

Cisco D9094/D9093 HD/SD AVC Low Delay Contribution Codec

Product Overview

The Cisco D9094/D9093 Codec are audio/video codecs that utilizes advanced MPEG-4 AVC encoding to perform real-time transmission of TV at low bit rates over DVB and broadband IP networks. With an optional built-in DVB-S/S2 modulator the D9094/D9093 provides a very dense solution for DVB satellite applications.

The D9094 Codec supports transmission of HDTV as well as SDTV, and the D9093 Codec is dedicated to SDTV transmission. Powerful error-correction functions help ensure high-quality of service over IP networks seeking to prevent the distortion of decoded images, even when network packet losses occur. With its compact size and rugged construction, the D9094 Codec helps reduce the cost of transmission from remote locations that demand HDTV image quality.

Figure 1. Cisco D9094 AVC Codec



The D9094 Codec now also supports transmission of HDTV with 4:2:2 chroma resolution. This is achieved very elegantly by a concept called Chroma Scalable Coding (CSC) which enables standard AVC decoders to decode the 4:2:0 part of the stream, while the D9894 AVC Contribution Decoder is capable of decoding the full 4:2:2 chroma resolution.

Applications

Applying the H.264 High Profile at Level 4 image processing algorithms, the D9094/D9093 Codec provides high video quality for use in Electronic News Gathering (ENG) as well as broadcast contribution networks. By utilizing sophisticated H.264 compression algorithms, the streaming bit rate may be reduced by more than half compared to MPEG-2 encoding, while still achieving the same video quality. Encoder delay is selectable between standard and low-delay modes, allowing the D9094/D9093 Codec to be used in delay-sensitive ENG applications.

With 4:2:2csc, the D9094 Codec and D9894 Decoder also provide high video quality for use in high-end event transmission and studio-to-studio links where 4:2:2 chroma resolution is sometimes required. 4:2:2csc enables an easy transition from 4:2:0 to 4:2:2 as existing 4:2:0 AVC decoders can be used to decode the 4:2:0 part of the signal.

As a result, HDTV content can now be transmitted at lower bandwidths over existing DVB satellite or low-cost broadband IP networks.

The D9094/D9093 Codec utilizes auto-sensing 10BT/100BT/1G Ethernet for IP connectivity as well as optional DVB-S/S2 modulation or ASI I/O ports for connecting to DVB networks. The unit also provides industry standard HD/SD-SDI and HDMI I/Os for connecting to HDTV camcorders and displays. Bi-directional voice intercom capability is provided across broadband networks for interactive communications between remote and studio locations.

Features – Software Version 4.0

- 4:2:0 High Definition MPEG-4 AVC encoding & decoding*
 - HP@L4 and MP@L4, 1080i, 720p (59.94/50 Hz)
 - Regular GOP based low-delay mode
 - Low-delay mode: 300 ms@ASI, 450 ms@IP, with D9093/D9094 Encoder
- 4:2:0 Standard MPEG-4 AVC encoding & decoding
 - HP@L3 and MP@L3, 720x480i, 720x576i (59.94/50 Hz)
 - Regular GOP based low-delay mode
 - Low-delay mode: 300 ms@ASI, 450 ms@IP, with D9093/D9094 Encoder
- 4:2:2csc High Definition MPEG-4 AVC encoding*
 - 4:2:2csc is decoded by the D9894 HD/SD AVC Contribution Decoder
 - 4:2:2csc compression is a unique compression scheme that enables standard 4:2:0 decoders to decode the 4:2:0 part of the compressed video.
- Secondary channel video encoder with up to SD resolution
- Can down-convert HD to Full or less than D1*
- Codec: User configurable as encoder or decoder
- Four AES pairs embedded in SDI, 1 HDMI stereo pair, 1 analog pair
 - MPEG-1 Layer II audio
 - MPEG-2 AAC audio
 - SMPTE-302M uncompressed audio & Dolby E pass-through
 - AC-3 pass-through
- VANC Support
- Advanced error correction functions help to ensure high quality of service
 - Pro-MPEG FEC
 - FEC and ARQ
 - For video transmission using IP network, Forward Error Correction (FEC) and Automatic Repeat Request (ARQ) are provided for network error correction. The combined use of FEC and ARQ provides high quality of service.
 - ARQ enables retransmission of packets lost in the network, and the user may adjust the re-transmission buffer size to optimize the end-to-end delay.
- ToS bit control enables usage of Diffserv IP QoS mechanisms in the network
- Encryption - BISS 1/E

* D9094 AVC Codec only

- Bi-directional Voice Intercom over IP
- SNMPv2 control and traps, ROSA[®] Driver

Optional Features

- DVB-ASI Input/Output module
- DVB-S/S2 Modulator for IF or L-band

Anticipated Future Factory Options

- Dual output DVB-ASI module

Product Specifications

Table 1. Product Specifications – Software Version 4.0

Parameter	Value
Video	
Input	1 x HD-SDI* or SD-SDI 1 x HDMI
Genlock Input	1 x NTSC/PAL Black Burst or HD Tri-level Sync*
Output	1 x HD-SDI* or SD-SDI 1 x HDMI 1 x NTSC/PAL
Video Format	
Input/Output	HD: 1920/1440/960 x 1080i (59.94 / 50 Hz)* HD: 1280/960/640 x 720p (59.94 / 50 Hz)* SD: 720 x 480i (59.94 Hz), 720 x 576i (50 Hz)
Video Coding	
HD*	4:2:0 - H.264 MP & HP @ L4, 3 to 27 Mbps 4:2:2csc - 12 to 38 Mbps
SD	4:2:0 H.264 MP & HP @ L3, 1.3 to 10 Mbps
Delay (nominal) Encode & Decode - D9094 @ HD*	
IP Ultra Low @ 4:2:0	0.43s (59.94 Hz), 0.45s (50 Hz)
IP Low @ 4:2:0	0.69s (59.94 Hz), 0.70s (50 Hz)
IP Standard @ 4:2:0	1.19s (59.94 Hz), 1.28s (50 Hz)
IP Standard @ 4:2:2csc	1.22s (59.94 Hz), 1.33s (50 Hz)
DVB-ASI Ultra Low @ 4:2:0	0.28s (59.94 Hz), 0.30s (50 Hz)
DVB-ASI Low @ 4:2:0	0.54s (59.94 Hz), 0.55s (50 Hz)
DVB-ASI Standard @ 4:2:0 & 4:2:2csc	1.07s (59.94 Hz), 1.18s (50 Hz)
Delay (nominal) Encode & Decode – D9093/D9094 @ SD	
IP Ultra Low	0.41s (59.94 Hz), 0.44s (50 Hz)
IP Low	0.55s (59.94 Hz), 0.58s (50 Hz)
IP Standard	1.05s (59.94 Hz), 1.12s (50 Hz)
DVB-ASI Ultra Low	0.26s (59.94 Hz), 0.29s (50 Hz)
DVB-ASI Low	0.40s (59.94 Hz), 0.43s (50 Hz)
DVB Standard	0.90s (59.94 Hz), 0.97s (50 Hz)
Ancillary Data	
HD	Private PES <ul style="list-style-type: none"> • 59.94 Hz: SMPTE RDD 11-2007 • 50 Hz: Proprietary (SMPTE RDD 11-2007 base)
	ATSC Closed Caption (@encoder) <ul style="list-style-type: none"> • 59.94 Hz: ATSC Closed Caption (ATSC CS/TSG-659r4(A/72)) • 50 Hz: Proprietary (ATSC CS/TSG-659r4(A/72) equivalent)

Parameter	Value
SD	Private PES <ul style="list-style-type: none"> 59.94 Hz: SMPTE RDD 11-2007 50 Hz: Proprietary (SMPTE RDD 11-2007 base)
	ATSC Closed Caption (@encoder) <ul style="list-style-type: none"> 59.94 Hz: ATSC Closed Caption (ATSC CS/TSG-659r4(A/72)) 50 Hz: Proprietary (ATSC CS/TSG-659r4(A/72) equivalent)
Sub Encoder	Private PES <ul style="list-style-type: none"> 59.94 Hz: SMPTE RDD 11-2007 50 Hz: Proprietary (SMPTE RDD 11-2007)
Bandwidth Optimization	DID filtering, Bit rate limiter
Audio	
Input/Output	4 x AES pairs embedded in SDI (48 kHz) 1 x HDMI 1 x Analog stereo pair (balanced)
Audio Coding	
Program	MPEG-1 Layer II MPEG-2 AAC SMPTE-302M uncompressed audio (Dolby E pass-through) AC-3 pass-through (ATSC/DVB)
Audio Encoding Bit Rates	MPEG-1 Layer II: 128, 256, 384 kb/s MPEG-2 AAC: 64, 128, 256, 384 kb/s Uncompressed audio or Dolby E pass-through: 2304 kb/s AC-3 pass-through (ATSC/DVB): 56-640 kb/s
Voice Intercom	G.711
Transport Interface	
Interface Type	10Base-T/100BASE-TX /1000BASE-T DVB-ASI (optional) DVB-S/S2 (optional)
Error Correction	Pro-MPEG FEC and ARQ
Encryption on ASI & DVB-S/S2	BISS 1/E
DVB-S/S2 - Option	
Modulator Type, Frequency	Option: L-Band Modulator, 950.000 to 1,750.000 MHz Option: IF-Band Modulator, 50.000 to 90.000 MHz, 100.000 to 180.000 MHz
Transmission System	CCM
Modulation & FEC	DVB-S (DSNG): QPSK: 1/2, 2/3, 3/4, 5/6, 7/8 8PSK: 2/3, 5/6, 8/9 DVB-S2: QPSK: 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 8PSK: 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 16APSK: 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
Environmental Specifications	
Operating Temperature	-10°C to 55°C (14°F to 131°F)
Chassis Mechanical Specifications	
Height	4.2 cm (1.65 in.)
Width	42.5 cm (16.73 in.)
Depth	35.0 cm (13.8 in.)
Weight	6 kg (13.2 lb)
Power	
Voltage Range	100 to 240 VAC

Parameter	Value
Line Frequency	50/60 Hz
Power Consumption	60 W maximum @ 100 VAC With option: 90W maximum @ 100 VAC

* D9094 AVC Codec only



Figure 2. D9094 AVC HD/SD Codec Rear Panel (Base unit – No Option Card installed)

Ordering Information

Table 2. Ordering Information

Cisco D9094/D9093 HD/SD AVC CoDec	Part Number
D9093 AVC SD Codec, IP In/Out, Enc/Dec switchable	40297660
D9093 AVC SD Codec, IP & ASI In/Out, Enc/Dec switchable	40297661
D9093 AVC SD Codec, IP & DVB-S/S2,IF, Enc/Dec switchable	40297663
D9093 AVC SD Codec, IP & DVB-S/S2, L-Band, Enc/Dec switchable	40297664
D9094 AVC HD/SD Codec, IP In/Out, Enc/Dec switchable	40297670
D9094 AVC HD/SD Codec, IP & ASI In/Out, Enc/Dec switchable	40297671
D9094 AVC HD/SD Codec, IP & DVB-S/S2,IF, Enc/Dec switchable	40297673
D9094 AVC HD/SD Codec, IP & DVB-S/S2, L-Band, Enc/Dec switchable	40297674
Power Cords	
UK power cord	1002798
Euro power cord	503414
Australia power cord	1002604
Argentina power cord	1002655
Brazil power cord	1003648
China power cord	1003670
India power cord	1003667
ROSA Drivers	
ROSA driver for D9093	7018618
ROSA driver for D9094	7018619



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