



## Home Certification and Troubleshooting Technics SCTE Piedmont Chapter



# **Technical Session Overview**

- Troubleshooting the Triple Play
- Return Path Analysis
- Digital Testing
- Auto Testing and Home Certification
- Perpetual Install



# Challenges faced by the Customer



Poor Picture Quality



**Dropped calls** 



#### **Slow Internet**



Slow Transmission Network Challenges



# What Is a Home Certification

- Verifying the health of the subscribers network
- Taking corrective actions to ensure network performance
- Creating a birth certificate for future references









# Challenges faced by the technician

- Increased SD and HD services
- Higher Demand for QoS & Reliability
- More Competition from Telecom & Others
- Must Reduce Truck Rolls & Service Calls
- Additional Products and CPE to learn
- Operational Costs are greater
- Enhancing Customer Satisfaction



# Troubleshooting the Triple Play Step by Step Procedures



## System Scan

- Provides graphical view of the entire channel plan based on the selected channel table.
- Both Analog and Digital channels are measured
- Fast visual snapshot of Analog, Digital, or DOCSIS carrier levels.
- Digital channels should be 6 to 10 dB below Analog channels
- DOCSIS/Digital channel levels should range between -8 to +7 dBmV





# Single Channel Analog Measurement

- Measurement of selected frequency or a Channel that is active in the Channel Table
- Content differs for Analog or Digital signals
- Analog Signal
  - Video Levels
  - Audio Levels
  - Video/Audio (V/A) Delta
  - Carrier to Noise (C/N) Ratio

Single Ch: >Home/Sir	annel ngle Channel					0 🐼
Channel	4	67.2500MHz		SLM		Pause
Name	VCR	NTSC	1			Clear Result
Video	-0.9dBmV	•				
Audio 1	-14.4dBmV					
V/A1	13.5dB					
Audio 2	N/A		A1			
VIA2	N/A					
ADJ Ch.	-4.3dB		A2			
C/N	44.0dB HUN	/1 <mark>0.5%</mark>	-40 -20	0 20 40	60	
Tbl:Frem	ont-AnnexB1	Loc:Off	TP	Off	16-04	2012 15:41:05



# Single Channel Digital Measurement

- Digital Signal
  - Average power of QAM
  - MER
  - BER: Pre FEC and Post FEC
  - Pre/Post Errored Seconds
  - Severely Errored Seconds





CX350 Training - Suddenlink 2012

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- What is QAM?
  - QAM stands for Quadrature Amplitude Modulation.
  - A scheme that transmits data by changing the amplitude of two carrier waves
  - The two carrier waves are out of phase with each other by 90 degrees
  - Each carrier represents half the transmitted symbol.
  - Multiple levels of amplitude & phase modulation

Digital Cable uses QAM to transmit signals - two major QAM schemes are;

- 64QAM which has a data throughput around 28 Mbps
- 256QAM which has data throughput of 38.8 Mbps



# Modulation Error Ratio (MER)

- Modulation Error Ratio (MER)
  - Measures the "signal-to-noise ratio" (SNR) in a digitally modulated carrier
  - Expressed in dB, indicates the system margin available before a failure can be expected
  - Considers amplitude, phase noise and other impairments on the signal
  - Is a direct measure of modulation quality and is linked to the bit error rate of signal





# Error Vector Magnitude (EVM)

- Error Vector Magnitude (EVM)
  - Noise, distortion, spurious signals, and phase noise all degrade EVM - these impairments cause symbol "landing" points to be spread out from their ideal positions
  - Informally, EVM (%) is a measure of how far the points are from the ideal locations
  - MER and EVM are inter-related see diagram below









- Common QAM impairments include;
  - Additive white Gaussian noise (AWG)
  - Coherent interference
  - Gain compression
  - RF phase noise
  - I/Q phase error
  - I/Q gain error







- Carrier-to-Noise (C/N) ratio
  - Used in analog systems measures ratio of peak video carrier power over the noise in the channel, over the system bandwidth expressed in dB.
  - Can be performed on digital signals, but does not provide a complete picture.

#### MER and SNR

- Used in digital systems however the terms "SNR" and "MER" are often used interchangeably
- MER is digital complex baseband signal-to-noise ratio (SNR) and is the ratio, in dB, of average symbol power to average error power.







#### Constellation display

- Provides a graphical view of the demodulated QAM signal.
- Allows quick identification of impairments such as gain compression or IQ imbalance.
- The visual appearance of the constellation can be used to isolate and troubleshoot problems.





# **Constellation Diagram**



#### Quadrants/Boxes

- Each box in the diagram contains one symbol
- 64QAM: 6 bits per symbol, thus 64 boxes
- 256QAM: 8 bits per symbol, thus 256 boxes
- Decision Boundaries/Build-Up
  - Each location on the constellation is framed by decision boundaries
  - If the signal falls within these boundaries, the correct data will be received
  - If it falls in an adjacent area, the data will be in (bit) error
  - Locations on the constellation build up over time

#### Purpose

 Shape and distribution of dots are indicative of signal impairments and help you interpret and understand QAM Modulation related problems

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## Digital vs Analog carriers Spectrum

# S0.00 Image: Constrained state s

Analog

- Video & two audio channels are modulated in three separate frequencies in a 6 MHz bandwidth.
- Transmitted at different levels. Normally, a video channel is about 10dB higher than the audio channels.
- Signals are in analog nature, therefore, more resistance to noise.



- Video and Audio signals are digitized, then modulated (QAM16/64/256), and transmitted in a 6MHz band
- Digital symbols (bits) are embedded in the Haystack.
- Noise can affect the digital bit streams
- FEC (forward error correction) is used to correct errors caused by noise



## Digital vs Analog carriers Key differences

- Digital carriers are generally more robust than analog carriers
- Downstream digital data is in the form of a "haystack"
- Level/Power Measurement
  - Analog carrier levels are measured using a peak detection method
  - Digital carriers use an averaging method





## Digital vs. Analog carriers Noise Impact

Effect of noise on Analog Systems (Gradually Poorer C/N)



Effect of noise on Digital Systems (Gradually Poorer MER)



- Noise has little effect on digital signals until the system fails completely commonly referred to as the "cliff effect"
- When a minimum signal quality (Max bit error rate i.e. Post-FEC error rate) is reached, the digital decoder (QAM demodulator) is no longer able to recover the digital bit stream.





#### What is BER?

- Major indication of system health
- As data is transmitted some of the bits may not be received correctly
- The more bits that are incorrect, the more the signal will be affected

#### BER Definition

- BER is defined as the ratio of the number of wrong bits over the number of total bits.
- BER is displayed in Scientific Notation.
- The more negative the exponent the better
- >1.0E-6 Pre-BER is the minimum for an installation

#### Typical Problems

- FEC can typically correct errors that are spread out are due to noise problems
- FEC may not be able to correct errors that are grouped are due to intermittent problems such as ingress or loose connectors.



# Forward Error Correction (FEC)

#### • What is FEC?

- The FEC process adds information to each packet in the transport stream, to enable the correction of transmission errors.
- Additional data is generated using Reed Solomon encoder calculated from the original data stream before transmission
- Using the same Reed Solomon decoder at the receiving end, bit errors can be detected as are called Pre-FEC errors
- By going through the error correction algorithm, some Pre-FEC errors can be corrected.
- When Pre-FEC errors become significant and some errors cannot be corrected, they are termed Post-FEC errors
- Post-FEC errors cause poor TV signal quality and/or Internet data retransmission
- Since analysis can be made on live data, this is the method recommended for non-intrusive in-service bit error ratio estimation.





# Adaptive Equalization

- Most Receivers have internal Adaptive Equalizers
  - Its important to measure a signal the way a real receiver would
- Adaptive Equalizer may be required for QAM symbol lock
  - Some signals cannot be measured without equalization.
- Valuable Troubleshooting tool
  - Distinguish between linear gain/phase errors and non-linear distortion.
  - Measure real systems while in service.
  - Quantify amount of stress put on receiver's equalizer.





- General Operating Guidelines (MER)
  - 64QAM set top converters usually require >23dB MER to operate
    - Allow a margin of 3 or 4dB for system degradation
  - 256QAM set top converters usually require >28dB MER to operate
    - Allow a margin of 3 or 4dB for system degradation
  - 256QAM picture tiling begins around 28dB MER
  - "Digital Cliff" effect begins around;
    - 22dB for 64QAM
    - 28dB for 256QAM
  - A good MER is usually around 31dB for 256QAM at customer device



# **MER TARGET - THE "CLIFF" EFFECT**

What is The "Cliff Effect"?







## Installation Check

- Performs more detailed measurements on pre-defined channels
- Can test multiple channels
- Can test both Analog and Digital channels

Installati >Home/l	on Check nstallation Che	⊧ck						) 🕢 😢
	Ana	alog			Dig	ital		Analog
2	55.2500	98	109.2750	116	747	124	795	Digital
3	61.2500	99	115.2750	117	753	125	801	A&D
4	67.2500	14	121.2625	118	759	126	807	Save
5	77.2500	15	127.2625	119	765	127	813	
6	83.2500	16	133.2625	120	771	128	819	
95	91.2500	17	139.2500	121	777	129	825	
96	97.2500	18	145.2500	122	783	130	831	
97	103.2500	19	151.2500	123	789	131	837	

Installation	Check								
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			D	igital Cheo	:k				Install Chk
Channel	Freq (MHz)	Name	QAM	Level (dBmV)	MER (dB)	Pre-BER	Post-BER	Adjch (dB)	Page >>
93	639.00	D3B1	QAM256	4.5	37.2	1.0e-09	1.0e-09	1.2	<< Page
94	645.00	D3B2	QAM256	3.3	37.6	1.0e-09	1.0e-09	-0.7	
100	651.00	D3B3	QAM256	3.1	39.0	1.0e-09	1.0e-09	-0.2	
101	657.00	D3B4	QAM256	2.6	38.9	1.0e-09	1.0e-09	-0.1	
102	663.00	D3B5	QAM256	2.0	38.7	1.0e-09	1.0e-09	-0.9	
103	669.00	D3B6	QAM256	2.2	38.1	1.0e-09	1.0e-09	-0.6	
104	675.00	D3B7	QAM256	2.2	38.6	1.0e-09	1.0e-09	-0.4	
105	681.00	D3B8	QAM256	3.0	34.9	1.0e-09	1.0e-09	0.6	
Tbl:Fremo	nt-AnnexE	31 Lo	oc:Off		TP:C	off		16-04-:	2012 16:12:31



# **Tilt Analysis**

- Used to check the channel levels at the lowest and highest frequencies
- Level variations across the frequency spectrum are indicative of distortion.
- Efficient tool for balancing distribution amplifiers.
- Useful to identify excessive cable lengths at the customer premises

Tilt An:	alys	is											
>Home	/Til	t											
													Stop
60 T	v 								CN#	Freq (MHz)	Name	Level (dBmV)	
40									2	55.25	None	8.4	
20									3	61.25	None	7.9	
• <del> </del>	-								4	67.25	None	7.2	
-20								-	5	77.25	None	7.6	
-40	-							-	6	83.25	None	7.2	
-60	2	3	4	5	6	95	96	97	95	91.25	None	-6.1	
Ch A		2	55	.25M	Hz	8.	4 dBr	nV	96	97.25	None	-7.3	
Ch B		97	103	3. <b>25</b> N	ЛНz	-3.	3 dB	mV					
Tilt						1	1.7 d	В	97	103.25	None	-3.3	



## Spectrum Analysis

- Provides a frequency domain view of the signal
- Convenient way to measure the amplitude of digitally modulated carriers
- Troubleshoot ingress in both Forward and Reverse paths.





# Ingress on Analog and Digital Channels

- Lines in picture
- High speed data problems
- Interference with two-way radio services using the same frequencies
- Macro Blocking
- Freeze Frame
- Loss of Picture and Sound



# Check for ingress on the drop

# Use the Max Hold





QAM Primer

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# Alternative Maintenance Techniques

## High Pass Filters

- Attenuate Return Path Noise and Ingress coming from the subscriber premise
- Isolate entertain services from data services

### Return Path Attenuators

- Increase the tap loss in the return path only
- Equalize the loss for subscriber devices and increase isolation between subscriber premise and cable system
- Drop Testing
  - Testing the integrity of the subscriber wiring



# HSD Troubleshooting Tips



## Activate the Cable Modem

- Check the DS and US power levels
- 'Results' should be displayed

Cable Modem					
≻Home/Cable Moder	n	(	<b>y</b>		
Cable Modem	Web/STP	Ping	Trace Route	VolP	Disconnect
Setup	Results	5	IP	Link	
Ch / Downstream	1 / 609.000 MHz	2/603.000 MHz	3 / 615.000 MHz	4 / 621.000 MHz	Reset
Lock / Level(dBmV)	PASS / 0.8 dBmV	PASS / 0.5 dBmV	PASS / 0.8 dBm	/ PASS / -0.9 dBmV	
Ch / Downstream	5 / 627.000 MHz	6 / 633.000 MHz	7 / 639.000 MHz	8 / 645.000 MHz	
Lock / Level(dBmV)	PASS / 0.0 dBmV	PASS / 1.1 dBmV	PASS / 0.7 dBm	/ PASS/0.4 dBmV	
Upstream (ID)	32.000 MHz (3)				
Upstream Ranging	44.5 dBmV				
DHCP	PASS T	od PASS	Registration	PASS	PING CMTS
Configuration File	'001c7be48911-b	c=1-reg=Ll-ver=d	BPI Status	Enabled/PASS	
Connection	Online		Mode/Bonding	3.0/8x1	R-Server
Status	Test Completed				
					Ethernet Tools
Tbl:LI WEST	Loc:Input	to Device	TP:Off	17-05-2	2013 14:58:13



#### Access to All Downstream Carriers and Upstream

Cable Modem		(	7								
>Home/Cable Moden	n	(	<u> </u>								
Cable Modem	Web/FTP	Ping	Trace F	loute	Vol	P					
Setup	Result	ts	IP		Link						
Downstream (Ch)	609.00	603.00	615.00		621.00						
Symbol Rate	5.361 MSps	5.361 MSps	5.361 MS	ps	5.361 MS	ps					
Modulation	256 QAM	256 QAM	256 QAM		256 QAM						
Level	-2.9 dBmV	-3.1 dBmV	-2.8 dBm	۷	-4.6 dBm	/					
SNR (dB)	41.2	41.1	41.0		40.3						
Pre-BER	0.0e+00	0.0e+00	0.0e+00	Cable Mo	dem			_			
Pre-Error Seconds	0	0	0	>Home/C	able Mode	m			<b>U</b>		
Post-BER	0.0e+00	0.0e+00	0.0e+00	Cable	Modem	Web/i	ТР	Ping	Trace Rout	te VolP	
Post-Error Seconds	0	0	0	:	Setup		Results		IP	Link	
				Upstream	n UCD	3					
		<b>a</b>		Frequen	cy	32.000	vHz				
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				Symbol F	Rate	5.120 M	Sps				
							(	🕙 🛛 Page 3 o	F 3 🕑		Ethernet Tools
				Tbl:LI W	EST		Loc:Input	to Device	TP:Off	17-05-	2013 14:53:55

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## Cable Modem Is Online Verify IP Connectivity

#### Go to the 'Ping' tab and run a quick Ping test

Cable Modem										
>Home/Cable Mod	em .									
Cable Modem	Web/FTP	Ping	Trace Route	VolP						
	Setup		Result			Dro	ss (Sta	t' and co	onfirm t	hat ID
Profile		Defaul	t	▼			55 <b>Sta</b>			ΠαιΠ
Destination		www.g	oogle.com			Pac	kets ar	e receive	ed.	
Number of Pings		😑 Co	ntinuous Ping		Start					
-		10								
Length	64	Pings/S	Sec	1	Cable Modem					
Time Out (ms)		1000			>Home/Cable Mod	em				
					Cable Modem	Web/FTP	Ping	Trace Route	VoIP	
						Setup		Result		
					PING: PASS					
					Destination		74.125.	24.115		
					Sent		10			
Tbl:Fremont Anne	xBLoc:Off		TP:Off	04-04-3	20'Received		10	V		Start
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receive	ed, it is l	ikely th	ne meter':	S	Current	62.896	Averag	e 64.60	00	-
Cabla	Madam	haana	ot boon		MIN	60.592	MAX	81.87	72	-
Capie	viouerri	nasno	n been							
provisi	oned pro	operlv	and canr	not ao						Ethernet Tools
				:	Tbl:Fremont Anne	x B Loc:Off		TP:Off	04-04	-2012 11:02:57
peyona	a the VVa	allea G	araen/Br	ICK.						



## Web Browser

Cable Modem							
>Home/Cable Modem				<b>B</b>			
Cable Modem	Web/FTP	Pi	ng	Trace Route	VoIP		
		Se	tup				
Mode			Web		V	ſ	
Web Mode			Browser		▼	ſ	
Profile			Default		▼		Burner
Address			http://ww	w.veexinc.com	>		Browse
JavaScript	Off	▼					
Proxy Server	Off	▼					
						E	nernet Tools
Tbl:Standard_Q256	Loc:Tap			TP:Off	06-05-	2013	19:27:22

## Sample Websites to Use





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_				1			
>Home/Cable Mod	em		```	<b>e</b>			
Cable Modem	Web/FTP	Pii	ng	Trace Route	VolP		
	Setup			Result			
Mode			VeTest		V	<b>r</b>	
Provider			CableVis	ion	▼	ſ	
VeTest Server			Parsippa	ny1	•		tart
List file version			16				
						Upda	te List
						Ethern	et lools
Tbl:Wingdale	Loc:Out	let		TP:Splitter	26-03-	-2013 :	21:46:40



11								
>Home/Cable Mod	em							
Cable Modem	Web/FTP	Ping	Trace	Route	VolP			
	Setup			Result				
CableVision   Beth	page1   bethpage1	.speedtest.opti	mumlightpath	n.com   65.	.51.228.155			
Status		PASS						
Connection Time		10 ms						
Total Data Transfe	er Time	5496 ms						Start
PING Test								
Ping Response		PASS		7.300 ms			_	
Throughput		Down	load		Upload		Up	date List
Current		90.490 Mbps		14.205 M	lbps			
Min		87.749 Mbps		13.882 M	lbps			
Max		90.490 Mbps		14.205 M	lbps			
Average		89.325 Mbps		13.976 M	lbps		_	
							Ethe	rnet Tools
Tbl:Standard	Loc:Tap		TP:Off			19-04-20	13	17:02:19



## Speed test from the PC

#### Example - http://www.speedtest.net/





# **VoIP Troubleshooting**



# How Testing Helps

- Must be quick to identify, isolate, and solve problems know system health
- Recruiting customers is expensive, and long-term retention is critical to ROI
- Loss of voice customer may also mean loss of the rest of the triple-play revenue





# Mean Opinion Score (MOS)

- Subjective voice quality score based on the perception of a random group of people listening to speech over a communication system.
- Group of males and females rate the quality of test sentences read
- Each person rates from 1 to 5
- MOS is average: 1 (worst), 5 (best)

Trace RouteWeb/FTPARPWizVolPSetupStatusTraceDTMFStatusMOS/RPacketsEventsStatusMOS/RPacketsEventsMOS-LQ4.204.20MOS-CQ4.164.16R-LQ9393R-CQ9191Burst R9191	Trace RouteWeb/FTPARPWizVolPSetupStatusTraceDTMFStatusMOS/RPacketsEventsStatusMOS/RPacketsEventsMOS-LQ4.204.20MOS-CQ4.164.16R-LQ9393R-CQ9191Gap R9191Burst R9191	•• LEDs	Setup	\$	itatus	Ping	
ToolsSetupStatusTraceDTMFStatusMOS/RPacketsEventsStatusMOS/RPacketsEventsWOS-LQ4.204.20MOS-CQ4.164.16R-LQ9393R-CQ9191Gap R9191Burst R9191	ToolsSetupStatusTraceDTMFUtilitiesStatusMOS/RPacketsEventsImage: StatusMOS/RPacketsEventsImage: StatusUPDNImage: StatusMOS-LQ4.20MOS-LQ4.164.16R-LQ9393R-CQ9191Gap R9191Burst R9191		Trace Route	Web/FTP	ARPWiz	VolP	
StatusMOS/RPacketsEventsStopImage: FilesVPDNMOS-LQ4.204.20MOS-CQ4.164.16R-LQ9393R-CQ9191Gap R9191Burst R9191	StatusMOS/RPacketsEventsUPDNFilesMOS-LQ4.20MOS-CQ4.164.16R-LQ9393R-CQ9191Gap R9191Burst R9191	X Tools	Setup	Status	Trace	DTMF	
Files     UP     DN       MOS-LQ     4.20     4.20       MOS-CQ     4.16     4.16       R-LQ     93     93       R-CQ     91     91       Gap R     91     91       Burst R     91     91	Files   UP   DN     MOS-LQ   4.20   4.20     MOS-CQ   4.16   4.16     R-LQ   93   93     R-CQ   91   91     Gap R   91   91     Burst R   91   91	Utilities	Status	MOS/R	Packets	Events	Stop
Files     MOS-LQ     4.20     4.20       MOS-CQ     4.16     4.16       R-LQ     93     93       R-CQ     91     91       Gap R     91     91       Burst R     91     91	Files     MOS-LQ     4.20     4.20       MOS-CQ     4.16     4.16       R-LQ     93     93       R-CQ     91     91       Gap R     91     91       Burst R     91     91				UP	DN	
MOS-CQ     4.16     4.16       R-LQ     93     93       R-CQ     91     91       Gap R     91     91       Burst R     91     91	MOS-CQ   4.16   4.16     R-LQ   93   93     R-CQ   91   91     Gap R   91   91     Burst R   91   91	Files	MOS-LQ		4.20	4.20	
R-LQ   93   93     R-CQ   91   91     Gap R   91   91     Burst R   91   91	R-LQ   93   93     R-CQ   91   91     Gap R   91   91     Burst R   91   91		MOS-CQ		4.16	4.16	
R-CQ     91     91       Gap R     91     91       Burst R     91     91	R-CQ 91 91   Gap R 91 91   Burst R 91 91		R-LQ		93	93	
Gap R     91     91       Burst R     91     91	Gap R     91     91       Burst R     91     91		R-CQ		91	91	
Burst R 91 91	Burst R 91 91		Gap R		91	91	
			Burst R		91	91	
		Cu P1				31-10	0-2013 10:06:07



# Mean Opinion Score (MOS)

- **Rating Definition Description** 
  - 5 Excellent A perfect speech signal recorded in a quiet booth
  - 4 Good Intelligent and natural like long distance telephone quality
  - 3 Fair Communication quality, but requires some hearing effort
  - 2 Poor Low quality and hard to understand the speech
    - Bad Unclear speech, breakdown



# Latency (Delay)

- Causes Echo and Talker Overlap
- When delay is > 50 msec, echo becomes a problem; echo cancellation is required
- Talker overlap is significant when oneway delay is > 250 msec





# Latency (Delay)

- Can seriously impair communication
- Usually a by-product of switching and routing
- Must be less than 300 msec. round trip





# Jitter

- Packets arrive at destination out of timing or sequence
- Jitter buffer is used to enable re-ordering of packets
- Increasing size of jitter buffer threatens delay
- Should be less than twice packetization rate
- Jitter buffer overflow causes packet loss

Cu P1 Link UP 1000	T F 192.168.1.23				
>Home→IP(Cu P1)		96-			
LEDs	Setup S		itatus	Ping	
	Trace Route	Web/FTP	ARPWiz	VoIP	
Tools	Setup	Status	Trace	DTMF	
Utilities	Status	MOS/R	Packets	Events	Start
			UP	DN	
Files	Burst Length		0	0	
	GAP Loss Rate		0.00	0.00	
	GAP Length		9980	10000	
	00S Packet		0	0	
	Duplicate Packets		1	0	
	PPDV Jitter		0.0110 ms	0.0180 ms	
	MAPDV Jitter		0.1610 ms	0.0480 ms	
O Cu P1				31-10-	-2013 10:11:02



# Packet Loss

- Can be caused by network congestion, jitter buffer overflow, or ingress
- Random packet loss is less noticeable than "bursty" packet loss
- Target <1%, which is less noticeable when loss is random; >4% renders service unusable

Cu P1 Link UP 1000	T F 192.168.1.23				
>Home->IP(Cu P1)		14			
LEDs	Setup S		tatus	Ping	
	Trace Route	Web/FTP	ARPWiz	VolP	0
X Tools	Setup	Status	Trace	DTMF	
Utilities	Status	MOS/R	Packets	Events	Start
			UP	DN	
Files	Data Throughput		64.0 kbits/s	64.0 kbits/s	
	Packets Received Packet Loss Rate		eived <mark>N/A</mark>		
			0.00 pk/s	0.00 pk/s	
	Packet Loss Count	et Loss Count N/A		0	
	Packet Discard Rate Packet Discard Count Burst Loss Rate		0.00 pk/s	0.00 pk/s	
			N/A	0	
			0.00	0.00	
		C Pao	e 1 of 3 🖸		
Cu P1				31-10-:	2013 10:09:50



# How To Automate the Home Certification



# Home Certification Program





# **Create Work Orders**

- New Installations
- Re-Connections
- Upgrades
- Trouble calls

Home Certification Process is the completion of a work order for a job professionally done, properly documented and easy accessible



- Auto test Macro functions
- Uploading test results to server
  - a) Passed/failed or failed only
  - b) Referencing work order
  - c) Technician ID
  - d) Date and time of saved tests
  - e) Current location
  - f) Other pertinent information
- Access to test results
  - a) Supervisors
  - b) System Managers
  - c) Regional directors
  - d) Corporate operations





## Home Certification / HIP Test Setup

#### **Step 3**: Select your Home Certification 'Profile'.

HIP							
>Home/HIP				/ 🙂 🗐			
Mode		Auto Test					
Profile		FRE_AB_Chi_No	B_Chi_NoVP ∠ ▼			Next	Stop 4: Droce 'Next'
Job ID		290998816_308	290998816_308				<u>Step 4</u> . Fless Next
Account #		261695206					
ThiFremont-	You ar no	e currently set wi ot use a two-way s O Yes	th a two-way spli plitter please se • No	tter. If you do lect NO. TP-Splitter	05-04-2	012 15:43:51	
Tbl:Fremont-	CX300	Loc:Off		TP:Splitter	05-04-2	2012 15:43:51	

Note: The <u>Job ID</u> and <u>Account # are already populated based on your TOA</u> work order.

Caution! If the Job ID or Account # does not match the current work order (or are blank), then go back to TOA to properly SAVE the latest work order.



## Home Certification / HIP Test Setup

<u>Step 5</u>: Select your 'Locator'. This is the location of where you are taking your measurements.





## Home Certification / HIP Test In Progress

Each major test portion will report status as the HIP test proceeds.

HIP				(				
>Home/HIP				(			$\mathbf{O}$	
Time	:	2012/4/5 15	5: <b>52</b> :18					
Locator		Kitchen						You can press the 'Detail' key
Analog Chai	nnels	PASS		Detail				next to each test portion to
Digital Char	nels	PASS			Detail			soo the test results
DOCSIS Se	rvice	In Progres	·s	Detail				see the test results.
Speed Test								
Tbl:Fremon	HIP >Home/HIP Time Locator Analog Cha Digital Cha DOCSIS Se Speed Test	nnels nnels ervice t	2012/4/5 16:05:00 Kitchen PASS PASS PASS Done		Detail Detail Detail Detail		Next Redo	Step 7: When all tests are complete, press 'Next'.
	Tbl:Fremor	nt-CX300	Loc:Off		TP:Off (	5-04-2012	16:09:08	8

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## Home Certification / HIP Test Complete

#### • The Home Cert / HIP Test is Complete



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# **Upload Confirmation Message**

**<u>Step 10</u>**: The final step is the 'Upload completed' confirmation message.

Press '**OK**' and the job is done.





# Signature Capture in TOA Work Order

 Once the job is completed, go back to TOA and access the existing work order. Capture the customer's signature.

Browser				) 🕢 😢
😋 🔻 🕥 👻 👩 🖬 💽 https://train30	).etadirect.com/app/#property/si् 🛞 🔍	Google	\$	
S 22:23 26324-Joshua Williams-BBT2 🛛				
26324-Joshua Williams-BBT2		Refresh	Logout	
Trouble Call - 730 MACARTHUR DR - AL326 - Customer Signature	704639001 - ALE-ALEX 6 (Rapides Ave)			R-Server HIP
Back				
				Setup
Tbl:Standard Loc:Tap	TP:Off		22-03-2	2011 20:24:18



R-Server

## Uploading Test Results At A Later Time

- If you were not able to upload results right after your test, you can upload at later time by:
- Step 1: Accessing 'R-Server' from the Home Menu
- Step 2: Press the 'Upload Tab', select your results



#### >Home/R-Server Upload Register Download Upload 99.37.104.70 Server Address Job 📄 Name Size Type Date 20120314\_144741 15585 HIP 03/14/12 Upload&Del 20120217\_100801 16321 HIP 02/17/12 Delete 20120222\_153345 02/22/12 16311 HIP 20120213\_140413 15589 HIP 02/13/12 20120405\_160938 15989 HIP 04/05/12 Page 2 of 2 Some files need to be downloaded. Tbl:Fremont-CX300 Loc:Off 05-04-2012 TP:Off 16:11:13

Step 3: Press 'Upload'

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# **Perpetual Install**





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# **Benefits of a Perpetual Install**

- Maintain High Performance of Signals
- Provide High Level of Signals Reliability
- Preserve the Integrity of Drop & Cabling
- Reduce Repeated Truck Rolls
- Reduce Service Calls
- Creating Workforce Database
- Enhancing Customer Satisfaction





## **Subjective & Objective Procedures**

- Drop must be properly bonded
- Proper identification tagging on the drop near tap
- All open ports must be terminated
- Tap pedestal must be locked
- Routing and attachments follow industry installation guidelines
- SDU's with triple play services must use RG-6 or greater for drop
- Outside lines must use weather-sealed compression fittings



## **Subjective & Objective Procedures**

- •Drops must be free of splices between pole hooks
- All digital STB must be checked to make sure they are responding
- Inspect the in home network wiring, tighten connectors
- •All external drop splitters must be sheltered with a SDU house box
- Egress & Ingress must be conducted on the line and in the home
- Home Certification measurements must be in compliance with company's procedures and standards



#### **Example of Home Certification Parameters**

Location	Pass	/Fail
(Тар)	Minimum	Maximum
Video RF level	+12dBmv	+28dBmv
Delta Video/Audio	10.0dB	22.0dB
Digital level (256 QAM)	+6dBmv	+22dBmv
Digital level (64 QAM)	+2dBmv	+18dBmv
MER (256 QAM)	34dB	
MER (64QAM)	29dB	
Pre BER		1.0E-8
Post BER		1.0E-9
CM transmit level	+40dBmv	+50dBmv
Leakage		25µv/m
Ingress	Depending on US	modulation type



#### **Example of Home Certification Parameters**

Location	Pass/Fail				
(Ground Block)	Minimum	Maximum			
Video RF level	+6dBmv	+22dBmv			
Delta Video/Audio	10.0dB	22.0dB			
Digital level (256 QAM)	0dBmv	+16dBmv			
Digital level (64 QAM)	-4dBmv	+12dBmv			
MER (256 QAM)	33dB				
MER (64QAM)	28dB				
Pre BER		1.0E-8			
Post BER		1.0E-9			
CM transmit level	+38dBmv	+52dBmv			
Leakage		25µv/m			
Ingress	Depending on US	modulation type			



#### **Example of Home Certification Parameters**

Location	Pass/Fail				
(Outlet)	Minimum	Maximum			
Video RF level	-2dBmv	+14dBmv			
Delta Video/Audio	10.0dB	22.0dB			
Digital level (256 QAM)	-8dBmv	+8dBmv			
Digital level (64 QAM)	-12dBmv	+4dBmv			
MER (256 QAM)	33dB				
MER (64QAM)	28dB				
Pre BER		1.0E-8			
Post BER		1.0E-9			
CM transmit level	+35dBmv	+50dBmv			
Leakage		25µv/m			
Ingress	depending on US	modulation type			



# Thank you.

Any questions?



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