**Smart Tree Screen Message System**

*1. Message from BMS to screen*

The syntax of a message is as follows:

|  |
| --- |
| <action character>:  <number of arguments>  <argument 1>  <argument 2>  …  <argument n>  ; |

All arguments, including numeric arguments, are in ASCII textual form.

The following action types are recognized.

|  |  |  |  |
| --- | --- | --- | --- |
| **Action** | **Char** | **# Args** | **Description of Arguments** |
| update energy **B**ars | B | 0-8 | The arguments represent the height of each bar. The plot’s y-axis scale is automatically calculated by the values. Note that writing to the energy bars does not erase the bars that are not written to; e.g. if the number of arguments is 5, then bar 7 is not erased. |
| **C**lear notice area | C | 0 |  |
| update screen **D**ata | D | 3 | The arguments are, in the following order: power in, energy, power out. (need to add total energy) |
| display **E**rror message✝ | E | 1+ | Each argument is a line of text to be displayed on top of the error popup window. |
| display built-in **e**rror message\* | e | 1-2 | The first argument is the error number. The second argument, if present, is a parameter of the error message. Some error messages have a parameter (e.g. *n*/4 batteries have stopped charging). |
| **L**og data | L | 2 | The first argument is the file name, and the second argument is a line of data to log. |
| update battery **M**eter | M | 1 | The argument is the percent charge of the batteries. |
| display **N**otice message\*✝ | N | 1+ | Each argument is a line of the notice (minor error) message. |
| display built-in **n**otice message\* |  |  | The first argument is the error number. The second argument, if present, is a parameter of the notice message. Some notice messages have a parameter. |
| **R**efresh normal screen | R | 0 |  |
| Turn screen off (**S**leep) | S | 0 |  |
| Turn screen on (**W**ake) | W | 0 |  |

\*These actions are not completely implemented.

✝These actions are deprecated.

To add or remove an action, the second argument to the Receiver constructor must be modified. Characters included in the string are recognized actions, all others will cause a Fail response to be sent back to the transmitter. Note that the characters do not have to be in any particular order in the accepted actions string. The current constructor is the following.

|  |
| --- |
| Receiver r(Serial1, "BCDEeLMNnRSW"); |

*2. Response from screen to BMS*

**Important:** Currently, the BMS does not monitor the responses. However, responses are sent by the screen for future use, and can provide useful information to the BMS regarding screen state.

The response from the screen to the BMS takes the form of a single character. The following responses are currently defined:

|  |  |  |
| --- | --- | --- |
| **Response** | **Character** | **Description** |
| REPLY\_SUCCESS | S | The screen has successfully parsed a message. |
| REPLY\_BUSY | B | The screen is currently processing a message. |
| REPLY\_READY | R | The screen is ready for another message. |
| REPLY\_FAILED | F | The screen either:   * Could not successfully parse the message; * Did not recognize the requested action; or * Determined that the arguments were invalid. |

Recommended future behavior of the BMS include:

* Stop sending a message immediately upon fail;
* Try to resend a message upon fail;
* Log failed transmissions in a separate file; and
* Delay sending if REPLY\_BUSY has been received.