TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL AND

DIRECT SUPPORT MAINTENANCE

INCLUDING REPAIR PARTS AND

SPECIAL TOOLS LIST
BATTERY, STORAGE

BB-542/U (NSN 6140-01-089-7636)

(NICKEL-CADMIUM SEALED)

HEADQUARTERS, DEPARTMENT OF THE ARMY
5 MARCH 1985

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5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

1. DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL
2. IF POSSIBLE, TURN OFF THE ELECTRICAL POWER
3. IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL
4. SEND FOR HELP AS SOON AS POSSIBLE
5. AFTER THE INJURED PERSON IS FREE OF CONTACT WITH THE SOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHORT DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

WARNINGS

- Sealed Nickel-Cadmium (NICAD) batteries contain potassium hydroxide (KOH), which is a caustic agent. Serious and deep burns of body tissue will result if the electrolyte comes in contact with the eyes or any part of the body.

- If batteries show signs of leaking use rubber gloves, rubber apron and protective goggles. Follow FIRST AID instructions if you believe any caustic has gotten on you.

FIRST AID INSTRUCTIONS

1. In the event of contact with the eyes, immediately flush eyes with water and continue to flush for 15 minutes.

   - The first few seconds after contact are critical and immediate flushing of the eyes may prevent damage. An eyewash fountain is preferred, however, an eyewash hose or any other source of clean water should be used in an emergency.

2. For other parts of the body, begin flushing the area with large quantities of clean water immediately.

3. After flushing, seek medical attention without delay. Inform medical personnel that you have been contaminated with potassium hydroxide.

4. The precautionary warnings on the product label should be consulted for full first-aid information. Provide the label information to the attending physician.

5. Neutralizers and solvents (alcohol, etc.) should not be used by the first aider. The spread of skin absorbing corrosive poison, like phenol, can result in death. (Don't depend upon spilled chemicals to evaporate from your clothes. Exposure of skin can *kill* you.)

FIRE FIGHTING SAFETY PRACTICE

"In the event of fire use a C02 fire extinguisher."

Technical Manual
No. 11-6140-224-13&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 5 March 1985

OPERATOR'S ORGANIZATIONAL AND DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST BATTERY, STORAGE BB-542/U (NSN 6140-01-089-7636) (NICKEL-CADMIUM SEALED)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in back of this manual direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, New Jersey 07703-5007. In either case, a reply will be furnished direct to you.

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CHAPTER 1

INTRODUCTION

1-1. Scope

This manual covers the specific data, maintenance and repair instructions, installation, operation and testing of Battery, Storage BB-542/U (Nickel-Cadmium Sealed) (see fig. 1-1). It is a sealed, fast charge storage battery which provides a 24 volt, direct current (dc) power source. The BB-542/U is used to supply operating power for various electronic equipments by itself or in conjunction with the G-76/G hand-cranked generator.

1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA PAM 310-1 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

1-3. Maintenance Forms, Records, and Reports

a. *Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, as contained in Maintenance Management Update.

b. *Report of Packaging and Handling Deficiencies.* Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR400-54/MCO4430.3F.

c. *Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C'AFR 75-18/MCO P4610.19D/ DLAR4500.15

1-4. Reporting Equipment Improvement Recommendations (EIR)

If your BB-542/U needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ME-MP, Fort Monmouth, NJ 07703-5007. We'll send you a reply.

1-5. Administrative Storage

Administrative Storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage, the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraph 5-6.

1-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

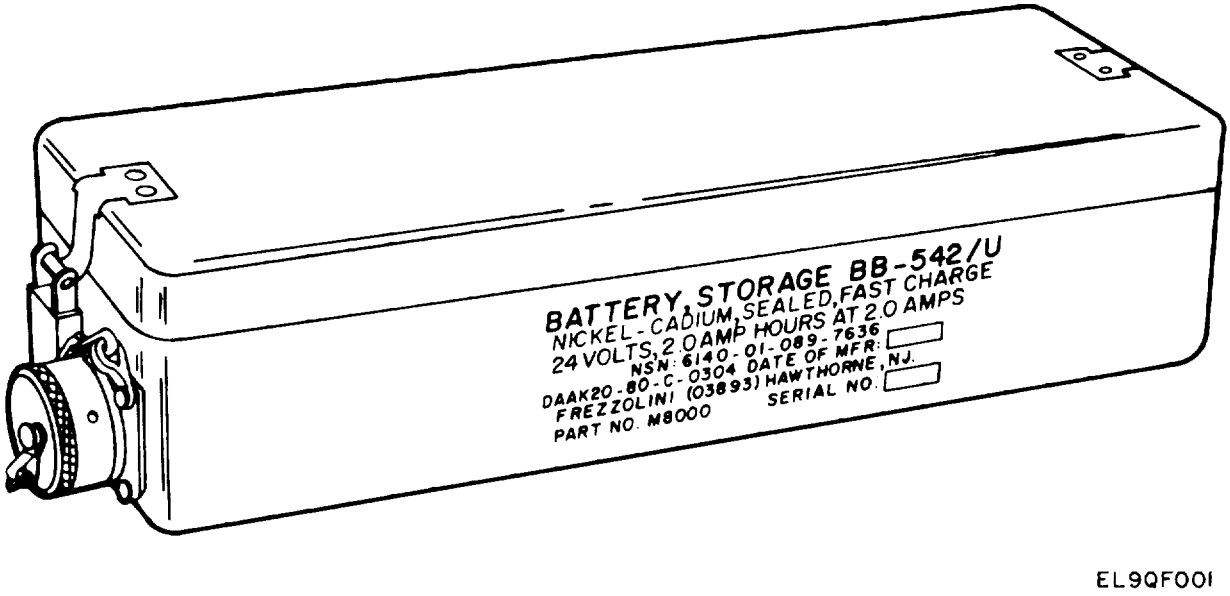


Figure 1-1. Battery, Storage BB-542/U (Nickel-Cadmium Sealed).

CHAPTER 2

SPECIFIC DATA FOR BB-542/U BATTERY

2-1. Tabulated Data for BB-5421U

Type	Nickel-Cadmium (sealed)
Number of cells	20
Electrolyte	Potassium hydroxide (KOH)
Operating Range:	
Temperature	-25°F (-32°C) to 125°F (520C)
Atmospheric Pressure	Sea level to 100,000 feet
Storage:	
Duration (maximum)	Unlimited, regardless of state of charge
Temperature	-80°F (-62.20C) to 125°F (520C)
Atmospheric Pressure	Sea level to 100,000 feet
Electrical Data:	
Rated 1-hour discharge capacity at temperature of:	
Approximately 75°F(23.90C)	2.0 ampere-hours at 24 volts
Approximately OF(-17.8°C)	1.2 ampere-hours at 24 volts
Approximately-25°F (32°C)	0.5 ampere-hours at 24 volts
Current at Temperature:	
Approximately 75°F (23.90C)	10 amperes for 8 minutes at 23 volts 400 milliamperes for 5 hours at 24 volts
Approximately 25°F(32°C)	2.0 amperes for 15 minutes above 20 volts, 400 milliamperes for 3.3 hours at 24 volts
Voltage:	
Open circuit	Approximately 26 volts (fully charged with a 24-hour rest period)
Minimum life cycle (charge and discharge)	500 cycles
Weight	7 pounds maximum
Size	2.56 inches high, 12.2 inches long, and 4.0 inches wide

2-2. Characteristics with Outstation Equipment

The service time obtainable (before recharge) from the BB-542/U is a function of the specific radio equipment. Typical capabilities at 700F are given below:

USE MODE	TYPICAL SERVICE TIMES EQUIPMENT		
	AN/PRC-70	AN/PSC-1(SAT)	AN/PSC-1(LOS)
Intermittent-Receive 40 min/day and Transmit 1 min/week	10 days		
or Transmit 2 min/day	5 days	5 days	7 days
Continuous 1/9 Transmit/Receive	2-1/4 hr	2-3/4 hr	4-3/4 hr
Continuous Receive	8 hours	7 hours	7 hours
Continuous Transmit	15 minutes	20 minutes	66 minutes

2.3. Description of BB-5421U

The BB-5421U is a rechargeable 24-volt, 2 ampere hour, sealed nickel-cadmium battery containing 20 cells, charge control and internal heating elements (fig. 2-1) with a capability of being charged in approximately 20 to 60 minutes under all temperature conditions. The BB-5421U is designed to mate directly with the AN/PRC-70 radio by mounting under the radio. A connector (MS3112E:14-5S) is provided on the side of the battery for cable connection with a G-76/G handcranked generator or other power sources, so that the battery car be recharged and/or a AN/PRC-70 radio directly powered. The BB-542/U contains controls designed to prevent overcharge, overdischarge, or rapid charging at extreme low temperature conditions internal to the battery. Figure 2-2 is a schematic detailing the various control elements.

a. *Cell Construction.* Each of the 20 cells consists of a sealed cylindrical can containing the battery plates. The cells are nonspillable and can operate in any position. Two of the 20 cells are equipped with pressure switches for charge termination.

b. *Electrolyte.* The electrolyte which is a solution of potassium hydroxide (KOH) is completely contained within the cells and requires no additions or changes throughout the life of the battery

c. *Battery Box.* The battery box provides a waterproof container for the cells, when used with the transmit cover or mounted under the using radios. Two latches are provided for mounting to the catches on the radio. A manual vent relief valve is located in the end of the battery box to release any vacuum induced by air transport.

d. *Heater.* A thermostatically controlled heating element of 10 ohm resistance, which provides 130 watts of heat at a 36 volt input, is located in two parts, one under and one on top of the battery cells. Heat transfer paste is employed to rapidly transfer heat to the cells.

e. *Control Circuits.* Overcharge is prevented by stopping the charge when either one of two pressure switch equipped cells measures an over-pressure condition, which signals the start of overcharge. Overdischarge is prevented by terminating discharge when the battery voltage falls to approximately 20 volts. In order to accomplish this function without excessive drain currents, the discharge cutoff uses a magnetic latch relay and a microampere sensing circuit which does not drain the battery on standby. A fuse is provided in the event of short circuiting to protect the control elements. Low temperature protection is provided by a thermostatically controlled charge limiter and a heater circuit which warms the battery prior to the start of rapid charge.

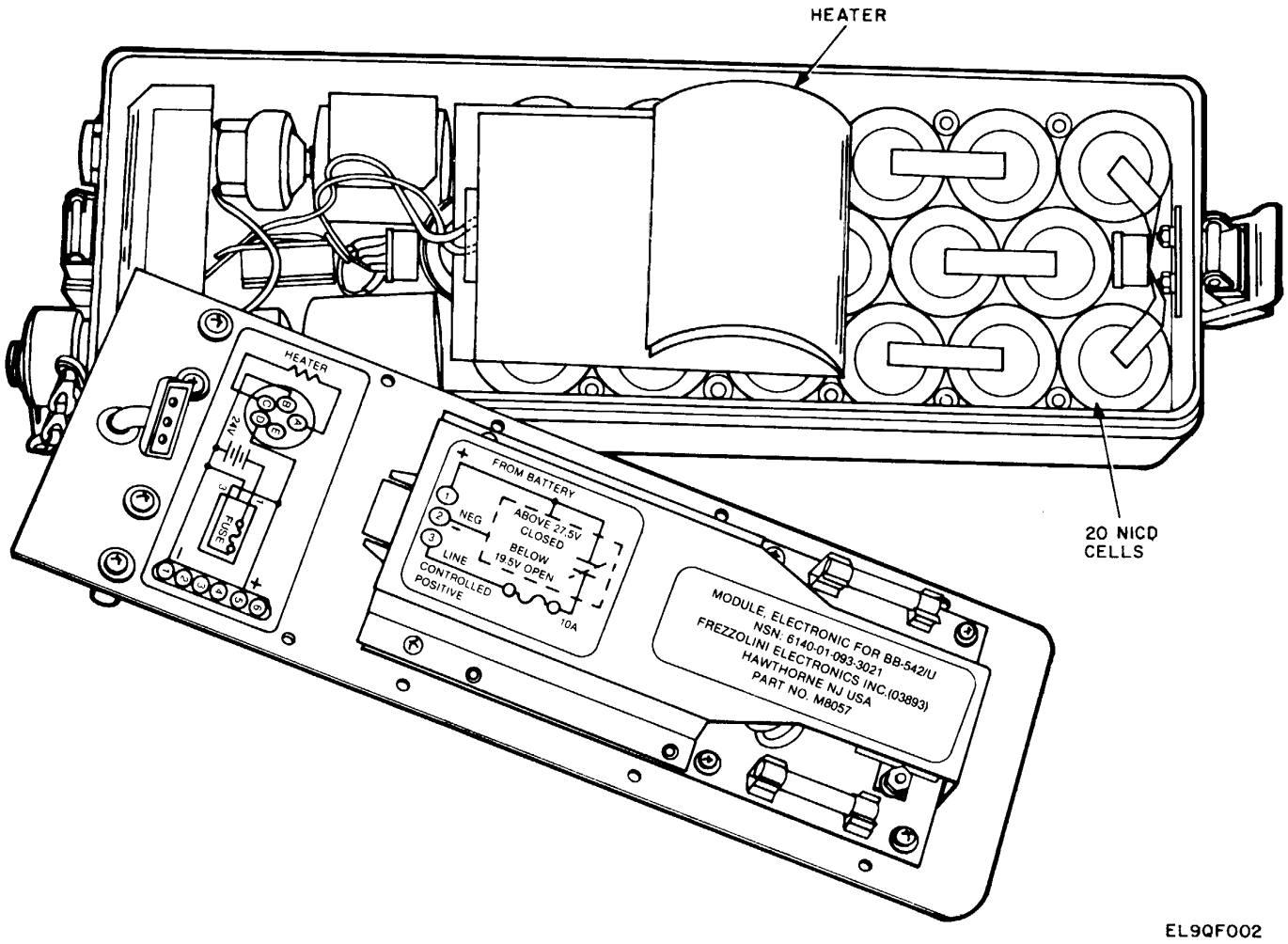


Figure 2-1. Battery, Storage BB-542/U.

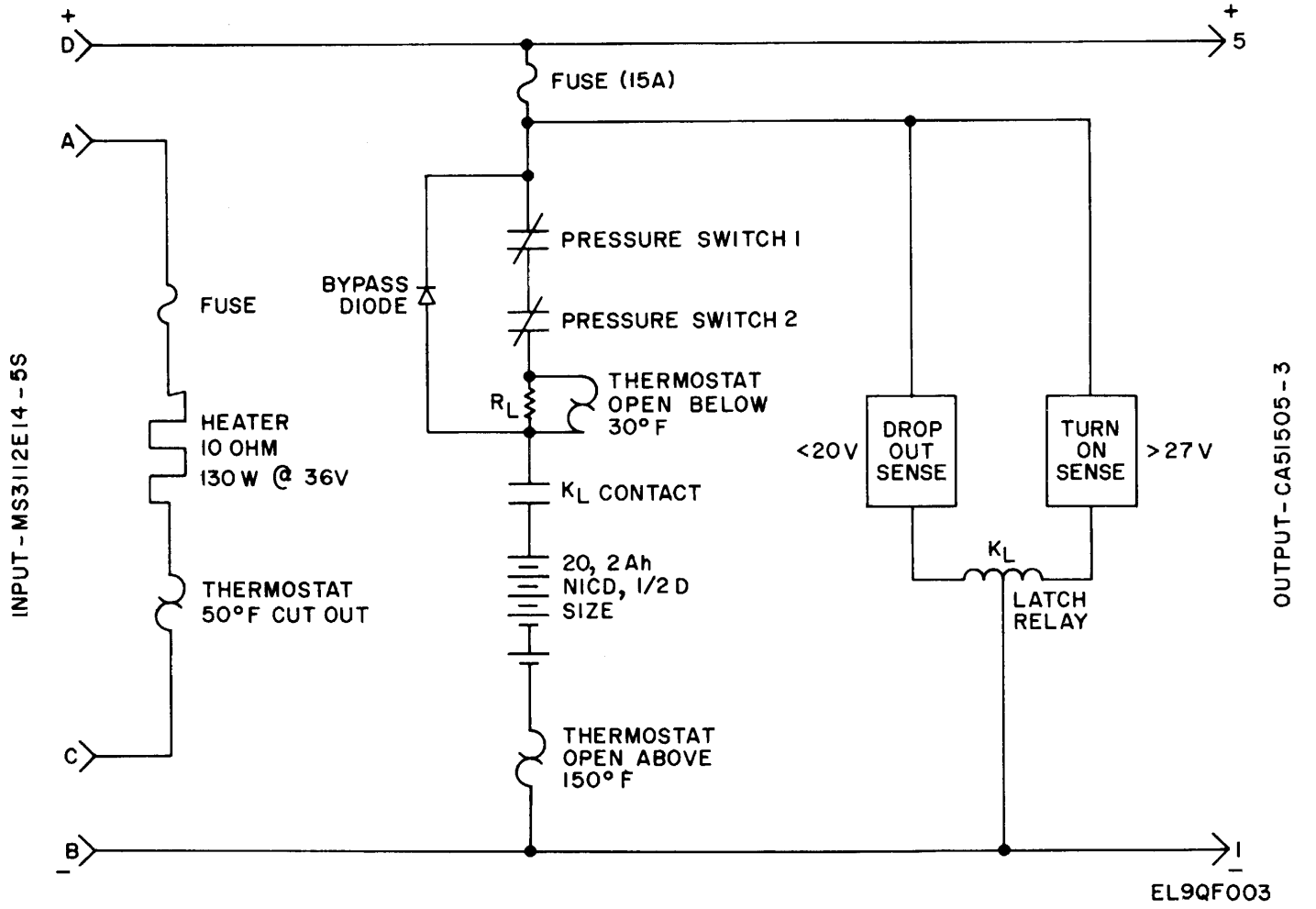


Figure 2-2. Battery, Storage BB-542/U Schematic Diagram.

CHAPTER 3

INSTALLATION

3-1. Unpacking

Battery, Storage BB-542/U is packed in protective material as shown in figure 3-1. The storage battery pack should be placed in a close fitting box as illustrated. One foam pad is placed at each end of the battery for protection, and then taped. The battery is then placed in a barrier bag and heat sealed closed. A multiple quantity of batteries can be packed in a single container. Batteries must be packed as specified within a close fitting box conforming to a container length and width of 48 x 24 inches and the weight not to exceed 100 pounds.

3-2. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on SF 364 (para 1-3b).

b. Check to see that the equipment is complete as listed on the packing slip. Report all discrepancies in accordance with procedures given in DA PAM 738-750. Shortages of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

NOTE

New batteries are prepared for service by direct support, general support, or depot maintenance personnel only.

c. Prepare the new battery for service as given in paragraph 3-4.

3-3. Battery Service Record

(Not applicable).

3-4. Installation of Battery, Storage BB-542/U

NOTE

Place into service only batteries that have been prepared for service by a qualified battery service facility. The battery is shipped in an activated-discharged state and must be charged before being used. See paragraph 4-12.

When installing the battery in its position, see that all electrical connections are made secure. Leads to the battery should be of sufficient size to carry the maximum current. The battery should be secured by holddowns.

3-5. Emergency Procedures

Alkaline or nickel-cadmium batteries may experience an overheated condition resulting from internal shorting or thermal runaway. The overheated battery presents a hazardous condition to equipment, vehicle, and personnel. When an overheated battery is detected, turn off charging source, disconnect all three battery connectors and wait for battery to cool. Emergency personnel should open the battery compartment, check for the following conditions and then take the action indicated.

WARNING

C02 is an acceptable fire extinguishing agent, once a fire has developed. In no case should C02 be directed into a battery compartment to effect cooling.

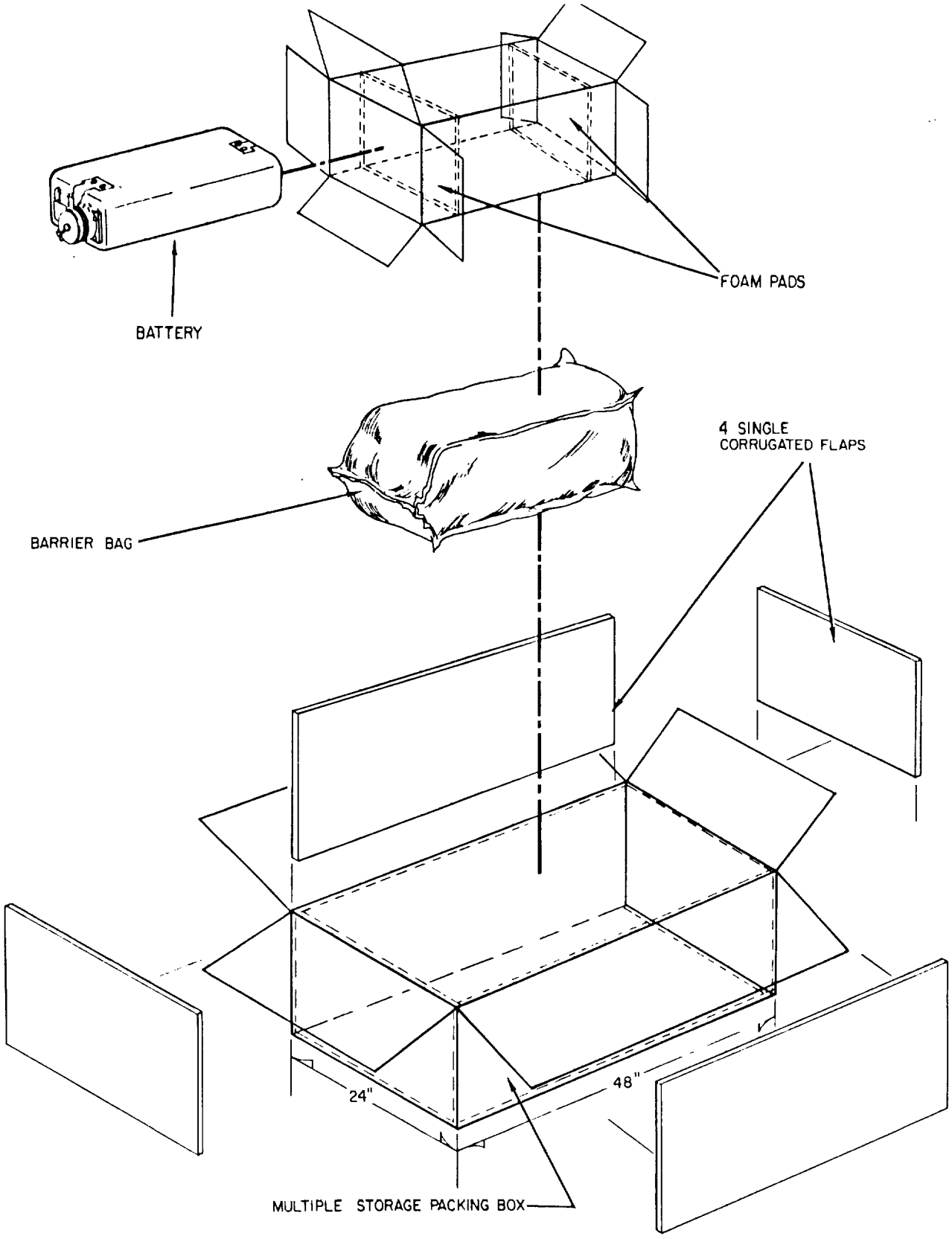


Figure 3-1. Battery, Storage BB-542/U, Packaging Diagram.

a. If no flame is present allow battery to cool and ventilate battery box. If necessary a water spray may be used to cool the battery box.
b. If flame is present, use a C02 fire extinguisher.

3-6. Functioning of the BB-5421U

The application of electrical energy to the storage battery (charging) causes the storage of a corresponding amount of chemical energy within its plates; the storage of chemical energy is accomplished through changes in the composition of the plate materials. When an electrical load is connected to the storage battery (discharging), the stored chemical energy is converted into a flow of electrical current through the load. In a sealed nickel-cadmium storage battery the specific gravity of the electrolyte cannot be measured to give an indication of the state of charge.

a. *Charging.* When the charging current (electrical energy) is applied to the storage battery, the cadmium-oxide material of the negative plates gradually becomes metallic cadmium. The nickel oxide material of the positive plates is brought to a higher state of oxidation. These changes (in both sets of plates) continue as long as the charging current is applied. Toward the end of this process, the cell generates gas because of the evolution of oxygen at the positive plates. At low rates of overcharge, i.e., 200mA, all the oxygen generated at the positive reacts with the negative electrode to maintain the composition of the components of the cell unchanged. The steady state pressure reached within the cells is very low. At higher rates of overcharge, i.e., 3A, enough pressure can be rapidly generated to cause cell venting if the charge is not stopped soon enough after overcharge and oxygen generation begins. In the BB-542/U the amount of overcharge is controlled by measuring the pressure in 2 of the cells of the battery and automatically terminating the charge once a pressure of approximately 10 psig is reached in one of the two control cells. When the battery stands, its internal pressure drops so that the pressure switches will cycle the charging current off and on If the battery is not removed from the charging source.

b. *Discharging.* When a load is connected to the storage battery, a reverse chemical action is immediately initiated. The positive plates gradually return to a state of lower oxidation, and the negative plates change from metallic cadmium to cadmium oxide. During this process, the amount of chemical energy that is converted to current flow is determined principally by the resistance of the load. In order to prevent reversal of any cells during deep discharge, the BB-542/U is equipped with an internal discharge cutoff which will automatically disconnect the battery from the load when the battery voltage falls to 20 volts. The battery will remain disconnected until a charging source of 28 volts, or higher, is connected to the battery.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE

4-1. Scope of Organizational Preventive Maintenance

The preventive maintenance duties assigned to the operator and organizational repair technician for the BB-542/U are listed below, together with a reference to the paragraph covering the specific preventive maintenance functions. Refer to the MAC Section III, Appendix B, for a list of tools and test equipment required for organizational maintenance.

a. Visual Inspection - paragraph 4-7
b. Electrical Leakage Test - paragraph 4-9
c. Battery Voltage Test - paragraph 4-10
d. Battery Charging - paragraph 4-11
e. Cleaning - paragraph 4-14

4.2. Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and checking of nickel-cadmium batteries to prevent occurrence of trouble, reduce downtime, and ensure that the equipment is serviceable.

a. *Systematic Care.* Procedures given in paragraphs 4-4 through 4-15 cover routine systematic care and cleaning essential to the proper upkeep of the battery.

b. *Preventive Maintenance Checks and Services.* The preventive maintenance checks and services charts (para 4-4, 4-5 and 4-6) outline checks and services to be performed at specific intervals. These checks and services are to maintain the BB-542/U in a combat-serviceable condition.

4-3. Organizational Preventive Maintenance Checks and Services

Organizational preventive maintenance checks and services of the BB-542/U are required weekly and monthly.

a. Paragraph 4-5 specifies checks and services that must be accomplished weekly.
b. Paragraph 4-6 specifies checks and services that must be accomplished monthly.

4-4. Operator Daily Preventive Maintenance Checks and Services Chart (At Equipment Site)

Sequence No.	Item to be Inspected	Procedure	Reference
1	Overall Battery	Clean top of cover.	
2	Overall Battery	During operation be alert for any abnormal condition.	None

4-5. Organizational Weekly Preventive Maintenance Checks and Services Chart for Battery BB-542/U

Sequence No.	Item to be Inspected	Procedure	Reference
1	Battery BB-542/U	Inspect battery.	Paragraph 4-7
2	Battery BB-542/U	Check battery voltage.	Paragraph 4-10
3	Battery BB-542/U	Charge battery.	Paragraph 4-11

4-6. Organizational Monthly Preventive Maintenance Checks and Services Chart

Sequence No.	Item to be Inspected	Procedure	Reference
1	Overall Battery	Inspect battery.	Paragraph 4-7
2	Overall Battery	Clean battery.	Paragraph 4-14
3	Overall Battery	Charge battery.	Paragraph 4-11
4	Overall Battery	Check leakage current of each battery.	Paragraph 4-9

4-7. Visual Inspection

Many causes of battery failure may be detected by visual inspection. Because the battery cannot be disassembled by an organizational repair technician, visual inspection is limited to observing the assembled battery. Only the fuse and dust cap can be replaced, obvious corrosion or contamination cleaned and loose nuts tightened at organization maintenance; for all other damages refer to higher category of maintenance. Release the snap fasteners and remove the battery cover. Check the storage battery for damage as indicated in (a) through (e) below:

a. Battery box or cover scratched or dented.
b. Connectors bent or broken.
c. Connector cover missing or bent.
d. Loose or missing control module holddown nuts.
e. Blown or missing fuse.

4-8. Organizational Testing

Testing will supplement the visual inspection in determining the cause of troubles which may occur in the storage battery. The tests given in paragraphs 4-9 and 4-10 may indicate an inoperative control module, defective cells, open wiring, or electrical leakage between the cells and the battery box.

4-9. Electrical Leakage Test

Prior to performing this check of the battery, all electrical cables should be disconnected from the unit under test. The electrical leakage test will indicate conditions that may cause the storage battery to discharge faster than normal or to discharge when not in use.

a. Use Multimeter, or equivalent, set to indicate on the 50 volt scale at 1,000 ohms per volt.
b. Connect positive lead of multimeter to positive (+) terminal of battery connector.
c. Connect negative lead to bare metal or unpainted area of case or connector shells.
d. If the TS-352B/U indicates less than 1 volt, set it to indicate on the 10 volt scale at 1,000 ohms per volt. The voltage indicated must be less than 1 volt.

NOTE

If the voltage is greater than 1 volt, leakage is present. The battery should be turned over to support maintenance.

e. Connect negative lead of multimeter to negative (-) terminal of battery.
f. Connect positive lead of multimeter to unpainted area of battery case such as the latches or screws on the connector.
g. Indications should be the same as those obtained in d above. If both indications are below 1 volt return battery to normal service.

4-10. Battery Voltage Test

Check the voltage of the BB-542,/U with the TS-352B/U or equivalent as follows:

a. Read between Pin 1 (minus) and Pin 5 (plus) on the top of 6 pin connector.
b. If recently charged, voltage should be approximately 26 volts or higher.
c. If zero voltage is read, apply 30 volt charging source (para 4-11) to battery for 1 minute. Listen for relay "click" when voltage is first applied.
d. Zero voltage after a 30 volt charging source is applied may indicate a defective control module.

NOTE

Low voltage (25 volts or less) may indicate defective cells, pressure switch controls, or thermal switch. However it may also be due to normal discharge of the battery.

4-11. Charging Procedures

The battery may be charged from any controlled power supply having an available voltage between 30 and 36 volts, and a current capability between 200 mA and 6 amperes. However, best results will be obtained by using modified constant potential charger with the current limited to 2 to 3 amperes, and the voltage set at 31.1 volt. At 2 amperes, 1-1/4 hours are required for a full charge. At 3 amperes, only 45 to 60 minutes are needed. Charging should be carried out at a battery temperature of 50-90"F (10-32°C). Charging at 32 to 125°F (0-520C) is permitted, but will result in a slight reduction in capacity. Below 30"F, rapid charging will be inhibited by the internal thermal controls and will not take place unless power is also provided to the heater circuit. Recommended charging conditions for optimum performance are given in Table 4-1.

Table 4-1. Recommended Charge Conditions with Power Supply for Optimum Performance

Battery Temperature	Current	Voltage	Time
90-125"F	3A	30-32V	1 hour
50-90"F	2A	30-32V	1-1/4 hours
30-50"F	1A	30-32V	2-1/2 hours
Under 30°F ∗	4A ∗	30-32V	1-1/2 hours

∗ Power required for internal heater

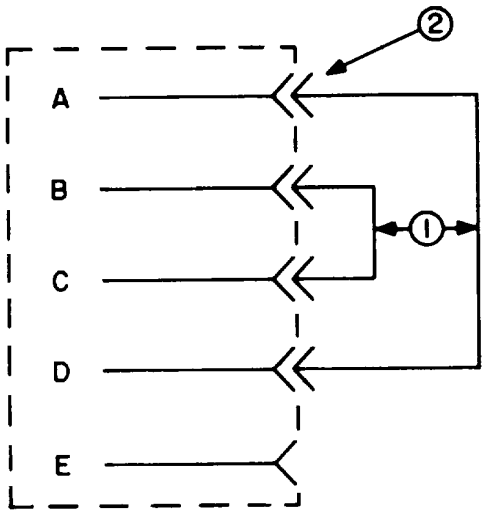
a. Charging from a Power Supply at Low Temperatures. Set power supply to specific current and voltage limits. Connect power supply to *BB-542/U* through top 6 pin connector using cable ES-D-212028 to any power supply with banana type outputs. Turn on power supply. Connect jumper plug fabricated as shown in figure 4-1 to 5 pin MS3112E-14-5S connector on side of battery. This will energize heater circuit.

CAUTION

Jumper plug must be removed except when power is being provided from power supply or battery will be discharged.

NOTE

Insulate battery from external environment to the greatest extent possible Wrap in towel, sleeping bag, etc.



MS 3116-J14-5P (NSN 5935-00-632-7314)
(1) #16 WIRE
(2) SOLDER (4 PLACES)

EL9QF004

Figure 4-1. Jumper Plug Fabrication

b. Charging with G-76/G Handcranked Generator.

(1) Temperature above 50°F. Connect cable from G-76/G to MS3112E-14-55 connector on side of battery. Crank generator at a speed sufficient to cause 2 ampere indicator light on generator to turn on. Continue cranking at 2 ampere rate until load suddenly lowers due to opening of pressure switch within the battery. The 3A light on generator will be extinguished and will not turn on, no matter how fast the generator is cranked. Battery is now fully charged.

(*2)* Temperature between 30° and 500F. Connect cable from G-76/G to MS3112E-14-55 connector on side of battery. Crank generator at a speed sufficient to cause 2 ampere indicator light on a generator to turn on. Continue cranking until G-76/G light goes out and stays out irrespective of charging speed. This will indicate that the battery is fully charged. At temperatures between 300 and 500F, the load on the generator may not change significantly when the pressure switch opens because the heater circuit will start drawing power after the battery is fully charged. The G-76/G does not provide any indication of the current in the heater circuit. The battery may also be charged intermittently as above.

(3) Temperatures below 30°F. At temperatures much below 300F intermittent charging is not recommended because a significant amount of cranking energy will be required to bring the battery to 30°F before high rate charging will start. The suggested procedures for minimum cranking time and effort is as follows:

(a) Start with a battery that is almost completely discharged.

(b) Keep battery in heated area if possible.

(c) Wrap battery with insulating material such as blanket, sleeping bag, coat, etc. to prevent heat loss.

(d) Crank at highest sustained rcte possible, use a 2 person cranking to minimize exposure time and resulting heat loss.

For each 10°F the battery is below 30°F, 2 minutes of heating at 130 watts, or 3 minutes at 3 ampere (90 watts), will be required before high rate charging will start. Thus, with the battery at -200F, approximately 10-15 minutes of heating will be required to bring it to 30°F where high rate charging can begin. When high rate charging starts, the current will be automatically switched by G-76/G generator from the heater to the battery. At this time the 2 ampere light will go on if the generator is being cranked at a fast enough rate. If the external temperature is low, the heater will switch on for 2 to 3 minute periods every 5 to 10 minutes during the charge, extinguishing the 2 ampere light on the generator while still maintaining a load on the generator. Total charge time at a 90 watt power input level will vary from about 45 minutes at 200F to 65 minutes at -25°F. Figure 4-2 is a typical curve showing the on-off heating characteristics at a fixed cranking speed.

20°F to 65 minutes at -250F. Figure 4-2 is a typical curve showing the on-off heating characteristics at a fixed cranking speed.

After the battery has been completely charged the heater load will still be maintained on the G-76/G generator until the battery temperature reaches approximately 500F. It is therefore difficult to determine when cranking can be stopped; however, if cranking has continued continuously at 2 amperes or above for the times given previously and the 2 ampere light cannot be lit after 3 minutes of additional cranking, then the battery is fully charged.

4-12. Discharge

The battery is designed to be discharged at currents up to 10 amperes Currents in excess of 15 arnperes or temporary shorting of output loads will cause the battery fuse to blow. The battery is equipped with an automatic discharge cutoff which will stop the discharge of the battery when its voltage falls to 20 volts. The battery cannot be discharged again and will read 0 volts at the output terminals unless it is exposed to an input voltage greater than 28 volts, which will reset the latch relay contacts. The battery is capable of 500 or more charge-discharge cycles however. operating, at temperatures above 120°F tends to degrade performance. Reduced performance is obtained at temperatures of -25°F to -40°F particularly for low currents associate,? with the radio receive loads.

4-13. Storage

The battery is capable of extended storage (up to 5 years) if temperature excursions above 120°F are limited. Charge retention in storage is dependent on temperature. Capacity loss will average approximately 4% per day at 120°F, 1% per day at 70°F, and 0.3% per day at 30°F.

4-14. Cleaning Storage Battery

Normal cleaning of nickel-cadmium battery involves removing the battery box cover. Clean battery by removing dirt and corrosion from connectors and other visible hardware. Do not use solvents for cleaning the storage battery.

4-15. Organizational Repair of Battery, Storage BB-542/U

Repair of the storage battery at the organizational maintenance category consists of replacing fuses and dust caps, cleaning obvious corrosion and dirt, and tightening loose screws.

WARNING

The storage battery is charged and will cause bodily injury and equipment damage if the cells or internal connections are short-circuited, or if the fuse is bypassed and the external connectors are short-circuited.

a. *Removal and Replacement of Dust Cap.*
   (1) Remove the screw that holds the dust cap keeper chain to the battery.
   (2) Place new dust cap in position on connector.
   (3) Secure the dust cap by inserting the screw and tightening it to the battery.

b. *Removal and Replacement of Fuse.*
   (1) Disconnect all external loads.
   (2) Remove defective fuse from fuseholder.
   (3) Examine fuseholder contacts for dirt or corrosion.
   (4) Remove spare fuse from holder.
   (5) Place spare fuse in fuseholder.

c. *Tightening Screws and Nuts.* The only screws and nuts that should be tightened by the operator are those holding the MS3112E-14-55S connector and the four screws holding the control module to the battery.

4-16. Organizational Troubleshooting Chart

The organizational troubleshooting chart, Table 4-2, will aid in isolating troubles that occur in the BB-542/U.

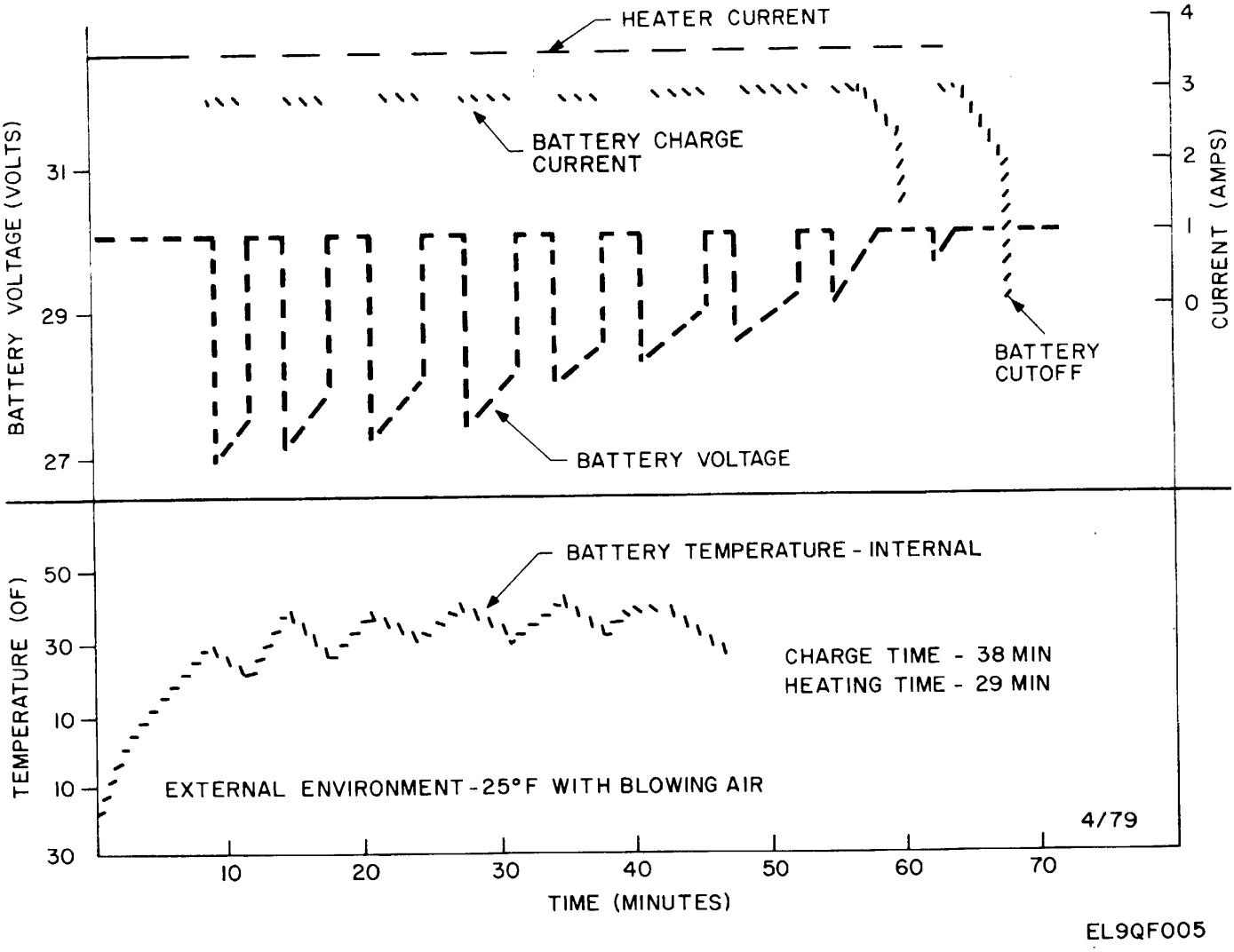


Figure 4.2. BB-542/U Low Temperature Charging.

Table 4-2. Organizational Troubleshooting Chart

CONDITION	PROBABLE TROUBLE	CORRECTION
No storage battery voltage.	Battery is discharged.	Charge with a power source having a minimum available voltage of 30 volts.
	Fuse blown.	Disconnect battery from external loads. Replace fuse. Apply charging voltage of 30 volts minimum to reset latch relay.
	Fuse connections are loose or dirty.	Clean and tighten fuse contacts.
	Defective control module.	Check voltage between Pin 1 (minus) on top connector and socket A (plus) of internal connector. If normal voltage is present, higher category of maintenance repair required.
	Battery temperature above 150°F.	Place battery in shade to cool.
	Battery over temperature cutout defective.	Higher category of maintenance repair required.
No storage battery voltage after full charge.	Defective bypass diode	Let battery stand for 1 hour until pressure switch resets. Voltage will then appear at battery terminals. Higher category maintenance required.
Low storage battery voltage.	Battery is partially discharged because of use or extended storage.	Fully charge battery, then recheck voltage.
		Test in accordance with paragraph 4-9. If readings are above 1 volt, higher category of maintenance repair required.
	One or more unbalanced or defective cells.	Charge battery at 200 mA for 16 to 20 hours. If voltage still remains low, higher category of maintenance repair required.

Table 4-2. Organizational Troubleshooting Chart Continued

CONDITION	PROBABLE TROUBLE	CORRECTION
No capacity before battery cutoff.	Battery not charged.	Charge battery at 30 volts.
	Defective pressure switch control preventing charge.	Higher category of maintenance repair required.
	Battery charged at low temperature with inoperative heater.	Check resistance of heater through Pins A and C of MS3112E-14-5S connector. At temperatures below 50 +50F resistance is 10 ohms above 50 5°0F read open circuit. If other values are measured, higher category of maintenance repair required.
	NOTE If no source of charging power is available. the latch relay may be reset, in an emergency. by using a short length of wire (or paper clip) to quickly short the back of socket 1 *(white/red* wire) to socket 3 (red wire) on the internal 3 pin connector. After relay clicks "on" remove the shorting wire.	

CHAPTER 5

DIRECT SUPPORT MAINTENANCE

5-1. General Instructions

The direct support maintenance procedures given in paragraphs 5-3, 5-4 and 5-5 supplement the procedures described for the organizational maintenance repairman. Tools, materials, and test equipment required for maintenance are listed in paragraph 5-2 and Appendix B, Section III. Direct support, general support, and depot maintenance for the storage battery consists of the following:

a. Constant Current Charging Procedure - paragraph 5-3
b. Direct Support Troubleshooting Chart - paragraph 5-4
c. Capacity Discharge Test - paragraph 5-5

5-2. Test Equipment, Tools, and Materials

a. Power Supply, PP-6148/U
b. Cable Assembly ES-D-212025, or
c. Cable Assembly ES-D 212028
d. Multimeter TS-352BfU, or equivalent
e. Resistor 20 ohms, 50 watt
f. Resistor, Variable, 0-7.5 ohms, 1,000 watt (NSN 5905-00-195-4496)

5-3. Constant Current Charging Procedure

a. Place the storage battery on a clean dry surface as close as possible to the PP-6148/U, or equivalent power supply.
b. Release the two snap fasteners and remove the cover from the battery case.
c. Turn on power and adjust the PP-6148/U to the current and voltage given in table 4-1. Turn PP-6148/U *off.*
d. Connect cable from PP-6148/U to BB-542/U and turn PP-6148/U on. Verify that specified current is flowing.
e. Charge will continue until the pressure switch cutoff is reached. The battery is fully charged at this time; however, it may be left connected to the charge without damaging the battery. At normal temperatures the pressure switch will reset approximately every 15 minutes due to the drop in internal cell pressure to permit about 30 seconds of additional charge.

5-4. Direct Support Troubleshooting Chart

The Direct Support Troubleshooting Chart, table 5-1, is provided to aid in isolating troubles that could occur in the storage battery. Before following the procedures outlined in the chart, visually inspect the storage battery to determine whether the trouble is caused by loose or corroded connections, fluid in the battery, or a broken wire.

5-5. Capacity Discharge Test

Testing will supplement the troubleshooting procedures in determining the cause of troubles which may occur in the storage battery.

WARNING

Do not discharge a storage battery by short-circuiting its output terminals. This practice may damage the battery and can cause severe burns if the shorting bar is held in the hand.

After the storage battery is fully charged, discharge the storage battery at a temperature of 600 to 80°F at 4.0 amperes for exactly 15 minutes (1.0 ampere hour). Use cable assembly ES-D-212028, Multimeter TS-352B/U, and resistor, variable 0 to 7.5 ohm, 1,000 watt (NSN 5905-00-195-4496). After 15 minutes of discharge, the closed circuit, battery minimum voltage should be 20 volts. If the storage battery is less than 20 volts, or has cutoff, the s' rage battery is defective.

5-6. Administrative Storage of Nickel-Cadmium Batteries

Nickel-cadmium batteries can be placed in administrative storage because of no Immediate operational need and the necessity to reduce the maintenance workload; or to hold it ready while the associated end item of equipment is in the repair or overhaul process or for temporary excess quantities of direct exchange batteries. The nickel-cadmium battery is handled differently under each set of circumstances.

CAUTION

DO NOT store batteries in equipment when equipment is not in use.

a. *Normal Administrative Storage Procedures.* The following procedure applies when a nickel-cadmium battery is being placed in normal administrative storage.

(1) Remove the nickel-cadmium battery from the end item of equipment.

(2) Perform the cleaning procedures in paragraph 4-14.

(3) When the nickel-cadmium battery is to be returned to service, perform the charging procedures, paragraph 4-11.

b. Hold-Ready Administrative Storage Procedures. The following procedure applies when a nickel-cadmium battery is placed in a hold-ready administrative storage while the end item of equipment is in the repair or overhaul process.

(1) Remove the nickel-cadmium battery from the equipment.

(2) Perform capacity discharge test of paragraph 5-5.

(3) Place the nickel-cadmium battery in the ready-hold administrative storage area. Protect from freezing and excessive heat.

(4) When the nickel-cadmium battery is required for installation in the repaired or overhaul end item of equipment, remove it from administrative storage.

(5) Charge the nickel-cadmium battery in accordance with the instructions contained in paragraph 4-11.

(6) Install the nickel-cadmium battery in the end item equipment.

5-7. Disposition of NICAD Batteries

CAUTION

DO NOT mutilate, incinerate, or throw away batteries with trash. Nickel-cadmium batteries are a potentially environmentally hazardous material. The Defense Property Disposal Service is responsible for disposal of hazardous items.

a. For disposal of NICAD batteries coordinate action with your local Defense Property Disposal Office (DPDO).

b. Prepare DD Form 1348-1, Disposal Turn-in Document, in four copies.

c. Provided the batteries are properly identified, packaged, and labeled DPDO will accept accountability and physical custody depending upon availability of most nearly conforming storage areas. DPDO will then process batteries for final disposition.

Table 5-1. Direct Support Troubleshooting Chart

CONDITION	PROBABLE TROUBLE	CORRECTION
No storage battery voltage.	Defective control module.	First check fuse. If fuse is good, connect to 30 volt DC source and attempt to charge. If no voltage is measurable at the external connector, check voltage between Pin 1 (minus) on top connector and socket A (plus) of the internal connector. If normal voltage is present across these points, then remove four hold-down screws and disconnect the internal battery connector. Lift out entire control module. Replace with new module and attempt to charge again.
	Battery overtemperature cutout defective.	With control module connected but not mounted on battery, lift up insulators and top heating pad. The thermal cutout is located between the two end cells farthest from the connectors. Check for continuity with an ohmmeter. If thermal cutout is open, replace or bypass with a short length of no. 6 wire.
	Defective cell (open) or open connection in battery.	Using voltmeter, place negative probe in Pin 1 of top connector and probe with positive lead from cell to cell until source of open is found. Resolder any broken connections if found, taking care not to overheat cells. If a cell is internally open, the battery must be replaced. Return defective battery as a source of spare parts.
No storage battery voltage immediately after full charge.	Defective bypass diode.	Test diode for continuity with multimeter and replace if defective.

Table 5-1. Direct Support Troubleshooting Chart - Continued

CONDITION	PROBABLE TROUBLE	CORRECTION
Low storage battery voltage.	Electrical leakage.	Test in accordance with paragraph 4-9. If readings are above 1 volt, battery must be cleaned. Remove control module, then wash battery with clean water and dry thoroughly. Check leakage value before reassembling battery.
	One or more unbalanced or defective cells	Charge at 200 mA for 20 hours. Read open circuit voltage, which shall be above 26 *volts.* Discharge at 1.2A through 20 ohms, 50 watt resistor minimum cutoff is 1 hour. Charge at 200 mA for 20 hours. If battery does not recover after 3 cycles, or low voltage is present indicating a shorted cell, it should be discarded. Salvage spare parts for use in other batteries.
No capacity	Defective pressure switch preventing charge.	Charge at 200 mA for 20 hours. Periodically monitor current on PP-6148/U to assure that pressure switch does not prematurely terminate charge. Premature cutoff of charge after only 2 or 3 hours would indicate a defective pressure switch. Remove the plug on the control module. Gain access to the two pressure switches (refer to fig. 5-1) by removing the control module *and* the 6 pin connector. Use an ohmmeter to check which switch is in the open position. Grasp metal barrel of pressure switch and turn the cap counterclockwise 1/4 turn to release internal pressure. Tighten pressure switch and again check switch contacts with an ohmmeter. If switch is still open, battery should be discarded. If switch is closed, reassemble top connector and control module, then charge battery at *3A* and

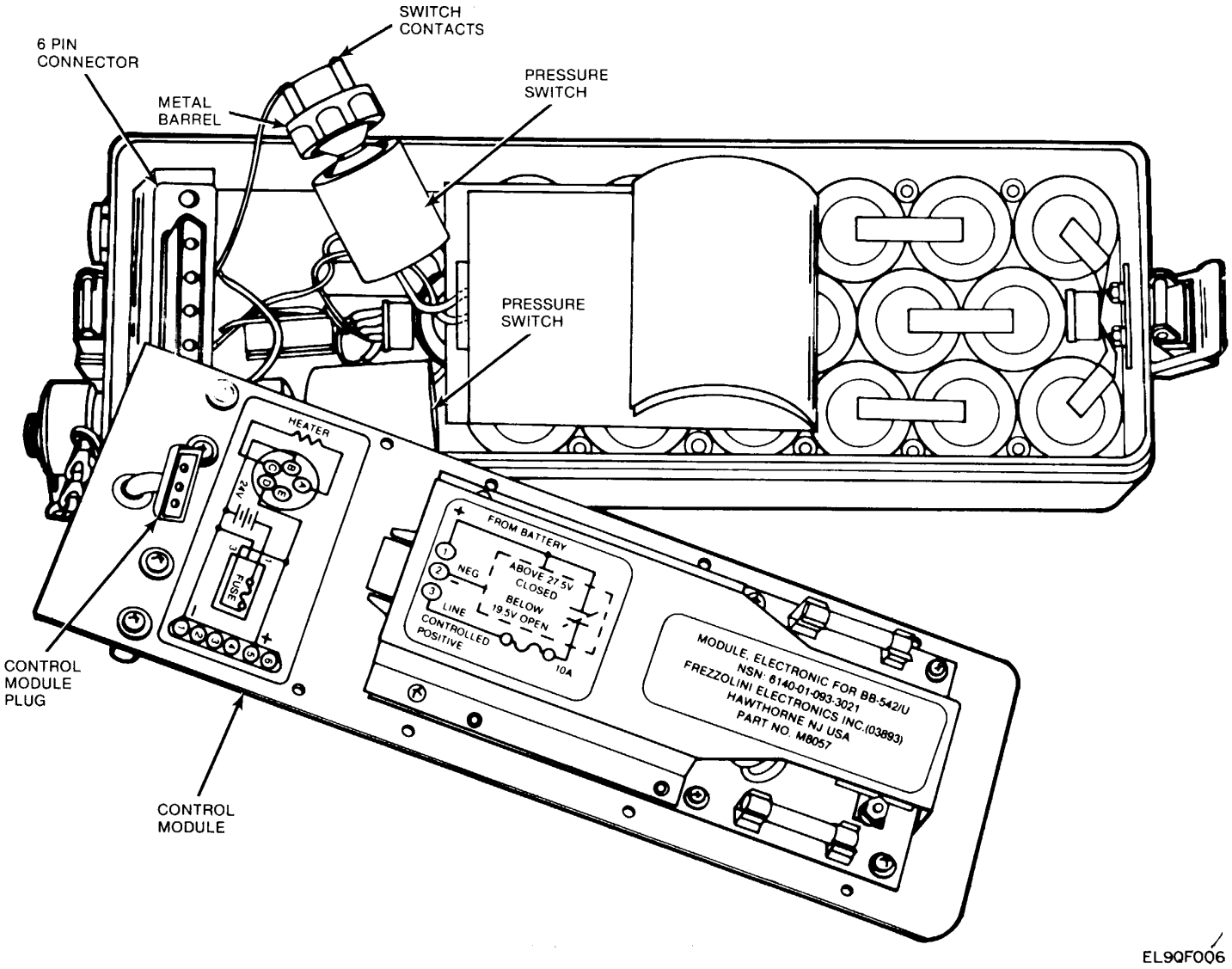


Figure 5-1. Pressure Switch Turning.

Table 5-1. Direct Support Troubleshooting Chart - Continued

CONDITION	PROBABLE TROUBLE	CORRECTION
		31 l 1V for 2 hours. The charge should be complete and the switch should reset at least once during the second hour of charge, otherwise replace battery.
No capacity after low temperature charge.	Inoperative heater.	With battery at a temperature of 400F or less, use ohmmeter and measure resistance between Pins A and C of connector MS3112E-14-5S. Reading should be 10 +1 ohm. A reading of 20 ohms would indicate that one of the two heater blankets are defective. Only the top heater is replaceable. An open reading would indicate a defective thermal switch. Replace thermal switch or use battery only at temperatures above 300F.
Overheating on charge	Shorted bypass diode.	Loosen eight screws holding the control module plate to battery. Diode is located under 6 pin connector. Check with TS-352B/U in ohmmeter mode. A low resistance in both directions would indicate a defective diode. Replace diode if shorted.

APPENDIX A
REFERENCES

DA Pam 310-1	Consolidated Index of Army Publications and Blank Forms.
DA Pam 738-750	The Army Maintenance Management System (TAMMS).
SB 11-573	Painting and Preservation of Supplies Available for Field Use for Electronic Command Equipment.
TB 43-0118	Field Instructions for Painting and Preserving Electronics Command Equipment Including Camouflage Pattern Painting or Electrical Shelters.
TM 11-6115-470-10	Operator's Manual, Direct Current Generator G-76/G (NSN 6115-01-082-8107), Direct Current Generator G-76/G(V)1, Direct Current Generator G-76/G(V)2.
TM 11-6130-356-12	Operator's and Organizational Maintenance Manual Power Supply PP-6148/U (NSN 6130-01-062-3618).
TM 11-6140-203-14-1	Operator's Organizational, Direct Support, General Support, Maintenance Manual: Aircraft and Nonaircraft Nickel-Cadmium Batteries (General).
TM 11-6625-366-10	Operator's Manual for Multimeter TS-352B/U (NSN 6625-00-553-0142).
TM 750-244-2	Procedures for Destruction of Electronics Materiel to Prevent Enemy Use (Electronics Command).

APPENDIX B
MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations for BB-542/U. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B.2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

b. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

e. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

f. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used in precision measurement. Consists of comparisons of two Instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

g. Install. The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment of system.

h. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

i. Repair. The application of maintenance services (inspect, test, service, adjust, align, calibrate. replace) or other maintenance actions (welding, grinding, riveting. straightening, facing. remachining. or resurfacing) to restore serviceability to an item by correcting specific damage, fault. malfunction. or failure in a part, subassembly. module (component or assembly), end item, or system.

j. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

k. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of turning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components.

B-3. Column Entries

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, and modules with the next higher assembly.

b. Column 2, Component/Assembly. Column 2 contains the noun names of components, assemblies subassemblies, and modules for which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

d. Column 4, Maintenance Category. Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category.

The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in addition to the time required to perform the specific task' identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C - Operator/Crew

O - Organizational

F - Direct Support

H - General Support

D - Depot

e. Column 5, Tools and Equipment. Column 5 specifies by code, those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function.

f. Column 6, Remarks. Column 6 contains an alphabetic code which leads to the remark in section IV

Remarks, which is pertinent to the item opposite the particular code.

B-4. Tool and Test Equipment Requirements (Sect. III)

a. Tool or Test Equipment Reference Code. The numbers in this column coincide with the number, used in the tools and equipment column of the MAC. The numbers indicate the applicable tool and test equipment for the maintenance functions.

b. Maintenance Category. The codes in this column indicate the maintenance category allocated the tool or test equipment.

c. Nomenclature. This column lists the noun name and nomenclature of the tools an(d test equipment required to perform the maintenance functions.

d. National/NATO Stock Number. This column lists the National/NATO stock number of the specific tool or test equipment.

e. Tool Number. This column lists the manufacturer's part number of the tool followed by the Federal Supply Code for manufacturers (5-digit) in parentheses.

B-5. Remarks (Sect. IV)

a Reference Code. This code refers to the appropriate item in section II, column 6.

b. Remarks. This column provides the required explanatory information necessary to clarify items appearing In section II.

Section II. MAINTENANCE ALLOCATION CHART
FOR
BATTERY, STORAGE
BB-542/U

(1) GROUP NUMBER	(2) COMPONENT/ASSEMBLY	(3) MAINTENANCE FUNCTION	(4) MAINTENANCE CATEGORY C	O	F	H	D	(5) TOOLS AND EQPT	(6) REMARKS
00	BATTERY, STORAGE								
	BB-542/U	INSPECT		0.1					A
	(NICKEL-CADMIUM	SERVICE		0.5				3	C
	SEALED)	TEST		0.1				1, 2, 7	B
		REPLACE		01					D
		INSPECT		0.5					A
		TEST		1.0				1,2,4 thru 7	E
		REPLACE		0.2				3	F
		REPAIR		1.0				3	G

Section III. TOOL AND TEST EQUIPMENT REQUIREMENTS FOR BATTERY, STORAGE BB-542/U

TOOL OR TEST EQUIPMENT REF CODE	MAINTENANCE CATEGORY	NOMENCLATURE	NATIONAL/ NATO STOCK NUMBER
1	O, F	MULTIMETER, TS-352B/U	6625-00-553-0142
2	O, F	POWER SUPPLY, PP-6148/U	6130-01-062-3618
3	O, F	TOOL KIT, ELECTRONIC EQUIPMENT TK-101!G	5180-00-064-5178
4	F	RESISTOR VARIABLE, 0-7.5 OHMS, 1000 WATT	5905-00-195-4496
5	F	RESISTOR 20 OHMS, 50 WATT	5905-00-194-6640
6	F	STOPWATCH	6645-00-903-1696
7	O, F	CABLE ASSEMBLY ES-D-212025 OR ES-D-212028	

Section IV. REMARKS

REFERENCE CODE	REMARKS
A	EXTERIOR
B	OPERATIONAL
C	CLEAN AND TIGHTEN SCREWS
D	FUSE AND DUST CAP ONLY
E	EVERYTHING
F	CONNECTOR RECEPTACLES, CONNECTOR PLUG, SEMICONDUCTOR DEVICE (DIODE), ELECTRONIC (CONTROL) MODULE, VENT(PRESSURE) RELIEF VALVE
G	LIMITED TO REPLACEMENT OF ABOVE ITEMS

APPENDIX C
REPAIR PARTS LIST

SECTION I. Introduction

C-1. Scope

This manual lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of organizational and direct support maintenance of the BB-542/U. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

C-2. General

This Repair Parts and Special Tools List is divided into the following sections:

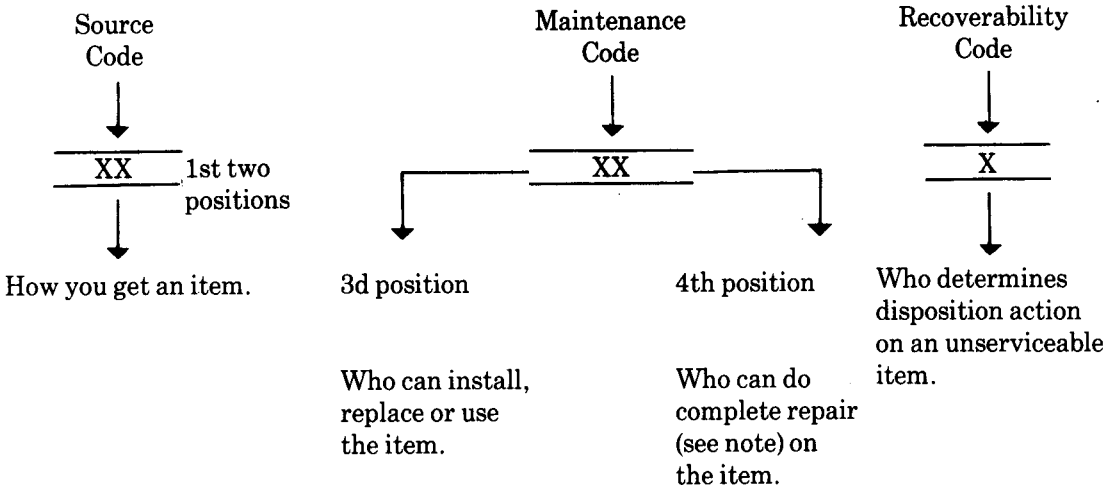
a. *Section II - Repair Parts List*. A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending numeric sequence, with the parts in each group listed in ascending item number sequence. Figure numbers are listed directly beneath the group header.

b. *Section III - Special Tools List*. Not applicable.

c. *Section IV - National Stock Number and Part Number Index*. A list, in National item identification number (NIIN) sequence, of all National stock numbered items appearing in the listing, followed by a list in alphameric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration figure and item number appearance. C-3. Explanation of Columns (Section II and III)

a. *Item No. (Column (1))*. Indicates the number used to identify items called out in the illustration.

b. *SMR Code (Column (2))*. The source, maintenance, and recoverability (SMR) code is a five-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:



NOTE

Complete repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) Source code. The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follows:

Code	Explanation
PA PB PC PD PE PF PG	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category in PC indicted by the code entered in the third position of the SMR code. **NOTE** Items coded PC are subject to deterioration.
KD KF KB	Items with these codes are not to be individually. They are part of a kit which is authorized to the maintenance category indicated in the third position of the SMR code. The complete kit must be requisitioned and applied.
MO–Made at org/ AVUM category MF–Made at DS/ AVUM category MH–Made at GS category ML–Made at Specialized Repair Activity (SRA) MD–Made at Depot	Items with these codes are not to be requested/requisitioned individually. They must be made from bulk material which is identified by the part number in the description and usable on code (UOC) column and listed in the Bulk Material group of the repair parts list. If the item is authorized to you by the third position code of the SMR code, but the source code indicates it a higher category, order the item from the higher category of maintenance.
AO –Assembled by org/AVUM category AF –Assembled by DS/AVUM category AH –Assembled by GS category AL –Assembled by SRA AD –Assembled by Depot	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be category of maintenance indicated by the source code. If the disposition code of the SMR code authorizes you to replace the item, but the source code indicates the item is assembled at a higher order the item from the higher category of maintenance. AD-Assembled by Depot

re ...embled at the

XA-Do not requisition an "XA" coded item. Order its next higher assembly.
XB-If an "XB" item is not available from salvage, order it using the FSCM and part number given.
XC-Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturers part number.
XD--Item is not stocked. Order an "XD" coded item through normal supply channels using the FSCM and part number given, if no NSN is available.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded XA or those aircraft support items restricted by requirements of AR 750-1.

(2) Maintenance code. Maintenance codes tell you the category of maintenance authorized to USE and REPAIR support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance category authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following categories of maintenance.

Code	Application/Explanation
C	Crew or operator maintenance done within organizational or aviation maintenance.
O	Organizational or aviation unit category can remove, replace, and use the item.
F	Direct support or aviation intermediate category can remove, replace, and use the item.
H	General support category can remove, replace, and use the item.
L	Specialized repair activity can remove, replace, and use the item.
D	Depot category can remove, replace, and use the item.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance category with the capability to do complete repair (i.e., perform all authorized repair functions). This position will contain one of the following maintenance codes.

NOTE

Some limited repair may be done on the item at a lower category of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

Code	Application/Explanation
O	Organizational or aviation unit is the lowest category that can do complete repair of the item.
F	Direct support or aviation intermediate is the lowest category that can do complete repair of the item.
H	General support is the lowest category that can do complete repair of the item. L-Specialized repair activity (designate the specialized repair activity) is the lowest category that can do complete repair of the item.
D	Depot is the lowest category that can do complete repair of the item.
Z	Nonreparable. No repair is authorized.
B	No repair is authorized. (No parts or special tools are authorized for the maintenance of a "B" coded item.) However, the item may be reconditioned by adjusting, lubricating, etc., at the user category.

(3) Recoverability code. Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR Code as follows:

Recoverability codes	Application/Explanation
Z	Nonreparable Item. When unserviceable, condemn and dispose of the item at the category of maintenance shown in the third position of SMR Code.
O	Reparable Item. When uneconomically reparable, condemn and dispose of the item at organizational or aviation unit category.
F	Reparable Item. When uneconomically reparable, condemn and dispose of the item at direct support or aviation intermediate category.
H	Reparable Item. When uneconomically reparable, condemn and dispose of the item at general sup-port category.
D	Reparable item. When beyond lower category repair capability, return to depot. Condemnation and disposal of item not authorized below depot category.
L	Reparable item. Condemnation and disposal not authorized below specialized repair activity (SRA). A-Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. FSCM (Column (3)). The Federal Supply Code for Manufacturer (FSCM) is a 5-digit numeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

d. Part Number (Column (4)). Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications, standards, and inspection requirements to identify an item or range of items.

NOTE

When you use a NSN to requisition an item, the item you receive may have a different part number from the part ordered.

e. Description and Usable on Code (UOC) (Column (5)). This column includes the following information.

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) The statement "END OF FIGURE" appears just below the last item description in Column (5) for a given figure in both section II and section III.

f. Qty. (Column (6)). Indicates the quantity of the item used in the breakout shown on the illustration figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

C-4. Explanation of Columns (Section IV)

a. National Stock Number (NSN) Index.

(1) Stock number column. This column lists the NSN by National item identification number (NIIN) se-quence. The NIIN consists of the last nine digits of the NSN. When using this column to locate an item, Ignore the first four digits of the NSN. When requisitioning items use the complete NSN (13 digits).

(2) Fig. column. This column lists the number of the figure where the item is identified/located. The il-lustrations are In numerical sequence in sections II and III.

(3) Item column. The item number identifies the item associated with the figure listed in the adjacent Fig. column. This item is also identified by the NSN listed on the same line.

b. Part Number Index. Part numbers in this index are listed by part number in ascending alphameric sequence.

(1) FSCM column. This column lists the Federal supply code for manufacturer (FSCM).

(2) Part number column. This column indicates the part number assigned to the item.

(3) Stock number column. This column lists the National stock number for the associated part number and manufacturer identified in the part number and FSCM columns to the left.

(4) Fig. column. This column lists the number of the figure where the item is identified/located in sections II and III.

(5) Item column. The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column. C-5. Special Information National stock numbers (NSN's) that are missing from P source coded items have been applied for and will be added to this TM by future change/revision when they are entered in the Army Master Data File (AMDF). Until the NSN's are established and published, submit exception requisitions to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-MM, Fort Mon-mouth, NJ 07703-5006 for the part required to support your equipment.

C-6. How to Locate Repair Parts

a. When National stock number or part number is not known.

(1) First. Using the table of contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) Second. Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) Third. Identify the item on the figure and note the item number.

(4) Fourth. Refer to the Repair Parts List for the figure to find the part number for the item number noted on the figure.

(5) Fifth. Refer to the Part Number Index to find the NSN, if assigned.

b. When National stock number or part number is known.

(1) *First*. Using the index of National stock numbers and part numbers, find the pertinent National stock number or part number. The NSN index is in National item identification number (NIIN) sequence (para 4a(1)). The part numbers in the part number index are listed in ascending alphameric sequence (para j). Both indexes cross-reference you to the illustration figure and item number of the item you are looking for.

(2) *Second*. After finding the figure and item number, verify that the item is the one you're looking for, then locate the item number in the repair parts list for the figure.

7. Abbreviations

Not applicable.

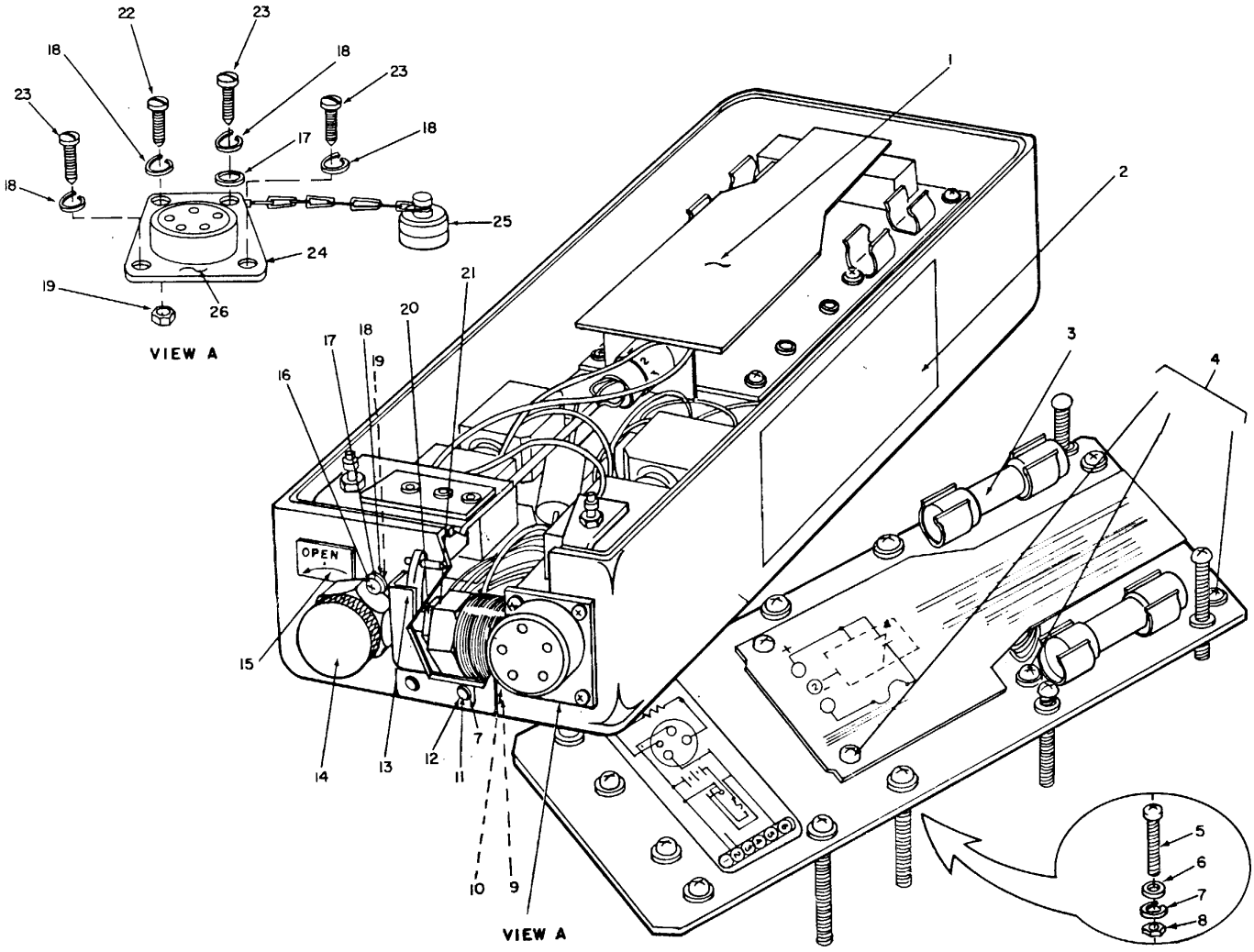


Figure C-1. Battery, Storage BB-542/U

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 00 BATTERY, STORAGE BB-542/U	
				FIG. C-1	
1	PAFZZ	03893	M8057	ELECTRONIC .MODILF	1
2	XBFZZ	57945	C5075607	NAMEPLATE	1
3	DAOZZ	81349	F03A250VIOAS	FUSE,CARTRIDGE	2
4	PAFZZ	96906	MS-51957-13	SCREW,MACHINE	6
5	PAFZZ	96906	MS51957-37	SCREW,MACHINE	8
6	PAFZZ	96906	MS-15795-805	WASHER,FLAT	8
7	PAFZZ	96906	MS-35338-136	WASHFR,LOCK	12
8	XBFZZ	57945	C5075639	SPACER	8
9	XBFZZ	57945	C5075637	WASHER MICA	1
10	PAFZZ	30131	IN5828	SEMICONDUCTOR DEVIC	1
11	PAFZZ	96906	MS-51957-30B	SCPEW,MACHINE	4
12	PAFZZ	18876	9052346	NUT,PLAIN,HEXAGON	4
13	XBFZZ	57945	C5075619	LATCH	2
14	PAFZZ	98021	I90ARL	VALVE,PRESSURE RELI	1
15	XBFZZ	57945	C5075609	ARROW LABEL	1
16	PAFZZ	96906	MS51957-16	SCREW,MACHINE	1
17	PAFZZ	96906	MS-15795-803	WASHER,FLAT	6
18	PAFZZ	96906	MS-35338-135	WASHER,LOCK	11
19	XBFZZ	80525	NAS671-C4	NUT,HEX SS#4-40	2
20	XBRZZ	57945	C5075638	WASHER SHOULDER	1
21	XBFZZ	80525	NAS671-C10	NUT-HEX i10	1
22	PARZZ	96906	MS-51957-17	SCREW,MACHINE	1
23	PAFZZ	96906	MS-51957-14	SCREW,MACHINE	3
24	XBFZZ	57945	C5075628	RASKET PUBBER	1
25	XBFZZ	57945	C5075636	DUST COVER	1
26	PAFZZ	96906	MS-3112E-14-5S	CONNECTCP,RECEPTACL	1
				END OF FIGURE	

NATIONAL STOCK NUMBER INDEX
NATIONAL STOCK NUMBER AND PART NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5305-00-054-5647	C-1	4			
5305-00-054-5648	C-1	23			
5335-00-054-5650	C-1	16			
5305-00-354-5651	C-1	22			
5305-00-054-6661	C-1	5			
5920-00-243-3787	C-1	3			
5305-00-469-5382	C-1	11			
5310-00-595-6211	C-1	17			
5310-00-616-8660	C-1	12			
5310-00-722-5999	C-1	6			
5935-00-893-7952	C-1	26			
4820-00-908-1571	C-1	14			
5310-00-929-6395	C-1	7			
5310-00-933-8118	C-1	18			
5961-01-016-1485	C-1	10			

NATIONAL STOCK NUMBER AND PART NUMBER INDEX
PART NUMBER INDEX

FSCM	PART NUMBER	STOCK NUMBER	FIG.	ITEM
57945	C5075607		C-1	2
57945	C5075609		C-1	15
57945	C5075619		C-1	13
57945	C5075628		C-1	24
57945	C5075636		C-1	25
57945	C5075637		C-1	9
57945	C5075638		C-1	20
57945	C5075639		C-1	8
81349	F03A250VIOAS	5920-00-243-3787	C-1	3
96906	MS-15795-803	5310-00-595-6211	C-1	17
96906	MS-15795-805	5310-00-722-5998	C-1	6
96906	MS-311?E-14-5S	5935-00-893-7952	C-1	26
96906	MS-35338-135	5310-00-933-8118	C-1	13
96906	MS-35338-136	5310-00-929-6395	C-1	7
96906	MS-51957-13	5305-00-054-5647	C-1	4
96906	MS-51957-14	5305-90-054-5648	C-1	23
96906	MS-51957-17	5305-00-054-5651	C-1	22
96906	MS-51957-30B	5305-00-469-539?	C-1	11
96906	MS51957-16	5305-00-054-5650	C-1	16
96906	MS51957-37	5305-00-054-6661	C-1	5
03893	M8057		C-1	1
80525	NAS671-C10		C-1	21
80525	NAS671-C4		C-1	19
80131	1N5828	5961-01-016-8485	C-1	10
98021	190ARL	4820-00-908-1571	C-1	14
18876	9052346	5310-00-616-8660	C-I	12

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