Hardware Installation Guide

Accenture StormTest Development Center

Model No. HV16HD

Document ID: ST-15031

Revision Date: May 2016

Version: 2.2

Web: http://www.s3tvtechnology.com

Safety Information

Read these instructions before switching on the unit.

WARNING:

- This unit is rated for 110-240VAC, 50-60Hz, 10A. Check that your power supply cord(s) and the supply circuit rating correspond accordingly. Do not use household extension cords with your StormTest product.
- Service only to be carried out by personnel trained by the manufacturer. It is dangerous for anyone other than authorised personnel to perform repair service. Failure to take this precaution may result in personal injury and system damage.
- StormTest products are designed to work with power systems that are earthed (grounded). This unit must be earthed. To reduce the risk of electric shock, do not plug StormTest products into any other type of power system. Contact your facilities manager or a qualified electrician if you are not sure what type of power is supplied to your building.
- Requirements for STATIONARY PLUGGABLE EQUIPMENT TYPE A with simultaneous multiple connections to the AC MAINS SUPPLY, intended for use in a location having equipotential bonding. **(EN 60950-5.1.7.1)**
    - The equipment must be installed in a RESTRICTED ACCESS LOCATION. Following installation, the equipment must be made stationary; and
    - the building installation shall provide a means for connection to protective earth; and
    - the equipment is to be connected to that means; and
    - a SERVICE PERSON shall check whether or not the socket outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective earthing terminal to the protective earth wire in the building.
- Grounding (Denmark: DK, Finland: FI, Norway: NO and Sweden: SE)
    - DK: Apparatets stikprop skal tilsluttes en stikkontakt med jord, som giver forbindelse til stikproppens jord.
    - FI: Laite on liitettävä suojakoskettimilla varustettuun pistorasiaan.
    - NO: Apparatet må tilkoples jordet stikkontakt.
    - SE: Apparaten skall anslutas till jordat uttag.

Safety Information

Read these instructions before switching on the unit.

Translation: This equipment must be connected to a mains socket outlet with a protective earthing connection **(EN 60950-1.7.2.1; 5.1.7.1).**

- Additional safety requirements for Norway (NO) and Sweden (SE)
  - NO: “Utstyr som er koplet til beskyttelsesjord via nettplugg og/eller via annet jordtilkoplet utstyr – og er tilkoplet et kabel-TV nett, kan forårsake brannfare. For å unngå dette skal det ved tilkopling av utstyret til kabel-TV nettet installeres en galvanisk isolator mellom utstyret og kabel-TV nettet.”
  - SE: ”Utrustning som är kopplad till skyddsjord via jordat vägguttag och/eller via annan utrustning och samtidigt är kopplad till kabel-TV nät kan i vissa fall medföra risk för brand. För att undvika detta skall vid anslutning av utrustningen till kabel-TV nät galvanisk isolator finnas mellan utrustningen och kabel-TV nätet.”

  Translation: “Equipment connected to the protective earthing of the building installation through the mains connection or through other equipment with a connection to protective earthing – and to a cable distribution system using coaxial cable, may in some circumstances create a fire hazard. Connection to a cable distribution system has therefore to be provided through a device providing electrical isolation below a certain frequency range **(Galvanic Isolator, see EN 60728-11).**

  NOTE: In Norway, due to regulation for installations of CATV-installations, and in Sweden, a galvanic isolator shall provide electrical insulation below 5MHz. The insulation shall withstand a dielectric strength of 1,5kV r.m.s, 50Hz or 60Hz, for 1 min. **(EN 60950-1.7.2.1)**
- The power cord serves as the primary disconnect device for the system. Be sure to plug the power cord into a grounded power outlet that is nearby the system and is readily accessible.
- This system has two power supply cables. All power cords must be disconnected to completely remove power from the system.
- Do not expose to moisture.
- This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. **(CE EN55022)**

Safety Information

Read these instructions before switching on the unit.

CAUTION:

- To ensure adequate ventilation, keep the ventilation openings free and follow the installation instructions. Consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature specified.
- When installing the system, consider the following:
    - Check the power at the site before installation to ensure that it is “clean” (free of spikes and noise).
    - Install proper grounding for the site to avoid damage from lightning and power surges.
- Observe extension cable and power strip ratings. Ensure that the total ampere rating of all equipment plugged into the extension cable or power strip does not exceed 80 percent of the ampere ratings limit for the extension cable or power strip.
- Position equipment cables and power cables carefully. Route cables so that they cannot be stepped on or tripped over. Ensure that nothing rests on any cables.
- StormTest is to be used by qualified personnel only.
- Do not make mechanical or electrical modifications to the equipment. Changes or modifications not expressly approved by the party responsible for compliance could void the users’ authority to operate the equipment. **(FCC 15.21)**

NOTE:

- Consult StormTest product documentation before use.
- The StormTest equipment has been tested and found to comply with the limits for a Class-A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. **(FCC 15.105)**

Contents

1 Preface

1.1 StormTest

StormTest Development Center is the leading automated test solution for digital TV services. It is designed to reduce the cost of getting high quality digital TV services to market faster.

StormTest Development Center greatly reduces the need for time-consuming, expensive and error-prone manual testing and replaces it with a more accurate and cost-effective alternative. It scales easily to large numbers and types of devices and integrates with existing infrastructure to give much greater efficiency in testing. It can be used to verify and validate services on a virtually every piece of consumer premises equipment (CPE), from set-top boxes to games consoles and from iPads to Smart TVs. It has been specifically designed to meet the needs of developers and testers of these CPE devices and the applications which run on them.

StormTest Development Center consists of:

- A choice of hardware units that can test 1, 4, or 16 devices. Each device under test can be controlled individually and independently and the audio/video from each device can be captured and analysed to determine the outcome of the test. The StormTest hardware supports capture of audio and video over HDMI interfaces and supports all HD resolutions up to 1080p. In addition there is a hardware upgrade option for the 16 device tester that will allow native capture of UHD content.
- Server software that controls all the hardware and devices in the rack as well as managing a central repository of test scripts and a central database of test results.
- A Client API that allows test scripts to interact with the server software
- A number of graphical tools that allow the user to directly control devices connected to StormTest Development Center, to create and schedule tests to run and to view the results of those test runs.

Test scripts can be run from any location – the tester needs only a network connection to the StormTest server. Video and audio output from the devices under test can be streamed over this network to any location, allowing remote monitoring and control of testing, either within a company LAN or across a WAN. Alternatively, scheduled tests can run directly on the server, negating the need for maintaining a continuous network connection to the StormTest server.

1.2 About This Document

This document describes how to install the physical StormTest HV16HD unit. A full description of HV16HD Satellite and HV16HD Cable hardware is provided – refer to sections specific to your build variant when necessary.

1.3 Who Should Read This Document

This document is targeted at the following groups:

- StormTest system installers
- StormTest facility administrators

1.4 Related Documentation

The StormTest user documentation set comprises of the following documents:

1) StormTest Developer Suite User's Manual
2) StormTest Programmer's Guide
3) StormTest Client API
4) StormTest Hardware Installation Guides (HV01HD, HV04HD, HV16HD)
5) StormTest Software Installation Guide
6) StormTest Server Monitor User's Manual
7) StormTest Administration Console User's Guide
8) StormTest Administration Tools User's Guide

The latest version of these documents can always be found on our support website, in the "Docs" section: https://larisa.engage.s3group.com/docman/?group_id=6.

1.5 Definitions and Acronyms

Acronym	Description
AMT	Active Management Technology
DUT	Device under test – the set-top-box, video source etc.
HDD	Hard Disk Drive
HDMI	High Definition Multimedia Interface
IR	Infra-Red
LAN	Local Area Network
LED	Light Emitting Diode
OCR	Optical Character Recognition
RPS	Remote Power Switch
STB	Set-Top Box
USB	Universal Serial Bus
VGA	Video Graphics Array
WAN	Wide Area Network

Table 1 – Definitions and Acronyms

2 Hardware Description

2.1 HV16HD Front Elevation

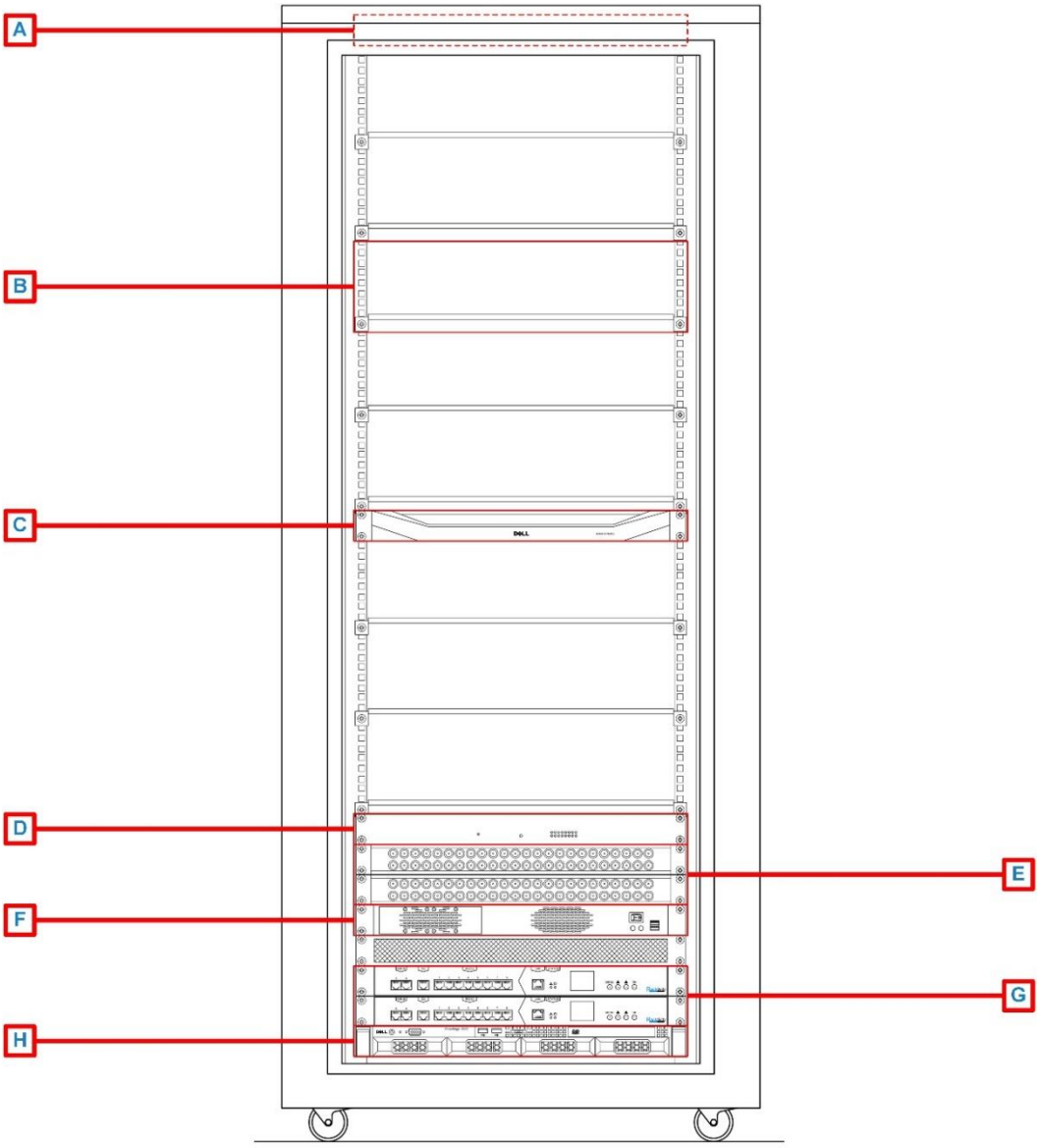

Figure 1: HV16HD Front Elevation

Item	Description
A	StormTest Video Server (VS102) (Connected to DUT Slots 9 to 12)
B	Device Under Test (DUT) Slots 1 to 8
C	Foldable rack monitor and keyboard
D	IR Control Unit
E	Musa Patch Panel
F	StormTest Video Server (VS100) (Connected to DUT Slots 1 to 4)
G	Remote Power Switch, DUT[1:8] and DUT[9:16]
H	StormTest Server

Table 2: HV16HD Front Elevation View and Description

2.2 HV16HD Rear Elevation

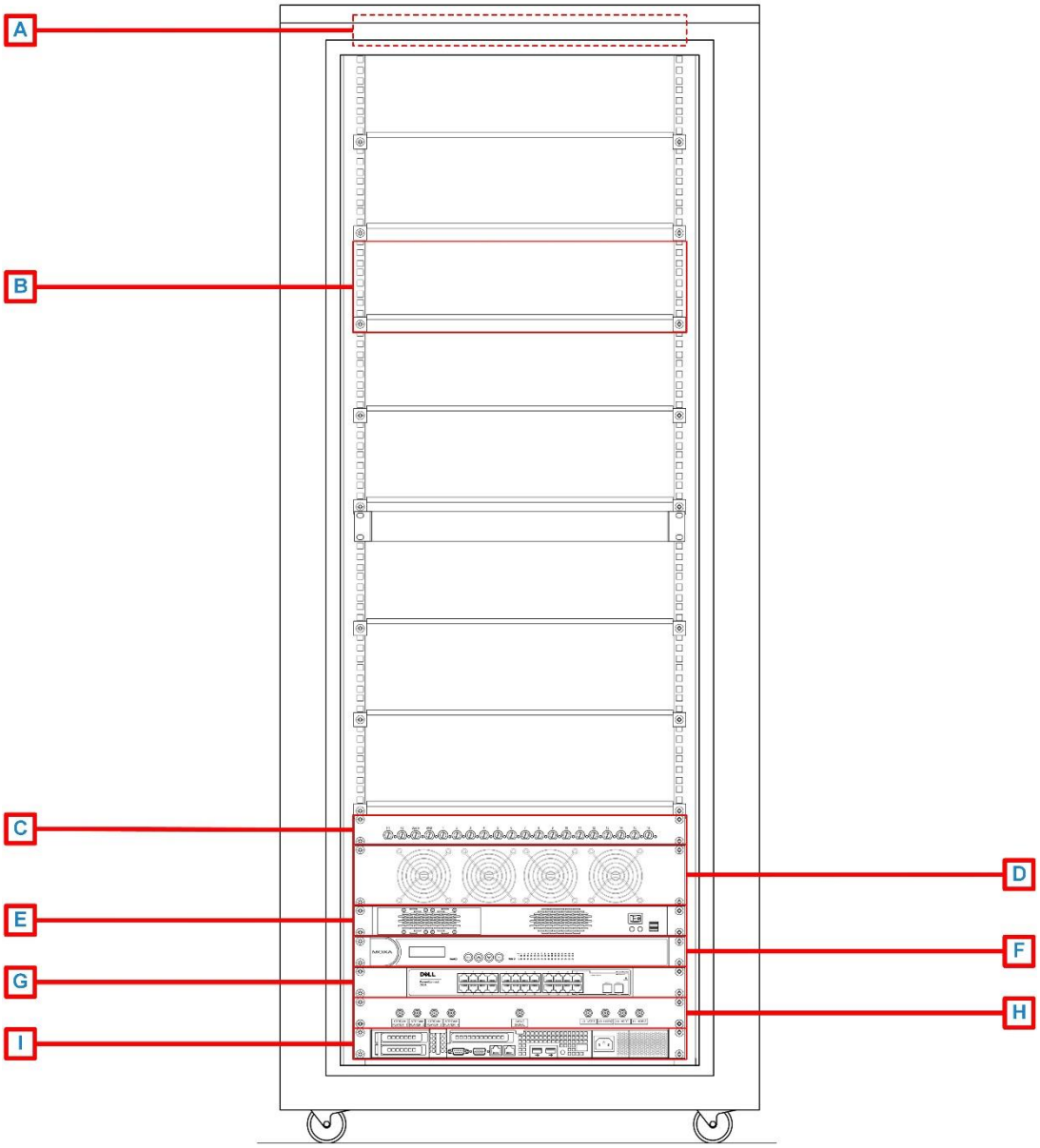

Figure 2: HV16HD Rear Elevation

Item	Description
A	StormTest Video Server (VS103) (Connected to DUT Slots 13 to 16)
B	Device Under Test (DUT) Slots 9 to 16
C	AC-DC Power Supply Breakout (5 Volt)
D	2U Fan Unit
E	StormTest Video Server (VS101) (Connected to DUT Slots 5 to 8)
F	Serial Terminal Server
G	Network Switch
H	RF Input Panel
I	StormTest Server (Rear)

Table 3: HV16HD Rear Elevation View and Description

2.3 Accessories Provided

Before assembling the StormTest system, check that the following components are present:

Component	Description
MUSA Patch Cord (32 HV16HD Satellite, 16 HV16HD Cable)	
MUSA U Links (32 HV16HD Satellite, 16 HV16HD Cable)	
RF Cable (32 HV16HD Satellite, 16 HV16HD Cable)	
RF Connector BNC to PUSH-F or EURO-IN/OUT (32 HV16HD Satellite, 16 HV16HD Cable)	
HDMI splitter (16)	
irBlaster Bracket – mounted on shelves (16)	
irBlaster – mounted to the irBlaster bracket (16)	
Ethernet cable RJ45 – Green (16)	
Ethernet cable RJ45 – Blue (16)	

DC Cable (16)	
RJ45 to RS232 Adapter (16)	
Universal Power Adapter (16)	
OCR Dongle (1)	
Recovery HDD (1)	
DELL OS Media (1)	
RedRat3 Infra-red (IR) Controller (1)	
RedRat3 software CD (1)	

Table 4 – Components supplied as part of the HV16HD pack

2.4 Additional Components

The following components are **NOT** included in the delivery and should be supplied by the end-user of the HV16HD System:

Component	Description
DUT (Device Under Test) power leads (16) Mandatory – DUT Power Supply Leads	
DUT Mandatory – STB (Set Top Box) shown here. The device to be tested.	
Remote Control Mandatory –Remote control for the DUT	
Ethernet Optional – an Ethernet connection is required to contact StormTest Support or to remotely use the unit.	

Table 5 – Additional Components – not included in the HV16HD delivery

3 Rack Installation

3.1 System Wiring Diagram – Satellite Option

Figure 3: System Wiring Diagram – Satellite Variant

3.2 System Wiring Diagram – Cable Option

Figure 4: System Wiring Diagram – Cable Variant

3.3 External Connectivity

The following external connections are made to the StormTest rack.

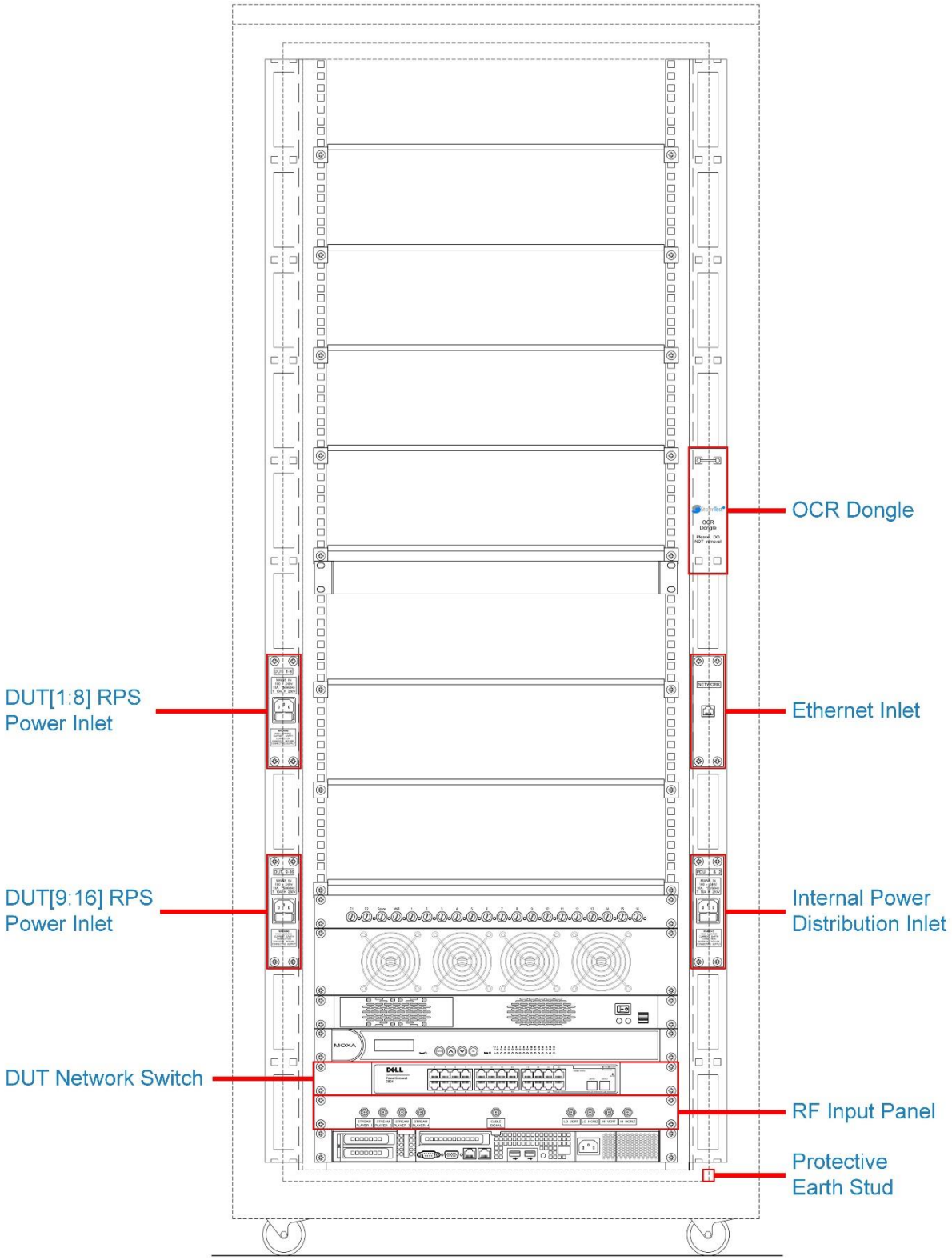

Figure 5: External Connections made to the HV16HD

3.3.1 RF Cabling – Satellite

RF input sources can be connected to the HV16HD Satellite rack as follows:

Figure 6: RF Input Panel - Satellite

- Four female F-Type connectors are provided for up to four stream players
- Four female F-Type connectors are provided for live satellite feeds.

  Internal rack satellite hardware selects from four modes (two frequency ranges and two polarisations). Connect the feeds from the satellite source as shown above:

  - Low Vertical
  - Low Horizontal
  - High Vertical
  - High Horizontal

3.3.2 RF Cabling – Cable Variant

RF input sources can be connected to the HV16HD Cable rack as follows:

Figure 7: RF Input Panel - Cable

- Four female F-Type connectors are provided for up to four stream players
- One female F-Type connector is provided for a live cable feed.

3.3.3 Corporate Ethernet Connection

If remote access or access to the internet is required, plug an Ethernet cable (RJ45) into the Ethernet socket at the rear of the StormTest rack (Figure 5). Do not plug the Ethernet cable into the network switch.

3.3.4 DUT Ethernet Connection

If a DUT Ethernet connection is required for device testing, plug an Ethernet cable (RJ45) into the Network Switch at the rear of the rack and configure accordingly.

Figure 8: DUT Network Switch

3.3.5 Power

Plug three IEC C13 terminated mains power leads into the mains power inlet sockets shown. When power is applied to the rack, the following components power on immediately:

- Remote Power Switches (DUT[1:8] RPS and DUT[9:16] RPS)
- Serial Terminal Server (STS)
- DUT Network Switch
- Internal Network Switch
- Four video servers (VS100 to VS103)
  If it is necessary to manually power on a video server, press the front panel rocker power switch to the "1" position for a maximum of one second.

One component (the StormTest server) must be powered on manually by briefly pressing the power button on the unit's front panel.

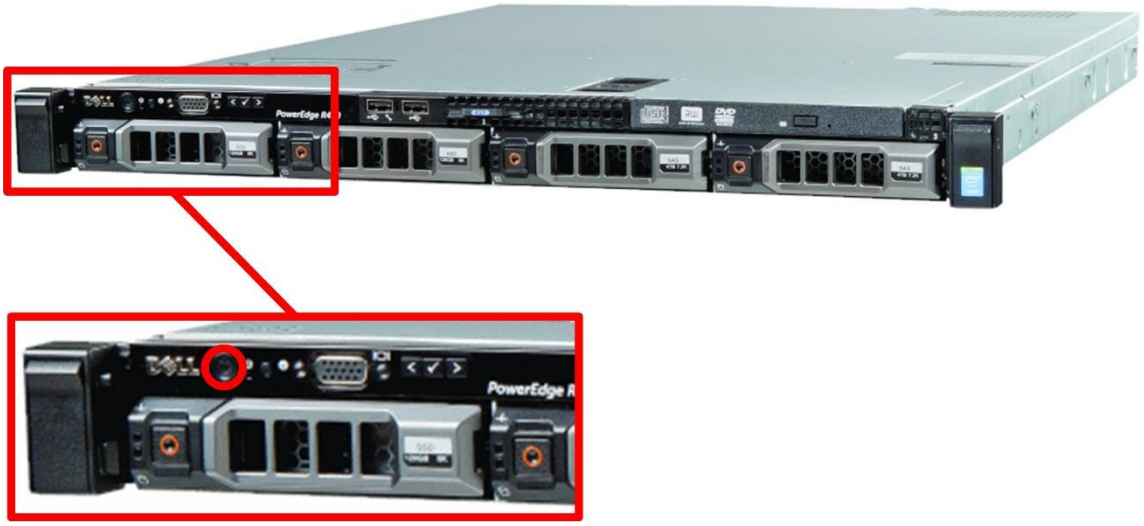

Figure 9: StormTest Server Power On

3.3.5.1 HV16HD Power Down

HV16HD components are powered down as follows:

- The four video servers (VS100 to VS103) should be powered down by setting the front panel power switch to the "1" position for a maximum of one second. The units will go through their shutdown routine before powering down.

  If a video server is unresponsive, it may be necessary to force the unit to power down. This is done by pressing and holding the power switch at the "1" position for up to 10 seconds. Following this, the unit will shut down and the fans will switch off.

- The StormTest server should be powered down as follows:
  Select: Start -> Shut down -> [Select Shut Down from the options list]

Following a power outage or unexpected shutdown, a video server may enter a “decision state” during its next start-up. It will appear to the user that the video server is unresponsive i.e. it cannot be contacted (ping attempts failing) and the StormTest server cannot make contact with the unit.

In this case, one of the following actions should be taken:

- Use the Intel AMT Configuration Utility to access and restart the unresponsive server
- Manually check the video server by connecting a separate monitor to the server’s video port. A keyboard and mouse may also be connected to resolve the issue and progress to a working desktop session.

NOTE:

Before power is disconnected from the HV16HD, ensure that the StormTest server and four video servers are shut down.

3.3.6 Protective Earth

The protective earth terminal (copper stud, located at the bottom rear of the HV16HD, marked with the symbol below) is provided for safety purposes.

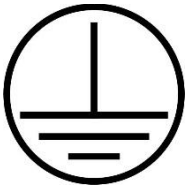

Figure 10: HV16HD Protective Earth Label Symbol

If the socket outlets that provide power to the HV16HD do not have a connection to building protective earth, arrangements must be made for the installation of a protective earthing conductor from this terminal to the protective earth wire in the building.

3.4 DUT Connectivity

3.4.1 DUT Patch Panel

A patch panel, located at the side of each DUT slot is used to connect the DUT to the HV16HD. Cables are provided to connect the DUT to this panel. The function of each connection is described below. There are additional adapters and cables available for some connections – they are described in the sections that follow.

NOTE: DC and IR connections are pre-wired.

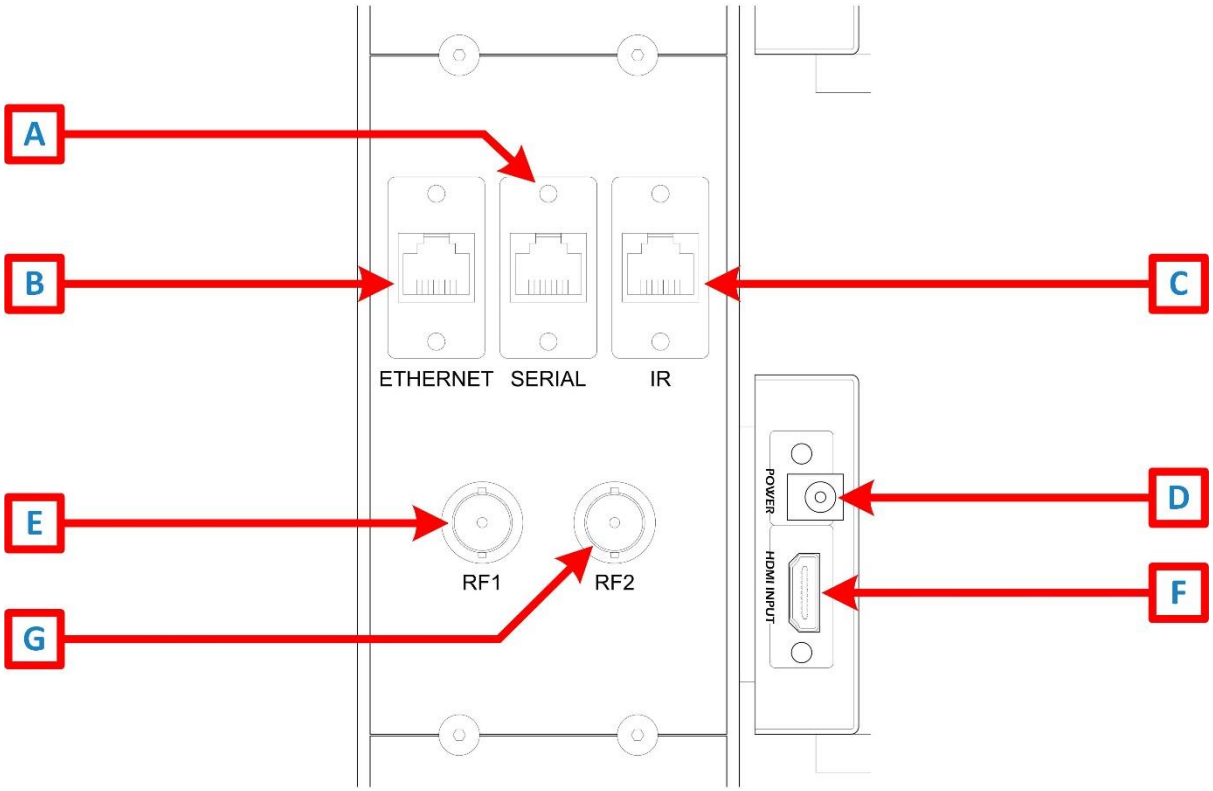

Figure 11: HV16HD - DUT Patch Panel Description

Item	Description
A	DUT Serial: connects the DUT to the Serial Terminal Server.
B	DUT Ethernet: connects the DUT to the DUT Network Switch.
C	DUT IR: connects the irBlaster to the IR Control Unit to generate DUT IR.
D	Pre-wired. HDMI Splitter DC power.
E	DUT RF1: RF connection – connects to MUSA patch panel.
F	DUT HDMI: connects through the HDMI splitter to the StormTest server.
G	DUT RF2: RF connection – connects to MUSA patch panel.

Table 6: DUT Patch Panel – located at the side of each HV16HD slot.

3.4.2 RF

RF is connected to a DUT using the patch panel BNC connectors. RF cables and BNC-F or BNC-Euro type adapters are provided to connect the DUT to the patch panel.

3.4.2.1 DUT Satellite

Wiring DUT RF-IN to BNC connectors “RF1” and “RF2” connects the MUSA patch panel to the DUT. The MUSA patch panel can be configured so that up to two live satellite feeds or any of the four stream player inputs connect to the DUT.

3.4.2.2 DUT Cable

Wiring DUT RF-IN to BNC connector “RF1” connects the MUSA patch panel to the DUT. BNC connector “RF2” is unused. The MUSA patch panel can be configured so that one live cable feed or any of the four stream player inputs connect to the DUT.

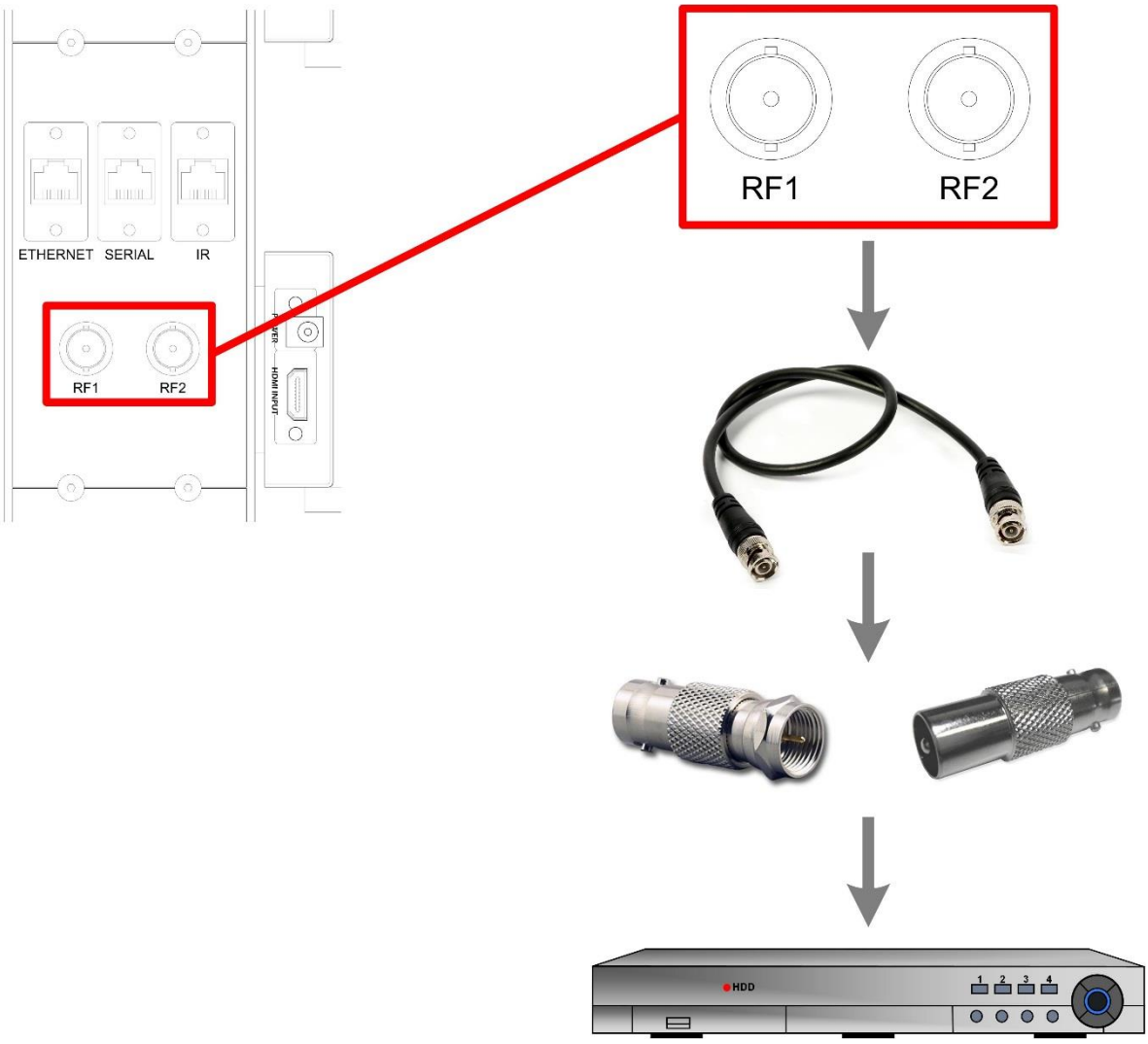

Figure 12: HV16HD Patch Panel - DUT RF

3.4.3 Serial

Serial signals are connected to a DUT using the green RJ45 connector on the patch panel. Green RJ45 cables and Ethernet to DB9 serial adapters are provided to connect the DUT to the patch panel. RJ45 to 9-pin D-Sub male adapters are provided as standard – alternative adapters are available if required.

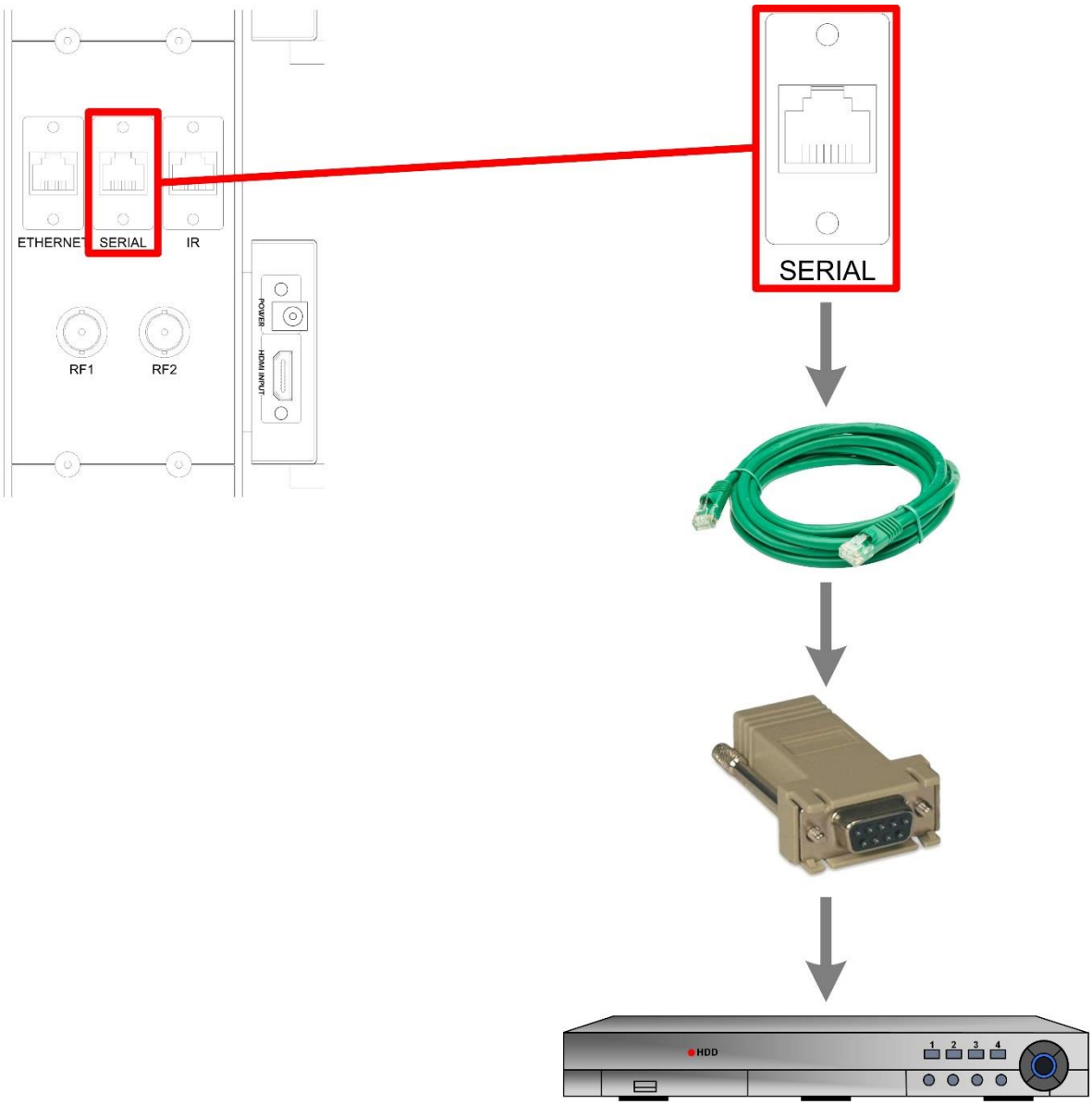

Figure 13: HV16HD Patch Panel - DUT Serial

3.4.4 Ethernet

Ethernet signals are connected to a DUT using the black RJ45 connector on the patch panel. Blue RJ45 cables are provided to connect the DUT to the patch panel.

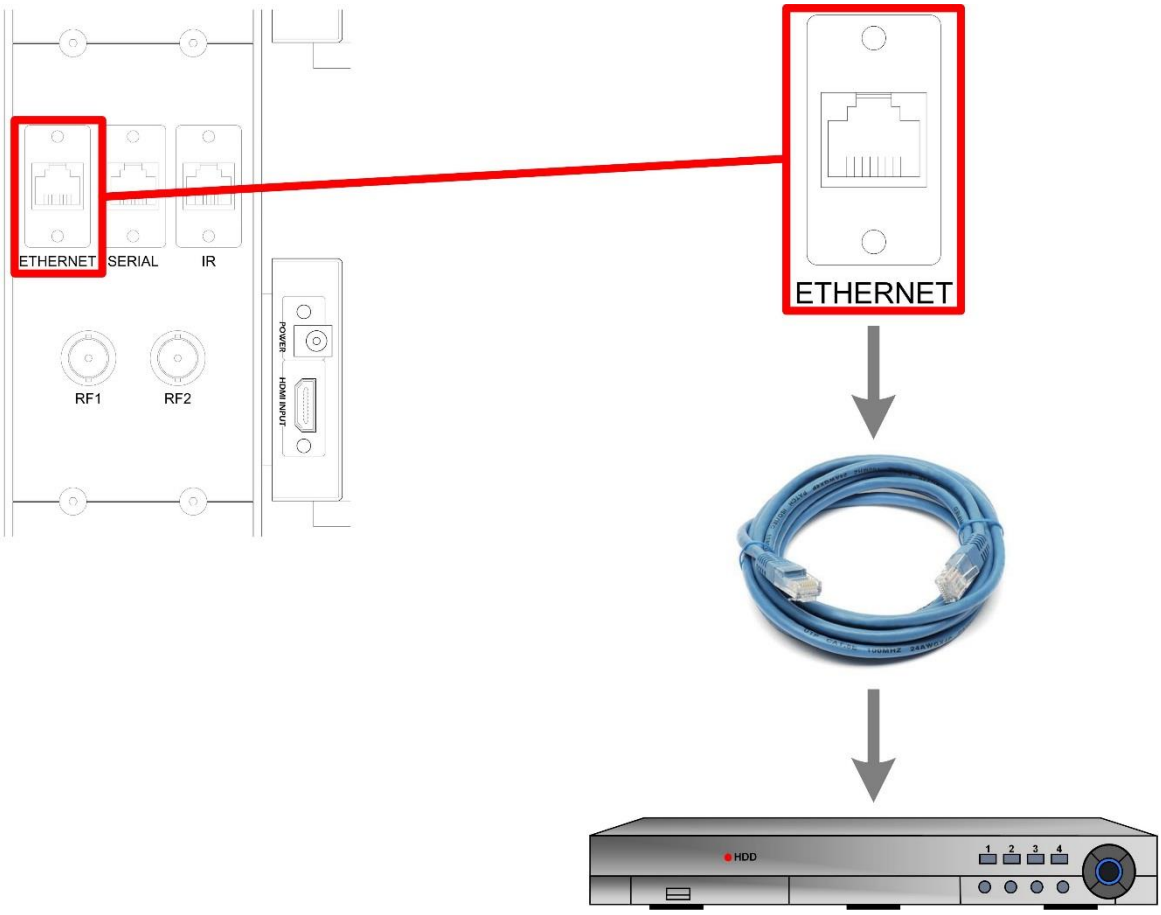

Figure 14: HV16HD Patch Panel - DUT Ethernet

3.4.5 Audio/Video

DUT HDMI audio and video output signals are connected to the HV16HD using the HDMI splitter mounted to each shelf. The DUT should connect to the HDMI splitter through the “HDMI INPUT” connector as shown below. HDMI splitter outputs are connected to video servers internally in the HV16HD.

The power connection to each splitter and the HDMI output wiring to the internal video servers are pre-wired during HV16HD manufacture.

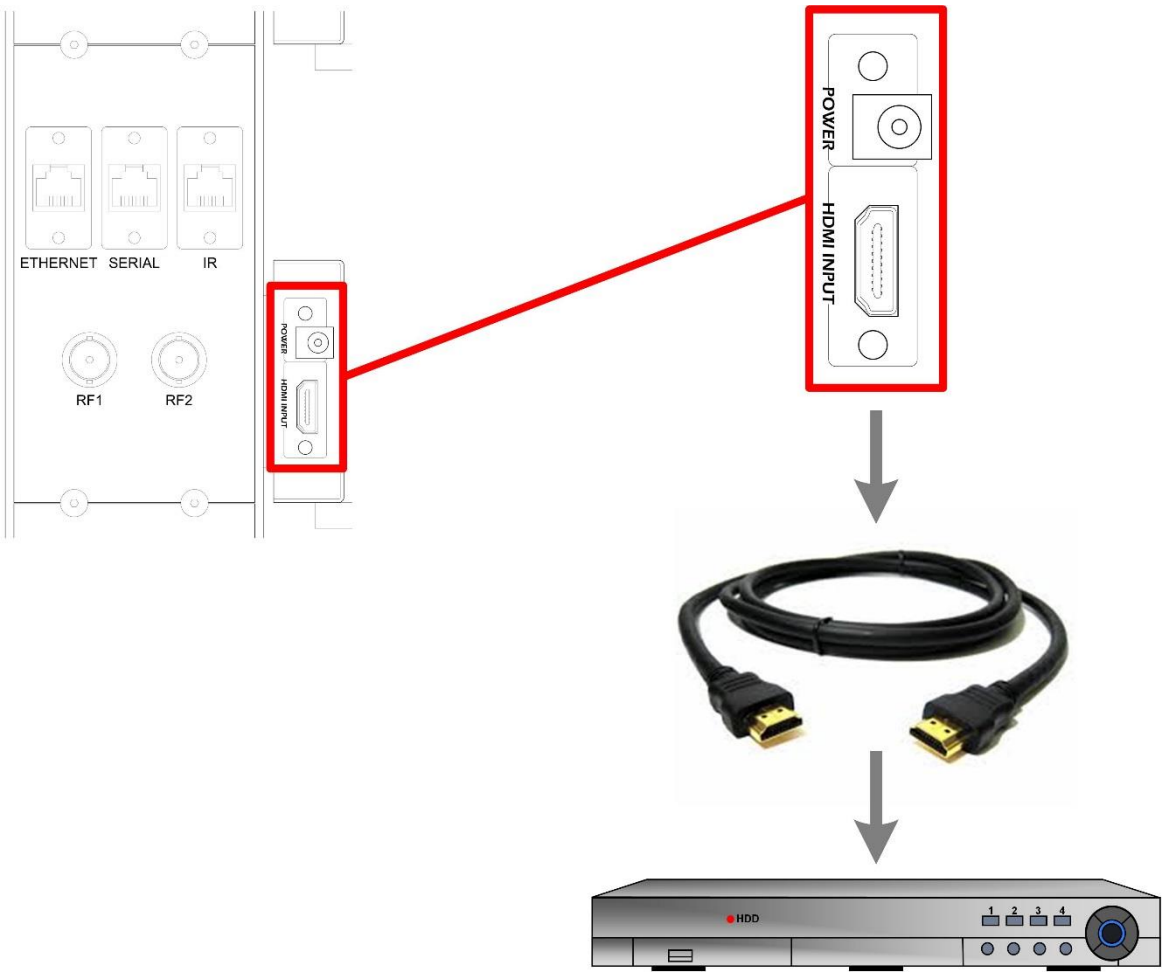

Figure 15: HV16HD Patch Panel - DUT HDMI

3.4.6 Infra-Red

IR commands are sent to a DUT using an irBlaster, mounted at the front of each DUT shelf. The irBlaster connects to the IR Control Unit (a device located internally in the HV16HD) through the red RJ45 connector on the patch panel.

NOTE: The irBlaster's infra-red emitter should be placed in front of the DUT's infra-red receiver.

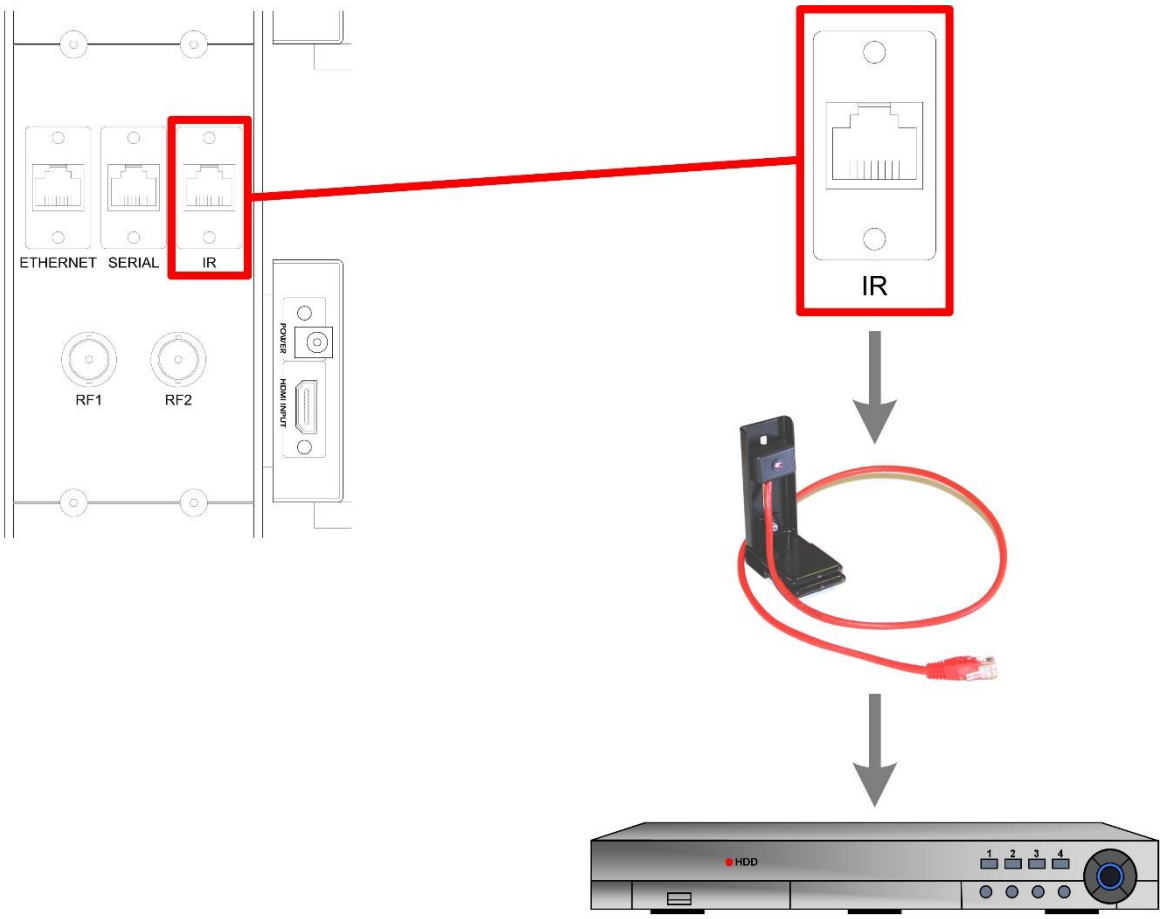

Figure 16: HV16HD Patch Panel - DUT IR

3.4.7 Power

Power is supplied to a DUT using an IEC C13 cable and a universal adapter, which supports all common plug types.

NOTE: The mains lead that connects the DUT to the adapter is not supplied and must be provided by the end user.

Figure 17: DUT Slot Universal Power Adapter

3.5 MUSA Patch Panel

The MUSA panel is used to route the input video sources to DUT slots in the HV16HD. The following sections describes the layout of both the satellite and cable patch panel.

3.5.1 MUSA Satellite

Figure 18: MUSA Patch Panel - Satellite

The correlation between the RF input panel (located at rear of the HV16HD) and the MUSA patch panel (front of the HV16HD) is shown below.

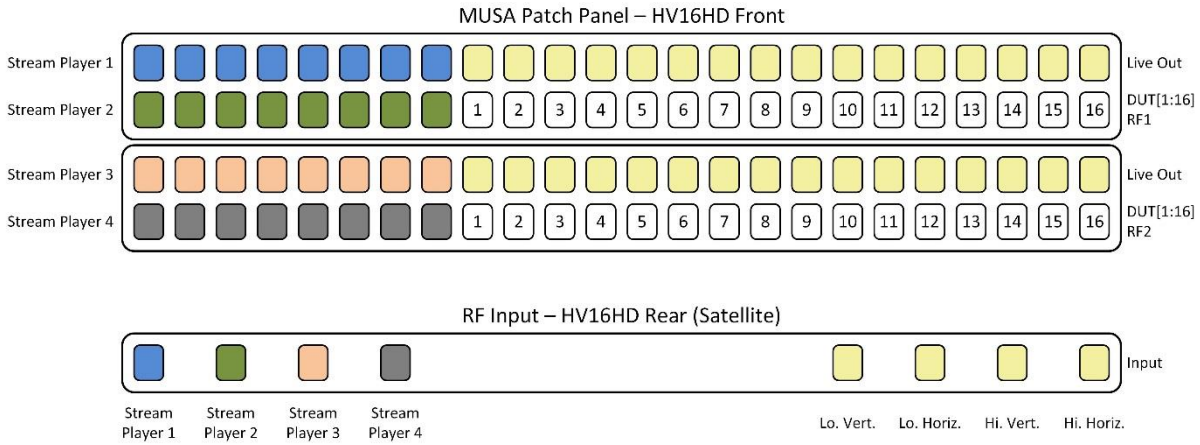

Figure 19: RF Input Panel - MUSA Patch Panel Correlation (HV16HD Satellite)

Item	Description – RF input Panel
Lo. Vert.	Live Input #1 – Low Band Vertical
Lo. Horiz.	Live Input #2 – Low Band Horizontal
Hi. Vert.	Live Input #3 – High Band Vertical
Hi. Horiz.	Live Input #4 – High Band Horizontal
Stream Player 1	Stream Player Input #1
Stream Player 2	Stream Player Input #2
Stream Player 3	Stream Player Input #3
Stream Player 4	Stream Player Input #4

Table 7: RF Input Panel - Satellite.

Item	Description – MUSA Patch Panel
Stream Player 1	Signal from RF Input Panel “Stream Player 1” - passive split (8-way)
Stream Player 2	Signal from RF Input Panel “Stream Player 2” - passive split (8-way)
Stream Player 3	Signal from RF Input Panel “Stream Player 3” - passive split (8-way)
Stream Player 4	Signal from RF Input Panel “Stream Player 4” - passive split (8-way)
Live Out	RF Input Panel “Live Inputs” are combined, amplified and distributed to 32 “Live Out” patch ports.
DUT[1:16] RF1	Connection to DUT[1:16] RF1 slots.
DUT[1:16] RF2	Connection to DUT[1:16] RF2 slots.

Table 8: RF Input Panel - Satellite.

The internal RF wiring diagram for HV16HD Satellite is shown below:

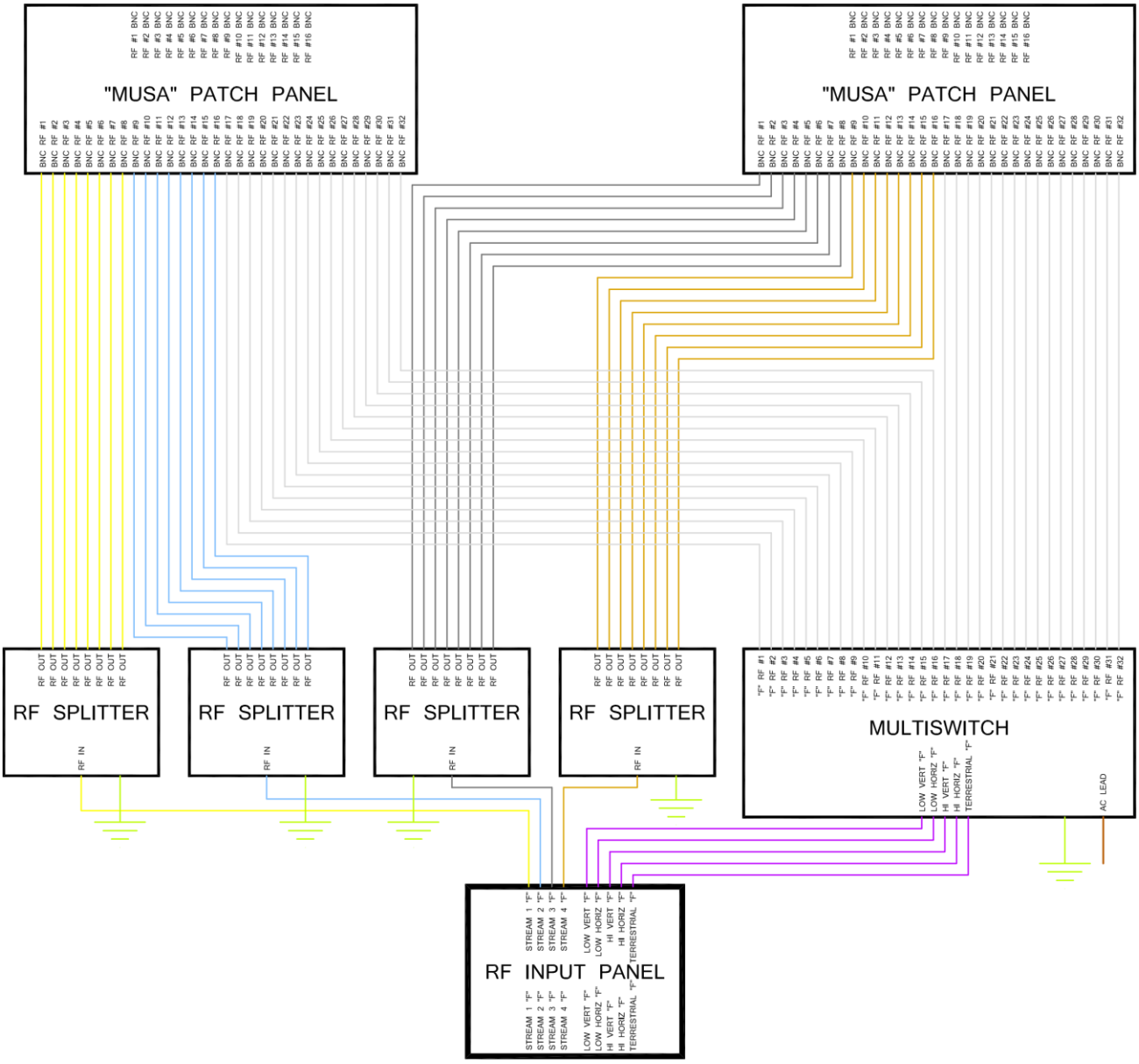

Figure 20: MUSA Satellite - Internal Wiring

3.5.2 MUSA Cable

Figure 21: MUSA Patch Panel - Cable

The correlation between the RF input panel (located at rear of the HV16HD) and the MUSA patch panel (front of the HV16HD) is shown below.

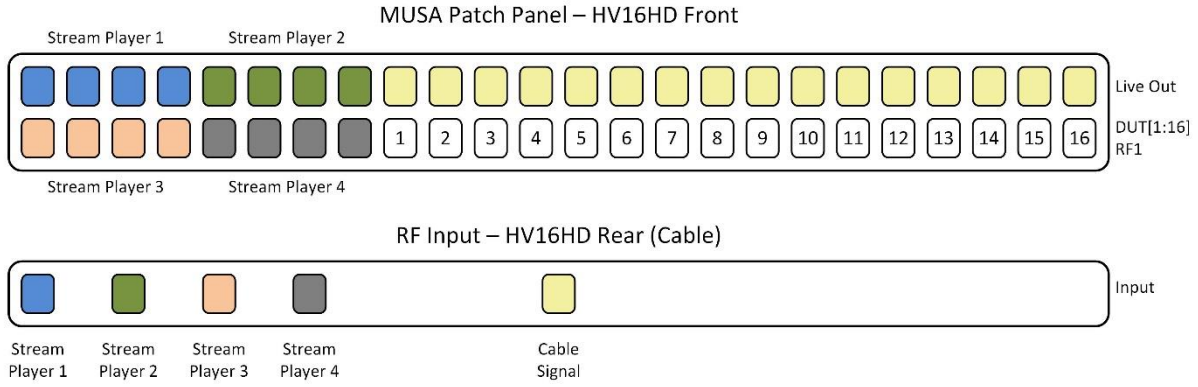

Figure 22: RF Input Panel - MUSA Patch Panel Correlation (HV16HD Cable)

Item	Description – RF input Panel
Cable	Live RF Signal Input
Stream Player 1	Stream Player Input #1
Stream Player 2	Stream Player Input #2
Stream Player 3	Stream Player Input #3
Stream Player 4	Stream Player Input #4

Table 9: RF Input Panel - Satellite.

Item	Description – MUSA Patch Panel
Stream Player 1	Signal from RF Input Panel “Stream Player 1” - passive split (4-way)
Stream Player 2	Signal from RF Input Panel “Stream Player 2” - passive split (4-way)
Stream Player 3	Signal from RF Input Panel “Stream Player 3” - passive split (4-way)
Stream Player 4	Signal from RF Input Panel “Stream Player 4” - passive split (4-way)
Live Out	RF Input Panel “CABLE” Live Input is amplified, split and distributed to 16 “Live Out” patch ports.
DUT[1:16] RF1	Connection to DUT[1:16] RF1 slots.

Table 10: RF Input Panel - Satellite.

The internal RF wiring diagram for HV16HD Cable is shown below:

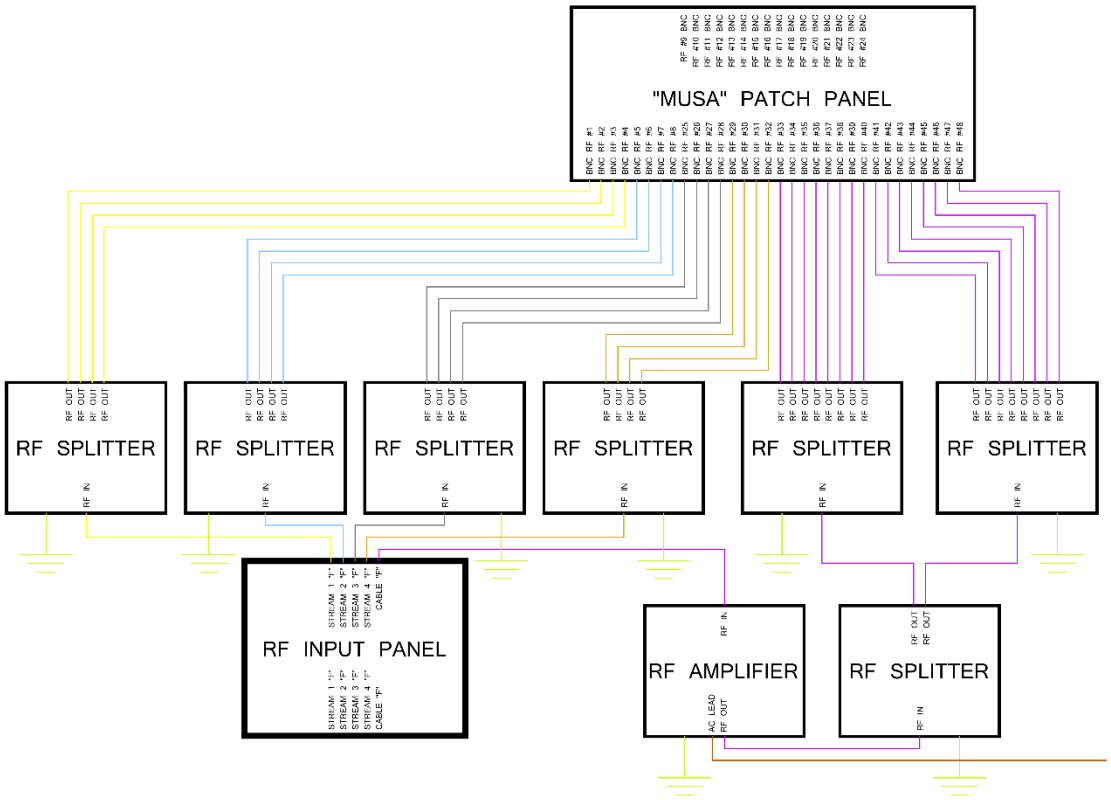

Figure 23: MUSA Cable - Internal Wiring

4 Appendix A: HV16HD Internal Components

The following components are installed into a HV16HD rack:

- IR Control Unit
- Remote Power Switch x 2 – ES1108-16-EUK
- StormTest Server
- Serial Terminal Server
- Network Switch – 24-port (DUT)
- Video Servers x 4
- Network Switch – 16-port (Internal LAN)
- MUSA Patch Panel
- Satellite Multiswitch (HV16HD Satellite)
- Cable Drop Amplifier (HV16HD Cable)

4.1 IR Control Unit

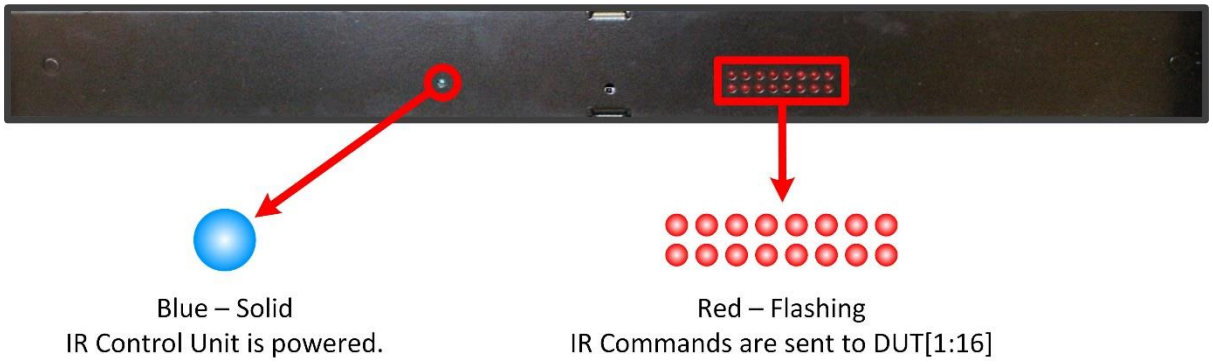

Figure 24: IR Control Unit

The IR Control Unit allows StormTest to control the IR control signals that each DUT receives, either individually or all at once. The unit has 16 outputs, each DUT requires one IR Control Unit output to be placed over its infra-red receiver.

The 16 red LEDs on the front of the unit will cycle left to right as the system boots up. This indicates that the StormTest software has not yet taken control of the IR Control Unit. When the StormTest server initialisation is complete, the front panel red LEDs will turn off. When IR commands are sent to a DUT slot, the LED corresponding to that slot will flash.

4.2 RPS

Power is provided to each DUT slot using two 8-way remote power switches (RPS). Both power switches are controlled over (Internal LAN) Ethernet. The RPS units are used in the HV16HD as follows:

- DUT[1:8] RPS – provides StormTest-controlled power to DUT slots 1 to 8.
- DUT[9:16] RPS – provides StormTest-controlled power to DUT slots 9 to 16.

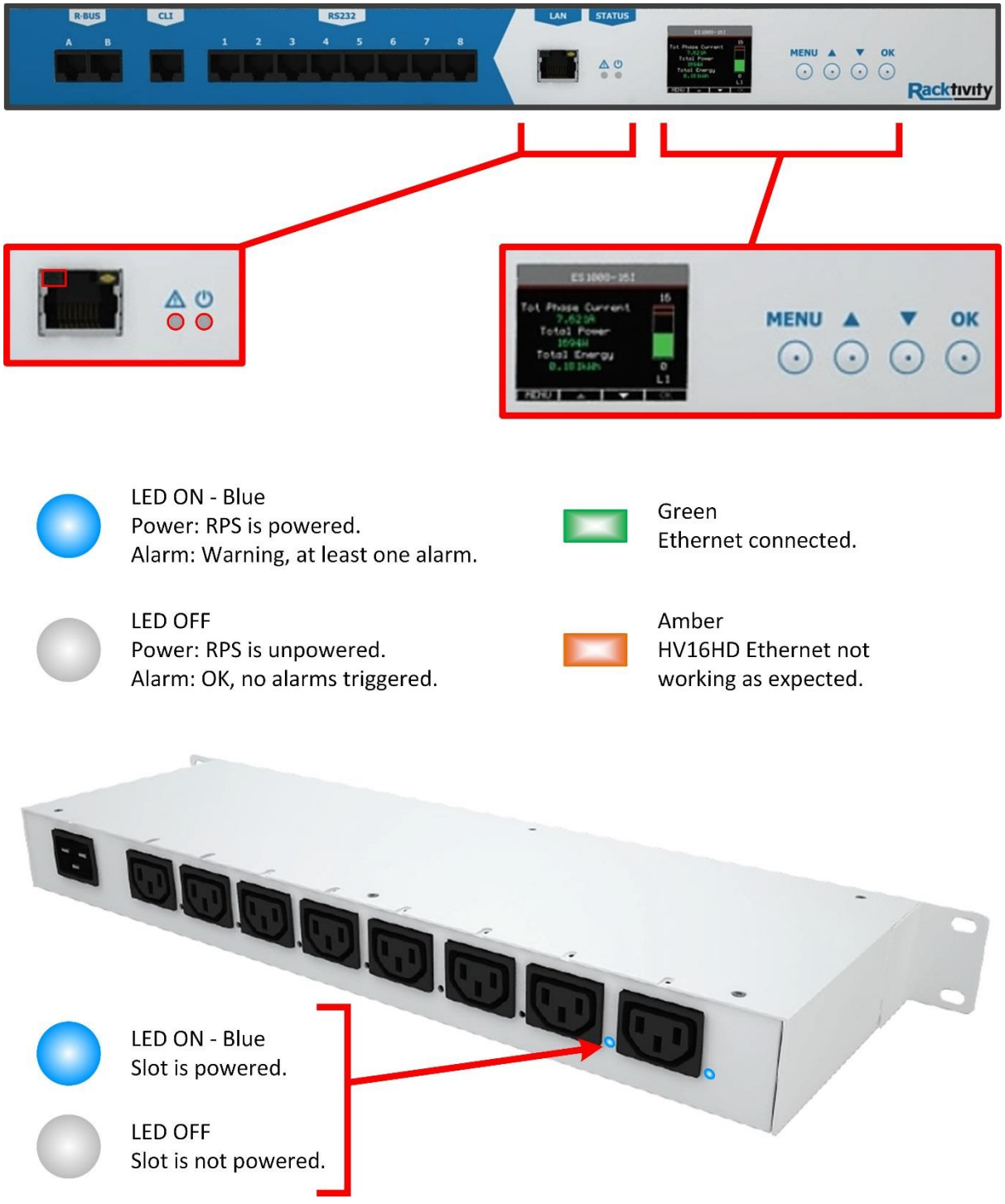

Figure 25: HV16HD Remote Power Switch

4.3 StormTest Server

The StormTest server controls the IR Control Unit, the STS, the two RPS units and the four Video Servers. It also maintains a database of test scripts and results and can stream video from any slot over a network.

4.4 Serial Terminal Server

DUT serial debug outputs are connected to the serial terminal server. From here, data is converted into TCP/IP data and transmitted back to the relevant client.

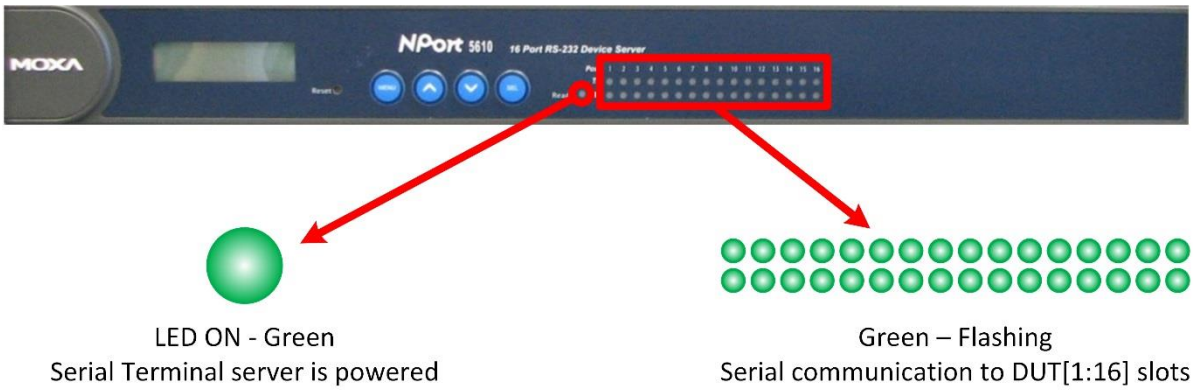

Figure 26: HV16HD Serial Terminal Server

4.5 Network Switch - 24-port (DUT)

DUT network connectivity is provided by a DELL PowerConnect 2824 network switch. The switch is set up in unmanaged mode. Additional configuration is available as follows:

- Insert a paper clip into the “Mode” hole located on the front of the unit. Press and hold the switch until the green “Managed” LED illuminates
- Access the switch’s web interface (192.168.2.1) and configure accordingly.

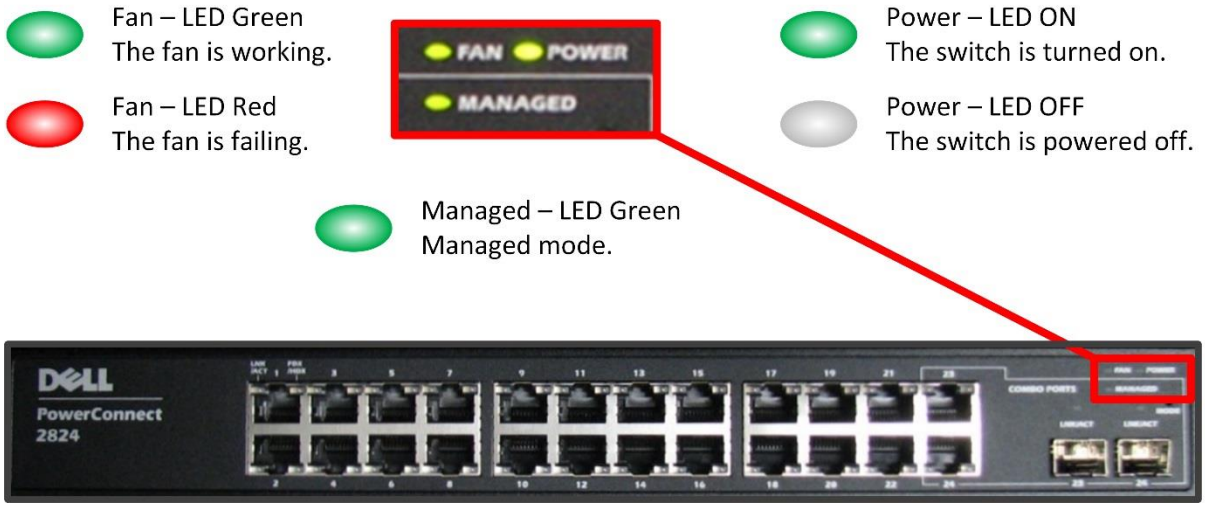

Figure 27: HV16HD DUT Network Switch

4.6 Video Servers

There are four video servers installed in the HV16HD. Each server captures the HDMI output of four DUTs and communicates with the StormTest server over Ethernet. The locations of these video servers and the slots that they serve are detailed below.

Video Server	IP Address	DUT Slots	Video Server Location
VS100	172.16.0.100	1 to 4	HV16HD front – above StormTest server.
VS101	172.16.0.101	5 to 8	HV16HD rear – above 2U fan unit.
VS102	172.16.0.102	9 to 12	HV16HD front – above DUT slot 1.
VS103	172.16.0.103	13 to 16	HV16HD rear – above DUT slot 9.

Table 11: HV16HD Video Server Details

Video servers are configured to power up when mains power is applied to the unit. Upon power up, the green LED on the front panel will illuminate and the unit's internal fans will activate. The red LED will turn on to indicate HDD activity.

4.7 Internal LAN Network Switch

An Internal LAN network switch (ZyXEL GS1100-16 16-port network switch) is used to connect the following over Ethernet:

- StormTest server internal LAN port
- Serial Terminal Server
- Two Remote Power Switches
- IR Control Unit
- Four Video Servers

Figure 28: Internal LAN Network Switch

NOTE: This switch is for internal use only – no other devices should be connected to it.

4.8 MUSA Patch Panel

The MUSA patch panel allows the user to patch a live signal or a signal from a stream player to the DUT slots. The MUSA patch panel structure is described in detail in Section 3.5.

Figure 29: MUSA Patch Panel - Satellite

Figure 30: MUSA Patch Panel - Cable

4.9 HV16HD Satellite MultiSwitch

A mains-powered, 32 output multiswitch (Triax TMP 5x32) is used to amplify and distribute source satellite signals to each DUT slot.

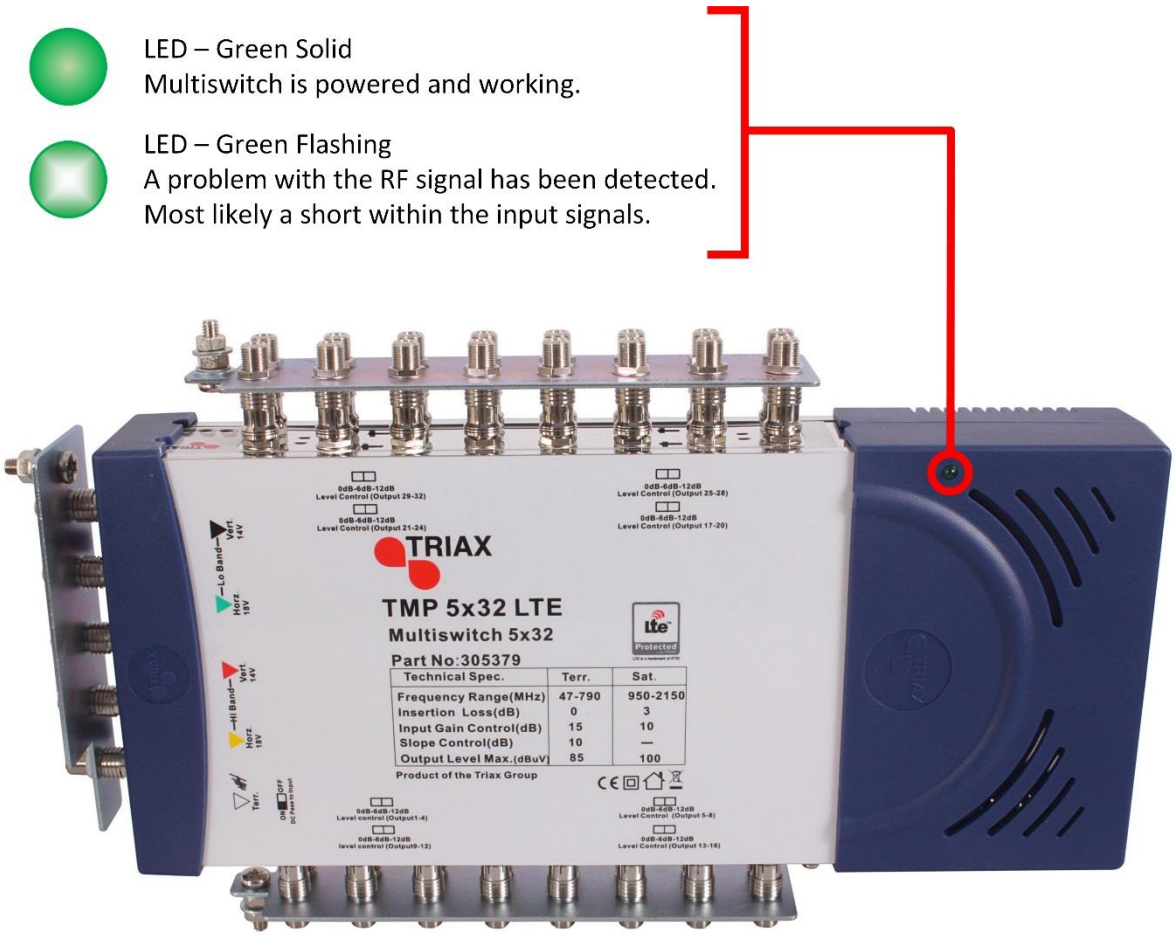

Figure 31: HV16HD Satellite Multiswitch

4.10 HV16HD Cable Drop Amplifier

An RF amplifier (Arris MDA-100) and splitter combination is installed into HV16HD Cable racks to amplify the live incoming cable signal and to distribute the amplified RF output to each DUT slot.

Figure 32: HV16HD Cable Drop Amplifier

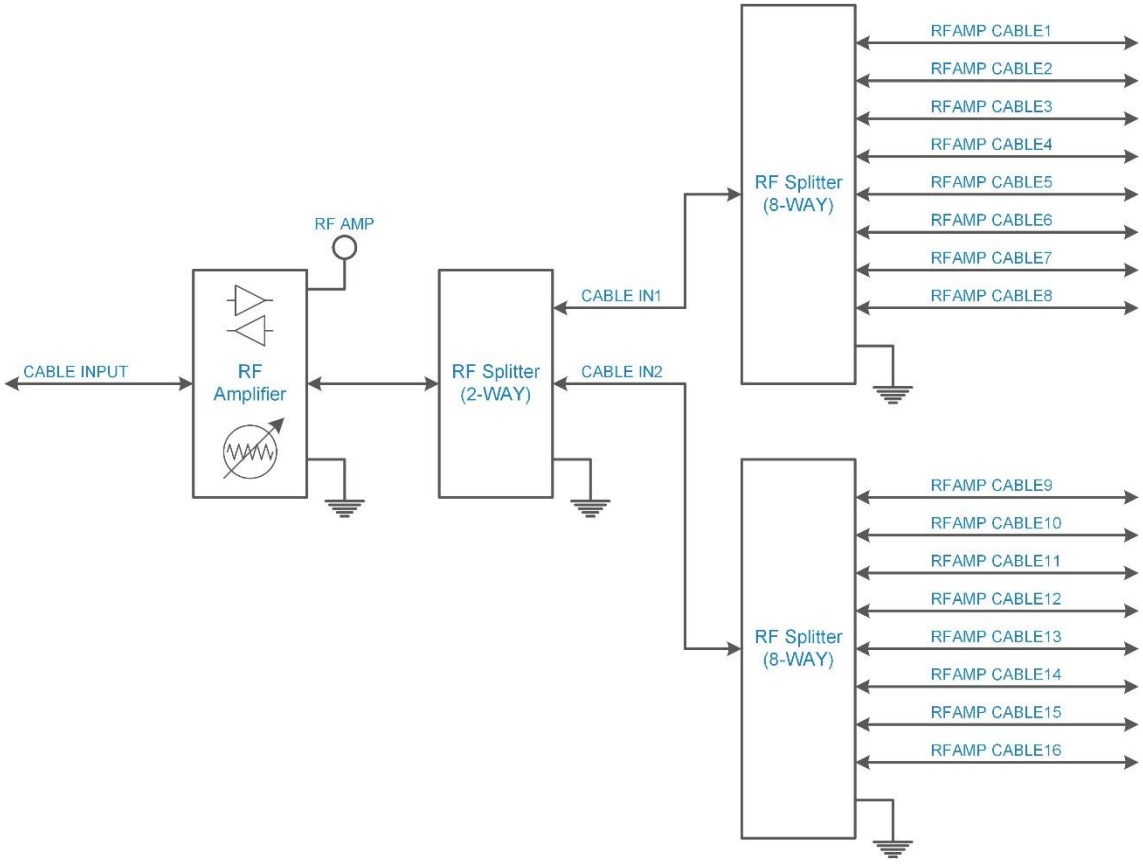

Figure 33: HV16HD Cable RF Distribution

4.10.1 Amplifier Balance and Setup

Warning: The RF amplifier has already been installed and activated by the StormTest Manufacturing Team - hazardous voltages are present once the cover is removed. Use approved safety equipment and procedures.

This section provides instructions on how to implement the correct balancing methods for the RF amplifier in the HV16HD, if it is necessary to do so during installation.

Ensure that a good earth connection has been made to the amplifier housing – this is required to ensure proper functionality. To open the amplifier housing, loosen the lid bolt with a 5.0 mm hex key and remove the cover.

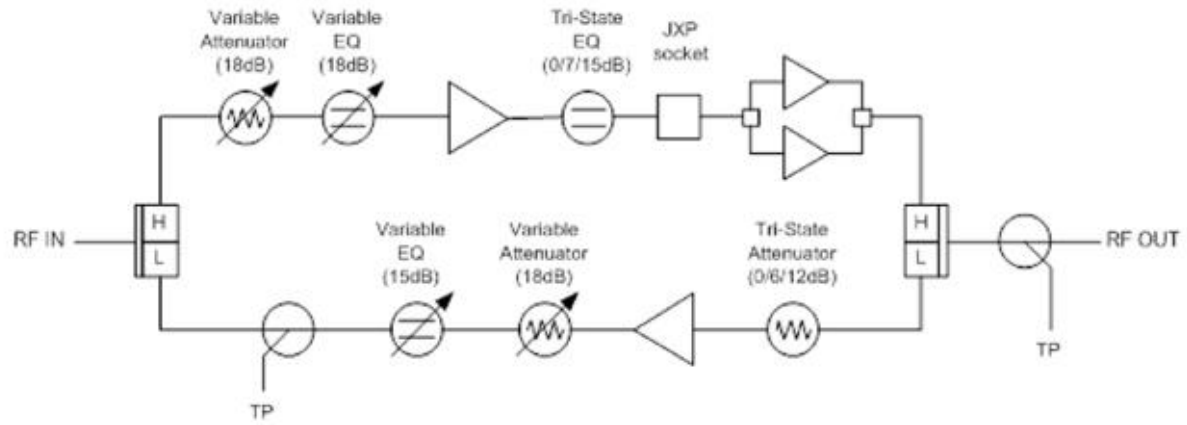

Figure 34: MDA-100 Forward and Return Paths

4.10.2 Default Forward and Reverse Path Settings

- The HV16HD is shipped with the rack input to output RF forward gain set to 0dB. The amplifier's equaliser settings are not modified by StormTest Manufacturing and are have the following default values:
  - The tri-state interstage equaliser is set to 15dB (tilted output).
  - The forward path equaliser is set to no equalisation (flat output).

- The HV16HD is shipped with the rack RF reverse gain set to 0dB. The amplifier's tri-state attenuator and reverse path equaliser settings are not modified by StormTest Manufacturing and are have the following default values:
  - The tri-state attenuator is set to 0dB.
  - The reverse path equaliser is set to no equalisation (flat output).

4.10.3 Forward Path Setup

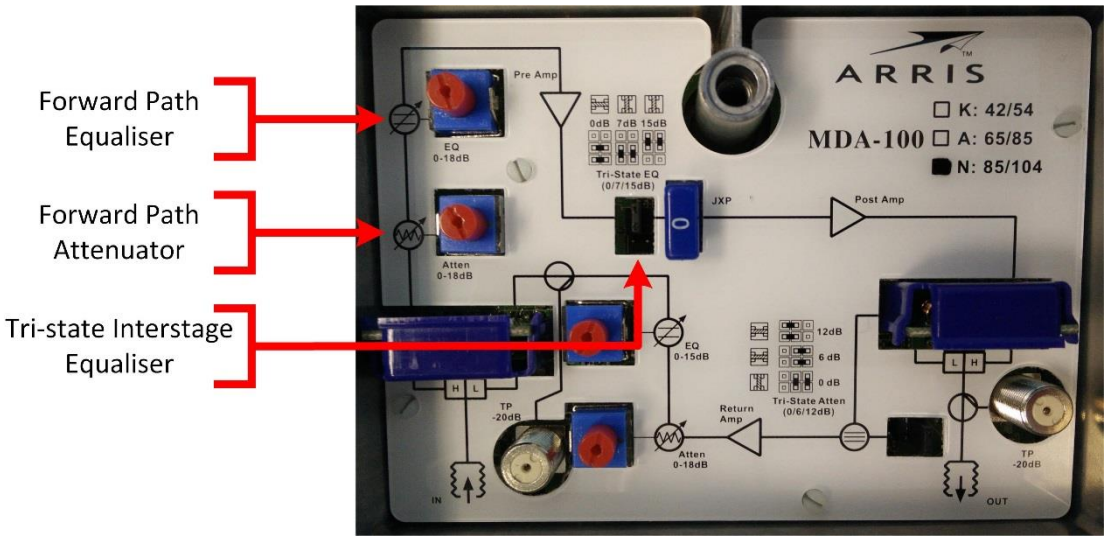

Figure 35: RF Amplifier Forward Path Control

To configure the HV16HD's forward path gain, complete the following steps:

- Connect a cable source to the RF input patch panel. Connect a signal meter to a DUT slot "RF1" cable and monitor.
- If the output level at the DUT slot is low, decrease the amplifier's forward path attenuation by turning the attenuator knob clockwise until the output level is correct. If the output level is too high, increase the forward path attenuation by turning the knob counter-clockwise until the forward path output level is correct.

To configure the amplifier's tri-state interstage equaliser, complete the following steps:

- Connect a cable source to the RF input patch panel. Connect a signal meter to a DUT slot "RF1" cable and monitor.
- If the tri-state interstage equaliser is being configured, set the forward path equaliser to 0dB equalisation by turning the knob fully clockwise (tilted output).
- Switch the tri-state interstage equaliser to the pre-configured desired value of 0dB, 7dB or 15dB

To configure the amplifier's forward path equaliser, complete the following steps:

- Connect a cable source to the RF input patch panel. Connect a signal meter to a DUT slot "RF1" cable and monitor.
- If the forward path equalisation is too low, increase the forward path equalisation by turning the forward path equalisation knob counter-clockwise until the equalisation is correct. If the forward path equalisation it too high, decrease the forward path equalisation by turning the knob clockwise until equalisation is correct.
- If the forward path equalisation is correct, proceed to the reverse path setup.

4.10.4 Reverse Path Setup

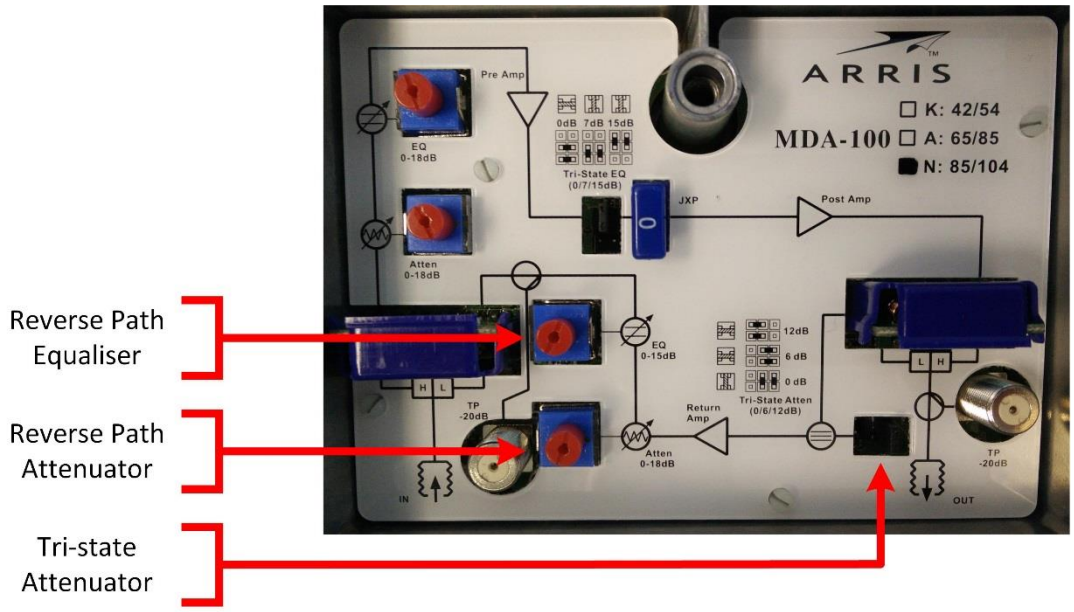

Figure 36: RF Amplifier Reverse Path Control

To configure the HV16HD's reverse path gain, complete the following steps:

- Connect a cable source to a DUT slot "RF1" cable. Connect a signal meter to the RF input patch panel "Cable" connector and monitor. Ensure that the cable source and meter are set to generate and measure a pre-defined return signal frequency. Refer to the MDA-100 datasheet for the return passband frequency range.
- If the output level at the RF input patch panel is low, decrease the amplifier's reverse path attenuation by turning the attenuator knob clockwise until the output level is correct. If the output level is too high, increase the reverse path attenuation by turning the knob counter-clockwise until the reverse path output level is correct.

To configure the amplifier's tri-state attenuator, complete the following steps:

- Connect a cable source to a DUT slot "RF1" cable. Connect a signal meter to the RF input patch panel "Cable" connector and monitor. Ensure that the cable source and meter are set to generate and measure a pre-defined return signal frequency. Refer to the MDA-100 datasheet for the return passband frequency range.
- If the tri-state attenuator is being configured, set the reverse path equaliser to 0dB equalisation by turning the knob fully clockwise (flat output).
- Switch the tri-state attenuation to the pre-configured desired value of 0dB, 6dB or 12dB

To configure the amplifier's reverse path equaliser, complete the following steps:

- Connect a cable source to a DUT slot "RF1" cable. Connect a signal meter to the RF input patch panel "Cable" connector and monitor. Ensure that the cable source and meter are set to

generate and measure a pre-defined return signal frequency. Refer to the MDA-100 datasheet for the return passband frequency range.

- If the reverse path equalisation is too low, increase the reverse path equalisation by turning the reverse path equalisation knob counter-clockwise until the equalisation is correct. If the reverse path equalisation it too high, decrease the reverse path equalisation by turning the knob clockwise until equalisation is correct.
- If the reverse path equalisation is correct, close the housing.

5 Appendix A: HV16HD Specifications

Physical	
Width	700mm (27.5”)
Depth	1100mm (43.3”)
Height	1660mm (65.4”)
Weight	265kg (584lb)

Electrical	
Power Supply	100-240V AC 50-60Hz
Power Rating (without DUTs)	600 Watts

Environmental	
Operating Temperature	18° C to 27° C (64° F to 80° F)
Operating Humidity (RH)	20 % to 75 %

DUT Slot Information	
Number of Test Slots	16 (independent)
Slot Width	450mm (17.7”)
Slot Depth	380mm (14.95”)
Slot Height	110mm (4.3”)

Audio / Video	
Video Input Interface	HDMI Type-A Receptacle 480i/p, 576i/p, 720p, 1080i/p
Audio Input Interface	HDMI Type-A Receptacle Stereo PCM, 16 bit, 32-48 kHz
Resolution	1920x1080, 1280x720, 720x576, 720x480
Video Bit Rate	128kbps – 12Mbps
Frame Rate	3fps – 30fps
Audio Frequency	48kHz

Slot Connections	
DUT Ethernet	1 (1000BASE-T connection on each slot.)
RF (Satellite)	2
RF (Cable)	1
DUT IR	1
DUT HDMI	1
DUT Serial	1
DUT Power	1

Table 12 – HV16HD Specifications