

PSC-10A

Programmable Smart Charger

User's Guide



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Safety Information

- Except as explained in this manual, do not attempt to service Albécorp equipment yourself. Opening the equipment may expose you to dangerous voltages. Refer servicing beyond that described in this manual to authorized personnel.
- Do not allow liquids or moisture to get into the equipment. If liquid does get into the equipment, unplug it immediately and contact your nearest authorized service center or Albécorp directly.
- Ensure equipment is provided adequate ventilation. Do not block equipment ventilation openings.
- Do not exceed equipment voltage or power ratings and capabilities.
- Make sure that equipment is properly grounded.
- Do not let unauthorized persons operate or service the equipment.

Information in this document is subject to change without notice.

PSC-10A Single Cell Charger Instruction Manual, Book Revision 2.0, P/N 4200-017

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1. Receiving

Upon receipt of the PSC-10A Programmable Smart Charger, please take time to inventory all contents of the shipment. If there is any visible damage to the cases or boxes, notify the freight carrier immediately for a damage claim. Unless otherwise noted, shipment of the test system is FOB Boca Raton, Florida, and any claims for shipping damage must be made directly to the freight carrier by the purchaser.

Check the items received against the packing slip. The standard unit includes the following items:

- The PSC-10A Charger
- A set of 8 foot test leads
- An AC power cord
- This instruction manual

If any of the contents are missing, contact Albécorp at (561) 997-2299.

2. Introduction

The PSC-10A is a programmable charger designed for charging a single 2-volt cell either on-line or off-line.

2.1. Charger Modes

The charger can be used in either the Power Supply or Timed Equalization mode explained below.

WARNING: To prevent arcing, only connect/disconnect the PSC leads to the battery posts when the PSC is in the Cell Voltage mode or when instructed to do so in this manual.

Power Supply Mode

In this mode, the user controls the float voltage level. You may set the PSC output voltage to any level up to 3.00 volts. After this target or final voltage (float voltage) is set, the PSC charges the cell to that level. If the cell is initially substantially below the target level, the power supply limits current to 10 amps until the cell voltage rises to near the programmed value. NOTE: The cell must be above 0.7 volts before charging can begin.

Timed Equalization

In this mode, you can program the PSC to the final voltage desired (equalization voltage) and how long that voltage will be applied. After the time expires, the PSC voltage returns to the float voltage set in the Power Supply mode.

To automatically equalize a cell, first set the desired float voltage in the Power Supply mode, then program the equalization voltage and time in the Timed Equalization mode. The PSC supply first equalizes the cell to the programmed voltage for the programmed time, and then adjusts the voltage to the float voltage level and leaves it there until the user intervenes.

The charger output is routed through a relay contact controlled by the microprocessor-based control system. When the PSC is first connected to a battery cell, the charger output voltage is automatically adjusted to equal the cell voltage. This way, when the output relay closes, there is no initial current flow and, therefore, no arcing takes place.

2.2. Selecting the Desired Function

The PSC-10A menu structure lets you select various operating options using soft keys. The Up/Down Arrow keys, the Mode key, and the Enter key are soft keys, which means their functions depend upon the menu shown on the display. The functions that the soft keys perform are displayed on the screen in brackets above the Mode and Enter keys and left of the Arrow keys. For example, the Cell Voltage screen in Figure 2 shows only one active soft key that lets you select the Power Supply [PwrSply] mode.

NOTE: This manual refers to the Mode, Enter, and Arrow keys by their soft key names.

3. Power Up

Connect the PSC-10A to a standard 115VAC outlet, attach the charger leads to the front panel, and set the rear panel power switch to On.

When the unit powers up, the display shows the Albécorp logo and program revision level. The unit then performs a self-diagnostic and calibration check. A message appears if the diagnostic detects a problem. If this occurs, cycle the power off then on. If the problem still exists, power down the unit and contact Albécorp for assistance.

If the self-check is good, the following screen appears:

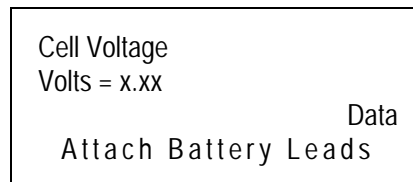


Figure 1. Power Up Screen

4. Connecting to the Cell

WARNING: Only connect or disconnect the PSC leads to the battery posts when the PSC is in the Cell Voltage mode.

After the charger leads are connected to the PSC, connect the red test clamp to the positive terminal of the cell being charged, and the black test clamp to the negative terminal of the cell.

5. Cell Voltage Display Function

After the leads are connected to the battery, the Cell Voltage screen appears.

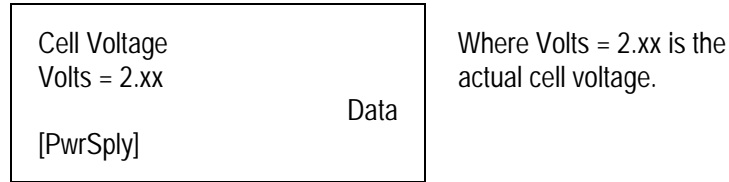


Figure 2. Cell Voltage Mode

The cell voltage displayed is the actual voltage of the cell being charged and is accurate to $\pm 0.1\%$ of reading ± 0.01 volt.

In the Cell Voltage mode, the cell voltage sense leads are connected to the cell, but the current-carrying charger leads are internally disconnected within the PSC by the charge control relay. Also, the charger supply is automatically adjusted to equal the cell voltage so that, when the current leads are internally connected within the PSC, there is no initial current flow.

[PwrSply] Power Supply - This is the only function available from the Cell Voltage mode screen. This function selects the Power Supply mode described in the next section.

6. Power Supply Mode

You can use the Power Supply mode to float a cell to a level or to equalize a cell to a level by controlling the voltage level and the length of charge time. To select the Power Supply mode, press the [PwrSply] key on the Cell Voltage screen. In the Power Supply mode, you can set the charger output voltage to any value up to 3.00 volts.

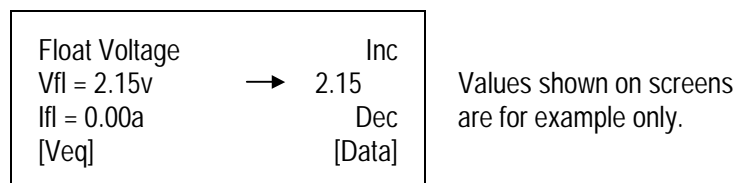


Figure 3. Power Supply Mode

The Power Supply mode screen shows two voltages. Vfl = 2.15v is the actual cell voltage as measured at the test clips. The value with the arrow pointing to it, 2.15, is the target voltage to which the cell is to be charged.

When the Power Supply mode is first selected, the target voltage is automatically set to equal the actual cell voltage. Since the cell voltage initially equals the PSC target voltage, the charge current (IfI) is zero.

The functions available from the Power Supply mode screen are Veq and Data.

[Veq] Voltage Equalization - The timed equalization function described in the Time Equalization Mode section.

[Data] - This function lets you scroll through data stored during a timed equalization charge. There are ten data points taken at equal intervals during a charge. This function is described in the General Test Notes section.

NOTE: If you want to return to the Cell Voltage mode from the Power Supply mode, press [Data] then press [Cell-V].

7. Float Voltage

In the Power Supply mode, to set the target float voltage to the desired level, press the Inc (Increment) or Dec (Decrement) up/down arrow keys. As soon as the target voltage is raised above the actual cell voltage, current starts to flow, and the cell voltage begins to increase. The charger current is limited to a maximum value of 10 amps.

NOTE: The target value should be the normal float voltage for that cell.

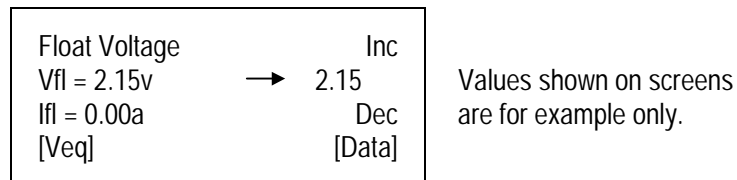


Figure 4. Power Supply Mode

NOTE: If a timed equalization function (described below) is to be performed, use the Power Supply mode to set the float voltage that the cell should be returned to following the equalization charge. When the timed equalization charge finishes, the PSC returns to the Power Supply mode.

NOTE: If you want to return to the Cell Voltage mode from the Power Supply mode, press [Data] then press [Cell-V].

8. Timed Equalization Mode

In the Power Supply mode, to program a timed charge, press the [Veq] Voltage Equalization key. The following screen appears.

Set Veq	Inc
Volts = 2.yy	
	Dec
[Teq]	[Accept]

Where Volts = 2.yy is the desired voltage that the cell is to be charged to.

Figure 5. Set Voltage Equalization

To set the end voltage that the cell is to be charged to (Veq), press the Inc or Dec (Increment or Decrement) keys, then press [Accept] to enter that value. After the voltage level is accepted, press the [Teq] Time Equalization key.

Set Teq	Inc
Time = 000 Hrs	
	Dec
[StartChg]	[Accept]

Figure 6. Set Time Equalization

To set the length of charge time (Teq), press the Inc or Dec keys, then press [Accept] to enter that value.

To start the timed charge cycle, press the [StartChg] Start Charge key. When this key is pressed, the following parameters are displayed.

Veq = 2.13	→	2.16
Ieq = 2.83	→	10.00
Teq = 000:00	→	001.00
[Pause]		[Abort]

Values shown are for example only.

Figure 7. Parameters During Charge Cycle

The Veq, Ieq, and Teq parameters show the present values of cell voltage, charge current, and charge time. The values the arrows are pointing to are the programmed (target) values. The voltage and time (Veq and Teq) are the values you entered in the previous steps. The value for current (Ieq) is the maximum current limit of the power supply.

A normal charge cycle terminates when the actual time reaches the programmed time. At that time, the system automatically changes to Power Supply mode, and the voltage control adjusts the cell float voltage to the target value set in the Power Supply mode. NOTE: The target value should be the normal float voltage for that cell.

[Pause] [Abort] [ResumeChg] - If a problem develops during the charge cycle, you can either pause or abort the cycle. Pausing the charge by pressing [Pause] opens the charge control relay and stops the timer until the cycle is resumed. To resume the charge after pausing, press [ResumeChg]. Pressing [Abort] to stop a cycle causes the same action as a normal time out, with the mode automatically returning to the Cell Voltage mode. Basically, the abort function short cycles the charge timer.

9. General Test Notes

The Data function lets you scroll through data stored during a timed equalization charge. There are ten data points taken at equal intervals during a charge. NOTE: Data is stored in volatile RAM, which means it will be lost when the PSC is powered off.

To access data that was stored during the timed discharge, press the [Data] key while in the Power Supply mode. The following shows a typical Charge History screen with sample data.

Charge History	Inc
Ve _{eq} = 2.25	I _{eq} = 06.7
T(02) = 001.25	Dec
[Cell - V]	

Figure 8. Charge History

The sample data is for the second of the ten stored data points (T02). To scroll through the other data points, press the Inc or Dec keys.

To return to the Cell Voltage mode from the Data (charge history) mode, press [Cell-V].

NOTE: To safely remove the PSC test leads from the cell, the PSC must be in the Cell Voltage mode to prevent arcing. To return to the Cell Voltage mode from the Power Supply mode, press [Data] then press [Cell-V].

If the test leads are disconnected during an active charge function, the PSC will detect the loss of voltage and display an error message. When the message is cleared by pressing the [Continue] key, the operating mode changes automatically to the Cell Voltage mode.

10. Calibration

The measuring circuits in the PSC are very stable and should not require any adjustment for several years. As with any test equipment, it is recommended that the displayed values be compared to known accurate instruments to verify calibration is within acceptable limits. Acceptable limits should be defined by the user. In typical battery applications, acceptable tolerances are:

$$V_{\text{cell}} = \pm 0.01 \text{ volt} \quad I_{\text{charge}} = \pm 0.25 \text{ amps} \quad T = \pm 1\%$$

The voltage and current readings are calibrated using a potentiometer adjustment to set the upper level of the input range. The circuit uses an auto zero feature, so there is no adjustment for that end of the range. Because the time is software generated using a crystal oscillator as the reference, there are no calibration adjustments for time. The time is either correct or there is a problem with the PSC.

WARNING: Remove power before opening the unit. Opening the equipment may expose you to dangerous voltages. Do not let unauthorized persons service this equipment.

To access the voltage and current calibration adjustments, remove the top cover of the charger. Refer to Figure 9 for the locations of potentiometers P1 and P2. After the top is removed, proceed with calibration as follows.

10.1. Cell Voltage Calibration

Power up the charger, and connect it to a nominal 2 volt battery of at least 25 ampere hours rating, using a calibrated 10 amp shunt in series with the positive test lead. Select the Cell Voltage display mode on the PSC.

Read the actual cell voltage with a known calibrated 3½-digit voltmeter, and adjust **P1** until the value displayed by the PSC matches that of the digital voltmeter.

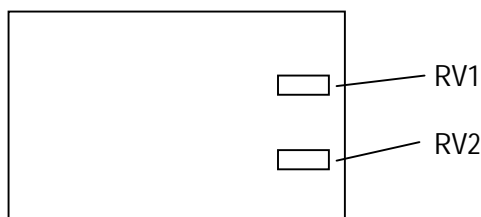


Figure 9. PSC-10A Control Board

10.2. Charge Current Calibration

Set the PSC to the Power Supply mode, and increase the charger voltage until the charge current reaches a stable level at or close to 10 amps.

Read the actual charge current flowing through the calibration shunt, and adjust **P2** until the value displayed by the PSC matches this current reading.