

SECTION 27 41 33

CATV CABLING

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

- A. Furnish and install a complete and fully operational Television Signal Distribution System capable of delivering up to 158 video channels (6 MHz NTSC Channels containing NTSC, ATSC and QAM modulated programs) and IP Video over an installed Category 6A unshielded twisted pair cable system. The System shall utilize a cable plant comprised of a TIA/EIA 568 compliant horizontal distribution cable system and a coaxial and/or single mode fiber backbone system. The System shall employ Active Automatic Gain Control Electronics to adjust the video signal levels to each TV and shall be capable of supporting up to 14,000 connected devices. The System shall support bi-directional RF transmission for backbone interconnections. Include amplifiers, power supplies, cables, outlets, attenuators, hubs, baluns, adaptors, transceivers, and other parts necessary for the reception and distribution of the local CATV signals. Back-feed existing campus system. (CAT 5e is acceptable to 117 channels)
- B. Distribute cable channels to TV outlets to permit simple connection of EIA standard Analog/Digital television receivers.
- C. Deliver at outlets monochrome and NTSC color television signals without introducing noticeable effect on picture and color fidelity or sound. Signal levels and performance shall meet or exceed the minimums specified in Part 76 of the FCC Rules and Regulations
- D. Provide reception quality at each outlet equal to or better than that received in the area with individual antennas. Deliver at television outlets a minimum 0 dBmv and maximum of +15 (analog equivalent) dBmv for each channel at each outlet.
- E. Meet FCC requirements regarding low radiation of RF signal.
- F. All active components shall be of solid state design. The system shall be designed to prevent direct pickup of signals from the building structure.
- G. Design and install the system for 24 hours a day continuous operation.
- H. System shall have capability for web-based monitoring program, allowing of equipment; including power status, RF levels, port functionality and balun condition.

1.2 SUBMITTALS

- A. Product Data: Prepare and submit data sheets for each piece of equipment called out in the specifications for review prior to installation. If more than one product is shown on a page, clearly indicate which device is submitted for approval.
- B. Shop Drawings: Prepare and submit for review prior to installation. Include complete system plans showing device layout, routing, wiring, termination, and connection diagrams. Include signal level and loss calculations.
- C. Contract Close-out Submittals:
- D. The Owner shall be provided with as-built drawings, included in the O&M manuals, which shall indicate:
 - 1. Actual cable types and routing.
 - 2. Actual system wiring diagrams, connection diagrams, and interface of components in the system.
 - 3. Levels of each tap used in system and appropriate signal level in dB of each leg off each tap.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Equipment shall be furnished and installed by a certified technician with proven experience in the design and installation of television distribution systems of this type. Installer must be manufacturer Certified. (Certified once per calendar year)
 - 2. Construct the system following good engineering practices and in accordance with applicable codes and safety precautions.
 - 3. Periodically inspect portions of the system installed by other contractors to minimize potential interference problems.
 - 4. Equipment shall be FCC Part 15 compliant.
 - 5. Equipment and supports/accessories shall bear UL label. Where specified equipment is not manufactured with label, arrange on-site review and labeling conforming to those requirements at the expense.
 - 6. Project manager (to be identified at time of install) will be responsible for all aspects of the video system: assuring that all cables, equipment, television signal quality and programming are provided for installation prior to system certification. Scheduling system certification will be the responsibility of the project manager.
- B. Manufacturer Warranty
 - 1. Warrant equipment: Intelligent Powered Baluns and Video Distribution Hubs for a two year period; (2) years from purchase date. The warranty shall conform to the standard manufacturer's backed warranty for each piece of equipment.
 - a. Warranty may be changed to be activated upon install only by contacting the manufacturer to arrange specific terms.
 - 2. Warrant against mechanical or electrical defects except when such defects are caused by misuse.

PART 2 - PRODUCTS

2.1 SUMMARY

- A. The RF High Definition Video Distribution System shall consist of user-configurable and auto-configuring components, which facilitate simple modifications and additions to the System. The System shall support up to 14,000 outlets and allow cascading of units up to four levels deep. Passive and active electronic components of the System shall be FCC certified to operate on a Category 6A cable plant, shall be compliant with "FCC Regulations, Part 15," and shall be UL/CSA listed. Additionally, the components shall be designed with passive circuitry to allow transmission of IP voice, IP data or other low voltage signal types on the pairs of the Category 6A cable which are unused by the System.

2.2 MANUFACTURERS

- A. Z-Band Video Inc.; 848B North Hanover St.; Carlisle, PA 17013
- B. Z-Light single mode fiber: 848B North Hanover St.; Carlisle, PA 17013 I

2.3 PRODUCTS

- A. RF Broadband High Definition Video Distribution Hub in 24 Port and 12 Port configurations
 - 1. Provides a method of distributing up to 158 RF modulated NTSC, ATSC or QAM channels and six sub-channels (T8-T13) over Category 6A (CAT 5e, 177 channels) in a TIA/EIA 568 horizontal cabling infrastructure. The High Definition Video Distribution Hub requires a 23dBmV CATV flat NTSC signal input for optimal performance. The optimum ATSC/QAM input signal level is 17dBmV for (Digital) and 20dBmV (Digital) for cable box applications.
 - 2. The HD Video Distribution Hub shall be self-configuring and plug-and-play so as to easily accommodate adds, moves and changes, and maintains proper signal level and slope to all drops.
 - 3. The HD Video Distribution Hubs shall combine, split, amplify and equalize the signals so as to achieve a high picture quality and to be in compliance with "FCC Regulation, Part 15".
 - 4. The HD Video Distribution Hub shall cascade up to four levels deep in series and accommodate up to 14,000 outlets.
 - 5. The maximum distances between the cascaded "HD GigaBUDs" are: 400' with RG-6 coaxial cable, 600' with RG-11, and 1050' with .500 semi-flex coax. These shall reflect an attenuation budget of 12.5 dB at 240 MHz. Single mode fiber up to 25km may be used to cascade HD Video Distribution Hub
 - 6. Category 6A cables and hardware must have the ability to transport NTSC, ASTC and or QAM signals up to 860 MHz and a distance of 100 meters.
 - 7. All patch cords must match cable plant

8. HD Video Distribution Hubs to have built in fiber receiver option available
- B. Intelligent/Remotely Powered High Definition RF Video Balun in free hang or wall mount style.
1. The Intelligent Powered Balun shall facilitate interactive software control via 10/100 Ethernet (without diplexer) and FSK or DOCSIS (with diplexer)
 2. The Intelligent Powered Balun shall provide an F-Connector for output to a device with a NTSC/ATSC/QAM RF tuner (TV, Cable Box, PC with Tuner Card) labeled "TO TV".
 3. The Intelligent Powered Balun shall provide a Modular Jack to connect to the RJ-45 outlet in the workspace labeled "TO WALL".
 4. The Intelligent Powered Balun shall provide a second Modular Jack for auxiliary services such as 10/100 Ethernet labeled "TO AUX".
 5. The Intelligent Powered Balun shall provide LED distance indicators. (Red-short, Yellow-medium, Orange-long, Orange Green-Extra Long)
- C. Fiber
1. Standard Single Mode Fiber utilizing SC/APC interconnects with a transmitter capable of providing adequate power to transverse the distance between the head end to each building and/or closet as per fiber equipment manufacturer's recommendations.
 2. Fiber Optic Media Convertors: Project shall be assigned a project specific part number, designated by the manufacturer. The fiber design will take into account the number of IDF's that will be fed via fiber. Design is determined by the following criteria:
 - a. Number of IDFs
 - b. Approximate number of channels
 - c. If return path is required from any IDF locations
 - d. Length of runs (if it is a campus wide distribution)
 - e. Future expansion capability
 - f. From this we will determine the size and number of the Fiber TX(s), the number of Fiber RX units and the attenuation values needed for the various pieces.
 - g. Fiber design contact
- Z-Band, Inc
Henry Collins
henryc@z-band.com
717.439.2305
- D. Return Path – DOCSIS / FSK
1. System supports DOCSIS / FSK RF return
 - a. Intelligent powered balun with diplexer required
 - b. Second strand of coax in backbone required (bi-directional cascade)
 - c. Separate point to point fiber transmitter and receiver is needed; and dedicated single mode strand.
- E. System RF Characteristics
1. Input level to RF broadband high definition video distribution hub:
 - a. +23 dBmV flat NTSC

- b. +17 to +20 dBmV flat ATSC or QAM
 - c. +20 dBmV flat QAM for cable box only applications
 2. Output level at RF-45 Outlet 10-100 meters in distance.
 - a. For Analog: 0 to +15 dBmV
 - b. Digital: -10 to +10 dBmV
 - c. Max Slope: 12 dB positive or negative
 3. Composite triple beat (CTB): 50 dB (134 channel loading)
 4. Composite second order (CSO): 51dB (134 channel loading)
 5. Modulation error rate (MER): greater than 32 dB
 6. Carrier to noise (C/N): greater than 43 dB
 7. When specifying the input to the Master Distribution Hub INPUT SIGNAL SHALL BE 23 dBmV FLAT PER ALL NTSC ANALOG CHANNELS; 17 dBmV FLAT/ALL ATSC OR QAM CHANNELS; 20 dBmV FLAT PER ALL QAM CHANNELS WHEN USING A CABLE STB. INITIAL C/N SHALL BE >45 Db
- F. System Power Requirements:
1. HD Video Distribution Hub: 90 to 264 VAC at 47 to 63 HZ at 2 AMPS
 2. Agile Modulator adaptor (8Vdc ½ Watt) remotely self-powered
 3. Intelligent Powered Balun (8Vdc, ½ Watt) remotely self-powered
- G. Environmental
1. Operating Temperature: 0 to 55C
 2. BTU/HR: Approx. 200

2.4 OUTLETS

- A. Provide outlets at each location shown on the plans. Mount in electrical contractor provided 4" square, 2" deep minimum flush electrical boxes as indicated on plans.
- B. Provisions shall be incorporated in the network to prevent 60 Hz AC or DC feedback into the distribution lines.
- C. Outlets shall be designed to cover a frequency range of 5 MHz to 1000 MHz. Insertion loss shall not exceed 1.0 db at any frequency within the designated frequency range for a 17dB isolation network. Outlets shall be back-matched from 5 MHz to 1000 MHz.
- D. The minimum isolation value between any two outlets shall be 24 db.

2.5 DISTRIBUTION DEVICES

- A. Distribution Amplifier
 1. Description: Broadband CATV distribution amplifier.
 2. Specifications:
 - a. Frequency Range: 5 MHz to 1000 MHz.
 - b. Channel Loading: 158.
 - c. Flatness: +/- .75dB.
 - d. Gain: 38dB.
 - e. Output Level: +48dBmV.

- f. Gain Control Range: 20dB.
 - g. Slope Control Range: 0-14 dB.
 - h. Plug in equalizers as needed.
 - i. Attenuator options as needed.
 3. Manufacturer: ACI Multiflex, Blonder-Tongue
- B. Splitters
1. Description: RF signal splitter.
 2. Specifications:
 - a. Frequency Range: 5MHz to 1000MHz.
 - b. Outputs: 2, 4, and 8.
 - c. Splitter Loss: less than 12 dB.
 - d. RFI Shielding: 120dB.
 3. Manufacturer: Scientific Atlanta, Blonder-Tongue
 4. NO TAPS OR SPLITS SHALL BE MADE IN ANY LEG/SECTION OF THE DISTRIBUTION HUB BACKBONE/TRUNK CABLE RUN.
- C. Couplers (not to be used after connector to distribution hub, GigaBUD)
1. Description: Directional Couplers.
 2. For use in Telecomm closets
 3. Specifications:
 - a. Frequency Range: 5MHz to 1000MHz.
 - b. Isolation Tap Value: Varies.
 4. Manufacturer: Scientific Atlanta, Blonder-Tongue
 5. NO TAPS OR SPLITS SHALL BE MADE IN ANY LEG/SECTION OF THE DISTRIBUTION HUB BACKBONE/TRUNK CABLE RUN.
- D. Connectors:
1. Coaxial cable connectors and connector inserts shall be designed to provide maximum performance with the cable to be used. Coaxial cables shall be connectorized with the Headend quality 360 degree F connectors as applicable, meeting or exceeding standard industry and the cable manufacture's specifications. Drop F-connectors shall be equal to or better than LRC model Snap and Seal. F-connectors that have a Hex type crimp will not be allowed.
 2. Hardline connectors shall be 3-piece standard Pin-Type connectors. Line terminators, Housing to Housing and 90 degree connectors shall be manufactured by Gilb
 3. Manufacturer: Gilbert or LRC
- E. Terminator
1. Description: 75-ohm terminator.
 2. Specifications:
 - a. DC blocking.
 - b. Bandwidth: 5 MHz-1000 MHz.
 - c. Return Loss: greater than 16dB.
 - d. Impedance: 75 ohm.
 3. Manufacturer: Gilbert, LRC
- F. Cables
1. Drop Cable: Industry standard (as specified by customer)
 2. Trunk Cable (industry standard as per customer specifications)
 - a. RG11 Cable up to 600 feet

- b. RG6 Cable up to 400 feet
3. Coax Jumper Cable
 - a. F-connector to F-connector RG-59 Black / RG6
 - 1) One per TV location
 - b. Coordinate exact lengths with Owner prior to ordering.
4. Nurse Call Pillow Speaker TV Control Jumper Cable (per customer spec)
5. All cables to be procured by project manager and/or verified that necessary cables have been included in bill of materials for Television Signal Distribution system

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install coaxial cables in continuous lengths except for terminations; no splices are permitted. Avoid sharp bends or other physical distortions in the installation of cable. Cable terminations shall be properly installed with no visible sign of cable braid between cable end and the connector.
- B. Maintain signal integrity. During installation, correct open grounds, broken shields, and other possible causes of poor RF signal quality.
- C. Identify cables terminating at amplifiers or splitters as to function and destination.
- D. Use Snap and Seal type cable connectors on connections, with the appropriate connector for the cable type being used.
- E. Terminate unused ports on splitters, taps, combiners, and amplifiers into 75 ohms with an approved terminator.
- F. Broadband Distribution Hubs and fiber optic transceivers shall be rack mounted.
- G. Free hang Intelligent Powered Baluns shall be mounted to the TV or CPU with Velcro such that they are not visible.

3.2 TESTING

- A. On completion of the system installation, perform the following tests:
 1. Adjust the output signal of the headend launch amplifier and equalization to provide +23 dBmV flat NTSC at the input of the video distribution hubs +17-20dBmV for digital signal.
 2. Perform test for each IDF – random sampling at TV locations residing at short, medium and long runs. Document test results from testing as described above. Testing should be performed and documented prior to final acceptance, training and certification by manufacturer.
 3. Procure all test equipment to perform the CATV system evaluation.

3.3 SYSTEM CERTIFICATION

- A. Product manufacturer recommends project certification. During this time the manufacturer is on site - making sure the system is functioning optimally, as well as using the time to train the responsible parties on the care and feeding of the Distribution System. This is invoiced out as engineering days. The number of days required is determined by a number of factors, such as the size of the project, RF experience of the Installer and the end user, complexity of the system etc. The project manager is charged with determining that all criteria have been met prior to on-site system certification.

- B. Criteria to be met prior to on-site system certification:
 - 1. Equipment racked
 - 2. All cabling/fiber, including cable/fiber jumpers must be installed
 - 3. TVs installed
 - 4. Intelligent Powered Baluns installed at TV locations
 - 5. CATV head end signal is functional and of sufficient quality and at acceptable signal levels

END OF SECTION