

SWARM 

Small Workplace Automation & Remote Monitoring

Building Operator Module

UCDAVIS

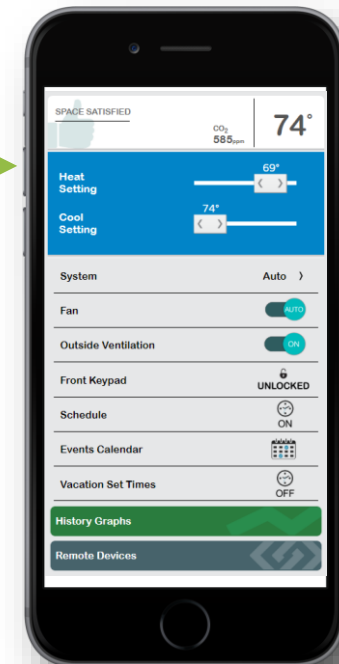
Energy & Engineering

What is SWARM?

- SWARM connects isolated buildings on campus to a central HVAC control and monitoring system
- This enables better temperature control in the space, better information for HVAC technicians, and the potential for energy savings due to more efficient HVAC use

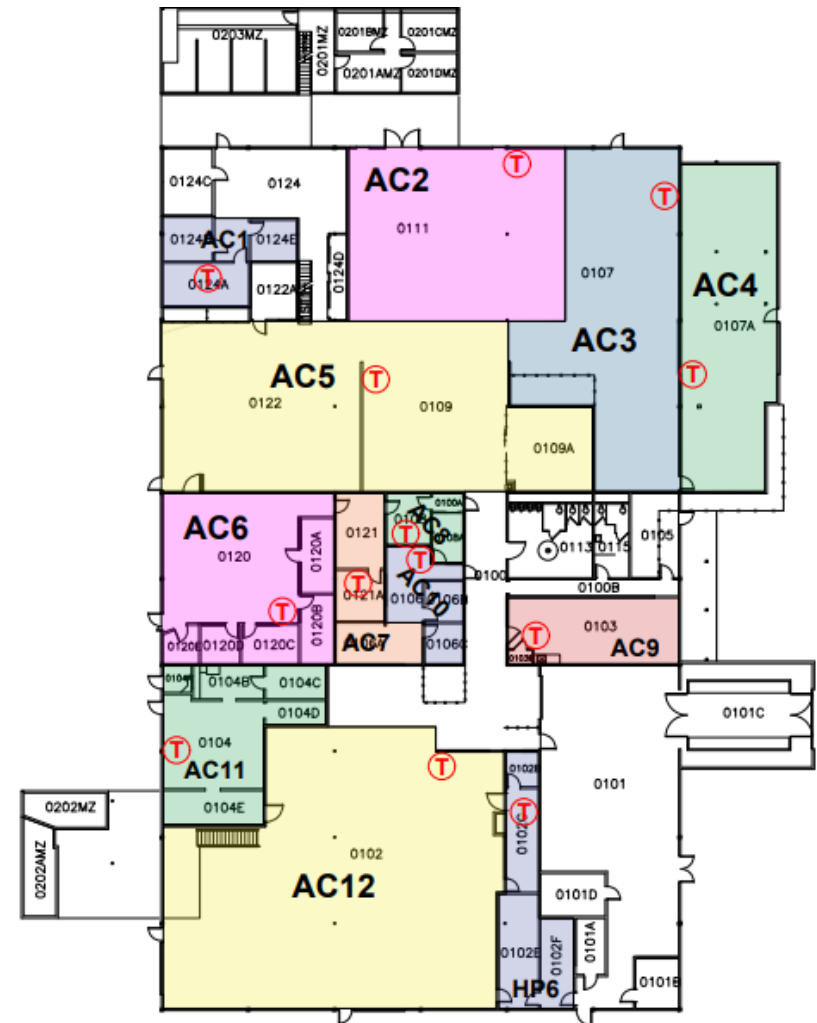


IET T1-1145 Tstat outside rm	Cool Setting 74°	74° CO ₂ 599 _{ppm}
IET T2-1141 Tstat outside rm 1141	Cool Setting 74°	73° CO ₂ 578 _{ppm}
IET T3-1135 Tstat outside rm 1135	Cool Running Setting 72°	72° CO ₂ 598 _{ppm}
IET T4-1129 Tstat outside rm 1129	Cool Running Setting 72°	72° CO ₂ 579 _{ppm}
IET T5-1123 Tstat outside rm 1123	Cool Running Setting 72°	72° CO ₂ 660 _{ppm}



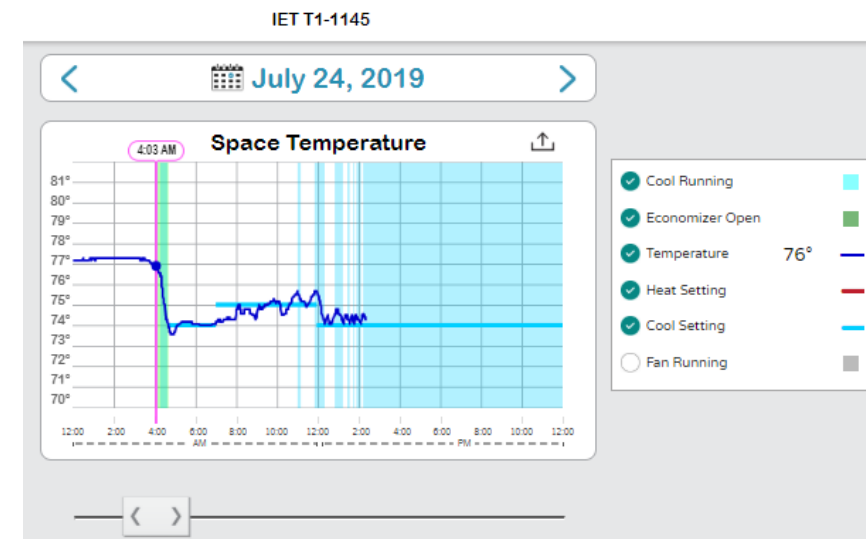
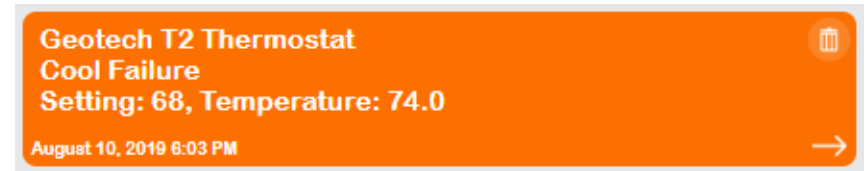
What *isn't* SWARM?

- SWARM **will not**:
 - Upgrade or fix **HVAC equipment issues** like balancing and broken units
 - Add more **temperature zones** to the building
 - If there are large spaces with **no thermostats**, we can add a **sensor** to average the space heating and cooling with a nearby thermostat



Benefits of SWARM

- **Reduce** equipment runtime
- **Remotely troubleshoot** equipment
- Collect building **temperature history** for cold/hot calls
- SWARM equipment **funded by energy savings**



SWARM Installation Process

ONGOING

Make a list of buildings not on the central BAS that are SWARM candidates

CLUSTER (Empty) Count: 28		Project Activity
1	100 Hunt Hall	No Action
2	1050 Extension Center Drive	
3	Agronomy Field Headquarters	Initial contact
4	Airport Hangar Office	Initial contact
5	Bookstore Warehouse	No Action
6	Coffee Lab (Advanced Materials Research Lab)	Initial contact

1 MONTH

HVAC team helps decide on best thermostat technology for SWARM buildings



1-6 MONTHS

SWARM team orders Ethernet port installation in the building and orders equipment



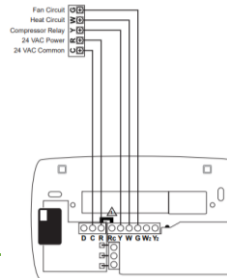
1 MONTH

SWARM team orders & programs thermostats with equipment and schedule details



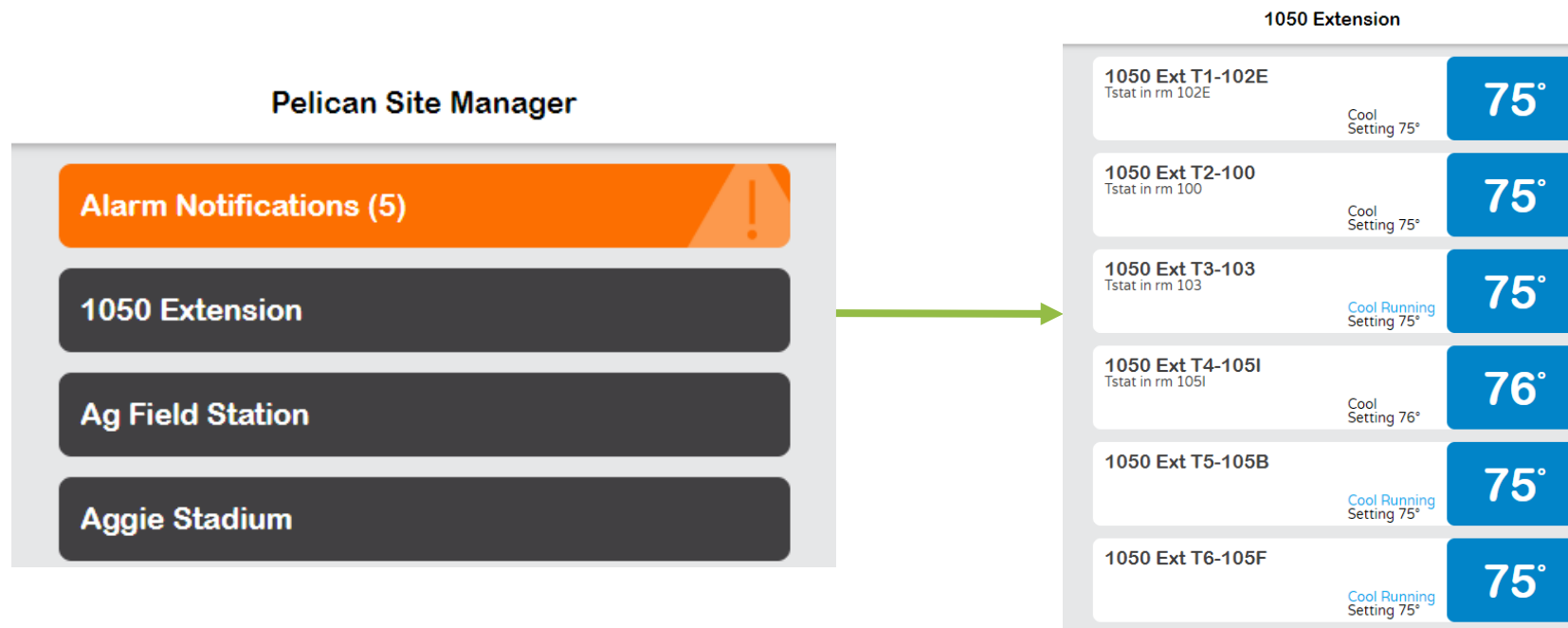
ONGOING

HVAC team installs thermostats and monitors equipment



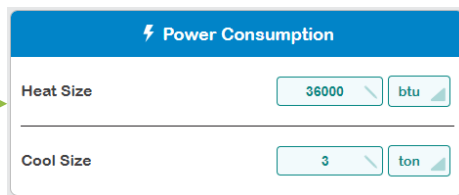
How Does One Use SWARM? – *SWARM Website*

- The main interface for SWARM is on a website hosted by Pelican Wireless, the makers of the thermostats
- View thermostat settings and history within each site



Using SWARM – *Configuring Thermostat*

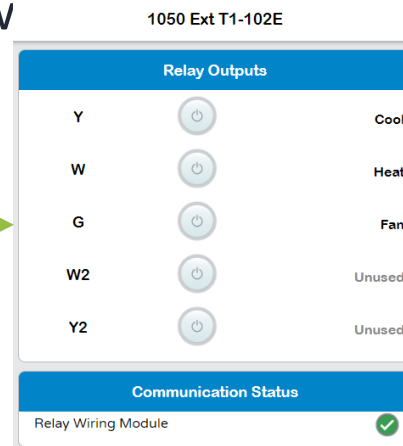
- Input system type (heat pump or conventional) and stages
- Boundaries for heating and cooling (usually ~60F-68F for heating and ~72F-80F for cooling)
- Input air change rate and other operation settings
- Input power consumption for heating and cooling
- Input notification settings as “Custom”, “5°F”, and “Yes”
- Ensure that the outputs on the wiring match the physical wiring



Power Consumption

Heat Size: 36000 btu

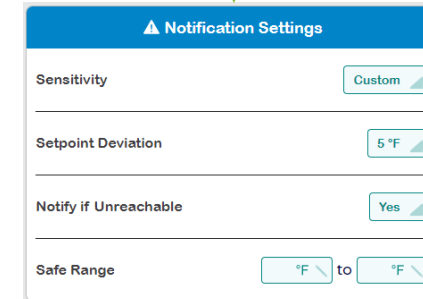
Cool Size: 3 ton



1050 Ext T1-102E

Relay	Status	Label
Y	On	Cool
W	On	Heat
G	On	Fan
W2	Off	Unused
Y2	Off	Unused

Communication Status: Relay Wiring Module ✓



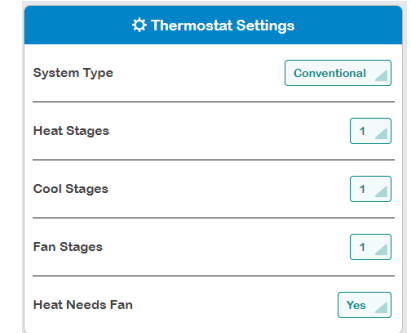
Notification Settings

Sensitivity: Custom

Setpoint Deviation: 5 °F

Notify if Unreachable: Yes

Safe Range: °F to °F



Thermostat Settings

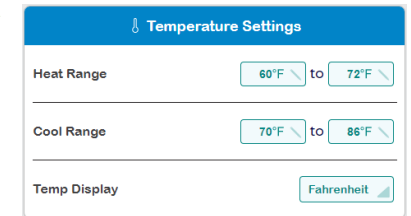
System Type: Conventional

Heat Stages: 1

Cool Stages: 1

Fan Stages: 1

Heat Needs Fan: Yes

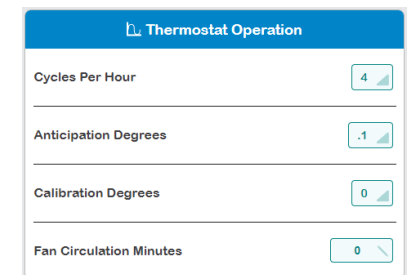


Temperature Settings

Heat Range: 60°F to 72°F

Cool Range: 70°F to 86°F

Temp Display: Fahrenheit



Thermostat Operation

Cycles Per Hour: 4

Anticipation Degrees: .1

Calibration Degrees: 0

Fan Circulation Minutes: 0

Using SWARM– *Thermostat Dashboard*

- Within each thermostat, you can:
 - View the current temperature and status
 - Change the heat and cool set points
 - Lock/unlock the physical thermostat
 - View/change the schedule
 - Create an event
 - Look at historical data
 - (see next slide)

1050 Ext T1-102E

COOL RUNNING | 73°

Heat Setting 68°

Cool Setting 72°

System Auto >

Fan AUTO

Front Keypad UNLOCKED

Schedule ON

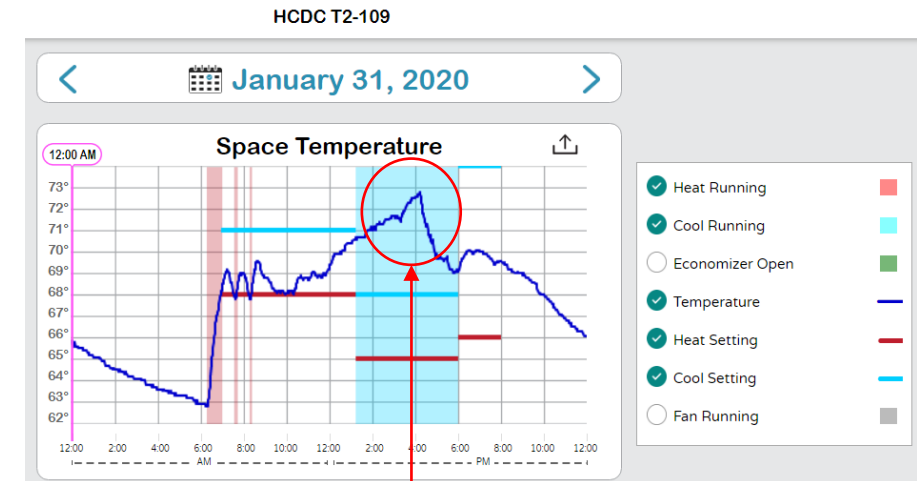
Events Calendar

Vacation Set Times OFF

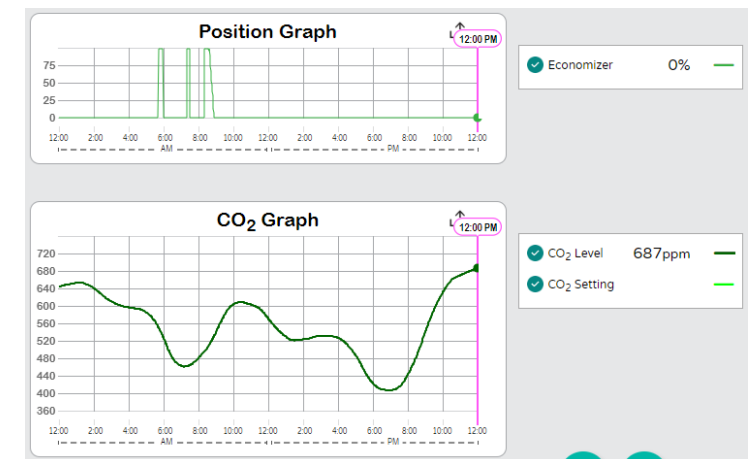
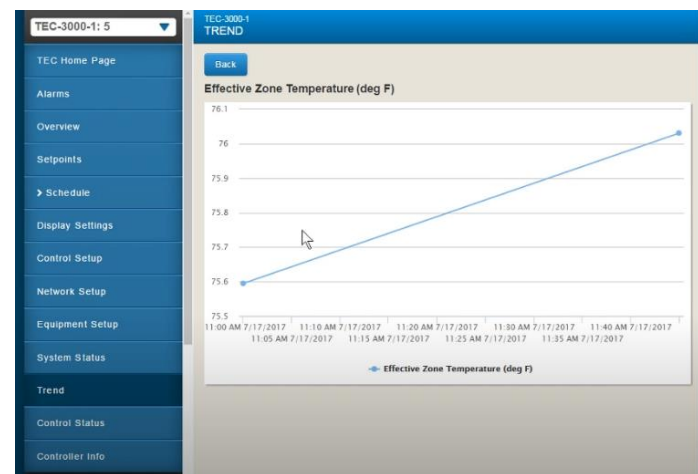
History Graphs

Using SWARM – Monitoring Equipment

- To remotely monitor HVAC equipment, look at “History Graphs”
- View temperature history, equipment (fan, cool/heat, economizer) runtime, economizer position, and CO₂ in the space if the thermostat is equipped with a CO₂ sensor
- Most of these features are available with technology other than Pelican, such as the JCI TEC-3000s



Cooling failure visible;
alarm notified staff



Thank you!

Questions or concerns? Email SWARM@ucdavis.edu