

RoVers Member Meeting

Thursday, November 7th, 2019



RV Batteries

Battery Boys

Peak Performance Plus Peace of Mind

4091 CR 108, Oxford, FL 34484

352-643-1241

Brad & Jordan Winkler

www.batteryboys.us

11-7-19



Golf Batteries Overview



Rick Sanders & Miguel Castro

About Trojan Battery Company

About Trojan Battery Company

- Founded in 1925 – 90 + Years
- World's largest manufacturer of deep-cycle batteries
- \$500 + Million in Global sales; 1100+ employees
- Made in USA
- 4 manufacturing plants: 2 West Coast - Santa Fe Springs, CA & 2 East Coast – Lithonia & Sandersville, GA
- Global Distribution Network: 50+ Distributors in 120+ Countries
- Markets: Oil & Gas, Off Shore, Renewable Energy, EV/Golf, AWP, Floor Machine, RV/Marine, RE – Off Grid, Grid-tied, Telecom, Inverter Backup
- Global Sales and Technical Support Teams



HQ, Santa Fe Springs, CA



Santa Fe Springs, CA



Lithonia, GA



Sandersville, GA

Trojan Battery Sale Locations

- TBS is a Master Distributor for Trojan Battery Company.
- TBS has 11 location primarily located throughout the Southeast.
- The Villages are supplied by Orlando DC.
- TBS Delivers two times a week to The Villages.



The Trojan Difference

- The strength of the Trojan brand
- Made in the United States
- Better availability/faster shipping in the United States
- Global Technical Support team
- Broadest single-source manufacturer of flooded and AGM deep-cycle products
- Competitive market pricing
- 150+ years of engineering experience in deep-cycle and AGM battery research and development



Trojan Battery Company is the OEM Battery for the Top Three Major Manufactures

- E Z Go



- Club Car



- Yamaha



Trojan T-875

- The T-875 170amp @20hr rate
- 295 min. of discharge time @25amps
- 117 min. of discharge time @56amps
- 24-month warranty



Trojan T-105

- The T-105 225amp @20hr rate
- 447 min. of discharge time @25amps
- 115 min. of discharge time @75amps
- 24-month warranty

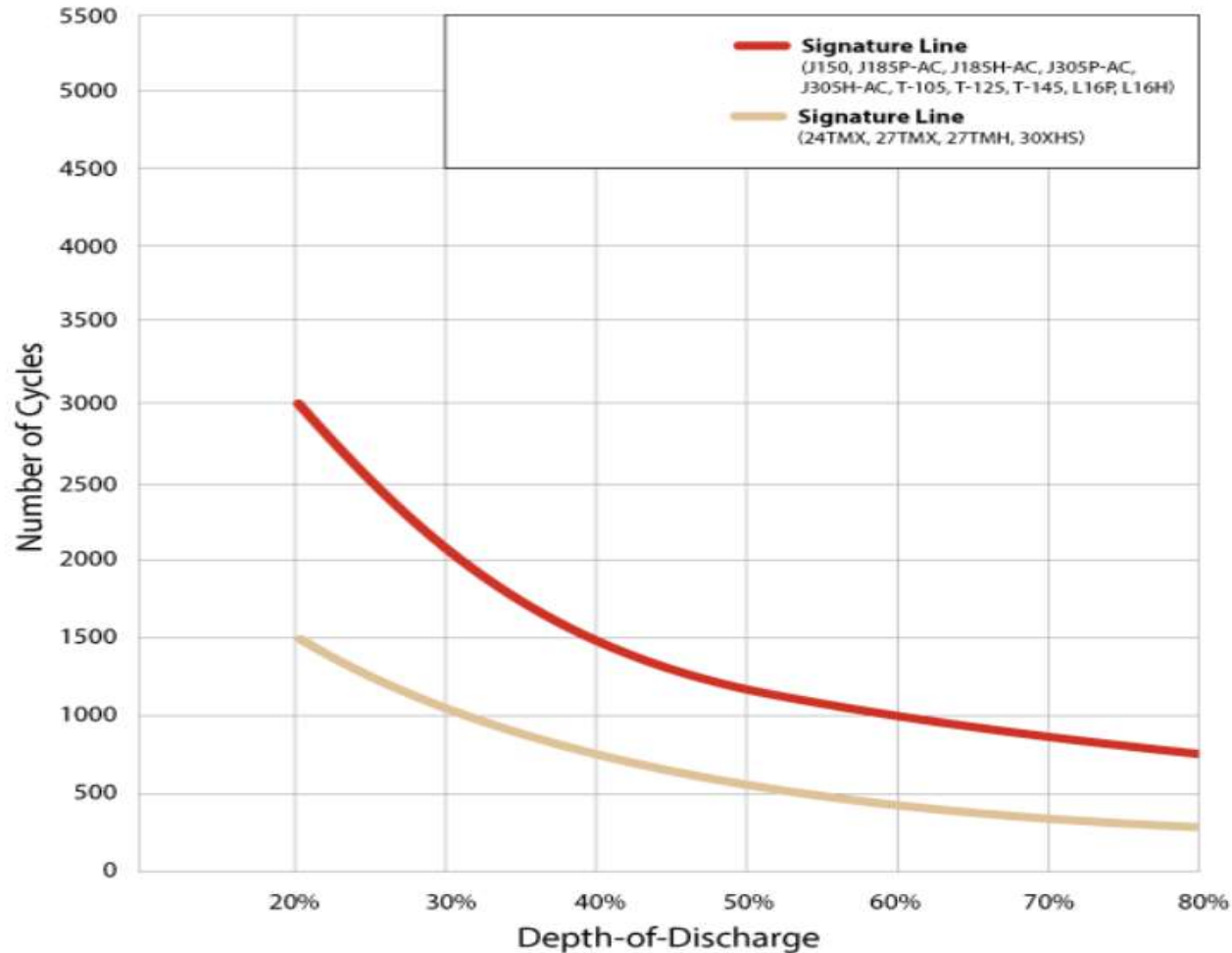


Trojan T-1275

- The T-1275 150amp @20hr rate
- 280 min. of discharge time @25amps
- 102 min. of discharge time @56amps
- 24-month warranty



Trojan Flooded Deep Cycle Chart



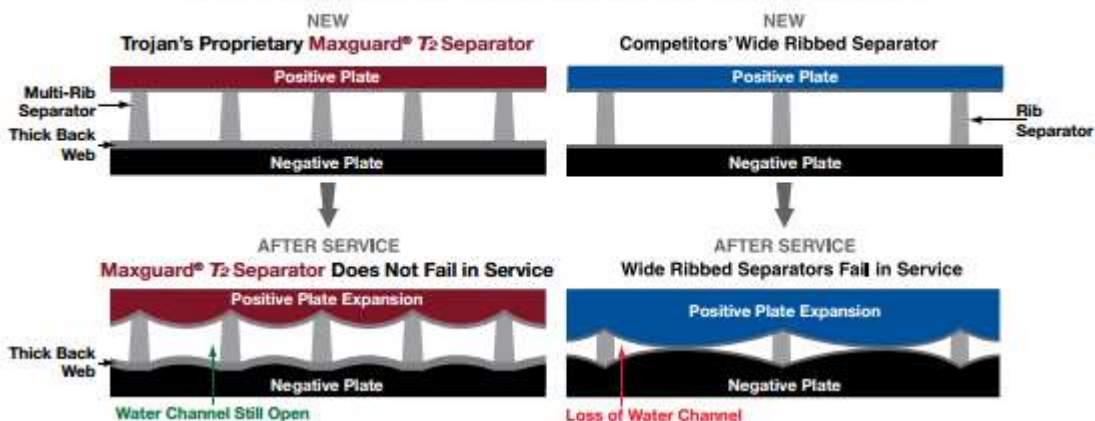
Most Usable Energy

- Highest Ah and kWh throughput
- Lowest cost of energy over lifetime
- Best overall battery value

Innovative Deep-Cycle Battery Technology

- Alpha Plus[®] Paste with T2 Technology[™]
- Trojan Grid Technology
- Maxguard[®] T2 Separator

THE MAXGUARD[®] T₂ SEPARATOR DIFFERENCE



Battery Maintenance Guide

SAFETY

- Always wear protective clothing, gloves and goggles when handling batteries.
- If acid contacts your skin or eyes, flush with water immediately.
- Keep flames, sparks and metal objects away from batteries.
- Charge batteries in a well-ventilated area.
- To avoid short circuits do not lay objects on top of battery.
- Check that all cable connections to the terminal are properly tightened; connections that are too tight or too loose could result in post breakage, meltdown or fire.

INSPECTION & CLEANING

- Keep batteries clean and dry from residue.
- Check that all vent caps are tight.
- Use a solution of baking soda and water to clean if there is acid residue on batteries or corrosion on the terminals.
- Protective spray or petroleum jelly should be applied to terminals to reduce corrosion.

STORAGE

- Batteries should be fully charged prior to and during storage.
- Never store discharged batteries.
- Store batteries in a cool, dry place.
- Recharge batteries before putting them back into service.

WATERING

- ADD WATER, NEVER ACID, TO CELLS (distilled water recommended).
- DO NOT OVERWATER.
- Before charging the batteries, only add water if the plates are exposed. Add just enough water to cover the plates, then charge the batteries. Once fully charged, add water to the proper level as indicated below.
- For fully charged standard deep-cycle batteries, add water to level of 1/8" (3 mm) below bottom of vent well (see diagram A).
- For fully charged Plus Series™ batteries, add water to the maximum water level indicator (see diagram B).
- After watering, secure vent caps back on batteries.
- For faster, easier and safer battery watering, ask about Trojan's HydroLink™ Watering System



Diagram 1



Add water to 1/8" (3 mm) below bottom of the vent well.

Diagram 2



Add water to the maximum water level indicator.

Trojan Reliant AGM With C-Max Technology™

*90+ years of true deep-cycle
experience and expertise*
Now maintenance free



Trojan Reliant AGM With C-Max Technology™

Trojan Reliant™ AGM Benefits:

- No watering required
- Lower operating costs due to less maintenance
- Non-spillable design
- Provides full capacity within a few cycles
- Requires less ventilation than flooded batteries
- Ideal for environments such as hospitals, airports and educational facilities
- Optimal for remote locations where batteries cannot be maintained
- Can be installed on their sides
- Delivers a *True* deep-cycle experience
- 99% recyclable components
- Made in the USA quality
- US DOT CFR 49 compliant for non-hazardous shipping



MAINTENANCE-FREE



Reliant is Designed for Key Markets & Applications

FM AW MH

MR OG TR EV

Hospitals
LEED
AIRPORTS
Schools

Key Customer Markets

- Floor Machine
- Aerial Work Platform/Access
- Material Handling
- Marine
- Recreational Vehicle
- Tiny House
- Oil & Gas
- Transportation
- Golf/EV

Focused Applications

- Hospitals
- Airports
- Universities/Schools
- LEED Facilities
- Museums
- Shopping Facilities
- Sport Venues
- Residential

Reliant AGM A True Deep-Cycle Experience

- Similar to T2 Technology™ in Trojan's flooded batteries, Reliant's C-Max Technology™ delivers customers the **greatest total amp hours** in an AGM technology
- Trojan focused Reliant AGM product development on **maintenance-free convenience, sustained performance and total energy output**
- AGM competitive products typically focus on high peak capacity. Their designs achieve high-capacity ratings for a short number of cycles, which result in a quick decline in capacity after 20+ cycles, shorter life and less total energy
- Trojan's Reliant AGM focuses on a ***True Deep-Cycle*** experience



Reliant's C-Max Technology Difference



Reliant's unique **C-Max Technology** incorporates a wide range of features not found in many of today's AGM battery offerings. **These combined elements deliver increased total energy output, maximized sustained performance, consistent quality, and enhanced durability.**

PROPRIETARY PASTE MAXIMIZES SUSTAINED PERFORMANCE AND **INCREASES TOTAL ENERGY**

THE UNIQUE SEPARATOR PROTECTS AGAINST STRATIFICATION AND **EXTENDS BATTERY LIFE**

THE PLASTIC POLYMER CASE INCREASES DURABILITY AND PROVIDES HIGHER BATTERY CELL COMPRESSION TO **ENSURE RELIABLE PERFORMANCE**

FLAME ARRESTORS PROVIDE **MAXIMUM BATTERY SAFETY**

MANUFACTURING EXCELLENCE DELIVERS **CONSISTENT BATTERY QUALITY** FOR DEPENDABLE BATTERY FUNCTIONALITY IN DEEP-CYCLE AGM APPLICATIONS

Reliant AGM Customer Testimonials

Road Less Traveled Blog

“Living in an RV on solar power fulltime, we depend on our batteries for all of our electricity. Our Trojan AGM batteries have performed flawlessly. Trojan’s AGM batteries are at the heart of our solar powered RV’s electrical system which we live in full-time, and they are dependable workhorses.” **Mark and Emily Fagan, The Road Less Traveled**



Mark installs the new Reliant batteries in the old plastic battery boxes



A rainbow over our rig in Flaming Gorge, Utah

Trillium Lithium Ion The Difference

Trillium™, Trojan's Intelligent Lithium battery delivers:

**MORE RUNTIME,
MORE LIFETIME, AND
MORE PEACE OF MIND.**



We didn't just build a competitive lithium ion battery;
We built a lithium ion battery that is superior in **every way**.

Premium features for premium markets:

- Robust look & feel
- High power (>350 A)
- >5,000 cycles
- Automotive-grade
- SOC gauge
- Microprocessor
- Fully self-protected
- CAN-communications
- Trojan-branded cell

Trillium Lithium Ion The Difference

BUT IF WE DID COMPARE...

Trillium's advanced electronics aren't just superior, they're unique — and what makes Trillium the best choice lithium ion battery on the market.



CHINA-BASED BMS



FEATURES	BENEFITS
No microprocessor	No intelligence
No communications	No integration
No current sensor	No tracking
No fuse	Limited protection
Simple coated	Poor reliability
Developed in China	Quality concerns

Examples: RELION, Topband, Heter, Optimumnano

TROJAN TRILLIUM



FEATURES	BENEFITS
Integrated microprocessor	SOC, SOH & life tracking
CAN-communications	Visibility, integration & usage optimization
Current sensor	Added intelligence
Fuse	Absolute safety
Conformally coated	Robust, proven & automotive-grade
Developed in the USA	Proven quality

Trillium Lithium Ion The Difference

THERE REALLY IS NO COMPARISON

This remarkable battery features extraordinary life – greater than 5,000 cycles – and highest capacity in its class.



	TRILLIUM	Competitor A	TRILLIUM	Competitor B
Size	Group 27	Group 31	Group 24	Group 24
Capacity	110Ah	100Ah	92.5Ah	80Ah
Intelligence	Integrated microprocessor SOC gauge	None, reliance on FETs	Integrated microprocessor SOC gauge	No SOC gauge
Environmental	IP67	IP54	IP67	IP54
Cycle Life	3,600 cycles @100% DOD (1C rate) 5,000 cycles @80% DOD (1C rate) 6,000 cycle @80% DOD (0.5C rate)	Not tested at 1C rate Not tested at 1C rate Claims 5,000 cycles at 80% DOD (0.5C rate)	3,600 cycles @100% DOD (1C rate) >5,000 cycles @80% DOD (1C rate) 6,000 cycle @80% DOD (0.5C rate)	Not tested at 1C rate Not tested at 1C rate 5,000 cycles at 80% DOD (0.5C rate)

MORE RUNTIME, LIFETIME AND PEACE OF MIND.

Trillium Lithium Ion 110Ah 12v TR27



DATA SHEET



MODEL TR 12.8-110 Li-ion
VOLTAGE 12.8V
NOMINAL CAPACITY 110Ah (1,400 Wh)
CASE PC/PBT Resin Blend, IP67 Enclosure, UL94 V-0
BATTERY Deep-Cycle Lithium Iron Phosphate
COLOR Maroon
CYCLE LIFE >5,000 Cycles @ 80% DOD*
INTELLIGENCE Integrated Microprocessor, State of Charge Gauge,
 Integrated Contactor, Current Sensor, Fuse



12.8 VOLT

PHYSICAL SPECIFICATIONS

BCI	Model	Terminal Type	Dimensions Inches (mm)			Weight Lbs. ^A (kg)	Handles	Installation Orientation
			Length	Width	Height			
Group 27	TR 12.8 - 110	5/16" - 18 Stud and 1/4" - 20 Threaded Hole	12.1 (307)	6.6 (168)	8.7 (221)	30 (13.6)	Molded	Horizontal and Vertical

Trillium Lithium Ion 110Ah 12v TR27

ELECTRICAL SPECIFICATIONS

Voltage	Capacity Amp-Hours (Ah)			Energy (kWh)	Short Circuit Current (A)
	5-Hr (22A)	10-Hr (11A)	20-Hr (5.5A)	20-Hr	
12.8V	110	110	111	1.4	Fused at 500 Amps

CHARGING INSTRUCTIONS

Charger Settings	
Recommended Charging Voltage	14.4 - 14.8 V
Recommended Float Voltage	13.8 V
Maximum Charging Current @ Temperature	
> 32° F (0°C)	110 A
14° to 32° F (-10° to 0°C)	15 A
-4° to 14°F (-20° to -10°C)	6 A

RECYCLE RESPONSIBLY



Do not mix with Lead Acid Batteries when Recycling.

*To 70% of Initial Capacity.

OPERATIONAL DATA

Operating Temperature Range	Storage Temperature Range
-4°F to 140°F (-20°C to 60°C) At Temperatures Below 32°F (0°C) Charging Current Reduced	-40°F to 140°F (-40°C to 60°C)

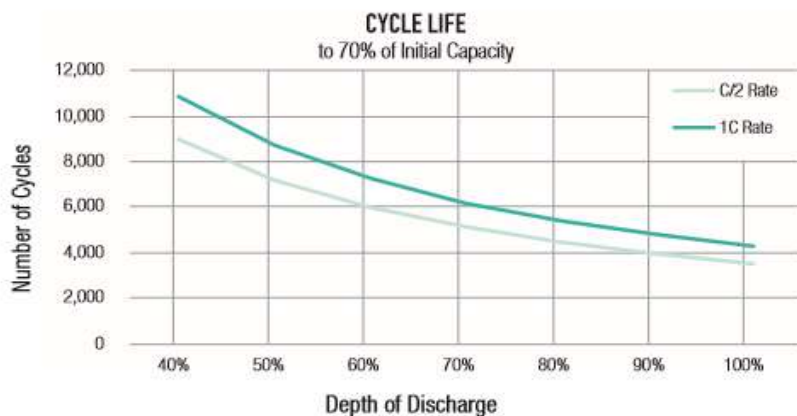
OTHER SPECIFICATIONS

Electrical Features	
Continuous Discharge Current	300 Amps
Pulse Discharge Current @ 77°F (25°C)	400 Amps for 30 Seconds
Communication	N/A
Reserve Capacity @ 25 Amps	265 Min
BMS Protections	Cell-Level Voltage, Temperature, Over Voltage, Under Voltage, Over-current
BMS Functions	Cell Balancing, State of Charge
Safety Systems	Contactors, Fuses, BMS
Series Connections	Up to 4S (51.2V)
Parallel Connections	Up to 20P
Discharge Voltage Cutoff	9.5V ± 5%
Charge Voltage Cutoff	15.2V ± 5% for 5 Seconds
Data Logging	Total Lifetime Amp Hours, Recent Faults
Other Features	
Environmental Protection	IP67
Shipping Classification	UN3480, Class 9, UN38.3 Certified
Case Flame Rating	Non-Flammable UL94 V-0

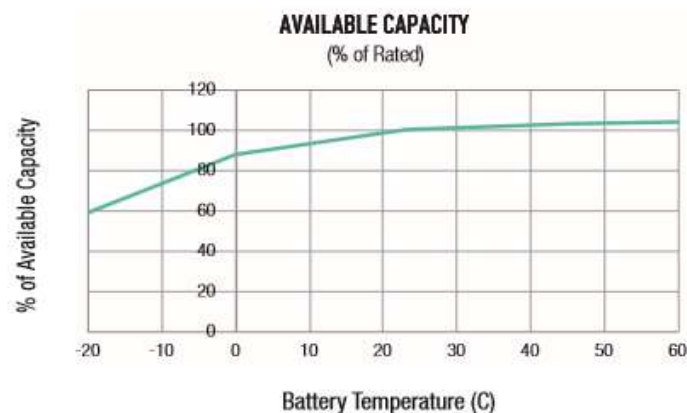
NOTE: See Trillium User's Guide for Proper Operation.

Trillium Lithium Ion 110Ah 12v TR27

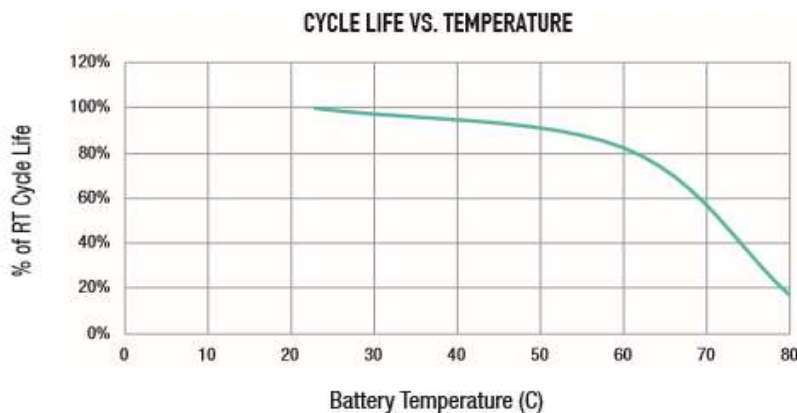
CYCLE LIFE



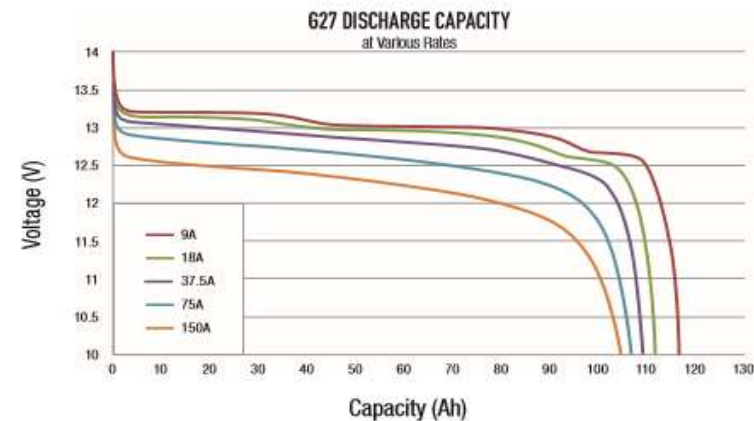
AVAILABLE CAPACITY



CYCLE LIFE VS. TEMPERATURE



G27 DISCHARGE CAPACITY



Trillium Lithium Ion 92Ah 12v TR24



DATA SHEET



MODEL	TR 12.8-92 Li-ion
VOLTAGE	12.8V
NOMINAL CAPACITY	92Ah (1,180 Wh)
CASE	PC/PBT Resin Blend, IP67 Enclosure, UL94 V-0
BATTERY	Deep-Cycle Lithium Iron Phosphate
COLOR	Maroon
CYCLE LIFE	>5,000 Cycles @ 80% DOD*
INTELLIGENCE	Integrated Microprocessor, State of Charge Gauge, Integrated Contactor, Current Sensor, Fuse



12.8 VOLT

PHYSICAL SPECIFICATIONS

BCI	Model	Terminal Type	Dimensions Inches (mm)			Weight Lbs. ^A (kg)	Handles	Installation Orientation
			Length	Width	Height			
Group 24	TR 12.8 - 92	M8 - 1.25 Threaded Hole	10.2 (259)	6.6 (168)	8.5 (216)	27 (12.3)	Molded	Horizontal and Vertical

Trillium Lithium Ion 92Ah 12v TR24

ELECTRICAL SPECIFICATIONS

Voltage	Capacity Amp-Hours (Ah)			Energy (kWh)	Short Circuit Current (A)
	5-Hr (18A)	10-Hr (9A)	20-Hr (4.6A)	20-Hr	
12.8V	92	92	92.5	1.18	Fused at 400 Amps

CHARGING INSTRUCTIONS

Charger Settings	
Recommended Charging Voltage	14.4 - 14.8 V
Recommended Float Voltage	13.8 V
Maximum Charging Current @ Temperature	
> 32° F (0°C)	92 A
14° to 32° F (-10° to 0°C)	12.5 A
-4° to 14°F (-20° to -10°C)	5 A

RECYCLE RESPONSIBLY



Do not mix with Lead Acid Batteries when Recycling.

*To 70% of Initial Capacity.

OPERATIONAL DATA

Operating Temperature Range	Storage Temperature Range
-4°F to 140°F (-20°C to 60°C) At Temperatures Below 32°F (0°C) Charging Current Reduced	-40°F to 140°F (-40°C to 60°C)

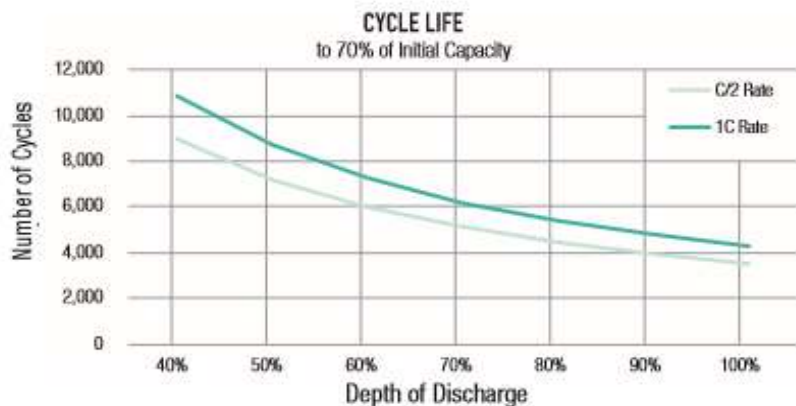
OTHER SPECIFICATIONS

Electrical Features	
Continuous Discharge Current	250 Amps
Pulse Discharge Current @ 77°F (25°C)	350 Amps for 30 Seconds
Communication	CAN-Open
Reserve Capacity @ 25 Amps	220 Min
BMS Protections	Cell-Level Voltage, Temperature, Over Voltage, Under Voltage, Over-current
BMS Functions	Cell Balancing, State of Charge
Safety Systems	Contactors, Fuse, BMS
Series Connections	Up to 4S (51.2V)
Parallel Connections	Up to 20P
Discharge Voltage Cutoff	9.5V ± 5%
Charge Voltage Cutoff	15.2V ± 5% for 5 Seconds
Data Logging	Total Lifetime Amp Hours, Recent Faults
Other Features	
Environmental Protection	IP67
Shipping Classification	UN3480, Class 9, UN38.3 Certified
Case Flame Rating	Non-Flammable UL94 V-0

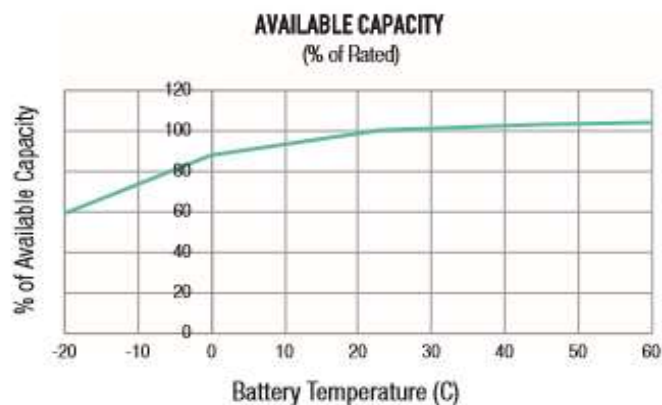
NOTE: See Trillium User's Guide for Proper Operation.

Trillium Lithium Ion 92Ah 12v TR24

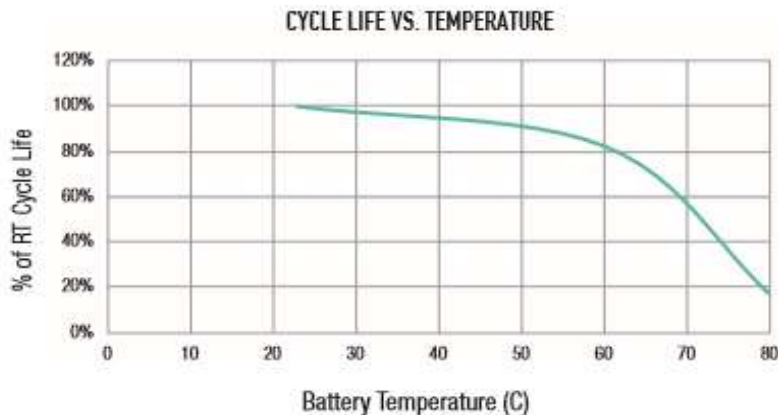
CYCLE LIFE



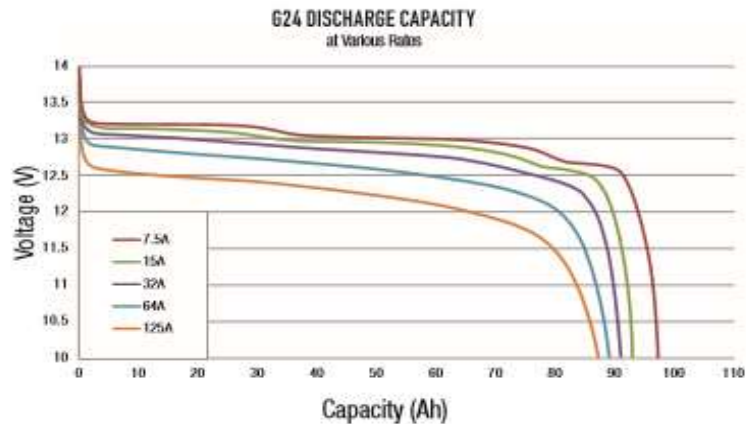
AVAILABLE CAPACITY



CYCLE LIFE VS. TEMPERATURE



G24 DISCHARGE CAPACITY



Any Questions?

