Why Z-Band is “The Right Choice for Quality Video”
Requirements for Quality RF Video

“Quality from Headend to Display ..... In a Building, Campus, or Metropolitan Area”
RF Video System Elements

- **Video Sources**
  - CATV - Direct Feed or Headend (Analog and Digital QAM)
  - Off Air – (Digital ATSC 8VSB – Headend Required)
  - Satellite – 2+GHz (Headend Required)
  - Internally Generated – (IP Camera/Server/Modulator)
  - Digital Signage – (IP Server/Modulator)

- **Backbone Cabling**
  - RG6 Coax – 400’ Maximum
  - RG11 – 600’ Maximum
  - Single-Mode Fiber – SC/APC Connector Required – Distance Depends on Laser Power/Cable/Splice & Connector Loss/Splitter Loss

- **Horizontal Cabling**
  - Coax – Home Run/Trunk & Tap/Amplifiers/Couplers
  - TIA 568 Twisted Pair (UTP) Cat 6 or Better – 100 Meters Maximum

- **Display**
  - HDTV – Direct Connection to Horizontal Cabling (BALUN Required for UTP)
  - Interactive System Computer - Direct Connection to Horizontal Cabling (BALUN Required for UTP)

*“Quality Source – Quality Distribution – Quality Display”*
RF Video Source - CATV

• Raw Feed:
  • May be Analog, SD and/or HD
  • “Premium Channels” are Typically encrypted (Pro idiom or Proprietary)
    • “Premium Channels” may mean all HD Channels or only those Channels that require additional subscription charges ie HBO, Cinemax, etc.
  • Set Top Box typically required at all TV’s for “Premium Channels”
  • Cable Provider must be asked to provide all Analog and Digital Channel Signal levels Flat with the Digital 3 to 6 dBmV less than the Analog.

• Headend:
  • Clear QAM (non-encrypted) is required in order receive on a standard digital TV without a STB
  • Set Top Box, at the Headend, required for each Channel
  • “Premium Channels” may also be HDCP (High Bandwidth Digital Content Protection; commonly called Hi-Def Copy Protection) encrypted at the HDMI output and, if so, they can not be Modulated at the Headend Component
  • Composite, or RGB Output can be Modulated at the Headend; if these Outputs are not available, “Premium Channels” can not be Modulated
**RF Video Source – Off Air**

- **Raw Feed:**
  - May be SD or HD
  - ATSC, 8VSB
  - Digital Signal Levels must be 17 to 20dBmV Flat
    - The Levels of the channels coming off the Antenna/s will vary significantly. Therefore, a raw feed is discouraged in favor of a Headend

- **Headend:**
  - A Transcoder (digital channel processor) is used to establish consistent signal levels for Video Distribution
RF Video Source – Satellite

• Raw Feed:
  • May be SD or HD
    • The channels coming off the Satellite Dish are QPSK (Quadrature Phase Shift Keying) at 2 to 2.4 GHz. Therefore, a raw feed cannot be transported over TIA 568 Cabling
  • All HD Channels are typically Pro Idiom encrypted (Direct TV)

• Headend:
  • Clear digital signal (non-HDCP encrypted) is required in order to Modulate Digital Channels
  • Digital Signal out of headend must have a MER (digital) CCN (analog) Levels within the requirements of the distribution and receiving devices.
  • Either a Satellite Receiver is required for each Channel or the Technicolor Comm 1000 (or similar device) may be used.
  • “Premium Channels” may also be HDCP (High Bandwidth Digital Content Protection; often referred to as HD Copy Protection) encrypted at the HDMI Output and, if so, the HDMI output cannot be Modulated at the Headend
  • Component, Composite, or RF Output can be Modulated at the Headend; if these Outputs are not available, “Premium Channels” cannot be Modulated.
RF Video Source – Combined Headend

- 1x4 Splitter
  - TC
  - TC
  - TC
  - TC
  - 1x4 Combiner

- 1x4 splitter
  - SR
  - SR
  - SR
  - SR
  - QM
  - QM
  - QM
  - QM
  - 1x4 Combiner

- 1x4 splitter
  - STB
  - STB
  - STB
  - STB
  - QM
  - QM
  - QM
  - QM
  - 1x4 Combiner

- 1x3 Combiner

To RF Distribution System
<table>
<thead>
<tr>
<th>City/Municipality</th>
<th>City/Municipality</th>
<th>Channel 1</th>
<th>Channel 2</th>
<th>Call Letters</th>
<th>Network</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Champaign/Urbana</td>
<td>Urbana</td>
<td>27</td>
<td>26</td>
<td>WCCU</td>
<td>Fox</td>
<td>satellite of WRSP-TV ch. 55 Springfield</td>
</tr>
<tr>
<td>Charleston</td>
<td>Charleston</td>
<td>51</td>
<td>50</td>
<td>WEIU-TV</td>
<td>PBS</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>2</td>
<td>12</td>
<td>WBBM-TV</td>
<td>CBS</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>5</td>
<td>29</td>
<td>WMAQ-TV</td>
<td>NBC</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>7</td>
<td>44</td>
<td>WLS-TV</td>
<td>ABC</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>9</td>
<td>19</td>
<td>WGN-TV</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>11</td>
<td>47</td>
<td>WTTW</td>
<td>PBS</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>20</td>
<td>21</td>
<td>WYCC</td>
<td>PBS</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>26</td>
<td>27</td>
<td>WCIU-TV</td>
<td>Ind.</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>32</td>
<td>31</td>
<td>WFLD</td>
<td>Fox</td>
<td>Ind. (1954-1986)</td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>38</td>
<td>43</td>
<td>WCPX-TV</td>
<td>ION</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Chicago</td>
<td>44</td>
<td>45</td>
<td>WSNS-TV</td>
<td>TEL</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>~Gary IN</td>
<td>50</td>
<td>51</td>
<td>WPWR-TV</td>
<td>MNT</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Aurora</td>
<td>60</td>
<td>50</td>
<td>WXFT-DT</td>
<td>TF</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>~Hammond IN</td>
<td>62</td>
<td>36</td>
<td>WJYS</td>
<td>Ind.</td>
<td></td>
</tr>
<tr>
<td>Chicago</td>
<td>Joliet</td>
<td>66</td>
<td>38</td>
<td>WGBO-DT</td>
<td>UNI</td>
<td></td>
</tr>
<tr>
<td>Decatur</td>
<td>Decatur</td>
<td>17</td>
<td>18</td>
<td>WAND</td>
<td>NBC</td>
<td></td>
</tr>
<tr>
<td>Decatur</td>
<td>Decatur</td>
<td>23</td>
<td>22</td>
<td>WBUI</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>LaSalle</td>
<td>LaSalle</td>
<td>35</td>
<td>10</td>
<td>WWTO-TV</td>
<td>TBN</td>
<td></td>
</tr>
<tr>
<td>Macomb</td>
<td>Macomb</td>
<td>22</td>
<td>21</td>
<td>WMEC</td>
<td>PBS</td>
<td>satellite of WSEC ch. 14 Springfield</td>
</tr>
<tr>
<td>Mount Vernon</td>
<td>Mount Vernon</td>
<td>13</td>
<td>21</td>
<td>WPXS</td>
<td>Ind.</td>
<td></td>
</tr>
<tr>
<td>Olney</td>
<td>Olney</td>
<td>16</td>
<td>19</td>
<td>WUSI-TV</td>
<td>PBS</td>
<td>satellite of WSIU-TV ch. 8 Carbondale</td>
</tr>
<tr>
<td>Peoria</td>
<td>Peoria</td>
<td>19</td>
<td>19</td>
<td>WHOI</td>
<td>ABC</td>
<td></td>
</tr>
<tr>
<td>Peoria</td>
<td>Peoria</td>
<td>25</td>
<td>25</td>
<td>WEEK-TV</td>
<td>NBC</td>
<td></td>
</tr>
<tr>
<td>Peoria</td>
<td>Peoria</td>
<td>31</td>
<td>30</td>
<td>WMBD-TV</td>
<td>CBS</td>
<td></td>
</tr>
</tbody>
</table>
RF Video Source Levels to Distribution

RF Signal Levels from the Source should *always* be set as flat as possible.

- **Analog**: 23dBmV, C/N >43
- **Digital**: 17dBmV, MER >36

(Example of levels to Z-Band “CATV IN”)

Copper Distribution Media will attenuate and slope the RF Video Signal Levels

**Signal Power At 100’**
- **Coax**: Frequency vs. Power
- **UTP**: Frequency vs. Power

**Signal Power At 250’**
- **Coax**: Frequency vs. Power
- **UTP**: Frequency vs. Power

**Signal Power At 300’**
- **Coax**: Frequency vs. Power
- **UTP**: Frequency vs. Power
Distribution – Trunk & Tap Coax

Remember...the largest value of drop taps are always used nearest the launch amp.

Know your cable attenuation characteristics so you can maintain control of "till" in the system.

Lowest tap values are always saved for the end of the run. When levels get too low and/or tilt is out of control, then use an auxiliary amp with tilt compensation.

Know you level at this point before attempting to calculate the system drop values!

Ends of each leg MUST be terminated!

3-way splitter here for equal power split. Use of more splits is acceptable if more legs are needed to be fed.

This split leg can be fed with either a splitter (assuming equal signal requirements for each of the two remaining distribution runs) or with a drop tap if the sub run is shorter than the main leg.

Source/s In
Distribution – Coax

Add a Passive Balun function and what do you have?

LYNX

Coax is Difficult to Design/Maintain & Requires On-going Loss Analysis and Manual Adjustments for any Moves/Adds/Changes
What Is the Solution?

**Z-Band Light Fiber Backbone, Intelligent Automatic Gain Technology, and Structured Cabling with Known and Consistant Performance Characteristics**

- TIA 568 – Provides the Structured Cabling Requirements and Limits resulting in Known and Constant Performance Characteristics

- Z-Band Video – Provides the Intelligent Automatic Gain Control (*GigaBUD and GigaBOB*) and *Z-Band Light* to Eliminate Signal Level Slope issues

- The Combination of TIA 568 and Z-Band Video - Provides Simplified Design, Installation and Maintenance with Plug-n-Play Moves/Adds/Changes

“Quality Distribution from Headend to Display ..... In a Building, Campus, or Metropolitan Area”
• **Building Entrance** - The point at which outside cabling enters a building. Often known as the MDF (Main Distribution Frame) and is usually the demarcation point for outside services.

• **Equipment Room** - Storage area for the more expensive, complex equipment, often the existing telecommunications closets. Often known as the IDF (Intermediate Distribution Frame) or the TR (Telecommunications Room) and is the point at which the Backbone Cabling Interfaces to the Horizontal Cabling through Electronic Equipment and Patch Panels.

• **Backbone Cabling** - Cabling (often incorrectly referred to as vertical) that carries the signals from equipment room to equipment room, between floors, and to and from the building entrance connections. May be Fiber or Coax for RF Video.

• **Horizontal Cabling** - Transmission media that carries signals from a same floor equipment room to the various work areas. May be Coax or Twisted Pair for RF Video.

• **Work Area** - Any area where the computer workstations, printers, TV’s, etc. are located, typically Office Space, Patient Room, Guest Room, Classroom, etc.
• **Z-Band Light** – Maintains the Video Signal Quality in the Backbone; from the Source in a MDF to IDF’s in the same or other Building/s.
  • Requires Singlemode Fiber and SC/APC (APC = Angle Polished Connector) connectors and fusion splices to eliminate the modal dispersion of multimode fiber and the back reflection of non-APC connectors and mechanical splices.
  • The Flat Signal Levels from the Source remains Flat to the Fiber Receiver/s in the other Closets and/or Buildings which eliminates the complexity of manual adjustments.
  • Has a 10dB dynamic range for the input from the Source and can adapt to signal level variations of +5dB and -5dB with no disruption of Video Quality.
• Why Singlemode Fiber:

Low Loss and no Modal Dispersion

- Loss >4dB/KM
- Loss >2.5dB/KM
- Loss <.3db/KM

• Why APC Connectors:

Light Bends & Reflects when The Index of Refraction Changes

PC (Physical Contact) Connector provides Less Reflection but Some Signal Distortion Occurs

APC (Angle Polished) Connector Results in any Reflection Going out of the Core to Minimize Signal Distortion
Single-mode Fiber Backbone

“Engineered for Consistent Quality………
In a Building or Throughout a Campus”
Single-mode Fiber Backbone

“Fiber to Every Closet – Ready for Tomorrow”
Single-mode Fiber/Coax Backbone

Main Building

“Single-mode Campus Backbone”
SM Fiber/Coax – Campus Backbone

Building 3

“Single-mode Campus Backbone”
Coax Backbone

“Quality Video to Every Closet”
What does Z-Band Provide?

• High Quality Video Distribution Solutions that are Easy to Design, Easy to Install, Easy to Maintain, and Adjustment Free Plug-n-Play Adds/Moves/Changes

• Fiber Backbone to assure Quality Video to Every Building and/or Closet

• Active, Automatic Gain Technology in the GigaBUD Video Hub to assure Quality Video over a Coax Backbone in or Between Buildings up to 600’ apart

• Active, Automatic Gain Technology in the GigaBOB Intelligent Balun to assure Quality Video to every Display over TIA 568 Category 6 Cable

Quality RF Video .... Source to Display
In a Building, Campus, or Metropolitan Area