

ENERSYS Ltd, NEWPORT
(formerly Hawker Energy Products)

SEALED LEAD ACID BATTERY

LEARJET PART NO. 7624308001-003
(ELN PART NO. 9750R0824 Rev04)

COMPONENT MAINTENANCE MANUAL

WITH

PARTS LIST

ELN DOCUMENT NO.
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Rev 03

24-01-03

Page T1/2

Aug 25/04

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

RECORD OF REVISIONS

REV NO.	ISSUE DATE	INSERT DATE	BY	REV NO.	ISSUE DATE	INSERT DATE	BY
01	21 Apr 99		SAB				
02	22 Jul 03		CJ				
03	25 Aug 04		SAB				

24-01-03

RR-1/2
Aug 25/04

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

SERVICE BULLETIN LIST

SERVICE
BULLETIN
NUMBER

REVISION
NUMBER

DATE BULLETIN
INCORPORATED
INTO MANUAL

PRODUCT IMPROVEMENTS

Product improvements have been incorporated using service bulletins entered in the service bulletin list. Service bulletin highlights are as follows:

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

LIST OF EFFECTIVE PAGES

The changes are shown by a vertical line along the edge of the changed page.
The total number of pages in this document is 41, which contains as follows

<u>SUBJECT</u>	<u>PAGE NO.</u>	<u>DATE</u>
Title Page	T-1/2	Aug 25/04
Record of Revisions	RR-1/2	Aug 25/04
Record of Temporary Revisions	TR-1/2	Apr 21/99
Service Bulletin List & Product Improvements	SBL-1/2	Apr 21/99
List of Effective Pages	LEP-1/2	Aug 25/04
Contents	TC-1 to TC-2	Aug 25/04
Introduction	INTRO-1/2	Aug 25/04
Description and Operation	1	Aug 25/04
	2	Apr 21/99
	3	Apr 21/99
	4	Apr 21/99
	5/6	Aug 25/04
Testing and Fault Isolation	101 to 103	Apr 21/99
	104	Aug 25/04
	105 to 107	Apr 21/99
	108	Aug 25/04
	109/110	Apr 21/99
Automatic Test Requirements	Not Applicable	-
Disassembly	301/302	Apr 21/99
Cleaning	401/402	Apr 21/99
Check	501/502	Apr 21/99
Repair	601/602	Apr 21/99
Assembly	701/702	Apr 21/99
Fits and Clearances	Not Applicable	-
Special tools, Fixtures & Equipment	Not Applicable	-
Parts List	1001/1002	Aug 25/04

LEP - 1/2

24-01-03

Aug 25/04

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

CONTENTS

Chapter No./Section No.	Page
INTRODUCTION	INTRO-1/2
DESCRIPTION AND OPERATION	1
1. Description	1
2. Operation	3
A. General	3
B. Temperature Effect	3
C. State Of Charge	4
D. Leading Particulars	5/6
TESTING AND FAULT ISOLATION	101
1. General	101
2. Required Test Equipment	101
3. Test Equipment Set Up	102
4. Testing	103
A. Test Equipment	103
B. Condition Of Batteries On Receipt	103
C. Unpacking And Acceptance Checks	103
D. Storage	104
E. Charging Procedures	105
F. Discharge Test Procedure	106
G. Commissioning Procedure	106
H. Servicing	107
I. Rejection Procedure	108
J. Disposal	108
5. Fault Isolation	109/110

LEP - 1/2

24-01-03

Apr 21/99

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

DISASSEMBLY	301/302
1. General	301/302
CLEANING	401/402
1. General	401/402
CHECK	501/502
1. General	501/502
REPAIR	601/602
1. General	601/602
ASSEMBLY	701/702
1. General	701/702
PARTS LIST	1001/1002

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

INTRODUCTION

The instructions in this manual provide the information necessary for an experienced shop mechanic to service batteries with no specialised training.

The manual is divided into separate sections:

- | | |
|----------------------------|-------------------------------|
| 1. Title Page | 4. Table of Contents |
| 2. Record of Revision | 5. Introduction |
| 3. List of Effective Pages | 6. Procedures and PL Sections |

The disassembly, repair and assembly sections generally contain only specific instructions to be used on the equipment covered herein. Most standard aerospace practices are not described herein.

All weights and measurements in the manual are in English units, unless otherwise stated.

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Verification:

Testing/Fault Isolation	Apr 21/99
Repair	Apr 21/99
Disassembly	Apr 21/99
Cleaning	Apr 21/99
Assembly	Apr 21/99

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

DESCRIPTION & OPERATION

1. Description

The EnerSys 24 volt 10 ampere-hour, Sealed Lead Acid Battery covered by this Maintenance Manual (Ref.Fig.1) is used as the emergency battery for the standby instrumentation on board Learjet 45 aircraft. It is also used to ensure that the avionics bus-bar remains powered during engine starts. Its emergency power duties include ensuring airspeed and altitude indicators remain operational as well as supplying power to illuminate the essential displays.

The Battery consists of two 12 volt Sealed Lead Acid monoblocs connected in series, enclosed in a metal outer case, which incorporates the battery main terminal connector. The monoblocs are packed tightly into the outer case and secured by the use of sheet rubber around the interior of the case and rubber hold down blocks placed on top of the monoblocs.

Each monobloc incorporates a resealing safety valve to guard against the effects of abusive use of the battery.

EnerSys Aerobatic Sealed Lead-Acid Aircraft Batteries are classified as Non-Spillable and exempt from hazardous goods transportation requirements, in accordance with :-

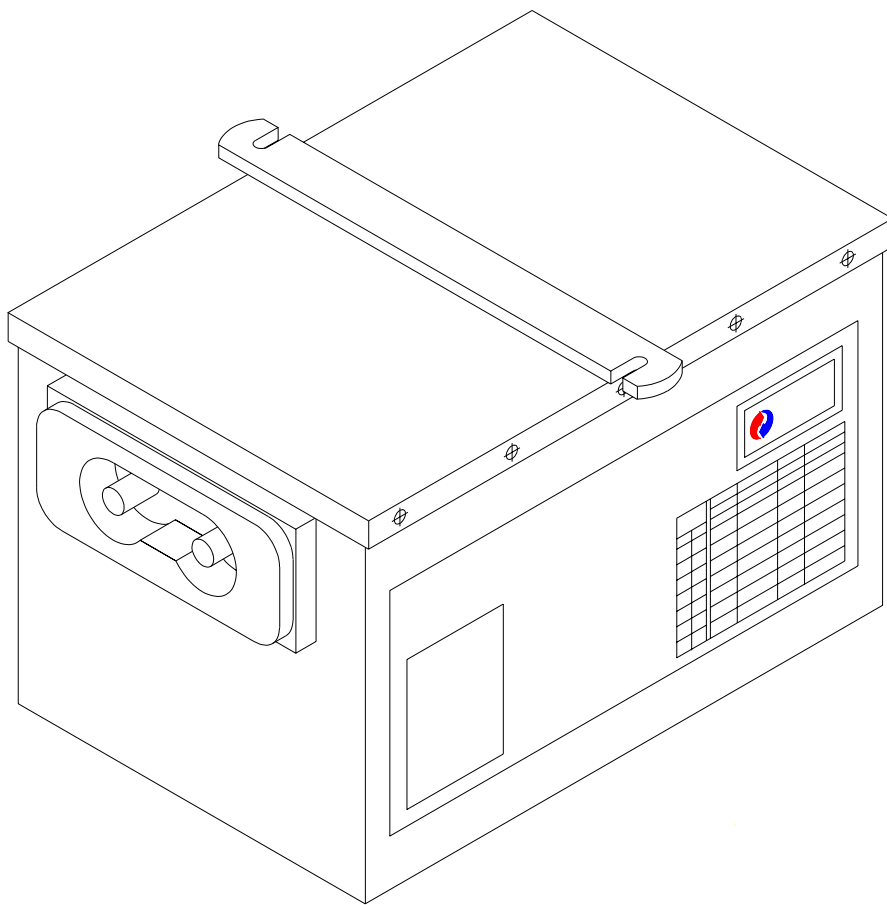
- 1) US Dept of Transportation - 49 CFR Section 173.159 para d.
- 2) ICAO/IATA Packing Instruction 806, Special Provision A67
- 3) IMDG Class 8, UN ID 2800, exemption for Non-Spillable batteries.
- 4) ADR 2003 and RID 2003 Special Provisions 238, 295 and 598

24-01-03

Page 1
Aug 25/04

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04



Sealed Lead Acid Battery
Figure 1

24-01-03

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

2. Operation

A. General

The battery is charged on the aircraft by constant potential.

CAUTION: The battery is maintenance free. Under no circumstances should any attempt be made to introduce any substances, eg., acid, distilled water or alkali, to the battery.

B. Temperature Effect

The ideal environmental temperature for battery operation is 20°C(68°F) to 25°C(77°F). Long term exposure to temperatures above 30°C (86°F) can shorten the life of the battery.

As the temperature falls, the available capacity of the battery is reduced, which causes a reduction in performance. However, this is not a permanent condition and the capacity will be restored as the temperature rises. Long term exposure to low temperatures will not damage the battery. Figure 2 shows variation of available capacity with temperature.

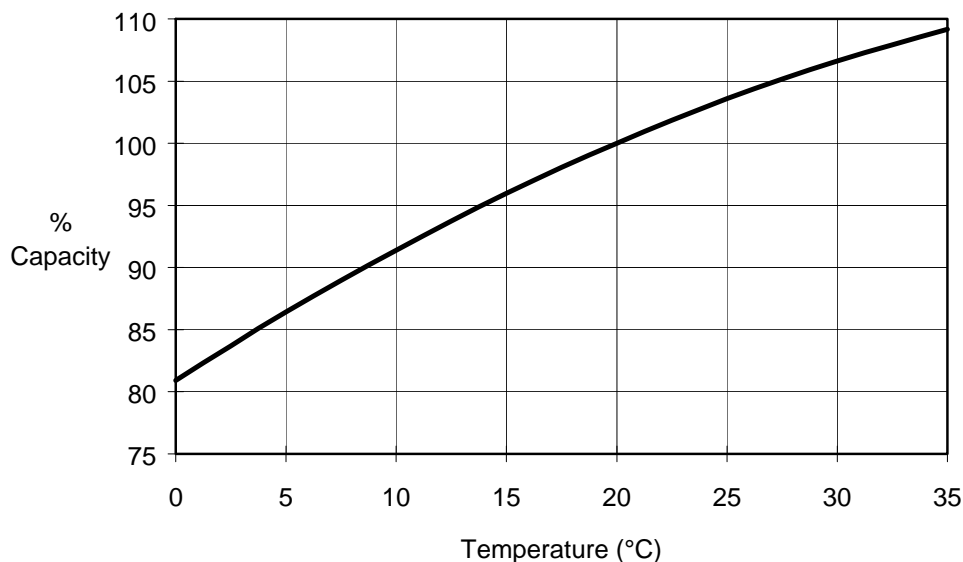


Figure 2

24-01-03

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

C. State of Charge

Figure 3 shows percentage State-of-Charge versus Open-circuit Voltage.

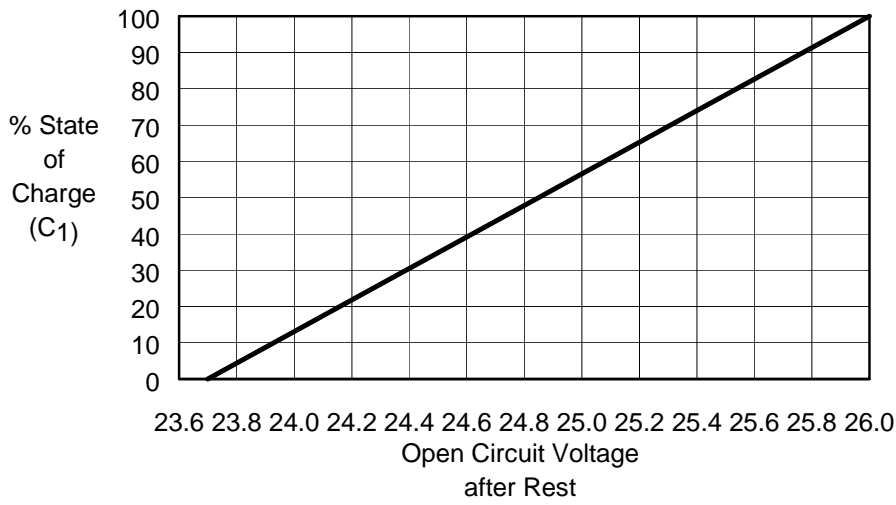


Figure 3

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

D. Leading Particulars

Battery Voltage: Nominal 24.0 Volts

Battery Weight: 11.4 Kg Max (25.1lbs)

Dimensions: Overall Height	155.50 mm Max	(6.122")
Overall Width	194.00 mm Max	(7.638")
Overall Length	249.00 mm Max	(9.803")

Connector: MS 3509 Style 1

Rated Capacity: 10 ampere-hours at the one hour rate

Monobloc Case Material: Flame Retardant Plastic

Battery Case Material: 1.5 mm thick Alloy to EN 485-2: 1994, Alloy EN
AW-5251/H22

Or

1.5mm thick Alloy to 5154A to BS1470/H4

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

TESTING AND FAULT ISOLATION

1. General

This section contains battery functional tests and fault isolation information. Trouble shooting is presented in chart form (Ref. Fig.8).

2. Required Test Equipment (Ref. Fig. 4).

NOTE: Test equipment having equivalent specifications can be used.

NOMENCLATURE	MFR	MODEL/PN	APPLICATION
DC Power Supply, regulated, 40V dc @ 10A minimum. (this can be replaced by the following Charger/Analyser)	Mead		Testing/F1
	Mead	Charger/Analyser	Testing/F1
DC Voltmeter, precision ($\pm 0.5\%$) 0 to 50V	Fluke	Fluke 85	Testing/F1
Discharge unit 10A MINIMUM	Digatron	RCT 50-24	Testing/F1
Disconnect	Rebling	7004	Testing/F1

Required Test Equipment

Figure 4

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

3. Test Equipment Set Up

A. Capacity Testing

Connect the battery to the discharge test unit in accordance with Figure 5.

B. Recharging

Connect the battery to the charging unit in accordance with Figure 5.

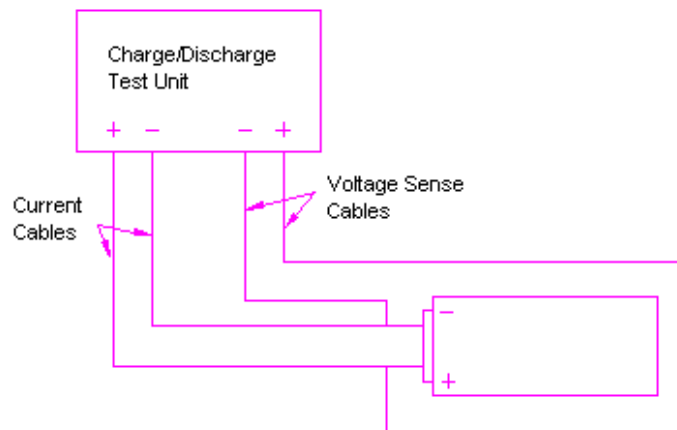


Figure 5

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

4. Testing

WARNING: Short circuit currents may exceed 1000 Amps; all tools must be insulated. Care must be taken with all items of metal in clothing and jewellery, eg. Buckles, zips, rings, watches, chains etc.

NOTE: A dedicated lead acid battery charging room is not required for battery commissioning. A normal electrical workshop may be used and the battery can even be commissioned in a Nickel Cadmium battery room without fear of contamination.

A. Test Equipment

Refer to Figure 4 for test equipment recommendations.

B. Condition of Batteries on Receipt

All batteries are despatched from manufacturer in a fully charged condition, the date of the latest charge being marked on the outer packaging.

C. Unpacking and Acceptance Checks

NOTE: The only acceptance check required immediately upon receipt is to look for signs of damage in transit. Unpacking and detailed examination is unnecessary and should be left until the battery is removed from storage.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

D. Storage

It is recommended that the fully charged battery should be stored in a cool dry place, ideally below 25°C (77°F). The battery charge retention will be reduced with increased temperature.

The graph in Figure 6 demonstrates typical capacity retention of the battery during storage without regular boost charges.

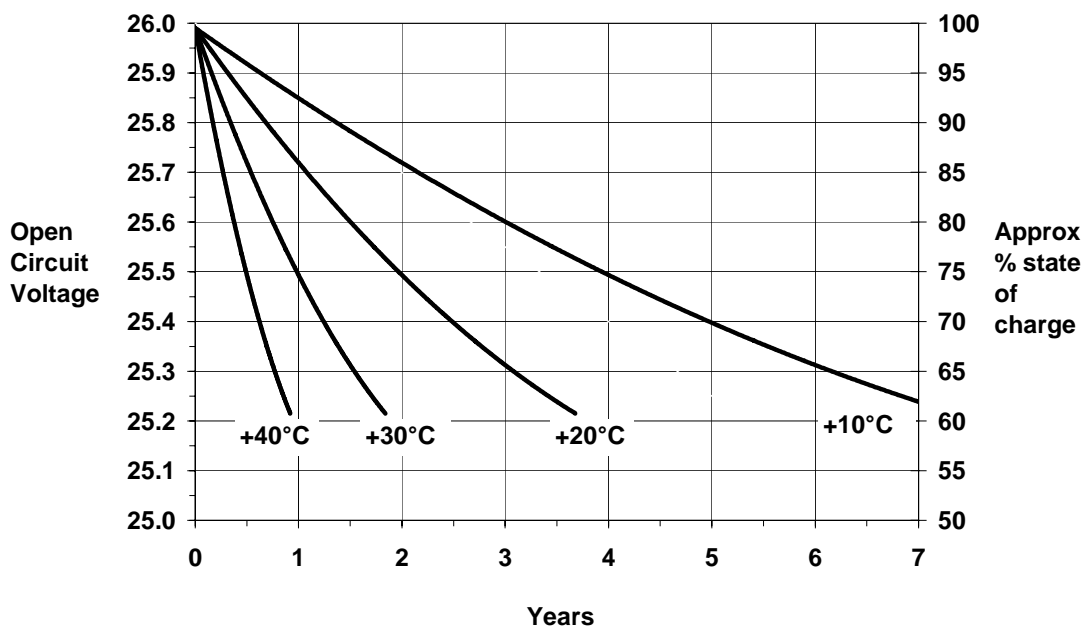


Figure 6

The battery may be stored up to 5 years without degradation of performance provided that an inspection and open circuit voltage check is conducted every 12 months. When stored in temperatures in excess of 35°C (95°F), the battery should be inspected every 6 months. If the Open-circuit Voltage falls below 25.3V the battery should be charged in accordance with Section 4. E.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

E. Charging Procedures

Charging of the battery can be either constant current or constant voltage depending on the charging equipment available.

NOTE: Charging should be conducted between 20°C (68°F) and 30°C (86°F). The battery capacity may vary if charged outside this recommended temperature range.

(1) Constant Current

Constant current chargers must be capable of applying a voltage of 40.0 volts or more.

Charge at 0.8 Amps for the times given in Figure 7 below.

Record the open circuit voltage prior to commencement of battery charge. After 30 minutes of charge measure and record battery on charge voltage. If the on charge voltage is greater than 29 volts and the open circuit voltage at the start was less than or equal to 25 volts, STOP the charge and reject the battery.

NOTE: It is normal for the voltage to rise as high as 35 volts as the gas recombination process starts and then to decline to 31 volts or less.

Battery Open-circuit Voltage	Time (Hours)
25.5	3.0
25.2	5.5
24.8	8.0
24.6	9.5
24.2	13.0
24.0	14.5
<24.0	16.0

Constant Current Charging
Figure 7

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

If three consecutive half-hourly voltage readings show a voltage decrease, the charge may be discontinued.

After charging, rest the battery for 4 Hours.

(2) Constant Voltage

Charge at 29.0 volts (minimum of 10 Amps available) for 4 Hours

After charging, rest the battery for 4 Hours.

F. Discharge Test Procedure

Discharging should be conducted between 20°C (68°F) and 30°C(86°F).

Discharge at 10 Amps to 20 Volts or for 48 Minutes, whichever occurs soonest.

G. Commissioning Procedure

- (1) Visually inspect the exterior of the battery casing for signs of damage, cracks, corrosion, etc.
- (2) Examine the battery terminal connector for signs of corrosion, damage and water/dirt ingress; clean if necessary.
- (3) Check open circuit voltage, if the open circuit voltage is in excess of or equal to 25.5 volts, ensure that the battery is clean and issue for service.
- (4) If the open circuit voltage is above or equal to 25.3 volts but below 25.5 volts, charge in accordance with section 4.E. After resting the battery for 4 Hours, ensure that the battery is clean and issue for service.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

- (5) If the open circuit voltage is below 25.3 volts
 - (a) Charge in accordance with section 4.E.
 - (b) Carry out a discharge test in accordance section 4.F.
 - (c) If the discharge duration is at least 48 Minutes, recharge in accordance with section 4.E., ensure the battery is clean and issue for service.
 - (d) If the discharge duration is less than 48 Minutes, recharge in accordance with section 4.E.
 - (e) Carry out a further discharge test in accordance section 4.F.
 - (f) If the discharge duration is now at least 48 Minutes, recharge in accordance with section 4.E ensure the battery is clean and issue for service.

If the discharge duration is less than 48 Minutes, reject the battery.

H. Servicing

- (1) Visually inspect the exterior of the battery casing for signs of damage, cracks, corrosion, etc.
- (2) Examine the battery terminal connector for signs of corrosion, damage and water/dirt ingress; clean if necessary.
- (3) Check and record the open-circuit voltage.
- (4) Recharge in accordance with section 4.E
- (5) Carry out a discharge test in accordance section 4.F
- (6) If the discharge duration is at least 48 Minutes, recharge in accordance with section 4.E., ensure the battery is clean and issue for service.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

- (7) If the discharge duration is less than 48 Minutes, recharge in accordance with section 4.E.
- (a) Carry out a further discharge test in accordance section 4.F
 - (b) If the discharge duration is now at least 48 Minutes, recharge in accordance with section 4.E, ensure the battery is clean and issue for service.
 - (c) If the discharge duration is less than 48 Minutes, reject the battery.

I. Rejection Procedure

If the battery fails to attain the appropriate discharge duration after two discharge tests, it should be rejected for aircraft use.

J. Disposal

Lead-Acid batteries contain some hazardous materials and should be disposed of in accordance with local regulations.

For advice on disposal in the UK, contact :-

Enersys Limited
Stephenson Street
NEWPORT
South Wales
NP19 4XJ
U.K.

Telephone: +44 (0) 1633 277673
Fax: +44 (0) 1633 281787

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

5. Fault Isolation

Trouble shooting information is presented in Figure 8 as a guide in locating a cause of malfunction and isolating the cause to a specific component.

TROUBLE	PROBABLE CAUSE	REMEDY
Zero battery voltage	Broken or loose terminal connections, or open-circuit battery monobloc.	Reject battery.
Low volts off aircraft	In service charging malfunction.	Check aircraft charger.
	Discharged battery	Service in accordance with section 4.H.
	Defective cell	Reject battery

Fault Isolation
Figure 8

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COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

DISASSEMBLY

1. General

Due to it's construction, disassembly of the battery is not permitted.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

CLEANING

1. General

- A. The following item is required to perform the cleaning procedure.

Soft clean dry cloth

- B. Battery external surfaces should be wiped clean as necessary.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

CHECK

1. General

A. Battery case and lid. Examine for:

- (1) Cleanliness
- (2) Damage
- (3) Corrosion

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

REPAIR

1. General

Due to it's construction, the battery is not repairable.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

ASSEMBLY

1. General

Due to it's construction, disassembly and subsequent reassembly of the battery is not permitted.

ENERSYS Ltd, NEWPORT

COMPONENT MAINTENANCE MANUAL
LEARJET PART NO.7624308001-003
ELN PART NO.9750R0824-Rev04

PARTS LIST

FIG	ITEM	PART NUMBER	NOMENCLATURE (12345)	EFF CODE	UNITS PER ASSY
1	1	7624308001-003	SEALED LEAD ACID BATTERY (9750R0824-Rev04)		1

The vendor of all parts shown in the parts list is as follows:

VENDOR CODE

NAME/ADDRESS

V U6335

ENERSYS Ltd
Stephenson Street
NEWPORT
South Wales
NP19 4XJ
U.K.

24-01-03

1001/1002

Aug 25/04