



MARATHON
P O W E R

**Uninterruptible Power Supply
Product Guide Spec**

Vault Series 700VA ~ 3000VA

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1.0 Scope & Modes of Operation

1.1 Scope

This specification covers the requirements & quality assurance provisions for AC line powered Uninterruptible Power Supplies for both Tower and 19" Rack-Tower units.

The UPS shall utilize On-Line (High Frequency Double Conversion) UPS topology. The UPS consists of an autotransformer (if required), battery charger, battery, inverter, transfer switches and all associated controls, monitoring and major protection devices. The term "UPS" shall denote the hardware and firmware associated to provide high quality AC power for sensitive electronic and other critical loads.

The UPS automatically maintains continuity of electrical power within tolerances and time frames specified in this product specification.

1.2 Modes of Operation

In normal operation (other than during UPS fault or Bypass conditions) the output is always a regulated, transient-free sinewave produced by the high frequency inverter within the UPS. During UPS Fault or Bypass (overload) conditions the output will automatically be switched to bypass with no break in power and then automatically return from bypass after the problem has been cleared with no break in power.

The battery can be charged from the utility irrespective of whether the UPS is ON or OFF.

The end-user shall be able to have the UPS operate in a High Efficiency Mode (Stand-by mode). While operating in High Efficiency mode the unit will transfer back to on-line mode when (1) input voltage is outside +/-10% from nominal or (2) input frequency is greater than +/-3 hertz. (3) Input line is not available. If a transfer is required, it will not take more than 10 ms. The input voltage window should be selectable by the customer at +/-10 % (default) or +/-15%.

2.0 Regulatory Standards and Requirements

The following documents and standards form a part of this specification to the extent specified herein. In the event of any conflict between this document and the referred document, this specification shall govern the final decision.

Model Suffix	U Models	E Models	A Models
Safety	UL 1778 Listed, c-UL Certified (to CSA 22.2 No. 107.1)	(GS) EN 50091-1-1; CE low voltage directive	
CB Report & Certificates	IEC 950 with amendments 1, 2, 3, 4 & 11 report required		
EMI / EMC	FCC Part 15 (6dB margin), Class B (700/1000/1500VA), Class A (2000/3000/4500VA)	CISPR 22 (6dB margin), EN 50091-2, Class B (700-2000VA), Class A (3000/4500VA); CE EMC directive, C Tick	
	VCCI (Japan), BCIQ (Taiwan, XXXX(Korea)		
Input Harmonics	IEC 61000-3-2		
Immunity	IEEE C62.41 Tested (measured let through) * (1) Let-through: 5% of peak with Category A3 (6KV, 200A) Ring Wave (normal mode only). (2) Survivability (Category B3): 6KV, 500A Ring Wave 6KV, 3kA Combination Wave.		
- Low Frequency Signals	IEC 61000-2-2 – System functions normally without degradation of product performance. **		

- ESD	IEC 61000-4-2 Level 3 **		
- Susceptibility	IEC 61000-4-3 Level 2 **		
- Electrical Fast Transient	IEC 61000-4-4 Level 2 **		
- Surge	IEC 61000-4-5 Level 3 Criteria A **		
Network TVSS	10/100 BASE T Speed Certification		
Modem TVSS	Conforms to New UL497A effective Jan. 11, 2001	Not Provided	Optional card for TS001, TS002 and AS3260
ISTA Project 2	Packing material must be capable of withstanding multiple shipments without breaking		

* Certification on low voltage models only.

** Certification on high voltage models only.

3.0 Electrical Requirements

3.1 Input

50 and 60 Hz Units	120 VAC Unit (U) (0.7-3kVA) 208 VAC Unit (U) (3kVA)	230 VAC Unit (E)	240 VAC Unit (A)
Acceptable Input Voltage Range	80 - 150 VAC (120V) 160 VAC-300 VAC (208)	160 VAC-300 VAC	
Acceptable Bypass Voltage Range	+10/-15% of nominal (default) +10/-10% of nominal +15/-20% of nominal Set on LCD display panel	+10/-15% of nominal (default) +10/-10% of nominal +15/-20% of nominal Set on LCD display panel	
Cold Start (0 to 100% load)	Yes, default = 60 Hz	Yes, default = 50 Hz	
Earth leakage (max.)	1 mA (UPS only)	2 mA (UPS only)	2 mA (UPS only)
Input protection type	Solid state or circuit breaker		

3.1.1 Inrush current (initial start up)

120 VAC rms., 25 degree C: 45 A (pk), decaying exponentially within 30 ms
208/230/240 VAC rms., 25 degree C: 45 A (pk), decaying exponentially within 30 ms

3.1.2 Surge Protection

U Models: 120 VAC units: MOVs ratings shall be 175 Volt (from L-N) and 300 Volt (from L-G and N-G) with 125 Joules minimum.
200/208/230/240 VAC units: MOVs ratings shall be 300 Volt, 280 Joules minimum. MOV's from L/L1, N/L2 to ground shall also have a gas discharge or "Y" capacitor as isolation between the MOV and ground (This is required to meet European requirements where you need a measurable air gap or/and Y capacitor). An acceptable air gap per EN60950 is (1) 2.5mm for surface creepage between bands and (2) 2.0mm through air. The MOV shall have fuse to satisfy the requirements of UL1449.

E & A Models: Will not have MOVs from L or N to ground.

3.1.3 Power Factor Correction

Input power factor correction of 0.97 or higher.

3.2 Output

	U Model	E Model	A Model
Power (VA) max.	700 / 1000 / 1500 / 2000 / 3000		
Power (Watts) max.	490 / 700 / 1050 / 1400 / 2100		
Load Power Factor Range	0.70 lagging to 1.0 (unity)		
Output Voltage			
Waveform	Sinusoidal		
Nominal Voltage	120 (0.7-3kVA) 208 (3kVA)	230	240
Other output voltages selectable via LCD panel	100,110,120 & 127 (120V) 200, 208, 220, 230, 240 (208V)	208, 220,230 & 240	
On-line Transfer Time – AC to Battery and Battery to AC	0 milliseconds transfer for all models		
On-line Transfer Time – Inverter to Bypass and Bypass to Inverter	Less than 4 milliseconds transfer for 1500VA and smaller models 0 milliseconds transfer for 2000VA and larger models		
High Efficiency Transfer Time – Inverter to Bypass and Bypass to Inverter	Less than 10 msec transfer time for all models and VA ratings		
Steady State Output Voltage Regulation	No-load to Full-load +/- 2% at full battery.		
Battery Mode Voltage Regulation	±3% RMS for entire battery voltage range and 0 to 100% load		
Transient Response (battery mode with R type load)	0%100%0%; ± 15 % max. 20%100%20%; ± 9 % max.		
Transient Recovery (R type Load)	To nominal voltage within 30 ms		
Output Frequency Range			
Line Mode	Same as section 3.1, with output phase locked to input freq.		
Battery Mode/Free Run Mode	± 0.25 Hz		
Output Voltage Distortion			
R Load	< 3 % THD		
SMPS Load	< 5 % THD		
Efficiency (AC to AC)	>88% at nominal voltage		
HE (High Efficiency) Mode Efficiency	Greater than 92% for all models		
Crest Factor	3:1		
Short Circuit Protection	Electronic overload and short circuit.		
Overload Capability (on-line)			
125% Load for 10 minutes	Overload warning then transfer to Bypass. Auto-retransfer when load returns to nominal.		
150% of 10 seconds	Overload warning then transfer to Bypass. Auto-retransfer when load returns to nominal.		
Overload Capability (on-battery)			
130% Load for 10 seconds	Overload warning		
>130% for 1.5 seconds	Overload warning		

3.3 Internal UPS Batteries (all parameters are defined at 25 degree C)

All Models	
Type / Rating	12VDC, 7.2Ah or 34W Batteries (model dependant)
Acceptable manufacture	CSB, Yuasa or panasonic
Life	Standard life (3-5 years)
Back-up Time (UPS only) at 25 °C	5 to 7 minutes (full load) / 12 to 16 minutes (half load) for the complete VA range
Battery Bus Voltage (VDC) & (Number of Batteries per UPS)	700VA 24V (2); 1000VA 24V (2); 1500VA 36V (3); 2000VA 48V (4); 3000VA 72V (6)
Protection	
Battery Protection	Fuse
Pre-alarm Level	2 minutes
Battery Level @ Shutdown	1.67 VPC, \pm 3% of battery voltage at FL with level automatically raised for lighter loading (see figure 1 below)
Overcharge Protection	2.50 VPC, \pm 3% of battery voltage
Temperature Compensated Charger	Maintains proper float voltage per battery specification over a temperature range of 10 to 40 °C (2.3V/cell at 25 °C with a temperature coefficient of minus 5 millivolts per °C)
Voltage Level	2.25 minimum, 2.275 nominal, 2.30V maximum voltage of battery voltage
Recharge	4 hours to 90% for all ratings
Protection against Battery Deep Discharge	Yes, by automatically raising the shutdown voltage based upon lighter loading (see figure 1 below). Based upon load % at onset of battery operation
Battery Leakage	100 μ A maximum
Battery Test	Automatic and manual (remote)
Replaceable Batteries	Hot swappable. Access to batteries requires use of only Phillips head screwdriver.

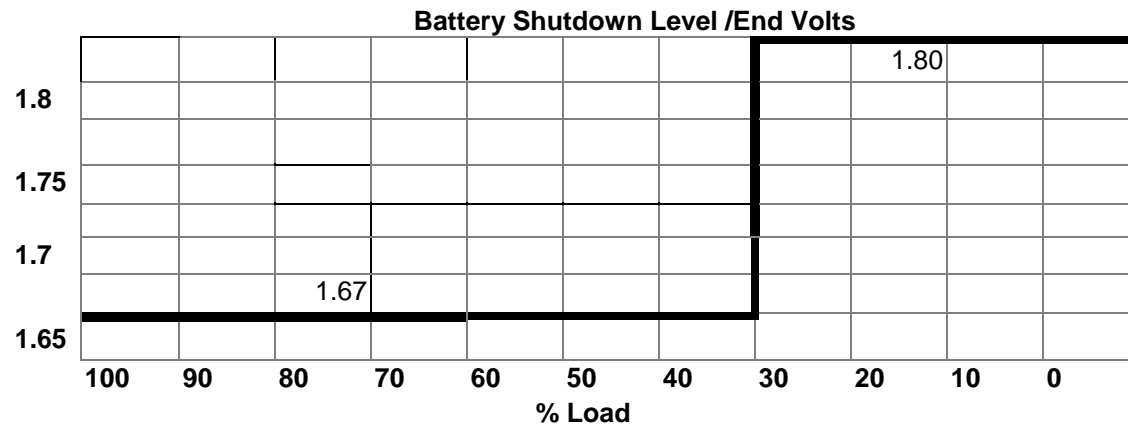


Figure 1: Battery shutdown voltage versus percent load

3.4 External Battery Cabinets.

VA vs Full/Half load runtime in minutes and recharge time in hours	700	1000	1500	2000	3000
With 1 string internal batteries	6/13 Minutes 3 (4)	5/12 Minutes 3 (4)	5/12 Minutes 3 (4)	5/12 Minutes 3 (4)	5/12 Minutes 3 (4)
With 2 string of external batteries (3 strings total)	26/60 Minutes 10 (11)	24/56 Minutes 9 (10)	24/56 Minutes 9 (10)	24/56 Minutes 9 (10)	24/56 Minutes 9 (10)
With 4 string of external batteries (5 strings total)	49/114 Minutes 18 (20)	45/106 Minutes 16 (18)	45/106 Minutes 16 (18)	45/106 Minutes 16 (18)	45/106 Minutes 16 (18)
With 6 string of external batteries (7 strings total)				68/164 Minutes 24 (27)	68/164 Minutes 24 (27)
With 8 string of external batteries (9 strings total)				93/224 Minutes 33 (37)	93/224 Minutes 33 (37)
With 10 string of external batteries (11 strings total)				120/290 Minutes 44 (48)	120/290 Minutes 44 (48)

Note: (1) Each external battery cabinet can have two (2) strings of batteries and the run/recharge times include one (1) string of internal batteries in the UPS.

3.5 ABM (Advanced Battery Management)

3.5.1 Initial charging cycle

The new battery charging cycle is initiated (charge mode is started) under the following conditions:

1. After every startup of the unit via the front panel on/off button.
2. When the cumulative time on battery operation exceed 20 seconds.
3. If the open cell voltage (OCV) decreases below 2.10VPC (Volts per Cell) during rest mode.
4. After 30 days in rest mode.

3.5.2 Charging cycle modes

The charging cycle consists of the following three phases described below in conjunction with the discharge mode:

1. Charge mode (constant current mode).
 - a) Battery charger voltage reference is 2.435VPC⁽¹⁾.
 - b) Continued until the voltage reaches an end level 2.385VPC⁽¹⁾.
 - c) UPScode ABM status STBM is CH.
 - d) Battery failure alarm STAT-BY is generated if the voltage has not reached the end level within 150 hours.
2. Float mode (constant voltage mode).
 - a) Battery charger voltage reference is 2.335VPC⁽¹⁾ for a time period of t_{float} .
 $t_{float} = 1.5 \times t_{charge} + 48$ hours
 - b) UPScode ABM status STBM is FT.

3. Rest mode.
 - a) After the float mode, the battery charger is turned off.
 - b) Continued until the new charging cycle is started.
 - c) UPScode ABM status STBM is RS.
 - d) Battery voltage level is not monitored during the first 3 minutes in rest mode (allowing time for the battery voltage to recover after short line breaks when a new charging cycle is not initiated).
 - e) Battery failure alarm STAT-BY is generated if the OCV decreases below 2.10VPC within the first 10 days in rest mode.

4. Discharge mode.
 - a) UPScode ABM status STBM is DI.
 - b) Low battery voltage condition STBL-11 is activated when the battery voltage declines below the alarm level where about three minutes of backup time is left.
 - c) Battery low limit alarm STAT-BL is generated and output of the unit is turned off when the battery voltage reaches the inverter shut off level.

The low battery voltage and battery low limit conditions are latching and are reset upon AC power return.

⁽¹⁾ The voltage values are defined at 25 °C. For other temperatures, see section 3.5.3, "Temperature compensation".

3.5.3 Temperature compensation

The battery charger voltage reference, charge mode end level, and OCV low level in rest mode are adjusted according to internal operating temperature of the UPS over a temperature range of 10 to 50 °C with a coefficient of -3 mV/°C. The voltage values at 10, 25, and 50 °C are presented in the table.

		10 °C	25 °C	50 °C
Charger voltage reference in charge mode	Vref+0.1	2.48VPC	2.435VPC	2.36VPC
Charge mode end voltage	Vref+0.05	2.43VPC	2.385VPC	2.31VPC
Charger voltage reference in float mode	Vref	2.38VPC	2.335VPC	2.26VPC
OCV low level in rest mode	constant	2.13VPC	2.13VPC	2.13VPC

4.0 Mechanical

VA Rating	700	1000	1500	2000	3000
Height (±5.0mm, ±0.20in) (Not to exceed)	See specs	See specs	See specs	See specs	See specs
Width (±5.0mm, ±0.20in) (Not to exceed)	See specs	See specs	See specs	See specs	See specs
Depth (±5.0mm, ±0.20in) (Not to exceed)	See specs	See specs	See specs	See specs	See specs
Bezel color:	Match color chip provided				
Cover & rear panel color:	Cover and rear panel to match bezel				
Color: printing on bezel & rear panel	Beige				
Product Aesthetic Design	Various (customizable upon request)				

4.1 AC Output Distribution (Various combinations available)

VA Rating	U Model (1)	E Model	A Model
700	(4) NEMA 5-15R, (2) 5-20RT	(4) IEC C13 (10A)	(4) Aust 10 A
1000	(4) NEMA 5-15R, (2) 5-20RT	(4) IEC C13 (10A)	(4) Aust 10 A
1500	(4) NEMA 5-15R, (2) 5-20RT	(4) IEC C13 (10A)	(4) Aust 10 A
2000	(8) NEMA 5-15R, (4) 5-20RT	(4) IEC C13, (1) IEC C19	(5) Aust. 10A
3000	(8) NEMA 5-15R, (2) 5-20RT, (1) L5-30R (120V) OR (8) L6-15R, (2) L6-20R, (1) L6-30R (208V)	(4) IEC C13, (1) IEC C19	(5) Aust. 15A
3000 H	Hardwired	N/A	N/A

4.1.1 Controlled Load Segmentation Receptacles

VA Rating	U Model	E Model	A Model
700	Segment 1: (2)NEMA 5-15R Segment 2: (2)NEMA 5-15R (2)NEMA 5-20RT	Segment 1: (2) IEC C13 Segment 2: (2) IEC C13	Segment 1: (2) Aust 10 A Segment 2: (2) Aust 10 A
1000	Segment 1: (2)NEMA 5-15R Segment 2: (2)NEMA 5-15R (2)NEMA 5-20RT	(Segment 1: (2) IEC C13 Segment 2: (2) IEC C13	Segment 1: (2) Aust 10 A Segment 2: (2) Aust 10 A
1500	Segment 1: (2)NEMA 5-15R Segment 2: (2)NEMA 5-15R (2)NEMA 5-20RT	Segment 1: (2) IEC C13 Segment 2: (2) IEC C13	Segment 1: (2) Aust 10 A Segment 2: (2) Aust 10 A
2000	Segment 1: (8)NEMA 5-20RT Segment 2: (4)NEMA 5-20RT	Segment 1: (2) IEC C13 + IEC C19 Segment 2: (2) IEC C13	Segment 1: (2) Aust 10 A Segment 2: (3) Aust 10 A
3000	Segment 1: (4)NEMA 5-15R Segment 2: (1)NEMA L5-30R (2)NEMA 5-20RT	Segment 1: (2) IEC C13 + IEC C19 Segment 2: (2) IEC C13	Segment 1: (2) Aust 15 A Segment 2: (3) Aust 15 A
3000 H	N/A	N/A	N/A

4.2 AC Input Entry

VA Rating	U Model	E Model	A Model
700	NEMA 5-15P, attached cord	IEC C14 (10A) recessed plug	
1000	NEMA 5-15P, attached cord	IEC C14 (10A) recessed plug	
1500	NEMA 5-15P, attached cord	IEC C14 (10A) recessed plug	
2000	NEMA 5-20P, attached cord	IEC C14 (10A) recessed plug	
3000	NEMA L5-30P (120V), OR L6-20P (208V), attached cord	IEC C20 (16A) recessed plug	
3000H	Hardwire terminal block	N/A	

The attached input cord on U model units (120 VAC and 208 VAC) shall be 6 feet (1.8 meters) in length, measured from the outside edge of the UPS case to the nearest edge of the plug connector. The output will not have power applied when the line cord is plugged in and the unit is in the off position.

The E model units (230 VAC) shall contain *one* (1) input cord that is 6 feet (1.8 meters) in length, measured between the inside edges of the connectors. These cords shall contain C14, and C20 type female connectors and a male Schuko connector.

The A model units (240 VAC) shall contain one (1) input cord that is 6 feet (1.8 meters) in length, measured between the inside edges of the connectors. These cords shall contain one Australian type male plug and one female CEE socket. The entire input cord shall be Australian Energy Authority approved.

4.3 Packaging and Shipping Materials

Packaging shall be adequate to provide protection for the UPS against damage, breakage or loss during shipment and shall be of a type that is not damaged when the package is opened. The packaging design shall also be capable of withstanding multiple shipments without breaking. The foam packing material shall be on the outside of the plastic bag. The Ship/Drop Test (Packed unit) shall be to International Safe Transit Association (ISTA), Project 2 standards. The certificate of compliance for this is available.

4.4 Cooling

The UPS shall be forced air cooled by fans, which shall operate only when needed to maintain internal temperatures at acceptable levels. Air intake shall be through the front of the unit and exit out the rear.

4.5 User Replaceable Batteries (Hot Swappable)

The UPS shall be capable of allowing the user to replace the internal battery/ies. Replacement of the batteries should be possible on a "hot swappable" basis (to be efficient and provide time/cost savings).

The batteries shall be capable of being replaced through a trap door on the front of the UPS.

The batteries shall be capable of being easily removed by securing the batteries together by a suitable means. The batteries shall also contain two "pull tabs", to allow battery removal without having to reach inside the US. The batteries shall also contain a plastic cover to prevent the terminals from accidental short circuit

The battery voltage once the trap door is opened shall be a "safe" voltage of 48 VDC or less as required by UL Standard 1778 and European EN standards. A method of dividing a string of batteries into smaller strings via a safe connector shall be provided for units with a bus voltage of greater than 48 volts nominal, wired in series.

The batteries must have to ability to be shipped without the UPS being turned on accidentally.

4.6 Data Line receptacles

All models will have two RJ-11/RJ-45 receptacles to provide transient voltage surge suppression for either one data line or one modem line (U models) or one data line (E and A models). The U models shall have this network protection designed to conform to UL497A. The data line TVSS circuit shall be certified for 10/100 BASE T operation.

5.0 Protocol and Communication Ports

5.1 Protocol

References the Marathon Power protocol.

5.2 Communication Port

An RS-232 communication port that supports the industry standard specifications including dry contact for basic alarms.

Pin #	EIA-574	Direction (UPS)	With Modem function	Without Modem function
1				
2	RxD	Output	RxD Output	RxD Output
3	TxD	Input	TxD / Inverter Off Input	TxD / Inverter Off Input
4				
5	Common	--	Common	Common
6	CTS	Output	CTS / AC Fail Output	AC Fail Output
7				
8	DCD	Output	Low Battery Output / DCD Input	Low Battery Output
9	RI	Output	+8-24 DC Power	+8-24 DC Power

5.3 Interface Slot – By complying with Marathon Power specifications.

5.4.1 References Marathon Power Communication Slot Pin-out Definition

5.4.2. USB Port – The product should be released with a USB port which communicates at a 2400 baud rate with the UPS. The USB port will share one of the UART's on the CPU with the DB9 port. Either the USB or the DB9 port can use RS-232 communication at a time. Both USB and DB9 ports will work in parallel. Reference Universal Serial Bus specification 1.1. for details

5.4 RJ45 cable – One (1) 6 foot (2 meter), RJ45 cable should be provided with each UPS for phone/modem and network line protection for U model units. This cable can only be used for network protection on E & A models.

6.0 Environmental

The UPS shall be capable of withstanding the following environmental conditions:

6.1 Ambient Temperature Range

6.1.1. Operating: 0 degree C to +40 degree C for altitudes 0 to 1500 meter above sea level
0 degree C to +35 degree C for altitudes 1500 to 3000 meter above sea level

6.1.2. Non-operating: -15 degree C to +50 degree C

6.2 Humidity: 0% to 95% non-condensing

6.3 Altitude: 3000 m (10,000 ft max.) without power derating when operated within the temperature range specified in section 6.1

6.4 Audible Noise

Maximum noise generated under normal and battery operations shall be less than 45 dBA in all models 1000VA and less. 1500VA unit shall be less than 50 dBA and units larger than 1500 VA will be less than 52 dBA. All measurements shall be taken 1 meter from the nearest surface of the UPS. When load is less than 70%, all noise limits are decreased by 2 dB.

7.0 Mean time between failure (MTBF)

The calculated mean time between failure for the UPS shall be greater than 150,000 hours when operated at an ambient temperature of 77°F (25°C) and with a 100% resistive load. The duty cycle for back up mode shall be assumed to be once per week. The calculation shall be based upon MIL-SPEC 217 Revision F. The MTBF calculation is not to include the battery or cooling fan. The MTBF shall be demonstrable by means of ongoing long term testing.

7.1 Mean time to repair (MTTR)

The UPS shall be designed for 5 minute battery replacement MTTR by the customer at the customer site, and for 30 minutes board level MTTR at a service location.

8.0 Controls and Status Indicators

8.1 LED's

The unit shall feature five LED's as follows:

- A green LED: UPS ON
- A green LED: UPS on line
- A yellow LED: UPS on battery
- A yellow LED: UPS on bypass mode
- A red LED: UPS alarm

8.2 LCD Display

16 characters X 1 line, 5X8 DOT character format, LED backlight type, +5VDC LCD power supply, +4.2VDC backlight power supply. There are two modes of operation:

A **General Mode** that provides operational modes and critical measurements of the UPS and

A **Functional Mode** that allows setting of UPS parameters and functions.

There are two push-buttons to navigate through the display menu. The first button is the Function button and the second is the Enter button. A third button is for power On/Off.

8.2.1. General Mode

The general mode automatically displays the following operational modes; UPS Off, On-line, On-battery, and Fault Mode. By using the Enter button the following data can be displayed in each operational mode.

MODES of OPERATION	UPS OFF	UPS ON-LINE	ON BATTERY	UPS FAULT (1)	HIGH-EFFICIENCY
Data					
% Load	X	X	X	X	X
Battery Voltage	X	X	X	X	X
Battery Capacity	X	X	X	X	X
Battery Time Remaining		X	X	X	X
Input/Bypass Voltage	X	X	X	X	X
Input/Bypass Frequency	X	X	X	X	X
Output Voltage	X	X	X	X	X
Output Frequency	X	X	X	X	X
Output VA	X	X	X	X	X
Output Current	X	X	X	X	X
Output Wattage	X	X	X	X	X

Alarms					
Site Wiring Fault				X	
Output Overload				X	
Over-Charge				X	
Over-Temperature				X	
Charger Failure				X	
Low Battery				X	
Low Charge				X	
Battery Failure				X	
High Output Voltage				X	
Low Output Voltage				X	
Output Short				X	
DC Bus Fault				X	

Note: (1) Display automatically shows any alarm and the data can be viewed using the Enter button. If the function key is not used within in 5 seconds the display will default back to the alarm.

8.3 Function Mode

The function mode allows the user to program the following parameters; Input Frequency, High-Efficiency, Alarm Silence, Output Voltage, Input Bypass Window, Manual Battery Test, Battery Ah setting, Free Run mode, Manual Bypass, Outlet control, Remote Shutdown.

These functional modes can be accessed by pushing and holding the function push-button for 1 second while in the following General Modes; UPS Off, On-line and High-Efficiency Modes. Using the Enter and Function Push-buttons allows navigation and selection of parameters.

8.3.1 Remote Shutdown

This function allows the user to select remote shutdown function via the DB9 port. Using the Enter and Function push-buttons allows navigation and selection of parameters.

8.3.2 High-Efficiency Mode

Once the high-efficiency mode function is selected, possible parameters can be viewed by using the function button. The first selection is ON or OFF. When selecting the ON parameter, the user will also select an input voltage range of +/- 10% or +/-15%. Once the selection is made the user will be asked to confirm the selection.

8.3.3 Alarm Silence

The alarm silence button is used to silence the audible alarm whether utility power is present or not, except when operating in a low battery condition. Once the Alarm Silence function is selected, possible parameters can be viewed by using the function button. There will be two parameters, ON and OFF. Toggle through the selections by using the function button and use the enter button to select the parameter. This function will not request confirmation prior to being saved. The alarm can also be silenced by pushing any button when an alarm is audible.

8.3.4 User Selectable Output Voltage

Once the user selectable output voltage is shown, choices can be viewed by using the function button. Once the section is made the user will be asked to confirm the selection. The options are as follows:

Voltage Selection	A & E Models	U Model (120V)	U Model (208V)
100VAC		X	
110VAC		X	
120VAC		X	
127VAC		X	
200VAC			X
208VAC	X		X
220VAC	X		X
230VAC	X		X
240VAC	X		X

8.3.5 User selectable Input Bypass window

Once the user selectable Input bypass window is selected, possible parameters can be viewed by using the function button. The user can select Narrow (+/- 10% of nominal voltage), Medium (factory default and is +10/-15% of nominal voltage) or Wide (+15/- 20% of nominal voltage).

8.3.6 User Selectable Input/Output Frequency

The user may select one of three options for the input frequency; Narrow (+/- 2% of nominal frequency), Medium (factory default and is +/-5% of nominal frequency) or Wide (+/- 7% of nominal frequency). This can be valuable where the output frequency needs to be very close to the nominal input frequency.

To be considered if the output frequency can be selected as either 50 or 60 Hz. This would enable the unit as a frequency converter.

The following table describes the input frequency where the output no longer tracks the input and operates in the free-run mode (Low or High Loss). The table also identifies the frequency level where the unit starts to track the input frequency (Low or High come back).

50 Hz Units	All Models
MEDIUM (Factory Preset): Low loss / come back	47.5 Hz / 48 Hz
MEDIUM (Factory Preset): High loss / come back	52.5 Hz / 52 Hz
WIDE: Low Loss/Come back	46.5 Hz/ 47 Hz
WIDE: High Loss/ Come back	53.5 Hz/ 53 Hz
NARROW: Low Loss/Come Back	49 Hz/49.5Hz
NARROW: High Loss/Come Back	51.0 Hz/50.5 Hz

60 Hz Units	All Models
MEDIUM (Factory Preset): Low loss / come back	57 Hz / 57.5 Hz
MEDIUM (Factory Preset): High loss / come back	63 Hz / 62.5 Hz
WIDE: Low loss/ Come Back	55.8 Hz/ 56.3Hz
WIDE: High Loss/Come Back	64.2 Hz/63.7 Hz
NARROW: Low loss/Come Back	58.8Hz/59.3Hz
NARROW: High Loss/Come Back	61.2 Hz/60.7 Hz

8.3.7 Battery Ah setting from display

Enables display of the remaining battery time depending the Ah rating of the batteries and battery packs.

8.3.8 Manual Battery Test

The “manual battery test” operates the same way as the “automatic battery test” except it is user initiated via the function and enter buttons on the front panel. The test will run once the user confirms the selection (if UPS is in normal mode). Should the UPS batteries not be capable of supporting the connected load for the test duration, the UPS shall immediately return to normal operation, without loss of connected load and fault signals (visual, audible, and remote via RS232) shall be enunciated. No audible or remote (via RS232/contact closures) indication of the battery test shall be enunciated during a manual battery test.

8.3.9 Free Run Operation

When the UPS is between the maximum input frequency limits (45Hz to 65Hz) and outside the selected frequency tolerance (+/-5% factory configured) the unit is in the Free Run Mode. Bypass mode is disabled and the output frequency is regulated at +/-0.25Hz (same as battery mode). During Free Run Mode, the user should be able to select if bypass is available (with the potential of a break during transfer of less than 10msec). There are two parameters, (1) Enable or disable Free Run mode and (2) Enable or disable bypass. Toggle through these choices by using the function button and use the enter button to select the parameter. This function will request confirmation prior to being saved.

Frequency parameters:

45Hz	Free Run Mode	50/60Hz-X	50/60Hz	50/60Hz+X	Free Run Mode	65Hz
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Condition Table:

FR	Bypass	Input Condition	Bypass Available	On-Battery	Output Frequency	Notes
-----	Enable	50/60Hz+/-X%	Yes	No	50/60Hz+/-X%	
Enable	Disable	45><50/60+/-X%><65	No	No	50/60Hz+/-0.5Hz	(1)
Disable	Disable	45><50/60+/-X%><65	No	Yes	50/60Hz+/-0.5Hz	
-----	Disable	<45Hz >65Hz	No	Yes	50/60Hz+/-0.5Hz	
Enable	Enable	45><50/60+/-X%><65	Yes	No	50/60Hz+/-0.5Hz	(2)

(1) Default mode. (2) <10msec break during transfer to/from bypass.

8.3.10 Manual Bypass

This function allows the UPS to be transferred to internal bypass upon user request. This function is required when connecting an external maintenance bypass switch.

8.4 Other Controls

8.4.1 On/Off Button

The UPS contains front panel mounted Standby (On/Off) button. The UPS shall also be micro-controller based for monitoring and control as well as for reliable operation. Pressing the Standby (On/Off) button for 1 second shall start the UPS whether input power is available or not. The 3000VA hardwired units shall include an input and output, ON/OFF breaker as the AC power disconnect and over-current protection. The input plug is AC power disconnect for cord connected units.

8.4.2 EPO (Emergency Power OFF) – This is an input that detects the status of an external switch contact. If the switch is closed the EPO is not activated. If the switch is open, EPO will be activated and the UPS will remove AC voltage to the output regardless if the unit is in Line, Battery, or Bypass mode. A separate connector on the back of the UPS will be utilized. This will be controlled by the firmware.

8.5 Automatic self diagnostic tests

The UPS shall perform three (3) different automatic self diagnostic tests as described below:

8.5.1 Automatic self diagnostic test: Power ON

Whether the utility power is present or not, pressing the UPS Standby (on/off) button shall initiate the UPS start-up tests. These tests, consisting of an electronics test and a battery test, shall occur while the unit supplies output power via the internal bypass circuit. Should the UPS fail any start-up test, except battery test, the output power shall not be enabled and fault signals (visual, audible, and remote via RS232) shall be enunciated. If the battery test fails, the UPS should continue the start sequence, supply power to the load via the internal bypass circuit and indicate the fault (visual, audible and remote via RS232).

8.5.2 Automatic self diagnostic test: Auto-restart

The UPS must sense the presence of AC power before auto-restarting. Auto-restart shall be defined as the restart of the UPS once AC power has returned (and is normal) after the UPS has shutdown due to battery depletion.

Once AC power has returned and is normal, the UPS shall perform auto-restart tests, which consist of an electronics and battery test, prior to enabling output power. The auto-restart battery test shall simply be a voltage check, to ensure the battery is present. The battery will not be loaded during this test; the UPS should supply the load directly from the input line (bypass) on restart. Should the UPS fail any test, the output power shall not be enabled and the fault (visual, audible, and remote via RS232) be enunciated.

In addition, a new Battery Charging (or low battery charge available) Alarm has been added to the UPS. This Alarm (3 beeps every 5 minutes) indicates the UPS batteries are charging and may not deliver full runtime. This may occur after a long power outage. This alarm will continue until the batteries have a minimum of 2 minutes of full load run time available.

The auto-restart feature shall be capable of being disabled by the operator through the serial (RS232) communications port or through the optional communications slot. When disabled the UPS shall not provide inverter output power until the Standby (On/Off) button has been toggled. The UPS shall recharge the batteries, once AC power has been restored to parameters defined in section 3.1 of this specification. The factory default is auto-restart feature enabled.

The auto-restart feature shall be capable of having a delay, determined by the operator and programmed through the serial (RS232) communications port or through the communications slot using an optional com card. Pin-outs for this slot are defined as part of the communications card specification. This delay shall be defined in seconds and shall be the time period before output power will be made available after the UPS has been restarted. This is only functional when the auto-restart feature is enabled.

8.5.3 Automatic battery test

The UPS contains a counter which will initiate a battery test after thirty (30) days at ABM floating mode of continuous normal mode operation. The test duration shall be approximately 15 seconds. Should a failure of the battery occur, the UPS will immediately return to normal mode and fault signals (visual, audible, and remote via RS232) shall be enunciated. The day timer shall be reset after a manual battery test, back-up mode operation or if the UPS is turned OFF. The automatic battery test shall be capable of being disabled by the operator through the serial (RS232) communications port or the optional communications slot.

8.6 Alarms

8.6.1 Fault status indicators

The UPS Alarm/Fault status shall be accomplished via the LCD display and an audible alarm.

8.6.2. Trouble Shooting

Displayed on LCD	Audible Alarm	Alarm Description	User Action
Output Overload	Two Beeps per second	The UPS is overloaded (in Line Mode). Your equipment requires more power than the UPS is rated to provide. The UPS operates in bypass.	Reduce the load (connected equipment) to the UPS. If this solves the overload problem, the UPS will switch from bypass back to normal operation.
Battery Test	No Beep	The UPS is performing a battery test.	No action required. The UPS will return to normal operation upon successful completion of the battery test.
Over-Charge	Constant beep	Batteries are overcharged.	Turn off protected loads then the UPS, call Marathon Power
Low Battery	2 beeps every 5 seconds	Unit is operating on Battery Power & will shut down soon due to low battery voltage.	The unit will restart automatically when good AC power returns.
Low Charge	2 beeps every 5 seconds	The battery is charging and will not deliver full run time.	Allow sufficient time for the batteries to fully charge.
On-Battery	1 every 5 seconds	The unit is operating on Battery Power.	Save your data and perform a controlled shutdown.
Charger Failure	Constant beep	Charger has failed.	Turn off protected loads then the UPS, call Marathon Power
Over-Temperature	Constant beep	High temperature.	Check whether the UPS fans and ventilation areas are not obstructed and ensure ambient surrounding

			temperature is not above 40°C (104°F).
Output Short	Constant Beep	Output short circuit	Turn off protected loads then the UPS, call Marathon Power
High Output Voltage	Constant Beep	High output voltage.	Turn off protected loads then the UPS, call Marathon Power
Low Output Voltage	Constant Beep	Low output voltage.	Turn off protected loads then the UPS, call Marathon Power
DC Bus Fault	2 Beeps per Second	High or low internal DC bus voltage.	Turn off protected loads then the UPS, call Marathon Power
Site Wiring Fault	1 Beep per second	UPS wired incorrectly.	Check the input and output wiring for correct installation.

The user shall have the ability of silencing all audible alarms with the exception of the “low battery” alarm. Once silenced, the audible alarm shall not sound, unless a new alarm condition is present.

Problem	Possible Cause	User Action
The LCD does not display UPS status even though AC power input seems to be present.	<ol style="list-style-type: none"> 1. No input power may be present. 2. Input circuit breaker (or fuse) on the back of the UPS has tripped (or opened). 3. The LCD display has failed. 	<ol style="list-style-type: none"> 1. Ensure the UPS is connected to a receptacle with good AC power. 2. Reset the breaker (or replace the fuse) and restart the UPS. 3. Shutdown the UPS and replace the LCD display.
The UPS operates normally but some or all of the connected loads will not operate.	<ol style="list-style-type: none"> 1. The loads are not connected to the UPS. 2. Output receptacle/s circuit breaker has tripped. 	<ol style="list-style-type: none"> 1. Ensure the loads are plugged into the UPS receptacles. 2. Reset the circuit breaker for the receptacle/s by resetting the button or switch.
The amount of time that the UPS can run on battery is less than the rated time.	The battery may not be fully charged, it may be faulty or the charger may have failed.	Recharge the battery for at least 10 hours by connecting the UPS to AC power. Then retest the battery backup time. If the problem persists, contact Marathon Power.
The LCD displays a Low Charge alarm.	The battery voltage is low.	Recharge the battery for at least 10 hours by connecting the UPS to AC power. Then retest the battery backup time. If the problem persists, contact Marathon Power.

8.6.3 Load level indicator

The LCD shall be used to indicate the relative load percentage connected to the UPS output.

8.6.4 Battery Capacity level indicator

The LCD shall be used to indicate the relative battery capacity during On-line, On-battery, High-Efficiency, and Fault modes of operation.

8.6.5 Battery Runtime Remaining

The LCD shall be used to indicate remaining battery runtime during On-line, On-battery, High-Efficiency, and Fault modes of operation.

9.0 Options

9.1 Optional Charger

Optional UPS internal battery charger to meet a recharge specification for runtimes up to 8 hours. The recharge time will be eight (8) times the discharge rate to 90% capacity. This charger will connect in parallel with the standard internal charger. The optional charger voltages are 24VDC, 36VDC, 48VDC, 72VDC.