CTS 1000
Compaction Testing System

Operating & Parts Manual

Amity
TECHNOLOGY

Field-proven Solutions

amitytech.com

2800 7th Avenue North
Fargo, ND 58102

P 701.232.4199
F 701.234.1716

OPERATING MANUAL

CTS 1000 (Compaction Testing System)

Amity Technology, LLC

2800 7th Ave N, Fargo, ND 58102 USA

Phone (701) 232-4199

www.amitytech.com.com

Amity Technology, LLC

PRODUCT WARRANTY

Amity Technology, LLC warrants to the original purchaser only, each new item of Amity Technology sold by it to be free of defects in workmanship materials for a period of twelve (12) months from the date the product is delivered to the Purchaser (Warranty Period).

The sole obligation of Amity Technology is limited to the repair or replacement, whichever Amity Technology chooses, of those parts which Amity Technology, in its sole discretion, determines to have failed as a result of a defect in workmanship or material occurring during the Warranty Period. Such defective part will, at the option of Amity Technology, either be repaired or replaced to the Purchaser through an authorized Amity Technology dealer. The Purchaser must, within the Warranty Period, give written notice to an authorized Amity Technology dealer and the dealer will have a reasonable time to repair or replace the defective part. Amity Technology dealer's claimed labor hours must be fair, reasonable and consistent with industry practice.

This Warranty does not cover damage to other parts of the product caused as a result of delay by the Purchaser to repair or replace defective parts. Amity Technology will not be liable for direct or indirect costs other than those specified and this Warranty specifically excludes damage to crops, loss of use, transportation expense to a dealer, service calls, normal maintenance and upkeep costs, overtime labor costs, and any and all other injuries, claims or consequential damage or other economic loss. This Warranty does not cover damage caused to or by any equipment, accessories or parts attached to or used in connection with Amity Technology equipment. This Warranty shall be void if alteration, modifications or additions are made to Amity Technology products without written consent of Amity Technology, or if in Amity Technology's judgment, the failure was due to abuse or neglect in the operation or maintenance of the product. This Warranty shall only apply if Amity Technology equipment is used for its recommended agricultural purpose. No dealer, salesman, or agent has any authority to alter or amend this Warranty.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, AND THERE IS NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

WARRANTY VOID IF NOT REGISTERED

WARRANTY REGISTRATION

PLEASE READ THE FOLLOWING INFORMATION REGARDING THE WARRANTY REGISTRATION OF YOUR NEW CTS 1000.

Thank you for your purchase. Amity Technology, LLC will warranty each new Compaction Unit to be free from factory defects in material and workmanship under normal use and service, when operated in accordance with factory instructions. Warranty will cover a period of one year from the date of purchase.

Amity Technology's obligation under this warranty is limited to the supplying of replacement parts in exchange for any parts which are defective. The warranty does not cover normal wear from usage. This warranty is void on any unit which has been tampered with or which has been subject to misuse, negligence or accident. Any part being returned for warranty service must be sent to Amity Technology prepaid, and will be returned to you at our expense.

To obtain registered warranty coverage, please complete the section below and return it to Amity Technology within 30 days of purchase.

Customer Name _____

Address _____

City _____ State/Prov. _____

Zip Code _____ Phone # _____

Dealer Name _____

Address _____

City _____ State/Prov. _____

Purchase Date _____ Customer Signature _____

Return to: Amity Technology, LLC
2800 7th Avenue North
Fargo, ND 58102
(701) 232-4199

WARNINGS & PRECAUSTIONS

SAFTEY FIRST

The purpose of this manual is to assist you in safely operating and maintaining your Amity Technology equipment. It is the responsibility of the owner to ensure that any operator takes the time to thoroughly read and understand the information given.

It is not possible to overstate the importance of safety. Serious injury or death can result from improper operation of any farm equipment. We have taken great care to point out potential hazards that require special consideration. Give all precautions and warnings the attention they deserve.

- ALWAYS keep hands away from moving parts
- ALWAYS disconnect power cable from battery connections before servicing any part of the electrical system. Make all other connections before connecting the power cables.
- ALWAYS disconnect power cables from battery when CTS 1000 is not in use.
- NEVER move vehicle when probe is lowered.
- DO NOT allow vehicle to raise more than 4” to 5”. If probing in hard soil, ballast may be added to the vehicle to allow better soil penetration.

CTS 1000 ASSEMBLY & INSTALLATION

Prior to first use the CTS 1000 requires some assembly. The CTS 1000 comes in three main components:

- Upper mast assembly
- Lower mast
- Receiver hitch mount

1. Assemble the upper and lower mast sections by using the preinstalled hardware(13,18, &19). Tighten the .375" locknuts(13) to the rear carriage bolts(19) first, then tighten the hardware on the sides. This will ensure that the two mast pieces are square from front to back.

   Note: It may be beneficial to remove the probe coupler(10) allowing for more access.

2. Detach the probe guide assembly(25) by removing retainer pins(17).

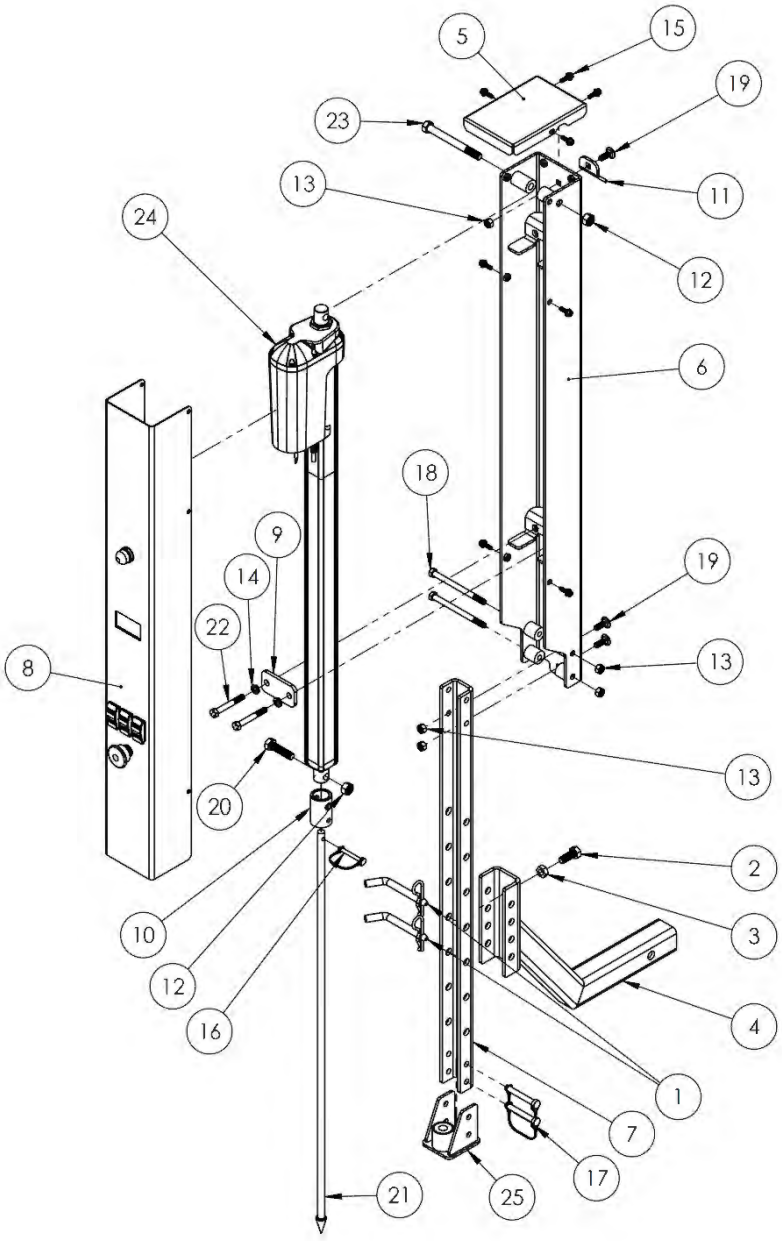
3. Install the probe(21) by sliding it through the probe guide(25), secure it to the probe coupler(10) with retaining pin(16), and reattach the probe guide to the lower mast.

4. Connect the lower mast to the receiver mount(4) using the preinstalled hitch pins(1). There are a series of holes on the lower mast spaced 3" apart, while the holes on the receiver mount are spaced at 1.5" allowing for greater flexibility to fine tune the final mounting height.

5. Install the complete assembled probe into the 2" receiver hitch of your vehicle and secure with hitch pin or bolt (not provided).

6. Adjust final mounting height of unit, keeping in mind that the more ground clearance given limits the depth that the probe can reach in the ground.

7. To remove any slop in the hitch and make unit more stable, fasten two ratchet straps (not provided) or similar item from tab(11) to anchor points on vehicle. Tighten bolt and jam nut(2&3) on the backside of the receiver mount.



8. Connect main power cable with the red connectors and route cable to battery of vehicle. Connect red wire to pos(+) terminal, and black wire to neg(-) terminal. Connect safety brake cable with gray connectors and plug cable into vehicle's trailer lights. If vehicle does not have trailer light receptacle, cut connector off and wire directly to the left or right brake light.

CTS 1000 OPERATING INSTRUCTIONS

Field Preparations

1. Make sure the CTS 1000 is mounted securely.

2. Connect power and brake light wires.

3. Make sure Emergency Stop button is pulled out.

4. Turn Power switch (I/O) on “I”.

FIGURE 1

5. Watch the LCD screen on the CTS 1000. The screens in **Figure 2** and **Figure 3** will each be displayed briefly. Take note of the Bluetooth Address (BT Addr:) in **Figure 3**. The last 4 characters in the address will be needed to identify the CTS 1000 when pairing to a phone later.

FIGURE 2

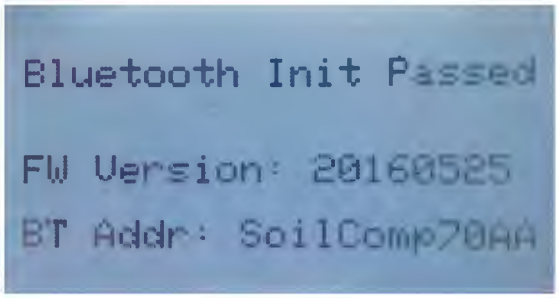


FIGURE 3

6. Follow the instructions on the LCD screen and Push the OPERATE button to retract the probe.

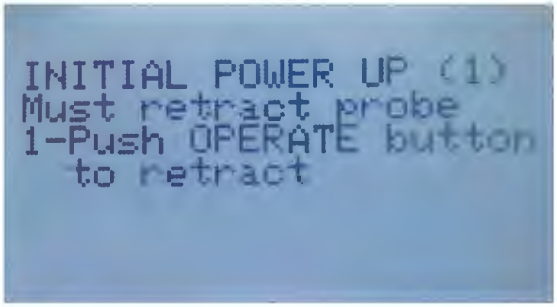


FIGURE 4

CTS 1000 OPERATING INSTRUCTIONS

7. Follow the instructions on the LCD screen and lower the probe tip until it touches the ground using the UP/DN (center) switch. This tares the probe (sets the zero point for the depth measurements). Push the OPERATE button to complete the tare.

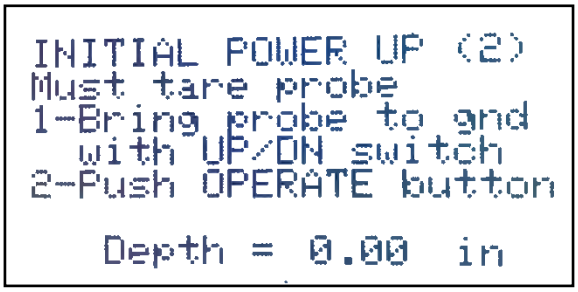


FIGURE 5

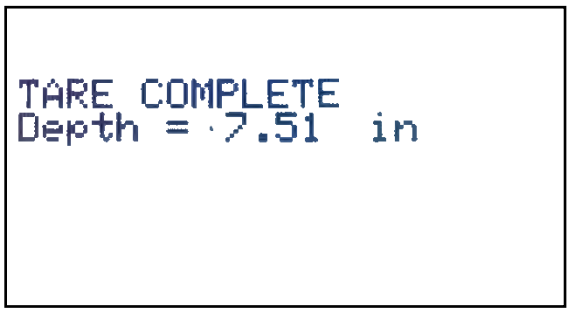


FIGURE 6

8. The screen shown in **Figure 7** will display when the CTS 1000 is ready to be used with the FarmQA Compaction phone app.

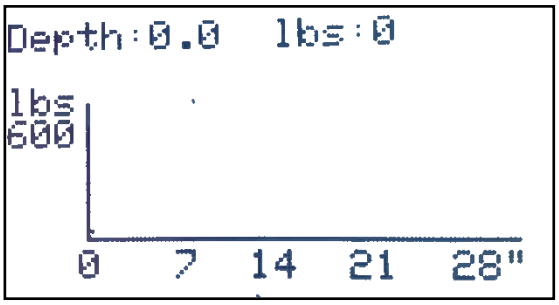
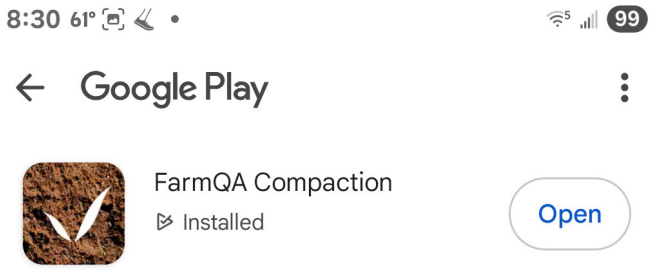


FIGURE 7

9. Download and open the FarmQA Compaction app on the device. **FarmQA Compaction is only available for Android devices**.



10. Pair a phone loaded with the FarmQA Compaction app with the Bluetooth of CTS 1000. This is done inside the FarmQA Compaction app.

Note: The process to connect to the device was changed on v2.3 and newer.

FIGURE 8

11. Push the SET CREDENTIALS button.

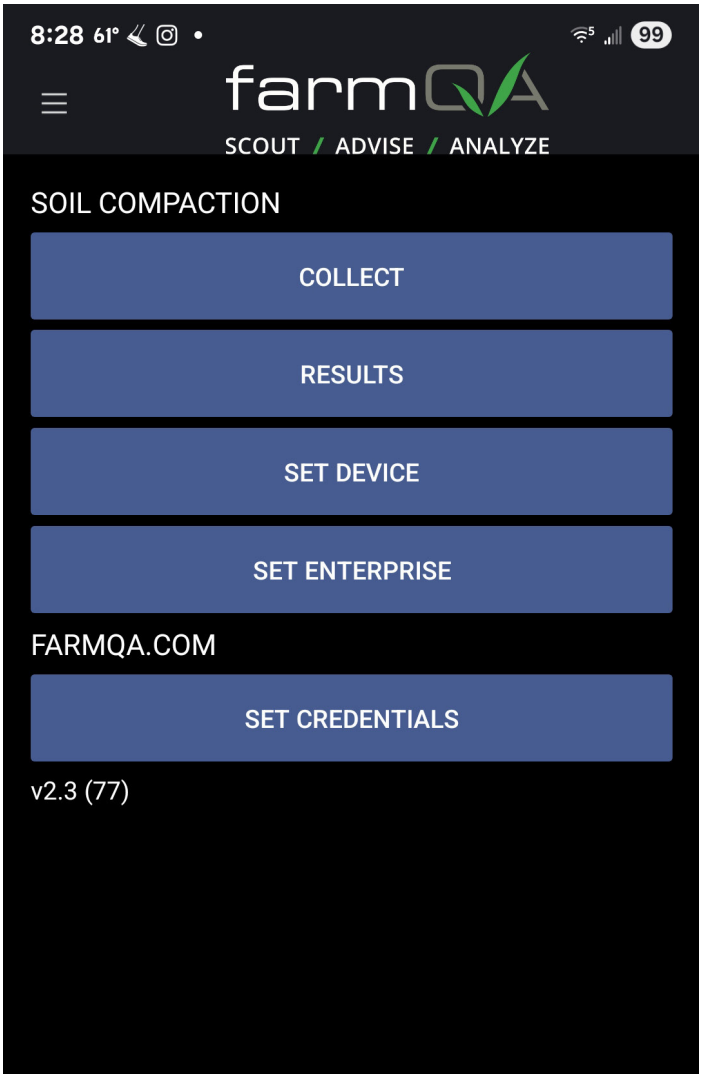


FIGURE 9

12. Enter your Email and Password, then push the LOG IN button. Contact FarmQA for assistance in receiving credentials.

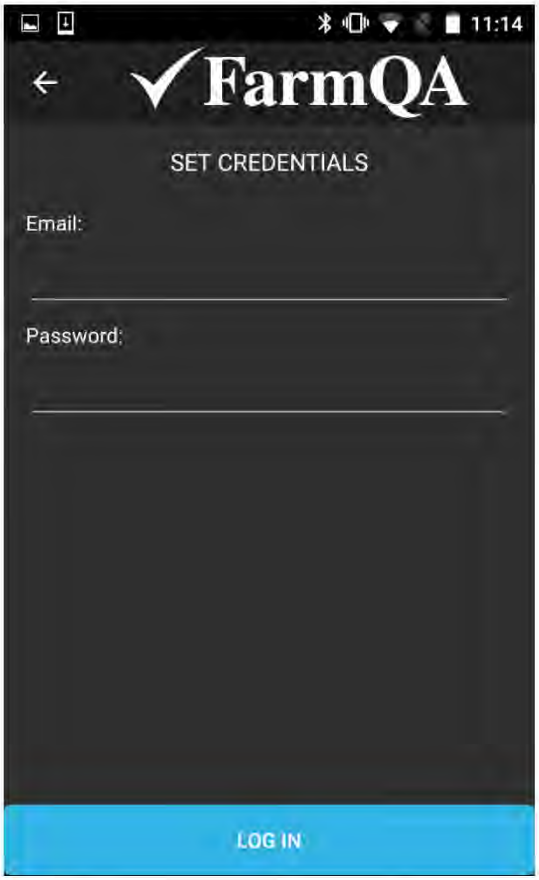


FIGURE 11

13. Push the SET ENTERPRISE button.

At any time you can keep pushing the Back button on your phone or the Back Arrow on the screen to get back to this page.

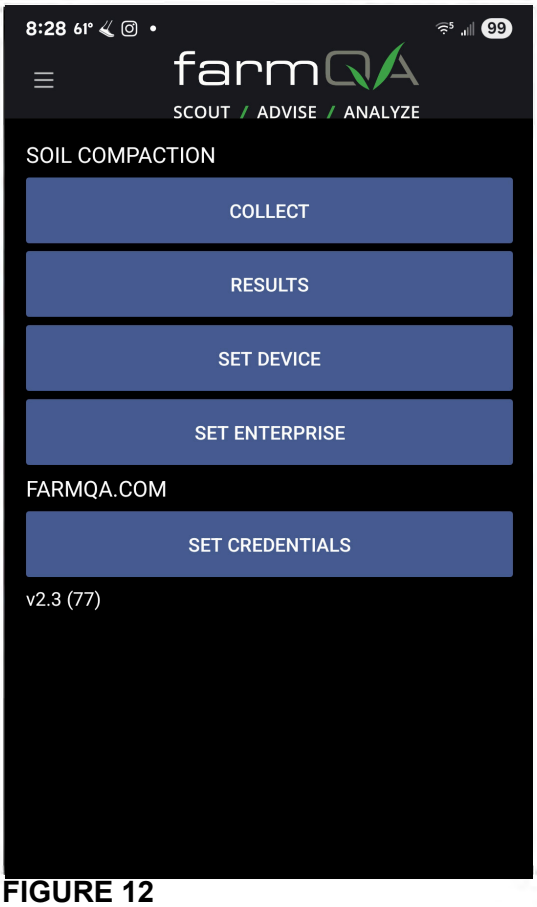


FIGURE 12

14. Select your Enterprise and push the SET ENTERPRISE button. Contact FarmQA for assistance in setting up Enterprises.

FIGURE 13

15. Push the SET DEVICE button.

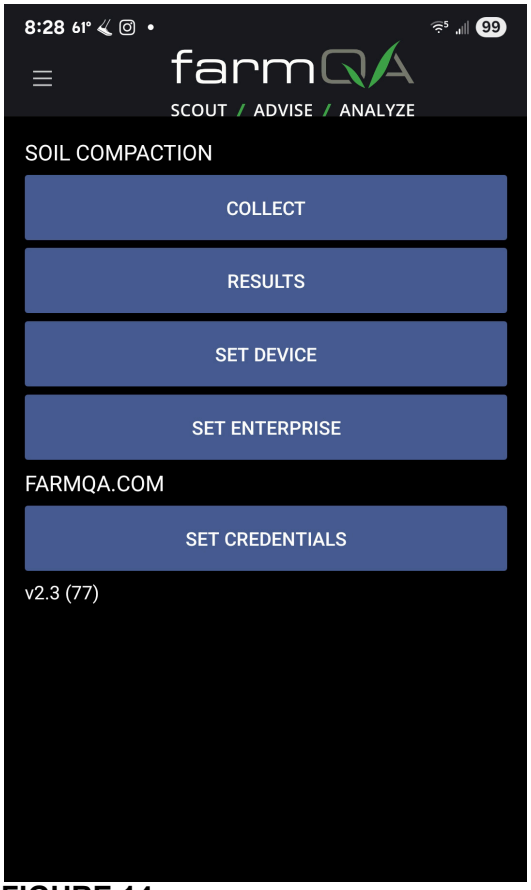


FIGURE 14

CTS 1000 OPERATING INSTRUCTIONS

16. Select your CTS 1000 device and push SET DEVICE. The last four characters should match the last four characters shown on the CTS 1000 LCD second screen after startup.

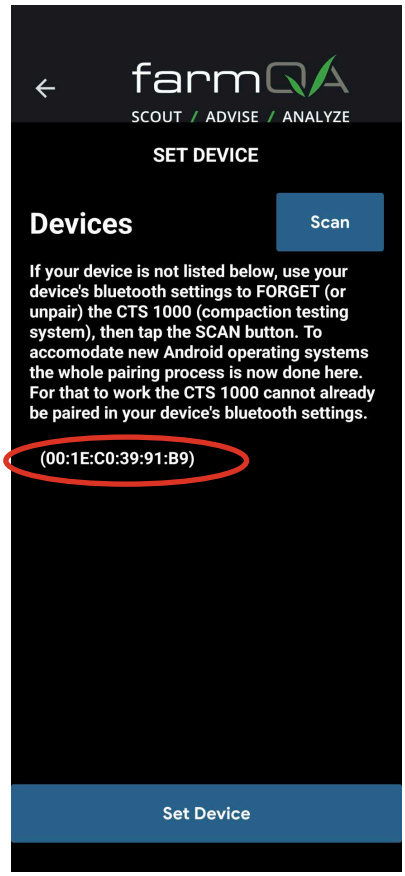


FIGURE 15

17. Push the COLLECT button.

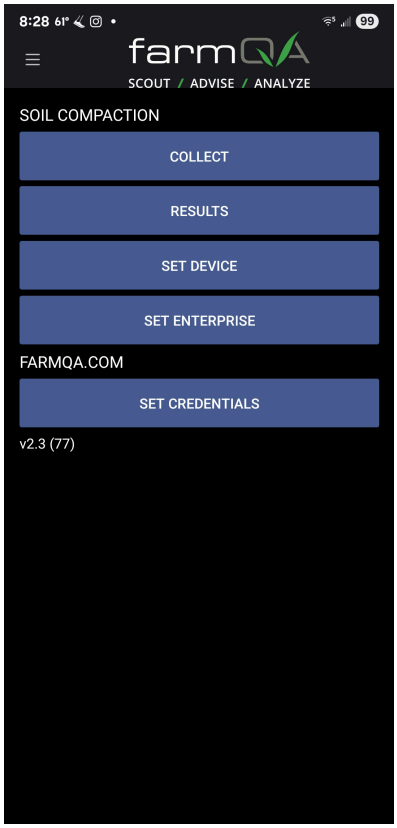


FIGURE 16

18. Push the SETTINGS button (**Figure 17**).

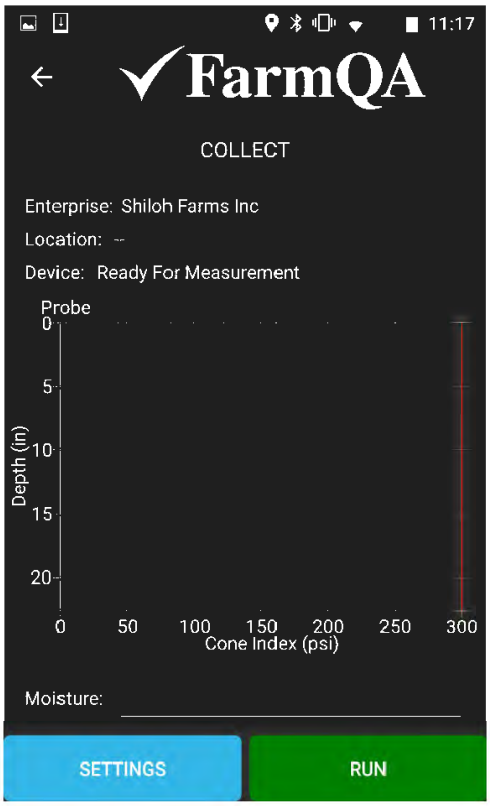


FIGURE 17

19. Enter the desired Max Depth (**Figure 18**). The Max Depth must be less than or equal to the Probe Length (29.5 inches) minus the Tare Depth. If a greater than allowable Max Depth is entered the app will automatically reduce the Max Depth value to Probe Length minus Tare Depth when the SAVE button under the setting is pushed.

20. You can also change the Max Force setting up to a maximum of 550 lbs if necessary to get measurements in your soil. The Max Force setting is intended to prevent damage to the probe if you were to hit a rock for example. The probe will stop if the Max Force is exceeded.

21. The Zero Force Current is a reference value to aid in diagnostics.

22. The Scale Factor is a calibration value set at the factory. Do not change that value unless specifically instructed to do so by FarmQA.

23. The DISPLAY CURRENT button tells the CTS 1000 to display the settings on the LCD screen of the CTS 1000.

24. The Cone Index setting determines the position of the red reference line on the graph.

25. The Results to Show can be set to show a number of results from previous samples on the background of the graph to help determine if there is an anomaly on the current sample (hitting a rock or a gopher tunnel for example) in which case another sample should be taken a short distance away.

26. Push the SAVE button under each setting you changed when finished.

27. Push the Back button on your phone or the Back Arrow on the screen to go back to the COLLECT page.

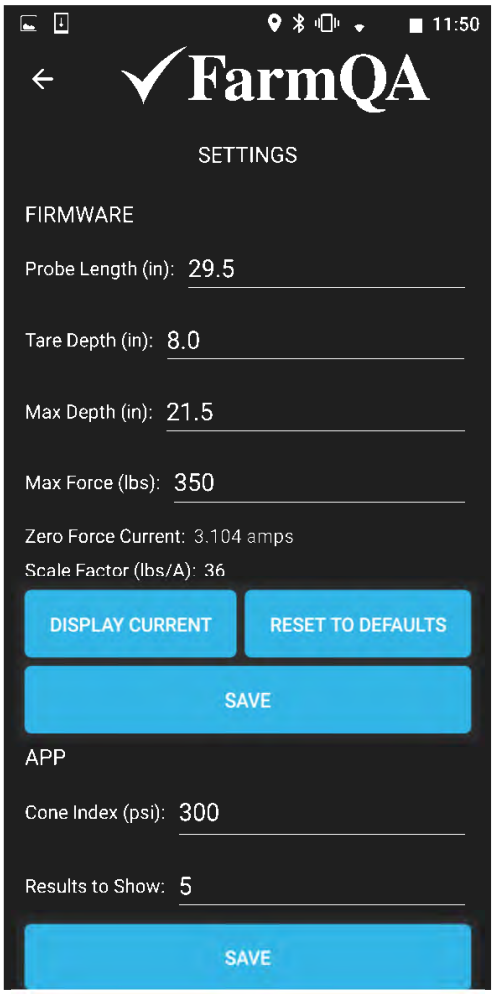


FIGURE 18

28. Enter a soil Moisture percentage for the field if you have a soil moisture sensor with you. In order to use cone index psi thresholds to determine compaction the soil moisture should be greater than 20% at the time of testing.

29. Take note of the Location information. For best results we recommend using a Bluetooth GPS receiver paired with your phone that is more accurate than the phone's internal GPS. If you don't have a high accuracy Bluetooth GPS we recommend that you set your phone's location mode to GPS Only. Typically you can set the location mode of your phone to GPS Only or Device Only in the Settings->Location screen. When you're in a field and the phone is trying to get a network based location using cellular towers or other networks the location errors can be significant.

30. When the CTS 1000 and FarmQA Compaction app are ready the Device status will say "Ready for Measurement" and the RUN button will be green.

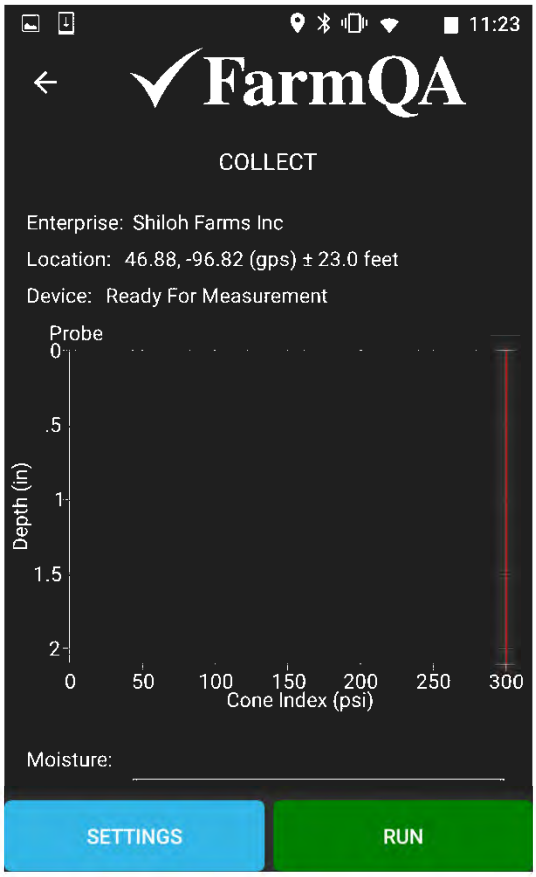


FIGURE 19

CTS 1000 OPERATING INSTRUCTIONS

Soil Measurements

31. Drive to the sample point and hold the vehicle brake. If the CTS 1000 is wired to the vehicle brake lights correctly a siren will sound any time the probe is extended and the brake is released. If the CTS 1000 is not wired to the vehicle brake lights correctly the siren will sound the whole time the probe is extended.

32. On the COLLECT page of the FarmQA app push and hold the RUN button for at least one second. After one second the RUN button will change from green to gray signifying you can release the button.

33. The Device status changes to “Measurement Started”. A red down arrow appears signifying the probe is extending into the ground. The probe depth is shown with a white bar on the left side of the graph and the psi measurements are shown to the right.

34. After the probe reaches the max depth the Device status changes to “Raising Probe” (**Figure 21**) and a red up arrow appears. The probe depth is still shown with the white bar on the left side of the graph. The depth of “0” is when the probe tip is at ground level. The probe still needs time to rise to the fully up position so the probe doesn’t get bent when you move the vehicle.

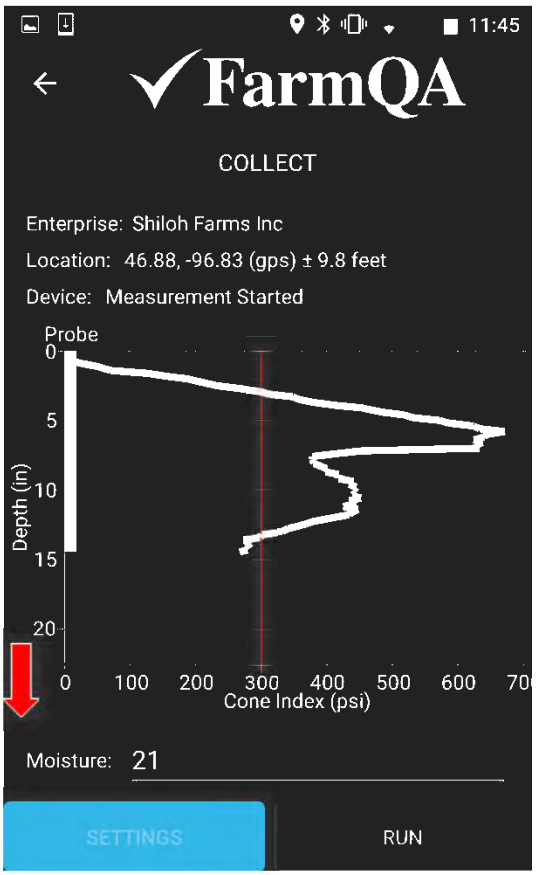


FIGURE 20

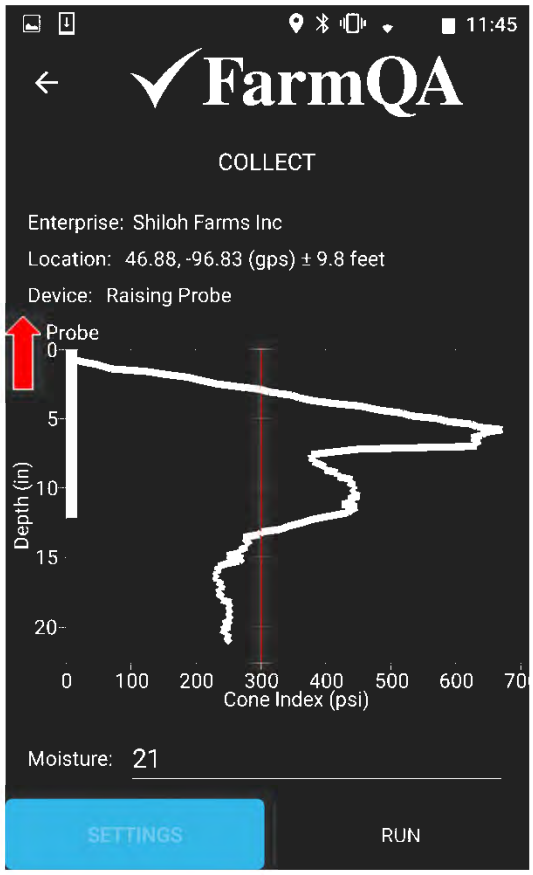


FIGURE 21

35. After the probe reaches it's fully up position the Device status changes to "Ready For Measurement", the red up arrow goes away, and the RUN button changes to green. You may now move the vehicle to the next sample point.

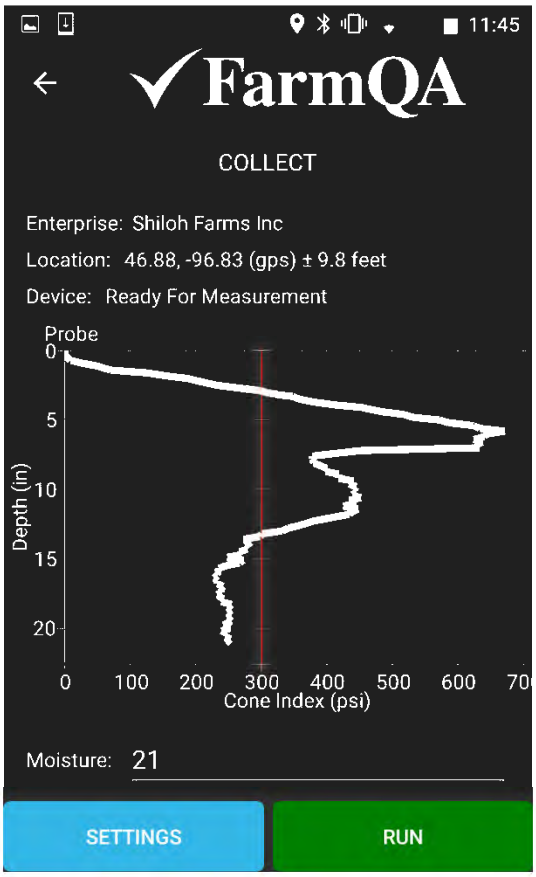


FIGURE 22

36. After several measurements have been taken, previous measurement results will be shown on the graph with thin gray lines. The number of previous measurement results shown is determined by the number entered in the "Results to Show:" field on the SETTINGS page. If "Results to Show:" is set to "0" no previous measurement results will be displayed. The purpose of showing previous measurement results is to help determine if additional samples should be taken close to the current sample point. For the case shown in **Figure 23** additional samples should be taken a few feet away since the current result is very different from previous ones. There may be an anomaly in the soil where the current sample was taken.

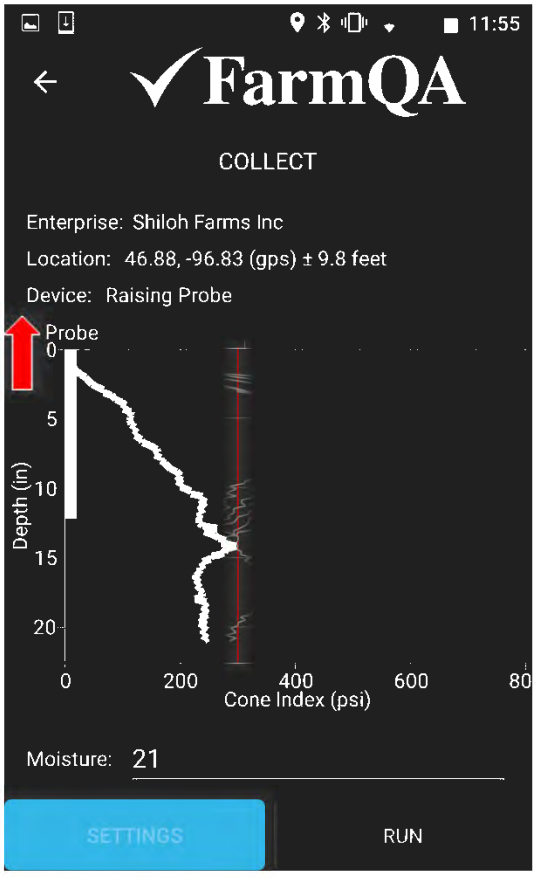


FIGURE 23

37. If during a sample the message in **Figure 24** appears that means the max force setting for the CTS 1000 was exceeded, the probe has stopped, and the probe is still in the ground. Go inspect the Compaction Testing System for damage. If there is no visible damage raise the probe by pushing the OPERATE button on the Compaction Testing System. You may increase the Max Force setting in the Settings page of the app to a maximum of 550 lbs if necessary to get measurements in your soil. If the max force was exceeded due to hitting a rock or some other anomaly it is recommended to not increase the Max Force setting.

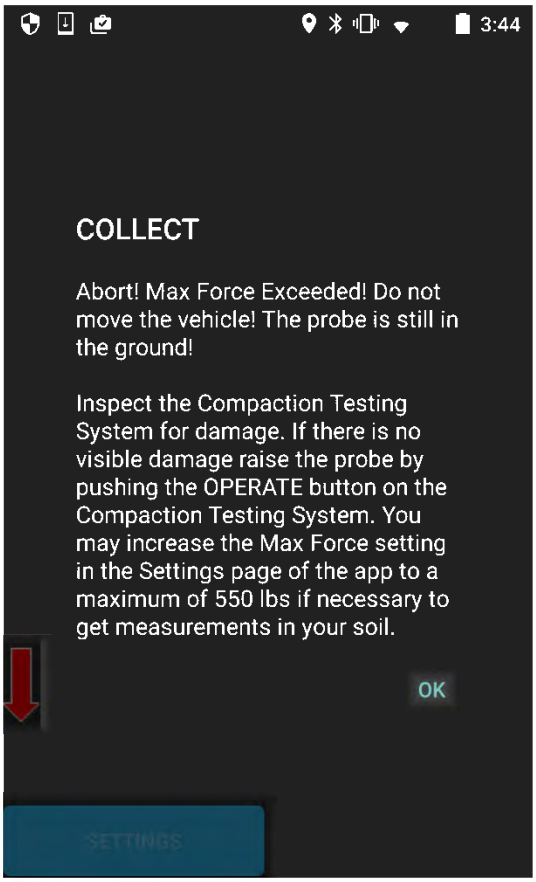


FIGURE 24

38. After pushing OK the screen should look similar to **Figure 25**. The Device status reads “Abort Max Force”, the red down arrow and white probe depth bar show that the probe is in the ground, and the RUN button is gray. Do not move the vehicle if the screen looks like this.

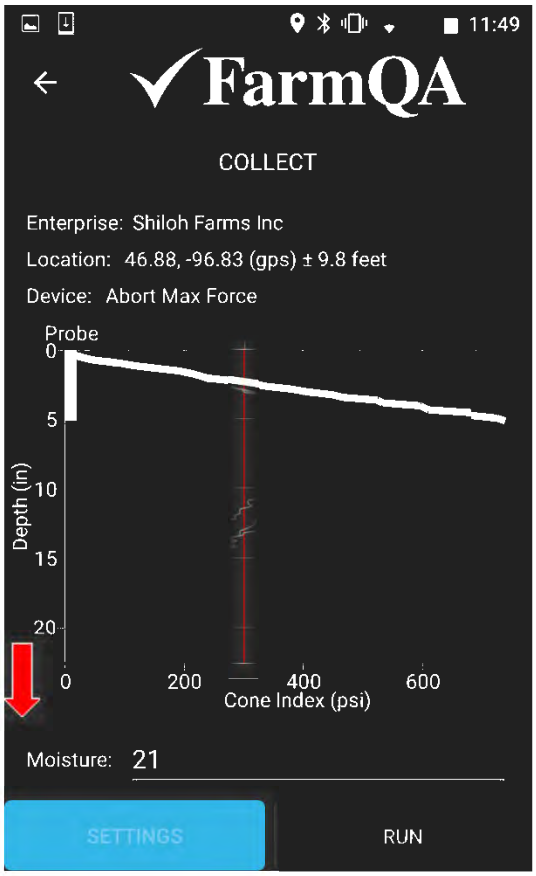


FIGURE 25

39. At any time you may review previous measurement results by pushing the RESULTS button.

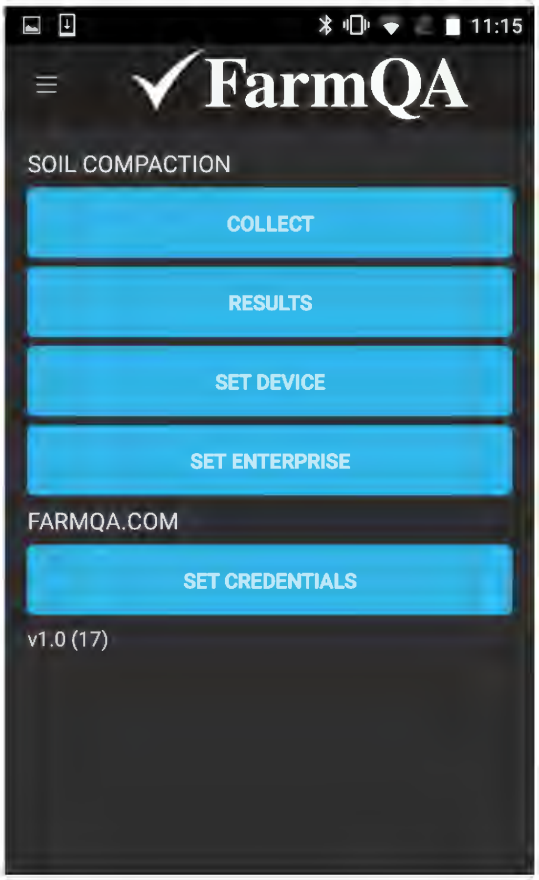


FIGURE 26

40. Select the result to view.

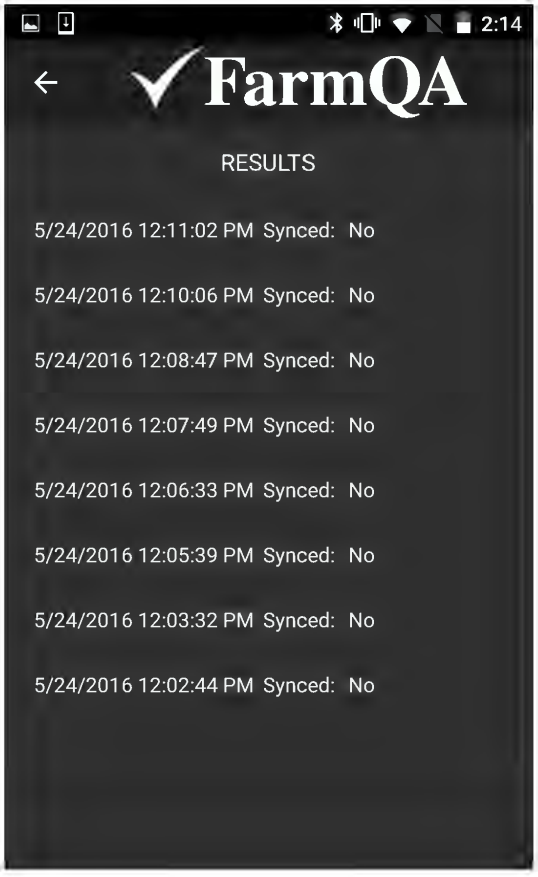


FIGURE 27

41. Normally if the phone is in good cellular coverage or connected to Wi-Fi the results will sync to the cloud automatically. If they don't you can sync by pushing the SYNC button later when you are in good cellular coverage or connected to Wi-Fi.

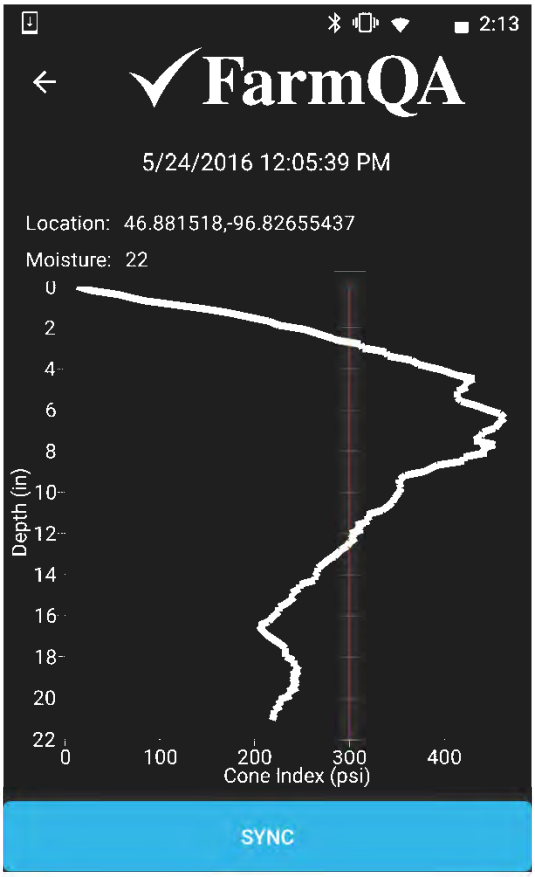
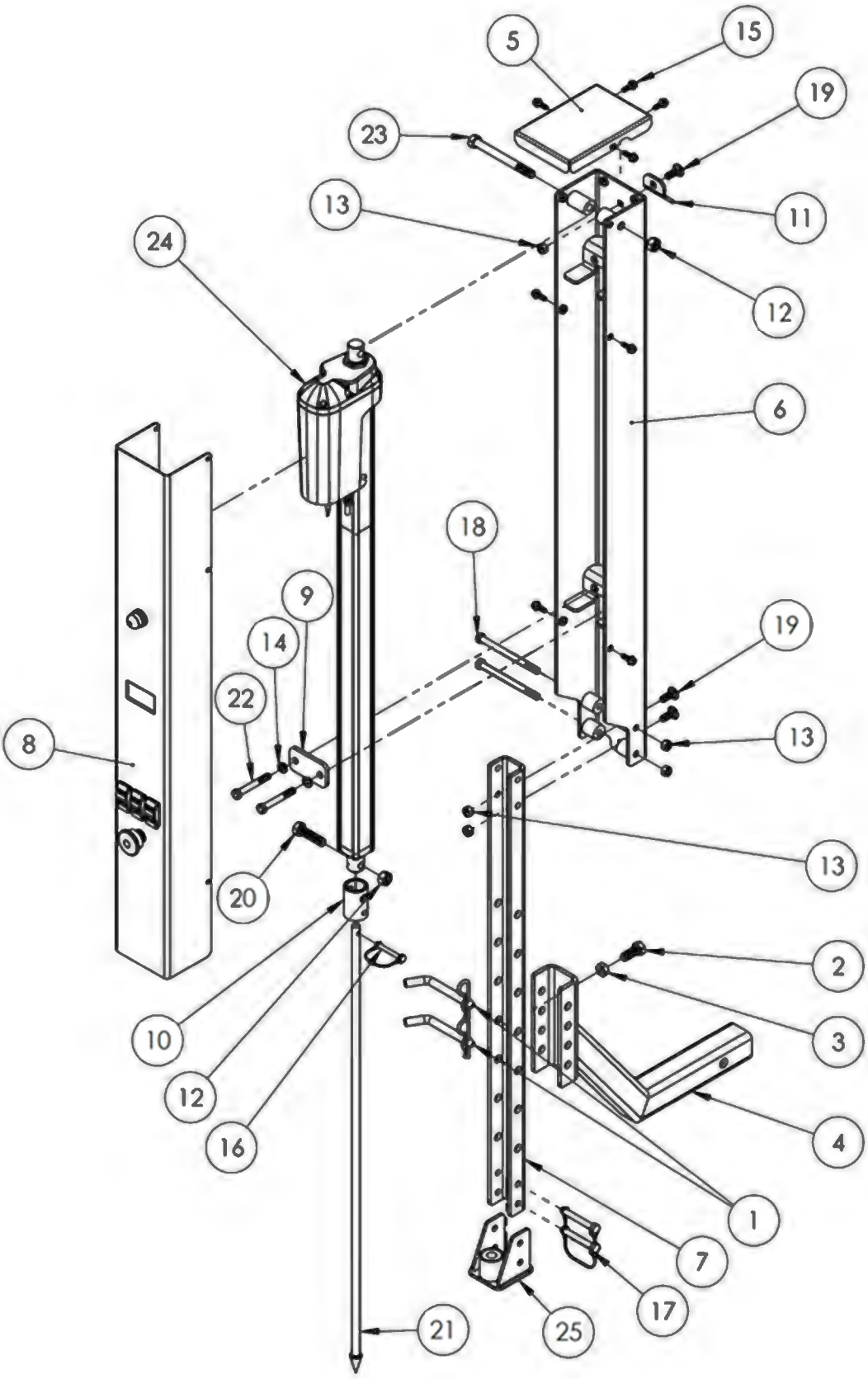


FIGURE 28

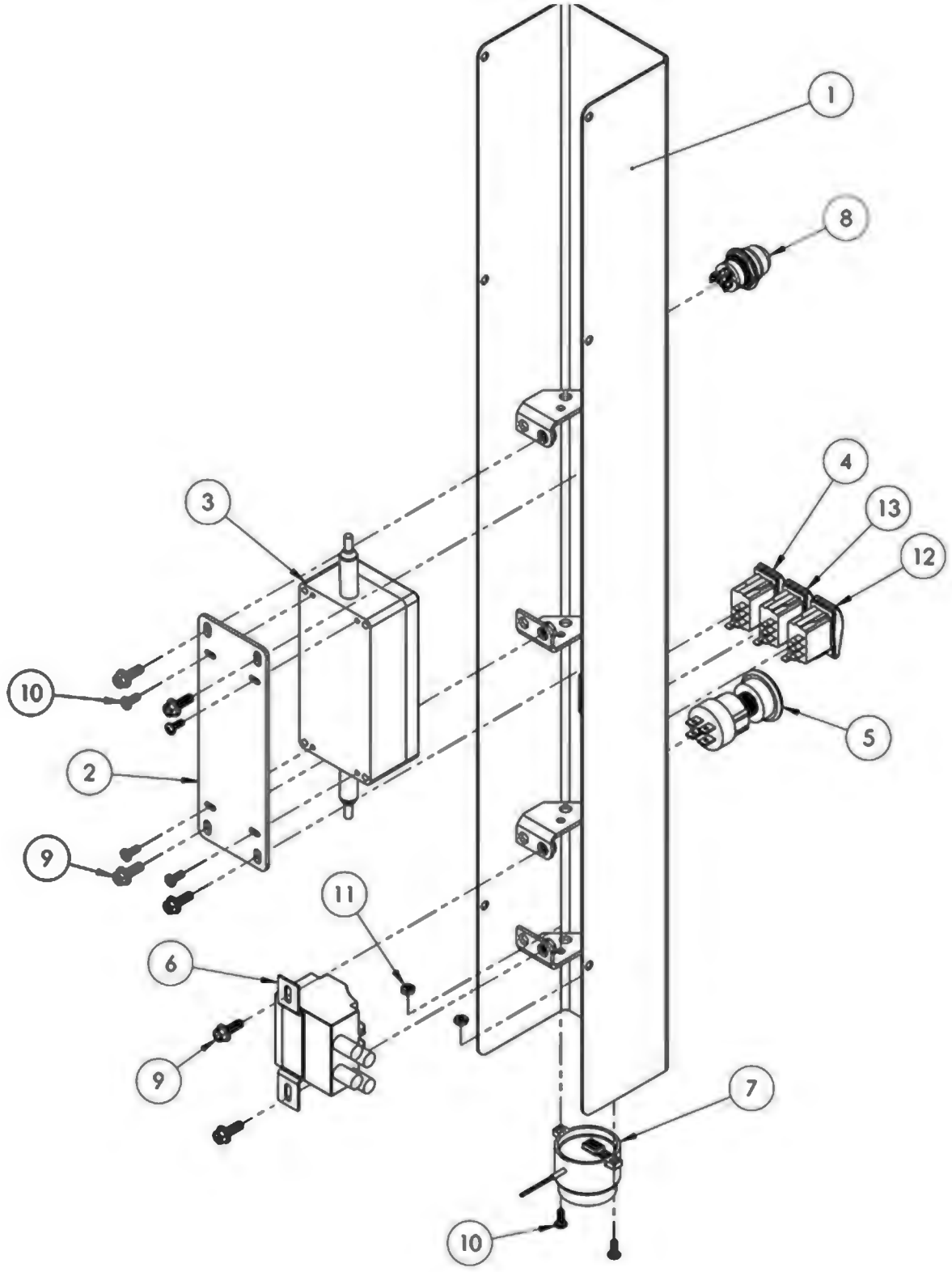
CTS 1000 Assembly



CTS 1000 Assembly

ITEM NO	PART NUMBER	DESCRIPTION	QTY
1	AT0203	1/2 X 3 HITCH PIN W/ COTTER PIN	2
2	AT0207	1/2-13 X 1-1/4 HEX BOLT GRS ZP	1
3	AT0208	1/2-13 JAM NUT, GR5 ZP	1
4	AT0309	HITCH MOUNT, 2" RECEIVER	1
5	AT0335	CAP, FORMED	1
6	AT0339	WLDMT-ACTUATOR MOUNT	1
7	AT0342	PROBE GUIDE CHANNEL	1
8	AT0343	COVER ASSY	1
9	AT0349	CLAMP PLATE	1
10	AT0356	ADAPTER, ROUND	1
11	AT0358	TAB, FORMED	1
12	AT0359	1/2-13 LOCK NUT ZP	2
13	AT0376	3/8-16 LOCK NUT ZP	5
14	AT0377	3/8 LOCK WASHER	2
15	AT0378	1/4-20 X 3/4 FLANGE HEX BOLT GR5 ZP	8
16	AT0383	1/4 X 1-3/4 LINCH PIN W RND RETAINER	1
17	AT0384	3/8 X 2-1/2 PIN, SQ RETAINER W EASY RELEASE	2
18	AT0385	3/8-16 X 5 HEX BOLT GR5 ZP	2
19	AT0386	3/8-16 X 1 CRG BOLT GR5 ZP	3
20	AT0387	1/2-13 X 2 HEX BOLT GR5 ZP	1
21	AT0388	PROBE ASSY	1
22	AT0390	3/8-16 X 2.75 HEX BOLT GR5 ZP	2
23	AT0391	1/2-13 X 5 HEX BOLT GR5 ZP	1
24	AT0392	750MM STROKE LINAK ACTUATOR	1
25	AT0396	PROBE GUIDE ASSY	1

Cover Assembly



Cover Assembly

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	AT0336	WLDMNT, SHROUD	1
2	AT0357	BACKING PLATE	1
3	AT0360	CONTROL BOX ASSY W/ WIRING HARNESS	1
4	AT0364	OPERATE ROCKER SWITCH	1
5	AT0365	EMERGENCY STOP SWITCH	1
6	AT0366	RELAY	1
7	AT0367	SIREN	1
8	AT0368	HIGH INTENSITY LED	1
9	AT0378	1/4-20 X 3/4 FLANGE HEX BOLT GR5 ZP	6
10	AT0380	10-24 X 1/2 MACHINE SCREW	6
11	AT0381	#10-24 LOCKNUT	2
12	AT0397	ON/OFF ROCKER SWITCH (ILLUMINATED)	1
13	AT0398	UP/DOWN ROCKER SWITCH	1