

# Federal Aviation Agency

## ADVISORY CIRCULAR

AC NO: AC 150/5345-18

Reprinted 3/17/75

Includes CH 1

AIRPORTS

EFFECTIVE :

3/3/64

**SUBJECT :** SPECIFICATION FOR L-811 STATIC INDOOR TYPE CONSTANT CURRENT REGULATOR ASSEMBLY, 4KW; WITH BRIGHTNESS CONTROL AND RUNWAY SELECTION FOR DIRECT OPERATION

1. PURPOSE. This circular describes the subject specification requirements for an indoor constant current regulator assembly with brightness control and runway selection for direct operation. The specification is for the guidance of the public, and its use is required for project activity under the Federal-aid Airport Program.
2. CANCELLATION. This circular cancels and replaces Federal Aviation Agency Specification L-811, "Static Indoor Type Constant Current Regulator Assembly; 2½ and 4KW; With Brightness Control and Runway Selection for Direct Operation", dated August 1, 1959. The substantive change in this circular is the deletion of requirements for a 2½KW regulator since it is no longer manufactured.
3. SCOPE OF SPECIFICATION. The specification requirements are for a 4KW constant current regulator to supply a 6.6-ampere series circuit having a nominal voltage rating of 600 volts for airport lighting installations. The regulator shall be of the static air-cooled type for indoor use. The assembly consists of five primary voltage taps, a primary control switch, overload protection, an input transformer, a resonant circuit constant current network, a brightness selector switch, a runway selector switch, an open-circuit protective device, and four auxiliary circuit breaker switches. All switches, transformers, and relays shall be mounted in a metal housing. All switches shall be hand-operated types.
4. APPLICABLE SPECIFICATION. Specification L-833, "Individual Lamp Series-to-Series Type Insulating Transformer for 600 Volt or 3000 Volt Series Circuits", of the issue in effect on the date of application for qualification (see paragraph 9), applies to this circular. This circular shall govern in case of conflict.

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Note: Obtain copies of Specification L-833 from the Federal Aviation Agency, Distribution Section, HQ-438, Washington, D. C. 20553.

5. SIZE. The regulator shall be built in one size (4KW). The primary shall be rated at 240 volts, single phase, 60 cycles, and the secondary at 6.6 amperes.

6. PERFORMANCE REQUIREMENTS.

- a. Regulation. The regulator assembly shall deliver its specified KW output to a unity power factor load when connected to a 240-volt, 60-cycle supply through the 100% primary voltage tap. When so connected and on the 100% brightness tap, the output current shall be within 3% of 6.6 amperes from full load to short circuit. The same percentage shall apply from 5.5 amperes when operating at 30% brightness and from 4.8 amperes when operating at 10% brightness.
- (1) When the regulator is operated on the 100% brightness tap with any load from 50% to 100% supplied through insulating transformers similar to those covered by Specification L-833, the output current shall not exceed 6.8 amperes when the secondaries of 30% of the insulating transformers supplying the above-specified loads are opened. This requirement shall be met when the regulator is operated at normal temperature with a normal supply voltage of 240 volts, 60 cycles.
- b. Overall Efficiency. The overall efficiency of the regulator, when it is operated at rated voltage, 100% power factor, full load, 70° F, shall not be less than 90%.
- c. Primary Power Factor. The primary power factor of the regulator shall not be less than 90%, when it is operated at rated voltage, 100% power factor, full load, 70° F.
- d. Temperature Rise. The temperature rise shall not exceed 55° C for Class A insulation or 80° C for Class B insulation in continuous operation for any load from no load to full load.
- e. Temperature Limits. The unit shall be designed and constructed for continuous service at any ambient temperature from a minimum of -45° F to a maximum of 120° F at sea level.

7. DETAIL REQUIREMENTS.

- a. Rating. The regulator shall supply 6.6 amperes to a series lighting load equal to its KW rating and shall also make provision for supplying 5.5 and 4.8 amperes to the same connected load. The primary shall be 240 volts, single phase, 60 cycles, and shall be

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provided with taps for 250, 230, 220, and 208 volts from which the proper tap may be selected for various supply voltages. The regulator shall be rated and connected for either grounded or ungrounded power supply.

- (1) If so stated on the order, the regulator may be rated and supplied for 50-cycle input. This should be reflected in the rating of the regulator and in the marking of its nameplate.
- b. Input Transformer. An input transformer of suitable rating shall be supplied to provide the voltage most suitable for the resonant circuit network (except that this voltage shall not exceed 650 volts and shall not be so low that the secondary current at rated load will exceed 7.5 amperes). Three taps shall be provided and spaced so that the voltage supplied the network will result in the output currents specified under paragraph 7.a. If this transformer is the single-winding type, a separate two-winding insulating transformer must be used to separate the line and load.
- c. Constant Current Network. The constant current network shall have no moving parts and shall utilize a resonant circuit to produce a constant current of the values specified under paragraph 7.a when the proper voltage and frequency are supplied to the regulator. The open-circuit voltage shall not exceed 200% of the rated load voltage.
- d. Control Equipment. A suitable hand-operated circuit breaker, opening both sides of the supply circuit to the input transformer, shall be supplied and shall be marked "Runway Power Control".
  - (1) The regulator shall be designed to permit changing of brightness under load, and for this purpose a suitable three-position rotary, snap-action switch shall be provided. The switch positions shall be marked "10", "30", and "100", and the switch marked "Brightness".
  - (2) A three-position rotary switch suitable for switching under load and insulated for the open-circuit voltage of the regulator shall be provided for runway selection. The switch positions shall be marked "A", "B", and "C", and the switch marked "Runway".
  - (3) An automatic open-circuit protective device shall be supplied to prevent damage in the event that an open circuit develops in the secondary. The protective device shall de-energize the regulator in less than 2 seconds after the secondary open circuit occurs, and shall be capable of being manually reset when the primary switch is opened after the open circuit is removed.

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(4) A minimum of four auxiliary circuit breakers shall be included for the operation of the beacon, wind cone, etc. These shall be single pole, single throw and rated for 15 amperes at 125 volts.

- e. Terminal Boards and Wiring. Suitable terminal boards or other provisions for making connections to the power supply and three runways shall be provided. Supply and load connections must be physically isolated. Each pair of runway connections shall be marked to conform to the selector switch markings. The regulator assembly shall be completely wired with the exception of the auxiliary circuit breaker switches which may be wired into individual circuits when the source of power in these circuits is outside the panel. A neutral terminal block shall be provided so that the breakers may be connected ahead of the runway power control switch and internally to one side of a 120/240-volt supply circuit by means of a jumper (or jumpers if these circuits must be balanced). If desirable, the neutral may be wired to the neutral terminal block to supply the auxiliary circuits from the auxiliary circuit breaker switches. Four  $\frac{1}{2}$ -inch conduit connections shall be provided in the regulator enclosure near the circuit breakers. A separate grounding lug shall be provided for grounding the case, and this lug shall accommodate No. 6 AWG to No. 8 AWG wire.
- f. Housing. The entire unit shall be mounted in a self-supporting sheet metal enclosure, the exact shape of which is optional providing other requirements are met. A separate accessible compartment in the housing shall be provided to house the brightness and runway selector switches, the protective device, the primary control, and the terminal boards. All switches, relays, terminals, and associated wiring shall be readily accessible. Overall dimensions shall not exceed 45" high, 22" wide, or 22" deep.
- g. Wiring Diagram. A wiring diagram shall be permanently mounted inside the control cabinet. It shall be legible and readily accessible.
- h. Operating Instructions. A brief set of operating instructions shall be permanently mounted on the outside of the control cabinet.
- i. Painting and Finish. The inside and outside of the housing shall be bonderized, given one prime coat and one finish coat of weatherproof paint. The outside of the housing shall be given a touchup after final assembly.
- j. Nameplate. A nameplate, permanently and legibly filled in with at least the following information, shall be securely attached to the outside front of the regulator housing. This information may be on the same plate with the operating instructions.

- (1) Constant Current Regulator, Static Type.
  - (2) 60 Cycles, 4KW, 240 Volts, 6.6 Secondary Amperes.
  - (3) Single Phase.
  - (4) Manufacturer's Part Number.
- k. Parts List and Installation Instructions. A component parts list and installation and maintenance instructions shall be furnished with each regulator assembly. Sufficient drawings or illustrations shall be provided to indicate clearly the methods of installation and maintenance.
1. Lightning Arrestors. Deleted by CHG

8. TESTING.

- a. Qualification Testing. In addition to the tests described in paragraph 8.b, the production model shall be tested as follows:
- (1) The temperature rise shall be determined by the resistance method and shall apply at any load from no load to full load at unity power factor.
  - (2) With 240 volts connected to the primary for 100% voltage and unity power factor load on the secondary, the overall efficiency and power factor, tested at rated full load, shall not be less than the values specified in paragraphs 6.b and 6.c.
  - (3) The output current shall be tested for operation with open-circuited insulating transformers in the circuit at 50% load and 100% load as described in paragraph 6.a(1).
- b. Production Testing. The following tests shall be made on each regulator after final assembly, and each regulator shall withstand the following tests successfully.
- (1) 1500 volts for one minute between supply terminals and frame.
  - (2) 3000 volts for one minute between load terminals and frame with supply terminals connected to frame.

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- (3) The output current shall be tested at all three brightness taps with the output short circuited through an ammeter, and with a constant connected unity power factor load equal to the KW rating of the regulator.
  - (4) The primary voltage compensation taps shall be checked.
  - (5) Operate open circuit (protective relay blocked) for two minutes.
  - (6) The brightness and runway selector switches shall be checked for proper operation.
  - (7) All control and protective devices shall be tested for proper operation and, where required, for reset.
- c. Additional inspections and tests will be made as deemed necessary by the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, to determine compliance with this specification.

## 9. QUALIFICATION.

- a. The manufacturer shall furnish a sample regulator to a disinterested testing laboratory to be tested as described herein to obtain certification regarding the ability to manufacture regulators meeting the requirements of this specification. The disinterested testing laboratory shall be a laboratory acceptable to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553. The manufacturer shall furnish two copies of the testing laboratory's reports to the Airports Service for review and approval consideration. Upon approval of the test reports which show satisfactory certification of compliance, the Airports Service will list the name of the qualified manufacturer and a description of their equipment in Advisory Circular No. 150/5345-1, "Approved Airport Lighting Equipment". The cost of testing shall be borne by the manufacturer offering the material for qualification.
- b. If the manufacturer has satisfactory laboratory facilities, the tests may be performed at the factory and such tests shall be witnessed by a representative of the Federal Aviation Agency, Airports Service, Washington, D. C. 20553. The manufacturer shall furnish written reports of these tests.
- c. A component parts list, drawings, and installation and maintenance instructions shall be submitted to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553.

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- d. At any time after approval has been granted under the above conditions, a certified copy of the factory test reports on the latest production run of equipment produced under this specification shall be made available by the manufacturer upon written request by the Federal Aviation Agency, Airports Service, Washington, D. C. 20553.
10. HOW TO GET THIS CIRCULAR. Obtain copies of this circular, AC 150/5345-18, "Specification for L-811 Static Indoor Type Constant Current Regulator Assembly, 4KW; With Brightness Control and Runway Selection for Direct Operation", from the Federal Aviation Agency, Distribution Section, HQ-438, Washington, D. C. 20553.



Cole Morrow, Director  
Airports Service





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6. PERFORMANCE REQUIREMENTS.
  - a. Regulation. The regulator assembly shall deliver its specified KW output to a unity power factor load when connected to a 240-volt, 60-cycle supply through the 100% primary voltage tap. When so connected and on the 100% brightness tap, the output current shall be within 3% of 6.6 amperes from full load to short circuit. The same percentage shall apply from 5.5 amperes when operating at 30% brightness and from 4.8 amperes when operating at 10% brightness.
    - (1) When the regulator is operated on the 100% brightness tap with any load from 50% to 100% supplied through insulating transformers similar to those covered by Specification L-833, the output current shall not exceed 6.8 amperes when the secondaries of 30% of the insulating transformers supplying the above-specified loads are opened. This requirement shall be met when the regulator is operated at normal temperature with a normal supply voltage of 240 volts, 60 cycles.
  - b. Overall Efficiency. The overall efficiency of the regulator, when it is operated at rated voltage, 100% power factor, full load, 70° F, shall not be less than 90%.
  - c. Primary Power Factor. The primary power factor of the regulator shall not be less than 90%, when it is operated at rated voltage, 100% power factor, full load, 70° F.
  - d. Temperature Rise. The temperature rise shall not exceed 55° C for Class A insulation or 80° C for Class B insulation in continuous operation for any load from no load to full load.
  - e. Temperature Limits. The unit shall be designed and constructed for continuous service at any ambient temperature from a minimum of -45° F to a maximum of 120° F at sea level.
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  - a. Rating. The regulator shall supply 6.6 amperes to a series lighting load equal to its KW rating and shall also make provision for supplying 5.5 and 4.8 amperes to the same connected load. The primary shall be 240 volts, single phase, 60 cycles, and shall be

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provided with taps for 250, 230, 220, and 208 volts from which the proper tap may be selected for various supply voltages. The regulator shall be rated and connected for either grounded or ungrounded power supply.

- (1) If so stated on the order, the regulator may be rated and supplied for 50-cycle input. This should be reflected in the rating of the regulator and in the marking of its nameplate.
- b. Input Transformer. An input transformer of suitable rating shall be supplied to provide the voltage most suitable for the resonant circuit network (except that this voltage shall not exceed 650 volts and shall not be so low that the secondary current at rated load will exceed 7.5 amperes). Three taps shall be provided and spaced so that the voltage supplied the network will result in the output currents specified under paragraph 7.a. If this transformer is the single-winding type, a separate two-winding insulating transformer must be used to separate the line and load.
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- (4) A minimum of four auxiliary circuit breakers shall be included for the operation of the beacon, wind cone, etc. These shall be single pole, single throw and rated for 15 amperes at 125 volts.
- e. Terminal Boards and Wiring. Suitable terminal boards or other provisions for making connections to the power supply and three runways shall be provided. Supply and load connections must be physically isolated. Each pair of runway connections shall be marked to conform to the selector switch markings. The regulator assembly shall be completely wired with the exception of the auxiliary circuit breaker switches which may be wired into individual circuits when the source of power in these circuits is outside the panel. A neutral terminal block shall be provided so that the breakers may be connected ahead of the runway power control switch and internally to one side of a 120/240-volt supply circuit by means of a jumper (or jumpers if these circuits must be balanced). If desirable, the neutral may be wired to the neutral terminal block to supply the auxiliary circuits from the auxiliary circuit breaker switches. Four  $\frac{3}{4}$ -inch conduit connections shall be provided in the regulator enclosure near the circuit breakers. A separate grounding lug shall be provided for grounding the case, and this lug shall accommodate No. 6 AWG to No. 8 AWG wire.
- f. Housing. The entire unit shall be mounted in a self-supporting sheet metal enclosure, the exact shape of which is optional providing other requirements are met. A separate accessible compartment in the housing shall be provided to house the brightness and runway selector switches, the protective device, the primary control, and the terminal boards. All switches, relays, terminals, and associated wiring shall be readily accessible. Overall dimensions shall not exceed 45" high, 22" wide, or 22" deep.
- g. Wiring Diagram. A wiring diagram shall be permanently mounted inside the control cabinet. It shall be legible and readily accessible.
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- (1) Constant Current Regulator, Static Type.
- (2) 60 Cycles, 4KW, 240 Volts, 6.6 Secondary Amperes.
- (3) Single Phase.
- (4) Manufacturer's Part Number.

k. Parts List and Installation Instructions. A component parts list and installation and maintenance instructions shall be furnished with each regulator assembly. Sufficient drawings or illustrations shall be provided to indicate clearly the methods of installation and maintenance.

l. Lightning Arrestors. Two 3KV lightning arrestors shall be installed across the output terminals of the regulator, one connecting each of the two legs of the output circuit to ground. The ground side of the arrestors shall be connected to the grounding lug on the regulator case. The arrestors shall be mounted inside the regulator case. The arrestors shall be disconnected for all high voltage testing of the regulator.

## 8. TESTING.

a. Qualification Testing. In addition to the tests described in paragraph 8.b, the production model shall be tested as follows:

- (1) The temperature rise shall be determined by the resistance method and shall apply at any load from no load to full load at unity power factor.
- (2) With 240 volts connected to the primary for 100% voltage and unity power factor load on the secondary, the overall efficiency and power factor, tested at rated full load, shall not be less than the values specified in paragraphs 6.b and 6.c.
- (3) The output current shall be tested for operation with open-circuited insulating transformers in the circuit at 50% load and 100% load as described in paragraph 6.a(1).

b. Production Testing. The following tests shall be made on each regulator after final assembly, and each regulator shall withstand the following tests successfully.

- (1) 1500 volts for one minute between supply terminals and frame.
- (2) 3000 volts for one minute between load terminals and frame with supply terminals connected to frame.

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- (3) The output current shall be tested at all three brightness taps with the output short circuited through an ammeter, and with a constant connected unity power factor load equal to the KW rating of the regulator.
  - (4) The primary voltage compensation taps shall be checked.
  - (5) Operate open circuit (protective relay blocked) for two minutes.
  - (6) The brightness and runway selector switches shall be checked for proper operation.
  - (7) All control and protective devices shall be tested for proper operation and, where required, for reset.
- c. Additional inspections and tests will be made as deemed necessary by the Federal Aviation Agency, Airports Service, Washington, D. C. 20553, to determine compliance with this specification.

## 9. QUALIFICATION.

- a. The manufacturer shall furnish a sample regulator to a disinterested testing laboratory to be tested as described herein to obtain certification regarding the ability to manufacture regulators meeting the requirements of this specification. The disinterested testing laboratory shall be a laboratory acceptable to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553. The manufacturer shall furnish two copies of the testing laboratory's reports to the Airports Service for review and approval consideration. Upon approval of the test reports which show satisfactory certification of compliance, the Airports Service will list the name of the qualified manufacturer and a description of their equipment in Advisory Circular No. 150/5345-1, "Approved Airport Lighting Equipment". The cost of testing shall be borne by the manufacturer offering the material for qualification.
- b. If the manufacturer has satisfactory laboratory facilities, the tests may be performed at the factory and such tests shall be witnessed by a representative of the Federal Aviation Agency, Airports Service, Washington, D. C. 20553. The manufacturer shall furnish written reports of these tests.
- c. A component parts list, drawings, and installation and maintenance instructions shall be submitted to the Federal Aviation Agency, Airports Service, Washington, D. C. 20553.

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Charles E. Morrow, Director  
Airports Service