

SECTION 27 15 00.71
RADIO ENTERTAINMENT HORIZONTAL CABLING - EXTENSION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the furnishing, complete installation, and connection of extensions to the existing radio entertainment distribution (RED) systems.
- B. Interface the RED extension with the existing systems and distribute the audio signals to all locations as shown on the drawings.
- C. Also, interface the extended RED system with the nurse call system. The interface requires not only a physical connection, but a matching of signals so that all programs may be received by each individual patient via the nurse call pillow microphone/speaker units. The audio interface must be accomplished utilizing solid state switching.

1.2 RELATED WORK

- A. Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS for general requirements that are common to all sections of Division 27.
- B. Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS for raceways, fittings and boxes.

1.3 SYSTEM DESCRIPTION

- A. The extensions are for distribution of "In-House" program sources and for the reception of four "Off-Air" audio programs on four channels.
- B. The system extensions shall be interfaced with the nurse call system so that all programs may be received by each individual patient via the nurse call pillow speaker/microphone units. The audio interface shall be accomplished utilizing solid state switching.

1.4 PERFORMANCE REQUIREMENTS

Sound Reproduction: The intercommunication system shall reproduce at all receiving stations a 30 dB dynamic range of a 40 dB minimum input signal referenced to sound pressure level (SPL) over the frequency range of 100 to 10,000 Hz. The root-mean square (rms) extraneous noise (e.g. hum) level introduced by the radio entertainment distribution system shall be at least 35 B below the nominal signal level. Distortion, including envelope delay, intermodulation, cross talk, and other nonlinear source, shall not exceed 3 percent.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An employee of the installer, certified by National Institute for Certification in Engineering Technologies (NICET) as Audio Systems Level III technician. That employee shall be present at the project site at all times work of this Section is underway.
- B. Listing Requirements: All supplies, materials or equipment shall be listed, labeled, or certified by a nationally recognized testing laboratory to comply with referenced UL Standards.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES and Section 27 05 11, REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS.
 - 1. Submittals shall be marked to show specification reference including the section and paragraph number.
 - 2. Concurrent Review: For Architect-Engineer projects, submit additional three copies of submittals.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings:
 - 1. Include detailed schematics of subsystems, assemblies and subassemblies to component level, clearly presented, and shall be included to determine compliance with drawings and specifications.
 - 2. Wiring and connection diagrams shall be certified by the Contractor performing the work of this Section.
 - 3. Provide power calculations for RED systems extensions connected to existing power amplifiers, and extensions connected to proposed new power amplifiers. Include all speakers connected to the existing systems, systems extensions, and the wattage tap settings associated with each.
- D. Guarantee Period Services: List the entities that will certify the system and who will perform the guarantee period services. The listing shall include a company brochure, and name - title - normal and emergency telephone numbers of the individuals providing the services.
- E. Field Quality Assurance:
 - 1. Test Plan: Submit an illustrated test plan, which, utilizing the test equipment specified in this Part, provides a detailed testing plan to verify that the system meets specified performance standards. Submit the test plan to the Office of Telecommunications (333), prior to pre-testing for evaluation and approval.
 - 2. Submit test reports.
- F. Training Plan: Provide a detailed lesson plan specified in the "TRAINING" Article.
- G. Manuals:
 - 1. Submit, simultaneously with shop drawings, copies of complete operating and maintenance manuals including technical data sheets, schematics, wiring diagrams, and information for ordering replacement parts.
 - a. Wiring diagrams shall have their terminals identified to facilitate installation, operation, and maintenance.
 - b. Wiring diagrams shall indicate internal wiring for each item of equipment and the interconnections between the items of equipment.
 - c. Provide a clear and concise description of the operation which gives, in detail, the information required to properly operate the equipment and system.
 - 2. Two weeks prior to final inspection, deliver four copies of a final updated operating and maintenance manuals to the Resident Engineer.

- a. Include information necessitated by shop drawing approval.
 - b. Include complete "As Installed" wiring and schematic diagrams which shows all items of equipment and their interconnecting wiring.
 - c. Show all terminal identifications.
 - d. Include information for testing, repair, troubleshooting, assembly, disassembly and recommended maintenance intervals.
 - e. Provide a replacement parts list with current prices. Include list of recommended spare parts, tools, and instruments for testing and maintenance purposes.
 - f. Furnish manuals in loose-leaf binder or manufacturer's standard binder.
- H. Test Equipment List: Furnish test equipment required to test the system in accordance with the parameters specified. Unless otherwise stated, the test equipment shall not be considered part of the system. Furnish test equipment of accuracy better than the parameters to be tested. Furnished test equipment shall have calibration traceable to the National Institute of Standards Technology. Submit a list of test equipment as a part of the intercommunication and program system submittal, include, as a minimum, the make and model number of the following types of equipment:
- 1. Sound Pressure Level (SPL) meter
 - 2. Sound Pressure Level Calibrator
 - 3. Random Noise Generator
 - 4. True RMS Voltmeter
 - 5. Audio Amplifier with external speaker

1.7 GUARANTEE PERIOD SERVICES

- A. Furnish and guarantee maintenance service for the system using authorized representatives of the Contractor performing the installation of work of this Section, for a period of one year after acceptance of the installation by the VA.
- B. Maintenance service shall include the following:
 - 1. Monthly preventive maintenance of equipment, minimum. Coordinate time of the maintenance with the VAMC, Chief Engineering Service.
 - 2. Responding to calls within 4 hours of notification of system troubles.
 - 3. Repairing and replacing parts and equipment as necessary to keep the system in optimum operating condition and proper working order.
 - 4. Furnishing tools, test instruments, and parts required.
- C. Work Not Included: Maintenance service shall not include the performance of any work due to improper use, accidents, or negligence for which the Contractor is not directly responsible.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in text by the basic designation only.

- B. National Electrical Contractors Association (NECA) 1-2000, Standard Practices for Good Workmanship in Electrical Contracting (ANSI).
- C. National Fire Protection Association:
(NFPA) 70-2008National Electrical Code.
(NFPA) 99-2005Standard for Health Care Facilities.
- D. Underwriters Laboratories, Inc. (UL):
813-1996 (Rev. 1999)Commercial Audio Equipment.

1.9 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to the job site in manufacturer's original unopened containers, clearly labeled with the manufacturer's name and equipment model identification number.
- B. Storage and Handling: Store and protect equipment in a manner which will preclude damage.

PART 2 - PRODUCTS

2.1 NEW EQUIPMENT

- A. All equipment to be supplied under this specification shall be new and the current model of a standard product of a manufacturer of record. A manufacturer of record shall be defined as a company whose main occupation is the manufacture for sale of the items of equipment supplied.
- B. Manufacturer shall have published and distributed descriptive literature and equipment specifications on each item of equipment offered.

2.2 EQUIPMENT COMPATIBILITY

While individual items of equipment may meet the equipment specifications, and in fact, meet the system specifications when electrically associated with other equipment; the total system shall be designed so that the combination of equipment actually employed does not produce any undesirable effects such as signal distortion, noise pulses, transients, crosstalk interferences.

2.3 EQUIPMENT LIST

ITEM	QUANTITY	UNIT
1.	4	AM/FM Tuners
2.	1	Audio Monitoring Panel
3.	As required	Power Amplifiers
4.	1	Master Power Panel
5.	1	Master Control Clock for turning AC
		Power on and off
6.	As required	Electronic Stepper switches
7.	As required	Speakers Wall/Ceiling
8.	As required	Volume Control-Channel Selectors
9.	As required	Central Equipment Cabinet

2.4 GENERAL EQUIPMENT REQUIREMENTS

- A. Specifications of component equipment as set forth in this specification are minimum specifications, unless otherwise stated, and shall not be construed as limiting the overall quality, quantity or performance characteristic of items furnished in the system. The Contractor shall be responsible for the supply, performance and overall quality of the Contractor Furnished Equipment.
- B. Comply with UL 813.
- C. Service Conditions: Intercommunications equipment shall be capable of operating continuously in the following environmental condition without mechanical or electrical damage or degradation of service:
 - 1. Input Voltage: 120 V RMS \pm 10 percent
 - 2. Input Frequency: 60 Hz
 - 3. Ambient Temperature: Zero to 40 degrees C
 - 4. Humidity: 0 to 80 percent relative, non-condensing.
 - 5. Antennas and their supports shall withstand adverse environmental conditions and 161 km/h (100 mph) winds without damage.
- D. All signaling and communication circuits shall be solid state. The system shall utilize microprocessor components for all signaling and programming circuits and functions. Program memory shall be non-volatile or protected from erasure from power outages for a minimum of five minutes.
- E. All equipment shall be rated for continuous duty.

2.5 SPEAKERS AND ENCLOSURES

- A. Speakers
 - 1. Cone type, 200 mm (8-inch) with 25 mm (1-inch) voice coil and at least 128 g (4.5 ounce) ceramic or 113 g (4 ounce) alnico magnet.
 - 2. Frequency response: not less than 45 to 15,000 Hz, within plus or minus 3 dB.
 - 3. Minimum Dispersion Angle: 100 degrees.
 - 4. Power rating: not less than 10 watts, RMS.
 - 5. Line-matching transformer: Line Transformer: Maximum insertion loss of 0.5 dB, power rating not less than 10 watts, and at least four level taps of 0.5, 1.0, 2.0 and 4.0 watts at the chosen line voltage.
 - 6. Volume Control: Equip each speaker with a means of adjusting the output level over the rated speaker range. This adjustment may be accomplished using taps on the output transformer, or a concealed wire-wound volume control.
- B. Speaker backboxes shall be steel, acoustically dampened, with front face of at least 0.0478-inch (1.2-mm) steel and whole assembly rust proofed and factory primed; complete with mounting assembly and suitable for surface ceiling, flush ceiling, pendant or wall mounting; with relief of back pressure. Provide each speaker installation with an independent safety support in addition to the standard support device attached to the ceiling support system.

- C. Baffles: Minimum thickness of 0.8 mm (0.032-inch) aluminum brushed to a satin sheen and lacquered with textured white finish.

- 1. All corridor speaker baffles shall be ceiling or wall mounted and shall match the color of the adjacent surfaces. Wall mounting is permissible on concrete or plaster ceilings.

2.6 PROGRAM SELECTOR SWITCH AND VOLUME CONTROL STATIONS

- A. Stations shall be factory made assemblies for use with speakers, consisting of program selector switch and volume control.
 - 1. Mount components on a common satin stainless steel wall plate at the factory.
 - 2. Selector switches: For selecting one of the available program channels to the connected speaker(s)
 - a. 5-position selector, each with 2-poles, with a positive stop at each selector position.
 - b. Engraved legend for each position: 1, 2, 3, 4 and OFF.
 - c. A control knob.
 - 3. Volume controls shall be wire wound, continuous rotation type, constant impedance type with control knobs.

2.7 CENTRAL EQUIPMENT

- A. Antennas:
 - 1. AM Antenna: Shall be a ferrite loopstick antenna, or equal, which will be an integral part of the AM/FM receiver.
 - 2. FM Antenna: Shall be an exterior mounted broadband antenna designed to receive VHF FM radio signals. It shall be constructed of rugged, non-corrodible metal, and be designed to withstand 161 km/h (100 MPH) winds with local ice loads.
- B. Central equipment cabinet(s) shall be provided and installed at a location determined by the Resident Engineer. The cabinet(s) shall be of adequate size to handle all amplifiers, power systems and other ancillary equipment indicated.
 - 1. Where free-standing cabinets are indicated, provide 482.6 mm (19-inch) standard modular rack(s), free-standing, multiple sections bolted together, designed for front and rear access, ventilated, with locking doors. Comply with CEA-310-E. Finish cabinet with corrosion resistant primer, suitable for field painting.
 - 2. Where wall-mounted cabinets are indicated, provide 482.6 mm (19-inch) standard modular rack(s), designed for front and rear access using full-height heavy-duty hinges, ventilated, with locking doors. Comply with CEA-310-E. Finish cabinet with corrosion resistant primer, suitable for field painting.
 - 3. Equip each cabinet with a low noise exhaust fan at the top of each cabinet, with an intake filter/louver in the bottom of the rack. The fan motor shall operate from a branch circuit separate from power provided for equipment mounted in the cabinet and shall be thermostatically controlled to run when the temperature at the fan location is above 35 degrees C.

4. Power to equipment mounted in the cabinet shall be from a full-height 120 V power strip with 15 A, NEMA 5-15R receptacles. The strip power shall be protected by a surge protective device meeting UL 1449, and shall be controlled by an illuminated on-off switch.
- C. Backup Power: Provide an uninterruptible power supply (UPS), UL 1778 listed, with a capacity of at least 130 percent of the connected load, including the exhaust fan.
1. Provide sealed nickel-cadmium battery that supplies power to the intercommunications system through an automatic electronic switch when normal power fails, for a period of not less than 15 minutes at rated output in the all-call mode. The transfer time shall not be more than 4.2 milliseconds. On-battery output voltage shall be 115 VAC, plus or minus 5 percent. The UPS shall use sealed, maintenance free type batteries that have a service life of at least three years. The batteries shall always be powered from a constant voltage or "float type" battery charger. Recharge time to 90 percent capacity after discharge to 50 percent capacity shall not exceed 10 hours. UPS visual indicators on the UPS front panel shall indicate on-line operation, output overload, low battery, and replace battery.
- D. Monitor Panel: Install in the upper portion of the central equipment cabinet, it shall include:
1. A monitor speaker with a permanent magnet, 76 mm (3 inch) minimum diameter and a monitor volume control.
 2. An easy to read VU meter with illuminated scale and VU meter calibrating control.
 3. A channel selector switch with six positions: Off, (1, 2, 3, 4, and 5) which shall connect the monitor speaker and VU meter to the selected channel.
- E. AM/FM Tuners:
1. Tuning Range
 - a. AM: 540-1600 KHz
 - b. FM: 88-108 MHz
 2. Frequency Response
 - a. AM: 50-5,000 Hz plus or minus 1 dB
 - b. FM: 50-10,000 Hz plus or minus 1 dB
 3. Selectivity
 - a. AM: 30 dB or higher
 - b. FM: 60 dB or higher
 4. Sensitivity
 - a. AM: 200 Microvolts for 20 dB S/N Ratio
 - b. FM: 2.0 Microvolts or lower
 5. Signal-to-Noise
 - a. AM: 40 dB or higher
 - b. FM: 60 dB or higher
 6. Bandwidth
 - a. AM: 7.5 KHz

- b. FM: 400 KHz
- 7. Rated Output: 1.5 Volts RMS minimum at full gain.
- 8. Distortion: FM less than 1 percent at rated output.
- 9. On-off switch with pilot light.
- 10. AM-FM selector switch.
- 11. Digital tuning control and readout.
- 12. Gain control, if not on preamplifier.
- 13. Audio jacks, microphone input and audio tape deck input.
- 14. Antenna terminal strip.
- 15. Automatic frequency control with cut-off switch.
- 16. Shall supply signals to the associated power amplifier at low level, high impedance.
- F. Power Amplifiers:
 - 1. Frequency Response: A minimum of 45 to 15,000 Hz plus or minus 1 dB.
 - 2. Maximum Hum and Noise: 80 dB Below Rated Output
 - 3. Rated Output: Minimum of 125 percent of power consumed by associated speakers.
 - 4. Input for Rated Output: 1.0 Volts.
 - 5. Total Harmonic Distortion (THD): 0.5 percent maximum at rated output.
 - 6. Output Level: 25 and 70 or 100 volt options on the power amplifier. Speaker output lines shall be for NFPA 70 Class 2 or Class 3 cable.
 - 7. Regulation: yes
 - 8. "ON" - "OFF" switch with pilot light.
 - 9. Master gain control or input level adjustment.
 - 10. AC input and audio output overload circuit protection.
 - 11. Operate from an input voltage of 105 to 130 volts.
- G. Master Control Clock: Digital readout and quartz crystal controlled time clock. Mounted in the central equipment cabinet to energize and de-energize the master AC power control strip. Comply with UL 917.
 - 1. Contact rating of 30 A, inductive or resistive.
 - 2. Two ON set points and two OFF set points for each day of the week.
 - 3. Shall have a battery backup to maintain normal operation in the event of an AC power failure for a minimum of three days.
 - 4. Shall have an external audible alarm function to annunciate an AC power failure.

2.8 WIRE AND CABLE

- A. 300 V, jacketed, twisted pair and twisted multipair, unshielded, stranded copper, UL listed for use in Class 2 and Class 3 control circuits. Minimum size: 18 AWG.
 - 1. NFPA 70 Type CMG, comply with UL 1581 flame resistance test.
 - 2. NFPA 70, Type CMP, comply with NFPA 262 flame resistance test.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment according to NFPA 70, accepted industry standards of good practice, the requirements of this specification, and in a manner which does not constitute a safety hazard.
 - 1. Comply with NECA 1.
- B. The Contractor shall insure that all installation personnel understand all the requirements of this specification.
- C. Install suitable filters, traps, and pads for minimizing interference and for balancing the amplifiers and distribution system.
- D. Connect all passive equipment according to the manufacturer's specification to insure correct termination, isolation impedance match, and signal level balance at each outlet.
- C. Identification: Color-code conductors and apply wire and cable marking to designate wires and cables in coordination with system wiring diagrams.

3.2 GROUNDING

Ground installed equipment in accordance with the Section 27 05 26, GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS to eliminate all shock hazards and to minimize all ground loops, common mode returns, noise pickup, crosstalk, or other interferences.

3.3 SYSTEM WIRING

- A. Install cabling in raceway except within instruments, cabinets, counters and desks. Conceal raceway and cables, except in unfinished spaces.
 - 1. Speaker cable in raceway shall be NFPA Type CMG.
 - 2. Speaker cable in cable tray in environmental air spaces, including plenum ceiling spaces, shall be NFPA Type CMP.
- B. Raceway and boxes shall be as specified in Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS. Exception, where raceway has not been provided for designated drops to rooms.
- C. Install cabling within enclosures by bundling, lacing and training to terminal points without exceeding manufacturer's limitation on bending radii. Provide and use lacing bars and distribution spools.
- D. Install grommets/bushings to protect cabling penetrating through counter or wall openings.
- E. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at outlets and terminal strips. Cables may not be spliced.
- F. Cold-weather installation: Bring cable to room temperature before dereeling. Heat lamps may not be used.

3.4 SEPARATION OF WIRES AND CABLES

- A. Separate speaker-microphone, line-level, speaker level, and power wiring runs. Install in separate raceways or, where in the same enclosure, separate conductors at least 300 mm (12-inches) for speaker-microphones, adjacent parallel power, and telephone wiring. Separate other intercommunications equipment conductors as recommended by equipment manufacturer.

1. Install all Radio Entertainment horizontal cabling in separate conduits and signal ducts. Exception: cabling may be installed in partitioned cable tray with MATV cables, provided, that upon request, permission is granted in writing by the Resident Engineer.

3.5 FIELD QUALITY ASSURANCE

A. System Pre-test:

1. Upon completing installation of the entire system align and balance the system and perform complete system pre-testing. After pre-testing and only after pre-testing, the system shall be formally tested in the presence of a Government representative.
2. During the system pre-test, verify that the system is installed properly, is fully operational, and meets all the system performance requirements of the specification.

B. Acceptance Testing:

1. Notify the Resident Engineer in writing seven days after the pre-test has been completed and 30 days prior to the date acceptance testing is expected to begin. Test system in the presence of a Government Representative. Verify that the total system meets all of the requirements of the specification and complies with all appropriate standards listed in this specification.
2. Perform an operational system test, and demonstrate proper routing and volume levels, and that the system is free of noise and distortion. Test every available message path from each station on the system.
3. Perform frequency response test of the transmission paths by transmitting and recording audio tones. Minimum acceptable performance is within 3 dB from 150 to 2500 Hz.
4. Perform signal-to-noise test:
 - a. Measure signal-to-noise ratio of complete system at normal gain settings in the all-call mode. Disconnect speaker-microphone at master station, and replace it with a signal generator using a 1000-Hz signal. Measure the signal-to-noise ratio at four speakers selected by the Government Representative.
 - b. Repeat the test with the master station in the intercommunications mode, at four staff stations selected by the Government representative.
 - c. Minimum acceptable ratio is 35 dB.
5. Distortion test: Measure distortion at normal gain settings and rated power. Feed signals a frequencies of 150, 200, 400, 1000, and 2500 Hz into all-call amplifier, and into intercommunication amplifier. For each frequency, measure distortion at the amplifier outputs. Maximum acceptable distortion at any frequency is 5 percent total harmonics.
6. Power output test: Measure electrical power output of all-call amplifier at normal gain setting, at 150, 1000, and 2500 Hz. Maximum variation in power output at these frequencies is plus or minus 3 dB.

3.6 TRAINING

- A. Furnish the services of a factory-trained engineer or technician for four, eight-hour periods to instruct VA Medical Center maintenance personnel. Instruction shall include corrective and preventive maintenance of

the intercommunications equipment. Training will be scheduled at the convenience of the VAMC, Chief Engineering Service at any time during the guarantee-period services.

- B. Also, furnish the services of a representative of the intercommunication manufacturer, familiar with the functions and operation of the equipment, for two, eight-hour periods to train personnel. Instructions shall be provided for staff personnel in each area where the new system is installed under this contract. When multiple areas are involved, classes will be grouped. Periods of training shall be coordinated with the Medical Center to ensure all shifts receive the required training. Each session shall include instructions utilizing "hands-on" operation of the intercommunication equipment.

- - - E N D - - -