CURTIN UNIVERSITY

PROJECT DELIVERY GUIDELINES

AUDIOVISUAL GUIDELINES PART 4 – DETAILED DESIGN SPECIFICATIONS

000317

Curtin University

ABSTRACT

The purpose of this document is to provide the detailed design specifications associated with the standard room and system configurations in teaching, learning and meeting spaces at Curtin University.

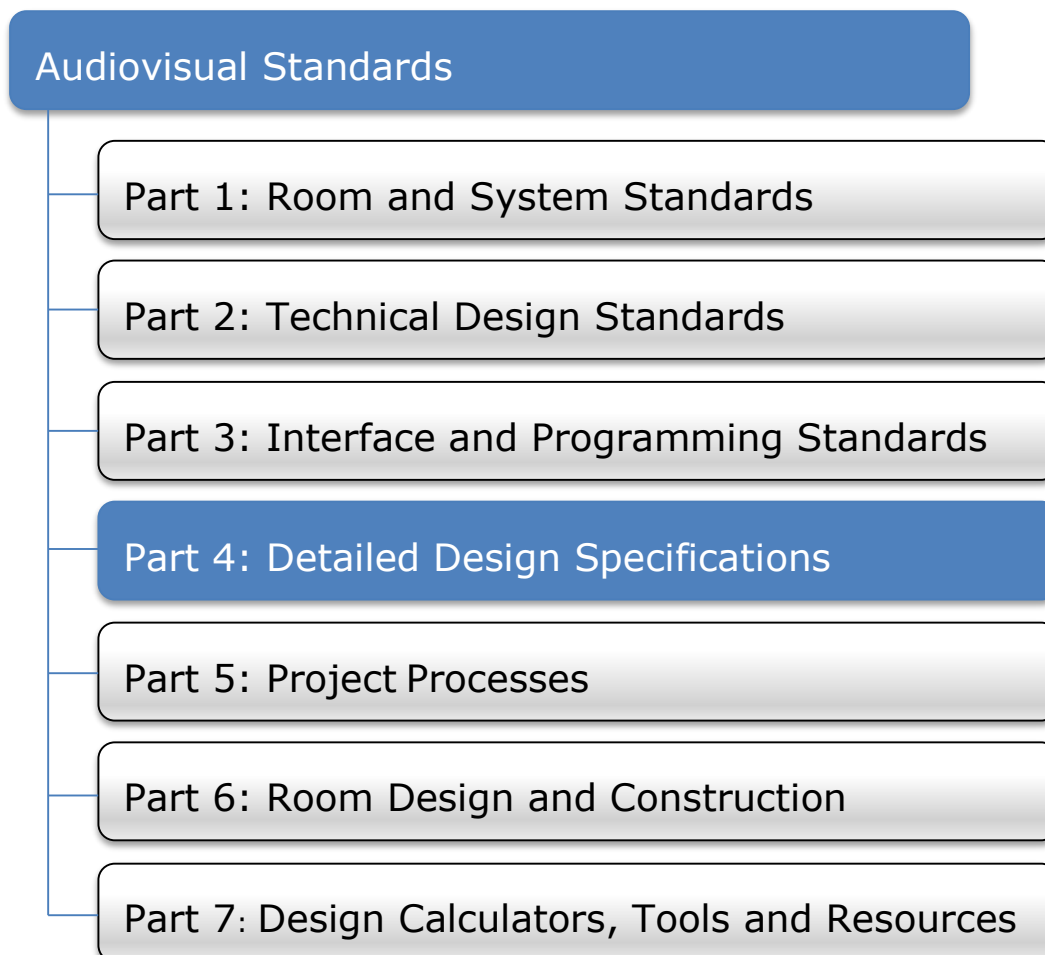| Details of revisions			
Level	*Details*	*Date*	*Initial*
1	*Original document created from Audio Visual Standards Part 4 - Detailed Design Specifications (v0.6)*	*Nov-16*	*RPS*
2	*Review and revision to match latest schematic diagrams for each AV system type*	*Sep-17*	*IRC*
3	*Add AV System Type 4n. Incorporate modifications to standard room configuration packages, including RFP and DSS*	*Sep-18*	*IRC*
3	*Inclusion of wording to allow departures from the existing guideline*	*Nov-19*	*RPS*

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1   INTRODUCTION

1.1   DOCUMENT BRIEF

This document describes the detailed design specifications for the standard types of AV systems at Curtin University. These designs are total digital solutions that incorporate modern AV specifications such as HDMI, wide screen projection and higher resolutions (HD and WUXGA).

AV SYSTEM TYPE 1

AMX Massio 8-button keypad controller with **FPD/projector switching**. Typical installations are single display systems such as basic tutorial (LEC01), and breakout/huddle (MET01).

AV SYSTEM TYPE 2

AMX touch panel with AMX NX 1200 controller and **Extron IN1608 switching**. Typical installations are single display systems able to show one source at a time such as computer suites (LEC02) and basic meeting (MET02) venues.

AV SYSTEM TYPE 3

AMX touch panel with AMX NX 1200 (or higher) controller with **Extron DTP Crosspoint switching**. These venues often feature the ability to display two sources simultaneously on a Primary and Secondary display set. This system is often installed in iLecture tutorial rooms (LEC03), lecture theatres (LEC04/5) and videoconference meeting rooms (MET03).

AV SYSTEM TYPE 4

AMX touch panel with AMX NX 1200 controller (or higher) with **Extron XTP Crosspoint matrix frame**. The systems are often used to centrally service more than one venue with collaborative and/or distributive features (e.g. CLB01, CLOB02, and CLB03).

AV SYSTEM VARIANTS

Newer AV products allow further convergence of audiovisual systems into the IT infrastructure and computing services. To allow for this trend, authorised variants to the four standard AV system types will be allowed.

Variant suffix:

- **'h' – hybrid** where network encoders and decoders are used to provide directed extension of AV content from source to output or vice versa (i.e. using existing structured cabling rather than separate AV cable runs)

- **'n'** – **network switching** where network encoders and decoders are used to replace all AV switching functionality. These systems are often used where

audiovisual sources and displays are spread out geographically but there is a requirement for linkage (e.g. overflow from a main venue).

OTHER SYSTEM TYPES

There are several specialised AV system types that do not include a controller or dedicated switching infrastructure. These are often small systems with specific purposes such as recorded reflective practice and digital signage.

This document should be referenced by AV consultants, designers, integrators and programmers in the application of these Curtin standard AV systems to specific venue requirements.

The definitions that apply to this document are listed in the Glossary of Terms in Appendix A.

1.2　　RATIONALE FOR STANDARD AV SYSTEM TYPES

The following list forms the rationale for developing and using standard AV system types:

- a high level of consistency across the portfolio of teaching and meeting spaces
- a single user experience across all touch panels
- robustness and reliability through proven system designs
- the same type of supportable components in the core layer
- unified controller code and DSP configurations
- easy-to-deploy reviewed and updated code
- the ability to maintain a streamlined spares inventory
- savings due to procurement in bulk quantities
- shorter installation times
- fixed pricing for most installations
- monitoring and control by an enterprise management system (RMS).

1.3　　USE OF NON-STANDARD SYSTEMS

Where a standard type does not meet the user requirements, a non-standard design may be used, provided it is:

- approved in writing by the AV Standards Manager strictly on a case-by-case basis
- based upon a standard type where possible
- based on the standardised user interface, controller code and matrix/DSP configurations
- managed by an enterprise management system (RMS).

1.4　　　DOCUMENT ACCESS

All Curtin IT Services staff and contracted personnel are provided with access to this document.

Designers, installers and contractors must ensure they have the most current version of all standards prior to engaging in any work.

The most recent version of this document can be found on the web at: https://properties.curtin.edu.au/workingwithus/guidelines.cfm.

Access to the Audiovisual Guidelines Part 7 – Resources is available by contacting:

AV Standards Manager

08 9266 2589

avservices@curtin.edu.au

1.5　　　CLARIFICATION

Whenever a conflict of information occurs or clarification of instruction is required, all queries shall be made to the AV Standards Manager in the first instance.

The Project Delivery Guidelines have been prepared in consultation with Curtin University subject matter experts and stakeholders. It is recognised that the subject matter of Guidelines will not always be suitable for all project elements and departures from the Guidelines may be required or desirable. Departures from Guidelines must be agreed upon in consultation with the relevant University Guideline subject matter expert. Departures must be recorded in a project register and recorded and reviewed in the Project Control Group meeting minutes under its own meeting agenda item "Project Delivery Guideline Departures". Where the University subject matter expert identifies that a departure adds ongoing value to the University, the subject matter expert will update the relevant Guideline.

1.6   ROLES AND RESPONSIBILITIES

The following table outlines the responsibilities of roles relating to the upkeep and maintenance of the AV system types described in this document.

Table 1: Roles and Responsibilities

Role	Responsibility
AV Standards Manager	Owner of this document. Maintains currency and approvals through document control and versioning.
AV Operations Manager	Ensures that the AV system types described in this document are relevant for all possible classrooms and meeting spaces at Curtin.
AV Project Staff	Use and recommend improvements to AV system types described in this document.
AV Consultant	Designs all possible Curtin venues using the AV system types described herein.
AV Integrator or Programmer	Reads and understands the AV system types described herein, including the accompanying design schematics in Audiovisual Standards Part 7 – Resource 1.

2 AV SYSTEM TYPE 1

The AV System Type 1 is characterised by the following features:

- a large format flat panel display (FPD) or projector, (which may be interactive), as the primary display device

- bring-your-own-device (BYOD) wireless connectivity to the FPD/projector

- laptop wired connectivity (HDMI cable)

- provision for resident computer with webcam

- provision for ceiling- or wall-mounted speakers

- a single source can be shown at a time (e.g. a resident PC or laptop)

- the source inputs (e.g. resident PC or laptop connection plate) are generally within 15 metres of the FPD/projector

- control of the source selection and audio levels via a wall-mounted keypad controller

- optional room occupancy sensor

- optional support camera

- management by an enterprise management system (RMS).

The room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) that are typically installed using an AV System Type 1 are:

- **LEC01** – Basic Flat Floor Tutorial

- **MET01** – Basic Meeting with BYOD (or Informal Breakout Space).

2.1 CORE LAYER

The core layer for the AV System Type 1 consists of the keypad controller and switching, as shown in **Table 2**.

Table 2: Core Layer for AV System Type 1

Component	Device
Keypad controller	AMX Massio MCP -108
Switching	Use projector or FPD switching for selection of AV sources

2.2 COMPONENTS

The non-core components for the AV System Type 1 per room configuration packages are shown in Table 3.

Table 3: Non-core Components for AV System Type 1

MET01	LEC01
Flat Panel Display **Or** **Projector**	Flat Panel Display Or Projector (either may be interactive)
	Resident PC
Grommet (HDMI cable)	Cable Cubby (HDMI cable, USB cable pass-through to interactive display, USB socket pass-through to PC)
	USB switch and extender (for interactive display)
Wireless Presentation Gateway – Solstice	Wireless Presentation Gateway – Solstice
	Webcam
	Support Camera
	Occupancy Sensor
Wall Speakers	Wall or Ceiling Speakers
Audio Amplifier	Audio Amplifier

Note:

1. The components shaded in grey are optional.
2. The approved make and models for non-core components are provided in the AV Approved Equipment List for Curtin (Audiovisual Standards Part 7 – Resource 3).
3. The bill of materials for AV System Type 1, with options, is provided in the 'All encompassing BOM' spreadsheet (Audiovisual Standards Part 7 – Resource 2).

2.3   CONNECTIONS

2.3.1   KEYPAD CONTROLLER

The standard connections for the keypad controller are shown in Table 4.

Table 4: Standard Connections for Keypad Controller

Standard Connection	Inputs	Controller	Outputs	Standard Connection
		AMX Massio MCP-108	LAN	LAN (POE)
			RS232 1	Primary Display – Serial (if required)
			RS232 2	USB Switch (if required)
Occupancy Sensor (if fitted)	Digital I/O 1		IR/Serial 1	
	Digital I/O 2		IR/Serial 2	
			Relay 1	Motorised Screen (if fitted)
			Relay 2	

The standard button assignments for the keypad controller are shown in **Table 5**.

Table 5: Standard Button Assignments for Keypad Controller (MCP-108)

Control	Label	Action
Button 1	POWER ON	Turn Display ON
Button 2	POWER OFF	Turn Display OFF
Button 3	PC	Set Resident PC as source
Button 4	HDMI	Set HDMI (e.g. laptop) as source
Button 5	Wireless	Set Wireless Presentation Gateway as source
Button 6	Doc Cam	Set Doc Cam (or other device) as source
Button 7	DVD	Set DVD (or other device) as source
Button 8	Picture Blank	Mute the AV on the display
Dial		Turn volume UP and DOWN. Push to mute

2.3.2   PRIMARY DISPLAY

The input sources are cabled directly to the FPD/projector as the primary display.

2.3.3   NETWORK

The following network outlets are required in the AVIP joinery (VLAN and POE as indicated):

1. resident PC (VLAN 396)

2. solstice pod (VLAN 397)

3. keypad controller (VLAN 399, POE)

4. spare (future).

The following network outlets are required directly to the following devices whether located in the wall or ceiling:

- FPD/projector (VLAN 399) – if network control is supported

- support camera (Security VLAN 942) – if fitted.

2.3.4   POWER

For fixed furniture containing AV equipment, two dual 10 A GPOs can be installed with a separate dual GPO above the furniture for general purpose use such as laptop power and BYOD charging.

In addition, GPOs are required near the following components (with location where indicated):

- one dual GPO on the wall near FPD/projector and audio distribution amplifier

- one GPO near the USB extender (if fitted)

- one GPO in ceiling near the room occupancy sensor (if fitted).

2.4   APPROVED OPTIONS

The following options are available for Type 1 systems:

- projector instead of FPD

- interactive FPD/projector

- resident PC with webcam

- wall or ceiling speakers

- room occupancy sensor

- support camera.

2.5   SCHEMATICS

The design schematics for the AV System Type 1 are available as an accompanying document in Audiovisual Standards Part 7 – Resource 1.

3   AV SYSTEM TYPE 2

The AV System Type 2 is characterised by the following features:

- a large format flat panel display (FPD) or projector, (which may be interactive), as the primary display device
- bring-your-own-device (BYOD) wireless connectivity to the FPD/projector
- laptop wired connectivity (HDMI cable)
- resident computer
- ceiling- or wall-mounted speakers
- a single source can be shown at a time (e.g. a resident PC or laptop)
- optional mirrored display devices (2 x HDMI)
- management of the source selection and audio levels via a touch panel
- a room occupancy sensor (discrete or incorporated into the touch panel)
- support camera
- optional web conference camera and AV bridge
- optional infrared hearing augmentation transmitter
- optional motorised projection screen
- optional wired or wireless microphones
- optional inline power filter
- management of equipment power with a networked power distribution unit (PDU)
- management by an enterprise management system (RMS).

The room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) that are typically installed using AV System Type 2 core layer and components are:

- **LEC02** – Flat Floor Tutorial - Basic
- **LEC02-COM** - Computer Suite
- **MET02** – Basic Meeting Space (including microphones as required).

3.1   CORE LAYER

The core layer for AV System Type 2 consists of the touch panel interface, controller and switching, as shown in Table 6.

Table 6: Core Layer for AV System Type 2

Component	Device
Interface	AMX MXT-701
Controller	AMX NX 1200
Switching	Extron IN1608 (Standard DTP or HDBT) 'MA' option if audio amplification is not provided separately

3.2 COMPONENTS

The non-core components for AV System Type 2 per room configuration packages are shown in **Table 7**.

Table 7: Non-core Components for AV System Type 2

LEC02	MET02
Flat Panel Display **Or** **Projector** **(either may be interactive)**	Flat Panel Display Or Projector (either may be interactive)
Student Lab PC	Resident PC
Cable Cubby (HDMI cable, USB cable pass-through to interactive display, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB cable pass-through to interactive display, USB socket pass-through to PC)
USB switch and extender (for interactive display)	USB switch and extender (for interactive display)
Wired or Wireless Microphone(s)	Wired or Wireless Microphone(s)
Solstice	Solstice
	Blu-ray Media Player/TV
Webcam	Webcam
Support Camera	Support Camera
Occupancy Sensor	Occupancy Sensor
Ceiling or Wall Speakers	Ceiling or Wall Speakers

Hearing Augmentation	Hearing Augmentation
Motorised Screens	Motorised Screens
Managed PDU	Managed PDU

Note:

1. The components shaded in grey are optional.

2. The approved make and models for non-core components are provided in the AV Approved Equipment List for Curtin (Audiovisual Standards Part 7 – Resource 3).

3. The bill of materials for AV System Type 2 with options, is provided in the 'All encompassing BOM' spreadsheet (Audiovisual Standards Part 7 – Resource 2).

3.3   CONNECTIONS

3.3.1   CONTROLLER

The standard connections for the AMX NX 1200 controller are shown in Table 8.

Table 8: Standard Connections for AMX NX 1200 Controller for AV System Type 2

Standard Connection	Inputs	Controller	Outputs	Standard Connection
	Power +12 V DC	AMX NX 1200	LAN	LAN
	Host USB		RS232/485	Lighting Interface – Serial (if required)
Occupancy Sensor (if fitted)	Digital I/O 1		RS232	Primary Display – Serial via Extron DTP Rx if required)
	Digital I/O 2		IR/Serial 1	
	Digital I/O 3		IR/Serial 2	
	Digital I/O 4			

Note:

1. It is preferred that the primary display, motorised screen/blinds, and lighting interface are controlled via IP from the controller. Otherwise with RS232, I/O as shown.

3.3.2   AV SWITCHER

The standard connections for the Extron IN1608 switcher are shown in **Table 9**.

Table 9: Standard Connections for Extron IN1608 Switcher

Standard Connection	Inputs	AV Switching	Outputs	Standards Connection
		Extron IN1608	LAN	LAN
	RGB In 1		HDMI Out A	Display 2 (if Display 1 mirrored)
	RGB In 2		HDMI Out B	Display 3 (if Display 1 mirrored)
Lectern PC	HDMI In 3		DTP Out C	Display 1
Solstice	HDMI In 4		RS232 over TP 1	Display 1 (from controller)
Wall/Table Plate – Laptop	HDMI In 5		IR over TP 1	
Optional Device	HDMI In 6			
Room Join or Optional Device (via extra DTP Tx)	DTP In 7			
	RS232 over TP 1			
	IR over TP 1			
Optional Device (via extra DTP Tx)	DTP In 8			
	RS232 over TP 2			
	IR over TP 2			
Wired Mic, if fitted	Audio LR In 1		Audio LR Out 1	Resident Computer
Wireless Mic, if fitted	Audio LR In 2		Audio LR Out 2	Hearing Augmentation (if fitted)
	Audio LR In 3		Audio HDMI 1	

			Audio HDMI 2	
	Audio LR In 4			
	Audio LR In 5			
	Audio LR In 6			
	Audio LR In 7		Mono Power Out	Speakers
	Audio LR In 8		Stereo Power Out	
Wired Mic 1	Mic/Line 1			
Wired Mic 2	Mic/Line 2			

3.3.3   NETWORK

The following network outlets are required in the AVIP joinery (with VLAN and POE where indicated):

1. resident PC (VLAN 396)
2. spare (future)
3. solstice (VLAN 397)
4. touch panel (VLAN 399, POE)
5. controller (VLAN 399)
6. AV switcher (VLAN 399)
7. spare (future)
8. managed PDU (VLAN 399).

The following network outlets are required directly to the following devices where located in the wall or ceiling:

- FPD/projector (VLAN 399) – if network control is supported
- motorised screen (VLAN 399) – if fitted
- support camera (Security VLAN 942) – if fitted.

3.3.4   POWER

For moveable furniture containing AV equipment (AVIP or lectern), a 20 A switched socket outlet is to be installed with internal soft wiring as per *000312 PDG Electrical Services Guidelines*, including a clamp-on switched double socket outlet on the furniture for general purpose use.

For fixed furniture containing AV equipment, a dual 10 A GPO is to be installed with a separate dual GPO above the furniture or at the table for general purpose use such as laptop power and BYOD charging.

In any case, GPOs are required near the following components (with location where indicated):

- one dual GPO on the wall near the FPD/projector and receiver
- one GPO on the wall near the motorised screen (if fitted)
- one GPO on the wall near the conference camera
- one GPO on the wall near the location for the hearing augmentation transmitter (if fitted).

3.4   APPROVED OPTIONS

The following options are available for Type 2 systems:

- FPD instead of projector
- interactive FPD/projector
- second and third display (mirror of Display 1)
- wireless microphone and receiver
- wired microphones
- room joining (as slave room receiving master input in DTP In 7).

3.5   VARIANTS

The 'hybrid' variant for a Type 2 (denoted as Type 2h) is currently held in reserve for products that integrate network encoders and decoders, and use structured cabling as a replacement for DTP extension and separate AV cabling.

3.6   SCHEMATICS

The design schematics for the AV System Type 2 are available as an accompanying document in Audiovisual Standards Part 7 – Resource 1.

4   AV SYSTEM TYPE 3

The Type 3 AV system is characterised by the following features:

- a large format flat panel display (FPD) or projector as the primary display device

- optional FPD or projector as a secondary display device for second source (can be mirrored)

- bring-your-own-device (BYOD) wireless connectivity to FPD/projector

- laptop wired connectivity (HDMI cable)

- resident computer

- optional interactive monitor

- ceiling- or wall-mounted speakers

- speech reinforcement and audio amplification with provision for an IR-based hearing augmentation system

- wired microphone at 'capture zone' (boundary or ceiling)

- wireless lapel microphone(s) for teaching staff

- standalone document camera (also connected via USB to resident PC)

- venue lecture capture

- presenter-facing auto tracking camera (for lecture capture and videoconferencing)

- optional AV Bridge for connecting diverting video and audio streams to the resident PC (via USB) for use with web conferencing applications

- optional audience-facing camera (for web conferencing)

- management of the source selection and audio levels via touch panel

- room occupancy sensor (discrete or incorporated into touch panel)

- support camera

- infrared hearing augmentation transmitter

- optional student computer connectivity to room display(s)

- optional videoconferencing for meeting rooms

- optional motorised projection screen(s)

- optional source devices such as Blu-ray player or MATV set-top box

- controller has provision to integrate with room lighting, motorised blinds and EWIS

- optional inline power filter

- management of equipment power with networked power distribution unit (PDU)

- management by an enterprise management system (RMS).

The room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) that are typically installed using AV System Type 3 core layer and components are:

- **LEC03** – Flat Floor Tutorial – iLecture
- **LEC04** – Tiered Lecture Theatre
- **LEC05** – Premium Lecture Theatre and Events
- **CLB01** – Collaborative Classroom – Basic
- **CLB02** – Collaborative Classroom – Student Pod Computers
- **MET03** – Meeting Space – Videoconferencing
- **MET04** – Open Event Space.

4.1 CORE LAYER

The core layer for AV System Type 3 consists of the touch panel interface, controller and switching, as shown in **Table 10**.

Table 10: Core Layer for AV System Type 3

Component	Device
Interface	AMX MXT-701
Controller	AMX NX 1200
Switching	Extron DTP CrossPoint 4K 84

Note:
1. The interface may be replaced with the larger 10" AMX MXT-1001 touch panel if required.
2. The controller may be replaced with AMX NX 2200 if relay or more serial ports are required.
3. The selection of a Crosspoint model other than as shown depends on the number of inputs and outputs required for the optional features.

4.2 COMPONENTS

The non-core components for AV System Type 3 per selected room configuration packages are shown in Table 11.

Table 11: Non-core Components for AV System Type 3

LEC03	LEC04/5	CLB01	CLB02	MET03
Projector – as primary display	Projector – as primary display	Flat Panel Display(s) or Projector (s) – as primary and/or secondary display	Flat Panel Display(s) or Projector (s) – as primary and/or secondary display	Flat Panel Display(s) – as video and content display
	Interactive Tablet	Interactive Tablet	Interactive Tablet	Interactive Tablet
Resident PC	Resident PC	Resident PC	Resident PC	Resident PC
Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)
Document Camera	Document Camera	Document Camera	Document Camera	
AV Bridge	AV Bridge	AV Bridge	AV Bridge	
Ceiling Mic	Lectern Mic	Ceiling Mic	Ceiling Mic	
	Boundary Mic			Table Mic(s)
Lapel Mic(s)	Lapel Mic(s)	Lapel Mic(s)	Lapel Mic(s)	
Pressure Mat	Pressure Mat	Pressure Mat	Pressure Mat	
Presenter Camera	Presenter Camera	Presenter Camera	Presenter Camera	
Web Conference Camera	Web Conference Camera	Web Conference Camera	Web Conference Camera	VC Camera
Solstice	Solstice	Solstice	Solstice	Solstice
Media Player / TV	Media Player / TV	Media Player / TV	Media Player / TV	Media Player / TV

Support Camera	Support Camera	Support Camera	Support Camera	Support Camera
Occupancy Sensor	Occupancy Sensor	Occupancy Sensor	Occupancy Sensor	Occupancy Sensor
			Student Pod PCs	
			HD Video Encoders and Decoder	
iLecture Capture	iLecture Capture	iLecture Capture	iLecture Capture	
				Video conference codec
Ceiling or Wall Speakers	Wall or Line Array Speakers	Ceiling Speakers	Ceiling Speakers	Ceiling Speakers
Audio Amplifier	Audio Amplifier	Audio Amplifier	Audio Amplifier	Audio Amplifier
Hearing Augmentation	Hearing Augmentation	Hearing Augmentation	Hearing Augmentation	Hearing Augmentation
Motorised Screens	Motorised Screens	Motorised Screens	Motorised Screens	Motorised Screens
Motorised Blinds	Motorised Blinds	Motorised Blinds	Motorised Blinds	Motorised Blinds
Managed PDU	Managed PDU	Managed PDU	Managed PDU	Managed PDU

Note:

1. The components shaded in grey are optional.
2. The approved make and models for non-core components are provided in the AV Approved Equipment List for Curtin (Audiovisual Standards Part 7 – Resource 3).
3. The bill of materials for AV System Type 3 with options, is provided in the 'All encompassing BOM' spreadsheet (Audiovisual Standards Part 7 – Resource 2).

4.3   CONNECTIONS

4.3.1   CONTROLLER

The standard connections for the AMX NX 1200 controller are shown in Table 12.

Table 12: Standard Connections for AMX NX 1200 Controller for AV System Type 3

Standard Connection	Inputs	Controller	Outputs	Standard Connection
	Power +12 V DC	AMX NX 1200	LAN	LAN
	Host USB		RS232/485	iSmart Camera (older models)
Occupancy Sensor	Digital I/O 1		RS232	Document Camera
Pressure Mat	Digital I/O 2		IR/Serial 1	
	Digital I/O 3		IR/Serial 2	
	Digital I/O 4			

Note:

1. It is preferred that the displays, videoconference codec, motorised screen/blinds, and lighting interface are controlled via IP from the controller. Otherwise with RS232 via the DTP receivers.

4.3.2   AV SWITCHER

The standard connections for the Extron DTP Crosspoint switcher are shown in **Table 13**. The connections shown in brackets are for a system with videoconference.

Table 13: Standard Connections for Extron DTP Crosspoint in AV System Type 4

Standard Connection	Inputs	AV Switching	Outputs	Standard Connection
	240 V Power	Extron Crosspoint 4K 84 (VC in brackets)	LAN	LAN
Resident PC	HDMI In 1		HDMI Out 1	AV Bridge
Document Camera (Solstice)	HDMI In 2		HDMI Out 2	SCHD 2 (spare)

Solstice (Codec HDMI 1)	HDMI In 3		HDMI Out 3A	SCHD 1 (Codec 1)	
Laptop (Codec HDMI 2)	HDMI In 4		HDMI Out 4A	spare (Codec 2)	
Video Decoder (spare)	HDMI In 5		DTP Out 3B	Display 1	
iSmart Camera	HDMI In 6		DTP Out 4B	Display 2	
Optional Device via extra DTP Tx (Table Box)	XTP In 7				
Audience Camera	XTP In 8				
spare (Codec Out)	Audio LR In 1				
	Audio LR In 2		S/PDIF		
	Audio LR In 3		Audio LR Out 1	Speakers via Amp	
	Audio LR In 4		Audio LR Out 2	Bridge	
	Audio LR In 5		Audio LR Out 3	SCHD (Hearing)	
	Audio LR In 6		Audio LR Out 4	Hearing (Codec)	
Wireless Mic 1/2 – Rx	Mic/Line 1				
Lectern Mic	Mic/Line 2				
Boundary Mic	Mic/Line 3				
	Mic/Line 4				

4.3.3 NETWORK

The following network outlets are required in the AVIP joinery (with VLAN and POE where indicated). The outlets should be provisioned in the order as shown.

1. resident PC (VLAN 396)

2. SCHD (VLAN 396) – if fitted

3. solstice (VLAN 397)

4. touch panel (VLAN 399, POE)

5. controller (VLAN 399)

6. AV switcher (VLAN 399)

7. AV Bridge (VLAN 399) – if fitted

8. managed PDU (VLAN 399)

9. video decoder (VLAN 397, POE) – if fitted

10. videoconference codec (VLAN 398) – if fitted.

The following network outlets are required directly to the following devices where located in the wall or ceiling:

- each FPD/Projector (VLAN 399) – in preference to serial control if available

- each motorised screen (VLAN 399) – if fitted

- presenter camera (VLAN 399) – if fitted (eg iSmart)

- audience camera (VLAN 399) – if fitted

- support camera (Security VLAN 492) - if fitted

- motorised blinds/curtains – if fitted

- dimmer interface – if fitted.

The following network outlets are required directly to the following devices where located near each student pod computer:

1. student PC (VLAN 597);
2. video encoder (VLAN 397, POE).

4.3.4   POWER

For moveable furniture containing AV equipment (AVIP or lectern), a 20 A switched socket outlet is to be installed with internal soft wiring as per *000312 PDG Electrical Services Guidelines*, including a clamp-on switched double socket outlet on the furniture for general purpose use.

General purpose power outlets (GPOs) are required near the following components (with location where indicated):

- one dual GPO on the wall near each FPD/projector and receiver

- one dual GPO on the wall near motorised screen (if fitted)

- one GPO on the wall near location for hearing augmentation transmitter

- one GPO in the ceiling near presenter (iSmart) camera (for optional alternate power)

- two dual GPOs within each student pod joinery.

4.4   APPROVED OPTIONS

The following options are available for Type 3 systems:

- FPD instead of projector

- second FPD/projector

- interactive monitor

- videoconference codec and cameras

- room joining (the master may require Crosspoint 86 to obtain another output to feed to slave)

- student computer connectivity to room display(s)

- motorised projection screen(s).

4.5   VARIANTS

The 'hybrid' variant for a Type 3 (denoted as Type 3h) is currently held in reserve for products that integrates network encoders and decoders, and use structured cabling as a replacement for DTP extension and separate cabling.

4.6   SCHEMATICS

The design schematics for the AV System Type 3 are available as an accompanying document in Audiovisual Standards Part 7 – Resource 1 (version 2.2 or greater).

5 AV SYSTEM TYPE 4

The Type 4 AV system is characterised by the following features:

- A large format flat panel display (FPD) or projector as the primary display device (can be mirrored)
- optional FPD or projector as secondary display device for second source (can be mirrored)
- optional FPD or projector as tertiary display device for videoconference
- bring-your-own-device (BYOD) wireless connectivity to FPD/projector
- laptop wired connectivity (HDMI cable)
- resident computer
- interactive monitor
- ceiling- or wall-mounted speakers
- speech reinforcement and audio amplification with inclusion of IR-based hearing augmentation system
- wired microphone at 'capture zone' (ceiling or boundary)
- wireless lapel microphone(s) for teaching staff
- standalone document camera (also connected via USB to resident PC)
- venue lecture capture
- presenter-facing auto tracking camera (for lecture capture and videoconferencing)
- AV Bridge for connecting diverting video and audio streams to resident PC (via USB) for use with web conferencing applications
- management of the source selection and audio levels via touch panel
- room occupancy sensor (discrete or incorporated into touch panel)
- support camera
- infrared hearing augmentation transmitter
- optional student computer connectivity to room display(s)
- optional videoconferencing with audience-facing auto tracking cameras
- optional motorised projection screen(s)
- optional Blu-ray player or MATV set-top box
- controller has provision to integrate with room lighting, motorised blinds and EWIS
- 4K transport and switching
- power management via networked PDU
- management by an enterprise management system (RMS).

The room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) that are typically installed using AV System Type 4 core layer and components are:

- **LEC05** - Premium Lecture Theatre and Events (centralised)
- **CLB01** – Collaborative Classroom – Basic (centralised)
- **CLB02** – Collaborative Classroom – Student Pod Computers (centralised)
- **CLB02-PDD** – Collaborative Classroom – Pod Dual Display (centralised)
- **CLB03** – Collaborative Classroom – VC and Student Pod Computers (fixed furniture)
- **CLB03-SF** – Collaborative Classroom – VC and Student Pod Computers
- **CLB03-FF** – Collaborative Classroom – VC (flexible furniture).

As the AV System Type 4 is often used as a centralised solution, other room configurations can be implemented using spare inputs and outputs of the AV switching frame.

5.1 CORE LAYER

The core layer for Type 4 AV systems consists of the touch panel interface, controller and switching, as shown in **Table 14**.

Table 14: Core Layer for AV System Type 4

Component	Device
Interface	AMX MST-1001
Controller	AMX NX 1200
Switching	Extron XTP CrossPoint 1600

Note:

1. The interface can be replaced with the smaller 7" AMX MST-701 touch panel if required (e.g. CLB01).
2. The controller may be replaced with AMX NX 2200 if relay or more serial ports are required.
3. The matrix switching frame may be replaced with the Extron XTP CrossPoint 3200 if more inputs and outputs are required (e.g. for centralised designs).

5.2 COMPONENTS

The non-core components for AV System Type 4 per selected room configuration packages are shown in Table 15.

Table 15: Non-core Components for AV System Type 4

LEC05	CLB01	CLB02	CLB03
Flat Panel Display(s) or **Projector(s) – as primary and/or secondary display**	Flat Panel Display(s) or Projector(s) – as primary and/or secondary display	Flat Panel Display(s) or Projector(s) – as primary and/or secondary display	Flat Panel Display(s) – as near, far end and content display
Interactive Tablet	Interactive Tablet	Interactive Tablet	Interactive Tablet
Resident PC	Resident PC	Resident PC	Resident PC
Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)	Cable Cubby (HDMI cable, USB socket pass-through to PC)
Document Camera	Document Camera	Document Camera	Document Camera
AV Bridge	AV Bridge	AV Bridge	
Boundary Mic	Ceiling Mic	Ceiling Mic	Ceiling Mic
			Student Mic(s)
Lapel Mic(s)	Lapel Mic(s)	Lapel Mic(s)	Lapel Mic(s)
Pressure Mat	Pressure Mat	Pressure Mat	Pressure Mat
Presenter Camera	Presenter Camera	Presenter Camera	Presenter Camera
Web Conference Camera	Web Conference Camera	Web Conference Camera	
Wireless Presentation Gateway	Wireless Presentation Gateway	Wireless Presentation Gateway	Wireless Presentation Gateway
Blu-ray Media Player / TV	Blu-ray Media Player / TV	Blu-ray Media Player / TV	Blu-ray Media Player / TV
Support Camera	Support Camera	Support Camera	Support Camera
Occupancy Sensor	Occupancy Sensor	Occupancy Sensor	Occupancy Sensor

LEC05	CLB01	CLB02	CLB03
		Students Pod PCs	Students Pod PCs
		HD Video Encoders and Decoder	HD Video Encoders and Decoder
iLecture Capture	iLecture Capture	iLecture Capture	iLecture Capture
			Videoconference codec
			VC Tracking Cameras
Auditorium Speakers	Ceiling Speakers	Ceiling Speakers	Ceiling Speakers
Audio Amplifier	Audio Amplifier	Audio Amplifier	Audio Amplifier
Hearing Augmentation (IR or Loop)	Hearing Augmentation	Hearing Augmentation	Hearing Augmentation
Motorised Screens	Motorised Screens	Motorised Screens	Motorised Screens
Motorised Blinds	Motorised Blinds	Motorised Blinds	Motorised Blinds
Power Distribution Unit	Power Distribution Unit	Power Distribution Unit	Power Distribution Unit

Note:

1. The components shaded in grey are optional.
2. The approved make and models for non-core components are provided in the AV Approved Equipment List for Curtin (Audiovisual Standards Part 7 – Resource 3).
3. The bill of materials for AV System Type 4 with options, is provided in the 'All encompassing BOM' spreadsheet (Audiovisual Standards Part 7 – Resource 2).

5.3   CONNECTIONS

5.3.1   CONTROLLER

The standard connections for the AMX NX 1200 controller are shown in **Table 16**.

Table 16: Standard Connections for AMX NX 1200 Controller for AV System Type 4

Standard Connection	Inputs	Controller	Outputs	Standard Connection
	Power +12 V DC	AMX NX 1200	LAN	LAN

				iSmart Camera (older models)
	Host USB		RS232/485	
Occupancy Sensor	Digital I/O 1		RS232 1	
Pressure Mat	Digital I/O 2		IR/Serial 1	
	Digital I/O 3		IR/Serial 2	
	Digital I/O 4			

Note:

1. It is preferred that the displays, motorised screen/blinds, and lighting interface are controlled via IP from the controller. Otherwise with RS232 via the DTP receivers.

5.3.2 AV SWITCHER

The standard connections for the Extron DTP Crosspoint switcher are shown in **Table 17**.

Table 17: Standard Connections for Extron XTP Crosspoint in AV System Type 4

Standard Connection	Inputs	AV Switching	Outputs	Standard Connection
	240 V Power	Extron Crosspoint 1600 (3200)	LAN	LAN
Resident PC	XTP In 1		XTP Out 1	Display 1 – XTP
Document Camera	XTP In 2		XTP Out 2	Display 2 – XTP
Laptop	XTP In 3		XTP Out 3	Display 3 – XTP
Web Conference Camera	XTP In 4		XTP Out 4	AV Bridge
Wireless Presentation Gateway	HDMI In 1		HMDI Out 1	SCHD 1
Video Decoder (or Presenter Camera)	HDMI In 2		HMDI Out 2	SCHD 2

Codec – HTML 1 (or External Camera)	HDMI In 3		HMDI Out 3	Codec (Content)
Codec – HTML 2 (or external HDMI)	HDMI In 4		HMDI Out 4	Codec (iSmart)
	Audio LR In 1		Audio LR Out 1	Source 1 Audio
	Audio LR In 2		Audio LR Out 2	Source 2 Audio
As needed	(HDMI In 5)			
As needed	(HDMI In 6)			
As needed	(XTP In 5)			

5.3.3 AUDIO DSP

The standard connections for the centralised Audio DSP are shown in **Table 18**.

Table 18: Standard Connections for QSYS Core in AV System Type 4

Standard Connection	Inputs	AV Switching	Outputs	Standard Connection
	240 V Power	QSYS Core 250i (500i)	LAN	LAN
Source 1 Audio	Mic/Line 1		Audio LR Out 1	SCHD
Source 2 Audio	Mic/Line 2		Audio LR Out 2	Amp 1
Codec - L	Mic/Line 3		Audio LR Out 3	Amp 2
Codec - R	Mic/Line 4		Audio LR Out 4	Codec

5.3.4 NETWORK

The following network outlets are required in the AVIP joinery (with VLAN and POE where indicated):

1. resident PC (VLAN 396) – alternate
2. touch panel (VLAN 399, POE)
3. QSYS-IO22 (VLAN 399)

4.   PDU (VLAN 399) – if managed.

The following network outlets are required in the Centralised Rack (with VLAN and POE where indicated):

1.   resident PC (VLAN 396)
2.   SCHD (VLAN 396)
3.   wireless presentation gateway (VLAN 397)
4.   controller (VLAN 399)
5.   AV frame (VLAN 399)
6.   QSYS core (VLAN 399)
7.   AV Bridge (VLAN 399)
8.   managed PDU (VLAN 399)
9.   video decoder (VLAN 397, POE)
10. videoconference codec (VLAN 398)
11. FPD/projector 1 (VLAN 399) – alternative using XTP passthrough
12. FPD/projector 2 (VLAN 399) – alternative using XTP passthrough
13. FPD/projector 3 (VLAN 399) – alternative using XTP passthrough
14. amplifier (VLAN 399) – may be multiple units
15. revolabs receiver (VLAN 399) – if required.

The following network outlets are required directly to the following devices where located in the wall or ceiling:

- FPD/projector 1 (VLAN 399) – in preference to serial control

- FPD/projector 2 (VLAN 399) – in preference to serial control

- FPD/projector 3 (VLAN 399) – in preference to serial control

- each motorised screen (AV LAN) – if fitted

- presenter camera (VLAN 399) – if fitted (e.g. iSmart)

- audience camera (VLAN 399) – if fitted

- support camera (Security VLAN 492)

- motorised blinds/curtains – if fitted

- dimmer interface – if fitted.

The following network outlets are required directly to the following devices where located near each student pod computer:

1.   student PC (Public VLAN)
2.   video encoder (VLAN 397, POE).

5.3.5   POWER

For moveable furniture containing AV equipment (AVIP or lectern), a 20 A switched socket outlet is to be installed with internal soft wiring as per *000312 PDG Electrical Services Guidelines*, including a clamp-on switched double socket outlet on the furniture for general purpose use.

For the central rack, a 20 A switched socket outlet with UPS and power conditioning is required.

General purpose power outlets (GPOs) are required near the following components (with location where indicated):

- one dual GPO on the wall near each FPD/Projector and receiver
- one dual GPO on the wall near the motorised screen (if fitted)
- one GPO on the wall near the location for the hearing augmentation transmitter
- one GPO in the ceiling near presenter (iSmart) camera (for optional alternate power)
- one GPO in ceiling near Qsys I/O Frame (if fitted)
- two dual GPOs within each student pod joinery.

5.4   APPROVED OPTIONS

The following options are available for Type 4 systems:

- FPD instead of projector
- videoconference codec and cameras
- student computer connectivity to room display(s)
- motorised projection screen(s).

5.5   VARIANTS

The network switching variant for a Type 4 (denoted as Type 4n) has the differences in specification as outlined in this section.

5.5.1   CORE LAYER

The core layer for a Type 4n AV system consists of the touch panel interface, controller and switching, as shown in **Table 19**.

Table 19: Core Layer for AV System Type 4n

Component	Device
Interface	AMX MST-701
Controller	AMX NX 1200
Switching	Enterprise network

Note:

1. The interface can be replaced with the larger 10" AMX MST-1001 touch panel if required (e.g. CLB03).

2. The controller may be replaced with AMX NX 2200 if relay or more serial ports are required.
3. With regard to switching, a single- or dual-channel encoder is used for each input source to link the corresponding AV stream onto the network. A single- or dual-channel decoder is used to link the AV stream off the network into the display or recording device.

5.5.2   AV SWITCHING

A typical set of encoders and decoders handling the network switching in the Type 4n system is shown in **Table 20**.

Table 20: Typical Encoders and Decoders in AV System Type 4n

Input Device	Encoder	AV Switching	Decoder	Output Device
Resident PC	ENC-PC	Enterprise network	DEC-FPD1	Display 1
Document Camera	ENC-DOC		DEC-FPD2	Display 2
Laptop	ENC-PCG		DEC-FPD3	Display 3
Wireless Presentation Gateway	ENC-WPR		DEC-CAP1	iLecture – HTML 1
Codec – HTML 1	ENC-VC1		DEC-CAP2	iLecture – HTML 2
Codec – HTML 2	ENC-VC2			
Codec – DVI 3	ENC-VC3			
iSmart Camera	ENC-CAM			

5.5.3   AUDIO DSP

The standard connections for the centralised Audio DSP are shown in **Table 21**.

Table 21: Standard Connections for QSYS Core in AV System Type 4n

Standard Connection	Inputs	AV Switching	Outputs	Standard Connection
	240 V Power	QSYS Core 250i (500i)	LAN	LAN

			Audio LR Out 1	SCHD
	Mic/Line 1			
	Mic/Line 2		Audio LR Out 2	Codec
	Mic/Line 3		Audio LR Out 3	
	Mic/Line 4		Audio LR Out 4	

Note:

1. Most audio streams connecting to the DSP are via the Enterprise IP networks rather than audio cabling.

5.5.4   NETWORK

The following network outlets are required in the AVIP joinery (with VLAN and POE where indicated):

1. resident PC (VLAN 396)
2. encoder ENC-PC (VLAN 397, POE)
3. encoder ENC-PCG (VLAN 397, POE), if required
4. encoder ENC-DOC (VLAN 397, POE), if required
5. touch panel (VLAN 399, POE)
6. amplifier (VLAN 399), if required
7. PDU (VLAN 399) – if managed.

The following network outlets are required in the Centralised Rack (with VLAN and POE where indicated):

1. SCHD (VLAN 396), if required
2. decoder DEC-CAP1 (VLAN 397,, POE), if required
3. decoder DEC-CAP2 (VLAN 397, POE), if required
4. wireless presentation gateway (VLAN 397)
5. decoder DEC-WPR (VLAN 397, POE)
6. decoder DEC-CAM (VLAN 397, POE)
7. controller (VLAN 399)
8. QSYS core (VLAN 399), if required
9. managed PDU (VLAN 399)
10. videoconference codec (VLAN 398), if required
11. decoder DEC-VC1 (VLAN 397, POE), if required
12. decoder DEC-VC2 (VLAN 397, POE), if required
13. encoder ENC-VC1 (VLAN 397, POE), if required
14. encoder ENC-VC2 (VLAN 397, POE), if required

15. encoder ENC-VC3 (VLAN 397, POE), if required.

The following network outlets are required directly to the following devices where located in the wall or ceiling:

- FPD/projector 1 (VLAN 399)

- decoder DEC-FPD1 (VLAN 397, POE)

- FPD/projector 2 (VLAN 399) – if fitted

- decoder DEC-FPD2 (VLAN 397, POE) – if fitted

- each motorised screen (AV LAN) – if fitted

- presenter camera (VLAN 399) – if fitted (eg iSmart)

- audience camera (VLAN 399) – if fitted

- support camera (Security VLAN 492)

- motorised blinds/curtains – if fitted

- dimmer interface – if fitted.

5.6   SCHEMATICS

The design schematics for the AV System Type 4 are available as an accompanying document in Audiovisual Standards Part 7 – Resource 1.

6 OTHER SYSTEM TYPES

6.1 INTERACTIVE WALL BOARDS

In this AV system, the control and interactivity is incorporated into the standalone wall board together with videoconferencing and wireless presentation functionality. An example of this technology is the Cisco WebEx Board.

The following room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) use this system type:

- **MET01-IWB** - Small Meeting Space with Interactive Wall Board.

6.2 REFLECTIVE PRACTICE

The reflective practice system consists of one or more cameras and microphones connected to a local device, usually a resident computer, running a video and audio capture application.

The following room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) use this system type:

- **RFP01** – Reflective Practice - Basic
- **RFP02** – Reflective Practice – Monitored.

The system includes the necessary displays, speakers and microphones to be able to monitor a group of reflective practice venues, including providing verbal feedback to the participants, from a control room.

6.3 DIGITAL SIGNAGE

The digital signage system consists of a single or matrix display connected to an AOpen signage media player. The content for the player is managed by the Appspace digital signage system.

The following room configuration packages (see *000314 PDG Audiovisual Guidelines Part 1 – Room and System Standards*) use this system type:

- **DSS01** – Digital Signage.

7   APPENDICES

APPENDIX A: GLOSSARY OF TERMS

Term or Acronym	Definition
AV	Audiovisual
AVIP	Audiovisual Interface Point (aka lectern)
Audiovisual (AV) System	All equipment integrated into the infrastructure necessary to fulfil the intent of communicating audio and/or video content to an audience. It is a set of specified, individual audio and video components designed and configured to operate as one comprehensive system.
Audio	Any audio signal in either analog or digital format
BOM	Bill of Materials
BYOD	Bring Your Own Device, e.g. laptop, tablet, smart phone
CITS	Curtin Information Technology Services
CITS–AV	CITS Audiovisual (project and support team)
CLI	Curtin Learning Institute, Curtin University
DSP	Digital Signal Processing (usually audio)
FPD	flat panel display
Full HD	Full High Definition – a display image resolution of 1920 x 1080 (1080p)
GPO	General Purpose Outlet (240 V power)
HD	High Definition – a display image resolution at least 1080 x 720 (720p)
HDMI	High Definition Multimedia Interface – a proprietary connection used for the delivery of high definition uncompressed digital data over short distances
iLecture	Curtin's lecture capture and online media delivery system
I/O	Input/Output
IP	Internet Protocol
IR	Infrared

LAN	Local Area Network
MATV	Master Antenna Television
PF&D	Properties, Facilities and Development, Curtin University
POE	Power over Ethernet
Presentation Media	The teaching material or meeting documentation
Resident Computer (PC)	A personal computer fitted permanently into the venue as a source of presentation media for display.
RMS	Resource Management Suite – the monitoring and reporting application by AMX
SCHD	Safe Capture High Definition – the venue recording device by Echo 360 linked to Curtin's iLecture system
VC	Videoconference
VLAN	Virtual LAN
USB	Universal Serial Bus – industry standard that defines the cables, connectors and communications protocols for connection between computers and electronic devices
WUXGA	A display image resolution of 1920 x 1200 (widescreen format)
WXGA	A display image resolution of 1366 x 768 (widescreen format)