

1.0	TMAC Tracker Controller Operations	3
1.1	Overview.....	3
1.2	Safety Procedures	4
1.2.1	Radio Frequency Safety.....	4
1.2.2	Electric Static Discharge	4
1.2.3	Shock Hazards	4
1.3	Pre-Commissioning Steps	5
1.3.1	Installing the Mitty® Application	5
1.3.2	Identifying Coordinator TMAC Units.....	7
1.3.3	Numbering TMAC Nodes In A Network	8
1.3.4	Setting Inclinator Offset.....	8
1.4	Setting Parameters and Verifying Functionality	9
1.4.1	Setting System Parameters	9
1.5	Commissioning Procedure	16
1.5	Remote Access	20
1.5.1	Overview of Control Interface and Capabilities.....	20
1.5.2	Accessing the TMAC Admin Server.....	20
1.5.2.1	Logging In	20
1.5.2.2	Viewing Customer Site Information.....	22
1.5.2.3	Viewing Network Information	25
1.5.2.4	Viewing TMAC Unit Information.....	26
1.5.2.5	Using the Graph.....	28
1.5.2.6	Viewing System Status	32
1.5.2.7	Viewing Controller Events.....	34
1.5.2.8	Sending Remote Updates.....	36
1.5.2.9	Viewing Recent Updates.....	38
1.5.2.10	Viewing Alerts	39
1.5.2.11	Viewing and Managing Customer Information.....	42
1.5.2.12	Viewing and Managing Site Information	44
1.5.2.13	Viewing and Managing Network Information	48

1.5.2.14	Viewing and Managing Units Information	50
1.5.2.15	Viewing Messages	52
1.5.2.16	Viewing Message Types	54
1.5.2.17	Viewing and Managing User Information	55
Appendix A:	Message Types	58
A.1	System Status: (101).....	58
A.2	Inclinometer Status (102)	59
A.3	Wireless 1 Status (103).....	60
A.4	Wireless 2 Status (104)	61
A.5	Wireless 3 Status (105).....	62
A.6	Operating System Status (106).....	63
A.7	GPS Status (107)	63
A.8	A/D Status (108).....	64
A.9	DIO Status (109).....	64
A.10	Motor Status (110)	65
A.11	Settings 1 Status (114)	66
A.12	Settings 2 Status (115)	67
A.13	Server Status (116).....	67
A.14	Tracker Status (117)	68

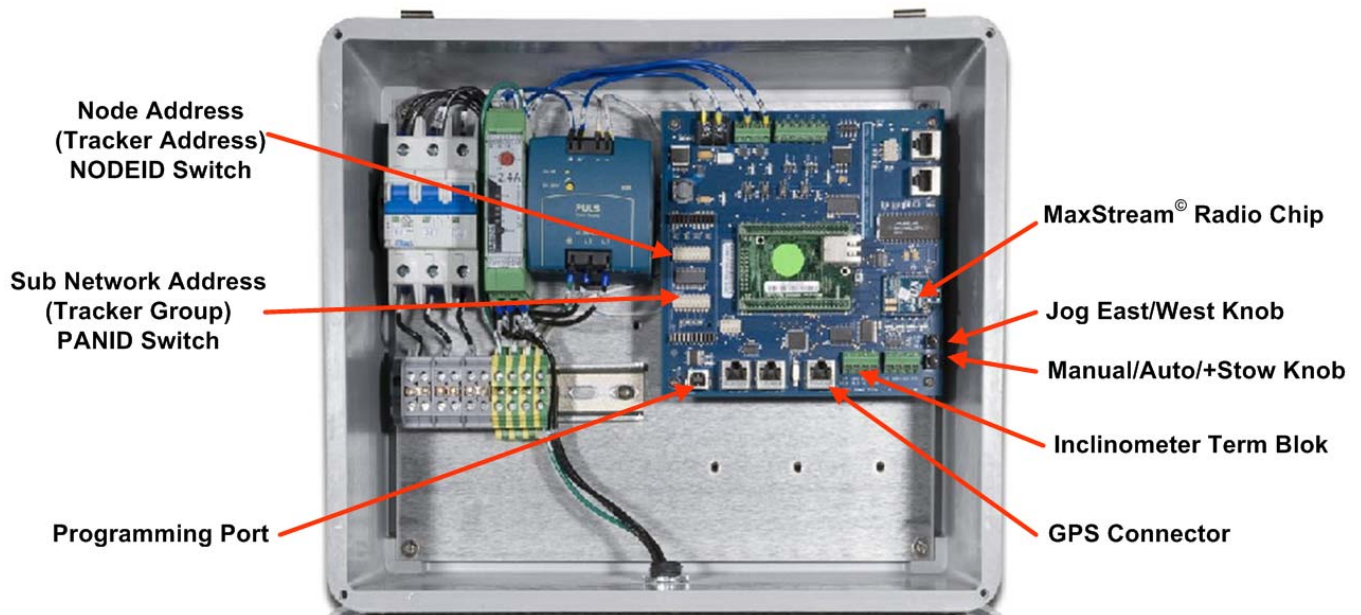
1.0 TMAC Tracker Controller Operations

1.1 Overview

The Tracker Monitoring and Control (“TMAC”) Advanced Tracker Controller controls the extension of the drive unit, which changes the rotation of the torque tubes and the position of the modules. By optimizing the angle of incidence between the sun and the modules, the system captures as much as 35% more sunlight than non-tracking solar electric systems.

The TMAC controller has full remote control capability that allows for stowing in adverse weather condition, equipment monitoring, and system optimization.

Here is an inside view of the TMAC controller:



TMAC Tracker Controller

1.2 Safety Procedures

Important! All personnel must adhere to the following safety procedures when working on the TMAC controller. These operating instructions are for use by qualified personnel only.

1.2.1 Radio Frequency Safety

- The design of the TMAC controller complies with the updated standard for safety levels with respect to human exposure to Radio Frequency (RF) signals adopted by the Federal Communications Commission (FCC) in August 1996. The hybrid standard consists of the existing standards of the Institute of Electrical and Electronic Engineering (IEEE) and the American National Standards Institute (ANSI), and its guidelines are published by the National Council of Radiation Protection (NCRP).
- Currently, the TMAC controller product is in the process of complying with the requirements of the FCC Radio Frequency Emission Guidelines and for FCC certification.

1.2.2 Electric Static Discharge

Warning! Static buildup and electrical discharge can damage the TMAC controller.

The avoid static buildup or discharge into the equipment:

- Before touching or connecting a laptop to the TMAC controller, SunPower recommends to discharge the laptop and yourself by simultaneously holding your laptop and grounding yourself to a metal service that is connected to the earth ground.
- Use a grounding strap when working on the TMAC control board.
- Use a grounding mat when working on the TMAC controller.

1.2.3 Shock Hazards

Warning! Lethal voltage is present in the TMAC control box. Use appropriate Personal Protection Equipment (PPE) when working on the equipment.

- The TMAC controller is designed to operate at 380 VAC–480 VAC 3-Phase power. Other voltages are not compatible.
- The TMAC controller is designed with finger guards to protect the user from electrical shock. However, SunPower requires that all personnel working on the equipment wear rubber insulating gloves.
- Ensure you avoid shocking the components on the controller circuit board.

1.3 Pre-Commissioning Steps

To ensure proper and efficient commissioning of each TMAC controller installed in a site, perform the pre-commissioning steps in this section.

1.3.1 Installing the Mitty[®] Application

To access the TMAC controller locally, the laptop you connect must have the Multi-Threaded TTY (“Mitty[®]”) application installed. The Mitty application—an RS-232 serial terminal program developed by Microsoft[®] and modified by Netburner[®]—is used as the main command prompt controller page.

To download a free copy of the Mitty application:

1. Navigate to the NetBurner website www.netburner.com
2. On the NetBurner home page, hover your mouse over the **Support** tab.
3. Click *Public Downloads* in the **Support** tab drop-down menu (Fig. 1).

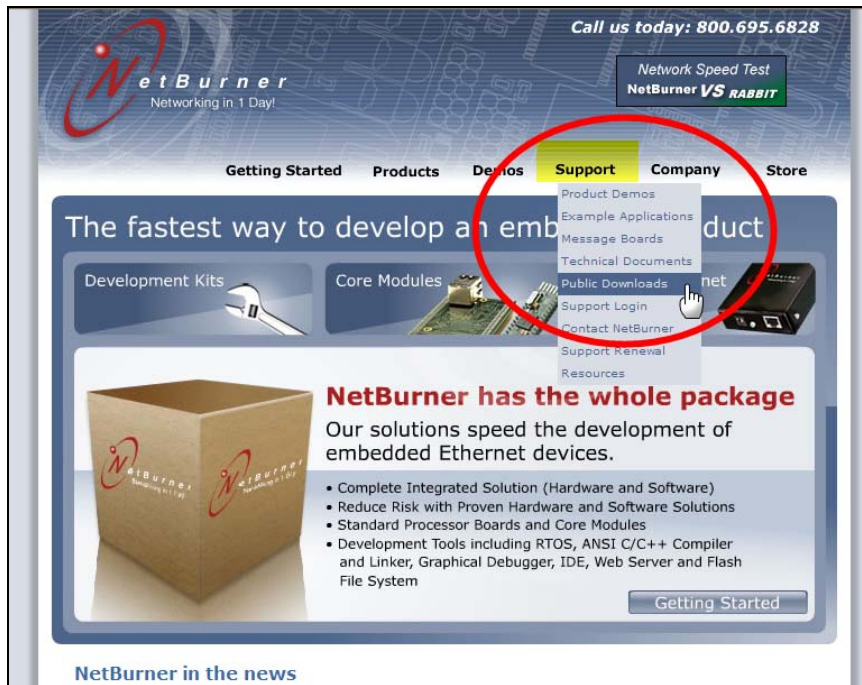


Fig. 1

4. On the Public Downloads page, locate the NetBurner RS-232 Terminal Program in the **NetBurner Utilities** section and click the **Download application** link (Fig. 2).

Home > Support > Public Downloads

Public Downloads

All of the downloads in this section are freely distributable so long as they are used on NetBurner hardware.

Product specific documentation
For additional documentation (Application notes, white papers, and FAQ) please visit your specific [product's page](#).

NetBurner Development Tools Updates*
Download the [latest tools release](#)

*Registration and valid support agreement required.

SB72 Ethernet to Serial Application


This section is intended for SB series users who are using the SB factory application. If you are using a Serial to Ethernet Network Development Kit (NNDK) these utilities are included with the kit.

- To quickly and easily configure your SB72 device, download the latest version of the [IPSetup program](#) located in the NetBurner Utilities section below.
- To update your SB to the latest revision of the SB Serial to Ethernet application, download the [AutoUpdate utility](#) in the NetBurner Utilities, and the latest revision of the SBXX application program on the specific [serial to Ethernet](#) board or device product page. For example, go to the [SB72 product page](#) to find its version of the SB72 application program in the software section.
- Download the latest revision of the SBXX Ethernet to Serial Application Program. You can find the serial application program on the product page specific to your SB series device. All the SB device pages can be found on the [Serial to Ethernet](#) web page. After downloading the application, run AutoUpdate to reprogram the flash memory of the SBXX.

NetBurner Utilities


UDP Terminal
The NetBurner UDP Terminal Application [Download Application](#)

NetBurner TFTP Server




NetBurner TFTP Server Program
[Download application](#)

NetBurner IPSetup Tool



IPSetup updates and displays static and DHCP assigned addresses
[Download application](#)

NetBurner AutoUpdate Tool




Download the AutoUpdate utility to enable application upgrades to flash memory.
[Download application](#)

NetBurner Java Server

JAVA UDP Server Example Code (Runs on Windows)
[Download application](#)

NetBurner RS-232 Terminal Program



MTTTY (Multi-Threaded TTY) is an easy to use high performance RS-232 serial terminal program.
[Download application](#)

Fig. 2

- Click *Run* in the **File Download** window to automatically install the program.
- The Mitty application icon should appear on your desktop.

To start the Mitty application, refer to Section **1.4.1**.

1.3.2 Identifying Coordinator TMAC Units

Refer to the project plans to identify which TMAC unit is assigned to function as the “coordinator”—that is, the TMAC node designated to manage the flow of communications for its associated network. The coordinator TMAC unit is hard-wired with Ethernet cable to a site network access point, typically located at the closest inverter station.

Verify that the coordinator TMAC unit has the specially labeled MaxStream® radio chip (Fig. 3). If an incorrect radio chip is installed, remove it and replace with the special coordinator chip.

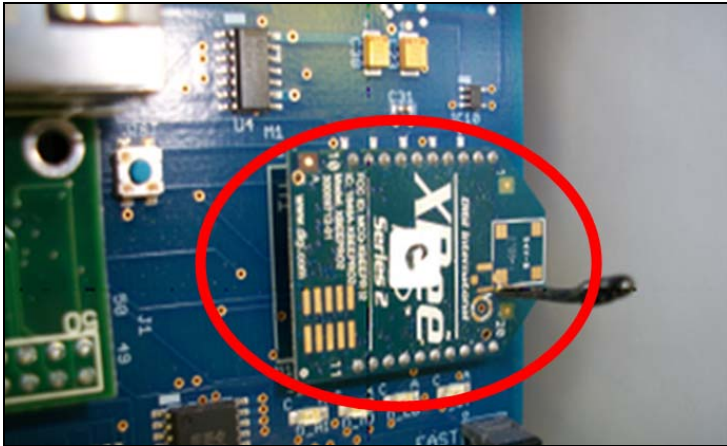
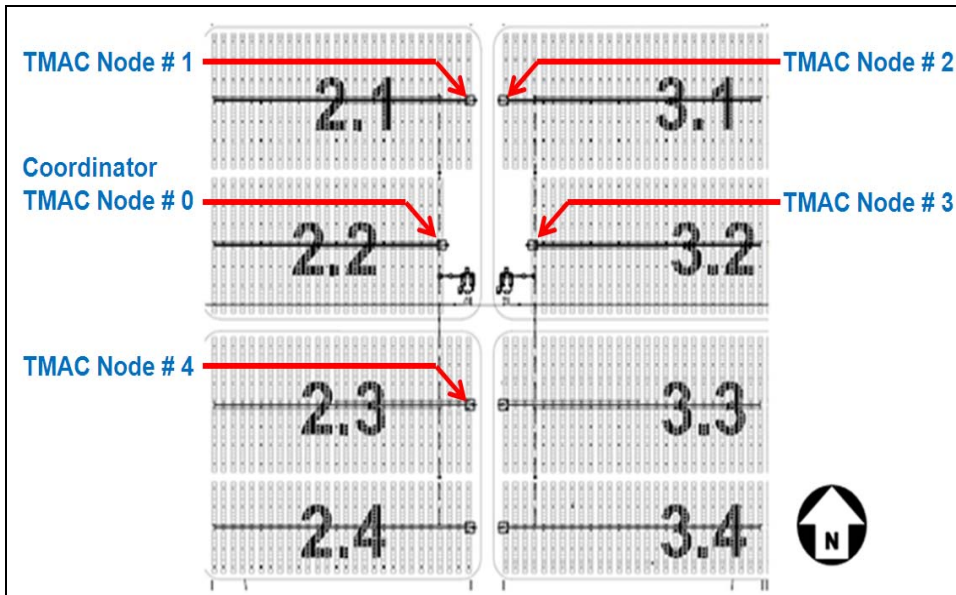


Fig. 3

1.3.3 Numbering TMAC Nodes In A Network

Each TMAC unit in a network must be identified by a node number that is a digit from 0 to 9. By default, the coordinator TMAC unit is always assigned node number 0. Assign a node number to each noncoordinator TMAC unit by numbering each of the controller box locations NW→SE. Refer to the following sample diagram for illustration.



TMAC Node Numbering sample diagram

1.3.4 Setting Inclinometer Offset

After you install the controller and before verifying the east and west limits the system inclinometer offset must be set for a flat PV array. After completing the offset adjustment the east and west limits can be verified.

1.4 Setting Parameters and Verifying Functionality

You must enter all of the parameters and perform all the verifications for *each* TMAC controller on the site. This data is stored in non-volatile memory within the TMAC memory.

1.4.1 Setting System Parameters

To set the system parameters for each TMAC controller:

1. Power down the controller.
2. Refer to the project plans for the Sub Network Address Pan ID.
3. Configure the **Sub Network Address PANID Switch** (Fig. 4):

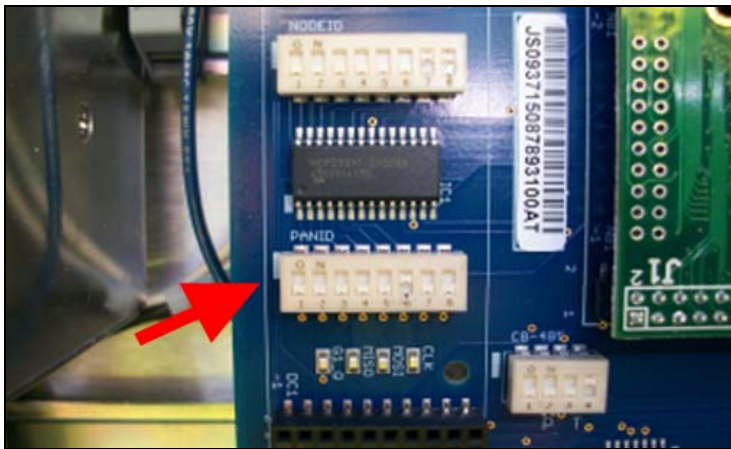


Fig. 4

- On the coordinator TMAC unit, set the binary switches to `00000000` (that is, all switches are down).
- For noncoordinator TMAC units, refer to the following table for the binary switch position.

Decimal (Node Number)	Binary Switch Position
1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
9	00001001
10	00001010

5. Configure the **Node Address NODEID Switch** (Fig. 5):

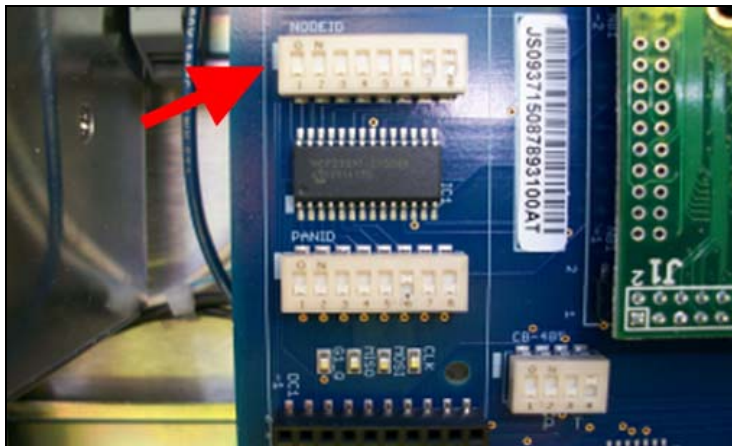


Fig. 5

- On the coordinator TMAC unit, set the binary switches to *00000000*.
- For noncoordinator TMAC units, refer to the following table for the binary switch position.

Decimal (Node Number)	Binary Switch Position
1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
9	00001001
10	00001010

- Record the controller's Mac address and the PCB Number on the commissioning form (Fig. 6). The Mac address and the PCB number are used to assign the controller to a site on the TMAC Admin Server.



Fig. 6

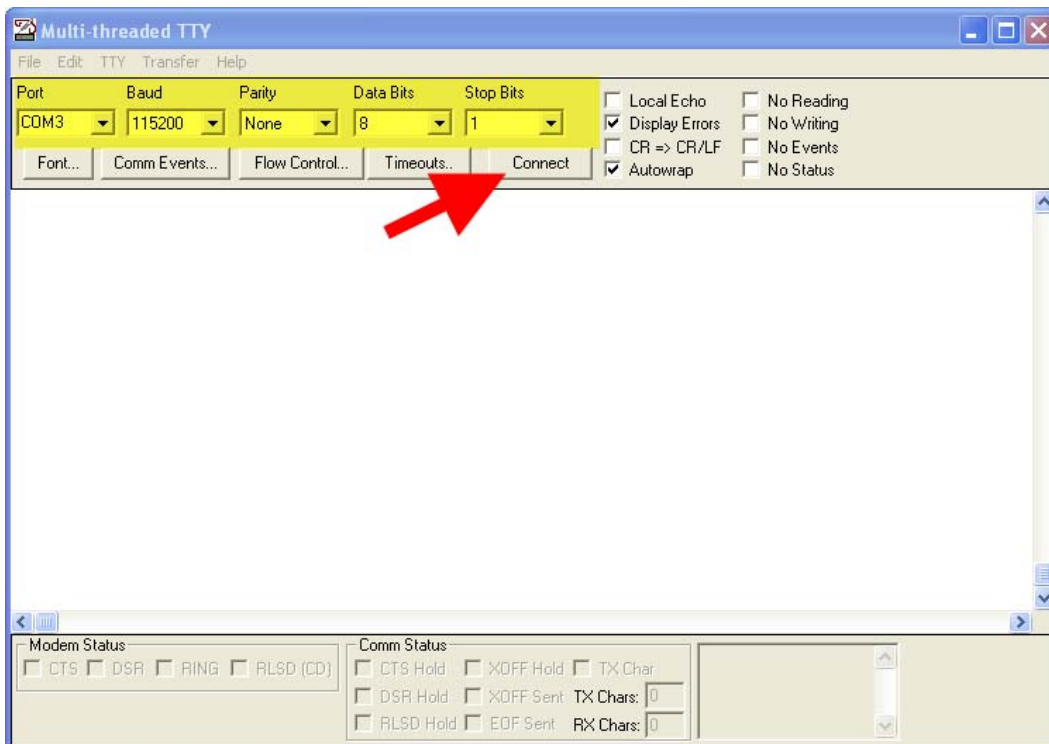
- Power up the controller.
- Use the USB A to USB B cable assembly to connect the laptop to the controller through the **Programming Port**.

9. Start the Mitty application.
10. The Multi-threaded TTY screen opens.
 - a. If not already entered, select the following Bits values in the respective fields:

Field	Value
Port	The COM Port you use in your computer
Baud	115200
Parity	None
Data Bits	8
Stop Bits	1

Important! To find the COM port number, open the **Device Manager** window on your laptop. Click *Start*, right-click *My Computer*, select *Properties*, click *Hardware* in the **System Properties** dialog box, and click *Device Manager*. If you're unable to get a port in the Multi-threaded TTY screen, restart the Mitty application and look for a new port in the **Port** drop-down list. Instructions on fixing the changing port issue is soon to be released.

- b. Click *Connect*.



Multi-threaded TTY screen

11. In the bottom left of the screen, a prompt appears (Fig. 7). The prompt indicates the Sub Network and Node ID being accessed, and the software programmed into the TMAC unit.

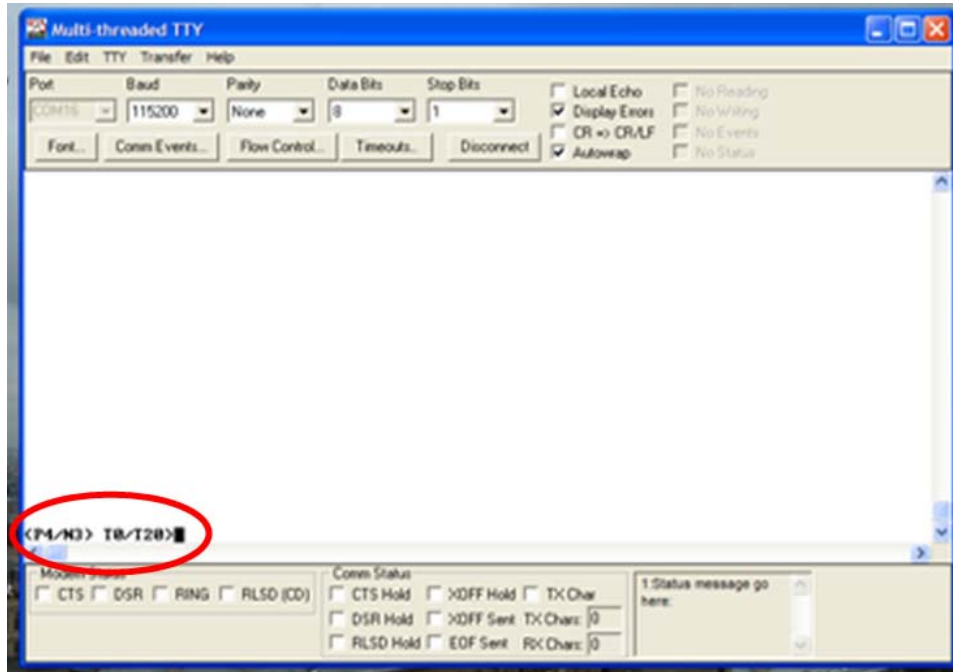


Fig. 7

12. Enter the following site parameters in any sequence:

Parameter	Description	Value
Mount	Refers to the side of the array on which the drive unit is installed	<ul style="list-style-type: none"> Enter <i>spmw</i> for WEST Mount Enter <i>spme</i> for EAST Mount.
Ground Coverage Ratio (GCR) (East/West)	The percentage of total ground surface taken up by the system when viewed from above with the modules flat. A smaller GCR means that modules are proportionally farther apart. GCR should typically be in the range of 0.35 for a ground-mounted system, and 0.50 for an elevated system.	Enter <i>spe.5</i> for a GCR of 0.50
GCR (North/South)	(Not used at this time)	
Stow Position (East/West)	A programmable position. This represents the number of degrees at which the modules are positioned and at which they remain overnight and during bad weather.	<ul style="list-style-type: none"> Enter <i>spsp5</i> (5° west bound Stow) Enter <i>spsp-5</i> (5° east bound Stow)

Stow Position (North/South)	(Not used at this time)	
North/South Torque Tube Slope	The slope of the fully installed torque tubes. The value is positive when the south end of the array is lower than the north.	<ul style="list-style-type: none"> • Enter <i>t1p5</i> (5° sloping to the South) • Enter <i>t1p-5</i> (5° sloping to the North)
East/West Site Slope	The E–W slope of the site on which the system is installed. The value is positive when the drive strut slopes downward toward the east.	<ul style="list-style-type: none"> • Enter <i>t1r5</i> (5° sloping to the East) • Enter <i>t1r-5</i> (–5° sloping to the West)
North/South Misalignment	The number of degrees by which the torque tube alignment is off from true N–S. If the value is positive, the tube alignment is clockwise from true N–S when assessed from overhead.	<ul style="list-style-type: none"> • Enter <i>t1y5</i> (5° to the East) • Enter <i>t1y-5</i> (5° to the West)
Inclinometer Calibration	The difference between the controller inclinometer reading and the digital level measurement for the tilt angle. This offset is expressed as a numerical value (after the space).	Enter <i>m1o 5</i>

Important! The coordinator TMAC units are equipped with a GPS device that will automatically set the longitude, latitude, and time for all controllers on the subnetwork.

13. Verify that all the entered data parameters are correct.

a. To verify all site parameters, enter “SP?” (Fig. 8).

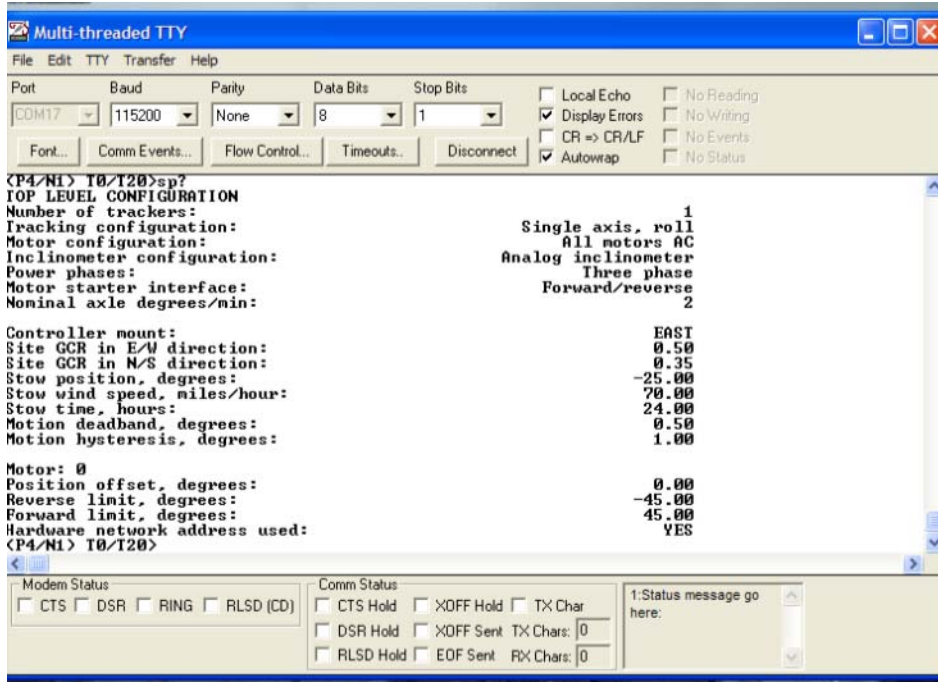


Fig. 8

b. To verify tracker status (Fig. 9), enter “TS?”.

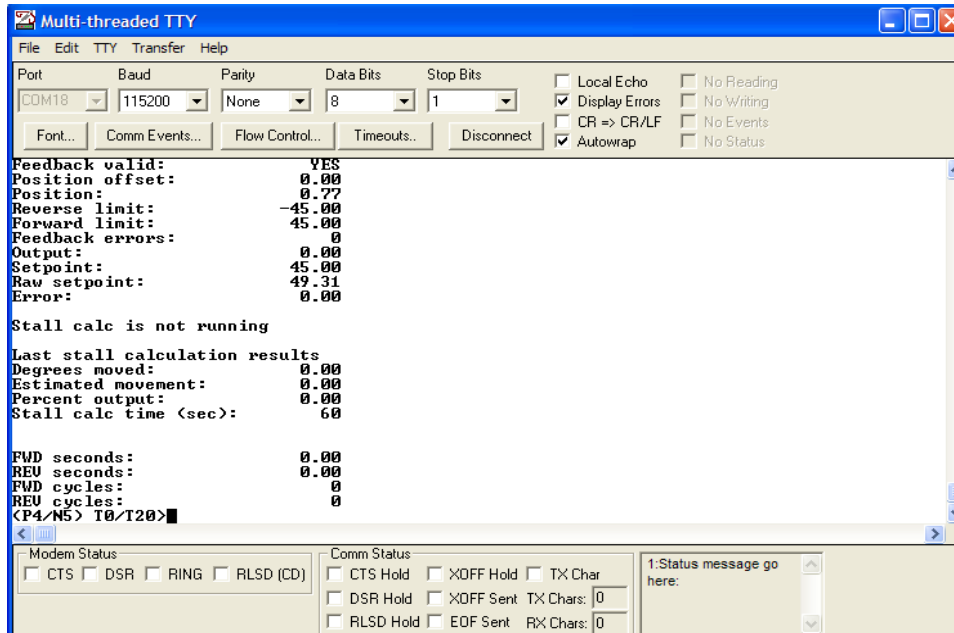


Fig. 9

14. To store the data parameters in the non-volatile memory, enter “fw” and press the **Return Key**.

15. To test the entered data:

- a. Power down the controller.
- b. Wait 10 seconds before powering the controller back up.
- c. Check the data parameters in the Multi-threaded TTY screen (refer to Step 12).

1.5 Commissioning Procedure

Warning! Lethal voltage is present in the TMAC control box. All personnel must use appropriate PPE when performing steps that require work on the TMAC controller.

To commission the TMAC controller:

1. Verify voltage on line side of breaker/disconnect.
2. Refer to the project plans for the Sub Network Address Pan ID or the address of the group of TMAC units that include the controller to be commissioned.
3. Configure the **Sub Network Address PANID Switch** (Fig. 10).

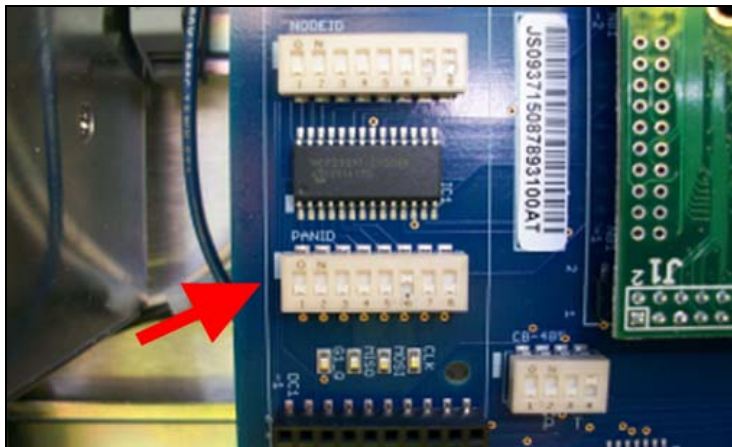


Fig. 10

- On the coordinator TMAC unit (Node 0), set the binary switches to *00000000*—that is, all switches are down.
- For the other TMAC nodes, refer to the following table for the binary switch position.

Decimal (Node Number)	Binary Switch Position
1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
9	00001001
10	00001010

4. Configure the **Node Address NODEID Switch** (Fig. 10).

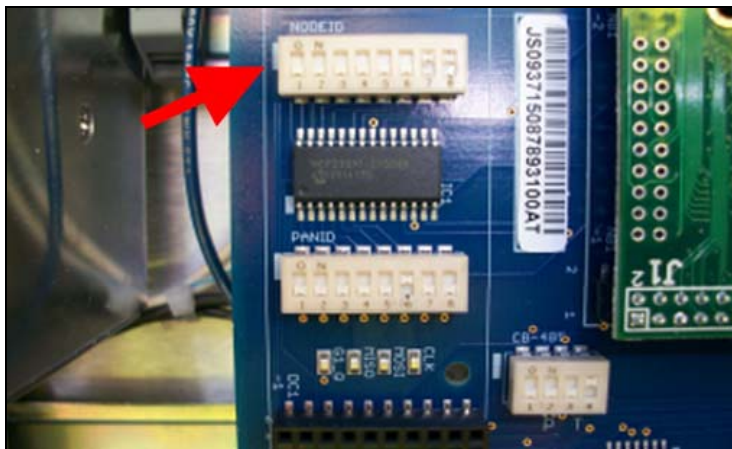


Fig. 10

- On the coordinator TMAC unit (Node 0), set the binary switches to *00000000*.
- For the other TMAC nodes, refer to the following table for the binary switch position.

Decimal (Node Number)	Binary Switch Position
1	00000001
2	00000010
3	00000011
4	00000100
5	00000101
6	00000110
7	00000111
8	00001000
9	00001001
10	00001010

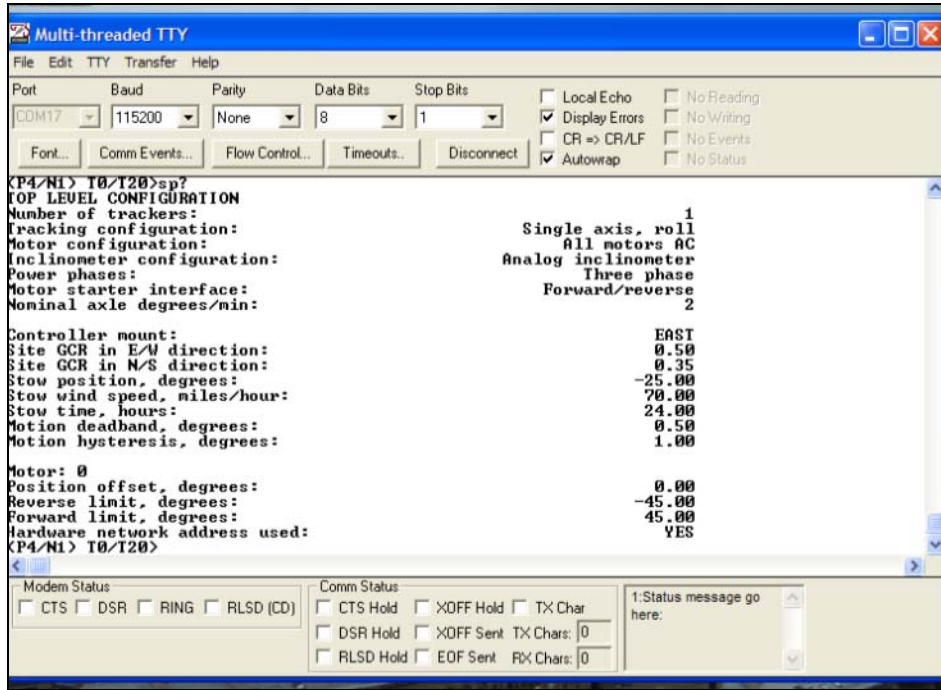
- Record the controller's Mac address and the PCB Number on the commissioning form (Fig. 11). The Mac address and the PCB number are used to assign the controller to a site on the TMAC Admin Server.



Fig. 11

- Close the breaker/disconnect.
- Use the USB A to USB B cable assembly to connect the laptop to the controller through the **Programming Port**.

8. Start the Mitty application.
9. In the Multi-threaded TTY screen, enter "SP?" to check the site parameters.



Multi-threaded TTY screen

10. Adjust if necessary tracker mounting, Check motor direction with in manual mode.
11. Using the TMAC controller in manual mode move the array to Flat.
12. Adjust inclinometer offset.
13. Verify East and West limit switches
14. Verify and adjust GCR
15. Verify and adjust Stow
16. Verify and adjust Site Slope
17. Verify and adjust Torque Tube Slope
18. Verify and adjust North/South Misalignment
19. Verify all setting and Program Memory by entering "fw" press Return
20. Set mode switch to "Auto"

1.5 Remote Access

1.5.1 Overview of Control Interface and Capabilities

Remote access to the TMAC controller enables better control of the entire network. By accessing the TMAC Admin Server, you can perform the following tasks:

- Stowing the array
- Checking array status
- Accessing weather data
- Accessing temperature readings for each TMAC controller
- Carrying out advanced control functions with outside data
- Performing advanced maintenance functions
- Generating email reports

Note. Most of these functions are add-ons and chargeable to our customers.

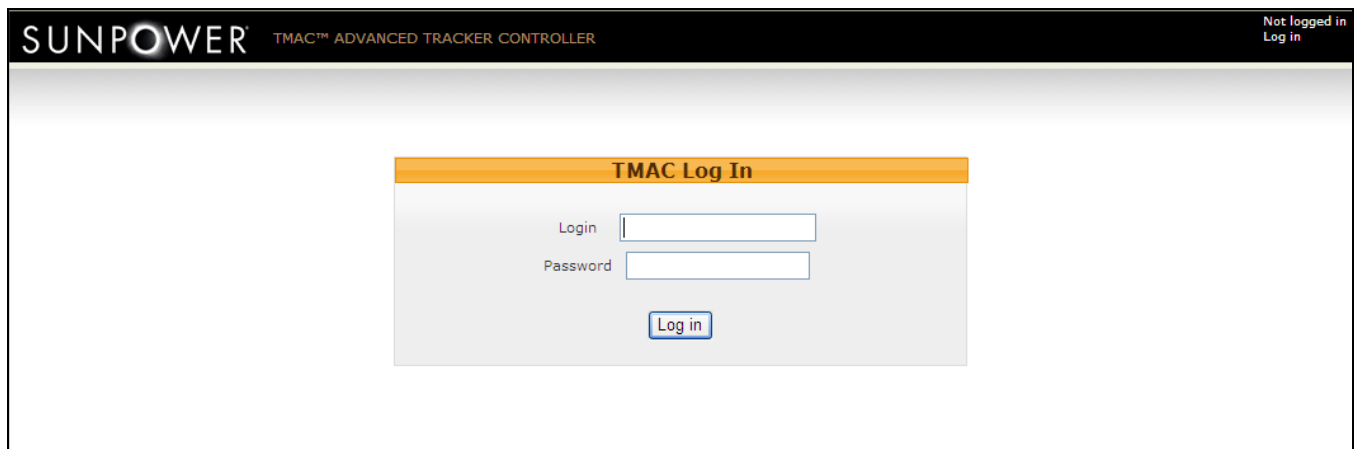
1.5.2 Accessing the TMAC Admin Server

To access the TMAC Admin Server, you need login information. Contact the Engineering Department to have an account set up for you.

1.5.2.1 Logging In

To log in to the server:

1. Navigate to the TMAC Admin Server website <http://tmac.sunpowermonitor.com>
2. On the TMAC Log In page, enter your username and password in the **Login** and **Password** fields, respectively and click *Log in*.



The screenshot displays the TMAC Log In page. At the top left, the SunPower logo is visible, followed by the text 'TMAC™ ADVANCED TRACKER CONTROLLER'. In the top right corner, it says 'Not logged in' and 'Log in'. The central part of the page contains a white box with a yellow header that reads 'TMAC Log In'. Inside this box, there are two input fields: 'Login' and 'Password', each with a small blue eye icon to its right. Below these fields is a blue 'Log in' button.

[TMAC Log In page](#)

Note. Passwords are case sensitive.

3. The TMAC Dashboard page appears. This page is the TMAC main page.

SUNPOWER TMAC™ ADVANCED TRACKER CONTROLLER Logged in as isay (Log out)

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Options Search

UNITS WITH PROBLEMS DURING THE LAST 24 HOURS:

- SUNPOWER, INC.**
 - Sonoma Alpha Site TZ:-08:00
 - Rancho California Water District TZ:-08:00
 - Inland Empire RP-5 TZ:-08:00
- UNCATEGORIZED UNITS
 - Uncategorized units TZ:-08:00
- SUNPOWER, INC. (R&D)
 - HQ TZ:-08:00
 - Elverta TZ:-08:00
 - QTP TZ:-08:00

SunPower, Inc.
Sonoma Alpha Site TZ:-08:00
 🚩 2: Center-West (M0338_AREA01_TRK02 PN:1/2)
 🚩 1: North-West (M0338_AREA01_TRK01 PN:1/1)
 🚩 3: South-West (M0338_AREA01_TRK03 PN:1/3)

SunPower, Inc.
Rancho California Water District TZ:-08:00
 🚩 00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)

SunPower, Inc.
Inland Empire RP-5 TZ:-08:00
 🚩 Pan: 1, Node: 7 (M0614_AREA01_TRK09 PN:1/7)
 🚩 Pan: 1, Node: 6 (M0614_AREA01_TRK10 PN:1/6)
 🚩 00:13:a2:00:40:54:f7:6f (M0614_AREA01_TRK11 PN:1/5)

Uncategorized units
Uncategorized units TZ:-08:00
 🚩 00:13:a2:00:40:54:f7:ac (PN:3/7)
 🚩 00:13:a2:00:40:54:f7:be (PN:3/1)
 🚩 00:13:a2:00:40:54:f7:9e (PN:3/5)
 🚩 00:13:a2:00:40:4c:1b:00 (PN:3/7)

SunPower, Inc. (R&D)
HQ TZ:-08:00
 🚩 0: North (PN:1/0)
 🚩 1: South (PN:1/1)
 🚩 Hammer prototype (PN:1/7)
 🚩 0: R&D lab (PN:1/0)
 🚩 2: R&D lab (PN:1/2)
 🚩 1: R&D lab (PN:1/1)
 🚩 00:13:a2:00:40:3a:43:52 (PN:1/0)
 🚩 00:13:a2:00:40:4c:1b:02 (PN:3/0)
 🚩 00:13:a2:00:40:3a:4c:41 (PN:3/0)

SunPower, Inc. (R&D)
Elverta TZ:-08:00
 🚩 East (coordinator) (PN:4/0)
 🚩 West (PN:4/9)

SunPower, Inc. (R&D)
QTP TZ:-08:00
 🚩 00:13:a2:00:40:54:f7:c3 (PN:2/0)
 🚩 00:13:a2:00:40:54:f7:b7 (PN:2/1)
 🚩 00:13:a2:00:40:54:f7:a3 (PN:2/2)
 🚩 00:13:a2:00:40:54:f7:7c (PN:2/3)
 🚩 00:13:a2:00:40:54:f7:a8 (PN:2/4)
 🚩 00:13:a2:00:40:3c:35:38 (PN:2/5)
 🚩 00:03:F4:03:F6:52 (PN:2/0)

Hover over a unit to view the issue summary.

TMAC Dashboard page

1.5.2.2 Viewing Customer Site Information

To view customer site information on the TMAC Dashboard page:

1. In the list on the left side of the page, click the name of the customer site you want to view (Fig. 11).

The screenshot displays the SunPower TMAC Advanced Tracker Controller dashboard. The top navigation bar includes 'DASHBOARD', 'CUSTOMERS', 'SITES', 'NETWORKS', 'UNITS', 'MESSAGES', 'MESSAGE TYPES', and 'USERS'. The user is logged in as 'isay'. The main content area is divided into several sections:

- Left Sidebar:** A list of customer sites under 'SUNPOWER, INC.'. The 'Sonoma Alpha Site TZ:-08:00' is selected and expanded, showing its network 'Sonoma Network 1' and three units with error messages: '2: Center-West (M0338_AREA01_TRK02 PN:1/2)', '1: North-West (M0338_AREA01_TRK01 PN:1/1)', and '3: South-West (M0338_AREA01_TRK03 PN:1/3)'. Other sites listed include 'Rancho California Water District TZ:-08:00', 'Inland Empire RP-5 TZ:-08:00', 'Uncategorized units TZ:-08:00', and 'SUNPOWER, INC. (R&D)' sites like 'HQ TZ:-08:00', 'Elverta TZ:-08:00', and 'QTP TZ:-08:00'.
- Top Right:** A header 'UNITS WITH PROBLEMS DURING THE LAST 24 HOURS:'.
- Right Column:** Detailed views for several sites:
 - Sonoma Alpha Site TZ:-08:00:** Lists three units with error messages: '2: Center-West (M0338_AREA01_TRK02 PN:1/2)', '1: North-West (M0338_AREA01_TRK01 PN:1/1)', and '3: South-West (M0338_AREA01_TRK03 PN:1/3)'.
 - Rancho California Water District TZ:-08:00:** Lists two units with error messages: '00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)' and '00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)'.
 - Inland Empire RP-5 TZ:-08:00:** Lists three units with error messages: 'Pan: 1, Node: 7 (M0614_AREA01_TRK09 PN:1/7)', 'Pan: 1, Node: 6 (M0614_AREA01_TRK10 PN:1/6)', and '00:13:a2:00:40:54:f7:6f (M0614_AREA01_TRK11 PN:1/5)'.
 - SunPower, Inc. (R&D) HQ TZ:-08:00:** Lists five units with error messages: '0: North (PN:1/0)', '1: South (PN:1/1)', 'Hammer prototype (PN:1/7)', '0: R&D lab (PN:1/0)', '2: R&D lab (PN:1/2)', '1: R&D lab (PN:1/1)', '00:13:a2:00:40:3a:43:52 (PN:1/0)', '00:13:a2:00:40:4c:1b:02 (PN:3/0)', and '00:13:a2:00:40:3a:4c:41 (PN:3/0)'.
 - SunPower, Inc. (R&D) Elverta TZ:-08:00:** Lists two units with error messages: 'East (coordinator) (PN:4/0)' and 'West (PN:4/9)'.
 - SunPower, Inc. (R&D) QTP TZ:-08:00:** Lists six units with error messages: '00:13:a2:00:40:54:f7:c3 (PN:2/0)', '00:13:a2:00:40:54:f7:b7 (PN:2/1)', '00:13:a2:00:40:54:f7:a3 (PN:2/2)', '00:13:a2:00:40:54:f7:7c (PN:2/3)', '00:13:a2:00:40:54:f7:a8 (PN:2/4)', '00:13:a2:00:40:3c:35:38 (PN:2/5)', and '00:03:F4:03:F6:52 (PN:2/0)'.

At the bottom of the dashboard, there is a note: 'Hover over a unit to view the issue summary.'

Fig. 11

2. In the collapsed pane below the customer site name, click the site name link to view the site-level details to the right (Fig. 12).

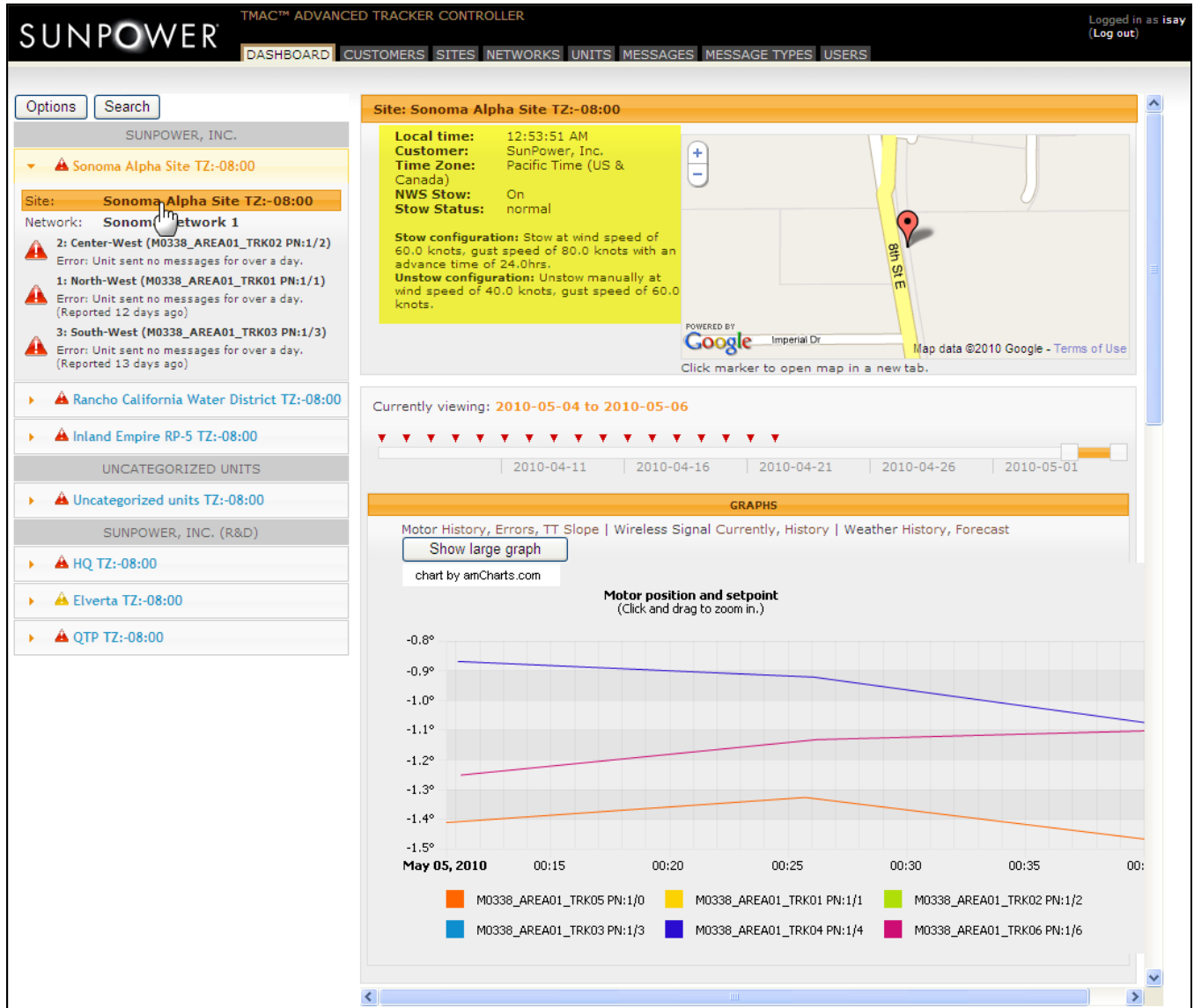


Fig. 12

3. View the customer site information:

Information	Description
Local time	Real-time, 12-hour format local time with AM/PM
Customer	Name of the customer
Time Zone	The time zone in text
NWS Stow	The National Weather Service Stow Enable indicator— <i>ON</i> indicates NWS is enabled; <i>OFF</i> , disabled. The stow and unstow perimeters are defined in the Stow and Unstow Configuration retrospect.
Stow Status	
Stow Configuration	Defines at what perimeters the tracker controller will stow the panels
Unstow configuration	Defines at what perimeters the tracker controller will allow the panels to resume normal operations

4. To view the site location map in a separate window, click the marker on the map (Fig. 13).



Fig. 13

1.5.2.3 Viewing Network Information

On the TMAC Dashboard page, you can view network information for a customer site:

1. In the list on the left side of the page, click the name of the customer site you want to view.
2. In the collapsed pane below the customer site name, click the network name link to view the network details to the right (Fig. 14).

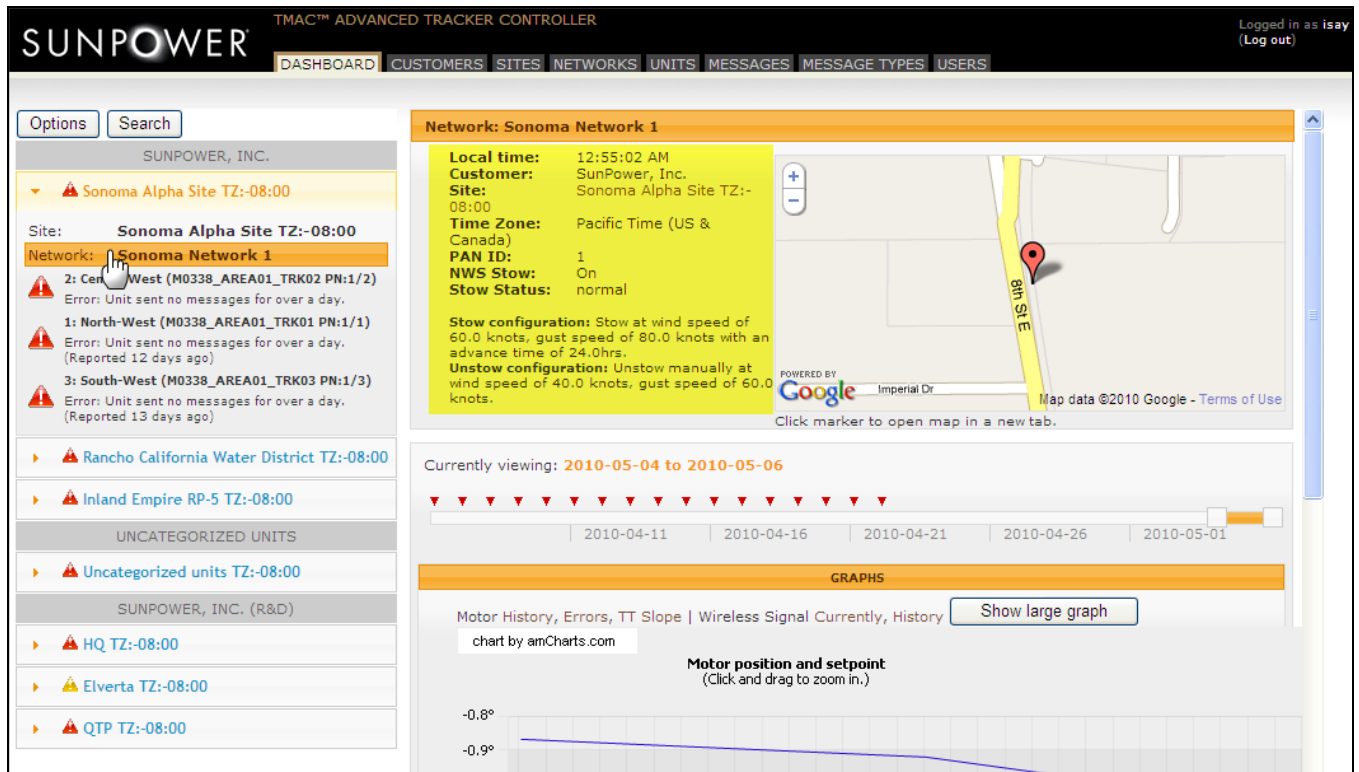


Fig. 14

3. View the network information:

Information	Description
Local time	Real-time, 12-hour format local time with AM/PM
Customer	Name of the customer
Site	The customer site name Note. The customer site name is an active link. Click to view the customer site information (refer to Section 1.5.2.2).
Time Zone	The time zone in text
PAN ID	The tracker group address used by the network

	communication
NWS Stow	The National Weather Service Stow Enable indicator— <i>ON</i> indicates NWS is enabled; <i>OFF</i> , disabled. The stow and unstow perimeters are defined in the Stow and Unstow Configuration retrospect.
Stow Status	Current system status: stowed/tracking/backtracking
Stow Configuration	Defines at what perimeters the tracker controller will stow the panels
Unstow configuration	Defines at what perimeters the tracker controller will allow the panels to resume normal operations

1.5.2.4 Viewing TMAC Unit Information

On the TMAC Dashboard page, you can view detailed information on each TMAC unit installed at the customer site:

1. In the list on the left side of the page, click the name of the customer site you want to view.
2. In the collapsed pane below the customer site name, click the TMAC unit link to view the unit details to the right (Fig. 15).

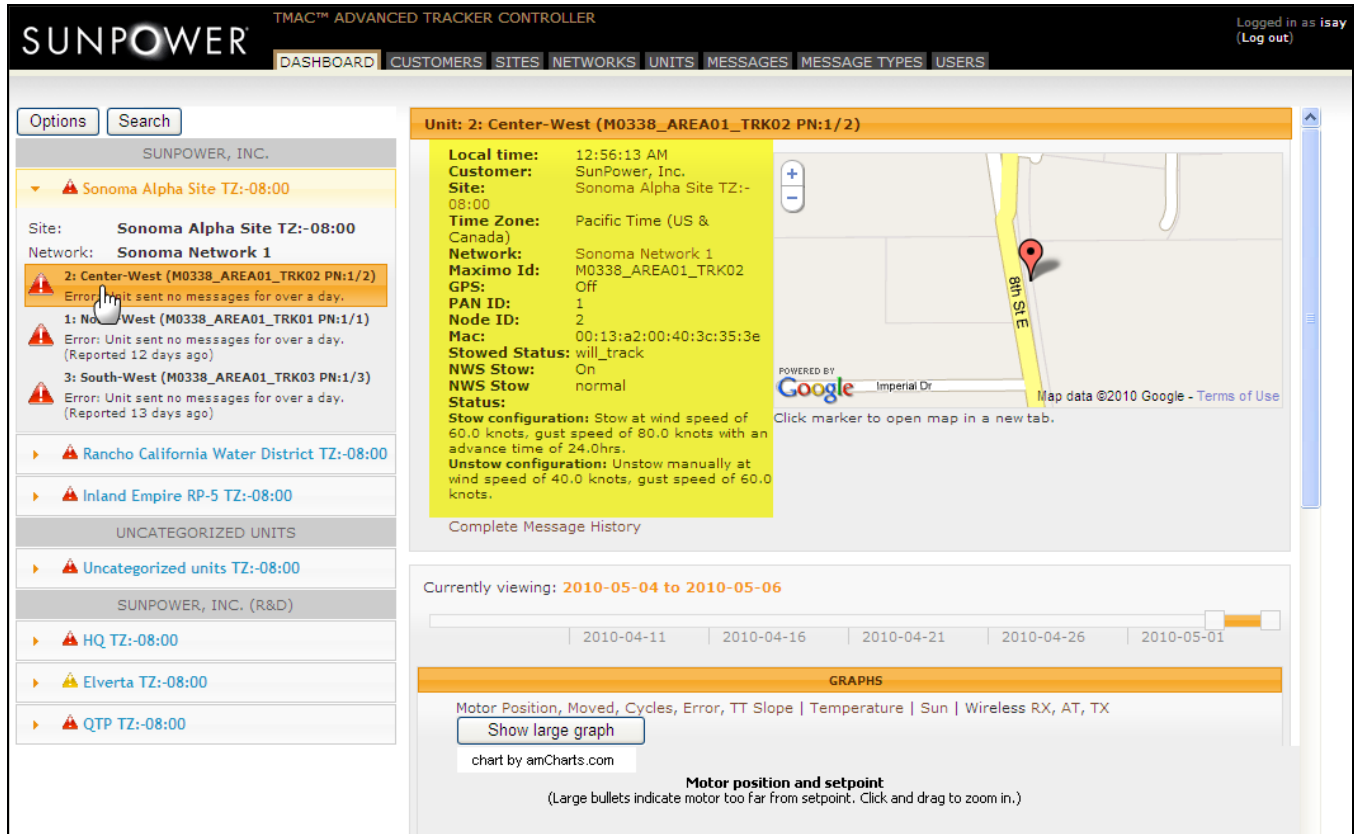


Fig. 15

3. View the TMAC unit information:

Information	Description
Local time	Real-time, 12-hour format local time with AM/PM
Customer	Name of the customer
Site	The customer site name Note. The customer site name is an active link. Click to view the customer site information (refer to Section 1.5.2.2).
Time Zone	The time zone in text
Network	The name of the network to which the TMAC unit belongs
Maximo ID	The description or name of the Tracker used as identifier for reporting in Maximo
GPS	GPS is enabled when a GPS receiver and antenna is installed

PAN ID	The tracker group address
Node ID	The individual tracker network address
Mac	This address is programmed at the factory in the network interface and cannot be changed
Stowed Status	Current system status: stowed/tracking/backtracking
NWS Stow	The National Weather Service Stow Enable indicator— <i>ON</i> indicates NWS is enabled; <i>OFF</i> , disabled. The stow and unstow perimeters are defined in the Stow and Unstow configuration retrospect.
NWS Stow Status	Indicates system stow status based on NWS forecast
Stow Configuration	Defines at what perimeters the tracker controller will stow the panels
Unstow configuration	Defines at what perimeters the tracker controller will allow the panels to resume normal operations

4. To view graphic and error reports for the selected TMAC unit, use the graph. To use the graph, refer to Section 1.5.2.5.

1.5.2.5 Using the Graph

On the TMAC Dashboard page, you can view the following level-specific graphs:

Level	Graph	Description
Site-level	Motor History	Plots motor position against programmed setpoint values for each tracker in the site
	Motor Errors	Plots the differential between motor position and setpoint values for each tracker in the site
	Wireless Signal Currently	Plots current minimum, maximum, and average signal strength values (in dB) for each tracker in the site
	Wireless Signal History	Plots historical signal strength values (in dB) for each tracker in the site
	Weather History	Plots historical temperature, wind speed, and gust speed values
	Weather Forecast	Plots temperature and wind-speed forecast for the next three days

Network-level	Motor History	Plots motor position against programmed setpoint values for each tracker within the network
	Motor Errors	Plots the differential between motor position and setpoint values for each tracker within the network
	Wireless Signal Currently	Plots current minimum, maximum, and average signal strength values (in dB) for each tracker within the network
	Wireless Signal History	Plots historical signal strength values (in dB) for each tracker within the network
TMAC unit-level	Motor Position	Plots the tracker's motor position against programmed setpoint values
	Motor Moved	Plots the amount of time the tracker motor is running in forward and reverse
	Motor Cycles	Plots the number of times the tracker motor is switched on and off
	Motor Error	Plots the differential between the tracker's motor position and setpoint values
	Temperature	Plots the tracker enclosure temperature over time
	Sun	Plots the position of the sun in both tracker and world frame throughout the day
	Wireless RX	Plots the quality of received data
	Wireless AT	(Wireless Communication Status: AT) [description]
	Wireless TX	Plots the quality of transmitted data

To illustrate, perform the following steps to view the graphed motor position and setpoint values for a TMAC unit—for example, *Unit: 00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)* installed at *Rancho California Water District TZ:-08:00*—over the last three days.

1. In the list on the left side of the TMAC Dashboard page, click *Rancho California Water District TZ:-08:00*.
2. In the collapsed pane below the customer site name, click *00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)*.
3. View the **Motor Position** graph—the default graph view—for *Unit: 00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0)* (Fig. 16).

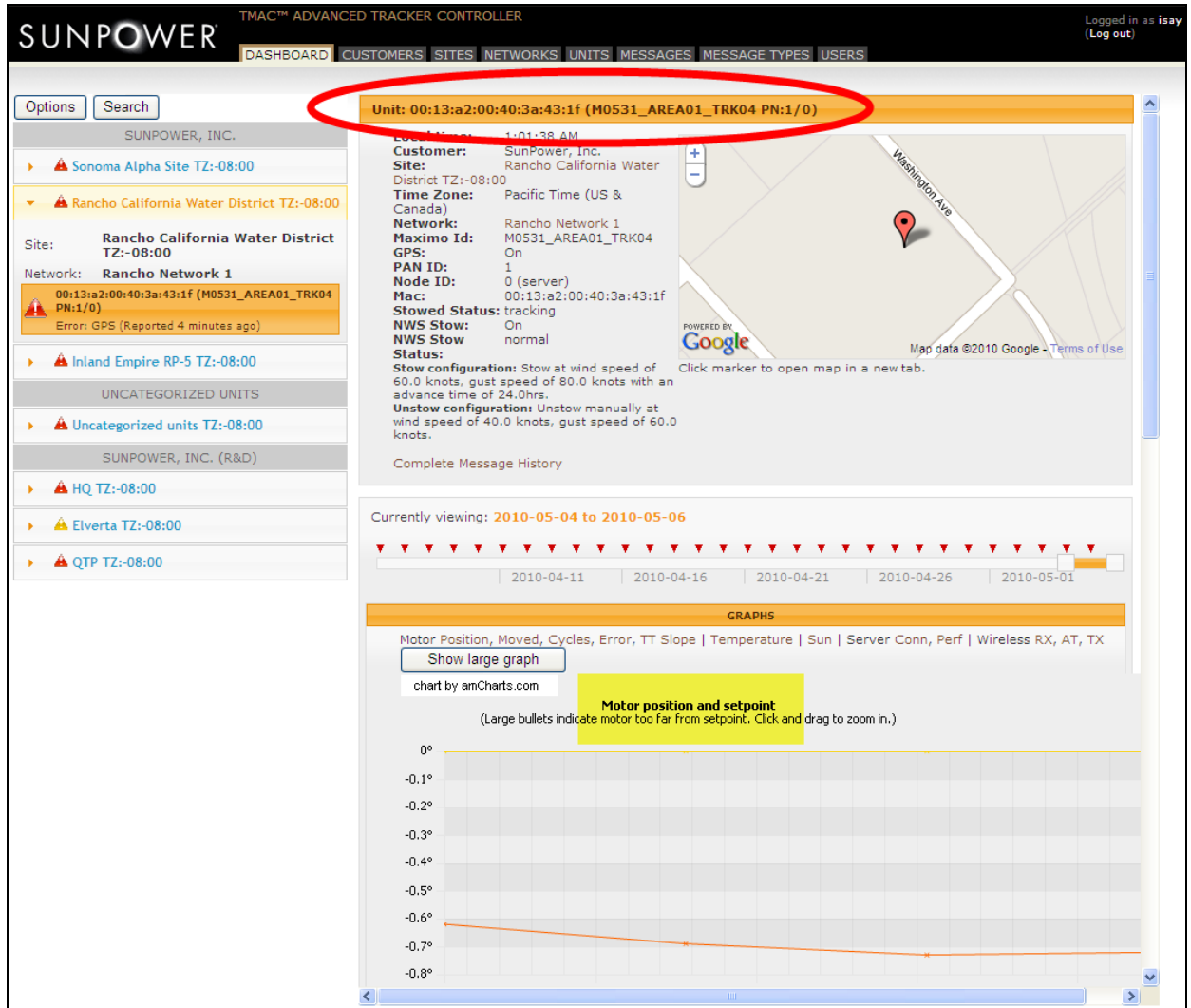


Fig. 16

- To view older data, move the slider above the **Graphs** title bar. To view data a day or two days at a time instead of the maximum three, decrease the width of the slider.

Important! You can view older data only if available. Small red triangles appear over the slider bar to indicate available older data.

If you want to view graph data for non-TMAC specific parameter such as temperature forecast for the next three days, select either the site- or network-level view and then click the *Weather Forecast* graph link (Fig. 17). Hover over interval points in the graph line to view the data details.

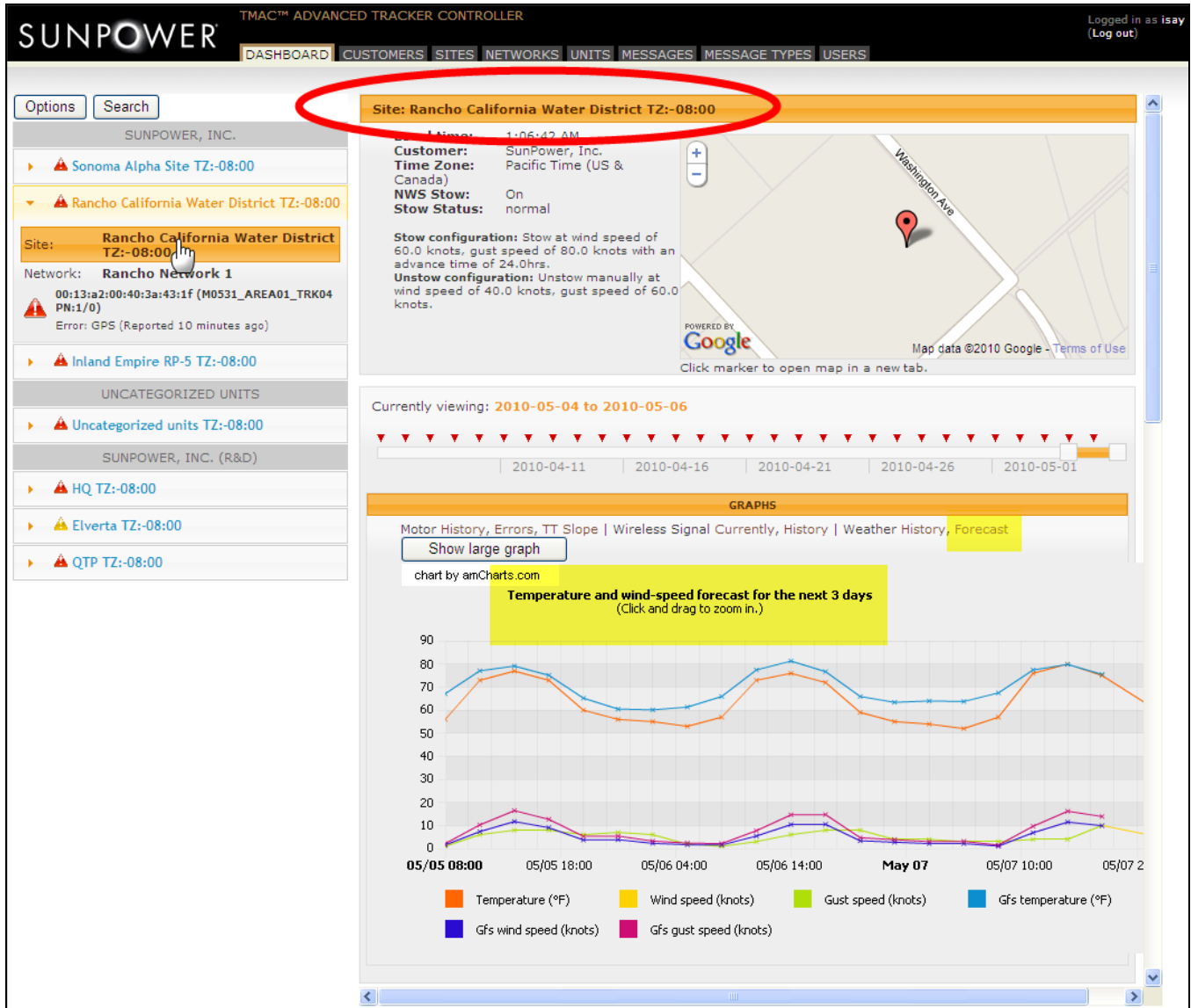


Fig. 17

1.5.2.6 Viewing System Status

On the TMAC Dashboard page, you can view system status details for each TMAC unit.

1. Perform the steps in Section 1.5.2.4 to open the unit-level page for the TMAC controller you want to view.
2. Scroll down the unit-level page. The **SYSTEM STATUS** section (below the **GRAPHS** section) lists message types and when each was last received (Fig. 18). Refer to Appendix A for full description of the message types.

The screenshot shows the SUNPOWER TMAC™ ADVANCED TRACKER CONTROLLER interface. The top navigation bar includes 'DASHBOARD', 'CUSTOMERS', 'SITES', 'NETWORKS', 'UNITS', 'MESSAGES', 'MESSAGE TYPES', and 'USERS'. The user is logged in as 'isay'. The left sidebar shows a tree view of units under 'SUNPOWER, INC.', with 'Elverta TZ:-08:00' selected. The main content area is divided into two sections: 'SYSTEM STATUS' and 'CONTROLLER EVENTS'.

MESSAGE TYPE	LAST RECEIVED	NOTES
System status (101)	about 7 hours ago	Too old
Inclinometer status (102)	about 7 hours ago	
Wireless1 status (103)	about 7 hours ago	
Wireless2 status (104)	about 7 hours ago	
Wireless3 status (105)	about 7 hours ago	
Operating system status (106)	about 7 hours ago	
GPS status (107)	about 7 hours ago	
A/D status (108)	about 7 hours ago	
DIO status (109)	about 7 hours ago	
Motor status (110)	about 7 hours ago	
Settings1 status (114)	about 7 hours ago	
Settings2 status (115)	about 7 hours ago	
Server status (116)	about 7 hours ago	
Tracker status (117)	about 7 hours ago	

EVENT	LAST RECEIVED
FORCE: 146 0x0000 1 Subsystem: Flash Priority: Always Id: Config_change Tag: 146	05-04-2010 16:32:56
FORCE: 145 0x0000 1 Subsystem: Flash Priority: Always Id: Config_change Tag: 145	05-04-2010 16:31:51
Flash: File PLATFORM contains update 20, written with version 3.6.3	05-04-2010 16:31:46
Flash: File CONFIG2 contains update 388, written with version 3.6.3	05-04-2010 16:31:46
Boot: The system rebooted	05-04-2010 16:31:46
ff,d8d0,0000000000002304,00,0f,00 Subsystem: Tsnet Priority: Always Id: Tsnet_ms Tag: 0	05-04-2010 16:31:45

Fig. 18

3. To view the details of a message type—for example, *System status (101)*, click the *Arrow_down* button under the LAST RECEIVED column to collapse the selected row (Fig. 19).

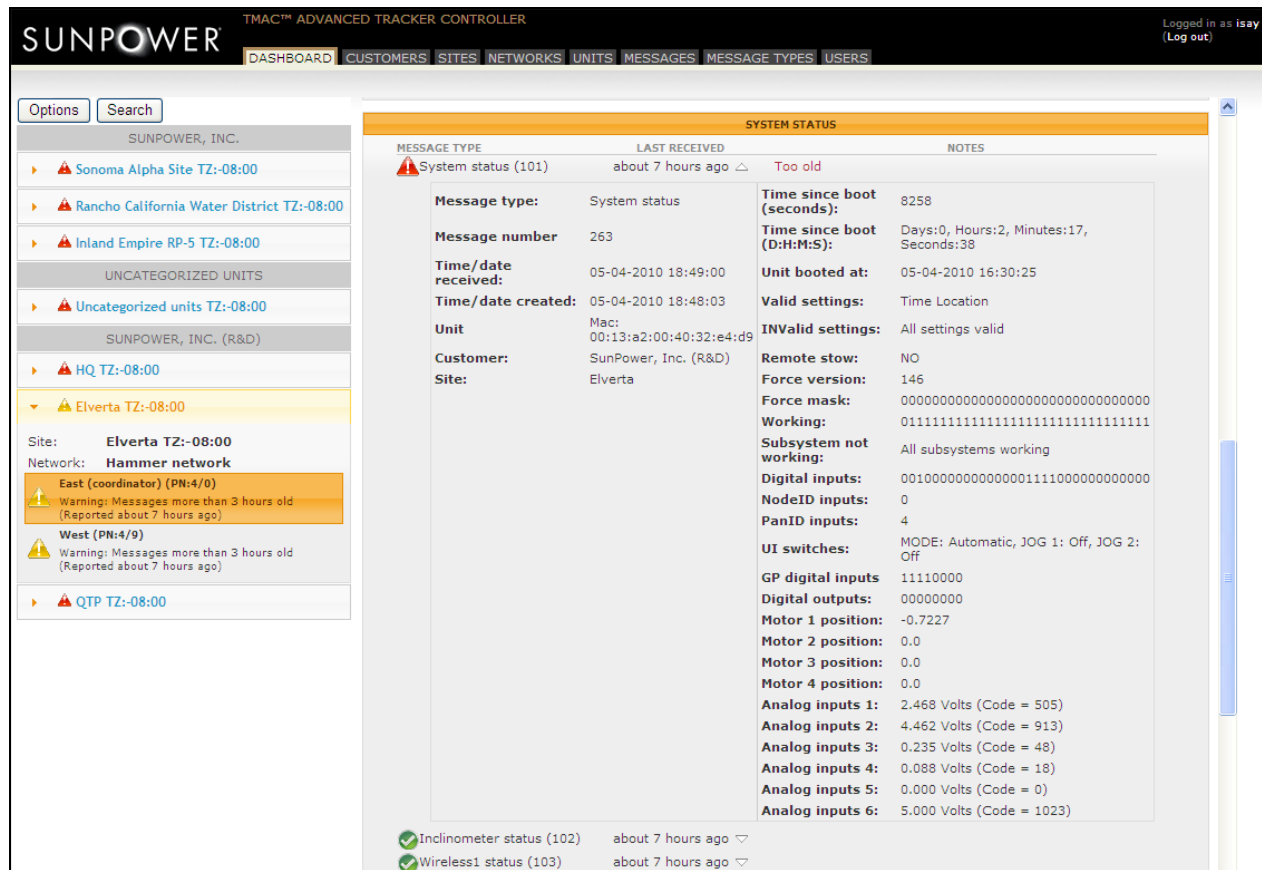


Fig. 19

4. Click the *Arrow_up* button to hide the details.
5. Perform Steps 3–4 to view the details of other message types.

1.5.2.7 Viewing Controller Events

On the TMAC Dashboard page, you can view details of controller events for each TMAC unit.

1. Perform the steps in Section 1.5.2.4 to open the unit-level page for the TMAC controller you want to view.
2. Scroll down the unit-level page. The **CONTROLLER EVENTS** section lists controller events and when each was last received (Fig. 20).

The screenshot displays the SUNPOWER TMAC ADVANCED TRACKER CONTROLLER interface. The top navigation bar includes 'DASHBOARD', 'CUSTOMERS', 'SITES', 'NETWORKS', 'UNITS', 'MESSAGES', 'MESSAGE TYPES', and 'USERS'. The user is logged in as 'isay'. The main content area is divided into several sections:

- Options** and **Search** fields.
- SUNPOWER, INC.** section with a list of sites: Sonoma Alpha Site TZ:-08:00, Rancho California Water District TZ:-08:00, and Inland Empire RP-5 TZ:-08:00.
- UNCATEGORIZED UNITS** section with 'Uncategorized units TZ:-08:00'.
- SUNPOWER, INC. (R&D)** section with 'HQ TZ:-08:00' and 'Elverta TZ:-08:00' (highlighted).
- Elverta TZ:-08:00** details: Site: Elverta TZ:-08:00, Network: Hammer network. It lists 'East (coordinator) (PN:4/0)' with a warning of messages more than 3 hours old, and 'West (PN:4/9)' with a similar warning.
- CONTROLLER EVENTS** section: A table listing events with columns for EVENT and LAST RECEIVED. Events include DIO status (109), Motor status (110), Settings1 status (114), Settings2 status (115), Server status (116), and Tracker status (117), all reported 'about 7 hours ago'. Below this, a detailed event log shows messages like 'FORCE: 146 0x0000 1 Subsystem: Flash Priority: Always Id: Config_change Tag: 146' and 'Flash: File PLATFORM contains update 20, written with version 3.6.3'. An 'Add event' button and 'View all events...' link are present.
- REMOTE UPDATES** section: Includes 'Remote update', 'Stow site', and 'Edit unit' buttons. Explanatory text states: 'If you change the unit, the TMAC unit will download the changes the next time it checks for updates. You can stow or unstow all the trackers at this site. The site will stow/unstow the next time a tracker checks for updates. Move this unit to another network.'

Fig. 20

3. To view the details of a controller event—for example, the event report at the top of the list, click the *Arrow_down* button under the LAST RECEIVED column to collapse the row (Fig. 21).

SUNPOWER TMAC™ ADVANCED TRACKER CONTROLLER Logged in as isay (Log out)

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Options Search

SUNPOWER, INC.

- Sonoma Alpha Site TZ:-08:00
- Rancho California Water District TZ:-08:00
- Inland Empire RP-5 TZ:-08:00

UNCATEGORIZED UNITS

- Uncategorized units TZ:-08:00

SUNPOWER, INC. (R&D)

- HQ TZ:-08:00
- Elverta TZ:-08:00

Site: **Elverta TZ:-08:00**
 Network: **Hammer network**

- East (coordinator) (PN:4/0)
Warning: Messages more than 3 hours old (Reported about 7 hours ago)
- West (PN:4/9)
Warning: Messages more than 3 hours old (Reported about 7 hours ago)

- QTP TZ:-08:00

- DIO status (109) about 7 hours ago
- Motor status (110) about 7 hours ago
- Settings1 status (114) about 7 hours ago
- Settings2 status (115) about 7 hours ago
- Server status (116) about 7 hours ago
- Tracker status (117) about 7 hours ago

CONTROLLER EVENTS

EVENT	LAST RECEIVED
FORCE: 146 0x0000 1 Subsystem: Flash Priority: Always Id: Config_change Tag: 146 Message type: Event report Message number: 23 Time/date received: 05-04-2010 16:32:56 Time/date created: 05-04-2010 16:32:54 Unit: Mac: 00:13:a2:00:40:32:e4:d9 Customer: SunPower, Inc. (R&D) Site: Elverta	05-04-2010 16:32:56 Message: FORCE: 146 0x0000 1 Priority: Always (4) Subsystem: Flash (Related to flash memory. 4) ID: Config_change (New force data has changed the controller configuration. 9) Tag: 146 (10010010)
FORCE: 145 0x0000 1 Subsystem: Flash Priority: Always Id: Config_change Tag: 145 Flash: File PLATFORM contains update 20, written with version 3.6.3 Flash: File CONFIG2 contains update 388, written with version 3.6.3 Boot: The system rebooted ff,d8d0,0000000000002304,00,0f,00 Subsystem: Tsnet Priority: Always Id: Tsnet_ms Tag: 0 Controller booted: 3.9.5 Subsystem: Global Priority: Always Id: Booted Tag: 32 New operation mode: AUTO => JOG Subsystem: Global Priority: Always Id: Mode_change Tag: 3 New operation mode: JOG => AUTO Subsystem: Global Priority: Always Id: Mode_change Tag: 1 New operation mode: AUTO => JOG Subsystem: Global Priority: Always Id: Mode_change Tag: 3	05-04-2010 16:31:51 05-04-2010 16:31:46 05-04-2010 16:31:46 05-04-2010 16:31:46 05-04-2010 16:31:45 05-04-2010 16:31:45 05-04-2010 15:17:34 05-04-2010 14:28:18 05-04-2010 13:00:33

[View all events...](#)

Fig. 21

- Click the *Arrow_up* button to hide the details.
- Perform Steps 3–4 to view the details of other controller events.

1.5.2.8 Sending Remote Updates

On the TMAC Dashboard page, you can send remote updates for each TMAC unit.

1. Perform the steps in Section 1.5.2.4 to open the unit-level page for the TMAC controller you want to view.
2. Scroll down the unit-level page. The **REMOTE UPDATES** section contains the *Remote update* button that enables you to send commands to the TMAC controller and enter values in the commissioning form (Fig. 22).

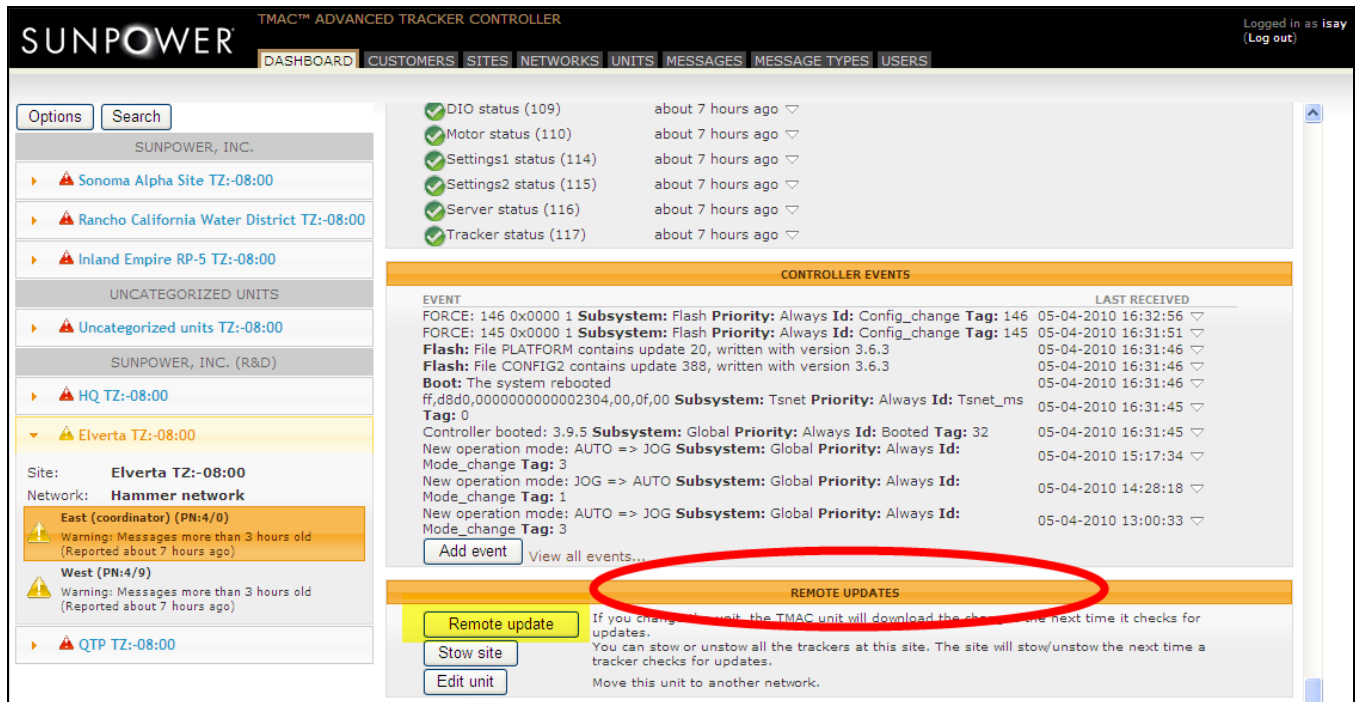


Fig. 22

3. Click *Remote update*.
4. A screen appears (Fig. 23).

force changed from 0x0 to 0x2

REMOTE UPDATE FOR UNIT EAST (COORDINATOR) (PN:4/0)

Send tracker to stow position? check this box to stow this unit

Send tracker to normal nighttime position? check this box to position this unit at the normal nighttime position

Forced to stow from weather forecast? This box can be checked as a result of the NWS forecast settings for this site. If the site's configuration for "Enable automatic unstow after wind abates?" is set to false, this must be unset manually to allow the unit to continue operating normally.

Error reset? check this box to reset errors on the controller. **Use only when someone is on-site!**

Reboot controller? check this box to reboot the controller

Desired firmware version: Firmware needs to be available on correct FTP server, and must be properly named, in order for this setting to cause a firmware upgrade

COMMISSIONING

Site configuration from server?: This box must be checked in order for the settings below to take effect

Site location

Latitude: positive is North of the equator (*from site*)

Longitude: positive is East of Prime Meridian, negative is west (*from site*)

Roll: positive slopes down to West

Pitch: positive slopes down to South

Yaw: positive is rotated CCW looking down on unit

East/west GCR:

Is the TMAC mounted on the east end of the tracker? Check this box for an east-end mounting. Uncheck if the TMAC is on the west end.

High-wind stow

Stow position Degree to stow trackers in case of high wind. (Manual or NWS forecast stow options.)

Stow on disconnect? Check this box to stow the tracker 24hrs after the network connection is lost.

Nighttime behavior

Nighttime position Position (degrees) the tracker takes at night to allow it to shed water or snow.

Alternate nights? Check this box to mirror the nighttime angle on even/odd days. (To reduce ground erosion caused by water dripping from the panels.)

Fig. 23

- **REMOTE UPDATE** section:
- **COMMISSIONING** section:

1.5.2.9 Viewing Recent Updates

On the TMAC Dashboard page, you can view recent updates sent remotely to each TMAC unit.

1. Perform the steps in Section 1.5.2.4 to open the unit-level page for the TMAC controller you want to view.
2. Scroll down the unit-level page. The **RECENT UPDATES** section lists the updates on remote commands sent to the TMAC controller (Fig. 24).

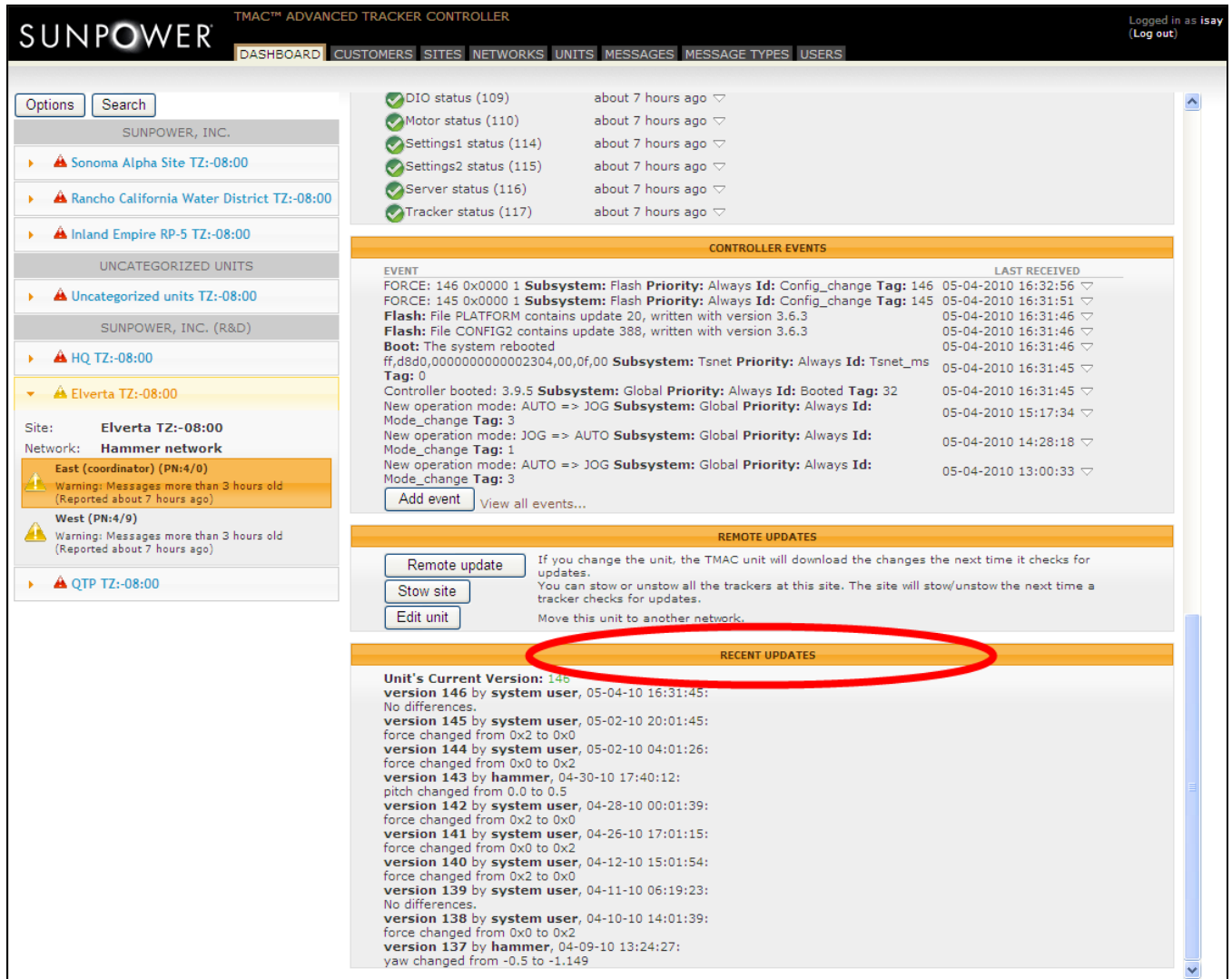
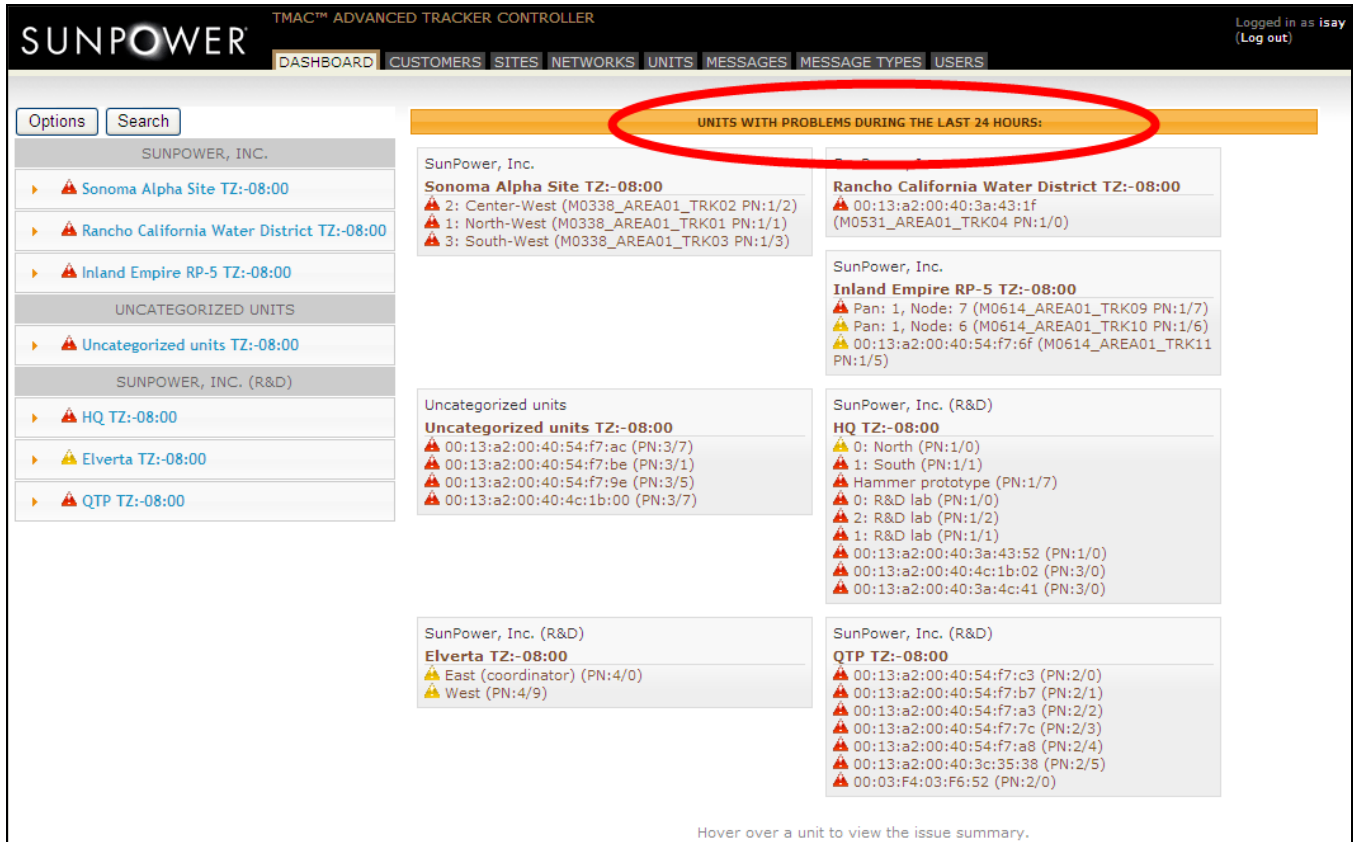


Fig. 24

1.5.2.10 Viewing Alerts

If there are TMAC units with problems during the last 24 hours, the TMAC Dashboard page displays the alerts by default.



TMAC Dashboard page

To see only the customer sites that have alerts, click the *Options* button below the SunPower logo. In the Dashboard Options window, select the **Show only errors?** check box and click *Save changes* (Fig. 25).

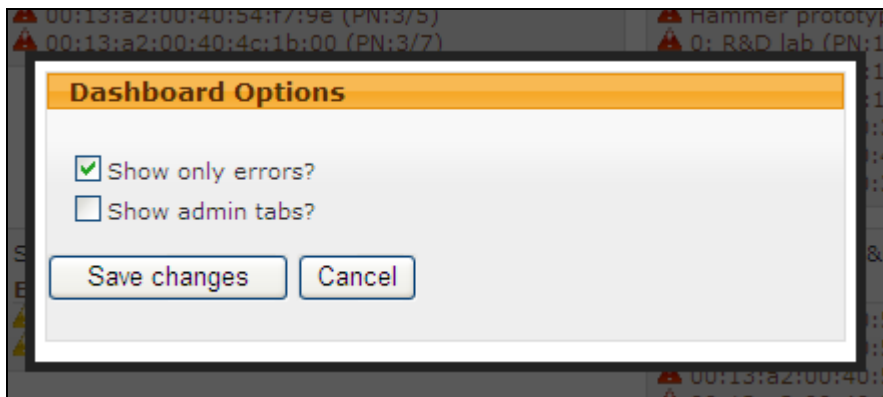


Fig. 25

Click *Reload Page* in the confirmation window (Fig. 26).

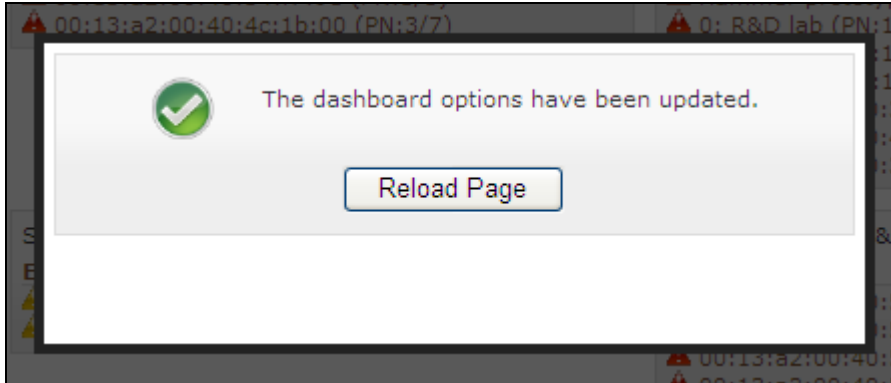


Fig. 26

Important! To see all customer sites on the TMAC Dashboard page, click *Options* and clear the **Show only error?** check box before saving the changes and reloading the page.

To view the issue summary, hover over the unit name (Fig. 27).

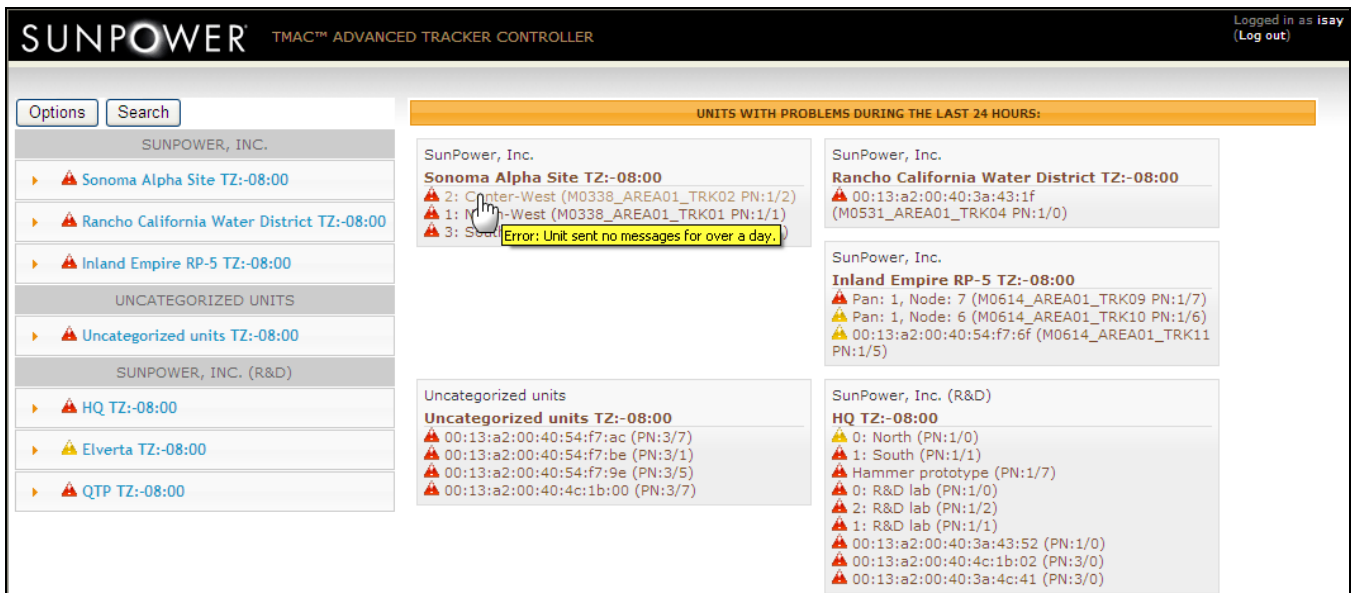


Fig. 27

Click the unit name link to open the unit-level view. Note that the graph does not show data for the unit with the issue (Fig. 28).

SUNPOWER TMAC™ ADVANCED TRACKER CONTROLLER Logged in as isay
(Log out)

Options Search

SUNPOWER, INC.

- ▶ Sonoma Alpha Site TZ:-08:00
- ▶ Rancho California Water District TZ:-08:00
- ▶ Inland Empire RP-5 TZ:-08:00

UNCATEGORIZED UNITS

- ▶ Uncategorized units TZ:-08:00

SUNPOWER, INC. (R&D)

- ▶ HQ TZ:-08:00
- ▶ Elverta TZ:-08:00
- ▶ QTP TZ:-08:00

Unit: 2: Center-West (M0338_AREA01_TRK02 PN:1/2)

Local time:	1:16:45 AM
Customer:	SunPower, Inc.
Site:	Sonoma Alpha Site TZ:-08:00
Time Zone:	Pacific Time (US & Canada)
Network:	Sonoma Network 1
Maximo Id:	M0338_AREA01_TRK02
GPS:	Off
PAN ID:	1
Node ID:	2
Mac:	00:13:a2:00:40:3c:35:3e
Stowed Status:	will_track
NWS Stow:	On
NWS Stow:	normal
Status:	

Stow configuration: Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.
Unstow configuration: Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.

Complete Message History

Currently viewing: 2010-05-04 to 2010-05-06

2010-04-11
2010-04-16
2010-04-21
2010-04-26
2010-05-01

GRAPHS

Motor Position, Moved, Cycles, Error, TT Slope | Temperature | Sun | Wireless RX, AT, TX

[Show large graph](#)

chart by amCharts.com

Motor position and setpoint
(Large bullets indicate motor too far from setpoint. Click and drag to zoom in.)

Fig. 28

Important! In the site-level view for a customer site where a unit has an issue, the graph will also not show any data.

1.5.2.11 Viewing and Managing Customer Information

To view, edit, or delete customer information, click the **CUSTOMERS** tab (Fig. 29).

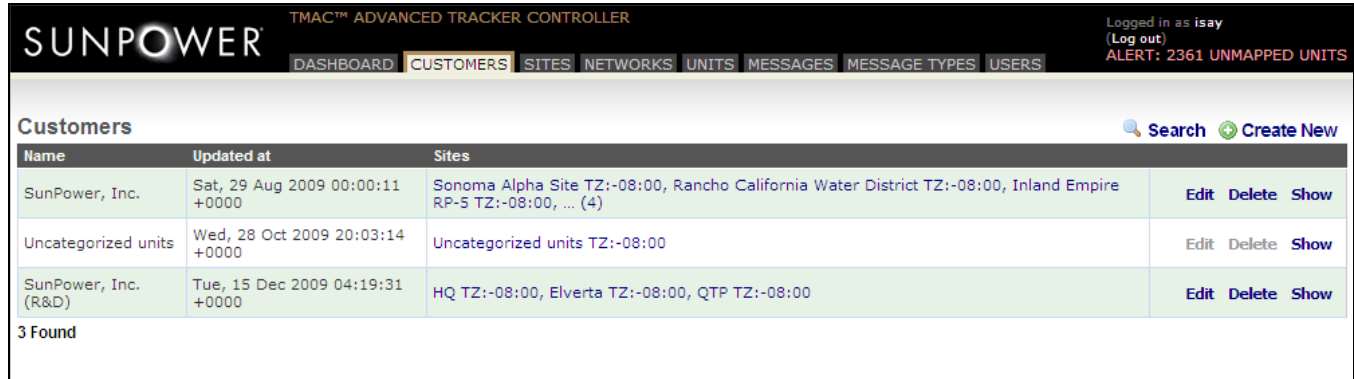


Fig. 29

The Customers page lists customer details in columns:

Column	Description
Name	The customer name...
Updated at	[description]
Sites	[description]

- To view customer information, click **Show** in the selected customer details row. The **Show Customer** window opens (Fig. 30). Click **Close** or the X button to close the window.

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as isay (Log out) ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Customers

Search Create New

Show Customer [X]

Admin: tmac_admin@sunpowercorp.com
 Created at: Sat, 29 Aug 2009 00:00:11 +0000
 Email report: false
 Name: SunPower, Inc.
 Sites: Sonoma Alpha Site TZ:-08:00, Rancho California Water District TZ:-08:00, Inland Empire RP-5 TZ:-08:00, ... (4)
 Updated at: Sat, 29 Aug 2009 00:00:11 +0000
 User roles: read only user for SunPower, Inc., read only user for SunPower, Inc., read only user for SunPower, Inc.

Close

Name	Updated at	Sites	
Uncategorized units	Wed, 28 Oct 2009 20:03:14 +0000	Uncategorized units TZ:-08:00	Edit Delete Show
SunPower, Inc. (R&D)	Tue, 15 Dec 2009 04:19:31 +0000	HQ TZ:-08:00, Elverta TZ:-08:00, QTP TZ:-08:00	Edit Delete Show

3 Found

Fig. 30

- To change customer information details, click **Edit**. The **Update [Customer name]** window opens (Fig. 31).

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as isay (Log out) ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Customers

Search Create New

Update SunPower, Inc. [X]

Name:
 Admin:
 Email report:

Name	Updated at	Sites	
Uncategorized units	Wed, 28 Oct 2009 20:03:14 +0000	Uncategorized units TZ:-08:00	Edit Delete Show
SunPower, Inc. (R&D)	Tue, 15 Dec 2009 04:19:31 +0000	HQ TZ:-08:00, Elverta TZ:-08:00, QTP TZ:-08:00	Edit Delete Show

3 Found

Fig. 31

- Enter or select new values in the **Name**, **Admin**, and **Email report** fields.
 - Click *Update* to save the changes. Click *Cancel* or the X button to close the window.
- To delete customer information profile, click **Delete**. Click *OK* in the confirmation window.

1.5.2.12 Viewing and Managing Site Information

To view, edit, or delete site information, click the **SITES** tab (Fig. 32).

Name	Address	Customer	Networks	Latitude	Longitude	Stow status	Stow configuration	Unstow configuration	Site setting	Time zone	
HQ	Create New	SunPower, Inc. (R&D)	Back 40 trackers, R&D lab, R&D Lab 3	37.9125	-122.358	Stow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	TMAC:locked, Wireless:locked	Pacific Time (US & Canada)	Edit Delete Show
Sonoma Alpha Site	Sonoma CA USA	SunPower, Inc.	Sonoma Network 1	38.2528	-122.441	Stow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	TMAC:locked, Wireless:unlocked	Pacific Time (US & Canada)	Edit Delete Show
Uncategorized units		Uncategorized units	Uncategorized units	37.8715	-122.294	Unstowed	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	Create New	Pacific Time (US & Canada)	Edit Delete Show
Elverta		SunPower, Inc. (R&D)	Hammer network	38.7289	-121.48	Stow site	Stow at wind speed of 20.0 knots, gust speed of 30.0 knots with an advance time of 24.0hrs.	Unstow automatically at wind speed of 15.0 knots, gust speed of 25.0 knots.	Create New	Pacific Time (US & Canada)	Edit Delete Show
Rancho California Water District		SunPower, Inc.	Rancho Network 1, Rancho Network 2	33.53	-117.19	Stow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	Create New	Pacific Time (US & Canada)	Edit Delete Show
QTP		SunPower, Inc. (R&D)	QTP Network 1, QTP Network 2	37.38	-122.01	Unstow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	Create New	Pacific Time (US & Canada)	Edit Delete Show
Inland Empire RP-5		SunPower, Inc.	RP-5 Network 1	33.96	-117.67	Stow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	Create New	Pacific Time (US & Canada)	Edit Delete Show
Exelon Network 3		SunPower, Inc.	Exelon Network 3	41.68	-87.65	Stow site	Stow at wind speed of 60.0 knots, gust speed of 80.0 knots with an advance time of 24.0hrs.	Unstow manually at wind speed of 40.0 knots, gust speed of 60.0 knots.	Create New	Central Time (US & Canada)	Edit Delete Show

8 Found

Fig. 32

The Sites page lists site details in columns:

Column	Description
Name	The site name...
Address	[description]
Customer	[description]
Networks	[description]
Latitude	[description]

Longitude	[description]
Stow status	[description]
Stow configuration	[description]
Unstow configuration	[description]
Site setting	[description]
Time zone	[description]

- To view information for a site, click **Show** in the selected site details row. The **Show Site** window opens (Fig. 33). Click **Close** or the X button to close the window.

SUNPOWER TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as **isay**
(Log out)
ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS **SITES** NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Sites Search Create New

Name	Address	Customer	Networks	Latitude	Longitude	Stow status	Stow configuration	Unstow configuration	Site setting	Time zone
Show Site x										
Address	-									
Admin	tmac_admin@sunpowercorp.com									
Created at	Sat, 29 Aug 2009 00:00:11 +0000									
Customer	SunPower, Inc. (R&D)									
Elevation meters	-7.6									
Enable email reporting?	false									
Forecasts	#<Forecast:0xb6ec2ba4>, #<Forecast:0xb6ec2b54>, #<Forecast:0xb6ec2b04>, ... (2771)									
Latitude	37.9125									
Longitude	-122.358									
Name	HQ									
Networks	Back 40 trackers, R&D lab, R&D Lab 3									
Nws stow state	0									
Site setting	TMAC:locked, Wireless:locked									
Hours of high wind forecast to monitor	24.0									
Stow clear time	Fri, 28 Aug 2009 00:52:31 +0000									
Gust forecast for stowing (knots)	80.0									
Enable stow on NWS forecast?	true									
Sustained wind forecast for stowing (knots)	60.0									
Time zone	Pacific Time (US & Canada)									
Units	0: North (PN:1/0), 1: South (PN:1/1), Hammer prototype (PN:1/7), ... (9)									
Enable automatic unstow after wind abates?	false									
Gust forecast that prevents unstow (knots)	60.0									
Hours to remain stowed after wind forecast abates	6.0									
Sustained wind forecast that prevents unstow (knots)	40.0									
Updated at	Wed, 05 May 2010 20:01:04 +0000									
Wind over stow	false									
Wind over unstow	false									
Close										

Fig. 34

- To change customer site information details, click **Edit**. The **Update [Site name]** window opens (Fig. 35).

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as Isay (Log out) ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Sites Search Create New

Name	Address	Customer	Networks	Latitude	Longitude	Stow status	Stow configuration	Unstow configuration	Site setting	Time zone
Update HQ TZ:-08:00										
Name	HQ									
Customer	SunPower, Inc. (R&D)									
Latitude	37.9125									
Longitude	-122.358									
Admin	tmac_admin@sunpowercorp.com									
Enable email reporting?	False									
Enable stow on NWS forecast?	True									
Sustained wind forecast for stowing (knots)	60									
Gust forecast for stowing (knots)	80									
Hours of high wind forecast to monitor	24									
Enable automatic unstow after wind abates?	False									
Sustained wind forecast that prevents unstow (knots)	40									
Gust forecast that prevents unstow (knots)	60									
Hours to remain stowed after wind forecast abates	6									
Time zone	(GMT-08:00) Pacific Time (US & Canada)									
Update Cancel										

Fig. 35

- a. Enter or select new values in the fields.
 - b. Click *Update* to save the changes. Click *Cancel* or the X button to close the window.
- To delete customer site profile, click **Edit**. Click *OK* in the confirmation window.

1.5.2.13 Viewing and Managing Network Information

To view, edit, or delete network information, click the **NETWORKS** tab (Fig. 36).

Site	Name	Pan	Units	Coordinator info	
HQ TZ:-08:00	Back 40 trackers	1	0: North (PN:1/0), 1: South (PN:1/1), Hammer prototype (PN:1/7)	166.131.61.17:2934 as root/sunpower1	Edit Delete Show
Sonoma Alpha Site TZ:-08:00	Sonoma Network 1	1	0: Center-East (M0338_AREA01_TRK05 PN:1/0), 2: Center-West (M0338_AREA01_TRK02 PN:1/2), 6: South-East (M0338_AREA01_TRK06 PN:1/6), ... (6)		Edit Delete Show
Uncategorized units TZ:-08:00	Uncategorized units	3	00:13:a2:00:40:54:f7:ac (PN:3/7), 00:13:a2:00:40:54:f7:be (PN:3/1), 00:13:a2:00:40:54:f7:9e (PN:3/5), ... (4)		Edit Delete Show
HQ TZ:-08:00	R&D lab	1	0: R&D lab (PN:1/0), 2: R&D lab (PN:1/2), 1: R&D lab (PN:1/1), ... (4)		Edit Delete Show
Elverta TZ:-08:00	Hammer network	4	East (coordinator) (PN:4/0), West (PN:4/9)	166.131.61.37:2954 as admin/password	Edit Delete Show
Rancho California Water District TZ:-08:00	Rancho Network 1	1	00:13:a2:00:40:54:f7:7f (M0531_AREA01_TRK06 PN:1/8), 00:13:a2:00:40:3a:43:1f (M0531_AREA01_TRK04 PN:1/0), 00:13:a2:00:40:3a:43:56 (M0531_AREA01_TRK13 PN:1/1), ... (9)	166.131.61.124:2954 as root/sunpower1	Edit Delete Show
Rancho California Water District TZ:-08:00	Rancho Network 2	2	00:13:a2:00:40:54:f7:7b (M0531_AREA01_TRK03 PN:2/1), 00:13:a2:00:40:3a:4c:33 (M0531_AREA01_TRK01 PN:2/0), 00:13:a2:00:40:30:0f:59 (M0531_AREA01_TRK02 PN:2/2), ... (4)	166.131.61.124:2955 as root/sunpower1	Edit Delete Show
QTP TZ:-08:00	QTP Network 1	2	00:13:a2:00:40:54:f7:c3 (PN:2/0), 00:13:a2:00:40:54:f7:b7 (PN:2/1), 00:13:a2:00:40:54:f7:a3 (PN:2/2), ... (6)		Edit Delete Show
Inland Empire RP-5 TZ:-08:00	RP-5 Network 1	1	Pan: 1, Node: 0 (M0614_AREA01_TRK08 PN:1/0), Pan: 1, Node: 7 (M0614_AREA01_TRK09 PN:1/7), Pan: 1, Node: 4 (M0614_AREA01_TRK12 PN:1/4), ... (15)		Edit Delete Show
QTP TZ:-08:00	QTP Network 2	2	00:03:F4:03:F6:52 (PN:2/0)		Edit Delete Show
Exelon Network 3 TZ:-06:00	Exelon Network 3	1	Tracker 4.2 (PN:1/0), Tracker 4.1 (PN:1/1), Tracker 4.3 (PN:1/5), ... (4)		Edit Delete Show
HQ TZ:-08:00	R&D Lab 3	3	00:13:a2:00:40:4c:1b:02 (PN:3/0), 00:13:a2:00:40:3a:4c:41 (PN:3/0)		Edit Delete Show

12 Found

Fig. 36

The Networks page lists network details in columns:

Column	Description
Site	The name...
Name	[description]
Pan	[description]
Units	[description]
Coordinator info	[description]

- To view the network information, click **Show** in the selected network details row. The **Show Network** window opens (Fig. 37). Click **Close** or the X button to close the window.



Fig. 37

- To change network information details, click **Edit**. The **Update [Network name]** window opens (Fig. 38).

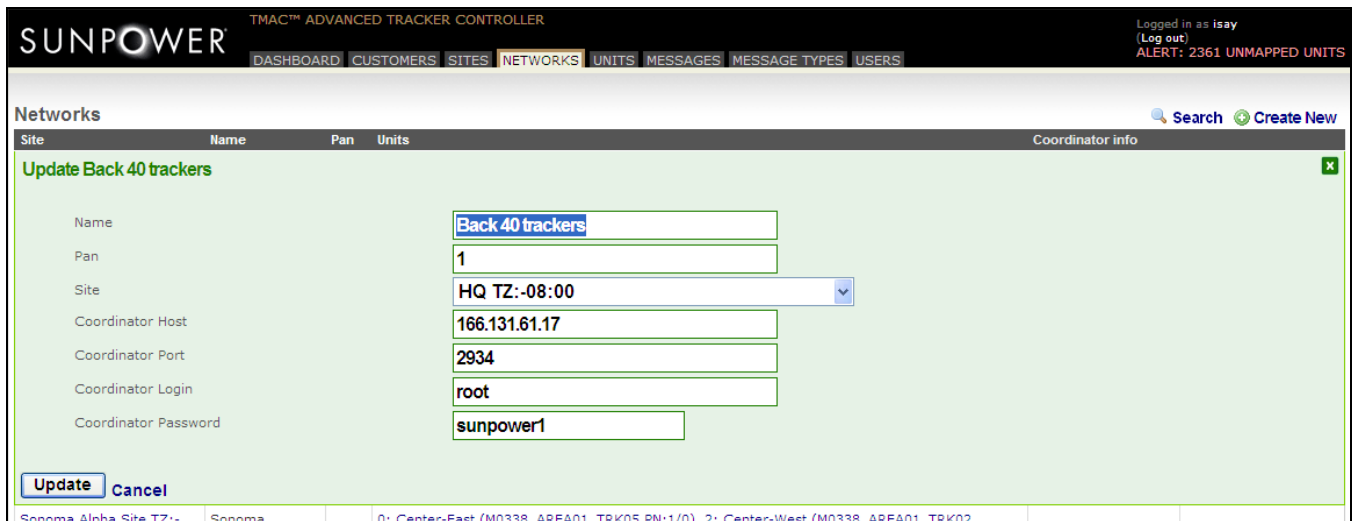


Fig. 38

- Enter or select new values in the fields.
 - Click *Update* to save the changes. Click *Cancel* or the X button to close the window.
- To delete a network profile, click **Delete**. Click *OK* in the confirmation window.

1.5.2.14 Viewing and Managing Units Information

To view all the TMAC units in the field, and edit, or delete TMAC controller information, click the **UNITS** tab (Fig. 39).

Name	Maximo	Mac	Network	Description	Nodeid	Force					
0: North	-	00:13:a2:00:40:3a:4c:3f	Back 40 trackers	North unit, manager	0	version 2993	Messages	Updates	Edit	Delete	Show
1: South	-	00:13:a2:00:40:3c:35:49	Back 40 trackers	South unit, router	1	version 2986	Messages	Updates	Edit	Delete	Show
0: Center-East	M0338_AREA01_TRK05	00:13:a2:00:40:3c:35:2e	Sonoma Network 1	Coordinator (#5)	0	version 150	Messages	Updates	Edit	Delete	Show
2: Center-West	M0338_AREA01_TRK02	00:13:a2:00:40:3c:35:3e	Sonoma Network 1	#2 (West, Center)	2	version 87	Messages	Updates	Edit	Delete	Show
Hammer prototype	-	00:13:a2:00:40:3a:43:51	Back 40 trackers	Unnamed	7	version 2954	Messages	Updates	Edit	Delete	Show
6: South-East	M0338_AREA01_TRK06	00:13:a2:00:40:54:f7:6e	Sonoma Network 1	Unnamed	6	version 2292	Messages	Updates	Edit	Delete	Show
1: North-West	M0338_AREA01_TRK01	00:13:a2:00:40:54:f7:8e	Sonoma Network 1	Unnamed	1	version 100	Messages	Updates	Edit	Delete	Show
3: South-West	M0338_AREA01_TRK03	00:13:a2:00:40:3c:35:5e	Sonoma Network 1	Unnamed	3	version 83	Messages	Updates	Edit	Delete	Show
4: North-East	M0338_AREA01_TRK04	00:13:a2:00:40:3a:43:27	Sonoma Network 1	Unnamed	4	version 88	Messages	Updates	Edit	Delete	Show
0: R&D lab	-	00:13:a2:00:40:48:3a:7e	R&D lab	Unnamed	0	version 958	Messages	Updates	Edit	Delete	Show
2: R&D lab	-	00:13:a2:00:40:3a:4c:51	R&D lab	Unnamed	2	version 738	Messages	Updates	Edit	Delete	Show
1: R&D lab	-	00:13:a2:00:40:48:3a:7f	R&D lab	Unnamed	1	version 738	Messages	Updates	Edit	Delete	Show
-	M0531_AREA01_TRK06	00:13:a2:00:40:54:f7:7f	Rancho Network 1	Unnamed	8	version 504	Messages	Updates	Edit	Delete	Show
-	M0531_AREA01_TRK03	00:13:a2:00:40:54:f7:7b	Rancho Network 2	Unnamed	1	version 504	Messages	Updates	Edit	Delete	Show
East (coordinator)	-	00:13:a2:00:40:32:e4:d9	Hammer network	Unnamed	0	version 146	Messages	Updates	Edit	Delete	Show

60 Found 1 2 3 4 | Next

Fig. 39

The Units page lists TMAC unit details in columns:

Column	Description
Name	The name...
Maximo	[description]
Mac	[description]
Network	[description]
Description	[description]
Nodeid	[description]
Force	[description]

- To view information on a TMAC unit, click **Show** in the selected TMAC unit details row. The **Show Unit** window opens (Fig. 40). Click **Close** or the X button to close the window.

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as isay (Log out) ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Units

Search Create New Maximo Mapping

Name	Maximo	Mac	Network	Description	Nodeid	Force
Show Unit [X]						
Name	0: North	-	-	-	-	-
Maximo	-	-	-	-	-	-
Mac	00:13:a2:00:40:3a:4c:3f	-	-	-	-	-
Network	Back 40 trackers	-	-	-	-	-
Description	North unit, manager	-	-	-	-	-
Admin	tmac_admin@sunpowercorp.com	-	-	-	-	-
Email report	false	-	-	-	-	-
Nodeid	0	-	-	-	-	-
Updated at	Wed, 05 May 2010 23:30:04 +0000	-	-	-	-	-
Close						
1: South	-	00:13:a2:00:40:3c:35:49	Back 40 trackers	South unit, router	1	version 2986
Messages Updates Edit Delete Show						

Fig. 40

- To change unit information details, click **Edit**. The **Edit for unit [Unit name]** window opens (Fig. 41).

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as isay (Log out) ALERT: 2361 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Units

Search Create New Maximo Mapping

Name	Maximo	Mac	Network	Description	Nodeid	Force
EDIT FOR UNIT 0: NORTH (PN:1/0) [X]						
Name	<input type="text" value="0: North"/>					
Maximo Id	<input type="text"/>					
Network	Back 40 trackers [v]					
Description	<input type="text" value="North unit, manager"/>					
Access Key	<input type="text"/>					
Admin	<input type="text" value="tmac_admin@sunpowercorp.com"/>					
Email report	false [v]					
Has GPS	true [v]					
Mac	<input type="text" value="00:13:a2:00:40:3a:4c:3f"/>					
Node id	<input type="text" value="0"/>					
<input type="button" value="Save changes"/>						
1: South	-	00:13:a2:00:40:3c:35:49	Back 40 trackers	South unit, router	1	version 2986
Messages Updates Edit Delete Show						

Fig. 41

- Enter or select new values in the fields.
 - Click *Save changes*.
- To delete a unit profile, click **Delete**. Click *OK* in the confirmation window.

1.5.2.15 Viewing Messages

To view messages, click the **MESSAGES** tab (Fig. 42).

Id	Message status	Name	Unit	Originated at	Created at	Desc	Show
3550826	✓	Message117	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:04	Tracker status	Show
3550825	✓	Message110	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:03	Motor status	Show
3550824	✓	Message116	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:02	Server status	Show
3550823	✓	Message115	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:01	Settings2 status	Show
3550822	✓	Message109	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:01	DIO status	Show
3550821	✓	Message108	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:00	A/D status	Show
3550820	✓	Message107	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:53:59	GPS status	Show
3550819	✓	Message117	1: South (PN:1/1)	03-30-2010 21:52:58	03-30-2010 21:53:59	Tracker status	Show
3550818	⚠ Not controlled	Message110	1: South (PN:1/1)	03-30-2010 21:52:58	03-30-2010 21:53:59	Motor status	Show
3550817	✓	Message105	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:53:59	Wireless3 status	Show
3550816	✓	Message116	1: South (PN:1/1)	03-30-2010 21:52:58	03-30-2010 21:53:58	Server status	Show
3550815	✓	Message104	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:53:58	Wireless2 status	Show

Fig. 42

The following table lists the descriptions of each message number.

Message Number	Short Description	Full Description
109	DIO Status	See Appendix A
111	Flash messages	See Appendix A
104	Wireless2 messages	See Appendix A
113	Boot messages	See Appendix A
105	Wireless3 messages	See Appendix A
114	Settings1 messages	See Appendix A
112	Event messages	See Appendix A
110	Motor messages	See Appendix A

116	Server messages	See Appendix A
106	Operating system messages	See Appendix A
115	Settings2 messages	See Appendix A
107	GPS messages	See Appendix A
117	Tracker messages	See Appendix A
102	Inclinometer messages	See Appendix A
	Test messages	See Appendix A
112	Event messages	See Appendix A
108	A/D messages	See Appendix A
101	System messages	See Appendix A
	SCADA messages	See Appendix A
103	Wireless1 messages	See Appendix A

- To view the details of a message, click **Show**. A pop-up window opens and displays the details (Fig. 43). Refer to Appendix A for a full description of message types.

The screenshot shows the SunPower TMAC™ Advanced Tracker Controller web interface. At the top, there is a navigation menu with tabs for DASHBOARD, CUSTOMERS, SITES, NETWORKS, UNITS, MESSAGES, MESSAGE TYPES, and USERS. The user is logged in as 'jordan' and there is an alert for 68 unmapped units. The main content area is titled 'Messages' and contains a table with columns for Id, Message status, Name, Unit, Originated at, Created at, and Desc. A search icon is located in the top right of the table. A pop-up window is open, displaying the details of a message. The pop-up window has a close button (X) in the top right corner. The details are as follows:

Message type:	Tracker status	Number	1
Message number	41272	Azimuth	-159.1
Time/date received:	03-30-2010 23:54:04	Elevation	-42.12
Time/date created:	03-30-2010 23:53:29	Site Roll	0.0
Unit	Mac: 00:13:a2:00:40:54:f7:a4	Site Pitch	0.0
Customer:	SunPower, Inc.	Site Yaw	0.0
Site:	Exelon Network 3		

Fig. 43

- To search for a specific message, click **Search** in the upper right of the table. Enter the [message ID] into the **Search Terms** field that opens and click **Search** (Fig. 34). Click **Reset** to return to the unfiltered message list.

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as **jordan**
 (Log out)
 ALERT: 68 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

Messages

Search

Id	Message status	Name	Unit	Originated at	Created at	Desc	
3550826	✓	Message117	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:04	Tracker status	Show
3550825	✓	Message110	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:03	Motor status	Show
3550824	✓	Message116	Tracker 4.1 (PN:1/1)	03-30-2010 23:53:29	03-30-2010 23:54:02	Server status	Show

Fig. 43

1.5.2.16 Viewing Message Types

To view the list of message types, click the **MESSAGE TYPES** tab (Fig. 44).

SUNPOWER™ TMAC™ ADVANCED TRACKER CONTROLLER

Logged in as **jordan**
 (Log out)
 ALERT: 68 UNMAPPED UNITS

DASHBOARD CUSTOMERS SITES NETWORKS UNITS MESSAGES MESSAGE TYPES USERS

- operating_system messages
- settings2 messages
- flash messages
- gps messages
- tracker messages
- inclinometer messages
- motor messages
- a_d messages
- scada messages
- server messages
- wireless1 messages
- dio messages
- wireless2 messages
- boot messages
- test messages
- event messages
- wireless3 messages
- system messages
- settings1 messages

Fig. 44

1.5.2.17 Viewing and Managing User Information

To view, edit, or delete user information, click the **USERS** tab (Fig. 45).

Name	Login	Email	User roles	
★ Admin User	admin	gabor@sunpowercorp.com	-	Change Password Edit Delete Show
★ Steve Kraft	skraft	skraft@sunpowercorp.com	-	Change Password Edit Delete Show
demo	demo	demo@demo.com	read only user for Oroville Olives, read only user for SunPower, Inc.	Change Password Edit Delete Show
★ kannan	kannan	kannan.d.r@sunpowercorp.com	-	Change Password Edit Delete Show
rduser	rduser	rd@sunpowercorp.com	read only user for SunPower, Inc. (R&D)	Change Password Edit Delete Show
★ Jordan	jordan	jordan.shechter@sunpowercorp.com	-	Change Password Edit Delete Show
★ Donald Arnold	donald	donald.arnold@sunpowercorp.com	-	Change Password Edit Delete Show
hammer	hammer	hammer@sunpowermonitor.com	network admin for SunPower, Inc. (R&D)	Change Password Edit Delete Show
★ doug	doug	doug.felmann@sunpowercorp.com	-	Change Password Edit Delete Show
★ Jim Amedeo	jim	jim.amedeo@sunpowercorp.com	-	Change Password Edit Delete Show

10 Found

Fig. 45

- To create a new user, click **Create New** in the upper right of the table. In the **Create User** window, enter or select values in the following fields (Fig. 46):

Name	Enter the user's name or user role.
Login	Enter the login username.
Email	Enter the email address of the user.
Password and Password confirmation	Enter and re-enter the user password.
Admin	Select <i>True</i> or <i>False</i> .
User roles	Select from the Customer dropdown list the customer name to which account the user will be given access/assigned permission. Enter [value] in the Role field.
Create Another	

- To view user information, click *Show*. The **Show User** window opens (Fig. 36). Click **Close** or the X button to close the window.

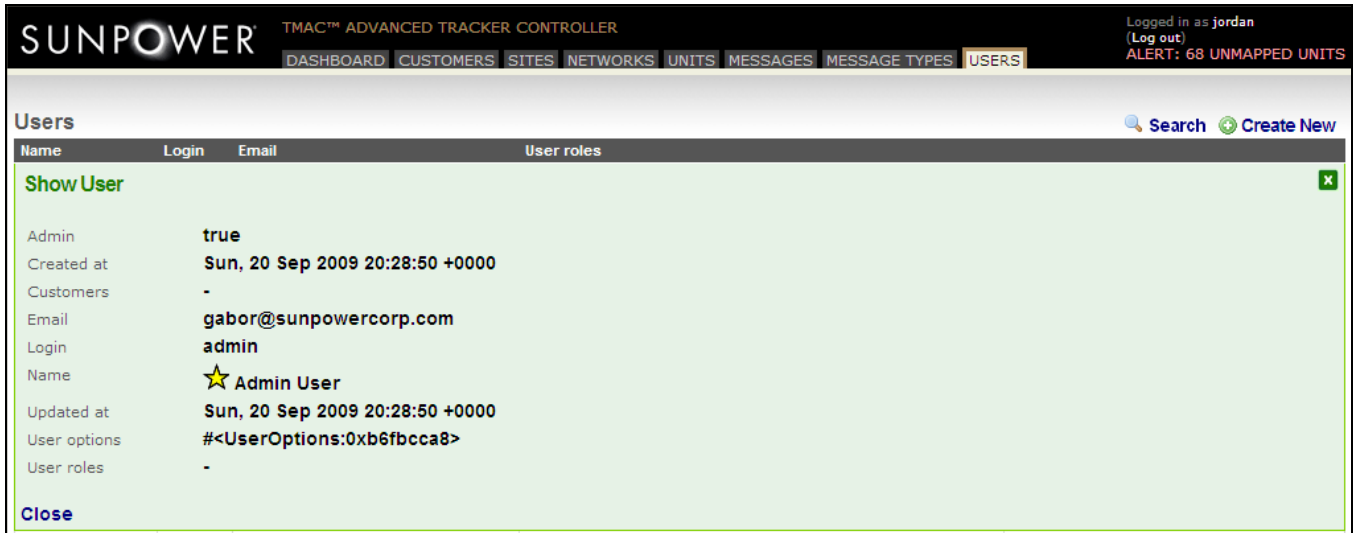


Fig. 46

- To change user information details, click *Edit*. The **Update [User name]** window opens (Fig. 47).

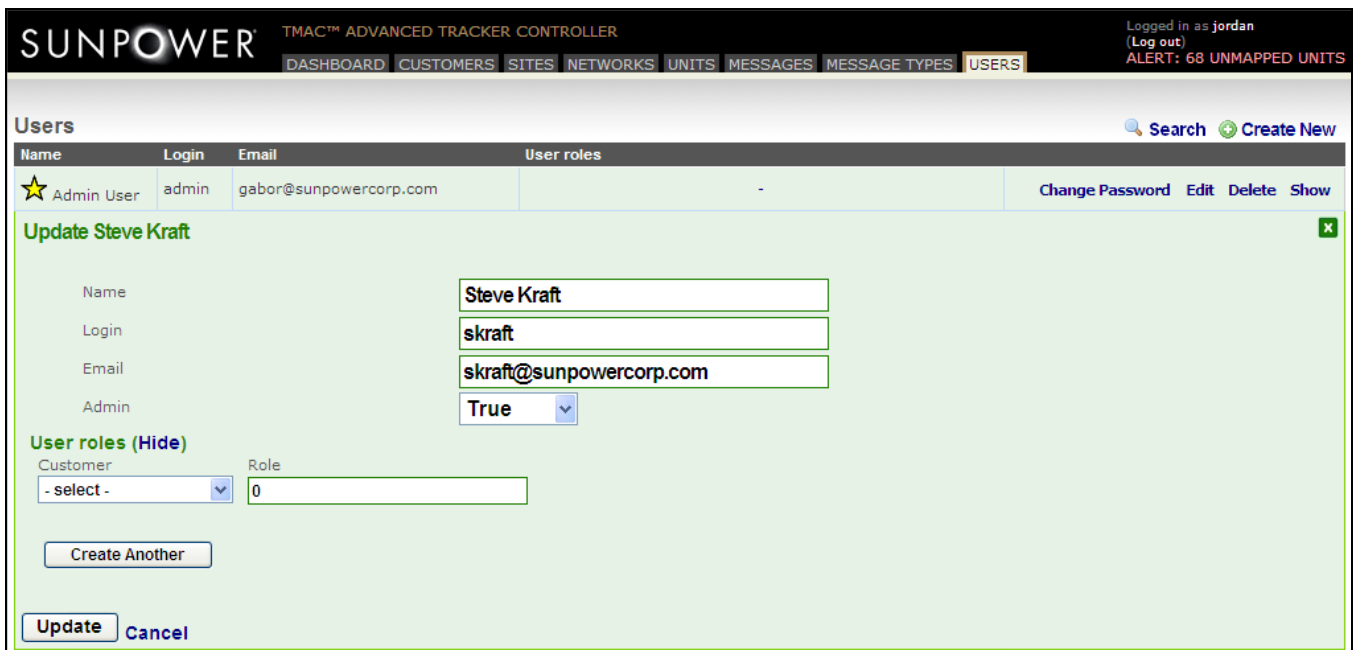


Fig. 47

- To change user passwords, click *Change Password*. The **Change password for user [User name]** window opens (Fig. 48).

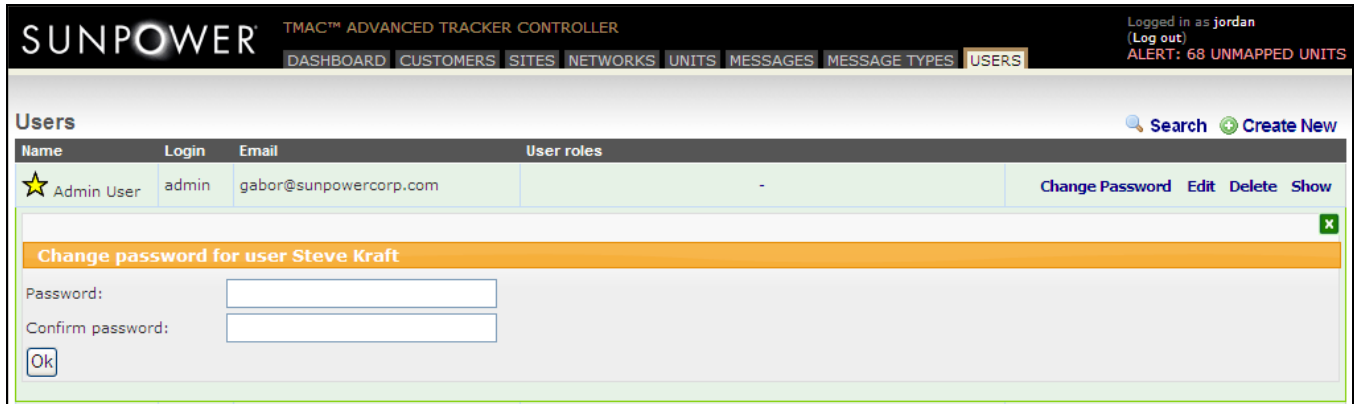


Fig. 48

- a. Enter the new password and re-enter to confirm.
 - b. Click *Ok*.
- To delete a user profile, click *Delete*. Click *OK* in the confirmation window.

Appendix A: Message Types

A.1 System Status: (101)

Message type	System status
Message number	12957
Time/date received	03-15-2010 15:54:49
Time/date created	03-15-2010 15:53:58
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Time since boot (seconds)	964038
Time since boot (D:H:M:S)	Days:11,Hours:3,Minutes:47,Seconds:18
Unit booted at	03-04-2010 11:06:40
Valid settings	Time Location
Invalid settings	All settings valid
Remote stow	NO
Force version	4
Force mask	00000000000000000000000000000000
Working	00000000000011111111111111111111
Subsystem not working	All subsystems working
Digital inputs	11000000000000001111000000000000
NodeID inputs	0
PanID inputs	3
UI switches	MODE:Automatic,JOG1: Off,JOG2: Off
GP digital inputs	11110000

Digital outputs	00000000
Motor1 position	-44.44
Motor2 position	0.0
Motor3 position	0.0
Motor4 position	0.0
Analog inputs 1	2.542 Volts (Code=520)
Analog inputs 2	1.085 Volts (Code=222)
Analog inputs 3	0.523 Volts (Code=107)
Analog inputs 4	0.083 Volts (Code=17)
Analog inputs 5	1.119 Volts (Code=229)
Analog inputs 6	0.904 Volts (Code=185)

A.2 Inclinometer Status (102)

Message type	Inclinometer status
Message number	12960
Time/date received	03-15-2010 15:54:52
Time/date created	03-15-2010 15:54:00
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Number	0
Reading valid	VALID
Reading, +/- 180	-44.91
Reading, 0-360	0.0
Temperature	0.0 C, 32.0 F

Maximum temperature	-999.0 C, -1766.2 F
Minimum temperature	999.0 C, 1830.2 F
Power supply voltage	0.0
Attempts	61647190
Updates	61647190
Failures	0

A.3 Wireless 1 Status (103)

Message type	Wireless1 status
Message number	13030
Time/date received	03-15-2010 16:55:04
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Wireless MAC	00:13:a2:00:40:3c:35:61
Address	0 (0x0)
Network	45995 (0xb3ab)
Rx: OK	28951
Rx: Out of frame	22
Rx: Bad checksum	0
Rx: Unknown packet ID	0
Rx: AT OK	57097
Rx: AT timeout	1
Rx: AT error	0

Rx: AT invalid command	0
Rx: AT invalid parameter	0

A.4 Wireless 2 Status (104)

Message type	Wireless2 status
Message number	13031
Time/date received	03-15-2010 16:55:05
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Tx: attempts	6800
Tx: OK	6800
Tx: failures	0
Tx: characters	176608
Tx: retries	0
# of decibel measurements	122
Average decibel measurement	-75
Minimum decibel measurement	-89
Maximum decibel measurement	-60
Wireless chip firmware version	2.1.6.4
Wireless chip hardware version	6724 (0x1a44)

A.5 Wireless 3 Status (105)

Message type	Wireless3 status
Message number	13032
Time/date received	03-15-2010 16:55:06
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Tx: bad state	0
Tx: packet timeout	0
Tx: route discovery	0
Tx: address discovery	0
Tx: CCA fail	0
Tx: invalid destination	0
Tx: ACK fail	0
Tx: unjoined	0
Tx: self addressed	0
Tx: address not found	0
Tx: route not found	0
Tx: unknown err	0
Tx: unknown err	0
Network resets	0
Network hardware resets	0

A.6 Operating System Status (106)

Message type	Operating system status
Message number	13027
Time/date received	03-15-2010 16:55:02
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Ethernet MAC	00:03:f4:03:f6:41
Minimum watchdog (ticks)	37366
Minimum watchdog (seconds)	4.61
Thread Watchdog Max (seconds)	0
Firmware version	3.2.6
PCA Serial Number	JS09371508789310000
Sun position valid	true
Sun azimuth (earth)	-66.59 (sun position is West of South)
Sun elevation (earth)	21.44 (sun is above horizon)
Enclosure temperature (deg. C)	21.94

A.7 GPS Status (107)

Message type	GPS status
Message number	13033
Time/date received	03-15-2010 16:55:07
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61

Customer	SunPower, Inc.
Site	Exelon Network 3
Errors	0
Total bytes	371934969
Latitude	41.68 N
Longitude	-87.65 W
Receiver status	A
GPS time	2010-03-15 21:54:21 UTC
UART status	

A.8 A/D Status (108)

Message type	A/D status
Message number	13034
Time/date received	03-15-2010 16:55:07
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Point updates	580489830
Full updates	96748305

A.9 DIO Status (109)

Message type	DIO status
Message number	13035
Time/date received	03-15-2010 16:55:08

Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Updates	404042

A.10 Motor Status (110)

Message type	Motor status
Message number	13038
Time/date received	03-15-2010 16:55:11
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Number	0
Enabled	YES
Controlled	YES
Setpoint valid	YES
Feedback valid	YES
Actual position	-29.55 degrees
Setpoint position	-28.73 degrees
Position error	0.82 degrees
Output	0.0 percent
Forward limit (H/W)	OK
Reverse limit (H/W)	OK

Forward limit (S/W)	45.0
Reverse limit (S/W)	-45.0
Feedback errors	0
FWD seconds	676.19
REV seconds	0.0
FWD cycles	47
REV cycles	0

A.11 Settings 1 Status (114)

Message type	Settings1 status
Message number	13028
Time/date received	03-15-2010 16:55:03
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Latitude	41.68
Longitude	-87.65
Location source	GPS (2)
Wind speed current (miles/hour)	0.0
Wind speed source	Invalid (0)
Wind speed peak (over interval)	0.0
Wind speed avg (over interval)	0.0
Time source	GPS (1)

A.12 Settings 2 Status (115)

Message type	Settings2 status
Message number	13036
Time/date received	03-15-2010 16:55:09
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3
Tracker type	Single axis, roll (0)
Inclinometer type	Analog (voltage) inclinometer (1)
Motor type	AC motors (0)
East to west GCR	0.5
North to south GCR	0.35
Stow position	25.0
Motion deadband (in)	0.5
Motion deadband (out)	1.0
Controller mount	East
Nominal degrees per minute	

A.13 Server Status (116)

Message type	Server status
Message number	13037
Time/date received	03-15-2010 16:55:10
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61

Customer	SunPower, Inc.
Site	Exelon Network 3
Attempts	14760
Successes	13642
Host transactions	26970
MS per host transaction	788.74
DNS OK	13949
Dns fail	811
Connect OK	26953
Connect fail	17
Bad command	0
Bad key	0
Bad status	290
Read fail	0
Write fail	17
Telnet Port	0

A.14 Tracker Status (117)

Message type	Tracker status
Message number	13039
Time/date received	03-15-2010 16:55:12
Time/date created	03-15-2010 16:54:22
Unit	Mac: 00:13:a2:00:40:3c:35:61
Customer	SunPower, Inc.
Site	Exelon Network 3

Number	1
Azimuth	-66.59
Elevation	21.44
Site Roll	0.0
Site Pitch	0.0
Site Yaw	0.0