



MoCA Installation and Troubleshooting Reference Guide

Overview

Introduction

This document contains installation guidelines, performance verification steps, and troubleshooting measures for devices that support a multi-room network over Multimedia over Coax Alliance (MoCA®). Multi-room networks allow client devices (non-DVR set-tops) to stream content from a server device (DVR set-top) that has recorded linear content.

Features

Support is provided for the following features on each MoCA device:

- Standard Definition (SD) and High Definition (HD) content
- Between two nodes, a streaming rate of greater than 250 Mbps (PHY rate)
- Trick modes (FF, REW, SLO-MO, and PAUSE)
- Up to three clients per server

MoCA Devices

The information in this guide applies to the following MoCA devices:

DVRs

- 9865HDC set-tops
- 8742HDC and 8642HDC set-tops

Non-DVRs

- 4742HDC and 4642HDC set-tops
- 1642HDC set-tops

Purpose

After reading this document, you will understand where to install the MoCA POE (Point of Entry) filter and MoCA set-tops with respect to cable splitters and amplifiers. You will also be able to verify links between MoCA set-tops and troubleshoot faulty installations.

Scope

This document does not address MoCA-compliant cable modem gateways. This document only addresses standalone DOCSIS 2.0 and DOCSIS 3.0 cable modems that are not MoCA compliant.

Audience

This document is intended for field technicians.

Audience

This document is intended for field technicians.

Document Version

This is the third formal release of this document.

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Installation Basics

A basic installation procedure involves the following:

- Install the MoCA Point of Entry (POE) filter
- Check QAM levels at each outlet
- Boot the set-tops and verify the MoCA links

These topics are covered in the following sections.

Install POE Filter

The POE filter is a 1002 MHz low-pass filter which is installed at the subscriber drop. It prevents interference between MoCA devices in homes connected to the same tap. As shown in *Basic Installation* (on page 4), you should connect the POE filter between the ground block and the splitter.

Verify QAM Levels

Verify that the QAM signal level of the highest frequency QAM channel (i. e., channel 158) is adequate at each outlet used in the installation. If this is not the case, the home wiring should be corrected before continuing.

Verify MoCA Links

Set-tops should automatically form a MoCA network after two or more MoCA devices boot up. Once a set-top has joined the network, its MoCA link indicator* illuminates (see the front-panel call-outs in the set-top guides listed below):

- *Cisco Explorer 9800 Hybrid Video Gateway Series* (part number OL-26440-01) for the 9865HDC set-tops
- *Cisco Explorer 8640HD, 8642HD, 8650HD, and 8652HD High-Definition DVR Set-Tops Quick Reference* (part number 78-4026879-01) for the 8640HD and 8642HD set-tops
- *Cisco Explorer 8640HDC, 8642HDC, 8650HDC, and 8652HDC High-Definition Set-Tops with Multi-Stream CableCARD (M-Card) Interface Quick Reference* (part number 78-4026878-01) for the 8642HDC set-tops
- *Cisco Explorer 4642HD and 4652HD High-Definition Set-Tops Quick Reference* (part number 78-4029078-02) for the 4642HD set-tops
- *Cisco Explorer 4642HDC and 4652HDC High-Definition Set-Tops with Multi-Stream CableCARD Interface Quick Reference* (part number 78-4029076-01) for the 4642HDC set-tops

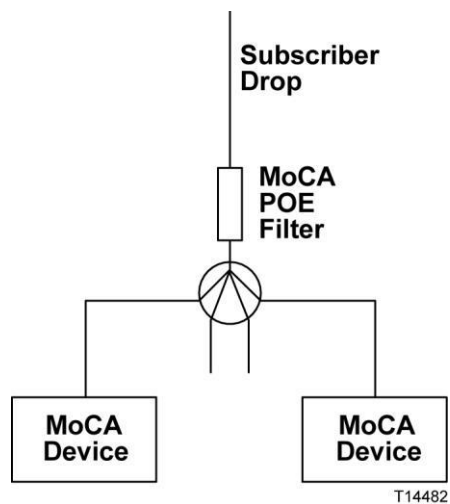
* The 164x set-tops do not have a MoCA indicator. To verify the MoCA link, you must refer to DRIVERS - MoCA SUMMARY PG 1 (see **Node Summary and Network Summary** (on page 8)).

Home Wiring Examples

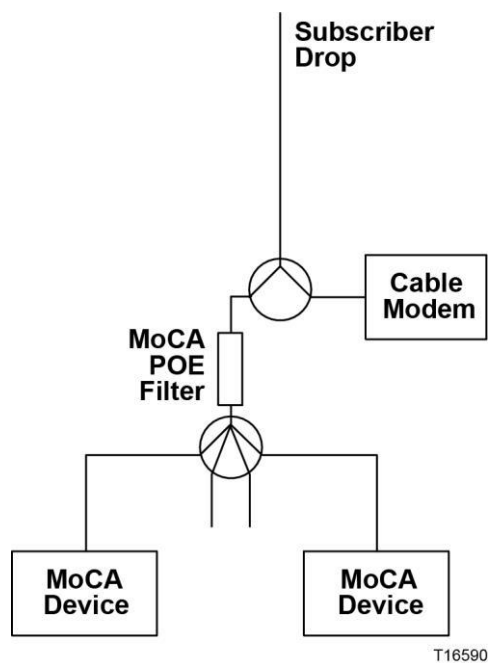
The diagrams in this section show home wiring examples that typically provide good MoCA performance.

Note: As in each of these diagrams, the POE filter should always be installed before the first split.

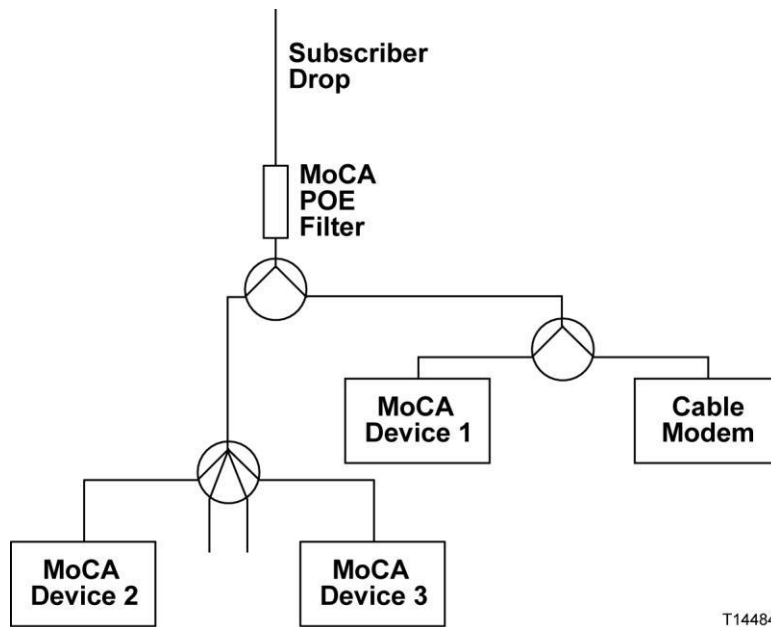
Basic Installation



With Cable Modem (Example A)

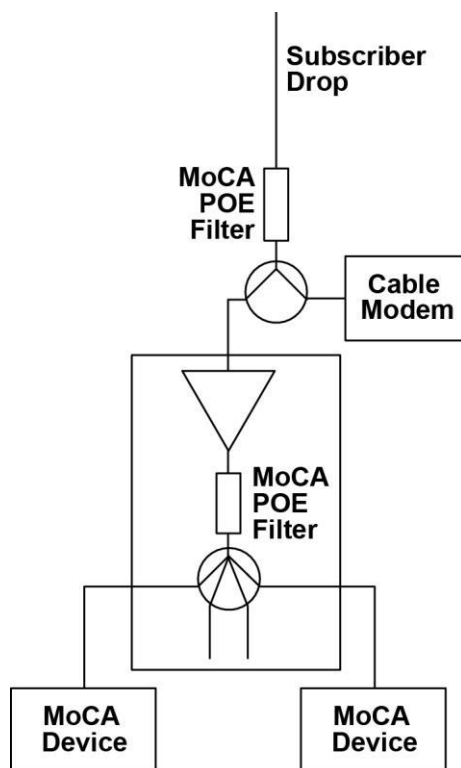


With Cable Modem (Example B)

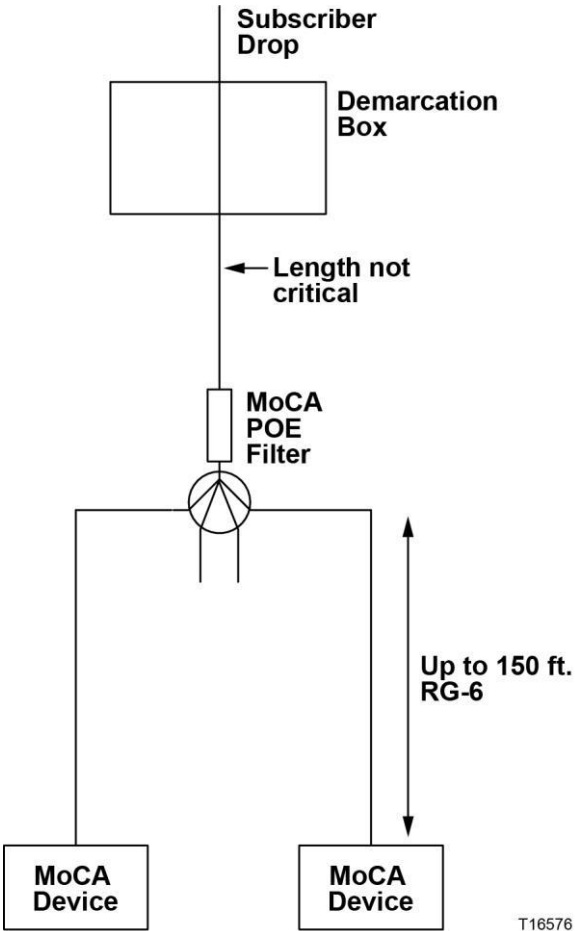


With Home Amplifier

Important: Home amplifiers can cause MoCA problems. You should use a MoCA-compliant amplifier when an amplifier is required. (A MoCA-compliant amplifier has an internal POE filter, as shown in the diagram.)



With Long Cable Runs



Note: The POE filter should be as close to the coaxial distribution point as possible.

Performance Verification

MoCA performance is verified by viewing the set-top diagnostic screens. To enter diagnostic mode, follow one of the following procedures based on the set-top you are using.

For 87xx, 86xx 46xx, and 16xx Set-Tops

- 1 Press and hold the set-top power button until the power indicator flashes.
- 2 Release the power button.
- 3 Press the power button again. The first diagnostic page opens.
- 4 Scroll to the MoCA diagnostic screens. The first one is called DRIVERS - MOCA SUMMARY PG1.
 - To scroll through the diagnostic screens, press the set-top volume control buttons (86xx and 46xx set-tops) or the Page Up/Down buttons on the remote (164x set-tops).
 - To exit diagnostic mode, press the set-top Exit button (86xx and 46xx set-tops) or the Exit button on the remote (164x set-tops).

Use the following diagnostic information to verify the performance of each MoCA set-top in the home. Start with the DVR set-top, since its performance is critical to the non-DVR set-tops that depend on it for multi-room content distribution.

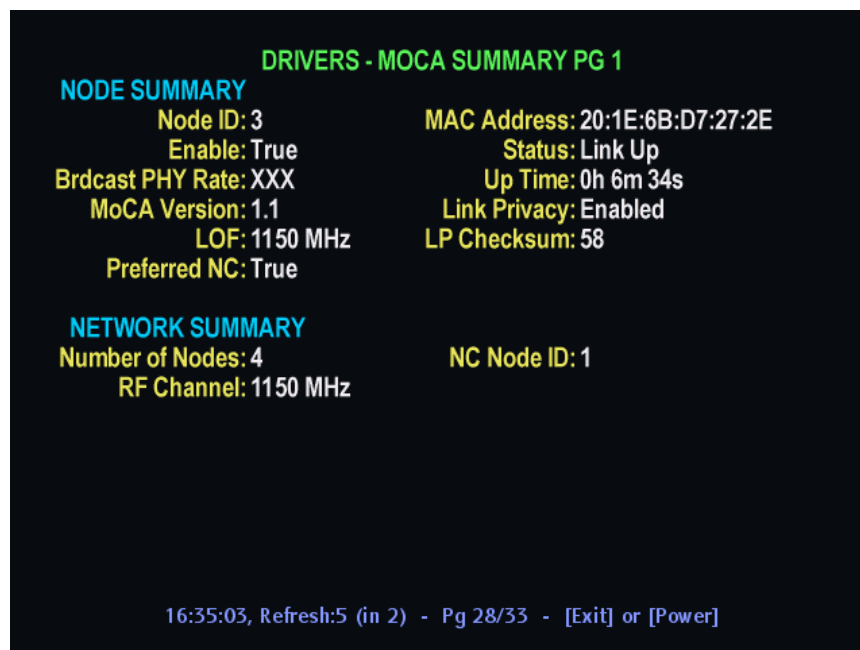
Note: Each set-top is referred to as a MoCA node; a given set-top refers to itself as the local node. See *Appendix A* (on page 19) for definitions of all MoCA diagnostic screen parameters.

For 9865 Set-Tops

- 1 Press and hold the **EXIT** button on the remote until the power indicator flashes.
- 2 Press the remote **down button** (⬇️) twice.
- 3 Press the number **2** on the remote. The diagnostic menu opens.
- 4 Scroll down to the **Home Networking** menu selection (this is where the MoCA diagnostics are).
 - Access the Home Networking pages using the remote left (⬅️) and right (➡️) arrows.
 - Pages 4 - 7 have useful MoCA diagnostic information.
 - To exit diagnostic mode, press the **EXIT** button on the remote.

Node Summary and Network Summary

To view Node Summary and Network Summary statistics, scroll to the first MoCA diagnostics page, DRIVERS - MoCA SUMMARY PG 1. Then verify the desired field values as shown in the table.



Field Name	Description	Possible Values
Enable	Indicates whether MoCA is enabled on this set-top	<ul style="list-style-type: none"> ■ True—preferred value ■ False <p>Note: Status is controlled at the headend.</p>
Brdcast PHY Rate	Data rate used for packets broadcast to all other nodes	<ul style="list-style-type: none"> ■ [Integer > 0] <p>Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring. Wait at least 30 seconds after Link Up is achieved then verify Broadcast PHY Rate.</p>
Status	Status of the MoCA network	<ul style="list-style-type: none"> ■ Link Up—preferred value ■ No Link ■ Disabled <p>Note: Link Up indicates that the node has successfully joined the network.</p>
Link Privacy	Indicates the status of Link Privacy	<ul style="list-style-type: none"> ■ Enabled—preferred value ■ Disabled

Field Name	Description	Possible Values
RF Channel	Channel center frequency of the MoCA network (in MHz)	<ul style="list-style-type: none"> Value: 1150 The RF channel frequency is typically 1150 MHz. If it is not, record the frequency for comparison with other devices on the network.

Node Statistics

To view Node Statistics, scroll to DRIVERS - MoCA SUMMARY PG 2A and DRIVERS - MoCA SUMMARY PG 2B. Then verify the desired field values as shown in the table.

DRIVERS - MOCA SUMMARY PG 2A
NODE STATISTICS 1/2

	Tx Unicast PHY Rate (Mbps)	Broadcast PHY Rate (Mbps)
Node 0:	250	248
Node 1:	250	249
Node 2:	251	251
Node 3:	---	---
Node 4:	n/a	n/a
Node 5:	n/a	n/a
Node 6:	n/a	n/a
Node 7:	n/a	n/a

09:11:51, Refresh:5 (in 3) - Pg 26/35 - [Exit] or [Power]

DRIVERS - MOCA SUMMARY PG 2B
NODE STATISTICS 2/2

	Local Node Rx Level (dBm)	Approx Path Loss (dB)
Node 0:	-42	42
Node 1:	-42	42
Node 2:	-42	42
Node 3:	---	---
Node 4:	n/a	n/a
Node 5:	n/a	n/a
Node 6:	n/a	n/a
Node 7:	n/a	n/a

09:12:00, Refresh:5 (in 3) - Pg 27/35 - [Exit] or [Power]

Performance Verification

Field Name	Description	Possible Values
TX Unicast PHY Rate (Mbps)	Transmit rate from the local node* to each other node in the network.	<ul style="list-style-type: none"> ■ [Integer > 0] Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring. Wait at least 30 seconds after Link Up is achieved.
Broadcast PHY Rate (Mbps)	Broadcast rate from each other node in the network to the local node*.	<ul style="list-style-type: none"> ■ [Integer > 0] Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring.
Approx Path Loss (dB)	Approximate loss from each node to the local node.	<ul style="list-style-type: none"> ■ [Integer > 0] Important: Losses greater than 50 dB requires fixing the home wiring.

*In this example, the local node is 5, noted by the absence of data in the fields adjacent to the node number.

Interface Info

To verify that the MoCA IF IP and MoCA IF mask have been assigned, scroll to DRIVERS - MoCA SUMMARY PG 3. Then verify the desired field values as shown in the table.

```

DRIVERS - MOCA SUMMARY PG 3
INTERFACE INFO
MoCA IF IP: 169.254.188.76
MoCA IF Mask: 255.255.0.0
Tx Pkts: 32141          Tx Pkts Drop: 0
Rx Pkts: 33543          Rx Pkts Corrected: 0
                          Rx Pkts Drop: 0

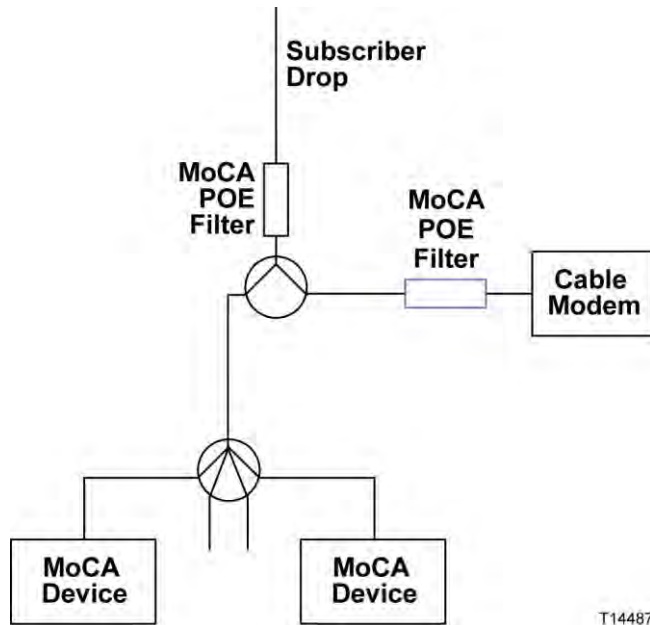
09:12:09, Refresh:5 (in 1) - Pg 28/35 - [Exit] or [Power]

```

Field Name	Description	Possible Values
MoCA IF IP	IP address acquired using HHCP or IPv4 Link-Local Protocol	<ul style="list-style-type: none"> ■ [Network-dependent] Note: After Link Up, the set-top automatically acquires an IP address from a DHCP server in a MoCA device. If none of the MoCA Devices have DHCP enabled, the set-top will acquire an IP address using IPv4 Link-Local Protocol.
MoCA IF Mask	Subnet mask of the MoCA IF IP	<ul style="list-style-type: none"> ■ [Network-dependent]

Preventing Interference with Cable Modems

Some cable modems can be affected by the MoCA signal. If interference is suspected, attach a POE filter to the F-connector of the cable modem. This attenuates the MoCA signal at the cable modem.



Installation Problems

There are several home wiring configurations that can cause a low PHY rate (physical layer bit rate) and other problems. The most common of these configurations and possible solutions are discussed in the following sections.

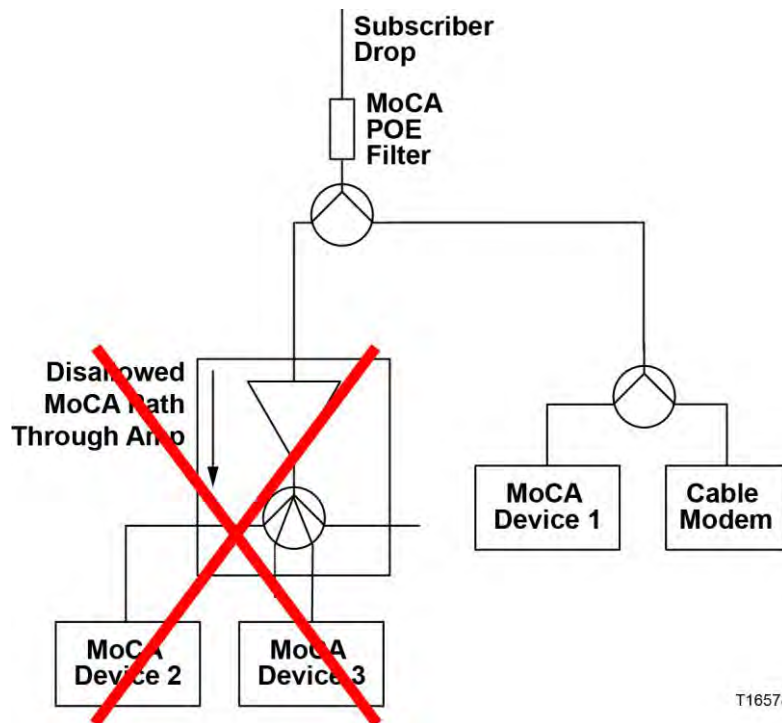
MoCA Path Through Amplifier

Problem

In the diagram below, MoCA Device 1 is connected off the initial split to the cable modem, while the other MoCA devices are connected after a home amplifier. **This configuration is not allowed.**

Consequently, MoCA network transmissions between MoCA Device 1 and the other MoCA devices must traverse the reverse isolation of the home amplifier.

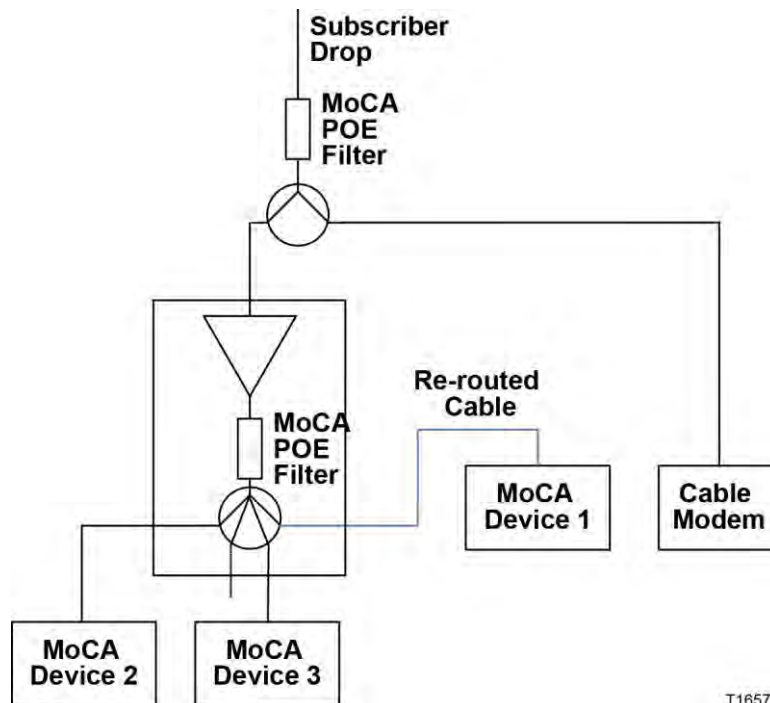
Furthermore, the MoCA signal travelling in the other direction may cause distortion in the home amplifier and affect video reception on CATV channels.



Installation Problems

Solution

A solution is to re-route the cable wiring so that MoCA Device 1 is connected to the output of the home amplifier.

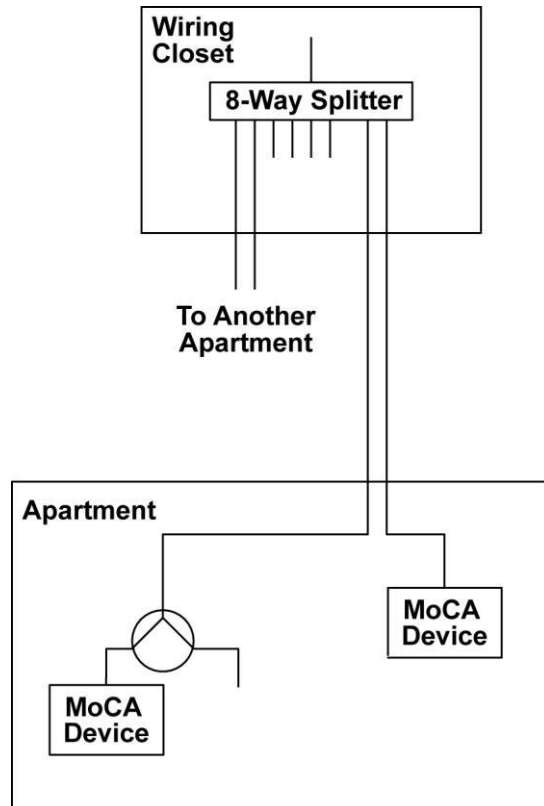


In addition to keeping all MoCA devices on the output side of the amplifier, you should use a MoCA-compliant amplifier when an amplifier is required. (A MoCA-compliant amplifier has an internal POE filter, as shown in the diagram.)

Multi-Dwelling

Problem

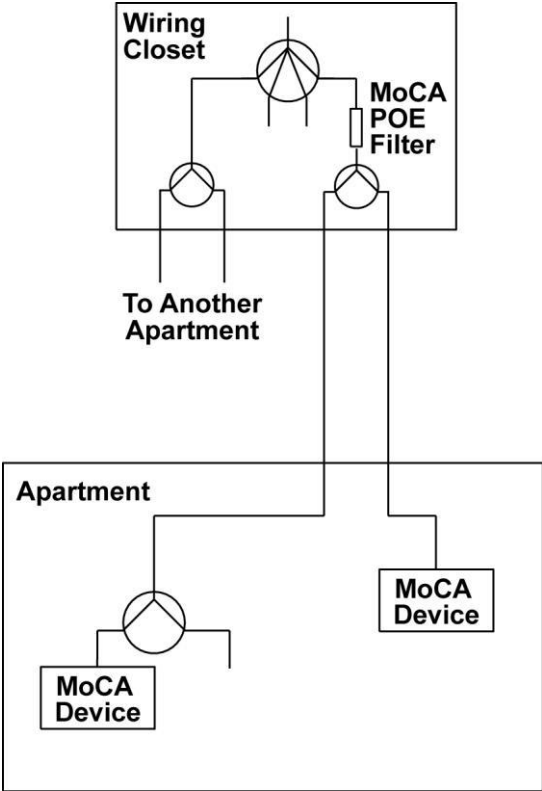
The diagram below shows an apartment wiring closet with multiple apartments fed by the same 8-way splitter. The 8-way splitter prevents installing the MoCA POE filter to isolate apartments.



T14493

Solution

The solution shown in the diagram below implements the same number of splits in such a way as to allow for installation of the MoCA POE filter. With this solution, each MoCA network is confined to its associated apartment.



T14494

Troubleshooting

This section contains troubleshooting measures for link loss, high path loss, and low PHY rates.

No Link

If there is no MoCA link, check the following:

- 1 On MoCA SUMMARY PG 1 (see *Node Summary and Network Summary* (on page 8)):
 - Verify that Enable is True. If Enable is False, ask a headend operator to set the value to True.
 - If Link Privacy is enabled, note the LP checksum value. All nodes must have the same LP checksum value.
 - Verify that the RF channel frequency is the same for all nodes and that the RF channel frequency does not change value (hunt).

If any of these conditions are not met, there may be a configuration problem on one or more set-tops.

- 2 At each outlet that feeds a MoCA device, measure the level of the highest channel on the system (channel 158). If the level is below the specified minimum, correct the home wiring.
- 3 Check for a home amplifier between MoCA devices (see *MoCA Path Through Amplifier* (on page 13)). If present, rewire as shown in the solution diagram.
- 4 Splitters— Check if any splitter feeds a single MoCA device (as opposed to multiple devices). If possible, remove the splitter and connect both devices at the next upstream splitter. Otherwise, verify that the splitter is rated for at least 1000 MHz. If not, replace the splitter.
- 5 Coaxial Surge Arrestors— Check for a coaxial surge arrestor on the cable feeding the set-top, and remove if present. Typically, coaxial surge arrestors are part of an AC power strip outlet. Using this device for the AC surge is acceptable, but **DO NOT USE THE COAXIAL SURGE ARRESTOR.**

Low PHY Rates

If the PHY rate is low, check the following:

- 1 Make sure to wait at least 30 seconds after link is achieved to check the PHY rate.
- 2 Check the path loss shown on MoCA SUMMARY PG 2B (see *Node Statistics* (on page 9)). If any path losses are greater than 50 dB, connect a level meter to the coaxial cable and measure the level of the highest channel on the system (channel 158). If the level is below the specified minimum, correct the home wiring.
- 3 Check for a home amplifier between MoCA devices (see *MoCA Path Through Amplifier* (on page 13)). If present, implement one of the recommended solutions.
- 4 Daisy chained splitters – Check if any splitter feeds a single MoCA device as opposed to multiple devices. If possible, remove the splitter and connect both devices at the next upstream splitter. Otherwise, verify that the splitter is rated for at least 1000 MHz. If not, replace the splitter.
- 5 Long cable runs – Check if any MoCA devices have cable runs longer than 300 feet between two MoCA devices. If possible, reduce the cable length. If RG-59 cable is used, replace with RG-6.
Note: For a comparison of the relative signal loss characteristics between RG-59 and RG-6, see *Appendix B* (on page 22).
- 6 Coaxial Surge Arrestors – Check for a coaxial surge arrestor on the cable feeding the set-top, and remove if present.
Note: See *Appendix B* (on page 22) for information on MoCA PHY rates vs. receiver sensitivity.

High Path Loss

See *Low PHY Rates* (on this page), steps 3–6.

Appendix A

The following tables describe all of the fields and possible values that can appear on the TV when you are reviewing MoCA diagnostic screens. They can be useful for troubleshooting MoCA issues.

DRIVERS - MoCA SUMMARY PG 1

Field Name	Description	Possible Values
Node ID	The local node ID	<ul style="list-style-type: none"> ■ [Range: 0 – N] where N = 15 for MoCA 1.1
Enable	Indicates whether MoCA is enabled on this set-top	<ul style="list-style-type: none"> ■ True—preferred value ■ False <p>Note: Status is controlled at the headend.</p>
Brdcast PHY Rate	Data rate used for packets broadcast to all other nodes	<ul style="list-style-type: none"> ■ [Integer > 0] <p>Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring.</p> <p>Wait at least 30 seconds after Link Up is achieved then verify Broadcast PHY Rate.</p>
MoCA Version	Version of the MoCA standard supported by the set-top	<ul style="list-style-type: none"> ■ [Set-top-dependent]
LOF	Last Operational Frequency (in MHz). The set-top will automatically default to this frequency after a reboot.	<ul style="list-style-type: none"> ■ [Integer > 0] <p>Note: This is typically equal to the RF channel.</p>
MAC Address	MAC address of the MoCA interface	<ul style="list-style-type: none"> ■ Based on the STB RF MAC on the back of the set-top. <p>Example: If the STB RF MAC of the set-top is 00:1E:6B:D2:4D:4C, the MoCA interface MAC is 20:1E:6B:D2:4D:4C.</p>
Status	Status of the MoCA network	<ul style="list-style-type: none"> ■ Link Up—preferred value ■ No Link ■ Disabled <p>Note: Link Up indicates that the node has successfully joined the network.</p>
Up Time	Length of time that the Status has been at Link Up	<ul style="list-style-type: none"> ■ [Time] <p>Example: 3h 10m 6s</p>
Link Privacy	Indicates the status of Link Privacy	<ul style="list-style-type: none"> ■ Enabled—preferred value ■ Disabled

Appendix A

Field Name	Description	Possible Values
LP Checksum	Link Privacy Checksum value	<ul style="list-style-type: none"> ■ [Integer > 0] Important: For two or more devices to form a MoCA network, their LP checksums must match, when Link Privacy is enabled.
Number of Nodes	Number nodes present on the MoCA network, not including the current node	<ul style="list-style-type: none"> ■ [Integer ≥ 1] The total number of nodes in the network is the Number of Nodes + 1.
RF Channel	Channel center frequency of the MoCA network (in MHz)	<ul style="list-style-type: none"> ■ Value: 1150 MHz Note: The RF channel frequency is 1150 MHz. If it is not, record the frequency for comparison with other devices on the network.
NC Node ID	Node ID of the network coordinator	<ul style="list-style-type: none"> ■ [Range: 0 – N] where N = 15 for MoCA 1.1

DRIVERS - MoCA SUMMARY PG 2A

Field Name	Description	Possible Values
TX Unicast PHY Rate (Mbps)	Transmit rate from the local node to each other node in the network (in Mbps)	<ul style="list-style-type: none"> ■ [Integer > 0] Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring. Wait at least 30 seconds after Link Up is achieved.
Broadcast PHY Rate (Mbps)	Broadcast PHY rate of each remote node (other than this set-top/node) in the MoCA network (in Mbps)	<ul style="list-style-type: none"> ■ [Integer > 0] Note: Minimum value is 200 Mbps, lower rates require fixing the home coaxial wiring.

DRIVERS - MoCA SUMMARY PG 2B

Field Name	Description	Possible Values
Local Node Rx Level (dBm)	Receive level from each other node to the local node.	<ul style="list-style-type: none"> ■ [Integer < 0]
Approx Path Loss (dB)	Approximate loss from each node to the local node.	<ul style="list-style-type: none"> ■ [Integer ≥ 0] Important: Losses greater than 50 dB can indicate a problem with the home wiring. These problems must be fixed so that the losses are less than 50 dB.

DRIVERS - MoCA SUMMARY PG 3

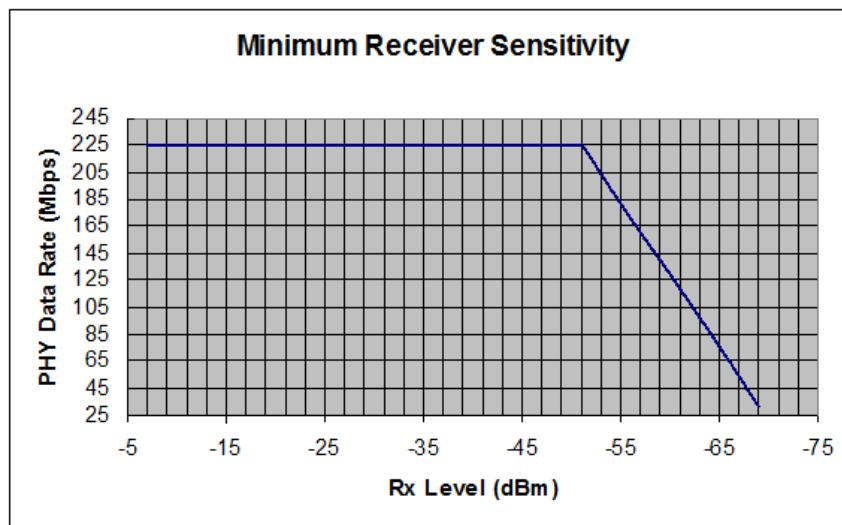
Field Name	Description	Possible Values
MoCA IF IP	IP address acquired using DHCP or IPv4 Link-Local Protocol	<ul style="list-style-type: none"> ■ [Network-dependent] Note: After Link Up, the DHCT automatically acquires an IP address from a DHCP server in a MoCA device. If none of the MoCA devices have DHCP enabled, the DHCT acquires an IP address using IPv4 Link-Local Protocol.
MoCA IF Mask	Subnet mask of the MoCA IF IP	<ul style="list-style-type: none"> ■ [Network-dependent]
Tx Pkts	Number of Ethernet packets transmitted by this node since MoCA link up	<ul style="list-style-type: none"> ■ [Integer ≥ 0]
Tx Pkts Drop	Number of transmitted Ethernet packets dropped by this node since MoCA link up	<ul style="list-style-type: none"> ■ [Integer ≥ 0]
Rx Pkts	Number of Ethernet packets received by this node since MoCA link up	<ul style="list-style-type: none"> ■ [Integer ≥ 0]
Rx Pkts Corrected	Number of Ethernet packets with errors corrected by this node since MoCA link up	<ul style="list-style-type: none"> ■ [Integer ≥ 0]
Rx Pkts Drop	Number of Ethernet packets with errors dropped by this node since MoCA link up	<ul style="list-style-type: none"> ■ [Integer ≥ 0]

Appendix B

This appendix has information on MoCA signal attenuation characteristics and link quality.

MoCA PHY Rate vs. Receiver Sensitivity

The MoCA transmitter adjusts its bit rate automatically, depending on channel quality, to maintain a low bit error rate (BER) at the MoCA receiver. For that reason, the PHY rate is a measure of link quality. PHY rate vs. receive level is plotted in the diagram below.



Cable Loss at 1150 MHz.

This table shows the loss characteristics for RG-59 and RG-6 cable at 1150 MHz.

Cable	Loss per 100 feet at 1150 MHz.
RG-59	8.7 dB
RG-6	7.0 dB

For Information

If You Have Questions

If you have technical questions, contact Cisco Services for assistance. Follow the menu options to speak with a service engineer.



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