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TYPE 1106 FLASHER MODIFICATION FOR REMOTE OPERATION

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FINAL REPORT

MARCH 1981

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TECHNICAL CENTER
Atlantic City Airport, New Jersey 08405

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16. Abstract

The Federal Aviation Administration (FAA) is presently planning to install an approach lighting system with sequenced flashing lights for category II (ALSF-2) on runway 22R at the McGhee-Tyson Airport, Knoxville, Tennessee. This project was performed in response to an Airway Facilities Services request to determine the feasibility of modifying a flasher unit, FAA 1106, to power a remoted FA-9425/1 flasher optical head to be used there. The modification was completed, and the flash tube photometrics met the required specifications.

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METRIC CONVERSION FACTORS

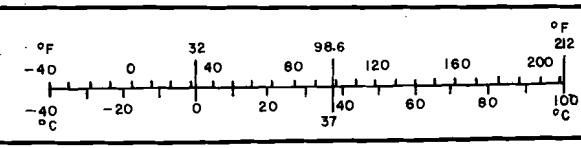
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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INTRODUCTION

The work described herein was undertaken and accomplished in response to an Airway Facilities Service (AAF-500) request and was assigned the task number AAF-ARD-80-X07. It was accomplished under Technical Center Program Document No. 08-493, subprogram 081-501, project 01, "Quick Response to Solve Field Encountered Problems."

PURPOSE.

The purpose of this project was to determine the feasibility of modifying a Federal Aviation Administration (FAA) 1106 flasher unit to power a remoted FA-9425/1 flasher optical head. To insure that the light output would meet the requirements stated in specification FAA-E-2325C, photometric tests were also required.

BACKGROUND.

The FAA is presently planning to install an approach lighting system with sequenced flashing lights for category II (ALSF-2) on runway 22R at the McGhee-Tyson Airport, Knoxville, Tennessee. This system will be constructed using the new frangible support structures. The need exists for flasher equipment to be compatible with these structures. As an efficient and cost-saving means, the Airway Facilities Service plans to use remote flasher heads powered by modified 1106 flasher units obtained from regional surplus. To determine the feasibility of such equipment modification, the FAA Technical Center was requested to conduct the required tests.

DESCRIPTION OF EQUIPMENT.

Three different FAA 1106 flasher units were used in the tests. They were the General Electric CD-100, specification CAA-1106A; the Sylvania CD-2000, specification FAA-1106A; and the Sylvania CD-2000, specification FAA-1106B. The remote flasher optical head used was an FA-9425/1 manufactured by the Multi-Electric Company. The equipment was set up in the laboratory with 50 feet of cable between the power supply and remote flasher head to simulate pole mounting. This cable was made up of one No. 14, 3,000-volt wire for the high voltage and two No. 12, 600-volt wires for the trigger and ground connections. The 1106 flasher unit was powered by an FAA SFT-1 flasher tester.

DISCUSSION

During the initial investigation, a relatively simple modification to the trigger circuit was required due to differences in the flash tube and trigger transformer location. After the modification was completed, the flash tube operated, but it had a very short life of 10 to 15 minutes. Further investigation revealed that the power supply output was a negative 2,000 volts direct current (Vdc), and the flash tube requires a positive 2,000 Vdc. This difference in polarity was contrary to discussions with the sponsor and the manufacturers. An unsuccessful search was made to locate a new version of the 1106 flasher unit with a positive output.

After further discussions with the sponsor, it was decided to modify the 1106 power supply to provide a positive 2,000 Vdc output to determine the feasibility and the amount of work required. Because of the relationship of the trigger voltage to the high voltage, the ground and hot leads could not simply be switched to provide the reversed power required.

By replacing the two rectifier tubes with a solid-state bridge and reversing the polarity of the capacitors and a diode in the 1106 power supply circuit, a positive 2,000 Vdc could be obtained.

(See the appendix for details on the modification of the Sylvania CD-2000, 1106B and the General Electric CD-100, 1106A units.) Figure 1 shows the top view of the modified Sylvania CD-2000, 1106B flasher unit, and figure 2, the bottom view. The required photometric tests were conducted, and the results met the requirements of specification FAA-E-2325C for the light output. Figure 3 shows the photometric curve obtained.

CONCLUSIONS

With the proper modifications as described in the appendix, the 1106 flasher unit (Sylvania or General Electric) can be modified to flash a remoted FA-9425/1 flasher head 50 feet and meet the requirements of specification FAA-E-2325C.

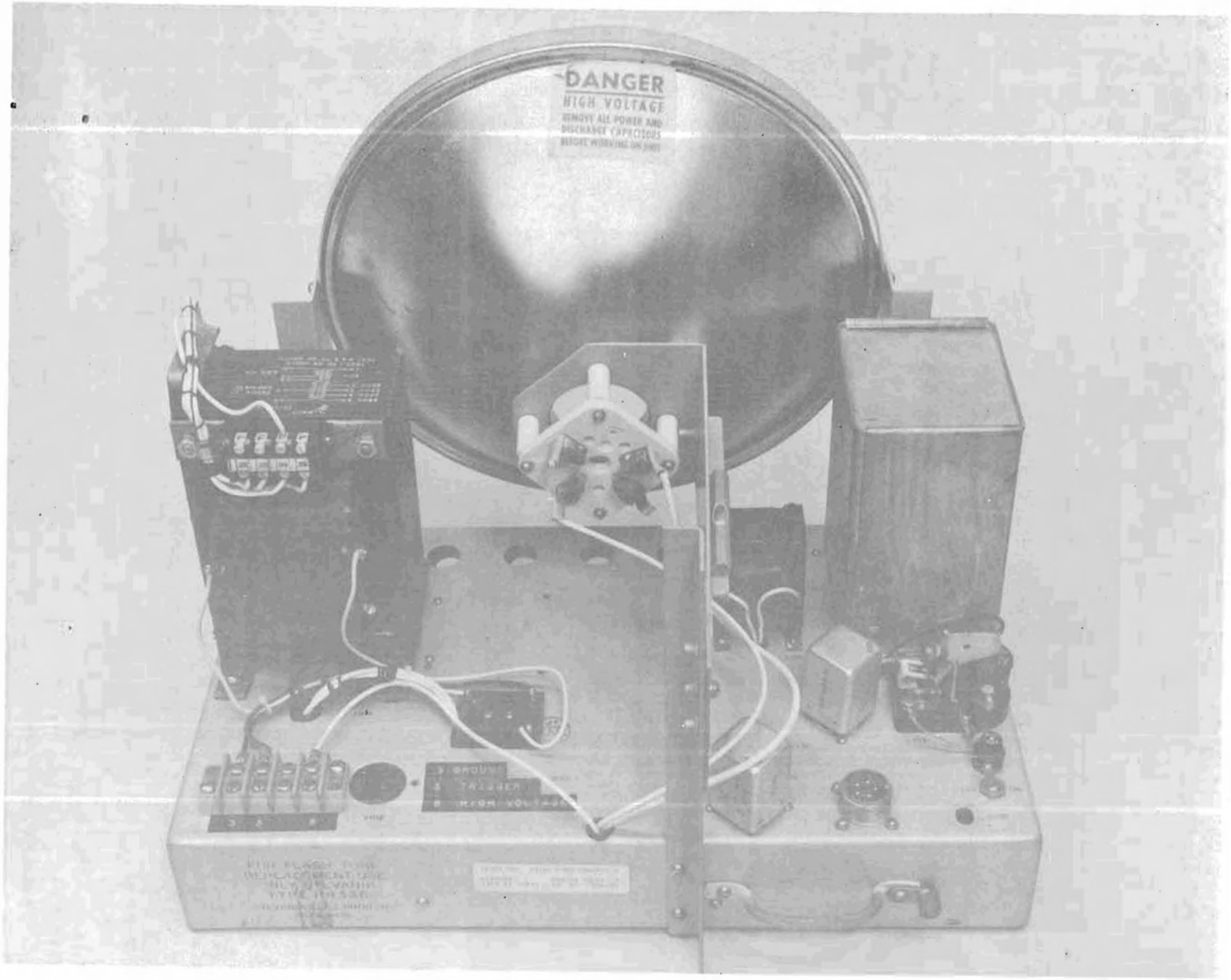


FIGURE 1. MODIFIED SYLVANIA CD-2000, 1106B FLASHER UNIT TOP VIEW

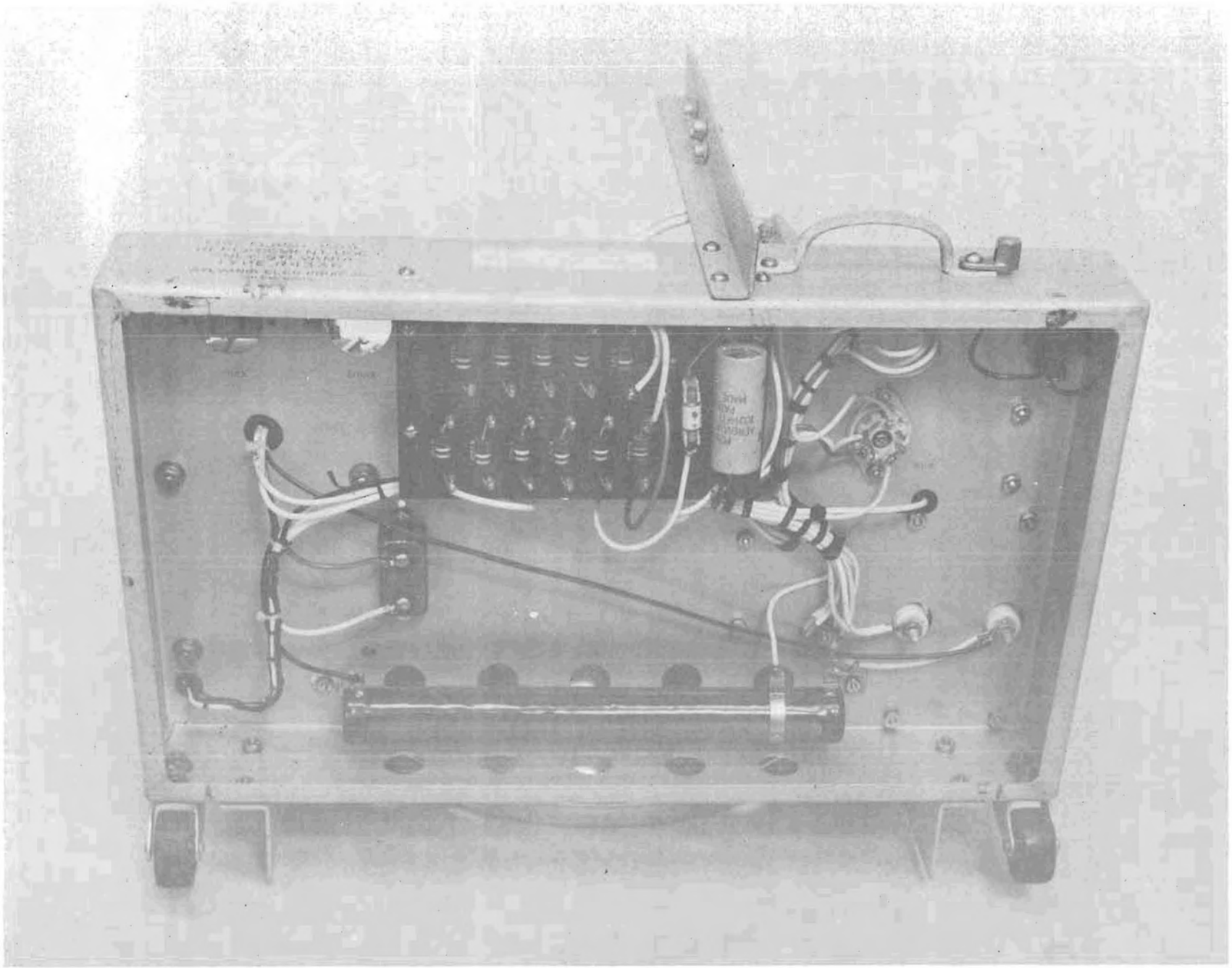


FIGURE 2. MODIFIED SYLVANIA CD-2000, 1106B FLASHER UNIT BOTTOM VIEW

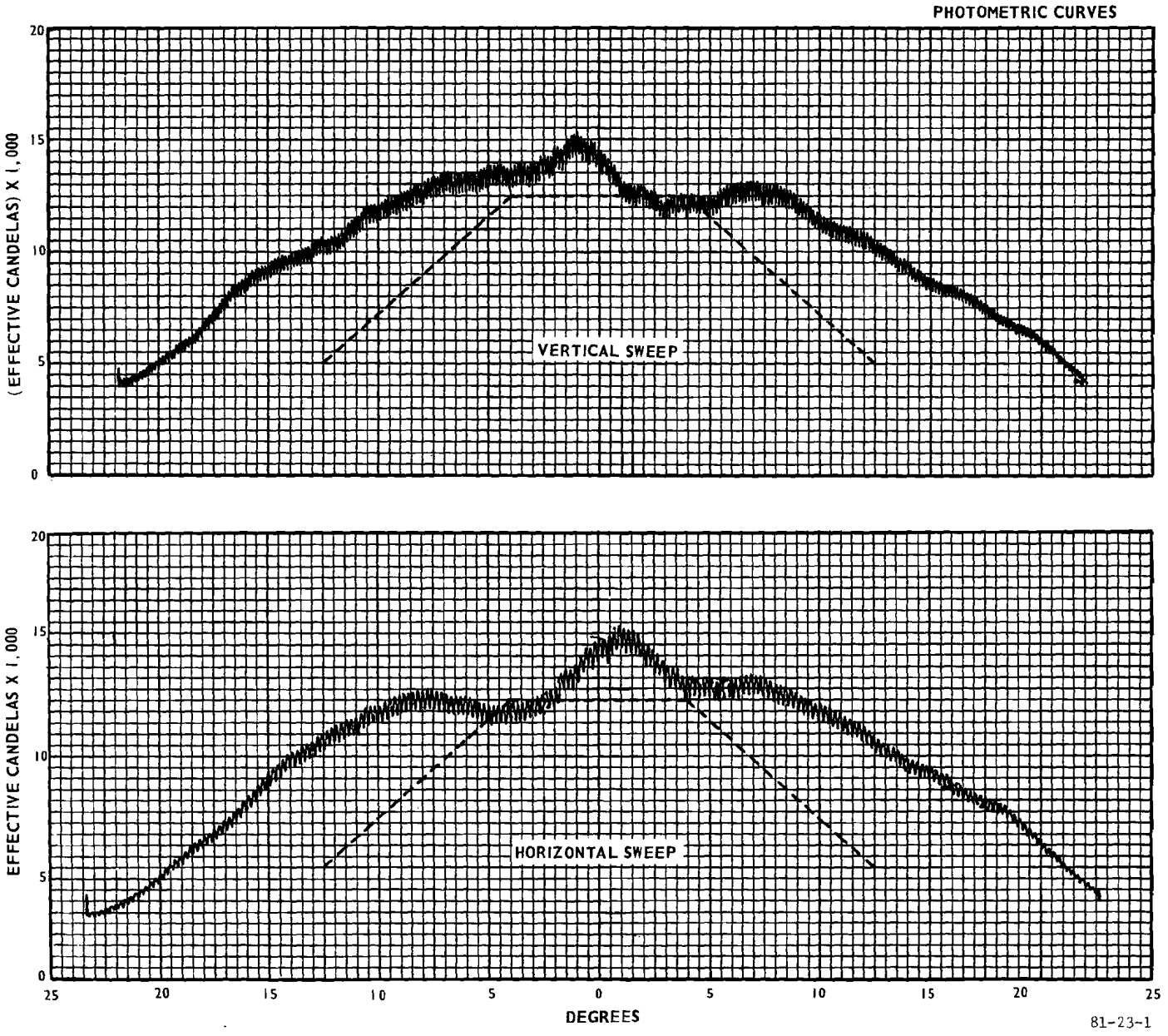


FIGURE 3. ACTUAL LIGHT DISTRIBUTION OF A MODIFIED 1106 FLASHER UNIT COMPARED TO SPECIFICATION FAA-E-2325C

APPENDIX

PROCEDURE FOR MODIFYING AN FAA 1106 FLASHER UNIT TO POWER A REMOTED FA-9425/1 FLASHER HEAD (Sylvania CD-2000 1106B and General Electric CD-100, 1106A)

Parts Required.

1. Solid-state bridge, Multi-Electric part No. CR101, Mfg. part No. BR860A, Federal stock No. 9261-00-309-0502.

2. Capacitor, 0.25 microfarad (μF), 600 volts.

3. Resistors, 130,000 and 220,000 ohms.

4. Terminal block, three terminals minimum, Kulka 39TB-4 or equivalent.

Steps.

1. Remove rectifiers and sockets.

2. Remove wires from terminals 6, 8, 9, and 10, of transformer T104 (T201).*

3. Remove coil L102 (T201) and connecting wires.

4. Remove flash tube.

5. Mount solid-state bridge near old rectifier location.

6. Disconnect wires from terminal 7 of T104 (T201) and save.

7. Connect a new No. 18 wire from terminal 7 to input of bridge.

8. Connect a new No. 18 wire from terminal 6 of T104(T201) to second input of bridge.

9. Connect two wires from output terminal (red dot) of bridge to capacitor C102 (C201) with wires removed from terminal 7.

10. Mount new output terminal block in convenient location.

11. Connect a new No. 18 wire from ground side of C102 (C201) to output terminal block.

12. Locate wire on old flash tube socket from C102 (C201) and connect to output terminal block.

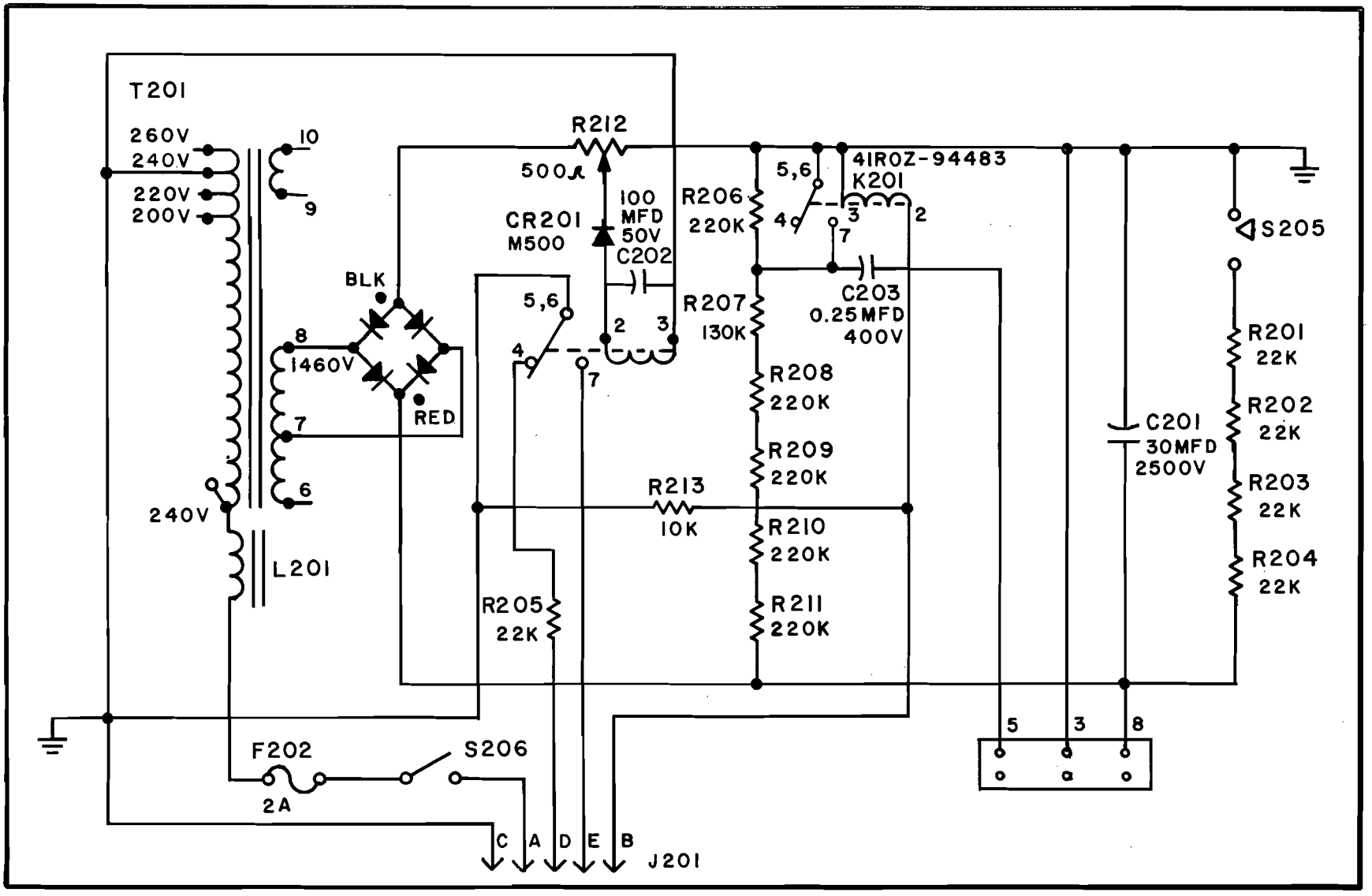
13. Replace capacitor C102 (C203) with a 0.25 μF capacitor and connect output to output terminal block.

14. Remove resistors R101 (R206) and R102 (R207). Install a 220,000-ohm resistor for R101 (R206) and a 130,000-ohm resistor for R102 (R207).

15. Change polarity of capacitor C103 (C202), diode D101 (CR201), and diode socket.

*Part numbers used are Sylvania. General Electric numbers are in parentheses.

Figures A-1 and A-2 show the Sylvania and the General Electric power supply schematics, respectively.



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NOTE:
SWITCHES S202 THRU S205 ARE SHOWN IN OPERATED POSITION.

FIGURE A-1. MODIFIED SYLVANIA CD-2000, 1106B POWER SUPPLY SCHEMATIC

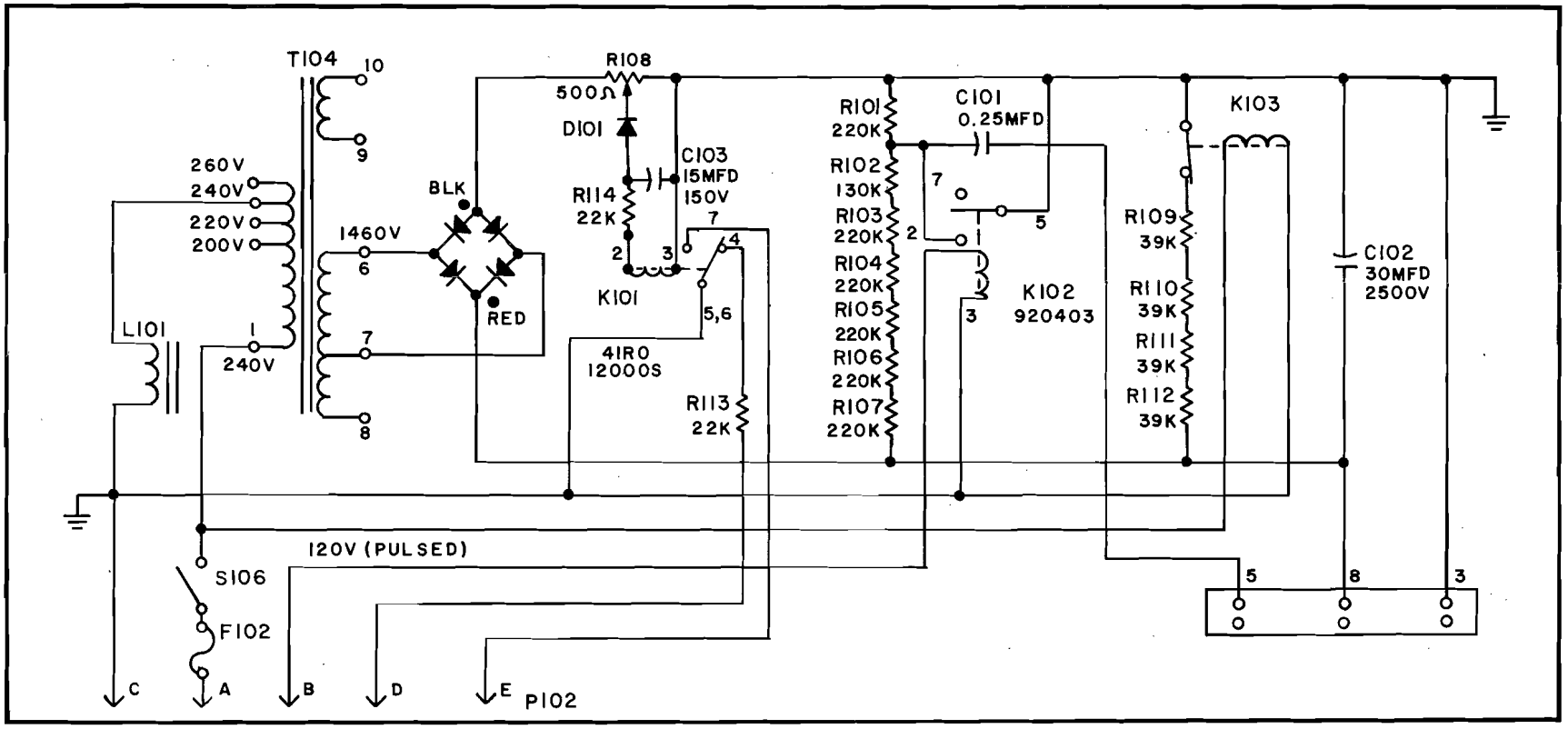

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FIGURE A-2. MODIFIED GENERAL ELECTRIC CD-100, 1106A POWER SUPPLY SCHEMATIC