

TROUBLE	PROBABLE CAUSE	REMEDY
TURRET HUNTS CONTINUOUSLY, HUNTING CENTERED 180° FROM PROPER ZERO.	Reversed connections on output terminals of amplidyne generator.	Correct connections.
	Reversed connections (B & F) to control field of amplidyne generator.	Correct connections.
TURRET HUNTS CONTINUOUSLY, HUNTING ABOUT FIXED POINT BUT INCORRECTLY ALIGNED.	Mis-alignment of 31-speed and one-speed selsyn zeros.	Zero selsyns.

TROUBLE	PROBABLE CAUSE	REMEDY
TURRET HUNTS CONTINUOUSLY, HUNTING AT CERTAIN POSITIONS ONLY.	Open selsyn stator lead.	Correct connection.
	Reversed selsyn stator leads on one selsyn. (Remove one selsyn cap and check direction in which turret follows sight to determine which selsyn is reversed.)	Correct connection.
TURRET ROTATES 180° FROM PROPER ZERO POINT, FOLLOWS DIRECTION OF SIGHT, BUT DOES NOT HUNT.	Reversed turret motor field.	Correct connections.
	Reversed connections to turret motor armature.	Correct connections.
	Reversed connections (C & D) to primary of servo-amplifier power transformer.	Correct connections.
	Reversed connections (R1 & R2) to rotors of both one-speed and 31-speed selsyn generators.	Correct connections.
	Reversed connections (R1 & R2) to both one-speed and 31-speed control transformer rotors.	Correct connections.
TURRET ROTATES IN OPPOSITE DIRECTION FROM SIGHT.	Reversed selsyn stator leads on both selsyns.	Correct connections.
TURRET OPERATION ABRUPT.	Open selsyn stator circuit.	Replace selsyn.
	Open selsyn rotor circuit, 31-speed selsyn set.	Replace selsyn.
	Binding of bearings, gears or turret rings.	Lubricate and/or readjust.
	Defective contact in one or more circuits, either in relays or connectors.	Replace contacts.
	Minor mis-alignment of 31-speed and one-speed selsyns.	Zero selsyns.
	Low a-c voltage.	Check dynamotor. Replace if necessary.
GUN POSITION INDEPENDENT OF SIGHT POSITION IN AZIMUTH. ELEVATION MOTION CORRECT.	Defective azimuth circuit wiring.	Correct connections.

TROUBLE	PROBABLE CAUSE	REMEDY
	Defective azimuth amplidyne.	Replace amplidyne.
	Defective azimuth motor.	Replace motor.
	Defective azimuth channel in amplifier.	Replace servo-amplifier.
TURRET SLUGGISH IN RESPONSE.	Supply voltage low, due to defective regulator.	Replace voltage regulator.
	Supply voltage low, due to defective generator.	Replace generator.
	Defective turret bearings.	Replace bearings.
	Defective amplidyne.	Replace amplidyne.
	Defective turret drive motor.	Replace motor.
	Defective servo-amplifier.	Replace servo-amplifier.
BORESIGHT CHECK INDICATES GUNS ARE NOT CORRECTLY ALIGNED WITH SIGHTS.	Gun mounting adjustment incorrect in turret.	Boresight guns.
	Unbalanced servo-amplifier.	Balance servo-amplifier.
	Defective amplidyne field.	Replace amplidyne.
	Selsyns not zeroed correctly.	Zero selsyns.
	Change in mounting position of turret or sight.	Align mounting.
NO RESPONSE TO ACTION OF SIGHT.	Amplidyne not operating.	Replace amplidyne.
	Defective dynamotor.	Replace dynamotor.
	Servo-amplifier connection defective.	Correct connection.
	Defective servo-amplifier.	Replace servo-amplifier.
	Defective action switch circuit.	Check and correct defective circuit.
TURRET HAS ERRATIC OPERATION.	Loose connections.	Correct connections.

TROUBLE	PROBABLE CAUSE	REMEDY
	Defective slip rings or brushes in turret, sight collector, dynamotor or selsyn.	Replace defective part.
OPERATION ACCOMPANIED BY VIBRATION OF THE DRIVE MOTOR AND GUNS.	Too much sensitivity in amplidyne.	Adjust at amplifier or replace amplidyne.
TURRET MOTOR FAILS TO OPERATE.	Defective connection.	Locate and correct defective connection.
	Turret jammed.	Locate and correct cause for turret jamming.
	Binding armature.	Replace motor.
	Incorrect or defective wiring.	Locate and correct defective wiring.
	Defective motor.	Replace motor.
	Improperly seated brushes.	Remove and reseal brushes correctly.
TURRET MOTORS ROTATE IN WRONG DIRECTION.	Incorrect wiring.	Correct wiring.
TURRET MOTOR ERRATIC OR SLUGGISH.	Defective brushes.	Replace brushes.
	Defective commutator.	Replace motor.
GUN CHARGER FAILS TO OPERATE WHEN FIRING KEY IS CLOSED.	Defective electric connection to charger.	Check firing lead and charger lead connected to shell of connector and correct if defective.
	Complete lack of air pressure.	Check pressure supply.
	Defective timer operating switch.	Replace timer.
CHARGER SLUGGISH IN OPERATION.	Low air pressure.	Correct pressure to at least 1000 psi.
	Air leakage through exhaust port.	Replace gun charger.
	Air leakage around piston assembly.	Replace piston assembly.
	Supports clamping cylinder too tight.	Loosen screws slightly.

TROUBLE	PROBABLE CAUSE	REMEDY
	Broken piston-spring.	Replace piston assembly.
SEAR-PIN MOVES BUT MOTOR FAILS TO OPERATE.	Timer reset improperly.	Move timer reset-button to START position.
	Motor mount binding motor too tightly.	Loosen screw holding motor in mount.
	Defective lead to motor.	Repair lead.
	Defective motor.	Replace motor.
	Defective motor brush.	Replace brush.
SEAR-PIN FAILS TO MOVE BUT MOTOR OPERATES.	Binding in bell cranks.	Replace gun charger.
	Defective solenoid switch.	Replace gun charger.
	Defective firing-solenoid coil.	Replace gun charger.
MOTOR OPERATES BUT INTAKE VALVE DOES NOT OPEN.	Defective charging-solenoid coil.	Replace gun charger.
	Insufficient friction between solenoid switch button arm and timer sleeve.	Replace timer.
	Defective solenoid switch.	Replace timer.
CHARGING SOLENOID OPERATES BUT VALVE DOES NOT OPEN.	Too much clearance between valve stem nut and charging plunger bushing.	Adjust clearance to 0.015-inch.
AIR LEAKS WHEN AIR PRESSURE IS FIRST APPLIED TO BLOCK.	Defective valve.	Replace valve.
	Weak or defective valve-compression spring.	Replace spring.
	Loose or worn nipple.	Replace nipple.
AIR LEAKS WHEN CHARGER OPERATES.	Improper seating of valve on exhaust port.	Adjust seating of valve.
	Defective valve-compression spring.	Replace spring.
	Leakage around piston assembly.	Replace piston assembly.

TROUBLE	PROBABLE CAUSE	REMEDY
CHARGER CONTINUES TO OPERATE WITHOUT STOPPING.	Defective timer operating switch.	Replace timer.
	Timer reset-button arm out of adjustment.	Replace timer.
SEAR-PIN REMAINS EXTENDED.	Dirt between sear-pin and mounting bar.	Clean sear-pin.
	Dirt in bell cranks.	Clean bell cranks.
	Defective solenoid spring.	Replace solenoid spring.
CHARGER FORCES GUN TO EJECT LIVE ROUNDS OF AMMUNITION.	Solenoid switch lever improperly set.	Replace timer.
	Friction between solenoid switch lever arm and timer sleeve too great.	Replace timer.
SEAR-PIN OPERATES BUT GUN FAILS TO FIRE.	Setting of sear-pin incorrect.	Adjust sear-pin to timing of gear.
	Low voltage.	Adjust voltage to 24 volts d c.
VALVE OPERATES BUT AIR DOES NOT ENTER CHARGER.	Dust strainer in valve block clogged.	Replace valve block assembly.
CHARGER CHARGES VERY FAST BUT DOES NOT CHARGE GUN.	Stud not installed in gun bolt.	Install stud.
CHARGER STOPS OPERATING TOO SOON (IN LESS THAN TWO SECONDS).	Friction between reset button arm and timer shaft too low.	Replace timer.
GUN FAILS TO CEASE FIRING WHEN FIRING CIRCUIT IS OPENED.	Solenoid spring is defective and linkage of bell crank is jammed, preventing retraction of sear-pin.	Replace solenoid spring and bell crank assembly.
AMMUNITION BOOSTER SPROCKET WHEEL WILL NOT ROTATE.	Defective free wheeling assembly.	Replace free wheeling assembly.
AMMUNITION BOOSTER MOTOR DRIVING UNIT DRIVES, BUT OTHER UNIT DOES NOT.	Defective flexible cable.	Replace flexible cable.
	Bevel gear not engaged on either shaft.	Check that bevel gears are engaged on shafts.
AMMUNITION BOOSTER SPROCKET TURNS BACKWARD.	Defective brake assembly or wrong hand brake assembled.	Replace brake assembly with one that prevents reverse rotation.

TROUBLE	PROBABLE CAUSE	REMEDY
AMMUNITION BOOSTER MOTOR FAILS TO OPERATE.	Open electrical circuit.	Check electrical circuits both externally and internally.
	Defective field coil.	Replace motor.
	Defective brush.	Replace brush.
AMMUNITION BOOSTER SPROCKET TURNS ONLY IN REVERSE DIRECTION.	Free wheeling assembly interchanged.	Replace free wheeling assembly with one which drives in proper direction.
AMMUNITION BOOSTER SPROCKET TURNS BUT AMMUNITION BELT NOT DRIVEN.	Defective sprockets.	Replace sprocket and shaft assembly.
	Ammunition guide bent sufficiently to impede belt.	Bend guides sufficiently to allow ammunition belt to pass freely.

2-4. SELSYNS. (See figures 2-3 and 2-4.)

2-5. DESCRIPTION. Four General Electric selsyns are used on each turret and on the sighting station. The selsyns on the turret are selsyn control transformers, a one-speed and a 31-speed selsyn for each movement of the turret (azimuth and elevation). The selsyns on the sighting station are selsyn generators, a one-speed and a 31-speed for each movement of the sighting station (azimuth and elevation). The selsyn generators transmit the voltage signal indicating the position of the sighting station. The selsyn control transformers receive this voltage signal and compare it with the voltage signal indicating the position of the turret. The voltage error, or difference between these voltage signals, is transmitted to the servo-amplifier for use in bringing the turret and sighting station into correspondence. Thus, the output of the selsyn control transformers is an electrical indication of the error in the correspondence between the turret and the sighting station. The polarity or phase of the output is an indication of the direction of error. The one-speed selsyns transmit and correct the large errors in correspondence of the turret and sighting station position; the 31-speed selsyns transmit and correct the small remaining errors.

2-6. REMOVAL.

- a. Disconnect electrical plug.
- b. Remove attaching screws.
- c. Lift selsyn from splined shaft connection.

2-7. MINOR REPAIR. The rotor and stator of the selsyns are matched and balanced assemblies and must be replaced as a unit.

2-8. INSTALLATION.

- a. Install selsyn on splined shaft.
- b. Install attaching screws.
- c. Connect electrical plug.

2-9. ADJUSTING SELSYN CONTROL TRANSFORMERS (ZEROING SELSYNS). (See figure 2-5.)

- a. Position turret to aft and horizontal; latch turret.
- b. Remove selsyn cap and make connections as shown in detail A-1, figure 2-5, to apply 115-volt, 400-cycle power.
- c. Loosen selsyn clamps (figure 2-6) and rotate selsyn stator until voltmeter indicates a minimum voltage.
- d. Remove connections and connect as shown in detail A-2, figure 2-5. Use a voltmeter capable of indicating 0.1 volt.
- e. Turn selsyn stator until voltmeter reads zero, being sure to turn in the direction that will reduce the voltage to zero. Tighten selsyn clamps, being sure that voltmeter reading does not change.

2-10. ADJUSTING SELSYN GENERATORS (ZEROING SELSYNS). (See figure 2-5.)

- a. Position sight to aft and horizontal; latch sight.
- b. Remove selsyn caps and make connections as shown in detail B-1, figure 2-5, applying 115-volt, 400 cycle power.
- c. Loosen selsyn clamps and rotate stator until voltmeter indicates a minimum voltage.

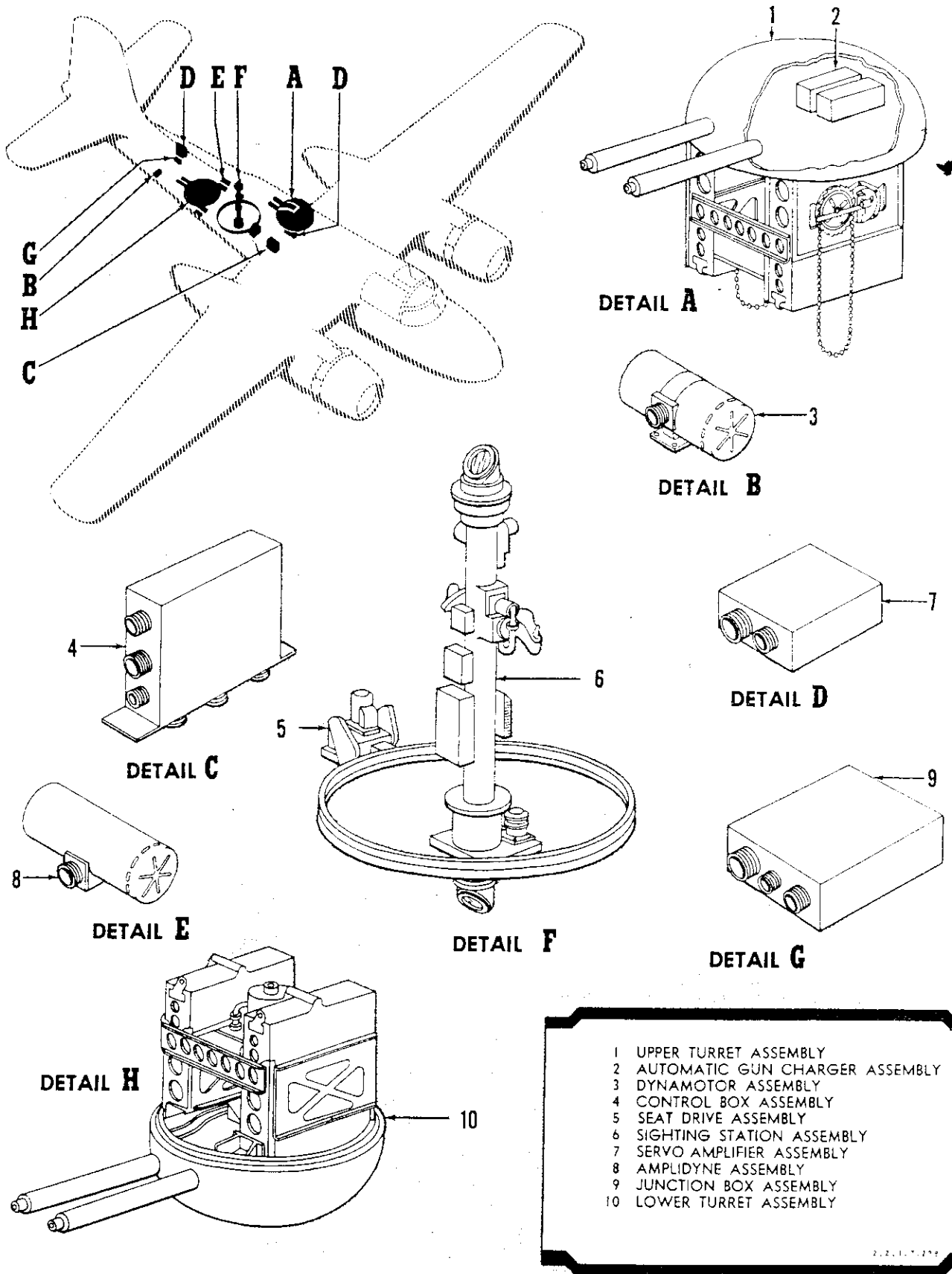


Figure 2-1. Central Fire Control Components

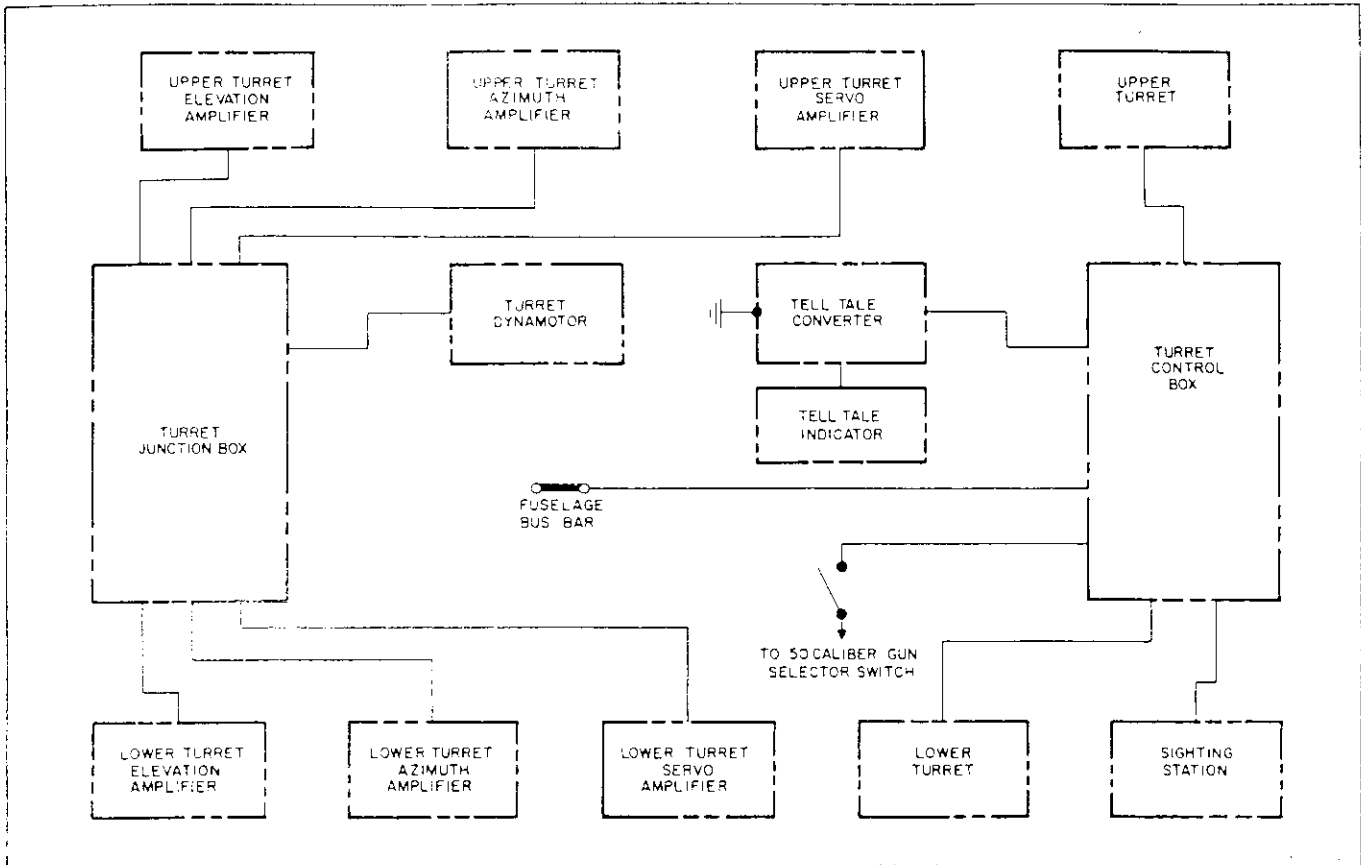


Figure 2-2. CFC Simplified Diagram

d. Remove connections and connect as shown in detail B-2, figure 2-5, using a voltmeter capable of indicating 0.1 volt.

e. Turn stator until voltmeter indicates zero volts. Tighten selsyn clamps, making sure voltmeter reading does not change.

2-11. CONTROL BOX. (See figure 2-7.) The turret control box is mounted on the left-hand side of the gunner's compartment. The box is secured to its mount by four attaching screws. On the face of the control box are the following switches: A-C POWER; UPPER TURRET POWER; LOWER TURRET POWER; UPPER TURRET GUNS FIRE; LOWER TURRET GUNS FIRE, and the UPPER TURRET TRANSFER switch. Three circuit breakers, included in the turret wiring, are mounted on the face of the control box. The control box carries the overload protective equipment for the system; two turret firing relays and the manually operated switches for selectively controlling the energization and deenergization of the selsyn's major units. Electrical connectors are provided on the box to facilitate the removal and installation of the unit. The control box is not to be repaired in the field. In the event of malfunction, the box is to be removed and replaced by a serviceable unit.

2-12. JUNCTION BOX. (See figure 2-8.) The turret junction box, secured by screws to the floor of the aft right-hand side of the fuselage, provides a central location for electrical conductors. The junction box also houses relays, capacitors and miscellaneous electrical devices needed for operating the system. Electrical connectors are provided on the box to facilitate the removal and installation of the unit. The

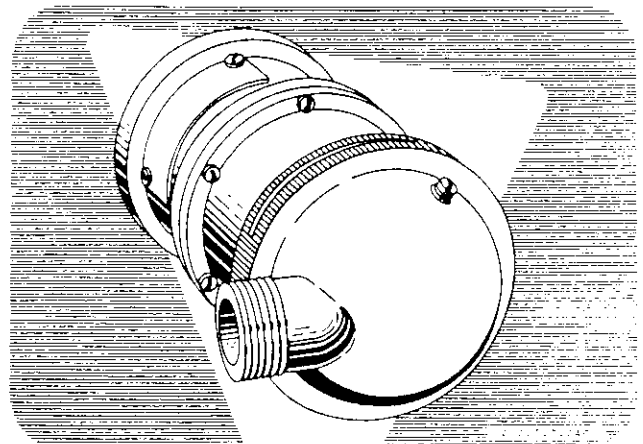


Figure 2-3. Selsyn Control Transformer

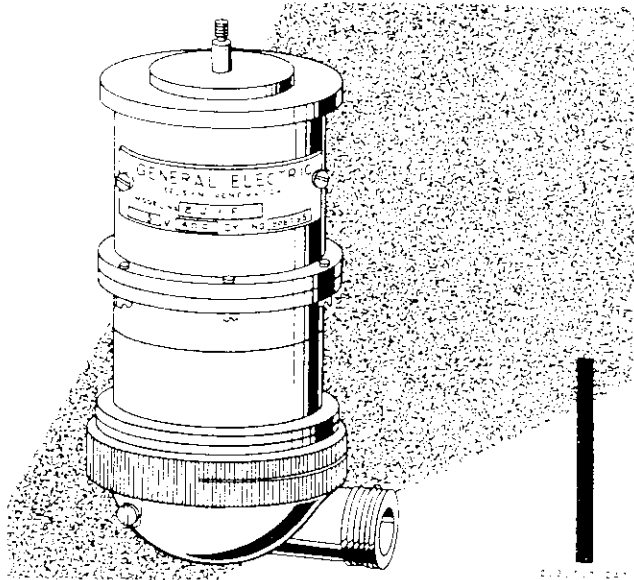


Figure 2-4. Selsyn Generator

junction box is not to be repaired in the field. In the event of malfunction, the box is to be removed and replaced by a serviceable unit.

2-13. DYNAMOTOR. (See figure 2-9.)

2-14. DESCRIPTION. The General Electric dynamotor, part No. 5D21NJ3, is a combination motor-

generator with a common magnetic field and a two-winding armature (motor assembly), mounted in the fuselage, aft of the lower turret. It converts the 24-volt, d-c power of the airplane electrical system into 115-volt, 400-cycle, a-c power for the operation of the selsyn system and the servo-amplifier. The dynamotor is composed of a stator assembly, motor assembly, commutator-end brush rigging, capacitor and resistor. Removal and installation of the dynamotor is made with four bolts. The electrical plug must also be removed and installed.

2-15. MINOR REPAIR.

Note

Commutator sparking should not cause alarm unless it is excessive. These dynamotors are designed to permit pinpoint sparks, but a continuous roll of sparks which are bright and appear to be very hot cannot be tolerated. Occasional streamer sparks are permissible, as they are merely brush treatment shooting off as burning vapor. Brushes should be replaced when they are worn to within 1/16-inch of the metal brush holder. It is desirable to change all brushes if one or two are worn. Such practice will require less frequent disassembly.

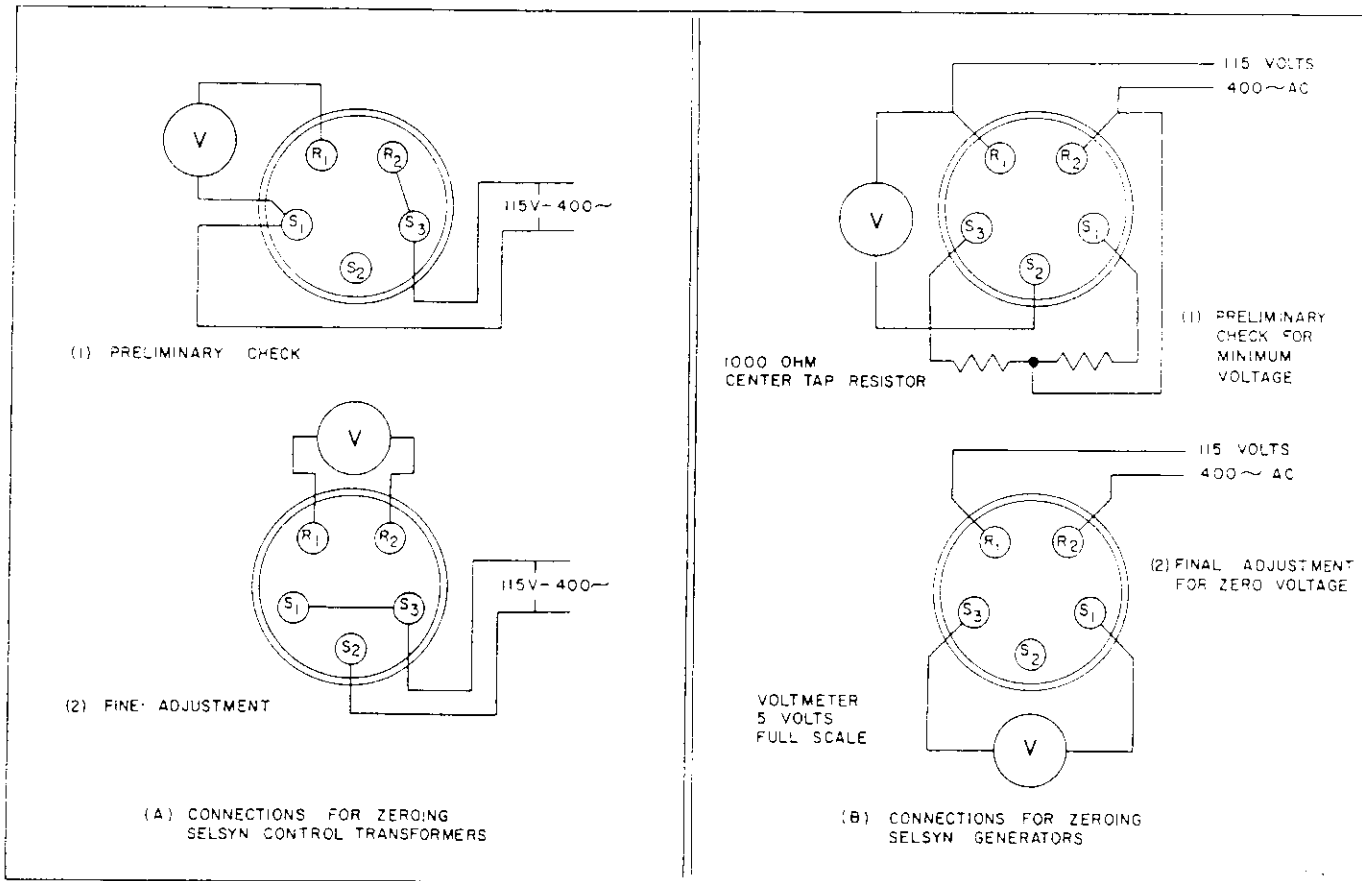


Figure 2-5. Zeroing Selsyn

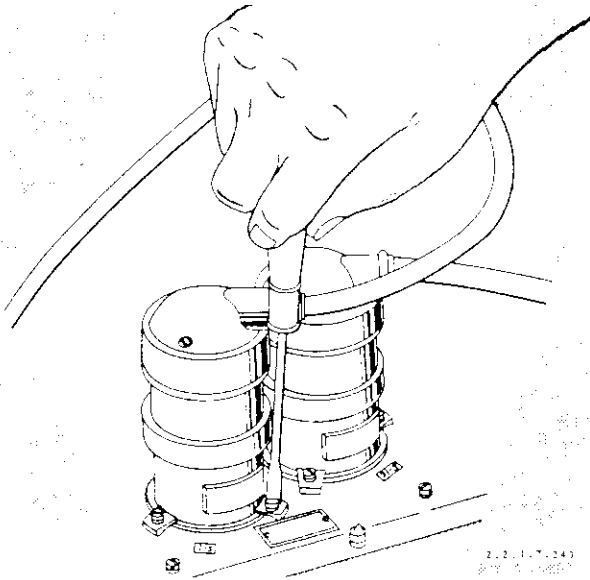


Figure 2-6. Loosening Clamps on Selsyn

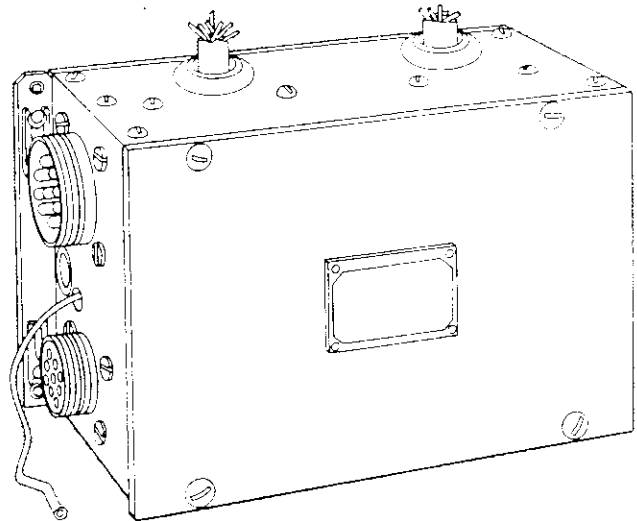


Figure 2-8. Turret Junction Box

2-16. REPLACING BRUSHES A-C END.

- a. Remove drive motor brushes by loosening brush mounting screws.
- b. Install new brushes and tighten mounting screws.
- c. Paint heads of screws with glyptol insulating varnish, Specification MIL-V-1137.
- d. Apply a strip of No. 0000 sandpaper to commutator with water-soluble glue, being sure that no overlap is evident.
- e. Hold brushes up and reassemble rotor to end shield.

- f. Release brushes onto commutator.
- g. Turn rotor until brushes are sanded into 80 percent fit.
- h. Remove sandpaper and glue with a damp cloth.
- i. Thoroughly clean rotor, stator and brush rigging with compressed air, carbon tetrachloride or both.

WARNING

Use carbon tetrachloride only in a well ventilated area, as its fumes are toxic.

j. Run the dynamotor at no load for an hour. Use of brush-seating stones is not recommended.

k. If brush yoke has not been moved, it should not be necessary to set a new brush position. Brush yoke position on the a-c end is of no importance.

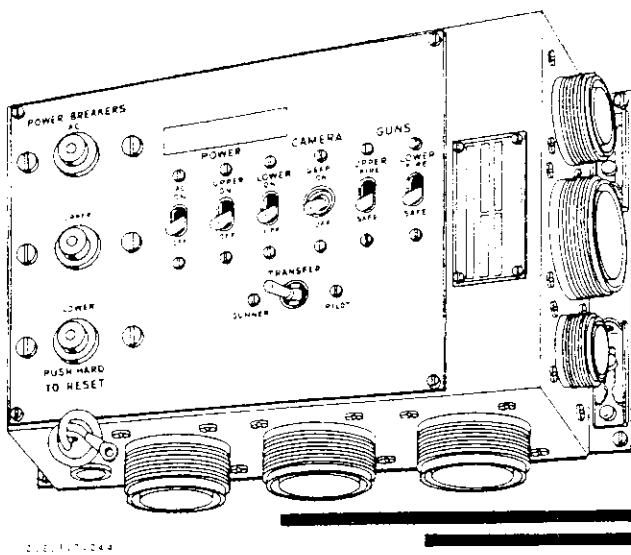


Figure 2-7. Turret Control Box

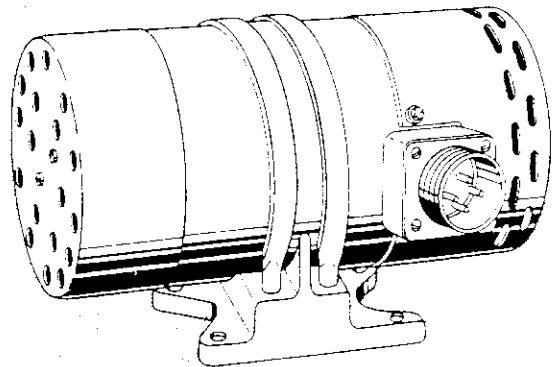


Figure 2-9. Turret Dynamotor