CLIMATEWORX
MISSION CRITICAL CLIMATE CONTROL

P-Series, Vertical Floor-Mount Units

Installation Manual

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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.

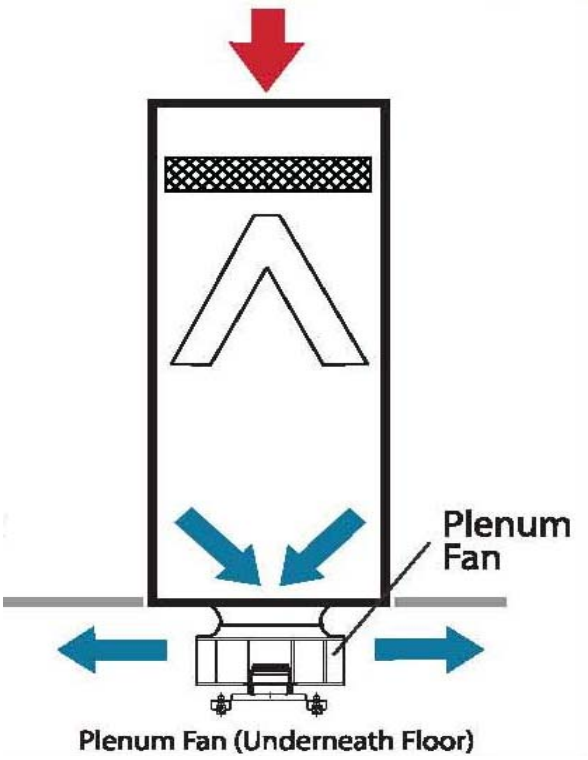
- Owing to the general nature of small population, a typical room should have outdoor fresh air kept at only about 5% of the recirculated air. This provides enough ventilation for personnel and pressurizes the room to prevent dust from entering through leaks. The incoming fresh air must be filtered very 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.

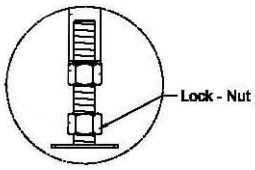
2.0 Location Consideration

Positioning of Indoor Units



Typical Downflow Unit on Raised Floor System

The units are designed to be free standing on an accessible raised flooring system provided with sufficient pedestal supports underneath. However, **it is highly recommended to use a separate floorstand as a support,** which is independent of the raised flooring system. This allows the unit to be installed prior to erecting the raised flooring system thus providing much easier access to piping and electrical connections. **Floor stands with turning vanes have a minimum height of 12 inches.** The floor stand or unit should be isolated using a suitable isolation method.

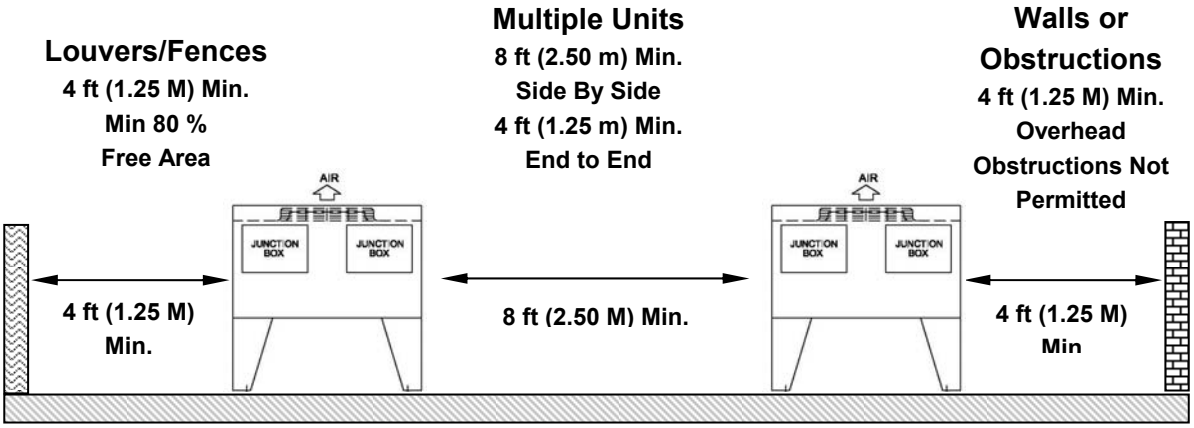


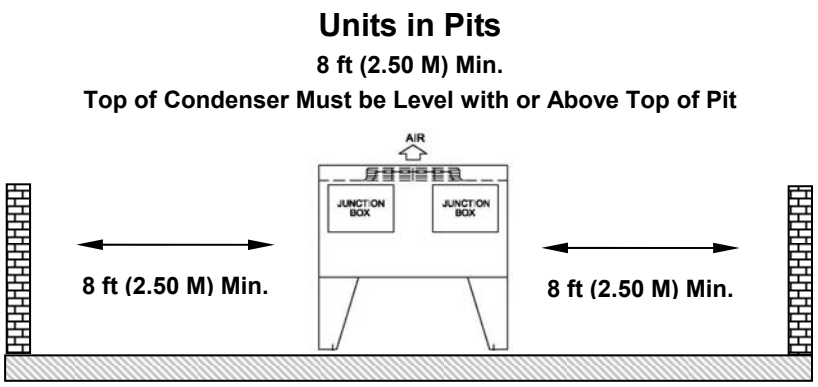
ClimateWorx OEM floor stands use a two-nut system for the floor stand feet. Use both nuts, the top nut for leveling and the bottom nut to lock the leveling nut in place.

The room layout should provide **33" service clearance in the front 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.**

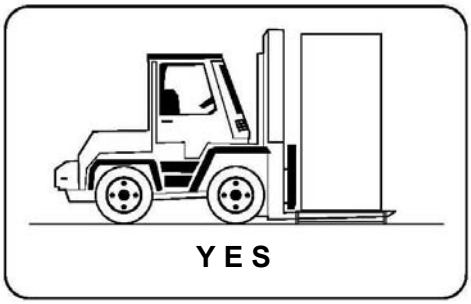
PLEASE NOTE:
Units shipped in dedicated trucks will typically have all the items above without the Wood Strapping.

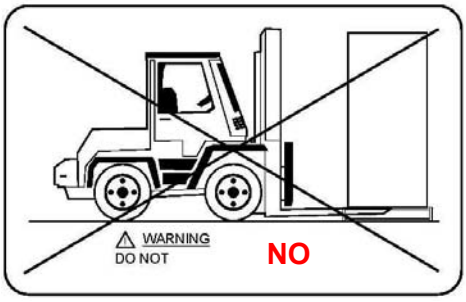
3.1.3 Removing Unit from Skid:

1. To begin separating the unit from skid, remove lag bolts located on each corner on the bottom of the unit. To gain access to these 4 bolts open the unit end doors. See photo (to the right) for exact location:

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

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

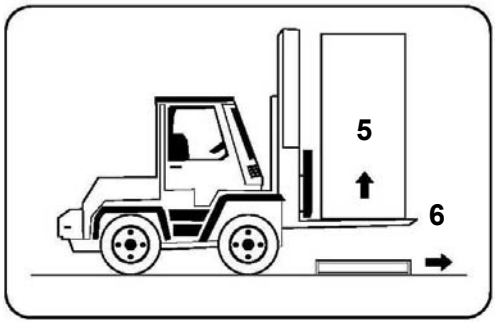




4. Make sure forklift forks are full into unit – do not lift unit if forks are halfway in – doing so will damage the unit frame.

5. Lift the unit.

6. Remove the skid from under the unit.



7. Unit now ready to be “placed” on floor or floor stand.

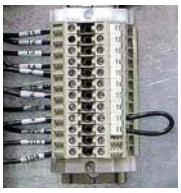
3.2 Electrical Connection

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



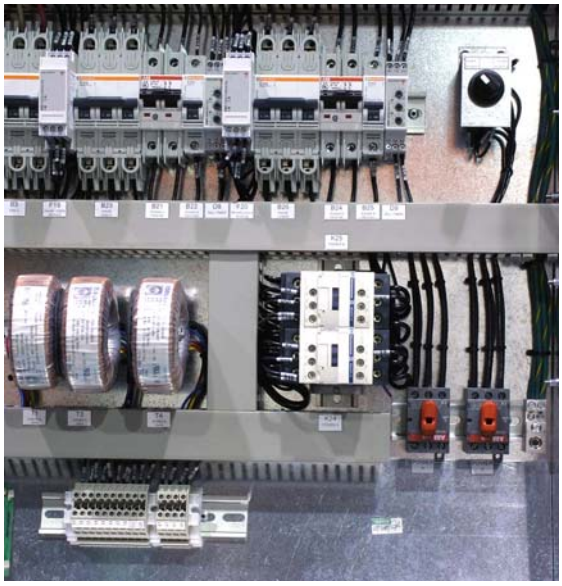
All the units internal wiring are completed and tested prior to delivery. A **numbered terminal block** for field installed control wiring is provided at the upper area of the power panel.

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 closed dry contact input
43- 44	Liquid High Limit **(optional)**	Normally closed 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 (ATS)

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. A selector switch is provided to allow the operator to choose either A grid as primary and B grid as secondary or B grid as primary and A grid as secondary. 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 customer must choose which source will be the primary source, A or B using a switch inside the electrical panel.

There are two phase loss monitors, F19 and F20 connected to each of the primary power sources, A and B on the load side of each respective disconnect. They are protected with their own over current device B23 and B26.

Each power source has its own control transformer, T3 and T4 which have over current protection, B21 and B24 on the primary winding and B22 and B25 secondary winding. The secondary voltage is 24 volts AC.

Each power source has a change over time delay relay, D8 and D9 that causes a minimum time delay before any change over of the ATS.

The timers are adjustable and factory set for 18 seconds. The purpose of the time delay is to ensure that any power is stable prior to initializing the transfer contactor. Additional unit restart delays may be programmed directly into the M52 microprocessor.

The transfer of power to the unit components is achieved using mechanically and electrically linked **contactors, K24 and K25.**

The ATS has a selector switch which enables the operator to manually select which source will be the primary source, A or B.

4.3 ATS - Sequence of Operation

4.3.1 Selector Switch Operation in 'A' Position:

When the selector switch is set to 'A', and the disconnect switch is closed, the 'A' power source Phase Loss Monitor, F19 auxiliary contacts, F19-1 and F19-2 are energized and power source A becomes the primary power source. The unit remains off during this time delay. DO NOT PANIC! The D8 timer begins to run and the D9 timer is de-energized. If the K25 contactor was engaged it will disengage. After the D8 time delay elapses the K24 contactor energizes powering the unit components and causes the M52 microprocessor to initiate normal unit start-up and operating sequences. See M52 Users Guide, Sequence of Operation. Field contacts X61 and X62 close and indicates that the unit is operating on power source A. Panel mounted Pilot Lights on unit front panel indicate that Power Source "A" is on.

If power source A is interrupted or if a phase deteriorates beyond the limit of the F19, F19-2 opens which disables D8 timer and releases the K24. Field contacts X61 and X62 open and indicate that the unit is not operating on power source A and the Pilot Light goes out. Unit operation stops immediately. At the same time K19-1 closes and the D9 timer starts timing. The unit remains off during this time delay. AGAIN, DO NOT PANIC! If the Primary source is still not available after D9 elapses the K25 contactor energizes powering the unit components and causes the M52 microprocessor to initiate normal unit start-up and runs operating sequences. Field contacts X63 and X64 close and indicates that the unit is operating on power source B. The panel mounted Pilot Light in the front of the unit indicates that Power Source “B” is on.

If the B source is interrupted the unit will stop immediately and will not restart until either power source is restored. Once the primary A source becomes available and is stable through the D8 time delay period the unit will revert back to A power. Field contacts X61 and X62 close and indicates that the unit is operating on power source A, X63 and X64 open, Power Source “ B” Pilot Light goes out and Pilot Light “A” Power Source turns on.

4.3.2 Selector Switch Operation in ‘B’ Position:

When the selector switch is set to ‘B’, and the disconnect switch is closed, the ‘B’ power source Phase Loss Monitor, F20 auxiliary contacts, F20-1 and F20-2 are energized and power source B becomes the primary power source. The unit remains off during this time delay. DO NOT PANIC! The D9 timer begins to run and the D8 timer is de-energized. If the K24 contactor was engaged it will disengage. After the D9 time delay elapses the K25 contactor energizes powering the unit components and causes the M52 microprocessor to initiate normal unit start-up and operating sequence. See M52 Users Guide, Sequence of Operation. Field contacts X63 and X64 close and indicates that the unit is operating on power source B. The panel mounted Pilot Light in the front of the unit indicates that Power Source “B” is on.

If power source B is interrupted or if a phase deteriorates beyond the limit of the F20, F20-2 opens which disables D9 timer and releases the K25. Field contacts X63 and X64 open and indicate that the unit is not operating on power source B and the Pilot Light goes out. Unit operation stops immediately. At the same time K20-1 closes and the D8 timer starts timing. The unit remains off during this time delay. AGAIN, DO NOT PANIC! If the Primary source is still not available after D8 elapses the K24 contactor energizes powering the unit components and causes the M52 microprocessor to initiate normal unit start-up and runs operating sequence. Field contacts X61 and X62 close and indicates that the unit is operating on power source A. The panel mounted Pilot Light in the front of the unit indicates that Power Source “A” is on.

If the A source is interrupted the unit will stop immediately and will not restart until either power source is restored. Once the primary B source becomes available and is stable through the D9 time delay period the unit will revert back to B power. Field contacts X63 and X64 close and indicates that the unit is operating on power source B. X61 and X62 open, Power Source “ A” Pilot Light goes out and Pilot Light “B” Power Source turns on.

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

Hot Gas Line

Model - PAD / PAU	028	034	042	051	057	065	076	087
50 ft. equivalent pipe length	7/8	7/8	7/8	7/8	7/8	1 1/8	1 1/8	1 1/8
100 ft. equivalent pipe length	7/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8
150 ft. equivalent pipe length	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8
200 ft. equivalent pipe length	1 1/8	1 1/8	1 1/8	1 1/8	1 1/8	1 3/8	1 3/8	1 3/8

Liquid Line

Model - PAD / PAU	028	034	042	051	057	065	076	087
50 ft. equivalent pipe length	1/2	5/8	1/2	5/8	5/8	5/8	3/4	3/4
100 ft. equivalent pipe length	5/8	5/8	5/8	5/8	5/8	3/4	3/4	7/8
150 ft. equivalent pipe length	5/8	3/4	5/8	3/4	3/4	3/4	7/8	7/8
200 ft. equivalent pipe length	5/8	3/4	3/4	3/4	3/4	3/4	7/8	7/8

NOTE: 028 and 034 are Single Circuit remaining Models are Dual Circuit.

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. Using the test mode, energize fan and all solenoid valves. (See M52 User's Guide) Open liquid line hand valve.

2. Connect a gauge manifold to the compressor suction and discharge rotalock valve.

3. Close the compressor discharge and suction ports and open all service valves.

4. Charge the system with dry nitrogen to approximately 150 psig (not to exceed 350 psig).

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 rotalock valves with refrigerant or high vacuum hoses. Provide an isolating valve and a pressure gauge for pressure checking.

8. Evacuate the system to an absolute pressure not exceeding 1500 microns. Break the vacuum to 2psig with dry nitrogen. Repeat the evacuation process and then re-break the vacuum with dry nitrogen.

9. 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.

Fan Speed Control System

The fan speed control system maintains not only a constant condensing pressure over a wide range of climatic conditions but also high sensible cooling for the evaporator so that re-humidification is rarely required throughout the year.A pressure-sensitive fan speed controller is employed in the fan speed control system. It regulates the condenser head pressure at low ambient temperatures by varying the airflow volume through the condenser.

Upon engaging the interlock contact in the indoor unit, the fan speed controller will directly sense the changes in the refrigerant head pressure and vary the speed of the first fan only. On Condensers with additional fans these fans are controlled by pressure activation controls and should be set to cut in at the following pressures.

Stage 1	190 psi.
Stage 2	220 psi.
Stage 3	240 psi.

Charging

Calculate the total charge required using this formula:

Indoor Unit Charge + Liquid Line Charge + Condenser Charge

+ Hot gas Line Charge = Total Charge

Proper performance of the system depends largely on proper charging. Adhere to 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 isolator and allow the compressor crankcase heater to operate for at least one hour.
3. Connect the gauge manifold to both discharge and suction rotalock 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. Please make sure outdoor condenser (if any) is powered.
6. Add additional refrigerant to the system until the sight glass is clear of bubbles and subcooling is measured between 10-15 ^{o}F.
7. Run system to maintain a hot gas (discharge) pressure based on refrigerant used (R407C @240psi and R22 a @225psi) then re-check subcooling, Add refrigerant if subcooling has dropped below 10 ^{o}F.
8. The system is now correctly charged for operating under fan speed control. 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.

Head Pressure Control System

For condensers possibly subjected to extremely low ambient temperature, it is recommended that a head pressure control system be installed. This avoids starving the evaporator coil, with the consequence of oil clogging; short cycling on low pressure control, reduction of the system capacity and erratic expansion valve operation.

A drop in the condensing pressure often occurs in air-cooled systems as a result of low ambient conditions encountered during fall-winter-spring operation. Head pressure control renders part of the condenser surface inactive. The reduction of active condensing surface results in a rise in condensing pressure and hence provides a sufficient liquid line pressure for normal system operation. The head pressure control system allows operation at extremely low ambient temperature down to -40°F.

ClimateWorx uses a two-valve head pressure control with receiver, for factory ordered condensers. The ORI is located in the liquid drain line between the condenser and the receiver, and the ORD is located in a hot gas line bypassing the condenser.

During periods of low ambient temperature, the condensing pressure falls until it approaches the setting of the ORI valve. The ORI then throttles, restricting the flow of liquid from the condenser. This causes refrigerant to back up in the condenser thus reducing the active condenser surface. This raises the condensing pressure. Since it is really the receiver pressure that needs to be maintained, the bypass line with the ORD is required.

The ORD opens after the ORI has offered enough restriction to cause the differential between condensing pressure and receiver pressure to exceed 20psi. The hot gas flowing through the ORD serves to heat up the cold liquid being passed by the ORI. Thus the liquid reaches the receiver warm and with sufficient pressure to assure proper expansion valve operation. As long as sufficient refrigerant charge is in the system, the two valves modulate the flow automatically to maintain proper receiver pressure regardless of outside ambient.

On Condensers with multiple fans these additional fans are controlled by pressure activation controls and should be set to cut in at the following pressures.

Stage 1	190 psi.
Stage 2	220 psi.
Stage 3	240 psi.

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 rotalock 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. Please make sure outdoor condenser (if any) is powered.

6. Add additional refrigerant to the system until the sight glass is clear of bubbles and subcooling is measured between 10-15 ^{o}F .

7. Run system to maintain a hot gas (discharge) pressure based on refrigerant used (R407C @240psi and R22 a @225psi) by adjusting ORI valve(s) then re-check subcooling, Add refrigerant if subcooling has dropped below 10 ^{o}F.

8. 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.

9. If the system is designed to operate at ambient below the ambient that exists during charging, additional charge will have to be added now.

Method to Determine Additional Refrigerant Charge to Operate to an Expected Minimum Ambient Temperature

Ambient Temp (°F)	% of Condenser to be Flooded
70	0
65	0
60	10
55	24
50	33
45	41
40	46
35	52
30	55
25	59
20	62
10	66
0	70
-10	73
-20	76
-30	77
-40	79

Example for KS11-078-1 Ambient Temp at Time of Charging = 60°F
to Operate to -30°F

Step 1. At the ambient temperature at the time of charging the system (e.g 60°F)
Read from the table – % of Condenser to be Flooded (e.g - 10 %)

Step 2. At the expected minimum ambient Temperature (e.g - - 30 °F)
Read from the table - % of the Condenser to be Flooded (e.g - 77 %)

Step 3. Calculate the difference of the above two values
(77 % - 10 % = 67 %)

Step 4. From the " Air Cooled Condenser Guide" read Winter Flooded (-40°F)
Refrigerant Charge (6.4 lbs)

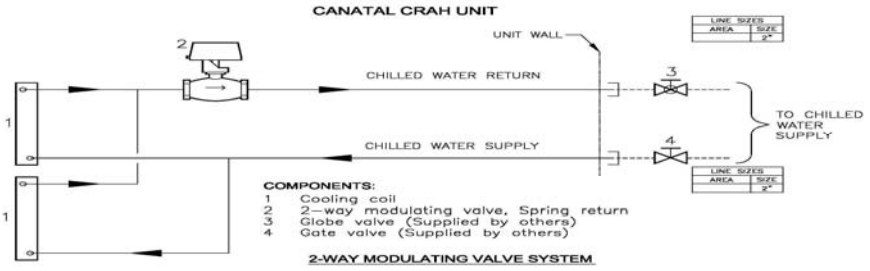
Step 5. Multiply the value found in Step 4 by the difference in %'s calculated in Step 3.

Additional Required Charge = 6.4 lb * (67 %) = 4.30 lb / Condenser
(If Two (2) Circuit Condenser 2.15 lb / Ref Circuit

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:

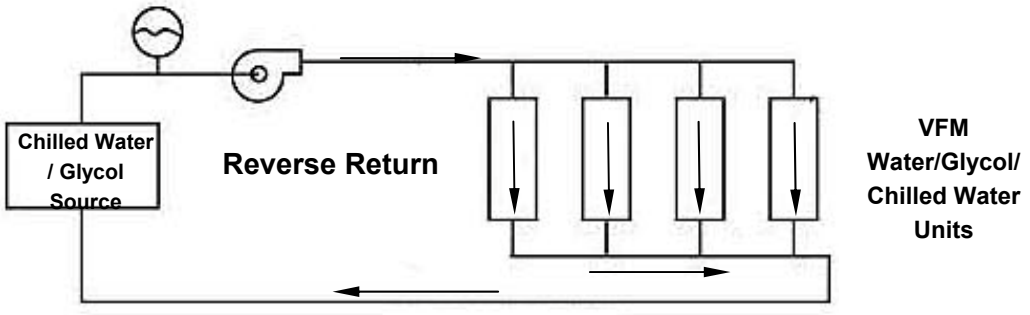
1. **A manual shut-off valve should be installed at the supply and return pipes of each indoor unit for routine service and emergency isolation of the unit.**



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 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 no. Suffix		028	034	042	051	057	065	076	087
Liquid Refrigerant	-ODM	1/2	1/2	5/8	5/8	5/8	5/8	7/8	7/8
Hot Gaseous Refrigerant	-ODM	7/8	7/8	1-1/8	1-1/8	1-1/8	1-1/8	1-3/8	1-3/8
Hot Water	-ODM	1	1	1	1	1-1/8	1-1/8	1-1/8	1-1/8
Steam	-MPT	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8
Steam Condensate	-ODM	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Humidifier Water	-ODM	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
Cooling Coil Condensate	-ODM	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Chilled Water	-ODM	1-5/8	1-5/8	1-5/8	2-1/8	2-1/8	2-1/8	2-1/8	2-1/8
Condensing Water	-ODM	1-3/8	1-3/8	1-3/8	1-3/8	1-5/8	1-5/8	2-1/8	2-1/8
Glycol Solution	-ODM	1-5/8	1-5/8	1-5/8	1-5/8	2-1/8	2-1/8	2-1/8	2-1/8

NOTE: 028 and 034 are Single Circuit remaining Models are Dual Circuit.

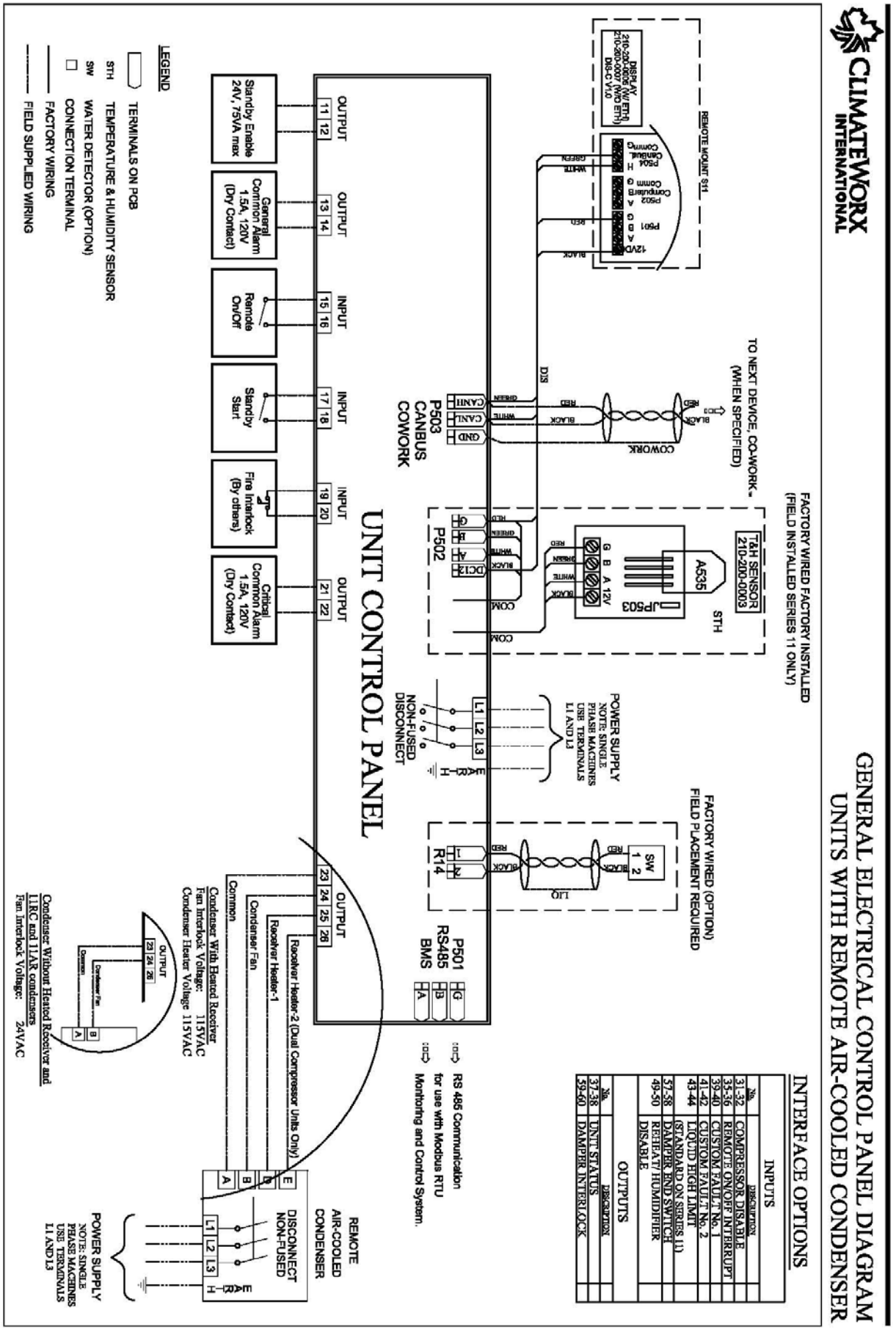
Glycol Water Make-up and Charging

The following outlines the procedure for the initial charge and subsequent make-up of glycol water for the 9G, 9F and 9E systems:

1. Pressurize the system with water and observe any leakage or pressure drop in the system.
2. After making sure that the system is leak free, drain out the water and if the volume of the system is unknown, measure the volume of water used.
3. If the filling or subsequent making-up volume of water is considerable, provide a meter to measure the water volume so that correct amount of glycol required can be calculated.
4. Calculate the volume of glycol required.
5. Open all the manual bleed valves.
6. With a pump, charge glycol and water through the lowest point of the system. Following the fluid flow, shut off the various manual bleed valves once the fluid reaches them.
7. After completing the filling, start the system pump and intermittently open the manual bleed valves to release the entrapped air.
8. Close all the manual bleed valves and the system is ready to operate.

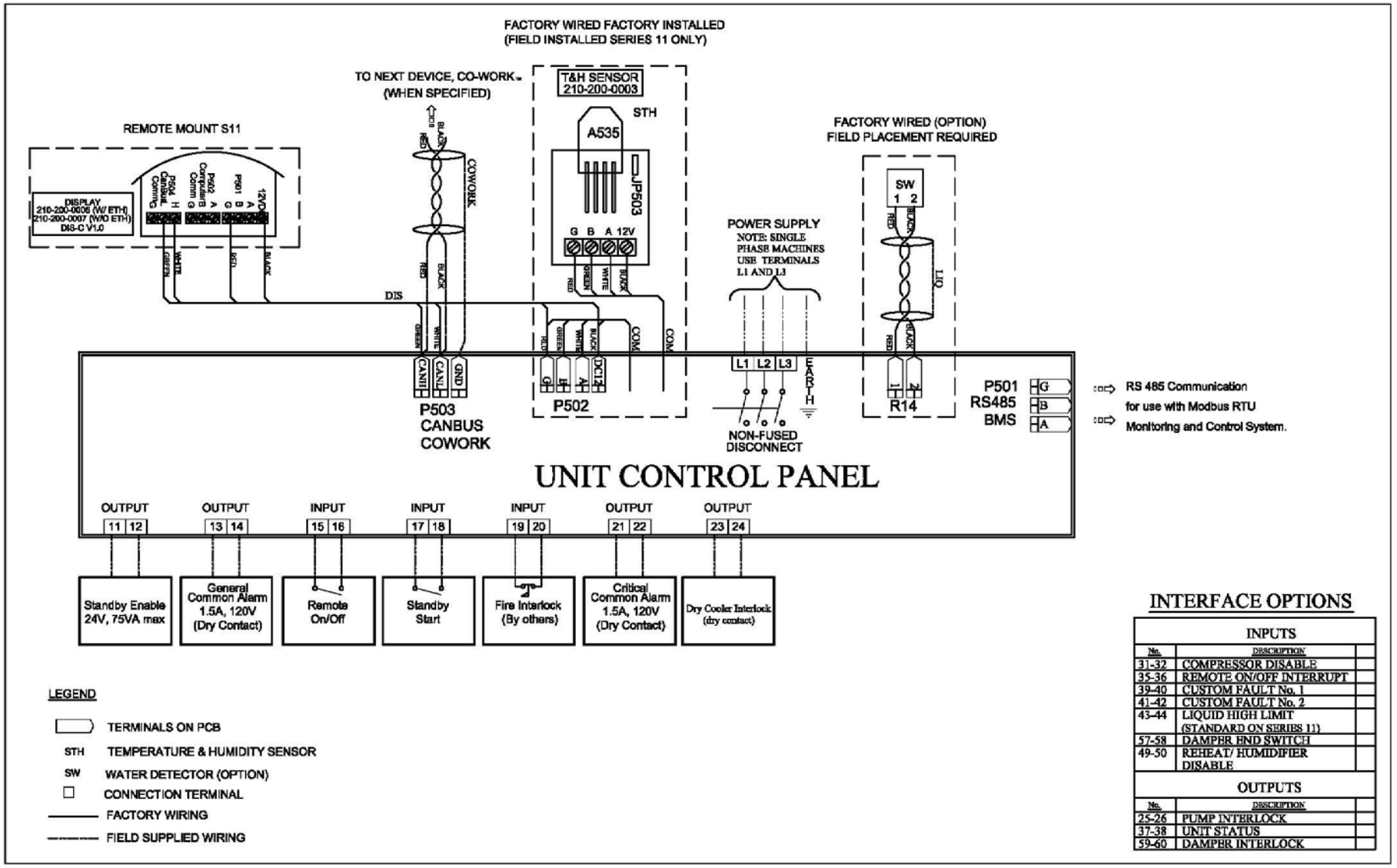
Appendix A: Electrical Schematic Diagrams

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 Dual Cooling Air – General,	ES9030
Electric Schematic Dual Cooling Water or Glycol – General,	ES9040
Electric Schematic Free Cooling – General,	ES9070
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 remote power	M52ES1005
Electric Schematic – Embedded Connection, Serial to Serial or Ethernet Communication Link factory power	M52ES1006


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
FACTORY WIRED FACTORY INSTALLED (FIELD INSTALLED SERIES 11 ONLY)
TO NEXT DEVICE, CO-WORK- (WHEN SPECIFIED)
T&H SENSOR 210-200-0003
STH
A535
JP503
P503 CANBUS COWORK
P502
P501
P504 CanBus/ Comm
DISPLAY 210-220-0606 (W/O ETH) 210-200-0007 (W/ ETH) DMO V1.0
REMOTE MOUNT S11
FACTORY WIRED (OPTION) FIELD PLACEMENT REQUIRED
SW 1 2
LIQ
POWER SUPPLY NOTE: SINGLE PHASE MACHINES USE TERMINALS L1 AND L3
NON-FUSED DISCONNECT
L1 L2 L3
UNIT CONTROL PANEL
OUTPUT 11 12 Standby Enable 24V, 75VA max
OUTPUT 13 14 General Common Alarm 1.5A, 120V (Dry Contact)
INPUT 15 16 Remote On/Off
INPUT 17 18 Standby Start
INPUT 19 20 Fire Interlock (By others)
OUTPUT 21 22 Critical Common Alarm 1.5A, 120V (Dry Contact)
OUTPUT 23 24 25 26
P501 RS485 BMS
RS 485 Communication for use with Modbus RTU
Monitoring and Control System.
Receiver Heater-2 (Dual Compressor Units Only)
Receiver Heater-1
Condenser Fan
Common
Condenser With Heated Receiver
Fan Interlock Voltage: 115VAC
Condenser Heater Voltage: 115VAC
Condenser Without Heated Receiver and 11RC and 11AR condensers
Fan Interlock Voltage: 24VAC
REMOTE AIR-COOLED CONDENSER
DISCONNECT NON-FUSED
POWER SUPPLY NOTE: SINGLE PHASE MACHINES USE TERMINALS L1 AND L3
LEGEND
TERMINALS ON PCB
STH TEMPERATURE & HUMIDITY SENSOR
SW WATER DETECTOR (OPTION)
CONNECTION TERMINAL
FACTORY WIRING
FIELD SUPPLIED WIRING

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

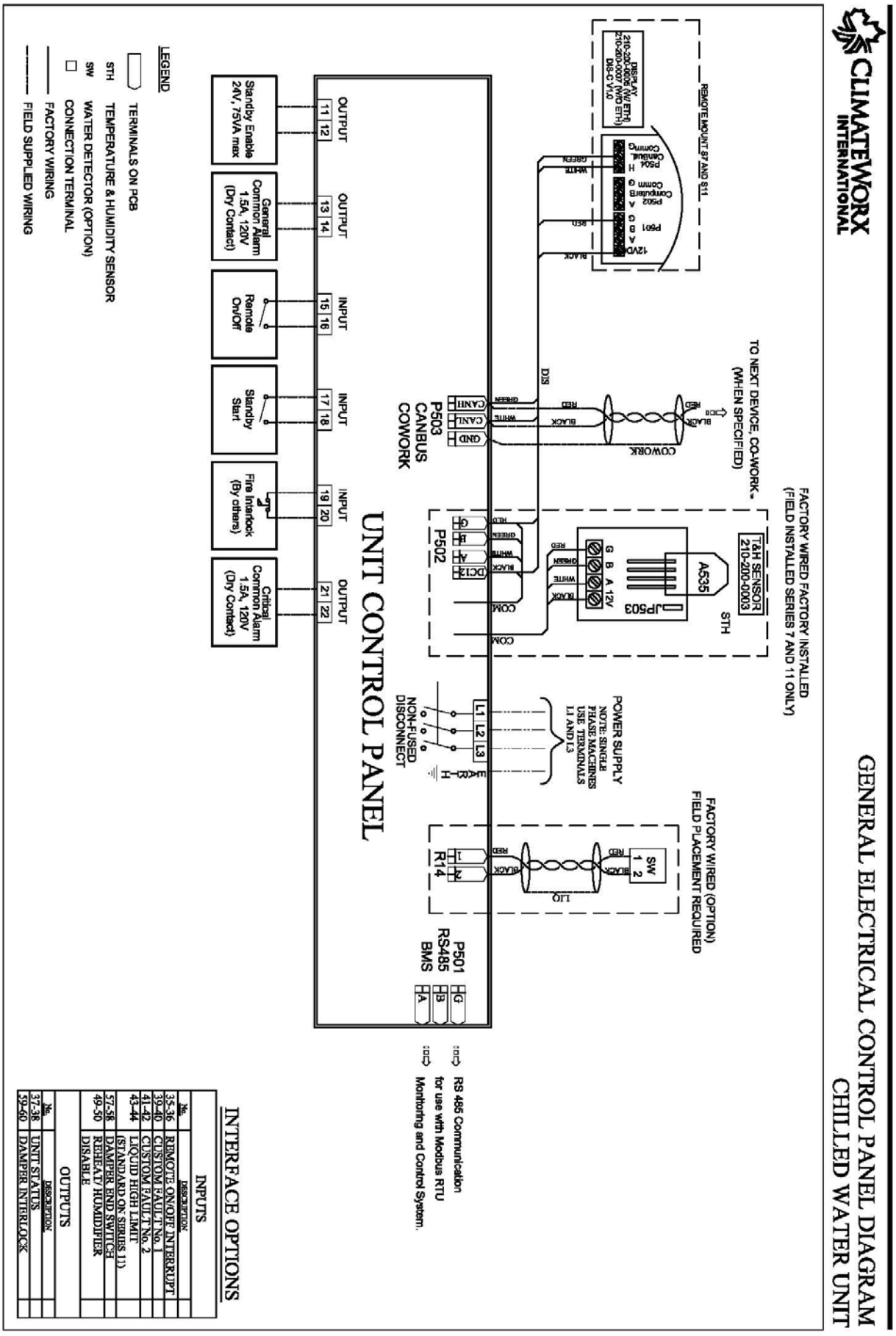
INTERFACE OPTIONS

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

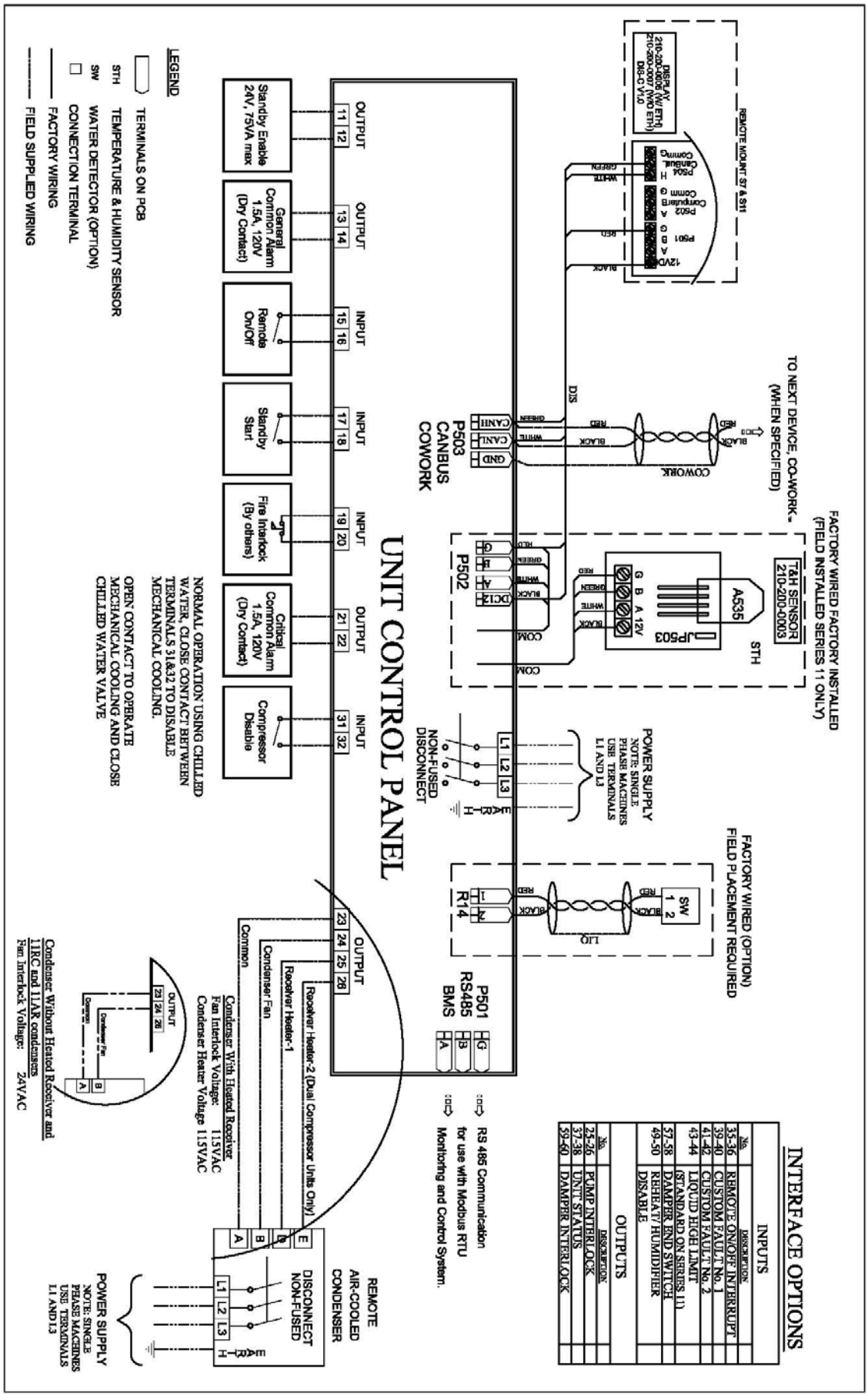
No.	DESCRIPTION	
25-26	PUMP INTERLOCK	
37-38	UNIT STATUS	
59-60	DAMPER INTERLOCK	



INTERFACE OPTIONS

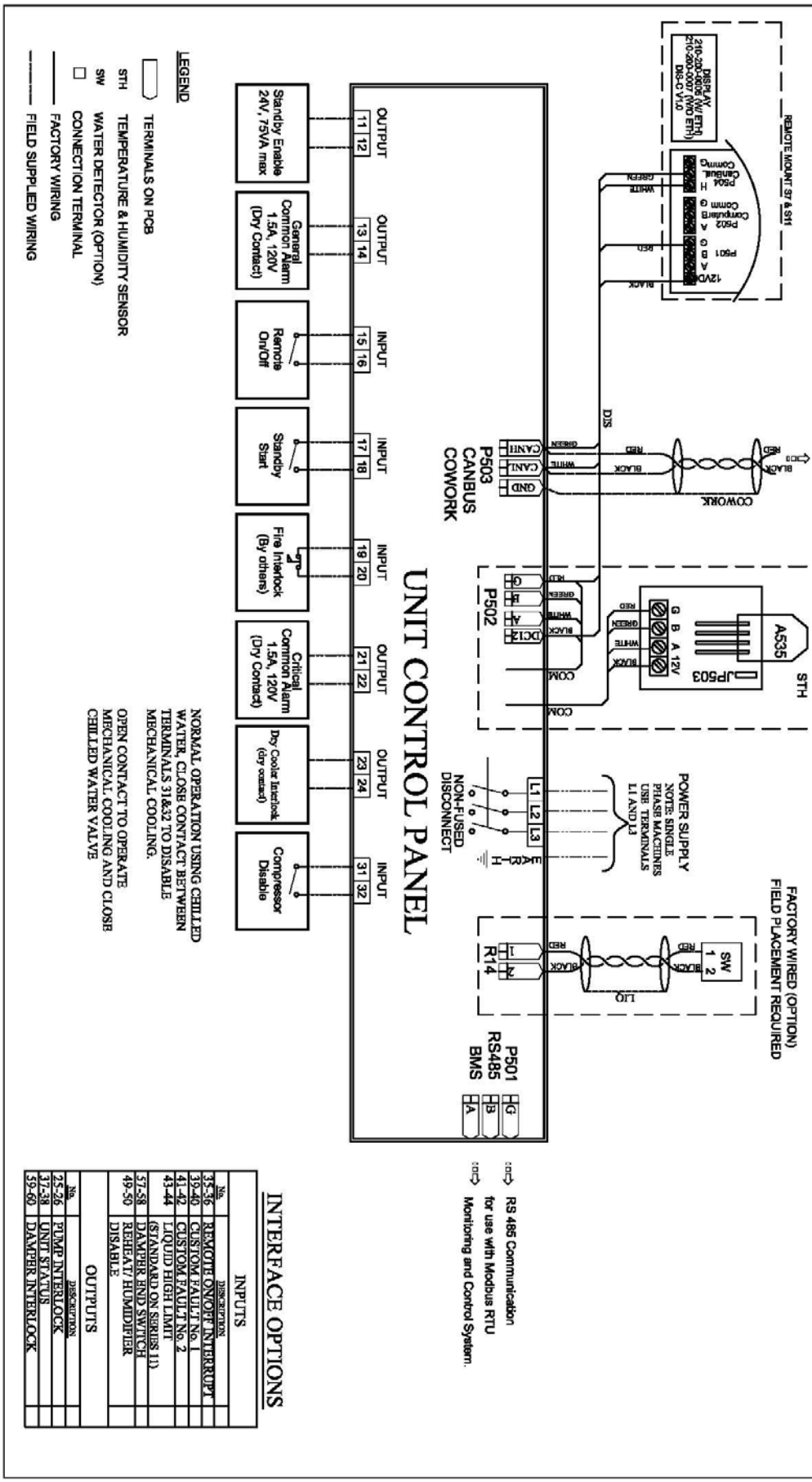
INPUTS		
No.		DESCRIPTION
35-36		REMOTE ON/OFF INTERRUPT
39-40		CUSTOM FAULT No. 1
41-42		CUSTOM FAULT No. 2
43-44		LIQUID HIGH LIMIT (STANDARD ON SERIES 11)
57-58		DAMPER END SWITCH
49-50		REHEAT/ HUMIDIFIER DISABLE

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


CLIMATEWORX INTERNATIONAL
GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
DUAL COOL UNIT WITH REMOTE AIR-COOLED CONDENSER
UNIT CONTROL PANEL
FACTORY WIRED FACTORY INSTALLED (FIELD INSTALLED SERIES 11 ONLY)
TO NEXT DEVICE, CO-WORK - (WHEN SPECIFIED)
REMOTE MOUNT S7 & S11
DISPLAY (W/ETH) 210-200-0007 (W/O ETH) DIS-C V1.0
P504 CanBus Comm
P502 Compressor Comm
P501 12VDC
T&H SENSOR 210-200-0003
A535
STH
JP503
G B A 12V
COWORK
DIS
P503 CANBUS COWORK
CAN H
CAN L
GND
P502
COM
POWER SUPPLY NOTE: SINGLE PHASE MACHINES USE TERMINALS L1 AND L3
L1 L2 L3
NON-FUSED DISCONNECT
FACTORY WIRED (OPTION) FIELD PLACEMENT REQUIRED
SW 1 2
LIQ
P501 RS485 BMS
R14
RS 485 Communication for use with Modbus RTU
Monitoring and Control System.
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 RHEAT/ HUMIDIFIER DISABLE
OUTPUTS
No. DESCRIPTION
25-26 PUMP INTERLOCK
37-38 UNIT STATUS
59-60 DAMPER INTERLOCK
OUTPUT 11 12 Standby Enable 24V, 75VA max
OUTPUT 13 14 General Common Alarm 1.5A, 120V (Dry Contact)
INPUT 15 16 Remote On/Off
INPUT 17 18 Standby Start
INPUT 19 20 Fire Interlock (By others)
OUTPUT 21 22 Critical Common Alarm 1.5A, 120V (Dry Contact)
INPUT 31 32 Compressor Disable
NORMAL OPERATION USING CHILLED WATER, CLOSE CONTACT BETWEEN TERMINALS 31&32 TO DISABLE MECHANICAL COOLING.
OPEN CONTACT TO OPERATE MECHANICAL COOLING AND CLOSE CHILLED WATER VALVE
LEGEND
TERMINALS ON PCB
STH TEMPERATURE & HUMIDITY SENSOR
SW WATER DETECTOR (OPTION)
CONNECTION TERMINAL
FACTORY WIRING
FIELD SUPPLIED WIRING
OUTPUT 23 24 25 26
Receiver Heater-2 (Dual Compressor Units Only)
Receiver Heater-1
Condenser Fan
Common
Condenser With Heated Receiver
Fan Interlock Voltage: 115VAC
Condenser Heater Voltage 115VAC
Condenser Without Heated Receiver and 11RC and 11AR condensers
Fan Interlock Voltage: 24VAC
REMOTE AIR-COOLED CONDENSER
DISCONNECT NON-FUSED
L1 L2 L3
POWER SUPPLY NOTE: SINGLE PHASE MACHINES USE TERMINALS L1 AND L3

CLIMATEWORX INTERNATIONAL

GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
DUAL COOLED UNIT WITH WATER/GLYCOL COOLED CONDENSER



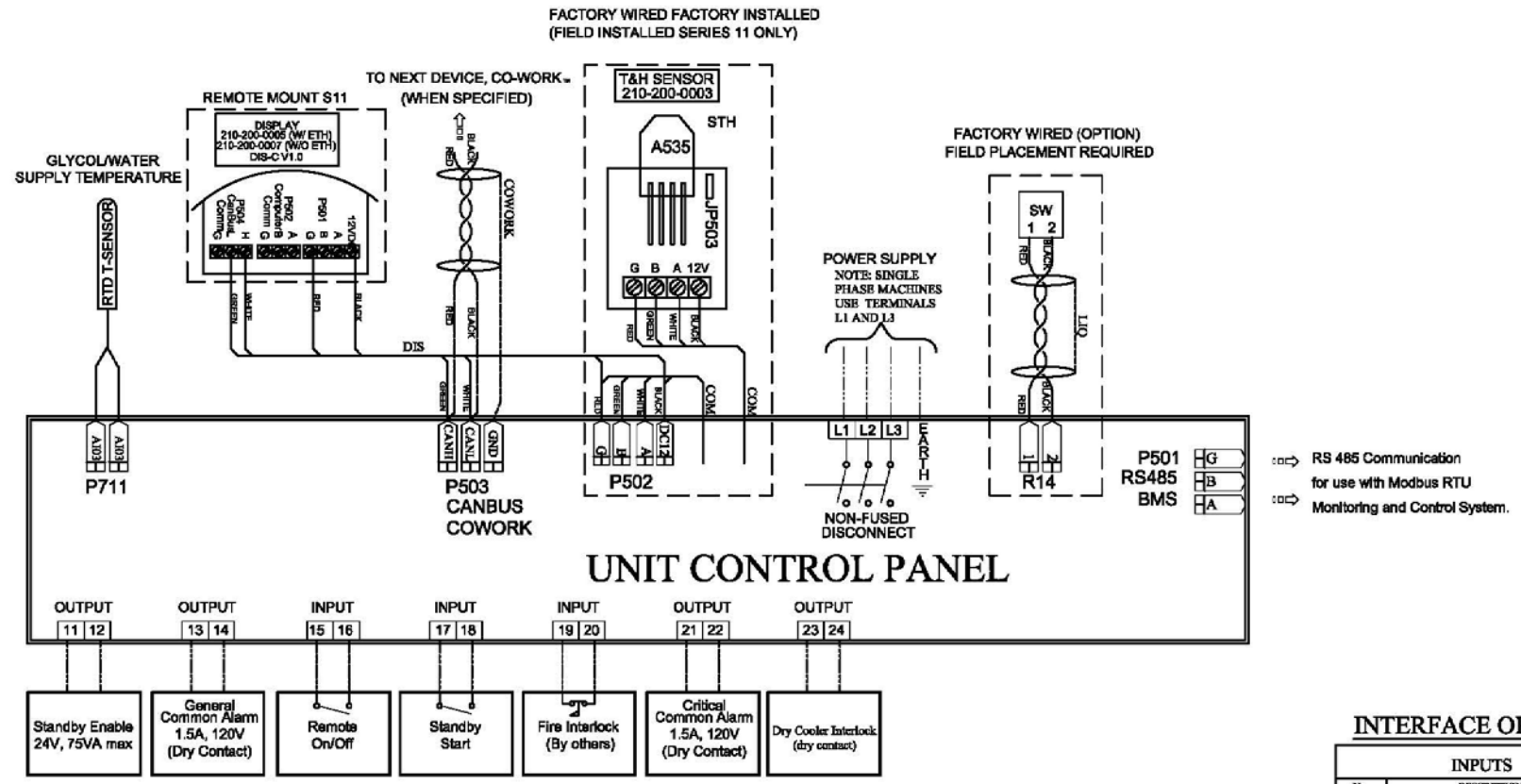
INTERFACE OPTIONS

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 SERIUS 11)
57-58	DAMPER END SWITCH
49-50	REHEAT/ HUMIDIFIER DISABLE

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

CLIMATEWORX INTERNATIONAL

GENERAL ELECTRICAL CONTROL PANEL DIAGRAM
WATER/GLYCOL COOLED UNIT WITH FREE COOL



LEGEND

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

INTERFACE OPTIONS

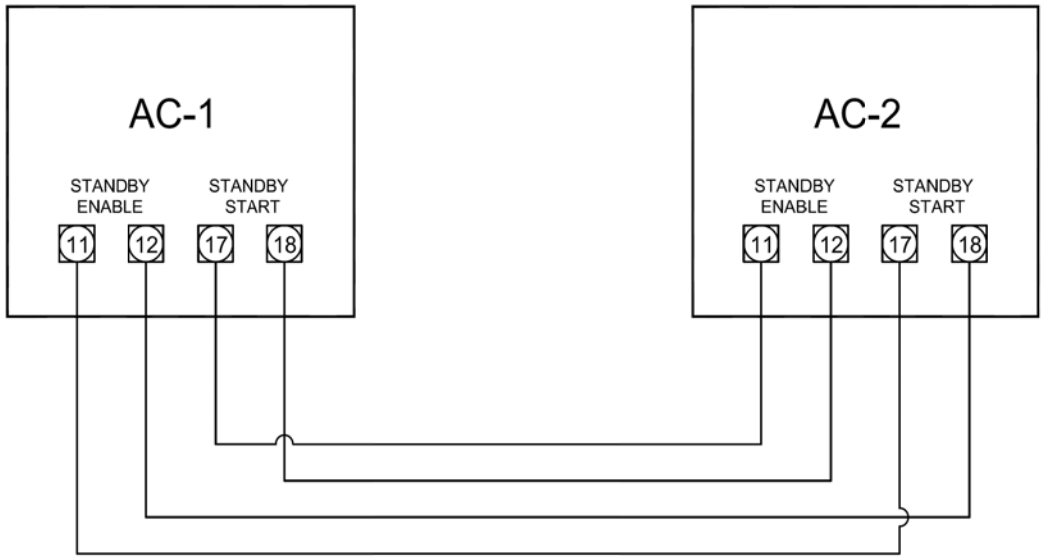
INPUTS

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	
25-26	PUMP INTERLOCK	
37-38	UNIT STATUS	
59-60	DAMPER INTERLOCK	

For Automatic Change Over
Field Wiring Standby Start/Standby Enable

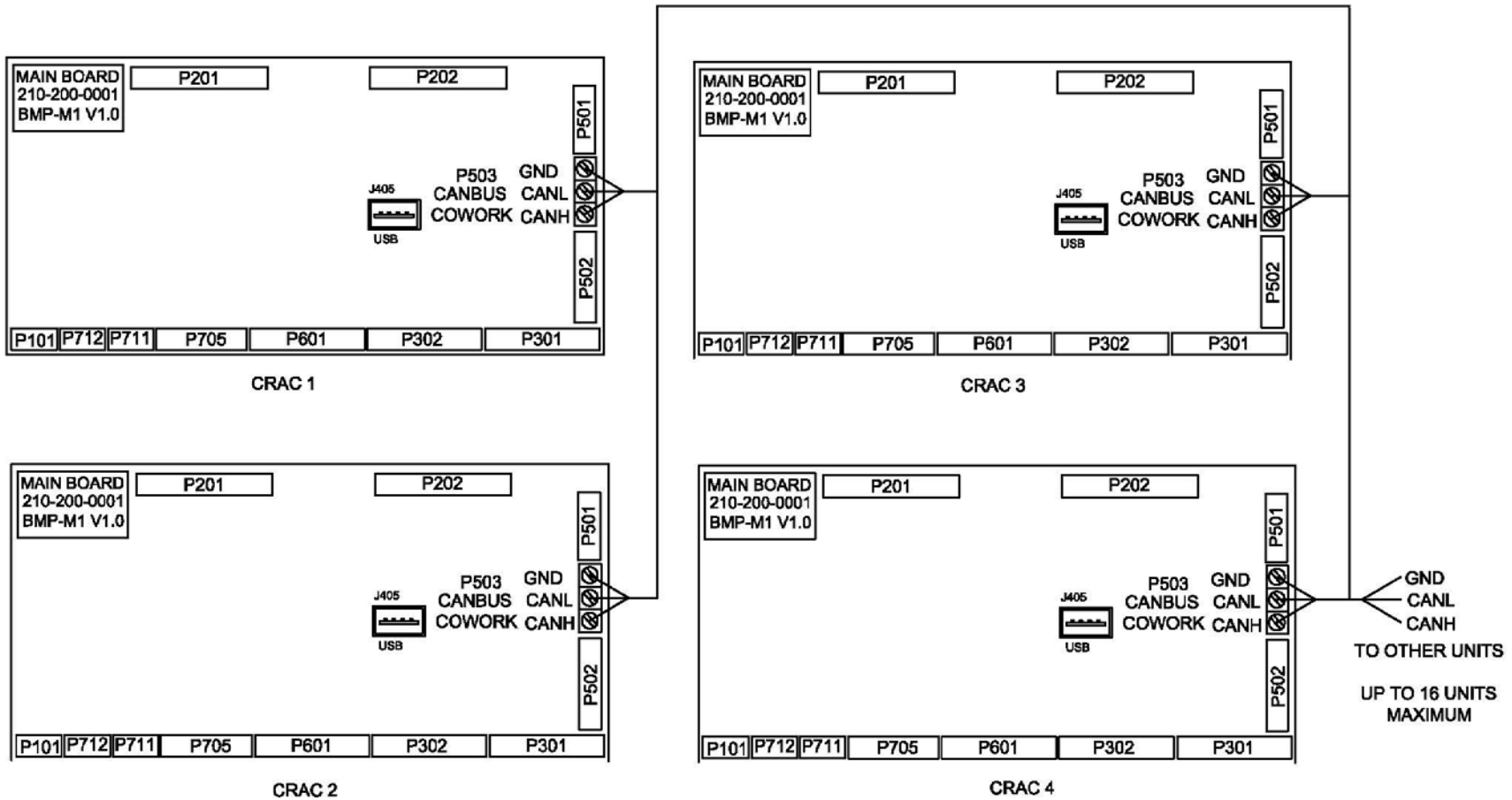


LEGEND:

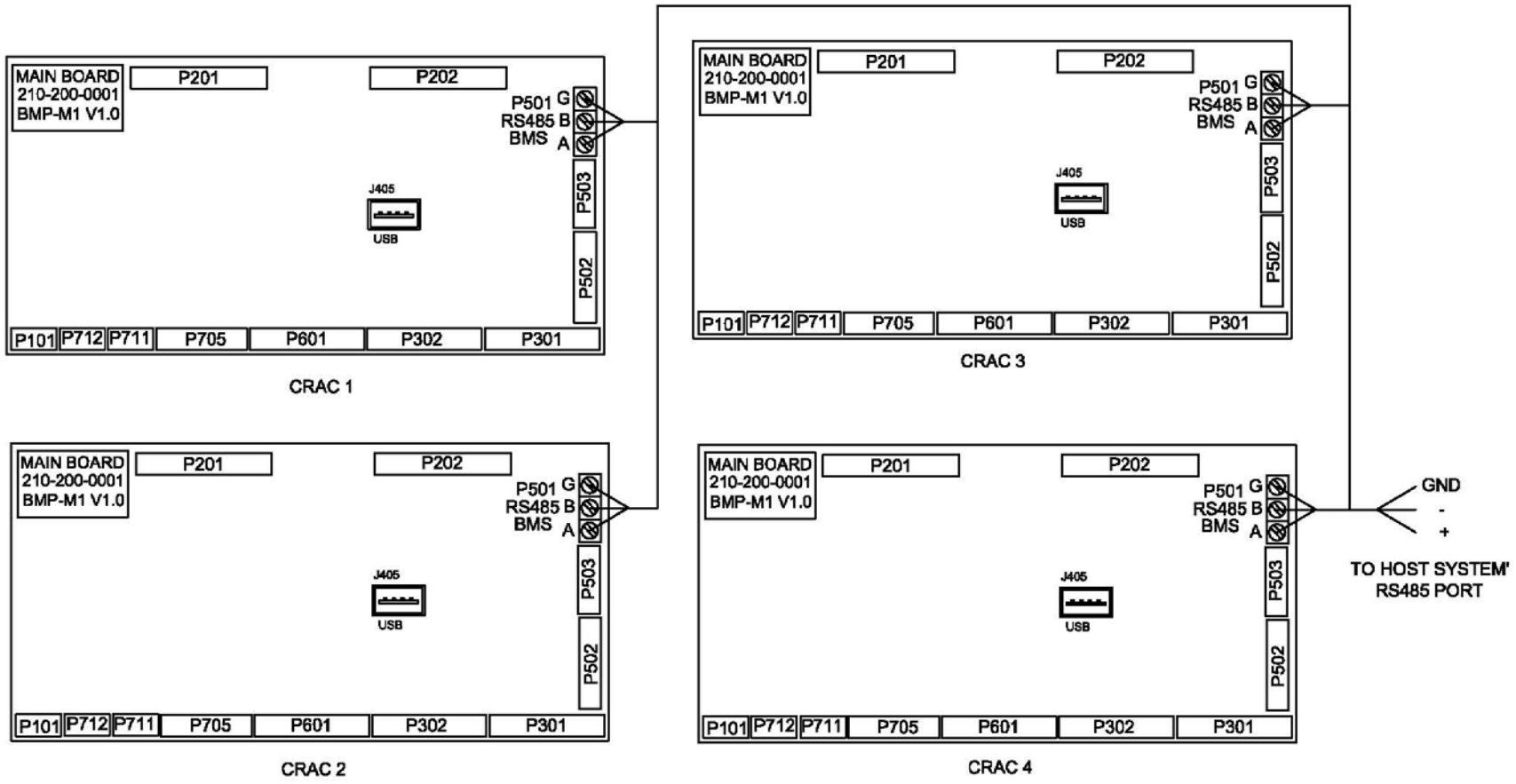
(#) FIELD TERMINAL

CLIMATEWORX INTERNATIONAL

ADVANCED M52 CONTROL SYSTEM
Electrical Schematic - Co-Work Link



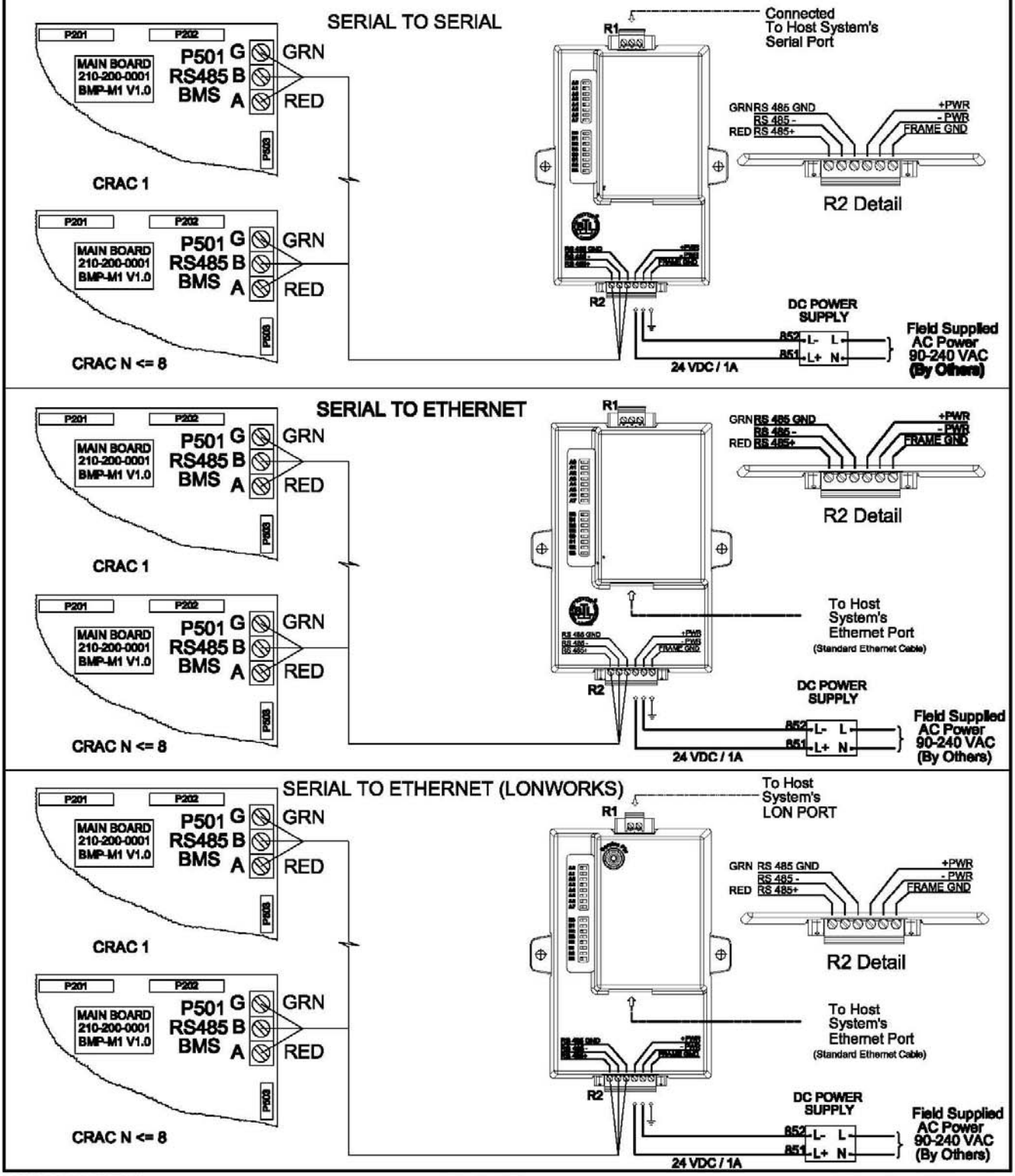
NOTE: TWISTED PAIR CABLE SHOULD BE 24 AWG OR LARGER CONDUCTOR



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

CLIMATEWORX INTERNATIONAL

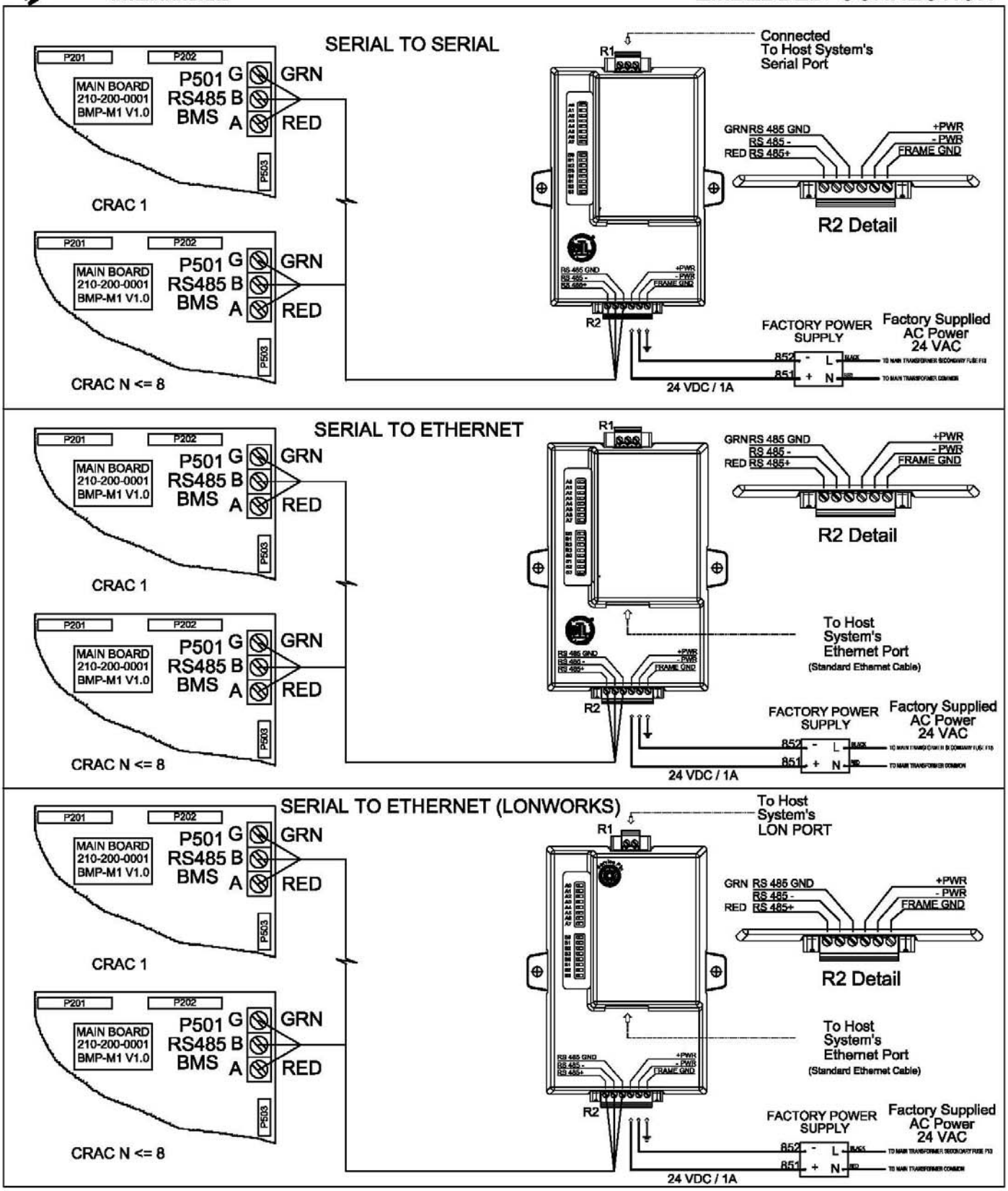
ADVANCED M52 CONTROL SYSTEM EMBEDDED CONNECTION



M52ES1005 REV A | 2015-09-23 | Dimension: Not to scale

CLIMATEWORX INTERNATIONAL

ADVANCED M52 CONTROL SYSTEM EMBEDDED CONNECTION



M52ES1006 REV -

2015-12-10

Dimension: Not to scale