

Engineering News



ALTEC Lansing Corporation 1515 S. Manchester Avenue, Anaheim, California
A SUBSIDIARY OF LING-TEMCO-VOUGHT, INC.

Technical Letter No. 134

TYPICAL SPECIFICATIONS For ALTEC LANSING VOICE WARNING SYSTEM

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SYSTEM GENERAL:

Provide and install a complete "Voice Warning System" together with all other apparatus, conduit, wire, outlet boxes, poles, remote equipment, houses, hardware, material and labor necessary to provide a complete system performing all of the services and functions described herein. The system shall be designed to propagate the desired audio signals and maintain a S.P.L. of 85 db at the distance of 900 feet in any horizontal direction, from each remote multicellular horn/speaker cluster. The government shall furnish the building for the central control equipment; all other equipment, apparatus, and buildings shall be supplied by the contractor and this system shall be completely installed so as to be totally independent of all existing facilities.

1: FUNCTIONS:

- 1.1 Provisions for sounding missile attack and/or disaster signals from central control.
- 1.2 Provisions for sounding fire alarm from central control.
- 1.3 Provisions for sounding all-clear signals from central control.
- 1.4 Paging announce microphone for voice announcements from central control.
- 1.5 Provisions for input from telephone lines and/or line at central control.
- 1.6 Provisions for reproduction of tape recordings at central control.
- 1.7 Provisions for instantaneous activation of all remote speaker/amplifiers from central control with a single switch (no warm-up-time delay will be acceptable).
- 1.8 Provisions for central control to have absolute priority over any remote inputs, such as automatic dial telephone input to central control.
- 1.9 Provisions for an independent line (pair) shall be installed from central control to each remote speaker/amplifier station for voice and/or signal announcements.
- 1.10 Provisions for an independent line (pair) from central control to each remote speaker/amplifier station to activate the remote station and test the remote station.
- 1.12 Provisions for automatic "Fail-Safe" operation of the central control. (A failure of any one component shall not prevent voice announcements from being broadcast, via all remote lines, to all remote stations). No mechanical or relay devices will be acceptable to perform this function.
- 1.13 Provisions for automatic "Fail-Safe" operation of each remote speaker/amplifier station. (A failure of any one component shall not prevent voice announcements being broadcast over the area of 360 degrees that the remote speaker/amplifier station is responsible for). No mechanical or relay devices shall be acceptable to perform this function.
- 1.14 Provisions for the Voice Warning System to provide for contact by central control for testing by means of visual monitoring each remote speaker/amplifier station without affecting any other remote speaker/amplifier station.
- 1.15 Provisions for this Voice Warning System to provide for contact by central control for signal or voice announce to any one of the six (6) zones without affecting the other zones.
- 1.16 Provisions for this Voice Warning System to provide for contact by central control for signal or voice announce to all zones and to all remote amplifier/speaker stations by the operator keying one switch.

2: EQUIPMENT GENERAL:

In order to provide for the performance of the above functions and services, the following equipment shall be provided:

- 2.1 The contractor shall furnish and install poles, wooden or metal, which will meet or exceed standard practices and provide a safe and rigid mounting for multicellular horns and drivers. All of these horns and driver clusters shall be mounted sixty (60) feet above the surface of the earth at the locations described on the area map or desired locations shall be selected and allocated by the government. A soil test shall be made of the land and the pole structure shall be approved by a licensed structural engineer.
- 2.2 The contractor shall furnish and install weatherproof structures, one at the base of each remote speaker pole (described in section 2.1) which shall provide adequate space in which to house, ventilate, and protect the rack of amplifiers and other equipment necessary to supply the proper audio power and control equipment to drive the speaker cluster (described in section 3.26).

- 2.3 The contractor shall furnish and install all wire, conduit, boxes, and protection devices to supply 115-volt, 60-cycle AC to each remote amplifier/speaker structure. (The AC supply source shall be furnished by the government).
- 2.4 The contractor shall furnish and install forty-three (43) remote speaker/amplifier stations (described in detail in section 4 of these specifications) which shall be designated as "Type A" remote amplifier/speaker stations.
- 2.5 The contractor shall furnish and install two (2) remote speaker/amplifier stations (described in detail in section 4 of these specifications) which shall be designated as "Type B" remote amplifier/speaker stations.
- 2.6 The contractor shall furnish and install one (1) central control facility which shall include, and perform, in console form (turret and pedestal) all of the functions described in section 1. (The building and AC power source for the central control shall be provided by the government) (Refer to section 5 of these specifications for details of the control facility).
- 2.7 The contractor shall furnish and install, at central control, two (2) microphones (described in section 3.3).
- 2.8 The contractor shall furnish and install, at central control, two (2) compressor type amplifiers (described in section 3.27).
- 2.9 The contractor shall furnish and install, at central control, a cartridge type magnetic tape machine (described in section 3.4).
- 2.10 The contractor shall furnish and install, at central control, a tone generator capable of producing three (3) distinct types of tones; the contractor shall also supply three (3) locking type keys to activate the generator (described in section 3.9).
- 2.11 The contractor shall furnish and install, at central control, a spring return type key switch (section 3.10) for each remote station. When each key switch is placed in the "On" position, it shall provide the facility whereby central control shall be able to visually determine the proper or improper operation of each remote station. Four (4) switch panels (section 3.10), signifying forty five (45) remote amplifier/speaker stations, shall contain the switches for all remote stations in all zones and shall be numbered to identify the remote station controlled by each switch. The unit thus described shall be referred to as the "Test Facility" (described in sections 5.13 and following) and shall utilize a meter so that central control may visually monitor each remote station to ascertain the quality of operation.
- 2.12 The contractor shall furnish and install, at central control, a switch panel which shall be called "Zone Control." This panel will be installed in such a manner that it will not disturb the test facility switches, but will provide a means of signaling or announcing to the desired zone.
- 2.13 The contractor shall furnish and install, at central control, one (1) switch which shall provide priority over the entire system and shall permit signal or voice announcements to be broadcast to the entire area covered by this warning system (described in section 3.13).
- 2.14 The contractor shall furnish and install, at central control, plug-in type amplifiers and two (2) spares and provide for "fail safe" operation (described in section 3.5).
- 2.15 The contractor shall furnish and install, at central control, power supplies and spare power supply which shall furnish power to the plug-in type amplifiers described in section 2.14 (described in section 3.6).
- 2.16 The contractor shall furnish and install, at central control, a line transformer for each remote amplifier/speaker station. Each remote amplifier/speaker station line shall be wired so that any line may be shorted out without affecting the level or output quality of any other remote amplifier/speaker station line (described in section 3.33).
- 2.17 The contractor shall furnish and install, at central control, a power amplifier to supply power to a monitor speaker (described in section 3.16).
- 2.18 The contractor shall furnish and install, in central control, a monitor speaker panel (described in section 3.14).
- 2.19 The contractor shall furnish and install, at central control, a "Watchguard" system (described in section 3.17).
- 2.20 The contractor shall furnish and install, at central control, a double master power switch to activate the DC voltage supply utilized for the testing of all remote stations.

3: EQUIPMENT: DETAILED SPECIFICATIONS:

All acoustical transducers, amplifiers, electronic devices, transformers, multicellular horns, throats, etc., shall be the product of the Altec Lansing Corporation, 1515 South Manchester Avenue, Anaheim, California; only equipment of this manufacture (or equal) shall be acceptable under this specification.

- 3.1 Central Control: The controls, input devices, amplifiers, signal generators, switches, line transformers, power supplies, and other components of this system shall be mounted in a control turret and pedestal. The control turret and pedestal shall be louvered and made of approximately 12 gauge metal. At installation (at the job site), all modular turret and cabinet sections shall be bolted together, forming a single unit.

3.2 **Tone Generator:** The tone generator shall be of the multiple-signal type having the following specifications: The tone generator shall contain all-transistor circuitry. Tone generators utilizing vacuum tubes are not acceptable. It shall be capable of generating a steady tone with a 550 cycle fundamental frequency, a siren-like tone of an harmonic chain at 550 cycles fundamental with a sweep rate of 1.5 cycles and a pulsed tone burst of 600 cycles fundamental frequency with a 750 ms duration at 1.5 second intervals. The tone generator shall incorporate an integral volume level control which shall function independently of the volume level of the sound distribution system.

The tone generator shall have a case of sheet metal, finished in dark green enamel and measuring not more than 1-5/8" high by 2-5/8" deep by 6-3/4" wide. A six-position terminal strip shall be available on the case for connection of the output cable and switch leads. The generator shall be furnished complete with power cable and plug for operation from the 115-volt power source.

The tone generator shall be Altec Lansing model 357A.

3.3 **Microphones:** The microphone shall be of the dynamic moving coil type. It shall have an aluminum diaphragm with tangential compliance and the voice coil shall be of aluminum ribbon, edge-wound. The frequency response shall be from 100 to 10,000 cycles. At 100 cycles, it shall be approximately 6 db down and at 10,000 cycles it shall be approximately 5 db down. From 150 to 10,000 cycles, the microphone shall have a gradually rising characteristic. This microphone shall have an impedance of 30/50 ohms and shall be balanced with respect to ground. The diameter of the microphone shall not exceed 2" with a length of not more than 2-1/8". The mounting chapter shall have 5/8" x 24 threads.

The microphone shall weigh not more than 0.4 ounces. It shall be designed for close-talking application and operation. The unit shall be such as to be used with plug, jack, and/or adapter, where specified. The output level of the microphone shall be at least -55 dbm/10 dynes/cm².

The microphone shall be Altec Lansing model 32C.

3.4 **Tape Machine:** The tape machine supplied with the system shall be the product of the KRS Corporation, of Palo Alto, California. It shall bear the registered trade mark of this company, "STACT Deck." The machine shall be capable of producing an output level of +10 db from a properly recorded tape with an output impedance of 600 ohms. The machine shall be of the cartridge type, whereby cartridges containing pre-recorded magnetic tape are placed in position (i.e., "at the ready") in the machine and instantaneously actuated, or played, by depressing a button for each tape wished to be heard. The speed of tape travel, the maximum amount of recording/playback time on each cartridge, the number of cartridges accommodated by the instrument, and the magnetic head configuration shall be determined by the contractor, according to governmental specifications and requirements.

3.5 **Preamplifiers:** The preamplifier shall be of the plug-in type, immediately interchangeable or replaceable with a like unit, in order to provide uninterrupted service, should failure of a single amplifier occur. The unit shall have a gain of 40 db (into an unterminated input) or 34 db (into a terminated input). Power output of this unit shall be +20 dbm at less than .1% THD, 50 - 15,000 cycles; +25 dbm at less than 1% THD at 1,000 cycles. The overall frequency response shall be ± 1 db, 20 - 20,000 cycles. The source of load impedances shall each be 150 or 600 ohms, with a center tap available when connected for 600 ohms; the output impedance shall be equal to the load impedance. Noise level shall be -126 dbm, valid for unterminated input operation. The preamplifier shall utilize a power supply furnishing 15 ma at 275 VDC, and .7 amperes at 6.3 VDC; the unit shall have push buttons in order that the individual vacuum tubes may be instantaneously tested. The unit shall plug into a mounting tray, the latter being permanently affixed to the console shell. Dimensions of the preamplifier shall be 1-3/4" wide by 3-15/16" high by 9-11/16" long, when mounted in this tray. The preamplifier shall utilize two low-noise 6072 12AY7 vacuum triodes, conservatively rated and operated.

The preamplifier shall be Altec Lansing model 458A, furnished with Altec Lansing model 13401 mounting tray.

3.6 **Power supply:** The power supply necessary to properly energize the preamplifiers described in section 3.6 shall have a power output of 275 VDC at 275 ma; the ripple shall be no more than .02 volt (peak to peak) at 275 ma. The power supply shall also have a power output of 6.3 VDC at 13 amperes; maximum ripple at this figure shall be no more than 1.5 volts, peak to peak.

The unit shall operate from a 115-volt 50-60 cycle source, drawing 245 watts at full load. The power supply shall utilize silicon rectifiers for maximum life and freedom from replacement or maintenance. The power supply shall weigh 16 pounds and have the following controls:

- (1): Power (off-on) switch
- (2): Circuit breaker (push to reset type)
- (3): 4-position tap switch providing adjustment to line voltages.

3 The power supply shall be Altec Lansing model 535A.

- 3.7 Line Transformer: The line transformer utilized in the input stages of the console shall be of the miniature plug-in type to provide a balanced output for the amplification facilities designed to accept this accessory. The transformer shall utilize 30 db of electro-magnetic shielding, have a frequency response of ± 1 db from 30 to 20,000 cycles, impedances of 125/150, 500/600 (with center tap), and 15,000 ohms; maximum operating level shall be -15 dbm above 30 cycles; +18 dbm above 40 cycles.

The line transformer shall be Altec Lansing model 15095.

- 3.8 "SEOUR" Panel: The sound system under these specifications shall be comprised of pairs of individual power amplifiers of the same type and specifications. Each pair of power amplifiers shall be equipped with a SEOUR system panel, which panel shall occupy no more than 3-1/2" of vertical rack space. The SEOUR panel shall indicate failure of one amplifier, of any pair, due to a defect of any kind. Such failure shall have no effect upon the load impedance as seen from the output terminals of the surviving audio power amplifier. No change shall occur in the power delivered to the actual load except on peaks of program material.

Signal supply to the input of the surviving amplifier shall be automatically increased 6 db to compensate for losses in the SEOUR circuit which become effective when one amplifier fails to operate.

The SEOUR system shall be so designed that no noticeable change in volume occurs in the projection of speech.

The SEOUR panel shall include an alarm which automatically operates to inform appropriate personnel of such failure or subnormal operation. This alarm shall consist of a blue signal light, mounted on the SEOUR panel, and terminal facilities for connection to other audible signal devices, such as remote lights, buzzer or bell, specified elsewhere in this specification (if required). The SEOUR alarm shall operate on the first program signal passing through the system after such failure develops and the alarm shall continue to operate independently of program material until an alarm-release push-button on the front of the SEOUR panel is depressed.

The panel shall provide terminals for the drive channel, the inputs of the two amplifiers, the separate outputs, the common load, and AC line connection and remote alarm. There shall be provided, as part of the panel, necessary power resistors with shunting facilities to accommodate the three types of power amplifiers. Also included under these specifications, shall be necessary relays to operate the alarm and to change the drive to the surviving amplifier upon the failure of one amplifier of any pair.

Any control panel not meeting all these requirements shall not be acceptable under these specifications.

The SEOUR system control panel shall be Altec Lansing model 15740.

- 3.9 Switch Panel: Each switch panel shall consist of 12 independent, unlit, 2-circuit, 3-position switches, mounted on a 3-1/2" by standard 19" rack panel. The panel shall be Altec Lansing model 1505A.
- 3.10 Switch Panel (Modified): Each switch panel shall consist of 12 independent, unlit, 2-circuit, 3-position switches, mounted on a 3-1/2" by standard 19" rack panel. The switches employed in this panel shall be Centralab PA 7025 with spring return feature. The panel shall be Altec Lansing model 1553A (modified).
- 3.11 Power Amplifier: The power amplifiers shall be designed to fit in rack, cabinet, or shelf mounting, measuring not less than 10-1/2" high, 19" wide, and 3-1/2" deep. This amplifier shall have an input sensitivity of 1.0 volt, RMS, for rated output, and shall provide a continuously variable volume control, a pilot light, and on-off switch on the front panel.

The power output shall be 165 watts with less than 3% THD over the frequency range of 70 to 13,000 cycles and 1/5 watts at less than 5% THD from 65 to 20,000 cycles. The frequency response of the amplifier shall be within ± 1.0 db from 10 to 50,000 cycles; output noise shall be no greater than -25 dbm (-77 db below rated output) and overall gain shall be no less than 72 db.

The output impedance shall be less than 10% of nominal load impedance, which shall be 8 (35v), 16 (50v), 32 (70v) ohms.

The input impedance shall be 70,000 ohm potentiometer, with source impedances of 150 and 600 accommodated by an accessory plug-in transformer.

The power amplifier shall operate from 105 to 130 volts, 60 cycles, and its line power rating (per UL standards) shall not exceed 350 watts. The tube complement shall be one 12AX7, one 6SN7GTB, two 6WE6GT, two 811-A, and four 5R4GY. The unit shall be finished in green and shall weigh in the order of 59 pounds.

The amplifier shall be equipped with a protective device which shall automatically reduce the primary voltage to the power transformer, by an amount which permits the amplifier to continue operating, when the temperature of the equipment rises.

Any amplifier which does not have a tertiary winding on the output transformer to permit isolation of the load circuit from ground shall not be deemed acceptable under these conditions and specifications.

The amplifier shall be Altec Lansing model 15703.

- 3.12 Standby Panel: The standby panel shall consist of the necessary electrical facilities which, when the master power switch in central control is actuated, will remove the continuous 80-90 volt AC supply from all remote amplifiers, permitting normal operation at a nominal 115 volts, AC. The standby panel, owing to the decreased standby voltage of 80-90 volts, results in extended tube and component life within all remote amplifiers, yet permits them to remain ready for immediate service, without the necessity of an undesired warm-up period.

The standby panel shall be Altec Lansing model 1576A.

- 3.13 Microphone Stands: The microphone stands shall be of modern design, manufactured of cast iron for maximum stability, and finished in a matching dark green enamel. Provision is made on these stands for the inclusion of the Altec 7A multipurpose switch, when required.

The microphone stands shall be Altec Lansing model 26A.

- 3.14 Monitor Panel: The monitor panel shall consist of a good-quality 8-inch PM loudspeaker, line transformer, and adjustable L-Pad control. The panel shall occupy a rack space of 8-3/4" by 19".

The monitor panel shall be Altec Lansing model 1553A.

- 3.15 Meter Panel: The meter panel shall consist of a VU meter, range switch, pads, and terminal strip, mounted on a 8-1/2" by 19" panel. The range switch shall include an "off" position, in addition to providing ranges (to indicate program levels) of +5, +10, +15 v. on a 600-ohm circuit. Provision shall be available for mounting an additional fixed pad for circuits of other impedances or level (e.g., a 70-volt line).

The meter panel shall be Altec Lansing model 152A.

- 3.16 Power Amplifier (with Overload Protection): The amplifier shall be of the rack-mounting type measuring not more than 8-3/4" high by 19" wide and 7" deep. The amplifier shall include a meter and necessary switching facilities to inspect the performance of each vacuum tube by measuring space current. Any amplifier not including these features shall not be acceptable under these specifications.

The amplifier shall be equipped with an automatic re-setting Thermeguard thermal-type circuit breaker, located within the windings of the power transformer and be capable of sensing any excessive rise of temperature, caused by possible component failure. The amplifier shall automatically recycle into operation when safe temperatures have been re-established; any power amplifier not including this safety feature shall not be deemed acceptable.

The amplifier shall be equipped with a high pass filter providing attenuation of 8 db at 250 cycles.

Power output shall be 40 watts with less than 2% total harmonic distortion over the frequency range of 20 to 20,000 cycles; the frequency response shall be ± 1 db from 3 to 30,000 cycles. The noise level shall be 85 db below the rated output. The overall gain of the amplifier shall be not less than 64 db; the output impedance shall be less than 17% of the nominal impedance (load); the load impedance shall be 4 (12.6v), 8 (18v), 16 (25v), and 125 (70v) ohms, ungrounded. The input shall be (A) 100,000 ohm potentiometer, or (B), plug-in transformer with not less than 30 db shielding and having impedances of 125/150 and 500/600 ohms.

The power supply of the amplifier shall require 105/125 volts, 60 cycles, 125 watts.

The tube complement of the power amplifier shall consist of two 6CG7, two 6CA7, (or EL340 and one 5AR4; the unit shall be finished in dark green and weigh approximately 27 pounds.

Any power amplifier which does not have a tertiary winding in the output transformer for isolation of the output circuit from the amplifier ground shall be deemed unacceptable under this specification.

The power amplifier shall be Altec Lansing model 128B.

- 3.17 "Watchguard" Panel: The "Watchguard" panel shall include the following facilities:

- (1): For monitoring, from the control center, the condition of telephone lines to all remote amplifier/speaker stations.
- (2): For determining, from the control center, the condition and turn-on capability of the remote amplifiers.
- (3): For determining, from control center, the condition of the loudspeaker voice coils (remote) and the line transformers coupled thereto.

The "Watchguard" Panel shall include all apparatus necessary to perform the foregoing functions in addition to containing the timers necessary to turn on each remote station (i.e., to raise the 80-90 volt continuous operation of each remote station to the nominal 115-volt operating voltage). When correctly installed, the "Watchguard" Circuitry shall be used in conjunction with the SEQR panel (Altec 7740; section 3.8), in order that complete system checks may be performed to determine the condition and operational capability of each remote station from central control.

The "Watchguard" System shall be Altec Lansing model 1577A.

- 3.18 High-Frequency Horn (Class "A" Stations): The high-frequency horn shall be of the multicellular type, equipped with proper throat and adapters and two (2) 290D compression drivers or transducers. As specified, it shall produce a uniform sound pressure field of 119 db at 30 feet with 100 watts input power applied to each driver over a field of distribution of 35 by 90 degrees, uniformly averaged over the band of 600 to 2,400 cycles. Single frequency measurements will not be acceptable under this specification. The low-frequency cutoff shall be 300 cycles. The horn shall be constructed of individual weatherproofed metal cells with a special damping material coating the external surfaces of each cell. The cells shall all be straight with an exponential expansion. Folded or re-entrant horns, or horns fabricated of wood or other fibrous materials will not be acceptable under this specification. The horn shall be equipped with mounting brackets or facilities, both on the front, or mouth, and on the appropriate cast throat. Multicellular horns for Class "A" stations shall be Altec Lansing model 1003B.
- 3.19 High-Frequency Horns (Class "B" Stations): The high-frequency horn shall be of the multicellular type, equipped with proper throat and adapters and 4 (four) 290D compression drivers or transducers. As specified, it shall produce a uniform sound pressure level of 122 db at 30 feet with 100 watts input applied to each driver over a field of distribution of 40 by 100 degrees, uniformly averaged over a band of 600 to 2,400 cycles. Single frequency measurement will not be acceptable under this specification. The low-frequency cutoff shall be 400 cycles. The horn shall be constructed of individual weatherproofed metal cells with a special damping material coating the exterior surfaces of each cell. The cells shall all be straight, with an exponential expansion. Folded or re-entrant horns, or horns fabricated from wood or other fibrous materials, shall not be acceptable under this specification. The horn shall be equipped with mounting brackets, or facilities, both on the front or mouth and on the appropriate cast throat. Multicellular horns for Class "B" Stations shall be Altec Lansing model 1004B.
- 3.20 Line Transformer: The transformer shall deliver within 1 db of its full rating power over the entire range of 450 to 10,000 cycles, with an insertion loss not greater than 0.5 db (above cutoff frequency) for the most unfavorable impedance combination. The primary of the transformer shall be labeled in terms of power of 100 watts allowed to the load when the transformer is connected to a 70-volt line, and the secondary shall be tapped for 4 ohm loads. The transformer shall have a low-frequency cutoff of 450 cycles at 100 watts for adequate protection of horn driver elements from potential damage by low frequencies. The transformer shall be Altec Lansing model 15045A.
- 3.21: The driver-loudspeaker shall employ a phenolic diaphragm and a voice coil of edge-wound copper ribbon. The voice coil diameter shall be at least 2.8"; the voice coil gap shall have a flux density of at least 18,800 gauss. The entire diaphragm and voice coil assembly shall be field replaceable without special tools or skills. This shall be interpreted to mean that the speaker shall incorporate self-centering dowels to insure proper indexing. With 1 watt input, the speaker shall produce a sound pressure level of at least 114 db at a distance of four (4) feet over the warble band of 500 to 2,500 cycles. Single frequency measurements will not be acceptable under these specifications. The frequency response shall be uniform over the range of 300 to 8,000 cycles. The unit shall be capable of handling a continuous power level of 100 watts above 300 cycles. Provision shall be incorporated to permit mounting an Altec 70-volt matching transformer on the speaker and the entire assembly shall be encased in a weatherproofed housing. This speaker shall be used in conjunction with the 15045A transformer for low frequency attenuation and, therefore, driver protection. The driver-loudspeaker shall be 19 pounds in weight. The driver-loudspeaker shall be Altec Lansing model 290D.
- 3.22 Horn Throats: The horn throats required for connecting the multicellular horn (sections 3.18; 3.19) to the 45-degree weatherproof throat adapters (section 3.23) shall be of sandcast aluminum, acoustically designed for maximum efficiency in the transfer of sound from the driver-loudspeaker (section 3.21) to the entrance of the horn array. The throat shall be Altec Lansing model 30170.

- 3.23 Weatherproof Adapter: The weatherproof adapter shall be of sand-cast aluminum for connecting the driver transducer (section 3.21) to the horn throat (section 3.22) at a 45-degree angle, thereby preventing the entrance of water and other injurious materials into the driver element itself. The weatherproof adapter shall be Altec Lansing model 30546.
- 3.24 Wiring: All wiring between control center and all remote stations shall be 19 gauge, two-pair twisted aerial type telephone wire with a 109 messenger strand; all wiring between control center and all remote stations shall be self-supporting and shall be suspended from poles spaced approximately 450 feet (average). The wire shall be Whitney Blake type 132-11-21.

- 3.25 Dynamic Microphone/Solid State Amplifier Assembly: The microphone shall be of the dynamic type, having a frequency response relatively uniform from 200 to 10,000 cycles when properly installed in the G1-type handset (or equivalent); such response shall be no more than 5 db down at 150 cycles. The output level of the microphone shall be 1 volt (maximum) RMS at clipping level into a 100 ohm load; 3 volts RMS into a 333 ohm load.

The integrated assembly shall be comprised of a solid-state amplifier, necessary to raise the amplitude of the output level of the microphone to -3 dbm for 10 dynes/cm² or -38 db, referred to 1 volt, for 1 dyne/cm². The microphone shall utilize a diaphragm of Mylar polyester, providing virtual immunity to the harmful effects of dust, salt, and corrosive fumes; the acoustic elements of the microphone shall be protected by a sintered bronze filter. The encapsulated assembly shall measure no more than 1-7/8" in diameter by 1" high, less cord clamp.

The microphone amplifier assembly shall operate directly from the telephone line supply voltage formerly utilized by the carbon transmitter; no regard need be paid to the polarity of the supply voltage, the output circuitry of the assembly having special design which makes the unit function equally well regardless of polarization. The output level of the assembly shall vary not more than 1 db with a supply voltage variation of from 5 to 18 volts. The assembly shall incorporate an external strapping arrangement, whereby the output level may be attenuated 6 db, if desired.

The assembly shall be readily adaptable for all paging, public address, surveillance, and related applications--wherein the ease of operation of the standard teletest is desirable, but with the aforementioned characteristics of a high-quality dynamic microphone in place of the limited-response carbon transmitter.

The microphone amplifier assembly shall be Altec Lansing model 690A.

- 3.26 House: The structure provided for the housing of the electronic equipment necessary for the operation of each remote station (hereafter referred to as the "House") shall be as follows: The house shall be constructed on a concrete slab measuring 6 feet by 6 feet by 4 inches thick; the walls shall consist of 2 inch by 4 inch studding, on 16 inch centers, covered with stucco on the exterior side. The roof shall be gabled and consist of 2 inch by 4 inch rafters, on 24 inch centers, covered with 1 foot by 4 foot sheathing and red cedar shingles. To insure adequate ventilation, vents shall be provided in each gable and around the perimeter of the base of the house. Entry to the interior of the house shall be gained by providing a 2 foot-6 inch by 6 foot-8 inch by 8 inch doorway, with door, 1-3/8 inches thick, complete with lock and all necessary hardware; the door and the doorway shall be of wood. All necessary electrical outlets, together with one (1) electric lamp and switch, shall be provided in the interior of the house.
- 3.27 Compressor Amplifier: The compressor amplifier shall have a frequency response of ± 1.5 db from 30 to 15,000 cycles and shall be capable of delivering a power output of +19 dbm at full compression (30db), or +26 dbm as a straight amplifier. With 25 db of compression, distortion shall not exceed 1.5% over the frequency range from 35 to 15,000 cycles. The threshold point shall not be greater than zero dbm at the output and the amplifier shall provide 30 db compression. Attack time shall be fixed at 50 milliseconds; release time shall be fixed at one second for 63% recovery.

The gain of the amplifier shall be 90 db from microphone input or 40 db bridging a 600 ohm line. Equivalent input noise shall not exceed -119 dbm at microphone input. The input impedance shall be 20,000 ohms (unbalanced) and for source impedance of microphone input, 30/50 ohms. The load impedance shall be 150 or 600 ohms. The amplifier shall have the capability of operating from a 115-volt, 60 cycle power source; it shall be provided with a panel meter reading db of compression; it shall be of the rack mounting type, also having provisions for mounting in a desk top type cabinet for remote operation where required. The unit shall measure 3-1/2" high by 19" long by 6" deep and weigh approximately 8-1/2 pounds. The tube complement shall be one 12AY7, one 6BC8, one 6CG7, and one 6AL5. The hinged front panel shall be finished in dark green.

Any compressor not meeting these specifications as to the microphone input, amount of compression, nor use as a straight amplifier, shall be deemed unacceptable under these specifications.

The compressor amplifier shall be Altec Lansing model 438A.

- 3.28 Rack: Each of the equipment racks, provided in each house for the installation of all electronic equipment necessary to operate each remote amplifier/speaker station, shall be as follows: The rack shall measure 83-1/8" high by 22" wide by 18" deep. The rack shall be constructed of rigid 16 gauge steel with a 12 gauge bottom, welded throughout. Louvers shall be provided at both the top and bottom of the sides and rear door to insure reasonable ventilation. A rectangular cutout shall be furnished, at the base of the rack, in order that all necessary cables may pass through. The rack shall be finished in dark green enamel, attording a perfect match to the equipment therein installed.

The rack shall be Premiere model

- 3.29 Turret and Pedestal (Console Shell): The turret (upper portion) and pedestal (lower portion), which comprise the console shell, shall be of 12 gauge steel, firmly and rigidly bolted together at the installation location. General configuration, layout, design of operating controls, et al, shall be determined by the contractor and the government with regard to the opinions and requirements of the latter.

The console shall contain all electronic equipment, if possible, for the operation of central control.

- 3.30 Timer: A timer shall be incorporated at each remote location. Each timer shall function as a power switch actuator, when actuated by the master ac line power switch in central control, and (by means of a cam arrangement) remain in that position which supplies normal operating power (115 VAC) to each remote station for a pre-determined length of time -- approximating three (3) minutes. The timer shall be of the DC actuated type, whereby operation is commenced by a DC current (from central control), causing the AC driver motor of the timer to also begin operation. For test purposes, the master power switch (central control) is then opened; the timer will then continue to operate, applying nominal AC voltage to the remote station for a pre-determined length of time (3 to 5 minutes) as long as no DC remains on the remote line to hold open the starting relay (as in a test). When the cam on the timer returns around to the starting point, the master AC control (in the 1576 standby panel) is actuated, reducing the AC line voltage to all remote components to 80-90 volts.

The timer shall be employed in order that no inadvertant occurrence may cause the entire system to remain in the "On" position when only a test is scheduled.

The timer shall be included in the Altec 1577A 'Watchguard' Panel

- 3.31 Ventilating Panels: The ventilating panels shall be of perforated metal, 1-3/4" high by 19" wide. The panels shall be used for ventilation to the electronic and audio amplifiers employed in the remote stations in order to provide proper ventilation.

The panels shall be Altec Lansing model 10367.

- 3.32 DC Power Supply: A separate DC power supply shall be provided within each remote amplifier/speaker location with sufficient capacity to operate the starting relay of the automatic timer (section 3.33); this DC supply shall be controlled by the master power switch in central control.

The DC power supply shall be B. S. A., model no. 113-12.

- 3.33 Line Transformer: A line transformer shall be employed at the output of the final stage of pre-amplification within central control (i.e., from 438A amplifier nos. 3 thru 14) -- see wiring #556; such a transformer shall have both drop and line impedances of 100 ohms with an insertion loss of 0.5 db at 1000 cycles. Frequency response shall be ± 1 db from 100 to 10,000 cycles; maximum operating level is 120 dbm; maximum current and out-of-balance current in line winding is 100 ma. The transformer shall measure 3-7/16" high by 2" deep by 1-1/2" wide; it shall be of the plug-in type, suitable for installation on a mounting panel within the console of central control.

The transformer shall be Altec Lansing model 15192

3.34 Pre-amplifiers: The preamplifiers utilized in central control for amplification of the tape machine and the two tone generators shall be of the rack mount type and shall not occupy more than 1-3/4" of rack space. Each preamplifier shall operate from a 115-volt, 60-cycle AC power supply; amplifiers which require an external source of plate (B+) and filament (C) voltages will not be acceptable under this specification. The gain of the preamplifier shall be at least 67 db; the frequency response shall be ± 1 db from 30 to 15,000 cycles. The equivalent input noise shall not be greater than -122 dbm. The preamplifier shall be equipped with an interstage volume control. The input impedance shall be 100,000 ohms; the load impedance shall be 150 and 600 ohms, as provided by a plug-in line transformer (Altec 15095; section 3.7).

The maximum power output shall be at least ± 10 dbm (with the plug-in line transformer). A standard three-blade AC convenience receptacle shall be provided on the chassis of the preamplifier; power consumption of the preamplifier shall not exceed 5 watts.

The preamplifier shall be Altec Lansing model 1566A.

3.35 Transformer Mounting Panel: The mounting panel shall accommodate up to eight (8) plug-in 15189 line transformers; it shall measure 1-3/4" by 19" and shall be located within the central control console, if possible.

The mounting panel shall be Altec Lansing model 7612.

4: REMOTE STATIONS:

4.1 Type "A" Stations: The forty-three (43) 300-watt remote amplifier/speaker stations (described in section 2.4) shall include (each) a suitable structure to both house and protect the equipment; a pole on which to mount the speaker assembly; four (4) Altec 1003B multicellular horns, covering 90 degrees each (total: 360-degree coverage); two (2) Altec 290D 100-watt drivers transducers mounted on each horn; one (1) Altec 30170 throat per horn; two (2) Altec 30456 45-degree weatherproof adapters per horn, and two (2) Altec 15045A line transformers, connected for a low-frequency cutoff at 450 cycles per horn (one per driver).

Total speaker equipment for each type "A" remote station shall be mounted sixty (60) feet above the ground; the amplification equipment for each remote station shall include the following:

- 4.1.1 All hardware, wire, conduit, and boxes required.
- 4.1.2 Pole, no less than sixty (60) feet above ground.
- 4.1.3 House or structure to protect amplifier rack.
- 4.1.4 Four (4) Altec 1003B multicellular horns (3.18).
- 4.1.5 Eight (8) Altec 290D drivers (3.21).
- 4.1.6 Eight (8) Altec 15045A line transformers, mounted on drivers (3.20).
- 4.1.7 Eight (8) Altec 30546 weatherproof 45-degree adapters (3.23).
- 4.1.8 Four (4) Altec 30170 throats (3.22).
- 4.1.9 Two (2) Altec 7740 SEQR panels (3.8).
- 4.1.10 Four (4) Altec 1570B amplifiers (3.11).
- 4.1.11 One (1) metal rack.
- 4.1.12 One (1) Altec 1576A Standby Panel (3.10).
- 4.1.13 Four (4) Altec 10399 perforated metal ventilating panels (3.31).
- 4.1.14 Four (4) Altec 15095 transformers (installed in 1570B amplifiers) (section 3.7).
- 4.1.15 One (1) timer (3-5 minute operation) (3.30).
- 4.1.16 Two "Watchguard" panels (3.17).

4.2 Type "B" Stations: The two (2) 1600-watt type "B" remote speaker/amplifier stations shall each consist of the following:

- 4.2.1 All required hardware, wire, conduit, and boxes.
- 4.2.2 Pole, no less than sixty (60) feet high (above ground).
- 4.2.3 House or structure to protect amplifier rack.
- 4.2.4 Four (4) Altec 1004B multicellular horns (3.19).
- 4.2.5 Sixteen (16) Altec 290D drivers (3.21).
- 4.2.6 Sixteen (16) Altec 15045A line transformers (mounted on drivers (3.20).
- 4.2.7 Sixteen (16) Altec weatherproof adapters, 30546 (3.23).
- 4.2.8 Eight (8) Altec 30170 throats (3.22).
- 4.2.9 Four (4) Altec 7740 ("SEQR") panels (3.8).

- 4.2.10 Eight (8) Altec 1570B amplifiers (3.11).
 - 4.2.11 Two (2) metal racks
 - 4.2.12 Two (2) Altec 1576A standby panels (3.10).
 - 4.2.13 Eight (8) Altec 10399 perforated metal ventilating panels (mounted above each 1570 amplifier) (3.31).
 - 4.2.14 Eight (8) Altec 15095 plug-in transformers (installed in 1570B amplifiers) (3.7).
 - 4.2.15 One (1) timer (set for 3-5 minute operation) (3.30).
 - 4.2.16 Four (4) Altec 1577A "Watchguard" panels (3.17).
- 4.3 Both "A" and "B" type remote amplifier/speaker stations shall be wired so that a failure in any one component will not result in failure of signal or voice announcements to be propagated within the 360-degree area covered by that remote speaker/amplifier station.
 - 4.4 All wiring of the entire Voice Warning System shall be done on a parallel basis; no series wiring shall be acceptable under this specification.
 - 4.5 All remote speaker stations will provide for voice propagation over a circular area of 1800 feet in diameter. Each horn system shall be pole mounted at least 60 feet above the surface of the earth and shall be included in a downward direction of approximately six (6) to eight (8) degrees. Each pole and horn system shall be positioned in the center of the circular area to be covered and shall propagate sound over the 1800 foot diameter circular area, dispersing the sound from zero (0) to 360 degrees from the center point of the area (i.e., the speaker station). A 1000 cycle tone and/or signal will provide a S.P.L. of 85 db at 900 feet from the speaker horns. This measurement shall be made at a point four (4) feet from ground level and on center axis of any one of the four multicellular horns. The S.P.L. of 85 db will be met under ideal conditions.
 - 4.6 Each remote station shall receive two pairs of 19 gauge twisted wire from central control. One pair (Pair "A") shall be fed to the 7740 SEQR panel in each remote amplifier/speaker station; (The "A" pair will be installed to accept DC voltage, simplex) then to the 15095 input transformer of the 1570B amplifiers. All inputs to the 1570B amplifiers shall be wired in parallel. The other pair of wires (called Pair "B") shall be connected to the 1577A "Watchguard" panel which will receive signals from the central control to activate the 1570B amplifiers and timer. The "Watchguard" Panel provides a means for central control to test and verify that the remote station is in proper operating condition.
 - 4.7 The 1576A standby panel shall contain a means of reducing the 115 volt AC supply voltage, thereby supplying the 1570B amplifiers with a lowered voltage. The 1577A standby panel shall be activated by a DC voltage from central control which shall instantaneously increase the reduced AC line voltage to the normal operating figure of 115.
 - 4.8 The 1570B amplifiers shall be in the "on" position and ready for immediate operation when keyed from central control.
 - 4.9 Each pair of 1570 amplifiers and 7740 SEQR panels shall be wired to four (4) 290D drivers which shall provide 360-degree coverage of that remote location. No 1003B or 1004B multicellular horn shall have less than two (2) drivers; therefore, in the event a pair of amplifiers should fail or become inoperative, the remaining pair of amplifiers will continue to provide power to the four (4) 290 drivers, covering the entire 360-degree area with a loss in level of (approximately) only 7 db.
 - 4.10 Each pair of 1570B amplifiers shall be wired into the 7740 SEQR panel; the 7740 SEQR panel provides the "Fail Safe" feature which allows one of the two amplifiers to fail without affecting the overall gain of the other amplifier.
 - 4.11 All type "A" remote stations shall be in accordance with drawing A-411.
 - 4.12 All type "B" remote stations shall be in accordance with drawing B-412.

5: CENTRAL CONTROL:

The central control shall provide complete "Fail Safe" facilities whereby a failure of any one component shall not seriously impair the overall operation of the system, nor result in any notable decrease in amplitude of the signal and/or voice announcement being propagated by the forty-five remote amplifier/speaker stations of this warning system. Complete control and test facilities shall also be incorporated in the central control.

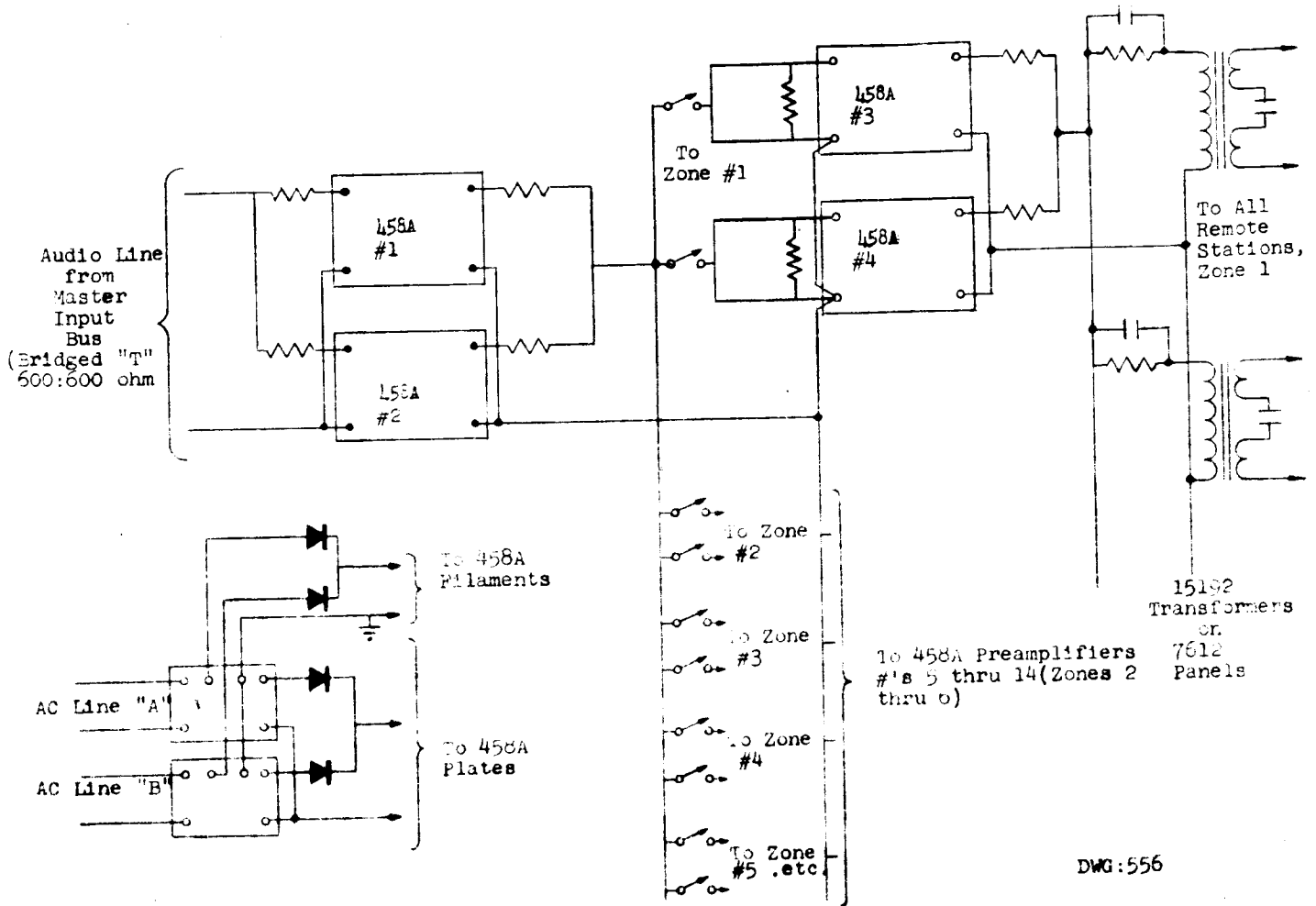
- 5.1 The structure, or building, housing the central control shall be furnished by the government. Two independent 115-volt 60-cycle sources of AC supply voltage shall also be furnished by the government. Two individual AC switches shall be provided and shall require a key to operate, in order that only authorized personnel may turn the system completely "off" for maintenance.
- 5.2 The contractor shall furnish and install the console which shall consist of a turret and pedestal (section 3.1 and 3.29).

- 5.3 Two AC switches with green pilot lights shall be installed on the center panel of the control console turret; these switches shall be connected by a common mechanical bar (although electrically independent of each other). The operator, by throwing this switch, will activate all of the forty five (45) remote stations and the system shall be instantly ready to receive and propagate the desired signal or announcement.
- 5.4 The contractor shall furnish and install two (2) Altec 632C Microphones (section 3.3) mounted on two Altec 26A desk stands (section 3.13). These microphones shall be wired in parallel with build-out resistors in order to eliminate the possibility of one microphone failure affecting the other. These microphones shall operate into two Altec 408A compressor amplifiers.
- 5.5 The contractor shall furnish and install two (2) Altec 408A compressor amplifiers (section 3.27); these amplifiers shall be installed in a "Fail Safe" circuit configuration in accordance with drawing no. 555.
- 5.6 The contractor shall furnish and install two (2) Altec 357A tone generators (section 3.2); these generators shall be installed in a "Fail Safe" circuit configuration, in accordance with drawing no. 555. The generators shall be actuated by three key switches, positioned on the center portion of the console turret, and labeled "Steady Tone," "Pulse Tone," and "Siren Tone."
- 5.7 The contractor shall furnish and install three (3) Altec 1566A preamplifiers (section 3.34), each supplied with an Altec 1569F input transformer (section 3.7). One 1566A shall amplify the signal from the tape machine and shall be fed into the input system by means of a key type switch located on the center panel of the console turret, labeled "Tape". Two (2) Altec 1566A preamplifiers shall be installed in the central console and shall receive the signal output of the 357A tone generators, feeding the main output system through control switch panel. The Altec 1566A preamplifiers shall be installed in accordance with drawing no. 555.
- 5.8 The contractor shall furnish and install one (1) KRS "INSTACT" (type) tape machine (section 3.1) of the cartridge type for playback of prerecorded tape signals and/or announcements through the entire system. The signal from the tape machine shall be a mechanical contact switch, the switch to which the connection is made shall be labeled "Tape Monitor."
- 5.9 The contractor shall furnish and install a sufficient number of key type switches which are required for selection of all input signals as well as the selection of the desired tone signal from the Altec 357A tone generators. The Altec 1566A switch panel (section 3.3) shall be employed for this purpose and shall be installed according to drawing no. 555. The 1566A shall contain 12 switches; the panel shall mount in the center section of the control console turret and shall be labeled "Control Panel." The left-hand five (5) switches (facing the front of the panel) shall be the control switches for selecting the various input signals and broadcasting these signals to all forty five remote station locations. These five switches shall be labeled (from left to right) in the following manner:
- 1: Steady Tone
 - 2: Siren Tone
 - 3: Pulsed Tone
 - 4: Tape
 - 5: Microphone
- The remaining seven (7) switches of the control panel shall provide contact with the six (6) remote areas, together with the local monitor speaker/amplifier.

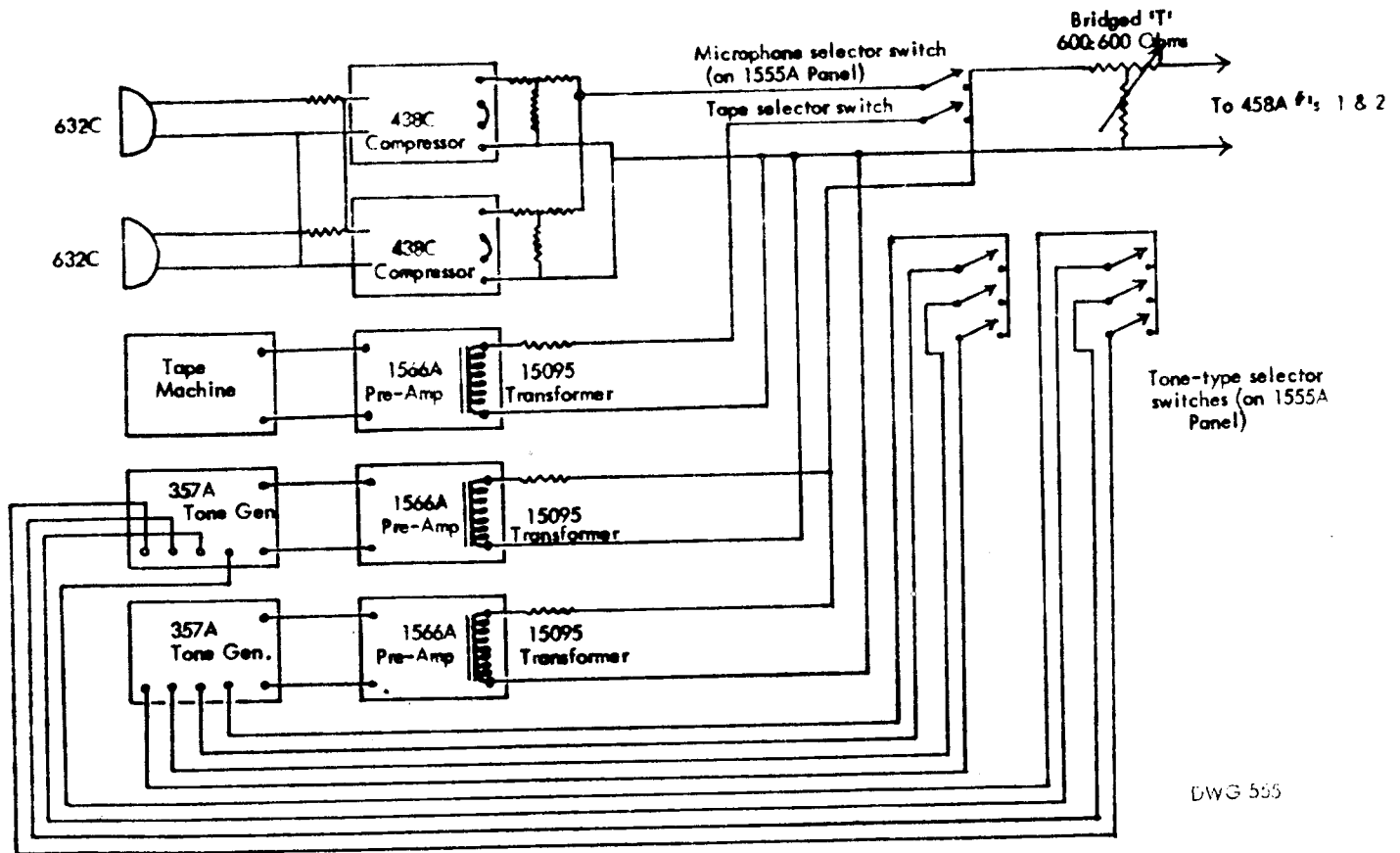
In order to contact a given zone, the zones not desired must be removed from the main circuit bus (this system is designed to minimize the number of switching operations required in an emergency situation); the remaining (undisturbed) switch(es) will then be feeding the zone wherein it is desired to propagate a signal or announcement. To eliminate the possibility of any of the zone switches and monitor switch being inadvertently left in the "Off" position (i.e., disconnected from the main audio bus), a red pilot light shall indicate which zone has (zones have) been placed in the "On" position. The microphone switch shall place a load on the local monitor speaker to avoid the possibility of feedback in the central control area.

- 5.10 The contractor shall furnish and install fourteen (14) Altec preamplifiers (section 3.5) plus one spare. The 14 shall be installed in a "Fair Safe" circuit in accordance with drawing no. 556. The preamplifiers shall be Altec Lansing model 458A, furnished with an Altec 13401 mounting tray. The preamplifiers shall be mounted in the pedestal of the console and shall employ two (2) Altec 13225 rack mounting assemblies. The Altec 5981 tube test meter shall be located in this general area, in order that routine checks of tubes may be made without removing the preamplifiers or the vacuum tubes therein. By this means, all possibility of inadvertent interruption of service or immediate operation is avoided.

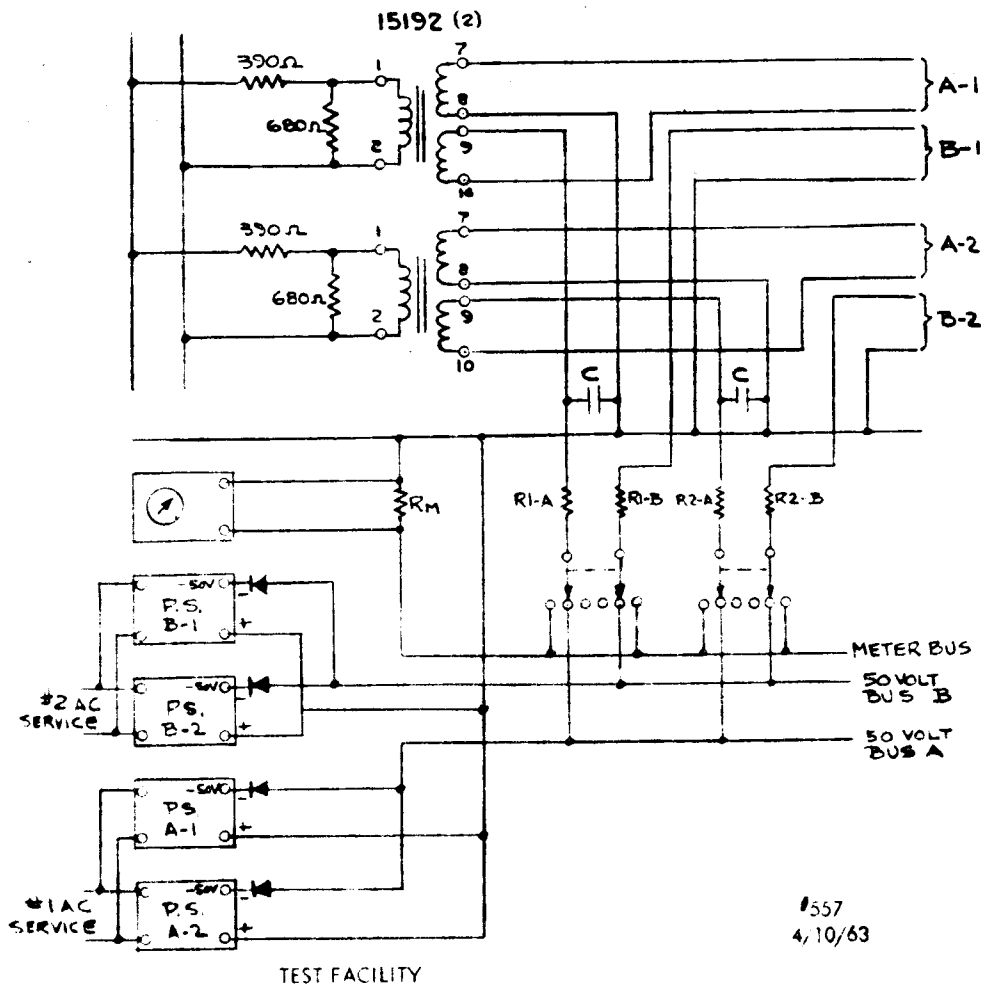
- 5.11 The contractor shall furnish and install two (2) Altec 535A power supplies which shall utilize the two separate AC lines of the central control structure. These power supplies shall furnish B+ (plate) and DC filament voltages to the Altec 458A preamplifiers (section 5.9). The Altec 535A power supplies shall be installed in accordance with drawing no. 556.
- 5.12 The contractor shall furnish and install two (2) pair of wires which will connect central control with each remote station; each remote signal line shall be terminated (at central control) in an Altec 15192 line transformer, providing the facility for simplexing a DC signal over the signal line. The signal line shall be called Pair "A" which shall also be connected to the Altec 1577A "Watchguard" Panel and timer, at the remote location, providing central control with a testing facility which shall confirm that the remote amplifiers are operating. The second pair of wires (Pair "B") from central control to each remote station shall be terminated at a switch on the test panel. A DC signal shall be applied to the "B" pair, activating the second Altec 1577A "Watchguard" Panel and timer, located at the remote station(s); the "B" pair shall provide testing facilities for the amplifiers that are monitored by the remote "Watchguard." (For more information, refer to drawing no. 557).
- 5.13 The contractor shall furnish and install a testing facility at central control which shall utilize the Altec 1552A meter panel (section 3.15) and the modified four Altec 1555A switch panels (section 3.10), in accordance with drawing no. 557. This facility shall permit the system operator to test each remote amplifier station for operation. If a remote station indicates a malfunction, it may be serviced immediately and restored to proper operation.
- 5.14 The contractor shall furnish and install six (6) Altec 7612 transformer mounting panels at central control (section 3.35).
- 5.15 The contractor shall furnish and install forty-five (45) Altec 15189 line transformers (section 3.33); these transformers shall be installed in accordance with drawing no. 557.
- 5.16 The contractor shall furnish and install at central control, six (6) Electronics Research Associates, Inc., model TR 50D DC power supplies (section 3.32). Each of these power supplies shall be connected to one of the independent 115-volt, 60-cycle AC sources or three (3) (other) power supplies shall be connected to one AC source; three (3) other power supplies to the other AC source. The DC "Power On" switch shall be located on the center panel of the control console turret (as indicated in section 5.3).
- 5.17 The contractor shall furnish and install in central control a bridged "T" 600:600 ohm control which shall set the level of the input signals being fed into the Altec 458A preamplifier.



CONTROL CONSOLE



CONTROL CONSOLE



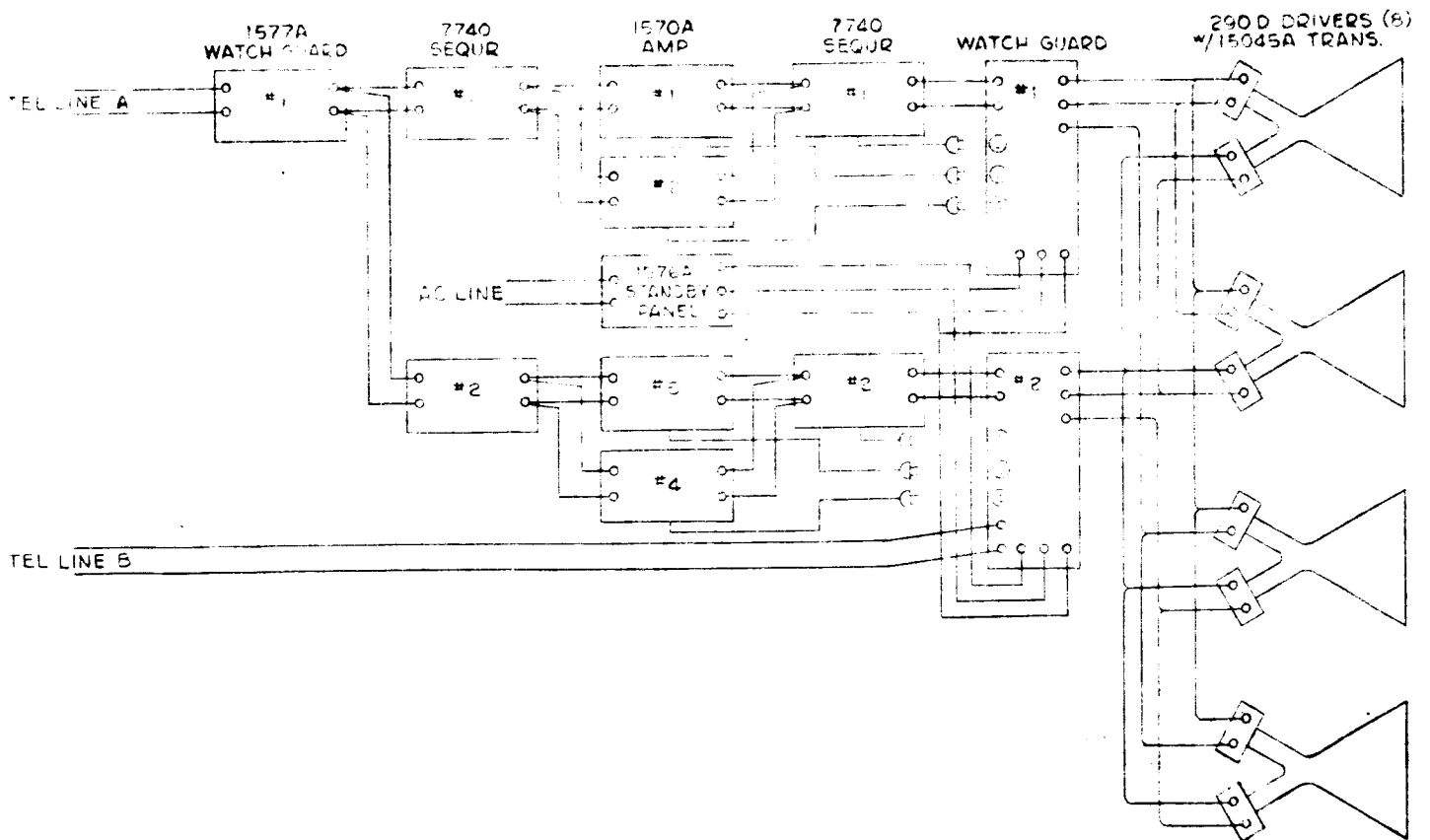
C IS NON-POLARIZED ELECTROLYTIC, 200 MFD., 50 VW OR HIGHER. (MALLORY NP1225A SUITABLE)

R-1-1, R-1-2, etc., SELECTED TO PROVIDE 10 MILLIAMPERES TO EACH 'WATCHGUARD' K-1 RELAY.

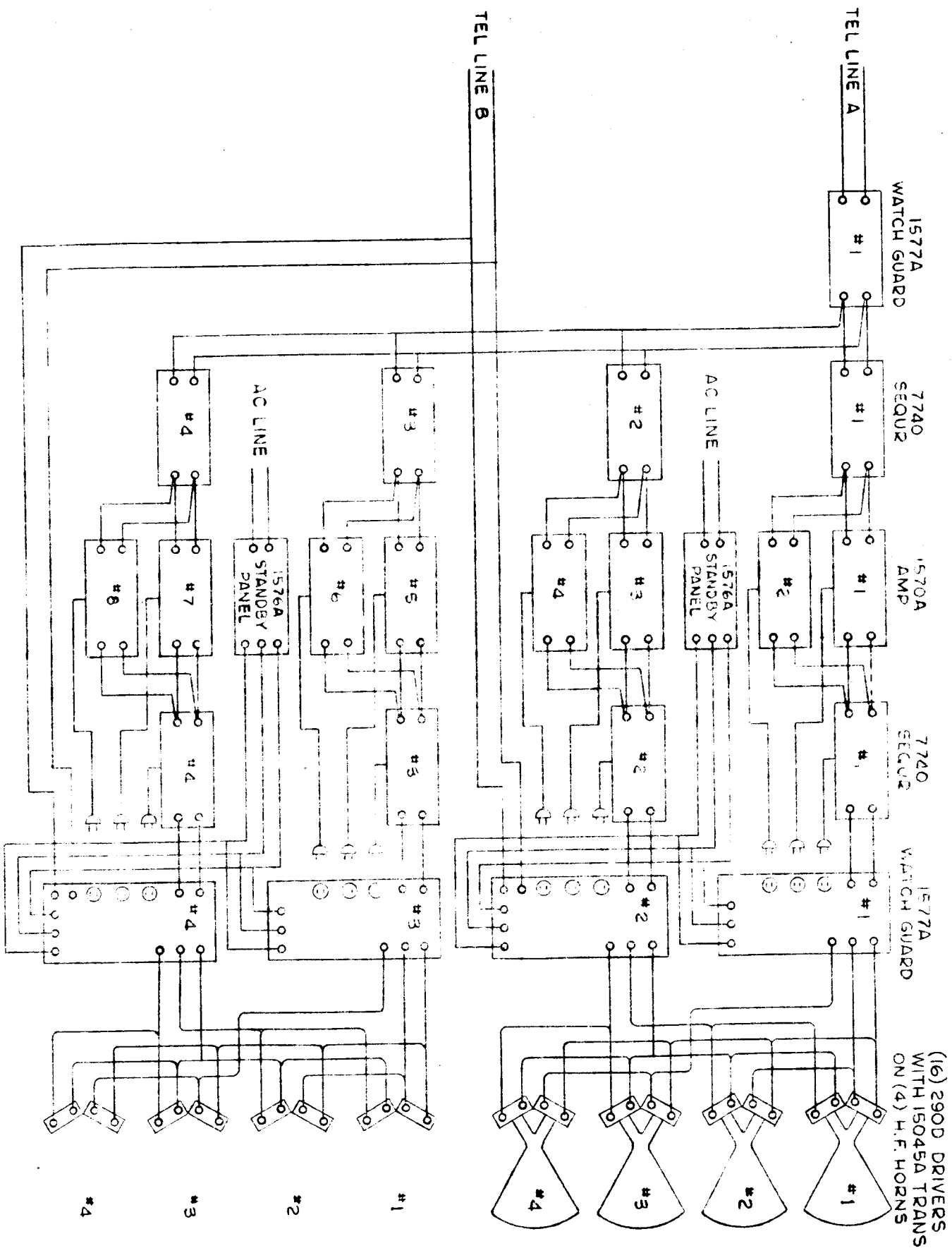
RS-1, etc., SELECTED TO DELIVER SPEECH PEAKS 0.3 VOLT AT REMOTE AMPLIFIER INPUT TERMINALS.

#557
4/10/63

TEST FACILITY



REMOTE AMPLIFIER SPEAKER STATION



REMOTE AMPLIFIER/SPEAKER STATION

B 412
ALTEC LANSING CORP.