To: Holders of 4579 (Saft 018550-000) batteries

Subject: CMM Revision No. 13 Dated Aug 30/2022

HIGHLIGHTS

Discard any previous revision of the CMM and use the current revision dated Aug 30/2022..

NOTE: The CMM can be downloaded from the internet at www.saftbatteries.com

CHAPTER/SECTION PAGE NUMBER	DESCRIPTION OF CHANGE
Title Page T-1	Updated revision number, update CAGE code.
Record of Revision ROR 1	Updated revision number and issue information
Record of Temporary Revision RTR 1	Updated table heading
Service Bulletin List SBL 1	Deleted paragraph
List of Effective Pages LEP 1	Update revisions to applicable pages
List of Illustrations LOI 1	Updated IPL figure information
Introduction Intro 2	Add warning for vent valve, update CAGE code.
Testing and Fault Isolation 1001	Update IPL Figure link, update CAGE code.
Testing and Fault Isolation 1004 - 1014	Item numbers
Testing and Fault Isolation 1016 - 1018	Add test step paragraphs
Disassembly 3001 – 3002	Update IPL Figure link and item numbers, update CAGE code.
Cleaning 4001 -4002	Update IPL Figure link and item numbers
Check 5001 - 5003	Update IPL Figure link and item numbers
Repair 6001 - 6004	Update IPL Figure link and item numbers, update CAGE code.
Assembly 7001 - 7004	Update IPL Figure link and item numbers
Fits and Clearance 8001	Update item numbers
Special Tool, Fixtures, Equipment, and Consumables 9001 - 9002	Change range by using “to” , update CAGE code.

CHAPTER/SECTION PAGE NUMBER	DESCRIPTION OF CHANGE
Illustrated Parts List 10002 - 10008	Update IPL Figure link and item numbers Update figure to include IPL text, update CAGE code.
Storage (Including Transportation) 15001 – 15002, 15005	Corrected grammar and environmental parameters. Remove obsolescent information.

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COMPONENT MAINTENANCE MANUAL

WITH

ILLUSTRATED PARTS LIST

Nickel Cadmium Battery

4579

(BA06-01 ELDEC PART NUMBER)
(S282T002-1 BOEING PART NUMBER)
(SAFT PART NUMBER 018550-000)

Website: www.saftbatteries.com

RECORD OF REVISIONS

REV NO.	ISSUE DATE	INSERT DATE	BY	REV NO.	ISSUE DATE	INSERT DATE	BY
1	02/28/84	03/01/84	Saft				
2	06/15/91	07/01/91	Saft				
3	01/30/98	01/30/98	Saft				
4	07/13/01	07/13/01	Saft				
5	06/16/17	06/16/17	Saft				
6	10/02/17	10/02/17	Saft				
7	Sep 6/18	Sep 6/18	Saft				
8	Mar 15/19	Mar 15/19	Saft				
9	Dec 18/19	Dec 18/19	Saft				
10	Jul 21/20	Jul 21/20	Saft				
11	Jun 17/21	Jun 17/21	Saft				
12	Feb 8/2022	Feb 8/2022	Saft				
13	Aug 30/2022	Aug 30/2022	Saft				

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RECORD OF TEMPORARY REVISIONS

TEMPORARY REV NO	ISSUE DATE	INSERTED DATE / INSERTED BY	DATE REMOVED / REMOVED BY	DATE INCORPORATED

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SERVICE BULLETIN LIST

SERVICE BULLETIN NUMBER / REV	SERVICE BULLETIN DATE	DATE INCORPORATION OR NO EFFECT	TITLE

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LIST OF EFFECTIVE PAGES

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RECORD OF TEMPORARY REVISIONS	RTR 1 RTR 2	Aug 30/2022 Blank
SERVICE BULLETIN LIST	SBL 1 SBL 2	Aug 30/2022 Blank
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ASSEMBLY	7001 7002 7003 7004	Aug 30/2022 Aug 30/2022 Aug 30/2022 Aug 30/2022
FITS AND CLEARANCES	8001 8002	Aug 30/2022 Blank
SPECIAL TOOLS, FIXTURES, EQUIPMENT, AND CONSUMABLES	9001 9002	Aug 30/2022 Aug 30/2022
ILLUSTRATED PARTS LIST	10001 10002 10003 10004 10005 10006 10007 10008	Feb 8/2022 Feb 8/2022 Aug 30/2022 Aug 30/2022 Aug 30/2022 Aug 30/2022 Aug 30/2022 Aug 30/2022
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INTRODUCTION

1. General

A. This manual is written to the ATA Specification 100 and in ASD Simplified Technical English. International Standard units of measure are used in this manual, with imperial units in parentheses.

B. This manual describes maintenance on components in a workshop. It does not describe maintenance on components when they are installed in aircraft.

C. Only approved personnel with the necessary skill can do maintenance tasks described in this manual.

D. This manual contains:

(1) Technical data for components

(2) Maintenance procedures for components

(3) An Illustrated Parts List (IPL) with data for parts of components. Parts are identified in all sections of the manual by IPL figure and item number.

E. We make sure of DISASSEMBLY, TESTING AND FAULT ISOLATION, and ASSEMBLY procedures are correct by doing them.

F. The manual is divided into separate sections:

(1) Title Page

(2) Record of Revisions

(3) Record of Temporary Revisions

(4) List of Effective Pages

(5) Table of Contents

(6) Introduction

(7) Procedures and IPL Sections

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

This manual provides information necessary for an experienced shop technician to maintain Saft nickel-cadmium batteries. It describes construction of the battery, as well as techniques used to operate, maintain, and provide care for the battery. Following these instructions will enhance the ability to obtain optimum performance and maximum life from Saft batteries.

All aircraft batteries require checking and maintenance to make sure they are safe when installed and they perform their required functions especially in emergency conditions on board the aircraft. Maintenance allows any problems to be identified and corrected. The maintenance interval is the period for which correct operation is assured with a low probability of failure and allows high levels of MTBUR and MTBF.

Every effort has been made to provide complete and accurate instructions. If a situation arises that is not adequately described in this manual, please contact Saft via the internet at www.saftbatteries.com/ or at one of the following addresses:

Saft America Inc. (09052)
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2. Definitions

Warnings call attention to use of materials, procedures, or limits which must be followed precisely to avoid injury to persons.

Cautions call attention to procedures which should be followed to avoid damage to equipment.

Notes call attention to procedures which make the job easier.

3. Safety

WARNING: EXCEPT FOR THOSE STEPS THAT REQUIRE THE BATTERY TO BE CHARGED, DO ALL STEPS ON DISCHARGED BATTERIES (REFER TO INITIAL DISCHARGE AND CELL SHORTING) TO AVOID THE POSSIBILITY OF ELECTRIC SHOCK. FINGER TIGHTEN VENT VALVES (020) WITH T01 or (320) PRIOR TO BEGINNING DISCHARGE. BATTERY CELLS DELIVER VERY HIGH CURRENT WHEN SHORT-CIRCUITED. EXERCISE CAUTION. REMOVE RINGS, WATCHES, NECKLACES, METALLIC BELTS AND OTHER JEWELRY TO AVOID ELECTRIC SHOCK.

WARNING: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW ELECTROLYTE LEAKAGE WHILE ON THE AIRCRAFT RESULTING IN UNSCHEDULED REMOVALS.

WARNING: DO NOT TILT THE BATTERY DURING MAINTENANCE, ANY CONTACT OF SKIN WITH ELECTROLYTE CAN CAUSE SEVERE BURNS.

Safety rules differ from one country to another. Always follow local safety regulations.

There are three types of risks.

A. Physical

(1) Handling: the battery is heavy. When you lift it, bend your legs and not your back.

(2) Use protective shoes.

B. Electrical

(1) Do not wear rings, watches, chains, belt buckles, necklaces, or any other metallic objects.

(2) Use insulated tools.

C. Chemical

(1) For a complete listing of hazards, refer to the safety information sheet available on Saft's website at www.saftbatteries.com.

(2) Electrolyte is very corrosive and can damage the skin: use gloves and an apron. If it touches the skin, flush affected part with large quantity of water. Remove contaminated clothing, after flushing begins.

(3) Electrolyte is very dangerous for eyes, use protective goggles. If the electrolyte comes in contact with an eye, flush it with water and get immediate medical attention.

(4) Saft recommends the use of an amphoteric solution (both acidic and basic behavior) and chelator (able to trap cations as a chelate complex) to neutralize electrolyte according to the local regulation.

(5) Electrolyte ingestion can cause damage to the throat and the respiratory tract. Do not try to vomit and get immediate medical attention.

(6) Skin contact with nickel can cause chronic eczema.

(7) Inhalation of cadmium oxide can cause dry throat, headaches, vomiting, chest pain. If inhaled, move to fresh air. If the affected person is not breathing, give artificial respiration. If breathing is difficult, give oxygen and get immediate medical attention.

4. New Battery Commissioning

Saft new batteries are shipped discharged. All new Saft batteries that are receiving the initial commissioning within 12 months of the DOM refer to Initial New Battery Commissioning on page 5001 to place into service.

For all new Saft batteries that have not received an initial commissioning within 12 months of the DOM, then refer to Servicing at end of long-term storage, Table 15001.

5. Battery Ratings

A. Capacity

Nickel-cadmium batteries are rated in terms of capacity in ampere-hours (Ah) (rated capacity).

Other definitions for battery ratings can be found in EN2570, IEC 60952, and RTCA DO 293.

6. Recycling

All batteries eventually lose their ability to perform and are eligible for scrapping and recycling. Saft takes environmental matters seriously and advocates proper recycling of nickel-cadmium batteries and their components. To that end, Saft operates recycling facilities in both Europe and North America.

Nickel-cadmium batteries contain nickel, cadmium, and potassium hydroxide and should be disposed of properly. In all cases, rely on local and national regulations for proper battery disposal and/or shipping to an appropriate recycling location.

Universal Recycling Symbols
Figure Intro 1

You can find the nearest recycling collection point on our website at www.saftbatteries.com.

7. End of Life

EASA and FAA regulations “Part 145” requires end of life cells to be disposed of in a manner prohibiting them to be returned to service. Other authorities may have requirements less explicit, Saft recommends the following procedure to be followed to provide a means of compliance.

A. Make sure the appropriate protective measures (refer to Safety paragraph and Battery Information Sheet (BIS)) are taken.

A. Make sure the cell is fully discharged (See Cell shorting).

B. Put one of the terminals from the cell into a bench vice and bend the terminal until it breaks. If any electrolyte leakage occurs, make sure the cleaning procedures are correctly applied (see Battery Information Sheet (BIS)).

C. Dispose of the cell in accordance with applicable transport, health and safety, and recycling regulations. (Refer to Recycling paragraph)

All batteries eventually lose their ability to perform and are eligible for scrapping and recycling. Saft takes environmental matters seriously and advocates proper recycling of nickel-cadmium batteries and their components. To that end, Saft operates recycling facilities in both Europe and North America.

8. Abbreviations

A	Amperes
ASD	AeroSpace and Defence Industries Association of Europe
ATA	Air Transport Association of America
EASA	European Air Safety Authority
FAA	Federal Aviation Authority
IATA	International Transport Air Association
IMDG	International Maritime Dangerous Goods
IEC	International Electrotechnical Commission
IPL	Illustrated Parts List
MTBF	Mean Time Between Failure
MTBUR	Mean Time Between Unscheduled Removal
P/N	Part Number
RTCA	Radio Technical Commission for Aeronautics
V	Volt

Verification:

Testing / Fault Isolation:	June 15, 1991
Disassembly:	June 15, 1991
Assembly:	June 15, 1991

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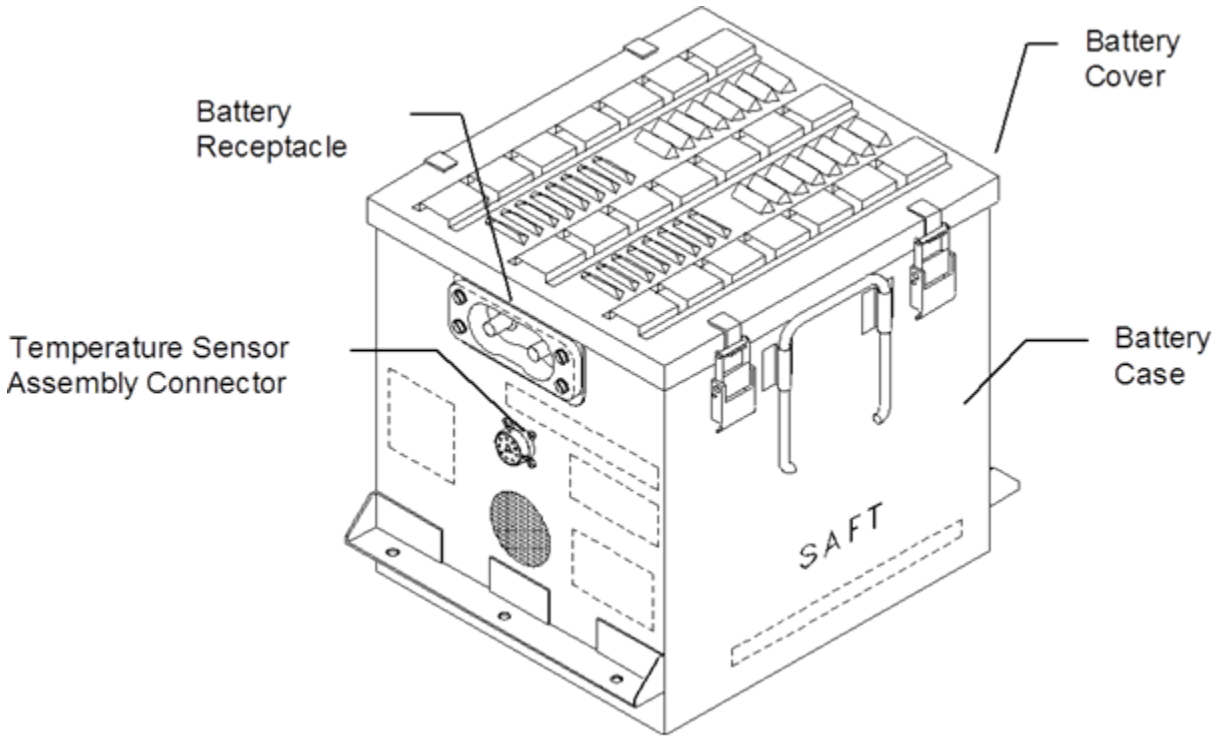
DESCRIPTION AND OPERATION

1. Description

The Nickel Cadmium Battery provides power either to the standby system or to start the auxiliary power unit (APU). It is a nickel-cadmium type with sintered plate construction and uses a potassium hydroxide electrolyte. The battery consists of a case and cover, 20 cell assemblies, and a sensor harness. The sensor harness includes a thermoswitch mounted on a plate against the end of the center row of cells. A charge control thermistor is located between cells 6 and 9 in the center row of cells.



Nickel Cadmium Battery
Figure 1

PARAMETER	VALUES
Voltage: Nominal Open Circuit Voltage (fully charged)	 24 Volts 26 ± 1 Volts
Weight	43.64 Kg (96 lb)
Dimensions (Maximum): Height Length (including side brackets) Width (including handles)	 285 mm (11.4 in) 325 mm (13.0 in) 275 mm (11.0 in)
Cell Terminal	M10 X 1.25, externally threaded
Number of Cells	20
Cell Model	Saft-Type VHP450KA-1
1.0C_1 A Rate	45.0A
0.5C_1A Rate	22.5A
0.1C_1A Rate	4.5A
Cell Rated Capacity (C_1)	45 Ah at 1.0 C_1 A
Battery Nameplate Capacity	40 Ah at 1.0 C_1 A
Vent Valve	M8 X 1.00 thread
Venting Pressure	0.14 to 0.69 bar (2 to 10 psi)
Maximum Consumable Water Reserve per Cell	80 cm^3 (4.88 in^3)
Cell Case Material	Polyamide
Battery Case Material	Stainless Steel
Electrolyte	Potassium Hydroxide
Recommended Storage Temperatures	+5°C to +35°C (+41°F to +95°F)
Ambient Temperature	+15°C to +30°C (+59°F to +86°F)

Leading Particulars
Table 1

2. Operation

A. Flight charging

The battery is charged on the aircraft by an on-board charger. The charge control thermistor provides a signal to the charger to compensate the charge according to the battery temperature. The thermostat will cut off the charger if the battery temperature exceeds a safe operating limit.

B. Maintenance

(1) Maintenance interval basis

The aircraft manufacturer and/or operator is responsible for the definition of the maintenance interval based on the use profile of the batteries installed on the aircraft. The maintenance interval has two main factors:

- Energy available for emergency requirements
- Electrolyte consumable reserve.

Both factors depend on the battery charging system, operating temperature, discharge magnitude, charge cycles, flight duration, ground operation, and battery technology.

The higher voltage per cell applied, the higher overcharge current and capacity the battery receives.

The overcharged capacity is directly related to the electrolysis of water from the electrolyte, and hence the consumption of the electrolyte reserve. For every 3 Ah of overcharge, 1 cc (0.06 in^3) of water is consumed via electrolysis. Once the water reserve has been consumed, the result is:

- Dried out cells with a significant risk of permanent damage
- Internal short circuit
- Overheating
- Thermal runaway

(2) Maintenance interval extensions

To validate maintenance interval extensions, the recommendation is to have the Operator and Saft review the maintenance records for a minimum period of 12 months.

The data includes but is not limited to the recording of aircraft flight hours accrued while installed, its removal date, inspection date, off-wing capacity, and water consumption as required by this CMM.

As with any maintenance extension, subsequent monitoring of the water addition and electrical performance upon removal from the aircraft must be performed to detect any adverse effects and, if necessary, re-adjust the maintenance interval accordingly. To determine the electrical performance more readily after aircraft removal, the battery may be floated 31V for 1.5 hours if the aircraft uses a dedicated charger or 28.5V for 1.5 hours if it floats on the aircraft bus before performing the Initial discharge (off-wing capacity) test.

C. Battery data requirements

Maintenance information is required for any Saft battery evaluation to determine its condition and health. Throughout this manual there are multiple steps requiring specific information be recorded to maintain a battery service history. The information provided not will only reflect the batteries airworthiness, but also provide information to assist in any battery issue investigations required at the factory. As a minimum the items identified below are required for each battery maintenance step/action.

(1) Record the date the battery was received, and time testing started.

(2) As required for all discharges, record the duration the first cell reaches 1.0V.

(3) As required during charges,

(a) Record the cell voltages at the start of the charge, at the end of the main charge, and the last 30 minutes of the final charge.

(b) Record the water added to each cell during the last 30 minutes of the final charge.

(4) As required for special testing, record location and reason for cell replacement either voltage or capacity.

(5) Record the date the battery is returned to service.

TESTING AND FAULT ISOLATION

1. General

This section contains battery functional tests and fault isolation information. Test procedures are written in a step-by-step format following Figure 1001. Fault isolation information is presented in chart form Table 1007, Table 1008, or Table 1009.

NOTE: All ( ) part identification numbers herein are IPL Figure 1 item numbers.

NOTE: All voltage readings are DC unless otherwise stated.

2. Required and Materials

A. Equipment

NOTE: Equivalent equipment may be used.

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Constant current charger	-	0 to 60A DC 40V DC Minimum	Commercially Available	Sorenson Power (DCR-40-70B)
Constant current source with load bank	-	0 to 60A DC 1 to 40V DC	Commercially Available	Sorenson Power (DCR-40-70B) with Ohmite (L225J5ROE)
Megohmmeter	-	0 to 50 MΩ @ 250 V continuous	Commercially Available	Fluke (1507)
Digital multimeter	-	2000 count, accuracy 1% or better	Commercially Available	Fluke (179)
Climatic chamber	-	+15°C to +80°C (+59°F to +176°F)	Commercially Available	Cincinnati Sub-Zero (MCB-1.2-.33-H/AC)
Torque wrench	Insulated	0 to 15 N-m (0 to 133 lb_f-in)	Commercially Available	McMaster-Carr (7936A12)
Universal vent wrench	-	-	09052 F6177	093365-000 (T01) 413876
Syringe assembly	-	-	09052 F6177	020915-004 (T02) 416231
Equalizing resistors	-	1 Ω 3 W	F6177	164829 (T03)
Cell puller tool	-	-	09052 F6177	017556-000 (T04) 416159
Vent valve adapter	-	-	09052	025098-000 (T05)

Equipment (Testing)
Table 1001

B. Materials

NOTE: Equivalent substitutes are permitted for all items except for those that become part of the configured unit. Equivalent substitutes are not allowed for items marked with a double asterisk (**).

NAME	SPECIFICATION OR PART NUMBER	SOURCE OR CAGE CODE	USE
Distilled or deionized water**	M01	Commercially Available	Water addition
Neutral petroleum jelly	M02	Commercially Available	Lubrication
Cloth, soft, clean	-	Commercially Available	Protect from FOD

Materials (Testing)
Table 1002

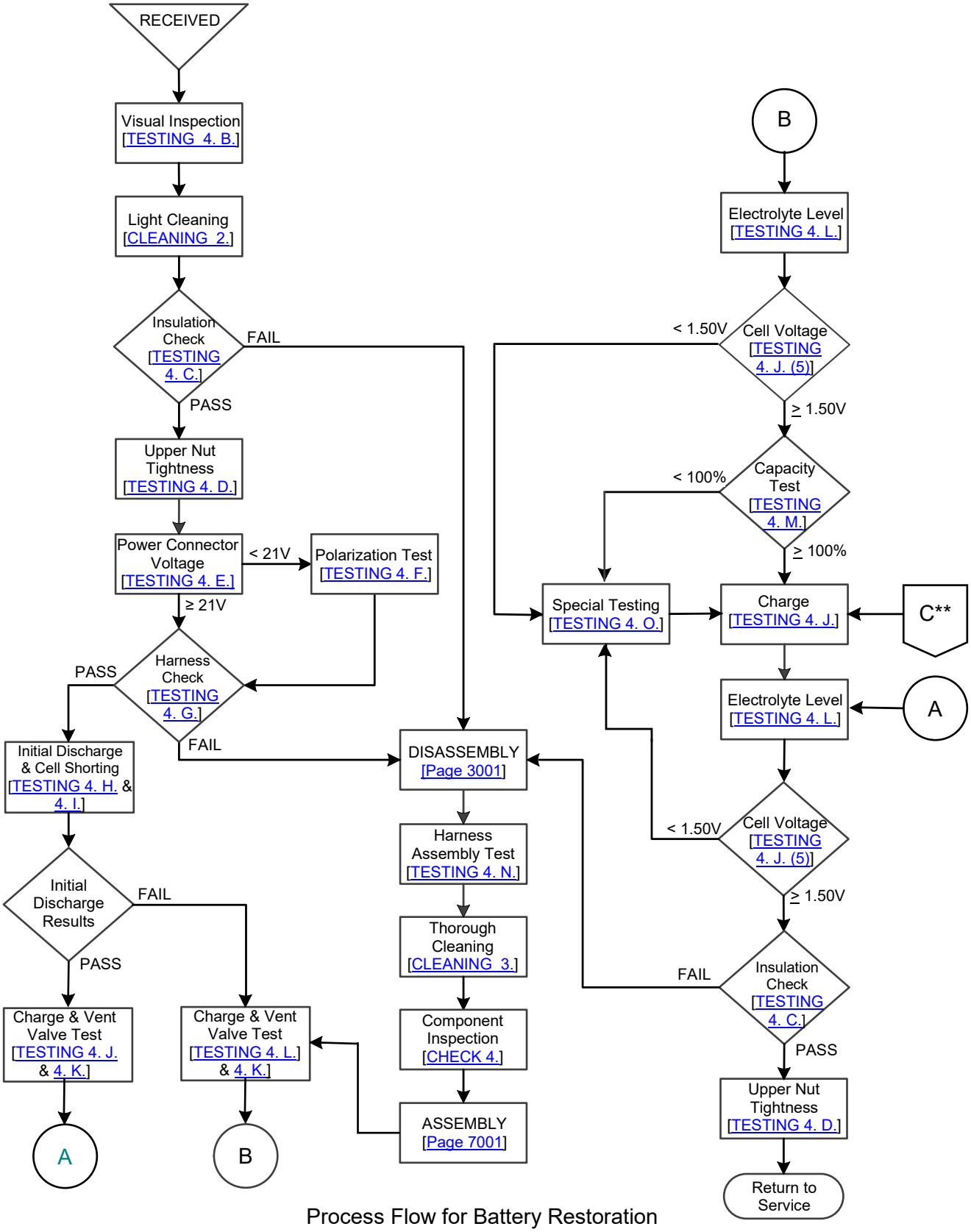
3. Maintenance Procedures

In addition to the checks specified for airborne or ground use, in normal service SAFT 4579 batteries require the following maintenance operations.

A. Restoration Procedure

Outlined in Figure 1001 is a step-by-step process flow. A request for overhaul or restoration should follow this same procedure.

NOTE: Overhaul by some airworthiness authorities is defined as an item that has been disassembled, cleaned, inspected, repaired as necessary, reassembled, and tested. To identify this process the entire battery must require total disassembly, thorough cleaning, inspection, assembly, and testing.



Process Flow for Battery Restoration
Figure 1001

**From Table 15001

4. Testing

A. Test conditions

CAUTION: FUMES FROM LEAD ACID BATTERIES OR SMALL TRACES OF SULFURIC ACID ENTERING A NI-CD BATTERY CAN CAUSE PERMANENT DAMAGE.

(1) Facilities and equipment

(a) Service facilities for Ni-Cd batteries must be entirely separate from those for lead acid batteries.

(b) Equipment used to service lead acid batteries must not be used to maintain Ni-Cd batteries.

(2) For optimum results conduct all tests with the battery temperature at ambient, unless otherwise noted in this manual.

B. Visual inspection

Items found may require doing immediate disassembly while the majority do not. If a finding does not require going to disassembly procedure, then specific instructions are provided after the battery has been received its initial discharge

(1) Visually inspect cover (130) for dents, distortion, or other damage, replace as needed with new Saft component.

(2) Visually inspected hold-down pad (140) and formed insulator (150) for distortion and other damage, replace as needed with new Saft component.

(3) Visually inspect battery case (120)for dents, distortion, or other damage. If found, identify the component for replacement.

(4) Visually inspect each cell (010) for any evidence of electrolyte leakage and damage by removing battery cover (130), hold-down pad (140) and formed insulator (150).

(a) Damaged cells (010) should be identified for replacement or further cleaning.

NOTE: Excessive electrolyte leakage will cause the battery to fail the Battery insulation test.

(b) Excessive salts around the terminal posts gives an indication of possible leakage from terminal O-ring (110). Identify the cells with excessive salts for later torquing of the lower nut (060).

(c) When inspection reveals electrolyte leakage from the cell at the vent hole opening, replace the defective O-ring (030), do Vent valve O-ring replacement.

(5) Inspect the upper nuts (040), (240), washers (050), (250), and links (160 through 200) to ensure it is free of bends, tarnish, corrosion, burns, or loss of plating. Minor tarnish can be polished off with a fine wire brush. Identify the defective hardware for later replacement.

(6) Check all ventilation openings to make sure that they are clean and clear.

(7) Inspect the power connector (210) and its pins for defects, evidence of arcing, or excessive oxidization. If observed, identify the power connector (210) for later replacement.

C. Battery insulation

NOTE: A breakdown in electrical insulation between the cells and the battery case will result in a “leakage” current, which, over a period of time, can discharge the battery.

NOTE: Method A or B may be used to check the insulation breakdown.

(1) Method A

(a) Set up the multimeter for current measurement of 500mA

(b) Connect the negative lead to the battery container then touch the positive lead from the meter to the positive terminal of the battery followed by each positive cell terminal.

(c) If there is a reading other than zero, the battery insulation is a “FAIL”.

NOTE: If, after cleaning and assuring everything is dry, a leakage current is still indicated by a deflection of the needle, then one or more cells (010) are defective. Isolate and identify for later replacement.

(d) If the reading is equal to zero, the battery insulation is a “PASS”.

(2) Method B

(a) Measure the insulation resistance between the block of cells and the metal case. The value measured must be greater than 10MΩ under a DC voltage 250V continuous using a megohmmeter.

1. If, while doing the above, there the reading does not meet the above criteria, the battery insulation is a “FAIL”.

NOTE: If after cleaning and assembly and the resistance is still less than 10MΩ, then one or more cells (010) are defective. Isolate and identify for later replacement.

2. If the reading meets the above criteria (≥ 10MΩ), the battery insulation test is a “PASS”.

D. Upper nut tightness

Check the tightness on each upper terminal nut (040) and power connector nuts (240) per Table 8001.

E. Battery voltage

Measure the voltage at the power connector and confirm the voltage is greater than or equal to 21.0V.

F. Polarization test

(1) Charge the battery at $0.1C_1$ (4.5A) for 1.5 hours.

(2) Keep the battery in open circuit for 1 hour.

(3) Measure the open circuit voltage of each cell (010).

(a) Identified for replacement any cell (010) with zero volts or negative polarity. If any cell (010) is identified for replacement, the polarization test is a “FAIL”.

(b) If all cells (010) are above zero volts, the polarization test is a “PASS”.

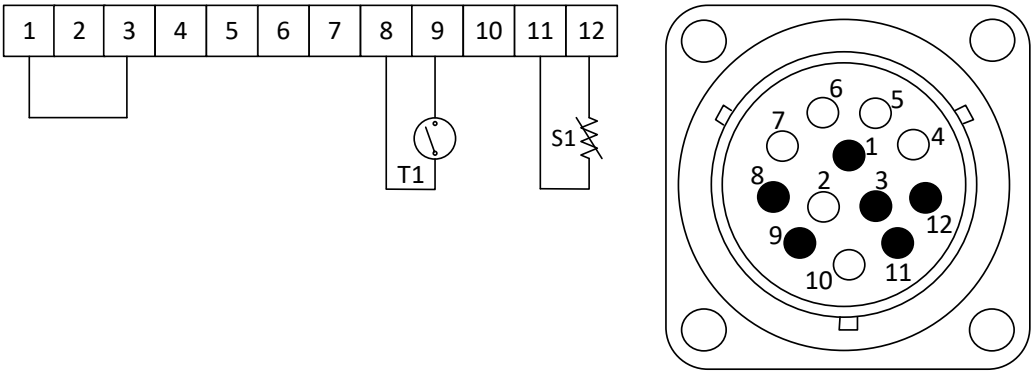
G. Sensor harness check

NOTE: A climate chamber or alternate methods may be used provided the temperatures below are achieved.

NOTE: This sensor harness check may be substituted with the paragraph Sensor harness test by assuming this check is “FAIL” then return to Figure 1001.

The sensor harness should be tested on a biennial basis instead of doing this check (see Sensor harness test).

NOTE: Refer to Figure 1002 for pinout locations.



Connector Pinout
Figure 1002

(1) If any part of the sensor harness (260) is damaged, the entire assembly must be replaced, refer to Sensor harness replacement.

(2) Be sure the internal battery temperature is per Table 1003, and then test with an ohmmeter to sensor harness (260). Any erratic readings represent a failure and the entire sensor harness (260) must be replaced with new Saft component.

ITEM	PINS	VALUES @ +22.8 ± 5°C (+73 ± 9°F)
-	Pin 1 to Pin 3	<1Ω
S1	Pins 11 to 12	1854Ω to 3116Ω
T1	Pins 8 to 9	≥ 20MΩ

Sensor Harness Check Values
Table 1003

H. Initial discharge (off-wing capacity)

The purpose of this procedure is to discharge the battery to a known state of charge and determine the battery capacity from the aircraft.

CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

(1) Using (320) or T01, confirm the vent valve (020) is finger tight on each cell (010).

(2) Discharge the battery at a rate listed in Table 1004 until the battery reaches 20.0V. Record the times the first cell reaches 1.0V and battery reaches 20.0V.

NOTE: It is important that the discharge current be continually maintained at the selected value, and that the time of discharge be measured accurately.

NOTE: If a cell goes to zero volts or reverses polarity during the discharge, short out the cell's terminals for the remainder of the discharge.

DISCHARGE TIMES		
DISCHARGE RATE (AMPS)	FIRST CELL MINIMUM DISCHARGE TIME TO 1 VOLT	
	BATTERY WITH PRIOR SERVICE FROM STORES OR AIRCRAFT	NEW BATTERY
10	260.0 MINUTES	270.0 MINUTES
20	130.0 MINUTES	135.0 MINUTES
40	64.5 MINUTES	67.0 MINUTES
45	60.0 MINUTES	60.0 MINUTES

Capacity Table
Table 1004

(3) If items were found during the visual inspection or cell(s) (010) identified for replacement, they should be corrected here.

(a) If the case (120) was identified for replacement, do Case replacement.

(b) For each cell (010) identified for replacement, do Cell replacement.

(c) For power connector (210) requiring replacement, do Power connector replacement.

(d) Remove and replace with new Saft component as needed nuts (040), (240) and washers (050), (250). Torque nuts (040), (240) per Table 8001.

(e) Replace as needed links (160 to 200) using Link replacement.

(f) For each cell (010) which had excessive salts around the terminals during visual inspection, then do Lower nut tightness.

(g) If any cell hardware (060), (070), (080), (090), (100) or O-ring (110) was identified to need replacing, then do Cell hardware replacement.

(4) If the discharge time the first cell reaches 1.0V equals or exceeds the value shown in Table 1004 for the discharged rate, then the battery capacity is a "PASS".

(5) If the discharge time the first cell reaches 1.0V is less than the value shown in Table 1004 for the discharged rate, then the battery capacity is a "FAIL".

I. Cell shorting

CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

(1) Using (320) or T01, confirm the vent valves (020) are finger tight on each cell (010).

(2) Discharge each cell in the battery to 0V using one of the two methods below:

NOTE: It is not necessary to have a rest period between a discharge and cell shorting.

(a) Method A

1. Continue to discharge the battery per Table 1004 until each cell is < 1.0V and its terminals have a T03 across its terminals. Once all cells have been shorted, then leave the devices in place for 12 to 24 hours.

(b) Method B

1. Continue to discharge the battery per Table 1004 until each cell is < 0.5V, then insert a shorting clip between its terminals. Continue this discharge until all cells have been shorted, then leave these clips on for 16 to 24 hours.

(3) After the completion of Method A or B, remove the shorting devices.

(4) If no cells (010) are identified for replacement, return to Figure 1001 utilizing the PASS or FAIL results of the Initial discharge.

(5) If any cell (010) was identified for replacement, do Cell replacement.

J. Charge

(1) Allow the battery to cool to ambient temperature.

(2) Remove the cover (130), pad (140), and insulator (150).

(3) Prior to charging the battery, loosen (do not remove) all vent valves (020). Ensure that the shorting spring has been removed.

NOTE: If required by Figure 1001, it is recommended to do the Vent valve test during the charge.

(4) Charge using one of methods shown in Table 1005.

(a) Record the cell voltages at the start and end of the main charge (Step 1), and then the last 30 minutes of the final charge (Step 2).

1. If the start cell voltage of the main charge (Step 1) goes above 1.50V, add to the cell about 10 cm^3 (0.61 in^3) of M01.

2. During the during the last 30 minutes of the final charge, adjust the Electrolyte level, and check the Minimum final charge voltage.

Charge Table			
Main Charge (Step 1)			**Final Charge (Step 2)****
Current	Minimum Time*	End of Main Charge Criteria	Current Time
$0.1C_1A$ (4.5A)	10h	Every cell >1.5V or 12h*** whichever comes first	$0.1C_1A$ (4.5A) for 4h
$0.5C_1A$ (22.5A)	2h	Every cell >1.55V or 2.5h*** whichever comes first	$0.1C_1A$ (4.5A) for 4h
$1.0C_1A$ (45.0A)	1h	Every cell >1.57V or 1.25h*** whichever comes first	$0.1C_1A$ (4.5A) for 4h

* Minimum time applies to a battery previously discharge to at least 20.0V.
** During the last 30 minutes do Electrolyte Level and confirm minimum voltage criteria in Table 1006.
** New batteries may need 20% more time to reach proper cell voltages.

Charge Table
Table 1005

(5) Minimum final charge voltage

During the last 30 minutes of the final charge (Step 2), measure and verify the voltage of each cell (010) meets the value shown in Table 1006. Identify each cell that does not comply and do Special testing per Figure 1001.

CELL VOLTAGE (Last 30 minutes at $0.1C_1A$)
≥ 1.50V

Final Charge Voltage Limit
Table 1006

K. Vent valve test

CAUTION: THE CELL OPENINGS MUST BE COVERED WITH A CLEAN DAMP CLOTH TO PREVENT ENTRY OF FOREIGN MATTER.

NOTE: The vent valve test should be done once a year of battery operation or every maintenance interval, whichever is longer. This test is not necessary if all the vent valves are replaced with new Saft valves each year or maintenance interval, whichever is longer.

NOTE: It is recommended to do this test while the battery is on charge.

(1) Check the operation of the vent valve (020) as follows:

(a) Use T05 or prepare a fixture from stainless steel tubing with an end adapter threaded on the inside to match the vent valve threads (M8 x 1.00). The adapter can be made from ½ inch round stock with ¼ inch I.D. hole.

(b) Finger tighten the valve (020) with its O-ring (030) into the adapter end of the pressure test fixture.

(c) Attach the fixture to a compressed air line through an adjustable pressure reducing valve limited to 1.38 bar (20 psi).

(d) Slowly raise the air pressure to 1.38 bar (20 psi) maximum to test functionally below.

(e) Immerse the valve and end of fixture in water, and slowly raise the pressure. Make sure the valve opens between 0.14 to 0.69 bar (2 to 10 psi).

(f) Reuse only those vent valves that open in the 0.14 to 0.69 bar (2 to 10 psi) range. Re-soak those valves that do not open at 0.69 bar (10 psi). Discard valves that are not gas tight at low pressure.

L. Electrolyte level

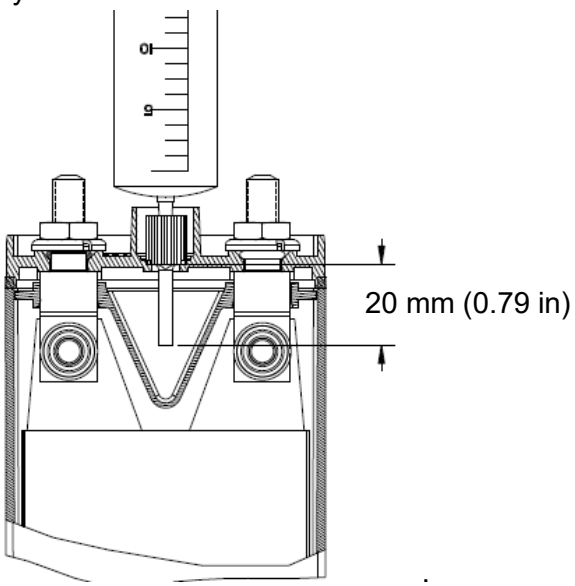
This procedure is to be carried out during the last 30 minutes of the final charge (Step 2) at $0.1C_1$.

WARNING: USE CARE NOT TO TILT CELLS WHILE VENT VALVES ARE LOOSENED OR REMOVED; CONTACT OF ELECTROLYTE WITH SKIN CAN CAUSE SEVERE BURNS.

CAUTION: USING ANYTHING OTHER THAN M01 IN NICKEL-CADMIUM CELLS WILL CAUSE ELECTROLYTE CONTAMINATION AND DAMAGE. DO NOT RE-USE WATER REMOVED FROM CELLS.

(1) Remove the vent valves (020) with vent valve wrench (320) or T01. Always take precautions to prevent foreign substances from entering the cell.

(a) Immerse the valves (020) and their O-rings (030) in M01 and let them soak to dissolve any salts.



Position of T02 in Cell Vent Seat
Figure 1003

(2) Insert T02 (syringe) into the cell opening until the shoulder of the nozzle rests on the valve seat, refer to Figure 1003.

(3) Withdraw the plunger and check for any liquid in T02.

(a) Any excess liquid in the cell will be drawn into T02 until the electrolyte is level with the end of the nozzle. This is the correct level for the electrolyte.

(b) If the liquid level is too low, the syringe will remain empty, indicating that the end of the syringe nozzle did not reach the liquid in the cell.

NOTE: If the quantity of water added per cell exceeds 80 cm^3 (4.88 in^3), then check the charging system. If the charger is functioning properly, the maintenance period may need to be reduced.

1. Draw a measured amount of M01, such as 5 cm^3 (0.31 in^3) into T02 and inject it into the cell.
2. With the syringe nozzle resting on the valve seat, slowly withdraw the plunger in T02.
3. If T02 remains empty, repeat steps 1 and 2, counting the total number cm^3 required to achieve the correct level.
4. At the point in step 2 when some excess liquid is drawn into T02, the correct level for that cell has been reached. Expel the excess liquid into a separate container for later disposal.
5. Record the amount of water added from each cell in the battery logbook or battery test sheet.

WARNING: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW ELECTROLYTE LEAKAGE WHILE ON THE AIRCRAFT RESULTING IN UNSCHEDULED REMOVALS.

(4) Using (320) or T01, finger tighten the vent valve (020) on each cell (010).

M. Capacity check (second discharge)

The purpose of this discharge procedure is to verify minimum battery capacity.

(1) Prior to doing this capacity check, do Charge and Electrolyte level.

CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

(2) Using (320) or T01, verify the vent valve (020) is finger tight on each cell (010).

(3) Discharge the battery at one of the rates listed in Table 1004 until the battery reaches 20.0V to determine and record the times the first cell reaches 1.0V and battery reaches 20.0V.

NOTE: It is important that the discharge current be continually maintained at the selected value, and that the time of discharge is measured accurately.

NOTE: If a cell goes to zero volts or reverses polarity during the discharge, short out that cell's terminals with a T03 for the remainder of the discharge.

(4) If the time the first cell reached 1.0V equals or exceeds the values shown in Table 1004 at the discharge rate, then the battery capacity is ≥ 100%. Allow the battery to rest for at least 2 hours.

(5) If the discharge time the first cell reached 1.0V is less than the minimum time listed in Table 1004 at the discharge rate, then the capacity is <100%.

N. Sensor harness test

This test shall be done for a Battery insulation failure or disassembly, otherwise the test should be done biennial basis by doing DISASSEMBLY to allow the sensor harness removal and testing.

NOTE: A climate chamber or alternate method may be used provided the temperatures below are achieved.

WARNING: IF BATTERY IS FULLY ASSEMBLED AND TO PREVENT INJURY THE BATTERY MUST BE IN A FULLY DISCHARGED STATE, REFER TO CELL SHORTING.

(1) If any part of the sensor harness (260) is damaged or fails any portion of this test, the entire assembly must be replaced with new Saft sensor harness (260).

NOTE: Refer to Figure 1002 for pinout locations.

(2) Confirm the battery was discharged and disassembled.

(3) Overtemperature Thermoswitch is part of the sensor harness (260). It is mounted on the plate (290) in contact with the face of cell #4. Disassembly is required to test the thermoswitch.

(4) Test with an ohmmeter the sensor harness (260) per Table 5001. Any erratic readings represent a failure.

(5) Overtemperature Thermoswitch functional testing as follows:

(a) Suspend the thermoswitch plate (290) with thermoswitch in a beaker of water with the thermoswitch a minimum of 2 inches from the bottom and 1 inch from the top of the water surface.

(b) Insert a thermometer, or other suitable temperature-measuring device in the water with the bulb adjacent to the thermoswitch.

(c) Slowly raise the water temperature to +66°C (+150°F) while observing the ohmmeter (still connected to pins 8 and 9). Ohmmeter should read >1 MΩ at temperatures below +66°C (+150°F).

(d) Continue to raise the water temperature and allow the temperature to stabilize at +68°C ± 5.0°C (+155°F ± 9°F). The thermoswitch should close (≤ 5Ω resistance) at a stabilized temperature of +68°C ± 2.8°C (+155°F ± 5°F).

(e) Slowly add cool water to the beaker to reduce the water temperature to +55°C ± 5.0°C (+131°F ± 9°F). The thermoswitch should open (>1 MΩ) at a 5.6°C (10°F) to 10.5°C (19°F) of the closing temperature.

(f) If the thermoswitch fails to meet any of the above criteria, replace with new Saft sensor harness (260).

(6) Charge Control Thermistor is permanently mounted on a sensor plate. Check the function of the thermistor as follows:

(a) Immerse the thermistor plate in a beaker containing a mixture of ice and water.

(b) Insert a thermometer or other suitable temperature-measuring device, in the container in contact with the plate.

(c) Confirm the ohmmeter indicates 7355Ω ± 672Ω at 0.0°C ± 1.7°C (+32°F ± 3°F).

(d) Following the low temperature test, slowly raise the temperature to +60.0°C ± 2.8°C (+140°F ± 5°F).

(e) Confirm the ohmmeter indicates 560Ω ± 60Ω at +60.0°C ± 2.8°C (+140°F ± 5°F).

NOTE: At +71.1°C ± 2.8°C (+160°F ± 5°F) the thermistor resistance shall be 380 ± 38Ω.

(f) If the thermistor fails any of the above tests, replace with new Saft sensor harness (260).

O. Special testing

These procedures are to be followed for a battery that does not meet capacity or if the end of charge cell voltage was < 1.50V during the final charge. Refer to Figure 1004 flow chart.

NOTE: For a new battery or one removed from aircraft that has not passed capacity after doing the Special testing more than 3 times, then it is recommended to replace noncompliant cells with new Saft cells (010), refer to All cell replacement recommendation.

NOTE: For a battery from long-term storage, several complete charge/discharge cycles may be needed to restore performance.

(1) Special testing decision

For a battery with < 100% capacity, do Low capacity (Special testing). Otherwise for a battery with any cell voltage < 1.50V, do Supplementary test.

(2) Low capacity (Special testing)

(a) Loosen, but do not remove all vent valves (020) and fully charge the battery as outlined in Charge section.

(b) For a battery containing any cell voltage < 1.50V during the final charge, do Supplementary test. Otherwise, do Capacity test (Special testing).

(3) Supplementary test

(a) Charge at 0.1C_1A for an additional 5 hours and monitor the voltage of the individual cells every 30 minutes.

1. Identify for replacement any cell (010) with voltage < 1.50V.
2. During the last 30 minutes of this charge adjust the Electrolyte level.
3. Do Cell replacement for cells identified for replacement. Otherwise, do Capacity test (Special testing).

NOTE: If more than one cell (010) was replaced due to low charge voltage during the current maintenance cycle, then replacement of all cells should be considered. Refer to Cell replacement.

(4) Capacity test (Special testing)

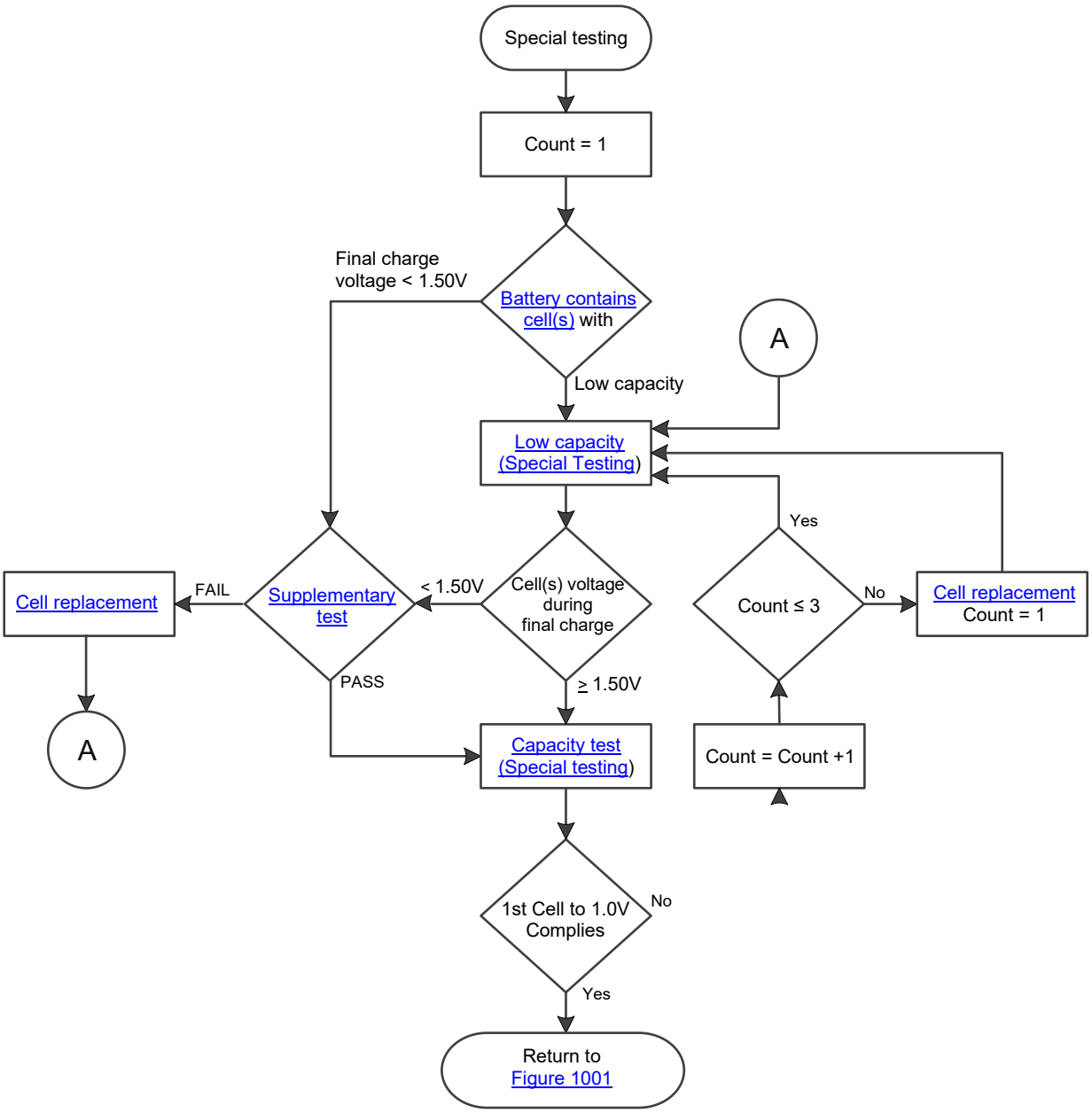
CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

(a) Using (320) or T01, verify the vent valve (020) is finger tight on each cell (010).

(b) Discharge the battery at rate shown in Table 1004 until the battery reaches 20.0V. Record the time and current the battery reached 20.0V and identify the noncompliant cells with voltage < 1.0V.

(c) If the time the first cell reached 1.0V equals or exceeds the values shown in Table 1004 at the applicable discharge rate, then return to Figure 1001. Otherwise, repeat Low capacity (Special testing) or refer to Fault Isolation.

1. For noncompliant cells that have failed this capacity test 3 times, replace with new Saft cells (010) (refer to Cell replacement).



Special Testing Flow Chart
Figure 1004

5. Fault Isolation

Fault isolation information is presented in Table 1007, Table 1008, or Table 1009 as a guide in locating a cause of malfunction and isolating the cause to a specific component.

TEST STEP		FAULT	POSSIBLE CAUSE	REMEDY
4.E		(1) No battery voltage	(a) Defective electrical connector (not making contact). (b) Broken or damaged links	Check electrical contacts, links Replace if required, Power connector replacement, Cell hardware replacement, Link replacement, or Upper nut tightness
4.C		(2) Low insulation	(a) Leakage of electrolyte (b) Incorrect electrolyte level (c) Reverse cell polarity (d) Condensation / Contamination (e) Improper cleaning (f) Loose or damage vent valve (g) Damaged cell case (h) Charge rate too high	Do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level Finger tighten or replace vent valve, do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level Do Thorough Cleaning, Cell replacement, ASSEMBLY, Charge, Electrolyte level Investigate the cause of the excessive charge. Do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level
4.M		(3) Loss of battery capacity	(a) Normal wear after long service (b) Exceptionally heavy use	Do Special testing

Battery Faults
Table 1007

TEST STEP	FAULT	POSSIBLE CAUSE	REMEDY
4.L	(1) All cells have reserve consumed	(a) Charged more than allowed or charged at high temperature. (b) Previous maintenance has not been done (c) Maintenance interval too long	Examine the cause of the excessive charge. Do Charge, and be sure what for the next maintenance interval. If this continues the maintenance interval should be done reduced.
4.L	(2) High water consumption in one or more cells	(a) Damaged separator when the water consumption is less than 30% below the average value of added water in all cells. (b) Cell imbalance when water addition is more than 30% above the average value of added water in all cells.	Do Charge, Supplementary test. Do Thorough Cleaning, Cell replacement, ASSEMBLY, Charge, Electrolyte level
4.J	(3) Abnormally high cell voltage at beginning of charge	(a) Dry cell	Add 5 to 10 cm^3 (0.305 to 0.610 in^3) of distilled water, do Electrolyte level during final charge
4.F	(4) Zero Voltage on cell	(a) Short-circuited cell	Do Cell replacement
4.J	(5) Low cell voltage at end of charge	(a) Separator damage	Do Cell replacement
4.M	(6) Low cell capacity	(a) Normal wear from long service	Do Cell replacement
4.A	(7) Cell with a swollen case	(a) Cell operated with low electrolyte level, deterioration of separator and damaged plates	Do Cell replacement

Cell Faults
Table 1008

TEST STEP	FAULT	POSSIBLE CAUSE	REMEDY
4.B	(1) Tarnished or burned links	(a) Loose terminal nuts and links	Clean and torque per Table 8001 or do Power connector replacement, Cell hardware replacement, or Link replacement.
4.B	(2) Exposed copper material on power connector pin	(a) Mechanical damage (b) Electrical arcing	Do Power connector replacement
4.B	(3) Melted plastic on power connector	(a) Overheat due to contact resistance	Do Power connector replacement
4.B	(4) Corroded links	(a) Operation in acidic atmosphere (b) Inadequate greasing (c) Mechanical damage to protective nickel-plating	Check room eliminate acid source. Do Link replacement and lubricate properly Do Link replacement and lubricate properly Do Link replacement and lubricate properly
4.B	(5) Battery case and cover damage with dents, deformations, and visible cracks which affect fit or impede performance.	(a) Various, transport (b) Mechanical stress, drop	Replace defective component. Refer to Case replacement

Physical Faults
Table 1009

DISASSEMBLY

1. General

This section provides step-by-step instructions on disassembling the complete battery.

NOTE: All ( ) part identification numbers herein are IPL Figure 1 item numbers.

2. Equipment and Materials

A. Equipment

NOTE: Equivalent equipment may be used.

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Universal vent wrench	-	-	09052 F6177	093365-000 (T01) 413876
Equalizing resistors	-	1 Ω 3 W	F6177	164829 (T03)
Cell puller tool	-	-	09052 F6177	017556-000 (T04) 416159

Equipment (Disassembly)
Table 3001

B. Materials

No materials required.

3. Detailed Instructions

WARNING: BATTERY CELL ASSEMBLIES DELIVER VERY HIGH CURRENTS WHEN SHORT-CIRCUITED. EXERCISE CAUTION. REMOVE RINGS, WATCHES OR OTHER JEWELRY FROM HANDS AND ARMS.

WARNING: BATTERY MUST BE COMPLETELY DISCHARGED BEFORE CELL ASSEMBLIES CAN BE REMOVED DUE TO POSSIBILITY OF ELECTRIC SHOCK.

WARNING: USE CARE NOT TO TILT BATTERY WHILE VENT VALVES ARE LOOSENED; CONTACT OF ELECTROLYTE WITH SKIN CAN CAUSE SEVERE BURNS.

A. Preparation

(1) Discharge the battery at one of the current rates shown in Table 1004 until each cell reaches 1.0V.

(2) Remove cover (130), pad (140) and formed insulator (150) by opening latches and lifting from case.

(3) Do Cell shorting

B. Cell (010) removal

(1) Remove upper terminal nuts (040), connector nuts (240) and washers (050), (250) from cell (010) terminals and power connector (210).

(2) Remove intercell terminal links (160 through 200) from cell (010) terminals and power connector (210) being careful not to damage the nickel plating.

(3) Using T04 remove cells (010) from the battery case (120) by tightening the T04 on cell terminals and removing cell with a steady straight up pull.

C. Disassembly of the cells(010) is restricted to replacing defective vent valve O-rings (030), lower nut (060), polarity washers (070 or 080), Belleville washers (090), flat washer (100), and terminal O-ring (110). Refer to Cell hardware replacement.

D. Remove the power connector (210) and gasket (230) from the battery case (120) by removing screws (220).

E. Sensor harness (260) removal

(1) Remove the thermoswitch mounting nuts (280) from the thermoswitch plate (290).

(2) Remove the sensor harness connector mounting screws (270) and nuts (280) and lift the sensor harness (260) out of the battery case (120).

F. Remove all spacers (300) from the battery case (120).

CLEANING

1. General

CAUTION: DO NOT USE PETROLEUM SPIRITS, TRICHLOROETHYLENE OR OTHER SOLVENTS FOR CLEANING THE BATTERY. USE OF THESE PRODUCTS MAY DETERIORATE THE INTEGRITY OF METAL PARTS.

NOTE: All ( ) part identification numbers herein are IPL Figure 1 item numbers.

2. Equipment and Materials

A. Equipment

NOTE: Equivalent equipment may be used.

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Stiff bristle brush	Non-metallic	-	Commercially Available	-
Fine wire brush	-	-	Commercially Available	-
Soft brush	Non-metallic	-	Commercially Available	-

Equipment (Cleaning)
Table 4001

B. Materials

NAME	SPECIFICATION OR PART NUMBER	SOURCE OR CAGE CODE	USE
Neutral petroleum jelly	M02	Commercially Available	Lubrication
Mild soap	M03	Commercially Available	Cleaning
Cloth, soft, clean	-	Commercially Available	Protect from FOD

Materials (Cleaning)
Table 4002

3. Light Cleaning

A. Remove the battery cover (130), pad (140) and insulator (150).

CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

B. Using (320) or T01, make sure that the vent valves (020) are finger tight on each cell (010) are closed and secure. Do not over-tighten.

CAUTION: DO NOT USE A WIRE BRUSH TO CLEAN CELL TOPS. CELLS MAY BE DAMAGED.

C. Remove white deposits (potassium carbonate) from tops of all cells (010) using a stiff, bristle nonmetallic brush.

WARNING: TO PREVENT INJURY WHEN USING COMPRESSED AIR, DIRECT AIRFLOW AWAY FROM BODY AND USE SAFETY GOGGLES TO PREVENT INJURY TO EYES FROM FINE DUST PARTICLES.

D. Disperse residual dust and particles from the battery with blasts of clean, dry, compressed air not over 1.38 bar (20 psi).

E. Coat cell upper terminal nuts (040), connector nuts (240) and all intercell terminal links (160 through 200) with a light film of M02.

F. Clean the exterior surfaces of the battery cover (130) and case (120) using a soft, clean cloth, moistened with water. Dry with compressed air or a dry, clean cloth.

4. Thorough Cleaning

A. The battery must be discharged (refer to Initial discharge and Cell shorting) and disassembled (refer DISASSEMBLY).

B. Remove greasy residue from power connector (210) with warm mild soapy M03 water.

C. After ensuring that the vent valves (020) are closed, wash each cell (010) in running water. Do not allow any water to enter the cell. Dry with compressed air or a dry, clean cloth.

D. Wash the battery case (120), cover (130) and pad (140), spacers (300), gasket (230), links (160 through 200), and cell hardware (040) and (050) in warm mild soapy M03 water to remove dirt and salt deposits. A plastic scraper or a stiff bristle brush (nonmetallic) may be used to aid in the removal of heavy deposits. Rinse away M03 and dry with compressed air or a dry, clean cloth.

CHECK

1. General

This section contains battery inspection information. The procedures are written in step-by-step formats that follow the process flow outlined in Figure 1001.

NOTE: All voltage readings are DC unless otherwise stated.

NOTE: All ( ) part identification numbers herein are IPL Figure 1 item numbers.

2. Equipment and Materials

A. Equipment

No equipment required

B. Materials

No materials required

3. Initial New Battery Commissioning

A. Before the initial charge, thoroughly inspect the battery assembly to ensure no damage has occurred during shipping or storage as follows:

NOTE: For a new battery not receiving its initial commission within one year of its DOM, then battery must follow Figure 1001.

(1) Inspect the battery case (120) and cover (130) for dents, distortion, or other damage. If found, refer to REPAIR section and replace with new Saft cover (130) or case (120).

(2) Remove the battery cover (130), pad (140) and formed insulator (150).

(3) If present, remove cap (330) and shorting spring (310).

(4) Visually confirm the power connector (210) is present and undamaged.

(5) Visually confirm all cells (010) are positioned for proper polarity per Figure 7002.

(6) Visually confirm all cells (010) are equipped with a vent valve (020).

(7) Tighten all upper cell nuts (040) and power connector nuts (240) per Table 8001.

(8) Visually confirm the sensor harness (260) is present and undamaged.

B. Charge the battery per Charge on page 1008 and level electrolyte per Electrolyte level on page 1010.

C. Do successful Battery insulation, install battery cover (130), pad (140) and formed insulator (150), then the battery is ready for service.

4. Component Inspection

The following procedures are for a disassembled battery.

A. Cell (010)

(1) Visually for evidence of electrolyte leakage, cracks, corrosion, burns, holes, or cross threaded terminals. Replace any defective cells (010) with new Saft cells.

(2) Excessive salt around a terminal post indicates leakage. Refer to Cell hardware replacement on page 6002 for replacement of lower terminal O-ring (110) per IPL if leakage is evident.

(3) Visually check each cell vent valve (020) for defective O-rings (030), cracks, or other physical damage. Replace defective O-rings (030) per IPL.

(a) Suspect vent valves should be tested in accordance with the procedures in Vent valve test and/or be discarded, if necessary.

(4) Inspect the nuts (060), washers (090), (070 or 080), (100) to ensure it is free of bends, tarnish, corrosion, burns, or loss of plating. Minor tarnish can be polished off with a fine wire brush. Defective hardware should be replaced with new Saft components.

B. Inspect the upper nuts (040), (240) and washers (050), (250) to ensure it is free of bends, tarnish, corrosion, burns, or loss of plating. Minor tarnish can be polished off with a fine wire brush. Defective hardware should be replaced with new Saft components.

C. Intercell terminal links (160 through 200)

Inspect for bends, tarnish, loss of nickel plating, corrosion or burns. Tarnish can be polished off with a fine wire brush. Replace any defective intercell links with new Saft components.

D. Spacers (300)

The spacers (300) should be clean and free of cracks or holes. Replace any that are defective with new Saft components.

E. Power connector (210)

CAUTION: A DEFECTIVE POWER CONNECTOR CAN CAUSE BATTERY DISCHARGE, AS WELL AS IN-SERVICE LOW VOLTAGE.

(1) Check the power connector (210) for evidence of arcing, corrosion, cracks or cross threaded terminals.

(2) Using the same methods described in the Battery insulation, test the power connector (210) by measuring the resistance between the positive pin and the connector shell, and the negative pin and the connector shell.

(3) Replace with new Saft the power connector (210) if found to be defective.

F. Sensor harness (260)

(1) Inspect electrical connector for bent or loose pins, corrosion, cracks, faulty wire connections and evidence of arcing.

(2) Visually check all wiring for damage to insulation, cracked or broken wire and other physical defects. Any evidence of the above conditions however minor, is cause for replacement new Saft component.

(3) Inspect charge control thermistor and thermostat for damaged, loose or broken wire connections, cracks, dents, or other physical defects.

(4) Any evidence of the above conditions however minor, is cause for replacement. Discard the damaged unit and replace with new Saft sensor harness (260).

NOTE: The sensor harness (260) is a non-repairable item.

G. Battery cover (130), case (120), thermostat plate (290)

Inspect the components for damage. And replace with new Saft components, cover (130), case (120), or thermostat plate (290) as needed.

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REPAIR

1. General

This section contains basic battery component for removing and replacing components.

NOTE: The ( ) part identification numbers herein are IPL Figure 1 item numbers.

NOTE: All voltage readings are DC unless otherwise stated.

2. Equipment and Materials

A. Equipment

NOTE: Equivalent equipment may be used.

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Universal vent wrench	-	-	09052 F6177	093365-000 (T01) 413876
Equalizing resistors	-	1 Ω 3 W	F6177	164829 (T03)
Cell puller tool	-	-	09052 F6177	017556-000 (T04) 416159

Equipment (Repair)
Table 6001

B. Materials

NOTE: Equivalent substitutes are permitted for all items except for those that become part of the configured unit.

NAME	SPECIFICATION OR PART NUMBER	SOURCE OR CAGE CODE	USE
Neutral petroleum jelly	M02	Commercially Available	Lubrication

Materials (Repair)
Table 6002

3. Component Replacement

A. Cell replacement (010)

Battery containing cell(s) require replacement. Note the All cell replacement recommendation below.

(1) All cell replacement

(a) For a battery compliant with the following then it is best to assume that all the original cells are or soon will be in unsatisfactory condition. Saft strongly recommends all cells (010) should be replaced with new Saft cells for a battery having:

1. 3 or more cells are replaced during the same maintenance interval

Or

2. 1 or more cells are found to be faulty due to low capacity during this maintenance period and 5 of the original cells in the battery had been previously replaced due to low capacity.

NOTE: The recommendation does not apply to the following failures: terminal thread damage, cell leakage, or cell short-circuit

(2) Procedure

(a) Discharge the battery completely by doing a Cell shorting.

(b) Remove the necessary hardware; upper cell terminal nuts (040), connector nuts (240), washers (050), (250), and intercell connecting links (160 to 200) from the cell to be replaced.

(c) Attach T04 (cell puller) to the cell's terminal and remove the cell (010) from the case using a steady upward pull.

(d) Insert a new Saft cell (010) into the case and pushing it downward on the cell terminals with a small block of soft wood, if necessary (refer All cell replacement).

NOTE: New cell must be discharged before installation is done.

(e) As needed, attach intercell connecting links (160 to 200), washers (050), (250), nuts (040), (240), and torque nuts (040), (240) per Table 8001.

B. Lower nut (060) tightness

(1) Remove necessary hardware; nuts (040), (240) and washers (050), (250), and links (160 to 200). Tighten lower nut (060) per Table 8001

(2) Install the necessary hardware, links (160 to 200), washers (050), (250), and nuts (040), (240). Torque the upper nuts (040), (240) per Table 8001.

C. Cell hardware (060), (070), (080), (090), (100), or O-ring (110) replacement

WARNING: USE CARE NOT TO TILT CELLS WHILE LOWER HARDWARE ARE LOOSENED OR REMOVED; CONTACT OF ELECTROLYTE WITH CAN CAUSE SEVERE BURNS.

NOTE: The battery should be discharged prior to starting cell hardware replacement.

(1) Replace necessary hardware (060), (070), (080), (090), (100) by removing and replacing nuts (040), (240), washers (050), (250), links (160 to 200) with new Saft components. Torque nuts (040), (060), (240) per Table 8001.

(2) Terminal O-ring (110) replacement

(a) Remove the necessary nuts (040), (240), washers (050), (250), links (160 to 200).

(b) Remove lower terminal nut (060), polarity washer (070 or 080), washers (090), (100), and terminal O-ring (110) as needed. Be careful to prevent anything from falling into the cell opening.

(c) Replace O-ring (110) per IPL, install washer (100), 2 Belleville washers (090), polarity washer (070 or 080) and torque lower terminal nut (060) per Table 8001.

NOTE: Spring washers (090) should be put in parallel, stacked in same direction with the larger edge downward on the terminal.

(d) Install the necessary links (160 to 200), washers (050), (250) and torque the nuts (040), (240) per Table 8001 as required.

D. Link replacement (160 to 200)

(1) As required remove nuts (040), (240) and washers (050), (250) from the link.

(2) Replace the link with new Saft component as required and then install the washers (050), (250) and torque nuts (040), (240). Torque nuts (040), (240) per Table 8001 as required.

E. Vent valve O-ring (030) replacement

WARNING: USE CARE NOT TO TILT CELLS WHILE LOWER HARDWARE ARE LOOSENED OR REMOVED; CONTACT OF ELECTROLYTE WITH CAN CAUSE SEVERE BURNS.

(1) Remove the vent valves (020) from the cell (010) using (320) or T01.

(2) Remove and replace the defective O-rings (030) per IPL.

CAUTION: CARE SHOULD BE TAKEN NOT TO OVER TIGHTEN THE VENT VALVES (020) AS STRIPPED TREADS ON EITHER THE VALVE OR CELL COVER MAY ALLOW CONTAINMENTS TO ENTER THE CELL (010). ANY STRIPPED TREADS REQUIRE COMPONENT REPLACEMENT.

(3) Install and finger tighten vent valve (020) with vent wrench (320) or T01 onto the cells (010).

F. Sensor harness (260) replacement.

(1) Remove the necessary hardware; nuts (040), (240), washers (050), (250), and intercell connecting links (160 to 200) to allow the sensor harness to be removed.

NOTE: Cell 6 or 9 may need to be partially removed to remove the thermistor plate.

(2) Remove the power connector (210) and gasket (230) from the battery case (120) by removing screws (220).

(3) Remove the thermoswitch mounting nuts (280) from the thermoswitch plate (290).

(4) Remove the sensor harness connector mounting screws (270) and nuts (280) and lift the sensor harness (260) out of the battery case (120).

(5) Install the sensor harness connector mounting screws (270) and nuts (280) of the new Saft sensor harness (260) into the case (120). Torque the screws (270) and nuts (280) per Table 8001.

(6) Pass the thermostat-end of sensor harness (260) through the hole in the partition, liner, and spacer assembly.

(7) Install thermoswitch by mounting nuts (280) on the thermoswitch plate (290). Torque the nuts (280) per Table 8001.

(8) Assemble the power connector gasket (230) to the power connector (210) and insert the terminals of power connector (210) through the oval mounting hole in the front of the battery case (120).

(9) Attach the power connector (210) from the battery case (120) by using the screws (220). Secure the power connector by torquing the screws (220) per Table 8001.

NOTE: Cell 6 or 9 may need to be partially removed to install the thermistor plate.

(10) Install the necessary hardware; nuts (040), (240), washers (050), (250), and intercell connecting links (160 to 200) back into the battery. Torque nuts (040), (240) per Table 8001.

G. Power connector (210) replacement

(1) Remove nuts (040), (240), washers (050), (250), and intercell connecting links (180).

(2) Remove the power connector (210) and gasket (230) from the battery case (120) by removing screws (220).

(3) Assemble power connector gasket (230) to new power connector (210).

(4) Insert terminals of new Saft power connector (210) through the oval mounting hole in the front of the battery case (120).

(5) Attach the power connector (210) to the battery case (120) with screws (220). Torque the screws (220) per Table 8001.

(6) Install intercell connecting links (180), washers (050), (250), terminal nuts (040), connector nuts (240). Torque nuts (040), (240) per Table 8001.

H. Case (120) replacement

(1) Do DISASSEMBLY

(2) Replace case (120) with new Saft component and do ASSEMBLY.

ASSEMBLY

1. General

This section contains assembly instructions necessary after disassembly.

2. Equipment and Materials

A. Equipment

NOTE: Equivalent equipment may be used.

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Torque wrench	Insulated	0 to 15 N-m (0 to 133 lb_f-in)	Commercially Available	McMaster-Carr (7936A12)

Equipment (Assembly)
Table 7001

B. Materials

NOTE: Equivalent substitutes are permitted for all items except for those that become part of the configured unit.

NAME	SPECIFICATION OR PART NUMBER	SOURCE OR CAGE CODE	USE
Neutral petroleum jelly	M02	Commercially Available	Lubrication

Materials (Assembly)
Table 7002

3. Spacers, Sensor Harness, and Cells

NOTE: Ensure all components are clean and dry before assembly.

NOTE: All ( ) part identification numbers herein are IPL Figure 1 item numbers.

A. Insert one edge of bottom spacer (B) (Figure 7001) into battery case from either the left or right side, then slide the spacer under the cell partition.

B. Install sensor harness (260).

(1) Insert the sensor harness connector into its mounting hole in the case (120) and install the mounting screws (270) and nuts (280) by torquing per Table 8001.

(2) Insert the spacer assembly (A) (Figure 7001) on the inside face of the center partition, take care to align the holes in the spacer with the hole in the partition.

(3) Insert the thermoswitch plate (290) in back of spacer assembly (A) (Figure 7001) so that it is between the thermoswitch plate (290) and the spacer assembly (A) which is against the partition.

(4) Pass the thermoswitch end of the sensor harness (260) through the hole in the partition, spacer assembly (A) (Figure 7001).

(5) Attach the thermoswitch to the thermoswitch plate (290) with mounting nuts (280) and torque per Table 8001.

C. Install the center row spacers and cells as follows:

(1) Install spacers (D) (Figure 7001) on inside of cell partition.

(2) Install five cells (010) into positions 4, 5, 6, 9 and 10 in the center partition of battery case (120). Be sure to maintain the proper cell arrangement and polarity orientation per Figure 7002. Install the charge control thermistor plate between cells 6 and 9 as shown in.

(3) Install spacers (F and H) Figure 7001 into the center partition of battery case.

(4) Install a cell assembly (010) into position 13 in the center partition of the battery case (120), Insertion of the last cell is sometimes difficult and may be assisted by pushing down on the terminals with a small block of softwood.

NOTE: Spacers (C) (Figure 7001) are used as required to ensure the center row cells are retained securely in place and prevent free movement.

D. Install the left and right side row of cells and spacers as follows:

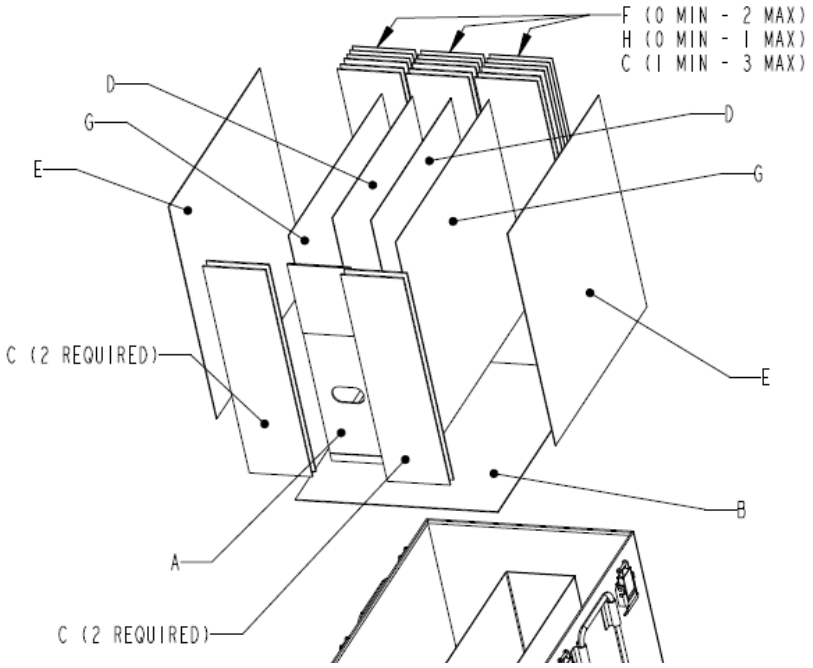
(1) Install spacers (E, F, G, and H) (Figure 7001) into the battery case (120) as shown in Figure 7001.

(2) Install six cells (010) in the left and right hand side of the battery case (120). Be sure to maintain the proper cell arrangement and polarity orientation per Figure 7002.

(3) Install the left and right end spacers (H) into the battery case (120) at each end as shown in Figure 7001.

(4) Install the remaining two cells (010) and be sure to maintain polarity orientation per Figure 7002. Insertion of the last cell on each side can be assisted by pushing down on the terminals with a small block of softwood.

NOTE: Spacers (C) (Figure 7001) are used as required to ensure the row of cells are retained securely in place.



ITEM	DESCRIPTION	DIMENSION [IN]	MAX. UNIT PER ASSEMBLY
A	SPACER ASSEMBLY	9.86 x 2.95	1
B	SPACER	9.52 x 10.72 x 0.032	1
C	SPACER	2.953 x 10.373 x 0.062	13
D	SPACER	9.108 x 9.861 x 0.032	2
E	SPACER	10.629 x 10.373 x 0.032	2
F	SPACER	2.953 x 10.373 x 0.032	6
G	SPACER	10.629 x 9.861 x 0.020	2
H	SPACER	2.953 x 10.373 x 0.020	3

Battery Spacer Kit (300)
Figure 7001

4. Power Connector (210)

Install the power connector (210) in the case (120) using the following steps:

A. Assemble power connector gasket (230) to the power connector (210) and insert terminals through the oval mounting hole in the front of the battery case (120).

B. Attach the power connector (210) to the battery case (120) with screws (220). Secure the connector by tightening the screws (220) per Table 8001.

5. Complete Battery Assembly

A. Recheck all cell polarities.

B. Mount the intercell connector links (160 through 200).

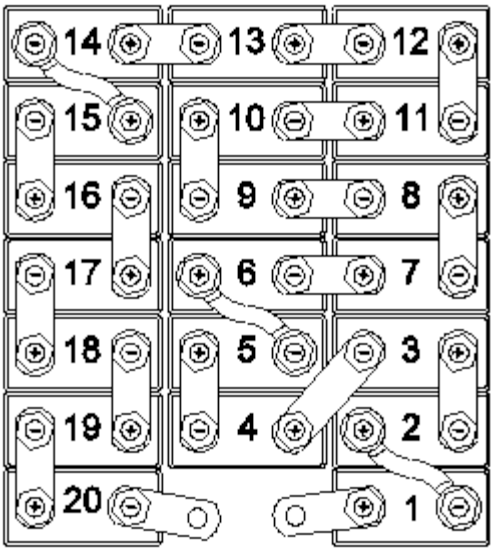
(1) Replace any intercell connector links that are bent, burnt, or have defective nickel plating with new Saft components.

(2) Using a small brush, lightly coat cell terminals and intercell links with M02.

NOTE: Excessive use of M02 on the terminals and connector links will contribute to current leakage in high ambient temperature operations.

(3) Mount the washers (050), (250), connector nuts (240), and upper terminal nuts (040).

NOTE: Cell and connector terminals should be lightly greased prior to installation of nuts (040) and (240). Torque upper nuts per Table 8001.



Cell Number and Polarity Orientation
Figure 7002

C. Install formed insulator (150), pad (140), and cover (130) on the cells and close the latches on the case.

FITS AND CLEARANCES

1. Torque Table

Table 8001 is a listing of all pertinent torque values needed to assemble and service the battery.

NOTE: The values listed in Table 8001 are “lube torque” values. The threads should be lightly greased prior to installation and applying torque.

FIGURE IPL	ITEM NUMBER	TORQUE VALUE		NAME, LOCATION
		N-m	lb_f-in	
Figure 1 (#3 of 3)	040	13.0 ± 1.0	115 ± 9	Nut, Terminal, Upper
Figure 1 (#3 of 3)	060	5.0 ± 0.5	44 ± 4	Nut, Terminal, Lower
Figure 1 (#1 of 3)	220	2.3 ± 0.2	20 ± 2	Screws, Sems
Figure 1 (#1 of 3)	240	13.0 ± 1.0	115 ± 9	Nut, Terminal Adapter
Figure 1 (#2 of 3)	270	0.8 ± 0.1	7 ± 1	Screw Aux Connector Mounting
Figure 1 (#2 of 3)	280	0.8 ± 0.1	7 ± 1	Nut, Thermostat Mounting

Torque Values
Table 8001

2. Fits and Clearances Table

No fits and clearances required.

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SPECIAL TOOLS, FIXTURES, EQUIPMENT, AND CONSUMABLES

1. Special Tools

A. Battery maintenance kit

NOTE: Equivalent tools can be used.

NOTE: The kit (P/N 416161) is available from Saft containing special tools T01, T02, T03, and T04 housed in a polypropylene box

(1) T02 (P/N 416231) is assembled using syringe P/N 105112 and nozzle P/N 016544. T02 (P/N 020915-004) is assembled using syringe P/N 018327-000 and nozzle P/N 017536-004.

ITEM	DESCRIPTION	09052 P/N	F6177 P/N
T01	Universal vent wrench	093365-000	413876
T02	Syringe assembly (with nozzle 20 mm (0.79 in))	020915-004	416231
T03	1 Ω 3 W equalizing resistors	-	164829
T04	Universal cell extraction tool	-	416159
	M10x1.25 tool	017556-000	-
T05	Vent valve adapter for M8 valve	025098-000	-

Special Tools
Table 9001

2. Equipment

NOTE: Equivalent equipment may be used

EQUIPMENT	MINIMUM EQUIPMENT SPECIFICATION		SOURCE OR CAGE CODE	REPRESENTATIVE TYPE (MFG MODEL/CAGE)
	CHAR.	RANGE, ACCURACY, TOLERANCE		
Constant current charger	-	0 to 60A DC 40V DC Minimum	Commercially Available	Sorenson Power (Supply DCR-40-70B)
Constant current source with load bank	-	0 to 60A DC 1 to 40V DC	Commercially Available	Sorenson Power (Supply DCR-40-70B) with Ohmite (L225J5ROE)
Megohmmeter	-	0 to 50 MΩ @ 250 V continuous	Commercially Available	Fluke (1507)
Digital multimeter	-	2000 count, accuracy 1% or better	Commercially Available	Fluke (179)
Climatic chamber	-	+15°C to +80°C (+59°F to +176°F)	Commercially Available	Cincinnati Sub-Zero (MCB-1.2-.33-H/AC)
Torque wrench	Insulated	0 to 15 N-m (0 to 133 lb_f-in)	Commercially Available	McMaster-Carr (7936A12)

Equipment
Table 9002

3. Consumables

This paragraph describes the consumables used in the CMM.

NOTE: Equivalent alternatives can be used for list items.

ITEM	DESIGNATION PART NUMBER AND SPECIFICATION DESCRIPTION	MANUFACTURER OR SUPPLIER (NAME, ADDRESS, CODE)
M01	Distilled or deionized water @ +20°C ± 5°C (+68°F ± 9°F): Clear, colorless, and odorless while boiling Conductivity < 33 µS/cm 5 < pH < 7 Mn-COD < 30 mg/l (1.7×10^{-5} oz/in^3) (Chemical Oxygen Demand, methodology to evaluate organic or mineral pollution) Chlorines Cl^- < 5 mg/l (2.9×10^{-6} oz/in^3) Sulfates SO_4^{2-} < 10 mg/l (5.8×10^{-6} oz/in^3) STORAGE: dry and clean container without any corrosion and damage; Temperature: +20°C ± 5°C (+68°F + 9°F). Over 1 year of storage, do an analysis of the liquid.	Local Vendor
M02	Neutral petroleum jelly Density @ 60°C (140°F) Range = 0.840 to 0.866 kg/l (0.486 to 0.501 oz/in^3) Melting Point Range = +46°C to +52°C (+115°F to +126°F) Acidity/Alkalinity = Neutral to Litmus	Mineral Vaseline NATO: S 743 F: AIR 3565 US: VV-P-236A UK: DEF 2333
M03	Mild Soap	Local Vendor

Consumables
Table 9003

ILLUSTRATED PARTS LIST

1. Introduction

A. Purpose

(1) This section provides illustrations and parts breakdown of the 4579 battery, which can be disassembled, replaced, and reassembled.

B. Explanation and usage of section

(1) Assembly order indenture system

The Indenture System used in the parts list shows the relationship of one part to another. For a given item, the number of indentures depicts the relationship of the item to the associated next higher assembly.

(2) Effectivity code

Reference letters (A, B, C, etc.) are assigned in the EFF CODE column to each top assembly. The reference letter of the applicable top assembly is also shown in the EFF CODE column for each detail part and subassembly except that no reference letter is shown for detail parts and subassemblies used on all top assemblies.

(3) Quantity per assembly

The UNITS PER ASSY column shows the total number of units required per assembly, per subassembly, and per sub-subassembly as applicable. The letters REF indicates the item is listed for reference purposes.

(4) Parts replacement data

Interchangeability information will be provided in a future manual revision if it becomes applicable.

(5) Service Bulletin incorporation

Service Bulletin incorporation information applicable to the parts list will be provided in a future manual revision if it becomes applicable.

(6) Items not illustrated

Items not illustrated are indicated by a dash (-) ahead of the item numbers in the FIGURE and ITEM NO. column.

(7) Alpha variant item numbers

(a) Alpha variants A - Z (except I and O) are assigned to existing item numbers when necessary to show:

1. Added items
2. Service Bulletin modifications
3. Configuration differences
4. Optional parts
5. Product improvement parts (non-service bulletin)

(b) Alpha variant item numbers are not shown on the exploded view when the appearance and location of the alpha variant item is the same as the basic item.

(8) Vendors

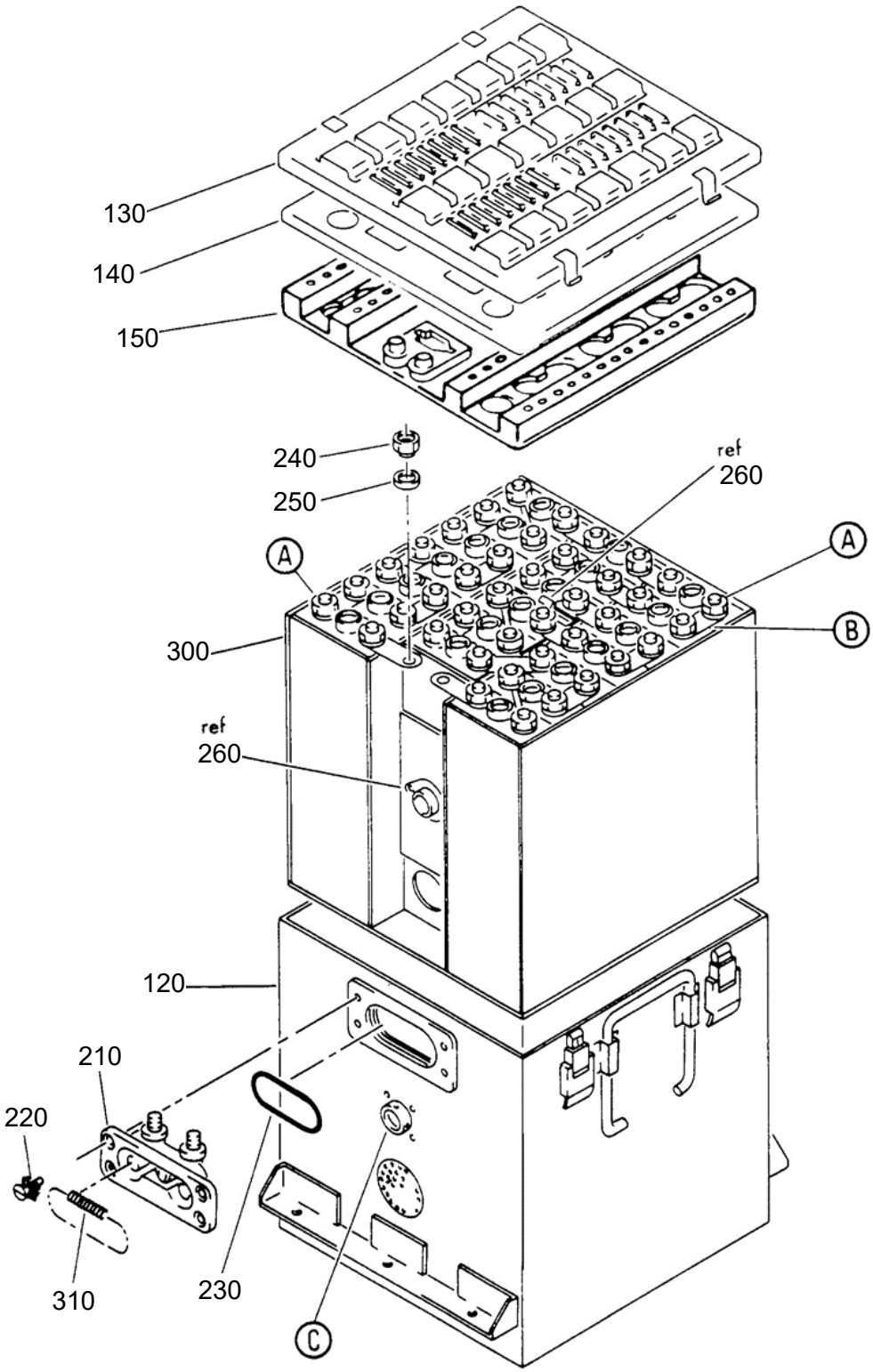
The vendor of all parts shown in the parts list is as follows:

CAGE Code	NAME / ADDRESS	CAGE Code	NAME / ADDRESS
09052	Saft America Inc. 711 Gil Harbin Industrial Boulevard Valdosta, GA 31601 USA Phone: +1 (229) 247-2331 Fax: +1 (229) 247-8486	**F6177**	Saft 126 quai Charles Pasqua 92300 Levallois-Perret France Phone: +33 1 58 63 16 00 Fax: +33 1 58 63 16 18

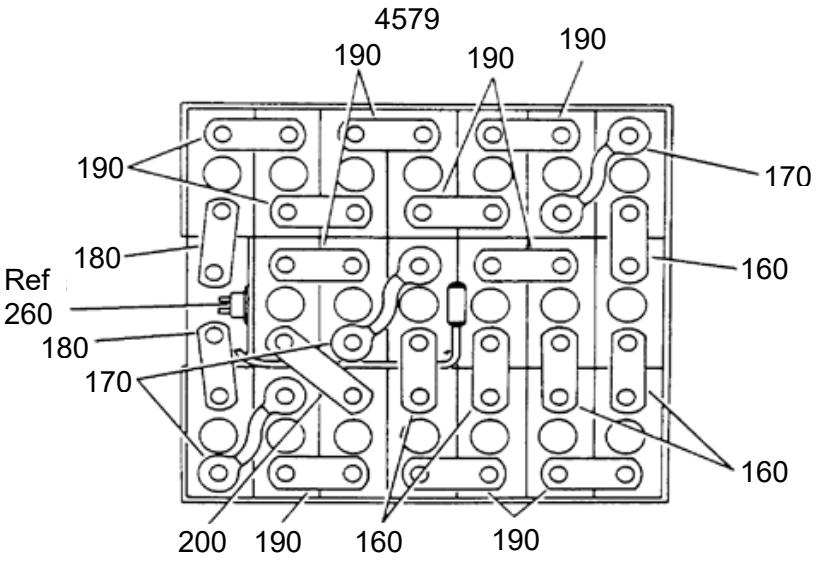
http://www.saftbatteries.com

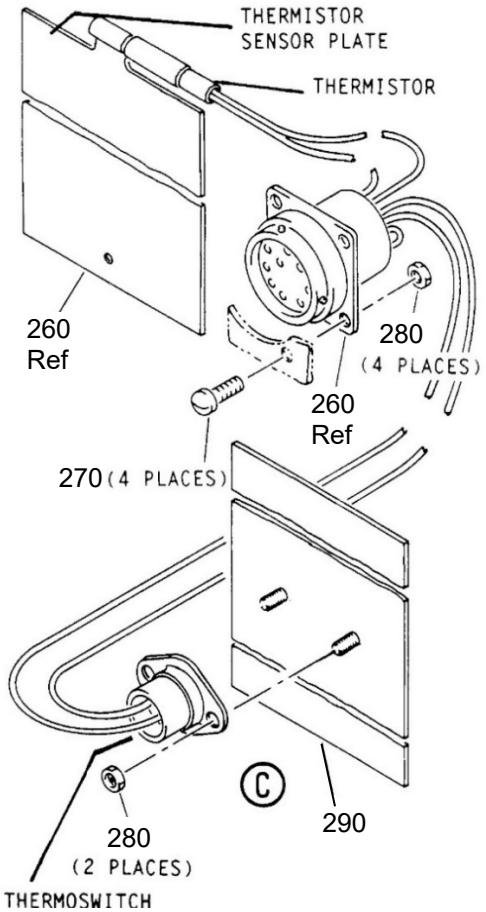
2. Numeric Index

PART NUMBER	AIRLINE STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	UNIT	UNITS PER BATTERY
MS21083C04 (09052 P/N 090064-00)			280	EA	6
009384-000			230	EA	1
015575-000			160	EA	5
015579-000			040, 060, 240	EA	82
015957-000			020	EA	20
018346-000			330	EA	1
018520-000			010	EA	20
018552-003			130	EA	1
018550-000		1	1		RF
018553-000			140	EA	1
018559-000			150	EA	1
018567-000			190	EA	10
018568-000			200	EA	1
018569-000			170	EA	3
018730-000			120	EA	1
018737-000			290	EA	1
018740-000			260	EA	1
018951-000			300	EA	1
021870-000			100	EA	40
021871-000			090	EA	80
022078-000			210	EA	1
022228-000			050, 250	EA	42
023388-001			070	EA	20
023388-002			080	EA	20
026705-000 REPL 015577-000			180	EA	2
091180-008			030	EA	20
091181-002			110	EA	40
092178-008			270	EA	4
092508-001			310	EA	1
093382-000			320	EA	1
093616-000			220	EA	4

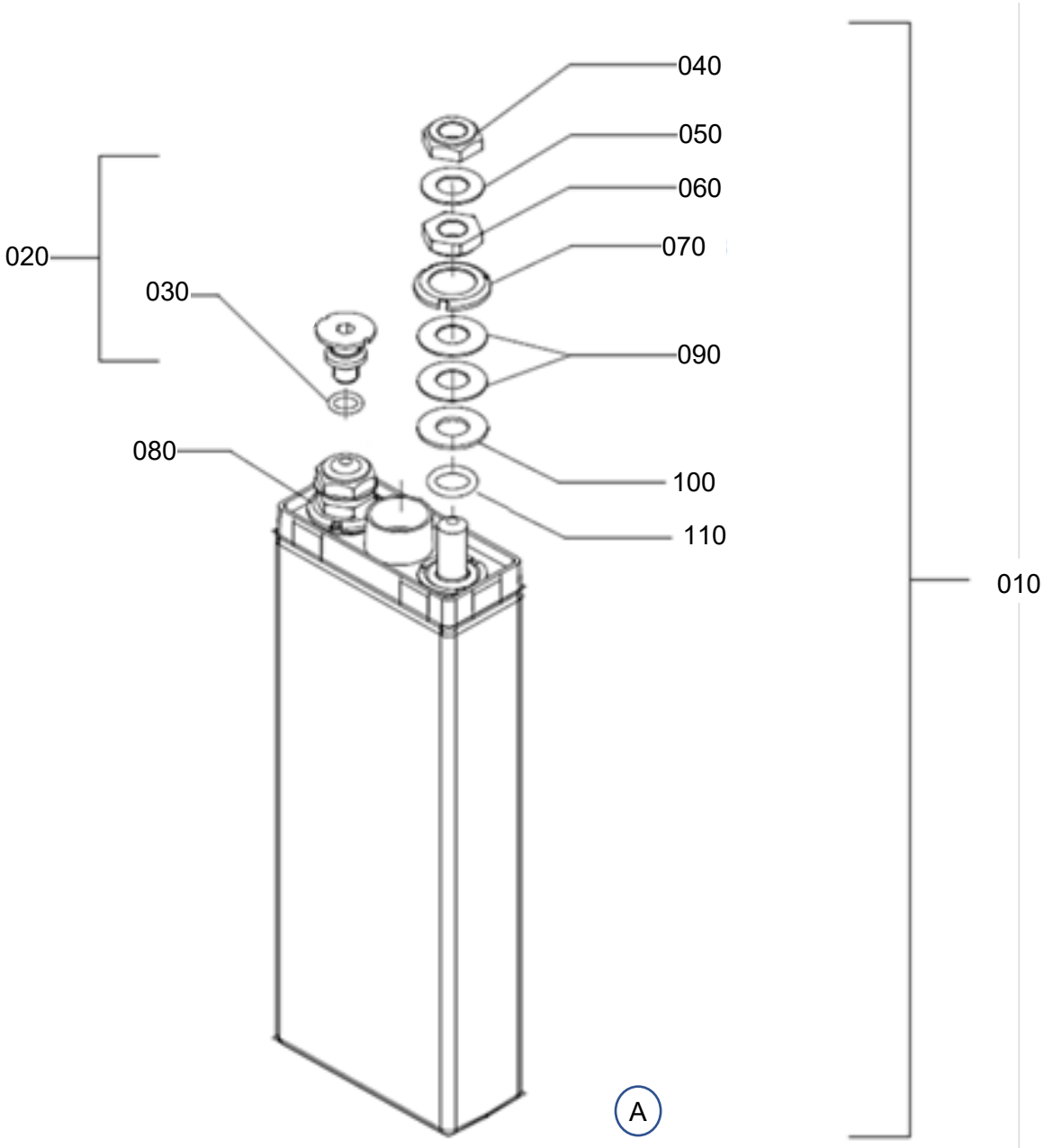


Battery, Exploded View
IPL Figure 1 (#1 of 3)





Battery, Exploded View
IPL Figure 1 (#2 of 3)



Battery, Exploded View
IPL Figure 1 (#3 of 3)

3. Detail Parts List

FIG	ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	EFF CODE	UNIT	UNITS PER ASSY
1	1	018550-000	Nickel-Cadmium Battery (09052) 018550-000 is Ref/Code for Saft 4579			RF
	010	018520-000	. Cell Assembly, VHP450KA-1 (with hardware)		EA	20
	020	015957-000	. . Valve, Vent		EA	1
	030	091180-008	. . . O-Ring, Vent Valve		EA	1
	040	015579-000	. . Upper Nut, Terminal		EA	2
	050	022228-000	. . Washer, Terminal		EA	2
	060	015579-000	. . Lower Nut, Terminal		EA	2
	070	023388-001	. . Washer, polarity, red		EA	1
	080	023388-002	. . Washer, polarity, blue		EA	1
	090	021871-000	. . Washer, Belleville		EA	4
	100	021870-000	. . Washer Flat		EA	2
	110	091181-002	. . O-Ring, Lower Terminal		EA	2
	120	018730-000	. Case, Battery		EA	1
	130	018552-003	. Cover, Battery Case		EA	1
	140	018553-000	. Pad, Hold-Down		EA	1
	150	018559-000	. Insulator, Formed		EA	1
	160	015575-000	. Link, Flat, Terminal		EA	5
	170	018569-000	. Link, Curved, Terminal		EA	3
	180	026705-000	. Link, Flat, Terminal REPLS 015577-000		EA	2
	190	018567-000	. Link, Flat, Terminal		EA	10
	200	018568-000	. Link, Flat, Terminal		EA	1
	210	022078-000	. Connector, Power		EA	1
			Attaching Parts			
	220	093616-000	. Screw, Sems		EA	4
			* * *			
	230	009384-000	. Gasket, Power Connector		EA	1
	240	015579-000	. Nut, Terminal Adapter		EA	2
	250	022228-000	. Washer, Terminal Adapter		EA	2

FIG	ITEM	PART NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	EFF CODE	UNIT	UNITS PER ASSY
	260	018740-000	. Harness, Sensor		EA	1
			Attaching Parts			
	270	092178-008	. Screw, Connector		EA	4
	280	MS21083C04	. Nut, Connector Mounting (09052 P/N 090064-000)		EA	6
			* * *			
	290	018737-000	. Plate, Thermoswitch		EA	1
	300	018951-000	. Spacer, Kit		EA	1
	310	092508-001	. Spring, Shorting		EA	1
	-320	093382-000	. Wrench, Vent Valve		EA	1
	-330	018346-000	. Connector, Cap Marked		EA	1

STORAGE (INCLUDING TRANSPORTATION)

1. Introduction

NOTE: For more storage information, refer to latest revision of Saft Technical Note TN01. Contact Saft for the latest copy of this document.

A. Storage preparation and packaging makes sure that the equipment is protected against any attack by atmospheric agents.

B. For a battery which has been cleaned and serviced and is not directly put into service on board an aircraft, different methods can be recommended depending on the purpose and the storage environment conditions.

C. Keep the batteries and spares in a dry and clean room.

2. Inactive Long-Term storage

A. Procedure

(1) The following must be done to any battery with prior service history.

(a) Charge, Electrolyte level, Vent valve test, and Capacity test

NOTE: It is not necessary that it be short circuited. There is no need of maintenance operation during the storage period.

NOTE: The standard cardboard packaging is considered unsealed and allows 2 years of storage. Storage is allowed for 10 years if the following conditions are met: sealed packaging and isolated from harmful agents (i.e.: dirt, dust, vibrations, or corrosive atmosphere).

- sealed packaging,
- temperature: +5°C to +35°C (+41°F to +95°F),
- humidity < 90 %,
- normal vertical position,
- Isolated from detrimental agents: i.e., dirt, dust, dampness, vibration, corrosive atmosphere.

(2) Saft Ni-Cd batteries may be stored in temperatures ranging from -55°C to +5°C or +35°C to +60°C (-67°F to +41°F or +95°F to +140°F) for an accumulated exposure that does not exceed 30 days.

(3) Lead batteries must not be stored in the same room.

B. Servicing at end of long-term storage

STORAGE TIME	SERVICE PROCEDURE
Less than or equal to 12 months	Do Visual inspection and return to Figure 1001 entry point "C"
More than 12 months	Do Charge and return to Figure 1001 entry point "Received"

Return to Service Following Storage
Table 15001

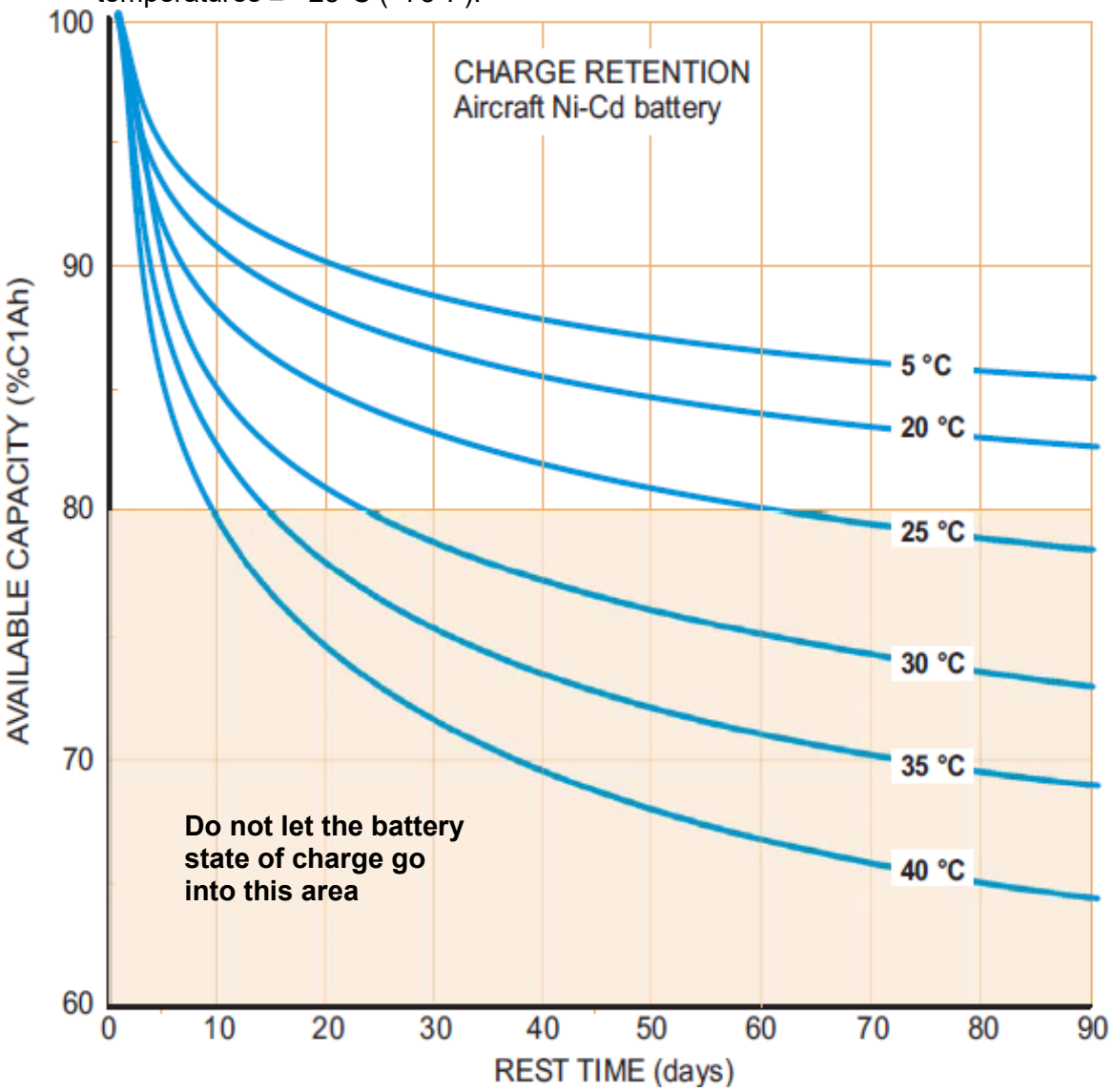
3. Inactive standby storage

The battery is charged after being serviced then stored fully charged in a dedicated room in such a way that it can be installed in the aircraft without further maintenance except as provided within this section. Refer to Figure 15002.

NOTE: At any time during the Inactive standby storage shown in Figure 15002, the battery may be installed on the aircraft or placed into Inactive Long-Term storage.

NOTE: For a battery previously stored at a temperature below ambient temperature, condensation within the battery may occur, do Battery insulation before installation.

A. Standby period is the rest time that corresponds to 80% available capacity shown in Figure 15001. For example, 24 days at +30°C (*86°F) or maximum time of 90 days for temperatures ≤ +23°C (+73°F).



Inactive Standby Period
Figure 15001

B. Refresh charge is a quick constant current charge that can be done at the end of a Standby period to extend the time the battery is in inactive standby storage. The charge is shown in Table 15002.

CAUTION: DO NOT DO THE 4 HOURS FINAL CHARGE AT 0.1 C_1A (REFER TO CHARGE) DURING THIS 'REFRESH' CHARGE OPERATION

CHARGE RATE	VOLTAGE (END OF "REFRESH" CHARGE)
0.1C_1A	30.0V for 20 Cells
0.5C_1A	31.0V for 20 Cells
1.0C_1A	31.4V for 20 Cells

Refresh Charge
Table 15002

C. Standby duration consists of a maximum of 3 Standby periods with 2 Refresh charges in between each standby period. The number of consecutive standby durations is limited to 3. Refer to Figure 15002.

(1) For a battery completing the first or second standby duration and not immediately installed in the aircraft or sent to long-term storage, do one of the following:

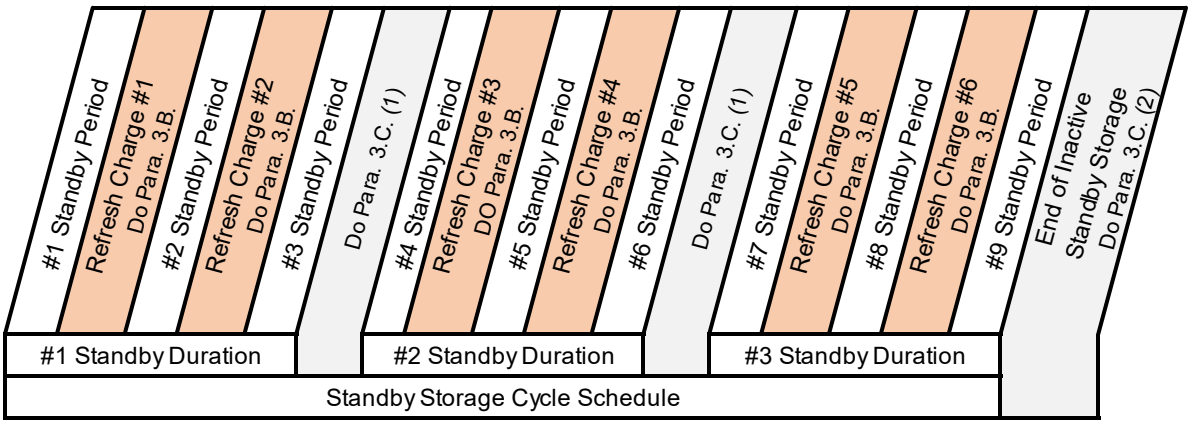
(a) For environments ≤ +30°C (+86°F) do Battery insulation, Initial discharge, Charge, Electrolyte level, and Battery insulation.

(b) For environments > +30°C (+86°F) do Battery insulation, Initial discharge, Cell shorting, Charge, Electrolyte level, and Battery insulation.

(2) For a battery completing the third consecutive standby duration, the battery can go into long-term storage (refer to Inactive Long-Term storage) or return to Figure 1001.

D. Inactive standby storage schedule is limited to the Standby duration being conducted a maximum of 3 times as shown in Figure 15002.

NOTE: Anytime during this standby storage cycle shown in Figure 15002, the battery may be installed on the aircraft or placed into Inactive Long-Term Storage.



Inactive Standby Storage Schedule
Figure 15002

4. Active standby mode (trickle charge)

CAUTION: WATER CONSUMPTION OCCURS WHEN THE BATTERY IS CONTINUOUSLY CHARGED, IN AN OVERCHARGE CONDITION. SAFT DOES NOT RECOMMEND THIS METHOD, HOWEVER SOME OPERATORS TAKE RESPONSIBILITY FOR ITS USE.

NOTE: This method is not reliable due to quantity and inaccuracy of water consumption.

Example: A 40 Ah battery on a continuous trickle charge of 3 mA/Ah for one month may consume over 35 cm^3/cell (2.14 in^3/cell) of water. The reserve available per cell is provided in Table 1.

5. Spares

A. Spare Cells

Spare cells must be stored filled and discharged (in a discharged cell, the electrolyte level is not visible). It is not necessary that they be short circuited. The vent valves must not be removed. The storage conditions are the same as those given in para. Inactive long-term storage. No maintenance operation is needed during storage. Before installation in a battery, cells must be visually inspected for damage or leakage and cleaned and repaired as necessary in accordance with the battery maintenance documentation.

B. Spare O-rings, gaskets and vent valves

(1) O-rings and gaskets

Six (6) years of storage with storage conditions from date of manufacture unless otherwise specified on the packaging. They must be protected from exposure of air, light, and high humidity (< +70%). Storage life depends on temperature, so it is recommended to store in a cool area < +25°C (+77°F). At storage temperatures of +35°C (+95°F), the storage life is reduced to 5 years.

O-rings must be inspected before use and must be disregarded if there are visible signs of damage, distortion or deterioration.

(2) Vent valves with O-rings

Six (6) years of storage with storage conditions from date of manufacture unless otherwise specified on the packaging (the limitation is due to the O-ring). Protected from exposure of air, light, and high humidity (< 70%). Storage life depends on temperature, so it is recommended to store in a sealed container (non-PVC) in a cool area < +25°C (+77°F). At storage temperatures of +35°C (+95°F), the storage life is reduced to 5 years.

O-rings must be inspected before use and must be disregarded if there are visible signs of damage, distortion or deterioration.

C. Other spares

Other spares, protected from external contamination (i.e. dirt, dust, dampness, vibration, corrosive atmosphere) and high humidity (> 70%), may be stored for unlimited periods. Before use, they must be inspected and any showing visible signs of dam- age, distortion or deterioration must be discarded.

6. Transportation procedure

The battery is normally discharged before packing. If it is necessary to transport a charged battery, make sure that the output terminals are protected against short circuit.

The battery should then be packed vertically in its original container. If the original container is not available, the international and/or local packaging regulations applicable to the mode of transport and destination must be followed.

According to the IATA / IMDG dangerous goods regulations, Saft ships all existing nickel-cadmium batteries or cells for aircraft under the classification UN2795 (wet, filled with alkali).

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