Thermal Edge Inc.

PLR (Programmable Logic Relay) Based Redundant System

Improved Service Life

with balanced run-time and an industry leading warranty

Reliable Cooling

in both normal and high heat load environments.

Ensured Operation

with reduced risk of downtime due a disabled AC unit with a **true failsafe** system

Enhanced Monitoring

with a web-based interface and remote diagnostics

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Scope

The purpose of this document is to provide guidance on the wiring installation for redundant air conditioning systems combined with other features that utilize a programmable logic relay (PLR). Please take note to follow instructions regarding inspecting, unpacking, handling, and preliminary testing in the User & Technical Manual prior to proceeding with instructions in this document.

Definitions

1. **Redundant System** – Two air conditioners with staggered set points to provide reduced load on a single air conditioner and provide a backup cooling mechanism in the event of an air conditioner malfunction while maintaining acceptable enclosure temperature.
2. **Set Point** – Enclosure temperature that air conditioner operates to achieve.
3. **Hysteresis** – Number of degrees above set point that triggers air conditioner to operate.
4. **Primary Controller** – Device that receives an input signal for enclosure temperature and compares against set point. When the difference between these two values exceeds a certain value, an output signal is sent to turn on the air conditioner. Lower set point in system.
5. **Secondary Controller** - Device that receives an input signal for enclosure temperature and compares against set point. When the difference between these two values exceeds a certain value, an output signal is sent to turn on the air conditioner. Higher set point in system.

Operating Conditions

When reading the AC Operation charts in the conditions below, please note the following:

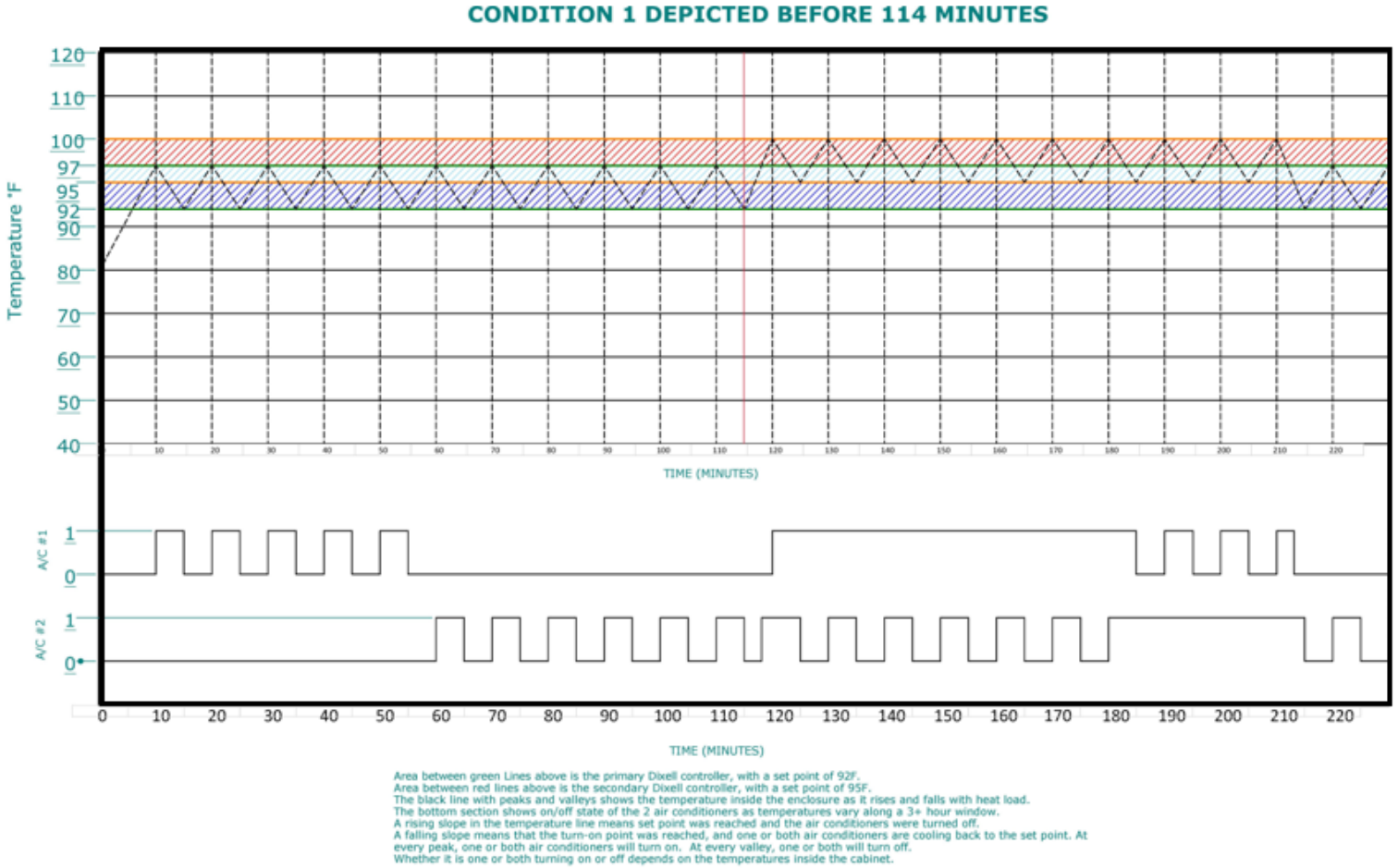
1. Y-Axis represents the on or off condition of an air conditioner. 1 indicates the air conditioner is ON and 0 indicates the air conditioner is OFF.
2. X-Axis represents time in minutes.
3. Unit operation is plotted on each graph over time. Note that in some conditions both air conditioners are operating.
4. The Primary controller has a default temperature range of 87°F - 92°F.
5. The Secondary controller has a default temperature range of 90°F - 95°F.

Condition 1

The capacity of a single air conditioner is ***greater than*** the heat load of the enclosure.

When the enclosure temperature reaches the primary controller's set point plus hysteresis, one of the two units will be commanded on after a 3-minute delay and operate to meet the set point of the primary controller. When the enclosure temperature reaches the primary controllers' set point, the unit will turn off. The same unit will continue to operate in this manner for the remainder of the hour.

After 1-hour, the first unit previously in operation will remain off. The controller will then call for the Stand-by unit to turn on and operate after a 3-minute delay. The system will continue to operate with this control scheme switching between each unit from hour to hour to maintain an acceptable enclosure temperature thus, evening the run time between each unit throughout the day.

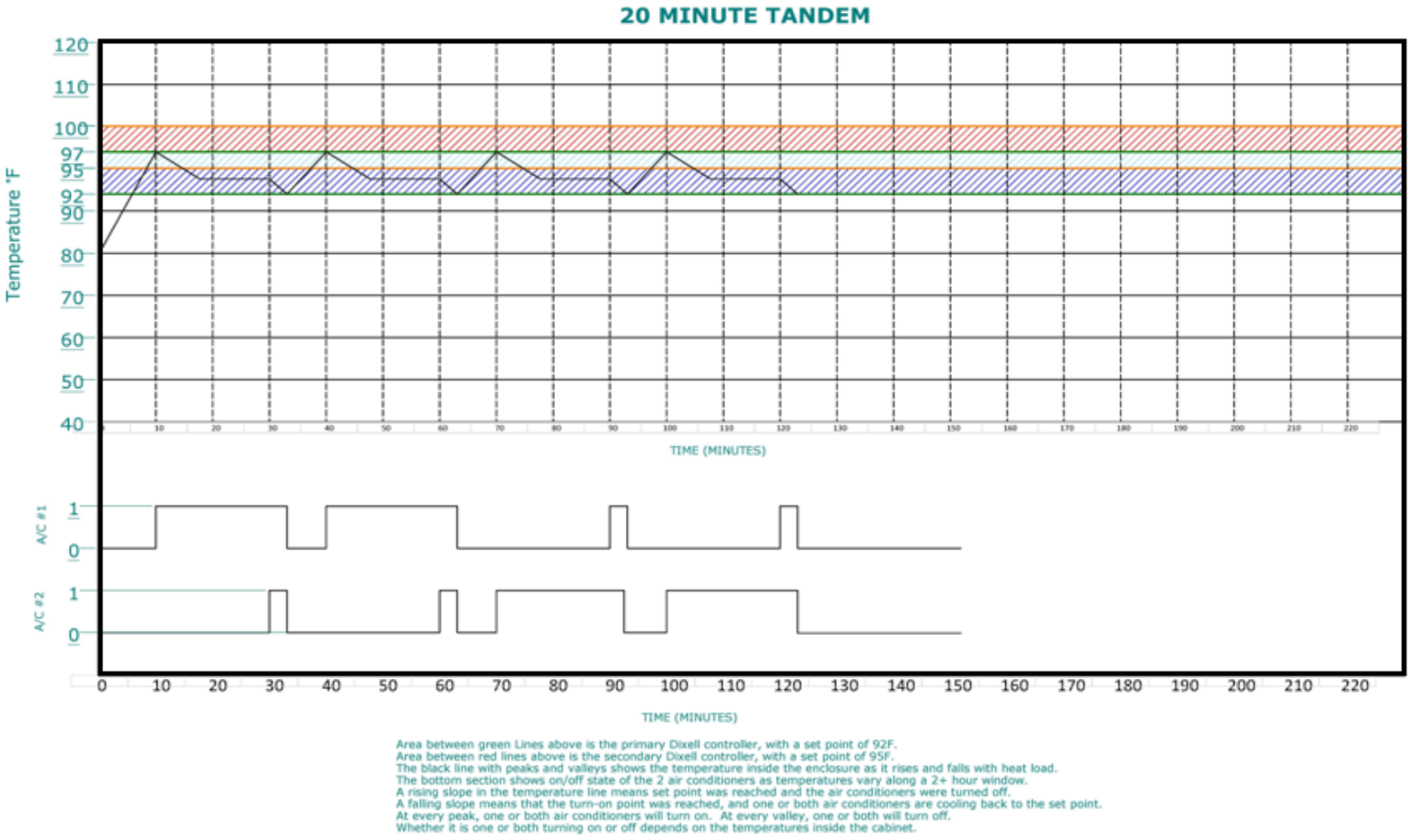


Condition 2

The capacity of a single air conditioner is ***equal to*** the heat load of the enclosure.

When the enclosure temperature reaches the primary turn-on set point, plus hysteresis, one of the two units will be commanded on after a 3-minute delay and operate to meet the set point of the primary controller; the other unit is on stand-by. If the primary controller set point is not reached after 20 minutes due to a dead-band, the Stand-by unit will be commanded on and run in tandem after the 3-minute delay. Once the primary controllers' set point is reached, both units will turn off. Both units will operate in this manner for the remainder of the hour prioritizing only the primary controllers' set points.

After 1-hour, the stand-by unit in the previous operating sequence will now turn on first. Both units will continue to operate with this control scheme to maintain an acceptable enclosure temperature thus, evening the run time between each unit throughout the day.

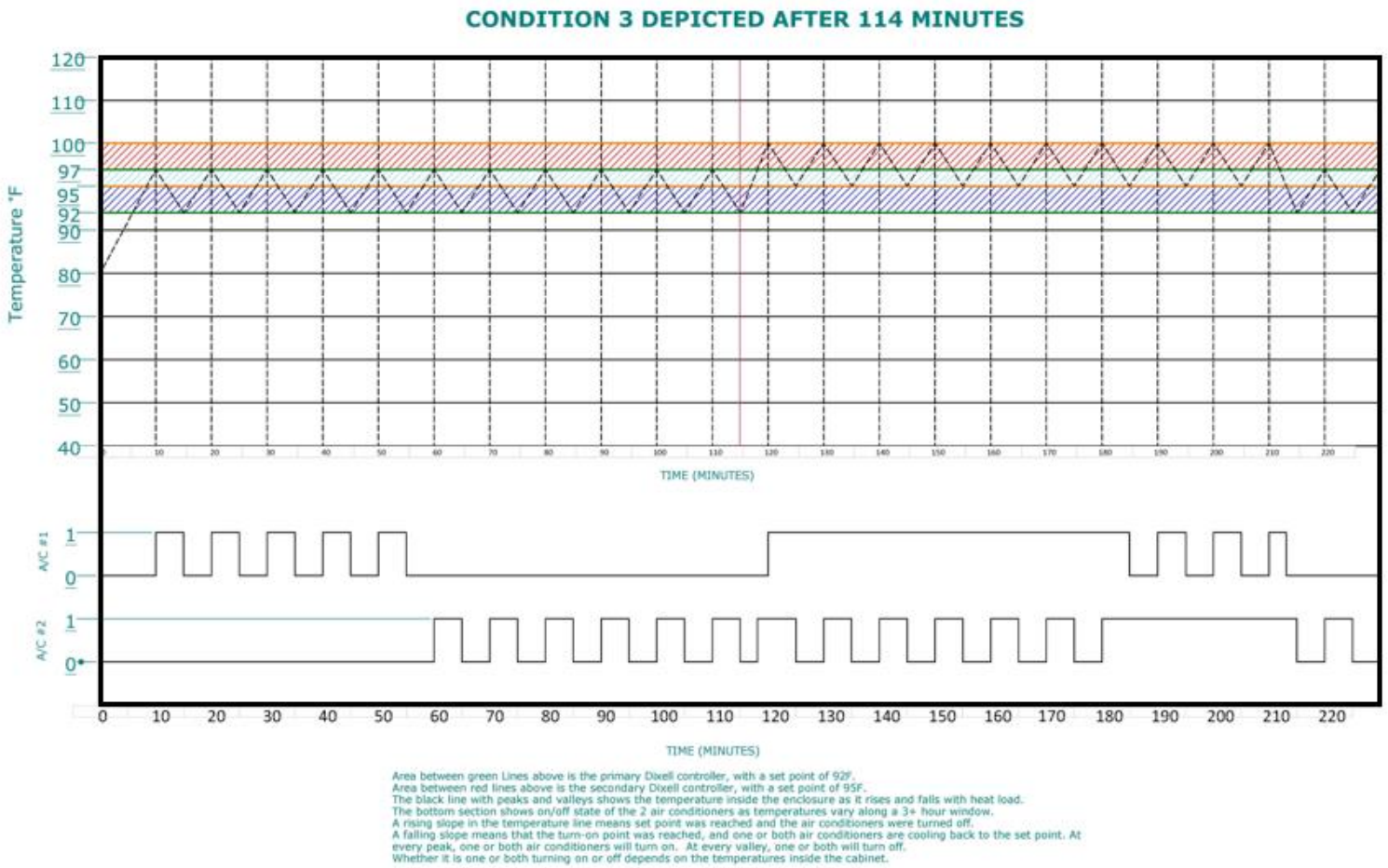


Condition 3:

The capacity of a single air conditioner is ***less than*** the heat load of the enclosure.

When the enclosure temperature reaches the primary set point plus hysteresis, one unit will be commanded on and operated to meet the set point of the primary controller. Since the capacity of a single air conditioner in the system is ***less than*** the heat load of the enclosure, the enclosure temperature will continue to rise. When the enclosure temperature reaches the secondary controller's turn-on set point plus hysteresis value, the first unit will continue to run while the stand-by unit cycles on and off until the secondary controller set point is reached. The system will continue to operate in this manner, prioritizing the secondary controller set points for the remainder of the hour.

After 1-hour, the stand-by unit in the previous operating sequence will now be ***commanded on first.*** Both units will continue to operate with this control scheme, prioritizing the secondary set points to maintain an acceptable enclosure temperature, thus, evening the run time between each unit throughout the day.



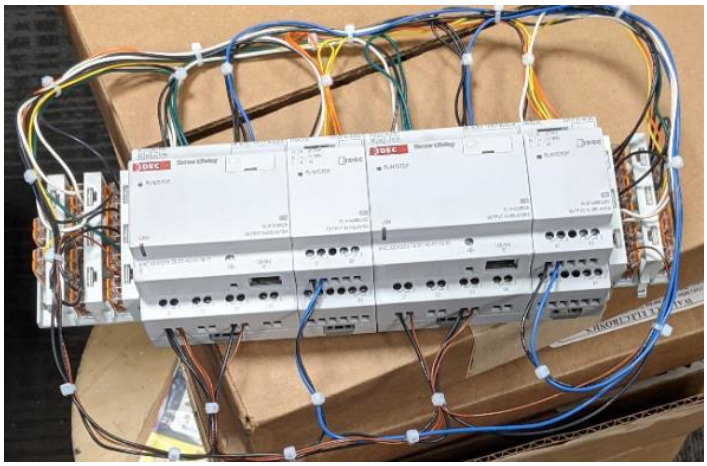
Unit Identification | Redundant Failsafe System with HMI Diagnostics (Dual PLR used as example)

Both Air conditioning units will be packaged individually and consolidated onto a single pallet with two pre-wired PLR sub-assemblies. Both PLRs mounted to a din rail will be shipped in a separate package and will include cables with the necessary wires to connect to
the PLR sub-assemblies.

Note: *All connections between PLR and terminal blocks are within the manufacturer's scope. All connections between the air conditioner units and the wiring harness are within customer scope.*

1. Verify that you received two units. Both units will have different model numbers but will be the same units. The E5 and E8 within the code string in the model numbers below are for example only, your application may be different.

2. Verify that you received two PLR sub-assemblies on a din rail with power, inputs, and outputs. The necessary connections per the ordered options will be pre-wired from the factory into the PLR. The unterminated wires on the shielded harness will be field installed into the unit by a qualified Technician. An example photo of a pre-wired PLR is shown below.

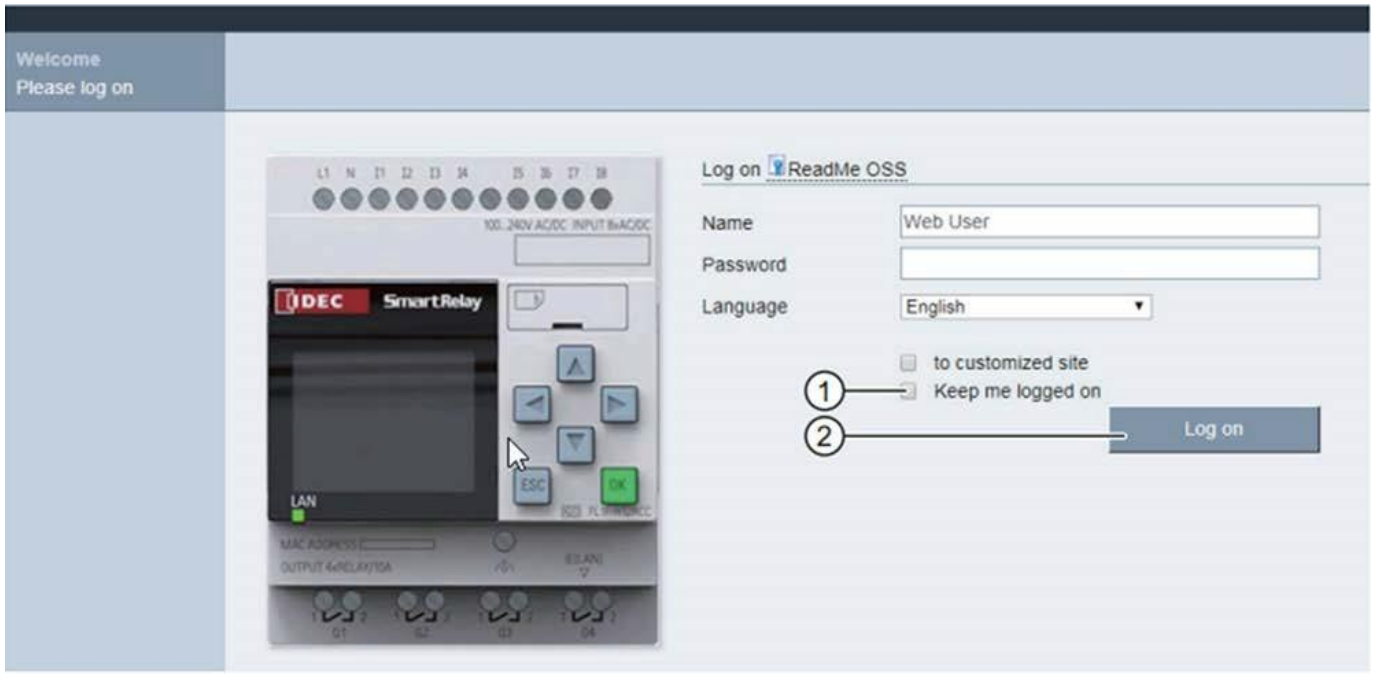


Remote Monitoring / Diagnostics for IDEC Smart Relay

- Default IP address of a single PLR: 192.168.2.254
- Subnet IP address: 255.255.255.0
- Default Gateway address: 192.168.2.1
- Backup PLR address (If you have one): 192.168.2.253

If remoting from outside network: Set up Port-forward on your router to port 8080

Login Screen example below:



Steps:

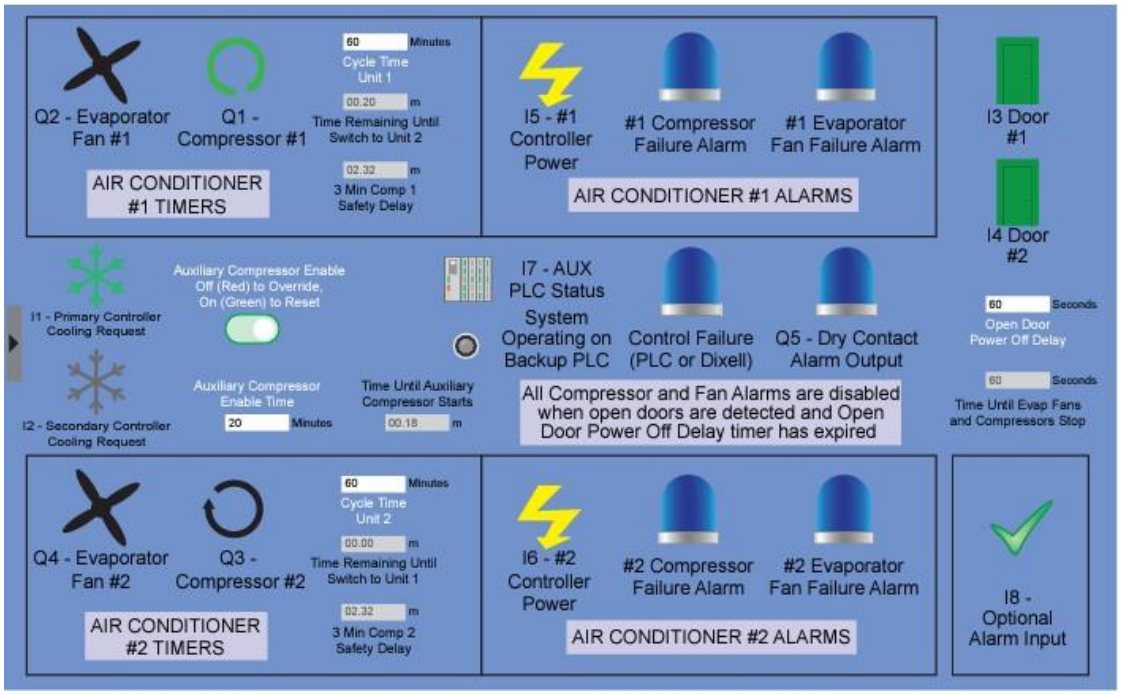
1. Check "to customize site."
2. Leave the default name as is.
3. Enter password: Ch1ller (Ensure capital "C" and number 1 in place of "i")
4. Log in

- If there are problems finding it on your network, the Mac address is on the PLR above the output terminals, and can be scanned using a free scanner called Advanced IP Scanner. The scanner can scan the network for all connected devices and will show all IP addresses associated with the Devices Mac address.

- For a different IP address requirement, you can change the IP address by downloading the 30 trial software (WindLGC) from IDEC's website.

- Website for free trail: https://us.idec.com/idec-us/en/USD/Software-WindLGC

DIAGNOSTICS
(X1)



Compatible with Thermal Edge Redundant System options (E5, E6, E7, E8, X1, X2, X3, X4, X5)

The HMI provides remote access via a web-based portal which displays how the system should be operating based on what the PLR is calling for. End-users may configure five (5) settings through this portal including the cycle time of both air conditioners, the auxiliary compressor status and enable time. If installed with the Option K4 – Open Door Kill Switch, set the open-door delay time prior to the system powering off.

When combined with the E8 Secondary Unit Backup with PLR, end users get a failsafe system with full system visibility for both the primary and secondary system.

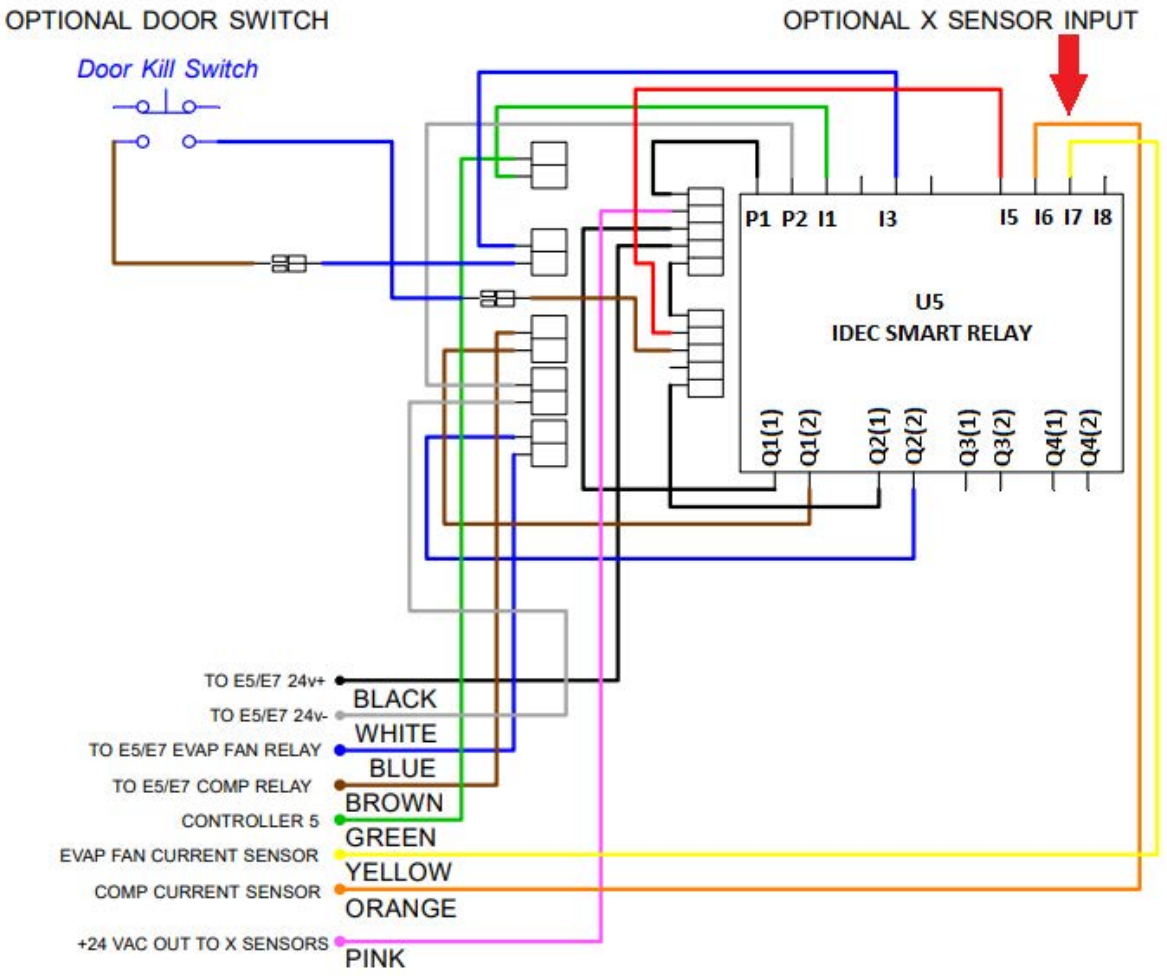
PLR WIRING SCHEMATIC

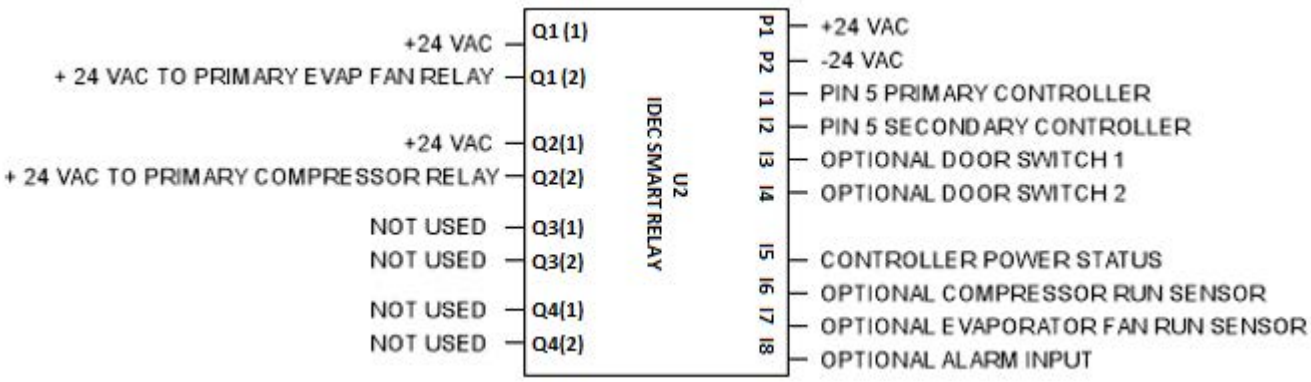
1. Single unit with X sensors with and or without door switches

2. E5/E6 with Single PLR

3. E5/E6 with Dual PLR

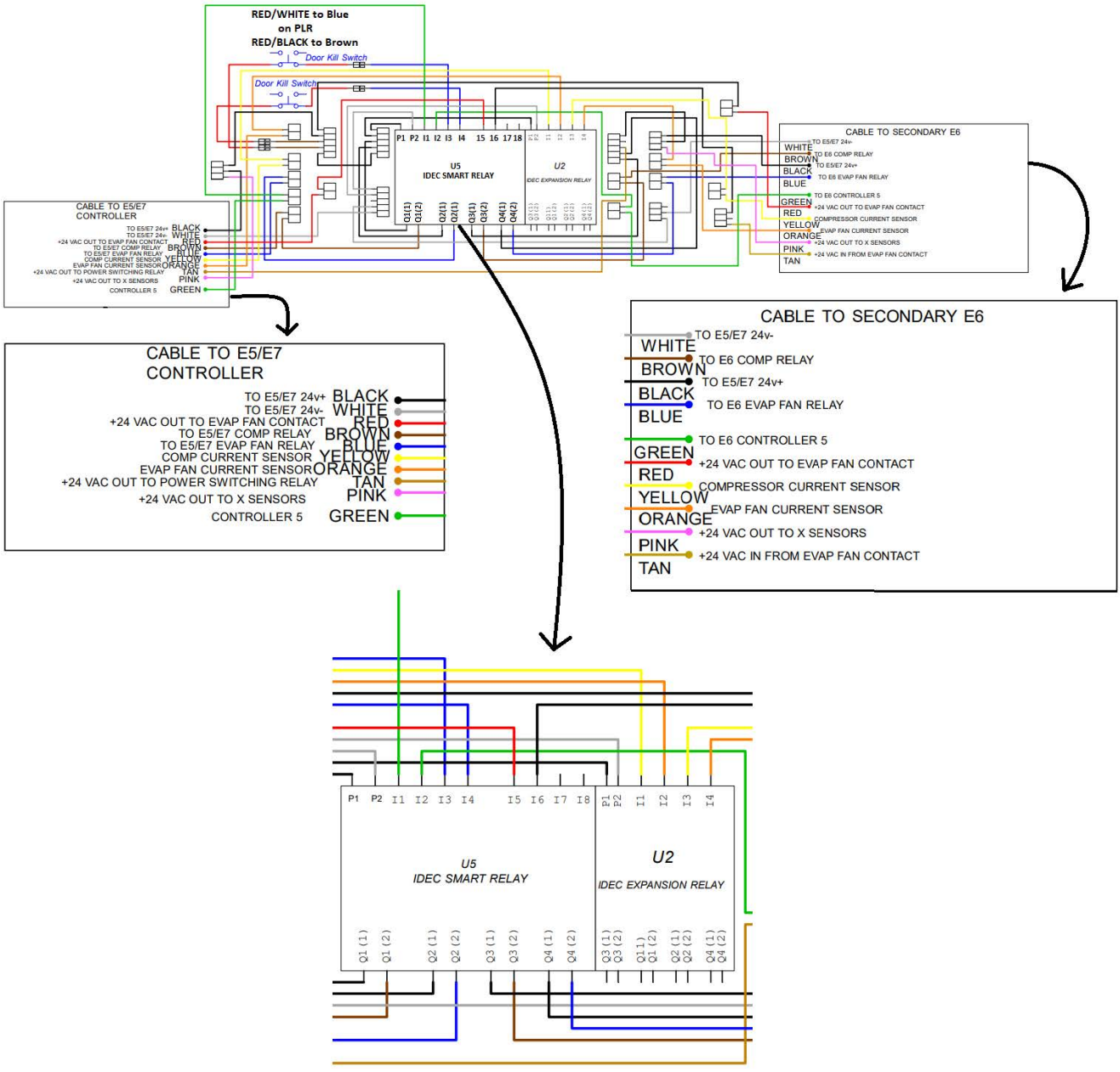
Single System PLR with Optional Door Switch and X Sensors Shown:

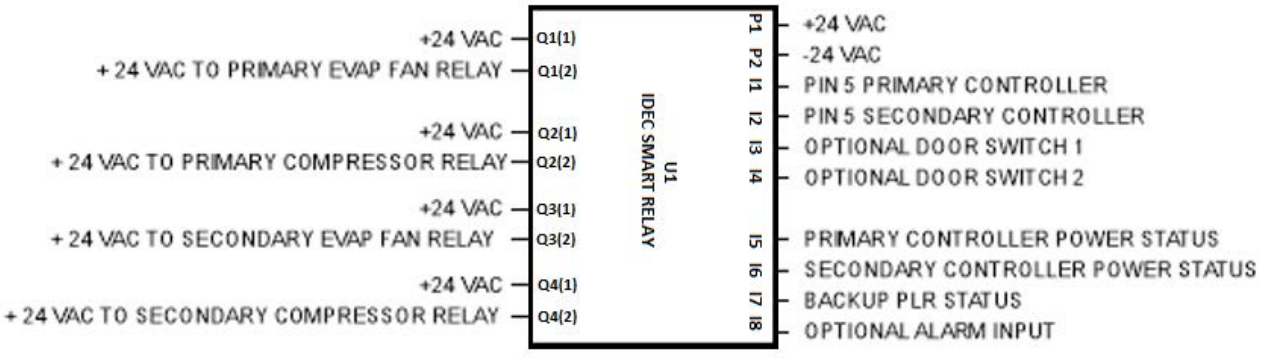




Single PLR Redundant with Optional Door Switches and Optional X sensors shown: Expansion Module not present without X sensors

Note: Arrows point to zoomed-in portion the diagram





All wires jumped from the Primary PLR to the Secondary PLR, in the same INPUT/ OUTPUT, except for the I7 INPUTS. On the expansion modules, jump P1, P2, I1, I2, I3, and I4 to the other expansion module.

Figure 1 = Whole Schematic, Figure 2 = Expanded view Cable to Controller, Fig 3. = Expanded view Cable to Secondary Unit.

Fig.1

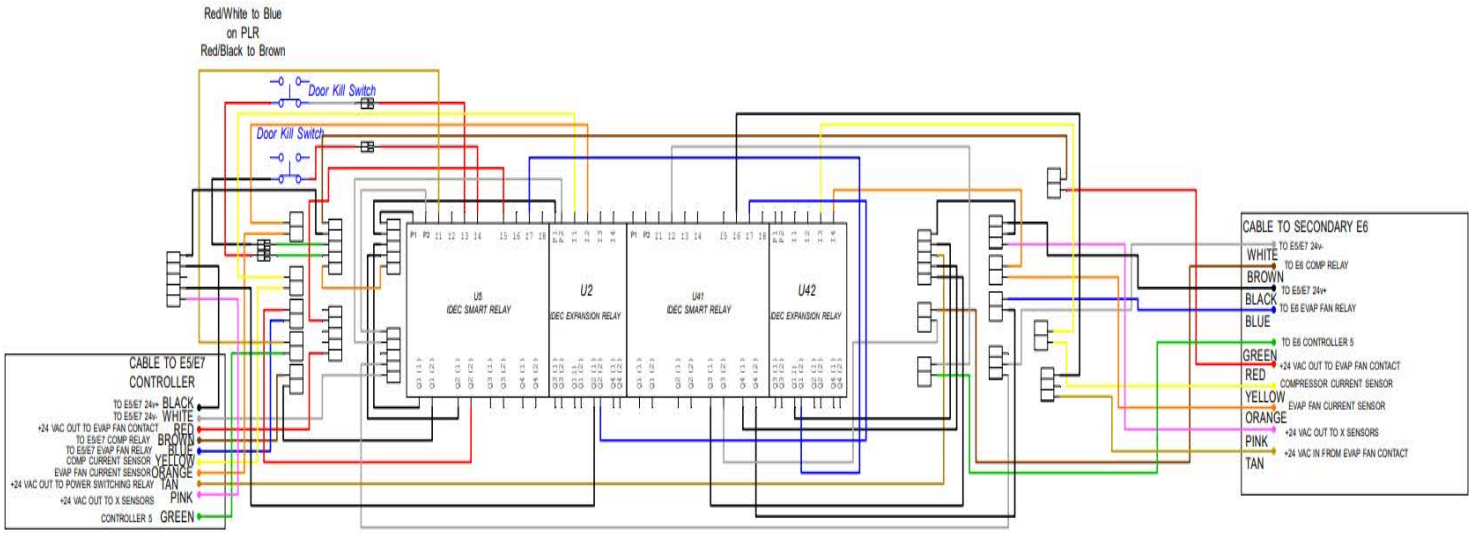


Fig. 2

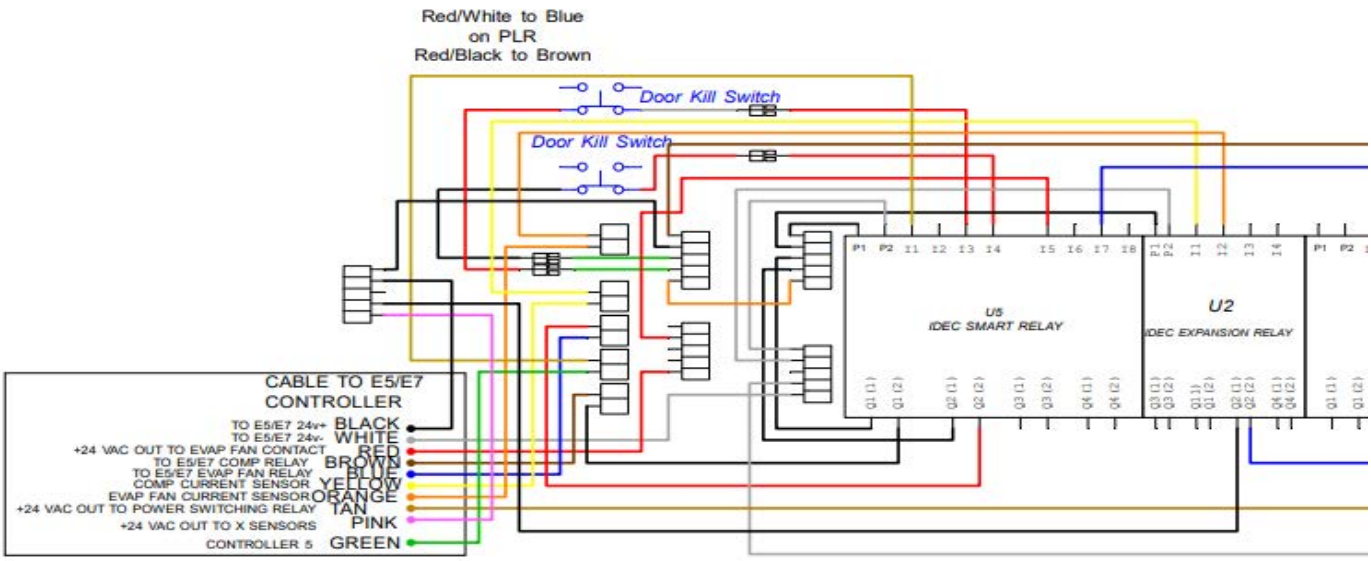
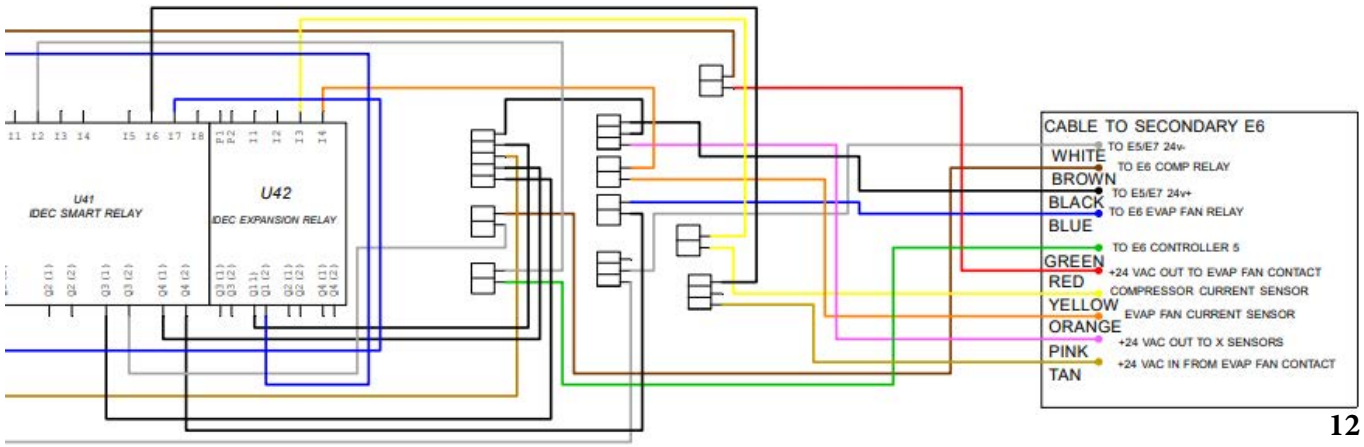
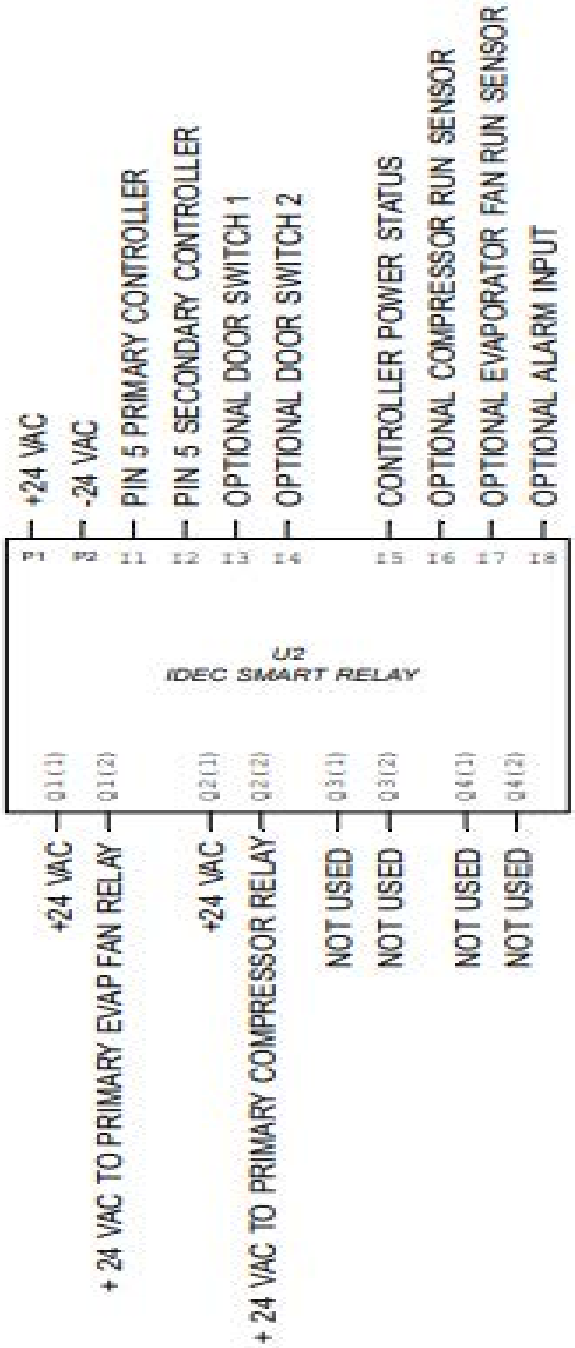


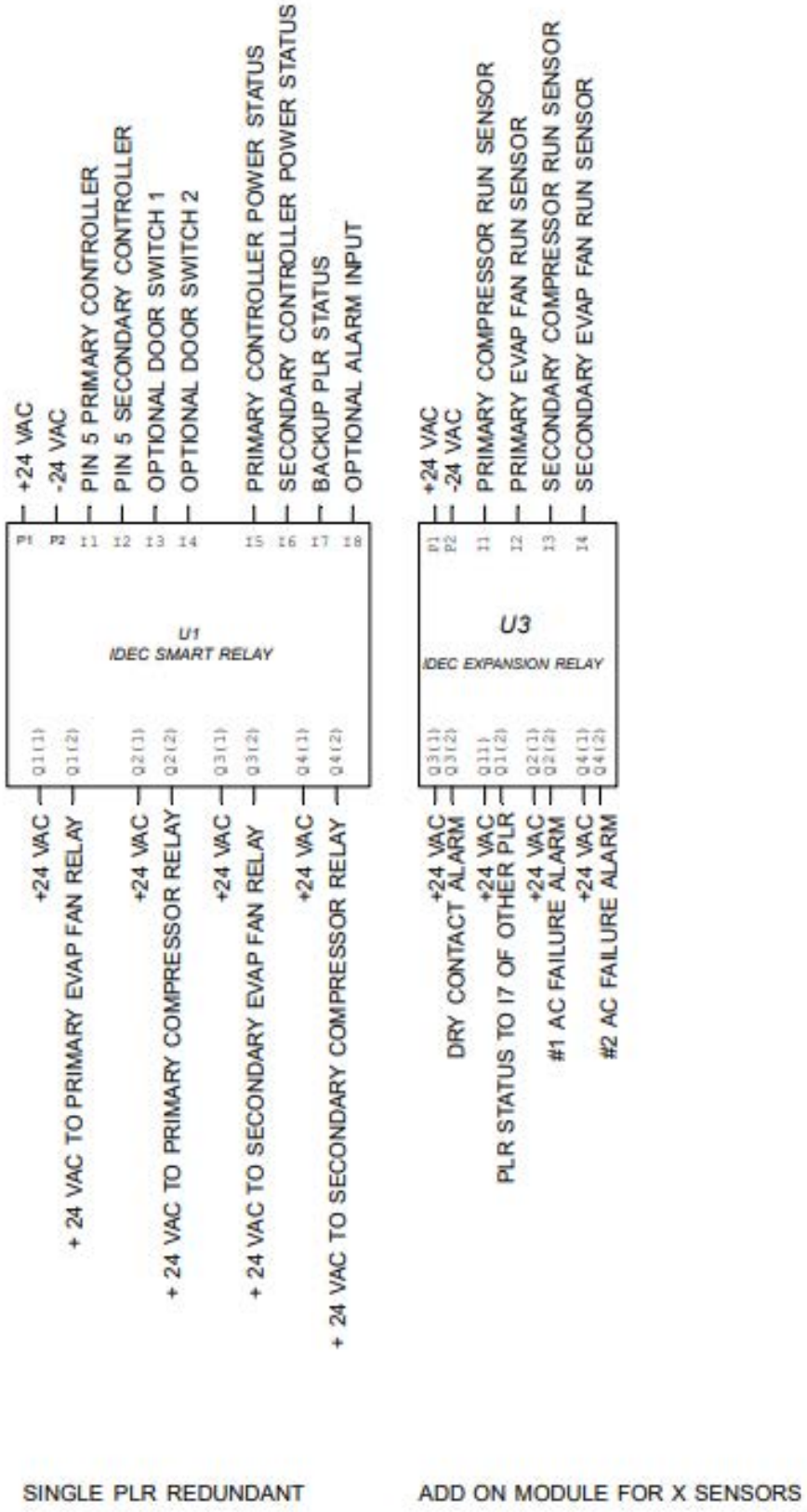
Fig. 3



Wire Designations

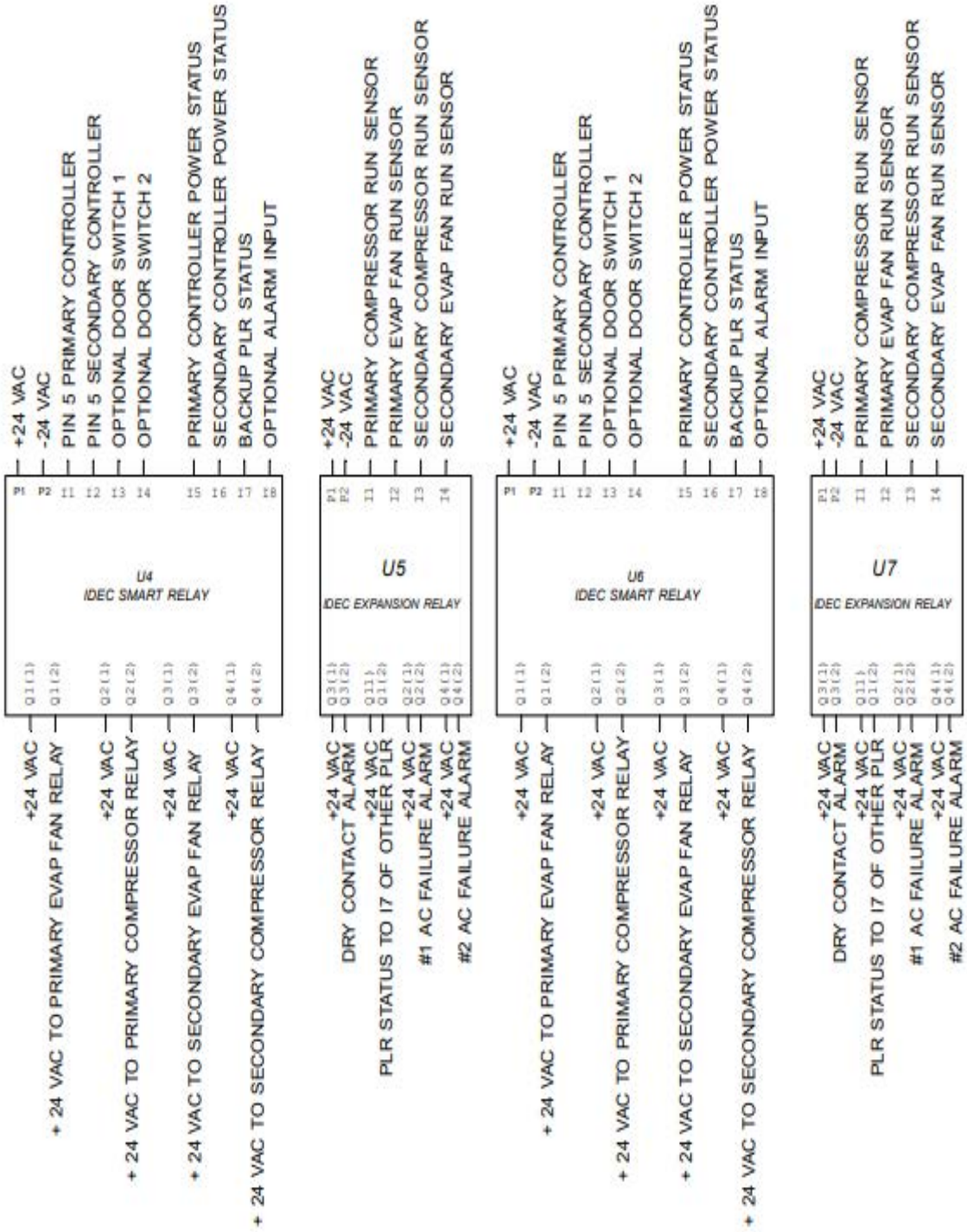


SINGLE PLR NON REDUNDANT



SINGLE PLR REDUNDANT

ADD ON MODULE FOR X SENSORS



DUAL PLR REDUNDANT
ALL OPTIONS SHOWN