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MILITARY SPECIFICATION

RECEIVING SET, RADIO AN/APN-70B

1. SCOPE

1.1 This specification covers one type of radio receiver designated Receiving Set, Radio AN/APN-70B which is designed to furnish navigation information to navigators of aircraft up to distances of 2000 nautical miles from special ground transmitters.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids, or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

Military

MIL-C-172	Cases; Bases, Mounting; and Mounts, Vibration (For Use With Electronic Equipment In Aircraft)
MIL-C-3098	Crystal Units, Quartz, General Specification for
MIL-E-5400	Electronic Equipment, Aircraft, General Specification for
MIL-T-5422	Testing, Environmental, Aircraft Electronic Equipment
MIL-E-5556	Enamel, Camouflage, Quick Drying
MIL-P-7788	Panels, Information, Integrally Illuminated
MIL-S-19500/118	Semiconductor Device, Diodes, Silicon, Types 1N483B, 1N485B, and 1N486B
MIL-C-39012	Connectors, Coaxial, Radio Frequency, General Specification for

STANDARDS

Military

MIL-STD-200	Electron Tubes; Selection and Use of
MIL-STD-415	Test Points and Test Facilities for Electronic Systems and Associated Equipment Design Standard for
MIL-STD-461	Electromagnetic Interference Characteristics, Requirements for Equipment
MIL-STD-471	Maintainability Demonstration

MIL-STD-781 Reliability Tests Exponential Distribution
MS91403 Cases, Large-Size (For Use with Electronic Equipment in Aircraft)

DRAWINGS

59D12660 Mounting MT-810/U Outline Dimensions of

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Preproduction. This specification makes provisions for preproduction testing.

3.2 Component parts. The radio receiving set shall consist of the following:

1 Receiver, Radio	R-277C/APN-70
1 Indicator, LORAN	IP-58A/APN-70
1 Mounting	MT-810/U (Receiver)
1 Mounting	MT-811A/U (Indicator)

3.3 General specification. The requirements of MIL-E-5400 for class 1 equipment apply as requirements of this specification with the exceptions and additions called out herein. When the two specifications conflict, this specification shall govern.

3.3.1 Separable component parts. Component parts such as tubes and subassemblies shall be located in the equipment and attached thereto so that they are readily accessible and can be replaced without the use of any special tools. All separable component parts shall be so designed that they can be inserted in the equipment in but one position, that position being the one for optimum operation and performance.

3.3.2 Circuits. All circuits shall be so designed that no damage occurs when the equipment is operated with any combination of operating controls and service adjustments set to any possible combination of settings.

3.3.3 Motors. Motors used for ventilating fans or for other purposes shall be brushless types.

3.3.4 Fuse. Fuses shall not be included in the equipment. Fusing shall be provided in the aircraft wiring system.

3.3.5 Convenience. The design of the major subassemblies shall be such that they may be removed from the chassis proper, without unsoldering any connections. After being removed, it shall be possible to interconnect them with the chassis to form a complete working unit for test purposes.

3.3.6 Maintenance provisions

3.3.6.1 Adjustments. Each maintenance adjustment shall be marked to permit its ready identification. Each maintenance adjustment shall be of the screwdriver adjustment type with a grounded metal shaft. No maintenance adjustments shall be located on the front panel of the receiver. The equipment shall require no maintenance adjustments under flight conditions.

3.3.6.2 Service bench operation. When the Receiver, Radio R-277C/APN-70 is removed from its housing, it shall be possible to place it on any side except front and rear on a smooth surface without causing damage to any components. It shall be possible to operate it when it is removed from its housing, but the detailed performance specified herein need not be provided while the housing is removed. It shall also be possible to service and align the receiver subassembly when removed from the main unit without objectionable interference upon any r-f channel.

3.3.6.3 Provision for field maintenance. Circuit test facilities shall be provided in accordance with MIL-STD-415. The location of the test points shall be determined by the component layout and the circuitry involved.

3.3.7 Electron tubes. Electron tubes shall be selected in accordance with MIL-STD-200.

3.3.8 Diodes. Diodes shall be selected in accordance with MIL-S-19500/118.

3.3.9 Interference. Interference control requirements shall be an accordance with MIL-STD-461.

3.4 Design. The radio receiving set, when installed in an aircraft with a suitable primary power source and connected to an antenna system supplied with signals from Loran ground transmitters, shall constitute a complete and operative navigational system.

3.4.1 Size and weight. The dimensions of Receiver, Radio R-277C/APN-70 shall be in accordance with MS91403-B1D1. The weight of Receiver, Radio R-277C/APN-70 shall not exceed 50 pounds. The dimensions of Indicator, LORAN IP-58A/APN-70 shall not exceed 6-1/4 inches wide, 6-3/4 inches high, 20 inches deep. The weight of Indicator, LORAN IP-58A/APN-70 shall not exceed 15 pounds.

3.4.2 Housing. Receiver, Radio R-277C/APN-70 and Indicator, LORAN IP-58A/APN-70 shall comprise 2 metal cabinets. The housings shall be of sufficient rigidity and strength to withstand rough handling. The parts within each housing shall be assembled in a single unit which can be easily removed from the housing. The entire set shall permit easy removal from the shock mountings.

3.4.2.1 Handle. The housing of Receiver, Radio R-277C/APN-70 shall have suitable carrying handles attached for ease of handling.

3.4.2.2 Enclosure and ventilation. Adequate provision shall be made to prevent leakage into the interior of the equipment of water, sand, oil, or the like, that may fall or collect on top of the unit. The equipment shall be as waterproof and dustproof as practicable, and therefore, the use of ventilating louvers shall be restricted as much as possible without interfering with the performance of the equipment.

3.4.3 Cathode ray tube. A 5-inch cathode ray tube shall be used in Indicator, LORAN IP-58A/APN-70.

3.4.3.1 Visor for CRT. A visor designed to enhance readability in the presence of sunlight shall be mounted in front of the indicator tube. The visor shall be of material sufficiently flexible that personnel accidentally hitting it are not likely to be injured or to damage the indicator. It shall be easy to install or remove without the use of special tools.

3.4.4 Front panel. The front panel shall be in accordance with MIL-P-7788, type II.

3.4.4.1 Dimensions. The plastic lighting plate shall be between 1/32 and 1/16 inch smaller in length and width dimensions than the control panel mounting plate.

3.4.4.2 Light source. Specific approval of the procuring activity shall be obtained as to the type of light source and assembly to be used with the plastic lighting plate.

3.4.4.3 Mounting plate. All component fastenings except those extending all the way through the plate, such as control shafts and switches, shall not extend beyond the front surface of the mounting plate.

3.4.4.4 Lamp power circuit. The power circuit to the illuminating lamps shall be controlled by the on-off power switch for the equipment.

3.4.4.5 Finish. The edges of the mounting plate shall be finished with black non-reflecting enamel conforming to MIL-E-5556.

3.4.4.6 Markings. All operating controls shall be located on the front panel. Gain control knobs and control knobs having fixed detent positions shall include a position marking on the knob which shall be illuminated from the lamps used to illuminate the panel lettering. Knobs having fixed detent positions shall also have an indication for each position marked on the plastic lighting plate.

3.4.4.7 Veeder-root type counters. Illumination shall be provided for the time difference counters which shall permit readings under all lighting conditions, but shall not interfere with the operator's vision at night. The numerical read out from the veeder-root counters shall be entirely compatible with existing Loran charts on all modes of operation, including LORAN A, LORAN C and LORAN CS. No interpolation or cross references charts shall be required.

3.4.5 Interconnecting receptacles. Radio Frequency Plug UG-88C/U in accordance with MIL-C-39012 shall be suitable for mating with receptacles located on the front

or rear panels of the equipment. Either Part Number M39012/16-0001, solder type, or Part Number M39012/16-0004, crimp type, shall be provided as specified by the procuring activity (see 6.2).

3.4.6 Warning notice. The statement "WARNING - HIGH VOLTAGE - TURN OFF POWER BEFORE REPAIR OR ADJUSTMENT WITHIN UNIT" or equivalent shall be displayed conspicuously on the units. A durable form of lettering or engraving, or a nameplate shall be used.

3.4.7 Primary power source. The receiving set shall be designated as a category B utilization equipment in accordance with MIL-STD-704 with exceptions and additions specified herein. The primary power for the equipment shall be a single-phase, 380 to 420 Hz source. One side of the power input circuit may be grounded.

3.4.7.1 Power consumption. The maximum power consumption shall not exceed 410 voltamperes at nominal line voltage (115 volts root-mean-square).

3.4.8 Reliability. Reliability of the Receiving Set, LORAN AN/APN-70B shall be determined in accordance with MIL-STD-781. The equipment shall provide a minimum acceptable time-between-failure (MTBF) (θ_1) of not less than 250 hours at a confidence level of 90 percent.

3.4.9 Longevity. The equipment shall have a longevity of not less than 2000 hours before wearout failures occur or the equipment consistently fails to meet the specified MTBF index.

3.4.10 Maintainability. Maintainability requirements shall be in accordance with MIL-STD-471.

3.5 Performance

3.5.1 Delay controls. Two speeds of delay control shall be provided by the same control knob. The two speeds shall be obtained by axial movement of the control knob. When the control knob is pushed in, a coarse delay control covering approximately 1000 microseconds per revolution of the control knob shall be provided. When the control knob is pulled out, a fine delay control covering approximately 100 microseconds per revolution of the control knob shall be provided. The maximum torque for course delay control rotation at room temperature or above shall be 75 ounce-inches to start and 50 ounce-inches to run. The electro-mechanical stops at the end of the delay crank rotation shall not loosen when the end of the range is reached. Suitable detent action shall be provided in both positions of the delay control knob. These controls shall actuate both the electronic delay network and their respective veeder-root type counter. Two sets of these controls shall be provided. One of these controls shall be designated W DELAY and the other shall be designated Y DELAY. It shall be possible to rotate the delay controls in both fine and coarse positions from minimum to maximum delay and from maximum to minimum delay without any discontinuities in the presentation. Electro-mechanical stops shall be provided in the vicinity

of the minimum and maximum delay settings so that it is not possible to obtain an erroneous delay reading. The setting of the delay control knobs shall not be affected by vibration or shock conditions encountered in normal operation. The electro-mechanical stops shall be of the type that cause a lock whenever power is removed from the equipment no matter what the position of the control knobs happens to be at the time. The stops shall permit a range of adjustment of the delay readings from 0 - 98,400 μs or wider.

3.5.2 Delay reading range. The minimum range of delay readings obtainable shall be 0 to L/2 minus 3100 microseconds on LORAN A operation and shall be 9500 to L minus 3100 microseconds on LORAN C operation. (Repetition rate is defined in 6.3.14.)

3.5.2.1 Indicator presentation. Indicator presentation shall provide suitable means for matching one pari of pulses such as is normally used in standard LORAN operation (1700 kHz to 2000 kHz).

3.5.3 Spurious pedestals. No slave pedestals or fast sweep slave traces shall appear on the cathode ray tube when a delay reading exceeds L/2 minus 1625 microseconds while in the LORAN A mode of operation, or when a delay reading exceeds L minus 1625 microseconds while operating on the LORAN C or LORAN CS mode.

3.5.4 Self-checking function. Self-contained facilities shall be provided so that the timer operation of the pulse repetition rates and the delay marker systems can be checked. With input signals up to one volt peak, interference from radio frequency signals or noise shall not appear on the oscilloscope traces with the function switch in a position used exclusively for self-checking purposes.

3.5.5 Pedestal vertical amplitude. The vertical amplitude of all pedestals shall be 5/16 inch, plus or minus 1/8 inch.

3.5.6 Drift control. The combination of fine and coarse drift controls shall provide a means of changing the pulse repetition rate (PRR) a minimum of plus and minus 200 parts per million without discontinuity. The fine drift control alone shall be capable of changing the PRR a minimum of plus and minus 125 parts per million and a maximum of plus and minus 250 parts per million when the coarse drift control is properly adjusted. The fine, manual, drift control shall be located on the front panel of the unit. The coarse drift control shall be a screwdriver adjustment and be accessible for maintenance purposes only. The fine drift control shall have a pointer or marker set to indicate to the operator the approximate position at which the exact PRR is obtained when the course drift control is properly set. In no case shall the operation of the drift controls enable synchronization with any LORAN PRR except the one to which the pulse repetition rate switch is set. The coarse and fine drift controls shall have stops to limit their rotation to less than 360 degrees. The limits on the fine drift control are to be met only at normal ambient conditions. Under extreme ambient conditions the pulse shall drift left when the fine drift control is turned full

counterclockwise. Under extreme ambient conditions, a pulse which has been locked in place by turning on the automatic drift control switch must remain locked when the drift control pot is turned throughout its entire range.

3.5.7 Left-right control. A 3-position control with spring return to center position shall be provided to change any pulse repetition period between plus and minus 75 and plus and minus 150 microseconds with the function switch set to position one, and between plus and minus 11 and plus and minus 14 microseconds with the function switch set to any other position.

3.5.8 Indicator presentation. The oscilloscope pattern presented on the cathode ray tube shall be such that LORAN pulses can be readily matched.

3.5.8.1 Function switch positions (LORAN A). The oscilloscope sweep for different positions of the function switch of LORAN A operation shall be as follows:

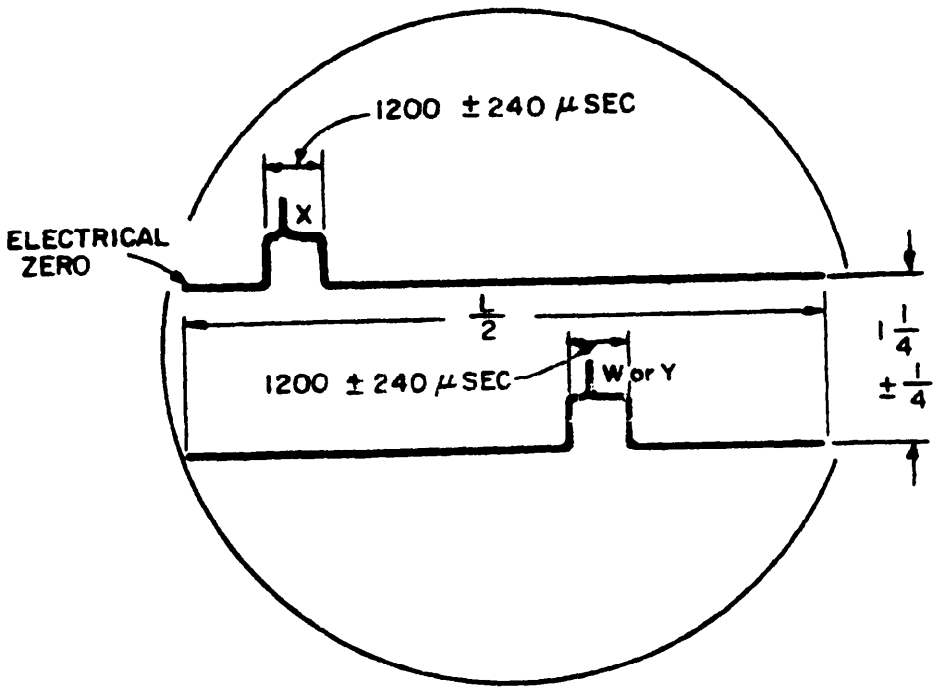
a. Function switch position 1: Two linear traces of L/2 duration, one positioned above the other. The top trace shall have one raised X or master pedestal. The bottom trace shall have one raised slave pedestal. The slave pedestal shall be either W or Y, and shall be chosen by the W-Y HF delay switch. Each pedestal shall be 1200 ±240 microseconds wide. Refer to figure 1 for additional characteristics. Cathode ray tube sweep speed shall be increased by a factor of between 15 to 1 and 18 to 1 during the time occupied by each pedestal. After each pedestal, the sweep speed shall slow down exponentially to a constant sweep commensurate with the screen width and the rep rate. This return to normal speed shall be complete between 1500 and 2000 microseconds after each pedestal.

b. Function switch position 2: Two traces referred to as X and W or Y vertically spaced. Each trace shall be 1200 ±240 microseconds duration. These traces shall correspond to the tops of the pedestals mentioned for function switch 1 above. Refer to figure 2 for additional characteristics.

c. Function switch position 3: Two linear traces, superimposed. Each trace shall be 400 ±80 microseconds duration. These traces shall correspond to approximately the first one-third portion of the traces in function switch position 2. Refer to figure 3 for additional characteristics.

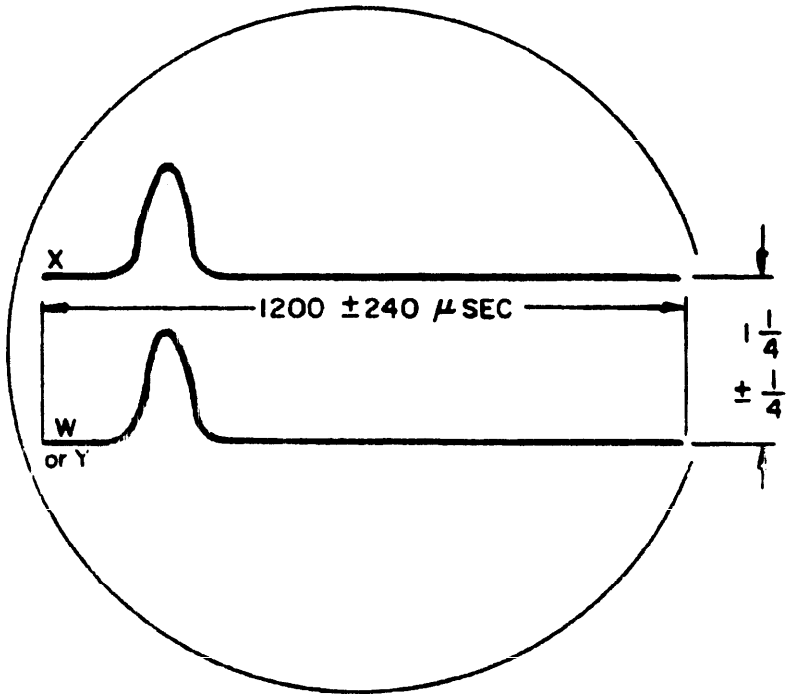
d. Function switch position 4: Identical to function switch position 2, except for trace separation. The trace separation shall be from 1/4 to 1/2 inch.

e. Function switch position 5: Identical to function switch position 3, except for the addition of self-checking calibration markers to check timer operation of the delay marker systems. Refer to figure 4 for additional characteristics.



DIMENSIONS IN INCHES

FIGURE 1. Function Switch Position 1 Indicator Presentation (Mode A Only)



DIMENSIONS IN INCHES

FIGURE 2. Function Switch Position 2 Single Presentation (Mode A Only)

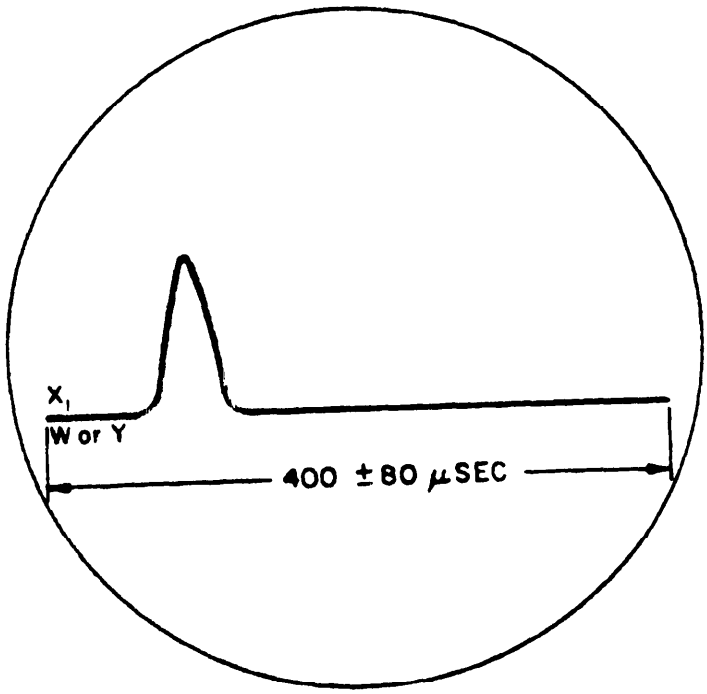


FIGURE 3. Function Switch Position 3 Single Presentation (Mode A Only)

3.5.8.2 Function switch positions (LORAN C). The oscilloscope sweep for different positions of the function switch on LORAN C operation shall be as follows:

a. Function switch position 1, one linear trace of L duration. Near the beginning or left hand edge of the trace shall be a raised master pedestal. Along the remainder of the trace, but not sooner than 11,000 microseconds from the beginning of the trace, there shall appear a raised slave pedestal. The slave pedestal shall be either W or Y and shall be chosen by the W-Y, HF Delay Switch. Each pedestal shall be 1400 ±240 microseconds wide. Refer to figure 5a for additional characteristics.

b. Function switch position 2, two linear traces referred to as X and W, or Y vertically spaced. Each trace shall be 1400 ±240 microseconds duration. These traces shall correspond to the tops of the pedestal dimensions for junction switch position 1 above. Refer to figure 5b for additional characteristics.

c. Function switch position 3, two traces superimposed. Each trace shall be 400 ±80 microseconds duration. These traces shall correspond up to approximately the first one-third portion of the traces in function switch position 2. Refer to figure 5c for additional characteristics.

d. Function switch position 4 identical to function switch position 2, except for trace separation. The trace separation shall be 1/4 to 1/2 inch.

e. Function switch position 5 identical to function switch position 3, except for the addition of self-checking calibration markers to check timer operation of delay marker systems. Refer to figure 4 for additional characteristics.

3.5.9 W-Y HF delay switch. The W-Y HF delay switch shall provide means of activating either the W gain and delay controls or the Y gain and delay controls.

3.5.10 Time sharing gain controls. Three separate gain controls shall be provided, each of which shall be capable of controlling the gain of the receiver from minimum to maximum gain on certain specified portions of the traces when the function switch is in position one, and those portions of these traces used with the function switch in positions 2, 3 and 4.

3.5.10.1 XZ master control. In the LORAN A mode of operation, the XA master gain control shall control the gain of the traces on function switch position 1 from electrical zero to L/2 (the master or upper trace). In the LORAN C and LORAN CS modes of operation, the XZ master gain control shall control the gain of the trace on function switch position 1 from electrical zero (reset) to 11,000 microseconds.

3.5.10.2 W and Y gain control. The W or Y gain control in the LORAN A mode of operation shall control the gain of the traces from L/2 to L (the slave or lower trace). In the LORAN C or CS modes of operation, W or Y gain control shall control the gain

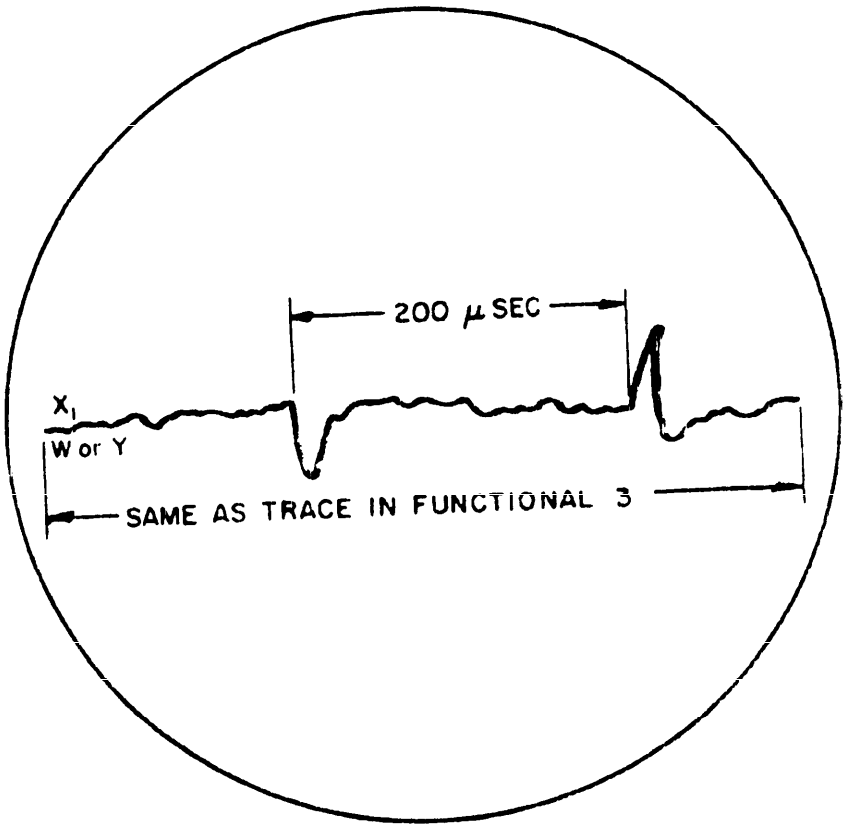
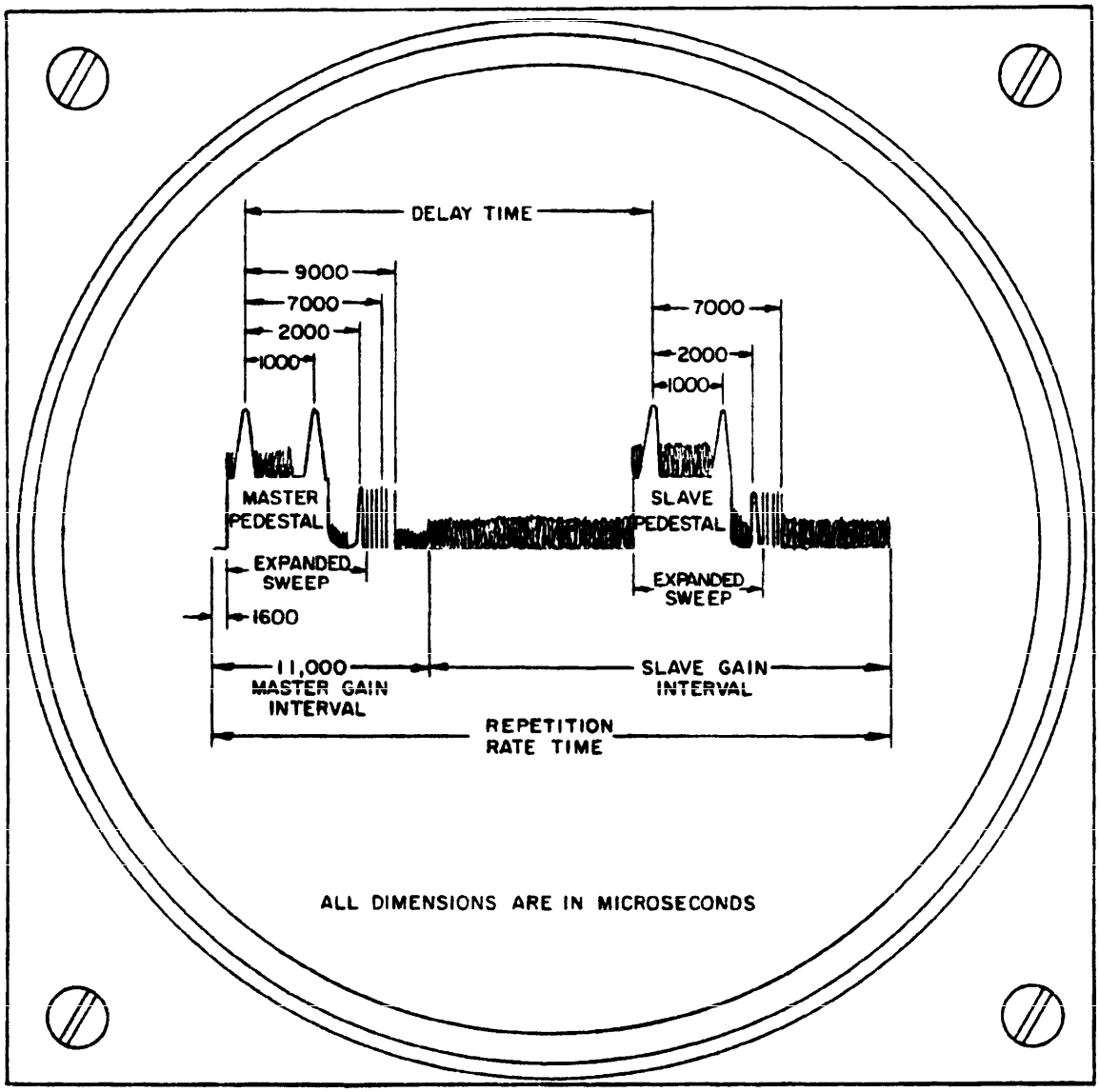
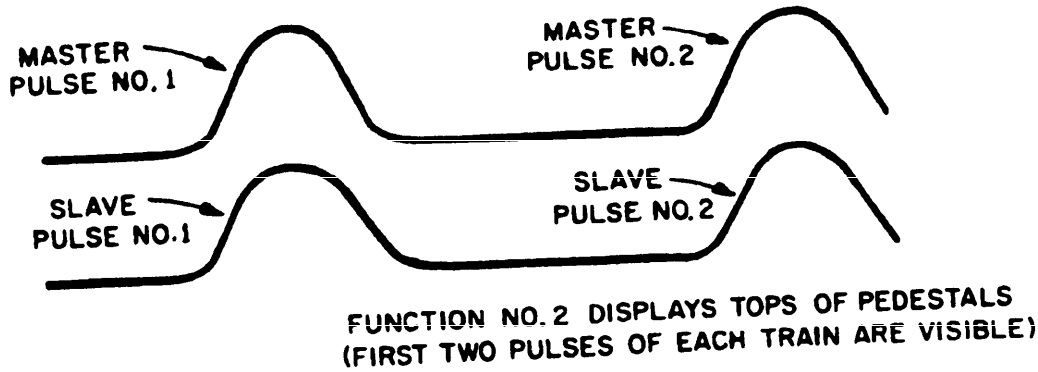


FIGURE 4. Function Switch Position 5 - Single Presentation (Modes A and C)



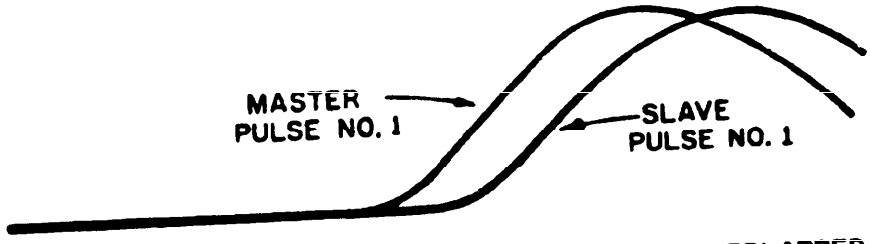
FUNCTION NO. 1 SINGLE LINE DISPLAY
(FIRST TWO PULSES OF MASTER AND SLAVE TRAINS ARE SHOWN IN POSITION ON THEIR RESPECTIVE PEDESTALS. REFER TO 3.5.8)

FIGURE 5a. LORAN C and CS Indicator Displays

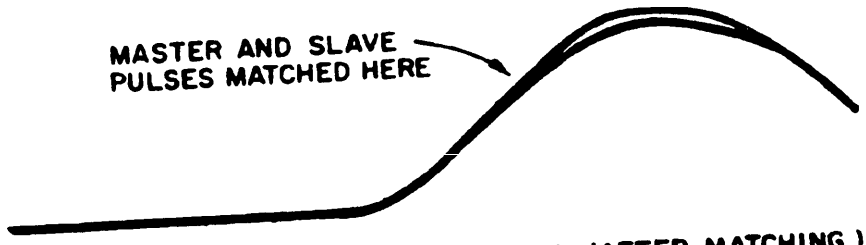


FUNCTION NO. 2 DISPLAYS TOPS OF PEDESTALS
(FIRST TWO PULSES OF EACH TRAIN ARE VISIBLE)

FIGURE 5b. LORAN C and CS Indicator Displays (Contd)



FUNCTION NO. 3 TRACES OVERLAPPED AND
SWEEP EXPANDED (SHOWN SLIGHTLY MISMATCHED)



FUNCTION NO. 3 (AFTER MATCHING)

FIGURE 5c. LORAN C and CS Indicator Displays (Contd)

of the traces from 12,800 microseconds to L (the right hand portion of the trace in function 1). The choice of use of W or Y gain control shall be provided by the W-Y HF delay switch.

3.5.11 PRR - station selector. A 24-position switch shall be calibrated clockwise S0 through S7, then L0 through L7 and finally H0 through H7, eight positions each. When the pulse repetition rate switch is set at a given position, the time shall generate the proper L/2 period, or L period, as the case may be in the following chart.

Pulse Repetition Rate	L/2 Period (LORAN A)	L Period (LORAN C)	L Period (LORAN CS)
S0	25,000 microseconds	50,000 microseconds	100,000 microseconds
S1	24,950 "	49,900 "	99,900 "
S2	24,900 "	49,800 "	99,800 "
S3	24,850 "	49,700 "	99,700 "
S4	24,800 "	49,600 "	99,600 "
S5	24,750 "	49,500 "	99,500 "
S6	24,700 "	49,400 "	99,400 "
S7	24,650 "	49,300 "	99,300 "
L0	20,000 "	40,000 "	80,000 "
L1	19,950 "	39,900 "	79,900 "
L2	19,900 "	39,800 "	79,800 "
L3	19,850 "	39,700 "	79,700 "
L4	19,800 "	39,600 "	79,600 "
L5	19,750 "	39,500 "	79,500 "
L6	19,700 "	39,400 "	79,400 "
L7	19,650 "	39,300 "	79,300 "
H0	15,000 "	30,000 "	60,000 "
H1	14,950 "	29,900 "	59,900 "
H2	14,900 "	29,800 "	59,800 "
H3	14,850 "	29,700 "	59,700 "
H4	14,800 "	29,600 "	59,600 "
H5	14,750 "	29,500 "	59,500 "
H6	14,700 "	29,400 "	59,400 "
H7	14,650 "	29,300 "	59,300 "

3.5.12 Power ON-OFF switch. The power ON-OFF switch shall be combined with the XZ gain control so that only one knob is required for both controls. The OFF position shall be such that the gain control is turned to the extreme counter clockwise position.

3.5.13 R-F channel switch. A suitable 5-position switch shall be incorporated in the receiver to allow the selection of one of 5 r-f channels. These channels shall be numbered in a clockwise direction as follows: 1, 2, 3, 4, and 7. The first four are to be bracketed with the nomenclature HF and the number 7 is to have the nomenclature LF suitably inscribed in its immediate vicinity.

3.5.14 R-F channel frequencies. The frequency coverage of different r-f channels shall be as shown in table I. Channel No. 1 shall always be set to the highest frequency channel. Crystals of appropriate frequencies shall be used in the oscillator circuit of the receiver to provide proper heterodyne action with the received signal.

TABLE I

Channel Number	Frequency Range Kilohertz	Nominal Frequency Kilohertz	Peak Set Frequency		
			Frequency Kilohertz	Room Temp. Tolerance Kilohertz	Maximum Variation From Room Temperature Frequency During Environmental Tests Kilohertz
1	1700-2000	1950	1950	±5	±15
2	1700-2000	1850	1850	±5	±15
3	1700-2000	1900	1900	±5	±15
4	1700-2000	1750	1750	±5	±15
7	90-110	100			

1/

1/ Due to the double hump response of the receiver bandpass on channel 7, Peak Set Frequency does not apply.

3.5.15 Heterodyne oscillator. The receiver heterodyne oscillator shall be crystal controlled on all channels.

3.5.15.1 Heterodyne oscillator radiation. Radiation from the heterodyne oscillator shall be kept to the lowest practical value.

3.5.15.2 Heterodyne oscillator stability. The maximum frequency deviation of the crystal controlled heterodyne oscillator shall not exceed the frequency stability requirements imposed on the crystal units themselves by the applicable crystal specification.

3.5.16 Automatic drift control. The automatic drift control (ADC) shall provide suitable means of holding the received master and slave pulses on their respective pedestals. The ADC shall be capable of locking and holding the master and slave pulses so that the leading edges of the pulses are approximately 100 microseconds from the left edge of their respective pedestals. The ADC shall be capable of holding noise-free received pulses whose vertical amplitude on the cathode ray tube trace is three-eighths inch and whose pulse repetition rate differs from that of the receiver by as much as plus or minus 150 parts per million. In the presence of noise, where the peak signal-plus-noise to noise ratio is a maximum of 2 to 1, the ADC shall hold synchronization for at least a 1-minute period with the manual drift control centered. The noise source for this condition shall be that of the receiver itself.

3.5.16.1 ADC ON-OFF switch. The ADC ON-OFF switch shall be incorporated with the drift control with only one dual control on the front panel.

3.5.16.2 ADC direction of drift. The direction of pulse drift when not positioned on the pedestal, as viewed on the cathode ray tube traces, and with the ADC ON-OFF switch on the ON position, shall be from left to right for the maximum clockwise position of the fine drift control, and from right to left for the maximum counterclockwise position of the fine drift control.

3.5.17 Indicator focus control. A suitable screwdriver type of focusing control shall be accessible from the front of Indicator, LORAN IP-58A/APN-70.

3.5.18 Indicator brilliance control. A suitable screwdriver type of brilliance control shall be accessible from the front panel of Indicator, LORAN IP-58A/APN-70.

3.5.19 Quartz crystal units. Nontemperature controlled standard quartz crystal units shall be chosen from MIL-C-3098.

3.5.20 Residual hum. With the receiver input terminal grounded, hum amplitude modulation shall not show on the oscilloscope screen when the receiver gain controls are varied through their entire range. Hum intensity modulation shall not interfere with operation with the brilliance control adjusted to normal brilliance.

3.5.21 Receiver overload. There shall be no evidence of receiver overload with standard signal input to one volt peak.

3.5.22 Receiver input. The input circuits of all r-f channels of the receiver shall be designed to operate with an external antenna coupling unit. Connection between the antenna coupling unit and Receiver, Radio R-277C/APN-70 shall be by means of up to 125 feet of Radio Frequency Cable RG-58C/U.

3.5.23 Local-distant switch. A single-pole double-throw switch shall be provided with the three terminals connected to pins on the power input receptacle for the purpose of controlling an attenuation device to be located in an auxiliary antenna coupler unit.

3.5.24 B-plus power for external antenna coupler unit. A direct current voltage shall be connected to a pin on the power input receptacle for furnishing approximately 120 volts at 10 milliamperes current. This voltage shall be used as the B-plus supply for an external antenna coupler unit to be used with this equipment.

3.5.25 Selectivity. The overall selectivity of the receiver shall be as indicated in table II with the following qualifications:

3.5.25.1 Symmetrical bandwidth shall be the condition where not less than 40 percent of the total bandwidth exists on either side of the r-f channel peak set frequency for channels 1, 2, 3, and 4 and on either side of the r-f channel nominal frequency for channel 7. At no time shall the nominal r-f channel frequency be more than 6 dB down from the actual center frequency.

TABLE II

Channel Number	dB Down From Set Frequency	dB Down From Nominal Freq.	Symmetrical Bandwidth In Kilohertz		Room Temp. Tolerance In Kilohertz		Max Variation From Room Temp. Cond. As A Result Of Environmental Tests in Kilohertz	
			LORAN		LORAN		LORAN	
			A	C	A	C	A	C
1,2,3,4,7	6	6	50	23	±10	±3	±15	±4.5
1,2,3,4,7	60	60	240 max	60	---	---	---	---
1,2,3,4,7	100	100	600 max	200	---	---	---	---

Refer to figure 6 for additional characteristics on the response of channel 1, 2, 3, and 4. Refer to figure 7 for additional characteristics of response on channel 7.

3.5.26 Video selectivity. The overall video response between the input to the first video stage and the cathode ray tube output shall be flat within plus or minus 3 dB between 30 hertz to 30 kilohertz.

3.5.26.1 Video amplification. With the receiver input terminal shunted by a 50-ohm noninductive resistor, it shall be possible to obtain at least one-quarter inch of grass on the cathode ray tube traces on sweep speed one. When viewing a single pulse on the face of the cathode ray tube, clipping of the top of the pulse shall not occur until the pulse amplitude is at least 2 inches, or until it extends beyond the tube face, whichever occurs first.

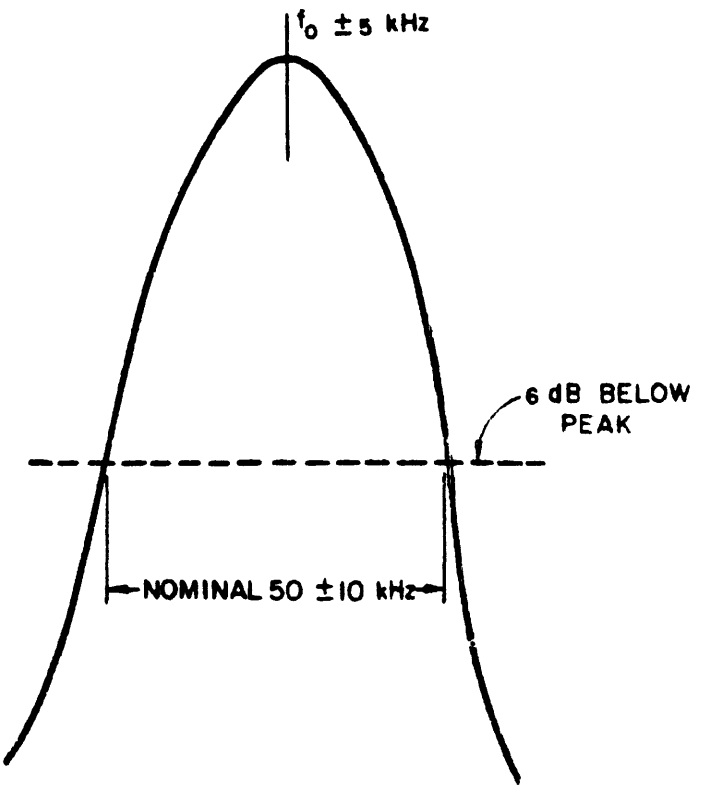


FIGURE 6. Bandpass for Channels No. 1, 2, 3 and 4

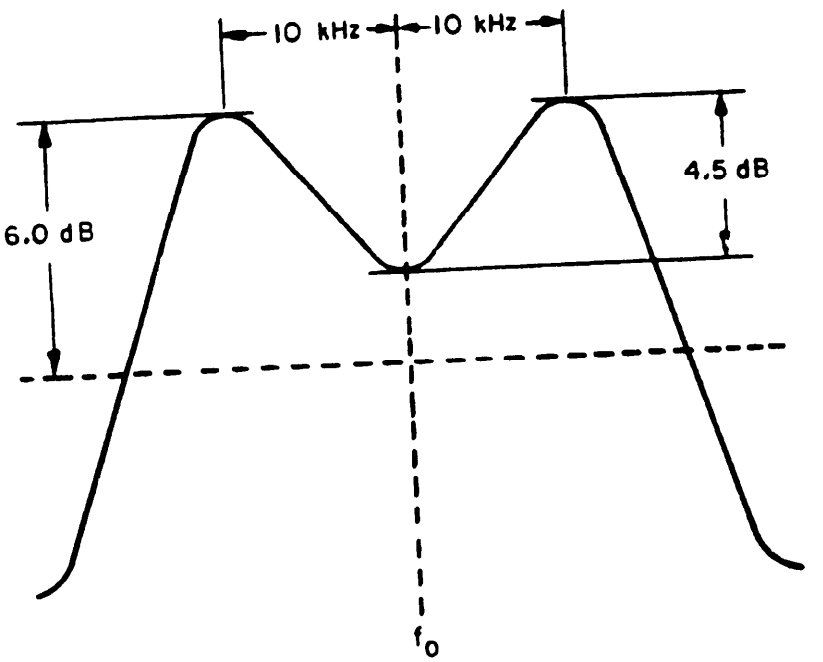


FIGURE 7. Bandpass for Channel 7 "LF" (100 kHz)

3.5.27 Sensitivity. Using the dummy receiver input load, signal source and output indicator specified below, the sensitivity of the receiver over the entire frequency range shall be such that 5 microvolts input shall provide not less than standard output.

3.5.27.1 Dummy receiver input load. The dummy receiver input load shall consist of a 50-ohm noninductive resistance.

3.5.27.2 Standard signal source. The standard signal source shall be obtained from an approved type signal generator. The signal shall be unmodulated continuous wave.

3.5.27.3 Gain control. The gain control shall be set as required.

3.5.27.4 Standard output. An output level of one volt root-mean-square combined signal and noise shall be referred to as standard output. The signal output shall be measured by replacing the second detector with a vacuum tube voltmeter, the input impedance which shall be equal to the parallel connection of the following circuit elements:

10 micromicrofarads (maximum)
33,000 ohms (noninductive).

3.5.28 Signal-to-noise ratio. With the gain control adjusted so that the input specified under 3.5.27 provides standard output, the root-mean-square value of the noise shall in no case exceed 0.2 volts on all channels when the r-f input voltage is removed.

3.5.29 Spurious responses. The ratio of the input required to produce standard output at the spurious response frequency to the standard signal input at resonant frequency with the gain control adjusted for standard output at this frequency shall exceed the values tabulated below for all channels:

Intermediate frequency	3,000 to 1
Image frequencies	20,000 to 1
Other frequencies	100,000 to 1.

The frequencies classified under other frequencies shall not include harmonics or subharmonics of the signal generator frequency at circuit resonance nor frequencies within the 100 db pass band of the receiver as specified in 3.5.25.

The term "intermediate frequency" shall include all frequencies within the intermediate frequency pass band of the receiver. The term "image frequency" shall mean the frequency near the nominal image frequency at which spurious response is maximum. The frequencies classified under "other frequencies" shall not include harmonics or subharmonics of the signal generator frequency at circuit resonance, frequencies within the 100 dB pass band of the receiver as specified in 3.5.25.1, nor frequencies within the 100 dB pass band at the intermediate and image frequencies.

3.5.30 Interconnecting cable. The equipment shall be so designed that a cable length of from 3 to 25 feet may be used to interconnect Receiver-Radio R-277C/APN-70 with Indicator, LORAN IP-58A/APN-70.

3.5.31 Mode switch. The mode switch shall be a 3-position rotary switch with lighted pointer. It will be part of the basic modification of the original APN-70. It should be mounted on the timer chassis near the lower edge of the front panel. The three positions shall be labeled A, C, and CS. This switch shall select a proper group of repetition rate timing signals from the rep rate switch and alter the display sequence and pattern in a matter appropriate for each mode of operation as follows:

a. "A" position: Selects a proper group of repetition rate timing signals for a L/2 period ranging from 14,650 microseconds to 25,000 microseconds in 24 step positions. Four frequencies are utilized in this mode, 1750, 1850, 1900, and 1950 kHz.

b. "C" position: Selects a proper group of repetition bite timing signals for repetition periods ranging from 39,000 microseconds to 50,000 microseconds (S and L) in 16 step positions utilizing 100 kHz.

c. "CS" position: Selects a proper group of repetition rate timing signal for repetition periods ranging from 59,300 microseconds to 100,000 microseconds (SH, SL and SS) in 24 step positions utilizing 100 kHz.

3.5.32 Coherent detector switch. This switch shall have no effect on the operation when in the UP position. When moved to the DOWN position it shall cause the receiver gain to be down graded by 30 dB at all times except during the pedestals. The purpose of this switch is to prevent intermittent noise pulses and strong stations which occur outside the pedestal periods from over loading the receiver to the extent that recovery would amount to a substantial proportion of the repetition rate time.

3.6 Mounting MT-810/U (Receiver). The mounting shall be constructed in accordance with Drawing 59D12660 except that automatic locking devices shall be used in lieu of clamp assembly.

3.7 Mounting MT-811A/U (Indicator). The mounting shall be so designed and constructed that the detail requirements set forth herein shall be met when the indicator is subjected to service condition tests as stated in section 4. Provision shall be afforded so that the mounting may be inverted and the indicator suspended therefrom as well as the condition wherein the indicator is installed superior to the mounting. The normal horizontal axis of the indicator unit when installed in an aircraft may vary a maximum total of plus or minus 30 degrees from the true horizontal. Provision shall be included so that the horizontal axis of the indicator unit when viewed from the front, may be tilted 10 degrees upward when the indicator unit is installed superior to the mounting, or 10 degrees downward when the mounting is installed superior to the indicator unit. The mounting shall comply with MIL-C-172.

3.8 Visual performance. When supplied with suitable signals from any Loran pair of a LORAN chain (either a LORAN A chain or LORAN C chain depending upon which used), and in a favorable service area, the presentation upon the Indicator IP-58A/APN-70B shall be clear and unambiguous. Reading error shall not be greater than one microsecond. Indications shall be free from spurious responses to such a degree that no confusion may result therefrom.

3.9 Government loaned property. When specified in the contract, the Government will loan the following to the contractor upon his request.

Item No.	Item Description	Quantity
1	Receiver, Radio R-277C/APN-70	1
2	Indicator, LORAN IP-58A/APN-70	1
3	Mounting MT-810/U (Receiver)	1
4	Mounting MT-811A/U (Indicator)	1

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 The quality assurance provisions of MIL-E-5400 and the requirements specified herein shall be applicable to this specification. When the two documents conflict, this specification shall govern.

4.2.1 Classification of tests. The inspection and testing of the Radio Receiving Set AN/APN-70B shall be classified as follows:

a. Preproduction tests . . . . . See 4.3

b. Quality conformance inspection tests . . . . . See 4.4

4.3 Standard test conditions. Unless otherwise specified or indicated, the following conditions shall exist during tests and performance measurements on all components.

a. Ambient temperature: Room ambient (between the limits of plus 15°C and plus 35°C (59°F and 95°F)).

b. Humidity: Prevailing ambient, up to 95 percent.

c. Atmospheric pressure: Normal.

d. Vibration: None.

e. Interconnecting cable: Interconnecting cable between units may be any length from 3 to 25 feet.

f. Warmup and stabilization period: Not to exceed 15 minutes.

g. Primary power supply: All detailed testing, except where otherwise specified as a test condition, shall be accomplished with the line voltage maintained at 115 volts rms, 400 hertz, measured across the input terminals at the equipment end of the primary power supply cable.

h. Number of tests: Tests to determine compliance with each of the performance requirements specified herein shall be made on not less than one representative frequency in each r-f frequency channel, unless it is perfectly obvious from the particular performance requirement or from the results of other measurements that a smaller number of tests will serve to demonstrate full compliance with the requirements or, on the other hand, that a larger number of tests are necessary to demonstrate full compliance with the requirements.

i. Vacuum tubes: The tubes used shall be chosen at random from representative groups of the selected types, all tubes in each group having been tested and found to comply with the requirements of the applicable tube specification.

j. Orientation: Substantially upright.

4.4 Preproduction testing

4.4.1 Preproduction test samples. The preproduction tests samples shall consist of models representative of the production equipment. They shall be tested under the test conditions specified herein and at the point designated by the contract.

4.4.1.1 Sampling instructions. The contractor shall conduct tests on 11 preproduction sample equipments to determine that the design of the equipments meet the requirements specified herein. The contractor's test shall be conducted in accordance with the test procedures specified herein.

4.4.1.1.1 Testing schedule. The 11 sample equipments shall be processed as follows:

a. Sample No. 1. Sample No. 1 shall be subjected to the following tests:

Tests	Applicable Paragraph
Examination of product	4.6.1
Operational tests	4.6.2
Environmental tests as follows:	4.6.3
Shock	4.6.3.4
Explosion	4.6.3.6

b. Sample No. 2. Sample No. 2 shall be subjected to the following tests:

Tests	Applicable Paragraph
Examination of product	4.6.1
Electrical tests	4.6.2.1
Environmental tests as follows:	
Temperature-altitude	4.6.3.3
Humidity	4.6.3.5
Vibration	4.6.3.4
Equipment stability	4.6.4

c. Sample No. 3. Sample No. 3 shall be subjected to the following tests:

Tests	Applicable Paragraph
Examination of product	4.6.1
Electrical tests	4.6.2.1
Power tests	4.6.2.2
Power source transient	4.6.2.4

d. Seven equipments shall be subjected to the reliability demonstration test specified in 4.6.5. Two of the seven equipments shall be continually tested for longevity as specified in 4.6.6.

e. One equipment shall be subjected to the maintainability demonstration test specified in 4.6.7. The equipment shall be subjected to examination of product, 4.6.1, and electrical tests, 4.6.2.1, prior to, and after, the maintainability demonstration test.

4.4.2 Preproduction tests. Preproduction tests shall consist of the tests specified under 4.6, subjected to the test conditions specified herein.

4.5 Quality conformance inspection tests. Quality conformance inspection tests shall consist of individual test and sampling plans and tests.

4.5.1 Individual tests. Each Receiving Set, Radio, AN/APN-70B shall be subjected to the following tests:

Tests	Applicable Paragraph
Examination of product	4.6.1
Electrical tests	4.6.2.1
Power tests	4.6.2.2

Group A Inspection

4.5.2 Sampling plans and tests

4.5.2.1 Sampling plan A. Production reliability acceptance tests shall be conducted in accordance with the requirements of test level E of MIL-STD-781. The test program shall be in accordance with table III.

TABLE III. Production Reliability Test Program

Quantity ordered per year per contractor	Number of Reliability test programs per increment*	Total test programs per No. ordered per year
1 to 100	1	1
101 to 200	1	2
Over 200	One from each additional 100 or fraction thereof on order	Variable

*A reliability test program shall consist of a quantity of at least 4 and not more than 7 units to be tested. The actual number shall be that which is most economical.

4.5.2.1.1 Accept-reject criteria. Accept-reject criteria shall be in accordance with test plan I of MIL-STD-781.

4.5.2.2 Sampling plan B. Quantities of Receiving Set, Radio AN/APN-70B shall be selected at random in accordance with table IV and subjected to the sampling tests of 4.5.2.2.1.

TABLE IV. Sampling Plan B

Quantity of Consecutively Produced items on order by Groups Per Contractor	Number tested per Increment	Total tested per number ordered per year
1 to 25	1	1
26 to 50	1	2
51 to 75	1	3
76 to 125	1	4
126 to 200	1	5
201 to 300	1	6
Over 300	One from each additional 100 or fraction thereof on order	Variable

drift controls shall provide

4.5.2.2.1 Sampling tests. Sampling tests shall consist of the following:

Tests	Applicable Paragraph
Environmental tests as follows:	4.6.3
Temperature-altitude	4.6.3.3
Vibration	4.6.3.4
Humidity	4.6.3.5

4.5.2.2.2 Rejection and retest. When one equipment from a production run fails to meet the specification, no equipments still on hand or produced later shall be accepted until the extent and cause of failure are determined and corrected.

4.5.2.2.3 Continuation of tests. For operational reasons, individual tests may be continued pending the investigation of a sampling test failure. Final acceptance of equipments on hand or produced later shall not be made until it is determined that equipments meet all the requirements of the specification.

4.5.3 Defects in equipments already accepted. The investigation of a test failure could indicate that defects may exist in equipments already accepted. If so, the contractor shall fully advise the procuring activity of all defects likely to be found and methods of correcting them.

4.6 Test methods

4.6.1 Examination of product. The Receiving Set, Radio AN/APN-70B shall be visually inspected to verify that the materials, design and construction, necessary mechanical measurements, marking, and workmanship comply with the requirements of this specification.

4.6.2 Operational tests

4.6.2.1 Electrical tests. The procedures and application of electrical tests to determine proper performance and compliance with the requirements of this specification shall be prepared by the contractor and subject to approval by the procuring activity. The electrical tests shall be performed prior to the other specification and is ready to proceed with the other tests. Unless otherwise specified, the tests shall be conducted on the complete equipment.

4.6.2.2 Power tests. The Receiving Set, Radio AN/APN-70B shall be subjected to tests that will demonstrate compliance with the power supply requirements of this specification. These tests shall include tests as outlined in 4.6.2.1, with the power sources adjusted to extreme limits of specified voltages and frequency.

4.6.2.2.1 Primary power. Compliance with power ratings shall be ascertained concurrently with the power factor test of 4.6.2.2.1.1.

4.6.2.2.1.1 Power factor test. Compliance with the equipment power factor requirements of MIL-STD-704 shall be ascertained using the following instruments, or approved equal:

Wattmeter:	Weston model 310, form 3
Voltmeter:	Weston model 341
Ammeter:	Weston model 370

The sign of the power factor shall be determined by connecting suitable capacitors across the power input while the equipment is in operation, and measuring its effect on the resultant power factor.

4.6.2.3 Interference. Compliance with electrical interference and susceptibility requirements shall be checked in accordance with MIL-STD-461.

4.6.2.4 Power source transient response. The equipment shall be tested for transient response in accordance with figures 8 and 9.

4.6.3 Environmental tests. Environmental testing shall be in accordance with class 1 requirements of MIL-T-5422 with the following additions or exceptions. When the two documents conflict, this specification shall govern.

4.6.3.1 Salt spray, sand and dust, and fungus resistance tests shall not apply unless specifically designated for critical units. The explosion test shall not be required on pressure-sealed units.

4.6.3.2 Supplemental procedures. The contractor's test procedures, when approved, shall form a part of this specification.

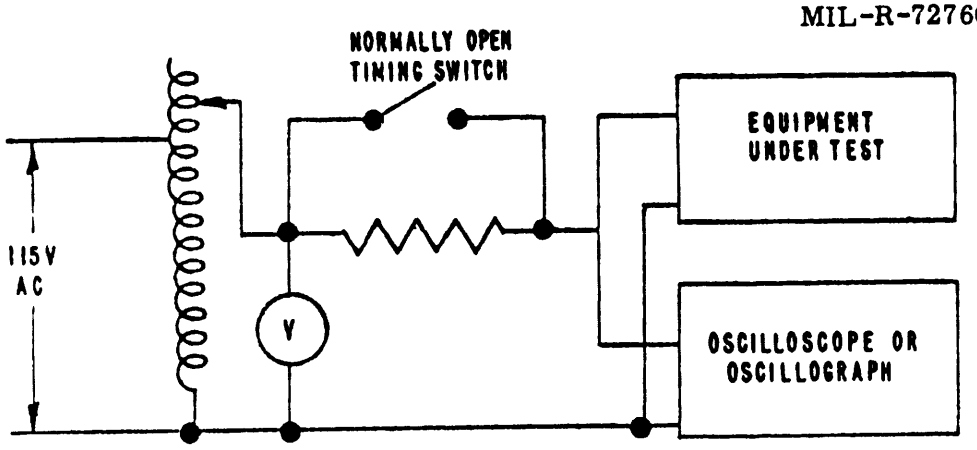
4.6.3.3 Temperature and altitude tests. Units installed only in pressurized crew compartments shall be tested to a minimum pressure of 8.9 inches of mercury (30,000 feet altitude) for required performance, and nonoperating to 3.4 inches of mercury (50,000 feet altitude).

4.6.3.4 Vibration tests

4.6.3.4.1 Vibration isolated equipment with isolators removed. When equipment is vibrated with external isolators removed, it shall be nonoperating during the 10-minute periods at each resonant frequency.

4.6.3.5 Humidity test

4.6.3.5.1 Test installation. The equipment shall be placed in a vented test chamber in a manner simulating installed conditions whenever possible. The equipment shall be placed on an inert, interposing material such as loosely woven glass cloth to prevent the development of corrosion due to contact of dissimilar metals. The equipment shall be protected against dripping of condensed moisture by an antidrip device that will not impair the flow of air through the test compartment. An example of this antidrip device is, though not limited to, a gabled or sloped roof.



The power source rating in kva should be considerably greater than the load kva in order to avoid difficulty in the determination of the effective voltage during the transient. Each of the four transients shall be repeated at least three times. The interval between transients shall not be less than 30 seconds. Tolerances shall be ± 2% on voltages and ± 10% on time intervals.

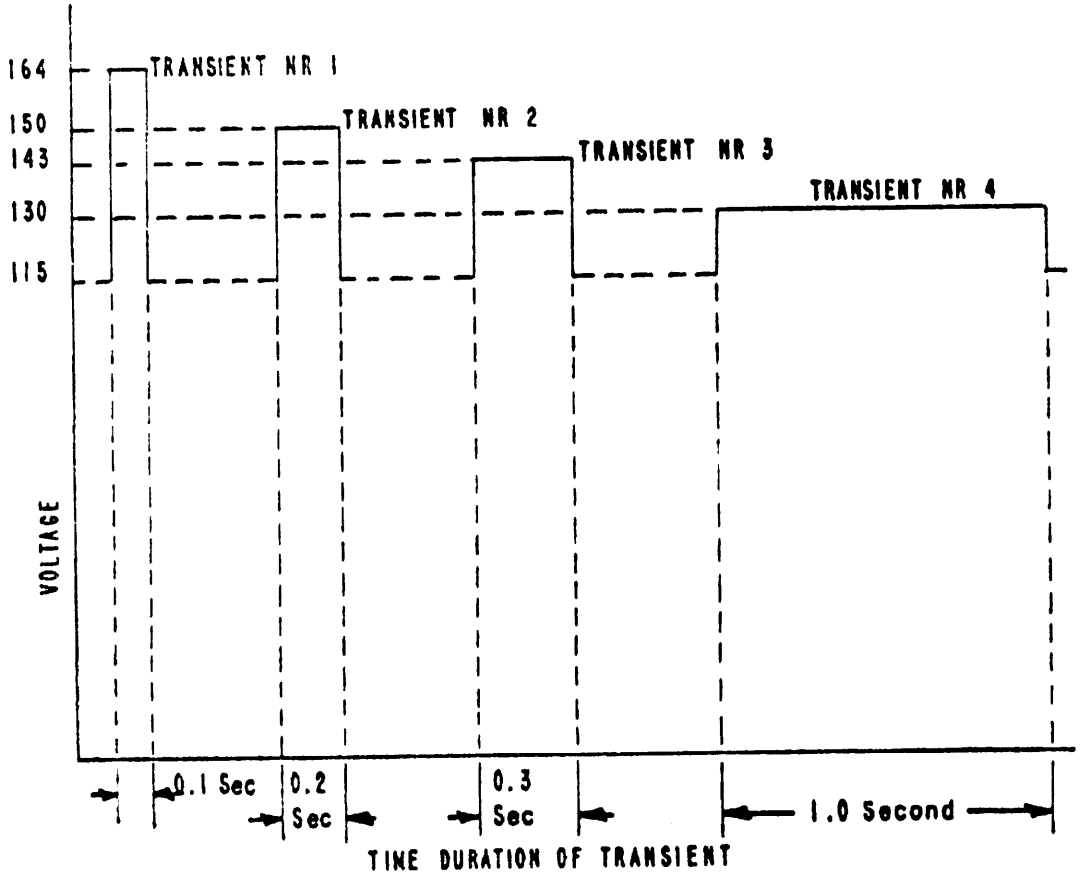
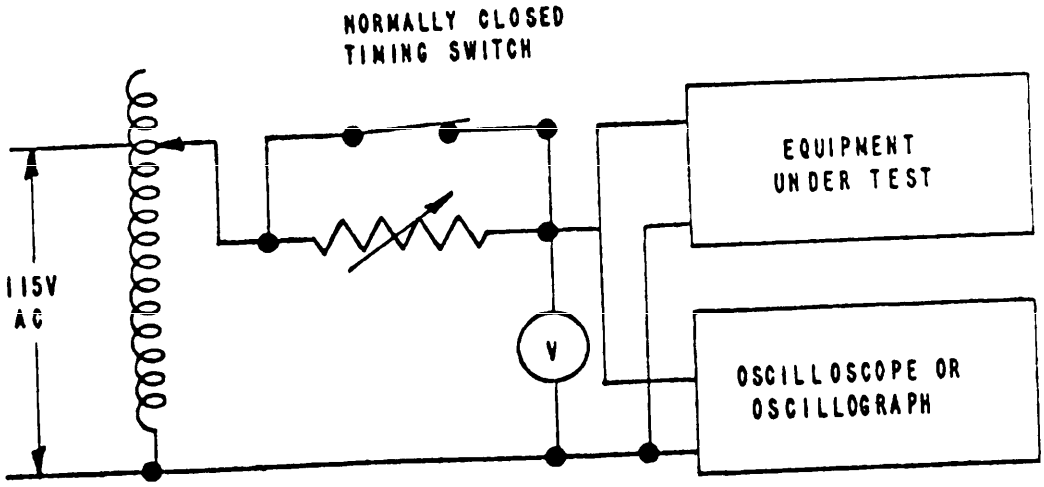


FIGURE 8. Overvoltage Transient Tests



The requirements specified on figure 8 shall also apply to tests with these low voltage transients.

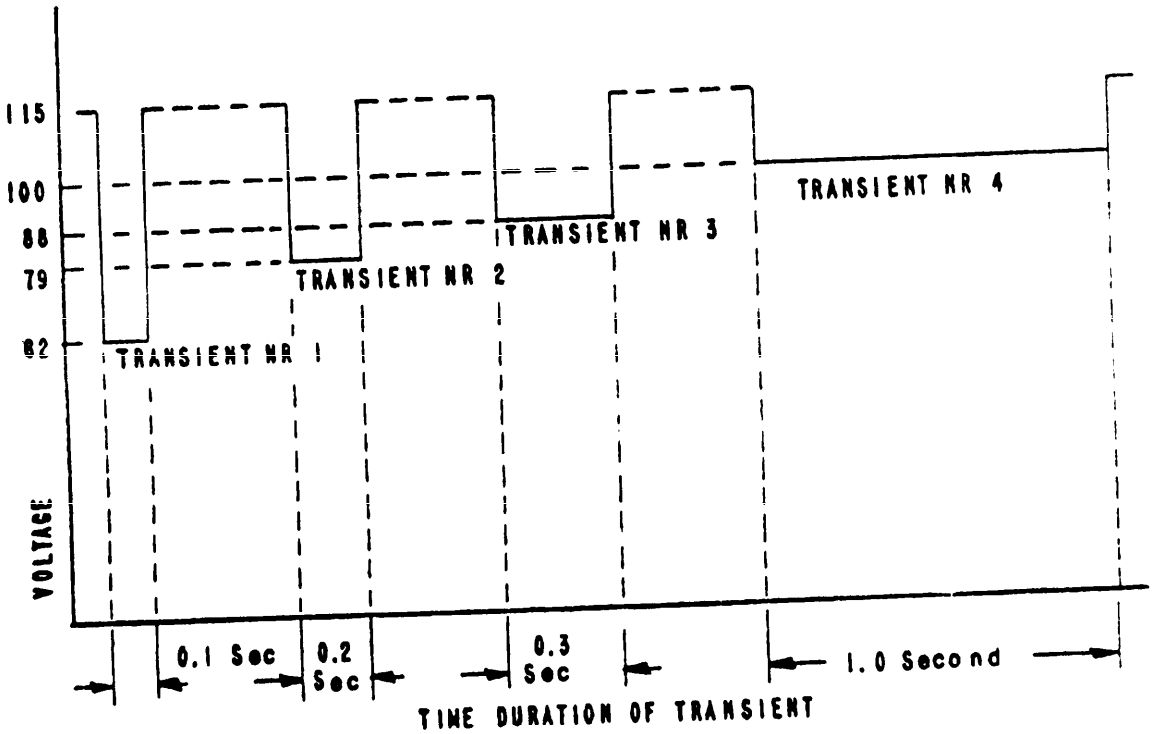


FIGURE 9. Undervoltage Transient Tests

4.6.3.5.2 Test procedure. Commercial distilled water or tap water shall be used to obtain the necessary humidity. When wet and dry bulb thermometers are used to determine relative humidity, the minimum air velocity over the wet bulb shall be 900 feet per minute. The temperature within the test chamber shall be raised from prevailing room temperature, 20°C to 38°C (68°F to 100.4°F) to 50°C (122°F), during a 2-hour period and shall be maintained for 6 successive hours. At the conclusion of this 6-hour period, the temperature shall be returned to prevailing room temperature, at as uniform a rate as is possible, over a 16- to 17-hour period. This constitutes one temperature cycle. The relative humidity shall be 95 ±5 percent throughout each of the 24-hour temperature cycles, except that a transitory minimum relative humidity of 85 percent shall be permitted during the down cycle of temperature. The temperature cycle shall be repeated 10 consecutive times.

4.6.3.5.3 Comparison test. At the conclusion of the low stage of each temperature cycle and after removal of excess moisture by inverting or tilting the equipment and wiping it with a soft, clean cloth, the equipment shall be operated for a period not to exceed 1 hour and checked against the initial performance record. Unless the preliminary checks indicate that the equipment will be endangered by further testing, the equipment shall be subjected to the electrical tests specified in 4.6.2.1. If the equipment is found to be on the verge of failure and if testing will endanger the equipment, it shall be dried in a drying oven capable of maintaining a temperature of 37.7°C (100°F) for a maximum period of 4 hours. Check shall be made during this drying period to determine the recovery trends of the equipment. At the conclusion of the drying period, 4 hours of any cycle, the equipment shall be operated and checked against the initial performance record. If the equipment does not conform to specification tolerances, or is nonoperable, or excessively deteriorated, it shall be considered as having failed to pass the humidity tests.

4.6.3.6 Explosion test. Explosion tests shall be in accordance with MIL-T-5422, procedure I.

4.6.4 Equipment stability. All of the units required to make up a complete Receiving Set, Radio AN/APN-70B shall be put into operation with all dust covers and shock mountings in place. After the equipment has operated for an initial 30-minute warmup period, it shall be adjusted for optimum performance. The equipment shall be operated continuously for a period of 50 hours. Changes in performance that occur during the 50-hour test shall be noted in order to determine compliance with the stability requirements of section 3.

4.6.5 Reliability demonstration test. The reliability demonstration test shall be conducted in accordance with test level E of MIL-STD-781. Accept-reject criteria shall be in accordance with test plan I of MIL-STD-781 for preproduction tests and plan III for quality conformance inspection tests.

4.6.6 Longevity test. An accumulable longevity test shall be conducted in accordance with the requirements of 4.6.5.

4.6.7 Maintainability. Maintainability tests and demonstration shall be in accordance with MIL-STD-741. The quantitative requirements shall be demonstrated to a confidence level of 90 percent.

4.7 Design data and material

4.7.1 Preproduction test report. The contractor shall prepare a preproduction test report in accordance with MIL-STD-831.

5. PREPARATION FOR DELIVERY

5.1 The Receiving Set, Radio AN/APN-70B shall be prepared for delivery in accordance with the instructions of the procuring activity.

5.2 Reinspection markings. Reinspection marking shall be as specified by the procuring activity.

6. NOTES

6.1 Intended use. The Receiving Set, AN/APN-70B covered by this specification is a navigation aid intended for use in aircraft.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification

b. Stock number

c. Preproduction samples and test

(1) Number of preproduction samples

(2) Point of inspection

(3) Requirement for concurrent delivery of each sample and its test data. The procuring activity should be given at least 10 days prior notice when the preproduction tests are to be conducted so that they may be supervised or witnessed, if desired, by a Government representative.

d. Solder type plug or crimp type plug (3.4.5)

e. Selection of applicable levels of preservation and packaging, and packing.

6.3 Definitions

6.3.1 LORAN C. LORAN C is a long range precision LORAN system employing automatic envelope and r-f cycle comparison techniques. It operates in the frequency band 90 to 110 kHz with a carrier frequency of 100 kHz. It utilizes group pulsing (eight pulses/group at each slave station and nine pulses/group at the master station) techniques in lieu of single pulse transmission in order to raise the average transmitted power. The pulses of the group are phase-coded (carrier frequency cycle phase relationship with respect to envelope is changed from pulse to pulse in a group in accordance with a prescribed code.) The use of synchronous detection and post-detection narrow banding reduces the effect of noise and interference and in conjunction with the use of phase coding virtually eliminates the effect of skywave contamination. In addition, phase-coding provides signal identification required for automatic search. A LORAN C chain, consisting of one master and two or more slaves, operates on a single specific repetition rate.

NOTE: The AN/APN-70-B LORAN A/C receiver operates in the LORAN C environment to a lesser degree of accuracy than Standard LORAN C receivers by utilizing only a manual envelope comparison technique.

6.3.2 Pulse shape. The LORAN C pulse shape is presently an unsymmetrical pulse having a fast rising (essentially cosine function) leading edge together with a relative slow decay of the trailing edge. It has a total rise time from 0 to 100 amplitude of approximately 70 microseconds. Its total width at 10 percent amplitude is approximately 200 microseconds.

6.3.3 Basic repetition rate. The basic repetition rate is the approximate rate at which a LORAN transmitter is group pulsed. There are five basic rates, as follows:

a. SS: 10 pulses per second

b. SL: 12-1/2 pulses per second

c. SH: 16-2/3 pulses per second

d. S: 20 pulses per second

e. L: 25 pulses per second

6.3.4 Specific repetition rate. The specific repetition rate is the precise rate at which a LORAN C transmitter is group pulsed. Specific rates are identified by a letter(s) followed by a numeral. The letter(s) signify the basic repetition rate, and the numeral indicates the number of hundred of microseconds that the specific period is

less than the basic period. Eight specific rates numbered 0 to 7, inclusive, are provided. Repetition periods in microseconds for each of the five basic and eight specific rates are tabulated below:

	SS	SL	SH	S	L
0	100,000	80,000	60,000	50,000	40,000
1	99,900	79,900	59,900	49,900	39,900
2	99,800	79,800	59,800	49,800	39,800
3	99,700	79,700	59,700	49,700	39,700
4	99,600	79,600	59,600	49,600	39,600
5	99,500	79,500	59,500	49,500	39,500
6	99,400	79,400	59,400	49,400	39,400
7	99,300	79,300	59,300	49,300	39,300

6.3.5 LORAN C master station (M). A LORAN C master station is one of the group of LORAN C transmitting stations comprising a single LORAN C rate. It has the burden of precisely maintaining its assigned repetition rate and carrier frequency, and of monitoring the synchronization, accuracy and stability of its paired slave stations.

6.3.6 LORAN C slave station (X, Y, Z). A LORAN C slave station is the LORAN C transmitting station whose transmissions paired with that of its master station comprise a LORAN C pair. It has the burden of maintaining an accurate fixed delay between the reception of master and transmission of its own signal, and of monitoring the time difference of the other signals on the same rate.

6.3.7 Time difference. Time difference is a measure of the relative times of reception of master and slave signals. It is measured as the time in microseconds between the reception of the master signal and reception of the slave signal.

6.3.8 LORAN C pulse group. A LORAN C pulse group consists of eight (or nine at a master station) phase-coded pulses transmitted by any one LORAN C station. These eight pulses are separated by 1,000 microseconds within the group. The ninth pulse at a master station is separate from the eight by 2,000 microseconds.

6.3.9 LORAN C GRR. The LORAN C group repetition rates correspond to the specific repetition rates under 6.3.4.

ve test with a supply voltage or

the frequency of lowest sensitivity. Repeat the abo

6.3.10 Phase coding. Phase coding is a method of changing phase of the r-f cycle relative to the envelope of each pulse of the LORAN C pulse group. The phase relationship varies from pulse to pulse in accordance with a code below:

Master Pulses

Period	1	2	3	4	5	6	7	8	9
1	0°	0°	180°	180°	0°	180°	0°	180°	0°
2	0°	180°	180°	0°	0°	0°	0°	0°	180°
3	0°	0°	180°	180°	0°	180°	0°	180°	0°
4	0°	180°	180°	0°	0°	0°	0°	0°	180°

Slave Pulses

Period	1	2	3	4	5	6	7	8
1	0°	0°	0°	0°	0°	180°	180°	0°
2	0°	180°	0°	180°	0°	0	180°	180°
3	0°	0°	0°	0°	0°	180°	180°	0°
4	0°	180°	0°	180°	0°	0°	180°	180°

6.3.11 Signal-to-interference ratio. Signal-to-interference ratio is defined as the square root of the ratio of the power of a pure cw signal having the same peak-to-peak amplitude as that of the r-f cycle of the LORAN C pulse at the standard sampling point, to the power of interfering signal.

6.3.12 Slave station blink transmission. All slave stations shall have a common blink procedure. The blink shall consist of the first two of the eight pulses blinking on and off with no shift in position. The duration of the "on" portion shall be between 0.2 and 0.35 second and shall repeat every 4 seconds. The remaining six of the eight pulses shall be continuously "on" with their normal phase code. Blink transmission will indicate a malfunction in system timing accuracy of the transmitter.

6.3.13 LORAN A. LORAN A is a long range system comprised of a master station and two or more slave stations. A master and slave station is called a pair and have a common r-f carrier frequency and repetition rate. A second pair is needed to obtain a fix and operates on a different repetition rate than the first pair. Separate measurements must be made on each rate of transmission from the lines-of-position (LOP). The LORAN A system of navigation may be used at ranges from 700 to 900 NM during the day and up to 1400 NM at night. The system utilizes both ground wave and sky wave signals of which the former gives the greater accuracy. Shipboard or airborne receivers operating in the LORAN A environment use a visual envelope matching

2.000( )/GR Measure the output voltages and output voltage

technique to obtain time differences for two different station pairs. These time-difference readings are plotted on a LORAN A navigational map to obtain a receiver position fix.

6.3.14 Repetition rate. "L" is defined as the time required for one complete cycle of a LORAN pulse repetition rate. For example, on pulse repetition rates "S0" and "S1", "L" will be 50,000 microseconds and 49,000 microseconds, respectively, on both LORAN A and LORAN C operation modes. In the third mode of operation (LORAN CS), "L" will be 100,000 microseconds and 99,900 microseconds for pulse repetition rates "SS0" and "SS1", respectively.

6.3.15 Frequencies. The LORAN A frequency band is 1700 to 2000 kHz. Nominal frequencies are 1750, 1850, 1900, and 1950 kHz.

Custodian:
Air Force -11

Review activities:
Air Force - 84, 85

Preparing activity:
Air Force - 11

Project 5826-F034

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)*

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT
$

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

   ☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*

DATE

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