



# MARINERS LEARNING SYSTEM™

PROVIDING KNOWLEDGE AND KNOWHOW... ANYTIME, ANYWHERE

## INTRODUCTION TO NAVIGATION



DIGITAL EDITION

Captain Robert L. Figular

*Page intentionally left blank*



**MARINERS**  
LEARNING SYSTEM™

*INTRODUCTION  
TO NAVIGATION*

by Captain Robert L. Figular

Mariners Learning System™  
Princeton, New Jersey

Copyright © 2017 by Mariners Learning System™ - All Rights Reserved.  
No part of this publication can be reproduced in any form or by any  
process without permission in writing from Mariners Learning System™.

Mariners Learning System™ books are available at special quantity  
discounts for use in corporate training programs. For more information  
please email: [info@marinerslearningsystem.com](mailto:info@marinerslearningsystem.com)

**ACKNOWLEDGEMENTS**

This book is designed to provide a wide variety of information on the  
practice of good seamanship as it pertains to the marine environment.  
This publication contains data and associated information produced and  
obtained from the U.S. Department of Homeland Security and the  
United States Coast Guard (USCG). This title is published by a private  
company and any appearance of the USCG's name, seal, or initials does  
not indicate endorsement of this title.

**DISCLAIMER**

Every effort has been made to make this publication as complete and  
accurate as possible. All references contained in this publication have been  
compiled from sources believed to be the most recent, reliable, and  
represent the best current opinion on the subject. Mariners Learning  
System™ is not responsible or liable for any adverse effects or  
consequences to any person or entity with respect to any loss or damage  
caused or alleged to be caused directly or indirectly from use of  
information contained in this publication.

---

# Introduction to Navigation

---

## Introduction

- The art and science of navigation is an ancient skill. For thousands of years sailors navigated by using the stars as their guide. In the distant past, only a select few were allowed access to the mysteries of navigation, for possession of them gave one considerable power. A person who could safely follow the stars and navigate a ship from one point to another exercised significant influence over crewmembers who could not.
- Navigation has expanded from using the stars and planets (celestial navigation) to sophisticated electronic systems (electronic navigation). The safe and confident navigation of the boat is an absolute necessity. Boat navigation falls into four major categories:
  - a. **Piloting:** use of visible landmarks and Aids to Navigation (AtoN) as well as by soundings.
  - b. **Dead Reckoning (DR):** navigation using visual reference points, aids to navigation, landmarks, and water depths.
  - c. **Electronic Navigation:** piloting by manual or automatic electronic devices, echo sounders, electronic compass, radio direction finder, radar, and various position-finding systems such as GPS.
  - d. **Celestial Navigation:** position is determined by reference to sun, stars, and moon. Usually a sextant measures the altitude of the observed heavenly body; a highly accurate source of time information is used to determine the time of sight; tables are used to determine a position line. The place where two positions cross is a fix.
- The Captain or boat operator is responsible for knowing the position of the boat at all times. Additionally, he/she has been entrusted with the safety of the boat, all crewmembers, and people from distressed vessels.
- Each crewmember is a Captain-in-training. A crewmember should learn all landmarks, charts, and navigation aids used for the waters while operating. Through experience, a crewmember will become proficient in the various skills necessary to perform any essential task in an emergency.

### The Earth and Its Coordinates

- Navigation is concerned with finding a position and calculating distances measured on the surface of the earth.
- The earth is not a perfect sphere. The diameter through the equator is about 23 nautical miles longer than is the diameter through the North and South Poles. This difference is so small that most navigational problems are based on the earth being a perfect sphere. Charts are drawn to include this slight difference. Distance is figured from certain reference lines.
- Position at any given time while underway may be determined by location relative to these lines as well as visible landmarks in the local area. Knowing what these lines are and how to use them is essential.

### The Earth and Its Coordinates

- The earth rotates around an axis; this axis may be defined as a straight line drawn through the center of the earth. The axis line meets the surface of the earth at the North Pole and at the South Pole.
- To determine location, a system of reference lines is placed on the surface of the earth as shown in the picture below. This figure reveals the difficulty a boat navigator faces; the earth is curved as a sphere, but navigation is typically done on a flat chart with straight reference lines running top to bottom and left to right.



**Earth with Reference Lines**

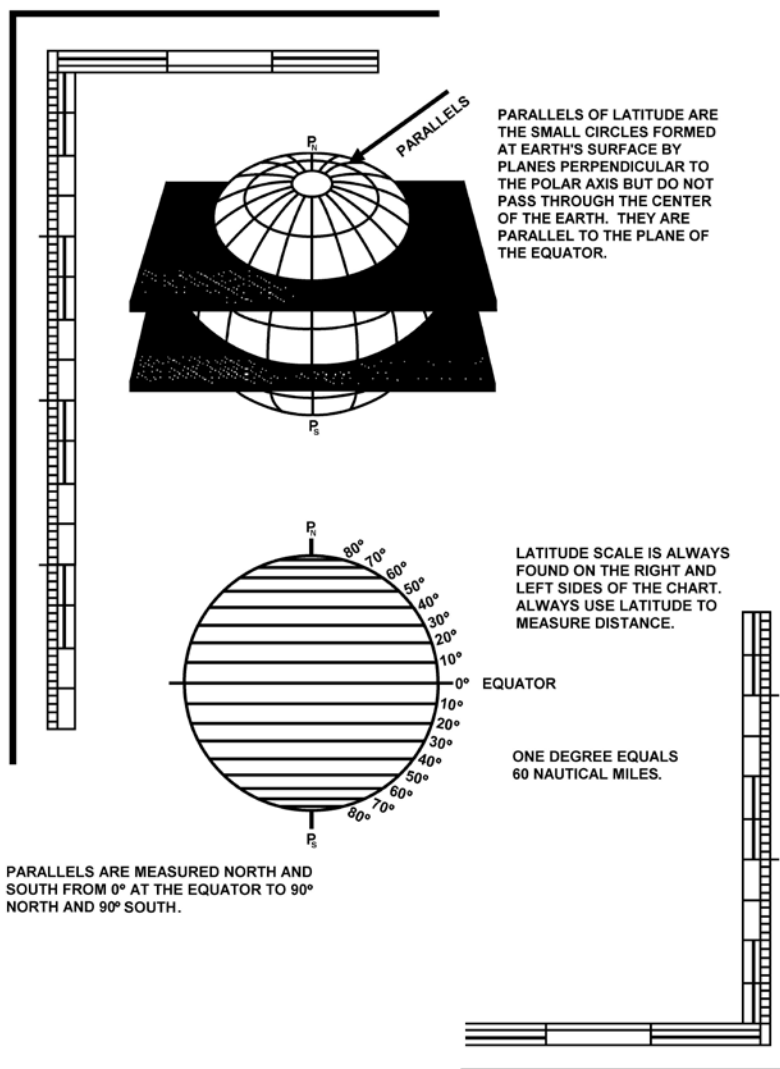
## Great Circles

- A great circle is a geometric plane passing through the center of the earth that divides the earth into two equal parts. A great circle always passes through the widest part of the earth. The equator is a great circle. Great circles represent the shortest distance between two points on the earth. For navigational purposes, each great circle on the Earth has a length of 21,600 miles.
- The outline of the moon also reveals another fact about great circles, and a property of all circles: each circle possesses 360° around its edge, which passes through a sphere, as to divide the sphere into two equal half-spheres. There are an infinite number of great circles on a sphere.
- Great circles have 360° of arc. In every degree of arc in a circle, there are 60 minutes. Sixty minutes is equal to 1° of arc, and 360° are equal to a complete circle. When degrees are written, the symbol (°) is used.
- For every degree of arc, there are 60 minutes. When minutes of degrees are written, the symbol (') is used; 14 degrees and 15 minutes is written: 14°15'.
- When written, minutes of degrees are always expressed as two digits. Zero through nine minutes are always preceded with a zero. Three minutes and zero minutes are written as 03' and 00' respectively.
- For every minute of arc in a circle, there are 60 seconds of arc. Sixty seconds is equal to one minute of arc, and 60 minutes is equal to 1° of arc.
- For every minute of arc, there are 60 seconds. When seconds are written, the symbol (") is used; 24 degrees, 45 minutes, and 15 seconds is written: 24°45'15".
- When seconds are written, they are always expressed as two digits. Zero through nine seconds are always preceded with a zero. Six seconds and zero seconds are written as 06" and 00" respectively.
- Seconds may also be expressed in tenths of minutes; 10 minutes, 6 seconds (10'06") can be written as 10.1'.

Circle =	360 degrees (°)
1 degree (°) =	60 minutes (')
1 minute (') =	60 seconds (")

## Parallels

- Parallels are circles on the surface of the earth moving from the equator to the North or South Pole. They are parallel to the equator and known as parallels of latitude, or just latitude.
- Parallels of equal latitude run in a west and east direction (left and right on a chart). They are measured in degrees, minutes, and seconds, in a north and south direction, from the equator. ( $0^\circ$  at the equator to  $90^\circ$  at each pole).
- The North Pole is  $90^\circ$  north latitude, and the South Pole is  $90^\circ$  south latitude. The equator itself is a special parallel because it is also a great circle. One degree of latitude (arc) is equal to 60 nautical miles (NM) on the surface of the earth; one minute ( $'$ ) of latitude is equal to 1 NM. The circumference of the parallels decreases as they approach the poles.
- On charts of the northern hemisphere, true north is usually located at the top. Lines running from side to side normally indicate parallels. Latitude scales, however, are normally indicated along the side margins by divisions along the black-and-white border as shown in the upper left and the lower right margins.

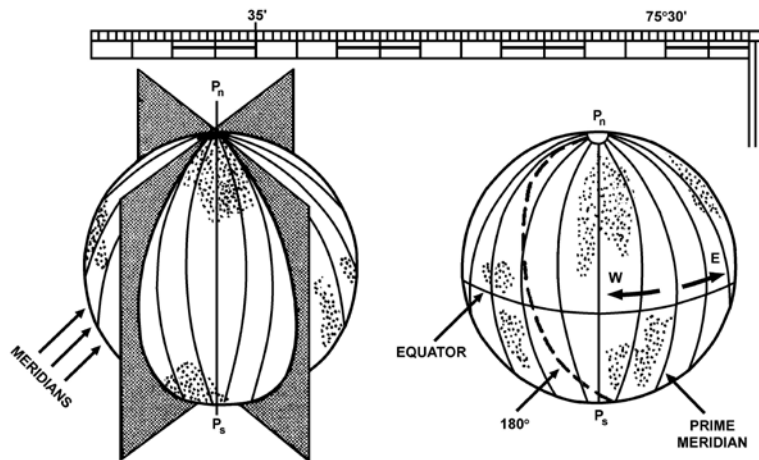


Parallels of Latitude



## Meridians

- A meridian is a great circle formed by a plane, which cuts through the earth's axis and its poles. Such circles are termed meridians of longitude.
- The meridian which passes through Greenwich, England, by international convention, has been selected as  $000^\circ$  and is called the Prime Meridian. From this point, longitude is measured both east and west for  $180^\circ$ .
- The  $180^\circ$  meridian is on the exact opposite side of the earth from the  $000^\circ$  meridian. The International Date Line generally conforms to the 180th meridian. The great circle of the Prime Meridian and the International Date Line divide the earth into eastern and western hemispheres.
- A degree of longitude equals 60 miles only at the equator and is undefined at the poles since all meridians meet there at one point. Meridians of Longitude run in a north and south direction (top to bottom on a chart) and are measured in degrees, minutes, and seconds, in an east or west direction.

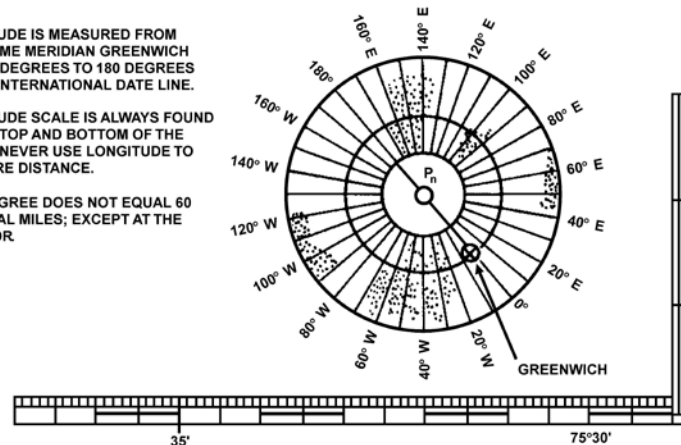


MERIDIANS OF LONGITUDE ARE FORMED ON THE EARTH'S SURFACE BY GREAT CIRCLES WHICH PASS THROUGH THE NORTH AND SOUTH POLES AND ARE MEASURED EAST AND WEST.

LONGITUDE IS MEASURED FROM THE PRIME MERIDIAN GREENWICH "ZERO" DEGREES TO 180 DEGREES AT THE INTERNATIONAL DATE LINE.

LONGITUDE SCALE IS ALWAYS FOUND ON THE TOP AND BOTTOM OF THE CHART. NEVER USE LONGITUDE TO MEASURE DISTANCE.

ONE DEGREE DOES NOT EQUAL 60 NAUTICAL MILES; EXCEPT AT THE EQUATOR.



## Meridians of Longitude

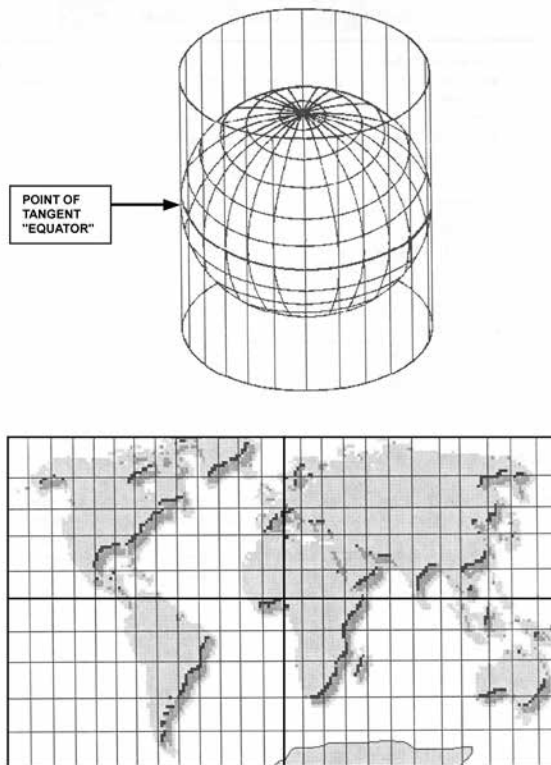
### Rhumb Line

- Typical boat navigation is done by plotting rhumb lines on a Mercator chart. A rhumb line is an imaginary line that intersects all meridians at the same angle. The rhumb line on the surface of a sphere is a curved line. On most nautical charts, this curved line (rhumb) is represented as a straight line.
- A course line, such as a compass course, is a rhumb line that appears as a straight line on a Mercator chart. Navigating with a rhumb line course allows the helmsman to steer a constant heading (disregarding wind, current, etc.).

### Chart Projections

- For the purpose of coastal navigation, the earth is considered to be a perfect sphere. To represent the features of the earth's spherical surface on the flat surface of a chart, a process termed "projection" is used.

Mercator charts are the primary charts used aboard boats. A Mercator projection is made by transferring the surface of the globe (representing the earth) onto a cylinder. The equator is the reference point for accomplishing the projection from one geometric shape to another. The distinguishing feature of the Mercator projection is that the meridians are projected so they appear to be equal distance from each other and parallel. The North and South poles cannot be shown on a Mercator chart. Only the latitude scale is used for measuring distance.



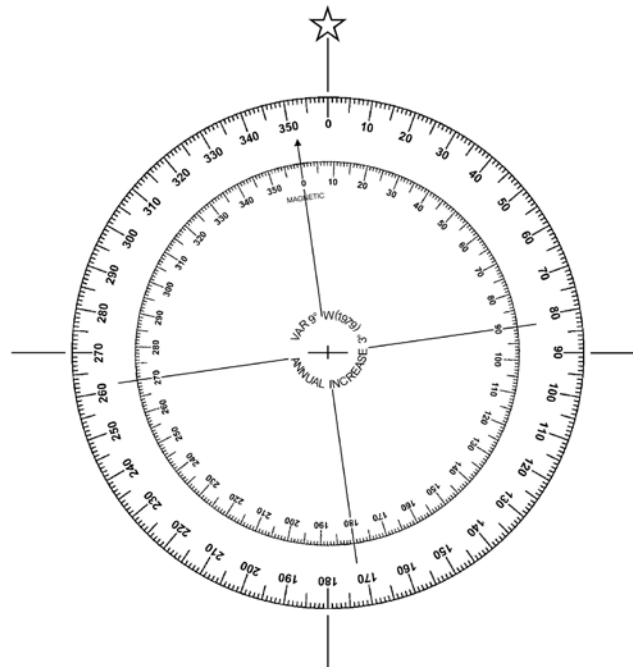
**Mercator Projection**

## Nautical Charts

- The nautical chart is one of the mariner's most useful and most widely used navigational aids. Navigational charts contain a lot of information of great value to you as a boat operator.

## Compass Rose

- Nautical charts usually have one or more compass roses printed on them. These are similar in appearance to the compass card and, like the compass card, are oriented with north at the top. Directions on the chart are measured by using the compass rose. Direction is measured as a straight line from the center point of the circle to a number on the compass rose.
- True Direction is printed around the outside of the compass rose.
- Magnetic direction is printed around the inside of the compass rose. An arrow points to magnetic north.

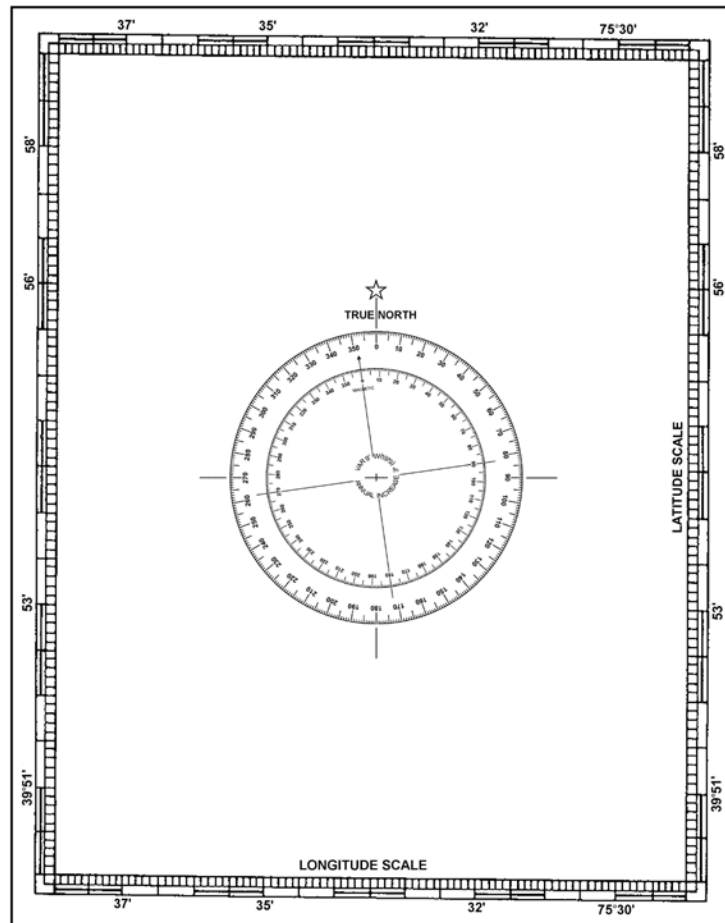


**Compass Rose**

- Variation, the difference between true and magnetic north for the particular area covered by the chart, is printed in the middle of the compass rose (as well as any annual change).

### Basic Chart Information

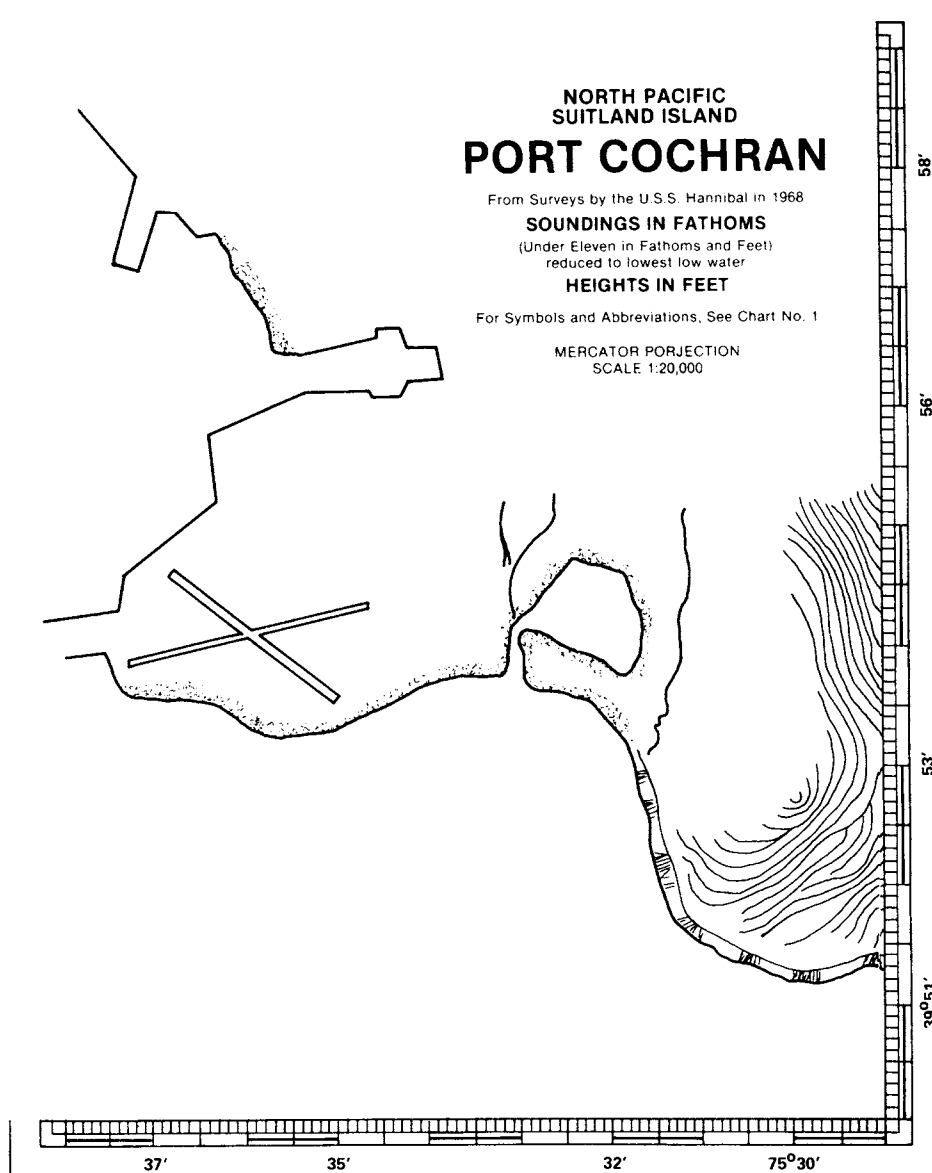
- The nautical chart shows channels, depth of water buoys, lights, lighthouses, prominent landmarks, rocks, reefs, sandbars, and much more useful information for the safe piloting of the boat. The chart is the most essential part of all piloting equipment. Below are some basic facts to know about charts:
  - a. Charts are oriented with north at the top.
  - b. The frame of reference for all chart construction is the system of latitude and longitude.
  - c. Any location on a chart can be expressed in terms of latitude or longitude.
  - d. The latitude scale runs along both sides of the chart.
  - e. The longitude scale runs across the top and bottom of the chart.
  - f. Latitude lines are reference points in a north and south direction with the equator as their zero reference point.
  - g. Longitude lines are the east and west reference points with the prime meridian as their zero reference point.



**Chart Orientation**

## Title Block

- The general information block contains the following items:
  - a. The chart title, which is usually the name of the prominent navigable body of water within the area covered in the chart.
  - b. The survey information on which a chart is based is found near the chart title.
  - c. A statement of the type of projection and the scale.
  - d. The unit of depth measurement, listed as soundings (feet, meters, or fathoms).



**Title Block of Chart**

### Notes

- Notes are found in various places on the chart, such as along the margins or on the face of the chart. They may contain information that cannot be presented graphically, such as:
  - a. The meaning of abbreviations used on the chart.
  - b. Special notes of caution regarding danger.
  - c. Tidal information.

### Edition Number

- The edition number of a chart and latest revisions indicate when information on the chart was updated.
  - a. The edition number and date of the chart are located in the margin of the lower left hand corner.
  - b. The latest revision date immediately follows in the lower left hand corner below the border of the chart. Charts show all essential corrections concerning lights, beacons, buoys, and dangers that have been received to the date of issue.
  - c. Tidal information.
- Corrections occurring after the date of issue are published in the Notice to Mariners and must be entered by hand on the chart of your local area on receipt of the notice.

### Scale of Chart

- The scale of a nautical chart is the ratio comparing a unit of distance on the chart to the actual distance on the surface of the earth.
- For example: The scale of 1:5,000,000 means that one of some kind of measurement of the chart is equal to 5,000,000 of the same kind of measurement on the earth's surface. One inch on the chart would equal 5,000,000 inches on the earth's surface. This would be a small scale chart, since the ratio 1/5,000,000 is a very small number.
- A large-scale chart represents a smaller area than that of a small-scale chart. There is no firm separation between large scale and small scale.
- Remember large-scale is for small area, and small scale is for large area. For example, the scale of 1:2,500 (one inch on chart equals 2,500 inches on the earth's surface) is a much larger number and is referred to as a large-scale chart.

## Sailing Charts

- Sailing charts are produced at scales of 1:600,000 and smaller. They are used in fixing the mariner's position for approach to the coast, from the open ocean, or for sailing between distant coastal ports.

## General Charts

- General charts are produced at scales between 1:150,000 and 1:600,000. They are used for coastwise navigation outside of outlying reefs and shoals when the ship or boat is generally within sight of land or AtoN and its course can be directed by piloting techniques.

## Coastal Charts

- Coastal charts are produced at scales between 1:50,000 and 1:150,000. They are used for inshore navigation, for entering bays and harbors of considerable width, and for navigating large inland waterways.

## Harbor Charts

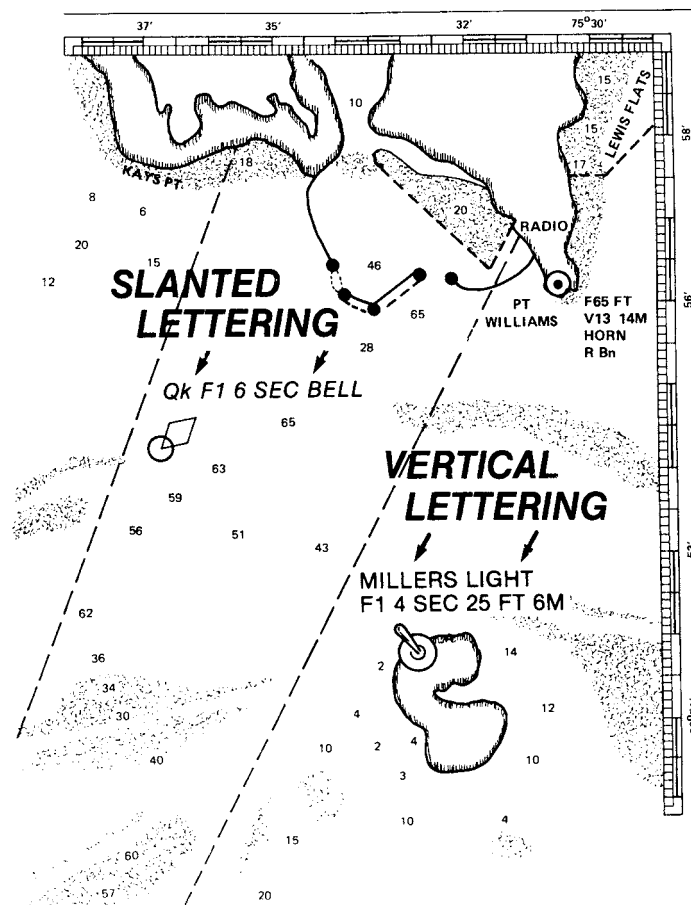
- Harbor charts are produced at scales larger than 1:50,000. They are used in harbors, anchorage areas, and the smaller waterways.

## Small Craft Charts

- Small craft charts are produced at scales of 1:40,000 and larger. There are special charts of inland waters, including the intracoastal waterways. Special editions of conventional charts, called small craft charts, are printed on lighter weight paper than a normal chart and folded.
- These "SC" charts contain additional information of interest to small craft operators, such as data on facilities, tide predictions, and weather broadcast information.

## Chart Symbols and Abbreviations

- Many symbols and abbreviations are used on charts. It is a quick way to determine the physical characteristics of the charted area and information on AtoN.
- These symbols are uniform and standardized, but may vary depending on the scale of the chart or chart series. These standardized chart symbols and abbreviations are shown in the pamphlet “CHART No. 1,” published jointly by the Defense Mapping Agency Hydrographic Center and the National Ocean Service.
- Nearly all charts employ color to distinguish various categories of information such as shoal water, deepwater, and land areas. Color is also used with Aids to Navigation (AtoN) to make them easier to locate and interpret. Nautical purple ink (magenta) is used for most information since it is easier to read under red light normally used for navigating at night.
- Lettering on a chart provides valuable information. Slanted Roman lettering on the chart is used to label all information that is affected by tidal change or current (with the exception of bottom soundings). All descriptive lettering for floating AtoN is found in slanted lettering.
- Vertical Roman lettering on the chart is used to label all information that is not affected by the tidal changes or current. Fixed aids such as lighthouses and ranges are found in vertical lettering.



**Chart Lettering**



## Buoy Symbols

- Buoys are shown with the following symbols:
  - a. The basic symbol for a buoy is a diamond and small circle.
  - b. A dot will be shown instead of the circle on older charts.
  - c. The diamond may be above, below, or alongside the circle or dot.
  - d. The small circle or dot denotes the approximate position of the buoy mooring.
  - e. The diamond is used to draw attention to the position of the circle or dot and to describe the aid.

## Other Chart Symbols

- Lighthouses and Other Fixed Lights

The basic symbol is a black dot with a magenta “flare” giving much the appearance of a large exclamation mark (!). Major lights are named and described; minor lights are described only.

- Ranges

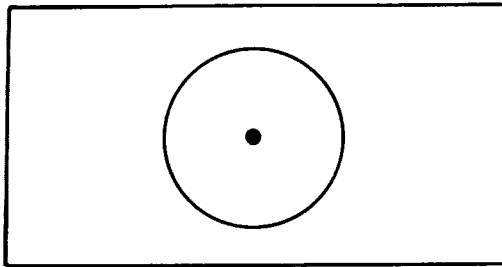
Ranges are indicated on charts by symbols for the lights (if lighted) and dashed line indicating the direction of the range.

- Daybeacons

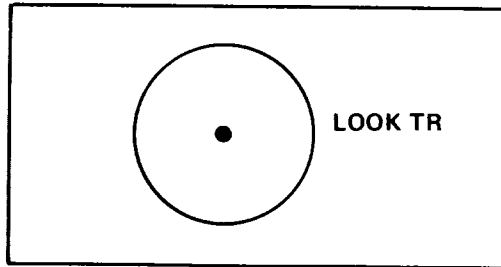
Daybeacons are indicated by small triangles or squares, which may be colored to match the aid. Daybeacons, also commonly called day marks, are always fixed aids. That is, they are on a structure secured to the bottom or on the shore. They are of many different shapes.

- Prominent Landmarks

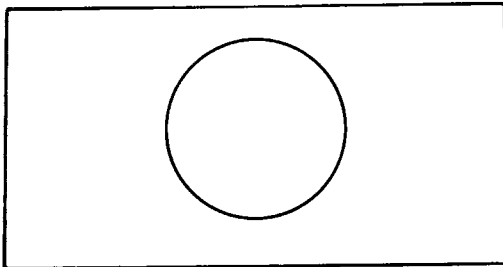
Prominent landmarks, such as water towers, smoke stacks, and flagpoles, are pinpointed by a standard symbol of a dot surrounded by a circle. A notation next to the symbol defines the landmark’s nature. The omission of the dot indicates the location of the landmark is only an approximation.



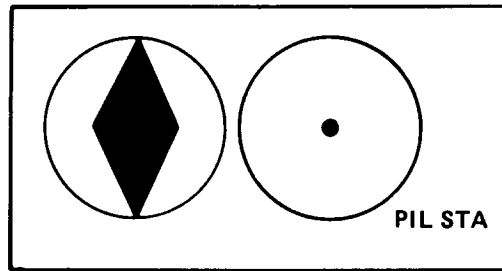
LANDMARK ( POSITION ACCURATE )



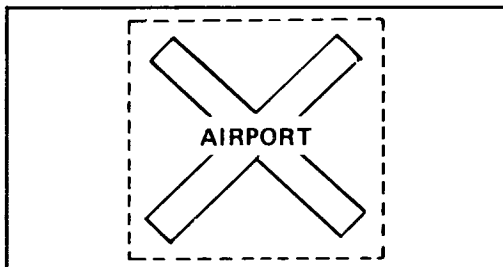
LOOKOUT STATION; WATCH TOWER



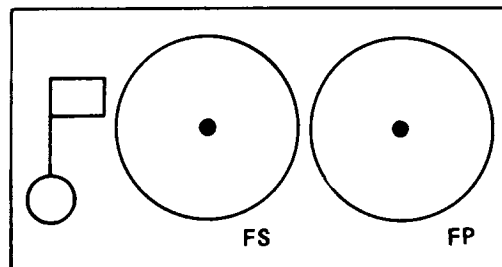
LANDMARK ( POSITION APPROXIMATE )



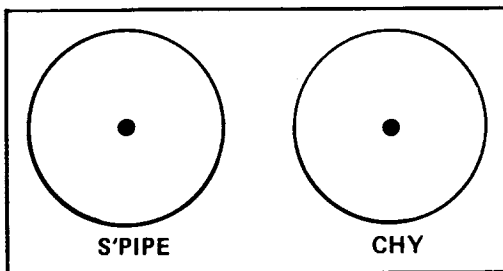
PILOT STATION



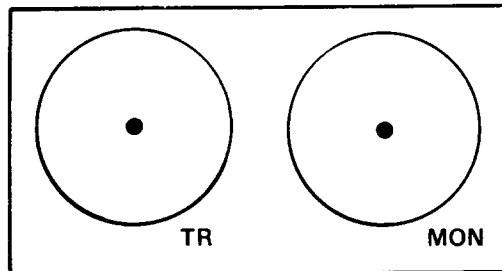
AIRPLANE LANDING FIELD



FLAG STAFF; FLAG POLE



STAND PIPE; CHIMNEY



TOWER; MONUMENT

### Symbols for Prominent Landmarks

## Wrecks, Rocks, and Reefs

- These are marked with standardized symbols, for example, a sunken wreck may be shown either by a symbol or by an abbreviation plus a number that gives the wreck's depth at mean low or lower low water. A dotted line around any symbol calls special attention to its hazardous nature.

BREAKERS			CORAL REEF OVER WHICH DEPTH IS SHOWN AT MEAN LOW WATER
EDDIES			ROCKY REEF OVER WHICH DEPTH IS SHOWN AT MEAN LOW WATER
TIDE RIPS			REEF LINE
WRECK ALWAYS PARTIALLY SUBMERGED			ROCK DANGEROUS TO NAVIGATION
WRECK WITH DEPTH CLEARED BY WIRE DRAG			AN AREA FOULED BY WRECKAGE, ROCKS OR CORAL
WRECK WITH DEPTH SHOWN			SUBMERGED PILING
WRECK WITH ONLY MAST VISIBLE AT MEAN LOW WATER			ROCK OVER WHICH DEPTH IS SHOWN AT MEAN LOW WATER
WRECK NOT DANGEROUS TO SURFACE NAVIGATION			ROCK NOT DANGEROUS TO NAVIGATION

## Breakers, Rocks, Reefs, Pilings

### Bottom Characteristics

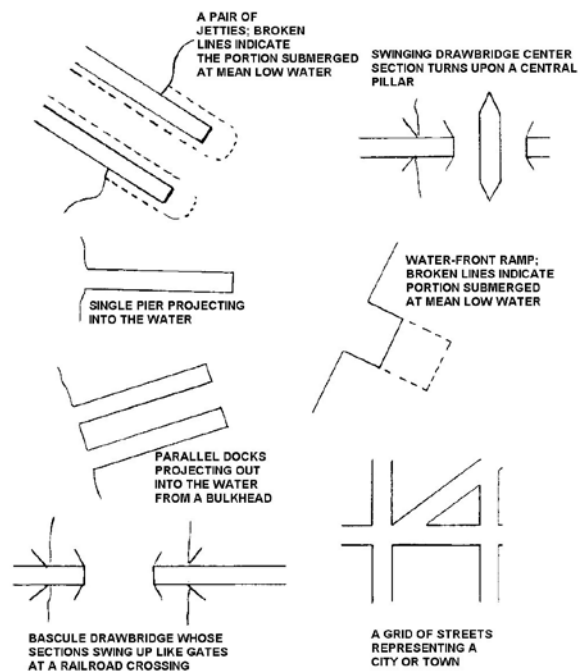
- A system of abbreviations, used alone or in combination, describes the composition of the bottom, allowing selection of the best holding ground for anchoring.

Bottom Composition Abbreviations Shown on Charts			
Abbreviation	Composition	Abbreviation	Composition
h; hrd	Hard	M	Mud; Muddy
so; sft	Soft	G	Gravel
S	Sand	Stk	Sticky
Cy; CL	Clay	Rk; rky	Rock; Rocky
St	Stone	S/M	Two layers, Sand over mud
Co	Coral	Wd	Seaweed
Co Hd	Coral Head	Grs	Grass
Sh	Shells	Oys	Oysters

Knowledge of bottom quality is very important in determining a safe anchorage.

### Structures

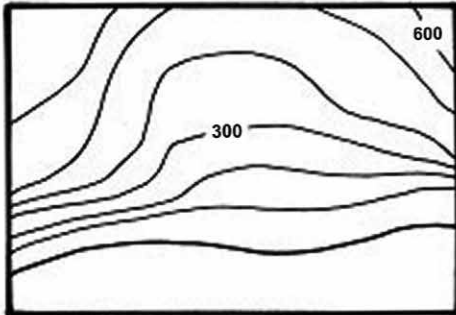
- Shorthand representations have been developed and standardized for low-lying structures such as jetties, docks, drawbridges, and waterfront ramps. Such symbols are drawn to scale and viewed from overhead.



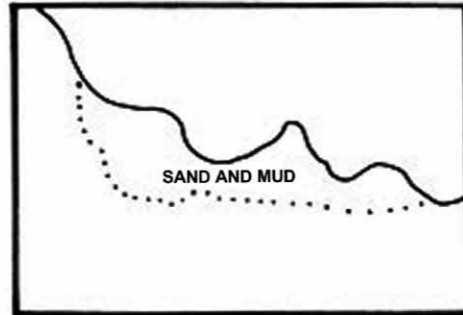
Structures

## Coastlines

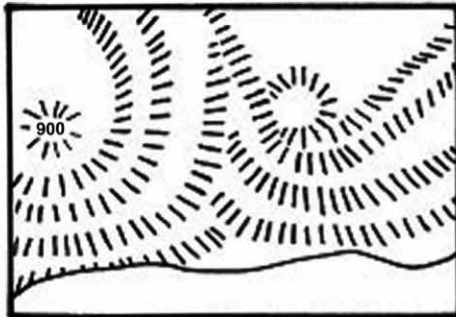
- Coastlines are viewed at both low and high water. Landmarks that may help in fixing position are noted and labeled.



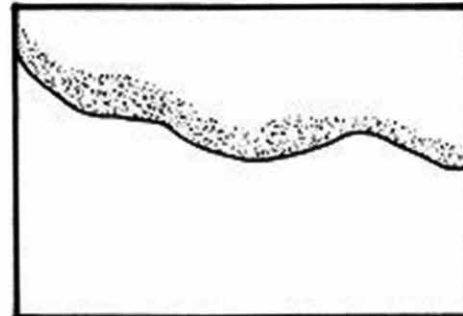
COASTAL HILLS; CONTOURED LINES INDICATE ELEVATIONS.



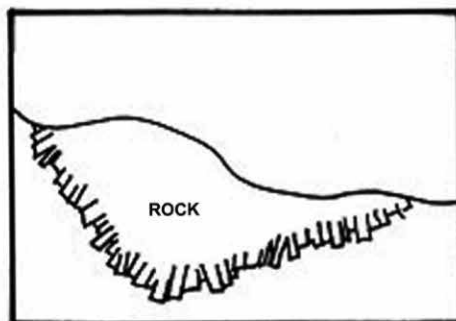
SAND AND MUD FLATS, THAT ARE EXPOSED AT MEAN LOW WATER.



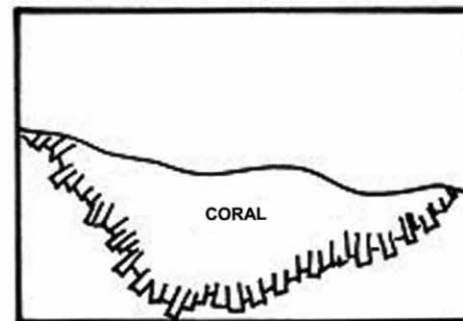
STEEP INCLINED COASTLINE; HACHURES (HATCH MARKS) ARE DRAWN IN THE DIRECTION OF THE SLOPES.



SANDY SHORE, THAT IS EXPOSED AT MEAN LOW WATER.



ROCK SHELF; UNCOVERS AT MEAN LOW WATER.



CORAL SHELF; UNCOVERS AT MEAN LOW WATER.

## Coastlines

### Accuracy of Charts

- A chart is only as accurate as the survey on which it is based. Major disturbances, such as hurricanes and earthquakes, cause sudden and extensive changes in the bottom contour. Even everyday forces of wind and waves cause changes in channels and shoals. The prudent sailor must be alert to the possibilities of changes in conditions and inaccuracies of charted information.
- Compromise is sometimes necessary in chart production as various factors may prevent the presentation of all data that has been collected for a given area. The information shown must be presented so that it can be understood with ease and certainty.
- In order to judge the accuracy and completeness of a survey, the following should be noted:
  - a. Source and date
  - b. Testing
  - c. Full or sparse soundings
  - d. Blank spaces among sounding
- The source and date of the chart are generally given in the title along with the changes that have taken place since the date of the survey. The earlier surveys often were made under circumstances that precluded great accuracy of detail.
- Until a chart based on such a survey is tested, it should be regarded with caution. Except in well-frequented waters, few surveys have been so thorough as to make certain that all dangers have been found.
- Noting the fullness or scantiness of the soundings is another method of estimating the completeness of the survey, but it must be remembered that the chart seldom shows all soundings that were obtained. If the soundings are sparse or unevenly distributed, it should be taken for granted, as a precautionary measure, that the survey was not in great detail.
- Large or irregular blank spaces among soundings mean that no soundings were obtained in those areas. Where the nearby soundings are deep, it may logically be assumed that in the blanks the water is also deep. When the surrounding water is shallow, or if the local charts show that reefs are in the area, such blanks should be regarded with suspicion. This is especially true in coral areas and off rocky coasts. These areas should be given wide berth.

---

# Introduction to Navigation

## Word Problems

---

1. What defines a great circle?
  - A. A curved line drawn on a Mercator Chart
  - B. A course line that inscribes a loxodromic curve
  - C. The shortest distance between any two points on the earth
  - D. The smallest circle that can be drawn on the face of a sphere
2. What is a characteristic of a rhumb line?
  - A. It is the shortest distance between two points on the Earth.
  - B. It plots as a straight line on a Lambert conformal chart.
  - C. It intersects each meridian at the same angle.
  - D. The course angle constantly changes to form the loxodromic curve.
3. What is the major advantage of a rhumb line track?
  - A. The vessel can steam on a constant heading (disregarding wind, current, etc.).
  - B. The rhumb line is the shortest distance between the arrival and departure points.
  - C. It is easily plotted on a gnomonic chart for comparison with a great circle course.
  - D. It approximates a great circle on east-west courses in high latitudes.
4. For navigational purposes, each great circle on the Earth has a length of \_\_\_\_\_.
  - A. 3,600 miles
  - B. 5,400 miles
  - C. 12,500 miles
  - D. 21,600 miles
5. A Mercator chart is a \_\_\_\_\_.
  - A. cylindrical projection
  - B. simple conic projection
  - C. polyconic projection
  - D. rectangular projection

6. Which statement is TRUE concerning a Mercator projection?
  - A. Degrees of longitude decrease in length as latitude increases.
  - B. The length of the meridians is increased to provide for equal expansion in all directions.
  - C. The mileage between the meridians is increased as the latitude increases.
  - D. All of the above
  
7. What area of the earth cannot be shown on a standard Mercator chart?
  - A. Equator
  - B. Areas including both North and South latitudes
  - C. North and South Poles
  - D. A narrow band along the central meridian
  
8. On a Mercator chart, 1 nautical mile is equal to \_\_\_\_\_.
  - A. 1 minute of longitude
  - B. 1 degree of longitude
  - C. 1 minute of latitude
  - D. 1 degree of latitude
  
9. The revision date of a chart is printed on which area of the chart?
  - A. Top center
  - B. Lower-left corner
  - C. Part of the chart title
  - D. Any clear area around the neat line
  
10. The survey information upon which a chart is based is found \_\_\_\_\_.
  - A. at the top center of the next line
  - B. near the chart title
  - C. at the lower left corner
  - D. at any convenient location



---

# Answer Key

---

1. C
2. C
3. A
4. D
5. A
6. B
7. C
8. C
9. B
10. B



# MARINERS LEARNING SYSTEM™

PROVIDING KNOWLEDGE AND KNOWHOW... ANYTIME, ANYWHERE

## About Mariners Learning System

The Mariners Learning System™ is the go-to place for education and information for obtaining a Captain's License. Fully certified by the U.S. Coast Guard, Mariners Learning System™ has helped thousands of students pass their Captain's exam each year with a national pass rate of 98.7%.

As an unrivaled alternative to traditional testing methods, the approved courses are designed to give you the knowledge and know-how to earn your Captain's license conveniently from anywhere you have access to the internet.

This learning method, refined and perfected by years of experience, has proven remarkably effective and is the reason Mariners Learning System™ has one of the highest success rates in the industry.

## CONTACT A LICENSING SPECIALIST TODAY!

**TOLL FREE:** 1-866-732-2278

**WEB:** [www.MarinersLearningSystem.com](http://www.MarinersLearningSystem.com)

**EMAIL:** [Staff@MarinersLearningSystem.com](mailto:Staff@MarinersLearningSystem.com)