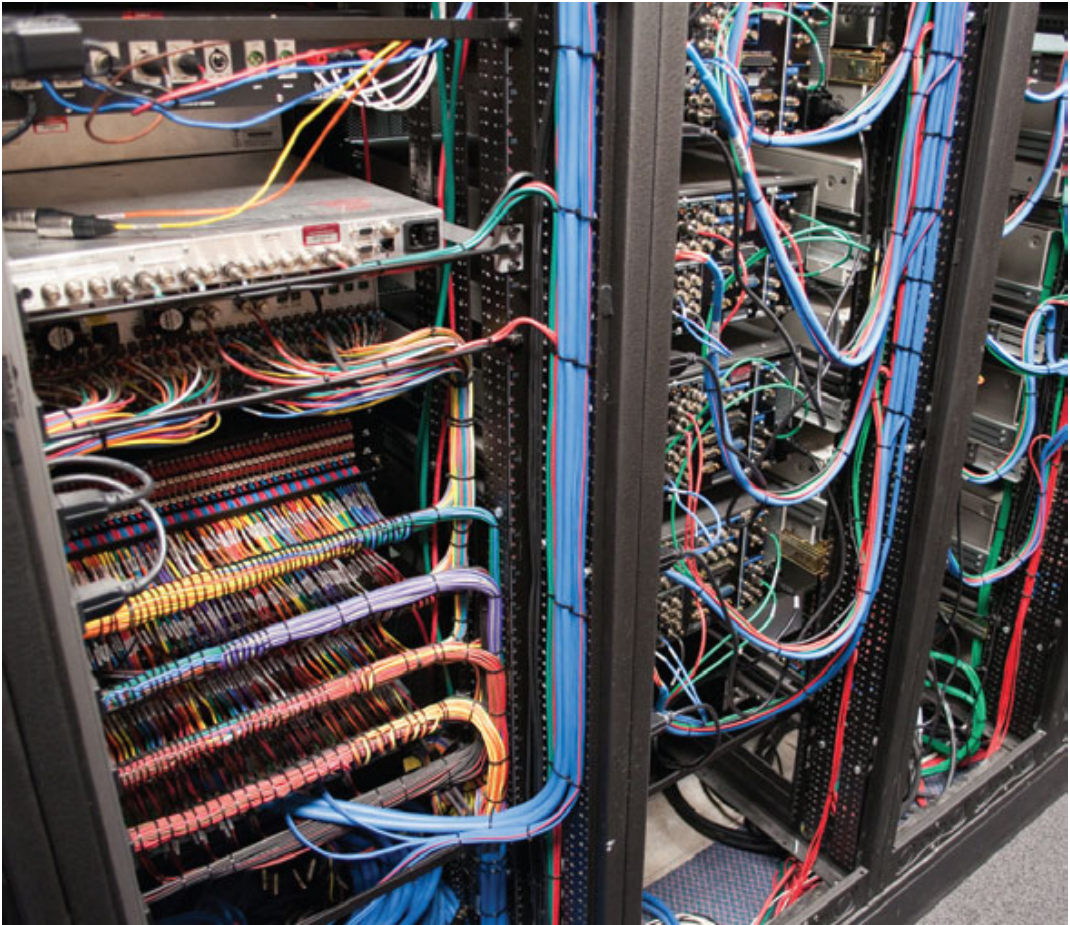
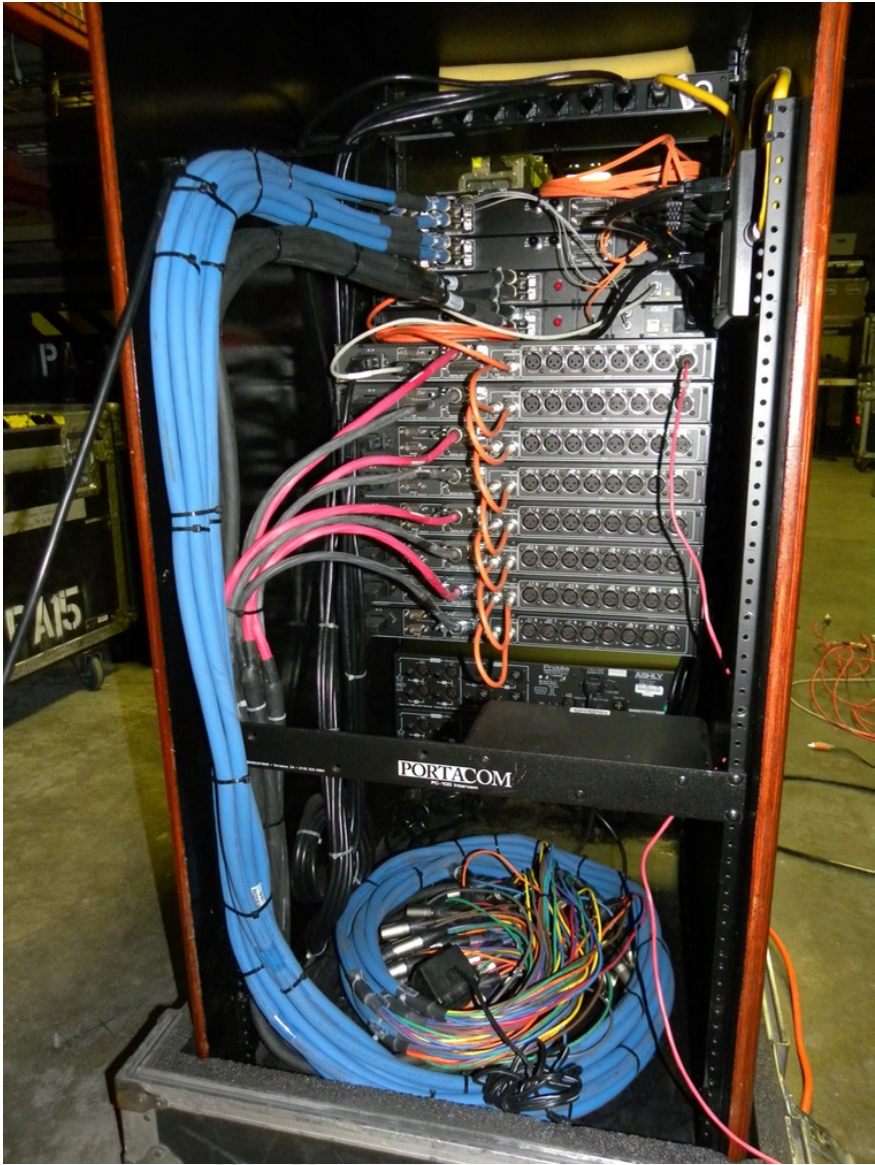




# Not Power, Not Network What Is It?

Eric Wenocur  
Lab Tech Systems  
Olney, MD





# Overview

In addition to power and network...

- Conventional baseband video – analog & digital
- CATV video – analog RF or QAM RF
- Computer and consumer digital video
- Baseband audio – analog & digital
- Wireless audio RF (antenna)
- Control – serial, contact closure, IR, RF
- KVM (dedicated cables or on CAT)





# Baseband & RF Video



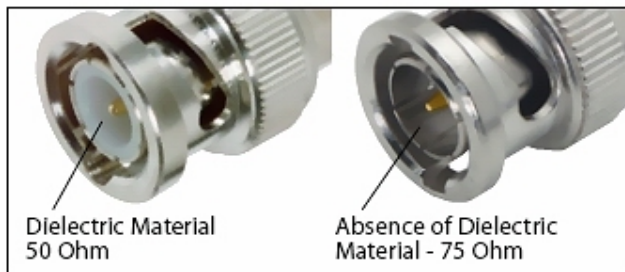
Digital video  
Analog video  
RF (antenna)  
Digital Audio



Coaxial cable  
Center conductor  
Dielectric  
Braid (and sometimes foil) shield  
  
Also comes in Triax (three conductors)



CATV RF  
Analog or QAM



Antennas  
typically

Baseband  
video



Video  
terminator

**Bicsi**



# Computer & Consumer Video



**VGA**

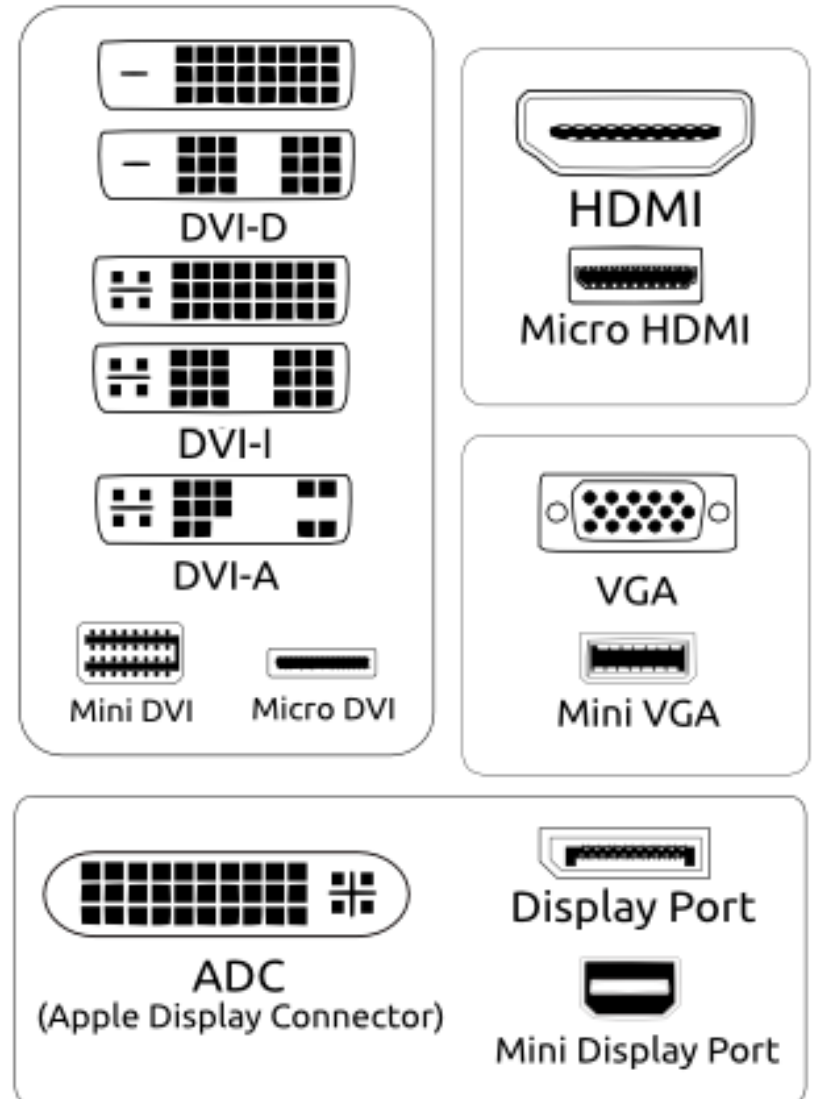
Computer video  
Component video (RGB or YUV)

## DVI

Computer video  
Misc. digital video  
No audio!



## Modern Video Interfaces



# Computer & Consumer Video

## Modern Video Interfaces

Analog (RGB) pins

DVI-A or DVI-I analog pins =  
same signal as VGA

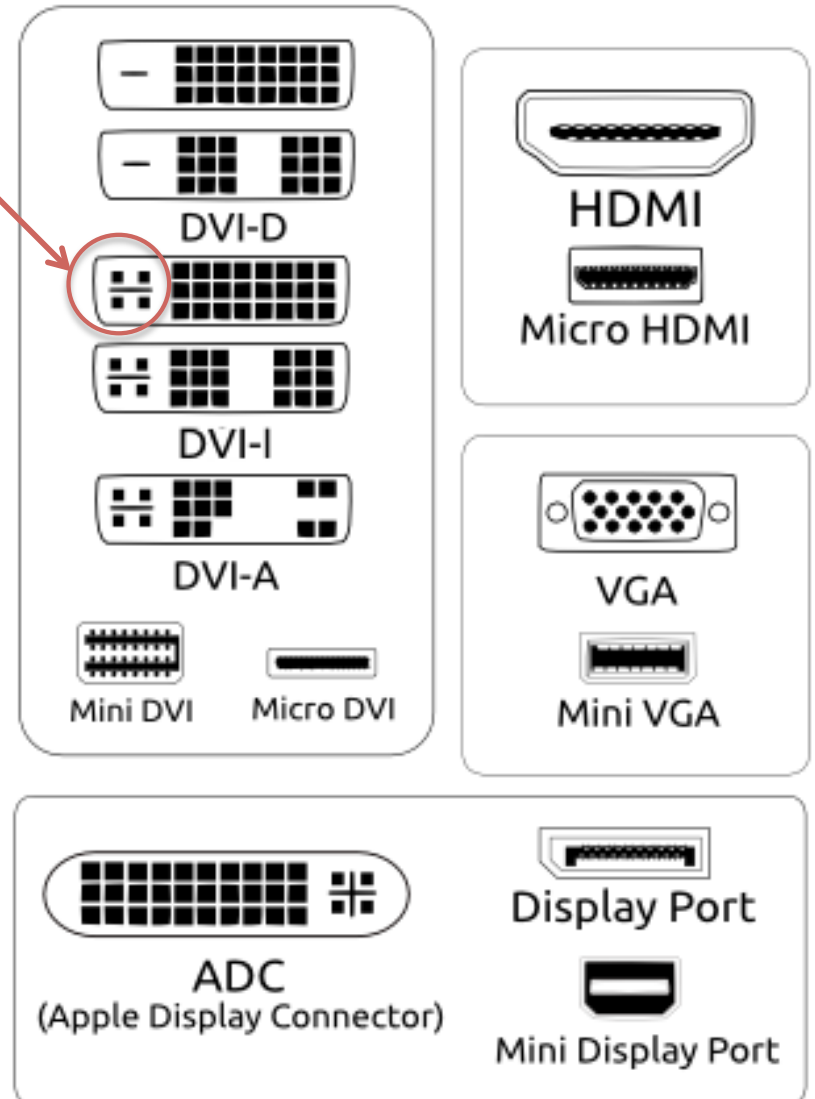
Can adapt to VGA without electronic conversion  
(passive adapter)



VGA Side



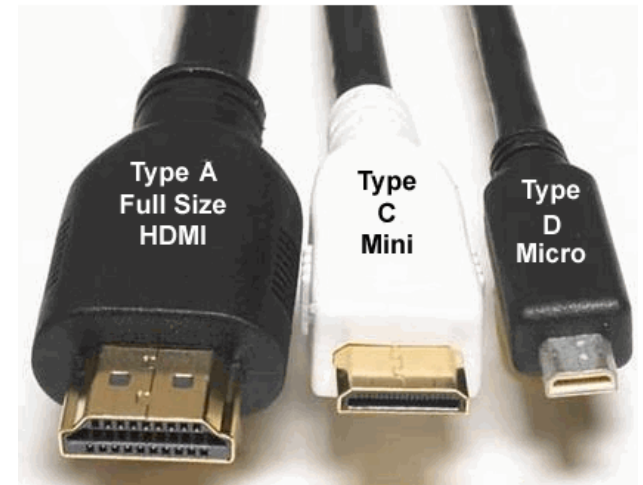
DVI Side



# Computer & Consumer Video



**DisplayPort**  
Computer video & HDTV  
With audio  
Latching connector!



**HDMI**  
Computer video & HDTV  
With audio

Video is generally compatible  
with DVI-D (passive adapter)



**Mini DisplayPort**  
Computer video & HDTV  
With audio

Also used for Thunderbolt

**Connection from any of these to VGA requires  
active D/A conversion, not just an adapter!**



# Audio Connectors



**Stereo Mini (1/8")**  
Unbalanced stereo audio  
Computers & music players  
Misc. signals & uses  
Special versions have more sections

**1/4" Phone (TRS)**  
Balanced pro audio  
Misc. signals & uses



**RCA (Phono)**  
Unbalanced audio  
Misc. signals & uses



**XLR (Canon)**  
Balanced pro audio  
Misc. signals & uses









**Mini XLR (QG)**  
Lavalier mics



**Terminal Block**  
Bal/unbal audio  
Misc. signals & uses

# Audio Connectors

**Simple Chart of Audio Connectors and Signal Levels**

Connector Type	Description	Typical Uses	Operating Levels	Typically Found
<b>XLR</b> (aka Canon)  <i>Note: Usually signal flow follows direction of pins.</i> <i>Note: In most audio applications Pin 1 is ground/shield. Generally do not connect Pin 1 to shell!</i>	3 pins plus shell	Balanced Audio	Mic level	Mics, mixers, preamps
			Line Level (+4)	Pro audio gear Interfaces Pro video gear
<b>TRS Phone Plug</b> (aka 1/4" Stereo Plug) 	Tip/Ring/Sleeve	Balanced Audio	Line Level (+4)	Mixers Pro audio gear
		Headphone	Line / speaker Level	Headphones
<b>TS Phone Plug</b> (aka 1/4" Mono Plug) 	Tip/Sleeve	Unbalanced Audio	Line Level (+4 / -10)	Semi-pro audio gear
		Musical Instruments	Varies	Musical instruments
		Speakers	Speaker Level	PA speakers
<b>Mini Plug</b> (aka mini phone, 1/8" Plug) 	Tip/Ring/Sleeve (or T/S)	Bal or Unbal Audio	Line Level (-10)	Computer audio Audio players Misc. device ins/outs
		Headphone / earpiece	Line / speaker Level	Audio players, earbuds
<b>RCA</b> (aka Phono) 	Center Pin w/ metal surround	Unbalanced Audio	Line Level (-10)	Semi-pro audio gear Computer interfaces Consumer gear
<b>TRS Patch Plug</b> (aka 1/4" or Longframe telephone patch) <i>Note: Although similar, Patch plugs and jacks do not mate well with Phone plugs and jacks.</i>	Tip/Ring/Sleeve	Balanced Audio	Line Level (+4)	Pro (broadcast) patchbays
<b>Bantam Patch Plug</b> (aka Tiny Telephone or TT)	Tip/Ring/Sleeve	Balanced Audio	Line Level (+4)	Pro (broadcast) patchbays
<b>Terminal Block</b>  (aka terminal strip, screw terminals, screw contacts, Phoenix block...)	Screws or screw-down slots	Any	Any	Distribution amps Converters Device ins/outs Misc.

**The connector alone does not indicate the signal type!**



**NOTE:** Some connectors above, particularly XLR, mini plug and terminal blocks, may be used for non-audio applications (such as control or power).

# Audio Connectors?



3-pin XLR  
Balanced pro audio  
DMX lighting control (serial)



5-pin XLR  
Intercom headset  
DMX lighting control (serial)



4-pin XLR  
Intercom headset  
Pro video equip power



# Audio & A/V Cable



Shielded single-pair audio  
Two twisted signal conductors & shield  
Pro analog audio (mic or line level)  
Digital audio  
Control & general purpose



Multi-pair audio (snake)  
Several single-pairs in jacket



A/V Combo  
Coax & audio  
Coax & DC power  
Coax & control



# The Ubiquitous D-Sub!

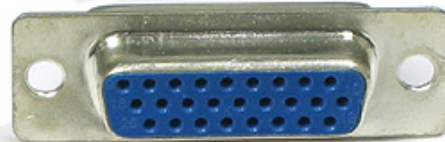
## Subminiature “D” Connector

Dozens of variations, 9 and 25-pin very common  
Available in solder, crimp pins, IDC (flat cable)

**DB-25**  
RS232/422, parallel  
audio, other



**HD-26**  
Various stuff



**HD-15**  
VGA video, other

**DA-15**  
Various stuff



**DE-9**  
RS232/422, other

**DD-50**  
Old SCSI, other



DataPro

**Bicsi**

# The Ubiquitous D-Sub!

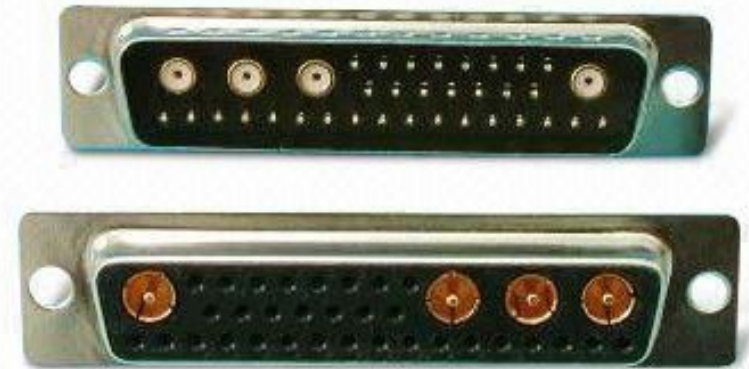
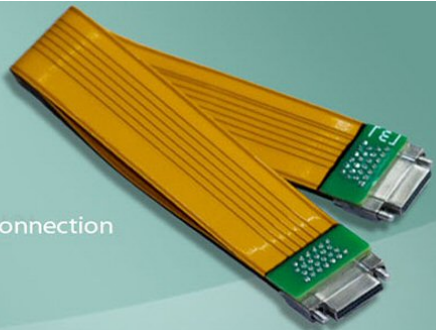
Other interesting configurations...

R06- 9~69 PI/RH

Twist pin contacts, Nano d connector

Contacts: 9, 15, 21, 25, 31, 37, 69 pins

0.635mm contact spacing, high density interconnection



**Bicsi**



# RJ45 & Category Cable

What has happened to the humble RJ45?



Becoming handy choice for  
a variety of signals



# RJ45 & Category Cable

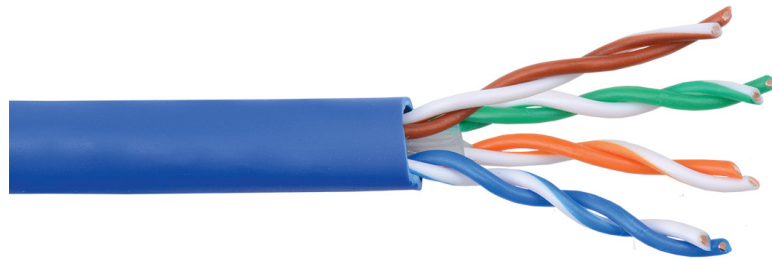
Multiple twisted-pairs useful for many purposes

Twisting minimizes outside interference

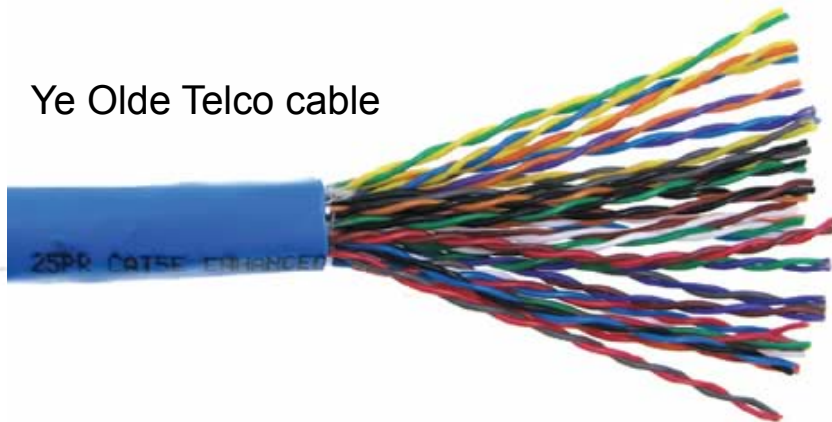
Twisting minimizes crosstalk

Multiplex high bandwidth signals on several pairs

Pairs in one cable used for different functions



Ye Olde Telco cable



Look familiar?



**Bicsi**

# RJ45 & Category Cable

Analog Video & Audio Extension  
Generally passive (balun)





# RJ45 & Category Cable

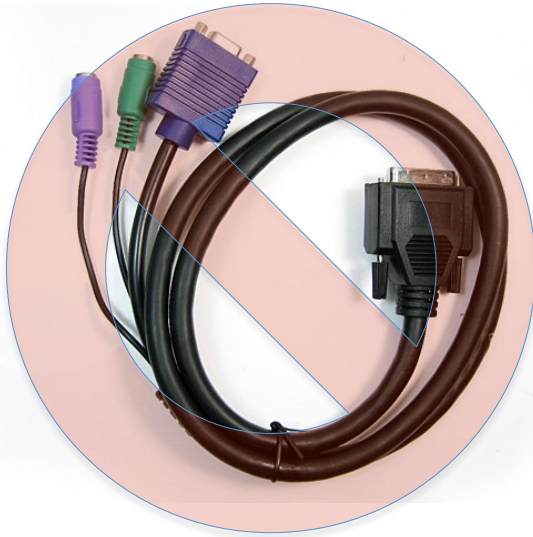


HDMI Video Extension  
TMDS

HDMI Video Extension  
HDBaseT  
Can include control, ethernet, power



# RJ45 & Category Cable



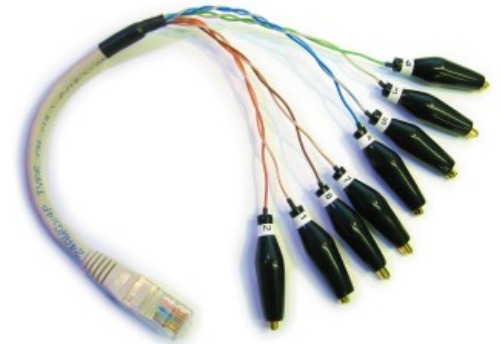
KVM & Peripheral  
Extension



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# RJ45 & Category Cable

Control and Misc. Applications



**Bicsi**



# RJ45 & Category Cable

Ce ne est pas un commutateur de réseau!  
**This is not a network switch!**



# A/V and Broadcast Patching

## Broadcast-style Video Patch Panel



Standard Size Jacks  
Tight but usually accessible by hand



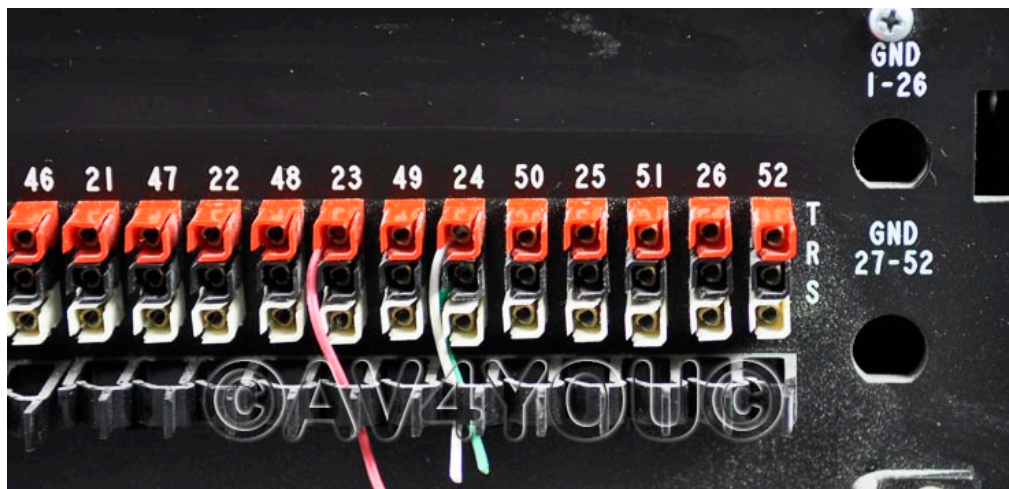
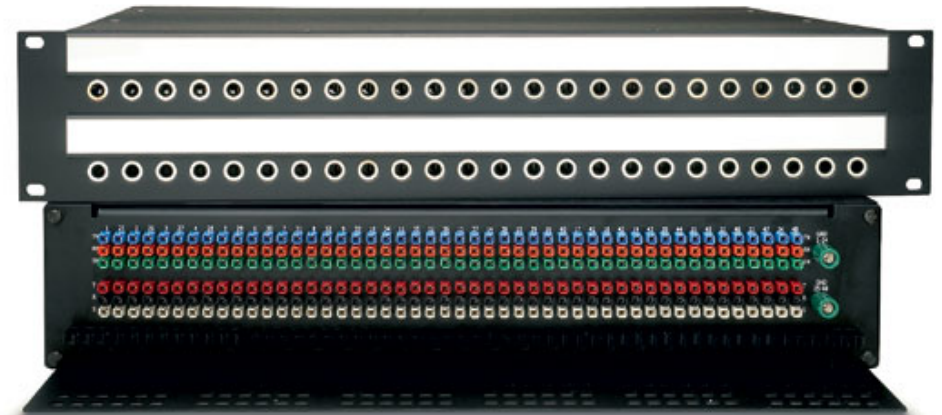
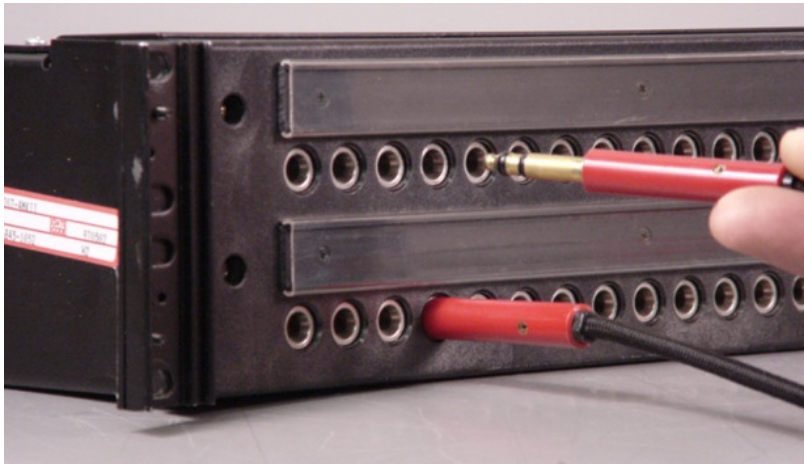
Mid-Size Jacks  
Really need the tool!

**Bicsi**



# A/V and Broadcast Patching

## Broadcast-style Audio Patch Panel



ADC QCP Punchdown  
IDC-type connection  
Tool similar to 66/110 punch

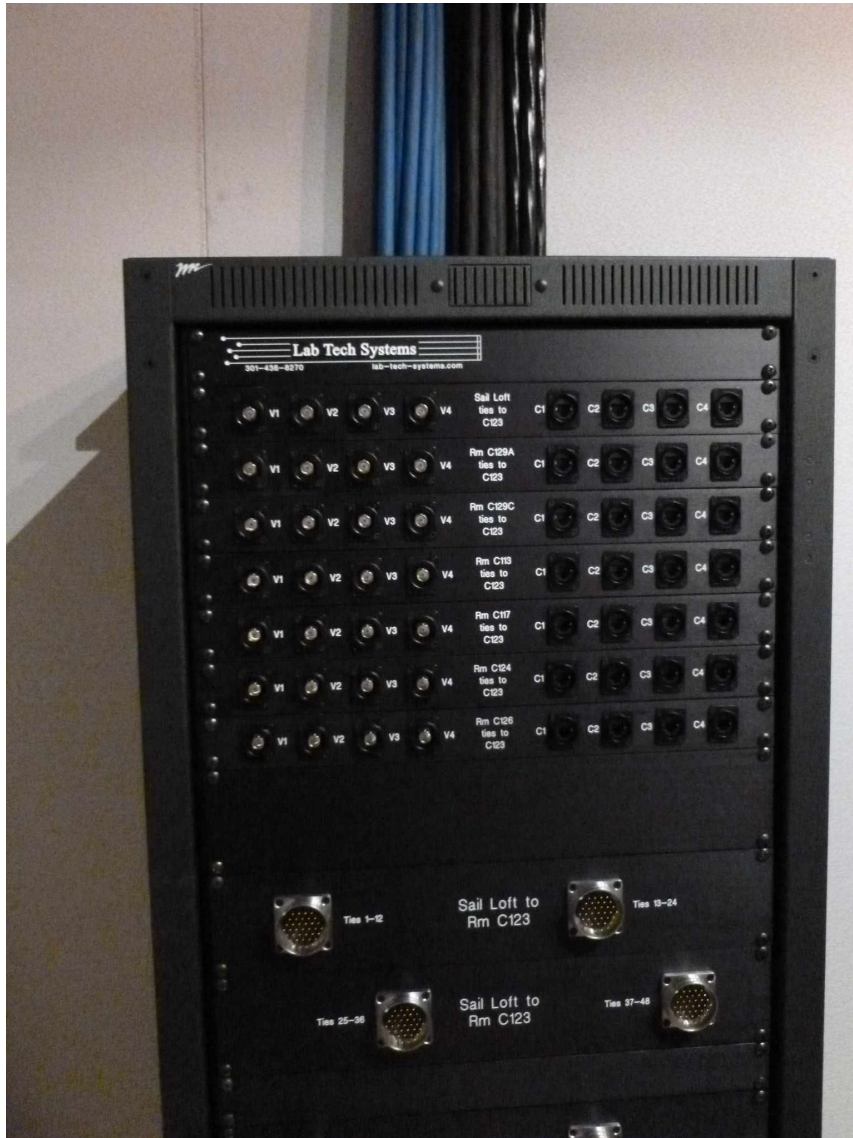


**Bicsi**



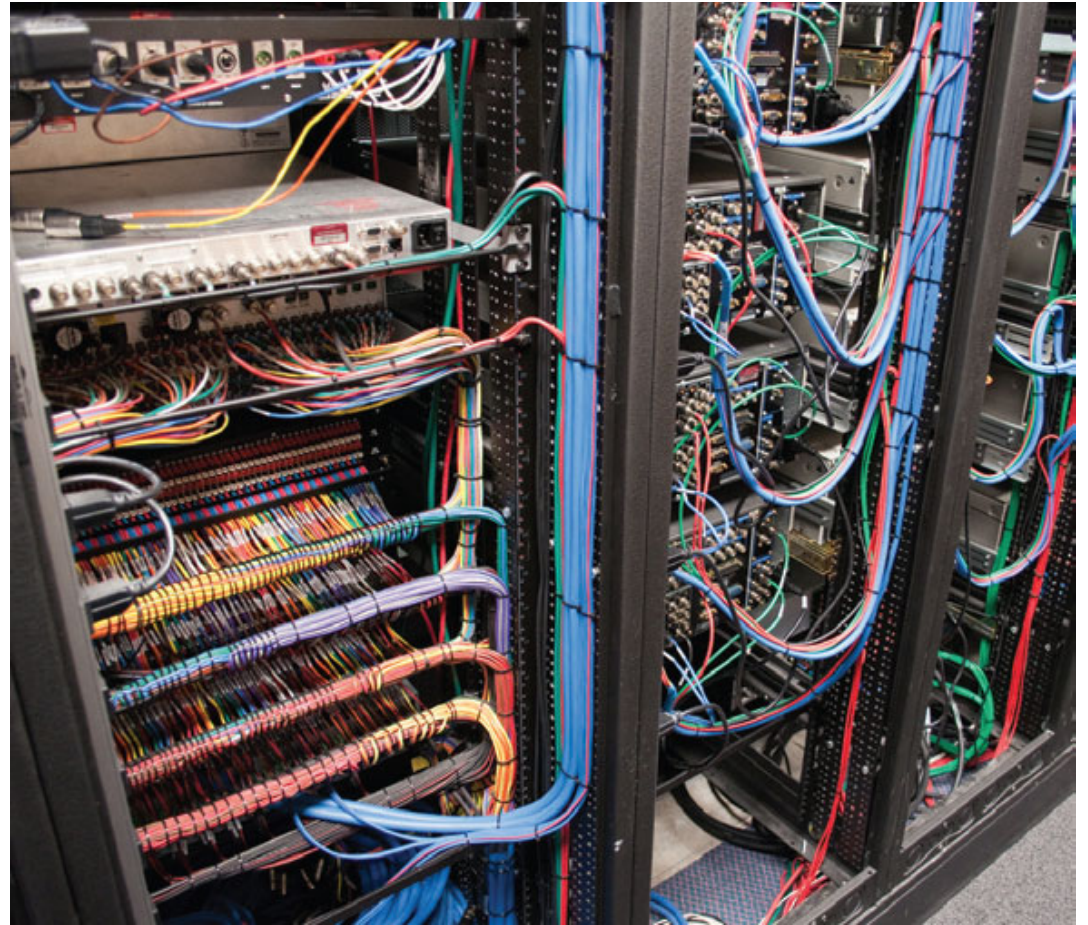
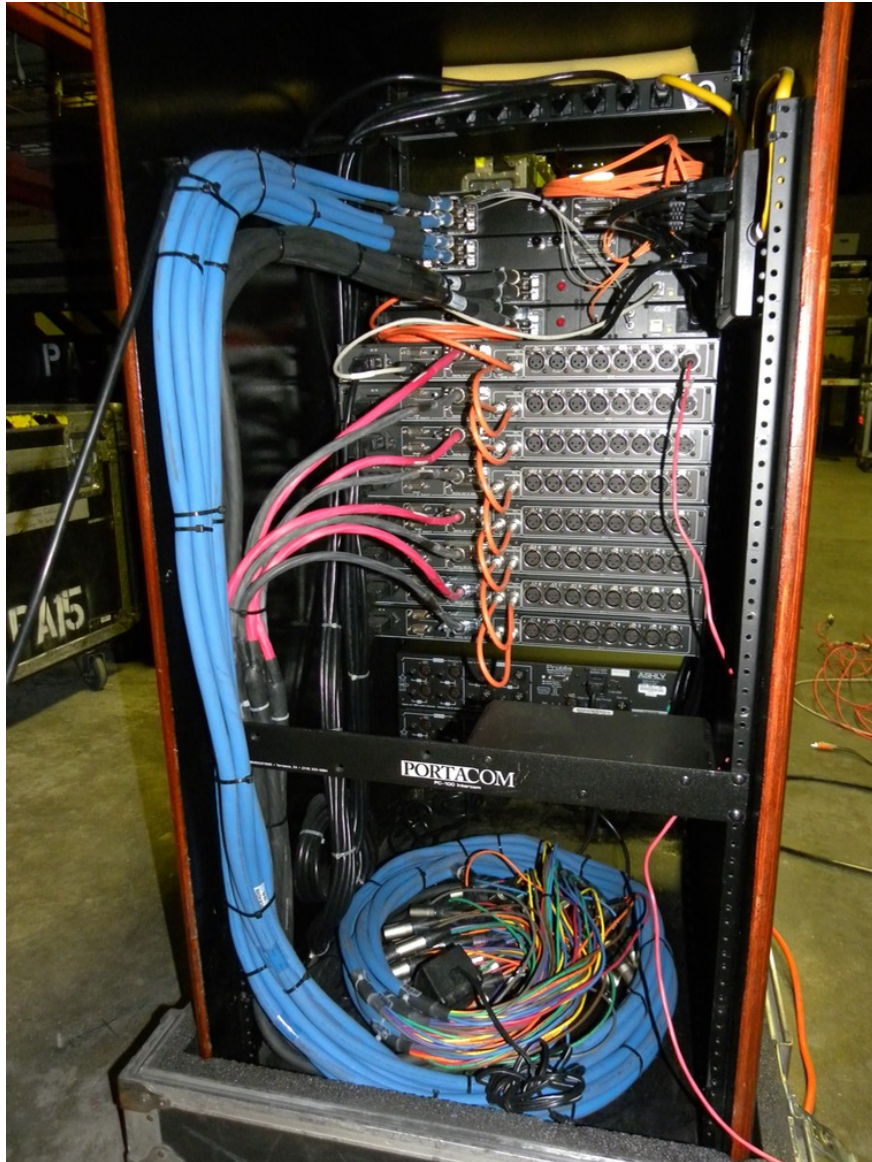
# A/V and Broadcast Patching

## A/V Connector Panel





# A/V and Broadcast Racks



# A/V and Broadcast Racks

- Racks have 10-32 tapped rails or clip-nuts
- Rack slide kits often don't conform to IT
- Equipment typically mounts in front
- Equipment connections always on rear
- Power management usually similar to IT
- Mix of cable and signal types
- Cables labeled—does not rely on jack position
- Variety of termination types/styles



# A/V and Broadcast Racks



**Sometimes it's  
a work of art!**

# Contacts

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