

OPE - TETHER MANUAL

Updated 11/12/20

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Intro to OPE Tether Operations Manual

The purpose of this manual is to guide you through the setup and operation of your OPE Tether. The Tether can be used to update and configure all settings on the Wakespeed WS-500 or APS-500 alternator regulators. It can also act as a monitor for those units.

The manual provides a general overview of the Tether's capabilities, and also includes a step by step instruction on the set up and use of the unit. It is important that you take the time to read and understand how to configure your Tether as outlined in this manual, and it should be used in conjunction with the WS and APS-500 user manuals outline below:

Additional Resources

→ WS-500 Quick Start Guide

- ◆ This Guide provides an overview for basic WS 500 regulator functions.
- ◆ <http://wakespeed.com/WS500quickstartguide.pdf>

◆ APS-500 Quick Start Guide

- This Guide provides an overview for basic AP 500 regulator functions.

→ WS-500 Wakespeed Communications and Configuration guide

- ◆ This guide goes into deep detail regarding each command setting and the effects of those commands.
- ◆ <http://wakespeed.com/Wakespeed%20%20Communications%20and%20Configuration%20Guide%20v2.3.0.pdf>

Overview of OPE Tether

The OPE Tether is a device designed to act as a graphical interface between you, the owner/technician and either the Wakespeed WS-500 or the American Power Systems APS-500 regulators. These regulators are immensely configurable but the extensive command structure and computer coding can be difficult to comprehend and implement. The Tether solves this problem by using a tab and drop down menu interface to modify and customize configurations.

In addition it also acts as a remote access hub, allowing technicians to troubleshoot, view logs and modify settings remotely.

The hardware is based on a small router design enabling the use of many connectivity options, including Ethernet, Wireless and USB to CANbus. The Tether will connect directly to the regulator harness's CANbus devicenet plug. Additional CANbus drops can be added to this network for battery BMS, and Engine J1939 CAN data inputs. For the purposes of easy display readouts and monitoring, the Tether CANbus network can also bridge into your existing NEMA 2000 (N2K) network through an Ethernet Gateway device. The following manual provides an overview of the process of connecting, logging in and navigating within the Tether interface.

I- Install and connecting Tether

Powering the Tether & Ports Overview

The Tether is shipped with an AC adapter that has a selection of plugs for international outlets. Alternatively, it can be powered by a DC source between 9 and 35 volts. To power with DC, cut the power cable between the AC adaptor and the DC plug and connect to a DC source with standard + and - connections. It may be beneficial to verify the consistency of the color of the positive and negative wires in the power cable with a continuity test on your multimeter. The center pin on the plug is the positive lead. The Tether will draw 0.35 Amps at 12V, so fuse the positive lead with a 1 or 3A fuse.



Above: Tether power cable ready for DC power supply between 9-35V.

Tether Installation- Networking cables, Ports etc.

Tether Connection Ports Overview

1. **TEL:** Not used for any regulator interfacing.
2. **SAT:** Satellite Area Network Configured with DHCP, connects to the boat's primary satellite unit if equipped or internet hub. RJ45 Ethernet cable Cat 5 or higher.
3. **LAN:** Local Area Network IP address 192.168.10.1. This port connects to the boat's NEMA 2000 (N2K) network if applicable via the Yacht Devices Ethernet Gateway. (sold by OPE). RJ45 Ethernet cable Cat 5 or higher.
You may also choose to hardwire this port directly to a computer as an alternative to using the Tether's built in Wifi. The port is also needed for the N2K connection, so use of an Ethernet Switch would be recommended.
4. **USB:** Connects to Tether CAN bus through 'USB to CANbus' cable (sold by OPE) into the USB port on the Tether.



Above: Tether ports ready to connect to regulator (Left to Right)

1. Ethernet hub (green) 2. Boat's N2K network (blue) 3. CAN bus (USB) 4. Power supply

Creating the Tether CANbus Network

The Tether will connect to the alternator regulator through a CANbus network. Set up the network by using *Devicenet* CAN connectors. If your boat is so equipped, you can also connect the Battery BMS CAN and Engine CAN (J1939) to the Tether CANbus network to utilize the CAN data from these units. Multiple regulators, Engines and battery BMS can all be networked together.

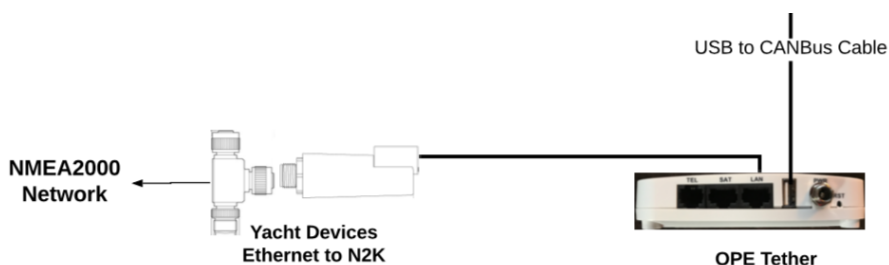
The Tether communicates with the following CAN protocols: CAN Specification 2.0b / ISO-11898; CiA 303; SAE J1939 and OS Energy (Open Systems Energy - derived from the RV-C standard).



Figure 2: CAN connections shown from Left to Right.
1. CAN to tether USB port, Black cable (sold By OPE)
2. Battery BMS connected, black cable
3. Regulator to WS/AP500 Wire Harness, purple cable
(colors hard to distinguish-tw)

Connecting to your Boat's NEMA 2000 (N2K) network

On its own, the Tether is not an 'approved N2K device', however we have made it possible to bridge into your N2K network for display and monitoring purposes. To accomplish this you must use an N2K approved gateway such as the Yacht Devices Ethernet Gateway (sold and programmed by OPE). Follow the simple diagram below to complete this connection. (RJ45 Ethernet Cat 5 or higher cable required).



Above: Yacht Devices Ethernet to N2K gateway bridges into N2K network to use display data on Multi Function Displays (MFD) or other monitoring screens.

Installation Set-up Guide for Tether

The following steps and figures overview the process for setting up your OPE tether CANbus network and connecting to your regulator harness and boat's N2K network. If your existing WS/APS-500 harness does not have an existing CAN plug or separate CAN High & Low wires, you will likely need to purchase new Harness from OPE.

To install your Tether will need to following: (sold by OPE unless noted)

1. OPE Tether
2. WS/APS-500 Regulator
3. Wire harness for WS/APS-500 with CAN plug or Can High & Low wires
4. USB to CAN cable
5. 2x RJ45 Ethernet cables for SAT and LAN ports (sold separately)
6. Yacht Devices Ethernet to N2K gateway (optional)
7. Devicenet N2K CAN drops for each CAN connection drop.
8. 2x CAN Terminators

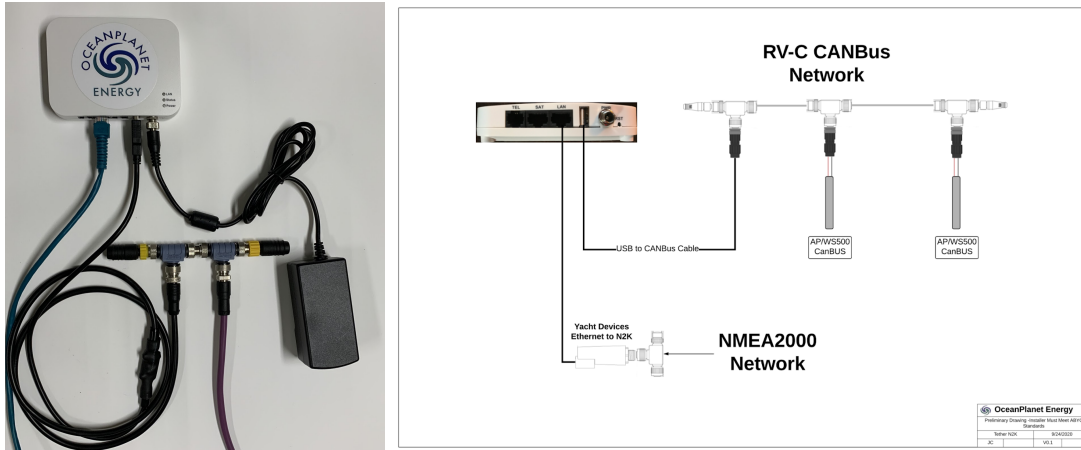
Step 1:

Connect Tether to power source either AC or DC (see: Powering the Tether).

Step 2.

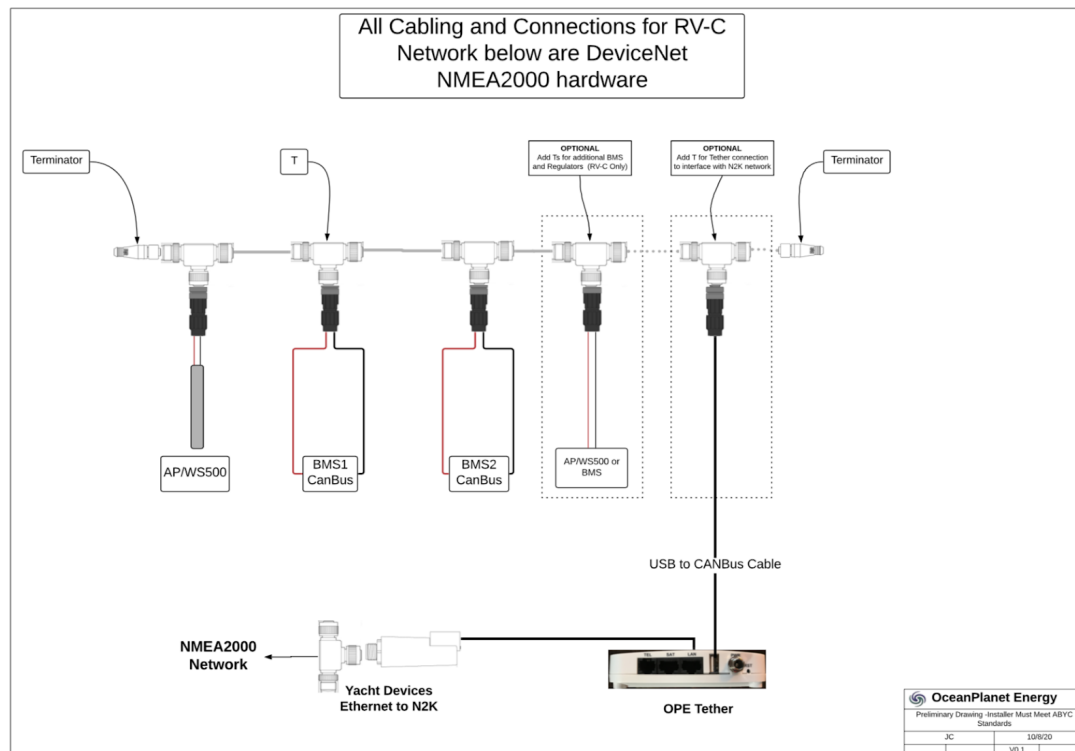
Connect Tether USB to CAN network and build a new CANbus network.

- **The number of “tees” or drops will correspond to how many regulators, Battery BMS and Engine CAN connections you are using.**
 - Simple CANbus network: 2x Tee's- 1x Tether and 1x Regulator.
 - More complex CANbus network: 7x Tee's- 1x Tether, 2x Regulators, 2x Battery BMS, 2x Engine CAN.
- **Install terminators to your CAN bus ends. These contain resistors that filter unwanted noise on the bus.**



Above: Simple tether CANbus network examples shown (left to right).

1. Single regulator installation, 2. Dual regulator installation without BMS or engine CAN.



Above: More complex CAN network example shown.

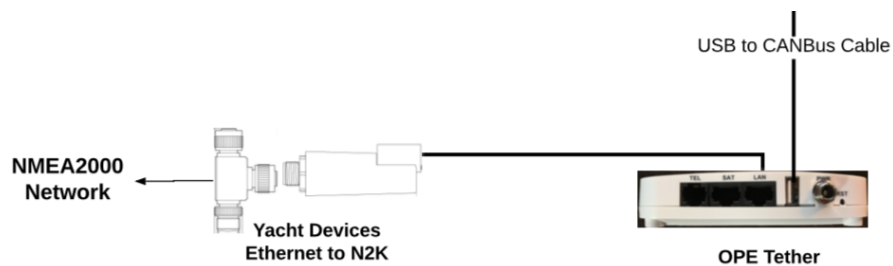
Single regulator, 2x BMS and optional drop for another regulator or BMS.

Step 3.

Bridging into boat N2K network with Yacht Device Ethernet Gateway.

Use Tether LAN port, RJ45 Ethernet Cat 5 or higher cable into Gateway.

- Gateway is pre-programmed by OPE for easy application.
- Note: Panbo Article for N2k Options perks.



Step 4: Connect Tether to boat Satellite unit or internet router (optional).

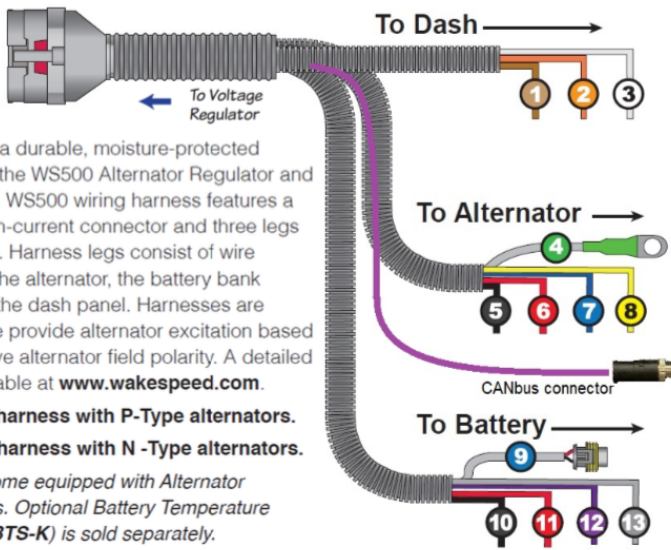
- *If applicable use the SAT port to hardwire tether into your boat's internet network.*
- *This is not required but allows for a simpler remote access gateway.*
- *Note: To allow remote access the tether needs to either connect as described here, connect to marina Wifi OR connect wirelessly through a phone internet hotspot (see: Remote Access instructions)*

WS/AP 500 Regulator CAN connections



WS500

**ADVANCED
ALTERNATOR
REGULATOR**



Designed to provide a durable, moisture-protected connection between the WS500 Alternator Regulator and the electrical system, WS500 wiring harness features a rugged Ampseal high-current connector and three legs of tinned marine wire. Harness legs consist of wire groups destined for the alternator, the battery bank being charged, and the dash panel. Harnesses are configured to provide alternator excitation based on positive or negative alternator field polarity. A detailed User's Guide is available at www.wakespeed.com.

Use the WS500-PH harness with P-Type alternators.
Use the WS500-NH harness with N-Type alternators.

NOTE: Harnesses come equipped with Alternator Temperature Sensors. Optional Battery Temperature Sensor Kit (WS500-BTS-K) is sold separately.

- 1 Ignition Wire (Brown)** Connects to switched voltage source (key switch or oil pressure switch). Must see zero volts when off and minimum of 8.5 VDC to activate.
- 2 Lamp/Feature Out Wire (Orange)** Remains neutral during normal regulator operation, and provides a source of ground to drive warning lamp or alarm if faults are detected. See User Guide for details.
- 3 Feature In Wire (White)** Can be connected to a voltage source greater than 8.5 VDC to enable a range of selectable optional capabilities as detailed in the User's Guide.
- 4 Alternator Temperature Sensor (Grey two-wire cable. Green cable shrink.)** Connects to alternator case bolt or ground post.
- 5 Alternator Ground (Black)** Connects to alternator ground post.
- 6 Alternator Positive (Red)** Connects to alternator positive output post. Fused at 15A.
- 7 Alternator Field (Blue)** Connects to alternator's external field terminal.
- 8 Stator (Yellow)** Connects to alternator's AC/stator output.
- 9 Battery Temperature Cable (Grey two-wire cable. Blue cable shrink.)** Provides a connection point for optional battery temperature sensor. Battery Temperature Sensor (WS500-BTS-K) sold separately.
- 10 Battery Ground Sense* (Black/Yellow Stripe)** Connects to ground terminal of battery being charged. Connect wire to battery ground terminal closest to the center of the battery bank.
- 11 Battery Positive Sense* (Red/Yellow Stripe)** Connects to positive terminal of battery being charged. Connect wire to battery positive terminal closest to the center of the battery bank. Fused at 3A.
- 12 Current Sensing** (+) (Purple)** Connects to the positive sense terminal on the battery shunt.
- 13 Current Sensing** (-) (Grey)** Connects to the negative sense terminal on the battery shunt.

*Battery voltage sensing is most accurate when positive and negative sense wires are located nearest the center of the battery bank, or at opposite ends of the battery bank. See discussion of voltage sensing in the User's Guide for more information.
 **Current sensing is calibrated for a 500A/50mV (default) current shunt. Installation may depend on whether shunt is installed HIGH or LOW. Refer to User's Guide for recommendations.

WWW.WAKESPEED.COM

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Above: WS/APS-500 Wiring harness connections:
New harnesses come with a CANbus connection as shown. Older models may have CAN High and Low wires that can be converted, or if no wires and harness should be upgraded.
Consult the WS quick start guide for detailed information on how to connect your regulator.

DIP settings for tether software override (WS500 only)

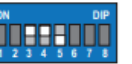
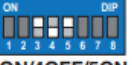


WS500

**ADVANCED
ALTERNATOR
REGULATOR**

Configuring Regulator With DIP Switches

While the WS500 Alternator Regulator provides an extensive level of configurability via its USB connection to a PC-based configuration software, the simplest way to configure your WS500 Alternator Regulator is via the onboard DIP switches. With these, you can select one of eight preset battery programs to match your battery type, identify the battery being charged, define battery capacity and toggle between small and large alternator modes. Please refer to the online User Guide for further reference.

SELECTING BATTERY ID The Battery ID provides a designator for the battery being monitored by the WS500 alternator regulator. Used in CAN connected systems.	 1OFF/2OFF <i>House Battery</i>	 1ON/2OFF <i>Main Starter</i>	 1OFF/2ON <i>Secondary House</i>	 1ON/2ON <i>Other</i>	
SELECTING CHARGE PROFILES The WS500 offers the ability to select from one of eight charging profiles based on battery types being charged, including two customizable profiles which can be configured on a PC via the regulator's USB port. Refer to the online User's Guide for detailed profile values and configuration instructions.	 3OFF/4OFF/5OFF <i>Default, AGM#1</i>	 3ON/4OFF/5OFF <i>Std. FLA</i>	 3OFF/4ON/5OFF <i>Deep Cycle FLA</i>	 3ON/4ON/5OFF <i>High Density AGM</i>	
	 3OFF/4OFF/5ON <i>Gel</i>	 3ON/4OFF/5ON <i>Carbon Foam</i>	 3OFF/4ON/5ON <i>Custom #1</i>	 3ON/4ON/5ON <i>Custom #2 LiFeP04</i>	
DEFINING BATTERY CAPACITY Provides configurability based on the size of the battery bank being charged. Four capacity levels shown at right.	 6OFF/7OFF <i>< 250Ah</i>	 6ON/7OFF <i>250Ah-500Ah</i>	 6OFF/7ON <i>500Ah - 750Ah</i>	 6ON/7ON <i>> 750Ah</i>	
SMALL/LARGE ALTERNATOR (FULL OUTPUT) MODES Small Alternator Mode limits the maximum alternator output to 75% of maximum field potential and can be used to protect smaller alternators with larger battery loads and smaller engines and belts from excessive alternator horsepower loads. (Percentage adjustable via PC configuration. See online User Guide for details).	 8 OFF <i>Large Alternator Mode</i>				 8 ON <i>Small Alternator Mode</i>

Above: DIP switch settings info for WS500

To set DIP Switches on the WS-500 only (AP500 has no DIPS), you need to remove the top cover of regulator. Refer to the WS-500 manual for more information. The Tether will override all of the DIP switch settings in the software **except for #8**. We still recommend setting them up correctly even if not being used.

Example: Lithionics custom settings below:

#1 Off #2 Off #3 On #4 On #5 On

#6 and #7 will be different based on the battery capacity

#8 Off- **This one must be turned off**, to enable the full output of the alternator.

II - Initial Network connections

How to Login to the Tether Administration interface

The default method for connecting to the tether interface is through wireless/Wifi. If you choose to hardwire the tether to your computer we recommend adding an ethernet switch device so the LAN port can also be used for multiple purposes.

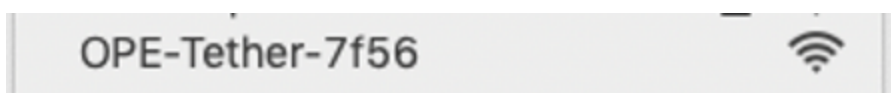
Wired:

Plug an ethernet cable into the LAN port on the Tether and plug the opposite end into the ethernet port on your computer. You should then be able to open a web browser and go to <http://192.168.10.1> to access the Tether administration interface.

Wireless/Wifi:

The Tether will create a default wifi network called OPE-Tether-<XXXX> <XXXX> will be a unique number for your Tether.

EXAMPLE:



Connect to this wifi network and browse to to <http://192.168.10.1> to access the Tether admin interface

 A screenshot of the Tether administration interface. At the top, it says 'OPE-Tether | wXa-202 v2.73 | Load: 0.08 0.02 0.01'. Below that is a section titled 'Authorization Required' with the instruction 'Please enter your username and password.' There are two input fields: 'Username' and 'Password'.

User Access/Login

Browse to: <http://192.168.10.1>

Users:

superadmin – Use this login when doing administrative work on the Tether Itself like setting up the network or upgrading the firmware.

admin – Use this login during daily operations of the Tether for Wakespeed configuration.

Password:

Default Password: The default password for both is **webxaccess**

Password Change: Login as **superadmin**

click **System** → Router Password (re-enter the superadmin auth. if prompted)

Follow the instructions on screen.

Make sure to click “Save and Apply”

Status	Router Password	
Services	Change Password	
System	Change password for the superadmin user:	
System	Router Password	
Router Password	Confirmation	
Backup / Flash Firmware	Change Password	
Reboot	Change the password for the admin user. This password does not apply to the superadmin account.	
Network	Logout	
		Save & Apply Save Reset

Forgot password: A factory reset can be used to recover from a forgotten password.

This works for both the login and WiFi SSID passwords. Save and export profile to a file as backup before a factory reset.

Remote Access Instructions

Only required if you seek to have a technician remotely log into your tether for service or trouble shooting.

Login: admin OR superadmin

Pswd: webxaccess

Tether URL: <http://192.168.10.1/>

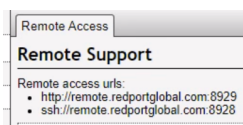
To share the remote access link so a technician can get inside, log into Tether and follow instructions.

1. Connect the Tether to your satellite network or Internet router via the **SAT** port (or use phone hotspot method below)
2. Under **SERVICES** tab on the left side bar, navigate to remote access
3. Check the box for **Enable Remote Support**

Status	Remote Access
Services	Remote Support
Wakeup / W500	☐ Enable remote support
Remote Access	☒ Allow remote personal access to your router via a broadband satellite, WIFI, or cell phone link
Wireless	

4. Email the URL's that pop up as shown below. Each URL will have a unique 4 digit code at end:

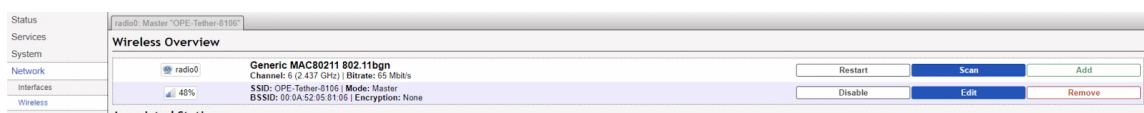
Remote access site for tech: <http://remote.redportglobal.com:8929>



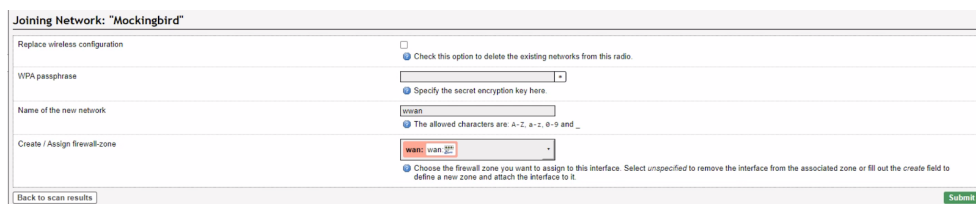
This URL is invalid once you power off the tether, so you will need to re-do if this occurs. Relaying the code to a remote technician via phone is a good method if you do not have multiple internet sources. Technicians can reference this document to find the body of URL needed: **http://remote.redportglobal.com:XXXX**

Remotely access from phone hotspot:

1. Turn on hotspot on phone
2. Wifi connect to tether from phone
3. Go to URL <http://192.168.10.1/>
4. Login: admin/superadmin → webxaccess
5. **Services** tab → **Wireless** tab → **Scan**



6. Phone should pop up → join network
 - a. Ensure Replace is NOT checked
 - b. Enter password again
 - c. Keep WWAN info the same.
 - d. Click “Submit”



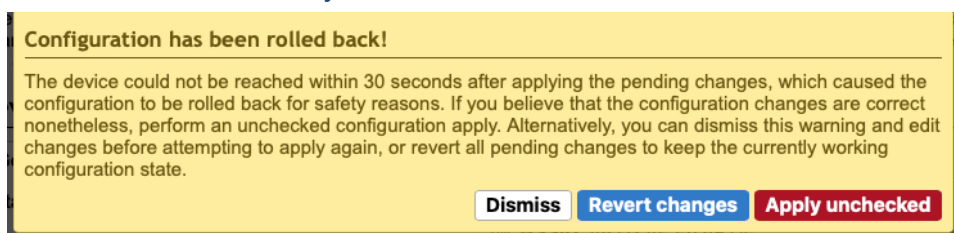
- e. Click “Save and Apply”

Connection notes:

The following only applies when configuring over WiFi. If using wired Ethernet connection to the tether to connect to your phone then please ignore and skip over the following steps.

If connected to the tether via wifi you may drop the connection to the OPE-Tether WiFi. Reconnect if you do. You will see the following message when reconnected. Click “Apply unchecked”. Note that you may lose connectivity to

the Wifi. Reconnect if you do.



7. Follow Remote access instructions above and send now URL or last 4 digits to technician

Verify that the regulator and the Tether are communicating.

- On the tabs: **Services**→ **WS500 Wakespeed**→ **App Settings** Tab make sure that USB is selected on the Regulator Interface line
-
- Mark the check box to put the regulator in configuration mode and click **Save/Apply** on the lower right
- Verify that the regulator is running and responsive by going to the **Syslog** tab. The logs will look similar to the below image:
- Note the Firmware version of the regulator. In the above image the string “ARGE2.2.1” = fw version 2.2.1

App Settings		Reg Settings	Profiles	Tools	Sys Log	AST	CST	CPE	SCV	SST
WS500 Log										
Wed Jul	8 07:39:51	2020	user.info	WS500[8849]:	CPE,1,14.10,360,15,0,0,0,0.00,0,13.40,-1,0,-10,0,12.80,0,0.00,0,0.00,0,0.0,0.024,-9,-45,45,0.00,-99,-99,0,50,100,0.00					
Wed Jul	8 07:39:52	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.9,-4.9,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:01	2020	user.info	WS500[8849]:	NPC,1,ALTREG,1234,1082165939					
Wed Jul	8 07:40:02	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.8,-4.8,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:11	2020	user.info	WS500[8849]:	CST,1,0.1,70,1,1,1,1,1,0,0,0,128,0,0,0					
Wed Jul	8 07:40:12	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.8,-4.8,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:22	2020	user.info	WS500[8849]:	SST,ARGE2.2.1,1,0,1.2.00,1.00,0,0,0,0,0					
Wed Jul	8 07:40:23	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.8,-4.8,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:32	2020	user.info	WS500[8849]:	SCV,0,0,0.00,0.00,0,100,1.00,0.75,0.50,-1,0,0,12.2.393,10000,0,-1,30,0,0.00					
Wed Jul	8 07:40:33	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.8,-4.8,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:42	2020	user.info	WS500[8849]:	CPE,1,14.10,360,15,0,0,0,0.00,0,13.40,-1,0,-10,0,12.80,0,0.00,0,0.00,0,0.0,0.024,-9,-45,45,0.00,-99,-99,0,50,100,0.00					
Wed Jul	8 07:40:43	2020	user.info	WS500[8849]:	AST,0.00,0.14,-4.9,-4.9,0,13.40,200,15000,9,-99,-99,0,0.14,23,-99,0					
Wed Jul	8 07:40:53	2020	user.info	WS500[8849]:	NPC,1,ALTREG,1234,1082165939					

III- Tether Interface Navigation & Basic Regulator Configuration

Overview & introduction

Once logged into the tether, use the left side bar (some phone/tablet browsers may show these above the “top tabs”) to navigate internally to different functions within the Tether. More details on using the SideBar functions are outlined in this section.

The top tabs are where all the programming is done. Navigate to “Services” → “Wakespeed WS 500” tab to do all the regulator programming. **It’s important to read this section thoroughly and understand how to navigate within the Tether.** The Tether works by using your inputs to build a configuration that it then converts into code and pushes into the regulator. Please refer to the Wakespeed quick start guide and manual for WS programing details that are not covered here.

Navigation Tabs: Left Side Bar overview

Status
Overview
Firewall
Routes
System Log
Kernel Log
Realtime Graphs
Services
System
Network
Logout

Use the Side Bar tabs to navigate within the Tether itself to check network connections, select screen to program and perform Tether firmware updates. There are three main Left Sidebar tabs that you will use:

1. STATUS

Shows connections regarding tether and networks. This tab shows Tether Firmware Versions, Wifi Connections, and more.

2. SERVICES

- Wakespeed WS500**- ALL of the Regulator programing action use this tab
- Remote Access**- Enable for Remote Access
(see: Remote access instructions)
- Wireless**- Create a remote access Hotspot via your phone in this tab
(see: Remote access instructions)

3. SYSTEM

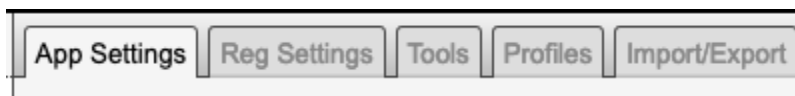
Perform Tether Firmware updates, password changes and more here.

- System**- Change timezone here for log readouts. Leave remaining lines as default.
- Router Password**- Change Password here if desired
(see: User access/Login)

Status
Services
Wakespeed WS500
Remote Access
Wireless
System
Network
Status
Services
System
System
Router Password
Backup / Flash Firmware
Reboot
Network
Logout

- c. **Backup/FlashFirmware-** Update Tether firmware if needed. Tether will be shipped with most current version. Please contact OPE for instructions if you need to update.
- d. **Reboot-** Reboot regulator here to power cycle it. This is needed to apply any changes to the Configuration mode checkbox.
- e. **Network-** You will not need to use Network tab for the OPE Tether.

Programing Tabs: Important tips



- Both APS-500 and WS-500 will be listed as Wakespeed WS500 regardless of your actual regulator type.
- You need to get in the habit of clicking **“Save and Apply”** in the bottom right corner after all changes:
 - “Save and Apply” only saves updates in the tab you currently are working in. It does not save and update your config **profile**. You will need to save this as a new or updated “profile” (see: **Profiles - Profile Manager** tab below).
 - All changes will be lost whenever you click between Top Bar tabs if you do not click **“Save and Apply”** first.
 - To add or save as a **“profile”** on the Tether hard drive, (see: **Profiles** tab below) instructions (see: **Profiles - Profile Manager** tab below).
 - To actually update the configuration in the regulator you need to navigate to **TOOLS** tab and select **Program**. This will Program controller with whatever is loaded in the **“Reg settings** tab”

Programing Tabs: Quick Step guide to programing Regulator

1. Physically Connect Regulator to tether (See: **I. Install and connecting Tether**)
2. Navigation tab: **Services**→ **WS500**→ **App settings-** Select Configuration mode & select the correct regulator interface, click “Save and Apply”
 - a. Note: Need to reboot or power cycle regulator to fully turn configuration mode on or off.
3. **Profile-** To start from blank, proceed to step 4 or click **IMPORT** button to upload from tether to Reg settings (**See: Import/export- Profiles** below) OR upload and modify from a saved profile (see **Profiles** tab below) or import a file from saved profile.
4. **Reg settings-** Modify all configuration settings here, whenever leaving the **“reg settings”** tab CLICK **“Save and Apply”**
5. **Profile- Save profile** (saves to tether hard drive) Select Refresh if re-save an existing profile or click ADD if saving new profile, then click “Save and Apply”

6. **Tools-** Programming actions- click “**Program**”, review code and click “**Commit**”
7. **Tools-** view status of last action at top.
8. **Syslog-** to verify new programming will look like the following:

```
Regulator now in CONFIGURATION mode
Send "$RAS:@" expect "AOK;"
expect: AST; ,0.00, ,1.29,-4.2,-4.2,-5, ,13.40,500,15000,9, , -99,-99, ,0, ,1.29,18,-99,0
expect: CPE; ,6,14.40,360,7,0, ,0,0,0.00,0, ,13.40,-1,0,-20,0,12.00, ,0,0.00,0, ,14.40,0,180,3, ,0.024,-20,-20,50, ,0.00,-99,-99,0,50, ,500, ,0.00
expect: NPC; ,1,ALTREG,1234, ,1057196418
expect: CST; ,4,0,1,70, ,1,1, ,1,0,1, ,0,0,0, ,128, ,0,0,0
expect: SST; ,AREG2.2.2, ,0,0, ,6,1.00,1.00, ,0,0, ,0,0,0, ,0
expect: SCV; ,0,0,0,0.00,0.00,0, ,100,1.00,0.75,0.50,-1, ,0,0, ,12,2.393,10000, ,0,-1,30,0,0.00,0
expect: AOK;
Got "AOK;"
```

9. **App Settings-** Uncheck “Configuration mode” and “Save and Apply” when finished programming. Note: Need to reboot or power cycle regulator to fully turn off configuration mode.

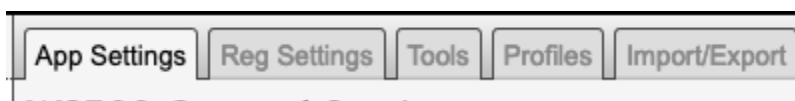
Tips when building the Regulator Configuration from existing Profile

- Setting the Regulator name (No spaces 16 characters max)
- Adjust the Battery Capacity Drop down for the install
- Adjust the Alt Derate Factor, the PBF, and the Idle RPM variables.
- If the engine is of standard size for the boat and the customer isn’t using multiple alternators then the Derate Factor and PBF can usually be left at the default values. Adjust the idle RPM if the engine manufacturer (like Beta) recommends it.
- If the customer is using a battery shunt adjust the factor to the shunt size.
- Click on the **SCT** Sub-Tab and adjust the pulley ratio if needed.
- Click “**Save and Apply**”
- Profile Tab- click **ADD** to re-save new **Profile**

Top Bar Tabs: Overview



Programing tabs: Primary programing tabs



App settings- Everything on this tab controls the Tether, not the regulator. When selecting the Regulator, you are actually telling the Tether to connect to that port.



Reg Settings- ALL changes to the regulator's config modifications will take place in this tab. **"Save and apply"** saves modifications to this tab only.

Profiles- This is where you can save the changes to your configuration from "Reg settings" tab as a new or updated profile. This saves the **"Reg settings"** changes to the Tether's hard drive as a **"profile"**.

Tools- All actions that interface directly with the regulator are done here. You can push out new configurations, update regulator firmware, upload saved profiles etc.

Programming tabs: Data readout tabs



SysLog- Shows a log of the latest tether actions, reference this tab to verify and troubleshoot.

Logs- N/A

AST- Alternator Status, actual readings from the regulator.

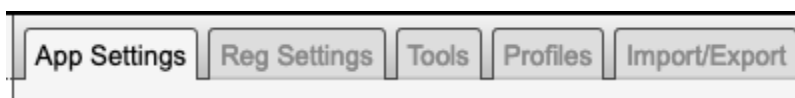
CST- CAN Bus status

CPE- Charge Profile Entry

SCV- System Configuration

SST- System Status

Programing Tabs: In depth Overview



App Settings - Tether General Settings

General Settings

Configuration Mode:

Check this box if you are going to be configuring the regulator. When checked, the tether disables the regulators ability to look for temperature, voltage, current, etc outputs from the alternator, engine or battery. **Ensure you uncheck the box when completely finished.** You will need to Reboot or power cycle the regulator each time to you click this “**configuration mode**” to apply. Make sure you “**Save and Apply**” first.

Regulator Interface:

Make sure that your regulator is selected under the “Regulator Interface” dropdown. This tells the tether to connect to the regulator via the selected option. Then click “Save and apply”.

USB:

CANbus: (The regulator name will be different based on your configuration)

Logging:

Log Settings	
Enable Logging	☒
Log Rotation	120V ☒ Log rotation schedule
Number Logs	4 ☒ Number of log files to keep. If, for example, log rotation is set to "weekly" and number of logs is set to 4 then 4 weeks worth of logs will be maintained.

If you would like to enable logging of all inputs and outputs of the regulator you can enable it here.

Once you have adjusted the settings on the General Page click **“Save and Apply”** in the lower right. Make sure you are in the habit of clicking this button after making adjustments in any tab to save your work.

Reg Settings - WS500 Profile Settings

WS500 Profile Settings	
NOTE: Profile settings are not automatically transferred to the regulator. You must "Save & Apply" settings and then use the "Program" button under the "Tools" tab to transfer the settings to the regulator.	
Basic Settings	
Profile Description	Panel 55
Regulator Name	CP6L20-20V-55 String up to 18 characters, no spaces, comma, or . Name used for CAN ID. If you have twin engines, you might wish to set these to descriptive names.
Require Password	☐ Require a password to access regulator. If password is lost a hard reset will be required via the Feature_3 in feature method described in the manual. CAUTION: You must be very careful with this feature. Once locked the regulator can not be reprogrammed unless a physical hardware reset is done. Software can not be used to unlock the unit. See manual for details.
Charge Profile	Custom R2 - Funt_ in Line + Funt ☒ Select charge profile
Battery Capacity	1000 ☒ Battery capacity in Amp-hr. NOTE: If CIP switch is selected then ALL Amp-hr settings must be normalized to a 505Amp-hr battery.
CAN Battery Capacity Override	☒ (v2.2.0) Allow overriding value from battery capacity received over CAN bus.
Battery Voltage	12V NOTE: If "Auto Detect" voltage is selected then ALL Voltage settings must be normalized to a 12V battery.

Profile Description:

Enter the name for your regulator settings profile, this will allow the profile to be saved and recalled at a later time using the Profiles Tab.

Regulator Name:

This will be applied to the regulator and will show up in the logs, very useful if you have multiple regulators.

Charge Profile:

See WS manual

Battery Capacity:

Enter in the battery capacity of the bank that is being charged by the Wakespeed.

CAN Battery Capacity Override:

Check this if you want to override the capacity received from the CANbus. Default is unchecked, If you have multiple BMS' then you want this unchecked.

Battery Voltage:

Select the nominal system voltage for this installation.

Advanced Settings: See WS manual

Tools - WS500 Programing

This is the page where the tether interacts directly with the Regulator to program. After completing the “**Reg settings**” tab and clicking “**Save and Apply**” this is where you will push those commands out to the regulator.

1. Regulator Status
2. Programming Actions
3. Import/Export Profiles
4. Regulator Actions

1. Regulator Status

Regulator Status	
Status of Last Action	Waiting for TTY: /dev/WS500-tyACM0
Alternator State	Gathering AltState...
Output of Last Action	Refresh It make take a while for an action to complete. Wait for the "Status of Last Action" to signal completion then request a "Refresh". No harm is done by pushing "Refresh" repeatedly.

In this section you can monitor the results of your commands sent to the regulator.

Status of Last Action: *Waiting for TTY: /dev/ttyACM0* means that the Tether is waiting for a regulator to be plugged in via USB.

Alternator State:

Quickly verify which mode you are in or which charging mode the regulator is in.

Output of last action:

This text box will expand to show you the results of a command.

2. Programming Actions

Programming Actions

Program

Generate program sequence from current settings, review, and then commit to regulator.

Note: Command will fail if regulator is password protected.

This is where your configuration is sent to the regulator.

Click the **Program** button to generate the commands that will configure the WS regulator to match your settings on the Reg Settings page.

Verify the commands:

Programming Actions

```
# Program for WS500 target version = 222
$SCN:0,0PE-12V-FF,WS500#
$SCA:0,121,1.0,0.75,0.5,1,0,0,10000,0,0,30,0#
$SCT:12,2.5,-1,0#
$SCB:1,1,70,1,1,1,0,0,0,0,10#
$CPA:8 14.4,60,20,0#
$CPO:8 0,0,0,0#
$CPF:8 13.5,-1.0,0,0,13.2,80#
$CPF:8 0,0,0,0#
$CPE:8 0,0,0,0#
$CPB:8 0,0,2,43,0,5,40,22,227#
$SCO:8,1,1,1,0#
$RBT:0
```

Commit

Write program to regulator, commit, and reboot.

Verify the configuration strings that will be sent to the regulator.

Note: On the final step before loading the programming, the Tether will output a text version of the configuration file that will be sent to the regulator. This text file should be Copied and saved for reference, and it is up to the user to review it and verify that these values are correct for your installation. (reference: WS 500 Wakespeed Communications and Configuration guide).

If you are satisfied with the commands click the **Commit** button

Click the **Commit** button to send the commands to the regulator.

Commit

Write program to regulator, commit, and reboot.

You can monitor the programming commands results via the **Syslog** tab.

(You will need to refresh occasionally)

```

Regulator now in CONFIGURATION mode
Send "$RAS:@\" expect \"AOK;\"
expect: AST; ,0.00, ,1.29,-4.2,-4.2,-5, ,13.40,500,15000,9, , -99,-99, ,0, ,1.29,18,-99,0
expect: CPE; ,6,14.40,360,7,0, ,0,0,0.00,0, ,13.40,-1,0,-20,0,12.00, ,0,0.00,0, ,14.40,0,180,3, ,0.024,-20,-20,50, ,0.00,-99,-99,0,50, ,500, ,0.00
expect: NPC; ,1,ALTREG,1234, ,1057196418
expect: CST; ,4,0,1,70, ,1,1, ,1,0,1, ,0,0,0, ,128, ,0,0,0
expect: SST; ,AREG2.2.2, ,0,0, ,6,1.00,1.00, ,0,0, ,0,0, ,0
expect: SCV; ,0,0,0,0.00,0.00,0, ,100,1.00,0.75,0.50,-1, ,0,0, ,12,2.393,10000, ,0,-1,30,0,0.00,0
expect: AOK;
Got \"AOK;\"

```

Above: Log of a successful configuration programmed to regulator. Please note the “AOK” responses and the Success notice.

3. Regulator Actions

Regulator Actions	
Status	Request ALL Status. Regulator status will be displayed in the system log.
Fault Status	Request Previous Fault Status. Regulator status will be displayed in the system log. Note: FLT status under the SST tab will display previous fault once this is executed.
Reboot	Reboot Regulator. Command will fail if regulator is password protected.
Debug	Enter debug state. This command will generate additional information in the system logs that can be used by support for trouble shooting. Reboot or restart regulator to end debug mode. Considerably more debug information is available over the USB interface although CAN bus data is also useful.
Factory Reset	Restore all regulator parameters to factory defaults. Command will fail if regulator is password protected.
Restore System Config	Restore System configuration table defaults. Command will fail if regulator is password protected.
Restore CAN Config	Restore CAN configuration table defaults. Command will fail if regulator is password protected.
Restore Charge Profile	No Action Restores Charge Profile 'n' to default values. Command will fail if regulator is password protected.
Force Regulator Mode	No Action - Let regulator do it's thing

Status – This button will request a RAS (Request All Status) from the Regulator. This will allow you to see the current configuration under the “Output of Last Action” section and in the Syslog.

Fault Status - This command will instruct the WS500 Alternator Regulator to send a copy of the Last Known Fault information, including the Fault Number and a copy of the AST and CST strings at the time of the fault

Reboot - Reboot the Regulator

Debug - This command will generate additional information in the system logs that can be used by support for troubleshooting. Reboot or restart regulator to end debug mode.

Why not run in Debug Mode all the time?

This creates a flurry of CAN messages that would otherwise overwhelm the CAN. Tether data is RV-C CAN protocol. RV-C however does not support all data that Regulator can provide. Example: (Field % and data regarding wattage) **Debug mode** will show parameters that are not typically shown in RV-C. Clicking **Debug** will push out all the regulator data messages so you can view correctly in the **SAT** tab. All this data will however overload the CAN RV-C and thus cannot stay in this mode permanently.

Click **debug** and it will stay in **debug** until you **Reboot** regulator, power cycle, or turn off engine.

Factory Reset - use this button to restore the regulator to the default configuration. (See WS manual)

Restore System Config - Restores System Configuration values to original factory default values. (See WS manual)

Restore CAN Config -Restores CAN Configuration values to original as-compiled (default). (See WS manual)

Restore Charge Profile - Restores to default (values at compile time) Charge Profile

Force Regulator Mode - (See WS manual p. 54)

WS500 Firmware Upgrade

To upgrade firmware for the regulator follow these steps. Note: regulator will come with the latest firmware version and process should not be needed in most cases.

1. Remove regulator cover and run a USB to USB mini cable to your tether to regulator.
2. Select correct firmware version and click “**upgrade**”
 - a. 2.2.X... for WS500 Regulators
 - b. 2.3.X... for AP500 Regulators
3. Hold down the RESET button on the regulator for 5 seconds.
4. Regulator will program and reboot. View “**Status of last action**” line at top showing completion. click the **RESET** button once on the regulator again to finish. Do not hold down this time, regulator will begin to flash green if correct.



Profiles - Profile Manager

App Settings | Reg Settings | Tools | Profiles | Import/Export | Sys Log | Logs | AST | CST | CPE | SCV | SST | ENG

Profile Manager

To create predefined regulator configurations first adjust regulator settings then save them by selecting **Add**, giving the profile a name and description, followed by **Save & Apply**. The **Add** function memorizes the current alternator configuration and stores it in the named profile.

- Restore:** Copy profile into current settings
- Program:** Copy profile into current settings and then transfer to regulator.
- Refresh:** Copy current settings into selected profile.
- Export:** Download profile settings and store in a ".txt" file.
- Delete:** Remove profile from system
- Add:** Create a new profile and copy current settings into it.

Manage Profiles

Profile	Description	Restore	Program	Refresh	Export	Delete
Bliss	Single regulator config					
BattleBorn	Charge profile for drop in Battle Born and Dragonfly Energy LiFePO4 batteries. No BMS integration. Current shunt and battery temperature sensor are required.					

After configuring your profile on the “**Reg Settings**” tab and click “**Save and Apply**” you should permanently save your config with the **Profile Manager**.

To create a new profile with the current settings, click **ADD**. Enter your description and then click **Save/Apply** to save it to the Tether hard drive.

AP500 for 55i for L13 No CAN	For 1200Ah x 28V L13 system, 1x55i + 1xHPI on one engine, this is the 55i reg	Restore	Program	Refresh	Export	Delete
AP500 for HPI for L13 No CAN	For 1200Ah x 28V L13 system, 1x55i + 1xHPI on one engine, this is the HPI reg	Restore	Program	Refresh	Export	Delete
Add Save & Apply Save Reset						

- **Restore:** Uploads saved profile into **Reg Settings** tab.
- **Program:** Uploads saved profile into **Reg Settings** tab then transfers to regulator.
- **Refresh:** Save current settings into selected **profile**.
- **Delete:** Remove **profile** from system.
- **Add:** Saves current **Reg Settings** tab as a **new profile**.

Import/Export- Profiles

App Settings | Reg Settings | Tools | Profiles | Import/Export | Sys Log | Logs | AST | CST | CPE | SCV | SST | ENG

Import/Export Regulator Settings and Backup/Respose Profiles

Import/Export Regulator Settings

Reset

Clear application regulator settings and set to default values. Note that this does not modify the regulator itself.

Reg Import

Query regulator for settings and create a profile from them. This will import settings from regulator to populate UI elements in the "Reg Settings" tab. Note that the process is not perfect. Please check imported values carefully.

Export Profile

... Please choose ...

Select profile to export then push the "Export" button. Select "custom" and enter a filename to export current "Reg Settings".

Export

Query regulator for settings and create a profile from them. This will import settings from regulator to populate UI elements in the "Reg Settings" tab. Note that the process is not perfect. Please check imported values carefully.

Import From

Select Source

Import

Import profile file into UI elements in the "Reg Settings" tab.
Note: On success you will be redirected to the "Reg Settings" tab. You will remain on this page on failure.

In this section you can archive your profiles for backup, or you can import a new profile file that has been sent to you.

Reset- Regulator has been requested to reset. This can take up to 10 seconds to complete. (see WS 500 manual)

Reg Import- This button will pull the config currently programmed in the regulator into the tether “Reg Settings” tab. Note: to save these on the tether hard drive, you still need to save as a new profile. Please check over imported values carefully as the process may not upload exactly.

Export- Export and save profile to computer for backup

Import- Select previously Exported profile.

Note: Newly imported profiles will be saved under **Profile Tab**, not populated in the **Reg Settings tab** until you load them there. To perform this navigate to **Profiles** tab and Click “**Restore**”. (See: Profiles - Profile Manager above)

Questions, comments please contact:

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