CLIMATEWORX
MISSION CRITICAL CLIMATE CONTROL

In Row

Installation Manual

ClimateWorx International Inc.
14 Chelsea Lane, Brampton, Ontario, Canada L6T 3Y4

Table of Contents:

1.0 Site Preparation

In order to maximize operation efficiency and performance, the following areas should be observed in the site planning stage:

- A vapor seal to eliminate moisture migration through the building structure should surround the room. Windows should be sealed and at least double-glazed to prevent sweating. All doors jams should fit tightly and should not have any grilles in them. Polyethylene film type ceiling, vinyl wallpaper or plastic base paint on the walls and slab are recommended to minimize absorption and transmission of moisture into the room.

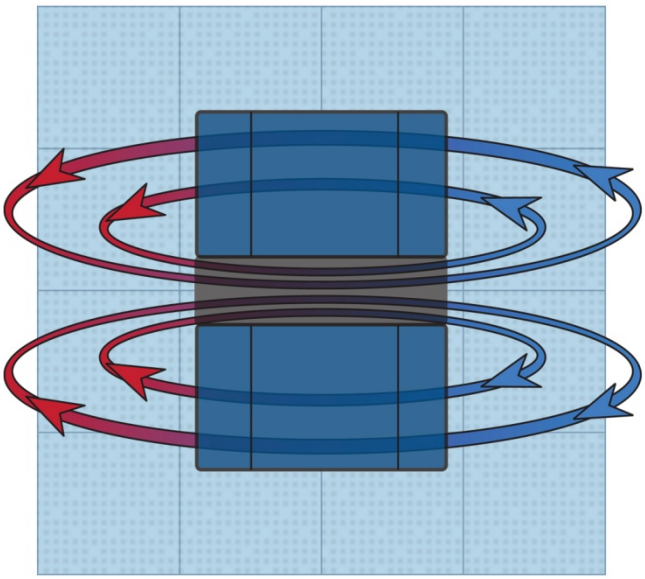
- Owing to the general nature of small population, a typical room should have outdoor fresh air kept at only about 5% of the recirculated air. This provides enough ventilation for personnel and pressurizes the room to prevent dust from entering through leaks. The incoming fresh air must be filtered very closely, and preferably pretreated. Otherwise heating, cooling, humidifying and dehumidifying loads of the incoming fresh air should be taken into account in determining total loading requirements.

- All cables and piping should be carefully routed to lower resistance to the distribution of conditioned air and to avoid the blockage of air-path to any portion of the room. As a good practice, all cables and piping running under the raised floor should be mounted horizontally and whenever possible, routed to run in parallel with the air-path.

- In order to obtain the most effective air distribution, units should not be located too close together. Attention should be taken to avoid locating the units in an alcove or an extreme end of a long narrow room.

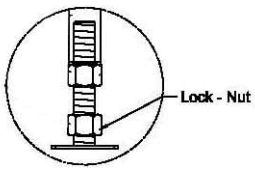
2.0 Location Consideration

Positioning of Indoor Units



Typical In Row Unit with IT Cabinets

The units are designed to be free standing on a slab floor or a raised floor with sufficient supports underneath. The unit should be isolated using a suitable isolation method.

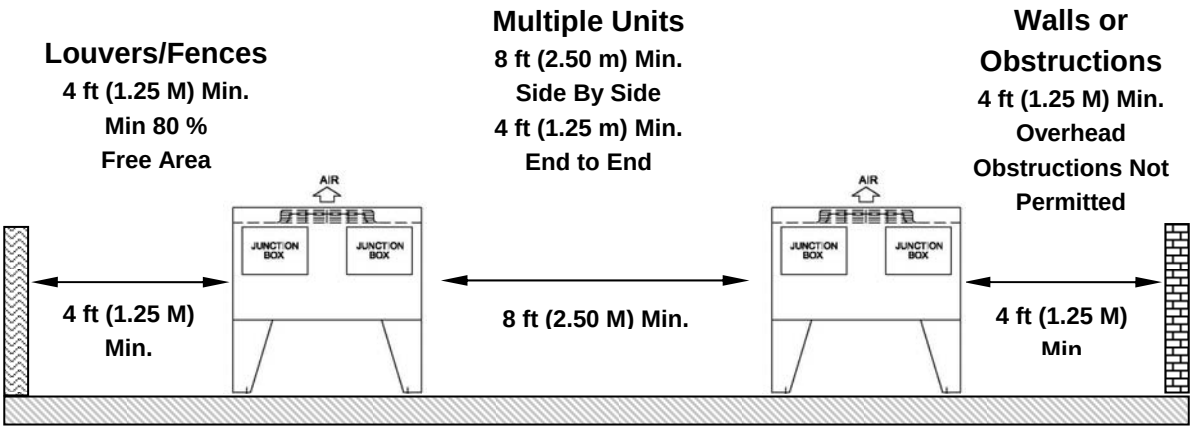


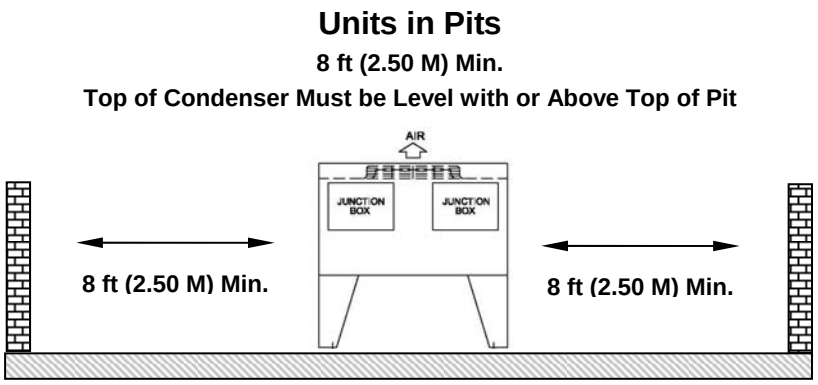
ClimateWorx OEM equipment uses a threaded leveling foot with a locking nut. Use bottom nut to lock the leveling foot in place.

The room layout should provide **33" service clearance in the front and the rear of the unit** for routine service and maintenance.

Positioning of Outdoor Heat Rejection Devices

The outdoor heat rejection devices such as air-cooled condensers and glycol coolers should be located as close to the indoor unit as possible. From a security and environment standpoint, the outdoor heat rejection devices should be installed away from public access and occupied spaces where low ambient sound level is required.





In order to avoid short-circuiting and inter unit recirculation, outdoor heat rejection devices should be located as per above**.** To ensure maintenance-free operation, outdoor heat rejection devices should be located away from areas continuously exposed to loose dirt and foreign materials that may clog the coil.

The outdoor heat rejection devices should be firmly secured on steel supports or concrete plinths.

3.0 Installation

3.1 Handling and Unpacking Equipment

3.1.1 Initial Inspection

Upon arrival of the ClimateWorx unit and prior to unpacking it, please conduct a visual inspection of the unit. Check for external damage(s) whether visible or concealed. Any damage(s) noted should be immediately reported to the transport carrier. Damage(s) claimed must be made towards the carrier.

3.1.2 Uncrating

The ClimateWorx units are:

To Unpack the Unit :

Remove Outer Packaging

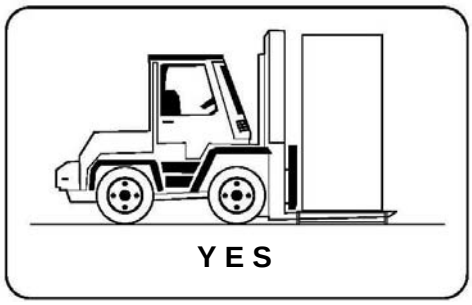
1. **Carefully remove wooden crate (strapping) using a crowbar.**
2. **Remove shrink wrapping.**
3. **Remove cardboard tops and sides.**

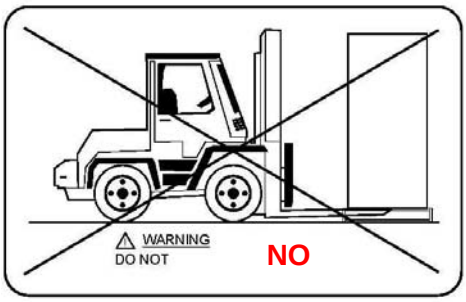
PLEASE NOTE:
Units shipped in dedicated trucks will typically have all the items above without the Wood Strapping.

3.1.3 Removing Unit from Skid:

1. Use a forklift to physically remove unit from skid.

2. Align the forklift with either the front or rear side of the unit.

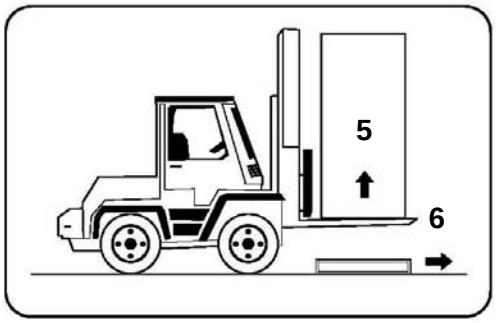




3. Make sure forklift forks are full into unit – do not lift unit if forks are halfway in – doing so will damage the unit frame.

4. Lift the unit.

5. Remove the skid from under the unit.



6. Unit now ready to be “placed” on floor and can be moved around on factory installed castors.

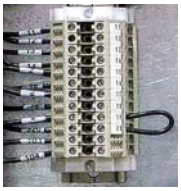
3.2 Electrical Connection

All models are fitted with one (two when ATS is provided), **3-pole mains isolators**, neutral and earth terminal, which are located in the electrical power panel.

The isolators and terminals will accept cables up to #2 AWG (35 mm²). The power cables should be sized in accordance with local and national codes. Refer to the "Electrical Data" section in the Technical Data Manual for current requirements.

The disconnect switch on the front of the unit is mechanically connected to power source disconnect switch. Opening the disconnect switch will turn off both the sources of power to the unit.

3.3 Interconnecting Wiring



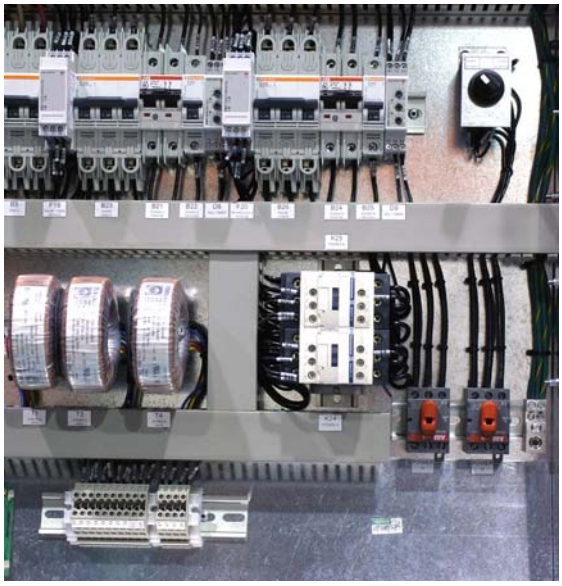
All the units internal wiring are completed and tested prior to delivery. A **numbered terminal block** for field installed control wiring is provided at the upper area of the power panel.

The numbered terminal block will accept control wiring up to #12 AWG (4 mm²). The terminal assignment is listed as follows:

Terminal	Function	Requirement
11-12	Standby enable	Normally open output
13-14	Common alarm (General)	Normally open output
21-22	Common alarm (Critical)	Normally open output
15-16	Remote on / off	Normally open dry contact input
17-18	Standby start	Normally open dry contact input
19-20	Fire alarm	Normally closed dry contact input
23 thru 28	Condenser/Pump interlock	Normally open dry contact output
31-32	Compressor disable **(optional)**	Normally open dry contact input
35-36	Remote on/off Interrupt **(optional)**	Normally open dry contact input
37-38	Unit Status **(optional)**	Normally open dry contact output
39- 42	Custom Fault1/2 **(optional)**	Normally open dry contact input
43- 44	Liquid High Limit **(optional)**	Normally open dry contact input
49- 50	Hum/ Reheat disable **(optional)**	Normally open dry contact input
57- 58	Damper Motor Interlock **(optional)**	Normally open dry contact output
59- 60	Damper End Switch **(optional)**	Normally open dry contact input

4.0 Auto Transfer Switch (Optional on 24")

4.1 ATS Principle of Operation



ClimateWorx Electrical Panel c/w A T S Components and power source selector switch

The Auto Transfer Switch monitors the availability of power from either source to the unit using phase monitor devices and automatically switches to the secondary source of power when the primary source fails using mechanically and electrically interlocked contactors. Once the primary source of power is restored the unit will automatically switch back to primary power **(i.e Automatic transfer switch shall auto reset on a return to normal/clean power)**. Independent and interlocked timing relays ensure the components in the unit shut down during the change over. They allow the microprocessor to perform the normal component sequencing to minimize the load on the power sources during the times of transfer and limit the stress on the components normally associated with transferring power under load.

4.2 ATS Features

The Auto Transfer Switch, (ATS) feature of the ClimateWorx unit must be powered from two separate independent sources to function properly. There are two non-fused disconnect switches in the unit, one for the **primary power source A** and one for **primary power source B.**

Opening the disconnect using the handle on the outside of the electrical panel will disconnect both sources of power.

The transfer of power to the unit components is achieved using mechanically and electrically linked **contactors,**

Refrigerant Pipe work Installation

Good practices should always be followed when connecting refrigerant piping in systems.

As many of the operational problems encountered in a refrigeration system can be traced back to improper design and installation of refrigerant piping, it is essential that the following guidelines be observed:

1. Use clean and dehydrated refrigeration quality tubing purchased with both ends sealed.

2. Cut and form tubes carefully to avoid getting dirt or metal particles into the refrigeration lines. Never use a hacksaw to cut the tubing.

3. Once opening the system, complete the work as quickly as possible to minimize ingress of moisture and dirt into the system. Always put caps on ends of tubes and parts not being worked on.

4. To prevent scaling and oxidation inside the tubing, pass an inert gas such as nitrogen through the line while carrying out brazing, silver soldering or any other welding processes.

5. It is recommended that refrigeration quality solder (95% tin, 5% silver) be used for its excellent capillary action.

6. Use minimum amount of solder flux to prevent internal contamination of the piping. Use flux with care as it is usually acidic in nature.

7. Install a trap at the bottom of the vertical riser of a hot gas line and a trap for every 20 ft. (6m) in elevation to collect refrigerant and lubrication oil during off cycle. A discharge line trap is an important function both during the compressor on and during the compressor off cycle. During the on cycle, the trap collects oil droplets and carries them efficiently up the elevated discharge line. During the off cycle, the traps captures and retains oil residing on the pipe walls that would otherwise drain back to the compressor head, causing damage on startup.

8. Install inverted trap whenever a condenser is located above the compressor. An inverted trap or check valve should be installed at the condenser inlet and outlet to prevent liquid refrigerant from flowing backwards into the compressor during off cycles.

9. Insulate the suction line and insulate liquid lines that may be subjected to high heat gains. Insulate low level discharge lines to avoid burning due to accidental contact.

10. Design and arrange refrigerant piping for the remote condenser in such a way so that adequate velocity of refrigerant can be maintained to prevent oil trapping. Under sizing discharge lines will reduce compressor capacity and increase compressor load. Over sizing

discharge lines increases the initial cost of the project and can reduce the refrigerant gas velocity to a level where oil is not returned to the compressor.Recommended pipe sizes are tabulated as follows:

Recommended Pipe Size for Remote Condenser

Model	**12”**	**24”**
Hot Gas Line		
25 ft. equivalent pipe length	5/8”	7/8”
50 ft. equivalent pipe length	5/8”	1 1/8”
75 ft. equivalent pipe length	5/8”	1 1/8”
100 ft. equivalent pipe length	3/4”	1 1/8”
150 ft. equivalent pipe length	3/4”	1 1/8”
Liquid Line		
25 ft. equivalent pipe length	3/8”	1/2”
50 ft. equivalent pipe length	3/8”	5/8”
75 ft. equivalent pipe length	1/2”	5/8”
100 ft. equivalent pipe length	1/2”	3/4”
150 ft. equivalent pipe length	1/2”	3/4”

Consult Factory for additional distances

Evacuation

The procedure for leakage testing and evacuation of the system is as follows:

1. Disconnect all line voltage fuses except the fuses for control transformers.
2. Connect a gauge manifold to the compressor suction and discharge access valve.
3. Close the compressor discharge and suction ports and open all service valves.
4. Charge the system with dry nitrogen to approximately **2**50 psi **(not to exceed 550psi).**
5. Leave pressure in system for at least 12 hours. If pressure holds, continue with next step. If the pressure drops, detect and seal leak before continuing.

6. Release all pressure. Connect a vacuum pump to the compressor suction and discharge valves with refrigerant or high vacuum hoses. Provide an isolating valve and a pressure gauge for pressure checking.

7. Evacuate the system to an absolute pressure not exceeding **500** microns. Break the vacuum to 2psig with dry nitrogen. Repeat the evacuation process and then re-break the vacuum with dry nitrogen.

8. Open the compressor discharge and suction ports. Evacuate to an absolute pressure not exceeding 500 microns. Let the vacuum pump run without interruption for minimum two hours.

9. Stop the vacuum pump. Break the vacuum and charge the system with vapor 410A (see spec label for unit refrigerant) through the discharge side of the compressor. It is a good practice to weigh the charge that is put into the system. Allow the pressure to equalize.

Charging

Proper performance of the system depends largely on proper charging. Adhere to the following guidelines for charging:

Calculate the total charge required using this formula:

Indoor Unit Charge + Liquid Line Charge + Condenser Charge

+ Hot gas Line Charge + 20% of Receiver volume = Total Charge

When head pressure control is utilized, there must be enough refrigerant to flood the condenser at the lowest expected ambient and still have enough charge in the system for proper operation. After completing the evacuation procedures as in the fan speed control system, follow the following guidelines for charging:

1. Open the main isolator and insert the fuses for the fans, control transformers and the compressor.

2. Close the main power and allow the compressor crankcase heater to operate for at least one hour.

3. Connect the gauge manifold to both discharge and suction service valves, with a common connection to the refrigerant cylinder. Purge the lines by opening the refrigerant cylinder vapor valve.

4. Connect the refrigerant cylinder to recovery unit and charge system with 90% of calculated amount.

5. Start the unit using the test mode to energize the main fan and compressor.

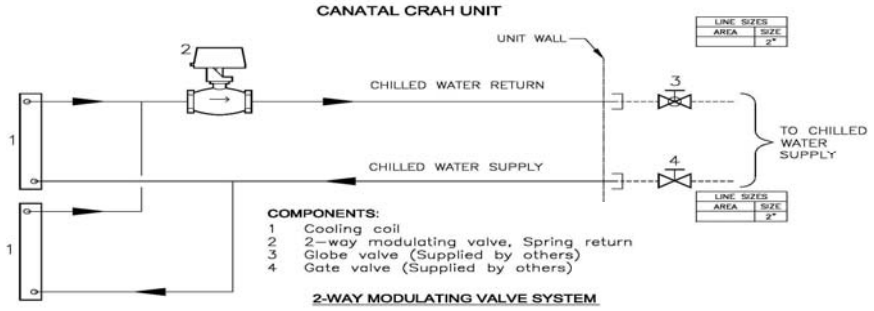
6. Add additional refrigerant to the system until the sight glass is clear of bubbles and subcooling measured in 10-15F range.

7. The system is now correctly charged for operating under head pressure control at the ambient temperature charging is being carried out. It is a good practice to weigh the amount of additional refrigerant that was added and keep a record of the total charge in the system.

Water / Glycol / Chilled-water Pipe work Installation

The Water / Glycol / Chilled-water pipe work in all systems should be installed in accordance with the following recommendations:

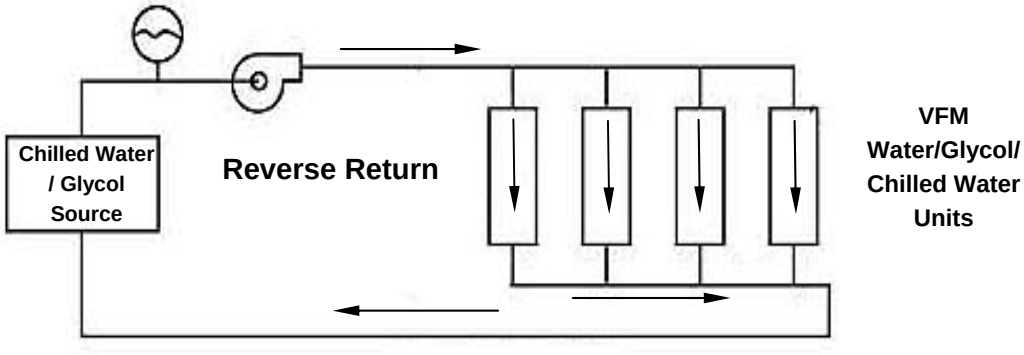
1. A manual shut-off valve should be installed at the supply and return pipes of each indoor unit for routine service and emergency isolation of the unit.



2. Joints installed inside the room must be kept to a minimum. The system drain discharge point should be installed outside the room.

3. Piping inside the building should be insulated to eliminate the possibility of condensation under low ambient conditions.

4. Always use the reverse return system when two or more indoor units are served by the same source.



5. For condensing water supplied from a cooling tower which is located in a poor environment or when water quality is poor, adequate filtration and an inhibitor should be added at a correct quantity to prevent the formation of scale and corrosion.

6. Only ethylene glycol or propylene glycol containing a corrosion inhibitor should be used. Automotive anti-freeze is unacceptable and must not be used in the Glycol system.

7. Concentration of glycol required depends on the minimum ambient temperature. The following glycol concentration is recommended:

% of Ethylene Glycol by Weight	10	20	30	40	50
Minimum Operating Temp °C (°F)	0 (32)	- 5 (23)	-11.6 (11)	- 20 (-4)	- 32.2 (-26)

Piping Connection Sizes

Model	**12”**	**24”**
Steam Condensate –ODM	3/4”	3/4”
Humidifier Water –ODM	1/4”	1/4”
Cooling Coil Condensate –ODM	3/4”	3/4”
Chilled Water –ODM	1 1/8”	1 3/8”
Condensing Water –ODM	7/8”	1 1/8”
Glycol Solution –ODM	7/8”	1 3/8”

All units provided with a factory installed condensate pump have 3/8” O.D. connection size.

The drain line can be connected through the top or the bottom of the unit.
Condensate pump is rated for a maximum working head of 15 feet.

Temperature (Rack) Sensor Installation

1. Route the sensor through either the top or the bottom of the equipment

2. Secure the temperature sensor in front of the warmest heat source in the enclosure. Do not secure in front of a blanking panel

3. Secure the temperature sensor cable to the front door of the enclosure at multiple locations using wire clips

Repeat these steps if the unit has additional sensors (optional up to 16 sensors) In settings select sensor control strategy for multiple sensors as average or highest. See settings page 5 Temp Control

The sensors must be installed where lack of sufficient cooling air is most likely. The optimum position of the rack temperature sensors will vary from installation to installation.

Servers that will most likely have insufficient or inadequately cooling air due to the recirculation of hot air from the hot aisle include:

a. Servers positioned at the top of a rack

b. Servers positioned at any height in the last rack at an open end of a row

c. Servers positioned behind flow-impairing obstacles such as building elements

d. Servers positioned in a bank of high-density racks

e. Servers positioned next to racks with Air Removal Units (ARU)

f. Servers positioned very far from the equipment

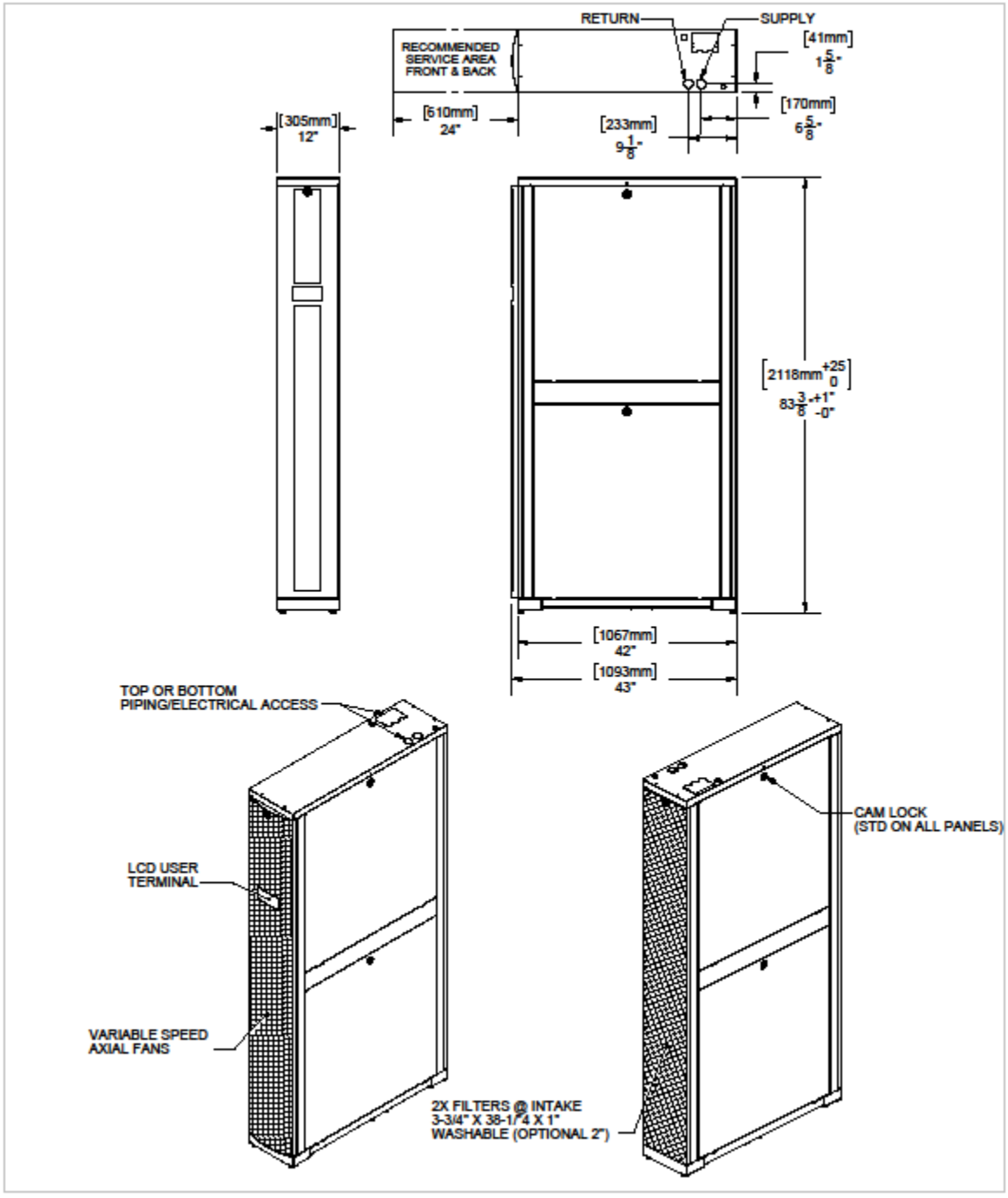
g. Servers positioned very close to the equipment

Appendix A: Dimensional Drawings

Drawing Title	Drawing No.
SERIES IR – Dimensional Drawing 12”	IRC-12-SUBMITTAL-A
SERIES IR – Dimensional Drawing 24”	IRC-24-SUBMITTAL-A

CLIMATEWORX INTERNATIONAL

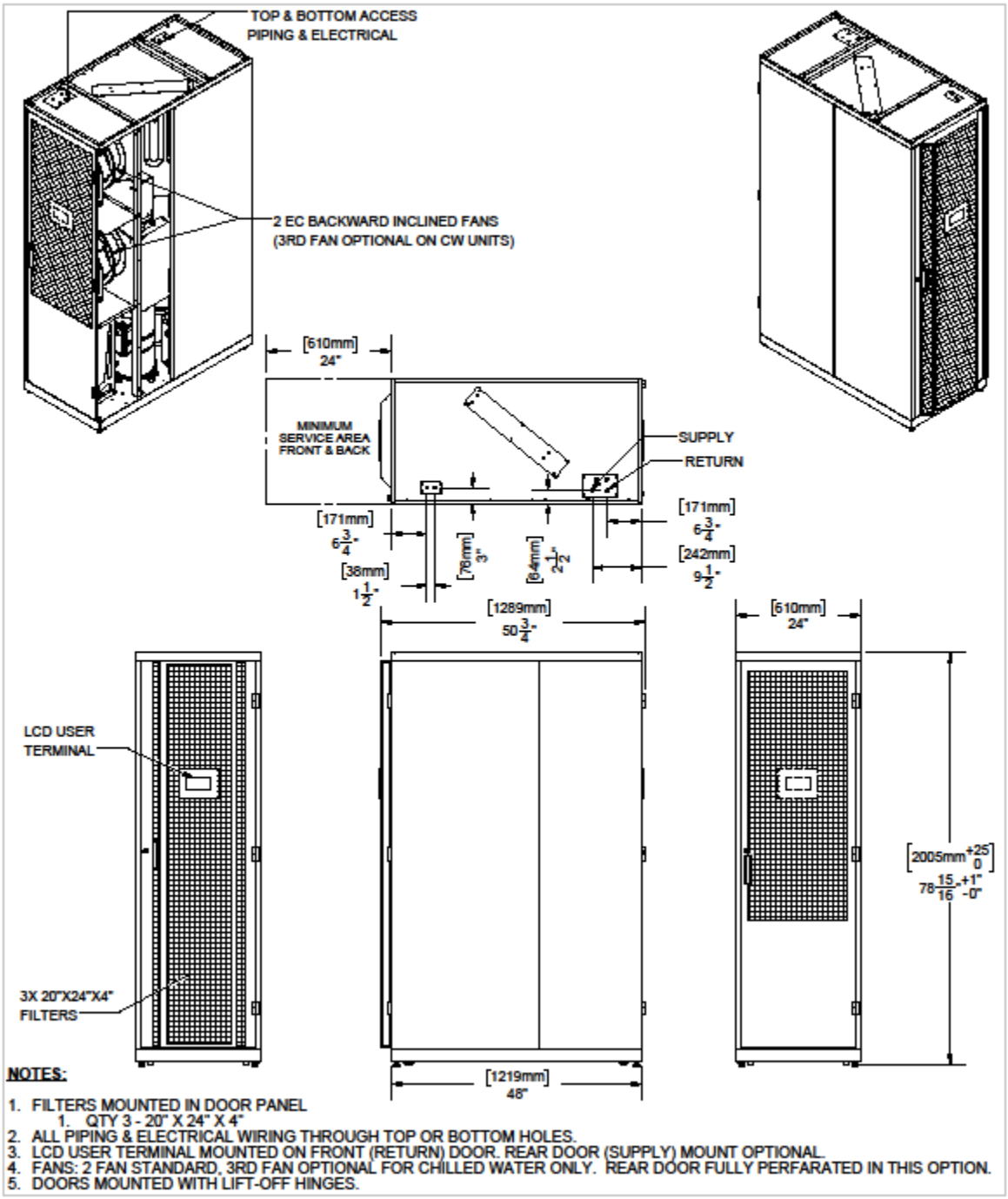
12" IN-ROW COOLING ASSEMBLY



IRC-12-SUBMITTAL-A | DATE 2017-10-05 | NOT TO SCALE

CLIMATEWORX INTERNATIONAL

24" IN-ROW A/C UNIT



NOTES:

1. FILTERS MOUNTED IN DOOR PANEL
   1. QTY 3 - 20" X 24" X 4"
2. ALL PIPING & ELECTRICAL WIRING THROUGH TOP OR BOTTOM HOLES.
3. LCD USER TERMINAL MOUNTED ON FRONT (RETURN) DOOR. REAR DOOR (SUPPLY) MOUNT OPTIONAL.
4. FANS: 2 FAN STANDARD, 3RD FAN OPTIONAL FOR CHILLED WATER ONLY. REAR DOOR FULLY PERFARATED IN THIS OPTION.
5. DOORS MOUNTED WITH LIFT-OFF HINGES.

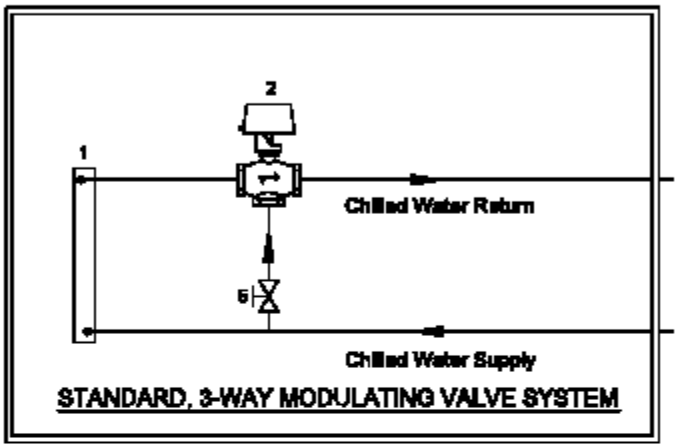
IRC24-SUBMITTAL-A | DATE 2017-10-05 | NOT TO SCALE

Appendix B: Piping Schematic Diagrams

Drawing Title	Drawing No.
SERIES IR – Chilled Water System Schematic	IRDS401
SERIES IR – Air Cooled System Schematic	IRDS101
SERIES IR – Water Cooled System Schematic	IRDS201

CLIMATEWORX INTERNATIONAL

IN ROW - PIPING SCHEMATIC DIAGRAM
CHILLED WATER SYSTEM



STANDARD, 3-WAY MODULATING VALVE SYSTEM

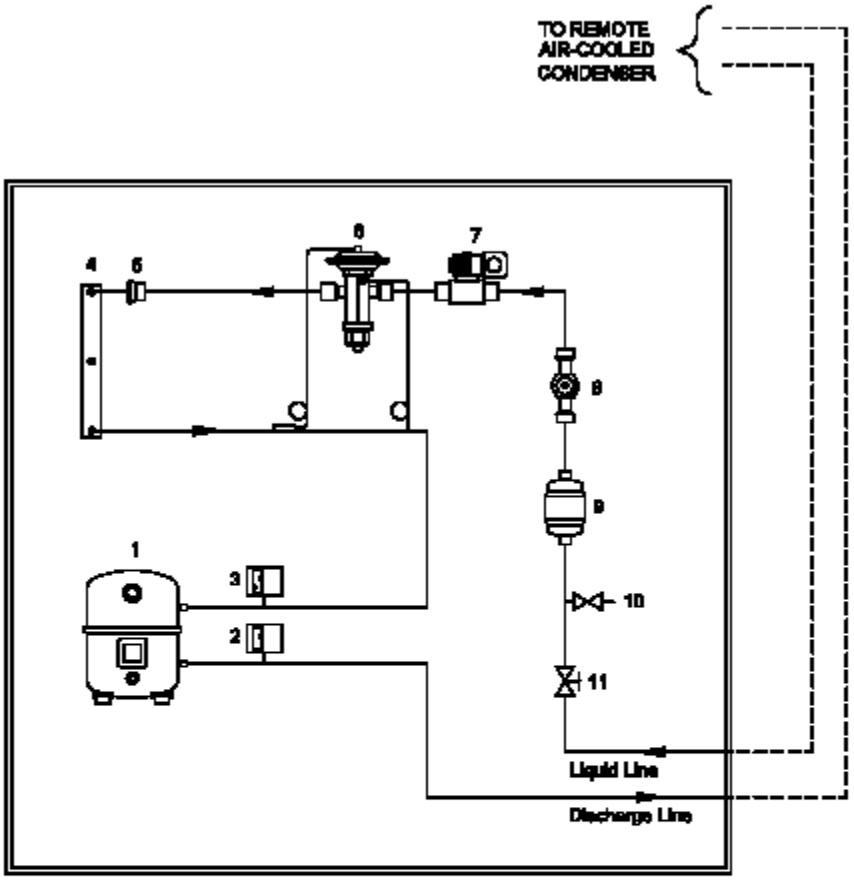
COMPONENTS:

1 Cooling coil
2 3-way modulating valve
3 Globe valve (Supplied by others)
4 Gate valve (Supplied by others)
5 Ball valve

IRD8401 31 JANUARY 2012 NOT TO SCALE

CLIMATEWORX INTERNATIONAL

IN ROW - PIPING SCHEMATIC DIAGRAM
AIR-COOLED SYSTEM



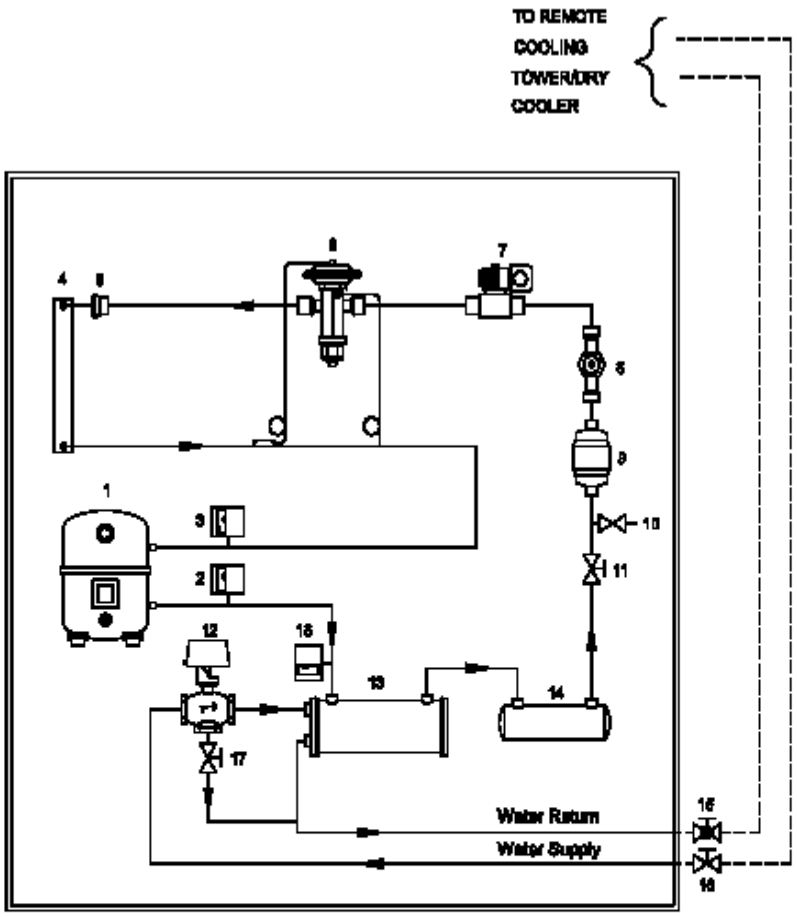
COMPONENTS:

1 Compressor
2 High pressure switch
3 Low pressure switch
4 Evaporator
5 Refrigerant distributor
6 Thermostatic expansion valve
7 Liquid line solenoid valve
8 Sight glass
9 Filter- drier
10 Access valve
11 Shut off valve

IRIS101 31 JANUARY 2012 NOT TO SCALE

CLIMATEWORX INTERNATIONAL

IN ROW - PIPING SCHEMATIC DIAGRAM
WATER COOLED SYSTEM (3-WAY VALVE)



COMPONENTS:

1	Compressor	10	Access valve
2	High pressure switch	11	Shut off valve
3	Low pressure switch	12	Water regulating valve (Standard 3-way)
4	Evaporator	13	Water cooled condenser
5	Refrigerant distributor	14	Receiver
6	Thermostatic expansion valve	15	Globe valve (supplied by others)
7	Liquid line solenoid valve	16	Gate valve (supplied by others)
8	Sight glass	17	Ball valve
9	Filter- drier	18	Pressure Transducer

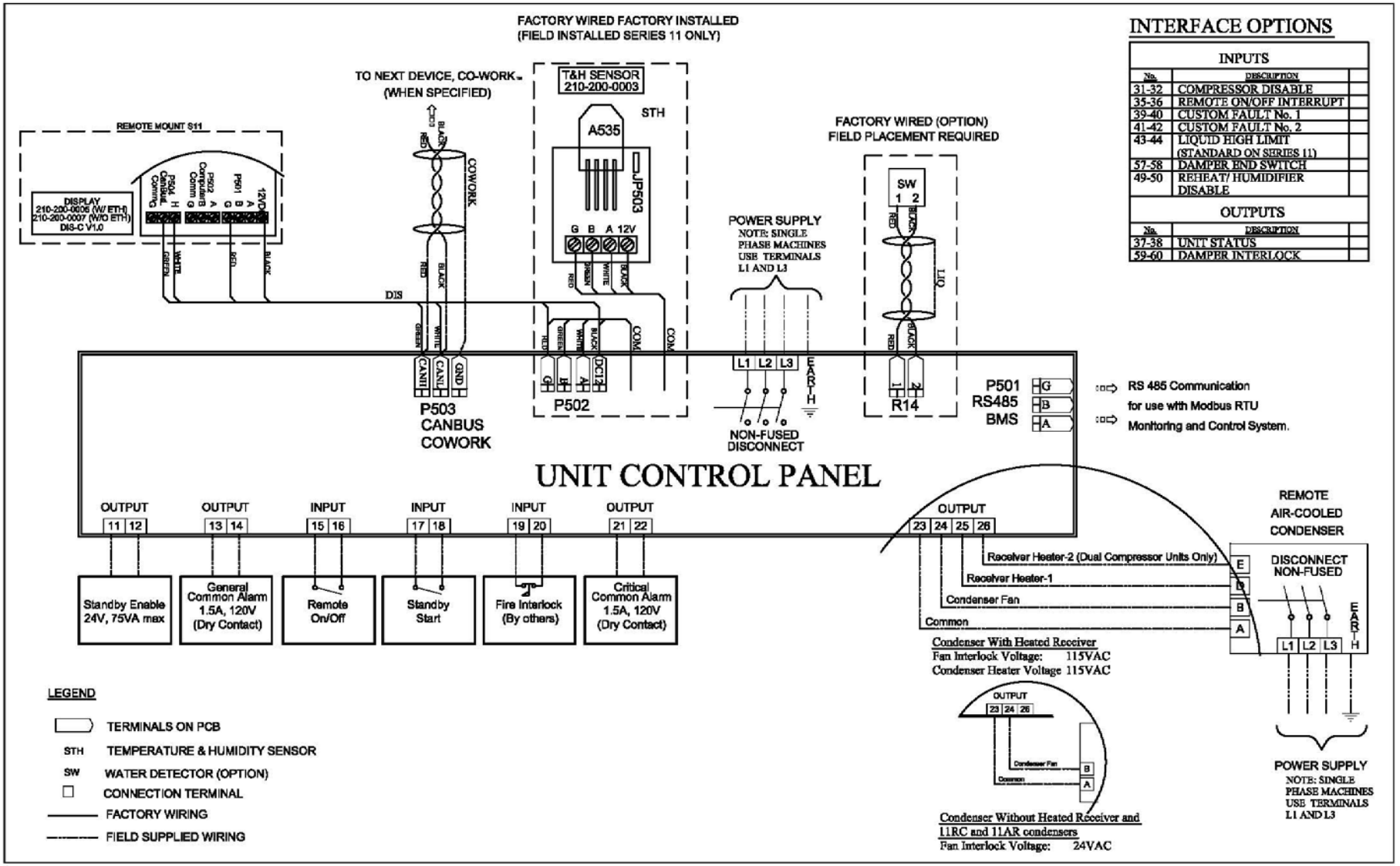
IRD5201 | 31 JANUARY 2012 | NOT TO SCALE

Appendix C: Electrical Schematic Diagrams

Drawing Title	Drawing no.
Electric Schematic Air-Cooled – General,	ES9030
Electric Schematic Water/ Glycol-Cooled – General,	ES9065
Electric Schematic Chilled Water – General,	ES9050
Electric Schematic – Field Wiring Standby Start/ Standby Enable, For automatic change over	M52ES05
Electric Schematic – Co-Work I2C Interconnection Link	M52ES1003
Electric Schematic – RS485 ModBus RTU Connection, Serial Communication Link	M52ES1004
Electric Schematic – Embedded Connection, Serial to Serial or Ethernet Communication Link	M52ES1005

CLIMATEWORX INTERNATIONAL

GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
UNITS WITH REMOTE AIR-COOLED CONDENSER



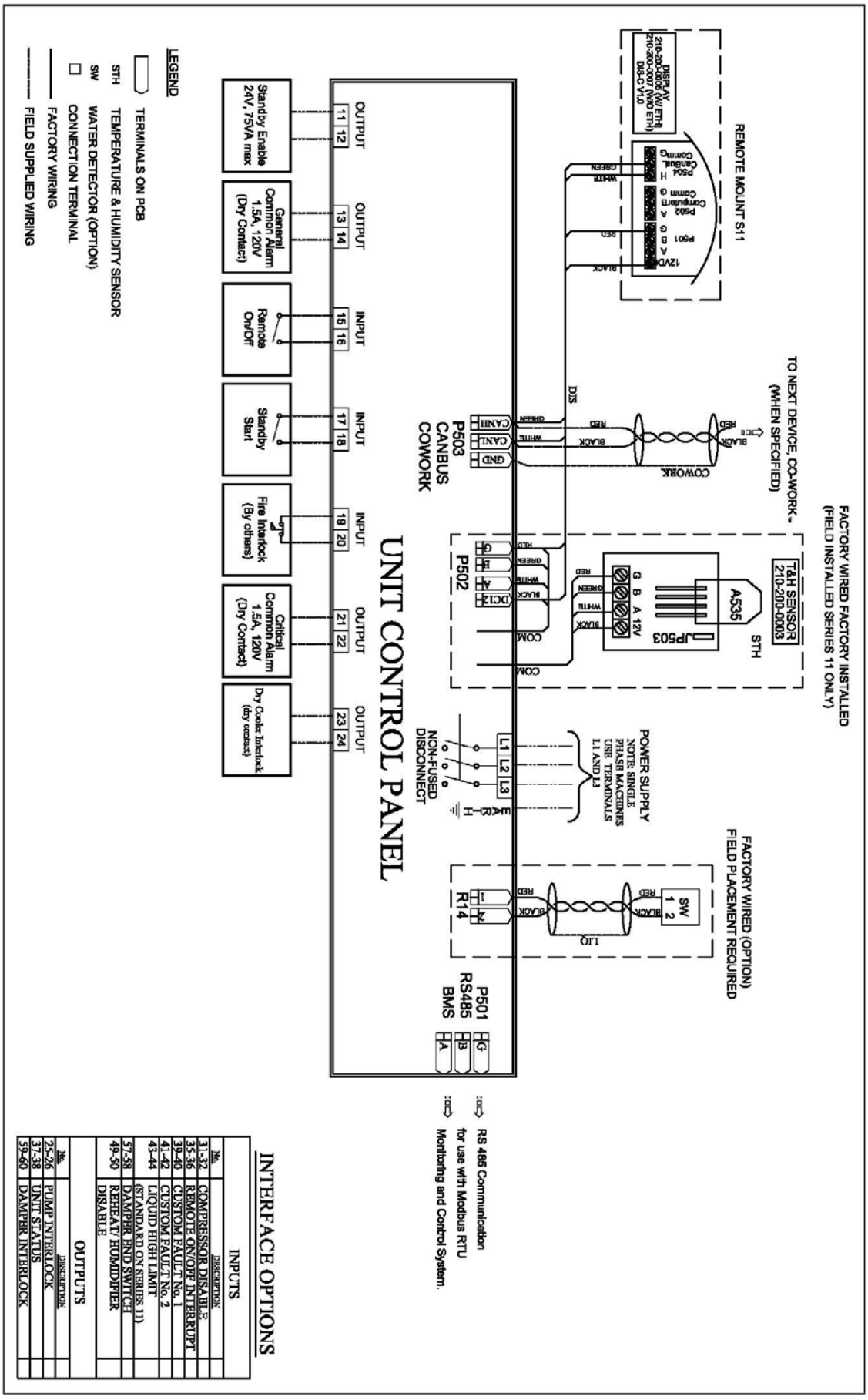
INTERFACE OPTIONS

INPUTS		
No.	DESCRIPTION	
31-32	COMPRESSOR DISABLE	
35-36	REMOTE ON/OFF INTERRUPT	
39-40	CUSTOM FAULT No. 1	
41-42	CUSTOM FAULT No. 2	
43-44	LIQUID HIGH LIMIT (STANDARD ON SERIES 11)	
57-58	DAMPER END SWITCH	
49-50	REHEAT/ HUMIDIFIER DISABLE	

OUTPUTS		
No.	DESCRIPTION	
37-38	UNIT STATUS	
59-60	DAMPER INTERLOCK	

CLIMATEWORX INTERNATIONAL

GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
WATER/GLYCOL COOLED UNITS



LEGEND

- TERMINALS ON PCB
- STH TEMPERATURE & HUMIDITY SENSOR
- SW WATER DETECTOR (OPTION)
- CONNECTION TERMINAL
- FACTORY WIRING
- FIELD SUPPLIED WIRING

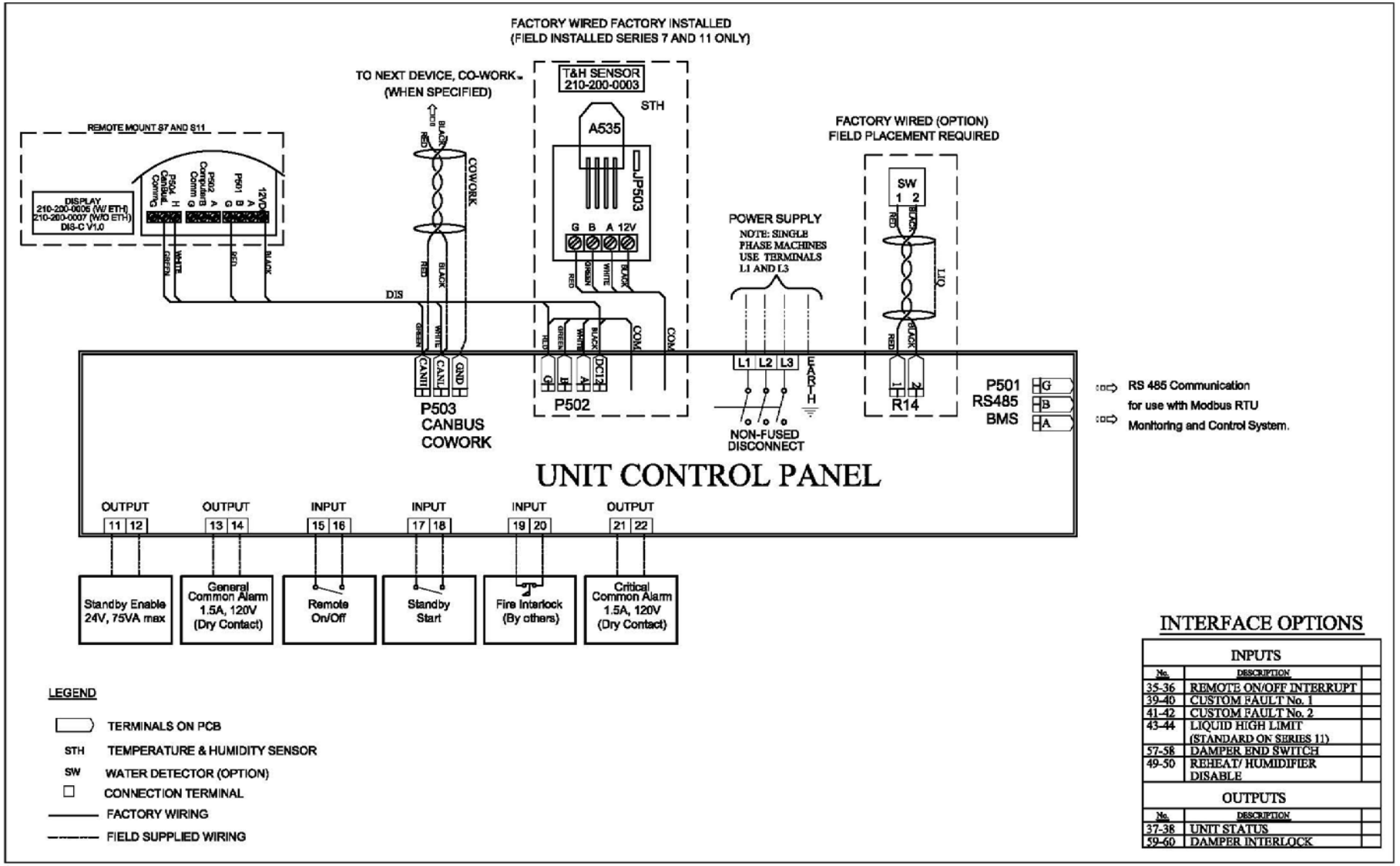
INTERFACE OPTIONS

No.	INPUTS DESCRIPTION
31-32	COMPRESSOR DISABLE
35-36	REMOTE ON/OFF INTERRUPT
39-40	CUSTOM FAULT No. 1
41-42	CUSTOM FAULT No. 2
43-44	LIQUID HIGH LIMIT (STANDARD ON SERIES 11)
57-58	DAMPER END SWITCH
49-50	REHEAT/ HUMIDIFIER DISABLE

No.	OUTPUTS DESCRIPTION
25-26	PUMP INTERLOCK
37-38	UNIT STATUS
59-60	DAMPER INTERLOCK

CLIMATEWORX INTERNATIONAL

GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
CHILLED WATER UNIT



LEGEND

- TERMINALS ON PCB
- STH TEMPERATURE & HUMIDITY SENSOR
- SW WATER DETECTOR (OPTION)
- CONNECTION TERMINAL
- FACTORY WIRING
- FIELD SUPPLIED WIRING

INTERFACE OPTIONS

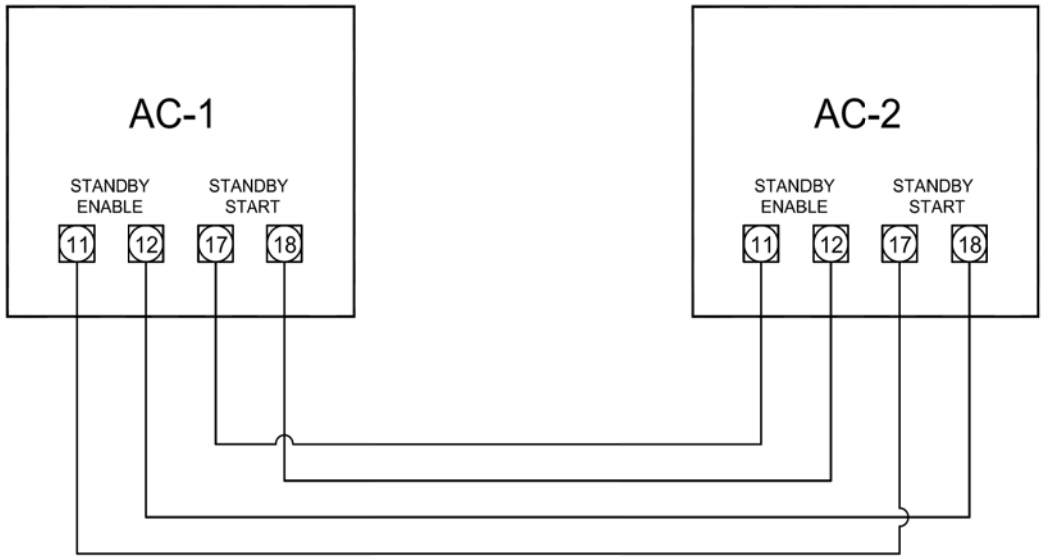
INPUTS

No.	DESCRIPTION	
35-36	REMOTE ON/OFF INTERRUPT	
39-40	CUSTOM FAULT No. 1	
41-42	CUSTOM FAULT No. 2	
43-44	LIQUID HIGH LIMIT (STANDARD ON SERIES 11)	
57-58	DAMPER END SWITCH	
49-50	REHEAT/ HUMIDIFIER DISABLE	

OUTPUTS

No.	DESCRIPTION	
37-38	UNIT STATUS	
59-60	DAMPER INTERLOCK	

For Automatic Change Over
Field Wiring Standby Start/Standby Enable

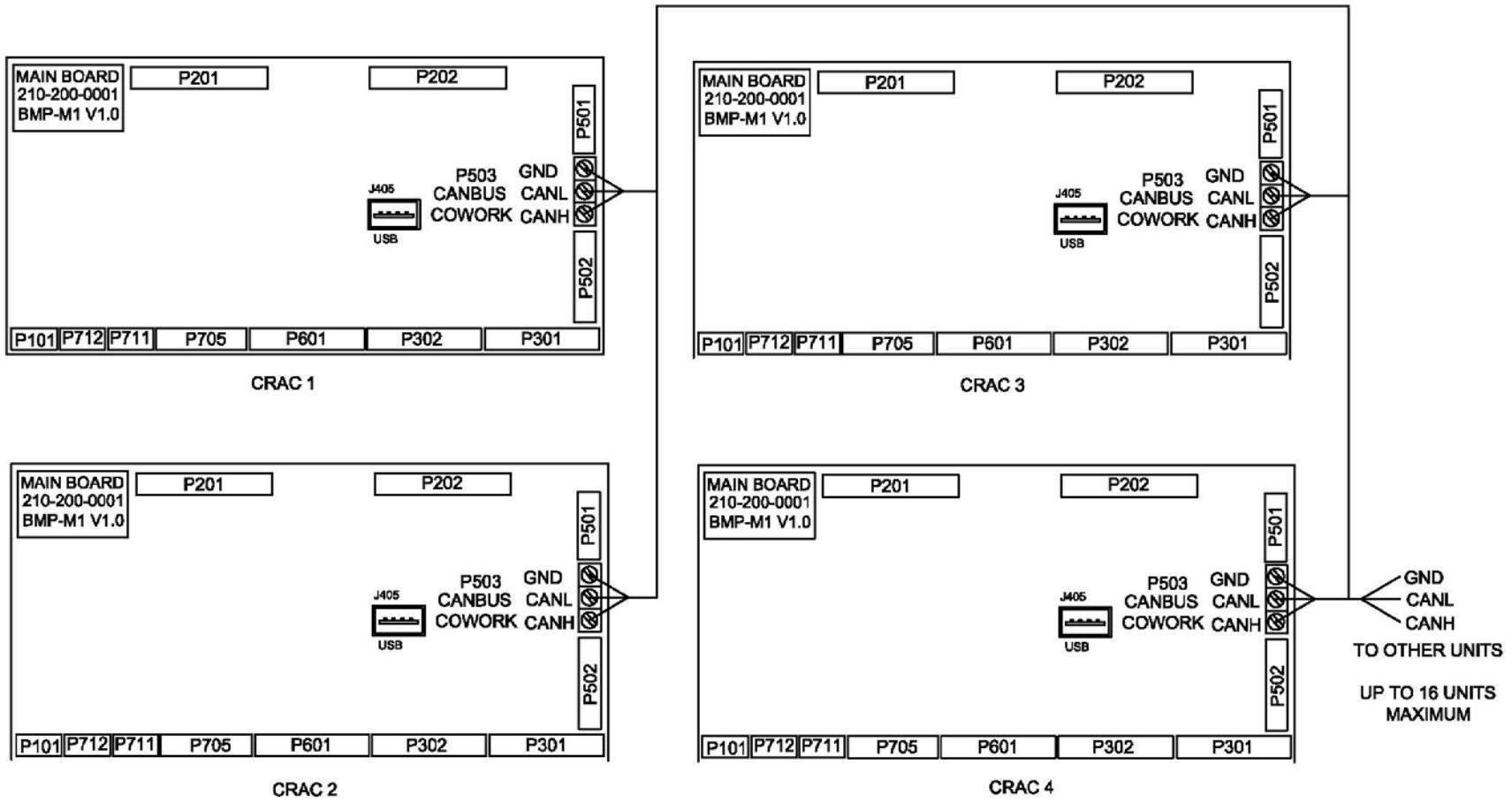


LEGEND:

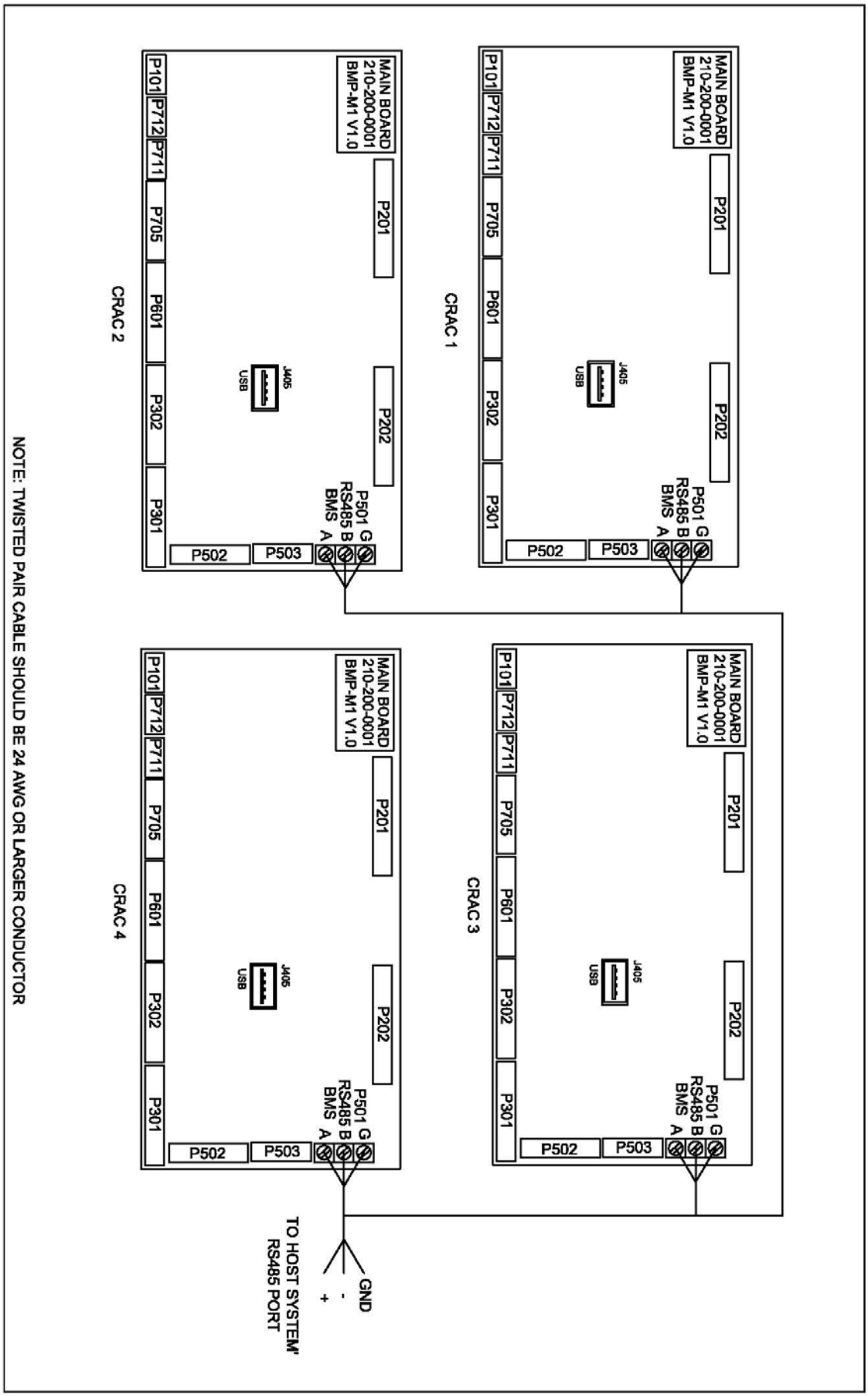
(#) FIELD TERMINAL

CLIMATEWORX INTERNATIONAL

ADVANCED M52 CONTROL SYSTEM
Electrical Schematic - Co-Work Link



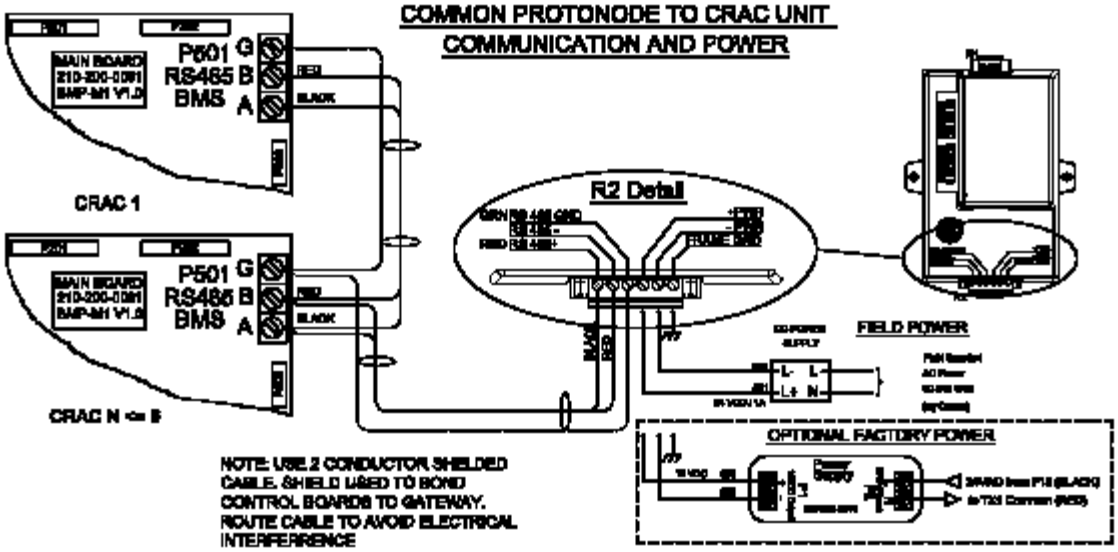
NOTE: TWISTED PAIR CABLE SHOULD BE 24 AWG OR LARGER CONDUCTOR


CLIMATEWORX INTERNATIONAL
ADVANCED M52 CONTROL SYSTEM
Electrical Schematic - RS485 ModBus RTU to Serial Communication Link
MAIN BOARD
210-200-0001
BMP-M1 V1.0
P201
P202
P501 G
RS485 B
BMS A
P502
P503
P101
P712
P711
P705
P601
P302
P301
J405
USB
CRAC 1
CRAC 2
CRAC 3
CRAC 4
NOTE: TWISTED PAIR CABLE SHOULD BE 24 AWG OR LARGER CONDUCTOR
GND
-
+
TO HOST SYSTEM'
RS485 PORT

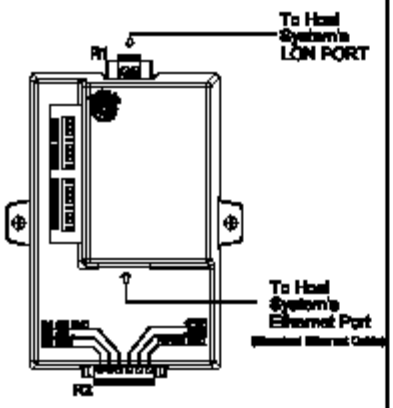
CLIMATEWORX INTERNATIONAL

ADVANCED M62 CONTROL SYSTEM EMBEDDED CONNECTION

COMMON PROTONODE TO CRAC UNIT COMMUNICATION AND POWER

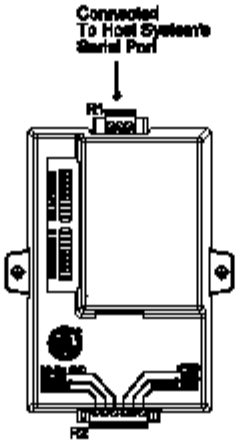


SERIAL TO ETHERNET (LONWORKS)



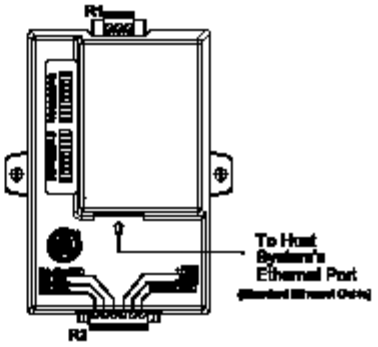
NOTE: LON GATEWAY MUST BE USED FOR LON CONNECTIVITY

SERIAL TO SERIAL



NOTE: SEE PROTONODE STARTUP GUIDE FOR SWITCH SETTINGS AND SUPPORTED PROTOCOLS

SERIAL TO ETHERNET



NOTE: SEE PROTONODE STARTUP GUIDE FOR SWITCH SETTINGS AND SUPPORTED PROTOCOLS

M62ES1005 REV B | 2015-05-23 | Dimension: Not to scale