CCE-100

Closed Caption Encoder

INSTRUCTION MANUAL

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One Year Limited Warranty

★ ★ ★ ★ ★

USL, Inc. warrants that each product manufactured by it will be free from defects in material and workmanship under normal usage for a period of one (1) year after its purchase new from an authorized dealer. Our obligation under this warranty is limited to repairing or replacing any product or component which we are satisfied does not conform with the foregoing warranty and which is returned to our factory, freight paid, or serviced by one of our authorized contractors. The forgoing warranty is exclusive and in lieu of all other warranties, whether expressed or implied. Such warranty shall not apply to any product or component (A) repaired or altered by anyone other than USL, Inc. or an authorized service contractor; (B) tampered with or altered in any way or subjected to misuse, negligence or accident or (C) which has been improperly connected installed or adjusted other than in accordance with USL, Inc.'s instruction.

TABLE OF CONTENTS

Safety Instructions....4
FCC Notice....4
Introduction....5
SMPTE Captioning....5
Front Panel Description....6
Rear Panel Description....7
System Installation....8
System Configuration....8
System Operation....11
Troubleshooting....12
Finding The Box....12
Streaming Log....12
Basic DCS Test....12
Viewing an RPL....13
Viewing Caption Data....14

Important Safety Instructions

1) Read these instructions.
2) Keep these instructions.
3) Heed all warnings.
4) Follow all instructions.
5) Do not use this apparatus near water.
6) Clean only with a dry cloth.
7) Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.
8) Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
9) Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
10) Only use attachments/accessories specified by the manufacturer.
11) Unplug this apparatus during lightning storms or when unused for long periods of time.
12) Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.
13) WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, DO NOT EXPOSE THIS APPARATUS TO RAIN OR MOISTURE.
14) DO NOT EXPOSE TO DRIPPING OR SPLASHING. DO NOT PLACE OBJECTS FILLED WITH LIQUID, SUCH AS VASES,ON THIS APPARATUS.

FCC Notice:

This device complies with part 15 of the FCC rules. Operation is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept interference received, including interference that may cause undesired operation.
3. Changes or modifications to this device that are not expressly approved by USL, Inc. could void your authority to operate this device.

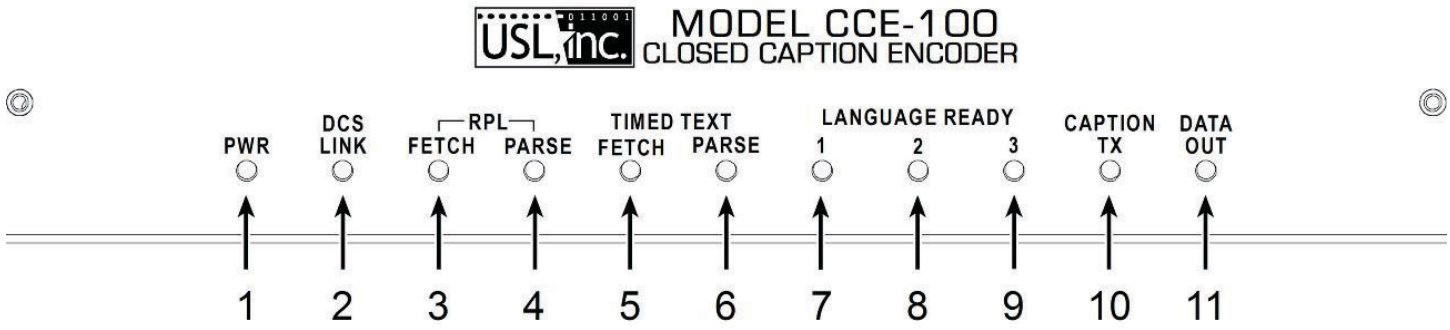
Introduction

The CCE-100 is a SMPTE compliant Auxiliary Content Server (ACS) that interfaces a Digital Cinema Server to a variety of personal caption displays including Rear Window® and IR-based receivers. A Rear Window ® display may be plugged directly in to the CCE-100. The RF output of the CCE-100 can drive IR panels such as the USL IRC-28.

Introduction to SMPTE Captioning

The Society of Motion Picture and Television Engineers has established several standards that are used to provide closed captioning in digital cinema. These include:

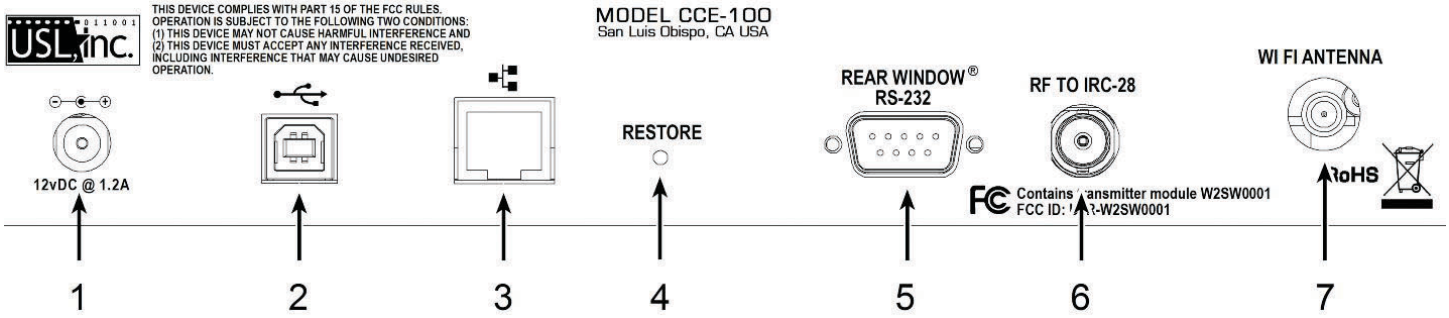
- **SMPTE 428-7**, which describes the XML (extensible markup language) structure of "timed text" files that are used for subtitles and captions.
- **SMPTE 428-10**, which constrains SMPTE 428-7 for closed captions. These constraints limit the timed text file such that the captions can be displayed on commonly used displays. These constraints deal with the number of lines in a caption, the number of characters in a line, disallow multiple captions at the same time, etc.
- **SMPTE 430-10**, which describes the Auxiliary Content Synchronization Protocol. This protocol provides synchronization information to Auxiliary Content Servers (such as the CCE-100) that handle captioning, seat shakers, lightning strobes, and other auxiliary content that may be played back in synchronization with the projected image. The CCE-100 initiates a connection over Ethernet to the Digital Cinema Server (DCS). The DCS then tells the CCE-100 where various files required for caption playback are located, tells the CCE-100 when playback is started and stopped, and provides timeline information to the CCE-100 to synchronize the captions with the audio and image.
- **SMPTE 430-11**, which describes the Auxiliary Content Resource Presentation List. This file, created by the DCS, contains a list of the auxiliary resources (such as captions), the time in playout this resource is to be used, and the language of the resource. Using the Auxiliary Content Synchronization Protocol, the DCS tells the CCE-100 where this file is located. The CCE-100 fetches and parses this file. The CCE-100 then uses the information in this file to determine the location, language, and time of use of each of the caption (timed text) files. The CCE-100 then fetches and parses the timed text files and sends them to the displays at the proper time.



1. PWR. Lit when power is applied and the processor is running. Flickers during firmware restore.
2. DCS LINK. Lit when CCE-100 connects to the Digital Cinema Server (DCS) using the Auxiliary Content Synchronization Protocol.
3. RPL FETCH. Lit when the CCE-100 is fetching an Auxiliary Resource Presentation List (RPL) file from the DCS.
4. RPL PARSE. Lit when the CCE-100 is parsing data from the RPL.
5. TIMED TEXT FETCH. Lit when the CCE-100 is fetching timed text (caption text) from the DCS.
6. TIMED TEXT PARSE. Lit when the CCE-100 is parsing a timed text file and preparing captions for display.

7-9. LANGUAGE READY. When some caption data for each language is ready for display, the corresponding LED is lit. Not all content has three languages, so all three LEDs may not light.

10. CAPTION TX. Toggles when the next caption is transmitted to the display device.
11. DATA OUT. Lit when the DCS has sent the “set output mode enabled” command over the Auxiliary Content Synchro nization Protocol link. The DCS has started playing content that includes auxiliary content such as captions.



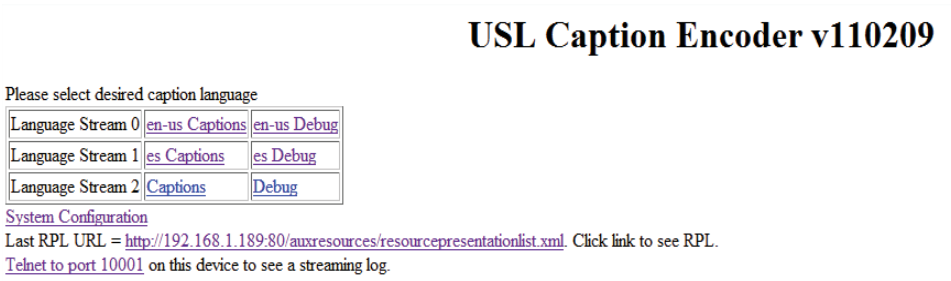
1. Power supply, 12VDC, 1.2A.
2. USB data duplicates RS232. Used for debug and configuration.
3. Ethernet. Connect to Digital Cinema Server control network.
4. Restore button. Use a paperclip to press button during powerup to restore original firmware and default configuration.
5. RS232 port. Connect Rear Window ® display or use null modem cable to connect a terminal for debug and configuration.
6. RF to IRC-28. If an IR panel is used to transmit captions, run a 75 ohm coaxial cable from this connector to the RF IN connector on an IRC-28.
7. Wi-Fi antenna. If the optional Wi-Fi module is installed, connect an antenna in the auditorium to this connector to provide captions to Wi-Fi devices.

System Installation

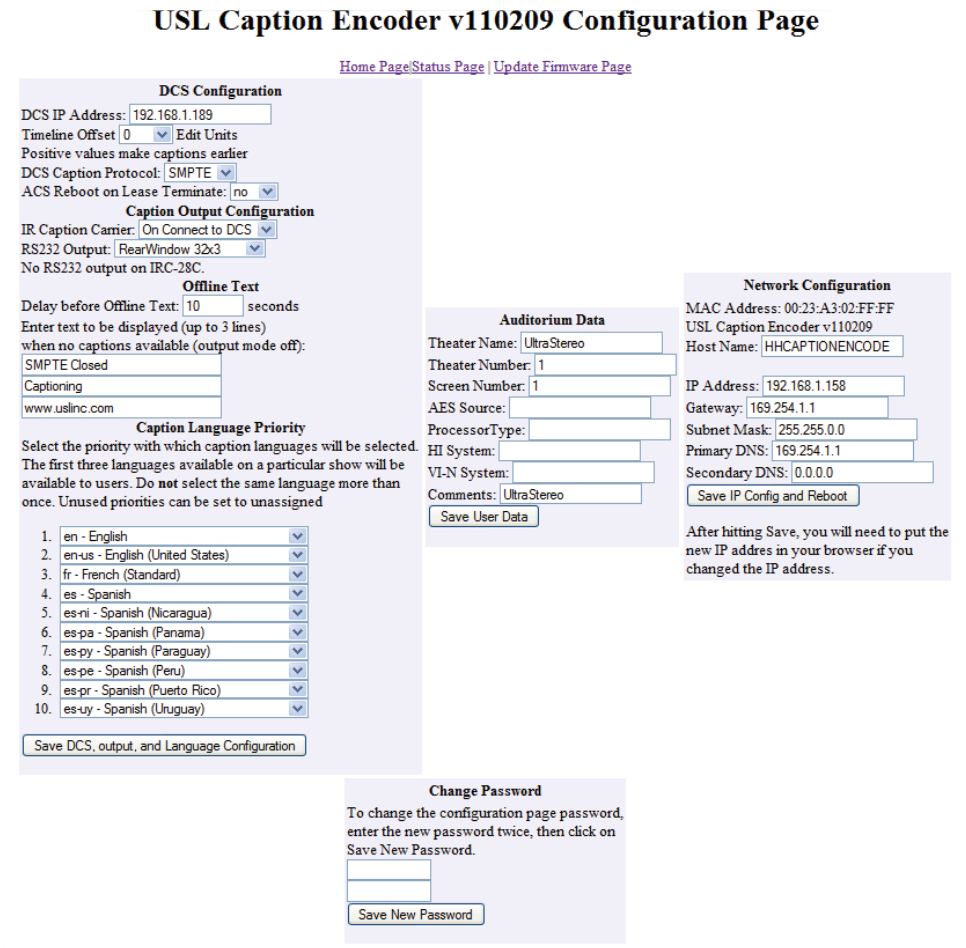
1. Choose a location for the CCE-100. The CCE-100 may be rack mounted if the optional rack mount adapter (USL PN: DAX-RAX), was supplied. The CCE-100 needs access to the digital cinema control network, power, and cables to drive the chosen display. Display cables may be:
    1. RS232 cable with 9 pin D connector to Rear Window ® display.
    2. 75 ohm coax (such as RG-59/U) with BNC connectors to carry captioning RF to an IR panel in the auditorium.
2. Apply power and configure the system, as described below.
3. Connect the CCE-100 to the digital cinema control network and the display device (cable to Rear Window ® display and/or cable to IR panel).

System Configuration

The system is configured using a web browser on a laptop computer. Connect the laptop to the CCE-100 using a crossover Ethernet cable. A straight through cable may be used on many laptops, but a crossover will work with all laptops. Set the laptop IP address to 169.254.1.123 with a subnet mask of 255.255.0.0. Open a web browser and go to http://169.254.1.1 . A page similar to that below should appear.



Click “System Configuration” to get to the configuration screen. You will be prompted for a username and password. The username is admin and the password is ultra. A configuration screen similar to that below should appear.



Starting on the left side of the screen, configure the system using these steps:

1. Set the DCS IP address. This is the Digital Cinema Server IP address the CCE-100 will use to get data from the DCS.

2. Set the timeline offset to 0 Edit Units. If desired, this can be changed to make captions earlier or later. A positive number makes captions appear earlier.

3. Set the caption protocol to SMPTE. The Doremi protocol is also supported, but Doremi also supports the SMPTE protocol.

4. Set ACS Reboot on Lease Terminate to “no”. On rare occasions, it may be necessary to set this to yes. If you find the CCE-100 must be rebooted between shows, set this to yes.

5. If the CCE-100 is driving an IRC-28 IR panel, set the IR Caption Carrier to “On Connect to DCS.” This will shut down the caption carrier when the DCS is shut down. If the CCE-100 is not driving an IRC-28, this setting does not matter.

6. If the CCE-100 is driving a Rear Window(R) display, select the type of display (32x3 for 3 lines, 32x2 for 2 lines). If the CCE-100 RS232 port is not driving a display, it can be used to view log data.

7. Set the delay before offline text. This is the number of seconds after playout stops that the offline text appears.

8. Set the offline text. This text appears on caption displays after playout stops. This is typically a welcome message. The text can be up to 3 lines of up to 32 characters each.

9. Select language priorities. As discussed above, the Auxiliary Resource Presentation List includes the language of each resource. The CCE-100 supports the display of up to three languages on IR receivers. A single language is supported on Rear Window ® displays. The CCE-100 searches the Auxiliary Resource Presentation List for the languages in the language priority list. If the first language in the priority list is not found, the Auxiliary Resource Presentation List is searched for the next language, etc. Languages are assigned to IR data streams and web streams according to priorities selected here. The first language found is assigned to stream 0 (language 1). Do NOT include the same language in more than one priority position. If the Auxiliary Resource Presentation List does not include language attributes for the caption files, the captions will be sent to stream 0. If the Auxiliar Resource Presentation List has language attributes for the caption files, but the attributes are not standard (for example “English” instead of “en”), the first three languages found will be used. The system will search for nonstandard language attributes only if standard language codes were not found. The Rear Window ® display is always driven by captions on stream 0.

10. Once caption configuration settings have been made, click on the save button in the bottom of that field to save the settings.

11. If desired, user data that is not used but is displayed can be set and saved.

12. If desired, the admin password can be set and saved. The password has to be entered in both fields, then Save New Password pressed.

13. Moving to the right side of the screen, set the IP address, gateway,

and subnet mask for the CCE-100. If desired, a netbios hostname can also be set. Since DNS is not used by the CCE-100, these fields can be left unchanged.

14. Once the network configuration has been entered, press Save IP Config and Reboot. The CCE-100 will reboot at the new IP address.

15. Connect the CCE-100 to your DCS control network.

16. Reconfigure your laptop for the DCS control network and connect it.

17. You should be able to point the web browser the the new CCE-100 IP address and see the opening screen.

System Operation

When captioned content is played, the CCE-100 should send captions to the display(s) at the appropriate time. The front panel LEDs show the system status. The power LED is lit when the system has power. The DCS Link LED is lit when the CCE-100 has made a Content Synchronization Protocol connection to the DCS and has received the required announce message. The RPL and Timed Text Fetch and Parse LEDs show the progress of the system as it acquires the required files from the DCS. When a language has been assigned to a stream, the corresponding language LED flashes. When data is available for a language, the corresponding LED lights steady. The CCE-100 tells the DCS that it is ready to start playback when all assigned languages have data ready for transmission. If a movie only has captions for one language, the DCS is told that the CCE-100 is ready when language 1 (stream 0) is ready. The Data Out LED is lit when the DCS sets the output mode to enabled. This indicates that the DCS has started playback. As captions are transmitted, the Caption TX LED will toggle.

Rear Panel Restore Button

To restore the CCE-100 to its original state (original firmware, original IP address settings, etc.), use a paper clip to hold down the restore button while powering up the CCE-100.

System Status Page

A System Status page is available from the selections at the top of the configuration page. This page shows the last 10 log entries. However, the streaming log, described below, is more useful.

Update Firmware Page

An Update Firmware page is available from the selections at the top of the configuration page. Use this page to load new firmware into the CCE-100. During the update, the front panel LEDs on the CCE-100 will flash. When the update is complete, a blank page will appear on the browser. Enter the IP address of the CCE-100 in the browser URL field to reconnect to the CCE-100 and verify that the version number has changed to the new version. All user configuration is saved through a firmware update.

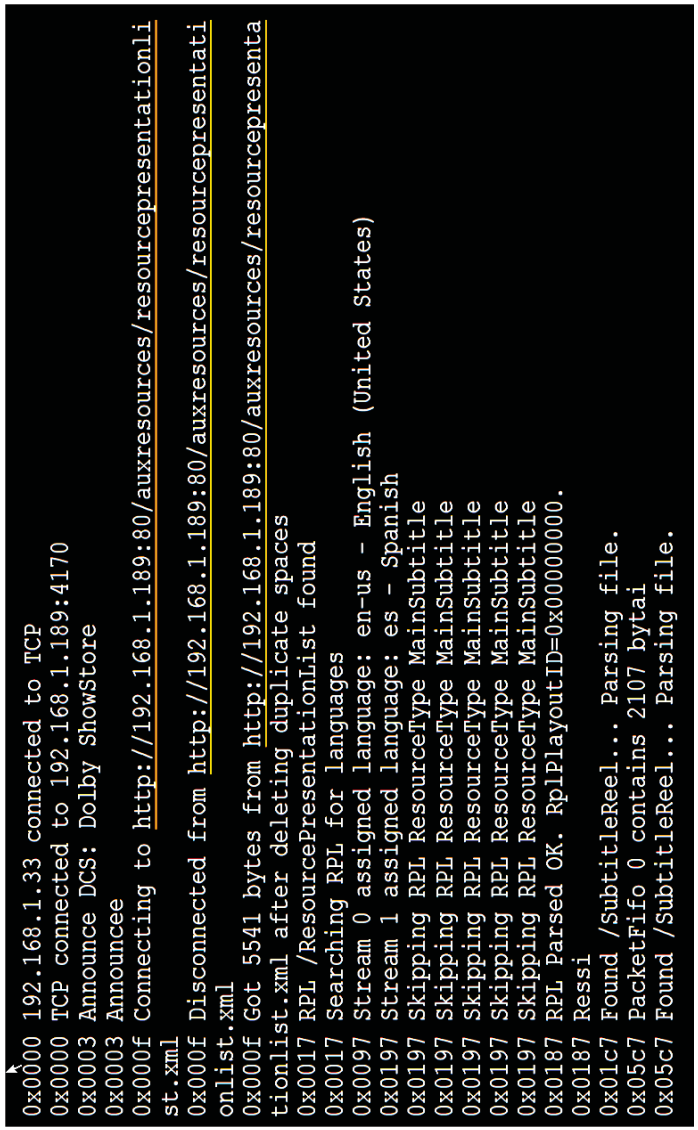
TROUBLESHOOTING

Finding The Box

At times, it can be difficult to determine the IP address of the CCE-100. You can use the Ethernet Discoverer at http://www.uslinc.com/products-sound-CCE100.html to determine the IP address of the CCE-100. Clicking on the text line for the caption encoder in the Ethernet Discoverer window will open a web browser pointing to that IP address. If the IP address is on the same subnet as your computer, you should see the opening page of the caption encoder.

Streaming Log

The CCE-100 makes a streaming log available on TCP port 10001. You may view this log using telnet, a terminal program such as Tera Term, or by using the PCMan Firefox extension. If the IP address of the CCE-100 is 192.168.1.158, a telnet command to view the streaming log would be “telnet 192.168.1.158 10001”. With the PCMan Firefox extension, it’s possible to just click the “Telnet to port 10001 on this device to see a streaming log.” link on the CCE-100 home page to view the log. A typical streaming log screen from within Firefox is below.



Basic DCS Test

You can verify whether the DCS supports SMPTE captioning by using a laptop to connect to the Content Synchronization Port. Disconnect the CCE-100 from the network. Set your laptop to the IP address of the CCE-100. Use Tera Term or telnet to connect to the DCS on port 4170. For example, the command “telnet 192.168.1.189 4170” (assuming the DCS IP address is 192.168.1.189) should connect, dump some garbage that normally includes the model of the DCS. If the laptop cannot connect to the DCS on port 4170, there may be networking, DCS configuration, or DCS software issues.

Viewing an RPL

If captions do not run, it is possible that the content does not have captions or the DCS is unable to decrypt the captions. Click the “Last RPL URL” link on the CCE-100 main page. You should see the Auxiliary Resource Presentation List supplied by the DCS. A portion of a typical RPL is shown below.

Note that some servers do not include the IP address in the RPL URL (they use a relative instead of absolute RPL). If the IP address does not appear in the RPL link on the CCE-100 home page, click the RPL URL link, then type the DCS IP address in front of the URL in the browser URL field.

In the above RPL fragment, there is a ReelResources element for each reel of the movie. Within each ReelResources element are one or more ReelResource elements. The CCE-100 looks for a ReelResource with ResourceType of Closed-Caption. Note the Language attribute within the ReelResource. Here “en-us” and “es” are shown. If captions are only provided in one language, the Language attribute is optional. Further note that within each ReelResource element is a ResourceFile element. This contains the URL of the timed text file holding the captions. If a ResourceFile is not present, either the movie is not captioned or the DCS was unable to decrypt the captions.

You can also copy the ResourceFile URL into a web browser to see the actual caption file.

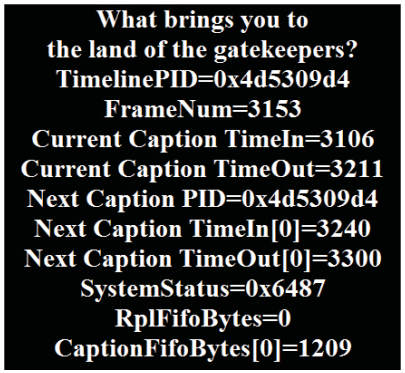
Viewing Caption Data

The CCE-100 main page includes links to real time captions for each of the three language streams. When the CCE-100 identifies languages in an RPL, the language codes and their stream assignments are shown in the table at the top of the main page.

Please select desired caption language

Language Stream 0	en-us Captions	en-us Debug
Language Stream 1	es Captions	es Debug
Language Stream 2	Captions	Debug

In the screen capture shown above, stream 0 is assigned to U.S. English, and stream 1 is assigned to Spanish. Stream 2 is unused since the RPL only had two languages. Clicking on the left link (such as “en-us Captions” shows captions similar to the way they will appear on caption displays. Clicking on the right link shows real time captions with debug information. A sample screen capture is shown below.



The caption text is shown at the top of the screen. Below that is the Program ID of the content currently playing, as reported by the DCS in the Content Synchronization Protocol timeline update message. The FrameNum is the edit unit currently being displayed. This is generated by a clock in the CCE-100 that is synchronized with the DCS using the Content Synchronization Protocol. The Current Caption TimeIn and TimeOut show the edit unit (or frame) number when the caption should appear and when it should disappear. These numbers are calculated from data in the RPL and the timed text files. The playout ID, TimeIn, and TimeOut for the next caption to be dispalyed are shown next.

The SystemStatus is a hexadecimal number indicating the overall system status. It shows data similar to that shown on the front panel LEDs. The bit assignments in the SystemStatus word are shown below.

0	Connected to server
1	Announce request received
2	Lease active
3	Fetching RPL
4	Parsing RPL
5	Fetching timed text
6	Parsing timed text
7	Stream 0 assigned
8	Stream 1 assigned
9	Stream 2 assigned
10	Language 0 captions ready
11	Language 1 captions ready
12	Language 2 captions ready
13	Caption transfer (toggles every time a caption is transferred into the transmit buffer)
14	Output mode enabled

In the sample screen capture, 0x6487 is binary 0110 0100 1000 0111. This is decoded as:

We are connected to the DCS.
Connected to server
An announce request has been received from the DCS
The lease with the DCS is active.
We are not currently fetching an RPL.
We are not currently parsing an RPL.
We are not currently fetching a timed text (caption) file.
We are not currently parsing a timed text file.
Stream 0 is assigned (we have data for language 1).
Stream 1 is not assigned.
Stream 2 is not assigned.
Language stream 0 captions are ready.
Language stream 1 captions are not ready (there is no second language).
Language stream 2 captions are not ready (there is no third language)
Bit 13 will toggle as each caption is displayed.
Output mode is enabled (the DCS is playing content).

RplFifoBytes shows much data is in the RPL buffer. As an RPL is parsed, the resulting “RPL records” are put in the RPL FIFO. Each record contains information on another file the CCE-100 needs to fetch and parse.

CaptionFifoBytes shows how much caption data we are holding that has not yet been shown. CaptionFifoBytes will increase as timed text files are parsed, then decrease as the captions are played.

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