

EO 40-65GB-2

ROYAL CANADIAN AIR FORCE



HANDBOOK WITH PART LIST

POSITION LIGHT FLASHER
MODELS 450250-0-3, 450350-0-3,
452061, 452062 AND 554230

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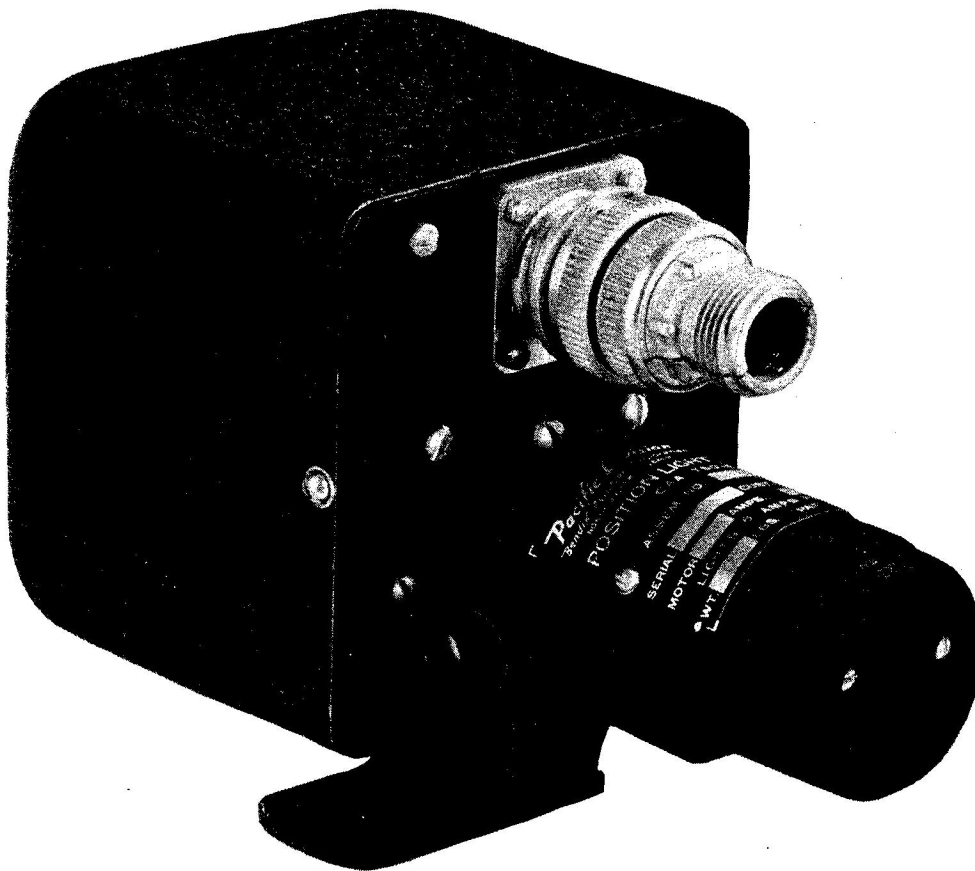
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Assemblies 450250-0-3, 450350-0-3, 452061 and 452062



Assembly 554230, Three Quarter View - Position Light Flashers - (Frontispiece)

PART I

INTRODUCTION

This report covers descriptive data and instructions for the Installation, Operation, Maintenance and Overhaul of Position Light Flashers 450250-0-3, 450350-0-3, 452061, 452062 and 554230.

Basically this information is on assemblies 450250-0-3 and 452061 except when specific reference is made to the other models. The inclusion of significant details designating the 12V and 24V models make the report equally

applicable to both models. Principal differences between the models are indicated in Table I.

A part list is included to facilitate ordering spare parts. The list includes exploded drawings and a Group Assembly Part List.

The position light flashers are manufactured by the Pacific Division, Bendix Aviation Corporation, North Hollywood, California.

TABLE I - TABLE OF DIFFERENCES

ITEM NO.	ASSEMBLY NUMBER	OPER. VOLTAGE	CONNECTOR AND PLUG
1	450350-0-3	12V	AN 3102-14S-5P Receptacle AN 3106-14S-5S Plug
2	450250-0-3	24V	AN 3102-14S-5P Receptacle AN 3106-14S-5S Plug
3	452061	24V	Bendix 407467 Receptacle Bendix 407468 Plug
4	452062	12V	Bendix 407467 Receptacle Bendix 407468 Plug
5	554230	24V	AN 3102C14-6P Receptacle



PART 2

DESCRIPTION

GENERAL (See Figure 2-1)

Function

1. The position light flasher is a device to flash the position lights of an airplane according to a predetermined sequence. As a flashing light is more conspicuous than one which shows continuously, a plane equipped with a position light flasher will be more apparent to the pilots of other planes, allowing more time for any necessary corrections in course. In addition, the periodic flashing of red and white lights eliminates the possibility of any confusion of a plane's lights with other lights.
2. The flashing sequence for the position light flashers, Items No. 1, 2, 3 and 4 of Table I consists of periodically repeated cycles, each 360-degree cycle consisting of 130 degrees of white light, 50 degrees of no light, 130 degrees of red light, and 50 degrees of no light. The flashing sequence for the flasher, item 5 Table I, consists of the same flashing rate as listed above with the addition of the optional double flashing rate which may be used at the operator's discretion.
3. Assembly numbers 450250-0-3, 452061 and 554230 operate from a 24 to 28 volt dc source; 450350-0-3 and 452062 operate from a 12 to 14 volt dc source. The flashing switches of any of the models will safely conduct 6 amperes to either the white-light circuit or the red-light circuit. Six amperes represent six 24 to 28 volt, 32 candlepower lamps for assembly numbers 450250-0-3, 452061 and 554230, or three 12 to 14 volt, 32 candlepower lamps for assembly numbers 450350-0-3 and 452062. The normal motor current drain for assemblies 450350-0-3 and 452062 will not exceed .70 amperes; for assemblies 450250-0-3, 452061 and 554230 the drain will not exceed .35 amperes.
4. A micro-switch operated by a centrifugally-operated actuator assures that the white light will show continuously in the event that the motor stops. Should the conditions of service require that the pilot have the option of showing continuous white lights, instead of alternately

flashing red and white lights, provision is made for the connection of a separate switch for the motor. Thus, turning off the motor will automatically assure continuous white lights regardless of the position of the flashing switches.

CONSTRUCTION

(See Figures 2-1 and 2-2.)

5. The overall dimensions of the position light flasher assembly are 6-3/32 x 4-13/16 x 3-23/32. (Figure 3-1.) The total weight is 1.82 pounds.
6. The position light flasher consists of a switching mechanism driven by a constant-speed electric motor compactly assembled in a small unit with all electrical connections made through a single connector plug (6). The motor, enclosed in a separate motor housing (24) is fastened to one side of the gear box and a receptacle for attaching the connector plug (6) is mounted directly above. A gear train is assembled within the gear box. The gear box also holds the actuator assembly (18). The gear box cover plate (10) forms the mounting plate for cam-operated flashing switches composed of the contact screws (11) and the breaker arms (14), and for the micro-switch (17). A readily removable dust cover encloses the gear box, the capacitor (9), the cam-operated switches, micro-switch and the wiring cable, effectively protecting them against mechanical injury and the entrance of dust or splashed water. Flasher assembly 554230 also has a relay (25), enclosed under the dust cover to provide a double flashing rate.

DETAILED

Motor

7. The motor consists of an armature (3) mounted on ball bearings (1) and rotates in a two-pole field (2). The rated speed of the motor is 8000 rpm. Carbon brushes (21), reached by removing the caps (23), contact the seven-segment commutator (4). The single field coil consists of a shunt winding of many turns of

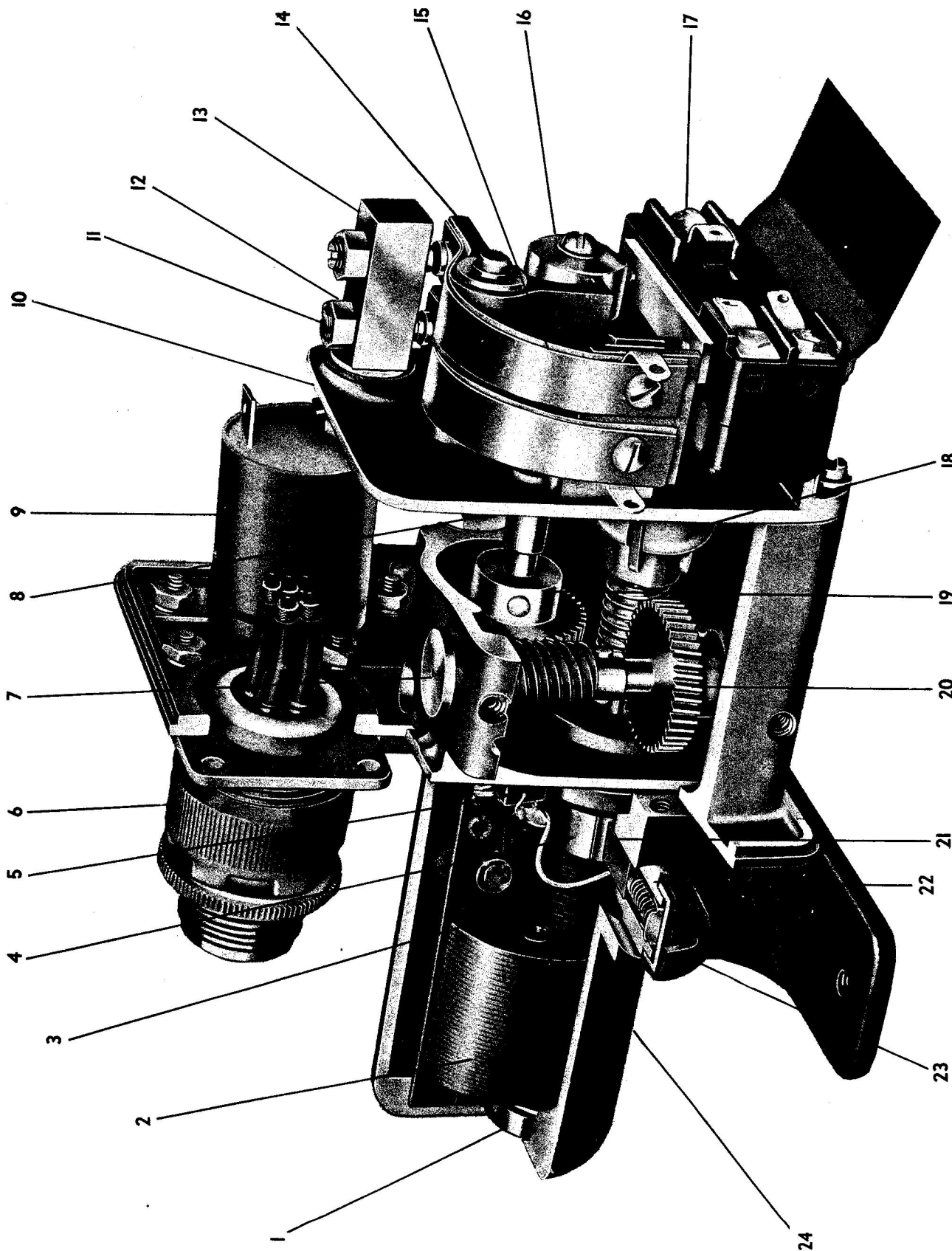


Figure 2-1 - Cut-Away View-Position Light Flashers 450250-0-3, 450350-0-3, 452061 And 4502062

fine wire, and a non-inductive temperature compensating thermistor wound over the shunt field winding. The motor housing (24) die cast from aluminum, has a flange for mounting to the gear box assembly.

Gear Train

8. The gear train has a speed reduction of 200 to 1. It consists of a two-thread worm, mounted on the motor shaft meshing with a worm gear fastened to the jackshaft assembly (20), to which, is attached a four-thread worm meshing with a worm gear fastened to the camshaft assembly (19). The jackshaft and camshaft are carried by bronze bushings.

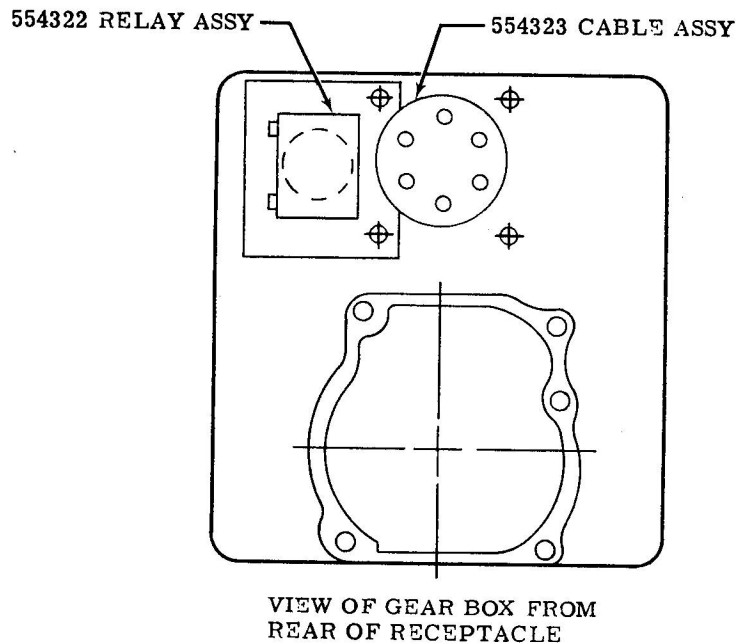
Flashing Switches

9. Two cams (16) on the camshaft act upon breaker arms (14) mounted upon the breaker arm pivot post which is die cast into the gear box cover plate (10). The springs (15) close the breaker arm contacts against their respective, mating, adjustable contacts (11),

during the "on" period of the flashing cycle. The contacts are held open during the "off" period by the cam lobes passing under the breaker arm followers. Copper jumpers lie under the breaker arm springs and provide a low resistance circuit between the breaker arm contacts and the leads to the AN connector. The contact screws (11) are supported by the contact screw mounting post (13) which is mounted on the gear box cover plate (10) but insulated from it. The breaker arms and contact screws together compose the flashing switches.

Radio Interference Filter

10. The radio interference filter eliminates radio interference in the motor at all frequencies from less than 200 kilocycles to well over 150 megacycles. The filter consists of two capacitors and a choke. A .0001 microfarad mica capacitor bypasses the positive motor brush to the grounded negative brush. Power is supplied to the motor by a single lead connected to a pie-wound r-f choke connected to the AN connector through a 3-terminal .5 microfarad paper condenser.



THIS FLASHER IDENTICAL TO STANDARD FLASHER EXCEPT FOR THE FOLLOWING MODIFICATIONS:

- A. Additional components:
 - (a) Relay Assy
 - (b) Cable Assy
- B. Relay wired to an additional circuit to produce a flashing frequency of 80~ /min. (See wiring diagram)
- C. New wiring diagram decal.

Figure 2-2 - View Showing Relay and Cable Assembly of 554230 Flasher

Actuator

11. A centrifugally-operated actuator mounted on the end of the motor shaft actuates the micro-switch. The cup-shaped actuator body has two slots milled through diametrically opposite the sides of the cup. A narrow groove is cut slightly below the inside lip of the cup to receive the force arm retainer ring, made of music wire. Two actuator force arms of case-hardened steel swing in the slots about the force arm retainer ring. The actuator force arms form cams resting upon a poppet of case-hardened steel which is free to move coaxially with respect to the motor shaft. A spring between the poppet and the bottom of the cup presses the poppet against the cams on the actuator force arms with a force of two pounds, forcing the actuator force arms down against the actuator body. A guide for the poppet and poppet

spring is located in the bottom of the cup and limits the travel of the poppet to slightly under 1/16 inch. At motor speeds of 5000 rpm or higher, the centrifugal force causes the actuator force arms to move out, depressing the poppet against the poppet spring. The depression of the poppet draws it away from contact with the plunger of the snap-action micro-switch, eliminating all wear at that point when the motor is running at normal speed. When the motor is slowed or stopped the poppet spring forces the poppet out against the plunger, which actuates the micro-switch.

Relay

12. A solenoid actuated relay actuated by both 40 cycle switches integrates the action to provide an 80 cycle rate. (This relay is on the Flasher Assembly 554230 only.)

PART 3

INSTALLATION

LOCATION

1. The position light flasher may be mounted in any available location. However, since periodic inspections must be made, accessibility should be considered in selecting a location. While the unit is designed to operate satisfactorily in any position, it is recommended that the motor shaft be kept in a horizontal plane, thereby reducing the thrust load on the motor bearings. The supporting member to which the unit is mounted should be sufficiently rigid to avoid resonant vibration at any frequency that might occur in normal operation of the air-craft. Space requirements are shown by the outline dimensional drawing in figure 3-1.

INSTALLATION PROCEDURE

Mechanical

2. Where the supporting member is in a vertical plane, the motor shaft will be horizontal if the holes are drilled one above the other. Two 0.199-0.196 mounting holes on four-inch centers are provided for installation of the unit.

Electrical - Assemblies 450250-0-3, 450350-0-3 and 554230. (Figure 3-2.)

3. When an installation is made in an air-plane having a single white tail light, it will be necessary to add a red tail light and run a supply lead to the junction box. As the motor current is very small compared with the lamp currents, a separate two-ampere motor fuse should be installed in any convenient location, generally in the main fuse box, and a lead for the motor supply run to the junction box. These connections are shown in figures 3-2 and 3-3. When it is desired that the pilot be able to select be-

tween flashing lights or continuous white lights, install a separate motor switch in the motor supply lead at a convenient location. This type of installation is shown in figures 3-2 and 3-3. If it is desired that the lights always flash when they are on, follow the wiring in figures 3-2 and 3-3, but replace the motor switch with a jumper wire.

Electrical - Assemblies 452061 and 452062.

4. Inasmuch as these assemblies provide for an additional white light which is lighted when the motor is slowed or stopped, the connector employs a six-wire lead instead of a five-wire. A wiring diagram for these assemblies is shown in figure 3-4.



Because of the very low resistance of tungsten filaments when cold, it is recommended that all wiring used in the circuits of the flashing lamps be as small as is consistent with approved practice. Even a few hundredths of an ohm increase in the wiring resistance will decrease the input current by a substantial percentage, with a consequent increase in switch life.

CHECK AFTER INSTALLATION

5. If all connections are correctly made in accordance with the block diagram, the unit should perform satisfactorily without any adjustments being required. The rate should be approximately 40 cycles per minute after the unit has been running for a few minutes. If the optional double rate is used on the 554230 unit, the flashing rate will be approximately 80 cycles per minute.

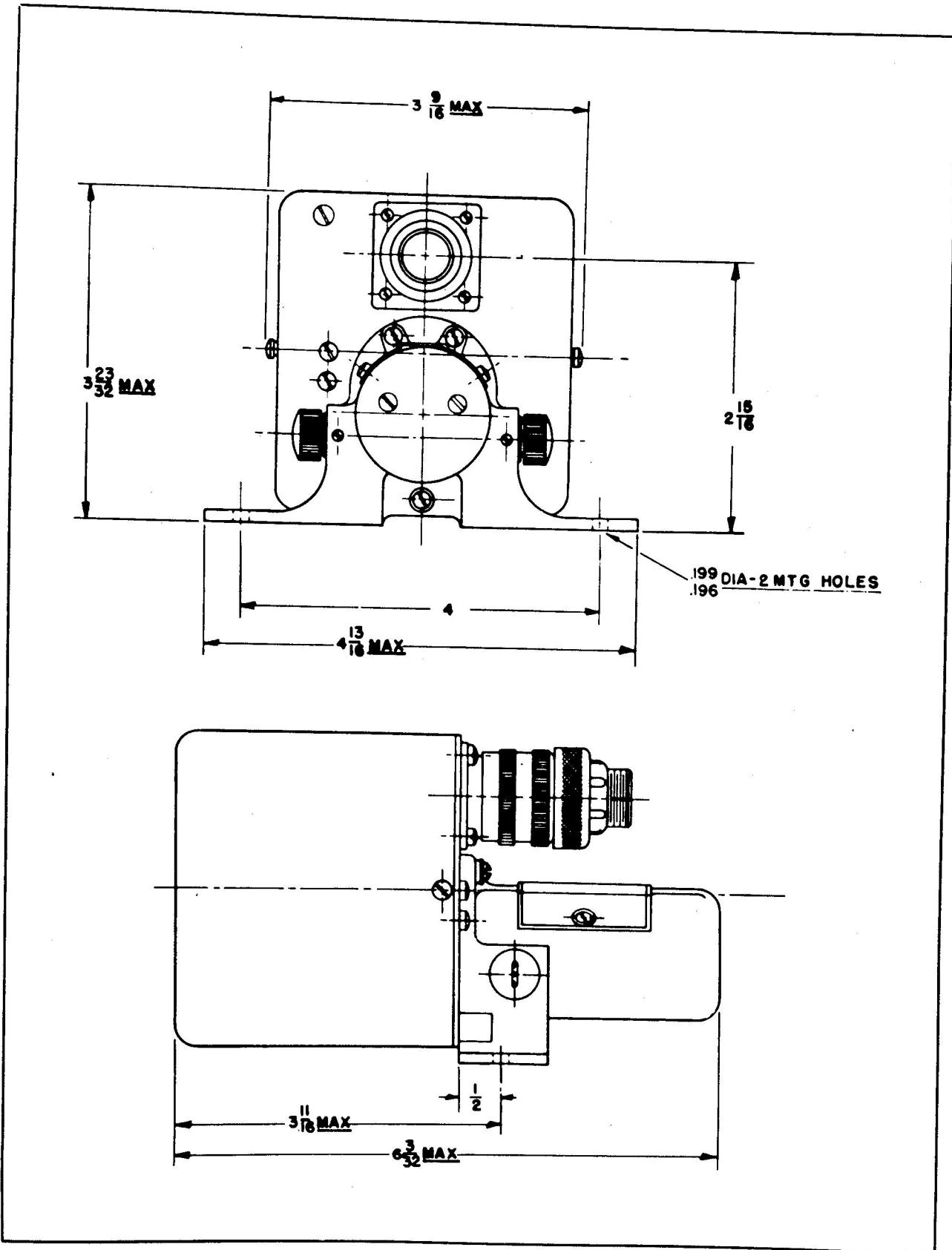


Figure 3-1 - Outlined Dimensional Drawing - Position Light Flasher

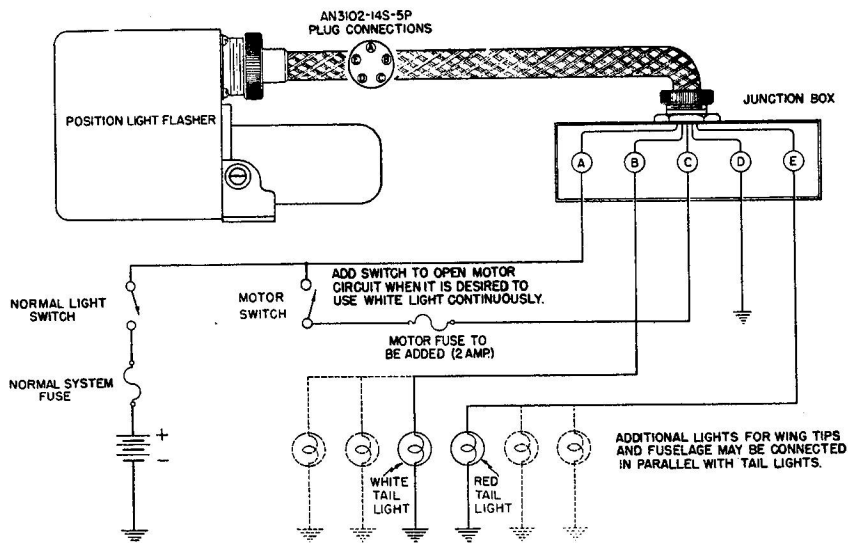


Figure 3-2 - Installation Diagram - Flasher Assemblies 450250-0-3 And 450350-0-3

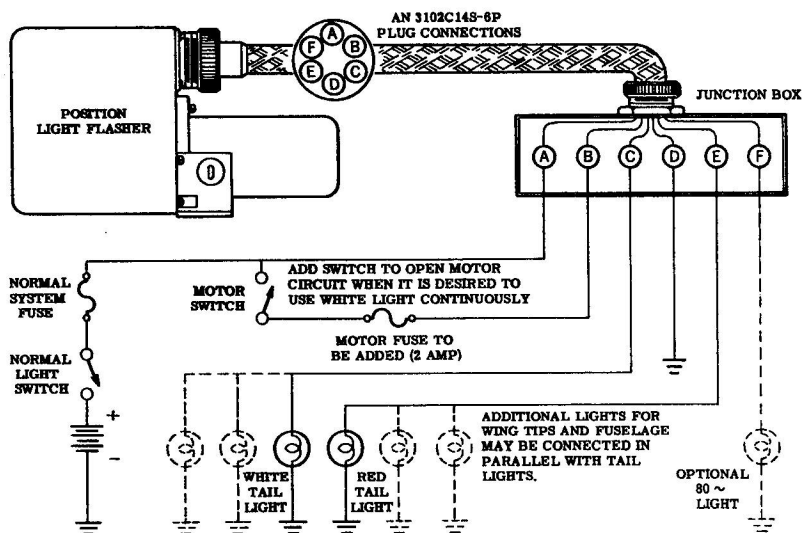


Figure 3-3 - Installation Diagram - Flasher Assembly 554230

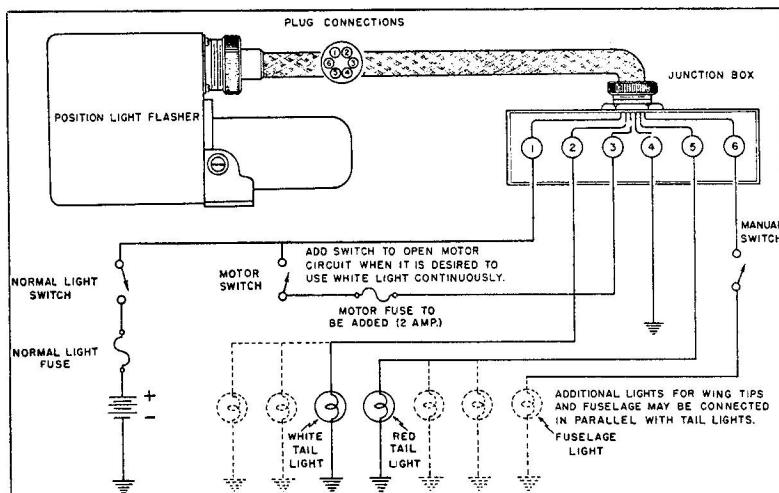


Figure 3-4 - Installation Diagram - Flasher Assemblies 452061 And 452062

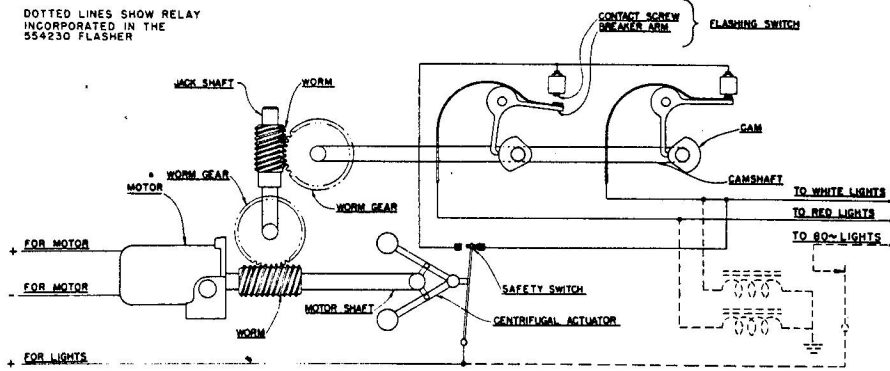


Figure 4-1 - Position Light Flasher, Functional Diagram With Identification Of Parts

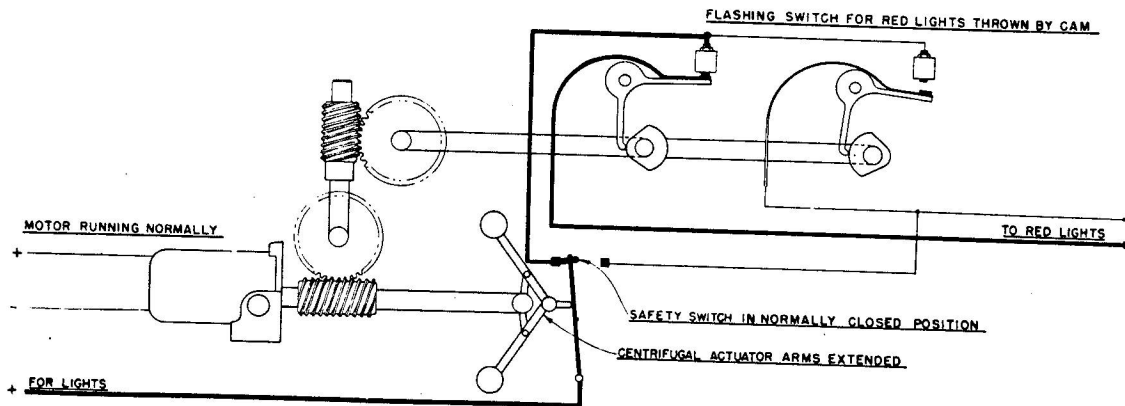


Figure 4-2 - Position Light Flasher, Functional Diagram Showing Red Light Flashing

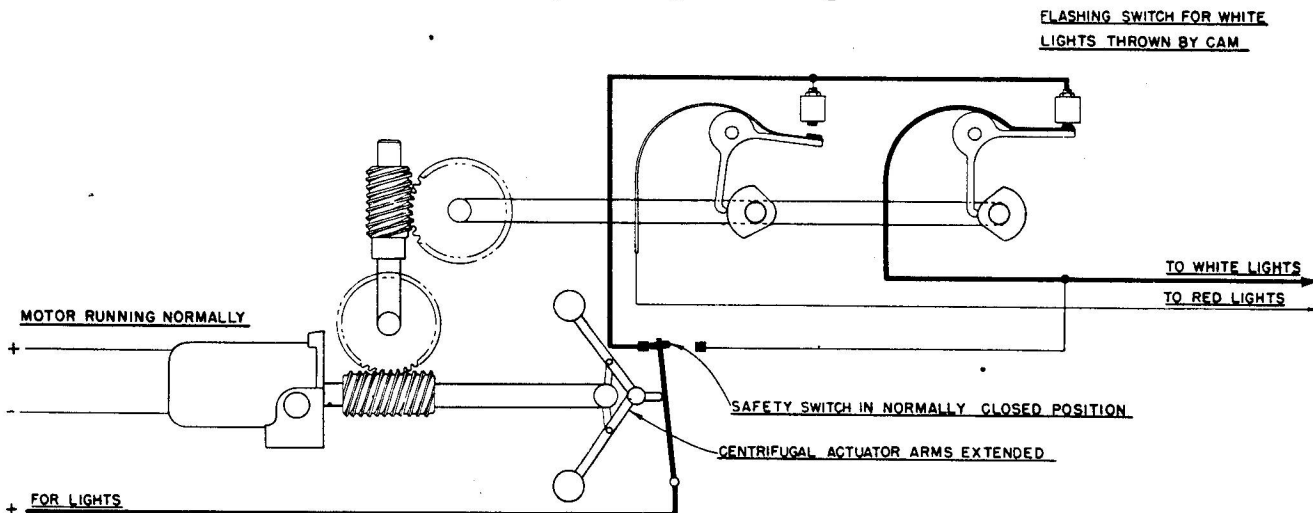


Figure 4-3 - Position Light Flasher, Functional Diagram Showing White Light Flashing

PART 4

OPERATION

PRINCIPLES OF OPERATION (See Figures 4-1, 4-2, 4-3, and 4-4)

1. The d-c motor drives the motor shaft which operates the centrifugal actuator and drives a train of gears.
2. The actuator operates a micro-switch. When the motor runs at a normal speed, the micro-switch is in its normal position and supplies d-c power to the flashing switches. This circuit is shown in figures 4-2 and 4-3. If the motor falls below its normal speed, pressure is applied to the micro-switch, removing the d-c power from the flashing switches and connecting the white light circuit continuously to

the power circuit. (The circuit for Assembly Numbers 450250-0-3, 450350-0-3, and 554230 is shown in figure 4-4.) This is a safety provision which serves in case of failure of the motor. It is also possible to utilize this device to manually switch the white light circuit on continuously, if an additional switch is installed, (figure 3-2) enabling the pilot to stop the motor whenever he desires.

3. Assemblies 452061 and 452062 are designed to connect the third light circuit, which normally flashes with the red light circuit, to the power circuit in the event the motor falls below its normal speed. The circuit for these two assemblies is shown in figure 4-5.

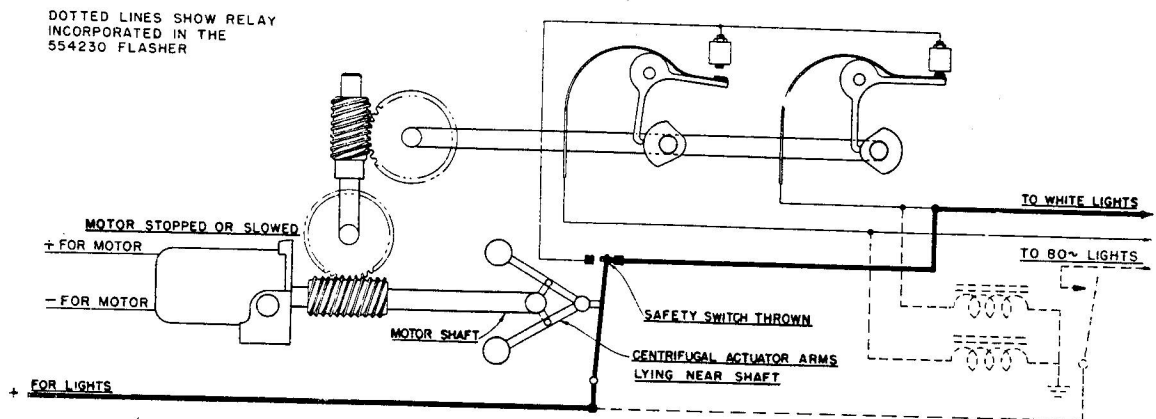


Figure 4-4 - Position Light Flasher, Functional Diagram Showing White Light On Continuously, Assemblies 450250-0-3, 450350-0-3 And 554230

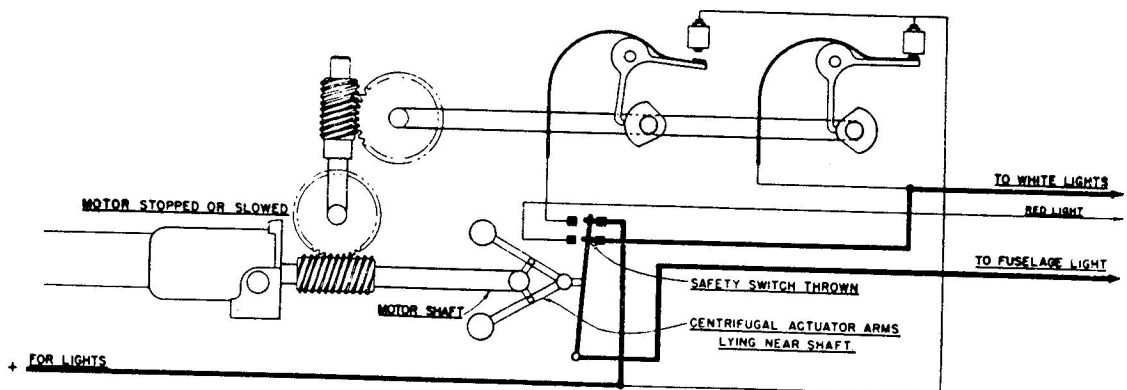


Figure 4-5 - Position Light Flasher, Functional Diagram, Showing White Light And Fuselage Light On Continuously, Assemblies 452061 And 452062

4. The train of gears reduce the motor speed and drive the camshaft. The camshaft has two cams that operate breaker arms, which in turn make and break contact with contact screws. One breaker arm supplies d-c power to the white light circuit and the other breaker arm supplies power to the red light circuit. The cams are arranged so that the contacts are made and broken according to a cycle of 130 degrees of white light, 50 degrees of no light, 130 degrees of red light, and 50 degrees of no light. The nominal frequency of flashing is 40 cycles per minute with the exception of the 80 cycle per minute circuit incorporated in the 554230 unit. Temperature variations will slightly affect the speed of the motor because of changes in the resistance of the copper motor windings, and in the drag of the grease used to lubricate the bearings and gears. Such variations necessitate some tolerance in the fre-

quency, which has been set at 10 per cent plus or minus, or if expressed in frequency, 36 to 44 cycles per minute.

5. A radio interference filter reduces conducted radio interference to a level well under 50 microvolts at all frequencies used in aircraft.

OPERATION INSTRUCTIONS

6. If the motor supply circuit is connected directly to the light supply circuit (as described in paragraph 3.5), the controlled lights will flash whenever the light switch is turned "ON". If the installation is made with a separate motor switch (as described in paragraph 3.5), the lights will either flash or show white continuously, depending upon whether the motor switch is "ON" or "OFF".

PART 5

SERVICE INSPECTION, MAINTENANCE AND LUBRICATION

SERVICE TOOLS REQUIRED

1. There are no special service tools required for the maintenance of this equipment.

SERVICE INSPECTION

500 Hour Inspection

2. Unscrew the caps from the brush holders. Remove brushes and measure them for wear. Replace brushes measuring 5/16 inch or more in length which do not have badly distorted springs or broken shunt wires. See paragraph 5. Part 5.

NOTE

In replacing an old brush, take care to insert it in exactly the same position which it originally occupied. The procedure for inserting a new brush (paragraph 5, Part 5) is equally applicable to old brushes.

3. Remove the dust cover and inspect the contacts of the flashing switches. Remove any projections on the contact surfaces with a small file. If the cams appear dry, follow the directions given in paragraph 6 Part 5. If the flashing of the lights is erratic or the contacts appear to heat excessively, the position light flasher must be overhauled in accordance with the procedure in Part 6.

4. Check the functioning of the micro-switch by starting and stopping the motor. A click will be heard upon starting and stopping the motor when the micro-switch is functioning properly. If these clicks are not heard, the position light flasher must be overhauled in accordance with the procedure in Part 6.

NOTE

Before replacing the position light flasher in the airplane, make certain that the proper washers are used under the screws holding the dust cover in place, and that the screws are tight.

MAINTENANCE

Replacing Brushes

5. The brushes may be replaced by unscrewing the caps and removing the brushes from the brush holders. After new brushes are installed the flasher should be run continuously until at least 75 to 80 percent of the brush faces are in contact with the commutator.

LUBRICATION

6. The motor bearings and the gears are packed with sufficient grease to give lubrication for over 1000 hours of operation. Therefore, no additional lubrication of these parts is required between periods of general overhaul. Should the cams appear dry upon inspection, a light film of oil, 3-GP-335A, or grease, 3-GP-683A, may be added, although no damage will result from failure to add lubrication to the cams during the 1000-hour interval, as the phenolic material of the breaker arms normally absorbs sufficient oil to protect them from complete loss of lubrication.

SERVICE TROUBLES AND REMEDIES

7. Should difficulty be experienced with the flasher unit during service, refer to Table 2 "Service Troubles and Remedies" for possible cause, and recommended remedy.

TABLE 2 - SERVICE TROUBLES AND REMEDIES

Trouble	Probable Cause	Remedy
MOTOR FAILS TO RUN	Fuse blown.	Replace.
	Defective cable.	Replace or repair.
	Loose connection	Tighten all connections between primary power XXXX source and motor.
	Brushes worn.	Replace as instructed in paragraph 5.
	Defective motor.	Clean, repair, or replace as instructed in Part 6.
WHITE LIGHT SHOWS CONTINUOUSLY WHILE MOTOR IS RUNNING.	Incorrect micro-switch adjustment.	Readjust position of micro-switch by moving it out from gear box cover plate.
WHITE LIGHT FAILS TO COME ON EVERY TIME MOTOR IS STOPPED	Incorrect micro-switch adjustment.	Readjust position of micro-switch by moving it in toward gear box cover plate.
LIGHTS FLICKER.	Burned contacts in flashing switches	Replace contacts as instructed in Part 6.
	Loose connections in lamp circuits.	Replace, resolder or re-tighten part responsible for loose connection.
RED AND WHITE LIGHT FLASHES OF UNEQUAL LENGTH	Incorrect adjustments of contacts of flashing switches.	Readjust screw contacts as instructed in Part 7.
FLASHING CYCLES TOO LONG.	Brushes	Replace brushes as instructed in Part 5, paragraph 5
	Motor defective.	Clean, repair or replace motor, as instructed in Part 6.
FLASHING CYCLE TOO SHORT	Motor defective.	Clean, repair, or replace motor, as instructed in Part 6.
SAFETY SWITCH FAILS TO OPERATE WHEN CORRECTLY ADJUSTED	Defective actuator.	Clean, repair, or replace actuator as instructed in Part 6.
RADIO INTERFERENCE	Poor electrical bond between position light flasher and metal structure of airplane.	Clean contact surfaces between position light flasher and mounting surface.
	Worn-out capacitor or choke.	Replace as instructed in Part 6.

PART 6

DISASSEMBLY, INSPECTION, REPAIR AND REASSEMBLY

SPECIAL TOOLS REQUIRED

1. There are no special tools required for the disassembly, repair, and reassembly of this equipment.

DISASSEMBLY (See Figure 9-1)

NOTE

Complete disassembly, inspection, repair, and reassembly, as outlined in this Part, is recommended after every 1000 hours of use of the Position Light Flasher.

Removal of Dust Cover

2. Remove two screws (2) washers (3) and remove dust cover (1) from unit.

Removal of Motor And Actuator Assembly

3. (a) Unsolder the yellow lead to the motor from the choke (39) and straighten wire so it may be pulled through the hole in the gear box case.

(b) Detach the motor assembly by removing the three screws (4) and washers (5). No force is necessary in pulling the actuator on the end of the motor shaft past the worm gear. In case of interference, move the motor from side to side and rotate the motor shaft 90 degrees until the actuator is free.

Disassembly of Motor and Actuator Assembly

4 (a) Remove cotter pin (7) securing actuator assembly (6) to the motor shaft. The actuator may then be pulled from the shaft.

(b) Remove cotter pin (9) and pull worm gear (8) from motor shaft.

(c) Unscrew caps (10) from brush holders and remove brushes (11 and 12). Note the brush positions so they may be reassembled in their former positions.

(d) Remove screws (13) and pull end plate (15) from housing. Shims (16, 17 and 18) may then be removed.

NOTE

It may be necessary to use a screw driver to pry the end plate from the housing, however, care must be taken not to spring the motor shaft.

(e) Lift armature assembly (19) from housing. Bearings may be removed from the armature with a bearing puller.

NOTE

If a bearing puller is not available, support the inner race of the bearing with a notched metal plate and apply force to the motor shaft with an arbor press.

(f) Remove brush holder leads from field terminals.

(g) Remove brush holders (22 and 23) by loosening set screws (21), located next to screw holes for end plate (15) and in bottom flange of the motor.

NOTE

The setscrews are Bristol-type and it is necessary to use a Bristol wrench for their removal.

(h) Remove two screws (25) and washers (26) from the end of motor housing (31) and lift the field assembly from the housing. Remove insulation strips (27 and 28).

(j) Unsolder thermister (29) and capacitor (30) from field assembly.

Removal of Cable Assembly From Units 450250-0-3, 452061, 450350-0-3 and 452062

5 (a) Unsolder wires leading to lugs (58, 59 and 70) choke (39) and capacitor (39).

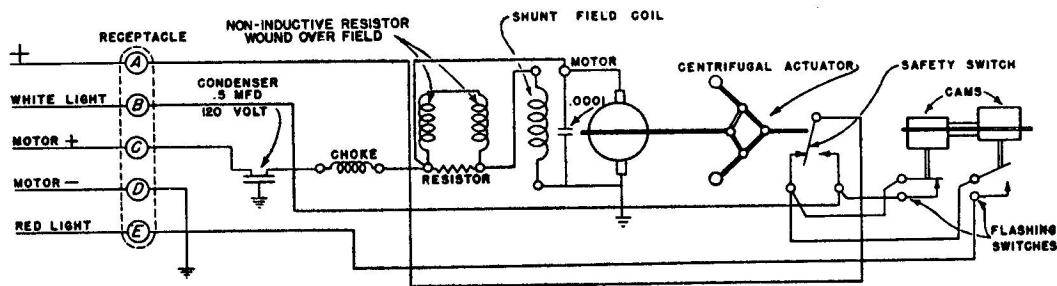


Figure 6-1 - Position Light Flasher-Assembly Numbers 450250-0-3 and 450350-0-3 Schematic Wiring Diagram

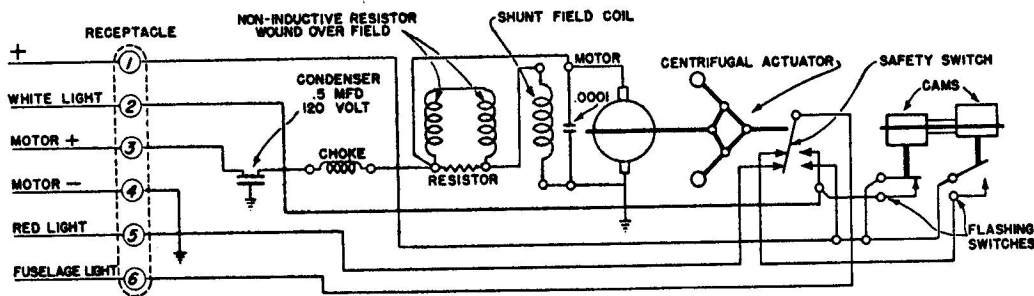


Figure 6-2 - Position Light Flasher-Assembly Numbers 452061 and 452062 Schematic Wiring Diagram

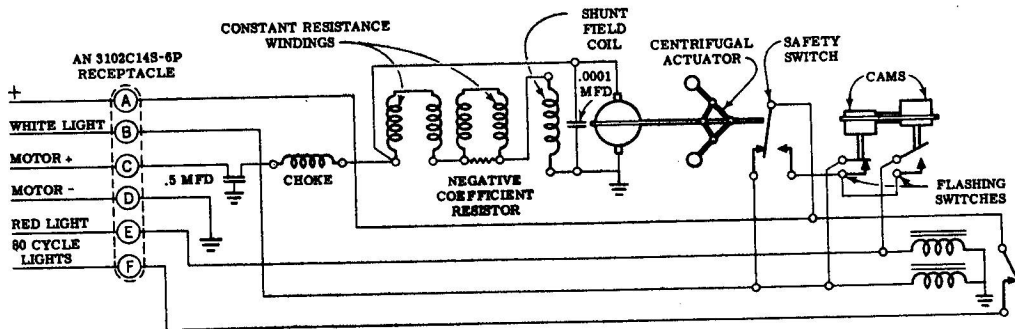


Figure 6-3 - Position Light Flasher-Assembly 554230 Schematic Wiring Diagram

(b) Remove screws (34) washers (36) nuts (37) and pull cable assembly (33) from gear box assembly (101).

Removal of Cable Assembly and Relay Assembly on the 554230 Flasher

6 (a) Remove screws (34 and 35) washers (36) and nuts (37) holding the cable and relay assemblies to the gear box.

(b) Unsolder the electrical leads and pull the cable and relay assemblies from the gear box.

Removal of Capacitor and Choke.

7 (a) Remove screws (44) washers (45) and nuts (46) to release capacitor (43).

(b) The choke (39) may be removed by unscrewing screw (40).

Disassembly of Gear Box and Flashing Mechanism

8 (a) Remove screws (48) washers (49) nut (50) and pull micro switch (47) from plate assembly (80).

(b) Remove nuts (52) washers (53 and 54) strip (55) and insulator (56) permitting screws (57) terminal lugs (58 and 59) board (60) and insulating washers (61) to be removed.

(c) Disengage retaining spring (62) from slot in end of breaker arm pivot post. Pull washer (63) breakers (64) and washer (65) from post.

(d) Loosen lock nuts (66) and unscrew contacts (67).

(e) Remove nut (68) washer (69) terminal lug (70) and washers (71 and 72) to release contact post (76), then remove tubing (73) and washers (74 and 75) from post.

(f) Remove screw (78) and washer (79) to permit the cam (77) to be pulled from the camshaft.

(g) Removing screws (81) and washers (82) releases plate assembly (80) from the gear box assembly.

(h) Pull camshaft assembly from gear box and disassemble worm drive gear (87) from shaft (88) by driving out groove pin (86).

(j) To remove the jackshaft loosen set-screws (89) and pull bushings (90) from gear box. The jackshaft may be removed from the box.

(k) To disassemble the jackshaft tap out groove pin (93) and pull gear (94) from shaft. Then tap out groove pin (95) and pull worm gear (96) from shaft (97).

(l) Remove screw (98) and washer (99) to release lug (100) from gear box (101).

CLEANING

Gear Box

9 (a) The motor and actuator assembly should always be removed before cleaning the gear box to prevent solvent from entering the motor assembly through the bearing, also remove the micro switch. The connecting wires are of sufficient length to permit the camshaft assembly to be removed from the gear box without disconnecting the wires. After removing the camshaft and jackshaft (paragraph 7 Part 6) wipe out excess grease with a rag and wash out the gear box and bushings with a solvent (RCAF REF. 33C/425 carbon tetrachloride, U.S. Federal Specification O-C-141, or RCAF REF. 33E/26 Naptha ((Unleaded Gasoline)) CGSB Spec 3-GP-27) and dry with an air jet or clean cloth. The shafts, gears, cam and bushings may be washed in one of the specified solvents.

CAUTION

Avoid splashing solvent on the electrical components.

NOTE

To prevent corrosion cover all steel parts with oil 3-GP-335A, or grease 3-GP-683A immediately following their being dried.

Armature and Field

(b) The armature and field assemblies should be removed as described in paragraph 4 Part 6. Blow the carbon dust from all parts

with an air jet and wipe off with a clean, dry rag. Before blowing out the motor housing, be sure to remove any shims that may be behind the rear bearing so that they will not be lost.

CAUTION

Do not allow solvent to come in contact with the armature, commutator or bearings. The bearings are packed with sufficient grease to last the life of the bearings if not contaminated with solvent or dirt.

Actuator

(c) The actuator may be cleaned by blowing it out with an air jet and wiping it off with a clean rag.

CAUTION

Avoid washing the actuator with solvent unless it is disassembled so the steel parts can be thoroughly protected with oil or grease against corrosion immediately after drying.

Inspection, Testing, and Repair of Parts Subject to Wear

10 The only parts subject to wear in normal operation are the brushes, the commutator, and the contacts of the flashing switches. Other parts, though listed here, normally should not require repair or replacement.

Brushes

(a) Brushes worn shorter than 5/16 inch should be replaced. The procedure is described in paragraph 5. Part 5.

Commutator

(b) If the commutator shows signs of uneven wear or scoring it should be trued up by turning on a lathe. First, remove the rear bearing and mount the armature shaft in a collet. Support the opposite end of the shaft with the front bearing in a chuck and take a light smooth cut on the commutator. Concentricity of the commutator with the bearings must be within .001 F. I. R.

CAUTION

Under no circumstances should emery paper or sand paper be used on the commutator.

It will be necessary to remove the actuator from the end of the motor shaft in order to chuck the front bearing.

Flashing Switches

(c) Inspect the contacts of the flashing switches. Remove any projections on the contact surfaces with a small file. When a contact shows excessive pitting, the component part to which it is attached namely the contact screw (67) or the breaker arm (64), must be replaced before assembly.

Armature and Field Assemblies

(d) Measure the resistance of the field between the yellow motor lead and lug at room temperature. With the negative brush removed, the resistance should be approximately 105 ohms (31 ohms for Assembly Numbers 450350-0-3 and 452062). Measure the resistance between the positive brush and ground. This should be approximately 310 ohms (90 ohms for Assembly Numbers 450350-0-3 and 452062). Measure the resistance of the armature between adjacent segments of the commutator. The resistance between adjacent segments should be approximately 9.5 ohms (3.0 on Assembly Numbers 450350-0-3 and 452062). If any of these readings are not close to the above, the defective part should be replaced. However, if inspection reveals an open at the terminals of the commutator or field coil which can easily be resoldered, a satisfactory repair can be made provided no soldering flux other than rosin or rosin dissolved in alcohol is used.

Bearings, Gears, and Bushings

(e) While these components are subject to wear, only a negligible amount of wear will occur in many thousands of hours of operation, providing the proper lubrication is maintained. The bushing and gears are normally set up to have fairly loose fits, thus assuring smooth operation under all conditions of extreme temperature. Backlash in the gear train in no way impairs the accurate functioning of the position light flasher.

Choke, Capacitor and Relay

(f) It is not necessary to test the choke, capacitor or relay inasmuch as these are normally good for the life of the unit. Unless externally damaged or broken, they may be replaced without changing.

Micro-Switch

(g) The micro-switch, functioning only when the motor starts and stops, should give no trouble for many years, provided oil or grease is not allowed to enter past the plunger as a result of the application of excessive lubrication to the centrifugal actuator. Micro-switches cannot be repaired and must be replaced in the event of failure or damage from any cause.

Actuator

(h) The actuator is a mechanical device which functions only when the motor starts and stops. All parts subject to wear are of hardened steel, and the unit will function indefinitely with no lubrication. However, a light film of grease, MIL-G-7118, should be applied to the steel components as a protection against corrosion.

Reassembly

11. In following the reassembly steps, certain precautions are mentioned which must be observed to assure proper functioning of the position light flasher.

Gear Box and Flashing Mechanism Reassembly

12. (a) Install lug (101) with screw (98) and washer (99).

(b) To reassemble jackshaft, place worm gear (96) on shaft (97) and insert groove pin (95), then install gear (94) and secure with groove pin (93).

(c) To install jackshaft assembly in gear box, place washer (92) and shim (93) on jackshaft against gear (94) and drop assembly into place. Put a little grease (MIL-G-7118) in one jackshaft bushing (90) and press it over the jackshaft end nearest the worm gear, determining that the bushing is firm in the counter-bored seat and tighten setscrew (89). Next put

grease, MIL-G-7118, in the second bushing (90) and press into position at the other end of the jackshaft. Slide a 0.010 feeler gage between gear (94) and washer (92). Press bushing lightly against washer and tighten setscrew (89). Remove feeler gage and check end play. Maximum end play is 0.010. The jackshaft should rotate freely.

(d) Reassemble camshaft by placing gear (87) on shaft (88) and secure with groove pin (86).

(e) Grease camshaft with MIL-G-7118 or a mixture of 20 per cent oil 3-GP-335A and 80 per cent grease 3-GP-683A and slide into position in the gear box.

(f) Pack grease, MIL-G-7118, to form large fillets on each side of camshaft and jackshaft worm gears (Figure 6.4) also place a small amount of this grease in the lower camshaft bushing.

(g) Place gasket (83) in position and attach plate (80) with four screws (81) and washers (82). After the screws have been tightened there should be 0.010 to 0.015 in. end play in the camshaft. Adjust end play with shims (84 and 85), as required, between the camshaft and cover plate (80).

(h) Slide cam (77) on shaft and secure with screw (78) and washer (79).

(j) Screw contacts (67) into post (76) and lock with nuts (66). Place washers (74 and 75) and tubing (73) on post. Insert post in plate (80), then place washers (72 and 71) lug (70) and washer (69). Do not tighten nut (68) until breakers (64) are in place.

(k) Push one breaker (64) on the pivot post, follow with phenolic washer (65) and second breaker (64). Secure with washer (63) and spring (62). Place a light film of oil (3-GP-335A) on the pivot post and cam.

(l) Place insulating washers (61) in supporting bracket. Using screws (57), washers (53 and 54) and nuts (52) attach breakers (64), lugs (58 and 59), board (60), insulator (56) and strip (55). After securing breakers, align contact post (76) so contacts (67) mate with the breaker arm contacts. Position lug (70) to clear dust cover (1) and tighten (68) and jam nuts (66).

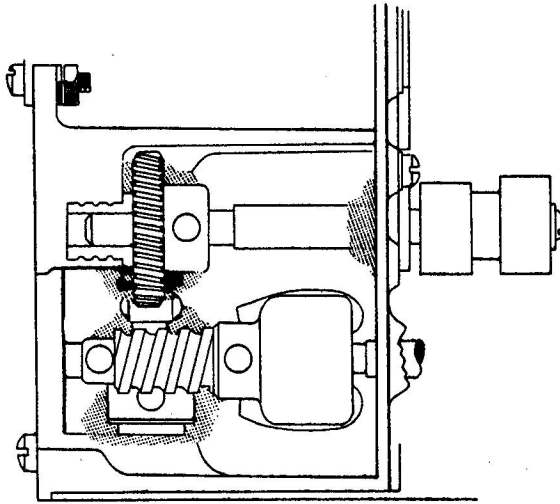


Figure 6-4 - Greasing of Gears

(m) Attach micro switch (47) to plate assembly (80) with screws (48) washers (49) insulating strip (51) and nut (50). Adjust the micro switch by pressing it down 0.015 to 0.020 in. (about 1/64 inch) past the point where it snaps. Tighten screws after proper adjustment has been obtained.

(n) Securely fasten capacitor (43) to the face of the gear box assembly with screws (44) washers (45) and nuts (46). Replace the choke (39) securing it to the gear box assembly with screw (40) and washer (42). Use washer (42) on choke side of plate.

(p) Replace cable assembly (33) and secure with screws (34) washers (36) and nuts (37). In replacing the cable assembly on the 554230 flasher, two longer screws (35) are used to attach relay assembly (38).

Motor and Actuator Reassembly

13 (a) Resolder capacitor (30) and thermister (29) to field assembly (24). Install insulator (28) in housing and insulator (27) on field assembly. Place field assembly in motor housing and secure with screws (25) and washers (26).

(b) Replace brush holders (22 and 23). Press the holder into the housing until the armature will just clear the inside faces of the holders. Turn the holders until the brush holes are square with the motor shaft and mount-

ing face. Tighten the setscrews (21) to prevent any possible movement of the brush holders.

(c) Press bearings on armature shaft, using an arbor press. Apply pressure to the inner race only. Seat the bearings firmly on the shoulders of the shaft, but, avoid excessive pressure and pressure not true with the axle of the shaft or the shaft will be sprung.

CAUTION

Make certain that the metal brush holder which acts as a guide for the negative brush is placed on the correct side of the motor housing. The positive and negative brushes are designated by plus and minus stamped on either side of the motor housing.

(d) Replace shims (20) originally used in motor housing bearing bore. Put shims (16, 17 and 18) on shaft and press end plate on bearing. Position the armature assembly in the housing and press the bearing end plate into its recess in the housing. Secure end plate with screws (13). Check for end play, which should be not less than 0.005 nor more than 0.010 inch. If necessary, adjust by adding or removing shims behind the rear bearing. To accurately measure end play clamp the motor housing to a surface plate and check with a dial indicator at the end of the armature shaft. Turn the motor shaft by hand. It should spin freely. If not, locate the source

of the trouble and correct it before proceeding with reassembly. Defective bearings must be replaced. If the armature rubs against the field assembly, the whole motor assembly should be replaced. Realignment of the field assembly is impracticable without special jigs and should never be attempted except in an emergency.

(e) Insert brushes (11 and 12) in original positions, unless new brushes are being installed, and replace caps (10).

(f) Slide worm gear (8) on motor shaft and secure with cotter pin (9). Form the pin to clear the bearing end plate.

(g) Place a drop of oil 3-GP-335A in the actuator bore to lubricate the poppet and slide the actuator (6) on the shaft. Secure with cotter pin (7) and form the pin so it will not extend beyond the outside diameter of the actuator body.

(h) Test the reassembled motor and actuator assembly to make certain that it runs smoothly in a clockwise direction, facing the end on which the actuator is located, with the application of 24 to 28 volts (12 to 14 volts in the case of Assembly Numbers 450350-0-3 and 452062), between the yellow motor lead and ground. Normal current should be between 0.275 and 0.300 ampere (between 0.550 and 0.600 ampere for Assembly Number 450350-0-3 and 452062) after the motor has run long enough to reset the brushes properly. Observe the action of the actuator. The actuator force arms

should fly out, with the motor running on voltages above 14 volts (7 volts for Assembly Numbers 450350-0-3 and 452062), and snap in when motor stops. The spring should resist a two-pound pressure on the poppet and depress with 2-1/4 pounds.

Final Assembly.

14 (a) Reconnect the wires from the cable assembly (33). Refer to schematic wiring diagrams (see Figure 6.1, 6.2 and 6.3)

(b) Attach the motor and actuator assembly to the gear box with screws (4) and washers (5). Make sure that the worm is correctly matched with the bronze gear on the jackshaft assembly.

(c) Replace dust cover (1) and secure with screws (2) and washers (3).

Resistance Reading for Modified Field Assemblies

15 The field assemblies of Position Light Flashers have been modified by replacing resistor between the field terminals with a "Thermistor" on all Flasher assemblies with the following serial numbers:

ASSEMBLY NUMBER	SERIAL NUMBER
45250-0-3	3356 thru 3362, 3384 and over
452061	1-231 and over
450350-0-3	1- 44 and over
452062	1- 27 and over

Measure the resistance of the field between lugs 1 and 4 (Fig 6-5) at room temperature. With the negative brush removed the resistance should be approximately 108 ohms (27 ohms for Assembly Numbers 450350-0-3 and 452062). The resistance between the positive brush and ground should be 355 ohms (95 ohms for Assembly Numbers 450350-0-3 and 452062).

16 New field assemblies have the same part numbers as the old assemblies and are interchangeable as complete assemblies. However, the resistor is not interchangeable with the "Thermistor".

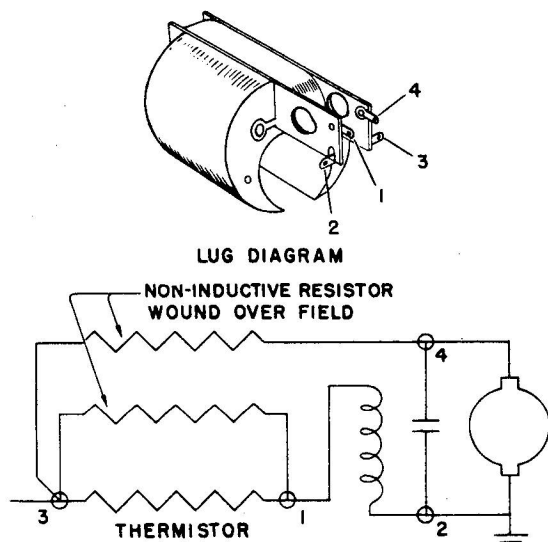


Figure 6-5 - Resistance Readings for Modified Field Assemblies



PART 7

TEST PROCEDURE

TEST SETUP

1 Following repair replacement of parts or general overhaul, the unit should be tested and adjusted. A convenient setup for testing may be built using pilot lights to give a visual indication of the performance. If available, a tape recorder connected to the light circuits is very convenient, and permits extremely accurate adjustment. The recorder should be connected to both lamp circuits in parallel. A simultaneously recorded timing pulse is convenient, although not essential, as will be explained later.

2 If the connector plug is not convenient for making connections to the unit, leads may be tacked to the respective circuits internally with solder. Clips are not recommended because of the danger of shorting or grounding.

3 The plug connections for the test circuit are similar to those indicated in Figures 3-2 and 3-3. The connections are as shown in Table 3.

TABLE 3 - PLUG CONNECTIONS

ASSEMBLY NUMBERS 450250-0-3, 450350-0-3 and 554230 (24 Volt)	
Plug Letter	Connection
B	White light circuit
E	Red light circuit
A	Light input from battery
C	Motor input from battery
D	Ground
F (554230 only)	Double Flashing rate circuit

ASSEMBLY NUMBERS 452061 and 452062 (12 Volt)	
Plug Number	Connection
1	Light input from battery
2	White light circuit
3	Motor input from battery
4	Ground
5	Red light circuit
6	Fuselage light circuit

TIMING ADJUSTMENTS

Setting Screw Contacts

4 The timing between the red and white circuits for each cycle is permanently established in the grinding of the cams. Thus the only timing adjustment necessary consists of adjusting the contact screws so that each pair of flashing switch contact is closed through 130 degrees out of each revolution of the camshaft. Screwing the contact screw in lengthens the flash for its circuit, while screwing it out shortens the flash. A very close approximate setting is made by stopping a cam with its lobe under the breaker arm which opens the flashing switch contacts. Adjust the contact screw to give a contact separation of 1/32 inch. Rotate the cams half a revolution so that the other pair of flashing switch contacts is open and adjust them to the same spacing. The contact screw jam nuts should be tightened and the spacing rechecked after each adjustment.

FINAL TEST OF OVERALL PERFORMANCE

NOTE

Final test should be made at normal room temperature after the motor has had a short warming up period of several minutes.

Speed of Flashing Cycles

5 With a motor supply voltage of 27 Volts (13.5 Volts for Assembly Numbers 450350-0-3 and 452062) each light should flash between 38 and 42 times per minute, (76 to 84 on 554230 flasher). Check by counting the number of flashes of either light for one minute. A speed slightly higher than 42 (84 on 554230 flasher) will generally be due to the motor brushes not seating properly or due to weak springs. If the speed is between 46 and 48 (92 and 96 on 554230 flasher) flashes per minute, the non-inductive resistor is probably open.

6 With negative brush removed, the resistance between lug and the positive brush should

be 105 ohms at room temperature (31 ohms for Assembly Numbers 450250-0-3 and 452062). If the resistor is open the field assembly must be replaced.

Micro-Switch Operation

7 The micro-switch is tested by starting and stopping the motor. When the motor is stopped, the white light must always come on regardless of the cam positions. When the adjustment of the micro-switch is correct, the lights will flash with 20 volts (10 volts for Assembly Numbers 450350-0-3 and 452062) applied to the motor but will not flash when 14 volts (7 volts for Assembly Numbers 450350-0-3 and 452062) are applied. Failure to flash at 20 volts (10 volts for Assembly Numbers 450350-0-3 and 452062) indicates that the switch is set too close to the actuator on the motor shaft. The screws which clamp the micro-switch in

place should be loosened and the micro-switch moved out from the gear box cover plate a few thousandths of an inch. If the lights continue to flash on 14 volts (7 volts for Assembly Numbers 450350-0-3 and 452062) the micro-switch should be moved slightly.

CAUTION

Do not move the micro-switch in far enough for the actuator poppet to contact the switch plunger when the motor is running at normal speed.

NOTE

On Assembly Numbers 452061 and 452062 the fuselage light flashes with red light and comes on continuously with the white light whether or not the motor is either slowed down or stopped.

PART 8

STORAGE

1 When preparing for storage it is advisable to wrap the position light flashers in greaseproof paper conforming to Specifications JAN-B-121 - RCAF REF 40D/596 or 606 and pack in cartons. No additional lubrication for storage is necessary.

2 If the position light flasher has been in storage for a considerable length of time,

it is advisable to check the flashing sequence and operation prior to installation.

3 Rotate the stock of spare parts in storage as much as possible using first those which have been in storage the greatest length of time.



PART 9

PART LIST

INTRODUCTION

1 This part list contains a list of parts for all models listed in Part I. Since there is a high degree of interchangeability between the various models of the position light flashers, all models are presented on the same part list. This part list is both a standard part list and a numerical part list.

2 Figure 9-1, an exploded view of a typical Position Light Flasher may be considered applicable to all models. The only exception to this is to the different type of micro-switch and the relay for the 554230 Assembly shown in inserts on Figure 9-1.

3 If the part number is known but its relationship to other parts or assemblies is in doubt, refer to the index number assigned to that part on the part list and pick up that number on the exploded view.

4 If the part is in hand and the part number is not known, pick out the part on the exploded view and, having selected the proper index

number, locate the index number on the parts list. Follow the index number line across the parts list into the PART NO. column to obtain the number of the part, into the NOMENCLATURE column to obtain the proper name of the part and into the UNITS PER ASSEMBLY column to select the quantity of that particular part needed to make up a complete position light flasher.

5 Part variations within the Flasher Assemblies are indicated by a letter symbol or combination of letter symbols in the "USAGE ON CODE" Column. An explanation of the letter symbols is outlined below.

- (a) 450250-0-3 Position Light Flasher
- (b) 450350-0-3 Position Light Flasher
- (c) 452061 Position Light Flasher
- (d) 452062 Position Light Flasher
- (e) 554230 Position Light Flasher

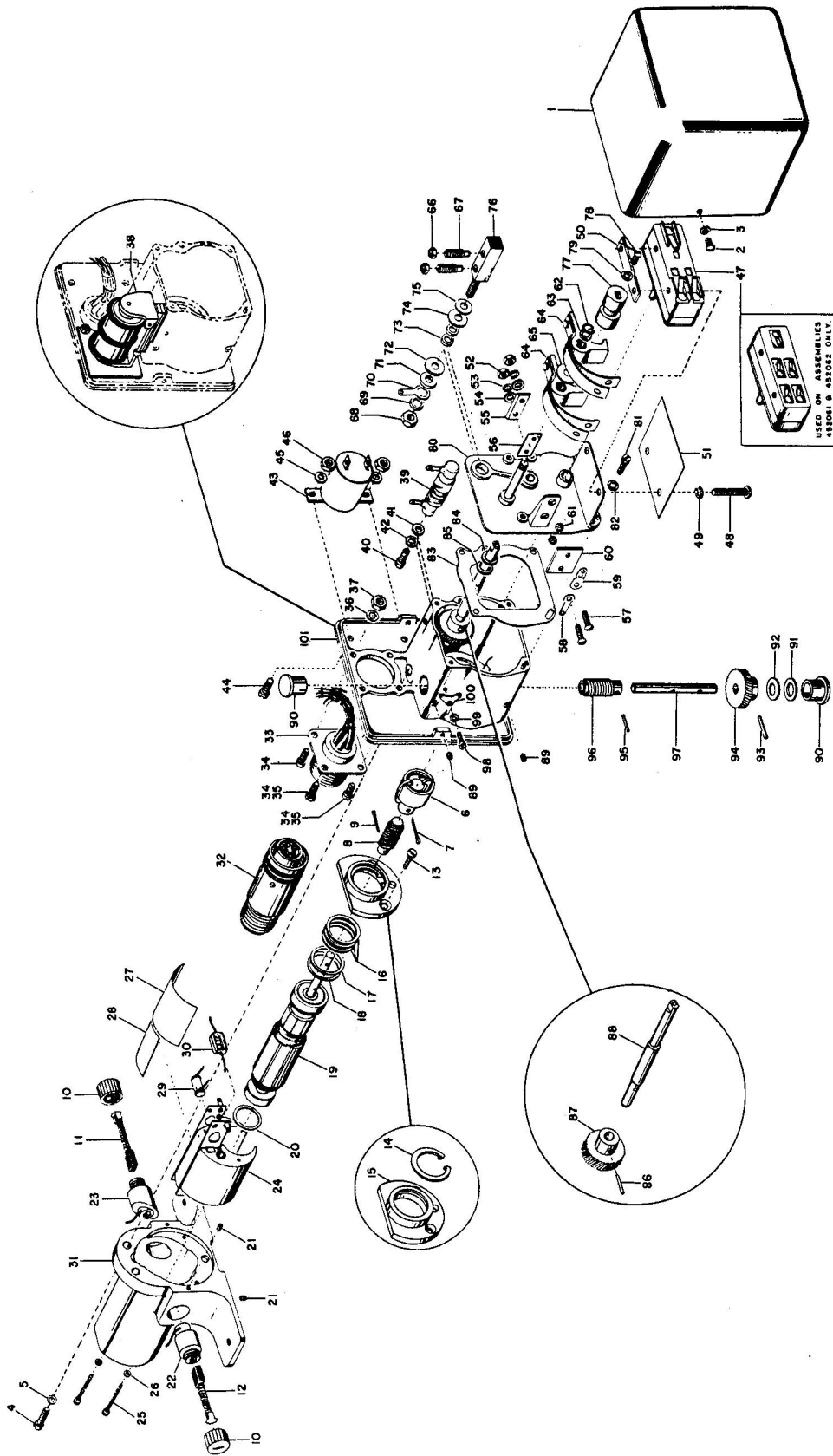


Figure 9-1 - Exploded View - Position Light Flasher

Group Assembly Part List

Group Assembly Part List

FIGURE AND INDEX NUMBER	GROUP POSITION LIGHT FLASHER ASSEMBLY		UNITS PER ASSY	USAGE ON CODE
	MAJOR ASSEMBLY STANDARD AND NUMERICAL PART LIST			
	PART NUMBER	1 2 3 4 5 6 7 NOMENCLATURE		
9-1	450250-0-3	POSITION LIGHT FLASHER	REF	A
	450350-0-3	POSITION LIGHT FLASHER	REF	B
	452061	POSITION LIGHT FLASHER	REF	C
	452062	POSITION LIGHT FLASHER	REF	D
	554230	POSITION LIGHT FLASHER	REF	E
-1	450286	COVER, Dust (ATTACHING PARTS)	1	ALL
-2	AN515-4-3	SCREW, Machine, rd hd, steel 4-40 x 3/16	2	ALL
-3	AN936A4	WASHER, Tooth lock, internal, steel, No. 4 bolt size	2	ALL
	406046	MOTOR AND ACTUATOR ASSEMBLY	1	AE
	407472	MOTOR AND ACTUATOR ASSEMBLY	1	C
	407496	MOTOR AND ACTUATOR ASSEMBLY	1	B
	407502	MOTOR AND ACTUATOR ASSEMBLY (ATTACHING PARTS)	1	D
-4	AN500-6-7	SCREW, Machine, fil h, steel, 6-32 x 7/16	3	ALL
-5	AN935-6	WASHER, Spring lock, steel, No. 6 bolt size	3	ALL
-6	4500289	ACTUATOR ASSEMBLY (ATTACHING PARTS)	1	ALL
-7	901220	PIN - COTTER	1	ALL
-8	BX-71-10	WORM GEAR (ATTACHING PARTS)	1	ALL
-9	901208	PIN, COTTER	1	ALL
	450350-0-1	MOTOR ASSEMBLY, Flasher	1	BD
	450950-0-1	MOTOR ASSEMBLY, Flasher	1	ACE
-10	4274	CAP, Brush holder	2	ALL
-11	454760	BRUSH, Positive	1	ALL
-12	454761	BRUSH, Negative	1	ALL
	450953	PLATE ASSEMBLY, End (ATTACHING PARTS)	1	ALL
-13	AN505-4-6	SCREW, Machine, flat hd, 82°, steel 4-40 x 3/8	2	ALL
-14	NAS50-75	RING	1	ALL
-15	549442	PLATE	1	ALL
-16	450095	SHIM, .003 steel	AR	ALL
-17	451425	SHIM, .005 steel	AR	ALL
-18	451426	SHIM, .010 steel	AR	ALL
-19	450353	ARMATURE ASSEMBLY	1	BD
	450954	ARMATURE ASSEMBLY	1	ACE
	454670	BEARING - Commutator end (ND77035LR1E)	1	ALL
	405492	BEARING - Rear (ND77034LR1F)	1	ALL
-20	450096	SHIM,	1	ALL
-21	450982	SCREW, Set, fluted socket, cup point	4	BD

FIGURE AND INDEX NUMBER	GROUP POSITION LIGHT FLASHER ASSEMBLY							UNITS PER ASSY	USAGE ON CODE	
	MAJOR ASSEMBLY STANDARD AND NUMERICAL PART LIST									
	PART NUMBER	1	2	3	4	5	6 7			NOMENCLATURE
9-1	461499K1							SCREW, Set	4	ACE
-22	406041							HOLDER ASSEMBLY, Brush, negative	1	ALL
-23	450983							HOLDER ASSEMBLY, Brush, positive	1	ALL
-24	406042							FIELD ASSEMBLY	1	ACE
	407504							FIELD ASSEMBLY (ATTACHING PARTS)	1	BD
-25	AN500C4-12							SCREW, Machine, fil h, CRS, 4-40 x 3/4	2	ALL
-26	AN935-4							WASHER, Spring lock, steel No. 4 bolt size	2	ALL
-27	450094							INSULATOR STRIP	1	ALL
-28	548555							INSULATOR STRIP	1	ALL
-29	412339							THERMISTER	1	ALL
-30	468097							CAPACITOR	1	ALL
-31	409158							HOUSING ASSEMBLY, Motor	1	ALL
-32	407468							PLUG, Electrical	1	CD
	AN3106-14S									
	-5S							PLUG, Electrical connector, straight, 7/8-20 thd	1	AB
-33	406975							CABLE ASSEMBLY	1	AB
	407469							CABLE ASSEMBLY	1	CD
	554323							CABLE ASSEMBLY (ATTACHING PARTS)	1	E
-34	AN500-4-7							SCREW, Machine, fil h, steel, 4-40 x 7/16	4	ABCD
	AN500-4-7							SCREW, Machine, fil h, steel, 4-40 x 7/16	2	E
-35	AN500-4-6							SCREW, Machine, fil h, steel, 4-40 x 3/8	2	E
-36	AN936 A4							WASHER, Tooth lock, internal, steel, No. 4 bolt size	4	ALL
-37	AN340-4							NUT, Light hex, steel 4-40 NC2	4	ABCD
	AN340-4							NUT, Light hex, steel 4-40 NC2	2	E
-38	554322							RELAY ASSEMBLY	1	E
-39	406974							CHOKE (ATTACHING PARTS)	1	ALL
-40	AN500-4-6							SCREW, Machine, fil h, steel, 4-40 x 3/8	1	ALL
-41	AN935-4							WASHER, Spring lock, steel, No. 4 bolt size	1	ALL
-42	AN936-A4							WASHER, Tooth lock, internal, steel, No. 4 bolt size	1	ALL
-43	406649							CAPACITOR (ATTACHING PARTS)	1	ALL
-44	AN500-6-5							SCREW, Machine, fil h, steel, 6-32 x 5/16	2	ALL
-45	AN936-A6							WASHER, Tooth lock, internal, steel, No. 6 bolt size	2	ALL
-46	AN340-6							NUT, Light hex, steel, 6-32 NC2	2	ALL
-47	407466							MICRO SWITCH, (Microswitch BZ-3YSTC)	1	CD
	450291							MICRO SWITCH, (Microswitch BZ-7RSTC) (ATTACHING PARTS)	1	ABE
-48	460506							SCREW	2	ALL
-49	AN960-6							WASHER, Flat, steel, No. 6 bolt size	AR	ALL

FIGURE and INDEX NUMBER	GROUP POSITION LIGHT FLASHER ASSEMBLY							Units Per Assy	Usage on Code		
	MAJOR ASSEMBLY STANDARD AND NUMERICAL PART LIST										
	PART NUMBER	1	2	3	4	5	6			7	NOMENCLATURE
9-1-50	407320								NUT,	1	ALL
-51	15694								STRIP, Insulating	1	ALL
-52	AN340-4								NUT, Light hex, steel, 4-40 NC2	2	ALL
-53	AN935-4								WASHER, Spring lock, steel, No.4 bolt size	2	ALL
-54	AN960-4								WASHER, Flat, steel, No.4 bolt size	2	ALL
-55	16294								STRIP, Jumper contact insulating	1	ALL
-56	407015								INSULATOR	1	ALL
-57	AN515-4-7								SCREW, Machine, rd, hd, steel, 4-40 x 7/16	2	ALL
-58	407390								LUG, Terminal	1	ALL
-59	547823								LUG, Terminal	1	ALL
-60	16289								BOARD, Jumper contact insulator	1	ALL
-61	407014								WASHER,	2	ALL
-62	560155								SPRING, Retaining	1	ALL
-63	AN960-10L								WASHER, Flat, steel, No.10 bolt size	2	ALL
-64	450273								BREAKER	2	ALL
-65	450260								WASHER, Phenolic	1	ALL
-66	16475								NUT, Lock	2	ALL
-67	450292								SCREW, Contact	2	ALL
-68	AN345-10								NUT, Light hex, steel, 10-32 NF2	1	ALL
-69	AN935-10								WASHER, Spring lock, steel, No.10 bolt size	1	ALL
-70	450294								LUG, Terminal	1	ALL
-71	AN960-10								WASHER, Flat, steel, No.10 bolt size	1	ALL
-72	450260								WASHER, Phenolic	1	ALL
-73	450259								TUBING, Flasher insulating	2	ALL
-74	450260								WASHER, Phenolic	1	ALL
-75	AN960-10L								WASHER, Flat, steel, No.10 bolt size	1	ALL
-76	16268								POST, Flasher contact	1	ALL
-77	407464								CAM	1	ALL
									(ATTACHING PARTS)		
-78	AN515-4-4								SCREW, Machine, rd hd, steel, 4-40 x 1/4	1	ALL
-79	AN936-A4								WASHER, Tooth lock, internal, steel, No.4 bolt size	1	ALL
-80	450257								PLATE ASSEMBLY (ATTACHING PARTS)	1	ALL
-81	AN500-4-7								SCREW, Machine, fil h, steel, 4-40 x 7/16	4	ALL
-82	AN936-A4								WASHER, Tooth lock, internal, steel, No.4 bolt size	4	ALL
-83	450263								GASKET, Gear box	1	ALL
-84	468138								SHIM, .010 steel	AR	ALL
-85	451990								SHIM, .005 steel	AR	ALL
	450267								CAMSHAFT ASSEMBLY	1	ALL
-86	466504-1-5-8								PIN, Groove	1	ALL
-87	450268								GEAR, Worm drive	1	ALL
-88	450274								SHAFT, Camshaft	1	ALL
-89	450293								SCREW, Set	2	ALL
-90	450272								BUSHING, Jackshaft	2	ALL

FIGURE and INDEX NUMBER	GROUP POSITION LIGHT FLASHER ASSEMBLY							Units Per Assy	Usage on Code	
	MAJOR ASSEMBLY STANDARD AND NUMERICAL PART LIST									
	PART NUMBER	1	2	3	4	5	6 7			NOMENCLATURE
9-1-91	468138							SHIM	1	ALL
-92	450260							WASHER	1	ALL
	450249							JACKSHAFT ASSEMBLY	1	ALL
-93	466504-1-5-8							PIN, Groove	1	ALL
-94	450265							GEAR, Worm Drive	1	ALL
-95	466504-1-5-5							PIN, Groove	1	ALL
-96	409716							GEAR, Worm	1	ALL
-97	450258							SHAFT	1	ALL
-98	AN500-4-3							SCREW, Machine, fil h, steel, 4-40 x 3/16	1	ALL
-99	AN935-4							WASHER, Spring lock, steel, No. 4 bolt size	1	ALL
-100	406970							LUG, Terminal	1	ALL
-101	406973							BOX ASSEMBLY, Gear	1	ALL