HALL RESEARCH

Model CC-101 & CC-101-PRO
Closed Caption and Text Video Overlay
With CC Streaming, Progressive Component (YPbPr) and VGA outputs on the '-PRO' unit

UMA1116
Rev 2.6

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1.0 General

Thank you for purchasing Hall Research's CC-101 or CC-101-PRO Closed Caption Decoder and Text Video Overlay Unit.

These units can capture the closed captioning text (CC1 through CC4), information and then overlay it on the video output. They can also display any user defined text anywhere on the video. On the CC-101-PRO units, the closed captioning text can also be streamed out the serial port and captured on another device.

The closed captioning overlay can be turned on or off from the front panel. Furthermore, the unit can decode CC1 through CC4.

The unit is equipped with a serial port, through which the unit can display user defined text anywhere on the screen. The unit also has EEPROM (internal non-volatile flash memory) in which the user store up to 10 strings of data and automatically display them either every time the unit is turned on or the playback can be activated via the front panel.

Free Windows™ software is available that allows the user to define and store text in the unit's memory for playback. This powerful software allows timers so the text can stay for predefined time on the screen. You can also configure the unit to end and freeze the last displayed text on the screen or to loop the playback from the beginning ad infinitum. Also, during the playback, you can turn on Closed Caption decoding for long periods of time. This makes the unit to be useable as a digital signage playback device where either constantly or periodically you can display stored messages.

The CC-101 has both S-Video and Composite Video inputs and outputs. There is a front panel switch that you can use to select the input that you are going to use. If you select the CV input then you must use the CV output and if you use the S-Video input, then you should use the S-video output. Do not use the unit to convert from one standard to another.

The CC-101-Pro also has progressive outputs of either component video (Y Pb Pr 480p/576p) or VGA (RGBHV 640x480/800x600). There is switch on the front panel to set the progressive output mode as either component video or VGA. The progressive output resolutions are based on the input standard (NTSC/PAL).

2.0 Features

- ✓ Overlays User Defined Text on Video
- ✓ Decodes Closed Captioning data and overlays it on video
- ✓ RS232 port for configuration or real-time video text overlay
- ✓ CC-101-PRO has the ability to stream out the Closed Caption via the RS232 port
- ✓ Free Windows™ GUI software for defining and storing messages in built-in flash memory of the unit for later manual or automatic playback
- ✓ S-Video and Composite Video inputs and outputs
- ✓ CC-101-PRO also has progressive outputs (YPbPr and VGA)
- ✓ Front panel switches for selection closed captioning mode, input selection, and progressive output mode (on –PRO unit)
- ✓ Ships with universal (100~240 VAC) power supply
- ✓ Compact, Rugged, Reliable, and Economical
- ✓ Made in USA
- ✓ Perfect for classrooms and digital signage applications where closed captioning decoding may not be an option (such as when projectors are used or scalers that strip-out the captioning
- ✓ Excellent for adding titles to any video
- ✓ Choice of font sizes and background styles for text overlay
- ✓ Screen can be Blanked with Closed Caption text displayed
- ✓ -PRO unit eliminates interlace flicker with its progressive output

3.0 Installation

. Included Cables

The CC-101 comes with a 6 ft Male/Female DB9 Serial Cable. The –PRO also includes HD15-to-3 RCA cable for component video output. All other cables are to be supplied by the user.

. Inputs & Outputs

The CC-101 has 2 video inputs: S-Video and Composite Video. The unit has 2 video outputs: S-Video, Composite Video. –PRO unit also has a choice of, VGA or Component Video.

On CC-101 use the same output as the input (S-Video or Composite Video), there may be an image on both outputs, but the one not corresponding to the input, will have color or image artifacts. The -PRO output will display either the S-Video input or the Composite video input.

. Connecting the CC-101

Connect your video source (S-Video or Composite Video) to the CC-101 and select the source by pressing the "Input select" button on the front panel. If the selected input does not have valid video, then the corresponding LED on the front panel will be blinking.

On the –PRO unit connect the video output to your display device using either a VGA cable or the supplied HD15 to Component cable. If you have a –PRO unit, the front panel PRO OUTPUT will be lit.

Connect the included power supply to the CC-101-PRO and apply power (do not substitute power supplies, inputs over 5.5 VDC cause damage).

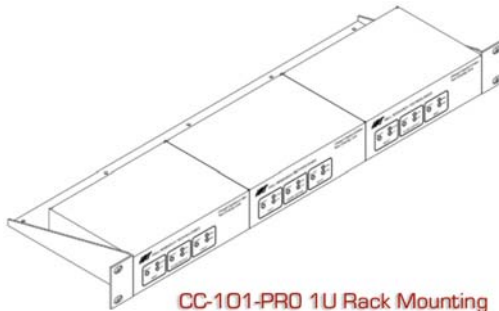For programming the unit's internal memory with your own text or for streaming ASCII data to the unit, Connect the supplied DB9 RS-232 Serial cable to your PC and the CC-101 or CC-101-PRO.

CC-101-PRO Rear Panel

. Rack Mounting the CC-101

The CC-101 has threaded holes on the bottom that allows 3 of them to be installed on a Hall Research 1U rack mount shelf (Model RMS-1U-1A)

CC-101-PRO 1U Rack Mounting

4.0 Operation

. Closed Captioning

The CC-101-PRO has the ability to display 4 different Close Captioning data channels. The CC data channels that can be displayed are CC1, CC2, CC3, and CC4.

The CC-101-PRO can cycle between CC1 and a user-defined CC Alternate, which can be defined as CC2, CC3, or CC4. Defining the CC Alt selection is done via the RS-232 Serial interface, but it is set as CC2 at the factory. See the Overlay Mode Parameter Commands section for specifics.

Selecting the CC data channels is accomplished by pressing the "CLOSED CAPTION" select button on the front panel. The button will cycle between: CC1 ➔ CC Alt ➔ CC off. The respective LED's will be turned on or off.

.   Text Overlay

Text Overlay is the ability to superimpose user-generated text over the output video. Text Overlay and CC are mutually exclusive; i.e. at any given time, you can only display CC or text overlay but not both. Text Overlay is generated via RS-232 Serial port (in live mode) using an application such as HyperTerminal, or played-back from internal memory.

Note on RS-232 port availability on your PC

Some PCs and notebooks do not have a serial port. To program the sender you may need a USB to RS-232 Serial converter. These are available from Hall Research (Model USB-RS232-1).

Text overlay requires a video input; this means that if you have no video connected, you cannot get a video output.

The unit can display a variety of text styles on the screen as shown below:
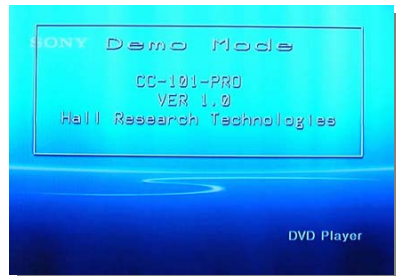
.   CC Stream out (CC-101-PRO Only)

Press the "CC" and the "Pro Output" selection buttons simultaneously to enable/disable the Closed Caption streaming out through the RS232 serial port.

When the Closed Caption stream out is enabled, the CC green LED will blink for 3 seconds. And when the Closed Caption stream out is disabled, the CC red LED will blink for 3 seconds.

To have the unit default to streaming the CC out on power up, you must use the RS232 port with the available GUI software to turn on the feature.

5.0 Storing and playing back messages from internal memory

The CC-101 units will playback data from its internal user programmable memory. While the unit is in playback mode, the CC mode LEDs will be blinking. To stop playback, hit the CC mode selection button.

. GUI (Graphical User Interface by Hall Research)

You can download a Windows® GUI from the CC-101(-PRO) product's webpage on www.hallresearch.com. There are multiple versions of the program available depending on the revision of firmware in the device. The newer revisions programs are not 100% compatible with older firmware devices.

This software will allow you to upload up to 10 different strings to the CC-101 or CC-101-PRO for text overlay. Each of these 10 strings may be up to 200 bytes in length. A wait time of 0 seconds to 65,535 seconds may be added to the end of each of these strings.

After these strings have been uploaded to the CC-101(-PRO), there are 4 different ways to tell the CC-101(-PRO) how to show these stored strings.

1. Specify, in the GUI, to show these stored strings every time the unit is turned on.

2. Press the "Input" and the "CC" selection buttons simultaneously for 3 seconds. Hitting the closed caption "CC" mode button will terminate the playback mode. (Note that there is a slight delay after pressing the buttons before the playback starts). Both the red and green led's will blink to indicate that a playback is occurring.

3. Specify, in the GUI, to show these stored strings immediately after the upload is complete, via the **"Show strings on upload"** checkbox.

4. Send a hex command to display these stored strings on power-up. Hex commands are listed in table 2.

These 10 strings can be composed of ASCII characters, Hexadecimal characters, and special TOC (text overlay commands)

. . Selecting the Com Port

The Programming Software will detect your available COM ports. Just select the COM port you will use to connect the CC-101(-PRO) to your PC.

. . How to insert Text Overlay Commands

Select the command from the "Command to Insert" drop down menu

Depending on the command selected, a parameter may be needed. If a parameter is needed you will need to specify a value in the Command Parameter text box.
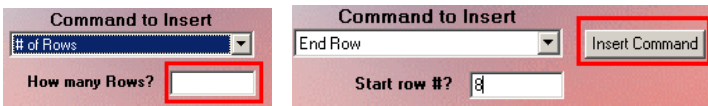
After you have entered a valid parameter, the **Insert Command** Button will show up and be available. Click on this button and the command will be inserted into the selected string at the current position.

. . Inserting Hex Bytes

Enter a 1 byte hexadecimal value into the Hexadecimal text box then click the **Insert Hex Byte** button and your hex byte will be inserted into the selected string at the current position.
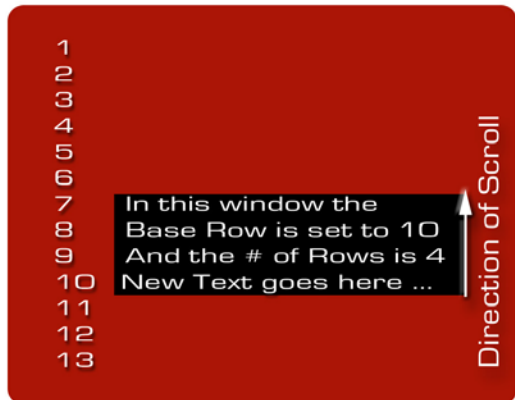
. . Inserting standard ASCII characters

To insert standard ASCII characters into the selected string, select the large Serial String text box and just type directly from the keyboard

You can use [Enter] to insert a CR, or use [Backspace] to erase characters

The standard Windows® cut and paste functions are <u>disabled</u>.

. . Inserting non-standard characters

Refer to Table 1 for the Hexadecimal codes to use to insert standard and non-standard ASCII characters.

For example:

> To insert a vertical line, insert the Hexadecimal byte AC.
> To insert an upside down question mark, insert the Hexadecimal byte 13.

TABLE 1

. . How to use "Delay to Next String" and invoke repeat loop

A "Delay to Next String" wait time can be added to the end of each stored string. This wait time can be anywhere from 0 to 65,535 seconds (~18 hours). When these stored strings are displayed by the CC-101(-PRO), they will be displayed in order from 1 to 10. After each individual string is shown, the CC-101(-PRO) will wait the amount of time specified in the "Delay to Next String" field for that string. After that wait time is complete, the CC-101(-PRO) will display the next string.

After string 10 is displayed, **if there is a wait time specified in "Delay to Next String" for string 10**, the CC-101(-PRO) will wait that amount of time then it will loop and begin displaying the stored strings <u>again starting</u> with string #1. **If there is no wait time specified in "Delay to Next String" for string 10** the CC-101(-PRO) will <u>not</u> loop back to string #1. Whatever text is currently overlaid on the screen will remain until the CC Selection button is pressed.

Important note on Delay or Wait Times

The "Delay to Next String" wait times are not exclusive. This means that during the wait time period, other actions can take place like changing the input or output.

The "Wait Frames" command is an exclusive wait. During this time, the CC-101-PRO will be unresponsive to any button press or Serial communication. Use it sparingly!

. . Set CC Alt

It is used to set the current CC Alternate by selecting the desired option button.

. . Show strings on power-on

When this checkbox is checked, the CC-101(-PRO) will always display the stored strings immediately on power-up.

. . Show strings on Upload

When this checkbox is checked, the CC-101(-PRO) will display the
stored strings immediately after a successful upload has been completed.

NOTE: You cannot start uploading your strings while the CC-101 is
playing back some data in playback mode (CC LED's are blinking). The
unit will pause for 10 seconds after reset or power-on before it starts
playing back (if you have set the start on power on flag). This gives you
enough time to start uploading your commands even if you are looping
the playback

. . CC streaming on power-on (CC-101-PRO Only)

When this checkbox is checked, the CC-101-PRO will always stream out
Closed Caption through RS232 immediately on power-up.

. . CC streaming on Upload (CC-101-PRO Only)

When this checkbox is checked, the CC-101-PRO will stream out Closed
Caption through RS232 immediately after a successful upload has been
completed.

6.0 Serial Port Communication

The CC-101(-PRO) operates at 9600 baud (8 bits, no parity) and has 2 modes.

> **1. Query Mode (default on power up)**
> **2. Overlay/Command Mode**
>
> ....

. Query Mode

In Query Mode, the CC-101(-PRO) will print out current states in response to properly formatted queries. All Query Mode commands and responses are in ASCII format. Commands and responses will be inside double quotes. The double quotes are not part of the command or response. Only what is inside the double quotes is the command or response.

Query: <u>Video Status</u> (Is there an active video on the selected input?)
Command: "?V"
Response: "A" = Active. "I" = Inactive (no video)

Query: <u>Video Standard</u> (What is the video standard of the video?)
Command: "?S"
Response: "N" = NTSC standard. "P" = PAL or SECAM standard

Query: <u>Current Output CC-101-PRO</u> (What is the PRO output?)
Command: "?O"
Response: "V" = VGA.   "C" = 480P (Component)

Query: <u>Current Input</u> (What is the selected input?)
Command: "?I"
Response: "S" = S-Video. "C" = Composite Video

Query: <u>Current CC selection</u> (What is the current CC selection?)
Command: "?C"
Response: "1" = CC1. "A" = CC Alternate. "N" = CC Off

Query: <u>Current CC Alternate value</u> (What CC version is Alternate?)
Command: "?A"
Response: "2" = CC2. "3" = CC3. "4" = CC4

Query: <u>Current Firmware Version</u> (What is the current firmware version?)
Command: "?F"
Response: "Firmware Ver 2.x"

Query: Turn On/Off CC
Command: "S" (or "s")
Response: "Enable CC stream" or "Disable CC stream"

Query: Blank Video Output
Command: "B" (or "b")
Response: Video Output Blanks (Closed Caption or Text still displayed)

Query: Un-Blank Video Output
Command: "U" (or "u")
Response: Video Output Un-Blanks

NOTE: The GUI, described in the previous section, requires that your unit be in Query mode for uploading the strings, but if you want to create your own strings see the Appendix.

Certain characters have special meaning in the QUERY MODE

Character 0xC0 (192)	Enter OVERLAY/COMMAND MODE
Character 0xEE (238)	Enter DOWNLOAD MODE
Character 0xFA (250)	Resets unit to FACTORY Defaults
Character 0xFB (251)	Requests device version (0x00 or 0x01)
Character 0xFE (254)	Reserved

. Overlay/Command Mode

In this mode, you can send ASCII text and display it in real-time on the screen. Non-ASCII bytes are either reserved for special functions, such as changing the text style (see Table 2), or display special characters shown in Table 1.

. . Starting the Overlay/Command Mode

The serial mode is switched to Overlay/Command Mode from Query Mode by issuing the hexadecimal command hC0 (192 Decimal).

When this mode is activated, CC will automatically turn off and all existing CC on the screen will be cleared.

From HyperTerminal you can hold the [Alt] key down and hit 0192 on numeric keys and let go of [Alt]. This will send a hex character "C0" to the serial port.

. . Overlay/Command Set

Refer to Table 1 for all the printable characters. These include all the standard ASCII characters plus some non-standard characters. Next refer to Table 2 (below) for additional commands:

(Note that you must have entered 'OVERLAY/COMMAND' Mode by sending a 192 (0C0h) first as described above)

Description	Byte 1,2	Byte 3
Number of rows	255, 20 (hFF,h14)	1 – 13 [h01 – h0D]
Base row	255, 21 (hFF,h15)	1 – 13 [h01 – h0D]
Cursor position	255, 22 (hFF,h16)	1 – 32 [h01 - h20]
Standard character	255, 23 (hFF,h17)	
Double wide char	255, 24 (hFF,h18)	
Drop shadow	255, 25 (hFF,h19)	
Box	255, 26 (hFF,h1A)	
Horizontal Position	255, 27 (hFF,h1B)	1 – 20 [h01 - h14]
Clear Row	255, 28 (hFF,h1C)	
Clear Page	255, 29 (hFF,h1D)	
Wait Frames	255, 30 (hFF,h1E)	0 – 65 [h00 – h41]
Flash (blink) On	255, 31 (hFF,h1F)	
Flash (blink) Off	255,32 (hFF,h20)	
No Background	255, 33 (hFF,h21)	
No Background space	255, 34 (hFF,h22)	
Black Characters	255, 35 (hFF,h23)	
Black Underlined Characters	255, 36 (hFF,h24)	
White Characters	255, 37 (hFF,h25)	
White Underlined Characters	255, 38 (hFF,h26)	
Set CC Alt Mode	255, 39 (hFF,h27)	2 – 4 [h02 – h04]
Brightness (-PRO)	255, 40 (hFF,h28)	0 – 255 [h00 – hFF]
Contrast (-PRO)	255, 41 (hFF,h29)	0 – 255 [h00 - hFF]
Show Stored Strings on Power	255, 42 (hFF,h2A)	
Don't show Stored Strings on Power	255, 43 (hFF,h2B)	
Turn on CC	255, 44 (hFF,h2C) This command terminates the OVERLAY/COMMAND mode	
CC Stream on Power	255, 45 (hFF,h2D)	
No CC Stream on Power	255, 46 (hFF,h2E)	
Exit OVERLAY/COMMAND mode	255, 192 (hFF,hC0)	
Factory Defaults	255, 250 (hFF,hFA)	

*** Table 2 ***

<u>Number of Rows</u>: Sets the number of Text Overlay rows to be shown above and including the base row. It can be from 1 to 13 rows.

<u>Base Row</u>: Sets the location of the bottom row where new text is entered. As you stream text, each Carriage Return will scroll data up above this line.

<u>Cursor Position</u>: Within each row there are 32 standard character positions (16 double wide). Character positions start with position 1 on the left hand side of the row. Character 32 (16 double wide) is on the right hand side of the row. The cursor position will specify where you want your next character to be printed. Characters written past the right edge of the screen will overwrite the last character on the screen.

<u>Standard Character</u>: Printable characters from Table 1 come in 2 sizes, Standard and Double Wide. A Standard Character takes up the space of 1 of the 32 character positions in a row. You **can** mix Standard and Doublewide characters in the same row.

<u>Double Wide Character</u>: A Double Wide Character will take the space of 2 of the 32 character positions in a row. You **can** mix Standard and Doublewide characters in the same row.

<u>Drop Shadow</u>: When displaying Text Overlay Drop Shadow indicates there will be a black shadow behind each character displayed.

<u>Box</u>: When displaying Text Overlay, Box indicates there will be a black box behind each character typed to make the character more easily readable. This is very much how CC is displayed.

<u>Horizontal Position</u>: This refers to the left/right position of the Text Overlay rows. This will allow you better center the Text Overlay rows. The value range for Position is 1 to 20. 1 is starting the left hand side of the Text Overlay rows at the left edge of the screen and 20 is ending the right hand side of the Text Overlay rows at the edge of right hand side of the screen. ALL rows move to the same horizontal position.

<u>Clear Row</u>: This will delete the entire current row regardless of the current cursor position.

<u>Clear Page</u>: This will clear all the rows of the Text Overlay and reposition the cursor at row 1 Cursor Position 1.

Wait Frames: This is essentially a small timer. This will wait for a specified number of video frames. The number frames to wait can range from 1 to 65 frames. There are 30 frames per second. This is 33.3 ms per frame.

The "Wait Frames" command is an exclusive wait. During this time, the CC-101(-PRO) will be <u>unresponsive</u> to any button press or Serial communication. Use it sparingly!

Flash ON: Starting with the current Cursor Position, all the characters display until the end of the row will be flashing. The next row will automatically turn off the flashing off.

Flash OFF: This will stop the flashing of characters from the current position to the end of the row.

No Background: Will make the entire Text Overlay have a no background.

Space with no Background: Will print a space with no background.

Black Characters: Will print black characters.

Black Underlined Characters: Will print black underlined characters.

White Characters: Will print white characters.

White Underlined Characters: Will print white underlined characters.

Set CC Alt Mode: Will choose the CC mode to be used for the CC Alternate selection. The values can be [2-4] 2 = CC2, 3 = CC3, 4 = CC4

Brightness: Set the brightness of the scaled video outputs. The brightness value can be in the range [0-255]

Contrast: Set the contrast of the scaled video outputs. The contrast value can be in the range [0-255]

Show Stored Strings on Power: Display the stored strings immediately on power-up.

Don't Show Stored Strings on Power: Don't display the stored strings on power-up.

<u>Turn on CC</u>: Turn on the ON-SCREEN Closed Captioning. (This command takes you out of OVERLAY/COMMAND mode). To turn off the Closed Captioning, enter OVERLAY/COMMAND mode and send any character). Because of this, this should be the last command you send.

<u>CC Stream on Power</u>: Enable Closed Caption stream-out through RS232 port immediately on power-up.

<u>No CC stream on Power</u>: Disable Closed Caption stream-out through RS232 port on power-up.

<u>Factory Defaults</u>: This will restore the factory defaults for brightness, contrast and Text Overlay. All stored strings are erased.

7.0 Resetting the CC-101(-PRO)

If for any reason you need to reset the CC-101(-PRO), press the "Input" and "Pro Output" buttons simultaneously for 3 seconds and the unit will reset. This will not result in the loss of any serial command programming. This will only reboot the unit. All the serial commands are still stored in the unit.

8.0 Troubleshooting

Make sure that all your connections are solid, and check the state of the LED's on the front of the unit. Do not open or try to repair the unit yourself. There are no customer repairable items in the unit and you will void your warranty.

Contact Hall Research Technical Support at 714-641-6607 or via email or our website, <u>www.hallresearch.com</u>.

If you need to ship your converter for repair, make sure to get a Return Material Authorization (RMA) number first by calling us.

9.0 Specifications

Video Inputs   S-Video and Composite Video, NTSC, PAL, or SECAM

Video Level   1V p-p for Y, 0.3 V p-p for C (S-Video)
1V p-p (Composite)

Temperature   Operating: 32 to 122°F (0 to 50°C);
Storage: –40 to +185°F (–40 to +85°C)

Enclosure   Steel

MTBF   90,000 hours (calculated estimate)

Power   5 V DC from the supplied universal power supply.

Size   1.7" High x 5.6" Wide x 4.1" Deep

Weight   1.5 pounds

Appendix – Advanced Programming

In this section we will examine some advanced aspects of programming the internal EEPROM (for text overlay playback).

When you create your 10 strings and hit upload, this is what happens:

```
Send hEE to CC-101
Wait to receive Acknowledge byte of h0A

Send h01 or h00 to turn playback on power-up on/off
Wait to receive Acknowledge byte of h09

For I = 1 to 10 (one for each string)
        Send length of String in one byte (0 to hC8)
        Wait to receive Acknowledge byte of h09
        If String length (I) > 0 Then
                For J = 1 to String length (I)
                        Send Character (J)
                        Wait to receive h06
                Next J
        End If
        Send LSByte of Wait till next string in msec
        Wait to receive Acknowledge byte of h09
        Send MSByte of Wait till next string in msec
        Wait to receive Acknowledge byte of h09
```

Next I

Send h01 or h00 to display your text on/off
Wait to receive Acknowledge byte of h09

Send h01 or h00 to enable/disable CC stream out on power-up
Wait to receive Acknowledge byte of h09

Send h01 or h00 to enable/disable CC stream out
Wait to receive Acknowledge byte of h09

Send h00, h01 or h02 to set CC Alt to 2, 3, or 4 respectively
Wait to receive Acknowledge byte of h09

Done

Application Example:

Let's assume that you want to write a program to periodically display some random text on the screen and save it so that if power goes off, the unit will show the last text that you displayed.

You need to first make sure the text is properly formatted (i.e. if the length of the text is longer than one line, you need to insert CR as required).
Then count the # of bytes in your string and set it as string #1 length. String #2 through 10 lengths is 0. Use a wait time of 0 for "Wait till next string" and use the above program to send out the data. Your String will show on the screen and will reappear after power up.

Note:
Make sure the CC mode is off (both LED's off) to make this work. Since after completion of playback, the unit will recall the CC mode and if CC1 or Alt were on, the OSD will disappear before you even see it!

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Product Designed and Made in the USA

$C\epsilon$

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