COMCAST TECHNOLOGY SOLUTIONS
ADDELIVERY FORMAT SPECS - COMCAST

The following are the audio and video technical specifications for SD and HD spots submitted to Comcast Technology Solutions.

FILE LAYOUT FOR COMCAST TECHNOLOGY SOLUTIONS

For all SD and HD spots submitted to Comcast Technology Solutions, spots must be submitted at below length:

Spec 1	Leading Black	Slate	Black	Spot	Trailing Black
Comcast	2 sec/60 frames	5 sec/150 frames	2 sec/60 frames	15 sec/450 frames, 30 sec/900 frames, 60 sec/1800 frames, 90 sec/2700 frames, 120 sec/3596 frames, 5 min/8992 frames	2 sec/60 frames

HD VIDEO FORMATS

	Recommended Format—MPEG	Quicktime	Quicktime
Stream Type	MPEG-2 TS MPEG-2 PS	Apple ProRes 422	Avid DNxHD
Video Bitrate	20 - 100 Mbps (CBR or VBR)	40 - 220 Mbps (VBR)	145/220 Mbps (CBR)
Frame Rate	29.97 (1080i), 23.976 (1080p) 59.94 (720p) **native frame rate is preferred	29.97 (1080i), 23.976 (1080p) 59.94 (720p) **native frame rate is preferred	29.97 (1080i), 23.976 (1080p) 59.94 (720p) **native frame rate is preferred
GOP Structure	Closed GOP	N/A	N/A
Closed Captioning[1]	EIA-608 and EIA-708	EIA-608 and EIA-708	EIA-608 and EIA-708
Chroma	4:2:0, 4:2:2	4:2:2	4:2:2
Interlacing	Upper Field First (29.97), Progressive (23.976/59.94)	Upper Field First (29.97), Progressive (23.976/59.94)	Upper Field First (29.97), Progressive (23.976/59.94)
Aspect Ratio	16:9	16:9	16:9
Width/Height[3]	1920x1080 1280x720	1920x1080 1280x720	1920x1080 1280x720
Audio Type	MPEG-1 Layer 2 AES (MPEG-2 TS Only)	LPCM	LPCM
Typical Transfer[2]	2-40 minutes	4-90 minutes	15-90 minutes
Typical Export[3]	< 1 minute	< 1 minute	< 1 minute
Notes	MP@HL HP@HL	ProRes 422 LT, ProRes 422, ProRes 422 HQ are all acceptable	DNxHD 145, DNxHD 220 are both acceptable

SD VIDEO FORMATS

	Recommended Format—MPEG	Quicktime
Stream Type	MPEG-2 Program Stream	Apple ProRes 422
Video Bitrate	12 - 30 Mbps (CBR or VBR)	20 - 65 Mbps (VBR)
Frame Rate	29.97 23.976 **native frame rate is preferred	29.97 23.976 **native frame rate is preferred
GOP Structure	Closed GOP	N/A
Closed Captioning[1]	EIA-608	EIA-608
Chroma	4:2:0; 4:2:2	4:2:2
Interlacing	29.97 Upper Field First 23.976 Progressive	29.97 Upper Field First 23.976 Progressive
Aspect Ratio	4:3	4:3
Width/Height	720x486/512	720x486
Audio Type	MPEG-1 Layer 2	LPCM
Typical Transfer[2]	1-5 minutes	2-24 minutes
Typical Export[3]	< 1 minute	< 1 minute
Notes	MP@ML, HL, HP@HL, 422@ML, HL are all acceptable	ProRes 422 LT, ProRes 422, ProRes 422 HQ are all acceptable

30s to 2m spot assuming an average bandwidth of 5 Mbps. Use http://speedtest.comcast.net/ to give you an idea of your bandwidth. 5 Mbps is the suggested minimum bandwidth.

[3]Estimated time to fully export from Avid or Final Cut Pro.

[4]For MPEG formats, Comcast Technology Solutions supports SD closed captioning in an EIA-608 encoding. For MPEG-TS Supply the EIA-608 encoding in both ATSC A/53 user data and additionally as SCTE-20 user data (for MPEG-PS ATSC A/53 only is required). For QuickTime formats, Comcast Technology Solutions supports SD closed captioning in an EIA-608 encoding stored as a QuickTime closed captioning text track.

[5]For MPEG formats, Comcast Technology Solutions supports HD closed captioning in an EIA-708 encoding in ATSC A/53 user data. An additional EIA-608 encoding, also as ATSC A/53 user data, is required for backwards compatibility reasons. For QuickTime formats, Comcast Technology Solutions supports closed captioning in an EIA-708 encoding as a QuickTime closed captioning text track. An additional EIA-608 encoding also within a QuickTime closed captioning text track is required for backwards compatibility reasons.

[8] Comcast Technology Solutions adheres to SMPTE RP 2046-2 - title safe areas should be 90% of the width and 90% of the height of the part of the image to be extracted. Comcast Technology Solutions determines duration based on 29.97 DF regardless of source media frame rate. All content delivered over :120, should be edited and uploaded using DF.

Comcast Technology Solutions adjusts each outbound transcode to conform to receiver specifications, both audio and video.

COMCAST TECHNOLOGY SOLUTIONS
ADDELIVERY FORMAT SPECS

HD/SD AUDIO FORMATS

	HD & SD	HD & SD	HD ONLY
Encoding Type	MPEG-1 Layer 2	AES/LPCM	AES/LPCM
Number of Channels	2 - Stereo	2- Stereo	6, 8, or 10
PIDs/Channel per PID	1/2	1/2	3/2, 4/2, 5/2, 1/6, 1/8. 1/10
Channel 1	Stereo Left	Stereo Left	Left Front
Channel 2	Stereo Right	Stereo Right	Right Front
Channel 3		Mono SAP (optional)7	Center
Channel 4		Mono VDS (optional)7	Low Frequency Effects
Channel 5			Left Surround
Channel 6			Right Surround
Channel 7			Lt Stereo (optional)6
Channel 8			Rt Stereo (optional)6
Channel 9			Mono SAP (optional)7
Channel 10			Mono VDS (optional)7
Bit Depth	16	16	16
Bit Rate	384 Kbps	1536 Kbps	1536 Kbps
Sampling Rate	48 KHz	48 KHz	48 KHz
Instantaneous Peak Audio Max	-8 dBFS	-8 dBFS	-8 dBFS
Average Peak Audio Max	-10 dBFS	-10 dBFS	-10 dBFS
Average Levels	-20 dBFS	-20 dBFS	-20 dBTP
True Peak	-2 dBTP	-2 dBTP	-2 dBTP

When sending 5.1 audio, the Lt/Rt pair is optional and we will automatically create the pair as a mix down of the 5.1 channels. If the Lt/Rt pair is included then we will use those and not create a mix down. Both sides of the pair must be included. If you do *not* have Lt/Rt pair do not send these channels as silence, but rather do not include these channels.

Any audio on channel 3,4 when sending stereo or channel 9,10 when sending 5.1 is assumed to be SAP and VDS. If you do *not* have SAP *and* VDS do not send these channels as silence, but rather do not include these channels. If you have SAP *or* VDS then include both channels but make the one you don't have silent (even throughout the slate - no beeps or tone during the slate). Please make sure audio levels meet FCC CALM ACT requirements.

COMCAST TECHNOLOGY SOLUTIONS RADIO SPECIFICATION

The following are the radio technical specifications for SD and HD spots submitted to Comcast Technology Solutions.

FILE LAYOUT FOR COMCAST TECHNOLOGY SOLUTIONS

Radio spots submitted to Comcast Technology Solutions are not checked for duration and may include slates of any length.

RADIO FORMATS

	Recommended Format—MPEG	WAV	WAV
Encoding Type	MPEG-1 Layer 3 (MP3) MPEG-1 Layer 2 (MP2)	PCM	PC
Extension	.mp3, .mp2	.wav	.aif
Number of Channels	2 (Stereo)	2 (Stereo)	2 (Stereo)
Bit Depth	16, 24	16, 24	16, 24
Bit Rate	192 – 320 Kbps	1536 Kbps, 2304 Kbps	1536 Kbps, 2304 Kbps
Sampling Rate	44.1 KHz, 48 KHz	44.1 KHz, 48 KHz	44.1 KHz, 48 KHz
Instantaneous Peak Audio Max	-8 dBFS	-8 dBFS	-8 dBFS
Average Peak Audio Max	-10 dBFS	-10 dBFS	-10 dBFS
Average Levels	-20 dBFS	-20 dBFS	-20 dBFS