MATE3

Owner's Manual Addendum

Purpose

This document is an addendum to 900-0117-01-00, Revision C of the MATE3 System Display and Controller Owner's Manual. It provides descriptions of changes to the MATE3 programming or menus as related to the Radian Series Inverter/Chargers.

This addendum does not replace the previous MATE3 addendum, 901-0022-01-00. All content from that addendum applies as appropriate to other products. All content from that addendum for Radian inverters is considered to apply to models GS8048A, GS4048A, GS7048E, and GS3548E.

Scope

This document applies to any MATE3 with firmware revision 002.017.xxx and higher.

This document applies in all aspects to Radian models GS8048A, GS4048A, GS7048E, and GS3548E with firmware revision 001.005.xxx or higher.

This document applies to model GS8048 inverters only where noted in the table on page 7. In all other aspects the existing Revision C of the MATE3 Owner's Manual applies.

Revision History

➢ Added items relating to inverter indicators and status
➢ Added items relating to inverter programming
➢ Added items relating to MATE3 functions

Operation Chapter

LED Status Indicators

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➢ **Events LED (red)**

During a warning, the **Events** LED flashes to indicate the warning only while the condition occurs. It does not continue flashing if conditions return to normal.

Soft Keys

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➢ **Inverter Warnings**

The **Phase Loss** message has been moved from the **Inverter Errors** screen to the **Inverter Warnings** screen. The **Comm Fault** message has been moved from the **Inverter Warnings** screen to the **Inverter Errors** screen.

```
            Inverter Warnings      Port 01
   AC Freq Too High N      AC Freq Too Low N
   Voltage Too High N      Voltage Too Low N
   Input Amps > Max N      Temp Sensor Bad N
   Phase Loss       N      Fan Failure     N
     Back       Temps   GT Limits    Port
```

Figure 1   Inverter Warnings

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➢ Inverter Errors

In the first **Inverter Errors** screen, the **Phase Loss** message has been moved from the **Inverter Errors** screen to the **Inverter Warnings** screen.

The **Comm Fault** message has been moved from the **Inverter Warnings** screen to the **Inverter Errors** screen. The **Comm Fault** message accompanies an inverter shutdown. It indicates that the inverter may require service.

```
        Inverter Errors      Port 01              Inverter Errors      Port 01
Low Output Voltage N   Low Battery V    N    Loose DC Neg Terminals  N
AC Output Shorted   N   High Battery V   N    Battery Voltage Sense   N
AC Output Backfeed N   Over Temperature N    AC Relay Fault          N
Stacking Error      N   Comm Fault       N
  Back       Next            Port              Back                  Port
```

Figure 2   Inverter Errors

In the second **Inverter Errors** screen, the **DC Negative Imbalance** message has been changed. The new message is **Loose DC Neg Terminals**. The meaning of this error has not changed, although the inverter does not indicate whether it has occurred on the left or right module.

A new error message has been introduced to this screen. **Battery Voltage Sense** indicates that the internal voltage sensing circuitry has detected battery voltages below 8.0 Vdc or above 72.0 Vdc. If these readings are not correct, it indicates that the inverter may require service.

This error message was not featured in Revision A of either of the Operator's Manuals for the Radian series (900-0145-01-01 or 900-0161-01-00).

Hot Keys

➢ AC Input Hot Key

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AC Disconnect Reasons

This screen shows the primary seven reasons for disconnection. An eighth field may be visible, but it can feature several different messages which vary with conditions. A list of these messages and their definitions is featured on the OutBack website at www.outbackpower.com.

```
        Last AC Disconnect   Port 01
Frequency Too High   N  Backfeed       N
Frequency Too Low    N  Phase Lock     N
Voltage > Maximum    N  Island Detect  N
Voltage < Minimum    N
  Back                        Port
```

Figure 3   Last AC Disconnect

Programming Chapter

System Settings

➢ Firmware Version

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The **Firmware Versions** screen now shows the device model (GS4048A, GS8048, etc.).

```
        Firmware Versions
        MATE3 002.017.005
     1:  GS8048A 001.005.03
     2:  GS8048A 001.005.03
     3:  FNDC  001.001.000
```

Figure 4   Firmware Versions

Inverter Settings

NOTE: See the inverter *Operator's Manual* for more information on the function of each bulleted item.

➢ **Grid AC Input Mode and Limits**

➢ **Gen AC Input Mode and Limits**

Pages 86, 87

In both menus (all modes), the **Transfer Delay** item is now displayed in seconds instead of AC cycles.

When the **Mini Grid** mode is selected, additional set points appear on the lowest line.

```
    Grid AC Input Mode and Limits
Input Mode  Mini Grid          Port   1
Voltage Limit Lower 108 VAC  Upper 132 VAC
Transfer Delay 1.0 Second
Connect Delay 0.2 Minutes
Connect to Grid 48.0 VDC    Delay  10 Minutes
```

Items displayed for Mini Grid mode only:

➢ **Connect to Grid** – Adjusts the low-voltage level that causes the Radian to reconnect to the utility grid in **Mini Grid** mode.

➢ (Connect) **Delay** – Adjusts the delay period after reaching **Connect to Grid** before the Radian reconnects to the grid.

Figure 5   Mini Grid Mode (Example)

Another mode, **Grid Zero**, has been added to the menu. **Grid Zero** mode also has additional set points.

```
    Grid AC Input Mode and Limits
Input Mode  Grid Zero          Port   1
Voltage Limit Lower 108 VAC  Upper 132 VAC
Transfer Delay 1.0 Second
Connect Delay 0.2 Minutes
DoD Volts 48.0 VDC   DoD Amps   5 AAC
```

Items displayed for **Grid Zero** mode only:

➢ **DoD Volts** – Adjusts the lowest allowable battery discharge voltage in **Grid Zero** mode. Any additional loads will use power from the utility grid, not the batteries.

➢ **DoD Amps** – Adjusts the maximum current (in AC amperes) at which **Grid Zero** mode draws power from the batteries.

Figure 6   Grid Zero Mode (Example)

NOTE: The **DoD Amps** setting is only effective when the Radian inverter is in **Grid Zero** mode, connected to the utility grid, and accepting grid power. If any of these conditions are not true, the **DoD Amps** setting will not limit the current drawn from the batteries. The current is not limited when the Radian is in normal inverting mode.

This note was not featured in Revision A of either of the Operator's Manuals for the Radian series (900-0145-01-01 or 900-0161-01-00).

➢ **AC Output**

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For applicable models, the range of the **Output Voltage** setting has been increased, allowing use with different nominal AC voltages in all parts of the world.

➢ GS8048A/GS4048A: New range is 100 to 130 Vac for both the L1 and L2 outputs.

➢ GS7048E/GS3548E: New range is 200 to 260 Vac.

NOTE:

➢ All Radian models can be used in the external application called AC Coupling when used with the GSLC175-AC-120/240 enclosure. For this application the **AC Coupled Control** function must be enabled. See page 7.

➢ However, the **AC Output** menu also contains an internal Radian function called **AC Coupled Mode**. **AC Coupled Mode** is not currently available.

```
              AC Output
                          Port   1

Output Voltage 240 VAC
AC Coupled Mode NA N
```

Figure 7   AC Output (Example)

➢ Battery Charger

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All of these changes comprise the Radian's Advanced Battery Charging (ABC) functionality, which allows the inverter to charge lithium-ion, sodium-sulfur, and other battery technologies.

➢ The charging voltage ranges have been widened. The common range for all voltage settings is 44.0 to 64.0 Vdc.

➢ A new menu item, **Re-Bulk Voltage**, has been added. It has the same setting range as above.

➢ All charging timers have been adjusted so that setting the time to **0.0 hours** completely defeats that charging stage.

➢ A **24/7** selection has been added to the (Float) **Time** menu item so that this stage can run continuously if uninterrupted.

```
        Battery Charger
                          Port 1
Absorb Voltage   58.4 VDC   Time  1.0
Float Voltage    53.6 VDC   Time  1.0
Re-Float Voltage 50.0 VDC
Re-Bulk Voltage  49.6 VDC
```

➢ **Re-Bulk Voltage** – Adjusts the low-voltage level that activates the Absorption timer. This allows the inverter to enter the Bulk stage during a new charging cycle.

This item was not shown or adjustable in previous models.

Figure 8   Battery Charger

➢ Auxiliary Output and Auxiliary Relay

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Gen Alert

In general the inverter's **GRID** or **GEN** terminal input can be used for the input of an AC generator. However, when using either the **AGS** or the **Gen Alert** function, the generator must be connected to the **GEN** terminals.

IMPORTANT:

The AC generator must connect to the inverter's **GEN** terminal input when using **Gen Alert.** If the input priority is set to **GRID** and the **GRID** terminals are energized, an automatically controlled generator will shut down.

```
            Auxiliary Output
Status Auto Off                    Port 1
Aux Mode Gen Alert
ON:  Voltage 44.0 VDC    Delay   4 Minutes
OFF: Voltage 52.0 VDC    Delay   9 Minutes
              Off        Auto      On
```

Figure 9   Gen Alert

➢ Inverter Stacking

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IMPORTANT:

➢ All stacked Radian inverters must have the same firmware revision. If inverters are stacked with different firmware revisions, any inverter with a revision different from the master will not invert and will not connect to an AC source. The **Events** LED will illuminate. The MATE3 will register an Event in the log and will display the following message:

An inverter firmware mismatch has been detected. Inverters X, Y, Z [1] are disabled. Visit *www.outbackpower.com* for current inverter firmware.

Combining inverters without stacking (or stacking incorrectly) may cause similar problems.

---

1 The port designations for the mismatched inverters are listed here.

IMPORTANT:

➢ Radian model GS8048 cannot be stacked with model GS8048A or GS4048A. None of these models can stack with models GS7048E or GS3548E. If more than one model series is stacked together, any inverter model belonging to a series different from the master will not invert and will not connect to an AC source.   The **Events** LED will illuminate. The MATE3 will register an Event in the log and will display the following message:

A model mismatch has been detected. Inverters are incompatible. Inverters X, Y, Z[2] are disabled. Match all models before proceeding.

The GS8048 can share a HUB Communications Manager with the GS8048A or GS4048A without being stacked as long as it is wired to an independent, isolated AC bus.

The structure of the *Inverter Stacking* menu has changed. The *Master Power Save Level* and *Slave Power Save Level* items have been removed and placed in a separate menu. (See next section.)

The *Inverter Stacking* menu has a single selection, the **Change** soft key. When this is pressed, the MATE3 will enter a new series of screens. The inverter's output is disabled as shown in Figure 10. This prevents phase shifting and other problems which can arise from inverters remaining active while their programming is changed. The output is enabled (also as shown) when the selection is complete.

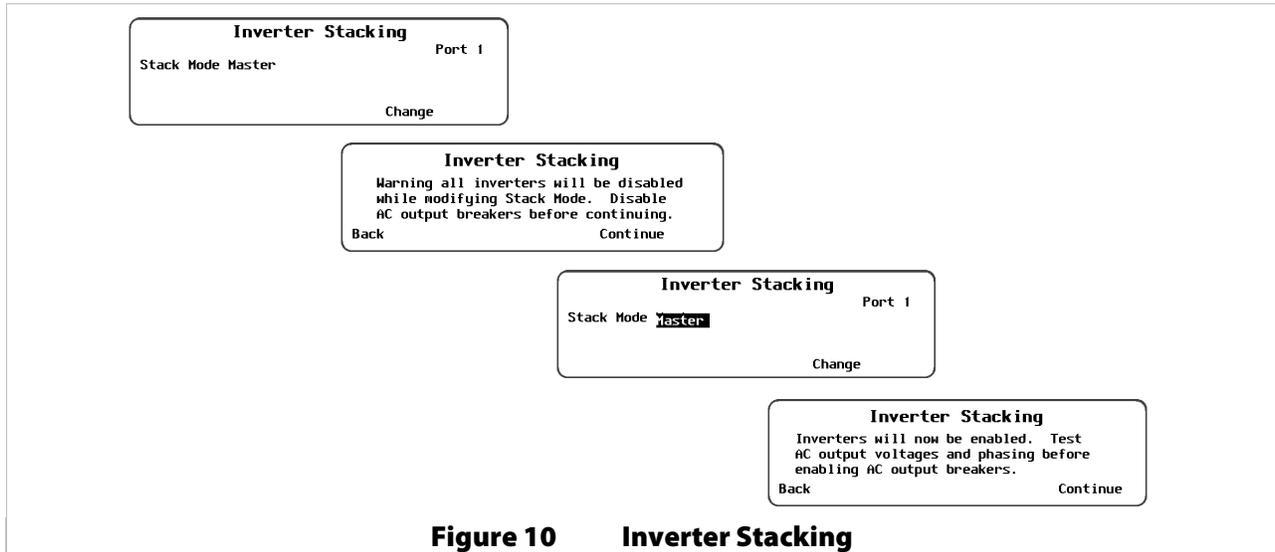The stacking modes available for each inverter model have not changed.

Figure 10   Inverter Stacking

➢ **Power Save Ranking**

This is a new menu, selectable from the *Inverter* series of menu options. The screen that appears will show the *Stack Mode* that was chosen in the menus in Figure 10. Examples are shown in Figure 11.

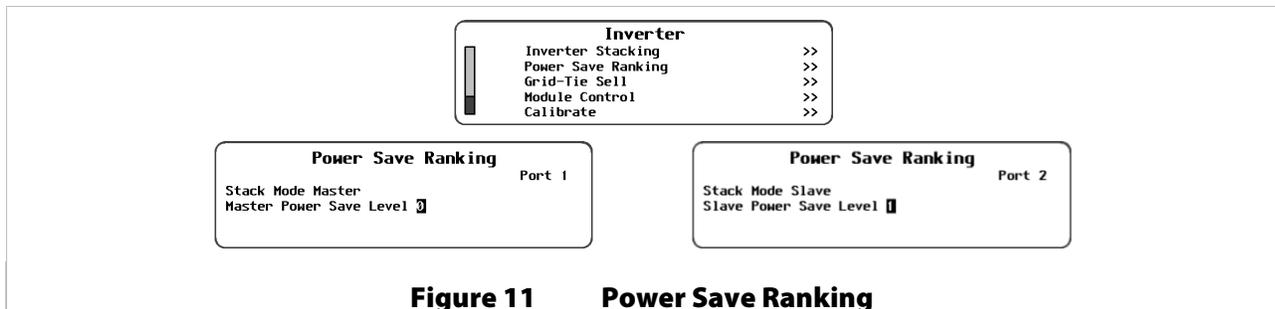The Power Save ranking structure for each stacking mode has not changed.

Figure 11   Power Save Ranking

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2 The port designations for the mismatched inverters are listed here.

➢ **Grid-Tie Sell**

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In the **Grid-Tie Sell** menu, the **Grid-Tie Window** item no longer appears. The **Grid Interface Protection** menu serves this purpose.
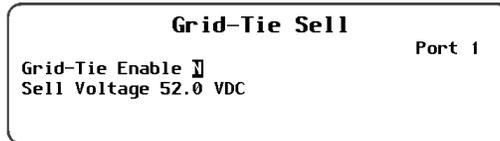
```
                    Grid-Tie Sell
                                          Port 1
    Grid-Tie Enable ]
    Sell Voltage 52.0 VDC
```

Figure 12   Grid-Tie Sell

➢ **Reset the Inverter to Factory Defaults**

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Some items are retained at the present setting even when the inverter is reset to factory defaults. The retained settings include the **Output Voltage**, all items in the **Calibrate** menu, and all items in the **Grid Interface Protection** menu.

```
                 Reset Inverter to
                 Factory Defaults ?
                                          Port 1

         No                                Yes
```

Figure 13   Reset to Factory Defaults

MATE3 Settings

➢ **Advanced Generator Start (AGS) Mode**

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In general the inverter's **GRID** or **GEN** terminal input can be used for the input of an AC generator. However, when using either the **AGS** or the **Gen Alert** function, the generator must be connected to the **GEN** terminals.

⚠ **IMPORTANT:**
The AC generator must connect to the inverter's **GEN** terminal input when using **AGS**. If the input priority is set to **GRID** and the **GRID** terminals are energized, an automatically controlled generator will shut down.

```
              Advanced Generator Start
         Setup                          >>
         Voltage Start                  >>
         Load Start                     >>
         State of Charge Start          >>
         Must Run Schedule              >>
```
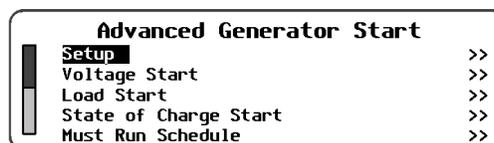
Figure 14   Advanced Generator Start

➢   **AC Coupled Control**

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This menu activates the Radian's AC Coupling function. Using the GSLC175-AC-120/240, the Radian's output can interface with the output of another grid-tied inverter. AC Coupling provides the following benefits.

➢   The Radian will transfer excess power from the grid-tied inverter to the utility grid during the day. It also transfers grid power to the critical loads panel at night.

➢   During a grid failure, the Radian's own output provides a stable AC source to the grid-tied inverter. This allows the grid-tied inverter to remain active without the grid. The grid-tied inverter will continue delivering power to any loads present on the Radian's output.

➢   Any AC power not consumed by the loads is converted by the Radian to DC power and delivered to the battery bank.

If the battery voltage exceeds a certain high level, the Radian's 12V AUX output will order the GSLC175-AC-120/240 to disconnect the grid-tied inverter from the Radian's output bus. This will shut down the grid-tied inverter while still allowing the Radian to power the critical loads. The 12V AUX output will reconnect the Radian's output to the grid-tied inverter when the battery voltage decreases to a safe level.

The MATE3 can select the settings for disconnection and reconnection in the Radian inverter's **12V AUX** menu.

See the OutBack website, www.outbackpower.com, for detailed information on AC Coupling.

```
        AC Coupled Control
Enabled N
AUX 12V Port  0
```

➢   **Enabled** – Activates the AC Coupling function.

➢   **AUX 12V Port** – Selects the port on the HUB Communications Manager to match the Radian inverter where the 12V AUX port is physically connected.

Figure 15   AC Coupled Control

Applicability of Functions for Radian Models

Table 1   Scope of Functions by Inverter Model

Page	Manual Page	Function	GS8048A/GS4048A GS7048E/GS3548E	GS8048
		Operation Chapter		
1	31	Events LED	Yes	Yes
	42	Inverter Warnings	Yes	No
2	43	Inverter Errors	Yes	No
	62	AC Input Hot Key	Yes	Yes
	Programming Chapter (System Settings)			
	76	Firmware Version	Yes	Yes
3	**Programming Chapter (Inverter Settings)**			
	86, 87	Grid AC Input Mode and Limits Gen AC Input Mode and Limits	Yes	No
	88	AC Output	Yes	No
		AC Coupling	Yes	Yes
4	89	Battery Charger	Yes	No
	97	Gen Alert	Yes	No
	99	Inverter Stacking	Yes	No
5		Power Save Ranking	Yes	No
6	101	Grid-Tie Sell	Yes	No
	103	Reset to Factory Defaults	Yes	No
	Programming Chapter (MATE3 Settings)			
	115	Advanced Generator Start	Yes	Yes
7	128	AC Coupled Control	Yes	Yes

About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. OutBack products include true sine wave inverter/chargers, maximum power point tracking charge controllers, and system communication components, as well as circuit breakers, batteries, accessories, and assembled systems.

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