

## Startup / Trouble Shooting Inverter OFF

1. Record the system Information from the system label in the table below.

| <b>System Information form System Label</b> |                     |                     |                      |
|---|---------------------|---------------------|----------------------|
| <b>Model / Unit S/O</b>                     | <b>KVA from S/O</b> | <b>Vin from S/O</b> | <b>Vout from S/O</b> |
|   |                     |                     |                      |

2. Check system for loose connections.  
 3. Check that all connections are properly connected.  
 4. Measure the resistance of the bottom (output) of the input Circuit Breaker to frame for each pole. See the table below for measurement limits.

| <b>Input Impedance Check</b> |                |                |
|------------------------------|----------------|----------------|
| Input Vac                    | Lug 2 to Frame | Lug 4 to Frame |
| 120Vac                       | >20K Ohms      | <2 Ohms        |
| 208Vac                       | >20K Ohms      | >20K Ohms      |
| 240Vac                       | >20K Ohms      | >20K Ohms      |
| 277Vac                       | >20K Ohms      | <2 Ohms        |

5. Measure the resistance of the bottom (UPS side) of the DC Breaker to frame for each pole. The measurement should be greater than 20K ohms.  
 6. Before turning on the Input Circuit Breaker (CB1) record the input voltage in the table below and ensure that it is per the system label.

| Input Voltage (Actual)<br>Unit OFF<br>(CB1 OFF, CB2 OFF, CB3 OFF) |        |        |        |        |
|---|--------|--------|--------|--------|
|   | 120Vac | 208Vac | 240Vac | 277Vac |
| G-N   |        |        |        |        |
| G-H <sub>1</sub>  |        |        |        |        |
| G-H <sub>2</sub>  |        |        |        |        |
| H <sub>1</sub> -H <sub>2</sub>                                    |        |        |        |        |

See Tables at end of Document for limits

- Turn ON the Input Circuit Breaker (CB1) and record the input voltage in the table below in the row marked Actual. After the system has gone through its initial checks and is displaying “Battery Breaker is Open – Ready to Close” use the Menu Forward and Menu Reverse” buttons to fine the input voltage readings, and record in the table below in the row marked Display Readings.

|                                |           | Input Voltage<br>Unit On SBS Utility<br>(CB1 ON, CB2 OFF, CB3 OFF) |        |        |        |
|--------------------------------|-----------|--|--------|--------|--------|
|                                |           | 120Vac   | 208Vac | 240Vac | 277Vac |
| G-N                            | Actual    |  |        |        |        |
|                                | Displayed |  |        |        |        |
| G-H <sub>1</sub>               | Actual    |  |        |        |        |
|                                | Displayed |  |        |        |        |
| G-H <sub>2</sub>               | Actual    |  |        |        |        |
|                                | Displayed |  |        |        |        |
| H <sub>1</sub> -H <sub>2</sub> | Actual    |  |        |        |        |
|                                | Displayed |  |        |        |        |

See tables at end of document for limits.

8. Turn ON the Output Circuit Breaker (CB3) to connect the customer loads to the unit. Record the input voltage and current in the table below in the row marked Actual Voltage and Actual Current. Use the Menu Forward and Menu Reverse” Buttons to find the input voltage readings, and record in the table below in the row marked Display Readings.

|                                |             | Input Voltage and Current<br>Unit On SBS Utility, With Load<br>(CB1 ON, CB2 OFF, CB3 ON) |        |        |        |
|--------------------------------|-------------|--|--------|--------|--------|
|                                |             | 120Vac   | 208Vac | 240Vac | 277Vac |
| G-N                            | Actual      |  |        |        |        |
|                                | Displayed   |  |        |        |        |
| G-H <sub>1</sub>               | Actual      |  |        |        |        |
|                                | Displayed   |  |        |        |        |
| G-H <sub>2</sub>               | Actual      |  |        |        |        |
|                                | Displayed   |  |        |        |        |
| H <sub>1</sub> -H <sub>2</sub> | Actual      |  |        |        |        |
|                                | Displayed   |  |        |        |        |
| H <sub>1</sub>                 | Actual Amps |  |        |        |        |
| H <sub>2</sub>                 | Actual Amps |  |        |        |        |

See Tables at end of Document for limits

9. Record the actual output Voltage and Current in the table below in the row marked Actual Voltage and Actual Current. Use the Menu Forward and Menu Reverse” Buttons to find the output voltage and current readings and record in the table below in the rows marked Display Voltage Readings and Display Current Readings.

|                                |              | Output Voltage and Current<br>Unit On SBS Utility<br>(CB1 ON, CB2 OFF, CB3 ON) |        |        |        |            |
|--------------------------------|--------------|--|--------|--------|--------|------------|
|                                |              | 120Vac   | 208Vac | 240Vac | 277Vac | 120/277Vac |
| G-N                            | Actual       |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>1</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>2</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| H <sub>1</sub> -H <sub>2</sub> | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| H <sub>1</sub>                 | Actual Amps  |  |        |        |        |            |
|                                | Display Amps |  |        |        |        |            |
| H <sub>2</sub>                 | Actual Amps  |  |        |        |        |            |
|                                | Display Amps |  |        |        |        |            |

See Tables at end of Document for limits

10. Using the Menu Forward and Menu Reverse buttons record the displayed KW of the unit in the table below. Using the following formula, Voltage (measured phase to ground) times current (on same phase), calculate the watts for each phase and record in the row marked Actual. Add the actual values to get the Total.

|                           |  | Output KVA<br>Unit On SBS Utility<br>(CB1 ON, CB2 OFF, CB3 ON) |                         |       |
|---------------------------|--|--|-------------------------|-------|
|                           |  | H1<br>(Volts * Current)  | H2<br>(Volts * Current) | Total |
| Actual                    |  |  |                         |       |
| Display readings<br>(Kva) |  |  |                         |       |

11. Verify that the Actual Watts does not exceed the rating of the unit. The total cannot exceed the total Watts for the unit as per the system label.

12. Record the DC bus voltage in the table below as measured at the bottom and top of the Battery Circuit Breaker (CB2). Then using the Menu Forward and Menu Reverse Buttons to find the DC Voltage reading, record in the table below in the row marked Displayed Reading.

| DC Bus Voltage<br>Unit On SBS Utility<br>(CB1 ON, CB2 OFF, CB3 ON) |                              |
|--|------------------------------|
| Charger Voltage<br>at Bottom of CB                                 | Battery Voltage<br>Top of CB |
| Actual   |                              |
| Displayed<br>Reading   |                              |

See Tables at end of Document for limits

13. Verify that the polarity of the DC voltage at top and bottom of the Battery Circuit Breaker (CB2) are the same.
14. Press the MNI Button on the  $\mu$ Processor PCB, and ensure there is a “T” displayed in the bottom right corner of the display.
15. Turn on the Battery Circuit Breaker (CB2) and record the DC bus voltage in the table below as measured at the bottom of the Battery Breaker. Then using the Menu Forward and Menu Reverse Buttons to find the DC Voltage reading, record in the table below in the row marked Displayed Reading.

| DC Bus Voltage,<br>Unit On SBS Utility<br>(CB1 ON, CB2 ON, CB3 ON) |  |
|--|--|
| DC Voltage   |  |
| Actual   |  |
| Displayed<br>Reading   |  |

See Tables at end of Document for limits

16. Turn OFF the Battery Circuit Breaker (CB2)
17. Press the MNI Button on the  $\mu$ Processor PCB, and ensure there is “\*” displayed in the bottom right corner of the display.

**Startup / Trouble shooting tool**

**Inverter ON**

18. Turn on the Battery Circuit Breaker (CB2) and then turn OFF the Battery Circuit Breaker (CB2) after 2 seconds
19. After the inverter goes through its checks and displays “Load is on Inverter – Rectifier Operational” record the AC input voltages and currents in the tables below. Then using the Menu Forward and Menu Reverse Buttons to find the Input Voltage reading, record in the table below in the row marked Displayed Reading.

|                                |               | Input Voltage and Current<br>Unit On Inverter with load, no battery charge current<br>(CB1 ON, CB2 OFF, CB3 ON) |        |        |        |
|--------------------------------|---------------|---|--------|--------|--------|
|                                |               | 120Vac  | 208Vac | 240Vac | 277Vac |
| G-N                            | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>1</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>2</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub> -H <sub>2</sub> | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub>                 | Actual Amps   |   |        |        |        |
| H <sub>2</sub>                 | Actual Amps   |   |        |        |        |

20. Verify that the input current does not exceed the Input Circuit Breaker (CB1) current rating.

21. Turn OFF the output Circuit Breaker (CB3) and turn ON the Battery Circuit Breaker (CB2) and then record the AC input Voltages and Currents in the table below. Then using the Menu Forward and Menu Reverse Buttons to find the Input Voltage reading, record in the table below in the row marked Displayed Reading.

|                                |               | Input Voltage and Current<br>Unit On Inverter with No Load and with Battery Charge Current<br>(CB1 ON, CB2 ON, CB3 OFF) |        |        |        |
|--------------------------------|---------------|---|--------|--------|--------|
|                                |               | 120Vac  | 208Vac | 240Vac | 277Vac |
| G-N                            | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>1</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>2</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub> -H <sub>2</sub> | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub>                 | Actual Amps   |   |        |        |        |
| H <sub>2</sub>                 | Actual Amps   |   |        |        |        |

22. Verify that the input current does not exceed the Input Circuit Breaker (CB1) current rating.

23. Turn on the Output Circuit Breaker (CB3) and record the AC input voltages and current in the tables below. Then using the Menu Forward and Menu Reverse Buttons to find the input voltage reading, record in the table below in the row marked Displayed Readings

|                                |               | Input Voltage and Current<br>Unit On Inverter with Load, and battery charge current OFF<br>(CB1 ON, CB2 ON, CB3 ON) |        |        |        |
|--------------------------------|---------------|---|--------|--------|--------|
|                                |               | 120Vac  | 208Vac | 240Vac | 277Vac |
| G-N                            | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>1</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| G-H <sub>2</sub>               | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub> -H <sub>2</sub> | Actual Vac    |   |        |        |        |
|                                | Displayed Vac |   |        |        |        |
| H <sub>1</sub>                 | Actual Amps   |   |        |        |        |
| H <sub>2</sub>                 | Actual Amps   |   |        |        |        |

24. Verify that the input current does not exceed the Input Circuit Breaker (CB1) current rating.

25. Turn OFF the Output Circuit Breaker (CB3) and the Battery Circuit Breaker (CB2) then record the AC output voltages in the table below. Then using the Menu Forward and Menu Reverse Buttons to find the Output AC Voltage reading, record in the table below in the row marked Displayed Reading.

|                                |              | Output Voltage<br>Unit On Inverter, No change current, No Load<br>(CB1 ON, CB2 OFF, CB3 OFF) |        |        |        |            |
|--------------------------------|--------------|--|--------|--------|--------|------------|
|                                |              | 120Vac   | 208Vac | 240Vac | 277Vac | 120/277Vac |
| G-N                            | Actual       |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>1</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>2</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| H <sub>1</sub> -H <sub>2</sub> | Displayed    |  |        |        |        |            |
|                                | Display Amps |  |        |        |        |            |

26. Verify that the Output Voltage(s) are within 3% of the Voltage(s) as per the System Label.

27. Turn ON the Battery Circuit Breaker (CB2) and Turn OFF the Input Circuit Breaker (CB1). Then record the Output Voltage in the table below. Then using the Menu Forward and Menu Reverse Buttons to find the Output Voltage reading, record in the table below in the row marked Displayed Reading.

|                                |              | Output Voltage<br>Unit On Batteries, No Load<br>(CB1 OFF, CB2 ON, CB3 OFF) |        |        |        |            |
|--------------------------------|--------------|--|--------|--------|--------|------------|
|                                |              | 120Vac   | 208Vac | 240Vac | 277Vac | 120/277Vac |
| G-N                            | Actual       |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>1</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| G-H <sub>2</sub>               | Displayed    |  |        |        |        |            |
|                                | Actual       |  |        |        |        |            |
| H <sub>1</sub> -H <sub>2</sub> | Displayed    |  |        |        |        |            |
|                                | Display Amps |  |        |        |        |            |

28. Verify that the Output Voltage(s) are within the 3% of the voltage(s) as per the System Label.

29. Turn ON the Output Circuit Breaker (CB3) and record the Output Voltages and Currents in the table below in the rows marked Actual. Then using the Menu Forward and Menu Reverse Buttons to find the Output Voltage and Current reading, record in the table below in the row marked Displayed Reading.

|                                |              | Output Voltage and Current<br>Unit On Batteries, With Load<br>(CB1 OFF, CB2 ON, CB3 ON) |        |        |        |            |
|--------------------------------|--------------|---|--------|--------|--------|------------|
|                                |              | 120Vac  | 208Vac | 240Vac | 277Vac | 120/277Vac |
| G-N                            | Actual       |   |        |        |        |            |
|                                | Actual       |   |        |        |        |            |
| G-H <sub>1</sub>               | Displayed    |   |        |        |        |            |
|                                | Actual       |   |        |        |        |            |
| G-H <sub>2</sub>               | Displayed    |   |        |        |        |            |
|                                | Actual       |   |        |        |        |            |
| H <sub>1</sub> -H <sub>2</sub> | Displayed    |   |        |        |        |            |
|                                | Actual Amps  |   |        |        |        |            |
| H <sub>1</sub>                 | Display Amps |   |        |        |        |            |
|                                | Actual Amps  |   |        |        |        |            |
| H <sub>2</sub>                 | Display Amps |   |        |        |        |            |

30. Using the Menu Forward and Menu Reverse buttons record the displayed KW of the unit in the table below. Using the following formula, Voltage (measured phase to ground) times current (on same phase), calculate the watts for each phase and record in the row marked Actual. Add the actual values to get the Total.

| Output KW<br>Unit On SBS Utility<br>(CB1 ON, CB2 OFF, CB3 ON) |                         |                         |       |
|---|-------------------------|-------------------------|-------|
|   | H1<br>(Volts * Current) | H2<br>(Volts * Current) | Total |
| Actual  |                         |                         |       |
| Display readings<br>(Kva)                                     |                         |                         |       |

31. Verify that the Actual Watts does not exceed the rating of the unit. The total for each must not exceed the KW rating of the unit as per the system label.

32. Startup is now complete, verify with DSPM field service the entry of the Startup Code into the  $\mu$ Processor by the following steps.
  - a. Press both the Increase and Decrease Buttons at the same time till the screens says to enter the password mode
  - b. Press Second Button from the left until an “X” appears in the screen.
  - c. Press Third Button form the left until an “X” appears on the screen.
  - d. Press the Fourth Button form the left until an “X” appears on the screen.
  - e. Press the Fifth Button from the left until an “X”
  - f. Waiting about 10 seconds the screen will change to a “P” in the lower right corner of the unit.
  - g. Using the Menu Reverse or Menu Reverse button go to the screen that says screen variable
  - h. Using the Increase and Decrease Keys changed the displayed number to the number that has been issued to you by DSPM for this system.
  - i. Press the First Button from the left and ensure that it says “57” in the top left corner and KeyCodeOK.
  - j. Release of the button will change the “P” in the bottom left corner to an “\*”

Steps 1 thru 8

|      | Input Voltage Limits |       |     |       |     |
|------|----------------------|-------|-----|-------|-----|
| Vac  | 120                  | 208   | 240 | 277   | 480 |
| Low  | 108                  | 187.2 | 216 | 249.3 | 432 |
| High | 132                  | 228.8 | 264 | 304.7 | 528 |

Steps 9, 25, 27, and 29

|      | Output Voltage Limits |     |     |     |     |
|------|-----------------------|-----|-----|-----|-----|
| Vac  | 120                   | 208 | 240 | 277 | 480 |
| Low  | 117                   | 204 | 235 | 271 | 470 |
| High | 123                   | 212 | 245 | 283 | 490 |

Steps 12a and 15

|                  | Battery Charger Voltage Low/High Limits |       |       |       |       |
|------------------|---|-------|-------|-------|-------|
| No. of Batteries | 2                                       | 4     | 6     | 8     | 10    |
| Low Limit        | 26.4                                    | 52.8  | 79.2  | 105.6 | 132   |
| High Limit       | 27.6                                    | 55.2  | 82.8  | 110.4 | 138   |
| No. of Batteries | 12                                      | 14    | 16    | 18    | 19    |
| Low Limit        | 158.4                                   | 184.8 | 211.2 | 237.6 | 250.8 |
| High Limit       | 165.6                                   | 193.2 | 220.8 | 248.4 | 262.2 |
| No. of Batteries | 20                                      | 21    | 22    | 40    | 41    |
| Low Limit        | 264                                     | 277.2 | 290.4 | 528   | 541.2 |
| High Limit       | 276                                     | 289.8 | 303.6 | 552   | 565.8 |
| No. of Batteries | 42                                      | 43    | 44    | 45    | 46    |
| Low Limit        | 554.4                                   | 567.6 | 580.8 | 594   | 607.2 |
| High Limit       | 579.6                                   | 593.4 | 607.2 | 621   | 634.8 |

Note: Value Measured is Vdc and is not decreasing

Step 12b

|                  | Battery Voltage Low Limits |     |     |     |     |
|------------------|----------------------------|-----|-----|-----|-----|
| No. of Batteries | 2                          | 4   | 6   | 8   | 10  |
| Low Limit        | 22                         | 44  | 66  | 88  | 110 |
| No. of Batteries | 12                         | 14  | 16  | 18  | 19  |
| Low Limit        | 132                        | 154 | 176 | 198 | 209 |
| No. of Batteries | 20                         | 21  | 22  | 40  | 41  |
| Low Limit        | 220                        | 231 | 242 | 440 | 451 |
| No. of Batteries | 42                         | 43  | 44  | 45  | 46  |
| Low Limit        | 462                        | 473 | 484 | 495 | 506 |