Proprietary Notice: The Information contained in this document is proprietary and confidential to SkyTrac Systems Ltd.
**Warning**
Changes or modifications not expressly approved by SkyTrac Systems Ltd. could void the user’s authority to operate the equipment.

**Warranty Information**
SkyTrac Systems Ltd (STS) warrants this product to be free of defects in materials and workmanship, and that the product meets or exceeds approved factory acceptance test requirements. STS reserves the right to replace any warranted product at its sole discretion during the warranty period.

The STS0032 LI-ION Battery Pack is under warranty for 6 months from date of purchase. Failed units caused by defective parts, or workmanship should be returned to:

SkyTrac Systems Ltd.
#200-170 Rutland Road North
Kelowna, B.C. Canada
V1X 3B2
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1 GENERAL

1.1 Introduction
This publication provides technical information for the STS0032 LI-ION Battery Pack.

1.2 Description
The STS0032 LI-ION Battery Pack is a 2400 mAh 7.2V nominal Lithium ION battery pack consisting of 2 Panasonic CGR18650DA Li-ION cells in series and a protection circuit. A thermistor is included for monitoring battery pack temperature.

1.3 Purpose of Equipment
The STS0032 LI-ION Battery Pack is custom designed to power the DSAT-200.

1.4 System Requirements
A DSAT-200 is required to charge the STS0032 LI-ION Battery Pack

2 CERTIFICATE OF CONFORMANCE
The STS0032 LI-ION Battery Pack has been approved on a SkyTrac Systems Certificate of Conformance. This C of C certifies that the STS0032 has been inspected by SkyTrac Systems Ltd. and has passed the STS0032 Quality Procedures Manual Final Assembly Inspection Procedure to verify that the unit has been assembled in conformance with SkyTrac Systems Ltd. approved drawings and documentation.

3 SPECIFICATIONS

3.1 Operational Conditions

<table>
<thead>
<tr>
<th>Condition</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>7.2V nominal 2450 mAh</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-20 C to +60C</td>
</tr>
<tr>
<td>Battery Charging Temperature</td>
<td>0 C to +45C</td>
</tr>
</tbody>
</table>

Refer to cell datasheet in Appendix for additional information on operating conditions.

3.2 Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>Length: 5.3in / 134.6mm</td>
</tr>
<tr>
<td></td>
<td>Width: 0.89in / 23mm,</td>
</tr>
<tr>
<td></td>
<td>Depth: 0.74in/19 mm</td>
</tr>
<tr>
<td>Weight</td>
<td>0.215lb / 97.6g</td>
</tr>
</tbody>
</table>
3.3 Technical Specifications

Please refer to attached CGR18650DA Datasheet in Appendix A for individual cell specifications.

Battery Pack Protection Circuit Specifications:

- Over Discharge Protection: 2.2 volts/cell
- Over Charge Protection: 4.375 volts/cell.
- Built In thermal protection circuit disables cell

4 AIRWORTHINESS LIMITATIONS

4.1 Installation Limitations

The STS0032 LI-ION Battery Pack shall only be installed in the DSAT-200 as per the DSAT-200 SOI (DOC0268). Use for any other purpose may result in damage or failure of the battery.

4.2 Operation Limitations

- Operation: -20°C to +60°C (-4°F to +131°F) ¹
- Charging: 0°C to +45°C (32°F to 113°F) ²
- Storage: Store batteries at room temperature at 30-50% of capacity

Refer to the battery datasheet in Appendix 1 for more information including important safety information.

**NOTE 1** – Operating the battery pack below -20 C results in reduced performance. Operating the battery pack above +60°C may cause the battery to leak or rupture.

**NOTE 2** - The DSAT-200 has a built in protection circuit to prevent charging outside of the battery charge operational range.

5 INSTALLATION INSTRUCTIONS

5.1 Installation Requirements

When installing the STS0032 LI-ION Battery Pack, the installer must have a working knowledge of aircraft electronics installation, and be a holder of either an FAA Repairman’s Certificate or a Transport Canada equivalent. All installations should meet the requirements of FAA advisory circular AC43.13-1B.
5.2 Unpacking and Inspecting

5.2.1 Equipment Packing Log
Save the original shipping container in case of need for return due to damage or warranty claims. Check that each item listed on the packing slip has been shipped in the container.

5.2.2 Installation Tasks
The main tasks for this installation are listed below:
1. Inspect the battery pack for shipping damage, if damaged contact SkyTrac Systems and do not use the battery.
2. The battery expands and contracts based on charge level and temperature. The flame retardant foam allows for this expansion. Place the battery in the battery enclosure as shown. Coil or fold excess wire in the space provided. Slide the lid in from the side to cushion the battery on both sides with foam.

3. The batteries arrive from the factory only partially charged (this increases the storage life of battery). The battery pack must be charged before use.
4. Apply mains power to the DSAT-200. The battery will charge automatically if the battery pack is between 0 and 45 degrees Celsius. It will take up to 6 hours to charge completely depending on the current level of the battery.
6 POST INSTALLATION TESTS

6.1 Function Test

The avionics installer must perform this test immediately after installation.

   a) Apply mains power and ensure that the battery charges by checking the DSAT-200 menu as per the DSAT-200 Users Guide (DOC0305)

   b) Once unit is charged, turn on the DSAT-200 and check the battery status as per the DSAT-200 Users Guide (DOC0305)

7 CONNECTORS AND PIN DESCRIPTIONS

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Battery Positive Terminal</td>
</tr>
<tr>
<td>2</td>
<td>Battery Negative Terminal</td>
</tr>
<tr>
<td>3</td>
<td>Do not Connect</td>
</tr>
<tr>
<td>4</td>
<td>Battery Charge Voltage Select (connected to pin 6 for 8.4V Charge voltage)</td>
</tr>
<tr>
<td>5</td>
<td>Thermistor Temperature Sensor</td>
</tr>
<tr>
<td>6</td>
<td>Ground</td>
</tr>
</tbody>
</table>

8 OPERATING INSTRUCTIONS

8.1 Operating Instructions

8.1.1 Charging the Battery

The battery pack must be charged with the DSAT-200 or an STS approved charger or damage to the battery pack and/or fire may result.

The DSAT-200P Mod None is an approved charger for the STS0032 LI-ION Battery Pack. The DSAT-200 will automatically charge the battery when main power is connected and the battery pack is between 0 and 45 degrees Celsius.

9 MAINTENANCE AND CONTINUED AIRWORTHINESS
9.1 Continued Airworthiness

The STS0032 LI-ION Battery Pack does not require any maintenance if installed in an actively flying aircraft, other than the battery replacement instructions below:

**NOTE:** All batteries are subject to service life restrictions.

Once every six months Operator is to charge the battery fully and use the DSATs menu system to check battery health and inspect the battery.

The STS0032 LI-ION Battery Pack must be replaced under the following conditions:

- The battery no longer maintains a satisfactory charge.
- The battery will not charge.

**CAUTION:** If the battery has leaked electrolyte, gets hot during charging, or emits odours, do not use the cell and contact SkyTrac Systems Ltd.

Do not operate or store the battery pack above 60 degrees Celsius. If battery is exposed to operating temperatures greater than 60 degrees Celsius, the battery must be inspected for electrolyte leakage. If the battery is leaking, safely discard the battery as per the battery cell manufacturer’s recommendations.

9.2 Maintenance Instructions

The lithium ion battery pack must not be discharged below 6 VDC to avoid damage to the battery. The DSAT will automatically shut down the system should the battery near the 6V cut-off; however the battery will continue to slowly self discharge. Do not leave the battery discharged for more than 3 days without recharging or the life and capacity of the battery may be reduced, or the battery may be permanently damaged.

If the DSAT-200 is not installed in an actively flying aircraft for a period of time that is greater than 1 week, the battery must be disconnected from unit and stored following battery cell manufacturers recommendations.
10 APPENDIX A: CGR18650DA DATASHEET

LITHIUM ION BATTERIES: INDIVIDUAL DATA SHEET

CGR18650DA: Cylindrical Model

To ensure safety, the referenced Li-ion cell is not sold as a bare cell. Li-ion cells must be integrated with the appropriate safety circuitry via an authorized Panasonic Li-ion pack assembler.

Specifications

<table>
<thead>
<tr>
<th>Nominal Voltage</th>
<th>3.6 V</th>
</tr>
</thead>
</table>
| Standard Capacity
| 2450mAh |

<table>
<thead>
<tr>
<th>Dimensions²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter</td>
</tr>
<tr>
<td>Height</td>
</tr>
<tr>
<td>Weight</td>
</tr>
</tbody>
</table>

*1 After a fresh battery has been charged at constant voltage/constant current (4.2 V, 1630mA (max), 50mA cut-off, 25°C), the average of the capacity (ending voltage of 3 V at 25°C) that is discharged at a standard current (466mA).

*2 Dimensions of a fresh battery
11 APPENDIX B: PANASONIC LI-ION PRECAUTIONS

NOTES AND PRECAUTIONS

- Safety Precautions for the Lithium Ion Battery Pack
  Use of Lithium Ion Batteries and the Design of Equipment That Uses These Batteries

In general, lithium ion batteries are used in battery packs that contain both lithium ion batteries and battery protection circuits. Both items are sealed in a container made of a material such as resin so that the battery pack cannot be easily disassembled.

1. Charging the Batteries
   The “constant voltage/constant current” method is used to charge lithium ion batteries. (See Figure below.)

   ![Schematic diagram of the charging process (assuming a single cell)]

   - Constant voltage/constant current
   - Voltage: MAX 3.6V
   - Current: 0.7CmA
   - Duration

(1) Charge Voltage
   The maximum voltage is 4.2 V x the number of cells connected in series.

(2) Charge Current
   We recommend 0.7 CmA.
   When the voltage per cell is 2.9V or less, charge using a charge current of 0.1CmA or less.
   (Contact Panasonic for information regarding pulse charging.)

(3) Charge Temperature
   The batteries should be charged at temperatures between 0°C and 45°C.

(4) Reverse-polarity Charging
   Verify the polarity of the batteries before charging to insure that they are never charged with the polarity reversed.

2. Discharging the Batteries

(1) Discharge Current
   The current should be maintained at 1.0 CmA or less. (Consult Panasonic if you plan to discharge the batteries with a current in excess of 1.0 CmA.)

(2) Discharge Temperature
   The batteries should be discharged at a temperature between -20°C and +60°C.
   (Consult Panasonic if you plan to discharge the batteries at temperatures less than -10°C.)

(3) Discharge Termination Voltage
   Avoid discharging at voltages less than 3.0 V per cell. Overdischarge can damage the performance of the battery. Equip the unit with a mechanism to prevent overdischarge, especially in situations where the user may forget to turn the equipment off.
NOTES AND PRECAUTIONS - CONTINUED

3. Equipment Design
(1) Installing Battery Packs in the Equipment
   To avoid damage to the battery pack, make sure that the battery pack is positioned away from heat sources
   in the equipment or in the battery charger.

(2) Mechanisms to Prevent Dropping
   Be sure to use a battery pack lock mechanism to prevent the battery pack from being ejected when the
   equipment is dropped or receives a sudden impact.

(3) Preventing Short Circuits and Reversed Connections
   Use a terminal structure that makes it unlikely that the terminals will be shorted by metallic necklaces, clips,
   hairpins, etc. Structure the battery and the terminals to the battery in such a way that the battery pack
   cannot be put in backwards when installed in the charger or the equipment.

(4) Inclusion in Other Equipment
   If the battery is built into other equipment, use caution to strictly avoid designing airtight battery compart-
   ments.

(5) Terminal Materials in the External Equipment
   Use materials that are highly resistant to corrosion (such as nickel or nickel-coated copper). If contact
   resistance is an issue, we recommend that you use contact plating (such as gold plating) on the terminals.

4. Storing the Batteries
   The batteries should be stored at room temperature, charged to about 30 to 50% of capacity.
   We recommend that batteries be charged about once per year to prevent overdischarge.

5. Use of the Batteries
   See the section on "Safety Precautions for the Lithium Ion Battery Pack."

6. Other
   The Chemical Reaction
   Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored
   for a long period of time without being used. In addition, if the various usage conditions such as charge,
   discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of
   the battery may be shortened or the device in which the battery is used may be damaged by electrolyte
   leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged
   correctly, this may indicate it is time to change the battery.

7. Please Note
   The performance and life expectancy of batteries depends heavily on how the batteries are used. In order
   to insure safety, be sure to consult with Panasonic in advance regarding battery charging and discharging
   specifications and equipment structures when designing equipment that includes these batteries.

   Please Note:
   Panasonic assumes no liability for problems that occur when the Notes and Precautions for use listed above
   are not followed.
SAFETY PRECAUTIONS FOR LITHIUM ION BATTERY PACKS

• Safety Warnings
  1. When Using the Battery

⚠️ WARNING

(1) Misusing the battery may cause the battery to get hot, rupture, or ignite and cause serious injury. Be sure to follow the safety rules listed below:
  - Do not place the battery in fire or heat the battery.
  - Do not install the battery backwards so that the polarity is reversed.
  - Do not connect the positive terminal and the negative terminal of the battery to each other with any metal object (such as wire).
  - Do not carry or store the batteries together with necklaces, hairpins, or other metal objects.
  - Do not pierce the battery with nails, strike the battery with a hammer, step on the battery, or otherwise subject it to strong impacts or shocks.
  - Do not solder directly onto the battery.
  - Do not expose the battery to water or salt water, or allow the battery to get wet.
(2) Do not disassemble or modify the battery. The battery contains safety and protection devices which, if damaged, may cause the battery to generate heat, rupture, or ignite.
(3) Do not place the battery on or near fires, stoves, or other high-temperature locations. Do not place the battery in direct sunshine, or use or store the battery inside cars in hot weather. Doing so may cause the battery to generate heat, rupture, or ignite. Using the battery in this manner may also result in a loss of performance and a shortened life expectancy.

⚠️ CAUTION

(1) If the device is to be used by small children, the caregiver should explain the contents of the user’s manual to the children. The caregiver should provide adequate supervision to ensure that the device is being used as explained in the user’s manual.
(2) When the battery is worn out, insulate the terminals with adhesive tape or similar materials before disposal.
(3) Immediately discontinue use of the battery if, while using, charging, or storing the battery, the battery emits an unusual smell, feels hot, changes color, changes shape, or appears abnormal in any other way. Contact your sales location or Panasonic if any of these problems are observed.
(4) Do not place the batteries in microwave ovens, high-pressure containers, or on induction cookware.
(5) In the event that the battery leaks and the fluid gets into one’s eye, do not rub the eye. Rinse well with water and immediately seek medical care. If left untreated the battery fluid could cause damage to the eye.

2. While Charging

⚠️ WARNING

(1) Be sure to follow the rules listed below while charging the battery. Failure to do so may cause the battery to become hot, rupture, or ignite and cause serious injury.
  - When charging the battery, either use a specified battery charger or otherwise ensure that the battery charging conditions specified by Panasonic are met.
  - Do not attach the batteries to a power supply plug or directly to a car’s cigarette lighter.
  - Do not place the batteries in or near fire, or into direct sunlight. When the battery becomes hot, the built-in safety equipment is activated, preventing the battery from charging further, and heating the battery can destroy the safety equipment and can cause additional heating, breaking, or ignition of the battery.
(2) Do not continue charging the battery if it does not recharge within the specified charging time. Doing so may cause the battery to become hot, rupture, or ignite.
SAFETY PRECAUTIONS FOR LITHIUM ION BATTERY PACKS - CONTINUED

⚠️ CAUTION

The temperature range over which the battery can be charged is 0°C to 45°C. Charging the battery at temperatures outside of this range may cause the battery to become hot or to break. Charging the battery outside of this temperature range may also harm the performance of the battery or reduce the battery’s life expectancy.

3. When Discharging the Battery

⚠️ WARNING

Do not discharge the battery using any device except for the specified device. When the battery is used in devices aside from the specified device it may damage the performance of the battery or reduce its life expectancy, and if the device causes an abnormal current to flow, it may cause the battery to become hot, rupture, or ignite and cause serious injury.

⚠️ CAUTION

The temperature range over which the battery can be discharged is -20°C to 60°C. Use of the battery outside of this temperature range may damage the performance of the battery or may reduce its life expectancy.

To insure the safe use of this battery, contact Panasonic when designing a device that uses this battery.