LTV® Transport Battery System (TBS)

Operator's Manual

CareFusion

P/N 17216-001 Rev. H

Revision History	
Revision Level	Revision Date
Rev. 01, ECO 2749	12/16/03
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Rev. E ECO 3220	10/29/04
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Rev. G ECO 3791	03/03/06
Rev. H ECO 6320	5/14/10

Contact Information

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Notice To Operators

Unsafe Operation - Operating the LTV® TBS without a complete and thorough understanding of its attributes is unsafe. It is important that this manual be read and understood in its entirety before operating the LTV® TBS.

Warnings and Cautions Section - Read the section on **Warnings** and **Cautions** carefully before operating the LTV® TBS.

Use and Maintenance - Any questions regarding installing, operating, or maintaining the LTV® TBS, should be directed to a certified CareFusion service technician or CareFusion.

Warranty

The LTV® Transport Battery System (TBS), a CareFusion product, is warranted to be free of defects in material and workmanship for a period of six months from the date of purchase.

CareFusion warrants the LTV® Lithium Ion Battery to be at least a 4 Amp-hour capacity after 6 months of one full charge/discharge cycle per day.

CareFusion will, at its option, either repair, replace, or issue credit for products that prove to be defective during the warranty period.

For warranty service or repair, the product must be returned to CareFusion or a service facility designated by CareFusion, shipping prepaid by the Buyer.

LIMITATION OF WARRANTY

Normal maintenance, as specified in the LTV® Transport Battery System Operator's Manual, is not covered under the foregoing warranty.

The foregoing warranty does not apply to defects resulting from:

1) Improper or inadequate maintenance of the unit.
2) Improper use or misuse of the unit.
3) Unauthorized modifications or repair to the unit.
4) Use of the unit with unauthorized accessories.
5) Operation of the unit outside the specified environment.

LIMITATION OF LIABILITY

CareFusion shall not be liable for loss of profits, loss of use, consequential damages, or any other claim based on breach of warranty. CareFusion's liability for damages of any kind shall be limited to the purchase price of the defective unit.

Table of Contents

Chapter 1 - INTRODUCTION

This manual describes how to set up and operate the LTV® TBS, and contains what you need to know to perform the following:

- Unpack, inspect, and set up the LTV® TBS.
- Power an LTV® Ventilator using the Lithium Ion battery.
- Recharge the Lithium Ion Battery using the Battery Charger.
- Perform simple troubleshooting on the LTV® TBS.

For service tests and major maintenance operations contact a certified CareFusion service technician or CareFusion.

Operator's Safety Information

All Operators are to read and understand the following information about **Warning**, **Caution** and **Note** statements before operating the LTV® TBS.

WARNING

"**Warning**" statements alert the reader to potentially hazardous situations, which if not avoided, could result in death or serious injury.

CAUTION

"**Caution**" statements alert the user to potentially hazardous situations, which if not avoided, could result in equipment damage.

NOTE

"**Note**" statements contain additional information to assist in the proper operation of the LTV® TBS.

Warnings

These warnings apply any time you handle or operate the Lithium Ion Battery.

WARNING

- **Read instructions -** Before operating the Lithium Ion Battery, read all instructions, warnings, cautions and notes.
- **Risk of electric shock -** To reduce the risk of electrical shock and damage to the battery charger or Lithium Ion battery, do not expose them to snow, rain, or liquid of any kind. Do not operate the Battery Charger if it has a damaged cord, or use the battery charger or Lithium Ion Battery if they have been dropped, or damaged in any way. Have any damaged cord or plug immediately replaced by a certified technician. Contact a certified CareFusion service technician or CareFusion with any questions.
- **Unauthorized repairs -** Do not disassemble the battery, battery charger or any connectors or use the LTV® Lithium Ion battery if any piece is disassembled. Do not try to repair any piece of the LTV® Lithium Ion battery yourself. If it is functioning improperly, contact a certified CareFusion service technician or CareFusion.
- **Disconnect before cleaning -** To reduce the risk of electrical shock always disconnect the battery from the ventilator or battery charger, and the battery charger from the outlet before cleaning.
- **Alternate power supply –** It is recommended that an alternative means of supplying external power to the ventilator be available at all times.
- **Charging the battery -** Never charge the LTV® Lithium Ion battery while it is being used to power an LTV® Ventilator.

Cautions

These cautions apply any time you handle or operate the Lithium Ion Battery.

CAUTION

- **Unauthorized accessories -** Do not use parts or accessories that have not been authorized for use with the Lithium Ion Battery. Using unauthorized parts or accessories may damage the LTV® Transport Battery System.
- **Positioning of equipment** - Do not position the Lithium Ion battery, battery charger or any cord in a way that it may be tripped over, stepped on, or dislodged from other equipment.
- **Connecting to the ventilator -** When connecting the ventilator to the Lithium Ion battery, use only the approved method and connectors specified in this *LTV® TBS Operator's Manual*.
- **Cleaning agents -** Do not use cleaning agents that contain phenols, ammonium chloride, chloride compounds, or more than 2% glutaraldehyde. These agents may damage plastic components.
- **Harsh abrasives -** Do not use harsh abrasives when cleaning the Lithium Ion battery, they may damage the case. Clean the battery with a damp cloth.
- **Immersion in liquids -** Do not immerse the battery, cords or battery charger in liquid sterilizing agents or liquids of any kind.
- **Safe handling of chemicals** - Check with the manufacturer of all cleaning chemicals to ensure safe handling procedures are followed.
- **Risk of overheating -** To reduce the risk of overheating the battery charger and to allow for adequate heat dissipation, do not use battery charger in an enclosed space such as in a bag or ventilator back pack. It is recommended that the sides and top of the charger not be in contact with any other objects during the charging operation. Additionally, do not stack chargers next to or on top of other chargers during the battery charging operation.

Symbols

Symbol	Compliance[1]	Title	Application
	ISO 3864 (Prev. IEC 348) Symbol No. B.3.1	Caution (refer to accompanying documents)	Used to direct the user to the instruction manual where it is necessary to follow certain specified instructions where safety is involved.
	IEC 417 Symbol No. IEC-5019	Protective earth (ground)	To identify any terminal which is intended for connection to an external protective conductor for protection against electric shock in case of a fault or the terminal of a protective earth (ground) electrode.
	IEC 417 Symbol No. IEC-5031	Direct Current	To indicate on the rating plate that the equipment is suitable for direct current only; to identify relevant terminals.
	IEC 417 Symbol No. IEC-5032	Alternating current	To indicate on the rating plate that the equipment is suitable for alternating current only; to identify relevant terminals.

[1] Reference *IEC Medical Electrical Equipment, 2nd. Edition 1988*

Notices

CE

European Regulatory Requirements per 93/42/EEC Medical Device Directives

CareFusion's European Representative for vigilance reporting within the European Community is:

CareFusion Respiratory Systems GMBH

Leibnizstrasse 7

97204 Hoechberg, Germany

Main Office: 49.931.4972.0

Fax: 49.931.4972.423

Email: support.vent.eu@carefusion.com

Any product malfunctioning issues that fall under Medical Device Directives Essential Requirements should be directed to CareFusion.

Chapter 2 - LTV® Transport Battery System Overview

The LTV® Transport Battery System (TBS) is a portable, rechargeable external power source for the CareFusion line of LTV® Ventilators. The LTV® TBS has the following features:

- The LTV® TBS is a comprehensive package that provides up to six hours of mobile power for the LTV® Ventilator with two Lithium Ion batteries.
- The LTV® TBS is easy to set-up, operate, and maintain.
- The LTV® TBS uses 9 amp/hr rechargeable, sealed, no-maintenance batteries.

Intended Use

The LTV® TBS is a portable, easy to operate, reusable extended power source for the LTV® Ventilator. It is intended to enhance the versatility of the already mobile LTV® Ventilator to provide support for the care of individuals who require mechanical ventilation.

The LTV® TBS and LTV® Ventilator are suitable for use in institutional, home care and transport settings.

Getting Assistance

If a problem occurs while operating the LTV® TBS or if you require additional information, contact your Service Representative or CareFusion at:

CareFusion Respiratory Systems
22745 Savi Ranch Parkway
Yorba Linda, California 92887-4645, USA

Main Phone: 763.398.8500
Customer Care Center: 800.754.1914
Fax: 763.398.8403

Email: ltvservice@carefusion.com
Website: www.carefusion.com

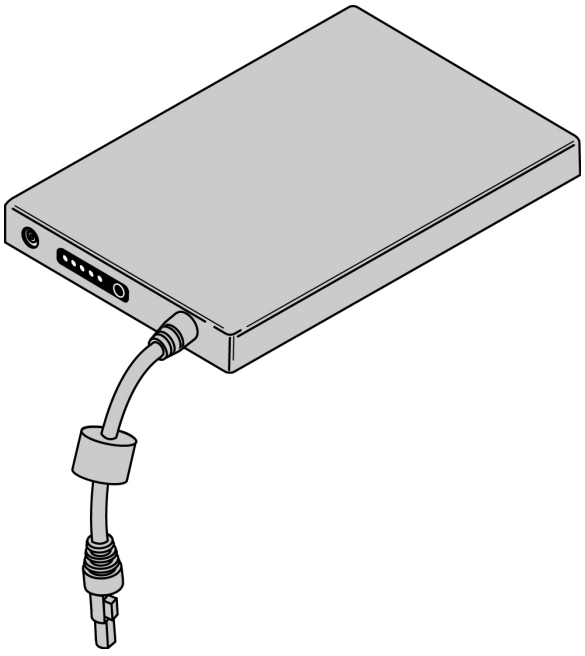
Chapter 3 - LTV® Transport Battery System Accessories

This section describes the available LTV® Transport Battery System Accessories listed below:

Description	P/N
Lithium Ion Battery	14497-001
Lithium Ion Battery Charger and Cords	18274-001
LTV® Transport Pack	15096-001
LTV® Transport Battery System Operator's Manual	17216-001
LTV® Transport Battery Storage Pouch	17493-001

Lithium Ion Battery

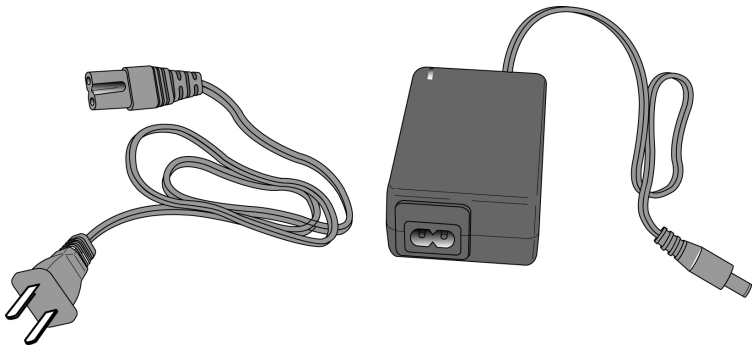
The Lithium Ion battery connects to the LTV® Ventilator's power inlet. When the Lithium Ion battery is unplugged, the LTV® Ventilator automatically reverts to internal battery power. The Lithium Ion battery is inserted into the outside pouch of the LTV® Transport Pack and is held in place by Velcro straps.



An electronic "fuel gauge" consisting of five LED's shows the status of the battery charge.

The battery is a Lithium Ion type battery; therefore, it has none of the memory effects seen in rechargeable Ni-Cd batteries ("memory effect" refers to the phenomenon where the apparent discharge capacity of a battery is reduced when it is repetitively discharged incompletely and then recharged) and does not have to be completely discharged prior to recharging.

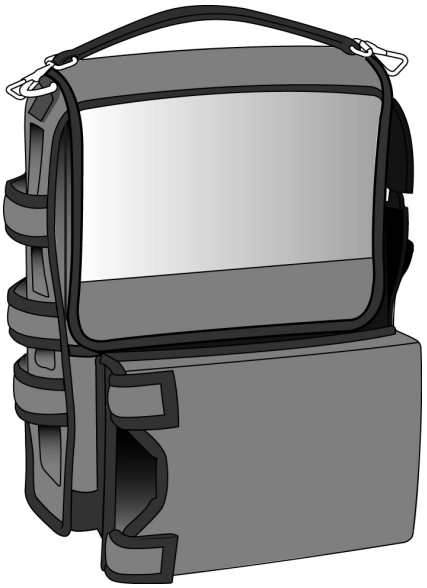
Lithium Ion Battery Charger and Cords



The Lithium Ion Battery Charger is an AC/DC converter that provides a controlled charge voltage to a Lithium Ion battery.

You must disconnect the Lithium Ion battery from the ventilator to charge it. When the Lithium Ion battery is unplugged, the ventilator automatically reverts to internal battery power. Connecting the charger to the battery will disable the battery's output.

LTV® Transport Pack



The LTV® Transport Pack accommodates the LTV® ventilator with protective boots attached. It also includes an external pouch for the LTV® Lithium Ion Battery, a shoulder strap, a hand strap, D-rings, and a bed rail attachment.

Battery Storage Pouch

The LTV® Transport battery storage pouch includes a strap and hardware to attach an extra Lithium Ion Battery to a backpack.

CAUTION

Risk of overheating - To reduce the risk of overheating the battery charger and to allow for adequate heat dissipation, do not use battery charger in an enclosed space such as in a bag or ventilator back pack. The sides and top of the charger should not be in contact with any other objects during the charging operation. Do not stack chargers next to or on top of other chargers during the battery charging operation.

Chapter 4 - Charging the Lithium Ion Battery

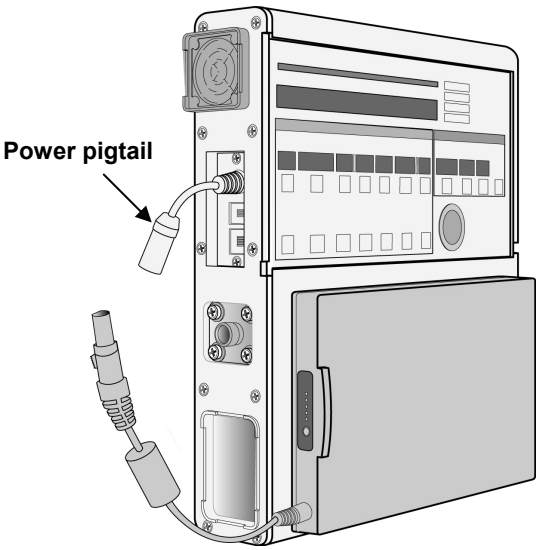
After determining that you have received all of the proper components for the LTV® Lithium Ion Battery, you must fully charge the battery before using it to power an LTV® Ventilator by following the instructions below.

WARNING

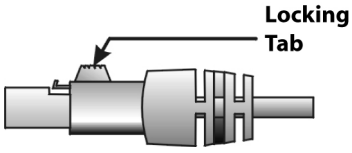
Possible patient harm - Do not attempt to charge the Lithium Ion battery while it is being used to provide power to an LTV® Ventilator.

CAUTION

Risk of overheating - To reduce the risk of overheating the battery charger and to allow for adequate heat dissipation, do not use battery charger in an enclosed space such as in a bag or ventilator back pack. It is recommended that the sides and top of the charger not be in contact with any other objects during the charging operation. Do not stack chargers next to or on top of other chargers during the battery charging operation.



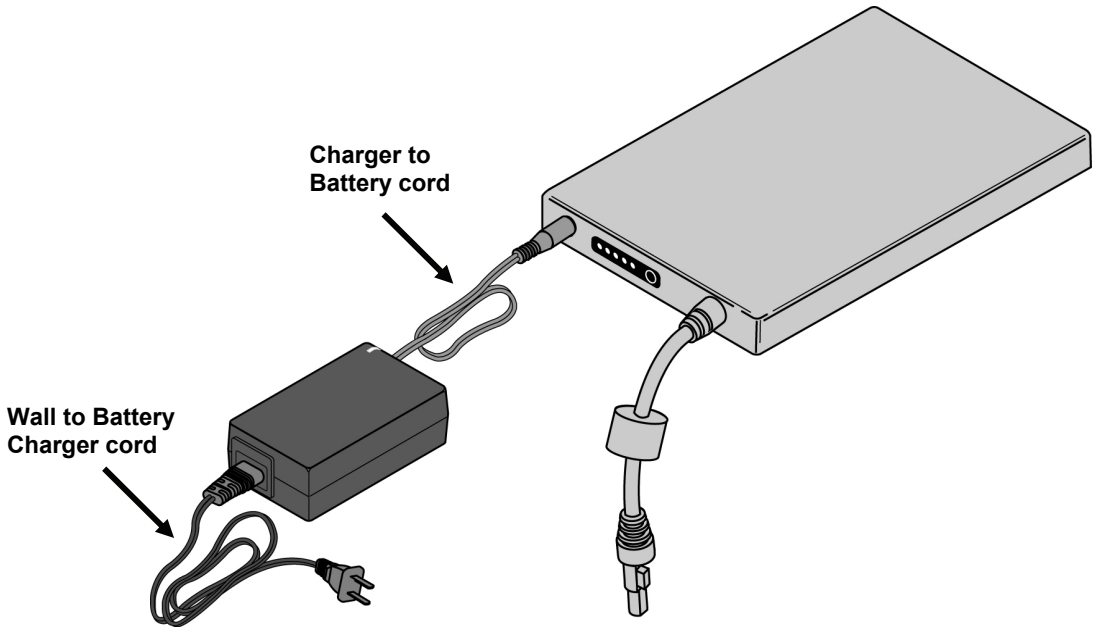
The Lithium Ion battery must be disconnected from the ventilator before charging. To do this, depress the locking tab on the connector and disengage the connector from the LTV ventilator power pigtail.



CAUTION

Possible damage to the battery - Never lift or handle the Lithium Ion battery by its power cord. You could cause damage to the battery

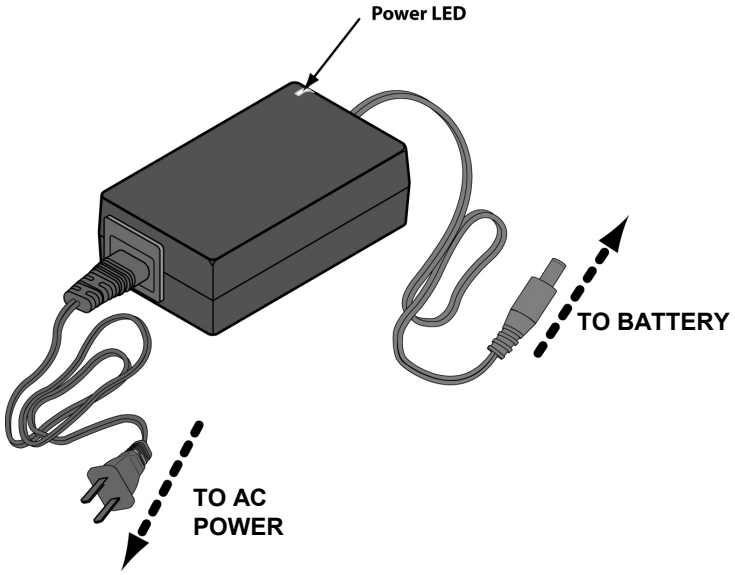
Connecting the Lithium Ion Battery and Charger



1. Connect the Lithium Ion battery to the Battery Charger using the Charger to Battery Cord.
2. Using the Wall to Battery Charger Cord, connect the Battery Charger to an electrical outlet.

CAUTION
Possible damage to the battery - Never lift or handle the Lithium Ion battery by its power cord. You could cause damage to the battery

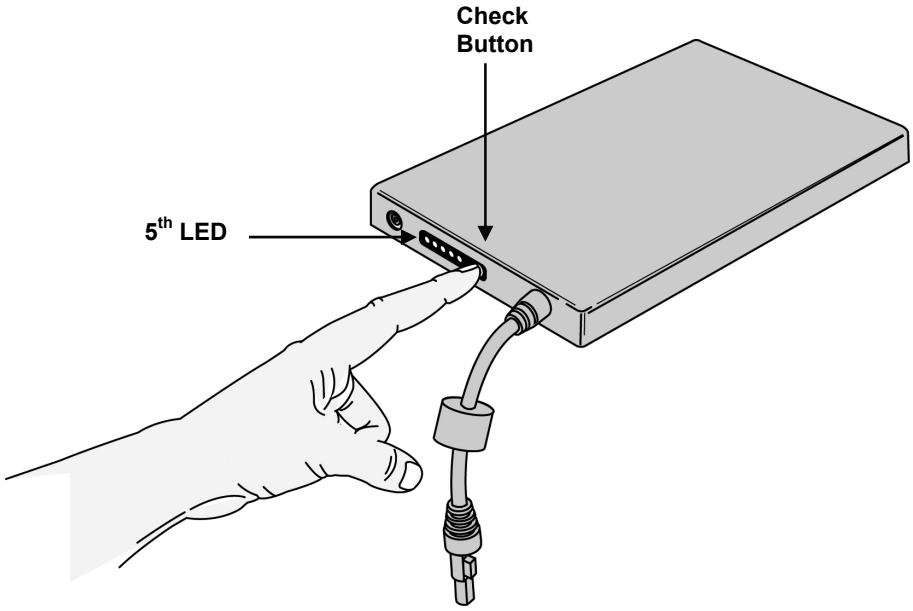
When the Battery Charger is powered, the Power Indicator on the Battery Charger will be lit.



Battery Charge Level

The charge level of the Lithium Ion battery is indicated by the LED display on the battery. To check the Battery charge level, press the Check Button and read the number of LED's. Each LED indicates approximately 20 percent of the charge level.

All five LED's will light when the Battery is 80-100% of the charge level.



One of the Battery LED's (the 5th LED) may flash Red for up to 5 minutes when a powered charger is connected. The 5th LED will light solid Red within 5 minutes. When the battery is fully charged, the 5th LED will light solid Green.

Expected Charge Time

Battery charge time depends upon how deeply the battery has been discharged. Generally, the battery should be fully charged within seven hours. If, after 18 hours of charging the five LED's do not illuminate when you press the Check button on the battery, contact a certified CareFusion service technician.

NOTE

Five lit LED's, indicating a full recharge, should never occur within the first hour of charging.

Expected Cycle Life

A cycle is the degree to which the battery is discharged before being recharged. The cycle life (number of cycles) of the battery is determined by the depth of discharge the battery continually encounters. The less a battery is discharged before being recharged, the longer the cycle life will be.

The battery is a Lithium Ion type battery; therefore, it has none of the memory effects seen in rechargeable Ni-Cad batteries and does not have to be completely discharged prior to recharging. ("Memory effect" is the phenomenon where the apparent capacity of a battery is reduced when it is repetitively discharged incompletely and then recharged).

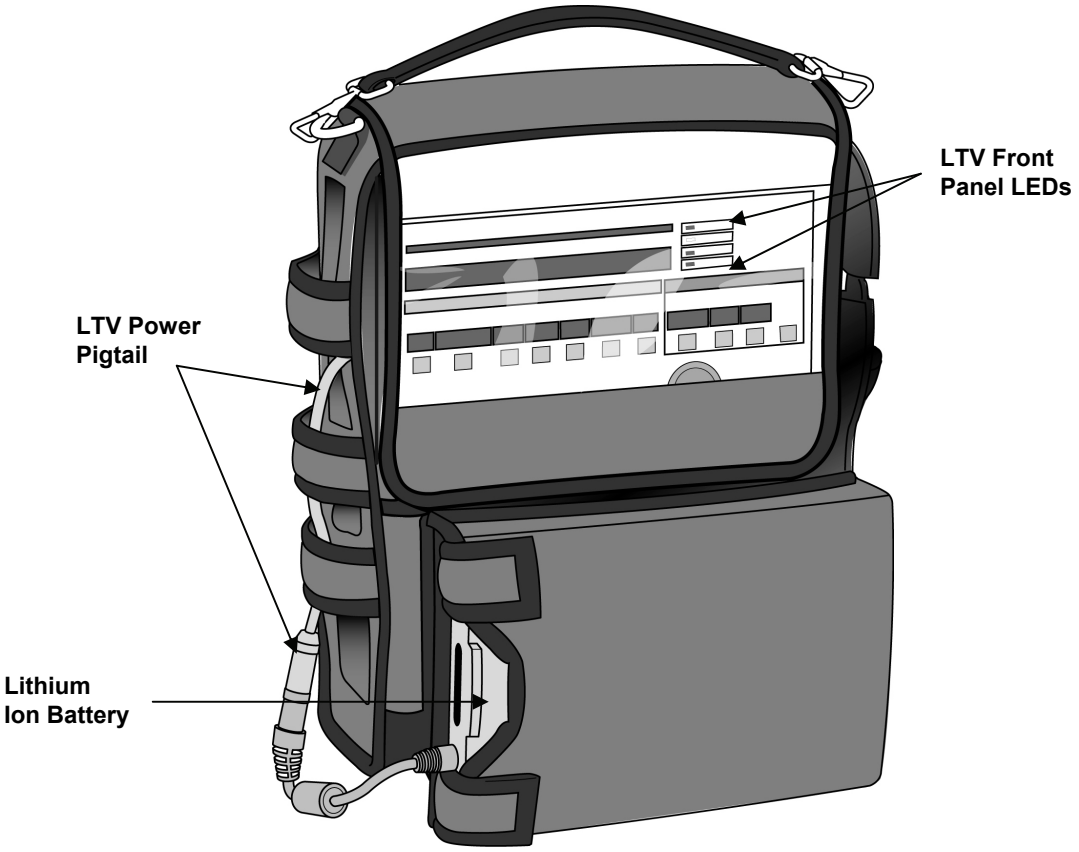
Chapter 5 - Powering the LTV® Ventilator

This section explains how to power an LTV® ventilator using the Lithium Ion battery.

Connecting the Lithium Ion battery and LTV® Ventilator

After fully charging the Lithium Ion battery using the Battery Charger, the Lithium Ion battery is ready to act as an external DC power source for the LTV® ventilator.

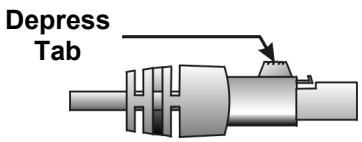
1) Place Lithium Ion battery into the battery compartment of the LTV® Transport Pack and secure it in place with the Velcro fasteners.
2) The LTV® Ventilator external power outlet is located on the left-hand side panel of the LTV® Ventilator. Plug the plastic four-pin Lithium Ion battery connector into the LTV® Ventilator's power port.



CAUTION

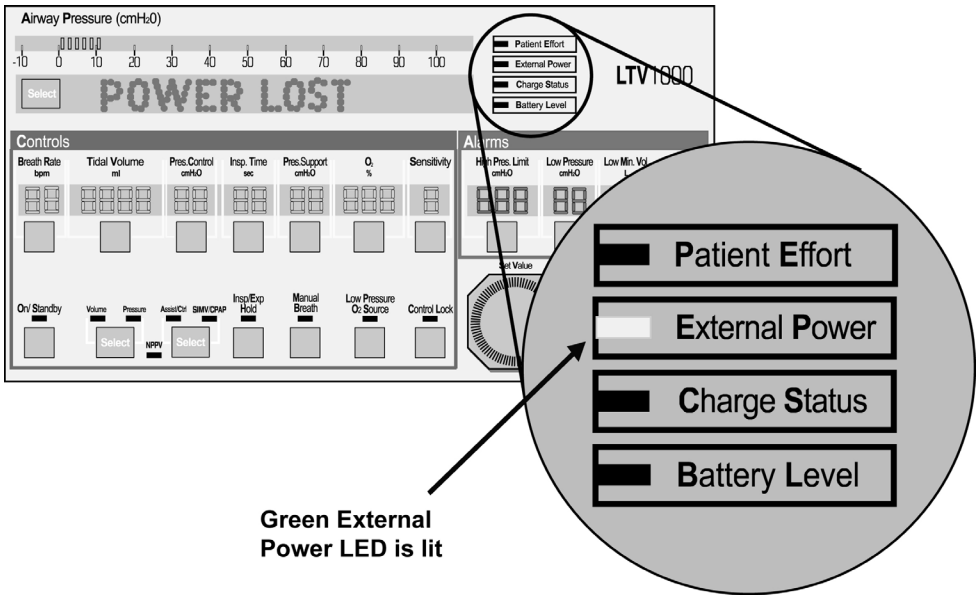
To avoid damaging the ventilator or the power connector, always press the release button on the bottom of the connector before removing it from the ventilator.

The four-pin power connector is locked by a plastic tab in the connector itself. To unlock the connector, depress the tab on the connector head and pull the connector from the socket.



With all connections properly attached and the Lithium Ion battery fully charged, the proper LED indicators should appear on the LTV® Ventilator's front panel. The Lithium Ion battery is now powering the LTV® Ventilator.

Battery Status and the LTV® Ventilator



The front panel of the LTV® Ventilator provides an LED indication of power source and power status. With the external battery properly attached, the LTV® Ventilator's Green **EXTERNAL POWER** LED should be illuminated indicating the ventilator is receiving power from a source other than its internal battery.

As the external battery discharges, the terminal voltage will drop. The LTV® Ventilator will announce a **POWER LOW** alarm when the external battery voltage is less than 11.5V and the **EXTERNAL POWER** LED will glow Amber.

When the external battery is less than 10V, the LTV® Ventilator will automatically switch to the internal battery. The **POWER LOST** message will be displayed and the **EXTERNAL POWER** LED will be off.

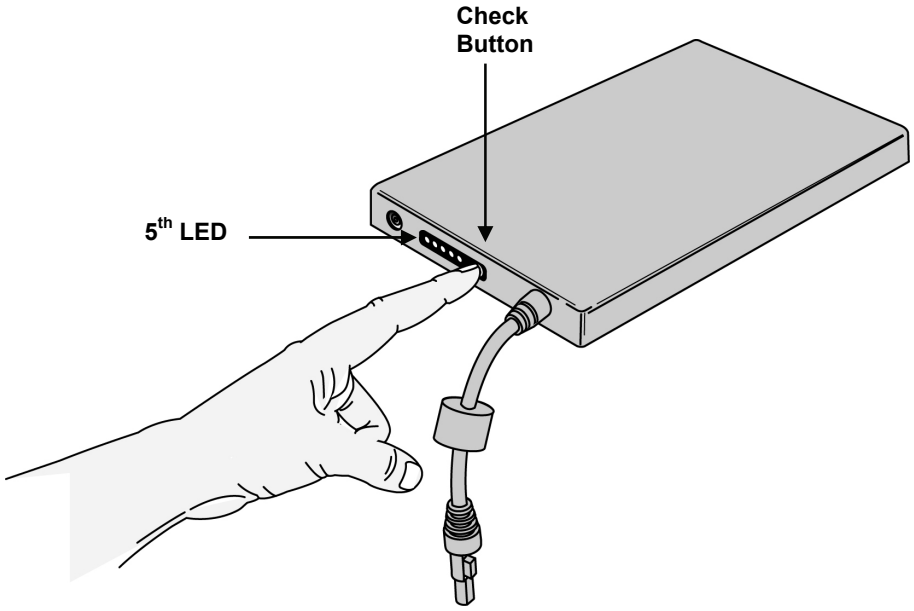
NOTE

- The time between the LTV® External Power Low Alarm and the External Power Lost Alarm will be a few seconds. The ventilator will shift to its internal battery when the Lithium Ion battery is exhausted.
- The **BATTERY LEVEL** LED should be off when operating from an external power source since this LED refers to the internal battery.
- **CHARGE STATUS** on the LTV® Ventilator front panel refers to the internal battery, not the external battery.
- Refer to your *LTV® Ventilator Operator's Manual* for extended information including other **CHARGE STATUS** and **EXTERNAL POWER** LED indications and alarms.
- The operator should keep a log of battery cycle life and recharge time in order to maintain an awareness of battery strength.

Lithium Battery Charge Status

To check the Battery charge level, press the Check Button and read the number of LED's.

Battery charge level is indicated by the LED's on the Battery. Each LED indicates approximately 20 percent of the charge level. All five LED's will light when the Battery reaches 80-100% of the charge level.



The 5th LED will flash (1Hz) yellow **without pressing the check button** when the Battery has 20% or less capacity. The 5th LED will also flash yellow, faster (2Hz) when the Battery has 10% or less capacity.

Troubleshooting

The LTV® Ventilator **EXTERNAL POWER** LED is not illuminated:

- Disconnect and reconnect the DC cord from both the Lithium Ion battery receptacle and the ventilator and verify that all connectors are free of debris and securely lock into their proper outlet.
- Check Battery Status Indicator for charge level indication.
- Connect the Battery charger for a minimum of 5 seconds to reset the battery.

Expected Lithium Ion Battery Life

Several factors affect the life of the Lithium Ion battery, including temperature, length of storage, and the amount of discharge during each cycle. The Lithium Ion battery has a normal operating life of three hours per cycle from a 100% charge to a full discharge.

Chapter 6 - CLEANING

This section explains how to clean the LTV® Transport Battery System.

Lithium Ion Battery, Charger, and Cords

The battery charger, cords, and Lithium Ion battery should be kept clean and free of dust and debris. Occasionally they should be wiped clean using a damp cloth.

WARNING

Risk of Electric Shock - To reduce the risk of electrical shock and damage to the battery charger or Lithium Ion battery, do not expose them to snow, rain, or liquid of any kind. Do not operate the Battery Charger if it has a damaged cord, or use the battery charger or Lithium Ion Battery if they have been dropped, or damaged in any way. Have any damaged cord or plug immediately replaced by a certified technician. Contact a certified CareFusion service technician or CareFusion with any questions.

CAUTION

Cleaning agents - Do not use cleaning agents that contain phenols, ammonium chloride, chloride compounds, or more than 2% glutaraldehyde. These agents may damage plastic components.

Immersion in liquids - Do not allow any cleaning solution to enter inside the LTV® Lithium Ion battery or Charger, this could cause internal damage.

Chapter 7 - Storage and Maintenance

This section explains how to store and maintain the LTV® TBS.

Serviceable Items

The following items should be routinely checked for integrity and changed when necessary:

- The Lithium Ion battery is maintenance free and only requires recharging.
- For the servicing of all other items, such as a worn cord connector, or damaged wire, contact a certified CareFusion service technician or CareFusion.
- The LTV® Battery Charger is a solid-state device that requires no ongoing service under normal operating conditions.

WARNING

Risk of electrical shock. Do not attempt any servicing of the LTV® Battery Charger.

Storage

Storage of the Lithium Ion battery affects its cycle life. When not in use the Lithium Ion battery can be left on the LTV® Battery Charger and the charger left plugged in. This will provide the Lithium Ion battery with a continual float charge to ensure that it is at its highest capacity when it is time to put it to use.

NOTE

- Do not store the Lithium Ion battery connected to an LTV® Ventilator. The Lithium Ion battery will discharge into the ventilator.
- A Lithium Ion battery that is stored off the LTV® Battery Charger will self-discharge at a rate of approximately 10% a month.

Temperature and Location

Shelf discharge of the Lithium Ion battery depends upon storage temperature. A lower temperature decreases this discharge and allows the Lithium Ion battery to be stored for longer periods. Each ten-degree drop in ambient temperature in the storage area doubles the shelf life of the Lithium Ion battery.

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Chapter 8 - Lithium Ion battery Specifications

This section presents battery technical specifications for the Lithium Ion battery.

Lithium Ion Battery:

- Battery Chemistry: Lithium Ion
- Battery Voltage: Nominal Voltage: 14.4 Volt
- Cycles: 150 full cycles @ room temperature (70^{o} F, 21^{o} C)
- Source Impedance: 150 milliohm ± 15%
- Operating Temperature and Humidity: 5 to 40 degrees C, 15% to 95% relative, non-condensing.
- Storage Temperature and Humidity: -20 to 50 degrees C, 10% to 95% relative, non-condensing.
- Shock and Vibration: MIL-STD-810E
- Water Ingress: IEC601-1 Clause 44.3
- EMC Compatibility: IEC 60601 Emissions, Immunity and ESD
- RF Emissions: RTCA DO-160D Section 21.4 Radiated RF Interference
- ESD Protection: ASTM F1246-91 4.14.3.1 & IEC60601 for ESD

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