IT/AV and HDBaseT™ Control Systems
This Changes Everything

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IT/AV and HDBaseT™ Control Systems

- Why we need Control Signals
- Control Signal Options & Examples
- HDBaseT Control Features
- Simple Room Control Example Using HDBaseT
Control Signals

Why do we need them?
AV Control Applications

• Convenient and centralized control
  – Device power
  – Input or output signal switching
  – Audio volume
  – Room attributes
    • Projection screens, Lights, Shades
  – Device monitoring
    • Projector lamp life, Scheduled system-wide power-down, Theft detection
AV Control Applications

AV Switching Distribution Device

Window Screen

PC

Speaker

Projector Screen

Speaker

Audio Amplifier

Control Panel

Keyboard & mouse

Window Screen
Control Signals

Options and Examples
# Control Signal Options

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<td>Ethernet (Internet Protocol over the LAN)</td>
<td>- Wi-Fi (2.4 &amp; 5GHz, 802.11, Ethernet/IP)</td>
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<td>- Bluetooth (UHF 2.4-2.485 GHz)</td>
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<td>- Z-Wave (908.42MHz)</td>
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<td>- ZigBee (802.15.4 standard – low cost, low speed, and low power)</td>
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<td>- Thread (802.15.4 standard, Nest)</td>
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Relays and Contact Closures (switches)

- Low-voltage signal from control device energizes the relay coil

- Coil becomes a magnet to close a contact to complete circuit, energize motor
Relay and Contact Closure Example

Projector Screen Up/Down

120V AC Power

AC Switch

120V Output

AC Relays
Screen Motor
Limit Switches

Control Device

120V Output

Low Voltage Relays
Screen Motor
Limit Switches

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RS-232

• Serial bidirectional communication
  – Typically 3 wires
  – Max distance per standard of ~15m or 50’ – depends on data rate
  – Logic 1 (mark) asserted at -3 to -15V
  – Logic 0 (space) asserted at +3 to +15V

• Each manufacturer’s device has its own protocol and command set

• Implementation
  – AV controller with RS232 output
  – Direct communication using a PC terminal emulation to send discrete ASCII or hexadecimal commands
Serial Command Example
Switching inputs of an audio amplifier

• Typical protocol
  – 9600 Baud rate, 8 data bits, 1 stop bit, No parity

• ASCII Command: 2A1.
  – Switches from Input #1 stereo RCA to Input #2 3.5mm stereo
Serial Command Example
Switching inputs of an audio amplifier

• PC to stereo RCA input #1, Display to stereo 3.5mm input #2
• Control device connected to RS232 input of amplifier
Serial Command Example

Switching inputs of an audio amplifier

- Input # 1 PC stereo RCA to start
Serial Command Example
Switching inputs of an audio amplifier

- Send ASCII command: 2A1.
  - Switches to 3.5mm input connected to display
USB

• Universal Serial Bus
  – Bus for connection, communication, and power between computers and electronic devices
  – Intelligent host-to-device differential signaling over twisted-pair cables

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USB

• Most common AV usage
  – Interactive projectors and whiteboards
Ethernet – TCP/IP Protocol Suite

• Computer network communication
  – Bidirectional serial packet-based transmission of data
  – Implemented over category cable or fiber (or via Wi-Fi)
  – Transmission Control Protocol provides host-to-host connectivity
  – Internet Protocol is responsible for addressing hosts and routing packets across the network

• IP command
  – Created within control software application or web server interface
  – Unique to AV device

• Implementation
  – Typically sent between a computer or AV controller and a device on the network
IP Command Example

Turning on a projector

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Infrared – IR

• Modulated one-way infrared light transmission from transmitter to receiver
  – Light pulse code for each function
  – Light pulses converted to electrical signal pulses at the receiver
• Short range line-of-sight (~10m or 30’)
• Can be affected by bright ambient light
• Inexpensive and simple
• Included in virtually all consumer electronics products and in many professional AV devices
IR Learning

AV Device with IR Learning / Input Port

Light-to-Electrical Binary Code Conversion and Storage

Binary Code for Each Command / Button of the Control Panel

IR Remote Control
IR Control Example

Controlling a Projector

AV Device with IR Learning / Input Port and Learned Control Code

Control Panel

IR Emitter

Projector

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IR Control Example

Controlling an Amplifier

AV Device with IR Learning / Input Port and Learned Control Code

Control Panel

IR Target

IR Receiver

Amplifier

Stereo Speakers

Display with Audio Output

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Radio Frequency – RF

- Typically omni-directional radio transmission from transmitter to receiver
- Short-range radios most used for AV control indoors
  - Wi-Fi - 2.4 & 5GHz, 802.11, 100m or 330’
  - Bluetooth - UHF 2.4-2.485 GHz, typically less than 10m or 33’
- Relatively inexpensive and Wi-Fi is available in most facilities today
- Considerations
  - Affected by (walls and ceilings)
  - Security
  - Bandwidth usage
  - Implementation requires coordination with IT managers
RF Control Example
Powering a Projector
RF Control Example
Selecting Sources

Tablet
IP Command over WiFi
WAP

Network Switch / Gateway

AV Control

Video Sources

Projector

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Bluetooth® Control Example

Powering a Projector

Tablet

IP Command over Bluetooth

AV Control

Video Sources

Projector
Bluetooth® Control Example

Selecting Sources
HDBaseT™ Control Features
HDBaseT™ – Breakthrough Technology

• HDMI® extension on a single category cable
  – Packet-based technology for extending HDMI on category cable up to 100m
  – Marketed and certified by the HDBaseT Alliance
  – Reliable, plug-and-play HDMI extension method
  – IEEE is adopting the HDBaseT spec as IEEE 1911.1

www.hdbaset.org
HDBaseT™ 1.0 – More than AV

Full digital audio
HDMI uncompressed video
100Mb Ethernet channel
Power over HDBaseT (PoH)
Control via RS-232 and IR

Simultaneous transmission of all 5 on a single category cable
End-To-End HDBaseT™ Certified System

HDBaseT Certified Connectivity System

Category Cable Certified Link

Testable
Certified
Plug and Play
Reliable
HDBaseT™ 2.0 – Adds USB

- Full digital audio
- HDMI uncompressed video
- 100Mb Ethernet channel
- Power over HDBaseT (PoH)
- Control via RS-232, IR & USB

Simultaneous transmission of all 6 on a single category cable
Options For Control Over HDBaseT™

• HDBaseT is a wired connection
  – RS-232
  – IR
  – Ethernet (IP)
  – USB
Options for Control Over HDBaseT™

- Serial Transmission
- Ethernet TCP/IP
- IR
Application of IR Control Over HDBaseT™

[Diagram showing IR control setup with HD Media Source (Blu-ray Player), HDBaseT Extender Transmitter, HDBaseT Category Cable Link, HDBaseT Extender Receiver, IR Receiver, and HD Display connected to IR Remote Control in a Home Theater setup.]

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Application of IR Control Over HDBaseT™

- HD Media Source (Blu-ray Player)
- HDBaseT Extender Transmitter
- HDBaseT Category Cable Link
- Amplifier
- Stereo Speakers
- HDBaseT Extender Receiver
- IR Receiver
- IR Remote Control
- HD Display

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Simple Room Control Example Using HDBaseT™
Leviton IT/AV Control Devices

IR Receiver

Autoswitching Wallplate

IR Learn Activation Button

8-Button Panel

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Room Control Example Using HDBaseT™

Control Interface
Leviton 8-Button Control Panel

HDMI Extender Receiver

Learned and Stored
IR Commands for Display

IR Emitter

Laptop

VGA
Audio

RS-232

Autoswitching HDBaseT Extender
2 HDMI, VGA+Audio, IR Learning Port

HD Display

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Room Control Example Using HDBaseT™

- Control Interface: Leviton 8-Button Control Panel
- HDMI Extender Receiver
- Learned and Stored IR Commands for Display
- IR Emitter
- Laptop: VGA, Audio
- Tablet: HDMI
- Autoswitching HDBaseT Extender
  - 2 HDMI, VGA+Audio, IR Learning Port
- HD Display

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Questions?

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