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BattaMax

Absorbent Glass Mat (AGM) – Sealed Lead Acid (SLA) Batteries

BAT-NSAP12-040 BAT-NSAP12-100

User's Manual

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1 INTRODUCTION

Thank you for purchasing a BattaMax battery, another quality product from Windy Nation. Deep cycle batteries are a key component in various types of renewable energy systems and the primary method to store direct current (DC) power produced from sources like solar panels and wind generators. A battery bank can provide a relatively constant power source when the grid is down or during periods when your renewable energy system is not producing power.

This manual contains vital information regarding proper care and maintenance of your new BattaMax battery. Read through this User's Guide carefully and completely BEFORE using and installing your battery.

The manual will provide safety guidelines and procedures for using your battery to ensure optimum performance and long life. The manual will not provide details about any of the connected equipment to the battery (eg: charge controllers, inverters, etc.). Information concerning any connected equipment should be available from the equipment manufacturer.

1.1 SAFETY

Windy Nation Inc. ("Windy Nation") is not assembling or installing the product and therefore Windy Nation, its directors, officers, and employees disclaim that by purchasing a Windy Nation product you accept all liability and responsibility for damage to property, injury, or death arising out of or related to the use or misuse of any product offered by Windy Nation.

- > Installation and servicing should be referred to qualified service personnel.
- Remove all sources of power (photovoltaic, wind generator, battery chargers, etc.) before servicing or installing.

Battery Safety

Warning: Batteries can produce explosive gasses; observe extreme caution.

- Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing or eyes.
- ◆ NEVER smoke or allow a spark or flame in the vicinity of the battery.
- Be extremely cautious of metal items such as jewelry and tools to reduce risk of short circuit.
- Never charge a frozen battery.
- Be sure battery is mounted in a well-ventilated compartment.
- Use insulated tools and wear protective clothing when working with batteries

1.2 **DEFINITIONS**

AGM Absorbed Glass Mat

Ah Amp-Hours

AWG American Wire GaugeCCA Cold Cranking Amps

BAT Battery

SOC State of Charge: Available Amp-hours relative to the batteries full capacity

2 PRODUCT OVERVIEW

The BattaMax is an AGM battery, which is a lead-acid electric storage battery, sealed using special pressure valves and designed to never be opened. The battery has all of its electrolyte absorbed in separators consisting of a sponge-like mass of matted glass fibers using a recombination reaction to prevent the escape of hydrogen and oxygen gases normally lost in flooded lead-acid batteries (particularly in deep cycle applications).

The BattaMax is non-spillable meaning it can be operated in virtually any position and is completely maintenance-free. Typically, new deep-cycle batteries will not immediately deliver their full rated capacity. This is normal and should be expected since it takes time for a deep-cycle battery to reach maximum performance or peak capacity; usually in less than 10 cycles.

When operating batteries at temperatures below 77°F (25°C), they will deliver less than the rated capacity. For example, at 0°F (-18°C) the battery will deliver 86% of its capacity and at 77°F (25°C) it will deliver 100% of its capacity. Similarly, when operating batteries at temperatures above 77°F (25°C), they will deliver more than the rated capacity but the battery life expectancy will be reduced. The overall life expectancy will vary by application, frequency of usage and environmental temperature.

2.1 FEATURES

- ✓ Maintenance Free Operation
- ✓ Compact Design with embedded carry handles
- √ High Quality and High Reliability
- √ 10-year life expectancy (@25°C)
- √ 6-month storage life
- ✓ Reliable threaded terminals
- ✓ ABS plastic container offering excellent impact resistance and strength

2.2 APPLICATIONS

- ✓ Renewable energy (Solar & Wind) power storage
- ✓ Telecommunication systems
- ✓ Alarm and security systems
- √ Backup Emergency power
- ✓ Portable DC power
- ✓ UPS (Uninterrupted Power System)
- ✓ Marine & RV house power
- ✓ Electric Vehicles

2.3 SPECIFICATIONS

2.3.1 Electrical Specifications

Parameter	BAT-NSAP12-040	BAT-NSAP12-100						
Nominal Voltage	12V (6 cells)							
Nominal Capacity (20hr, 1.80V/cell, 25°C)	40 Ah	106 Ah						
Nominal Capacity (10hr, 1.80V/cell, 25°C)	38 Ah	100 Ah						
Max Discharge Current	456A (5S)	1200A (5S)						
Internal Resistance	10.0mΩ	$4.9 \mathrm{m}\Omega$						
Cycle Use	14.4~15.0V (25°C) Tem	p. Coefficient -30mV/°C						
Standby Use	13.5~13.8V (25°C) Tem	p. Coefficient -20mV/°C						
Max Charge Current	11.4 Amps	30 Amps						

Nominal Capacity: Calculated by multiplying current in amperes by time in hours of discharge to specified volts per cell.

2.3.2 Physical Specifications

Parameter	BAT-NSAP12-040	BAT-NSAP12-100						
Dimension (L x W x H)	7.8" x 6.5" x 6.7"	13.0" x 6.8" x 8.7"						
	(197mm x 165mm x 170mm)	(330mm x 173mm x 220mm)						
Unit Weight	29.1 lb. (13.2Kg)	67.0 lb. (30.4Kg)						
Terminal	T6	T11						
Container Material	ABS I	Plastic						
Nominal Operating Temperature	25°C +/-3°C	(77°F +/-5°F)						
Discharge Temperature Range	-15°C to 50°C	(5°F to 122°F)						
Charge Temperature Range	0°C to 40°C (3	32°F to 104°F)						
Storage Temperature Range	-15°C to 40°C	-15°C to 40°C (5°F to 104°F)						

2.3.3 Regulatory Information

The 40ah and 100ah BattaMax Batteries have the following safety approvals and certifications:

- CE
- IEC 60896.22

3 INSTALLATION

Deep-cycle AGM batteries release small amounts of gas during usage, particularly during the charging process. Be sure there is adequate ventilation in the area where the batteries are to be installed. If using multiple batteries, the empty space surrounding adjacent batteries should be at least 0.50" (12.7 mm) to permit airflow around each battery.

The BattaMax is non-spillable and can be placed either upright or on their sides. The battery should never be oriented upside down (terminals facing down).

Important: Batteries deliver large amounts of power that can cause injury and even death. Please observe the rules set forth in Section 1.1 when working on or around batteries.

Caution: Risk of fire, explosion, or burns. Do not disassemble, heat above 70°C (160°F), or incinerate.

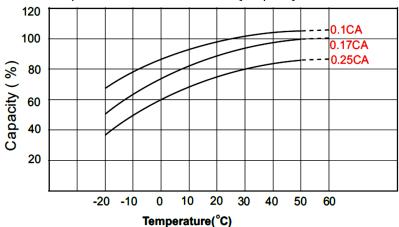
3.1 ENVIRONMENT

Batteries should be installed in a clean, dry, well ventilated area, keeping water, oil, and dirt away from the batteries. The accumulation of these materials on the batteries can result in self-discharge and possible short-circuits.

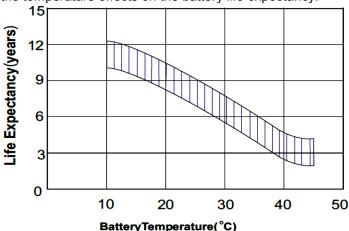
3.1.1 Temperature

Temperature is a major factor in battery performance and battery life expectancy. This is because at higher temperatures there is more chemical activity inside a battery than at lower temperatures.

The following chart shows the temperature effects to the battery capacity:



The following chart shows the temperature effects on the battery life expectancy:



The recommended operating temperature range is between 0°C to 40°C (32°F to 104°F) with a humidity of less than 90%. Elevated battery temperatures of greater than 25°C (77°F) will reduce operating life, while lower battery temperatures of less than 25°C (77°F) will reduce battery performance and extend battery life.

It is important to note that the temperature of the battery and the ambient temperature can differ significantly. As an ambient temperature can be changed rapidly, the battery temperature is slower to change due to the thermal mass of the battery. Batteries that are exposed to colder climates should be kept at a higher State of Charge (SOC) to prevent freezing. A frozen battery must be completely thawed prior to any use.

3.2 CONNECTIONS

WARNING: Faulty connections can lead to poor performance, terminal damage, and possible fire.

Battery cables provide the link between the batteries, equipment, and charging system. The battery cable should be sized for the maximum load of the system where the voltage drop on the cable will not exceed 0.2 volts. To ensure proper connections, please use the wire gauge reference in Sec 3.2.1. Please note: UL and NEC electrical cable amperage ratings are lower than the chart below.

3.2.1 Wire Gauge Reference

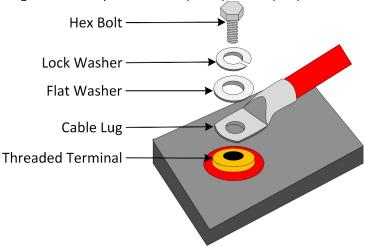
AWG	Diameter inches (mm)	Ohms per 1000ft	Maximum Current (A)
16	0.051 (1.29)	4.016	22
14	0.064 (1.63)	2.525	32
12	0.081 (2.05)	1.588	41
10	0.102 (2.59)	0.999	55
8	0.129 (3.26)	0.628	73
6	0.162 (4.11)	0.395	101
4	0.204 (5.19)	0.249	135
2	0.258 (6.54)	0.156	181
0 (1/0)	0.325 (8.25)	0.098	245
00 (2/0)	0.365 (9.27)	0.078	283
000 (3/0)	0.410 (10.4)	0.062	328
0000 (4/0)	0.460 (11.68)	0.049	380

3.2.2 Threaded Terminals

The BattaMax has two threaded terminals and comes with the necessary bolts and washers to secure a cable connection.

Place battery connection cable lug (not included) over the threaded insert of the battery terminal ensuring that the cable lug connection is contacting the metal surface of the terminal. Place the flat washer on top of the cable lug, followed by the lock washer. Do not place washer between the terminal lead and the battery wire, which creates high resistance and can cause terminal meltdown.

Add the hexagonal bolt and tighten to a torque of 98-107 (in-lbs), 11-12 (Nm)



3.2.2.1 Terminal Protection

Corrosion can build up on terminals if they are not kept clean and dry. To prevent corrosion, apply a thin coat of terminal protector spray that can be purchased through your local automotive parts dealer.

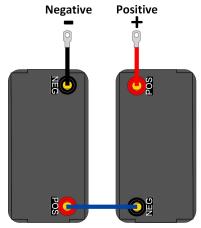
3.3 CONFIGURATION

Batteries can be connected in series (increases voltage, maintains ah capacity), in parallel (increases ah capacity, maintains voltage), or in a combination of series and parallel.

3.3.1 Series Connection

A series connection will increase the system voltage and the system capacity (Ah) will remain unchanged.

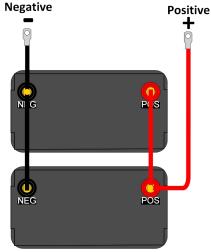
For example, if two 12V batteries with 50Ah of capacity are wired in series, the resulting battery bank will be 24V (12V + 12V = 24V) of 50Ah.



3.3.2 Parallel Connection

A parallel connection will increase the system capacity (Ah) and the system voltage will remain unchanged.

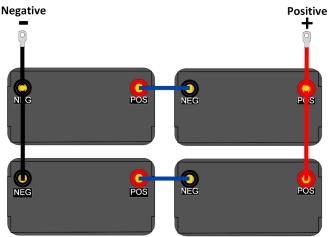
For example, if two 12V batteries with 50Ah of capacity are wired in series, the resulting battery bank will be 12V of 100Ah (50Ah + 50Ah = 100Ah).



3.3.3 Series-Parallel Connection

A Series-Parallel connection will increase the system capacity (Ah) as well as increase the system voltage.

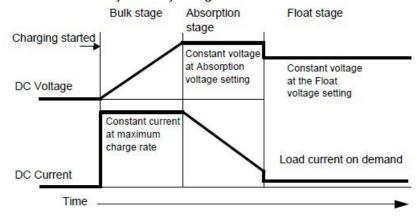
For example, if four 12V batteries with 50Ah of capacity are wired in series-parallel, the resulting battery bank will be 24V of 100Ah.



4 SERVICE AND MAINTENANCE

4.1 CHARGING

BattaMax batteries are charged at the factory and are ready for installation when they are received. Proper charging will maximize battery performance and lifecycle. Undercharging as well as overcharging batteries will significantly reduce the life of the battery. For optimum performance the use of a 3-stage charge controller is recommended (Bulk, Absorption, and Float). The three stage charge process provides a somewhat higher charge voltage to charge the battery quickly and safely. Once the battery is fully charged, a somewhat lower voltage is applied to maintain the battery in a fully charged state.



Important: Batteries should be fully charged after each discharge of at least 30 minutes. Charge only in well-ventilated areas.

Caution: Never charge a frozen battery and avoid charging at temperatures above 122°F (50°C).

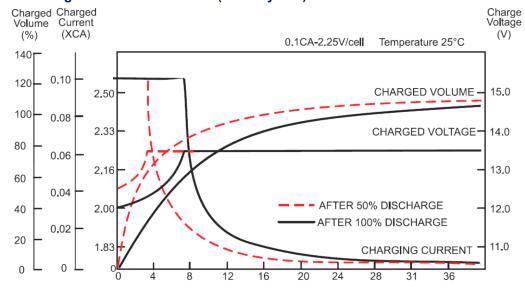
Charge Mode	Voltage Setting ¹ (@25°C, 77°F)
Bulk	14.4V
Absorption	14.1 – 14.7V
Float	13.5V

¹Temperature compensated charging should be used at -4.0 mV/Cell/_°C

4.1.1 State of Charge (SOC)

Charge Percentage (%)	Cell (Open Circuit Voltage)	Battery (Open Circuit Voltage)
100	2.14	12.84
75	2.09	12.54
50	2.04	12.24
25	1.99	11.94
0	1.94	11.64

4.1.2 Charge Characteristic Curve (Standby Use)



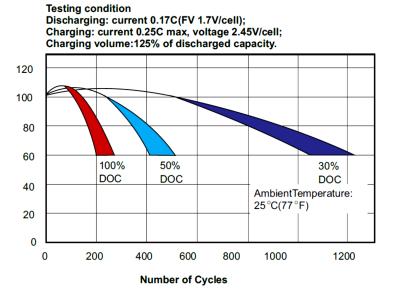
4.1.3 Temperature Compensation

Many charge controllers offer a Battery Temperature Sensor (BTS) that automatically adjusts the charging parameters based on the measured battery temperature.

The temperature should be adjusted by subtracting 0.004 volt per cell from the voltage reading for every 1°C above 25°C, or adding 0.004 volt per cell for every 1°C below 25°C.

4.2 DISCHARGING

Batteries should be sized so the rated capacity is double that of the required load. As an example, if the load will require 50Ah on average, the battery capacity should be 100Ah. This will limit the average depth of discharge to 50% and will extend the life of the battery as shown below



4.2.1 Constant Current Discharge

Amperes at 25°C (77°F)

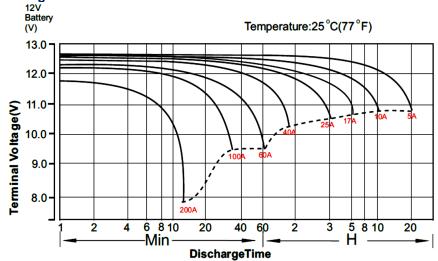
·	10min		0min 15min		20min		30min		45min		1h		2h		3h		5h		10h		20h	
F.V/Time	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100
1.80V/cell	50.9	167.6	42.0	143.7	36.7	123.5	29.9	92.1	22.9	68.7	19.2	55.1	12.6	33.1	9.5	24.6	6.5	17.2	3.8	10.0	2.0	5.2
1.75V/cell	57.8	186.3	47.3	154.0	40.5	130.8	32.5	96.5	25.0	71.3	20.9	57.1	13.1	34.4	9.9	25.4	6.6	17.6	3.9	10.1	2.1	5.3
1.70V/cell	65.3	199.5	52.5	165.1	44.7	138.9	35.5	101.8	26.9	74.6	22.1	59.5	13.9	35.3	10.4	26.0	7.0	17.9	4.1	10.2	2.1	5.3
1.65V/cell	70.1	215.1	56.2	178.5	47.6	146.6	37.4	106.7	28.5	77.4	22.9	61.9	14.4	36.3	10.8	26.7	7.2	18.3	4.2	10.3	2.2	5.4
1.60V/cell	77.1	232.5	61.6	188.5	51.7	154.3	39.9	112.3	29.6	80.5	23.6	63.8	14.7	37.5	11.1	27.6	7.4	18.6	4.3	10.5	2.2	5.5

4.2.2 Constant Power Discharge

Watts per Cell at 25°C (77°F)

	10min		15min		20min		30min		45min		1h		2h		3h		5h		10h		20h	
F.V/Time	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100	040	100
1.80V/cell	93.9	312.2	78.1	271.0	68.9	235.1	56.7	176.8	44.1	132.7	37.2	107.2	24.6	63.8	18.6	47.7	12.7	33.6	7.6	19.8	4.1	10.3
1.75V/cell	104.9	344.9	87.0	288.7	75.4	247.8	61.1	184.3	47.7	137.3	40.3	110.8	25.5	66.0	19.3	49.1	13.0	34.3	7.8	19.9	4.2	10.4
1.70V/cell	115.9	366.5	95.2	307.7	82.6	261.8	66.3	193.6	51.2	143.0	42.5	115.0	26.8	67.6	20.2	50.1	13.7	34.8	8.1	20.1	4.3	10.5
1.65V/cell	123.3	391.4	101.1	330.2	87.2	274.5	69.4	201.9	53.7	147.7	43.7	119.1	27.7	69.2	21.0	51.3	14.1	35.3	8.3	20.3	4.4	10.6
1.60V/cell	132.6	418.2	109.0	345.1	93.7	286.6	73.6	211.1	55.5	152.9	44.8	122.4	28.2	71.1	21.4	52.7	14.4	35.9	8.5	20.5	4.5	10.7

4.2.3 Discharge Characteristic Curve



4.3 MAINTENANCE

BattaMax batteries do not require equalizing or electrolyte leveling but periodic inspections and parameter recording will ensure effective operation and identify issues before they become problematic.

- 1. Examine the outside appearance of the battery. The tops of the batteries and terminal connections should be clean and dry, as well as free of dirt and corrosion.
- 2. Check for any evident fluids. If fluid is present on the top of the battery, it generally indicates that the battery is being overcharged.
- 3. Check battery cables and connections. Replace any damaged cables and tighten any loose connections.
- 4. The following will only be done when all electrical connections are completely disconnected from the battery. Clean the top of the battery, terminals and connections with a cloth or brush, and a solution of baking soda and water (1 cup of baking soda to 1 gallon of water). Rinse with water and dry with a clean cloth and re-apply a thin coat of terminal protector spray. Thoroughly and completely dry the battery before attaching electrical connections.

5 STORAGE

Batteries may be stored prior to installation for up to 2 years at 25°C (77°F).

NOTE: Store in a cool, dry location, protected from the elements.

Disconnect all connections to the battery and charge the battery to 100% SOC. When batteries are taken out of storage, they should be recharged before use.

Batteries in storage should be boost charged every 3 months or when the SOC drops below 50%.

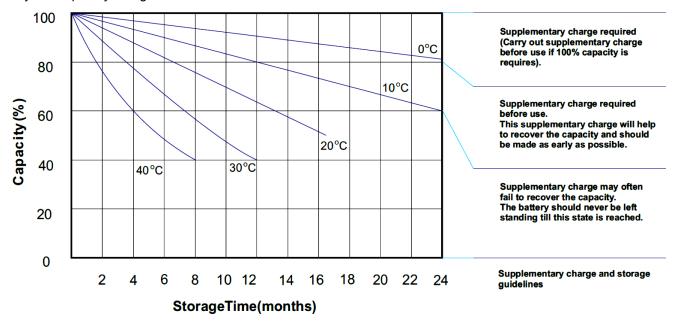
5.1 TEMPERATURE EFFECTS ON STORAGE

5.1.1 Hot Environments (greater than 90°F or 32°C)

Avoid direct exposure to heat sources, if possible, during storage as batteries self-discharge faster in high temperatures. If batteries are stored during hot summer months, monitor the voltage every month as opposed to every 3 months.

5.1.2 Cold Environments (less than 32°F or 0°C)

Avoid locations where freezing temperatures are expected, if possible, during storage. Batteries can freeze in cold temperatures if they are not fully charged. If batteries are stored during cold winter months, it is critical that they are kept fully charged at all times.



5.2 RECYCLING

Batteries that have reached the end of their service life should be returned to a local or regional collection center for recycling. Batteries should never be discarded in the trash or a landfill and all local regulations and ordinances must be followed.

Lead acid batteries have fortunately been an environmental success with more than 98% of all battery lead being recycled. Batteries are at the top of the list as one of the most highly recycled consumer products.

Windy Nation supports a clean environment and we hope that you will do the same.

6 TESTING AND SUPPORT

These battery testing procedures are guidelines only for identifying a battery that may need to be replaced. It is recommended that batteries configured in a battery bank are the same type and the same vintage.

IMPORTANT: Shock Hazard

Clean the battery and check all terminals as stated in Section 4.3. Ensure the battery is fully charged prior to testing.

6.1 OPEN CIRCUIT VOLTAGE

For accurate voltage readings, batteries must remain idle at least 6 hours, preferably up to 24 hours.

Measure the individual battery voltages and remove any battery with a voltage that is greater than 0.3V compared to other batteries in set (e.g. battery bank).

6.2 DISCHARGE - CAPACITY

- 1. Connect a load or discharger to battery and start the discharge process.
- 2. Record the runtime (minutes) until the discharge is complete.

- 3. Normalize the runtime minutes for temperature using the following formula: Rc = Ra [1 0.004 (Bt 80)]
 - i. Rc = Runtime Corrected
 - ii. Ra = Actual discharge time
 - iii. Bt = Battery temperature at end of discharge (°F)

If the discharge runtime is greater than 50% of the batteries' rated capacity at that discharge rate, then all the batteries are operational.

4. Restart the discharger to record the individual battery voltage while still under load (current being drawn).

If the discharge runtime is less than 50% of the batteries' rated capacity, the battery with a voltage that is 0.5V lower than the highest voltage may be a failed battery.

6.3 SUPPORT

If you are experiencing technical problems, and cannot find a solution in this manual, you can contact Windy Nation Inc. for further assistance.

- Call: (805) 323-6445
- Email: info@windynation.com
- Write: 398 S. Ash St. Unit C, Ventura, CA 93001

For challenging issues or to just ask a question, consider using our FREE Community Forums! Consult our community of DIY'ers for fast answers to all your questions.

Post on our Forums: Windy Nation Community Forum

6.4 LIMITED WARRANTY

Windy Nation warrants that the Battery (the "Product"), will be free from manufacturing defects in materials and workmanship under normal authorized use consistent with product instructions for a period of one (1) year from the date the original purchaser ("Customer") receives the Product (the "Warranty Period"). This warranty extends only to the original purchaser. The Customer's sole and exclusive remedy and the entire liability of Windy Nation, its suppliers and affiliates for breach of the warranty is, at Windy Nation's option, either (i) to replace the Product (or defective component part(s)) with a new or reconditioned Product (or component part(s)); (ii) to repair the reported problem; or (iii) to refund the purchase price of the Product. Repaired or replaced products are warranted for the remainder of the original warranty period only. No employee, agent, dealer or other person is authorized to give any warranties on behalf of Windy Nation not expressly set forth in this limited warranty.

6.5 RESTRICTIONS

No warranty will apply if the Product (i) has been altered or modified except by Windy Nation; (ii) has not been installed, operated, repaired, or maintained in accordance with instructions supplied by Windy Nation; (iii) has been subjected to abnormal physical, thermal or electrical stress, misuse, negligence, or accident. If Windy Nation determines that the problem with the Product is not due to a manufacturing defect in Windy Nation's workmanship or materials, or otherwise does not qualify for warranty repair, then the Customer will be responsible for the costs of all necessary repairs and expenses incurred by Windy Nation.

6.6 WARRANTY CLAIMS & RETURN PROCEDURES

To be eligible for service under this warranty, the Customer must submit a service request within the Warranty Period by contacting Windy Nation in writing or via telephone and obtaining a Returned Materials Authorization ("RMA") number. This RMA must be obtained before returning any product under this warranty. Notification must include a description of the alleged defect, the manner in which the Product was used, the serial number, and the original purchase date in addition to the name, address, and telephone number of the Customer. Within five (5) business days of the date of notification, Windy Nation will provide the Customer with an RMA number and the location to which the Customer must return the defective Product. Any Product returned for warranty service shall be shipped at the expense and risk of the Customer. The Customer must return the entire Product kit (or, if authorized by Windy Nation, the defective component parts), within fifteen (15) days after issuance of

the RMA number. Windy Nation will be under no obligation to accept any returned Product that does not have a valid RMA number. Customer's failure to return the Product within fifteen (15) days of its receipt of an RMA number may result in cancellation of the RMA. All parts that Windy Nation replaces shall become Windy Nation's property on the date Windy Nation ships the repaired Product or part back to the Customer. Windy Nation will use all reasonable efforts within thirty (30) days of receipt of the defective Product to repair or replace such Product. If a warranty claim is invalid for any reason, the Customer will be charged at Windy Nation's then-current rates for services performed and will be charged for all necessary repairs and expense incurred by Windy Nation. If Windy Nation determines that a warranty claim is valid, it will ship the repaired or replaced Product to Customer at Windy Nation's cost.

6.7 DISCLAIMER

EXCEPT FOR THE EXPRESS LIMITED WARRANTY SET FORTH IN THE PREVIOUS PARAGRAPH, WINDY NATION DISCLAIMS ALL WARRANTIES, EXPRESS, IMPLIED AND STATUTORY INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO ANY PRODUCTS PROVIDED BY WINDY NATION. NO ORAL OR WRITTEN INFORMATION OR ADVICE GIVEN BY WINDY NATION, ITS DEALERS, DISTRIBUTORS, AGENTS OR EMPLOYEES SHALL IN ANY WAY INCREASE THE SCOPE OF THIS WARRANTY. WINDY NATION DOES NOT WARRANT THAT THE QUALITY OR PERFORMANCE OF THE PRODUCTS WILL MEET YOUR REQUIREMENTS OR THAT YOU WILL BE ABLE TO ACHIEVE ANY PARTICULAR RESULTS FROM USE OR MODIFICATION OF THE PRODUCTS. Some jurisdictions do not allow the limitation or exclusion of implied warranties or how long an implied warranty may last, so the above limitations may not apply to you. In any such jurisdiction, the warranty shall be limited to the minimum warranty and period required by law.

WINDY NATION EXPRESSLY DISCLAIMS ALL LIABILITY FOR BODILY INJURIES OR DEATH THAT MAY OCCUR, DIRECTLY OR INDIRECTLY, BY USE OF THE PRODUCT BY ANY PERSON.

6.8 LIMITATION OF LIABILITY

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