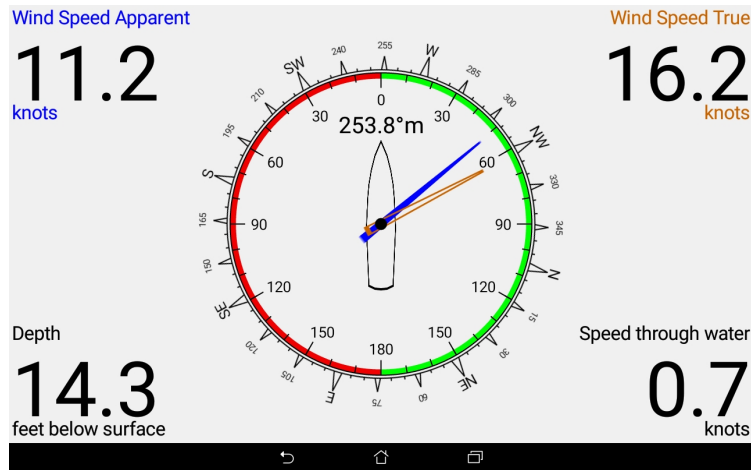


# Encoded Solutions, LLC NMEA Instruments Software



## Users Guide

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# 1 NMEA Instruments Android Software

The Encoded Solutions NMEA Instruments software is a wireless marine instruments display head that allows you to receive NMEA0183 sentences on your Android device via WIFI using either TCP or UDP protocol, and to display that data on text or graphical marine instrument style display screens. When used with the Encoded Solutions NMEA-to-WIFI Multiplexer, this software allows you to see your marine instruments wherever you are on your boat (within WIFI range of the multiplexer).

The following single-instrument full screen text displays are available:

- Compass
- Depth
- Boat Speed Through the Water
- Boat Speed Over Ground
- Apparent Wind
- True Wind
- Water Temperature

The following graphic displays available:

- Depth – a depth graph showing the current and 120 historic depth values
- Multi-Instrument – a display that shows apparent wind angle, true wind angle, and compass rose graphically, and apparent wind speed, true wind speed, compass heading, depth, and boat speed textually

A scrolling text display of the raw NMEA0183 data as it is received by the Android device is also available. This allows you to see exactly what your instruments are sending to help you when setting up your Encoded Solutions NMEA-to-WIFI multiplexer and this software.

The software allows you to choose the units that will be used to display Depth, Wind Speed, and Boat Speed. If the NMEA sentence containing the data to display for these instruments does not contain the data in the desired units, the data will be converted to the desired units for display.

In addition, you can control various other aspects of the software such as the color scheme, which instruments are available for display, what NMEA sentence to use for each type of data, and what references to use for the Compass, Depth, and Boat Speed.

## 2 Initial set-up

There are two steps to setting up the software for your use. First is establishing a connection which allows the NMEA sentences to be received by the software. Next is to set up the parameters for each type of data to be displayed so that the NMEA sentences being received will be used and the data will be properly displayed on the instruments.

There are links in this section that you can click to go to the referenced menu items for detailed instructions.

### 2.1.1 Receiving NMEA sentences

For the NMEA Instruments software to receive NMEA sentences there are only a few things to consider.

Your Android device that is running the software must be connected via WIFI to the WIFI hub that is sending the NMEA sentences. That hub is normally a NMEA multiplexer, but may also be a WIFI router to which the NMEA sentence source is also connected.

The [Connection Protocol and Parameters](#) must be set to match those of the NMEA sentence source. In the NMEA Instruments settings, under the Connection Protocol and Parameters menu item:

- the Transmission Protocol entry must match that used by the NMEA sentence source: TCP or UDP
- the [IP Address](#) must be set to the NMEA data source
- if the transmission protocol on the NMEA sentence source is TCP then the TCP Port must match that of the NMEA sentence source's TCP port on which it sends sentences
- or, if the transmission protocol on the multiplexer is UDP then the UDP Recieve Port must match that of the NMEA sentence source's UDP Send Port on which it sends sentences

All NMEA sentences that are received by the software are displayed on its Raw NMEA Data screen, so use that screen to check to see if the software is receiving the data. All received sentences received by the software are displayed on that screen as long as the button in the lower right of that screen says "PAUSE DISPLAY", which can be pressed to pause the display. Here is [How to Change the Displayed Instrument](#).

### 2.1.2 Using the received NMEA sentences

Once the NMEA data flow has been established to the software it is necessary to set up the software for your data and preferences.

The first step is to set up the [Units of Measure](#) because these units are used in the settings menu in addition to being used for instrument display.

Next you must select the NMEA sentence that will be used for each data type to be displayed. Depth will be used here as the example because there are other depth settings that are also critical in order to see depth properly.

In the Settings / [Depth](#) / Depth NMEA Sentence menu item choose the NMEA sentence type that the software is receiving that you want to use for your depth source.

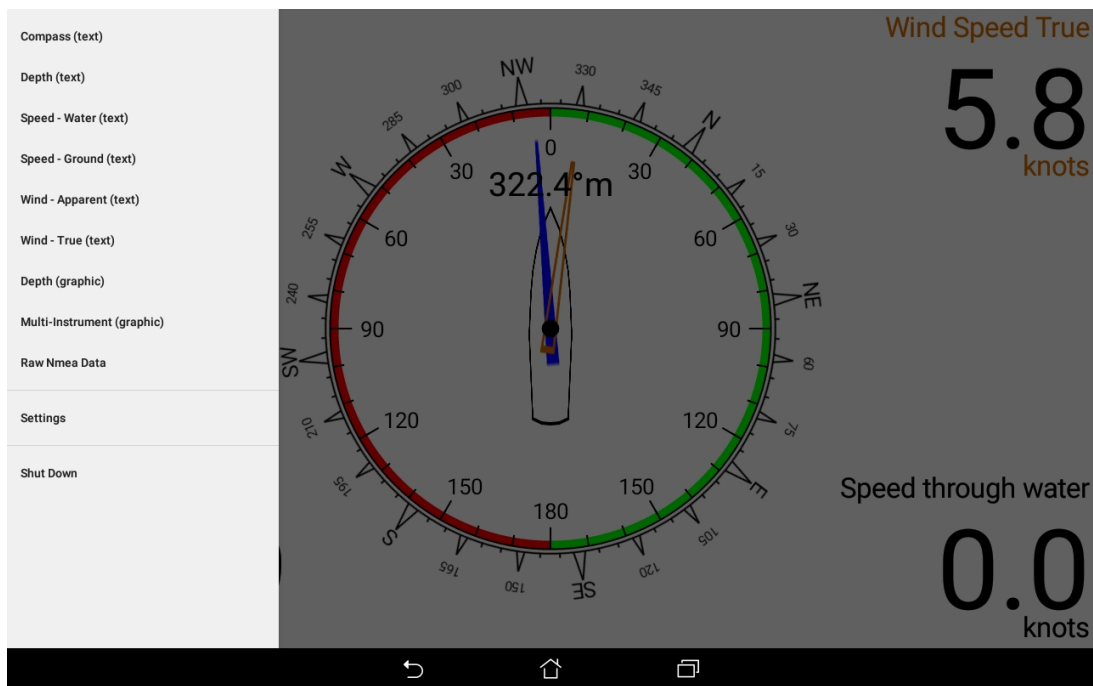
Within the Depth menu ***there are two settings that are critical to displaying the correct depth value:*** [Transceiver Depth](#) and [Keel Depth](#). In the Transceiver Depth setting enter the depth of the transceiver below the water surface. This value is used as an offset when you choose to show the depth below the water surface. In the Keel Depth setting enter the depth of the keel below the water surface. This value is used when you choose to show depth below the keel.

For [Wind](#) (two sentences must be selected, one for True wind and one for Apparent wind), [Compass](#), and [Boat Speed](#) you must select the NMEA Sentence to be used and should also check the other settings for each of those types too. [Water Temperature](#) only uses the MTW NMEA sentence, so you either have it or you don't.

For any data type for which NMEA data is not available you can set the [Instruments Available for Display](#) to hide those instruments which will otherwise just show no data available.

### 3 The Menu

In normal mode, the main menu is accessed by selecting the “three dot” overflow icon. In full screen mode, the main menu is accessed by sliding in from the left side of the display. The following image shows the menu in full screen mode.



## 3.1 Instruments

At the top of the main menu is a list of all of the instruments that are currently available for display. Selecting one of these menu items will immediately change the display to the selected instrument and close the menu. If no instruments are currently available for display, these menu items will not be visible.

Beneath the instrument menu items, the menu always contains “Settings” and “Shut Down” menu items which are fully described below.

## 3.2 Settings

Selecting this menu item will show the settings menu, with menu items as described below.

### 3.2.1 Full Screen Mode

With full screen mode turned on two things are different; the instrument being displayed takes up all of the screen, and the menu is accessed by sliding your finger in from the left side of the screen. With full screen mode turned off, the menu is accessed by selecting the “three dot” menu.

NOTE: With certain Android versions and devices when full screen mode is on, the device is in landscape mode, and the device soft keys are on the left side of the screen, it may be difficult to access the menu because the device’s soft keys may be inadvertently selected instead, though it is still possible. To make it easier to access the menu in this circumstance, you can simply rotate the screen.

## 3.2.2 Color Scheme

You can choose the color scheme that is used by the software. The light theme is optimal for daytime viewing and the dark themes are great for saving your night vision. The software supports the following color schemes:

- Device display settings
- Light background with dark text
- Dark background with light text
- Dark background with gray text
- Dark background with red text

When using 'Device display settings' the software will utilize the screen color settings that Android is using on your device.

## 3.2.3 Connection Protocol and Parameters

This menu item is used to set up the protocols and parameters that are used to connect the software to the network device that is sending the NMEA data, which will normally be a NMEA multiplexer. These parameters must match those of the network device sending the NMEA data, so it may be helpful to refer to the setup menu of that device to determine the correct settings to enter here. The following sub-menu items are in this menu:

### 3.2.4 Transmission Protocol

Select the protocol used by the network device that is sending the NMEA data, which will be either TCP or UDP.

#### 3.2.4.1 IP Address

This is the IP address that the software will use to make the TCP or UDP connection with the network device sending the NMEA data. The IP Address must be set to the IP address of the network device that is sending the NMEA data. If connected to a NMEA multiplexer then this will be the IP address of a NMEA multiplexer but if your system includes a separate NMEA data source connected to a router then it will be the IP address of the NMEA data source itself, not the router.

#### 3.2.4.2 TCP Port

If the protocol being used is TCP, this is the port that the software will use to make the TCP connection. This port must match the port of the network device that is sending the NMEA data. If the protocol being used is UDP then the TCP Port values is not used.



### **3.2.4.3     *UDP Receive Port***

If the protocol being used is UDP, this is the port on which that the software will listen to receive the NMEA sentences. This port must match the UDP output port of the network device that is sending the NMEA data. It may be identified in the setup of the sending device as UDP Output Port, UDP Transmit Port, or UDP Send Port. If the protocol being used is TCP then the UDP Receive Port values is not used.

## **3.2.5        Instruments Available for Display**

This menu contains a list of all of the various instrument display screens that the software is capable of displaying. If an instrument is checked in this list then it will be included in the menu of available displays and will be shown as you swipe between instruments. If you do not want to use a particular instrument on this Android device, simply uncheck that instrument to eliminate it from the direct-access list of instruments in the menu and from the instruments that are displayed as you swipe sideways to access different instruments.

## **3.2.6        Units of Measure**

You can choose the units that will be used for Depth, Wind Speed, and Boat Speed. These units are used when entering values into settings in the Settings menu and for display of values on the instruments. If the NMEA sentence containing the data to display for these instruments does not contain the data in the desired units, the data will be converted to the desired units for display.

### **3.2.6.1     *Depth Units***

Depth values can be displayed in feet, meters, or fathoms.

### **3.2.6.2     *Wind Speed Units***

Wind speed can be displayed in knots, miles per hour (mph), kilometers per hour (km/h), or meters per second (m/s).

### **3.2.6.3     *Boat Speed Units***

Boat speed can be displayed in knots, miles per hour (mph) or kilometers per hour (km/h).

## **3.2.7        Depth**

Select this menu item to manage the following depth parameters.

### **3.2.7.1     *Depth NMEA Sentence***

Select the NMEA sentence to use for depth values. For depth data you can choose from the following sentences to use as the source of the data:

- DBK – depth below keel

- DBS – depth below water surface
- DBT – depth below transceiver
- DPT – depth of water

### 3.2.7.2 **Depth Data Timeout**

Specify the number of seconds that will be used to determine if depth data is missing. If you specify “0” for this value, then the depth timeout timer will be disabled.

If a NMEA sentence containing depth data is not received for this number of seconds, then the depth data will be considered missing. When depth data is considered missing then the text display will change to reflect “no data”. The depth graphic display will have a “no data” indicator put into the graph in the place of the normal depth value. The “no data” indicator is a red vertical bar from the waterline to the deepest value on the chart.

### 3.2.7.3 **Depth Reference**

Depth values can be displayed relative to the water surface, the depth transceiver, or the keel. The software can do this regardless of whether or not the depth sentence being processed has the same reference by adjusting the depth value in the NMEA sentence to the new reference. If you choose to display depth with a reference that is different from that which is available in the NMEA sentence then it is **essential that you enter the correct values of *Transceiver Depth* and *Keel Depth* for your vessel or the depth displayed by this program will be incorrect.**

### 3.2.7.4 **Transceiver Depth**

Enter the depth of the depth sounder transceiver on your boat below the surface of the water. This value is used to calculate the depth displayed by the software when the Depth Reference selected for display is not the same as the depth reference of the NMEA depth sentence, and one of those two values is referenced from the transceiver depth. In this case it is **essential that you enter the correct value for *Transceiver Depth* for your vessel or the depth displayed by this program will be incorrect.**

### 3.2.7.5 **Keel Depth**

Enter the depth of the keel (the deepest point) on your boat below the surface of the water. This value is used to calculate the depth displayed by the software when the Depth Reference selected for display is not the same as the depth reference of the NMEA depth sentence, and one of those two values is referenced from the keel depth. In this case it is **essential that you enter the correct value for *Keel Depth* for your vessel or the depth displayed by this program will be incorrect.**

### **3.2.7.6 What about offsets already in the DPT sentence?**

The depth value that the DPT sentence reports is depth below the transmitter. In order to avoid confusion we do not consider the offset value in the DPT sentence. When you choose to display depth with reference to the surface or the keel then the values that you specify for Transceiver Depth and Keel Depth in this program will be applied.

## **3.2.8 Wind**

Select this menu item to manage the following wind parameters.

### **3.2.8.1 True Wind NMEA Sentence**

Select the NMEA sentence to use for true wind values. For true wind data you can choose from the following sentences to use as the source of the data:

- MWD – Contains true wind only
- MWV – may contain true or relative wind values

Please note that MWV may contain both True North and Magnetic North wind direction headings. This software only uses the Magnetic North value from this NMEA sentence.

### **3.2.8.2 Apparent Wind NMEA Sentence**

Select the NMEA sentence to use for apparent wind values. For apparent wind data you can choose from the following sentences to use as the source of the data:

- MWV – may contain true or relative wind values
- VWR – contains only relative wind values

### **3.2.8.3 Wind Data Timeout**

Specify the number of seconds that will be used to determine if wind data is missing. If you specify “0” for this value, then the wind timeout timer will be disabled.

The wind data timeout time specified here is applied individually to true and apparent wind values. It is possible for one of them to be missing, while the other is present.

If a NMEA sentence containing true or apparent wind data is not received for this number of seconds, then the respective wind data will be considered missing. When wind data is considered missing then the text display for that wind value will change to reflect “no data”. If the missing wind data is being displayed on the multi-instrument graphic display, then the arrow for that data will not be shown on the display.

## **3.2.9 Compass**

Select this menu item to manage the following compass parameters.

### **3.2.9.1 Compass NMEA Sentence**

Select the NMEA sentence to use for compass values. For compass data you can choose from the following sentences to use as the source of the data:

- HDT – heading true
- HDM – heading magnetic
- HDG – heading true and magnetic
- VHW – may contain true and/or magnetic heading

### **3.2.9.2 Compass Data Timeout**

Specify the number of seconds that will be used to determine if compass data is missing. If you specify “0” for this value, then the compass timeout timer will be disabled.

If a NMEA sentence containing compass data is not received for this number of seconds, then the compass data will be considered missing. When compass data is considered missing then the text display for compass heading value will change to reflect “no data”. If the missing compass data is being displayed on the multi-instrument graphic display, then the compass rose will not have heading references.

### **3.2.9.3 Compass Reference**

You can choose to show compass heading values referenced to true or magnetic north. NMEA Instruments software does not perform conversion between true and magnetic north. Therefore, if the compass heading value for the desired reference is not provided in the selected NMEA sentence, no compass data will be shown.

## **3.2.10 Water Temperature**

Select this menu item to manage the following water temperature parameters.

### **3.2.10.1 Water Temperature NMEA Sentence**

Select the NMEA sentence to use for water temperature values. Hope you want to use MTW:

- MTW

### **3.2.10.2 Water Temperature Data Timeout**

Specify the number of seconds that will be used to determine if water temperature data is missing. If you specify “0” for this value, then the compass timeout timer will be disabled.

If a NMEA sentence containing water temperature data is not received for this number of seconds, then the water temperature data will be considered missing. When water temperature data is considered missing then the text display for water temperature value will change to reflect “no data”.

### **3.2.10.3 Water Temperature Units**

You can choose to show water temperature heading values in Fahrenheit or Celsius.

### **3.2.11 Boat Speed**

Select this menu item to manage the following boat speed parameters.

#### **3.2.11.1 Speed through the Water NMEA Boat Speed Sentence**

Select the NMEA sentence to use for boat speed through the water. You can choose from the following sentences to use as the source of this data:

- VBW – speed over ground and through the water
- VHW – speed through the water only
- VTG – speed over ground only (from GPS)

#### **3.2.11.2 Speed over Ground NMEA Boat Speed Sentence**

Select the NMEA sentence to use for boat speed over ground. You can choose from the following sentences to use as the source of this data:

- VBW – speed over ground and through the water
- VHW – speed through the water only
- VTG – speed over ground only (from GPS)

#### **3.2.11.3 Boat Speed Data Timeout**

Specify the number of seconds that will be used to determine if boat speed data is missing. If you specify “0” for this value, then the boat speed timeout timer will be disabled.

If a NMEA sentence containing boat speed data is not received for this number of seconds, then the boat speed data will be considered missing. When boat speed data is considered missing then the text display for boat speed heading value will change to reflect “no data”.

#### **3.2.11.4 Boat Speed Reference**

You can choose to show boat speed heading values through the water or over ground. NMEA Instruments software does not perform conversion from speed through the water to speed over ground. Therefore, if the boat speed value for the desired reference is not provided in the selected NMEA sentence, no boat speed data will be shown.

### **3.2.12 Multi-Instrument Graphic Display**

Select this menu item to manage what is displayed on the multi-instrument graphic display. The options are:

### **3.2.12.1 Show True Wind**

If this is on, true wind will be shown on this display. The true wind speed is shown in text in the upper right of the display, and the true wind direction is shown as an orange hollow arrow. This arrow is shorter than the apparent wind direction arrow. If true wind data is missing, the arrow will not be shown.

### **3.2.12.2 Show Apparent Wind**

If this is on, apparent wind will be shown on this display. The apparent wind speed is shown in text in the upper left of the display, and the apparent wind direction is shown as a blue filled arrow. This arrow is longer than the true wind direction arrow. If apparent wind data is missing, the arrow will not be shown.

### **3.2.12.3 Show Compass Rose**

If this is on, the compass rose will be shown on this display. The compass rose will rotate to show the compass heading from the NMEA sentence containing the data. To avoid confusion, if compass data is missing then the compass rose will not have direction labels.

### **3.2.12.4 Show Compass Text**

If this is on, the compass heading will be shown in text on the multi-instrument graphic display.

### **3.2.12.5 Show Depth**

If this is on, depth values will be shown on this display. The depth is shown in text in the lower left of the display.

### **3.2.12.6 Boat Speed to Display**

Select this menu item to choose what boat speed you want to be shown on this display. The choices are 'Not displayed', 'Speed through water', and 'Speed over ground'.

## **3.3 Shut Down**

NMEA Instruments uses a background process to listen for NMEA sentences so that it can continuously read and process the depth data in order to maintain the history list for the graphical data. This listener continues to run in the background, even if the NMEA Instruments program is not visible in the foreground. Whenever NMEA Instruments is running, the "Encoded Solutions NMEA Listener" notification can be seen in the notifications area of your Android device.

You should manually stop this background process when you no longer want to use the NMEA Instruments program. There are two ways to access the shut-down menu:

- From within the program’s menu: select the “Shut Down” menu item, and choose “STOP AND CLOSE” from the shutdown dialog.
- From the notification area of your Android device: tap on the “Encoded Solutions NMEA Listener” notification.

After selecting the “Shut Down” menu, you can choose “KEEP LISTENING” to cancel stopping of the background process.

## 4 Features and Information

### 4.1 How to Change the Displayed Instrument

There are two ways to change which instrument is displayed:

- Swipe left or right on the main display
- Open the menu and choose the display from the list of displays on the initial menu screen

### 4.2 How to Access the Menu

How the menu is accessed depends upon whether or not the NMEA Instruments software is in full-screen display mode or not. When in full-screen display mode, swipe in from the left side of the screen. When not in full-screen display mode, choose the “three-dot” menu selector.

### 4.3 Missing NMEA Data

For each type of data displayed, Depth, Wind, Compass and Heading, and Boat Speed, the NMEA sentence that will be used to provide the data for that type of data is specified in the settings. Additionally, there is a “Timeout” settings value specified for that data type. If an instrument that displays a particular data type is visible and it has been as long as the timeout value specified for that data type since a valid NMEA sentence containing that data type has been received, then the data is considered missing.

For all textual displays of data, when the data is missing the value shown is changed to “---.” to ensure that you are not relying upon outdated data. On the graphical depth display, when depth data is missing a solid red bar is used in place of the missing data in the graph. On the multi-instrument display, when heading data is missing the compass rose will not have heading text values displayed, and when apparent or true wind data is missing it’s directional indicator arrow will not be shown.

If you set the Data Timeout value to “0” for a particular data type then that data type will never timeout and the value displayed will always be the last value received ***with no indication that the data is missing and the display is invalid.*** Therefore, we strongly recommend that you not set this value to “0”.

## 4.4 Multi-instrument Display Update Frequency

In order to avoid excessive screen updates caused by receiving different data types at different times, the multi-instrument is updated once per second with the most current data that has been received for each data type it is displaying.