RS23210V
RS232 to 0~10 Volt Analog Converter Controller V2.10

OVERVIEW

Control most any 10 volt controllable equipment from an RS232 port such as a touch panel controller or computer terminal. The output voltage is directly proportional to the percentage sent to the unit for example, a sent value of 97% would be 9.7 volts out. Or 50% = 5 volts, 2.1% = 2.1 volts etc. The RS23210V, an RS232 to 0~10V converter/controller, is easy to install and use. Connect an RS232 port to the RS23210V unit and control up 4, 8, 12 or more depending on the options and enclosure. Each of the 0~10 volt outputs have 256 steps of resolution. A powerful set of commands and auto fade rates offer power and flexibility for controlling equipment. Use any RS232 terminal application to create command strings to: turn on, turn off, fade up, and fade down each output or (Dimmer) channel, save or snapshot up to 100 settings to be recalled at anytime. 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. Any of the command strings can have a transition (or Fade) rate up to 59.9 seconds, and all outputs can have 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 to immediately end any fades. Additional commands: "Echo" sends received data back to the DTE (Data Terminal Equipment), and "M=B" command sends a full buffer data block with error log back to the DTE for verification or analyses. Save and recall up to 100 scenes with optional fade times.

Other enclosure styles availble

CONNECTIONS

Connect an RS232 serial output device to the RS232 input screw terminals and set the output terminal for: 9600-8-N-1 (baud rate of 9600, 8 data bits, parity of None, and 1 stop bit). The RS232 connections are:

Terminal - RX (optional)
Terminal - TX data (from DTE to the DS232 unit)
Terminal - Signal Ground
Terminal - CTS (Clear to Send) (optional)

Connect the 0~10V controlled device(s) to the screw terminals. And a +12VDC regulated power supply to the power input terminals. The 'data' LED will blink when an RS232 character is received. The 'error' LED will illuminate solid if an invalid character, or if an invalid string character is received. A blinking 'error' LED indicates an internal 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. *Ensure not to exceed the maximum output current load of each output, 20mA source, and 10mA sink.*

STOCK PHOTO SHOWN-Enclosure will have terminals labled as per custom order.
Other enclosures may be available, contact ELM Video Technology www.elmvideotechnology.com for more information.

Ensure not to exceed the maximum output current load of each output, 20mA source, and 10mA sink.

OPERATION

Once powered the RS23210V will immediately set all of the outputs to 0V. To control the each output send command string referencing 1 or more outputs using the "D" command including the output number(s) that changes are desired on. For a 4 channel output unit, send the D commands from D1 through D4. For a 16 channel output unit, send the "D" commands from D1 through D16, etc. The command string can contain up to 96 characters and must be entered with the proper syntax (shown below). An error will occur (indicated by a solid red LED) if an invalid character is entered or a character in the incorrect order within a string. Each command string is not executed until the 'G command is sent.

NOTE - Wait a minimum of 100mS between strings (G command) to allow the unit time to calculate the previous string, otherwise an OVERRUN error could occur.

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 insure the sending source's flow control CTS option is selected.

If a fade rate (up or down) is desired any command string can end with a fade command and all the output channels included in the string will fade to the intended value at the fade rate from their current value(s). All output

output 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 default output channel values are entered as percentage values in the range of 0 to 100%. If specific values are needed, 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. (Re power if desired to verify the mode change.) This will allow output 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.

> **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 changes - see specs).

Green=Power	+5 volt power source is present
Yellow=Data	Flash: a character was received
	2 Blinks: Scene save confirmed
Red=Error	Flash: Non Volatile (permanent) memory was successfully changed
	On solid: Character error (an unknown character was received).
	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: Insure your program is free of any errors to insure proper operation.

Command Characters Accepted:
0-9, B, C, D, E, e, F, G, L, M, R, S, 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') channel output command - A channel output or channel output range 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 channel output (512) 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 - output channel levels will be interpreted as specific level values in the range of 0-255. 'M=%' sets the level mode to percentage - output 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 513 data *(see mode commands below)*

C   Clear command [single command] - clears any existing errors and does not affect output channel 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

R   Reset command [single command] - will reset the unit clearing all errors and set all channel levels to zero

S   Scene recall or save
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+7+10, selects output channels 5 and 7 and 10
-   is a 'through' range e.g. D2-15, selects output channels 2 through 15.
        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 output channel range to the level commanded e.g. D10@55, commands output channels 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 segment of the string overrides the latter value(s) within the string.*

<   is the 'increase' action and will increase a output channel(s) by a specified level up to 100%, e.g. (Current output channel 12 is at 50%) D12<10 will increase output channel 12 to 60% (string fade time optional).

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

Mode Commands:

M=L   Mode = Level: Output channel values are in the range of 0-255
        Permanent memory change (not for program use, initial setup recommended - see note**)
M=%   Mode = Percentage: Output channel values are in the range of 0-100%
        Permanent memory change (not for program use, initial setup recommended - see note**)
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.
        Permanent memory change (not for program use, initial setup recommended - see note**)
M=e   Mode = echo OFF: No data bytes are echoed back to the DTE
        Permanent memory change (not for program use, initial setup recommended - see note**)
M=B   Mode = Buffer Read: 513 data bytes are sent to the DTE of the current values at the time the command was received. i.e. If a fade command is in progress the values will read the current values. The first 512 bytes represent the 512 channel levels. If the RS23210V unit is equipped with 8 channels for example then ignore values from 9-512. The buffer read function is useful to verify that the levels are as intended, and the error status of the RS23210V. 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. Convert into binary data bits will indicate:

  - 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 - RS232 Output Port Error: An error has occurred on the on the RS232 send 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)

Scene Commands:

S   Scene read or save in the range of 1 - 100
V   Scene save
    Permanent memory change (not for program use, initial setup recommended - see note**)
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 output channel segments 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-Wait a minimum of 100mS between strings to allow the unit time to calculate the previous string. If a string is sent to quickly an overrun error will occur indicated by the red LED blinking

> *NOTE - Wait a minimum of 100mS between strings to allow the unit time to calculate the previous string, otherwise an OVERRUN error will occur.*

Command String Examples:

D12@95   [Output channel 12 is prepared for 95%]

G   [Go - command string is executed i.e. Output channel 12 is then set to 95%]

D2+4+9@50G   [Output channels 2, 4, and 9 are immediately set to 50%]

D1-16@10G   [Output channels 1 through 16 are immediately set to 10%]

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

D2+4+16<10D5-10>50G   [Output channels 2, 4, and 16 will increase by 10%, Output channels 5 through 10 will decrease by 50%, both from their current value at the time the 'G' command is sent]

**D1+4+15<10D10-24>5G   [Output channels 10 through 24 are increased by 5%, and *then* Output channels 1, 4, and 15 are decreased by 10%.] Note - Output channel 15 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   [Output channel 5 will fade to 10% in 10.5 seconds.]

D3+1+10<10D5-10>50D12-16@5F59.9G   [Output channels 3, 1, and 10 will fade increase by 10%, output channels 5-10 will fade decrease by 50%, output channels 12 through 16 will fade to 5%, in 59.9 seconds from their current values.] During this fade time if a new command string is received commanding any of these output channels with a fade rate, the new fade time will override the existing fade values. For example, if at 30 seconds of this fade, output channel 3 is currently at 5% and increasing, and a new command D3@50F01.0G is sent then output channel 3 will now fade to 50% in 1 second from 5%.

D7-10@99F50.0G   [Output channels 7 through 10 will fade to 99% in 50 seconds, if at 30 seconds of this fade a command string of D8+9@10G is sent then output channels 8 and 9 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

S11@50F12.5G   Scene 11 will be recalled at 50% of the saved levels with a fade to rate of 12.5 seconds

S7VG   Scene 7 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 output channel values will immediately go to their intended values.]

**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 - 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).

*SEGMENT - Multiple portions of a command string are composed of segments e.g. "D2@50"

SPECIFICATIONS

CONTROL WARNING: NEVER use this device where human safety must be maintained.
NEVER use this device for pyrotechnics or similar controls.

Manufacturer: ELM Video Technology, Inc.
Description: RS232 to 0~10V Converter Controller
Model Number: RS23210V-DIN
Functional description: The RS23210V is an RS232 (terminal or computer port) to 0~10 Volt converter that will control 0~10 volt analog controlled dimmers and devices.
Operating temperature: 32°F to 100°F
Storage temperature: 0°F to 120°F
Humidity: Noncondensing
Non-volatile Memory Writes: 100K, Typical 1M - times
Scene File Saves: 10K, Typical 100K - times
Non-volatile Memory Retention: Minimum 40 Yrs, Typical 100 Yrs

RS232 Input: 9600-8-N-1
BAUD RATE: 9600
DATA BITS: 8
PARITY: None
STOP BITS: 1

RS232 Connections
Terminal - RX (optional)
Terminal - TX data (from DTE to the DS232 unit)
Terminal - Signal Ground
Terminal - CTS (Clear to Send) (optional)

Control Channels: 512
Command String Length: 96 characters
Comm. String Send Wait Timing: 100mS recommended
Data Output: 0~10 Volt Analog: Source current max 20mA, Sink current max 10mA

Dimensions: 2.75" Height x 3.95" Width x 4.43" Depth
Weight: 6oz
Power Input: Regulated +12VDC at 500mA - 12 channels under full load

Internal FUSE:
12V to 5V regulator PCB - 1 Amp 5x20 mm
RS232 Converter PCB - 500mA Surface Mount
0-10V Controller PCB - 750mA Surface Mount