Westminster Glen West Entrance Solar Lighting System

This document describes the solar-powered lighting system for the new monument sign at the west entrance on Narrow Ridge. It was installed in December, 2018.

Obtaining Austin Energy electrical service to light the sign would have been cost-prohibitive, so a solar option was selected.

The system uses a low-voltage LED lamp, solar panel, battery and charge controller.

There are several on-line calculators available to determine the size of the solar panel and battery required for off-grid systems. This calculator from Tycon Systems yielded information consistent with other off-grid calculators.

Because the system uses a low voltage DC LED, no DC-AC inverter is required. The system consists of a 30-watt solar panel, 12V battery (52 Ah), a charge controller, and a 5-watt DC LED lamp. It is designed to provide lighting all night long (up to 14 hrs per day in the winter) for about 3 days with no sunshine. Trees restrict the amount of sunshine that the solar panel receives to about half that of an unobstructed location, and this is taken into account with the choice of panel size. A fan was added that turns on at 40°C (104°F) and off at 30°C (86°F).

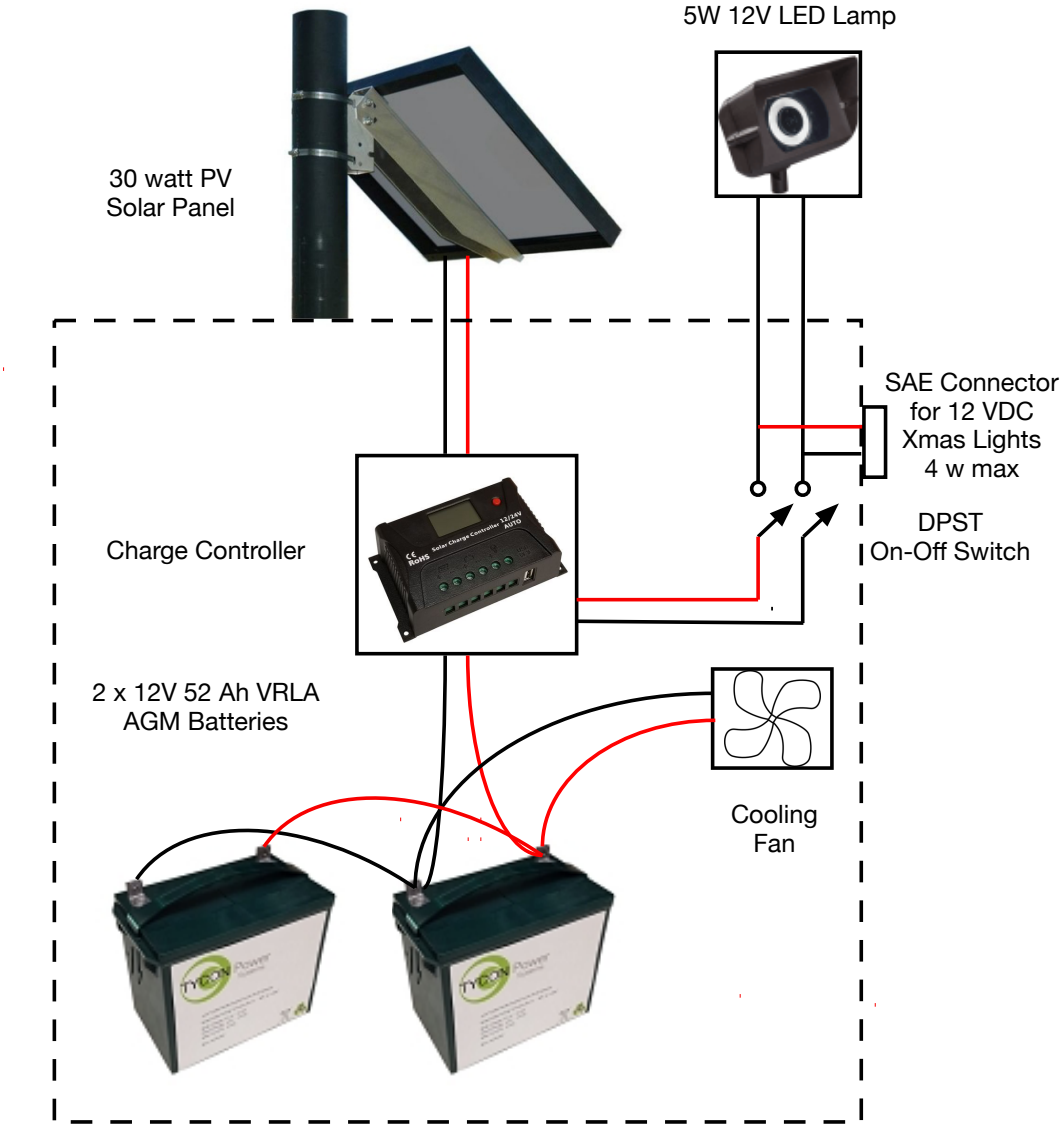
After over a year of service it became clear that the design for 3 days without sunshine was insufficient. There were a few occasions when the sun did not shine for more than 3 days, and at least once for about 5 days. In October, 2021, a second 52 Ah battery was added in parallel to increase the time to over 5 days without sunshine.

The specific components are listed in the following table.

Item	Company	Part No.
Solar Panel Kit (12V-30W) w/controller, panel & mount	Tycon Systems	TPSK12-30W
Battery 12V 52Ah (2 each)	Tycon Systems	TPBAT12-52
Enclosure	Tycon Systems	ENCST23x14x12
Cooling Fan	Tycon Systems	RPST-POWERVENT-24
On-Off Switch	Amazon.com	15A 250V 20A 125V DPST 4 Pin
SAE Connector	Amazon.com	IMESTOU SAE-1201
Pole, 2-7/8” Sch 40 Galvanized, 6 ft	Advanced Lighting Technology	2126-72
Post cap	Advanced Lighting Technology	5202-2-5
LED Floodlight, 5W 3000 deg, 12V DC	Build.com	Kichler 16070-30R
LED Christmas lights, warm white, 2.4W 12V DC	Christmas Light Source	12V-49193R
Floodlight mounting post & cap	Amazon.com	RAB MP19B
Installation Items (wiring, conduit, fittings, concrete, etc.)	Home Depot	

In 2021 we added the capability to connect 12V DC LED Christmas lights to the system. A standard SAE automotive receptacle was added to the side of the box next to the on/off switch. The present set of two strings of lights connected in parallel draw a total of 300 mA. With these lights connected, the days without sunshine drops to 3-1/2.

Below is a sketch of the design. Following that are installation photos, the specifications for the components and the instructions for the charge controller.



Westminster Glen West Entrance
Solar Lighting System

December, 2018
Rev November 2021


BATTERY
CSB
EVX 12520
12V 52Ah
Made in Taiwan
Hitachi Chemical Energy Technology Co., Ltd.
Pb
Pb

TYCON Solar™

TPS Series

DATA SHEET

Heavy Duty Solar Panels

Features

- **Outstanding Low Light Performance**
- **Solar cells laminated with TPT/EVA bi-layer for long life. 25 year solar cell output warranty**
- **High Efficiency with high transparency low iron tempered glass cover. Rugged extruded anodized aluminum frame**
- **Sealed for protection from harsh environments**
- **Enclosed junction box for wired connections**

TPS-12-10 and TPS-12-30
12V 10W and 30W Panels

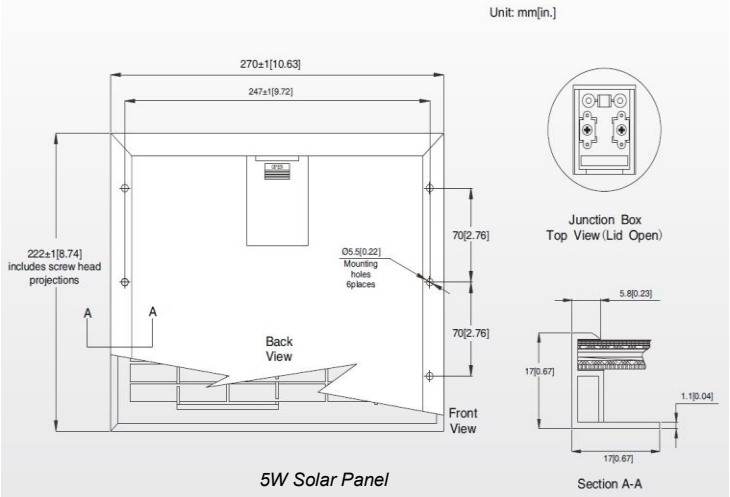
Applications

- **Battery Charging Applications**
- **Wireless Base Stations**
- **Remote Sensors**
- **Surveillance Cameras**
- **Outdoor Lighting**
- **Backup Power Systems**

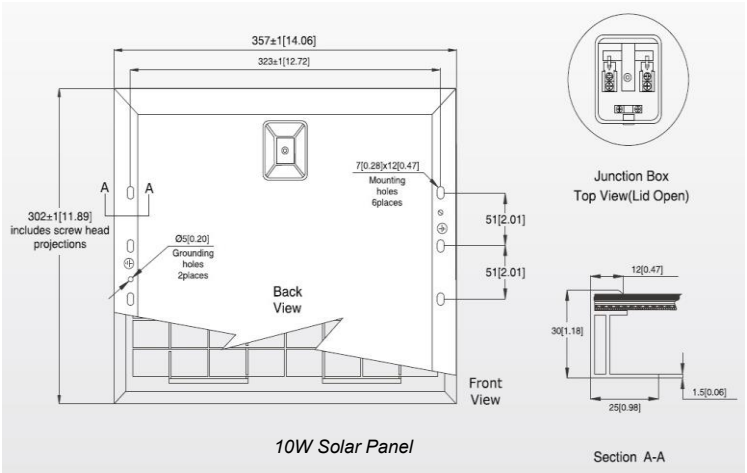
Description

The TPS series solar panels are high efficiency designs with excellent low light performance. The multicrystalline silicon solar cells from Germany are laminated with a TPT (Tedlar/Polyester/Tedlar) and EVA (Ethylene Vinyl Acetate) bi-layer for high reliability and long life. The cell array is sealed in a heavy duty extruded aluminum frame with a high transparency low iron tempered glass cover to protect the solar cells from harsh environments; hail, wind, snow and ice.

The solar panels are easy to mount because of the aluminum frame design. The wired connections are via a weatherproof junction box on the back of the panels.

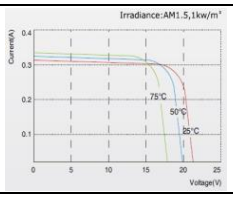
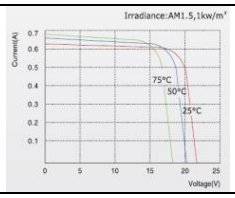
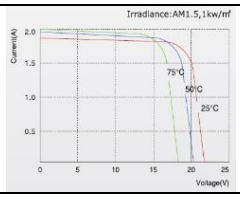
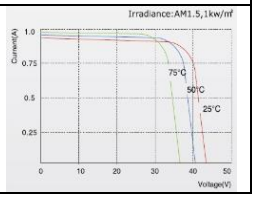


5W Solar Panel



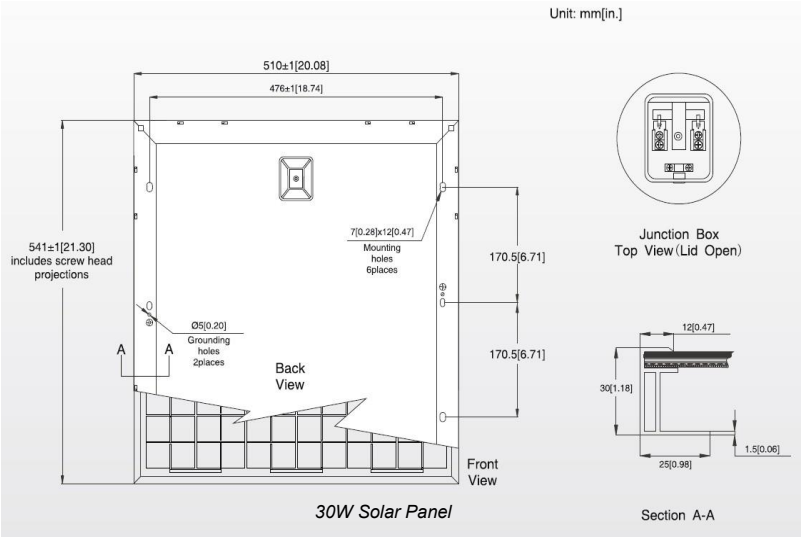
10W Solar Panel

Specifications

	TPS-12-5	TPS-12-10	TPS-12-30	TPS-24-30
Maximum Power (+/-5%)	5W	10W	30W	30W
Voltage at Pmax (Vmp)	17V	17V	17.2V	34.4V
Current at Pmax (Imp)	0.29A	0.58A	1.74A	0.87A
Open Circuit Voltage (Voc)	21.6V	21.6V	21.6V	43.2V
Short Circuit Current (Isc)	0.34A	0.68A	1.93A	0.97A
Short Circuit I Temp Coeff	.065% / °C			
Open Circuit V Temp Coeff	-80mV / °C			
Output Power Temp Coeff	0.5%/°C			
Wind Survivability	201kph (125mph)			
Hailstone Survivability	1" @ 50mph			
Operating Temperature	-40 to +85°C			
Continuous Power Capability *(6hrs average sunlight per day)*	1.25W	2.5W	8W	8W
Size	222 x 270 x 17mm (8.7 x 10.6 x 0.67")	302 x 357 x 30mm (11.9 x 14 x 1.2")	541 x 510 x 30mm (21.3 x 20 x 1.2")	541 x 510 x 30mm (21.3 x 20 x 1.2")
Weight	0.75kg (1.7lb)	1.6kg (3.5lb)	3.8kg (8.4lb)	3.8kg (8.4lb)
IV Curves				

Notes:

- All shipments F.O.B. Bluffdale, UT 84065
- Tycon Solar®, Solar Panels carry a 5 year limited warranty and a 25 year limited power output warranty



System Ordering:

TPS-12-5	12V 5W Heavy Duty Solar Panel
TPS-12-10	12V 10W Heavy Duty Solar Panel
TPS-12-30	12V 30W Heavy Duty Solar Panel
TPS-24-30	24V 30W Heavy Duty Solar Panel

For further information contact:

Tyconsystems.com

RoHS compliant

TYCON Solar™

14641 S 800 W Ste A
Bluffdale, UT 84065
PH: 801-432-0003
FAX: 801-618-4220

TYCON Solar™

TPBAT12-52

DATA SHEET

High Rate Valve Regulated SLA Battery

Features

- **Sealed and Maintenance Free**
- **Safety Valve for Ultimate Safety; Prevents Overpressure**
- **Exceptional Deep Discharge Recovery Performance**
- **Low Self Discharge Characteristics**
- **Highly Resistant to Vibration and Shock**

TPBAT12-52
12V 52Ah SLA AGM Battery

Applications

- **Remote Equipment Power**
- **Wireless Base Stations**
- **Remote Sensors**
- **Surveillance Cameras**
- **Medical Equipment**
- **Backup Power Systems**

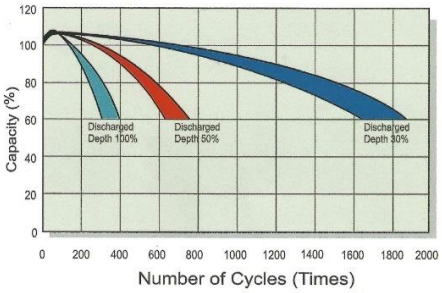
Description

The TPBAT12-52 high rate valve regulated sealed lead acid (VRLA) AGM battery has been developed for long term operation in harsh environments. They have a high cycle life and impressive 8 year float life. They are designed to operate over a wide temperature range such as those experienced in outdoor equipment applications. The batteries can be installed in any position without affecting their performance or reliability.

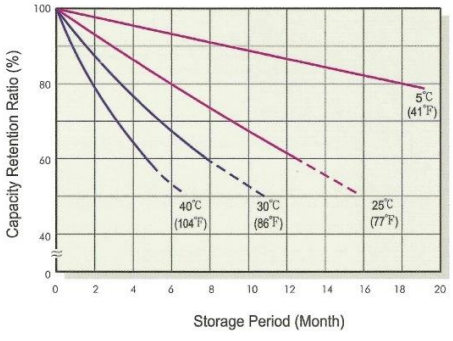
Specifications

	TPBAT12-52
Voltage	12V
Capacity (amp hours; 20hr)	52
Typical Float Life	8 Years
30% Discharge Cycle Life	1800 Cycles
Type / Technology	Valve Regulated Sealed Lead Acid / Absorbent Glass Mat (AGM)
Self-Discharge (25°C)	<3% per month
Charge Voltage (-30mV / °C)	14.4 to15V ; Max Current 15.6A
Float Voltage (-20mV / °C)	13.5 to 13.8V
Internal Resistance	5.2mΩ
Operating Temperature	-30C (-22F) to +60C (140F)
Housing	ABS (UL94HB)
Certifications	ISO 9001: 2000, ISO 14001, ISO 5001, UL, IEC, VdS
Compliances	JIS C 8704-2: 1999, BS6290 PART4 1987, TL9000, EUROBAT, OHSAS, NEBS, REACH, RoHS
Dimensions (L x W x H)	228 x 138.4 x 219 (9 x 5.4 x 8.6")

Cycle Service Life

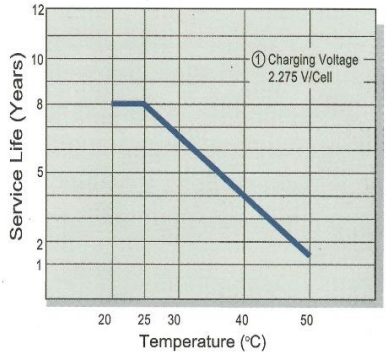


Capacity vs Storage Time

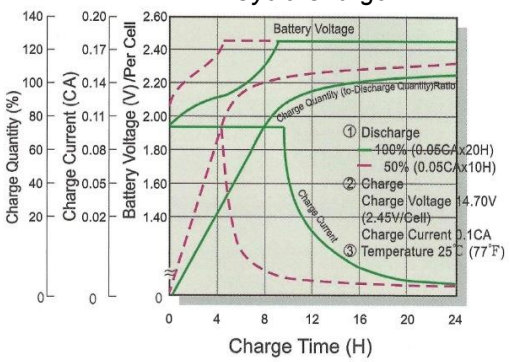


Weight	18.3kg (40.3lb)
Warranty	2 Years

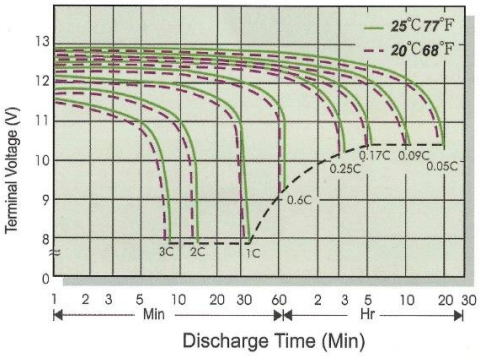
Float Service Life



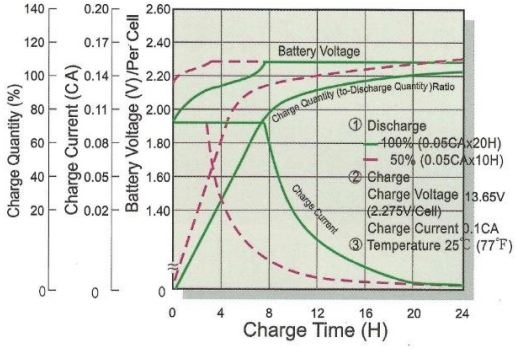
Cycle Charge



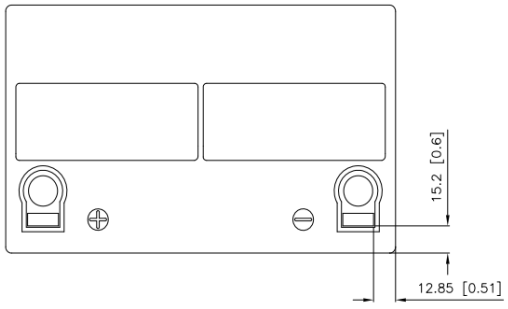
Voltage vs Discharge Time



Float Charge

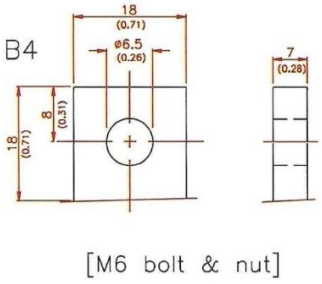


Battery Layout



TAB Dimensions

Max Torque 110 in-lb



System Ordering:

TPBAT12-52 12V 52Ah Valve Regulated Sealed Lead Acid AGM Battery

For further information contact:

Tyconsystems.com

TYCON Solar™
14641 S 800 W Suite A
Bluffdale, UT 84065
PH: 801-432-0003
FAX: 801-618-4220

2700K Warm-White LED Wall Wash BBR

16070BBR27R (Bronzed Brass)

Project Name: _____
Location: _____
Type: _____
Qty: _____
Comments: _____

Dimensions

Height	6.00"
Length	5.25"
Width	6.50"

Ordering Information

Product ID	16070BBR27R
Finish	Bronzed Brass
Available Finishes	BBR, BKT, BKT, AZT, BBR, AZT

Dimensions

Weight	4.00 LBS

Photometrics

Color Rendering Index	80
Beam Angle Options	100

Electrical

Voltage	12V
Operating Voltage Range	9-15V

Qualifications

Safety Rated	Wet
Warranty	www.kichler.com/warranty

Primary Lamping

Light Source	LED
Lamp Included	Integrated
Lamp Type	LED

Kichler
7711 East Pleasant Valley Road
Cleveland, Ohio 44131-8010
Toll free: 866.558.5706 or kichler.com

Notes:
1) Information provided is subject to change without notice. All values are design or typical values when measured under laboratory conditions.
2) Incandescent Equivalent: The incandescent equivalent as presented is an approximate number and is for reference only.

TYCON Solar™

ENC Series

DATA SHEET

Outdoor Enclosures

Features

- **Weatherproof Nema 4X / IP65, UV resistant, outdoor enclosures**
- **Choice of Die Cast 10x8x3” or Polycarbonate 14x10x5” or Steel 23x14x12"**
- **Gasket sealed**
- **Weatherproof cable feedthru**

ENC-DC
Die Cast Enclosure

ENC-PL
Polycarbonate Enclosure

Applications

- **Wireless Base Stations and Clients**
- **Wireless Bridge and Repeaters**
- **Outdoor Utilities**
- **Surveillance Cameras**
- **Remote Sensors**
- **Solar and Wind Power**

ENC-ST
Steel Enclosure

Description

The ENC series outdoor enclosures are designed for applications that require a sturdy, weatherproof enclosure to house various electronics. They have gasket seals and are made from UV resistant materials for long service life. They can be wall or pole mounted. The ENC-PL and ENC-ST enclosures have lockable closures to prevent unauthorized access.

Features include a hinged cover for easy access and weatherproof feedthru’s for cables and wiring. The ENC-DC comes with two RJ45 feedthru which allows passing of an RJ45 connector to make the entire enclosure field replaceable. It also has three cutouts for an N Female connector for attaching external antennas. Hole Plugs are included for the N Cutouts if all aren’t needed. The ENC-PL has 3 weatherproof universal cable feedthru’s. The ENC-ST has four cutouts for RJ45 Feedthrus (included) and DIN rail mounts on both interior sides as well as on the door. The ENC-St also comes with a removable battery shelf.

ENC-DC
Bottom Panel Cutouts

ENC-ST
Bottom Panel Cutouts

ENC-PL
Bottom Panel with Universal Feedthru

ENC Series

Specifications

	ENC-DC	ENC-PL	ENC-ST
Enclosure Type	Die Cast Aluminum with powder coat paint	Glass Filled Polycarbonate	Powder Coated Steel
Weatherproofing	Nema 4X / IP65	Nema 3R / IP54	Nema 4X / IP65
Enclosure Mounting	Wall or pole mount with included U-Bolts for up to 1.6”	Wall or pole mount with hose clamps (not included)	Wall or pole mount with hose clamps (optional)
Interior Mounts	Qty 9 4mm threaded standoffs	Numerous holes for 4mm self tapping screws/standoffs	Removable Steel Backplate
Enclosure External Size	11 x 8.5 x 3.5” (279 x 216 x 89mm)	17.5 x 12.5 x 6” (445 x 318 x 152mm)	24 x 15 x 14" (610 x 381 x 356mm)
Enclosure Internal Size	10 x 7.75 x 3” (254 x 197 x 76mm)	14 x 10 x 5” (356 x 254 x 127mm)	23 x 14 x 12" (584 x 356 x 305mm)
Weight	4lb (1.8kg)	4lb (1.8kg)	55lb (25kg)

Notes:

- All shipments F.O.B. Bluffdale, UT 84065
- Tycon Power Systems ENC Outdoor Enclosures carry a 3 year limited warranty

ENC-DC
Die Cast Enclosure

ENC-PL
Polycarbonate Enclosure

ENC-ST
Steel Enclosure with Pole Mount Kit

System Ordering:

ENC-DC-10x8x3	Outdoor Die Cast Enclosure 10x8x3”
ENC-PL-14x10x5	Outdoor Polycarbonate Enclosure 14x10x5”
ENC-ST-23x14x12	Outdoor Powder Coated Steel Enclosure 23x14x12”
ENC-ST-POLEKIT	Pole Mount Kit for Steel Enclosure 23x14x12”

For further information contact:

Tyconsystems.com

RoHS compliant

TYCON Solar™
14641 S 800 W Ste A
Bluffdale, UT 84065
PH: 801-432-0003
FAX: 801-618-4220

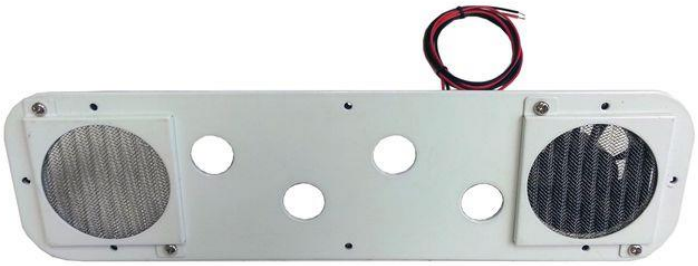
RPST-PowerVent

DATA SHEET

12/24V Power Ventilation Adapter

Features

- **12/24V Power Ventilation Adapter for Tycon ST Enclosures**
- **Field Upgradeable**
- **Thermostatically Controlled**
- **Only 1W Power Draw at 12VDC**



Description

The RPST-PowerVent is a field upgradeable power ventilation system for Tycon® ENC-ST enclosures which are used in RPST Remote Power and UPS-ST Outdoor Backup Power systems. The RPST-PowerVent unit replaces the existing access plate located in the bottom of the enclosure.

The RPST-PowerVent has a built in thermostat that turns it on when the temperature reaches 50 degrees centigrade (122F) and turns it off when the temperature falls below 50C. The thermostat control saves battery life in battery systems by turning on the fan only when needed to cool the interior of the enclosure. It typically takes less than 5 minutes to cool the interior of the enclosure to ambient temperature. The system has stainless steel mesh filters which can be removed for cleaning. The unit works on 12V or 24V battery systems. It comes with a 1m long 2 wire cable to connect to a voltage source.

Specifications

	RPST-PowerVent-24
Voltage Requirements	12VDC to 24VDC
Power Requirements	1W @ 12VDC – when temperature over 50C (122F)
Power Connection	1 meter 22AWG 2 Conductor red/black wire
Fan Air Volume	14 CFM min
Filter Mesh x 2	Stainless Mesh - 0.050” Openings
Cable Ports	20mm holes x 4 for Cable Gland
Mounting	8 Existing Screws in Enclosure Bottom Plate
Operating Temperature	-30C to +65C (-22F to 149F)
Humidity (RH)	5% - 95% (non-condensing)
Dimensions (LxWxH)	330 x 91.4 x 38mm (13” x 3.6” x 1.5”)
Weight	430g (15 oz)

Notes:

- All shipments F.O.B. Bluffdale, UT 84065
- RPST-PowerVent carries a 3 year warranty

Ordering:

RPST-PowerVent-24 12/24V Power Ventilator Adapter for ENC-ST Enclosures, RPST Systems, UPS-ST Systems

For further information contact:

Tyconsystems.com

14641 S 800 W Suite A
Bluffdale, UT 84065
PH: 801-432-0003
FAX: 801-618-4220

Charge Controller Instructions

TP-SC Series Smart Solar Charge Controller

TP-SC24-20

User Manual

Dear users,

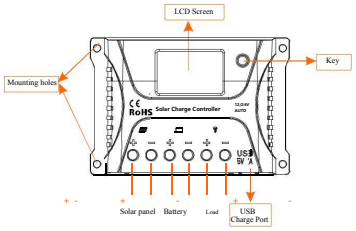
Thank you for choosing our product. Before using the product, please read this manual carefully.

Manual version: 1. 01 The contents of this manual are subject to change without prior notice.

Product Features

1.12V/ 24 V system voltages are automatically recognized.
2.An upgraded 3-stage PWM charging algorithm is adopted. Application of an equalizing charging to the battery periodically or when over discharged, can effectively prevent the battery from non-equalization and sulfation, thus extending the battery's service life.
3.With temperature compensation charging, charging parameters are automatically adjusted.
4.A wide range of load working modes facilitate the product's application to different types of load.
5.The product provides overcharge, over-discharge, overload protection, as well as short-circuit protection.
6.By virtue of an advanced load starting method, large-capacitance loads can be started smoothly.
7.The product provides an LCD screen for voltage and current measurements.
8.The user-friendly design ensures convenient and intuitive operations.
9.Boasting an industrial grade design, the product can function well in various tough conditions.
10.TVS lightning protection is included.

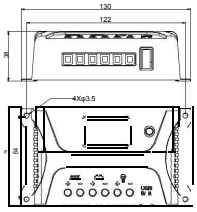
Panel Structure



Installation Instructions and Precautions

1.The controller shall be installed securely, and its dimensions are as follows:
TP-SC24-20 External dimensions:130×75×38 (mm)
Installation dimensions:122×64(mm)

2.Installation hole diameter:3.5(mm)



TP-SC24-20

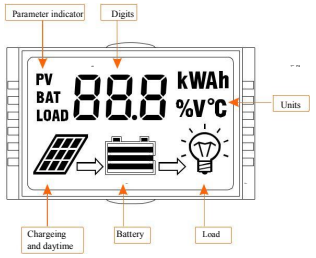
3. Operation Instructions
a)Step 1: Connect the battery. If the connection is correct, the controller screen lights up; otherwise, check whether the connection is correct. Always connect battery first and disconnect battery last to prevent damage to the charge controller.
b)Step 2: Connect the solar panel. If sunlight is present and strong enough (the solar panel voltage is greater than battery voltage), the sun icon on the LCD screen is on; otherwise, check whether the connection is correct.
c)Step 3: Connect the load. Connect the load leads to the controller's load output terminal, and the current shall not exceed the controller's rated current of 20A.

4.As the controller generates heat during operation, it is recommended that the controller be installed in an environment with good ventilation conditions.
5.Choose cables with large enough capacity to minimize losses. We recommend 12AWG cables for most applications.
6.The controller has a common positive pole inside. If grounding is needed, ground the positive pole.
7.It's important to fully charge the battery regularly. At least once full charging every month is recommended, and failure to do that may cause permanent damage to the battery. Only when in-flow energy outpaces out-flow energy can the battery be charged fully. Users shall bear this in mind when configuring the system.
8.Check that each of the controller's connection terminals are tightened securely; if not, the terminals may suffer damage when there is excessive current.

State Indicators

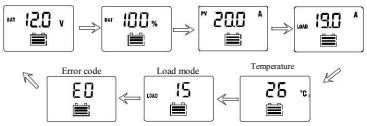
LCD Icon	Indicated Object	State
PV	Solar Panel Current	Cycles
BAT	Battery Voltage	Cycles
LOAD	Load Current	Cycles
	Daytime or Charging	Steady On
	Night Recognition	Steady Off
	Load Short Circuit or Overload	Quick Flashing
	Load Switched On	Steady On
	Load Switched Off	Steady Off
	Normal Battery	All On
	Over-Discharge	Outline Flashes
	Over-Voltage	3 Dashes Flashing

LCD Screen Illustration



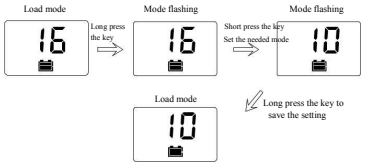
Browsing Menu on LCD Screen

The following menu is shown in an automatic cycle on the screen, with an interval of 3s.



Setting Menu on LCD Screen

Long press the key in any mode to enter the load mode setting interface, and the load mode begins to flash. Short press the key to adjust the load mode, and long press the key again to save and exit mode setting or wait for 10s to let the system save and exit automatically.



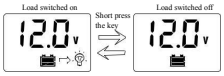
Five Load Working Modes

1. Pure Light Control (0): When sunlight disappears and the solar input voltage drops below the set point, the controller initiates a one minute delay, and then turns on the load output. When sunlight returns and the solar input voltage exceeds the set point, the controller initiates a one minute delay, and then turns off the load output.
2. Light Control + Time Control (1 to 14): The starting process is the same as pure light control. After operating for a preset period of time (settable from 1 to 14 hours), the load turns off automatically.
3. Manual Mode (15): In this mode, the user can switch the load on or off by the key, no matter whether it's day or night. This is the Default mode.
4. Debugging Mode (16): This mode is same as Pure Light Control mode without the 1 minute delay. This mode enables a quick check of the system installation and function.
5. Normal On (17): This mode is the same as Manual Mode (15) except now the load on/off Key is disabled.

LED Display	Mode
00	Pure light control mode
01-14	Light control + time control (1 to 14 hours)
15	Manual mode (default)
16	Debugging mode
17	Normal on mode

Manually Switching On/Off Load

When the load mode is set to 15 (manual mode), short press the key to switch on or off the load.



Note: Because load startup has a soft start function, display of the load icon on the LCD screen may have a slight delay after pressing the on/off key.

Overload and Short Circuit Recovery

Overload and short circuit automatic recovery time: 5s delay for the 1st occurrence; 10s delay for the 2nd occurrence; 25s delay for the 3rd occurrence; 30s delay for the 4th occurrence; after the 5th occurrence it requires manual recovery (press key button) or automatic recovery after 24hours.

Error Code List

Code on LCD screen	Corresponding error
E0	No error
E1	Battery over-discharging
E2	Battery overvoltage
E4	Load short circuit
E5	Overload
E6	Controller inner temperature over heat

Common Problems and Solutions

Symptoms	Causes and Solutions
LCD screen does not light up.	Check whether the battery is correctly connected. Check battery voltage >9V
Incomplete display or no renewal on LCD screen	Check whether the ambient temperature is too low and whether the display recovers when the temperature rises. Check battery voltage >9V
No charging with sunlight present	Check whether the solar panel is correctly connected, and contact is good and reliable. Check whether the solar panel voltage falls below the battery voltage.
The battery icon flashes quickly, and there is no output.	System overvoltage. Check whether the battery voltage is too high.
The battery icon flashes slowly, and there is no output.	The battery is over-discharged, and will recover after recharged adequately.
The load icon flashes quickly, and there is no output.	The load's power exceeds the rated value or the load is short -circuited. After the problem is solved, long press the key or wait until it recovers automatically.
Other symptoms	Check whether wiring is sound and reliable, and system voltage is correctly recognized.

Technical Data Sheet

TP-SC24-20	
Rated Current	20A
Current Display Function	Displays Load and Solar Current
System Voltage	Automatic recognition of 12 V/ 24 V
Self Consumption	< 10mA/12V ; < 12mA/24V ; <0.3W
Max. Solar Panel Input Voltage	<55V
Max. Battery Input Voltage	<35V
Overvoltage Protection	17.0V @ 12V ：34V @ 24V
Equalize Charging Voltage	14.6V @ 12V ：29.2V @ 24V
Boost Charging Voltage	14.4V @ 12V ：28.8V @ 24V
Float Charging Voltage	13.8V @ 12V ：27.6V @ 24V
Charging Recovery Voltage	13.2V @ 12V ：26.4V @ 24V
Over-Discharge Recovery Voltage	12.6V @ 12V ：25.2V @ 24V
Over-Discharge Voltage	11.1V @ 12V ：22.2V @ 24V
Equalize Charging Interval	30 days
Equalize Charging Time	1 Hour
Boost Charging Time	2 Hour
Temperature Compensation	-3.0mV/℃/Cell
Light Control Voltage	Light Control On 5V @ 12V ; 10V @ 24V Light Control Off 6V @ 12V ; 12V @ 24V

Material Code: 1.1.24.01443