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The B232-8 is a bridge device which allows any system supporting the RS-232 (COM port) protocol to directly interface with the Shades In Motion Compact Custom™ and Ready-Set™ controller family devices. The B232-8 supports bidirectional communication with a host. Up to 8 segregated groups of controllers, each with up to 24 daisy chained Compact Custom™ or Ready-Set™ devices may be used, allowing for the control of up to 768 motors individually, in groups, or all simultaneously from one RS-232 connection.

Installation

Mounting is done using the two mounting flanges on opposing ends of the unit. It is important to select a fastener which has a head low enough to avoid the DB-9 connector. See below for dimensions and mounting hole sizes.

There are 8 labeled 4-conductor RJ-11 jacks on the B232-8. Jack 1 must **always** be connected to the EYE jack of a Compact Custom™ or Ready-Set™ device. This will supply the necessary +5VDC power. All other jacks can be optionally connected. Each jack can be used to physically group controllers in complex installations where the design and control of the system can be simplified using this type of arrangement. Jacks 2 - 8 may be connected either to the EYE or the AUX connectors of a Compact Custom™ or Ready-Set™ device.

The host or controlling system is connected using a standard (not a null-modem) cable with a DB-9 connector. The B232-8 is a DCE device according to the EIA/TIA-232-E standard. For most installations using a high quality cable, it should be possible to have cable lengths up to 130 feet (40m) without signal degradation.

Configuration

When the unit is powered up, the LED will flash once and a welcome message will be transmitted to the host. If you are using a host computer running Windows™, a terminal emulation program such as Hyperterm™ can be used to verify that cabling and connection hardware is functioning properly. Note that Hyperterm™ is no longer shipped with Windows Vista™.

The protocol settings necessary to communicate with the B232-8 are not configurable and must be set as described in the table below:

Parameter	Value
Baud Rate	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	XON/XOFF (Software)

It is critical that flow control is properly set in order to establish error free communication with a DTE (host) device.

If you are using a terminal emulation program to manually set up and test your installation, we suggest that you turn on local echo and ensure that when the *Enter* key is pressed, only a CR (carriage return) character is sent, rather than a CR+LF. The B232-8 does not echo characters sent to it.

Command Syntax

The B232-8 accepts three types of commands sent to it on the RS232 port:

1. Commands which query the B232-8 itself for information. The query result is reported on the RS232 port.
2. Commands which delay the output of data to the output jacks in order to create pauses in the output stream.
3. Commands which send data to the output jacks in order to control Compact Custom™ and Ready-Set™ devices.

Each command must have a terminator as its last character. There are two equivalent command terminator characters, “CR” = Carriage Return, and “;” (semicolon). Commands are **not** case sensitive.

The B232-8 responds to commands sent to it with either a “command valid” or “error” acknowledgement, described below. However there is no need to set up an artificial transmission delay other than standard XON/XOFF software flow control. The device has an internal buffer which stores commands and processes them in the order received.

The table below lists all currently defined commands and their syntax. Square brackets indicate that the command is optional - the square brackets should never be in a command string.

Command Syntax	Function
?	Output the B232-8 welcome message to the RS232 port
~	Delay sending of next command on any jack by 250 ms ¹
!	Delay sending of next command on any jack by 5 seconds ¹
<i>jw</i>	Send “Wind” command to jack <i>j</i> ^{2,3}
<i>j+</i>	Send “Open All” command to jack <i>j</i> ³
<i>j-</i>	Send “Close All” command to jack <i>j</i> ³
<i>js</i>	Send “All Stop” command to jack <i>j</i> ³
<i>j[p]on</i>	Send “Open <i>n</i> ⁴ ” command to jack <i>j</i> ³ - Optionally sending program bit ⁵
<i>j[p]cn</i>	Send “Close <i>n</i> ⁴ ” command to jack <i>j</i> ³ - Optionally sending program bit ⁵

¹The delay time is not configurable.

²Wind commands are not currently supported in the Compact Custom™ and Ready-Set™ controller family devices.

³Allowed values for *j* are 0 - 8. Values of 1-8 specify that the command will be sent only to that jack. A 0 specifies the command will be sent to all jacks simultaneously.

⁴Allowed values for *n* are 01-60. For values between 1 and 9, single digits (no preceding zero) may be optionally used.

⁵Command for sending the program bit does not include the square brackets. See the section below on programming.

It is important to note that the delay commands, “~” and “!” do not cause any output from any jack. They delay the processing of the next command for the specified time. This can be useful for programming devices and setting up timed scenes as described below.

Likewise, the “?” command does not cause any output from any jack. The power on welcome message is only sent to the RS-232 port.

Command Examples

The following table contains valid commands and their function.

Command String	Function / Comments
?;	Prints the power on welcome message to the RS-232 port
1o1;	Send the "Open 1" command to Jack 1 - use semicolon as command separator
1O1	Send the "Open 1" command to Jack 1 - use uppercase "O" and CR as separator
1o01;	Send the "Open 1" command to Jack 1 - use "01" instead of "1" if desired
2c1	Send the "Close 1" command to Jack 2
0c1	Send the "Close 1" command to all jacks, 1 through 8, simultaneously
0+;	Send the "Open All" command to all jacks simultaneously
8s;	Send the "All Stop" command to Jack 8
7C60;	Send the "Close 60" command to Jack 7
7C60;8C1;	Send the "Close 60" command to Jack 7 followed by "Close 1" sent to Jack 8
4c1;-;-;-;-;5o2;	Send the "Close 1" command to Jack 4 followed by a 1 sec delay and "Open 2" to Jack 5
;;;;;	Legal command, but does nothing
4p05;4O5;	Send program bit with "Open 5" on Jack 4 followed by plain "Open 5" on Jack 4

The following table contains *invalid* commands and their function.

INVALID String	Comments
0~;	Delay is not jack specific. It delays execution of the next jack-based command
~~~;	Each tilde constitutes a command. Commands must be separated with ";" or CR
23c1;	Jack 23 does not exist. To send to both Jack 2 and three, use 2c1;3c1;
7C0;	Channel 0 is not allowed. Channel must be between 1 and 60.
7C059	Channel 59 is legal, but a leading 0 for the channel is only allowed for channels 1 - 9
9C1	Jack 9 does not exist
0x1;	No such command "x"
C1;	Jack must be specified
0+0-; or 0+-	Separate commands must have separators between them
5 C1;	Spaces are not allowed. Backspaces are also not allowed.
3p5	Program bit can only be used if followed by O or C command
07pC12;	Jack cannot be prefixed with zero - and command is too long (max 6 characters)

## Data Output to Jacks

Data written to the output Jacks 1 - 8 is sent in a serial format at the relatively low speed of about 1 kbaud. Input commands are buffered however so there is no need for any delay between individual commands sent to the unit as long as flow control is enabled properly. For each command sent to the B232-8, there will be 7 output "flashes" transmitted through the jacks, similar to holding down a button on an IR remote for a brief time. Between commands transmitted to a jack there is a 250ms delay to allow the receiver to differentiate between the commands. The number of flashes and the inter-command delay are not configurable.

## LED Behavior

The B232-8 has a single LED which flashes briefly when power is applied to the unit. When data is being transmitted out any or all of Jacks 1 through 8, the LED will flash rapidly. This can aid in troubleshooting installations. If the LED is flashing and a connected Compact Custom™ or Ready-Set™ device is not responding, first check that the command is being sent out the expected jack. If so, it is possible that the receiving device is not programmed to respond to the particular control code being sent. Some Compact Custom™ devices have an LED on the board which will flash when any command is received on its EYE or AUX jack. This can also aid in troubleshooting.

## RS232 Responses

The B232-8 responds to several events in order to report status information back to the connected DCE device. The table below summarizes the events and their response. None of the events below cause any change in the state of Jacks 1-8.

Event	RS-232 Port Response
Power On	XON, followed by welcome message with software version
Framing Error Detected	F ¹
Internal Buffer Overflow	O ¹
Command Syntax Error	? ¹
Valid Command Received	LF
Internal Buffer Near Full	XOFF
Internal Buffer Empty	XON

¹The detection of any error condition will purge the immediate data but will *not* invalidate the entire input buffer

## Compact Custom™ and Ready-Set™ Programming Examples

The B232-8 can be used to configure as well as to operate Compact Custom™ and Ready-Set™ family devices. The following example illustrates this capability. Remember that space and backspace characters are not allowed.

Assume that a single Compact Custom™ AC4 is being used in a three motor installation, with the EYE jack on the AC4 connected to Jack 1 on the B232-8. The first step should always be to set the unit back to its factory defaults. After this, we will initiate the automatic calibration cycle, then place motors 1 and 3 in a group on channel 5, while motors 1, 2, and 3 will be mapped to channels 7, 9, and 10 respectively.

This string sent to the RS-232 port will set the AC4 to its factory default state:

```
1p05;1o5;
```

The next set of commands performs the auto calibration:

```
1p05;1c5;
```

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Because the calibration process is time consuming and the receiving controllers will not accept commands until calibration is complete, there must be a very long wait before sending the next programming commands. To accomplish this, delay commands are used, chained together to achieve the required delay, in this case, 35 seconds. Each delay command “!” is 5 seconds:

!;!;!;!;!;

Note that a similar delay sequence is required for current sensing controllers which have custom intermediate stop capability, when setting up the intermediate stop.

These commands first place the unit into channel-to-motor mapping mode for motor 1, then wait until the shade has finished its brief movement that allows the installer to see which shade is being programmed, followed by the commands that associate channels 5 and 7 to the motor, followed by a stop command, which terminates the programming mode:

**1p01;-;-;1o5;1o7;1s;**

The next string is similar, associating motor 2 with channel 9:

**1p02;-;-;1o9;1s;**

The last sequence is similar to that for motor 1 - setting up motor 3 to be activated by channels 5 and 10:

**1p03;-;-;1o5;1o10;1s;**

Finally, since we only have three motors in this system, we will eliminate any relay noise for the unused motor 4 by changing the unit from its factory default settings (channel 4 activates motor 4) to making motor 4 completely unmapped - no channel will activate the motor, including the ALL commands.

**1p04;-;-;1s;**

## Scene Sequencing

It is possible to create a timed sequence of events by using the delay command. For example, if a single motor controller were connected to Jack 1, while another single motor controller were connected to Jack 2 and a third to Jack 3, a “sequenced opening” effect could be created by sending the following commands:

1o1;-;-;-;2o1;-;-;-;3o1;

This assumes that each controller is set to respond to channel 1. A 1 second delay is created between events.

## Programming Notes

Compact Custom™ and Ready-Set™ controllers require that a special programming bit be set in the first command sent to them in order to place the unit into programming mode. This is the purpose of the “p” character used in the examples above. Likewise, although some commands will exit programming mode when the proper number of commands are sent to the unit, it is good practice to send a stop command to a unit in order to ensure that programming mode is terminated. Please refer to the operating manuals for your specific controller for details.

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#### LED Function

- |                              |                                         |
|------------------------------|-----------------------------------------|
| • Power Up                   | One blink upon power up                 |
| • Activity on any Jack 1 - 8 | Rapid flashing while data is being sent |

#### Electrical Specifications

- |                     |                                   |
|---------------------|-----------------------------------|
| • Operating Voltage | 5 Volts DC supplied through Jack1 |
| • Operating Current | 24 mA Max                         |
| • Power Consumption | 120 mW Max                        |

#### Physical Specifications

- |                                                  |                                                              |
|--------------------------------------------------|--------------------------------------------------------------|
| • Dimensions (including mounting flange)         | 3.9 inches (length); 2.1 inches (width); 0.9 inches (height) |
| • Dimensions (metric, including mounting flange) | 99mm (length); 54mm (width); 23mm (height)                   |
| • Enclosure Color                                | Black                                                        |
| • Mounting Flange Hole Diameter                  | 0.19 inches                                                  |
| • Mounting Flange Hole Distance                  | 3.5 inches (89mm)                                            |
| • Operating Temperature Range                    | 32 F - 158 F; (0 C - 70 C)                                   |

#### Connectors

- |                                      |                                                                   |
|--------------------------------------|-------------------------------------------------------------------|
| • EIA/TIA-232-E                      | DB-9 connector with minimum of three conductors: RXD, TXD and GND |
| • 8 x RJ-11 Jacks using 4 conductors | Jack 1 is used to supply +5V power to unit                        |

#### Mechanical Drawings

