

# miniCMTS200a Setup Notes

**Application Note** 

Pico Digital Inc. www.picodigital.com

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v1.3

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### **Revision History**

Rev #	Date	Author	Reason
0.8	10/01/14	R. Fajarit	Initial Preliminary Release
0.9	10/16/14	R. Fajarit	FAQ Addition, minor edits
0.95	02/13/14	R. Fajarit	FAQ Addition, edits
1.0	03/10/15	R. Fajarit	FAQ Additions
1.1	10/29/15	R. Fajarit	FAQ Additions
1.2	11/11/15	R. Fajarit	Trouble Shooting – Using the Snooping page
1.3	12/17/15	R. Fajarit	FAQ Additions – DHCP/TFTP, Pubic IP Remote
1.2 1.3	11/11/15 12/17/15	R. Fajarit R. Fajarit	Trouble Shooting – Using the Snooping page FAQ Additions – DHCP/TFTP, Pubic IP Remote

Table 1: Revision History

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## 1 miniCMTS200a Quick Setup

The information below is intended to assist in configuring the miniCMTS200a. The primary interface for the minCMTS200a is the Web GUI (Graphical User Interface). This document is intended as a Quick Setup document to get the user configured and operation in a simple system. Refer to the User Manual for more detail information.

#### 1.1 Introduction

The information below uses the Web GUI through its discussion.

The default IP address (backdoor) is 192.168.2.200. Additionally, units with v2.622/v5.36 will also have a secondary configurable IP address of 192.168.130.91 or 192.168.130.93.

This document assumes the user is using System software version 2.622 with DOCSIS software version 5.36 and above. For units with earlier versions of code, it is highly recommend the unit be updated. Please contact Pico Digital via the email <u>miniCMTSsupport@picodigital.com</u> for the latest version of software, user manuals and configuration files.

### 1.2 Overview

If you are already familiar with a CMTS system or want a quick reference, use this information below as a refresher.

From the Login Page - Language/Login/Password – English/admin/admin

Below is the recommended setup for Annex B.

Channel Settings / Down Channel setup:

- Start Frequency 255 MHz
- Annex B
- Interleave 128\_1 (v2.622/v5.36 or above only. Earlier SW versions use 128\_4)

Channel Settings / Up Channel Setup:

- Frequency 9 MHz
- Modulation Profile AtdmaMediumNoiseQpsk (or ScdmaLowNoiseQam64)

Verify modems online via the Start page / CM status section (bottom right).

Edit the CM Config file so Shared Secret has the default 123456 value.

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#### 1.3 Equipment List

The following equipment list summarizes a baseline CMTS setup. The optional equipment is not required for the base setup, but provided as a reference for other Pico Digital Products that is compatible with the miniCMTS200a.

The following is an example for 'hard wiring' the miniCMTS200a (CMTS).

- CMTS (Ethernet)  $\rightarrow$  PC and/or DHCP server (via 192.168.2.200 initial setup only)
- CMTS (RF Uplink and RF Downlink connectors) → 2 to 1 splitter → Cable Modems (Shared Secret 123456)
- DHCP Server (Ethernet)  $\rightarrow$  CMTS, PC, and modems and optional equipment

Note: Attenuating the signal. If the cabling is short, it is recommended that the signal be attenuated. Recommend 30 to 40 dBm attenuation as a starting point.

	miniCMTS200a Equi	oment List	
Title	Description	Quantity	Notes
CMTS	miniCMTS200A	) 1	CMTS unit
DHCP Server	Assign IP address to	1	Condor DHCP Server
	moderns		Optional
RF 2 to 1	Combine Uplink and	1	Single output for
Splitter	Downlink RF output to 1		distribution to modems
(diplexer)	splitter		
РС	Connector to DHCP Server	1	Web Browser Software
	or directly to CMTS		recommended for initial
			setup
1Gbit Switch	Communication and data	1 or more	1 Gigibit per port, CAT5E or
/	transfer		CAT6 Ethernet Cables.
Cable Modem	DOCSIS 2.0, DOCSIS 3.0	250 D3.0	400 CM maximum however
	(recommended)	max	only 250 CM D3.0 Max.
Smartbox	Satellite media to be	1	Optional
	distributed		
2PD1000	Encoder with IP option	1	Optional
Condor	EPG and CAS system	1	Optional

Table 2: miniCMTS200a Equipment List

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#### **1.4** Down Channel and Up Channel Configuration Files

One of features of the miniCMTS200a, other than manually configuring the unit via the WEB GUI (or by CLI commands) is to upload a configuration file(s). Configuration files are available from Pico Digital upon request. Configuration files are available for the Down Channel setting and for the Up Channel settings. They can be used as a baseline working setup. Note: These 2 files are unique and cannot be intermixed with the other. The files are intended for software version v2.66/v5.36 or higher.

Configuration files have a '.conf' ending. Files are available on the FTP site upon request (<u>miniCMTSsupport@picodigital.com</u>). Once loaded the configuration must be save to be retained after a power cycle or reset. Power cycle or reset is recommended to confirm that configuration is saved properly into the unit.

Note: The management IP port and Cable Modem IP ports are recommended to be on the same IP subnet, to establish good communication.

#### **1.5 Updating the unit**

Latest software is available from the Pico Digital FTP site. Software Version listed below is for example only and may be different in actual practice.

Reference the CMTS Upgrade Procedure v1.0.pdf document for detailed instructions.

FTP: ftp://ftp.picodigital.com

- Username: pdcmts
- Password: P1c0CMT\$

System Software

• e8k\_target\_v2.622\_20140619\_md5\_6303e7407b578bf02172632cc8525383.tar.gz

DOCSIS Software

CmcApp\_cmc4\_3\_0beta2\_v536\_20140611\_md5\_d38105dd995631d6b32b4c0b95bebb12.bin

Note: This setup is for System Software v2.622 and DOCSIS Software v5.36 or higher.

#### 1.6 User manual

Documentation is available for the miniCMTS200a. Documentation is available from the FTP site reference in section 1.5.

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miniCMTS200a-UserManual – Primary Manual for the Web GUI interface. •

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### 2 Basic setup

The following is a more expanded example of basic functional setup. The following web pages is where most of the configuration takes place.

- Network Settings / Manage IP
- Channel Settings / Down Channel
- Channel Setting / Up Channel
- Termination Management/ Shared Secret
- Start Page / CM Status (bottom right)

#### 2.1 Network Setup

There are two network settings with the miniCMTS200a. The Backdoor IP address and the Management IP address. The Backdoor IP address is intended for initial setup and if the user forgets the Management port. It is not configurable and the IP address is 192.168.2.200.

The Management IP address is recommended to be configured and used for the CMTS application.

Pico Digital Inc. 3 192 168 130 59 = C 0+ 00 PICO DIGITAL Welcome admin O Device MAC : FCE8929P.81/55 S Device Rebool -fuide Start Manage IP onts **Net Paname Management** # Channel Settings NAC Address: FC:E8:02:0F:81:65 I Network Settings E Hanage # Configuration Static Configuration Business P mode Doton60 Settings Ip Address: 192,168.130.09 Business Model Setting Subnet Mask: 255,254.0.0 L2VPN Server Settings Default Gateway: 192.168.130.1 SNNP Setings Option60: and CIN SINMP Settings Management Osablad a Security a Terminal Management VLAN: BE POAN VLAN Freed System Monitor B Povice Management VLAR SH Mastan Save Save&Efective

It can be configured in the Network Settings/ Manage IP Web interface section.

Figure 1: Management IP Setup

#### 2.2 Down Channel Configuration

The Down Channel setup is located in the Channel Settings / Down Channel section of the CMTS web page. The recommended basic Down Channel Configuration for Annex B is shown in the figure below. Click on the number and enter the appropriate change. Note the red triangles (dog ear) will appears across a column indicating that a change has been entered and awaits confirmation. Select the 'Save' button icon to apply the changes to the CMTS.

PICO DIGITAL			1	Netcome, ad	imin 👘	2 De	vice MAC	FCER9	2.9F.BF.6B		\$ Devic	e Reboot		
as (1)	Star	Dow	n Channel <sup>3</sup>	Up Durnel	1									
1 (C)	EU	oad Confi	File 2 Ref	esh @ Back :	G Sine	Export	Tume							
Channel Settings	Chan	Inel_Amo	unt 10	✓ Configur	ation Sam	ple	Power	Compens	notes					
Up Channel		Note	TS	Frequency (Hp)	Symbol Rate	Modul.	Annas	Inter Jeave	InnerP	R/Pov (dBr	NBC 51/3			
Advanced Network Setting	4	doteis		255 M	6361	256	в	128 1	45					
Security Terminal Management	2	docsis		261 M	5361	256	в	128_1	45					
PQAN	1	docata		207 M	6361	256	8	128 1	45					
System Monitor	4	dacsis		273 10	5361	256	в	128_1	45					
Device Management		docete		278 M	5361	256	в	128_1	45					
	e	docala		285 M	5361	256	в	128_1	45					
	Ŧ	doceis		291 M	5361	250	в	128_1	45					
	8	docers		297 M	5361	256	в	128_1	45					
	8	docele		303 M	0361	256	в	128_1	45					
	10	decsis		309 M	5361	256	в	128_1	45					
	11	doceis		315 M	5361	256	в	12B_1	45					
	12	dacsis		321 M	5361	256	в	128_1	45					
	13	docala		327 M	5361	250	8	128_1	45	(				
	14	docsis		333 M	5361	256	в	128_1	45					
	15	000818		339 M	6361	256	в	128_1	45					
	16	docsis		345 M	5361	256	в	128_1	45					
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	:56													
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	40													
	1		111									11		
	-92											1		
	24											1 1		
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	- 16													
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	0				1									
and strength	1.10		255 M 2	61 M 267 M	273 M	279 M	285 M	291 M	297 M	303 M	309 M	315 M	321 M	327

Figure 2: Down Channel Setup

### 2.3 Up Channel Configuration

The Up Channel setup is located in the Channel Settings / Up Channel section of the CMTS web page. The recommended basic Up Channel Configuration for Annex B is shown in the figure below. Click on the number and enter the appropriate change. Note the red triangles (dog ear) will appears across a column indicating that a change has been entered and awaits confirmation. Select the 'Save' button icon to apply the changes to the CMTS.



#### 2.4 Shared Secret – CM and CMTS connection

Communication between the Cable Modems (CM) and the miniCMTS200a will require a CM config file and a 'key' otherwise known as a Shared Secret code.

The default value is 123456.

On the miniCMTS200a the 'key' can be determined and/or configured in the Terminal Management / Shared Secret Web Page.

<ul> <li>3 192 168 130 59</li> </ul>						
PICO DIGITAL		B Welcome,	admin 👘 🖄	Device MAC : 1	FCER92.9F	81:65 💈
Guides	Start QOE * 1	AC Aging * Pap Li	= * Shared Secr	ut in		
onta -	Shared Secret Con	ilig				
Network Settings     Advanced Network Setting     Security     Terminal Management     CN List     CPE List     CPE List     CPE List	Shared Secret Switch: String/Binary: Share Secret:	C Opan Sbing 123450	Close Binary			
E Load Balancing E QOS WAC Aging E Rap List				Retesh	Ok.	Clear Edit .
Shared Secret						
				$\langle \langle \langle \rangle \rangle$	$\searrow$	

A CM configuration file must match the same Shared Secret number (123456) on the miniCMTS200a. The example below uses the Excentis Editor to edit the Shared Secret number on the CM configuration file. The Editor can be found at this link.

https://www.excentis.com/products/configfileeditor

Once installed

- 1. Go to the Edit/Shared Secret and select.
- 2. A pop up window will appear
- 3. Enter the Shared Secret value of 123456
- 4. Save the changes
- 5. Place the CM configuration file on a designated server.







Figure 6: CM Config File Edit – Entered Shared Secret Value must match CMTS value

Olgital Inc.	1+												
192368130.99						= C	0 + DuckDuck	Ga :	P	☆	白山	1 11	ł
Start	ITAL	B Welcome, 6	admin 👘 🔿	Device MAC : FO	ER929P.B1:65	# Dev	ice Reboot						
				1 2			0	Neviza: Tools					
	N:Iwork&NMS	- IPQAM	DownChann	iels	Odbuv @dbmv		Signals Ch	eck 🕴 Faul					
	Business VLAN		Freg:255~34	SMHz			G Spectrum+	Scoops	10-				
	OHCP RELAY: (Basic)	IPQAM : Supported Channels:0	Channels: 16 MER: N/A	45dbmv 600Mbpa			🛃 Signals Lis	ten 😨 Optical	Receiver				
	•	* Check Set	Check S	at the			Version & Setti	ogs					
	Basic	DOCSIS	UpChanne	dis.			a Bummary	Time Sync This	nunningtim	NR: 1683	Imota		
	Check Safe		Freq SNR PER	Noise			Name	Value	Name		Valu	61 - T	
	Colored Provide	4	9.0 28.6 4.0e-0	3 L Cthous			Product	EBKB	CPU		87%		
	alist Ports	→ DOCSIS 3.0 -	15.4 30.2 2.0e-0 21.8 35.6 7.1e-0	5 L 160Mbps			Boffrier	2.622	Flash		71%		
	R343 3000Mbps double	Charle Sat	28.2 39.5 2.3e-0	SL			Hardver	1	MEM		42%		
_	SFP	LAUNAL 220	Prints S				Boot/er	4	Pawel		12.3	1	
12	<u> </u>				10	FIET	D Modelver	4_3_0beta2_vf	Tempe	rature	30%		
0							Hebook	78	Netspe	bec	riari	KDD9 :	
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ts Statistics												1.000	
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M UpPower	2 22 24	2 2 2	CH UDSNR	2 2	2 2 31 20		CH Online	93		OPEN	ian.	37	
(domv)	<<30.30.38 42	45 48 52 5552 N/A	(db)	<<2020 22 2	5 28 30 34>>34	N/A	CHOR	03		UPE O	CODE:	44	
							CN RE Egranti	anai 11					
DownPower			CM DownSNP				CN SNR Face	ntional g					
(dbmv)	<c-15-15 -10="" -3<="" td=""><td>3 10 15 5515 N/A</td><td>(db)</td><td>-20 20 22 2</td><td>5 28 30 345534</td><td>N/A</td><td>CM Init</td><td>0</td><td></td><td></td><td></td><td></td><td></td></c-15-15>	3 10 15 5515 N/A	(db)	-20 20 22 2	5 28 30 345534	N/A	CM Init	0					
				- 300 125 402.5		10000		10-		_			i

#### 2.5 Start Page – CM online Status



Name	Value	Name	Value
CM Max	63	CPE Max	37
CM Online	63	CPE Online	37
CM3.0	37		
CM RF Exceptional	11		
CM SNR Exceptional	9		
CM Init	0		
•			•

Figure 8: Start Page CM Status Section

#### miniCMTS200a Setup Notes Application Note

	CH List									100	1
	CR details	Raboot+ SC	bear Nodem Hi	story 🐜 Pit	KI CM 🗱 SNMP1	fest 🐐 Nove Freig - MAC	Filler:	Cur Type: CM U	pSNR→34(dB) y		
	E SD	MAC Addr	IP Addr	connect	docals version	Soft Version	Up Power(dbmv)	Up SNR(ds)	Down Power(dbmv)	Do	1
Down (	1 1 49	001ade7e1c86	192.168.1	Online	Docsis20	S85102N-2.7.5.0-GA-0	45.2	41.9	-59	41	
B lip Cha	2 🛄 54	001ade7b1dc	192.158.1.	Griane	Docsis20	885102N-2.7.5.0-G4-0	44.4	40.6	0.4	42	ing+:
E showing	3 🗔 18	001ade810006	192.168.1	Online	Docals20	S85102N-2.6.0.0-GA-0	44.2	41.1	-42	42	Receiver
Security	4 11 44	001e467e0a7e	192.158.1.	Griline	Docsis20	885102N-2.7.5.0-G4-0	43.5	42:1	-20	42	
ferminat #	5 🖂 60	001e467e2830	192.168.1	Online	Docals20	S85102N-2.7.5.0-GA-0	44.4	197	.45	43	
POAN	6 🛄 33	001e46918302	192.168.1.	Gnlate	Docsia20	885102N-2.7.5.0-G4-0	44.2	41.0	0.0	42	Inuming1
Sevice Ma	7 1 2	002374414162	192.168.1	Online	Docals20	S85102N-2.7.5.0-G4-0	457	89.1	4.5	42	Nam
00000	8 23	002374419264	192.158.1.	Griling	Docsis20	885102N-2.7.5.0-G4-0	44.2	40.6	0.0	43	CPL
	9 🖂 25	0023745pac62	192.168.1	Online	Docala20	S85102N-2.7.5.0-G4-0	44.4	40.0	-4.5	42	Flas
	10 🗐 37	0023745c01a4	192.158.1.	Griana	Docsis20	885102N-2.7.5.0-G4-0	44.2	42:1	-10	42	MEN
	11 🖂 16	0023746501c6	192.168.1	Online	Docals20	S85102N-27.5.0-G4-0	442	40.0	-4.8	43	Paw
	12 🗐 58	002374654386	192.158.1.	Gnlate	Docsis20	SB5102N-2.7.5.0-G4-0	44.4	40.5	-0.3	43	5 Tem
	13 🔲 52	00237465800c	192.168.1	Online	Docsis20	S85102N-2.7.5.0-G4-0	447	41.1	4.5	43	Nets
	14 🗐 5	002374658938	192.158.1.	Gnlate	Docsia20	SB5102N-2.7.5.0-G4-0	44.7	41.7	(0.1	42	CLin
	15 🔲 17	0023746d14de	192.168.1	Online	Docals20	S85102N-27.5.0-G4-0	43.5	40.0	44	42	Net
	16 🛄 26	00237461324a	192.158.1.	Griling	Docsia20	SB5102N-2.7.5.0-G4-0	44.4	40.0	-20	42	SFP
	17 1 50	00237471e27a	192.168.1	Online	Docsis20	S85102N-27.5.0-G4-0	44.9	41.1	47	42	
	1B 🛄 39	0023747c6010	192.158.1.	Gnlate	Docsis20	885102N-2.7.5.0-G4-0	44.2	42:1	4.0	42	Name
	10 🔲 55	0023748.00094	192.168.1	Online	Docsis20	S85102N-27.5.0-G4-0	44.4	417	-41	42	CPE N
	20 34	0023748e26aa	192.158.1	Online	Docsia20	885102N-2.7.5.0-G4-0	44.2	40.0		42	CPEC

Figure 9: Cable Modems Online

### 3 Troubleshooting Tips

The following are some troubleshooting tips in setting up your system. Prior experience with CMTS systems or advance network configuration is assumed.



Figure 10: Cable Modems Offline

#### 3.1 Common Issues

There are many considerations when setting up the CMTS top consider.

- Frequencies greater than 99 MHz is recommended for initially testing the operation with the cable modems.
- Signal Strength output is too strong for the Cable Modems if cable length is short. Recommend attenuating the RE signal (at least 30 to 40 dbm).
- Setting up shared secret (matching CMTS code with CM config file) to complete CM communication (bringing the CMs online).
- Download Channel Interleave configuration Earlier versions of code is 128\_4. Version 2.66 and above uses interleave 128\_1 for Annex B.
- Control (Management) Ethernet communication and CM (data) communication needs to be in the same network for good Upload and Download Sync.
- DOCSIS 1.1 may require flow encoding.

#### 3.2 Snooping Page example – Checking RF connections

There are two considerations when connecting a miniCMTS200a, the RF connections and the Network connections. Before troubleshooting any network configuration, first verify the Downstream (DS) and Upstream (US) connections. Until RF connections is confirm no network connection is possible. The Snooping Page (Start Page, upper right, Snooping Text link) can assist in this.

Below is an example output if there is no RF (DS or US) connected to the miniCMTS200a.

shooping	TOPIDUND									
Auto Ref	resh									
® Al	O Spe	CIAI MAC		🗹 dmm	dhcp	E pppge				
id i	DateTime	Type	Packet Type	Source MAC	Source IP	Target MAC	Target IP	aption60	vian	rease

The content is empty suggestion there is an RF issue.

Check your RF connections, and if the cable length is short from the miniCMTS200a to the Cable Modem, add attenuation (start with 30db and adjust). Using the default setup, in general it will be between 28db to 38 db required). An RF specialist may be able to assist to verify proper input levels. Also recommend using 2 cable modems. This will help isolate cable modem issues.

Below is an example when there is good RF but no Network connections. This is a step forward, because now the user can focus on the network configuration. All cable modems are discovered and await IP address allocation

Shoopi	opmulo PCIT po									
ALLO	Refrech									
⊛ AII	() Specia	I MAC		dmm	🕑 dhap	Pppoe				
	DateTime	Type	Packet Type	Source MAC	Bource IP	Target MAC	Target (P	option60	vian	reas
1 回	2012-01-25 00:59:08	dhip_shoop	DISCOVER	001e4691151e	0.0.0.0	*****	265,265,265,265	docsis2.0.053		
2 [1]	2012-01-25 00:59:03	thep_snoop	DIBCOVER	e83e8:4d5a3b	0.0.0.0	111111	255 255 255 255	docsia3.0.		
1日	2012-01-25 00:58:59	dhop_snoop	DISCOVER	001e4691151e	0.0.0.0	mm	255,255,255,255	docsis2.0.053		
4 ET	2012-01-25 00:58:54	direp_snoop	DISCOVER	e83e8:4d5a3b	0.0.0.0	111111	255.265.255.265	doceie3.0		
8.111	2012-01-25 00:58:54	dhap_snoop	DISCOVER	001e4691151e	0.0.0.0	TTTTT	265 265 265 265	docsis2.0.053		
6 [1]	2012-01-25 00:58:51	dhep_snoop	DISCOVER	e83e8.4d5a3b	0.0.0.0	111111	265,265,265,265	docsis3.0:		



Below is an example of the cable modems and miniCMTS200a communication where discover/offer/request/acknowledge process is in full operation. This is the output prior to receiving IP addresses from the DHCP server. This confirms that the network connections are working as expected.

	ind Truck could 1								
🗟 Auto	Refresh								
⊚ AI	O Specia	IMAC		i dmm	🗹 dhap 🛛 🕅 pi	ppoe			
101	DeteTime	Туре	Packet Type	Source MAC	Source IP	Target MAC	Target IP	option60	vian
1.0	2012-01-25 01 31:20	dhop_snoop	ACK	ke89298663f	192,168,130,93	mm	265,265,265,265		
2 []	2012-01-25 01:31:20	dhcp_snoop	REQUEST	001e4691151e	0.0.0.0	mm	255.255.255.255	docsis2.0.053	
3 El	2012-01-25 01:31:18	dhtp_snoop	OFFER	tce892916631	192,168,130.93		255 255 255 255		
4.00	2012-01-25 01:31:17	thep_snoop	DISCOVER	001446911514	0.0.0.0	TTTTTT	265 265 265 265	docsis2.0.053	2
5 日	2012-01-25 01:38:35	dhsp_snoop	ACK	fce89298363f	192.168.130.93	mm	265.265.265.265		
6 🖂	2012-01-25 01 30 35	thep_snoop	REQUEST	e83e64d5a3b	0.0.0.0	mmr	255 255 255 255	0.Calazob	
7 12	2012-01-25 01:30:35	thep_snoop	OFFER	tce892910631	192,168,130,93	******	265.265.265.265		
8 1	2012-01-25 01 30:34	disp_snoop	DISCOVER	e83e8:465a3b	0.0.0.0	TTTTTT	255 255 255 255	darsis3,0.	
東田	2012-01-25 01:30:00	thtp_snoop	DISCOVER	001e469161e	0000	*****	265 265 265 265	dorsis2.0.053	
10 21	2012-01-25 01:29 28	direp_snoop	DISCOVER	e83e8:4d5a3b	0.0.0.0	mm	255 265 255 265	docsis3.0	
n 🗉	2012-01-25 01:29:13	dhep_snoop	DISCOVER	e03et;4d5a3b	0.0.0.0	*****	205 205 205 205	docste3.0:	
12 1	2012-01-25 01:29:06	thep_snoop	DISCOVER	e8348.4d5a3b	0.0.0.0	mm	255 255 255 255	dousis3.0:	
	2012-01-25 01:28:02	dhop_snoop	DISCOVER	e83eR4d5a3b	0.0.0.0	mm	265 265 265 265	donsis3.0:	
A	3012-01-25 D1 :28:55	thep_snoop	DISCOVER	001e4691151e	0.0.0.0	mm	255 255 255 255	docsic2.0:053.	
IS EL	2012-01-25-01-28:22	thep_snoop	DISCOVER	001e4691151e	0.0.0.0	*****	265,265,265,265	dorsis2.0.053	

#### Figure 13: CMs starting to receive IP addresses

#### Lastly, the cable modems are receiving IP addresses.

Snoopi	ng TOP.dump									
Auto	Refresh									
(€ AI	🔿 Specia	MAC		🕑 dmm	🕑 dhop 🛛 🖻 p	ррое				
vE.	DataTima 2012-01-2517:09.08	Type dhcp_shoop	Packet Type REQUEST	Source MAC eKJett 4dba 3t	Source IP 192,168,121,0	Target MAC me8929rd63r	Target IP 192.168.130.93	aption60 docsis2.0	vian	RR
PE	2012-01-2512:09:15	dhcp_snaop	ACK	fxx8929f463f	192.168.130.93	001e4691/Ste	192.168.131.1			
10 11	2012-01-25 12:09:15	dhcp_snoop.	REQUEST	001e4691/51e	192.168.131.1	fr e8929fd63f	192.168.130.93	docsis7.0:063.		
11 🗉 :	2012-01-25 12:09:08	dhcp_snoop	ACK	fce8929fd63f	192.168.130.93	eB3efc4d5a3b	192.168.131.0			
12 1	2012-01-2612:09:08	dhcp_enoop	REQUEST	e83eft 4d5a3b	192.166.131.0	ft e8929rd63f	192.188.130.93	docsis3.0		
13 🖂	2012-01-25 07:09:13	dhcp_snoop	ACK	ft e8 92 91/46 3f	192168130.93	001e4691/51e	192.168.131.1			
14 10	2012-01-26 07:09:13	dhcp_snoop	REQUEST	001e4891/51e	192.168.131.1	fre8929fd63f	192.168.130.93	docsis2.0.063		
15 1	2012-01-25 07:09:08	dhcp_snoop	ACK	fixe8.929fd63f	192168.130.93	eB3efc4d5a3b	192.168.131.0			
16 🗐	2012-01-25 07:09:08	dhcp_snoop	REQUEST	eB3eft4d5a3b	192.168.131.0	fx e8 92 91d6 31	192.168.130.93	docsis3.0		
17 [1]	2012-01-25 02:09:12	dhcp_snoop	ACK	n; e8.92.9n/i6.3r	192.168.130.93	100000	256 256 256 255			
18	2012-01-25 02:09:12	dhcp_snoop	REQUEST	001e4691/51e	0000	(11111)	255 255 255 255	docs/s2.0.063		
19 1	2012-01-25 02:09:10	dhcp_snoop	OFFER	10009290831	192168.130.93	100000	256 256 256 255			
20 🖽	2012-01-25 02:09:09	dhcp_snoop	DISCOVER	001e4691/51e	0.0.0.0	(11111)	255 255 255 255	docate2.0.053		
21 🔳	2012-01-25 02:09:08	dhcp_snoop	ACK	fce8929fd63f	192168.130.93	10000	256 256 256 256			
22 0	2012-01-25 02:09:08	dhcp_snoop	REQUEST	eB3efr4d5a3b	0.0.0.0	111111	255,255,255,255	docsis3.0		
23	2012-01-25 02:09:08	dhop_snoop	OFFER	fke8929fd63f	192.168.130.93	00000	256 255 256 255			
24 1	2012-01-25 02:09:07	dhcp_snoop	DISCOVER	eB3efc4d5a3b	0.0.0.0	1222221	256,255,256,255	docsts3.0		

Figure 14: Cable Modems receiving IP addresses

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#### 3.3 Flow Encoding

Below is an example of flow encoding (optional setup).

Note: Editing a CM file for Flow encoding using Excentis

Make a copy of the config file and open it with Excentis (https://www.excentis.com/products/configfileeditor)

a) Upstream Service Flow Encoding

b) Downstream Service Flow Encoding.

Before Editing enter Share Secret Value '123456' under the Edit menu (This is the same value located on the miniCMTS200a Termination Management /Shared Secret page. Both values need to match.)

Under the Upstream Service Flow Encoding,

- Right Click on the text.
- A Pop up window will open. Select Add.
- The Add option will give you a menu, select the Arrow button to view the 'drop down' menu.
- Once the arrow is selected you will be given several options. Chose an option. Example: Selecting 'Upstream Peak Traffic Rate will place this option under the 'Upstream Service Flow Encoding' Section.
- Click on text of the select option above and enter the rate you want (in this case 320000, then select the Apply button.

Under The Downstream Service Flow Encoding

- Right Click on the text.
- A Pop up window will open. Select Add.
- The Add option will give you a menu, select the Arrow button to view the 'drop down' menu.
- Once the arrow is selected you will be given several options. Chose an option. Example: Selecting 'Downstream Maximum Sustained Traffic Rate' will place this option under the Downstream Service Flow Encoding' Section. (note Downstream Peak Traffic Rate option is also available as well as several other configurable)
- Click on text of the select option above and enter the rate you want (in this case 4500000, then select the Apply button.

Save a copy of the file when finish. There are several options to choose. Feel free to try different ones to see which one meets your needs.

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#### 3.4 FAQ - Frequency Ask Questions

- 1. What is the quickest way to get Cable Modems online? The miniCMTS200a is shipped already configured for an Annex B setup. So.... it is possible to get Cable Modems online without making any changes to the miniCMTS200a. This is referred to as a basic setup. This is highly recommended to perform this test first to familiarize oneself with the miniCMTS200a before moving on to a custom setup.
  - a) Set up the DHCP on the 192.168.130.x network. The miniCMTS200a fixed management IP address is 192.168.130.93.
  - b) Place the Pico's CM Config file from Pico's FTP site (after confirming Share Secret is 123456) into the DHCP/TFTP directory location
  - c) Reference the CM Config file on the DHCP server
  - d) For short cable length from miniCMTS200a to Cable Modems) (3 meters or less) recommend starting with 30db attenuation.
  - e) Hardware setup DHCP/TFTP server → Switch →miniCMTS200a →diplexer →attenuators (optional)→Cable Modems. Apply power and check results.
  - f) See Setup Notes above for more details.
- 2. Is the CMTS a bridge or router? It is a bridge. Limit the communication within the same network and/or provided an external router.
- 3. Do you have a sample of DHCP Server file and a TFTP file? Yes, this is available from Pico Digital FTP site.
- 4. How are Cable Modems with 8 Downstream Channels Load balanced? They are eventually distributed to the 16 channels or user enabled Downstream Channels.
- 5. How does the internal DHCP/TFTP server work (v3.76 or higher)? The DHCP/TFTP server is a basic server which is useful for general tests and supplementing an existing Provisional DHCP server system. It provides IP addresses and config files to the CMs. It does not, however provide IP addresses to the CPEs, which require access to the external network gateway, resulting in the requirement of an external Provisional DHCP Server. Any network functions that are not included in setup for the internal DHCP/TFTP sever is intended for the external Provisional DHCP Server.
- 6. After a software update the browser shows zero CMs online. Why? After an update, the system will reboot requiring the user to re-login. Depending on browser in use, this may require the user to refresh the window and then re-login, otherwise the 'old' browser window will display 'outdated' incorrect information.
- 7. How can I confirm that the Cable Modems can be 'seen' by the miniCMTS? On the Start page, top right is the SNOOP text link. Select SNOOP link. IF the Cable Modems are connected correctly, 'DISCOVER' text info will be display (regardless if DHCP/ TFTP server is connected). IF not, then there is an RF link problem that needs to be resolve. Review attenuation, if applicable and/or change to a different Cable Modem for comparison.
- 8. For remote technical support, how do I setup a Public IP address? To setup a public IP remote access, do the following:

- a. Obtain a static public IP address assignment from your ISP and subsequently the IANA.
- b. Setup on router ---> 'port forward' which tells the router to forward any incoming traffic on a specific port to the one internal IP address (via NAT) and to the miniCMTS. Recommend to check Router Manual for 'Port Forward' details.
- c. Configure access for Port 80 (HTTP) and Port 22 (SSH).
- d. Recommend checking with an IT specialist for specific details.
- 9. Does the CMTS support CLI? Yes. This is available from the Pico Digital FTP site. The GUI interface is recommended as the primary interface for ease of initial configuration monitoring. The CLI manual is available from the FTP site.
- 10. Why is my configuration not retained after loading a config file? Loading the config files is a 3 step process (Start Upload, Start Loading, Save). If the Save button is not selected, any reset to the system will revert back to the previous configuration.
- 11. How can I save the entire configuration? There is more than one config save option available. The 'global' config save option is on the Start Page (upper rights side), under the word 'Config'. Upon selection, a drop down menu will appear. Select 'Export Configs' and save the file. To load the 'global' config file, go to the same menu and Select 'Import Config (cover)'.
- 12. The CMTS Multicast bandwidth usage varies and appears to work fine, however if the bandwidth usage is high, we have notice pixelization on the output. At low bandwidth the video appears fine. What could cause this? It is possible that the switch in use, cannot handle the larger packet sizes. In selecting a switch, verify it is 1 GigiBlt switch per port and each port can handles that much traffic at the same time. Recommend the Alcatel Lucent Omni Switch 6450 for high bandwidth usage.
- 13. What is the sequence of events in communicating with the Cable Modems? The web interface only allows the operator to change what the miniCMTS does, like what channel it's on etc. The sequence of events is as follows:
  - e. The CM scans for the QAM channel and gets the information on where to transmit
  - f. The CMTS eventually acknowledges the CM requests and two way communications is established.
  - g. The CM asks for an IP Address (via DHCP) from the provisioning server this is based on the MAC address.
  - h. The DHCP message contains a configuration file and location where to get it, the CM downloads this from a TFTP server, and the file tells the CM what to do.
  - i. The CM sends some 'magic' numbers to the CMTS which are based on what is in the configuration file, the CMTS then authorises the CM (this is called registration).
- 14. The CPE List (Online) shows one of the two IP address. What seems to be the problem? Most likely the issue is the DHCP server configuration. Review the configuration and if needed, compare the configuration with the DHCP server example from the FTP site.
- 15. Under the Business Model Settings / Relay Model Section, the GIADDR does not show up in the pull down? Only option is "Manage IP"? There is a configuration sequence where the 'Business IP' page must be setup first. Once setup, enabled, and saved, the GIADDR will appear on the

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Business Model Settings /Relay model page, below the Manage IP text. Note: After setting up all network settings recommend rebooting the miniCMTS200a to confirm all changes.

Start Robber	U Business Hodel 5	ettings *		
Busives Nodel:	Ratay modul .	e.		
	Cipter (gRotern () p	natse Configuration		
	Oevice Name	OPTIONED	Server Addr List	GIADDR by
6.96	CM	HACKIN .	182 168,56,27	(v)

16. Under the Business Model Settings / Option 60 Model, the VLAD ID info shows '?' mark. There is a configuration sequence where the 'Business IP' page must be setup first. Once Setup, enabled, and saved, then checked the Option 60 Model settings. Note: After setting up all network settings, recommend rebooting the miniCMTS200a to confirm all changes.

Start Manage	P Business Model Se	sttings. *			
usiness Model	OPTIONSE Model	8			
-Save Cant	Cipe Steten D B	able Configuration Add OPTION	12		
10	Device Name	OPTION60	VLAN ID	VLAN Priority	CPE L2VPN Enable
1.0	CM	docera	7	0	

- 17. The system is setup for a VLAN using Option 60. Un-tagging works but tagging does not. Why? Under the Business Model Settings, look at the VLAN ID. VLAN 1 is a reserved and should not be used. Try using another VLAN number that is not 1.
- 18. What the range 'triggers' the RF exception and RF SNR exceptions on the Start Page (bottom right)?

RF Exception occurs if one or more of the following situations occur.

- upstream power < 38
- upstream power > 48
- downstream power <50
- downstream power > 75

SNR exception occurs when SNR value is < 28.

- 19. Does the miniCMTS200a support the MULPI spec requirement? (Engineering Change for CM-SP-MULPIv3.0-I20-121113, MULPIv3.0-N-12.1071-10 10/17/2012 1x1 Energy Management Support)? Yes. The miniCMTS200a supports the MULPI spec requirement.
- 20. How much attenuation do I need for a short cable length test setup?

Below is an example of a cable test setup:

miniCMTS --->DS cable / US cable ---> Diplexer (separator/combiner) ---> -30 db Attenuator ---> 3 way splitter, -7db ---> cable modem.

DS power on miniCMTS is set at 45 dBmV.

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- 21. I had an issue where some of data is display displayed on the Web User Interface. What would cause this? This is a possible browser and Adobe flash update issue. Please insure that both browser and Adobe flash is at latest version. Also try a different browser and if needed a different PC for comparison.
- 22. How many Cable Modems can the miniCMTS200a support? Below is the maximum tested CMs for field use.
  - a. The total number of DOCSIS 2.0 CMs is 400
  - b. The total number of DOCSIS 3.0 CMs is 250
  - c. In combination, the total maximum CMs is 400. The maximum number of D3.0 CMs in a 400 CM system is 250. This leaves 150 CMs for D2.0. This has been verified in our labs.

Recommended maximum for use case.

- d. Hotel (light usage) 400 total, (example: 250 CM D3.0 and/or 150 CM D2.0 maximum)
- e. Residential (heavy use) 200 CM maximum total.

Note: We generally recommend less than maximum number, but it really depends on how many users are frequently accessing the system. If there are too many regular heavy active users within the same network, then it is recommended that those CMs be moved to another CMTS that has less traffic.

Additionally, there is the CM registration maintenance to consider.

Each CM has a very specific time that it expects communication with the CMTS. If it does not get the proper communication from the CMTS, then the CM will restart its registration process (basically go offline and initialized). If there are too many CMs active, then the system will appear 'unstable' in respect to the CM constantly reinitializing their registration process.

- 23. Are there any other supported Upstream Channel Widths besides what is provided? No, the miniCMTS200a support only DOCSIS standard widths of 1.6 MHz, 3.2 MHz, and 6.4 MHz. This is a hardware limitation.
- 24. Is there a way to verify net speed performance? Yes, from the start page select the Netspeed text. A pop up page showing the Net speed status will be displayed.

25. More Multicast FAQ

- a. What is the maximum IP multicast data rate on the downstream channel, total and for each individual IP multicast stream? No limit, just the limit of the PHY, appx. 50Mbps.
- b. What is the maximum IP multicast throughput of a typical cable modem? Any limits on the number of IP multicast streams in the cable modem? Typical DOCSIS 3.0 modem would be 400 Mbps. The limit on stream will be modem specific and depends on their implementation.

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- c. Where are the IGMP messages from the end user devices processed? The CMTS 'snoops' these and forwards appropriately, they are also processed in the external switch.
- d. How does the CMTS decided when to start, and when to stop sending an IP multicast stream on the downstream channel? Is this a dynamic process and if so, how is it managed? By using the IGMP snooping. Go over the message exchange to initiate and terminate IP multicast streams.

See <u>http://en.wikipedia.org/wiki/Internet\_Group\_Management/Protocol</u> all about IGMP. Its basically using IGMP to start and keep the message alive, and to stop it when no-one is requesting it.. What is the maximum IP multicast data rate on the downstream channel, total and for each individual IP multicast stream? No limit, just the limit of the PHY about 50Mbps.

e. Are there any limitation using Bridge Mode vs Router Mode? Presently, there are some issues with Multicast joins when running cable modems in bridge mode.

End.