CASA

# Casa Systems **C2150 Downstream Digital Cable Termination System**

**The C2150 Downstream Digital Cable Termination System (DCTS) is Casa Systems' second generation multi-purpose Edge-QAM. It is designed to meet the DOCSIS multi-channel RF specification (Downstream RF Interface Specification) and modular CMTS Edge-QAM specification. C2150 offers the highest density and most flexible solution for cable operators to deliver both video over IP services and MPEG video services concurrently.**

**The revolutionary IP bandwidth capacity and cost per IP stream of the C2150 provide an unprecedented opportunity for cable operators to cost-effectively provision high-bandwidth IP services such as video over IP and interactive gaming, in addition to traditional broadband access and VoIP services. The integrated MPEG video processing capability of the C2150 provides cable operators the flexibility to offer MPEG or DVB-based switched digital video, video-on-demand (VOD), and interactive TV services in the same platform.**

## Compact and Modular Architecture

The C2150 DCTS comes in a compact 1RU form factor. It is based on a modular architecture that gives cable operators flexibility in tailoring their networks according to the requirements of their services. The C2150 consists of a base system with four slots for downstream (QAM) modules. Each downstream module has four RF ports (connectors) and each port contains up to four QAM channels. In aggregation, the C2150 suppports up to 48 downstream QAM channels in a 1RU form factor. C2150 can be configured for either AC or DC power to fit operation environment.

## Third Generation DOCSIS Device

The broadband access over cable market has experienced two generations of DOCSIS compliant CMTSs. Both the first generation CMTS and the second generation CMTS can be characterized by fixed downstream to upstream ratios, very low downstream channel density per rack, unit and very high per channel cost. The C2150 Downstream DCTS is a third generation DOCSIS edge device that is optimized for very high downstream bandwidth applications such as video streaming. A C2150 Downstream DCTS can be combined with a C2200 Upstream DCTS to form a complete DOCSIS headend system compatible with DOCSIS1.0, 1.1, 2.0, 3.0 and EuroDOCSIS1.0, 1.1, 2.0 and 3.0.

As a third generation DOCSIS device, the C2150 has several unique features not available in a legacy CMTSs. First, any downstream channel in a C2150 can be associated with any upstream channel in a C2200 providing flexible downstream to upstream channel ratios. Cable operators can add and bind downstream and upstream channels completely independently. Second, the C2150 has significantly higher downstream channel density than a legacy CMTS. The C2150 can have up to 48 downstream QAM channels in a 1RU while a legacy CMTS typically has 1 or 2 downstream channels in a 1RU. The C2150's extremely high downstream channel density makes it an economical choice for providing video-over-IP service today. Third, the C2150 can support both DOCSIS and MPEG/DVB traffic in a single platform. This unique feature is very important to cable operators in managing their HFC spectral resources in a single platform. It also allows the spectral resources to be shared dynamically between video and DOCSIS. An example setup for a more optimized spectrum could have more bandwidth allocated to DOCSIS traffic during the day and more bandwidth allocated to MPEG/DVB video traffic at night.

## FEATURE HIGHLIGHTS

**Hybrid QAM –** MPEG video traffic and DOCSIS IP traffic can share the same RF channel

**Exceptional Performance –** Designed to meet the DOCSIS DRFI performance specification for multi-channel QAMs

**Broadcast and Narrowcast –** Support broadcast (MPTS pass-through) and narrowcast (SPTS to MPTS mux) mode in the same RF channel

**High Density –** Offers the highest channel density per 1RU space in the industry (48 channels)

**MPEG Processing –** Provides integrated video grooming, PID filtering, and PCR reconditioning

**Conditional Access Scrambling –** Integrated 3DES encryption and DVB common scrambling

**Modular CMTS Edge-QAM –** Designed as modular CMTS Edge-QAM for DOCSIS and wideband DOCSIS applications

**Session and Resource Management –** Support multiple edge resource allocation and session management protocols for switched digital video, netPVR and VOD

**Input Redundancy –** Up to four GbE ports for 1+1 or N+1 input redundancy

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## Feature-Rich Video QAM

The C2150 DCTS downstream channels can also function as a MPEG or DVB-C compliant video QAM for digital video applications such as broadcast digital cable TV, video-on-demand, interactive TV and network DVR. The C2150 receives MPEG-2 over IP/Ethernet packets in multiple program transport streams (MPTS) or single program transport streams (SPTS) through its multiple Gigabit Ethernet ingress interfaces, it then de-multiplexes MPTS and routes the native MPEG-2 packets to its egress QAM interfaces. At the egress interfaces, the re-multiplexing function generates multiple program transport streams (MPTS) for the designated cable channels. It also supports a MPTS pass through mode for broadcast streams. The C2150 performs all the PSI/SI table processing, PID filtering/substitution, and PCR de-jittering to satisfy the most demanding needs of various video networks.

C2150 supports both CBR traffic and VBR traffic for narrowcast applications and broadcast applications. C2150 is the only product that can make the most efficient use of the RF bandwidth while maintaining video quality at the same time through concurrent use of tools such as statistical multiplexing of MPEG video and DOCSIS traffic and dynamic scheduling of MPEG and IP traffic.

## Multi-Layer Switching & Routing

The C2150 DCTS can be configured as a Layer2 bridge, multi-layer switch, or as a Layer3 router for CMTS applications. The hardware-based packet forwarding engine can handle 24Gbps capacity at wire-speed for both Layer2 and Layer3 forwarding. The C2150 DCTS supports Layer2 services such as transparent LAN bridging, VLAN, and PPPoE traffic. When configured as a multi-layer switch, it bridges traffic within a LAN segment and routes traffic among different network segments.

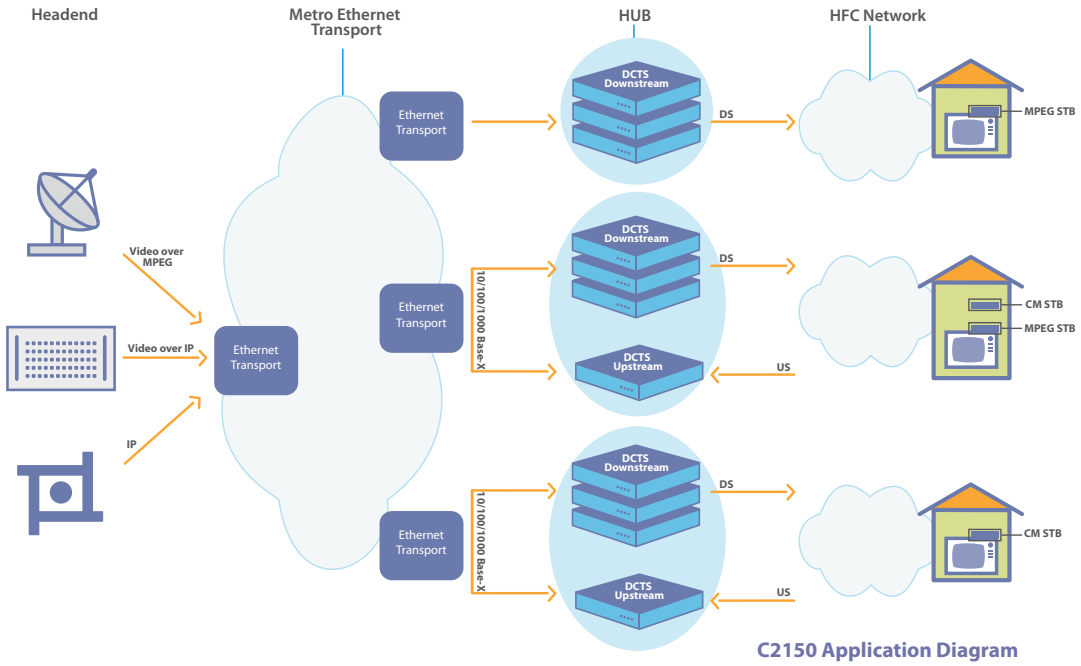
## Applications

There are several scenarios in which the Casa C2150 can be deployed today to provide different types of services and migration paths:

- **Deployed as MPEG Edge-QAM and video switch today:** The C2150 can be deployed as an Edge-QAM today for MPEG-based unicast applications and for switched digital broadcast applications in a new deployment or as an additional capacity without the need to remove legacy equipment. The C2150 is completely compatible with existing MPEG Edge-QAMs deployed in the field today. No change to existing network architecture is needed to deploy the C2150. When the operator is ready to move to video-over-IP, the C2150 can be field-upgraded to provide IP functionality without any change of hardware. Deploying the C2150 as MPEG Edge-QAM today provides investment protection and a migration path to an all-IP network.

- **Deployed as MPEG Edge-QAM and video-over-DOCSIS edge device:** The C2150 can also be deployed as a unified platform to provide simultaneous video-over-MPEG and video-over-IP services. The RF spectrum resources are shared among MPEG and IP traffic, the ratio of MPEG traffic and IP traffic can be adjusted in real-time.

- **Deployed as video-over-IP edge only:** The C2150 can be deployed from day one as a downstream DOCSIS edge device to provide video-over-IP services at a cost very competitive relative to video-over-MPEG services.




C2150 Application Diagram

## System
12x12 Gbps switching capacity
Ethernet switching
MPEG switching from any port to any port
CLI , SNMP and Web GUI management
Four RF interface slots per system
1~4 Downstream modules per system

## Standard Compliance
DOCSIS compatible
EuroDOCSIS compatible
VLAN Trunking
Spanning Tree
SNMPv1, SNMPv3
IGMPv3
DHCP Relay
Proxy ARP

## MPEG Stream Processing
MPEG de-multiplexing and re-multiplexing
Unicast to Multicast conversion
PAT and PMT extraction and regeneration
DID filtering and remapping
PCR jitter removal and re-stamping
SI table generation and insertion
DVB SimulCrypt scrambling
Session-based Encryption

## Management
RS232 Serial port (DB9)
10/100BaseT management port
Command Line Interface (CLI)
Telnet
SNMP
Standard DOCSIS and IETF MIBs
Casa Systems Enterprise MIBs
Event logging through Syslog
Electronic mail notification
Performance monitoring
Web based GUI
Multi-node Casa EMS

## GbE Interfaces
10/100/1000 Mbps
4-port Copper or fiber SFP
CWDM
Full line-rate support

## Downstream Module

| | |
|---|---|
| Number of ports | 4 |
| Number of channels | 16 |
| QAM modulation | Annex A, B, or C |
| QAM constellations | 64 & 256 QAM |
| Data Rates (DOCSIS) | 64 QAM: 30 Mb/s<br>256 QAM: 42 Mb/s |
| Data Rates (EuroDOCSIS) | 64 QAM: 41 Mb/s<br>256 QAM: 55 Mb/s |
| Connector | F-type, 75 Ω |
| Frequency range (center) | 91 to 867 MHz (standard)<br>52 to 999 MHz (optional) |
| Frequency step size | 5 kHz |
| Channel width | 6 to 8 MHz (tunable) |
| Max. output power (per channel) | 61 dBmV @ 1-ch/port<br>57 dBmV @ 2-ch/port<br>53 dBmV @ 4-ch/port |
| Output step size | 0.1 dB |
| Output stability | ± 0.3 dB |
| Return Loss | 50 ~ 870MHz, 14 dB<br>870 ~ 1002 MHz, 10 dB |
| Modulation Error Rate | 44 dB (equalized) |
| Wideband Noise | -73 dBc |

## Mechanical

| | |
|---|---|
| Form Factor | 1RU |
| Height | 1.75 in. /44.45 mm |
| Width | 19 in. /482.6 mm |
| Depth | 23.5 in. / 597 mm |
| Weight | 30 lbs / 13.62 kg |
| Mounting | 19 inch, 1 RU high |
| Front Panel LED | Power, alarm, & I/O status |

## Environmental

| | |
|---|---|
| Operating temperature | 0° to 50° C |
| Storage temperature | -40° to 70° C |
| Operating humidity | 5% to 95%, non-condensing |
| Power supply | |
| AC operating range | 90 to 264 V |
| DC (optional) | -36 to -60 V (redundant) |
| Power consumption | < 400 W (nominal) |

## Regulatory Compliance
Safety: UL/IEC/CSA 60950-1
EMC: FCC Part 15 Class A and CISPR Class A
Immunity: EN61000-4