RBOX Response Box

Hardware Reference

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RBOX Response Box

The RBOX has four buttons for user response and four LEDs that can be used to provide a subject with feedback. This small, lightweight response box is an affordable solution for collecting simple subject response data. The RBOX is intended for use as part of a TDT system with a compatible real-time processor providing control and response acquisition. There are several versions of the RBOX, each customized for a particular processor.

Part numbers:

RBOX - Response Box for RP2.1

RBOX4 - Response Box for PI2, RM1, or RM2

RBOX_RX6 - Response Box for RXn

RBOX_RZ6 - Response Box for RZ6

Software Support

PsychRP and SykoFizX software applications for psychophysics provide support for the RBOX. The response box can also be used with custom designed software developed using RPvdsEx and TDT's ActiveX or OpenDeveloper tools, or in Synapse software.

Connecting the RBOX to the Processor

The RBOX must be connected to Digital I/O port on the controlling processor, using the provided cable. The Digital I/O ports on the RP2.1, RXn, and RZ6 (serial numbers >=2000) use a DB25 connector. The Digital I/O ports on the RM1/RM2 and RZ6 (serial numbers <2000) use a DB9 connector.

The RM1/RM2, RXn, and RZ6 processors require additional RPvdsEx software configuration for use with the RBOX. See the corresponding sections below for device specific information.

Buttons and LEDs

The buttons and LEDs are numbered as follows.
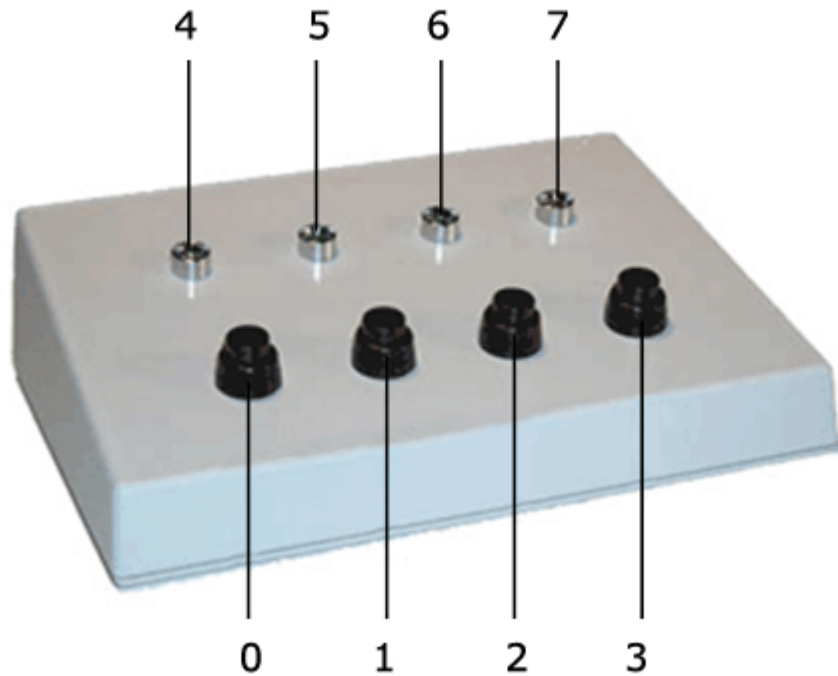
Button Number	BitIn Mask Value	LED Number	BitOut Mask Value
0	M=1	4	M=16
1	M=2	5	M=32
2	M=4	6	M=64
3	M=8	7	M=128

Note that the logic on the inputs to the processors is reversed. Therefore, when polling the lines to determine if a button has been pressed, a logic high or '1' means that no button is pressed and a logic low or '0' indicates a button press.

Configuring the RZ6 Processor for the RBOX_RZ6 in Synapse

The digital I/O is configured in the Synapse RZn Hal. Set Port-C.0 ... Port-C.3 as inputs to read the button presses in Synapse, and Port-C.4 ... Port-C.7 as outputs to drive the LEDs from Synapse.

Configuring the RZ6 Processor for the RBOX_RZ6 in RPvdsEx

The RBOX_RZ6 uses the ground connection (pin 5) and the 8-bits of bit-addressable digital I/O on an RZ6 Digital I/O port. Bits 0 through 3 are used as button inputs and Bits 4 through 7 are used as LED outputs (see Buttons and LEDs).

To use the response box with an RZ6 processor, use RPvdsEx BitIn and BitOut components to address the buttons and LEDs.

> ✏️ **Note**
>
> Logic inputs are Logic-High by default with open circuit (button not pressed). A button press shorts the input, causing a Logic-Low state.

The bit-addressable digital I/O lines can be either inputs or outputs. By default, all are configured for inputs. Modifying the RZ6_Control macro will enable Bits 4-7 to be outputs for driving the LEDs of the RBOX.

To configure the RZ6_Control macro:

1. In RPvdsEx, under the **Components Menu**, choose **Circuit Macros**.

2. Navigate to **Device\RZ6_Processor** and choose **RZ6_Control**.

3. Click **Insert** and click the circuit to place the macro.

4. Double-click the newly placed macro to open its properties.

5. Choose the **Digital I/O** tab.

6. Select Output for bits 4, 5, 6, and 7 to set them all as outputs, as shown below.

> ✏️ **Note**
>
> Byte-A and Byte-B are not used with the RBOX.
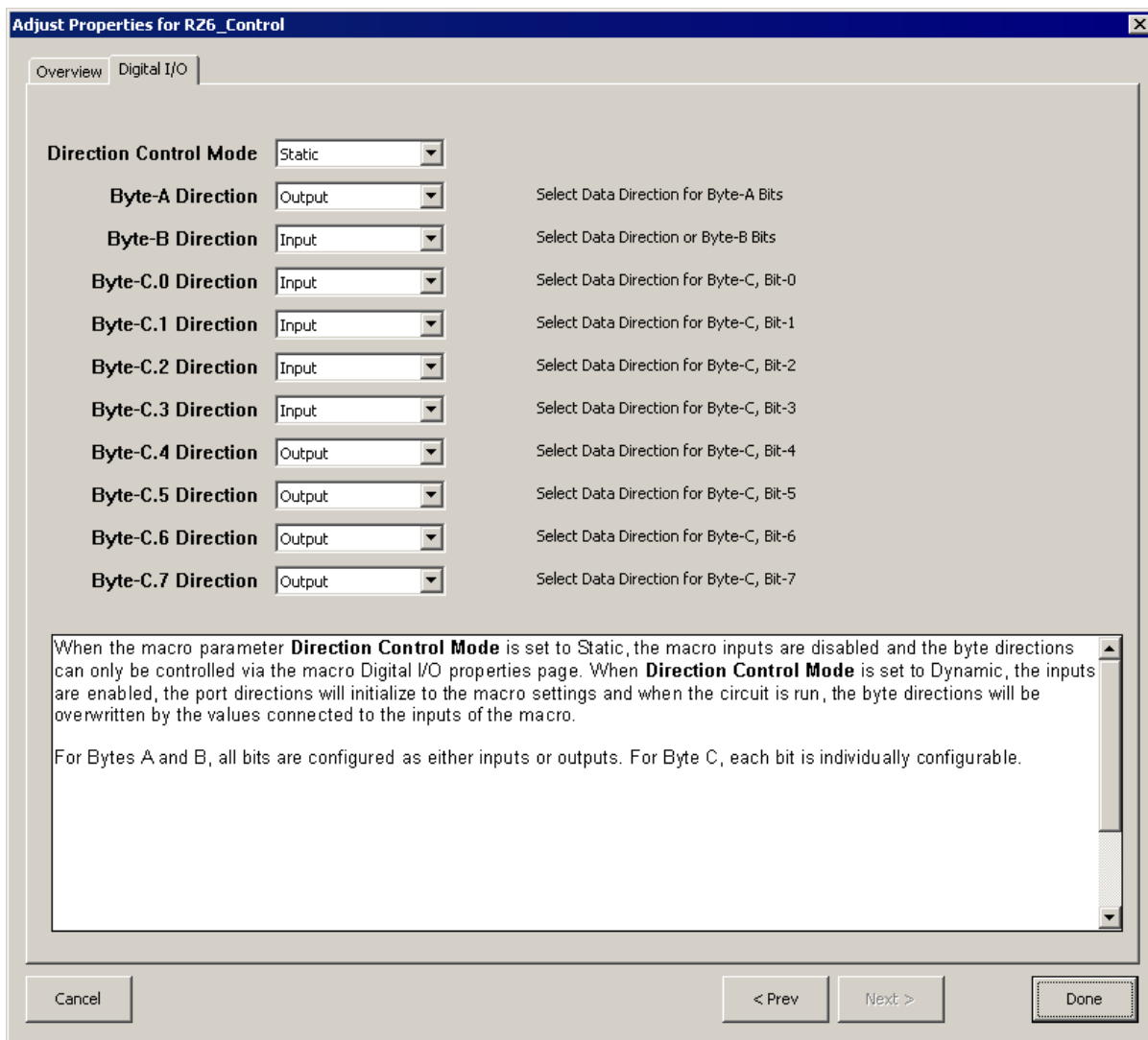
Configuring an RX Processor for the RBOX_RX6 in Synapse

The digital I/O is configured in the Synapse RXn Hal. Set Port-C.0 ... Port-C.3 as inputs to read the button presses in Synapse, and Port-C.4 ... Port-C.7 as outputs to drive the LEDs from Synapse.
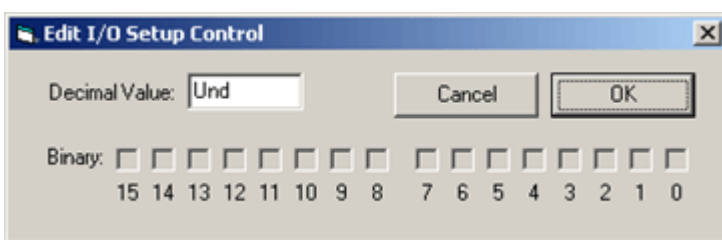
Configuring an RX Processor for the RBOX_RX6

The RBOX_RX6 uses the ground connection (pin 5) and the 8-bits of bit-addressable digital I/O on an RX-series processor Digital I/O port. Bits 0 through 3 are used as button inputs and Bits 4 through 7 are used as LED outputs.

To use the response box with an RX processor, configure the bits in the RPvdsEx configuration register as follows:
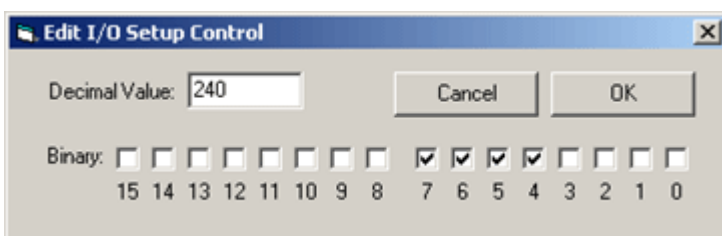
1. Click the **Device Setup** command on the **Implement** menu.

2. In the **Set Hardware Parameters** dialog box, click the **Device Type** box and select any RX device from the list.

3. The dialog expands to display the **Device Configuration Register**.
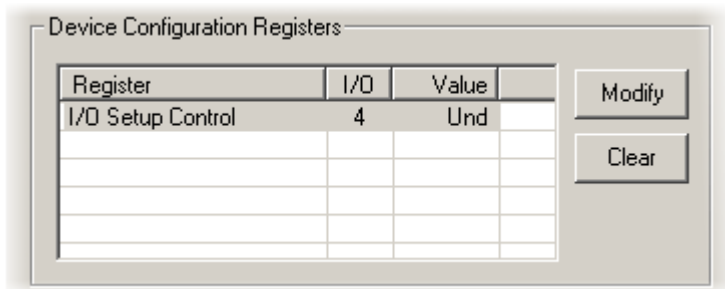
4. Click **Modify** to display the **Edit I/O Setup Control** dialog box. In this dialog box, a series of check boxes are used to create a bitmask that is used to program all bits.

5. To enable the check boxes, delete **Und** from the **Decimal Value** box and enter **240**. This configures Bits 4 through 7 as outputs.
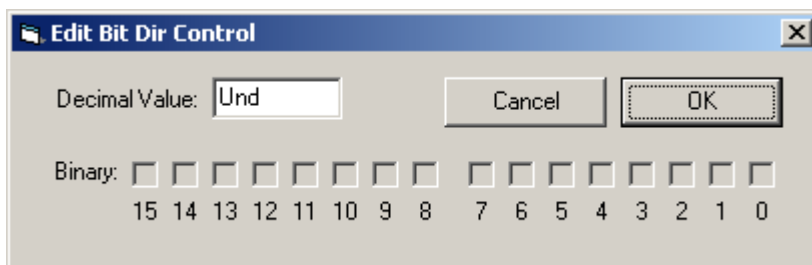

6. When the configuration is complete, click **OK** to return to the **Set Hardware Parameters** dialog box.

Configuring an RM Processor for the RBOX4

The RBOX4 uses the ground connection (pin 1) and the 8 bits of digital I/O on an RM-series processor Digital I/O port. Bits 0 through 3 are used as button inputs and Bits 4 through 7 are used as LED outputs.

To use the response box with an RM processor, configure the bits in the RPvdsEx configuration register as follows:

1. Click the **Device Setup** command on the **Implement** menu.

2. In the **Set Hardware Parameters** dialog box, click the **Type** drop-down box and select either the **RM1** or **RM2** from the list.

3. The dialog expands to display the **Edit Bit Dir Control** dialog box.

4. Click **Modify** to display the **Edit Bit Dir Control** dialog box. In this dialog box, a series of check boxes are used to create a bitmask that is used to program all bits.

5. To enable the check boxes, delete **Und** from the **Decimal Value** box and enter **240**. This configures Bits 4 through 7 as outputs.
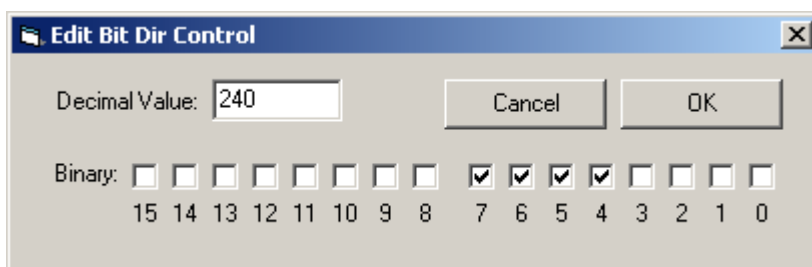
6. When the configuration is complete, click **OK** to return to the **Set Hardware Parameters** dialog box.

Response Box Technical Specifications

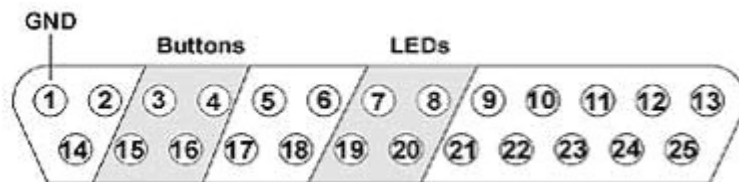## RBOX, RBOX_RX6, and RBOX_RZ6 Specifications

Response Box for RP2.1, RXn, and RZ6.

Buttons	4
LEDs	4
Connection	25-pin
Cable Length	2 m

> ✎ **Note**
>
> RBOX_RZ6 serial numbers <2000 use a DB9 Connector. See RBOX4 DB9 Connector Pinout.

RBOX DB25 Pinout

Pin	Name	Description	Pin	Name	Description
1	GND	Ground	14	NA	Not Used
2	NA	Not Used	15	B0	Button Bit 0
3	B1	Button Bit 1	16	B2	Button Bit 2
4	B3	Button Bit 3	17	NA	Not Used
5	NA	Not Used	18	NA	
6	NA		19	L0	LED Bit 0
7	L1	LED Bit 1	20	L2	LED Bit 2
8	L3	LED Bit 3	21	NA	Not Used
9	NA	Not Used	22	NA	
10	NA		23	NA	
11	NA		24	NA	
12	NA		25	NA	
13	NA				

RBOX4 Technical Specifications

Response Box for RM1 and RM2.

Buttons	4
LEDs	4
Connection	9-pin
Cable Length	2 m

RBOX4 DB9 Connector Pinout
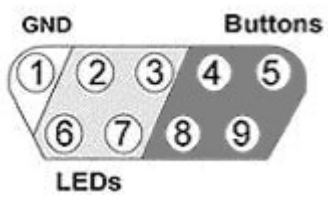
Pin	Name	Description		Pin	Name	Description
1	GND	Ground		6	L3	LED Bit 3
2	L2	LED Bit 2		7	L1	LED Bit 1
3	L0	LED Bit 0		8	B3	Button Bit 3
4	B2	Button Bit 2		9	B1	Button Bit 1
5	B0	Button Bit 0				