ROYAL CANADIAN ARMY CADETS

GOLD STAR

INSTRUCTIONAL GUIDE

SECTION 3

EO M422.03 – FOLLOW A MULTI-LEG ROUTE USING A GLOBAL POSITIONING SYSTEM (GPS) RECEIVER

Total Time: 90 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.

Photocopy Attachment A (Input a Multi-Leg Route in the Magellan eXplorist 200 GPS Receiver) for each cadet.

Design a 4-km route with a minimum of 12 legs.

Assistant instructors are required for this lesson.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A practical activity was chosen for this lesson as it is an interactive way to allow cadets to experience following a multi-leg route using a GPS receiver in a safe and controlled environment.

INTRODUCTION

REVIEW

The review for this lesson is from EO M422.02 (Set a Multi-Leg Route Using a Global Positioning System [GPS] Receiver).

QUESTIONS:

Q1. Describe the differences between the two types of points of interest (POIs).

Q2. What are the steps to create a personalized mark?

Q3. What is a GOTO route?

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ANTICIPATED ANSWERS:

A1. A marked POI saves the user's current location, while a stored POI can be a manually entered GR. It can be marked from the map page of the GPS receiver, or it can taken from the list of POIs that come pre-loaded into the GPS receiver's memory.

A2. To create a personalized mark:

(1) press MARK;

(2) personalize the POI by:

(a) moving the arrow joystick to highlight the name field;

(b) pressing ENTER;

(c) moving the arrow joystick to select the character desired, pressing ENTER after each character is selected;

(d) moving the arrow joystick to OK once all characters have been selected;

(e) pressing ENTER;

(f) moving the arrow joystick to highlight the icon / symbol field;

(g) pressing ENTER;

(h) moving the arrow joystick to the desired icon / symbol; and

(i) pressing ENTER to select the icon / symbol;

(3) move the arrow joystick to highlight the save field; and

(4) press ENTER.

A3. A GOTO route is the simplest and most common type of route. A GOTO route is a one-leg route with a starting point (present location) and a destination (selected POI). This type of route is useful when travelling to a specific manually entered or stored POI. GOTO routes can only be used once.

OBJECTIVES

By the end of this lesson the cadet shall have followed a multi-leg route using a GPS receiver.

IMPORTANCE

It is important for cadets to know how to follow a multi-leg route using a GPS receiver as each leg represents a checkpoint during an expedition. Breaking the expedition into legs allows for planning in rest points, meal locations, sleep locations and ensures that cadets feel a sense of success as the expedition progresses. Multi-leg routes also reaffirm the group is on the correct course, limiting the chances of becoming lost.

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Teaching point 1 **Have the cadets, in groups of four, practice following a multi-leg route using a GPS receiver.**

Time: 80 min Method: Practical Activity

BACKGROUND KNOWLEDGE

PROCESS FOR CONFIRMING CORRECT MILITARY GRID REFERENCE SYSTEM (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:

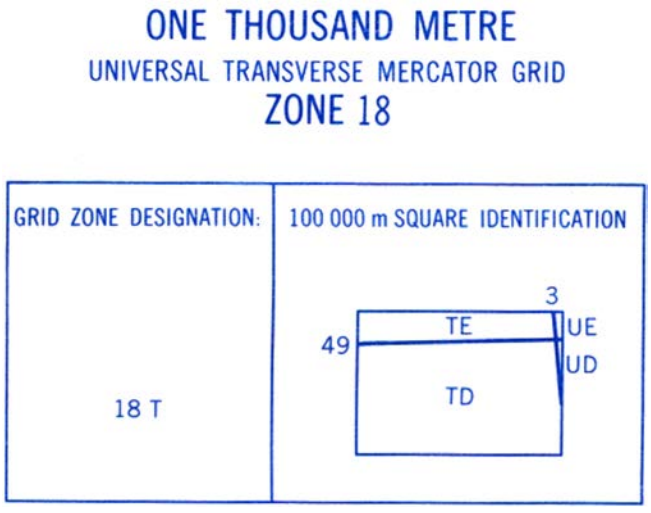
1. Identify the MGRS grid system on the topographical map.
2. Locate the grid zone designator.
3. Confirm the 100 000-m square identifier.

Identifying MGRS Grid System on a Topographical Map

Locating the MGRS grid system on topographical maps provides the cadet 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 1 is 18 T.



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

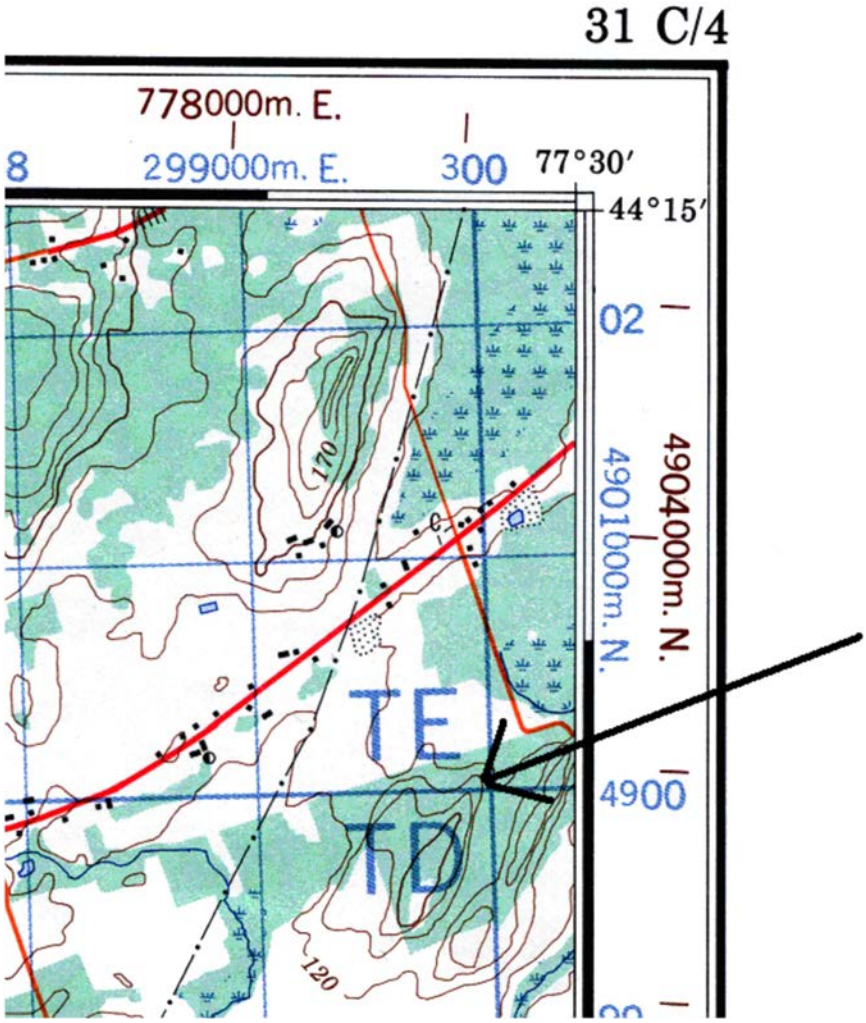
Figure 1 Grid Zone Designator

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 1 states that the map is adjacent to the 100 000-m square identifications UE and UD.

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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 2.



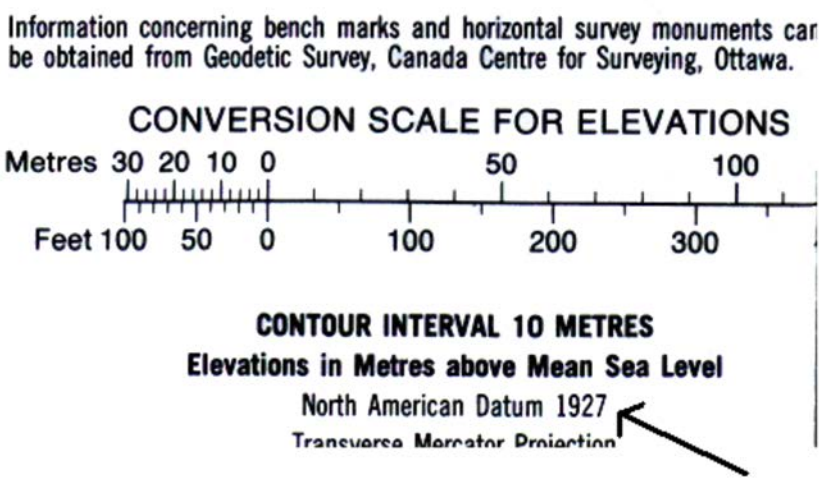
Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure 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 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.

IDENTIFYING MGRS GRID SYSTEM ON A GPS RECEIVER



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

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GPS receivers will identify the Universe Transverse Mercator (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 4 GPS Receiver Coordinates

The coordinates displayed on the GPS receivers in Figure 4 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

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

Position. The position screen is used for confirming coordinates, datum, time, date, and the estimated position error (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.



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

Figure 5 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

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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.

CREATING A PERSONALIZED MARK

The steps to create a personalized mark are as follows:

1. press MARK;
2. personalize the POI by:
   a. moving the arrow joystick to highlight the name field;
   b. pressing ENTER;
   c. moving the arrow joystick to select the character desired, pressing ENTER after each character is selected;
   d. moving the arrow joystick to OK, once all characters have been selected;
   e. pressing ENTER;
   f. moving the arrow joystick to highlight the icon / symbol field;
   g. pressing ENTER;
   h. moving the arrow joystick to the desired icon / symbol; and
   i. pressing ENTER to select the icon / symbol;
3. move the arrow joystick to highlight the save field; and
4. press ENTER.

CREATING A COORDINATE MARK

The steps to create a coordinate mark are as follows:



It is important to make sure that the GPS receiver has been set to the same coordinate system as the coordinates that are going to be entered.

1. press MARK;
2. move the arrow joystick to highlight the location field;
3. press ENTER;
4. use the arrow joystick to adjust the characters in the first line (grid zone designation and 100 000-m square identification) of the location field;
5. press ENTER to move to the second line of the location field;
6. use the arrow joystick to adjust the characters in the second line (grid reference) of the location field;



Moving the arrow joystick in an up / down motion will increase / decrease the value at the cursor point.

Moving the arrow joystick in a left / right motion will move the cursor point to the left / right.

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7. press ENTER;
8. personalize the POI, if desired (as detailed personalize a mark, Step 2);
9. move the arrow joystick to the save field; and
10. press ENTER.

CREATING A MULTI-LEG ROUTE

The steps to create a multi-leg route are as follows:

1. press MENU;
2. use the arrow joystick to highlight ROUTES;
3. press ENTER;
4. use the arrow joystick to highlight NEW;
5. press ENTER;
6. ensure 'add POI' is highlighted and press ENTER;
7. use the POI database to add POIs by highlighting the desired POI and pressing ENTER after each one;
8. use the arrow joystick to highlight SAVE ROUTE once all the desired POIs have been entered;
9. press ENTER;
10. use the arrow joystick and the ENTER button to input a route name;
11. highlight OK; and
12. press ENTER.

ACTIVATING A MULTI-LEG ROUTE

The steps to activate a multi-leg route are as follows:

1. press MENU;
2. use the arrow joystick to highlight ROUTES;
3. press ENTER;
4. use the arrow joystick to highlight the name of the route that is to be activated;
5. press MENU;
6. highlight ACTIVATE ROUTE; and
7. press ENTER.

ACTIVITY

Time: 80 min

OBJECTIVE

The objective of this activity is to have the cadets, in a group of no more than four, follow a multi-leg route using a GPS receiver.

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RESOURCES

- GPS receiver (one per group),
- Start point,
- Three POIs (per group),
- Compass (one per group),
- Topographical map of the local area (one per group),
- Whistle (one per cadet),
- First aid kit (one),
- Hand-held radio (one per group), and
- Input a Multi-leg Route in the Magellan eXplorist 200 GPS Receiver handout located at Attachment A (one per cadet).

ACTIVITY LAYOUT

Break the route into three legs (POIs) for each group.

ACTIVITY INSTRUCTIONS

1. Brief the cadets prior to the start of the activity, to include an explanation of:
    a. the objectives and importance of the activity;
    b. the coordinates they will require to input their routes, including start and end points and the POIs; and
    c. any safety guidelines that must be followed while performing the activity.
2. Divide cadets into groups of no more than four.
3. Provide one GPS receiver, topographical map of the local area, compass and hand-held radio to each group.
4. Provide a whistle and a copy of the Input a Multi Leg Route in the Magellan eXplorist 200 GPS Receiver handout to each cadet.
5. Have each group determine who will navigate each leg.
6. Assign each cadet within each group their POI coordinates.
7. Have the cadets, in navigating order, input their provided coordinates using a GPS receiver by:
    a. confirming that the GPS receiver is set to the correct coordinate system;
    b. confirming that the correct map datum is set;
    c. marking the start point, using a personalized mark by;
        (1) pressing MARK;
        (2) personalizing the POI by:
            (a) moving the arrow joystick to highlight the name field;
            (b) pressing ENTER;

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(c) moving the arrow joystick to select the character desired, pressing ENTER after each character is selected;

(d) moving the arrow joystick to OK once all characters have been selected;

(e) pressing ENTER;

(f) moving the arrow joystick to highlight the icon / symbol field;

(g) pressing ENTER;

(h) moving the arrow joystick to the desired icon / symbol; and

(i) pressing ENTER to select the icon / symbol;

(3) moving the arrow joystick to highlight the save field; and

(4) pressing ENTER;

d. establishing three POIs using coordinate marks by:

(1) pressing MARK;

(2) moving the arrow joystick to highlight the location field;

(3) pressing ENTER;

(4) using the arrow joystick to adjust the characters in the first line (grid zone designation and 100 000-m square identification), as required;

(5) pressing ENTER to move to the second line of the location field;

(6) using the arrow joystick to adjust the characters in the second line (gird reference) of the location field;

(7) pressing ENTER;

(8) personalizing the POI, if desired;

(9) moving the arrow joystick to the save field;

(10) pressing ENTER; and

(11) repeating the process for the remaining POIs; and

e. creating a multi-leg route by:

(1) pressing MENU;

(2) using the arrow joystick to highlight ROUTES;

(3) pressing ENTER;

(4) using the arrow joystick to highlight NEW;

(5) pressing ENTER;

(6) ensuring ADD POI is highlighted and pressing ENTER;

(7) using the POI database to add POIs by highlighting the desired POI and pressing ENTER after each one;

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(8) using the arrow joystick to highlight SAVE ROUTE once all the desired POIs have been entered;

(9) pressing ENTER;

(10) using the arrow joystick and the ENTER button to input a route name;

(11) highlighting OK; and

(12) pressing ENTER.

8. Have the cadets, in navigating order:

a. activate the route by:

(1) pressing MENU;

(2) using the arrow joystick to highlight ROUTES;

(3) pressing ENTER;

(4) using the arrow joystick to highlight the name of the route that is to be activated;

(5) pressing MENU;

(6) highlighting ACTIVATE ROUTE; and

(7) pressing ENTER; and

b. navigate to each POI along the set route using the GPS receiver (within a 10-m radius).

9. Debrief the cadets by asking:

a. how they felt about the activity;

b. what part of the activity they found difficult;

c. what they felt they accomplished; and

d. what they would try to improve if given the chance to complete the activity again.

SAFETY

Cadets will be navigating legs on their own. Additional instructors will be required to monitor the activity by positioning themselves in random locations along the route.

Provide cadets with a safety bearing to travel on in the case of GPS receiver fails or in the event of becoming lost.

END OF LESSON CONFIRMATION

The cadets' participation in the GPS navigation activity will serve as the confirmation of this lesson.

CONCLUSION

REVIEW

Nil.

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HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

This lesson is assessed IAW A-CR-CCP-704/PG-001, *Gold Star Qualification Standard and Plan*, Chapter 3, Annex B, 422 PC.

CLOSING STATEMENT

The ability to identify route legs and input those legs into a GPS allows one to divide up the route when navigating. Dividing the expedition route into legs allows the leader to prepare for rest stops, meal breaks and particular points to use as overnight rest points. A leg also provides the group with minor points of accomplishments and promotes individual and team morale.

INSTRUCTOR NOTES / REMARKS

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

Additional instructors will be required to supervise the cadets while participating in the activity. Assistant instructors shall be randomly placed along the route to assist cadets.

The type of GPS receiver may vary. If the Magellan eXplorist 200 is not being used to refer the owner's manual for instructions and proper methods of use.

REFERENCES

C1-178 Thales Navigation Inc. (2004). *Magellen eXplorist 200 GPS user manual*. San Dimas, CA: Thales Navigation Inc.

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INPUT A MULTI-LEG ROUTE IN THE MAGELLAN EXPLORIST 200 GPS RECEIVER

To input a multi-leg route in a GPS receiver:

1. Confirm that the GPS receiver is set to the correct coordinate system.
2. Confirm that the correct map datum is set.
3. Mark the start point, using a personalized mark by:
    a. pressing MARK;
    b. personalizing the POI by:
        (1) moving the arrow joystick to highlight the name field;
        (2) pressing ENTER;
        (3) moving the arrow joystick to select the character desired, pressing ENTER after each character is selected;
        (4) moving the arrow joystick to OK once all characters have been selected;
        (5) pressing ENTER;
        (6) moving the arrow joystick to highlight the icon / symbol field;
        (7) pressing ENTER;
        (8) moving the arrow joystick to the desired icon / symbol; and
        (9) pressing ENTER to select the icon / symbol;
    c. moving the arrow joystick to highlight the save field; and
    d. pressing ENTER.
4. Establish three POIs using coordinate marks by:
    a. pressing MARK;
    b. moving the arrow joystick to highlight the location field;
    c. pressing ENTER;
    d. using the arrow joystick to adjust the characters in the first line (grid zone designation and 100 000-m square identification), as required;
    e. pressing ENTER to move to the second line of the location field;
    f. using the arrow joystick to adjust the characters in the second line (gird reference) of the location field;
    g. pressing ENTER;
    h. personalizing the POI, if desired;
    i. moving the arrow joystick to the save field;
    j. pressing ENTER; and
    k. repeating the process for the remaining POIs.

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5. Create a multi-leg route by:
    a. pressing MENU;
    b. using the arrow joystick to highlight ROUTES;
    c. pressing ENTER;
    d. using the arrow joystick to highlight NEW;
    e. pressing ENTER;
    f. ensuring ADD POI is highlighted and pressing ENTER;
    g. using the POI database to add POIs by highlighting the desired POI and pressing ENTER after each one;
    h. using the arrow joystick to highlight SAVE ROUTE once all the desired POIs have been entered;
    i. pressing ENTER;
    j. using the arrow joystick and the ENTER button to input a route name;
    k. highlighting OK; and
    l. pressing ENTER.
6. Activate the route by:
    a. pressing MENU;
    b. using the arrow joystick to highlight ROUTES;
    c. pressing ENTER;
    d. using the arrow joystick to highlight the name of the route that is to be activated;
    e. pressing MENU;
    f. highlighting ACTIVATE ROUTE; and
    g. pressing ENTER.

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