CONSOLIDATED REPRINT

This consolidated reprint incorporates change 1

Obsolete

AC NO: 150/5345-49

DATE: May 20, 1977

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: SPECIFICATION L-854, RADIO CONTROL EQUIPMENT

1. PURPOSE. This advisory circular contains the specification for radio control equipment to be used for controlling airport lighting facilities.

2. CANCELLATION. AC 150/5340-14B, Economy Approach Lighting Aids, dated June 1970, which contains this specification as appendix 1, section 3, will be cancelled by AC 150/5340-26, Installation of Approach Lighting Aids.

3. REFERENCES. Publications that may be used in connection with this advisory circular are listed in paragraph 2 of the specification.

4. HOW TO OBTAIN THIS CIRCULAR. Additional copies of this advisory circular may be obtained, free of charge, from the Department of Transportation, Publications Section, TAD-443.1, Washington, D. C. 20590.

Joseph A. Foster

JOSEPH A. FOSTER
Assistant Administrator
Office of Airports Programs

Initiated by: AAP-550

(b) Ground-to-ground System. The ground-to-ground system is intended for operating lighting systems from an airport control tower, and the basic system can perform a maximum of 8 separate control functions. Additional control functions, in multiples of 8, can be obtained by the addition of decoder modules and associated parts.

(c) Air-to-ground Plus Ground-to-ground System. The dual system will be used where there is a part-time airport control tower. When the control tower is in operation, the lighting facility will be controlled through the ground-to-ground unit with the air-to-ground unit deactivated. When the control tower is not in operation, the lighting facility will be controlled by the air-to-ground unit. Transfer of control to and from the air-to-ground unit will be accomplished through the ground-to-ground unit.

3.4 Design Requirements.

3.4.1 General. - The equipment shall be type accepted in accordance with Federal Communications Commission (FCC) Rules and Regulations; Part 15 for a receiver and Part 89 for a transmitter.

3.4.2 Power Input. - The equipment shall be designed to operate from 120 VAC, ±15%, 60 Hz. Power for the encoder and decoders may be taken from the associated transmitter or receiver.

3.4.3 Receiver. - The receiver shall conform to the following requirements:

* (a) Type. Fixed frequency superhet**erodynes,** amplitude modulated for the Type I system and frequency modulated for the Type II system.

(b) Frequency. 118-136 MHz band for the Type I system; 150-174 MHz and/or 450-512 MHz band for the Type II systems. A Type III system uses both Type I and Type II receivers. Frequency tolerance shall be 0.003%. The exact frequency shall be specified by the purchaser.

(c) Sensitivity. For AM, 5 microvolts or less for a 10 dB signal plus noise-to-noise ratio, (S+N)/N; for FM, 5 microvolts or less for 20 dB of quieting. A sensitivity adjustment shall be provided. *

(d) Selectivity. Bandwidth of not less than ±9.0 kHz from the assigned frequency at 6 dB attenuation and a bandwidth of not more than ±40 kHz from the assigned frequency at 60 dB attenuation. Spurious signals shall be not less than 50 dB below the desired signal.

(e) Fidelity. Output uniform within ±2 dB from 300 Hz to 2450 Hz.

(f) Antenna Impedance. Nominal 50 ohms unbalanced.

* (g) Output. For an FM receiver, audio output of zero dBm or more into a 600 ohm load with signal input of 5 microvolts having deviation of 1.2 kHz at 1000 Hz. For an AM receiver, pulses resulting from bursts of radio frequency energy shall have sufficient output to drive a Type I decoder when the input signal is 5 microvolts or more. *

3.4.4 Transmitter. -The transmitter shall conform to the following requirements:

* (a) Type. Fixed frequency, frequency modulated.

(b) Frequency. 150-174 MHz and/or 450-512 MHz band with a frequency tolerance of 0.00025%. The exact frequency will be specified by the purchaser. *

(c) Power Output. Not less than 1 watt nor more than 3 watts.

* (d) Modulation. Capable of frequency deviation of ±2.5 kHz with an input of -10 dBm within the frequency band of 300 Hz to 2450 Hz. *

(e) Output Impedance. Nominal 50 ohms unbalanced.

(f) Input Impedance. 600 ohms.

3.4.5 Decoders.

3.4.5.1 General. - The Style A decoder shall decode a series of electrical pulses, such as generated by clicking a transmitter microphone, to control the desired function while the Style B decoder detects a series of 3 tone burst characters per control function or address. The decoders shall not respond to signal elements of less than 50 milliseconds and shall not require signal elements of more than 100 milliseconds.

3.4.5.1.1 Output Relays. -Output relays shall be the plug-in type having SPST NO contacts rated at 3 amps, 120 VAC, resistive and shall have a mechanical life of 100,000 cycles or more.

3.4.5.1.2 Output Terminals. - Output terminals shall be a screw-type barrier terminal strip rated not less than 250 VAC.

3.4.5.1.3 Input Terminals. -When the decoder or decoders are installed in an enclosure with a receiver, the input terminals are not required. When the decoder or decoders are installed in a separate enclosure, use a screw-type barrier terminal strip of proper voltage rating and size.

3.4.5.2 Style A Decoder. - The decoder shall energize 1, 2, or 3 relays upon receipt of a series of electrical pulses within a 5-second period, hold the relays energized for 15 minutes, and deenergize the relays at the end of the 15-minute period. The 5-second gate period shall be started by the first pulse received. At the third pulse, the first relay will be energized; at the fifth pulse, the second relay shall be energized; and at the seventh pulse, the third relay shall be energized. If 2 or 3 relays are energized and a new series of pulses are received, at the third pulse, all relays, except the first, shall be deenergized and the timer shall reset for a full 15 minutes; at the fifth pulse, the second relay shall be energized; and at the seventh pulse, the third relay shall be energized. The decoder shall be designed so a simple change of connection shall disable the circuit that deenergizes the relays when pulses are received. The decoder shall have terminals for connecting a switch or relay to disable the decoder.

3.4.5.3 Style B Decoder. - The basic Style B decoder shall recognize 8 discrete addresses. Each address shall cause a relay to close, a relay to open, or a relay to close and another relay to open. The relay operating scheme shall be specified by the purchaser.

3.4.5.3.1 Address. - An address shall be a series of 3 characters that are received within a period of 3 seconds. The address may be any combination of 1, 2, or 3 individual characters such as 1-1-1, 1-4-1, 4-4-1, 1-2-4, etc., and shall be specified by the purchaser.

3.4.5.3.2 Characters. - Each character shall be a burst of the paired tones shown in Table 1.

TABLE 1

Character	Frequencies	Character	Frequencies
1	697 Hz and 1209 Hz	7	852 Hz and 1209 Hz
2	697 Hz and 1339 Hz	8	852 Hz and 1339 Hz
3	697 Hz and 1477 Hz	9	852 Hz and 1477 Hz
4	770 Hz and 1209 Hz	0	941 Hz and 1209 Hz
5	770 Hz and 1339 Hz	*	941 Hz and 1339 Hz
6	770 Hz and 1477 Hz	#	941 Hz and 1477 Hz

3.4.5.3.3 Security Tone. - The decoder shall recognize tone burst characters only if a security tone of 1633 Hz is also present.

3.4.5.3.4 Sensitivity. - The Style B decoder shall operate on input signals of -10 dBm or more.

3.4.6 Encoder.

3.4.6.1 General. - The basic encoder shall have a capacity of not less than 8 addresses. Each address shall be represented by a single pole switch closing which will cause the encoder to generate the address that is represented by that switch. An address switch remaining closed or opened and reclosed shall have no further effect until a cancelling address is generated.

3.4.6.2 Output. - The encoder output shall be a security tone of 1633 Hz and the selected address. Each character of the address shall be generated for no less than 100 milliseconds and the address shall be transmitted within 1.5 seconds. The address shall be as specified in 3.4.5.3.1.

3.4.6.3 Control Panel. - The control panel for the basic encoder shall be no larger than 4" X 8" (10 cm X 20 cm) and shall have a single pole normally open momentary switch having a minimum rated life of 50,000 cycles for each address. Each switch shall be marked in characters of not less than 3/16-inch and not more than 1/4-inch in height formed by engraving, etching, or stamping. The control panel shall also have indicator lights (color to be selected by purchaser) to indicate the status of each address. The control panel shall be designed to be removed from the encoder and installed up to 25 feet (7.5 m) from the encoder.

3.4.6.4 Output Terminals. - When installed in an enclosure with a radio transmitter, the terminals shall be as required. When installed in a separate enclosure, output terminals shall be a screw-type barrier terminal strip of the proper voltage rating and size.

3.4.7 Mean Time Between Failure (MTBF). - The receiver, encoder, and decoders shall be designed and constructed to provide 10,000 hours MTBF. The transmitter shall be designed and constructed to provide 2,000 hours MTBF. The manufacturer shall show his method of determining MTBF.

3.4.8 Materials and Workmanship. - Materials and workmanship shall be in accordance with the highest grade commercial quality and practices for equipment of this type.

3.4.9 Nameplate. - Each piece of equipment shall have a permanently attached nameplate having at least the following information:

(a) Identification - Radio Control Equipment Type FAA L-854.

(b) Unit (Receiver/Decoder, Transmitter/Encoder, etc.).

(c) Input voltage.

(d) Frequency range.

(e) Manufacturer's name or trademark.

3.5 Instruction Book. - An instruction book containing the following information shall be furnished with each system:

(a) Complete schematic and wiring diagrams showing all components cross indexed to the part list.

(b) Complete part list with applicable rating and characteristics of each part and with manufacturer's part number.

(c) Installation instructions.

(d) Maintenance instructions.

(e) Troubleshooting charts.

(f) Theory of operation.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Qualification Procedures. - Manufacturers producing products certified by the FAA as having met the requirements of this advisory circular will be listed in Advisory Circular 150/5345-1, Approved Airport Lighting Equipment, as approved suppliers. Submit requests for qualification in writing to the Federal Aviation Administration, Visual Aids Standards Branch, AAP-550, Washington, D. C. 20591, at least two weeks prior to the start of qualification tests. The request shall include: (1) a statement that the manufacturer agrees to comply with the requirements of this advisory circular; (2) one copy of proposed test procedures and test data sheets; (3) one preliminary copy of the instruction book with drawings, photographs, and installation instructions in order to permit a preliminary analysis of the manufacturer's design. Successful completion of all tests specified herein, approval of the instruction book and written agreement by the manufacturer to comply with all requirements of this advisory circular are required for qualification. All tests may be witnessed by an authorized FAA representative and may be conducted at the manufacturer's plant or at an independent testing laboratory acceptable to FAA. The manufacturer shall bear all testing costs. A certified copy of the results of all qualification tests shall be submitted to the FAA. After successful completion of all tests, the manufacturer shall provide 12 copies of the final approved instruction book to the FAA. A product, once listed in Advisory Circular 150/5345-1, shall not be changed as to design, method of manufacture, quality or quantity of materials, or substitution of components without prior concurrence of the FAA.

4.2 Production Tests. - The electrical tests of 4.3.2 shall be conducted on all units. Test results shall be recorded and retained by the manufacturer for a period of at least two years. Production test reports shall be made available to the FAA upon written request.

4.3 Qualification Tests.

4.3.1 Environmental Tests.

4.3.1.1 High Temperature (Outdoor Enclosure). - Install the equipment in an outdoor (weatherproof) enclosure, energize the power supply, and subject the equipment to an ambient temperature of 55° C. ±5° for no less than 8 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.2 Low Temperature (Outdoor Enclosure). - Install the equipment in an outdoor enclosure, energize the power supply, and subject the equipment to an ambient temperature of -55° C. ±5° for no less than 4 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.3 Low Temperature (Indoor Enclosure). - Install the equipment in an indoor enclosure, energize the power supply, and subject the equipment to an ambient temperature of -20° C. ±5° for no less than 4 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.4 Humidity. - Install the equipment in a humidity chamber. Raise the temperature and relative humidity to 30° C. ±2° and 95% relative humidity ±2%. Maintain these conditions for no less than 8 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.2 Electrical Tests. - Test for compliance with the requirements for frequency tolerance (3.4.3 and 3.4.4), sensitivity (3.4.3 and 3.4.5.3.4), selectivity (3.4.3), input power (3.4.2), output power (3.4.4), response time (3.4.5.1), fidelity (3.4.3), and operation (3.4.5.2 and 3.4.5.3). Test reports shall show test equipment, block diagrams of test setups, measurements, calculations, and test procedures.

5. PREPARATION FOR DELIVERY.

5.1 General. - Packing and packaging shall be in accordance with industry standards for equipment of this type.

6. NOTES.

6.1 Options. - Purchasers using this specification will specify the following:

(a) System Type (1.2).

(b) Enclosure Type (3.2).

(c) Frequency (3.4.3 and 3.4.4).

(d) Addresses (3.4.5.3.1) for encoder and Style B decoder.

(e) Relay operating scheme (3.4.5.3).

U.S. Department
of Transportation

**Federal Aviation
Administration**

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AC 150/5345-49

CHANGE 2

DATE 1/4/82

ADVISORY CIRCULAR

CHANGE

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: Change 2 to SPECIFICATION L-854 RADIO CONTROL EQUIPMENT--Revises Equipment Qualification Procedures

1. PURPOSE. This Change revises the procedures for obtaining equipment qualification approval as contained in paragraph 4.

2. EXPLANATION. Procedures for obtaining equipment qualification approval are now contained in AC 150/5345-1G, Approved Airport Lighting Equipment, and supersede those contained in paragraph 4 of this advisory circular.

3. FILING THIS CHANGE. This Change should be filed on the front of the advisory circular. Page changes to reflect this revision will be made at a later date.

Leonard E. Mudd
LEONARD E. MUDD
Director, Office of Airport Standards

Suggest filing this transmittal at the back of the AC. It will provide a reference authority for changes, a method of determining that all Changes have been received, and a check for determining if the AC contains the proper pages.

Initiated by: AAS-200

TAD 494.4

Obsolete

AC NO: 150/5345-49

DATE: May 20, 1977

ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

SUBJECT: SPECIFICATION L-854, RADIO CONTROL EQUIPMENT

1. PURPOSE. This advisory circular contains the specification for radio control equipment to be used for controlling airport lighting facilities.

2. CANCELLATION. AC 150/5340-14B, Economy Approach Lighting Aids, dated June 1970, which contains this specification as appendix 1, section 3, will be cancelled by AC 150/5340-26, Installation of Approach Lighting Aids.

3. REFERENCES. Publications that may be used in connection with this advisory circular are listed in paragraph 2 of the specification.

4. HOW TO OBTAIN THIS CIRCULAR. Additional copies of this advisory circular may be obtained, free of charge, from the Department of Transportation, Publications Section, TAD-443.1, Washington, D. C. 20590.

Joseph A. Foster

JOSEPH A. FOSTER
Assistant Administrator
Office of Airports Programs

SPECIFICATION L-854, RADIO CONTROL EQUIPMENT

1. SCOPE AND CLASSIFICATION

1.1 Scope. - This specification covers the equipment requirements for radio control systems to be used for remote control of airport lighting facilities from aircraft, from a ground location, or from both. The basic system elements include radio receivers, radio transmitters, encoders, and decoders.

1.2 Classification. - Three types of systems are covered by this specification as follows:

Type I - Air-to-ground (consists of an AM receiver and a Style A decoder)

Type II - Ground-to-ground (consists of an AM transmitter, an AM receiver, an encoder, and a Style B decoder)

Type III - Air-to-ground plus ground-to-ground (consists of an AM transmitter, two AM receivers, an encoder, a Style A decoder and a Style B decoder)

2. APPLICABLE DOCUMENTS.

2.1 FAA Advisory Circular.

AC 150/5345-1 Approved Airport Lighting Equipment

2.2 Federal Communications Commission (FCC) Rules and Regulations.

Part 15 Radio Frequency Devices

Part 89 Public Safety Radio Service

(Copies of FAA advisory circulars may be obtained, free of charge, from the Department of Transportation, Publications Section, TAD-443.1, Washington, D. C. 20590.)

(FCC Rules and Regulations may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. 20402.)

3. REQUIREMENTS.

3.1 General. - Each radio control system shall be complete in accordance with all specification requirements and shall include the basic components as listed in 1.2. Each set of equipment shall be tuned and adjusted for operation at the frequency specified by the purchaser.

3.2 Environmental Conditions. - The equipment shall be designed and constructed to operate in the following indoor or outdoor environmental conditions as specified by the purchaser.

3.2.1 Indoor Conditions. - Indoor conditions shall be as follows:

(a) Temperature. Temperature range of -20° C. to $+55^{\circ}$ C.

(b) Humidity. Relative humidity up to 95%.

3.2.2 Outdoor Conditions. Outdoor conditions shall be as follows:

(a) Temperature. Temperature range of -55° C. to $+55^{\circ}$ C.

(b) Humidity. Relative humidity up to 100%.

(c) Wind. Wind speeds up to 100 mph (87 knots).

(d) Precipitation. Exposure to rain, hail, snow, or sleet.

3.3 Operating Requirements. The radio control equipment will be used to operate airport lighting facilities in the following manner:

(a) Air-to-ground System. The lighting facility will be operated from aircraft by clicking the microphone button a specified number of times within a 5-second period as follows:

3 clicks - lighting system energized on the low brightness step.

5 clicks - lighting system energized on the medium brightness step.

7 clicks - lighting system energized on the high brightness step.

After the system is energized on a brightness step, any other brightness step may be selected by clicking the "mike" button the specified number of times. The system shall shut off automatically 15 minutes after the last brightness step operation.

(b) Ground-to-ground System. The ground-to-ground system is intended for operating lighting systems from an airport control tower, and the basic system can perform a maximum of 8 separate control functions. Additional control functions, in multiples of 8, can be obtained by the addition of decoder modules and associated parts.

(c) Air-to-ground Plus Ground-to-ground System. The dual system will be used where there is a part-time airport control tower. When the control tower is in operation, the lighting facility will be controlled through the ground-to-ground unit with the air-to-ground unit deactivated. When the control tower is not in operation the lighting facility will be controlled by the air-to-ground unit. Transfer of control to and from the air-to-ground unit will be accomplished through the ground-to-ground unit.

3.4 Design Requirements.

3.4.1 General. The equipment shall be type accepted in accordance with Federal Communications Commission (FCC) Rules and Regulations; Part 15 for a receiver and Part 89 for a transmitter.

3.4.2 Power Input. - The equipment shall be designed to operate from 120 VAC, ±15%, 60 Hz. Power for the encoder and decoders may be taken from the associated transmitter or receiver.

3.4.3 Receiver. - The receiver shall conform to the following requirements:

(a) Type. Fixed frequency amplitude modulated superhetrodyne.

(b) Frequency. 118-136 MHz band for the Type I system and 150-175 MHz band for the Type II system. A Type III system uses both receivers. Frequency tolerance shall be 0.003%. The exact frequency shall be specified by the purchaser.

(c) Sensitivity. Five microvolts or less for a 10 dB signal plus noise-to-noise ratio, (S+N)/N. A sensitivity adjustment shall be provided.

(d) Selectivity. Bandwidth of not less than ±9.0 kHz from the assigned frequency at 6 dB attenuation and a bandwidth of not more than ±40 kHz from the assigned frequency at 60 dB attenuation. Spurious signals shall be not less than 50 dB below the desired signal.

(e) Fidelity. Output uniform within ±2 dB from 300 Hz to 2450 Hz.

(f) Antenna Impedance. Nominal 50 ohms unbalanced.

(g) Output. Audio output of zero dBm or more into a 600 ohm load with signal input of 5 microvolts modulated 30% at 1000 Hz. Pulses resulting from bursts of radio frequency energy shall have sufficient output to drive a Type I decoder when the input signal is 5 microvolts or more.

3.4.4 Transmitter. - The transmitter shall conform to the following requirements:

(a) Type. Fixed frequency amplitude modulated.

(b) Frequency. 150-175 MHz band with a frequency tolerance of 0.0005%. The exact frequency will be specified by the purchaser.

(c) Power Output. Not less than 1 watt nor more than 3 watts.

(d) Modulation. Capable of 75% amplitude modulation with an input signal of -10 dBm within the frequency band of 300 Hz to 2450 Hz.

(e) Output Impedance. Nominal 50 ohms unbalanced.

(f) Input Impedance. 600 ohms.

3.4.5 Decoders.

3.4.5.1 General. - The Style A decoder shall decode a series of electrical pulses, such as generated by clicking a transmitter microphone, to control the desired function while the Style B decoder detects a series of 3 tone burst characters per control function or address. The decoders shall not respond to signal elements of less than 50 milliseconds and shall not require signal elements of more than 100 milliseconds.

3.4.5.1.1 Output Relays. - Output relays shall be the plug-in type having SPST NO contacts rated at 3 amps, 120 V AC, resistive and shall have a mechanical life of 100,000 cycles or more.

3.4.5.1.2 Output Terminals. - Output terminals shall be a screw-type barrier terminal strip rated not less than 250 V AC.

3.4.5.1.3 Input Terminals. - When the decoder or decoders are installed in an enclosure with a receiver, the input terminals are not required. When the decoder or decoders are installed in a separate enclosure, use a screw-type barrier terminal strip of proper voltage rating and size.

3.4.5.2 Style A Decoder. - The decoder shall energize 1, 2, or 3 relays upon receipt of a series of electrical pulses within a 5-second period, hold the relays energized for 15 minutes, and deenergize the relays at the end of the 15-minute period. The 5-second gate period shall be started by the first pulse received. At the third pulse, the first relay will be energized; at the fifth pulse, the second relay shall be energized; and at the seventh pulse, the third relay shall be energized. If 2 or 3 relays are energized and a new series of pulses are received, at the third pulse, all relays, except the first, shall be deenergized and the timer shall reset for a full 15 minutes; at the fifth pulse, the second relay shall be energized; and at the seventh pulse, the third relay shall be energized. The decoder shall be designed so a simple change of connection shall disable the circuit that deenergizes the relays when pulses are received. The decoder shall have terminals for connecting a switch or relay to disable the decoder.

3.4.5.3 Style B Decoder. - The basic Style B decoder shall recognize 8 discrete addresses. Each address shall cause a relay to close, a relay to open, or a relay to close and another relay to open. The relay operating scheme shall be specified by the purchaser.

3.4.5.3.1 Address. - An address shall be a series of 3 characters that are received within a period of 3 seconds. The address may be any combination of 1, 2, or 3 individual characters such as 1-1-1, 1-4-1, 4-4-1, 1-2-4, etc., and shall be specified by the purchaser.

3.4.5.3.2 Characters. - Each character shall be a burst of the paired tones shown in Table 1.

TABLE 1

Character	Frequencies	Character	Frequencies
1	697 Hz and 1209 Hz	7	852 Hz and 1209 Hz
2	697 Hz and 1339 Hz	8	852 Hz and 1339 Hz
3	697 Hz and 1477 Hz	9	852 Hz and 1477 Hz
4	770 Hz and 1209 Hz	0	941 Hz and 1209 Hz
5	770 Hz and 1339 Hz	*	941 Hz and 1339 Hz
6	770 Hz and 1477 Hz	#	941 Hz and 1477 Hz

3.4.5.3.3 Security Tone. - The decoder shall recognize tone burst characters only if a security tone of 1633 Hz is also present.

3.4.5.3.4 Sensitivity. - The Style B decoder shall operate on input signals of -10 dBm or more.

3.4.6 Encoder.

3.4.6.1 General. - The basic encoder shall have a capacity of not less than 8 addresses. Each address shall be represented by a single pole switch closing which will cause the encoder to generate the address that is represented by that switch. An address switch remaining closed or opened and reclosed shall have no further effect until a cancelling address is generated.

3.4.6.2 Output. - The encoder output shall be a security tone of 1633 Hz and the selected address. Each character of the address shall be generated for no less than 100 milliseconds and the address shall be transmitted within 1.5 seconds. The address shall be as specified in 3.4.5.3.1.

3.4.6.3 Control Panel. - The control panel for the basic encoder shall be no larger than 4" X 8" (10 cm X 20 cm) and shall have a single pole normally open momentary switch having a minimum rated life of 50,000 cycles for each address. Each switch shall be marked in characters of not less than 3/16-inch and not more than 1/4-inch in height formed by engraving, etching, or stamping. The control panel shall also have indicator lights (color to be selected by purchaser) to indicate the status of each address. The control panel shall be designed to be removed from the encoder and installed up to 25 feet (7.5 m) from the encoder.

3.4.6.4 Output Terminals. - When installed in an enclosure with a radio transmitter, the terminals shall be as required. When installed in a separate enclosure, output terminals shall be a screw-type barrier terminal strip of the proper voltage rating and size.

3.4.7 Mean Time Between Failure (MTBF). - The receiver, encoder, and decoders shall be designed and constructed to provide 10,000 hours MTBF. The transmitter shall be designed and constructed to provide 2,000 hours MTBF. The manufacturer shall show his method of determining MTBF.

3.4.8 Materials and Workmanship. - Materials and workmanship shall be in accordance with the highest grade commercial quality and practices for equipment of this type.

3.4.9 Nameplate. - Each piece of equipment shall have a permanently attached nameplate having at least the following information:

(a) Identification - Radio Control Equipment Type FAA L-854.

(b) Unit (Receiver/Decoder, Transmitter/Encoder, etc.).

(c) Input voltage.

(d) Frequency range.

(e) Manufacturer's name or trademark.

3.5 Instruction Book. - An instruction book containing the following information shall be furnished with each system:

(a) Complete schematic and wiring diagrams showing all components cross indexed to the part list.

(b) Complete part list with applicable rating and characteristics of each part and with manufacturer's part number.

(c) Installation instructions.

(d) Maintenance instructions.

(e) Troubleshooting charts.

(f) Theory of operation.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Qualification Procedures. - Manufacturers producing products certified by the FAA as having met the requirements of this advisory circular will be listed in Advisory Circular 150/5345-1, Approved Airport Lighting Equipment, as approved suppliers. Submit requests for qualification in writing to the Federal Aviation Administration, Visual Aids Standards Branch, AAP-550, Washington, D. C. 20591, at least two weeks prior to the start of qualification tests. The request shall include: (1) a statement that the manufacturer agrees to comply with the requirements of this advisory circular; (2) one copy of proposed test procedures and test data sheets; (3) one preliminary copy of the instruction book with drawings, photographs, and installation instructions in order to permit a preliminary analysis of the manufacturer's design. Successful completion of all tests specified herein, approval of the instruction book and written agreement by the manufacturer to comply with all requirements of this advisory circular are required for qualification. All tests may be witnessed by an authorized FAA representative and may be conducted at the manufacturer's plant or at an independent testing laboratory acceptable to FAA. The manufacturer shall bear all testing costs. A certified copy of the results of all qualification tests shall be submitted to the FAA. After successful completion of all tests, the manufacturer shall provide 12 copies of the final approved instruction book to the FAA. A product, once listed in Advisory Circular 150/5345-1, shall not be changed as to design, method of manufacture, quality or quantity of materials, or substitution of components without prior concurrence of the FAA.

4.2 Production Tests. - The electrical tests of 4.3.2 shall be conducted on all units. Test results shall be recorded and retained by the manufacturer for a period of at least two years. Production test reports shall be made available to the FAA upon written request.

4.3 Qualification Tests.

4.3.1 Environmental Tests.

4.3.1.1 High Temperature (Outdoor Enclosure). - Install the equipment in an outdoor (weatherproof) enclosure, energize the power supply, and subject the equipment to an ambient temperature of 55° C. ±5° for no less than 8 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.2 Low Temperature (Outdoor Enclosure). - Install the equipment in an outdoor enclosure, energize the power supply, and subject the equipment to an ambient temperature of -55° C. ±5° for no less than 4 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.3 Low Temperature (Indoor Enclosure). - Install the equipment in an indoor enclosure, energize the power supply, and subject the equipment to an ambient temperature of -20° C. ±5° for no less than 4 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.1.4 Humidity. - Install the equipment in a humidity chamber. Raise the temperature and relative humidity to 30° C. ±2° and 95% relative humidity ±2%. Maintain these conditions for no less than 8 hours. Turn the equipment "on" and test for compliance with 4.3.2 within 10 minutes.

4.3.2 Electrical Tests. - Test for compliance with the requirements for frequency tolerance (3.4.3 and 3.4.4), sensitivity (3.4.3 and 3.4.5.3.4), selectivity (3.4.3), input power (3.4.2), output power (3.4.4), response time (3.4.5.1), fidelity (3.4.3), and operation (3.4.5.2 and 3.4.5.3). Test reports shall show test equipment, block diagrams of test setups, measurements, calculations, and test procedures.

5. PREPARATION FOR DELIVERY.

5.1 General. - Packing and packaging shall be in accordance with industry standards for equipment of this type.

6. NOTES.

6.1 Options. - Purchasers using this specification will specify the following:

(a) System Type (1.2).

(b) Enclosure Type (3.2).

(c) Frequency (3.4.3 and 3.4.4).

(d) Addresses (3.4.5.3.1) for encoder and Style B decoder.

(e) Relay operating scheme (3.4.5.3).

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