

12.215 Modern Navigation

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MW 11:00-12:30 Room 54-820A
<http://geoweb.mit.edu/~tah/12.215>**

Summary of Last class

- Satellite Orbits
- Treat the basic description and dynamics of satellite orbits
- Major perturbations on GPS satellite orbits
- Sources of orbit information:
 - SP3 format from the International GPS service
 - Broadcast ephemeris message
- Accuracy of orbits and health of satellites

Today's class

- Basics of Handheld GPS
 - Run through typical screens that are available in handheld GPS
 - Navigation screens
 - Tips on using this type of GPS

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Garmin Receivers

- This is the brand we will use in our “field trip” next week.
- At left is the Garmin V (we will also use a Garmin III).
- Both receivers work either in “portrait” or “landscape” mode
- Set by pressing and holding the page button



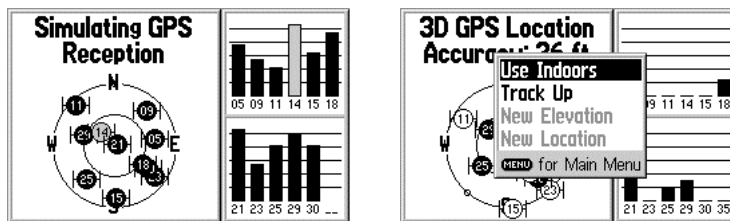
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Basic Screens

- Start up screen when receivers starts
- The satellite constellation it shows depends on the last almanacs that we downloaded and where it thinks you are located
- Pressing menu allows user to graphically select location
- Height of bars denotes signal strength and solid bars indicate that the satellite can be used for positioning (i.e., the ephemeris for the satellite has been downloaded).



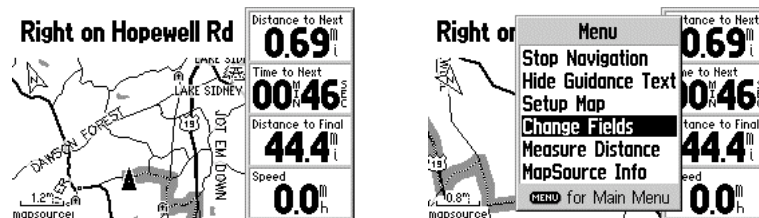
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Map screens

- Page and quit cycle through the screens. After the receiver has locked up on satellites and has a position, the map screen appears
- The menu button allows the features of the map to be changed.
- The screen below is when the receiver is in navigation mode and is given directions on where to go.
- When you get close to a turn, the map changes to a detailed view of the turn. In and Out control the zoom on map.



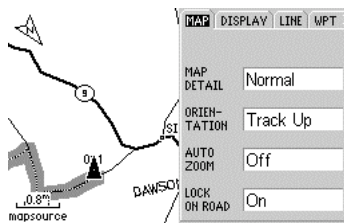
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Map step up screen

- The map setup screens allow of great deal of control of the appearance of the maps.
- The top menu line (moved with the rocker pad) lets different parts of the map be changed.



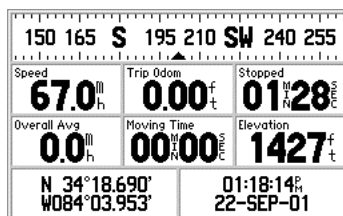
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Position page

- This page displays basic position and motion information
- The bearing shown is the direction of motion relative to true North. (When not in motion, the bearing has no meaning in this receiver. Other models has built in compass which will show a direction that receiver is pointing.
- Magnetic bearings can be calculated (with out the compass) using a built in model for the magnetic field)



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Turn-by-Turn guidance

- This receiver will automatically compute routes between where you are and a selected location.
- These give street names, the distance to the point and the expected time to arrival (times are based on the speed limits on the roads)

↑	Take Exit 2 on right towards Buckhe	35.9 ^m	32:46
↙	Turn left on Piedmont Rd NE	36.5 ^m	33:43
↘	Turn right on Peachtree Rd NE	36.8 ^m	34:21
↑	Arrive at 2001 PEACHTREE	39.7 ^m	37:39

↘	Turn right on		00:46
↙	Turn		01:54
↘	Turn		03:31
🚩	Arrive at		43:12

Menu

- Stop Navigation
- Recalculate
- Use Detour
- Save Route
- Show Arrival Times

MENU for Main Menu

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Pointer guidance system

- These screens appear when direct path navigation is used (i.e., when roads are not being followed).
- Again directions here are for the motion, not the direction the receiver is facing.

	Speed	0.0 ^{m/h}
	Distance to Next	0.89 ^m
	ETA at Next	04:45 ^p
	Next Destination	TAXCO

	Speed	0.0 ^{m/h}
	Distance to Next	0.89 ^m
	ETA at Next	04:46 ^p
	Next Destination	TAXCO

Menu

- Stop Navigation
- Change Fields
- Big Numbers
- Course Pointer
- Restore Defaults

MENU for Main Menu

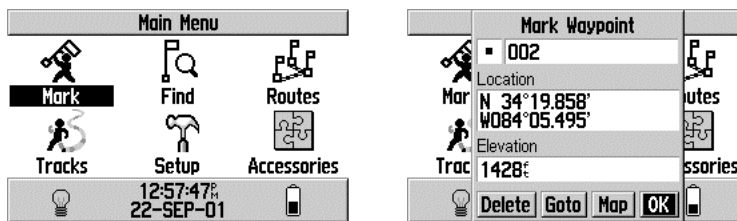
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Main Menu/Mark

- The main menu is obtained by pressing menu twice.
- Option below is to mark a waypoint (also appears when the enter button is pressed on the map screen).



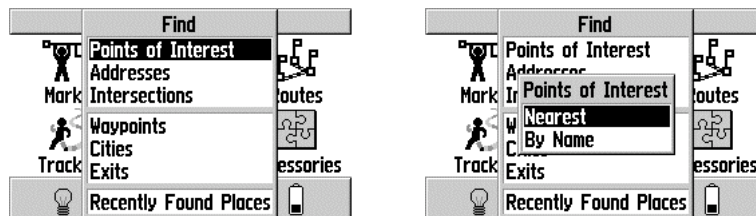
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Main Menu/Find

- The find screen allows different methods of finding a location
- This screen also appears when goto pressed from the map screen,



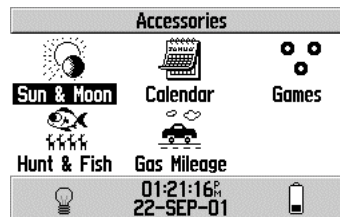
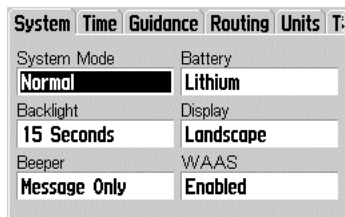
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Setup menu

- This menu allows main features to be set. If working with paper maps for example, the datum should be set correctly. UTM coordinates can be specified as well for maps.
- There is also the accessories menu
- On and enter at same time shows the test screen



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Other inexpensive hand helds

- Garmin emap (\$250): This model is less expensive than the GPS IV. It has computer connector and external antenna co-axial cable connector



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Magellan receivers

- Low cost Magellan receivers



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Magellan 330 Map

- Magellan also makes GPS units with maps:



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Car Navigation Systems

- Many of these systems now available as stand-alone and built in options.
- Most speak and interact through touch screens.
- Operation is intuitive with questions such as “Where to” and options like “faster time”, “shortest distance”, and “off road”.
- Because detailed maps are built in there are usually no map datum options.

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General considerations with handhelds

- With newer models look for WAAS capability. This is FAA wide-area augmentation system which during daytime should improve accuracy of the receivers.
- There are quite a few web sites that review GPS receivers and these can be consulted for guidance
- In general when using hand held receivers try to start in a location with good sky visibility
- Most of the receivers have many features and so working your way through the menu options can take some time.

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