ROYAL CANADIAN ARMY CADETS

SILVER STAR

INSTRUCTIONAL GUIDE

SECTION 4

EO M322.04 – IDENTIFY FEATURES OF A GLOBAL POSITIONING SYSTEM (GPS) RECEIVER

Total Time: 30 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-703/PG-001, Chapter 4. Specific uses for said resources are identified throughout the instructional guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering the lesson.

Ensure GPS receivers are available and ready to use (eg, batteries charged).

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TP 1 to orient the cadets to components of a GPS receiver and to present background material.

Demonstration and performance was chosen for TP 2 as it allows the instructor to explain and demonstrate how to scroll through the different screen pages of a GPS receiver while providing an opportunity for the cadets to practice under supervision.

INTRODUCTION

REVIEW



Choose three to five of the questions provided to review the material covered in EO M322.03 (Identify Components of the Global Positioning System [GPS], Section 3). If additional review is required to confirm understanding, continue with questions. Be mindful of the time remaining to complete this lesson.

QUESTIONS

Q1. What does the acronym GPS stand for?

Q2. What are ground stations responsible for?

Q3. How does a receiver calculate your position?

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Verify against the official publication.

Q4. What is a 3D coordinate?

Q5. What is triangulation?

Q6. What is a waypoint?

Q7. What is the accuracy of a GPS receiver without WAAS?

Q8. What three dimensions will a GPS receiver provide location in?

Q9. How does a GPS receiver calculate speed?

ANTICIPATED ANSWERS

A1. GPS stands for Global Positioning System.

A2. Ground stations are responsible for tracking the satellites, monitoring their condition and making any necessary adjustments to keep the system accurate.

A3. The receiver uses the signal from one satellite to continuously monitor, and be synchronized with, the time maintained by the satellites. The receiver collects signals from the other satellites and calculates the difference between them. This calculation positions the receiver from each satellite and triangulates its location. This location gives the user latitude, longitude and altitude.

A4. A 3D coordinate is one's position as determined by latitude, longitude, and altitude.

A5. Triangulation is what a GPS receiver does to determine position based on data received from three or more GPS satellites.

A6. A waypoint is an intermediate position(s) between the starting and destination points along a navigational route.

A7. A GPS receiver without WAAS measures to an accuracy of 5 m, 95 percent of the time.

A8. A GPS receiver provides location in the following three dimensions:

- latitude (X coordinate),
- longitude (Y coordinate), and
- altitude.

A9. To calculate speed a GPS receiver measures the time and distance between the point where a person was and the point where the person is and then divides the distance by the time to get to that speed (speed = distance/time).

OBJECTIVES

By the end of this lesson the cadet shall have identified features of a GPS receiver.

IMPORTANCE

It is important for cadets to know the features of a GPS receiver because GPS receivers will be used during expeditions for navigation and planning. The GPS is a navigational aid that will be used regularly.

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Teaching point 1 **Identify and Briefly Describe Components of a GPS Receiver**

Time: 10 min Method: Interactive Lecture



Distribute GPS receivers. If there is not a receiver for each cadet, divide the cadets into groups so they may share.

Allow cadets to practice locating the information and pages being discussed.



The two terms “Point of Interest” and “Waypoints” mean the same thing – an intermediate position on a navigation map. In this lesson, the term “Point of Interest” will be used.

COMPONENTS OF A GPS RECEIVER

Antenna. Allows the GPS receiver to receive satellite signals.

Screen. Displays information.



Some GPS receivers use an arrow joystick that acts as a mouse, providing a simple to use interface with the GPS receiver.

Battery Compartment. Stores the receiver power supply.



The buttons in the following list are found on the Magellan eXplorist 200 GPS receiver. Other makes and models of GPS receivers may have different function buttons. Consult user manual for GPS receiver button functions.

BUTTONS

On/Off. Turns the receiver on and off.

Backlight. Turns the display backlight on and off and changes intensity.

Enter. Used to access highlighted menu items or highlighted page menu options.

Escape. Cancels, data inputs. Closes the accessed function and goes back to the previous screen and moves backward through the navigation screens.

Zoom In. Used on the map screen to zoom in on the map displayed. The map display can be zoomed in to 35 m (100 feet). Also used to move through the list of waypoints when using an alphabetical search.

Zoom Out. Used on the map screen to zoom out on the map displayed. The map display can be zoomed out to 2736 km (1700 miles). Also used to move through the list of waypoints when using an alphabetical search.

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Menu. Displays a menu with available options. Options may be selected by using the arrow joystick to highlight the option and pressing “enter” to access it.

NAV. Moves through the navigation screens (Map screen, Compass screen, Position screen, Satellite screen).

Mark. Used to save present position as a waypoint. Waypoints are saved and stored in “My Points of Interest”.

GOTO. Creates a one-leg route from the present position to a destination selected from the POI database or by using the cursor on the background map and pressing GOTO on a point.

Arrow Joystick. Moves the cursor on the map screen. It also moves the highlighted bar to select menu options and data-entry fields.



Thales Navigation, Inc. Magellan eXplorist 200 Reference Manual, Thales Nav, Inc. (p. 1)

Figure 1 eXplorist 200 GPS Receiver

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Name three components of a GPS receiver.

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Q2. What is the purpose of the NAV button on the GPS receiver?

Q3. What is the GOTO button used for on the GPS receiver?

ANTICIPATED ANSWERS

A1. Three components of a GPS receiver may be any of the following:

- antenna,
- screen,
- battery compartment, and
- buttons, to include:
  - on/off,
  - backlight,
  - enter,
  - escape,
  - zoom in,
  - zoom out,
  - menu,
  - NAV,
  - mark,
  - GOTO, and
  - arrow joystick.

A2. The NAV button moves through the navigation screens (Map screen, Compass screen, Position screen, Satellite screen).

A3. The GOTO button creates a one-leg route from the present position to a destination selected from the POI database or by using the cursor on the background map.

Teaching point 2 **Explain and Have the Cadets Scroll Through the Screen Pages on a GPS Receiver**

Time: 15 min Method: Demonstration and Performance



GPS receivers may differ in the way they present information, from unit to unit. Identify the screens that are similar to those contained in this TP, and have the cadets practice finding the different pages and the information they display.

Allow the cadets time to become familiar with the GPS receiver and its functions.

Note: The term “Page” refers to the different screens an operator can scroll through to locate different information in a GPS receiver.

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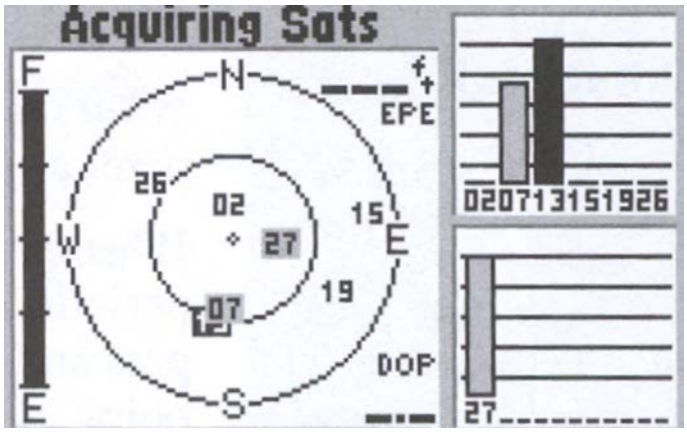
SATELLITE STATUS

The satellite status screen displays the acquisition of satellites (satellite signal strength and satellite geometry) and the progress of the collection of satellite data. The receiver is constantly monitoring satellites. The display on the satellite status page graphically depicts the activity.

As new satellites come into view, a new bar appears in the graph. Bars that were solid minutes ago disappear as satellites pass over the horizon. If a satellite is being monitored but not used, the bar will appear hollow. On Wide Area Augmentation System (WAAS) enabled GPS receivers, the WAAS satellite signal strength is indicated on its own bar on the graph. On this page it is common for GPS receivers to display the following information:

- satellite signal strengths,
- battery strength, and
- estimated position error (EPE).



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 45)

Figure 2 Satellite Status Page

MENU

This page is used for customizing the GPS receiver. All data fields can be changed to give a person the information they require including waypoints, routes, time and speed, etc. On this page it is common for GPS receivers to display the following information:

- customization options for the GPS receiver,
- waypoints and routes, and
- map datum.

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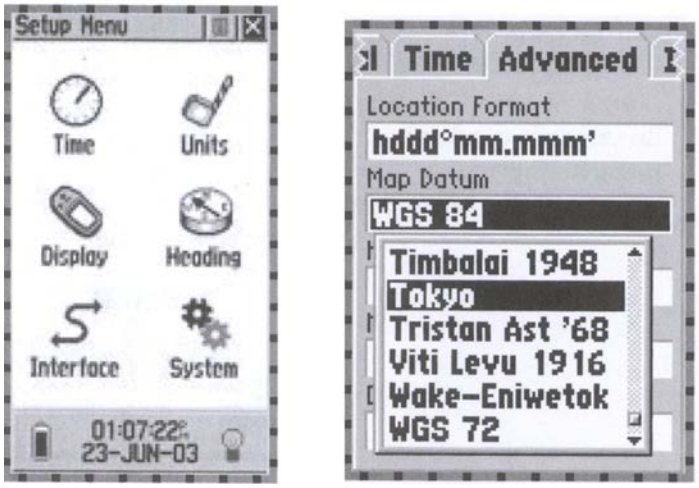
Verify against the official publication.



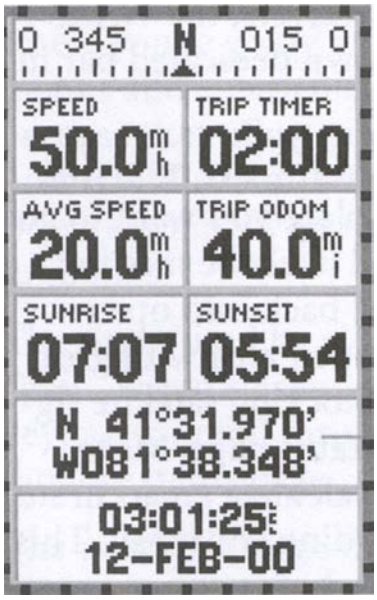
S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 54)

Figure 3 Menu Page

POSITION

The position page is used for confirming coordinates, datum, time, date, and the EPE. This page is used infrequently, for brief periods, mostly in planning and after marking a waypoint. No easy-to-understand graphics, like a compass rose, are displayed. This page is not ideally laid out for user-friendly navigation.

After acquiring enough satellites to begin navigating, many GPS receivers automatically go to the position page or the map page. In addition to the information mentioned above, an operator may find current speed, heading and a trip odometer. On some GPS receivers the information displayed can be changed.



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 46)

Figure 4 Position Page

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COMPASS NAVIGATION

This page shows the direction of travel (track) as it relates to the direction of the destination (bearing). It will show the distance from the destination and time to the destination. This page is used frequently when navigating from point to point and for navigating around obstacles.

The digital compass graphic should not be confused with a real compass. Although they look the same, it can give a very different reading because without movement GPS receivers cannot display direction. Read the owners manual and determine if the compass is an electronic compass capable of identifying a compass heading while the operator is standing still.



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing international, Inc. (p. 47)

Figure 5 Compass Navigation Page

MAP

This page identifies position. A GPS without a built-in map will identify where a person is in relation to another waypoint. A GPS receiver with a built-in map will identify where a person is in relation to landmarks, such as roads, cities and bodies of water. A GPS receiver with downloadable maps will identify where a person is in relation to city streets and topographical features.

The advantage of this screen is its ability to identify the current position by looking at the features on a map rather than just the coordinates. Depending on the zoom level – which is shown at the bottom of the page – these features could be roads or cities or entire continents.

The map page allows an operator to pinpoint where one is and create a waypoint on the map the cursor over a feature and pressing “enter” or “mark”, making route building easier. The map page can also serve as an address book. By moving the cursor over a certain waypoint and pressing “enter”, information is displayed, such as phone numbers, addresses, and navigation information.

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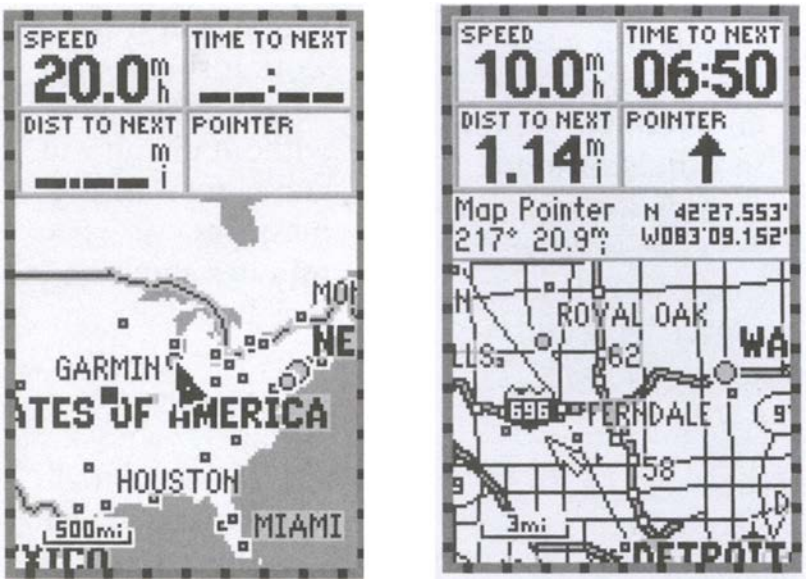
Verify against the official publication.



S. Featherstone, Outdoor Guide to Using Your GPS, Creative Publishing International, Inc. (p. 50)

Figure 6 Map Page

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. Where is the battery strength information located?

Q2. What is the possible problem of using a GPS digital compass for navigating?

Q3. Which screen identifies the coordinates and datum of the GPS?

ANTICIPATED ANSWERS

A1. The satellite status page identifies the battery strength information.

A2. The possible problem of using a GPS digital compass for navigating is if the navigator is standing still some GPS receivers cannot display direction. It only knows how to identify direction when moving.

A3. The position page identifies the coordinates and datum.

END OF LESSON CONFIRMATION

QUESTIONS

Q1. What does the menu button display on the GPS receiver?

Q2. On a GPS receiver’s compass navigation page what information can you expect to find?

Q3. On a GPS receiver’s satellite status page what information can you expect to find?

ANTICIPATED ANSWERS

A1. The menu button displays a menu with available options. Options can be selected by using the arrow joystick to highlight the option and pressing “enter” to access it.

A2. On the compass navigation page, a person can expect to find the following information:

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Verify against the official publication.

- direction of travel,
- bearing,
- distance from destination,
- CDI, and
- time to destination.

A3. On the satellite status page a person can expect to find the following information:

- satellite signal strengths,
- battery strength, and
- EPE.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A

METHOD OF EVALUATION

This EO is assessed IAW A-CR-CCP-703/PG-001, Chapter 3, Annex B, Appendix 5 (322 PC).

CLOSING STATEMENT

GPS receivers have become a very common tool for navigating. Receivers vary from make to model, each offering its own method of use. By identifying the common features offered on a GPS receiver, cadets will be familiar with the information a GPS receiver can provide. Cadets who have an understanding of this information should be able to retrieve the required information from any make or model of GPS receiver.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-142 (ISBN 0-7645-6933-3) McNamara, J. (2004). *GPS for Dummies*. Hoboken, NJ: Wiley Publishing, Inc.

C2-143 (ISBN 1-58923-145-7) Featherstone, S. (2004). *Outdoor Guide to Using Your GPS*. Chanhassen, MN: Creative Publishing International, Inc.

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