OutBack POWER™
member of The alpha Group™

MATE3 USB Card

Owner's Manual

About OutBack Power Technologies

OutBack Power Technologies is a leader in advanced energy conversion technology. Our 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.

Audience

These instructions are intended for anyone required to install and operate this equipment. Operators must have software engineering knowledge and the ability to address ports.

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Introduction

Welcome to OutBack Power Technologies

This document contains the instructions for installing the MATE3 USB Card into the MATE3™ System Display and Controller. It also provides the software protocols for USB communications between a MATE3 and a personal computer (PC), as well as status information from various OutBack devices. Some of the devices can accept operational commands.

IMPORTANT:

- This information applies to MATE3 firmware revisions 2.7.16 and greater.
- For more detailed information on programming the MATE3, see the *Owner's Manual* for the *MATE3 System Display and Controller*.

Requirements

The MATE3 provides an option for an isolated port for PC communication in the form of a USB cable. The USB card must be installed for this function to work (see next page). The MATE3's ***Serial Data Stream*** menu item must be set to ***Enabled*** in order for it to send data streams. (See the *MATE3 System Display and Controller Owner's Manual*.) If this command is not enabled, direct commands are required for any communications. (See page 17.)

The USB card operates with Windows and Linux systems, and Mac OS X 10.7 or later.

The initial baud rate and other settings of the USB card are not necessarily a known value, particularly if the card receives new settings from the PC upon connection. The USB card must be set with the PC to match the MATE3. The initial MATE3 settings are a baud rate of 19200, 8 bits, no parity, and 1 stop bit. (See the *MATE3 System Display and Controller Owner's Manual*.)

Parts Included

- MATE3 USB Card; equipped with a USB Standard Type B port
- USB Standard Type A/B cable, 2-meter (6-foot) length

MATE3 USB Card

USB Cable

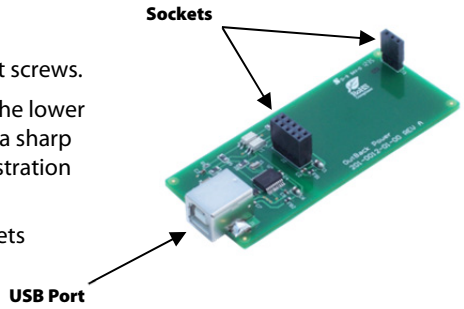
Figure 1 Parts Included

Installation

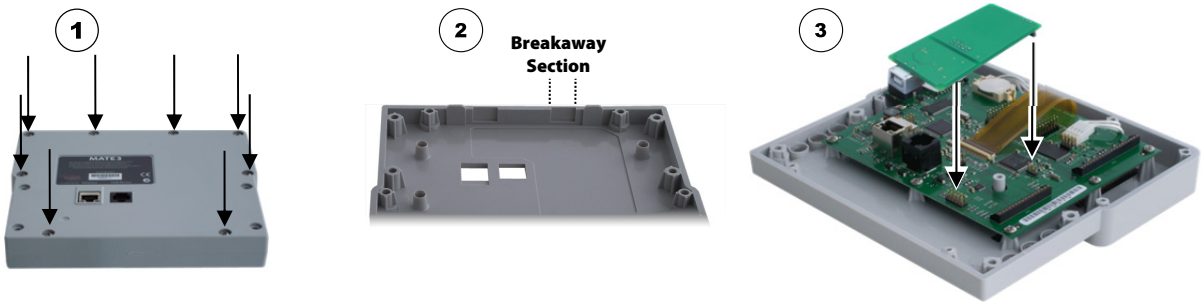
CAUTION: Hazard to Equipment

The MATE3 USB card has two pin sockets. These sockets must be aligned correctly when installing the card (see step 3 below). Misalignment could damage both devices.

To Install the MATE3 USB Card:



1. Remove the back cover of the MATE3. The cover is secured with eight screws.
2. Make an opening in the MATE3 cover for the USB port. A section on the lower edge of the cover must be broken away with pliers after scoring with a sharp knife (to allow a clean break). This section is marked in the Step 2 illustration below. The USB port must protrude through the opening.
3. Turn the card over and plug it into the MATE3 board. Match the sockets to the pins on the board.
4. Replace the back cover of the MATE3.



5. Windows users only: Download and install the PC drivers for the USB card. Drivers may be downloaded from the OutBack website at www.outbackpower.com.

IMPORTANT:

Windows users are **required** to install the drivers before operation. Mac and Linux users can ignore this instruction and proceed to Step 6.

6. Connect the USB cable to the MATE3 and the PC. Make any other external connections as appropriate for the system. (See below.)

Figure 2 Installing the USB Card

External Connections

The MATE3 communicates with OutBack devices through a proprietary communication link. It receives pre-defined status pages and can issue commands to various OutBack devices. The MATE3 can be directly connected to a single OutBack device or to multiple devices using an OutBack Communications Manager (HUB4 or HUB10). These connections are illustrated in the *MATE3 System Display and Controller Owner's Manual.*

NOTE: The Ethernet port on the back of the MATE3 is not used for PC communications. The USB cable must be plugged directly into the port on the USB card.

Communication Protocol

Status information from the supported OutBack devices is provided using an ASCII protocol. This protocol allows for simple commands to be passed from the personal computer to an OutBack device using the MATE3.

The data streams sent from an inverter have a different content then those from a charge controller or FLEXnet DC battery monitor; however, the format is the same.

FX-Class Inverter Data Stream

This is the data stream generated for each FX-class inverter connected to the system. This includes all variants on the FX such as VFX, GTFX, GVFX, and so on.

- The data stream for each inverter is 52 characters long.
- An example is 00,2,00,00,00,119,000,00,00,000,01,254,008,000,033.
- The matrix in Table 1 and the list in Table 2 define the data stream by character. Specific descriptions for each category begin on page 5.

Table 1 Data Stream Matrix for FX-Class Inverters

	Start of Status Page	Port Address			separator	Device Type 2	separator	Inverter current		separator	Charger current		separator	Buy current		separator	AC input voltage			separator	AC output voltage			separator	Sell current		separator	Inverter operating mode		separator	Error codes			separator	AC mode		separator	Battery voltage			separator	Misc			separator	Warning codes			separator	Checksum			End of status page
ASCII code	10	X	X	44	50	44	X	X	44	X	X	44	X	X	44	X	X	X	44	X	X	X	44	X	X	44	X	X	44	X	X	44	X	X	44	X	X	X	44	X	X	X	44	X	X	X	44	X	X	X	13
Character	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52

Table 2 Data Stream Definitions for FX-Class Inverters

Character	Definition	Character	Definition
1	New Line character, ASCII (10). Denotes the start of the status page.	27	Tens digit of inverter operating mode.
2	Tens digit of Port number.	28	Units digit of inverter operating mode.
3	Units digit of Port number.	29	Comma, ASCII (44). Used as a data separator.
4	Comma, ASCII (44). Used as a data separator.	30	High digit of inverter Error status code.
5	Device type 2, ASCII (50). Indicates FX-class.	31	Middle digit of inverter Error status code.
6	Comma, ASCII (44). Used as a data separator.	32	Low digit of inverter Error status code.
7	Tens digit of Inverter current.	33	Comma, ASCII (44). Used as a data separator.
8	Units digit of Inverter current.	34	High digit of inverter AC mode.
9	Comma, ASCII (44). Used as a data separator.	35	Low digit of inverter AC mode.
10	Tens digit of Charger current.	36	Comma, ASCII (44). Used as a data separator.
11	Units digit of Charger current.	37	Tens digit of battery voltage.
12	Comma, ASCII (44). Used as a data separator.	38	Units digit of battery voltage.
13	Tens digit of Buy current.	39	Tenths digit of battery voltage.
14	Units digit of Buy current.	40	Comma, ASCII (44). Used as a data separator.
15	Comma, ASCII (44). Used as a data separator.	41	High byte of inverter Misc.
16	Hundreds digit of AC input voltage.	42	Middle byte of inverter Misc.
17	Tens digit of AC input voltage.	43	Low byte of inverter Misc.
18	Units digit of AC input voltage.	44	Comma, ASCII (44). Used as a data separator.
19	Comma, ASCII (44). Used as a data separator.	45	High digit of inverter Warning status code.
20	Hundreds digit of AC output voltage.	46	Middle digit of inverter Warning status code.
21	Tens digit of AC output voltage.	47	Low digit of inverter Warning status code.
22	Units digit of AC output voltage.	48	Comma, ASCII (44). Used as a data separator.
23	Comma, ASCII (44). Used as a data separator.	49	Hundreds digit of Checksum.
24	Tens digit of Sell current.	50	Tens digit of Checksum.
25	Units digit of Sell current.	51	Units digit of Checksum.
26	Comma, ASCII (44). Used as a data separator.	52	Carriage return, ASCII (13). Denotes the end of the status page.

Descriptions of Data Stream Items for the FX-Class Inverter

The items below describe each category shown in Table 1 and Table 2.

Port Number: Indicates the designation of the OutBack HUB port used by the inverter. The addresses will be 01 to 10 and will correspond to the appropriate numbered port. If the MATE3 is connected directly to the inverter without a HUB, this item will read 00.

Device Type: Indicates the presence of an FX-class inverter. This device type is always 2.

Inverter Current: Measures the AC current the inverter is delivering to loads from the batteries. The range is 00 to 99 in increments of 1 ampere.

Charger Current: Measures the AC current the inverter is taking from the AC input and delivering to the batteries. The range is 00 to 99 in 1-ampere increments.

Buy Current: Measures AC current the inverter is taking from the AC input and delivering to both the batteries and output loads. The range is 00 to 99 in 1-ampere increments.

AC Input Voltage: Measures the voltage at the inverter's AC input terminals. The range is 000 to 256 in 1-volt increments. If bit 1 of ***Misc*** is set, this number must be doubled. See the definition of ***Misc*** on page 7.

AC Output Voltage: Measures the voltage at the inverter's AC output terminals. The range is 000 to 256 in 1-volt increments. If bit 1 of ***Misc*** is set, then this number must be doubled. See the definition of ***Misc*** on page 7.

Sell Current: Measures the AC current the inverter is taking from the batteries and delivering to the AC input. The range is 00 to 99 in 1-ampere increments.

Inverter Operating Modes: Reports any of a variety of functions that can be performed by the inverter. The range is 00 to 99, although not all items are in use. Items and their corresponding modes are shown in Table 3.

Table 3 FX Inverter Operating Modes

Data	Mode
00	Inverter Off
01	Search
02	Inverter On
03	Charge
04	Silent
05	Float
06	Equalize
07	Charger Off
08	Support
09	Sell Enabled
10	Pass-through
90	Inverter Error
91	AGS Error
92	Comm Error

- ***Inverter Off***: The user has turned the inverting mode off and no other functions are active.
- ***Search***: The inverter is using the Search function of the inverting mode.
- ***Inverter On***: The inverter is powering loads with the inverting mode.
- ***Charge***: The inverter is using an AC source to charge the batteries.
- ***Silent***: The inverter is using an AC source, but has entered the quiescent period following a battery charging cycle.
- ***Float***: The inverter is using an AC source and is in the low-level maintenance stage of a battery charging cycle.
- ***Equalize***: The user has initiated equalization, a controlled overcharge for battery maintenance.
- ***Charger Off***: The user has manually turned the charging function off.
- ***Support***: The inverter is drawing power from the batteries to support an AC source which is running heavy loads.
- ***Sell Enabled***: A grid-interactive inverter is exporting more power then it has AC loads. This excess power flows out through the inverter's AC input. It is measured with the ***Sell Current*** meter (characters 24 and 25).
- ***Pass-through***: The inverter is transferring AC power from a source on its input to operate output loads. This mode is used by a grid-interactive inverter waiting for criteria to be met before it begins selling.
- ***Inverter Error***: The inverter has suffered a critical fault and has probably stopped functioning. Characters 30 to 32 show the nature of the error. (See ***Error Code*** and Table 4 on page 7.)
- ***AGS Error***: The MATE3 tried to automatically start the generator in Advanced Gen Start mode and failed, or the generator was successfully started by the MATE3, then stopped unexpectedly.
- ***Comm Error***: The inverter's control board is no longer communicating. The inverter may require repair.

EXAMPLE:

A grid-interactive inverter has a SellRE setting of 25.6 Vdc and 10 amps (1200 watts) of AC output load. DC sources contribute 480 watts to the battery. The inverter maintains the battery at 25.6 Vdc by converting the excess 480 watts of DC power to AC. The inverter mode displays ***Support*** with the ***Inverter Current*** meter showing 4 amps (480 watts) of production. The ***Buy Current*** would show 6 amps (720 watts), for 10 amps (1200 watts) of total AC load current. If the AC load was removed, the inverter would have ***Sell Enabled*** as the mode, and show 4 amps of ***Sell Current***.

Descriptions of Data Stream Items (continued)

Error Codes: This is an ASCII expression of an 8-bit byte, displayed in values ranging from 000 to 255. Each bit represents a different error as shown in Table 4. If more than one error occurs, the values are additive. For example, an overtemp error and backfeed error would return an ASCII value of 132 (a binary value of 10000100).

Table 4 FX Error Codes

Bit	Value	Error
1	1	Low Vac Output
2	2	Stacking Error
3	4	Over Temp
4	8	Low Battery
5	16	Phase Loss
6	32	High Battery
7	64	Shorted Output
8	128	Backfeed

AC Modes: This represents the status of the AC input. The range is 00 to 99, but only three states are in use as shown in Table 5. ***No AC*** means that no AC source has been detected by the inverter. ***AC Drop*** means that AC is present but the inverter is not allowed to accept it. ***AC Use*** means AC is present and valid, and the inverter will utilize it.

Table 5 FX AC Modes

Value	Mode
00	No AC
01	AC Drop
02	AC Use

Battery Voltage: The DC voltage as measured at the inverter's battery terminals. The range is 000 to 999, incorporating one decimal place. For example, a 24.8 Vdc battery voltage will be sent as '248'.
The resolution of battery voltage is 0.1 Vdc for 12-volt systems, 0.2 Vdc for 24-volt systems, and 0.4 Vdc for 48-volt systems.

Misc Byte: This is an ASCII expression of an 8-bit byte, displayed in values ranging from 000 to 255. Each bit represents a different condition.

Only two of the bits are used at this time (see Table 6). Bit 1 indicates an inverter with greater than 200 Vac output. If this bit is set, then AC input and output voltages must be multiplied by two *and all currents must be divided by two*. Bit 8 indicates the status of the inverter's AUX output. If it is set, the AUX output is active.

Items labeled "Reserved by inverter" change without notice and are intentionally not published by OutBack.

Table 6 FX Misc Byte

Bit	Value	Error
1	1	230 Vac unit
2	2	Reserved by inverter
3	4	Reserved by inverter
4	8	Reserved by inverter
5	16	Reserved by inverter
6	32	Reserved by inverter
7	64	Reserved by inverter
8	128	AUX output ON

Warning Codes: This is an ASCII expression of an 8-bit byte, displayed in values ranging from 000 to 255. Each bit represents a different warning as shown in Table 7. If more than one warning occurs, the values are additive. For example, a low AC input voltage and low AC input frequency would return an ASCII value of 10 (a binary value of 00001010).

Table 7 FX Warning Codes

Bit	Value	Warning
1	1	AC Input Freq High
2	2	AC Input Freq Low
3	4	Input Vac High
4	8	Input Vac Low
5	16	Buy Amps > Input size
6	32	Temp Sensor Failed
7	64	Comm Error*
8	128	Fan Failure

*For FX3048T inverters upgraded to firmware revision 67, bit 7 is assigned to "Shorted Relay Fault". This warning indicates a problem with the inverter's transfer relay.

Checksum: This is a simple additive checksum of the decimal values of the data stream. Range is 000 to 999.

EXAMPLE:

- 00,2,00,00,00,119,000,00,00,000,01,254,008,000,033
- 0+0+2+0+0+0+0+0+0+1+1+9+0+0+0+0+0+0+0+0+0+0+0+1+2+5+4+0+0+8+0+0+0=033
- 01,2,00,00,00,120,000,00,02,000,01,254,008,000,028
- 0+1+2+0+0+0+0+0+0+1+2+0+0+0+0+0+0+0+2+0+0+0+0+1+2+5+4+0+0+8+0+0+0=028

Radian-Class Inverter Data Stream

This is the data stream generated for each "Radian-class" inverter connected to the system. (This includes all variations of the GS inverter.)

- The data stream for each inverter is 80 characters long.
- An example is 00,6,00,00,00,00,119,000,119,00,00,00,00,121,000,121,04,000,02,554,000,000,056.
- The matrix in Table 8 and the list in Table 9 define the data stream by character. Specific descriptions for each category begin on page 11.

Table 8 Data Stream Matrix for Radian-Class Inverters

	Start of Status Page	Port Address		separator	Device Type 6	separator	L1 Inverter current		separator	L1 Charger current		separator	L1 Buy current		separator	L1 Sell current		separator	L1 Grid input voltage			separator	L1 Generator input voltage			separator	L1 output voltage			separator	L2 Inverter current		separator	L2 Charger current		separator	L2 Buy current		separator	L2 Sell Current
ASCII code	10	X	X	44	54	44	X	X	44	X	X	44	X	X	44	X	X	44	X	X	X	44	X	X	X	44	X	X	X	x	X	X	44	X	X	44	X	X	44	X	X
Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40

	L2 Sell Current	separator	L2 Grid input voltage			separator	L2 Generator input voltage			separator	L2 output voltage			separator	Inverter operating mode		separator	Error codes			separator	AC mode		separator	Battery voltage			separator	Misc			separator	Warning codes			separator	Checksum			End of status page
ASCII code	X	44	X	X	X	X	X	X	X	44	X	X	X	44	X	X	44	X	X	X	44	X	X	44	X	X	X	44	X	X	X	44	X	X	X	44	X	X	X	13
Char.	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Table 9 Data Stream Definitions for Radian-Class Inverters

Character	Definition	Character	Definition
1	New Line character, ASCII (10). Denotes the start of the status page.	41	Units digit of Sell current on line L2.
2	Tens digit of Port number.	42	Comma, ASCII (44). Used as a data separator.
3	Units digit of Port number.	43	Hundreds digit of AC output voltage on line L2.
4	Comma, ASCII (44). Used as a data separator.	44	Tens digit of AC output voltage on line L2.
5	Device type 6, ASCII (54). Indicates Radian-class.	45	Units digit of AC output voltage on line L2.
6	Comma, ASCII (44). Used as a data separator.	46	Comma, ASCII (44). Used as a data separator.
7	Tens digit of Inverter current on line L1.	47	Hundreds digit of AC input voltage on grid L2.
8	Units digit of Inverter current on line L1.	48	Tens digit of AC input voltage on grid L2.
9	Comma, ASCII (44). Used as a data separator.	49	Units digit of AC input voltage on grid L2.
10	Tens digit of Charger current on line L1.	50	Comma, ASCII (44). Used as a data separator.
11	Units digit of Charger current on line L1.	51	Hundreds digit of AC output voltage on line L2.
12	Comma, ASCII (44). Used as a data separator.	52	Tens digit of AC output voltage on line L2.
13	Tens digit of Buy current on line L1.	53	Units digit of AC output voltage on line L2.
14	Units digit of Buy current on line L1.	54	Comma, ASCII (44). Used as a data separator.
15	Comma, ASCII (44). Used as a data separator.	55	Tens digit of inverter operating mode.
16	Tens digit of Sell current on line L1.	56	Units digit of inverter operating mode.
17	Units digit of Sell current on line L1.	57	Comma, ASCII (44). Used as a data separator.
18	Comma, ASCII (44). Used as a data separator.	58	High digit of inverter Error code.
19	Hundreds digit of AC input voltage on grid L1.	59	Middle digit of inverter Error code.
20	Tens digit of AC input voltage on grid L1.	60	Low digit of inverter Error code.
21	Units digit of AC input voltage on grid L1.	61	Comma, ASCII (44). Used as a data separator.
22	Comma, ASCII (44). Used as a data separator.	62	High digit of inverter AC mode.
23	Hundreds digit of AC input voltage on generator L1.	63	Low digit of inverter AC mode.
24	Tens digit of AC input voltage on generator L1.	64	Comma, ASCII (44). Used as a data separator.
25	Units digit of AC input voltage on generator L1.	65	Tens digit of battery voltage.
26	Comma, ASCII (44). Used as a data separator.	66	Units digit of battery voltage.
27	Hundreds digit of AC output voltage on line L1.	67	Tenths digit of battery voltage.
28	Tens digit of AC output voltage on line L1.	68	Comma, ASCII (44). Used as a data separator.
29	Units digit of AC output voltage on line L1.	69	High digit of inverter Misc.
30	Comma, ASCII (44). Used as a data separator.	70	Middle digit of inverter Misc.
31	Tens digit of Inverter current on line L2.	71	Low digit of inverter Misc.
32	Units digit of Inverter current on line L2.	72	Comma, ASCII (44). Used as a data separator.
33	Comma, ASCII (44). Used as a data separator.	73	High digit of inverter Warning code.
34	Tens digit of Charger current on line L2.	74	Middle digit of inverter Warning code.
35	Units digit of Charger current on line L2.	75	Low digit of inverter Warning code.
36	Comma, ASCII (44). Used as a data separator.	76	Comma, ASCII (44). Used as a data separator.
37	Tens digit of Buy current on line L2.	77	Hundreds digit of Chksum.
38	Units digit of Buy current on line L2.	78	Tens digit of Chksum.
39	Comma, ASCII (44). Used as a data separator.	79	Units digit of Chksum.
40	Tens digit of Sell current on line L2.	80	Carriage return, ASCII (13). Denotes the end of the status page.

Descriptions of Data Stream Items for the Radian-Class Inverter

The items below describe each category shown in Table 8 and Table 9.

Port Number: Indicates the designation of the OutBack HUB port used by the inverter. The addresses will be 01 to 10 and will correspond to the appropriate numbered port. If the MATE3 is connected directly to the inverter without a HUB, this item will read 00.

Device Type: Indicates the presence of a Radian-class inverter. This device type is always 6.

Inverter Current: Measures the AC current the inverter is delivering to loads from the batteries. The range is 00 to 99 in increments of 1 ampere.

Charger Current: Measures the AC current the inverter is taking from the AC input and delivering to the batteries. The range is 00 to 99 in increments of 1 ampere.

Buy Current: Measures AC current the inverter is taking from the AC input and delivering to both the batteries and output loads. The range is 00 to 99 in 1-ampere increments.

Grid Input Voltage: Measures the voltage at the inverter's AC input terminals labeled **GRID**. This data is for both the L1 and L2 input lines in separate portions of the data stream. On each line, the range is 000 to 256 in 1-volt increments. When Bit 8 of ***Misc Byte*** is set, this number must be doubled. See ***Misc Byte*** on page 12.

Generator Input Voltage: Measures the voltage at the inverter's AC input terminals labeled **GEN**. This data is for both the L1 and L2 input lines in separate portions of the data stream. On each line, the range is 000 to 256 in 1-volt increments. When Bit 8 of ***Misc Byte*** is set, this number must be doubled. See ***Misc Byte*** on page 12.

AC Output Voltage: Measures the voltage at the inverter's AC output terminals. This data is listed for both the L1 and L2 inputs in separate data stream sections. The range on each line is 000 to 256 in 1-volt increments.

Sell Current: Measures the AC current the inverter is taking from the batteries and delivering to the AC input. The range is 00 to 99 in 1-ampere increments.

Inverter Operating Modes: Reports any of a variety of functions that can be performed by the inverter. The range is 00 to 99, although not all items are in use. Items and corresponding modes are shown in Table 10.

- ***Inverter Off***: The user has turned the inverting mode off and no other functions are active.
- ***Search***: The inverter is using the Search function of the inverting mode.
- ***Inverter On***: The inverter is powering loads with the inverting mode.
- ***Charge***: The inverter is using an AC source to charge the batteries.
- ***Silent***: The inverter is using an AC source, but has entered the quiescent period following a battery charging cycle.
- ***Float***: The inverter is using an AC source and is in the low-level maintenance stage of a battery charging cycle.
- ***Equalize***: The user has initiated equalization, a controlled overcharge for battery maintenance.
- ***Charger Off***: The user has manually turned the charging function off.
- ***Support***: The inverter is drawing power from the batteries to support an AC source which is running heavy loads.
- ***Sell Enabled***: A grid-interactive inverter is exporting more power than it has AC loads. This excess power is flowing out through the inverter's AC input. It is measured with the ***Sell Current*** meter (characters 24 and 25).
- ***Pass-through***: The inverter is transferring AC power from a source on its input to operate loads on the output. This mode is the result of a grid-interactive inverter waiting for criteria to be met before it begins selling.
- ***Slave Inverter On*** (or ***Off***): The master inverter has turned a (parallel-stacked) unit on (or off) due to conditions.
- ***Offset***: The inverter is offsetting use of the AC source by using excess DC power to run loads.
- ***Inverter Error***: The inverter has suffered a critical fault and has probably stopped functioning. Characters 58 to 60 show the nature of the error. (See ***Error Codes*** and Table 11 on page 12.)

Table 10 Radian Operating Mode

Data	Mode
00	Inverter Off
01	Search
02	Inverter On
03	Charge
04	Silent
05	Float
06	Equalize
07	Charger Off
08	Support
09	Sell Enabled
10	Pass-through
11	Slave Inverter On
12	Slave Inverter Off
14	Offset
90	Inverter Error
91	AGS Error
92	Comm Error

- ***AGS Error***: The MATE3 tried to automatically start the generator in Advanced Gen Start mode and failed. This error will also occur if the generator was successfully started by the MATE3, then stopped unexpectedly.
- ***Comm Error***: The inverter's control board is no longer communicating with the MATE3. The inverter may require repair.

EXAMPLE:

A grid-interactive inverter has a ***SellRE*** setting of 51.2 Vdc and 10 amps (1200 watts) of AC output load on L1. DC sources contribute 480 watts to the battery. The inverter maintains the battery at 51.2 Vdc by converting the excess 480 watts of DC power to AC. The inverter mode displays ***Support*** with the ***Inverter Current*** meter showing 4 amps (480 watts) of production. The ***Buy Current*** would show 6 amps (720 watts), for 600 watts of total AC load current. If the AC load was removed, the inverter would have ***Sell Enabled*** as the mode and show 4 amps of ***Sell Current***.

Descriptions of Data Stream Items (continued)

Error Codes: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Each bit represents a different error as shown in Table 11. If more than one error occurs, the values are additive. For example, an overtemp error and backfeed error would return an ASCII value of 132 (a binary value of 1000100).

AC Mode: This represents the status of the AC input. The range is 00 to 99, but only three states are in use as shown in Table 12. ***No AC*** means that no AC source has been detected by the inverter. ***AC Drop*** means that AC is present but the inverter is not allowed to accept it. ***AC Use*** means AC is present and valid, and the inverter will utilize it.

Battery Voltage: The DC voltage as measured at the inverter's battery terminals. The range is 000 to 999, incorporating one decimal place. For example, a 24.8 Vdc battery voltage will be sent as '248'. The resolution of battery voltage is 0.4 Vdc for 48-volt systems.

Misc Byte: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Only certain bits are in use at this time. Each bit represents a different condition. Bit 7 indicates the AC input that is presently in use. (AC1 is the Radian input labeled **GRID**. AC2 is the input labeled **GEN**.) Bit 8 indicates the Radian inverter's nominal output voltage. As noted on page 11, when this bit is set, the input voltage readings from Table 9 must be multiplied by two.

Items labeled "Reserved by inverter" change without notice and are intentionally not published by OutBack.

Warning Codes: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Each bit represents a different warning as shown in Table 14. If more than one warning occurs, the values are additive. For example, a low AC input voltage and low AC input frequency would return an ASCII value of 010 (a binary value of 00001010).

Checksum: This is a simple additive checksum of the decimal values of the data stream. Range is 000 to 999.

EXAMPLE:

- 00,6,00,00,00,00,119,000,119,00,00,00,00,121,000,121,04,000,02,554,000,000,056
- 0+0+6+0+0+0+0+0+0+0+0+1+1+9+0+0+0+1+1+9+0+0+0+0+0+0+0+0+1+2+1+0+0+0+1+2+1+0+4+0+0+0+0+2+5+5+4+0+0+0+0+0+0=056

Table 11 Radian Error Codes

Bit	Value	Error
1	1	Low Vac Output
2	2	Stacking Error
3	4	Over Temp.
4	8	Low Battery
5	16	Comm Fault
6	32	High Battery
7	64	Shorted Output
8	128	Backfeed

Table 12 Radian AC Modes

Value	Mode
00	No AC
01	AC Drop
02	AC Use

Table 13 Radian Misc Byte

Bit	Value	Error
1	1	Reserved by inverter
2	2	Reserved by inverter
3	4	Reserved by inverter
4	8	Reserved by inverter
5	16	AUX output ON
6	32	Relay output ON
7	64	1 = AC 2 selected 0 = AC 1 selected
8	128	1 = 230 Vac inverter 0 = 120 Vac inverter

Table 14 Radian Warning Codes

Bit	Value	Warning
1	1	AC Input Freq High
2	2	AC Input Freq Low
3	4	Input Vac High
4	8	Input Vac Low
5	16	Buy Amps > Input size
6	32	Temp Sensor Failed
7	64	Phase Loss
8	128	Fan Failure

Charge Controller Data Stream

This is the data stream generated for each OutBack charge controller connected to the system.

- The data stream for each charge controller is 52 characters long.
- An example is 00,3,00,08,06,034,031,00,05,000,02,262,000,000,045.
- The items shown in Table 15 define the data stream by character. Specific descriptions for each category begin on page 14.

Table 15 Data Stream Matrix for Charge Controller

	Start of Status Page	Port Address		separator	Device Type 3	separator	unused		separator	Charger current		separator	PV current		separator	PV voltage			separator	Daily kilowatt-hours			separator	Charger current tenths	separator	AUX mode		separator	Error codes			separator	Chager mode		separator	Battery voltage			separator	Daily amp-hours				separator	unused		separator	Checksum			End of status page
ASCII code	10	X	X	44	51	44	48	48	44	X	X	44	X	X	44	X	X	X	44	X	X	X	44	48	X	44	X	X	44	X	X	X	44	X	X	44	X	X	X	44	X	X	X	X	44	48	48	44	X	X	X	13
Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52

Character	Definition
1	New Line character, ASCII (10). Denotes the start of the status page.
2	Tens digit of Port number.
3	Units digit of Port number.
4	Comma, ASCII (44). Used as a data separator.
5	Device type 3, ASCII (51). Indicates charge controller.
6	Comma, ASCII (44). Used as a data separator.
7	Unused, ASCII (48).
8	Unused, ASCII (48).
9	Comma, ASCII (44). Used as a data separator.
10	Tens digit of Charger current.
11	Units digit of Charger current.
12	Comma, ASCII (44). Used as a data separator.
13	Tens digit of PV current.
14	Units digit of PV current.
15	Comma, ASCII (44). Used as a data separator.
16	Hundreds digit of PV input voltage.
17	Tens digit of PV input voltage.
18	Units digit of PV input voltage.
19	Comma, ASCII (44). Used as a data separator.
20	Tens digit of daily kilowatt-hour harvest.
21	Units digit of daily kilowatt-hour harvest.
22	Tenths digit of daily kilowatt-hour harvest.
23	Comma, ASCII (44). Used as a data separator.
24	Unused, ASCII (48).
25	Tenths digit of Charger current (not used on MX60).
26	Comma, ASCII (44). Used as a data separator.
27	High digit of AUX mode.
28	Low digit of AUX mode.
29	Comma, ASCII (44). Used as a data separator.
30	High digit of charge controller Fault code.
31	Middle digit of charge controller Fault code.
32	Low digit of charge controller Fault code.
33	Comma, ASCII (44). Used as a data separator.
34	High digit of Charger mode.
35	Low digit of Charger mode.
36	Comma, ASCII (44). Used as a data separator.
37	Tens digit of battery voltage.
38	Units digit of battery voltage.
39	Tenths digit of battery voltage.
40	Comma, ASCII (44). Used as a data separator.
41	Thousands digit of daily amp-hour accumulation.
42	Hundreds digit of daily amp-hour accumulation.
43	Tens digit of daily amp-hour accumulation.
44	Units digit of daily amp-hour accumulation.
45	Comma, ASCII (44). Used as a data separator.
46	Unused, ASCII (48).
47	Unused, ASCII (48).
48	Comma, ASCII (44). Used as a data separator.
49	Hundreds digit of Checksum.
50	Tens digit of Checksum.
51	Units digit of Checksum.
52	Carriage return, ASCII (13). Denotes the end of the status page.

Descriptions of Data Stream Items for the FLEXmax CC

Port Number: Indicates the designation of the OutBack HUB port used by the charge controller. The addresses will be 01 to 10 and will correspond to the appropriate numbered port. If the MATE3 is connected directly to the charge controller without a HUB, this item will read 00.

Device Type: Indicates the presence of an OutBack charge controller of any model. This device type is always 3.

Charger Current: Measures the DC current delivered from the controller output to the batteries. The range is 00 to 99 in increments of 1 ampere. (A separate item measures tenths of an amp. The MX60 controller does not use this item.)

PV Current: Measures the DC current delivered from the PV array to the charge controller's input. The range is 00 to 99 in increments of 1 ampere.

PV Input Voltage: The DC voltage as measured at the charge controller's input (PV) terminals. The range is 000 to 255 in increments of 1 volt.

Daily Kilowatt-Hours: The kilowatt-hours harvested by the controller that day. The range is 000 to 999, incorporating one decimal place. For example, a harvest of 55.5 kilowatt-hours will be sent as '555'. This number is reset to zero any time the controller undergoes its wakeup procedure, or every 24 hours.

AUX Modes: The current operating mode for the charge controller's auxiliary terminals. (See Table 16.) The range is 00 to 99. (The MX60 controller only uses the first six modes on the list.) When the AUX output becomes active, the 7th bit in each byte is set, adding 64 to the value. Hence, values below 63 indicate the selected AUX mode, while values above 63 also show that it is active.

Table 16 CC AUX Modes

Data	With Bit 7	Mode
00	64	Disabled
01	65	Diversion
02	66	Remote
03	67	Manual
04	68	Vent Fan
05	69	PV Trigger
06	70	Float
07	71	Fault Output
08	72	Night Light
09	73	PWM Diversion
10	74	Low Battery

Fault Codes: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Each bit represents a different fault as shown in Table 17. For example, a shorted battery sensor would return an ASCII value of 32 (a binary value of 00100000). Only certain bits are used.

- In MX60 controllers, this is only valid with firmware above revision 5.11.
- In FLEXmax Extreme controllers, bits 4 and 5 (values 8-16) are in use. Bit 4 represents the Fault Input Active error. Bit 5 is the Over Temperature error.)

Table 17 CC Fault Codes

Bit	Value	Warning
1-5	1-16	Unused (see note for FLEXmax Extreme)
6	32	Shorted battery sensor
7	64	Too hot
8	128	High VOC

Charger Mode: Reports the charge controller's present status in a three-stage charge cycle. The range is 00 to 99, although not all items are in use. Items and their corresponding modes are shown in Table 18.

- ***Silent***: The controller has entered the quiescent period following a charging cycle.
- ***Float***: The controller is in a low constant-voltage charge, the last stage of a charging cycle.
- ***Bulk***: The controller is in a constant-current charge, the beginning stage of a charging cycle.
- ***Absorb***: The controller is in a high constant-voltage charge, the middle stage of a charging cycle.
- ***Equalize***: The controller is running equalization, a controlled overcharge for battery maintenance.

Table 18 CC Charger Modes

Data	Mode
00	Silent
01	Float
02	Bulk
03	Absorb
04	Equalize

Battery Voltage: The DC voltage as measured at the charge controller's battery terminals. The range is 000 to 999, incorporating one decimal place. For example, a 24.8 Vdc battery voltage will be sent as '248'.

Daily AH: The daily total of amp-hours delivered to the batteries by the charge controller. Range is 0000 to 2000. The number is reset to zero at midnight. This item is not valid for the MX60 controller; '9999' will be returned.

Checksum: This is a simple additive checksum of the decimal values of the Status page. Range is 000 to 999.

EXAMPLE:

- 00,3,00,08,06,034,031,00,05,000,02,262,000,000,045
- 0+0+3+0+0+0+8+0+6+0+3+4+0+3+1+0+0+0+5+0+0+0+0+2+2+6+2+0+0+0+0+0+0=045

FLEXnet DC Data Stream

This is the data stream generated for a FLEXnet DC (FN-DC) battery monitor connected to the system.

- The data stream for the FLEXnet DC is 52 characters long.
- An example is 0,4,0000,0126,0000,02,00023,287,099,001,00,33,062.
- The matrix in Table 19 and the list in Table 20 define the data stream by character.
- Specific descriptions for each category begin on page 15.

Table 19 Data Stream Matrix for FLEXnet DC Battery Monitor

	Start of Status Page	Port Address	separator	Device Type 4	separator	Shunt A Amps	separator	Shunt B Amps	separator	Shunt C Amps	separator	Extra Data Identifier	separator	Extra Data	separator	Battery Voltage	separtator	State of Charge	separator	Shunt 1 Enable	Shunt 2 Enable	Shunt 3 Enable	separator	Status Flags	separator	Battery Temperature	separator	Checksum	End of status page
ASCII code	10	X	X	44	52	44	X	X	X	X	44	X	X	X	X	44	X	X	X	X	44	X	X	X	X	44	X	X	X	44	X	X	X	X	44	X	X	X	X	44	X	X	X	13
Char.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52

Table 20 Data Stream Definitions for FLEXnet DC Battery Monitor

Character	Definition	Character	Definition
1	New Line character, ASCII (10). Denotes the start of the status page.	27	Hundreds digit of extra data identifier.
2	Tens digit of Port number.	28	Tens digit of extra data identifier.
3	Units digit of Port number.	29	Units digit of extra data identifier.
4	Comma, ASCII (44). Used as a data separator.	30	Comma, ASCII (44). Used as a data separator.
5	Device type 4, ASCII (52). Indicates battery monitor.	31	Tens digit of battery voltage.
6	Comma, ASCII (44). Used as a data separator.	32	Units digit of battery voltage.
7	Hundreds digit of Shunt A current.	33	Tenths digit of battery voltage.
8	Tens digit of Shunt A current.	34	Comma, ASCII (44). Used as a data separator.
9	Units digit of Shunt A current.	35	Hundreds digit of battery state of charge percentage.
10	Tenths digit of Shunt A current.	36	Tens digit of battery state of charge percentage.
11	Comma, ASCII (44). Used as a data separator.	37	Units digit of battery state of charge percentage.
12	Hundreds digit of Shunt B current.	38	Comma, ASCII (44). Used as a data separator.
13	Tens digit of Shunt B current.	39	Enable flag for Shunt A.
14	Units digit of Shunt B current.	40	Enable flag for Shunt B.
15	Tenths digit of Shunt B current.	41	Enable flag for Shunt C.
16	Comma, ASCII (44). Used as a data separator.	42	Comma, ASCII (44). Used as a data separator.
17	Hundreds digit of Shunt C current.	43	High digit of status flag.
18	Tens digit of Shunt C current.	44	Low digit of status flag.
19	Units digit of Shunt C current.	45	Comma, ASCII (44). Used as a data separator.
20	Tenths digit of Shunt C current.	46	Tens digit of battery temperature.
21	Comma, ASCII (44). Used as a data separator.	47	Units digit of battery temperature.
22	Tens digit of extra data identifier.	48	Comma, ASCII (44). Used as a data separator.
23	Units digit of extra data identifier.	49	Hundreds digit of Checksum.
24	Comma, ASCII (44). Used as a data separator.	50	Tens digit of Checksum.
25	Ten thousands digit of extra data identifier.	51	Units digit of Checksum.
26	Thousands digit of extra data identifier.	52	Carriage return, ASCII (13). Denotes the end of the status page.

Descriptions of Data Stream Items for the FLEXnet DC

Port Number: Indicates the designation of the OutBack HUB port used by the FLEXnet DC. The addresses will be 01 to 10 and will correspond to the appropriate numbered port.

Device Type: Indicates the presence of a FLEXnet DC battery monitor. This device type is always 4.

Shunt Current: Measures the DC current delivered across a specified shunt. The range is 0009 to 9999, incorporating one decimal place. For example, a current of 112.3 amps will be sent as '1123'. Separate character strings report the status of up to three shunts (A, B, and C), if present).

Extra Data Identifier: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Bits 1 through 7 are the only bits used in the string. The 8th bit is not used. The full range of numbers is also not used.

FLEXnet DC Battery Voltage: The DC voltage as measured at the batteries by the FLEXnet DC's sense wires. The range is 000 to 999, incorporating one decimal place. For example, a voltage of 24.8 Vdc will be sent as '248'.

Battery State of Charge: The state of charge as determined by the programmed parameters of the FLEXnet DC. The range is 0 to 100 percent.

Shunt Enable Flags: Indicates whether shunts A through C are enabled (a state of 0) or disabled (a state of 1).

Status Flags: This is an ASCII expression of an 8-bit binary string, displayed in values ranging from 000 to 255. Each bit is a flag for a different function as shown in Table 22.

Relay State indicates whether the function has been set to manual mode (a state of 0) or automatic mode (a state of 1).

Relay Mode indicates whether the AUX relay is open (a state of 0) or closed (a state of 1).

EXAMPLE: A returned value of 009 would indicate that the FLEXnet DC charge parameters have been met and that the values are negative for Shunt 1.

Battery Temperature: The temperature of the batteries as reported by the Remote Temperature Sensor (RTS). The range is 00 to 70. This represents a range of degrees Celsius that is ten less than the value shown. The result is a range of –10°C to 60°C. A value of 99 indicates that no RTS is installed.

Table 21 Extra Data Identifier for FN-DC

Bit: 7	extra data numeric sign
0:	positive value
1:	negative value
Bits: 1-6	
0:	Accumulated AH[1] shunt 'A'
1:	Accumulated kWH[2] shunt 'A'
2:	Accumulated AH shunt 'B'
3:	Accumulated kWH[2] shunt 'B'
4:	Accumulated AH shunt 'C'
5:	Accumulated kWH[2] shunt 'C'
6:	Days since full[3]
7:	Today's minimum SOC[4]
8:	Today's net input AH[1]
9:	Today's net output AH[1]
10:	Today's net input kWH[2]
11:	Today's net output KWH[2]
12:	[5]Charge factor corrected Net battery AH[1]
13:	[5]Charge factor corrected Net battery kWH[2]
14-35:	Reserved

[1]AH values: 00000 to 65535 (0 to 65535 amp-hours)
[2]kWH values: 00000 to 65535 (000.00 to 655.35 kilowatt-hrs.)
[3]Days since full output: 00000 to 09999 (0.0 to 999.9)
[4]Minimum SOC output: 00000 to 00100 (0 to 100 percent)

[5]MATE version 4.04 and above

Table 22 Status Flag

Bit	Value	Status
1	1	Charge parms met
2	2	Relay State
3	4	Relay Mode
4	8	Shunt A values are negative
5	16	Shunt B values are negative
6	32	Shunt C values are negative

Checksum: '000' to '999'. This is a simple additive checksum of the decimal values of the Status page.

EXAMPLE:

- 00,4,0000,0126,0000,02,00023,287,099,001,00,33,062
- 0+0+4+0+0+0+0+0+1+2+6+0+0+0+0+0+2+0+0+0+2+3+2+8+7+0+9+9+0+0+1+0+0+3+3=062

Commands

The MATE3 serial commands are text based, using a command and response method. For each command, there is a corresponding response.

- Commands start with a "<" and end with a ">".
- Responses start with a " [" and end with a "] ".

Example:

- PC sends the command <INV:1> (enable search mode).
- The MATE3 responds with [INV:1].

If the serial data stream is enabled, the response will be inserted between output lines of device status data. The PC commands will operate if the serial data stream is disabled.

NOTE: Bulk, Absorption, and Float commands are universal commands sent to all ports. They cannot be sent to individual devices. If a more extensive or flexible command set is needed, the OutBack AXS Port Modbus Interface is recommended. (The AXS Port, however, can only send individual commands and not universal ones.)

Table 23 Command/Response Definitions

Command	Response	
<INV:0>	Inverter Off [INV:0]	
<INV:1>	Search enabled [INV:1]	
<INV:2>	Inverter On [INV:2]	
<INV:?>	Returns current INV mode [INV:n]	n = 0-2
<AC:0>	AC Drop [AC:0]	
<AC:1>	AC Use [AC:1]	
<AC:?>	Returns current AC input mode [AC:n]	n = 0,1
<AUXON:p>	Returns AUX On state for port [AUXON:P,1] p = port 0-10	
<AUXOFF:p>	Returns AUX Off state for port[AUXOFF:P,0] p = port 0-10	
<AUX:p>	Returns AUX state for port [AUX:p,s]	p = port 0-10 s = state 0=Off 1=On
<GEN:0>	Manual OFF Generator, if AGS is enabled [GEN:0]	
<GEN:1>	Manual ON Generator, if AGS is enabled [GEN:1]	
<GEN:2>	Auto Generator, if AGS is enabled [GEN:2]	
<GEN:?>	Returns current state of generator [GEN:s]	s = state 0=Off 1=On 2= Auto
<HBX:0>	Set HBX disabled [HBX:0]	
<HBX:1>	Set HBX mode to voltage [HBX:1]	
<HBX:2>	Set HBX mode to SOC [HBX:2]	
<HBX:3>	Set HBX mode voltage and SOC [HBX:3]	
<HBX:?>	Returns current HBX mode [HBX:s]	s = state 0=disabled 1=HBX mode voltage 2=HBX mode SOC 3 = HBX mode voltage and SOC
<SELL:0>	Set inverter Selling disabled [SELL:0]	
<SELL:1>	Set inverter Selling enabled [SELL:1]	
<SELL:?>	Returns current inverter sell mode [SELL:s]	s = state 0=disabled 1=enabled

Table 23 Command/Response Definitions

Command	Response	
<SELLV:nnn>	Sets inverter selling battery voltage [SELLV:nnn]	nn.n = selling voltage
<SELLV:+>	Increments inverter selling battery voltage [SELLV:+]	
<SELLV:->	Decrements inverter selling battery voltage [SELLV:-]	
<SELLV:?>	Returns the selling voltage [SELLV:nnn]	nn.n = selling voltage
<CHG:0>	Set the inverter's charger(s) off [CHG:0]	
<CHG:1>	Set the inverter's charger(s) auto [CHG:1]	
<CHG:2>	Set the inverter's charger(s) on [CHG:2]	
<CHG:?>	Returns current charger mode [CHG:m] for inverter	m = mode 0=Off 1=On 2=Auto
<CHGLM:nn>	Sets inverter's AC charger limit amps [CHGLM:nn]	nn = charger amps
<CHGLM:+>	Increments inverter's charger limit amps [CHGLM:+]	
<CHGLM:->	Decrements inverter's charger limit amps [CHGLM:-]	
<CHGLM:?>	Returns inverter's AC charger limit amps [CHGLM:nn]	nn = charger amps
<AC1INLM:nn>	Sets inverter's AC1 (**Grid** terminal) input limit amps [AC1INLM:nn]	nn = input amps
<AC1INLM:+>	Increments inverter's AC1 (**Grid** terminal) input limit amps [AC1INLM:+]	
<AC1INLM:->	Decrements inverter's AC1 (**Grid** terminal) input limit amps [AC1INLM:-]	
<AC1INLM:?>	Returns inverter's AC1 (**Grid** terminal) input limit amps [AC1INLM:nn]	nn = input amps
<AC2INLM:nn>	Sets inverter's AC2 (**Gen** terminal) input limit amps [AC2INLM:nn]	nn = input amps
<AC2INLM:+>	Increments inverter's AC2 (**Gen** terminal) input limit amps [AC2INLM:+]	
<AC2INLM:->	Decrements inverter's AC2 (**Gen** terminal) input limit amps [AC2INLM:-]	
<AC2INLM:?>	Returns inverter's AC2 (**Gen** terminal) input limit amps [AC2INLM:nn]	nn = input amps
<BULK:1>	Starts system wide bulk charge [BULK:1] (all ports)	
<BULK:2>	Stops system wide bulk charge, i.e. goto float [BULK:2] (all ports)	
<BULK:?>	Returns the current bulk charge state [BLK:s] (all ports)	s = state 2 =bulk charge stopped 1 =bulk charge enabled
<TEMP:p>	Returns inverter's internal temperatures [TEMP:p,F,C,X] All Radian series models return [TEMP:p,F,C,X,F,C,X], allowing for models with two power modules and dual readings. The first F, C, and X readings are for the left module. The others are for the right. Example <TEMP:p> returns [TEMP:1:25,27,20,26,27,28] **NOTE**: In Radian models with one module, the second F, C, and X readings are ignored.	p = port 0-10 F = FET temp in °C C = capacitor temp in °C X = transformer temp in °C
<BTEMP:?>	Returns battery temp value in degrees C [BTEMP:nnn]	nnn = degrees C, can be a negative value
<ABSORBV:nnn>	Sets system wide absorb voltage [ABSORBV:nnn] (all ports)	nn.n = absorb voltage
<ABSORBV:?>	Returns current system wide absorb voltage [ABSORBV:nnn] (all ports)	nn.n = absorb voltage
<ABSORBT:ttt>	Set system wide absorb time in tenths of hours [ABSORBT:ttt] (all ports)	ttt = absorb time
<ABSORBT:?>	Returns system wide absorb time in tenths of hours [ABSORBT:ttt] (all ports)	ttt = absorb time
<FLOATV:nnn>	Sets system wide float voltage [FLOATV:nnn] (all ports)	nn.n = float voltage
<FLOATV:?>	Returns current system wide float voltage [FLOATV:nnn] (all ports)	nn.n = float voltage
<FLOATT:ttt>	Set inverter's float time in tenths of hours [FLOATT:ttt] (all ports)	ttt = float time
<FLOATT:?>	Returns inverter's float time in tenth of hours [FLOATT:ttt] (all ports)	ttt = float time
<FIRM:p>	Returns firmware revision of software for device connected to port [FIRM:p,V1.V2.V3]	p = port
<FIRM3:?>	Returns MATE3 firmware revision [FIRM3:V1.V2.V3]	

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