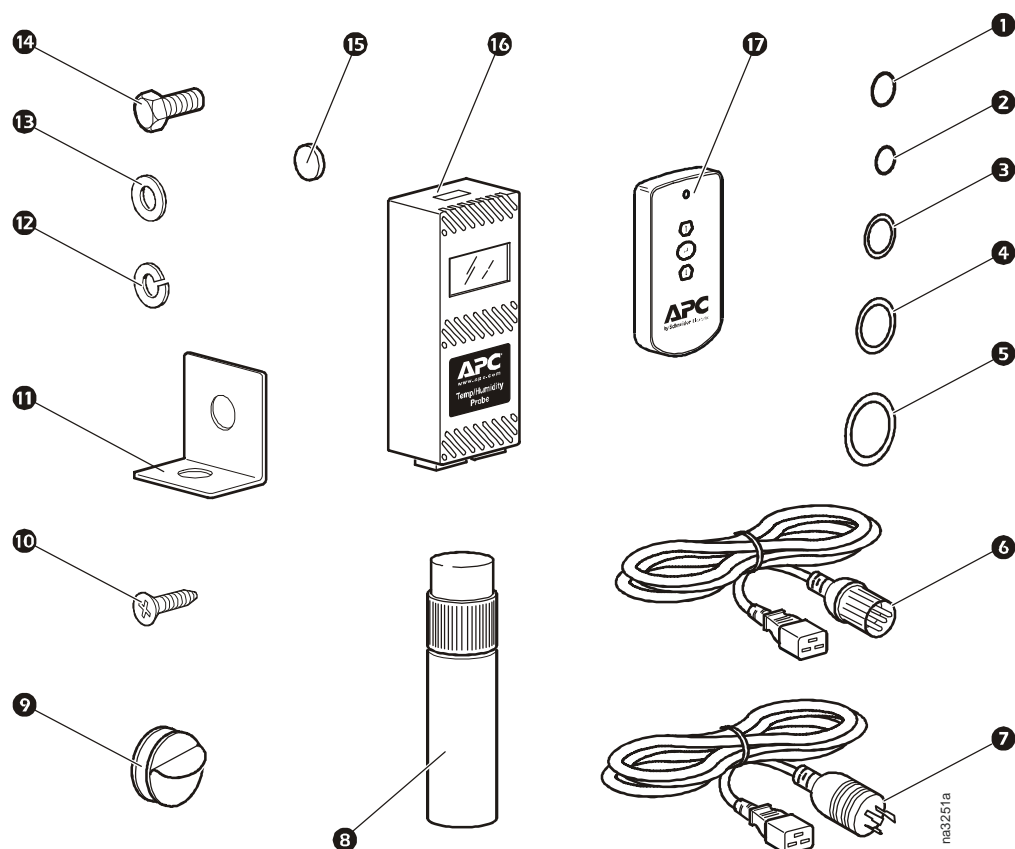
Item Description

- ❶ Schrader valve
- ❷ Clean out tee
- ❸ Brazed plate heat exchanger
- ❹ Actuator
- ❺ User interface
- ❻ Nameplate
- ❼ Electronics board
- ❽ Subcooler
- ❾ Pressure transducer

Item Description

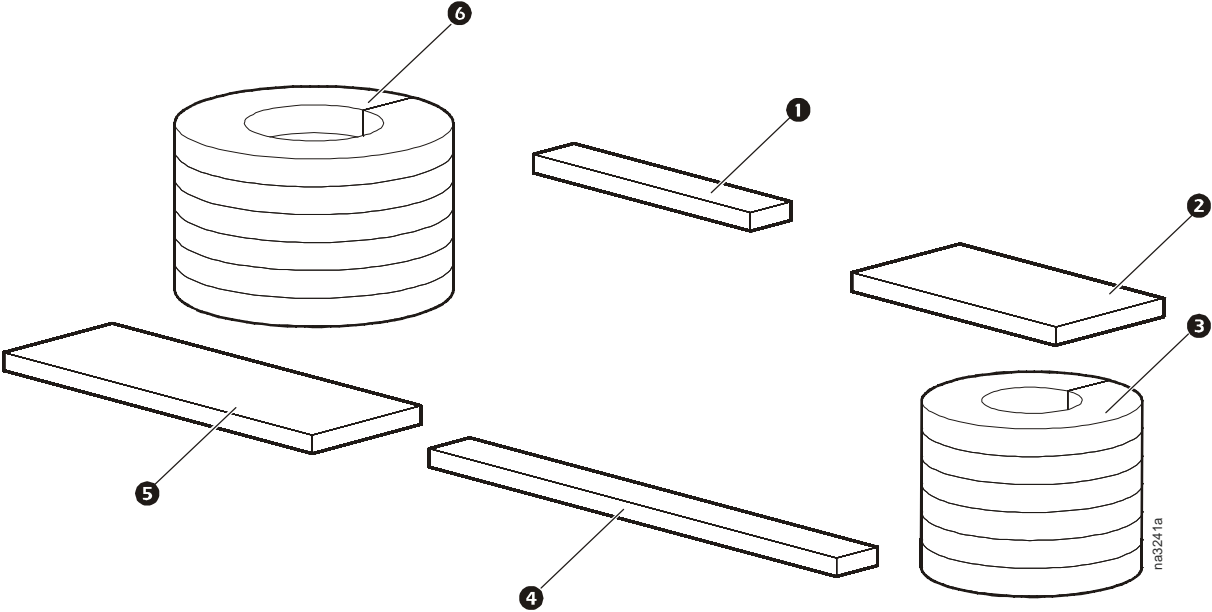
- ❿ Drip shield
- ⓫ Refrigerant pumps
- ⓬ Power supply housing
- ⓭ Rotolock valves
- ⓮ Receiver
- ⓯ Pressure relief valve
- ⓰ Liquid level sensor
- ⓱ Electrical receptacles

Loose parts kit



Item	Description	Qty	Item	Description	Qty
1	Teflon ring, 1-3/4 in (for rotolock valves)	2	10	Philips screw	2
2	Teflon ring, 1-1/4 in (for rotolock valves)	2	11	Mounting bracket	4
3	Gasket, 1-5/8 in flange (for refrigerant supply line)	1	12	Lock washer	4
4	Gasket, 2-in union (for internal water valves)	4	13	Washer	4
5	Gasket, 2-5/8 in flange (for refrigerant return and chilled water inlet and outlet lines)	3	14	Bolt	4
6	Power cord, IEC 309	2	15	Magnets for remote control mount	2
7	Power cord, L5-20P	2	16	Temperature and humidity sensor	1
8	Touch-up paint	1	17	Infrared remote control	1
9	Hook and loop fastener	2			

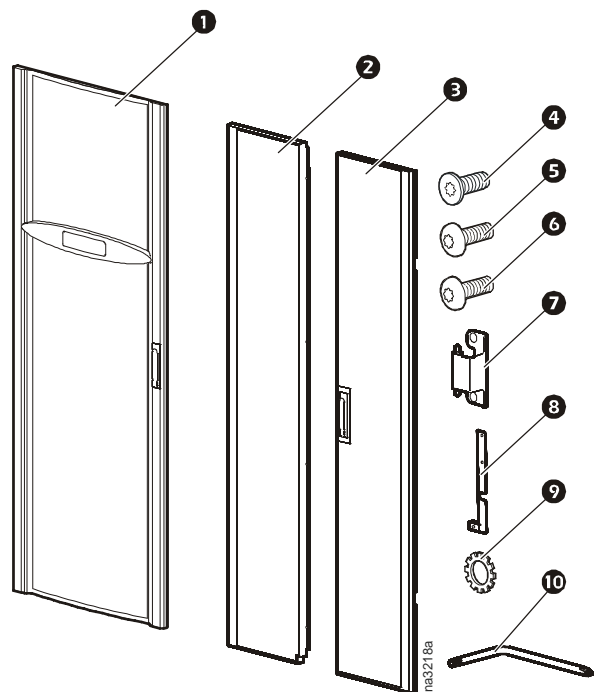
Insulation kit



Item	Description	Qty	Item	Description	Qty
❶	Inside cover, 1.5 in pipe clamp insulation	2	❷	Inside cover, 3 in pipe clamp insulation	5
❸	Cover, 1.5 in pipe clamp insulation	2	❹	Cover, 3 in pipe clamp insulation	5
❺	Flange boot, 1.62 in ID	1	❻	Flange boot, 2.62 in ID	3

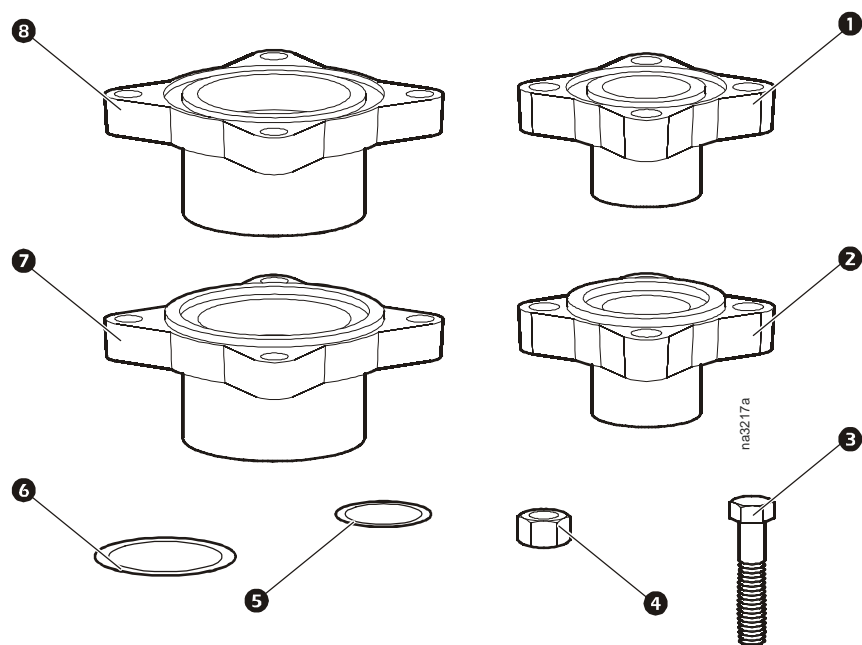
Optional kits

Rack door kit - ACAC21005



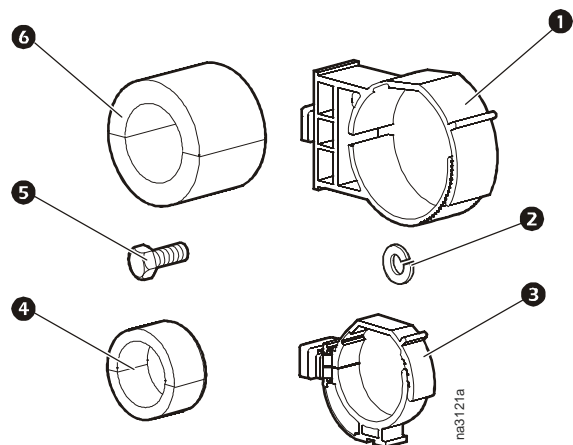
Item	Description	Qty	Item	Description	Qty
❶	Door assembly	1	❸	Door assembly, right, split	1
❷	Door assembly, left, split	1	❹	Screw, T30 M6 × 12 flat head	12
❸	Door assembly, right, split	1	❺	Screw, T30 M6 × 12 nylok pan head	2
❹	Screw, T30 M6 × 12 flat head	12	❻	Screw, T30 M6 × 12 pan head	3
❺	Screw, T30 M6 × 12 nylok pan head	2	❼	Hinge	6
			❽	Closure bracket	1
			❾	Washer, M6 external tooth	3
			❿	Wrench, T30 / #2 Philips	1

Flange kit - ACAC21006



Item	Description	Qty	Item	Description	Qty
1	Flange, 1.625 in OD female	1	5	Gasket, 1-5/8 in flange	1
2	Flange, 1.625 in OD male	1	6	Gasket, 3-1/8 in flange	1
3	Bolt	8	7	Flange, 3.125 in OD male	1
4	Nut	8	8	Flange, 3.125 in OD female	1

Pipe clamp kit - ACAC11005

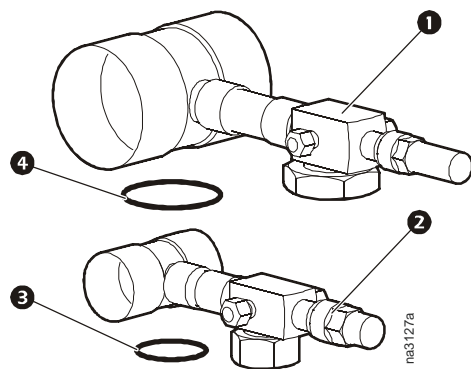


Item	Description	Qty	Item	Description	Qty
1	Pipe clamp, 3.98 in - 4.53 in (return)	2	4	Pipe support insulation 1 5/8 in x 2 in	2
2	3/8 in split lockwasher	4	5	Hex head bolt, 3/8 x 16 x 3/4	4
3	Pipe clamp, 2.60 in - 2.99 in (supply)	2	6	Pipe support insulation 3 1/8 in x 3 in	2



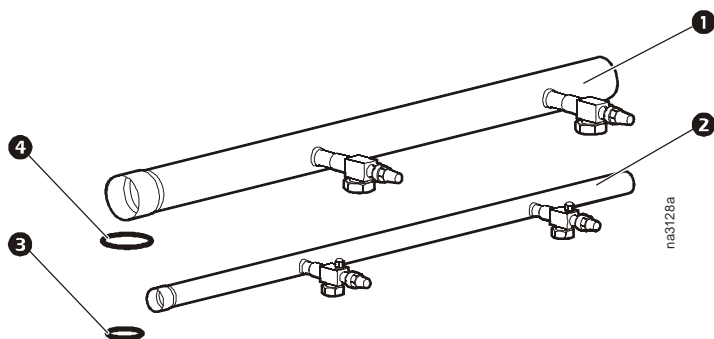
Note: Depending on system configuration, you may have extra parts remaining after assembly.

RDU piping kit, one port - ACAC21000



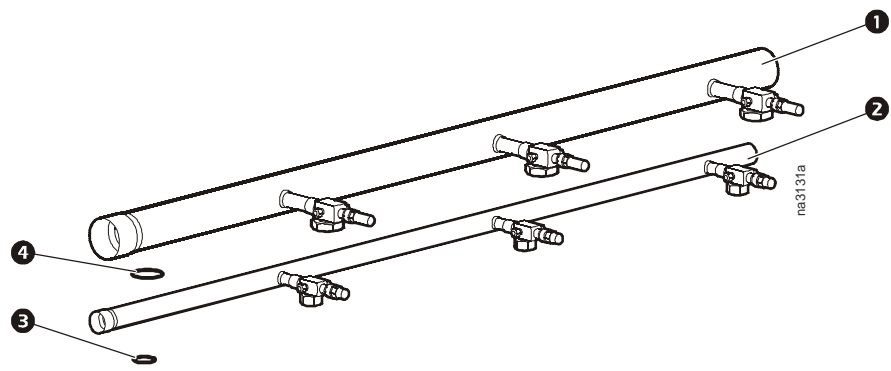
Item	Description	Qty	Item	Description	Qty
1	RDU 1 port assembly, return	1	3	Teflon ring for rotolock 1 1/4 in	2
2	RDU 1 port assembly, supply	1	4	Teflon ring for rotolock 1 3/4 in	2

RDU piping kit, two port - ACAC21002



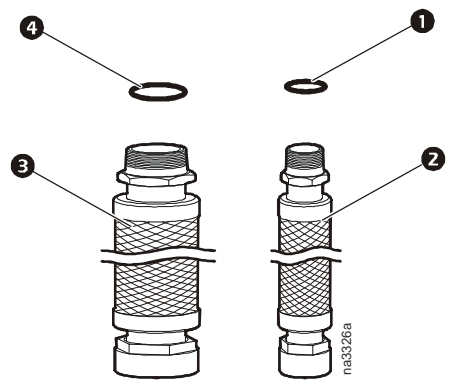
Item	Description	Qty	Item	Description	Qty
1	RDU 2 port assembly, return	1	3	Teflon ring for rotolock 1 1/4 in	4
2	RDU 2 port assembly, supply	1	4	Teflon ring for rotolock 1 3/4 in	4

RDU piping kit, three port - ACAC21004



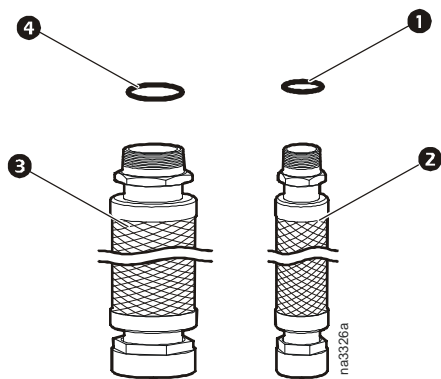
Item	Description	Qty	Item	Description	Qty
1	RDU 3 port assembly, return	1	3	Teflon ring for rotolock 1 1/4 in	6
2	RDU 3 port assembly, supply	1	4	Teflon ring for rotolock 1 3/4 in	6

914 mm (3 ft) stainless steel flex pipe kit - ACAC21007



Item	Description	Qty	Item	Description	Qty
1	Teflon ring, 1.25 in	1	3	Hose, 1.25 in OD, 914 mm (3 ft)	1
2	Hose, 1 in OD, 914 mm (3 ft)	1	4	Teflon ring, 1.75 in	1

1828 mm (6 ft) stainless steel flex pipe kit - ACAC21008



Item	Description	Qty	Item	Description	Qty
1	Teflon ring, 1.25 in	1	3	Hose, 1.25 in OD, 1828 mm (6 ft)	1
2	Hose, 1 in OD, 1828 mm (6 ft)	1	4	Teflon ring, 1.75 in	1

Performance Specifications

Performance Specifications 7°C (45°F) EWT

CW Delta T °C (°F)	Total Net Capacity kW (BTU/hr)	CW Flow Rate l/s (GPM)	CW Pressure Drop kPa (psig)	Power Consumption Watts
3.9 (7)	160 (545,900)	10.1 (160)	83 (12)	650
4.4 (8)	141 (481,540)	8.2 (130)	61 (8.8)	555
5.0 (9)	116 (396,161)	6.3 (100)	43 (6.2)	450

Note: All values are accurate to +/- 3 kW (10,236 BTU/hr) rated with 20% PG

Note: Dewpoint must be 13.3°C (56°F) Or lower to achieve conditions listed in table.

General Data

Performance Data - General

MODEL			ACDA901
PHYSICAL DATA			
	Weight - kg (lbs)		
	Net Weight		544 (1200)
	Operating Weight (top piped)		661 (1455)
	Operating Weight (bottom piped)		674 (1482)
	Shipping Weight		580 (1279)
	Nominal Dimensions - mm (in)		
	Net Height		1991 (78.39)
	Net Width		1070 (42.13)
	Net Depth		750 (29.50)
	Shipping Height		2165 (85.2)
	Shipping Width		1168 (46)
	Shipping Depth		1150 (45.3)
CONNECTION SIZES - mm (in) OD - nominal			
	CW inlet - Cu - brazed		76.2 (3)
	CW outlet - Cu - brazed		76.2 (3)
	Refrigerant Supply - Cu - brazed		38.1 (1.5)
	Refrigerant Return - Cu - brazed		76.2 (3)
CONTROL VALVES - mm (in) - nominal			
	Main 2-way - brass		50.8 (2)
	Bypass 2-way - brass (102 Cv orifice included)		38.1 (1.5)
FLOW RATE			
	Maximum Flow Rate of RDU - l/s (GPM)		11.4 (180)
WORKING PRESSURE			
	Maximum Working Pressure of RDU - kPa (PSI) - Water		2068 (300)
	Maximum Working Pressure of RDU - kPa (PSI) - Refrigerant		1379 (200)
NUMBER OF INROW PUMPED REFRIGERANT COOLING MODULES CONNECTED, MAX (MIN)			
	InRow OA		6 (0)*
OPERATING TEMPERATURE			
	Maximum Ambient Operating Temperature - °C (°F)		52.8 (127)

Performance Data - General

SOUND		
	Lp Sound Pressure (front unit**) dB re: 20 μ Pa***	61 dBA
REFRIGERANT		
	Type	R-134a
	Unit Charge - kg (lb) MINIMUM	27 (60)
	System Charge**** - kg (lb)	77 (170)
WATER		
	Volume (Top Piped) - liters (gal)	43 (11.3)
	Volume (Bottom Piped) - liters (gal)	50.6 (13.4)
<p>Note: Maximum distance between the RDU and the farthest cooling module is 24.4 equivalent meters (80 equivalent feet).</p> <p>* The quantity of 6 OAs is based on a capacity of 25kw per unit. If OAs are operating at less capacity, more units can be piped to an RDU to total 160kW</p> <p>** Unit only tested at 1.0m (3.3 ft) in front of the unit.</p> <p>*** Weighted Sound Pressure dBA in a 1223 m³ (43,200 ft³) room at 1.0 m (3.3 ft) distance.</p> <p>**** 6 CMs and maximum piping length</p>		



Power Consumption

Total Net Capacity kW (BTU/hr)	Power Consumption Watts
160 (545,900)	650
140 (478,125)	551
120 (409,822)	466
100 (341,518)	394
80 (273,214)	337

Glycol Correction Factors

Performance Criteria	Glycol Solution	Percent Volume of Solution***					
		0%	10%	20%	30%	40%	50%
Capacity*	Propylene	1.00	1.00	1.00	0.90	0.76	0.64
	Ethylene	1.00	1.00	1.00	0.90	0.78	0.62
Pressure Drop**	Propylene	0.91	0.96	1.00	1.05	1.14	1.22
	Ethylene	0.93	0.97	1.00	1.03	1.07	1.13
<p>All correction factors are based on 160 GPM (10.1l/s) and 45°F (7.2°C) EWT</p> <p>*Multiply capacity of device or system by factor above for% solution.</p> <p>**Multiply pressure drop of system by factor above for% solution.</p> <p>***Glycol concentrations over 50% are not recommended.</p>							

Electrical Data

SKU	Power (Watts)	MOP (Amps)	MCA (Amps)	Plug Type
ACDA901 100-240V / 1 / 50/60 Hz	650*	20	20	NEMA L5-20P  100-120 VAC
				IEC-309 16/20A  200-240 VAC

Note: Above data is based on maximum operating condition

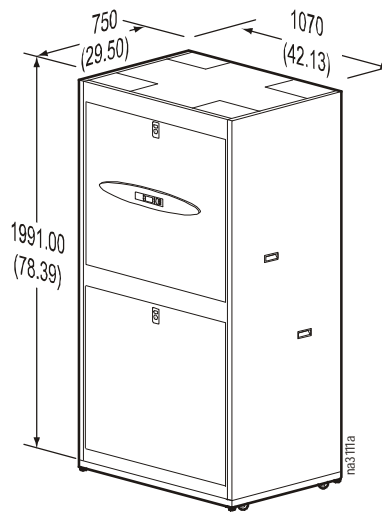
Note: Installation must comply with local and/or national electrical codes

* Watts power value is to be used for genset and UPS sizing.

MCA - Minimum Circuit Ampacity

MOP - Maximum Overcurrent Protection

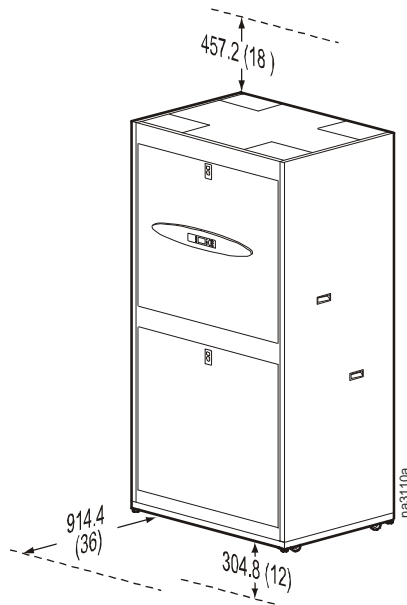
Dimensional Data



Dimensions are shown in mm (in).

Service access dimensions

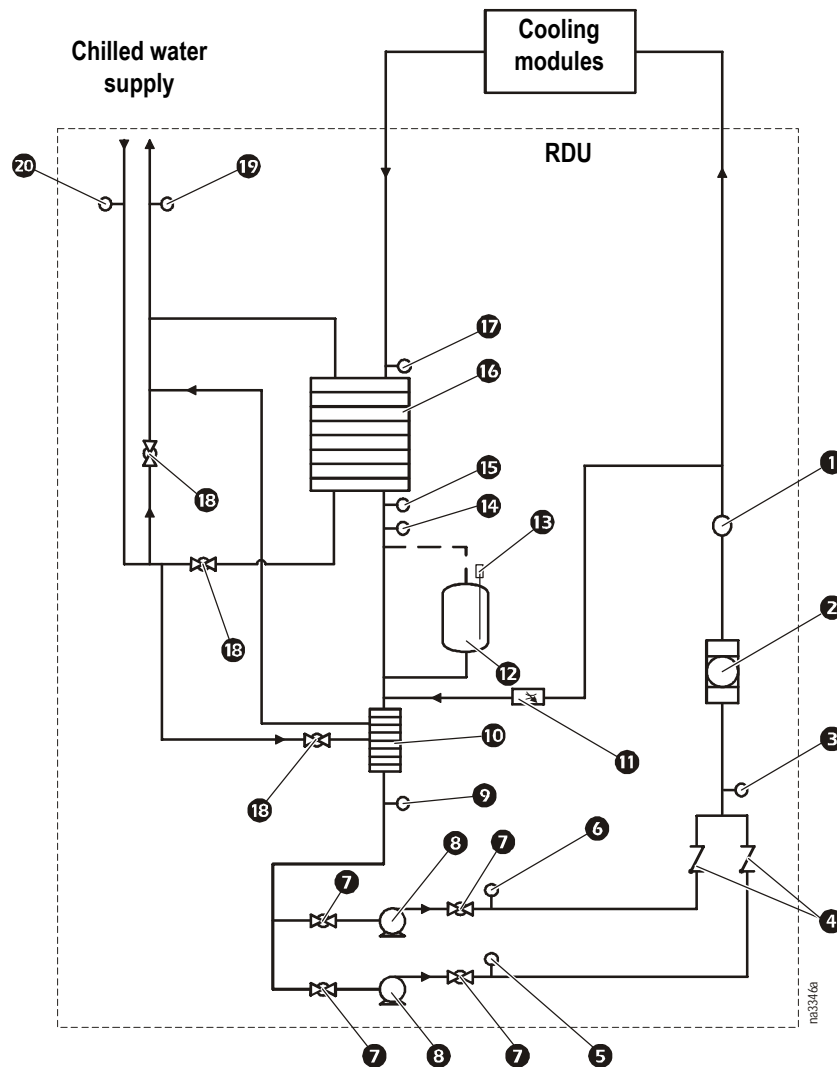
For service, an area of clear space around the RDU is required as shown.



Note: Bottom clearance is optional for top piping; top clearance is optional for bottom piping.

Piping and Mechanical Connections

Internal Piping Diagram



Item Description

- ① Sight glass
- ② Filter dryer
- ③ Refrigerant pump output temperature sensor
- ④ Check valves
- ⑤ Refrigerant pump B output pressure sensor
- ⑥ Refrigerant pump A output pressure sensor
- ⑦ Isolation valves
- ⑧ Pumps
- ⑨ Refrigerant subcooler output temperature sensor
- ⑩ Subcooler

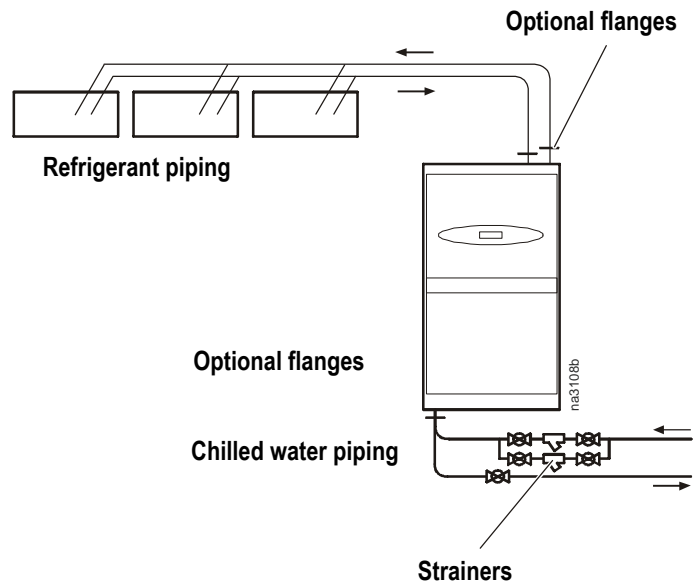
Item Description

- ⑪ ORD valve
- ⑫ Receiver
- ⑬ Liquid level sensor
- ⑭ Refrigerant HXGR output temperature sensor
- ⑮ Refrigerant HXGR output pressure sensor
- ⑯ Condenser
- ⑰ Refrigerant HXGR input temperature sensor
- ⑱ Two-way water ball valves
- ⑲ Leaving water temperature sensor
- ⑳ Entering water temperature sensor

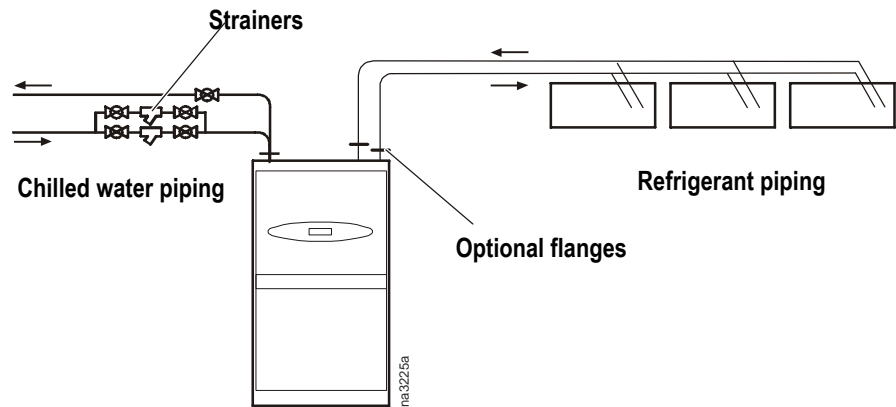
External Piping Diagrams

OA units

This example shows an RDU with bottom piped chilled water lines and top piped refrigerant lines routed to multiple OA units.

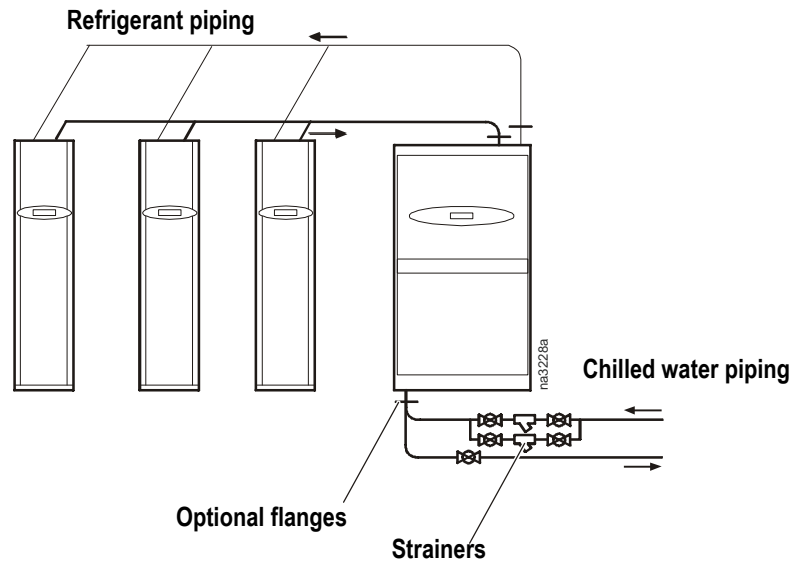


This example shows an RDU with both top piped chilled water lines and top piped refrigerant lines routed to multiple OA units.

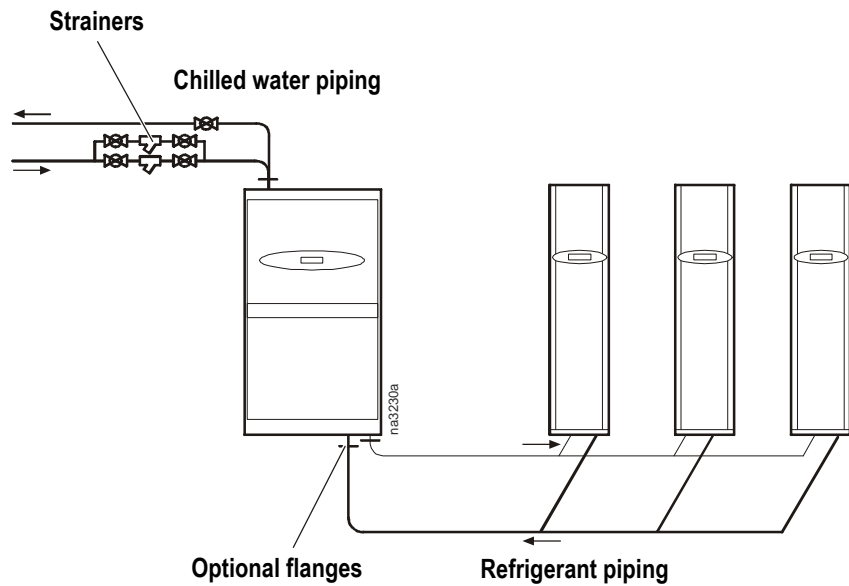


RA units

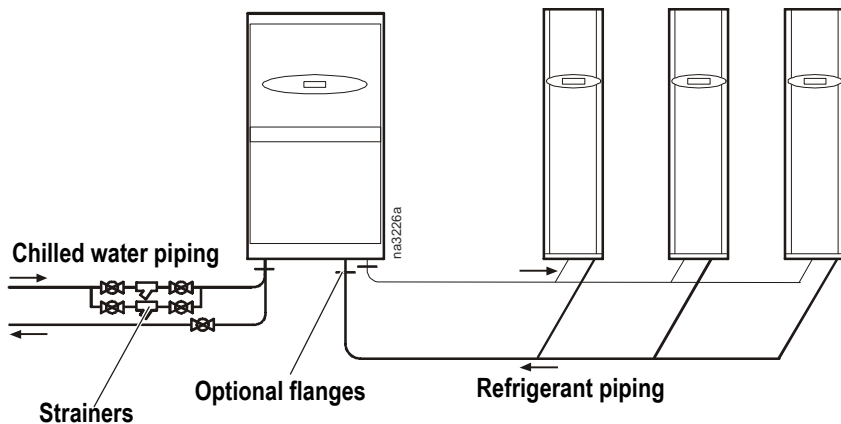
This example shows an RDU with bottom piped chilled water lines and top piped refrigerant lines routed to multiple RA units.



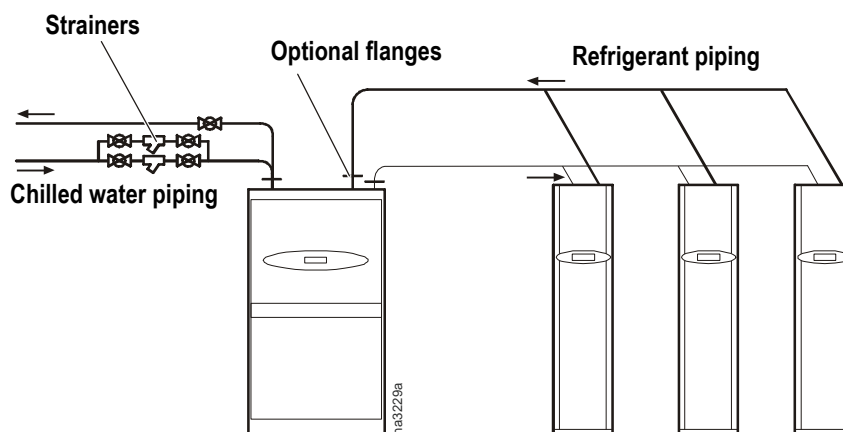
This example shows an RDU with top piped chilled water lines and bottom piped refrigerant lines routed to multiple RA units.



This example shows an RDU with both bottom piped chilled water lines and bottom piped refrigerant lines routed to multiple RA units.



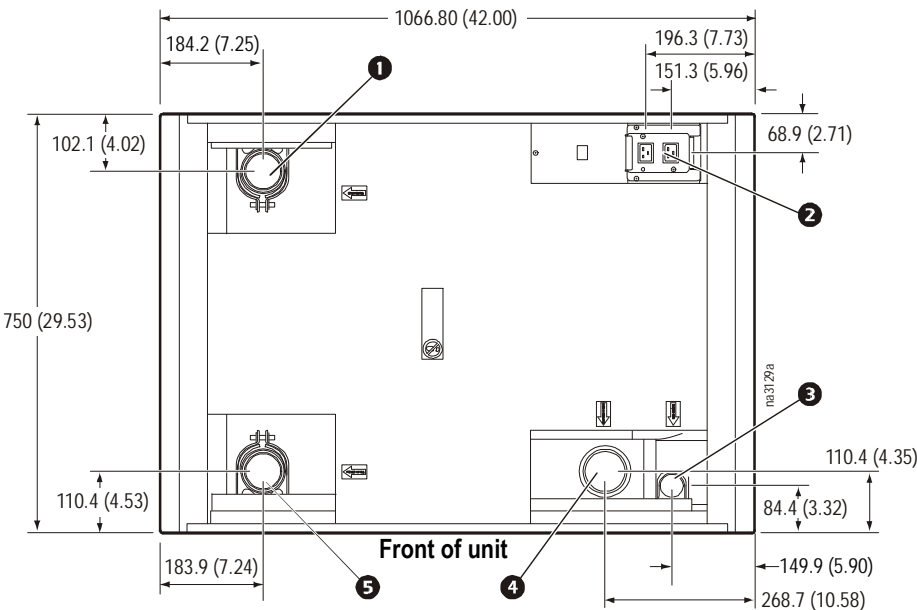
This example shows an RDU with both top piped chilled water lines and top piped refrigerant lines routed to multiple RA units.



Note: In addition to the preceding examples, both OA and RA units can be piped to the same RDU.

Piping and Power Access Locations

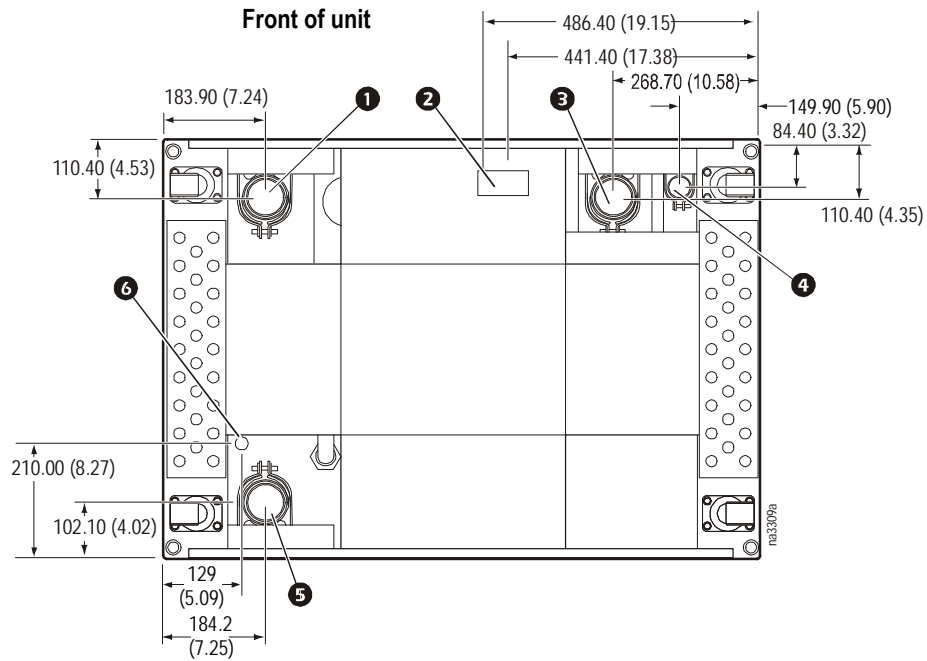
Top view



Dimensions are shown in mm (in).

Item	Description	Item	Description
❶	Chilled water inlet	❷	Refrigerant return line
❷	Top electrical power connections (as shipped)	❸	Chilled water outlet
❸	Refrigerant supply line		

Bottom view (looking up)



Dimensions are shown in mm (in).

Item	Description	Item	Description
❶	Chilled water outlet	❷	Refrigerant supply line
❸	Bottom electrical power connections (optional)	❹	Chilled water inlet
❺	Refrigerant return line	❻	Pressure relief valve outlet

Guide Specifications

PART 1 — GENERAL

1.01 SUMMARY

- A. These specifications describe requirements for a system designed for cooling of IT equipment. The system shall be designed to distribute refrigerant to the row based (close coupled) cooling units.

1.02 DESIGN REQUIREMENTS

- A. The RDU shall be manufactured by APC, shall include supply and return refrigerant connections that may be piped to the distribution manifold installed to distribute the refrigerant to the cooling units. The unit shall be as described in the following specification as manufactured by APC.

1.03 SUBMITTALS

- A. Submittals shall be provided with the proposal and shall include: overall dimensions of the unit, electrical requirements and capacity data; typical Piping and Electrical Connection drawings.

1.04 QUALITY ASSURANCE

- A. The unit shall be factory tested prior to shipment. Testing shall include complete pressure and leak testing to ensure system integrity. The system shall be inspected for quality control before shipment.
- B. The unit shall be UL Listed to UL 1995 and CSA C22.2 No. 236.

1.05 WARRANTY

With factory startup, parts and labor shall be provided with a warranty against defects for a period of 12 months from date of shipment from factory. Without factory startup, the warranty is parts only.

PART 1 — STANDARD COMPONENTS

1.01 STANDARD FEATURES

- A. The RDU shall include a heat exchanger, redundant pumps, sub-cooler, refrigerant receiver, ACDA901, modulating control valve, dual power feeds, and associated factory piping.

1.02 CABINET CONSTRUCTION

- A. The frame shall be 14 gauge formed steel and bolted together.
- B. The front and back exterior panels shall be 18 gauge steel and the side exterior panels shall be 20 gauge steel.
- C. All exterior panels and corner posts on the frame shall be powder coated black. The unit shall include front removable panels for system installation and service.
- D. The front panels shall have provisions to be locked with a key.
- E. The unit shall include casters for easy installation and leveling feet at each corner.
- F. All internal piping including headers and distribution lines shall be insulated with ½-inch (12.7 mm) closed cell insulation.

1.03 CONNECTIONS

- A. The unit shall include provisions for either top or bottom piping connections of chilled water and refrigerant. The top connections to be piped overhead attached to the ceiling structure or bottom connections to be piped through the raised floor.

1.04 PUMPS

- A. The pumps shall be factory-piped and factory wired in the pumping unit.
- B. The unit shall have 2N redundant pumps.
- C. Each pump shall be able to be replaced while unit is in operation without affecting the performance of the system.
- D. The pumps shall be able to automatically adjust the flow of refrigerant for variable capacity of the system.

1.05 HEAT EXCHANGER

- A. The heat exchanger shall be brazed-plate type, constructed of 316 stainless-steel plates.
- B. The primary side shall be piped to a chilled water source.
- C. The secondary side shall be piped to the cooling units.

1.06 WATER CONTROL VALVE

- A. A modulating chilled water valve shall control the flow of chilled water on the primary side of the heat exchanger. The valve actuator shall maintain a constant refrigerant condensing temperature for optimum cooling.

1.07 MICROPROCESSOR CONTROLLER

- A. **Monitoring and Configuration:** The master display shall allow monitoring and configuration of the cooling system through a menu-based control. Functions include status reporting, set-up, and temperature set points. Four LEDs report the operational status of the connected cooling system.
- B. **Controls:** The ACDA901 shall come equipped with control keys to allow the user to navigate between menus, select items, and input alpha numeric information.
- C. **Alarms:** The microprocessor controller shall activate a visible and audible alarm in the occurrence of the following events:
 - 1. Bypass valve actuator fault
 - 2. Condenser inlet temperature sensor fault
 - 3. Condenser outlet pressure sensor fault
 - 4. Condenser outlet temperature sensor fault
 - 5. Condensing temperature high violation
 - 6. Condensing temperature low violation
 - 7. CW valve actuator fault
 - 8. DC power supply 1 fault
 - 9. DC power supply 2 fault
 - 10. Discrete input abnormal
 - 11. Entering fluid temperature high violation
 - 12. Inlet water temperature sensor fault
 - 13. Internal communication fault
 - 14. Low refrigerant level
 - 15. No redundant pump
 - 16. No temperature/humidity sensors available
 - 17. Outlet water temperature sensor fault
 - 18. Persistent pumps vapor locked
 - 19. Persistent receiver pumped dry
 - 20. Primary power source failure
 - 21. Secondary power source failure
 - 22. Pump 1 discharge pressure sensor fault
 - 23. Pump 1 fault
 - 24. Pump 1 high head pressure
 - 25. Pump 2 discharge pressure sensor fault
 - 26. Pump 2 fault
 - 27. Pump 2 high head pressure
 - 28. Pumps vapor locked
 - 29. RDU communication fault
 - 30. Pump outlet temperature sensor fault
 - 31. Receiver pumped dry
 - 32. Refrigerant loss detected
 - 33. Subcooler outlet temperature sensor fault
 - 34. System stop
 - 35. Temperature/humidity duplicate CAN address
 - 36. Unit is in maintenance mode
 - 37. Starting conditions not satisfied
 - 38. Water leak detected

39. Water leak detected warning
40. Air filter service interval expired
41. Evaporation temperature below dewpoint
42. Fan 1 door open
43. Fan 1 fault
44. Fan 1 missing or wrong type
45. Fan 2 door open
46. Fan 2 fault
47. Fan 2 missing or wrong type
48. Fan 3 fault (RA only)
49. Fan 4 fault (RA only)
50. Fan 5 fault (RA only)
51. Fan type not configured
52. Group communication fault
53. Liquid inlet pressure sensor fault
54. Liquid temperature sensor fault
55. Primary power source overvoltage
56. Secondary power source overvoltage
57. Rack temperature sensor fault
58. Rack temperature high violation
59. RDU communications fault
60. Return air high temperature violation
61. Return air temperature sensor fault (front)
62. Return air temperature sensor fault (middle)
63. Return air temperature sensor fault (rear)
64. Supply air high temperature violation
65. Supply air temperature sensor fault (front)
66. Supply air temperature sensor fault (rear)
67. Unit ID needs configuration
68. Unit personality not configured
69. Vapor outlet pressure sensor failure
70. Evaporation temperature below dew point

- D. Logging: The microprocessor controller shall log and display all available events. Each alarm log shall contain time/date stamp as well as operating conditions at the time of occurrence. Controller shall display the run time hours for major components.

1.08 NETWORK MANAGEMENT CARD

- A. The unit shall include a network management card to provide management through a computer network through TCP/IP. Management through the network should include the ability to change set points as well as view and clear alarms.

1.09 SELECTABLE TOP OR BOTTOM PIPING

- A. Pipe connections for field connection from either the top or bottom of the unit. Unit connections shall be made external to the unit.
- B. Piping should be factory insulated with 1/2 inch closed cell neoprene insulation.

1.10 DUAL POWER INPUT

- A. Input Power Feeds: Dual power inputs should be a locking NEMA or IEC plug connection suitable for the input power.

1.11 DUAL REFRIGERANT PUMP POWER SUPPLIES

- A. Power Supplies: The unit shall include two power supplies, each capable of running the unit at 90% capacity in the event of a single power supply failure.
- B. Operation and Service: Power supply shall be replaceable by certified personnel.

PART 2 — IMPLEMENTATION

2.01 INSTALLATION

- A. Installation of the system shall be in accordance to the Guidelines for Installation by the manufacturer.
- B. Installation shall be performed by the manufacturer or supervised by the manufacturer service representative.
- C. Installation of piping and connections from the RDU to the distribution manifold shall be performed be supervised by the manufacturer service representative.

Note: Minimum raised floor height for bottom piping is 18 inches (357.2 mm)

2.02 STARTUP

- A. Start up of the RDU shall be performed by the manufacturer.

Guidelines for Installation

The RDU provides cooled refrigerant to InRow cooling modules (CM) to achieve reliable, accurate temperature control of computer rooms, laboratories, and other environments that require close tolerance control. The unit incorporates the latest system design innovations to provide you with optimum efficiency, reliability, and accuracy of control.

The RDU unit will provide years of trouble-free service when installed and maintained by technically qualified personnel. For more detailed information, see the appropriate RDU Installation manual.

Room preparation

During the design of the data center, consider ease of entry for the equipment, floor loading factors, and accessibility to piping and wiring.

Seal the room with a vapor barrier to minimize moisture infiltration. (Polyethylene film is recommended for ceiling and wall applications.) Apply rubber or plastic based paints to concrete walls and floors.

Insulate the room to minimize the influence of exterior heat loads. Use the minimum required amount of fresh air for make up to comply with local and national codes and regulations. Fresh air imposes extreme load variation on the cooling equipment from summer to winter and causes increased group operating costs.

Service access

For installation, at least 914 mm (36 in) of clear space must be left in the front of the unit.

Receiving the unit

Your RDU has been completely tested and inspected prior to shipment. To ensure that you have received the unit in excellent condition, perform a careful inspection of the crating and the unit immediately upon receipt. Verify that all parts ordered were received as specified. Report any damage discovered to the freight carrier. If necessary, contact the APC field service department for help in repairing or replacing damaged parts. While APC is not responsible for damage incurred in transit, we want to make sure that you have no undue delays in your system start-up. See the unpacking sheet and installation manual for more information.

Rigging

The unit is manufactured with a formed steel frame for maximum strength and unit integrity. However, as with all electrical and mechanical equipment, you must take care with proper rigging of your unit. When using a forklift to move the unit, use the shipping skid to protect the bottom of the unit. When using chains, cables, or rope to lift the unit, use spreader bars to prevent damage to the finished panels. Four threaded M10X16 holes are provided in the top of the frame to accommodate lifting eye bolts that can be utilized to lift the unit.

APC Worldwide Customer Support

Customer support for this or any other APC product is available at no charge in any of the following ways:

- Visit the APC Web site to access documents in the APC Knowledge Base and to submit customer support requests.
 - **www.apc.com** (Corporate Headquarters)
Connect to localized APC Web sites for specific countries, each of which provides customer support information.
 - **www.apc.com/support/**
Global support searching APC Knowledge Base and using e-support.
- Contact the APC Customer Support Center by telephone or e-mail.
 - Local, country-specific centers: go to **www.apc.com/support/contact** for contact information.

For information on how to obtain local customer support, contact the APC representative or other distributors from whom you purchased your APC product.

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