US Solar Mounts
Universal Slow Start Control

Owner and Installer Manual

REV. 1

Universal SSC

AC-Series SSC

Patent Pending

US Solar Mounts

3498 Acorn Ave. Sparta, WI 54656

(608)272-3999 www.ussm.us

1. Welcome

Thank you for choosing the US Solar Mounts Slow Start Control.

This device manages the start or restart of an aeration system by gradually increasing allowed compressor run time in stages over a controlled 15-day period. When a startup cycle is complete, the controller automatically returns the system to normal, full-time operation.

Slow Start control with two operating modes
Simple push-button operation
Built-in Wi-Fi access point and web interface
Timer scheduling
Service reminders
Installer contact information
Event history
Device information and status reporting

2. Audience

- Pond owners and pond managers
- Maintenance personnel
- Pond and water feature installers
- Service technicians

3. Scope

This manual covers the installation and operation of the Slow Start Controller only.

This manual does not cover compressor installation, electrical circuit design, wire sizing, voltage drop, or maximum allowable distance between the power source and compressor. These topics must be addressed by the compressor manufacturer's documentation and applicable electrical codes.

GFCI protection, if required, is determined by local electrical codes and compressor manufacturer requirements.

4. Quick Start — No Setup Required

The Universal SSC is designed for plug-and-play operation using a standard 120VAC NEMA 5-15 connection. The controller plugs into a properly protected outlet, and the compressor plugs into the controller.

The controller is ready to use right out of the box. No programming is required for basic operation.

By default, the controller is set to Round-the-Clock Slow Start mode. This default mode does not depend on the controller's date and time settings.

Basic Out-of-Box Use

1. Mount the enclosure on a solid surface. Vertical orientation only.
2. Plug in the controller.
3. Connect the compressor.
4. Press and hold the Start button for 3 seconds.
5. The controller will begin a Slow Start cycle.

NOTE: Extension cords are not permitted for use with this device.

After the Slow Start cycle is complete, the controller no longer limits runtime and allows normal, full-time compressor operation.

To Cancel an Active Slow Start Cycle

6. Press and hold the Start button again for 3 seconds.
7. The Slow Start cycle will stop.
8. The controller will return to normal operation.

Navigation: Front Panel Button → Press and Hold 3 Seconds

Electrical Summary

- Voltage: 120VAC only
- Maximum Compressor Size: 3/4 HP (120VAC systems only)
- Plug Type: NEMA 5-15 (Universal Model)
- Overcurrent Protection: Must be provided by the supply circuit
- Extension Cords: Not permitted

5. First-Time Connection and Login

The controller includes a built-in Wi-Fi access point and web interface for phone, tablet, or laptop access.

The Slow Start Controller does not require any network or cellular access and cannot connect to any existing network.

The controller supports a single active user connection at a time to prevent conflicting configuration changes.

Connection Steps

1. Power the controller and wait for the Wi-Fi access point to start (about 30 seconds).
2. Open Wi-Fi settings on your device.
3. Look for a network name in this format: USSM-SSCU-XXXX.
4. Connect to that network.
5. Open a web browser and enter the web address of 192.168.4.1

When connected to the controller's Wi-Fi network, the user's device will not have internet access.

Default Login Credentials

User account: **admin / password**

> **Security recommendation** Change the default credentials as soon as practical and write the new credentials down in a safe place.

Fallback Login Reset

6. Press and hold the front-panel Start button for 15 seconds.
7. The controller resets the user and installer login accounts to their default values.

Navigation Notes

Back arrow in the upper-left corner returns to the previous page
Navigation row of icons at the bottom of each page moves between main sections

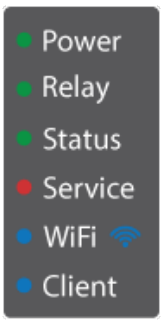
If a connected user moves out of range and returns, the session will persist unless it has timed out. Sessions automatically terminate after approximately 5 minutes of inactivity.

6. Front Panel and LED Indicators

Your version of the controller may include a front panel LED display. The front of the controller includes a push-button and several LED indicators that help the user understand what the controller is doing without opening the web interface.

LED Summary

Indicator	Meaning
Power LED	Controller is powered up
Relay LED	Relay is allowing compressor operation
Status LED steady ON	Compressor is allowed to run
Status LED blinking	Blink count shows current Slow Start day
Service LED	A service reminder is active
Wi-Fi LED	Wi-Fi access point is active
Client LED flashing	Client Communication is occurring



- Status LED solid ON indicates the controller is allowing continuous compressor operation.
- Relay LED ON indicates that the compressor circuit is energized and power is being delivered to the compressor.
- During Slow Start, the Status LED blinking count corresponds to the current day of the cycle (e.g., 3 blinks = Day 3).
- When the Slow Start cycle is complete, the Status LED remains solid ON.

7. What the Controller Does

The controller is an advanced Patent Pending device that manages when the compressor is allowed to run. Its main purpose is to prevent full, unrestricted compressor operation immediately at startup and instead gradually increase allowed running time over a controlled 15-day period.

The controller uses a normally closed (NC) relay. The compressor is allowed to run unless the controller actively energizes the relay to inhibit operation.

In the event of controller failure or loss of power, the relay defaults to the closed state, allowing the compressor to run continuously.

8. Why Slow Start Matters

In many conditions, deeper pond water may contain harmful gases and have much lower oxygen levels than water near the surface. If bottom aeration is started too aggressively, that lower-oxygen water can be mixed upward too quickly. A gradual startup helps reduce that risk.

Slow Start should be used whenever there is a risk of water stratification, including:

- Initial startup of a new aeration system
- Restart after extended downtime
- Warm or hot weather conditions
- Older or Unmanaged Ponds

Slow Start may also be used at any time during the season when a system restart is required.

9. Basic Terms Used in This Manual

Slow Start Cycle: A 15-day startup process that gradually increases compressor run time.

Allowed to Run: The controller allows the compressor to run.

Inhibited: The controller is intentionally preventing the compressor from running.

Time Clock: A scheduling system that can allow or block compressor operation based on programmed events.

Round-the-Clock Mode: A Slow Start mode that divides each hour into an allowed run portion and an off portion.

Day-Centering Mode: A Slow Start mode that creates one operating window per day centered around midday.

RTC: Real-Time Clock. This keeps the current date and time

Pass-Through: The controller is not currently inhibiting compressor operation and is allowing power to pass through the relay, allowing normal operation.

Duty Cycle: The percentage of time the controller allows the compressor to run during a given period. For example, a 25% duty cycle means the compressor runs for 25% of the time and is off for the remaining 75%. During Slow Start, the duty cycle gradually increases until full-time operation is reached.

10. Slow Start Overview

The same 15-day progression is used for both Slow Start modes.

Day	Allowed %
1	1.0%
2	1.5%
3	3.0%
4	5.5%
5	9.1%
6	13.6%
7	19.2%
8	25.8%
9	33.3%
10	41.9%
11	51.5%
12	62.1%
13	73.7%
14	86.4%
15	100.0%

The Slow Start progression is fixed and based on empirical testing and input from aquatic biology experts. The curve is intentionally conservative in the early days and increases smoothly over time.

11. What Happens When a Slow Start Cycle Is Started

The controller enters Slow Start Active mode
The current day is set to Day 1
The selected Slow Start mode is locked in
The controller begins following the Slow Start schedule
The compressor is allowed to run only during the allowed portions of that schedule

All Slow Start parameters including current day, timing, and state are stored in non-volatile memory and will resume from the same point after a power interruption.

When a Slow Start cycle is active, the selected mode is locked.

To change modes, cancel the active cycle, change the mode, and start a new Slow Start cycle.

12. Time Clock Interaction During Slow Start

When a Slow Start cycle is active, the Slow Start cycle controls compressor scheduling and the Time Clock is disabled. Once the Slow Start cycle is complete or canceled, the controller returns to normal operation based on the current Mode and Time Clock setting.

Time Clock functions are disabled during Slow Start to ensure the integrity of the controlled startup process.

13. Choosing a Slow Start Mode

Round-the-Clock Mode

This mode spreads the allowed run time across the full day in repeating hourly segments. It is the default out-of-box mode and does not require the controller date and time to be set before use.

Minimum ON duration during Slow Start is approximately 36 seconds per hour (Day 1). Minimum OFF duration is greater than 59 minutes per hour during early stages.

Behavior:

When the controller and aerator are first powered on, the compressor will be running. When a cycle is initiated in Round-the-Clock Mode, the compressor will continue to run for 36 seconds and then shut off for the remainder of the hour. It will repeat this process every hour in an ever-expanding pattern for 14 days. On Day 15, the controller will have reached 100% Duty Cycle and allow uninhibited compressor function.

Day-Centering Mode

This mode places the allowed run time into one daily operating window centered around midday.

It **requires** the controller date and time to be set correctly before use.

Dashboard → Settings → Set Date & Time

Behavior:

When the controller and aerator are first powered on, the compressor will be running. When a cycle is initiated in Day-Centering Mode, the compressor will continue to run IF the current Time of Day is within the mid-day run window.

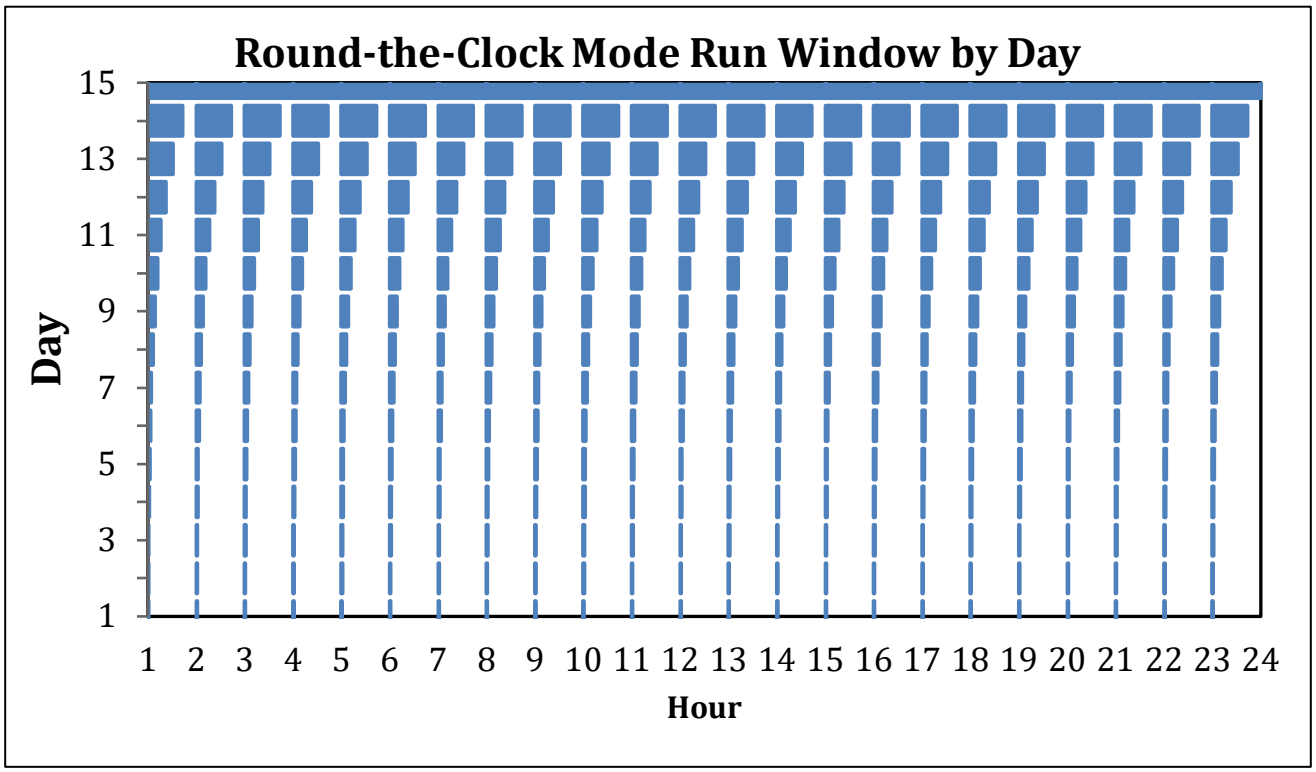
If the Current Time of Day is outside of the Day 1 Run Window, the compressor will immediately shut off. The compressor will turn on for the Day 1 Run Duration once the Real-Time Clock reaches the beginning of the Day 1 Run Window.

The Day 1 Run Window begins at Noon – 7min, 12sec and continues until Noon + 7min, 12sec.

It will repeat this process every hour in an ever-expanding pattern for 14 days. On Day 15, the controller will have reached 100% Duty Cycle and allow uninhibited compressor function.

14. Slow Start Mode 1: Round-the-Clock

In Round-the-Clock mode, each hour is divided into an allowed run portion and an off portion. This pattern repeats every hour. The cycle timer is set to zero when the cycle is initiated and does not rely on the actual time of day.



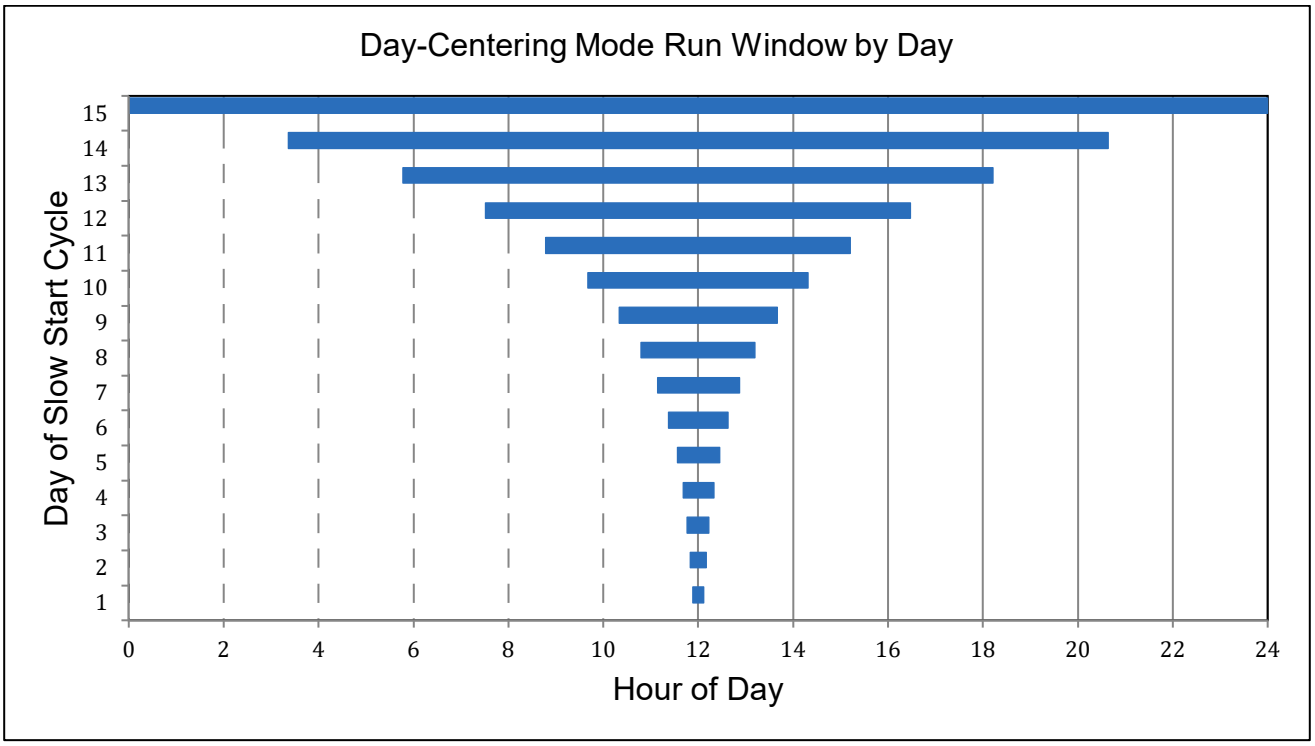
15. Round-the-Clock Run-Time Chart

Day	Duty %	Run Time Each Hour	Off Time Each Hour
1	1.0%	36 sec	59 min 24 sec
2	1.5%	54 sec	59 min 6 sec
3	3.0%	1 min 48 sec	58 min 12 sec
4	5.5%	3 min 18 sec	56 min 42 sec
5	9.1%	5 min 28 sec	54 min 32 sec
6	13.6%	8 min 10 sec	51 min 50 sec
7	19.2%	11 min 31 sec	48 min 29 sec
8	25.8%	15 min 29 sec	44 min 31 sec
9	33.3%	19 min 59 sec	40 min 1 sec
10	41.9%	25 min 8 sec	34 min 52 sec
11	51.5%	30 min 54 sec	29 min 6 sec
12	62.1%	37 min 16 sec	22 min 44 sec
13	73.7%	44 min 13 sec	15 min 47 sec
14	86.4%	51 min 50 sec	8 min 10 sec
15	100.0%	60 min	0 min

16. Slow Start Mode 2: Day-Centering

Important: The controller's date and time must be set correctly before using Day-Centering mode.

If the RTC becomes invalid during operation, Day-Centering mode will stop.



In Day-Centering mode, the controller creates one operating window per day centered around midday. Outside that window, the compressor is inhibited.

17. Day-Centering Run-Time Chart

Day	Total Allowed Run Time Per Day
1	14 min 24 sec
2	21 min 36 sec
3	43 min 12 sec
4	1 hr 19 min 12 sec
5	2 hr 11 min 2 sec
6	3 hr 15 min 50 sec
7	4 hr 36 min 29 sec
8	6 hr 11 min 31 sec
9	7 hr 59 min 31 sec
10	10 hr 3 min 22 sec
11	12 hr 21 min 36 sec
12	14 hr 54 min 14 sec
13	17 hr 41 min 17 sec
14	20 hr 44 min 10 sec
15	24 hr

18. Examples of Slow Start Operation

Out-of-box use:

Round-the-Clock mode starts immediately upon a 3-second button press and the compressor runs continuously after the cycle is completed and no timer programming exists.

Time Clock MANUAL ON:

After the cycle ends, the compressor returns to continuous operation.

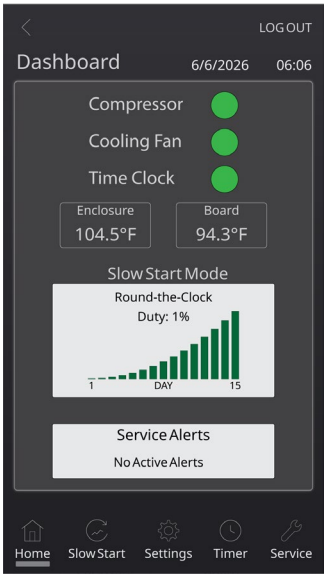
Time Clock MANUAL OFF:

After the cycle ends, the compressor does not run.

AUTO with timer events:

After the cycle ends, the controller follows programmed events.

18. Dashboard Page

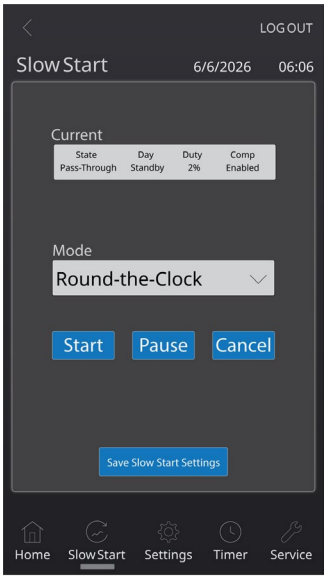


The Dashboard is the main overview page and is usually the best place to check first.

It may show compressor status, Time Clock status, Slow Start status, current day, current duty percentage, the Slow Start progress graph, external temperature, board temperature, and service alerts.

When Slow Start is active, the progress graph appears and highlights the current day and duty percentage. The graph is visible ONLY while a cycle is active.

19. Slow Start Page



The Slow Start page is where the user views and controls the Slow Start cycle from the web interface.

It shows:

1. Current State
2. Current Day of the cycle (if active)
3. Current Date & Time (if programmed)
4. Duty Cycle Percentage
5. Selected Mode
6. Compressor Enabled/Disabled
7. Start/Pause/Cancel controls.

Day-Centering mode requires the date and time to be set correctly before the cycle is started.

NOTE:

If a High Temperature shutdown occurs during a Slow Start cycle, the cycle is paused and will resume from the same point once the condition clears.

20. Timer Page

The Timer page controls how the Time Clock affects compressor operation when a slow start cycle is NOT currently active.

Modes are **Manual OFF**, **Automatic** and **Manual ON**

To use scheduled operation:

1. Select AUTO
2. Enable the desired event with the slider
3. Press Set/Edit
4. Program the event
5. Save the event

> **NOTE:**
>
> Timer events require a valid RTC. If the RTC is invalid, timer-based operation may not function correctly.

21. Event Pages

- Each timer event has its own setup page.
- At least one day must be selected.
- Both ON and OFF times are required.
- ON time must be earlier than OFF time.
- Overnight events are not allowed and events must not overlap.

Example:

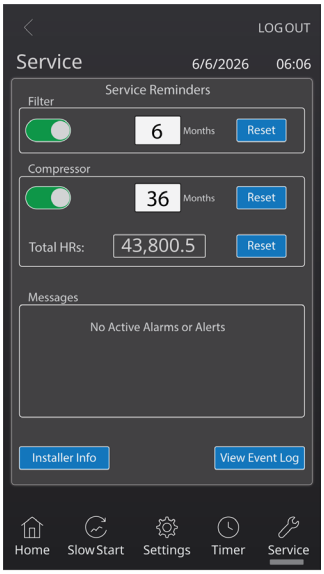
If you'd like an overnight schedule that runs from 8pm to 4am, you can use 2 events to accomplish this.

Event 1: 20:00 → 24:00
Event 2: 00:00 → 04:00

22. Service Page

The Service Page shows the following information:

1. Service Reminders for Filter(s) and Compressor
2. Total Compressor Runtime hours
3. Installer Info access
4. Event Log access.



- The Service Reminder function can be Enabled/Disabled using the corresponding slider.

Service Intervals:
The default Service Reminder Interval is 6 months for filter(s) and 36 months for Compressor re-build / replacement. Both values may be adjusted as needed.

Active reminders can be cleared either from the Service page or by pressing the front-panel Start button two quick times. Installer Info, if entered, is always available on this page.

The Event Log is always available to all users.

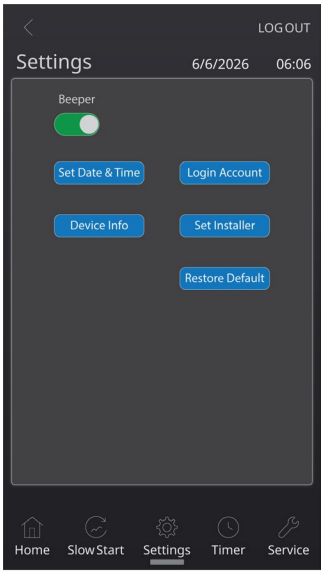
NOTE:
Service reminders are based on calendar time (months), not runtime hours.

Total Hours:
The controller tracks the total elapsed ON time whenever the compressor is enabled. This value should only be reset when the compressor is rebuilt or replaced.

NOTE:

Runtime hours are based on relay ON time and do not verify actual compressor operation.

23. Settings Page



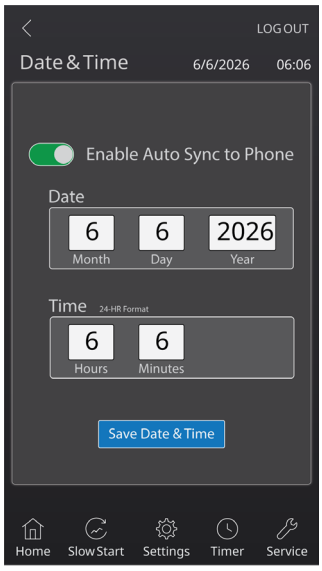
The Settings page is the main menu for configuration and information pages.

It provides access to the following:

1. Set Date & Time
2. Login Account Settings
3. Device Info
4. Enter Installer Information
5. Restore Settings to Factory Default.

24. Date & Time Page

The Set Date & Time page is used to set the controller's internal clock.



Auto Sync to Phone is available for all accounts on all versions and is enabled by factory default.

If the date and time are not set correctly, the controller may not function the way the user expects after the Slow Start cycle is completed.

The controller includes a rechargeable LIR2032 backup battery to retain date and time when main power is removed. Normally, this battery should not need to be replaced. Should replacement be required, **never** replace it with a standard non-rechargeable 2032 battery.

If the RTC becomes invalid:

- Day-Centering mode cannot be started
- Timer events will not function correctly
- Round-the-Clock mode remains fully operational

25. Login Account Page

The Login Account page is used to change the current account username and password.
Default user account: **admin / password**
Default installer account: **installer / password**

NOTE:
If login credentials are forgotten, press and hold the front-panel Start button for 15 seconds to reset both accounts to default values.

26. Device Info Page

The Device Info page shows identification, firmware, and network information such as model number, serial number, firmware version, access point name, MAC address, IP address, feature status, RTC status, and DIP switch states.

27. Event Log Page

The Event Log shows a history of important controller activity and is always available from the Service page.
It may include Slow Start initiated/completed/canceled, RTC updated, timer event saved/cleared, service reminder reset, high temperature shutdown, and external temperature sensor fault.

The Event Log is especially useful if troubleshooting is ever required.

28. Messages and Alerts

Informational messages report normal and/or abnormal operating conditions.

Reminder messages indicate maintenance may be due.

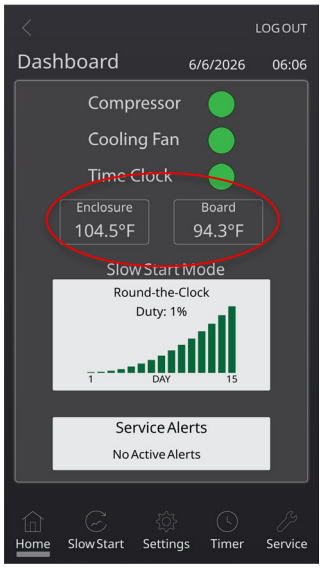
- If installer information has been entered, the message window will show the contact info for the installer when a Service Reminder is active.

NOTE:
On the Universal Slow Start Control, a High Temperature Alarm can occur only if the optional external temperature sensor is installed and enabled.

The External Sensor is standard on the AC-Series OEM version.

RTC INVALID means the real-time clock is not set correctly or is not operating correctly.

29. Temperature Monitoring and Protection



The controller shows board temperature and, if the optional external sensor is installed and enabled, external temperature.

The optional external sensor can monitor a remote compressor enclosure and provide shutdown protection during a High Temp event.

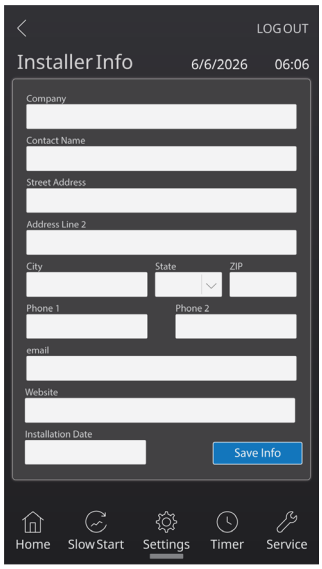
The controller does not create a High Temperature Alarm from the board temperature reading alone.

High Temperature Shutdown Thresholds:

- Trip: 145°F
- Reset: 135°F

Upon reset, the controller automatically resumes operation and any active Slow Start cycle continues from its previous state.

30. Installer Info Page



The Installer Info page allows the installer to store company and contact information inside the controller. This data is stored in Non-Volatile Memory.

If Company Name or Contact Name is entered, Primary Phone must also be entered.

If the form is left blank, the displayed Installer Info will show US Solar Mounts info by default.

31. Restore Defaults

Restore Defaults returns select settings to their factory default values and should be used carefully because it may clear timer settings, user settings, service reminder settings, and other saved configuration values.

32. Troubleshooting

Most operating questions can be answered by checking Dashboard, Slow Start, Timer, Service, and Event Log.

Common causes of the compressor not running include:

1. Slow Start OFF periods
2. Time Clock is OFF
3. Invalid or inactive timer events
4. Active service reminders
5. High Temp shutdown (if the optional external temperature sensor is installed)

Service reminders do not clear automatically.

If the date and time are wrong, timer operation and Day-Centering mode may not work as expected.

If Day-Centering mode will not start, verify that the RTC is set correctly.

33. Quick Reference

Out-of-box use: press and hold the Start button for 3 seconds to begin Slow Start.
First-time web access: connect to USSM-SSCU-XXXX, open 192.168.4.1, and log in.
Main navigation:

Dashboard → Settings → Set Date & Time
Dashboard → Slow Start
Dashboard → Timer
Dashboard → Service.

34. Closing Notes

The US Solar Mounts Universal Slow Start Control is designed to make compressor startup easier to manage, easier to understand, and safer to operate.

- For installers, entering Installer Info is strongly recommended and encourages return business.
- For all users, setting the correct date and time is strongly recommended even if the controller is first used in default Round-the-Clock mode.
- For installers, the controller provides a fail-safe method of managing aeration startup, reducing the risk of fish kill events and associated liability.
- For end users, the system provides an easy and reliable method to safely bring an aeration system online.