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**Boost Application Notes**

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Firmware Version: 5.00 and above

Products: C7200, C7400 and C7400ER & the C-series C7200, C7400 and C7400ER

**Boost**

The Boost program "forces" a dead battery's voltage back to nominal levels so that the analyzer can attempt a service. For example, a NiCd battery if left alone will self-discharge. Over time, the battery will eventually lose all its energy (a dead battery displays about 0.00V). A dead battery on a Cadex 7000 series battery analyzer will either not respond, give error 12x codes, or Short/Rev codes.

Boost applies a 100mA trickle charge for three minutes in order to wake up a battery. This program differs from running a Charge program *because all internal protection—hardware and software—has been temporarily disabled.* (Therefore, the program works whether there is a battery inserted or not!!!). If the Boost program cannot revive the battery, the analyzer cannot service the battery

Since the most common reason behind a dead battery is low voltage, a good sign that Boost is working is that the voltage rises gradually and the current remains steady. After the program is finished, the analyzer will resume normal operation and try to service the battery as programmed in the active C-Code of the adapter. Repeat Boost if the analyzer still does not detect the battery.

For some batteries, you may have to run Boost *more than once* until the battery is recognized on the analyzer. If the battery still does not respond after 5 or 6 repetitions (or when you run out of patience!), the battery is most likely dead. A laptop battery (Li-Ion, 14.8V, 3200mAh) when initially inserted into the analyzer triggered the failure message "Shorted". After 10 successive boost cycles, the analyzer was able to recognize the battery and prime the battery to 90% capacity.

**Boost on Li-Ion and Li-Polymer batteries**

Lithium-based batteries have protection circuitry that prevents the battery cells from being over-charged or over-discharged. Lithium-based cells are sensitive to over-voltage, over-current, and under-voltage. Without such protection, lithium cells are unstable, leading to cell damage, failure, or in extreme cases an explosion. Protection circuits differ between battery manufacturers, but the basic operation is similar.

If a lithium-based battery is discharged below its minimum voltage (typically 2.50V per cell), the protection circuitry disconnects the cells and prevents any further discharge. In order to reconnect the cell, a trickle charge current is applied until battery voltage reaches the end of discharge voltage and turns off the over-discharge protection circuit in the battery. In some cases, voltage may have to go over the end of discharge voltage to reset. The actual value can only be determined through experimentation. If the cells are allowed to self-discharge to a point where the protection circuitry is inoperable, the battery is truly dead.

**Effectiveness of Boost**

Applications Engineering Department in Cadex performed an ad-hoc test on the success rate of Boost. Out of a batch of 32 Ericsson T28 lithium-polymer batteries that were not recognized in the Cadex 7200 analyzer, 19 of them could be recovered with Boost and subsequently be cycled as usual. The batteries that Boost could not recover were serviced on a C7400 battery analyzer on Charge. We found that the battery interrupted the service repeatedly for 5 seconds until the failure code 129 appeared: such results indicate that the battery is defective or unserviceable.

**Limitations**

Boost cannot repair damaged protection circuitry in a battery and it is recommended to turn off Boost as soon as the battery indicates that it is defective. Quite often, batteries with damaged protection circuitry may display very high voltages (e.g. a 3.6V Li-Ion battery may display 7 volts) or the current fluctuates wildly. Press Esc in these case to terminate Boost.

## Using Boost

Use the following steps if the analyzer is standalone or if using BatteryShop

### Analyzer Does Not Recognize The Battery Upon Insertion

- a. Insert the "dead" battery and press the corresponding station key for a few seconds. The following screen appears:

```
WARNING      WARNING      WARNING
Make sure the polarity is correct!!!
```

- b. Press <Enter>.
- c. If the following message appears, press <Enter> until the program starts:

```
Press ENTER and verify settings
then ENTER again to start
```

- d. Press the corresponding station key to monitor the voltage, current, and temperature (if any) readings on the battery. Press <Esc> at any time to terminate service or simply remove the battery.

### Analyzer Displays "Shorted" When The Battery Service Starts

- a. Press a station key for a few seconds. The following screen appears:

```
WARNING      WARNING      WARNING
Make sure the polarity is correct!!!
```

- b. Insert the battery and press <Enter>.
- c. If the following message appears, press <Enter> until the program starts:

```
Press ENTER and verify settings
then ENTER again to start
```

- d. Press the corresponding station key to monitor the voltage, current, and temperature (if any) readings on the battery. Press <Esc> at any time to terminate service or simply remove the battery.

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To disable the prompts for battery ID's and C-Codes, do the following:

- Press <Menu>
- Press <↑> or <↓> until the display reads "Option Controls" and press <Enter>
- Press <↑> or <↓> until the display reads "Battery Startup" and press <Enter>
- Press <↑> or <↓> to toggle the prompt setting.
- Press <→> or <←> to switch between the prompt settings.
- Press <Enter> twice to save the changes.

- END -