5.5 CEC Control

	CEC Control Overview
1	HDMI Consumer Electronics Control (CEC) is a method of controlling devices with one remote (e.g. the TV remote), to solve the problem of multiple remotes to control all connected devices.
2	Full support of CEC is required with some notable exceptions (no support for One touch Record).

5.5.1 Basic CEC requirements

	Basic CEC requirements	Notes
1	CEC is supported with the goal to improve the user experience by simplifying the set up and use of devices connected to the TV.	
2	Upon discovery, a device is controlled via CEC using the TV remote without need to define the make or model of the CEC device, or use IR or Bluetooth to pass IR codes.	
3	If CEC is enabled, the CEC device is controlled using CEC commands. TV Remote IR codes received by the TV are passed to the CEC device as CEC commands.	
4	The CEC setting of enabled or disabled applies to all connected devices. If CEC support is enabled, CEC must be turned off from the device to exclude it from CEC control.	

5.5.2 VIZIO CEC Vendor ID

	VIZIO CEC Vendor ID requirements	Notes
1	As defined by HDMI 2.0, the vendor ID uses the first 3 bytes of the IEEE Organizationally Unique Identifier (OUI) as defined by IEEE Registration Authority Committee (RAC).	
2	The vendor ID is the RAC assigned MAC address.	
3	VIZIO CEC Vendor ID uses the first 3 bytes of the very first assigned MAC address which is 00: 19:9D.	

5.5.3 CEC Features, Supported

	CEC features support	

1	Device Discovery	
2	One Touch Play	
3	System Standby	
4	Routing Control	
5	Remote Control Pass Through	
6	Deck Control	
7	System Audio Control	
8	ARC	
9	eARC	

5.5.3.1 Device Discovery

	Device Discovery requirements	Notes	TestRail Test Case #
1	Device discovery detects if the device includes CEC and discovers the device type.		
2	If discovered and CEC functionality remains enabled, then the supported CEC features apply.		
3	After discovery, if CEC is turned off, then no CEC functionality is supported, listed devices are deleted and CEC device name resets to the default HDMI port name (e.g. HDMI-1).		C20929957
4	Only one audio system (audio receiver or sound bar) can be configured: delete a previous audio system upon discovery of a new one.		

5.5.3.2 One Touch Play

	One Touch Play Requirements	Notes
1	One touch play is supported for playback devices, e.g. Blu-ray players	
2	If the PLAY key is pressed on a playback device, both the CEC device and the TV are powered on, if needed, the TV source is switched to the playback device, and play begins for the CEC device.	C21370503
3	Per VIZIO mandated requirement, One Touch Play is not supported for Tune	

5.5.3.3 System Standby

	System Standby Requirements	Notes	TestRail Test Case #
1	If the last source was an HDMI port and Input at Power On setting is VIZIO Home then at TV power on the CEC device is NOT powered on. • If Input at Power On setting is Last Used input then at TV power on the CEC device IS powered on. • A CEC device automatically powers off when no longer the source.	No CEC power on to support Input at Power On	
2	A CEC device is powered on when a CEC device is selected as the source for the TV and automatically powered off when no longer the source.		
3	If TV is powered down, issue a standby command to all connected CEC devices. Each device can choose to follow or ignore the request.		C21367096
4	The TV responds to a standby command issued by a CEC devices if the current active source. That is, the TV powers down when an active CEC device is the current source and is powered down from the power button on the front panel or remote of the device.	A standby command from a CEC device that is not the current active source is ignored.	
5	A sound bar follows a standby command. If a CEC audio system is connected and selected as the audio source (TV speakers are off), send power on to the audio system when TV is powered on.		

5.5.3.4 Routing Control

	Routing Control Requirements	Notes
1	Automatic switching by a signal source connected to a hub such as an AV receiver.	
2	Example 1: TV initiating an input switch on sound bar to the input with a Blu-ray player.	
3	Example 2: Press Play on a Blu-ray player switches to • input connected to the player on the audio receiver • input connected to the AVR on TV.	This is One Touch Play

5.5.3.5 Remote Control Pass Through

	Remote Control Pass Through Requirements	Notes
1	Remote Control Pass Through provides device control of the current source using the TV remote.	
2	A key press on the TV remote control is passed as a CEC command to the current CEC device.	Examples: Play, fast forward

5.5.3.6 Deck Control

	Deck Control Requirements	Notes
1	Deck Control supports TV control of the transport functions for a playback component such as Blu-ray or HD DVD players or Camcorders.	Transport functions include: play, pause, rewind, fast forward, stop, record

5.5.3.7 System Audio Control

	System Audio Control Requirements	Notes
1	Volume control of an AV receiver or sound bar using TV remote control.	Volume Up/Down and mute are sent as CEC commands to the audio device.

5.5.3.8 ARC/eARC

	ARC/eARC Requirements	Notes
1	ARC/eARC works immediately when an audio receiver or sound bar is discovered and TV speakers are turned off.	TV speakers setting is set to "Auto"
2	Volume control is sent to the sound bar or audio receiver via ARC/eARC.	
3	TV audio is sent for current source to the sound bar or audio receiver. • TV tuner • External devices connected to TV (e.g. cable box) • Streaming content.	
4	If TV speakers are turned on, both volume control and TV audio are no longer sent to the sound bar or audio receiver.	TV speakers setting is set to "On".

5.5.4 CEC Features, Not Supported

	CEC Features, Not Supported Requirements	Notes
1	One Touch Record	

2	Vendor Specific Command not supported for competitor sound bars/audio receivers.	Vendor specific commands are supported for VIZIO sound bars. • TV control of sound bar features • optimize volume response
3	Device OSD Display	May be supported for VIZIO sound bar

5.5.5 CEC Device Data

	CEC Device Data Requirements	Notes
1	Not included in CEC menu: • CEC physical address • CEC version • vendor ID • Power Status for device	Not included in System info either.

5.5.6 Automatic Audio System Support for TV

	Auto Audio System Support for TV Requirements	Notes
1	When a CEC audio receiver or sound bar is discovered, the TV speakers are turned off.	
2	VOLUME and MUTE keys are passed as commands to the audio receiver or sound ba	
3	A press of the TV VOLUME and MUTE keys displays the volume bar with "Audio System" above the volume bar.	
4	The audio receiver or sound bar is powered on and off with the TV	TV issues CEC power on and power off commands to the sound bar or audio receiver
5	If sound bar or audio receiver is turned off while the TV is on, then the TV speakers are turned on.	VOLUME and MUTE keys are sent as IR codes to the TV until the sound bar or audio receiver is powered again

5.5.7 CEC Automatic Naming

	CEC Automatic Naming Requirements	Details
1	5 device types discoverable over CEC. • TV (1) • Recording Device (2) • Playback Device (4) • Tuner (4) • Audio System (1).	• Only one audio system can be connected to a TV • Two recording devices can be connected to TV • Four playback devices or tuners can be connected to TV. • No cable boxes or satellite support CEC except Dish Network joeys and hoppers.
2	A maximum of 13 devices can be connected on the HDMI CEC system for the TV.	• Devices connected directly to a TV • Devices connected to a hub such as an audio receiver.
3	Devices may include two device types but is discovered as a single device. Examples are: • Tuner & Recording Device AKA DVR or cable box that records • Playback Device & Recording Device AKA camcorder	
4	At discovery, the TV assigns the name provided by the manufacturer which may include the branding name.	The assigned CEC name can be replaced with a customer name.

5.5.8 Key Support

	TV Remote Control Key	CEC Command	Recorder	Playback	Tuner	Audio System	TV
1	Play	Play	X	X	X		
2	Pause	Pause	X	X	X		
3	Stop	Stop	X	X	X		
4	Rewind	Rewind	X	X	X		
5	Fast Forward	Fast Forward	X	X	X		
6	<Forward>	Forward	X	X	X		
7	<Backward>	Backward	X	X	X		
8	Record	Record	X				
9	CH Up	Channel Up			X		
10	CH Down	Channel Down			X		
11	MENU	Root Menu	n/a	n/a	n/a		
12	OK	Select	X	X	X		
13	EXIT	Exit	X	X	X		
14	BACK	Exit	X	X	X		
15	<Enter>	Enter	X	X	X		
16	Up	Up	X	X	X		
17	Down	Down	X	X	X		
18	Left	Left	X	X	X		
19	Right	Right	X	X	X		
20	GUIDE	Electronic Program Guide			X		
21	LIST	Content menu		X	X		
22	0 – 9	0 – 9			X		
23	- (dash)	Dot			X		
24	Volume Up	Volume Up				X	X
25	Volume Down	Volume Down				X	X
26	Mute	Mute				X	X

5.5.8.1 Key Support Requirements

	Key Support Requirements	Notes
1	Remote Control Passthrough support of keys on the remote.	
2	Not all remote control keys are supported for all devices.	Manufacturer dictates passthrough functions available for the device.
3	Some passthrough functions do not apply to all device types (e.g. Channel Up /Down only applies to Tuner).	

5.5.9 ARC/eARC command for Dolby Digital Plus

	ARC Command Dolby Digital Plus Requirements	Notes
1	TV must query the audio decoding capabilities of the downstream device via the Short Audio Descriptor CEC message.	
2	If Dolby Digital Plus is detected, transmit Dolby Digital Plus over HDMI ARC to the audio device.	

5.5.10 HDMI Demo Mode Audio

	HDMI Demo Mode Audio Requirements

1		For sound bar, to play demo mode content from a media player and control the audio, only for HDMI demo mode, support audio commands from any device type (not limited to TV): • Volume Up • Volume Down • Mute.

5.5.11 Virtual Input Display and Selection

	Reset Input Select menu display Requirements	Notes
1	Input selection includes the ability to select all discovered CEC devices.	
2	If an HDMI hub, such as an audio receiver or sound bar, the Input selection is required to include the CEC devices connected to the hub as virtual devices.	

5.5.11.1 CEC device connected to HDMI port

	CEC device Connected to HDMI Requirements	Notes
1	Upon discovery, the CEC device name (as per section 2.5 CEC Automatic Naming) displays instead of HDMI port.	The device name can be replaced with a customer selected name if desired.
2	CEC devices connected to an HDMI hub (e.g. sound bar or audio receiver), then these devices must also display in the list of inputs that can be selected as virtual devices.	

5.5.11.2 CEC Virtual Devices AKA VCEC

	CEC Virtual Devices Requirements	Notes
1	CEC devices connected to a CEC HDMI hub such as an audio receiver or sound bar are also detectable via CEC.	
2	These devices must display in the Input list as selectable virtual devices.	
3	The CEC assigned name is used for the virtual device.	
4	CEC Virtual inputs cannot be hidden.	If the virtual input is connected to an audio device that is hidden then the virtual input is not displayed.

5.5.12 ARC Plug and Play

	ARC Plug and Play Requirements	Notes
1	When a sound bar or audio receiver is connected to the ARC HMDI input, the device is immediately discovered	
2	If CEC is set to Enabled, then full CEC support applies including discovery and control of virtual devices connected to sound bar or audio receiver.	

5.5.13 TV Device Discovery

	TV Device Discovery Requirements	Notes
1	If CEC is set to Enabled, then all connected CEC devices are discovered for all HDMI ports.	
2	If a sound bar or audio receiver discovered then virtual CEC devices connected to the audio device are also discovered.	