

# Serial Protocol of VZ-C12, VZ-C12<sup>2</sup>, VZ-C12<sup>3</sup>, VZ-C32 and VZ-C32

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## Introduction

The VZ-C12, VZ-C12<sup>2</sup>, VZ-C12<sup>3</sup>, VZ-C32<sup>3</sup> and VZ-C32 can be controlled via the RS-232-port by a computer or a control-system. It is possible to perform all functions of the IR-remote-control such as Zoom, Focus, Presets, etc. as well as a lot of other functions like reading and setting zoom-position, etc.

The protocol is upward compatible to the one of the VZ-27plus/57plus expect arm functions.

## Connection

The serial-port of the Visualizers is a standard 9-pin-Sub-D-connector, which can be found on most computers too. Only pin 2 (RxD), 3 (TxD) and 5 (GND) must be connected. The baud rate is (by default) 115.200 baud/s (19.200 baud/s on older units). There is no parity, 8 data-bits and 1 stop-bit.

## Changing the Baud rate

It is possible to change the baud rate from 9.600 to 19.200, 38.400, 57.600 or 115.200 baud/s. To change the baud rate, switch the unit on and press MENU-key for four seconds, until the Extra-Menu appears. Then enter the Serial Port-sub-menu. There you can change the baud rate.

## Control-Commands

The controlling of the Visualizer is done by sending codes (each code is 1 byte) to the Visualizer: these codes perform the desired action. There is no need for Carriage Return, Linefeed or similar. By default the Visualizer doesn't respond to the commands on the serial-port (except commands which return status-information like zoom-position or Get Light on/off, etc.). With special commands this behavior can be changed so that the Visualizer sends a reply after each command (for details see "Reply Mode Control"). Some commands have a quiet long execution time therefore you shouldn't send different codes immediately one after another. If you want to check if the Visualizer is ready to receive new commands, you can send code 32 (' ') until the unit answers with 32 (' ') (Blank Echo). While the unit is not ready, there is no answer.

If you want to test the commands with a terminal-program, you may prefer to enter the commands as ASCII-text. To do so, press underscore ('\_'), the Visualizer will respond with a question mark. Then enter the 3 digit decimal number within three seconds. The command will then be performed (e.g. type '\_ '2' '0' '0' for Power On or '\_ '0' '4' '9' to select command page 1).

In the following tables you will find the decimal and the hexadecimal codes. The dollar-sign ('\$') in front of the numbers indicates that the respective number is a hexadecimal number. The dollar-sign must not be sent.

## Custom Serial Mode

The manual Height adjustment can be performed via RS-232 (since firmware v1.30a, Custom Serial Mode - see page 12). The RS-232 control is very similar to the IR-remote control. The first time the unit is switched on, the height adjustment will start automatically. The Height Adjustment can be aborted with the command \_206 (Visualizer Menu on/off) every time.

- Step 1:      Center Lightfield (coarse)  
          Center the lightfield with the commands \_210 (Data Right), \_211 (Data Left), \_208 (Function Up) and \_209 (Function Down). Confirm the lightfield position with the command \_214 (Help).
- Step 2:      Adjust Camera Focus  
          Adjust the camera focus with the commands \_194 (Focus Far), \_198 (Focus Near) or \_131 (Start Focus Far), \_132 (Start Focus Near) and \_128 (Stop Focus). Confirm camera focus setting with the command \_214 (Help).
- Step 3:      Adjust Light Focus  
          Adjust the light focus with the commands \_194 (Focus Far), \_198 (Focus Near) or \_131 (Start Focus Far), \_132 (Start Focus Near) and \_128 (Stop Focus). Confirm light focus setting with the command \_214 (Help).
- Step 4:      Center Lightfield (fine)  
          Center the lightfield with the commands \_210 (Data Right), \_211 (Data Left), \_208 (Function Up) and \_209 (Function Down). Confirm the lightfield position with the command \_214 (Help).

Every step-name will be output to the computer via RS-232 (i.e. "Center Lightfield" + line feed + carriage return). When the Height Adjustment is completed, the Visualizer sends "Height Adjustment Done" (+ line feed + carriage return) to the computer. For more information regarding Height Adjustment, please read the installation manual of your Ceiling Visualizer (<http://www.wolfvision.com/wolf/techinfo.html>).

## Page-Commands

The commands are split into two pages (because for one command-page there are too many commands exist). Basically each command is a two Byte command, page-command + control-command.

If the command-reply mode is switched on, then the Visualizer sends a reply for each Byte, a reply for the control-command and also for the page-command (for details see "Reply Mode Control").

The standard command page is "0", that means, if you want to execute a command from the page "0" (standard page), then it's not necessary to select the page "0" before. If you want to execute a command from the page "1" then you must select the page "1" and input now your command.

If the page "1" command is executed, then the Visualizer switches automatically back to the page "0".

Check "Page" column for command page in the following tables.

### Select Page Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	048	\$30	SER_Page0	By sending this command the Visualizer switches to the page "0" and waits for the control command. Page "0" is the standard page and it is not necessary to select it	
0	049	\$31	SER_Page1	By sending this command the Visualizer switches to the page "1" and waits for the control command. After the control command is executed (i.e. 136 for Show All) the Visualizer changes back to the standard page (page 0)	

### New Hardware - extended possibilities

*VZ-C12<sup>2</sup> with serial number 1009412 and higher*

*VZ-C32 with serial number 1011797 and higher*

The above listed units are supporting the new WolfVision Command list. The new command list offers much more possibilities.

[www.wolfvision.com/wolf/protocol\\_command\\_wolfvision/protocol\\_command.htm](http://www.wolfvision.com/wolf/protocol_command_wolfvision/protocol_command.htm)

## Zoom Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	195	\$C3	Zoom wide	By sending this command the Visualizer zooms towards wide-position. For continuous zooming send this code repetitively (min. 10Hz) as long as you want to zoom.	1
0	199	\$C7	Zoom tele	By sending this command the Visualizer zooms towards tele-position. For continuous zooming send this code repetitively (min. 10Hz) as long as you want to zoom.	1
0	129	\$81	Start Zoom wide	This command starts to zoom towards the wide-position. The Visualizer zooms until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	1
0	130	\$82	Start Zoom tele	This command starts to zoom towards the tele-position. The Visualizer zooms until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	1
0	128	\$80	Stop Zoom/Focus/Iris	This command stops zooming, focusing and iris (if activated with the respective „Start xxx“-command before).	
0	161	\$A1	Get Zoom-Position	After sending this command the Visualizer sends back the current zoom-position as a 3-digit hexadecimal number in the range from '000' (wide) to 'FFF' (tele) as an ASCII-string followed by LF + CR.	2, 3
0	162	\$A2	Set Zoom-Position	After this command the Visualizer echoes a question-mark ('?') with no LF + CR. After this question mark the controller should send the desired zoom-position as 3-digit hexadecimal number in the range from '000' (wide) to 'FFF' (tele) within max. 3 seconds. No CR or LF is needed. After receiving the 3rd digit the Visualizer zooms to this position.	2, 3
1	163	\$A3	Set Digital Zoom	After this command the Visualizer echoes a question-mark ('?') with no LF + CR. After this question mark the controller should send the desired digital zoom-position as 3-digit hexadecimal number in the range from '000' (wide) to 'FFF' (tele) within max. 3 seconds. No CR or LF is needed. After receiving the 3rd digit the Visualizer zooms to this position.	3
1	164	\$A4	Get Digital Zoom	After sending this command the Visualizer sends back the current digital zoom-position as a 3-digit hexadecimal number in the range from '000' (wide) to 'FFF' (tele) as an ASCII-string followed by LF + CR.	3

## Focus Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	194	\$C2	Focus far	By sending this command the Visualizer focuses towards far. For continuous changing the focus, send this code repetitively (min. 10Hz) as long as you want to change the focus.	
0	198	\$C6	Focus near	By sending this command the Visualizer focuses towards near. For continuous changing the focus, send this code repetitively (min. 10Hz) as long as you want to change the focus.	
0	131	\$83	Start Focus far	This command starts to focus towards far. The Visualizer changes the focus until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	
0	132	\$84	Start Focus near	This command starts to focus towards near. The Visualizer changes the focus until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	
0	128	\$80	Stop Zoom/Focus/Iris	This command stops zooming, focusing, iris and mirror-movement (if activated with the respective „Start xxx“-command before).	
0	163	\$A3	Get Focus-Position	After sending this command the Visualizer sends back the current focus-position as a 3-digit hexadecimal number in the range from '000' (near) to 'FFF' (far) as an ASCII-string followed by LF + CR.	2, 3
0	164	\$A4	Set Focus-Position	After this command the Visualizer echoes a question-mark ('?') with no LF + CR. After this question mark the controller should send the desired focus-position as 3-digit hexadecimal number in the range from '000' (near) to 'FFF' (far) within max. 3 seconds. No CR or LF is needed. After receiving the 3rd digit the Visualizer moves to this position.	2, 3
0	249	\$F9	One-Push Auto Focus	By sending this command the Visualizer performs a one-push auto focus.	

## Iris Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	193	\$C1	Iris open / Brightness up	By sending this command the Visualizer opens the iris. For continuous opening the iris, send this code repetitively (min. 10Hz) as long as you want to open iris.	4, 5
0	197	\$C5	Iris close / Brightness down	By sending this command the Visualizer closes the iris. For continuous closing the iris, send this code repetitively (min. 10Hz) as long as you want to close iris.	4, 5
0	133	\$85	Start Iris open	This command starts to open the iris. The Visualizer opens the iris until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	4, 5
0	134	\$86	Start Iris close	This command starts to close the iris. The Visualizer closes the iris until the „Stop Zoom/Focus/Iris“-command or a different Start-Command is received (or the mechanical end-position is reached).	4, 5
0	128	\$80	Stop Zoom/Focus/Iris	This command stops zooming, focusing, iris and mirror-movement (if activated with the respective „Start xxx“-command before).	
0	167	\$A7	Auto Iris on	Switches the Auto Iris on.	
0	168	\$A8	Auto Iris off	Switches the Auto Iris off.	
0	166	\$A6	Get Auto Iris	This function returns '1'+LF+CR if the Auto Iris is switched on and '0'+LF+CR if the Auto Iris is switched off.	3
0	165	\$A5	Get Iris-Position	After sending this command the Visualizer sends back the current iris-position as a 3-digit hexadecimal number in the range from '000' (close) to 'FFF' (open) as an ASCII-string followed by LF + CR.	2, 3, 4
0	169	\$A9	Set Iris-Position	After this command the Visualizer echoes a question-mark ('?') with no LF + CR. After this question mark the controller should send the desired iris-position as 3-digit hexadecimal number in the range from '000' (close) to 'FFF' (open) within max. 3 seconds. No CR or LF is needed. After receiving the 3rd digit the Visualizer moves to this position.	2, 3, 4, 5

## Light On/Off Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	205	\$CD	Light off	By sending this command the Visualizer switches the light off.	
0	178	\$B2	Light on	This command switches the light on.	
0	172	\$AC	Get Light on or off	This function returns '1'+LF+CR if the light is switched on and '0'+LF+CR if the light is switched off.	3
0	177	\$B1	Lampchange	This command changes the lamp and replies "Perform Lampchange..." Changed to Lamp 1" (or lamp 2).	6



## Power / Presets Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	200	\$C8	Power on / Factory-Preset	If the Visualizer is in standby-mode, the unit is switched on. Then the factory-preset is recalled (even if the unit was already switched on). (approx. DIN A5, Light on)	7, 8, 9, 10, 11
0	201	\$C9	Power off	This command puts the unit in standby-mode (camera, light, etc. are switched off).	
0	171	\$AB	Get Power on or off	This function returns '1'+LF+CR if the power is switched on and '0'+LF+CR if the unit is in standby-mode.	3
0	186	\$BA	Power toggle switch	By sending this command the Visualizer switches on if it is off, or switches off if the Visualizer is on. (The main switch must be on.)	
0	154	\$9A	Recall Preset	This command sends "?" back and waits for character input "1"- "9" for preset number. Then the Preset recalls. (max. 3 seconds time for the character input)	9
0	155	\$9B	Store Preset	This command sends "?" back and waits for character input "1"- "9" for preset number. Then the Preset stores. (max. 3 seconds time for the character input)	9
0	213	\$D5	Preset 0 Factory-Preset	This command recalls the Factory-Preset. (approx. DIN A5, Light on)	7, 8, 9, 10, 11
0	202	\$CA	Preset 1	This command recalls Preset 1.	9
0	203	\$CB	Preset 2	This command recalls Preset 2.	9
0	253	\$FD	Preset 3	This command recalls Preset 3.	9
0	216	\$D8	Save Preset 1	This command stores the current Visualizer-settings as Preset 1.	9
0	217	\$D9	Save Preset 2	This command stores the current Visualizer-settings as Preset 2.	9
0	254	\$FE	Save Preset 3	This command stores the current Visualizer-settings as Preset 3.	9
0	229	\$E5	Preset Max. Wide	This command zooms to the maximum wide position, light is switched on.	7, 8
0	230	\$E6	Preset DIN A4	This command zooms to approx. DIN A4-size, light is switched on.	7, 8, 10, 11
0	231	\$E7	Preset DIN A5	This command zooms to approx. DIN A5-size, light is switched on.	7, 8, 10, 11
0	232	\$E8	Preset DIN A6	This command zooms to approx. DIN A6-size, light is switched on.	7, 8, 10, 11
0	233	\$E9	Preset DIN A7	This command zooms to approx. DIN A7-size, light is switched on.	7, 8, 10, 11
0	234	\$EA	Preset DIN A8	This command zooms to approx. DIN A8-size, light is switched on.	7, 8, 10, 11
0	235	\$EB	Preset Max. Tele	This command zooms to the maximum tele position, light is switched on.	7, 8

<b>Page</b>	<b>Dec. Code</b>	<b>Hex. Code</b>	<b>Command</b>	<b>Description</b>	<b>see Notes</b>
0	236	\$EC	Preset Slide	This command zooms to approx. slide-film size, light is switched off.	7, 8, 10
0	237	\$ED	Preset X-ray DINA4	This command zooms to approx. DIN A4-size	7, 8, 10, 11
0	238	\$EE	Preset X-ray DIN A5	This command zooms to approx. DIN A5-size.	7, 8, 10, 11

## Visualizer Menu, Camera control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	218	\$DA	Unlock Visualizer-Menu	This command unlocks the Visualizer-menu. After sending this command the menu can be entered by sending 206.	
0	206	\$CE	Visualizer-Menu on/off	This command enters the Visualizer menu (can be unlocked with 218!) which is then displayed on the screen. If the Menu is locked, then send this code 1 sec. with 10 Hz (repetitively). By sending this command again, the menu disappears and is locked again.	
0	139	\$8B	Unlock Extra-Menu (Baud rate)	This command unlocks the Visualizer-extra-menu. After sending this command the menu can be entered by sending 206.	12
0	208	\$D0	Function Up	Moves the menu-cursor up (if the menu is activated).	
0	209	\$D1	Function Down	Moves the menu-cursor down (if the menu is activated).	
0	210	\$D2	Data Right / White Balance	Changes the data of the current menu-item if the menu is activated. If the menu is not activated, a white-balance is performed.	
0	151	\$97	White Balance	By sending this command the camera performs a white balance. (Also works, when the menu is on.)	
0	211	\$D3	Data Left / Text Enhancer On/Off	Changes the data of the current menu-item if the menu is activated. If the menu is not activated, the Text Enhancer is toggled (switched on or off).	
0	150	\$96	Text Enhancer On/Off	By sending this command the Visualizer switches the Text Enhancement on. If the Text Enhancement is already on, it is switched off. (Also works, when the menu is on.)	
1	158	\$9E	Text Enhancer On	This command switches the Text Enhancement mode On.	
1	159	\$9F	Text Enhancer Off	This command switches the Text Enhancement mode Off.	
1	160	\$A0	Get Text Enhancer	This function returns '1'+LF+CR if the Text Enhancement mode is active and '0'+LF+CR if the Text Enhancement mode is inactive.	
0	214	\$D6	Help	This command gives a description off the settings in the Visualizer-menu.	
0	220	\$DC	Data Left + Data Right	This command behaves like if you press Data Right and Left together, i.e. the menu-item is preset to the default value.	
0	246	\$F6	Reset Menu	This command resets all Visualizer-settings except output-settings.	

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	241	\$F1	Custom Serial Mode On	This command switches the serial custom mode on. In this mode, the on-screen menu of the Visualizer can be controlled with the Data up/down and Data left/right commands. The current menu line (line marked with a cyan arrow in the on-screen menu) will be output via RS-232 (+ line feed + carriage return), i.e. > Color Settings <\$0A><\$0D>. Switching off the unit will deactivate the serial custom mode.	13
0	242	\$F2	Custom Serial Mode Off	This command switches the serial custom mode off.	13

## Reply Mode Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	156	\$9C	Reply Mode Off	By sending this command the Visualizer changes to the "no reply mode". In this mode the unit does not send a reply when a command is received. This is the default mode after power on the unit (mains).	14, 15
0	157	\$9D	Reply One Byte	By sending this command the Visualizer changes to the "one byte-reply mode". In this mode a byte is replied after each command that is received via the serial interface. If a valid command was received, the byte \$06 is replied. If an invalid command was received \$0F is replied. The Visualizer replies also a command if you send only the page select command.	14, 15, 16
0	158	\$9E	Reply Two Bytes	By sending this command the Visualizer changes to the "two byte-reply mode". This mode is similar to one byte-reply mode except that the byte which was just received is repeated before the \$06 or \$0F. e.g. if the Visualizer receives \$C8 (i.e. Power On) it replies \$C8 \$06. If it receives \$10 (i.e. an invalid command) it replies \$10 \$0F.	14, 15, 16
0	159	\$9F	Reply String	By sending this command the Visualizer changes to the "string-reply mode". In this mode the Visualizer replies 'OKAY'+LF+CR if a valid command was received or 'ERROR'+LF+CR if an invalid command was received.	3, 14, 15, 16

## Miscellaneous Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	032	\$20	Blank-Echo (' ')	This command (\$20 is the ASCII-value of a blank) echoes a blank (' ', without CR or LF) back to the controller. This may be useful for checking if the Visualizer is ready for receiving commands.	3
0	118	\$76	Visualizer-Type and Software-Version output ('v')	This command returns the Visualizer-Type and the version no. of the built-in Software (EPROM-version) back to controller. The output-format is as follows: e.g.: 'VZ-C32 V1.12b'+LF+CR	3, 17
0	250	\$FA	Debug Mode on	This command switches the debug mode on.	
0	063	\$3F	Camera and optic status ('?')	This command works only if the debug mode is activated. This command returns the camera and zoom wheel status depending on the Visualizer model and installed firmware in following format (i.e. VZ-C32 with firmware v2.04a): 'LVDS locked. No LVDS-problems detected.' '+LF+CR 'CZ:0 CF:0 CI:0 LZ:0 LF:0 LensReady:0'+LF+CR 'Accu: U:4711mV I:7% t:411min'+LF+CR 'Lightvoltage (Low-Side): 0mV'+LF+CR 'S: 0 R:255 G:255 F:255 B:255 Low:254 AF:0 AE:1'+LF+CR 'Flip:0 Portrait:0'+LF+CR 'CCDExp:324/792 Iris:000 IrisTD:000 GainAll:0 GainR:99 GainG:43 GainF:43 GainB:127 IrisOpt:164'+LF+CR 'Wheel:159 -> 0 -> 0'+LF+CR 'Cam.Ambient-Temp:67 Cam.ADC-Temp:46'+LF+CR 'InView.Detail:3, MenuSet[0].Detail:3,cDetailNoise Level:6'+LF+CR 'MBType: FB3 Rev.0'+LF+CR	
0	095	\$5F	ASCII ('_')	This commands initiates direct ASCII-text input: After receiving '_', the Visualizer responds with a question-mark. After that you have to send the three-digit decimal-number of the desired command within three seconds. These three digits are echoed back by the Visualizer. This command will then be performed. (No CR or LF is needed.) This is useful for testing commands with a standard terminal-program.	
0	175	\$AF	Key Lock On	This command activates the Key Lock. When the Key Lock is active the Visualizer can only be controlled via RS-232 and not with the IR-remote-control or the keys on the unit.	

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	176	\$B0	Key Lock Off	This command deactivates the Key Lock. When the Key Lock is inactive the Visualizer can be normally operated with the keys on the unit, the IR-remote-control or via RS-232.	
0	174	\$AE	Get Key Lock	This function returns '1'+LF+CR if Key Lock is active and '0'+LF+CR if the Key Lock is inactive.	3
0	160	\$A0	Get Status	This command returns all settings of the Visualizer depending on the Visualizer model and installed firmware in following format (i.e. VZ-C32 with firmware v2.04a): 'Zoom:E4C DigitalZoom:000 Focus:802 Iris:000 Power:1 AI:0 Light:0 LightBox:0 KeyLock:0 ImageTurn:0 ShowAll:0 Negative:0 Black/White:0 Text:0 ResolutionRGB:AUTO ResolutionDVI:VGA/60 Video: PAL Lamp1Blown:0 Lamp2Blown:0 OSD-Menu:0'+LF+CR (in one line) (The Values are for example only, '1' means that the respective item is on, '0' means that it is off. The zoom/iris/focus-positions are 3 digit HEX-numbers in the range from 000 to FFF.) In the future further items may be added. Therefore you should search for a specific item-string (e.g. 'Light:') within the complete string and then analyze the next character(s).	2, 3
0	221	\$DD	Switch IR-Mode	This command switches between IR-mode A, B, C and D (,A, B, ..). It's useful if you have up to four Visualizers close together with separate remote-controls.	
0	244	\$F4	Demo-Mode	This command starts the demo-mode. In this mode the Visualizer demonstrates some of its functions, i.e. it continuously zooms, switches the image off and on, etc. . To exit the demo-mode, send any code or press any key.	
1	128	\$80	Toggle Switch Intern/Extern	This command switches between the Visualizer image and the image from e.g. computer that is connected to the "Extern" connector.	
1	129	\$81	Switch Extern signal On	This command switches the extern connected e.g. Computer image to the Visualizer output.	
1	130	\$82	Switch Intern signal On	This command activates the output of the Visualizer image.	
1	131	\$83	Get Extern	This function returns '1'+LF+CR if the Extern signal is active and '0'+LF+CR if the Extern signal is inactive.	

## Image Turn Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
1	132	\$84	Switch Portrait On/Off	This command toggles the Image turn mode (behaves same as the Image Turn key). (Portrait-/Landscape mode).	18
1	133	\$85	Portrait On	This command activates the image turn mode On (+/-90° or 180°).	18
1	134	\$86	Portrait Off	This command activates the image turn mode Off.	
1	135	\$87	Get Portrait	When the image is turned by 0°, this command returns '0'+LF+CR, turned by -90° '1'+LF+CR, turned by 180° '2'+LF+CR and when it is turned by +90° this command returns '3'+LF+CR.	19



## Video Output Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
1	148	\$94	Video PAL	This command switches the Video output format to PAL.	20
1	149	\$95	Video NTSC	This command switches the Video output format to NTSC.	20
1	150	\$96	Get Video	This function returns 'PAL'+LF+CR if the PAL mode is active and 'NTSC'+LF+CR if the NTSC mode is active.	20

## Output Resolution Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
1	144	\$90	Resolution UP	This command switches the Output resolution on both outputs up.	21, 22
1	145	\$91	Resolution Down	This command switches the Output resolution on both outputs down.	21, 22
1	146	\$92	Resolution XGA/75	This command switches the Output resolution on both outputs to AUTO-detect.	
1	147	\$93	Get Resolution VGA	This function returns the current resolution setting on VGA-output. E.g. "XGA at 75Hz" for XGA-standard at 75Hz refresh rate.	
1	170	\$AA	VGA Resolution UP	This command switches the Output resolution on VGA-output up.	21, 22
1	171	\$AB	VGA Resolution DOWN	This command switches the Output resolution on VGA-output down.	21, 22
1	172	\$AC	VGA Resolution AUTO	This command switches the Output resolution on VGA-output to Auto-detect.	
1	169	\$A9	Get Resolution DVI	This function returns the current resolution setting on DVI-output. E.g. "XGA/75Hz" for XGA-standard at 75Hz refresh rate.	
1	173	\$AD	DVI Resolution UP	This command switches the Output resolution on DVI-output up.	21, 22
1	174	\$AE	DVI Resolution DOWN	This command switches the Output resolution on DVI-output down.	21, 22
1	175	\$AF	DVI Resolution AUTO	This command switches the Output resolution on DVI-output to Auto-detect.	

## Output Signal Setting Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
1	151	\$97	Switch Positive On	This command switches to the positive image mode.	
1	152	\$98	Switch Negative On	This command switches to the negative image mode.	
1	153	\$99	Switch Negative Blue On	This command switches to negative blue image mode.	
1	154	\$9A	Get Positive/Negative	This function returns '0'+LF+CR if the Positive mode is active, '1'+LF+CR for the Negative mode and '2'+LF+CR for the Negative /Blue mode.	
1	155	\$9B	Switch Color On	This command switches the color image On.	
1	156	\$9C	Switch Black/White mode On	This command switches the image to a black/white image.	
1	157	\$9D	Get Black/White	This function returns '0'+LF+CR if the Color-mode is active and '1'+LF+CR if the Black/White mode is active.	

## Image Storing Commands

Page	Dec. Code	Hex. Code	Command	Description	see Notes
1	140	\$8C	Memory Store x	This command sends "?" back and wait for character input "1"- "9" for memory number. Then the Memory stores (max. 3 seconds time for the character input).	
1	141	\$8D	Memory Recall x	This command sends "?" back and wait for character input "1"- "9" for memory number. Then the Memory recalls (max. 3 seconds time for the character input).	
1	142	\$8E	Memory Off	This command switches to the Live image.	
1	143	\$8F	Snapshot	This command stores one memory after the other memory, until all 9 memories are stored.	
1	136	\$88	Show All On/Off	This command toggles the Show All mode. (If this function is activated, the Visualizer is showing all stored images on the screen at the same time).	
1	137	\$89	Show All On	This command switches the Show All Memories mode On.	
1	138	\$8A	Show All Off	This command switches the Show All Memories mode Off.	
1	139	\$8B	Get Show All	This function returns '1'+LF+CR if the Show All memories mode is active and '0'+LF+CR if the Show All memories mode is inactive.	
1	165	\$A5	Erase Memory	This command erases all stored memories.	
0	215	\$D7	Freeze On/Off	This command toggles the Freeze-Mode	
1	166	\$A6	Freeze On	This command activates the Freeze function.	
1	167	\$A7	Freeze Off	This command switches off the Freeze function	
1	168	\$A8	Get Freeze	This function returns '1'+LF+CR if the Freeze function is active, and '0'+LF+CR if the life-image is active.	

## Image On/Off Control

Page	Dec. Code	Hex. Code	Command	Description	see Notes
0	185	\$B9	Image toggle switch	By sending this command, the Visualizer toggles between image OFF and image ON.	
0	192	\$C0	Image on	By sending this command the Visualizer switches the image on.	
0	196	\$C4	Image off	By sending this command the Visualizer switches the image off.	

## Notes

1. Zooming switches on Auto-Iris.
2. Not all zoom/focus/iris -positions in the range from 000 to FFF are supported („missing codes“). Reading the position always returns the exact position. Setting the position moves to the desired position as exact as possible.
3. Text under 'quotation marks' are ASCII-strings. The quotation marks must not be sent to the Visualizer and are not sent by the Visualizer. CR means Carriage Return (\$0D), LF is for Line Feed (\$0A).
4. The Auto Shutter, Auto Iris and dimming are not considered.
5. Changing the iris switches off the Auto Iris.
6. Lampchanger-commands available with firmware v1.30a and later.
7. These presets are pre-defined and cannot be modified. Focus is set to the working-plate, Auto Iris and image are switched on, and Text Enhancer is off.
8. The exact size of the picture depends very much on the adjustments of the monitor / video-projector.
9. Following Visualizer-settings are stored/recalled: Zoom-Position, Focus-Position, Auto Iris on/off, Iris-Position (if AI off), Image on/off, Light on/off, Text Enhancer on/off.
10. DIN A8 = 52mm x 74mm [≈2" x 2.9"], DIN A7 = 74mm x 105 [≈2,9" x 4.1"], DIN A6 = 105mm x 148mm [≈4.1" x 5.8"], DIN A5 = 148mm x 210mm [≈5.8" x 8.3"] and DIN A4 = 210 x 297mm [≈8.3" x 11.7"]
11. The image size depends on the distance between working surface and bottom of the Ceiling Visualizer. The "DIN size" is right with a distance of approximate 1.5m. If the distance is shorter, then the Ceiling Visualizer picks up a smaller image. If the distance is longer, a bigger image will be picked up.
12. In this sub-menu it's possible to change the Baud rate of the Visualizer.
13. Custom mode available with firmware v1.30a and later.
14. The verification if a command is valid or invalid is only done very roughly. E.g. if the Visualizer receives a zoom-command while the unit is in standby-mode, it recognizes a valid command and replies \$06 although the unit doesn't perform any action. Also the VZ-C12/C12<sup>2</sup>/C32 identifies a valid code for commands that are only supported on the VZ-57plus (and replies \$06 for a valid command), etc.
15. The reply mode is changed immediately after the respective command was received. This means that the new reply mode is already active for the command that changed the reply mode, i.e. after \$9C there is never a reply, after \$9F the Visualizer always sends 'OKAY'+LF+CR, etc.
16. The reply is always sent immediately after a command is received. When a command returns a status, this status is returned after the reply. E.g.: Reply mode = String Mode, Auto Iris = on: When the Visualizer receives \$A6 (i.e. Get Auto Iris) the unit replies 'OKAY'+LF+CR+'1'+LF+CR.
17. The current released version no. of today will be found on: <http://www.wolfvision.com/wolf/fware.html>.
18. Image rotation depends on the settings in the on-screen menu (miscellaneous settings): +90°, 180°, -90° or cycle.
19. Up to firmware version 2.03a, this command returns: '1'+LF+CR if the Portrait mode is active and '0'+LF+CR if the Portrait mode is inactive.
20. Video output is not available on VZ-C12<sup>2</sup>.

21. Since firmware v1.20a, some new resolutions are added:
- |          |                            |  |
|----------|----------------------------|--|
| VGA/60   | (640 x 480, 60Hz, 4:3)     | Required for HDTV                                |
| XGA 16:9 | (1024 x 768, 60Hz, 16:9)   | Special 16:9 resolution for older plasma monitor |
| WXGA/60  | (1366 x 768, 60Hz, 16:9)   | Resolution for Widescreen monitor                |
| WSXGA/60 | (1680 x 1050, 60Hz, 16:10) | Resolution for Widescreen monitor                |
| 720p/50  | (1280 x 720, 50Hz, 16:9)   | HDTV resolution (progressive scan)               |
| 720p/60  | (1280 x 720, 60Hz, 16:9)   | HDTV resolution (progressive scan)               |
| 1080p/50 | (1920 x 1080, 50Hz, 16:9)  | HDTV resolution (progressive scan)               |
| 1080p/60 | (1920 x 1080, 60Hz, 16:9)  | HDTV resolution (progressive scan)               |
22. With firmware version v2.03a the SXGA+ resolution has changed from 1360x1024 pixels to 1400x1050 pixels for more display compatibility.

## Commands of other Visualizers, Future

The serial protocols of all WolfVision Visualizers are almost the same. Only some commands more or less are supported on other Visualizer-types due to the different technologies.

(The VZ-7D has e.g. Auto Focus commands but no e.g. Sync-On-Green-command.) In the future (at higher FIRMWARE-versions) further commands may be added which are not supported yet.