Envision Technologies
Installations and Operations Manual
FG32+ Version 1.0 (updated 11/2/16)

FG32+ Main
Controller
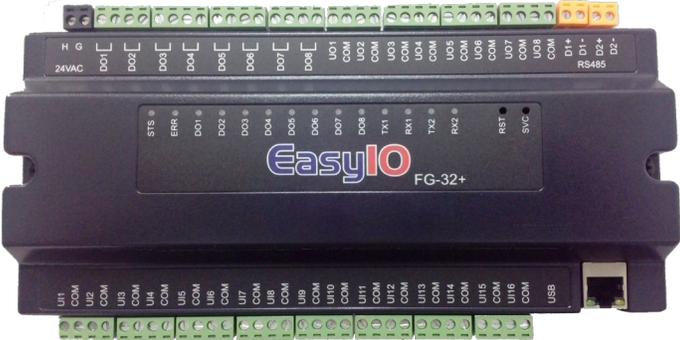
FC20 Expansion
Controller

Master Sequence of Operations

Occupied Mode

Supply Fan Control

<u>Constant Air Volume</u>
The supply fan runs continuously. The supply fan is maintained by minimum on and off timers.

<u>Variable Air Volume</u>
The supply fan runs continuously and is modulated to maintain supply duct static pressure at the supply duct static pressure setpoint. The supply fan will also be modulated for Single Zone VAV applications. The supply fan is maintained by minimum on and off timers.

<u>Single Zone VAV</u>
The supply fan runs continuously and is modulated during cooling and heating modes to maintain the space temperature setpoint. It will also be modulated during the dehumidification mode to maintain the space dehumidify setpoint as long as reheat is configured. The supply will modulate from its minimum speed setpoint (HVAC mode dependent) to its maximum speed setpoint to satisfy the HVAC mode. During economizer cooling mode, the economizer will be modulated fully open first and if more cooling is required, the supply fan will modulate to supplement the economizer in order to satisfy the cooling mode. During demand control ventilation, the economizer will be modulated fully open first and if the CO2 levels are still above setpoint, the supply fan will modulate to supplement the economizer in order to satisfy the CO2 levels. The supply fan is maintained by minimum on and off timers.

The following modes of operation are defined by each configurable mode and control sensor combination, based on the HVAC unit type. Configuration instructions are found in the User Interface section of this manual.

Make Up Air Unit / Discharge Air Control

Occupied Temp Mode Sensor = Outside Air Temp
Occupied Temp Control Sensor = Supply Air Temp

Cooling Mode
The cooling mode will be enabled when the outside air temperature rises above the occupied cooling mode setpoint and the outside temperature is above the outside air cooling lockout. During the cooling mode, the controller will modulate and/or stage cooling to maintain the supply air temperature at the occupied cooling control setpoint. The cooling mode will remain active until the outside air temperature falls below the occupied cooling mode setpoint.

Heating Mode
The heating mode will be enabled when the outside air temperature falls below the occupied heating mode setpoint and the outside temperature is below the outside air heating lockout. During the heating mode, the controller will modulate and/or stage heating to maintain the supply air temperature at the occupied heating control setpoint. The heating mode will remain active until the outside air temperature rises above the occupied heating mode setpoint.

Occupied Dehumidify Mode Sensor = Outside Air Dewpoint
Occupied Dehumidify Control Sensor = Supply Air Dewpoint

Dehumidify Mode

The dehumidify mode will be enabled when the outside air dewpoint rises above the occupied dehumidify setpoint and the outside temperature is above the outside air cooling lockout. During the dehumidify mode, the controller will modulate and/or stage cooling to maintain the supply air dewpoint at the occupied dehumidify setpoint. Reheat will be modulated and/or staged to maintain the supply air temperature at 1°F below the occupied cool control setpoint. The dehumidify mode will remain active until the outside air dewpoint falls below the occupied dehumidify setpoint.

Make Up Air Unit / Space or Return Air Control

Occupied Temp Mode Sensor = Outside Air Temp
Occupied Temp Control Sensor = Space Temp or Return Air Temp (configurable)

Cooling Mode

The cooling mode will be enabled when the outside air temperature rises above the occupied cooling mode setpoint and the outside temperature is above the outside air cooling lockout. During the cooling mode, the controller will modulate and/or stage cooling to maintain the occupied temp control sensor value at the occupied cooling control setpoint. The supply air temperature is continuously reset as needed but is not allowed to be maintained below the low supply air temperature limit setpoint. The cooling mode will remain active until the outside air temperature falls below the occupied cooling mode setpoint.

Heating Mode

The heating mode will be enabled when the outside air temperature falls below the occupied heating mode setpoint and the outside temperature is below the outside air heating lockout. During the heating mode, the controller will modulate and/or stage heating to maintain the occupied temp control sensor value at the occupied heating control setpoint. The supply air temperature is continuously reset as needed but is not allowed to be maintained above the high supply air temperature limit setpoint. The heating mode will remain active until the outside air temperature rises above the occupied heating mode setpoint.

Occupied Dehumidify Mode Sensor = Outside Air Dewpoint
Occupied Dehumidify Control Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)

Dehumidify Mode

The dehumidify mode will be enabled when the outside air dewpoint rises above the occupied dehumidify setpoint and the outside temperature is above the outside air cooling lockout. During the dehumidify mode, the controller will modulate and/or stage cooling to maintain the occupied dehumidify control sensor value at the occupied dehumidify setpoint. Reheat will be modulated and/or staged to maintain the occupied temp control sensor value at .5°F below the occupied cooling control setpoint. The dehumidify mode will remain active until the outside air dewpoint falls below the occupied dehumidify setpoint.

Mixed Air Unit / Discharge Air Control

Occupied Temp Mode Sensor = Space Temp or Return Air Temp (configurable)
Occupied Temp Control Sensor = Supply Air Temp

Cooling Mode
The cooling mode will be enabled when the occupied temp mode sensor value rises above the occupied cooling mode setpoint and the outside temperature is above the outside air cooling lockout. During the cooling mode, the controller will modulate and/or stage cooling to maintain the supply air temperature at the occupied cooling control setpoint. The cooling mode will remain active until the occupied temp mode sensor value falls below the occupied cooling mode setpoint.

Heating Mode
The heating mode will be enabled when the occupied temp mode sensor value falls below the occupied heating mode setpoint and the outside temperature is below the outside air heating lockout. During the heating mode, the controller will modulate and/or stage heating to maintain the supply air temperature at the occupied heating control setpoint. The heating mode will remain active until the occupied temp mode sensor value rises above the occupied heating mode setpoint.

Occupied Dehumidify Mode Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)
Occupied Dehumidify Control Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)

Dehumidify Mode
The dehumidify mode will be enabled when the occupied dehumidify mode sensor value rises above the occupied dehumidify setpoint and the outside temperature is above the outside air cooling lockout. During the dehumidify mode, the controller will modulate and/or stage cooling to maintain the occupied dehumidify control sensor at the occupied dehumidify setpoint. Reheat will be modulated and/or staged to maintain the occupied temp mode sensor at .5°F below the occupied cooling control setpoint or 1°F below if configured for duct static pressure control (VAV unit). The dehumidify mode will remain active until the occupied dehumidify mode sensor value falls below the occupied dehumidify setpoint.

Mixed Air Unit / Space or Return Air Control

Occupied Temp Mode Sensor = Space Temp or Return Air Temp (configurable)
Occupied Temp Control Sensor = Space Temp or Return Air Temp (configurable)

Cooling Mode
The cooling mode will be enabled when the occupied temp mode sensor value rises above the occupied cooling mode setpoint and the outside temperature is above the outside air cooling lockout. During the cooling mode, the controller will modulate and/or stage cooling to maintain the occupied temp control sensor value at the occupied cooling mode setpoint. The occupied cooling control setpoint is not used in this configuration and will be bypassed.

The supply air temperature is continuously reset as needed but is not allowed to be maintained below the low supply air temperature limit setpoint. The cooling mode will remain active until the occupied temp mode sensor value falls below the occupied cooling mode setpoint.

Heating Mode
The heating mode will be enabled when the occupied temp mode sensor value falls below the occupied heating mode setpoint and the outside temperature is below the outside air heating lockout. During the heating mode, the controller will modulate and/or stage heating to maintain the occupied temp control sensor value at the occupied heating mode setpoint. The occupied heating control setpoint is not used in this configuration and will be bypassed. The supply air temperature is continuously reset as needed but is not allowed to be maintained above the high supply air temperature limit setpoint. The heating mode will remain active until the occupied temp mode sensor value rises above the occupied heating mode setpoint.

Occupied Dehumidify Mode Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)
Occupied Dehumidify Control Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)

Dehumidify Mode
The dehumidify mode will be enabled when the occupied dehumidify mode sensor value rises above the occupied dehumidify setpoint and the outside temperature is above the outside air cooling lockout. During the dehumidify mode, the controller will modulate and/or stage cooling to maintain the occupied dehumidify control sensor value at the occupied dehumidify setpoint. Reheat will be modulated and/or staged to maintain the occupied temp mode sensor value at .5°F below the occupied cooling control setpoint. The dehumidify mode will remain active until the occupied dehumidify mode sensor value falls below the occupied dehumidify setpoint.

Auxiliary and Emergency Heating with Heat Pumps
For heat pump units, the outside air temperature must be between the outside air heat pump low and high lockout setpoints for compressor heating. If auxiliary heating is configured, it will be activated to supplement compressor heating if needed, once the auxiliary heat stage up timer has expired. Compressors will not stage down during the heating mode until auxiliary heating has staged off. Compressor and auxiliary heating stages are maintained by fixed minimum on, off and adjustable stage up and stage down timers.

If auxiliary heating is not configured, emergency heating will be activated once the outside air temperature is above or below the outside air heat pump low and high lockout setpoints.

Heat During Dehumidify
If the unit has electric heat, ensure the electrical (MOP) rating is capable of using electric heat while compressors are active. There are (3) configurations for heating to be used during dehumidification. Heating will be used to supplement hot gas reheat as additional stages and will be the only form of reheat if the unit is not equipped with hot gas reheat. If a modulating form of heat such as SCR electric, modulating gas or hot water heat is used, it will be modulated sequentially with hot gas reheat. See configuration section for setup and details.

Morning Warm-up / Cool-Down
Mode Temp Sensor = Space Temp or Return Air Temp (configurable)

Once the controller is occupied it will enter the morning warm-up mode if the mode temp sensor is below the morning warm-up setpoint. If the mode temp sensor is above the morning cool-down setpoint and the outside air temperature is above the outside air cooling lockout, it will enter the cool-down mode. During morning warm-up, heating is modulated to maintain the supply air temperature at the morning warm-up supply air heating setpoint. During morning cool-down, cooling is modulating and/or staged to maintain the supply air temperature at the occupied cooling control setpoint. The outside air damper will remain closed and the exhaust fan and heat wheel is off. This mode will continue until the morning cool-down/warm-up setpoint is satisfied or the timer expires.

Economizer

Economizer cooling has (6) possible configurations:
- 0 = No Economizer
- 1 = Air-side - Outside Dry Bulb Enabled Economizer, No Supplemental Cooling
- 2 = Air-side - Outside Enthalpy Enabled Economizer, Has Supplemental Cooling
- 3 = Air-side - Dual Enthalpy Enabled Economizer, Has Supplemental Cooling
- 4 = Waterside - No Supplemental Cooling
- 5 = Waterside - Has Supplemental Cooling

If configured for either outside air temperature (Dry Bulb) or enthalpy, the value must be less than the economizer enable setpoint. If configured for dual enthalpy, the outside air enthalpy must be less than the return air enthalpy. If configured for waterside, the entering water temperature must be below the economizer enable setpoint. The outside air temperature must also be more than 5°F below the return temperature for the economizer to be enabled unless configured as a waterside economizer.

When the DDC controller is in the cooling mode, the economizer will be used as the first stage of cooling. The economizer will modulate between its minimum and maximum positions to maintain the supply air temperature at the occupied cooling control setpoint. Cooling stages can be activated to supplement the economizer once the economizer has reached its maximum position and the cooling stage up timer has expired. Once supplemental cooling stages have been activated, the economizer output signal is held at its maximum position until cooling stages are no longer needed and then can resume normal modulation. Cooling stages are no longer needed when the economizer control loop has reached its minimum position and the cooling stage down timer has expired.

IAQ Mode (CO2)

The DDC controller enters the IAQ mode when the CO_2 level rises above the CO_2 level setpoint. The economizer will modulate between its minimum and IAQ maximum positions to maintain the CO_2 level at setpoint. The DDC controller will remain in the IAQ mode until the CO_2 level falls below the CO_2 setpoint. For Single Zone VAV applications, the supply fan will modulate to supplement if the economizer is fully open and the CO_2 level is still above setpoint.

Constant Outside Airflow

The outside air damper is modulated to maintain a minimum outside airflow. Economizer Mode or IAQ Mode can override the damper open but cannot reduce the minimum airflow. For Single Zone VAV applications, the supply fan will modulate to supplement if the economizer is fully open and the minimum airflow rate has not been achieved.

Low Supply Temp Heating

To prevent the supply air temperature from falling too low during economizer, IAQ and venting modes, the heating will be activated, modulated and or staged to maintain the supply air cooling minimum setpoint.

The following conditions activate the mode:
• 	Low SAT Heat Activate must be set to YES
• 	The supply air temp is below the supply air cooling minimum setpoint for 2 minutes
• 	The emergency shutdown input must be closed, the supply fan must be called to run and the supply fan status input must be closed (internal logic safety)

The following conditions deactivate the mode:
• 	The configuration for this is set to NO
• 	The supply air temp is above 70F for 2 minutes
• 	Our internal logic safety value is false
• 	Cooling stages are active (could be forced on or have not staged off yet)
• 	Cooling, heating or dehumidification mode is active

Low Ambient Heating

In order to prevent a hot water coil from freezing, we have built in freeze protection based on low outside ambient conditions below the Low OAT HW/CW Activate setpoint of 37°F (adj.). The heat stage 1 relay will be energized and the hot water valve will be driven to 100%. Heat stage 1 can be used to turn on a recirculating pump. The following conditions will activate this mode.

• 	The supply fan is off
• 	Low OAT Heat Active is enabled
• 	The outside temp is below the Low Ambient Heat setpoint

Fan Tracking Airflow/Speed

Airflow

The exhaust or return fan is modulated to maintain an airflow differential between the outside airflow (CFM) and exhaust airflow. Supply airflow can also be used in place of outside airflow. *NOTE: All airflow values are in CFM not FPM. This feature is not available on AAON standard applications, only custom applications.*

Speed

The exhaust or return fan can be modulated to track the speed of the supply fan or outside damper position using a multiplier. A value less than 1.0 will cause the exhaust or return fan to track behind the supply fan or outside damper and a value greater than 1.0 will cause the exhaust or return fan to track ahead of the supply fan or outside damper.

Heat Wheel Operation

The heat wheel will be active anytime the supply fan is active except during economizer cooling or on 100% OA units when all HVAC modes are off. It will also be deactivated during heat wheel defrost and is based on outside temperature. For VAV heat wheel operation, the wheel is modulated to prevent frosting during low ambient conditions.

Building Static Pressure Control

For direct acting control, on a rise in building static pressure, an exhaust fan, exhaust damper or return fan is modulated to maintain the building static pressure at the building static pressure setpoint. The exhaust/return fan relay is activated and deactivated based on the building static pressure setpoint and hysteresis (+/- 0.02"), maintained by fixed one minute on/off timers.
For reverse acting control, on a drop in building static pressure, the outside air damper or the supply fan is modulated to maintain the building static pressure at the building static pressure setpoint, depending on configuration.
NOTE: Return fan and exhaust damper outputs are not available on AAON standard applications, only custom applications.

Exhaust or Return Fan Control

The exhaust or return fan can either be constant volume or variable air volume. Variable volume applications would include direct acting building static pressure control, exhaust or return fan duct static pressure control or fan tracking based on airflow or speed monitoring.
NOTE: Return or exhaust fan duct static pressure control and airflow tracking are not available on AAON standard applications, only custom applications.

Supply Air Temperature Setpoint Reset

This is typically handled by the BAS by writing to and resetting our controller's supply air cooling and heating setpoints. When the controller is configured for space or return air temperature as the mode enable and control sensor, the supply air temperature is continuously reset as need to maintain the space or return air conditions but is limited to the low and high supply air setpoints.

UNOCCUPIED MODE

Unoccupied Temp Mode and Control Sensor = Space or Return Air Temp (configurable)
Unoccupied Dehumidify Mode and Control Sensor = Space Dewpoint, Return Air Dewpoint, Space Humidity or Return Air Humidity (configurable)

The unoccupied mode must be configured as YES in order for this mode to apply. The supply fan is off but activates on a call for any mode. Unoccupied heating and cooling modes and will be based on unoccupied heating and cooling setpoints. The unoccupied dehumidify mode and control sensor will be used for unoccupied dehumidification and will be based on the unoccupied dehumidify setpoint. Outside air cooling and heating lockouts are used as in the occupied mode. The supply fan will be activated on a call for any of the above modes of operation. No IAQ, economizer, heat wheel or exhaust fan operations during the unoccupied mode.

If a space or return air temperature/humidity sensor is not connected to the controller, a network space sensor can be configured. The network space temperature and humidity values are sent to our controller over BACnet from the BAS. Our controller will calculate the dewpoint value.

Alarms

EMERGENCY SHUTDOWN
The emergency shutdown input must be CLOSED for normal operation. If this input is OPEN, no outputs on the controller will be activated. If this input opens during normal operation, all of the controller outputs will be deactivated within 10 seconds and an alarm will be generated.

SUPPLY DUCT STATIC PRESSURE LIMIT SWITCH
The supply duct static pressure limit switch input must be CLOSED in order for the supply fan to operate (if configured). If this input opens during normal operation, all outputs will be deactivated and an alarm will be generated.

SUPPLY FAN STATUS
The supply fan status input must be CLOSED for mechanical heating or cooling to operate. If this input opens during normal operation, all mechanical heating and cooling outputs will be deactivated within 10 seconds and an alarm will be generated.

LOW SUPPLY AIR CUTOFF (FREEZE PROTECTION)
If the supply air temperature falls below the low supply air temperature limit (default 40ºF, adj.) and the low supply air temperature delay expires (default 10 minutes, adj.), all outputs will be deactivated and an alarm will be generated. For hot water units, the hot water pump enable will be activated and the hot water valve will be forced to 100%. Normal operation will be restored when the supply air temperature rises above the freeze protection limit by 5ºF. If this occurs 3 times during normal occupancy, the unit will be locked out. The lockout can be reset by either a power cycle or occupancy toggle. A mechanical freeze stat can also be connected and used in addition to the supply air temperature sensor for freeze protection and will also trigger an alarm.

OUTSIDE DAMPER END SWITCH
The outside damper end switch input must be CLOSED in order for the supply fan to operate (if configured). If this input opens during normal operation, all outputs will be deactivated and an alarm will be generated.

CONDENSATE OVERFLOW SWITCH
The condensate overflow switch input must be CLOSED in order for mechanical cooling or dehumidification to operate. If this input opens during normal operation, the mechanical cooling or dehumidification will be deactivated and an alarm will be generated.

SUCTION PRESSURE PROTECTION
Digital or modulating compressors are unloaded based on their individual suction pressure transducer to prevent them from remaining below the suction pressure setpoint 110psi (36ºF) (adj.). Each compressor circuit that is equipped with a suction pressure transducer, will be deactivated if its suction pressure remains below the low suction pressure limit of 90psi (26ºF) (adj.) for up to 5min. The compressor must remain off for 5min before its allowed to restart. A low suction pressure alarm will be generated for each circuit.

DIRTY FILTER
If the dirty filter input closes during supply fan operation, an alarm will be generated indicating the filters need to be changed.

Heat Pump Defrost Mode

If the defrost thermostat input closes during compressor heating mode and the defrost interval has expired (60min adj.), the reversing valve will switch the unit into the cooling mode and disable the condenser fan(s). The defrost mode will run until either the defrost timer has expired (10min) or the defrost thermostat opens.

If auxiliary heating is configured, the total number of defrost heating stages will be activated to compensate for the drop in supply air temperature.

WSHP Protection

Water proof of flow is monitored by way of a water flow switch. The water flow switch must be closed to allow any compressor operation. If the water proof of flow switch opens, the compressors will be de-energized within 10 seconds and an alarm will be generated. Compressors are maintained by stage up, stage down, minimum on and off timers.

Entering and leaving water temperatures are monitored for low temperature limits during heat pump heating modes of operation. During the heating mode, if the leaving water temperature drops below the low leaving water temperature setpoint for 5 seconds, compressors will be staged off until the leaving water temperature rises above the low leaving water setpoint plus hysteresis. If this alarm occurs 3 times, the compressor affected will be locked out and an alarm will be generated.

A suction pressure transducer will be monitored for each compressor. If the suction pressure drops below the low suction pressure setpoint for 2 minutes, the compressor being monitored will be de-energize for 5 minutes and an alarm will be generated. If the suction pressure rises above the low suction pressure setpoint plus hysteresis and the off delay of 5 minutes has expired, the compressor will be allowed to re-energize and the alarm will clear. If this alarm condition occurs 3 times, the compressor affected will be locked out and an alarm will be generated. The lockout will be cleared when occupancy changes, the call to the compressor is removed or by cycling power to the controller.

DESCRIPTION	WATER ONLY	20% GLYCOL	40% GLYCOL
Low Suction Pressure	100psi	80psi	50psi
Low Leaving Water Temp	37F	23F	0F

Head Pressure Control

Air Cooled Condensers

A discharge pressure transducer will be monitored on each compressor or refrigerant circuit. The condenser signal (fan or water valve) is modulated to maintain the head pressure setpoint 365psi (110°F) condensing pressure/temperature during the cooling and dehumidification modes. The condenser signal range is from an adjustable minimum setpoint to maximum (100%). If the maximum head pressure should climb to over 500psi (133F), the condenser signal will be forced to 100% until the head pressure falls by 150psi.

On air-to-air or water source heat pump units, the condenser signal will be at 100% during the heating mode. During defrost, the condenser signal minimum drops to 0%, turning the fans off. If the head pressure rises above the head pressure setpoint, the condenser fan(s) will begin to ramp up as necessary to prevent head pressure trips during a potential false defrost stat closure.

Water Cooled Condensers

Head pressure is controlled in the same manner as air cooled condensers. The water valve signal range is an adjustable minimum for setting proof of flow up to maximum of 100%.

NOTE: Head pressure setpoint and minimum fan speed/valve position is adjustable.

Graphical User Interface
User Access - Login

The FG32+ controller's HTML 5 graphical user interface is accessible using a standard web browser. It is not device or operating system dependent. A computer, tablet or smart phone can be used for access.

The FG32+ controller is set to 192.168.10.11 by default. Refer to the label on the controller to see if a different address has been assigned. The BAS contractor will change the network credentials on the FG32+ controller if it is a BACnet IP job. If the new network credentials are not written down inside the unit, you will either need to contact the BAS for this information or it can be retrieved from a file located on the controller's SD card. Contact Envision Technologies for assistance if the controller's SD card must be accessed to find this information.

For wired Ethernet access, ensure your device's network connection settings are set to a fixed IP address, not set to obtain an IP address automatically. There are many different types of Windows and MAC operating systems so either contact your IT department or Envision Technologies if assistance is needed in setting the IP address on your device's network connection.

FG32+ default settings are as follows:

IP: 192.168.10.11
Subnet: 255.255.255.0
Gateway: 192.168.10.1

Set your device's IP network connections to:

IP: 192.168.10.100
Subnet: 255.255.255.0
Gateway: (not important for direct connect access so you can leave this blank)

If a wireless router is attached to the FG32+ controller, the router will provide an IP address once your comptuer, tablet or smart phone is connected so your network connection settings will be set to obtain an IP address automatically. If it is an Envision supplied router, the SSID broadcast name and password can be found on the side of the router. Simply discover the SSID on your network and login to gain access.

Open a web browser on your device and enter the FG32+ controller's IP address. Once the login page loads, enter the username and password. Our default login information is as follows:

Username: admin
Password: hellocpt

More user accounts can be setup by the end user if desired but selecting the ADMIN button (dropdown menu) and configuring addtional accounts with specified user permissions.
WARNING: You can create a new admin username and password but do not modify the default credentials. If the information is lost, contact Envision for recovery options.

Graphical User Interface - Status

Once logged in, the browser will load the Status page. The navigation tree shown on the left hand side of each page is from our standard graphics package. Custom jobs may utilize more or less pages in the navigation tree and page layouts may be different.
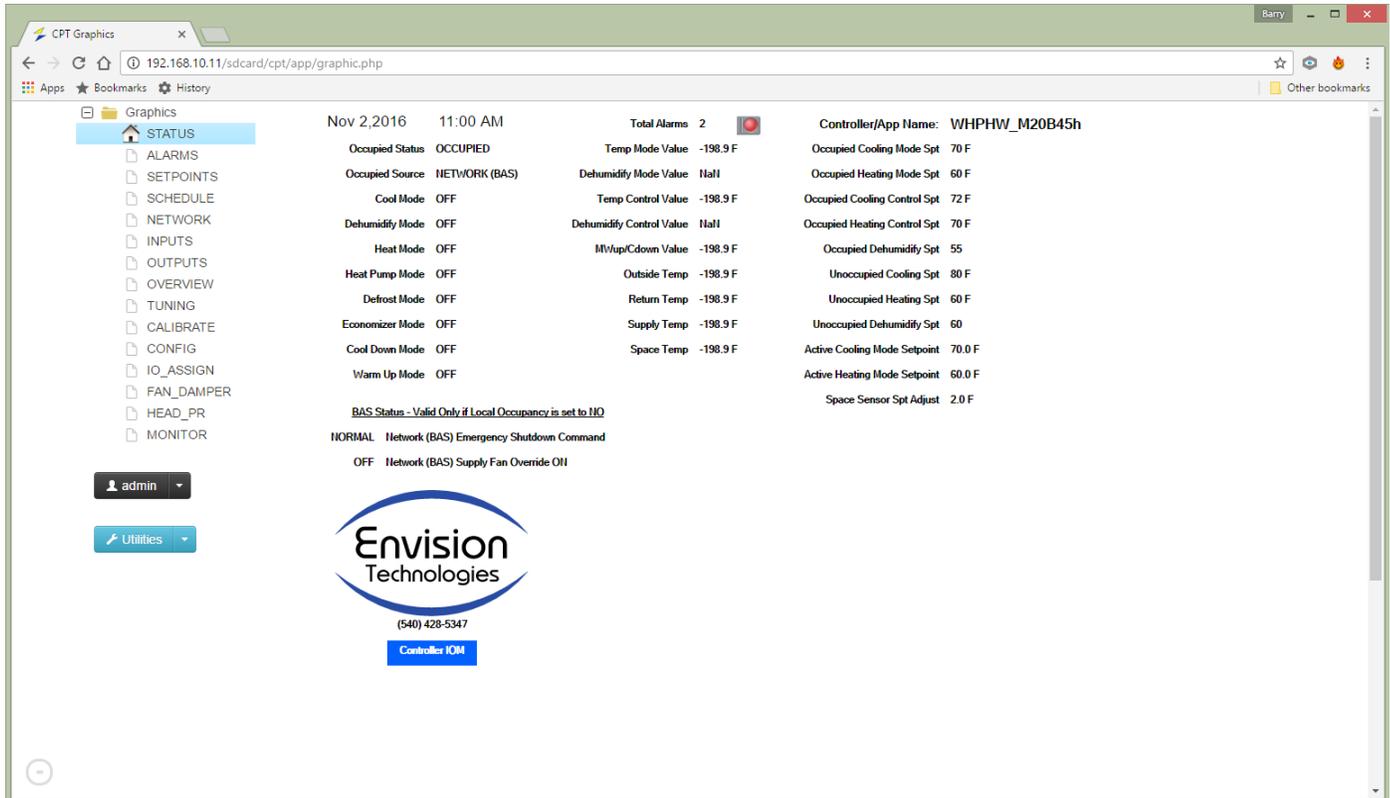
The following information is available on the **STATUS** page.
- Occupancy Status
- Date and Time
- Controller Name (Unit TAG)
- HVAC Mode Status
- Alarm Totals
- Basic Inputs and Outputs Status
- Basic Adjustable Setpoints
- Hyperlink Button to Controller IOM
- Admin Menu
  - Change Password
  - Manage Account and Permissions
- Utilities Menu
  - Backup
  - Restore
  - Restart (do not use)
  - Reboot
  - Configure Ports (do not change without Envision support)
  - Change Date and Time

Graphical User Interface - Alarms
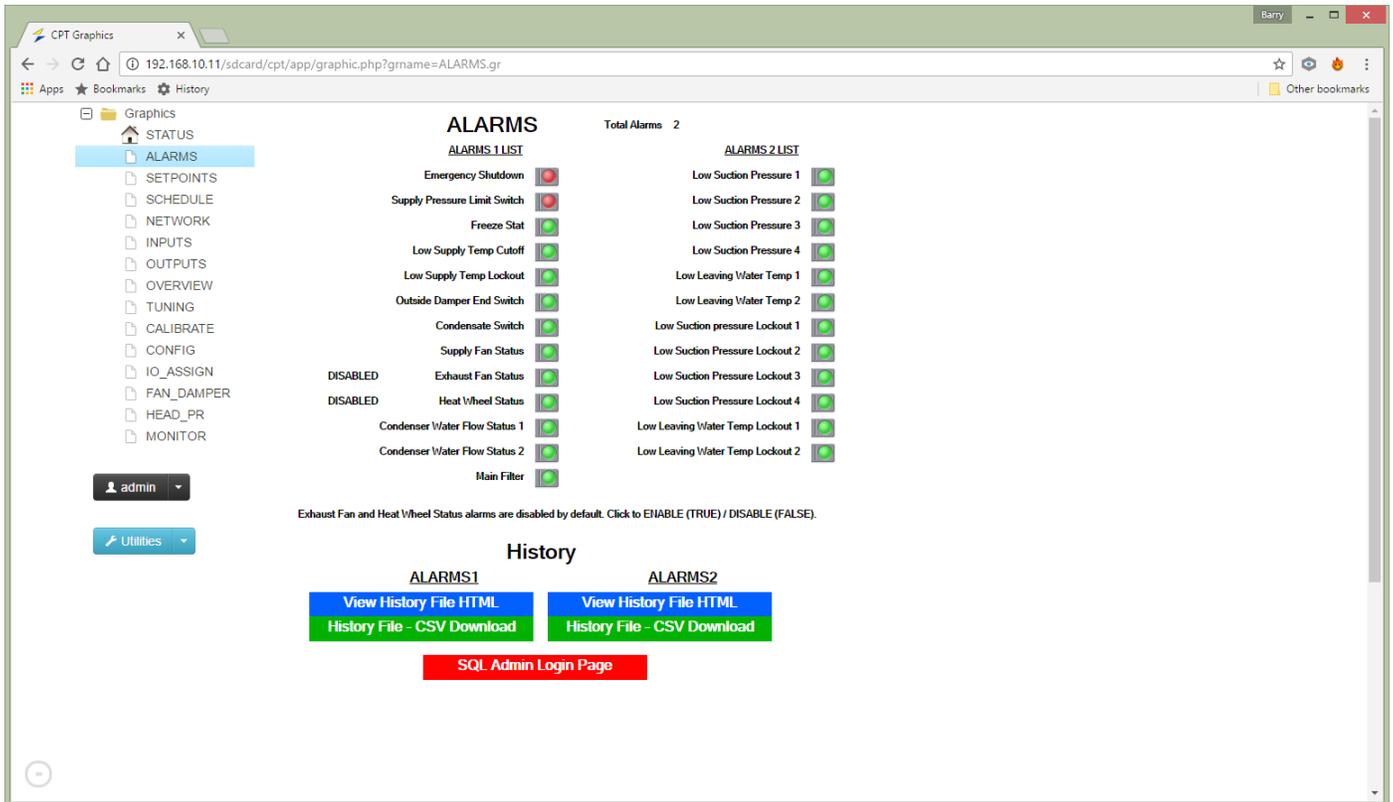
The following information is available on the **ALARMS** page.

•	Emergency Shutdown	(defined in Alarms section)
•	Supply Pressure Limit Switch	(defined in Alarms section)
•	Freeze Stat	(defined in Alarms section)
•	Low Supply Temp Cutoff	(defined in Alarms section)
•	Low Supply Temp Lockout	(defined in Alarms section)
•	Outside Damper End Switch	(defined in Alarms section)
•	Condensate Switch	(defined in Alarms section)
•	Supply Fan Status	(defined in Alarms section)
•	Exhaust Fan Status	(status only)
•	Heat Wheel Status	(status only)
•	Condenser Water Flow Status 1	(defined in WSHP Protection section)
•	Condenser Water Flow Status 2	(defined in WSHP Protection section)
•	Main Filter	(status only)
•	Low Suction Pressure 1	(defined in Alarms/WSHP Protection section)
•	Low Suction Pressure 2	(defined in Alarms/WSHP Protection section)
•	Low Suction Pressure 3	(defined in Alarms/WSHP Protection section)
•	Low Suction Pressure 4	(defined in Alarms/WSHP Protection section)
•	Low Leaving Water Temp 1	(defined in WSHP Protection section)
•	Low Leaving Water Temp 2	(defined in WSHP Protection section)
•	Low Suction Pressure Lockout 1	(defined in WSHP Protection section)
•	Low Suction Pressure Lockout 2	(defined in WSHP Protection section)
•	Low Suction Pressure Lockout 3	(defined in WSHP Protection section)
•	Low Suction Pressure Lockout 4	(defined in WSHP Protection section)
•	Low Leaving Water Temp Lockout 1	(defined in WSHP Protection section)
•	Low Leaving Water Temp Lockout 2	(defined in WSHP Protection section)

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Controller Setpoints

CAUTION: Refer to Controller IOM before changing values

Controller IOM

SETPOINTS	INTERNAL	NETWORK	SETPOINTS	INTERNAL	NETWORK
Occupied Cooling Mode	70 F	70 F	Supply Duct Pressure	1.50 in/wc	1.50 in/wc
Occupied Heating Mode	60 F	60 F	Building Static Pressure	0.050 in/w	0.050 in/wc
Occupied Cooling Control	72 F	72 F	Supply Fan Minimum	34 %	34 %
Occupied Heating Control	70 F	70 F	Supply Fan Heat Minimum	50 %	
Occupied Dehumidify	55	55	Supply Fan Heat Pump Minimum	70 %	
Unoccupied Cooling	80 F	80 F	Supply Fan Maximum	100 %	
Unoccupied Heating	60 F	60 F	Exhaust Fan Minimum	34 %	34 %
Unoccupied Dehumidify	60	60	Exhaust Fan Maximum	100 %	
Space Sensor Slide Range	2 F		Supply Fan Delay	10 sec	
Outside Cooling Lockout	35 F		Low Supply Temp Cutoff	40 F	
Outside Heating Lockout	70 F		Low Supply Cooling Limit	50 F	
Outside Heat Pump Low Lockout	20 F		High Supply Heating Limit	120 F	
Outside Heat Pump High Lockout	70 F		Low OAT HW/CW Activate	37 F	
Economizer Enable	50	50.0	Heat Wheel Defrost	20 F	
Economizer Minimum	20 %	20 %	Cool Stage Up Deadband	3.0 F	
Economizer Maximum	100 %	100 %	Cool Stage Down Deadband	3.0 F	
Outside Airflow	1000 cfm	1000 cfm	Heat Stage Up Deadband	3.0 F	
Carbon Dioxide	1000 ppm	1000 ppm	Heat Stage Down Deadband	3.0 F	
Morning Cool Down	80 F	80 F	Outside Airflow Minimum	0 cfm	
Morning Warm Up	60 F	60 F	Outside Airflow Maximum	10000 cfm	
Morning Warm Up SAT Heat	100 F	100 F			
Warm Up/Cool Down Timer	2.0 hr	2.0 hr			

The Internal column represents the adjustable internal setpoints. The Network column represents the setpoints the BAS are allowed to write to and are read only. The Network setpoints will be used as priority when Local Occupancy is set to NO. (see Schedule page).

The following information is available on the **SETPOINTS** page.
- **Occupied Cooling Mode** (0°F to 100°F) (refer to configuration)
  - Setpoint used to determine the occupied cooling mode
  - Can also be used for control based on configurations.
- **Occupied Heating Mode** (0°F to 100°F) (refer to configuration)
  - Setpoint used to determine the occupied heating mode
  - Can also be used for control based on configurations.
- **Occupied Cooling Control** (0°F to 100°F) (refer to configuration)
  - Setpoint used for occupied control of mechanical or economizer cooling
  - Will not be used with certain configurations.
- **Occupied Heating Control** (0°F to 150°F) (refer to configuration)
  - Setpoint used for occupied control of mechanical heating
  - Will not be used with certain configurations.
- **Occupied Dehumidify** (0 to 100)
  - Setpoint used to determine both the occupied dehumidify mode and control
- **Unoccupied Cooling** (0°F to 100°F)
  - Setpoint used to determine both the unoccupied cooling mode and control
- **Unoccupied Heating** (0°F to 100°F)
  - Setpoint used to determine both the unoccupied heating mode and control
- **Unoccupied Dehumidify** (0 to 100)
  - Setpoint used to determine both the unoccupied dehumidify mode and control

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Graphical User Interface - Setpoints

- **Space Sensor Slide Range** (0°F to 10°F)
  - Maximum setpoint adjustment range for occupied cooling and heating mode
- **Outside Cooling Lockout** (0°F to 100°F)
  - Outside air temperature lockout for mechanical cooling
- **Outside Heating Lockout** (0°F to 100°F)
  - Outside air temperature lockout for mechanical heating
- **Outside Heat Pump Low Lockout** (0°F to 100°F)
  - Outside air temperature low lockout for mechanical compressor heating
- **Outside Heat Pump High Lockout** (0°F to 100°F)
  - Outside air temperature high lockout for mechanical compressor heating
- **Economizer Enable** (0 to 100) (refer to configuration)
  - Temperature or Enthalpy value to enable the economizer mode during occupied
- **Economizer Minimum** (0% to 100%)
  - Minimum ecnomizer position occupied setpoint
- **Economizer Maximum** (0% to 100%)
  - Maximum economizer position occupied setpoint CO2 or airflow control
- **Outside Airflow** (0 cfm to 100,000 cfm)
  - Minimum airflow occupied setpoint
- **Carbon Dioxide** (0 ppm to 2000 ppm)
  - CO2 level occupied setpoint
- **Morning Cool Down** (0°F to 100°F) (refer to configuration)
  - Morning cool down occupied setpoint.
- **Morning Warm Up** (0°F to 100°F) (refer to configuration)
  - Morning warm up occupied setpoint.
- **Morning Warm Up SAT Heat** (0°F to 150°F)
  - Morning warm up supply air temperature occupied setpoint
- **Warm Up/Cool Down Timer** (0 hr to 24 hr)
  - Morning warm up or cool down duration timer occupied setpoint
- **Supply Duct Pressure** (0.00 in/wc to 5.00 in/wc)
  - Supply fan duct static pressure setpoint
- **Building Static Pressure** (-0.25 in/wc to 0.25 in/wc)
  - Exhaust fan/Outside damper building static pressure occupied setpoint
- **Supply Fan Minimum** (0% to 100%)
  - Minimum supply fan speed setpoint
- **Supply Fan Heat Minimum** (0% to 100%)
  - Minimum supply fan speed setpoint during the heating mode
- **Supply Fan Heat Pump Minimum** (0% to 100%)
  - Minimum supply fan speed setpoint during the heat pump mode
- **Supply Fan Maximum** (0% to 100%)
  - Maximum supply fan speed setpoint

Graphical User Interface - Setpoints

- **Exhaust Fan Minimum** (0% to 100%)
  - Minimum exhaust fan speed occupied setpoint
- **Exhaust Fan Maximum** (0% to 100%)
  - Maximum exhaust fan speed occupied setpoint
- **Supply Fan Delay** (0 sec to 180 sec)
  - Delay before supply fan activates
- **Low Supply Temp Cutoff** (0°F to 100°F)
  - Minimum supply air temperature allowed before freeze protection activates
- **Low Supply Cooling Limit** (0°F to 100°F)
  - Minimum supply air temperature during cooling and dehumidify modes
- **High Supply Heating Limit** (0°F to 170°F)
  - Maximum supply air temperature during the heating mode
- **Low OAT HW/CW Activate** (0°F to 100°F)
  - Outside air temperature setpoint for hot water/chilled water freeze protection
- **Heat Wheel Defrost** (0°F to 100°F)
  - Setpoint to initiate heat wheel defrost
- **Comp Stage Up Deadband** (0°F to 20°F)
  - Temp/Dehum sensor above control setpoint to allow compressor stage up
- **Comp Stage Down Deadband** (0°F to 20°F)
  - Temp/Dehum sensor below control setpoint to allow compressor stage down
- **Heat Stage Up Deadband** (0°F to 20°F)
  - Temp sensor below control setpoint to allow heat stage up
- **Heat Stage Down Deadband** (0°F to 20°F)
  - Temp sensor above control setpoint to allow heat stage down
- **Outside Airflow Minimum** (0 cfm to 100,000 cfm)
  - Minimum scalable range for outside airflow stations
- **Outside Airflow Maximum** (0 cfm to 100,000 cfm)
  - Maximum scalable range for outside airflow stations

Graphical User Interface - Schedule
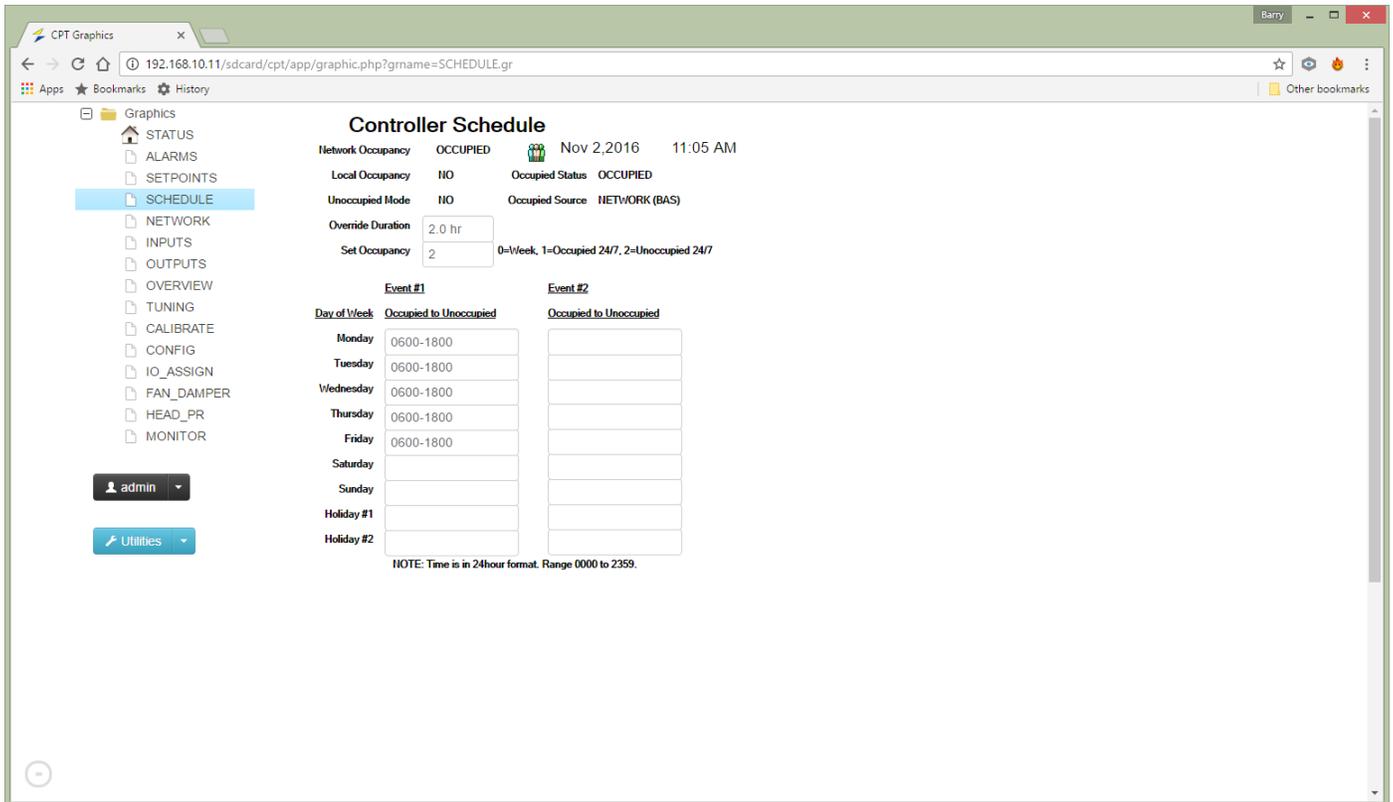
The Schedule page involves internal scheduling. If a building automation system (BAS) is commanding occupancy, this page will not need to be adjusted.

The following information is available on the **SCHEDULE** page.
- **Network Occupancy** (occcupied/unoccupied)
  - Shows status of the network occupancy command from a BAS
- **Local Occupancy** (NO/YES)
  - If set to YES, the controller will follow the internal schedule and setpoints
  - If set to NO, the controller will follow the BAS schedule and setpoints
- **Unoccupied Mode** (NO/YES)
  - If set to YES, the unoccupied setpoints will be used during unoccupied mode
  - If set to NO, there will be no unoccupied mode of operation
- **Override Duration** (0 hrs to 24 hrs)
  - This is the time the controller will enter and run in the occupied mode if it was in the unoccupied mode, once the space temp sensor override button is pressed.
- **Set Occupancy** (0=Internal Week Schedule, 1=24/7 occupied, 2=24/7 unoccupied)
  - Only used if Local Occupancy is set to YES
- **Occupied Status** (occupied/unoccupied)
- **Occupied Source** (0=Internal Week Schedule, 1=24/7 occupied, 2=24/7 unoccupied, 3=Override, 4=Network BAS)
  - Will read 4 if Local Occupancy is set to NO, 0 to 3 if set to YES.

If an internal week schedule is desired, set Local Occupancy to YES, then set Set Occupancy to 0. Start and stop times are entered in 24 hour format. Example: To set Monday for 6:00am to 6:00pm, enter 0600-1800 in the Event #1 column. Typically only one event per day is needed so you will not need to enter any data in the Event #2 column.

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Graphical User Interface - Network

The following information is available on the **NETWORK** page.

This page is used for IT and a BAS. The current TCP/IP information is display as current IP address, Subnet and Default Gateway. To change the TCP/IP information, enter the new IP address, Subnet and Default Gateway then click or press **SAVE**. Wait 5 seconds for the information to be saved then click or press **REBOOT**.

If the IP address is changed, please ensure it is written on a label/note and placed on or near the controller in the unit. This way the service technician will know what the new TCP/IP information is if he needs to connect to the controller interface.

The BAS can adjust the BACnet MAC address, Object ID and Baud Rate from this page. The Baud Rate can only be adjusted as 9600, 19,200 or 38,400. It comes preset to 38,400.

The Modbus Baud Rate should not be adjusted without contacting Envision. This is setup prior to the controller leaving our facility.

The controller name can also be changed from this page and the change will be reflected on the Status page.

The Auto Save feature is enabled so the controller will save any changes on power loss.

Graphical User Interface - Inputs/Outputs

Controller Inputs

INPUTS	VALUE	INPUTS	VALUE	INPUTS	VALUE
Outside Temp	-198.9 F	Mixed Air Temp	314.2 F	Defrost Stat	OPEN
Outside Humidity	100.0 %	Evaporator LAT	314.2 F	Main Filter Switch	OPEN
Outside Dewpoint	NaN F	Entering Water Temp	-517.4 F	Exhaust Fan Status	OPEN
Outside Enthalpy	NaN Btu	Leaving Water Temp 1	-517.4 F	Heat Wheel Status	OPEN
Supply Temp	-198.9 F	Leaving Water Temp 2	314.2 F	Condensate Switch	CLOSED
Supply Humidity	100.0 %	Supply Duct Pressure	0.00 in/wc	OA Damper End Switch	CLOSED
Supply Dewpoint	NaN F	Building Static Pressure	0.25 in/wc	Freeze Stat	CLOSED
Return Temp	-198.9 F	Carbon Dioxide (CO2)	2000 ppm	Supply Fan Status	OPEN
Return Humidity	100.0 %	Outside Airflow	0 cfm	Supply Pressure Limit	OPEN
Return Dewpoint	NaN F	Suction Pressure 1	500 psi	Emergency Shutdown	OPEN
Return Enthalpy	NaN Btu	Suction Pressure 2	500 psi	Condenser Water Flow 1	OPEN
Space Temp	-198.9 F	Suction Pressure 3	313 psi	Condenser Water Flow 2	CLOSED
Space Humidity	100.0 %	Suction Pressure 4	313 psi		
Space Dewpoint	NaN F	Discharge Pressure 1	667 psi		
Space Sensor Spt Adjust	2.0 F	Discharge Pressure 2	667 psi		
Heat Wheel LAT	-517.4 F	Discharge Pressure 3	0 psi		
Heat Wheel Exhaust LAT	-517.4 F	Discharge Pressure 4	0 psi		

Graphics: STATUS, ALARMS, SETPOINTS, SCHEDULE, NETWORK, INPUTS, OUTPUTS, OVERVIEW, TUNING, CALIBRATE, CONFIG, IO_ASSIGN, FAN_DAMPER, HEAD_PR, MONITOR — admin — Utilities

Controller Outputs

See override instructions at the bottom of the page.

DIGITAL OUTPUTS	DURATION	VALUE	ANALOG OUTPUTS	DURATION	VALUE
Supply Fan Relay	0 sec	OFF	Supply Fan Signal	0 sec	0 %
Cool Stage 1 Relay	0 sec	OFF	Cool 1 Signal	0 sec	0 %
Cool Stage 2 Relay	0 sec	OFF	Cool 2 Signal	0 sec	0 %
Cool Stage 3 Relay	0 sec	OFF	Reheat Signal	0 sec	0 %
Cool Stage 4 Relay	0 sec	OFF	Heat Signal	0 sec	0 %
Reversing Valve Relay	0 sec	OFF	Exhaust Fan Signal	0 sec	0 %
Reheat Stage 1 Relay	0 sec	OFF	Heat Wheel Signal	0 sec	0 %
Reheat Stage 2 Relay	0 sec	OFF	Outside Damper Signal	0 sec	0 %
Heat Stage 1 Relay	0 sec	OFF	Return Damper Signal		100 %
Heat Stage 2 Relay	0 sec	OFF	Return Bypass Signal	0 sec	0 %
Heat Stage 3 Relay	0 sec	OFF	Head Pressure 1 Signal	0 sec	0 %
Heat Stage 4 Relay	0 sec	OFF	Head Pressure 2 Signal	0 sec	0 %
Exhaust Fan Relay	0 sec	OFF	Head Pressure 3 Signal	0 sec	0 %
Heat Wheel Relay	0 sec	OFF	Head Pressure 4 Signal	0 sec	0 %
Outside Damper Relay	0 sec	OFF			

To override a digitial ouput, click on the VALUE field and select OVR ON or OVR OFF.

To override an analog output, click on the VALUE field and select OVR then enter the percentage you want the output to be.

To start or stop a timed override, click on the VALUE field and select START FORCE or STOP FORCE.

The DURATION field is read only and reflects the time remaining in override. If the field equals 0, then the output is in normal operation.

The override timer will expire in (4) hours unless the force is stopped manually or power is cycled to the controller.

Not all **INPUTS** and **OUTPUTS** will be connected to the controller on any one job.
These pages reflect the status of all inputs and outputs that are in the controller program. Inputs cannot be overriden but outputs can be. The instructions for forcing the outputs on shown on the outputs page.

Graphical User Interface - Tuning/Calibration

Tuning Parameters

WARNING: Contact Envision Technologies before changing these values! (540) 428-5347

SETPOINTS	VALUE
Cool Proportional Gain	10.00
Cool Integral Constant	1.00
Heat Proportional Gain	10.00
Heat Integral Constant	1.00
Reheat Proportional Gain	10.00
Reheat Integral Constant	1.00
Economizer Proportional Gain	10.00
Economizer Integral Constant	1.00
CO2 Proportional Gain	1.00
CO2 Integral Constant	1.00
Suction Pressure Proportional Gain	1.00
Suction Pressure Integral Constant	1.00
Supply Pressure Proportional Gain	10.00
Supply Pressure Integral Constant	1.00
Building Pressure Proportional Constant	10.00
Building Pressure Integral Constant	1.00
Airflow Proportional Gain	0.50
Airflow Intergral Constant	1.00
Head Pressure Proportional Gain	0.50
Head Pressure Integral Constant	1.00

Sensor Calibration

SETPOINTS	VALUE	
Outside Air Temp	0.0 F	
Supply Air Temp	0.0 F	
Return Air Temp	0.0 F	
Space Temp	0.0 F	
Outside Air Humidity	0.0 vdc	NOTE: All humidity calibrations are in volts, not percentage.
Supply Air Humidity	0.0 vdc	Example: Enter 5 to change humidity by 50%.
Return Air Humidity	0.0 vdc	
Space Humidity	0.0 vdc	

Contact Envision Technologies if values on the **TUNING** page need adjustment. This page is for fine tuning the individual PID loops in the controller program. Improper adjustments will cause erratic control behavior and could result in damaging the equipment. The **CALIBRATE** page allows the technician to enter an offset for a temperature or humidity sensor. This can be used temporarily for testing or to offset a value permanently.

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Graphical User Interface - Configuration
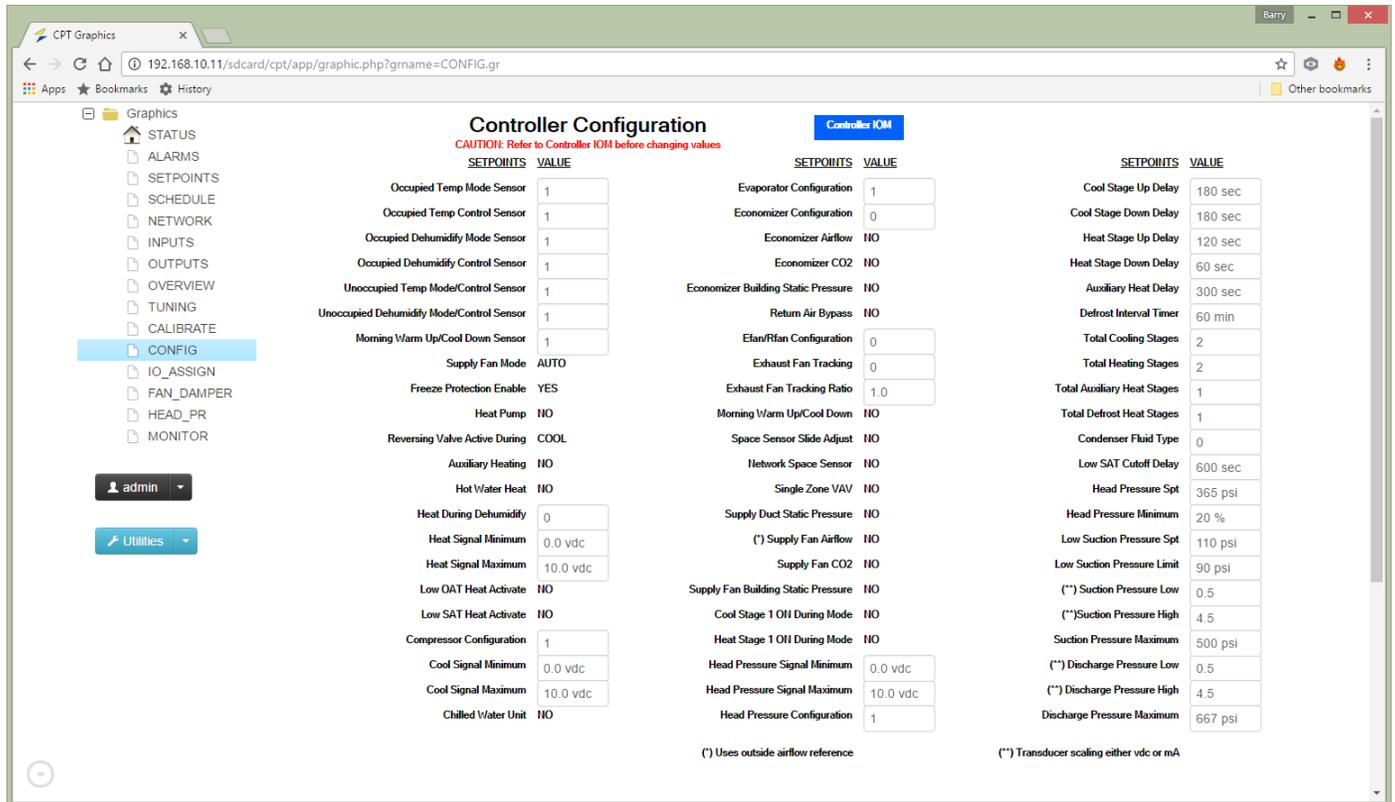
The Configuration page is for setting up the controller at equipment startup. Read carefully through the configuration process to ensure you have the controller setup properly. Contact Envision Technologies if support is needed.

The following information is available on the **CONFIG** page.
- **Occupied Temp Mode Sensor** (Range: 1 to 3)
    - 1 = Outside Air Temp
    - 2 = Space Temp
    - 3 = Return Air Temp

The occupied temperature mode sensor is used to determine the occupied cooling or heating modes of operation. Refer to the Sequence of Operation section for setup examples.

- **Occupied Temp Control Sensor**
    - 1 = Supply Air Temp
    - 2 = Space Temp
    - 3 = Return Air Temp

The occupied temperature control sensor is used to control the mechanical or economizer cooling routines, once in the cooling or economizer mode. Refer to the Sequence of Operation section for setup examples.

Graphical User Interface - Configuration

- **Occupied Dehum Mode Sensor**
  - 1 = Outside Air Dewpoint
  - 2 = Space Dewpoint
  - 3 = Return Air Dewpoint
  - 4 = Space Humidity
  - 5 = Return Humidity

The occupied dehumidify mode sensor is used to determine the occupied dehumidification mode of operation. Refer to the Sequence of Operation section for setup examples.

- **Occupied Dehum Control Sensor**
  - 1 = Supply Air Dewpoint
  - 2 = Space Dewpoint
  - 3 = Return Air Dewpoint
  - 4 = Space Humidity
  - 5 = Return Humidity

The occupied dehumidify control sensor is used to control the mechanical cooling routine once in the dehumidification mode. Refer to the Sequence of Operation section for setup examples.

- **Unoccupied Temp M/C Sensor**
  - 1 = Space Temp
  - 2 = Return Air Temp

The unoccupied temperature mode and control sensor is used to determine the unoccupied cooling or heating modes of operation as well as used for control of the cooling and heating routines. Refer to the Sequence of Operation section for setup examples.

- **Unoccupied Dehum M/C Sensor**
  - 1 = Space Dewpoint
  - 2 = Return Air Dewpoint
  - 3 = Space Humidity
  - 4 = Return Humidity

The unoccupied dehumidify mode and control sensor is used to determine the unoccupied dehumidification mode of operation as well as used for control of the dehumidify routine. Refer to the Sequence of Operation section for setup examples.

- **Morning Warm Up/Cool Down Sensor**
  - 1 = Space Temp
  - 2 = Return Air Temp

Select the temp sensor to be used to initiate the morning warm up or cool down modes.

Graphical User Interface - Configuration

- **Supply Fan Mode** (false = AUTO, true = ON)

Default is set to AUTO which means the supply fan runs continuously during the occupied mode and cycles with cooling, heating or dehumidification modes during unoccupied. Set to ON for continuous operation during both occupied and unoccupied. All safeties are maintained even if set to ON.

- **Freeze Protect Enable** (false = OFF, true = ON)

Default is set to ON which means the supply air temperature will be monitored for low supply air cutoff. This does not enable/disable a mechanical freeze stat.

- **Heat Pump** (false = NO, true = YES)

Set to YES if the unit is an air to air or WSHP.

- **Reversing Valve Active During** (false = COOL, true = HEAT)

Default is set to COOL which means the reversing valve will energize in the cooling or dehumidification modes of operation.

- **Auxiliary Heating** (false = NO, true = YES)

Set to YES if the unit is a heat pump and electrical (MOP) is rated for auxiliary heating.

- **Hot Water Heat** (false = NO, true = YES)

Set to YES if the unit has hot water heat.

- **Heat During Dehumidify**
    - 0 = No heat active during dehumidification, only hot gas reheat
    - 1 = Heat to supplement hot gas reheat (1-stage reheat)
    - 2 = Heat to supplement hot gas reheat (2-stage reheat)
    - 3 = Heat is the only source of reheat, no hot gas reheat

If the unit has electric heat, ensure the electrical (MOP) is rated for simultaneous cool (compressor) and heat.

- **Heat Signal Minimum** (0.0 vdc to 10.0 vdc)

Adjustable minimum output range for analog signal.

- **Heat Signal Maximum** (0.0 vdc to 10.0 vdc)

Adjustable maximum output range for analog signal.

- **Low OAT Heat Activate** (false = NO, true = YES)

Set to YES if the unit has hot water heat and the hot water valve is required to be fully open when the outside temperature falls below the Low OAT HW/CW Activate setpoint. Refer to the Sequence of Operations section for details.

Graphical User Interface - Configuration

- **Low SAT Heat Activate** (false = NO, true = YES)

This is useful on a typical VAV unit where the economizer is at its minimum position and the supply air temperature falls below the low supply air cooling limit. Set to YES in order to prevent the supply air temperature from staying below the low supply air cooling limit. Refer to the Sequence of Operations section for details.

- **Compressor Configuration**
  - 0 = No Digital Compressors
  - 1 = Single or Dual Digital/Modulating Compressors running in parallel
  - 2 = Dual Digital/Modulating Compressors running sequentially
  - 3 = Four Digitial/Modulating Compressors running in pairs sequentially

- **Cool Signal Minimum** (0.0 vdc to 10.0 vdc)

Adjustable minimum output range for analog signal.

- **Cool Signal Maximum** (0.0 vdc to 10.0 vdc)

Adjustable maximum output range for analog signal.

- **Chilled Water Unit** (false = NO, true = YES)

Set to YES if the unit has chilled water coil as the primary evaporator.

- **Evaporator Configuration**
  - 1 = Single Evaporator Units
  - 2 = Dual Evaporator Units
  - 3 = Triple Evaporator Units
  - 4 = Quadruple Evaporator Units

- **Economizer Configuration**
  - 0 = No Economizer
  - 1 = Airside - Outside Drybulb Enabled Economizer, No Supplemental Cooling
  - 2 = Airside - Outside Enthalpy Enabled Economizer, Has Supplemental Cooling
  - 3 = Airside - Dual Enthalpy Enabled Economizer, Has Supplemental Cooling
  - 4 = Waterside - No Supplemental Cooling
  - 5 = Waterside - Has Supplemental Cooling

- **Economizer Airflow** (false = NO, true = YES)

Set to YES to enable the outside damper to modulate based on outside airflow.

- **Economizer CO2** (false = NO, true = YES)

Set to YES to enable the outside damper to modulate based on CO_2.

- **Economizer Building Static Pressure** (false = NO, true = YES)

Set to YES to enable the outside damper to modulate based on building static pressure.

Graphical User Interface - Configuration

- **Return Air Bypass** (false = NO, true = YES)

Set to YES if the unit is equipped with a return air bypass damper for dehumidication.

- **Efan/Rfan Configuration**
  - 0 = Exhaust/Return Fan Building Pressure Control (fan cycle occupied only)
  - 1 = Exhaust/Return Fan Building Pressure Control/CAV (fan ON occupied only)
  - 2 = CAV Return Fan (ON whenever supply fan is running)

- **Exhaust Fan Tracking** (Select the source used to modulate the exhaust fan)
  - 1 = Supply Fan Signal
  - 2 = Outside Damper Signal

- **Exhaust Fan Tracking Ratio** (0.0 to 2.0)

Enter multiplier for exhaust fan tracking. A value of 1.0 will cause the exhaust fan signal to track equally to the exhaust fan tracking source. A value below 1.0 will cause the exhaust fan signal to track behind the exhaust fan tracking source. A value above 1.0 will cause the exhaust fan signal to track ahead of the exhaust fan tracking source.

- **Morning Warm Up/Cool Down Mode** (false = NO, true = YES)

Set to YES if the unit is required to have morning warm up or cool down modes.

- **Space Sensor Slide Adjust** (false = NO, true = YES)

Set to YES if the unit is equipped with a space sensor with setpoint adjustment and will be used to raise or lower the occupied cooling or heating mode setpoints.

- **Network Space Sensor** (false = NO, true = YES)

Set to YES if the BAS will be sending the space sensor information over BACnet.

- **Single Zone VAV** (false = NO, true = YES)

Set to YES if the unit is to control the supply fan based on a Single Zone VAV sequence.

- **Supply Duct Static Pressure** (false = NO, true = YES)

Set to YES if the unit is to control the supply fan based on duct static pressure.

- **Supply Fan Airflow** (false = NO, true = YES)

Set to YES to enable the supply fan to modulate based on airflow. Outside airflow will be used as the reference point for modulation. Only applies to 100% outside air units.

- **Supply Fan CO2** (false = NO, true = YES)

Set to YES to enable the supply fan to modulate based on CO2. Only applies to 100% outside air units.

- **Supply Fan Building Static Pressure** (false = NO, true = YES)

Set to YES to enable the supply fan to modulate based on building static pressure. Only applies to 100% outside air units.

Graphical User Interface - Configuration

- **Cool Stage 1 On During Mode** (false = NO, true = YES)

Set to YES to allow cool stage 1 to remain active and not stage off during cooling or dehumidify modes.

- **Heat Stage 1 On During Mode** (false = NO, true = YES)

Set to YES to allow heat stage 1 to remain active and not stage off during the heating mode.

- **Head Pressure Signal Minimum** (0.0 vdc to 10.0 vdc)

Adjustable minimum output range for analog signal.

- **Head Pressure Signal Maximum** (0.0 vdc to 10.0 vdc)

Adjustable maximum output range for analog signal.

- **Head Pressure Configuration**
  - 1 = Individual Circuit Head Pressure Control
  - 2 = Dual Bank Head Pressure Control
    - Circuits 1 & 2 to Condenser Signal Output 1
    - Circuits 3 & 4 to Condenser Signal Output 2
  - 3 = Dual Bank Head Pressure Control
    - Circuits 1 & 3 to Condenser Signal Output 1
    - Circuits 2 & 4 to Condenser Signal Output 2
  - 4 = Four Circuits to Output 1

- **Cool Stage Up Delay** (60 sec to 600 sec)
- **Cool Stage Down Delay** (60 sec to 600 sec)
- **Heat Stage Up Delay** (60 sec to 600 sec)
- **Heat Stage Down Delay** (60 sec to 600 sec)
- **Auxiliary Heat Delay** (60 sec to 600 sec)
- **Defrost Interval Timer** (1 min to 240 min)
- **Total Cool Stages** (1 to 8)
- **Total Heat Stages** (1 to 8)
- **Total Auxiliary Heat Stages** (1 to 8)
- **Total Defrost Heat Stages** (1 to 8)

- **Condenser Fluid Type**
  - 0 = Air to Air
  - 1 = Water Cooled
  - 2 = WSHP 0% Glycol
  - 3 = WSHP 20% Glycol
  - 4 = WSHP 40% Glycol

Graphical User Interface - Configuration

- **Low SAT Cutoff Delay** (60 sec to 600 sec)
- **Head Pressure Spt** (200 psi to 500 psi)
- **Head Pressure Minimum** (0% to 100%)
- **Low Suction Pressure Spt** (100 psi to 150 psi)
- **Low Suction Pressure Limit** (50 psi to 100 psi)

- **Suction Pressure Low** (0.0 to 20.0)

Adjustable minimum input signal range. Can be DC volts or Milliamps.

- **Suction Pressure High** (0.0 to 20.0)

Adjustable maximum input signal range. Can be DC volts or Milliamps.

- **Suction Pressure Maximum** (200 psi to 667 psi)

Adjustable maximum input pressure range for analog signal.

- **Discharge Pressure Low** (0.0 to 20.0)

Adjustable minimum input signal range. Can be DC volts or Milliamps.

- **Discharge Pressure High** (0.0 to 20.0)

Adjustable maximum input signal range. Can be DC volts or Milliamps.

- **Discharge Pressure Maximum** (200 psi to 667 psi)

Adjustable maximum input pressure range for analog signal.

Graphical User Interface - I/O Assignment

The **IO_Assign** page is used for moving an input or output to new physical location on the main controller. This can only be done if the new location is not occupied by another input or output.

Graphical User Interface - Monitoring Pages

CPT Graphics

192.168.10.11/sdcard/cpt/app/graphic.php?grname=FAN_DAMPER.gr

Apps · Bookmarks · History

Graphics
- STATUS
- ALARMS
- SETPOINTS
- SCHEDULE
- NETWORK
- INPUTS
- OUTPUTS
- OVERVIEW
- TUNING
- CALIBRATE
- CONFIG
- IO_ASSIGN
- FAN_DAMPER
- HEAD_PR
- MONITOR

admin

Utilities

Fan & Damper Control
See override instructions at the bottom of the page.

INPUTS	VALUE	ANALOG OUTPUTS	DURATION	VALUE
Supply Duct Pressure	0.00 in/wc	Supply Fan Signal	0 sec	0 %
Building Static Pressure	0.25 in/wc	Exhaust Fan Signal	0 sec	0 %
Carbon Dioxide (CO2)	2000 ppm	Outside Damper Signal	0 sec	0 %
Outside Airflow	0 cfm	Return Damper Signal		100 %
Supply Temp	-198.9 F			
		DIGITAL OUTPUTS	DURATION	VALUE
		Supply Fan Relay	0 sec	OFF
		Exhaust Fan Relay	0 sec	OFF
		Outside Damper Relay	0 sec	OFF

To override a digitial ouput, click on the VALUE field and select OVR ON or OVR OFF.

To override an analog output, click on the VALUE field and select OVR then enter the percentage you want the output to be.

To start or stop a timed override, click on the VALUE field and select START FORCE or STOP FORCE.

The DURATION field is read only and reflects the time remaining in override. If the field equals 0, then the output is in normal operation.

The override timer will expire in (4) hours unless the force is stopped manually or power is cycled to the controller.

CPT Graphics

192.168.10.11/sdcard/cpt/app/graphic.php?grname=HEAD_PR.gr

Apps · Bookmarks · History

Graphics
- STATUS
- ALARMS
- SETPOINTS
- SCHEDULE
- NETWORK
- INPUTS
- OUTPUTS
- OVERVIEW
- TUNING
- CALIBRATE
- CONFIG
- IO_ASSIGN
- FAN_DAMPER
- HEAD_PR
- MONITOR

admin

Utilities

Head Pressure Control
See override instructions at the bottom of the page.

INPUTS	VALUE	ANALOG OUTPUTS	DURATION	VALUE
Discharge Pressure 1	667 psi	Head Pressure 1 Signal	0 sec	0 %
Discharge Pressure 2	667 psi	Head Pressure 2 Signal	0 sec	0 %
Discharge Pressure 3	0 psi	Head Pressure 3 Signal	0 sec	0 %
Discharge Pressure 4	0 psi	Head Pressure 4 Signal	0 sec	0 %
Heat Pump Mode	OFF	Cool 1 Signal	0 sec	0 %
		Cool 2 Signal	0 sec	0 %
		DIGITAL OUTPUTS	DURATION	VALUE
		Cool Stage 1 Relay	0 sec	OFF
		Cool Stage 2 Relay	0 sec	OFF
		Cool Stage 3 Relay	0 sec	OFF
		Cool Stage 4 Relay	0 sec	OFF

To override a digitial ouput, click on the VALUE field and select OVR ON or OVR OFF.

To override an analog output, click on the VALUE field and select OVR then enter the percentage you want the output to be.

To start or stop a timed override, click on the VALUE field and select START FORCE or STOP FORCE.

The DURATION field is read only and reflects the time remaining in override. If the field equals 0, then the output is in normal operation.

The override timer will expire in (4) hours unless the force is stopped manually or power is cycled to the controller.

The **Fan & Damper Control** and **Head Pressure Control** pages are used for monitoring and testing. The test and balance contractor can use the Fan & Damper page to determine the supply and exhaust fan speeds as well as outside damper positions required. The service tech can also use both of these pages to analyze control operations of the fans and damper.

Graphical User Interface - Selectable Monitor
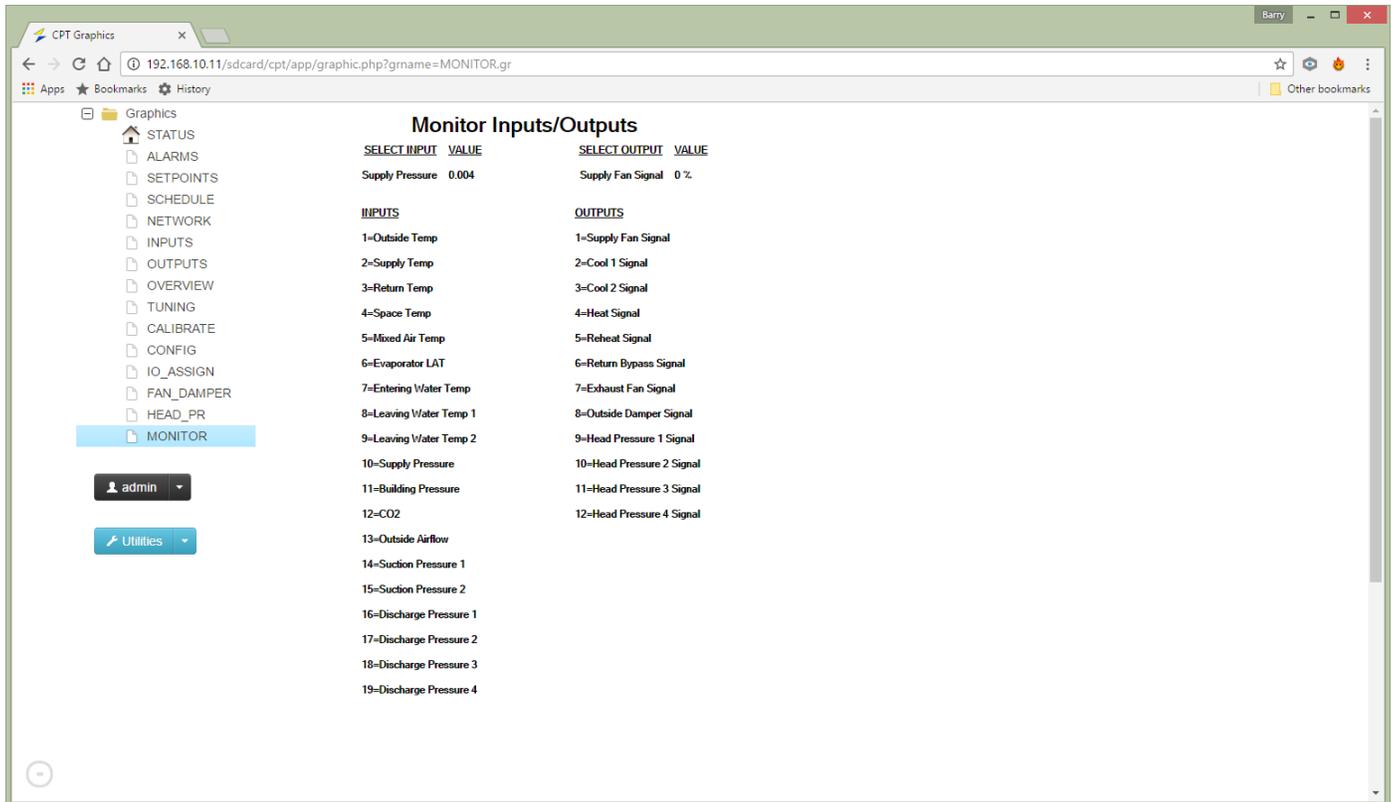
The **MONITOR** page is used for the service technician to see values update quickly for better analysis of a particular input or output. Each input and output is selectable by clicking/tapping on the SELECT INPUT or SELECT OUTPUT field and choosing one of the values listed below the INPUTS and OUTPUTS columns.

Installation and Troubleshooting

The following pages include:

- Installation instructions
- On board jumper settings
- On board SD card install and removal
- Input temperatures resistance/voltage table
- Input suction and discharge pressure/temperature table

Contact us for support:

Envision Technologies, LLC
6799 Kennedy Road Suite E
Warrenton, VA 20187
(540) 428-5347 office
blight@envisiontechllc.com (Barry Light)
anarro@envisiontechllc.com (Alex Narro)
www.envisiontechllc.com

FG-32+ Main Controller Installation

Do not install the EasyIO FG-32+:

- In an area where excessive moisture, corrosive fumes or explosion vapors are present.
- Where excessive vibration or shock is likely occur
- Location where excessive electrical noise such as large magnetic interference or variable speed drive modules
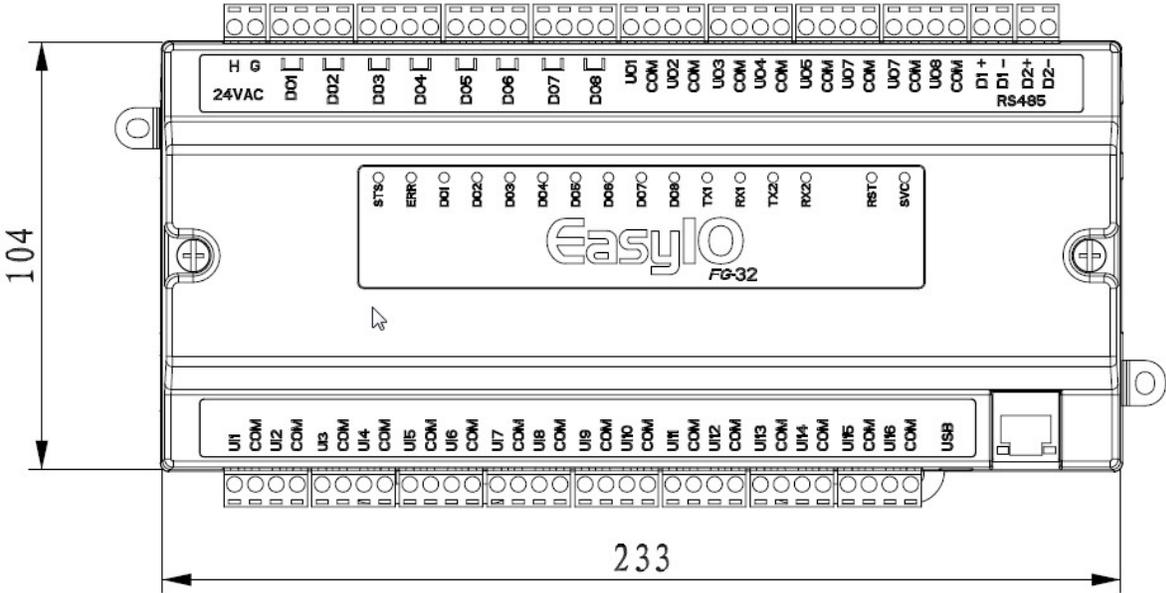
Dimensions

Top View. Width including connectors is approx 124mm
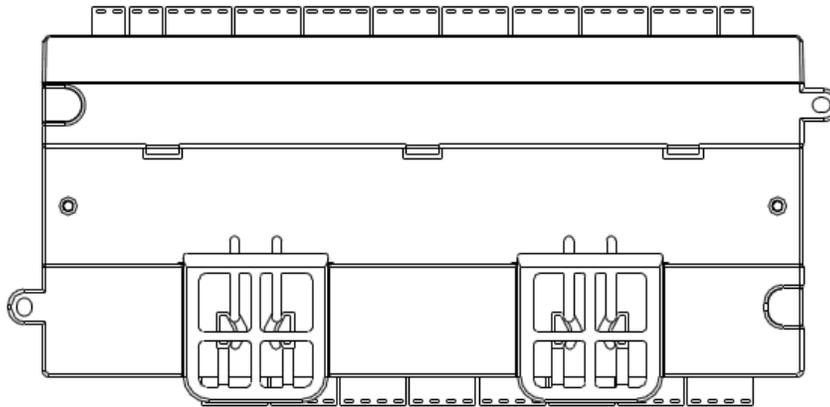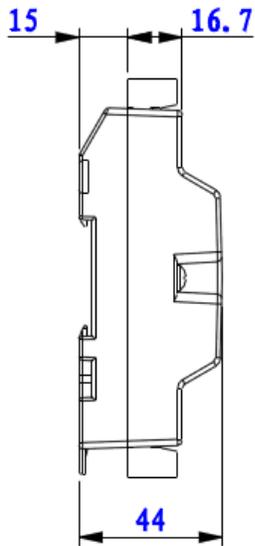
Side view and back view.
Improved DIN rail mounting for easy dismantling.

Alternate mounting option dimension

Physical Installation Instructions

Step 1
Securely fasten the DIN rail to the enclosure base plate. A standard DIN rail width 35mm.
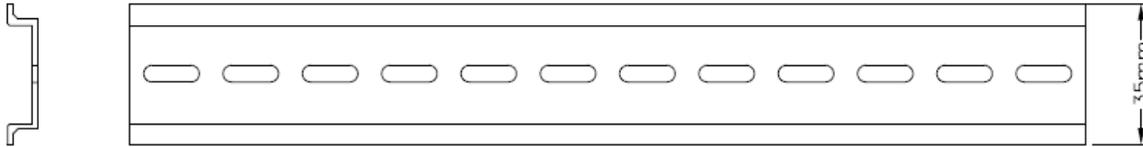
Typical industrial DIN rail, 35mm
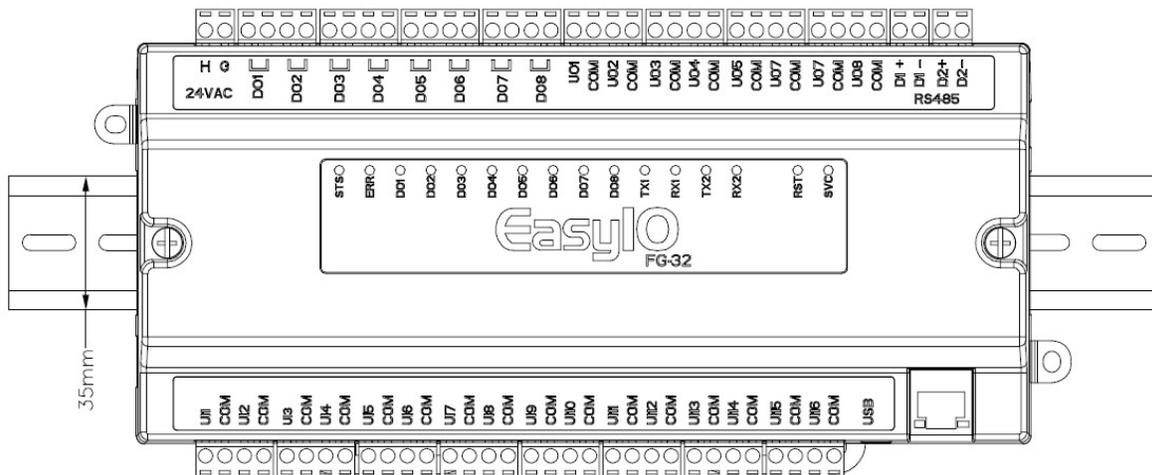
Step 2
Use a screwdriver to unlock the 2 numbers of locking clips. Eventually you may use your finger.

PULL TO
UNLOCK
THE CLIPS
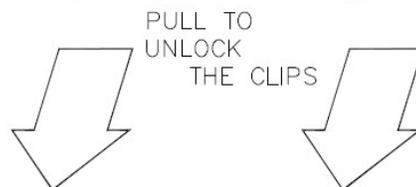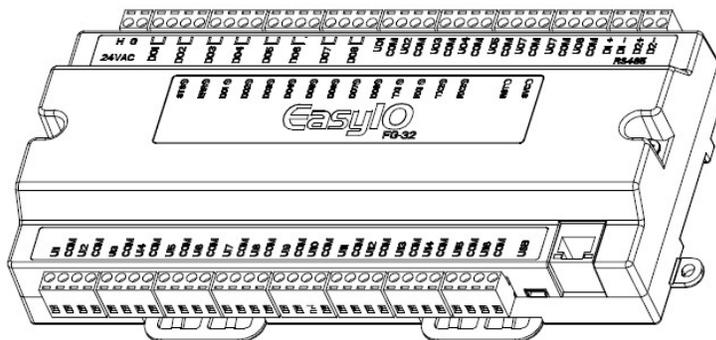
Step 3
Position the EasyIO FG-32+ on the DIN rail mount till it hooks over the top edge of the DIN rail.
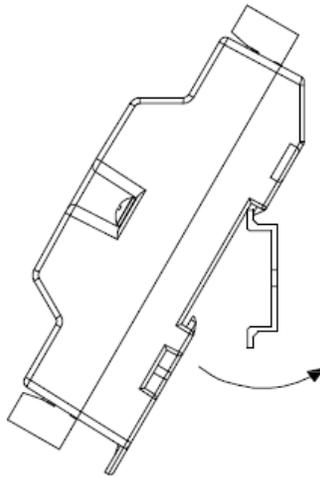
Push the controller towards the bottom part of the DIN rail

Step 4
Press/flatten the EasyIO FG-32+ to make sure the bottom of the base cover touches the enclosure base plate.

Step 5
Use a screwdriver to lock the locking clips to secure the EasyIO FG-32+ to the DIN rail. Eventually you may use your finger to press upwards and lock the clip to the DIN rail.
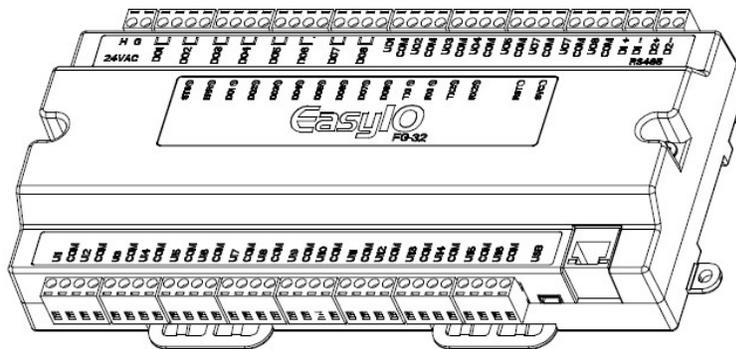
PRESS TO
LOCK

Step 6
To keep the assembly secures a DIN rail end clip can be use.
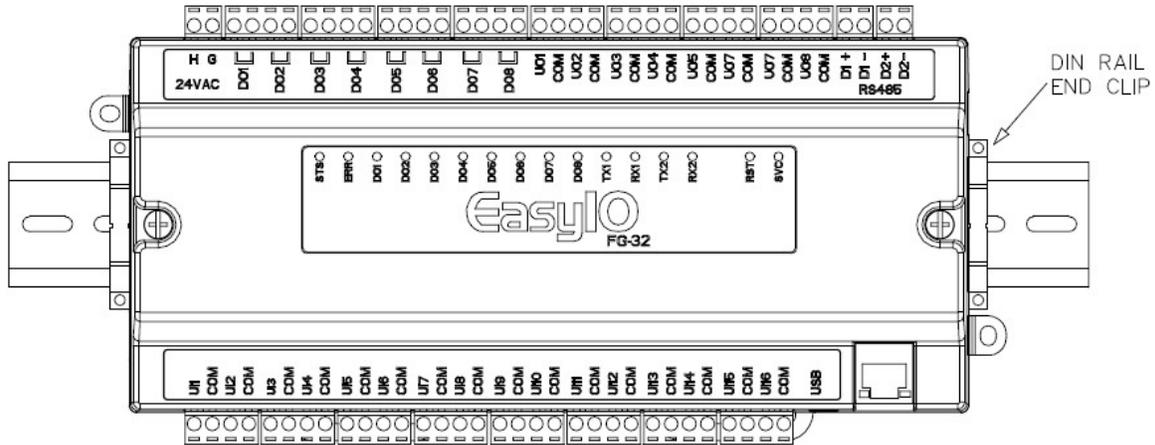
Image shows a typical "DIN rail end clip(end stopper)"

The EasyIO FG-32+ comes with 2 mounting holes as optional mounting. Occasionally if DIN rail mounting is not practical, you can use screws to mount the EasyIO FG-32+ to an enclosure base plate.
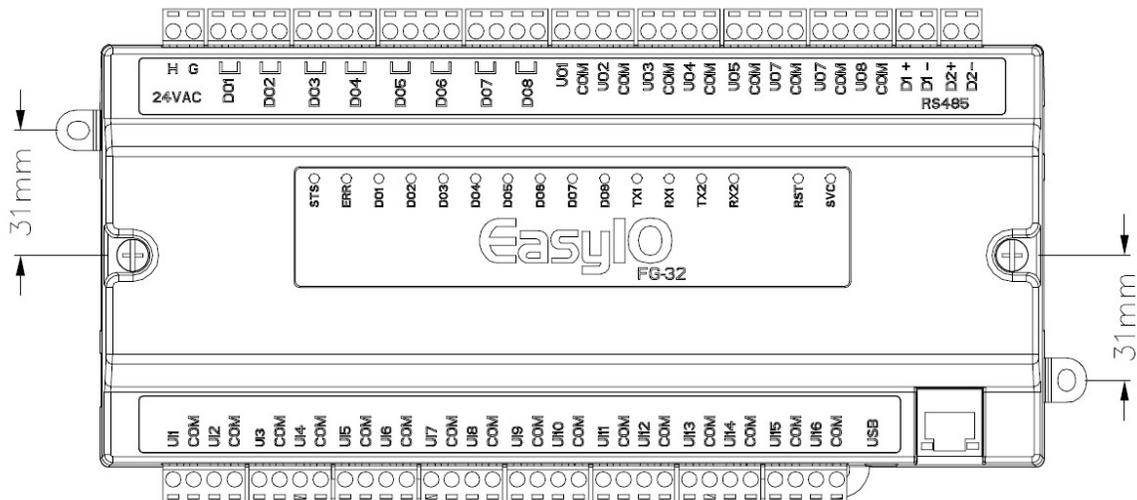
Opening the Top Cover

Step 1

Use a Philips screwdriver to unscrew the 2 Philips screw located on top the top cover.
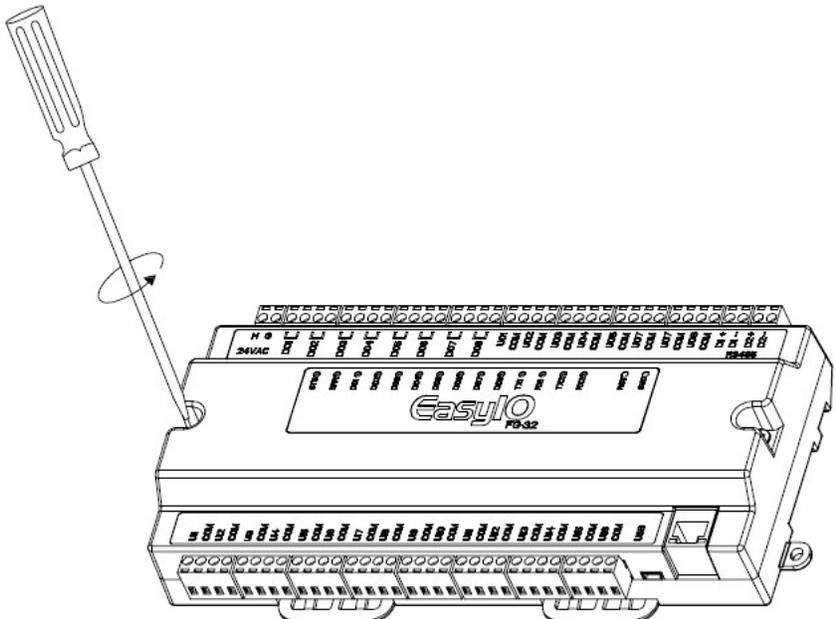
Remove the 2 Button Head Philips screws

Step 2

Hold both end of the top cover to lift up the top cover. Occasionally a small flat head screw driver might come handy in case the top cover stuck to the bottom cover.
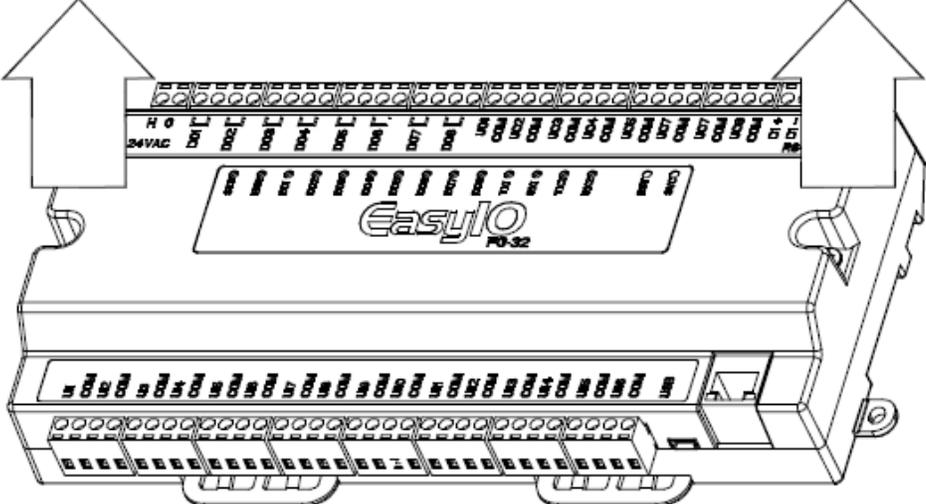
Hold both sides and lift up the top cover

FC-20 Expansion Controller Installation

Do not install the EasyIO FC-20:

- In an area where excessive moisture, corrosive fumes or explosion vapors are present.
- Where excessive vibration or shock is likely occur
- Location where excessive electrical noise such as large magnetic interference or variable speed drive modules
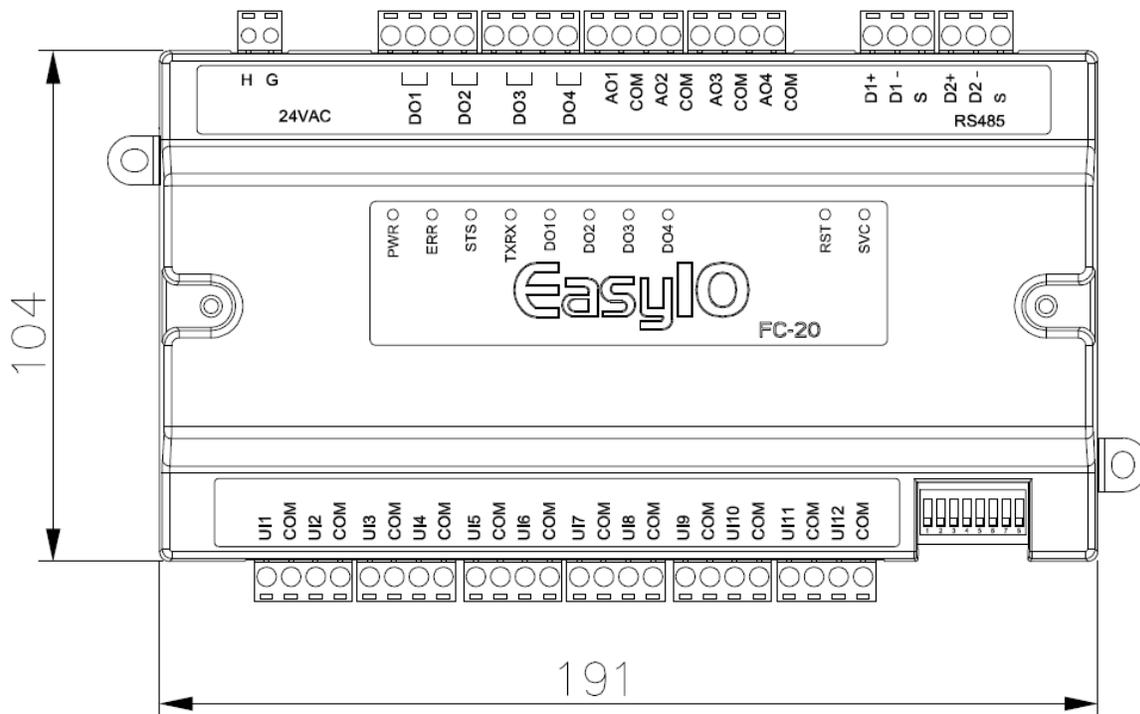
Dimensions

Top View. Width including connectors is approx 124mm
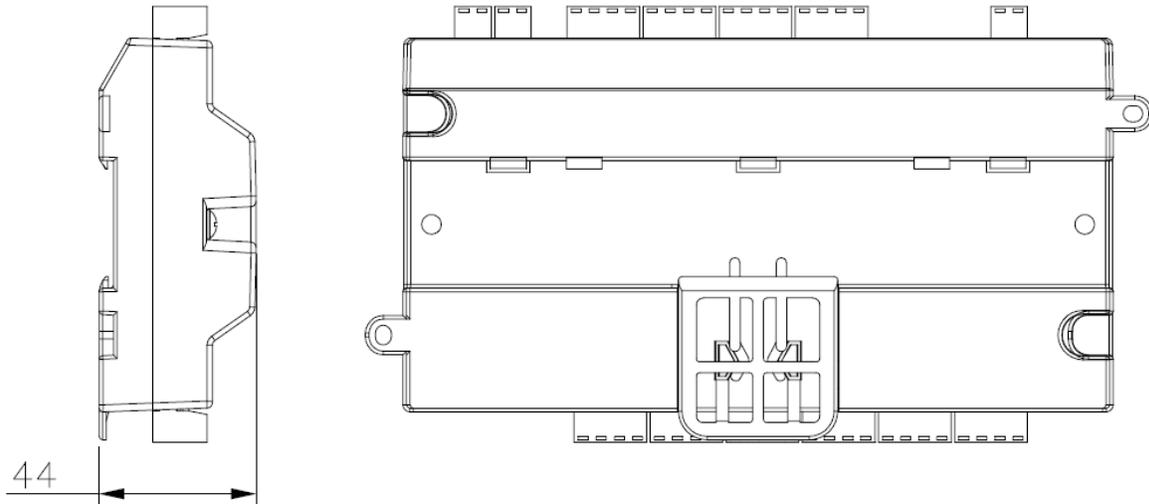
Side view and back view.
Improved DIN rail mounting for easy dismantling.

Alternate mounting option dimension

Physical Installation Instructions

Step 1
Securely fasten the DIN rail to the enclosure base plate.

Typical industrial DIN rail, 35mm
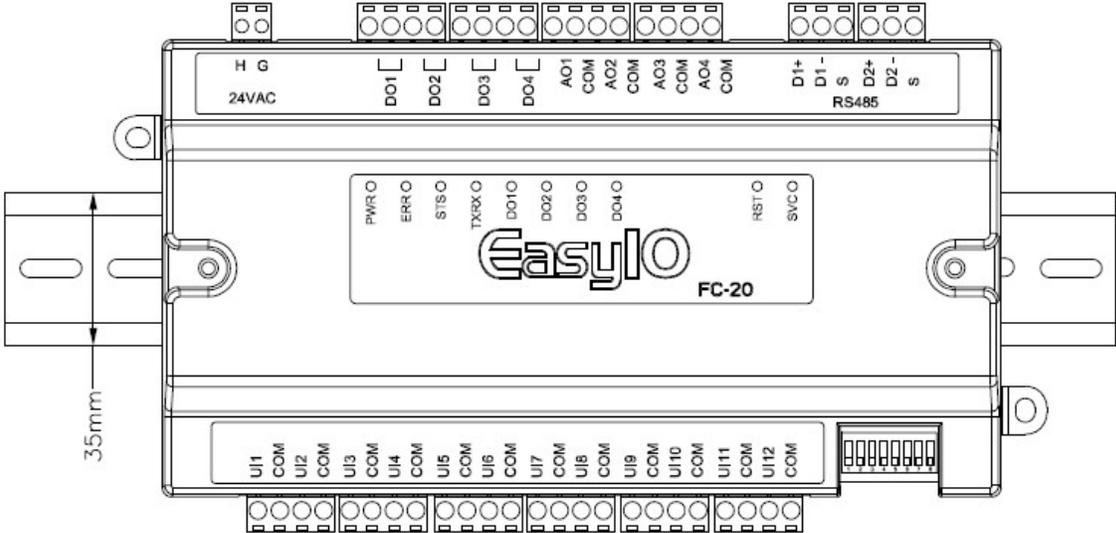
Step 2
Use a screwdriver to unlock the 2 numbers of locking clips.

PULL TO
UNLOCK
THE CLIPS
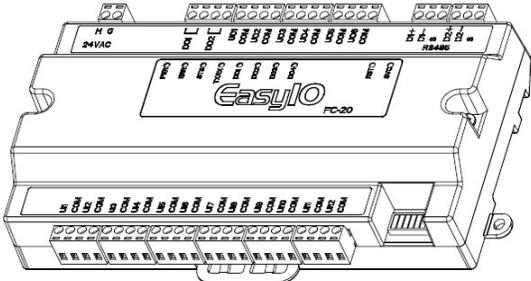
Step 3
Position the EasyIO FC-20 on the DIN rail mount till it hooks over the top edge of the DIN rail.
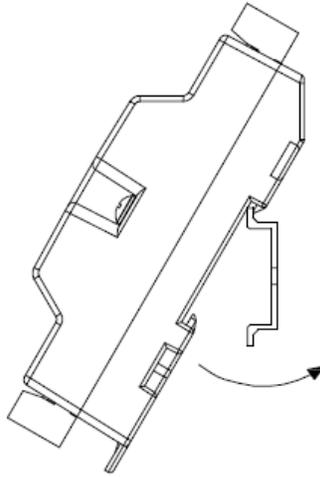
Push the controller towards the bottom part of the DIN rail

Step 4
Press/flatten the EasyIO FC-20 to make sure the bottom of the base cover touches the enclosure base plate.

Step 5
Use a screwdriver to lock the locking clips to secure the EasyIO FC-20 to the DIN rail.
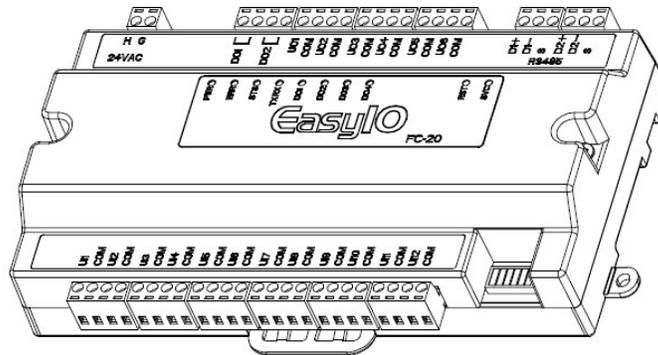
Step 6
To keep the assembly secures a DIN rail end clip can be use.
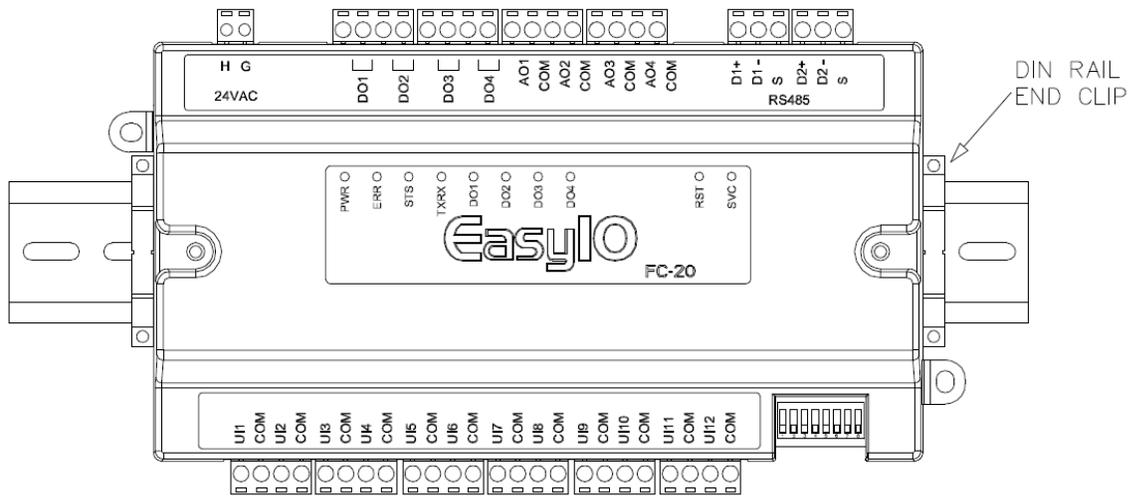
Image shows a typical "DIN rail end clip(end stopper)"

The EasyIO FC-20 comes with 2 mounting holes as optional mounting. Occasionally if DIN rail mounting is not practical, you can use screws to mount the EasyIO FC-20 to an enclosure base plate.
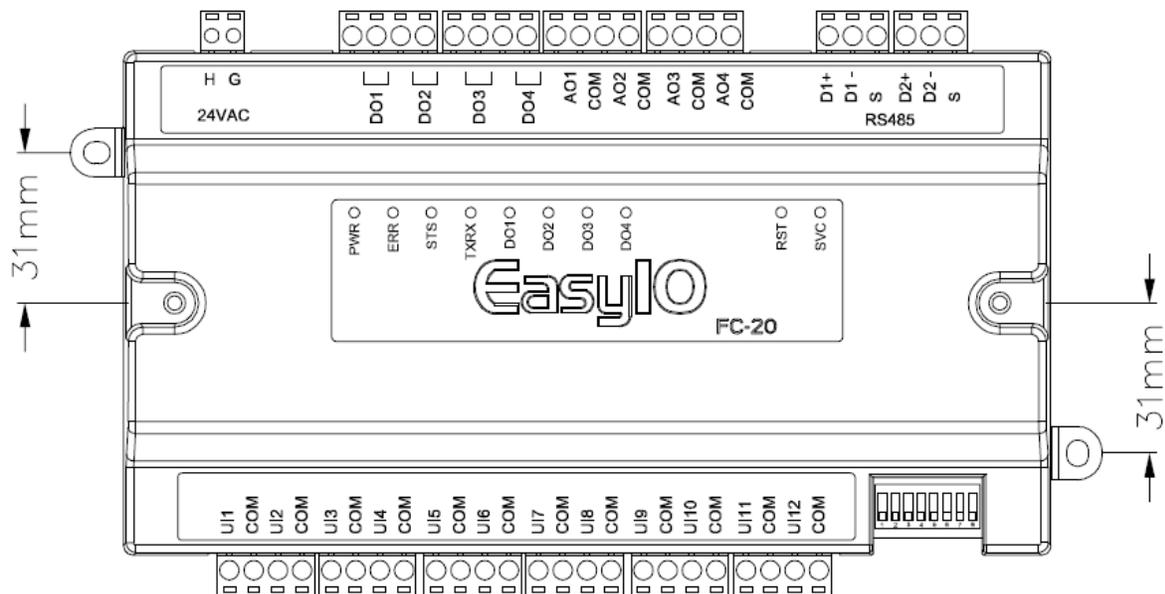
Opening the Top Cover

Step 1
Use a Philips screwdriver to unscrew the 2 Philips screw located on top the top cover.
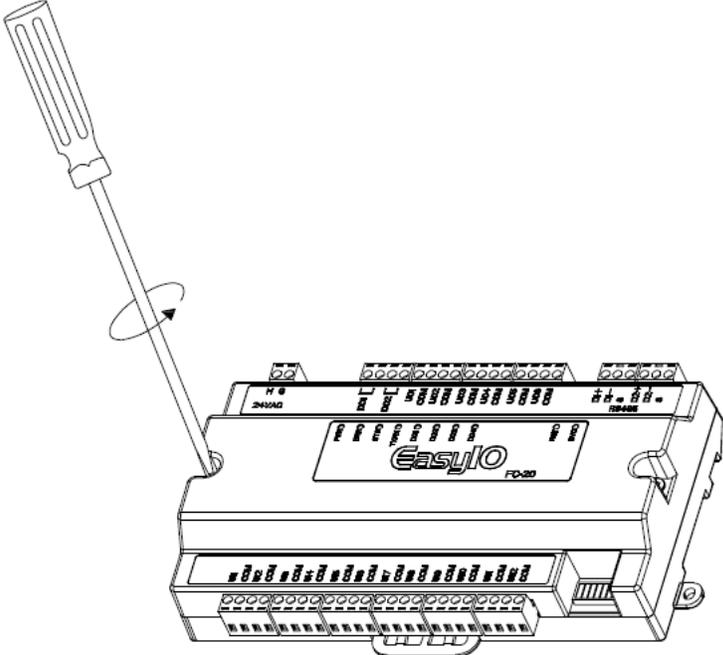
Remove the 2 Button Head Philips screws

Step 2
Hold both end of the top cover to lift up the top cover. Occasionally a small flat head screw driver might come handy in case the top cover stuck to the bottom cover.
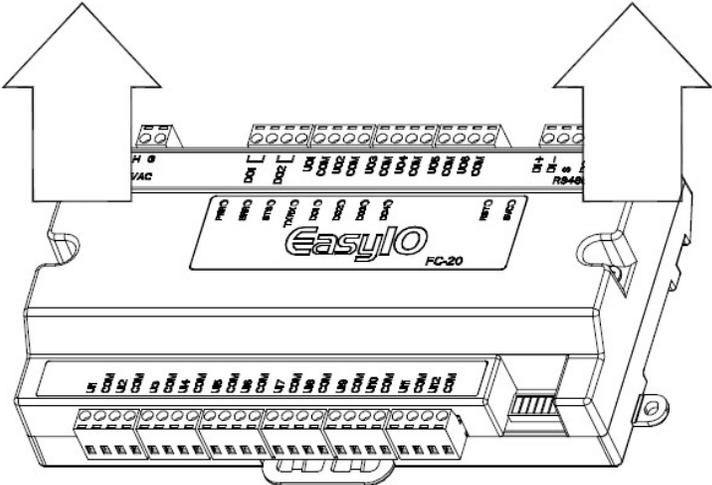
Hold both sides and lift up the top cover

Jumpers Settings - FG-32+ Main/FC-20 Expansion
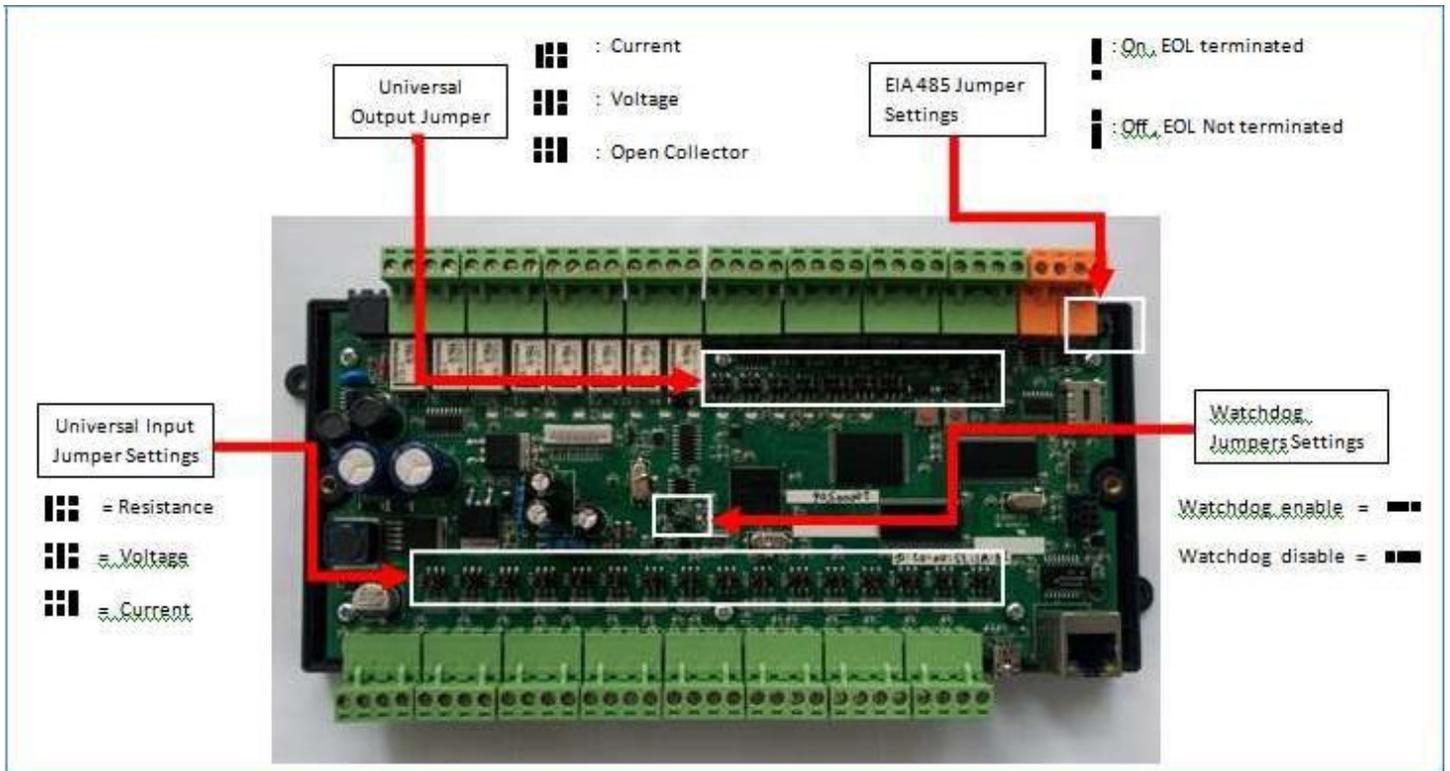
Input jumper setting for Resistance includes Temperature Sensors and Dry Contacts on both the FG-32+ Main Controller and FC-20 Expansion Controller.

Expansion Board Addressing
DIP switch #8   ON=1
DIP switch #7 ON, #8 OFF=2
DIP switch #7 ON, #8 ON=3
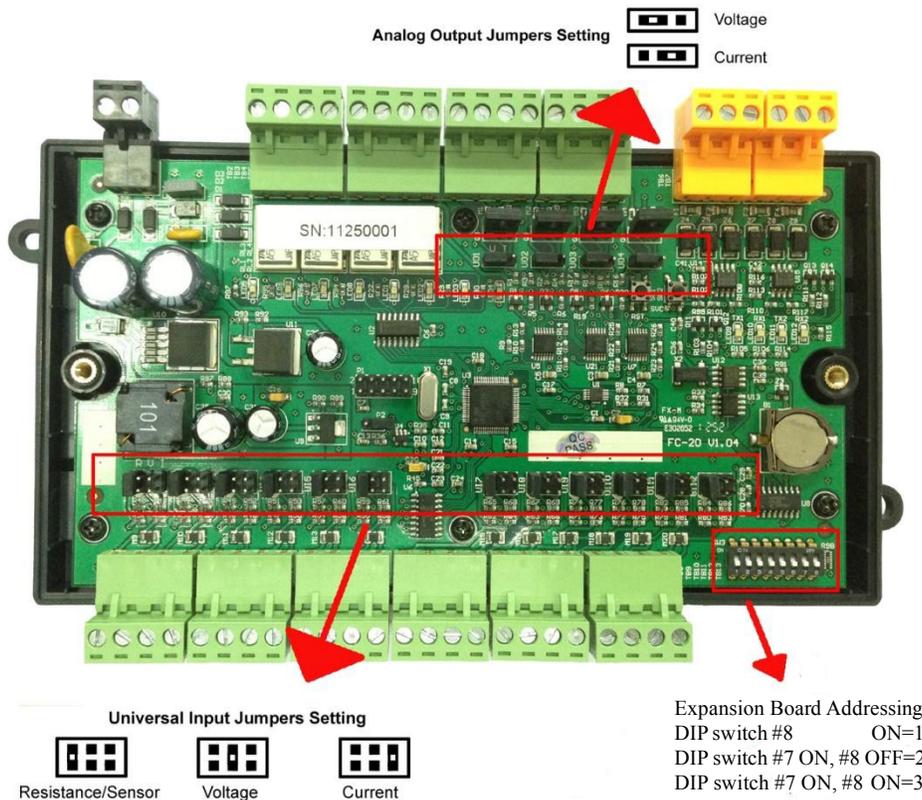
FG-32+ SD Card Install and Removal

Step 1

Locate the micro SD card slot at the top right corner. EasyIO FG-32+ comes with slide-in type of micro SD card holder.
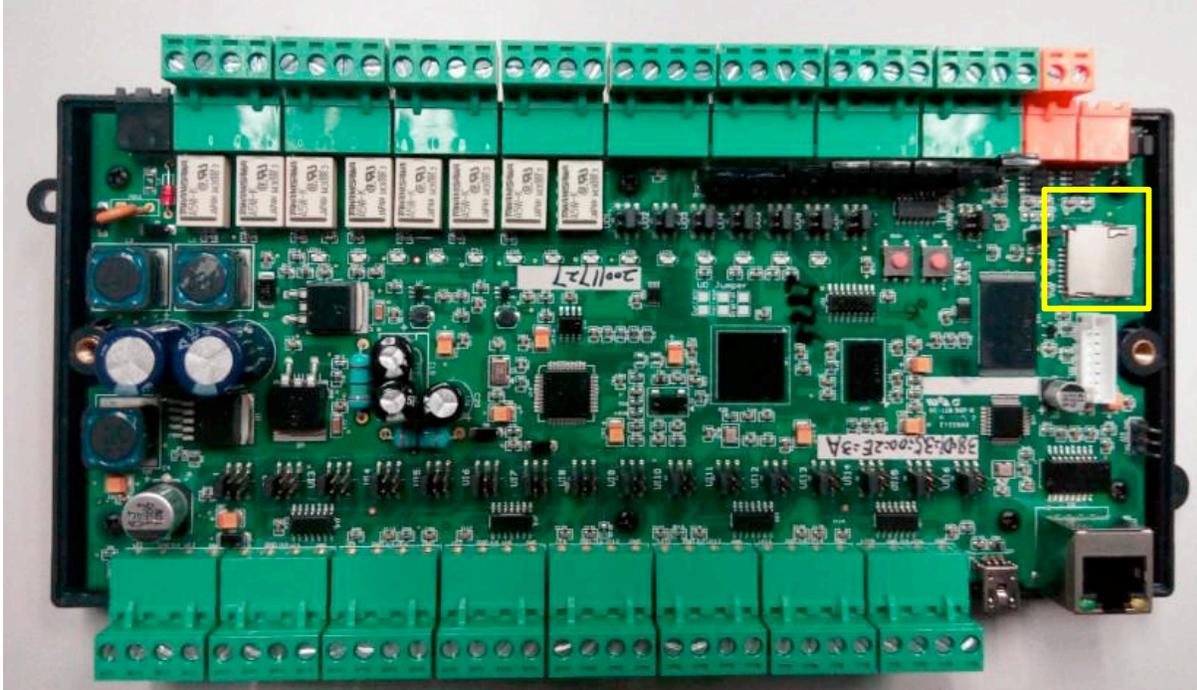
Step 2

Slide the micro SD card with contact pins face down.

Step 3

Carefully push the micro SD card in until it is lock. A click sound indicates the micro SD card is locked in position.
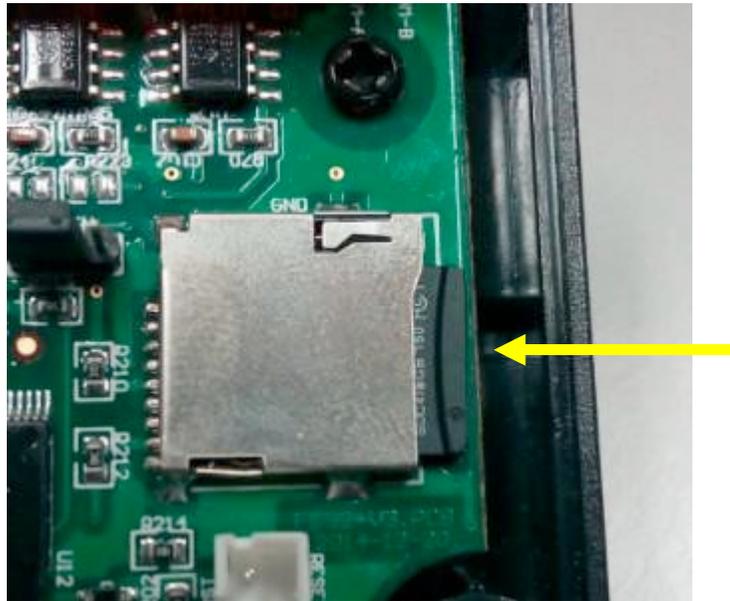
Step 4

To remove the micro SD card, push the micro SD card in towards the holder until you hear a click sound. The micro SD card will eject.

Then slide the micro Card out.
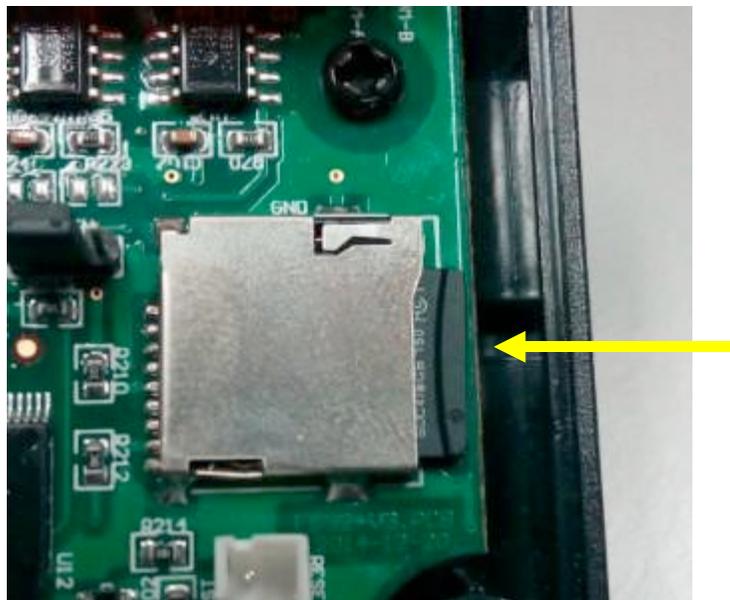
Voltage/Temperature Table ACI/10K Type III Sensor

| °F	VDC	Ω	°F	VDC	Ω	°F	VDC	Ω	°F	VDC	Ω
0	2.4648	44271	52	1.7178	16286	104	0.9419	5991.4	156	0.4228	2204.1
1	2.4528	43427	53	1.702	15976	105	0.929	5877.3	157	0.4157	2162.1
2	2.4406	42600	54	1.6861	15672	106	0.9162	5765.3	158	0.4088	2120.9
3	2.4283	41789	55	1.6703	15373	107	0.9035	5655.5	159	0.402	2080.5
4	2.416	40993	56	1.6544	15080	108	0.891	5547.8	160	0.3952	2040.9
5	2.4035	40212	57	1.6385	14793	109	0.8785	5442.1	161	0.3886	2002
6	2.3908	39446	58	1.6227	14511	110	0.8662	5338.5	162	0.382	1963.9
7	2.3781	38695	59	1.6068	14235	111	0.854	5236.8	163	0.3756	1926.5
8	2.3653	37958	60	1.591	13964	112	0.8418	5137	164	0.3692	1889.8
9	2.3524	37235	61	1.5751	13698	113	0.8298	5039.2	165	0.363	1853.8
10	2.3393	36526	62	1.5593	13437	114	0.818	4943.2	166	0.3568	1818.5
11	2.3262	35830	63	1.5435	13181	115	0.8062	4849.1	167	0.3507	1783.9
12	2.3129	35147	64	1.5277	12930	116	0.7945	4756.7	168	0.3448	1749.9
13	2.2996	34478	65	1.5119	12684	117	0.783	4666.1	169	0.3389	1716.6
14	2.2861	33821	66	1.4962	12442	118	0.7716	4577.2	170	0.3331	1683.9
15	2.2725	33177	67	1.4805	12205	119	0.7602	4490	171	0.3273	1651.8
16	2.2589	32545	68	1.4648	11973	120	0.749	4404.5	172	0.3217	1620.3
17	2.2451	31925	69	1.4492	11745	121	0.738	4320.6	173	0.3162	1589.5
18	2.2313	31317	70	1.4336	11521	122	0.727	4238.3	174	0.3107	1559.2
19	2.2173	30721	71	1.418	11302	123	0.7162	4157.6	175	0.3054	1529.5
20	2.2033	30136	72	1.4024	11086	124	0.7054	4078.4	176	0.3001	1500.4
21	2.1892	29562	73	1.387	10875	125	0.6948	4000.7	177	0.2949	1471.8
22	2.175	28999	74	1.3715	10668	126	0.6843	3924.5	178	0.2897	1443.8
23	2.1607	28446	75	1.3561	10465	127	0.674	3849.8	179	0.2847	1416.3
24	2.1463	27904	76	1.3408	10265	128	0.6637	3776.4	180	0.2797	1389.3
25	2.1318	27373	77	1.3255	10070	129	0.6536	3704.5	181	0.2748	1362.8
26	2.1172	26851	78	1.3103	9878.1	130	0.6436	3634	182	0.27	1336.9
27	2.1026	26340	79	1.2951	9690	131	0.6337	3564.7	183	0.2653	1311.4
28	2.0879	25838	80	1.28	9505.4	132	0.6239	3496.8	184	0.2607	1286.4
29	2.0731	25346	81	1.265	9324.4	133	0.6142	3430.2	185	0.2561	1261.9
30	2.0583	24863	82	1.25	9146.7	134	0.6046	3364.9	186	0.2516	1237.9
31	2.0433	24390	83	1.2351	8972.5	135	0.5952	3300.8	187	0.2471	1214.3
32	2.0283	23925	84	1.2203	8801.6	136	0.5859	3237.9	188	0.2428	1191.2
33	2.0133	23470	85	1.2056	8634	137	0.5767	3176.3	189	0.2385	1168.5
34	1.9981	23023	86	1.1909	8469.5	138	0.5676	3115.8	190	0.2343	1146.2
35	1.983	22584	87	1.1763	8308.2	139	0.5586	3056.4	191	0.2301	1124.4
36	1.9677	22154	88	1.1618	8150	140	0.5497	2998.2	192	0.226	1103
37	1.9524	21732	89	1.1473	7994.7	141	0.541	2941.1	193	0.222	1082
38	1.937	21318	90	1.133	7842.5	142	0.5323	2885.1	194	0.2181	1061.4
39	1.9216	20912	91	1.1187	7693.1	143	0.5238	2830.1	195	0.2142	1041.1
40	1.9062	20514	92	1.1045	7546.6	144	0.5154	2776.2	196	0.2104	1021.3
41	1.8907	20123	93	1.0905	7402.8	145	0.5071	2723.3	197	0.2066	1001.9
42	1.8751	19740	94	1.0765	7261.8	146	0.4989	2671.5	198	0.2029	982.78
43	1.8595	19364	95	1.0626	7123.5	147	0.4908	2620.6	199	0.1993	964.06
44	1.8439	18995	96	1.0488	6987.8	148	0.4828	2570.7	200	0.1957	945.7
45	1.8282	18633	97	1.035	6854.7	149	0.4749	2521.7			
46	1.8125	18278	98	1.0214	6724.2	150	0.4672	2473.7			
47	1.7968	17930	99	1.0079	6596.1	151	0.4595	2426.6			
48	1.7811	17588	100	0.9945	6470.4	152	0.452	2380.3			
49	1.7653	17253	101	0.9812	6347.2	153	0.4445	2335			
50	1.7495	16925	102	0.968	6226.3	154	0.4372	2290.5			
51	1.7337	16602	103	0.9549	6107.7	155	0.4299	2246.9			

Pressure/Temperature Table for R410a

0-250psi			0-500psi			0-667psi		
VDC	PSI	TEM	VDC	PSI	TEM	VDC	PSI	TEM
0.50	0.00	-41.78	0.50	0.00	-41.78	0.50	0.00	-41.78
0.60	6.25	-35.98	0.60	12.50	-30.37	0.60	16.68	-26.72
0.70	12.50	-30.37	0.70	25.00	-19.68	0.70	33.35	-12.93
0.80	18.75	-24.93	0.80	37.50	-9.68	0.80	50.03	-0.33
0.90	25.00	-19.68	0.90	50.00	-0.35	0.90	66.70	11.14
1.00	31.25	-14.59	1.00	62.50	8.35	1.00	83.38	21.56
1.10	37.50	-9.68	1.10	75.00	16.45	1.10	100.05	31.00
1.20	43.75	-4.93	1.20	87.50	23.98	1.20	116.73	39.55
1.30	50.00	-0.35	1.30	100.00	30.98	1.30	133.40	47.26
1.40	56.25	4.08	1.40	112.50	37.46	1.40	150.08	54.22
1.50	62.50	8.35	1.50	125.00	43.47	1.50	166.75	60.51
1.60	68.75	12.48	1.60	137.50	49.04	1.60	183.43	66.18
1.70	75.00	16.45	1.70	150.00	54.19	1.70	200.10	71.33
1.80	81.25	20.29	1.80	162.50	58.96	1.80	216.78	76.01
1.90	87.50	23.98	1.90	175.00	63.38	1.90	233.45	80.31
2.00	93.75	27.55	2.00	187.50	67.48	2.00	250.13	84.31
2.10	100.00	30.98	2.10	200.00	71.30	2.10	266.80	88.06
2.20	106.25	34.28	2.20	212.50	74.85	2.20	283.48	91.66
2.30	112.50	37.46	2.30	225.00	78.18	2.30	300.15	95.17
2.40	118.75	40.53	2.40	237.50	81.31	2.40	316.83	98.66
2.50	125.00	43.47	2.50	250.00	84.28	2.50	333.50	102.21
2.60	131.25	46.31	2.60	262.50	87.11	2.60	350.18	105.90
2.70	137.50	49.04	2.70	275.00	89.85	2.70	366.85	109.80
2.80	143.75	51.67	2.80	287.50	92.51	2.80	383.53	113.98
2.90	150.00	54.19	2.90	300.00	95.13	2.90	400.20	118.51
3.00	156.25	56.63	3.00	312.50	97.75	3.00	416.88	123.47
3.10	162.50	58.96	3.10	325.00	100.39	3.10	433.55	128.94
3.20	168.75	61.22	3.20	337.50	103.08	3.20	450.23	134.99
3.30	175.00	63.38	3.30	350.00	105.86	3.30	466.90	141.69
3.40	181.25	65.47	3.40	362.50	108.76	3.40	483.58	149.11
3.50	187.50	67.48	3.50	375.00	111.80	3.50	500.25	157.34
3.60	193.75	69.42	3.60	387.50	115.02	3.60	516.93	166.44
3.70	200.00	71.30	3.70	400.00	118.45	3.70	533.60	176.49
3.80	206.25	73.10	3.80	412.50	122.13	3.80	550.28	187.56
3.90	212.50	74.85	3.90	425.00	126.07	3.90	566.95	199.73
4.00	218.75	76.54	4.00	437.50	130.32	4.00	583.63	213.06
4.10	225.00	78.18	4.10	450.00	134.90	4.10	600.30	227.64
4.20	231.25	79.77	4.20	462.50	139.85	4.20	616.98	243.54
4.30	237.50	81.31	4.30	475.00	145.20	4.30	633.65	260.83
4.40	243.75	82.81	4.40	487.50	150.98	4.40	650.33	279.59
4.50	250.00	84.28	4.50	500.00	157.21	4.50	667.00	299.89

Contact us for support:

Envision Technologies, LLC
6799 Kennedy Road Suite E
Warrenton, VA 20187
(540) 428-5347 office
blight@envisiontechllc.com (Barry Light)
anarro@envisiontechllc.com (Alex Narro)
www.envisiontechllc.com