

User's Manual

922

Field Retroreflectometer

| Revision # | Changes Made | Effective Date | ECN # |
|-------------------|---|-----------------------|--------------|
| A | Initial Release. | 01 DEC 05 | 5534 |
| B | Update information in paragraph 3.3.1 item 2. | 28 DEC 05 | 5573 |
| C | Update manual to reflect new firmware | 18 JUN 07 | 6049 |
| D | Update manual to reflect new features | 19 FEB 09 | 6318 |

Prepared by:



8581 Aero Drive, San Diego, CA 92123-1722
858-279-6044 • FAX (858) 576-9286
www.roadvista.com

COPYRIGHT INFORMATION

Copyright (c) 2005-2009 RoadVista. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual or otherwise, without the prior written permission of RoadVista, 8581 Aero Drive, San Diego, CA 92123.

DISCLAIMER

RoadVista, makes no representations or warranties with respect to the contents hereof and specifically disclaims any implied warranties of merchantability or fitness for any particular purpose. Further, RoadVista, reserves the right to revise this publication and to make changes from time to time in the content hereof without obligation of RoadVista, to notify any person of such revision or changes.

INSTRUMENT CERTIFICATION

If any one has comments or suggestions regarding this manual, its format, content, or otherwise, please direct them to:

Technical Publications Coordinator
RoadVista
8581 Aero Drive
San Diego, CA 92123
(888) 637-2758
or
www.roadvista.com

Your input is appreciated

INSTRUMENT CERTIFICATION

RoadVista, certifies that this instrument was thoroughly tested, inspected and found to meet its published specifications when it was shipped from the factory. RoadVista, further certifies that its calibration measurements are traceable to the U.S. National Institute of Standards and Technology (NIST) formerly National Bureau of Standards to the extent permitted by the Bureau's calibration facility.

WARRANTY AND CUSTOMER SERVICE

All products manufactured by RoadVista are warranted to be free from defects in material or workmanship subject to the following terms and conditions. All other products sold by RoadVista are warranted only to the extent of that offered by the manufacturer.

(a) PERIOD OF WARRANTY:

This warranty shall terminate one year after the date of shipment.

(b) REPAIR OR REPLACEMENT:

Seller's obligations under this clause shall be limited to repair or correction of any defect of material or workmanship in any such product or to replacement of any defective product or part or unit thereof, notice of which shall have been given to Seller within the warranty period specified in subdivision (a) above.

(c) LIMITATION AS TO REPLACEABLE COMPONENTS WHO'S LIFE IS A FUNCTION OF USAGE TIME:

Since the life of such components is a function of the customer's usage of them, all lamps and batteries are warranted only to the extent that the original manufacturer's warranty applies. Claims are limited to those presented within 30 days after occurrence of any failure.

(d) CANCELLATION OF WARRANTY:

This warranty shall not apply if modifications not authorized in writing by Seller are made.

The warranties set forth in this clause are in lieu of any other warranties, expressed or implied, which the purchaser or others might have under or arising from this agreement, by statute, at law, in equity, or otherwise, **INCLUDING ANY WARRANTY OR MERCHANTABILITY OR FITNESS.** Goods sold subject to above warranty only, and Seller expressly denies any other warranties or representations, statutory, legal or equitable, expressed or implied.

RoadVista, provides repair services for all RoadVista products. A complete, modern Service Department, Stock Room and Calibration Facility are employed at the factory.

In the event the instrument does not function properly or is damaged, RoadVista should be contacted

with regard to the specific symptoms of the problem.

NOTE

For all service requirements, please ask for the Customer Service Department. RoadVista must be contacted prior to any return shipment of equipment. Failure to do so will result in delayed return to the customers.

(e) SCHEDULED MAINTENANCE

The 922 should be returned to RoadVista on a yearly basis to verify all aspects of the measurement system are within specification and perform standard routine maintenance. Standard maintenance includes the following;

- Replace lamp
- Verify optical alignment
- Update firmware with newest version
- Full system check

TABLE OF CONTENTS

SECTION 1 INTRODUCTION..... 1

 1.1 GENERAL INFORMATION..... 1

 1.2 SPECIFICATIONS..... 3

 1.3 ENVIRONMENTAL CONSTRAINTS 4

SECTION 2 INITIAL SETUP 5

 2.1 UNPACKING AND INSPECTION 5

 2.2 INTRODUCTION 6

 2.3 USB & SOFTWARE INSTALLATION..... 7

 2.3.1 Windows GUI System Requirements 7

 2.3.2 USB Installation..... 7

 2.3.3 Windows Software Installation..... 9

SECTION 3 SYSTEM OPERATION..... 12

 3.1 SYSTEM POWER UP..... 12

 3.2 ROAD VISTA 922 GUI FLOW CHART 12

 3.3 CALIBRATING THE 922..... 13

 3.4 MEASURING SAMPLES..... 15

 3.4.1 Taking a measurement 15

 3.4.2 Adding comments and additional information to a measurement 16

 3.5 SETUP PARAMETERS..... 17

 3.6 GPS STATUS INFORMATION 20

 3.7 VIEW DATA..... 20

 3.8 BLUETOOTH 21

 3.9 WINDOWS INTERFACE..... 22

SECTION 4 MAINTENANCE AND TROUBLESHOOTING PROCEDURES 27

 4.1 SECTION OVERVIEW 27

 4.2 FACTORY REPAIR..... 27

 4.3 SCHEDULED MAINTENANCE 27

 4.4 STORAGE..... 27

 4.5 CLEANING..... 28

APPENDIX A BARCODE SYMBOLOGIES..... 29

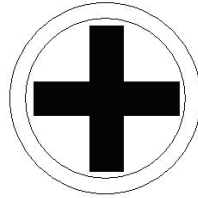
APPENDIX B - EXTENSION POLE KIT 31

APPENDIX C – DATA FORMAT..... 32

FIGURES

Figure 2.1 6
Figure 2.2 Initial Hardware Wizard Recognition 7
Figure 2.3 Installation Location Selection 8
Figure 2.4 USB Driver Location 8
Figure 2.5 Initial Driver Completion 9
Figure 2.6 Initial Installation Screen 9
Figure 2.7 Program Location 10
Figure 2.8 Components to be Added 10
Figure 2.9 Installation Progress 11
Figure 2.10 Installation Progress 11
Figure 3.1 Graphical User Interface Flow Chart 13
Figure 3.2 Main Screen 13
Figure 3.3 Calibrate Screen 14
Figure 3.4 Background Complete Screen 14
Figure 3.5 Measurement Screen 15
Figure 3.7 Setup Screen 17
Figure 3.8 UTC Offset Page 18
Figure 3.10 Memory Clear Warning 19
Figure 3.11 GPS Detail 20
Figure 3.9 View Data Page 21
Figure 3.13 Windows Interface Software 22
Figure 3.14 Com Port Settings Drop Down Menu 23
Figure 3.15 Communication Panel 23
Figure 3.16 Downloading Data from a 922 24
Figure 3.17 Downloaded Data 24
Figure 3.18 Comments Drop Down Menu 25
Figure 3.19 Comments Page 25
Figure A.1 Barcode Symbologies 29
Figure A.2 Sample Symbologies 30

SAFETY FIRST



Protect yourself. Follow these precautions:

- This Manual contains information about the proper procedures for preparing this product for its use and care.
- Follow the instructions of other manufacturer's equipment when used in conjunction with this product.
- Explosion Hazard. Do not use in the presence of flammable liquids, vapors, gases or dusts.
- **FIRE HAZARD: DO NOT DRAPE OR COVER ANY LIGHT SOURCE WHILE IT IS OPERATING.**
- Pay attention to **WARNING** statements. They point out situations that can cause injury or death.
- Pay attention to **CAUTION** statements. They point out situations that can cause equipment damage.
- The user of this product should be thoroughly familiar in the set-up, use, and care of this product.
- The user should carefully study this manual before using the equipment. Instructions should be followed, with special attention given to warnings, controls and user specifications. This manual should be available to the appropriate personnel.
- Before every procedure, carefully inspect the equipment to ensure it has been properly maintained and cleaned, and that it is fully functional. **DO NOT** use if inspection reveals anything unusual, including case damage or loose connectors.
- **SAFETY PRECAUTIONS MUST ALWAYS BE EXERCISED WHEN USING ELECTRICAL EQUIPMENT TO PREVENT OPERATOR SHOCK, FIRE HAZARD OR EQUIPMENT DAMAGE.**
- Don't touch any exposed wiring.
- All electrical equipment must be used with approved power cords and power plugs inserted properly into grounded AC power outlets.
- Don't plug in the power cord until directed to by the installation instructions.
- Don't bypass the power cord's ground lead with two-wire extension cords or plug adaptors.
- Don't disconnect the green and yellow safety-earth-ground wire that connects the ground lug of the power receptacle to the chassis ground terminal (marked with \ominus or \triangle).
- To reduce the risk of fire and electric shock, do not expose electrical equipment to moisture. When cleaning, do not immerse any electrical device in liquid.
- Do not use or store liquids on or above the equipment.
- Electric shock hazard. If unit is not functioning properly, **DO NOT OPEN**. Please refer to the Maintenance and Troubleshooting section of this manual.
- Use only properly functioning cables that are made for system instrument connectors.
- Light sources produce high intensity light. Thermal burns can result from improper use of the light source.
- Use care not to point any operating light source directly at the eye.
- When light source is not in use, turn off the power.
- Keep any cooling vents and fans free of obstructions.



922 Portable Retroreflectometer

SECTION 1 INTRODUCTION

1.1 GENERAL INFORMATION

The RoadVista 922 Field Retroreflectometer measures the retroreflection (R_A) of road signs and other materials in the field. Since a significant portion of the vehicles on the road in the USA are now SUVs and pickup trucks, ASTM has created a specification to require measurements to be performed at an observation angle of 0.5 degrees. The 922 meets or exceeds this change-over specification. The 922 allows you to know, with the press of a button, exactly how bright your sign will appear to most drivers.

The light sensor meets ASTM E1709 and E2540 requirements with the CIE standard human eye response in conjunction with the CIE illuminant "A" lamp. The photometric filter accurately measures colors without the need to calculate correction factors.

The user has the option of performing a calibration prior to taking measurements. Two standard observation angle readings are taken simultaneously at one entrance angle. An optional attachment to vary the entrance angle is available. The readings are taken locally, or remotely using an IrDA remote trigger. It maintains all these readings, but displays only the last four readings (for both the legend and background), and the average reading. (One or more incorrect readings may be deleted on the spot.)

When moving to a new sign, the unit saves only the current sign average reading (both angles, in either Metric or English units) but not individual readings. In addition, the 922 also records the following items with each sign:

- Global Positioning System (GPS) coordinates.
- Current date and time.
- The sign barcode number, if captured by the user.
- Up to six user-selected common sign faults.
- A user-entered comment of up to 17 characters.

The internal memory has the capacity to store readings and accompanying data for 2800 measurements. A long-life internal battery maintains the data in memory when power is turned off and when the external battery is removed.

The date and time clock is set for Coordinated Universal Time (UTC), but may be set for local time. A map is included in this manual to help the user adjust the offset according to geographical region.

An internal Bluetooth transceiver can be enabled to allow communications with other Bluetooth devices via the standard Serial Port Protocol (SSP). This allows wireless expansion of the instrument's capabilities, such as sub-meter-accuracy GPS, and is limited to only what is available on the market.

Data may be uploaded to a Windows-based computer using the Graphical User Interface (GUI) that comes with the 922. Uploading is accomplished through a USB interface, and

stored in ASCII delimited format.

1.2 SPECIFICATIONS

ASTM E1709 and E2540 Annular Geometry

| | |
|-----------------------------------|--|
| Entrance Angle (922): -4° | Observation Angle (922): 0.2° and 0.5° |
| Entrance Angle (922D): +5° | Observation Angle (922D): 0.33° |
| Entrance Angle (922E): +5° | Observation Angle (922D): 0.2° and 0.5° |

Light Source Angular Subtense: 0.1 degrees.

Receiver Angular Aperture (Annular): 0.1 degrees.

Field Measurement: 1 inch (25mm) diameter spot.

Optical Specifications

Range (cd/lx/m²): 0-9999.

Data Memory: 2800 measurements.

Computer Interface: USB, Bluetooth (SPP)

Power

Power Supply: Removable 12 VDC, 2.4Ah NiMH battery.
(DeWalt P/N DC9071)

Charger: Optional 12 VDC with cigarette lighter adapter.

Environmental

Operating Temperature: 0°C to 50°C (32°F to 122°F)

Operating Humidity: 0 to 90% non-condensing.

Dimensions

922 Field Retroreflectometer

3.6 in. (91 cm) wide; 12 in. (305 cm) high; 11 in. (280 cm) long.

Weight (without battery): 4.6 lbs (2.1 kg).

Weight (with battery): 5.75 lbs (2.6 kg).

Carry Case

20.5 in. (52.1 cm) wide; 8.5 in. (21.6 cm) high; 17 in. (43.2 cm) long.

Accessories and Options

Standard Accessories:

- Two (2) Batteries.
- 110 VAC Battery Charger.
- 10mm and 15mm Measurement Area (Aperture) Reducers.
- Calibration Standard.
- Calibration Certificate.
- Windows-Based Software.
- USB Cable
- Carrying Case.
- Shoulder Strap.

Additional Options:

- Annual Calibration Service
- Adjustable Entrance Angle Attachment (922-EAA)
- 12 VDC Car Battery Charger
- Extension Pole Kit (922-EPK)

1.3 ENVIRONMENTAL CONSTRAINTS

The RoadVista 922 is capable of operating between 0 and 50 degrees Celsius at altitudes up to 10 000 feet. Relative humidity must remain between 0 and 90 percent, non-condensing. By keeping the instrument within these limits, heat and moisture damage to the circuit boards can be prevented.

WARNING: While the Model 922 Field Retroreflectometer functions to 0°C, do not place excessive pressure on the touch screen if the air temperature is +5°C or below. Doing so could cause the touch screen to crack. Before using at an air temperature of +5°C or below, make sure the instrument has been in a warm area. Periodically return the instrument to a warm area to raise the screen temperature when taking readings.

SECTION 2 INITIAL SETUP

This section includes all the procedures required to place the 922 Field Retro-reflectometer into service. It begins with unpacking and inspecting the components, followed by the operating procedure.

2.1 UNPACKING AND INSPECTION

RoadVista has taken special care in packaging the instrument for shipment. Your 922 was shipped in a pressurized carry case. It is important that you carefully inspect the equipment for any damage that might have occurred during shipping. Visually inspect all the 922 components for dents or other signs of damage. If the instrument appears to be damaged, do not proceed to operating instructions. If the instrument appears to be damage free, proceed to operating instructions.

If damage is discovered, ascertain whether the shipping container shows damage caused by rough handling, making the shipper liable for damage. If a Polaroid or digital camera is available, take a picture of the shipping container and the instrument. Carefully re-package the instrument in its shipping container and include the photographs and/or comments in a separate envelope. Notify the shipper that the instrument needs to be returned because of shipping damage. Notify RoadVista of the damage. A RoadVista representative will explain how to return the equipment. This procedure will expedite the replacement of the damaged instrument.

2.2 INTRODUCTION

The main features of the 922 are shown in figure 2.1



Figure 2.1

2.3 USB & SOFTWARE INSTALLATION

2.3.1 Windows GUI System Requirements

Before making any electrical connections, verify that your computer is configured with the following minimum requirements:

- Operating System: Windows XP.
- Hard Disk Space: Minimum required; 100 MB.
- Random Access Memory (RAM): Minimum required; 128 MB.

2.3.2 USB Installation

1. Plug the USB cable into the computer and then into the 922.
2. Apply power to the 922.
3. The computer will immediately recognize that something has been plugged into the USB port.



Figure 2.2 Initial Hardware Wizard Recognition

4. Select the settings as shown above and click “Next.”

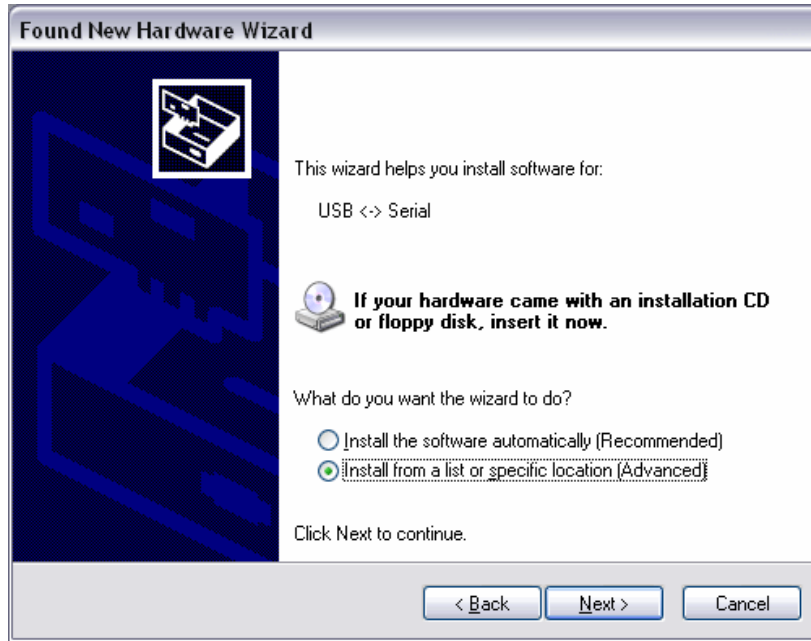


Figure 2.3 Installation Location Selection

5. Select “Install from a list or specific location,” and click “Next”

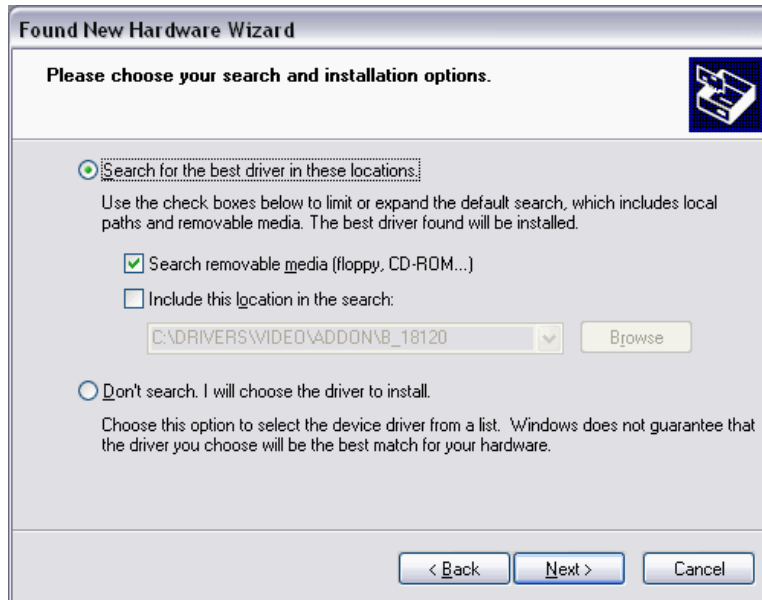


Figure 2.4 USB Driver Location

6. Select the above noted location for the USB driver location and click “Next.”

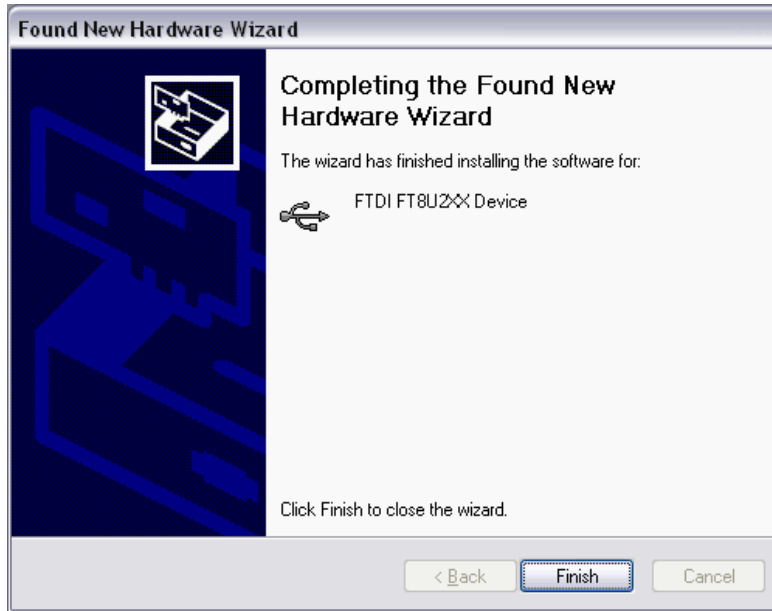


Figure 2.5 Initial Driver Completion

7. When the initial installation is complete you should see the above screen.
8. The operating system may have you install the drivers a second time, if so, repeat the above steps until the system is successfully installed the drivers and the system recognizes the hardware.

2.3.3 Windows Software Installation

1. Place installation CD into drive and select "Setup.exe."

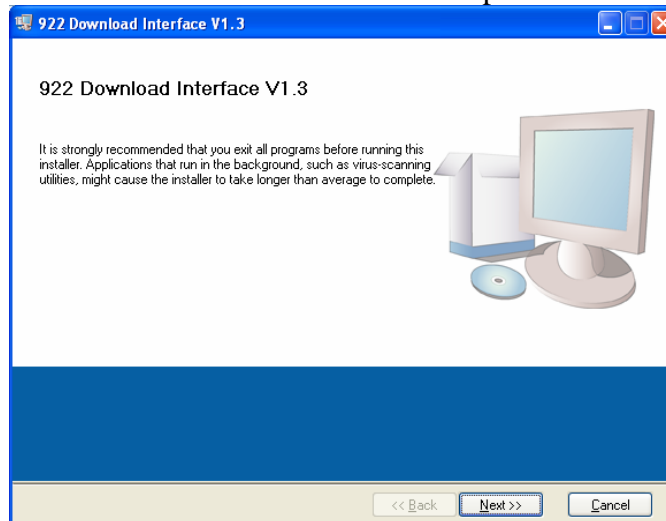


Figure 2.6 Initial Installation Screen

2. An initial screen will show the windows interface software that is being installed along with the version number of this software

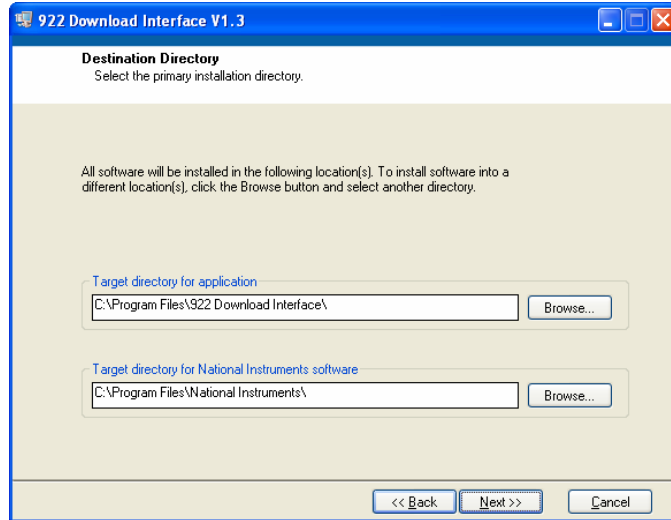


Figure 2.7 Program Location

3. Accept all default settings throughout installation process unless a different program location is desired

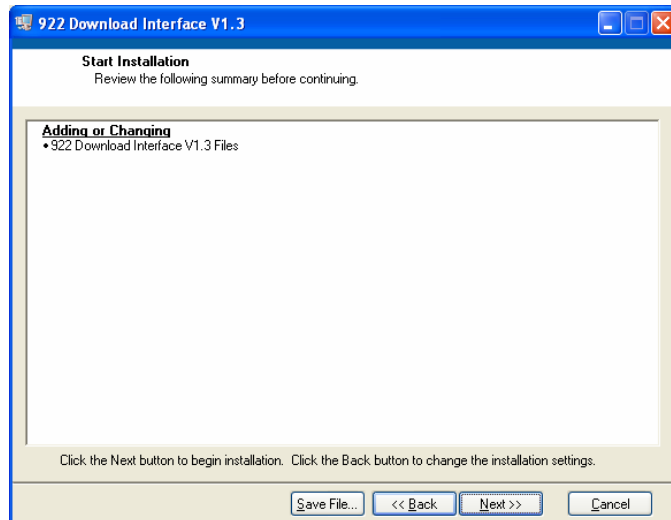


Figure 2.8 Components to be Added

4. A list of all applicable installation packages that the package will install onto the computer is then displayed.

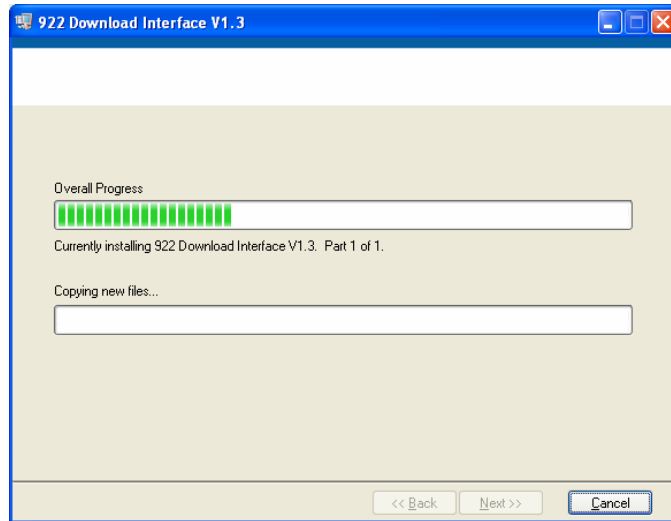


Figure 2.9 Installation Progress

5. A progress bar will show the current progress of the installation package.

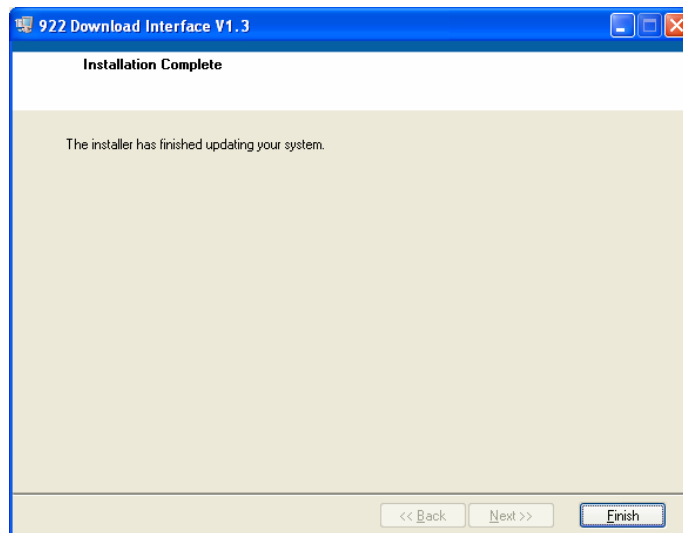


Figure 2.10 Installation Progress

6. When the software has completed the installation process it may prompt you to restart the computer to finalize the installation process.

SECTION 3 SYSTEM OPERATION

3.1 SYSTEM POWER UP

1. Power-up the 922 by using the ON/OFF rocker switch. The logo screen is displayed briefly. When the system has completed the boot up sequence the 922 will go directly to the measurement screen.
 - Reminder: Fully charge batteries before each use.
 - Reminder: The green LED will pulse when functioning properly

3.2 ROAD VISTA 922 GUI FLOW CHART

The following flow chart shows how the menus in the 922 are interconnected. By default the 922 will boot up and start in the “Measure” page. A button is located in the lower left corner of each screen that allows the user to return to the menu above the one that they are currently in. The 922 utilizes a touch screen interface and therefore all references to buttons refer location on the 922 screen.

CAUTION

Use only a finger to press the touch screen buttons. Using any hard, pointed device to press the touch screen will damage the screen.

NOTE: The “Number Pad” and “Alpha/Numeric Keypad” require the user to either “Enter” the current value or “Cancel” the changes made in the window.

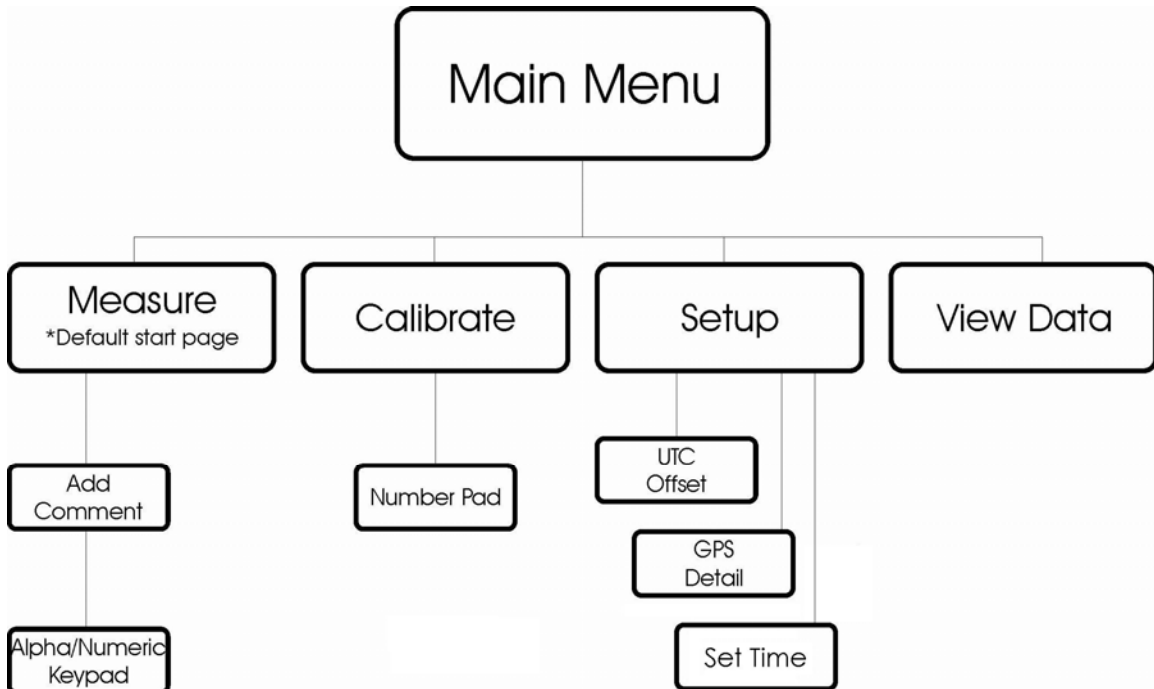


Figure 3.1 Graphical User Interface Flow Chart

3.3 CALIBRATING THE 922

1. Enter the “Calibration” menu. This will require you to return to the main screen (please see Figure 3.1 for reference).

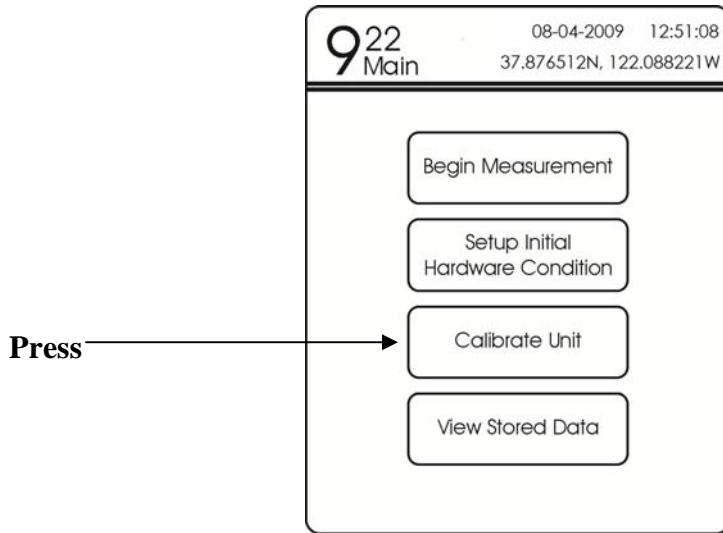


Figure 3.2 Main Screen

2. From the Main screen the user can now enter the Calibrate screen

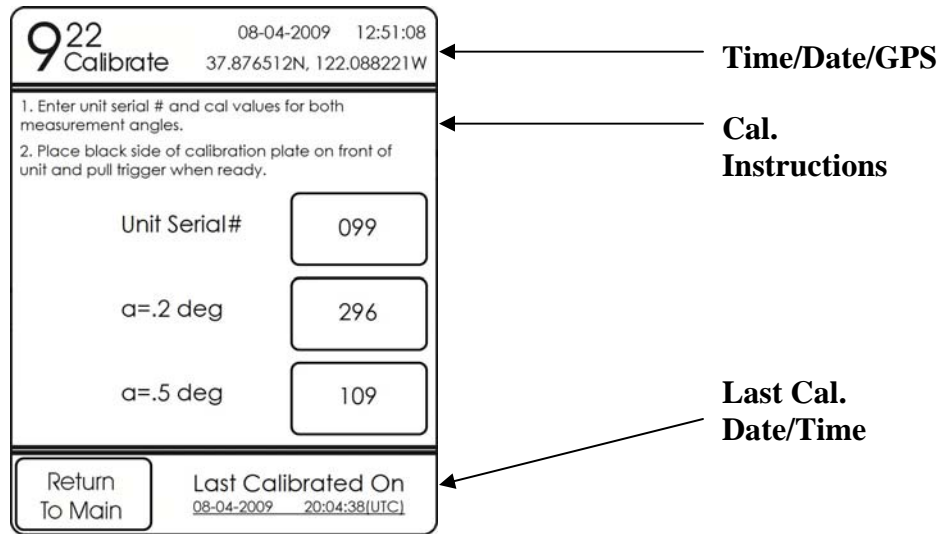


Figure 3.3 Calibrate Screen

3. The menu allows the user to enter all the applicable data for the calibration standard that is going to be used from the 922 calibration. The values are entered by pressing the button associated with the value that the user desires to change.
 - Calibration Value for $\alpha = .2$
 - Calibration Value for $\alpha = .5$
 - Serial Number of the Calibration Standard

NOTE: The numeric values are entered using a number keypad. The value is accepted by pressing “Etr.”

4. Once all applicable data is entered, the user places the black side of the standard against the front of the 922 and presses the trigger to take the initial background measurement.

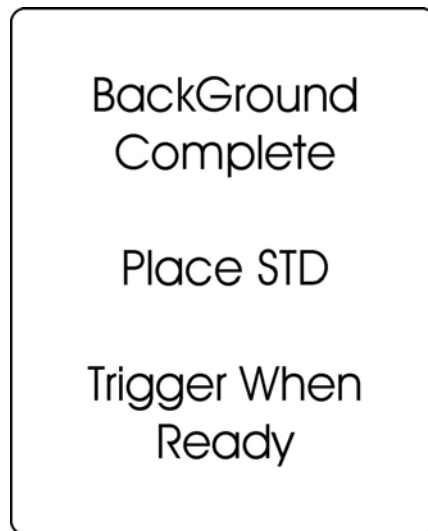


Figure 3.4 Background Complete Screen

5. When the background is complete the user is prompted to place the reflective side of the standard against the front of the 922. Be sure to center the sample for more

repeatable and accurate calibrations. Press the trigger when ready to calibrate unit.

6. After the unit has completed the calibration the system will automatically enter the measure screen and the user may now begin to take measurements.

3.4 MEASURING SAMPLES

3.4.1 Taking a measurement

1. If a calibration has just been completed the 922 will automatically enter the measurement screen. If however you are not in the Measurement screen please refer to the flow chart, Figure 3.1, on how to navigate to this screen.

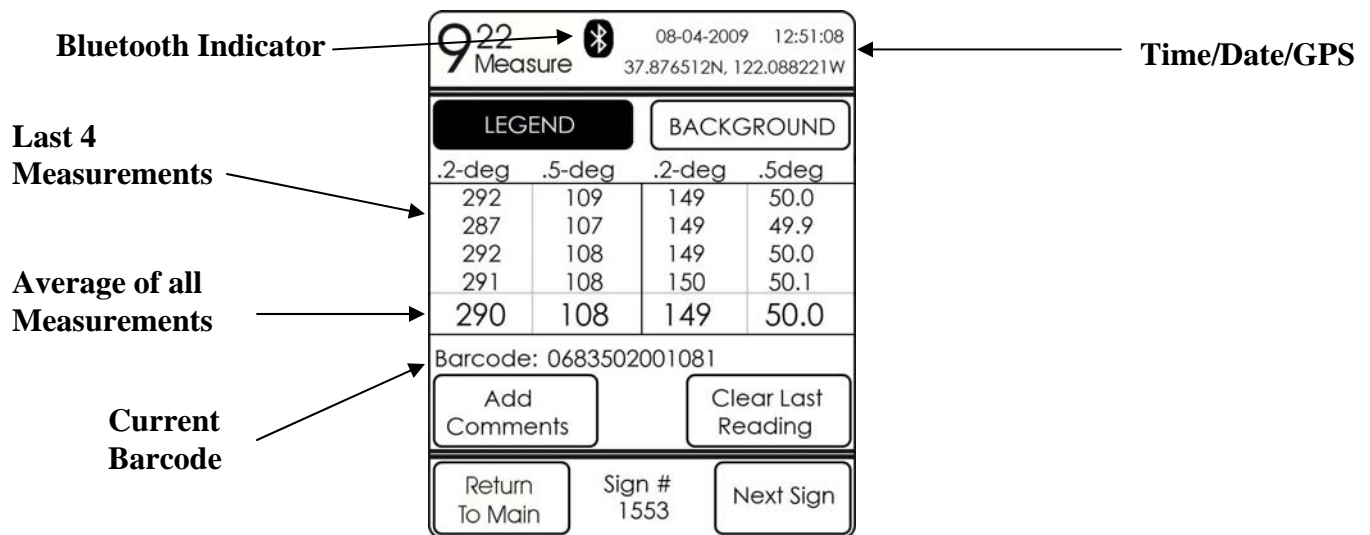


Figure 3.5 Measurement Screen

2. Place the front of the 922 against the legend of the sign being tested. Press either “LEGEND” or “BACKGROUND” depending on which part of the sign is being measured. On signs that do not require separate legend and background measurements, set the instrument to only read legend data. Be sure to locate the correct location of the measurement area within the lamp output port.

NOTE:

- Front plunger switch must be depressed for the system to take a measurement.
 - Sample must be larger than 1” in diameter. If the sample under test is not larger than this, an aperture reducer that is smaller than the sample must be used. If an aperture reducer is required, the 922 **MUST** be calibrated with the aperture reducer in place.
 - Long arrow on side of unit points to the center of the output port. This may help with alignment.
3. Press the trigger to perform a measurement. The last value will be shown in the small window to the right of the running average (see Figure 3.5). The user may take as many as 20 measurements for both the legend and the background. The

922 will continually use all of the available data for the average.

NOTE:

- When the unit has reached 20 measurements the 922 will no longer take any more measurements until the data is either cleared or saved
4. Press the "Next Sign" button when all the sign legend and background measurements have been completed. This will take you to the readings screen for the next sign.

NOTE:

- The 922 **will** only store the average of all values for both angles. All individual data readings will be deleted after the average has been saved.

3.4.2 Adding comments and additional information to a measurement

3.4.2.1 Barcode

1. A barcode value may be scanned by pressing the trigger while the front plunger is NOT depressed.
2. The barcode will remain on as long as the trigger is depressed. A short audible beep will sound when a valid barcode measurement has been taken.
3. The scanned barcode value will then be displayed on the measurement screen (see Figure 3.5)

NOTE: Please see appendix for additional barcode symbologies and how to activate them with the 922.

3.4.2.2 Comments

1. A comment can be added to any measurement saved in memory by pressing the "Add Com" button within the measurement window.

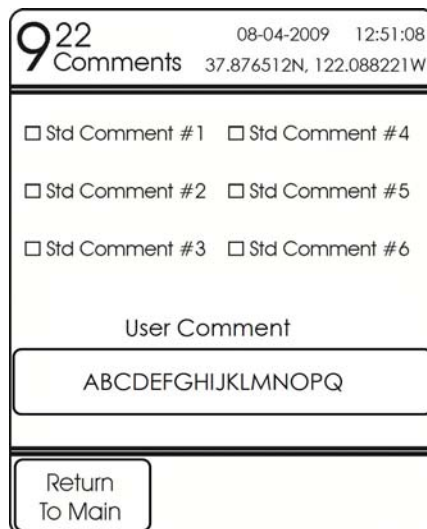


Figure 3.6 Comment Window

2. This screen allows the user to add anything from 0 to 6 different standard comments to any sign (these comments can be set through the computer interface software). Any or all comments can be selected at any one time. A 17 digit alpha/numeric user comment can also be added by selecting the large button in the middle section of the screen.
3. By selecting the user comment button, an alpha/numeric keypad will be displayed to allow the user to type any comment desired.
4. The comment is entered when the user selects "Ent." The user comment change can be canceled if "Cnc" is pressed within the alpha/numeric page.
5. When all comments are entered and the user would like to save the data to memory, press "Next Sign."
6. Once data is saved to memory all additional comments and information is returned to the default setting (either unchecked or blank).

3.5 SETUP PARAMETERS

1. Enter the setup screen through the main screen (refer to Figure 3.1)
2. The user has the ability to access the following information and features by entering the "Setup System Parameters" menu (Figure 3.7);
 - Backlight adjustment
 - Contrast Adjustment
 - Firmware Revision
 - Touch Screen Calibration
 - Manually set the time of day
 - Number of measurements in memory (bottom middle of screen)
 - Clear memory
 - Time Zone offset correction
 - GPS (Global Positioning System) detail information
 - Bluetooth Enable/Disable

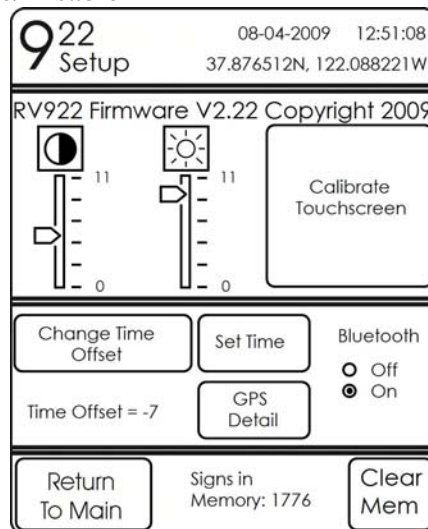


Figure 3.7 Setup Screen

3. Brightness and Contrast

- 1) The user can adjust both the contrast and brightness by selecting the respective indicators and dragging them to a new location. Notice that unlike some competitors units which may only go to 10, the Road Vista 922's contrast and brightness settings go to 11.
- 2) The new settings will be stored as the preferred setting when the "Return To Main" button is pressed

4. Touch Cal

- 1) If the touch screen appears to be out of sync, press the "Touch Cal" button and follow the on-screen instructions to recalibrate the touch screen. You will be asked to touch 3 different areas of the screen.

5. Set Time Zone

NOTE: The internal CPU uses UTC time and therefore requires an offset for local time correction. The hour is based on a 0-24 scale.

- 1) Press the "Set Time Zone" button to access the correction page.

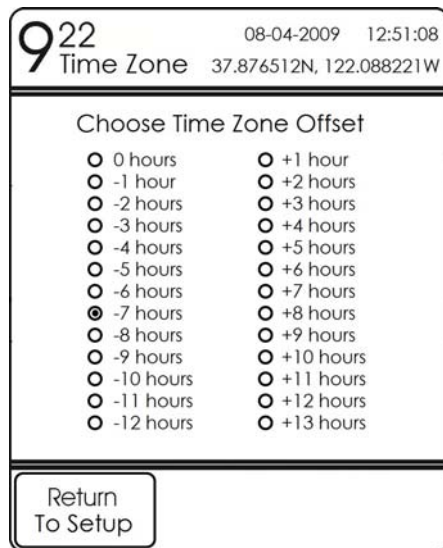


Figure 3.8 UTC Offset Page

- 2) Determine the local Time Zone with respect to UTC Time and select the correct offset. The internal CPU will use this setting to adjust the time for this new location.
6. If you do not have a GPS fix (if using the instrument indoors, for example), you may manually set the time. Touch the "Set Time" button. This will take you to a new screen. Enter in the Year, Month, Day, Hour and Minute by touching the

appropriate areas on the screen. Once you have entered in the information, touch the "Set Time" button. Touch the "Return to Setup" button

NOTE: The time will still use the Time Zone offset from the previous step. If you do not know your time zone, enter in the local time and set the Time Zone Offset to be zero "0" hours.

NOTE: The time will update itself from the GPS clock once a GPS position lock has been achieved.

7. If it is desired to clear the entire memory, press "Clear Mem." You will be prompted only once if this action is truly desired. Once cleared the memory cannot be restored.

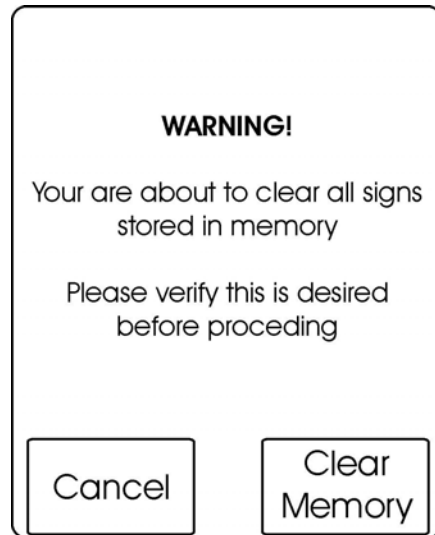


Figure 3.10 Memory Clear Warning

3.6 GPS STATUS INFORMATION

- 1) Access additional GPS information by pressing the “GPS Detail” button within the setup screen.

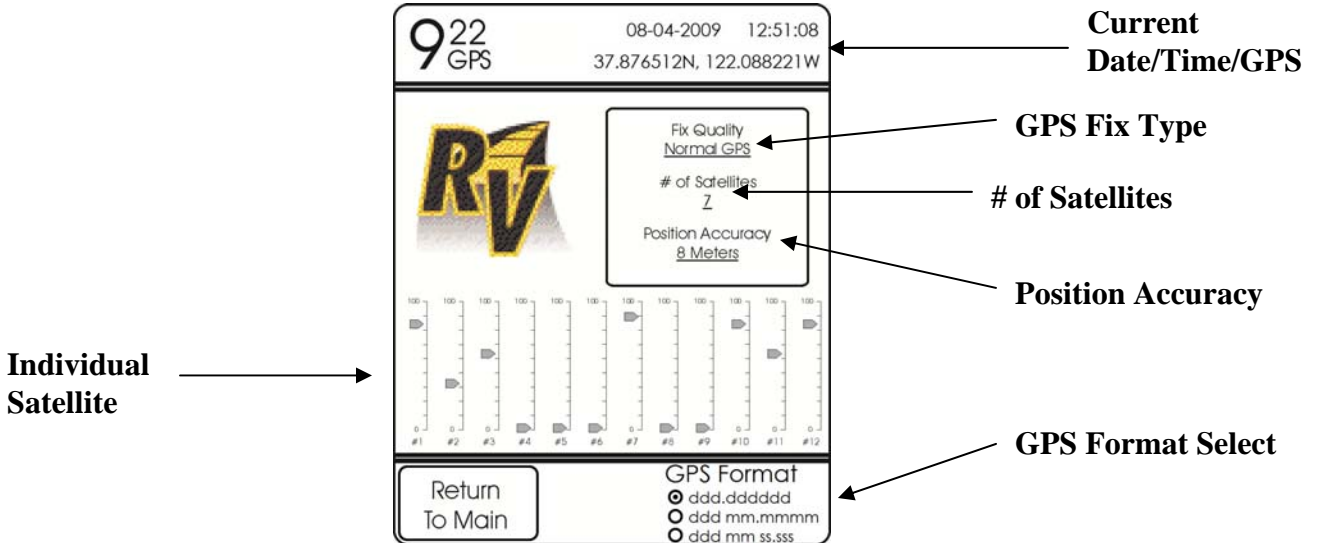


Figure 3.11 GPS Detail

- 2) The GPS detail screen gives the user the ability to view detailed information about the following
 - Type of GPS: N/A, Normal GPS, Differential GPS (WAAS enabled)
 - # of satellites currently being used to determine location
 - Positional accuracy based on the satellite information
 - Individual satellite strength

NOTE: Not all satellites returning signal are being used for positional calculation.

- 3) The GPS position format can be selected in the lower left corner. This allows the user to choose how the GPS position is displayed and stored in memory.
 - ddd.dddddd - displays positional information in decimal degree
 - ddd mm.mmmm – displays positional information in degrees and decimal minutes. Note: Use this format when exporting data to Google Earth.
 - ddd mm ss.sss – displays positional information in degrees, minutes, and decimal seconds

3.7 VIEW DATA

This page allows the user to view any data that has been previously saved and is currently in the memory.

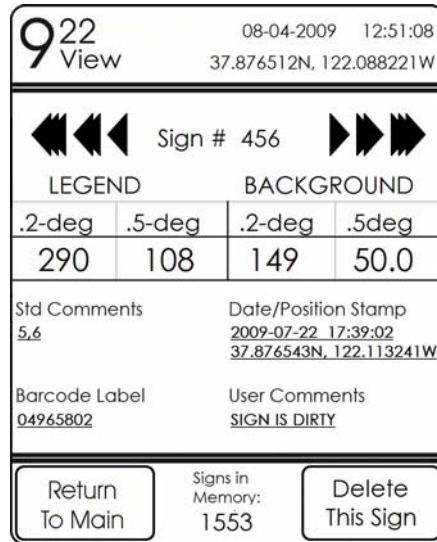


Figure 3.9 View Data Page

- 1) The data can be scrolled through using the left and right arrows. The single arrows increment or decrement the sign # by 1, the double arrows increment or decrement the sign # by 10, and the triple arrows increment or decrement the sign # by 100.
- 2) The currently selected sign can be deleted by pressing “Delete This Sign”. After going through a confirmation screen, the record will be permanently deleted and the remaining data will be moved forward.

3.8 BLUETOOTH

The 922 is equipped with a Bluetooth transceiver on version 2.0 and above. The Bluetooth transceiver can be enabled or disabled on the setup screen (Figure 3.7).

In order to connect with a remote device via Bluetooth, the remote device must support Serial Port Protocol (SPP), and be able to initiate a Bluetooth Connection.

- 1) Enable the Bluetooth on the 922.
- 2) On the remote device, do a search for Bluetooth devices. The 922 will show up as “RV922”
- 3) Pair the two devices, using “0000” as the passkey.
- 4) Open a serial connection on the remote device with the 922. When the serial connection is correctly initiated, a Bluetooth icon on the 922 will appear at the top of the screen next to the GPS data.

When an active SPP connection has been established with a remote device, the 922 will send out all of the data for each sign when “Next Sign” is pushed. This is the same data that is stored in memory. Additionally, sending the hex character “0x4d” (ascii “m”) will initiate a measurement or turn on the barcode reader depending on whether the front button is pressed. This is the equivalent of pulling the trigger. The hex character “0x4e”

will save the data and advance the memory to the next sign, which is equivalent to pressing the “Next Sign” button.

3.9 WINDOWS INTERFACE

The windows download interface gives the end user the ability to do the following:

- Adjust Communication settings
- Download data stored on any 922 or 922D
- Open existing data files
- View individual data points and all applicable information
- Download current standard comment settings
- Save data in an Excel comma delimited format
- Export data to a Google Earth format (Please refer to all Google’s requirements for conformity when using this external software package)
- Clear 922 Memory

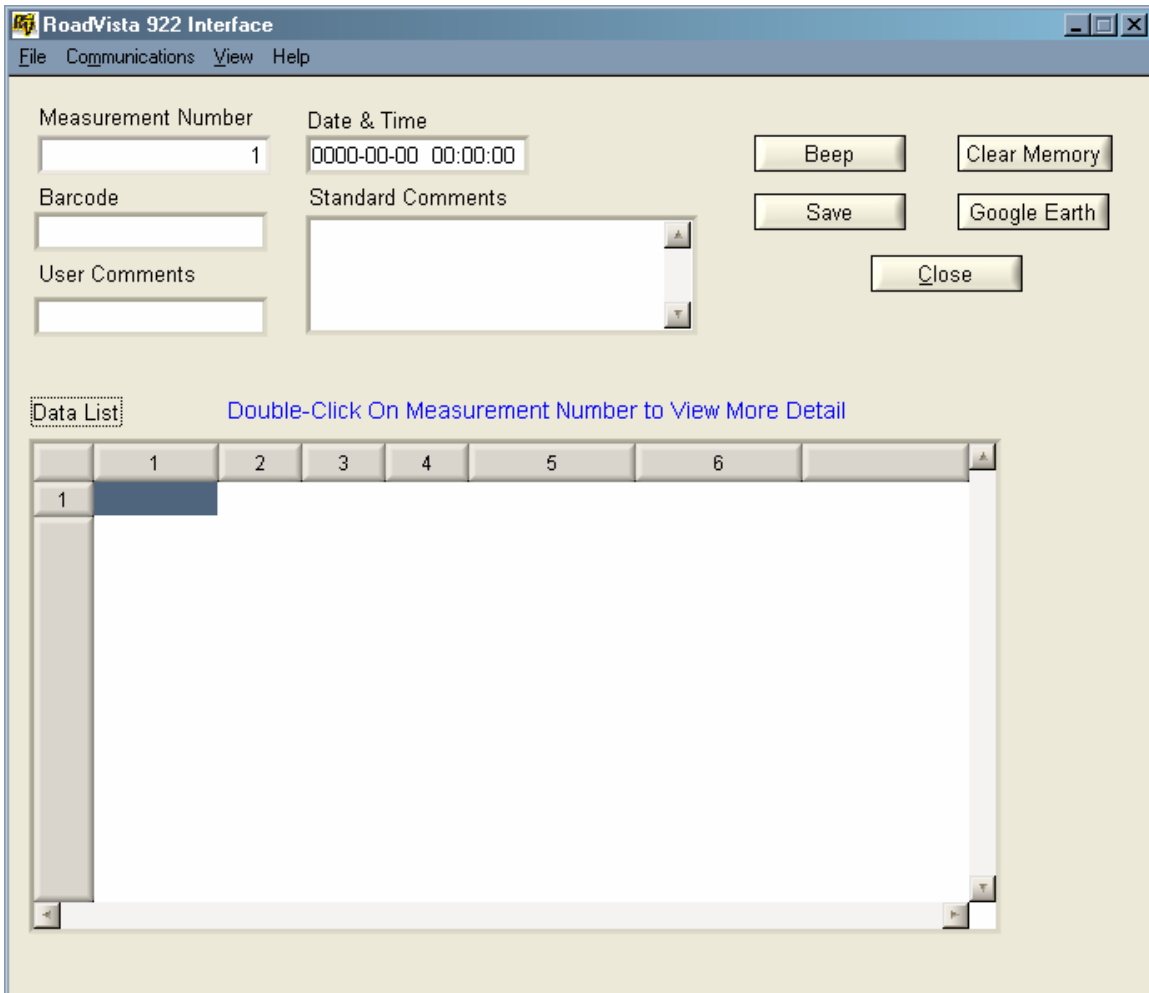


Figure 3.13 Windows Interface Software

1. Communication Setup
 - a. The communication settings are accessed through the “Communications”

drop down menu

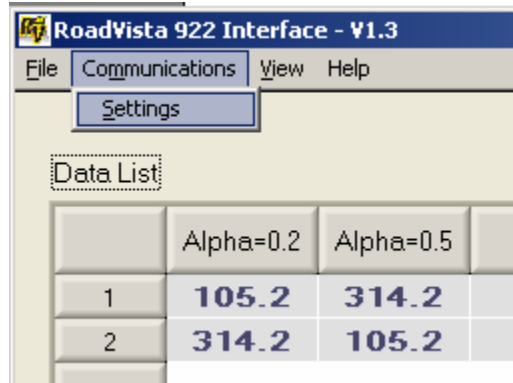


Figure 3.14 Com Port Settings Drop Down Menu

b. The user must first search for the appropriate communication port

NOTE: The USB drivers must have already been installed. The 922 should be connected to the computer and turned on.

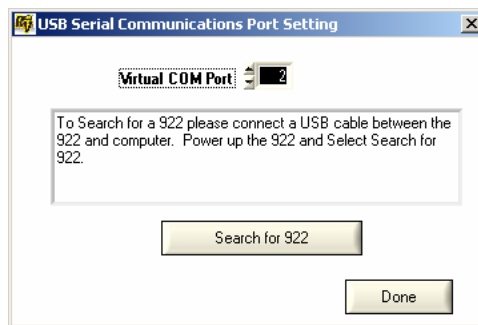


Figure 3.15 Communication Panel

c. Once the correct communication port is found, click “Done.” Click on the “Beep” button (refer to Figure 3.13) in the software to verify the communication with the 922.

2. Downloading Data

a. The data within a 922 is downloaded through the “File” drop down menu. Select “Download Data from 922”

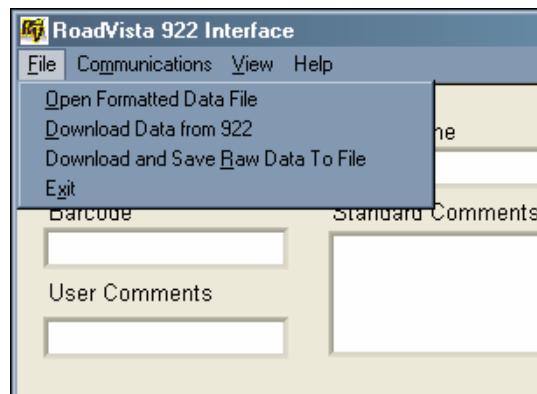


Figure 3.16 Downloading Data from a 922

- b. When the download is complete, all measurements stored within the 922 will be displayed within the Windows software

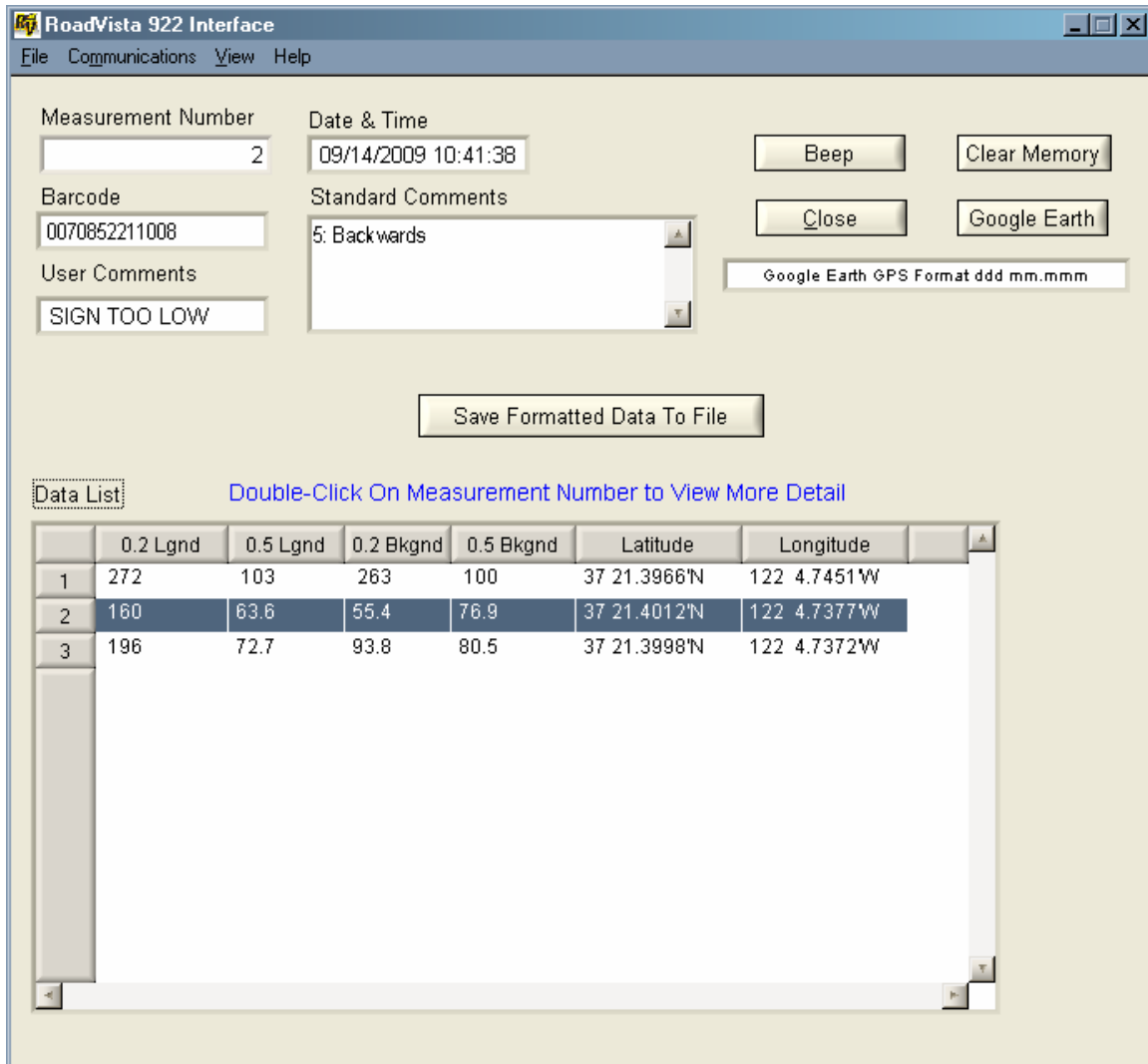


Figure 3.17 Downloaded Data

3. Save Formatted Data to File
 - a. Press this button to save the data as a .csv file, which can then easily be imported by a spreadsheet program such as Excel.
4. Open Formatted Data File
 - a. This option is selected from the “File” drop down menu. The user will be prompted to locate the file of interest
 - b. After the file has been loaded, all data points will be displayed within the software

5. Download and Save Raw Data to File
 - a. This option will download the data from the 922 and save it as a standard text file. See Appendix C for more information regarding the format.
6. View Additional Individual Information
 - a. If it is desired to view the additional information for any data point, one must double click the data point of interest. The data for this measurement will then be displayed in the appropriate locations to the right of the main data window.
7. View/Upload Standard Comments
 - a. Access the comments section within the "View" drop down menu.

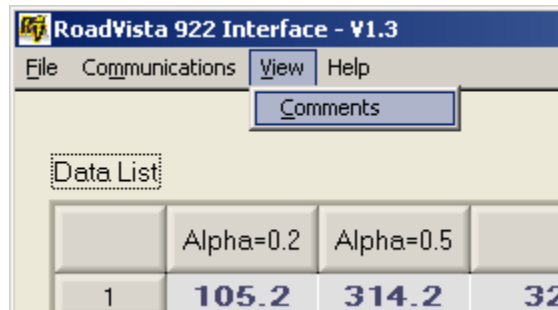
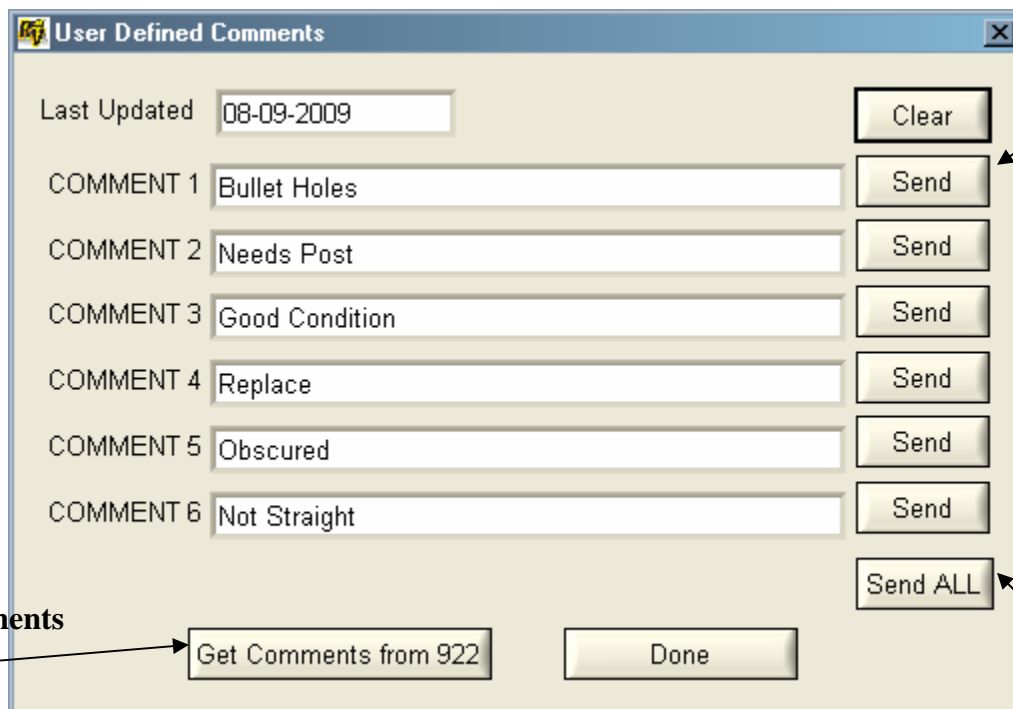


Figure 3.18 Comments Drop Down Menu

- a. Each individual comment (or all simultaneously) can be adjusted and uploaded to the attached 922. Each comment can be up to 19 characters.



Download Comments From 922

Send Individual Comment

Send All Comments

Figure 3.19 Comments Page

- c. The current comment settings within any 922 can also be downloaded for reference when examining the downloaded data.
- 8. Export to Google Earth
 - a. This button allows the user to export the data into a Google Earth format which shows the GPS location and measured values for all data points within the file.
- 9. Clear Memory
 - a. The software will prompt once to verify that this is desired. Once the memory is deleted it can no longer be recovered.

SECTION 4 MAINTENANCE AND TROUBLESHOOTING PROCEDURES

4.1 SECTION OVERVIEW

The 922 Field Retroreflectometer has **no user-serviceable components**. If the green LED is not pulsing, the 922 internal CPU has malfunctioned. If this occurs, cycle the 922 power off, then on. If the problem persists, or if any other problem develops, refer to paragraph 4.2, Factory Repair.

4.2 FACTORY REPAIR

RoadVista maintains a factory repair department to return the 922 Field Retroreflectometer to within specification. If returning any portion of the 922 Field Retroreflectometer for calibration or repair, please contact the factory for a Return Material Authorization (RMA) number prior to shipment. Please use the following to contact the factory:

Phone (858) 279-6044
FAX (858)576-9286
www.roadvista.com

Attach a detailed description of the specific problem (to minimize turnaround time), repack the instrument in its original case (if available), and ship it to the factory at the following address:

RoadVista
8581 Aero Drive
San Diego, CA 92123

Attn: Repair Department

4.3 SCHEDULED MAINTENANCE

The 922 should be returned to RoadVista on a yearly basis to verify all aspects of the measurement system are within specification and perform standard routine maintenance. Standard maintenance includes the following;

- Replace lamp
- Verify optical alignment
- Update firmware with newest version
- Full system check

4.4 STORAGE

When not in use, the 922 should be stored in its original shipping carton to protect it from damage, dust particles, and other potentially harmful environmental conditions.

4.5 CLEANING

Only the 922 exterior surface and touch screen may be cleaned.

CAUTION

When cleaning the 922, keep all cleaning materials and fingers away from the touch screen and lenses.

DO NOT use chemical cleaning agents that may damage the plastics, paint, or metal.

To clean the exterior surface, create a cleaning solution by combining water and a mild detergent. Dampen a soft cloth in the solution, and wring out the excess liquid. Wipe the 922 in a circular motion, making sure that the solution does not seep into any crevices.

To clean the touch screen, use only a new, dry, delicate task wiper, moving it in a circular motion.

APPENDIX A BARCODE SYMBOLOGIES

The barcode engine that exists within the 922 by default comes with several active symbologies. The engine also has several symbologies that must be activated before use. Below is a procedure for activating the symbology along with a list of the standard symbologies included with this engine.

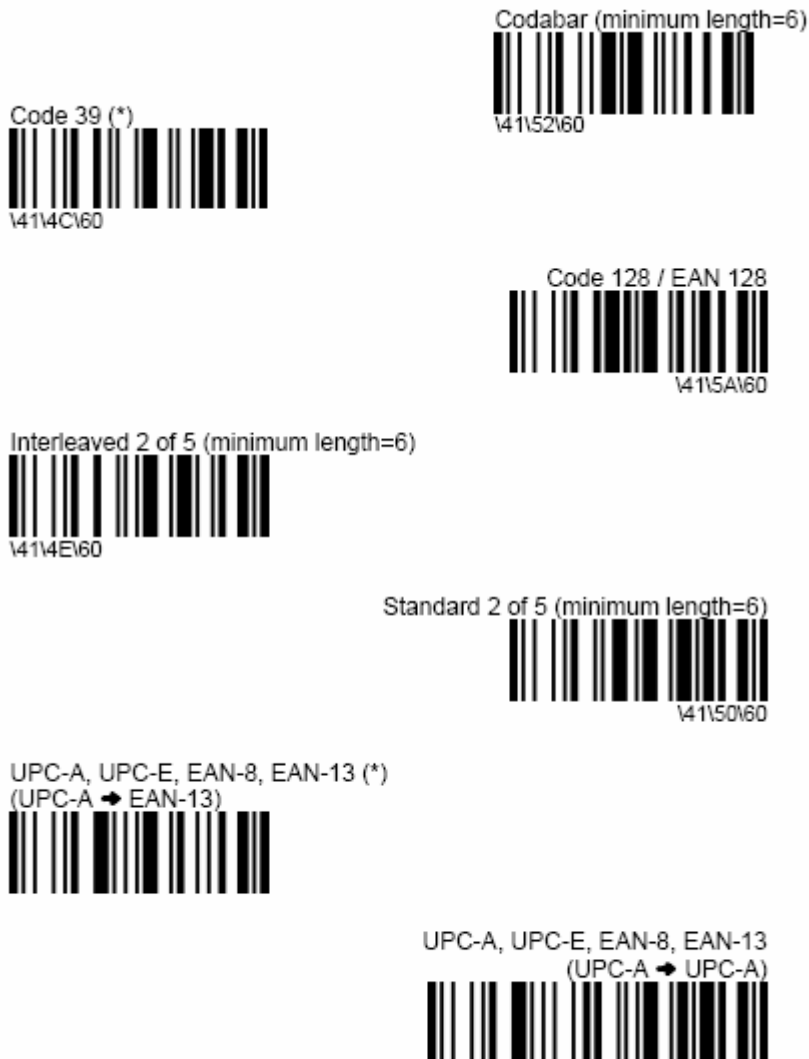


Figure A.1 Barcode Symbologies

1. Using the 922, scan barcode of the desired symbology from Figure A.1.
2. Cycle power on the 922 unit
3. Scan the supplied example symbology from Figure A.2 to verify that it is activated.

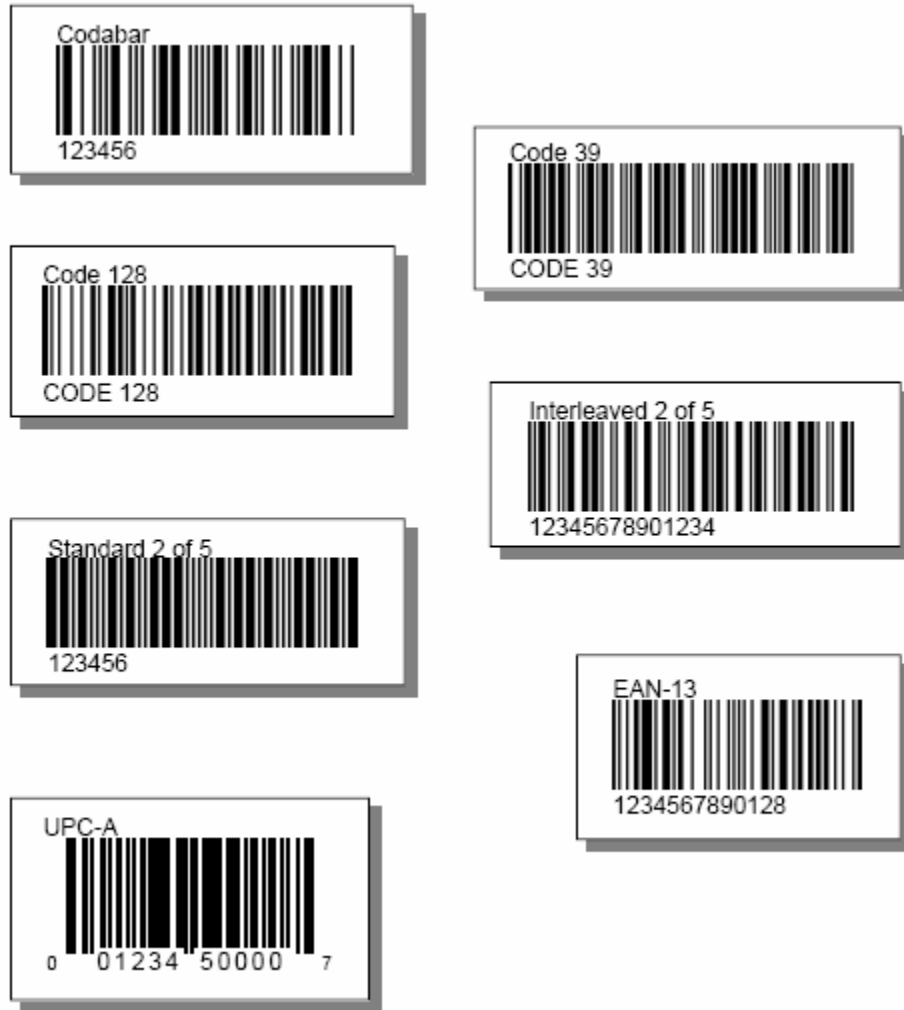
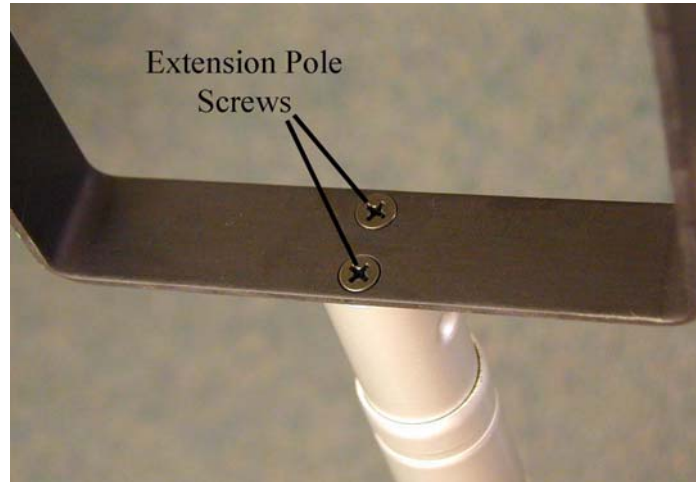


Figure A.2 Sample Symbologies

APPENDIX B - EXTENSION POLE KIT

1. Identify the extension pole end with the two black screws.



2. Remove the two screws from the extension pole end. Mount the Model 922 bracket at the pole end with these two screws.
3. Mount the Model 922 Field Retroreflectometer to the bracket with the thumbscrew.



APPENDIX C – DATA FORMAT

This section explains the raw data format used by the 922. This data can be accessed by using the download interface and selecting File, Download and Save Raw Data to File.

Here is an example raw file, with 3 data points:

```
1, 272, 103, 263, 100, 09/14/2009 10:40:50, 37 21.3966'N, 122 4.7451'W, 3, 0079893200507, 3, REPLACE
2, 160, 63.6, 55.4, 76.9, 09/14/2009 10:41:38, 37 21.4012'N, 122 4.7377'W, 4, 0070852211008, 16, SIGN TOO LOW
3, 196, 72.7, 93.8, 80.5, 09/14/2009 10:42:33, 37 21.3998'N, 122 4.7372'W, 3, 0090341121212, 36, ACCEPTABLE
```

Each column is separated by a comma.

Column 1: Measurement number

Column 2: 0.2° Alpha Legend

Column 3: 0.5° Alpha Legend

Column 4: 0.2° Alpha Background

Column 5: 0.5° Alpha Background

Column 6: Date and Time, expressed in month/day/year hour:minute:second

Column 7: Latitude, expressed in format selected under the GPS detail page

Column 8: Longitude, expressed in format selected under the GPS detail page

Column 9: Position Accuracy, in meters

Column 10: Barcode reading

Column 11: Standard Comments – see below for instructions to decode.

Column 12: User Comment

Note: The option to save the data as a formatted .csv file will produce the same data, expect the columns will be labeled, and the standard comments will be listed at the bottom of the file.

Decoding Standard Comments: There are 6 standard comments that can be selected. The 922 packs this information into a single byte. To decode the byte, convert the number to binary. Bit 0 corresponds to comment 1, bit 1 corresponds to comment 2, and so forth. The standard Windows calculator has the facility to easily convert decimal numbers to binary.

Example #1: The standard comment is 36. When converted to binary, 36 = 100100. This means that comments 3 and 6 were checked.

Example #2: The standard comment is 3. When converted to binary, 3 = 11. This means that comments 1 and 2 were checked.