

Serial Number: _____ **RMA#:** _____

Service Center/Company Name: _____

Directions: Following visual inspection of the unit, verify all mechanical hardware is installed and secure (control board **must** be screwed in prior to test!) Make appropriate electrical connections, and then go through all steps below in order, recording **measured values** and filling check boxes where appropriate. Include the required number of significant figures (denoted by #'s). **NOTE ANY VARIATIONS/OBSERVATIONS IN "Technician Notes"**.

Magnum Warranty Unit test procedure:

MODEL: _____ **-15B** **-20B** **-AE** **-PAE** **-E**

Inverter test:

0	Ground Continuity Test: Set Bench meter to continuity test, verify continuity between chassis (e.g. screw hole) and: both strain reliefs (romex clamp)(ME/MS/RD only), internal ground lug (or wire on MM, MS2000/ME2000 models), external ground lug.	<input type="checkbox"/>
1	Connect a power supply of appropriate voltage (NOT BATTERY): 12.6 VDC (25.2V for 24 V units, 50.4V for 48 V units) to the unit. Note that at first application of DC power, unit will run fans briefly and blink green LED. Record voltage displayed on remote here: 12V units: 12.5-12.7, 24V units: 25.0-25.4 V, 48V units: 50.0-50.8. If no readout is available on power supply, measure with known good digital meter.	_____ V (##.#)
2	a. Off current, no remote connected: b. Off current, remote connected (backlight should be set to 50%): c. Record the control board software type from the remote:	_____ mA (###) _____ mA (###) _____
3	Set search watts to 5W and turn inverter on (remote should display "Searching", inverter LED blinking) and measure maximum search mode current:	_____ mA (###)
4	Test search sensitivity with 5 – 7 W incandescent bulb: connect the bulb to AC out for 5 to 10 seconds. Remote should display "Inverting" as soon as bulb is connected and unit should continue inverting while bulb is connected; bulb should not flicker. Remote should display "Searching" after bulb is disconnected and not re-enter "Inverting". Some models may take up to 1 minute to return to search mode.	<input type="checkbox"/>
5	a. Disable search mode, allow unit to invert for 30 seconds, record output voltage : MS-AE, -PAE ONLY: Record VAC L2, VAC L1-L2 b. Sinewave models ONLY: Connect an oscilloscope to inverter AC output and verify that the waveform is a smooth, low distortion sine wave from both L1-N and L2-N (AE/PAE only). Some distortion at zero-crossing is acceptable for 24 & 48 V models.	_____ VAC L1 (###.#) _____ VAC L2 _____ VAC L1-L2 <input type="checkbox"/>
6	Measure maximum no load current draw: output voltage should be near value in step 5 when measuring.	_____ A (###)
7	Verify inverter output frequency is 60 ±0.05 Hz (RD export: 50 ±0.05 Hz, MS export: 49.8 ±0.05 Hz). Use a quality meter (e.g Fluke 87 or better) or oscilloscope "Measure" function.	<input type="checkbox"/>
8	b. Record voltage on bottom leg of thermistor mounted to back of control board: 0.9 V (17°C) to 1.3V (27°C). Not done on RD models.	_____ VDC (###)
9	Verify temperatures available on remote a. Battery temp sensor: measures 25°C with no BTS sensor connected * Reading must all be within 4°C for a unit at room temperature b. Battery temp sensor: with BTS sensor connected c. Transformer temp sensor: d. FET temp sensor:	<input type="checkbox"/> _____ °C (##) _____ °C (##) _____ °C (##)

Disconnect BTS before proceeding.

10	Dead battery boot: Disconnect DC power from the unit, wait until the unit has completely turned off (remote goes blank), then connect AC in. The green LED should blink and the remote should power up (remotes prior to ME-RC rev 2.6 may not fully power up). After 10 seconds the relay should close. After an additional 10 seconds the remote will display "Charging" and then "Bulk Charging". Voltage on remote should rise smoothly to 14.4V (28.8V for 24V units, 57.6V for 48 V units), then display should change to "Absorb Charging" and voltage should hold at 14.4-14.6 VDC (29.1-29.4V for 24V units, 58-59V for 48 V units). Some instability (±0.5V) is acceptable without batteries. *NEW (5.4 software): may take up to 1 minute to reach "Bulk Charging". ** Dead battery boot not supported on MS-PAE, MMS models.	<input type="checkbox"/>
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Disconnect AC Input from inverter before proceeding.

11. Connect unit to a **battery bank** of the appropriate voltage. Turn inverter on. Apply the following loads and make the following measurements. Maintain battery voltage close to rated voltage (12.6, 25.2, 50.4 depending on model) using another inverter or DC power supply if necessary. Verify shunt current matches current on remote within +/-10A up to rated load.
Battery bank: must be 200 Ah per 100 ADC of load e.g. a MS2012 requires a 400 Ah bank to adequately test.

VAC out specifications up to rated power (@ 25°C, unit at room temperature, fully charged battery bank at nominal voltage):
ME/RD: 116 – 124 VAC; **RD-E:** 220 – 234 VAC; **MS:** 118 – 124 VAC; **MS-E:** 226 – 236 VAC; **MS-PAE/-AE:** 240 – 248 VAC L1-L2; **MM:** 114 – 126 VAC; **MM-E:** 222 – 236 VAC; **MMS1012:** 118 – 124 VAC; **MMS912E:** 224 – 234 VAC.

Depending on model, use the appropriate wattage				Light Bank Load (real Watts)	DC Current:		Battery Voltage on remote	Measured VAC out L1-N (MS-AE/-PAE: L1-L2)	
MS	ME-RD	MM	MS-PAE		Remote	Shunt			
		X		500	A	A	. V	. V	
X	X	X	X	1000	A	A	. V	. V	
		X		1500	A	A	. V	. V	
X	X	X	X	2000	A	A	. V	. V	
X	X		X	3000	A	A	. V	. V	
X	X		X	4000	A	A	. V	. V	
			X	5000	A	A	. V	. V	

12. a. Test AC overload protection: Momentarily (1-2 seconds) short AC output L to N. Remote should display "AC Overload" along with lit Fault indicator and then return to displaying "Inverting" after 10 seconds.
- b. Apply continues short; the unit should shut down within 15 seconds and not reset. The remote should display "AC Overload" (**NEVER "DC Overload" or "FET Overload"**) and have the Fault indicator lit.
- c. Record average sustained DC current into short circuit from step b: _____ A (##)
13. Thermal test (run at 25°C ambient): Run unit with light bank load of ~1.7x rated power. When FET temperature reaches 61°C, remote should display "AC Overload" and output voltage should drop. Reduce load to ~1.4x rated power and run the unit until transformer temperature reaches 117°C. Unit should stop inverting, with the remote displaying "Overtemp". Unit should automatically reset when the transformer temperature reaches 110°C. MS, MS-E 12V units: FET temp will approach 81°C. **Check one box:**

(a) Transformer temp reached 117°C (b) FET temp reached 81°C (c) Neither

Charger Test

(initial settings: "Shore Amps" set to 30A, "Charge Rate" set to 100%, "Battery Type" set to Flooded). **Battery voltage must be less than or equal to: 12.6V for 12V units, 25.2V for 24V units, or 50.4V for 48V units.** If necessary, use another inverter running a load to maintain battery voltage at the required level.

14. Connect AC in to the unit. The relay should close after 10 seconds and the remote should display "Bulk Charging" after an additional 10 seconds. Charge current should ramp up/down slowly to rated value. Verify & record the current with the following settings:

	Charge Rate	Shore Amps	Shunt Current	Remote Current	Vbatt (remote)	VAC out
a	100%	30 A	A	A	. VDC	. VAC
b	100%	5 A	A	A	. VDC	. VAC
c	50%	30 A	A	A	. VDC	. VAC

Expected Values (+/- 10%): See nameplate for rated charger current.

Shore (5A) setting: 120 VAC models: 12V – 40 A, 24V – 20A; 230 VAC (export): 12V – 80 A; 24V – 40 A;

MS-AE/-PAE models: 24V – 40 A; 48 V – 20 A; MM models do not support "Shore" setting

15. Record the following information from the unit to indicate unit passed test:
 (Circle the value where appropriate. The transformer date code is a 4 digit code found on the transformer label)

a.	Control board rev./part #		30- _____
b.	FET board rev./part #		30- _____
c.	Control board software rev.		
d.	Remote Software rev.		
e.	AC board rev./part #*		30- _____

Date Codes:	[month]	[M_ ##]
f. FET Board	_____	08 09 10 11 12 13 14 _____
g. Control Board	_____	08 09 10 11 12 13 14 _____
h. Transformer*	_____	_____

*4-digit code e.g. 0410 or month-year

Technician Notes:

*Not used on MM series
 Technician Initials: _____
 Date: ____ / ____ / ____

Model	Search current: MS – maximum MM, ME, RD – avg.	Average inverting current at rated VDC in	VAC out no load
MM612, MM612AE	290 mA	0.8 – 1.0 A	125 ± 1 VAC
MM1212, MM1212AE	320 mA	1.4 – 1.7 A	125 ± 1 VAC
MM1512AE	330 mA	1.6 – 1.9 A	117 VAC
MM1524AE	170 mA	0.6 – 0.9 A	125 ± 1 VAC
MM1012E	490 mA	1.0 – 1.6 A	230 ± 2 VAC
MM1324E	220 mA	0.6 – 1.1 A	227 VAC
MMS1012	650 mA	1.4 – 1.9 A	117 – 123 VAC
MMS912E* preliminary	560 mA	1.9 – 2.2 A	224 - 230 VAC
ME2012, RD2212, ME2000	430 mA	1.9 ± 0.3 A	124 ± 1 VAC
ME2512	430 mA	2.0 ± 0.2 A	123 ± 1 VAC
ME3112	440 mA	2.1 ± 0.2 A	123 ± 1 VAC
RD1824	210 mA	0.4 – 0.9 A	122 ± 1 VAC
RD2824	230 mA	0.4 – 0.9 A	123 ± 1 VAC
RD3924	250 mA	1.0 – 1.3 A	123 ± 1 VAC
RD2624E	290 mA	0.8 – 1.0 A	226 ± 2 VAC
RD4024E	300 mA	1.0 – 1.4 A	226 ± 2 VAC
MS2012, MS2000	700 mA	1.6 – 2.2 A	118 VAC
MS2812	1000 mA	2.0 – 3.7 A	118 VAC
MS4024	440 mA	1.0 – 1.4 A	118 VAC
MS2024* preliminary	400 mA**	1.1 – 1.4 A**	118 VAC**
MS4024AE, PAE	440 mA	1.0 – 1.3 A	118 VAC
MS4448AE, PAE	210 mA	0.5 – 0.7 A	118 VAC
MS1512E* preliminary	750 mA	1.6 – 2.5 A	228 – 232 VAC
MS2712E	900 mA	1.9 – 3.0 A	218 ± 5 VAC
MS4124E, (MS4124PE)	650 mA	1.1 – 1.9 A	218 ± 5 VAC
MS3748AEJ, PAEJ	200 mA	1.3 – 1.6 A	118 VAC

* Preliminary: very little test data available ** From qual test ONLY
Data based on up to 1 year of data (or all shipped units for those introduced within the
last year and a half)