

CHAPTER 6

BATTERY PACKS

Section 6-1. Introduction

6-1. GENERAL.

6-2. Two battery chemistries have been authorized for use with Pusher Fan (P/N 3297AS600-1): the rechargeable NiCad (P/N 3297AS601-1) and the non-rechargeable Lithium Manganese Dioxide (LiMnO₂) (P/N 3297AS601-2) battery packs. The batteries' comparative specifications are listed in [table 6-1](#).

6-3. INTENDED USE.

6-4. The non-rechargeable lithium battery is intended for use during operational contingency missions and

the rechargeable NiCad battery is used for training missions. The non-rechargeable Lithium Manganese Dioxide battery pack is designed to provide electrical power to the Pusher Fan (P/N 3297AS600-1) for approximately 12+ hours at room temperature. The NiCad battery has an operational service life of 3 to 4 hours. If NiCad batteries are not available for proficiency training, Lithium batteries may be used on a limited basis until NiCad batteries are available. In an emergency situation, NiCad batteries may be used for contingency missions, however, the reduced service life must be considered. Aircrewmembers will always carry at least one spare battery, or more depending on mission duration.

Table 6-1. Battery Specifications

	Lithium Manganese Dioxide	NiCad
Chemistry:	Lithium Manganese Dioxide	Nickel Cadmium
Part No:	3297AS601-2	3297AS601-1
Mfg. P/N:	520-03-94	520-03-16
Type:	Non-rechargeable/Disposable	Rechargeable
Color:	Green	Black
Fuse:	Internal (non-replaceable)	Replaceable, 2A @ 250 V Racal P/N 521-01-38
Shelf Life:	10 yrs	7 years
Service Life:	12 hrs. (continuous use)	3-4 hrs. (continuous use) 2 yrs. (1000 cycles)
Storage Temp: (Optimum)	32°F to 85°F	32°F to 85°F
Cells:	(2) D cells	(4) 1/2 D Cells
Cell Voltage:	3V nominal	1.2V nominal
Battery OCV:	6 - 6.4 Vdc	4.8 - 5.5 Vdc
Weight:	15 oz.	18 oz.
Capacity:	10 Ahr @ ambient temp	2.3 Ahr @ ambient temp
Op. Temp:	-40°F to 160°F	-4°F to 160°F

Section 6-2. Rechargeable NiCad Battery Pack

6-5. DESCRIPTION.

6-6. The battery pack (figure 6-1) is a Nickel Cadmium type electrical power supply.

6-7. OPERATION.

6-8. The battery pack is designed to provide electrical power to the pusher fan (3M P/N 025-00-02) for approximately 3 1/2 to 4 hours at moderate temperatures. Each battery provides 500 to 750 charge/discharge cycles. However, the life of the battery will be significantly reduced when they are exposed to high heat over an extended period of time.

6-9. INSPECTIONS.

NOTE

Only batteries that are currently in use need to be inspected and charged. Batteries placed in storage do not need to be inspected or periodically recharged.

6-10. PLACE-IN-SERVICE INSPECTION. The battery pack Place-In-Service Inspection shall include unpacking, Visual Inspection, Functional Check, discharging, charging and storage. All Place-In-Service Inspections shall be performed at the Organizational Maintenance Level.

6-11. Remove the battery from its packing case.

6-12. Visual Inspection. The following components shall be visually inspected as part of the Place-In-Service Inspection. After completing the inspection, fill out a Quality Deficiency Report (QDR) on the battery pack and forward to the Naval Air Warfare Center, Aircraft Division, (NAWC-AD) Code 4.6.3.1, NAS Patuxent River, MD 20670-5304, if any of the following problems are apparent:

NOTE

Do not forward or dispose of battery until disposition instructions are provided by the Naval Air Warfare Center, Aircraft Division, Patuxent River.

1. Battery pack case appears swollen or cracked.

2. Battery pack leaks fluid or substance of any kind.

3. Battery pack 3-pin receptacle has become corroded, cracked or damaged.

4. Battery pack case contaminated with oil, grease or other matter.

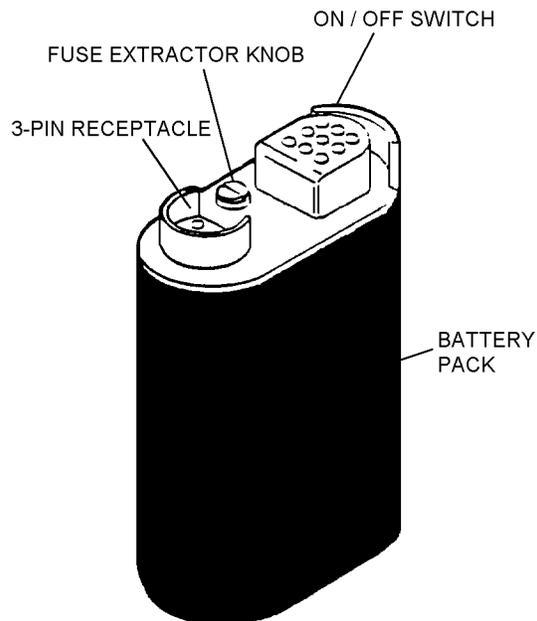


Figure 6-1. Rechargeable NiCad Battery Pack

6-1

5. ON/OFF push switch rubber cover is damaged or missing.

6. Fuse extractor knob is missing.

7. Fuse is missing.

8. Battery pack labels are missing.

6-13. Functional Check.

1. Plug a pusher fan cord into the battery pack 3-pin receptacle.

2. The battery pack is operated by a push button ON/OFF switch located in the top of the unit. Push once for ON or OFF depending on the switch's initial position.

3. Turn the battery pack ON/OFF switch to the ON position.

4. Should the battery pack fail to produce output, try a new pusher fan. If the battery pack still fails to produce output, see Troubleshooting, [table 6-2](#).

NOTE

Do not use the power cord to pull plug from the battery pack. Do not apply undue stress to the cord or carry the battery pack by the cord.

5. Switch battery pack OFF and unplug pusher fan from battery pack.



CAUTION

Running the batteries down completely (less than one volt output) or “deep discharging”

will damage the battery cells and will not improve the charge capacity.

6-14. Discharging Battery Pack. New batteries or batteries in use do not need to be fully discharged prior to charging. Batteries may be charged at any time during the discharge cycle. Voltage depression (a.k.a. “memory”) caused by repeated incomplete discharge cycles is not a significant factor for these 3M batteries. Allowing a battery to self-discharge during extended storage will not harm the battery. Batteries subjected to prolonged storage (longer than 12 months) may lose their capacity to hold a full charge. Checking the battery capacity can be accomplished by running a pusher fan, without filter, for approximately three and one half hours, using caution not to fully discharge the battery, and then checking that the required airflow is maintained. Several charge, discharge, and charge cycles may restore battery capacity. A battery can be discharged by running a pusher fan, without filter, for approximately three and one half hours, using caution not to fully discharge the battery.

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WARNING

When charging battery packs on the 10-unit charger, charge only in well ventilated and non-hazardous locations, and avoid any type of moisture. Failure to do so may expose the user to serious bodily injury.

CAUTION

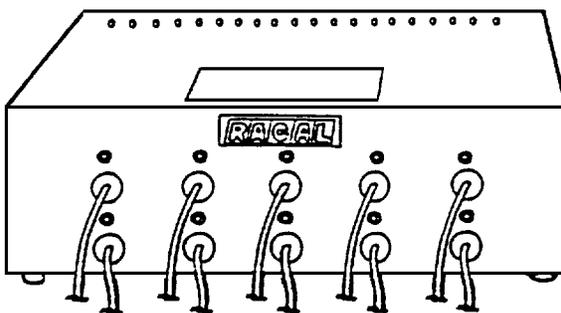
Always charge 3M batteries at a temperature of 77° F (25° C) or less. At higher temperatures, the battery may not accept a full charge. If a battery feels hot, let it cool one half hour at 77° F (25° C) or less before charging. Continuous charging generates heat that deteriorates NiCad batteries.

6-15. Charging the Battery Pack. New batteries or batteries in use do not need to be fully discharged prior to charging. Batteries may be charged any time during the discharge cycle. Keep a log of battery use time along with monitoring the air flow from the pusher fan to determine when batteries need to be charged.

6-16. Battery packs shall be charged on the 10-unit BCU-30/E charger (3M, telephone 651-736-3404 or 800-243-4630 P/N 520-01-61) (figure 6-2) as follows:

1. Place the charging station horizontally on a flat surface and plug the station AC power cord into a 120 V 60 Hz outlet. The green LED light for each channel will turn on.

2. Insert a charging lead into each battery pack. The LED for channel will turn off, indicating that the battery pack attached to that channel is being charged in a High Rate mode. After a period of time, the LED light will turn back on. This indicates that the charging station has detected a fully charged battery pack and has switched to a Trickle Rate mode, preventing the battery pack from going into overcharge.



6-2

Figure 6-2. 10-Unit BCU-30/E Charger

3. The battery pack requires approximately 3 to 3 1/2 hours to fully charge after being fully discharged.

NOTE

Do not charge a battery continuously for more than one week.

4. To determine that a battery pack has been fully charged you may monitor the charging process by observing the LED. A fully discharged battery pack should charge for 3 to 3 1/2 hours before the LED turns on. If the LED turns on prematurely, see [paragraph 6-30](#).

5. Record the charge date on the date label affixed to the back side of the battery pack after removing from charger.

6-17. Storage. The life of the batteries will be significantly reduced when they are exposed to high heat over an extended period of time. Batteries placed in storage do not need to be inspected or periodically recharged. Allowing a battery to self-discharge during extended storage will not harm the battery.

1. Battery packs should be stored in a cool, dry environment with optimum temperatures ranging from 32°F to 75°F.

NOTE

Battery packs self discharge at a rate of approximately 1% per day. Higher storage temperature will accelerate this rate.

2. Ensure charge date has been recorded on the label affixed to the back of the battery pack.

6-18. PREFLIGHT INSPECTION.

6-19. Visual Inspection. The following battery pack components shall be visually inspected as part of the Preflight Inspection ([figure 6-1](#)). Perform the Visual Inspection as described in [paragraph 6-12, steps 1 through 8](#).

NOTE

Rotate battery pack stocks to ensure all battery packs are used, i.e. first in storage first out.

Allow battery packs that have been recently charged to sit for approximately 20 minutes before being used.

6-20. Functional Check. Before a battery pack is used for flight, check the date on the battery pack label and ensure that it has been charged within the last month. If not, charge in accordance with [paragraph 6-15](#).

6-21. Perform Functional Check procedure in accordance with [paragraph 6-13](#).

6-22. POSTFLIGHT INSPECTION.

6-23. Visual Inspection. Perform Visual Inspection in accordance with [paragraph 6-12, steps 1 through 8](#).

6-24. Charging the Battery Pack.

NOTE

It is not necessary to charge a battery pack if it was not used in-flight. Unused battery packs shall be stored in accordance with [paragraph 6-17](#).

6-25. Battery packs that are fully or partially expended during flight shall be charged on the 10-unit Charger ([figure 6-2](#)) in accordance with [paragraph 6-15](#).

6-26. SPECIAL INSPECTION. A Special Inspection shall be performed on the battery packs every 30 days. The Special Inspection shall consist of visual inspection, charging and storage.

6-27. Visual Inspection. Perform Visual Inspection in accordance with [paragraph 6-12, steps 1 through 8](#).

NOTE

Ensure the date label is securely attached to the back of the battery pack. If the label is loose, missing or filled up, replace with a new label.

6-28. Charging the Battery Pack. Check the date on the battery packs in storage. If a battery pack has been on the shelf for more than 1 month, place it on the 10-unit charger and charge in accordance with [paragraph 6-15](#).

WARNING

When charging battery packs on the 10-unit charger, charge only in well ventilated and non-hazardous locations, and avoid any type of moisture. Failure to do so may expose the user to serious bodily injury.

6-29. Storage. Battery packs shall be stored (in a fully charged state) for no longer than one month before being placed in service. A battery pack stored for longer than 1 month should be placed on a 10-unit charger and charged in accordance with [paragraph 6-15](#).

1. Battery packs should be stored in a cool, dry environment with optimum temperatures ranging from 32°F to 75°F.

NOTE

Battery packs self discharge at a rate of approximately 1% per day. Higher storage temperature will accelerate this rate.

2. Ensure charge date has been recorded on the label affixed to the back of the battery pack.

6-30. TROUBLESHOOTING.

6-31. Troubleshooting shall be performed in accordance with procedures listed in [table 6-2](#).

Table 6-2. Troubleshooting

Trouble	Probable Cause	Remedy
Battery does not power pusher fan or provide voltage output.	Power cord is not securely attached to battery pack 3-pin connector.	Ensure that pusher fan power cord is securely attached to the 3-pin connector on the battery pack.
	Blown fuse.	Using a thin flat blade screwdriver, press down on the fuse extractor knob and twist a quarter of a turn (See figure 6-3). Pull the knob out and insert a 2 amp fuse (3M P/N 521-01-38) into the knob. Replace the O-ring (3M P/N 529-02-41R10) if damaged. Insert the fuse and knob back into the battery pack. <div style="text-align: center;"> <div style="border: 2px solid black; padding: 2px; display: inline-block;">CAUTION</div> </div> Use (exclusively) 3M (P/N 521-01-38) replacement fuses in battery packs. Other than fuse replacement, no other dismantling or repair of the battery packs should be attempted.
	Faulty power cord or corrosion on 3-pin plug.	Replace cord
	Battery pack not charged.	Charge battery pack in accordance with paragraph 6-15 . If after charging the battery pack between 3 to 3 1/2 hours, it still does not power a pusher fan, dispose of battery pack. <div style="text-align: center;"> <div style="border: 2px solid black; padding: 2px; display: inline-block;">WARNING</div> </div> Battery packs should not be discarded in the trash. All battery packs that are damaged or exceed their service life shall be disposed of in accordance with paragraph 6-32 .
10-unit charging station LED does not turn on when plugged into 120 V 60 Hz outlet.	Blown AC fuse on back of 10-unit charging station.	Replace blown fuse with a 3 amp 3M (P/N 521-01-87) fuse.

Table 6-2. Troubleshooting (Cont)

Trouble	Probable Cause	Remedy
10-unit charging station LED does not turn off when connected to a battery pack.	Fault in battery pack.	Check the fuse in the battery pack as previously mentioned above.
10-unit charging station LED turns on prematurely for a fully discharged battery pack in less than three hours.	Fault in battery pack or charging station.	Unplug battery pack from the charging station for several minutes and then plug battery pack back into the charging station. If the problem continues try a different battery pack on the same charging station port to determine if the problem is in the battery pack or the charging station.

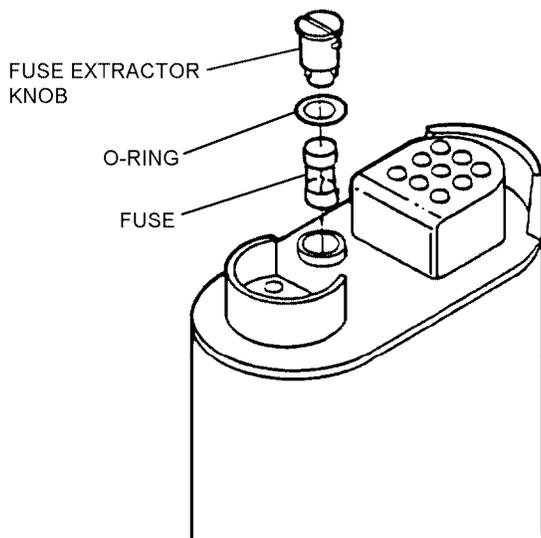


Figure 6-3. Battery Pack Fuse Replacement ⁶⁻³

NOTE

No dismantling of either the battery pack or charging station should be attempted. If a problem continues after the troubleshooting procedures have been performed, a Quality Deficiency Report (QDR) will be submitted and the defective battery pack or charging station shall be shipped with the QDR to the Naval Air Warfare Center, Aircraft Division, (NAWC-AD) Code 4.6.3.1, NAS Patuxent River, MD 20670-5304.

6-32. DISPOSAL.

6-33. AT SEA. Routine disposal of batteries is prohibited per 40CFR 220 Sub Chap H. Store defective

batteries in a separate cool, dry area away from other combustible material until ashore.

6-34. ASHORE. Dispose of batteries as follows:

1. Turn into the local Defense Reutilization and Marketing Office (DRMO) in accordance with Chapter II of OPNAVINST 5090.1 for disposal as a hazardous waste. Before initiating a NiCad battery disposal system, consult the local DRMO and military environmental protection branch to coordinate battery information, packaging, quantities, labeling, shipping, and tracking requirements.

2. If the local DRMO will not accept the batteries, contact the local military environmental branch for disposal of hazardous waste.

3. Under certain emergency conditions, if batteries are deemed to be too hazardous for routine disposal, Explosive Ordnance Disposal (EOD) shall be contacted for immediate removal to a safe site.

4. Questions or problems regarding the packaging, transportation, labeling, storage, tracking, or contract requirements of NiCad batteries for disposal should be addressed to:

Naval Ordnance Center (NOC) Code N713
 Farragut Hall, Bldg. D-323
 23 Strauss Avenue
 Indian Head, MD 20640-5555

Section 6-3. Non-Rechargeable Lithium Manganese Dioxide Battery Pack

6-35. DESCRIPTION.

6-36. The Lithium Manganese Dioxide (LiMnO_2) battery pack, P/N 3297AS601-2, is a green non-rechargeable battery that contains two D size cells wired in series. It will power the Pusher Fan (P/N 3297AS600-1) for 12+ hours at room temperature. The battery incorporates several internal safety features: an electrical line fuse (in case of an external short circuit), blocking diode (to prevent inadvertent charging), thermal fuse/switch (to protect against excessive heating) and a designed vent path. The battery has recently been qualified by NAWC-Crane for use with the Pusher Fan and is being procured under contract N00019-94-C-0080. See [figure 6-4](#).

6-37. OPERATION.

6-38. The Lithium battery is operated by depressing the push button On/Off switch located on the top of the battery. Plug a pusher fan cord into the battery's 3-pin receptacle ([figure 6-4](#)). Push once for On or Off, depending on the switch's initial position. Should the battery fail to produce output from the pusher fan, try a new pusher fan. If the battery still fails to power the pusher fan, fill out a Quality Deficiency Report (QDR) on the battery and forward to the Naval Air Warfare Center, Aircraft Division, Code 4.6.3.1, NAS Patuxent River, MD 20670-5304.

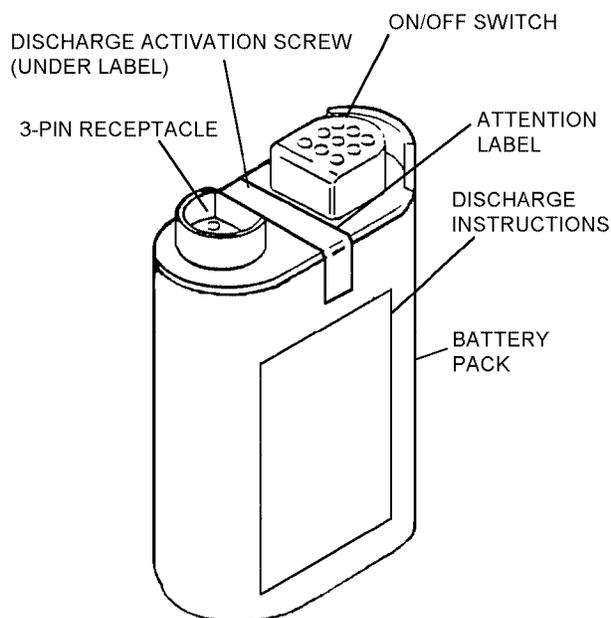


Figure 6-4. Lithium Manganese Dioxide Battery

6-4

6-39. INSPECTIONS.

6-40. Inspections shall include: Place-in-Service, Preflight and Postflight. Special inspections are not required.

6-41. PLACE-IN-SERVICE. Place-in-Service Inspection shall consist of unpacking, visual inspection, functional check and short term storage.

6-42. Unpacking. There are no special instructions for unpacking new Lithium batteries. Once unpacked, however, check to make sure that the ATTENTION label is affixed to the top of the Lithium battery. This label hides the discharge screw that is beneath it.

6-43. Visual Inspection. The following battery components shall be visually inspected: battery case (for cracks or leaks), 3-pin receptacle (for corrosion or cracks), On/Off switch (for damage to rubber), and labels (front and back) ([figure 6-4](#)).

6-44. Functional Check. Functional check shall consist of plugging a Pusher Fan cord into the battery pack 3-pin receptacle and switching the battery On. If the battery pack fails to produce output, try a new Pusher Fan.

6-45. Short Term Storage. Battery packs that pass the visual inspection and functional check shall be placed in short term storage (on-the-shelf) for near term use.

NOTE

If the battery fails the visual inspection or functional check, fill out a Quality Deficiency Report (QDR) on the battery and forward to the Naval Air Warfare Center, Aircraft Division, Code 4.6.3.1, NAS Patuxent River, MD 20670-5304.

6-46. PREFLIGHT. Preflight Inspection shall consist of a visual inspection and functional check.

6-47. Visual Inspection. Perform visual inspection in accordance with [paragraph 6-43](#).

6-48. Functional Check. Before a battery pack is used for flight, check the hours remaining on the battery pack label (back of battery). Ensure that there is ample time remaining for the intended flight. If not, choose another battery (with ample time) from short

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term storage. If there are none available, draw a new battery from long term storage.

6-49. POSTFLIGHT. Postflight Inspection shall consist of a visual inspection and functional check.

6-50. Visual Inspection. Perform visual inspection in accordance with [paragraph 6-43](#).

6-51. Functional Check. Strike through the hours used from flight on the label on the back of the battery. If there are not enough hours remaining for another flight, deactivate and dispose of the battery in accordance with [paragraph 6-54](#). If there are hours remaining, place in short term storage for future use.

6-52. LONG TERM STORAGE.

6-53. Lithium batteries shall be stored in a cool, dry environment with optimum temperatures ranging from 32°F to 85°F. Storage areas shall conform to the requirements specified in the latest revision of NAVSEAINST 9310 for LiMnO₂ chemistry.

6-54. DISPOSAL.

6-55. Lithium batteries ([figure 6-4](#)) shall be fully discharged in accordance with the instruction label on the front of the battery pack prior to disposal or for storage awaiting disposal.

6-56. AT SEA. Routine disposal of batteries is prohibited per 40CFR 220 Sub Chap H. Store used bat-

teries in a separate cool, dry area away from other combustible material until ashore.

6-57. ASHORE. Dispose of batteries as follows:

1. Turn into the local Defense Reutilization and Marketing Office (DRMO) in accordance with Chapter II of OPNAVINST 5090.1 for disposal as a hazardous waste. Before initiating a lithium battery disposal system, consult the local DRMO and military environmental protection branch to coordinate battery information, packaging, quantities, labeling, shipping, and tracking requirements.

2. If the local DRMO will not accept the batteries, contact the local military environmental branch for disposal of hazardous waste.

3. Under certain emergency conditions, if batteries are deemed to be too hazardous for routine disposal, Explosive Ordnance Disposal (EOD) shall be contacted for immediate removal to a safe site.

4. Questions or problems regarding the packaging, transportation, labeling, storage, tracking, or contract requirements of lithium batteries for disposal should be addressed to:

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