

# **RESPONSE KEY with LCD STIMULUS DISPLAY**

ENV-131M

USER'S MANUAL

**DOC-041**

**Rev. 1.3**

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## CHAPTER 1 - INTRODUCTION

The ENV-131M Response Key with LCD Stimulus Display, for the ENV-007 or ENV-008 series of modular test chambers, can store up to sixty-four, 240 pixel (W) x 320 pixel (H) color bitmaps (images).

The LCD-equipped ENV-131M Response Key replaces the obsolete projector-equipped ENV-130M Pigeon Key.

The ENV-131M comes pre-loaded with the same seven white shape images, plus a blank image, and the same five colors, in addition to a black background, previously found on the obsolete ENV-130M Pigeon Key.

The 48 image and color combinations, that are equivalent to the ENV-130M, are in the standard (default) image “album” memory within the ENV-131M.

The ENV-131M has memory space for an additional 16 images for a total of 64 images.

If using the ENV-131M as a replacement for the ENV-130M, or in addition to existing ENV-130Ms, please see the **12 Output Line (Med Legacy) Image Control** discussion in Chapter 3 – Operation, page 7.

Custom images and colors can be created and/or edited into a custom image album by the end user and uploaded to the ENV-131M image memory using the optional Image Downloader (ENV-131M-DL).

Refer to Note 3 in Chapter 3 – Operation, page 5, for additional information on image album management.

### Specifications

#### Power Requirement:

28 Volts DC @ 250 mA (maximum) – See Note 1 below.

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**NOTE 1:** The required 28 Volts DC operating power is supplied to the ENV-131M via the OUT 1 or the 28V POWER connector on the supplied SG-131 Output Cable.

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#### Dimensions:

The ENV-131M Response Key is designed to fit the ENV-007 or ENV-008 series of modular test chambers and utilizes the standard 3/8 panel form factor.

Height: 4.875” / 12.4 cm

Width: 3.063” / 7.8 cm

Depth: 2.80” / 7.1 cm

#### Weight:

1.1 lbs / 0.5 kg

#### Tap force required to depress the Response Key:

12 to 15 grams of force (typical)

**Included Items**

*Figure 1.1 – ENV-131M Response Key with LCD Stimulus Display*

---



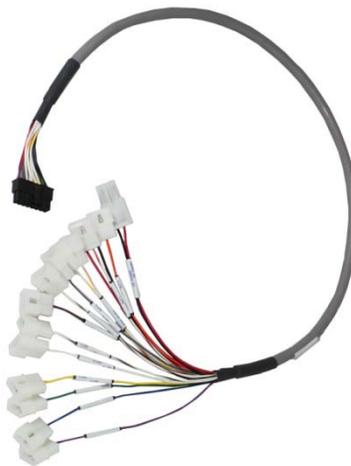
*Figure 1.2 – SG-222 Input Cable*

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*Figure 1.3 – SG-131 Output Cable*

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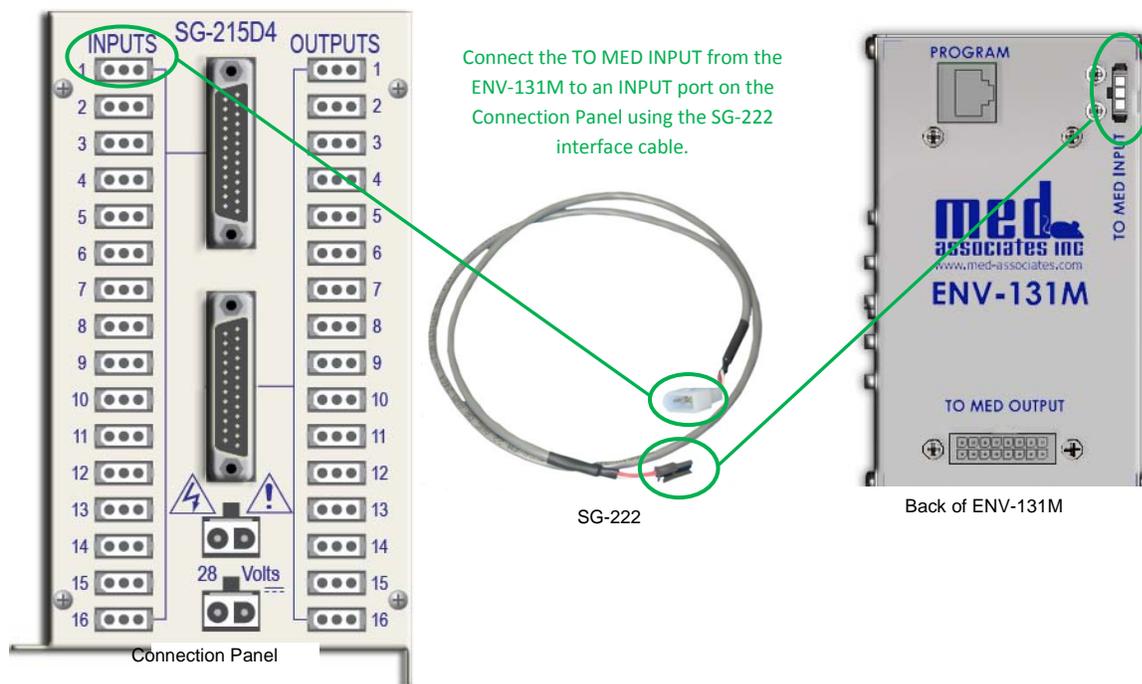


## CHAPTER 2 - HARDWARE

The ENV-131M Response Key is compatible with a number of Med Associates, Inc. connection panels. For example, the SG-215D4 connection panel, shown in Figure 2.1 below, or the SG-716B connection panel.

The INPUT from the ENV-131M is the tap key response from the test subject. Connect the SG-222 cable, shown in Figure 1.2, page 2, from the port labeled TO MED INPUT on the ENV-131M to an available INPUT on the connection panel.

*Figure 2.1 – Connecting the Input from the ENV-131M to the Connection Panel*



**NOTE 2:** A DIG-712F Input card, which is rated for 100 inputs per second, must be used with the ENV-131M. The standard DIG-712 Input card (no “F” suffix) does not have the required input response rate.

The SG-131 Output Cable, shown in Figure 1.3, page 2, has the output connections clearly labeled. Use the labels as a guide when plugging in the ENV-131M to your connection panel’s outputs.

The “OUT 1” connector also supplies 28 Volts DC operating power to the ENV-131M, see Figure 2.3, page 4.

The “28V POWER” connector, as shown in Figure 2.2, page 4, is only required if the “OUT 1” connector is not used.

Figure 2.2 – Connecting the Outputs from the ENV-131M to the Connection Panel

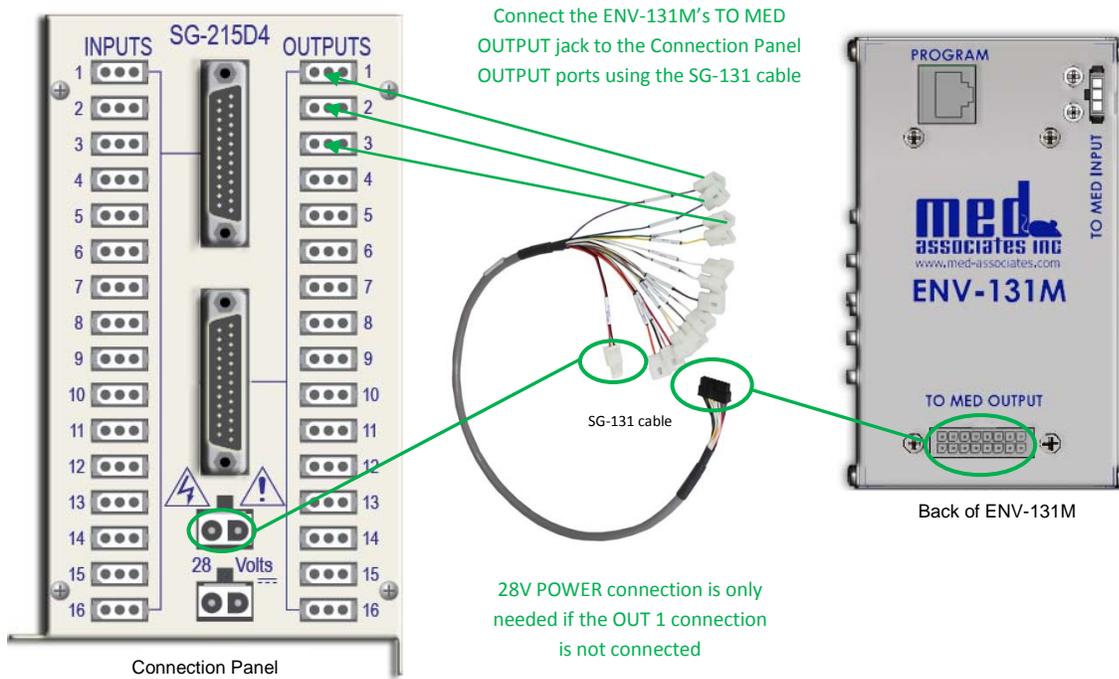


Figure 2.3 – OUT 1 Connector on the SG-131 Output Cable



## CHAPTER 3 - OPERATION

### Power up Sequence

When the ENV-131M is first powered up and no OUTPUT lines are attached or active, the display screen will flash all white very briefly, then momentarily go to a half-bright white display with the four status LEDs (described below) lit up. Then the four status LEDs will go out and the LCD display will go dark.

The sequence above will confirm that the unit is receiving power and functioning properly.

### Status LEDs (Light Emitting Diodes)

There are four status LEDs, numbered “1” (orange), “2” (green), “3” (red) and “4” (yellow), along the side of the ENV-131M. These four status LEDs will all light up briefly during the power up sequence described above.

These status LEDs will also indicate the progress of an image download - see Note 3 below.

### RESET Button

To check the operational status of the ENV-131M, press the RESET pushbutton on the side of the unit and note that the LCD screen will illuminate all white as long as the RESET button is held in.

Release the RESET button and the LCD display will go to a half-bright white display. At the same time the four status LEDs will all light up briefly. Then the four status LEDs will go out and the LCD display will go dark if no control lines are active, or it will display whatever image is related to the active control line, or lines, that are in the ON state.

### START Button

The START pushbutton is only used in conjunction with the ENV-131-DL Image Downloader, see Note 3 below.

---

**NOTE 3:** For more information on the management of image albums and the Image Download mode of operation, including the status LEDs, refer to DOC-249 titled ENV-131M-DL Image Downloader and SOF-400 Application User’s Manual. This manual explains in detail the use of the ENV-131M-DL Screen Image Loader transfer connection box and the supporting computer application software (SOF-400).

---

Pressing the START button on the side of the unit will cause the ENV-131M to enter the Image Download mode of operation. LED #1, located below the START button, will illuminate while the ENV-131M is in Download mode. Refer also to Note 4 below.

If the START button is pressed inadvertently, and downloading images to the ENV-131M is not desired, press the RESET button to exit the Image Download mode.

---

**NOTE 4:** While in the Image Download mode of operation, the display will be frozen and hold the last image that was being displayed. Further changes to the logic levels on the control lines being utilized will not affect the displayed image. To return the ENV-131M to normal operation, press the RESET button.

---

## Output Lines Control for Displayed Image Selection

The selection of the displayed image(s) is controlled by changing the voltage, 0 or 28V (ON or OFF), on the output lines connected to the ENV-131M. This control is executed via MedState Notation™ code.

The ENV-131M can display images using either a 6 output or a 12 output line control configuration as explained below. A table listing the 64 standard album images that are in memory and which of the output line controls are needed to display each image, in both the 6 and 12 line control configurations, is shown in Appendix A, page 13.

### 6 Output Lines (Binary) Image Control

If output lines #1 to #6 of the SG-131 output cable are plugged into outputs on a connection panel and the Mode Select line is not connected, then up to 64 different images can be displayed on the ENV-131M. Table 3.1 below lists the number of images that can be displayed based on the number of available OUTPUTS on the connection panel.

To use the 6 output line image control:

1. Plug in the desired number of output lines from the SG-131 cable to the connection panel. Make sure to use the OUTPUT control lines associated with the images desired.
2. Provide power to the ENV-131M by plugging OUT 1 into an available OUTPUT on the connection panel. If OUT 1 is not being used, the large, 28V connector must be plugged into one of the 28 Volt connections at the bottom of the connection panel.

---

**NOTE 5:** The ENV-131M will not be damaged if both power connectors are plugged in.

---

*Table 3.1 – Number of Images Available in 6 line mode.*

# of OUTPUT Lines Connected (see Note 6 below)	# of Available Images (see Note 7 below)
Any 1 line	Up to 2
Any 2 lines	Up to 4
Any 3 lines	Up to 8
Any 4 lines	Up to 16
Any 5 lines	Up to 32
All 6 lines	Up to 64

---

**NOTE 6:** The SG-131 output lines may be connected to any available OUTPUT on the connection panel. Med Associates recommends connecting the outputs to the connection panel in sequential order to simplify programming.

**NOTE 7:** Refer to Appendix A, page 13, for available images in the standard album shipped with the product. As an option, you may choose to cluster the images of interest together, for example certain shapes and colors, into an album that is controllable with a minimum (conservative) number of OUTPUT lines. Use the Med Associates' ENV-131M-DL product and SOF-400 computer application software.

---

## 12 Output Lines (Med Legacy) Image Control

Since the ENV-131M is a direct replacement for the obsolete ENV-130M Pigeon Key, the legacy mode of operation allows backward compatibility with MED-PC<sup>®</sup> protocols developed for the ENV-130M.

Users who are replacing ENV-130Ms, or who are adding ENV-131Ms as additional response keys to their existing systems, will benefit from utilizing this mode of image control in conjunction with their existing or expanded protocols.

To operate in Legacy Mode, all 12 output line connectors must be connected to available OUTPUTS.

The connector labeled **Mode Select** must be connected to the connection panel in order to use the 12 output lines of (legacy) image display control. The **Mode Select** connector can be plugged into any INPUT or OUTPUT port on the connection panel.

When output lines OUT 1 to OUT 12 from the SG-131 cable are plugged into a connection panel, up to 48 images can be displayed on the ENV-131M (see Appendix A, page 13, for the image and color list).

To use the 12 output line image control:

1. Plug in all 12 output lines from the SG-131 cable to the connection panel.
2. Plug in the **MODE SELECT** line into any available INPUT or OUTPUT; the connector is designed so that it is always ON when plugged in. No programming changes are required.
3. Provide power to the ENV-131M by plugging OUT 1 into an available OUTPUT on the connection panel. If OUT 1 is not being used, the large, 28V connector must be plugged into one of the 28 Volt connections at the bottom of the connection panel.

---

**NOTE 8:** The ENV-131M will not be damaged if both power connectors are plugged in.

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## CHAPTER 4 - SAMPLE MED-PC<sup>®</sup> PROCEDURES

The image displayed on the ENV-131M is controlled by the active lines on the SG-131 cable. Usually a MED-PC<sup>®</sup> protocol written using MedState Notation<sup>™</sup> will define the logic affecting the status of these control lines.

Below are four MedState Notation<sup>™</sup> sample procedure files that exemplify the different methods of controlling the image displayed on the ENV-131M.

1. **Test\_LCD\_12\_line.mpc** – displays up to 48 images in a loop using the 12-line control method.
2. **Test\_LCD\_6\_line\_3\_images\_OutputCtrl.mpc** – displays 3 images using the 6-line control method without using supplemental library function “WriteByte”.
3. **Test\_LCD\_6\_line\_64\_images\_OutputCtrl.mpc** – displays up to 64 images in a loop using the 6-line control method without using “WriteByte”.
4. **Test\_LCD\_6\_line\_64\_images\_WriteByte.mpc** – displays up to 64 images in a loop using the 6-line control method using “WriteByte”.

As described in Chapter 3 - Operation, beginning on page 7, if the SG-131 **Mode Select** line is connected, the ENV-131M is in the legacy “12-line” control mode. If the **Mode Select** line is not connected, the ENV-131M is in “6-line” control mode. To use the “12-line” sample, the **Mode Select** line must be plugged into any available connection panel INPUT or OUTPUT. The “6-line” samples require the **Mode Select** line to be disconnected. The number of actual lines required or used by either method is variable, but all 12 or 6 lines must be connected in either mode to access a full album of images.

These sample procedures require the TRANS IV component of MED-PC<sup>®</sup> to create MedState Notation<sup>™</sup> code files, then translating and compiling the files into MED-PC<sup>®</sup> executable code. These sample files are also available from Med Associates, Inc. Send a request for the sample files via email to support@med-associates.com to receive these files electronically. See the MED-PC<sup>®</sup> Programmer’s Manual (DOC-003) for more information on the translation and compilation process to convert text files into MED-PC<sup>®</sup> executable code.

### 1. 12 Control Lines Sample: Test\_LCD\_12\_line.mpc

The 12 control lines sample program will display 48 images on the display device connected to the box running the Test\_LCD\_12\_line.mpc protocol in MED-PC<sup>®</sup>.

The protocol has two nested loop. The inner loop cycles through the eight shapes, the outer loop cycles through the six background colors. The shapes and colors of the default album are listed in the sample.

As with all of the sample procedures shown, if an album other than the default album file is loaded to the display device, the results will differ. Characters following a “\” are ignored by the translator and are code comments.

```
\ 12 output control line test program for ENV-131M, ENV-132M
\ Displays 48 images using an inner loop to cycle through the
\ 8 foreground shapes and an outer loop to cycle through the
\ 6 background colors in the display's default album.
```

Shape (S)	OUTPUT	Color (C)	OUTPUT
None	None	Black	None
Triangle	1	Red	8
Circle	2	Green	9
Plus	3	Blue	10
Square	4	Yellow	11
X	5	Ecru	12
Vert Bar	6		
Horz Bar	7		

\ Variables used

\ S : Current Shape index = possible values: 0 to 7

\ C : Current Color index = possible values: 0 or 8 to 12

S.S.1,

S1,

0.01": SET S = 0, C = 0 ----> S2 \ Start with No shape on black

S2,

0.8": OFF 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16; \ wait .8 seconds,

ON S, C; \ turn all OUTPUTS OFF

SHOW 1,Shape index,S; \ turn ON the current Shape and Color

SHOW 2,Color index,C ----> S3 \ display the current Shape index

\ display the current Color index

S3,

0.01": IF S < 7 [@NotLast, @Last] \ Shapes loop - 0 to 7

@NotLast: ADD S ----> S2 \ if there are more shapes,

@Last: SET S = 0 ----> S4 \ go to the next one, else

\ show first shape, next color

S4,

0.01": IF C < 12 [@NotLast, @Last] \ Colors loop - 0,8,9,10,11,12

@NotLast: IF C = 0 [@Zero, @NotZero] \ if there are more colors,

@Zero: SET C = 8 ----> S2 \ either C was 0 so it becomes

@NotZero: ADD C ----> S2 \ 8 or C is

@Last: SET C = 0 ----> S2 \ 8,9,10,11 to next value

\ start back at first color

## 2. 6 Control Lines Sample 1: Test\_LCD\_6\_line\_3\_images\_OutputCtrl.mpc

The first 6 control line test procedure displays three images in an image album. If the LCD display is loaded with the default image set, this sample will display a triangle on black background, a plus sign on red background, and a circle on green background in a repeating loop. These are images numbered 1, 11, and 18.

\ 6 output control line test program for ENV-131M, ENV-132M  
 \ Displays 3 images in a loop by turning on the OUTPUT lines  
 \ representing the binary value of three image indexes.  
 \ Sets the output lines to display images #1, 11, and 18

Decimal	Binary	Active Lines	Image (Default Album)
1	000001	1	Triangle on Black
11	001011	4,2,1	Plus sign on Red
18	010010	5,2	Circle on Green

```

S.S.1,
S1,
  0.01": ON 1; ---> S2      \Image 1: Triangle on Black, Active line: 1

S2,
  1": ON 2, 4 ---> S3      \Image 11: Plus on Red, Active lines: 1,2,4

S3,
  1": OFF 1, 4; ON 5; ---> S4 \Image 18: Circle on Green, Active lines: 2,5

S4,
  1": OFF 1,2,3,4,5,6; ---> S1 \Turn all lines OFF, start over

```

### 3. 6 Control Lines Sample 2: Test\_LCD\_6\_line\_64\_images\_OutputCtrl.mpc

The second 6 control line test procedure cycles through 64 images on a display device. The images are displayed by converting sequential image indexes to their binary equivalent, and then activating the appropriate OUTPUT lines.

```

\ 6 output control line test program for ENV-131M, ENV-132M
\ Displays 64 images in a loop by turning on the OUTPUT lines
\ representing the binary value of the image indexes 0 - 63.
\ The image indexes on the ENV-131M and ENV-132M are 0-based.

\ Variables used
\ I : Current Image identifier - possible values: 0 to 63
\ N : Bit counter             - possible values: 1, 2, 3, 4, 5, or 6
\ T : Temporary value during decimal to binary conversion of I
\ A : Line 1                  - possible values: 0 or 1
\ B : Line 2                  - possible values: 0 or 2
\ C : Line 3                  - possible values: 0 or 3
\ D : Line 4                  - possible values: 0 or 4
\ E : Line 5                  - possible values: 0 or 5
\ F : Line 6                  - possible values: 0 or 6

S.S.1,
S1,
  0.01": SET I = 0 ---> S2      \ initialize variables

S2,
  0.8": OFF 1,2,3,4,5,6;      \ wait for .8 seconds
      SET N = 1, T = I,        \ clear all OUTPUT lines
      A=0, B=0, C=0, D=0, E=0, F=0 ---> S3      \ reset N to low bit 1, set Temp to Image number
      \ reset all 6 OUTPUT lines

      \ decimal to binary conversion of I
S3,
  0.01":~WHILE (T > 0) DO BEGIN IF (TRUNC(T) MOD 2 = 1) THEN BEGIN IF N = 1
THEN A := 1;~;
      ~IF N = 2 THEN B := 2;~;
      ~IF N = 3 THEN C := 3;~;
      ~IF N = 4 THEN D := 4;~;
      ~IF N = 5 THEN E := 5;~;
      ~IF N = 6 THEN F := 6;~;
      ~END; T := TRUNC(T) DIV 2;
      N := N + 1;

```

```

        END;~; ---> S4

S4,
    0.01": ON A, B, C, D, E, F; ---> S5

S5,
    0.01": SHOW 1, Image num, I; \ move on to the next image
        IF I < 63 [@NotLast, @Last] \ if I is less than the last image index
            @NotLast: ADD I ---> S2 \ then increase I
            @Last: SET I = 0 ---> S2 \ else restart at image 0

```

#### 4. 6 Control Lines Sample 3: Test\_LCD\_6\_line\_64\_images\_WriteByte.mpc

The last sample program uses the WriteByte function to eliminate converting the images' album index from decimal to binary. This sample cycles through the 64 images on an LCD display using the 6-line control mode. WriteByte is explained in detail below.

```

\ 6 output control line test program for ENV-131M, ENV-132M
\ Displays 64 images in a loop using the WriteByte function.
\ WriteByte is defined in PortIO.dll and declared in PortIO.hed.
\ The image indexes on the ENV-131M and ENV-132M are 0-based.

\ Variables used
\ I : Current Image identifier - possible values: 0 to 63

S.S.1,
S1,
    0.01": SET I = 0 ---> S2

S2,
    0.8": ~WriteByte(MG, BOX, 792, (BOX-1)*2, I);~;
        SHOW 1, Image num, I ---> S3 \ display the image index

S3,
    0.01": IF I < 63 [@NotLast, @Last] \ loop control, if more images
            @NotLast: ADD I ---> S2 \ move to the next image, else
            @Last: SET I = 0 ---> S2 \ back around to the first (index 0)

```

#### Definition of Commands

The TEST\_LCD\_6\_line\_64\_images\_WriteByte.mpc MedState Notation™ procedure uses the **WriteByte** command. The WriteByte procedure is defined in PortIO.dll, and declared in PortIO.hed. During the SOF-400 computer software installation, the two PortIO files are copied to the MED-PC® installation directory, and a line is added to the User.pas file to include PortIO.hed.

WriteByte writes a byte-long (8 bits) value to an output card. Any ON bits will turn on the corresponding outputs, and any OFF bits will turn off the corresponding outputs. WriteByte converts the last parameter from a decimal value to its binary equivalent and activates the appropriate OUTPUT lines representing that binary value.

## WriteByte Declaration

```
Procedure WriteByte(MPCGlobal: MPCGlobalPtr; box, port, offset, value:
                    real); stdcall; external PortIO name 'WriteByte';
```

WriteByte accepts five parameters:

1. Med Global Pointer: always represented by “MG” for Med Global.
2. Box identifier: always represented by “BOX” for the current loaded box identifier.
3. Output card Port address: varies depending on the address of the output card. 792 is the usual port address for output cards in a MED-PC® system.
4. Output card Port offset: varies according to the output card address offset. Normally, 0 is the address offset of the first chamber’s output card, 2 is the second chamber’s output card offset, 4 is third chamber’s output card offset, 6 is the fourth output card’s offset, etc.
5. Value: decimal value representing the zero-based index of the image to display.

## WriteByte Examples

The example below will cause the ENV-131M or ENV-132M stimulus display device attached to the box running the protocol in MED-PC® to show the 8<sup>th</sup> image in its album, represented by the 0-based index of 7. 7 is converted to 00000111, then OUTPUTs 1, 2, and 3 are activated on the display device.

```
~WriteByte (MG, BOX, 792, (BOX-1)*2, 7);~;
```

The command:

```
~WriteByte(MG, BOX, 792, (BOX-1)*2, 13);~;
```

converts the last parameter (13) to its 8-bit binary equivalent: 00001101, then activates OUTPUTs 1, 3, and 4 to display the 14<sup>th</sup> image in the display device.

**APPENDIX A - ENV-131M - 6 and 12 Output Lines Image Key**

		6 Line Control	12 Line Control			6 Line Control	12 Line Control
	Standard Album Image #	Active Output Line #s	Active Output Line #s		Standard Album Image #	Active Output Line #s	Active Output Line #s
	0	<none>	<none>		16	5	9
△	1	1	1	△	17	1, 5	1, 9
○	2	2	2	○	18	2, 5	2, 9
+	3	1, 2	3	+	19	1, 2, 5	3, 9
□	4	3	4	□	20	3, 5	4, 9
×	5	1, 3	5	×	21	1, 3, 5	5, 9
	6	2, 3	6		22	2, 3, 5	6, 9
—	7	1, 2, 3	7	—	23	1, 2, 3, 5	7, 9
	8	4	8		24	4, 5	10
△	9	1, 4	1, 8	△	25	1, 4, 5	1, 10
○	10	2, 4	2, 8	○	26	2, 4, 5	2, 10
+	11	1, 2, 4	3, 8	+	27	1, 2, 4, 5	3, 10
□	12	3, 4	4, 8	□	28	3, 4, 5	4, 10
×	13	1, 3, 4	5, 8	×	29	1, 3, 4, 5	5, 10
	14	2, 3, 4	6, 8		30	2, 3, 4, 5	6, 10
—	15	1, 2, 3, 4	7, 8	—	31	1, 2, 3, 4, 5	7, 10

**APPENDIX A - ENV-131M - 6 and 12 Output Lines Image Key (cont'd)**

		6 Line Control	12 Line Control			6 Line Control	12 Line Control
	Standard Album Image #	Active Output Line #s	Active Output Line #s		Standard Album Image #	Active Output Line #s	Active Output Line #s
	32	6	11	48	48	5, 6	n/a
△	33	1, 6	1, 11	49	49	1, 5, 6	n/a
○	34	2, 6	2, 11	50	50	2, 5, 6	n/a
+	35	1, 2, 6	3, 11	51	51	1, 2, 5, 6	n/a
□	36	3, 6	4, 11	52	52	3, 5, 6	n/a
×	37	1, 3, 6	5, 11	53	53	1, 3, 5, 6	n/a
	38	2, 3, 6	6, 11	54	54	2, 3, 5, 6	n/a
—	39	1, 2, 3, 6	7, 11	55	55	1, 2, 3, 5, 6	n/a
	40	4, 6	12	56	56	4, 5, 6	n/a
△	41	1, 4, 6	1, 12	57	57	1, 4, 5, 6	n/a
○	42	2, 4, 6	2, 12	58	58	2, 4, 5, 6	n/a
+	43	1, 2, 4, 6	3, 12	59	59	1, 2, 4, 5, 6	n/a
□	44	3, 4, 6	4, 12	60	60	3, 4, 5, 6	n/a
×	45	1, 3, 4, 6	5, 12	61	61	1, 3, 4, 5, 6	n/a
	46	2, 3, 4, 6	6, 12	62	62	2, 3, 4, 5, 6	n/a
—	47	1, 2, 3, 4, 6	7, 12	63	63	1, 2, 3, 4, 5, 6	n/a

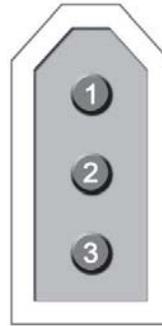
## APPENDIX B - ELECTRICAL CONNECTIONS

SG-131 **Mode Select** pinout (connect to any INPUT or OUTPUT for 12 line Legacy control):

Molex Pin #	Function
1	ON
2	n/a
3	n/a

SG-131 Output connector **OUT 1** pinout:

Molex Pin #	Function
1	28V Ground
2	Operate (ON/OFF)
3	+28 Volts



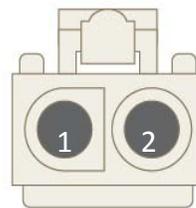
3 Pin Molex Output Connector

SG-131 Output connectors **OUT 2 to OUT 12** pinout:

Molex Pin #	Function
1	n/a
2	Operate (ON/OFF)
3	n/a

SG-131 **28V POWER** pinout:

Molex Pin #	Function
1	28V Ground
2	+28 Volts



2 Pin Molex Power Connector

## APPENDIX C - CONTACT INFORMATION

Please contact Med Associates, Inc. for information regarding any of our products. Visit our website at [www.med-associates.com](http://www.med-associates.com) for contact information and access to our Technical Manual Library, software drivers, release notes, and FAQs on our Customer Portal.

For technical questions, email [support@med-associates.com](mailto:support@med-associates.com).

For sales inquiries, email [sales@med-associates.com](mailto:sales@med-associates.com).