CISCO™

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
- Streaming rates of up to 100 Mbps
- 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
- 8642HD and 8642HDC set-tops
- 8652HD and 8652HDC set-tops

Non-DVRs
- 4642HD and 4642HDC set-tops
- 4652HD and 4652HDC set-tops
- 1642HD and 1642HDC set-tops

Purpose

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

Audience

This document is intended for field technicians.

Document Version

This is the second formal release of this document.

In This Document

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 (see *MoCA Point of Entry Filter Data Sheet* (part number 7016817)) 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), the POE filter should be connected 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* will illuminate (see the front panel call-outs in the set-top guides listed below):

- *Cisco Explorer 8640HD, 8642HD, 8650HD, and 8652HD High-Definition DVR Set-Tops Quick Reference* (part number 4026879)

- *Cisco Explorer 8640HDC, 8642HDC, 8650HDC, and 8652HDC High-Definition Set-Tops with Multi-Stream CableCARD (M-Card) Interface Quick Reference* (part number 4026878)

- *Cisco Explorer 4642HD and 4652HD High-Definition Set-Tops Quick Reference* (part number 4029078)

- *Cisco Explorer 4642HDC and 4652HDC High-Definition Set-Tops with Multi-Stream CableCARD Interface Quick Reference* (part number 4029076)
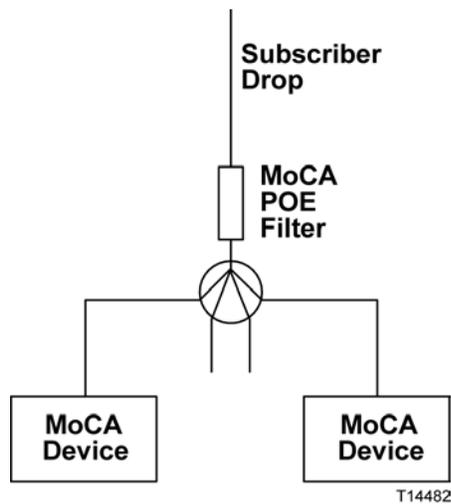
* The 164x set-tops do not have a MoCA indicator. To verify the MoCA link, you must refer to DRIVERS - MoCA SUMMARY PG 1 (see **Node Summary and Network Summary** (on page 8)).
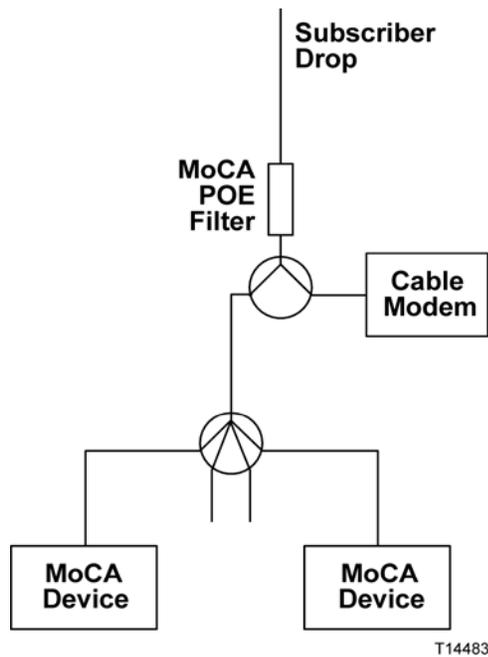
Home Wiring Examples

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

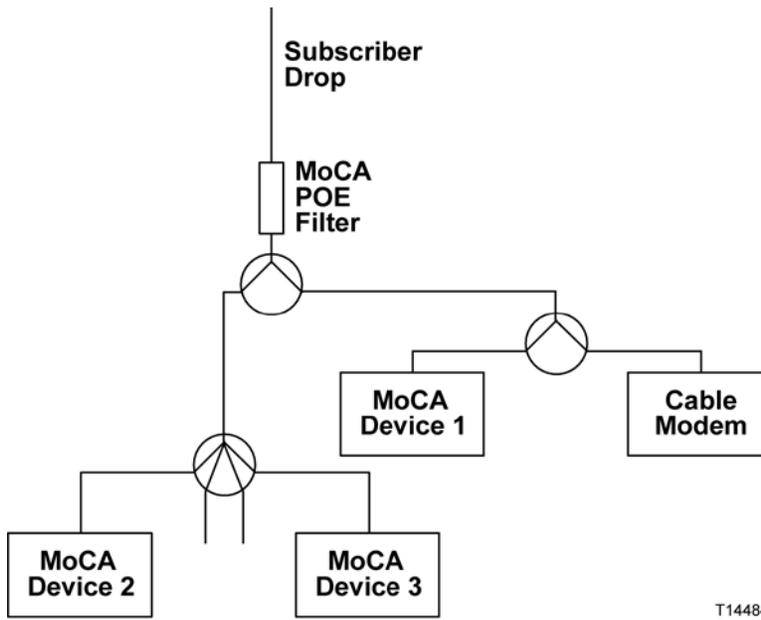**Note:** As in each of these diagrams, the POE filter should always be installed before the first split.
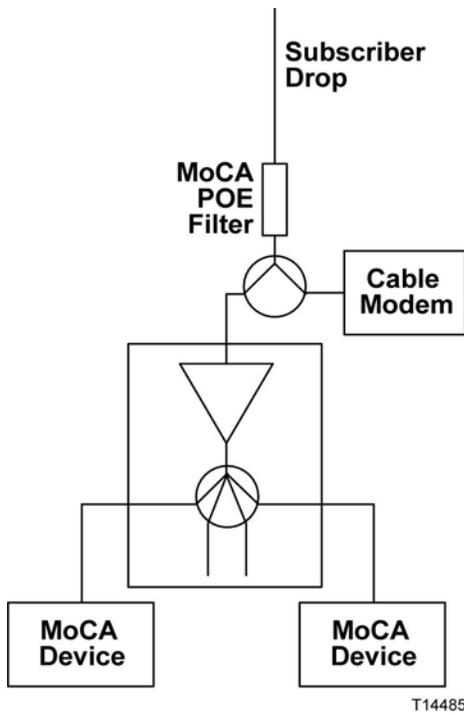
Basic Installation
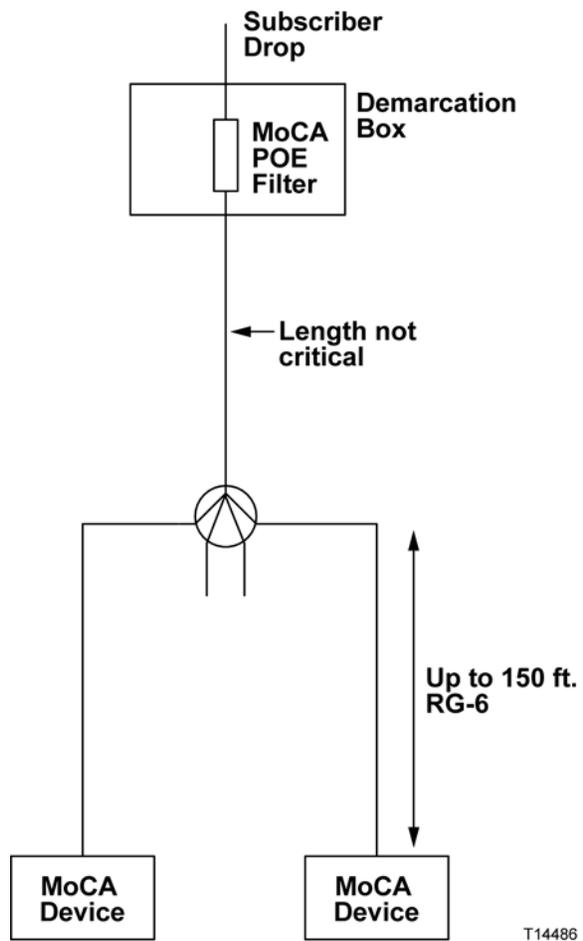

With Cable Modem (Example A)

With Cable Modem (Example B)

Subscriber Drop

MoCA POE Filter

MoCA Device 1

Cable Modem

MoCA Device 2

MoCA Device 3

T14484

With Home Amplifier

Subscriber Drop

MoCA POE Filter

Cable Modem

MoCA Device

MoCA Device

T14485

With Long Cable Runs

Subscriber
Drop

Demarcation
Box

MoCA
POE
Filter

← Length not
critical

Up to 150 ft.
RG-6

MoCA
Device

MoCA
Device

T14486

Performance Verification

MoCA performance is verified by viewing the set-top diagnostic screens. To enter diagnostic mode:
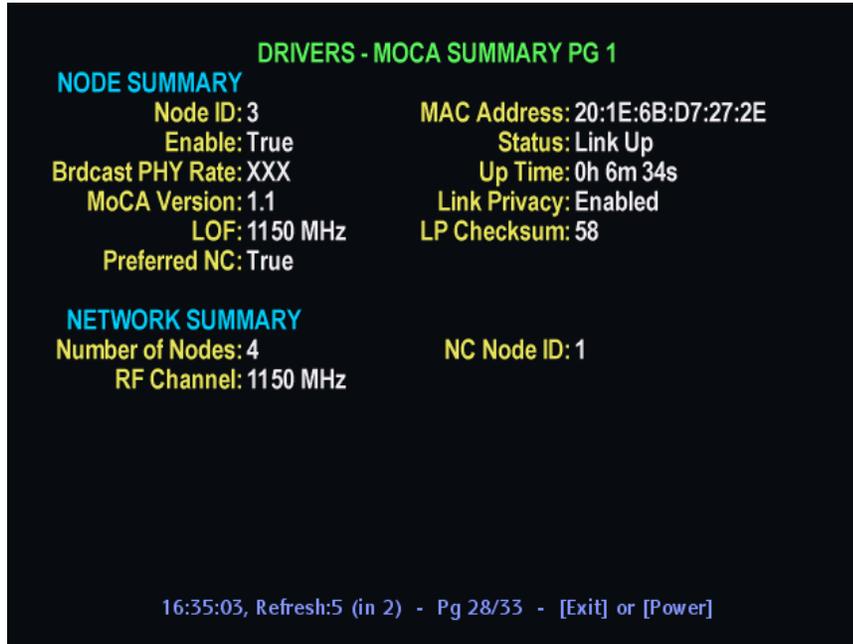
1 Press and hold the set-top power button until the power indicator flashes.

2 Release the power button.

3 Press the power button again. The first diagnostic page will appear.

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 21) for definitions of all MoCA diagnostic screen parameters.

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	■ **True**—preferred value ■ **False** **Note:** Status is controlled at the headend.
Brdcast PHY Rate	Data rate used for packets broadcast to all other nodes	■ **[Integer > 0]** **Note:** Preferred value is ≥ 150 Mbps. Wait at least 30 seconds after **Link Up** is achieved then verify Broadcast PHY Rate.
Status	Status of the MoCA network	■ **Link Up**—preferred value ■ **No Link** ■ **Disabled** **Note: Link Up** indicates that the node has successfully joined the network.
Link Privacy	Indicates the status of Link Privacy	■ **Enabled**—preferred value ■ **Disabled**

Field Name	Description	Possible Values
RF Channel	Channel center frequency of the MoCA network (in MHz)	▪ **[Range: 1150 – 1500]** **Important:** A changing value indicates that the set-top is hunting for the correct frequency. **Note:** 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.

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)	■ **[Integer > 0]** **Note:** Preferred value is ≥ 180 Mbps. 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)	■ **[Integer > 0]** **Note:** Preferred value is ≥ 150 Mbps.
Approx Path Loss (dB)	Approximate loss from each node to the local node (in dB)	■ **[Integer $\geq$ 0]** **Important:** Losses greater than 54 dB can indicate a problem with the home wiring.

*In this example, the local node is 3, 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.

Field Name	Description	Possible Values
MoCA IF IP	IP address acquired using DHCP or IPv4 Link-Local Protocol	■ **[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	■ **[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 will attenuate the MoCA signal at the cable modem.
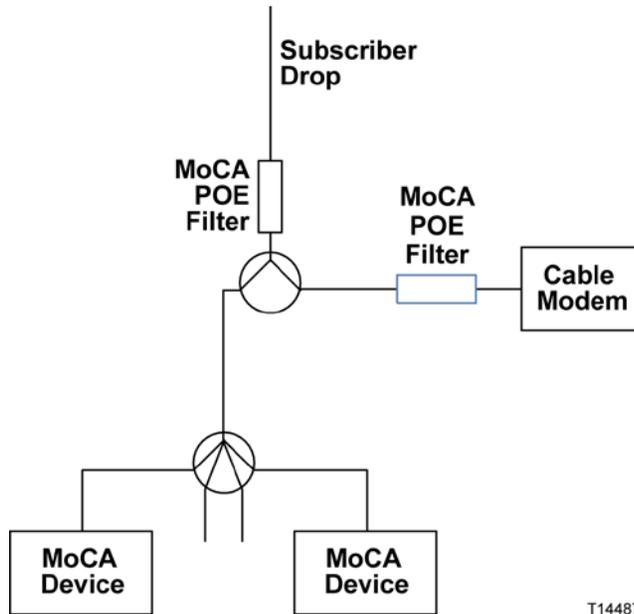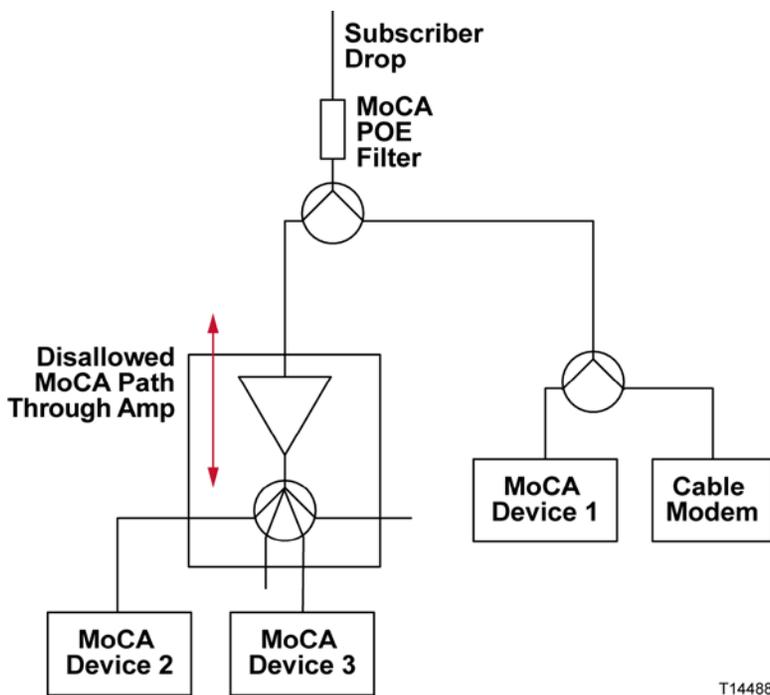
Installation Problems

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. 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.
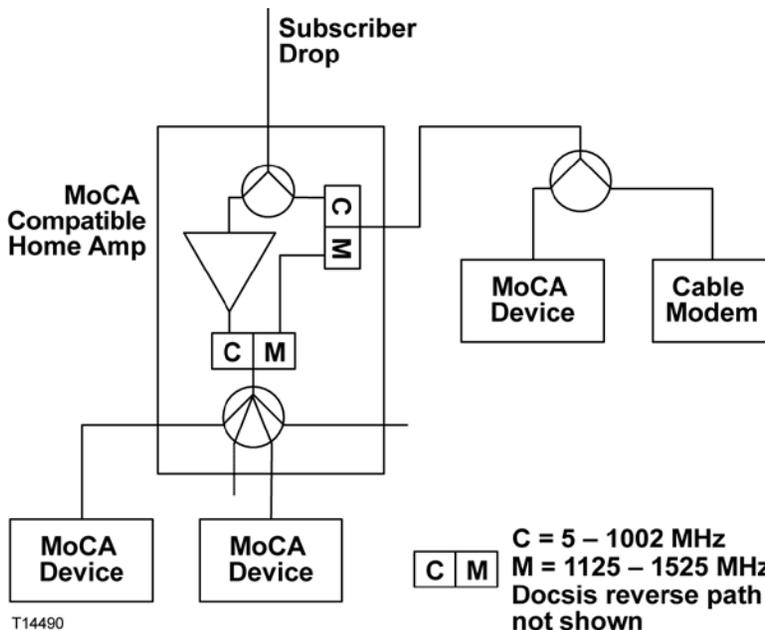
Solution 1

One solution is to re-route the cable wiring so that MoCA Device 1 is connected to the output of the home amplifier.
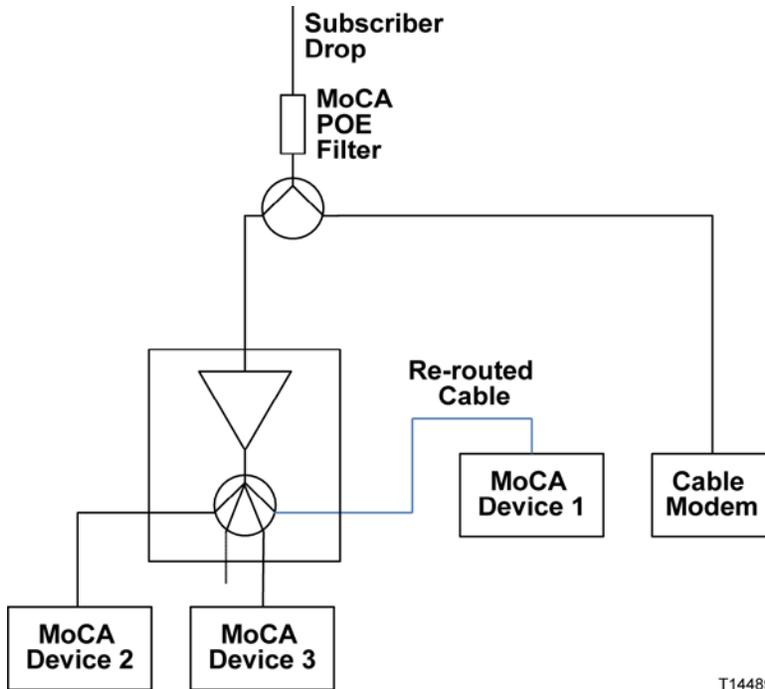
Solution 2

Another solution is to replace the home amplifier with a MoCA-compatible amplifier. A MoCA-compatible amplifier has a passive output for the CM path that also allows MoCA signals to bypass the amplifier. This solution does not require a new cable run.
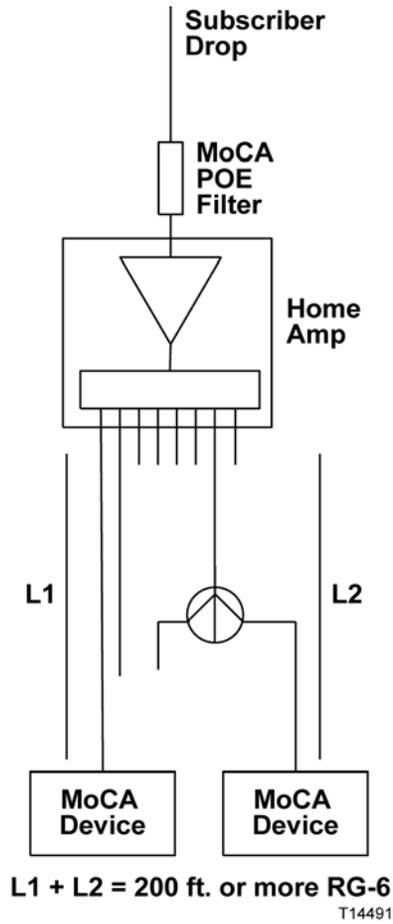
High Loss

Problem

The diagram below shows a home network that is experiencing high MoCA attenuation due to three factors: the port-port isolation of a home amplifier; long cable runs; and a splitter.

Solution

The solution shown in the diagram below is to remove the splitter by running a cable to an unused port of the home amplifier. This will reduce MoCA attenuation by 4 dB or more. Another option would be to replace the home amplifier with a MoCA-compatible amplifier with controlled port-port isolation.
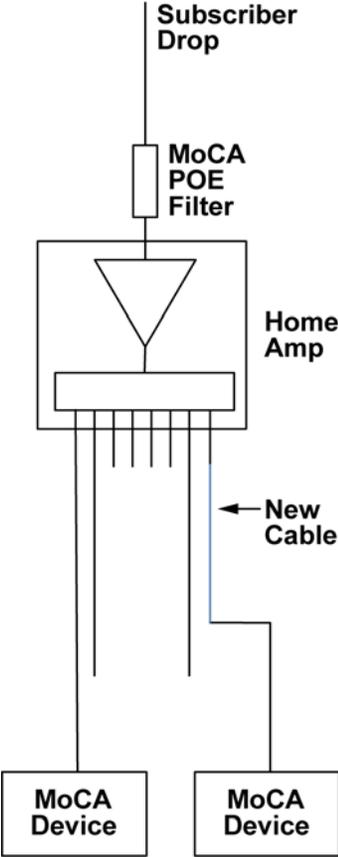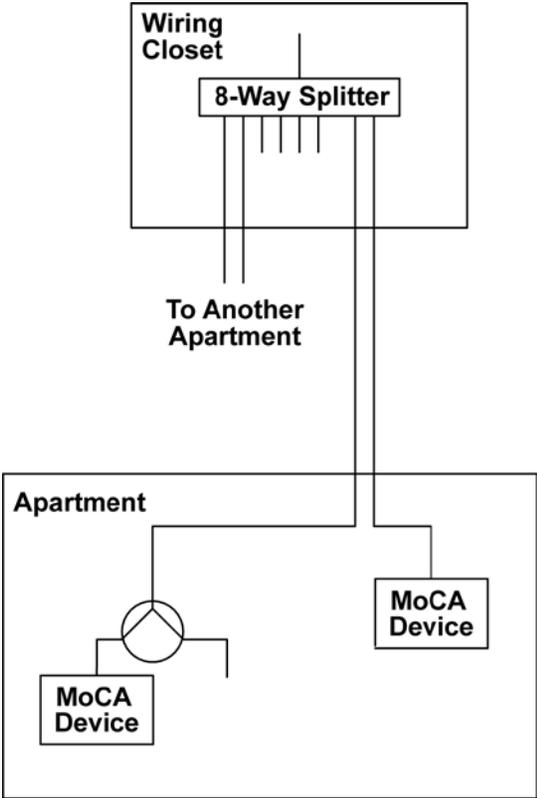
Multi-Dwelling

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.
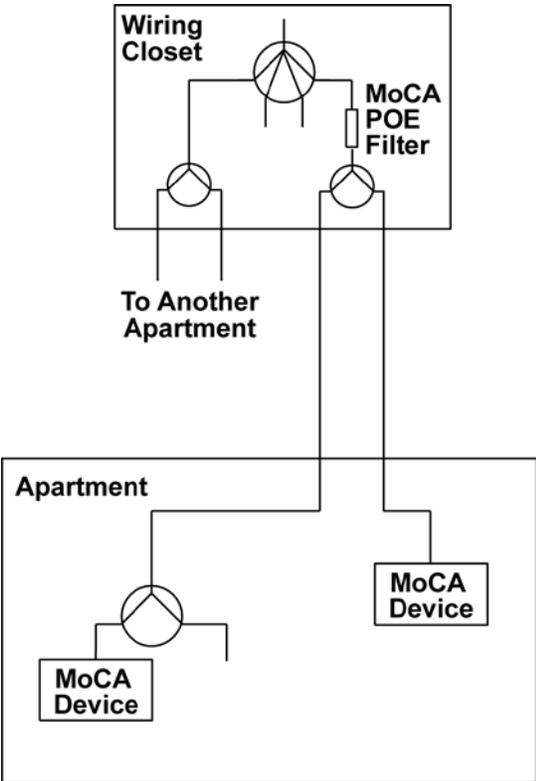
Solution

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.

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 DRIVERS - 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 (e.g. 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 860 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.

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 DRIVERS - MoCA SUMMARY PG 2B (see *Node Statistics* (on page 9)). If any path losses are greater than 54 dB, connect a level meter to the coaxial cable and measure the level of the highest channel on the system (e.g. 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 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 860 MHz. If not, replace the splitter.

5 Long cable runs—Check if any MoCA devices have cable runs longer than 100 feet between the device and the splitter. 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 25).

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 25) for information on PHY rate attenuation.

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	■ **[Range: 0 – N]** where **N** = 7 for MoCA 1.0 and **N** = 15 for MoCA 1.1
Enable	Indicates whether MoCA is enabled on this set-top	■ **True**—preferred value ■ **False** **Note:** Status is controlled at the headend.
Brdcast PHY Rate	Data rate used for packets broadcast to all other nodes	■ **[Integer > 0]** **Note:** Preferred value is ≥ 150 Mbps. Wait at least 30 seconds after **Link Up** is achieved then verify Broadcast PHY Rate.
MoCA Version	Version of the MoCA standard supported by the set-top	■ **[Set-top-dependent]**
LOF	Last Operational Frequency (in MHz). The set-top will automatically default to this frequency after a reboot.	■ **[Integer > 0]** **Note:** This is typically equal to the RF channel.
Preferred NC	Determines whether the set-top is configured to be a preferred network coordinator	■ **True**—Set-top is configured as a preferred network coordinator ■ **False**—Set-top is not configured as a network coordinator **Note:** Configuring a set-top as a preferred NC means that the set-top (node) has an advantage in the dynamic NC selection process. An NC will still be selected if all the nodes on the network are set to 'False'.
MAC Address	MAC address of the MoCA interface	■ Based on the STB RF MAC on the back of the set-top. **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.

Field Name	Description	Possible Values
Status	Status of the MoCA network	■ **Link Up**—preferred value ■ **No Link** ■ **Disabled** **Note: Link Up** indicates that the node has successfully joined the network.
Up Time	Length of time that the Status has been at Link Up	■ **[Time]** **Example:** 3h 10m 6s
Link Privacy	Indicates the status of Link Privacy	■ **Enabled**—preferred value ■ **Disabled**
LP Checksum	Link Privacy Checksum value	■ **[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	■ **[Integer ≥ 2]**
RF Channel	Channel center frequency of the MoCA network (in MHz)	■ **[Range: 1150 – 1500]** **Important:** A changing value indicates that the set-top is hunting for the correct frequency. **Note:** The RF channel frequency is typically 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	■ **[Range: 0 – N]** where **N** = 7 for MoCA 1.0 and **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)	■ **[Integer > 0]** **Note:** Preferred value is ≥ 180 Mbps. 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)	■ **[Integer > 0]** **Note:** Preferred value is ≥ 150 Mbps.

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 (in dBm)	■ **[Integer ≤ 0]**
Approx Path Loss (dB)	Approximate loss from each node to the local node (in dB)	■ **[Integer ≥ 0]** ■ **Important:** Losses greater than 54 dB can indicate a problem with the home wiring.

DRIVERS - MoCA SUMMARY PG 3

Field Name	Description	Possible Values
MoCA IF IP	IP address acquired using DHCP or IPv4 Link-Local Protocol	■ **[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 will acquire an IP address using IPv4 Link-Local Protocol.
MoCA IF Mask	Subnet mask of the MoCA IF IP	■ **[Network-dependent]**
Tx Pkts	Number of Ethernet packets transmitted by this node since MoCA link up	■ **[Integer $\geq$ 0]**
Tx Pkts Drop	Number of transmitted Ethernet packets dropped by this node since MoCA link up	■ **[Integer $\geq$ 0]**
Rx Pkts	Number of Ethernet packets received by this node since MoCA link up	■ **[Integer $\geq$ 0]**
Rx Pkts Corrected	Number of Ethernet packets with errors corrected by this node since MoCA link up	■ **[Integer $\geq$ 0]**
Rx Pkts Drop	Number of Ethernet packets with errors dropped by this node since MoCA link up	■ **[Integer $\geq$ 0]**

Appendix B

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

MoCA PHY Rate vs. Attenuation

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. path loss is plotted in the diagram below.
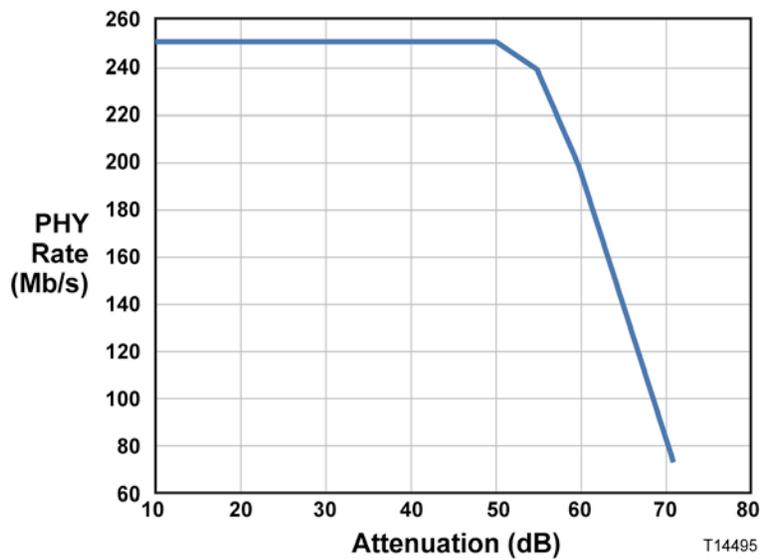
Cable Loss at 1150 MHz.

Cable loss contributes to the total path loss. Below are 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, call Cisco Services for assistance. Follow the menu options to speak with a service engineer.