



## Trouble Shooting – MagnaPLUS / Mariner / Harsh Duty

**MagnaPLUS / MARINER / Harsh Duty** models are 12 lead, re-connectable, brushless, AVR regulated generators. For simplicity, **MagnaPLUS** refers to all three product lines. A listing of models and specifications is included at the end of this trouble shooting guide.

A MagnaPLUS generator is simple to trouble shoot with 6 main components: **the exciter stator and exciter rotor windings, a voltage regulator, a rectifier assembly, and the main stator and rotor windings.** For tools you will need a good multi-meter – a Fluke works very well – a ratchet set, and a set of screwdrivers. You can make an analog style meter work as well.

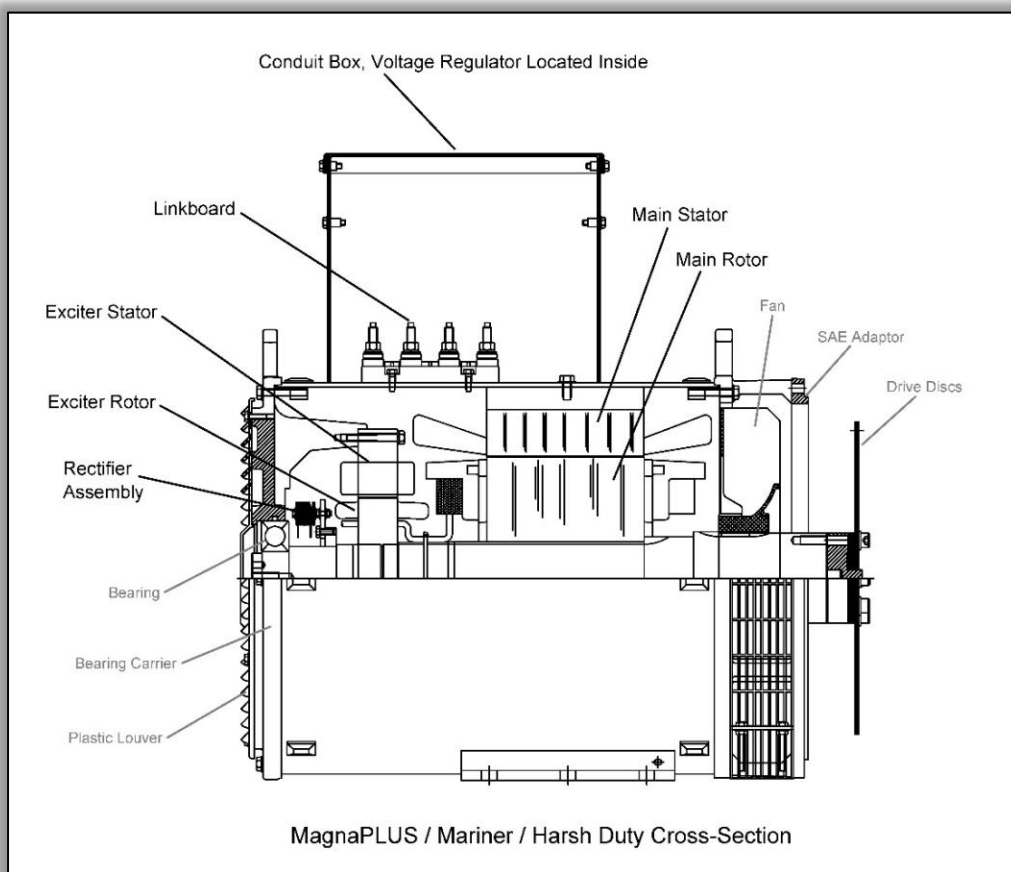


Figure 1

This trouble shooting guide addresses the most common causes of low or no output voltage, usually 15V – 50V as measured at the generator terminals, mounted on the linkboard located in the connection box mounted on top of the generator.

Start trouble shooting in the connection box mounted on the top of the generator. It gives easy access to the exciter stator leads ( F+ & F- ) and main stator output leads.

If your generator is equipped with a PMG Excitation Support system refer to the section on **PMG Powered Regulators** on page 6.

If the generator has been sitting, unused, for 3 – 6 months, or longer it may have lost its residual magnetic field required to build voltage. In this case, refer to the section on **Restoring Residual Magnetism** on page 5.



## **SAFETY NOTE – Dangerous Voltage May Be Present During Testing**

### **Step 1 : Check Exciter Stator Continuity and Resistance**

**SAFETY NOTE – Exciter stator testing must be done with the gen-set shut down.**

Disconnect exciter stator leads F+ & F- from the voltage regulator – red and black leads in Figure 2. Using meter check continuity between F+ & F-. **If you have NO continuity between F+ & F- , you have a failed exciter stator winding.**

Switch meter to auto-ranging Ohms setting and check resistance between F+ & F-. **If exciter stator resistance does not match the specifications table value within  $\pm 5$  Ohms, you have a failed exciter stator winding.**

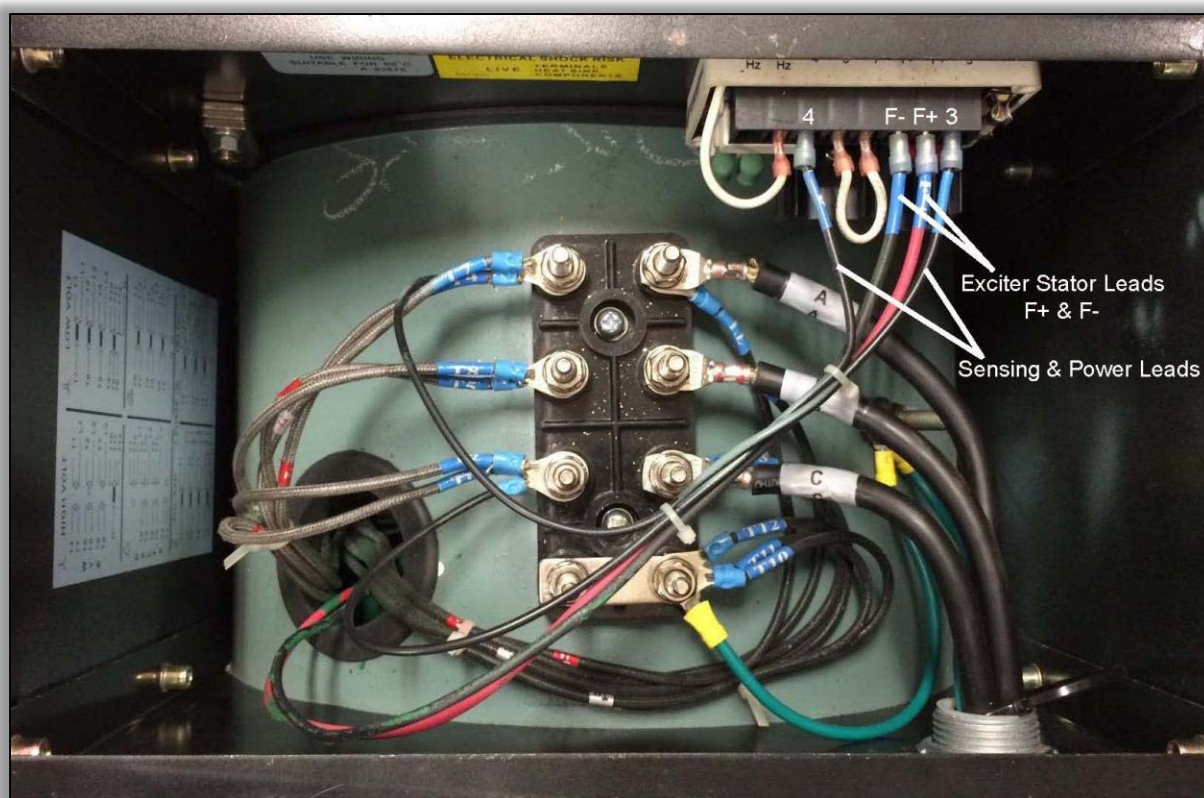


Figure 2

Switch meter to auto-ranging Ohms setting check continuity between F+ and generator ground. You should have at least 5 megOhms of resistance between the exciter stator and ground. **If you HAVE continuity between F+ and generator ground, or < 5 megOhms of resistance, you have a failed exciter stator winding.**

**A failed exciter stator cannot be repaired. Replace Exciter Stator**

## Step 2 : Constant Excitation Test



**SAFETY NOTE – Constant Excitation test MUST be done with the gen-set running.**

Conduct constant excitation test, only if Exciter Stator passed all tests in Step 1.

Disconnect exciter stator leads F+ & F- from the voltage regulator – see Figure 2 – and observing polarity, connect to a 12V battery. The gen-set starting battery can be used as the source of constant excitation.

Run the get-set, no-load with all breakers switched off. Measure output voltage at output terminals: A – B, B – C, and C – A shown in Figure 2. A well-charged battery should give nearly full output voltage – refer to specifications table by model – possibly a bit more. Voltage should be balanced between all three phases.

### Possible Constant Excitation Test Results

Results	Possible Corrective Action
Output voltage is balanced and within expected range. ( -10% – +15% )	<b>Voltage Regulator has failed and must be replaced.</b>
Output voltage is well below expected range.	<b>One or more diodes have failed. Replace Rectifier Assembly is preferred action. ALL diodes may be replaced individually.</b>
Output Voltage $\leq$ 100V	<b>Multiple component failures. Replace generator.</b>
Output Voltage is Unbalanced	<b>Main stator has failed. Replace generator.</b>

## Step 3 : Check Main Stator Windings

The main stator windings are very low resistance which makes them difficult to field test. Set meter to the lowest possible Ohms scale and measure resistance at output terminals: A – B, B – C, and C – A shown in Figure 2. You must have good continuity and should have a balanced resistance reading between phases. Refer to Specifications Table for resistance by model.

If you have NO continuity or resistance readings vary significantly – anything higher than about 1 ohm for most models, **you have a failed main stator winding.**

Set meter to the highest possible Ohms scale. Check for continuity between output terminals and the ground terminal. Resistance should be greater than 5 megOhms or infinite. If you have continuity or  $< 5$  megOhms resistance between the main stator leads and the ground terminal **the main stator is faulted to ground.**

**Failed main stator windings cannot be repaired. Replace generator.**

If testing STEPS 1 - 3 have not found any faults or defects, move to the opposite drive end of the generator to check the diodes on the rectifier assembly. You will need to remove the back cover to gain access to the rectifier assembly. It is not necessary to remove the exciter rotor.

## Step 4 : Checking Diodes / Rectifier Assembly

The diodes may be tested in place. Remove the two main rotor leads (B) and the three exciter rotor leads (A) from the rectifier assembly – see Figure 3. Note the location of each lead for proper reassembly. The diodes are now isolated from the generator and may be tested.

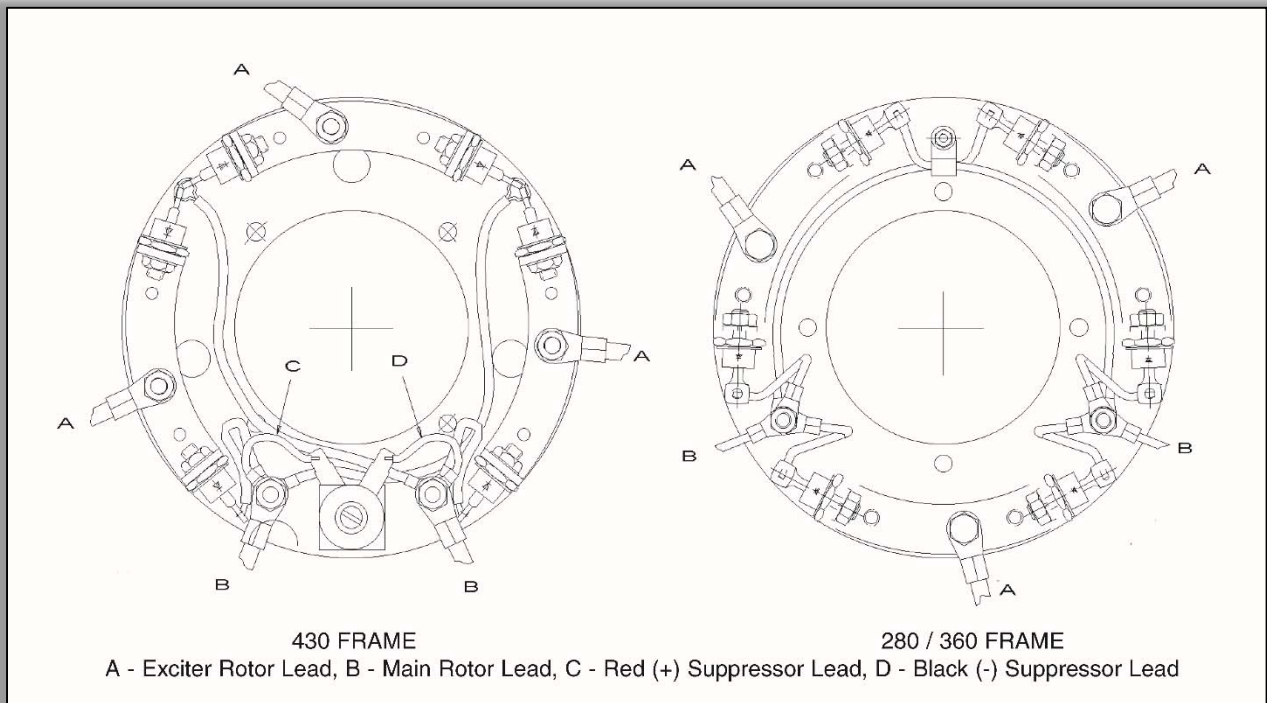


Figure 3

**Multimeter Diode Test** : Switch multimeter to diode test mode, place one lead on the top of a diode, the other lead in contact with corresponding main terminal post. Test each of the three FORWARD diodes in turn. Reverse test leads and repeat. A good diode will have no voltage reading in one direction and 0.4 – 0.5Vdc in the other.

Repeat testing procedure for the three REVERSE diodes.

**No voltage in either direction or voltage in both directions indicates a failed diode.**

OR

**Analog Meter:** Place one lead on top of a diode, the other lead in contact with corresponding main terminal post. Test each of the three FORWARD diodes in turn. Reverse test leads and repeat. A good diode will have much greater resistance in one direction. Typical forward resistance is under 100 Ohms. Typical resistance in the reverse direction is over 30,000 ohms.

Repeat testing procedure for the three REVERSE diodes.

**Continuity with little or no resistance in both directions or very high resistance in both directions indicates a failed diode.**

**Failed diodes must be replaced. Replace Rectifier Assembly.**



# Field Flashing / Restoring Residual Magnetism

If the generator has been sitting, unused, for 3 – 6 months, or longer it may have lost its residual magnetic field required to build voltage.

## 12V Dynamic Field Flash



**SAFETY NOTE – The Dynamic Field Flash MUST be done with the gen-set running.**

Disconnect sensing & power leads 3 & 4 from the voltage regulator – as indicated in Figure 4. Insulate and isolate leads for safety.

Disconnect exciter stator leads F+ & F- from the voltage regulator – as indicated in Figure 4 and **observing polarity, connect to a 12V battery**. The gen-set starting battery can be used.

Run the get-set, no-load with all breakers switched off. Measure output voltage at output terminals A – B, B – C, and C – A shown in Figure 4. A well-charged battery should give full output voltage – refer to specifications table by model – possibly a bit more. Voltage should be equally balanced between all three phases.

If output voltage comes up to normal range, run generator for 15 minutes to build residual magnetism.

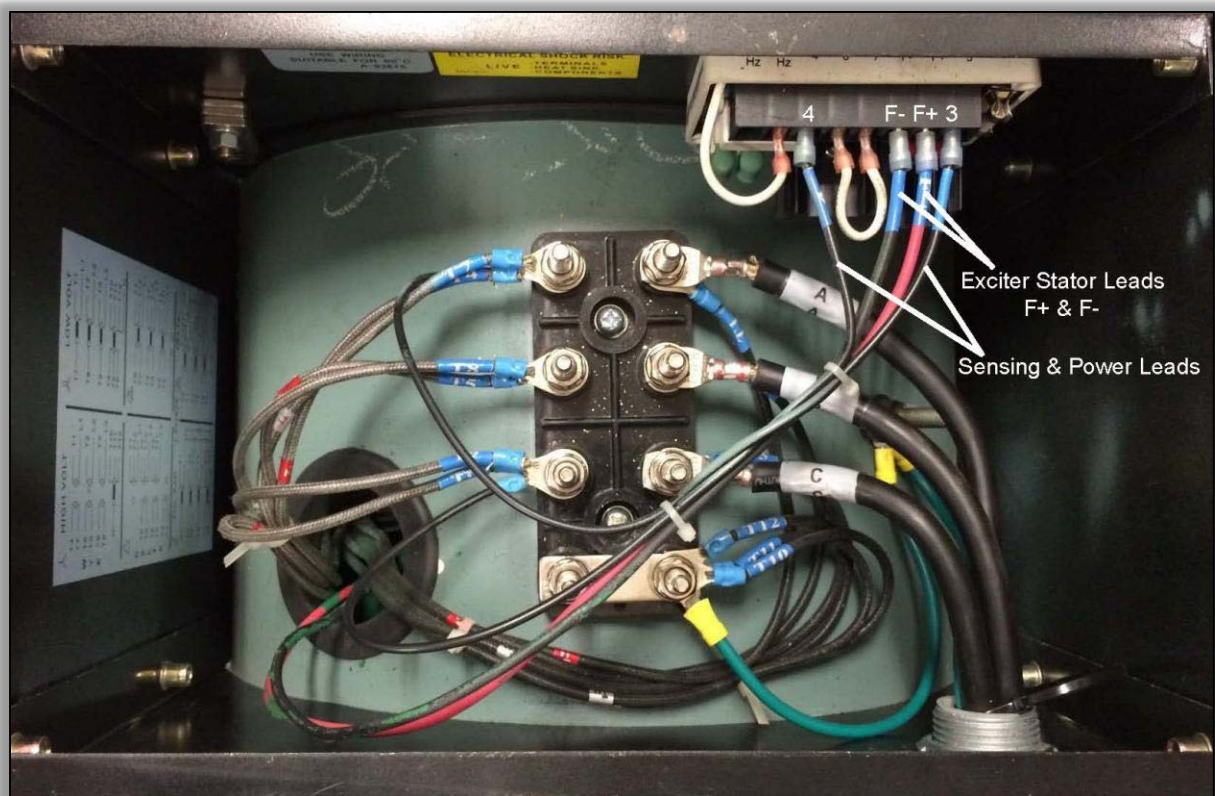


Figure 4

## PMG Powered Regulators – PM500 & Marathon DVR

The PMG Excitation Support System consists of a permanent magnet rotor, wire wound stator, a 7.5 microfarad capacitor and appropriate voltage regulator. The PMG system provides an isolated power supply to the voltage regulator which provides assured voltage build-up for critical applications.

### Check the Capacitor



**SAFETY NOTE – Discharge the capacitor by shorting terminals with insulated jumper wire or screwdriver with insulated handle.**

**Digital Multimeter:** Disconnect leads from capacitor as shown in Figures 5 & 6. Switch multimeter to the capacitor setting, and directly check the capacitance reading. **If capacitance is significantly less than 7.5uf, you have a failed capacitor that must be replaced.**

OR

**Analog meter:** Disconnect leads from capacitor as shown in Figures 5 & 6. Switch meter to Ohms x 1000 scale. Touch leads to the capacitor terminals – you should see the resistance start very low, near zero, gradually increase towards infinity and then return back to zero. Discharge capacitor, reverse leads and repeat. **If you do not see the charge / discharge pattern, you have a failed capacitor that must be replaced.**

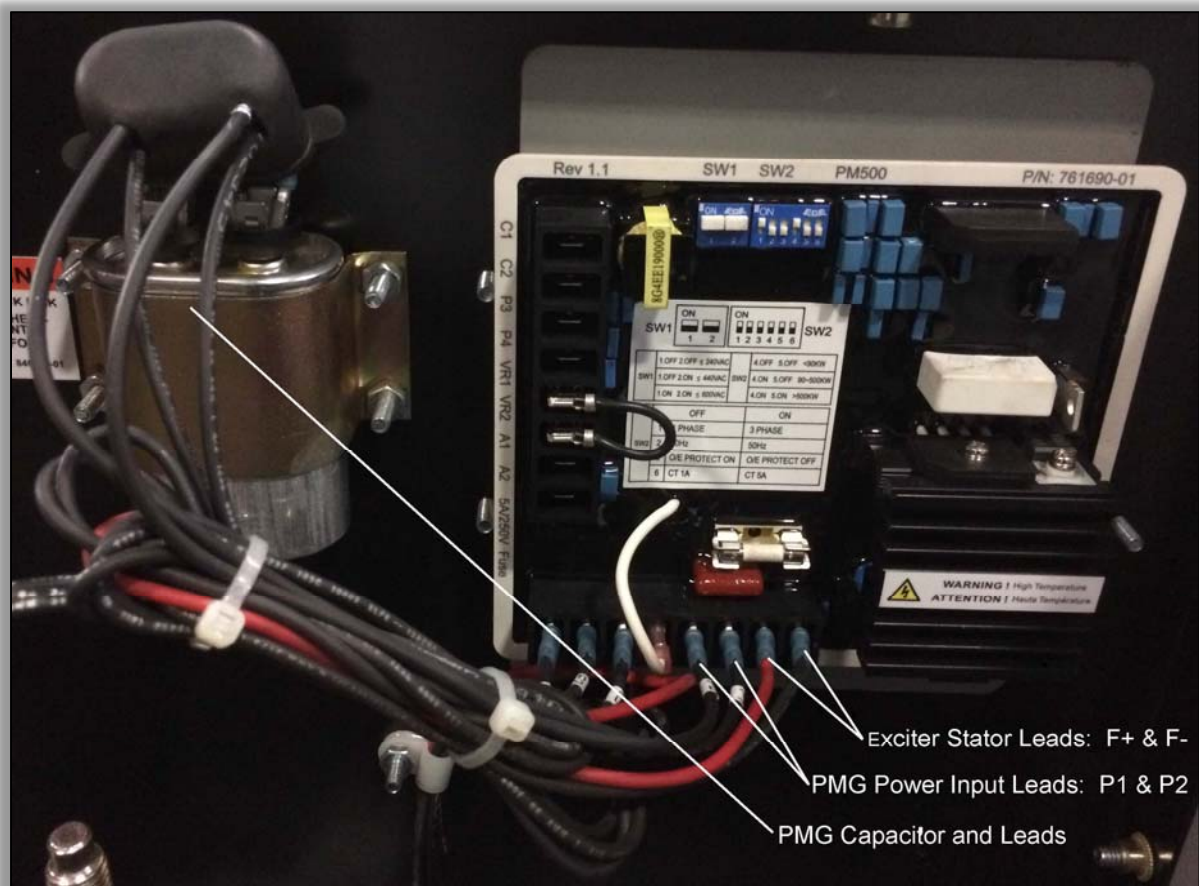


Figure 5



Figure 6

## Check PMG Stator Continuity and Resistance

**SAFETY NOTE – Exciter stator testing must be done with the gen-set shut down.**

Disconnect leads from capacitor as shown in Figures 5 & 6.

Using meter check continuity between the two PMG stator leads. **If you have NO continuity between PMG stator leads, you have a failed PMG stator winding.**

Switch meter to auto-ranging Ohms setting and check resistance between the two PMG stator leads. **If the PMG stator resistance does not measure between 1.9 – 2.3 ohms, you have a failed exciter stator winding.**

**A failed PMG stator cannot be repaired. Replace PMG Stator.**

Once the PMG Excitation System has been verified, continue trouble shooting at STEP 1 on page 2.





## MagnaPLUS / MARINER / Harsh Duty 3 Phase 480V Generator Specifications

MagnaPLUS Model	Main Stator	Main Rotor	Exciter Stator	Exciter Rotor	No Load Excitation 480V / 60Hz	Mariner / Harsh Duty Model
281CSL1500	4.2	0.4	18.0	0.120	11	n/a
281CSL1501	4.15	0.4	18.0	0.120	11	n/a
281CSL1502	0.47	0.72	18.0	0.120	6.4	n/a
281PSL1722	3.2	0.439	18.0	0.120	9	281PSL28040
282PSL1703	1.07	0.34	18.0	0.120	14.7	282PSL28041
282CSL1504	1.24	0.8	18.0	0.120	6.2	n/a
282PSL1704	1.07	0.34	18.0	0.120	14.7	282PSL28042
282CSL1505	0.87	0.9	18.0	0.120	5.8	n/a
282PSL1705	0.74	0.37	18.0	0.120	14.35	282PSL28043
283CSL1506	0.54	1.00	18.0	0.120	8.2	n/a
283PSL1706	0.45	0.4	18.0	0.120	12.95	283PSL28044
283CSL1507	0.44	1.18	18.0	0.120	9.2	n/a
283PSL1707	0.39	0.46	18.0	0.120	11.2	283PSL28045
284CSL1508	0.29	1.36	18.0	0.120	10	n/a
284PSL1708	0.27	0.52	18.0	0.120	14.18	284PSL28046
284CSL1542	0.27	1.36	18.0	0.120	8.3	n/a
284PSL1742	0.22	0.54	18.0	0.120	14	284PSL28047
285PSL1700	0.2	0.58	18.0	0.120	11.9	285PSL28048
286PSL1701	0.14	0.72	18.0	0.120	10.68	286PSL28049
287PSL1702	0.12	0.79	18.0	0.120	10.9	287PSL28050
361PSL/CSL1600	0.381	0.75	23.5	0.120	11.8	361PSL3120
361PSL/CSL1601	0.264	0.81	23.5	0.120	12.5	361PSL3121
361PSL/CSL1602	0.181	0.99	23.5	0.120	14.1	361PSL3122
362PSL/CSL1604	0.138	1.05	23.5	0.120	12.2	362PSL3124
362PSL/CSL1606	0.098	1.2	23.5	0.120	10.8	362PSL3126
363PSL/CSL1607	0.069	1.37	23.5	0.120	12.2	363PSL3127
431PSL/CSL6202	0.021	0.811	18.5	0.120	15.1	431PSL6252
431PSL/CSL6204	0.048	0.637	18.5	0.120	13.6	431PSL6254
431PSL/CSL6206	0.037	0.679	18.5	0.120	13.82	431PSL6256
431PSL/CSL6208	0.013	0.715	18.5	0.120	12.2	431PSL6258
432PSL6210	0.021	0.811	18.5	0.120	15.1	432PSL6260
432PSL6212	0.023	0.866	18.5	0.120	14.1	432PSL6262
433PSL6216	0.012	1.067	18.5	0.120	16.2	433PSL6266
433PSL6220	0.012	0.974	18.5	0.120	15.6	433PSL6270





## MagnaPLUS / MARINER / Harsh Duty Single Phase Generator Specifications

MagnaPLUS Model	Main Stator	Main Rotor	Exciter Stator	Exciter Rotor	No Load Excitation 240V / 60Hz
281PSL1500	4.200	0.400	18.0	0.120	11
281CSL1513	0.470	0.720	18.0	0.120	4.3
281PSL1511	1.420	0.381	18.0	0.120	8.3
281PSL1512	1.106	0.395	18.0	0.120	8.1
281PSL1513	0.632	0.430	18.0	0.120	8.7
282CSL1515	0.210	0.820	18.0	0.120	6.2
282PSL1714	0.190	0.350	18.0	0.120	13
282PSL1715	0.190	0.350	18.0	0.120	13
282PSL1716	0.110	0.360	18.0	0.120	12.4
283CSL1517	0.080	1.140	18.0	0.120	12.7
283PSL1717	0.500	0.410	18.0	0.120	11.8
283PSL1718	0.070	0.460	18.0	0.120	10.1
284CSL1518	0.060	1.410	18.0	0.120	12.5
284CSL1550	0.050	1.480	18.0	0.120	16
284PSL1750	0.050	0.550	18.0	0.120	11.1
285PSL1711	0.040	0.580	18.0	0.120	11
286PSL1712	0.030	0.710	18.0	0.120	9.7
287PSL1713	0.020	0.780	18.0	0.120	12.3
361PSL/CSL1611	0.070	0.750	23.0	0.135	17.5
361PSL/CSL1612	0.043	0.857	23.0	0.135	16.1
361PSL/CSL1613	0.037	0.926	23.0	0.135	13.6
362PSL/CSL1615	0.019	1.200	23.0	0.135	17
363PSL/CSL1617	0.012	1.350	23.0	0.135	23
431PSL6222	0.025	0.516	18.0	0.105	9.9
431PSL6224	0.013	0.615	18.0	0.105	13.8
431PSL6226	0.009	0.643	18.0	0.105	15.1
432PSL6228	0.007	0.852	18.0	0.105	11.2



## MagnaPLUS / MARINER / Harsh Duty 3 Phase 600V Generator Specifications

4 Lead	Main Stator	Main Rotor	Exciter Stator	Exciter Rotor	No Load Excitation 600V / 60Hz	12 Lead	12 Lead (Obsolete)
281PSL5246	3.2	0.439	18.0	0.120	9	281PSL28102	281PSL5261
282PSL5247	1.07	0.34	18.0	0.120	14.7	282PSL28103	282PSL5262
282PSL5248	1.07	0.34	18.0	0.120	14.7	282PSL28104	282PSL5263
282PSL5249	0.74	0.37	18.0	0.120	14.35	282PSL28105	282PSL5255
283PSL5250	0.45	0.4	18.0	0.120	12.95	283PSL28106	283PSL5256
283PSL5251	0.39	0.46	18.0	0.120	11.2	283PSL28107	283PSL5257
284PSL5252	0.27	0.52	18.0	0.120	14.18	284PSL28108	284PSL5258
284PSL5253	0.22	0.54	18.0	0.120	14	284PSL28109	284PSL5264
285PSL5254	0.2	0.58	18.0	0.120	11.9	285PSL28110	285PSL5260
361PSL1632	0.381	0.75	23.5	0.120	11.8	361PSL36111	361PSL3177
361PSL1633	0.264	0.81	23.5	0.120	12.5	361PSL36112	361PSL3178
361PSL1634	0.181	0.99	23.5	0.120	14.1	361PSL36113	361PSL1670
362PSL1635	0.138	1.05	23.5	0.120	12.2	362PSL36114	362PSL1667
362PSL1636	0.098	1.2	23.5	0.120	10.8	362PSL36115	362PSL1668
363PSL1658	0.069	1.37	23.5	0.120	12.2	363PSL36116	363PSL1666
431PSL6240	0.021	0.811	18.5	0.120	15.1	431PSL6610	431PSL6508
431PSL6242	0.037	0.679	18.5	0.120	13.82	431PSL6611	431PSL6509
431PSL6244	0.013	0.715	18.5	0.120	12.2	431PSL6612	431PSL6505
432PSL4246	0.023	0.866	18.5	0.120	14.1	432PSL6613	432PSL6506
433PSL6248	0.012	0.974	18.5	0.120	15.6	433PSL6614	433PSL6507