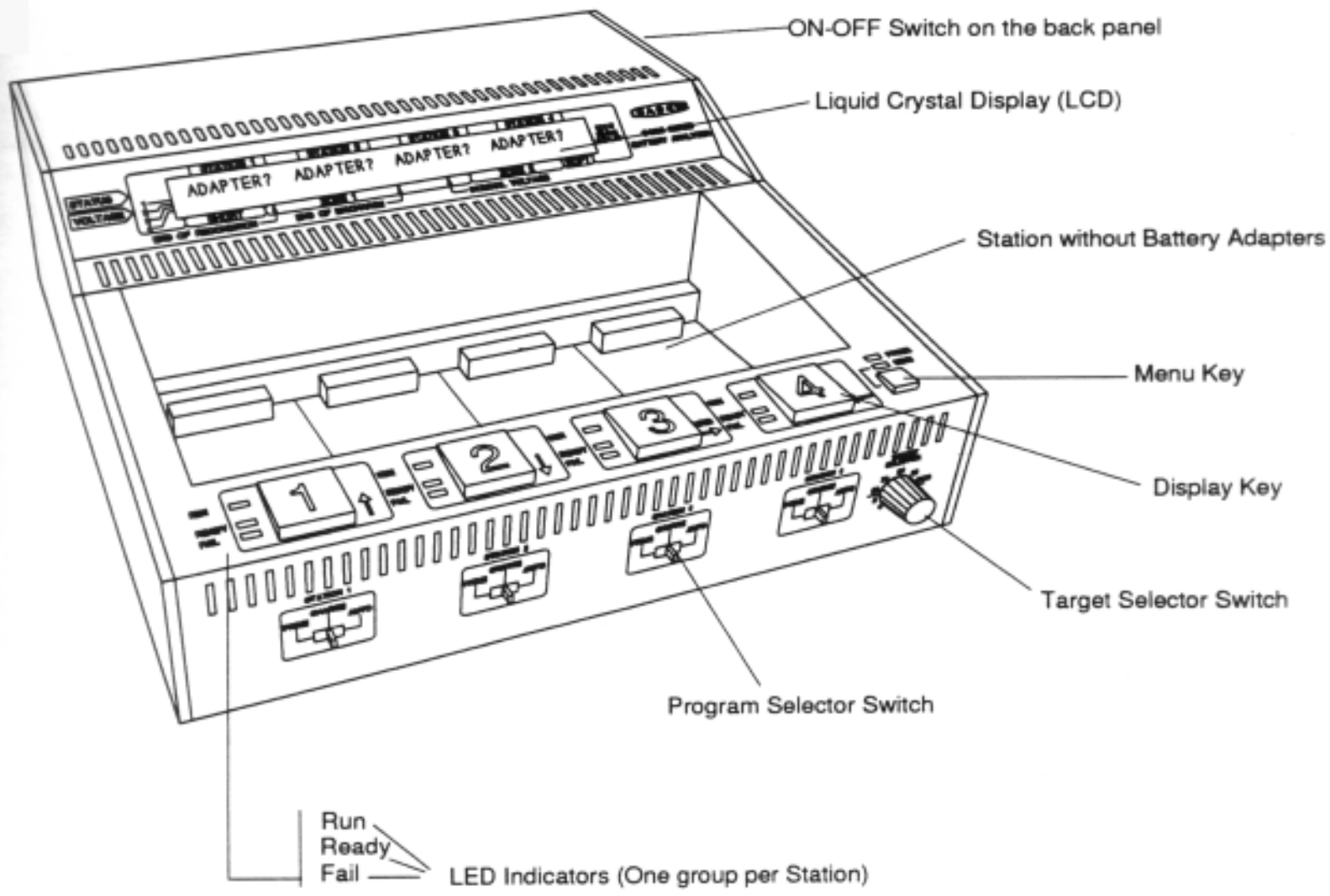


CHAPTER 1
INTRODUCTION

1. Overview of Cadex C4000



2. Getting Started

Plug in and turn on	Plug and on-off switch are located on the back of the C4000.
Select the program	The Program Selector Switch is on the front of the analyzer. <i>Select:</i> <ul style="list-style-type: none">■ PRIME for new or stored batteries prior to use■ CHARGE for fast-charging only (no analysis)■ AUTO to service batteries with unknown conditions.
Set Target Selector	Target Selector switch is on the right hand side of the front panel. <i>Select:</i> <ul style="list-style-type: none">■ 80% for most requirements■ 90% or 100% for more demanding applications■ 60% or 70% for less critical applications.
Battery Adapter	Configured Battery Adapters are pre-programmed for specific battery types. To reprogram, refer to CHAPTER 7 — PROGRAMMING BATTERY ADAPTERS.
Insert the Battery	When contact is made, a "Beep" is heard and the yellow RUN LED comes on.
When battery servicing is complete	The Green READY LED is on if the battery has successfully completed the program. The red FAIL LED comes on if the battery has failed to meet the specified requirement.
Display	<i>Global</i> The status of each battery is shown on the top line of the LCD display. The lower section of the LCD shows the relative voltage of each battery in a line-graph form. <i>Detailed</i> Detailed information about the battery can be seen by pressing the corresponding Display Key.
After completion of the program	Record the test results. The battery may be removed or left in the analyzer until needed. When the battery is removed, the test results are canceled.

CHAPTER 2
BASIC OPERATION

1. Power Up

Before connecting the C4000, check for the correct line voltage. The line voltage label is located on the bottom of the unit. The on-off switch is on the back panel.

When the power is turned on, the display (LCD) message briefly reads:

Start-up messages

```
C4000 (C)1993 CADEX ELECTRONICS INC.  
VERSION: 3.00P; ** DIAGNOSTICS PASS **
```

The display then shows the Target Capacity setting briefly, then switches to the Global Display. If the Battery Adapters are installed in Stations 1, 2 & 3, but not 4, the display shows:

Global Display

```
EMPTY  EMPTY  EMPTY  ADAPTER?  
=
```

The analyzer is now ready to service batteries in Stations 1, 2 & 3.

Note It is advised to install a Battery Adapter in all vacant stations. This prevents damage by static electricity.

Battery Adapters

The batteries interface with the C4000 through Battery Adapters. You can install, replace and reprogram the adapters while other batteries are being serviced. For more details on the various types of Battery Adapters, refer to CHAPTER 6 — BATTERY ADAPTERS.

2. Analyzing Batteries

Set Program

Before servicing a battery, select the desired program (refer to CHAPTER 3 — PROGRAMS & TARGET CAPACITY).

Set Target Capacity

Select the Target Capacity. If you are not certain what setting to use, select 80%. For more detail, refer to CHAPTER 3 — PROGRAMS & TARGET CAPACITY.

Verify correct battery setting

Check that the Battery Adapter is set to the correct battery parameters. With the display indicating EMPTY, press the appropriate Display Key. The display now indicates the setting of the Battery Adapter in question.

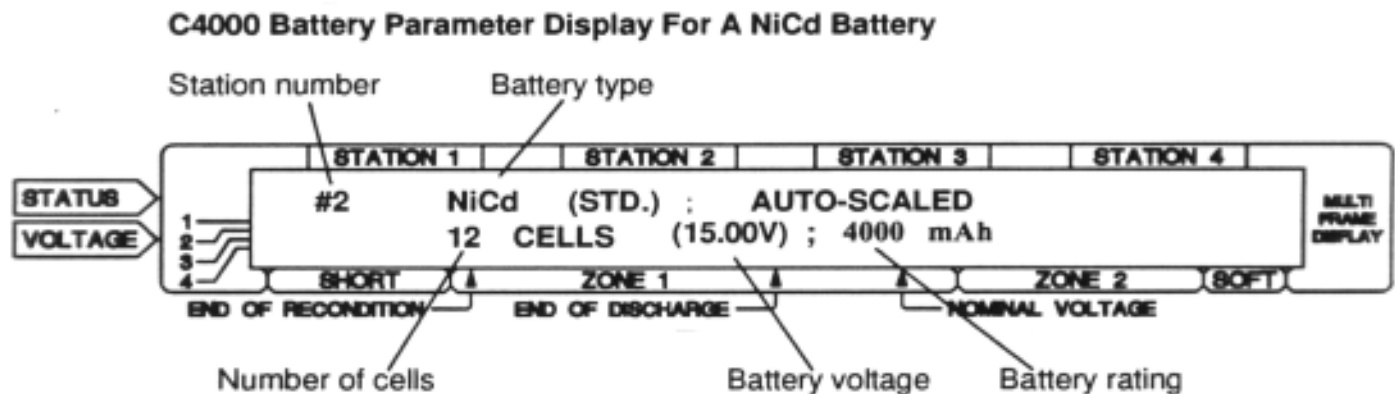


Figure 2.1

Viewing different display frames

Since not all information can be shown on one display frame, the battery parameters are contained in several frames. The basic information is shown in the first frame, followed by more detailed definitions in the subsequent frames.

To step through the frames, press the appropriate Display Key several times. For more details on the display, refer to CHAPTER 4 — STATUS INDICATORS.

Reverse polarity and short protection

The C4000 is electronically protected against reverse connection and short circuits. No harm is done to the equipment if the battery has a short or is accidentally connected in reverse polarity.

"Dead" batteries	If the battery to be serviced has no voltage reading, an initial brief charge by a designated charger is required. The C4000 will not start the program if battery voltage is not detected.
Connect battery	After selecting the program and target capacity, you are now ready to connect the battery. Battery connection is acknowledged with a beep tone. While the battery is being serviced, the yellow RUN LED is on.
<i>Program Sequence</i>	The program starts with discharge, followed by charge.
<i>PRIME and AUTO</i>	If the battery has no capacity (no energy), the program starts with charge.
<i>CHARGE</i>	On the CHARGE program, the battery commences with charge. No discharge is applied.
Method of battery analysis	<p>It is not possible to obtain an immediate capacity reading by inserting a battery. The capacity is derived by discharging the battery at a calibrated current to the end-of-discharge threshold voltage. The elapsed time is measured and displayed as the derived battery capacity.</p> <p>When the battery starts discharging, the Global Display reads "CAP: 0%". The flashing capacity figure indicates that the number is counting upwards. When the battery voltage has dropped to the end-of-discharge threshold, the discharge terminates. The readings stop flashing and the true capacity is then known.</p> <p>Several capacity readings may be shown. If more than five discharge-charge cycles have been applied, the 2nd, 3rd, 4th and 5th readings indicate the latest four capacities. The first reading (Residual Capacity) remains visible at all times.</p>
Definition of battery capacity	The capacity reading is the percentage of the manufacturer's battery rating. The rating is measured in mAh (milliampere per hour). For more information, refer to CHAPTER 11, "3. Battery Rating".

Example A fully-charged battery rated at 1000mAh must be able to provide a discharge current of 1000mA for one hour. If the battery can provide this current for that time, the derived capacity is 100%. If the battery can only provide the current for 30 minutes, the capacity is 50%.

Interrupt

When a battery is disconnected while in service, a beep tone sounds. If the battery is reconnected within five seconds, service resumes without interruption. If not reconnected, the Station resets to EMPTY in five seconds and the battery data is lost.

Pressing the Display Key during the five-second interrupt resets the Station immediately.

Changing control settings

Changing the Program Selector while a battery is serviced does not affect the program in progress. To restart with a different program, remove the battery and press the appropriate Display Key to reset the station. Select the new setting and re-insert the battery.

Changing the Target Selector during service is possible. Since the Target Capacity setting is read at the end of each discharge, the effect of changing the setting will depend on the battery's position in the program sequence at the time of change.

Full Load

Batteries requiring charge or discharge power in excess of the unit's capacity are put on a waiting queue. The display message for batteries on hold reads WAITING.

When the charge or discharge power becomes available, a battery that is waiting resumes service.

Note Energy from discharging batteries is used to charge the other batteries.

3. Evaluation of Battery Results

Evaluation by LEDs

PRIME and AUTO Each Station is equipped with RUN, READY and FAIL LEDs. During service, the RUN LED is on. When the program is completed and the battery has met or exceeded the Target Capacity, the READY LED lights up. If the Target Capacity has not been reached, the FAIL LED comes on. A flashing FAIL indicates incorrect battery voltage due to defective cells.

CHARGE Since no capacity reading is taken on the CHARGE program, the READY LED blinks when the battery is fully charged. For a summary of LED signals, refer to CHAPTER 4 — STATUS INDICATORS.

Evaluation by display

In addition to the RUN, READY and FAIL LEDs, the C4000 is equipped with an 80-character display.

Global Display The status of each battery in service is shown on the first line of the display. The average cell voltages are displayed in bar-graph form on the second line.

Detailed Display Pressing the Display Key allows you to get more detail on the battery services. Several capacity figures are shown on multi-cycle programs. Average cell voltage and battery Fault Codes (if present) are also displayed. For more information, refer to CHAPTER 5 — FAULT CODES.