

Guide To MATE3 Data Use

The introduction of the MATE3 operator and control panel for use with OutBack devices has not only expanded considerably the data available to OutBack users, but has also made the acquisition of that data much simpler through an SD memory card and remote access. The purpose of this Tech Note is to provide additional information to the MATE3 manual regarding the types of data available, how it could be used, and some additional steps to try if there is difficulty connecting your PC or other controller such as a PLC, to the MATE3.

The topics in this Tech Note are listed below.

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Things to try when having difficulty connecting your PC to the MATE3's Ethernet Port

If the instructions in the MATE3 manual for connecting between your PC and the MATE3's Ethernet port have not resulted in a successful communication link, then try the following steps.

Note: these instructions are for a PC running Windows XP or newer.

1. Open Network Connections
2. Highlight Local Area Connections and right click on Properties
3. Highlight Internet Protocol (TCP/IP) and click on Properties
4. Select, "Use the following IP address"
 - a. IP address 192.168.0.63 (must be different than MATE3)
 - b. Subnet mask 255.255.255.0 (must be the same as MATE3)
 - c. Default gateway 192.168.0.1 (must be the same as MATE3)
 - d. Leave the DNS server address blank and click OK
5. To test the connection:
 - a. Select "Command Prompt" from the Start Menu (could be called "Run" command)
 - b. Type: Ping 192.168.0.64
 - c. You should see the same number of packets received as sent.

Now be sure that the DHCP setting on the MATE3 is disabled using the following steps.

1. Press the MATE3's LOCK key.
2. Dial the User code to 141 and press the Select button.
3. Press the Select button with Settings highlighted on the Main Menu.
4. Press the Select button with System highlighted on the Settings Menu.
5. Scroll down the settings and highlight Ethernet Addresses and press the Select button.
6. Verify that DHCP is "Disabled"
7. If not, press the Select button and scroll through the settings until "Disabled" is displayed and then press the Select button.

Now open your Firefox or Chrome browser and type in: <http://192.168.0.64> and you should see the MATE3 generated web page.

About the data available through the MATE3's Ethernet Port

Once communication has been established with the MATE3, a variety of data becomes available to the user. The Ethernet connection on the back of the MATE3 will be the most common way to establish a hard-wired connection, but an optional RS-232 serial connection is also available. Complete information on the RS-232 ASCII status and control bytes can be found in the MATE Serial Communications Guide on the OutBack website, and won't be duplicated here.

Using a MATE3 compatible browser (presently Firefox and Chrome, but not Internet Explorer), you can receive the status information of all OutBack HUB-connected devices using the following HTTP command example: <http://192.168.0.64/>

By default, the Index.htm file sends a formatted web page to your browser that should look like the example below. This screen shows the main STATUS page, but the MODE, METERS, SETUP and SYSTEM pages can be navigated to by clicking those selections on the navigation bar at the top of the page.

The screenshot displays the 'Outback Test Configuration' web interface. At the top, there is a navigation bar with tabs for 'STATUS', 'MODE', 'METERS', 'SETUP', and 'SYSTEM'. The 'STATUS' tab is selected. Below the navigation bar, there are several sections:

- PV Output:** A dropdown menu set to 'Off'.
- Inverter Output:** An input field.
- Charger Output:** An input field.
- Inverter Input:** An input field.

The main content area is titled 'Status' and includes the following data:

- Battery:** 86 % charged, -0.5 ADC Current
- Battery Charge:**
 - Charge:
 - Battery State of Charge: 86 %
 - Min. today: 54 %
 - Days Since Full: 84.0 days
 - Net Battery Ah: -15 Ah
 - Net Battery kWh: -0.310 kWh
 - Current:
 - Channel A: -0.5 ADC
 - Channel B: 0.0 ADC
 - Total: -0.5 ADC
- Battery Voltage:**
 - Today:
 - Max: 27.3 VDC
 - Min: 23.3 VDC
 - Since Last Reset:
 - Max: 30.2 VDC
 - Min: 0.0 VDC

The application that creates the aforementioned web page and collects the data can be viewed using the following HTTP GET command: <http://192.168.0.64/app.js> This programming information could be useful as a reference for extracting data from the MATE3 using a custom user program.

The data can also be accessed using a CGI script that returns an ASCII file with much of the same data, but not in web page format. An example using a local IP address would look like: http://192.168.0.64/Dev_status.cgi?&Port=0 A zero value for Port returns all of the HUB connected device data, or if data for only one particular device is wanted, then specify the port number for that device instead of zero. A sample data file is shown below:

```

{"devstatus": {
  "Sys_Time": 1312982830,
  "Sys_Batt_V": 24.5,
  "ports": [

    { "Port": 1, "Dev": "FX", "Type": "120V", "Inv_I": 0, "Chg_I": 0, "Buy_I": 0, "Sell_I": 0, "VAC_in":
    0, "VAC_out": 119, "Batt_V": 24.8, "AC_mode": "NO AC", "INV_mode": "Inverting", "Warn":
    ["none"], "Error": ["none"], "AUX": "disabled"},

    { "Port": 2, "Dev": "CC", "Type": "FM", "Out_I": 0.0, "In_I": 0, "Batt_V": 24.8, "In_V": 1.2, "Out_kWh":
    0.0, "Out_AH": 0, "CC_mode": "Silent", "Error": ["none"], "Aux_mode": "Manual", "AUX": "disabled"},

    { "Port": 3, "Dev": "FNDC", "Enabled": ["A", "B"], "Shunt_A_I": -4.2, "Shunt_A_AH": -
    3, "Shunt_A_kWh": -0.060, "Shunt_B_I": 0.0, "Shunt_B_AH": 0, "Shunt_B_kWh": 0.000, "SOC":
    98, "Min_SOC": 97, "Days_since_full": 92.1, "CHG_parms_met": false, "In_AH_today":
    6, "Out_AH_today": 7, "In_kWh_today": 0.160, "Out_kWh_today": 0.170, "Net_CFC_AH": -
    2, "Net_CFC_kWh": -0.060, "Batt_V": 24.5, "Batt_temp": "23 C", "Aux_mode": "auto", "AUX":
    "disabled"}
  ]}

```

Using Port Forwarding to access MATE3 data remotely

For remote access, our MATE3 can be hardware connected from it's Ethernet port to a router's Ethernet port, with port forwarding enabled (details on page 26 of our MATE3 manual available for download on our website). The router in turn has a static IP address associated with it. Our MATE3 broadcasts available status information once a second to the forwarded port that can be accessed using the HTTP CGI script command shown above.

When to use Save & Restore Auto-Config versus Save & Restore existing settings

The MATE3 Configuration Wizard is a great tool for new users unfamiliar with OutBack devices and/or the MATE3 to get a system configured with the basic settings (see page 119 in the MATE3 manual for detailed instructions). These settings include: the System Voltage, Array Watts, Battery Type & Capacity; the Absorb, Float, Equalize Re-Float voltage and duration settings, The AC In/Out, Phase and Load settings, as well as basic Generator and Battery Monitor settings. The MX60 Charge Controller cannot be configured remotely so this will have to be done directly on its user interface.

The Configuration Wizard settings can then be saved at the end of the auto-configuration. The settings can be restored later by pressing the LOCK button (enter the 141 password if required), Main Menu, Configuration Wizard, then Restore Configuration. The file is in a binary format that cannot be edited, but can be given a filename of the user's choice. These settings can then be used as a recipe for configuring other similar systems. It should be noted that the Configuration Wizard does not walk the user through all of the setup parameters and some site specific requirements may require additional setup changes that differ from the factory default settings. Once a complete system is configured – inverters, charge controllers, battery monitors plus any MATE3 programming – those complete system settings can be saved using a *different* Setup and Restore Configuration that is found under the MATE3 LOCK button (enter the 141 password if required), Main Menu, Settings, System, Save/Restore Configuration (see page 74 in the MATE3 manual for detailed instructions). Unlike the Configuration Wizard BIN file, the system configuration XML file saves *all* of the settings on *all* of the OutBack devices connected to the HUB, including any programming that resides in the MATE3.

How To Change The CONFIG.XML File Remotely

Unlike the BIN Configuration Wizard file, the XML configuration file can be viewed and even edited. This can be extremely useful for remote troubleshooting of an OutBack system as the XML file can be emailed to the system designer or OutBack Tech Support and viewed for discrepancies. This shortens troubleshooting time considerably and more reliably when compared to navigating the MATE's menu system to verify each setting over the phone.

The existing settings at any given point in time are stored into the MATE3's internal memory as CONFIG.XML, and can be retrieved with user generated software that utilizes TCP/IP communication protocols through the Ethernet Port (see instructions for port forwarding on page 26 of the MATE3 manual). The following command returns the internal CONFIG.XML file using a browser, with a partial sample file listed below. <http://192.168.0.64/CONFIG.XML>

```
- <System_Config>
  <Sys_Name>Mays Mays</Sys_Name>
  <Sys_Title>Outback Power </Sys_Title>
  <Installed_By/>
  <Installer_Name/>
  <Installer_Phone/>
  <Installer_Notes/>
  <Time_Stamp> 8/11/11 10:34</Time_Stamp>
  <System_Type="Backup"/>
  <Nominal_Voltage>24</Nominal_Voltage>
  <PV_Size_Watts>1000</PV_Size_Watts>
  <Battery_AH_Capacity>110</Battery_AH_Capacity>
  <Generator_KW>50</Generator_KW>
  <Max_Inverter_Output_KW>36</Max_Inverter_Output_KW>
  <Max_Charger_Output_KW>32</Max_Charger_Output_KW>
- <New_Remote>
  <Firmware>002.004.009</Firmware>
- <Display>
  - <Backlight>
    <Red>19</Red>
    <Blue>19</Blue>
    <Green>19</Green>
    <Brightness>10</Brightness>
    <Contrast>45</Contrast>
    <Mode>Auto</Mode>
    <Timeout>120</Timeout>
  </Backlight>
  <Contrast>45</Contrast>
</Display>
<Button_Beep>Enabled</Button_Beep>
<Wheel_Click>Enabled</Wheel_Click>
<Data_Stream_Mode>Off</Data_Stream_Mode>
<Serial_Baud>19200</Serial_Baud>
<SD_CARD_Log_Mode>Disabled</SD_CARD_Log_Mode>
<SD_CARD_Log_Interval>5</SD_CARD_Log_Interval>
- <Network>
  <DHCP>Disabled</DHCP>
  <IP_address>192.168.000.064</IP_address>
  <Netmask>255.255.255.000</Netmask>
  <Gateway>192.168.000.001</Gateway>
  <DNS_1>192.168.000.002</DNS_1>
```

Settings in the XML file can be altered using a standard text editor, but a new checksum must be generated and inserted into the bottom of the file. The checksum generator is proprietary software that at present will require users to send their modified XML files to OutBack for review and a new checksum generated. Call OutBack Tech Support (360-618-4363) for more details.

How to use Datalogging CSV files

There are three types of data log files in a CSV format that can be retrieved from the MATE3's SD memory card. Two of these files contain data from the internal memories of the FLEXnet Battery Monitor (FN-DC) and the FLEXmax Charge Controller (CC), and are accessed by pressing the MATE3 LOCK button, then entering the 141 password if required, and selecting Device Data Logs from the Main Menu. The Device Data Logs submenus then walk the user

through the steps to save the data to the MATE3 SD memory card. While the Charge Controller only supplies 128 days of data, the FLEXnet DC battery monitor will provide 368 days of data. The files return header information for the columns of data. The header information is also available on page 130 of the manual.

The third type of CSV file is created when the Data Log to SD memory card is enabled on the MATE3. This can be accomplished by pressing the LOCK key, enter the 141 password if required, select Settings from the Main Menu, then select MATE3, then Data Logging. There are two settings under the Data Logging menu. The first one sets the Internal DataLog Write Interval. This memory is used for the Graph Displays and effectively sets the vertical resolution that is shown for a given display pixel. For example, a data reading that showed 25 volts would show a single dot at the 25 volt point, whereas readings that included a range of 23-27 volts would show a vertical line going from 23-27 volts on the graph. The pixel spacing is fixed at 720 seconds, or 30 hours total from left to right on the graph. This data memory is NOT available to the user other than what can be seen on the Graph displays.

The second setting, SD Card Data Logging Mode = Disabled/Excel/Compact, will enable data log writing to the SD Card at the interval specified when Excel or Compact are selected. The Compact selection leaves off the date and time parameters. Both file types are in CSV format and each file contains one hour's worth of data logs. When imported into Excel, the data can easily be sorted by device type or port number using the Excel Data Sort command.

The header information for the data columns can be found in the MATE3 Serial Communications Guide, available on the OutBack Power website. The inverter header information is in Figure 3, the Charge Controllers in Figure 9, and the Battery Monitor in Figure 13. Please note that Date and Time information is inserted in the first two columns of the CSV Data Log file preceding the Port Number column, which is normally the first data available in the serial communication status byte.

CSV files can be combined into a single file using the DOS Copy command in the RUN or COMMAND PROMPT mode from the Windows Start menu. Keep in mind that versions of Excel prior to 2007 are limited to 65,000 rows while Excel 2007 and later can have as many as 1,000,000 rows, so some filtering of the data prior to combining may be required. You can use the following steps to combine files using the DOS Copy command.

1. Use Windows Explorer (WE) or My Computer (MC) to create a folder in the "root" C: directory. This will reduce the amount of typing when it comes time to use the Copy command. For this example we will call the folder: MyData
2. Using WE or MC, copy the CSV files to be combined into the MyData folder.
3. Go to the Windows Start menu and select; COMMAND PROMPT (or RUN)
4. At the Command Prompt" type in: cd C:\MyData (this will change to the MyData directory, or folder).
5. At the C:\MyData prompt, type in: copy *.csv filename.csv (filename is a name of your choice and be sure to insert a space after copy and after *.csv).

Why Use Data Streaming?

The Data Stream selections can be enabled by pressing the LOCK button, enter the 141 password if required, select Settings from the Main Menu, then select System, then scroll down to Data Stream and select. From the Data Stream menu, the user can enable data streaming through the optional Serial Port at the bottom of the MATE3, or through the Ethernet Network port. Enabling the data stream will allow another device connected to the streaming port to "listen" for the data rather than establish a query/response communication which takes up more

communication bandwidth per data transfer. This could be advantageous if the listening device is wanting to use the updated data (about once a second) without having to re-establish communication each time.