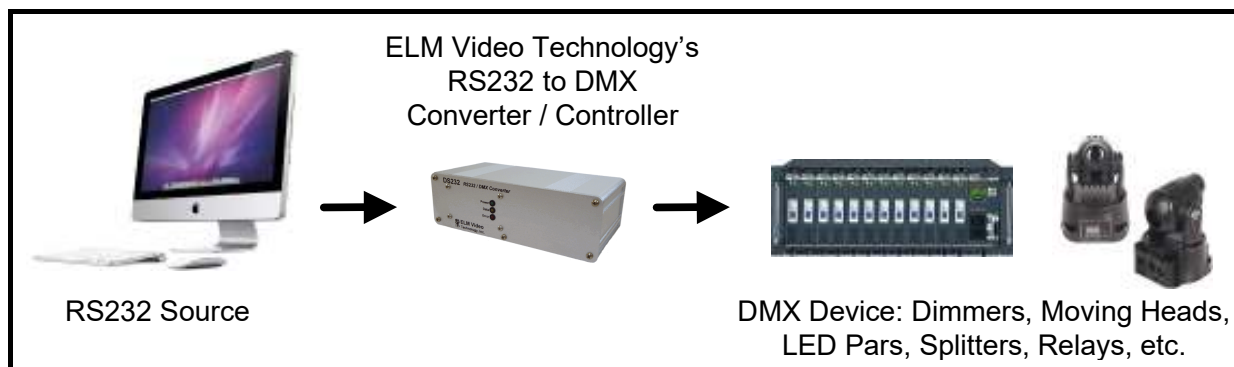


# DS232

## RS232 to DMX Converter v4



### OVERVIEW

The DS232 is an RS232 to DMX controller. Connect an RS232 terminal or computer port to the DS232 and control 512 channels of DMX controlled dimmers and devices. A set of commands and auto fade rates offer power and flexibility for controlling DMX equipment. Use any RS232 terminal application to create command strings to: turn on, off, fade up, and fade down dimmer channels or set a single channel or range (or a multiple set) of channels to a specific value, and add or subtract values to existing levels. Save up to 100 scenes, and recall as needed with optional fade times. Each scene will save all 512 channel levels. Any of the command strings can have a fade duration up to 59.9 seconds, and all 512 dimmer channels can have an independent and simultaneous fade rate up or down. With the global fade rate command, any existing fades can be updated to a new rate, finalize, or immediately end any fades. With the DMX input option (*Requires version 4.xx software and DMX input hardware*), DMX can be looped through on demand and saved for recall. The Echo Mode sends received data back to the DTE (Data Terminal Equipment) for confirmation. The Buffer Read command sends 512 DMX level value (Buffer) data bytes currently on the DMX output connector to the DTE, along with 1 error byte read as bits, and 1 status byte read as bits. See the "Buffer Read Mode Command" section for more information.

### CONNECTIONS

Connect an RS232 serial output device to the DS232's RS232 input connector using a standard 9 pin male to female through cable. Setup the serial terminal for: 9600-8-N-1 (baud rate of 9600, 8 data bits, parity of None, and 1 stop bit). There are 4 connections:

- Pin 2 - RX (optional)
- Pin 3 - TX data (from DTE to the DS232 unit)
- Pin 5 - Signal Ground
- Pin 8 - CTS (Clear to Send) (optional)



Connect the DMX(512) controlled device(s) to the XLR output. The 'data' LED will flash when an RS232 character is received. The 'error' LED will illuminate solid if an invalid character or an invalid string character has been received. A blinking 'error' LED indicates an internal DMX transmission or RS232 overrun error has occurred and input data commands could have been lost. Both errors can be cleared with a power reset, 'R' or 'C' command. If equipped, optionally connect a DMX signal to the XLR input. The DMX input is internally terminated. *NOTE: Insure that the DMX512 daisy chain is terminated at the end device, up to a maximum of 32 devices, and never 'T' a DMX daisy chain.*

## **OPERATION**

Once powered the DS232 will immediately generate a DMX signal of 512 channels. To control the dimmer channel values, send command strings from a serial terminal application. The command string can contain up to 96 characters and must be entered with the proper syntax (shown below). If an invalid character, or a character in the incorrect order within a string is entered, an error will occur indicated by a solid red LED. Each command string is executed when the 'G' command is received.

*NOTE - If multiple complex commands are sent too quickly an error could occur, if so add a wait time between commands of up to .1 seconds (100mS).*

The CTS (Clear to Send) signal is available from the DS232 to the sending source informing the flow control that the unit can receive a new string. If this function is desired, ensure the DTE (sending) source's flow control CTS option is selected. If the CTS signal is set then the DTE (Data Terminal Equipment) is clear to send.

If a fade rate (up or down) is desired any command string can end with a fade command and all the dimmer channels included in the string will fade to the intended value at the fade rate from their current value(s). All 512 dimmer channels can have simultaneous and independent fade times up or down. A global fade rate command can be sent that will override any existing fades to a new value to lengthen, shorten, or end fades. The fade command must be entered in the range of F00.0 through F59.9 seconds.

The dimmer channel values are entered as percentage values (default) in the range of 0 to 100% or if specific values are desired (levels 0 - 255), the input level mode can be changed by setting the NON VOLATILE memory setting by sending a mode change of "M=L". When a mode change is received the red LED will flash indicating the mode change is stored. (Repower to verify the mode change.) This will allow dimmer channel values in commands and string of commands to be entered in the range of 0-255.

Scene snapshots of current level settings can be saved in a scene file. Save up to 100 scenes and recall instantly or with a fade time if desired. *\*\*Non volatile memory setting see note 1*

If equipped with DMX input and a valid DMX signal is connected, the DS232 will loop the DMX data through to the DMX output when commanded. Once the command is entered the current output is over written and the DMX input signal is sent to the output. *Note - the current output will be lost if it has not been saved.* With the active DMX signal looping through, the DS232 can then be put in a HOLD mode and stored to scene(s) if desired. *Note, the DS232 doesn't have to be in a hold mode to be saved to a scene but is recommended so the levels are known before saving.* Once released from HOLD or released from Loop THROUGH, the DS232 DMX output levels will remain unchanged and can be saved or changed with the standard RS232 commands.

### **LED Indicators:**

Green=Power	+5 volt power source is present
Yellow=Data	RS232 NORMAL MODE - LED Flash: a character was received RS232 NORMAL MODE - 2 LED Blinks: Scene save confirmed DMX THROUGH MODE - LED OFF: No valid DMX received DMX THROUGH MODE - LED ON: Valid DMX received
Red=Error	LED Flash: Non Volatile (permanent) memory was successfully changed LED On solid: Character or string error (an unknown character was received). LED Blinking: RS232 input overrun error with data loss, or a scene save error occurred

***An overrun and scene save error will override a character error. A clear "C" or reset "R" will clear both errors.***



**NOTE:** Test that ALL programs are free of any errors to insure proper operation.

### **Command Characters Accepted:**

0-9, B, C, D, E, e, F, G, H, L, M, N, R, S, T, V, @, <, >, =, +, -, ., %, space, LF (line feed), and CR (carriage return)

### **Character Definitions:**

- 0-9** Numeric values - value or range within in a command string
- D** 'Dimmer' command - A dimmer (DMX channel) or dimmer range (DMX channels) within in a command string
- F** A command string can optionally end with a fade command, or can be entered independently as a new global fade rate for all existing fades in progress. I.e. All fades in action rates (times) will be overridden with the new fade rate. The new fade rate is calculated from the existing current channel level at the time the new fade rate is received. Each dimmer (512 DMX channels) can have an independent fade rate in either direction (up or down) with an accuracy of --250mS.
- M, L, %** (Mode, Level, Percentage) used to change the level entry type of % or 'L' Level. Send independently (not within a string). 'M=L' sets the level mode - dimmer channel levels will be interpreted as specific level values in the range of 0-255. 'M=%' sets the level mode to percentage - dimmer channel levels will be interpreted as percentage values in the range of 0-100%. *NOTE - This is a non volatile memory setting, a power reset or loss will not change this setting. It is recommended to initially setup the unit in the desired mode. DO NOT RUN PROGRAMS THAT WILL CHANGE THIS SETTING (as non volatile memory has a limited number of writes - see specs).*
- B** Buffer read - will return 514 data (see mode commands below)
- C** Clear command [single command] - clears any existing errors and does not affect dimmer levels. Can also be used to end fades at the current levels at the time the C command was received. (e.g. If a 59.9 second fade is started from 0 to 100%, and a C command is sent at 30 seconds, then the fade(s) would halt at the current values of apx 50%).
- E** Turns ON echo mode (see mode commands below)
- e** Turns OFF echo mode (see mode commands below)
- G** Go or execute command - used to execute a string or global fade command
- H** Hold Mode (While in DMX THROUGH Mode) if DMX input equipped
- N** Normal (RS232) Mode if DMX input equipped
- R** Reset command [single command] - will reset the unit clearing all errors and set all channel levels to zero
- S** Scene recall or save
- T** DMX Loop THROUGH Mode if DMX input equipped
- V** Scene save
- Space** ignored and won't generate an error
- LF** [line feed] ignored and won't generate an error
- CR** [carriage return] ignored and won't generate an error

### **Command Ranges:**

- +** is an 'and' range e.g. D5+127+201, selects *dimmers (DMX channels)* 5 and 127 and 201
- is a 'through' range e.g. D37-50, selects *dimmers (DMX channels)* 37 through 50.  
*Note - with the through range command the channel values must be in the range of 1 through 512 and the 1st channel must be less in value than the 2nd channel.*

### **Command Actions:**

- @** sets the dimmer (DMX channel) range to the level commanded e.g. D10@55, commands dimmer 10 to go to 55% (string fade time optional) *Note - If a string commands a duplicate channel or range of channels within the same string - the 1st command of the string overrides the latter value(s) within the string.*
- <** is the 'increase' action and will increase a dimmer channel(s) by a specified level up to 100%, e.g. (Current dimmer 12 is at 50%) D12<10 will increase dimmer 12 to 60% (string fade time optional).



- > is the 'decrease' action and will decrease a dimmer channel(s) by a specified level down to 0%, e.g. (Current dimmer 7 is at 42%) D7>15 will decrease dimmer 7 to 27% (string fade time optional).  
*Note - For the '<' and '>' actions - if a command within a string command contains a duplicate channel or range of channels in another command within the same string, the values are accumulated one at a time from latest to earliest e.g. If dimmer 5 is at 50% and the following command string is sent [D2-6<10D2+5+10>2%] then dimmer 5 would 1st decrease by 2% equaling 48% then the 1st command of the string will increase the value by 10% for a final value of 58%.*

#### **Mode Commands:**

- M=L **\*\*Mode = Level:** Dimmer (DMX channels) values are in the range of 0-255 **\*\*Non volatile memory setting see note 1**
- M=% **\*\*Mode = Percentage:** Dimmer (DMX channels) values are in the range of 0-100% **\*\*Non volatile memory setting see note 1**
- M=E **\*\*Mode = Echo ON:** All data bytes sent to the DS232 are echoed back to the DTE  
*Note: This is a echo function only, indicating the DS232 is communicating and doesn't indicate the function is being processed or completed. \*\*Non volatile memory setting see note 1*
- M=e **\*\*Mode = echo OFF:** No data bytes are echoed back to the DTE **\*\*Non volatile memory setting see note 1**

#### **DMX Loop Through Mode Commands: - If DMX input equipped**

- M=T **\*\*Mode = THROUGH:** (if DMX input equipped) DMX input is looped through to DMX output  
**\*\*Non volatile memory setting see note 1**
- DMX Receive is enabled, RS232 commands are disabled and DATA LED will now indicate DMX status. ON = valid DMX is being received, OFF = no DMX
  - DMX input values are looped through to the DMX output (when initiated the current output levels are overwritten)
  - Ceases any executing fades
  - RS232 dimmer commands, fade commands, and scene recalls will error
  - Save command is allowed, storing current output of DMX loop through
  - Buffer read command will return current output of DMX loop through
  - If no DMX is present the outputs will be zero
  - DMX output packet size is 512 bytes regardless of DMX input packet size
- M=H **Mode = HOLD:** (if DMX input equipped) DMX input is held on the DMX output
- Will error if NOT in loop THROUGH Mode
  - Current DMX input values are held on the DMX output, DMX input is still enabled but not looped through
  - There is no Indicator of HOLD mode (Buffer read status bit will indicate this mode is active)
  - Released by M=N or M=T mode command (An M=T command will release the hold and resume a DMX loop thru)
  - RS232 dimmer commands, fade commands, and scene recalls will error
  - Save command is allowed, storing current DMX output
  - Buffer read command will return current DMX output
- M=N **\*\*Mode = NORMAL:** (if DMX input equipped) RS232 commands are resumed **\*\*Non volatile memory setting see note 1**
- DMX loop THROUGH is disabled and DMX output values remain unchanged.
  - RS232 commands are re enabled (DATA LED resumes indicating RS232 character status)

#### **Buffer Read Mode Command:**

- M=B **Mode = Buffer Read:** 514 data bytes are sent to the DTE. The first 512 bytes are the current DMX level values at the time the command was received - *if a fade command is in progress the values will read the current values*. One error log byte, and one status byte. The buffer read function is useful to verify that the DMX levels are as intended, if any errors have occurred and the status of the DS232. If the DTE used is remote accessible, this data could be useful for remote verification and status.  
The 513th byte is an ERROR LOG byte read as bits:
- bit 0: String Error: A unrecognized character received, in the incorrect order, or character length exceeded 96 ("C" clears)
  - bit 1: RS232 Port Error: Parity error ("R" reset required to clear)



- bit 2: RS232 Port Error: Unexpected data error ("R" reset required to clear)
- bit 3: RS232 Port Error: Overrun error, excessive data was received and could not process ("C" clears)
- bit 4: RS232 Port Error: An error has occurred on the RS232 port since last power, reset, or clear ("R" reset required to clear)
- bit 5: DMX Port Error: An error has occurred on the DMX port since last power or reset ("R" reset required to clear)
- bit 6: Last Scene Read or Save Error: On the LAST scene read or save an error occurred (clear by a next read or save, "C" and "R" command)
- bit 7: Scene Save Error has occurred: 0 = no error, 1 = error (clear by a "C" and "R" command)

The 514th byte is a STATUS byte read as bits: (*Version 4.xx software*)

- bit 0: Mode 0=Normal Operation / 1=DMX Loop Through
- bit 1: Mode 0=No DMX Hold / 1=Hold
- bit 2: Mode 0=Percentage / 1=Level
- bit 3: Mode 0=Echo / 1=No Echo
- Bits 4-7: Unused

**Scene Commands:**

**S** Scene read or save in the range of 1 - 100

**V** \*\* Scene save *\*\*Non volatile memory setting see note 1*

*NOTE: If a scene is saved while any fades are in progress, a read/save error may occur. The command will save the snapshot of the levels at the time the G command was sent but the values may be undetermined. It is recommended to STOP all fades (C command or equivalent) before saving a scene.*

**Command String:**

The command string length can be up to 96 characters and all will execute when the 'G' command is sent. Duplicate dimmer channel commands are allowed within a string and all are executed from last to first. For an '@' action the earliest segment will be the final result. For the '<' and '>' actions, each segment will be calculated latest to earliest. *\*see example below.*

*NOTE - If multiple complex string commands are received back to back and an error occurs (blinking red LED), then add a .1 second (100mS) delay between strings to allow the unit time to calculate the previous string.*

**Command String Examples:**

D52@95 Dimmer 52 is prepared for 95%

G Go - command string is executed i.e. dimmer 52 is then set to 95%

D20+45+99@50G Dimmers 20, 45, and 99 are immediately set to 50%

D100-275@10G Dimmers 100 through 275 are immediately set to 10%

D2@75F01.5G Dimmer 2 will fade to 75% (from it's current value) in 1.5 seconds

D2+4+512<10D5-10>50G Dimmers 2, 4, and 512 will increase by 10%, dimmers 5 through 10 will decrease by 50%, both from their current value at the time the 'G' command is sent

\*\*D10+42+50<10D40-44>5G Dimmers 40 through 44 are increased by 5%, and *then* dimmers 10, 42, and 50 are decreased by 10%. *Note - Dimmer 42 is executed in both segments, the latter is executed 1st and will be*



decreased by 5% and then be increased by 10% so the final result will be an increase of 5%.  
\*Segments within a string are executed from last to first.

D5@10F10.5G Dimmer 5 will fade to 10% in 10.5 seconds.

D3+1+95<10D5-10>50D105-110@5D400-500@97F59.9G  
Dimmers 3, 1, and 95 will fade increase by 10%, dimmers 5-10 will fade decrease by 50%, dimmers 105 through 110 will fade to 5%, dimmers 400-500 will fade to 97%, in 59.9 seconds from their current values.] During this fade time if a new command string is received commanding any of these dimmer channels with a fade rate, the new fade time will override the existing fade values. For example, if at 30 seconds of this fade, dimmer 3 is currently at 5% and increasing, and a new command D3@50F01.0G is sent then dimmer 3 will now fade to 50% in 1 second from 5%.

D77-100@99F50.0G Dimmers 77 through 100 will fade to 99% in 50 seconds, if at 30 seconds of this fade a command string of D78+80@10G is sent then dimmers 78 and 80 will immediately go to 10% and the fade will be option will be turned off for these two channels, the remaining channels 77, 79, and 81 through 100 will continue fading as commanded.

S14@95G Scene 14 will be recalled at 95% of the saved levels

S100@50F12.5G Scene 100 will be recalled at 50% of the saved levels with a fade rate of 12.5 seconds

S57VG \*\* Scene 57 will be saved at the current levels

F10.0G If an independent fade rate is sent followed by the G command, all if any existing fades will now recalculate and fade from their existing level values at the time the command was sent to go to their intended values in 10 seconds.

F00.0G If an independent fade rate of 0 is sent, all if any existing fades will terminate and the respective dimmer values will immediately go to their intended values. *Also note, during any fades a 'C' command can be sent and will halt all fades at their current levels.*

M=T \*\* Enters the DMX loop THROUGH mode, DMX input is looped to the DMX output. The HOLD mode (M=H) and save commands are operable. RS232 commands are limited. Mode is exited by M=N - NORMAL.

M=N \*\* NORMAL Mode is resumed from THROUGH or HOLD mode, current DMX output levels remain the same and can be changed with standard RS232 commands.

M=L \*\* Level mode is set] All channel level values must be entered in a range from 0-255. For example D2+4+10@200G, will set dimmers 2, 4, and 10 to a specific value of 200.

M=% \*\* Percentage mode is set] All channel level values must be entered in a range from 0-100.

**\*\*NOTE 1 - Non volatile memory setting, a power reset or loss will not change this setting. It is recommended to initially setup the unit in the desired mode. DO NOT RUN PROGRAMS THAT WILL CHANGE THIS SETTING as non volatile memory has a limited number of writes - see specs.**



## SPECIFICATIONS

<b>DMX CONTROL WARNING:</b>	NEVER use DMX data devices where human safety must be maintained. NEVER use DMX data devices for pyrotechnics or similar controls.
<b>Manufacturer:</b>	ELM Video Technology, Inc.
<b>Description:</b>	RS232 to DMX Converter
<b>Model Number:</b>	DS232-5V3/5P
<b>Functional description:</b>	The DS232 is an RS232 (terminal or computer port) to DMX converter that will control and drive DMX controlled dimmers and devices.
<b>Operating temperature:</b>	32°F to 100°F
<b>Storage temperature:</b>	0°F to 120°F
<b>Humidity:</b>	Noncondensing
<b>Non-volatile Memory Writes:</b>	100K, Typical 1M - times
<b>Scene File Saves:</b>	10K, Typical 100K - times
<b>Non-volatile Memory Retention:</b>	Minimum 40 Yrs, Typical 100 Yrs
<b>Chassis:</b>	Anodized Aluminum .093" thick RoHS compliant.
<b>5V Current:</b>	apx 130mA - with full DMX output load (60mA)
<b>RS232 Input:</b>	9 Pin female serial connector at 9600-8-N-1 baud rate of 9600, 8 data bits, parity of None, and 1 stop bit
<b>DB9 Connections</b>	Pin 2 - RX (optional) Pin 3 - TX data (from DTE to the DS232 unit) Pin 5 - Signal Ground Pin 8 - CTS (Clear to Send) (optional) <i>Use a 9 pin male straight through cable</i>
<b>Command String Length:</b>	96 characters
<b>Command String Execute Timing:</b>	100mS
<b>DMX Control Channels:</b>	512
<b>DMX Data Input:</b>	<i>If equipped - DMX512 @ 250 kHz, 5 and/or 3 pin male XLR Pin 1 - N/C, Pin 2 Data -, Pin 3 Data +</i>
<b>DMX Data Output:</b>	DMX512 output 250 kHz, 5 and/or 3 pin female XLR <i>Pin 1 - Power supply common, Pin 2 Data -, Pin 3 Data +</i>
<b>Dimensions:</b>	3.7 x 6.7 x 2.1 inches
<b>Weight:</b>	1.5 pounds
<b>Internal Fuse:</b>	RS232 Converter PCB - 500mA PCB mount through hole
<b>UL Listings:</b>	Power supply, PCB pre populated
<b>External Power Supply:</b>	+5VDC wall mount
<b>Voltage Input:</b>	100 ~ 132 (or 240) VAC
<b>Current Output:</b>	1A
<b>Power:</b>	5 Watts Typical
<b>Polarization:</b>	Positive Center
<b>Output Connector:</b>	Barrel Plug, 2.5mm I.D. x 5.5mm O.D. x 9.5mm