Uni-Directional Digital Cable Products

Supporting M-Card

M-UDCP Device Acceptance Test Plan

TP-ATP-M-UDCP-I02-20070105

ISSUED

Notice

Document Status Sheet

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Key to Document Status Codes

Work in Process	An incomplete document designed to guide discussion and generate feedback, which may include several alternative requirements for consideration.
Draft	A document in specification format considered largely complete, but lacking review by Members and vendors. Drafts are susceptible to substantial change during the review process.
Issued	A stable document, which has undergone rigorous member and vendor review and is suitable for product design and development, cross-vendor interoperability, and for certification testing.
Closed	A static document, reviewed, tested, validated, and closed to further engineering change requests to the specification through CableLabs

Trademarks

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1 HOST ACCEPTANCE TEST PROCEDURES

1.1 Purpose and Scope

The Acceptance Test Plan (ATP) is a compendium of test procedures that may be used to demonstrate that an M-UDCP complies with certain Host specifications. CableLabs and Vendors have developed these procedures to facilitate the product development and verification efforts of M-UDCP equipment suppliers. The ATP procedures contained herein shall be used by CableLabs and by any other party seeking to Verify, Self-Verify, or otherwise certify that an M-UDCP complies with the relevant specifications.

The ATP techniques are not necessarily the only methods for demonstrating compliance. It may be possible to demonstrate compliance using other procedures. CableLabs will tend to use ATP procedures when auditing applications for Host verification on behalf of the DFAST certification authority.

The ATP procedures are "black box" tests; that is, they do not require opening the equipment under test to access special test points or to invoke test modes of operation. There are requirements that cannot be verified by black box techniques and supplier-proprietary procedures are required to test such requirements. These supplier-proprietary test procedures are beyond the scope of the ATP.

The ATP procedures are not complete. Subsequent revisions of this document may contain additional test procedures. However, for various reasons, additional procedures will always be required to show compliance to some requirements. Furthermore, some procedures in some revisions of the ATP are incompletely specified outlines of tests that are under development.

1.2 Test Definitions

Table 1.2-1 - Test Definitions

DUT	Device under Test
Low channel	77.25 MHz analog visual carrier, 79 MHz center freq QAM (channel 5)
Mid channel	211.25 MHz analog visual carrier, 213 MHz center freq QAM (channel 13)
High channel	571.25 MHz analog visual carrier, 573 MHz center freq QAM (channel 82)
Default V/A ratio	13 dB Video to Audio carrier ratio for NTSC signals
Default QAM signal levels	0 dBmV is normal for analog, -7 dBmV for 256 QAM, -10 dBmV for 64 QAM
Default digital video	HD moving zone plate
Default QPSK signal level	-7 dBmV

Note: Individual tests procedures that specify a specific set-up must be followed. In the test procedures where no specific setup is specified the "Default" value/level from above may be used.

Proper reception:

For analog signals: Means picture and sound with no impairments lower than a rating of 4 on the ITU-R BT.500 scale. (“Perceptible, but not annoying”)

For digital signals: Means picture and sound with no impairments lower than a rating of 4 on the ITU-R BT.500 scale. (“Perceptible, but not annoying”)

Table 1.2-2 - FDC Noise Power bandwidths

Transmission Rate	Noise BW	Correction Factor
1.544 Mbps	1.00 MHz	60 dB
2.048 Mbps	1.33 MHz	61 dB
3.088 Mbps	2.01 MHz	63 dB

CHANNEL POWER MEASUREMENT

Ensure that the spectrum analyzer has been on for at least 0.5 hrs and is calibrated. Refer to equipment manual for proper calibration procedure.

Configure the analyzer as follows:

Table 1.2-3 - Analyzer Configuration

Mode	Spectrum Analyzer
Center Frequency	Center of channel under test
Amplitude Units	dBmV
Input Z	75ohms
Ref Level	Positioned to upper 1/10 of display
Span	Wide enough to capture entire signal under test (6 MHz for FAT)
RBW	300 kHz
VBW	30 kHz or less
Video Averaging	ON
Change Marker Mode to display power on a per Hertz basis (dBmV/Hz).	
Move the marker to the center of the signal and record the power level as displayed.	
Refer to table and obtain the proper bandwidth correction factor for the signal being measured.	
The actual power level of the signal is as follows: Channel Power = Displayed marker level (dBmV/Hz) + correction factor For FAT QAM channels the correction to be used is 68 dB.	

1.3 Equipment List

Some tests may have more than one brand of equipment that may be used to complete the test and may be substituted when applicable.

Table 1.3-1 - Equipment List

Model Number	QTY	Description
HP8561E	1	Spectrum Analyzer
HP89441A	1	VSA
D9476	3	Scientific Atlanta QAM Modulators with ASI ports
Sycard 140A	2	Sycard PCExtend Cards
Sycard 145	1	Sycard PCExtend Card
	1	Type I PC Card
	1	Type II PC card
Fluke 54-2	1	Fluke 54-2 Dual input thermometer
	2	80PK-1 bead probe thermocouples
GK-0212-xx	1	Thermo label mini (xx: Temperature is indicated by suffix in the catalogue) thickness is 0.07mm Contact person in Toyorika corp.: Mr. Takeuchi +81-3-3252-3761 **Alternative to 80PK-1 bead probe thermocouples.
	1	HPNX PRO hardware/software/laptop (see below for laptop requirements)
Ver. 1.2.2003.12121	1	HPNX PRO Software
Minimum system requirements for HPNX PRO PC (or current)		OS – Windows 2000, XP, or Windows Server 2003 with latest service pack updates CPU – Pentium 4, 1.7Ghz or faster Hard Disk - 1 Gig free disk space for software and stream libraries Video 1024x768, 24 bit color, video controller capable of real time MPEG2 decoding (Newer NVidia or ATI cards will do). RAM 256MB CD - ROM for installation Network (10/100 base T) Ethernet card or built in MPEG@ Software Decoder For local rendering of selected channel program. The decoder needs to be installed for the HPNX PRO to work. Software MPEG2 decoder from the following companies. Nvidia, InterVideo, CyberLink (NOTE: The HPNX PRO will not install if there is not a valid MPEG2 Software Decoder installed on the computer). Sound - a sound card or built in installed for local audio rendering of selected program. Appropriate cabling.
Sycard 410 REV01	1	Sycard Reference Thermal card
2465	1	Oscilloscope w/NTSC triggering capability (or VM700 Video Tester)
HP8753D	1	Network Analyzer
HP85039B	1	Type F Calibration Kit for HP8753D
1672G	1	Agilent Logic Analyzer
8960	3	Sencore transport streamers (or one that will play three streams at the same time)

	1	Display Monitor
HP 8657A	1	FM Signal Generator
C6M	1	Jerrold NTSC modulator
HP11759D	1	HP Ghost Simulator
	1	PC for ghost simulator
ZFM 15	1	Passive double balanced mixer (Mini circuits)
7109	2	Noise generators, one with a gating option (Noisecom)
HP8116A	1	HP Pulse Generator
Acterna FireBerd 6000	1	Acterna FireBerd 6000 Communications Analyzer with Lab BNC interface
BCM93133	1	Broadcom QPSK modulator
RF Networks 5450	3	QPSK modulator for each data rate
	1	QAM mod that supports channel 3
	1	NTSC signal source
C6U	1	Upconverter (for NTSC)
NC7102	1	Audio noise generator
ZYSW-2-50DR	1	RF Switch Mini-Circuit's
Motorola Headend	1	Motorola development headend with CableCARD's.
Scientific Atlanta Headend	1	Scientific Atlanta development headend with CableCARD.
Harmonic Headend with NDS CAS	1	Harmonic development headend with NDS CableCARD's
Note1: Ability to provide cables, adapters, splitters; custom wiring to extender cards is required.		
Note2: This Equipment List is subject to changes, additions, or alternatives. CableLabs does not endorse such Equipment in any manner.		

1.4 Vendor Documentation Package

A Vendor's complete product vercertification submission SHALL include both (1) vendor submitted documentation for each PICS item that is not identified in this ATP and (2) Pass/Fail test results for all PICS in the ATP. Annex A identifies what is expected to satisify each of the M-UDCP Vendor Proof of Compliance documentation.

2 SECURITY

2.1 Conditional Access

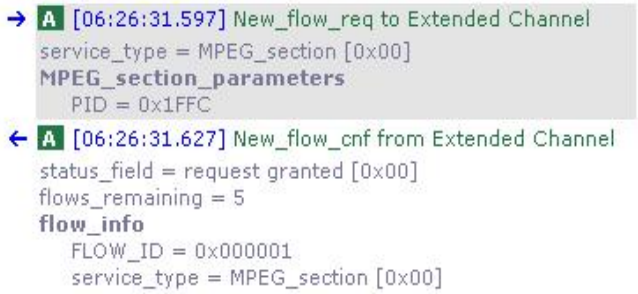
2.1.1 Host Conditional Access Resource Test [M-Mode]

This test verifies that the Conditional Access Resource is present and functioning properly.

Equipment: Host (DUT), HPNx Pro Test tool,

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
4.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, verify that the status of the HPNx Pro is ready.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Check that the Resource Manager has opened its session	N/A	
7.	Look trough resource list and verify the DUT reports support for Conditional Access resource with resource_identifier = 0x00030081.  [06:11:36.550] profile_reply to Resource Manager resource_list [0] resource_identifier = 0x00010041 [1] resource_identifier = 0x00020081 [2] resource_identifier = 0x00200081 [3] resource_identifier = 0x01040081 [4] resource_identifier = 0x00030081 [5] resource_identifier = 0x00110042 [6] resource_identifier = 0x00400081 [7] resource_identifier = 0x00240041 [8] resource_identifier = 0x00B00102 [9] resource_identifier = 0x00A00044 [10] resource_identifier = 0x002A0041 [11] resource_identifier = 0x002600C1 [12] resource_identifier = 0x00608043 [13] resource_identifier = 0x002B0081 [91 07 00 00 03 00 81 00 03]		DApCa.24
8.	Click on the”Application Information” tab. Press the Play button on the session slot.	N/A	
9.	Click on the”Man Machine Inferface” tab. Press the Play button on the session slot.	N/A	

Step#	Procedure	Pass/Fail	PICS
10	Click on the “Extended channel” tab. Right click on the session slot. (Depending on the version of DUT you may have to change the resource version of the HPNX PRO to match that of the DUT). To do this, right click on the extended channel session slot. Select “Change resource version”. In the explorer user prompt window enter the correct resource version needed to match the DUT. Click OK. On the “Extended channel” tab press the Play button to open the extended channel resource	N/A	
11	From the HPNx Pro trace, find the New_flow_req to Extended Channel requesting a service_type = MPEG_section with a PID = 0x1FFC.  Record the Flow_ID of New_flow_cnf () APDU. (_____).	N/A	
12	In the “Extended channel” tab, expand the “Flow Feed” button. Next to the “SI table file” click the browse button. Select the “Profile2thru3.hex” file from wherever you have stored it on the HPNx Pro, and click “OPEN”.	N/A	
13	Once the channel map is acquired by the DUT, tune ALL tuners to an analog channel. This step is necessary to make sure that Transport Stream will be sent to the HPNx Pro only on a channel change later on	N/A	
14	Click on the “Conditional Access” tab and expand “ca_info settings” button. Set value in the “ca_systems_ids”. Moto = 0x4749 SA = 0x0E00 Note: set CA_system_id equal to Head-end ca_system_id.	N/A	
15	Press the Play button to open the conditional access resource.	N/A	

Step#	Procedure	Pass/Fail	PICS
16	In the HPNx Pro trace window, verify that the DUT issues a CA _Info_Inquiry() to the HPNx Pro. ➔ A [01:23:42.231] ca_info_inq to Conditional Access [9F 80 30 00] Informative Note: The DUT sends the ca_inquiry and HPNx Pro responds with ca_info object with listed CA_system_Ids set on HPNx Pro. ← S [06:38:16.331] open_session_request from Conditional Access [91 04 00 03 00 81] → S [06:38:16.361] open_session_response on resource Conditional Access, Status = 0x00, SessionNb = 3 [92 07 00 00 03 00 81 00 03] → A [06:38:16.391] ca_info_inq to Conditional Access [9F 80 30 00] ← A [06:38:16.401] ca_info from Conditional Access [9F 80 31 04 00 02 47 49] CA_system_ids [0] CA_system_id = 0x0002 [1] CA_system_id = 0x4749		DApCa.5
17	In the “Extended channel” tab, expand the “Flow Feed” button. Next to the “SI table file” click the browse button. Select the “Profile2thru3.hex” file from wherever you have stored it on the HPNx Pro, and click “OPEN”.	N/A	
18	Enter the FLOW_ID that was noted above, into the Flow ID window and click “SEND”. .	N/A	
19	Tune your first tuner to a digital channel. At this point it does not matter whether the channel is encrypted or not. CableLabs link to Head-end channel maps is: http://visitors.cablelabs.com/interopweb	N/A	

Step#	Procedure	Pass/Fail	PICS
20	In the HPNx Pro trace window, Verify that the DUT sends ca_pmt() APDU from the Conditional Access detailing the status of all of the conditional access channels tuned. ➔ A [03:41:42.447] ca_pmt to Conditional Access [9F 80 32 1A 03 04 04 00 04 00 04 01 F0 06 09 04 47 49 00 E9 80 E0 D0 F0 00 81 E0 D1 F0 00] program_index = 0x03 transaction_id = 0x04 ltsid = 0x04 program_number = 0x0004 source_id = 0x0004 ca_pmt_cmd_id = ok_descrambling [0x01] program_info_length = 0x006 **program_info** **CA_descriptors** **[0] CA_descriptor** tag = ca_desc_tag [0x09] length = 4 **data** CA_system_id = 0x4749 CA_PID = 0x00E9 private_data = [ ] **elementary_stream** **[0]** stream_type = 0x80 elementary_PID = 0x00D0 ES_info_length = 0x000 **elementary_stream_info** **[1]** stream_type = 0x81 elementary_PID = 0x00D1 ES_info_length = 0x000 **elementary_stream_info** Take note of the **ltsid** field in the ca_pmt and click on the “Status” folder next to the “Trace” folder in HPNx Pro (bottom center) Scroll up left Panel of HPNx Pro up to the “M-CARD” bar. Click on it. You will see a “Refresh” button next to “Extender measures” label. Clik on it. You will then see measures being updated in the right panel (Status) 1. If several programs are selected, the DUT sends a ***ca_pmt()*** APDU for each program to the M-CARD. 2. CA descriptors at the program level and at the elementary stream level maybe included but NOT any other descriptors.		DApCa.7 DApCa.9 DApCa.10 DApCa.12 DApCa.25 DApCa.27 DApCa.28 DApCa.33 DApCa.34 DApCa.35
21	Verify that the ltsid in the previous ca_pmt matches the ltsid detected by HPNx Pro in the status window. Note : If several Transport Streams are being sent to the HPNx Pro, it is normal that more than one ltsid is detected. Switch back to “Trace” folder		DApCa.7 DApCa.9 DApCa.10

Step#	Procedure	Pass/Fail	PICS
22	Repeat the tuning procedure (starting at step 16) with all digital tuners. For each tune operation : 1. Verify that transaction_id field in ca_pmt is increased by one 2. Verify that ltsid field in ca_pmt is different from all previous ltsid (considering that a different tuner has been used each time) 3. Verify that the ltsid field in ca_pmt matches one of the ltsid detected by HPNx Pro in Status window		DApCa.7 DApCa.9 DApCa.10 DApCa.12 DApCa.25 DApCa.26 DApCa.27 DApCa.29 DApCa.30 DApCa.31 DApCa.36 DApCa.38 DApCa.39
23	Right click on the Conditional Access session and select Add Session Slot, select the play button.	N/A	
24	Verify that the DUT responds to the second open session request with an Open Session response with one of the following session status values. F1 or F3 as defined in [CCIF]. ➔ S [03:10:01.053] **open_session_response on resource Conditional Access, Status = 0xF1, SessionNb = 0** [92 07 F1 00 03 00 81 00 00]		DApCa.2

2.2 Copy Protection

2.2.1 Analog Program Copy Protection

2.2.1.1 Host Macrovision Test

This test verifies that the Host can enable analog program copy protection to the NTSC outputs (composite, composite RF, S-video, and "Y 480i, 480p) of YPbPr"), in accordance with the [Macrovision] standard, for video services carried on a QAM channel, that require CableCARD operation for reception.

Note: This test does not apply to any program that is displayable without CableCARD operation.

This test requires that Macrovision is turned-on in the DENC (Digital Encoder) of the Host. Macrovision is also known as anti-taping; it was created to prevent an analog recording device from being able to record a particular (or copyrighted) program. There are 4 basic modes of Macrovision. The specific Macrovision mode to be used with a particular digital stream is defined in the APS code of the CCI bits as shown in the table 2.2-1:

Table 2.2-1 – Macrovision Modes

APS Code	Macrovision Mode	Mode Description
00	0	Macrovision off
01	1	AGC on
10	2	AGC + 2-line color stripe*
11	3	AGC + 4-line color stripe*

- "color stripe" is also referred to as "split burst"

Equipment: Host under test, headend [input stream] or HPNX PRO tool with Copy Protection Functionality(S-Mode) or HPNx Pro with Copy Protection Functionality (M-Mode), Oscilloscope, with NTSC video triggering capability (or VM700 Video Tester), .

Setup: Connect the Host device to the headend. Connect an NTSC demodulator to the RF output (if an RF output exits) and tune the demodulator to the selected RF output channel. For the purpose of all procedures in this section, treat the baseband video output of the NTSC demodulator as an NTSC output of the Host device.

Definition of 'Verify': CE manufacturers have already complied with electrical specifications for Macrovision certification. Therefore, for this test section, 'Verify' shall be defined as "any video aberration that looks like "Macrovision" is present on the video signals, as viewed by an oscilloscope.

Note: If a product does NOT include any analog outputs then and only then is Macrovision technology not required.

Procedure 1: Digital Source Test

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID".	N/A	

4.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, verify that the status of the HPNx Pro goes ready and initialization completes.	N/A	
5.	Check that the Resource Manager opend its session.	N/A	
6.	Go to the Application Information tab and click on it. Press the play button to open the resource.	N/A	
7.	Go to the Man Machine Interface tab and click on it. Press the Play button to open the resource.	N/A	
8.	Select “Extended channel” tab, depending on the DUT you may have to change the resource version of the HPNX PRO to match that of the DUT. To do this, right click on the extended channel slot session. Select “Change resource version”. In the explorer user prompt window enter the correct resource version needed to match the DUT. Click OK. On the “Extended channel ” tab press the Play button to open the extended channel resource.	N/A	
9.	Find that the DUT issues a New_flow_req to Extended Channel requesting a service_type = MPEG_section with a PID = 0x1FFC. See example below.  Record the Flow_ID from New_flow_cnf () APDU. (_____).	N/A	

10	In the “Extended channel ” tab, under the “Flow Feed” function. Next to the “SI table file” click the Browse button. Select “MOT_STT.hex” file from wherever you have stored it on the HPNX PRO, and click “OPEN”. Note: Mot_STT.hex file must have valid date/time of after your manufacturer Certificate.	N/A	
11	Enter the FLOW_ID that was previously noted into the Flow ID window and click Send.	N/A	
12	Expand the Copy Protection resource and click on the CP provider. Select “Production button”. Also check in the Certificate Store that the certificate is valid.	N/A	
13	Select “Copy Protection” tab and open the Copy Protection resource by pressing the play button.	N/A	
14	Wait for the Copy protection binding procedure to complete. This is done when you see the “Copy Protection Session Key successfully generated”	N/A	
15	Expand the “Key Refresh” button and click the “Generate Session Key” button, verify “CopyProtection Session Key successfully generated.”	N/A	
16	In the “Extended Channel” tab, expand the “Flow Feed” button. Next to the “SI table file” click the Browse button. Select the “Profile1.hex” file from wherever you have stored it on the HPNX PRO, and click “OPEN”.	N/A	
17	Enter the FLOW_ID that was noted above, into the Flow ID window and click Send.	N/A	
18	Using the DUT channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Refer to CableLabs visitors WLAN for current channel map. http://visitors.cablelabs.com/Interopweb/	N/A	
19	Select “Conditional Access” tab to open the Conditional Access resource by pressing the Play button.	N/A	
20	Tune the DUT to an in the clear QAM transport stream.	N/A	
21	When the DUT does a channel change to tune the in the clear QAM, it SHALL send a CA_PMT to the HPNX PRO. In the HPNX PRO trace window locate with the CA_PMT message sent by the DUT. Note the Value of the Program Number _____ This is the Program number that the Host is tuned to with in the transport stream.	N/A	
22	Using the video analysis tool (oscilloscope) verify that Macrovision is not enabled. Note: Select one of the supported NTSC or 480i or 480p component outputs for this step and the remaining steps below.		HACP.2 CspC.23
23	Go to the Copy Protection tab, expand the CCI button to expose the “Analog Protection System” Pull down window.	N/A	

24	In the Program Number field type the decimal number that is the same as the Hex value sent by the Host in the CA_PMT. NOTE: You may have to convert the HEX number that was sent by the DUT in the CA_PMT to a decimal value.	N/A	
25	Select “AGC Process On, Split Burst Off” Click send.	N/A	
26	Using the video analysis tool verify that Macrovision is enabled.		HACP.2 HACP.5 CspC.23
27	Tune the DUT to another program within the in the clear program.	N/A	
28	Using the video analysis tool verify that Macrovision is disabled.		HACP.2 HACP.5
29	When the DUT does a channel change to tune the in the clear QAM, it SHALL send a CA_PMT to the HPNX PRO. In the HPNX PRO trace window locate with the CA_PMT message sent by the DUT and note the value of the “program_number = 0x????” field. This is the Program number that the Host is tuned to with in the transport stream.	N/A	
30	In the Program Number field type the decimal number that is the same as the Hex value sent by the Host in the CA_PMT. NOTE: You may have to convert the HEX number that was sent by the DUT in the CA_PMT to a decimal value.	N/A	
31	Select “AGC Process On, 2 Line Split Burst On” Click send.	N/A	
32	Using the video analysis tool verify that Macrovision is enabled.		HACP.2 HACP.5 CspC.23
33	Tune the DUT to another in-the-clear program.	N/A	
34	Using the video analysis tool verify that Macrovision is disabled.		CpsC.15 HACP.5
35	When the DUT does a channel change to tune the in the clear QAM, it SHALL send a CA_PMT to the HPNX PRO. In the HPNX PRO trace window locate with the CA_PMT message sent by the DUT and note the value of the “program_number = 0x????” field. This is the Program number that the Host is tuned to with in the transport stream.	N/A	
36	In the Program Number field type the decimal number that is the same as the Hex value sent by the Host in the CA_PMT. NOTE: You may have to convert the HEX number that was sent by the DUT in the CA_PMT to a decimal value.	N/A	
37	Select “AGC Process On, 4 Line Split Burst On” Click send.	N/A	
38	Using the video analysis tool verify that Macrovision is enabled.		CpsC.15 CspC.23 HACP.5
39	Select “Copy Protection Encoding Off” Click send.	N/A	
40	Using the video analysis tool verify that Macrovision is disabled.		HACP.2
41	Repeat for the remaining NTSC outputs		HACP.5

- Color stripe (split burst) applies only to composite outputs**.**

Procedure 2: Proof of Certification

Step#	Procedure	Pass/Fail	PICS
1.	Provide documentary proof of Macrovision compliance / certification of the Host device before final production product begins shipping. NOTE: Specific measurements of Macrovision waveform electrical characteristics are not required. Proof of certification implies complete compliance. This is in the form of a MacroVision Certificate.		HACP.2

2.2.2 Digital Program Copy Protection

2.2.2.1 Host Copy Protection and CCI Test

Procedure 1: Copy Protection Support [M-Mode]

Run the HPNx Pro for Copy Protection full authentication mode.

First time Host-CableCARD binding consists of a communication sequence to generate the matching Copy Protection keys in both Host and CableCARD, and store the intermediate keys in their respective non-volatile memory.

General Information:

1. The System Time Table file needs to be after the date of issued manufacturer certificates. Refer to the embedded file section on Doczone CWxx for current information.

2. The Card SHALL send CCI to the Host only after the Card and Host have successfully completed Authentication and ID Validation, and negotiated a shared CPKey.

Equipment: HPNx Pro test tool, DUT.

Procedure:

Step#	Procedure	Pass/Fail	PICS Item
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID".	N/A	
4.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, verify that the status of the HPNx Pro goes to ready.	N/A	
5.	Check that the Resource Manager opened its session.	N/A	
6.	Press the Play button on the "Application Information" tab.	N/A	
7.	Press the Play button on the "Man Machine Interface" tab.	N/A	
8.	Select "Copy Protection" tab and expand "CP Provider" button. Select "Production" button.	N/A	
9.	Press the Play button on the "Copy Protection" tab	N/A	
10.	Verify that the DUT responds with session response. ➔ S [73:32:10.762] open_session_response on resource Copy Protection, Status = 0x00, SessionNb = 4 [92 07 00 00 B0 01 03 ~~1~~ 00 04]		CpsR.12 CpsM.2 CpsM.3

11.	Verify that the DUT responds to a CP_open_req() APDU with a CP_open_cnf() APDU. ➔ A [73:32:10.882] CP_open_cnf to Copy Protection [9F 90 01 04 00 00 00 02] CP_system_id_bitmask = 0x00000002		CpsM.6 CpsM.10
12.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide Host_DevCert, Host_ManCert, DH_pubKey_H and $SIGN_H$. ➔ A [77:17:01.891] CP_data_cnf to Copy Protection [9F 90 03 82 11 0E 02 04 0F 08 00 30 82 03 76 xx xx xx xx xx xx ...] CP_system_id = 0x02 Send_data_nbr = 4 **Send_datatypes** **[0]** Datatype_ID = Host_DevCert [0x0F] Datatype_length = 2048 Data_type = [30 82 03 76 30 82 02 5E A0 xx xx xx ...] **[1]** Datatype_ID = Host_ManCert [0x07] Datatype_length = 2048 Data_type = [30 82 03 E9 30 82 02 D1 A0 xx xx xx ...] **[2]** Datatype_ID = DH_pubKey_H [0x0D] Datatype_length = 128 Data_type = [B1 D3 48 2B 2F 98 90 36 C7 xx xx xx ...] **[3]** Datatype_ID = SIGN_H [0x11] Datatype_length = 128 Data_type = [25 47 02 EA 47 14 14 C3 9D xx xx xx ...]		CpsB.10 CpsB.16 CpsB.30 CpsB.33 CpsB.38 CpsB.39 CpsM.1 CpsB.45 CertMgt.3
13.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the authentication key. ➔ A [77:17:09.703] CP_data_cnf to Copy Protection [9F 90 03 19 02 01 16 00 14 B4 3F 8F 51 3D 84 xx xx xx xx xx xx ...] CP_system_id = 0x02 Send_data_nbr = 1 **Send_datatypes** **[0]** Datatype_ID = AuthKey_H [0x16] Datatype_length = 20 Data_type = [B4 3F 8F 51 3D 84 BB B8 83 xx xx xx ...]		CpsR.13 CpsB.34 Cpsb.23 CpsB.43 CpsL.7 CpsB.44 CpsL.6 CertMgt.2 CertMgt.3
14.	Verify that the DUT displays the MMI “ID Reporting Screen” to the subscriber through the TV. The ID Reporting Screen SHALL include the Card_ID, Host_ID, a reporting telephone number and any other information required to identify the Card and Host to the CA system.		CpsB.28 CpsB.42

15.	Verify in the displayed Host_ID (40-bits), the first 3 digits (10 most significant bits) of the Host_ID match the manufacturer ID assigned to the specific vendor. The manufacturer ID list is a CableLabs assigned and maintained list for each vendor. **In order to start service for this device please contact SuperVision Cable at 1-800-555-8888** **CableCARD ID: 7-561-034-449-003** **Host ID: 0-100-331-784-015** **Example ID Reporting Screen**		CertMgt.11
16.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the Host_ID and N_Host. ➔ A [77:17:10.684] CP_data_cnf to Copy Protection [9F 90 03 15 02 02 05 00 05 07 40 00 00 05 0B xx xx xx ...] CP_system_id = 0x02 Send_data_nbr = 2 **Send_datatypes** **[0]** Datatype_ID = Host_ID [0x05] Datatype_length = 5 Data_type = [07 40 00 00 05] **[1]** Datatype_ID = N_Host [0x0B] Datatype_length = 8 Data_type = [2C 8F AE 18 16 B6 20 C0]		CpsK.7 CpsM.7 CpsR.11
17.	Verify that the DUT responds to a CP_sync_req() ADPU with a CP_sync_cnf() ADPU. ➔ A [77:17:20.959] CP_sync_cnf to Copy Protection [9F 90 05 01 00] Status_field = OK [0x00]		CpsK.18 CpsM.8 CpsM.9
18.	Expand “Key Refresh” button and click “Generate Session Key” button	N/A	

19.	Verify that the Verify that the DUT sends the same N_Host through the CP_data_cnf() ADPU. ➔ A [77:17:10.684] CP_data_cnf to Copy Protection [9F 90 03 15 02 02 05 00 05 07 40 00 00 05 0B xx xx xx …] CP_system_id = 0x02 Send_data_nbr = 2 **Send_datatypes** **[0]** Datatype_ID = Host_ID [0x05] Datatype_length = 5 Data_type = [07 40 00 00 05] **[1]** Datatype_ID = N_Host [0x0B] Datatype_length = 8 Data_type = [B9 AB 33 3C EA AB FA 33]		CpsK.11 CpsK.13 CpsK.14 CpsK.15 CpsK.12 CpsK.17
20.	Verify that the DUT responds to a CP_sync_req() ADPU with a CP_sync_cnf() ADPU. ➔ A [77:17:20.959] CP_sync_cnf to Copy Protection [9F 90 05 01 00] Status_field = OK [0x00]		CpsK.15 CpsK.18 CpsM.8 CpsM.9 CpsK.12 CpsK.17 DPh.88 DPh.89 DPh.90 DPh.91 DPh.94
21.	In the “Extended Channel” tab, expand the “Flow Feed” button. Next to the “SI table file” click the Browse button. Select the “Profile1.hex” file from wherever you have stored it on the HPNX PRO, and click “OPEN”.	N/A	
22.	Tune all tuners to analog channel(s).	N/A	
23.	Select “Conditional Access” tab and press play button to open the Conditional Access resource.	N/A	
24.	Tune the first tuner to a CLEAR digital program. Verify that a ca_pmt is received by HPNx Pro. Verify that you can see video and hear audio on the DUT	N/A	
25.	When the DUT does a channel change to tune the in the clear QAM, check DUT as it will send a CA_PMT to the HPNx Pro. In the HPNx Pro trace window locate with the CA_PMT message sent by the DUT and note the value of the “program_number = 0x????” field. This is the Program number that the Host is tuned to in the transport stream. Under Copy Protection tab, expand the “TS Auto Encryption” menu. The table entries should be grayed except for the channel that has just been sent to HPNx Pro through the previous ca_pmt. On the entry line matching your previous ltsid and program number (see in ca_pmt) Check the “ON” radio button. Verify that you can still see Video and hear Audio on the DUT	N/A	
26.	In the same table entry, now check “Corrupted” radio button and verify that video freezes and Audio stops		CpsT.5 CpsT.6 CpsD.1 CpsD.2
27.	Expand the CCI tab.	N/A	
28.	In the “Program Number” field, type the program number that is the same as the Hex value sent by the Host in the CA_PMT message.	N/A	
29.	In the “LTSID” field, type the LTSID that is the same as the Hex value sent by the Host in the CA_PMT message.	N/A	

30.	Expose the “Digital Copy Permission” pull down menu In the “Digital Copy Permission” field, select “No further copying is permitted” and the click “send” button.	N/A	
31.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the CCI_N_Host, program number and the LTSID. ➔ A [04:26:40.878] CP_data_cnf to Copy Protection [9F 90 03 16 02 03 13 00 08 C9 C3 DF 1C 01 xx xx xx …] CP_system_id = 0x02 Send_data_nbr = 3 **Send_datatypes** **[0]** Datatype_ID = CCI_N_host [0x13] Datatype_length = 8 Data_type = [C9 C3 DF 1C 01 23 25 E9] **[1]** Datatype_ID = Program_Number [0x1A] Datatype_length = 2 Data_type = [00 01] **[2]** Datatype_ID = LTSID [0x1D] Datatype_length = 1 Data_type = [01]		CpsC.9 CpsC.30
32.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the CCI_ack, program number and the LTSID. ➔ A [04:26:41.248] CP_data_cnf to Copy Protection [9F 90 03 22 02 03 1C 00 14 6A 67 9E 5C 04 4D 4B xx xx xx …] CP_system_id = 0x02 Send_data_nbr = 3 **Send_datatypes** **[0]** Datatype_ID = CCI_ack [0x1C] Datatype_length = 20 Data_type = [6A 67 9E 5C 04 4D 4B ED 25 xx xx xx …] **[1]** Datatype_ID = Program_Number [0x1A] Datatype_length = 2 Data_type = [00 01] **[2]** Datatype_ID = LTSID [0x1D] Datatype_length = 1 Data_type = [01] *CCI_ack verified - CCI delivery completed successfully* Verify “CCI_ack verified – CCI delivery completed successfully” is displayed in HPNx Pro trace window.		CpsC.12a
33.	If the device has a DVI or HDMI output, connect the DVI or HDMI source to a display device without HDCP and make sure that Copy protection is being applied to that output source interface by the absence of a picture when CCI EMI bits are set to any value other than 0x00. **Note** : The DUT SHALL not include (i) switches, buttons, jumpers or software equivalents of any of the foregoing, (ii) specific traces that can be cut, or (iii) service menus or functions (including remote-control functions), in each case by which intended content protection can be defeated or by which Controlled Content can be exposed to unauthorized copying.	C-M	CpsC.1 CpsC.27 CpsL.11 CpsC.23 UDVI.7 UDVI.9

<table>
<tr><td>34.</td><td>Repeat and verify steps 30 to 33 with the following Digital Copy Permission values :

One Generation Copy is Permitted
Copying is prohibited</td><td>N/A</td><td></td></tr>
<tr><td>35.</td><td>Still in CCI tab, in Digital Copy Permission field, select “Copy is permitted” and check “Image Constraint Required” checkbox. In the “Reserved bits field value” pull down, select (7) for the value of reserved bits.</td><td>N/A</td><td></td></tr>
<tr><td>36.</td><td>Type the program number and the LTSID that is the same as the Hex value sent by the Host in the CA_PMT message. Click on Send and verify CCI exchange success as in steps 31 and 32</td><td></td><td>CpsC.12a
CpsC.21</td></tr>
<tr><td>37.</td><td>If the DUT supports a Component Video Output, connect the component output to a display device.
Verify the output constraint has been applied to that output source interface.</td><td></td><td>CpsC.1
CpsC.21</td></tr>
<tr><td>38.</td><td>If the DUT provides the means to request the Card’s validation status, then verify the DUT sent CP_valid_req() and DU tag 9F 90
Trace example:
A [189:37:17.100] CP_valid_req to Copy Protection
[9F 90 06 00]

A [189:37:17.130] CP_valid_cnf from Copy Protection
[9F 90 07 01 00]
Status_field =

The Card Validation Status_field values the host must support are:
<table><tr><th>Status_field</th><th>Value</th></tr><tr><td>Card is busy with binding authentication process</td><td>0x00</td></tr><tr><td>Not bound for Card reasons</td><td>0x01</td></tr><tr><td>Not bound, Host Certificate Invalid</td><td>0x02</td></tr><tr><td>Not bound, failed to verify Host’s $SIGN_H$</td><td>0x03</td></tr><tr><td>Not bound, failed to match AuthKey from Host Device</td><td>0x04</td></tr><tr><td>Binding Failed, other reasons</td><td>0x05</td></tr><tr><td>Not Validated, Binding Authentication Complete, Validation message not received yet</td><td>0x07</td></tr><tr><td>Validated, validation message is received, authenticated, and the IDs match those in the current binding</td><td>0x06</td></tr><tr><td>Not Validated, validation revoked</td><td>0x08</td></tr><tr><td>Reserved</td><td>0x09 to 0xFF</td></tr></table>
Note: If supported, the host vendor should include setup method documentation.</td><td>(O)</td><td>CpsM.11</td></tr>
</table>

39.	Expand the “Certificate store” button and select invalid certificate “No Common Name” from the list. **Certificate Store** No Common Name 15 Character CN 17 Character CN No Key Usage Digital Signature Only Key Encipher Only Key Usage Not Critical No AKI	N/A	
40.	Press the play button on the “Copy Protection” tab. Verify that the DUT and the HPNx Pro fail the copy protection binding process.	N/A	
41.	Verify that the DUT reports an error to the user with the following text “Please call your cable operator and report an invalid CableCARD”		CpsB.27 CpsB.36
42.	Following the Display at initial failure, use the vendors diagnostics interface menu to select the DUT CableCARD information menu. Verify that the DUT can generate and display the following message: “Please call your cable operator and report an invalid CableCARD”		CpsB.27a
43.	Tune to a scrambled channel protected by the CA system, and verify that the CP system failure notification message is displayed.		CpsB.37
44.	Repeat steps 55 through 58 for remaining invalid certificate inthisCertificate Store list. Verify that each certificate from the HPNx Pro trace window, indicates “***Copy Protection Session Key***” error message. **“Certificate Store”** No Common Name 15 Character CN 17 Character CN No Key Usage Digital Signature Only Key Encipher Only Key Usage Not Critical No AKI Note: CableLabs’ position with the remaining error certificates listed in HPNx Pro Certificate Store are that they are covered through VeriSign Issuance or an optional state that is not required as part of this test.		CertMgt.1 through CertMgt.4 CertMgt.3a CertMgt.3b CertMgt.3c CertMgt.3d CertMgt.4a CertMgt.4b CertMgt.8 CertMgt.10 CertMgt.12 CertMgt.13 CertMgt.16 CertMgt.21a CertMgt.25 CertMgt.26 CertMgt.28
45.	Do not remove HPNx Pro and physically unplug DUT from a power source.		
46.	Wait 60 seconds, plug DUT back into the power source.		
47.	On the HPNx Pro click the Copy Protection tab and press play.		

48.	Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the authentication key. ➔ A [77:17:09.703] CP_data_cnf to Copy Protection [9F 90 03 19 02 01 16 00 14 B4 3F 8F 51 3D 84 xx xx xx xx xx xx ...] CP_system_id = 0x02 Send_data_nbr = 1 **Send_datatypes** **[0]** Datatype_ID = AuthKey_H [0x16] Datatype_length = 20 Data_type = [B4 3F 8F 51 3D 84 BB B8 83 xx xx xx ...]		CpsR.13 CpsB.34 Cpsb.23 CpsB.43 CpsL.7 CpsB.44 CpsL.6
49.	Verify the Authyey received matches that of the AuthKey received. Verify that the DUT responds to a CP_data_req() ADPU with a CP_data_cnf() ADPU in order to provide the authentication key. ➔ A [77:17:09.703] CP_data_cnf to Copy Protection [9F 90 03 19 02 01 16 00 14 B4 3F 8F 51 3D 84 xx xx xx xx xx xx ...] CP_system_id = 0x02 Send_data_nbr = 1 **Send_datatypes** **[0]** Datatype_ID = AuthKey_H [0x16] Datatype_length = 20 Data_type = [B4 3F 8F 51 3D 84 BB B8 83 xx xx xx ...]		CpsB.4b
50.	Repeat Steps 16-19		CpsB.4a

2.3 Certificate Storage and Management

2.3.1 Certificate CA Structure

First time M-UDCP-CableCARD binding consists of a communication sequence to generate the matching Copy Protection keys in both M-UDCP and CableCARD. It will store the intermediate keys in their respective non-volatile memory. DFAST requires that the M-UDCP shall use specific root origination structure (CA00004) for manufacturer and device certificates.

CableLabs tests M-UDCP certificate with a product from Digital Keystone called the HPNx PRO. Follow procedure below to launch the HPNx Pro resources. Capture both the manufacturer certificate (MAN_CERT) and the device certificate (DEV_CERT) to verify the M-UDCP root origination.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNX PRO software on the PC, and verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card).	N/A	
3.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, verify that the status of the HPNx Pro goes to ready.	N/A	
4.	Check that the Resource Manager opened its session.	N/A	
5.	Go to the Application Information tab and click on it. Press the Play button to open the resource.	N/A	
6.	Go to the Man Machine Interface tab and click on it. Press the Play button to open the resource.	N/A	
7.	Expand the “Extended Channel” tab. The DUT should support extended channel version 1 as defined in CCIF2.0 Specification. Right click on the Session slot. Select “Change Resource Version”. Enter the correct resource version. Click OK. On the “Extended channel” tab press the Play button to open the extended channel resource.	N/A	
8.	Verify that the DUT issues a New_flow_req to Extended Channel requesting a service_type = MPEG_section with a PID = 0x1FFC. See example below. ← S [00:00:22.242] open_session_request from Extended Channel → S [00:00:22.613] open_session_response on resource Extended Channel, Status = 0x00, SessionNb = 4 → A [00:00:22.663] New_flow_req to Extended Channel (note: description version and opened version differs) service_type = MPEG_section [0x00] **MPEG_section_parameters** PID = 0x1FFC ← A [00:00:22.723] New_flow_cnf from Extended Channel status_field = request granted [0x00] flows_remaining = 0x05 **flow_info** FLOW ID = 0x000001	N/A	
9.	In the “Extended channel” tab, under “Flow Feed” function, next to the “SI table file” click the Browse button. Select a valid system time file from wherever you have stored it on the HPNx Pro, and click “OPEN”. Note: A current STT.hex (C5) table identifier file should be created.	N/A	

10	Enter the FLOW_ID that was noted from HPNx Pro New_flow_req trace into the Flow ID window and click Send.	N/A	
11	Select the Copy Protection tab. Expand CP Provider Menu and choose production certificate.	N/A	
12	Press the Copy Protection Play button.	N/A	
13	Verify that the **"CopyProtection Session Key successfully generated"** in the trace display window. → S session_number (incoming APDU) on Session Nb 5 (Copy Protection) [90 02 00 05 9F 90 03 15 02 02 05 00 05 01 40 00 00 01 0B 00 08 EB 94 0F B1 17 26 7A 9D] → A [00:01:07.898] CP_data_cnf to Copy Protection [9F 90 03 15 02 02 05 00 05 01 40 00 00 01 0B 00 08 EB 94 0F B1 17 26 7A 9D] CP_system_id = 0x02 Send_data_nbr = 2 **Send_datatypes** [0] Datatype_ID = Host_ID [0x05] Datatype_length = 5 Data_type = [01 40 00 00 01] [1] Datatype_ID = N_Host [0x0B] Datatype_length = 8 Data_type = [EB 94 0F B1 17 26 7A 9D] *CopyProtection Session Key successfully generated*	N/A	
14	Under the Copy Protection tab expand the "Save DUT Certificates" menu. Press save for the Device Certificate. Label this file and save it somewhere on the given PC as a .cer file.	N/A	
15	Under the same "Save DUT Certificates" menu, press save for the Manufacturer Certificate. Label this file and save it somewhere on the given PC as a .cer file.	N/A	
16	Open the saved manufacturer CA certificate and click on the "Details" menu. Click "Issuer" and verify CN = CableLabs Manufacturer Root CA.. Exit window.		CertMgt.8
17	Open the saved device certificate and click on the "Details" menu. Click "Issuer" and verify the OU=CA00004. Exit window.		CertMgt.8

3 PHYSICAL LAYER CHARACTERISTICS

3.1 FAT Channel

3.1.1 Host FAT Channel Functional Test

This test verifies that the Host is meeting lowest and highest frequencies requirements and weakest and strongest RF signal levels.

Equipment: Host under test, Reference CableCARD, Spectrum Analyzer, RF Modulator (2 if possible for lowest and highest frequencies), 15 dB pad.

Setup: Setup the system as described below.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Powered up Host under test (DUT) (with or without CableCARD) connected to a TV.	N/A	
2.	Connect the Spectrum Analyzer to the RF tap in the same RF network that feeds the DUT.	N/A	
3.	Set NTSC modulator to channel to be tested.	N/A	
4.	With a 15dB pad on the output of the NTSC modulator, adjust the output level until it read 0 dBmV on the spectrum analyzer. Then remove the 15 dB pad. This will test the +15 dBmV RF signal level. Make sure that channel is displayed properly on the TV.	N/A	
5.	On the modulator adjust the output level of the NTSC modulator until it read 0 dBmV on the spectrum analyzer. Replace the 15 dB pad. This will test the -15 dBmV RF signal level. Make sure that channel is displayed properly on the TV.	N/A	
6.	With a 15dB RF pad on the output of the modulator, adjust the output level of the modulator until 0 dBmV is measured on the screen of the Spectrum analyzer.	N/A	
7.	Remove the 15 dB pad from the output of the modulator. Monitor the screen of the analyzer, the carrier level should now read +15dBmV.	N/A	
8.	The analog aural carrier (audio) sits at 4.5MHz above the video carrier. Adjust the frequency on the spectrum analyzer accordingly to view the audio carrier level. Then adjust the output audio level in the modulator to vary between –10dBc and –17dBc and listen to the audio on the TV to confirm that the DUT is able to lock and output the audio correctly.	N/A	
9.	Set 64QAM modulator to channel to be tested.	N/A	
10	With a 15dB pad on the output of the 64QAM modulator, adjust the output level until it read 0 dBmV on the spectrum analyzer. Then remove the 15 dB pad. This will test the +15 dBmV RF signal level. Make sure that channel is displayed properly on the TV.		HFATrf.10
11	On the modulator adjust the output level of the 64QAM modulator until it read 0 dBmV on the spectrum analyzer. Replace the 15 dB pad. This will test the -15 dBmV RF signal level. Make sure that channel is displayed properly on the TV.		HFATrf.10
12	Set 256QAM modulator to channel to be tested.	N/A	
13	With a 15dB pad on the output of the 256QAM modulator, adjust the output level until it read 0 dBmV on the spectrum analyzer. Then remove the 15 dB pad. This will test the +15 dBmV RF signal level. Make sure that channel is displayed properly on the TV.		HFATrf.11

Step#	Procedure	Pass/Fail	PICS
14	On the modulator adjust the output level of the 256QAM modulator until it read +3 dBmV on the spectrum analyzer. Replace the 15 dB pad. This will test the -12 dBmV RF signal level. Make sure that channel is displayed properly on the TV.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 HFATrf.11 Hnop.2 HFATrf.5 HFATrf.13
15	Using a NTCS Modulator, change the frequency to 54 MHz, tune the DUT to channel 2 and verify the channel has proper reception.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.1 HFATrf.5 HFATrf.13
16	Using the RD-21 Broadband Reference Guide, change to the next frequency for the STD frequency column and tune the DUT to the correct channel. Verify the channel has proper reception.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.1 HFATrf.5 HFATrf.13
17	Repeat last step for every valid frequency between 54 MHz and 864 MHz for the STD tuning type. Then for IRC tuning types. Then HRC tuning types.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.1 HFATrf.5 HFATrf.13
18	Using a 64 QAM modulator , change the frequency to 54 MHz, tune the DUT to channel 2 and verify the channel has proper reception.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.2 HFATrf.5 HFATrf.13
19	Using the RD-21 Broadband Reference Guide, change to the next frequency for the STD frequency column and tune the DUT to the correct channel. Verify the channel has proper reception.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.2 HFATrf.5 HFATrf.13

Step#	Procedure	Pass/Fail	PICS
20	Repeat last step for every valid frequency between 54 MHz and 864 MHz for the STD tuning type. Then for IRC tuning types. Then HRC tuning types. **NOTE is will be nessisary to use two different modulators to complete this test. A lower one for lower frequencies and an upper one for upper frequencies.		HFATrf.1 HFATrf.2 HFATrf.8 HFATrf.9 Hnop.2 HFATrf.5 HFATrf.13

3.1.2 FAT Channel HRC/IRC Tuning Test

This test verifies HRC/IRC tuning of Device under Test.

Equipment: Analog HRC channel 5, Analog IRC channel 5, (64 or 256) QAM HRC at low channel, (64 or 256) QAM IRC at mid channel, digital source

Setup: Prepare the receiving device in the proper tuning mode. To set C6U to HRC/IRC mode, Select Converter A or B, push down arrow until “option menu” appears. Push “right” arrow once, then down arrow twice until “mode” appears. Push right arrow on front panel display until desired modulation (HRC/IRC) is displayed. Push the “enter” button to lock desired settings. Set visual carrier to 0 dBmV and Analog aural carrier signal to –10dBc at the RF input to the DUT.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Power up DUT.	N/A	
2.	Connect a HRC low-channel QAM source to HFC network. (Spectrum between 54 to 864MHz.)	N/A	
3.	Tune the DUT to the low-channel QAM HRC source.	N/A	
4.	Verify proper reception of QAM source with/on DUT.		HFATrf.5 HFATrf.13
5.	Connect HRC analog channel 5 source to HFC network.	N/A	
6.	Tune DUT to the HRC analog channel 5.	N/A	
7.	Verify proper reception of Analog source with/on DUT.		HFATrf.5 HFATrf.13
8.	Re-configure the HRC to an Analog IRC low-channel source. (Spectrum between 54 to 864MHz.)	N/A	
9.	Tune DUT to the low-channel Analog IRC source.	N/A	
10	Verify proper reception of IRC source with/on DUT.		HFATrf.5 HFATrf.13
11	Re-Configure the IRC analog channel 5 source to output IRC QAM channel 5.	N/A	
12	Tune the DUT to the IRC QAM channel 5.	N/A	
13	Verify proper reception of QAM source with/on DUT.		HFATrf.5 HFATrf.13

3.1.3 Host FAT LO Leakage Test

This test verifies that the amount of local oscillator power leaking out of a Host Device and back into the cable plant is within spec limits.

Equipment: Host under test, HP8561E spectrum analyzer

NOTE: This test only applies to Host devices using a single conversion type RF tuner where the local oscillator frequency is separated from the desired video carrier by an amount equal to the IF frequency. If the Host device employs a dual conversion type RF tuner the local oscillator frequencies are typically above the entire input range and therefore the test is not applicable.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Connect the DUT to the 75 ohm input of the spectrum analyzer	N/A	
2.	Tune the DUT to the 1st EIA channel listed in Table (step 10)	N/A	
3.	Set the spectrum analyzer center frequency to the value specified in the column labeled Video Carrier from Table (step 10)	N/A	
4.	Set the spectrum analyzer frequency span to 1 MHz	N/A	
5.	Change the spectrum analyzer amplitude units to dBmV	N/A	
6.	Set the spectrum analyzer reference level to 0 dBmV	N/A	
7.	Set the spectrum analyzer video bandwidth to 300 Hz	N/A	
8.	Set resolution bandwidth to 9 KHz.	N/A	
9.	Measure the level at the corresponding LO frequency	N/A	
10	Repeat test for each of the Video Carriers listed in the table 3.1-1: ***Table 3.1-1 – Video Carriers*** Verify the LO leakage is <-37 dBmV over 54 MHz to 864 MHz. Range.		HFATrf.14

EIA channel designation	Video Carrier (Mhz)	LO Frq (Mhz)	LO level (dBmv)
2	55.25	101	
17	139.25	185	
23	217.25	263	
36	295.2625	341.0125	
49	373.2625	419.0125	
63	457.25	503	
76	535.25	581	
89	613.25	659	
108	697.25	743	
121	775.25	821	

3.1.4 FAT Channel Micro-reflection Test

This test fulfills band pass ripple, group delay and static ghost impairments.

Equipment: HP11759D Ghost Simulator (or TAS or Rhode and Schwarz SFQ.) 256QAM source, Spectrum analyzer, Analog NTSC source.

Setup: Set up the ghost simulator as described below

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Set up the ghost simulator as described in the next steps.	N/A	
2.	Set NTSC signal on a mid channel at 0 dBmV	N/A	
3.	Set the ghost generator primary path for 0dB attenuation, 0 phase, 0 delay, LO oscillator to 207 MHz at +10 dBm	N/A	
4.	Verify proper video reception.		
5.	Verify Proper reception with the ghost generator secondary path Set to Phase, -10dB @ 0.5 uSec, 0 degrees referenced to RF channel center freq. (NTSC)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
6.	Verify Proper reception with the ghost generator secondary path Set to Phase, -15dB @ 1 uSec, 0 degrees referenced to RF channel center freq. (NTSC)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
7.	Verify Proper reception with the ghost generator secondary path Set to Phase -20dB @ 1.5 uSec, 0 degrees referenced to RF channel center freq. (NTSC)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
8.	Verify Proper reception with the ghost generator secondary path Set to Phase-30dB @ 4.5 uSec, 0 degrees referenced to RF channel center freq. (NTSC)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
9.	Replace NTSC source with 256QAM signal on mid channel at 0 dBmV.	N/A	
10	Verify Proper reception with the ghost generator secondary path Set to Phase, -10dB @ 0.5 uSec, 0 degrees referenced to RF channel center freq. (256QAM)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
11	Verify Proper reception with the ghost generator secondary path Set to Phase, -15dB @ 1 uSec, 0 degrees referenced to RF channel center freq. (256QAM)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
12	Verify Proper reception with the ghost generator secondary path Set to Phase -20dB @ 1.5 uSec, 0 degrees referenced to RF channel center freq. (256QAM)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32
13	Verify Proper reception with the ghost generator secondary path Set to Phase -30dB @ 4.5 uSec, 0 degrees referenced to RF channel center freq. (256QAM)		HFATrf.26 HFATrf.28 HFATrf.29 HFATrf.32

Note: 256QAM modulation will represent the worst case scenario for this test. A micro-reflection of –10 dB @ 0.5 uSec is required in order to meet the 250 nSec group delay specification

3.1.5 FAT Channel Phase Noise Tolerance

This test verifies operation of QAM signals under phase noise conditions

Equipment: HP model #8675A FM signal generator, (NoiseCom model #7102) Audio white noise source, passive double balanced mixer (ex. Mini circuits ZFM 15), 256QAM source at 150 MHz, spectrum analyzer

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Set the FM signal generator to 63MHz at +10dBm.	N/A	
2.	Connect the audio noise source to FM input on the signal generator.	N/A	
3.	Connect signal generator to spectrum analyzer.	N/A	
4.	Set Spectrum Analyzer freq. To 63 MHz, 50kHz span, resolution BW to 1 kHz.	N/A	
5.	Set two markers, first marker @ PEAK, then press the marker delta soft key to set second marker @ 10 KHz below PEAK marker.	N/A	
6.	Adjust FM deviation of the signal generator so that spectrum analyzers 10 kHz offset measures –56dBc. Video averaging “on” is suggested to obtain a stable reading on spectrum analyzer. (Alternate: QAM source at IF, generator at 257 MHz)	N/A	
7.	This set up initializes phase noise at –86dBc per Hz at 10 kHz offset. 30dB correction factor that corresponds to1 kHz resolution bandwidth.	N/A	
8.	Connect signal generator output to mixer L port.	N/A	
9.	Connect 256QAM signal to mixer I port at +6 dBmV.	N/A	
10	Verify that the signal level output is 0dBmV. Connect mixer output to DUT input.	N/A	
11	Tune DUT to channel 13.	N/A	
12	Verify proper reception.		HFATrf.27

3.1.6 FAT Channel AM Hum Modulation Immunity

This test verifies operation of DUT in the presence of hum

Equipment: HP11759D Ghost Simulator, (TAS or Rhode and Schwarz SFQ.) 256QAM source, Spectrum analyzer.

Setup: 256QAM signal on the mid channel at 0 dBmV. Set the ghost generator primary path for 0dB attenuation, 0 phase, 0 delay.

CableLabs Setup: Dolch mega PC (CL tag #1572), select TS Player, open "E" drive and select Sarnoff_HD, then Ocabv01.mpg. Connect BNC cable from ASI output of Dolch to "ASI" input of modulator.

Setup of Ghost Simulator:

Power up PC (PC defaults to Windows at power up, exit windows) and at DOS prompt type "dir", then type "cd chansim", then "chansim" again. At main menu type "G". DO NOT HIT THE "enter" key. Under "Path1" on main menu, set spectrum to "Doppler" by moving curser next to "off". Hit the enter button and select Doppler. Do nothing else to path 1. Under path 2, move cursor to "spectrum" and press the enter key and select "Doppler". Move cursor down to Doppler/Phase box, with cursor next to "Hz" and enter "120"

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Connect RF output of modulator to "RF input" of ghost simulator connect output of ghost simulator to the DUT.	N/A	
2.	Setup 256QAM signal on the mid channel at 0 dBmV.	N/A	
3.	Set LO oscillator to 207 MHz and set to +10 dBm.	N/A	
4.	Set the ghost generator primary path (path 1) for 0dB attenuation, 0 phase, 0 delay	N/A	
5.	Set ghost generator secondary path (path 2) for –37 dB attenuation, 120Hz Doppler (Change Hz setting, not kmh setting)	N/A	
6.	Verify that the DUT is not adversely affected by AM Hum Modulation on digital carrier of less than or equal to 3% p-p @ 120Hz. Note: Applicable only when converted RF outputs are provided.		HFATrf.23

3.1.7 Host Spurious Emissions Test

This test verifies that the amount of spurious signal power leaking out of a Host Device and back into the cable plant is within spec limits.

Equipment: Host Device, HP8561E spectrum analyzer or equivalent

Procedure:

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>1.</td><td>Connect the DUT under test to the 75 ohm input of the spectrum analyzer</td><td>N/A</td><td></td></tr>
<tr><td>2.</td><td>Power up the DUT under test and tune to the mid channel.</td><td>N/A</td><td></td></tr>
<tr><td>3.</td><td>Set the spectrum analyzer center frequency to 9 MHz</td><td>N/A</td><td></td></tr>
<tr><td>4.</td><td>Set the spectrum analyzer frequency span to 10 MHz</td><td>N/A</td><td></td></tr>
<tr><td>5.</td><td>Change the spectrum analyzer amplitude units to dBmV</td><td>N/A</td><td></td></tr>
<tr><td>6.</td><td>Set the spectrum analyzer reference level to 0 dBmV</td><td>N/A</td><td></td></tr>
<tr><td>7.</td><td>Set the spectrum analyzer video bandwidth to 300 Hz</td><td>N/A</td><td></td></tr>
<tr><td>8.</td><td>Set resolution bandwidth to 9 kHz</td><td>N/A</td><td></td></tr>
<tr><td>9.</td><td>Measure the level of any signal greater than -30 dBmV over the range 54 MHz to 864 MHz and -26 dBmV over the range 5 MHz up to but not including 54 MHz.

Note: On the first measurement, ignore the 4 MHz to 5 MHz range.</td><td>N/A</td><td></td></tr>
<tr><td>10</td><td>Increase the center frequency by 100 MHz</td><td>N/A</td><td></td></tr>
<tr><td>11</td><td>Repeat this test until the entire range from 54 to 864 MHz is covered filling in the following chart:
<table>
<tr><th>Spur Frequency (MHz)</th><th>Power level (dBmV)</th><th>Spur Frequency (MHz)</th><th>Power level (dBmV)</th></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table></td><td>N/A</td><td></td></tr>
<tr><td>12</td><td>Verify Proper reception for each of these channels. Also verify that each have Spurious Emission of-30 dBmV over the range 54 MHz to 864 MHz and -26 dBmV over the range 5 MHz up to but not including 54 MHz.</td><td></td><td>UniDir.1</td></tr>
</table>

3.1.8 Host Maximum Individual Carrier Test

This test verifies that the DUT can receive FAT channels properly in the presence of interfering signals over frequency range from 5MHz to 54MHz.

Equipment: DUT, Spectrum Analyzer, CW signal generator and (two) 2-way splitter.

Setup: Setup the system as shown below.

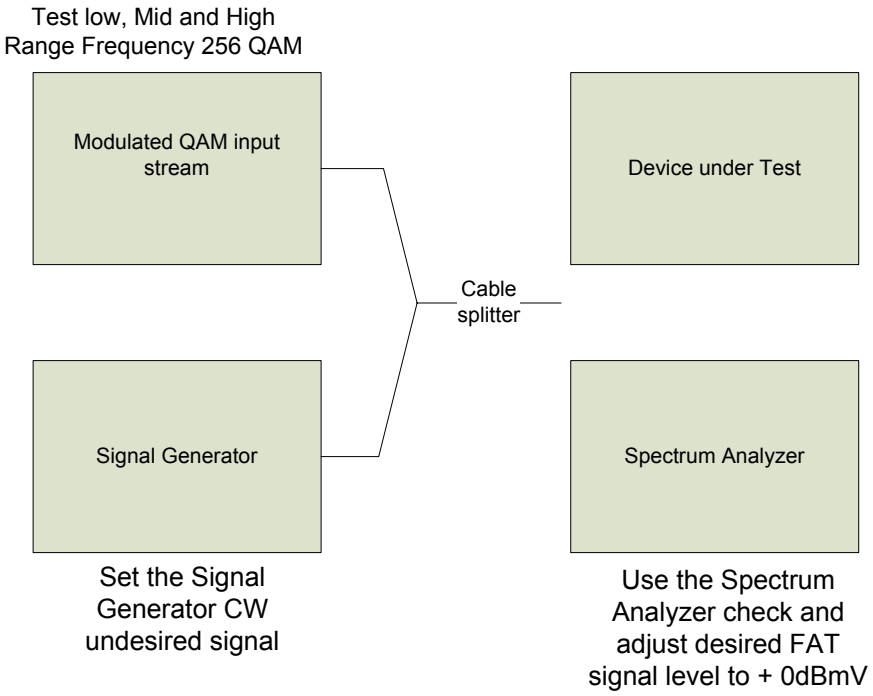


Figure 3.1-1 – Maximum Individual Carrirer Set-up

Note: The undesired individual signals are simulated by Continue Wave (CW) signals taken from signal generator and the desired signal level should be verify for any channel used for test.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Connect the equipment as depicted in diagram above. - Connect the Modulated QAM input stream to one of the output ports on the 2-way splitter. - Connect the other output of the splitter to the signal generator. - Check levels with spectrum analyzer. Switch the input port to the DUT.	N/A	
2.	Create low Frequency 256 QAM (typically ch3) using Modulator and Stream Player. Use the Spectrum Analyzer check and adjust desired FAT signal level to + 0dBmV.	N/A	

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>3.</td><td>Set the Signal Generator CW undesired signal to 0.5MHz input set at +42 dBmV.</td><td>N/A</td><td></td></tr>
<tr><td>4.</td><td>Low Range FAT channel (ch3) test:
1. Record result of setting the CW undesired signal to 5MHz input set at +42 dBmV in first line of Table below.
2. Increment the next center frequency indicated in the measurement column of undesired CW signals below and record that result. Step through each frequency indicated in measurement column of table below up to 54MHz and record results in rthe charts below.
(All frequencies must pass this requirement)
<table>
<tr><th>Measurement</th><th>Results</th></tr>
<tr><td>5MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>10MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>19MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>30MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>41MHz, input set at +24 dBmV</td><td></td></tr>
<tr><td>48MHz, input set at 0 dBmV</td><td></td></tr>
<tr><td>54MHz, input set at -10 dBmV</td><td></td></tr>
</table></td><td></td><td>HMICA.1
HMICA.2</td></tr>
<tr><td>5.</td><td>Change the modulation to mid range FAT channels (typically ch13).</td><td>N/A</td><td></td></tr>
<tr><td>6.</td><td>Mid Range FAT channel (ch13) Test:
Complete the Measurement Table again for Mid range FAT channel.
(All frequencies must pass this requirement)
<table>
<tr><th>Measurement</th><th>Results</th></tr>
<tr><td>5MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>10MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>19MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>30MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>41MHz, input set at +24 dBmV</td><td></td></tr>
<tr><td>48MHz, input set at 0 dBmV</td><td></td></tr>
<tr><td>54MHz, input set at -10 dBmV</td><td></td></tr>
</table></td><td></td><td>HMICA.1
HMICA.2</td></tr>
<tr><td>7.</td><td>Change the modulation to high range FAT channels (typically ch82).</td><td>N/A</td><td></td></tr>
</table>

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>8.</td><td>High Range FAT channel (ch82) Test:

Complete the Measurement Table again for Mid range FAT channel.

(All frequencies must pass this requirement)
<table>
<tr><th>Measurement</th><th>Results</th></tr>
<tr><td>5MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>10MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>19MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>30MHz, input set at +42 dBmV</td><td></td></tr>
<tr><td>41MHz, input set at +24 dBmV</td><td></td></tr>
<tr><td>48MHz, input set at 0 dBmV</td><td></td></tr>
<tr><td>54MHz, input set at -10 dBmV</td><td></td></tr>
</table></td><td></td><td>HMICA.1
HMICA.2</td></tr>
</table>

3.1.9 Host RF Input Return Loss Test

This test verifies the Host RF Input Return Loss meets the required spec over the full tuning range.

Equipment: Host under test, HP8753D network analyzer with 75 ohm input impedance, HP85039B Type F calibration kit

Calibration of Return Loss Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Power on the network analyzer and press the ***PRESET*** button.	N/A	
2.	Set the frequency to cover the range of 54 to 864 MHz. as follows: Press ***START*** *54* ***M/u*** and then ***STOP*** *864* ***M/u.***	N/A	
3.	Set the power to 0 dBmV by pressing ***MENU*** *Power, -48.75* ***x1***. **Note:** This step will set the output power to –48.75 dBm which is 0 dBmV.	N/A	
4.	Decrease the IF bandwidth by pressing ***AVG*** *IF BW.* Press the down arrow button twice to set the bandwidth to 300 Hz.	N/A	
5.	Change the display resolution and reference position as follows: -Press ***SCALE REF*** *Reference Position.* -Press the up arrow button 3 times to move the 0 dB reference to the eight division. -Change the scale by pressing *SCALE/DIV* and pressing the down arrow button twice to obtain 2 dB/div.	N/A	
6.	Press ***MEAS*** *Refl:Fwd S11(A/R)*	N/A	
7.	Press ***CAL*** *Cal Kit -> Select Cal Kit -> User Kit -> Return -> Return -> Calibrate Menu -> S11 1-Port*	N/A	
8.	Attach the N(m) to F(f) adapter from the calibration kit, (P/N 85039-60013), to the test port on the analyzer	N/A	
9.	Attach the F-cable which will be used to feed the DUT. The calibration loads will be placed at the DUT side of that cable.	N/A	
10	Attach an F-81 barrel to the end of the cable (input to the DUT).	N/A	
11	Attach the F(f) OPEN from the calibration kit, (P/N 85039-60005), to the F adapter and press OPEN(F).	N/A	
12	Attach the F(f) SHORT from the calibration kit, (P/N 85039-60003), to the F adapter and press *SHORT(F).*	N/A	
13	Attach the F(f) LOAD from the calibration kit, (P/N 85039-60004), to the F adapter and press *LOAD.*	N/A	
14	Press *DONE 1-PORT CAL.*	N/A	
15	After the calibration is complete, verify that the trace is now at the bottom line of the display when the calibrated load is attached.	N/A	
16	Power on the DUT and tune to mid channel.	N/A	
17	Connect the Cable Input port of the DUT directly to the network analyzer test port. Place a marker on the highest point on the measurement trace. -The return loss measurement should be greater than or equal to 6 dB over full tuning range. -RF Input Impedance 75 ohms unbalanced indirectly tested.		HFATrf.6 HFATrf.7

3.1.10 Adjacent Channel Characteristics Test

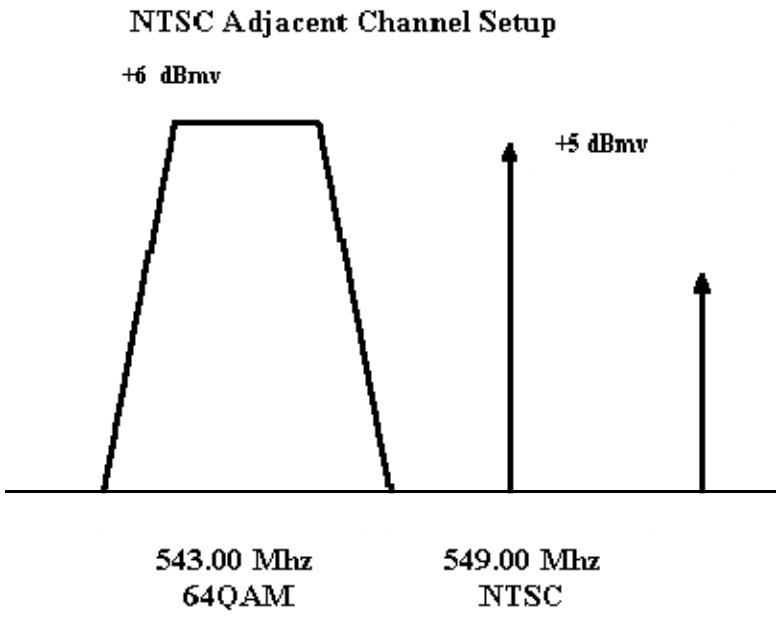
This test verifies the performance of a particular modulation type (e.g. NTSC Analog) in the presence of a higher power adjacent channel of a different modulation type.

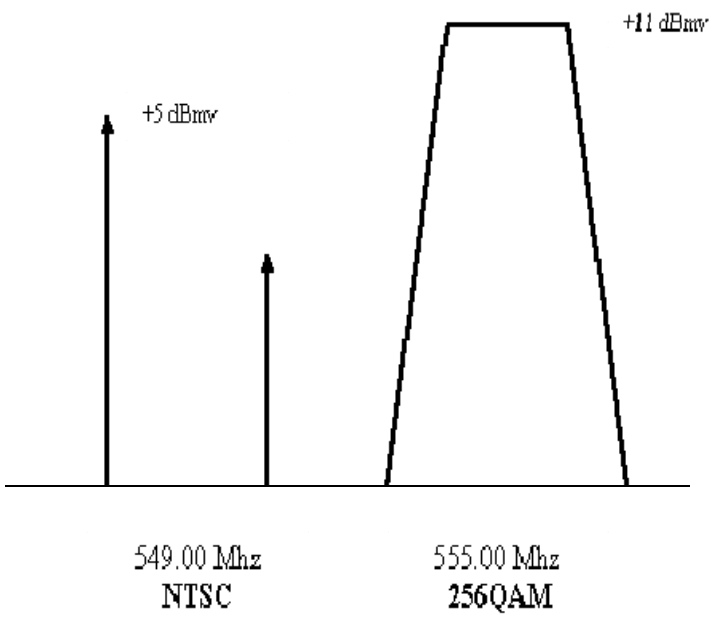
Equipment: DUT, Spectrum analyzer, one NTSC modulator, two QAM modulators, color bar generator capable of generating SMPTE 100% color bars.

Setup: NTSC Analog channel: 78, Additional NTSC analog adjacent channel and Visual/Aural carrier ratio +13dB

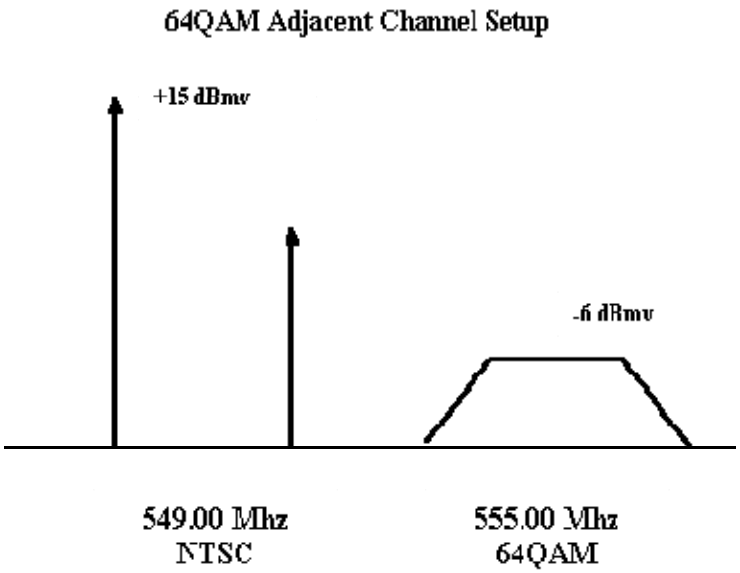
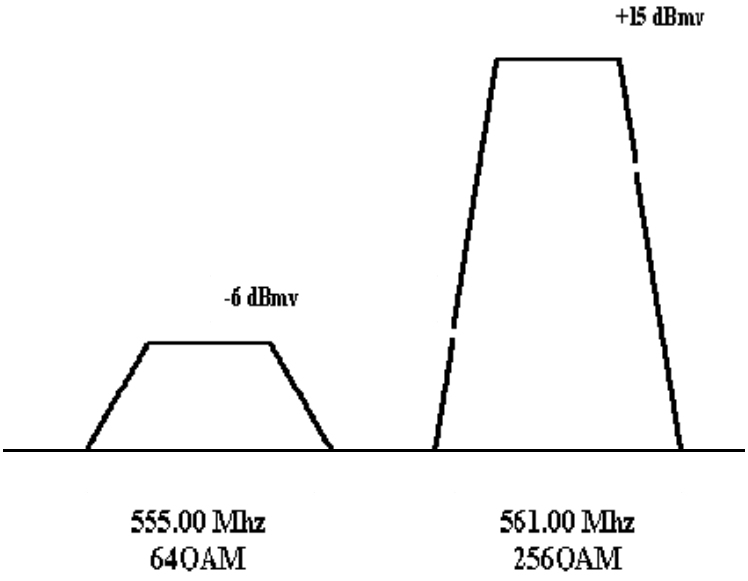
Note: It is recommeded that power levels be verified and adjusted using unmodulated carriers.

Procedure: Desired Channel Modulation: NTSC Analog

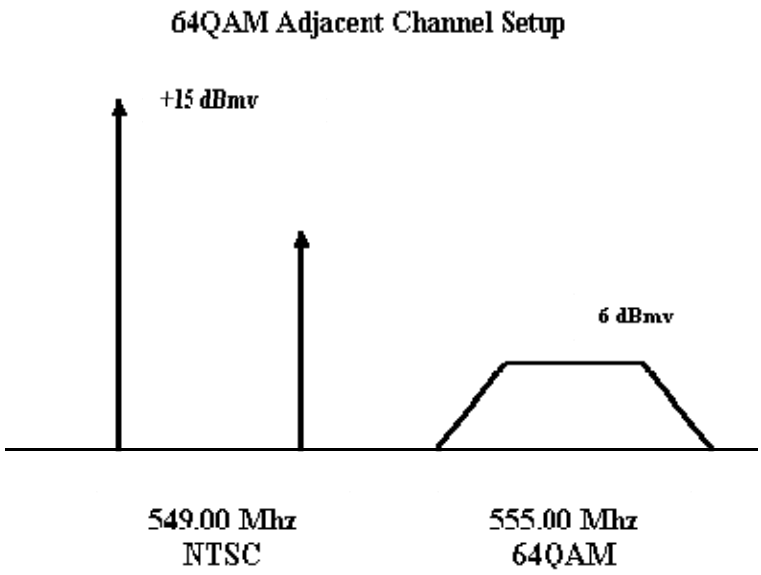
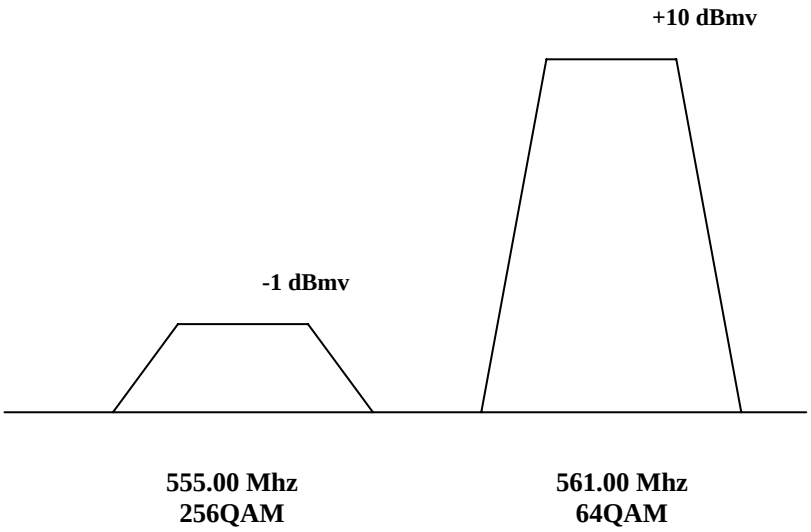
Step#	Procedure	Pass/Fail	PICS
1.	Tune the DUT to the NTSC channel.	N/A	
2.	Set the power level of the NTSC analog channel for +5 dBmV.	N/A	
3.	Set the lower adjacent 64QAM channel for a total power that is +1dB above the power of the NTSC analog channel. 	N/A	
4.	Verify DUT properly tunes and displays desired channel at a CCIR level of 3 or better. Remove 64QAM signal.		HRFAcc.3

Step#	Procedure	Pass/Fail	PICS
5.	Adjust the 256QAM upper adjacent channel for a total power that is +6 dB above the power of the NTSC analog channel. 	N/A	
6.	Verify DUT properly tunes and displays desired channel at a CCIR level of 3 or better.		HRFAcc.3
7.	Adjust the NTSC Adjacent channel for a total power of +3db above power of the desired NTSC analog channel.	N/A	
8.	Verify DUT properly tunes and displays desired channel at a CCIR level of 3 or better.		HRFAcc.1

Desired Channel Modulation: 64QAM

Step#	Procedure	Pass/Fail	PICS
1.	Tune the DUT to the 64QAM channel.	N/A	
2.	Set the 64QAM channel for a total power that is -6dBmV.	N/A	
3.	Set the lower adjacent NTSC analog channel is set for a total power that is +21dB above (+15 dBmV) the power of the 64QAM channel. 	N/A	
4.	Verify proper reception.		HRFAcc.4
5.	Remove NTSC analog channel.	N/A	
6.	Adjust the 256QAM upper adjacent channel for a total power that is +21 dB above (+15 dBmV) the power of the 64QAM. 	N/A	
7.	Verify receiving device properly tunes and displays desired channel.		HRFAcc.4

Desired Channel Modulation: 256QAM

Step#	Procedure	Pass/Fail	PICS
1.	Tune the DUT to the 256QAM channel.	N/A	
2.	Set the 256QAM channel is adjusted for -1 dBmV.	N/A	
3.	Set the lower adjacent NTSC analog channel is set for a total power that is +16dB above (+15 dBmV) the power of the 256QAM channel. 	N/A	
4.	Verify proper reception.		HRFAcc.5
5.	Remove NTSC analog channel.	N/A	
6.	Adjust the 256QAM upper adjacent channel for a total power that is +11 dB above (+10 dBmV) the power of the 256QAM. 	N/A	
7.	Verify receiving device properly tunes and displays desired channel.		HRFAcc.5

3.1.11 Combined Distortions Test

This test verifies the successful decompression and display of an MPEG-2 compressed video bitstream after demodulation, using 256QAM transmission in the presence of multiple combined channel impairments. The impairments consist of a –18dB ghost at 0.5uS, 36dB C/N and 16 uS bursts of noise at –12dBmV

Equipment: DUT, 256QAM video source set to channel 82 (573MHz), Echo Generator (HP11759D Ghost Simulator, or equivalent), 2 Noise generators, one with gating option (NoiseCom model 7109 or equivalent), Pulse generator (HP8116A or equivalent), 2-2 way splitters, Oscilloscope, (HP89441a or equivalent) vector signal analyzer.

Set up: Set test up as shown in figure 3.1-2 below. QAM256 RF input to the DUT should be –7dBmV (-55.7dBm) with 36dB C/N ratio and 16 uS noise bursts of –12 dBmV (-60.75 dBm).

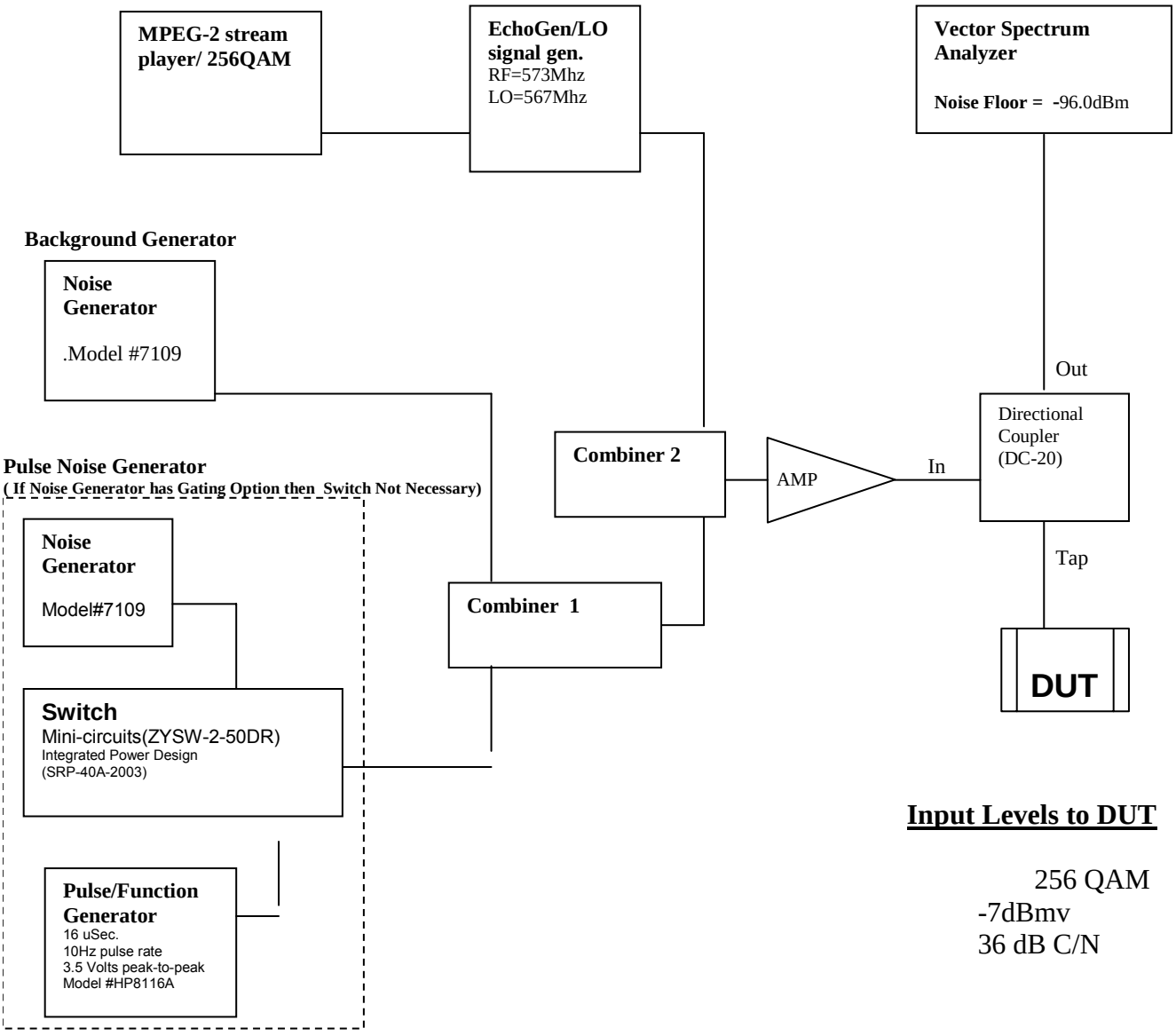


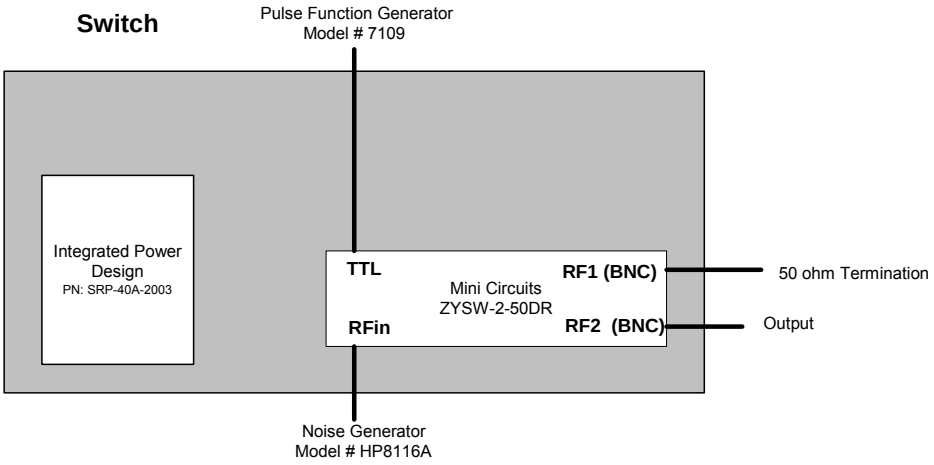
Figure 3.1-2 – Combined Distrotion Set-up

Equipment list:

Table 3-1-2 – Combined Distrotion Test Equipment List

Manufacturer	Model Number	Quantity	Description
Sencore	AD951	1	MPEG Analyzer/Player
Radyne ComStream	QAM256	1	QAM modulator
NoiseCom	UFX 7109	2	Noise Generator
HP	11759D	1	Ghost Simulator
	8657B	1	Signal Generator
	Vectra XP/60	1	PC for Ghost simulator
	8116A	1	Pulse Generator
	89441A	1	Vector Spectrum Analyzer w/RF section
	8447D	1	Low Noise Amplifier
Mini-Circuits	ZYSW-2-50DR	1	Switch
Integrated Power Designs	SRP-40A	1	PS for switch
EMCT	4112P	1	50 Ohm, 1 watt, SMA male terminator
Regal	GRS2DGV	2	Splitter/Combiner
	RDCT10-20	1	Directional Coupler
Trilithic	BMA-781	1	Variable Attenuator

Switch: Per Host Combined Distortion Test



BOM

Mini-Circuits	ZYSW-2-50DR	1	Switch (Ref. Dg03-218) below
Integrated Power Designs	SRP-40A-2003	1	P/S for switch (Ref. SRP-40A) below
Generic Circuit Box		1	

Component Specs.

Figure 3.1-3 – Combined Distrtion Test Switch

dg03-218[1].pdf (76 KB)

SRP-40A[1].pdf (133 KB)

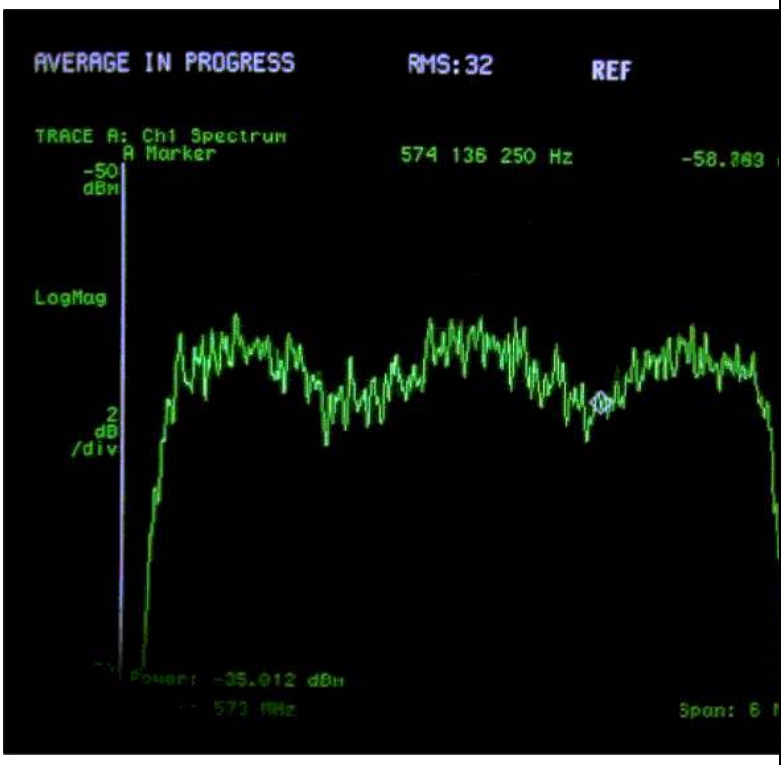
4112p.pdf (58 KB)

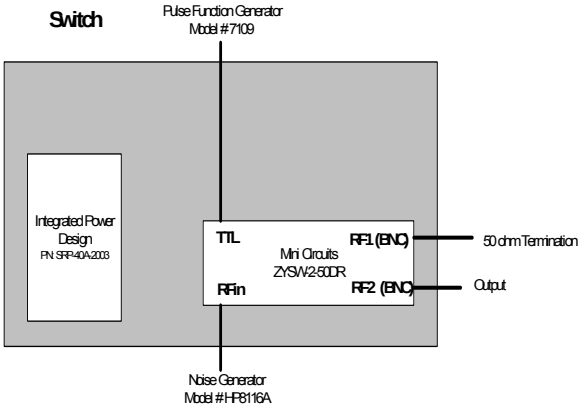
Step	Equipment set-Up Procedure:	Pass/Fail	PICS
1.	(Pulse) noise generator set up	N/A	
2.	Power on the 7109 noise generator and press “noise attenuation” button and enter “347” and press enter, in order to set the pulse noise generator attenuation to 34.7 dB.	N/A	
3.	Power on the HP 8116a (pulse function generator) and configure it as follows: Set Mode to “Norm” Set single pulse high level (HIL) to “3.50’ this set the pulse amplitude to 3.5v p-p* Set single pulse level (LOL) to “0” Set “frq” to “10.0 Hz” repetition rate Set “Wid” to “16 uSec” pulse width Verify the “disable” LED is off and press the “disable” button if necessary. Verify the “CMPL” LED is off and press the “CMPL” button if necessary. Verify the proper pulse on the Oscilloscope (Tek 2465) 1V/Div, 15 uS/Div *Note: Exceeding 3.5V will damage the Switch.	N/A	
4.	Connect the “Output” of the HP 8116a (pulse function generator) to the switch.	N/A	
5.	Connect the noise generator output to the switch.	N/A	
6.	Connect the switch RF output to oscilloscope at 5mV/Div, 3uSec/Div to verify the gated noise.	N/A	
7.	Take the output of the switch and connect it to combiner 1.	N/A	
8.	Connect all remaining equipment per the block diagram above.	N/A	
9.	MPEG-2 Video Stream Player and QAM Modulator Set-up	N/A	
10.	Connect MPEG-2 Stream Player playing a High Definition “Moving Zone Plate” stream to 256 QAM modulator, (see your MPEG-2 player documentation to see how to play out MPEG-2 transport stream).	N/A	
11.	Setup QAM modulator following the instructions below: Set the frequency on the modulator to 573 MHz. Set the modulation type to 256 QAM. Select an interleaver depth of I=128, J=4. Set the modulator output level to approximately +51dBmV. Insert the appropriate amount of attenuation on the back of the modulator in order to achieve “+37dBmV”. If the overload light on the ghost generator is lit, add attenuation until the overload light does not flash. (Note: The HP 89441A echo generator accepts an input level of up to +37dBmV before overload. Lower levels decrease S/N.)	N/A	
12.	Echo Generator Set up	N/A	

13.	Power up echo generator PC (PC defaults to Windows at power up, exit windows) and at DOS prompt type “cd chansim”, then “chansim” again. At the main menu type “G”. DO NOT PRESS THE “enter” key. Set the echo generator to the following parameters: RF Freq to 573 (center freq of QAM mod) LO freq to 567 (6 MHZ below RF freq). Set path 1 to “Phase”, 0 delay, 0 degrees, and 0 dB attenuation. Set path 2 to “Phase”, 0.5uSec delay, 0 degrees and 18 dB attenuation. Set paths 2 to 6 to “OFF” (temporarily removes ghosted signal). Note: After set up has been completed path 2 MUST be set to “Doppler” to enable the echo impairment. This will be executed later in this procedure.	N/A	
14.	LO Signal Generator Set-up	N/A	
15.	Set the HP 8657B signal generator to the following parameters: (Note: the signal generator is physically connected to, the echo generator HP11759D) Set the frequency by pressing the “FREQ” button and enter “567MHz” Set the amplitude by pressing the “AMPTD” button and enter “10 dBm”	N/A	
16.	Echo Generator RF output verification/ HP 89441a Vector Analyzer set up procedure:	N/A	
17.	Turn off the background noise. On the 7109 noise generator and press “noise attenuation” button and enter “999” and press enter, in order to set the pulse noise generator attenuation to 99.9 dB.	N/A	
18.	Turn off the pulsed noise. On the second 7109 noise generator and press “noise attenuation” button and enter “999” and press enter, in order to set the pulse noise generator attenuation to 99.9 dB.	N/A	
19.	To compensate the input for the 75 to 50 ohm adapter, select “Input” on the front panel, press the “ch1 input Z” to select 75 ohm.	N/A	
20.	Select “Instrument Mode” on the front panel and press the “Vector” option on the VSA screen.	N/A	
21.	Press the”RF (2-2650MHz normal)” option on the screen.	N/A	
22.	Select “Frequency” on the front panel and select “center” on the display options, enter “573” on the front panel and press the “MHz” option on the screen.	N/A	
23.	Select “Span” on the display enter “6” on the front panel and press the “MHz” option on the screen.	N/A	
24.	Select “Marker Function” on the front panel, select “band power marker” option on the display.	N/A	

25.	Select “band center” option on the display, enter “573” on the front panel and press the “MHz” option on the screen.	N/A	
26.	Select “bandwidth” option on the display, and enter “6” on the front panel and press the “MHz” option on the screen.	N/A	
27.	On the display verify ”band power marker” is on. (If not turn it on)	N/A	
28.	On the front panel press the “ResBW/Window” button select the “num Freq Pts” option on the front panel enter “1601” and select enter on the display.	N/A	
29.	On the front panel press the “Range” button using the “up arrow ” and/or “down arrow” buttons until the channel 1 “over” and ‘half” range LED’s are illuminated. If the “over” and “half” LED’s are illuminated, range “up arrow ” on the front panel and verify that the LED’s extinguish.	N/A	
30.	On the front panel press the “average” button and select the “num averages” option on the display, enter “32” and select enter on the display.	N/A	
31.	On the display verify average is “on” (if not turn it “on”) to obtain stable reading on vector analyzer.	N/A	
32.	Observe “Power” reading in the lower left hand corner of the display, note that value here; _____ (this value will be approximately -31.7 dBm)	N/A	
33.	To set the power level to –7dBmV at the input to the DUT the following loss must be taken in to consideration, combiner 2 applies 3.5 dB of loss, additional attenuation must be added to the RF output of the echo generator so that the power level at the input of the DUT is –7dBmV. Add the necessary attenuation in the form of a fixed attenuator to the output of the echo generator to obtain –35.75 dBm on the VSA.	N/A	
34.	The value of -35.75 dBm on the VSA reflects an input level of –7dBmV to the DUT based on the formula below. Legend: X = Power level read on Vector signal analyzer. 0dBmV = 48.75 dBm Formula: -35.75 dBm + 48.75 = +13 dBmV Accounting for the loss of the DC-20 the level present at the DUT is –7 dBmV	N/A	
35.	(Background) noise generator set up	N/A	
36.	Remove the QAM signal by tuning off channel. On the QAM modulator front panel press the “frq” button, adjust the modulator using the up/down arrows until 519.000 are displayed on the LCD and press the “enter” button.	N/A	
37.	On the noise generator and press “noise attenuation” button and enter “733” and press enter, in order to set the background noise generator attenuation to 73.3dB.	N/A	

38.	On the front panel of the VSA press the “range” button, on the display find the “chl range”, on the front panel of the VSA, press the “down arrow” until “chl range” is set to –50 dB.	N/A	
39.	On the vector analyzer verify the “Power” reading in the lower left hand corner of the display Verify that the Power level is –71.7dBm. If –71.7dBm is not achieved go back and adjust the noise attenuation to achieve the desired level. Record the final attenuation setting here _____. Note: This is the power that is measured at the pass-thru leg of the DC-20. The actual value that will be sent to the DUT will be 20 dB lower because of the DC-20 tap. The actual value will be –42.95 dBmV (-91.7 dBm). This is the desired background noise level in that will be used in this test (36 dB C/N)	N/A	
40.	(Pulse) noise generator signal set up	N/A	
41.	Turn off the background noise. On the 7109 noise generator and press “noise attenuation” button and enter “999” and press enter, in order to set the pulse noise generator attenuation to 99.9 dB.	N/A	
42.	On the front panel of the VSA press the “range” button, on the display find the “chl range”, on the front panel of the VSA press the “up arrow” until “chl range” is set to -30 dBm.	N/A	
43.	On the noise generator and press “noise attenuation” button and enter “347” and press enter, in order to set the pulse noise generator attenuation to 34.7 dB.	N/A	
44.	On the HP 8116a (pulse function generator) press the “COMPL” button to turn the LED “on”.	N/A	
45.	On the vector analyzer verify that the “Power” reading in the lower left hand corner of the display is -40.75 dBm. If –40.75 dBm is not achieved go back and adjust the noise attenuation to achieve the desired level. Record the final attenuation setting here _____. Note: This is the power that is measured at the pass-thru leg of the DC-20. The actual value that will be sent to the DUT will be 20 dB lower because of the DC-20 tap after accounting for the loss of the switch the actual value that will be sent to the DUT will be approximately -11.95dBmV.	N/A	
46.	On the HP 8116a (pulse function generator) press the “COMPL” button to turn the LED “off”.	N/A	
47.	Echo Generator second path reflection verification.	N/A	
48.	Turn off the pulsed noise. Press the “disable” button on the front panel of the pulse generator to turn the LED “on”.	N/A	
49.	Add the QAM signal by tuning back on channel. On the QAM modulator front panel press the “frq” button, adjust the modulator using the up/down arrows until 573.000 are displayed on the LCD and press the “enter” button.	N/A	

50.	From the echo generator PC, set path 2 to “Phase ”, 0.5uSec delay, 0 Degrees and 18db attenuation.	N/A	
51.	On the Vector signal analyzer verify that the ripple reflection impairment is present on the 256QAM @ 573MHz. Verification process on the vector signal analyzer: The ripple pattern on the screen should consist of three ripples within the 6MHz channel. On the front panel press “RefLvl/Scale”, on the display press the “Y ref level” enter “–50 dBm” and press the “dBm” option of the screen. Select the “Y per div” on the display enter “2” and select the “db” option on the display On the front panel press the “average” button on the display press the “num averages” option enter “100” and press “enter” on the display. On the front panel press the “Marker” button, using the wheel on the front panel adjust the marker position to the middle ripples highest position, this should be around –57dBm. Adjust the marker position to the right (or left) “valley” lowest position (may have to try both side to achieve the lowest reading), this should be approximately –59dBm. The peak-to-peak difference between highest and lowest level should be approximately 2dBm. Below is an example of what this will look like on the vector signal analyzer: 		HFATrf.31
52.	Bring DUT to stable operating condition. (Consult DUT users manual)	N/A	
53.	Final Connection set up		

54.	Turn on the background noise. On the 7109 noise generator and press “noise attenuation” button and enter the final value recorded above in the background noise setup and press enter.	N/A	
55.	Turn on the pulsed noise. Press the “disable” button on the front panel of the pulse generator to turn the LED “off”.	N/A	
56.	Measurement Procedure: Connect the combined output to the DUT according to the following configuration. **Switch: Per Host Combined Distortion Test**  **BOM** Mini-Circuits ZYSW-2-50DR 1 Switch (Ref. Dg03-218) below Integrated Power Designs SRP-40A-2003 1 P/S for switch (Ref. SRP-40A) below Generic Circuit Box 1 **Component Specs.**		
57.	Verify proper reception is no macro-blocking, freeze framing, or complete loss of service. Notes: 1. With both the pulse noise and the background noise parameters the RF level going in to the DUT will be –7dBmV and C/N will be 36dB. 2. Turn on path 2 of the Echo Generator by selecting “Doppler” and observe DUT for 3- 20-second intervals 3. Repeat Intervals if macro block, freeze frame or loss of service occurs to verify failure.		HRFAcc.8 HRFAcc.8a

3.2 **Forward Data Channel (FDC)**

3.2.1 Host FDC Channel Parametric Test

The forward data channel (FDC) is the out-of-band communication line from the headend to the host. The modulation scheme is QPSK, with typical data rate of 1.544Mbps. The frequency range is from 70MHz to 130MHz with step size of 250KHz.

Equipment: Host under test, CableCARD, television, Spectrum analyzer, two-way splitter, and variable attenuator.

NOTE: Test to be performed at 75.25 MHz, 1.544 Mbps, +/- 15 dBmV

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Connect the RF network to the HOST DEVICE (with CableCARD attached).	N/A	
2.	From head-end controller set the FDC carrier to the desired frequency. Measure the amplitude level using the spectrum analyzer. Adjust the FDC carrier level to –15dBmV (lowest limit). Send Inband_tune_req() command to tune HOST DEVICE to mid channel.	N/A	
3.	Verify the host can still receive good out of band data at -15 dBmv and +15 dBmv.		HFDCrf.8

3.2.2 FDC tuning range and bit rate test

This test verifies tuning range for all three OOB transmission bit rates and verifies reception with channel impairment.

Equipment:

- DUT,
- TTC Fireberd 6000A communications analyzer,
- PRBS generator (Broadcom BCM93133)
- HPNX PRO emulator,
- CableCARD extender with FDC serial out (clock on pin CBE1, data on pin AD14),
- HP11759D Ghost Simulator.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Setup the Fireberd with the following setting: • Data: 215-1; • Gen Clk: Synth; • Timing Mode: Sync; • Menu Intf Setup: Lab; • Menu Synth Freq: 1.544; • Signal Gen Freq 1544000; • Signal Rcv freq 1544000 or Error Bit Errs; • Analysis Mode: Continuous	N/A	
2.	Connect Fireberd clock and data lines to QPSK modem at -7 dBmV, 75.25 MHz, 1.544 Mbps.	N/A	
3.	Connect modem to DUT cable input.	N/A	
4.	Connect HPNX PRO to DUT CableCARD slot through CableCARD extender, tune 75.25 at 1.544 Mbps, invert spectrum if necessary.	N/A	
5.	Connect serial data and clock out from CableCARD extender to Fireberd., Ghost Simulator RF freq: 73 MHz; LO freq: 67 MHz.	N/A	
6.	Set up the OOB mod at 75.25MHz with bit rate of 1.544 Mbps.	N/A	
7.	Connect QPSK source through Ghost Simulator.	N/A	
8.	Set Ghost generator primary path for static phase, 0dB attenuation, 0 phase, 0 delay.	N/A	
9.	Re-Calibrate QPSK source to –7 dBmV, @ input to DUT and tune OOB tuner.	N/A	
10	From HPNX PRO GUI, open OOB_RX_tune_req menu tab.	N/A	
11	Enter Frequency 75250	N/A	
12	Set Bit Rate same as Synth Frequency of Fireberd.	N/A	
13	Check Spectrum Inv. Depending upon RF Modulator Modulation.	N/A	
14	Click “Send” and verify in trace window that tuning is granted.	N/A	

Step#	Procedure	Pass/Fail	PICS
15	Verify that Fireberd received data matches transmit data and Bit error rate is BER<1x10E-10 (after error correction) error rate or better. (i.e. 1 error in 2 hours at 1.5 Mbps/s)		HFDCrf.12 HFDCrf.24 HFDCrf.27 HFDCrf.7 HFDCrf.5 HFDCrf.27a HFDCrf.23 FDCP.3
16	Set up the OOB mod to 104.2 MHz at bit rate of 2.048Mbps	N/A	
17	Change Ghost Simulator RF freq: 101.95 MHz; LO freq: 95.95 MHz	N/A	
18	Re-Calibrate QPSK source to –7 dBmV, @ input to DUT and tune OOB tuner.	N/A	
19	From HPNX PRO, open OOB_RX_tune_req menu tab.	N/A	
20	Enter Frequency 104200.	N/A	
21	Set Bit Rate same as Synth Frequency of Fireberd.	N/A	
22	Check Spectrum Inv. Depending upon RF Modulator Modulation. (Try one then the other if you are not sure).	N/A	
23	Click “Send” and verify in trace window that tuning is granted.	N/A	
24	Verify that Fireberd received data matches transmit data and Bit error rate is BER<1x10E-10 (after error correction) error rate or better. (i.e. 1 error in 2 hours at 1.5 Mbps/s)		HFDCrf.12 HFDCrf.24 HFDCrf.27 HFDCrf.7 HFDCrf.5a HFDCrf.27a HFDCrf.23 FDCP.3
25	Set up the OOB mod to 125MHz with a bit rate of 3.088Mbps.	N/A	
26	Change Ghost Simulator RF freq: 122.75 MHz; LO freq: 116.75 MHz	N/A	
27	Set the Ghost generator secondary path to Phase, -13 dB @ 0.5 uSec, 0 degrees referenced to RF channel center freq.	N/A	
28	Re-Calibrate QPSK source to -7 dBmV, @ input to DUT and tune OOB tuner.	N/A	
29	From HPNX PRO, open OOB_RX_tune_req menu tab.	N/A	
30	Enter Frequency 125000	N/A	
31	Set Bit Rate same as Synth Frequency of Fireberd.	N/A	
32	Check Spectrum Inv. Depending upon RF Modulator Modulation. (Try one then the other if you are not sure).	N/A	
33	Click “Send” and verify in trace window that tuning is granted.	N/A	
34	Verify that Fireberd received data matches transmit data and Bit error rate is BER<1x10E-10 (after error correction) error rate or better. (i.e. 1 error in 2 hours at 1.5 Mbps/s)		HFDCrf.12 HFDCrf.24 HFDCrf.27 HFDCrf.7 HFDCrf.5 HFDCrf.27a HFDCrf.23 FDCP.3

3.2.3 FDC Adjacent Channel BER Test

This test verifies OOB transmission bit rates and the performance of FDC reception in the presence of higher power adjacent channels of various modulation types.

Equipment:

- DUT Sycard Extender
- HPNX Pro Test tool
- Sycard Extender
- TTC Firebird 600A communitations analyzer with Lab BNC interface
- QAM/QPSK Module generating a PRBS stream
- Signal Generator
- Spectrum Analyzer for reference
- RF modulator
- RF combiner

Setup Diagram:

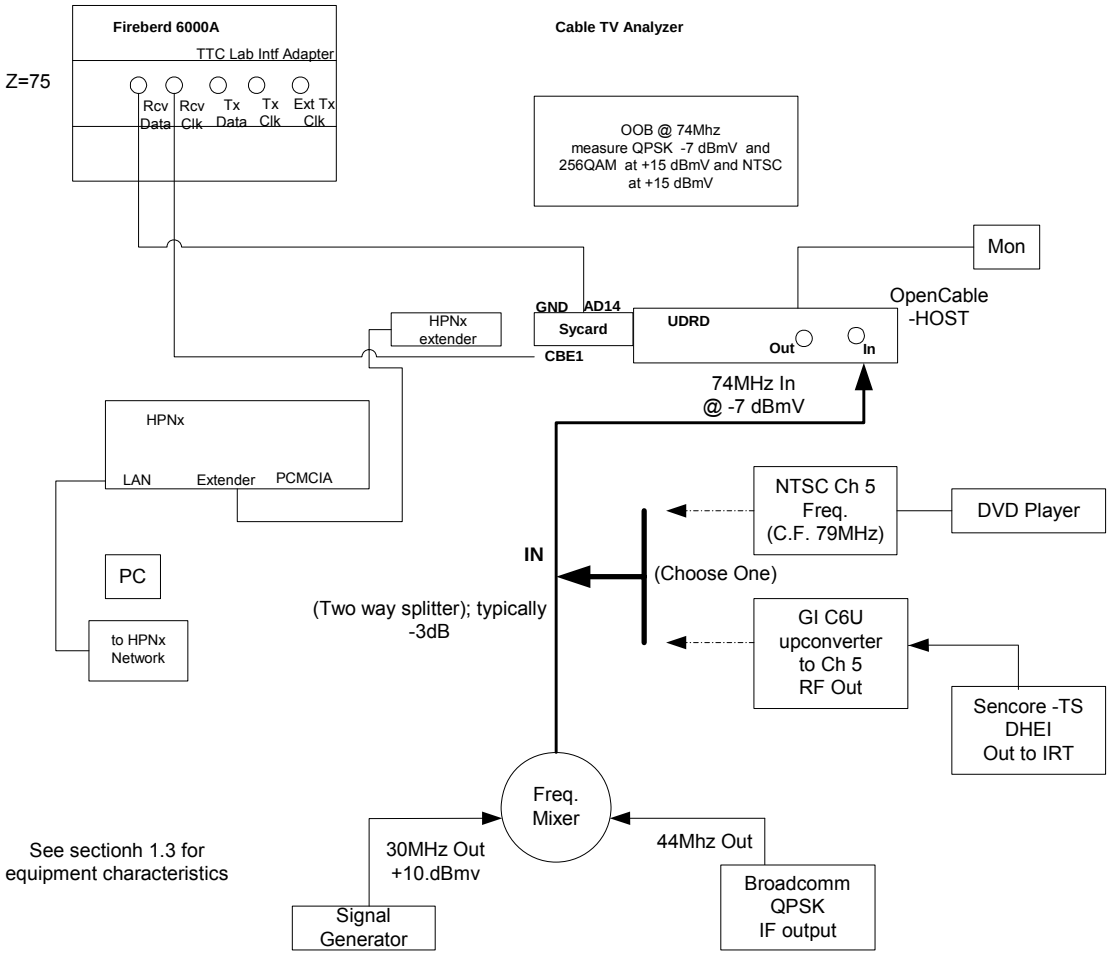


Figure 3.1-4 – FDC Adjacent Channel BER Test Set-up

Note: Do all padding after the output of the mixer only.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	**Setup Firebird:** Data: 2^{15}-1; Gen Clk: Synth; Timing Mode: Sync; Menu Intf Setup: Lab; Menu Synth Freq: Test each Frequency; (1.544Mbps, 2.048Mbps and 3.088Mbps); Set Signal Gen Freq: (1.544Mbps, 2.048Mbps and 3.088Mbps); Test the three Bit Rates: Change Signal Gen Freq for each Test. Setup the Firebird Analysis Results: Signal/ Rcv Frequency and Error Bit Errs; Analysis Mode: Continuous.	N/A	
2.	**Setup QAM/QPSK modulator:** Data source PRBS 215-1, Change Symbol rates for each test: 0.772Msymbols for 1.544Mbps Test. 1.024Msymbols for 2.048Mbps Test. 1.544Msymbols for 3.088Mbps Test. Note: If output is 44 MHz IF only, use RF mixer and RF generator (30 MHz, @10 dBm) to generate 74 MHz QPSK signal. Measure and pad attenuation of the 44Mhz IF output from QPSK modulator with Spectrum Analyzer to -7 dBmV. Combine 44Mhz IF with 30Mhz Signal Generator into mixer for 74 MHz signal. Measure and pad attenuation this output signal +/- 15dBmv.	N/A	
3.	**Verify QAM/QPSK modulator configuration:** Operational control on front panel display: QAM 4, No FEC, PRBS_15, SYM Fixed (0.772, 1.024, or 1.544) CH=N/A, a=0.12, IF=44.0, MPEG:N/A, s=NORM, INTLVR:N/A	N/A	
4.	Connect Fireberd serial Rx data to DUT Sycard pin AD14 and Rx Clock to pin CBE1 using TTL buffer to 75 ohm driver adapter.	N/A	
5.	Insert the Sycard into the DUT.	N/A	
6.	Bring up the HPNX Pro software on the given PC. PC and HPNX Pro need to be on the same isolated network.	N/A	
7.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
8.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
9.	Insert the HPNX Pro extender card into DUT. From the HPNx Pro trace window, verify that the status of the HPNX Pro is ready.	N/A	
10	Right click on the Trace window to select SPDU, TPDU and Payload for full vision of all layers.	N/A	
11	Click the “Test tab” in the HPNX Pro application.	N/A	

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>12</td><td>Press the Play button on the “Low level test/setup” tab.</td><td>N/A</td><td></td></tr>
<tr><td>13</td><td>Go to Host Control, click play in “session slot”. Host Control menu shows Session nb (opened). Trace window shows Open Session request/response from Host Control.</td><td>N/A</td><td></td></tr>
<tr><td>14</td><td>From HPNX PRO, open OOB_RX_tune_req menu tab.
Enter Frequency 74000
Set Bit Rate same as Sync Frequency of Fireberd.
Check Spectrum Inv. Depending upon RF Modulator Modulation. (Try one then the other if you are not sure).
Click “Send” and verify in trace window that tuning is granted.</td><td>N/A</td><td></td></tr>
<tr><td>15</td><td>Verify the Fireberd tester receiver Locks “Sync” (Green) and “MK, SP” LEDs stay yellow.
(FYI) Procedure for Fireberd Setup Ref:
Under Analysis Results menu arrow up/down to set left side category to Signal
Arrow right/left to set RCV Frequency on display.
(RCV Frequency should be Bit Rate sent from HPNX PRO)
Setup Fireberd for BER in Analysis Results right side menu by arrow up/down to ERROR; (use arrow right/left to display either errors: BER or Ave. BER).</td><td>N/A</td><td></td></tr>
<tr><td>16</td><td>Setup a 64QAM output to GI C6U tuned to EIA 5. Combine 64QAM with mixed QPSK signal into a RF combiner signals to DUT input.
Verify DUT FDC locked @ 74MHz and that Firebird received data Sync Locks to Bit Rates:
Sync Lock Threshold table:
Sync RCV Frequency 1.544Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 2.048Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 3.088Mbps (no worse than BER 1x E-10).
<table>
<tr><th>Bit Rate</th><th>Pass/Fail</th><th></th></tr>
<tr><td>1.544 Mbps</td><td></td><td></td></tr>
<tr><td>2048 Mbps</td><td></td><td></td></tr>
<tr><td>3088 Mbps</td><td></td><td></td></tr>
</table></td><td></td><td>FDCP.2
HFDCrf.8
HFDCrf.2
HFDCrf.19
HFDCrf.25
HFDCrf.29
HFDCrf.32
HFDCrf.23</td></tr>
<tr><td>17</td><td>After above section of testing is completed change setup to test adjacent channel NTSC analog channel 5 source. Combine NTSC into RF combiner with QPSK for this adjacent channel test.
Verify DUT FDC locked @ 74MHz and that Firebird received data Sync Locks to Bit Rate.
Sync Lock Threshold table:
Sync RCV Frequency 1.544Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 2.048Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 3.088Mbps (no worse than BER 1x E-10).
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<tr><td>3088 Mbps</td><td></td><td></td></tr>
</table></td><td></td><td>FDCP.2
HFRDCrf.27a
HFDCrf.29
HFDCrf.33
HFDCrf.23</td></tr>
<tr><td>18</td><td>Add a QPSK carrirer at 74Mhz @ -7 dBmV, and 256QAM at the adjacent channel (channel 5, Center Freq 79Mhz @ +15dBmV).</td><td>N/A</td><td></td></tr>
</table>

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>19</td><td>Verify DUT FDC locked @ 74MHz and that Firebird received data Sync Locks to Bit Rate.
Sync Lock Threshold table:
Sync RCV Frequency 1.544Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 2.048Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 3.088Mbps (no worse than BER 1x E-10).

<table><tr><th>Bit Rate</th><th>Pass/Fail</th><th></th></tr><tr><td>1.544 Mbps</td><td></td><td></td></tr><tr><td>2048 Mbps</td><td></td><td></td></tr><tr><td>3088 Mbps</td><td></td><td></td></tr></table></td><td></td><td>HRFAcc.6</td></tr>
<tr><td>20</td><td>Add a QPSK carrirer at 74Mhz @ -2 dBmV, and 64QAM at the adjacent channel (channel 5, Center Freq 79Mhz @ +15dBmV).</td><td>N/A</td><td></td></tr>
<tr><td>21</td><td>Verify DUT FDC locked @ 74MHz and that Firebird received data Sync Locks to Bit Rate.
Sync Lock Threshold table:
Sync RCV Frequency 1.544Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 2.048Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 3.088Mbps (no worse than BER 1x E-10).

<table><tr><th>Bit Rate</th><th>Pass/Fail</th><th></th></tr><tr><td>1.544 Mbps</td><td></td><td></td></tr><tr><td>2048 Mbps</td><td></td><td></td></tr><tr><td>3088 Mbps</td><td></td><td></td></tr></table></td><td></td><td>HRFAcc.6</td></tr>
<tr><td>22</td><td>Add a QPSK carrirer at 74Mhz @ -7 dBmV, and NTSC at the adjacent channel (channel 5, Center Freq 79Mhz @ +15dBmV).</td><td>N/A</td><td></td></tr>
<tr><td>23</td><td>Verify DUT FDC locked @ 74MHz and that Firebird received data Sync Locks to Bit Rate.
Sync Lock Threshold table:
Sync RCV Frequency 1.544Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 2.048Mbps (no worse than BER 1x E-10).
Sync RCV Frequency 3.088Mbps (no worse than BER 1x E-10).

<table><tr><th>Bit Rate</th><th>Pass/Fail</th><th></th></tr><tr><td>1.544 Mbps</td><td></td><td></td></tr><tr><td>2048 Mbps</td><td></td><td></td></tr><tr><td>3088 Mbps</td><td></td><td></td></tr></table></td><td></td><td>HRFAcc.6</td></tr>
</table>

4 CABLECARD INTERFACE

4.1 Host Device & Initialization

4.1.1 Host-CableCARD Interface Visual Test

This test verifies that certain physical conditions are met.

Equipment: Type I card (SYCARD PCCextend 140A), Type II card (HPNx Pro Extender)

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Insert the Type-I PC CARD into the CARD slot of the DUT. Verify that the Type-I PC CARD mates with the Card connector of the DUT and slides easily in and out of CableCARD slot. **Note**: The SYCARD PCCextend 140A extender is a Type-I CARD.		HPPh.1 HPPh.3 HPPh.4
2.	Insert the Type-II PC CARD into the CARD slot of the DUT. Verify that the Type-II PC CARD mates with the Card connector of the DUT and slides easily in and out of CableCARD slot. **Note**: The HPNx Pro extender is a Type-II CARD.		HPPh.1 HPPh.3 HPPh.4
3.	Verify that the vendor has submitted documentation indicating that the CableCARD connector meets the reliability standards of section 7 of PC Card Standard, Volume 3. Review vendor submitted documentation for particular certification wave.		HPPh.6
4.	Verify that the vendor has submitted documentation indicating that the CableCARD connector meet the durability standards of section 8.2 of PC Card Standard, Volume 3 Review vendor submitted documentation for particular certification wave.		HPPh.7

4.1.2 Host Device Capability Discovery

This test verifies that the Host supports a Card Resource resource.

Equipment: Host (DUT), HPNx Pro Test tool.

Procedure:

Step#	Procedure	Pass/Fail	PICS Item
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID"	N/A	
4.	Insert the HPNx Pro extender card into the DUT. From the HPNx Pro trace window, verify that the status of the HPNx Pro is ready.	N/A	
5.	Right click on the Trace window to select Payload for full vision of all layers.	N/A	
6.			
7.	Select the "CARD RES" tab. And then press the Play button to open the CARD RES resource.	N/A	
8.	Verify that the DUT establishes a session to the CARD RES and reports support for CARD RES resource = 0x002600C1. ← S [97:52:25.956] open_session_request from CARD RES [91 04 00 26 00 C1] → S [97:52:26.016] open_session_response on resource CARD RES, Status = 0x00, SessionNb = 4 [92 07 00 00 26 00 C1 00 04]	N/A	
9.	Right click on the CARD RES tab and select Add session slot. Select the play button.	N/A	
10.	Verify that the DUT responds to the second open session request with an open_session_response with one of the following session status values. F1 : session not opened, resource exists but unavailable F3 : session not opened, resource busy ← S [98:00:47.467] open_session_request from CARD RES [91 04 00 26 00 C1] → S [98:00:47.527] **open_session_response on resource CARD RES, Status = 0xF1, SessionNb = 0** [92 07 F1 00 26 00 C1 00 00]		DapHDis.1
11.	On the HPNx Pro delete the 2nd session from previous step.	N/A	

12.	Using the HPNx Pro test tool, send a stream_profile() APDU with the following value. Verify that the DUT replies with a stream_profile_cnf() APDU. Max_number_of_streams = 3 ← A [98:03:49.379] stream_profile from CARD RES [9F A0 10 01 03] max_number_of_streams = 3 → A [98:03:49.509] stream_profile_cnf to CARD RES [9F A0 11 01 02] number_of_streams_used = 2 (Note: This represents the number of transport streams that the Host is sending the Card simultaneously)		DapHDis.4
13.	Using the HPNx Pro test tool, send a program_profile() APDU with the following value. Verify that the DUT replies with a program_profile_cnf() APDU. Max_number_of_programs = 4 ← A [98:12:13.043] program_profile from CARD RES [9F A0 12 01 04] max_number_of_programs = 4 → A [98:12:13.173] program_profile_cnf to CARD RES [9F A0 13 00]		DapHDis.5
14.	Using the HPNx Pro test tool, send a es_profile() APDU with the following value. Verify that the DUT replies with a es_profile_cnf() APDU. Max_number_of_es = 16 ← A [98:18:54.040] es_profile from CARD RES [9F A0 14 01 10] max_number_of_es = 16 → A [98:18:54.180] es_profile_cnf to CARD RES [9F A0 15 00]		DapHDis.6
15.	Verify during Initalization that the DUT does issue a request_pids() APDU to the HPNx Pro. The request_pids() APDU Tag value = 0x9FA016		DapHdis.2 DapHdis.3 DapHDis.7 DapHdis.9

4.1.3 Host OOB Signaling Test

This test measures the OOB interface signal characteristics.

Equipment: DUT, HPNx Pro, SYCARD PCCextender 140A, Oscilloscope

Procedure :

Step#	Procedure	Pass/Fail	PICS
1.	Insert in the SYCARD PCCextend 140A into the DUT. Insert HPNx Pro extender into the SYCARD PCCextend 140A.	N/A	
2.	Connect the oscilloscope to the CRX pin and the DRX pin.	N/A	
3.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
4.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
5.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”	N/A	
6.	From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
7.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
8.	On the HPNx Pro application, select the “Host Control” tab. And then press the Play button to open the Host Control resource.	N/A	
9.	Verify that the DUT establishes a session to the Host Control and reports support for Application Information resource = 0x00200081. ← S [01:39:57.814] open_session_request from Host Control [91 04 00 20 00 81] ➔ S [01:39:57.854] open_session_response on resource Host Control, Status = 0x00, SessionNb = 2 [92 07 00 00 20 00 81 00 02]	N/A	
10.	Using the HPNx Pro test tool, send oob_rx_tune() requests with the following parameter values, and verify that the DUT replies with an oob_rx_tune_cnf() with “tuning granted”. Frequency = 75250KHz, Bit rate = 1544kbps, Spectrum = 0 (non-inv)	N/A	
11.	Verify measurement of the set-up time (T_{su}) of DRX with respect to rising edge of CRX. **Note**: Set-up time is the time from where DRX reaches 90% of the high level (rising) or 10% of high level (falling) to where CRX reaches 50% of it’s high level. Refer to Figure CableCARD Device Input Timing Diagram below.		FDCP.11 FDCP.6

12.	Verify measurement of the hold time (t_H) of DRX with respect to rising edge of CRX. **Note**: The hold time is the time from when CRX reaches 50% of the high level to when DRX reaches 90% of the high level (falling) or 10% of the high level (rising). Refer to Figure 4.1-1, CableCARD Device Input Timing Diagram below.		FDCP.12 FDCP.6

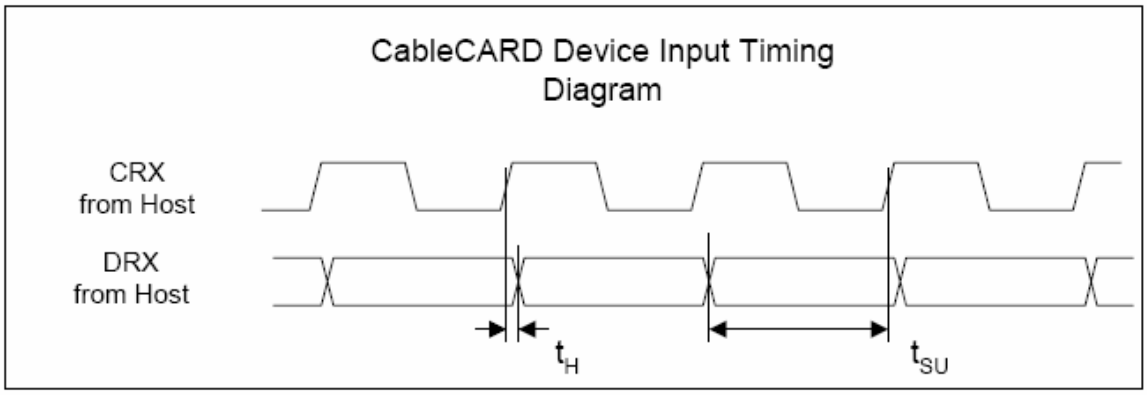


Figure 4.1-1 – CableCARD Device Input Timing

4.1.4 Host Initialization Test

This test verifies successful initialization processes between the DUT and the CableCARD when the CableCARD is inserted into the DUT that is powered up and has finished its internal initialization.

Equipment: DUT, HPNx Pro, SYCARD PCCextend 140A, Logic analyzer (PN# Agilent 1672G), Modified[1] logic analyzer CableCARD adapter card.

Software: Logic Analyzer configuration file is "HOST_44._A". Agilent Configuration file is "HOST_44._"


HOST_44._A


HOST_44.__

Setup: Connect the DUT and the HPNx Pro to extender card SYCARD PCextend. Connect the modified logic analyzer CableCARD adapter to the CableCARD extender card and insert all 4 logic analyzer CableCARDs into the adapter.

Table 4.1-1 – Pin Signal Monitor

SIGNALS MONITORED

[1] The modified logic analyzer adapter card refers to the standard SYCARD PCCextend 145, which has been changed to allow access to signals CD1 and CD2.

Pin Number	Pin Name
36	CD1#
67	CD2#
17	VCC
52	VPP2
58	RESET
21	MICLK
28	SCLK

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Apply power to the DUT.	N/A	
2.	Connect the modified logic analyzer CableCARD adapter to the PCCextender 140A and insert all 4 logic analyzer connectors into the adapter.	N/A	
3.	Insert the SYCARD PCextender card into the DUT.	N/A	
4.	Power up the Agilent Logic Analyzer Model number 1672G. Click “Analyzer”, Select “System”. Click “External I/O”, select “hard disk”. Scroll down until you find “HOST_44._A ” Click Load, followed by Execute. This will load the analyzer configuration.	N/A	
5.	Click “System”. Select “Analyzer”. Click “Configuration” and select “Wave form Machine 1” option. Select “RUN” to initiate the capture process.	N/A	
6.	Note the last 4 (mac address) digits of HPNx Pro you are using. **Note**: Information is on the back side of card.	N/A	
7.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”	N/A	
8.	Insert the HPNx Pro extender card into the other female end of the SYCARD PCextender card. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
9.	Verify that power is applied to the VCC and VPP2 pins, after detecting the presence of a CableCARD using CD1# and CD2# pins. **Note**: Once the Captured, the Times per division will need to be changed in order to see the measurement results.		HPinit.302 Hpower.21 HPPh.26 Hpower.23 Hpower.24 Hpower.25 Hpower.27

10.	Verify that the DUT performs power and reset timing functions as defined in section 7.4.2.2.1 and Table 7.4-8 of HPIA. **Note**: Once the Captured, the Times per division will need to be changed in order to see the measurement results.		HPinit.301 HPinit.302 Hpower.22 Hpower.23 Hpower.24 Hpower.25 Hpower.27 DPh.64 DPh.65 DPh.66 DPh.67 DPh.68 DPh.69 DPh.70 DPh.71 DPh.73 DPh.74 DPh.75 DPh.76 DPh.77 DPh.78 DPh.79 DPh.80 DPh.81 DPh.82 DPh.83 DPh.84 DPh.85 DPh.86 DPh.87 DPh.95 DPh.96 HPPii.10 HPPii.11 HPinit.303 HPinit.304 HPinit.305 HPinit.306 HPinit.307 Hpower.26
11.	Select “RUN” button on the Logic Analyzer to initiate the capture process.	N/A	
12.	Remove the HPNx Pro extender card from the SYCARD PCextender card.	N/A	
13.	Verify that the DUT power-down the VCC and VPP2 pins, upon removal of the CableCARD. **Note**: Once the Captured, the Times per division will need to be changed in order to see the measurement results.		HPinit.302 Hpower.25

Example Logic Analyzer Capture:

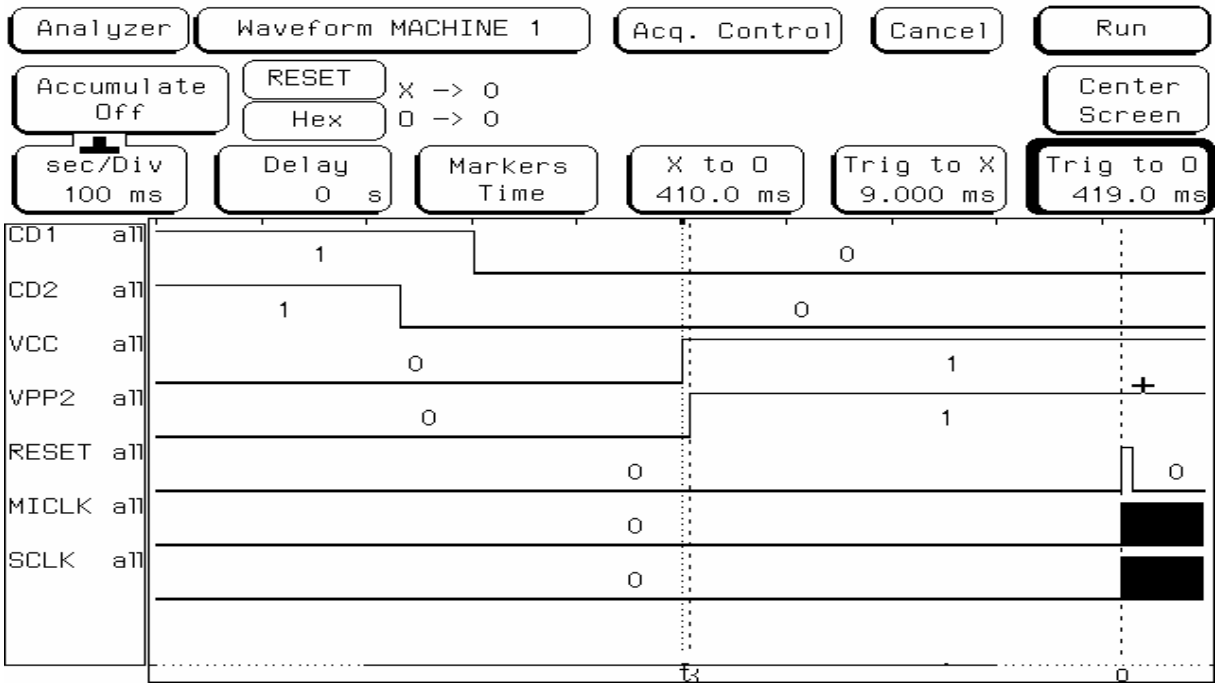


Figure 4.1-2 – M-CARD Power-On Timing

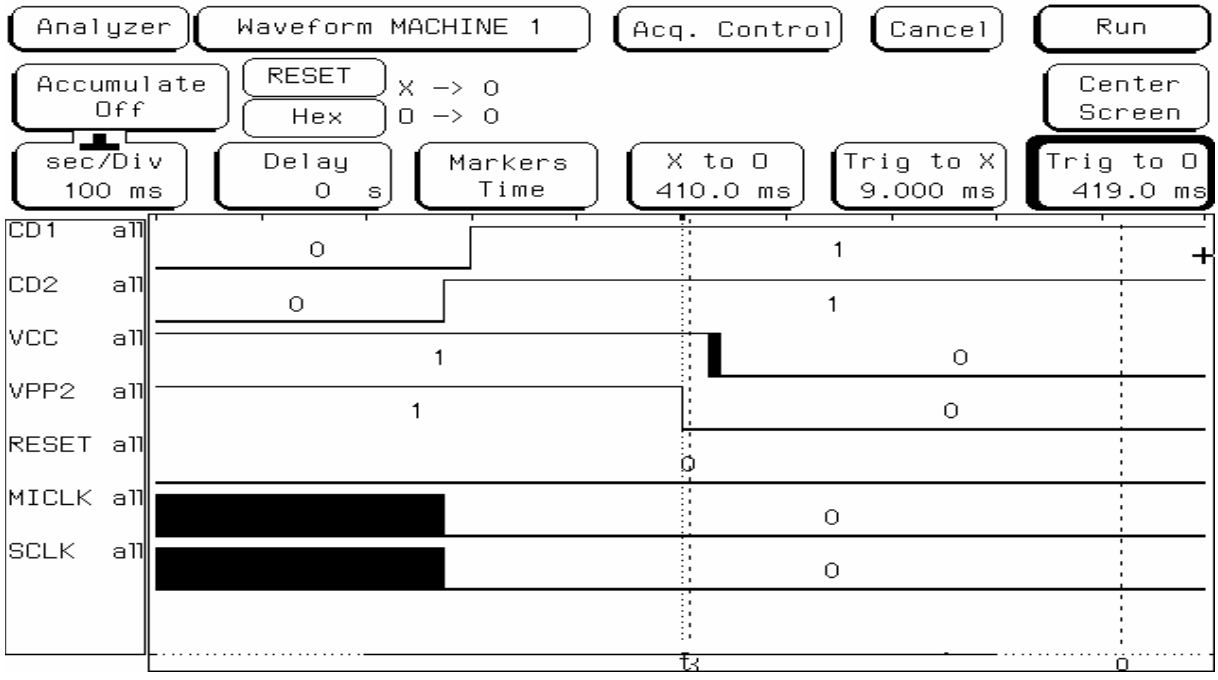


Figure 4.1-3 – M-CARD Power-Down Timing

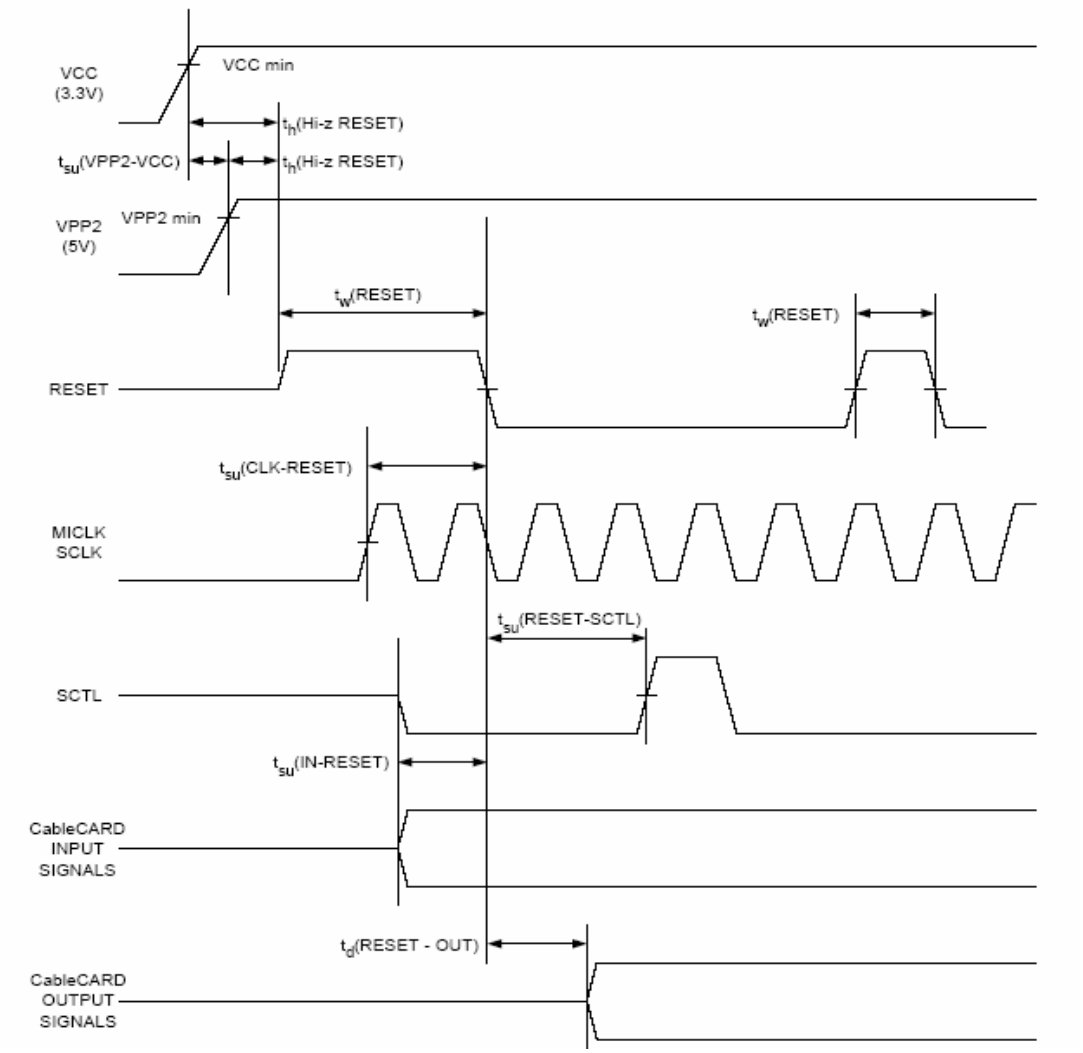


Figure 4.1-4 – M-CARD Power-On and Reset Timing

4.1.5 OOB Host Control Test

This test verifies that the CableCARD can successfully control the out-of-band tuning of the Host and that the Host will only support one Host Control Session.

Equipment: Host (DUT), HPNx Pro Test tool.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”	N/A	
4.	Insert the HPNx Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.			
7.	Select the “Host Control” tab. And then press the Play button to open the Host Control resource.	N/A	
8.	Verify that the DUT establishes a session to the Host Control and reports support for Application Information resource = 0x00200081. ← S [01:39:57.814] open_session_request from Host Control [91 04 00 20 00 81] → S [01:39:57.854] open_session_response on resource Host Control, Status = 0x00, SessionNb = 2 [92 07 00 00 20 00 81 00 02]		DApHc.1 DApHc.37
9.	Right click on the Host Control tab and select Add session slot. Select the play button.	N/A	
10.	Verify that the DUT responds to the second open session request with an open_session_response with one of the following session status values. F1 : session not opened, resource exists but unavailable F3 : session not opened, resource busy ← S [01:42:44.974] open_session_request from Host Control [91 04 00 20 00 81] → S [01:39:57.854] **open_session_response on resource Host Control, Status = 0xF1, SessionNb = 0** [92 07 F1 00 20 00 81 00 00]		DApHc.2

11.	Using the HPNx Pro test tool, send oob_rx_tune() requests with the following parameter values, and verify that the DUT replies with an oob_rx_tune_cnf() with tuning granted. **Lower Level** Frequency = 70000 (70 MHz) bit rate = 1544 kbps Spectrum = 0 (non-inv) Frequency = 70000 (70 MHz) bit rate = 1544 kbps Spectrum =1 (inv) Frequency = 70000 (70 MHz) bit rate = 2048 kbps Spectrum = 0 (non-inv) Frequency = 70000 (70 MHz) bit rate = 2048 kbps Spectrum =1 (inv) Frequency = 70000 (70 MHz) bit rate = 2048 kbps(b) Spectrum = 0 (non-inv) Frequency = 70000 (70 MHz) bit rate = 2048 kbps(b) Spectrum =1 (inv) Frequency = 70000 (70 MHz) bit rate = 3088 kbps Spectrum = 0 (non-inv) Frequency = 70000 (70 MHz) bit rate = 3088 kbps Spectrum =1 (inv) **Upper level** Frequency = 130000 (130 MHz) bit rate = 1544 kbps Spectrum = 0 (non-inv) Frequency = 130000 (130 MHz) bit rate = 1544 kbps Spectrum =1 (inv) Frequency = 130000 (130 MHz) bit rate = 2048 kbps Spectrum = 0 (non-inv) Frequency = 130000 (130 MHz) bit rate = 2048 kbps Spectrum =1 (inv) Frequency = 130000 (130 MHz) bit rate = 2048 kbps(b) Spectrum = 0 (non-inv) Frequency = 130000 (130 MHz) bit rate = 2048 kbps(b) Spectrum =1 (inv) Frequency = 130000 (130 MHz) bit rate = 3088 kbps Spectrum = 0 (non-inv) Frequency = 130000 (130 MHz) bit rate = 3088 kbps Spectrum =1 (inv) ← A [04:15:39.707] OOB_RX_tune_req from Host Control [9F 84 06 03 01 90 7E] RF_RX_frequency_value = 0x0190 **RF_RX_tuning_value** rate = 2048kbps(b) [0x1] spec = normal [0x0] → A [04:15:40.037] OOB_RX_tune_cnf to Host Control [9F 84 07 01 00] status_field = Tuning granted [0x00]		DApHc.30 DApHc.31 DApHc.41
12.	Using the HPNx Pro test tool, send oob_rx_tune() requests with the following parameter values, and verify that the DUT replies with an oob_rx_tune_cnf() with tuning denied. **Frequency out of Range** Frequency = 65500 KHz bit rate = 1544 kbps Spectrum = 0 (non-inv) Frequency = 130500 KHz bit rate = 1544 kbps Spectrum = 0 (non-inv) ← A [04:38:25.701] OOB_RX_tune_req from Host Control [9F 84 06 03 01 36 BE] RF_RX_frequency_value = 0x0136 **RF_RX_tuning_value** rate = 1544kbps(b) [0x2] spec = normal [0x0] → A [04:38:25.791] OOB_RX_tune_cnf to Host Control [9F 84 07 01 03] status_field = Tuning granted – Invalid parameters [0x03]		DApHc.36

13.	Using the HPNx Pro test tool, send OOB_TX_tune_req(), and verify that the DUT replies with an OOB_TX_tune_cnf() with tuning denied - RF Transmitter not physically available (0x01).		DApHc.20

4.1.6 Host System Time Test

This test verifies that the Host supports a System Time resource.

Equipment: Host (DUT), HPNx Pro Test tool.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID"	N/A	
4.	Insert the HPNx Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Using the HPNx Pro Test Tool trace, verify that the DUT establishes a session to the Application Manager. Verify resource returned is ID 0x00240041.		DApSt.1
7.	Select the "System Time" tab; press the Play button to open the System Time resource.	N/A	
8.	Open system_time inq tab. Send system_time inq () with response_interval set to zero.	N/A	
9.	Using the HPNx Pro test tool send a system_time_inq() with response interval = 1 second.	N/A	
10.	Verify that the DUT starts sending system_time () APDU in the tool trace window at 1-second intervals.		DApSt.7 DApSt.8
11.	Using the HPNx Pro test tool, send a system_time_inq() with response interval = 10 second.	N/A	
12.	Verify that the DUT starts sending system_time() object to the tool trace window at 10-second intervals.		DApSt.7 DApSt.8
13.	After at least 30 seconds, send a system_time_inq() with response interval equal to zero.	N/A	
14.	Verify that the DUT sends system_time() APDU immediately.		DApSt.6
15.	Right click on the System Time session and select Add session slot. Select the play button.	N/A	
16.	Verify that the DUT rejects the second session. Verify that the DUT responds to the second open session request with an Open Session response with a session status values of F1 or F3 as defined in [CCIF].		DApSt.2

4.1.7 In band Host Control and Host CableCARD Firmware Upgrade Test (Homing)

This test verifies that the Host can support firmware upgrade of a CableCARD when the CARD is inserted and there is a different image for it.

Equipment: Host (DUT), HPNX PRO Test tool

Procedure 1: Homing Canceled Firmware Upgrade

Step	Procedure	Pass/Fail	PICS
1.	Power up the DUT.	N/A	
2.	Bring up the HPNX Pro software on the given PC. Verify that the PC and HPNX Pro are on the same isolated network.	N/A	
3.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
4.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
5.	Insert the HPNX Pro extender card into DUT. From the HPNx Pro trace window, check that the status of the HPNX Pro goes ready and the resource manager has opened its session	N/A	
6.	The HPNx Pro should open session request on resource manager with this exchange of profile_inq() / profile_reply APDU’s to continue. -> **S** [00:00:03.633] open_session_request from Resource Manager (0x010041) <- **S** [00:00:03.634] open_session_response on resource Resource Manager (0x010041), SessionNb = 1, Status = 0x00 <- **A** [00:00:03.635] profile_inq to Resource Manager, SessionNb = 1 -> **A** [00:00:03.755] profile_reply from Resource Manager, SessionNb = 1 resource_list <- **A** [00:00:03.756] profile_changed to Resource Manager, SessionNb = 1 -> **A** [00:00:03.762] profile_inq from Resource Manager, SessionNb = 1 <- **A** [00:00:03.762] profile_reply to Resource Manager, SessionNb = 1 resource_list [0] resource_identifier = 0x00010041 [1] resource_identifier = 0x00020081 [2] resource_identifier = 0x00200081 [3] resource_identifier = 0x01040081 [4] resource_identifier = 0x00030081 [5] resource_identifier = 0x00110042 [6] resource_identifier = 0x00400081 [7] resource_identifier = 0x00240041 [8] resource_identifier = 0x00B00101 [9] resource_identifier = 0x00A00043 [10] resource_identifier = 0x002A0041 [11] resource_identifier = 0x002600C1 [12] resource_identifier = 0x00608043 [13] resource_identifier = 0x002B0042	N/A	
7.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	

8.	Using the HPNX Pro, send open_session_request from Host Control. Verify the DUT response <- S [00:00:04.148] open_session_response on resource Host Control Support (0x200081), SessionNb = 11, Status = 0x00 [92 07 00 00 20 00 81 00 xx]	N/A	
9.	Using HPNx Pro, send open_session_request from resource Homing. Verify the DUT response <- S [00:01:40.104] open_session_response on resource Homing (0x110042), SessionNb = 2, Status = 0x00 [92 07 00 00 11 00 42 00 xx]		DApHm.1
10.	Bring the DUT to a "STANDBY" state by pressing the power button so that the DUT appears to be in an "off" state.	N/A	
11.	Verify that the HPNX PRO Test tool received an open_homing() APDU from the DUT. <- A [00:01:40.105] open_homing to Homing, SessionNb = 2 [9F 99 90 00] The HPNx Pro replies to Homing with -> A [00:01:40.113] open_homing_reply from Homing, SessionNb = 2 [9F 99 90 00] And the DUT then send the Homing Active <- A [00:01:40.114] homing_active to Homing, SessionNb = 2 [9F 99 93 00]		DApHm.4 DApHm.5 DapHm.8 DApHm.9
12.	Before the DUT is informed that a firmware upgrade is in progress, bring the DUT out of the "STANDBY" state by pressing the power button so that the DUT appears to be in an "on" state.	N/A	
13.	Verify that the HPNX PRO Test tool received a homing_canceled() APDU from the DUT.		DApHm.10 DApHm.11

Procedure 2: Delayed Firmware- Host in Stand-by Continued from Homing Canceled

17.	Bring the DUT to a "STANDBY" state by pressing the power button so that the DUT appears to be in an "off" state.	N/A	
	Verify that the HPNX PRO Test tool received an open_homing() APDU from the DUT. <- A [00:01:40.105] open_homing to Homing, SessionNb = 2 [9F 99 90 00] The HPNx Pro replies to Homing with -> A [00:01:40.113] open_homing_reply from Homing, SessionNb = 2 [9F 99 90 00] And the DUT then send the Homing Active <- A [00:01:40.114] homing_active to Homing, SessionNb = 2 [9F 99 93 00]		DApHm.4 DApHm.5 DapHm.8 DApHm.9 DAPHm.47

18.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QAM In Band Channel Download time = 0 seconds timeout type = No Timeout download_timeout_period = 0 seconds user notification text = “CableCARD upgrade in Progress” To initate the delayed upgrade Click send to issue the firmware_upgrade() APDU to the DUT 		
19.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT. 		DApHm.23 DApHm.33 DApHm.34 DApHm.40
20.	Using the HPNX PRO test tool click open the Host Control tab. Select in_band_tune_req and send inband_tune_req() requests with the following parameter values. **1st set Frequency to:** (Use lowest digital channel frequency that is present on the CableLabs plant). Tune type = Frequency, Frequency = 63000 (63 MHz, ch3), Modulation type = 64QAM **Then Setup Frequency/Modulation to:** Use highest digital channel frequency that is present on the CableLabs plant). Tune type = Frequency, Frequency = 729000 (729 MHz, ch113), Modulation type = 256QAM	N/A	
21.	Verify that the DUT replies with an inband_tuning_cnf() with tuning accepted. > **A** [00:01:40.113] inband_tune_cnf to Host Control [9F 84 09 02 00 04] Ltsid= Tune_status=Tuning accepted		DApHc.33

22.	Using the HPNX PRO test tool click open the Host Control tab. Select in_band_tune_req and send inband_tune_req() requests with the following parameter values. **1st set Frequency to:** (Use lowest digital channel frequency that is present on the CableLabs plant). Tune type = Source ID Source ID = 0x2F11 Modulation type = 64QAM **Then Setup Frequency/Modulation to:** Use highest digital channel frequency that is present on the CableLabs plant). Tune type = Source ID Source ID = 0x03 Modulation type = 256QAM	N/A	
23.	Verify that the DUT replies with an inband_tuning_cnf() with tuning accepted. > **A** [00:01:40.113] inband_tune_cnf to Host Control [9F 84 09 02 00 04] Ltsid= Tune_status=Tuning accepted		DApHc.33
24.	Under the "Homing" tab expand the firmware_upgrade_complete button and set the reset_request_status to "No reset requested." Click send to issue the firmware_upgrade_complete() APDU to the DUT.		DApHm.45 DApHm.2
25.	Verify that the DUT continues normal operation without performing a reset on the CableCARD > **A** [00:01:40.222] firmware_upgrade_complete from Homing [9F 99 97 01 02] Reset_request_status=No reset required [0x02] .		DApHm.45
26.	Under the "Homing" tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QAM In Band Channel Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 10 seconds user notification text = "CableCARD Upgrade in progress" Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
27.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT. → **A** [824:02:46.056] firmware_upgrade_reply to Homing [9F 99 96 00]		DApHm.23 DApHm.33 DApHm.34 DApHm.40
28.	Repeat the previous two steps (click the send button) every 5 seconds, at least 4 times. Verify that the DUT does NOT reset the HPNX PRO (because each firmware_upgrade() APDU extends the timeout by 10 seconds).		DApHm.35 DApHm.36 DApHm.41 DApHm.42 DApHm.43

29.	Verify that the DUT performs a PCMCIA reset of the CableCARD 10 seconds after sending the last firmware_upgrade()		DApHm.18 DapHc.32 DapHc.33 DapHc.35 DapHc.42 DApHm.44
30.	Wait for the reset and CableCARD initialization to complete.	N/A	
31.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
32.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Download timeout only download_timeout_period = 10 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
33.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT.		DApHm.23 DApHm.33 DApHm.34 DApHm.40
34.	Verify that the DUT performs a PCMCIA reset of the CableCARD 10 seconds after sending the firmware_upgrade() (because the DUT did not receive a firmware_upgrade_complete() APDU).		DApHm.18 DapHc.32 DapHc.33 DapHc.35 DapHc.42
35.	Wait for the reset and CableCARD initialization to complete.	N/A	
36.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
37.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 0 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
38.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT.		DApHm.23 DApHm.33 DApHm.34 DApHm.40

39.	Wait at least 60 seconds. Veify that the DUT does NOT reset the HPNX PRO (because a download_timeout_period of 0 is an indefinitely long timeout).		DApHm.37 DApHm.38
40.	Under the “Homing” tab expand the firmware_upgrade_complete button and set the reset_request_status to “PCMCIA reset request.” Click send to issue the firmware_upgrade_complete() APDU to the DUT.	N/A	
41.	Verify that the DUT performs a PCMCIA reset of the CableCARD.		DApHm.37
42.	Wait for the reset and CableCARD initialization to complete.	N/A	
43.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
44.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 0 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
45.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT → A [824:02:46.056] firmware_upgrade_reply to Homing [9F 99 96 00]		DApHm.23 DApHm.33 DApHm.34 DApHm.40
46.	Under the “Homing” tab expand the firmware_upgrade_complete button and set the reset_request_status to “CableCARD reset.” Click send to issue the firmware_upgrade_complete() APDU to the DUT.	N/A	
47.	Verify that the DUT performs a CableCARD reset of the CableCARD.		DApHm.28 DApHm.46

Procedure 3: Immediate Firmware Upgrade

1.	Put the DUT in an “On” state. And tune to an “In the Clear” channel.	N/A	

2.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QAM In Band Channel Download time = 0 seconds timeout type = No Timeout download_timeout_period = 0 seconds user notification text = “CableCARD upgrade in Progress” To initate the immedieate upgrade Click send to issue the firmware_upgrade() APDU to the DUT 		
3.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT. 		DApHm.23 DApHm.33 DApHm.34 DApHm.40
4.	Verify that the DUT displays message “CableCARD upgrade in Progress”		DApHm.19 DApHm.21 DApHm.39
5.	Using the HPNX PRO test tool click open the Host Control tab. Select in_band_tune_req and send inband_tune_req() requests with the following parameter values. **1st set Frequency to:** (Use lowest digital channel frequency that is present on the CableLabs plant). Tune type = Frequency, Frequency = 63000 (63 MHz, ch3), Modulation type = 64QAM **Then Setup Frequency/Modulation to:** Use highest digital channel frequency that is present on the CableLabs plant). Tune type = Frequency, Frequency = 729000 (729 MHz, ch113), Modulation type = 256QAM	N/A	
6.	Verify that the DUT replies with an inband_tuning_cnf() with tuning accepted. > **A** [00:01:40.113] inband_tune_cnf to Host Control [9F 84 09 02 00 04] Ltsid= Tune_status=Tuning accepted		DApHc.33

7.	Using the HPNX PRO test tool click open the Host Control tab. Select in_band_tune_req and send inband_tune_req() requests with the following parameter values. **1st set Frequency to:** (Use lowest digital channel frequency that is present on the CableLabs plant). Tune type = Source ID Source ID = 0x2F11 Modulation type = 64QAM **Then Setup Frequency/Modulation to:** Use highest digital channel frequency that is present on the CableLabs plant). Tune type = Source ID Source ID = 0x03 Modulation type = 256QAM	N/A	
8.	Verify that the DUT replies with an inband_tuning_cnf() with tuning accepted. > **A** [00:01:40.113] inband_tune_cnf to Host Control [9F 84 09 02 00 04] Ltsid= Tune_status=Tuning accepted		DApHc.33
9.	Under the "Homing" tab expand the firmware_upgrade_complete button and set the reset_request_status to "No reset requested." Click send to issue the firmware_upgrade_complete() APDU to the DUT.		DApHm.45 DApHm.2
10.	Verify that the DUT no longer displays the user notification text and continues normal operation without performing a reset on the CableCARD > **A** [00:01:40.222] firmware_upgrade_complete from Homing [9F 99 97 01 02] Reset_request_status=No reset required [0x02] .		DApHm.45
11.	Verify that the DUT can now take control of the tuner by attempting to change the channel.		DApHm.32
12.	Under the "Homing" tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QAM In Band Channel Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 10 seconds user notification text = "CableCARD Upgrade in progress" Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
13.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT. → **A** [824:02:46.056] firmware_upgrade_reply to Homing [9F 99 96 00]		DApHm.23 DApHm.33 DApHm.34 DApHm.40

14.	Repeat the previous two steps (click the send button) every 5 seconds, at least 4 times. Verify that the DUT does NOT reset the HPNX PRO (because each firmware_upgrade() APDU extends the timeout by 10 seconds).		DApHm.35 DApHm.36 DApHm.41 DApHm.42 DApHm.43
15.	Verify that the DUT performs a PCMCIA reset of the CableCARD 10 seconds after sending the last firmware_upgrade()		DApHm.18 DapHc.32 DapHc.33 DapHc.35 DapHc.42 DApHm.44
16.	Wait for the reset and CableCARD initialization to complete.	N/A	
17.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
18.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Download timeout only download_timeout_period = 10 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
19.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT.		DApHm.23 DApHm.33 DApHm.34 DApHm.40
20.	Verify that the DUT performs a PCMCIA reset of the CableCARD 10 seconds after sending the firmware_upgrade() (because the DUT did not receive a firmware_upgrade_complete() APDU).		DApHm.18 DapHc.32 DapHc.33 DapHc.35 DapHc.42
21.	Wait for the reset and CableCARD initialization to complete.	N/A	
22.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
23.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 0 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	

24.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT.		DApHm.23 DApHm.33 DApHm.34 DApHm.40
25.	Wait at least 60 seconds. Veify that the DUT does NOT reset the HPNX PRO (because a download_timeout_period of 0 is an indefinitely long timeout).		DApHm.37 DApHm.38
26.	Under the “Homing” tab expand the firmware_upgrade_complete button and set the reset_request_status to “PCMCIA reset request.” Click send to issue the firmware_upgrade_complete() APDU to the DUT.	N/A	
27.	Verify that the DUT performs a PCMCIA reset of the CableCARD.		DApHm.37
28.	Wait for the reset and CableCARD initialization to complete.	N/A	
29.	On the “Homing” tab press the Play button to open the Homing resource.	N/A	
30.	Under the “Homing” tab expand the firmware_upgrade button and set the following parameter values: upgrade source = QPSK Download time = 0 seconds timeout type = Both Timeouts download_timeout_period = 0 seconds user notification text = “Performing download test” Click send to issue the firmware_upgrade() APDU to the DUT.	N/A	
31.	Verify that the HPNX PRO Test tool received a firmware_upgrade_reply() APDU from the DUT → A [824:02:46.056] firmware_upgrade_reply to Homing [9F 99 96 00] .		DApHm.23 DApHm.33 DApHm.34 DApHm.40
32.	Under the “Homing” tab expand the firmware_upgrade_complete button and set the reset_request_status to “CableCARD reset.” Click send to issue the firmware_upgrade_complete() APDU to the DUT.	N/A	
33.	Verify that the DUT performs a CableCARD reset of the CableCARD.		DApHm.28 DApHm.46

4.1.8 Initialization Error Detection and Handling

This test verifies the Host supports initialization error condition detection and reporting.

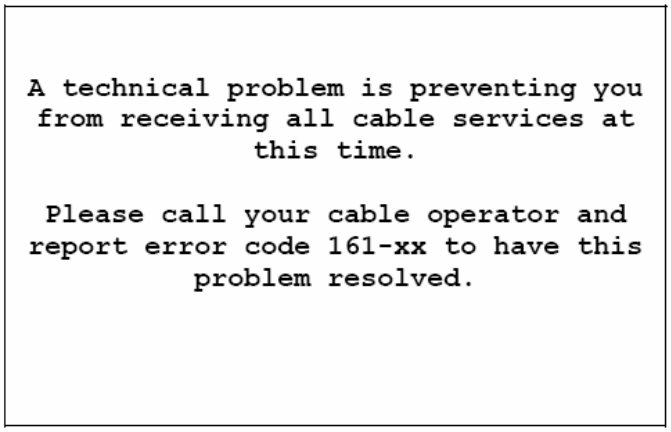
Equipment: DUT, HPNX Pro Test tool, HPNX Test tool (PBM).

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNX Pro software on the given PC. Verify that the PC and HPNX Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNX Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNX Pro ID"	N/A	
4.	Insert the HPNX Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Right click on the "session slot" of Resource Manager. Check the "Block outgoing APDUs".	N/A	
7.	Press the Play button on the "Low level test/setup" tab.	N/A	

8.	Verify that the DUT reports error to user.
	
	Note : In the event that an error in which the Host must display an error message, the following message, or its equivalent, SHALL be displayed:
	`A technical problem is preventing you from receiving all cable services at this time.`
	`Please call your cable operator and report error code 161-xx to have this problem resolved.`
	The "xx" after the error code 161 SHALL be the item number of the table B-1 – Error Handling of HPIA. In this case, the item number is 17.
			HPinit.262

9.	Press the Stop button on the "Low level test/setup" tab.	N/A	
10.	Right click on the "session slot" of Resource Manager. Uncheck the "Block outgoing APDUs".	N/A	
11.	Press the Play button on the "Low level test/setup" tab.	N/A	
12.	Expand the "Conditional Access" tab.	N/A	

13.	Right click on the “session slot” of Conditional Access. Check the “Block outgoing APDUs”.	N/A	
14.	Press the Play button on the “Conditional Access” tab.	N/A	
15.	Verify that the DUT reports error to user. **Note** : In the event that an error in which the Host must display an error message, the following message, or its equivalent, SHALL be displayed:  The “xx” after the error code 161 SHALL be the item number of the table B-1 – Error Handling of HPIA. In this case, the item number is 38.		HPinit.279
16.	Press the Stop button on the “Low Level test/ setup” tab.	N/A	
17.	Extract the HPNX Pro Extender Card from the DUT. Close the HPNX Pro application on the PC.	N/A	
18.	Using an HPNx in Pod Behavior Mode (PBM) bring up the HPNX sofware on the given PC, and verify that the PC and HPNX are on the same isolated network.	N/A	
19.	On the HPNX GUI, click the Setup Menu, select (PBM) and then click “Connect”. From the trace window wait until Card initialization is ready. Click the “Test” tab in the HPNX application. And then press the “Play” button on the “Low level test/setup” tab. to start the initialization process. Note: if the M-UDCP supports the S-Card or the M-Card in S-Mode, this error condition will not exist, and the S-Card/ M-Card in S-Mode should complete initialization.	N/A	

20.	Verify that the DUT reports error to user. **Note** : In the event that an error in which the Host must display an error message, the following message, or its equivalent, SHALL be displayed: A technical problem is preventing you from receiving all cable services at this time. Please call your cable operator and report error code 161-xx to have this problem resolved. The “xx” after the error code 161 SHALL be the item number of the table B-1 – Error Handling of HPIA. In this case, the item number is 64.		HPinit.312 Hpower.29

4.1.9 Host Transport Stream Data Rate Test

The Host must be able to receive/transmit transport stream data from/to the CableCARD at data rates of 26.97035Mbps (64 QAM) and 38.8107Mbps (256 QAM).

Equipment: DUT under test, CableCARD, CableCARD extender card, input stream, logic analyzer, logic analyzer CableCARD adapter card.

Software: Logic Analyzer Configuration file "HOST_439._A"


HOST_439._A

Configuration File:


HOST_439.__

Setup: The Host should have the extender card in the CableCARD slot with the CableCARD connected to the extender card socket. The input stream from the headend should be connected to the Host's "cable in" input. The television should be connected to the "to TV/VCR" output of the Host.

Procedure:

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>1.</td><td>Connect the logic analyzer CableCARD adapter to the CableCARD extender card.

These signals should be monitored.
<table><tr><th>Pin Number</th><th>Pin Name</th></tr><tr><td>37,38,39,40,41,64,65,66</td><td>MD_OUT[7:0]</td></tr><tr><td>14</td><td>MCLKO</td></tr><tr><td>63</td><td>MOSTRT</td></tr><tr><td>62</td><td>MOVAL</td></tr></table></td><td>N/A</td><td></td></tr>
<tr><td>2.</td><td>Power up Host and all test equipment.</td><td>N/A</td><td></td></tr>
<tr><td>3.</td><td>Tune to a 64QAM encrypted channel. Video reception should be displayed.</td><td>N/A</td><td></td></tr>
<tr><td>4.</td><td>Load the file HOST_439._A into the analyzer.
Change MENU from "SYSTEM" to "ANALYZER".
Change display from "CONFIGURATION" to "WAVEFORM".
Select "RUN" / "SINGLE" to initiate the capture process. The analyzer will trigger on the rising edge of MOSTRT, which signifies the start of an MPEG packet. The display will be centered on the start of the next packet after the trigger, approximately 56 uS later.</td><td>N/A</td><td></td></tr>
<tr><td>5.</td><td>Click on "Trig to X" and move the X marker to the rising edge of MOSTRT to measure the time between MPEG packets.</td><td>N/A</td><td></td></tr>
</table>

6.	Repeat this measurement two more times and record the data below. Time between sync bytes : 1._____ 2._____ 3._____ Total the average. Divide by 3 = average = _____ Divide above into 1 (1 / (17932.41 packets per sec) =55.765 uSec per packet) Notes: 1. The acceptable range shall be between 55.65 µS < average < 55.89 µS over the period between the sync bytes of successive transport packets with allowable jitter of +/- one MCLKI clock period. 2. The MPEG packet calculation for a 64QAM is 26.97035 Mbps / 8 bits per byte / 188 bytes per packet =17932.41 packets per sec).		HstDr.1 HstIBCS.175
7.	Tune to a 256QAM encrypted program.	N/A	
8.	Select “RUN” / “SINGLE” to initiate the capture process. Change “Delay” from 55.77 uS to 38.75 uS. Click on “Trig to X” and move the X marker to the rising edge of MOSTRT to measure the time between MPEG packets. Record this time below.	N/A	
9.	Repeat this measurement two more times and record the data below. Time between sync bytes : 1._____ 2._____ 3._____ Total the average. Divide by 3 = average = _____ Divide above into 1 (1 / (25804.99 packets per sec) =38.75 uSec per packet) Notes: 1. The acceptable range shall be between 38.63 µS < average < 38.87 µS over the period between the sync bytes of successive transport packets with allowable jitter of +/- one MCLKI clock period. 2. The MPEG packet calculation for a 256QAM is 38.8107 Mbps / 8 bits per byte / 188 bytes per packet =25804.99 packets per sec).		HstDr.1 HstIBCS.176

4.2 Host Channel Change

4.2.1 Host Channel Change Functional Test

The Host must be capable of changing channels in a timely manner. The Host must store the channel map in non-volatile memory in the Host.

Equipment: Host under test, TV, Host remote control, input stream, headend channel information, stopwatch, CableCARD

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the DUT and CableCARD up to an operating state where a channel map has been loaded and the DUT is able to tune a 64QAM and 256QAM source.	N/A	
2.	Tune to a 64QAM channel/source and verify the channel has been acquired.		HFATrf.1 HFATrf.2
3.	Change to another channel in a 256 QAM multiplex and verify the channel has been acquired.		HFATrf.1 HFATrf.2
4.	With the CableCARD inserted, unplug/Power down Host for 2 minutes (time for all capacitors to discharge).	N/A	
5.	Power up Host. Verify that the channel map is still available by tuning to each of the 64QAM and 256QAM sources previously tuned to above. This will ensure the channel map used above was saved into non-volatile memory in the DUT.		HSTCCP.8
6.	Remove the CableCARD, Unplug/Power down Host for 2 minutes (time for all capacitors to discharge).	N/A	
7.	Power up the Host. Attempt to tune each of the 64QAM and 256QAM sources previously tuned to above using the same channel numbers used before. Verify that these services are no longer accessible; this verifies that the channel map was purged from non-volatile memory.		Hnop.17

4.3 Man Machine Interface (MMI) Support

4.3.1 Host Data Channel Multi-Layer Test

This test verifies that the Host successfully implements the session/application layer protocols on the data channel.

Equipment: Host (DUT)

HPNx Pro Test tool.

Procedures:

Step #	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
4.	Insert the HPNx Pro extender card into. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session..	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Verify that DUT responds with open_session_response_tag = 0X92, a resource_identifier value of 0X00010041 and session_nb of YYYY. (The SPDU tag value is the first byte of the SPDU.) Verify host response: -S [294:15:01.304] open_session_response on resource Resource Manager, Status = 0x00, SessionNb = 1 [92 07 00 00 01 00 41 00 03]		HPinit.239 DSs.8 DSs.9 DSs.10 DSs.11 DSs.19
7.	Verify the DUT’s Resource Manager sends a Profile Inquiry APDU to HPNx Pro with Profile_inq_tag value 0X9F8010. (The APDU tag value is the first three bytes of the APDU.) -A [294:15:01.334] profile_inq to Resource Manager [9F 80 10 00]		HPinit.236 DApRm.4
8.	Verify DUT sends a profile_changed APDU with profile_changed _tag value 0X9F8012 -A [294:15:01.374] profile_changed to Resource Manager [9F 80 12 00]		HPinit.237 DApRm.8
9.	Verify HPNx Pro sends a Profile Inquiry APDU to request information on the available resources from the DUT.	N/A	

<table>
<tr>
<td>10</td>
<td>Verify DUT then replies with a Profile Reply APDU with profile_reply_tag value 0X9F8011 and provides the resource identifiers of available resources (the figure below is an example list and may not match the actual resources supported by the DUT).

A [294:15:01.414] profile_reply to Resource Manager
[9F 80 11 38 00 01 00 41 00 02 00 81 00 20 00 81 01 04 00 81 00 03 00 81 00 11 00 42 00 40 00 81 00 24 00 41 00 B0 01 01 00 A0 00 43 00 2A 00 41 00 26 00 C1 00 60 80 43 00 2B 00 42]
resource_list
[0] resource_identifier = 0x00010041
[1] resource_identifier = 0x00020081
[2] resource_identifier = 0x00200081
[3] resource_identifier = 0x01040081
[4] resource_identifier = 0x00030081
[5] resource_identifier = 0x00110042
[6] resource_identifier = 0x00400081
[7] resource_identifier = 0x00240041
[8] resource_identifier = 0x00B00101
[9] resource_identifier = 0x00A00043
[10] resource_identifier = 0x002A0041
[11] resource_identifier = 0x002600C1
[12] resource_identifier = 0x00608043
[13] resource_identifier = 0x002B0042</td>
<td></td>
<td>HPinit.238
DApRm.2
DApRm.3
DApRm.10
DApGn.1
DS.s.18
DApGn.15</td>
</tr>
<tr>
<td>11</td>
<td>Verify the DUT provides support for resource identifiers with proper resource naming, Class, Type, and Version.

<table>
<tr><th>Resource</th><th>Class</th><th>Type</th><th>Version</th><th>Resource identifier</th></tr>
<tr><td>Resource Manager</td><td>1</td><td>1</td><td>1</td><td>0x00010041</td></tr>
<tr><td>Application Information</td><td>2</td><td>2</td><td>1</td><td>0x00020081</td></tr>
<tr><td>Conditional Access Support</td><td>3</td><td>2</td><td>1</td><td>0x00030081</td></tr>
<tr><td>Host Control</td><td>32</td><td>2</td><td>1</td><td>0x00200081</td></tr>
<tr><td>System Time</td><td>36</td><td>1</td><td>1</td><td>0x00240041</td></tr>
<tr><td>MMI</td><td>64</td><td>2</td><td>1</td><td>0x00400081</td></tr>
<tr><td>Homing</td><td>17</td><td>1</td><td>2</td><td>0x00110042</td></tr>
<tr><td>Copy Protection</td><td>176</td><td>4</td><td>2</td><td>0x00B00102</td></tr>
<tr><td>Extended Channel</td><td>160</td><td>1</td><td>1</td><td>0x00A00041</td></tr>
<tr><td>CARD RES</td><td>38</td><td>3</td><td>1</td><td>0x002600C1</td></tr>
</table>
</td>
<td></td>
<td>DSs.6
DSs.7
DApGn.2
DApGn.3
DApGn.5
DApGn.7
DApGn.8
DApGn.9
DApMi.1
DApGn.14
DApGn.23</td>
</tr>
<tr>
<td>12</td>
<td>Right click on the Resource Manager tab. Select “add session slot”. Click the Play button beside the new Resource Manager Session slot.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Right click on the Resource Manager tab. Select “add session slot”. Click the Play button beside the new Resource Manager Session slot. Verify you can open at least (32) Resource Manager session slots.</td>
<td></td>
<td>DApRm.1</td>
</tr>
</table>

14	Verify that the DUT responds with open_session_response_tag = 0x92 with the proper resource identifier value and a session # YYYY 16-bit unique identifier. S [317:59:26.617] open_session_response on resource Resource Manager, Status = 0x00, SessionNb = 1 [92 07 00 00 40 00 81 00 03]		DSs.1 DSs.2 DSs.17
15	Expand the Resource Manager tab and close the Resource Manager Resource by clicking on the “Stop” button. Note that the HPNx Pro closes the opened sessions by issuing a close_session_request with a tag value of 0x95. S [18:36:44.417] close_session_request from Session Nb 1 (Resource Manager) [95 02 00 01]	N/A	
16	Verify the DUT replies to these close requests by issuing a close_session_response with a tag value of 0X96 ➔ S [18:36:44.477] close_session_response on Session Nb 1 (Resource Manager), Status = 0x00 [96 03 00 00 01]		DSs.3 DSs.14 DSs.15 DSs.16
17	Verify that the HPNx Pro did not at any point report any application protocol data unit structure error(s) or message(s) going to the wrong TSID, etc.		DApGn.16 DApGn.18

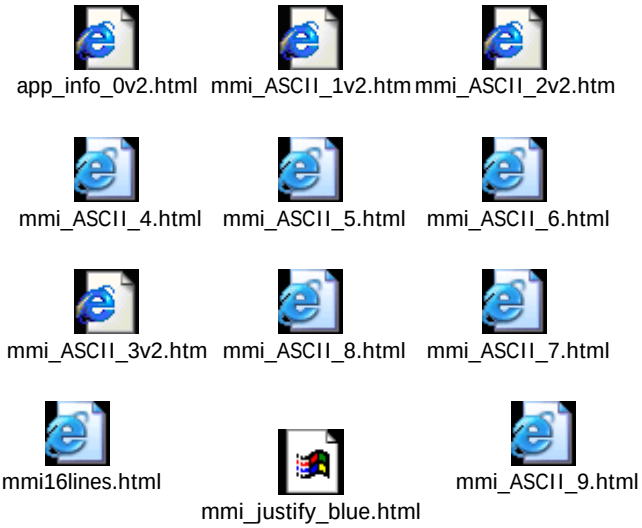
4.3.2 Host Application Information and MMI Test

This test verifies that the Host supports a Man Machine Interface Resource.

Equipment: Host (DUT), HPNx Pro Test tool**,** Host Documentation Package submitted by vendor.

Procedure:

Step	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
4.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Copy the file to the HPNx Pro PC. Click on the M-CARD tab. Click on “Load Settings”. Copy the file to the HPNx Pro PC. Open and insert the ATP_4_3_2_settings.xml file.  ATP_4_3_2_settings.xml	N/A	
7.	Verify from the trace window that the DUT establishes a session to the Resource Manager and reports support for Application Information resource = 0x00020081. open_session_response on resource Application Information [92 07 00 00 02 00 81 00 02]		DApAi.1
8.	Go to the Application Information tab and click on it. Press the play button to open the resource.	N/A	
9.	Verify that immediately after the session to the Application Information resource has been established, the DUT sends the eight application_info_req() APDU.		DApAi.5 HPinit.240
10	Verify the Host processes the application_info_cnf() APDU with the eight different Card applications..		DApAi.14 DApAi.35
11	Note the display_type_suupport value within this APDU. Write that here: _____ie: (Full Screen)		DApMi.3
12	Go to the Man Machine Interface tab and click on it. Press the Play button to open the resource.	N/A	

13	Check from the HPNx Pro test tool that the open_session_response()" on resource Man Machine Interface resource was sent by the DUT. ➔ S open_session_response on resource MMI, Status = 0x00, SessionNb = 3 92 07 00 00 40 00 81 00 03	N/A	
14	Load these files on the given PC under C:/Program Files/Digital Keystone/Digital Keystone HPNx ProPro/Resources/test_files/mmi (These files are required and contain html tags for mmi hyperlinks to pages).  	N/A	
15	Under the "Man Machine Interface" tab expand the open_mmi_req button. Set the Display Type to what you wrote in the display type above. Click the browse button and select the URL, C:/Program Files/Digital Keystone/Digital Keystone HPNx Pro Resources/test_files/mmi_files/app_info_0v2.html. Click send.	N/A	
16	Verify that the DUT replies in trace window with an open_mmi_cnf () APDU and its syntax is correct. HPNx Pro trace window should display: -> open_mmi_cnf to MMI Dialog_number = 0x00 Open_status = OK		DApMi.2 DApMi.4 DApMi.5

17	Verify that the DUT sends a server_query to the open_mmi_req: A server_reply from Application Information transaction_number = 0x02 file_status = OK [0x00] header_length = 0 header = "" file_length = 196 file = "<html> Application information (0) test page This is a link to an other mmi page Digital Keystone </html> " Note: Reference [CCIF2.0] Table 9.5–5 - server_query() APDU Syntax.		DApAi.15 DApAi.16 DApAi.17 DApAi.18 DApAi.20 DApAi.21 DApAi.22 DApAi.36
18	After receiving a server_reply from the Card the Host MAY send data to the Card using a server_query APDU.	(O)	DApAi.19
19	Using the DUT remote, Press vendor displayed commands to navigate within the DUT MMI displayed screen. Verify you can get through each link on DUT after the open_mmi_req send. -Application Information (0) page with {Link} -mmi16lines by 32 character page with Fonts with {Link} & (optional Colors) -mmi_justify (Right, Center & Left) with {Link} -Complete ASCII Character Code with 8 {Links} and 9 html pages. Characters and names are displayed from Numeric expression, Mnemonic expression (if applicable) and character name. Test script will display two characters in front of character name if a Mnemonic expression. Completion of link navigation tests proves the mandatory requirements. Verify the DUT uses the CableCARD as the access indicator in the URL.		DApMi.11 DApMi.12 DApMi.13 DApMi.14 DApMi.15 DApMi.16 DApMi.18 DApMI.19 DApMi.20 DApMi.21 DApMi.22 DApMi.23 DApMi.24 DApMi.25 DApMi.26 DApMi.31a DApAi.7 DApAi.30 DApAi.31 DApAi.32 CpsB.41 DApAi.33 DApAi.34 DapAi.23 DapAi.24
20	Verify that the DUT displays the MMI on all active video outputs.		DApMi.34
21	The Host SHALL not close the Application Information resource session during normal operation. Press vendor displayed commands to exit the MMI display.		DApAi.13
22	Verify that the DUT removes the MMI display. The Host May send a close_mmi_cnf() without the cableCARD having sent a close_mmi_req() to inform about a close operation performed by the Host. HPNx Pro trace should receive the close_mmi_cnf().		DApMi.7
23	Verify that the DUT removes the MMI from all video outputs.		DApMi.35
24	Open the MMI display again. Click the browse button and select the URL /app_info_0v2.html again. Click send	N/A	
25	From the HPNx Pro trace window, note the dialog_number. Dialog_number = _____ You will need this dialog_number to perform a close mmi screen later in this test.		DApMi.6

26	Right click on the Man Machine Interface tab and select Add Session Slot. Click Play on the new session slot.	N/A	
27	Expand the "+" (close_mmi_req) button. Input the dialog_number notedfrom step procedure above. Click Send.	N/A	
28	Verify that the Host closes the mmi page on the DUT. Also verify that in the trace window; DUT responds with a close_mmi_cnf to Man Machine Interface.		DApMi.7
29	Place the DUT in an off (power stand-by state) or non-video viewing state.	N/A	
30	Open the MMI display again. Click the browse button and select the URL /app_info_0v2.html again. Click send.	N/A	
31	Verify the DUT denies the MMI Dialoge open request by sendig an open_mmi_cnf() with a open_status field of request denied.		CpsB.40

4.4 Extended Channel Support

4.4.1 Host Extended Channel Link Layer Test

This test verifies that the Host can successfully implement link layer protocols for transferring data between the Host and the CableCARD device. The test also verifies that the Host has properly implemented the extxtended channel APDU's to open a data flow of type MPEG sections, IP flow and a DSG flow.

Equipment: Host (DUT), HPNX PRO Test tool.

Procedure:

Step	Procedure	Pass/Fail	PICS
1.	Bring up the HPNX Pro software on the given PC. Verify that the PC and HPNX Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID".	N/A	
4.	Insert the HPNX Pro extender card into DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Select "Extended channel" tab. Depending on the DUT you may have to change the resource version of the HPNX PRO to match that of the DUT. (To do this, right click on the extended channel slot session. Select "Change resource version". In the explorer user prompt window enter the correct resource version needed to match the DUT). Click OK. On the "Extended channel" tab press the Play button to open the extended channel resource.	N/A	
7.	From HPNx Pro trace window, verify that the DUT sends a open_session response on resource "extended channel"		ExchF.1 ExchF.24 ExchF.39 ExchF.40
8.	Verify that the DUT sends a new_flow_req() from extended channel with service_type = MPEG_section. (PID = 0x1FFC).		ExchF.2 ExchF.4 ExchF.23
9.	Note that the HPNX PRO Test tool sends back new_flow_cnf() from extended channel granting the flow. Note: the Flow_Id (0x_____)	N/A	
10.	Verify no error condition occurs on the DUT.		ExchF.27 ExchF.28 Exchf.29

11.	Right Click on the “Extended channel” tab. Select “Add Session Slot” Depending on the DUT you may have to change the resource version of the HPNX PRO to match that of the DUT. (To do this, right click on the extended channel slot session. Select “Change resource version”. In the explorer user prompt window enter the correct resource version needed to match the DUT). Click OK. On the “Extended channel” tab press the Play button to open the extended channel resource.	N/A	
12.	Verify that the DUT denies the request. The Host should not respond to the request of the flow type.		ExchF.4 ExchF.30
13.	Delete the 2nd session on the HPNx Pro.	N/A	
14.	Using the HPNX PRO Test tool, click on the lost_flow_ind button and enter the flow_id recorded. Click Send to send a lost_flow_ind() to the DUT.	N/A	
15.	Verify that the DUT accepts the lost_flow_ind for the right flow_id and includes a reason field.		ExchF.13 ExchF.14 ExchF.32 ExchF.33
16.	Verify that the DUT acknowledges by sending a lost_flow_cnf() PDU.		ExchF.15

4.4.2 SCTE 65 Service Information Delivered OOB Profiles 1-6

This test verifies different profiles of SI tables delivered via an out-of-band path to support service selection and navigation by digital cable set-top boxes and other “digital cable-ready” devices. The SI tables defined in this test procedure are formatted in accordance with the Program Specific Information (PSI) data structures and constructed in accordance with SCTE65.

Equipment: DUT, HPNx Pro Test tool, SI files (Profile1.hex, Profile2thru3.hex, Profile 4.hex, Profile 5.hex, and Profile 6.hex).

Note: The attached files need to be copied to the computer running the HPNX application.


profile1.hex


profile2thru3.hex


profile4.hex


profile5.hex


Profile6.hex

Procedure:

Step#	Procedure	Pass/Fail	PICS Item
1.	Bring up the HPNX Pro software on the given PC. Verify that the PC and HPNX Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNX Pro you are using. (Information is on the back side of card)	N/A	

3.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNX Pro ID"	N/A	
4.	Insert the HPNX Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.	Select the "Extended Channel" tab. Depending on the DUT you may have to change the resource version of the HPNX Pro to match that of the DUT. To do this, right click on the extended channel session slot. Select "Change resource version". In the explorer user prompt window enter the correct resource version needed to match the DUT. Click OK. On the "Extended Channel" tab press the Play button to open the Extended Channel resource.	N/A	
7.	Verify that the DUT establishes a session to the Extended Channel and requests a service_type = MPEG_section with a PID = 0x1FFC. ← S [649:19:06.023] open_session_request from Extended Channel [91 04 00 A0 00 43] → S [649:19:06.123] open_session_response on resource Extended Channel, Status = 0x00, SessionNb = 2 [92 07 00 00 A0 00 43 00 02] → A [649:19:06.313] New_flow_req to Extended Channel (note: description version and opened version differs) [9F 8E 00 03 00 FF FC] service_type = MPEG_section [0x00] **MPEG_section_parameters** PID = 0x1FFC ← A [649:19:06.383] New_flow_cnf from Extended Channel [9F 8E 01 06 00 05 00 00 01 00] status_field = request granted [0x00] flows_remaining = 0x05 **flow_info** FLOW_ID = 0x000001 service_type = MPEG_section [0x00] **Note**: Note the FLOW_ID assigned by the DUT in the New_flow_cnf. In this example, the FLOW_ID assigned to the PID 0x1FFC MPEG_section flow is 0x000001.	N/A	
8.	Under the "Extended channel" tab, expand the Flow Feed button.	N/A	
9.	Click the "Browse" button and select "Profile1.hex" file. Click "OPEN".	N/A	

10.	Enter the FLOW_ID that was noted in step 8 into the Flow ID window and click send. In this step immediately after you click send, the following tables will be sent to the DUT. ● Network Information Table ✓ Network Information Table with a Carrier Definition table subtype. ✓ Network Information Table with a Modulation Mode table subtype. ● Short Form Virtual Channel Table ✓ Short Form Virtual Channel Table with Defined Channel Map subtype. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 1. ✓ Short Form Virtual Channel Table with Optional Inverse Channel Map. ● System Time Table. ● Network Text Table ✓ Network Text Table with optional Source Name Sub-table ✓ Network Text Table with optional Source Name Sub-table. **Note**: It is imperative that the correct Flow id be used in order for this test to function properly.	N/A	
11.	On the DUT using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Verify that navigation occurs with at least one or more of the SCTE65 profiles. Record if profile 1 is supported. **Note**: Refer to CableLabs site, http://visitors.cablelabs.com/interopweb for current HE channel maps.		ExchF.38 ExchF.56 FDCP.14
12.	Under the “Flow Feed” function, click the “Browse” button. Select the “Profile2thru3.hex” file and click “OPEN”.	N/A	

13.	Enter the FLOW_ID that was noted in step 8 into the Flow ID window and click send. In this step immediately after you click send, the following tables will be sent to the DUT. ● Network Information Table. ✓ Network Information Table with a Carrier Definition table subtype. ✓ Network Information Table with a Modulation Mode table subtype. ● Short Form Virtual Channel Table. ✓ Short Form Virtual Channel Table with Defined Channel Map subtype. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 1. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 2. ✓ Short Form Virtual Channel Table with Optional Inverse Channel Map. ● System Time Table ● Network Text Table ✓ Network Text Table with optional Source Name Sub-table. **Note**: It is imperative that the correct Flow id be used in order for this test to function properly.	N/A	
14.	On the DUT using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Verify that navigation occurs with at least one or more of the SCTE65 profiles. Record if profiles 2 and 3 are supported. **Note**: Reference step 12 for channel map.		ExchF.38 ExchF.56
15.	Using whatever means available clear the channel map from the DUT. Example of this would be on a Motorola DUT press and hold the “Power” and “select” buttons on the front panel. While depressing these buttons unplug the DUT and allow the front panel to flash at least 3 times and release the buttons. Power on the DUT and verify that there is no channel map loaded. This can be accomplished by channel up down operations.	N/A	
16.	Repeat steps 1 through 9.	N/A	
17.	Under the “Flow Feed” function, click the “Browse” button. Select the “Profile4.hex” file and click “OPEN”.	N/A	

18.	Enter the FLOW_ID that was noted in step 8 into the Flow ID window and click send. In this step immediately after you click send, the following tables will be sent to the DUT. ● Network Information Table. ✓ Network Information Table with a Carrier Definition table subtype. ✓ Network Information Table with a Modulation Mode table subtype. ● Short Form Virtual Channel Table. ✓ Short Form Virtual Channel Table with Defined Channel Map subtype. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 1. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 2. ✓ Short Form Virtual Channel Table with Optional Inverse Channel Map. ● System Time Table. ● Network Text Table. ✓ Network Text Table with optional Source Name Sub-table. ● Master Guide Table. **Note**: It is imperative that the correct Flow id be used in order for this test to function properly.	N/A	
19.	On the DUT using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Verify that navigation occurs with at least one or more of the SCTE65 profiles. Record if profile 4 is supported. **Note**: Reference step 12 for channel map.		ExchF.38 ExchF.56 FDCP.13 VirtChan.1
20.	Using whatever means available clear the channel map from the DUT. Example of this would be on a Motorola DUT press and hold the “Power” and “select” buttons on the front panel. While depressing these buttons unplug the DUT and allow the front panel to flash at least 3 times and release the buttons. Power on the DUT and verify that there is no channel map loaded. This can be accomplished by channel up down operations.	N/A	
21.	Repeat steps 1 through 9.	N/A	
22.	Under the “Flow Feed” function, click the “Browse” button. Select the “Profile5.hex” file and click “OPEN”.	N/A	

23.	Enter the FLOW_ID that was noted in step 8 into the Flow ID window and click send. In this step immediately after you click send, the following tables will be sent to the DUT. ● Network Information Table. ✓ Network Information Table with a Carrier Definition table subtype. ✓ Network Information Table with a Modulation Mode table subtype ● Short Form Virtual Channel Table. ✓ Short Form Virtual Channel Table with Defined Channel Map subtype. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 1. ✓ Short Form Virtual Channel Table with Virtual Channel Map subtype 2. ✓ Short Form Virtual Channel Table with Optional Inverse Channel Map. ● System Time Table. ● Network Text Table. ✓ Network Text Table with optional Source Name Sub-table ● Master Guide Table. ● Aggregate Event Information Table **Note**: It is imperative that the correct Flow id be used in order for this test to function properly.	N/A	
24.	On the DUT using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Verify that navigation occurs with at least one or more of the SCTE65 profiles. Record if profile 5 is supported. **Note**: Reference step 12 for channel map.		ExchF.38 ExchF.56 VirtChan.1 Hpinit.308 Hpinit.309
25.	Using whatever means available clear the channel map from the DUT. Example of this would be on a Motorola DUT press and hold the “Power” and “select” buttons on the front panel. While depressing these buttons unplug the DUT and allow the front panel to flash at least 3 times and release the buttons. Power on the DUT and verify that there is no channel map loaded. This can be accomplished by channel up down operations.	N/A	
26.	Repeat steps 1 through 9.	N/A	
27.	Under the “Flow Feed” function, click the “Browse” button. Select the “Profile6.hex” file and click “OPEN”.	N/A	

28.	Enter the FLOW_ID that was noted in step 7 into the Flow ID window and click send. In this step immediately after you click send, the following tables will be sent to the DUT. A. Network Information Table. B. System Time Table. C. Master Guide Table. D. Long Form Virtual Channel Table. **Note**: It is imperative that the correct Flow id be used in order for this test to function properly.	N/A	
29.	On the DUT using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map. Attached is the channel map that is used for this test. Verify that navigation occurs with at least one or more of the SCTE65 profiles. Record if profile 6 is supported.  Profile6_LVCT_Summary.doc		ExchF.38 ExchF.56 FDCP.14 ExchF.41 ExchF.42
30.	If the vendor stated in “Vendor Documentation” that they support CRC error checking, then remove the CableCARD and power cycle the DUT and repeat steps 1 through 9.	N/A	
31.	Open the Extended Channel Resource and under “Flow Feed” function, click the “Browse” button. Select the “Test CRC.hex” file and click “OPEN”.  TEST CRC.hex	N/A	
32.	Verify the DUT correctly processes the TestCRC.hex file.		ExchF.36 ExchF.62

5 MULTI-MEDIA INTERFACES

5.1 NTSC Analog and Vertical Blanking Interval (VBI)

5.1.1 Host VBI Pass-Through Test

This test verifies that the Host can receive analog channels with VBI data. VBI data such as closed-caption data/information is carried in the vertical interval (closed-caption is on line 21, scrambling data usually on line 10 thru 14).

Equipment: Device under test (DUT), CableCARD, Headend with analog channels and closed-caption EIA/CEA-608-C, Line 21 Data Services, TV, Tektronix VM700 or equivalent, and remote control of the DUT.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Power up the DUT and connect DTV or test monitor to NTSC output that carries closed-captioning. Turn on the closed-captioning feature on the DTV.	N/A	
2.	Insert a CableCARD	N/A	
3.	Setup a digital channel that is confirmed to have closed-caption data.	N/A	
4.	Tune the DUT to the digital channel and verify closed-caption data is displayed over the active video.	C-M	HSTDCC.1
5.	Setup an NTSC channel that is confirmed to have closed-caption data.	N/A	
6.	Tune the DUT to the NTSC channel and verify closed-caption data is displayed over the active video.	C-M	HVBIPT.1
	Connect the output of the DUT to the CVBS input of the VM700. Ensure any other inputs on the VM700 are properly terminated with 75 ohm termination.	N/A	
	On the VM700, view waveform and select line 21, averaging off	N/A	
7.	Verify analog output timing on “Line 21 is within Waveform Timing”. All waveform characteristics must fall within the timing tolerances as defined in the diagram, table, and accompanying notes in EIA 608 C.	C-M	HVBIPT.1

5.1.2 Host Analog Closed Caption Test

This test verifies that the Host can render and display Analog closed captions.

Equipment: Device under test (DUT), input NTSC channel with the closed captioning feature, and remote control of the DUT.

Procedure:

Step	Procedure	Pass/Fail	PICS
1.	Setup the NTSC channel confirmed to have closed-caption data.	N/A	
2.	Using the DUT remote, enable the closed captioning feature.	N/A	
3.	Tune to the NTSC channel with closed captioning data.	N/A	
9.	Verify Closed Captioning is displayed on the display (for a set-top) or on the DUT itself (for terminal). Note: For a set-top it is expected to observe rendered closed-captions on any digital video output (such as DVI/HDMI) or component video output when set to 480p, 720p or 1080i output. It is optional for a set-top to render closed-captions on any NTSC output (or 480i component video output) since VBI reinsertion is already required. For a terminal it is expected that rendering always occurs.	C-M	HNIACC.1

6 VIDEO

6.1 Digital Video

6.1.1 Reserved

NOTE: This section intentionally left blank to retain document's section numbering.

6.1.2 Digital Video Decoding

6.1.2.1 Digital Video Compression Test

Equipment: DUT, Television Monitor, Digital Stream Player (Analyzer), Sarnoff SD Test Stream (SCB-CABSD v.1.1), Sarnoff HD Test Streams (SCB-CABHD-VTT), QAM Modulator, Head End Feed

Note: Contact Sarnoff for Sarnoff HD Test Streams.

Setup: Connect Host Device (DUT) in one of the two following ways:

Procedure: Direct Test Connection

Step#	Procedure	Pass/Fail	PICS
1.	Connect DUT to a Head End system, ensure an initialization has completed, and a channel map has been acquired by the DUT and then remove from the Head End system.	N/A	
2.	Connect the Stream Player (containing the Sarnoff test stream) to a QAM Modulator. Bring the stream player and QAM Modulator up to a stable operating state.	N/A	
3.	Tune the QAM Modulator to a comparable frequency of the channel map loaded into the DUT. Ensure all programs within the selected stream frequency are "clear" channels, (not encrypted). Initially set QAM modulator for 64 QAM, change to 256QAMfor the second part of the test.	N/A	
4.	Program the QAM Modulator in the appropriate mode, to "pass through" the desired digital test stream from the Stream Player.	N/A	
5.	Connect the RF output of the QAM Modulator to the RF input of the DUT. Ensure output levels are set and attenuator pads added for the desired RF level into the DUT. Connect the RF output of the DUT (or audio/video) to a television monitor.	N/A	
6.	Tune the DUT to a virtual channel for program one, corresponding to the selected frequency stream.	N/A	
7.	Follow "Testing" procedure for stream detail.	N/A	

Procedure: System Test Connection

Step#	Procedure	Pass/Fail	PICS
1.	Connect the RF input of the DUT to the appropriate Head End system that contains the designated Stream Player QAM channel, (frequency). Connect the RF output of the DUT (or audio/video) to a television monitor.	N/A	
2.	Ensure Stream Player (containing the Sarnoff digital test stream) is properly connected to the desired QAM Modulator input. Initially set QAM modulator for 64 QAM, change to 256QAMfor the second part of the test.	N/A	
3.	Turn the Stream Player and all associated equipment on, and bring to a stable operating state. Turn on the DUT and bring to a stable operating state.	N/A	
4.	Follow “Testing” procedure for stream detail.	N/A	

Choice what you will be testing:

Step#	Summary	Pass/Fail	PICS
1.	If an analog component video output is present on the DUT, it SHALL comply with [CEA-770.3-C] and employ three RCA Phono jack connectors. Connect the video output to display and run the test stream for video output compliance. If an HD analog component video interface is present on DUT (as with a HD set-top), verify user controlled selection switch to HD output format with the chosen display. Connect the component video interface to display and run the test stream for video output compliance.	N/A	
2.	Sarnoff Test Stream Notes: The test will operate according to the test grid listed in Table 6.1-3 Compression Format Constraints of this document. The grid is divided into test “segment”. Each segment will have start and stop packet counts, (or times). The Stream Player may be place in the “loop mode”, allowing the DUT sufficient time to acquire the test stream signal, and display to the television monitor. Each test begins with a one-second-title screen describing the format under test. The title screen contains two moving elements to indicate that the DUT is functioning: An orange block moving from left to right in a small black box and light-gray bars moving from left to right on the top and bottom of the screen. The title screen is followed by an approximately three-second test sequence containing several moving elements: Two green vertical bars moving smoothly from left to right, two yellow horizontal bars moving from top to bottom, a large black region that fills with white blocks, and a small box in each corner of the screen which changes slowly from black to white.	N/A	

3.	Each test repeats three times, making one test segment. Please ensure that you are the beginning of the stream before beginning this test. Dead time at the end of the loop may appear as video freezes or blank screens, due to the stream player 'rewinding' to the beginning.	N/A	

Table 6.1-1 - Digital Video Compression Test Table (Sarnoff SD Formats)

Program	Test Segment	H-size	V-size	Aspect	Prog	Fr-rate	Start Packet	Stop Packet	Pass/Fail Comments
1	1	720	480	3	1	1			
PID 0x31	2	720	480	2	1	1			
Ch 22-1	3	704	480	3	1	1			
	4	704	480	2	1	1			
	5	640	480	1	1	1			
	6	640	480	2	1	1			
	7	544	480	2	1	1			
	8	528	480	2	1	1			
	9	352	480	2	1	1			
2	1	720	480	3	1	2			
PID 0x41	2	720	480	2	1	2			
Ch 22-2	3	704	480	3	1	2			
	4	704	480	2	1	2			
	5	640	480	1	1	2			
	6	640	480	2	1	2			
3	1	720	480	3	1	4			
PID 0x51	2	720	480	3	0	4			
Ch 22-3	3	720	480	2	1	4			
	4	720	480	2	0	4			
	5	704	480	3	1	4			
	6	704	480	3	0	4			
	7	704	480	2	1	4			
	8	704	480	2	0	4			
4	1	640	480	1	1	4			
PID 0x61	2	640	480	1	0	4			
Ch 22-4	3	640	480	2	1	4			
	4	640	480	2	0	4			
	5	544	480	2	0	4			
	6	528	480	2	0	4			
	7	352	480	2	0	4			
5	1	720	480	3	1	5			
PID 0x71	2	720	480	3	0	5			

Ch 22-5	3	720	480	2	1	5			
	4	720	480	2	0	5			
	5	704	480	3	1	5			
	6	704	480	3	0	5			
	7	704	480	2	1	5			
	8	704	480	2	0	5			
6	1	640	480	1	1	5			
PID 0x81	2	640	480	1	0	5			
Ch 22-6	3	640	480	2	1	5			
	4	640	480	2	0	5			

Table 6.1-2 - Digital Video Compression Test Table (Sarnoff HD Formats)

Program	Test Segment	H-size	V-size	Aspect	Prog	Fr-rate	Start Packet	Stop Packet	Pass/Fail Comments
	1	1920	1080	1	1	1			
	2	1920	1080	1	1	2			
	3	1920	1080	1	1	4			
	4	1920	1080	1	1	5			
	5	1920	1080	3	1	1			
	6	1920	1080	3	1	2			
	7	1920	1080	3	1	4			
	8	1920	1080	3	1	5			
	9	1920	1080	1	0	4			
	10	1920	1080	1	0	5			
	11	1920	1080	3	0	4			
	12	1920	1080	3	0	5			
	13	1440	1080	3	1	1			
	14	1440	1080	3	1	2			
	15	1440	1080	3	1	4			
	16	1440	1080	3	1	5			
	17	1440	1080	3	0	4			
	18	1440	1080	3	0	5			
	19	1280	720	1	1	1			
	20	1280	720	1	1	2			
	21	1280	720	1	1	4			
	22	1280	720	1	1	5			
	23	1280	720	1	1	7			
	24	1280	720	1	1	8			
	25	1280	720	3	1	1			
	26	1280	720	3	1	2			
	27	1280	720	3	1	4			
	28	1280	720	3	1	5			
	29	1280	720	3	1	7			
	30	1280	720	3	1	8			
	31	704	480	2	1	7			
	32	704	480	2	1	8			
	33	704	480	3	1	7			
	34	704	480	3	1	8			
	35	720	480	2	1	7			
	36	720	480	2	1	8			
	37	720	480	3	1	7			
	38	720	480	3	1	8			

	39	640	480	1	1	7			
	40	640	480	1	1	8			
	41	640	480	2	1	7			
	42	640	480	2	1	8			

Table 6.1-3 - Compression Format Constraints

vertical_size_ value	horizontal_size_ value	aspect_ratio_ information	frame_rate_ code	progressive _sequence
1080	1920	1,3	1,2,4,5	1
1080	1920	1,3	4,5	0
1080	1440	3	1,2,4,5	1
1080	1440	3	4,5	0
720	1280	1,3	1,2,4,5,7,8	1
480	720	2,3	1,2,4,5,7,8	1
480	720	2,3	4,5	0
480	704	2,3	1,2,4,5,7,8	1
480	704	2,3	4,5	0
480	640	1,2	1,2,4,5,7,8	1
480	640	1,2	4,5	0
480	544	2	1	1
480	544	2	4	0
480	528	2	1	1
480	528	2	4	0
480	352	2	1	1
480	352	2	4	0

Table 6.1-4 – MPEG-2 Coded Values

Legend for MPEG-2 coded values in Table 6.1-3
Aspect_ratio_information 1 = square samples 2 = 4:3 display aspect ratio 3 = 16:9 display aspect ratio
Frame_rate_code 1 = 23.976 Hz 2 = 24 Hz 4 = 29.97 Hz 5 = 30 Hz 7 = 59.94 Hz 8 = 60 Hz
Progressive_sequence 0 = interlaced scan 1 = progressive scan

Procedure 1: Testing Procedure

Step#	Procedure	Pass/Fail	PICS
1.	Set the QAM Modulator set for 64 QAM.	N/A	
2.	Play each segment of the test. Verify Pass/Fail status and comments of the output display of the DUT in the "**Digital Video Compression Test Tables"** for each segment.		HNETdig_vid.2 HNETdig_vid.3 HNETdig_vid.4 HNETdig_vid.5 HNETdig_vid.6 HNETdig_vid.8 HNETdig_vid.9 HNETdig_vid.10 HNETdig_vid.11 HNETdig_vid.12 HNETdig_vid.13 HNETdig_vid.14 HNETdig_vid.15 HNETdig_vid.16 HNETdig_vid.17 HNETdig_vid.18 HNETdig_vid.19 HNETdig_vid.20
3.	Verify the DUT decodes all "Compression Format Constraints" from Table 6.1-3 Compression Format Constraints		HDST.20
4.	If DUT is UHMS (STB), verify it decodes MPEG-2 video with resolutions shown in Table 6.1-3 Compression Format Constraints		HDST.11 HNETdig_vid.4
5.	Set the QAM Modulator set for 256 QAM.	N/A	
6.	Play each segment of the test. Verify Pass/Fail status and comments of the output display of the DUT in the "Digital Video Compression Test Tables" for each segment.		HNETdig_vid.7 HSTCCP.7
7.	Connect the three RCA Phono jack connectors to the analog component output.	N/A	
8.	Verify that the video was converted to the selected SD output format on the analog output interface.		HDST.13
9.	Connect the Y', Pb', Pr' component format connectors and test the HD analog interface.	N/A	
10	Verify the video was converted to the selected HD output format on the HD Analog Interface.		HDST.11 HNETdig_vid.4

6.1.2.2 MPEG-2 Maximum Rate Single Transport Stream Test

The DUT MPEG-2 decoder needs to support a variable bit rate input with peak rates up to the maximum rate allowed by MPEG-2 Main Profile @ High Level. The maximum available with QAM-256 is 38.81070 Mbps.)

Current CW testing dates list test streams and are available through CableLabs DocZone listed under the current CW submission. (Requires NDA agreement)

ATP test file is ZonePlate 388 Test Transport Stream.

IntroDemo_bit rate.jpg

Note: The above reference descriptor file shows SPSTS and data rate.

Equipment:

- DUT
- 38.8 Mbps test stream
- Head-end transport or setup through transport stream player
- QAM modulator.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Power up Host.	N/A	
2.	Tune to the “38.8” test stream by whatever means you choose. Note: This test stream is available on one of the headend channel maps. (Reference Head-end channel map and tune the Host to “38.8” test stream).	N/A	
3.	Verify proper reception. (For digital signals: This means picture and sound with no impairments lower than a rating of 4 on the ITU-R BT.500 scale. ("Perceptible, but not annoying").		HDST.5

6.1.3 In-Band Service/System Information

6.1.3.1 In-Band PSIP Tests

The tests in this section verify the ability of the DUT to navigate using in-band service information data. In-band Emergency Alerts are also tested here.

Table 6.1-5 describes digital services carried on three Transport Streams, modulated on RF channels 79, 80, and 81 on one of CableLabs Head-Ends. Each of the three multiplexes has been formed by play out of a 30 second or one minute loop, therefore system time given in the STT will be discontinuous, and reflect an incorrect time of day (approximately 12:05 pm, June 1, 2004 UTC).

Services in the multiplex on channel 79 are described by a TVCT (file name RF79n.mpg). Services in channel 80 are described by a CVCT and include some two-part and some one-part channel numbers (file name RF80w2.mpg). Services on channel 81 are described by both TVCT and a CVCT, each of which assign different channel numbers to a given service (file name RF81v2.mpg). The DUT must disregard the TVCT if a CVCT is present in the Transport Stream.

Table 6.1-5 identifies the one- or two-part channel number that should be displayed to the user for each service on these three multiplexes. Two virtual channels are hidden, thus not visible until such time as they might be selected by reception of a Cable Emergency Alert Message. The table also identifies the short channel name and the extended channel name, which has been chosen to identify the content.

Note that channel 93-4 is interrupted once per loop (60 seconds) by an Emergency Alert event. EAS is tested in the following section.

Here is a brief description of each of the virtual channels. Each is a 30-second or one-minute loop:

The Science channel, (parental rating TV-14). Includes a Service Location Descriptor, a “GA94” MPEG-2 Registration Description, an AC-3 audio descriptor.

A golf match, containing one English and one Spanish audio track. Rating is TV-PG-L.

A data-only channel (one without a video or audio program element).

A Korean channel (KISB) containing a single audio track labeled (by ISO 639 Language Descriptor) as Spanish. The program is rated TV-G and includes an “SCTE” MPEG-2 Registration Descriptor.

A 30-second loop of the IFC channel. The program is rated TV-PG-DLSV, and includes two audio tracks. One is a Complete Main, and the other is”Music & Effects” channel. The M&E track is labeled with a Component Name Descriptor entitled “Crowd Noise.”

Game Show channel, rated MPAA-PG13. Includes two English-language audio tracks, each labeled with a Component Name Descriptor. The first track is named “Home announcers” and the second is “Away announcers.”

BBC America, including three audio tracks (no ISO-639 Language Descriptors). The audio tracks are of type Complete Main, Visually Impaired (VI), and Hearing Impaired (HI), as identified in accompanying Audio Stream (AC-3) Descriptors. This service is rated for the Canadian region (region_code 0x02) for the “Canadian French” dimension as “16+.”

An HD channel (Hawaii volcanoes) with content advisory level TV-MA (for US region 0x01) and 16+ (Canadian region 0x02).

An audio-only channel of classical music.

Hidden channel (MTV Hits). The EAS message uses this as a Details channel.

Hidden channel (a Prince movie). The EAS uses this as a Details channel, but at such a low priority that the DUT should not tune to it.

A channel (Ovation) that will be interrupted by the EAS event occurring once per loop.

Table 6.1-5 - In-Band PSIP Test Digital Service List

Virtual Channel (UI)	Short Name	Extended Channel Name	Rating	Descriptors*	Comments
85-1	Sci85-1	"Science Loop"	TV-14	CAD, AC3, GA94, SLD	TVCT 2-part channel number
85-3	Glf85-3	"Golf Loop"	TV-PG-L	CAD, AC3, 639pe, A1	TVCT 2-part channel number. Two audio tracks, English + Spanish
85-90	CL-Data	"Data-only Loop"	-	-	Data-only channel; no audio or video component.
86-1	KISB	"KISB-1 Korean"	TV-G	CAD, RC, 639pe, SCTE	The single audio track is Spanish.
86-3	IFC-86	"IFC Loop on 86-3"	TV-PG-DLSV	CAD, AC3, CND	Two audio tracks: a CM track and an ME track. CND_{ME}="Crowd noise"
87	Game-87	"Game Show Loop"	MPAA-PG13	CAD, 639pe, CND	Two English audio tracks, CND labels each. CND_1="Home announcers" CND_2 = "Away announcers"
88	BBC-88	"BBC America Loop"	16+ (Can. Fr.)	AC3 (x3), CAD (region 2), A2	Content advisory for Canadian region; Three audio tracks: CM, VI, HI; no ISO-639 lang. descriptors.
90	KCTS-HD	"KCTS HDTV Loop"	TV-MA, 16+	CAD (region 1, region 2)	Content advisories for both US and Canadian regions
91-3	Class91	"Classical Loop 91-3"	-	Audio-only channel. CAD	Audio-only
(92-2) (hidden)	MTVhits	"EAS Details channel"	-		Hidden channel. Accessed via EAS only.
(92-3) (hidden)	Prince	"Shouldn't be here"	-		Shouldn't be tuned by EAS (low priority)
93-4	Ovation	"Interrupted by EAS"	-		Will be interrupted by EAS event.

Table 6.1-6 – Descriptor List

Service Types		Descriptors	
DV	Digital video	639pe	ISO-639 Language Descriptor at program-element level
DO	Data only	639pg	ISO-639 Language Descriptor at program level
AO	Audio only	A2	Arbitrary Descriptors (not presently defined)
Audio Tracks		AC3	Audio Stream Descriptor
CM	Complete Main	CAD	Content Advisory Descriptor (v-chip)
ME	Music & Effects	CND	Component Name Descriptor
HI	Hearing Impaired	ECND	Extended Channel Name Descriptor
VI	Visual Impaired	GA94	MRD with "GA94" format identifier
		MRD	MPEG-2 Registration Descriptor
		RC	Redistribution Control Descriptor (Broadcast Flag)
		SCTE	MRD with "SCTE" format identifier
		SLD	Service Location Descriptor

Equipment: DUT, display monitor (if needed), 3 QAM modulators, RF combiner, 3 MPEG transport Stream Players, 3 transport stream files ("RF79n.mpg", "RF80w2.mpg", "RF81v2.mpg")

Setup: Connect the DUT to the combined RF output of the three QAM modulators (each fed by a stream player, set to RF channels 79, 80 and 81).

The output power of the combiner needs to be set at 0 dBmv. Connect the output of the Combiner with the power level set to 0 dBmv to the DUT.

Procedure:

Step	Procedure	Pass/Fail	PICS
1.	With no CableCARD module inserted in the DUT, perform the initialization "channel scan" user setup step.	N/A	
2.	Tune to 85-1 and verify the Science channel displays. Note: It includes a parental rating TV-14, a Service Location Descriptor, a "GA94" MPEG-2 Registration Description and an AC-3 audio descriptor.		HstIBCS.4 HstIBCS.6 HstIBCS.30 HstIBCS.143 HstIBCS.147
3.	Tune to 85-3 and verify the golf channel displays. Note: It contains one English and one Spanish audio track with Rating TV-PG-L.		HNETdig_aud.2
4.	Tune to 85-90 and verify it is data-only channel. Note: It contains data only without a video or audio program element).		HstiBCS.1

5.	Tune to 86-1 and verify Korean channel (KISB) displays. Note: It contains a single audio track labeled (by ISO 639 Language Descriptor) as Spanish, with program Rating TV-G and includes an "SCTE" MPEG-2 Registration Descriptor.		HstIBCS.6 HstIBCS.125
6.	Tune to 86-3 and verify 30-second loop of the IFC channel. Note: The program is rated TV-PG-DLSV, includes two audio tracks: (one is a Complete Main, and the other is"Music & Effects" channel). The M&E track is labeled with a Component Name Descriptor entitled "Crowd Noise".		HstIBCS.145 HstIBCS.151 HstIBCS.153 HstIBCS.155 HstIBCS.157 HstIBCS.159
7.	Tune to 87 and verify Game Show channel displays. Note: It is rated MPAA-PG13, includes two English-language audio tracks, (each labeled with a Component Name Descriptor, the first track is named "Home announcers" and the second is "Away announcers.").		HstIBCS.151
8.	Tune to 88 and verify BBC America channel displays. Note: It includes three audio tracks (no ISO-639 Language Descriptors), the audio tracks are of type Complete Main, Visually Impaired (VI), and Hearing Impaired (HI), as identified in accompanying Audio Stream (AC-3) Descriptors. This service is rated for the Canadian region (region_code 0x02) for the "Canadian French" dimension as "16+".		HstIBCS.30 HstIBCS.125
9.	Tune to 90 and verify HD channel (Hawaii volcanoes) displays. Note: It has content advisory level TV-MA (for US region 0x01) and 16+ (Canadian region 0x02).		HstIBCS.143
10.	Tune to 91-3 and verify an audio-only channel of classical music.		HstiBCS.1

11.	Verify that all channels 86-1, 86-3, 87, 88, 90, and 93-4 are accessible (proper audio and video output/display) and labeled appropriately with the one- or two-part channel number given in Table 6.1-5 above. Notes: Channel 91-3 (an audio-only channel) may also be accessible. Other unscrambled channels below channel 85 and above channel 100 may be accessible as well.		Hnop.3 Hnop.3c Hnop.3a HstIBCS.1 HstIBCS.2 HstIBCS.3 HstIBCS.4 HstIBCS.16 HstIBCS.18 HstIBCS.19 HstIBCS.47 HstIBCS.48 HstIBCS.49 HstIBCS.69 HstIBCS.71 HstIBCS.72 HstIBCS.93 HstIBCS.149 HstIBCS.183
12.	Verify that channels 92-2 and 92-3 are not accessible by direct tuning or by channel surfing (channel-up, channel-down) as they are “hidden” channels.		HstIBCS.3
13.	Verify that channels 84-2, 84-4, 84-5, and 84-6 are NOT accessible or displayed on any UI (these are delivered in a TVCT within a multiplex also containing a CVCT).		HstIBCS.3 Hnop.3b
14.	Verify that the only channels accessible by channel surfing are those corresponding to in-the-clear services (no channel results in black video + muted audio).		Hnetdig_aud.1
15.	Insert and initialize an M-Card. Verify that DUT can deliver an out-of-band channel map.		Hnop.10

6.1.4 Closed Captioning

6.1.4.1 Closed Captioning Test from a Digital Source

This test verifies the DUT handles various fielded Closed Caption options for digital sources, reconstructs the VBI and renders captions when appropriate. It utilizes closed caption test files based upon a full variety of closed caption formats based on CEA/EIA-608-B, CEA/EIA-708-B standards, in both SCTE 20 and SCTE 21 transport formats.

Closed captions are output from a DUT either by reconstructing the VBI or by the DUT rendering the captions directly on-screen.

- **Reconstruct VBI**

  When the DUT has an active NTSC or 480i component video output and 608 caption data is available, the DUT must reconstruct the line 21 VBI which includes the 608 caption data. The closed captions are observed by enabling captions on a connected TV.

Input Captions	**Expected Result**
608 only	DUT reconstructs VBI, 608 captions observed on the connected TV
608 and 708	DUT reconstructs VBI, 608 captions observed on the connected TV

- **Render Captions**

  Rendering (decoding and displaying) captions is in addition to any requirement for reconstructing the VBI and may occur simultaneously. A terminal DUT (UHMT) must always provide an option to render captions. A set-top DUT (UHMS) must provide an option to render captions with an active 480p or greater component video output or an uncompressed digital video output. A set-top DUT may support an option to render captions with an active NTSC or 480i component video output. Rendered captions are observed by enabling captions on the DUT.

Input Captions	**Expected Result**
608 only	DUT renders 608 captions
608 and 708	DUT renders 708 captions

Equipment: DUT, QAM modulator, stream playout device w/ the below Closed Caption Test Files:

Setup: Example QAM Modulator setup.

SA QAM Modulator Setup.doc

Physical Configuration

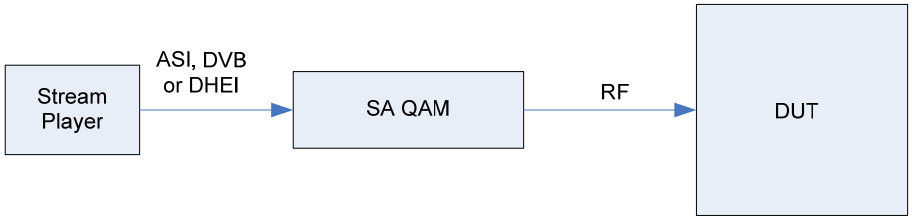


Figure 6.1-1 – DUT w/ RF Tuner Set-up

A. SCTE test streams

Note: The attached file describes the caption contents of "SCTE" files.

Test Text-11Nov2003.txt

Filename	Description
"SCTE20_only.mpg"	Contains only SCTE20 user data extensions, with NTSC captioning. The caption at the beginning of the stream reads: 608 CC
"SCTE20&SCTE21_NTSC&DTVCC.mpg"	Contains SCTE20 user data extensions with NTSC captioning, and SCTE21 user data extensions with both NTSC and DTVCC in them. The caption at the beginning of the stream reads: 608 CC 608B CC 708B CC
"SCTE21_NTSC&DTVCC.mpg"	Contains only SCTE21 user data extensions with both NTSC and DTVCC in them. The caption at the beginning of the stream reads: 608B CC 708B CC

B. PowerVu test streams

These are 3 test streams provided that have different locations for private user data mixed in with both types of standard user data. All streams have both SCTE 20 and SCTE 21 data and other user data field(s).

PowerVu 4-7-3.ts	Private User Data first
PowerVu 7-4-3.ts	Private User Data second
PowerVu 7-3-4.ts	Private User Data third

Files in this section use the same content.

Video test pattern – 75% bars

AC3 Audio 500 Hz Tone

CC Test Pattern is the string “Scientific Atlanta (CC F1)” repeated constantly

C. CEA test streams

The CEAv1.2zero.trp closed caption file is used to determine a receiver's ability to receive, decode and display ATSC caption data encoded per ATSC A/53A and CEA-708-B. The CEA bitstream includes 608 caption data "compatibility bytes" (for downstream NTSC devices), and "derived 708" (upconverted from 608) data for downstream 708 decoders. The first part of the test is run at 64QAM, the second part is run at 256QAM.

Table 6.1-7 – Closed Caption Procedure

Digital Video Closed Caption Test
Test File: CEAv1.2 zero.mpg

Display Time	Content	Service 1	Comments
01:00:02:02	Title		
01:00:11:00	FCC 91-119 Table of Standard Characters (1)		
01:00:21:00	FCC 91-119 Table of Standard Characters (2)		
01:00:31:00	FCC 91-119 Table of Standard Characters (3)		
01:00:41:00	FCC 91-119 Table of Special Characters		
01:00:51:00	EIA-608 Table 5, Extended Character Set – Spanish		
01:01:01:00	EIA-608 Table 6, Extended Character Set – Misc.		
01:01:11:00	EIA-608 Table 7, Extended Character Set – French		
01:01:21:00	EIA-608 Table 8, Extended Character Set – Portuguese		
01:01:31:00	EIA-608 Table 9, Extended Character Set – German		
01:01:41:00	EIA-608 Table 10, Extended Character Set – Danish		
01:01:50:00	FCC 91-119 Preamble Address Codes (Color)		
01:02:02:00	FCC 91-119 Preamble Address Codes (Underline)		
01:02:11:00	FCC 91-119 Preamble Address Codes (Indent)		
01:02:30:00	FCC 91-119 Mid-Row Codes		
	Roll-Up Captions:		
01:02:55:00	3-Row		
	3-Row w/Continuation		
	4-Row		
	4-Row w/Indents		
	4-Row w/PAC codes		
	3-Row w/Mid-Row codes		
	2-Row w/Special Chars		
	2-Row w/Upper Case Chars		
	3-Row, Base Row 4		
	2-Row, Base Row 2		
	4-Row, Base Row 12		
	2-Row, Base Row 14		
	4-Row, Moved w/o Erase		

	Decreased Depth		
01:03:56:02	Paint-On Captions		
	Paint-On w/Mid-Row codes		
	Pop-On, changed by Paint-On, followed by Pop-On		
	2-row Roll-Up, followed by Paint-On		
	Roll-Up erasing Paint-On		
01:04:15:02	End of Test (caption) **		

****NOTE:** The last caption does not include a clearing pulse. This can be used to check a decoder's ability to clear "hanging captions", per EIA-608 spec.

Reconstruct VBI from a Digital Source Closed Captioning Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Connect the stream playout device to the QAM modulator.	N/A	
2.	Connect the feed from the modulator into the RF input to the DUT (@ –7dBmv, mid channel). Tune the DUT to the same channel as the modulator. Run the test stream with modulator set for QAM 64 modulation. Note: The stream player should derive the correct bit rate from the stream. QAM64 bit rate = 26.97035	N/A	
3.	Connect the NTSC or 480i component video output of the DUT to a TV.	N/A	
4.	Enable captions and select C1 service on the connected TV only. (Disable captions on the DUT)	N/A	
5.	The Stream Player may be placed in the “loop mode”, allowing the DUT sufficient time to acquire the test stream signal, and display correctly.	N/A	
6.	Using the SCTE files, verify that the 608 closed captions (from either SCTE 20 or SCTE 21 format) are displayed on the connected TV for each file segment for each available NTSC or 480i component video output on the DUT and that the beginning of each stream presents captions according to each SCTE type file description listed above.		HSTDCC.1 HSTDCC.2 HSTDCC.3
7.	Change to the PowerVu test streams on the stream player. Verify that the 608 closed captions (from either SCTE 20 or SCTE 21 format) are displayed on the connected TV for each file segment for each available NTSC or 480i component video output on the DUT.		HSTDCC.1 HSTDCC.2 HSTDCC.3 HSTDCC.70
8.	Change to the first part of the CEA test stream. Verify that the 608 closed captions are displayed on the connected TV for each available NTSC or 480i component video output on the DUT and that the title information is displayed for each sequence. Note: The closed caption display should run as indicated by the title screen, providing smooth transitions and proper characters.		HSTDCC.1 HstIBCS.141 HSTDCC.12
9.	Change to 256QAM for the second part of the CEA test. QAM256 bit rate = 38.81070	N/A	
10.	Change to the second part of the CEA test stream. Verify that the 608 closed captions are displayed on the connected TV for each available NTSC or 480i component video output on the DUT and that the title information is displayed for each sequence. Note: The closed caption display should run as indicated by the title screen, providing smooth transitions and proper characters.		HSTDCC.1 HstIBCS.141 HSTDCC.12

Render Closed Captions from a Digital Source Procedure:

For each verification step below, these requirements apply:

- A terminal DUT must always render these captions.
- A set-top DUT must render these captions with a 480p or greater component video output and any uncompressed digital video output. A set-top DUT may optionally render these captions for NTSC or 480i component video outputs (in addition to simultaneously reconstructing the VBI).

Step#	Procedure	Pass/Fail	PICS
1.	Change to 64QAM. QAM64 bit rate = 26.97035	N/A	
2.	For a set-top DUT connect one of the video outputs to a TV. (Each DUT video output should be checked in the steps below).	N/A	
3.	Enable captions and select C1 service/ Service 1 on DUT only. (Ensure captions are disabled on any connected TV).	N/A	
4.	Using the "SCTE20_only.mpg" stream, verify that the 608 closed captions are displayed on the terminal DUT or set-top DUT's connected TV for each file segment and that the beginning of each stream presents captions according to the SCTE20 type file description listed above. Verify the reconstruction of VBI on any active NTSC or 480i component video output.		HSTDCC.2 HSTDCC.69 HSTDCC.71
5.	Using the SCTE20/21 and SCTE21 streams, verify that the 708 closed captions are displayed on the terminal DUT or set-top DUT's connected TV for each file segment and that the beginning of each stream presents captions according to the SCTE file type file descriptions listed above. Verify the reconstruction of VBI on any active NTSC or 480i component video output.		HSTDCC.2 HSTDCC.3 HSTDCC.69 HSTDCC.15 HSTDCC.71 HSTDCC.72 HSTDCC.73
6.	Change to the PowerVu test streams on the stream player. Verify that the closed captions (from either SCTE 20 or SCTE 21 format) are displayed on the terminal DUT or set-top DUT's connected TV for each file segment. Verify the reconstruction of VBI on any active NTSC or 480i component video output.		HSTDCC.1 HSTDCC.2 HSTDCC.3 HSTDCC.69 HSTDCC.70 HSTDCC.71
7.	Change to the first part of the CEA test stream. Verify that the 708 closed captions are displayed on the terminal DUT or set-top DUT's connected TV and that the title information is displayed for each sequence. Note: The closed caption display should run as indicated by the title screen, providing smooth transitions and proper characters.		HSTDCC.69 HSTDCC.72 HSTDCC.73 HSTDCC.15 HstIBCS.141 HSTDCC.12
8.	Change to 256QAM for the second part of the CEA test. QAM256 bit rate = 38.81070	N/A	

9.	Change to the second part of the CEA test stream. Verify that the 708 closed captions are displayed on the terminal DUT or set-top DUT's connected TV and that the title information is displayed for each sequence. Note: The closed caption display should run as indicated by the title screen, providing smooth transitions and proper characters. Verify the reconstruction of VBI on any active NTSC or 480i component video output.		HSTDCC.69 HSTDCC.15 HstIBCS.141 HSTDCC.12

6.1.5 Emergency Alert Service (EAS)

6.1.5.1 In-Band EAS Tests

The tests in this section verify the ability of the DUT to handle in-band EAS (Cable Emergency Alert) messages.

The Transport Stream modulated on channel 81 is used for these tests. Channel 81 includes three visible (90, 91-3 and 93-4) and two hidden (92-2 and 92-3) virtual channels. Channels 90 and 91-3 are included in the "exception list" and hence are not interrupted by the EAS event. Channel 93-4 will be affected by an EAS event.

NOTE: The transport streams (and modulator setup) are the same as "In-Band PSIP".

The EAS tests start (at the beginning of the loop) with a low-priority test, with no channel exceptions, that should be ignored by the DUT because of its low priority.

Next,several two-second events are sent, each extending the time duration of the prior event. Then an infinite duration event is sent including text for display, followed 10 seconds later by a two-second event. At the end of those two seconds, return should be made to the channel that was initially interrupted.

Equipment: Host device under test, display monitor (if needed), QAM modulators, RF combiner, MPEG Stream Player.

Setup: In order to run this test you will need to have a MPEG stream player, 1 QAM modulators set up at EIA 81. The output of these modulators needs to be connected to the RF combiner. The output power on the combiner needs to be set at 0 dBmv. Connect the output of the Combiner with the power level set to 0 dBmv to the DUT.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	With no CableCARD module inserted in the DUT, perform the initialization "channel scan" user setup step, if not already done in the "In-band PSIP tests" section above.	N/A	
2.	Tune to channel 90 and verify that the full one-minute loop is viewable without interruption.		HNIEAS.17 HNIEAS.19a HNIEAS.22

3.	Tune to channel 93-4. Verify that at 20 seconds following the start of the loop, an EAS event causes channel 92-2 to be accessed (MTVhits channel).		HNIEAS.1 HNIEAS.4 HNIEAS.5 HNIEAS.6 HNIEAS.7 HNIEAS.8 HNIEAS.9 HNIEAS.14 HNIEAS.15 HNIEAS.16 HNIEAS.17 HNIEAS.18 HNIEAS.19a HNIEAS.23 HNIEAS.24 HNIEAS.26 HNIEAS.28 HNIEAS.29 HNIEAS.31 HNIEAS.32 HNIEAS.33 HNIEAS.38
4.	Verify that the DUT stays on channel 92-2 for 20 seconds (with no audio/video glitches in that period) and then returns to channel 93-4.		HNIEAS.17 HNIEAS.19a HNIEAS.20 HNIEAS.25 HNIEAS.27 HNIEAS.34 HNIEAS.35 HNIEAS.36 HNIEAS.37 HNIEAS.39

6.1.6 OOB EAS Tests

This test verifies the DUT correctly behaves when different priorities of ANSI J-STD-042-2002 Cable_Emergency_Alert() messages are sent via the out-of-band (OOB) mode.

Equipment: Host under test (DUT), possibly monitor, HPNx Pro Test tool and these three OOB files (Low_Priority.hex, Medium_priority.hex, and Maximum_priority.hex), plus valid System Information (SI) Channel Maps of either Motorola or SA.


Low_priority_V2.hex

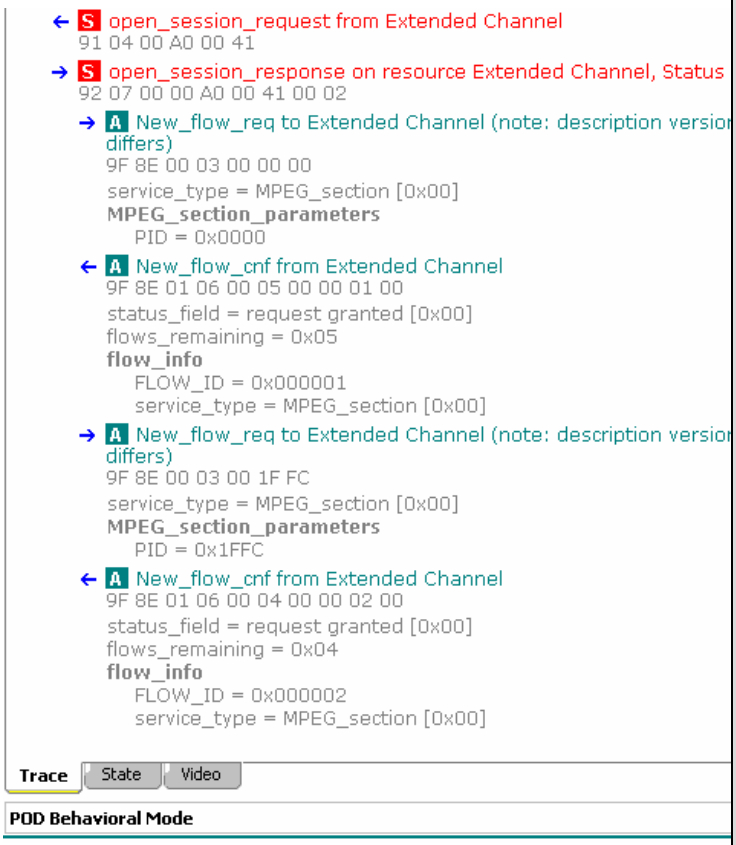

Meduim_priority_V2.hex


Maximum_priority_V2.hex

Note: The attached files need to be copied to the computer running the HPNX PRO application.

Procedure:

Step#	Procedure	Pass/Fail	PICS
1.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
2.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
3.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”.	N/A	
4.	Insert the HPNx Pro extender card into DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
5.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
6.			
7.	Select “Extended channel” tab, depending on the DUT you may have to change the resource version of the HPNX PRO to match that of the DUT. To change version, right click on the extended channel slot session. Select “Change resource version”. In the explorer user prompt window enter the correct resource version needed to match the DUT. Click OK. On the “Extended channel” tab press the Play button to open the extended channel resource.	N/A	
8.	On the “Extended channel” tab press the Play button to open the extended channel resource.	N/A	

Step#	Procedure	Pass/Fail	PICS
9.	Verify that the DUT issues a New_flow_req to Extended Channel requesting a service_type = MPEG_section with a PID = 0x1FFC. See example below.  Record the FLOW_ID from the the New_flow_cnf () APDU. Flow ID: _____	N/A	
10.	Select “System Time ” tab, and press the play button.	N/A	
11.	Under the “Extended channel session slot” tab, expand the Flow Feed button.	N/A	
12.	Next to the “SI table file” click the browse button and select a current System Time file from wherever you have stored it on the HPNx Pro. Click “OPEN”. Note: It is best to create new system time file for testing.	N/A	
13.	Enter the FLOW_ID noted in HPNx Pro trace and click send.	N/A	
14.	Under same “Flow Feed, next to the “SI table file” click the browse button. Select the “Profile1.hex” file from wherever you have stored it on the HPNx Pro. Click “OPEN”.	N/A	
15.	On the DUT, using the channel up and down buttons or the remote control, verify that the channel map has been successfully loaded and that the DUT can navigate the channel map.	N/A	

Step#	Procedure	Pass/Fail	PICS
16.	Under same “Flow Feed” next to the “SI table file” click the browse button. Select the “Low_priority_v2.hex” file from wherever you have stored it on the HPNx Pro. Click “OPEN”. Enter the FLOW_ID that was noted earlier. Click send.	N/A	
17.	Verify that the DUT Ignores the Low_priority_v2.hex message as the priority is set to “0”.		HNIEAS.22 HNIEAS.11
18.	Under same “Flow Feed” tab, next to the “SI table file” click the browse button. Select the “Medium_priority_v2.hex” file from wherever you have stored it on the HPNx Pro. Click “OPEN”. Enter the FLOW_ID that was noted earlier. Click send.	N/A	
19.	Verify that the DUT starts a scrolling message “EAS Blizzard Warning test message if you get this look outside and see if it is snowing”.		HNIEAS.2 HNIEAS.10
20.	Under same "Flow Feed" tab next to the "SI table file" click the browse button. Select the "Medium_priority_v2.hex" file from wherever you have stored it on the HPNx Pro. Click "OPEN". Enter the FLOW_ID that was noted earlier. Click send.	N/A	
21.	Verify that the DUT ignores the duplicate message.		HNIEAS.13 HNIEAS.19 HNIEAS.40
22.	Upon scroll completion, Under same “Flow FEED” tab, next to the “SI table file” click the browse button. Select the “Maximum_priority_v2.hex” file from wherever you have stored it on the HPNx Pro. Click “OPEN”. Enter the FLOW_ID that was noted earlier.	N/A	
23.	Insert RF 81v2.mpg stream into the player. The Stream Player may be placed in the “loop mode”, allowing the DUT sufficient time to acquire the test stream signal, and display correctly.	N/A	
24.	Verify that the DUT force tunes to channel 163. Using the remote control try to tune off channel 163 within 120 seconds of the initial force tune.		HNIEAS.6 HNIEAS.21
25.	Click Play on the stream player. Note: Within 20 seconds, the in-band (RF 81v2) stream uses EAS message as a Details channel.	N/A	
26.	Verify that the OOB EAS force tune message was not interrupted.		ExchF.62 ExchF.60 HNIEAS.12

6.1.7 Content Advisory

The purpose of this test is to verify:
From Analog Source:

1) That the DUT can extract CEA-608 XDS Content Advisory packet 0x05 from the VBI of an analog channel,
2) Pass that 608 data to a downstream TV (for a 480i output of a set-top)
3) Perform blocking of U.S. ratings, if supported by the DUT.

From Digital Source:

1) That a terminal DUT can *process* content advisory descriptors.
2) That set-top DUT must provide an option to render captions with an active 480p or greater component video output or an uncompressed digital video output.
3) Perform blocking of U.S. ratings, if supported by the DUT.

Equipment: DVD Player with baseband video output, QAM Modulator, Stream Player, Content Advisory DVD (Line 21Tests), "ratings.ts" CD and "RF80w2.mpg", "RF81v2.mpg" streams.

For each verification procedures below, these requirements apply:

- A terminal DUT must always process content advisory descriptors.
- A set-top DUT must render content advisory descriptors with a 480p or greater component video output and any uncompressed digital video output.

Procedure: Analog Source

Step#	Procedure	Pass/Fail	PICS
1.	Hook the baseband output of the DVD player to the baseband input of the RF modulator and then hook the RF output of the RF modulator to the RF input of the DUT. Set the TV channel switch to (3 or 4) on the RF modular.	N/A	
2.	Tune the DUT to that channel. Insert the DVD labeled "Line 21 Tests"; "Ratings Tests ". Click Play on the DVD player.	N/A	
3.	Content advisory Line 21 Test includes these ratings: TV - None TV – Y TV - Y7 TV - Y7 - FV TV - G TV - PG TV - PG - D TV - PG - L TV - PG - S TV - PG - V TV - PG - D - L TV - PG - D - S TV - PG - D - V TV - PG - L - S TV - PG - L - V	N/A	

	TV - PG - S - V TV - PG - D - L - S TV - PG - D - L - V TV - PG - D - S - V TV - PG - L - S - V TV - PG - D - L - S - V TV - 14 TV - 14 - D TV - 14 - L TV - 14 - S TV - 14 - V TV - 14 - D - L TV - 14 - D - S TV - 14 - D - V TV - 14 - L - S TV - 14 - L - V TV - 14 - S - V TV - 14 - D - L - S TV - 14 - D - L - V TV - 14 - D - S - V TV - 14 - L - S - V TV - 14 - D - L - S - V TV - MA TV - MA - L TV - MA - S TV - MA - V TV - MA - L - S TV - MA - L - V TV - MA - S - V TV - MA - L - S - V MPAA - N/A MPAA - G MPAA - PG MPAA - PG13 MPAA - R MPAA - NC-17 MPAA - X MPAA - Not Rated		
4.	Verify that the DUT (if applicable), can display content advisory rating information for each of the ratings listed above.			HNIRate.2
5.	Use the DUT remote to setup DUT to block content advisory over a rating “TV-G”.		N/A	
6.	Verify that the DUT can block on the rating and presents message for OSD similar to “Rating Limit Exceeded”.			HNIRate.2
7.	Verify that any DUT with a 480i output can pass 608 data to a downstream TV.			HNIRate.2

Procedure 2: Reconstruct Ratings from a Digital Source

Step#	Procedure	Pass/Fail	PICS
1.	Connect the stream player device to the QAM modulator.	N/A	
2.	Connect the feed from the modulator into the RF input to the DUT (@ –7dBmv, mid channel). Tune the DUT to the same channel as the modulator. Insert the "Ratings.ts" test stream. (includes content descriptors) Play the stream with modulator set for QAM 64 modulation. Note: The stream player should derive the correct bit rate from the stream. QAM64 bit rate = 26.97035	N/A	
3.	Connect the video output of the DUT to a TV.	N/A	
4.	The Stream Player may be placed in the "loop mode", allowing the DUT sufficient time to acquire the test stream signal, and display correctly.	N/A	
5.	Verify the DUT can process 608 content advisory data to connected TV of each file segment		HNIRate.3
6.	If the DUT is a DTV, verify DUT can decode and display the content advisory data.		HNIRate.4
7.	Use TV remote to setup the TV to block over "TV –G" rating.	N/A	
8.	Verify that the DUT can block on the rating and presents message for OSD similar to "Rating Limit Exceeded".		HNIRate.3

Procedure 3: Render Ratings from a Digital Source

Step#	Procedure	Pass/Fail	PICS
10.	Change to 64QAM. QAM64 bit rate = 26.97035	N/A	
11.	For a set-top DUT connect the video output (HDMI/DVI) to a monitor. Notes: 1. The set-top DUT needs to support 480p or greater component video or any uncompressed digital output. 2. Vendor documentation may be required to put DUT into correct mode.	N/A	

12.	The content advisory “Ratings’” include: TV - None TV – Y TV - Y7 TV - Y7 - FV TV - G TV - PG TV - PG - D TV - PG - L TV - PG - S TV - PG - V TV - PG - D - L TV - PG - D - S TV - PG - D - V TV - PG - L - S TV - PG - L - V TV - PG - S - V TV - PG - D - L - S TV - PG - D - L - V TV - PG - D - S - V TV - PG - L - S - V TV - PG - D - L - S - V TV - 14 TV - 14 - D TV - 14 - L TV - 14 - S TV - 14 - V TV - 14 - D - L TV - 14 - D - S TV - 14 - D - V TV - 14 - L - S TV - 14 - L - V TV - 14 - S - V TV - 14 - D - L - S TV - 14 - D - L - V TV - 14 - D - S - V TV - 14 - L - S - V TV - 14 - D - L - S - V TV - MA TV - MA - L TV - MA - S TV - MA - V TV - MA - L - S TV - MA - L - V TV - MA - S - V TV - MA - L - S - V MPAA - N/A MPAA - G MPAA - PG MPAA - PG13 MPAA - R MPAA - NC-17 MPAA - X MPAA - Not Rated	N/A	

13.	Insert the “Ratings.ts ” stream. Click Play. Verify that the content advisory descriptor ratings within the transport stream are displayed on the terminal DUT or set-top’s connected TV for each rating segment. Note: The “Ratings.ts” stream contains content_advisory_descriptor () (0x87), when present, as defined in ATSC A/65-CB and EIA 766-A and transported in either the PMT of the in-band MPEG-2 transport stream		HNIRate.1
14.	Per vendor documentation, setup the set-top to block over “TV –G” rating.	N/A	
15.	Verify that the DUT can block on the rating and presents message for OSD similar to “Rating Limit Exceeded”.		HNIRate.3
16.	Change the transport stream player to the RF80w2.mpg stream.	N/A	
17.	Tune to virtual channel 88. Check that the BBC America channel displays. The service is rated for the Canadian region (region_code 0x02) for the “Canadian French” dimension as “16+”. Use the DUT remote menu to verify service information content on rating region. Note: Verify the DUT is not adversely affected by the receipt of a content advisory descriptor referencing a rating region unsupported.		HNIRate.5 HNIRate.6 HNIRate.7
18.	Change the transport stream player to the RF81v2.mpg stream.	N/A	
19.	Tune to virtual channel 90. Check that the HD channel (Hawaii volcanoes) displays. It has content advisory level TV-MA (for US region 0x01) and 16+ (Canadian region 0x02). Use the DUT remote to verify service information content on rating region.		HNIRate.5 HNIRate.6 HNIRate.7

6.2 Video Performance Specifications

6.2.1 Uncompressed Digital Video Interface & Signal Formats

6.2.1.1 Uncompressed Digital Video Interface Test

M-JTS follows EIA/CEA 861 standard defined waveform timing requirements and discovery structures that shall be used to provide uncompressed, base-band digital interfaces on digital televisions (DTV) or DTV monitors. HDMI is a derivative of DVI that adds new features to the TMDS-based uncompressed high-speed digital video interface.

Table 6.2-1 - Required Video Formats and their Relation to CEA Definitions

CEA Definition	Video Format	EDTV Monitor (Display)	HDTV Monitor (Display)	EDTV Tuner (Source)	HDTV Tuner (Source)
SDTV	720x480i	o	o	o	o
EDTV	640x480p	x	x	✔*	✔*
EDTV	720x480p	x	x	✔*	✔*
HDTV	1280x720p	o	✕*	o	✔
HDTV	1920x1080i	o	✕*	o	✔

Legend

✕ Required by the EIA/CEA 861 standard
✕* Either one of the two formats is required, the other is optional
✔ Recommended by this standard and implied by CEA DTV definitions
✔* Either one of the two formats is recommended, the other is optional
o Optional

Table 6.2-2 - Summary of Required Video Formats per EIA/CEA 861 specifications

Type	Video Format	Field Rate	Picture Aspect Ratio	Pixel Aspect Ratio	Requirement
VGA	640x480p	59.94Hz	4:3	1:1	**Required**
SDTV	720x480p	59.94Hz	4:3	8:9	**Required** in one of the two picture aspect ratios.
SDTV	720x480p	59.94Hz	16:9	1:1	**Required** in one of the two picture aspect ratios.
HDTV	1280x720p	59.94Hz, 60Hz	16:9	*1:1*	One of these (1280x720p or 1920x1080i) HDTV formats is **Required**
HDTV	1920x1080i	59.94Hz, 60Hz	16:9	1:1	One of these (1280x720p or 1920x1080i) HDTV formats is **Required**
	720x480i	59.94Hz, 60Hz	4:3	8:9	**Optional**

	720x480i	59.94Hz, 60Hz	16:9	32:27	**Optional**

The DTV Monitor shall have the capability of displaying either 59.94 or 60Hz (frame rate for progressive scan and field rate for interlaced scan) for the formats that it supports.

The source device is responsible for the format conversions necessary to supply video, based on VESA Enhanced Extended Display Identification (E-EDID) for format discovery.

Assumption: The specified video signal generator technique is applicable for discrete transmitter testing to input components and MAY provide support for an uncompressed digital video interface (output) using either Digital Visual Interface DVI or High-Definition Multimedia Interface HDMI.

Test Equipment:

Quantum Data Inc. Model 802 Series (802BT) HDMI test generator tool or equivalent. The optional Quantum Data High-bandwidth Digital Copy Protection (HDCP) software tests for production key.

The type of video that is output by the video signal generator transmit (tx) can be controlled from the front panel controls of the Quantum video signal generator.

Test Scope:

Procedure: M-UDCP M-Card Settop (UHMS)

Step#	Procedure	Pass/Fail	PICS
1.	When testing a set-top device, (UHMS), verify it supports an uncompressed digital video interface (output) using either Digital Visual Interface [DVI] or High-Defintion Multimedia Interface [HDMI].	C-M	UDVI.1
2.	If the DUT includes an HDMI output, verify it is using a female HDMI connector, which at a minimum supports the Single Link Transmission Minimized Differential Signaling as defined in [HDMI].	C-M	UDVI.5
3.	If the DUT includes a DVI output, verify it is using a female DVI-D connector, which at a minimum supports the Single Link Transmission Minimized Differential Signaling as defined in [DVI].	C-M	UDVI.4
4.	Put the settop in each of the supported output modes (if possible).	N/A	
5.	Verify the DUT displays/ presents the output it supports		HDST.21

Procedure: M-UDCP M-Card Terminal (UHMT)

Step#	Procedure	Pass/Fail	PICS
1.	When testing a terminal device, (UHMT), verify it supports an uncompressed digital video interface (input) using either Digital Visual Interface [DVI] or High-Defintion Multimedia Interface [HDMI].		UDVI.2

Step#	Procedure	Pass/Fail	PICS
2.	The DUT MAY provide support for an uncompressed digital video interface (output) using either Digital Visual Interface [DVI] or High-Defintion Multimedia Interface [HDMI]	O	UDVI.1
3.	If the DUT includes a DVI input and/or output, verify it is using a female DVI-D connector, which at a minimum supports the Single Link Transmission Minimized Differential Signaling as defined in [DVI].	C-M	UDVI.4a
4.	If the DUT includes an HDMI input and/or output, verify it is using a female HDMI connector, which at a minimum supports the Single Link Transmission Minimized Differential Signaling as defined in [HDMI].	C-M	UDVI.5a
5.	Reset the video signal generator to remove any previous mode by holding the ACS, DCS & DSS key buttons while powering-on. Release buttons when LCD window displays the text “no special modes” and wait for initialization to complete. Now power down signal generator for next step.	N/A	
6.	Hold the STEP, G, B buttons and power-on the signal generator. Release the buttons when the LCD window displays the text “status display” and wait for initialization to complete. This will cause information to be displayed, just to the left of the format name, indicating the current video output format mode. Status Display values: Left Character X represents (either A for Analog video format, D for DVI video format and H for HDMI video format. Center Digit X represents (either 4 Bits-per-pixel Depth or 8 Bits-per-pixel Depth) Right Character X represents (M for Monochrome Video, C for RGB Color Video, Y for Color Difference Mode) Using example (H8C); shows the left character is H=HDMI mode, center digit is 8= 8 bits-per-pixel depth, right character is C= RGB Color Video. Whenever the component trio is RGB, the letter “C” will appear, while the letters “Y” or “y” indicate the presence of YCbCr (optional) color difference video encoding. In the case of color difference video, an uppercase “Y” indicates 4:4:4 color sampling, while a lowercase “y” signals 4:2:2 color sampling.	N/A	
7.	Press the G, B button to toggle the analog to digital mode. This mode lists three characters that show the status of the selected format.	N/A	
8.	Connect the HDMI-to-HDMI or HDMI-to-DVI cable to Model 802 BT generator’s “TX” (HDMI) output connector. Connect the other end of the cable to the DUT’s digital input interface. (Either HDMI or DVI).	N/A	
9.	Check that the status display (XXX) starts with letter H (HDMI protocol). If the letter C is in the last digit, (the component trio is RGB). You may have to add the missing color back into the display by pressing the color letter button.	N/A	

Step#	Procedure	Pass/Fail	PICS
10.	On Model 802 generator, to the right of the Front panel "LCD Window" turn the "Format" knob to the first format listed in the table below. Turn the "Image" knob to the corresponding image listed with that defined format from the list. Go through each of the listed format/images and verify each displays the format/image onscreen. Notes: Format and image files are alphabetical. Turning the generator's OUTPUTS/ ON off (light off), before changing format/image ensures the signal does not output till format/image is set. Image GenOps displays the video signal generator's command information. Each time you change the format, you will need to press the G, B and then R to get back into digital HDMI mode. Remember to "Turn the signal generator back on" (Outputs/ON) (light on) before each test.	N/A	

<table>
<tr><th>Step#</th><th>Procedure</th><th>Pass/Fail</th><th>PICS</th></tr>
<tr><td>11.</td><td>Test each of the defined format/images at the resolution defined and note your results in the Pass/Fail column.
<table>
<tr><th>Step</th><th>Format</th><th>Image</th><th>R-G-B</th><th>Resolution</th><th></th><th>Pass
Fail</th></tr>
<tr><td>1</td><td>DMT0659</td><td>PGCB</td><td>R-G-B</td><td>640x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>2</td><td>DMT0659</td><td>Dyna</td><td>R-G-B</td><td>640x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>3</td><td>DMT0659</td><td>Flat_B</td><td>B</td><td>640x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>4</td><td>DMT0659</td><td>Flat_G</td><td>R</td><td>640x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>5</td><td>DMT0659</td><td>Flat_R</td><td>G</td><td>640x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>7</td><td>480p59</td><td>PGCB</td><td>R-G-B</td><td>720x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>8</td><td>480p59</td><td>Dyna</td><td>R-G-B</td><td>720x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>9</td><td>480p59</td><td>Flat_B</td><td>B</td><td>720x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>10</td><td>480p59</td><td>Flat_G</td><td>R</td><td>720x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>11</td><td>480p59</td><td>Flat_R</td><td>G</td><td>720x480p</td><td>H31/V60</td><td></td></tr>
<tr><td>12</td><td>720p59</td><td>PGCB</td><td>R-G-B</td><td>1280x720p</td><td>H45/V60</td><td></td></tr>
<tr><td>13</td><td>720p59</td><td>Dyna</td><td>R-G-B</td><td>1280x720p</td><td>H45/V60</td><td></td></tr>
<tr><td>14</td><td>720p59</td><td>Flat_B</td><td>B</td><td>1280x720p</td><td>H45/V60</td><td></td></tr>
<tr><td>15</td><td>720p59</td><td>Flat_G</td><td>R</td><td>1280x720p</td><td>H45/V60</td><td></td></tr>
<tr><td>16</td><td>720p59</td><td>Flat_R</td><td>G</td><td>1280x720p</td><td>H45/V60</td><td></td></tr>
<tr><td>17</td><td>1080i30</td><td>PGCB</td><td>R-G-B</td><td>1920x1080i</td><td>H34/V60</td><td></td></tr>
<tr><td>18</td><td>1080i30</td><td>Dyna</td><td>R-G-B</td><td>1920x1080i</td><td>H34/V60</td><td></td></tr>
<tr><td>19</td><td>1080i30</td><td>Flat_B</td><td>B</td><td>1920x1080i</td><td>H34/V60</td><td></td></tr>
<tr><td>20</td><td>1080i30</td><td>Flat_G</td><td>R</td><td>1920x1080i</td><td>H34/V60</td><td></td></tr>
<tr><td>21</td><td>1080i30</td><td>Flat_R</td><td>G</td><td>1920x1080i</td><td>H34/V60</td><td></td></tr>
</table>
Note: It is imperative that you check that “status display” is displayed left side of format for these tests. (When DUT reports it does not see signal “no signal” on the display it could mean the generator has reverted to analog mode). Also, each time you change the format it will require that you toggle back to digital mode. (Press both G, B buttons to toggle).</td><td>N/A</td><td></td></tr>
</table>

Step#	Procedure	Pass/Fail	PICS
12.	Refer back to previous step (Required Video Formats table) and verify that the each format/image displays correctly for these "**Required" source device** test Image formats. -720x480p -1280x720p or 1920x1080i **Note:** Other formats listed in the table MAY have also passed but are not required.		HDST.21 HDST.22 HDST.24
13.	Turn the signal generator outputs "off" (on off). Using the signal generator Front LCD Window, select one of the formats the DUT accepted and set the image knob to EdidData (d48). Turn the signal generator's outputs ON.	N/A	
14.	Verify that the (EdidData) test image displays on the host display monitor. Host Screen display text shall state: "To start the EDID image:" For boxes Press the STEP button (step on) then rotate the image knob. For cards use the command: ISUB 1; IVER 0; IMGU Follow above procedure for boxes; Press the step button then rotate the image knob through 6 pages of screen display and then "the last one page left blank intentionally". Verify readable text on each page. (6 pages) Press the step button (step off) to exit EDID Image control. Press the outputs "ON" to off.		HDST.23
15.	From the video signal generator's LCD Window, leave the format the same and turn the Image knob to "HdcpProd". Press the outputs "ON". (If display is flashing, try one of the other formats tested from above list). Text with standard background Color-Bar screen should be displayed to the "Host" screen display. Note: The text lists the automatic sequencing through the internal and external HDCP communications authentication process.	N/A	
16.	Verify that the boxed text message displays: "HDCP test passed as long as you can read this." Verify that The RiTx and RiRx display a changing hex data display every two seconds and that the number counts for at least 30 seconds. Stop the video signal generator tool by pushing the "outputs" LED to off (Light OFF)		UDVI.7 UDVI.8
17.	Refer back to table results for the format/images (Flat_R, Flat_G, Flat_B) showing RGB video display.	N/A	

Step#	Procedure	Pass/Fail	PICS
18.	Verify the DUT displayed the RGB component format for at least these "**Required" source device** test Image formats. -720x480p -1280x720p or 1920x1080i **Note:** Other formats listed in the table MAY have also passed but are not required.		HDST.25

7 AUDIO

7.1 Audio Performance Specifications

7.1.1 Audio Parametric/ Digital Audio FunctionalityTest

Vendor Submit: Certification

Step#	Procedure	Pass/Fail	PICS Item
			Audio.15 HstIBCS.30 HstIBCS.182 HNETdig_aud.2 HNETdig_aud.4 HNETdig_aud.5 HNETdig_aud.6 HNETdig_aud.7 HNETdig_aud.8 HNETdig_aud.9 HNETdig_aud.11 HNETdig_aud.12 HNETdig_vid.22
1.	Proper documentation in Host package Submitted by vendor to include the following: Dolby Digital Decoding Certification and Dolby Acceptance Letter.		

8 HOST DEVICE POWERING STATES

8.1.1 Host Power Supply Test

This test measures the ability of the Host Power Supply to remain within regulation limits with the peak current load of the CableCARD applied.

Equipment:
DUT, DC Electronic load devices, (Such as Kikusui PLZ153W or equivalent), DC Voltmeter, Ohmmeter,
Sycard PCExtend 140A,
Quantity ≤ 25cm lengths of 22AWG cables with correct connector types.

Setup: Verify the host power cord is disconnected use ≤ 25cm length 22AWG hook up wires for the following connections.

1.) Connect the two VCC pins on J1 and J2 of the extender card to the positive terminal of the first electronic load. Connect two of the GND pins of J1 and J2 to the negative terminal of the first electronic load.

2.) Connect the VPP2 on J2 of the extender card to the positive terminal of the second electronic load. Connect two of the GND pins of J1 and J2 to the negative terminal of the second electronic load. Connect the extender card to the Host under test.

3.) Set the electronic loads to constant current mode. Set the VCC load to 1.0A and the VPP2 load to 0.125A. (Consult the electronic load manual for operation detail if necessary.)
Plug in the Host.

Note: Due to power supply design options (regulation may be based on VCC output), it may be necessary to apply a load to VCC for VPP2 voltage test.

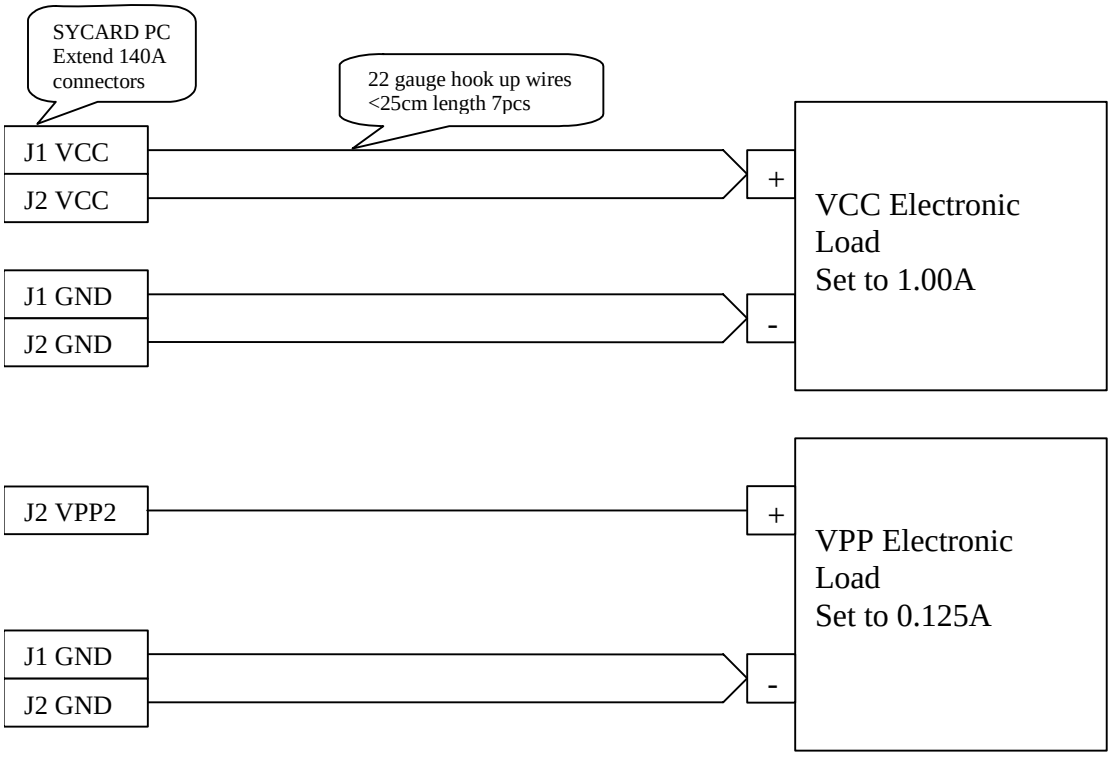


Figure 8.1-1 – DUT Power Suply Test Set-up

Procedure:

Step#	Procedure	Pass/Fail	PICS Item
1.	Apply Power to the DUT.	N/A	
2.	Insert the SYCARD PCextender CARD into the DUT.	N/A	
3.	Measure the voltage between the VCC and GND test points on the extender card with the DC voltmeter. Verify that the VCC pins are at a High-Z with the Ohmmeter. **Note**: The Host shall not apply 3.3V on VCC pins until Card-type identification and M-CARD discovery is performed.		HPower.12
4.	Measure the voltage between the VPP2 and GND test points on the extender card with the DC voltmeter. Verify that the VPP2 pin is at a High-Z with the Ohmmeter. **Note**: The Host shall not apply 5V on VPP2 pin until Card-type identification and M-CARD discovery is performed.		HPower.12
5.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
6.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	

7.	Under the Device tab, enter the 4 digits in the blank space labeled “Your HPNx Pro ID”	N/A	
8.	Insert the HPNx Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its session.	N/A	
9.	Set the VCC electronic load to on. Verify the load is drawing 1.00A with the load meter. If necessary, adjust the current setting to draw 1.00A.	N/A	
10.	Measure the voltage between the VCC and GND test points on the extender card with the DC voltmeter. Record the results. **Note**: The Host shall apply 3.3V ± 0.3 VDC on VCC pins after Card-type identification and M-CARD discovery is performed.		Hpower.11 Hpower.12 Hpower.13 Hpower.15
11.	Set the VPP2 electronic load to on. Verify the load is drawing 0.125A with the load meter. If necessary adjust the current setting to draw 0.125A.	N/A	
12.	Measure the voltage between the VPP2 and GND test points on the extender card with the DC voltmeter. Record the results. **Note**: The Host shall apply 5.0V ± 0.25 VDC on VPP2 pin after Card-type identification and M-CARD discovery is performed.		Hpower.11 Hpower.12 Hpower.14 Hpower.15

8.1.2 Host Standby Mode Test

This test verifies the operation of the Host device in Standby Mode.

Equipment: DUT, HPNx Pro, SYCARD PCCextend 140A, logic analyzer, modified[1] logic analyzer CableCARD adapter card

Software: Logic Analyzer configuration file: "HOST_437._A" (this need to be clarified which config file shall be used, and what is the difference between both of them)


HOST_437._A


HOST_437.__

Setup:

Connect the DUT to CableCARD extender card, HPNx Pro to extender card. Connect the modified [2]logic analyzer CableCARD adapter to the CableCARD extender card and insert all 4 logic analyzer connectors into the adapter.

Table 8.1-1 – Pin Signals

Signals Monitored	
Pin Number	**Pin Name**
12	CRX
11	DRX

Procedure:

Step#	Procedure	Pass/Fail	PICS Item
1.	Power up the Agilent Logic Analyzer Model number 1672G. Click Analyzer, Select system. Click External I/O, select hard disk. Scroll down until you find "HOST_437._A" Click Load, followed by Execute. This will load the analyzer configuration.	N/A	
2.	Insert in the SYCARD PCCextend 140A into the DUT. Connect the modified logic analyzer adapter to the PCCextend 140A and insert all 4 logic analyzer connectors into the adapter. Insert HPNx Pro extender into the SYCARD PCCextend 140A.	N/A	
3.	Bring up the HPNx Pro software on the given PC. Verify that the PC and HPNx Pro are on the same isolated network.	N/A	
4.	Note the last 4 (mac address) digits of HPNx Pro you are using. (Information is on the back side of card)	N/A	
5.	Under the Device tab, enter the 4 digits in the blank space labeled "Your HPNx Pro ID"	N/A	
6.	Insert the HPNx Pro extender card into the DUT. From the HPNx Pro trace window, check that the status of the HPNx Pro goes ready and the resource manager opens its sesion.	N/A	

[2] : The modified logic analyzer adapter card refers to the standard SYCARD PCCextend, 145 which have been changed to allow access to signals CD1 and CD2. Rework as follows: CD1 connect to JP2 pin F, CD2 connect to JP1 pin A.

7.	Right click on the Trace window to select SPDU and Payload for full vision of all layers.	N/A	
8.	Select the “Host Control” tab. And then press the Play button to open the Host Control resource.	N/A	
9.	Verify that the DUT establishes a session to the Host Control and reports support for Application Information resource = 0x00200081. ← S [01:39:57.814] open_session_request from Host Control [91 04 00 20 00 81] ➔ S [01:39:57.854] open_session_response on resource Host Control, Status = 0x00, SessionNb = 2 [92 07 00 00 20 00 81 00 02]	N/A	
10	Using the HPNx Pro test tool, send oob_rx_tune() requests with the following parameter values, and verify that the DUT replies with an oob_rx_tune_cnf() with “tuning granted”. Frequency = 75250KHz, Bit rate = 2048kbps, Spectrum = 0 (non-inv)	N/A	
11	Capture the signal traces at the logic analyzer. Change MENU from “SYSTEM” to “ANALYZER”. Change display from “CONFIGURATION” to “WAVEFORM”. Select “RUN” to initiate the capture process. The analyzer will trigger continuously on the rising edge of CRX. Verify that the clock signal, CRX, is present as well as DRX.	N/A	
12	Put the DUT in standby mode (follow manufacturer provided instructions).	N/A	
13	Verify that there is no change to any of the signals.		Hstby.1 Hstby.2 Hpower.9

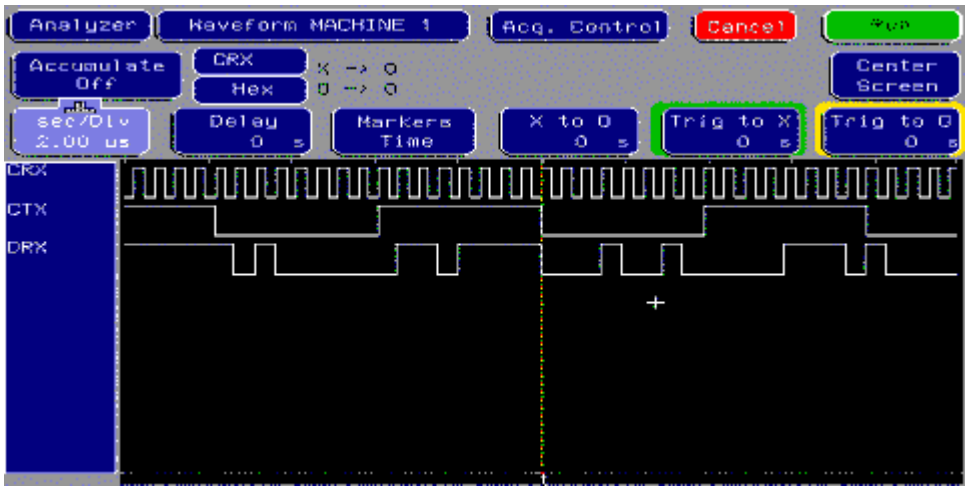


Figure 8.1-2 – Analyzer Capture

9 MECHANICAL

9.1.1 Host-CableCARD Temperature/Average Power Test

The Host must be able to dissipate the heat generated by the CableCARD when running over a period of time.

Equipment: Host under test, Fluke 54 II Thermometer and temperature probe, AC power supply, Reference Thermal CableCARD (Sycard Model 410) (The reference CableCARD will draw a 2.5 Watt average load). Alternative measurement devices can also be used as necessary.

Attached are the PDF files that describe the Reference Thermal CableCARD.

Assembly.pdf

bottom.PDF

silk.PDF

top.PDF


GWK1.gwk


SYCARD02.AST


readme.txt

Reference thermo tapes are:

Product name 1: GK-0212-xx Thermo label mini xx: (Temperature is indicated by suffix in the catalogue, the thickness is 0.07mm).

Product name 2: Chino C060 series surface temperature sensor.

Setup: Insert the Reference Thermal CableCARD into Host Connect the AC power supply to the line voltage input.

Procedure:

Step	Procedure	Pass/Fail	PICS
1	With the power load CableCARD face up, on the table with the connector towards you, all writing on the CableCARD will be upright and correct left to right. Place the temperature probe by first: Measure up from the connector edge, 39mm. Mark that point. Then measure from the left (with the CableCARD situated as stated above), 24 mm. Mark that point where both points intersect.	N/A	

	 Temperature probe placement Connect one probe so that it dangles above the Host, this probe will measure the ambient temperature.		
2	Place DUT in environmental chamber, AC power applied, Reference Thermal CableCARD inserted. Set environmental chamber to 25°C. Allow chamber to stabilize.	N/A	
3	Leave test running until the CableCARD temperature probe no longer changes more than 1 degree C over a 2 minute period.	N/A	
4	Record the measurement of the temperature from the probe on the CableCARD case. (Top center of CableCARD case).	N/A	
5	Verify using the temperature probe, that no external protruding surface point is hotter than 50° C for metallic and 60° C for nonmetallic surfaces and no non-accessible surface point is hotter than 65° C.		Hmech.1
6	Record measurement of the ambient temperature. This is the probe dangling above the Host.	N/A	
7	Check that the temperature measurement is between 0° to 40° C.	N/A	
8	Record the temperature measured at each probe, in and around the Host device.		
9	Verify the DUT is capable of dissipating the heat from a CableCARD module drawing an average of 2.5 watts across the CableCARD interface.		Hmech.1

10 MULTI-FAT RECEIVER TEST

This test verifies the capabilities of the DUT that supports multiple FAT tuner(s) through a single RF "Cable In" input connector. All additional FAT tuner(s) must provide the same physical layer FAT channel characteristics as the DUT with a single tuner.

Test Requirements:

The multi-stream CableCARD (M-CARD) interface allows the DUT to utilize multiple MPEG decoder(s) for video decoding, or to make multiple simultaneous DVR recordings. A DUT that incorporates multiple FAT Tuner(s) shall satisfy the same requirements for each tuner as it would for DUT with a single FAT tuner.

Note: Prior to production, the manufacturer shall demonstrate or document that the DUT meets the requirements of 47 CFR 15.118 (c)(3) Direct pickup interference.

The DUT submitted for testing should provide, a way to display, either by picture in a picture, or by a specific key-stroke sequence the ability to toggle between tuners, and to be able to identify/ differentiate specific tuner functions independently of the other tuner(s) in the DUT submitted for testing.

Possible example:
1. Tune tuner #1 to the desired channel. Run test.
2. Tune tuner #1 to any channel other than the desired channel.
3. Tune tuner #2 to the desired channel. Run test.
4. Tune tuner #2 to any channel other than the desired channel and what tuner #1 is tuned to.

Procedure:

Step	Procedure	Pass/Fail	PICS
1.	Perform visual inspection to verify that the MHost supports reception of all FAT channels and interface to all cable signals through a single RF input connector.		MHost.7
2.	These physical layer tests for FAT channel characteristics shall be re-tested again each additional FAT tuner. Test procedures are in the sections noted.	N/A	

<table>
<tr>
<td>3.</td>
<td>Setup and Test each additional tuner against each of these tests. Verify all tuners pass/fail.

<table>
<tr><th>FAT CH Tests</th><th>ATP Section</th><th>Pass/Fail</th></tr>
<tr><td>Host FAT Channel Functional Test</td><td>3.1.1</td><td></td></tr>
<tr><td>FAT Channel HRC/IRC Tuning Test</td><td>3.1.2</td><td></td></tr>
<tr><td>Host FAT LO Leakage Test</td><td>3.1.3</td><td></td></tr>
<tr><td>FAT Channel Micro-reflection Test</td><td>3.1.4</td><td></td></tr>
<tr><td>FAT Channel Phase Noise Tolerance</td><td>3.1.5</td><td></td></tr>
<tr><td>FAT Channel AM Hum Modulation Immunity</td><td>3.1.6</td><td></td></tr>
<tr><td>Host Spurious Emissions Test</td><td>3.1.7</td><td></td></tr>
<tr><td>Host Maximum Individual Carrier Test</td><td>3.1.8</td><td></td></tr>
<tr><td>Host RF Input Return Loss Test</td><td>3.1.9</td><td></td></tr>
<tr><td>Adjacent Channel Characteristics Test</td><td>3.1.10</td><td></td></tr>
<tr><td>Combined Distortions Test</td><td>3.1.11</td><td></td></tr>
</table>
</td>
<td></td>
<td>MHost.6</td>
</tr>
</table>

4.	Setup and test these Digital Video test requirements for each additional FAT tuner: **Digital Video** / **ATP Section** / **Pass/Fail** Digital Video Decoding — 6.1.2 Digital Television (In-Band Service/ System Information) — 6.1.3 Digital Television (DTV) Closed Captioning — 6.1.4 Digital Television (DTV) Emergency Alert Service (EAS) — 6.1.5 OOB EAS Tests — 6.1.6 Note: For the EAS tests, all tuners are expected to respond to the EAS message ie: crawl, audio override, details channel and/ or force tune message. The DUT design and the possibility to “select” one of the tuners as the “Primary” tuner or tuner “In Focus”, both tuners may not respond simultaneously to the EAS message when sent, but the “Selected” or “In Focus” tuner is expected to respond as defined in section 6.1.5 of this ATP.		MHost.6

5.	Setup and test these DUT test requirements for each additional FAT tuner: **M-UDCP** / **ATP Section** / **Pass/Fail** Host Transport Stream Data Rate Test — 4.1.9 Host Channel Change Functional Test — 4.2.1 In-Band PSIP Test — 6.1.3.1 Host Data Channel Multi-layer — 4.3.1 Host Application Information and MMI Test — 4.3.2 Note: When testing the MMI resource, each of the tuners in the DUT are expected to respond and display the Card/ Host binding / Copy Protection messages related to a specific tuner in a manor that the user can identify what tuner and/or tuner action generated the error. Ie: tuning to a copy protected program, and the Card/ Host pair not authorized for High Value content. Host VBI Pass Through Test — 5.1.2 Host Analog Closed Caption Test — 5.1.2 Host Standby Mode Test — 8.1.2 Note: When Testing the Homing resource on the DUT, and the DUT is placed in stand-by, only one of the tuners is expected to respond, and grant the in-band tune request. In Band Host Control and Host Card Firmware Upgrade (Homing) test. — 4.1.7		
6.	Verify any additional tuners support both Analog program and digital program M-Mode Copy Protection. (ATP section 2.2) Tune a High value digital channel on each tuner and verify that the Host observes the Copy Portection independently for each channel for each tuner.		MHost.4

7.	Note: When testing the DUT's ability to support Copy Protection, each of the tuners in the DUT are expected to respond and display the Card/ Host Copy Protection messages related to a specific tuner in a manor that the user can identify what tuner and/or tuner action generated the error. Ie: tuning to a copy protected program, and the Card/ Host pair not authorized for High Value content.		
8.	Verify the Host supports the simultaneous reception of at least two independent channels anywhere on the RF frequency range.		MHost.5 MHost.3

Note: The following tuner combinations should be tested:

Test 1	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	X	-	-
Tuner N+1	X	-	-

Test 2	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	-	X	-
Tuner N+1	X	-	-

Test 3	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	X	-	-
Tuner N+1	-	X	-

Test 4	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	-	X	-
Tuner N+1	-	X	-

Test 5	Analog	64QAM	256QAM
Tuner 1	-	X	-
Tuner 2	X	-	-
Tuner N+1	X	-	-

Test 6	Analog	64QAM	256QAM
Tuner 1	-	X	-
Tuner 2	-	X	-
Tuner N+1	X	-	-

Test 7	Analog	64QAM	256QAM
Tuner 1	-	X	-
Tuner 2	X	-	-
Tuner N+1	-	X	-

Test 8	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	X	-	-
Tuner N+1		-	X

Test 9	Analog	64QAM	256QAM
Tuner 1	X	-	-
Tuner 2	-	-	X
Tuner N+1	X	-	-

Test 10	Analog	64QAM	256QAM
Tuner 1	-	-	X
Tuner 2	X	-	-
Tuner N+1	X	-	-

Test 11	Analog	64QAM	256QAM
Tuner 1	-	-	X
Tuner 2	-	-	X
Tuner N+1	X	-	-

Additional Notes:

For Card RES, the DUT shall support the Card_RES resource, and that the use of single tuners as well as multiple tuners will create a Card/Host MPEG interface load based on the elementary streams passed across the Card/ Host interface, and the Card/ Host interface limit, when reached, behaves as defined in section 5.8 and 9.12 of CCIF 2.0.

11 EQUIPMENT CONFIGURATION

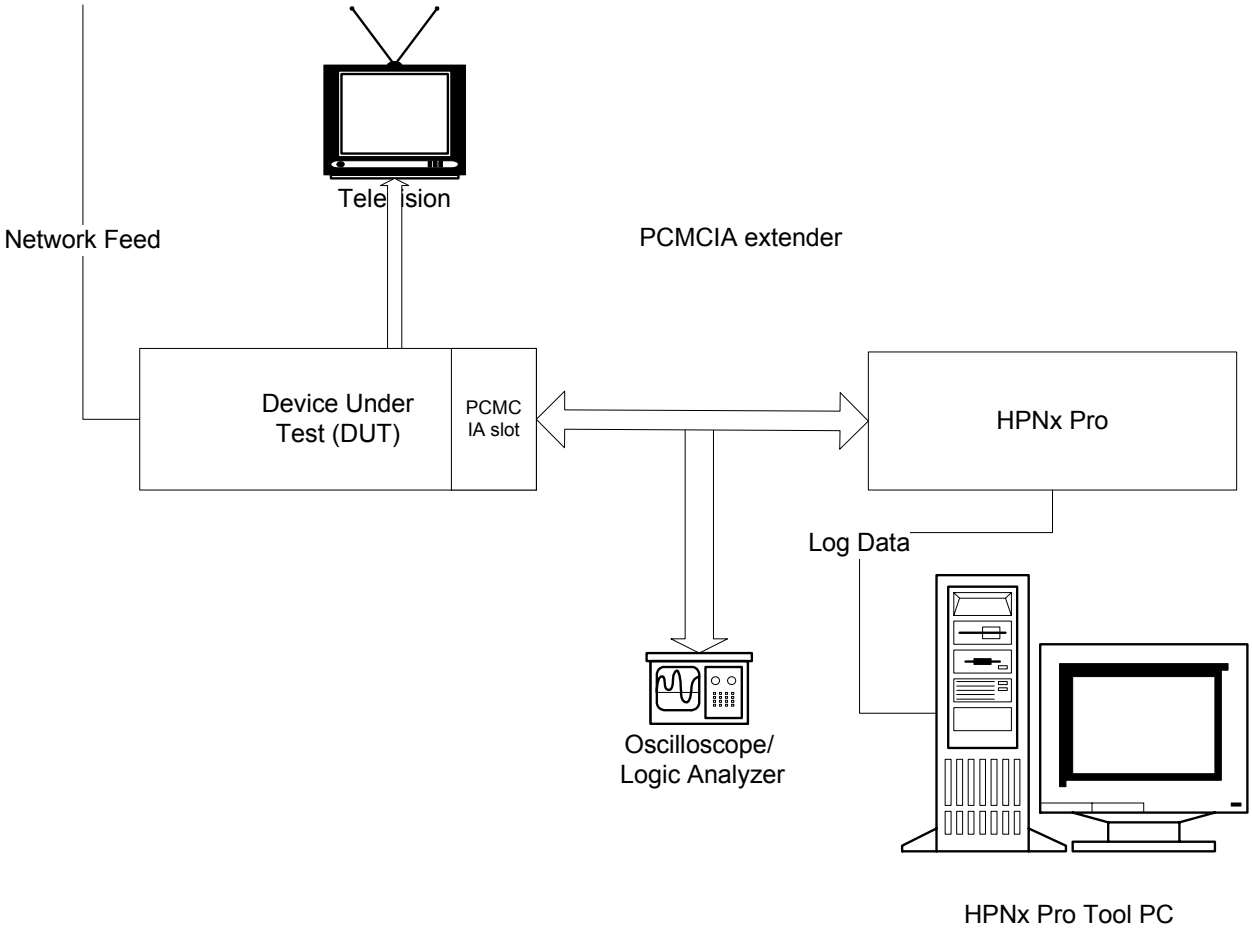


Figure 11.1-1 - HPNX PRO test configuration for Host ATP

12 M-UDCP INTEROPERABILITY TESTS

All tests in this section are to be performed with the assumption that the Card being used will match the specific headend network. Each Host SHALL be tested against all available qualified CableCARD devices (Motorola, SA and Harmonic) for the following interoperability test procedures.

This ATP Interoperability section MAY or MAY NOT have been completed prior to submission, although these tests will be perfomed as a part of certification testing.

12.1 Scientific Atlanta

12.1.1 Scientific Atlanta CORE Interoperability Tests

All tests in this section are to be performed with the assumption that the Scientific Atlanta CableCARD is being used to test interoperability with “vendor XXX” hosts on the Scientific Atlanta head-end network.

12.1.1.1 Verify that the SA CableCARD and vendor XXX host combination present a MMI message screen that asks the user to call in and register the CableCARD and Host mating/addresses.

(Note: This will only happen on initial mating of the CableCARD/Host)

Results	Comments

12.1.1.2 Using the “vendor XXX” remote control tune the SA CableCARD “vendor XXX” host combination to high value content channel. (Refer to SA channel map) Verify that the SA CableCARD “vendor XXX” host combination cannot view the high value content.

Note: This test shall be done prior to the Head-end authorizing the CableCARD/Host pair for high value content.

Results	Comments

12.1.1.3 Add a SA CableCARD to the DNCS database and initialize the SA CableCARD. Verify that the SA CableCARD can be successfully added to the DNCS database.

Results	Comments

12.1.1.4 Authorize a SA CableCARD "vendor XXX" host combination to receive high value content through the DNCS. Using the "vendor XXX" remote control and the network XXX application tune to that high value content channel. Verify that the SA CableCARD "vendor XXX" host combination can view the high value content.

Results	Comments

12.1.1.5 Using the "vendor XXX" remote control, verify that when the SA CableCARD diagnostics menu is selected the SA CableCARD and vendor XXX host combination display an MMI message screen with the CableCARD ID and Host ID as part of the MMI display. Follow manufacture instructions bring up the MMI screen through the application information resource selection screen.

Results	Comments

12.1.1.6 Confirm Power removal from "vendor XXX" host while SA CableCARD is inserted. Physically unplug input power from "vendor XXX" host SA CableCARD combination. Wait 10 seconds and reapply input power. Verify that the SA CableCARD, "vendor XXX" host combination, successfully re-initialize and return to the state left in step 1, without requiring a re-initialization from the DNCS.

Results	Comments

12.1.1.7 Confirm function power on/off from "vendor XXX" host front panel. Verify that the SA CableCARD, "vendor XXX" host combination can be turned on and off from the hosts front panel at least 5 times and successfully recover after each power cycle. A successful recovery is defined by the CableCARD and host combination not requiring a CableCARD re-initialization, and the front panel LED's turning OFF and back on respectively.

Results	Comments

12.1.1.8 Load the XXX application on the S&T object carousel. Set the application file for autstart and run. Verify SA CableCARD, "vendor XXX" host combination finishes loading the application(s) that is available from the Carousel. (Refer to S&T Broadcaster instructions on how to launch the application). Once the application has been launched, verify that you can navigate within the application.

Results	Comments

12.1.1.9 Using the "vendor XXX" remote control and the network XXX application verify SA CableCARD, "vendor XXX" host combination has basic user interface function of Channel up/down. Changing channels up then down on the host and confirming that they are displayed correctly on a TV.

Results	Comments

12.1.1.10 Using the "vendor XXX" remote control and the network XXX application verify the ability of SA CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to clear analog channel. (Refer to SA channel map) Verify audio and video on TV.

Results	Comments

12.1.1.11 Using the "vendor XXX" remote control and the network XXX application verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to unencrypted QAM64. (Refer to SA channel map). Veify audio and video on TV.

Results	Comments

12.1.1.12 Using the "vendor XXX" remote control and the network XXX application verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM256. Tune "vendor XXX" host to unencrypted QAM256. (Refer to SA channel map). Verify audio and video on TV.

Results	Comments

12.1.1.13 Verify that the front panel LED or onscreen display, etc. on the vendor "XXX" host correctly displays the channel number of the analog or digital service being displayed on the TV. (Verify a service at lower, middle and upper frequencies)

Results	Comments

HOST PICS satisfied by this test:

HFDCrf.20	The Host shall provide an a=0.03 square root raised cosine receive filter.	Indirect
HFDCrf.23	The receiver in the Host shall be capable of receiving symbols transmitted with a Frequency Stability of +/- 50 ppm measured at the upper limit of the frequency range	Indirect
HFDCrf.26	The Host shall operate with carrier suppression that is > 30 dB	Indirect

12.1.1.14 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital channel through the SA DNCS. Using the "vendor XXX" remote control and the network XXX application verify the host can display the encrypted digitalchannel.

Results	Comments

12.1.1.15 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital channel through the SA DNCS. Using the "vendor XXX" remote control and the network XXX application verify the host cannot display the encrypted digital channel.

Results	Comments

12.1.1.16 Verify the correct channel map is loaded into the host by using the "vendor XXX" remote control and the network XXX application to display each channel by comparing the channel map to the LED, onscreen, etc display on "vendor XXX" host. Verify that the channel map matches the content displayed on the TV.

Results	Comments

12.1.1.17 Using the "vendor XXX" remote control verify that the "vendor XXX" host responds correctly to commands from a hand-held remote control or programmable addressable IR blaster that simulates the remote control. Channel up, channel down, and verify "vendor XXX" host successfully changes channels and displays audio and video on TV.

Results	Comments

12.1.1.18 Using the "vendor XXX" remote control and the network XXX application verify the ability of the SA CableCARD, "vendor XXX" host combination to channel wrap at the last defined channel. Tune "vendor XXX" host to last defined channel in the channel map, and then channel up. Verify that the "vendor XXX" host tunes to the first channel in the channel map. Channel down and verify that "vendor XXX" host displays the last channel in the channel map.

Results	Comments

12.1.1.19 Verify SA CableCARD, "vendor XXX" host combination can display closed captioning on a TV, from a digital multiplex. Tune "vendor XXX" host to a digital channel and verify the closed captioning on the TV. (Refer to SA channel map)

Note: Not all content is closed caption, some commercials do not have closed captioning.

Results	Comments

12.1.1.20 Verify SA CableCARD, "vendor XXX" host combination can display closed captioning on a TV, from an analog service. Tune "vendor XXX" host to an analog channel and verify the closed captioning on the TV. (Refer to SA channel map)

Results	Comments

12.1.1.21 Using the "vendor XXX" remote control and the network XXX application tune the SA CableCARD, "vendor XXX" host combination to analog channel. Send an EAS force tune message from the Scientific Atlanta head-end. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.1.1.22 Using the "vendor XXX" remote control and the network XXX application tune the SA CableCARD, "vendor XXX" host combination to digital channel. Send

an EAS force tune message from the Scientific Atlanta head-end. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.1.1.23 Using the "vendor XXX" remote control tune the SA CableCARD "vendor XXX" host combination to digital channel. Send an EAS force tune message from the Scientific Atlanta head-end. The SA CableCARD, "vendor XXX" host SHALL acknowledge the EAS force tune. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.1.1.24 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to display QAM64 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.1.1.25 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to display QAM256 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.1.1.26 Verify that SA CableCARD and "vendor XXX settop" host combination can display services on output channel 4. On the DNCS change the output channel from 3 to 4, initialize SA CableCARD and "vendor XXX settop" host combination. Verify that the DUT changes from channel 3 to 4 to view content from the host on the TV.

Results	Comments

12.1.1.27 Verify that the SA CableCARD and "vendor XXX settop" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.1.2 Minimum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the Scientific Atlanta CableCARD is being used to test interoperability with "vendor XXX" hosts on the Scientific Atlanta head-end network. The power level of the FAT channel should be attenuated to –15dBmV for 64 QAM, -12dBmV for 256 QAM and 0dBmV for analog. Check plant with a spectrum analyzer. This test will ensure interoperability of the SA CableCARD "vendor XXX" hosts combination at minimum power levels.

12.1.2.1 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to display clear analog channel. Verify audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.2.2 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to displayunencrypted QAM64 channel.Verify audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.2.3 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM256. Tune "vendor XXX" host to display unencrypted QAM256 channel.Verify audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.2.4 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host can display the encrypted digital service.

Results	Comments

12.1.2.5 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host cannot display the encrypted digital service.

Results	Comments

12.1.2.6 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to display QAM64FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.2.7 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to displayQAM256 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.2.8 Verify that the SA CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.1.2.9 Tune the SA CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the SA head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.2.10 Tune the SA CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the SA head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.3 Maximum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the Scientific Atlanta CableCARD is being used to test interoperability with "vendor XXX" hosts on the Scientific Atlanta head-end network. The power level of the FAT channel should be amplified to +15dBmV and verified on a spectrum analyzer. This test will ensure interoperability of the SA CableCARD "vendor XXX" hosts combination at maximum power levels.

12.1.3.1 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to displayclear analog channel and verify audio and video on TV.

Results	Comments

12.1.3.2 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to displaunencrypted QAM64 and veify audio and video on TV.

Results	Comments

12.1.3.3 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM256. Tune "vendor XXX" host to displayunencrypted QAM256and veify audio and video on TV.

Results	Comments

12.1.3.4 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host can display the encrypted digital service.

Results	Comments

12.1.3.5 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host cannot display the encrypted digital service.

Results	Comments

12.1.3.6 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to display QAM64 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.1.3.7 Verify SA CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT channel. Tune SA CableCARD and "vendor XXX" host combination, to displayQAM256 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the SA CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.1.3.8 Verify that the SA CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.1.3.9 Tune the SA CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the SA head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.3.10 Tune the SA CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the SA head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.4 Lower Frequency Interoperability Test

This test is to verify the Scientific Atlanta CableCARD and "vendor XXX" hosts can successfully tune in the lowest EIA QAM channel requirement of 54 MHz. Refer to SA channel map for low frequency QAM channel.

12.1.4.1 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64. Tune "vendor XXX" host to displaythe lowest EIA unencrypted QAM64 channel and verify audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.5 Upper Frequency Interoperability Test

This test is to verify the Scientific Atlanta CableCARD and "vendor XXX" hosts can successfully tune in the upper EIA QAM channel requirement of 860MHz. Refer to SA channel map for upper frequency QAM channel.

12.1.5.1 Verify the ability of SA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to displaythe highest EIA QAM64 channel and verify audio and video on TV. (Refer to SA channel map)

Results	Comments

12.1.6 One Way Legacy OOB Messaging

All tests in this section are to be performed with the assumption that the Scientific Atlanta CableCARD is being used to test interoperability with "vendor XXX" hosts on the Scientific Atlanta head-end network.

12.1.6.1 Set the power level of the FDC channel between –15dBmV and +15dBmV. Set the FDC channel frequency between low FDC frequency range. (70MHz - 90MHz.)

12.1.6.2 Verify FDC channel frequency and power level on a spectrum analyzer.

(Note: This will only happen on initial mating of the CableCARD/Host)

Results	Comments

12.1.6.3 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host can display the encrypted digital service.

Results	Comments

12.1.6.4 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host cannot display the encrypted digital service.

Results	Comments

12.1.6.5 Tune the SA CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.6.6 Tune the SA CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.6.7 Change FDC channel frequency between middle range. (90MHz - 110MHz.) Verify FDC channel frequency and power level on a spectrum analyzer.

Results	Comments

12.1.6.8 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host can display the encrypted digital service.

Results	Comments

12.1.6.9 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host cannot display the encrypted digital service.

Results	Comments

12.1.6.10 Tune the SA CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.6.11 Tune the SA CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.6.12 Change FDC channel frequency between high range. (110MHz - 130MHz.) Verify FDC channel frequency and power level on a spectrum analyzer.

Results	Comments

12.1.6.13 Authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host can display the encrypted digital service.

Results	Comments

12.1.6.14 De-authorize a SA CableCARD "vendor XXX" host combination for an encrypted digital service through the SA DNCS. Verify the host cannot display the encrypted digital service.

Results	Comments

12.1.6.15 Tune the SA CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.6.16 Tune the SA CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Scientific Atlanta head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.1.7 In Band Host Control Firmware Upgrade Test

The Scientific Atlanta (SA) Head-end (DNCS) network is capable of sending “in-band code download” image to the “DUT”. The system sends this image to defined SA CableCARD**.**

1) Perform steps necessary on SA DNCS to load an updated firmware image. Build (BFS) image based upon type association, timeout type and download timeout. Configure image setup for priority and group association.
2) Verify that the DUT issues a New Flow Request to Extended Channel OOB and that the DNCS spools the image and sends to CableCARD.
3) Verify the system sends user notification and that the Host receives the MMI screen.

“Performing download test”

4) Verify in-band “CODE Download” Firmware completion from the DNCS.

Test Results: CableCARD FIRMWARE UPGRADE Test

Results	Comments

12.2 Motorola

12.2.1 Motorola CORE Interoperability Tests

All tests in this section are to be performed with the assumption that the Motorola CableCARD is being used to test interoperability with "vendor XXX" hosts on the Motorola head-end network.

12.2.1.1 Using the "vendor XXX" remote control tune the MOTOROLA CableCARD "vendor XXX" host combination to high value content channel. (Refer to Motorota Channel map) Verify that the MOTOROLA CableCARD "vendor XXX" host combination cannot view the high value content.

(Note: This test shall be done prior to the Head-end authorizing the CableCARD/Host pair for high value content.)

12.2.1.2 Add a MOTOROLA CableCARD to the DAC6000 database and initialize the MOTOROLA CableCARD. Verify that the Motorola CableCARD can be successfully added to the DAC6000 database and that the Motorola CableCARD.

Results	Comments

12.2.1.3 Authorize a MOTOROLA CableCARD "vendor XXX" host combination to receive high value content channel. (Refer to Motorota channel map) Using the "vendor XXX" remote control tune to high value content service. Verify that the MOTOROLA CableCARD "vendor XXX" host combination can view the high value content.

Results	Comments

12.2.1.4 Using the "vendor XXX" remote control, verify that when the vendor XXX diagnostics menu is selected the Motorola CableCARD and vendor XXX host combination display an MMI message screen with the CableCARD ID and Host ID as part of the MMI display. Follow manufacturer instructions bring up the MMI screen through the application information resource selection screen.

Results	Comments

12.2.1.5

12.2.1.6 Confirm Power removal from "vendor XXX" host while MOTOROLA CableCARD is inserted. Physically unplugged input power from "vendor XXX" host MOTOROLA CableCARD combination. Wait 10 seconds and reapply input power. Verify that the MOTOROLA CableCARD, "vendor XXX" host combination, successfully re-initialize and return to the state left in step 1, without requiring a re-initialization from the DAC6000.

Results	Comments

12.2.1.7 Confirm function power on/off from "vendor XXX" host front panel. Verify that the MOTOROLA CableCARD, "vendor XXX" host combination can be turned on and off from the hosts front panel at least 5 times and successfully recover after each power cycle. A successful recovery is defined by the CableCARD and host combination not requiring a CableCARD re-initialization, and the front panel LED's turning OFF and back on respectively.

Results	Comments

12.2.1.8 Using the "vendor XXX" remote control and the network XXX application verify MOTOROLA CableCARD "vendor XXX" host combination has basic user interface function of Channel up/down. Changing channels up then down on the host and confirming that they are displayed correctly on a TV.

Results	Comments

12.2.1.9 Using the "vendor XXX" remote control verify the ability of MOTOROLA CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to clear analog channel. (Refer to Motorota channel map) Verify audio and video on TV.

Results	Comments

12.2.1.10 Using the "vendor XXX" remote control verify the ability of MOTOROLA CableCARD, "vendor XXX" host combination to tune unencrypted QAM64. (Refer to Motorola channel map) Tune "vendor XXX" host to unencrypted QAM64. Verify audio and video on TV.

Results	Comments

12.2.1.11 Using the "vendor XXX" remote control verify the ability of MOTOROLA CableCARD, "vendor XXX" host combination to tune unencrypted QAM256. (Refer to Motorola Channel map) Tune "vendor XXX" host to unencrypted QAM256. Verify audio and video on TV.

Results	Comments

12.2.1.12 Verify that the front panel LED or onscreen display, etc. on the vendor "XXX" host correctly displays the channel number of the analog or digital channel being displayed on the TV. (Verify a service at lower, middle and upper frequencies)

Results	Comments

HOST PICS satisfied by this test:

HFDCrf.20	The Host shall provide an a=0.03 square root raised cosine receive filter.	Indirect
HFDCrf.26	The Host shall operate with carrier suppression that is > 30 dB	Indirect

12.2.1.13 Authorize a MOTOROLA CableCARD "vendor XXX" host combination for an encrypted digital service through the MOTOROLA DAC6000. Verify the host can display the encrypted digital channel.

Results	Comments

12.2.1.14 De-authorize a MOTOROLA CableCARD "vendor XXX" host combination for an encrypted digital channel through the MOTOROLA DAC6000. Verify the host cannot display the encrypted digital channel.

Results	Comments

12.2.1.15 Verify the correct channel map is loaded into the host by using the "vendor XXX" remote control to display each service and comparing the channel map to the LED, onscreen, etc display on "vendor XXX" host. Verify that the channel map matches the content displayed on the TV.

Results	Comments

12.2.1.16 Using the "vendor XXX" remote control verify that the "vendor XXX" host responds correctly to commands from a hand-held remote control or programmable addressable IR blaster that simulates the remote control. Channel up, channel down, and verify "vendor XXX" host successfully changes channels and displays audio and video on TV.

Results	Comments

12.2.1.17 Using the "vendor XXX" remote control and the network XXX application verify the ability of the MOTOROLA CableCARD, "vendor XXX" host combination to channel wrap at the last defined channel. Tune "vendor XXX" host to last defined channel in the channel map, and then channel up. Verify that the "vendor XXX" host tunes to the first channel in the channel map. Channel down and verify that "vendor XXX" host displays the last channel in the channel map.

Results	Comments

12.2.1.18 Verify MOTOROLA CableCARD, "vendor XXX" host combination can display closed captioning on a TV, from a digital multiplex. Tune "vendor XXX" host to a digital channel and verify the closed captioning on the TV. (Refer to Motorola Channel map)

Note: Not all content on this channel is closed caption. Some commercials do not have closed captioning.

Results	Comments

12.2.1.19 Verify MOTOROLA CableCARD, "vendor XXX" host combination can display closed captioning on a TV, from an analog channel. Tune "vendor XXX" host to analog channel service and verify the closed captioning on the TV. (Refer to Motorola Channel map)

Results	Comments

12.2.1.20 Using the "vendor XXX" remote control tune the MOTOROLA CableCARD, "vendor XXX" host combination to an analog channel. (Refer to Motorola Channel map) Send an EAS force tune message.the Motorola head-end. Verify EAS message is received. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.2.1.21 Using the "vendor XXX" remote control tune the MOTOROLA CableCARD, "vendor XXX" host combination to an digital channel. (Refer to Motorola Channel map) Send an EAS force tune message from the Motorola head-end. Verify EAS message is received. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.2.1.22 Using the "vendor XXX" remote control tune the Motorola CableCARD, "vendor XXX" host combination to digital channel. (Refer to Motorola Channel map). Send an EAS force tune message from the Motorola head-end. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.2.1.23 Verify MOTOROLA CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune MOTOROLA CableCARD and "vendor XXX" host combination to display 64QAM FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the MOTOROLA CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.2.1.24 Verify MOTOROLA CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT channel. Tune MOTOROLA CableCARD and "vendor XXX" host combination to display QAM256 FAT channel. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the MOTOROLA CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.2.1.25 Verify that the MOTOROLA CableCARD and "vendor XXX" host can be deleted from the DAC6000. On the DAC6000 delete the CableCARD module from the DAC database. Verify that the MOTOROLA CableCARD and "vendor XXX" host can only receive unencrypted analog and digital services.

Results	Comments

12.2.1.26 Verify that MOTOROLA CableCARD and "vendor XXX settop" host combination can display services on output channel 4. On the DAC6000 change the output channel from 3 to 4, initialize MOTOROLA CableCARD and "vendor XXX settop" host combination. Verify that the TV must be changed from channel 3 to 4 to view content from the host on the TV.

Results	Comments

12.2.1.27 Verify that the MOTOROLA CableCARD and "vendor XXX settop" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.2.2 Minimum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the Motorola CableCARD is being used to test interoperability with "vendor XXX" hosts on the Motorola head-end network. The power level of the FAT channel should be attenuated to –15dBmV for 64 QAM, -12dBmV for 256 QAM and 0dBmV for analog. Check plant with a spectrum analyzer. This test will ensure interoperability of the Motorola CableCARD "vendor XXX" hosts combination at minimum power levels.

12.2.2.1 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune clear analog channels. (Refer to Motorola Channel map) Tune "vendor XXX" host to analog service verify audio and video on TV.

Results	Comments

12.2.2.2 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune unencrypted QAM64. Tune "vendor XXX" host to QAM64 channel. (Refer to Motorola Channel map) Verify audio and video on TV.

Results	Comments

12.2.2.3 Verify the ability of Motorota CableCARD, "vendor XXX host combination to tune unencrypted QAM256. Tune "vendor XXX" host to QAM256 channel. (Refer to Motorola Channel map) Verify audio and video on the TV.

Results	Comments

12.2.2.4 Authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the Motorola DAC6000. Verify the host can display the encrypted digital channel.

Results	Comments

12.2.2.5 De-authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the Motorola DAC6000. Verify the host cannot display the encrypted digital channel.

Results	Comments

12.2.2.6 Verify Motorola CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT Channel. Tune Motorola CableCARD and "vendor XXX" host combination to display QAM64 channel. (Refer to Motorola Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the Motorola CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.2.2.7 Verify Motorola CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT Channel. Tune Motorola CableCARD and "vendor XXX" host combination to display QAM256 channel. (Refer to Motorola Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the Motorola CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.2.2.8 Verify that the Motorola CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.2.2.9 Tune the Motorola CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.2.10 Tune the Motorola CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.3 Maximum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the Motorola CableCARD is being used to test interoperability with "vendor XXX" hosts on the Motorola head-end network. The power level of the FAT channel should be amplified to +15dbmv and verified on a spectrum analyzer. This test will ensure interoperability of the Motorola CableCARD "vendor XXX" hosts combination at maximum power levels.

12.2.3.1 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to displayed an analog channel. Verify audio and video on TV.

Results	Comments

12.2.3.2 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to QAM64 channel. Verify audio and video on TV.

Results	Comments

12.2.3.3 Verify the ability of Motorota CableCARD, "vendor XXX host combination to tune unencrypted QAM256. Tune "vendor XXX" host to QAM256 channel. (Refer to Motorola Channel map) Verify audio and video on the TV.

Results	Comments

12.2.3.4 Authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the Motorola DAC6000. Verify the host can display the encrypted digital channel.

Results	Comments

12.2.3.5 De-authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the Motorola DAC6000. Verify the host cannot display the encrypted digital channel.

Results	Comments

12.2.3.6 Verify Motorola CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune Motorola CableCARD and "vendor XXX" host combination, to QAM64 multiplex. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the Motorola CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.2.3.7 Verify Motorola CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT Channel. Tune Motorola CableCARD and "vendor XXX" host combination to display QAM256 channel. (Refer to Motorola Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the Motorola CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.2.3.8 Verify that the Motorola CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.2.3.9 Tune the Motorola CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.3.10 Tune the Motorola CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.4 Lower Frequency Interoperability Test

This test is to verify the Motorola CableCARD and "vendor XXX" hosts can successfully tune in the lowest EIA QAM channel requirement of 54MHz. Refer to Motorola Channel map for low frequency QAM channel.

12.2.4.1 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tuning "vendor XXX" host to any channel in QAM64 multiplex, verify audio and video on TV.

Results	Comments

12.2.5 Upper Frequency Interoperability Test

This test is to verify the Motorola CableCARD and "vendor XXX" hosts can successfully tune in the upper most requirement of 860MHz. Refer to Motorola channel map for low frequency QAM channel.

12.2.5.1 Verify the ability of Motorola CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tuning "vendor XXX" host to any channel in QAM64 multiplex, verify audio and video on TV.

Results	Comments

12.2.6 One Way Legacy OOB Messaging

All tests in this section are to be performed with the assumption that the Motorola CableCARD is being used to test interoperability with "vendor XXX" hosts on the Motorola head-end network.

12.2.6.1 Set power level of the FDC channel between –15dBmV and +15dBmV and the FDC channel frequency between low FDC frequency range. (70MHz - 90MHz.) Verify FDC channel frequency on a spectrum analyzer.

12.2.6.2 Authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC6000. Verify the host can display the encrypted digital service.

Results	Comments

12.2.6.3 De-authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC6000. Verify the host cannot display the encrypted digital service.

Results	Comments

12.2.6.4 Tune the Motorola CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.6.5 Tune the Motorola CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.6.6 Change the FDC channel frequency between middle FDC frequency range. (90MHz - 110MHz.) Verify FDC channel frequency and power level on a spectrum analyzer.

12.2.6.7 Authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC6000. Verify the host can display the encrypted digital service.

Results	Comments

12.2.6.8 De-authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC6000. Verify the host cannot display the encrypted digital service.

Results	Comments

12.2.6.9 Tune the Motorola CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.6.10 Tune the Motorola CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.6.11 Change the FDC channel frequency between high FDC frequency range. (*110MHz - 130MHz.)* ***Verify FDC channel frequency and power level on a spectrum analyzer.***

12.2.6.12 Authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC6000. Verify the host can display the encrypted digital service.

Results	Comments

12.2.6.13 De-authorize a Motorola CableCARD "vendor XXX" host combination for an encrypted digital service through the DAC 6000. Verify the host cannot display the encrypted digital service.

Results	Comments

12.2.6.14 Tune the Motorola CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.2.6.15 Tune the Motorola CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Motorola head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3 Harmonic

12.3.1 Harmonic CORE Interoperability Tests

All tests in this section are to be performed with the assumption that the Generic CableCARD is being used to test interoperability with “vendor XXX” hosts on the Harmonic head-end network.

Note: For this ATP release, the SCM/NDS CableCARD on NDS/Harmonic head-end sytem implementation is currently under development and does not support test procedures as noted.

12.3.1.1 Using the “vendor XXX” remote control and the network XXX application, tune CableCARD “vendor XXX” host combination to High Value content channel. (Refer to channel lineup). Verify that the CableCARD “vendor XXX” host combination cannot view the high value content.

Results	Comments

12.3.1.2 Add a CableCARD ID & Host ID to the system database, per vendor procedure. Verify that the CableCARD can be successfully added to the system database.

Results	Comments

12.3.1.3 Authorize CableCARD “vendor XXX” host combination to receive high value content through the system authorization process. Using the “vendor XXX” remote control, Verify the host combination can view the high value content.

Results	Comments

12.3.1.4 Using the “vendor XXX” remote control, verify that when the CableCARD diagnostics menu is selected the NDS CableCARD and vendor XXX host combination display an MMI message screen with the CableCARD ID and Host ID as part of the MMI display. Follow manufacture instructions bring up the MMI screen through the application information resource selection screen.

Results	Comments

12.3.1.5 Confirm Power removal from "vendor XXX" host while CableCARD is inserted. Physically unplug input power from "vendor XXX" Host/CableCARD combination. Wait 10 seconds and reapply input power. Verify that the CableCARD, "vendor XXX" host combination, successfully re-initialize without requiring a re-initialization.

Results	Comments

12.3.1.6 Confirm function power on/off from "vendor XXX" host front panel. Verify that the CableCARD, "vendor XXX" host combination can be turned on and off from the hosts front panel at least 5 times and successfully recover after each power cycle. A successful recovery is defined by the CableCARD and host combination not requiring a CableCARD re-initialization, and the front panel LED's turning OFF and back on respectively.

Results	Comments

12.3.1.7 Load XXX application on the object carousel. Set the application file for autostart and run. Verify CableCARD, "vendor XXX" host combination has finished loading the application(s) that are currently loaded and being fed to the DUT from the Carousel. This can be done by launching one of the applications. See application instructions on how to launch the application. Once the application has been launched verify that you can navigate within the application.

Results	Comments

12.3.1.8 Using the "vendor XXX" remote control and the network XXX application verify CableCARD, "vendor XXX" host combination has basic user interface function of Channel up/down. Changing channels up then down on the host and confirming that they are displayed correctly on a TV.

Results	Comments

12.3.1.9 Using the "vendor XXX" remote control and the network XXX application verify the ability of CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to clear analog channel. (Refer to Harmonic channel map) Verify audio and video on TV.

Results	Comments

12.3.1.10 Using the "vendor XXX" remote control and the network XXX application verify the ability of CableCARD, "vendor XXX" host combination to tune unencrypted QAM64. (Refer to Harmonic channel map) Verify audio and video on TV.

Results	Comments

12.3.1.11 Using the "vendor XXX" remote control and the network XXX application, verify the ability of CableCARD, "vendor XXX" host combination to tune unencrypted QAM256. (Refer to Harmonic channel map). Verify audio and video on TV.

Results	Comments

12.3.1.12 Verify that the front panel LED or onscreen display on the vendor "XXX" host correctly displays, etc. the channel number of the analog or digital service being displayed on the TV. (Verify a services, at lower, middle and upper frequencies, reference plant channel map)

Results	Comments

HOST PICS satisfied by this test:

HFDCrf.20	The Host shall providean a=0.03 square root raised cosine receive filter.	Indirect
HFDCrf.23	The receiver in the Host shall be capable of receiving symbols transmitted with a Frequency Stability of +/- 50 ppm measured at the upper limit of the frequency range	Indirect
HFDCrf.26	The Host shall operate with carrier suppression that is > 30 dB	Indirect

12.3.1.13 Authorize CableCARD "vendor XXX" host combination for an encrypted channel through system authorization process. Using the "vendor XXX" remote control tune to that service and verify that the CableCARD "vendor XXX" host combination can display the encrypted digital channel.

Results	Comments

12.3.1.14 De-authorize CableCARD "vendor XXX" host combination for an encrypted channel through system authorization process. Using the "vendor XXX" remote control tune to that service and verify that the CableCARD "vendor XXX" host combination cannot display the encrypted digital channel.

Results	Comments

12.3.1.15 Verify the correct channel map is loaded into the host by Using the "vendor XXX" remote control to display each service and Comparing the channel map to the LED, onscreen, etc display on "vendor XXX" host. Verify that the channel map matches the as well as to the content displayed on the TV.

Results	Comments

12.3.1.16 Using the "vendor XXX" remote control verify that the "vendor XXX" host responds correctly to commands from a hand-held remote control or programmable addressable IR blaster that simulates the remote control. Channel up, channel down, and verify "vendor XXX" host successfully changes channels and displays audio and video on TV.

Results	Comments

12.3.1.17 Using the "vendor XXX" remote control verify the ability of the CableCARD, "vendor XXX" host combination to channel wrap at the last defined channel. Tune "vendor XXX" host to last defined channel in the channel map, and then channel up. Verify that the "vendor XXX" host tunes to the first channel in the channel map. Channel down and verify that "vendor XXX" host displays the last channel in the channel map.

Results	Comments

12.3.1.18 Verify CableCARD, "vendor XXX" host combination can display closed captioning on a TV, from a digital multiplex. Tune "vendor XXX" host to a digital channel and verify the closed captioning on the TV.

Note: Not all content on this channel is closed caption commercials do not have closed captioning.

Results	Comments

12.3.1.19 Verify CableCARD, "vendor XXX" host combination can display closed captioning, from an analog service. Tune "vendor XXX" host to analog channel and verify the closed captioning on the TV. (Refer to Harmonic channel map)

Results	Comments

12.3.1.20 Using the "vendor XXX" remote control tune the CableCARD, "vendor XXX" host combination to analog service. (Refer to Harmonic Channel map) Send an EAS Force Tune message from head-end and verify EAS message is received. .

Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.3.1.21 Using the "vendor XXX" remote control tune the CableCARD, "vendor XXX" host combination to a digital service. Send an EAS FORCE TUNE message from the head-end and verify EAS message is received. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.3.1.22 Using the "vendor XXX" remote control tune the CableCARD, "vendor XXX" host combination to digital channel. Send an EAS maximum priority force tune message from the system head-end The CableCARD, "vendor XXX" host SHALL acknowledge the EAS force tune. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.3.1.23 Using the "vendor XXX" remote control tune the Harmonic CableCARD, "vendor XXX" host combination to digital service . Send an EAS maximum priority force tune message from the Harmonic head-end to The Harmonic CableCARD, "vendor XXX" host SHALL acknowledge the EAS force tune. Once the Force tune has expired the DUT shall return to its original viewing channel when complete.

Results	Comments

12.3.1.24 Verify CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune CableCARD and "vendor XXX" host combination to QAM64 FAT channel.(Refer to Harmonic Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.3.1.25 Verify CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT channel. Tune HARMONIC CableCARD and "vendor XXX" host combination to

QAM256 FAT channel. (Refer to Harmonic Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.3.1.26 Verify that the CableCARD and "vendor XXX" host service level authorization can be deleted from the system. Verify that the "vendor XXX" host can only receive unencrypted analog and digital services.

Results	Comments

12.3.1.27 Verify that CableCARD and "vendor XXX settop" host combination can display services on output channel 4. On the Host change the output channel from 3 to 4, initialize HARMONIC CableCARD and "vendor XXX settop" host combination. Verify that the DUT changes from channel 3 to 4 to view content from the host on the TV.

Results	Comments

12.3.1.28 Verify that the CableCARD and "vendor XXX settop" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.3.2 Minimum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the CableCARD under test is being used to test interoperability with "vendor XXX" hosts on the Harmonic head-end network. The power level of the FAT channel should be attenuated to –15dBmV for 64 QAM, -12dBmV for 256 QAM and 0dBmV for analog. Check plant with a spectrum analyzer. This test will ensure interoperability of the CableCARD under test "vendor XXX" hosts combination at minimum power levels.

12.3.2.1 Verify the ability of NDS CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to displayed an analog channel. Verify audio and video on TV.

Results	Comments

12.3.2.2 Verify the ability of NDS CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to QAM64 channel. Verify audio and video on TV.

Results	Comments

12.3.2.3 Verify the ability of NDS CableCARD, "vendor XXX host combination to tune unencrypted QAM256. Tune "vendor XXX" host to QAM256 channel. (Refer to NDS/Harmonic Channel map) Verify audio and video on the TV.

Results	Comments

12.3.2.4 Authorize a NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the NDS system. Verify the host can display the encrypted digital service.

Results	Comments

12.3.2.5 De-authorize a NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the NDS system. Verify the host cannot display the encrypted digital service.

Results	Comments

12.3.2.6 Verify NDS CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune NDS CableCARD and "vendor XXX" host combination, to QAM64 multiplex. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the NDS CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.3.2.7 Verify NDS CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT Channel. Tune NDS CableCARD and "vendor XXX" host combination to display QAM256 channel. (Refer to NDS/Harmonic Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the NDS CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.3.2.8 Verify that the NDS CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.3.2.9 Tune the NDS CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the NDS/Harmonic head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.2.10 Tune the NDS CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the NDS/Harmonic head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.3 Maximum FAT Power Interoperability test

All tests in this section are to be performed with the assumption that the CableCARD under test is being used to test interoperability with "vendor XXX" hosts on the Harmonic head-end network. The power level of the FAT channel should be amplified to +15dBmV and verified on a spectrum analyzer. This test will ensure interoperability of the CableCARD under test "vendor XXX" hosts combination at maximum power levels.

12.3.3.1 Verify the ability of NDS CableCARD, "vendor XXX" host combination to tune clear analog channels. Tune "vendor XXX" host to displayed an analog channel. Verify audio and video on TV.

Results	Comments

12.3.3.2 Verify the ability of NDS CableCARD, "vendor XXX" host combination to tune unencrypted QAM64.Tune "vendor XXX" host to QAM64 channel. Verify audio and video on TV.

Results	Comments

12.3.3.3 Verify the ability of NDS CableCARD, "vendor XXX host combination to tune unencrypted QAM256. Tune "vendor XXX" host to QAM256 channel. (Refer to NDS/Harmonic Channel map) Verify audio and video on the TV.

Results	Comments

12.3.3.4 Authorize a NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the NDS system. Verify the host can display the encrypted digital service.

Results	Comments

12.3.3.5 De-authorize a NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the NDS system. Verify the host cannot display the encrypted digital service.

Results	Comments

12.3.3.6 Verify NDS CableCARD and "vendor XXX" host ability to re-acquire QAM64 FAT channel. Tune NDS CableCARD and "vendor XXX" host combination, to QAM64 multiplex. Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the NDS CableCARD and "vendor XXX" host combination can re-acquire QAM64 FAT channel and display audio and video on TV.

Results	Comments

12.3.3.7 Verify NDS CableCARD and "vendor XXX" host ability to re-acquire QAM256 FAT Channel. Tune NDS CableCARD and "vendor XXX" host combination to display QAM256 channel. (Refer to NDS/Harmonic Channel map) Physically remove F-connector from the back of the host. Wait 10 seconds and reconnect. Verify that the NDS CableCARD and "vendor XXX" host combination can re-acquire QAM256 FAT channel and display audio and video on TV.

Results	Comments

12.3.3.8 Verify that the NDS CableCARD and "vendor XXX" host combination can pass through content advisory information present in the VBI lines to a TV with a V-Chip present. To do this set up a TV with rating control via remote control for TV. Set up V-Chip to block any content over a rating "G". Channel through the channel map for analog and digital services and verify the TV has the ability to read the VBI lines and block the video with a rating above "G".

Results	Comments

12.3.3.9 Tune the NDS CableCARD, "vendor XXX" host combination to an analog service. Send an EAS message from the NDS/Harmonic head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.3.10 Tune the NDS CableCARD, "vendor XXX" host combination to digital service. Send an EAS message from the NDS/Harmonic head-end and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.4 Lower Frequency Interoperability Test

This test is to verify the CableCARD under test and "vendor XXX" hosts can successfully tune in the lowest EIA QAM channel requirement of 54MHz.

Refer to the NDS/Harmonic channel map for low frequency QAM channel.

Note: NDS/Harmonic configuration does not support low frequency QAM channel.

12.3.4.1 Verify the ability of CableCARD under test, "vendor XXX" host combination to tune unencrypted QAM64.Tuning "vendor XXX" host to QAM64 multiplex and verify audio and video on TV.

Results	Comments

12.3.5 Upper Frequency Interoperability Test

This test is to verify the CableCARD under test and "vendor XXX" hosts can successfully tune in the upper most EIA QAM channel requirement of 860MHz. Refer to NDS/Harmonic channel map.

Note: NDS/Harmonic head-end configuration does not support upper frequency QAM channel.

12.3.5.1 Verify the ability of CableCARD under test, "vendor XXX" host combination to tune unencrypted QAM64.Tuning "vendor XXX" host to QAM64 multiplex and verify audio and video on TV.

Results	Comments

12.3.6 One Way Legacy OOB Messaging

All tests in this section are to be performed with the assumption that the SCM/NDS CableCARD is being used to test interoperability with "vendor XXX" hosts on the Harmonic head-end network.

12.3.6.1 Verify power level of the FDC channel between –15dBmV and +15dBmV. Set the FDC channel frequency between low FDC frequency range. (70MHz - 90MHz.) Verify FDC channel frequency on sprectrum analyzer.

Results	Comments

12.3.6.2 Authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the Harmonic HE system. Verify the host can display the encrypted digital service.

Results	Comments

12.3.6.3 De-authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the HARMONIC HE SYSTEM. Verify the host cannot display the encrypted digital service.

Results	Comments

12.3.6.4 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Harmonic HE system and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.6.5 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Harmonic HE system and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.6.6 Change the FDC channel frequency between middle FDC frequency range. (90MHz - 110MHz.) Verify FDC channel frequency and power level on a spectrum analyzer.

12.3.6.7 Authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the HARMONIC HE SYSTEM. Verify the host can display the encrypted digital service.

Results	Comments

12.3.6.8 De-authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the HARMONIC HE SYSTEM. Verify the host cannot display the encrypted digital service.

Results	Comments

12.3.6.9 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the HARMONIC HE SYSTEM and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.6.10 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Harmonic HE system and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.6.11 Change the FDC channel frequency between high FDC frequency range. (*110MHz - 130MHz.)* ***Verify FDC channel frequency and power level on a spectrum analyzer.***

12.3.6.12 Authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the HARMONIC HE SYSTEM. Verify the host can display the encrypted digital service.

Results	Comments

12.3.6.13 De-authorize a SCM/NDS CableCARD "vendor XXX" host combination for an encrypted digital service through the HARMONIC HE SYSTEM. Verify the host cannot display the encrypted digital service.

Results	Comments

12.3.6.14 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to analog service. Send an EAS message from the Harmonic HE system and verify EAS message is displayed correctly on a TV.

Results	Comments

12.3.6.15 Tune the SCM/NDS CableCARD, "vendor XXX" host combination to unencrypted digital service. Send an EAS message from the Harmonic HE system and verify EAS message is displayed correctly on a TV.

Results	Comments

Annex A M-UDCP Vendor Proof of Compliance Submitted Documentation Recommendations

This provides guidance and further explanation for submitting vendor proof of compliance documentation for verification of M-UDCP as identified for the specific requirements in the M-UDCP PICS document.

- Documentation naming convention recommendation:
  - [4 letter company designator] NN X [PICS reference(s)], where NN = CW number, X = model sequence number e.g. CLAB192_HPPii13.xxx or CLAB193_HPPh6_7.xxx

- Portable Document Format (.pdf) documents are preferred but any typical electronic document is acceptable, such as .doc, .rtf, .xls, ppt, etc. Use .gz for .zip files.

- Use English

- Each document should state the conclusion clearly – This XXX [software | hardware design, etc.] complies with [PICS reference #] as described above.

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
MOCLK Operation	Hpower.19	The MOCLK signal SHALL be derived from MICLK and SHOULD operate at 27 MHz.	M	Submit logic analyzer trace showing MOCLK period.	HPIA, 7.3.3.4
MOSTRT and MDO 7:0 Operation	Hpower.20	The MOSTRT and MDO[7:0] signals SHALL be clocked into the M-UDCP on the rising edge of MOCLK .	M	Submit logic analyzer trace showing MOSTRT and MDO signals in reference to MOCLK.	HPIA, 7.3.3.4
Connector Reliability	HPPh.6	The M-UDCP SHALL have connector reliability described in Section 7 of PC Card Standard, Volume 3 - Physical Specification.	M	Provide connector specifications, from 3rd party vendor/manufacturer. (e.g. copy of connector data sheet)	HPIQ, Volume 3
Connector Durability	HPPh.7	The M-UDCP SHALL have connector durability described in Section 8.2 (harsh environment) of PC Card Standard, Volume 3 - Physical Specification.	M	Provide connector specifications, from 3rd party vendor /manufacturer. (e.g. copy of connector data sheet)	HPIQ, Volume 3
MPEG Data Stream	HPPii.2	The M-UDCP SHALL not route the MPEG data stream through the Card during PCMCIA reset.	M	Describe a test setup, equipment and procedure that demonstrates that there is not an MPEG stream present on the Card/ Host Interface (CHI) during a PCMCIA reset.	HPIA, 7.6.3.3.2
OOB Receiver	HPPii.9	The OOB receiver in the M-UDCP SHALL be connected only to the Card module interface.	M	Vendor statement of compliance including a block diagram and/or schematic indicating compliance.	HPIA, 7.6.3.8
Error/ Reset Handling	HPinit.290	When the Card fails to respond to any request other than described above by HPinit.262 or HPinit.279 within five seconds, the M-UDCP SHALL either; Minimal – Perform 1 PCMCIA reset and Report Error using screen in figure B-1 "Error Display" if not successful. Optional – Retry PCMCIA resets up to two times and then Report Error. Preferred – Perform at least 1 PCMCIA reset. Report Error if not successful, and continue to perform PCMCIA resets.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to satisfy PICS for Card Reset and Error Handling.	HPIA, Annex B

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
Error/ Reset Handling	HPinit.291	When the M-UDCP receives an invalid session APDU from the Card the M-UDCP SHALL ignore invalid sessions.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to satisfy PICS handling of invalid session APDU.	HPIA, Annex B
Error/ Reset Handling	HPinit.292	When the M-UDCP receives an invalid SPDU tag from the Card the M-UDCP SHALL ignore invalid SPDU tags.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to satisfy PICS handling of invalid session SPDU.	HPIA, Annex B
Error/ Reset Handling	HPinit.293	When the M-UDCP receives an invalid APDU tag from Card the M-UDCP SHALL ignore invalid APDU tags.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to satisfy PICS handling of invalid session APDU tags.	HPIA, Annex B
Error/ Reset Handling	HPinit.295	When the M-UDCP receives a Session ID from the Card that has not been created by the M-UDCP the M-UDCP SHALL ignore session ID's that have not been created.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to satisfy PICS ignore session ID's.	HPIA, Annex B
Error/ Reset Handling	HPinit.316	When the Host sets the ER bit but the Card fails to set the CR bit in the IQB within 5 seconds of RESET going inactive the M-UDCP SHALL display an error message using the screen in figure B-1 "Error Display" to the user, and either; Minimal – Perform 1 PCMCIA reset and Report Error if not successful. Optional – Retry PCMCIA resets up to two times and then Report Error. Preferred – Perform at least 1 PCMCIA reset. Report Error if not successful, and continue to perform PCMCIA resets.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure error message is displayed and resets are performed.	HPIA, Annex B
Resource Identifier	DSs.12	When the response is resource_non_existent the M-UDCP SHALL respond with the resource_identifier field identical to that supplied in the open request.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure the M-UDCP responds with the resource_identifier field identical to that supplied in the open request.	HPIA, 9.1.4.1

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
CA_PMT() APDU	DApCa.22	When the Card firsts receives ca_pmt_cmd_id = “ok_mmi” it can begin a MMI dialog but can not begin descrambling until receiving another CA_PMT object with the ca_pmt_cmd_id = “ok_descrambling”. In this case the M-UDCP SHALL guarantee that a MMI session can be opened by the CA application.	C-M	Indicate support for sending an “ok_mmi” CA_PMT object and submit flow-chart, code snippet or pseudo code, demonstrating the MMI processing when “ok_mmi” is sent.	HPIA, 9.7.3
CA_Enable() APDU	DApCa.21	Where the M-UDCP cannot support descrambling of different elementary streams by different Cards then it MAY take as the CA_enable value for the program of the lowest of the CA_enable values returned for each elementary stream of the program.	O	Indicate support and submit flow-chart, code snippet or pseudo code, demonstrating the CA_enable processing.	HPIA, 9.7.4
Program_Index	DApCa.37	The M-UDCP SHALL update assignments to each program_index as old programs are replaced by new programs, thereby maintaining the total number of active programs within the M-Card’s limitations.	M	Submit flow-chart, code snippet or pseudo code, demonstrating the program index processing.	HPIA, 9.7.3.1
Transaction_ID	DApCa.40	The M-UDCP SHALL maintain a separate transaction_id counter for each program index, so that the transaction_ids increment independently for each index.	M	Submit flow-chart, code snippet or pseudo code, demonstrating the program index and transaction ID processing.	HPIA, 9.7.3.1
Source_ID	DApCa.41	When the M-UDCP has not yet acquired the Source ID, the M-UDCP MAY set the Source ID value to 0 until the Source ID information is available.	O	Submit code snippet or pseudo code, demonstrating the source ID processing.	HPIA, 9.7.3.1
	DApCa.42	The M-UDCP SHALL replace the previously set value of 0 to that of the received Source ID value.	C-M		

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
Request_PIDs	DApCa.43	If the M-UDCP performs any filtering of elementary streams, it SHALL utilize the request_pids() APDU to determine what PIDS to filter and to accept and process the request_pids_cnf() APDU from the M-Card as defined in section 9.12.7 and 9.12.8 of HPIA.	C-M	Indicate support for PID filtering.	HPIA, 9.7, 9.12
MMI Navigation	DApMi.12	The M-UDCP SHALL support a navigation method to allow user navigation with the MMI resource defined in reference HPIA.	M	Describe the keys on the remote used to navigate within an MMI message. I.e. EXIT and hyperlink. Screen shots, photos, drawings of buttons would be helpful to illustrate the process.	HPIA, 9.11
CA_Descriptor	HstIBCS.123	The M-UDCP SHALL not be adversely affected by the presence or absence of the descriptor tag 0x09 = CA_descriptor().	M	Submit code snippet or pseudo code, demonstrating what happens when the CA_descriptor is processed and that the M-UDCP is not adversely affected by the presence or absence of the ca_descriptor.	HPIL, 5.8.3, Table 5.5
MMI Pairing Display	CpsB.27a	When the M-UDCP / Card pairing information screen application info APDU is selected after the Card has provided an invalid certificate to the M-UDCP then the M-UDCP SHALL generate and display the following message: "Please call your cable operator and report an invalid CableCARD".	M	Instructions for how to access the vendor diagnostic menu to display the CableCARD information screen.	Appendix A, R102
CCI Association	CpsC.4a	The M-UDCP SHALL retain the temporal association of CCI with content to within two seconds. Note: The Temporal association conditions are identified in CPsC.4b.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure the M-UDCP retains the temporal association of CCI with content to within two seconds.	HPIN, 9.4.3
CCI Output Association	CpsC.4b	The M-UDCP SHALL control output of content according to the originally associated CCI value, independent of any other action of the M-UDCP, including but not limited to:	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance.	HPIN, 9.4.3

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		a) recording and delayed playback or output of content, b) M-UDCP "power-off" while the Card remains powered, or c) M-UDCP tuning away to analog or clear digital channels and then back to content with non-zero CCI			
CCI Modification Prevention	CpsC.32	The M-UDCP SHALL maintain associated CCI value from unauthorized modification, substitution, and loss of temporal association on internal interfaces.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis and/or hardware analysis to ensure compliance.	HPIN, 9.4.3
CCI_Auth	CpsC.12b	If the compared CCI_auth value does not match, the M-UDCP SHALL set the Host CCI=0x03, set and return a zero value CCI_ack to the Card to indicate the failure.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance.	HPIN, 9.4.2
CCI to MPEG Association Timing	CpsC.31	The M-UDCP SHALL control output of the associated MPEG program according to valid CCI within one second.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance	HPIN, 9.4.2
CP_Valid_Req()	CpsM.11	The M-UDCP MAY use CP_valid_req() APDU to request the Card Validation status. The Card Validation status is set as indicated in Table 11.8-4 of HPIN.	O	Provide instructions to indicate under what conditions the host will issue CP_valid_req() APDU and if there are any user interface components for initiating the APDU or viewing results.	HPIN, 11.8
Resource Identifier	CpsM.4	When the version field of the supplied resource identifier is zero, then the M-UDCP SHALL use the current version in its list.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance	HPIN, 11.3
Version Number Request	CpsM.5	When the requested version number is higher than the version in the M-UDCP's list, the M-UDCP SHALL refuse the request with the appropriate return code as defined in HPIA.		Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance.	HPIN, 11.3
Secure Secrets	CertMgt.26	M-UDCP's SHALL be designed and manufactured in a manner to effectively frustrate attempts to discover or reveal	M	Using flowcharts and/or (pseudo) code, demonstrate hardware an/or software analysis to ensure compliance to	Appendix A, R-317

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
		(i) the unique number, of a specified bit length, assigned to each Multi-stream Unidirectional Digital Cable Product, the numbers used in the process for encryption or decryption of Controlled Content, or the private key used in the process for encryption or decryption of Controlled Content (collectively, "Keys") and (ii) the methods and cryptographic algorithms used to generate such Keys. For the avoidance of doubt, Keys includes the private key used for authentication. All authentication private keys shall be protected using encryption or obfuscation methods when being transferred across internal buses and stored in memory.		protect secrets.	
Dolby	HstIBCS.30	The M-UDCP SHALL support the value of stream_id for AC-3 audio of 1011 1101 (private_stream_1).	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HPIL, 5.6.1
Dolby	HstIBCS.182	The M-UDCP SHALL accept Packetized Elementary Stream syntax and semantics format used to encapsulate the audio and video elementary stream information according to ISO/IEC 13818-1.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HPIL, 5.6
Dolby	HNETdig_aud.2	The M-UDCP SHALL use the ISO_639_language_descriptor, when present, as defined in [ISO/IEC 13818-1] and constrained by [ANSI/SCTE 54], to identify the language associated with audio tracks and to allow access to each available Complete Main audio stream of stream type 0x81 in a given service.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HD, Annex B Section 6
Dolby	HNETdig_aud.4	The M-UDCP SHALL recognize the synchronization word as syncword = 0x0B77	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	NIT, 5.4.1.1

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
Dolby	HNETdig_aud.5	The M-UDCP with audio decoding capabilities SHALL support the frequency code fscod = '00' (which is the sampling rate of 48 kHz).	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	NIT, 5.4.1.3 HD, Annex B 5.1, 5.2
Dolby	HNETdig_aud.6	The M-UDCP SHALL accept the audio constraints called out in table B1 of reference HD: Any main audio service or associated audio service containing all necessary program elements will have the frmsizecod element less than or equal to '011110', indicating 448 kbps.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HD, Table B-1
Dolby	HNETdig_aud.7	The M-UDCP SHALL support the AC3 audio with a bsid = '01000'.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	NIT, 5.4.2.1
Dolby	HNETdig_aud.8	The M-UDCP SHALL not be adversely affected by any audio service type (bsmod) defined in HD Annex B Table B2.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HD, Annex B 6.2 Appendix A, R-33
Dolby	HNETdig_aud.9	The M-UDCP SHALL support the AC3 audio with acmod = as defined in Table 5.8 of NIT.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	NIT, 5.4.2.3 Table 5.8
Dolby	HNETdig_aud.11	The M-UDCP SHALL not be adversely affected by any audio service type (bsmod) defined in HD Annex B Table B2.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HD, Annex B-6.2, Appendix A, R-33
Dolby	HNETdig_aud.12	The M-UDCP SHALL accept the audio constraints called out in table B-1 of reference HD: The combined rate of a main and an associated service intended to be simultaneously decoded SHALL be less than or equal to 512 kbps.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	HD, Annex B 5.1
Dolby	HNETdig_vid.22	The M-UDCP SHALL use an MPEG-2 decoder that is capable of decoding video streams with the low_delay flag enabled.	M	Submit a copy of the Dolby Digital Certificate and Dolby Laboratory acceptance letter.	NIF, 2.4.3.2
Dolby	Audio.15	The M-UDCP SHALL be certified by	M	Submit a copy of the Dolby Digital	Appendix A, R-

Category	PICS Reference	PIC Text	Status	Recommendations	Standard Reference
		Dolby Laboratories, Inc. for Dolby Digital™ decoding.		Certificate and Dolby Laboratory acceptance letter.	375
EAS	HNIEAS.30	The M-UDCP SHALL process multi-lingual alert_text(), and SHALL choose at most one language for display when text is provided multi-lingually.	M	Using flowcharts and/or (pseudo) code, demonstrate software analysis to ensure compliance processing of a multi-lingual alert text.	NIQ, 5, 7.2 #15 Appendix A, R-341
Macrovision	HACP.2	The M-UDCP SHALL use APS bits to control copy protection encoding on analog video outputs (Macrovision) as follows: APS=00 no encoding, utilize specific modes of analog protection encoding for APS=01,10,and 11. Note: Analog copy protection only applies to analog outputs as constrained by the license agreement.	M	Submit a copy of the Macrovision Certificate.	HPIN, 9.1.2
Direct Pick-up	HMech.31	Prior to production, the manufacturer shall demonstrate or document that the M-UDCP meets the requirements of 47 CFR 15.118 (c)(3) Direct pickup interference.	M	Submit complete documentation, including test results, model number, tester, date, interference levels, test equipment used.	Appendix A, R-202
Radiated Emissions	HMech.7	The M-UDCP SHALL meet radiated emissions limits caused by cable signals on the product's cable RF connector input in accordance with 47 CFR 76.605 (12) (15 uV/m at 30 m for frequencies outside the range 54 to 216 MHz and 20 uV/m at 3 m for frequencies inside the range 54 to 216 MHz).	M	Submit complete documentation, including test results, model number, tester, date, interference levels, test equipment used.	Appendix A, R-200
Plugfest	HDST.15	If the M-UDCP has a HMDI or DVI output, for the manufacturer's first M-UDCP or UDCP, manufacturer agrees to participate with cable operators and cable operator vendors in a digital interface plugfest event.	C-M	Submit documentation verifying this model participated in an authorized plugfest, for example, the participation agreement OR registration form (must show model number and plugfest dates.)	Appendix A, R-40