

E-SAXIMETER

User Manual produced by FDOT District 3, July 2018

Note: This manual is intended to augment the existing 2011 Saximeter Model User's Manual dated May 9, 2016 offered by Pile Dynamics, Inc. For more detailed explanations, please refer to the PDI User's Manual.



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1. Introduction

1.1. The E-Saximeter (ESAX), also referred to as unit, will detect hammer blows by sound or manual input. The outputs displayed are stroke, blow number (BN), blows per minute (BPM), blow per foot (BPF), blows per inch (BPI), total blows, Potential Energy (PE) in kips-ft, penetration depth (PEN) in feet, date and time.

Note: the highest blow rate is 240 BPM, but Saximeter can be manually set up to 300 BPM.

2. Operation

2.1. Battery Information and Charging

2.1.1. The Saximeter uses rechargeable lithium-ion batteries that can last up to 12 hrs. To recharge, connect power cable to the port on the left side of the unit. A red light will illuminate on the power cord pack and will turn green when fully charged, which takes approximately 4 hours. It is fine to leave charger on overnight, but it is not recommended to leave charger plugged into an outlet continually. The battery will auto discharge over time. Therefore, it is recommended that the unit be taken out periodically and cycled monthly. Run the battery down until the unit displays a low battery warning (Figure 1), then recharge it. If the unit is left unused for multiple months, repeatedly discharge and recharge a few times to help revive the battery to optimum operation. The best practice is to always store and maintain the ESAX at a full charge. This will greatly help to promote the longest battery lifespan.

Note: While the memory effect is minimal in a Lithium-ion battery, cycling as described above is recommended.

Warning: Storage of the ESAX on a low charge or dead battery can severely reduce the life span of the internal battery.

2.1.2. Low Battery Indication - A low battery indication will occur at approximately 3.3V. The ESAX will power down at approximately 3V. After first indication of a low battery, the ESAX should remain functional for approximately 1 hour before the automatic shutdown. When the battery is approximately 3.3V or less, a "Low Battery" message (Figure 1) will appear upon boot-up before entering the

main menu and again prior to going to data collection mode. In data collection mode on the Level Line, an "L" will flash (Figure 2), on the level line. When in standby mode the "L" alternates with "S" (Figure 3).

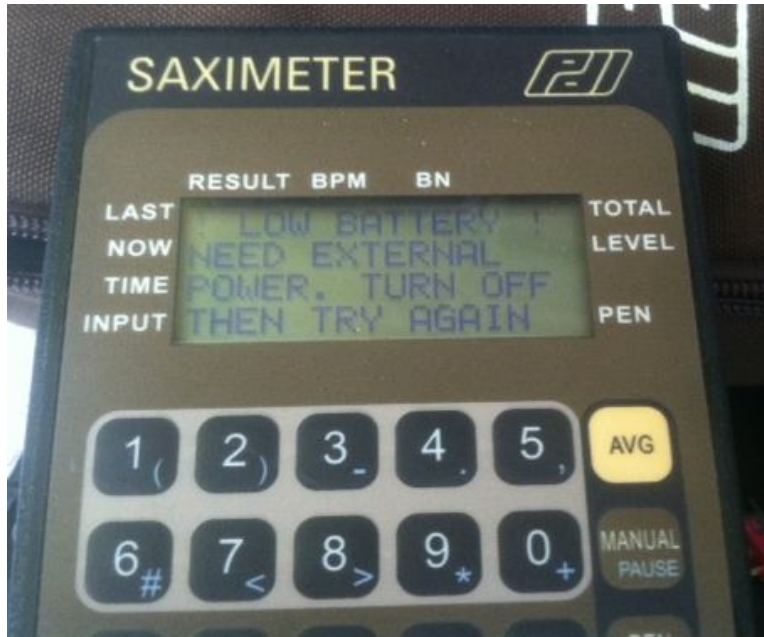


Figure 1.

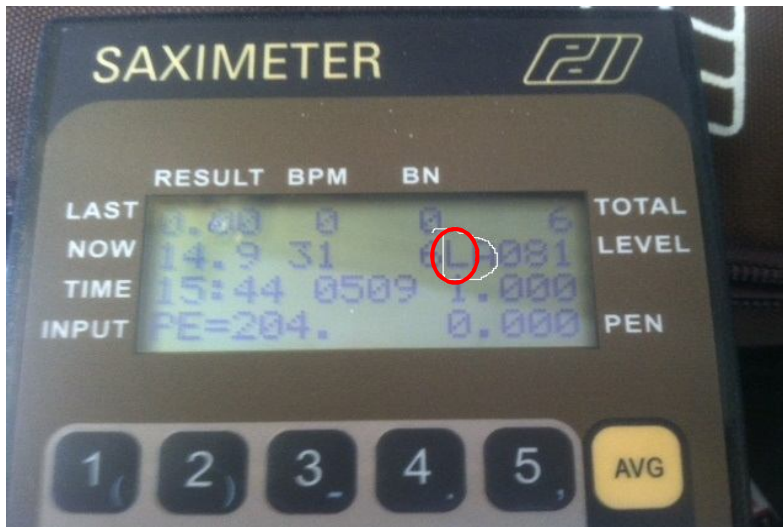


Figure 2.

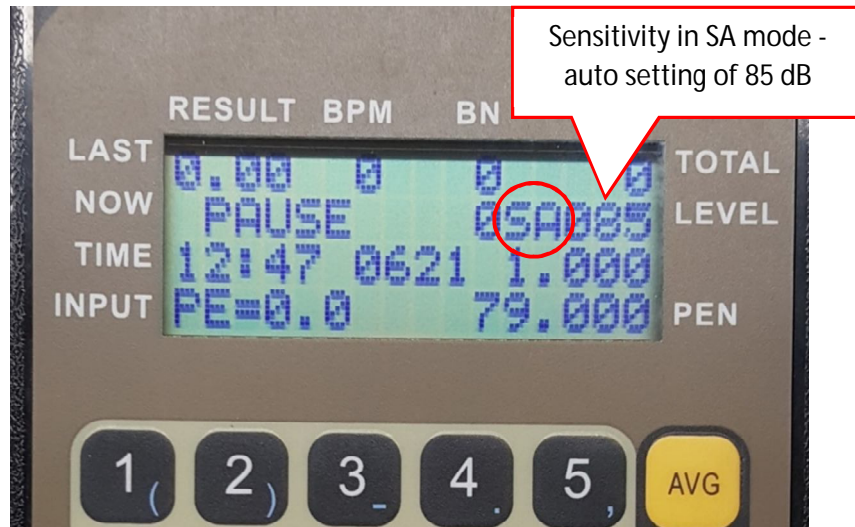


Figure 3.

2.2. Saximeter Setup

2.2.1. When unit is first turned ON, pressing the ALT then S key within the first 3 seconds will continue to the main setup menu or select ENTER to proceed directly to the job specific setup menu.

2.2.2. Main Setup Menu

2.2.2.1. The main setup allows general Saximeter parameters to be set. Selections are made by using the up and down arrows to navigate through menu items and ENTER is used to make selections. When finished, select the back arrow to exit the main setup menu.

2.2.2.2. AUDIO: Set sensitivity to 110 dB as a starting point. When using manual microphone mode (SM), it is easier to adjust sensitivity down than up.

2.2.2.3. PEN INCREMENT: Input the MAIN as 1 foot and ALT then PI as 1 inch. This is the actual penetration increment the Saximeter will use when the AVG (average) button is pressed.

2.2.2.4. Units: Sets ENGLISH or SI units.

2.2.2.5. EDIT NOTES: This allows 6 preprogrammed notes to be used during driving. Notes can be up to 6 characters.

2.2.2.6. OWNER: Enter applicable owner's name.

2.2.2.7. DATE TIME: Allows adjustment for date/time.

- 2.2.2.8. USB HOST: For programming to provide data transfer to a USB.
LEAVE THIS ALONE!
 - 2.2.2.9. RST HAMMER LIST: This will reset the pre-programmed hammer list to include erasing all manually programmed hammers.
 - 2.2.2.10. MODE: Includes *basic* or *memory*. In memory mode, data is saved to internal memory. In basic mode, no data is saved to internal memory. Always select MEMORY mode.
 - 2.2.2.11. When finished with main setup menu, select the back arrow to enter the job specific menu.
- 2.2.3. Job Specific Setup Menu
- 2.2.3.1. Selections are made by using up and down arrows to navigate through menu items and ENTER is used to select. When finished, select the back arrow to exit the job specific setup menu.
 - 2.2.3.2. PILE (name): Input Bent and Pile number.
 - 2.2.3.3. HAMMER: Select to input correct hammer used on project.
 - 2.2.3.3.1. HT: select OED for open-end diesel hammers or select OTHER Hammer for all other types, i.e., air or hydraulic.
 - 2.2.3.3.2. HN (Hammer Name): Select to change hammer used on the job. Once selected, use the down arrow to show the lists of pre-programmed D# hammers and the manually entered hammers. The manual hammers are indicated by *hmr 1*, *hmr 2* or a manually created hammer name. Continually pressing the down arrow will cycle through multiple screens of hammers.
 - 2.2.3.3.2.1. D# Hammers: Select these for typical open-end diesel (OED) hammers with the same D# designator. For example, select D100 for an APE D100-52 OED hammer. The saximeter will automatically fill in the values of hammer weight (HT) and MAXBPM.
 - 2.2.3.3.2.2. Manual Hammer creation: If the hammer is not on the list or the hammer provided is an air or hydraulic hammer, manual input is required to obtain the best data. Use of a hammer type that has a close hammer weight to the actual hammer used can work fine for strokes and blows on OED, but it will NOT give

accurate energy readings. To create a manual hammer name, select one of the available hmr# for list. Use arrow to cycle through entries and make selections. When finished with all the entries, use the back arrow to go back to the job specific setup screen.

- 2.2.3.3.2.2.1. HN (Hammer name): Manual hammer name.
- 2.2.3.3.2.2.2. HT (Hammer type): Select the appropriate hammer type of either open-end diesel or OTHER.
- 2.2.3.3.2.2.3. HW (hammer weight): Use manufactures product sheets or pile installation plan to obtain the hammer/ram weight. Must enter as kips. A quick method is to use the hammer designation. A D50-13 hammer means that the ram weight is 5000 kg. Take $(5000 \text{ kg})/1000 \times 2.205 \text{ lbs/kg} = 11.03$ kips.
- 2.2.3.3.2.2.4. STROKE: Enter hammer's max stroke (ft) up to two decimals, i.e., 11.50 ft.
- 2.2.3.3.2.2.5. MAXBPM: Enter hammer's max speed or BPM. Note: Always make sure this value is higher than hammer will operate, but do not use a value that is much larger than actual BPM observed. As a general rule, set MAXBPM to a value 10 to 20 higher above the highest expected rate. For example, if an air hammer is operating at 47-53 BPM observed, set the MAXBPM to~ 65. Excessively high BPM setting can lead to Saximeter adding extra blows or missing blows when BPM is set too low.

2.2.3.4. PROJ (Project): Enter project number with no dashes.

2.2.3.5. LENGTH: Enter current pile's overall length (ft).

3. Data Collection

CAUTION: In order to protect the Saximeter from water damage during inclement weather, place unit into a 1-gallon zip lock bag. The sensitivity/trigger

may need to be set to a lower dB, but usually will work fine without readjustment.

3.1. Once finished with the job specific setup screen, the Saximeter will display the data collection screen in PAUSE mode with the sensitivity/trigger set in automatic mode: displayed as sensitivity auto (SA) on the level line (Figure 4).

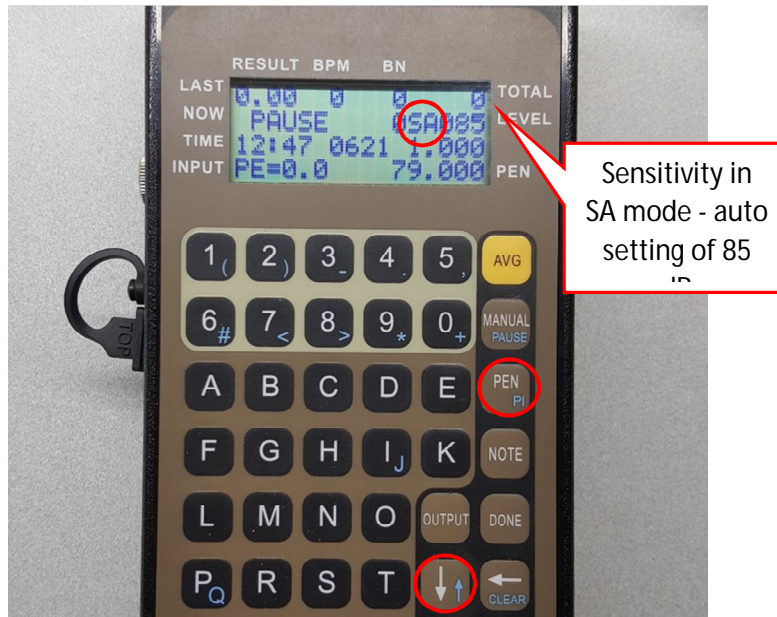


Figure 4. Ready to collect data in PAUSE mode.

3.2. Sensitivity/Trigger Adjustment: Displayed as decibels (dB).

3.2.1. Figure 4 shows unit set on sensitivity auto (SA) mode. In SA mode, the decibel reading will automatically change to a different value each blow based on factory programmed parameters. It is more common to run in sensitivity manual mode (SM). Select the down arrow once, and Saximeter will change to SM mode while changing the sensitivity setting to a value one lower from what was set in step 2.2.2.2. This value can be adjusted up or down with arrows to the desired setting. As a general rule, large hammers work well between 110-115 dB and smaller hammers work well between 100-110 dB. The sensitivity/trigger can be adjusted while driving with the arrow keys. **General Rule: If blows seem to be counting on their own, then adjust**

the sensitivity/trigger UP (increase dB). If the blows seem to be NOT counting, then adjust sensitivity DOWN (decrease dB).

Note: If the unit was last changed to manual blow recording, the sensitivity/trigger adjustment will not be possible.

3.3. Penetration Adjustment (PEN).

3.3.1. Push the PEN button (Figure 4) and enter the LP depth (ft), which is the depth of pile penetration relative to a specific reference elevation. If the pile runs during driving, the PEN key can be pressed to correct penetration depth; however, make note of existing blow number prior to pressing key, because the blow count will zero out at new penetration depth. The blow number noted can be added to corrected penetration depth for pile log sheet entries.

3.4. Increment Adjustment (PI).

3.4.1. The Increment setting should be already set to 1.00 ft. (shown above the PEN depth on display), but if it is set to inches or 0.083 ft., select ALT then PEN key to cycle between inch and feet.

3.5. AUTO or MANUAL Blow Recording.

3.5.1. Saximeter can record blows in either Manual Mode or Automatic data collection mode. This is not to be confused with auto and manual sensitivity/trigger modes. By pressing the MANUAL key, the saximeter will switch to manual mode, the letters MAN will be displayed on the Level line (Figure 5). In manual mode, the blow counts are increased by pressing the MANUAL key for each blow and the increments are changed with the AVG key. It is preferred to collect data in auto mode; therefore, **to switch back to automatic data collection mode, press the following key sequence: ALT>CLEAR>ALT>CLEAR.**

3.6. Starting Data collection

3.6.1. **CAUTION: Do not hit DONE key until finished.** It will close current file. If this happens, repeat steps 2.2 onward and start another log.

3.6.2. To begin data collection/start pile log, press either ALT then PAUSE key, ENTER key or ALT then CLEAR, which will cause the PAUSE display to go away and the NOW line will start displaying the current data. To pause driving, press ALT then PAUSE keys and PAUSE will be displayed once again.

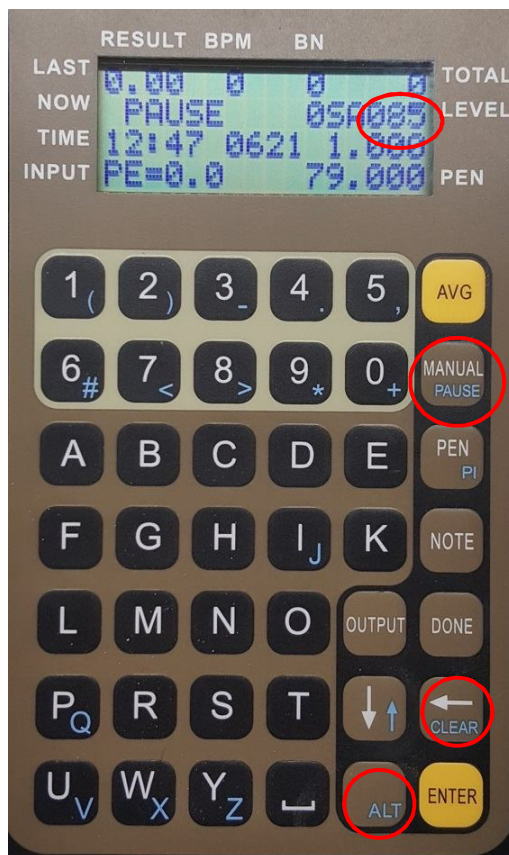


Figure 5. Manual collection mode displayed.

- 3.6.3. As the pile is driven, press the AVG key each time the pile foot markings visually reach the reference elevation point. If driving becomes hard, the increments of collection can be switched to inches by pressing ALT then PI key, which will change increment from 1.000 to 0.083 ft.
- 3.6.4. Correcting penetration depth - If the pile runs during driving, the PEN key can be pressed to correct penetration depth; however, **make note of existing blow number prior to pressing key, because the blow count will zero out at new penetration depth.** The blow number noted can be added to corrected penetration depth for the pile log sheet.
- 3.6.5. Adding Notes - Preprogrammed notes can be added during the drive, which were added from step 2.2.2.5. Select the NOTE key, then select applicable note from the list.

3.6.6. Adding Comments - The user may add comments during the drive (up to 16 characters). Press the back arrow, which clears the bottom line on display, then type comment and select ENTER when finished.

3.7. Ending the Drive

3.7.1. Once the drive is finished, press ALT then PAUSE key to pause the drive.

3.7.2. Make any last-minute comments or notes.

3.7.3. To finalize log, press the DONE button. Enter the END PENETRATION depth (ft) and press ENTER. By default, the ESAX will display the next increment. If you press ENTER, this value will be stored. Once ENTER is pressed, the log is completed and stored in internal memory: available for download or review.

4. Display

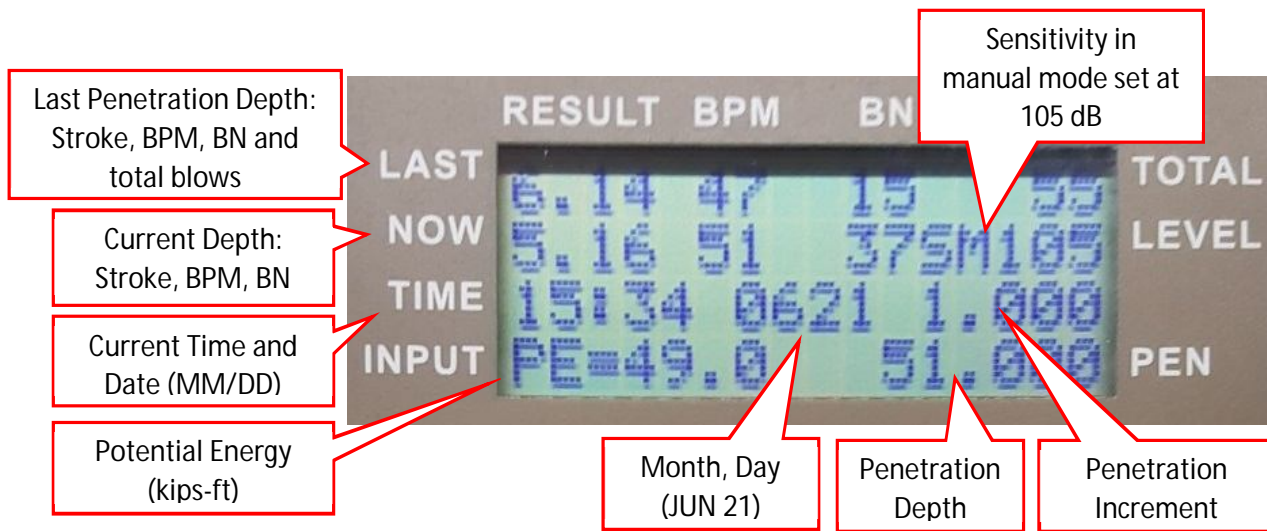


Figure 6.

5. Output

5.1. Data Review

5.1.1. The data collected is stored internally and can be reviewed on the display screen.

5.1.2. Press the OUTPUT key, select REVIEW PILE with arrow keys and press the ENTER key.

- 5.1.3. Select PILE DATA and press ENTER key again. The listing of data files is arranged from the LAST project number counting backwards to the first. Select the LAST project using the arrow and ENTER keys. There will be an asterisk "*" beside the current selection. Next, select the applicable file by pile name. There is an "L" besides the most current or last file.
- 5.1.4. Once data files open, use arrow keys to navigate through data. NOTE: no comments or notes can be seen on the review screen. The files need to be downloaded in order to see them.
- 5.1.5. To exit REVIEW mode, press back arrow when finished.

5.2. Save Data

- 5.2.1. The Saximeter can save the data from its internal memory to a USB stick. Use a formatted USB drive (FAT 32), and the ESAX will create a folder named, SAXDATA, to store saved files. The saved files can be opened and view with Microsoft WordPad.
- 5.2.2. Press OUTPUT key then select SAVE DATA with arrow keys and ENTER KEY. Wait for the Saximeter to prompt insertion of USB drive into the left side port. Once USB is found by the ESAX, select data to be saved. The selection options are: *ALL Piles*-which will save everything in the memory, *select by pile name* or *select by date*.
 - 5.2.2.1. If *select by pile name* is chosen, select the project name desired using the arrow and ENTER keys. The files are arranged from "L" (last or most current file) to the oldest file. There will be an asterisk "*" beside the current selection. Next, select the desired pile name and the saximeter will provide the option to change the pile name prior to pressing the ENTER key to save the data. The Saximeter will either display *File Saved* or if previous data file exists on USB, it will prompt selection of **C**ancel, **A**ppend or **O**verwrite. Use keys to select appropriate letter of choice to continue saving file.

Note: If only one project number or one pile name is in the internal memory, the selection options will skip some of the previously mentioned steps prior to saving data.
 - 5.2.2.2. If *select by date* is chosen, make selection of *edit date*, or *this date*. Enter a file name and press ENTER to save. The Saximeter

can either display *File Saved* or if previous data file exists on USB, it will prompt selection of **C**ancel, **A**ppend or **O**verwrite. Use keys to select appropriate letter of choice to continue saving file.

6. Memory Management

6.1. The Saximeter has limited internal memory capacity and will sometimes need to be cleared.

NOTE: Partial Memory clearing is not possible.

Warning: Clearing of memory is permanent.

6.2. Check Memory Capacity

6.2.1. Press OUTPUT and the percent of memory used is displayed.

6.3. Clearing Memory

6.3.1. Press OUTPUT and select MEMORY with arrow and ENTER keys.

6.3.2. Press ALT then CLEAR key to erase all data.

6.3.3. If the erase is not desired, press back arrow multiple times to return to data collection screen.

7. Inclined (Battered) piles

7.1. Driving battered piles can affect the stroke heights obtained from the Saximeter. For battered angles greater than 1H:2V, use the PDI E-Saximeter user manual for corrected stroke heights. For battered piles, less than 1H:5V, no corrections are needed.

Appendix A: Quick Start Guide 2011 ESAX Model

1. Turn ESAX ON
2. Press ALT-S for MAIN menu or ENTER for Job setup menu
3. Set Job Parameters
 - a. Pile Name, Hammer, Project Name and Pile length-Sec: 2.2
 - b. Hammers not in hammer listing (air or hydraulic hammers) require manual hammer entry-Sec: 2.2.3.3.2.2.
4. Set sensitivity/trigger value with arrow keys (Average 105-110)-Sec 3.2
 - 7.1.1. If ESAX in MAN (manual) mode, press the following key sequence: ALT>CLEAR>ALT>CLEAR.
5. Set Penetration depth (PEN)-Sec: 3.3
6. Press ALT then PAUSE or ENTER to begin recording blows
7. Press ALT then PAUSE to pause blow recording
8. Press AVG every increment aligned with reference
9. Add notes and comments as needed-Sec: 3.6.4-5
10. Press DONE when finished and enter final LP depth
11. Press OUTPUT to review or SAVE log data-Sec: 5
12. Turn ESAX OFF and recharge battery before storage

NOTE: During inclement weather, place unit in a 1-gallon zip lock bag.

