US Department of Transportation
Federal Aviation Administration

MAJOR REPAIR AND ALTERATION
(Airframe, Powerplant, Propeller, or Appliance)

Form Approved
OMB No. 2120-0020
For FAA Use Only
Office Identification

INSTRUCTIONS: Print or type all entries. See FAR 43.9, FAR 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. 1421). Failure to report can result in a civil penalty not to exceed $1,000 for each such violation (Section 901 Federal Aviation Act of 1958).

1. Aircraft	Make: MOONEY	Model: M18L
	Serial No.: 51	Nationality and Registration Mark: N119C
2. Owner	Name *(As shown on registration certificate)*: E. G. GRAMMAN, Trustee of Trust Dated: March 10, 1984	Address *(As shown on registration certificate)*: 1967 Garrison Way El Cajon, CA 92019

3. For FAA Use Only

The data contained herein complies with airworthiness requirements and is approved only for the above described aircraft, subject to conformity inspection by a person authorized in FAR 43.7

Date SEP. 22 1993

David M. Lehman, FSDO 4.0.17.

4. Unit Identification

Unit	Make	Model	Serial No.	**5. Type** Repair	Alteration
AIRFRAME	*(As described in Item 1 above)*				XX
POWERPLANT					
PROPELLER					
APPLIANCE	Type / Manufacturer				

6. Conformity Statement

A. Agency's Name and Address	B. Kind of Agency	C. Certificate No.
Harry R. Dellicker 2121 So. Wildcat Way Porterville, CA 93257	X U.S. Certificated Mechanic Foreign Certificated Mechanic Certificated Repair Station Manufacturer	A & P 1484886

D. I certify that the repair and/or alteration made to the unit(s) identified in item 4 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.

Date	Signature of Authorized Individual
September 22, 1993	Harry R. Dellicker

7. Approval for Return To Service

Pursuant to the authority given persons specified below, the unit identified in item 4 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is XX APPROVED ☐ REJECTED

BY						
	FAA Flt. Standards Inspector		Manufacturer	X	Inspection Authorization	Other *(Specify)*
	FAA Designee		Repair Station		Person Approved by Transport Canada Airworthiness Group	

Date of Approval or Rejection	Certificate or Designation No.	Signature of Authorized Individual
Sept. 22, 1993	IA 1484886	Harry R. Dellicker

FAA Form 337 (12-88)

NOTICE

Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. An alteration must be compatible with all previous alterations to assure continued conformity with the applicable airworthiness requirements.

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Installed Electrical system in accordance with Mooney Mite Model M18L, N119C, Ser. No. 51, Report No. 51 dated September 22, 1993.

x x x E N D x x x

☒ Additional Sheets Are Attached

★U.S.GPO:1990-0-568-[illegible]

ELECTRICAL SYSTEM

FOR

MOONEY MITE MODEL M18L, N119C

SERIAL #51

REPORT # 51

TABLE OF CONTENTS

ELECTRICAL SYSTEM FOR
MOONEY MITE MODEL M18L, N119C, SER. # 57

ALTERNATOR - NIPPONDENSO, FOR 1977 HONDA CIVIC
OUTPUT VOLTAGE 13.5V TO 14.5V
OUTPUT CURRENT 35 AMPS AT 2350 RPM ENGINE SPEED
35 AMPS AT 4650 RPM ALTERNATOR SPEED

ALT. SPEED AT HONDA RATED H.P. RPM = 11,000 RPM

ALTERNATOR SPEEDS IN MOONEY M18L, N119C

RATIO OF ENGINE TO ALTERNATOR RPM	=	.506
RATIO OF ALTERNATOR TO ENGINE RPM	=	1.98
ALTERNATOR RPM AT 2450 ENGINE RPM	=	4842 - 35A
ALTERNATOR RPM AT 2550 ENGINE RPM	=	5039 - 35A
ALTERNATOR RPM AT 745 ENGINE RPM	=	1470 - 20A
ALTERNATOR RPM AT 506 ENGINE RPM	=	1000 - 10A
ALTERNATOR RPM AT 405 ENGINE RPM	=	800 - STARTS CHARGING

BEARINGS, SKF 478203-010 12,000 RPM SPEED LIMIT,
1,650 LBS. DYNAMIC LOAD RATING

BEARING FLANGES, FT-40, PRESSED STEEL

FLEXIBLE COUPLING, LOVEJOY L-050 18,000 RPM MAXIMUM SPEED

BELT - GOODYEAR #13215 AUTOMOTIVE, OR EQUAL

SHAFT - 5/8" DIA., 1018 STEEL, CENTERLESS GROUND

ALL SUPPORT BRACKETS OF 4130 CHROMIUM MOLYBDENUM ALLOY STEEL

PULLEYS - 2024T ALUMINUM, SPLIT PULLEY ON ENGINE IS SAME AS ORIGINAL MOONEY PULLEY EXCEPT FOR DIAMETER.

MASTER SW. RELAY - CESSNA 111-140

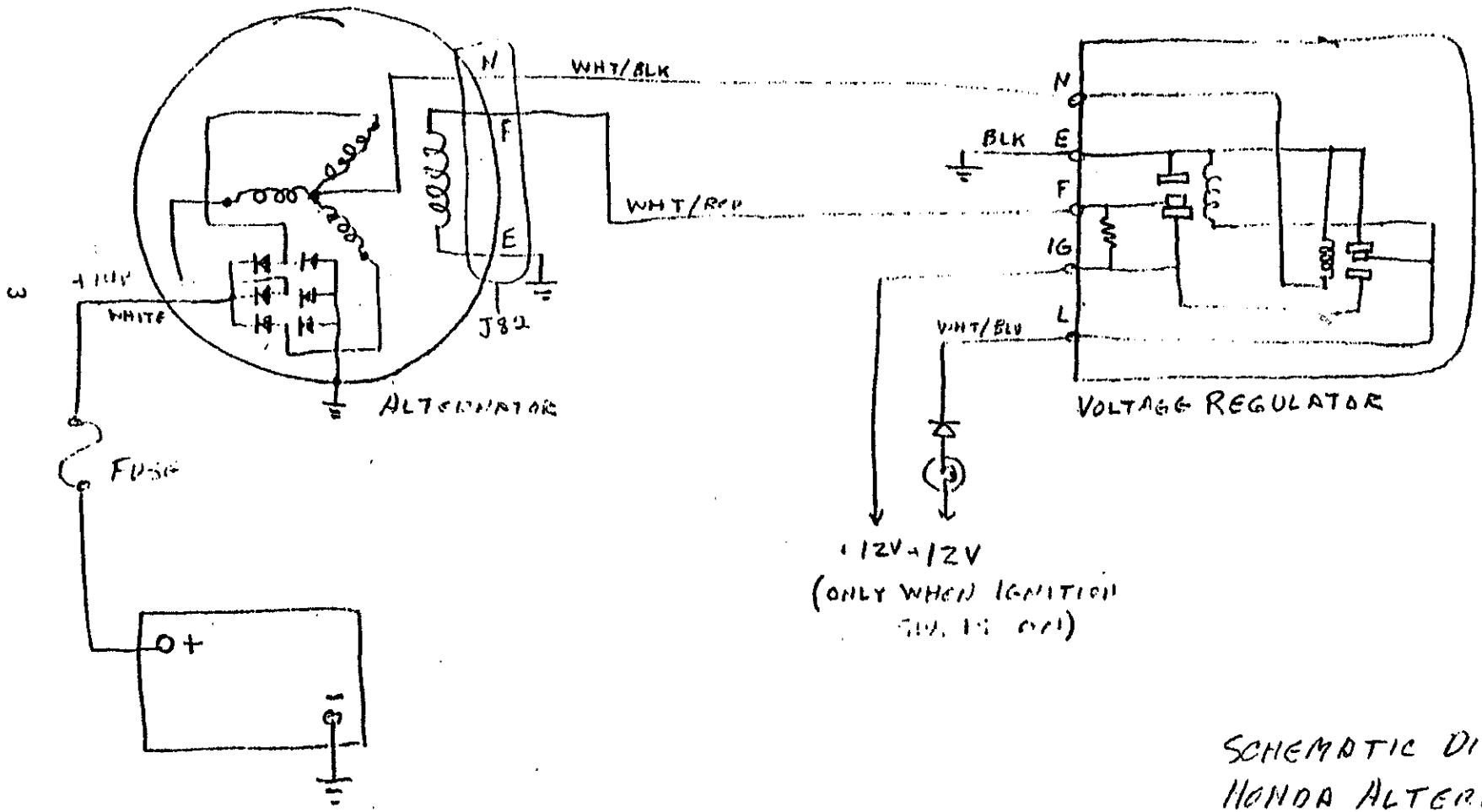
BATTERY BOX - ALUMINUM, WITH COVER, INSIDE PAINTED WITH ACID RESISTANT VARNISH. HAS DRAIN TO OUTSIDE OF FUSELAGE. LOCATED IN FACTORY-INSTALLED MOUNTING BRACKETS IN REAR FUSELAGE.

BATTERY - SUZUKI GS-12N5.5-3B

TESTING
THIS SYSTEM, CONSISTING OF THE ALTERNATOR, REGULATOR AND BATTERY WAS TESTED FOR 25 HOURS ON A TEST STAND WITH THE ALTERNATOR BEING DRIVEN BY A 1 HP ELECTRIC MOTOR. VARIOUS TESTS WERE PERFORMED TO INSURE RELIABILITY AND PROPER PERFORMANCE.

ONE OF THE TESTS CONDUCTED WAS THAT OF COMPLETELY DISCHARGING THE BATTERY AND THEN CHARGING IT WITH THE NORMAL OUTPUT OF THE ALTERNATOR. THE CHARGE/DISCHARGE PROCESS WAS REPEATED SEVERAL TIMES.

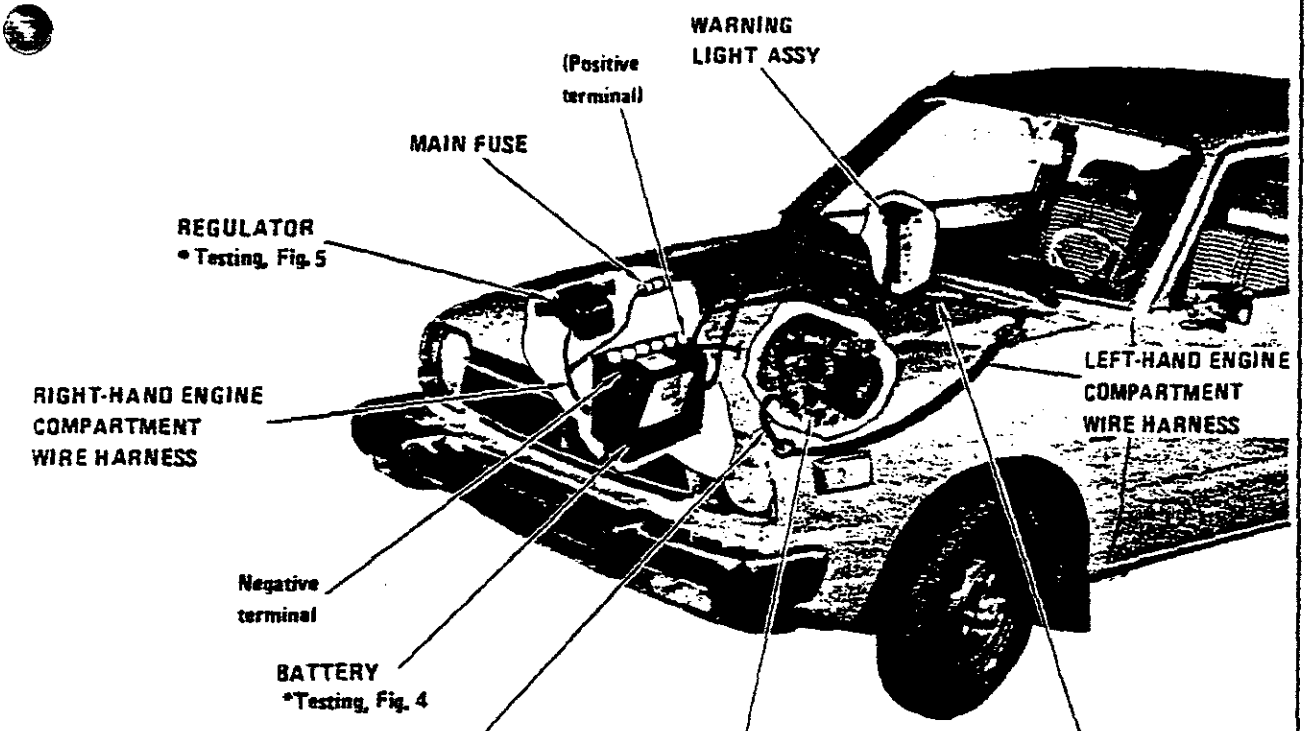
THE ENTIRE ELECTRICAL SYSTEM HAS BEEN GROUND TESTED IN THE AIRCRAFT FOR ABOUT 2 HOURS. IT OPERATES VERY SATISFACTORILY. AFTER TESTING IT WAS REMOVED AND THE ORIGINAL 8 AMPERE GENERATOR WAS REINSTALLED.



SCHEMATIC DIAGRAM
HONDA ALTERNATOR
AND REGULATOR

From Honda Serv. Manual, Fig 33, Page 60.47

ELECTRICAL SYSTEMS



ENGINE - 62 HP AT 5000 RPM
PULLEY RATIO = 2.2:1
ALT. RPM AT RATED HP = 11,000

ARGING SPECIFICATIONS

ATTERY	12 volts, 45 amp/hr
EGULATOR	
stem Voltage	13.5 to 14.5 volts
echanical Adjustments	
gulator and Warning Light Relays	
Point Gap	0.4 to 1.2 mm (0.016 to 0.020 in.)
Spring Deflection	0.2 to 0.6 mm (0.008 to 0.024 in.)
Armature Gap	Not less than 0.5 mm (0.020 in.)
Angle Gap	Not less than 0.5 mm (0.020 in.)
.TERNATOR	35 amp @2000 engine rpm (without A/C) 45 amp @2000 engine rpm (with A/C) Pulley ratio 2.2:1
ld Current	2.5 amp @ 12V.
arity	Negative ground
tation Standard	Counterclockwise (ccw)
Conditioning	Clockwise (cw)

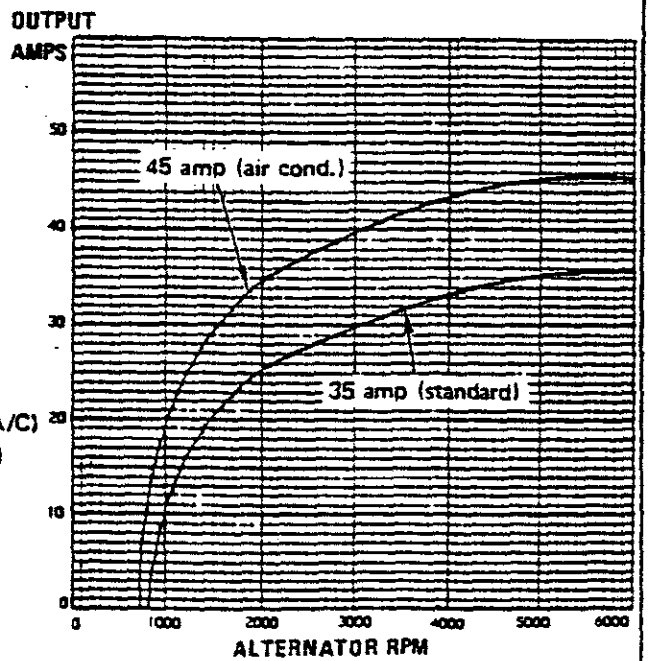


Fig. 2. Charging System Index and Specifications

6165740
Printed in USA

DESCRIPTION

The charging system is essentially a basic electric generating network, consisting of a battery, alternator (ac generator), and regulator.

The battery stores electrical energy produced by the alternator. The alternator generates electrical energy. This takes place when the rotor, which is essentially an electric magnet, rotates within the stator (three coils). The rotor, being an electro magnet, must be initially excited by the battery to generate electricity. An alternator, unlike a dc generator, has no residual magnetism, and will not generate electricity unless the field is excited.

The three coils of the stator generate three-phase alternating current. This current is converted into dc current by a full-wave silicon diode rectifier.

The regulator controls the current to the alternator field which, in turn, regulates the alternator output.

CONNECTORS	LOCATION
J55/P55	RH ENGINE COMP., BEHIND BATTERY
J1/P1	UNDER RH DASH - 22 SOCKET
J4/P4	RH DOOR FWD POST AREA
J5/P5	RH DOOR FWD POST AREA
J18/P18	UNDER DASH, ADJ. TO INST. CLUSTER
J21/P21	UNDER DASH, STEERING COLUMN AREA
J47/P47	UNDER LH DASH - 16 PIN
J81/P81	LH FWD ENGINE COMP.
J82	BACK OF ALTERNATOR

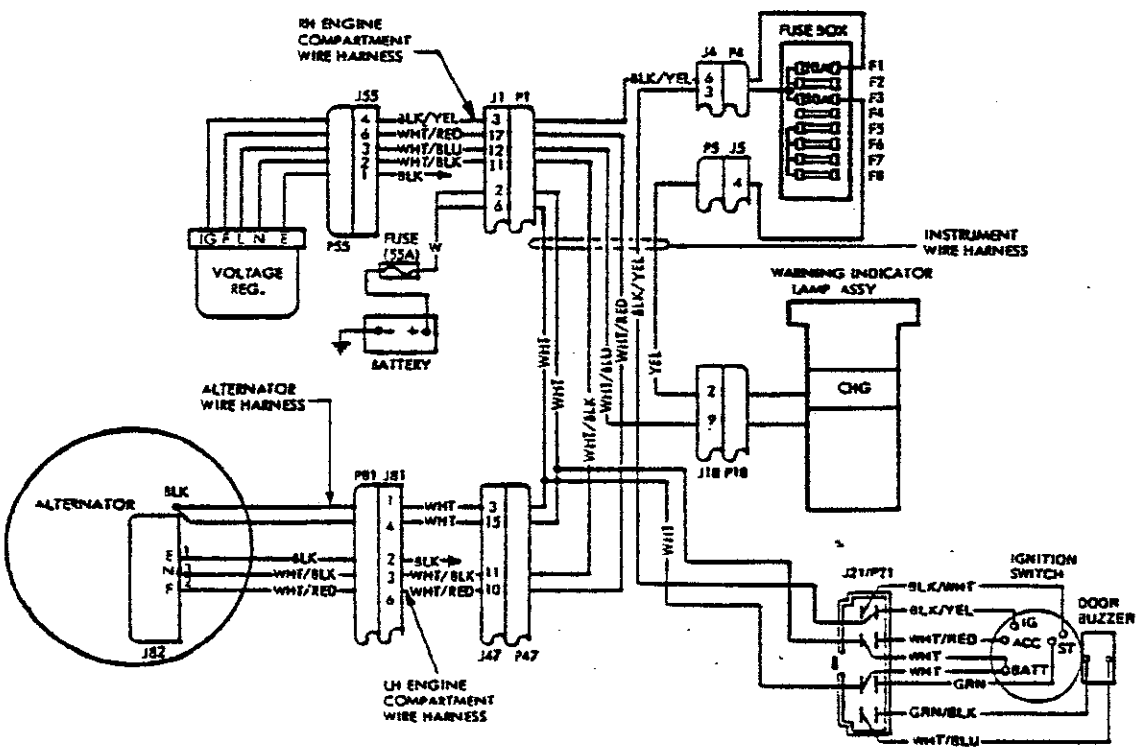


Fig. 3. Charging System Wiring Diagram and Description

ELECTRICAL

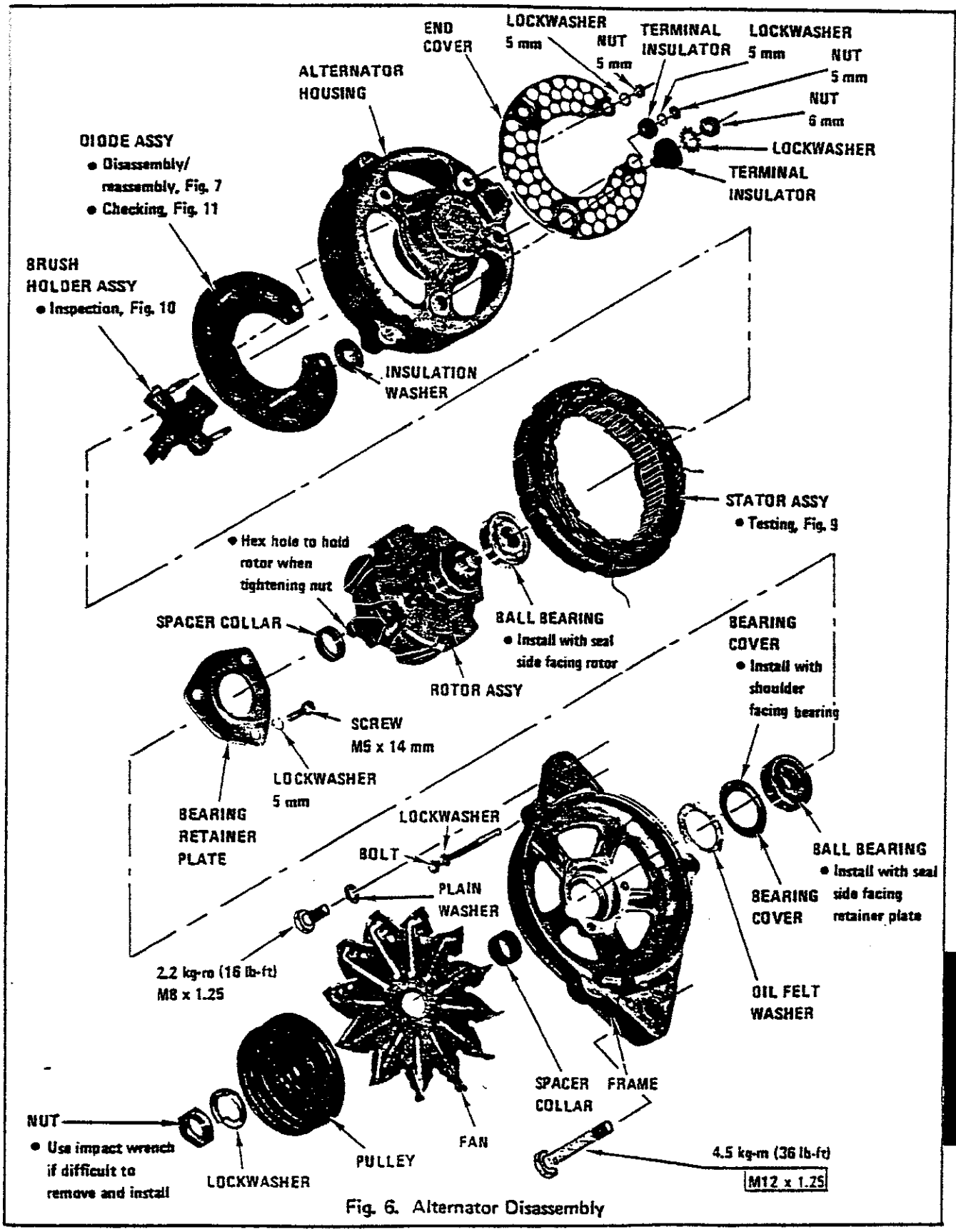


Fig. 6. Alternator Disassembly

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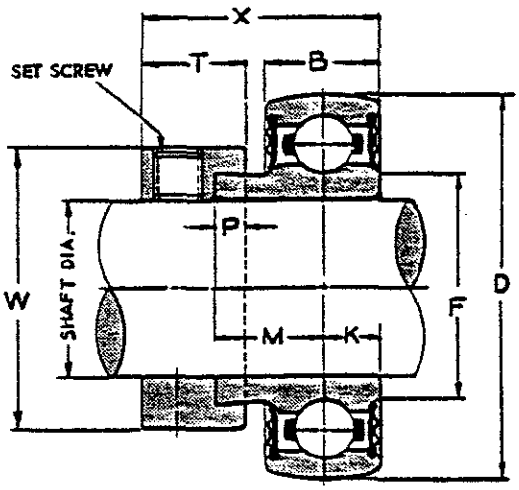
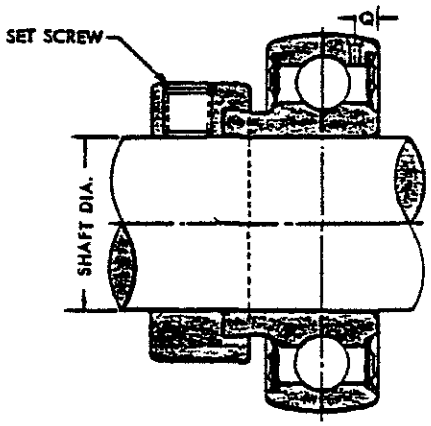


4782
STANDARD



4782 VSB
RE-LUBRICABLE

SERIES 4782—single row, ball bearing units

BEARING NUMBER	Shaft Dia.[1]	Nominal Bearing Dimensions												Set Screw Size in.	Weight lbs.	Basic Dynamic Load Rating C lbs.[2]	Approx. Speed Limit rpm[3]
		D		B		F	K	M	X	P	Q	T	W				
		mm	in.	mm	in.	in.	in.	in.	in.	in.	in.	in.	in.				
478203-008	½	40	1.5748	13	.5118	.836	.2559	½	1⅛	3/32		19/32	1⅛	¼-28 x ¼	.35	1,850	12,000
478203-010	⅝		1.5748												.31	1,850	12,000
△478204-012	¾	47	1.8504	15	.5906	1.013	.2953	29/64	17/32	5/32	.124	19/32	1 9/16	¼-28 x ¼	.39	2,210	9,900
478205-014	⅞	52	2.0472	15	.5906	1.222	.2953	29/64	17/32	5/32		19/32	1½	¼-28 x ¼	.48	2,420	8,700
478205-015	15/16		2.0472												.45	2,420	8,700
△478205-100	1		2.0472								.124				.42	2,420	8,700
478206-101	1 1/16	62	2.4409	18	.7087	1.466	.3543	37/64	1 19/32	5/32		⅝	1⅜	5/16-24 x 5/16	.71	3,388	7,300
△478206-102	1⅛		2.4409												.67	3,388	7,300
△478206-103	1 3/16		2.4409								.149				.62	3,388	7,300
△478206-104	1¼		2.4409								.149				.57	3,388	7,300
△478207-104	1¼	72	2.8346	19	.7480	1.718	.3748	⅜	1 17/32	5/32	.149	1 1/16	2 1/16	⅜-24 x ⅜	1.15	4,448	6,300
478207-105	1 5/16		2.8346												1.10	4,448	6,300
△478207-106	1⅜		2.8346								.149				1.06	4,448	6,300
△478207-107	1 7/16		2.8346								.149				.96	4,448	6,300

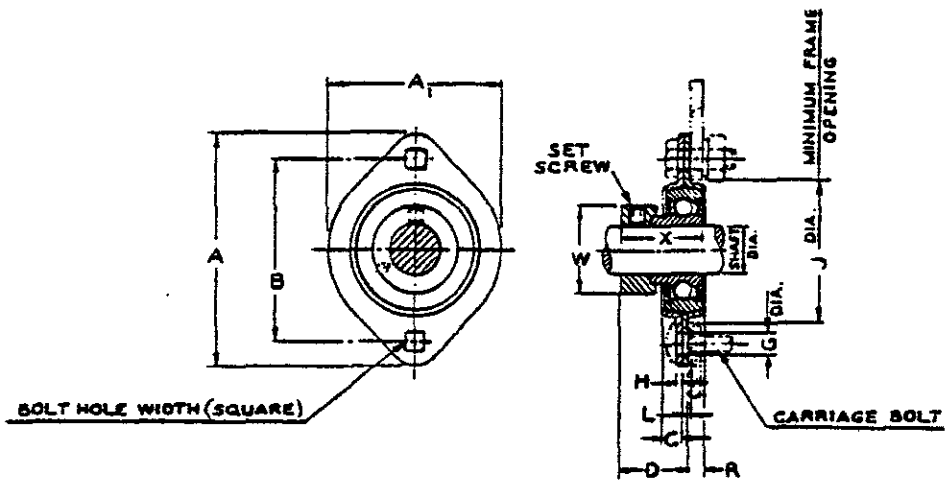
[1]For best results, ground shafting should be used to obtain a snug fit on the shaft. For heavy loads or where dynamic balance is important, a light press fit is recommended.

RECOMMENDED SHAFT TOLERANCES

Shaft Diameter	Tolerances
Up to 1 7/16"	Nominal to −.0005"

[2]These bearings have the same load carrying capacities as the 62 series and the basic size is identified by the digits 204, 205, etc.; i.e., 478204 equals 6204, 478205 equals 6205.
[3]This refers to grease lubrication and moderate load.
△These sizes available with lubrication hole. Suffixed VSB Ex. 478204—012VSB.

FTP



Series FTP

Shaft Dia. in.	Unit No.	Bearing No.	Flange No.	A in.	A_1 in.	B in.	C in.	D in.	G Flange Hole Dia. to Clear Square Shank	H in.	J in.	R in.	W in.	X in.	Set Screw Size Inches	Bolt Hole Width in.	Bolt Size in.	L Short Shank in.	L Long Shank in.	Weight lbs.	Radial Load Rating lbs.*
½	FTP-8	478203-008	FT-40	3 7/16	2 5/16	2½	9/32	1 5/16	17/32	.075	1 13/16	7/32	1⅛	1⅛	⅛-28 x ¼ Lg.	9/32	¼	.006	.100	.51	600
⅝	FTP-10	408203-010																		.47	
¾	FTP-12	478204-012	FT-47	3 7/16	2⅜	2 13/16	5/16	1	½	.083	2 5/16	⅛	1 5/16	1 7/32	¼-28 x ¼ Lg.	11/32	5/16	.021	.115	.60	700
⅞	FTP-14	478205-014	FT-52	3¾	2 9/64	3	5/16	1	½	.083	2⅜	¼	1½	1 7/32	¼-28 x ¼ Lg.	11/32	5/16	.021	.115	.70	800
15/16	FTP-15	478205-015																		.67	
1	FTP-100	478205-100																		.64	
1 1/16	FTP-101	478208-101	FT-62	4 7/16	3 5/16	3 5/16	11/32	1 5/32	19/32	.104	2 13/16	⅛	1¾	1 15/32	5/16-28 x 5/16 Lg.	13/32	⅜	.011	.104	1.08	1,100
1⅛	FTP-102	478208-102																		1.03	
1 3/16	FTP-103	478208-103																		.98	
1¼	FTP-104A	478208-104																		.93	

Note: Maximum thrust rating equals ½ radial rating.

* Steady loads only.

See p. 104

Elastomeric Elements

Elastomeric Jaw Type

"Sox" (NBR) (Style A)
The standard L-Line coupling flexible insert material is NBR (Nitrile Butadiene Rubber). This material is oil—including hydraulic oil—resistant, resembles natural rubber in resilience and elasticity. Temperature range is -40°F to +212°F. The spider features patented, built in spacer dots—raised dots on the hub faces of the spider—that provide the correct gap between each hub.

Urethane
The Urethane flexible spider has 1.5 times the torque capacity of the standard NBR spider but provides less dampening and its operating temperature range is -30°F to +160°F.

Hytrel®
The Hytrel flexible spider is designed for high temperature (-60°F to +250°F) applications. Hytrel has excellent resistance to oil and can carry 3 times the torque of the standard NBR spider.

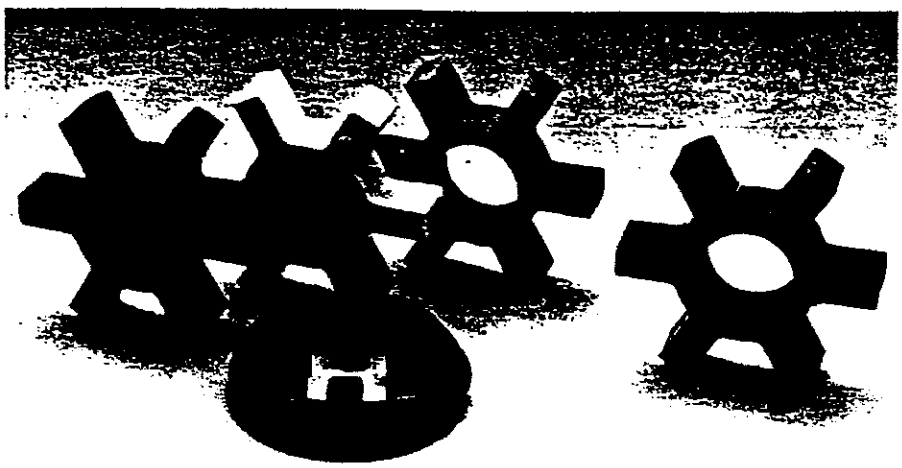
All the flexible spiders feature a solid web center for high RPM capacity.

Bronze-BNZ
This porous, oil-impregnated spider is used exclusively for slow speed, high torque applications. Bronze is not affected by extreme temperatures, water, dirt. Torque capacity is 3 times greater than standard Sox spider.

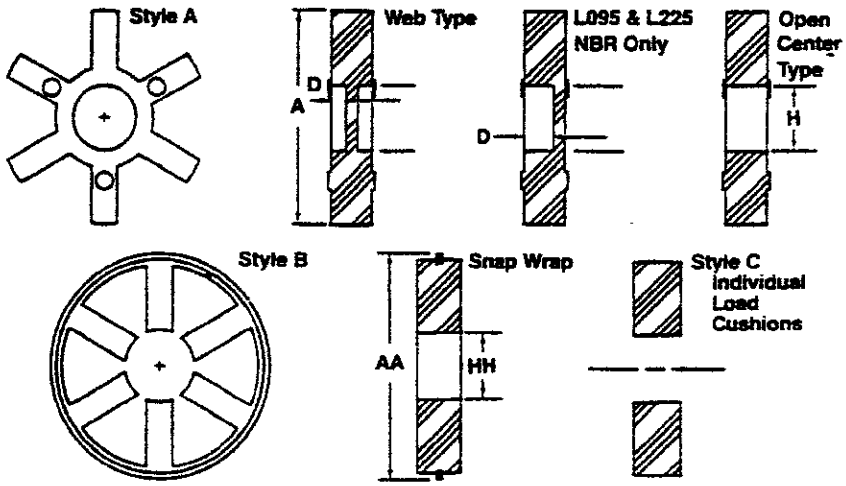
Open Center Spiders
These flexible spiders are available in the same materials mentioned above: NBR, Urethane and Hytrel except they do not have a center web. This permits applications where close shaft to shaft distance between the pump and motor is required. Open center spiders have a lower maximum RPM. Consult our Engineering Department for applications over 1750 RPM for specific recommendations.

Snap Wrap Flexible Spider (Style B)
The material is the same as the standard Sox NBR spider. The spider is easily assembled or removed from the coupling assembly without disturbing the alignment of the coupled equipment. Consult Lovejoy engineering for applications using Snap Wrap spiders at more than 1750 RPM.

C & H Type Cushions (Style C)
C & H type couplings use individual load cushions of NBR or Hytrel. These cushions are used with a removable outside retaining collar and inner support ring. Cushions are used in style 3 couplings shown on page 10 & 12.



Sox (NBR), Hytrel, Urethane, NBR Snap Wrap, and Sox OCT Type (Open Center Type) Elastomeric Elements.



Flexible Spider Dimensional Data

Spider Number	Style A Material Web	Open Center	Dimensions in Inches A	D	H	Style B Material	Dimensions AA	HH
L035	S[1]	NA	5/8	None	—	—	NA	NA
L050	S[1]	B	1 1/16	None	5/16	—	NA	NA
L070	S[1]U[1]	B	1 23/64	None	1/2	—	NA	NA
L075	S[1]	B	1 3/4	None	3/4	—	NA	NA
L090/L095	S,B	U,H,S	2 1/8	3/16	7/8	S	2 9/16	1 1/16
L099/L100	S	U,H,S,B	2 17/32	1/4	1 1/32	S	3 1/16	1 3/8
L110	S,H	U,H,S,B	3 5/16	S1/4 H3/16	1 3/16	S	3 7/8	1 1/2
L150	S,H,B	U,H,S	3 3/4	S5/16 H7/32	1 1/4	S	4 9/16	1 3/4
L190	S,H,B	U,H,S	4 1/2	S5/16 H3/16	1 3/8	S	5 5/16	2 1/4
L225	S,H	U,H,S,B	5	S3/8 H3/16	1 3/4[2]	S	NA	NA
L276	NA	S,B	6 3/16	NA	1 3/4	NA	NA	NA

S = NBR ("SOX") H = HYTREL 1 = NO WEB, SOLID
U = URETHANE NA = NOT APPLICABLE 2 = 1 1/4 BRONZE ONLY
B = BRONZE

*Hytrel is a registered trademark of E.I. Dupont Nemours & Co.

Elastomeric Jaw Type

Jaw Couplings
Standard Materials

Standard Materials Chart

Hub Materials	Coupling Numbers										Hub Materials
	035	050	070	075	090-095	099-100	110	150	190	225	276	
Sintered Iron												Sintered Iron
Aluminum												Aluminum
Bronze												Bronze
Stainless Steel												Stainless Steel
Steel												Steel
Cast Iron												Cast Iron
Spider Materials												**Spider Materials**
Sox												Sox
Bronze												Bronze
Urethane												Urethane
Hytrel												Hytrel

Standard— **Available—as option**

Non-shaded areas indicate not available

Standard Materials

Powdered Metal (sintered iron)—L Series thru L-150

Cast Iron—L-190 and up thru C & H, can be plated if necessary for harsh environments

Optional Materials

Steel—specials are available, can be welded

Stainless Steel—available for corrosive atmosphere

Bronze—available for non-sparking applications and for better corrosion resistance than plain steel or iron

Aluminum—available for weight reduction needs and for its resistance to water and moisture

Certification of materials and or processes is available, review your requirements with Lovejoy Engineering prior to ordering.

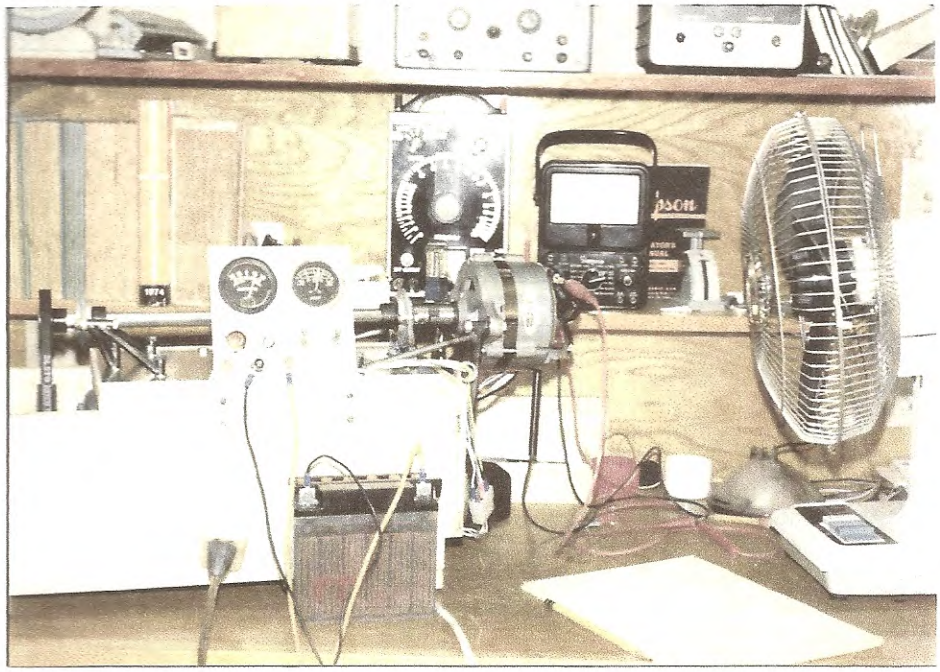
SPIDER Performance Data—JAW TYPE Couplings

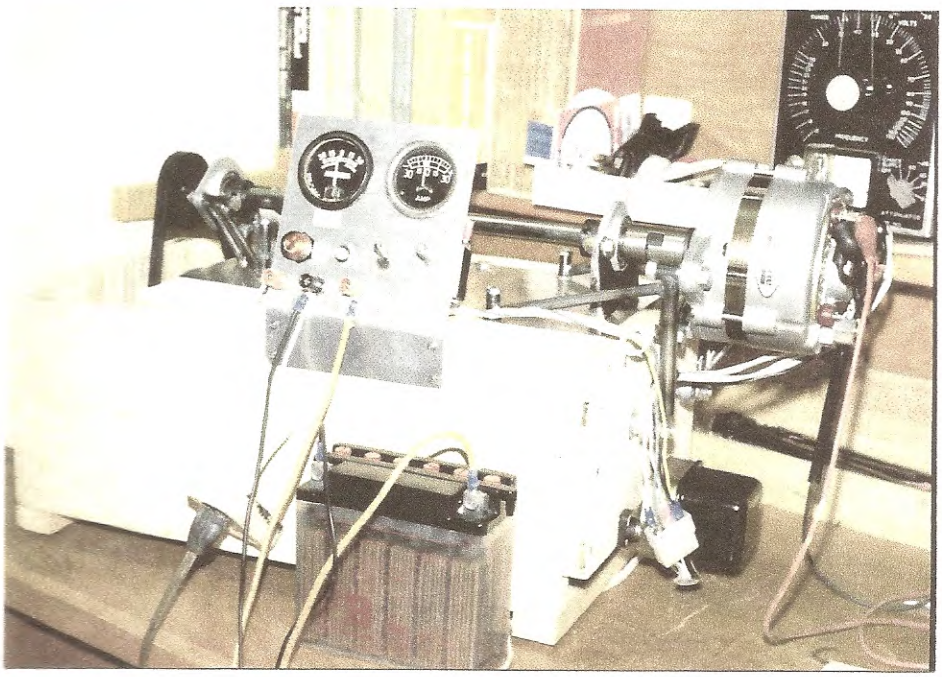
Type	Temp Range (F°)	Misalignment Angular	Misalignment Parallel	Shore Hardness	Remarks & Specific Characteristics	Torque* Range Factor
SOX (NBR)	–40 to 212°	1°	.015	80 ± 5A**	Good misalignment & dampening capacity. Good resistance to oil, standard material supplied.	1
HYTREL®	–60° to 250°	½°	.015	55D	Very good oil & chemical resistance. High temperature capacity, torsionally stiffer than Sox.	3
URETHANE	–30 to 160°	1°	.015	90 ± 5A	Good oil & chemical resistance	1.5
BRONZE	–40 to 450°	½°	.010	.....	Max RPM-250. High torque, high temp, excellent chemical resistance.	3

*Torque range when compared to standard Sox.
Example: Hytrel has 3 times the torque capacity of Sox.

**Except 035-60A

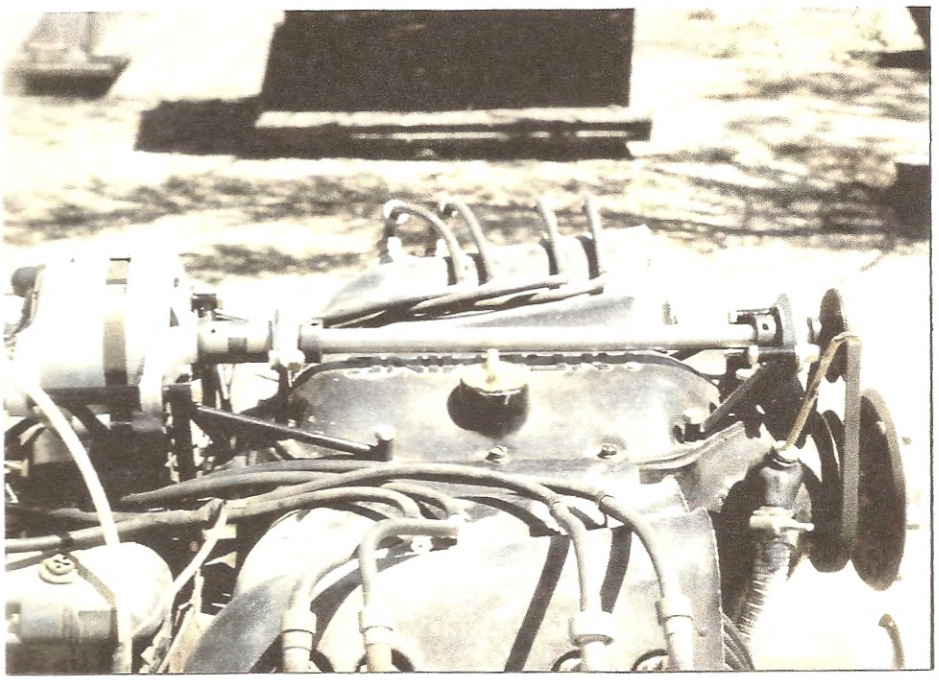
BENCH TESTING



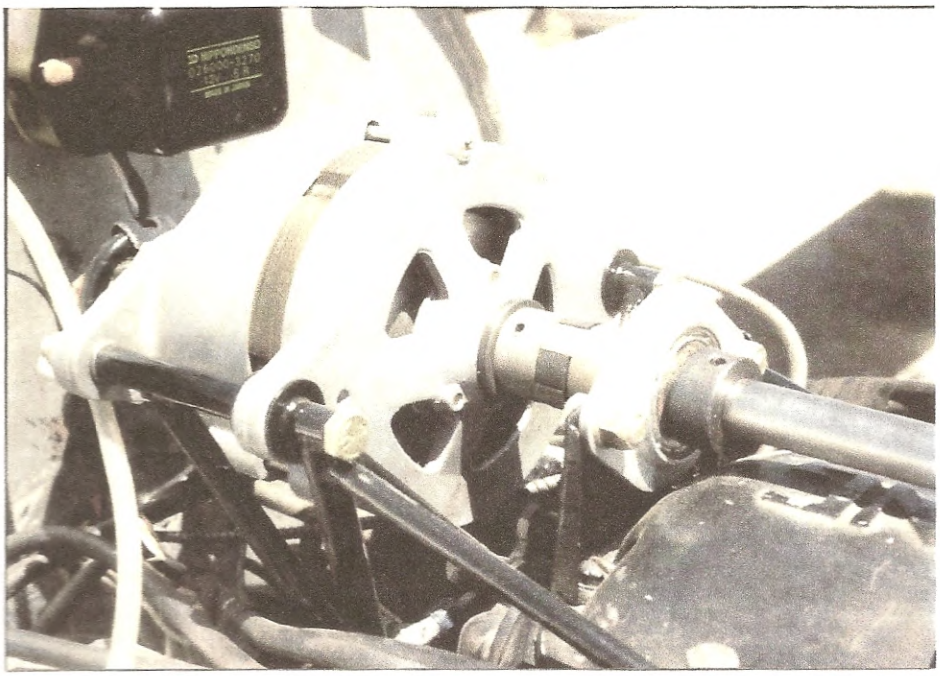


Pictures of electrical system during bench testing. The equipment was operated for 25 hours with this test set-up. A one-horsepower electric motor was used to drive the alternator. One ammeter was wired to indicate total alternator output current and the other to indicate net current to or from the battery. The tests uncovered several problem areas, which were later confirmed after the system was installed in the airplane. These were the alternator heating problem and the bearing problem. These were subsequently resolved. The tests proved the system could operate at engine cruising speeds for extended periods of time at various alternator output loads. It proved that the regulator would safely regulate the output of the alternator into the battery after it had been discharged to 4 volts, even when the alternator was operating at cruising RPM.

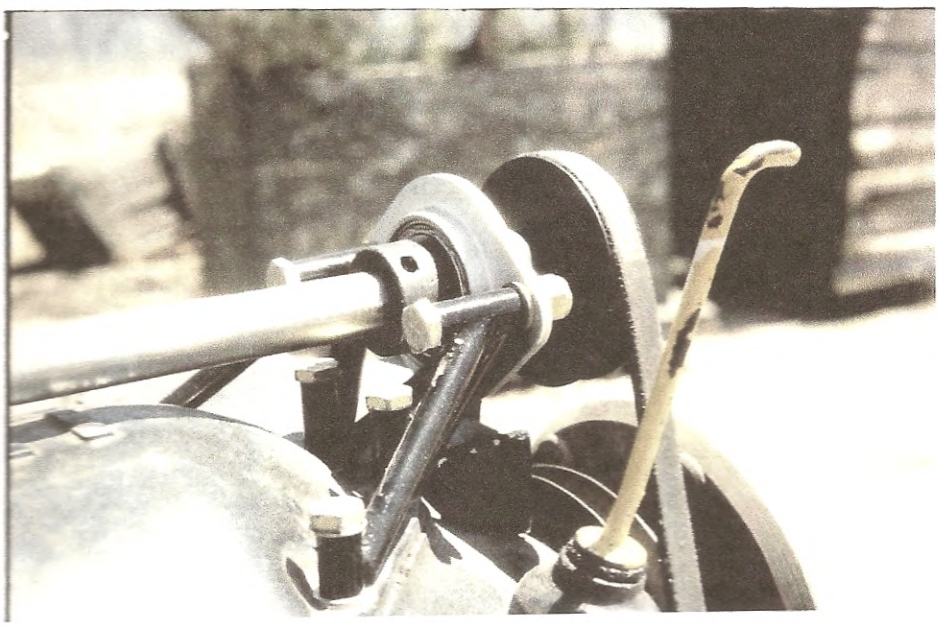
ORIGINAL AIRCRAFT INSTALLATION



Overall view of system installed on Lycoming 0-145-B2 engine in Mooney



Alternator and mounting brackets



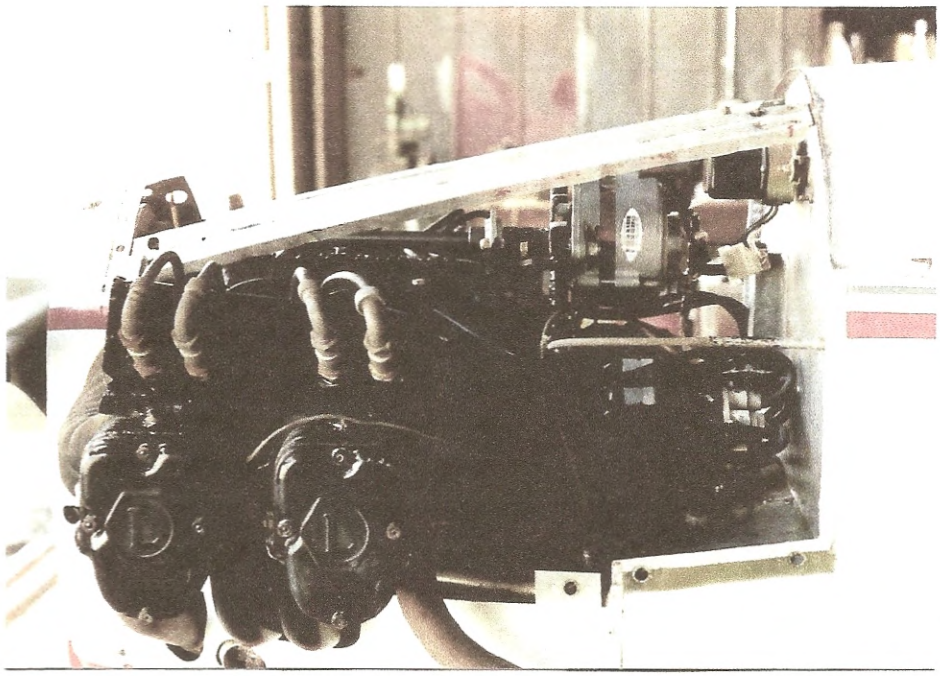
Details of front support, pulleys & belts

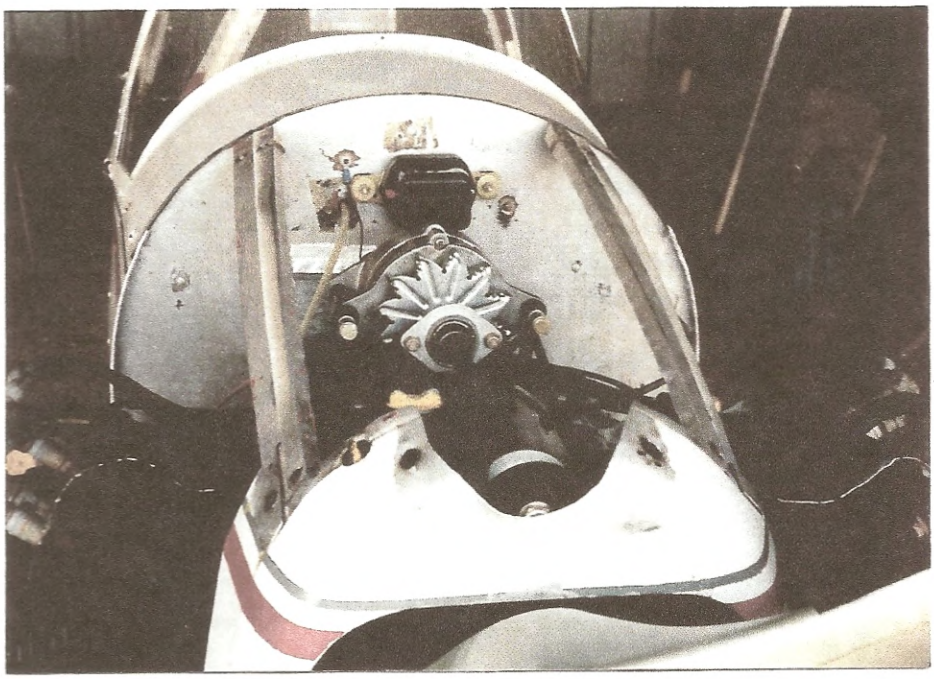
ORIGINAL AIRCRAFT INSTALLATION

After 25 hours of operation on the test stand the alternator was installed on the engine. As a result of two hours of testing, several changes were made which are reflected in the final design.

1. The fractional H.P. belt was replaced with an SAE automotive belt to prevent belt slippage at high alternator output loads. This necessitated fabrication of new engine and alternator pulleys.
2. The alternator fan was installed to prevent overheating.
3. The lateral bracing of the alternator mounting brackets was redesigned to provide clearance for the fan.
4. The original shaft, which was made of 4130 chromium molybdenum steel tubing was replaced with a centerless ground solid shaft of 1018 steel. This eliminated the heating problem of the bearings, which was caused by the outside surface of the shaft deviating slightly in its dimensions, causing stress on the bearings.

FINAL INSTALLATION





Pictures of alternator in its final configuration with fan installed for better cooling. Regulator is mounted on firewall behind alternator. Cutout in nose-bowl behind propeller is for the 8 ampere generator, previously installed.

MOUNTING HARDWARE

FRONT BEARING SUPPORT BRACKET

FRONT BOLTS	AN4 - 15A
REAR BOLTS	AN4 - 12A
WASHERS	AN960 - 416 and AN960 - 416L

WASHERS ARE USED UNDER BRACKETS. ADDITIONAL WASHERS ARE USED TO ADJUST FOR BELT TIGHTNESS

REAR BEARING FLANGE SUPPORT BRACKET USED EXISTING TOP COVER SCREWS

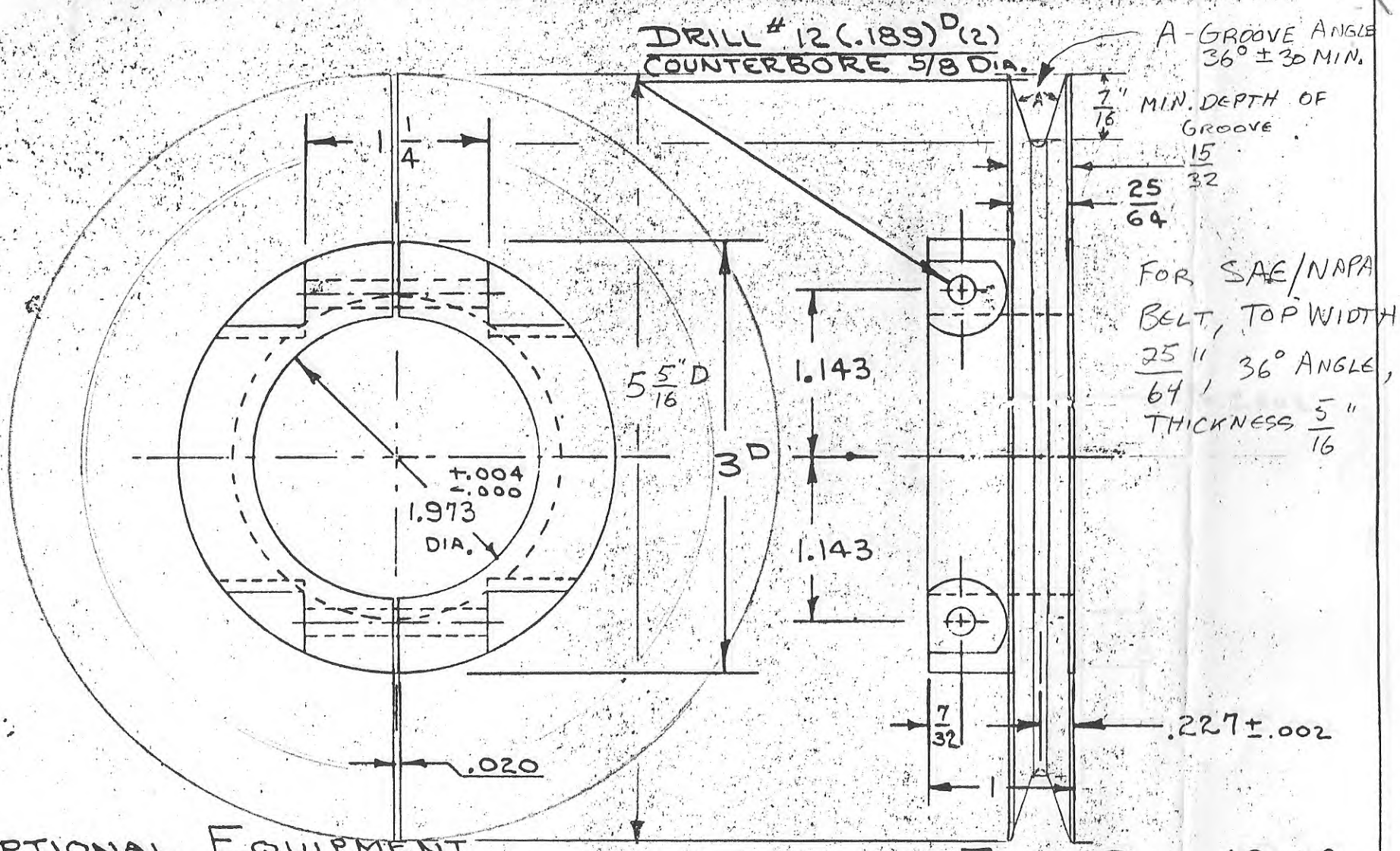
ALTERNATOR SUPPORT BRACKETS

FORWARD BRACE	AN4 - 12A
WASHERS	AN960 - 416

ALL OTHER SUPPORT MEMBER (4) USED EXISTING ENGINE BOLTS.

WEIGHT AND BALANCE DATA

	LBS	ARM
ELECTRICAL SYSTEM, MOONEY #899	20.3	55.4
REMOVE: 8 AMP. GENERATOR	-8.0	-15.5
ADD: HONDA ALTERNATOR ASS'Y	10.0	-3.26



OPTIONAL EQUIPMENT

FINISH SPEC. 10-1-C

2024T
MATERIAL 24ST ALUM.

PULLEY - ENGINE	Drn. A-27-49 BAYS	
	App.	
	Model M-18X	
NEXT ASSEM. DWG. 686380	Scale FULL	
Mooney Mite Homebuilts CHARLOTTESVILLE, VA.	182960	

UNLESS OTHERWISE SPECIFIED
FRACTIONS ± .010 DECIMALS ± .005
HOLES .003 .001 ANGLES ± ½
REMOVE SHARP EDGES & BURRS