DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL AND FIELD MAINTENANCE MANUAL

LIGHT SETS, GROUND OBSTRUCTION MARKER MK-221/G AND MK-221A/G (INCLUDING ACCESSORY KIT, OBSTRUCTION LIGHT CONTROL MK-705/G)

HEADQUARTERS, DEPARTMENT OF THE ARMY
19 SEPTEMBER 1963

Change No. 1

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, D.C., *25 October 1973*

**Operator, Organizational, and
Field Maintenance Manual
LIGHT SETS, GROUND OBSTRUCTION
MARKER MK-221/G AND MK-221A/G
(INCLUDING ACCESSORY KIT, OBSTRUCTION
LIGHT CONTROL MK-705/G)**

TM 11-6230-202-14, 19 September 1963, is changed as follows:

Page 3, paragraph 2. Delete paragraph 2 and substitute new paragraph 2.

2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment. Paragraph 3. Delete paragraph 3 and substitute new paragraph 3.

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army)/NAVSUP Pub 378 (Navy)/AFR 71-4 (Air Force)/and MCO P4030.29 (Marine Corps).

c. Discrepancy in Shipment Report (DISREP) (SF361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUP Pub 459 (Navy)/AFM 75-34 (Air Force)/and MCO P4610.19 (Marine Corps).

Add paragraph 3.1 after paragraph 3.

3.1. Reporting of Equipment Publication Improvements

The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-A, Fort Monmouth, NJ 07703.

Paragraph 5. Delete paragraph 5 and substitute the following:

5. Table of Components

(fig. 1)

NOTE

This listing is based on the original shipments by the contractors on Orders No. 20002-Phila-55, No. 21777-Phila-56, No. 9101-PP-59, No. 10117-PP-60, and No. 20339-PP-62

Quantity	*Item*
2	Obstruction light assembly.
2	Lamp socket and cable assembly.
2	Incandescent lamp, 111-watt.
1	Junction box.
1	Circuit breaker assembly.
10	Clamp, Electrical MX-1402A/U.
20	Cable clamp.
175 ft	Cable, three-conductor.
1 oz	Electrical Insulating and Sealing Compound (CIS).
8[a]	Pole step.
1[a]	Strapping kit.

[a] None furnished on Order No. 21777-Phila-56.

Add paragraph 5.1 after paragraph 5.

5.1. Items Comprising Operable Light Set Ground Marker MK-221/G, and MK-221A/G (FSN 6230-345-9212), and Obstruction Light Control MK-705/G (FSN 6230-973-2178)

FSN	*QTY*	*NOMENCLATURE, PART NO. AND MFR. CODE*	*USABLE ON CODE*
		Light Sets, Ground Marker MK-221 and MK-221A/G	
		NOTES **1. The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc.** **2. In usable on code column, number 1 refers to MK-221/G; number 2 refers to MK-221A/G.**	
6210-549-7394	2	Cable, Assembly Power Electrical: type ERSL; 32537	1.2
6145-161-0768	175 ft	Cable, Power, Electrical: MIL type CO-03HGF(3/10)0675; to be ordered in increments of 175 ft each only.	1,2
	1	Circuit Breaker: AU3091; 94295	2
6210-314-4196	20	Clamp Cable 'LayCIT' Type 19234; Kearny Corp (5 running spares)	1.2
5450-346-5342	13	Clamp Electrical MX-1402A/U: (3 of 13 are running spares)	1,2
5970-752-5249	1	Insulating Compound, Electrical: OSL-3; 15235	1.2
6210-696-2533	2	Junction Box: 664-1025; Specialty Engrg and Elect	1
5975-892-9123	2	Junction Box: AC2047-C44; 94295	2
6210-341-4194	1	Light, Marker, Aircraft Obstruction: 44678, 15235	1
6210-821-8132	2	Light, Marker, Aircraft, Obstruction: AU3085; 94295	2
5975-636-0171	5	Stop Pole 7123; 20117	1.2
5180-322-6337	1	Strapping Kit type Wraplock; 70095	1,2
		Obstruction Light Control MK-705/G	
6210-141-4190	3	Bracket Mounting SC-C-61165; 80063	
6210-889-1813	1	Control Electrical Light LC2134; 94295	
6230-973-3914		Photo Tube Assembly: 118; 94295	

Add paragraph 5.2 after paragraph 5.1.

5.2. Running Spares.

FSN	*QTY*	*ITEM*
		Light Set, Ground Obstruction Marker MK-221, and MK-221A/G
6210-341-4196	5	Clamp Cable: Kearny Corp “Lay cit” type 19235
5450-346-5342	3	Clamp Electrical MX-1402A/U
6240-267-1164	2	Lamp Incandescent: 111 watt; GE type A21-OBSTR-120
		Obstruction Light Control MK-705/G
5960-189-6511	1	Photoelectric Cell: RCA part No. 1P39
5960-235-9136	1	Electron Tube: RCA part type 2050

Page 37, appendix III. Delete appendix III.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

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VERNE L. BOWERS
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  Ft Richardson (ECOM Ofc) (2)
Army Dep (2) except
  LBAD (14)
  SAAD (30)
  TOAD (14)
  ATAD (10)
USA Dep (2)
Sig Sec USA Dep (5)
Sig Dep (5)
Sig FLDMS (2)
USAERDAA (1)
USA ERDAW (1)
MAAG (1)
USARMIS(1)
Units org under fol TOE:
  (1 copy each unit)
  11-97
  11-98
  11-117
  11-158
  11-500 (AA-AC)
  29-134
  29-136

NG: None
USAR: None
For explanation of abbreviations used, see AR 310-50.

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PIN 020736-001

Technical Manual
No. 11-6230-202-14

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *19 September 1963*

LIGHT SETS, GROUND OBSTRUCTION MARKER MK-221/G AND MK-221A/G (INCLUDING ACCESSORY KIT, OBSTRUCTION LIGHT CONTROL MK-705/G)

* This manual supersedes TM 11-6230-202-15, 9 February 1960, including C2, 10 November 1960, and C3, 12 March 1963.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This manual describes Light Sets, Ground Obstruction Marker MK-221/G and MK-221A/G and covers the installation, operation, and maintenance of these equipments. Information covering the installation and maintenance of Accessory Kit, Obstruction Light Control MK-705/G is included.

b. Official nomenclature including (*) is used to designate all models of the equipment item covered in this manual. Thus, Light Set, Ground Obstruction Marker MK-221(*)/G represents Light Sets, Ground Obstruction Marker MK-221/G and MK221A/G.

2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. Department of the Army Pamphlet No. 310-4 is an index of current technical manuals, technical bulletins, supply bulletins, lubrication orders, and modification work orders available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of damaged or improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58(Army), NAV-SANDA Publication 378 (Navy), and AFR 71-4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting by the individual user of errors, omissions, and recommendations for improving this equipment manual is authorized and encouraged. DA Form 2028 will be used for reporting these improvement recommendations. This form may be completed using pencil, pen, or, typewriter. DA Form 2028 will be completed in triplicate and forwarded by the individual using the manual. The original and one copy will be forwarded direct to: Commanding Officer, U. S. Army Electronics Materiel Support Agency, ATTN: SELMS-MP, Fort Monmouth, New Jersey, 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc).

Section II. DESCRIPTION AND DATA

4. Purpose and Use

a. Purpose. Light Set, Ground Obstruction Marker MK-221(*)/G is equipment for lighting obstructions to aircraft as required in the United States of America by United States Federal Aviation Agency (USFAA) regulations.

b. Use. The MK-221(*)/G is installed on masts, antenna supports, radio towers, and similar structures that do not exceed 150 feet in height, to indicate the presence of an obstruction to air navigation.

5. Table of Components

(fig. 1)

Note: This listing is based on the original shipments by the contractors on Orders No. 20002-Phila-55, No. 21777-Phila-56, No. 9101-PP-59, No. 10117-PP-60, and No. 20339-PP-62. For the current official listing of

components of individual models, see the basic issue items list (appx III).

a. Components.

Quantity	Items
2	Obstruction light assembly.
2	Lamp socket and cable assembly.
2	Incandescent lamp, 111-watt.
1	Junction box.
1	Circuit breaker assembly.
10	Clamp, Electrical MX-1402A/U.
20	Cable clamp.
175 ft	Cable, three conductor.
1 oz	Electrical Insulating and Sealing Compound (CIS).
8[a]	Pole step.
1[a]	Strapping kit.
1 set	Running spares (*b* below).

[a] None furnished on Order No. 21777-Phila-56.

b. Running Spares.

Quantity	Items
1	Junction box.
2	Incandescent lamp,111-watt.

6. Description

The MK-221(*)/G consists of unassembled components (fig. 1 and para. 5) that can be installed on either metal or wooden structures (fig. 2). Two obstruction light assemblies, each equipped with a red, prismatic globe; a circuit breaker assembly; a junction box; and all interconnecting cabling and hardware required to install the lighting equipment on structures up to 150 feet in height are provided.

7. Additional Equipment Required

a. On-Off Switch. Although the circuit breaker can be used as an on-off switch, it is preferable to use a separate switch between the circuit breaker and the power source. Any enclosed, single-pole, single-throw switch rated at approximately 120 volts, 2.5 amperes is suitable.

b. Other Equipment. No other equipment normally is required, but if it is desirable or necessary to have the obstruction lights operate automatically, auxiliary

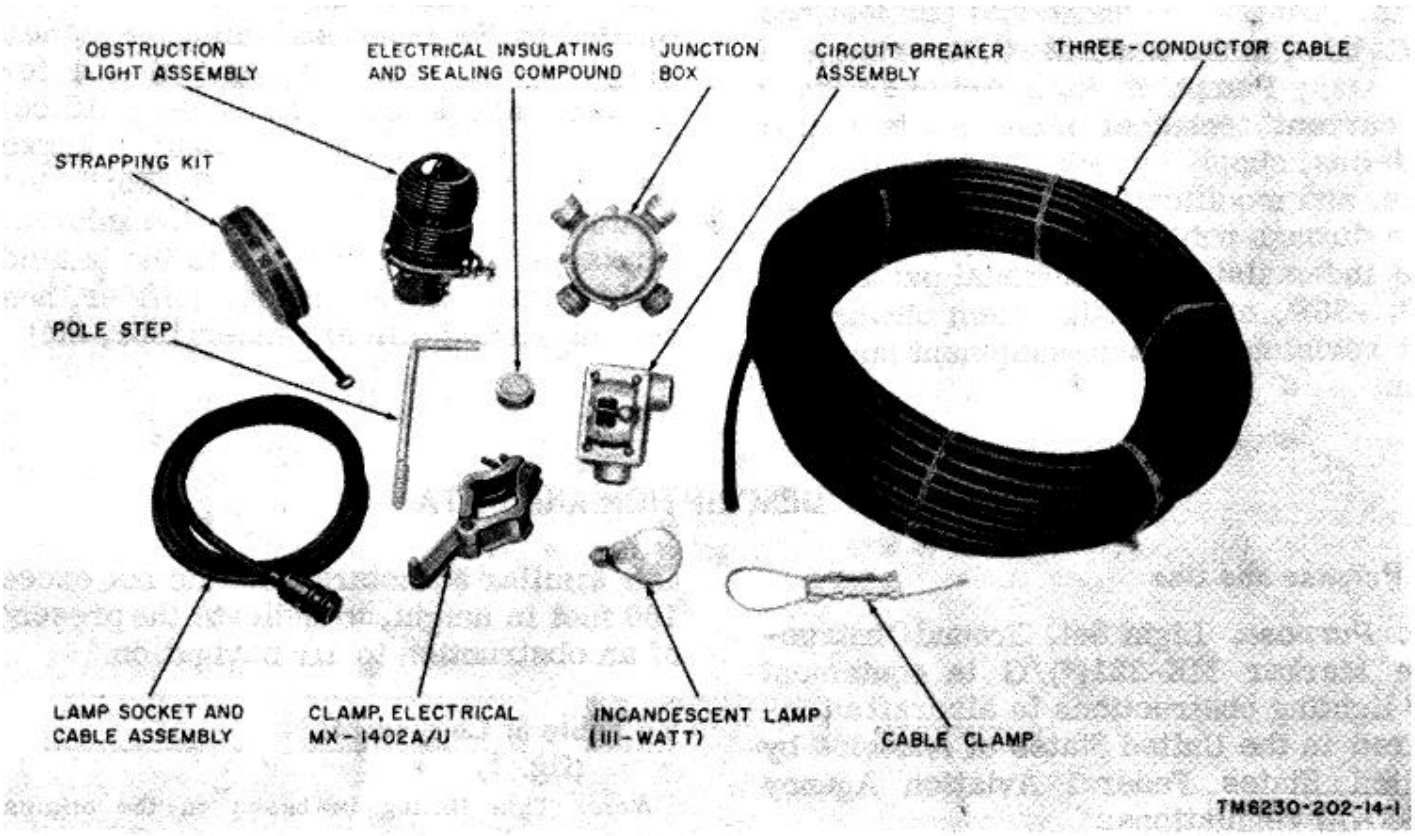


Figure 1. Light Set Ground Obstruction Marker MK-221(*)/G, components (one each shown).

automatic control equipment, Accessory Kit, Obstruction Light Control MK-705/G (FSN 6230-973-2178), is available. Refer to paragraphs 17 through 34 for information on the MK-705/G.

8. Differences in Models

Item	MK-221/G (Order No. 20002-Phila-55)	MK-221/G (Order No. 7-Phila-56)	MK-221/G (Order No. 9101-PP-59)	MK-221A/G (Order No. 10117-PP-60)	MK-221A/G (Order No. 20339-PP-52
Circuit breaker assembly.	Has feedthrough connector at top and bottom. Lever has two positions, ON and OFF.	Same as Order No. 20002-Phila-55.	Same as Order No. 20002-Phila-55, except has feed-through connec-tor at top and one side.	Same a Order No. 20002-Phila-55.	Same as Order No. 20002-Phila-55, ex-cept lever has four positions, ON, OFF, RE-SET, and TRIPPED.
Junction boxes	Have 10 screw-type terminals color-coded black, white, and red.	Same as Order No. 20002-Phlla-55.	Have three, three-terminal lugs die-stamped B (black), W (white), and R (red).	Same as Order No. 9101-PP-59.	Same as Order No. 9101-PP-59.
Strapping kit	One furnished.....	None furnished.....	One furnished.....	One furnished	One furnished.
Pole steps.....	Eight furnished	None furnished.....	Eight furnished	Eight furnished.....	Eight furnished

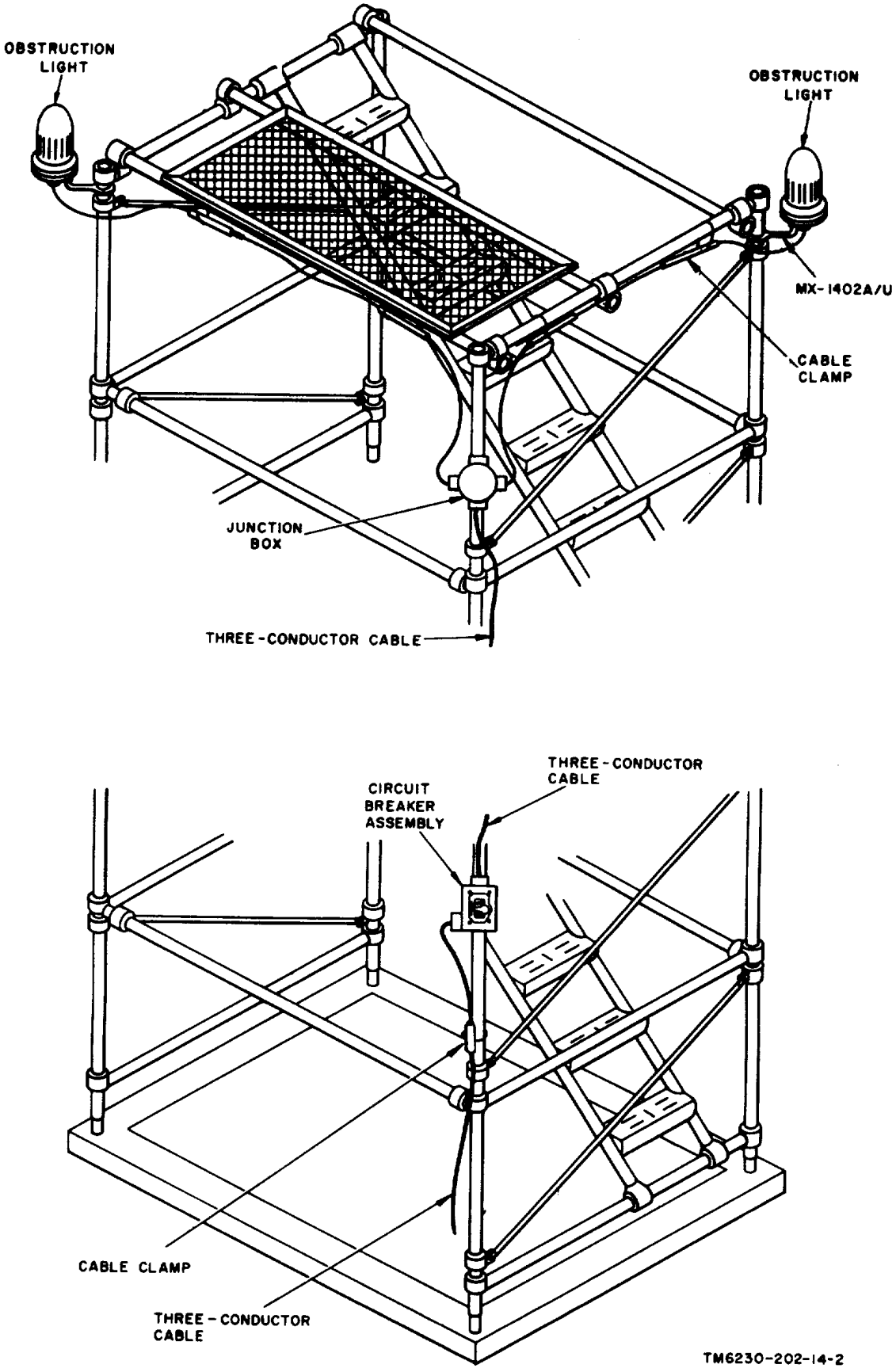


Figure 2. Light Set, Ground Obstruction Marker MK-221(*)/G, typical installation.

CHAPTER 2
INSTALLATION AND OPERATION

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

9. Unpacking

a. Packaging. Data. All the component part of the MK-221(*)/G, except the roll of three-conductor cable, first are packaged for protection and then are packed in a single, corrugated fiberboard carton. For oversea shipment only, the sealed fiberboard carton is placed in a nailed wooden box with a waterproof case liner. The roll of cable is wrapped for protection and shipped separately. The approximate dimensions, volume, and weight of the equipment packed for shipment are given in (1) and (2) below.

(1) *Domestic shipment*.

MK-221(*)/G	Dimensions (In.)			Volume (cu ft)	Weight packed (lb)
	Height	Width	Depth		
Carton	16-1/4	16-1/4	16-1/4	2.5	60
Roll of cable	8	23	23	2.4	52

(2) *Oversea shipment*.

MK-221(*)/G	Dimensions (In.)			Volume (cu ft)	Weight packed (lb)
	Height	Width	Depth		
Box	20	20	20	4.6	80
Roll of cable	8	23	23	2.4	52

b. Removing Contents. Follow the instructions in (1) through (4) below that are appropriate to the type of packaging.

(1) Remove the nails with a nailpuller and remove the top and one side of the box.

(2) Slit and fold back the waterproof case liner and remove the fiberboard carton from the wooden box.

(3) Slit the sealing tape, fold back the flaps of the carton, and remove the packaged equipment from the carton.

Caution: Handle the equipment carefully at all times. Some items are glass and may break if they are dropped.

(4) Open each package and remove its contents. Place all items together with like items arranged in groups.

10. Checking Unpacked Equipment

a. Check the equipment against the packing list; if a packing list is not available, use the list in paragraph 5. See that all items are present in the correct quantities. Report all discrepancies in accordance with TM 38-750.

Note: Shortage of an item of hardware or a spare part that does not prevent the proper installation and operation of the equipment should not prevent use of the equipment.

b. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para. 3*b*).

Section II. INSTALLATION

Note: Installation will be performed only by trained second or higher echelon personnel.

11. Tools Required for Installation

No tools are furnished with the MK-221(*)/G. The tools required to assemble and install the equipment are contained in Tool Kit, Radio Repair TK-115/U and Tool Kit, Radar and Radio Repairman TK-87/U. In addition, the following are required:

a. Wrench, open-end, 1-1/4-inch (FSN 5120-293-2124).

b. Tape, common measuring, 100-foot (FSN 5210-293-2101).

12. Preliminary Assembly

Note: To identify parts, refer to figure 1.

a. Install the socket of a lamp socket and cable assembly in the receptacle clamp of each obstruction light assembly. Screw an incandescent lamp into each socket.

b. Strip the ends of the cable of the two lamp socket and cable assemblies. Draw the stripped ends of the cables through opposite feedthrough connectors of a Junction box and connect the leads as shown in figure 3 (MK-221/G on Orders No. 20002-Phila-55 and No. 21777-Phila-56) or figure 4 (MK-221/G on Order No. 9101-PP-59 and MK-221A/G).

c. Coat the gland threads of the feedthrough connectors *sparingly* with Electrical Insulating and Sealing Compound (CIS). Tighten the feedthrough connectors so that the compressed rubber plug and the cable completely fill the tubular opening of the connector and make a watertight seal.

d. Replace the rubber plug in the bottom feedthrough connector of the junction box with a plug with an oversized hole. Replace the plug in the top feedthrough connector with a blank plug. Plugs with oversized holes and blank (no hole) plugs are in a bag packed inside the junction box.

e. Strip an end of the three-conductor cable. Draw the stripped end through the bottom feedthrough connector of the junction box and connect the leads to the junction box terminals (fig. 3 or 4). Tighten the feedthrough connector (*c* above).

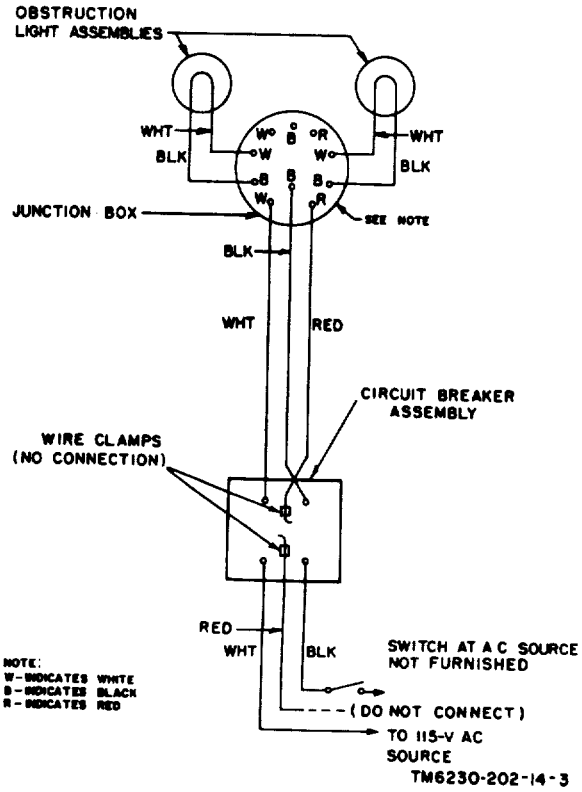


Figure 3. MK-221/G (Orders No. 20002-Phila-55 and No. 21777-Phila-56), wiring connection diagram.

13. Installation of MK-221(*)/G

(fig. 2)

Note: The .instructions in this paragraph cover a typical installation of the MK-221(*)/G. Alternate methods of mounting items are described in paragraph 14.

a. Installation of Obstruction Lights and Junction Box.

(1) Raise the assembled obstruction lights and junction box (para. 12) to the top of the tower. Support the three-conductor cable to avoid placing two much strain on the cable connections.

(2) Mount two MX-1402A/U's (fig. 1) on opposite corners of the top of the tower. Use the universal clamps on the obstruction light assemblies to mount the obstruction lights on the MX-1402A/U's.

(3) Mount another MX-1402A/U on the tower

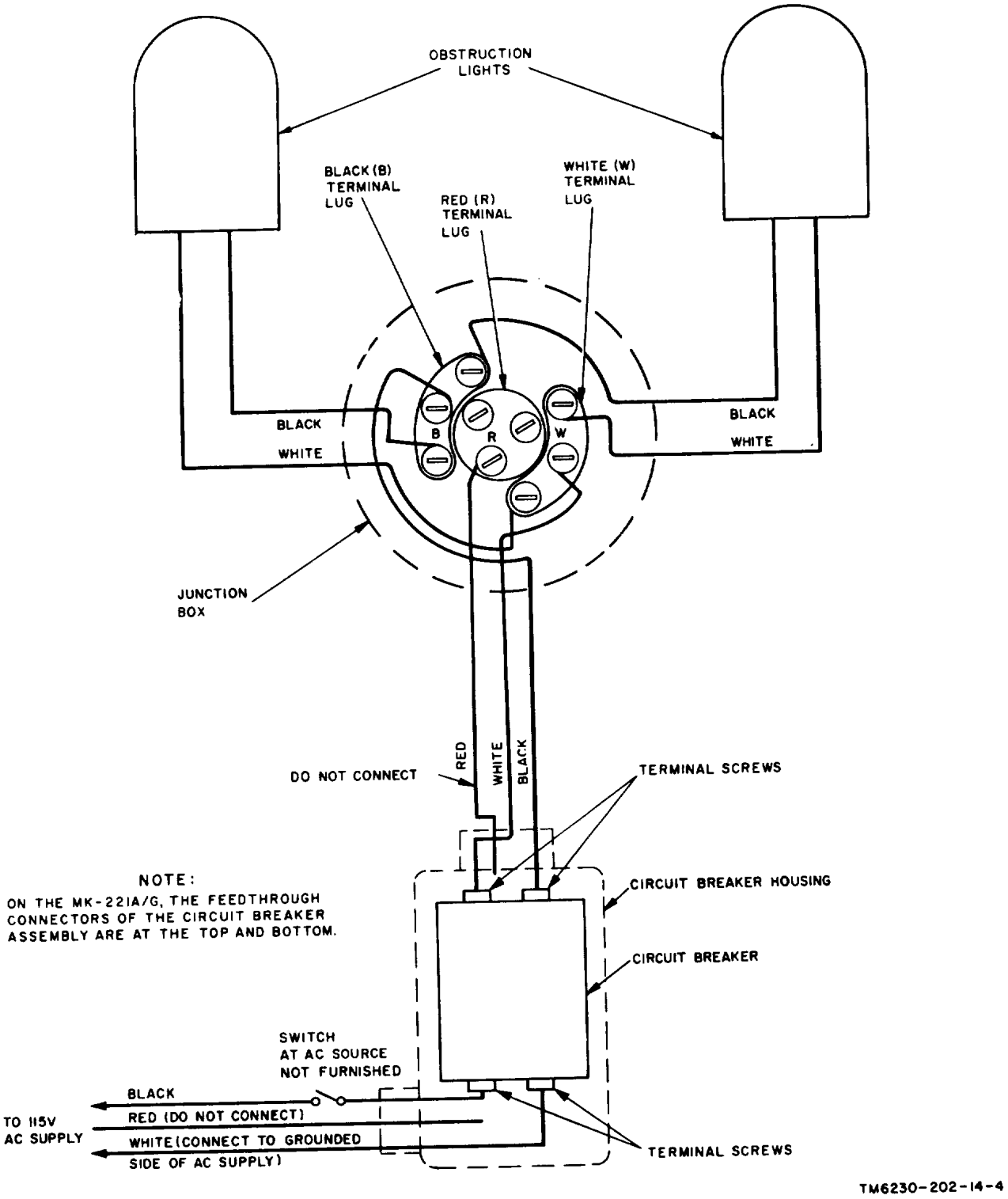


Figure 4. Mk-221/G (Order No. 9101-PP-59) and MK-221A/G, wiring connection diagram.

about 2 feet below the obstruction lights. Using the universal clamp on the junction box, mount the junction box on this MX-1402A/U.

(4) Attach the three-conductor cable to the tower with a cable clamp (fig. 1 and 5) about every 15 feet down the tower. Leave a little slack in the cable between the junction box and the first cable clamp

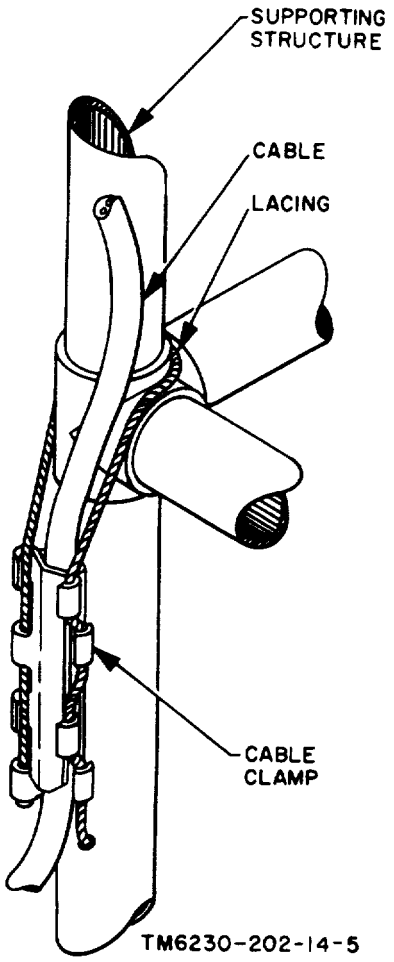


Figure 5. Cable clamp installed.

and between each two successive cable clamps.

(5) Cut off the three-conductor cable about 5 feet above the base of the tower.

b. Installation of Circuit Breaker Assembly.

(1) Strip the free end of the three-conductor cable connected to the junction box; strip only the black lead and the white lead. Draw the cable through the feedthrough connector in the top of the circuit breaker assembly (fig. 1). Connect the black lead and the white lead to the two top terminals of the circuit breaker (fig. 3 or 4); the red lead is never used. On the MK-221/G furnished on Orders No. 20002-Phila-55 and No. 21777-Phila-56, fasten the red lead with the wire clamp inside the circuit breaker housing, near the top. On the MK221/G furnished on Order No. 9101-PP-59 and on the MK-221A/G, tape the red lead with Electrical Insulation Tape TL-559/U or equal.

(2) Strip an end of the three-conductor cable remaining in the roll; strip only the white lead and the black lead. Draw the stripped end through the unused feedthrough connector of the circuit breaker assembly and connect the black lead and the white lead to the bottom terminals of the circuit breaker (fig. 3 or 4). On the MK-221/G on Orders No. 20002-Phila-55 and 21777-Phila-56, fasten the red lead with the wire clamp inside the circuit breaker housing, near the bottom. On the MK-221/G furnished on Order No. 9101-PP-59 and on the MK221A/G, tape the red lead with TL-599/U.

(3) Use an MX-1402A/U and the universal clamp on the circuit breaker assembly housing and mount the circuit breaker assembly on the tower. Leave a little slack in the three-conductor cable between the lowest cable clamp and the circuit breaker assembly.

Note: If auxiliary automatic control equipment (Accessory Kit, Obstruction Light Control MK-709/G) is to be installed, refer to paragraph 19.

c. Connection to AC Power Source.

(1) Check all wiring connections (fig. 3 or 4) to be sure they have been made correctly. See that the circuit breaker lever is in the OFF position.

(2) Connect the free end of the length of the three-conductor cable connected to the circuit breaker (or to the control assembly (para. 19*d*) if the MK-705/G is installed) to a 115-volt, 60-cycle-per-second alternating current (ac) source of power as follows:

(a) Determine which side of the ac

power source is grounded. Connect the white lead directly to the grounded side of the power source and connect the black lead to the live or hot side. The red lead of the three-conductor cable is not used; *do not connect it to the power source*.

(b) It is recommended that an *on-off* switch be inserted in the black lead between the circuit breaker and the power source before the black lead is connected. This switch is not furnished with the MK-221(*)/G (para. 7*a*).

14. Alternate Mounting Procedures

a. Pole Steps. When the MK-221(*)/G is to be installed on a wooden pole or other wooden support, mount the equipment, on four pole steps (fig. 1 and 6 instead of on MX-1402A/UPs (para. 13). Proceed as follows:

(1) Screw the pole steps into the wood until about 4 inches of each pole step remain exposed. Turn the pole steps so that the legs point upward.

Caution: **If the wooden support on which the equipment is to be mounted is not solid, make certain that the wood is thick enough to hold the pole steps firmly without splitting.**

(2) Mount the two obstruction lights, the junction box, and the circuit breaker assembly each on a pole step by means of the universal clamp provided on each of these items.

b. Strapping Kit. When items cannot be mounted as described in paragraph 13 or *a* above, use the strapping kit (fig. 1). Use the strapping kit, also, to support the three-conductor cable when cable clamps cannot be used. General instructions for the use of the strapping kit are given in (1) through (7) below; the exact procedure depends on the individual situation.

(1) Measure and cut off a length of the steel band about 4 inches more than enough to pass *twice* around the item and the support to which the item is to be secured.

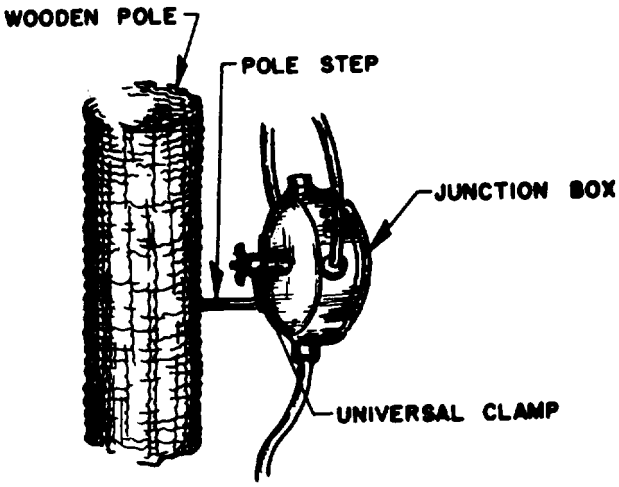


Figure 6. Junction box mounted on pole step.

(2) Insert one end of the piece of band through one of the steel buckles furnished with the kit, bend back the band about 1-1/2 inches from the end, and flatten the band (A, fig. 7).

(3) Pass the free end of the band around the item and the support and then through the buckle (B).

(4) Pass the band a second time around the item and the support and insert the end of the band through the buckle (C). Draw the band snug with pliers.

(5) Insert the free end of the band between the tines of a cotter pin (D) or in the special ratchet tool furnished with the kit. Rotate the cotter pin or tool and roll up the end of the band (E) until the roll is tight against the buckle and the buckle holds the band tightly.

(6) Back off the cotter pin or ratchet tool slightly and slip the pin or tool out of the rolled-up band.

(7) To release the band, unroll the rolled portion; use a cotter pin, the ratchet tool, or the fingers. Press down on the band where it passes through the curved part of buckle. Pull the unrolled end out of the buckle.

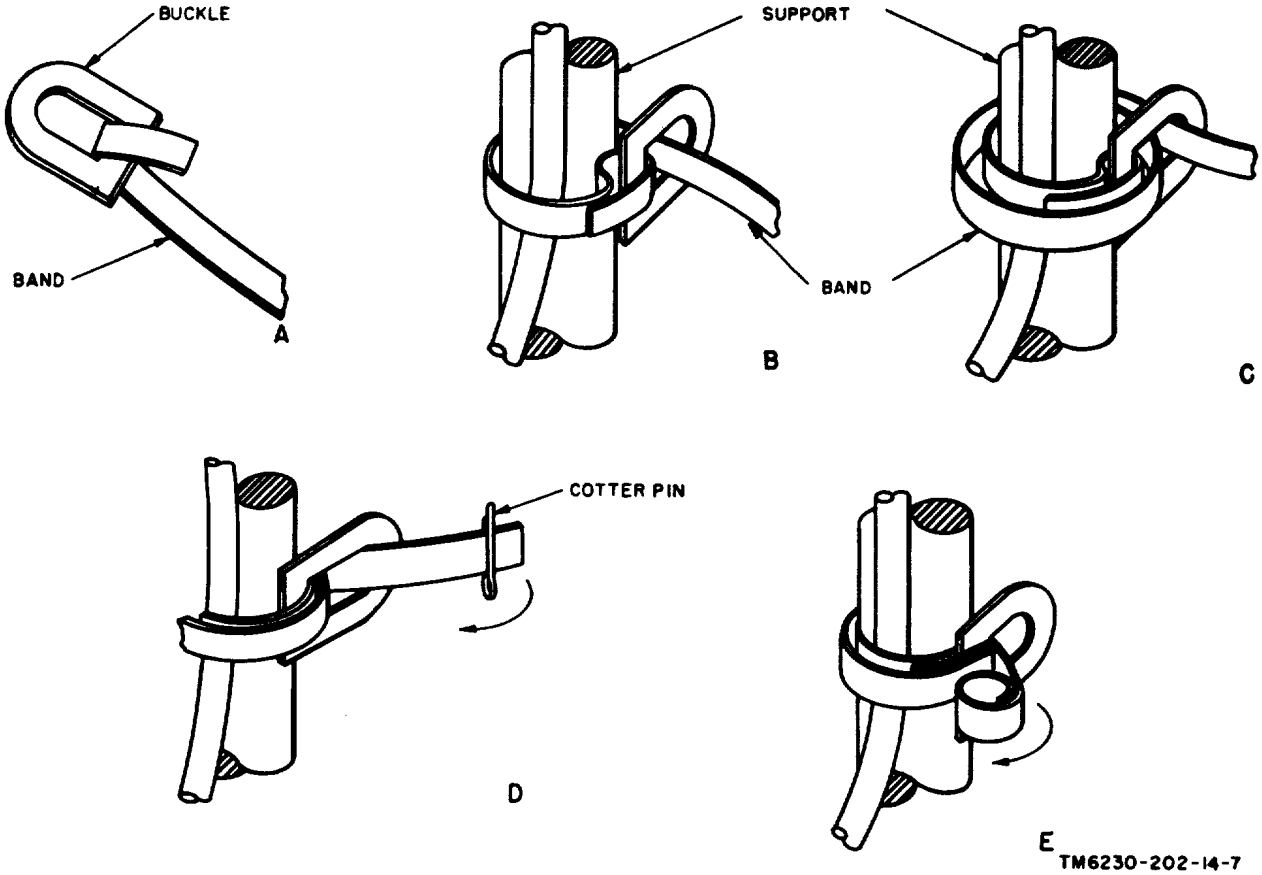


Figure 7. Using strapping kit to secure cable to support.

Section III. OPERATION

15. Controls

The MK-221(*)/G has only one control, a circuit breaker, which is used as an *on-off* switch if no separate on-off switch at the ac source is used. An external operating lever is provided on the housing of the circuit breaker assembly (fig. 1). If a short circuit or overload causes the circuit breaker to trip automatically, it must be reset manually. The operating lever of the circuit breaker furnished with the MK-221/G and the MK-221A/G (Order No. 10117-PP-60 only) has two positions, ON and OFF. In the ON position, the ac circuit is closed; in the OFF position, the ac circuit is open. The operating lever of the circuit breaker furnished with the MK-221A/G (Order No. 20339-PP-62) has four positions: ON, OFF, TRIPPED, and RESET. In the ON position, the ac circuit is closed; in the OFF position, the ac circuit is open. In the TRIPPED position, also, the ac circuit is open and the operating lever must be moved to RESET and then to ON to reclose the circuit.

16. Operating Procedure

a. Starting. Whenever the light intensity is such that the obstruction lights are required, close the switch (if installed) at the ac source (if used) and place the circuit breaker in the ON position.

Note: On the MK-221A/G (Order No. 20339-PP-62 only), if the obstruction lights do not light when the circuit breaker operating lever is placed at ON, move the lever to RESET and then to ON.

b. Stopping. When the obstruction lights no longer are required, open the switch at the ac source, and, if necessary, place the circuit breaker in the OFF position.

Note: When an *on-off* switch Is installed at the ac source, leave the MK-221(*)/G circuit breaker in the ON position and use the *on-off* switch to turn the lights on and off unless circumstances require that the circuit to the obstruction lights be opened also at-the circuit breaker.

CHAPTER 3

AUXILIARY EQUIPMENT

Section I. PURPOSE AND DESCRIPTION

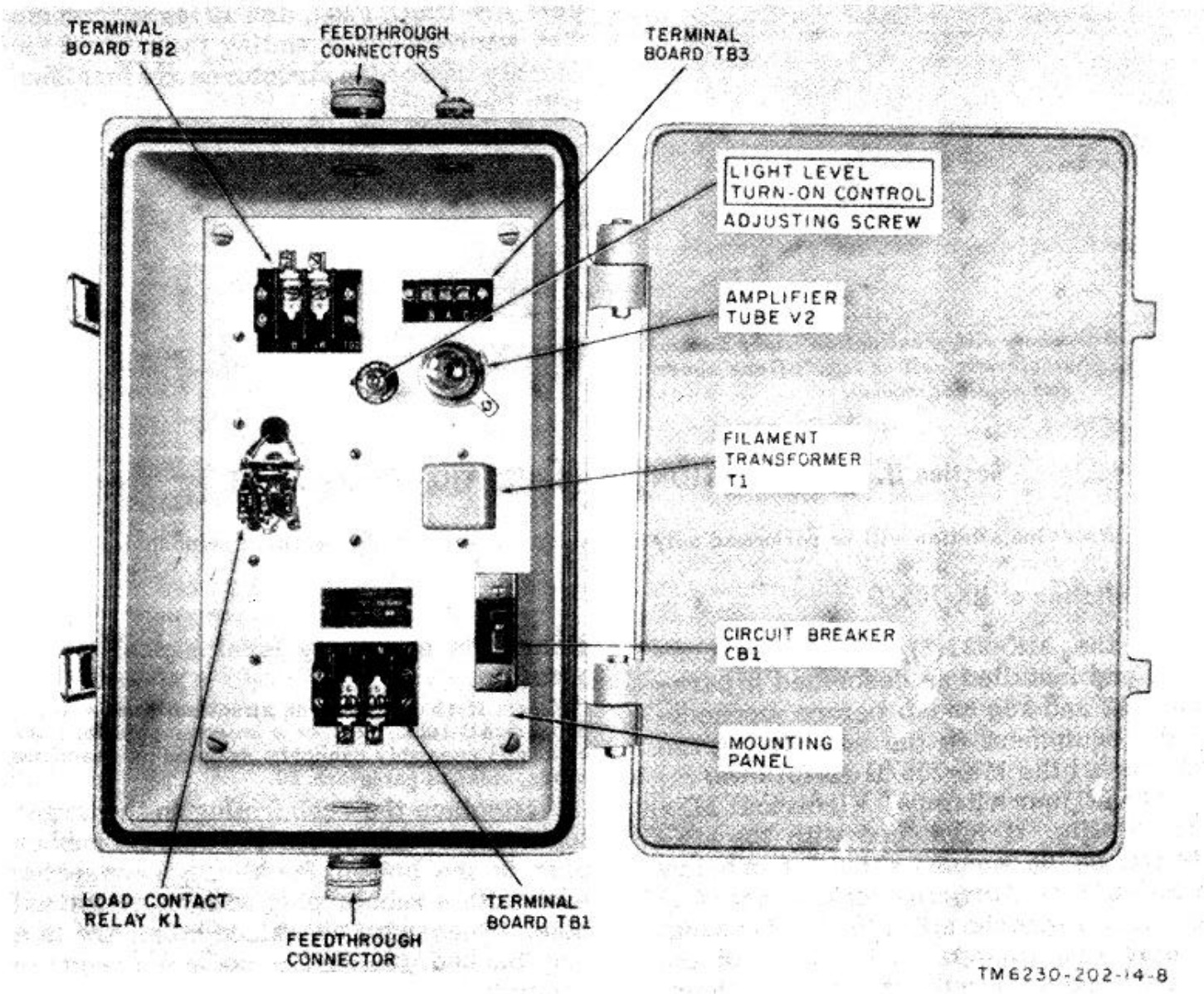
17. Purpose of Auxiliary Equipment

Although the MK-221(*)/G obstruction lights can be turned on and off manually, in some instances manual operation may be impractical or undesirable. In such cases; Accessory Kit, Obstruction Light Control MK-705/G (FSN 6230-973-2178) can be used to turn the obstruction lights on and off automatically when a preselected daylight intensity prevails.

18. Description of Accessory Kit, Obstruction Light Control MK-705/G

The MK-705/G consists of a control assembly and a photoelectric cell assembly.

a. The control assembly (fig. 8) consists of



Figue 8. Accessory Kit, Obstruction Light Control MK-705/G, control assembly.

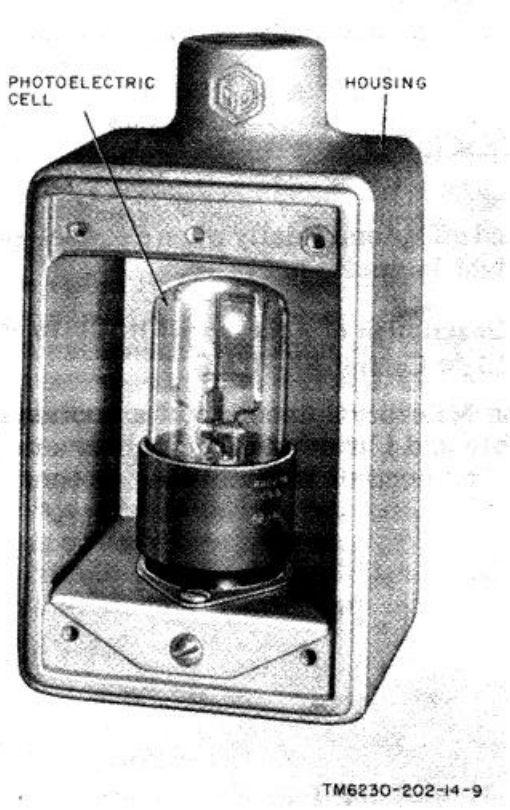


Figure 9. Accessory Kit, Obstruction Light Control MK-705/G, photoelectric cell assembly (less cover and shielded cable).

electronically actuated switching equipment installed in a waterproof housing with a hinged door. Four universal clamps are mounted on the rear of the housing. Provisions for connecting the control assembly into the MK-221(*)/G obstruction light circuit and to the photoelectric cell assembly (*b* below) are included.

b. The photoelectric cell assembly (fig. 9) consists of a photoelectric cell installed in a waterproof housing with a transparent window in the cover, and a 20-fool shielded cable for connecting the photoelectric cell assembly to the control assembly (*a* above). One universal clamp it mounted on the rear of the housing.

c. Three mounting brackets for installing the control assembly on Antenna Support AB-105C/FRC, and 10 lag screws and flat washers for mounting the control assembly on wooden structures are furnished with the MK-705/G.

Section II. INSTALLATION AND OPERATION OF MK-705/G

Note: Installation will be performed only by trained second or higher echelon personnel.

19. Installation of MK-705/G

When the MK-221(*)/G has been connected and installed as described in paragraphs 12 and 13*a* and *b* before connecting the equipment to the ac supply (para. 13*c*), install the MK-705/G as follows:

a. Mount four Clamps, Electrical MX-1402A/U (fig. 1) furnished with the MK-221(*)/G on the support about 1 foot below the MK-221(*)/G circuit breaker assembly (fig. 2). Arrange the MX-1402A/U's so that the universal clamps on the back of the control assembly will mate with them. Mount the control assembly on the MX-1402A/U's by means of the universal clamps in as nearly level a position as possible.

Note: If the supporting structure is an Antenna Support AB-105C/FRC or a wooden pole, or if the control assembly cannot be mounted as described above, refer to paragraph 20.

b. Replace the rubber plug in the larger top feedthrough connector and the rubber plug in the bottom feedthrough connector each with a rubber plug with an oversized hole. Plugs with oversized holes are in a bag packed inside the control assembly housing.

c. Cut off the three-conductor cable connected to the bottom terminals of the MK-221(*)/G circuit breaker

(para. 13*b*(2)) about 3 feet below the bottom of the circuit breaker assembly. Allow a sufficient length of three-conductor cable to reach easily to the upper left-hand terminal board inside the control assembly (fig. 8) with the cable a little slack.

d. Strip the free end of the short piece of three-conductor cable connected to the MK-221(*)/G circuit breaker and draw it through the top feedthrough connector of the control assembly that has a plug with an oversized hole. Connect the black lead and the white lead to the upper left-hand terminal board inside the control assembly (fig. 8 and 10) and tighten the feedthrough connector (para. 12*c*). Tape the red lead with electrical insulation tape.

e. Strip an end of the three-conductor cable remaining in the roll furnished with the MK-221(*)/G (fig. 1). Draw the stripped end through the bottom feedthrough connector of the control assembly (fig. 8) and connect the black lead and the white lead to terminals L and N, respectively, on the bottom terminal board (fig. 10). Tape the red lead with electrical insulation tape.

f. Mount the photoelectric cell assembly on the support; use an MX-1402A/U furnished with the MK-221(*)/G and the universal clamp on the back of the photoelectric cell assembly housing. Locate the photoelectric cell assembly so that the 20-foot shielded cable connected to it will reach easily to the control assembly but high enough so that the window in the cover never will be shadowed by buildings, trees, or persons. Position the photoelectric cell assembly so that the window faces north (in the Northern Hemisphere).

g. Fasten the shielded cable to the support with cable clamps (fig. 1 and 5) furnished with the MK-221(*)/G at two points between the photoelectric cell assembly and the control assembly.

h. Draw 8 to 10 inches of the shielded cable connected to the photoelectric cell assembly through the unused feedthrough connector in the top of the control assembly. Connect the three leads to the upper right-hand terminal board (fig. 8 and 10).

i. Check all wiring connections to the MK-705/G (fig. 10) to be sure they have been made correctly. See that the control assembly circuit breaker (fig. 8) is in the OFF position.

j. Connect the free end of the three-conductor cable connected to the control assembly (*e* above) to the ac power source (para. 13*c*(2)).

20. Alternate Methods for Mounting MK-705/G

a. On Antenna Support AB-105C/FRC. When the MK-705/G is used on the AB105C/FRC, mount the photoelectric cell assembly as described in paragraph 19*f*. Mount the control assembly on two mounting brackets (furnished with the equipment) as follows:

(1) Remove the four universal clamps on the back of the control assembly housing by removing the universal clamp mounting screws.

(2) Refer to TM 11-2615A. Remove two adjacent horizontal braces G10-A from the ladder face of the support at the height at which the control assembly will be installed.

(3) In place of each horizontal brace G10-A that was removed, install a mounting bracket. Use the two end holes in the mounting bracket and the bolts, lockwashers, and nuts that originally secured horizontal brace G10-A.

(4) Secure the control assembly to the mounting brackets with the universal clamp mounting screws ((1) above). The large holes near the center of the mounting brackets will mate with the universal clamp mounting holes in the control assembly housing. B, figure 11 shows the control assembly mounted on the AB-105C/FRC.

b. On Wooden Pole or Mast or Other Wooden Structure. When the MK-705/G is to be installed on a wooden support, mount the photoelectric cell assembly on a pole step (fig. 1) furnished with the MK221(*)/G. Follow the procedure described in paragraph 14*a* for mounting items on pole steps. Mount the control assembly as follows:

(1) Remove the four universal clamps from the control assembly housing (*a*(1)

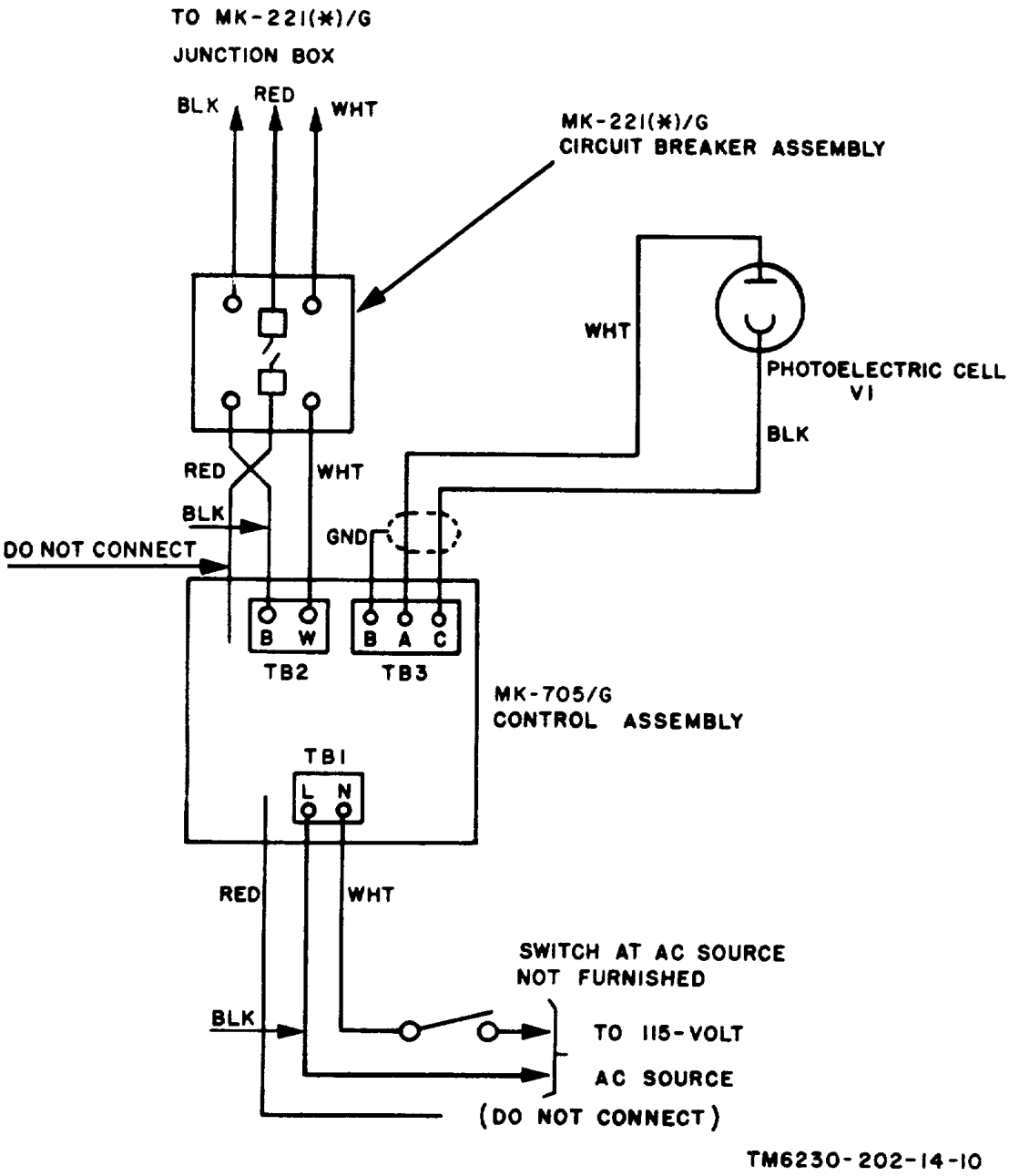


Figure 10. Accessory Kit, Obstruction Light Control MK-705/G, connection diagram.

above). Using the universal clamp mounting screws and holes, fasten two mounting brackets to the control assembly housing.

(2) If the control assembly is to be mounted on a support such as a pole, bend the mounting brackets and fasten them to the support with lag screws and flat washers (furnished with the equipment) as shown in C, figure 11. If the wooden mounting surface is fiat, mount the brackets flush against the surface.

c. On Other Structures.

(1) When the MX-1402A/U's for mounting the control assembly cannot be arranged in the normal manner (para. 19*a*), install the MX-1402A/U's one above the other and mount the control assembly on the MX-1402A/U's as shown in A, figure 11.

(2) When the automatic control for the MK-221(*)/G cannot be mounted by any of the methods described in paragraph 19*a* or *a*, *b*, and (1) above, use the strapping kit

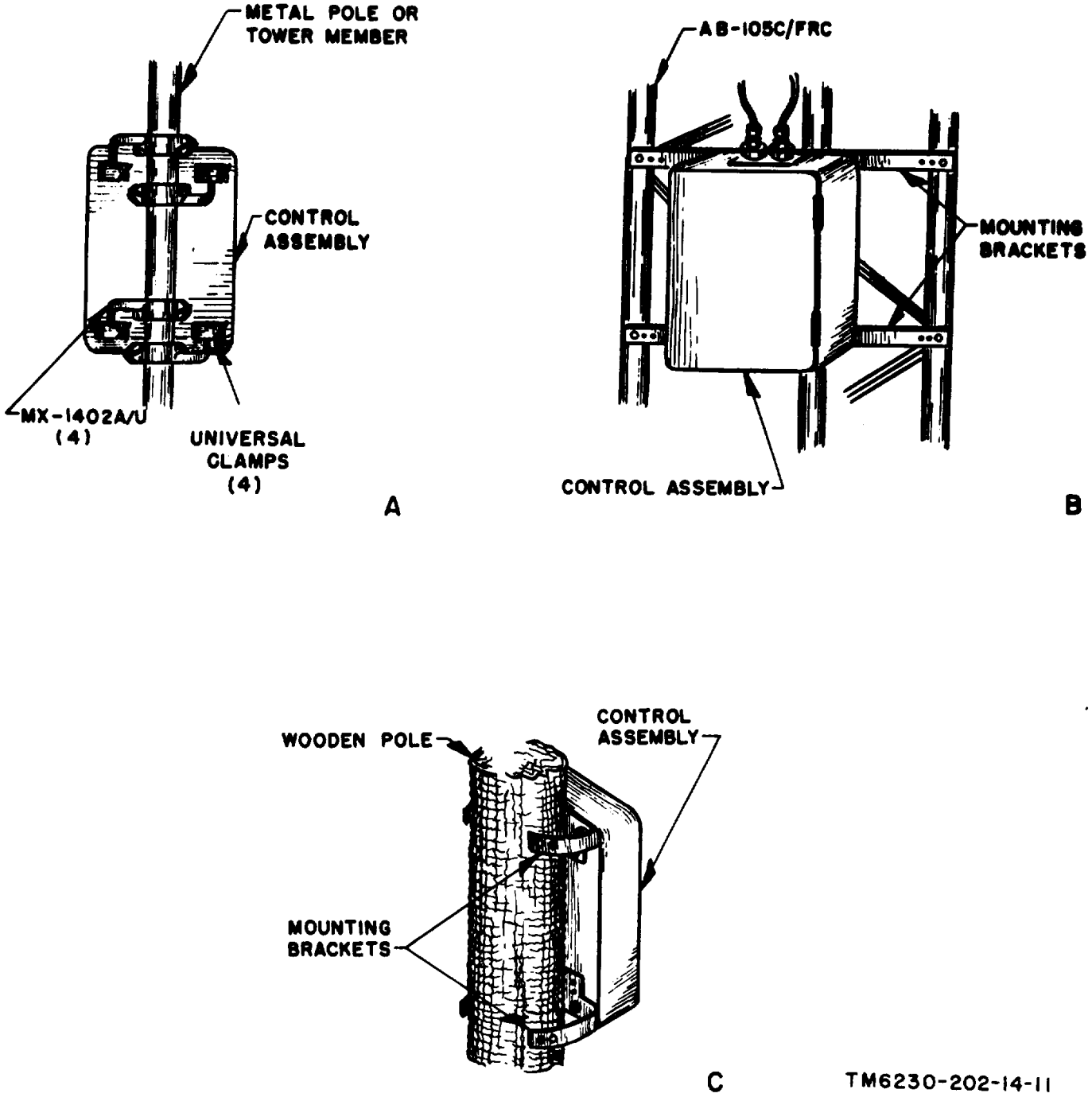


Figure 11. Alternate methods of mounting control assembly.

furnished with the MK-221(*)/G (fig. 1 and para. 14*b*).

21. Preoperational Procedures

a. Operational Check. When the installation of the MK-221(*)/G and the MK-705/G has been completed (para. 13 and 19), check the operation of the automatic control as follows:

(1) Place the MK-221(*)/G circuit breaker lever (para. 15) and the control assembly circuit breaker lever (fig. 8) both in the ON position. Close the switch at the ac source.

(2) Wait 2 minutes to allow the tube in the control assembly to warm up. During this time, the MK-221(*)/G obstruction lights may come on momentarily; they should go out again by the time 2 minutes have elapsed.

(3) Cover the window of the photoelectric cell assembly with the palm of the hand, Both MK-221(*)/G obstruction lights should come on immediately. Remove the hand from the window; both lights should go out Immediately.

(4) Open the switch pt the ac source and place both circuit breaker levers in the OFF position.

b. Light Turn-On Adjustment. To adjust the MK-705/G so that the MK-221(*)/G obstruction lights will come on and go off at the desired daylight intensity, adjust the LIGHT LEVEL TURN-ON CONTROL adjusting screw (fig. 8) in the control assembly as follows:

Note: It is recommended that this adjustment be made in the early evening when the light intensity is approximately that at which the obstruction lights should come on.

(1) Close the switch at the ac source and place the MK-221(*)/G circuit breaker and control assembly circuit breaker both at ON. Wait 2 minutes to allow the tube in the control assembly to warm up.

(2) Loosen the locknut that secures the LIGHT LEVEL TURN-ON CONTROL adjusting screw (fig. 8). With a screwdriver, slowly rotate the LIGHT LEVEL TURN-ON CONTROL adjusting screw between the positions marked HI and LO and find the position of the adjusting screw at which the obstruction lights just come on. If the existing daylight intensity is that at which the lights should come on, no further adjustment is necessary. To have the lights come on when it is a little lighter, turn the adjusting screw *slightly* toward the position marked HI. To have the lights come on when it is a little darker, turn the adjusting screw slightly toward the position marked LO. When the adjustment is satisfactory, tighten the LIGHT LEVEL TURN-ON CONTROL locknut.

22. Operation

a. Controls. The MK-705/G has one control, a circuit breaker located in the control assembly (fig. 8). This circuit breaker normally is in the ON position. When a short circuit or overload causes it to trip automatically, it must be reset manually by placing the circuit breaker lever in the ON position.

b. Starting. Close the switch at the ac source and place the MK-221(*)/G circuit breaker lever (para. 15) and the control assembly circuit breaker lever (*a* above) both in the ON position. The MK-221(*)/G obstruction lights now will be operated automatically at the preset light intensity (para. 21*b*).

c. Stopping. To deenergize the equipment for maintenance or repair, place the control assembly circuit- breaker lever in the OFF position and open the switch at the ac source.

Section III. FUNCTIONAL DESCRIPTION OF MK-705/G

23. Block Diagram Description

(fig. 12)

When a 115-volt ac supply is connected to the control assembly and circuit breaker CB1 is at ON, Input voltage is applied to rectifier CR1, amplifier tube V2, and the normally closed contacts of load contact relay K1. The direct current (dc) output of rectifier CR1 is applied to photoelectric cell V1. When the intensity of the light applied to photoelectric cell V1 causes photoelectric cell V1 to conduct, its output, applied through variable resistor R6, causes amplifier tube V2 to conduct. The output of amplifier tube V2 is applied to the coil of load contact relay K1. When load contact relay K1 operates, the 115-volt ac circuit to the obstruction lights circuit breaker is interrupted at load contact relay K1. When the intensity of the light applied to photoelectric cell V1 is below a value that will produce an output

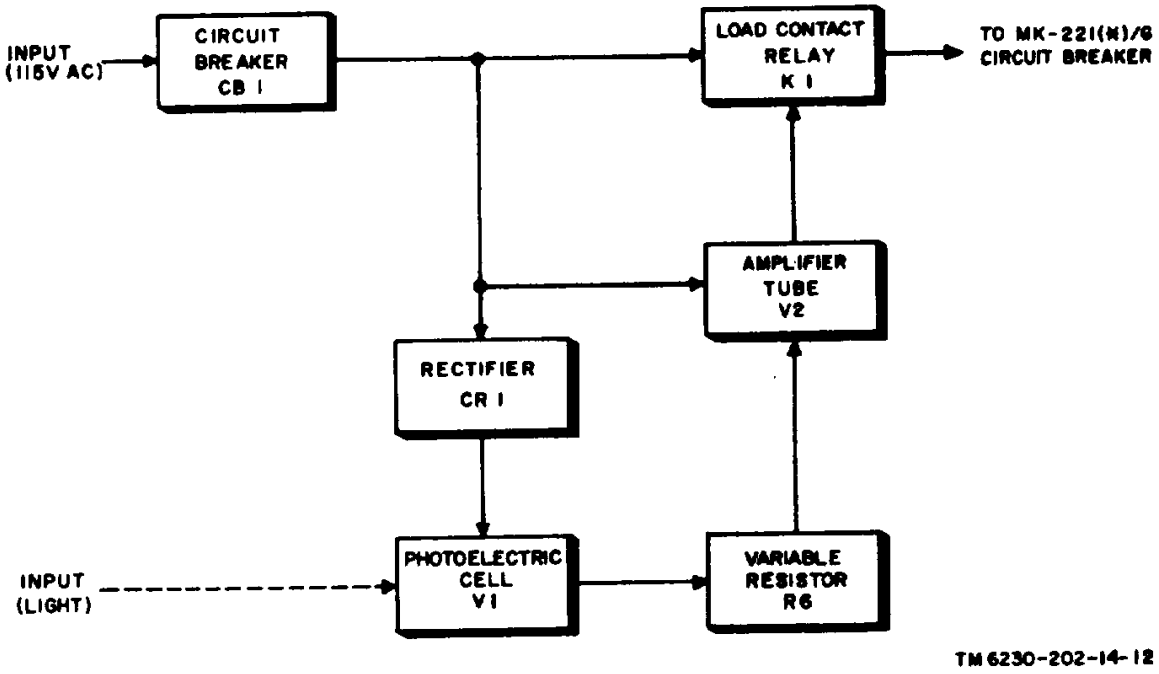


Figure 12. Accessory Kit, Obstruction Light Control MK-705/G, block diagram.

that will cause amplifier tube V2 to conduct, load contact relay K1 is deenergized and its contacts are closed. When load contact relay K1 is unoperated, the 115-volt ac circuit to the obstruction lights circuit breaker is closed.

24. Circuit Description

(fig. 13)

a. The ac circuit to the obstruction lights circuit breaker is energized by 115-volt ac applied through circuit breaker CB1 and the contacts of load contact relay K1, which are normally closed. Resistor R1 is an ac isolation resistor to prevent possible shock hazard. The operation of load contact relay K1 is controlled by the automatic switching circuits.

b. The automatic switching circuits are energized constantly when a 115-volt ac supply is connected to terminal board TB1 and circuit breaker CB1 is in the ON position.

(1) The ac filament supply for amplifier tube V2 is taken from the secondary winding of filament transformer T1. The plate voltage for amplifier tube V2 is taken from the 115-volt ac input through the coil of load contact relay K1, voltage-dropping resistor R9, and filter choke L1. Grid voltage for amplifier tube V2 is established by variable resistor R6. The bias on amplifier tube V2 is established by the voltage drop across resistor R7 and the portion of variable resistor R6 determined by the position of its sliding contact (4) below. Cathode voltage for amplifier tube V2 is established by voltage-divider resistors R7 and R8. Plate voltage for photoelectric cell V1 is supplied through voltage-dropping resistor R2, rectifier CR1. and filter capacitor C1B.

(2) Photoelectric cell V1 is a high-vacuum tube with a light-sensitive cathode. When light strikes the cathode, electrons are emitted and collected by the plate, which is maintained at a positive potential with respect to the cathode by rectifier CR1 ((1) above). When photoelectric cell V1 conducts, the resulting voltage change across a voltage-divider network consisting of resistors R3, R4, and R5 causes the bias voltage on the grid of amplifier tube V2 to become more positive (less negative) and amplifier tube V2 conducts (fires). When amplifier tube V2 conducts, the coil of load contact relay K1 is energized. When load contact relay K1 operates, its contacts open and the ac

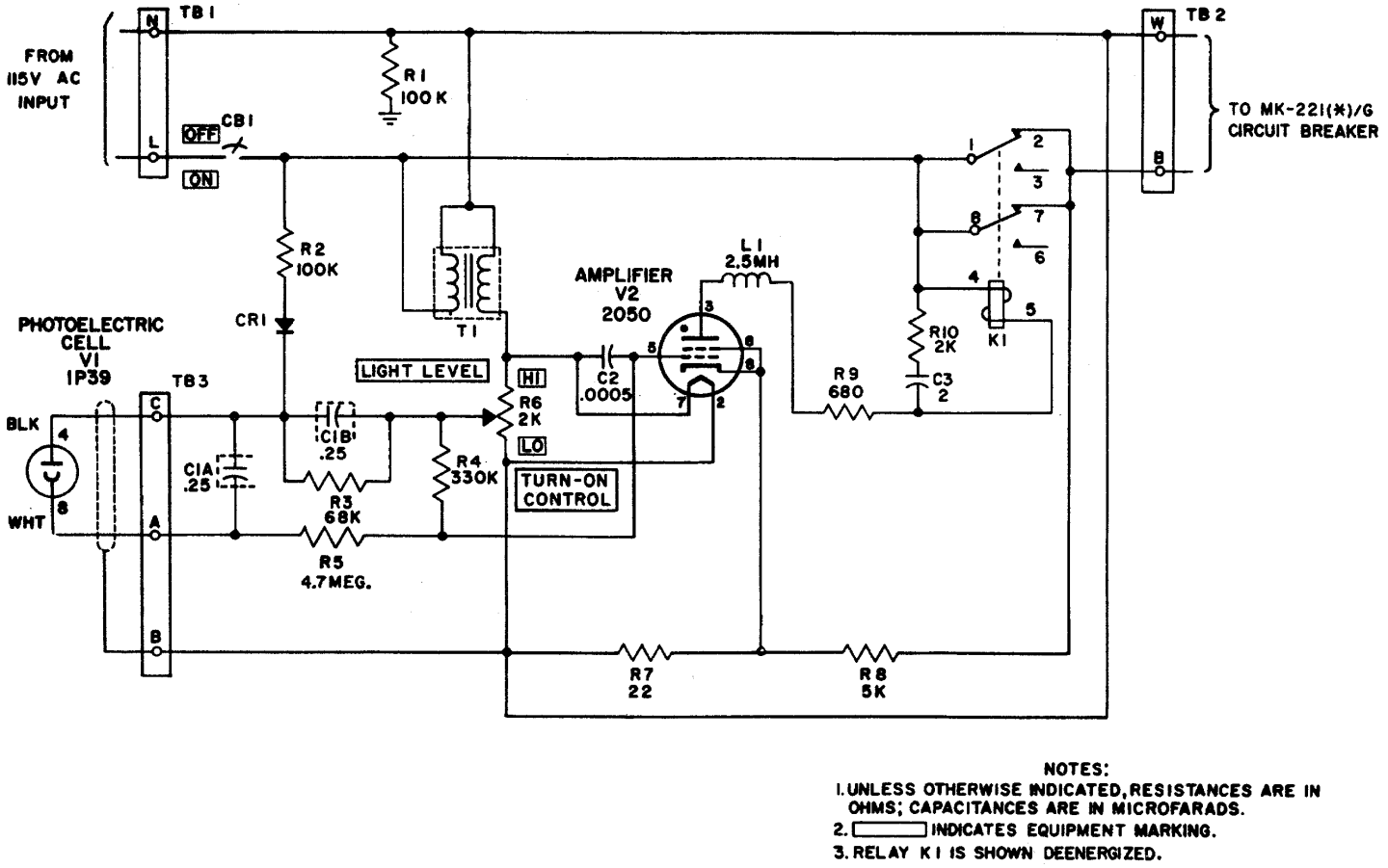


Figure 13. Accessory Kit, Obstruction Light Control MK-705/G, schematic diagram

circuit to the obstruction light circuit breaker (*a* above) is interrupted at load contact relay K1. Resistor R10 and capacitor C3 are connected across the coil of load contact relay K1 to prevent chattering (rapid opening and closing of the contacts of load contact relay K1) when amplifier tube V2 is conducting. Capacitors C1A and C2 suppress the effects of any momentary changes in the intensity of the light (such as might be caused by a shadow or a flash of light) striking photoelectric cell V1 that might otherwise cause the obstruction lights to flash on and off.

(3) When the intensity of the light striking photoelectric cell V1 is insufficient to cause it to conduct, the conditions described in (2) above are reversed. When photoelectric cell V1 does not conduct, the negative bias on amplifier tube V2 cuts off the tube. When amplifier tube V2 does not conduct, the coil of load contact relay K1 is deenergized and its contacts are closed, thus completing the ac circuit to the obstruction lights circuit breaker (*a* above).

(4) The operation (firing) of amplifier tube V2 is controlled by the adjustment of variable resistor R6, which increases or decreases the bias impressed on the grid of amplifier tube V2 ((1) above). With a lower value of grid bias (sliding contact of variable resistor R6 nearer the LO position), amplifier tube V2 will conduct when photoelectric cell V1 conducts less strongly (less light strikes the cathode) and load contact relay K1 will be energized when it is darker. Conversely, with a higher value of grid bias (sliding contact of variable resistor R6 nearer the HIposition), amplifier tube V2 will conduct only when photoelectric cell V1 conducts strongly (more light strikes the cathode) and load contact relay K1 will be energized when it is lighter.

Section IV. MAINTENANCE INSTRUCTIONS FOR MK-705/G

25. Scope of MK-705/G Maintenance

No maintenance of the MK-705/G is performed at first or fifth echelons. The maintenance duties performed at second, third, and fourth echelons are indicated in *a, b*, and *c* below.

a. Second Echelon. Second echelon (organizational) maintenance consists of the following:

(1) Performance check (para 27).
(2) Preventive maintenance (para 28, 29, and 30).
(3) Adjustment of LIGHT LEVEL TURN-ON CONTROL (para 21*b* (2)).
(4) Troubleshooting (para 31).
(5) Replacement of all maintenance parts (para 32).
(6) Testing after maintenance or repair (para 34).

b. Third Echelon. Third echelon maintenance duties are the same as second echelon duties (*a* above) and, in addition, includes testing the photoelectric cell (para 33).

c. Fourth Echelon. Fourth echelon duties consists of overhaul of the equipment to restore it to completely serviceable condition.

26. Tools and Test Equipment for MK-705/G Maintenance

a. Second Echelon Maintenance.

(1) Tool Kit, Radio Repair TK-115/U.
(2) Wrench, open-end, 1-1/4-inch (FSN 5120-293-2124).
(3) Multimeter AN/URM-105.
(4) Test Set, Electron Tube TV-7/U.

b. Third and Fourth Echelon.

(1) Tool Kit, Radar and Radio Repairman TK-87/U.
(2) Wrench, open-end, 1-1/4 inch (FSN 5120-293-2124).
(3) Multimeter TS-352/U.
(4) Meter, Foot Candle, Photographic ME-86/U.
(5) Variable light source.

27. MK-705/G Performance Check

When the performance of the MK221(*)/G obstruction lights is being checked (para 37*a*), check the operation of the MK-705/G (para 21*a*(3)). If the MK705/G does not turn the MK-221(*)/G obstruction lights on and off properly, follow the instructions in paragraph 37*b*.

28. General Preventive Maintenance Instructions for MK-705/G

Unless otherwise directed by the commanding officer, the MK-705/G requires preventive maintenance (para 38) monthly (para 40) and semiannually (para 42). Paragraph 29 specifies preventive maintenance checks and services that must be accomplished monthly. Paragraph 30 specifies *additional* preventive maintenance checks and services that must be performed each 6 months. These preventive maintenance checks and services should be performed concurrently with the MK-221(*)/G checks and services (para 41 and 43).

29. Monthly Preventive Maintenance Checks and Services Chart for MK-705/G

Sequence No.	Item	Procedure	References
1	Control assembly	Inspect control assembly to see that: *a*. It is installed correctly on support *b*. Feedthrough connectors are tight *c*. Latches hold door tightly closed and there is no evidence of leakage. *d*. Circuit breaker is not stuck. Operate circuit breaker two or three times. Return to ON position.	 *a*. Para 19*a* and 20. *b*. Para 12 *c*. *c*. None. *d*. None
2	Photoelectric cell assembly.	*a.* Inspect photoelectric cell assembly to see that it is Installed correctly on support; that cover is tight and there is no evidence of leakage; and that window is not cracked or broken.	*a*. Para 19 *f*.

Sequence No.	Item	Procedure	References
		b. Clean window; do not use an abrasive cleaning agent. *c*. See that feedthrough connector is tight *d*. See that shielded cable is fastened properly to support.	b. None c. Para 12*c* D. Para 19*g*.
3	Mounting	Check all mounting hardware to see that it is secure. Tighten screws and nuts with appropriate tools; tighten wingnuts by hand.	

30. Semiannual Preventive Maintenance Checks and Services Chart for MK-705/G

Sequence No.	Item	Procedure	References
1	Interior of control assembly (fig. 8)	*a*. Clean inside of control assembly housing. Remove dirt and corrosion from terminals and terminal boards. *b*. See that all connections are tight and that wiring is in good condition. *c*. See that general condition of internal parts is good. Look for signs of overheating and other visible evidence of possible trouble, *d*. See that parts are mounted securely and that mounting panel is fastened securely to housing. Tighten loose mounting hardware. *e*. See that gasket is not loose, hardened or cracked *f*. Check amplifier tube V2 with tube tester.	*a*. None. *b*. None. *c*. Para 32. *d*. None. *e*. None *f*. Para 32*c*.
2-A[a]	Interior of photoelectric cell assembly (fig. 9)	*a*. Wipe dust from photoelectric cell with clean, soft cloth. *b*. See that photoelectric cell is seated firmly in socket and that all mounting screws are tight. *c*. See that cover gasket is not loose, hardened or cracked.	
3	LIGHT LEVEL TURN-ON CONTROL	Check to see that MK-705/G turns MK-221(*)/G obstruction lights on and off at desired daylight intensity. Adjust LIGHT LEVEL TURN-ON CONTROL if necessary.	Para 21*b* (3).
4	Preservation	*a*. Inspect metal surfaces for rust and corrosion. Remove Rust and corrosion and spot-paint bare areas. *b*. In tropical climates and where humidity is high, inspect all components for fungus and mildew. Remove all fungus and mildew thoroughly.	*a*. TM 9-213. *b*. None.
5	Modifications	Check DA Pam 310-4 to determine whether new applicable MWO's have been published. All URGENT MWO must be scheduled.	TM 38-750 and DA Pam 310-4
6	Spare parts	Check all spare parts for general condition and method of storage. There should be no overstock and all shortages must be on valid requisition.	Appx III and TM 11-6230-202-25P

[a] To be accomplished annually instead of semiannually.

31. Troubleshooting, MK-705/G

a. General Procedures.

(1) *Visual inspection*. Inspect the equipment thoroughly for broken connections or leads, burned insulation, discolored parts, and similar obvious faults that can be detected by sight or smell.

(2) *Troubleshooting chart*. Use the troubleshooting chart (*b* below) to aid in localizing the trouble to a component part.

(3) *Tests*. Use a multimeter (AN/URM-105 or TS-352/U (para 26)) to make continuity tests to locate broken wires and shorted or open parts. Disconnect the equipment from the ac supply before making continuity tests. Refer to figure 13 to identify circuit elements and to figure 14 for test points and point-to-point wiring. Use Test Set, Electron Tube TV-7/U to test tube V2. Use Meter, Foot Candle, Photoelectric ME-86/U to test photoelectric cell V1.

b. Troubleshooting Chart. The troubleshooting chart (b below) applies to troubles that may occur in the MK-705/G. If the difficulty is not in the MK-705/G, refer to the troubleshooting chart for the MK-221(*)/G (para 45).

Symptom	Possible cause	Suggested remedy
Circuit breaker trips repeatedly	Short circuit	Check continuity (para 31*a*(3)); remove short.
	Defective circuit breaker	Check circuit breaker; replace if defective (para 32).
Both MK-221(*)/G obstruction lights fall to come on when window of photoelectric cell is covered.	Circuit breaker tripped	Place circuit breaker in ON position.
	Ac supply failure	Check ac supply.
	Loose three-conductor cable connect- to control assembly terminal board.	Check all three-conductor cable connection (fig. 10) tighten loose connection.
	Broken conductor in three-conductor cable.	Check continuity of three-conductor cable between ac supply and control assembly and between control assembly and MK-221(*)/G circuit breaker (para 31*a*(3) and fig. 10); repair cable or replace defective cable section (para 31*a*).
	Open circuit in control assembly part or internal wiring.	Check continuity para 31*a*(3)); repair defective wiring or replace defective part (para 32).
	Photoelectric cell cable connections to control assembly defective.	Tighten and repair connection (fig. 10).
	Defective photoelectric cell cable	Check continuity (para 31*a*(3)); repair cable, if defective.
	Relay K1 defective	Check relay K1; replace, if defective para 32).
	Tube V2 defective	Test tube V2 (para 31*a*(3)); replace; if unsatisfactory (para 32).
	Photoelectric cell V1 defective	Test photoelectric cell V1 (para 33); replace (para 32) if defective.
MK-221(*)/G obstruction lights do not come on or go off at the desired daylight intensity.	Resistor R6 out of adjustment	Adjust resistor RS (para 21*b*).
Desired operation of MK-221(*)/G obstruction lights cannot be obtained by adjust- ing resistor R6.	Defective photoelectric cell V1	Test photoelectric cell V1 (para 33); replace (para 32*c*) if defective.
	Defective tube V2	Test tube V2 (para 31*a*(3)); replace, if unsatisfactory (para 32*c*).
Both MK-221(*)/G obstruction lights remain on in full daylight.	Photoelectric cell V1 defective -	Test photoelectric cell V1 (para 33); replace (para 33*c*) if defective.
	Tube V2 defective	Test tube V2 (para 31*a*(3)); replace, if defective (para 32).
	Relay K1 defective	Check relay K1; replace if defective (para 32).

32. Removal and Replacement of Parts, MK-705/G

Warning: Disconnect the equipment from the as supply before attempting to remove any part.

a. To remove any individual part, except photoelectric cell V1 and tube V2 (*c* below), disconnect or unsolder the leads and remove the mounting screws and bolts. To replace the part, reverse the removal

NOTES:

1. WHERE NO COLOR IS INDICATED, WIRE IS BARE.
2. DASHED LINES INDICATE PARTS AND WIRING LOCATED ON FACE OF MOUNTING PANEL.

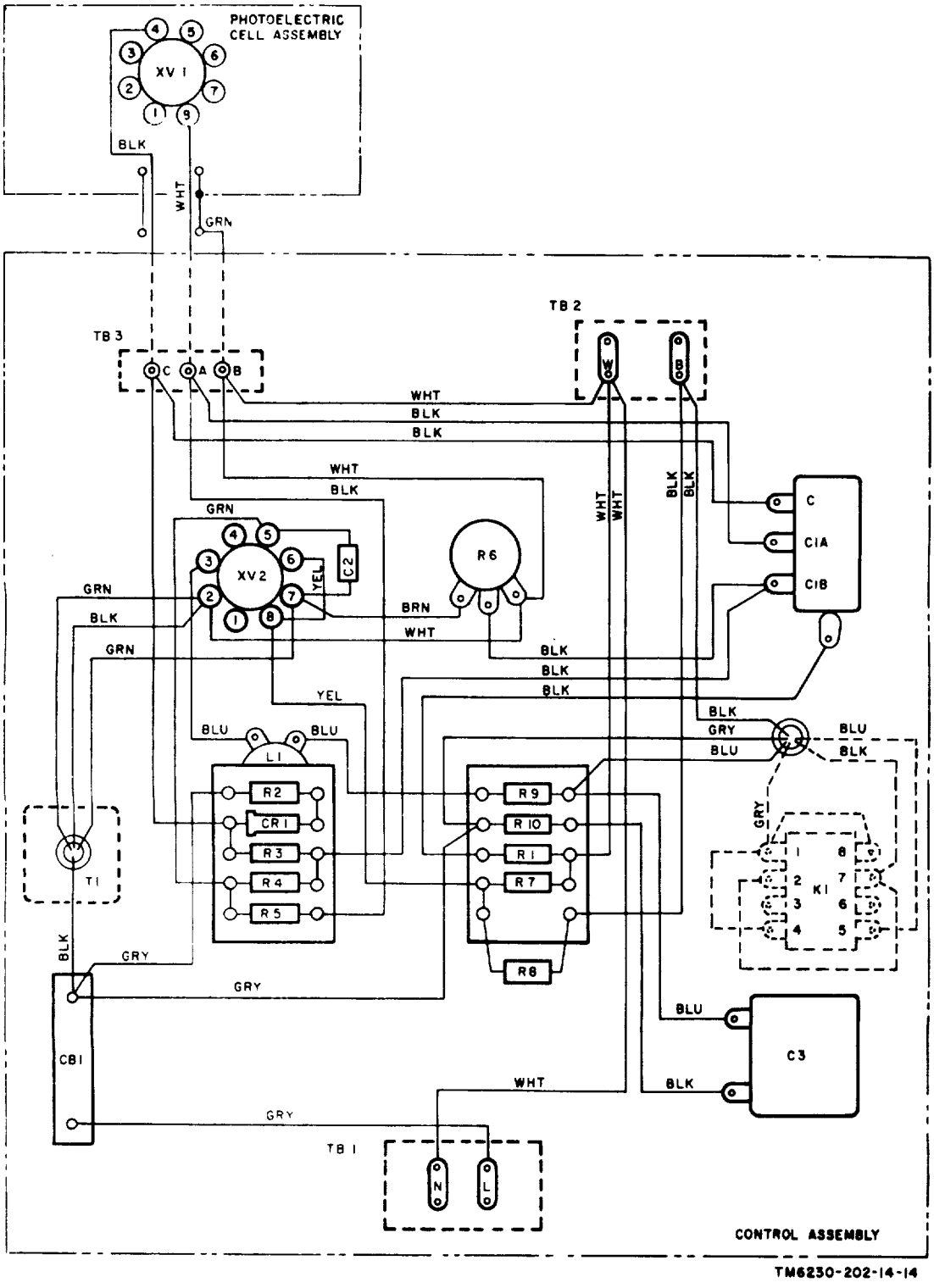


Figure 14. Accessory Kit, Obstruction Light Control MK-705/G, wiring diagram

procedure. Be careful to reconnect all leads to the terminals from which they were disconnected. Check connections with figure 14 before reconnecting the equipment to the ac supply.

b. To reach parts and wiring located on the back of the control assembly mounting panel (fig. 8), disconnect the cable leads from the three terminal boards (fig. 10) and remove the screws that fasten the mounting panel to the control assembly housing.

c. Use a tube puller to remove photoelectric cell V1 and tube V2. When photoelectric cell V1 or tube V2 is replaced, be sure to use the correct tube type. Photoelectric cell V1 is type IP39. Tube V2 is type 2050.

33. Testing Photoelectric Cell

Note: This test will be performed only by third or fourth echelon maintenance personnel.

Photoelectric cell V1 (type IP39) should function so that when the cell is exposed to light having a minimum value of 35 foot-candles, the MK-221(*)/G obstruction lights will come on, and when the cell is exposed to light having a minimum value of 58 foot-candles, the lights will go off. Test photoelectric cell V1 as follows:

a. Connect the photoelectric cell assembly to the control assembly (fig. 10).

b. Connect one of the MK-221(*)/G obstruction lights or a standard incandescent lamp between terminals W and B of terminal board TB2 (fig. 14) of the control assembly.

c. Connect terminals N and L of terminal board TB1 of the control assembly, through an on-off switch, to a 115-volt ac supply. Place the on-off switch in the off position.

d. Set the LIGHT LEVEL TURN-ON CONTROL (fig. 8) at approximately the midpoint of its range.

e. Place the photoelectric cell assembly and the ME-86/U side by side on the workbench. Darken the area where the test is being performed so that the photoelectric cell will not be affected by surrounding light.

f. Allow light from a variable light source (such as an incandescent lamp connected in series with a rheostat) to fall directly on the ME-86/U from a distance of about 4 feet. Adjust the light source so that the meter indicates 35 foot-candles.

g. Place the *on-off* switch (*c* above) in the on position. Allow light from the variable light source, adjusted to 35 foot-candles (*f* above), to fall upon the window of the photoelectric cell assembly from a distance of about 4 feet.

h. Note whether the incandescent lamp connected to the control assembly terminal board (*b* above) lights. If the lamp lights, the lower range operation of the photoelectric cell is satisfactory. Leave the *on-off* switch in the *on* position.

i. Adjust the variable source (*f* above) to 58 foot-candles.

j. With the light source adjusted to 58 foot-candles, repeat the procedure described in *g* above. If the incandescent lamp goes out, the upper range operation of the photoelectric cell is satisfactory.

34. Testing After Maintenance or Repair, MK-705/G

After any maintenance has been performed and when any part has been repaired or replaced, check the overall operation of the equipment (para 21*a*). Adjust the LIGHT LEVEL TURN-ON CONTROL (para 21*b*) if necessary.

CHAPTER 4

MAINTENANCE INSTRUCTIONS FOR MK-221(*)/G

35. Scope of MK.221(*)/G Maintenance

No maintenance of the MK-221(*)/G is performed at first, third, or fifth echelon. Fourth echelon maintenance consists of overhaul of the equipment to restore it to completely serviceable condition. Organizational (second echelon) maintenance consists of the following:

a. Daily performance check (para 37).

b. Preventive maintenance (para 38 through 43).

c. Troubleshooting (para 44 and 45).

d. Replacement of all maintenance parts (para 46).

e. Testing after maintenance or repair (para 47).

36. Tools and Test Equipment for MK-221(*)/G Maintenance

The following tools and test equipment are required for maintenance of the MK-221(*)/G.

a. Second Echelon Maintenance.

(1) Tool Kit, Radio Repair TK-115/U.

(2) Wrench, open-end, 1-1/4-inch (FSN 5120-293-2124).

(3) Multimeter AN/URM-105.

b. Fourth Echelon Maintenance.

(1) Tool Kit, Radar and Radio Repairman TK-87/U.

(2) Wrench, open-end, 1-1/4-inch (FSN 5120-293-2124).

(3) Multimeter TS-352/U.

37. Daily Performance Check

In the United States of America, USFAA regulations require that lighting equipment marking obstructions to aircraft be inspected at regular intervals. Check the performance of the MK-221(*)/G as follows:

a. AT LEAST ONCE EACH 24 HOURS, check visually to see that both obstruction lights light and burn steadily when the switch at the ac source is closed and the circuit breaker is in the ON position.

Note: If the MK-705/G is installed, refer to paragraph 27.

b. If either (or both) of the obstruction lights fails to light, or does not burn steadily (or if the MK-705/G does not turn the lights on and off properly (para 21*a*(3)), and *if the difficulty cannot be corrected in 30 minutes or less*, report the failure at once by the quickest available means as prescribed in USFAA regulations.

38. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 40 through 43 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services charts (para 41 and 43) outline functions to be performed at specific intervals. These checks and services are to maintain Army equipment in serviceable condition; that is, in good general condition (physical) and in good operating condition. To assist personnel in maintaining serviceability, the charts indicate what to check, how to check, and what the normal conditions are. The References column lists paragraphs or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied during service and inspection, higher echelon repair is required. Records and reports of these checks and services must be made in accordance with the requirements of TM 38-750.

39. Preventive Maintenance Checks and Services Periods

Unless otherwise directed by the commanding officer,

the MK-221(*)/G requires preventive maintenance checks and services on a monthly and semiannual basis. Paragraph 41 specifies checks and services that must be accomplished monthly. Paragraph 43 specifies *additional* checks and services that must be performed once each 6 months.

40. Monthly Maintenance

Perform the maintenance functions indicated in the monthly preventive maintenance checks and services chart (para 41) once each month. A month is defined as approximately 30 calendar days of normal operation. The maintenance interval must be adjusted to compensate for any unusual operating conditions such as extreme cold, ice and snow, violent storms, and prolonged darkness (as in Arctic areas during winter months). All deficiencies or shortcomings will be recorded and those not corrected during inspection and service will be reported immediately to higher echelon, using forms and procedures specified in TM 38-750. Equipment that has a deficiency that cannot be corrected during inspection and service should be deadlined in accordance with TM 38-750. Perform all the services and inspections listed in the monthly preventive maintenance checks and services chart in the sequence indicated. Whenever a normal condition or result is not observed, take corrective action in accordance with the *References*.

41. Monthly Preventive Maintenance Checks and Services Chart for MK-221(*)/G

Sequence No.	Item	Procedure	References
1-D[a]	Performance.....	Check performance of equipment (para 37).	
2	Obstruction light globes	Inspect globes of obstruction light assemblies to see that they are not cracked or broken and that they are mounted securely. Replace defective globe	
3	Incandescent lamp	*Warning*: Be sure incandescent lamps are cool before touching them. Never replace Incandescent lamps with the circuit breaker in ON position. Inspect the incandescent lamps. Replace lamps that have darkened glass.	
4	Junction box.....	Examine the junction box. See that feedthrough connectors are tight and that a blank rubber plug is in unused feed-through connector. See that cover is tight; look for evidence of leakage around cover gasket.	
5	Circuit breaker.....	*a*. Examine circuit breaker. See that feedthrough connectors are tight. See that cover is tight; look for evidence of leakage round cover. *b*. Operate circuit breaker manually several times to see that it is not stuck and that action Is positive. Return circuit breaker to ON position.	
6	Cable.....	See that all cables are in good condition. Replace any section of cable that has deteriorated.	
7	Cable clamps	See that all cable clamps are present and are properly installed and that they support the three-conductor cable properly.	Para 13*a*(4).
8	Mounting	See that all components are securely mounted. Tighten screws. and nuts with appropriate tools; tighten nuts by hand.	

[a] To be accomplished daily instead of monthly.

42. Semiannual Maintenance

The MK-221(*)/G requires semiannual preventive maintenance checks and services. Periodic monthly checks and services (para 41) constitute a part of the semiannual preventive maintenance checks and services and must be performed concurrently.

All deficiencies or shortcomings will be recorded in accordance with the requirements of TM 38-750. Perform the checks and services listed in the semiannual preventive maintenance checks and services chart in the sequence shown.

43. Semiannual Preventive Maintenance Checks and Services Chart for MK-221(*)/G

Sequence No.	Item	Procedure	References
1	Obstruction light globes.	Clean globes of obstruction light assemblies inside and out. Do not use an abrasive cleaning agent.	
2	Incandescent lamps.....	Regardless of their condition, replace both incandescent lamps.	
3-A[a]	Junction box and circuit breaker assembly.	Inspect interior of junction box and circuit breaker assembly: *a*. See that all connections are tight and that wiring is in good condition. Tighten loose connections and replace any wiring that has deteriorated. *b*. Remove dirt and corrosion from contacts of circuit breaker. *c.* Inspect gaskets for hardening, cracks, and other signs of deterioration. Replace defective gaskets.	
4	Preservation.....	*a*. Inspect all metal surfaces for rust and corrosion. Remove rust and corrosion and spot-paint bare areas. *b*. In tropical climates and where humidity is high, inspect all components for fungus and mildew. Remove all fungus and mildew thoroughly.	*a*. TM 9-213. *b*. None.
5	Publications.....	Check to see that all pertinent publications are available, current, complete, and in usable condition.	DA Pam 310-4.
6	Modifications.....	Check DA Pam 310-4 to determine whether new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	TM 38-750 and DA Pam 310-4.
7	Spare parts.....	Check all spare parts for general condition and method of storage. There should be no overstock and all shortages must be on valid requisition.	Appx III.

[a] To be accomplished annually instead of semiannually.

44. General Troubleshooting Procedures

Troubleshooting includes all the techniques required to isolate a defective part.

a. Visual Inspection. Inspect the equipment thoroughly for defective incandescent lamps, broken connections or wires, and other obvious faults that can be detected by sight.

b. Performance Check. Operate the equipment (para 16) to determine the general location of the trouble.

c. Troubleshooting Chart. Use the troubleshooting chart (para 45) to aid in localizing the trouble to a component part.

d. Tests. Use Multimeter AN/URM-105 or TS-352/U (para 36) to make continuity tests to locate broken wires or cable conductors and shorted or open parts. Disconnect the equipment from the ac supply before making continuity tests.

45. Troubleshooting Chart

Symptom	Possible cause	Suggested remedy
One obstruction light fails to light.	Incandescent lamp burned out..... Loose connection in Junction box..... Lamp socket of lamp socket and cable assembly defective.	Install new incandescent lamp. Tighten connections, (fig. 3 or 4). Check lamp socket; install new lamp socket and cable assembly, If unsatisfactory. (para 46).

Symptom	Possible cause	Suggested remedy
	Cable of lamp socket assembly defective	Check continuity of cable conductors; repair cable or install new lamp socket and cable assembly (para 46).
Both obstruction lights fail to light.	Circuit breaker tripped	Place circuit breaker in the ON position
	Ac supply failure	Check ac supply.
	Loose three-conductor cable connection	Tighten cable connections in junction box and circuit breaker assembly (fig. 3 or 4).
	Broken conductor in three conductor cable.	Check continuity; repair or replace defective cable section.
	Open circuit in junction box (MK-221/G On Orders No. 20002-Phila-55 and 21777-Phila-56 only) or circuit breaker wiring.	Check continuity; repair defective wiring.

46. Removal and Replacement of Parts, MK-221(*)/G

***Warning*: Disconnect the equipment from the ac power source before attempting to remove any part.**

No special instructions for the removal and replacement of parts are required. Observe the following precautions:

a. Be careful not to interchange the positions of any of the colored terminal screws (MK-221/G on Order No. 2002-Phila-55 and 21777-Phila-56-only).

b. After reconnecting leads, check connections with figure 3 or 4 before connecting the equipment to the ac power source.

47. Testing After Maintenance or Repair, MK-221( )/G

After any maintenance has been performed and when any part or component has been repaired or replaced, check the operation of the equipment as follows:

a. Place the circuit breaker in the ON position. Close the switch (if used) at the ac source. Note whether both obstruction lights come on immediately and burn steadily.

b. Open the switch at the ac source or place the circuit breaker in the OFF position, if no switch at the ac source is used. Both obstruction lights should go out immediately.

c. Repeat the procedure in *a* and *b* above several times.

CHAPTER 5

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

48. Preparation of MK-221(*)/G for Shipment or Storage

a. Disconnect the cable from the ac supply and remove the equipment from the support.

b. Disassemble the equipment and clean it thoroughly.

c. Check the equipment to see that all items are present (para 5). Inspect each item to see that it is in good condition and ready for re-use.

49. Repackaging for Shipment or Limited Storage

a. Materials Required. The materials required to repackage the MK-221(*)/G are listed below. For stock numbers of materials, refer to SB 38-100.

Single-face, corrugated fiberboard
Gummed paper tape
Waterproof barrier material
Pressure-sensitive tape
Cotton twine
Filler material
Wooden shipping box
Steel strapping (intertheater shipment only)

b. Packaging.

(1) Package fragile items separately within a wrap of corrugated fiberboard secured with gummed tape. Cushion the obstruction lights and the incandescent lamps with filler material before packaging them.

(2) Consolidate like items, such as the cable clamps, within a wrap of corrugated fiberboard secured with gummed tape. Coil the lamp socket and cable assemblies neatly and tie them with cotton twine before wrapping them.

(3) Wind the lengths of three-conductor cable into coils of convenient dimensions and tie the coils with cotton twine.

(4) Wrap the technical literature in waterproof barrier material and seal all closures with pressure sensitive tape.

c. Packing.

(1) Pack the packaged equipment in a nailed wooden box lined with waterproof barrier material. Fill all voids with corrugated fiberboard pads and filler material to prevent movement of the equipment.

(2) Fold down the waterproof barrier material so that it completely in-closes the equipment and seal all closures with pressure-sensitive tape.

(3) Nail on the cover of the shipment box. Bind the box with steel strapping for intertheater shipment only.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

50. Authority for Demolition

The demolition procedures given in paragraph 51 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

51. Methods of Destruction

a. Smash. Smash the obstruction lights, the incandescent lamps, the circuit breaker, and the Junction box; use sledges, axes, handaxes, pickaxes, hammers, crowbars, or other heavy tools.

b. Cut. Cut all cables and wiring; use axes,

handaxes, machetes or similar tools.

***Warning*: Be extremely careful with incendiary devices; use them only when the need is urgent.**

c. *Burn*. Burn the cables and the technical literature; use gasoline, kerosene, oil, flamethrowers, or incendiary grenades.

d. *Bend*. Bend everything that cannot be smashed or burned; use sledges, axes, or other heavy tools.

e. *Dispose*. Bury or scatter the destroyed parts in slit trenches, foxholes or other holes, or throw them into streams.

APPENDIX I

REFERENCES

DA Pamphlet 310-4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SB 38-100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army.
TB 11-6625-274-12/1	Test Data for Electron Tube Test Sets TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 9-213	Painting Instructions for Field Use.
TM 11-2615A	Antenna Support AB-105C/FRC.
TM 11-5527	Multimeters TS-352/U, TS-352A/U, and TS-352B/U.
TM 11-6230-202-25P	Organizational, Field and Depot Maintenance Repair Parts and Special Tools List: Light Sets, Ground Obstruction Marker MK-221/G and MK-221A/G.
TM 11-6625-203-12	Operation and Organizational Maintenance: Multimeter AN/URM-105, Including Multimeter ME-77/U.
TM 11-6625-274-12	Operator's and Organizational Maintenance Manual: Test Sets, Electron Tube TV-7/U, TV-7A/U, TV-7B/U, and TV-7D/U.
TM 38-750	The Army Equipment Record System and Procedures.

APPENDIX II

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

1. General

a. This appendix assigns maintenance functions and repair operations to be performed by the lowest appropriate maintenance echelon. It also specifies the tool and test equipments authorized to perform the assigned maintenance functions.

b. The maintenance allocation chart columns are as follows:

(1) *Part or component*. This column shows only the nomenclature or standard item name.

(2) *Maintenance function*. This column indicates the various maintenance functions to the echelon capable of performing the operations. These functions are defined as follows:

(a) Service. To clean, to preserve, and to replenish lubricants.

(b) Adjust. To regulate periodically to prevent malfunction.

(c) Inspect. To verify serviceability and to detect incipient electrical or mechanical failure by scrutiny.

(d) Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment, such as gages and meters.

(e) Replace. To substitute serviceable components, assemblies, subassemblies, and parts for unserviceable components.

(f) Repair. To restore an item to serviceable condition by correcting a specific failure or unserviceable condition. This function includes, but is not limited to, welding, grinding, riveting, straightening, and the replacement of parts other than the trial and error replacement of running spare type items such as lamps or electron tubes.

(g) Overhaul. To restore an Item to completely serviceable condition as prescribed by serviceability standards developed and published by heads of technical services. This is accomplished by means of the technique of "Inspect and Repair Only as Necessary" (IROAN). Maximum utilization of diagnostic and test equipment is combined with minimum disassembly of the item during the overhaul process.

(3) *1st, 2d, 3d, 4th, 5th echelons*. The symbol X indicates the echelon responsible for performing that particular maintenance operation, but does not necessarily indicate that repair parts will be stocked at that level. Echelons higher than the echelon designated by X are authorized to perform the indicated operation.

(4) *Tools required*. The numbers in this column represent tool and test equipments required to perform the related maintenance function. These numbers are identified in the allocation of tools for maintenance functions.

(5) *Remarks*. This column contains notations necessary to clarify the data cited in the preceding columns.

c. The allocation of tools for maintenance functions columns are as follows:

(1) *Tools required for maintenance functions*. This column lists the tool and test equipments required to perform the assigned maintenance functions.

(2) *1st, 2d, 3d, 4th, 5th echelon*. A dagger (†) indicates that the tool

or test equipment normally is allocated to that echelon.

(3) *Tool code*. The numbers in this column are code numbers that represent the associated tool or test equipment and are used in the maintenance allocation chart to refer to the indicated item.

(4) *Remarks*. Not used.

2. Maintenance by Using Organizations

When this equipment is used by signal service organizations organic to the theater headquarters or communications, those maintenance functions allocated up to and including fourth echelon are authorized to the organization operating this equipment.

SECTION II. MAINTENANCE ALLOCATION CHART

PART OR COMPONENT	MAINT. FUNCTION	1ST ECH.	2ND ECH.	3RD ECH.	4TH ECH.	5TH ECH.	TOOLS REQUIRED	REMARKS
LIGHT SET GROUND OBSTRUCTION MARKER MK-221/G	service		X					1
	adjust		X				5	Automatic control
	inspect		X					Visual
	test		X					Preoperational procedures
				X			1	Photoelectric cell
	replace		X					
	repair		X				2,5	
	overhaul				X			Ship facilities
OBSTRUCTION LIGHT ASSEMBLIES AND LAMPS	service		X					Fitcal
	inspect		X					Visual
	test		X					Preoperation checks
	replace		X				5	
CABLES AND LAMP SOCKET	inspect		X					Visual
	test		X				2	
	replace		X				5	
CIRCUIT BREAKER AND JUNCTION BOX	inspect		X					Visual
	replace		X				5	
AUTOMATIC CONTROL	service		X					
	adjust		X					
	inspect		X					
	test		X				4	
				X			1,3,4	
	replace		X					
	repair		X				5	
				X			6	
	overhaul				X			

SECTION II. MAINTENANCE ALLOCATION CHART

TOOLS REQUIRED FOR MAINTENANCE FUNCTIONS	1ST ECH.	2ND ECH.	3RD ECH.	4TH ECH.	5TH ECH.	TOOLS CODE	REMARKS
MK-221/G (continued)							
METERFOOT CANDLE ME-86			†	†		1	
MULTIMETER AN/URM-105		†				2	
MULTIMETER TS-352			†	†		3	
TEST SET ELECTRON TUBE TV-7		†	†	†		4	
TOOL KIT TK-115		†				5	
TOOL KIT TK-87			†	†		6	
WRENCH OPEN END 1-1/4 inches FSN 5120-293-2124		†				7	

APPENDIX III

BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

a. This appendix lists items supplied for initial operation and for running spares. The list includes parts and accessories issued as part of the major end item and all items authorized for basic maintenance of the equipment. End items of equipment are issued on the basis of allowances prescribed in equipment authorization tables and other documents that are a basis for requisitioning.

b. The columns of the functional parts list are:

(1) *Federal stock number.* This column lists the 11-digit Federal stock number.

(2) *Designation by model*. A dagger (†) indicates that the part is used in that model of the equipment.

(3) *Description.* Nomenclature or the standard item name and brief identifying data for each item are listed in this column. When requisitioning, enter the nomenclature and description.

(4) *Unit of issue.* The unit of issue is the supply term applied to the smallest quantity by which the individual item is counted for procurement, storage, requisitioning, allowances, and issue purposes. Unless otherwise specified, the unit of issue is each.

(5) *Expendability*. Nonexpendable items are indicated by NX. For expendable items, the column is blank.

(6) *Quantity authorized.* For "Items Comprising an Operable Equipment," the column lists the quantity of each item supplied for the initial operation of the equipment. For "Running Spares and Accessory Items," the quantities listed are those issued initially with the equipment as accessories or spare parts. The quantities shown are authorized to be kept on hand for maintenance of the equipment.

(7) *Illustration*. The "Figure No." column is not used. Reference designations in the "Item No." column are part-identification designations used on equipment, on illustrations of-equipment, and in text to identify items.

SECTION II. FUNCTIONAL PARTS LIST

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL						DESCRIPTION	UNIT OF ISSUE	EXP	QUANTITY AUTHORIZED	ILLUSTRATIONS	
											FIGURE NO.	ITEM NO.
							LIGHT SET, GROUND OBSTRUCTION MARKER MK-221/G; MK-221A/G					
6230-345-9212							LIGHT SET, GROUND MARKER MK-221/G; MK-221A/G:	ea	NX			
							ITEMS COMPRISING AN OPERABLE EQUIPMENT					
							NOTE: Model Column 1 refers to MK-221/G, Column 2 refers to MK-221A/G					
Order thru AGC	†	†					TECHNICAL MANUAL TM 11-6230-202-15			2		
6210-549-7394	†	†					CABLE, ASSEMBLY POWER ELECTRICAL: Joy Mfg Co type ERSL			2		W2
6145-161-0768	†	†					CABLE, POWER, ELECTRICAL: MIL type CO-03HGF(3/10)0675;	ft		175		WL
							NOTE: To be ordered in increments of 175 ft each only.					
		†					CIRCUIT BREAKER: Hughy & Philips part No. AU3091			1		
6210-341-4196	†	†					CLAMP CABLE: Kearny Corp 'LayCIT' Type 19235			15		
5450-346-5342	†	†					CLAMP ELECTRICAL MX-1402A/U			10		
5970-752-5249	†	†					INSULATING COMPOUND, ELECTRICAL: Crouse Hinds type OSL-3			1		
6210-696-2533	†						JUNCTION BOX: Specialty Engrg and Elect part No.664-1025			2		
5975-892-9123		†					JUNCTION BOX: Hughy & Philips part No. AC2047-SC-44			2		
6240-267-1164	†	†					LAMP, INCANDESCENT: 111 watt; GE type A21-OBSTR.120			2		
6210-341-4194	†						LIGHT, MARKER, AIRCRAFT OBSTRUCTION: Crouse Hines part No.44678			2		
6210-821-8132		†					LIGHT, MARKER, AIRCRAFT, OBSTRUCTION: Hughy Philips Inc dwg AU3085			2		
5975-636-0171	†	†					STEP POLE: Hubbard part/No. 7123			5		
5180-322-6337	†	†					STRAPPING KIT: Actus Products Corp type 'Wraplock'		NX	1		
										2		

FEDERAL STOCK NUMBER	DESIGNATION BY MODEL	DESCRIPTION	UNIT OF ISSUE	EXP	QUANTITY AUTHORIZED	ILLUSTRATIONS	
						FIGURE NO.	ITEM NO.
		MK-221/G, MK-221A/G (continued)					
		OPTIONAL EQUIPMENT					
		NOTE: Not issued with light set, but may be requisitioned when required by using organization					
6230-973-2178		OBSTRUCTION CONTROL MK-705/G		NX	1		
		OBSTRUCTION CONTROL MK-705/G					
6210-341-4190		BRACKET MOUNTING: Sig dwg SC-C-61165			3		
6210-889-1813		CONTROL ELECTRICL LIGHT: Hughy & Philips part No. LC2134			1		
6230-973-3914		PHOTO TUBE ASSEMBLY: Hughy & Philips part No. 11 8					
		RUNNING SPARE ITEMS LIGHT SET, GROUND OBSTRUCTION MARKER MK-221/G,MK-221A/G					
6210-341-4196	† †	CLAMP CABLE: Kearny Corp 'Lay cit' type 19235			5		
5450-346-5342	† †	CLAMP ELECTRICAL MX-1402A/U			3		
6240-267-1164	† †	LAMP, INCANDESCENT: 111 watt; GE type A21-OBSTR-120			2		
		OBSTRUCTION CONTROL MK-705/G					
5960-189-6511		PHOTOELECTRIC CELL: RCA part No. 1P39			1		V1
5960-235-9136		ELECTRON TUBE: RCA part type 2050			1		V2

By Order of Secretary of the Army:

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General, United States Army,
Chief of Staff.

Official:

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  Ft Monmouth (65)
Svc Colleges (2)
Br Svc Sch (2) except
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Sig Dep (OS) (12)
Sig Sec, GENDEP (5)
Army Dep (2) except
  Ft Worth (8)
  Lexington (12)
  Sacramento (28)
  Tobyhanna (12)
USA Elct RD Actv, White Sands (13)
USA Elct RD Actv, Ft Huachuca (2)
USA Trans Tml Comd (1)
Army Tml (1)
POE (1)
USAOSA (1)
AM8 (1)
WRAMC (1)
AFIP (1)
Army Pic Cen (2)
USA Mbl Spt Cen (1)
USA Elct Mat Agcy (12)
Chicago Proc Dist (1)
USARCARIB Sig Agcy (1)
Sig Fld Maint Shop (3)
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  (2 cy ea UNOINDC):
  11-7
  11-16
  11-57
  11-97
  11-98
  11-117
  11-155
  11-157
  11-500 AA-AE (4)
  11-557
  11-587
  11-592
  11-597

NG: State AG (3) Unite same as active Army except allowance is one copy to each unit
USAR: None.
For explanation of abbreviations used, see AR 320-50.

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

TM 11-6230-202-14 - LIGHT SETS, GROUND OBSTRUCTION MARKER MK-221/G AND MK-221A/G (INCLUDING ACCESSORY KIT, OBSTRUCTION LIGHT CONTROL MK-705/G) - 1963

PIN : 020736-000