Beech Aircraft Corporation

OVERHAUL SPECIFICATION

INVERTERS - MODEL C-45G, C-45H, AND SNB-5

OVERHAUL SPECIFICATION 3412

ISSUED May 13, 1953

REVISED September 9, 1954

M. D. DAVIS
M. D. Davis
Writer

R. B. Bosworth
R. B. Bosworth
Chief Liaison Engineer

J. R. Ball
For [illegible] Balapp
Model Project Engineer

A. St. Odevseff
Chief Project Engineer - Military

M. R. Terry
USAF Quality Control

A54

E-371

Scott Aircraft Corporation

OVERHAUL SPECIFICATION 3412

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TITLE INVERTERS - MODEL C-45G, C-45H, AND SNB-5

ISSUED May 13, 1953

WRITTEN BY M. D. Davis, Revised: T. E. Taylor REVISED September 9, 1954

1. SCOPE

1.1 Purpose.- The purpose of this specification is to provide instructions for reconditioning and modifying 94-32270-A, MG-149-F and MG-149-H inverters for use on Model C-45G, C-45H, and SNB-5 aircraft.

1.2 Application.- All reconditioning operations and repairs covered by this specification may be accomplished where required without further authorization. Repairs not authorized by this specification cannot be performed without further authorization.

1.3 List of Pages and Revisions.- This specification consists of the pages listed below. An asterisk (*) denotes the pages revised by the current revision.

Page	Date	Description of Revision	Serial Effectivity
1*	9-9-54	Record Revision	Record Change
2	5-13-53		
3	5-13-53		
4	5-13-53		
5	5-13-53		
6	5-13-53		
7	5-13-53		
8	5-13-53		
9	5-13-53		
10*	9-9-54	Revised to standardize on test equipment and test procedures for MG-149-F and MG-149-H inverters. The revised specification has only 19 pages.	Record Change
11*	9-9-54		Record Change
12*	9-9-54		Record Change
13*	9-9-54		Record Change
14*	9-9-54		Record Change
15*	9-9-54		Record Change
16*	9-9-54		Record Change
17*	9-9-54		Record Change
18*	9-9-54		Record Change
19*	9-9-54		Record Change
20*	9-9-54	Deleted	
21*	9-9-54	Deleted	
22*	9-9-54	Deleted	

2. APPLICABLE PUBLICATIONS

2.1 Specifications:

2.1.1 Beech.-

OS 7008 General Acceptable Quality Standards

2.2 Technical Orders.- Compliance with this specification constitutes compliance with the technical orders listed below,

03-5H-5	Types MG-149-F and MG-149-H Inverters, dated October 18, 1949
03-5H-22	Electrical Equipment - Testing MG-149F Inverters, dated June 17, 1946

3. REQUIREMENTS

3.1 Parts Involved:

3.1.1 Parts Not Used.- None.

3.1.2 Parts to be Reconditioned.- The following parts are to be reconditioned in accordance with the instructions contained herein. "Reconditioned" means the disassembly, cleaning, inspection and correction of discrepancies, repair and/or replacement of components, and modifications to incorporate changes in accordance with applicable engineering drawings to assure an operationally safe and serviceable aircraft.

Type MG-149-F	Inverter
Type MG-149-H	Inverter
94-32270-A	Inverter (SNB-5 only)

3.1.3 Parts to be Supplied New.- None.

3.2 Cause for Rejection.- The following specific conditions as well as damage or wear which cannot be corrected by one or more of the methods listed herein is cause for rejection.

3.2.1 Type MG-149-F Inverter:

3.2.1.1 Armature Assembly.-

(a) Short circuited or open circuited DC armature.

(b) Grounded motor armature.

3.2.1.2 Field Ring Assembly.-

(a) Short circuited or grounded motor shunt field.

(b) Open motor shunt winding.

(c) Open motor shunt field winding.

(d) Short circuit in stator.

(e) Open circuit in stator winding.

(f) Grounded field coils.

3.2.1.3 Governor Stationary Unit.-

(a) Badly pitted contacts.

3.2.1.4 Governor Rotating Unit.-

(a) Excessive wear at point of contact between spring and bakelite button.

(b) Dimple in governor spring eccentric and cannot be trued up.

3.2.1.5 Filter Assembly.-

(a) Short circuit in filter capacitor.

(b) Defective filter.

3.2.1.6 Brush Ring and Holder Assembly.-

(a) Grounded brush holder.

3.1.2.7 Brushes.-

(a) Brushes worn so that brush holder spring is within 3/16-inch of bottom of slot in brush holder.

3.2.1.8 Lubricating Brush.-

(a) Brush worn so that brush holder spring is within 1/8-inch of bottom of slot in brush holder.

3.2.1.9 Bearings.-

(a) Excessively noisy or defective.

3.2.1.10 Resistor or Capacitor.-

(a) Open circuit.

3.2.2 Type MG-149-H Inverter.- Those causes listed in Paragraphs 3.2.1.1, 3.2.1.2, 3.2.1.5, 3.2.1.6, 3.2.1.7, 3.2.1.8, and 3.2.1.9 above also apply to Type MG-149-H inverter.

3.2.2.1 Field Ring Assembly.-

(a) Short circuited or open control field winding.

(b) Grounded control field.

3.2.2.2 Frequency Control Unit.-

(a) Open circuit in frequency control unit.

3.2.2.3 Rectifier.-

(a) Evidence of overheating.

(b) Speed and output frequency outside specified limits.

3.2.2.4 Reactor or Capacitor.-

(a) Speed and output frequency outside specified limits.

3.3 Reconditioning Operations:

3.3.1 Type MG-149-F Inverter.-

(a) Disassemble as follows:

(1) Remove covers and field and resistor leads from unit.

(2) Remove governor stationary unit and governor rotating unit.

(3) Remove brushes and lubricating brush.

(4) Remove filter unit and armature assembly.

(5) Remove bearings and field coil leads.

(6) Remove brush and ring holder assembly.

(7) Remove the resistor and the base.

(b) Inspect component parts of the inverter for nonrepairable conditions.

(c) Clean component parts with compressed air. Polish commutator with 4/0 sandpaper while armature is turning. Do not use file or emery paper or stone.

(d) Test for short circuits in the field coils by removing brushes from the commutator and applying 27.5-volt DC between terminal "D" of the receptacle and the base of the inverter. With governor contacts closed, the current drawn should not exceed 4.3 amperes.

(e) Check for burned out resistor by removing resistor lead from governor terminal. An open circuit between this lead and the base of the inverter indicates a burned out resistor.

(f) Test for a shorted capacitor or open filter coil in the filter by removing the leads from the filter terminal board and applying power and a test load to the leads instead of the receptacle.

(g) Check the concentricity of the dimple in the governor rotating unit by first connecting the shunt lead and the resistor lead together. Make certain this connection is insulated from the frame. With no load on the inverter,

3.3.1 Type MI-149-F Inverter.- (Continued)

apply 27.5 volts between terminal "P" of the receptacle and the base of the inverter. The inverter will run at approximately 7000 rpm. The spring member of the rotating unit will straighten out and a sharp pointed pencil touched lightly to the edge of the dimple will scribe a circle around the dimple. Shut off the inverter and check to see if the dimple is in the center of the circle. If this dimple is not in the center, bend the frame of the rotating unit in the direction which will bring the dimple into the center and recheck.

(h) Adjust the governor as follows: with the speed adjusting screw one turn clockwise from the extreme backed out position, adjust the "no load" speed to 6100 rpm ±25 rpm at 27.5 volts by properly positioning the rotating unit. To increase the speed move the rotating unit away from the ball-bearing hub, and to reduce the speed move the rotating unit toward the ball-bearing hub.

(i) Replace any parts found to be defective and/or repair as necessary as authorized in Paragraph 3.4 of this specification. Refer to Table 1 of this specification for group assembly parts list for numbers of replaceable parts.

(j) If necessary to replace brushes, insert the replacement brushes and fasten the pigtails in accordance with Figure 1 of this specification. Insert a strip of 4/0 sandpaper 7/8-inch wide between the commutator and the brushes with the sanded surface against the brushes. By drawing the sandpaper over the brush face the brushes will be fitted to the commutator. At least three-quarters of the brush face should be in contact with the commutator before the brush is considered properly fitted. (The lubricating brush need not be fitted to the commutator.) Before running inverter move the brushes to the flash neutral position on the commutator. Run the inverter for not less than 4 hours at rated load. The total movement of the brushes from the neutral should not exceed 1/8-inch at the outer edge of the brush ring.

(k) Reassemble inverter and functional test as outlined in Paragraph 3.5 of this specification. NOTE: During reassembly apply a small amount of light grease to the tip of the bakelite button of the stationary element of the governor and to the dimple in the rotating spring.

3.3.1 Type MG-149-F Inverter.- (Continued)

(1) Touch up rough spots and scratches with paint. Use a brush and match color as near as possible.

3.3.2 Type MG-149-H Inverter.-

(a) Disassemble as follows:

(1) Remove cover, fan, conducting brushes and lubricating brush.

(2) Remove filter unit and armature assembly.

(3) Remove bearings and field coil leads.

(4) Remove brush and ring holder assembly.

(5) Remove rectifier, capacitor and reactor assembly.

(6) Remove terminal board, control bracket and base.

(b) Inspect component parts of the inverter for nonrepairable conditions.

(c) Clean component parts with compressed air. Polish commutator with 4/0 sandpaper while armature is turning. Do not use file or emery paper or stone.

(d) Test for short circuited shunt field coils, with inverter disconnected, by removing the yellow lead from the capacitor clamp and the lead from the reactor terminal board and applying 28 volts between terminal "D" of the receptacle and the yellow lead. The current should not exceed 1.4 amperes.

(e) Test for a grounded shunt field coil by removing the brushes from the commutator, the yellow ground lead from the capacitor clamp, the lead from the reactor terminal board and the leads from terminal "D" at the filter. Apply a dielectric test voltage of 500 volts between the yellow ground lead and the frame.

(f) Test for short circuited control field coils, with the inverter disconnected, by unsoldering the leads from the black and red terminals of the rectifier and applying 28-volt DC to the black lead and the red lead. The current should not exceed 3.2 amperes.

(g) Test for open control field as described in Paragraph (b) above.

(h) Check the control field for a ground by unsoldering the red DC leads from the rectifier and applying a dielectric test voltage of 500 volts between these leads and ground.

3.3.2 Type MG-149-H Inverter.- (Continued)

(i) Check the condition of the reactor, with the inverter disconnected, by unsoldering the red lead from one terminal of the capacitor and applying 115 volts, 400 cycles to the red lead and terminal "4". The current taken by the reactor should be .85 to .95 amperes. These values will change dependent on the voltage and frequency. In order to determine these values under actual voltage and frequency, the use of the following formula will give the new correspondingly low and high current limits.

$$\frac{\text{Actual voltage}}{115} \times \frac{400}{\text{Actual frequency}} \times (.85) \text{ or } (.95)$$

The frequency can be determined by use of the following formula.

$$\text{Actual frequency} = \frac{\text{Actual rpm} \times 400}{6000}$$

(j) Check the condition of the capacitor by unsoldering the leads to both capacitor terminals and applying 115 volts, 400 cycles across both terminals. The current taken by the capacitor should be within .81 to .92 amperes when tested at room temperature. These values will change dependent on the voltage and frequency. In order to determine the values under actual voltage and frequency, the use of the following formula will give the new corresponding low and high current limits.

$$\frac{\text{Actual voltage}}{115} \times \frac{\text{Actual frequency}}{400} \times (.81) \text{ or } (.92)$$

(k) Make a rough check of the rectifier by running the inverter without load, but with a DC voltmeter connected across the red and black terminals. If the voltage is less than 18 volts, a defective rectifier is probable and a more complete check should be made as follows: Disconnect movable lead on reactor and unsolder red or black lead of rectifier. Apply 18 volts, 60 cycles across the AC terminals of the rectifier. The input current flowing through the rectifier under this condition should not exceed 0.114 amperes.

(l) Ground test rectifier, reactor, and capacitor by applying 1100 volts, 60 cycles from terminals to ground for 1 second.

3.3.2 Type MG-149-H Inverter.- (Continued)

(m) Test for a shorted capacitor or open filter in the filter by removing the leads from the filter terminal board and applying power and a test load to the leads instead of the receptacle.

(n) Replace any parts found to be defective and/or repair as necessary as authorized in Paragraph 3.4 of this specification. Refer to Table 2 of this specification for group assembly parts list for numbers of replaceable parts.

(o) If necessary to replace brushes, proceed as outlined in Paragraph 3.3.1(j) of this specification.

(p) Reassemble inverter and functional test as outlined in Paragraph 3.5 of this specification.

(q) Touch up rough spots and scratches with paint. Use a brush and match color as near as possible.

3.3.3 Inverter 94-32270A.-

(a) Recondition and functional test using general information contained in this specification.

3.4 Authorized Repairs:

3.4.1 Inverter Type MG-149-F.-

(a) File badly pitted governor contacts with a smooth file until at least 50 percent of their faces are smooth.

(b) Modify any inverters that do not have decal, Part No. 57101 with 36426 clip on brush holder and 56976 brush lubricating.

(c) Turn badly pitted commutator using a sharp tool.

3.4.2 Inverter Type MG-149-H.-

(a) Turn badly pitted commutator using a sharp tool.

TITLE INVERTERS - MODEL C-45D, C-45H, AND SMB-5

ISSUED May 13, 1953

Revised by: Ted Taylor

WRITTEN BY M. D. Davis REVISED September 9, 1954

3.5 Functional Test:

3.5.1 Inverter Type MS-149-H and MS-149-J

3.5.1.1 Test Equipment Required.-

Part Number	Nomenclature	Application
1	Resistor, 26.5 ohms	Artificial load, 115-volt circuit
2	Resistor, 35.2 ohms	Artificial load, 115-volt circuit
3	Resistor, 2.71 ohms	Artificial load, 26-volt circuit
4	DC Voltmeter, 0-30 volts	DC input voltage
5	DC Ammeter, 0-50 amps	DC input current
6	AC Voltmeter, 0-150 volts (400 cycles)	Output voltage
7	AC Voltmeter, 0-150 volts (400 cycles)	Output voltage
8	AC Ammeter, 0-5 amps (400 cycles)	Output current
9	AC Ammeter, 0-20 amps (400 cycles)	Output current
10	Wattmeter, 0-1000 watts (400 cycles) 150 volts, 5 amps	Output watts, 115-volt current
11	Wattmeter, 0-500 watts (400 cycles) 50 volts, 10 amps	Output watts, 26-volt circuit
12	DC Millivoltmeter, 0-50 millivolts	Setting brushes

(a) Part 1 is used for full load for the 115-volt circuit.

TITLE INVERTERS - MODEL C-45G, C-45K, AND SER-5

ISSUED May 13, 1953

Revised by: Ted Taylor

WRITTEN BY M. D. Davis REVISED September 9, 1954

3.5.1.1 Test Equipment Required.- (Continued)

(b) Part 2 is used for three-quarter load for the 115-volt circuit.

(c) Part 3 is used for the 26-volt full load.

3.5.1.2 Test Procedure.-

(a) With primary DC voltage of 28 volts applied between terminal "D" (+) and the base of the inverter (-), run the inverter at no load. The "no load" current should not exceed 12 amperes.

(b) Artificial Loads - 26-Volt Circuit.-

(1) A 2.71 ohm resistor provides a load of 250-volt amperes at 100 percent power factor, rated-load, when 26 volts, 400 cycles is applied.

(c) Artificial Loads - 115-Volt Circuit.-

(1) A 26.5 ohm resistor provides a load of 500-volt amperes at 100 percent power factor, rated-load, when 115 volts, 400 cycles, is applied.

(2) A 35.2 ohm resistor provides a load of 375-volt amperes at 100 percent power factor, three-quarter load, when 115 volts, 400 cycles is applied.

NOTE: The artificial loads remain fixed and the actual load varies with voltage and frequency.

(d) With primary DC voltage of 28 volts apply rated-load to the 26-volt circuit between terminal "D" and the base of the inverter. The motor current should not exceed 25 amperes.

(e) (Type MS-145K inverter only). With primary DC voltage of 28 volts apply rated-load on both 115-volt and 26-volt circuits. With the voltage adjustment board set at tap "1", the 115-volt circuit should be between 109.5 and 125.5 volts. The 26-volt circuit should be between 23 and 26 volts. The input current should not exceed 55 amperes.

TITLE INVERTERS - MODEL C-45G, C-45H, AND SMB-5

ISSUED May 13, 1953

Revised by: Ted Taylor

WRITTEN BY M. B. Davis REVISED September 9, 1954

3.5.1.2 Test Procedure.- (Continued)

(f) (MS-149-F inverter only). With a primary DC voltage of 27.5 volts, apply rated impedance load to the 26-volt winding and to the 115-volt winding (terminals "A" and "C" of the receptacle). The motor current should not exceed 40 amperes, and the voltage of the 115-volt circuit should be between 110 and 120 volts with the toggle switch on "HI".

(g) With primary DC voltage of 26 volts and three-quarter load on the 115-volt circuit only, the output voltage of the 115-volt circuit must be between 112 and 118 volts.

4. INSPECTION

4.1 General.- The parts will be inspected to the general acceptable quality standards of 08.7008 and the specific quality standards listed below.

4.1.1 Inverter Type MS-149-F Only:

4.1.1.1 Governor Rotating Unit.-

(a) Plated surface worn off the spring steel at the point of contact between the spring and the bakelite button does not necessarily indicate excessive wear.

4.1.1.2 Governor Contacts.-

(a) A badly balckened or pitted area does not indicate defective contacts.

4.1.2 Inverters Type MS-149-F and MS-149-H.-

4.1.2.1 Armature.-

(a) Slight burning at all segments is not necessarily evidence of a faulty armature.

TABLE I

INVERTER ASSEMBLY, TYPE MG-149-F

PART NUMBER	NOMENCLATURE	UNITS PER ASSY.
25258	INVERTER ASSEMBLY - TYPE MG-149F	1
36306	Ring Assembly-Field	1
#36325	Ring-Field	1
#36328	Stator-Wound	1
2046	Terminal(Patton-MacGuyer)	1
*103713	Screw-Stator-headless drive No.2 x 3/16 in.	3
36307	Coils-dc Field(set of four)	1
*#35949	Piece-Pole	4
12868	Screw-Pole piece drive No.2 x 3/8 in.	4
*AN505-416-8	Screw-Pole piece FH iron 1/4-20 x 1/2 in.	4
36288	Base	1
AN520B416-6	Screw-Base front RH brass 1/4-28 x 3/8 in.	2
105816ZP	Washer-Base front flat steel .016 thick #255 ID x .495 in. OD	2
AN520B416-8	Screw-Base rear RH brass 1/4-28 x 1/2 in.	2
*AN364B428	Nut-Base rear elastic stop brass 1/4-28 x 7/16 hex x 13/64 in.	2
56844	Bracket-Mounting	1
610	Rivet-Bracket tubular .146 dia. x 3/16 in. (Tubular Rivet)	4
36335	Switch and Lead Assembly	1
26354KC	Switch-(Arrow-Hart Hegeman)	1
56516	Plate-Escutcheon	1
56559	Plate-Engraved escutcheon	1
57422	Nut-Switch brass 15/32-32 x 9/16 hex x 5/64 in.	2
56518	Insulation-Switch	1
35932	Cap-Front	1
*56436	Ring-Ball bearing shoulder	1
*21133	Screw-Cap retaining fil-hd iron No. 10-32 x 7-5/16 in.	4
35973	Brush Ring and Holder Assembly	1
*56481	Spring-Brush	4
*36032	Clamp Assembly-Brush ring	2
*AN365-1032	Nut-Clamp elastic stop steel No. 10-32 x 3/8 hex x 15/64 in.	2
36027	Resistor and Lead	1
56485	Washer-Resistor centering	1

103811ZP	Screw-Resistor RH iron No. 6-32 x 1 7/16 in.	1
AN365B632	Nut-Resistor elastic stop brass No.6-32 x 5/16 hex x 11/64 in.	1
*36026	Armature Assembly-Complete	1
*20471	Armature Assembly-Wound	1
*56437	Washer-Ball bearing clamping	1
*CMC88502	Bearing-Ball(New Departure)	2
*56465	Nut-Ball bearing check thick	1
*56552	Nut-Ball bearing check thin	1
*AN935-8	Washer-Bearing screw kantlink lock No. 8 x 3/64 thick x 3/64 in. wide	3
*1038$5ZP	Screw-Bearing fil-hd iron No.8-32 x 13/16 in,	3
*35933	Cap-Back	1
*AN960-10L	Washer-Rear cap steel 7/16 OD x 13/64 ID x 1/32 in. thick	3
*AN365-1032	Nut-Rear cap elastic stop steel No.10-32 x 3/8 hex x 15/64 in.	4
36021	Rotating Unit-Governor	1
36022	Stationary Unit-Governor	1
56453	Button-Governor	1
AN365B632	Nut-Governor terminal elastic stop brass No.6-32 x 5/16 hex x 11/64 in.	1
*AN500A6-4	Screw-Governor fil-hd steel No.6-32 x 1/4 in. (56728)	3
35961	Cover-Front cap enclosing	1
AN500A8-6	Screw-Front cap cover fil-hd steel No.8-32 x 3/8 in.	2
56078	Washer-Coverscrew retainer	2
36023	Brush-Conducting	4
56458	Cover-Governor enclosing	1
*AN500A6-4	Screw-Governor cover fil-hd steel No.6-32 x 1/4 in.	3
*56438	Cap-Ball bearing dust	1
56851	Block-Filter mounting	1
36334	Filter Assembly-Radio interference	1
104324	Filter-Less cover and four screws	1
AN3102-22-4P	Receptacle	1
56880	Screw-Filter mounting fil-hd steel No.6-32 x 2-3/8 in.	4
36324	Cover-Filter enclosing	1
*AN515-4-4	Screw-Filter cover RH iron No.4-40 x 1/4 in.	4
56914	Bracket-Switch locking	1
500A6-3	Screw-Locking bracket fil-hd steel No.6-32 x 3/16 in.	2

	Plate-Name	1
*AN535-0-3	Screw-Name plate drive steel No.0 x 3/16 in.	4

NOTE:
Brush ring and holder assembly, part No. 35973, was furnished on original contracts. On later contracts the following items are furnished in place of part No. 35973.

*36487	Brush Ring and Holder Assembly	1
*56976	Brush-Lubricating	1

*Interchangeable parts

#Parts not recommended for service replacement

TABLE II

GROUP ASSEMBLY PARTS LIST

INVERTER ASSEMBLY, TYPE MG-14SH

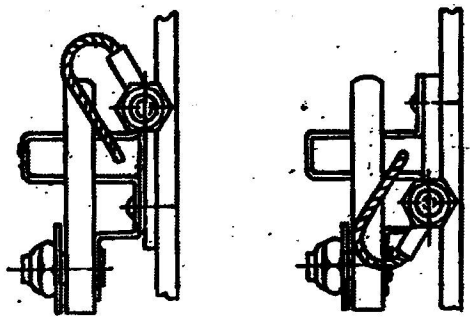
PART NUMBER	NOMENCLATURE	UNITS PER ASSY.
25281	INVERTER ASSEMBLY-TYPE MG-14SH	1
105996	Ring Assembly-Field and frequency control unit complete	1
28915	Ring Assembly-Field pole pieces stator and base	1
#36841	Ring-Field	1
99C5-026	Nut-Field ring elastic clinch brass NO.10-32 (Elastic Stop Nut)	6
#36827	Stator-Wound	1
*103713-Anneal	Screw-Stator headless drive No.2 x 3/16 in.	3
Commercial	Lead-Rectifier to filter-wire single conductor stranded No.16 red cotton wrap 1/64 in. wall synthetic rubber cotton braid cover	1
36845	Coils-dc Field(set of 4)	1
*#35949	Piece-Pole	4
106012	Screw-Pole piece headless drive No.2 x 3/8 in.	4
*AN505-416-8	Screw-Pole piece FH iron 1/4-20 x 1/2 in.	4
36750	Base	1
AN960-416	Washer-Base rear flat 1/16 thick.x .255 ID x .489 in. OD	2
AN501A416-14	Screw-Base rear fil-hd iron 1/4-28 x 7/8 in.	2
*AN364B428	Nut-Base rear elastic stop brass 1/4-28 x 7/16 hex x 13/64 in.	2
AN936A416	Lockwasher-Base front(Shakeproof No.1214)	2
AN501A416-10	Screw-Base front fil-hd iron 1/4-28 x 5/8 in.	2
Not Supplied * Complete	Unit-Frequency control(Details on Dwg 25281)	1
36848	Bracket Assembly	1
AN501AB10-8	Screw-Frequency control rear fil-hd brass No.10-32 x 1/2 in.	4
57510	Screw-Frequency control front fil-hd brass No.10-32 x 9/32 in.	2

36955	Reactor Assembly	1
AN515-6-5	Screw-Reactor RH iron No.6-32 x 5/16 in.	4
25F357	Capacitor(General Electric)	1
56681	Clamp-Capacitor	1
57217	Washer-Clamp flat brass .016 thick x .142 ID x .330 in. OD	1
AN515-6-7	Screw-Clamp RH iron No.6-32 x 1/2 in.	1
57541	Support-Capacitor	1
1000-308	Rectifier-Selenium(Federal Telephone and Radio)	1
AN500A6-5	Screw-Rectifier front fil-hd steel No.6-32 x 5/16 in.	2
*AN500A6-4	Screw-Rectifier rear fil-hd steel No.6-32 x 1/4 in.	2
Commercial	Lead-Rectifier to capacitor-wire single conductor stranded No.18 black cotton wrap 1/64 in. wall synthetic rubber cotton braid cover	1
104075	Insulation-Capacitor and resistor	1
36882	Board Assembly-Voltage adjustment	1
AN515-6-6	Screw-Voltage adjustment board RH iron No.6-32 x 3/8 in.	2
57504	Connector-Terminal	1
AN515B6-7	Screw-Connector RHbrass No.6-32 x 7/16 in.	2
21185	Lead Assembly-Voltage adjustment board to filter	1
3017	Terminal-Lead(Patton-MacGuyer)	1
57513	Insulator-Voltage adjustment board	1
36880	Cover-Frequency control unit enclosing	1
AN515-6-6	Screw-Cover RH iron No.6-32 x 3/8 in.	4
36849	Enclosure Assembly-Front cap and fan	1
*56436	Ring-Ball bearing shoulder	1
*21133	Screw-Cap retaining fil-hd iron No.10-32 x 7-5/16 in.	4
*36487	Brush Ring and Holder Assembly	1
*56481	Spring-Brush	4
*36032	Clamp Assembly-Brushing	2
*AN365-1032	Nut-Clamp elastic stop steel No.10-32 x 3/8 hex x 15/64 in.	2
103693	Washer-Brush holder flat brass 1/32 thick x .200 ID x 5/8 in. OD	2
AN364B1032	Nut-Brush holder elastic stop brass No.10-32 x 3/8-hex x 11/64 in.	2
*36026	Armature Assembly-Complete	1

*20471	Armature Assembly-Wound	1
*56437	Washer-Ball bearing clamping	1
*CMC88502	Bearing-Ball(New Departure)	2
*56465	Nut-Ball bearing check thick	1
*56552	Nut-Ball bearing check thin	1
*AN935-8	Washer-Bearing screw Kantlink lock No.8 x 3/64 thick x 3/64 in. wide	3
*1038252P	Screw-Bearing fil-hd iron No.8-32 x 13/16 in.	3
NAS51No.181	Ring-Retaining(Truarc)	1
*35933	Cap-Back	1
*AN960-10L	Washer-Back cap flat steel 1/32 thick x 13/64 ID x 7/16 in. OD	4
*AN365-1032	Nut-Back cap elastic stop steel No.10-32 x 3/8 hex x 15/64 in.	4
36878	Fan Assembly	1
57599	Screw-Fan No.10-32 x 3/4 in.	1
36819	Brush-Conducting	4
*56976	Brush-Lubricating	1
36831	Cover-Front cap enclosing	1
AN515-6-6	Screw-Front cover RH iron No.6-32 x 3/8 in.	3
*56438	Cap-Ball bearing dust	1
57525	Block-Filter mounting	1
36835	Filter Assembly-Radio interference	1
AN3102-22-4P	Receptacle	1
106084ZP	Screw-Receptacle filshd steel No. 6-32 x 2-3/4 in.	4
AN501AB10-8	Screw-Filter rear fil-hd brass No.10-32 x 1/2 in.	2
57510	Screw-Filter front fil-hd brass No.10-32 x 9/32 in.	1
36874	Cover-Filter enclosing complete	1
*AN515-4-4	Screw-Filter cover RH iron No.4-40 x 1/4 in.	4
	Plate-Name	1
*AN535-0-3	Screw-Name plate drive No.0 x 3/16 in.	4

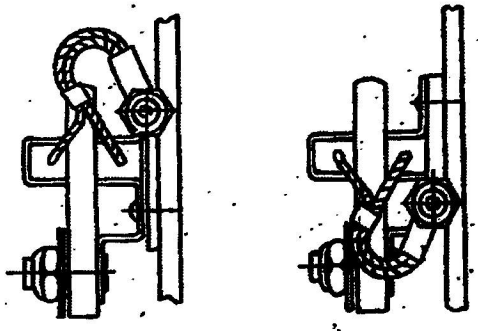
*Interchangeable parts

#Parts not recommended for service replacement



INSULATED BRUSH GROUNDED BRUSH

FIGURE 1 - BRUSH PIGTAIL POSITION, MG-149F



INSULATED BRUSH GROUNDED BRUSH

FIGURE 2 - BRUSH PIGTAIL POSITION, MG-149H