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## NAVAL SHIPS TECHNICAL MANUAL

### CHAPTER 9640

### LIGHTING



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NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D. C. 20360

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## NAVAL SHIPS TECHNICAL MANUAL

## CHAPTER 9640—LIGHTING

March 1969 Edition

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## SECTION 1. GENERAL

## 9640.1 SCOPE OF LIGHTING INSTALLATION

The lighting installation on a Naval ship includes equipment for:

1. General illumination.
2. Detail illumination for applications such as desks and work benches.
3. Red lighting for low level illumination used with darkened ship conditions.
4. Special lighting for navigation, signalling or warnings to other ships, aircraft or to shore.
5. Battery powered emergency lighting, such as hand lanterns, flood lanterns, and flashlights.

## 9640.2 PURPOSE OF THIS CHAPTER

This chapter contains general information regarding the proper maintenance procedures and operating precautions for lighting installations.

## 9640.3 OTHER LIGHTING INFORMATION

Information regarding the theory and design of lighting equipment and installations, such as the fundamentals of light and vision, illumination levels, light sources, general and detail lighting fixtures, hand lanterns, photometric surveys, etc., is contained in *Naval Ships Lighting Manual*, NAVSHIPS 250-560-4.

Operation and maintenance for Naval Ordnance Fresnel Lens Optical Landing System (FLOLS) should be as required in the operation and maintenance manuals listed herein.

NAVWEPS 51-40ABA-1-Technical Manual—Installation; Service; Operation and Maintenance Instructions for Fresnel Lens Optical Landing System Mk 6 Mod 0

NAVWEPS 51-40BA-2-Technical Manual—Illustrated Parts Breakdown for Fresnel Lens Optical Landing System Mk 6 Mod 0

NAEL ENG Report No. 7012 of 3 Apr 1963-Handbook, Overhaul Procedures (Shipboard Use) Mk 6 Mod 0 Fresnel Lens Optical Landing System

NAVWEPS 00-35QF-2 Section F of Dec 1962-Initial Outfitting List for Visual Landing Aids

NAVWEPS 51-40ACA-1 revised 1 May 1963—Manually Operated Visual Landing Aid System

Information concerning visual landing aid lighting is covered in NAVAIRSYSCOM Technical Manuals and Bulletins.

## SECTION II. GENERAL AND DETAIL ILLUMINATION

## Part 1. Description

## 9640.11 POWER SUPPLY

Most United States Naval ships have two sources of power supply for lighting fixtures. Normal supply is from the ship service system at 115-volts ac or 120-volts dc. A designated number of fixtures can also be supplied from the emergency power supply. Small craft have 24-volt dc lighting systems, or in some special cases, 12-volt dc lighting systems. Battery powered, relay-operated hand lanterns (article 9640.83) automatically provide illumination in strategic places upon failure of both ship service and emergency power.

## 9640.12 LIGHTING FIXTURES

1. **Permanent fixtures.** Permanently installed lighting fixtures provide general and detailed illumination needed in specific locations.

2. **Portable fixtures and lights.** Portable fixtures and lights supplement the permanently installed lighting fixtures. Portable fixtures and lights, such as desk lamps, portable lights, and flood lights, are energized through portable cables plugged into outlets in the lighting distribution system.

## Part 2. Operation

## 9640.21 PRECAUTIONS

Once a lighting system has been designed and the permanent lighting fixtures have been installed, operation is little more than turning light switches on and off. There also are certain precautions which, if observed by all hands, will result in more effective use of the lighting installation. These are:

1. When working for any length of time in an area where there are unshielded lights, place yourself or the work so that you will not face any of the lights. If this is impractical, shield your eyes with a visor.
2. Reflected glare can be as annoying as direct glare. Place yourself, the work, or the light source so that bright light sources are not reflected towards your eyes from shiny metal surfaces, calendered paper, etc.
3. Use the right size lamp in every fixture. A 100-watt lamp in a fixture designed for a 50-watt lamp invariably produces glare.
4. Avoid extreme brightness contrasts between work and background. When there are fixtures beyond the work area that would illuminate the background, turn them on.
5. Never install an exposed lamp or an unshielded globe in spaces where prolonged critical seeing must be done. Use shielded fixtures in such areas.

6. When dark adaptation must be maintained, guard the eyes against exposure to white light. Wear red goggles if it is necessary to enter an area illuminated by white light, or, if these are not available, keep one eye closed. Dark adaptation in one eye is independent of that in the other.

7. When darkened ship condition is ordered, check every door switch installation on board to make sure that all lock-in devices or short-circuiting switches are set at the "darkened ship" position.

8. Keep light traps free of all obstructions. A light-colored object of any appreciable size placed in a light trap might be sufficiently illuminated by the interior lighting to be visible beyond the safe limit.

9. Replace burned-out lamps at once.

10. If a lamp shatters in its socket, de-energize the circuit at the lighting distribution panel before removing the lamp. This is essential since the local switch controlling the fixture may open one side of the line and the other side may still be energized at the fixture, thereby resulting in possible danger of shock to the person removing the broken lamp.

11. Install and remove fuses with fuse pullers, not with your bare hands or metal pliers.

12. Note the position of the hand lanterns when entering a compartment and be able to find them without delay in case of need.

13. Wiring and rewiring of fixtures should be done only by qualified electricians and only after authorization has been obtained from the proper authority.

14. When repainting compartments do not spray paint on the reflecting surfaces of lighting fixtures. Paint will materially reduce the reflection factor of the reflecting surfaces and decrease the illumination.

15. Keep the lighting power supply voltage at its rated value. Low voltage decreases illumination, high voltage causes more frequent lamp burnouts.

16. Periodically inspect all portable or extension lights as follows:

a. Examine cable sheath—if frayed or damaged, replace with new cable (see chapter 9600).

b. Make sure that guard is not damaged—if beyond repair replace with new guard. (NEVER USE LIGHT WITHOUT GUARD).

c. Make sure that guard is tightly secured to the handle. This assures a good ground connection.

d. Check for continuity of ground circuit between guard and ground contact on plug tip.

e. Check plug and tip. If damaged replace with new tip or plug assembly (see chapter 9600).

f. Upon relamping the explosion proof extension light, be sure that all components are tight upon reassembly. (NEVER RELAMP IN HAZARDOUS AREA).

17. Never take any portable or extension light into a hazardous area without first checking to make sure that such light displays the seal of approval by the Bureau of Mines.

18. Bare lamps or fixtures with exposed lamps shall not be installed in machinery spaces. Only enclosed fixtures shall be installed in such spaces in order to minimize the hazard of fire caused by flammable fuels making contact with exposed lamps.

### Part 3. Maintenance

#### 9640.31 GENERAL

The illumination produced by a lighting installation decreases gradually as a result of lamp deterioration and the accumulation of dirt on lamps and fixtures. Maintenance of the shipboard lighting installation requires:

1. Lamp replacement (articles 9640.32 and 9640.33).
2. Fixture cleaning (article 9640.34).
3. Inspection of shock mounts (article 9640.35).
4. Check on explosion proof lighting fixtures (article 9640.36).

#### 9640.32 REPLACEMENT OF INCANDESCENT LAMPS

1. **Blackening.** The inside of the bulb of an incandescent lamp is gradually blackened by evaporation of the tungsten filament. The light output of a tungsten filament lamp near the end of its normal life is approximately 80 percent of its initial output. This is an inherent characteristic of incandescent lamps and is unavoidable.

2. **When to replace.** Persons responsible for replacing burned-out incandescent lamps should examine a number of lamps that have failed in normal service to familiarize themselves with the degree of blackening typical of these lamps. When lamps of this general appearance are found still in service, they should be replaced at the first opportunity. This practice minimizes the inconvenience caused by unexpected lamp failures and contributes to the effectiveness of the lighting system. Good judgment must be used when replacing an old lamp or lamps will be wasted.

#### 9640.33 REPLACEMENT OF FLUORESCENT LAMPS

1. **Cause of trouble.** Most of the trouble with fluorescent lamps is caused by worn out or defective starters, or by damaged or expended lamps. The remedy is to replace the starter on the lamp or both.

2. **When to replace.** A flickering fluorescent lamp should be removed immediately, even if no replacement is at hand. A flickering fluorescent lamp gives no useful light output, and, if allowed to run in this condition, will burn out the starter. A new lamp should be put in as soon as possible.

3. **Disposal of old lamps.** Fluorescent lamps contain mercury, which is poisonous. No danger arises from unbroken lamps, whether in use or not, because the mercury is sealed inside. There is some danger of injury, however, when disposing of old lamps. Injury could result from cuts or broken glass or from breathing the mercury vapor liberated when lamps are broken. To prevent this, the following precautions should be followed:

a. Wear goggles, gloves, and sufficient clothing to prevent injury by flying glass.

b. Break the lamps topside over the lee side of the ship so that dust and vapor will be carried away by the wind, and fragments will fall into the sea.

c. Wash down the area where the lamps have been broken to get rid of fragments of glass.

d. Avoid breathing the dust and vapor evolved when the tubes are broken.

e. Do not dispose of lamps except where there is a considerable depth of water.

The reason for breaking the lamps is that they will float if thrown overboard without being broken. For reasons of military security, it is undesirable to leave floating lamps behind.

#### 9640.34 FIXTURE CLEANING

1. **Personnel to do cleaning.** Only qualified electricians should be allowed to clean fixtures which have to be disassembled and reassembled as part of the cleaning operation.

2. **Factors which affect frequency.** There are three basic factors that influence the frequency of cleaning and the methods to be used. These are the type of lighting fixture, its location, and the amount and kind of dust.

a. **Type of fixture.** So far as cleaning is concerned, shipboard lighting fixtures can be classified as open or enclosed. Different cleaning operations are needed for these types.

b. **Location and kind of dust.** Lighting fixtures in staterooms and offices will be subjected to much less dirt and dust than those in shops, galleys, machinery spaces, and messrooms. There is also a great difference in the kind of dust. The dust will usually be a dry powder in staterooms and offices. It will probably be greasy and adherent in the other spaces listed above. There is practically no dust in air conditioned spaces because the air is filtered as it circulates. Fixtures in such spaces will seldom need to be cleaned.

3. **Cleaning open type fixtures.** For open type fixtures, either incandescent or fluorescent, the louvers or baffles and the reflector and lamps should be cleaned periodically by removing the louvers or baffles and the lamps. The reflectors, if coated with the dry dust, should be cleaned in place with a soft, dry, lintless cloth. The baffles or louvers (egg crate type) should be similarly cleaned; also the lamps. Where the dust is greasy and adherent, it may be necessary to use a mild detergent such as Synthetic Detergent Cleaner FSN G6850-282-9702 \*diluted as directed), in which case the reflector should be removed along with the baffles or louvers and the lamps. After cleaning with a cloth dampened with the detergent, components should be rinsed with a cloth dampened in fresh water and thoroughly dried with a lintless cloth. The fixture should not be reassembled until all components are thoroughly dry. If the reflector is of polished aluminum, make sure that the polish is not impaired.

4. **Cleaning enclosed type fixtures.** Enclosed fixtures are designed to be dust proof and the accumulation of dust should be limited to the outside of the fixture. If the dust is dry and powdery, it can be removed by wiping the outside of the enclosure with a dry lintless cloth. If the dust is of the greasy and adherent type, use a cloth dampened with the above mentioned detergent and follow this with a rinse using a cloth dampened in fresh water. If the cover or window is of glass or plastic, it should be allowed to dry without wiping to avoid the development of a static charge that would subsequently attract dust particles.

5. **Cleaning reflectors in enclosed fixtures.** Usually the reflectors in enclosed fixtures do not require cleaning; however, a dry dust may accumulate which can be cleaned with a soft, dry, lintless cloth without removing the reflector. If a damp cloth must be used on a reflector because of greasy dirt, remove the reflector before cleaning to avoid the possibility of getting moisture into the socket or lamp-

holders. This procedure will also eliminate the possibility of electric shock. The cleaning and rinsing procedure and the detergent to be used are the same as described above for open fixtures. Reassembly in the housing should not be undertaken until all components are thoroughly dry.

#### 9640.35 INSPECTION OF SHOCK MOUNTS

Shock mounts for lighting fixtures are expendable and should be replaced if badly distorted. All lighting fixtures in the affected area should be inspected for shock mount distortion after a severe shock. The shock mounts found seriously out of line may be bent back into shape as a temporary expedient until they can be replaced. Replacement shockmounts should be of the same configuration as those originally installed on the fixture. In general, mild steel shockmounts should be used as replacements on all lighting fixtures installed throughout the ship except for minesweepers or localized areas for low magnetic signature or weather decks, where the use of aluminum or brass shockmounts should be continued.

### SECTION III. DARKENED SHIP ILLUMINATION

#### Part 1. Description

##### 9640.41 EQUIPMENT FOR DARKENING SHIP

The purpose of darkened ship condition is to prevent the exposure of light which would reveal the location of the ship. This is achieved by means of light traps which prevent the escape of light from illuminated spaces, or door switches which automatically turn off the light when doors are opened.

##### 9640.42 LIGHT TRAPS

1. **Construction.** Light traps consist of screens placed inside access doors or hatches to prevent the escape of direct or reflected light. Their inside surfaces should always be painted flat black to cut down light reflection. A typical light trap is shown in figure 9640-1. Where light traps are used, at least two black light-absorbing surfaces should be interposed between the light source and the outboard opening.

2. **Use.** Wherever they are practical, light traps are preferred to door switches:

- a. Where egress and ingress are frequent.
- b. Where interruption of the light would cause work stoppage in large areas.
- c. Where light might be exposed from a series of hatches of successive deck levels.
- d. Where many small compartments and passages jointed by numerous inside and outside doors would tend to complicate a door switch installation.

##### 9640.43 DOOR SWITCHES

1. **Mounting.** Door switches are mounted inside compartments on the break side of the door jamb. When the door is opened, the switch is automatically opened at the same time. Single circuit (NAVSHIPS standard plant, number 9000-S6202-74052, type S-193A) or three-circuit (NAVSHIPS standard plan, number 9000-S6202-74304, type A-53A) door switches are used.

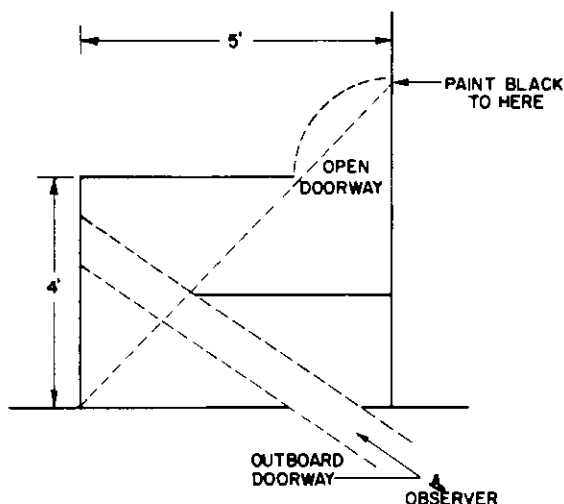


Figure 9640-1.

2. **Control.** Provision is made in all door switch installations to permit changing the settings of the door switch from "lighted ship" to "darkened ship" and vice versa. This is done with mechanical devices or short-circuiting switches. Each standard door switch is furnished with a mechanical lock-in device which is used where only one door switch is required. Where two or more door switches are connected in series, a single separately mounted short-circuiting switch (NAVSHIPS standard plans, number 9000-S6202-74276 or 9000-S6202-74207 for 10 amps. and 30 amps, respectively) is installed in an accessible location to avoid the possibility of overlooking any of the door switches when the changeover is made. Where a single door switch at an outer door is connected in parallel with door switches at inner doors, only the door switch at the outer door has a lock-in device; the lock-in devices are removed from the other door switches. A plate indicating the location of the control switch is mounted adjacent to each door switch. The control switch is plainly marked "Caution-Door Switch Control." The handle position of the short-circuiting switch is marked "Darkened Ship" at the position connecting the door switches in the circuit, and "Lighted Ship" in the position rendering the door switches inoperative. In all compartments, personnel should familiarize themselves with the location of the short-circuiting switch and the number of doors which it controls.

## Part 2. Operation and Maintenance

### 9640.51 CHECK AND ADJUSTMENT OF DOOR SWITCHES

1. **Check.** The check on door switches should be made at night under darkened ship conditions. Station a dark adapted observer on deck to watch for light, and have another man open and close the door. No light should be detectable if the door switch is operating properly.

2. **Adjustment.** If a door switch is not operating properly, it should be adjusted, as follows:

- a. Close and dog the door shut.
- b. Some door switches have a knob on the arm which is moved by opening or closing the door. For such switches:

- (1) Move this arm as far as it will go from the open door position.
- (2) Depress the knob labeled LOCK, hold it in, and let the arm return as far as it will go with the knob depressed.
- (3) Turn the threaded push rod until the button on its end meets the striker plate on the door, and continue for an additional  $3/4$  turn.
- (4) Release the LOCK knob.

c. Some door switches do not have a LOCK knob.

For such switches:

- (1) Remove the cover on the door switch enclosure.
- (2) Turn the threaded push rod until the internal quick-break latch drops into place, and then turn an additional  $3/4$  turn.

### 9640.52 CHECK ON LUMINOUS TAPE

The luminous tape should be checked at regular and frequent intervals to make sure that it is not peeling and that the brightness has not decayed to an inadequate level.

### 9640.53 REMOVAL OF RADIOACTIVE MARKERS

Radioactive luminous personnel, deck, and area markers were formerly used where luminous tape is now employed. Some of the markers contain strontium 90 as the activating material, others contain radium. The strontium 90 and radium type deck and personnel markers are buttons which look much alike. The area markers are in the form of flexible plastic tubing approximately  $3/8$  inch in diameter and 5 feet long. All such radioactive markers present a radiation hazard. They should be removed and disposed of by ships force in accordance with NAVSHIPS INSTRUCTION 5100.7, Serial 560-21718.

## SECTION IV. NAVIGATION AND SIGNAL LIGHTS

### Part 1. Description

#### 9640.61 RUNNING, ANCHOR, AND SIGNAL LIGHTS

1. Running, anchor, and signal lights include all external lights used for navigational and signalling purposes between ships to reduce the possibility of collision and to transmit intelligence. For design convenience, these lights are divided into three groups (see figures 9640-14-9640-16.

- a. Navigational Lights—International Rules of the Road.
- b. Signal Lights—Visual communication.
- c. Signal Lights—Station or Operational.

The number, location, arc, and range of visibility of the Navigational Lights which must be displayed from sunset to sunrise by all ships in International Waters are established by the International Regulations for Preventing Collisions at Sea. Title 33, United States Code, Sections 1051-1094, is the statutory law that requires Naval compliance with the International Rules of the Road. This law provides that any requirement as to number, position, and range of visibility of lights required under the Rules shall not apply to any ship of the Navy where the Secretary of the Navy shall certify that, by reason of special construction, it is not possible for that ship to comply with the statutory requirements without interfering with the military function of the ship. The Code of Federal Regulations—United

States—Naval Vessels—Part 706 Navigational Lights Waivers and Part 707 Distinctive Lights Authorized For Submarines codifies the exemptions certified by the Secretary of the Navy. The statute requires such exempted ships to comply as closely to the requirements of the applicable statutes as the Secretary shall find to be feasible. Certificates executed in this connection by the Secretary are published in Notice to Mariners and in the Federal Register as amendments to Part 706 or Part 707. Signal lights are not required by statutory law but are in accordance with Naval criteria. Locations for these lights are determined in accordance with figures 9640-15 and 9640-16 and the configuration of the ship.

2. Navigational lights for small boats and landing craft were formerly installed to comply with the motorboat act of 25 April 1940 for inland waters and in accordance with Public Law 172-82nd Congress for international waters. However, Public Law 552-84th Congress modified the motorboat act to permit small boats and landing craft to display the navigational lights required for international waters in both inland and international waters. See chapter 9820 for requirements.

3. Naval Ships operating upon the Great Lakes are permitted, under Code of Federal Regulations, United States—Naval Vessels—Part 706—Navigational Light Waivers, to use navigational lights mounted according to the international rules with one exception. Ships under 150 feet in length, that are equipped with one masthead light, should, upon assignment to the Great Lakes area, rig a temporary all-around range light to comply as closely as possible to the Great Lakes rules. The light should conform to standard plan 815-1, 197, 089, Sym No. 114.

4. Steering lights will not be installed before delivery of new construction ships. They may be installed at the option of Type Commanders by Forces Afloat when desired.

#### 9640.62 SUPPLY, CONTROL AND TELLTALE PANEL FOR RUNNING LIGHTS

This panel is provided to aid a ship in keeping her running lights lit at all the times prescribed in the rules for preventing collisions at sea. It is installed in or near the pilot house and gives an alarm when one of the running lights is out or has had a failure of its primary filament and is operating on its secondary filament. Failure of the primary filament, or its circuit, of any one of the following lights; masthead, stern, range and side lights, actuates a relay. This relay effects a transfer of power to the secondary filament of the affected light, sounds a buzzer, lights an indicator light, and moves an annunciator target to read, "out." The buzzer may be silenced during repairs for restoring the primary filament by turning the handle of the reset switch 90°, however, the indicator lamp of the affected light stays lit until the repair has been made and the reset switch is turned back to the normal position. Certain ships have permanent towing lights installed and connected to control switches on the telltale panel. The towing light switches are manual. The designs of this panel for ac and dc systems are shown on NAVSHIPS standard plans 9-S-5170-L and 9000-S6405-73127 respectively. The wiring diagrams and coil winding data are shown in figures 9640-2—9640-5 for the ac panel and in figures 9640-6—9640-9 for the dc panel.

## Part 2. Operation and Maintenance

### 9640.71 OPERATION

Running, anchor, and signalling lights are operated and controlled by switches in the pilot or local switches in the vicinity of the light in accordance with figure 9640-13.

### 9640.72 MAINTENANCE

1. **Check of alinement and location:** The alinement of navigational lights on a ship or a craft and their locations shall be checked for compliance with the rules for preventing collisions at sea when considered necessary by Fleet personnel. Such factors as time elapsed since last previous check of navigational lights, rough weather encountered, topside alterations accomplished or scheduled, etc., should be considered when determining the need for rechecking the location, alinement and freedom from obstruction of navigational lights. Where it is found that the lights do not comply with the rules and it is not possible to relocate these lights to conform with the rules, the lights should be located at the smallest variance from the rules. Navigational lights that have been permitted by waivers to be located at positions other than those specified by the rules should be checked at the same time to determine whether it is possible to relocate them to positions nearer to those specified by the rules. When it is necessary to obtain a waiver for a new ship or when modification of an existing waiver is required, a report should be forwarded to NAVSHIPS. The report should be in sufficient detail so that NAVSHIPS can determine that the closest possible compliance with the rules has been obtained and to serve as a basis for a NAVSHIPS request to the Chief of Naval Operations and Judge Advocate General for a certificate of waiver of change in existing waiver. The report should show dimensioned locations of all navigational lights, describe any features of the installation which fail to conform to the rules, and reasons for nonconformance. A note should be made in the ship's departure report stating what changes, if any, have been made to the navigational light locations. Reference should be made to drawings indicating the current or modified locations of such lights. If location drawings are not available, actual locations of each navigational light shall be indicated in the ship's departure report.

2. **Check on alinement.** Whenever the location of the navigational lights is checked, the alinement of the lights should also be checked.

a. The alinement of the side lights should be such that the forward screens are parallel with the centerline of the ship.

b. The range, masthead, and stern lights should be installed so that the outboard edges of the screens are equidistant from the centerline on a line parallel to the centerline.

3. **Check on relamping.**

a. **Bifilament lamps.** Upon indication of primary filament "burnout" the lamp should be replaced at the earliest convenient opportunity. Lights using these lamps are side, masthead, range, stern, etc.

b. **Lamp cluster.** Some navigational and signal lights employ a cluster of lamps. Lights in this category are aircraft warning, man-over-board and breakdown, ship's task, and speed lights. Upon experiencing a single

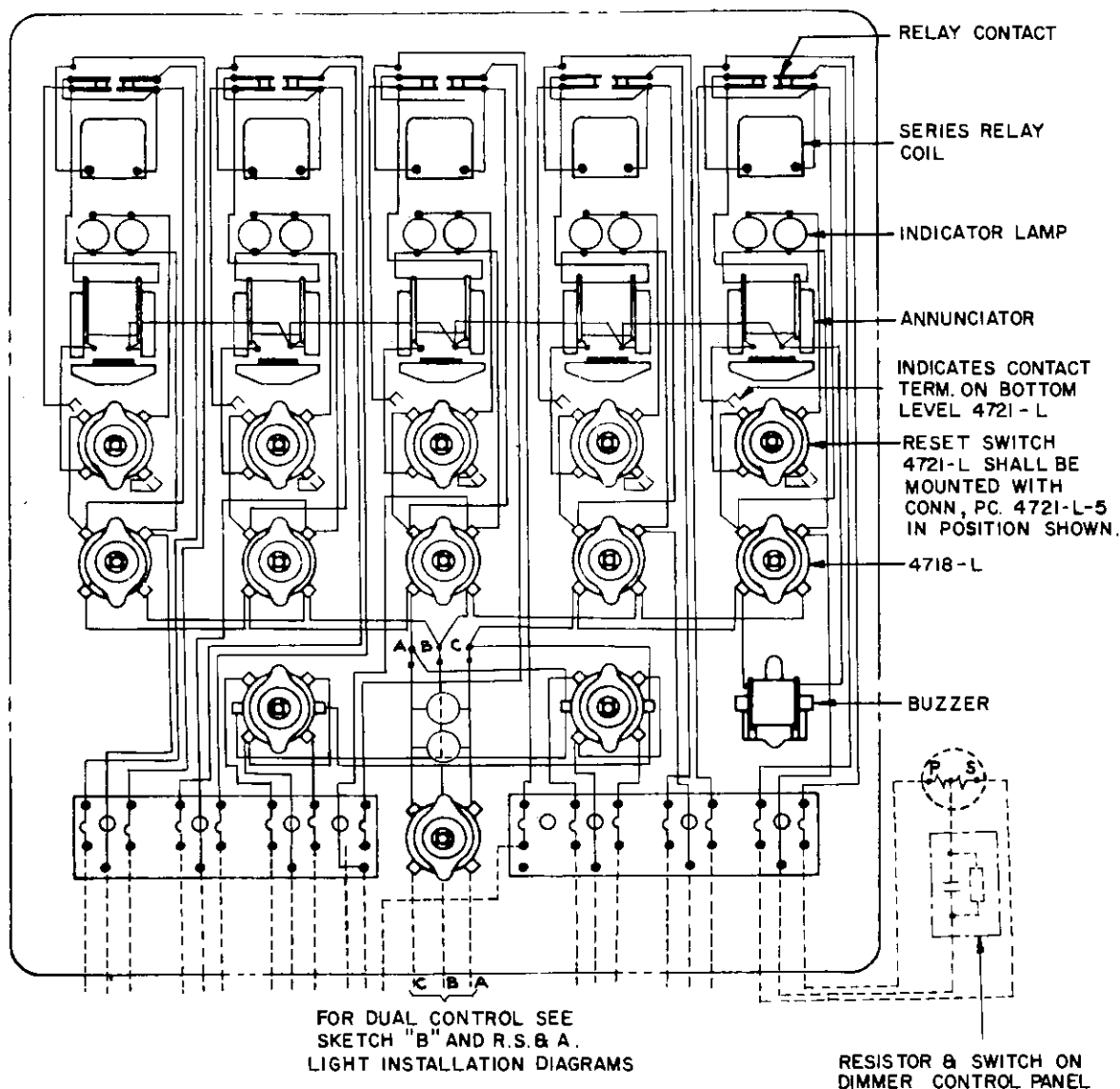


Figure 9640-2.

lamp failure, all of the lamps in the cluster should be replaced

### 9640.73 OPERATION OF SUPPLY, CONTROL AND TELLTALE PANEL

#### 1. Sequence of Operations (see figures 9640-11 and 9640-12).

a. When primary filament of running light lamp is lighted, relay contacts are held open, indicator lamps are dark, and annunciator and buzzers are not energized. Reset switch must be kept pointing at "reset" under normal condition (1) or buzzer will not sound when condition (2) occurs.

b. If the primary filament circuit is opened, (as when the filament burns out) relay contacts close, secondary filament is lighted, indicator lamps light, annunciator target

moves from "reset" to "out" position. At the same time, buzzer contacts close and buzzer sounds.

c. When the "reset" switch handle is turned to horizontal position, buzzer stops but indicator lamps remain lighted, and target reading is still "out."

d. When the running light lamp is replaced (or fault in primary circuit corrected), relay coil is energized and relay contacts open, indicator lamps remain lighted and annunciator coil and secondary filament are deenergized. Target reads "reset."

e. Reset switch is returned to "reset" position, indicator lamps go out and entire unit is in condition (1).

2. When failure of the primary filament occurs in towing lights connected to this panel, transfer of power to the secondary filament is not automatic but must be done manually by turning towing light switch to position marked "sec."

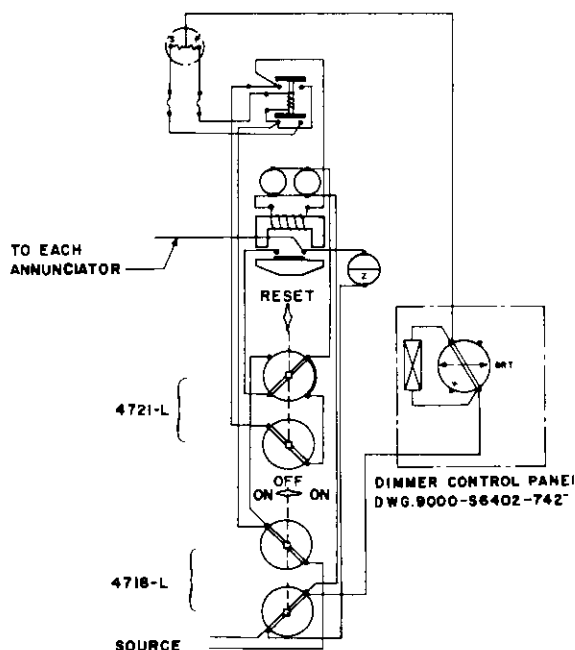


Figure 9640-3.

SERIES RELAY								
Circuit Volts	Cycles	Service Connection	No. Turns	Wire Size B & S Ga.	Resist OHMS $\pm 5\%$	Amps	Volts Lamp	Volts Across Coil
115 A.C.	60	In series with one 50 W. lamp	750	22 Enamel	2.85	.45	100	15
115 A.C.	60	In series with one 100 W. lamp	750	22 Enamel	2.85	.84	91	24

Adjust relay for satisfactory operation with a contact pressure of at least 50 grams on the contacts and a current value of not more than .180 amperes in the magnet winding.

Figure 9640-4.

ANNUNCIATOR							
Circuit Volts	Cycles	No. Turns	Wire Size B & S Ga.	Resist OHMS $\pm 5\%$	Amps	Max. Temp. Raise C°	Wgt. Wire
115 A.C.	60	3800	33 Enamel	175.	.073	25	.15 lb.

Adjust annunciator for satisfactory operation at 100 volts.

Figure 9640-5.

3. **Operation With Dimmer.** A dimmer panel connected as shown in figure 9640-3 is provided for dimming the running lights when directed. This panel is preset to give but one position of dimming. In the dim position, the visibility of the masthead, stern, range, and side lights is reduced to about 4000 yards. The sequence of operation of the telltale panel is the same whether the running lights are in the bright or dimmed condition.

## 9640.74 MAINTENANCE OF SUPPLY CONTROL AND TELLTALE PANEL

1. A weekly check to ascertain that the automatic features of the telltale panel are in good working condition may be made by simulating a burn-out of the primary filament. This may be done by pulling the fuse of the primary filament circuit in the telltale panel.

2. Several ships and naval shipyards have reported that a feed-back circuit existed in revision G of the 9-S-5170-L panel such that when a light was operated in the dimmed condition and on secondary filament, the annunciator for that light did not return to normal position when the primary filament was restored. Where this condition is found, it may be corrected as follows: Add a switch rotor blade and two fixed contacts in the blank spaces provided for them in the empty level in the existing reset switch. Referring to figure 6490-18, delete the wiring shown lined out and add the wiring shown in dashed line. Change the relay coil from the type with 400 turns of number 20 enameled wire with .265 amperes current adjustment in winding to the type with 750 turns of number 22 enameled wire described in figure 9640-4 and adjusted for .180 ampere in the coil winding.

## 9640.75 CHECK ON MULTI-PURPOSE SIGNAL LIGHT

These lights should be periodically inspected in accordance with the instructions furnished with the kit for the "Care, Operation, and Maintenance of the Equipment."

## SECTION V. BATTERY POWERED EMERGENCY LIGHTING

### Part 1. Description

#### 9640.81 GENERAL

Battery powered lights are provided to furnish emergency lighting if the ships service and emergency power supply both fail. The battery powered lights include portable flood lanterns, hand lanterns, and flashlights.

#### 9640.82 FLOOD LANTERNS, PORTABLE

These lanterns are often called "damage control lanterns" because they are used by damage control personnel to provide high intensity illumination for emergency repair work. The lantern consists of a sealed-beam lamp, Industry No. 4524, adjustably mounted on a carrying case which contains four Type BB-254/U, 2V-SPBP-20AH storage battery cells. The lamp is rated at 6 volts but operated at 8 volts to increase light output. At full battery charge, the lamp produces more than 200,000 candlepower in the center of the beam. The lantern will run for about 3 hours on one charge. At the end of this time the light output is about half the full charge output.

#### 9640.83 RELAY-OPERATED HAND LANTERNS

1. Dry battery powered, relay-operated hand lanterns are installed in certain strategic locations to prevent total darkness if the lighting power supply fails. These lanterns should not be installed in compartments having door switch control (article 9640.43), in magazines or powder handling spaces (except those spaces where only fixed or semi-fixed ammunition is handled), or in any locations where explosion-proof equipment is required. Lanterns should not be



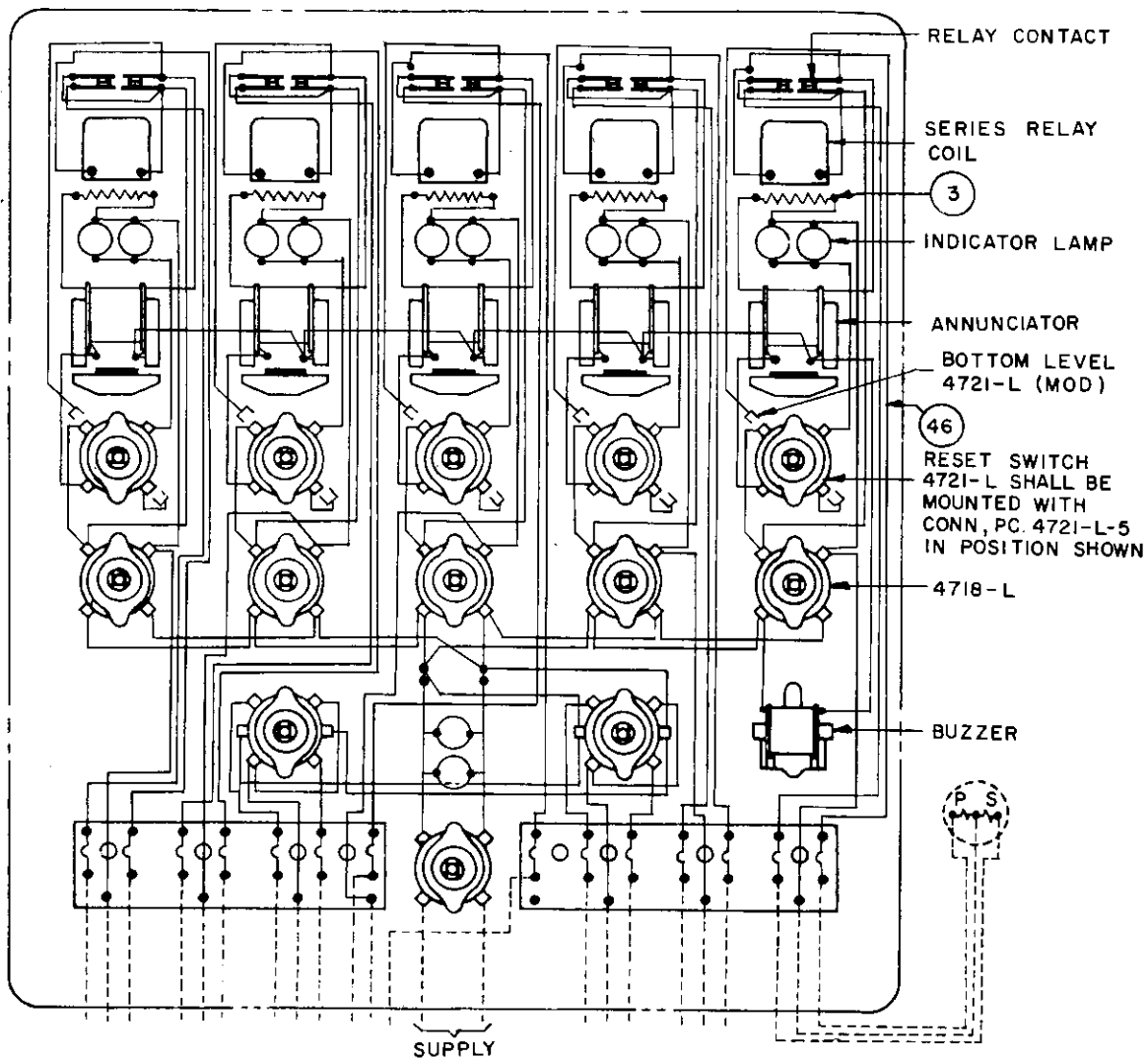


Figure 9640-6.

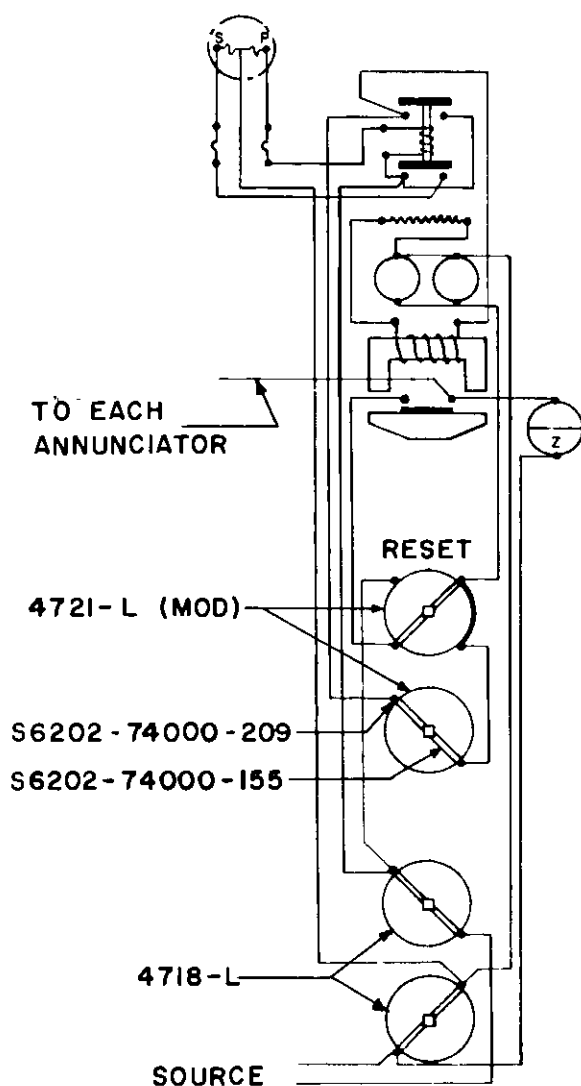


Figure 9640-7.

removed from the compartment where they are installed unless the compartment is to be abandoned entirely.

2. The relay for the lantern is connected to the power supply for lighting in the compartment where the lantern is installed. When power fails, the relay causes the lantern to light from its batteries. Two conditions must be satisfied in connecting the relay leads to the power circuit.

a. The leads must be connected to the power supply side of the lighting switch which controls lighting in the compartment. Otherwise, the lantern would light whenever lights are turned off.

b. The leads must be fused in such a way that a short circuit in the relay leads in one compartment will be cleared by low capacity fuses near the short circuit before heavier fuses closer to the source of power blow and cut off the lighting power supply to other compartments.

3. The lamp, Industry No. 1491, of the metal case lantern is rated at 2.4 volts, but is operated at 3 volts (when the dry batteries are new) to increase light output.

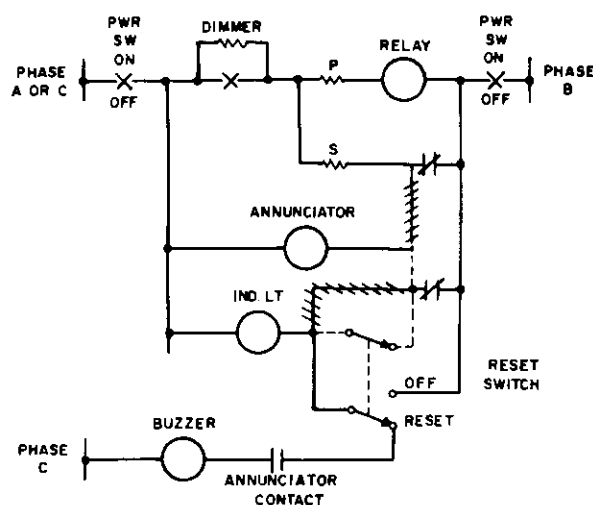


Figure 9640-8.

SERIES RELAY								
Circuit Volts	Service Connection	No. Turns	Wire Size B & S Ga.	Resist. OHMS $\pm 5\%$	Amps	Volts Lamp	Volts Across Coil	Wgt. Wire
115 D.C.	In series with one 50 W. lamp	750	22 Enamel	2.85	.44	113.7	2.30	.282 lb.
115 D.C.	In series with one 100 W. lamp	750	22 Enamel	2.85	.86	112.6	2.40	.282 lb.

\*Adjust relay for satisfactory operation with a contact pressure of at least 50 grams on the contacts and a current value of not more than .180 amps in the magnetic winding.

Figure 9640-9.

ANNUNCIATOR							
Circuit Volts	No. Turns	Wire Size B & S Ga.	Resist. OHMS $\pm 5\%$	Series Res. PC. 3 OHMS	Amps	Max. Temp. Rise C	Wgt. Wire
115 D.C.	11000	38 Enamel	1490	1200	.041	35	.13 lbs.

Adjust annunciator for satisfactory operation at 100 volts.

Figure 9640-10.

Starting with fresh dry cells, the lantern will operate continuously for approximately 8 to 10 hours before the light output becomes too weak to be useful.

4. The lamp, Industry No. 4546, of the plastic case lantern is rated at 5.0 volts operated from two 6-volt, BA 200/U batteries in parallel with a peak voltage of 6.5 volts.

#### 9640.84 FLASHLIGHTS

Flashlights are provided, one to a man. In an emergency, they can be used for short range Morse code signalling. One model of Navy flashlight is watertight. Another model is watertight and usually referred to as being also explosion-proof. It is not explosion-proof in the sense that the extension lights described in article 9640.36 are, but is, instead, intrinsically safe as described in chapter 9600.184(5).

SEQUENCE NO.	OPERATION	CONDITION	INDICATION	ACTION
1	Turn all switches on panel to "ON". Turn all reset switches on panel to "RESET".	Primary filaments of running lights lit.	NONE	NONE
2	Primary filament fails.	Secondary filament of running light lit.	Buzzer sounds, indicator lights, annunciator reads "OUT".	Turn reset switch to horizontal to silence buzzer.
3	Reset switch in horizontal position.	Secondary filament of running light lit.	Indicator light lit. Annunciator reads "OUT".	Renew lamp in running light.
4	Lamp in running light renewed.	Primary filament of running lights is lit.	Indicator lamp lit. Annunciator reads "RESET"	Turn reset switch to "RESET" (vertical) position.
5	Reset switch in RESET position.	Primary filament of running light lit.	NONE	NONE

Figure 9640-11.

SEQUENCE NO.	CONDITION AND OPERATION	RUNNING LIGHT		BUZ'R	IND. LIGHT	ANNUN. TARGET READS	RELAY CONTACTS TO		ANNUN. CONTACT
		PRIM.	SEC.				SEC. FIL.	ANNUN. COIL	
1	NORMAL - Switches on. RESET - Switch handles, all points to RESET.	ON	OUT	OFF	OFF	RESET	OPEN	OPEN	OPEN
2	Primary filament fails.	OUT	ON	ON	ON	OUT	CLOSED	CLOSED	CLOSED
3	Reset switch in horizontal position.	OUT	ON	OFF	ON	OUT	CLOSED	CLOSED	CLOSED
4	Lamp in running light renewed.	ON	OUT	OFF	ON	RESET	OPEN	OPEN	OPEN
5	Reset switch in RESET position.	ON	OUT	OFF	OFF	RESET	OPEN	OPEN	OPEN

Figure 9640-12.

## Part 2. Maintenance

## 9640.91 CHECK ON FLOOD LANTERNS, PORTABLE

1. **How to check charge.** The degree of charge of the storage batteries in portable flood lanterns (article 9460.82) can be determined by observing the charge indicator balls

through the plastic windows in the battery case. When a cell is fully charged, all three indicator balls float at the surface of the electrolyte in the cell. As the cell discharges, the indicator balls sink in the following order:

- a. The green ball sinks when approximately 10 percent of the cell capacity has been discharged.

## NAVIGATION LIGHTS

## Surface Ships:

Supply control and telltale panel	Supply and control (no telltale panel)	Local lighting circuit
Masthead light	Aircraft warning lights	Approach lights (replenishment)
Port side light	Anchor light, after	Polarity signal lights
Range light	Anchor light, forward	Revolving beam ASW light
Starboard side light	Blinker lights	
Stern light, white	Breakdown and man overboard light	
	Minesweeping lights	Station marking box
	Underwater task lights	Towing lights (portable)
	Speed light	
	Station keeping lights (minesweeping)	
	Stern light, blue	
	Towing light, lower (permanent)	
	Towing light, upper (permanent)	
	Wake light	

## Submarines:

## Supply and Control Panel

Anchor light, after  
Anchor light, forward  
Masthead light  
Port side light  
Starboard side light  
Stern light  
Identification light  
Searchlight

Figure 9640-13.

b. The white ball sinks when the cell is 50 percent discharged.

c. The red ball sinks when the cell is 90 percent discharged.

2. **When and how to charge.** Batteries should be charged as soon as possible after the green ball sinks. Since a battery discharges at a slow rate even when not in use, a check should be made at least once each week to see if the green indicator balls are floating. If they are not, the battery should be charged. Direct current must be used for charging. If alternating current only is available, a suitable rectifier must be used. Cells should be charged at a rate of 1-1/2 to 2 amperes until all three indicator balls are floating. This will require from 20 to 25 hours if the battery is completely discharged. Charging should not be continued for more than an hour after the charging voltage has remained constant at 10 volts.

3. **Addition of water.** Pure water should be added, when necessary, to keep the electrolyte level at the indicator line marked on the front of the cell. **DO NOT OVERFILL.** Overfilling nullifies the nonspill feature of the battery and may cause electrolyte to spurt out through the vent tube. Furthermore, if the electrolyte level is not at the indicator

line, the charge indicator balls will not correctly indicate the condition of charge in the battery.

## 9640.92 CHECK ON HAND LANTERNS

1. **Batteries.** The dry batteries in hand lanterns (article 9640.83) should be checked at least once every three months by operation of the hand lantern and observing the brightness of the lamp. When observed, if emitted light is dim, the batteries should be replaced immediately. Lanterns placed where the normal temperature is consistently higher than 90°F. should be checked more often. For example, the high temperature in boiler rooms may require that the batteries be replaced weekly in order to ensure adequate service from the lanterns.

2. **Relays.** In addition to the check of the batteries, the operation of the relay in lanterns should be checked at least once a quarter by de-energizing the lighting circuit to which the relay is connected. When the circuit is de-energized, the relay should operate and automatically turn on the lantern.

The circuit may be de-energized, on newer models, by pressure exerted on the push switch located on the relay housing.

# NAVIGATIONAL LIGHTS—INTERNATIONAL RULES OF THE ROAD

Navigation Light	Symbol Number of Fixture	Rule No.	Function	Arcs of Visibility and Colors of Signal	Range of Visibility (Minimum)	Position of Fixtures	Notes
Anchor—aft	161.3 174.2*	11(a), (b).	Required to be shown from sunset to sunrise by ship at anchor, aground, or secured to a buoy.	HORIZONTAL—An unbroken (white) light visible, as far as possible, all around the horizon. VERTICAL —No special requirements.	Three miles	At or near the stern of the ship, not less than 15 feet lower than the forward anchor light.	Not required on ships under 150 feet in length.
Anchor—forward	161.3 174.2*	11(a), (b).	Required to be shown from sunset to sunrise by ship at anchor, aground, or secured to a buoy.	HORIZONTAL—An unbroken (white) light visible, as far as possible, all around the horizon. VERTICAL —No special requirements.	Two miles <sup>1</sup>  Three miles <sup>2</sup>	<sup>1</sup> In the forepart of the ship, where it can best be seen. <sup>2</sup> Near the stem, not less than 20 feet above the hull.	
Masthead	172.1 174.2*	(2(a) i, ii, iii).	Required to be shown from sunset to sunrise by ship under way and making way to indicate presence and course to other ships except when ship is not under command or is in underwater operation.	HORIZONTAL—An unbroken (white) light visible from right ahead to 22-1/2 deg. abaft the beam on either side (total arc 225 deg.). VERTICAL —Screens shall be fitted at base if glare or reflection interfere with navigation.	Five miles	On or in front of the foremast, or if the ship has no foremast, in the forepart of the ship.  In line with and over the keel. Not less than 20 feet above the hull (see note).  If the breadth of the ship exceeds 20 feet, then at a height above the hull not less, than such breadth. However, the light need not be placed at a greater height above the hull than 40 feet.	"Height above the hull" shall be considered the height above the uppermost continuous deck. In the case of aircraft carriers or ships of similar construction, this deck will be the flight deck.  In all circumstances this and the range light shall be placed to be clear of and above all other lights and obstructing superstructure.
Minesweeping	116	4(d).	Required to be shown from sunset to sunrise to warn other ships it is dangerous to approach within 3000 feet on the side or sides on which danger exists.	HORIZONTAL—An unbroken (green) light visible, as far as possible, all around the horizon. VERTICAL —Top of globe to be marked (or painted) to prevent light being visible directly above. Aperture of light to have a vertical height of approximately 2-1/2 inches.	Two miles.	Three lights in a triangular display, mounted as follows: (a) one at the fore truck, stepped 45 degrees aft to port of the mast. (b) one at each fore yard end.	(1) Switching shall be arranged to energize these lights in combinations, as follows: (a) fore truck and starboard yard end lights. (b) fore truck and port yard end lights. (c) all three lights.

Navigation Light	Symbol Number of Fixture	Rule No.	Function	Arcs of Visibility and Colors of Signal	Range of Visibility (Minimum)	Position of Fixtures	Notes
							(2) The vertical distance between the 20 point white light, used as the range light or masthead light, and any minesweeping light shall not be less than four feet.
Not-under-command (break-down and man-overboard)	190.1	4(a).	Required to be shown on ship unable to maneuver.  Also used (on U.S. Naval ships only) to furnish blinking "man-overboard" signal to warn other ships to keep clear.	HORIZONTAL—An unbroken (red) light visible as far as possible, all around the horizon.  VERTICAL —No special requirements.	Two miles	Two lights, in a vertical line not less than 6 feet apart, where they can best be seen.	Shall be mounted on brackets to starboard of, and offset from, the mast or structure, to permit all-around visibility, insofar as practical.  To facilitate pulsating these lights as a "man-overboard" signal, the rotary snapswitch which controls them shall be fitted with crank handle.
Range	172.1	2(a) (i, ii, iii).	Required to be shown from sunset to sunrise by ship under way and making way to indicate presence and course to other ships except when ship is not under command or is in underwater operation.	HORIZONTAL—An unbroken (white) light visible from ahead to 22-1/2 deg. abaft the beam on either side (total arc 225 deg.).  VERTICAL —Screens shall be fitted at base if glare or reflection interferes with navigation.	Five miles	In line with and over the keel, aft of and not less than 15 feet higher than the masthead light.  The horizontal distance between these lights shall be not less than three times the vertical distance.	Shall be installed on all ships 150 feet in length and over.  Optional on ships under 150 feet in length.
Side—port	182.1 189.2*	2(a) (v, vi).	Required to be shown from sunset to sunrise by ship under way and making way to indicate presence and course to other ships.	HORIZONTAL—An unbroken (red) light visible from right ahead to 22-1/2 deg. abaft the beam on the port side (total arc 112-1/2 deg.).  VERTICAL —No special requirements.	Two miles	Locate so as not to be in direct line of sight of lookouts on navigating bridge.	Side light shall be fitted with inboard screen projecting at least three feet forward from the light, so as to prevent this light from being seen across the bow.

Minesweeping  
(Continued)

Figure 9640-14.

NAVIGATIONAL LIGHTS—INTERNATION RULES OF THE ROAD (Continued)

Navigation Light	Symbol Number of Fixture	Rule No.	Function	Arcs of Visibility and Colors of Signal	Range of Visibility (Minimum)	Position of Fixtures	Notes
Side—starboard	183.1 188.2*	2(a) (iv, vi).	Required to be shown from sunset to sunrise by ship under way and making way to indicate presence and course to other ships.	HORIZONTAL—An unbroken (green) light visible from right ahead to 22-1/2 deg. abaft the beam on the starboard side (total arc 112-1/2 deg.).	Two miles	Locate so as not to be in direct line of sight of lookouts on navigating bridge.	Side light shall be fitted with inboard screen projecting at least three feet forward from the light, so as to prevent this light from being seen across the bow.
Stern (white)	196.1	10(a).	Required to be shown from sunset to sunrise by ship under way to indicate presence and course to other ships.	HORIZONTAL—An unbroken (white) light visible 67-1/2 deg. from right aft on each side of the ship (total arc 135 deg.). VERTICAL —No special requirements.	Two miles	At the stern, on or near the centerline.	On submarines, the stern light shall be located as far aft as practical and arranged to permit it being used without attention from outside the hull.
Ship's task	190.1 192.1	4(c).	Required to be shown on all ships engaged in laying or picking up a submarine cable or navigation mark, or a ship engaged in surveying, or underwater operations, or a ship engaged in replenishment-at-sea, or in the launching or recovery of aircraft, to warn approaching ships that it is unable to get out of the way due to the nature of its work.	HORIZONTAL—Unbroken (red, white, and red) lights visible as far as possible, all around the horizon. VERTICAL —No special requirements.	Two miles	Three lights in a vertical line not less than six feet apart, equally spaced, the highest and lowest red and the middle clear white, and located where they can best be seen.	The red lights shall be the same fixtures as those used for breakdown and man-overboard lights and the switching shall be arranged accordingly.
Towing (permanent)	172.1	3(a), (b).	Required on tugs and other ships normally engaged in towing operations to indicate presence of a tow.	HORIZONTAL—An unbroken (white) light visible from right ahead to 22-1/2 deg. abaft the beam on either side (total arc 225 deg.). VERTICAL —Screens shall be fitted at base if glase or reflection interferes with navigation.	Five miles	Two towing lights shall be installed vertically in line with the light in rule 2(a)(i). These three lights shall be equally spaced not less than 6 feet apart. The lowest light shall be located not less than 14 feet above the hull.	The towing lights shall be of the same construction and character as the light in rule 2(a)(i).

Figure 9640-14 (Continued).

Navigation Light	Symbol Number of Fixture	Rule No.	Function	Arcs of Visibility and Colors of Signal	Range of Visibility (Minimum)	Position of Fixtures	Notes
Towing (portable)	206.1 172.1	3(a),(b).	Required on ships not fitted with permanent towing lights to indicate the presence of a tow.	HORIZONTAL—An unbroken (white) light visible from right ahead to 22-1/2 deg. abaft the beam on either side (total arc 225 deg.).	Five miles	<p>Rigging shall be provided for the installation of two portable towing lights, for use in conjunction with the light in rule 2(a)(i). These three lights shall be equally spaced not less than 6 feet apart, in a vertical line. The lowest light shall be located not less than 14 feet above the hull.</p> <p>The rigging shall be such as to maintain the required arc of visibility. Where it is not feasible to use a portable mast or brackets, sufficient rigging shall be provided to ensure a satisfactory installation. Two or more cables shall be used to maintain the proper horizontal arcs of visibility. A portable array on a single cable arranged for suspension will not provide adequate horizontal stability so as to maintain the proper arc of visibility.</p>	Two portable towing lights are required per ship, equipped with sufficient type THOF-3 cable, and a plug connector, to permit energizing these lights from the nearest emergency lighting receptacle connector. The secondary filament in the lamp of each portable towing light shall be unconnected. The third conductor or this cable shall be connected permanently to the fixture on one end, and to the grounding contact of the plug on the other end.

Figure 9640-14 (Continued).



SIGNAL LIGHTS—VISUAL COMMUNICATION.

Signal Light	MIL. Spec. No. or Symbol No.	Function	Arcs of Visibility	Position of Fixtures	Notes
Blinker	Symbol No. 191.2	For limited range visual communi- cation.	HORIZONTAL—An unbroken white light visible all around the horizon (360 deg. using two fixtures).  VERTICAL —Screens shall be fitted at base to prevent glare or re- flection from inter- fering with naviga- tion of the ship.	On signal yardarms outboard, one port and one starboard. On ship with more than one mast, lights shall be installed only on the forward signal yardarms.	Lights shall be operable from signal keys located on each side of the signal bridge. A four position switch, plan, NAVSHIPS No. 9000-S6202- 74207, Unit No. 3, shall be installed in such manner as to provide for ener- gizing the top light, the bottom light, or both lights, and provide an "OFF" position. Where infrared transmitting set (AN/SAT-2 series) is installed, the blinker lights shall be connected to operate from the signal keys and transfer switch provided for this equipment.
8-Inch searchlights	MIL-S-16938	Primarily signaling		The following conditions shall be met in selecting the best location: Searchlights shall be installed in locations which are readily accessible. Signaling searchlights shall be provided port and starboard on the navigating bridge and port and starboard on each signal station not adjacent to, or on the same level as, the navigating bridge. However, on small ships where only one searchlight is required, it shall be installed to give coverage throughout 360 deg. of azimuth, if practical. On submarines, provide sockets as necessary to permit coverage from minus 25 degrees to 105 degrees eleva- tion from dead ahead to as nearly astern as possible.	The searchlights shall be installed in locations to obtain a minimum of ob- struction to the operating arc of the beam both in train and elevation. These searchlights are for signaling and deck lighting aboard submarines and certain small boats. On submarines, they shall be portable and stowage facilities shall be provided within the submarine while submerged.
12-inch searchlights (all types)	MIL-S-19551	Primarily signaling		Same as 8-inch searchlight. If fewer than four 12-inch searchlights are specified for a ship they be brought to bear in elevation from 25 deg. below the horizontal to 105 deg. above the horizontal. The number installed shall ensure coverage throughout 360 deg. of azimuth. If four or more 12-inch searchlights are specified for a ship, they shall be installed so that	The searchlights shall be installed in locations to obtain a minimum of obstruction to the operating arc of the beam in train and elevation.

Signal Light	MIL. Spec. No. or Symbol No.	Function	Arcs of Visibility	Position of Fixtures	Notes
12-inch searchlights (all types)				at least two of the lights can be brought to bear on an object from dead ahead to dead astern on either port or starboard sides and in elevation from 25 deg. below the horizontal to 105 deg. above the horizontal.	

Figure 9640-15.

SIGNAL LIGHTS—STATION OR OPERATIONAL.

Signal Light	Symbol Number	Function	Arcs of Visibility	Range of Visibility	Position of Fixtures	Notes
Aircraft warning	160.1 193*	To indicate the presence of an obstruction to low flying aircraft when ship is at anchor.	HORIZONTAL—An unbroken red light all around the horizon (360 deg.). VERTICAL —No special requirements.	Three miles	One light installed at truck of each mast extending more than 25 feet above highest point on superstructure. Where impossible to locate one light for all around visibility, two lights shall be installed. Where two masts high enough to require these lights, are located less than 50 feet apart, lights shall be provided on only the higher mast.	Where a red all around light is already installed at the truck of a mast for another purpose, a separate aircraft warning light is not required.  *When combined with speed light.
Contour approach light (replenishment)	164	Required on ships having replenishment-at-sea delivery ship capabilities, to establish the contour of the delivery ship in order to assist the receiving ship in coming alongside.	HORIZONTAL—Red lights visible outboard from right astern through the arc of 135 deg. permitted by the design of the fixture. VERTICAL —Fitted with hoods to prevent upward shining of direct light.	At least 1000 yards, but not more than 8000 yards.	Two lights shall be installed on each side of the ship rigged at the rail at points which mark the extremes of that portion of the side parallel to the keel and posi-	Lights shall be supplied from a convenient lighting distribution box or panel having an emergency source of power. Additional lights, as required, shall be installed to mark obstructions that ex-

Figure 9460-16

**SIGNAL LIGHTS—STATION OR OPERATIONAL (Continued).**

Signal Light	Symbol Number	Function	Arcs of Visibility	Range of Visibility	Position of Fixtures	Notes
Contour approach light (replenishment) (Continued)					tioned on the coaming at the edge of the deck or on top of bulwark or catwalk so as to give the required arc of visibility.	tend beyond the ship's parallel contour lines during delivery.
Polarity signal	215	Required on all magnetic minesweepers to indicate polarity or direction of magnetic field.	HORIZONTAL—To be visible from 20 deg. forward of 20 deg. abaft the beam on either side. VERTICAL —No special requirements.	500 yards (full day-light)	Two lights (one red and one green) installed on each side of the ship.	Polarity signal lights shall be energized from a ship service lighting circuit via pulsation contacts in the mine-sweeping control panel.
Speed light (also used as aircraft warning or replenishment red truck lights)	193	Shall be installed in ships of destroyer escort size and larger to indicate the order being transmitted over the engine order system, or if more than one system, the mean between the orders.	HORIZONTAL—An unbroken combination red and white light visible all around the horizon. VERTICAL —No special requirements.		It shall be located at the truck of the main-mast, or other position where it can best be seen.	Where it is impractical to locate this light so that it is visible throughout 360 deg. of azimuth, two lights shall be provided. These lights shall be controlled by a standard controller for speed lights (ac or dc, as required) located on the bridge.
Station keeping (minesweeping)	225-Stbd 226-Port 227-Full Aft	On minesweeping ships required to sweep in formation at night as an aid in maintaining prescribed intervals and bearings.	HORIZONTAL—These white lights shall be mounted to be visible 20 deg. before the beam on either side to right astern. If it is impossible to locate the lower light so that it can be seen on both sides of ship, two lights shall be used, one on each side. VERTICAL —No special requirements.	200 yards minimum	Lights shall be located in a vertical plane perpendicular to the keel 30 feet $\pm$ 3 inches apart on MSC and MSI types so that accurate observations may be taken to aid in maintaining prescribed intervals and bearings. The lights shall be located as close to a vertical line as possible.	

**Figure 9460-16 (Continued).**

Signal Light	MIL. Spec. No. or Symbol No.	Function	Arcs of Visibility	Range of Visibility	Position of Fixtures	Notes
Identification light for submarines		To identify submarines because the normal naviga- tional lights are easily mistaken for those of small ships.	HORIZONTAL—An amber colored rotat- ing light emitting approxi- mately 90 flashes per minute and visible all around the horizon.  VERTICAL —No special requirements.	Three miles	To be located not less than two feet, and not more than six feet, higher than the masthead light.	Mounting shall be permanent and arranged so that it does not obstruct visibility of the masthead light.
Station marking box (replen- ishment)	285	To indicate the commodity being handled.	No special requirements		On delivery ships— One box shall be vided for each re- plenishment station.  For all other ships— One box shall be provided for each replenishment sta- tion on one side of the ship, plus one spare.	One watertight recep- tacle shall be installed at each replenishment-at- sea station, outboard near or under the rail or life line in a position which will cause the least obstruction. Mechanical protection shall be provided where the receptacle is in- stalled in an exposed location.
Revolving beam ASW light	176	For intership signaling ing ASW operations. Installed on all ships equipped to participate in operations.	HORIZONTAL—A colored light (see note) visible, as nearly as practical all around the horizon.  VERTICAL —A screen shall be fitted at the base if glare or reflection interferes with navigation.		On either the yard- arm or mast plat- form where it can best be seen all around the horizon.	Two red, two green, and two amber lenses are provided with each fixture. Colors to be used are determined by operating forces.
Stern (blue)	197.1	Required on ships likely to be engaged in convoy operations, to enable ship astern to keep station in wartime on dark nights when ships are darkened and not showing navigation lights,	HORIZONTAL—An unbroken dim blue light from right aft to 22-1/2 deg. abaft the beam on each side of the ship (total arc 135 deg.).  VERTICAL —No special requirements.		Shall be installed on flagstaff or after part of ship, positioned to il- luminate the wake and shall be so mounted that no part of the ship is illuminated.	

These lights authorized by Rule 13(a) International Regulations for Preventing Collisions at Sea.

Figure 9460-16 (Continued).

Signal Light	MIL. Spec. No. or Symbol No.	Function	Arcs of Visibility	Range of Visibility	Position of Fixtures	Notes
Wake	200.2	To illuminate the wake.	HORIZONTAL--Spot light, white VERTICAL --No special requirements.		Shall be installed on flagstaff or after part of ship, positioned to il- luminate the wake and shall be so mounted that no part of the ship is illuminated.	

**9640.93 CHECK ON FLASHLIGHTS**

Flashlights required for repair stations shall be checked every 6 weeks by operating the flashlight and observing the brightness of the lamp. If the lamp is dim, the batteries should be replaced.

**SECTION VI. SHIPALT WORK INVOLVING  
CHANGES AFFECTING LIGHTING  
INSTALLATIONS.****9640.101 SPACE CHANGES**

Where space changes, rearrangement, or functional changes are made as a part of shipalt work, the lighting

installation will be modified, when required, to provide illumination meeting the requirements for the space involved. The planning activity should include, as a part of the shipalt involved, any incidental modifications to the lighting systems. Presently installed lighting fixtures should be utilized in accomplishing the new installation wherever possible. The level of illumination provided should be suitable for the new function of the space involved.

## NAVAL SHIPS TECHNICAL MANUAL

## CHAPTER 9640—LIGHTING

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