2000XA Soil EC Mapping System

Operating Instructions

Table of Contents

VERIS 2000XA SOIL EC MAPPING SYSTEM
(software v.1.76 alt)

OPERATING INSTRUCTIONS

Warranty

Veris Technologies warrants this product to be free of defects in materials and workmanship for a period of one (1) year from the date of delivery to the purchaser. Veris Technologies will repair or replace any product returned to Salina, Kansas, which appears upon inspection to be defective in materials or workmanship. Veris Technologies will have shall have no obligation under this warranty for the cost of labor, down-time, transportation charges, or for the repair or replacement of any product that has been misused, carelessly handled, modified, or altered.

ALL OTHER WARRANTIES OF ANY KIND, WHETHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE AND ALL CLAIMS FOR CONSEQUENTIAL DAMAGES, ARE SPECIFICALLY DISCLAIMED AND EXCLUDED.
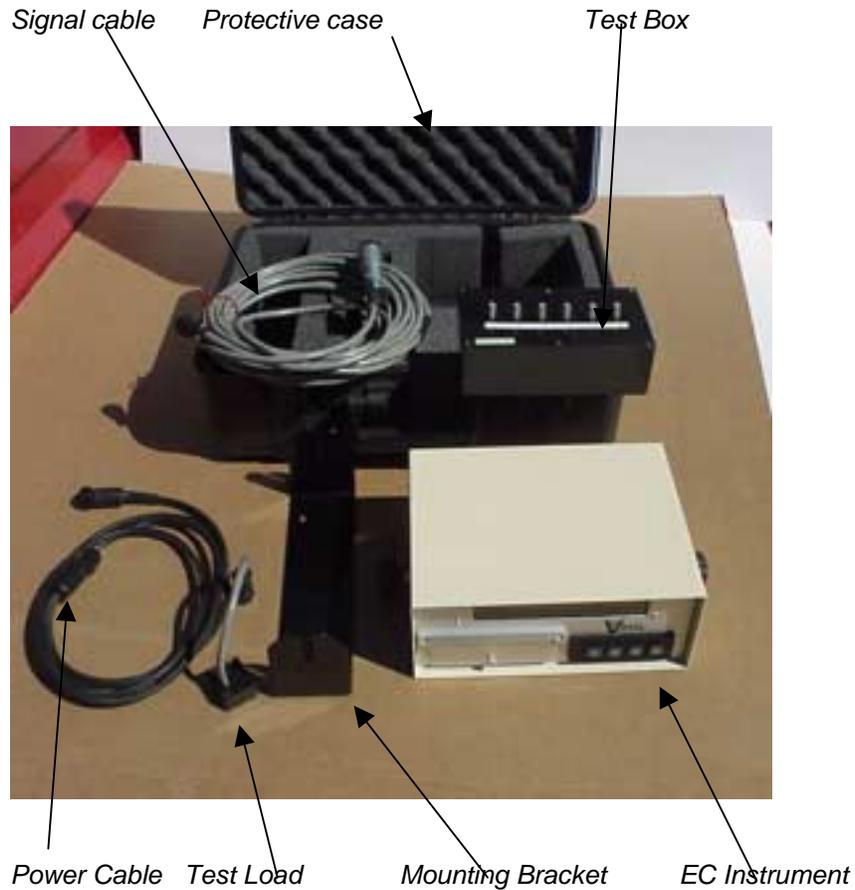
Important!   Read the following SAFETY PROCEDURES before operating the Veris 2000XA:

1) To prevent possible electrical shock, or damage to the instrument, do not connect to any power source greater than twelve (12) volts DC.
2) Never allow anyone to ride on the implement during operation.
3) Lift the implement only with the provided ratchet jack.
4) Properly support the unit before performing any adjustment or maintenance.
5) Due to its small size and narrow design, it is not intended for high-speed travel on public roads. If you choose to do so, contact your state Department of Transportation for safety markings and guidelines. Veris Technologies suggests trailer transport.

Installation and Set-up

Instrument

The Veris EC Instrument Kit (PN 15161) includes the following:

Signal cable   *Protective case*   *Test Box*

Power Cable   *Test Load*   *Mounting Bracket*   *EC Instrument*

Make sure that you have received all of these components in your EC Package.

Mount instrument in a location that is as free as possible from dust, vibration, and electrical interference. Display should be visible to operator and shielded from direct sunlight.

Below is a rear view of the instrument

Serial Port for   Serial Port for   Power   Power cable   Signal Port
GPS Signal   Listening Computer   Switch   Port   For signal cable
*   or Test Load*

Connect GPS cable to GPS INPUT serial port on back of instrument. The Veris instrument is designed to accept GPS input in NMEA format via an RS232 connector. Note: GPS signals are frequently affected by electrical interference from magneto electrical systems. If your vehicle uses a magneto, consider powering the Veris instrument with a 12-volt battery or converting to an alternator system.

The Veris 3100 is shipped with an accessory power plug. If an alternative connection is desired, make sure that the unit is properly connected to a power connection that is not controlled by the ignition switch. If connecting directly to the battery, we suggest a **3 amp**. in-line fuse is installed between the battery and the instrument. **Important – Do not allow moisture to enter the instrument, and do not pass strong magnets near the unit.**

Signal Testing – The Veris 3100 is shipped with an **Instrument Test Load** (Part No. 10447) that will enable you to quickly check the instrument to ensure that it is functioning properly. To perform this test, do the following:
   1) Disconnect the signal cable from the 9-pin (signal) terminal on the instrument.
   2) Connect the test load to the signal terminal.
   3) Switch on the unit and go into "data acquisition" mode.
   4) The display should show: (approx.)
                                    Shallow   14 Not used on VS 2000XA
                                    Deep   21

   5) If the readings vary greatly (more than one whole number) contact our service department.
   6) Once the test is complete, remove the test load and reinstall the implement signal cable.

Test Load

Note: It is advisable to conduct this test as a routine check to ensure that you are obtaining reliable data.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense. Changes and modifications not expressly approved by Veris Technologies could void the user's authority to operate the Veris 3100.

Implement

Prior to operating the implement for the first time, it is important to check the following:

1) All fasteners – some may have loosened during shipment.
2) Coulter electrode isolation – check so see that no metal part of the any coulter electrode is in contact with the implement frame. This may be by visual inspection or by connecting one lead of an ohmmeter to the individual coulter electrode, and the other to a grounded fastener on the frame. If the coulter electrode is properly isolated, no reading will be obtained. Make sure that all electrode coulter clamp bolts are properly tightened to prevent lateral movement of the coulter electrode

Coulter Electrode Isolation

Grounded bolt   Ohmmeter   Coulter
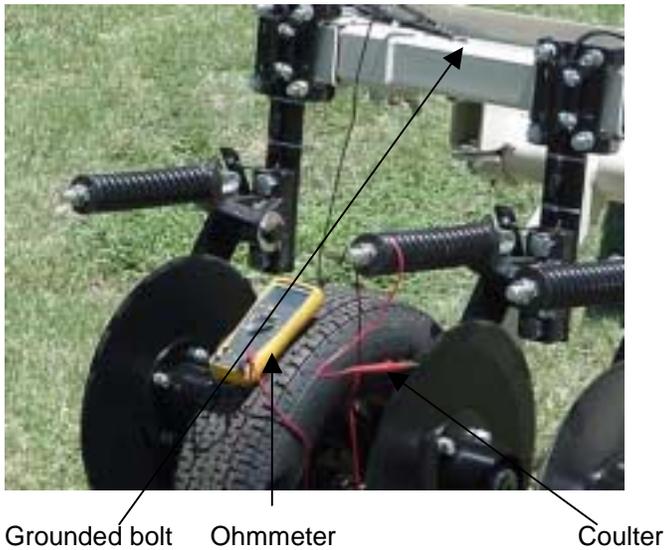
3) **Implement Test Box** – To properly measure conductivity, good electrical continuity must be present from the coulter electrode to the instrument. The Implement Test Box (Part No. 15231) allows you to quickly check this.

Use the following method:
a) Connect the signal cable to the terminal on the test box.
b) Touch one lead of an ohmmeter to the #1 coulter blade (left hand, standing behind the unit) and the other lead to the #1 terminal on the test box. A reading of less than 2 ohms is normal.
c) Continue to check each coulter electrode in succession, left to right.
d) If any coulter electrode exhibits no continuity or resistance higher than 2 ohms, refer to the maintenance or trouble shooting sections for possible causes.

Note: It is advisable to perform this test on a routine basis (weekly or every 20-25 hours of data collection) to ensure you are obtaining reliable data.

4) Hitch height—adjust hitch on implement so implement operates level when coulter electrodes are 1-2" in the soil. The hitch is designed with four possible height positions.

Maintenance and Lubrication

Proper maintenance and lubrication of the Veris Soil Sensor Cart will greatly extend the useful life of the unit, and Veris Technologies strongly suggests that you follow the following guidelines:

LUBRICATION

Rockshaft pivot points –   Each pivot (left and right) contains an upper and lower grease zerk. Due to the limited motion of the rockshaft, these should be lubricated on **40-hour** intervals.This may vary based on the number of times the unit is raised and lowered.

Pivot grease zerks

Rachet jack --   **40 hour** intervals

Grease zerks

Electrode coulters

Pivot --   In all but the most extremely rocky conditions, the coulter electrodes should not flex in the field, thus minimal movement will be realized at the pivot. **80-hour** intervals should be sufficient.

Grease zerk

Hubs --   Use good quality wheel bearing or lithium grease for lubrication, but we suggest that you grease the hubs sparingly. Over-lubricating the hub will result in pre-mature seal failure, and an excessive amount of grease in the hub cap/commutator. On an interval of **150 hours,** 1-2 strokes of grease should be sufficient.

Coulter Hub

Grease zerk

ADJUSTMENTS

Commutators-- The spring-loaded commutators are located in the center of each coulter
electrode hub cap. They are factory preset, and should not need
routine adjustment. If a continuity test shows abnormally high resistance,
the commutators should be checked. This may be performed in the following
manner:

1) Remove the 3/8" allen head set screw.
2) Remove the commutator by turning counter-clockwise.
3) Depress the spring loaded tip on a hard surface to determine if
plunger has adequate tension and can move freely.
4) If the plunger will not move freely, replace, and coat with di-electric
silicone grease.
5) If the commutator appears to be in good working order, reinstall in the
hub, and adjust until it bottoms against the spindle end. Rotate 1/2 turn
backward to allow adequate clearance. Improper adjustment will result in
premature failure (too little tolerance) or poor continuity (too much
tolerance).
6) Reinstall locking set screw and tighten firmly on top of commutator. The
top of the set screw should be even with the face of the hub. If not,
remove and adjust the commutator inward or outward as necessary.
7) Re-test coulter electrode continuity.

Here is a cut away view of the hubcap assembly

| Cap | Commutator | Set screw | Spindle |
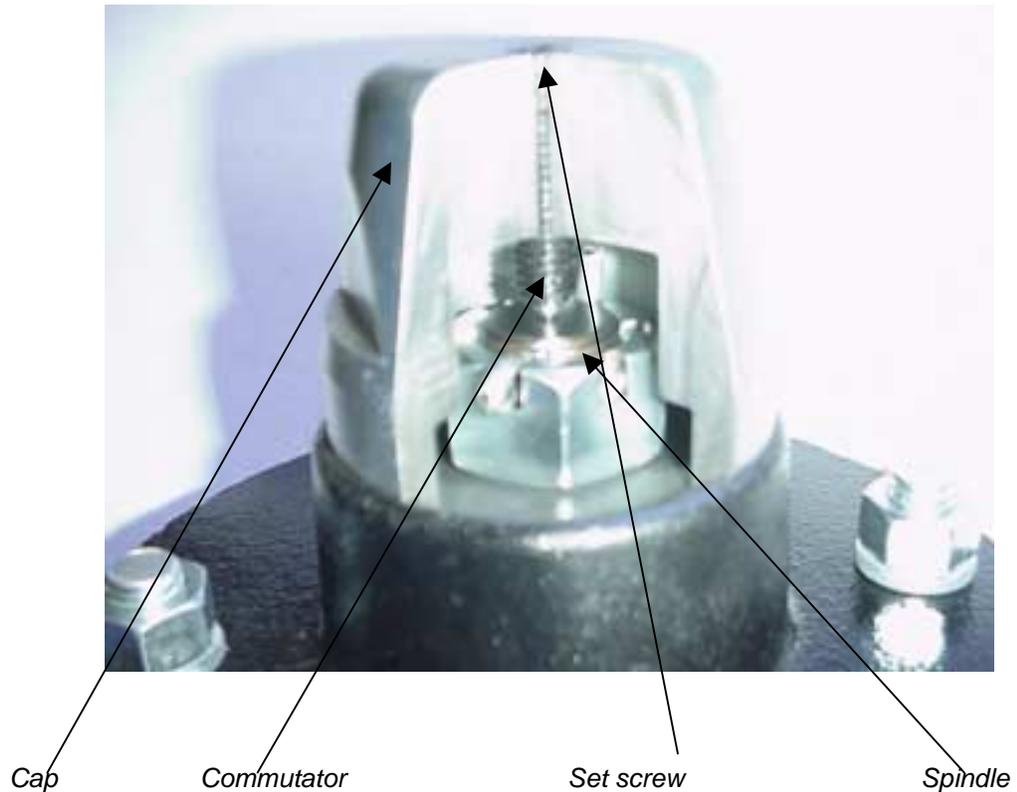
Note: If you are still unable to obtain favorable resistance readings, check for excessive corrosion at the coulter blade mounting bolts, or the terminal located near the coulter pivot.

ANNUAL MAINTENACE

Wheel hubs --   On and annual basis, disassemble, clean, and properly repack the wheel hubs with suitable wheel bearing grease. It is advisable to replace the seals. As with any tapered roller bearing, proper pre-load will extend the life of the assembly. Fully tighten the nut, then rotate backward up to ¼ turn, so that the hub turns freely, without endplay. Install cotter pin, and reinstall hub cap.

Coulter electrode
hubs --   The coulter electrode hubs operate in a significantly harsh environment, and annual inspection is of utmost importance. The double-lip seals are designed to keep grease in, and contaminates out, but they are the cause of practically all hub failures. It is advisable to disassemble, clean, repack, and re-install annually. To perform this maintenance, do the following:

1) Remove hub cap by turning in a **clockwise direction** (left-hand thread prevents loosening in operation).
2) Remove cotter pin, castle nut, thrust washer, and remove hub.
3) Remove outer bearing and knock out inner bearing using a wooden dowel or brass rod. Be sure to match each bearing to its location on the

hub and do not mix bearings between hubs. Natural wear will cause the
bearing and race to form pattern that is unique to that set.
4) Thoroughly wash hub and bearings in solvent and dry.
5) Replace bearings and races that show excessive wear or pitting.
6) Pack with grease, and reassemble -- or reassemble, and pack via grease
zerk with wheel bearing or lithium grease. It is advisable to replace the
seals.
7) Adjust bearing pre-load as mentioned above. Excessive pre-load may
cause plugging in extremely loose soil conditions, and excessive endplay
may damage the commutators.
8) Inspect the sealing o-ring on the hub cap, and reinstall by threading
counter-clockwise on the hub.
9) Adjust commutator clearance as mentioned on page 8.

Hub   *Thrust washer*   *Seal*   *Nut*   *Bearing*

Swing arm
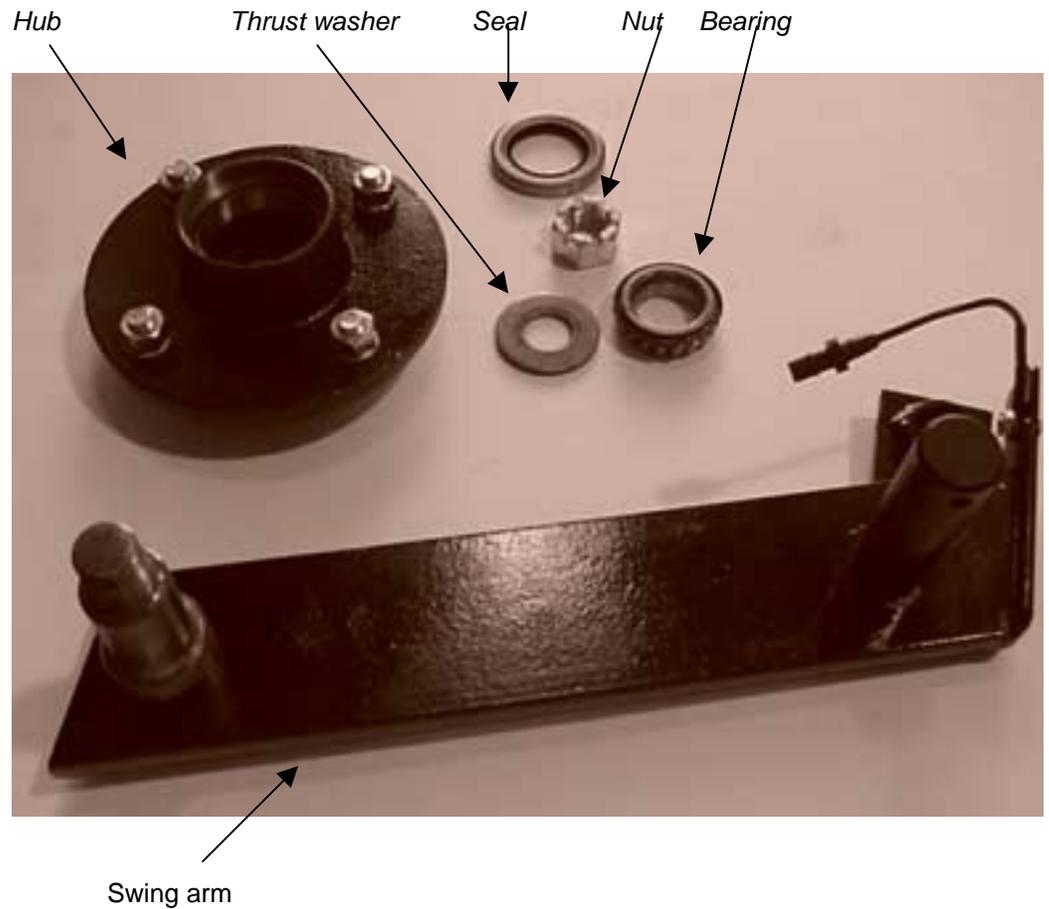
Field Operations

Soil Contact

Begin field operation by lowering unit into soil. For good electrical conductivity, all coulter electrodes must be in direct contact with the soil, at all times and in every region of the field. A depth of 1-2" is recommended. To insure this depth is consistently achieved, 300-350 lbs. of additional weight are normally required. Veris offers optional weights and mounting hardware that can be installed on the 2000XA. Do not adjust the tension on the coulter electrode springs to increase soil contact or penetration. They are pre-set at the factory with the proper tension.

Speed

Proper field operating speed depends on field conditions. Because of the importance of consistent contact, the unit must not be allowed to bounce over rough fields at high speeds. On smooth fields, the implement can be operated at speeds from 8-12 m.p.h. Reduce speeds in rocky conditions.

Field Condition

Field should be in a uniform state. Mapping after intensive primary tillage is not recommended. The soil must have a minimum of 10% available water, and cannot be frozen. If rocky conditions exist, you may wish to consider the optional coulter rock guard kit , PN 15170.

Pulling Vehicle

The 2000 XA, with its small size and low draft requirement, is designed for ATV use, yet may be pulled with a variety of vehicles: 4x4 ATV (400cc or larger), small compact tractor, compact or full-sized pickup. Veris suggests that the unit be loaded for road transport.

Swath width and Navigation

Setting the swath width and navigation system is at the discretion of the customer. A 40-60' swath works well in most areas. In areas of high soil variability, a narrower swath may be preferred. Several methods of navigation are possible: following previous crop rows, flagging the field, or using a field navigation computer. While it is important to map in a consistent pattern, it isn't absolutely critical that each pass be exactly the same distance from the previous pass.

Array Selection

The 2000 XA , in the narrow (shallow) configuration, with the adjustable toolbar fully retracted will investigate the top 2' of soil. In the wide, fully extended configuration, the array will penetrate 0-3' of soil. Adjustment is made by loosening the jam nuts and set screws located on the lower front of each side of the toolbar, adjusting the toolbar wing extensions, and re-tightening the set screws. Veris suggests setting the toolbars at either the maximum or minimum setting, not at a point in between. A limiter bolt determines full extension, so there should be no danger of extending to the point at which the outside coulters disconnect from the main frame. Important – do not attempt to combine maps in which two different investigative depths are used.
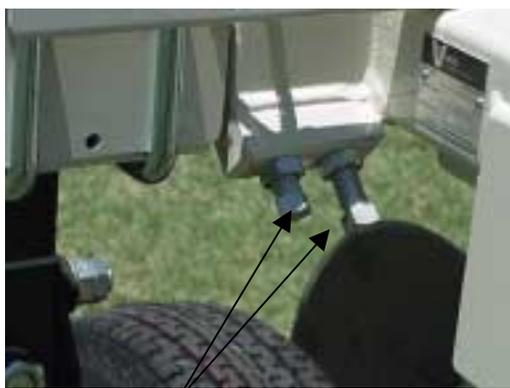
Set Screws   *Narrow Setting*

Wide Setting

GPS Settings

1. Make sure that the GPS is plugged into the proper DB-9 input. Looking at the back of the instrument, the GPS should be plugged into the leftmost input port. A null modem adapter should not be used.

2. Make sure that the GPS has power and has been turned on long enough to start outputting data. Some units may require a couple minutes to start while others may require much longer.

3. Make sure the GPS output is at 4800 baud, 8 data bits, no parity and 1 stop bit. (note: set parity to "None", not "zero")

4. Make sure the GPS is set to output NMEA-0183 messages that include the GGA and VTG or RMC string. The GGA string provides the position and fix quality while the VTG or RMC string provides the speed. Make sure the update rate is set at 1 Hz.

5. If your settings appear correct, but the position still does not appear on the Veris instrument, use a laptop to monitor the GPS signal to verify its integrity. If the signal appears properly on a laptop, it should work on the instrument as well.

Signal Cable

Attach the signal cable to the quick connect coupler at front of frame, and to Signal Port on back of instrument

Instrument display readings

Here are the display readings that you will see when operating the system, the meaning of each, and what choices you have at each step:

Booting up…

Veris v1.76	**You have _____min. available**
	Press any key

Meaning: The unit is ready to operate. The computer is informing you of how much of its internal memory is available. Check available minutes to be sure you have enough available memory to contain the data from field you are about to map.
Choices: Press any key

1.   Download/Delete old files
2.   Continue

Meaning: You are being given a choice between downloading/deleting map files you have made previously, or starting a new map file.
Options: 1. **Download/Delete old files:** For information on Option 1, see section on Downloading, p.7.

2. **Continue:** Pressing this key will bring up the next display and continue the process of creating a new map file.

Creating a new map file…

1.   Begin data acquisition
2.   Conductivity Output Only
3.   Quit

Meaning: The unit is asking whether you're ready to start mapping.

Choices: If you press 1, you've initiated the beginning of a map file. Command #2 is for sending a data string to a second data-logging device. (The conductivity output format is 9600 baud, 8 data bits, no parity and 1 stop bit. A null modem adapter is required.) If you press 3, the system will tell you it's ok to shut off power.

Creating file #_____
Press any key to start (Any key to stop)

Meaning: The unit is letting you know the name of the map file it is creating, in case you want to record it along with any other information about the field.
Choice: Press any key to begin new map file (after starting the file, pressing any key will stop the file)

		DGPS
Lat _____	Shallow: _____	**Relative elev.**
Long _____	Deep: _____	

Meaning: The unit is telling you the **latitude and longitude** of your position, the conductivity of the soil, the relative elevation, and whether you have GPS or **DGPS** (differentially corrected) signal. The system does not record any conductivity point that isn't DGPS geo-referenced. **Note: The 2000 has only a single array, so only the "deep" reading will be logged. Shallow will always show a negative reading**. The Veris Instrument uses the same software for the 2000XA Implement as the 3100 Implement so you can use the same Veris Instrument with either Implement.
Choices: At any time during the mapping process, you can press any key to stop the file. If you create more than one file from the same field, you can bring the files into a spreadsheet program and combine them prior to mapping.

Downloading a file…

File # _____(date)   (time)

Press any key to see options

Meaning: The unit is telling you that you have finished creating a file, along with the date and time it was completed.
Choices: Pressing any key will bring up the next window.   You may also shut the power off at this point.

| #_____ | **(1) Download to disk** | **(3) Keep File** |
| | **(2) Delete file** | **(4) Exit File Manager** |

Meaning: You can do four different things with the file you have just created:
Option 1: **Download to disk.** If you press the #1 button, you will be asked to insert a diskette in the disk drive and begin downloading the file.
Option 2: **Delete the file.** If you press the #2 button, you will be asked if you really want to delete the file, as a safeguard against accidentally deleting files. A typical scenario for deleting a file you have just created is when you're checking out the system at the beginning of a day.
Option 3: **Keep file.** If you press the #3 button, the file will remain in memory, and the display will index to the next file. It will continue offering the options for each file in memory, until it reaches the last file. At that time, it will ask you whether you wish to begin data acquisition, or quit.

Option 4: **Exit File Manager.** If your press the #4 button, you will immediately go to data acquisition mode, and can then choose to begin or quit.

If you selected Option 1 above, here is the next display you will see:

Insert disk and press any key

Meaning: The instrument is expecting to download the file.
Choice: **Insert disk, then press any key.** The display will read "Working", which means the system is checking out your disk to see if you have enough disk space to accept the file. If you do not have enough space, it will ask you to insert a different disk. Depending on the size of the file, it may take a couple of minutes before the next display appears.
(If you discover you don't have a diskette at this point, you can shut the power off and restart. The file will be available for downloading later. *Once the system has begun downloading the file, do not remove the disk or shut the power off until the file is completely downloaded*)

Downloading:
Veris_____.dat
_____ percent complete

Meaning: System is **downloading** the file. *Do not remove disk or shut power off until downloading is complete.*

Finished downloading Veris_____.dat
Press any Key

Meaning: The system has **finished downloading** to your disk and is ready for the next step.
Choices: Press any key to bring up next display.

| #_____ | (1) Download to disk | (3) Keep file |
| | (2) Delete file | (4) Exit File Manager |

Choices: If you press #3, the instrument will index to the next file and offer the same options. If no files are left to download, you will then go into acquisition mode. If you press #4, you will go directly into data acquisition mode.

---

(1) Begin data acquisition
(2) Quit

Downloading/deleting old files…

This section deals with how to download and delete old files. Veris Technologies recommends that you do not delete any old files until they have been saved to a hard disk drive and properly backed up. Once you have done this, it's a good idea to delete the files from the Veris instrument. This will save time in searching the system for new files, and will insure that you have enough available memory to store the new map files you are creating. It is also recommended that you delete any files

that you make while setting up or checking out the system, especially files with no data on them, such as those you make while testing the DGPS signal reception.

At display:

---

1. Download / Delete old files
2. Continue

Meaning: This is the second window you will see after powering up the unit, once the system has any old files on it.

Options:
1. Puts you into the mode of **downloading** previously saved map files (Note: once you have made this selection, you will need to scroll through all old files before starting a new map file.)
2. **Continue:** Starts a new map file (see above for info)

Here is the display you'll see by pressing #1

File #_____ (date)   (time)

Press any key to see options

Meaning: The system is asking if this is the **file** you're looking for. The date and time are helpful in identifying the file.
Option: **Press any key** to bring up the next window

#____   **(1) Download to disk**   **(3) Keep file**
                   (2) Delete file   **(4) Exit File Manager**

Meaning: You can do three different things with the file you have just created:
Option 1: **Download to disk.** If you press the #1 button, you will be asked to insert a diskette in the disk drive and begin downloading the file.
Option 2: **Delete the file.** If you press the #2 button, you will be asked if you really want to delete the file, as a safeguard against accidentally deleting files.
Option 3: **Keep file.** If you press the #3 button, the display will bring up the next file. If you want to scroll through old files, keep pressing #3
Option 4: **Exit File Manager.** If you press #4, you will be able to go back into acquisition mode.

At the end of the old files, the display will read**:**

---

1. Begin data acquisition
2. Quit

Options: You can **begin acquiring data** for a new map file, or **Quit**

If you choose to quit, the display will read:

Ok to shut off power
Press any key to restart

TROUBLESHOOTING

Map doesn't match known or expected soil types --

1. Check electrical continuity using Implement Test Box as discussed on Page 5).
2. Check isolation of coulter electrodes (pg. 4)
3. Map additional fields to see if similar condition results
4. Contact Veris Service Department

No conductivity readings on instrument display--

1. No continuity on coulter electrode # 1 or # 4.
2. Check for excessive corrosion on coulter terminal.
3. Check for broken signal wire by disconnecting wire from coulter electrode and checking continuity from end of wire to corresponding terminal on test box. Replace coulter wiring (PN 14564) or signal cable (PN 13602) as required.
4. Check for collapsed spring-loaded commutator on # 1 or # 4.

Data missing from display reading –

1. Unit must be in contact with soil to record data points; lower unit or add weights to ensure consistent 1"-2" penetration into soil
2. Check GPS and DGPS signal; Veris instrument is programmed to eliminate all non-DGPS geo-referenced points.
3. Shut power off and restart
4. Check electrical continuity: coulter electrodes to terminal…terminal to instrument.
5. Check input voltage, 12 v minimum required

Excessive number of negative readings in data --

1. Increase depth of penetration.
2. Slow down in extremely rough fields.
3. Alter transect pattern to avoid areas of heavy residue (combine swath)

Instrument has "locked up" and is not responding --

1. Shut off power and restart. Download the file that you were creating at the time the problem occurred. Continue mapping the field. The files can be combined later in your spreadsheet.
2. Check for diskette in drive. Do not start up the instrument with a diskette inserted in the drive.

File will not download –

1. Try again
2. Check to see if you are receiving DGPS signal; system eliminates all non-DGPS geo-referenced points
3. Restart computer and try again
4. Try another diskette.
5. Use Rescue Disk (Veris part #12330) to download files. Follow instructions on Rescue Disk label.

Time or date on instrument display is incorrect or needs to be reset for new time zone--

1. Insert Time Set Disk (Veris part #-12331) to adjust time or date. Follow instructions on Time Set Disk.

Troubleshooting GPS Problems--

This is a problem-solving guide for the user who is not able to obtain a position from the GPS when it is connected to the Veris 3100 instrument. Note that when the system is working properly, the latitude and longitude should appear on the instrument display and the instrument should not beep when the vehicle is in motion (provided the conductivity readings are positive).

<p align="center">Troubleshooting steps</p>

6. Make sure that the GPS is plugged into the proper DB-9 input. Looking at the back of the instrument, the GPS should be plugged into the leftmost input. A null modem adapter should not be used.

7. Make sure that the GPS has power and has been turned on long enough to start outputting data. Some units may require a couple minutes to start while others may require much longer.

8. Make sure the GPS output is at 4800 baud, 8 data bits, no parity and 1 stop bit. (note: set parity to "None", not "zero")

9. Make sure the GPS is set to output NMEA-0183 messages that include the GGA and VTG or RMC string. The GGA string provides the position and fix quality while the VTG or RMC string provides the speed. Make sure the update rate is set at 1 Hz.

10. If your settings appear correct, but the position still does not appear on the Veris instrument, use a laptop to monitor the GPS signal to verify its integrity. If the signal appears properly on a laptop, it should work on the instrument as well.

    To do this,

    a) plug the GPS output into the laptop serial input and then start the "HyperTerminal" program under "Accessories" in Windows.

    b) click on the icon called "hypertrm.exe" to establish a connection.

    c) Type in "gps" when the program prompts you for the name of your connection and then hit "OK".

    d) The program will then ask you for a phone number. Instead of entering a phone number, specify the proper serial port number. For example, if Com 1 of the laptop is being used, specify "Direct to Com 1" under "connect using:" at the bottom of the entry area.

    e) HyperTerminal will then display a configuration menu where you can specify 4800 bits per second, 8 data bits, no parity, 1 stop bit and no flow control.

At this point, upon clicking ok, legible strings of GPS data should begin appearing on the laptop screen. Here's an example of a typical set of strings:

$GPGGA,191528.00,3851.0333,N,09737.2342,W,2,08,1.3,372.7,M,27.3,M,10.0,0100*69
$GPGSA,A,3,09,23,21,17,08,01,03,29,,,,,2.6,1.3,2.3*39
$GPRMC,191528.00,A,3851.0333,N,09737.2342,W,0.1,0.0,090998,6.3,E*48

If GPS data doesn't appear, recheck the port and configuration settings to make sure they are correct. If the data won't appear correctly in HyperTerminal, consult your GPS supplier to see

what adjustments (connectors or software) are necessary to bring the signal into a computer. On the other hand, if the signal appears correctly on HyperTerminal and it shows that the required strings are being output, retry the unit with the Veris instrument. If it still doesn't work, please call Veris at 785-825-1978 to see how we can help solve the problem.