



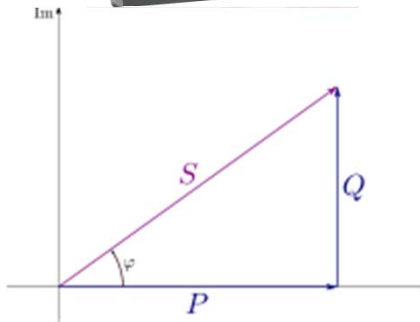
SMA CLUSTER CONTROLLER



Discussion Points

1	Cluster Controller Overview
2	Installation
3	Network
4	Configuration
5	SMA Performance Package

What Is It?



- > Communication Device
 - > Monitor and Data log up to 75 Sunny Tripower inverters
 - > Gateway to the SMA Solar Monitoring Center

- > Plant Control Device
 - > Set active and passive grid management features

- > Remote Troubleshooting Device
 - > Analyze before rolling a truck

Communication Package



COMMUNICATION IS EVERYTHING

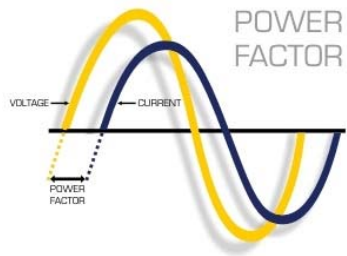
- > SPEEDWIRE – The new standard
- > Optimal for large scale plants
- > Ethernet-based and faster than RS485
- > Uses standard IT-components

▶▶ All options can be upgraded 'Plug & Play', even after the installation

What does it do?



- > Configures Tripower Speedwire network
- > Displays, gathers and reports plant data



- > Provides user interface for inverter parameter changes
- > Acts as Command feedback device for grid management




- > Sends data to FTP server and/or Sunny Portal
- > Provides firmware updates to itself and inverters

Firmware updates on SMA America Website

Overview Technical Data **Downloads**

Downloads Language: English (US) ▼

▼ Firmware

 **SMA CLUSTER CONTROLLER - Firmware-Version 1.00.49.R**

Type: Firmware
Language: International
Document number: Cluster_Controller_FW_v1_00_49_R
Version number: 1.00.49.R

0 KB

Why would I want to use the SMA Cluster Controller?



> Plant monitoring with SCADA

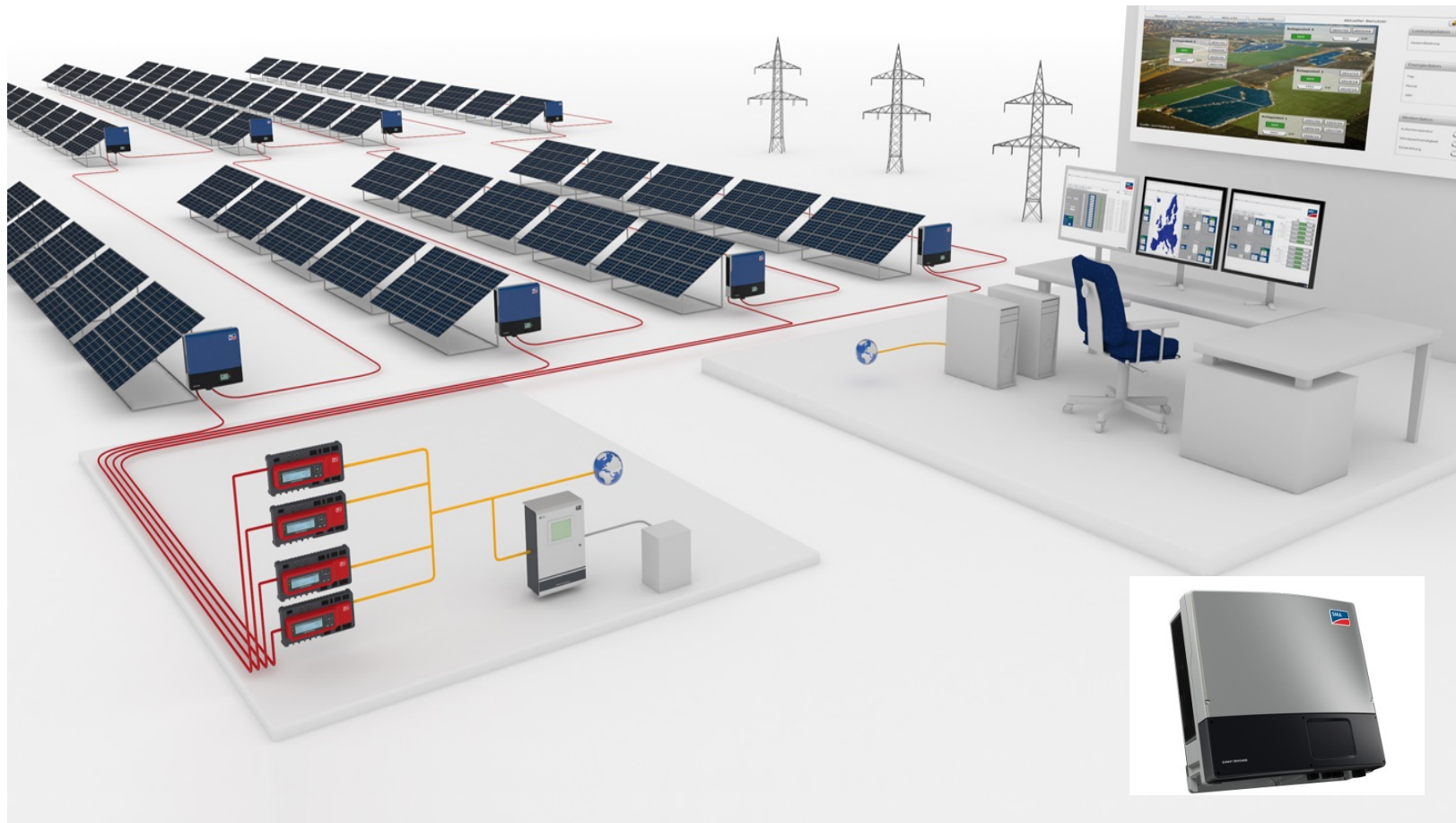


> Utility interface for Grid Management control



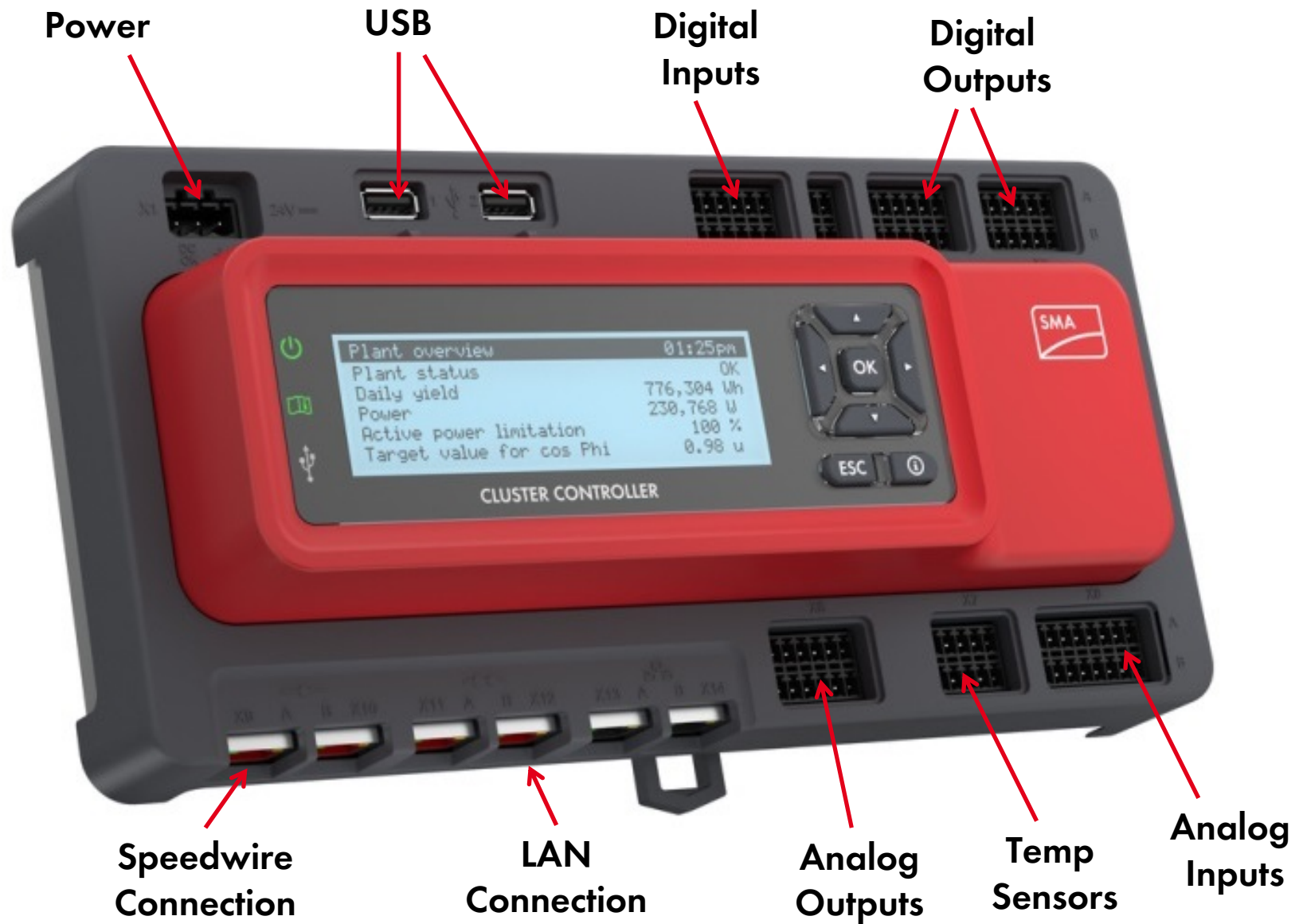
> Performance Package

Large Commercial PV Application Using SCADA



- > **Site with multiple Cluster Controllers, real-time plant monitoring and control**




Connection Area Terminals



Display & Keyboard



Operation LEDs

LED	Description	Explanation
	Power LED	Displays whether the Cluster Controller is starting or is in operation (for a description of the LED statuses, see Section 7.1.1)
	Status LED	Displays the status of the Cluster Controller and the connected devices as well as the communication status of the plant and the status of the grid management (for a description of the LED statuses, see Section 7.1.1)
	Data carrier status LED	Displays the status of the connected USB data carrier (for a description of the LED statuses, see Section 7.1.1)

Display Orientation

Display View Title

Yield Data	12:34
Power	358 kW
Day yield	6,742 kWh
Monthly yield	171 MWh
Annual yield	1,826 MWh
Total yield	5,296 MWh

Data and Values

Overview of Displays – Sunny Portal Settings



Discussion Points

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Cluster Controller Overview

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SMA Performance Package

What are the components in a Cluster Controller network?



- > Tripower Speedwire Module
 - > Every inverter needs one!
 - > Factory installed

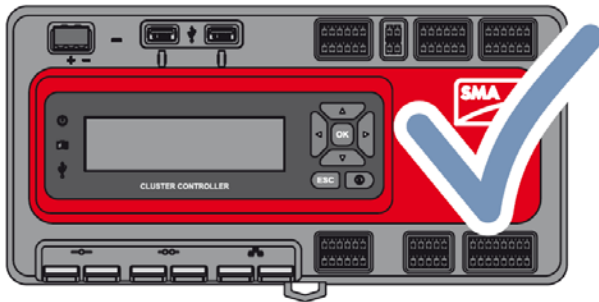


- > Cluster Controller & Accessories
 - > Power supply, weather instrumentation, etc.



- > Monitoring Network
 - > Sunny Portal, SCADA or Utility Control Center

Mounting the Device

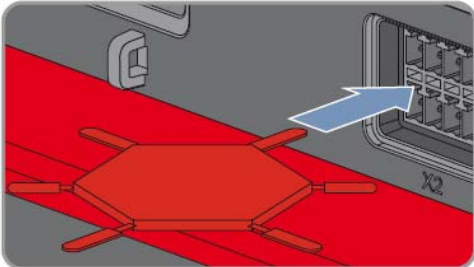


- > Inside or in a NEMA rated box for adequate protection
- > Vertical mounting only

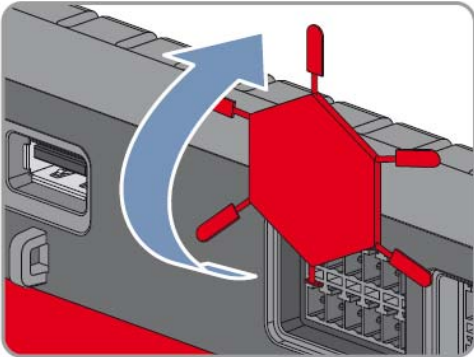


- > Must attach to 35mm DIN rail at least 26cm (10 inches) long

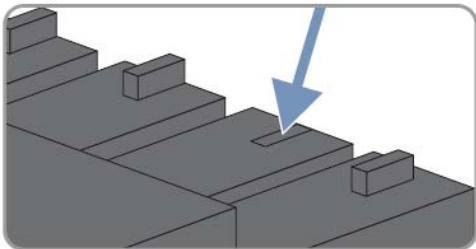
Pin Coding – Prevents inserting wrong multipole plug into the wrong terminal



> Insert coding tab into pin slot

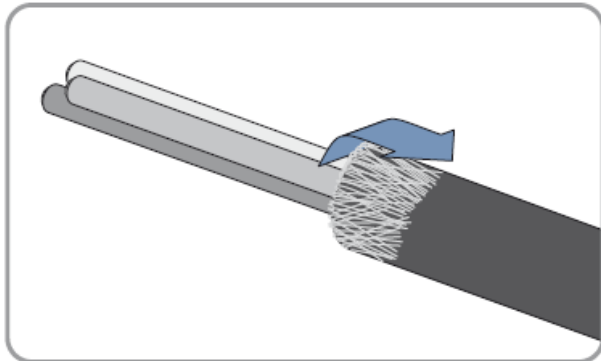


> Lift up the coding star to break off the tab into the pin slot

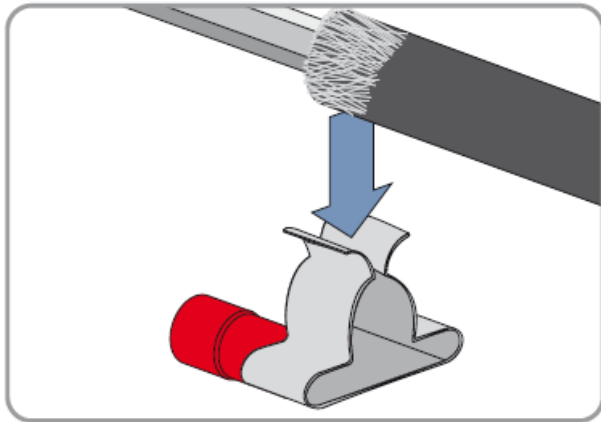


> Snap off the guide on the multipole plug that matches with the coding tab location.

Preparing the Connection Cables

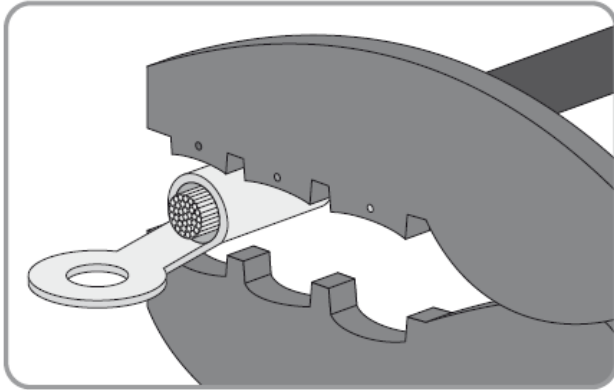


- > Strip off ½" of insulation on the cable that will be connected to the multipole plug
- > Fold the excess cable shield back onto the insulation

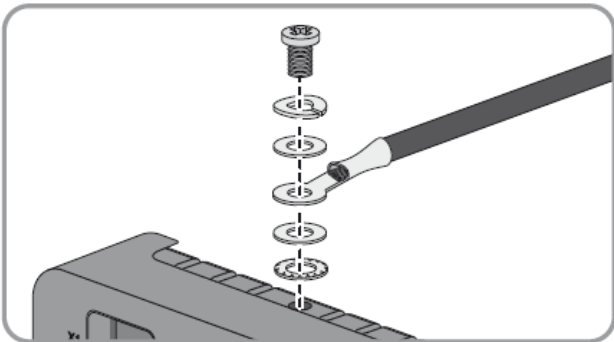


- > Press the wire into the multipole plug clamp

Equipment Grounding Conductor Connection

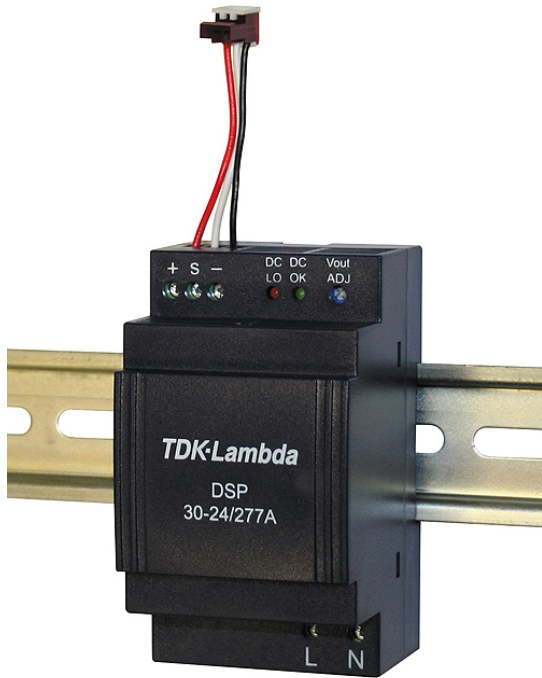


- > EGC Kit (included):
- > Fastening screw and ring terminal lug
- > 2 washers
- > Split lock washer and tooth lock washer



- > Strip off 1/4" of insulation from EGC and crimp on ring lug.
- > Screw → lock washer → washer → ring lug → washer → lock washer
- > Hand tighten to 7 inch pounds

Power Supply Requirements



- > Not included with Cluster Controller
- > Too many voltage options - 208, 120, 277, DC
- > Installation manual has recommendations for specs

TDK Lambda # DSP-30-24277

Power Supply Requirements

- > Phoenix Contact, Mini-PS-100-240-AC/24DC/2, Order#: 19 38 73 0
- > TDK Lamda # DSP-30-24277
- > 24V DIN Rail ClCon \$22 Expert-Daq, Input: 90-264VAC, Output: 24VDC, Nom current: 1.8A, 45W, \$22
- > 24V DIN Rail power supply \$33 Mean Well, Input: 100-264VAC, Output: 24VDC, Nom current: 2.5A, 60W, \$33.58
- > 24V DIN Rail \$119 , Spec Sheet , PS1060, Input: 85-264VAC or 120-370VDC, Output: 24VDC, Nom current: 2.5A (range 0-2.5), 60W, \$119
- > 24V DIN Rail Wesco \$156 ACME Electric DMP1-2402, Input: 90-264VAC, Output: 24VDC, Nom current: 2.1A, 50W, \$156.43 (see Wesco's catalog)

Powering Up the Cluster Controller



- > Prepare 24VDC power wire by connecting it to a multipole plug
- > Connect 24VDC plug to power input terminal of CLCON
- > Connect other end of power supply to AC service.



Cluster Controller Quick reference Guide for Commissioning

Quick Reference Guide for Commissioning
SMA CLUSTER CONTROLLER

ClusterController-IS-US_en-1.1 | Version 1.1

AMERICAN ENGLISH

1 GENERAL INFORMATION

WARNING

All electrical installations in the USA and Canada must be made in accordance with the local standards and National Electrical Code® ANSI/NFPA70 or the Canadian Electrical Code®. To reduce the risk of personal injury and to ensure the safe installation and operation of the product, you must carefully read and observe all instructions, cautions and warnings in the CD-ROM manual attached to the product before installing or using the product.
Wiring of this product must be made by qualified persons only.

2 INFORMATION ON THIS DOCUMENT

Validity
This document is applicable for the device type "CLCON-10.GR1" (SMA Cluster Controller) from hardware version A1 and from firmware version 1.0.

Target Group
This document is for qualified persons. Only qualified persons are allowed to perform the tasks described in this manual. Qualified persons must have the following skills:

- Training in the installation and commissioning of electrical devices
- Training in how to deal with the dangers and risks associated with installing and using electrical devices and plants
- Training in the installation and configuration of IT systems
- Knowledge of how an inverter works and is operated
- Knowledge of all applicable standards and directives
- Knowledge of and adherence to this document and all safety precautions

3 SAFETY

Intended Use
The Cluster Controller* is a device for monitoring and controlling up to 75 SMA inverters with Speedwire/ Webconnect interface in decentralized large-scale PV power plants. The Cluster Controller is a digital Class A device according to section 1.5 of the FCC directives and is designed for industrial use. The Cluster Controller must only be used in an indoor environment and must only be used with supported products (for a list of the supported products, see the installation manual on the CD included in the scope of delivery). For safety reasons, it is forbidden to modify the product or install components that are not explicitly recommended or distributed by SMA**. Only use the Cluster Controller in accordance with the information provided in the enclosed documentation. Any other use can result in personal injury or property damage. The enclosed documentation is an integral part of this product:

- Read and observe the documentation.
- Keep the documentation in a convenient place for future reference.

* In this document, the SMA Cluster Controller is referred to as Cluster Controller.
** In this document, SMA America Production, LLC and SMA Solar Technology Canada Inc. will be referred to as SMA.

2

Discussion Points

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Cluster Controller Overview

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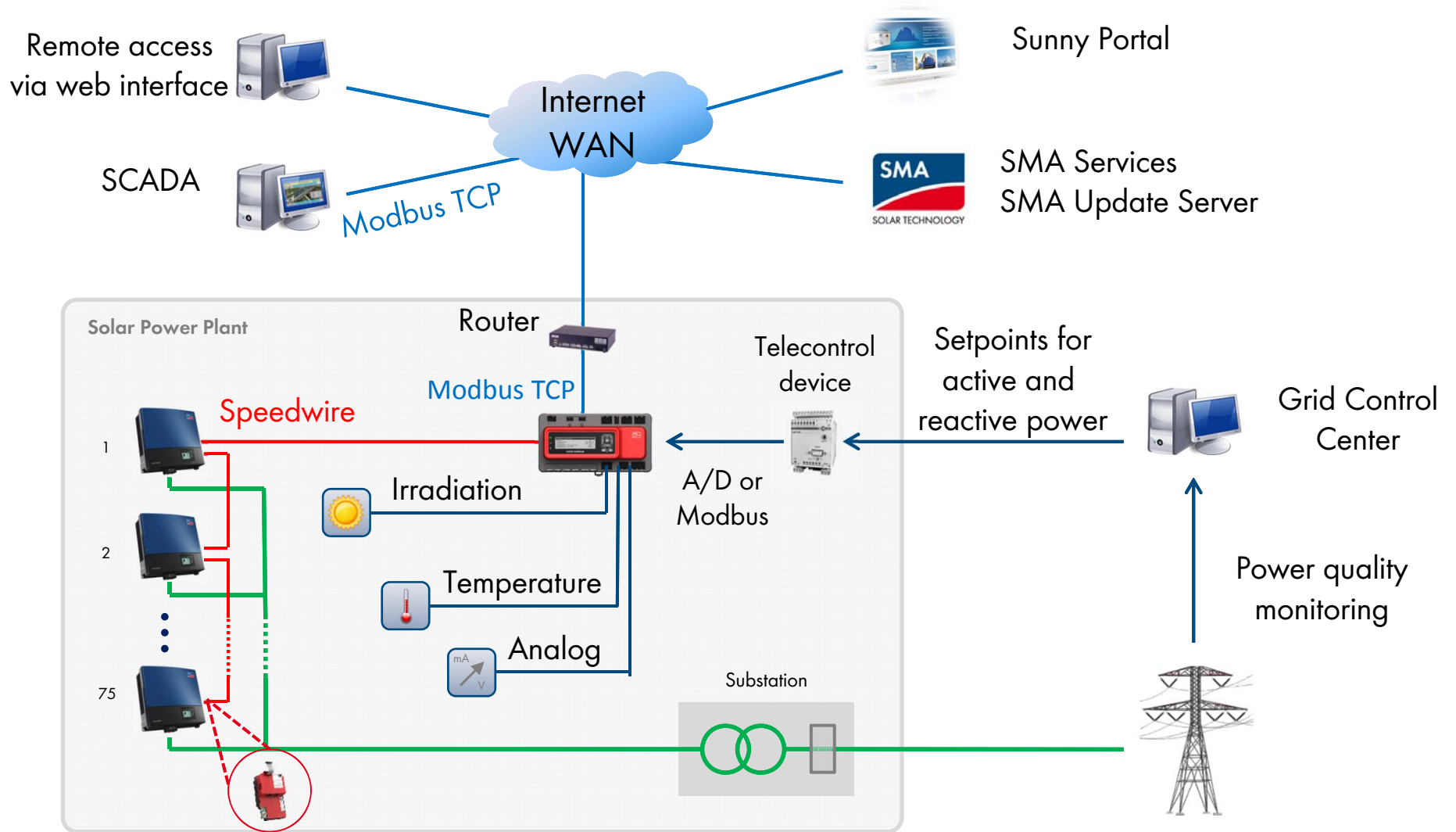
4

Configuration

5

SMA Performance Package

Cluster Controller Network Setup



Connect Cluster Controller to Speedwire Network

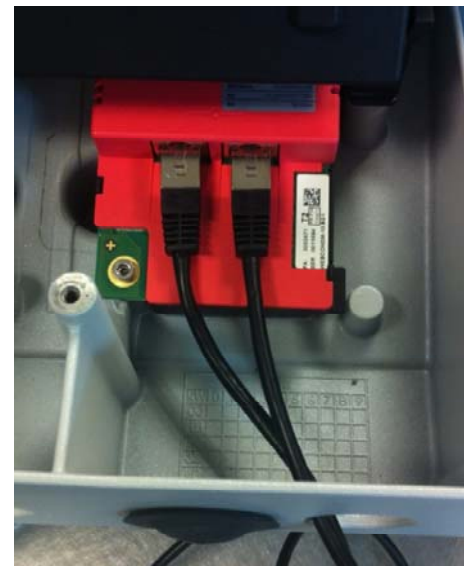
- > Daisy chain the STP Webconnect modules together
- > Ethernet cable with RJ45 connectors
- > Last STP connects to router



1



2



75



Connect Cluster Controller to Speedwire Network

- > Connect Ethernet homerun from last STP to Cluster Controller
 - > X9 - X12
- > Connect Cluster Controller to router (X13 or X14)
- > Connect router to WAN/Internet



Overview of Displays - Speedwire



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SMA Performance Package

Cluster Controller Local Area Network Configuration



```
C:\> Administrator: C:\Windows\sys
Media State . . . . .
Connection-specific
Ethernet adapter Local
Connection-specific
Link-local IPv6 Addr
IPv4 Address. . . . .
Subnet Mask . . . . .
Default Gateway . . . . .
```

Modbus[®]

> Router will assign IP address to CLCON when it is connected

> Static IP can be set using a computer directly connected to CLCON

> Modbus data server configuration may be required

> External Communication → Modbus

> SMA Cluster Controller Modbus Interface technical description

User Defined MODBUS Mapping Whitepaper



SMA America, LLC
6020 West Oaks Blvd, Ste 300
Rocklin, CA 95765-3714
Tel.: +1 916 625 0870
Fax: +1 916 625 0871

SMA Cluster Controller

Creating a user-defined Modbus® map for more efficient Modbus® polling

Scope: This document is intended to assist the customer in creating a user-defined Modbus map that can be polled in one continuous sequence on the SMA Cluster Controller. It is intended as a supplement for the SMA Cluster Controller Modbus Interface Technical Description document, and not as a replacement.

Target Group: The user of this document shall be a skilled person. A skilled person is one who has:

- Knowledge of IP-based network protocols
- Vocational training for installation and configuration of IT systems
- Knowledge of and compliance with this document & the SMA Cluster Controller Modbus Interface Technical Description document.
- Have the permissions to modify parameters of connected devices.

Procedure:

1. Ensure that your computer is on the same network as the inverter (hardwired into router or wireless).



Advanced Network requirements



> HTTP Port 80 must be open for Sunny Portal connection



> Port 9522 must be open on all routers/switches between CLCON and Internet connection



- > Firewall exception if required
- > Portal upload server IP: 171.25.178.23
- > Portal upload server name: ccl-com.sunny-portal.de

Overview of Displays – External Communication



Overview of Displays – Modbus Settings



Cluster Controller External Memory



- > CLCON has 1.7GB internal memory
- > USB sticks are compatible / FAT16 or FAT32
- > 2TB maximum



- > Highly recommend using an external USB hard drive

Connecting External Sensors to the Cluster Controller



- > Meteorological weather instrumentation can be directly connected to CLCON
- > Must match output of sensors to input requirements of CLCON

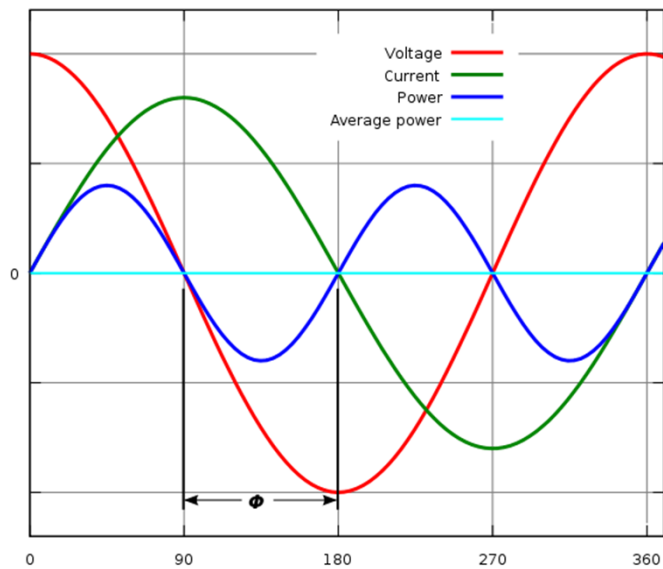


- > Connect instrumentation to either analog or digital inputs on CLCON
- > Ambient & PV temperatures, irradiance meter, wind speed

Overview of Displays - Meteorology



Grid Management Setpoints



- > Setpoints will be utility/operator directed
- > Can be set at CLCON display, computer direct connect, SCADA or even Sunny Portal

- > Setpoints activated by plant monitor
- > If...Then function

Overview of Displays – Grid Management

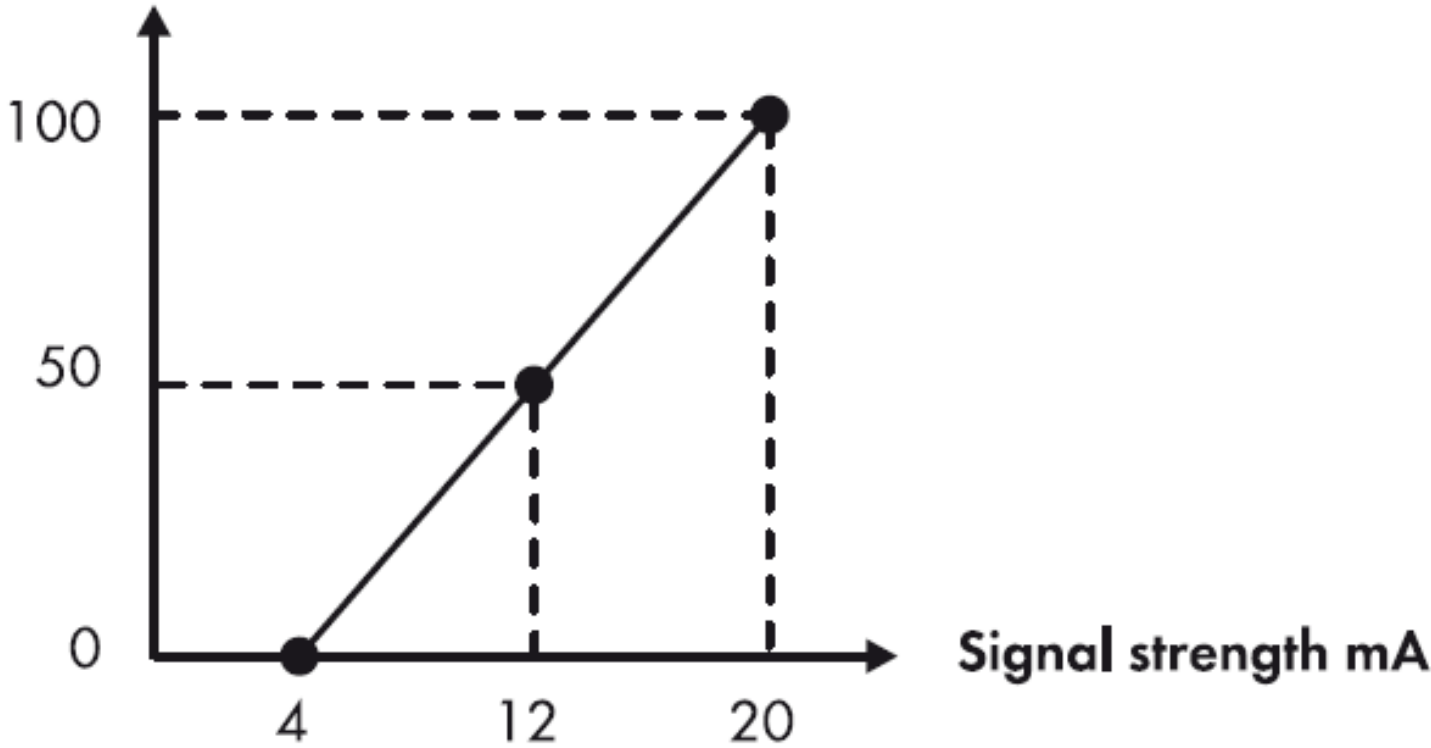


Overview of Displays – Reactive Power Setpoint



Active Power Reduction Setpoint Example

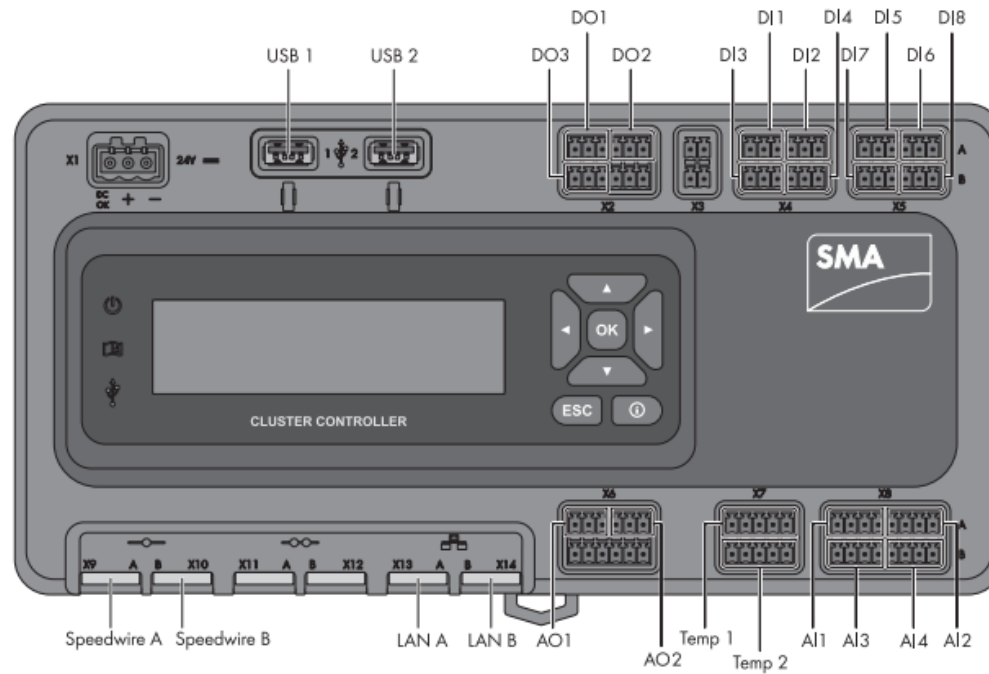
Active power limitation in percent (%)^{*}



Cluster Controller Connection ID Sheet

SMA CLUSTER CONTROLLER

Angeschlossene Geräte/Connected devices/Equipos conectados/Appareils raccordés/
 Aparelhos ligados/Apparecchi collegati/Aangesloten apparaten/Připojené přístroje/
 Συνδεδεμένες συσκευές/ 接続デバイス



AI= Analog Input, AO= Analog Output, DI= Digital Input, DO= Digital Output, LAN= Local Area Network, Temp= Temperature

USB 1	
USB 2	
DO 1	
DO 2	
DO 3	
DI 1	

Speedwire A	
Speedwire B	
LAN A	
LAN B	
AO 1	
AO 2	

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SMA Performance Package

SMA Performance Package



SUNNY TRIPOWER 12000TL-US / 15000TL-US / 20000TL-US / 24000TL-US

The ultimate solution for decentralized PV plants

SMA's new Sunny Tripower TL-US is raising the level of performance for decentralized commercial PV plants. This three-phase transformerless inverter is UL listed for up to 1000 V DC maximum system voltage and has peak efficiency above 98 percent, while OptiTrac Global Peak minimizes the effects of shade for maximum energy production. The Sunny Tripower delivers a future-proof solution with full grid management, and communications and monitoring features. The Sunny Tripower is also equipped with all-pole ground fault protection and is the only three-phase inverter on the market with integrated AFCI for a safe, reliable solution. It offers unmatched flexibility with a wide input voltage range and two independent MPP trackers. Suitable for both 600 V DC and 1,000 V DC applications, the Sunny Tripower allows for flexible design and a lower levelized cost of energy.

[Download the SMA Decentralized Commercial Brochure](#)

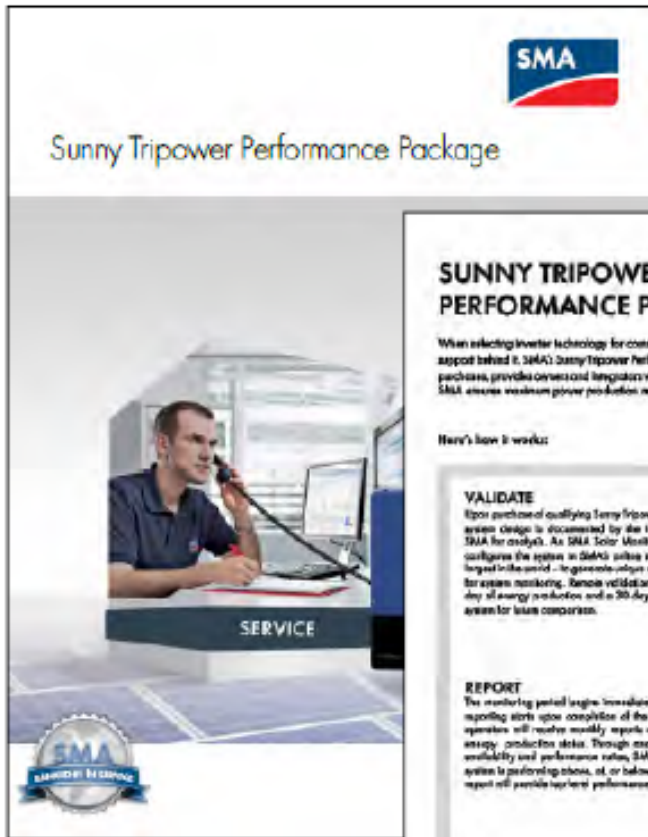
WATCH THE VIDEO

WHERE TO BUY

**PERFORMANCE
PACKAGE INCLUDED**

http://www.sma-america.com/fileadmin/fm-america/26_General_Files_July_2013/FINAL_STPVAPKG_AUS132715W.pdf

Tripower Performance Package



STP 24000TL-US Inverter

SUNNY TRIPOWER PERFORMANCE PACKAGE

When selecting inverter technology for commercial and utility projects, it is important to consider not just the hardware, but the support behind it. SMA's Sunny Tripower Performance Package, included at no cost with qualifying Sunny Tripower 24000TL-US purchases, provides owners and integrators with an unmatched level of confidence that their systems will perform to specifications. SMA ensures maximum power production and reduced investment risk.


Here's how it works:

<p>VALIDATE</p> <p>Upon purchase of qualifying Sunny Tripower 24000TL-US inverters, system design is documented by the installer and provided to SMA for analysis. An SMA Solar Monitoring Center professional configures the system in SMA's online monitoring platform - the largest in the world - to generate online reports, event notifications for system monitoring. Remote validation is completed on the first day of energy production and a 30-day analysis benchmarks the system for later comparison.</p>	
<p>REPORT</p> <p>The monitoring period begins immediately and performance rate reporting starts upon completion of the 30-day analysis. System operators will receive monthly reports and statistics that convey energy production status. Through analysis of expected system availability and performance ratios, SMA will report whether the system is performing above, at, or below expectations. An annual report will provide year-end performance and availability metrics.</p>	
<p>ALERT</p> <p>To help protect energy production, event-triggered alerts will be issued when appropriate. Upon receiving the alert, the system operator will be advised to contact the SMA Service line to request resolution. The SMA Service line experts will provide analysis and service recommendations for improving performance.</p>	

- Validate Energy Production
 - Day 1 to day 30
- Reporting
 - Monthly, 10 years
 - Annual report
- Alerts
 - Events & Alarms
 - E-Mail, Text, etc.

Tripower Performance Package

Customer fill out the following checklist:



SMA Tripower Performance Package Checklist STP 24000 TL US-10

Remote monitoring with 10 years Monthly & Annual Performance Report

1. Customer Information:

Company Name: Phone Number:

Fax Name: Email:

Lea Name:

Date/Time:

2. Site Information

Plant Owner:

Plant Name: Plant Identifier given at the Cluster Controller for Monitoring Portal Setup

Plant Identifier: Plant name given at the Cluster Controller for Monitoring Portal Setup

Start Up Date: Yes No ...Has Web page generated previously?

2.1 Monitoring Contact Info (E-Mail, phone, fax, etc.)

Primary: first Name Secondary: first Name

Primary: last Name Secondary: last Name

Primary: e-mail Secondary: e-mail

Primary: phone # Secondary: phone #

2.2 Physical PV Plant Address

Street Longitude

City Latitude

State Altitude

Zip Code

3. Yield Performance Information

Plant Power LWP Yearly Energy Yield Specific Yield in kWh/Wp

Monthly Plant Energy Yield in kWh

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

4. Equipment Details:

4.1 Solar Module Details:

Module: Power (Peak):

Model: Voltage (Voc):

Additional Module: Current (Isc):

[Click to insert Module Picture please Image](#)

4.2 Cluster Controller Information:

of Cluster Controller

	Cluster Controller Name	Serial Number	IP Address
1	<input type="text"/>	<input type="text"/>	<input type="text"/>

4.3 Inverter Information:

of Inverters

	Inverter Type	Inverter Name	Serial Number	Total DC kW Power
1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Tripower Performance Package

Example Monthly Report - for 10 years!



SMA America, LLC
 3925 Atherton Rd.
 Redlands, CA 95763
US-SMC@sma-america.com
 855-884-8441

Sunny Tripower Monthly Performance Report - Example
 "Project Name"
 September 2013

Monthly Production:	86.79 MWh
Monthly Power (max.):	561.11 kW
Plant Total Energy Field:	96.46 MWh
Performance Ratio:	80.86%

US-SMC@sma-america.com
 855-884-8441

1

Info page:

This Sunny Tripower Performance Report is for September 2013.


SMA Contacts:
US-SMC@sma-america.com
 855-884-8441

Plant description:

Plant Name:	Solar Plant 1
Location:	Redland, Oregon
Operator:	Name, First & Last
Commissioned:	8/30/2013
Plant Power:	520kWp
Annual Production:	1127 MWh
Modules:	Trina Solar
Inverter:	24x STP-20KTL-LN-10

1. Performance Ratio:

Predicted (PVsyst) / Actual Production



Month	Expected (MWh)	Actual (MWh)
Jan	60	
Feb	75	
Mar	90	
Apr	100	
May	110	
Jun	120	
Jul	130	
Aug	125	
Sep	110	86.79
Oct	90	
Nov	70	
Dec	50	

1.1 Performance Ratio: (percentage) 86.20%

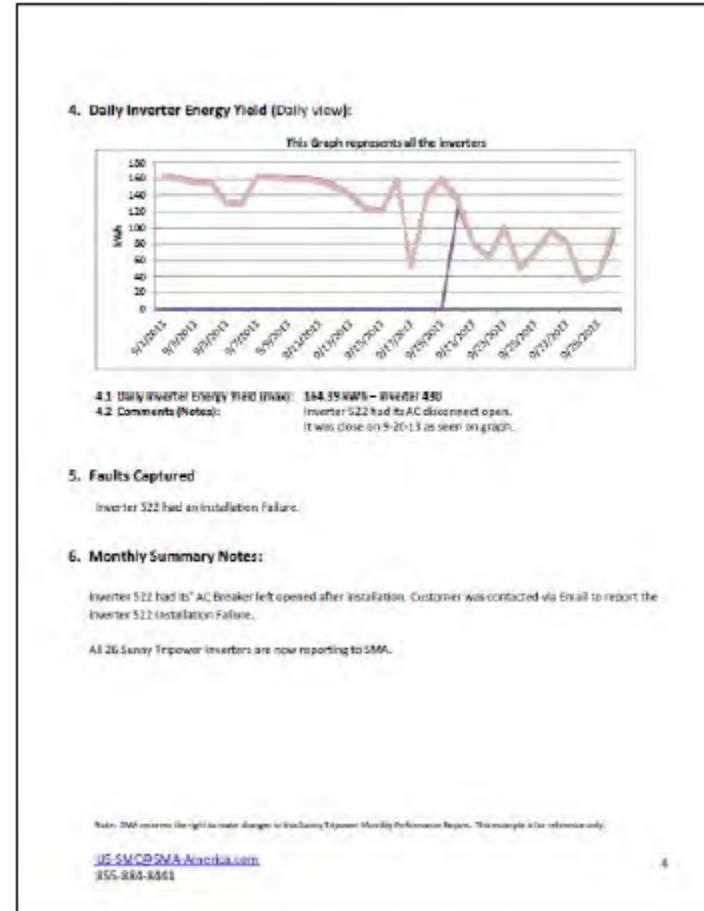
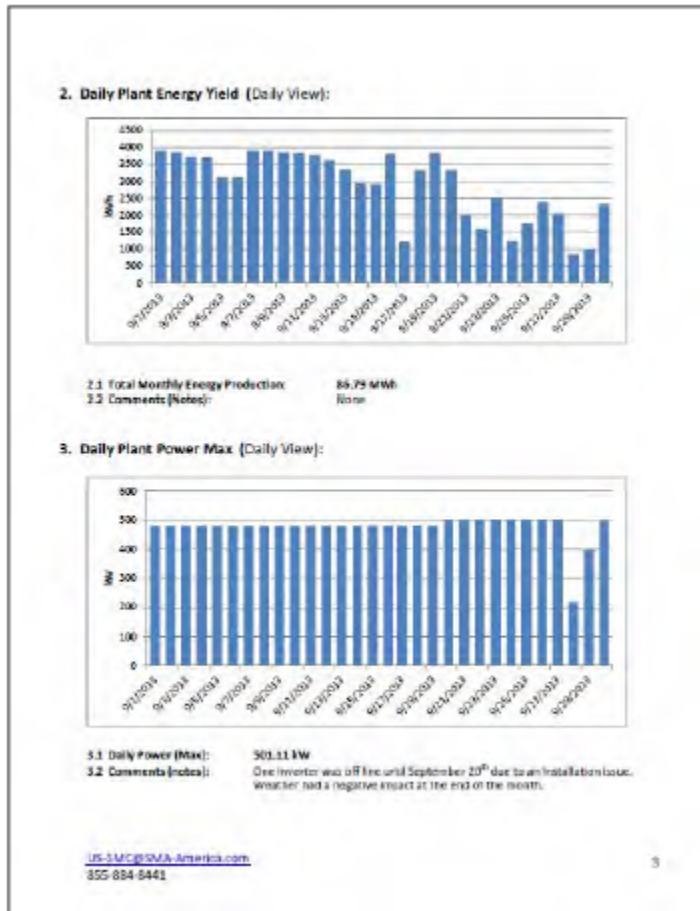
1.2 Comments (Notes): Performance ratio is based on PVsyst model provided by customer. Plant commissioned the end of August.

US-SMC@sma-america.com
 855-884-8441

2

Tripower Performance Package

Annual report includes input from an SMA Solar Monitoring Technician



Sunny Tripower Applications



1 MW commercial rooftop
42x STP 2400TL-US
Shaw Industries Dalton, GA
Installed by: Radiance Solar



Sunny Tripower Applications



Location: Central Oregon

Application Information:

- 26 STP 20000TL-US inverters
- PV Connector Method without Connection Unit
- Trina 295W Modules with a 1000 Vdc design
- Total of 23.6Kw DC on each inverter
- Total DC Array Power 613KW
- Total Inverter AC power = 520Kw

Sunny Tripower Applications



The security of a lifetime of reliability



PV-Plants installed in 1990/91 in Germany with SMA inverters, still in operation

▶▶ Do you know other inverters that have been in operation for 25 years?



Thank you!

