

OPERATION AND SERVICE MANUAL



ALT 170B UNIVERSAL WORKSHOP CHARGER (BTC-70844-1)

Manufactured for Thales Communications



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WARNING

**HIGH VOLTAGES ARE PRESENT IN THE
OPERATION OF THIS EQUIPMENT**

Avoid contact with AC supply voltage connections during installation, operation or maintenance of the battery charger.

CAUTION

**ACID CONTAMINATES NICKEL-CADMIUM, LITHIUM-ION,
LITHIUM-POLYMER and NICKEL-METAL HYDRIDE BATTERIES**

Every effort must be made to keep Nickel-Cadmium, Lithium-Ion, Lithium Polymer and Nickel-Metal Hydride batteries as far away as possible from Lead-Acid batteries because Lead-Acid batteries contain sulfuric acid. Do Not use the same tools and materials, such as screwdrivers, wrenches, syringes, hydrometers, and gloves for both types of batteries. Any trace of acid or acid fumes will permanently damage Nickel-Cadmium, Lithium-Ion, Lithium Polymer and Nickel-Metal Hydride batteries on contact.



WARNING

NO SMOKING IS PERMITTED NEAR THE CHARGING STATION

Batteries can produce explosive gases during charging or discharge cycles. Never smoke or allow open flames near the charging station.

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CHAPTER 1 INTRODUCTION

1-1. SCOPE

The ALT 170B Universal Workshop Charger (P/N BTC-70844-1) is a state-of-the-art, high performance lightweight portable battery charger designed for field deployment or shop usage. It provides fast reactivation of various rechargeable batteries. It is capable of sequentially charging up to eight batteries completely unattended.

The ALT 170B is simple to use by design. Without any user intervention, the ALT 170B charges up to eight batteries. It automatically identifies the specific battery type and provides the appropriate charge profile. Based on the current operating environment, the ALT 170B automatically customizes the charge profile to provide the quickest charge in a safe manner. The charge status for each of the eight batteries is conveyed to the user via three easy-to-understand panel mounted LED indicators (amber – CHARGE, green – READY and red – FAULT).

The ALT 170B is universal by design. It can readily use either AC or DC input power – whichever is most convenient for the user. The universal AC input fully allows 85-264 VAC and 47-420 Hz operation without any adjustment or user intervention. Additionally, the DC input power permits a range of 20-33 VDC, standard on most military vehicles.

The ALT 170B is adaptive by design. It is microprocessor controlled and is presently programmed to automatically charge over 80 different battery types as listed in Table 1. With the appropriate battery adapter, however, it can be readily reprogrammed via RS232 software upgrade port in the field to charge a countless number of additional battery types and chemistries including: Nickel Metal Hydride, Nickel Cadmium, Lithium Ion, and Lithium Polymer. The ALT 170B also provides a Revitalization function for Nickel Cadmium batteries and a Destorage function for Lithium Ion batteries.

The battery charger components are housed in a durable, non-conductive ABS equipment case, as shown in Figure 1. The assembled unit is watertight when the cover is securely latched and the pressure equalization valve on the front of the case (near the carrying handle) is closed. The Charger is a standard BTC-70844 shipped with one BTA-70589 and three BTA-70589A Adapters.

1-2. TECHNICAL SPECIFICATIONS

Dimensions 580mm W x 375mm D x 230mm H

Weight (less adapters and cables).....12.5kg
 (with adapters and cables)..... 15kg

Power Requirements

AC operation Automatic selection: 85 to 264 VAC, single-
 phase, 47 to 440 Hz, 375 VA max
 1.95m detachable three-wire power cord
 Included.
 (125 VAC @ 3 A)
 DC operation 20-33 VDC, 15A
 1.55m DC cable Assembly Included.
 (24 VDC @ 12.5 A)

Charging Output Voltage..... Automatically selected for each battery type
Duty Cycle..... Continuous

Protective Features..... Resettable circuit breakers:
 AC – 7 A
 DC – 20 A

Operating Temp. Range -10°C to 50°C

Storage Temp. Range -40°C to 70°C

Case Material..... ABS (Acrylonitrile Butadiene Styrene)

Case Color Olive Drab #34088 per Fed-Std-595B

Shipment..... No restrictions

1-3. Declaration of Conformity

Manufacturer's Name: Bren-Tronics, Inc.

Manufacturer's Address: 10 Brayton Court
Commack, New York 11725
U.S.A.

Declares the Product:

Product Name: Solder Portable Charger

Model Number: BTC-70844

Conforms to the following Product Specifications:

Safety:

IEC 60950-1

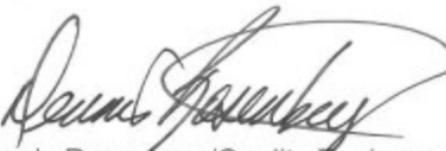
EMC:

EN 55022:1998	Class B Conducted Emissions, 150kHz to 30MHz
EN 55022:1998	Class B Radiated Emissions, 30MHz to 1GHz
EN 61000-3-2:1995	Harmonics
EN 61000-3-3:1995	Flicker

IEC 61000-4-2:1995	Electrostatic Discharge
IEC 61000-4-3:1997	Radiated Immunity
IEC 61000-4-4:1995	FFT/Burst, Power Leads
IEC 61000-4-5:1995	Surge Immunity
IEC 61000-4-6:1996	Conducted Immunity
IEC 61000-4-11:1994	Voltage Dips and Interrupts

Supplementary Information:

I Dennis Rosenberg declare that the above product complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE marking accordingly.



Dennis Rosenberg/Quality Engineer

1-4. ACCESSORIES

Table 1 shows the various batteries and appropriate adapters the ALT 170B can charge as of the writing of this document.

Table 1 - Supported Batteries and Adapters

ADAPTER	ADAPTER NSN	BATTERY	TYPE	BATTERY NSN
BTA-70360	6130-01-555-7818	BB-4600	NiCd	6140-13-113-0171
BTA-70394	5940-01-427-9247	BB-503A/U	NiCd	6140-01-419-8193
BTA-70395	5940-01-427-9183	BB-326/U BB-516A/U	NiMH NiCd	6140-01-533-7674 6140-01-419-8191
BTA-70396	5940-01-427-9278	BB-2847A/U BB-2847/U	Li Ion Li Ion	6140-01-493-8092 6140-01-419-8194
BTA-70443	5940-01-467-8813	BB-2600/U BB-2600A/U	Li Ion Li Ion	6140-01-467-5853 6140-01-490-4311
BTA-70492A	5940-01-513-5662	BT-70477 BT-70492 BT-70492A	NiMH Li Ion Li Ion	6140-14-513-5369 6140-01-523-9840 6140-01-523-9840
BTA-70557	5940-01-467-5852	BB-557/U	NiCd	6140-01-071-5070
BTA-70574	5940-01-483-6772	ICOM SI	NiCd	---
BTA-70581	---	CSEL	Li Ion	6140-01-534-3856
BTA-70581A	5940-01-544-3476	CSEL	Li Ion	6140-01-534-3856
BTA-70582	---	ALI 124 ALI 142/BA-682A BA-682B BA-684A	NiCd Li Ion Li Ion Li Ion	--- 6140-14-328-2258 6140-14-561-1542 6140-14-529-5971
BTA-70589	6130-01-564-8116	ALI 116 ALI 124 ALI 142/BA-682A ALI 143/BA-687A ALI 243 BA-684A BA-685A BA-682B ALI 147 ALI 247	NiCd NiCd Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion	--- --- 6140-14-328-2258 6140-14-530-0061 6140-14-553-4062 6140-14-529-5971 6140-14-529-5973 6140-14-561-1542 --- ---
BTA-70589A	---	ALI 142/BA-682A ALI 143/BA-687A ALI 243 BA-684A BA-685A BA-682B ALI 147 ALI 247	Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion	6140-14-328-2258 6140-14-530-0061 6140-14-553-4062 6140-14-529-5971 6140-14-529-5973 6140-14-561-1542 --- ---
BTA-70598	---	BT-70598	Li Ion	---
BTA-70715	5940-01-573-9693	BT-70593 BT-70715	Li Ion Li Ion	--- ---

INTRODUCTION

BTA-70721	6130-01-573-4962	BT-70721	Li Ion	---
BTA-70732	---	BT-70732	Li Ion	---
BTA-70737	---	BT-70737	Li Ion	---
BTA-70740	---	BT-70740	Li Ion	---
BTA-70763	6130-01-555-7821	BN-2250	NiCd	6140-13-116-5482
BTA-70774	5940-01-573-9679	Motorola – NNTN7032A NTN9816A NTN9815A	Li Ion NiCd NiCd	--- --- ---
BTA-70807	5940-01-493-6750	BB-2800/U	Li Ion	6140-01-490-5372
BTA-70808	5940-01-493-6388	BB-2588/U BB-388/U	Li Ion NiMH	6140-01-493-7623 6140-01-490-4313
BTA-70810	5940-01-493-6751	THALES – MBITR	Li Ion	---
BTA-70811	5940-01-493-7622	AA CELLS	NiMH	---
BTA-70812	5940-01-492-7238	BB-2557/U BB-557/U	Li Ion NiCd	6140-01-490-5387 6140-01-071-5070
BTA-70817	---	D CELLS	NiMH	---
BTA-70834	5940-01-501-3312	BB-2590/U BT-70791A BT-70791E BB-390B/U BB-590/U BT-70876 SAFT – SAI-2590	Li Ion Li Ion Li Ion NiMH NiCd Li Ion Li Ion	6140-01-490-4316 --- --- 6140-01-490-4317 6140-01-063-3918 --- ---
BTA-70899	---	BB-2590/U BB-390B/U BT-70791A BT-70791E BT-70899A BT-70876 Saft – SAI-2590 Ultralife – UBI-2590	Li Ion NiMH Li Ion Li Ion Li Ion Li Ion Li Ion Li Ion	6140-01-490-4316 6140-01-490-4317 --- --- --- --- --- ---
BTA-70732	---	BT-70732	Li Ion	---
BTA-70406-3	---	BA-386	NiCd	---
BTA-70851	---	Racal 931	NiCd	---
BTA-70852	---	PTR-349	NiCd	---
BTA-70853	---	Loral – RT1606	NiCd	---
BTA-70872	---	BB-NM10	NiCd	---
BTA-70868	---	LI-145 LI-80	Li Ion Li Ion	--- ---
BTA-70706-1	---	BB-2598	Li Ion	---
BTA-70406	---	BB-586	NiCd	6140-01-084-1460
BTA-70661	---	BT-70661	Li Ion	---

NOTES:

- 1) The ALT 170 (BTC-70565) Adapter (BTA-70480/3) is not compatible with this charger and can only be used in the ALT 170.
- 2) These Adapters and Batteries are supported by Charger Revision K software.
- 3) Additional Adapters are available, but may require additional software.
- 4) The ALT 170B is shipped from the factory with one BTA-70589 and three BTA-70589A Adapters.

Table 2 - Power Cables and Other Accessories

DESCRIPTION	ORDER NUMBER
IEC AC POWER CORD US	591609
IEC AC POWER CORD EU	590233-3
IEC AC POWER CORD UK	590233-UK
DC POWER CABLE (Ring Lugs)	BTA-70844-24
DC POWER CABLE (Alligator Clips)	BTA-70844-24AL
PR4G ADAPTER	BTA-70589
PR4G ADAPTER (Li Ion ONLY)	BTA-70589A



Figure 1-3.1 BTA-70844-24



Figure 1-3.2 BTA-70844-24AL



Figure 1-3.3 BTA-70589A



Figure 1-3.4 BTA-70589

1-5. CHARGE CYCLE DESCRIPTION

Each of the battery types that are capable of being charged by the Charger is connected to the charger via their respective battery adapter cable. Each adapter can charge two batteries simultaneously. The appropriate battery adapter is installed on the control panel and serves as the electrical interface between the batteries being charged and the charger circuits. The battery charger control circuits constantly monitor the following battery conditions during the charge cycle, as appropriate, to ensure that the battery is properly being charged:

- a. Temperature (T)
- b. Voltage (V)
- c. Current (I)
- d. Time (t)
- e. Voltage change (ΔV)
- f. Temperature rate of change ($\Delta T/\Delta t$)

The charger operation during a typical charge sequence is automatic and the battery charge status is displayed to the user by the panel LED indicators as follows:

- a. **Detection** - The charger tries to detect a battery in an adapter. The CHARGE LED (amber) blinks slowly during this process.
- b. **Pre-charge** – The charger brings the battery voltage up to a safe level before the rapid charge process begins. This step may take several minutes for a very discharged battery. The CHARGE LED (amber) blinks rapidly during this process.
- c. **Fast Charge** – A timed fast charge cycle brings the battery to approximately 90% of full charge capacity. The CHARGE LED (amber) is lit solid during this process.
- d. **Ready** – The fast charge cycle is complete. The Battery may be removed and used at this time. The READY LED (green) is lit steadily at this time.
- e. **Trickle / Top-off** – When fast charge is complete, the charger will top off of the battery to 100%. Each battery is charged for five minutes at a time. For Lithium Ion and Lithium Polymer batteries the top-off cycle will stop after the battery is 100% charged. For all other types, the Trickle / Top-off cycle is repeated indefinitely to keep the battery at 100% charge. Leaving the battery on the charger will not harm the battery. The battery may be removed and used at this time. The READY LED (green) blinks during this process.

The Battery may be removed and used at anytime during the charge cycle without damage to the charger or battery. The state-of-charge indicator (SOC) will display the battery condition.

NOTE

After removing a battery from the charger, wait for the corresponding battery status LED's to turn off before installing a new battery.

1-6. SEQUENTIAL CHARGING DESCRIPTION

The ALT 170B is a dual-channel sequential charger. It automatically charges up to eight batteries in approximately eight hours – depending on the battery type and state-of-charge.

Two independent charging channels, designated A and B, can charge one battery at a time. Upon charge completion of the first battery, each channel sequentially charges up to three additional batteries that are waiting in queue. Sequencing to the other three Ports is performed completely automatic and requires no intervention by the user.



Figure 1 – ALT 170B Typical Configuration

During the sequencing process, the channel spends only as much time as is necessary to charge each battery to greater than 90% capacity. A partially charged battery will charge quicker than a totally discharged battery. It then sequences, in numerical order (Port 1 – Port 2 – Port 3 – Port 4 – Port 1 – Port 2, etc.), to the next battery in queue. As the channel sequences through the four Ports and comes to a battery that has already been charged, it will attempt to Trickle or Top-off that battery (if necessary) for approximately 5 minutes and then continue onto the next Port.

This means batteries added later may charge first, depending on their position on the charger. If certain batteries must be charged first, then this must be taken in to account. When the charger moves to a position it will charge or top off the battery at that position, as necessary. This allows batteries to be added or removed at anytime. The charger automatically keeps track of the current state of each Port.

1-7. UPGRADING CHARGER SOFTWARE

The software in the charger is readily field upgradeable. By loading new software into the charger, it is possible to alter its operation and add or change the charging profiles for the batteries. Loading new software into the charge is accomplished via the use of a standard RS232 interface of a personal computer (PC). Utilizing special software running on the PC in conjunction with the boot program resident within the charger, a two-way communication link is established and the revised operational parameters and battery charge profiles can be loaded into the charger. Specific instructions for upgrading the ALT 170B software are provided with the software upgrades.

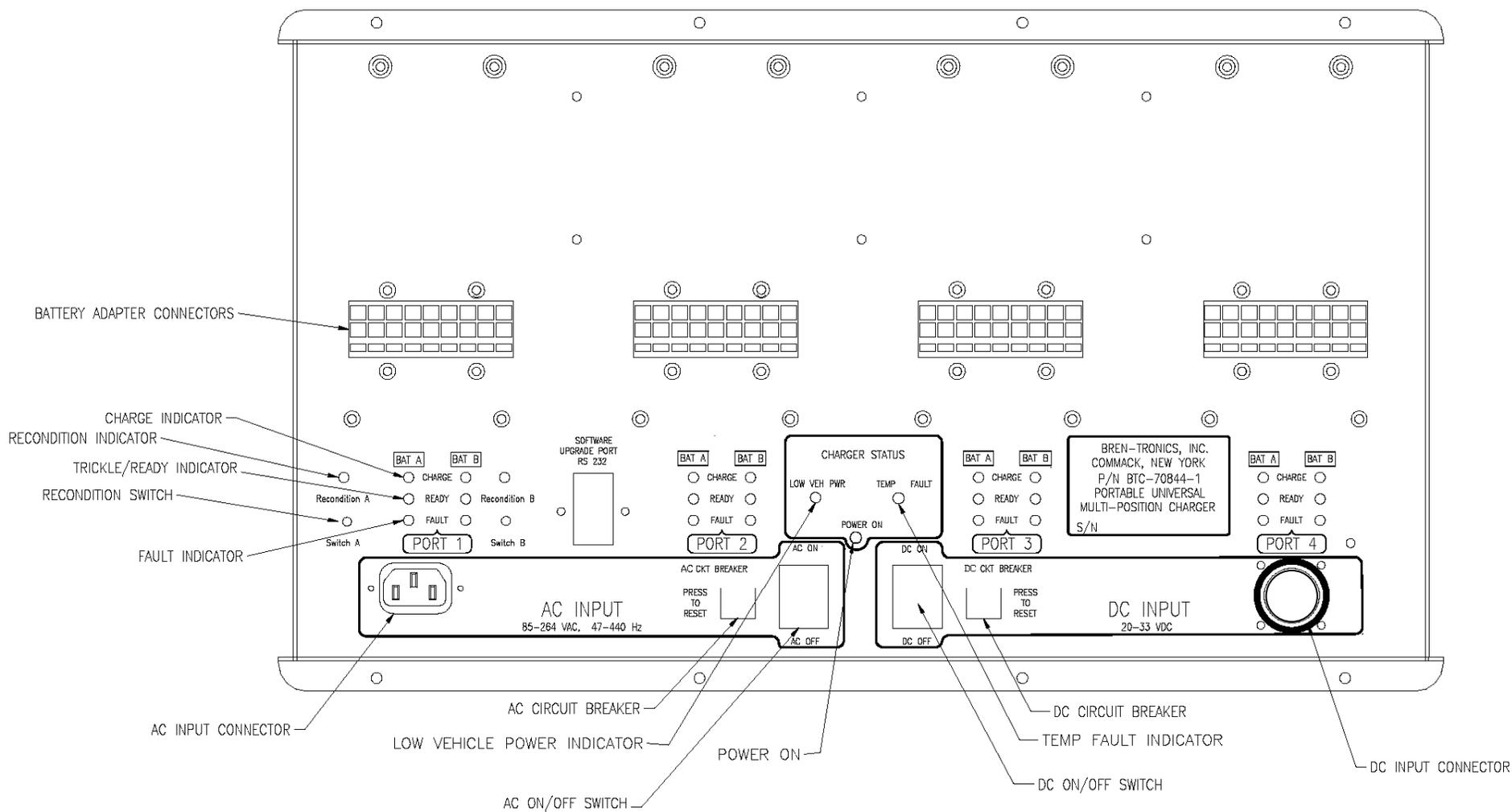
CHAPTER 2 OPERATING PROCEDURES

2-1. PANEL CONTROLS AND INDICATORS

Battery charger panel components are described below and shown in Figure 2-1.

<i>Item</i>	<i>Function</i>
AC ON/OFF power switch	Turns battery charger AC supply on or off.
AC CKT BREAKER	Turns power to the charger off in an overload condition. Remove the overload condition and push to reset.
LOW VEH POWER LED	The Low Vehicle power indicator lights when external DC power is too low to charge batteries. The charger will stop charging batteries.
TEMP FAULT LED	The Temperature Fault indicator lights when charger temperature is too high (50°C) or too low (-10°C). The charger will stop charging batteries.
DC ON/OFF POWER SWITCH	Turns battery charger DC supply on or off. If both AC and DC power are connected and both power switches are on, then DC Power will be used by the charger.
DC CKT BREAKER	Turns power to the charger off in an overload condition. Remove the overload condition and push to reset.
CHARGE LED	The Amber LED lights steady while the associated battery is being fast-charged. A slow blinking indication means the charger is trying to find a battery at the select position. A fast blinking indication means the charger is precondition the battery before charging it.
READY LED	The Green LED indicates the associated battery is fully charged and ready to be removed for use. Steady light means the battery has completed fast charge. A blinking indication means the battery is being topped off.
FAULT LED	If the Red LED lights steady the associated battery, or adapter plate, is defective or will not accept charge. A blinking indication means the battery's temperature sensor or communication connection is not making contact with the adapter.
RECONDITION Switch	Activates NiCad Revitalization or Li-Ion Destorage function with battery in PORT 1.
RECONDITION LED	Lights amber during revitalization / destorage process.
BATTERY ADAPTER PORT ..	Provides interface connection for battery adapters.
AC INPUT Connector	Input connection for AC cable assembly. (Provided)
DC INPUT Connector	Input connection for DC cable assembly. (Optional)

Figure 2-1 – ALT 170B Front Panel Components



2-2. PRELIMINARY SETUP PROCEDURES

- Step 1. Place the unit on the work surface. Unscrew the pressure equalization valve (near the carrying handle) in a counterclockwise direction about two full turns. Unfasten latches and open cover.
- Step 2. Set AC and DC power ON-OFF switches, to OFF position.
- Step 3. The Cover may be removed by removing both hinge pins with pliers.
- Step 4. For AC operation: Connect AC power cord from AC INPUT connector to power source and set AC power ON-OFF switch to ON position. Observe that POWER ON LED lights, fan operates, and all LED status indicators blink in order (amber ,green, then red) briefly when power is first applied.
- Step 5. For DC operation: Connect DC cable from 24 VOLT DC INPUT connector to DC power source (via NATO slave receptacle found in most military vehicles) and set DC power ON-OFF switch ON position. Observe that POWER ON LED lights, fan operates, and all LED status indicators blink in order (amber ,green, then red) briefly when power is first applied. Note that if both AC and DC power are connected that DC power will be used if the DC power switch is on.
- Step 6. Observe that only the POWER ON LED is lit.
- Step 7. Install appropriate battery adapter(s) on panel for battery types to be charged. Install the Adapter(s) by placing the back of the adapter into the rear retainer and rotating the adapter down until the front retainer clicks over it. Note the alignment of the pins. The connector can only plug in one way. Do not force it. Be sure that battery adapter and connector are fully seated. All battery adapters are interchangeable, only the battery connections are different.
- Step 8. Observe, after a short delay, the amber CHARGE LED's blink for several seconds at each installed adapter. This shows battery charger circuits are initialized to the selected battery adapter and are ready to accept a battery (or batteries) for charging. If all of the Indicators for a channel light at the same time, the Adapter could not be recognized or the adapter is damaged. Insure it is seated correctly.

2-3. CHARGING BATTERIES

- Step 1. With the appropriate battery adapter installed, insert the first battery to be charged in the Port-1 Channel-A battery location. Insure the battery is fully seated into the adapter. Observe that CHARGE LED (amber) for the corresponding location is lit or blinking rapidly. The CHARGE LED for the B battery location will continue to blink if it is searching for a battery on that channel. If the FAULT LED (red) is lit, the battery or adapter may be defective. Check by removing battery and adapter. Then reinstall adapter and battery. If the FAULT LED again lights, go to the Trouble Shooting section of this Guide.
- Step 2. Install the next battery into the Port-1 Channel-B battery location.
- Step 3. Install the rest of the batteries. The indicators for these batteries will not light until the charger has finished the batteries in the preceding Port locations.
- Step 4. After fast charging is complete, the CHARGE LED extinguishes and the READY LED is lit. After the charger cycles through the batteries, it will top-off batteries that have completed fast charge. The battery is slow-charged to full capacity, as indicated by the blinking READY LED (green). The battery is charged for five minutes at a time (10 minutes for dual section batteries) then the charger will move on to the next battery. For Lithium type batteries, the cycle will stop after the battery is 100% charged. For other types the cycle is repeated indefinitely to keep the battery at 100% charge. As long as the READY LED is lit (blinking or solid) the battery may be removed and returned to service and another battery may be installed for charging.

NOTE

Battery charger power may be left ON while batteries and/or adapters are removed or replaced. Batteries may be left in the charger for long periods of time without damaging the batteries or charger.

2-4. BATTERY REVITALIZATION AND DESTORAGE

The procedures outlined below describe the means of invoking the Revitalization and Destorage functions of the ALT 170B Charger as well as the sequence of operations the charger will execute to perform the commanded tasks.

- a. *NiCad Revitalization (ALI 116 and ALI 124) – requires BTA-70589 Adapter*
Revitalization exists on PORT 1 and is available for both the A and B channels of the ALT 170B Charger. Due to the increased power dissipation from discharging the batteries, this function will not operate above 40° C. The following procedure is used to invoke the Revitalization process:

1. Plug the Adapter into PORT 1
2. Power up the ALT 170B charger
3. Once the Adapter is recognized (the BAT LED's blink Amber in Position 1), press the RECONDITION SW pushbutton for the A or B channel; the RECON LED will light Amber for the corresponding channel
4. Plug the battery into the activated channel
5. Revitalization will commence upon recognition of the battery

Autonomously, the ALT 170B will perform the following revitalization sequence:

1. Check the temperature; if above 40° C do not proceed
2. Discharge the battery without a capacity measurement
3. Fully charge the battery
4. Discharge the battery and calculate the capacity
5. Fully charge the battery
6. If the capacity in step 4 is greater than or equal to 80% of the battery specification, the BAT LED turns Green, the RECON LED remains lit and process is complete
7. If the capacity in step 4 is less than 80%, repeat step 4 and 5 a second time. If after the second cycle the capacity is less than 80% of the battery specification, the BAT LED turns Red, the RECON LED remains lit and the process is complete

b. *Li-Ion Destorage (ALI 142, ALI 143, BA-684A, BA-685A, ALI 243)*

Destorage exists on Position 1 and is available for both the A and B channels of the ALT 170B Charger. Due to the increased power dissipation from discharging the batteries, this function will not operate above 40° C. The following procedure is used to invoke the Destorage process:

1. Plug the Adapter into PORT 1
2. Power up the ALT 170B charger
3. Once the Adapter is recognized (the BAT LED's blink Amber in Position 1), press the RECONDITION SW pushbutton for the A or B channel; the RECON LED will light Amber for the corresponding channel
4. Plug the battery into the activated channel
5. Destorage will commence upon recognition of the battery

Autonomously, the ALT 170B will perform the following Destorage sequence:

1. Check the temperature; if above 40° C do not proceed
2. Fully discharge the battery
3. Fully charge the battery
4. Discharge 55% of the specified capacity from the battery

The BAT LED turns Green, the RECON LED remains lit and process is complete

2-5. BATTERY CHARGER COVER LABEL

Shown below are the instructions contained on the "SHORT FORM - OPERATING PROCEDURE" label, attached inside the ALT 170B cover.

LED INDICATIONS FOR EACH BATTERY

Yellow	GREEN	RED	RECON	MEANING	REMARKS
F	F	F		Charger start up.	All lights appear momentarily when charger is turned ON.
				Power on, no adapter.	Adapter(s) must be installed.
F				Power on, adapter present, no battery present.	Install battery(s) on to adapter or turn off charger.
RF				Battery identification.	Battery identification is in progress - wait.
S				Battery is fast charging.	Lights while battery is fast charging.
	F			Battery is trickle charging.	Battery is charged at > 90%.
	S			Battery charging complete.	Battery is ready to use. Remove it.
			S	Recondition cycle on queue.	
S			S	Recondition cycle in progress	
			F	Temperature > 40° C recondition prohibited.	Reduce Ambient temperature and restart recondition cycle.
S	S	S		Unknown adapter.	Software revision required.
S or F	S or F	F		Charging or identification contacts damaged or dirty.	Clean battery contacts and check (replace) Adapter pins.
		S		Faulty battery.	Remove battery & do not use. Consult operation procedures.

F = FLASHING

S = STEADY

RF = RAPID FLASHING

2-6. SOLID RED LED TROUBLESHOOTING

1. Remove battery and reinstall at same location for another charge cycle. Note battery and adapter location for later review.
2. If charge indications go "red" again at the same location remove battery and do the following:
 - a. Check battery: older than 3 yrs? Maybe ready for disposal. Discharge & recharge, IF RED AGAIN?
 - b. Check warranty instructions on battery. If not covered or no instructions, dispose of.
 - c. Note success/failure of future battery charges at this location. More "RED" lights? Change adapter.

2-7. OPERATION IN EXTREME ENVIRONMENTAL CONDITIONS

Observe these precautions when the ALT 170B is operated in areas where severe climatic conditions may exist:

a. Operation in Arctic Climates. The battery charger is designed to function in temperatures extremes as low as -4°F (-20°C.). The following precautions should be observed:

- (1) Handle equipment carefully. The plastic components may become more brittle.
- (2) Keep equipment clean and dry.
- (3) Prevent ice from forming on the ALT 170B and batteries. Ice formations may prevent proper electrical connections. Melting ice may cause water to enter the charger.

b. Operation in Desert Climates. The charger is designed to operate in temperature extremes as high as 122°F (50°C) and the dryness associated with a desert environment. Sand and dust accumulation on and in the charger may cause poor electrical connections and reduce the cooling effectiveness of the charger. Follow proper cleaning and maintenance guidelines to assure proper operation. When not in use, be sure that cover is fully latched and pressure relief valve is fully closed (in a clockwise direction).

c. Operation in Salt Spray. Keep equipment clean and dry at all times and immediately wipe salt spray from exposed surfaces, cables and connectors. When not in use, be sure that cover is fully latched and pressure relief valve is fully closed (in a clockwise direction).

NOTE

Battery charge acceptance varies with ambient temperature conditions. At temperatures lower than 32°F (0°C) or higher than 104°F (40°C) it may be necessary to initiate two complete charging cycles to secure a fully charged battery.

2-8. PREPARATION FOR MOVEMENT

- a. Set both AC and DC POWER switches to OFF.
- b. Remove any installed batteries.
- c. Disconnect and coil AC power cable.
- d. Disconnect and coil DC power cable.
- e. Disconnect and coil Battery Adapter cables.
- f. Replace ALT 170B cover if it was removed by reinstalling the hinge pins.
- g. Store all cables in the cover compartment.
- h. Close and latch the cover compartment.
- i. Close cover and secure with latches.
- j. Close pressure equalization valve on front of unit by turning fully clockwise.

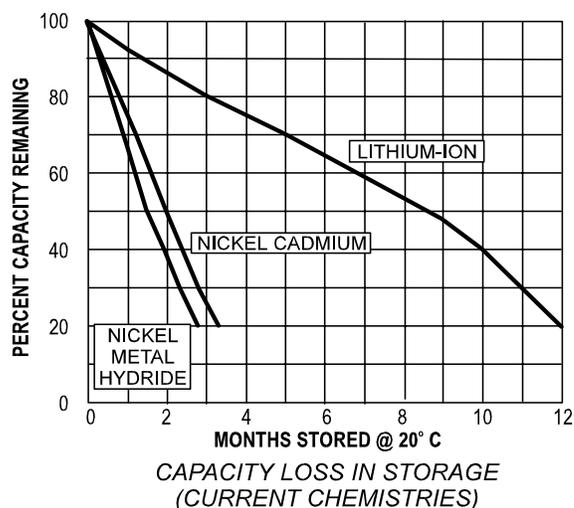
2-9. BATTERY STATE-OF-CHARGE DISPLAYS

Batteries equipped with state-of-charge (SOC) displays indicate battery charge status on a five-segment LCD bar graph readout. The number of LCD segments activated corresponds to the battery state-of-charge as follows:

<u>Segments</u>	<u>State-of-Charge</u>
0	0% (fully discharged)
1	1 to 20%
2	21 to 40%
3	41 to 60%
4	61 to 80%
5	81 to 100% (fully charged)

2-10. BATTERY CAPACITY RETENTION

As shown in the adjoining graph, fully charged batteries that are stored lose a portion of their charge due to battery the chemistry. This is normal and should not be interpreted as battery failure. Storage at higher temperatures increases capacity losses while storage at lower temperature decreases capacity losses.



2-11. BATTERY STORAGE

Nickel based batteries may require one or more charge/discharge cycles after a long period of storage. They may not charge fully on the first charge cycle. Repeat the charge if necessary. If the battery does not fully charge after three cycles it may no longer be serviceable. The Revitalization feature of the charger can do this task easily.

Lithium based batteries must be charged yearly if held in storage. Long term storage of fully discharged Lithium based batteries can permanently damage the battery. They do not require charge/discharge cycling after storage. If the battery does not charge (no SOC Bars), place it back on the charger for an additional charge cycle. It is not necessary to discharge it first. If the battery does not fully charge it may no longer be serviceable.

CHAPTER 3 OPERATOR MAINTENANCE INSTRUCTIONS

3-1. INTRODUCTION

Periodic maintenance, inspection and cleaning will help insure the ALT 170B is kept at full readiness.

3-2. CLEANING

1. Brush loose dirt and dust from the charger. Low-pressure air may be used to remove heavy dust from the case, connectors and power switches. Avoid blowing dust into the unit. Low-pressure air may be blown into the left and right air vents at the edge of the control panel to help remove internal dust.
2. Wipe surfaces with a damp (not wet) rag. Non-solvent cleaners maybe used (Windex[®], Fantastik[®], FORMULA 409[®]). Do not spray or drip water or cleaners onto the panel or into the connectors.
3. The flush mounted adapter connectors may be cleaned with electronic grade spray cleaner. Allow the cleaner to dry before installing the adapters or applying power to the charger.
4. The connections on the Adapters may be cleaned with electronic grade spray cleaner or isopropyl alcohol. Insure the Adapters are dry before using them.

3-3. INSPECTION

1. Inspect case for cracks and other damage.
2. Insure the lid gasket is in place.
3. Insure the Hinge Pins are fully inserted.
4. Insure the lid closes and can be properly latched.
5. Insure all Screws are in place and are not loose.
6. Inspect the panel and connectors for damage.
7. Inspect all adapters for excessive wear and damage.
 - a. Inspect charger connector for bent or corroded pins.
 - b. Inspect battery connector pins for damage or corrosion.
 - c. Insure all spring pins are not bent and move freely.
 - d. Note that spring pins can be removed and replaced.
8. Inspect power cords for damage.
9. Insure power switches move freely.
10. Insure the pressure equalization valve, located near the carrying handle is snugly tightened.

3-4. BASIC FUNCTIONAL TEST

1. Turn off all power switches, and remove all adapters.
2. Connect the ALT 170B to AC power.
3. Turn On the AC power switch.
4. The front panel LED's should light in sequence. Amber, then Green, then Red. Insure all LED's light.
5. Insure the POWER-ON LED is lit and that all other indicators are off.
6. Place an Adapter into each of the four ports.
7. Verify that the CHARGE LED blinks for several seconds at each position, then moves to the next Port.
8. Press each of the Recondition Buttons several times. Verify the Recondition LED alternates on then off with each press.
9. Place a battery in Port 1 Channel A. Insure that the CHARGE LED blinks rapidly or turns on solid.
10. Repeat above step for all other ports and channels.
11. Turn off the AC power switch and disconnect AC Power.
12. Connect the ALT 170B to DC Power.
13. Turn On the DC power switch.
14. The front panel LED's should light in sequence. Amber, then Green, then Red. Insure all LED's light.
15. End of Test.

3-5. SIMPLIFIED OPERATOR TROUBLESHOOTING PROCEDURES

Item	MALFUNCTION	POSSIBLE CORRECTIVE ACTION
1	POWER ON LED is not lit during AC operation.	1) Inspect Power Cord and AC Switch. 2) Reset AC circuit Breaker.
2	POWER ON LED is not lit during DC operation	1) Inspect Power Cord and DC Switch. 2) Reset DC circuit Breaker.
3	All LED's light and stay lit after the charger is turned on.	1) The unit has lost its program. The unit requires repair. Call or e-mail Bren-Tronics. Info on warranty tag.
4	The LED's do not blink in sequence at start up.	1) Verify the Temp Fault and Veh Pwr indicators are not lit.
5	TEMP FAULT LED is lit.	1) The Charger is too hot or too cold. Move the charger to a more suitable environment. 2) The air vents at the left and right side of the charger are blocked. 3) The internal fan has failed. The unit requires repair. Call or e-mail Bren-Tronics. Info on warranty tag.
6	LOW VEH PWR LED is lit.	1) If the unit is running from DC Power verify the voltage is correct. 2) If the unit is running from AC Power the unit requires repair.
7	All 3 LED's (CHARGE, READY, FAULT) are lit at one port.	1) Poor connection between Adapter and Charger. Inspect, clean and reseat Adapter. 2) Defective Adapter, use a different Adapter. 3) Defective Port on Charger, try a different Port. 4) The charger does not support the Adapter. Update the charger software.
8	FAULT LED is lit on one port.	1) Check battery: older than 3 yrs? Maybe ready for disposal. Discharge & recharge, IF RED AGAIN? 2) Check warranty instructions on battery. If not covered or no instructions, dispose of. 3) Note success/failure of future battery charges at this Port. More "RED" lights? Change adapter.

Item	MALFUNCTION	POSSIBLE CORRECTIVE ACTION
9	Charger never tries to charge a battery.	<ol style="list-style-type: none"> 1) Possible poor connection. Inspect and clean battery and Adapter contact. 2) Defective Adapter, Use a different adapter. 3) Defective Charger Position, Try a different position. 4) Defective Battery, Replace Battery
10	Port LED goes to Amber CHARGE), but never turns Red (FAULT) or Green (READY), instead it turns off.	<ol style="list-style-type: none"> 1) Poor Connection, inspect and clean battery and adapter contact. 2) Defective Adapter. Use a different adapter. 3) Defective Charger Port, try a different position. 4) Defective Battery. Replace Battery
11	Revitalize LED will not turn on when button is pressed or turns off when the battery is "Found".	<ol style="list-style-type: none"> 1) The Battery or Adapter does not support Revitalizing or Destorage.
12	Revitalize LED is blinking and the Port Status LEDs are all off.	<ol style="list-style-type: none"> 1) The charger is too hot (over 40°C) to discharge the battery. Move the charger to a cooler area. 2) The air vents at the left and right side of the charger are blocked. 3) Operating the chargers edge to edge can cause overheating of the charger on the right. 4) The internal fan has failed. The unit requires repair. Contact Bren-Tronics. Info on warranty tag.

3-6. WARRANTY / REPAIR INFORMATION

If the Charger or Adapters fail to function they must be returned to Bren-Tronics for repair. The warranty label gives the expiration date on each unit. Contact Bren-Tronics for an Return Material Authorization (RMA) number before returning any hardware to Bren-Tronics. The part numbers, serial numbers and failure descriptions must be included for Bren-Tronics to issue an RMA number. Chargers that have been damaged by abuse or that are no longer under warranty may be returned for a repair quotation. There are no user repairable parts in the charger. Opening the charger will void the warranty.

For return authorization call (631) 499-5155 or email sales@bren-tronics.com

3-7. Upgrade / Update Information

The Charger Operation Software is field upgradeable. Updates usually add support for additional battery adapters. They may also include enhanced battery charging methods. The upgrade can be done with a PC running Windows® 95 or newer in about 15 minutes. All that is required is a computer serial cable and a screwdriver. Information about new adapters and software can be found at:

<http://www.Bren-Tronics.com>

(631) 499-5155

sales@bren-tronics.com