To: HOLDERS OF COMPONENT MAINTENANCE MANUAL 24-30-55, 257CH3 (Saft 416497)

Subject: CMM Revision No. 4 Dated Mar 20/2023

Replace revised pages by adding and removing pages for pages dated Mar 20/2023.

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

HIGHLIGHTS

CHAPTER/SECTION PAGE NUMBER	DESCRIPTION OF CHANGE
Title Page T-1	Add Revision 4 with Date and update website
Record of Revisions ROR 1	Add revision 4
List of Effective Pages LEP 1	Corrected/Changed pages
Introduction Intro 1	Correction and update website
Introduction Intro 2 – Intro 3	Update website
Testing and Fault Isolation 1002	Corrections
Testing and Fault Isolation 1003 -1004	Clarification and added vent value O-ring from repair section, updated insulation resistance format.
Testing and Fault Isolation 1005 - 1006	Updated to reflect disassembly and assembly sections
Testing and Fault Isolation 1007 – 1008, 1011	Clarification
Testing and Fault Isolation 1002, 1009 - 1010	Moved Sensor test and capacity test paragraphs to help flow
Testing and Fault Isolation 1012	Clarification and relocated lower nut tightness from repair section
Testing and Fault Isolation 1013, 1015	Update remedy
Disassembly 3001	Clarifications
Check 5001 - 5002	Clarification
Repair 6001 - 6002	Clarifications and removed items covered under disassembly and assembly

CHAPTER/SECTION PAGE NUMBER	DESCRIPTION OF CHANGE
Special Tools, Fixtures, Equipment, and Consumables 9001	Corrected resistance and added tool
Storage (Including Transportation) 15004 - 15005	Add storage of spare parts

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COMPONENT MAINTENANCE MANUAL

WITH
ILLUSTRATED PARTS LIST

Nickel Cadmium Aircraft Battery

SAFT Type No. 257CH3

SAFT Part No. 416497

Website: www.saft.com

COMPONENT MAINTENANCE MANUAL
257CH3

RECORD OF REVISIONS

REV NO.	ISSUE DATE	INSERT DATE	BY	REV NO.	ISSUE DATE	INSERT DATE	BY
1	Oct 15/18	Oct 15/18	Saft				
2	Feb 21/2022	Feb 21/2022	Saft				
3	Sep 19/2022	Sep 19/2022	Saft				
4	Mar 20/2023	Mar 20/2023	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		DATE INCORPORATION OR NO EFFECT	TITLE
NUMBER / REV	DATE		

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LIST OF EFFECTIVE PAGES

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INTRODUCTION

1. General

A. This manual is written to the ATA Specification 100 and in AECMA Simplified 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. The manual verifies DISASSEMBLY, TESTING AND FAULT ISOLATION, and ASSEMBLY procedures.

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 to be used on the equipment covered herein. Most standard aerospace practices are not described herein.

This manual provides the 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 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 elevated levels of MTBUR and MTBF.

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

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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 must 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. TIGHTEN ¼ TURN VENT VALVES (210) WITH T01 PRIOR TO BEGINNING DISCHARGE. BATTERY CELLS DELIVER VERY HIGH CURRENT WHEN SHORT-CIRCUITED. EXERCISE CAUTION. REMOVE RINGS, WATCHES, NECKLACES, METALLIC BELTS OR OTHER JEWELRY TO AVOID ELECTRIC SHOCK.

WARNING: DO NOT TILT THE BATTERY WHILE DOING MAINTENANCE, ANY CONTACT OF ELECTROLYTE CAN CAUSE SEVERE BURNS.

Safety rules are different 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.saft.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 a 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 them 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.

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

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

4. Initial Commissioning New Battery

All new Saft 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.

Figure Intro 1 Universal Recycling Symbols

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

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

C. Break or cut the terminals from the cell. If any electrolyte leakage occurs, make sure the clean-up measures as described in the Battery Information Sheet (BIS).

D. 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

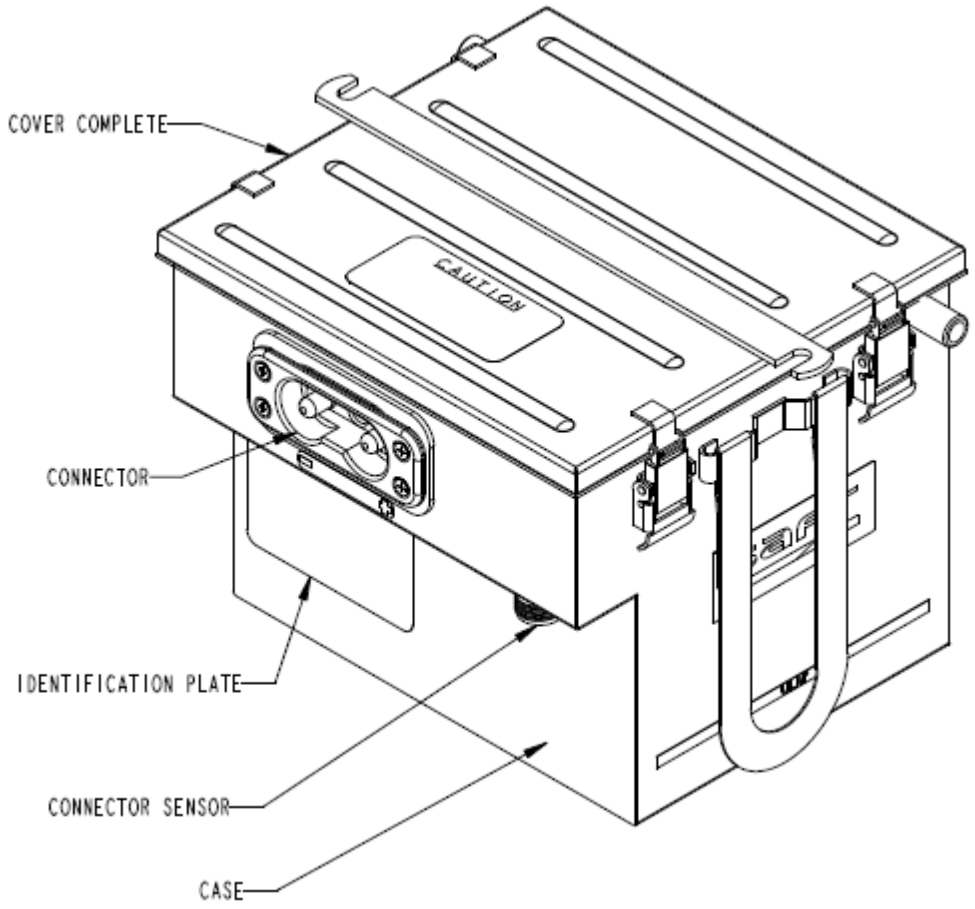
8. Abbreviations

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

DESCRIPTION AND OPERATION

1. Description

The Nickel Cadmium Battery provides power to the applicable aircraft systems. It is a nickel-cadmium type with sintered and plastic bonded electrode plate construction and uses a potassium hydroxide electrolyte. The battery consists of a case and cover, 21 cell assemblies and a harness assembly. The harness assembly includes 2 Thermostats in series mounted on a link between cells 4 & 5 and 16 & 17. A charge control thermistor is mounted on the negative terminal of cell 7.



Nickel Cadmium Battery
Figure 1

PARAMETER	VALUES
Voltage: Nominal	 25.2 Volts
Weight	25.7 kg (56.7 pounds) maximum
Dimensions (Maximum): Height Length Width	 227.07 mm (8.94 inches) 250.69 mm (9.87 inches) 312.16 mm (12.29 inches)
Number of Cells	21
Cell Assembly Terminal	M8 X 1.25 externally threaded
Cell Model	Saft Type CVH430KA
1.0C_1A Rate	25.0A
0.5C_1A Rate	12.5A
0.1C_1A Rate	2.5A
Rated Capacity (C_1)	25 Ampere-hours at 1.0C_1A
Vent valve	MS Style (¼ turn)
Venting Pressure	0.14 to 0.69 bar (2 to 10 psi)
Consumable volume of water per cell	40 cm^3 (2.44 in^3)
Cell Assembly Case Material	Polyamide
Battery Case Material	Stainless Steel
Electrolyte	Potassium Hydroxide
Operation temperature:	-40°C to +70°C (-40°F to +158°F)
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 provide a discrete 28Vdc/Open to the aircraft 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 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 (0.061 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 extension, 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 done 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 32.6V 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 step-by-step formats that follow the process flow outlined in Figure 1001. Fault Isolation is provided in chart form to identify faults, possible causes, and remedies, refer to Table 1006, Table1007, or Table 1008.

   NOTE: The ( ) part identification numbers herein are IPL numbers and are shown in the Battery, Exploded View IPL Figure 1.

   NOTE: All voltage readings are DC unless specifically otherwise stated.

2. Required Test Equipment

   NOTE: Test equipment having equivalent specifications can be used.

   Refer to Special Tools, Fixtures, Equipment, and Consumables for listing of Standard Tools.

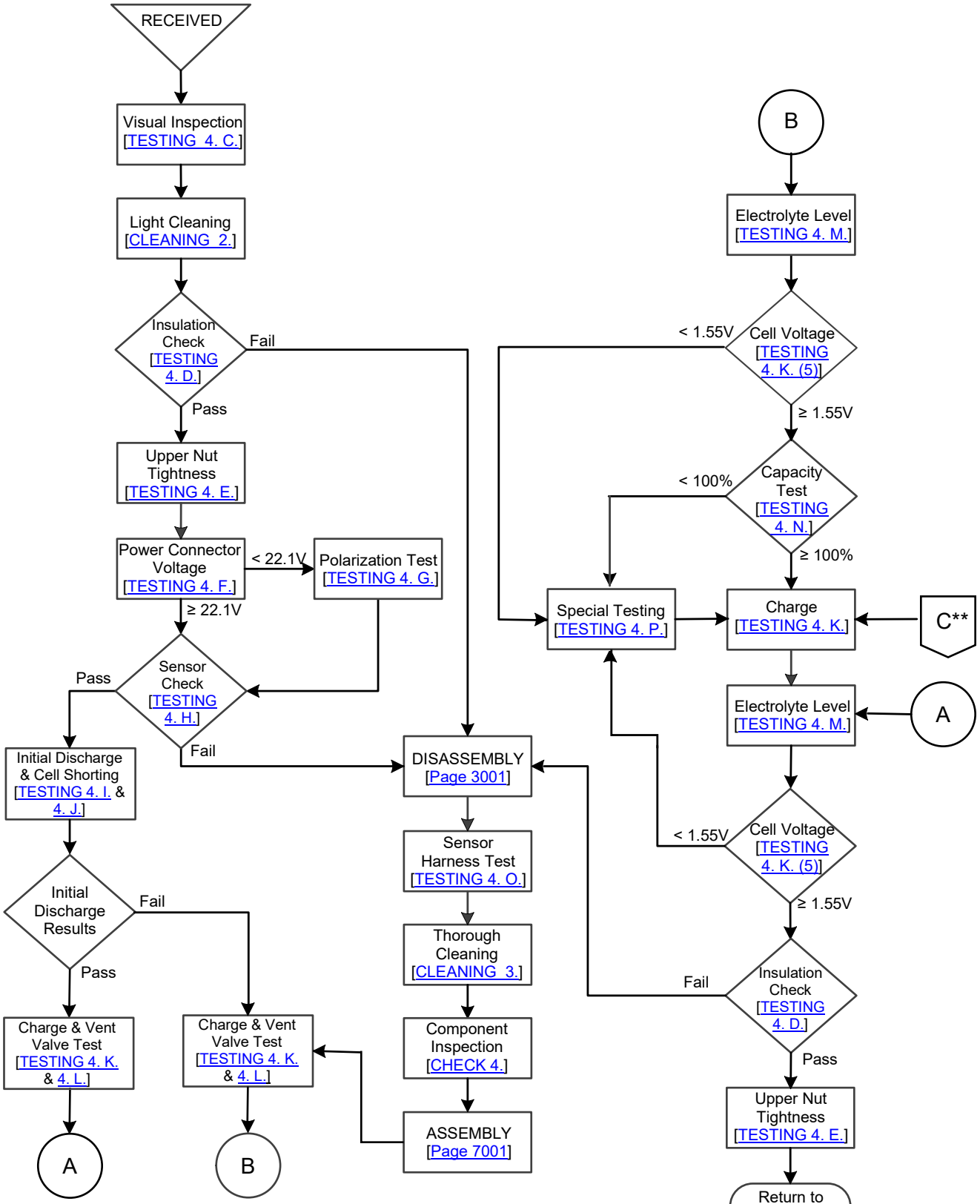
3. Maintenance Procedures

   In addition to the checks specified for airborne or ground use, in normal service SAFT 257CH3 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, assembly, and testing.



Process Flow for Battery Restoration
Figure 1001

**From Table 15001

4. Testing

A. Test conditions

(1) Facilities and equipment

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

(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 temperature, unless otherwise noted in this manual.

B. Test equipment

Refer to Special Tools, Fixtures, Equipment, and Consumables for test equipment recommendations.

C. Visually 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 battery cover (10) for dents, distortion, or other damage and replace as needed with new Saft component.

(2) Visually inspect battery case (330) for dents, distortion, or other damage. If found, identify the component for replacement.

(3) Visually inspect handles (340) for defects, frays, and other damage. Replace as needed.

(4) Visually inspect visible portions of each cell (200) for any evidence of electrolyte leakage and damage.

(a) Damaged cells (200) must be marked 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 (310). Identify any cells with excessive salts for later torquing the lower nut (260).

(c) When inspection reveals electrolyte leakage from the cell at the vent hole opening, replace the defective O-ring (240)

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

1 Using T01, loosen and remove the vent valve (210) from the cell (200).

2 Remove and replace defective O-rings (230) from the vent valve (210).

3 Using T01, tighten the ¼ turn vent valve (210) onto the cell (200)

(5) Inspect the upper nuts (20), (240), washers (30), (250), and links (40 to 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. Identify defective hardware for later replacement.

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

(7) Check the power connector (110) pins for defects, evidence of arcing, or excessive oxidization. If observed, identify the power connector (110) for later replacement.

D. 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.

(1) On a completely assembled battery using a megohmmeter under a continuous 250V, measure the insulation resistance between the metal box and

(a) the positive terminal of each cell,

(2) The value measured must be ≥ 10MΩ under a continuous 250V.

(3) If the reading meets the above criteria (≥ 10MΩ), the insulation is a “Pass”; otherwise, the insulation test is a “Fail”.

NOTE: If, after cleaning the battery and assuring that everything is dry, the resistance is still < 10MΩ, then one or more cells (200) is defective, isolate and identify for later replacement.

E. Upper nut tightness

Check that the tightness on each upper terminal nut (20), (240) per to Table 8001.

F. Battery voltage

Measure and verify the voltage at the battery connector is greater than or equal to 22.1V.

G. Polarization test

(1) Charge the battery at $0.1C_1A$ (2.5A) for 1.5 hours.

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

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

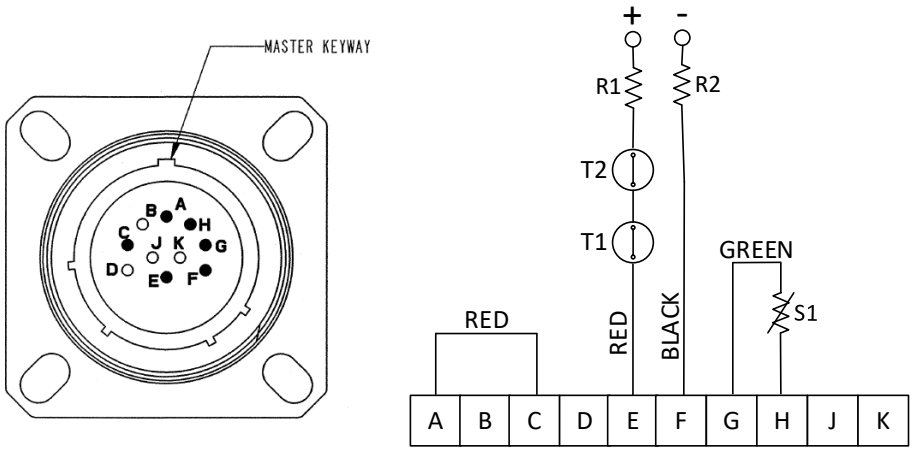
(a) Mark for replacement any cell (200) with zero volts or negative polarity. If any cell (200) is marked for replacement, the polarization test is a “Fail”.

(b) If all cells are greater than 0V, the polarization test is a “Pass”.

H. Sensor harness check

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

NOTE: Refer to Figure 1002 for pinout locations.



Connector Pinout
Figure 1002

(1) If any part of the sensor harness (150) is damaged, the entire assembly must be replaced after disassembly with a new Saft component.

(2) Be sure the internal battery temperature is per Table 1001, and then test with an ohmmeter to sensor connector. Any erratic readings represent a failure and the entire sensor harness (150) must be replaced with new Saft component, refer to DISASSEMBLY and ASSEMBLY.

PINS	VALUES @ +22.8 ± 5°C (+73 ± 9°F)
A - C	< 1Ω
Pos (+) to E	32.4 kΩ ± 1%
Neg (-) to F	32.4 kΩ ± 1%
G – H	1854Ω to 3116Ω

Sensor Check Values
Table 1001

I. 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.

(1) Using T01, confirm the ¼ turn vent valve (210) is installed on each cell (200).

(2) Discharge the battery at a rate listed in Table 1002 until the battery reaches 21.0V and record the times the first cell reaches 1.0V and battery reaches 21.0V.

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 RATE (C_1)	CURRENT (AMPS)	MINIMUM TIME FOR FIRST CELL TO 1.0V
0.5	12.5	121.2 MINUTES
1.0	25.0	60.0 MINUTES

Initial Discharge (Off-wing Capacity)
Table 1002

(3) If defective case (330), power connector (110), nuts (20), (240), washers (30), (250), or links (40 to 100) were found during the visual inspection, they are to be corrected by performing appropriate DISASSEMBLY and ASSEMBLY..

(a) For each cell (200) marked for replacement, do Cell replacement in REPAIR.

(b) For each cell (200) which had excessive salts around the terminals during visual inspection, do Lower nut tightness.

(c) If any cell hardware (260), (270 or 280), (300), (290) was identified as needing replacement, do Cell hardware replacement in REPAIR.

(d) If terminal O-ring (310) requires replacement, do Terminal O-ring replacement in REPAIR.

(4) Initial discharge results

NOTE: The results below will be used for a decision point in Figure 1001.

(a) If the discharge time of the first cell reaching 1.0V equals or exceeds the value shown in Table 1002 for the discharged rate, the battery capacity is a “Pass”.

(b) If the discharge time of the first cell reaching 1.0V is less than the value shown in Table 1002 for the discharged rate, the battery capacity is a “Fail”.

J. Cell shorting

(1) Using T01, confirm the ¼ turn vent valve (210) is tightened on each cell (200).

(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 discharge and cell shorting.

(a) Method A

1 Continue to discharge the battery per Table 1002 until each cell is < 1.0V, then connect a T03 across its terminals. After all the cells have been shorted, leave the devices in place for 12 to 24 hours.

(b) Method B

1 Continue to discharge the battery per Table 1002 until each cell is < 0.5V, then connect a shorting clip across its terminals. After all the cells have been shorted, leave these clips on for 16 to 24 hours.

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

(4) If no cell(s) are marked for replacement, then return to Figure 1001 utilizing the "Pass" or "Fail" results of the Initial discharge.

(5) If any cell (200) were marked for replacement, do Cell replacement in REPAIR.

K. Charge

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

(2) Remove the cover (10).

(3) Prior to charging the battery, loosen (do not remove) all ¼ turn vent valves (210). Ensure that the shorting spring has been removed.

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

(4) Charge the battery using one of the procedures in Table 1003.

(a) Record the cell voltages at the start and end of the main charge (Step 1), and 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 last 30 minutes of the final charge (Step 2), adjust the Electrolyte level and check for Minimum final charge voltage.

CHARGE TABLE			
Main Charge (Step1)			**Final Charge (Step 2)****
Current	Minimum Time*	End of Main Charge Criteria	Current and Time
0.1C_1A (2.5A)	10h	Every cell >1.5V or 12h whichever comes first	0.1C_1A (2.5A) for 4h
0.5C_1A (12.5A)	2h	Every cell >1.55V or 2.5h whichever comes first	0.1C_1A (2.5A) for 4h
1.0C_1A (25.0A)	1h	Every cell >1.57V or 1.25h whichever comes first	0.1C_1A (2.5A) for 4h

* Minimum time applies to a battery previously discharged to 21.0V.
** During the last 30 minutes, do Electrolyte level and confirm minimum voltage criteria in Table 1004.

Charge Table
Table 1003

(6) Minimum final charge voltage

During the last 30 minutes of final charge, measure and verify the voltage of each cell (200) meets the value shown in Table 1004. Identify each cell that does not comply and do Special testing per Figure 1001.

CELL VOLTAGE Last 30 minutes at $0.1C_1A$
≥ 1.55V

Final Charge Voltage Limit
Table 1004

L. Vent valve test

NOTE: The vent valve test should be done once a year of battery operation. This test is not necessary for all vent valves replaced with Saft new valves (210) each year.

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

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

(1) Check the operation of the vent valve (210) as follows:

(a) Using T01, tighten the ¼ turn vent valve (210) than contains O-ring (240) onto the test fixture T05.

(b) Attach the fixture T05 to a compressed air line through an adjustable pressure reducing valve limited to 1.38 bar (20 psi).

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

(d) 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).

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

M. Electrolyte level

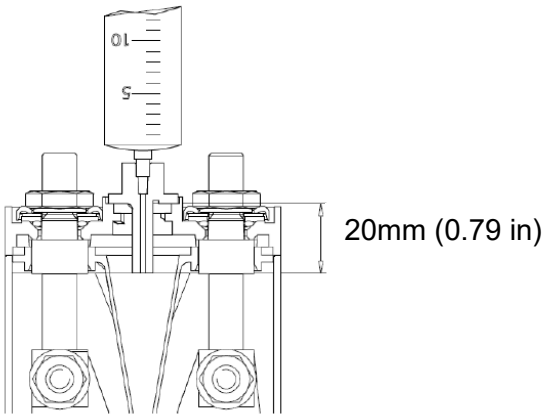
This procedure is to be carried out during the last 30 minutes of the final charge at $0.1C_1A$.

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 (DISTILLED OR DEIONIZED WATER) IN NICKEL-CADMIUM CELLS WILL CAUSE ELECTROLYTE CONTAMINATION AND DAMAGE. DO NOT RE-USE WATER REMOVED FROM CELLS.

(1) Clean the vent valves (210) and their O-rings (240) by immersing the valves in M01 and let them soak to dissolve any salts.

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



Position of T02 in Cell Vent Seat
Figure 1003

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

(a) Any excess liquid in the cell will be drawn into the syringe until the electrolyte is level is correct.

(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 40 cm^3 (2.44 in^3), then check the charging system. If the aircraft charging system 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 the T02 and inject it into the cell.

2 With the syringe nozzle resting on the valve seat, slowly withdraw the plunger into T02.

3 If T02 remains empty, repeat steps 1 and 2, counting the total number of cm^3 added 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 proper disposal of hazardous waste.

5 Record the amount of water added/removed from each cell in the battery logbook or battery test sheet.

(4) Using T01, tighten the ¼ turn vent valve (210) on each cell (200).

N. Capacity test (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.

(2) Using T01, verify the ¼ turn vent valve (210) is installed on each cell (200).

(3) Discharge the battery at one of the current rates shown in Table 1005 until the battery reaches 21.0V to determine and record the times the first cell reaches 1.0V and battery reaches 21.0V.

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.

DISCHARGE		MINIMUM TIME FOR FIRST CELL TO 1.0 VOLT
RATE (C_1)	CURRENT (AMPS)	
0.5	12.5	121.2 MINUTES
1.0	25.0	60.0 MINUTES

Capacity Check (Second Discharge)
Table 1005

(4) If the time until the first cell reaches 1.0V equals or exceeds the values shown in Table 1005 at the discharge rate the capacity is ≥ 100%, allow the battery to rest at least 2 hours.

(5) If the time the first cell reaches is less than the value shown in Table 1005 at the discharge rate the capacity is < 100%.

O. Sensor harness test

WARNING: A FULLY ASSEMBLED BATTERY MUST BE IN A FULLY DISCHARGE CHARGE STATE TO PREVENT INJURY, REFER TO CELL SHORTING.

(1) If any part of the sensor harness (150) is damaged, the entire assembly must be replaced do refer to DISASSEMBLY and ASSEMBLY.

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

NOTE: Refer to Figure 1002 for pinout locations.

(2) Test with an ohmmeter the connector sensor harness (150) per Table 1001. Any erratic readings represent a failure, replace with new Saft component.

(3) Slowly raise the temperature until the thermostats are above 154°F ± 5.0°F (60.0°C ± 2.8°C). check the resistance between the positive lug and pin E ofthe connector harness assembly (150). Ohmmeter reading should be open (>10MΩ). An erratic reading represents a failure, replace with new Saft component.

(4) Slowly lower the temperature until the thermostats are below 140°F ± 5.0°F (67.7°C ± 2.8°C). check the resistance between the positive lug and pin E ofthe connector harness assembly (150). Ohmmeter reading should be 32.4KΩ (±1%). An erratic reading represents a failure, replace with new Saft component.

P. Special testing

These procedures are to be followed for a battery that does not meet capacity or if the end of charge cell voltage < 1.55V during the final charge. Refer to Figure 1004 flow chart.

NOTE: For a new battery or one removed from the aircraft that has not passed capacity after doing the Special Testing more than 3 times, it is recommended to replace noncompliant cells with new Saft cells (220), refer to All cell replacement recommendation in REPAIR.

NOTE: For 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 < 1.55V, do Supplementary test.

(2) Low capacity (Special testing)

(a) Loosen, but do not remove all vent valves (210) and fully charge the battery as outlined in Charge section.

(b) For a battery containing any cell voltage < 1.55V during the final charge, do Supplementary test. Otherwise, do Capacity testing (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.

NOTE: The additional $0.1C_1A$ 5-hour charge may be stopped once all the cells ≥ 1.55V.

1 Identify for replacement any cell (220) with voltage < 1.55V.

2 During the last 30 minutes of this charge, adjust the Electrolyte level.

3 Do Cell replacement in REPAIR for cells marked for replacement otherwise go to Capacity test (Special testing).

NOTE: If more than one cell (200) was replaced due to low charge voltage during the current maintenance cycle, then the replacement of all cells should be considered. Refer to Cell replacement in REPAIR.

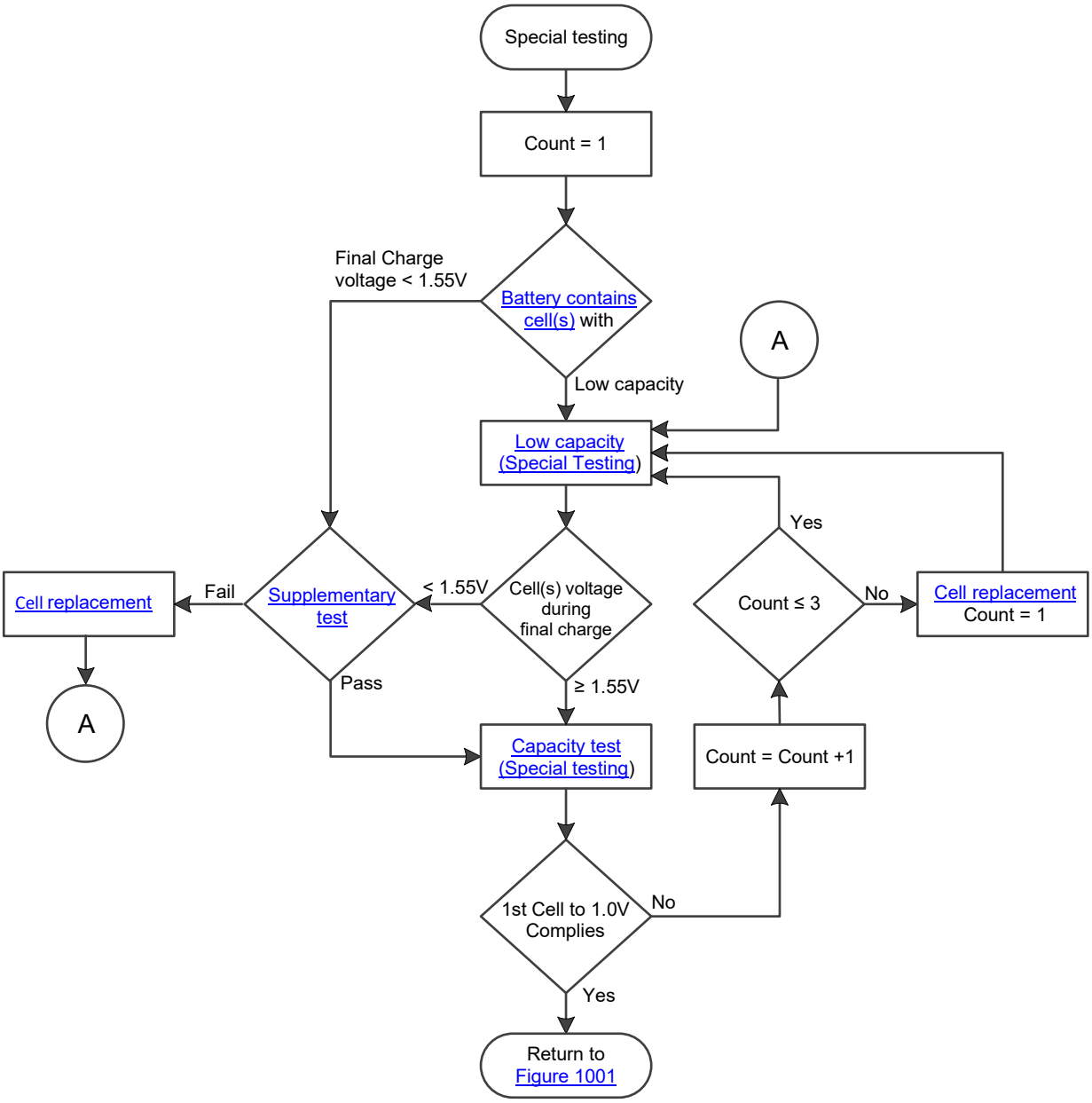
(4) Capacity test (Special testing)

(a) Using T01, verify the ¼ turn vent valve (210) is installed on each cell (220).

(b) Discharge the battery at a rate shown in Table 1005 until the battery reaches 21.0V. Record the time and current the battery reached 21.0V and identify noncompliant cells with voltage < 1.0V.

(c) If the time the first cell reached 1.0V equals or exceeds the values shown in Table 1005 at the applicable discharge rate, return to Figure 1001. Otherwise repeat this procedure 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 cell (200), refer to Cell replacement in REPAIR.



Special Testing Flow Chart
Figure 1004

Q. Lower nut tightness

(1) Remove the necessary hardware; remove nuts (20), (240), washers (30), (250), and intercell connecting links (40 to 100). Torque the lower nut (260) per Table 8001.

(2) Install applicable hardware; intercell connecting links (40 to 100), washers (30), (250), upper nuts (20), (240). Torque upper nuts per Table 8001.

5. Fault Isolation

Fault isolation information is presented in Table 1006, Table 1007, or Table 1008 as a guide in locating a cause of malfunction and isolating the cause to a specific component.

TROUBLE	PROBABLE CAUSE	REMEDY
(1) No battery voltage	(a) Defective electrical connector (not making contact). (b) Broken or loose terminal links, upper nuts	Check electrical connections Replace if required using DISASSEMBLY and ASSEMBLY
(2) Low Insulation	(a) Leakage of electrolyte (b) Incorrect electrolyte level (c) Reverse cell polarity (d) Condensation / Contamination (e) Improper cleaning	Do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level
	(f) Loose or damage vent valve	Tighten or replace ¼ turn vent valve, do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level
	(g) Damaged cell case	Do Thorough Cleaning, Cell replacement, ASSEMBLY, Charge, Electrolyte level
	(h) Charge rate too high	Investigate the cause of the excessive charge. Do Thorough Cleaning, ASSEMBLY, Charge, Electrolyte level
(3) Loss of battery capacity	(a) Normal wear after long service (b) Exceptionally heavy use	Do Special testing

Battery Faults
Table 1006

TROUBLE	PROBABLE CAUSE	REMEDY
(1) All cells have reserve consumed	(c) Charged more than allowed or charged at high temperature. (d) Previous maintenance has not been done (e) 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.
(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
(3) Abnormally high cell voltage at beginning of charge	(a) Dry cell	Add 5 to 10 cm^3 (0.31 to 0.61 in^3) of distilled water, do Electrolyte level during final charge
(4) Zero Voltage on cell	(a) Short-circuited cell	Do Cell replacement
(5) Low cell voltage at end of charge	(a) Separator damage	Do Cell replacement
(6) Low cell capacity	(a) Normal wear from long service	Do Cell replacement
(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 1007

TROUBLE	PROBABLE CAUSE	REMEDY
(1) Tarnished or burned terminal connectors	(a) Loose terminal nuts and links	Clean and torque per Table 8001.
(2) Exposed copper material on power connector pin	(a) Mechanical damage (b) Electrical arcing	Replace component using DISASSEMBLY and ASSEMBLY
(3) Melted plastic on connectors	(c) Overheat due to contact resistance	Replace component using DISASSEMBLY and ASSEMBLY
(4) Corroded links	(a) Operation in acidic atmosphere	Check room eliminate acid source, replace component using DISASSEMBLY and ASSEMBLY
	(b) Inadequate greasing	Replace component using DISASSEMBLY and ASSEMBLY
	(c) Mechanical damage to protective nickel-plating	Replace component using DISASSEMBLY and ASSEMBLY
(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 component using DISASSEMBLY and ASSEMBLY

Physical Faults
Table 1008

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DISASSEMBLY

1. General

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

   NOTE: The ( ) part identification numbers herein are IPL numbers and are shown in the Battery, Exploded View IPL Figure 1.

2. Detailed Instructions

   WARNING: BATTERY CELLS 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 CELLS CAN BE REMOVED DUE TO POSSIBILITY OF ELECTRIC SHOCK.

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

   A. Preparation

      (1) Discharge the battery at one of the current rates shown in Table 1005 until each cell reaches 1.0V.

      (2) Remove cover (10) by opening latches and lifting cover from case (330).

      (3) Do Cell shorting

   B. Cell (200) removal

      (1) Remove nuts (20), (240) and washers (30), (250) from cell (200) terminals and power connector (110).

      (2) Place the lugs S1, R1, and R2 (refer to Figure 1002) off to the side and away from the cell terminals.

      (3) Remove intercell terminal links (40 through 100) from cell (200) terminals.

      (4) Using T04 on the cell terminals as needed to remove cells (200) from the battery case (330).

   C. Disassembly of the cells (200) is restricted to replacing defective cell hardware (260), (270 or 280), (300), (290), or terminal O-rings (310), refer to Component replacement in REPAIR.

   D. Sensor harness (150) removal

      (1) Remove the thermostat mounting nuts (190) from links (90) and (100). Cut cable tie (180) from T2 wiring attached to link (70)

      (2) Remove the harness assembly connector mounting screws (170) and nuts (160) and lift the harness assembly (150) out of the battery case (330).

E. Power connector (110) removal

(1) Remove the four screws (120) from the connector.

(2) Remove the power connector (110) with its gasket (130) from the case (330).

F. Remove all spacers (320) from the battery case (330).

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: The ( ) part identification numbers herein are IPL numbers and are shown in the Battery, Exploded View IPL Figure 1.

   A. The following items are required to do the cleaning procedures (equivalent substitutes can be used):

      (1) Stiff bristled brush (nonmetallic)

      (2) Dry compressed air source, less than 1.38 bar (20 psi)

      (3) Safety goggles

      (4) Lubricant (non-acid petroleum jelly), M02

      (5) Soft, clean cloth (two required)

      (6) Running water

      (7) Mild Soap, M03

      (8) Distilled or de-ionized water, M01

2. Light Cleaning

   A. The following procedures are for an assembled battery with battery cover (10).

   B. Using T01 make sure that the ¼ turn vent valve (210) of each cell (200) are closed and secure. Do not over-tighten.

   C. Remove white deposits (potassium carbonate) from tops of all cells (200) using a stiff bristled nonmetallic brush.

      WARNING: TO PREVENT INJURY WHEN USING COMPRESSED AIR, DIRECT AIRFLOW AWAY FROM BODY AND USE SAFETY GOGGLES TO PREVENT EYE INJURIES 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 all nuts (20), (240), washers (30), (250), and links (40 through 100) with a light film of M02.

      CAUTION: Silicone coatings are not suitable due to the alkaline electrolyte.

   F. Clean the exterior surfaces of the battery cover (10) and battery case (330) using a soft, clean cloth, moistened with water. Dry with compressed air or a dry, clean cloth.

3. 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 (110) with warm mild soapy M03 water.

C. After ensuring that the vent valves (210) are installed and locked into place, wash each cell (200) in running water. Do not allow any water to enter the cell. Dry with compressed air or a dry, clean cloth.

D. Without submerging the connector of sensor harness (150), wipe clean with damp cloth and let dry.

E. Wash the battery case (330), handles (340), cover (10), spacers (320), gasket (130), cell links (40 through 100), cell hardware (20), (30), (240). (250), and connector hardware (120), (160), (170), and (190) in warm mild soapy M03 water to remove dirt and salt deposits. A plastic scraper or a stiff bristled brush (nonmetallic) may be used to aid in the removal of heavy deposits. Rinse away all 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 specifically otherwise stated.

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

2. 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 (330) and cover (10) for dents, distortion, or other damage. If found, replace with new Saft case (330) or cover (10).

      (2) Remove the battery cover (10).

      (3) Visually verify the power connector (110) is present and undamaged.

      (4) Visually verify all cells (200) are positioned for proper polarity per Figure 7002.

      (5) Visually verify all cells (200) are equipped with a vent valve (210).

      (6) Torque all upper cell nuts (20), (240) per Table 8001.

      (7) Visually verify the sensor harness (150) is present, secured, and undamaged.

   B. Charge the battery per Charge on page 1007 and level electrolyte per Electrolyte level on page 1008.

   C. Perform successful Battery insulation test and install battery cover (10), then the battery is ready for service.

3. Component inspection

   A. Cell (200)

      (1) Visually inspect for evidence of electrolyte leakage, cracks, corrosion, burns, holes, or cross-threaded terminals. Replace any defect cells with new Saft cells (200).

      (2) Excessive salt around a terminal post indicates leakage. Refer to Terminal O-ring replacement on page 6002 for replacement of lower terminal O-ring (310) if leakage is evident.

      (3) Visually check each cell vent valve (210) for defective O-rings (230), cracks, or other physical damage. Replace defective O-rings (230).

         (a) Suspect vent valves (210) should be tested in accordance with Vent valve test and/or be discarded.

(4) Inspect the nuts (260) and washers (270 or 280), (290), (300) 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. Refer to Cell hardware replacement in REPAIR.

B. Inspect upper nuts (20), (240) and washers (30), (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.

C. Intercell terminal links (40 through 100)

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.

D. Spacers (320)

The spacers (320) should be clean and free of cracks or holes. Replace any that are defective.

E. Power connector (110)

CAUTION: A DEFECTIVE POWER CONNECTOR CAN CAUSE DANGEROUS OVERHEATING AND IN-SERVICE LOW VOLTAGE DURING DISCHARGE.

(1) Check the power connector (110) for evidence of arching, corrosion, cracks, or cross threaded terminals.

(2) Using the Battery insulation method on page 1004, check the insulation between the positive pin and the connector shell and the negative pin and connector shell.

(3) Discard any connector found to be defective or fails the insulation test. Replace with factory new power connector (110).

F. Sensor harness (150)

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

(2) Inspect charge control thermistor and resistor lug for damage, loose or broken wire connections, cracks, dents, or other physical defects.

(3) Visually check all wiring damage to insulation, cracked or broken wire, and other physical defects.

(4) Any evidence of the above conditions the component should be discarded and replaced with new Saft harness (150).

NOTE: Sensor harness (150) is a non-repairable item and should be discarded if defective.

G. Battery cover (10), case (330), and handle (340)

Inspect the components for damage. If found, replace with new Saft cover (10), case (330), or handle (340) as needed.

REPAIR

1. General

This section contains basic battery component procedures.

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

NOTE: All voltage readings are DC unless otherwise stated.

2. Required Test Equipment

NOTE: Test equipment with equivalent specifications can be used.

Refer to Special Tools, Fixtures, Equipment, and Consumables for listing of Standard Tools.

3. Component Replacement

A. Cell Replacement

A battery containing cell(s) (200) require replacement. Note the All cell replacement recommendation below.

(1) All cell replacement

(a) For a battery compliant with the following, it is best to assume that all the original cells are or soon will be in unsatisfactory condition. Saft strongly recommends all cells (200) should be replaced with new Saft cells for a battery having:

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

Or

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

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

(2) Do DISASSEMBLY and ASSEMBLY to replace defective cells.

B. Cell hardware 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 cell hardware (260), (270 or 280), (300) , or (290) by removing and replacing the nuts (20), (240), washers (30), (250), links (40 to 100). Torque nuts (20), (240), (260) per Table 8001 as required

C. Terminal O-ring replacement

(1) Remove necessary nuts (20), (240), washers (30), (250), and links (40 to 100).

(2) Remove lower terminal nut (260), polarity washer (270 or 280), washers (290), (300), and terminal O-ring (310) being careful to prevent anything from falling into the cell opening.

(3) Replace O-ring (310), install washer (300), washer (290), polarity washer (270 or 280) and torque lower terminal nut (260) per Table 8001.

(4) Install the necessary links (40 to 100), washers (30), (250), and torque nuts (20), (240) per Table 8001 as required.

ASSEMBLY

1. General

   This section contains assembly instructions necessary after disassembly and test.

   NOTE: Make sure all components are clean and dry before re-assembly.

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

2. Sensor harness (150)

   A. Insert the harness assembly (150) connector into its mounting hole on the case (330) and reinstall the connector mounting screws (170) and nuts (160) by torquing per Table 8001.

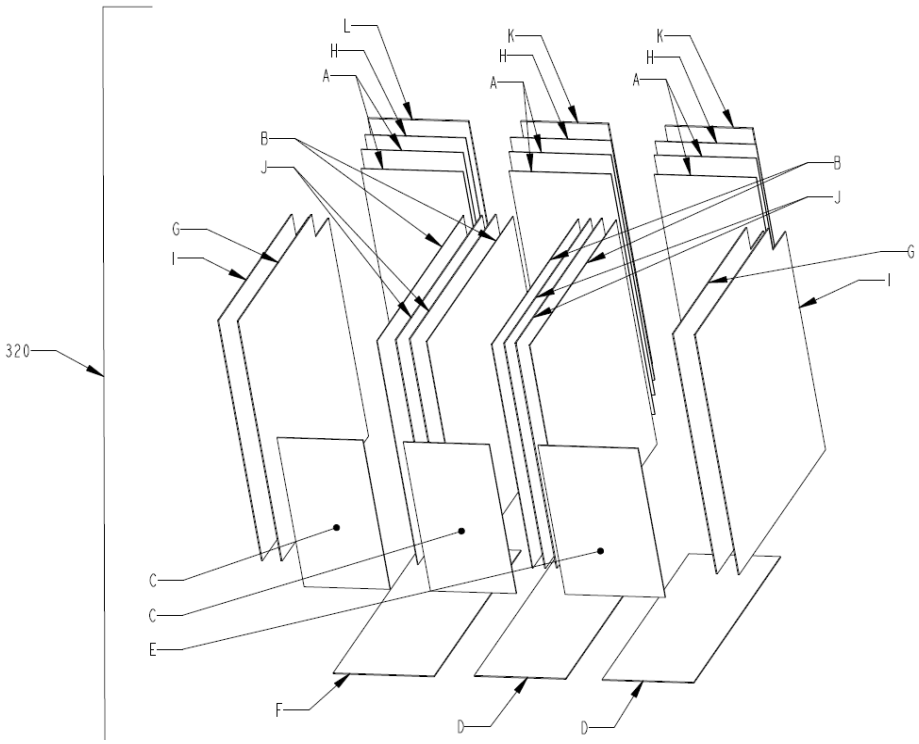
   B. Attach the thermostats, T1 and T2, to the thermostat links (90) and (100) with mounting nuts (190). Torque per Table 8001.

3. Spacers (320) and Cells (200)

   A. Install spacers (320) and cells (200) into the battery case (330), using the following steps. Refer to Figure 7001, Table 7001, and Figure 7002.

      (1) Insert one edge of bottom spacers into battery case (330) from the left or right side, then slide the spacer under the cell partition.

      HINT: It is often easier to install the center cell of a row last. Observe polarity.



Spacer Kit Installation
(Refer to Table 7001)
Figure 7001

Item	Description	Dimension (in)	Unit Per Assembly
A	Spacer	3.15 x 8.06 x 0.020	6
B	Spacer	7.46 x 7.52 x 0.020	4
C	Spacer	2.65 x 5.00 x 0.031	2
D	Spacer	2.83 x 7.50 x 0.031	2
E	Spacer	3.09 x 5.00 x 0.031	1
F	Spacer	3.12 x 7.50 x 0.031	1
G	Spacer, Notched	7.47 x 8.06 x 0.031	2
H	Spacer	3.110 x 8.031 x 0.032	3
I	Spacer, Notched	7.46 x 8.06 x 0.032	2
J	Spacer	7.562 x 7.438 x 0.032	4
K	Spacer	2.70 x 8.06 x 0.062	2
L	Spacer	8.063 x 3.100 x 0.062	1

Spacer Kit Installation
Table 7001

(2) Install the left and right side row of cells and spacers in accordance with the following steps in battery case (330), as shown in Figure 7001 and Figure 7002.

NOTE: Spacers are used as required to ensure the left and right row cells are retained securely in place.

(a) Install on each side and at each end spacers into the in the left and right-side of battery case (330), as shown in Figure 7001.

(b) Install seven cell subassemblies (200) into the left-side of the battery case (330) in positions 15 to 21. Be sure to maintain the proper cell arrangement and polarity orientation see Figure 7002. Insertion of the last cell 17 can sometimes be difficult, to assist insertion press down on the terminals with a small block of soft wood.

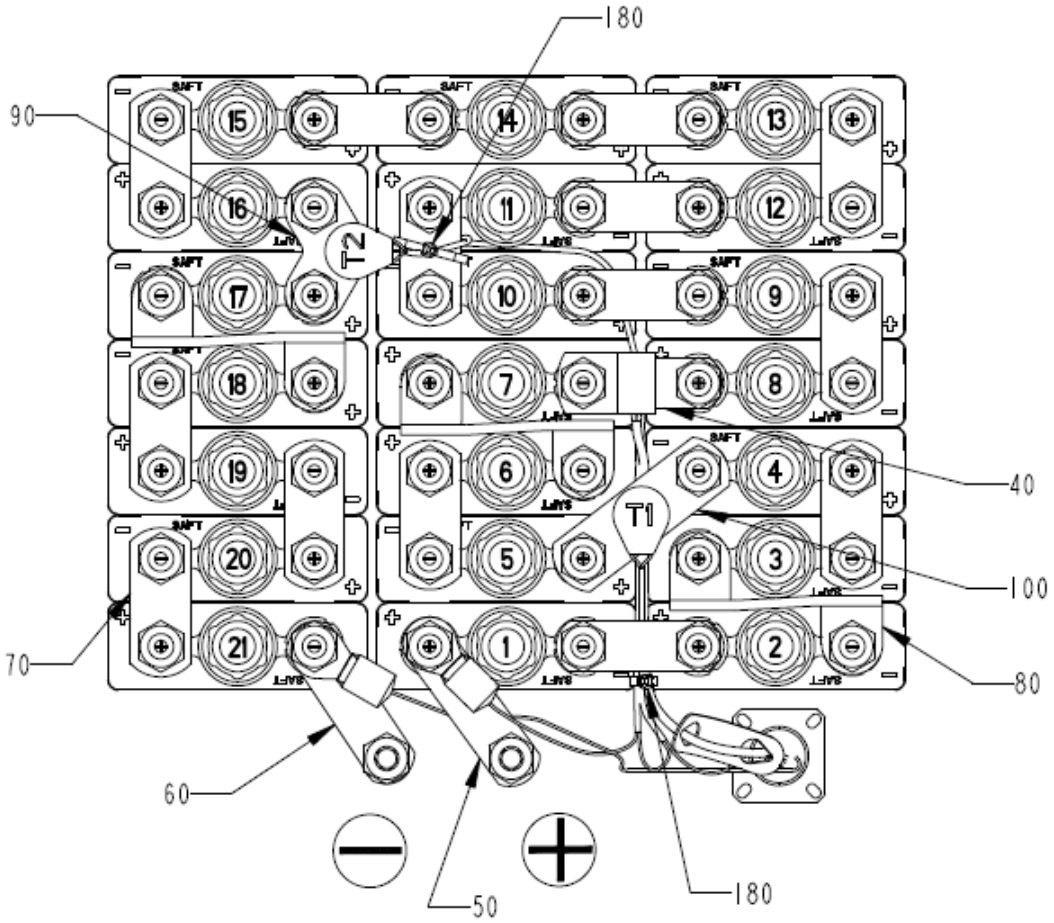
(c) Install seven cell subassemblies (200) into the right-side of the battery case (330) in positions 2 to 4, 8, 9, 12, and 13. Be sure to maintain the proper cell arrangement and polarity orientation (see Figure 7002). Insertion of the last cell 8 can sometimes be difficult, to assist insertion press down on the terminals with a small block of soft wood.

(3) Install center row of cells and spacers in accordance with the following steps in battery case (330), as shown in Figure 7001 and Figure 7002.

NOTE: Spacers are used as required to ensure the center row cells are retained securely in place.

(a) Install side and end spacers into the center partition of battery case (see Figure 7001).

(b) Install seven cell subassemblies (200) into positions 1, 5 to 7, 10, 11, and 14 in the center partition of battery case (330). Be sure to maintain the proper cell arrangement and polarity orientation (see Figure 7002). Insertion of the last cell 7 sometimes can be difficult, to assist insertion press down on the terminals with a small block of soft wood.



Cell Number and Polarity Orientation
Figure 7002

4. Power Connector

A. Apply a small amount M04 to the power connector gasket (130)

B. Install the power connector (110) with its gasket (130) and torque the four Sems screws (120) per Table 8001.

C. Remove excess M04, if any.

5. Complete Battery

A. Install intercell terminal links (40 through 100) on the terminals of the cell sub-assemblies (200) and power connector (110) as shown in Figure 7002.

B. Lightly lube with M02 the cell terminal threads, nuts, links, and power connector pins using a nonmetallic brush,

C. Install washers (30), (250) and nuts (20), (240) onto terminals of cells (200) and power connector (110). Torque nuts (20), (240) refer to Table 8001.

CAUTION: DO NOT CRIMP WIRE LEAD/LUG ASSEMBLIES OF THE SENSOR HARNESS.

D. Secure T2 wires using new cable tie (180) to link as shown in Figure 7002.

E. Lightly lube with M02 any other components that might be susceptible to atmospheric corrosion.

F. Install battery cover (10) onto the battery case (330) and secure in place by fastening the latches.

FITS AND CLEARANCES

1. Torque Table

IPL SECTION FIGURE	ITEM NUMBER	TORQUE VALUE		NAME, LOCATION
		Nm	lb_f-in	
1 (Sheet 1 of 4) 1 (Sheet 4 of 4)	20, 240	8.0 ± 0.8	71 ± 7	Nut, Terminal, Upper
1 (Sheet 1 of 4)	120	2.3 ± 0.2	20 ± 2	Screw, Sems, Power Connector
1 (Sheet 3 of 4)	160	0.8 ± 0.1	7 ± 1	Nut, Locking, Sensor
1 (Sheet 3 of 4)	170	0.8 ± 0.1	7 ± 1	Screw, Sensor
1 (Sheet 3 of 4)	190	1.1 ± 0.1	10. ± 1	Nut, Locking, Thermostat
1 (Sheet 4 of 4)	260	5.0 ± 0.5	44 ± 4	Nut, Terminal, Lower

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: A special tool kit (P/N 416161) is available from Saft containing special tools T01, T02, T03, and T04. The tools are housed in a polypropylene box and each tool is insulated to ensure optimum safety for the technician. Refer to Table 9001

(1) T02 (P/N 416232) is assembled using syringe P/N 105112 and nozzle P/N 104184. T02 (P/N 020916-001) is assembled using syringe P/N 018327-000 and nozzle P/N 020914-001.

(2) The T02 (syringe) is used in the electrolyte level adjustment and the T04 (cell puller) is used in cell removal.

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)	020916-001	416232
T03	1.2Ω 3W equalizing resistors	-	164829
T04	Universal cell extraction tool	-	416159
	M8x1.25 tool	017557-000	-
T05	Vent Valve adapter for MS valves	024398-000	-

Special Tools
Table 9001

2. Standard Tools

A. The following items are recommended to do the procedures described in this manual. When necessary equivalent substitutes may be used.

- Constant current charger (DC current range 0 – 60A, minimum open DC voltage 40V)
- Constant current load bank (DC current range 0 – 60 A, DC voltage range 1 – 40V)
- Megohmmeter (0 – 50 MΩ @ 250 V continuous)
- Precision Multimeter (Volt, Ω, mA) 2000 count, accuracy 1% or better
- Torque Wrench (Insulated) 0 to 15 N-m (0 to 133 lb_f-in)
  Torque Screwdriver 0 to 3.4 N-m (0 to 30 lb_f-in)
- Thermometer, Immersion
- Standard mechanic's tools.
- Safety gloves.
- Protective goggles.
- Safety shoes.
- Eye wash.
- Climatic Chamber

- Protective apron
- Stiff bristle brush (non-metallic)
- Small paintbrush (non-metallic)
- Dry, compressed air source [less than 1.38 bar (20 psi)]
- Soft, clean cloth (at least two required)

3. Consumables

NOTE: Equivalent alternatives can be used for list items.

This paragraph describes the consumables used in the CMM.

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 x 10^{-5} oz/in^3) (Chemical Oxygen Demand, methodology to evaluate organic or mineral pollution) Chlorines Cl^- < 5 mg/l (2.9 x 10^{-6} oz/in^3) Sulfates SO_4^{2-} < 10 mg/l (5.8 x 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
M04	Silicone sealant	Dow Corning 737 or equivalent neutral cure RTV

Consumables
Table 9002

ILLUSTRATED PARTS LIST

1. Introduction

   A. Purpose

   This section provides illustrations and parts breakdown of the 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.

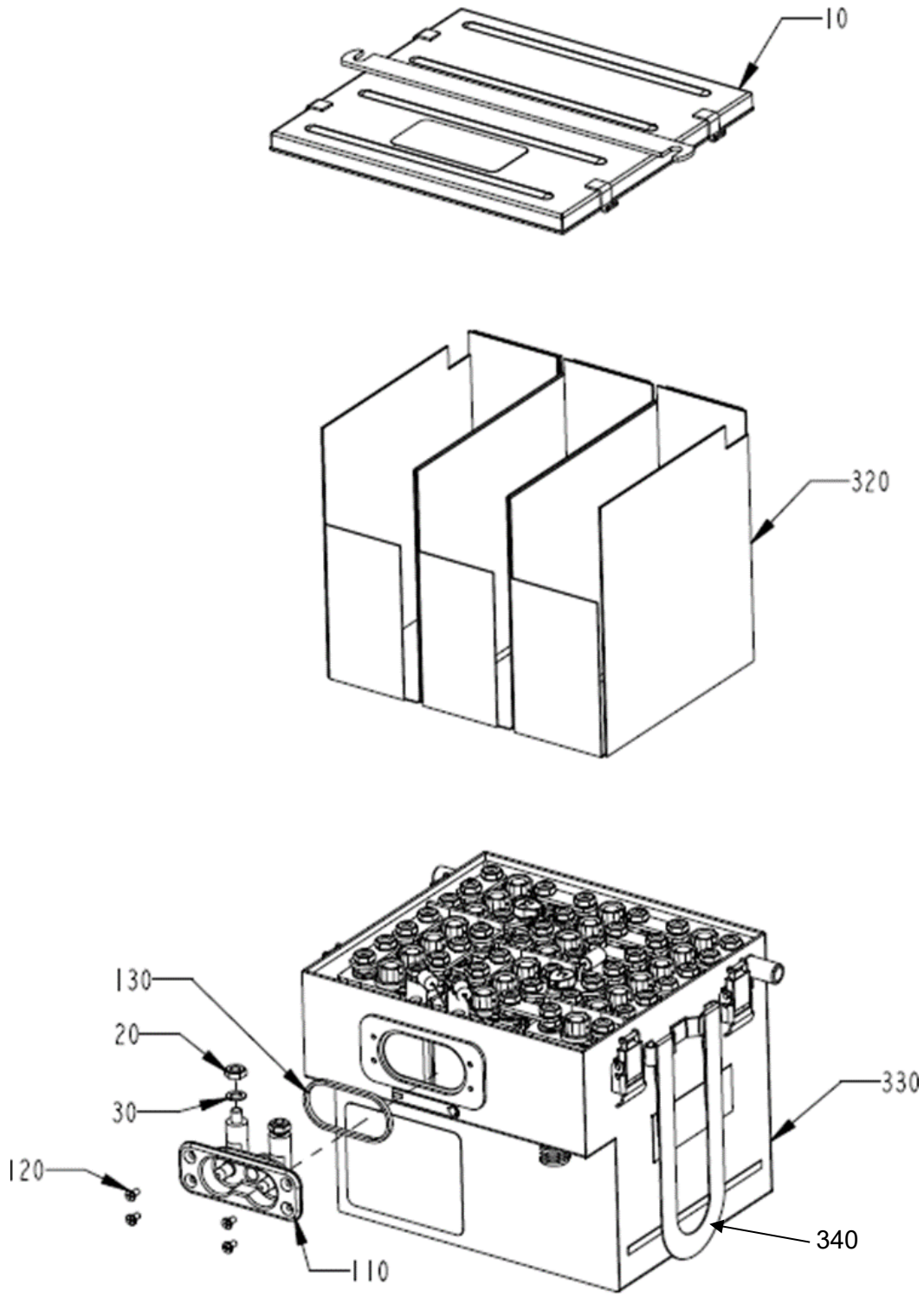
(8) Vendors

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

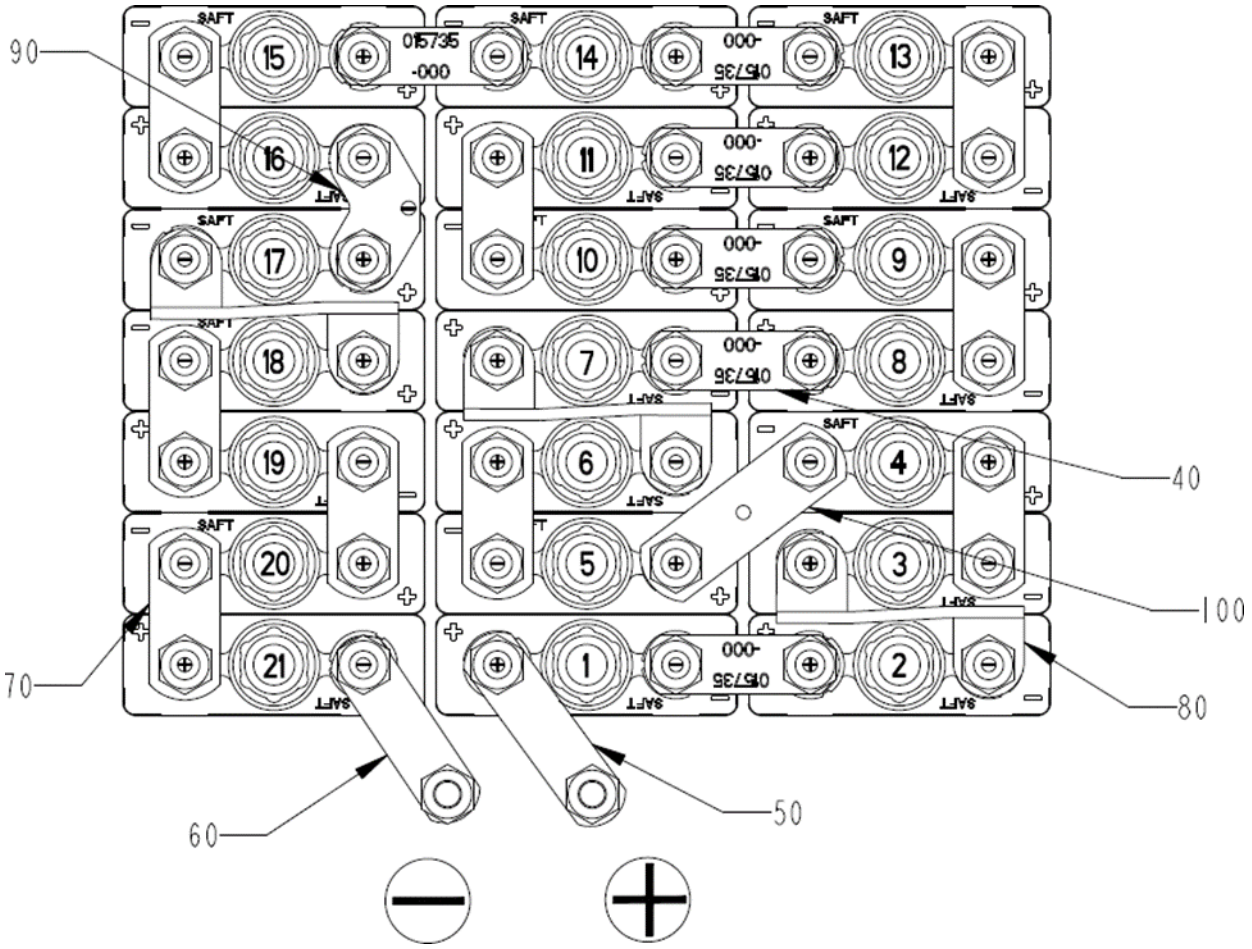
CAGE Code	NAME / ADDRESS	CAGE Code	NAME / ADDRESS
09052	Saft America Inc. 711 Gil Harbin Industrial Boulevard Valdosta, GA 31601, USA Phone: (229) 247-2331 Fax: (229) 247-8486	**F6177**	Saft 126 quai Charles Pasqua 92300 Levallois-Perret, France Phone: +33 1 58 63 16 00 Fax: +33 1 58 63 16 18

2. Numeric Index

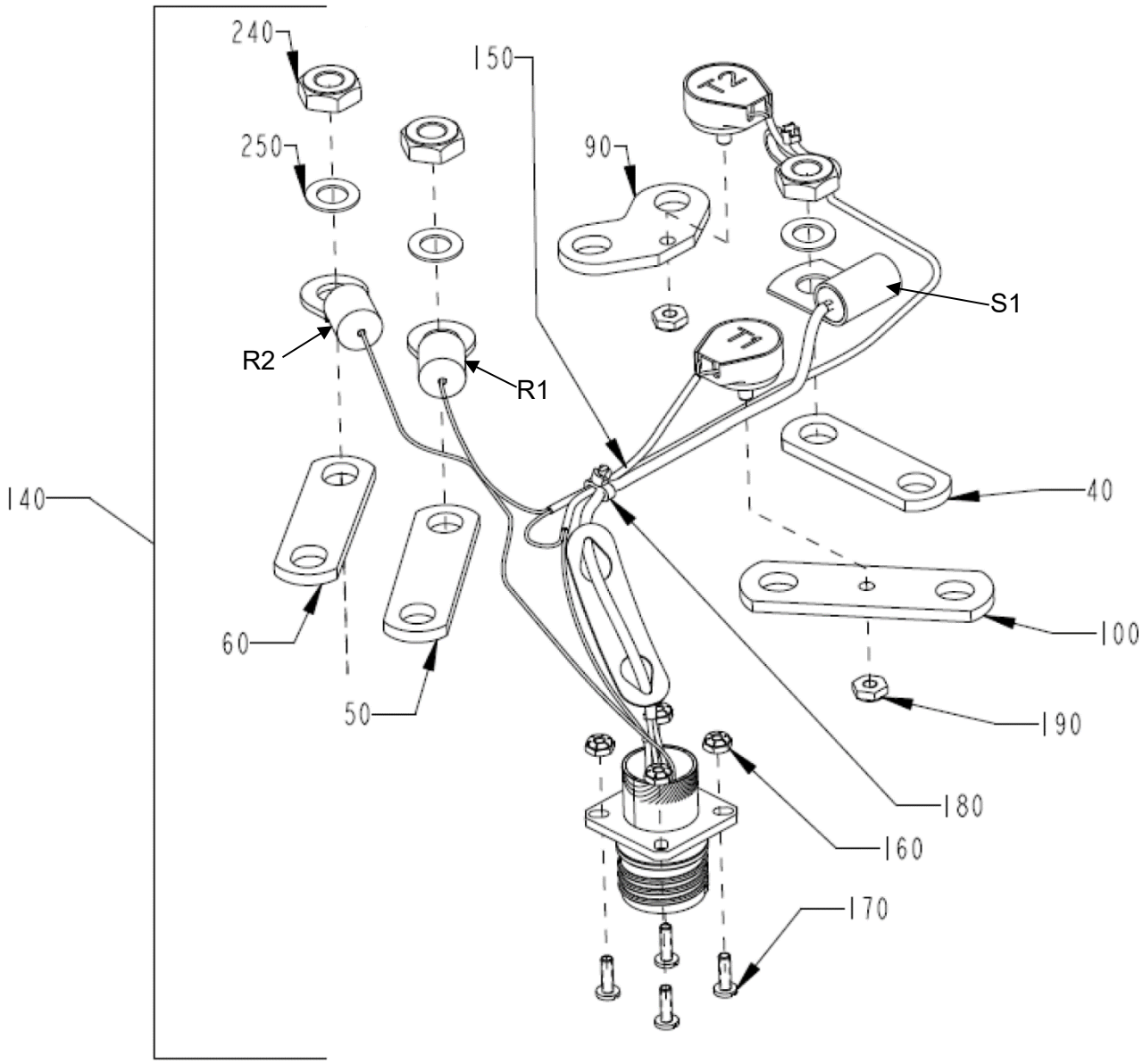
PART NUMBER	AIRLINE STOCK NUMBER	FIGURE NUMBER	ITEM NUMBER	UNIT	UNITS PER BATTERY
MS18034-4			180		2
009384-000			130		1
012536-002			230		1
015735-000			40		6
015995-000			20, 240, 260		86
015999-000			290		42
017303-000			50		1
018124-000			30, 250, 300		86
019707-000			60		1
021741-000			110		1
023412-000			200		21
023619-000			210		21
023707-000			340		2
023928-000			70		9
023935-002			280		21
023935-001			270		21
024210-000			80		3
025433-000			90		1
025434-000			100		1
026551-000			330		1
026554-000			10		1
026556-000			150		1
026702-000			320		1
090064-000			160		4
091180-008			310		42
092178-008			170		4
093169-000			190		2
093616-000			120		4
416497		1	-1		RF



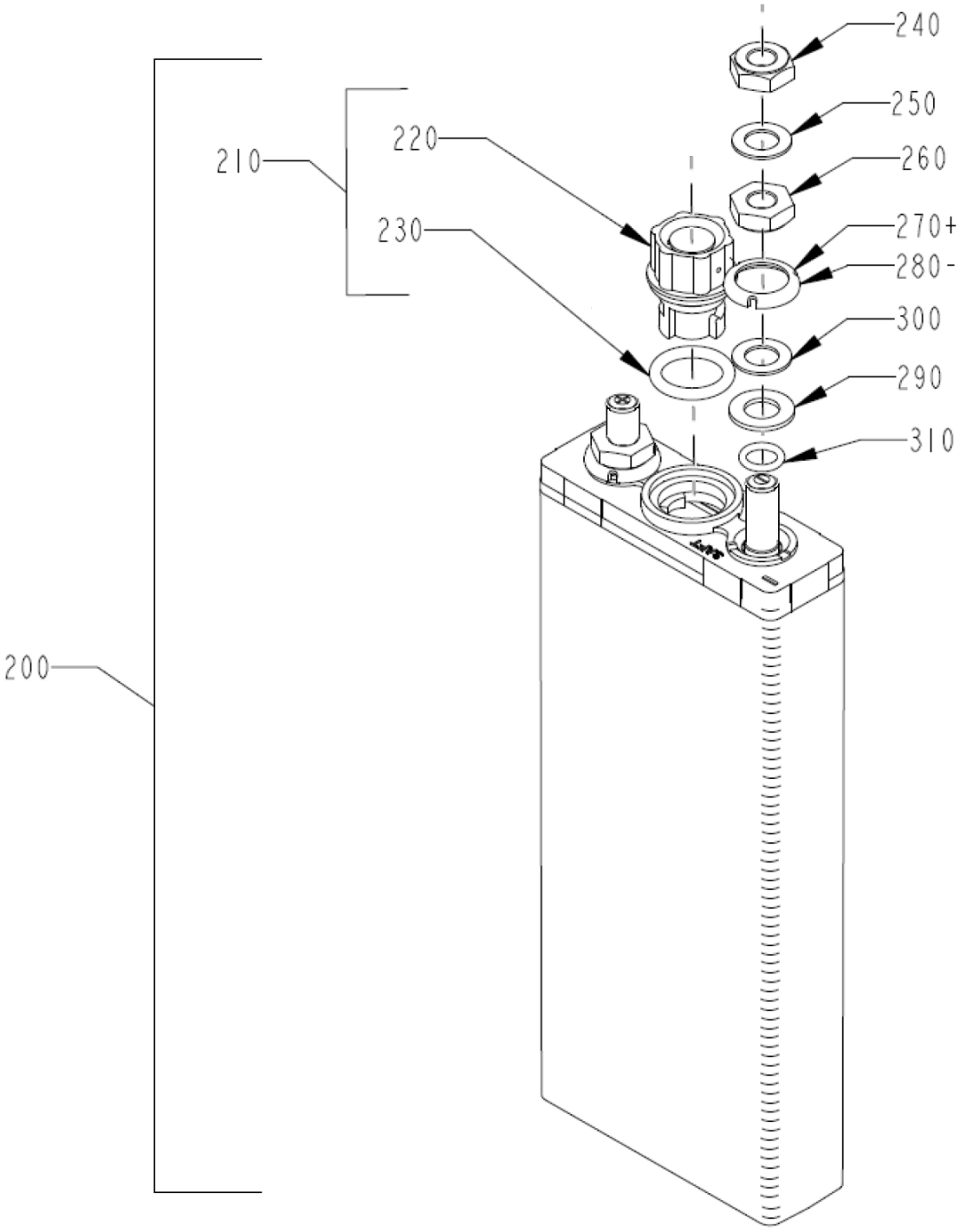
Battery, Exploded View
IPL Figure 1 (Sheet 1 of 4)



Battery, Exploded View
IPL Figure 1 (Sheet 2 of 4)



Battery, Exploded View
IPL Figure 1 (Sheet 3 of 4)



Battery, Exploded View
IPL Figure 1 (Sheet 4 of 4)

3. Details Parts List

FIG	ITEM	PART NUMBER	AIRLINE STOCK NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	QTY
1	-1	416497		BATTERY, 257CH3		RF
	10	026554-000		. Cover, Marked		1
	20	015995-000		. Nut, Upper Hex, M8 X 1.25		2
	30	018124-000		. Washer, Spring		2
	40	015735-000		. Link		6
	50	017303-000		. Link		1
	60	019707-000		. Link		1
	70	023928-000		. Link		9
	80	024210-000		. Link		3
	90	025433-000		. Link, Thermostat		1
	100	025434-000		. Link		1
	110	021741-000		. Connector, Power		1
				Attaching Parts		
	120	093616-000		. Screw, #8-32		4
				* * *		
	130	009384-000		. Gasket		1
	140	NONPROC1		. Sensor Assembly		1
	150	026556-000		. . Sensor Harness		1
				Attaching Parts		
	160	090064-000		. Nut, Lock, #4-40		4
	170	092178-008		. Screw, #4-40		4
	180	MS18034-4		. Tie, Cable 09052 P/N 092815-000		2
	190	093169-000		. Nut, Lock #6-32		2
				* * *		
	200	023412-000		. Cell, CVH250KA w/hardware		21
	210	023619-000		. . Valve, Vent		1
	220	NONPROC2		. . . Valve Body		1
	230	012536-002		. . . O-Ring		1
	240	015995-000		. . Nut, Upper Hex, M8 X 1.25		2
	250	018124-000		. . Washer, Spring		2
	260	015995-000		. . Nut, Lower Hex, M8 X 1.25		2
	270	023935-001		. . Washer, Polarity, Red		1
	280	023935-002		. . Washer, Polarity, Blue		1
	290	015999-000		. . Washer, Flat		2
	300	018124-000		. . Washer, Spring		2

DASH (-) ITEM NOT ILLUSTRATED

FIG	ITEM	PART NUMBER	AIRLINE STOCK NUMBER	NOMENCLATURE 1 2 3 4 5 6 7	USAGE CODE	QTY
	310	091180-008		. . O-ring		2
	320	026702-000		. Liner Kit		1
	330	026551-000		. Case Marked		1
	340	023707-000		. . Handle		2

DASH (-) ITEM NOT ILLUSTRATED

COMPONENT MAINTENANCE MANUAL
257CH3

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STORAGE (INCLUDING TRANSPORTATION)

1. Introduction

   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 environment conditions of the "storage".

   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, Sensor harness test, 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: If climatic conditions are met and the packaging protects the battery from mechanical damages, environmental contaminants (i.e.: dirt, dust, vibrations, or corrosive atmosphere), and is airtight, then a 10-year storage period is allowed (if not airtight, a 2 year storage period is allowed).

      - 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

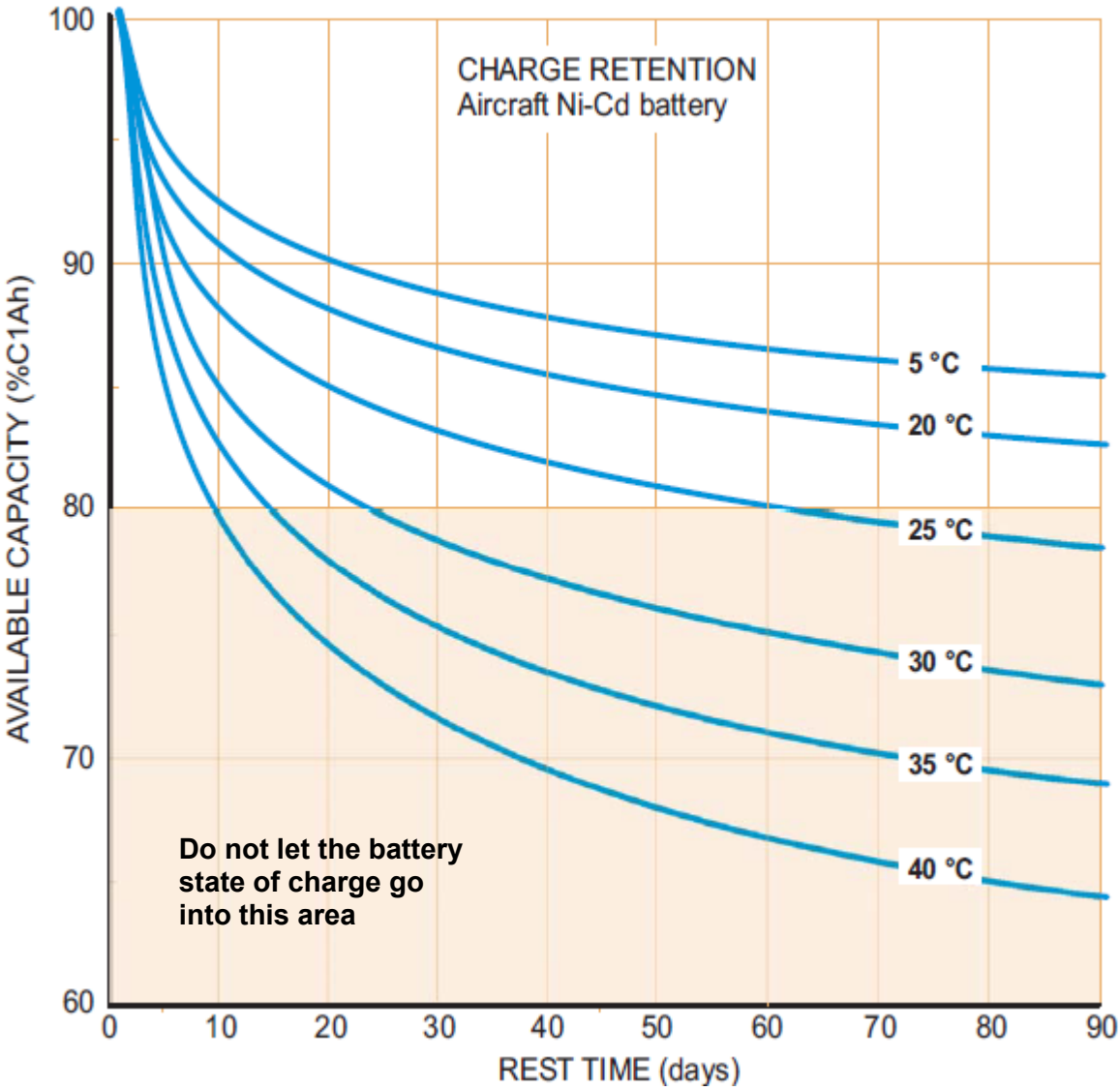
3. Inactive Stand-by Storage

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 duration that corresponds to 80% available capacity shown in Figure 15001. For example, maximum 24 days at +30°C (+86°F) or maximum of 90 days for temperatures ≤ +23°C (+73°F).



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 given 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	31.5V for 21 Cells
0.5C_1A	32.6V for 21 Cells
1.0C_1A	33.0V for 21 Cells

Refresh Charge
Table 15002

C. Standby duration consists of a maximum of 3 standby periods with 2 refresh charges. 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 into long-term storage, do the one of the following:

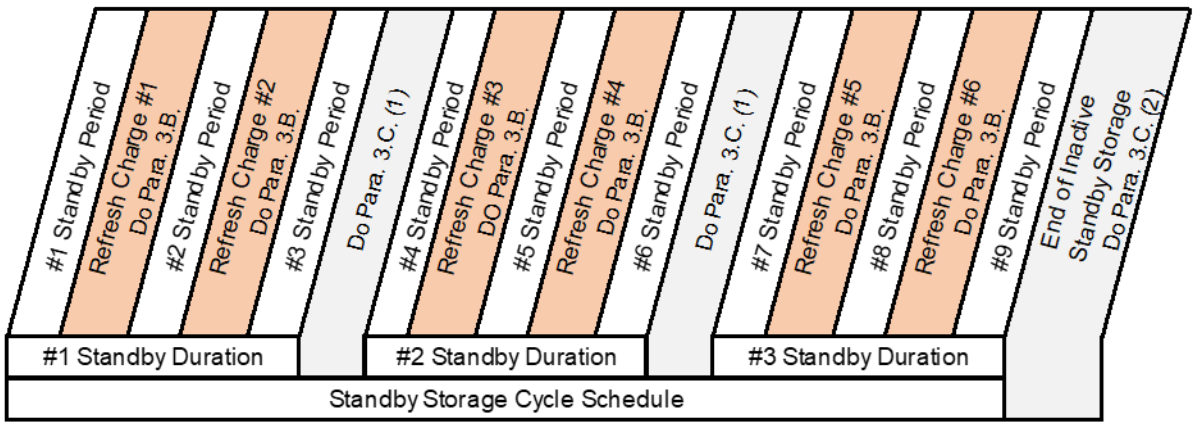
(a) For environments ≤ +30°C (+86°F) do Battery insulation, Initial discharge, Charge, Electrolyte level, and Battery insulation.

(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 durations, the battery can go into 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 inactive standby storage schedule shown in Figure 15002, 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 150 mA for one month may consume over 35 cm^3/cell (2.14 in^3/cell) of water.

5. Storage of spare parts

A. Spare Cells

Spare cells must be stored in a vertical upright position, filled, and discharged condition (electrolyte levels are not visible in discharged cells). It is not necessary to short circuit the cells. The vent valves must be installed. The storage conditions are the same as those given in paragraph 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 repaired as necessary in accordance with this CMM.

B. Spare O-rings, gaskets, and vent valves

(1) O-rings and gaskets

Six (6) years of storage period starts from the date of manufacture unless otherwise specified on the packaging. The O-rings and gaskets should be protected from exposure to the air, light, and high humidity < 85%. Storage life depends on temperature. It is recommended to store the parts in a cool area < +25°C (+77°F). Above +35°C (+95°F), storage life is reduced to 5 years. Before use the O-rings or gaskets it must be inspected. In case of visible signs of damage, distortion, or deterioration, the part must be discarded.

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 period starts from the date of manufacture unless otherwise specified on the packaging. The vent valves and O-rings should be protected from exposure of air, light and high humidity (< 85%). Storage life depends on temperature. It is recommended to store the parts in a sealed container (non-PVC) in a cool area < +25°C (+77°F). Above +35°C (+95°F), storage life is reduced to 5 years. Before use the vent valves and O-rings it must be inspected. In case of visible signs of damage, deformation, or deterioration, the vent valve and O-ring must be discarded.

C. Other spares

Other spares, protected from external contamination (i.e. dirt, dust, dampness, vibration, corrosive atmosphere) and high humidity (> 85%), may be stored for unlimited periods. Before use, they must be inspected and any showing visible signs of damage, 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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