ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 1

EO M422.01 – REVIEW SILVER STAR NAVIGATION

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, 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.

Learning stations are a form of group work, where the cadets learn by sorting through the information presented. When setting up learning stations, ensure there is enough room for each cadet to be comfortable and adequate space for writing down information. When the cadets arrive at a learning station, all required information shall already be available. These stations should be placed close enough together to minimize time for movement and far enough apart to avoid interruptions from other groups. For this lesson, set up three learning stations for reviewing navigation.

Instructors assigned to a learning station shall review their station's questions and locate and record their answers on the sheet provided prior to the cadets' arrival.

Photocopy the Silver Star Navigation Review worksheet located at Attachment A for each cadet.

Make three copies of the Silver Star Navigation Review Worksheet Answer Key located at Attachment B for each learning station instructor. Determine answers for Stations 2 and 3.

Photocopy the Learning Station Information Sheets located at Attachments C, D, and E for each learning station instructor.

Review Attachment A and complete a preliminary run-through of the provided questions for each station.

Review the activities, ensuring they are best suited to the training area, size of the group, staff and training aids available.

Prepare all resources necessary for the selected activities.

Assistant instructors are required at each learning station.

PRE-LESSON ASSIGNMENT

Nil.

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APPROACH

A practical activity was chosen for this lesson as it is an interactive way for the cadet to develop navigation skills and knowledge in a safe and controlled environment. This activity contributes to the development of navigational skills and knowledge in a fun and challenging setting.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have reviewed Silver Star navigation.

IMPORTANCE

It is important for cadets to review Silver Star navigation as it is the foundation for global positioning system (GPS) training. Silver Star navigation introduces cadets to the fundamentals of using a GPS receiver. Cadets should take every opportunity to practice and refine these skills.

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Teaching point 1 **Conduct a Silver Star navigation review activity using learning stations.**

Time: 50 min Method: Practical Activity

ACTIVITY

OBJECTIVE

The objective of this activity is to have the cadet review Silver Star navigation.

RESOURCES

- Three GPS receivers,
- Two topographical maps of the local area,
- Nine pencils,
- One pencil eraser,
- Three copies of the Silver Star Navigation Review Worksheet Answer Key located at Attachment B,
- Three copies of the Learning Station Information Sheets located at Attachments C–E,
- One copy of the Silver Star Navigation Review Worksheet located at Attachment A for each cadet, and
- Paper.

ACTIVITY LAYOUT

Set up three learning stations as follows:

- Station 1:
  - one GPS receiver,
  - three pencils,
  - one copy of the Silver Star Navigation Review Worksheet Answer Key, and
  - one copy of the Learning Station 1 Information Sheet;
- Station 2:
  - one GPS receiver,
  - one topographical map of the local area,
  - three pencils,
  - one copy of the Silver Star Navigation Review Worksheet Answer Key,
  - one copy of the Learning Station 2 Information Sheet; and
- Station 3:
  - one GPS receiver,
  - one topographical map of the local area,
  - three pencils,

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- one pencil eraser,
- one copy of the Silver Star Navigation Review Worksheet Answer Key, and
- one copy of the Learning Station 3 Information Sheet.

ACTIVITY INSTRUCTIONS

1. Explain to the cadets they will be taking part in a round robin activity with stations. At each station they will be presented with the questions found on their worksheets. Inform the cadets that the activity is to be completed individually.

2. Divide the cadets into three groups, and place each group at one of the learning stations.

3. Provide each cadet a copy of the Silver Star Navigation Review Worksheet located at Attachment A to complete as they rotate through the stations.

4. Assign an assistant instructor to each learning station. Give each assistant instructor a copy of:

   a. the Silver Star Navigation Review Worksheet Answer Key; and

   b. the Learning Station Information Sheet to assist the cadets in completing their worksheets if required.

5. Have the assistant instructor at each station explain the worksheet and what to do.

6. Allow the cadet(s) approximately fifteen minutes to complete the station.

7. Have the cadets explain their answers individually to the instructors.

8. The instructor will confirm the answers are correct by referring to the Silver Star Navigation Worksheet (as required) and correct any errors.

9. Allow one minute for the cadets to move between stations.

10. Have the cadets complete each station, following Steps 5–8.

11. Debrief the cadets at the end of the activity. Discuss any areas of concern and answer any questions.

Station 1: Components of the GPS. At this station, the cadet shall complete the following on the worksheet for Station 1:

1. identify and briefly explain the components of the GPS, to include:
   - satellites,
   - ground stations, and
   - receivers;

2. identify the features of a GPS receiver, to include the following components:
   - antenna,
   - screen,
   - battery compartment, and
   - buttons; and

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3. independently navigate through the GPS receiver and locate one of the following:
    - satellite status,
    - menu,
    - position,
    - compass navigation,
    - map, and
    - map screen.

Station 2: Set a map datum on a GPS receiver. At this station, the cadet shall complete the following on the worksheet for Station 2:

1. complete the process for confirming correct coordinate system by:
    - identifying military grid reference system (MGRS) grid system on a topographical map;
    - locating the grid zone designator; and
    - confirming the 100 000-m square identifier;
2. locate the map datum from a topographical map; and
3. set the map datum on a GPS receiver.

Station 3: Identify location using a GPS receiver. At this station, the cadet shall complete the following on the worksheet for Station 3:

1. confirm that the correct coordinate system is set on the GPS receiver;
2. locate the geographical position screen in the GPS receiver;
3. read the grid reference (GR); and
4. plot the eight-figure GR on the topographical map.

SAFETY

Nil.

CONFIRMATION OF TEACHING POINT 1

The cadets' participation in the activity will serve as the confirmation of this TP.

END OF LESSON CONFIRMATION

The cadets' participation in the learning stations will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

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METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

Concepts of Silver Star navigation should be understood before more challenging skills can be introduced at the Gold Star level. Throughout expeditions, there will be requirements to navigate routes. Take every opportunity to practice, whether it is plotting position on a map from a GPS grid reference or helping a junior cadet understand how a GPS receiver works.

INSTRUCTOR NOTES / REMARKS

The navigation activity will consist of three learning stations. The cadets will rotate through the stations every 15 minutes. There will be 5 minutes provided at the end of the lesson to answer questions or provide additional instruction on areas where cadets experienced difficulty.

This EO shall be conducted during the bivouac field training exercise.

Assistant instructors are required for this lesson, at each learning station.

Topographical maps have not been provided, so the cadet can use local area topographical maps.

REFERENCES

A2-036 A-CR-CCP-121/PT-001 Director Cadets 3. (2003). *Royal Canadian Army Cadet reference book*. Ottawa, ON: Department of National Defence.

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.

C2-144 ISBN 0-07-223171-8 Broida, R. (2004). *How to do everything with your GPS*. Emerville, CA: McGraw-Hill.

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SILVER STAR NAVIGATION REVIEW WORKSHEET

Cadet's Name: _____

Note: Use the back of the worksheet or an attached piece of paper(s) for additional notes / calculations if required.

Station 1: Components of the GPS	
Describe how satellites, ground stations, and receivers work. Select the correct statement. Identify the error(s) in the incorrect statements.	**Select the correct statement** 1. The minimum number of satellites that are required to cover the entire Earth is 18. 2. The ground control segment of the GPS is comprised of seven ground stations that track the satellites, monitor their condition and make any necessary adjustments to keep the system accurate. 3. GPS receivers make up the user segment. It is the GPS receiver, whether it is in an airplane, a truck, a boat or in a hiker's hand, that detects the radio signals from the satellite ground stations and calculates the receiver's position.
Identify the components of a GPS receiver.	**Components of a GPS receiver** 1. 2. 3. 4.
Identify and briefly explain the functions of 5 buttons on the GPS receiver.	**Buttons on a GPS receiver** 1. 2. 3. 4. 5.
Navigate through the GPS receiver and locate the selected screen screens determined by the instructor. List the screens identified.	**Screens identified** 1.

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Station 2: Set a map datum on a GPS receiver	
Given a topographical map of the local area and a GPS receiver, complete the process for confirming correct Military Grid Reference System (MGRS) coordinates.	**Process for confirming correct MGRS** 1. 2. 3.
Locate the map datum from a topographical map.	**Map Datum**
Set the map datum on a GPS receiver.	**Set Datum**

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Station 3: Identify location using a GPS receiver	
Confirm that the correct coordinate system is set on the GPS receiver. What coordinate system is used?	**Confirm correct coordinate system**
Locate geographical position screen in a GPS receiver.	**Locate geographical position screen in a GPS receiver**
Read the GR from the GPS.	**Record the GR**
Plot the GR on the topographical map.	**Plot GR**

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SILVER STAR NAVIGATION REVIEW WORKSHEET ANSWER KEY

Note: Learning stations require preparation of answers. Learning station information sheets have been provided with a detailed description on how each question should be answered.

Station 1: Components of the GPS	
Describe how satellites, ground stations, and receivers work. Select the correct statement. Identify the error(s) in the incorrect statements.	**Select the correct statement** 1. **The minimum number of satellites that are required to cover the entire Earth is 18.** 2. The ground control segment of the GPS is comprised of **FIVE** ground stations that track the satellites, monitor their condition and make any necessary adjustments to keep the system accurate. 3. GPS receivers make up the user segment. It is the GPS receiver, whether it is in an airplane, a truck, a boat or in a hiker's hand, that detects the radio signals from the **SATELLITES** and calculates the receiver's position.
Identify the components of a GPS receiver.	**Components of a GPS receiver** 1. **Antenna** 2. **Screen** 3. **Battery Compartment** 4. **Buttons**
Identify and briefly explain the function of 5 buttons on the GPS receiver.	**Buttons on a GPS receiver** 1. **On / Off** 2. **Backlight** 3. **Enter** 4. **Escape** 5. **Zoom in** **6. Menu** **7. NAV** **8. Mark** **9. Arrow Joystick**
Navigate through the GPS receiver and locate the selected screen screens determined by the instructor. List the screens identified.	**Screens identified** 1. **Satellite screen** 2. **Menu** 3. **Position** 4. **Compass navigation** 5. **Map** 6. **Map screen**

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Station 2: Set a map datum on a GPS receiver	
Given a topographical map of the local area and a GPS receiver, complete the process for confirming correct MGRS coordinate system.	**Process for confirming correct MGRS coordinate system** The learning station instructor shall reference the local topographical map and complete the following questions prior to the cadets' arrival: 1. **Identify MGRS grid system on a topographical map.** Answer:_____ 2. **Locate the grid zone designator.** Answer:_____ 3. **Confirm the 100 000-m square identifier.** Answer:_____
Locate the map datum from a topographical map.	**Map Datum** The learning station instructor shall refer to the local topographical map and find the correct datum. MAP Datum: _____
Set the map datum on a GPS receiver.	**Set Datum** Consult the GPS Receiver User Manual and Learning Station 2 Information Sheet for the detailed instructions on how to set the datum on a GPS receiver. Datum to be set:_____

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Station 3: Identify location using a GPS receiver	
Confirm that the correct coordinate system is set on the GPS receiver. What coordinate system is used?	**Confirm correct coordinate system** Confirm that the cadet follows the process and ensures the correct coordinate system is set. MGRS coordinate system should be used.
Locate geographical position screen in a GPS receiver.	**Locate geographical position screen in a GPS receiver**
Read the GR from the GPS.	**Record the GR**
Plot the GR on the topographical map.	**Plot GR**

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LEARNING STATION 1 INFORMATION SHEET

HOW THE GPS WORKS

The system is divided into three parts or segments: space, ground control and users. The space segment consists of 24 satellites that orbit 20 200 km above the Earth and send radio signals toward Earth. The radio signals broadcast the position of each satellite in the sky with an electronic code.

Each satellite performs a relatively simple primary task: it transmits a timing signal using its built-in atomic clock. When a device on the ground receives that signal, it can determine its distance from the satellite.

That single measurement alone does not accomplish much, but when a GPS receiver collects timing signals from three different satellites, the receiver can determine two precise coordinates: latitude and longitude. With four satellite signals, the GPS receiver is able to determine altitude as well.



A GPS receiver can also determine speed and heading.

COMPONENTS OF THE GPS

Satellites

The GPS and its satellites have the following characteristics:

- The minimum number of satellites that are required to cover the entire Earth is 18, however the number of satellites in orbit fluctuates between 24 and 29 satellites due to spares and upgrading.
- Satellites orbit in a semi-synchronous orbit (orbits are coordinated, but not identical).
- Each satellite completes an orbit every 12 hours.
- Satellites orbit the Earth at 20 200 km (12 552 miles) (airplanes routinely fly at 11–13 km [37 000–43 000 feet], the shuttle orbits at 370 km [230 miles]).
- Each satellite has three key pieces of hardware:
    - **Computer.** Controls its flight and order functions.
    - **Atomic clock.** Keeps accurate time within three nanoseconds (approximately three-billionths of a second).
    - **Radio transmitter.** Sends signals to Earth.

Ground stations

The ground control segment of the GPS is comprised of five ground stations that track the satellites, monitor their condition and make any necessary adjustments to keep the system accurate. The entire system functions and is monitored by the US Department of Defence. Information from the stations are sent to a master control station—the Consolidated Space Operations Centre (CSOC) at Schriever Air Force Base in Colorado where the data is processed and adjustments are made. The five ground stations are in Hawaii, Colorado, Diego Garcia, Ascension Island and Kwajalein.

Receivers

GPS receivers make up the user segment. It is the GPS receiver, whether it is in an airplane, a truck, a boat or in a hiker's hand, that detects the radio signals from the satellites and calculates the receiver's position.

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When a receiver is turned on, it interprets the radio signals and extracts the satellite location information. The GPS signal broadcasts information that tells the receiver the location of each satellite in the system. The receiver then interprets the radio signal to determine the exact time. This is required to calculate position.

The orbits of the GPS satellites ensure that there will be a minimum of four satellites covering any spot on the globe at all times. The receiver uses the signal from one satellite to continuously monitor and be synchronized with the time maintained by the other satellites. The receiver collects the signals from the other satellites and calculates the difference between them. This calculation positions the receiver from each satellite and triangulates its location. Based on a four-satellite fix, the receiver will identify location giving the user latitude, longitude and altitude (altitude is only possible with a four-satellite fix).

COMPONENTS OF A GPS RECEIVER

Antenna. Allows the GPS receiver to receive satellite signals.

Screen. Displays information.

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 the 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. Accesses highlighted menu items or highlighted screen 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. On the map screen zooms in on the map displayed. The map display can be zoomed in to 35 m (100 feet). Also moves through the list of waypoints when using an alphabetical search.

Zoom out. On the map screen zooms out on the map displayed. The map display can be zoomed out to 2736 km (1700 miles). Also moves through the list of waypoints when using an alphabetical search.

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. Saves 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.

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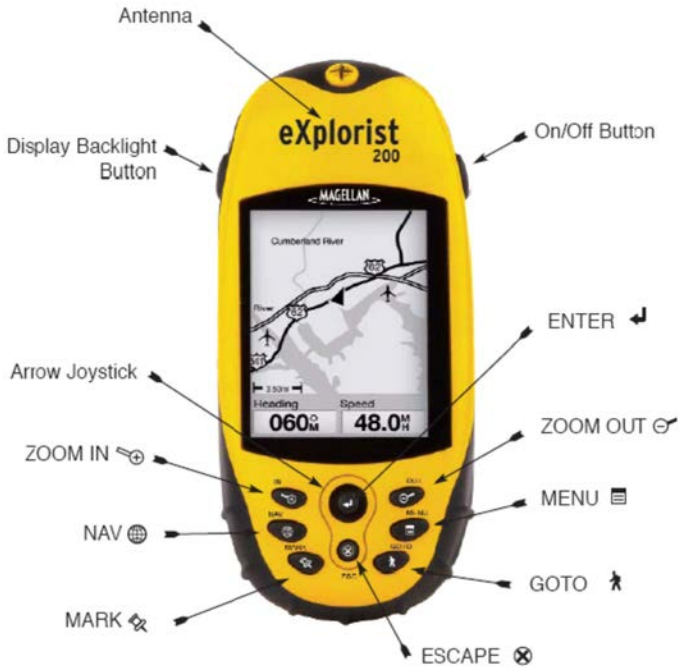

Note. From Magellan eXplorist 200 Reference Manual (p. 1), 2004, by Thales Navigation, Inc. Copyright 2004 by Thales Nav, Inc.

Figure C-1 Explorist 200 GPS Receiver

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 screen 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 screen it is common for GPS receivers to display the following information:

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

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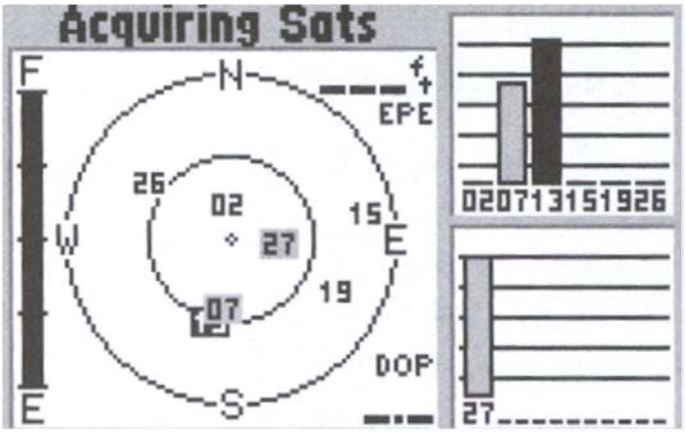


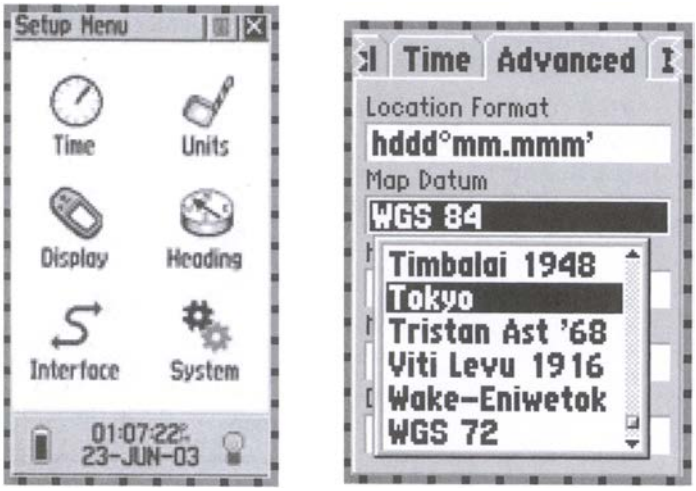
Note. From Outdoor Guide to Using Your GPS (p. 45), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing International, Inc.

Figure C-2 Satellite Status Screen

MENU

This screen 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 screen it is common for GPS receivers to display the following information:

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



Note. From Outdoor Guide to Using Your GPS (p. 54), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing International, Inc.

Figure C-3 Menu Screen

POSITION

The position screen is used for confirming coordinates, datum, time, date, and the EPE. This screen is used infrequently, for brief periods, mostly in planning and after marking a waypoint. Graphics, like a compass rose, are not displayed. This screen is not ideally laid out for user-friendly navigation.

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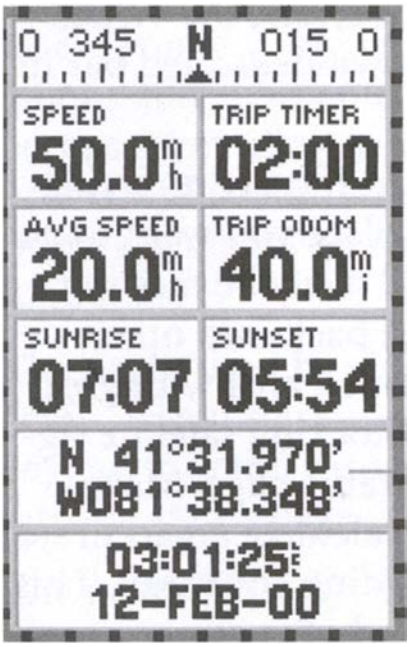
After acquiring enough satellites to begin navigating, many GPS receivers automatically go to the position screen or the map screen. In addition to the information mentioned above, an operator may find current speed, heading and a trip odometer. On some GPS receivers, the information displayed can be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



Note. From Outdoor Guide to Using Your GPS (p. 46), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing International, Inc.

Figure C-4 Position Screen

COMPASS NAVIGATION

This screen 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 screen 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 owner's manual and determine if the compass is an electronic compass capable of identifying a compass heading while the operator is standing still.

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Note. From Outdoor Guide to Using Your GPS (p. 47), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing international, Inc.

Figure C-5 Compass Navigation Screen

MAP

This screen 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 screen—these features may be roads or cities or entire continents.

The map screen allows an operator to pinpoint where they are and create a waypoint on the map by moving the cursor over a feature and pressing ENTER or MARK, making route building easier. The map screen 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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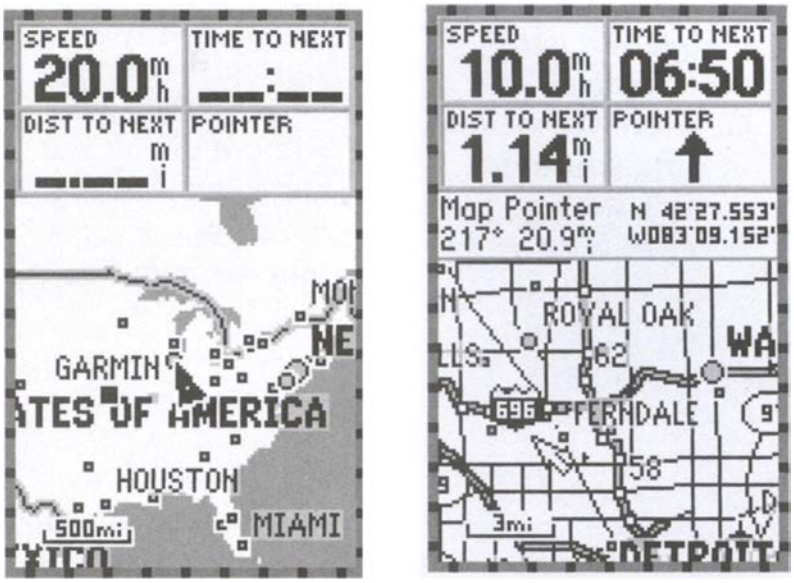

Note. From Outdoor Guide to Using Your GPS (p. 50), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing International, Inc.

Figure C-6 Map Screen

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LEARNING STATION 2 INFORMATION SHEET

PROCESS FOR CONFIRMING CORRECT MGRS COORDINATES

MGRS coordinates allow a GPS receiver to work in conjunction with a topographical map. To confirm the MGRS coordinates correspond with the topographical map the user will have to:

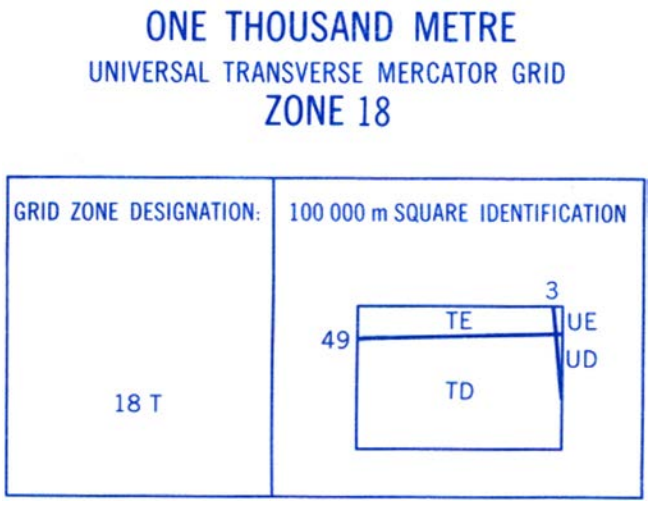
1. Identify the MGRS grid system on the topographical map.
2. Locate the grid zone designator.
3. Confirm the 100 000-m square identifier.

Identifying MGRS Grid System on a Topographical Map

Locating the MGRS grid system on topographical maps provides the navigator with another method to confirm the GPS receiver is reporting coordinates that correspond with the map being used. If the coordinates are different, the navigator will know that the GPS receiver is set to another datum and will have to be adjusted to provide the correct coordinates.

Locating the Grid Zone Designator

The location of the grid zone designator is found in the marginal information. The zone for the example in Figure D-1, is 18 T.



Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure D-1 Grid Zone Designator

Confirming the 100 000-m Square Identifier

The 100 000-m square identifier is located in the same marginal information area as the grid zone designator. The example in Figure D-1 states that the map is adjacent to the 100 000-m square identifications UE and UD. Additionally when the 100 000-m square identifier on a topographical map joins an adjacent grid zone, the identifier will be noted on the map in the 00 00 grid square. This is illustrated in Figure D-2.

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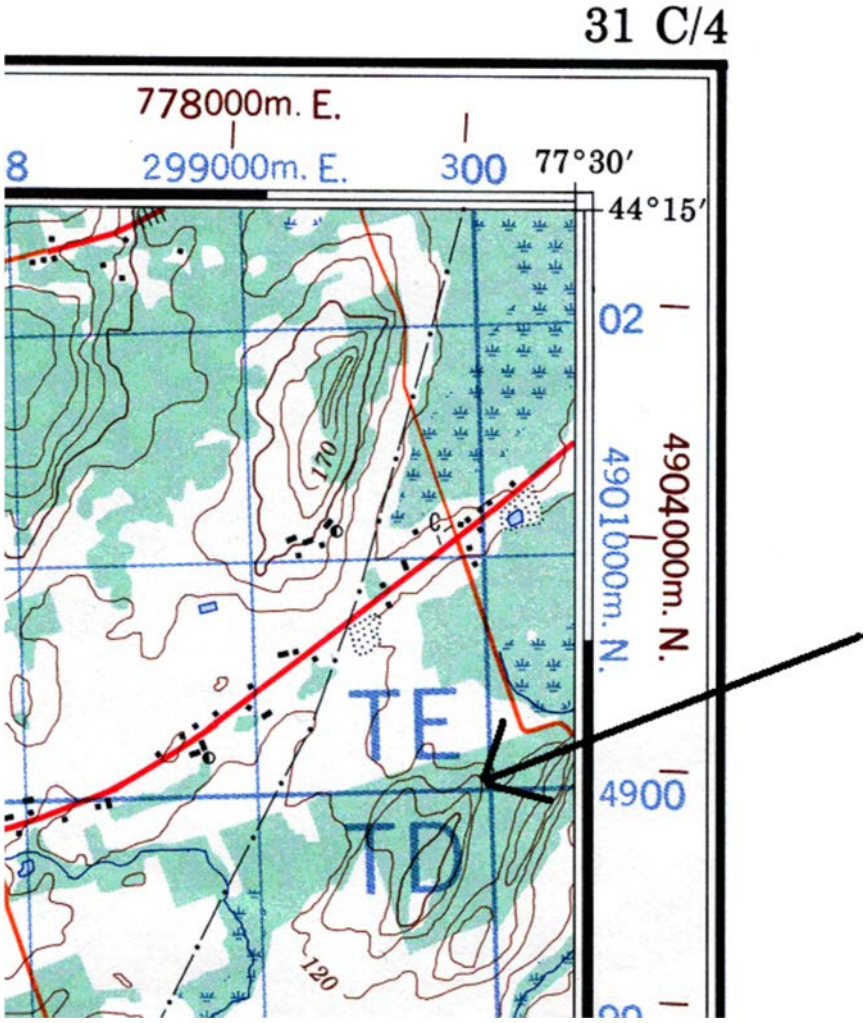
Verify against the official publication.



Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure D-2 Topographical Map 100 000-m Square Identifier

IDENTIFYING THE MAP DATUM FROM A TOPOGRAPHICAL MAP

The map datum of a topographical map is located in the lower right side of the marginal information, under the conversion scale for elevations.

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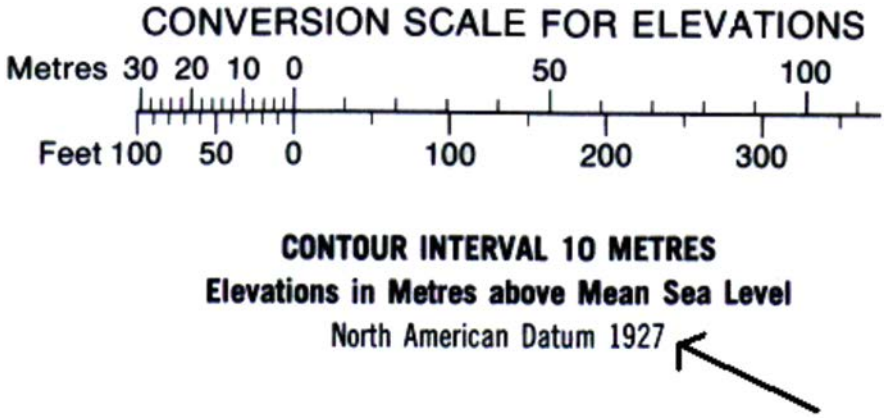

Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure D-3 Map Datum

SETTING A DATUM ON A GPS

To set a datum on a GPS:

1. Identify the map datum of the topographical map being used as the reference.
2. With the GPS, go to the set-up menu, then NAVIGATION, then SYSTEM or UNITS.
3. Highlight the map datum's box.
4. Scroll through the list of datums and find the map datum being used.
5. Set the correct datum.



To set the datum of the eXplorist 200 GPS receiver:

(1) Power up the receiver.

(2) Press the ENTER button.

(3) Press MENU button.

(4) Highlight the preferences and press ENTER.

(5) Highlight the map units and press ENTER.

(6) Highlight the map datum and press ENTER.

(7) Highlight the correct datum and press ENTER.

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Verify against the official publication.

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LEARNING STATION 3 INFORMATION SHEET

IDENTIFYING MGRS GRID SYSTEM ON A GPS RECEIVER

Ensure that the GPS receiver coordinate system is set to Military Grid Reference System (MGRS).

GPS receivers will identify the UTM coordinates when reading location, to include:

- grid zone designator,
- 100 000-m square identifier, and
- GR.

GPS receivers, depending on the make and model, are capable of selecting an MGRS accuracy of four-, six-, eight-, and ten-figure GRs. If the GPS receiver being used for this TP is enabled with this capability, it is suggested that it be set to a six-figure GR.



GPS Datum Set to NAD-27 GPS Datum Set to NAD-83

Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure E-1 GPS Receiver Coordinates

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The coordinates displayed on the GPS receivers in Figure E-1 are set to MGRS. Each GPS receiver is set with a different datum for the same location.

GPS Receiver Datum set to NAD-27	GPS Receiver Datum set to NAD-83
The coordinates are identified as: • grid zone designator—18 T, • 100 000-m square identifier—TD, and • 10-figure GR as—96785 86748	The coordinates are identified as: • grid zone designator—18 T, • 100 000-m square identifier—TP, and • 10-figure GR as—96830 86973



Note the difference between the coordinates of the same location using a different datum.

PROCESS FOR CONFIRMING CORRECT MGRS COORDINATES

MGRS coordinates allow a GPS receiver to work in conjunction with a topographical map. To confirm the MGRS coordinates correspond with the topographical map the user will have to:

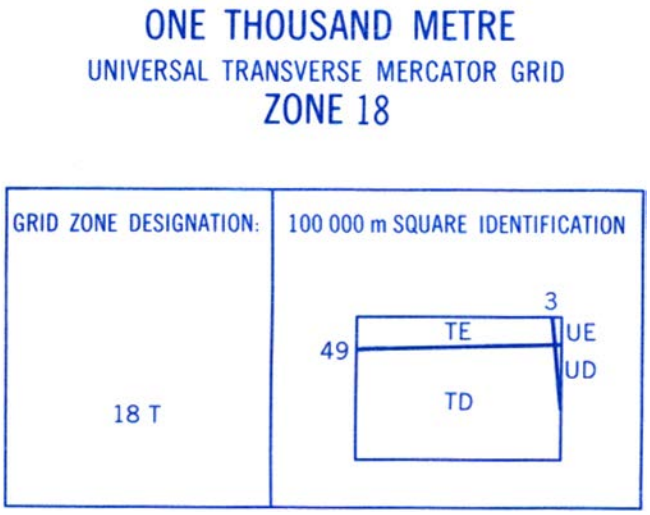
1. identify the MGRS grid system on the topographical map;
2. locate the grid zone designator; and
3. confirm the 100 000-m square identifier.

Identifying the MGRS Grid System on a Topographical Map

Locating the MGRS on topographical maps provides the navigator with another method to confirm the GPS receiver is reporting coordinates that correspond with the map being used. If the coordinates are different, the navigator will know that the GPS receiver is set to another datum and will have to be adjusted to provide the correct coordinates.

Locating the Grid Zone Designator

The location of the grid zone designator is found in the marginal information. The zone for the example in Figure E-1, is 18 T.



Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure E-2 Grid Zone Designator

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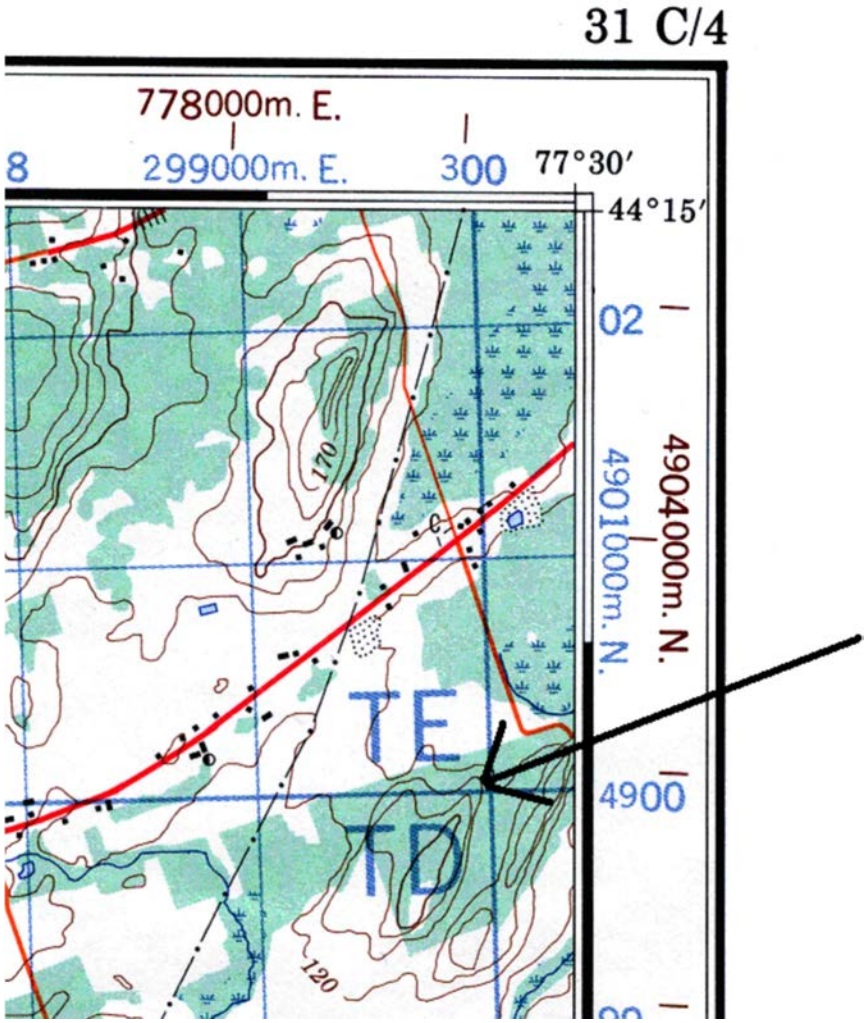
Verify against the official publication.

Confirming the 100 000-m Square Identifier

The 100 000-m square identifier is located in the same marginal information area as the grid zone designator. The example in Figure E-2 states that the map is adjacent to the 100 000-m square identifications UE and UD. Additionally, when the 100 000-m square identifier on a topographical map joins an adjacent grid zone, the identifier will be noted on the map in the 00 00 grid square. This is illustrated in Figure E-3.



Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure E-3 Topographical Map 100 000-m Square Identifier

Position. The position screen is used for confirming coordinates, datum, time, date, and the EPE. This screen 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.

After acquiring enough satellites to begin navigating, many GPS receivers automatically go to the position screen or the map screen. 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.

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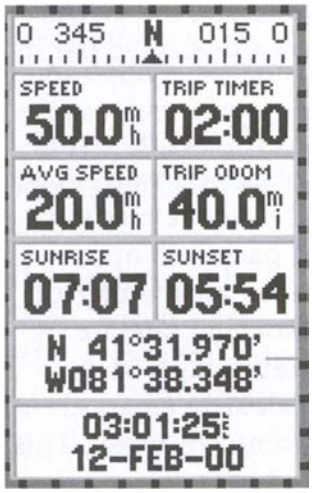
Verify against the official publication.



Note. From Outdoor Guide to Using Your GPS (p. 46), by S. Featherstone, 2004, Chanhassen, MN: Creative Publishing International, Inc.

Figure E-4 Position Screen

EXTRACTING A 6-FIGURE GR FROM A 10-FIGURE GR

A 10-figure grid reference given from a GPS receiver has 10 digits and is accurate to 1 m. To extract the 6-figure GR from the 10-figure GR one must understand how the figures work.

GRID REFERENCE WRITTEN FIGURES		
Definition	**Easting**	**Northing**
A 10-figure GR accurate to 1 m is written as	96779	86744
An 8-figure GR accurate to 10 m is written as	9677	8674
A 6-figure GR accurate to 100 m of the same coordinates is written as	967	867
A 4-figure GR accurate to 1 000 m of the same coordinates is written as	96	86

As illustrated in the above chart, the 10-figure GR has two sets of numbers. The first five digits are eastings and the second five digits are the northing coordinates. When taking a GR from a GPS receiver, it is important to identify the 10 digits and extract the first three numbers from the easting portion and the first three numbers from the northing portion (eg, **967**79 **867**44). The 6-figure grid reference can then be plotted on a map as GR 967 867.

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