Transportation of Lithium Batteries - 2018 Training Presentation

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Technical Services, Global Service Logistics and Operations (GSLO) – Global Service Delivery Excellence (GSDE)
Transportation of Lithium Batteries - 2018

Agenda:
• Regulatory Overview
• Training requirements
• Dangerous Goods Classification and Labeling
• Lithium Battery Safety Issues and Packaging
• Cisco Products that use Lithium Batteries
• Classification and Identification
• Mode Specific Limitations, Marking, Labeling and Documentation for Packing Instructions 965, 966, 967, 968, 969 and 970
• Example of Shipping Document
• Ground Transportation
• Example of Material Safety Data Sheet (MSDS)
Dangerous Goods Regulations

★ United Nations Standards are the basis for Dangerous Goods Classification by all modes of transportation
- The UN International Civil Aviation Organization, Technical Instructions (TI’s) cover air transport
★ The International Air Transport Association (IATA), Dangerous Goods Regulations, 59th Edition–2018 – Developed by carriers as a more user friendly version of the TI”s, and are used as the day to day working document by shippers, forwarders and carriers
- The International Maritime Dangerous Goods (IMDG) Code covers transport by ocean freight
- The UN Standards are adopted as law and enforced by each country
  - In the US, the Department of Transportation regulates Dangerous Goods (Hazardous Materials) for all modes of transportation
Dangerous Goods Training

Training is not optional – It is required for each individual with responsibility for the preparation and shipment of Lithium Batteries (Dangerous Goods)

- Training must cover each of the duties for which the individual is responsible
- Training must remain current based on changes in the requirements
- At a minimum, training must be repeated every 24 months
Dangerous Goods Labels – Air Transport

- Lithium (Li) and Lithium Batteries are regulated as Dangerous Goods
  - Lithium – Class 4, Flammable Solid, Dangerous When Wet
  - Lithium Batteries – Class 9, Miscellaneous Dangerous Goods
Lithium Battery Labeling

- Lithium Batteries contain small quantities of lithium and are “excepted” from certain requirements
  - Lithium Metal (button cell) Batteries are also referred to as primary (non-rechargeable) batteries
  - Lithium Ion Batteries are rechargeable batteries

★ For Services, the number of Lithium Batteries per package and the number of packages per consignment are strictly controlled
New Lithium Battery Labels – Cisco Part Numbers

UN 3480  
47-104036-01

UN3090  
47-104038-01

UN3481  
47-104037-01

UN3091  
47-104037-01

CARGO AIRCRAFT ONLY
FORBIDDEN IN PASSENGER AIRCRAFT

47-101436-02
Lithium Battery Safety Concerns

• Recent air transport incidents have heightened safety concerns over defective and improperly packaged Lithium Batteries shipped as cargo

• The Lithium Ion and Lithium Metal batteries used by Cisco are safe in normal use and may be transported safely when properly packaged

★ All batteries shipped by Cisco are installed in equipment or are individually packaged to prevent short circuit
Lithium Batteries and Battery Packs

• Lithium Ion Batteries are found in:
  – Wireless Handsets for IP Phones
  – RAID Controllers (battery back-up)
  – Cisco Wireless Access Point products (LAN/WAN)

• Lithium Metal (button cell) Batteries are found in:
  – PC boards
Lithium Battery Classification

• Lithium Ion Batteries
  • UN 3480, ICAO/IATA Packing Instruction 965, Section II
    – > 30% State of Charge, Forbidden on all Aircraft – Surface Transport Only
    – 2 batteries per box, and for surface transport, no limit on packages per consignment
    – ≤ 30% State of Charge. Forbidden on Passenger Aircraft
    – 2 batteries per box, one package per consignment, must be offered separately from other cargo

• Lithium Ion Batteries packed with equipment
  • UN 3481, ICAO/IATA Packing Instruction 966, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment

• Lithium Ion Batteries contained in equipment
  • UN 3481, ICAO/IATA Packing Instruction 967, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment

• Lithium Metal Batteries
  • UN 3090, ICAO/IATA Packing Instruction 968, Section II
    – Forbidden on Passenger Aircraft
    – 2 batteries per box, one package per consignment, must be offered separately from other cargo

• Lithium Metal Batteries packed with equipment
  • UN 3091, ICAO/IATA Packing Instruction 969, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment

• Lithium Metal Batteries contained in equipment
  • UN 3091, ICAO/IATA Packing Instruction 970, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment
## Services Battery Master List

<table>
<thead>
<tr>
<th>Battery Shipping PID</th>
<th>Product Description</th>
<th>For shipment by air</th>
<th>UN Code</th>
<th>Packing Instruction (see below)</th>
<th>Battery Configuration</th>
<th>Battery Chemistry</th>
<th>Battery Energy Density WH</th>
<th>Battery Recharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIR-1520-BATT-6AH=</td>
<td>1520 Series Battery Backup - NOT SUPPORTED</td>
<td>Forbidden State of Change &gt; 30%</td>
<td>UN 3480</td>
<td>PI 965 Section II State of Change &gt; 30%</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>86.58</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>B440-BASE-M2</td>
<td>UCS B440 M2 Blade Server w/o CPU; memory; HDD; mezzanine</td>
<td>Yes</td>
<td>UN 3481</td>
<td>PI 967 Section II</td>
<td>Contained in equipment</td>
<td>Lithium-ion (Li-ion)</td>
<td>4.995</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>B440-BASE-M2D</td>
<td>UCS B440 M2 Blade Server w/o CPU; memory; HDD; mezzanine</td>
<td>Yes</td>
<td>UN 3481</td>
<td>PI 967 Section II</td>
<td>Contained in equipment</td>
<td>Lithium-ion (Li-ion)</td>
<td>4.995</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CCS-BAT-RAID-710=</td>
<td>Content Security Raid Battery for x70 Model</td>
<td>Forbidden State of Change &gt; 30%</td>
<td>UN 3480</td>
<td>PI 965 Section II State of Change &gt; 30%</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>8.88</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CDE3-HBA-G2MR-BBU=</td>
<td>BTR-0023L-LSI000264; LSI 9261 Gen2/2108 M-RAID BBU ONLY</td>
<td>Yes</td>
<td>UN 3481</td>
<td>PI 967 Section II</td>
<td>Contained in equipment</td>
<td>Lithium-ion (Li-ion)</td>
<td>5.55</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CGR-BATT-4AH=</td>
<td>4 AH Battery Backup for CGR1200</td>
<td>Yes</td>
<td>UN 3481</td>
<td>PI 967 Section II</td>
<td>Contained in equipment</td>
<td>Lithium-ion (Li-ion)</td>
<td>9.80025</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CPAR-RAID-9266</td>
<td>MegaRAID 9266-8i + battery backup for C240 and C220</td>
<td>Yes</td>
<td>UN 3481</td>
<td>PI 967 Section II</td>
<td>Contained in equipment</td>
<td>Lithium-ion (Li-ion)</td>
<td>4.995</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CP-BATT-79216-EXT=</td>
<td>Cisco 79216 Battery; Extended - NOT SUPPORTED</td>
<td>Forbidden</td>
<td>UN 3480</td>
<td>PI 965 Section II</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>3.441</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CP-BATT-79216-STD=</td>
<td>Cisco 79216 Battery; Standard - NOT SUPPORTED</td>
<td>Forbidden</td>
<td>UN 3480</td>
<td>PI 965 Section II</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>5.88</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CP-BATT-79256-EXT=</td>
<td>Cisco 79256 Battery; Extended - NOT SUPPORTED</td>
<td>Forbidden</td>
<td>UN 3480</td>
<td>PI 965 Section II</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>2.6825</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CP-BATT-79256-STD=</td>
<td>Cisco 79256 Battery; Standard - NOT SUPPORTED</td>
<td>Forbidden</td>
<td>UN 3480</td>
<td>PI 965 Section II</td>
<td>Standalone/loose</td>
<td>Lithium-ion (Li-ion)</td>
<td>4.62</td>
<td>Rechargeable</td>
</tr>
<tr>
<td>CB880-BAT-25023=</td>
<td>Cisco C880 M4 Battery CR2032 Spare - NOT SUPPORTED</td>
<td>Yes</td>
<td>UN 3090</td>
<td>PI 968 Section II</td>
<td>Standalone/loose</td>
<td>Lithium Metal</td>
<td>N/A</td>
<td>Non-Rechargeable</td>
</tr>
<tr>
<td>CB880-BAT-2450=</td>
<td>Cisco C880 M4 Battery CR2450 Spare - NOT SUPPORTED</td>
<td>Yes</td>
<td>UN 3090</td>
<td>PI 968 Section II</td>
<td>Standalone/loose</td>
<td>Lithium Metal</td>
<td>N/A</td>
<td>Non-Rechargeable</td>
</tr>
<tr>
<td>CP-8821-K9=</td>
<td>Cisco Wireless IP Phone 8821 World mode Device ONLY - NO BATTERY</td>
<td>NOT RESTRICTED</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Non-Rechargeable</td>
</tr>
</tbody>
</table>

The Services Battery Master List should be used as the primary reference to determine the shipping requirements for each PID.
Battery documentation is now available to be printed from CICE
- The document is generated by the system based on PID
Lithium Ion Batteries – Uninstalled, spares

- Lithium Ion Batteries
- UN 3480, ICAO/IATA Packing Instruction 965, Section II
  - > 30% State of Charge, Forbidden on all Aircraft – Surface Transport Only
  - 2 batteries per box, and for surface transport, no limit on packages per consignment
  - ≤ 30% State of Charge. Forbidden on Passenger Aircraft
  - 2 batteries per box, one package per consignment, must be offered separately from other cargo

FedEx Section II – Not accepted per IATA operator variation FX-05A; must be offered as Section IA or IB.
Lithium Ion Batteries – Packing Instruction 965
(PID’s for batteries with less than or equal to 30% State of Charge, shipping uninstalled – apart from the product they power)

### Dangerous Goods Classification

<table>
<thead>
<tr>
<th>UN ID Number</th>
<th>Proper Shipping Name</th>
<th>Hazard Class</th>
<th>Packing Group</th>
<th>Packing Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN3480</td>
<td>Lithium Ion Batteries</td>
<td>9</td>
<td>II</td>
<td>PI965, Section II</td>
</tr>
</tbody>
</table>

Batteries less than or equal to 30% State of Charge (SoC)

### Quantity Limitation

<table>
<thead>
<tr>
<th>Transport Method</th>
<th>Quantity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Package</td>
</tr>
<tr>
<td>Truck</td>
<td>2</td>
</tr>
<tr>
<td>Air - Cargo Aircraft Only</td>
<td>2</td>
</tr>
<tr>
<td>Ocean - Special Provision 188</td>
<td>2</td>
</tr>
</tbody>
</table>

### Shipment Lead-Times

<table>
<thead>
<tr>
<th>Transport Method</th>
<th>Days</th>
<th>Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck</td>
<td>5-7</td>
<td>-</td>
</tr>
<tr>
<td>Air - Cargo Aircraft Only</td>
<td>2-4</td>
<td>-</td>
</tr>
<tr>
<td>Ocean</td>
<td>-</td>
<td>5-8 (may be longer)</td>
</tr>
</tbody>
</table>
Packing Instruction 965 – Marking, Labeling and Documentation

**Marking**

Lithium Ion Batteries, UN3480
- Forbidden for transport aboard Passenger Carrying Aircraft
- Special Provision 188

**Labeling**

Air Waybill: “Lithium ion batteries in compliance with Section II of PI 965, Cargo Aircraft Only”
PI 965 – Placement of Marking, Labeling and Document

- Place the appropriate battery statement in a document pouch
- Mark by hand or place the marking
- Affix the labels – DO NOT FOLD LABELS OVER EDGE
- If space is available on the box, it is preferable to place the marking, labeling, and documentation on the same surface of the package, near the address label

Address Label

Marking

Lithium Ion Batteries, UN3480
Forbidden for transport aboard Passenger Carrying Aircraft
Special Provision 188

Lithium Ion Battery & CAO Labels

Document Pouch containing the lithium battery shipping document
Lithium Ion Batteries – Installed in or shipped with product

• Lithium Ion Batteries packed with equipment
  • UN 3481, ICAO/IATA Packing Instruction 966, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment
• Lithium Ion Batteries contained in equipment
  • UN 3481, ICAO/IATA Packing Instruction 967, Section II
    – No State of Charge limitation, 2 batteries per box, no limit on packages per consignment

- Marking, labeling, documentation and air waybill notations are not required by the regulations, but may be required by State/carrier acceptance criteria
Battery PID’s listed on the Master List under UN3481

<table>
<thead>
<tr>
<th>Transport Method</th>
<th>Quantity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Package</td>
</tr>
<tr>
<td>Truck</td>
<td>2</td>
</tr>
<tr>
<td>Air</td>
<td>2</td>
</tr>
<tr>
<td>Ocean - Special Provision 188</td>
<td>2</td>
</tr>
</tbody>
</table>

Lithium Ion Batteries packed with equipment, UN3481 (PI 966, Section II)
- Special Provision 188

Lithium Ion Batteries contained in equipment, UN3481 (PI 967, Section II)
- Special Provision 188

Marking

Document/Statement

Labeling

Air Waybill: “Lithium ion batteries in compliance with Section II of PI966”

Air Waybill: “Lithium ion batteries in compliance with Section II of PI967”
Place the appropriate battery statement in a document pouch

Mark by hand or place the marking

Affix the labels – DO NOT FOLD LABELS OVER EDGE

If space in available on the box it is preferable to place the marking, labeling and documentation on the same surface of the package, near the address label
PI 966/967 – Optional Placement of Marking, Labeling and Document

- Place the appropriate battery statement in a document pouch
- Mark by hand or place the marking
- Affix the labels – DO NOT FOLD LABELS OVER EDGE
- If space in available on the box it is preferable to place the marking, labeling and documentation on the same surface of the package, near the address label
Restrictions on Lithium Metal Batteries

- Lithium Metal Batteries
  - UN 3090, ICAO/IATA Packing Instruction 968, Section II
    - Forbidden on Passenger Aircraft
    - 2 batteries per box, one package per consignment, must be offered separately from other cargo

FedEx Section II – Not accepted per IATA operator variation FX-05A; must be offered as Section IA or IB.
Packing Instruction 968 – Marking and Labeling for all modes of Transport

### Marking

<table>
<thead>
<tr>
<th>Transport Method</th>
<th>Quantity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Package</td>
<td>Boxes per Consignment</td>
</tr>
<tr>
<td>Truck</td>
<td>2</td>
</tr>
<tr>
<td>Air - Cargo</td>
<td>2</td>
</tr>
<tr>
<td>Aircraft Only</td>
<td></td>
</tr>
<tr>
<td>Ocean - Special</td>
<td>2</td>
</tr>
<tr>
<td>Provision 188</td>
<td></td>
</tr>
</tbody>
</table>

Lithium metal batteries, UN3090 (PI 968, Section II)
Forbidden for transport aboard Passenger Carrying Aircraft
Special Provision 188

### Labeling

Air Waybill: “Lithium metal batteries in compliance with Section II of PI 968, Cargo Aircraft Only”
PI 968 – Placement of Marking, Labeling and Document

- Place the appropriate battery statement in a document pouch
- Mark by hand or place the marking
- Affix the labels – DO NOT FOLD LABELS OVER EDGE
- If space in available on the box it is preferable to place the marking, labeling and documentation on the same surface of the package, near the address label
Lithium Metal Batteries – Installed in or shipped with product

- Lithium Metal Batteries packed with equipment
  - UN 3091, ICAO/IATA Packing Instruction 969, Section II
- Lithium Metal Batteries contained in equipment
  - UN 3091, ICAO/IATA Packing Instruction 970, Section II

- Marking, labeling, documentation and air waybill notations are not required by the regulations, but may be required by State/carryer acceptance criteria
Packing Instruction 969 and 970 – Marking and Labeling for all modes of Transport

### Marking

<table>
<thead>
<tr>
<th>Transport Method</th>
<th>Quantity Limitation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Package</td>
</tr>
<tr>
<td>Truck</td>
<td>2</td>
</tr>
<tr>
<td>Air</td>
<td>2</td>
</tr>
<tr>
<td>Ocean - Special Provision 188</td>
<td>2</td>
</tr>
</tbody>
</table>

**Lithium metal batteries packed with equipment, UN3091**
- Special Provision 188

**Lithium metal batteries contained in equipment, UN3091**
- Special Provision 188

### Labeling

Air Waybill: Per carrier requirements - “Lithium metal batteries in compliance with Section II of PI969 or PI970

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• Place the appropriate battery statement in a document pouch

★ Mark by hand or place the marking

★ Affix the labels – DO NOT FOLD LABELS OVER EDGE

• If space is available on the box it is preferable to place the marking, labeling and documentation on the same surface of the package, near the address label
PI969/PI970 – Optional Placement of Marking, Labeling and Document

- Place the appropriate battery statement in a document pouch
- Mark by hand or place the marking
- Affix the labels – DO NOT FOLD LABELS OVER EDGE
- If space in available on the box it is preferable to place the marking, labeling and documentation on the same surface of the package, near the address label
Shipping Document

Terminology:
- Cell – electrochemical unit, consisting of an anode and a cathode, capable of generating electrical current
- Battery – assembly of cells
- Lithium ion cells/batteries – rechargeable – includes lithium polymer cells/batteries
- Lithium metal cells/batteries – generally non-rechargeable

This package contains lithium cells or batteries in the following configuration (check applicable): 

Lithium Ion – Maximum of
- 20 Watt-hours per cell; and
- 100 Watt-hours per battery
- Less than or equal to 30% State of Charge

Lithium Metal – Maximum of
- 1 gram of lithium metal per cell; and
- 2 grams of lithium per battery

[X] Cells or batteries only (ICAO/IATA Packing Instruction 965, Section II) – Cells or batteries in a package, without electronic equipment
Package Limit:
≤2.7 Wh = 2.5 kg; or
>2.7 Wh but ≤20 Wh = 8 cells; or
>2.7 Wh but ≤100 Wh = 2 batteries

□ Cells or batteries only (ICAO/IATA Packing Instruction 968, Section II) – Cells or batteries in a package, without electronic equipment
Package Limit:
≤0.3 g = 2.5 kg; or
>0.3 g but ≤1 g = 8 cells; or
>0.3 g but ≤2 grams = 2 batteries
Highway and Ocean Transport

- **Transport by Highway or Ocean Freight** – Use the above packaging, marking, labeling and documentation instructions and prepare a waybill or ocean freight manifest, as appropriate.
A MSDS (Material Safety Data Sheet) is not required by the regulations, but may be demanded by parties who handle, inspect, transport or receive lithium battery shipments. Request copies at: batterycompliance@cisco.com
Certificate of Completion

Employee Name

has completed

Transportation of Lithium Batteries

December 15, 2017

Paul Quickert
Services Sustainability Manager
Thank you.