U.S. Department of Homeland Security

United States Coast Guard

# LIGHT LIST

## Volume I

## ATLANTIC COAST

St. Croix River, Maine to Shrewsbury River, New Jersey

This Light List contains a list of lights, sound signals, buoys, daybeacons, and other aids to navigation.

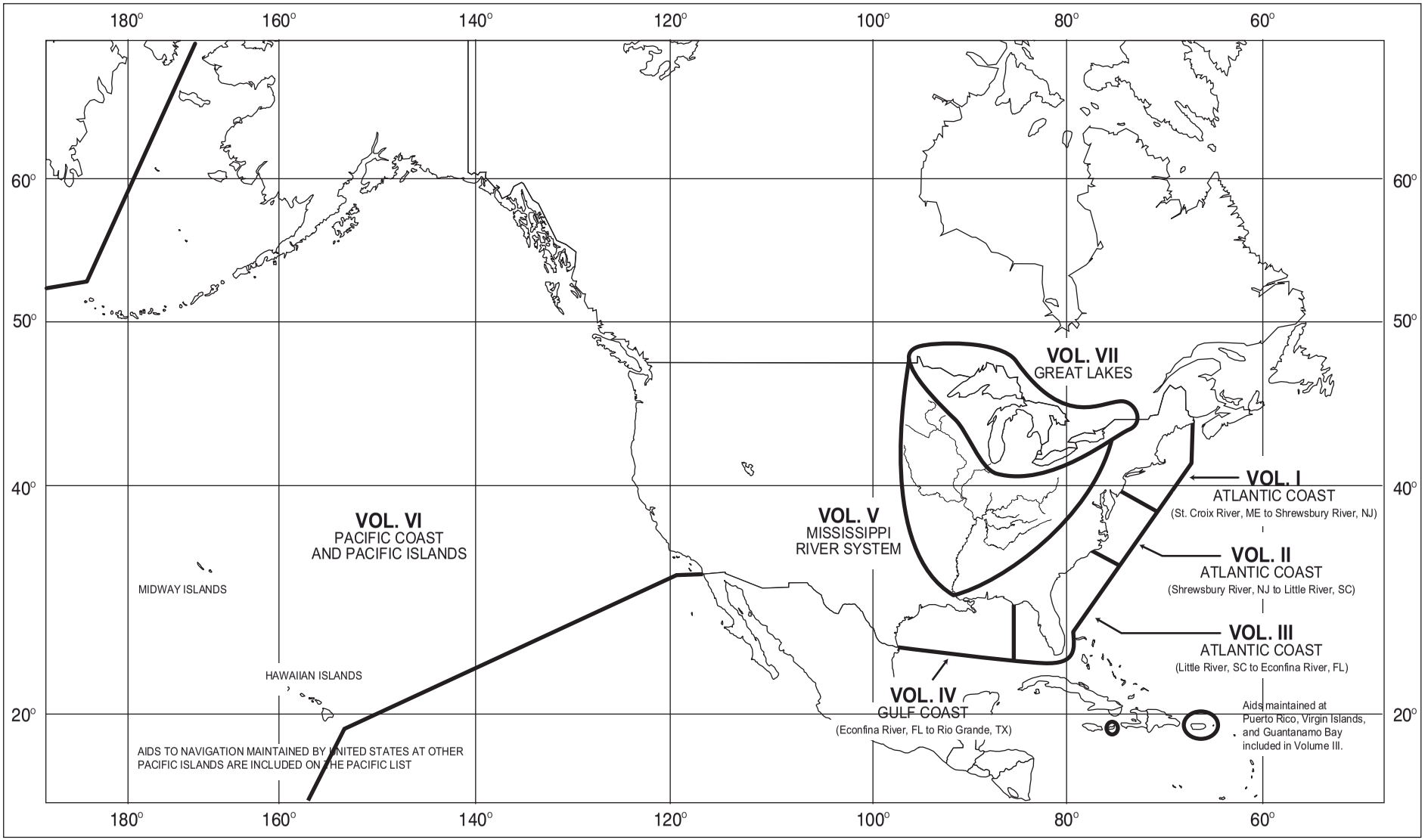
**IMPORTANT**
**THIS LIGHT LIST SHOULD BE CORRECTED EACH WEEK FROM THE LOCAL NOTICES TO MARINERS OR NOTICES TO MARINERS AS APPROPRIATE.**

2017

COMDTPUB P16502.1

LIMITS OF LIGHT LISTS PUBLISHED BY

# U.S. COAST GUARD



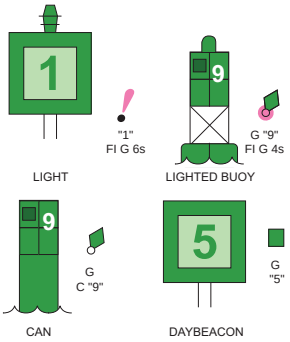
# U.S. AIDS TO NAVIGATION SYSTEM
## on navigable waters except Western Rivers

## LATERAL SYSTEM AS SEEN ENTERING FROM SEAWARD

### PORT SIDE
### ODD NUMBERED AIDS

GREEN LIGHT ONLY

FLASHING (2)
FLASHING
OCCULTING
QUICK FLASHING
ISO

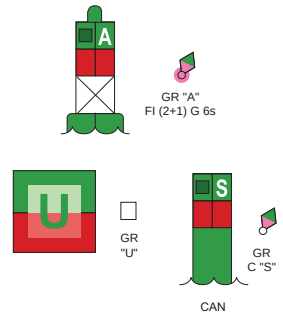



### PREFERRED CHANNEL
### NO NUMBERS - MAY BE LETTERED

PREFERRED
CHANNEL TO
STARBOARD
TOPMOST BAND
GREEN

GREEN LIGHT ONLY

COMPOSITE GROUP FLASHING (2+1)

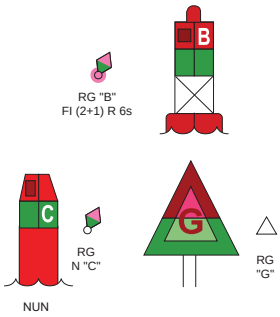



### PREFERRED CHANNEL
### NO NUMBERS - MAY BE LETTERED

PREFERRED
CHANNEL TO
PORT
TOPMOST BAND
RED

RED LIGHT ONLY

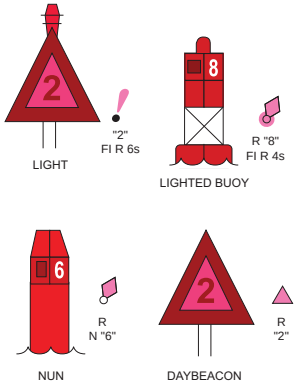
COMPOSITE GROUP FLASHING (2+1)




### STARBOARD SIDE
### EVEN NUMBERED AIDS

RED LIGHT ONLY

FLASHING (2)
FLASHING
OCCULTING
QUICK FLASHING
ISO

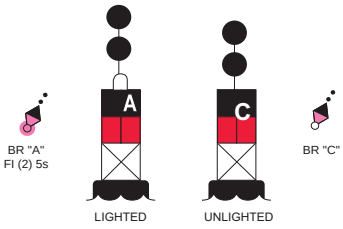



## AIDS TO NAVIGATION HAVING NO LATERAL SIGNIFICANCE

### ISOLATED DANGER
### NO NUMBERS - MAY BE LETTERED

WHITE LIGHT ONLY

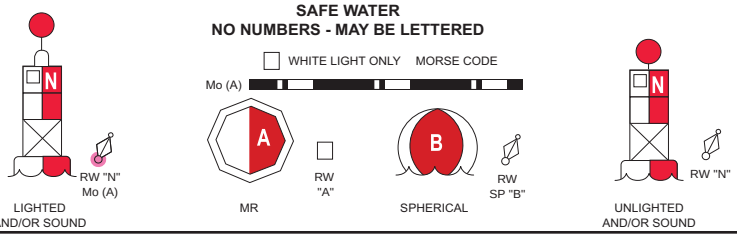
Fl (2) 5s




### SAFE WATER
### NO NUMBERS - MAY BE LETTERED

WHITE LIGHT ONLY  MORSE CODE

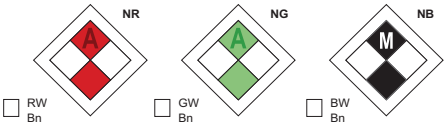
Mo (A)



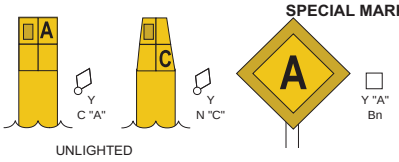

### RANGE DAYBOARDS MAY BE LETTERED


### DAYBOARDS - MAY BE LETTERED

WHITE LIGHT ONLY

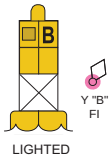



### SPECIAL MARKS - MAY BE LETTERED

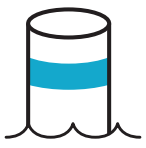



YELLOW LIGHT ONLY
FIXED
FLASHING

SHAPE OPTIONAL--BUT SELECTED TO BE APPROPRIATE FOR THE POSITION OF THE MARK IN RELATION TO THE NAVIGABLE WATERWAY AND THE DIRECTION OF BUOYAGE.




Aids to Navigation marking the Intracoastal Waterway (ICW) display unique yellow symbols to distinguish them from aids marking other waters. Yellow triangles △ indicate aids should be passed by keeping them on the starboard (right) hand of the vessel. Yellow squares ■ indicate aids should be passed by keeping them on the port (left) hand of the vessel. A yellow horizontal band ▬ provides no lateral information, but simply identifies aids as marking the ICW.



MOORING
BUOY

WHITE WITH BLUE BAND

MAY SHOW WHITE
REFLECTOR OR LIGHT

### TYPICAL INFORMATION AND REGULATORY MARKS

INFORMATION AND REGULATORY MARKERS

WHEN LIGHTED, INFORMATION AND REGULATORY MARKS MAY DISPLAY ANY WHITE LIGHT RHYTHM EXCEPT QUICK FLASHING, Mo(A), AND FLASHING (2)



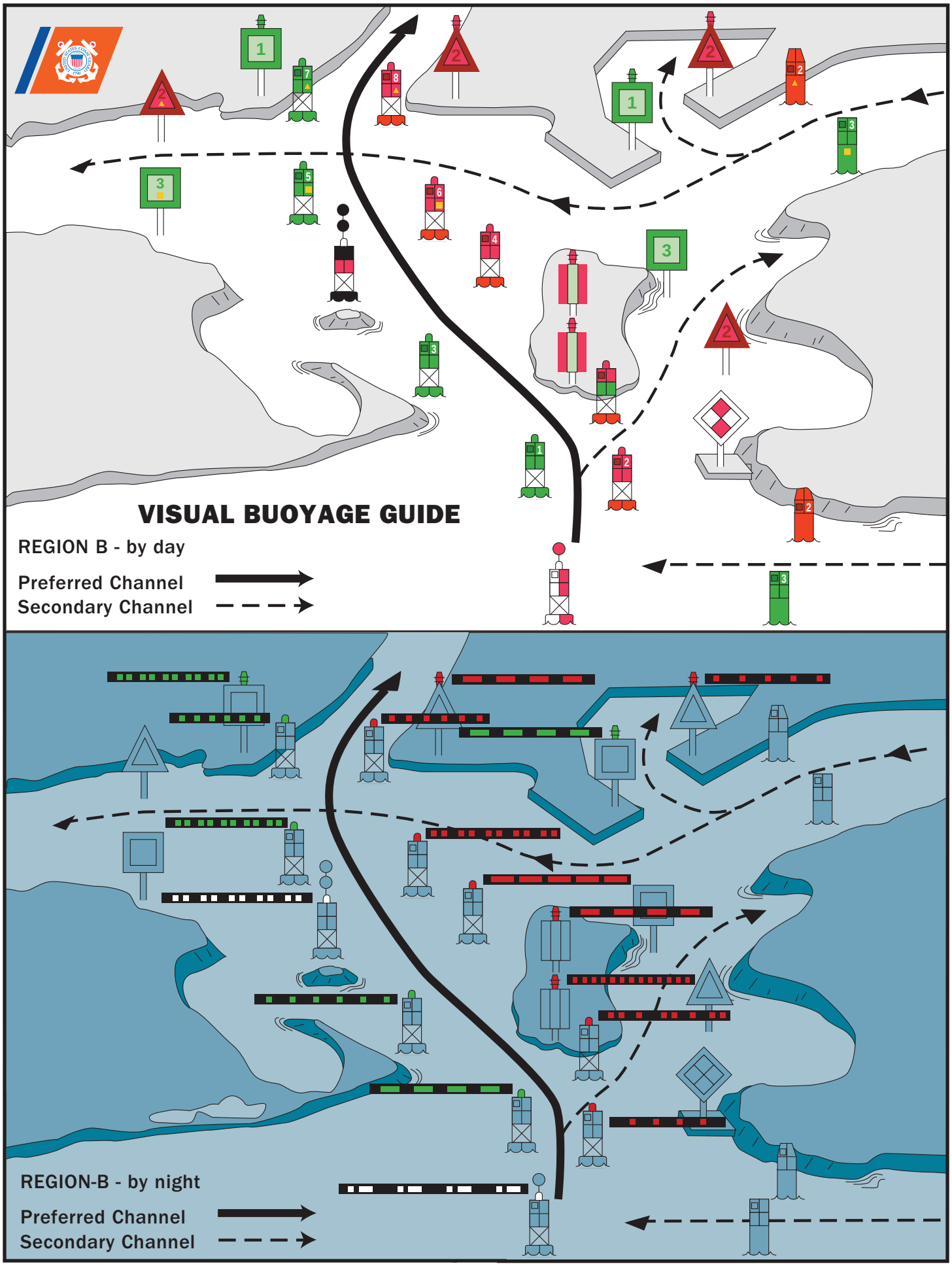
EXPLAINATION MAY BE PLACED OUTSIDE THE CROSSED DIAMOND SHAPE, SUCH AS DAM, RAPIDS, SWIM AREA, ETC.

THE NATURE OF DANGER MAY BE INDICATED INSIDE THE DIAMOND SHAPE, SUCH AS ROCK, WRECK, SHOAL, DAM, ETC.

TYPE OF CONTROL IS INDICATED IN THE CIRCLE, SUCH AS SLOW, NO WAKE, ANCHORING, ETC.


FOR DISPLAYING INFORMATION SUCH AS DIRECTIONS, DISTANCES, LOCATIONS, ETC.

PLATE 1


VISUAL BUOYAGE GUIDE
REGION B - by day
Preferred Channel
Secondary Channel
REGION-B - by night
Preferred Channel
Secondary Channel

# FICTITIOUS NAUTICAL CHART

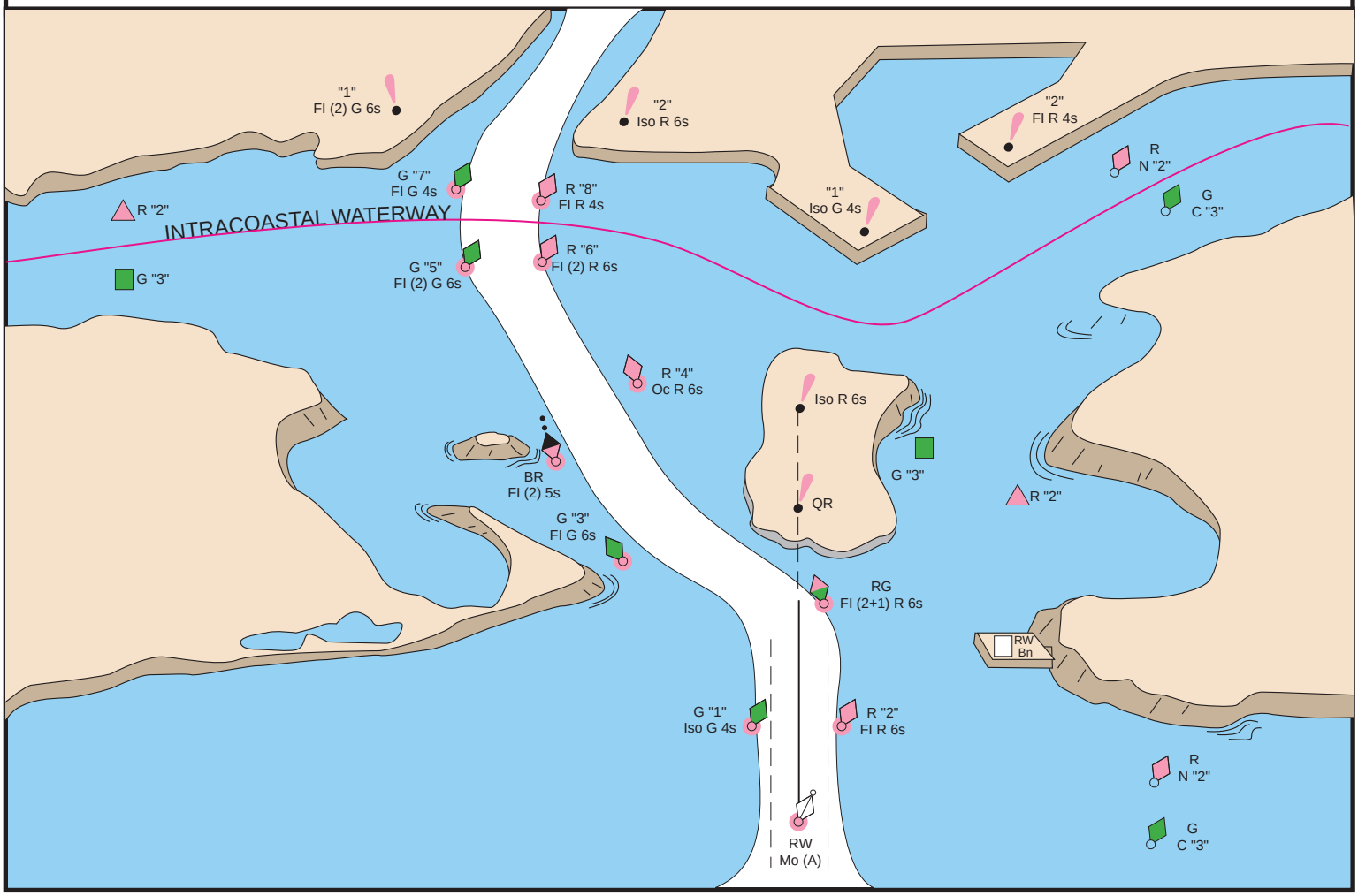



PLATE 3

# U.S. AIDS TO NAVIGATION SYSTEM

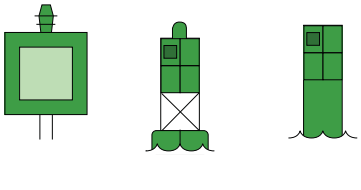
## on the Western River System

## AS SEEN ENTERING FROM SEAWARD

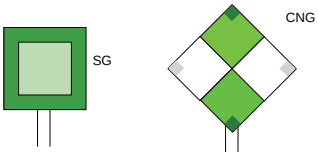
### PORT SIDE
OR RIGHT DESCENDING BANK

GREEN OR WHITE LIGHTS

FLASHING
ISO



LIGHT LIGHTED BUOY CAN



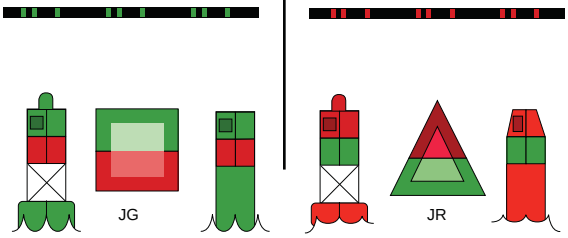

PASSING DAYBEACON CROSSING DAYBEACON

176.9
MILE BOARD

### PREFERRED CHANNEL
MARK JUNCTIONS AND OBSTRUCTIONS
COMPOSITE GROUP FLASHING (2+1)

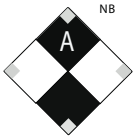
PREFERRED CHANNEL TO STARBOARD
TOPMOST BAND GREEN
FI (2+1) G

PREFERRED CHANNEL TO PORT
TOPMOST BAND RED
FI (2+1) R




### DAYBOARDS HAVING NO LATERAL SIsignificance

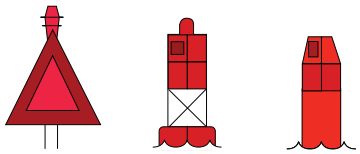
MAY BE LETTERED WHITE LIGHT ONLY




### STARBOARD SIDE
OR LEFT DESCENDING BANK

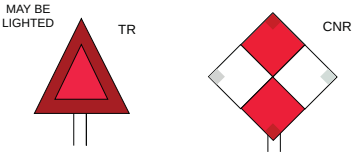
RED OR WHITE LIGHTS

FLASHING (2)
ISO



LIGHT LIGHTED BUOY NUN

MAY BE LIGHTED




PASSING DAYBEACON CROSSING DAYBEACON

123.5
MILE BOARD

### SPECIAL MARKS--MAY BE LETTERED


UNLIGHTED LIGHTED

SHAPE: OPTIONAL--BUT SELECTED TO BE APPROPRIATE FOR THE POSITION OF THE MARK IN RELATION TO THE NAVIGABLE WATERWAY AND THE DIRECTION OF BUOYAGE.

YELLOW LIGHT ONLY
FIXED
FLASHING

MOORING BUOY
WHITE WITH BLUE BAND

MAY SHOW WHITE REFLECTOR OR LIGHT

### TYPICAL INFORMATION AND REGULATORY MARKS

INFORMATION AND REGULATORY MARKERS

WHEN LIGHTED, INFORMATION AND REGULATORY MARKS MAY DISPLAY ANY LIGHT RHYTHM EXCEPT QUICK FLASHING, Mo(a) AND FLASHING (2)

NW WHITE LIGHT ONLY



BOAT EXCLUSION AREA

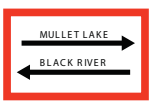
EXPLAINATION MAY BE PLACED OUTSIDE THE CROSSED DIAMOND SHAPE, SUCH AS DAM, RAPIDS, SWIM AREA, ETC.


DANGER

THE NATURE OF DANGER MAY BE INDICATED INSIDE THE DIAMOND SHAPE, SUCH AS ROCK, WRECK, SHOAL, DAM, ETC.

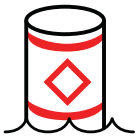

CONTROLLED AREA

TYPE OF CONTROL IS INDICATED IN THE CIRCLE, SUCH AS SLOW, NO WAKE, ANCHORING, ETC.




INFORMATION

FOR DISPLAYING INFORMATION SUCH AS DIRECTIONS, DISTANCES, LOCATIONS, ETC.



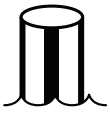
BUOY USED TO DISPLAY REGULATORY MARKERS


MAY SHOW WHITE LIGHT
MAY BE LETTERED

### STATE WATERS


INLAND (STATE) WATERS OBSTRUCTION MARK

MAY SHOW WHITE REFLECTOR OR QUICK FLASHING WHITE LIGHT



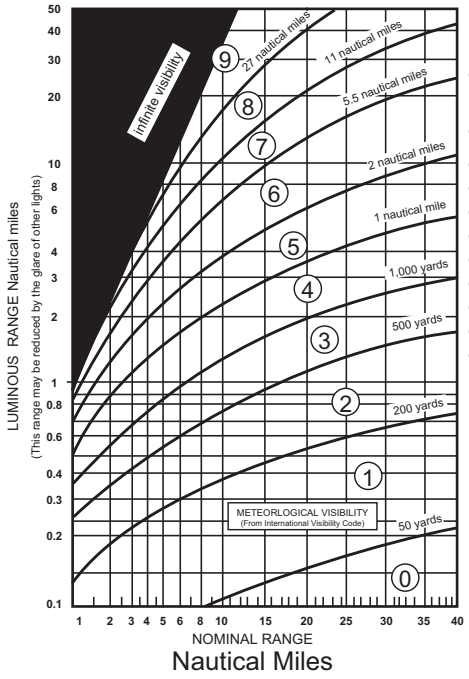
BLACK-STRIPED WHITE BUOY

Used to indicate an obstruction to navigation, extends from the nearest shore to the buoy. This means "do not pass between the buoy and the nearest shore." This aid is replacing the red and white striped buoy within the USWMS, but cannot be used until all red and white striped buoys on a waterway have been replaced.

# LUMINOUS RANGE DIAGRAM

The nominal range given in this Light List is the maximum distance a given light can be seen when the meteorological visibility is 10 nautical miles. If the existing visibility is less than 10 NM, the range at which the light can be seen will be reduced below its nominal range. And, if the visibility is greater than 10 NM, the light can be seen at greater distances. The distance at which a light may be expected to be seen in the prevailing visibility is called its luminous range.

This diagram enables the mariner to determine the approximate luminous range of a light when the nominal range and the prevailing meteorological visibility are known. The diagram is entered from the bottom border using the nominal range listed in column 6 of this book. The intersection of the nominal range with the appropriate visibility curve (or, more often, a point between two curves) yields, by moving horizontally to the left border, the luminous range.



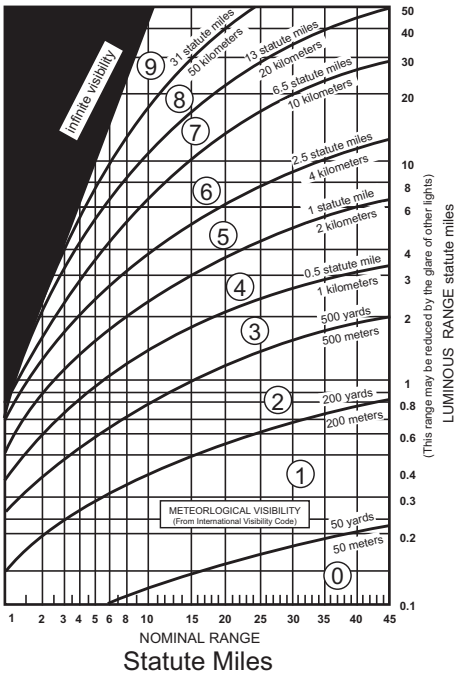

METEOROLOGICAL VISIBILITY
(From International Visibility Code)

| Code | Metric | Nautical (approximate) |
|---|---|---|
| 0 | less than 50 meters | less than 50 yards |
| 1 | 50-200 meters | 50-200 yards |
| 2 | 200-500 meters | 200-500 yards |
| 3 | 500-1,000 meters | 500-1,000 yards |
| 4 | 1-2 kilometers | 1,000-2,000 yards |
| 5 | 2-4 kilometers | 1-2 nautical miles |
| 6 | 4-10 kilometers | 2-5.5 nautical miles |
| 7 | 10-20 kilometers | 5.5-11 nautical miles |
| 8 | 20-50 kilometers | 11-27 nautical miles |
| 9 | greater than 50 km | greater than 27 nm |

CAUTION

When using this diagram it must be remembered that:

1. The ranges obtained are approximate.
2. The transparency of the atmosphere may vary between observer and light.
3. Glare from background lighting will reduce the range that lights are sighted.
4. The rolling motion of a vessel and/or of a lighted aid may reduce the distance that lights can be detected or identified.




# GEOGRAPHIC RANGE TABLE

The following table gives the approximate geographic range of visibility for an object which may be seen by an observer at sea level. It is necessary to add to the distance for the height of any object the distance corresponding to the height of the observer's eye above sea level.

| Height Feet / Meters | Distance Nautical Miles (NM) | Height Feet / Meters | Distance Nautical Miles (NM) | Height Feet / Meters | Distance Nautical Miles (NM) |
|---|---|---|---|---|---|
| 5/1.5 | 2.6 | 70/21.3 | 9.8 | 250/76.2 | 18.5 |
| 10/3.1 | 3.7 | 75/22.9 | 10.1 | 300/91.4 | 20.3 |
| 15/4.6 | 4.5 | 80/24.4 | 10.5 | 350/106.7 | 21.9 |
| 20/6.1 | 5.2 | 85/25.9 | 10.8 | 400/121.9 | 23.4 |
| 25/7.6 | 5.9 | 90/27.4 | 11.1 | 450/137.2 | 24.8 |
| 30/9.1 | 6.4 | 95/29.0 | 11.4 | 500/152.4 | 26.2 |
| 35/10.7 | 6.9 | 100/30.5 | 11.7 | 550/167.6 | 27.4 |
| 40/12.2 | 7.4 | 110/33.5 | 12.3 | 600/182.9 | 28.7 |
| 45/13.7 | 7.8 | 120/36.6 | 12.8 | 650/198.1 | 29.8 |
| 50/15.2 | 8.3 | 130/39.6 | 13.3 | 700/213.4 | 31.0 |
| 55/16.8 | 8.7 | 140/42.7 | 13.8 | 800/243.8 | 33.1 |
| 60/18.3 | 9.1 | 150/45.7 | 14.3 | 900/274.3 | 35.1 |
| 65/19.8 | 9.4 | 200/61.0 | 16.5 | 1000/304.8 | 37.0 |

Example: Determine the geographic visibility of an object, with a height above water of 65 feet, for an observer with a height of eyeof 35 feet.

Enter above table;

Height of object 65 feet= 9.4 NM
Height of observer 35 feet= 6.9 NM
Computed geographic visibility= 16.3 NM

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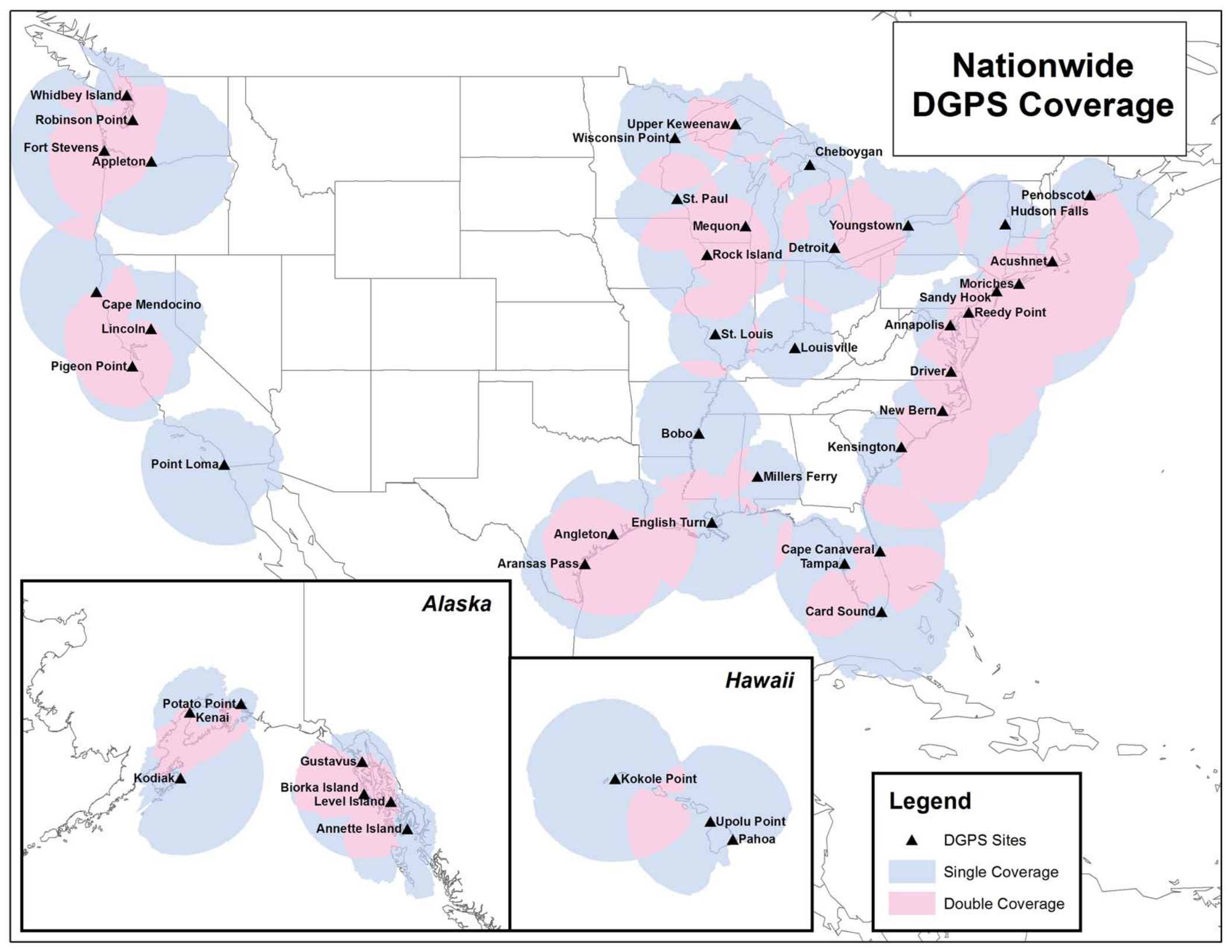
Nationwide
DGPS Coverage
Whidbey Island
Robinson Point
Fort Stevens
Appleton
Cape Mendocino
Lincoln
Pigeon Point
Point Loma
Upper Keweenaw
Wisconsin Point
Cheboygan
St. Paul
Mequon
Rock Island
Detroit
Youngstown
Penobscot
Hudson Falls
Acushnet
Moriches
Sandy Hook
Reedy Point
Annapolis
St. Louis
Louisville
Driver
New Bern
Bobo
Kensington
Millers Ferry
English Turn
Angleton
Aransas Pass
Cape Canaveral
Tampa
Card Sound
Alaska
Potato Point
Kenai
Kodiak
Gustavus
Biorka Island
Level Island
Annette Island
Hawaii
Kokole Point
Upolu Point
Pahoa
Legend
DGPS Sites
Single Coverage
Double Coverage

# COAST GUARD DISTRICT COMMANDERS

| DISTRICT | ADDRESS | WATERS OF JURISDICTION |
|---|---|---|
| FIRST | 408 Atlantic Avenue<br>Boston, MA 02110-3350<br>Tel: 617-223-8356<br>http://www.uscg.mil/d1 | Maine, New Hampshire, Massachusetts, Vermont (Lake Champlain), Rhode Island, Connecticut, New York, to Shrewsbury River, New Jersey. |
| FIFTH | Federal Building<br>431 Crawford Street<br>Portsmouth, VA 23704-5004<br>Tel: (757) 398-6486<br>(757) 398-6552<br>http://www.uscg.mil/d5 | Shrewsbury River, New Jersey to Delaware, Maryland, Virginia, District of Columbia, and North Carolina. |
| SEVENTH | Brickell Plaza Federal Building<br>909 SE 1st Avenue; Rm:406<br>Miami, FL 33131-3050<br>Tel: (305) 415-6752<br>(305) 415-6800<br>http://www.uscg.mil/d7 | South Carolina, Georgia, Florida to 83°50'W, and Puerto Rico and adjacent islands of the United States. |
| EIGHTH | Hale Boggs Federal Building<br>500 Poydras Street<br>New Orleans, LA 70130-3310<br>Tel: (504) 671-2327<br>(504) 671-2137<br>http://www.uscg.mil/d8 | Florida westward from 83°50'W, Alabama, Mississippi, Louisiana, Texas, the Mississippi River System except that portion of the Illinois River north of Joliet, Illinois. |
| NINTH | 1240 East 9th Street<br>Cleveland, OH 44199-2060<br>Tel: (216) 902-6060<br>(216) 902-6117<br>http://www.uscg.mil/d9 | Great Lakes and St. Lawrence River above St. Regis River. |
| ELEVENTH | Coast Guard Island Building 50-2<br>Alameda, CA 94501-5100<br>Tel: (510) 437-2975<br>http://www.uscg.mil/d11 | California, Nevada, Utah, Arizona. |
| THIRTEENTH | Federal Building<br>915 Second Avenue 35th Floor, Rm 3510<br>Seattle, WA 98174-1067<br>Tel: (206) 220-7270<br>(206) 220-7004<br>http://www.uscg.mil/d13 | Oregon, Washington, Idaho, and Montana. |
| FOURTEENTH | Prince Kalanianaole Federal Bldg.<br>300 Ala Moana Blvd<br>9th Floor, Room 9-220<br>Honolulu, HI 96850-4982<br>Tel: (808) 535-3409<br>(808) 535-3414<br>http://www.uscg.mil/d14 | Hawaiian, American Samoa, Marshall, Marianas, and Caroline Islands. |
| SEVENTEENTH | PO Box 25517<br>Juneau, AK 99802-5517<br>Tel: (907) 463-2029<br>(907) 463-2269<br>http://www.uscg.mil/d17 | Alaska. |

# U. S. COAST GUARD
# FIRST DISTRICT ATON UNIT LISTING

## AIDS TO NAVIGATION TEAMS

**ANT Boston**
427 Commercial St.
Boston, MA 02109-1027
Tel: (617) 223-3293

**ANT Bristol**
1 Thames St
P.O. Box 1050
Bristol, RI 02809-1050
Tel: (401) 253-9585

**ANT Long Island Sound**
120 Woodward Ave
New Haven, CT 06512-3698
Tel: (203) 468-4513

**ANT Moriches**
100 Foster Avenue
Hampton Bays, NY 11946-3233
Tel: (631) 728-6981

**ANT New York**
85 Port Terminal Blvd. Slip 6
Bayonne, NJ 07002-5041
Tel: (201) 443-6298

**ANT Saugerties**
154 Lighthouse Dr.
Saugerties, NY 12477-9101
Tel: (845) 246-7612

**ANT South Portland**
259 High St
South Portland, ME 04106-0007
Tel: (207) 767-0392

**ANT Southwest Harbor**
P.O. Box 5000
Southwest Harbor, ME 04679-5000
Tel: (207) 244-4281

**ANT Woods Hole**
1 Little Harbor Road
Woods Hole, MA 02543-1099
Tel: (508) 457-3329

## STATION

**STA Burlington**
Depot Street
Burlington, VT 05401-5226
Tel: (802) 951-6792

## BUOY TENDERS

**USCGC ABBIE BURGESS (WLM-553)**
54 Tillson Avenue
Rockland, ME 04841-3417
Tel: (207) 594-2663

**USCGC IDA LEWIS (WLM-551)**
Pier 2, NAVSTA
Newport, RI 02841-1716
Tel: (401) 841-6948

**USCGC JUNIPER (WLB 201)**
Pier 2, NAVSTA
Newport, RI 02841-1716
Tel: (401) 841-6953

**USCGC KATHERINE WALKER (WLM 552)**
85 Port Terminal Blvd. Slip #5
Bayonne, NJ 07002-5041
Tel: (201) 443-5311

**USCGC MARCUS HANNA (WLM-554)**
259 High Street
South Portland, ME 04106-0007
Tel: (207) 767-0380

**USCGC OAK (WLB 211)**
Pier 2, NAVSTA
Newport, RI 02841-1716
Tel: (401) 841-2944

## USCG NAVIGATION CENTER
## Navigation Information Service (NIS)

The U.S. Coast Guard Navigation Center (NAVCEN) is the official government source of information for civil users of the Global Positioning System (GPS). The Navigation Information Service (NIS) is available 24 hours a day, seven days a week, for all Radio Navigation and maritime related needs via phone, fax or e-mail. The NIS provides users the ability to access real time or archived GPS, NDGPS, DGPS, and LNM information at http://www.navcen.uscg.gov, as well as subscribe to an automated list service which enables users to receive GPS status messages and Notice to NAVSTAR User (NANU) messages via direct Internet e-mail.

The NAVCEN also disseminates GPS and DGPS safety advisory broadcast messages through USCG broadcast stations utilizing VHF-FM voice, HF-SSB voice, and NAVTEX broadcasts. The broadcasts provide the GPS and DGPS user in the marine environment with the current status of the navigation systems, as well as any planned/unplanned system outages that could affect GPS and DGPS navigational accuracy.

To comment on any of these services or ask questions about the service offered, contact the NAVCEN at:

**Commanding Officer**
**U.S. Coast Guard NAVCEN (NIS)**
**MS 7310**
**7323 Telegraph Road**
**Alexandria, VA 20598-7310**
Phone: (703) 313-5900
FAX: (703) 313-5920
Internet: http://www.navcen.uscg.gov

**This Light List is corrected through First Coast Guard District Local Notice to Mariners No. 01/17**

**and through National Geospatial-Intelligence Agency (NGA) Notice to Mariners No. 01/17**

**The 2017 edition supersedes the 2016 print edition.**

## RECORD OF CORRECTIONS

### YEAR 2017

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|---|---|---|---|---|
| 1..... | 2..... | 3..... | 4..... | 5..... |
| 6..... | 7..... | 8..... | 9..... | 10..... |
| 11..... | 12..... | 13..... | 14..... | 15..... |
| 16..... | 17..... | 18..... | 19..... | 20..... |
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| 31..... | 32..... | 33..... | 34..... | 35..... |
| 36..... | 37..... | 38..... | 39..... | 40..... |
| 41..... | 42..... | 43..... | 44..... | 45..... |
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| 51..... | 52..... | | | |

### YEAR 2018

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# PREFACE

Lights and other marine aids to navigation, maintained by or under authority of the U.S. Coast Guard and located on waters used by general navigation, are described in the Light List. This volume includes aids located in Maine, New Hampshire, Massachusetts, Vermont (Lake Champlain), Rhode Island, Connecticut and New York to Shrewsbury River, New Jersey.

Included are all Coast Guard aids to navigation used for general navigation such as lights, sound signals, buoys, daybeacons, and other aids to navigation. Not included are some buoys having no lateral significance, such as special purpose, anchorage, fish net, and dredging.

**Aids to Navigation Link:** http://www.uscgboating.org

CAUTION: Mariners attempting to pass a buoy close aboard risk collision with a yawing buoy or with the obstruction, which the buoy marks. Mariners must not rely on buoys alone for determining their positions due to factors limiting buoy reliability.

## PRIVATE AIDS TO NAVIGATION

Included: Class I aids to navigation on marine structures or other works which the owners are legally obligated to establish, maintain, and operate as prescribed by the Coast Guard.

Included: Class II aids to navigation exclusive of Class I, located in waters used by general navigation.

Not included: Class III aids to navigation exclusive of Class I and Class II, located in waters not ordinarily used by general navigation.

This Light List is published electroniclly annually and is intended to furnish more complete information concerning aids to navigation than can be conveniently shown on charts. This Light List is not intended to be used in place of charts or Coast Pilots. Charts should be consulted for the location of all aids to navigation. It may be dangerous to use aids to navigation without reference to charts.

This list is corrected to the date of the notices to mariners shown on the title page. Changes to aids to navigation during the year are advertised in U.S. Coast Guard Local Notices to Mariners and National Geospatial-Intelligence Agency (NGA) Notices to Mariners. Important changes to aids to navigation are also broadcast through Coast Guard or Naval radio stations and NAVTEX. Mariners should keep their Light Lists, charts and other nautical publications corrected from these notices and should consult all notices issued after the date of publication of this Light List.

The electronic version of this publication is available at: http://www.navcen.uscg.gov/index.php?pageName=lightLists

A weekly-updated electronic copy of this publication is also available at:
http://www.navcen.uscg.gov/index.php?pageName=lightListWeeklyUpdates

**IMPORTANT***:* A summary of corrections for this publication, which includes corrections from the dates shown on the title page to the date of availability, is advertised in the Local Notice to Mariners and the Notice to Mariners. These corrections must be applied in order to bring the Light List up-to-date. Additionally, this publication should be corrected weekly from the Local Notices to Mariners or the Notices to Mariners, as appropriate.

Mariners and others are requested to bring any apparent errors or omissions in these lists to the attention of:

**COMMANDER, FIRST COAST GUARD DISTRICT (dpw)**
**408 Atlantic Avenue, Boston, Massachusetts 02110-3350**
**Telephone: (617) 223-8356**
**24 Hour FAX: (617) 223-8291**
**http://www.uscg.mil/d1/prevention/Marineinforegulations.asp**

or

**USCG Navigation Center**
**Charting Branch**
**MS 7310**
**7323 Telegraph Road**
**Alexandria, VA 20598-7310**
**Email: TIS-PF-NISWS@USCG.MIL**

# INTRODUCTION

## Light List Arrangement

In the context of the Light List, aids to navigation on the coasts are arranged in geographic order clockwise from north to south along to Atlantic coast, east to west along the Gulf of Mexico, and south to north along the Pacific coast. On the Great Lakes, aids to navigation are arranged from east to west and from south to north, except on Lake Michigan, which is arranged from north to south. Seacoast aids to navigation are listed first, followed by entrance and harbor aids to navigation, arranged from seaward to the head of navigation.

Names of aids to navigation are printed as follows to help distinguish at a glance the type of aid to navigation.

**Seacoast/Lake coast Lights and Secondary Lights**
**RACONS**
**Sound Signals**
RIVER, HARBOR, OTHER LIGHTS, AND VIRTUAL AIS
*Lighted Buoys*
Daybeacons, Unlighted Buoys, and Virtual Automatic Identification System (V-AIS) ATON

Light List numbers are assigned to all Federal aids to navigation and many private aids to navigation for reference in the Light List. Aids to navigation are numbered by fives in accordance with their order of appearance in each volume of the Light List. Other numbers and decimal fractions are assigned where newly established aids to navigation are listed between previously numbered aids to navigation. The Light Lists are renumbered periodically to assign whole numbers to all aids to navigation.

International numbers are assigned to certain aids to navigation in cooperation with the International Hydrographic Organization. They consist of an alphabetic character followed by three or four numeric characters. A cross reference listing appears after the index.

## Description of Columns

Column (1): Light List Number.

Column (2): Name and location of the aid to navigation.
Note: A dash (-) is used to indicate the bold heading is part of the name of the aid to navigation. When reporting discrepancies or making references to such an aid to navigation in correspondence, the full name of the aid including the geographic heading, should be given.

Bearings are in degrees true, read clockwise from 000° through 359°.

Bearings on range lines are given in degrees and tenths or hundredths where applicable.

(C) indicates Canadian aid to navigation.

Column (3): Geographic position of the aid to navigation in latitude and longitude.

Column (4): Light characteristic for lighted aids to navigation.

Column (5): Height above water from the focal plane of the fixed light to mean high water, listed in feet.

For Volume 7 (Great Lakes), height above water from the focal plane of the fixed light to low water datum, listed in feet and meters.

Column (6): Nominal range of lighted aids to navigation, in nautical miles, listed by color for sector and passing lights. Not listed for ranges, directional lights, or private aids to navigation.

Column (7): The structural characteristic of the aid to navigation, including: dayboard (if any), description of fixed structure, color and type of buoy, height of structure above ground for major lights.

Column (8): Aid remarks, sound signal characteristics, including: VHF-FM channel if remotely activated, RACON characteristic, light sector arc of visibility, radar reflector, emergency lights, seasonal remarks, and private aid to navigation identification. AIS specific information may include its unique Maritime Mobile Service Identity (MMSI), the MMSI(s) of its source AIS transmission, and the application identifier of any Application Specific Messages (ASM) it may also be transmitting.

### U.S. Coast Guard Light List Distribution

U.S. regulations require that most commercial vessels maintain on board a currently corrected, copy or pertinent extract, of the U.S. Coast Guard Light Lists which are available for free and are updated weekly on the Coast Guard Navigation Center's website at http://www.navcen.uscg.gov/?pageName=lightLists. Commercially printed versions are also available, but the Coast Guard does not attest to their veracity or sanction such publications.

## CHARTS & PUBLICATIONS

### Nautical Charts & Publications

Nautical charts covering the coastal waters of the United States and its territories are published by the National Ocean Service (NOS). Up-to-date paper copies of NOS charts are available from NOS Certified Agents. A list of agents can be found at: http://www.nauticalcharts.noaa.gov/staff/print_agents.html. NOS also produces Raster Navigational Charts (RNC) and Electronic Navigational Charts (ENC). RNCs can be found at http://www.nauticalcharts.noaa.gov/mcd/Raster/index.htm. ENCs can be found at http://www.nauticalcharts.noaa.gov/mcd/enc/index.htm.

Inland Electronic Navigational Charts (IENC) and chart books are published by the U.S. Army Corps of Engineers and are available online at http://www.agc.army.mil/Missions/Echarts.aspx. Tide Tables and Tidal Current Tables are no longer printed or distributed by NOS. NOS Tide and Tidal Current predictions are available online at http://tidesandcurrents.noaa.gov/tide_predictions.html. Commercially printed versions, using data provided by NOS, are also available. These products may be obtained from local stores that carry marine publications.

### Notices to Mariners

**Broadcast Notices to Mariners** are made by the Coast Guard through Coast Guard radio stations. These notices, which are broadcast on VHF-FM, NAVTEX, and other maritime frequencies, are warnings that contain important navigational safety information. Included are reports of discrepancies and changes to aids to navigation, the positions of ice and derelicts, and other important hydrographic information.

Radio stations broadcasting Notices to Mariners are listed in the National Ocean Service United States Coast Pilot and in the National Geospatial-Intelligence Agency publication Radio Navigational Aids (Publication No. 117). VHF-FM voice broadcast times can be found online at http://www.nws.noaa.gov/om/marine/vhfvoice.htm.

**Local Notices to Mariners** (U.S. regional coverage) are another means which the Coast Guard disseminates navigational information for the United States, its territories, and possessions. A Local Notice to Mariners is issued by each Coast Guard district and is used to report changes and discrepancies to aids to navigation maintained by and under the authority of the Coast Guard. The Local Notice to Mariners also contain chart and Light List corrections, proposed aids to navigation projects open for public comment, ongoing waterway projects, bridge regulation changes, marine event information, and other concerns pertinent to the mariner.

Local Notices to Mariners are essential to all navigators for the purposes of keeping charts, Light Lists, Coast Pilots, and other nautical publications up-to-date. These notices are published weekly and can be found online at http://www.navcen.uscg.gov/index.php?pageName=lnmMain. Mariners may register with the Coast Guard Navigation Center to receive automatic notifications via email when new editions of the Local Notice to Mariners are available. Register at http://www.navcen.uscg.gov/?pageName=listServerForm. Vessels operating in ports and waterways in several districts will have to obtain the Local Notice to Mariners for each district.

**Notice to Mariners** are prepared jointly by the National Geospatial-Intelligence Agency (NGA), the U.S. Coast Guard, and the National Ocean Service, and are published weekly by the NGA. The weekly Notice to Mariners advises mariners of important matters affecting navigational safety including new hydrographic discoveries, changes to aids to navigation, and foreign marine information. Also included are corrections to Light Lists, Coast Pilots, and Sailing Directions. This notice is intended for mariners and others who have a need for information related to oceangoing operations. Because it is intended for use by oceangoing vessels, many corrections that affect small craft navigation and associated waters are not included. Information concerning small craft is contained in the Coast Guard Local Notice to Mariners only. The weekly Notices to Marines may be found online at http://msi.nga.mil/NGAPortal/MSI.portal.

## ATON DISCREPANCIES

The Coast Guard does not keep the tens of thousands of aids to navigation comprising the U.S. Aids to Navigation System under simultaneous and continuous observation. Mariners should realize that it is impossible to maintain every aid to navigation operating properly and on its assigned position at all times. Therefore, for the safety of all mariners, any who discovers an aid to navigation that is either off station or exhibiting characteristics other than those listed in

the Light Lists should promptly notify the nearest Coast Guard unit. Radio messages should be prefixed “COAST GUARD” and transmitted on VHF-FM channel 16 or directly to one of the U.S. Government radio stations listed in Chapter 3, Section 300L, Radio Navigation Aids (Publication No. 117). In addition to notifying the nearest Coast Guard unit by radio, a discrepant aid to navigation can be reported online at http://www.navcen.uscg.gov/?pageName=atonOutageReport.

# U.S. AIDS TO NAVIGATION SYSTEM

## GENERAL

The navigable waters of the United States are marked to assist navigation using the U.S. Aids to Navigation System, a system consistent with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Maritime Buoyage System. The IALA Maritime Buoyage System is followed by most of the world’s maritime nations and improves maritime safety by encouraging conformity in buoyage systems worldwide. IALA buoyage is divided into two regions made up of Region A and Region B. All navigable waters of the United States follow IALA Region B, except U.S. possessions west of the International Date Line and south of 10° north latitude, which follow Region A. Lateral aids to navigation in Region A vary from those located within Region B. Non-lateral aids to navigation in Region A are the same as those used in Region B. Appropriate nautical charts and publications should be consulted to determine whether the Region A or Region B marking schemes are in effect for a given area.

Aids to navigation are developed, established, operated, and maintained by the U.S. Coast Guard to accomplish the following:

1. Assist navigators in determining their position,
2. Assist the navigator in determining a safe course,
3. Warn the navigator of dangers and obstructions,
4. Promote the safe and economic movement of commercial vessel traffic, and
5. Promote the safe and efficient movement of military vessel traffic, and cargo of strategic military importance.

The U.S. Aids to Navigation System is designed for use with nautical charts. Nautical charts portray the physical features of the marine environment, which include: soundings, landmarks, hazards to navigation, and aids to navigation. To best understand the purpose of a specific aid to navigation, mariners should consult the associated nautical chart, which illustrates the relationship of the aid to navigation to channel limits, obstructions, hazards to navigation, and to the aids to navigation system as a whole. Seasonal aids to navigation are placed into service, withdrawn, or changed at specified times of the year. The dates shown in the Light Lists are approximate and may vary due to adverse weather or other conditions. These aids will be changed on Electronic Navigational Charts (ENC) based on Light List dates and electronic navigation system settings.

Mariners should maintain and consult suitable publications and navigation equipment depending on the vessel’s requirements. This shipboard navigation equipment is separate from the aids to navigation system, but is often essential to its use.

The U.S. Aids to Navigation System is primarily a lateral system, which employs a simple arrangement of colors, shapes, numbers, and light characteristics to mark the limits of navigable

routes. This lateral system is supplemented with non-lateral aids to navigation where appropriate.

Federal aids to navigation consist of Coast Guard operated aids to navigation. The Coast Guard establishes, maintains, and operates a system of aids to navigation consisting of visual, audible, and electronic signals designed to assist the prudent mariner in the process of navigation.

The U.S. Aids to Navigation System contains the following subsystems:

1. **Intracoastal Waterway**: The aids to navigation marking the Intracoastal Waterway are arranged geographically from north to south on the Atlantic Coast and generally east to west on the coast of the Gulf of Mexico. Red lights (if so equipped), even numbers, and red buoys or triangle shaped daymarks are located on the southbound/westbound starboard waterway boundary. Green lights (if so equipped), odd numbers, and green buoys or square shaped daymarks are on the southbound/westbound port waterway boundary.

2. **Western Rivers**: The Western Rivers System is employed on the Mississippi River System, in addition to the Tennessee-Tombigbee Waterway and the Alabama, Atchafalaya, and Apalachicola-Chattahoochee-Flint River Systems. The Western Rivers System consists of the following characteristics:

    a. Buoys are not numbered.
    b. Numbers on beacons do not have lateral significance, but rather indicate mileage from a fixed point (normally the river mouth).
    c. Diamond shaped non-lateral dayboards, red and white or green and white as appropriate, are used to indicate where the river channel crosses from one bank to the other.
    d. Lights on green aids to navigation show a single-flash characteristic, which may be green or white.
    e. Lights on red aids to navigation show a group-flash characteristic, which may be red or white.
    f. Isolated danger marks are not used.

3. **Bridge Markings:** Bridges across navigable waters are marked with red, green and/or white lights for nighttime navigation. Red lights mark piers and other parts of the bridge. Red lights are also placed on drawbridges to show when they are in the closed position. Green lights are placed on drawbridges to show when they are in the open position. The location of these lights will vary according to the bridge structure. Green lights are also used to mark the centerline of navigable channels through fixed bridges. If there are two or more channels through the bridge, the preferred channel is also marked by three white lights in a vertical line above the green light.

    Red and green retro-reflective panels may be used to mark bridge piers and may also be used on bridges not required to display lights. Lateral red and green lights and dayboards may mark main channels through bridges. Adjacent piers are marked with fixed yellow lights when the main channel is marked with lateral aids to navigation.

Centerlines of channels through fixed bridges may be marked with a safe water mark and an occulting white light when lateral marks are used to mark main channels. The centerline of the navigable channel through the draw span of floating bridges may be marked with a special mark. The mark will be a yellow diamond with yellow retro-reflective panels and may exhibit a yellow light that displays a Morse code "B" (a long flash followed by three short flashes). AIS-ATON and RACONs may be placed on the bridge structure to mark the centerline of the navigable channel through the bridge.

Vertical clearance gauges may be installed to enhance navigation safety. The gauges are located on the right channel pier or pier protective structure facing approaching vessels. Clearance gauges indicate the vertical distance between "low steel" of the bridge channel span (in the closed to navigation position for drawbridges) and the level of the water, measured to the bottom of the foot marks, read from top to bottom.

Drawbridges equipped with radiotelephones display a blue and white sign which indicates what VHF radiotelephone channels should be used to request bridge openings.

**Private** aids to navigation include aids to navigation that are either operated by private persons and organizations, or that are operated by states. Private aids to navigation are classified into three categories:

1. **Class I**: Aids to navigation on marine structures or other works which the owners are legally obligated to establish, maintain, and operate as prescribed by the U.S. Coast Guard.
2. **Class II:** Aids to navigation that, exclusive of Class I aids, are located in waters used by general navigation.
3. **Class III:** Aids to navigation that, exclusive of Class I and Class II aids, are located in waters not ordinarily used by general navigation.

Authorization for the establishment of a Class II or Class III private aid to navigation by the U.S. Coast Guard imposes no legal obligation that the aid actually be established and operated. It only specifies the location and operational characteristics of the aid for which the authorization was requested. Once the aid is established, however, the owner is legally obligated to maintain it in good working order and properly painted.

**Lights and sound signals on oil wells or other offshore structures** in navigable waters are private aids to navigation and are generally not listed in the Light List unless they are equipped with a RACON. Where space allows, the structures are shown on the appropriate nautical charts. Information concerning the location and characteristics of those structures which display lights and sound signals not located in obstruction areas are published in Local and/or weekly Notices to Mariners.

In general, during the nighttime, a series of white lights are displayed extending from the platform to the top of the derrick when drilling operations are in progress. At other times, structures are usually marked with one or more quick flashing white, red, or yellow lights, visible for at least one nautical mile during clear weather. Obstructions, which are a part of the appurtenances to the main structure, such as mooring piles, anchors, and mooring buoys, etc.,

are not normally lighted. In addition, some structures are equipped with a sound signal that produces a single two-second blast every 20 seconds.

## BUOYS, BEACONS, AND AIS-ATON

The primary components of the U.S. Aids to Navigation System are buoys, beacons, and AIS-ATON.

Buoys are floating aids to navigation used extensively throughout U.S. waters. They are moored to sinkers by varying lengths of chain and may shift due to sea conditions and other causes. Buoys may also be carried away, capsized, or sunk. Prudent mariners will not rely solely on any single aid to navigation, particularly floating aids.

Buoy positions represented on nautical charts are approximate position only, due to the practical limitations of positioning and maintaining buoys and their sinkers in precise geographical locations. The position of buoys and beacons are indicated with a circle on the chart. The center of the symbol corresponds with the position of the aid.

Positions of Federal aids to navigation are verified during periodic maintenance visits. Between visits, environmental conditions, including atmospheric and sea conditions, seabed slope and composition, may shift buoys off their charted positions. Buoys may also be dragged off station, sunk, or capsized by a collision with a vessel.

Beacons are aids to navigation which are permanently fixed to the earth's surface. They range from large lighthouses to small single-pile structures and may be located on land or in the water. Lighted beacons are called lights; unlighted beacons are called daybeacons. Lighthouses are placed on shore or on marine sites and most often do not indicate lateral significance. Lighthouses with no lateral significance exhibit a white light.

Beacons exhibit a daymark. For small structures, these are colored geometric shapes that make an aid to navigation readily visible and easily identifiable against background conditions. Generally, the daymark conveys to the mariner, during daylight hours, the same significance as the aid's light or reflector does at night. The daymark of towers, however, consists of the structure itself. As a result, these daymarks do not infer lateral significance.

Ranges are non-lateral aids to navigation composed of two beacons, which when the structures appear to be in line, assist the mariner in maintaining a safe course. The appropriate nautical chart must be consulted when using ranges to determine whether the range marks the centerline of the navigable channel and also what section of the range may be safely traversed. Ranges typically display rectangular dayboards of various colors and are generally, but not always lighted. Ranges may display lights during daylight and at night. When lighted, ranges may display lights of any color.

Vessels should not pass fixed aids to navigation close aboard due to the danger of collision with rip-rap or structure foundations, or with the obstruction or danger being marked.

Aids to Navigation (ATON) may be enhanced by the use of an automatic identification system (AIS). AIS is a maritime navigation safety communications protocol standardized by the International Telecommunication Union and adopted by the International Maritime Organization for the broadcast or exchange of navigation information between vessels, aircraft, and shore

stations. AIS ATON can autonomously and at fixed intervals broadcast the name, position, dimensions, type, characteristics, and status from or concerning an aid to navigation.
AIS ATON can be either real (physically fitted to an aid to navigation), synthetic (physically fitted somewhere other than to an aid to navigation) or virtual (physically nonexistent, but capable of being portrayed on AIS-capable displays).

**Note:** A Real or Physical AIS ATON can actively monitor and report the health and position status of its host; while Synthetic AIS ATON broadcasted from ashore (i.e. NAIS) can be used to electronically augment the range or portrayal (i.e., on radar and ECDIS) of an existing aid to navigation.

Although all existing AIS mobile devices can receive AIS ATON Reports and ASM messages, they may not readily appear on an AIS Minimal Keyboard Display or other shipboard navigational display systems (i.e., radar, ECDIS, ECS), which would require software updates to make these systems compliant with international navigation presentation standards (i.e., IEC 62288 (Ed. 2), IHO S-52 (Ed. 4.4.0)).

AIS ATON can also be used to broadcast both laterally (*e.g.,* Port Hand Mark) and non-laterally significant marine safety information (*e.g.,* environmental data, tidal information, and navigation warnings).

**Note:** AIS ATON stations broadcast their presence, identity (9-digit Marine Mobile Service Identity (MMSI) number), position, type, and status at least every three minutes or less via an AIS (ITU-R M.1371) message 21–AIS ATON Report. In addition to its AIS ATON Report, AIS ATON can broadcast significant marine safety information via Application Specific Messages (ASM), which are customized messages that can be used to broadcast additional aid information or other marine safety information (i.e., environmental conditions, wind speed and direction, tidal/current data, bridge air clearances, area notices, etc. They are identified by their: AIS message number (i.e. 6, 8, 25 or 26), Designated Area Code (DAC), Function Identifier (FI), and Version Number, e.g. U.S. Geographic Notice message: Msg# = 8, DAC = 367, FI = 22, Version = 2, and, denoted as 8/367.22.2.

## TYPES OF SIGNALS

**Lighted** aids to navigation are, for the most part, equipped with daylight controls which automatically cause the light to operate during darkness and to be extinguished during daylight. These devices are not of equal sensitivity; therefore, all lights do not come on or go off at the same time. Mariners should ensure correct identification of aids to navigation during twilight periods when some lighted aids to navigation are lit while others are not.

The lighting apparatus is serviced at periodic intervals to assure reliable operation, but there is always the possibility of a light being extinguished or operating improperly.
The condition of the atmosphere has a considerable effect upon the distance at which lights can be seen. Sometimes lights are obscured by fog, haze, dust, smoke, or precipitation which may be present at the light, or between the light and the observer, and which is possibly unknown by the observer. Atmospheric refraction may cause a light to be seen farther than under ordinary circumstances.

A light of low intensity will be easily obscured by unfavorable conditions of the atmosphere and little dependence can be placed on it being seen. For this reason, the intensity of a light should always be considered when expecting to sight it in reduced visibility. Haze and distance may

reduce the apparent duration of the flash of a light. In some atmospheric conditions, white lights may have a reddish hue. Lights placed at high elevations are more frequently obscured by clouds, mist, and fog than those lights located at or near sea level.

In regions where ice conditions prevail in the winter, the lantern panes of lights may become covered with ice or snow, which will greatly reduce the visibility of the lights and may also cause colored lights to appear white.

The increasing use of brilliant shore lights for advertising, illuminating bridges, and other purposes, may cause marine navigational lights, particularly those in densely inhabited areas, to be outshone and difficult to distinguish from the background lighting. Mariners are requested to report such cases in order that steps may be taken to improve the conditions.

The “loom” (glow) of a powerful light is often seen beyond the limit of visibility of the actual rays of the light. The loom may sometimes appear sufficiently sharp enough to obtain a bearing. At short distances, some flashing lights may show a faint continuous light between flashes.

The distance of an observer from a light cannot be estimated by its apparent intensity. Always check the characteristics of lights in order to avoid mistaking powerful lights, visible in the distance, for nearby lights (such as those on lighted buoys) showing similar characteristics of low intensity. If lights are not sighted within a reasonable time after prediction, a dangerous situation may exist, requiring prompt resolution or action in order to ensure the safety of the vessel.

The apparent characteristic of a complex light may change with the distance of the observer. For example, a light which actually displays a characteristic of fixed white varied by flashes of alternating white and red (the rhythms having a decreasing range of visibility in the order: flashing white, flashing red, fixed white) may, when first sighted in clear weather, show as a simple flashing white light. As the vessel draws nearer, the red flash will become visible and the characteristics will appear as alternating flashing white and red. Later, the fixed white light will be seen between the flashes and the true characteristic of the light will finally be recognized as fixed white, alternating flashing white and red (F W Al WR).

If a vessel has considerable vertical motion due to pitching in heavy seas, a light sighted on the horizon may alternatively appear and disappear. This may lead the unwary to assign a false characteristic and hence, to error in its identification. The true characteristic will be evident after the distance has been sufficiently decreased or by increasing the height of eye of the observer.

Similarly, the effect of wave motion on lighted buoys may produce the appearance of incorrect light phase characteristics when certain flashes occur, but are not viewed by the mariner. In addition, buoy motion can reduce the distance at which buoy lights are detected.

Sectors of colored glass are placed in the lanterns of some lights in order to produce a system of light sectors of different colors. In general, red sectors are used to mark shoals or to warn the mariner of other obstructions to navigation or of nearby land. Such lights provide approximate bearing information, since observers may note the change of color as they cross the boundary between sectors. These boundaries are indicated in the Light List (Col. 8) and by dotted lines on charts. These bearings, as all bearings referring to lights, are given in true degrees from 000° to 359°, as observed from a vessel toward the light.

Altering course on the changing sectors of a light or using the boundaries between light sectors to determine the bearing for any purpose is not recommended. Be guided instead by the correct compass bearing to the light and do not rely on being able to accurately observe the point at which the color changes. This is difficult to determine because the edges of a colored sector cannot be cut off sharply. On either side of the line of demarcation between white, red, or green sectors, there is always a small arc of uncertain color. Moreover, when haze or smoke is present in the intervening atmosphere, a white sector might have a reddish hue.

The area in which a light can be observed is normally an arc with the light as the center and the range of visibility as the radius. However, on some bearings, the range may be reduced by obstructions. In such cases, the obstructed arc might differ with height of eye and distance. When adjoining land cuts off a light and the arc of visibility is given, the bearing on which the light disappears may vary with the distance of the vessel from which observed and with the height of eye. When the light is cut off by a sloping hill or point of land, the light may be seen over a wider arc by a vessel farther away than by one closer to the light.

The arc drawn on charts around a light is not intended to give information as to the distance at which it can be seen. The arc indicates the bearings between which the variation of visibility or obstruction of the light occurs.

Only aids to navigation with green or red lights have lateral significance and exhibit either flashing, quick flashing, group flashing, occulting, or isophase light rhythms. When proceeding in the conventional direction of buoyage, the mariner in IALA Region B, may see the following lighted aids to navigation:

Green lights on aids to navigation mark port sides of channels and locations of wrecks or obstructions that must be passed by keeping these lighted aids to navigation on the port hand of a vessel. Green lights are also used on preferred channel marks where the preferred channel is to starboard (i.e., aid to navigation left to port when proceeding in the conventional direction of buoyage). Red lights on aids to navigation mark starboard sides of channels and locations of wrecks or obstructions that must be passed by keeping these lighted aids to navigation on the starboard hand of a vessel. Red lights are also used on preferred channel marks where the preferred channel is to port (i.e., aid to navigation left to starboard when proceeding in the conventional direction of buoyage).

White and yellow lights have no lateral significance. The shapes, colors, letters, and light rhythms may determine the purpose of aids to navigation exhibiting white or yellow lights.

Most aids to navigation are fitted with retro reflective material to increase their visibility in darkness. Colored reflective material is used on aids to navigation that, if lighted, will display lights of the same color.

Preferred channel marks exhibit a composite group-flashing light rhythm of two flashes followed by a single flash.

Safe water marks exhibit a white Morse code “A” rhythm (a short flash followed by a long flash).

Isolated danger marks exhibit a white flashing (2) rhythm (two flashes repeated regularly).

Special marks exhibit yellow lights and exhibit a flashing or fixed rhythm.

Information and regulatory marks exhibit a white light with any light rhythm except quick flashing, flashing (2) and Morse code “A.”

For situations where lights require a distinct cautionary significance, as at sharp turns, sudden channel constrictions, wrecks, or obstructions, a quick flashing light rhythm will be used.

**Shapes** are used to provide easy identification on certain unlighted buoys and dayboards on beacons. These shapes are laterally significant only when associated with laterally significant colors.

In IALA Region B, cylindrical buoys (referred to as “can buoys”) and square dayboards mark the port side of a channel when proceeding from seaward. These aids to navigation are associated with solid green or green and red-banded marks where the topmost band is green.
Conical buoys (referred to as “nun buoys”) and triangular dayboards mark the starboard side of the channel when proceeding from seaward. These aids to navigation are associated with solid red or red and green-banded marks where the topmost band is red.

Unless fitted with topmarks; lighted, sound, pillar, and spar buoys have no shape significance. Their numbers, colors, and light characteristics convey their meanings.

**Dayboards** throughout the U.S. Aids to Navigation System are described using standard designations that describe the appearance of each dayboard. A brief explanation of the designations and of the purpose of each type of dayboard in the system is given below, followed by a verbal description of the appearance of each dayboard type.

Designations:

1. First Letter – Shape or Purpose

   C: Crossing (Western Rivers only) diamond-shaped, used to indicate the points at which the channel crosses the river.

   J: Junction (square or triangle) used to mark (preferred channel) junctions or bifurcations in the channel, or wrecks or obstructions which may be passed on either side; color of top band has lateral significance for the preferred channel.

   K: Range (rectangular) when both the front and rear range dayboards are aligned on the same bearing, the observer is on the azimuth of the range, usually used to mark the center of the channel.

   M: Safe Water (octagonal) used to mark the fairway or middle of the channel.

   N: No lateral significance (diamond or rectangular) used for special purpose, warning, distance, or location markers.

   S: Square used to mark the port side of channels when proceeding from seaward.

   T: Triangle used to mark the starboard side of channels when proceeding from seaward.

2. Second Letter – Key Color

B – Black G – Green R – Red W – White Y – Yellow

3. Third Letter – Color of Center Stripe (Range Dayboards Only)

4. Additional Information after a (-)

   -I: Intracoastal Waterway; a yellow reflective horizontal band on a dayboard; indicates the aid to navigation marks the Intracoastal Waterway.

   -SY: Intracoastal Waterway; a yellow reflective square on a dayboard; indicates the aid to navigation is a port hand mark for vessels traversing the Intracoastal Waterway. May appear on a triangular daymark where the Intracoastal Waterway coincides with a waterway having opposite conventional direction of buoyage.

   -TY: Intracoastal Waterway; a yellow reflective triangle on a dayboard; indicates the aid to navigation is a starboard hand mark for vessels traversing the Intracoastal Waterway. May appear on a square daymark where the Intracoastal Waterway coincides with a waterway having opposite conventional direction of buoyage.

## Descriptions:

CNG: Diamond-shaped dayboard divided into four diamond-shaped colored sectors with the sectors at the side corners white and the sectors at the top and bottom corners green, with green reflective diamonds at the top and bottom corners and white reflective diamonds in the side corners (Western Rivers only).

CNR: Diamond-shaped dayboard divided into four diamond-shaped colored sectors with the sectors at the side corners white and the sectors at the top and bottom corners red, with red reflective diamonds at the top and bottom corners and white reflective diamonds in the side corners (Western Rivers only).

JG: Dayboard bearing horizontal bands of green and red, green band topmost, with corresponding reflective borders.

JG-I: Square dayboard bearing horizontal bands of green and red, green band topmost, with corresponding reflective borders and a yellow reflective horizontal band.

JG-SY: Square dayboard bearing horizontal bands of green and red, green band topmost, with corresponding reflective borders and a yellow reflective square.

JG-TY: Square dayboard bearing horizontal bands of green and red, green band topmost, with corresponding reflective borders and a yellow reflective triangle.

JR: Dayboard bearing horizontal bands of red and green, red band topmost, with corresponding reflective borders.

JR-I: Triangular dayboard bearing horizontal bands of red and green, red band topmost, with corresponding reflective borders and a yellow reflective horizontal band.

JR-SY: Triangular dayboard bearing horizontal bands of red and green, red band topmost, with corresponding reflective borders and a yellow reflective square.

JR-TY: Triangular dayboard bearing horizontal bands of red and green, red band topmost, with corresponding reflective borders and a yellow reflective triangle.

KBG: Rectangular black dayboard bearing a central green stripe.

KBG-I: Rectangular black dayboard bearing a central green stripe and a yellow reflective horizontal band.

KBR: Rectangular black dayboard bearing a central red stripe.

KBR-I: Rectangular black dayboard bearing a central red stripe and a yellow reflective horizontal band.

KBW: Rectangular black dayboard bearing a central white stripe.

KBW-I: Rectangular black dayboard bearing a central white stripe and a yellow reflective horizontal band.

KGB: Rectangular green dayboard bearing a central black stripe.

KGB-I: Rectangular green dayboard bearing a central black stripe and a yellow reflective horizontal band.

KGR: Rectangular green dayboard bearing a central red stripe.

KGR-I: Rectangular green dayboard bearing a central red stripe and a yellow reflective horizontal band.

KGW: Rectangular green dayboard bearing a central white stripe.

KGW-I: Rectangular green dayboard bearing a central white stripe and a yellow reflective horizontal band.

KRB: Rectangular red dayboard bearing a central black stripe.

KRB-I: Rectangular red dayboard bearing a central black stripe and a yellow reflective horizontal band.

KRG: Rectangular red dayboard bearing a central green stripe.

KRG-I: Rectangular red dayboard bearing a central green stripe and a yellow reflective horizontal band.

KRW: Rectangular red dayboard bearing a central white stripe.

KRW-I: Rectangular red dayboard bearing a central white stripe and a yellow reflective horizontal band.

KWB: Rectangular white dayboard bearing a central black stripe.

KWB-I: Rectangular white dayboard bearing a central black stripe and a yellow reflective horizontal band.

KWG: Rectangular white dayboard bearing a central green stripe.

KWG-I: Rectangular white dayboard bearing a central green stripe and a yellow reflective horizontal band.

KWR: Rectangular white dayboard bearing a central red stripe.

KWR-I: Rectangular white dayboard bearing a central red stripe and a yellow reflective horizontal band.

MR: Octagonal dayboard bearing stripes of white and red, with a white reflective border.

MR-I: Octagonal dayboard bearing stripes of white and red, with a white reflective border and a yellow reflective horizontal band.

NB: Diamond-shaped dayboard divided into four diamond-shaped colored sectors with the sectors at the side corners white and the sectors at the top and bottom corners black, with a white reflective border.

ND: Rectangular white mileage marker with black numerals indicating the mile number (Western Rivers only).

NG: Diamond-shaped dayboard divided into four diamond-shaped colored sectors with the sectors at the side corners white and the sectors at the top and bottom corners green, with a white reflective border.

NL: Rectangular white location marker with an orange reflective border and black letters indicating the location.

NR: Diamond-shaped dayboard divided into four diamond-shaped colored sectors with the sectors at the side corners white and the sectors at the top and bottom corners red, with a white reflective border.

NW: Diamond-shaped white dayboard with an orange reflective border and black letters describing the information or regulatory nature of the mark.

NY: Diamond-shaped yellow dayboard with yellow reflective border.

SG: Square green dayboard with a green reflective border.

SG-I: Square green dayboard with a green reflective border and a yellow reflective horizontal band.

SG-SY: Square green dayboard with a green reflective border and a yellow reflective square.

SG-TY: Square green dayboard with a green reflective border and a yellow reflective triangle.

SR: Square red dayboard with a red reflective border. (IALA Region “A”)

TG: Triangular green dayboard with a green reflective border. (IALA Region “A”)

TR: Triangular red dayboard with a red reflective border.

TR-I: Triangular red dayboard with a red reflective border and a yellow reflective horizontal band.

TR-SY: Triangular red dayboard with a red reflective border and a yellow reflective square.

TR-TY: Triangular red dayboard with a red reflective border and a yellow reflective triangle. These abbreviated descriptions are used in column (7) and may also be found on the illustrations of the U.S. Aids to Navigation System.

**Numbers** are used to provide easy identification of aids to navigation. In IALA Region B, all solid red and solid green aids are numbered, with the exception of buoys located on the Western Rivers. Red aids to navigation have even numbers and green aids to navigation have odd numbers. The numbers for each increase from seaward when proceeding in the conventional direction of buoyage. Numbers are kept in approximate sequence on both sides of the channel by omitting numbers where necessary.

Letters may be used to augment numbers when lateral aids to navigation are added to channels with previously completed numerical sequences. Letters will increase in alphabetical order from seaward, proceeding in the conventional direction of buoyage and are added to numbers as suffixes. Letters are not used for buoys on the Western Rivers.
No other aids to navigation are numbered. Preferred channel, safe water, isolated danger, special marks, and information and regulatory aids to navigation may be lettered, but not numbered.

**Sound signal** is a generic term used to describe aids to navigation that produce an audible signal designed to assist the mariner in periods of reduced visibility. These aids to navigation can be activated by several means (e.g., manually, remotely, or fog detector). The Coast Guard is replacing many fog detectors with mariner radio activated sound signals (MRASS). To activate, mariners key their VHF-FM radio a designated number of times on a designated VHF-FM channel. The sound signal is activated for a period of 15, 30, 45, or 60 minutes after which the activated assistance automatically turns off. In cases where a fog detector is in use, there may be a delay in the automatic activation of the signal. Additionally, fog detectors may not be capable of detecting patchy fog conditions.

Sound signals are distinguished by their tone and phase characteristics. The devices producing the sound, e.g., diaphones, diaphragm horns, sirens, whistles, bells, or gongs determine tones.

Phase characteristics are defined by the signal's sound pattern, i.e., the number of blasts and silent periods per minute and their durations. Sound signals sounded from fixed structures generally produce a specific number of blasts and silent periods each minute when operating. Sound signals installed on buoys are generally activated by the motion of the sea and therefore do not emit a regular signal characteristic. It is common, in fact, for a buoy to produce no sound signal when seas are calm.

The characteristic of a sound signal is listed in column (8) of the Light List. If the sound signal is remotely activated, column (8) will contain the VHF-FM channel and number of times the VHF-FM radio should be keyed. All waterway users equipped with a VHF-FM radio may activate the sound signal, but they are not required to do so. Unless it is specifically stated that a sound signal "Operates continuously," or the signal is a bell, gong, or whistle on a buoy, it can be assumed that the sound signal only operates during times of fog, reduced visibility, or adverse weather.

***Caution:*** *Mariners should not rely on sound signals to determine their position. Distance cannot be accurately determined by sound intensity. Occasionally, sound signals may not be heard in areas close to their location. Signals may not sound in cases where fog exists close to, but not at, the location of the sound signal.*

**Radar Beacons (RACONS)** are radar transponders that when triggered by an X-band radar produce a coded response from its location, which is portrayed radially as a series of dots and dashes on the triggering radar. Although RACONS may be used on both laterally significant and non-laterally significant aids to navigation, their signal should just be used for identification purposes only.

RACONS have a typical output of 600 milliwatts and are considered a short range aid to navigation. Reception varies from a nominal range of 6 to 8 nautical miles when mounted on a buoy to as much as 17 nautical miles for a RACON mounted on a fixed structure. It must be understood that these nominal ranges are dependent upon many factors.

The beginning of the RACON presentation occurs about 50 yards beyond the RACON position and will persist for a number of revolutions of the radar antenna (depending on its rotation rate). Distance to the RACON can be measured to the point at which the RACON flash begins, but the figure obtained will be greater than the vessel's distance from the RACON. This is due to the slight response delay in the RACON apparatus.

Radar operators may notice some broadening or spoking of the RACON presentation when their vessel approaches closely to the source of the RACON. This effect can be minimized by adjusting the IF gain or sweep gain control of the radar. If desired, the RACON presentation can be virtually eliminated by operation of the FTC (fast time constant) controls of the radar.

**Radar Reflectors** are special fixtures, incorporated into both lighted and unlighted aids to navigation, to enhance the reflection of radar energy. These fixtures help radar-equipped vessels to detect buoys and beacons, which are so equipped. However, they do not positively identify a radar target as an aid to navigation.

## NAVIGATION SERVICES

### GLOBAL POSITIONING SYSTEM (GPS), DIFFERENTIAL GPS (DGPS), AND NATION-WIDE AUTOMATIC IDENTIFICATION SYSTEM (NAIS)

**Global Positioning System (GPS)** is a satellite based navigation system, operated and controlled by the Department of Defense (DOD) under U.S. Air Force management, which provides precise, worldwide, three-dimensional navigation capabilities. The system was originally designed for military application; however, it is now available to all and used almost ubiquitously. The United States is committed to maintaining the availability of at least 24

operational GPS satellites, is six precise orbital planes, each of which complete a circular 10,900 nautical mile orbit of the earth once every 12 hours. Ideally, a minimum of four satellites will be visible from any position on the earth and will provide positions with a global horizontal accuracy within 3 meters, 95% percent of the time. Whenever possible, advance notice of when GPS satellites should not be used will be provided by the DOD and made available by the US Coast Guard through GPS status messages.

The Navigation Center coordinates and manages the Civil GPS Service Interface Committee (CGSIC), which comprises members from U.S. and international private, government, and industry user groups. The CGSIC is the recognized worldwide forum for effective interaction between all civil GPS users and the U.S. GPS authorities.

At least three satellites are required for a two-dimensional solution, however, GPS does not provide integrity information and mariners should exercise extreme caution when using GPS in restricted waterways.

**Differential GPS (DGPS)** is an augmentation to the GPS signals. Each site corrects for small variations in the signals from each satellite that is in view at that time. Satellite signals can vary due to small changes in the satellite's circuitry and orbit and from changes caused by local weather conditions. Satellite corrections are transmitted to users via radio signals in the medium frequency band (285-325 kHz) previously used for marine radiobeacons. DGPS corrections and integrity information are transmitted using Minimum Shift Keying (MSK) modulation. The modulation data rate is usually 100 or 200 bits per second (bps), but can also be 50 bps. The range of DGPS transmissions is from 40 to 300 nautical miles.

DGPS was the first Federal radionavigation system capable of providing the 10-meter navigation service required for the Harbor Entrance and Approach phase of maritime navigation. DGPS provides integrity messages for signals from the GPS satellites, as well as DGPS position corrections, and typically provides position accuracy of 1-3 meters.

Each DGPS site has two reference stations (which calculate the differential corrections), two integrity monitors (which ensure the differential corrections are accurate), a transmitter, and equipment to communicate status information to and receive commands from the control station. Each transmitter and reference station has a unique identification number that permits users to determine which site/equipment is providing their differential corrections. As distance from the transmitting site increases, the small error in the differential corrections increases. The best accuracy is achieved when using the DGPS site closest to the user.

Information regarding the location of DGPS transmitters is given on the map labeled U.S. DGPS Sites & Identification Numbers on page i. Users can access additional information and DGPS statuses, submit questions, and provide comments via the Navigation Information Service's website or by calling the Coast Guard Navigation Center DGPS watchstander at (703) 313-5902.

**Navigation Information Service (NIS):** The Coast Guard is the government interface for civil users of GPS and has established a Navigation Information Service (NIS) to meet the information needs of the civil user. The NIS is a Coast Guard entity that is manned 24 hours a day, 7 days a week, and is located at the Navigation Center (NAVCEN) in Alexandria, VA. It provides data broadcasts and on-line computer-based information services which are available 24 hours a day. The information provided includes present or future satellite outages, constellation changes, user instructions and tutorials, lists of service and receiver provides/users, and other GPS and DGPS related information.

**Navigation Center Internet Service (www)** website also offers an e-mail subscription service for GPS status messages, Notice Advisory to NAVSTAR Users (NANU) messages, Local Notice to Mariners, and Coast Guard Light List.

The NAVCEN disseminates GPS and DGPS safety advisory broadcast messages through USCG broadcast stations utilizing VHF-FM voice, HF-SSB voice, and NAVTEX broadcasts. The broadcasts provide the GPS and DGPS user in the marine environment with the current status of the navigation systems, as well as any planned/unplanned system outages that could affect GPS and DGPS navigational accuracy.

**Nationwide Automatic Identification System (NAIS)** consists of approximately 200 VHF receiver sites located throughout the coastal continental United States, inland rivers, Alaska, Hawaii, Puerto Rico, and Guam. NAIS couples AIS technology with a comprehensive network infrastructure to achieve ship-to-shore and shore-to-ship data transmission throughout the navigable waters of the United States. The system enables AIS-equipped vessels to receive important marine information such as safety and security messages, weather alerts, and electronic aids to navigation.

NAIS is designed to collect safety and security data from AIS-equipped vessels in navigable waters of the United States and share that data with Coast Guard operators and other government and port partners. The primary goal of NAIS is to increase situational awareness through data dissemination via a network infrastructure, particularly focusing on improving maritime security, marine and navigational safety, search and rescue, and environmental protection services. Collected AIS data improves the safety of vessels and ports through collision avoidance and the safety of the nation through detection, identification, and classification of vessels. NAIS broadcasts navigation enhancing safety related messages such as Synthetic AIS ATON Reports and Application Specific Messages.

For more information see:

- AIS messages at www.navcen.uscg.gov/?pageName=AISMessages,
- IMO Safety of Navigation Circular 289 and 290 regarding ASM's at www.navcen.uscg.gov/?pageName=AISReferences,
- IALA AIS ASM Catalog at www.e-navigation.nl/asm, and
- USCG Special Notice 14-02 regarding eATON at www.navcen.uscg.gov/?pageName=AISFAQ#21.

To comment on any of these services or ask questions about the service offered, contact the NAVCEN at:

Commanding Officer
U.S. Coast Guard Navigation Center
7323 Telegraph Road STOP 7310
Alexandria, VA 20598-7310
Phone: (703) 313-5900
Internet: http://www.navcen.uscg.gov

# ABBREVIATIONS

Various abbreviations are utilized in Broadcast Notices to Mariners, Local Notices to Mariners, on charts, and in the Light Lists. Refer to the following list.

**Light Characteristics**

| | |
|---|---|
| Alternating | AL |
| Characteristic | CHAR |
| Composite Group-Flashing | FL (2+1) |
| Composite Group-Occulting | OC (2+1) |
| Continuous Quick-Flashing | Q |
| Eclipse | EC |
| Fixed and Flashing | FFL |
| Fixed | F |
| Group-Flashing | FL (3) |
| Group-Occulting | OC (2) |
| Interrupted Quick-Flashing | IQ |
| Isophase | ISO |
| Morse Code | MO (A) |
| Occulting | OC |
| Single-Flashing | FL |

**Sound Signal Characteristics**

| | |
|---|---|
| Blast | BL |
| Every | EV |
| Seconds | S |
| Silent | SI |

**Colors***

| | |
|---|---|
| Black | B |
| Blue | BU |
| Green | G |
| Orange | OR |
| Red | R |
| White | W |
| Yellow | Y |

*NOTE: Color refers to characteristics of aids to navigation only.

**Aids to Navigation**

| | |
|---|---|
| Aeronautical Radiobeacon | AERO RBN |
| Automatic Identification System | AIS |
| Daybeacon | DBN |
| Destroyed | DESTR |
| Differential GPS | DGPS |
| Discontinued | DISCONTD |
| Established | ESTAB |
| Exposed Location Buoy | ELB |
| Extinguished | EXT |
| Fog Signal Station | FOG SIG |
| Light List Number | LLNR |
| Light | LT |
| Lighted Bell Buoy | LBB |
| Lighted Buoy | LB |
| Lighted Gong Buoy | LGB |
| Lighted Horn Buoy | LHB |
| Lighted Whistle Buoy | LWB |
| Mariner Radio Activated Sound Signal | MRASS |
| Ocean Data Acquisition System | ODAS |
| Privately Maintained | PRIV MAINTD |
| Radar Reflector | RA REF |
| Radar Responder Beacon | RACON |
| Remote Radio Activated Sound Signal | RRASS |
| Single Point Mooring Buoy | SPM |
| Sound Signal | SS |
| Temporarily Replaced by Lighted Buoy | TRLB |
| Temporarily Replaced by Unlighted Buoy | TRUB |
| Topmark | TMK |
| Virtual AIS Aid to Navigation | V-AIS |
| Whistle | WHIS |

**Organizations**

| | |
|---|---|
| Commander, Coast Guard District | CCGD (#) |
| Coast Guard | CG |
| Corps of Engineers | USACE |
| National Geospatial-Intelligence Agency | NGA |
| National Ocean Service | NOS |
| National Weather Service | NWS |

**Vessels**

| | |
|---|---|
| Aircraft | A/C |
| Fishing Vessel | F/V |
| Liquefied Natural Gas Carrier | LNG |
| Motor Vessel (includes Steam Ship, Container Ship, Cargo Vessel, Tanker etc) | M/V |
| Pleasure Craft | P/C |
| Research Vessel | R/V |
| Sailing Vessel | S/V |

**Compass Directions**

| | |
|---|---|
| North | N |

| | |
|---|---|
| South | S |
| East | E |
| West | W |
| Northeast | NE |
| Northwest | NW |
| Southeast | SE |
| Southwest | SW |

**Months**

| | |
|---|---|
| January | JAN |
| February | FEB |
| March | MAR |
| April | APR |
| May | MAY |
| June | JUN |
| July | JUL |
| August | AUG |
| September | SEP |
| October | OCT |
| November | NOV |
| December | DEC |

**Days of the Week**

| | |
|---|---|
| Monday | MON |
| Tuesday | TUE |
| Wednesday | WED |
| Thursday | THU |
| Friday | FRI |
| Saturday | SAT |
| Sunday | SUN |

**Various**

| | |
|---|---|
| Anchorage | ANCH |
| Anchorage Prohibited | ANCH PROHIB |
| Approximate | APPROX |
| Atlantic | ATL |
| Authorized | AUTH |
| Average | AVG |
| Bearing | BRG |
| Breakwater | BKW |
| Broadcast Notice to Mariners | BNM |
| Canadian Aid | (C) |
| Captain of the Port | COTP |
| Channel | CHAN |
| Code of Federal Regulations | CFR |
| Continue | CONT |
| Degrees (temp, geo, pos) | DEG |
| Diameter | DIA |
| Edition | ED |
| Effect/Effective | EFF |
| Entrance | ENTR |
| Explosive Anchorage | EXPLOS ANCH |
| Fathom(s) | FM(S) |
| Foot/Feet | FT |
| Harbor | HBR |
| Height | HT |
| Hertz | HZ |
| Horizontal Clearance | HOR CL |
| Hour | HR |
| International Regulations for Preventing Collisions at Sea | COLREGS |
| Kilohertz | KHZ |
| Kilometer | KM |
| Knot(s) | KT(S) |
| Minute (time, geo, pos) | MIN |
| Megahertz | MHZ |
| Moderate | MOD |
| Mountain, Mount | MT |
| Nautical Mile(s) | NM |
| Notice to Mariners | NTM |
| Obstruction | OBSTR |
| Occasion/Occasionally | OCCASION |
| Operating Area | OPAREA |
| Pacific | PAC |
| Point(s) | PT(S) |
| Position | POS |
| Position Approximate | PA |
| Pressure | PRES |
| Private, Privately | PRIV |
| Prohibited | PROHIB |
| Publication | PUB |
| Range | RGE |
| Reported | REP |
| Restricted | RESTR |
| River | RIV |
| Rock | RK |
| Saint | ST |
| Second (time, geo, pos) | SEC |
| Signal Station | SIG STA |
| Station | STA |
| Statute Mile(s) | SM |
| Storm Signal Station | S SIG STA |
| Temporary | TEMP |
| Thunderstorm | TSTORM |
| Through | THRU |
| True | T |
| Uncovers, Dries | UNCOV |
| Universal Coordinate Time | UTC |
| Urgent Marine Information Broadcast | UMIB |
| Velocity | VEL |
| Vertical Clearance | VERT CL |
| Vessel Traffic Service | VTS |

| | |
|---|---|
| Visibility | VIS |
| Yard(s) | YD |
| Warning | WARN |
| Weather | WX |
| Wreck | WK |

**Countries and States**

| | |
|---|---|
| Alabama | AL |
| Alaska | AK |
| American Samoa | AS |
| Arizona | AZ |
| Arkansas | AR |
| California | CA |
| Canada | CN |
| Colorado | CO |
| Connecticut | CT |
| Delaware | DE |
| District of Columbia | DC |
| Florida | FL |
| Georgia | GA |
| Guam | GU |
| Hawaii | HI |
| Idaho | ID |
| Illinois | IL |
| Indiana | IN |
| Iowa | IA |
| Kansas | KS |
| Kentucky | KY |
| Louisiana | LA |
| Maine | ME |
| Maryland | MD |
| Marshall Islands | MH |
| Massachusetts | MA |
| Missouri | MO |
| Mississippi | MS |
| Mexico | MX |
| Michigan | MI |
| Minnesota | MN |
| Montana | MT |
| Nebraska | NE |
| Nevada | NV |
| New Hampshire | NH |
| New Jersey | NJ |
| New Mexico | NM |
| New York | NY |
| North Carolina | NC |
| North Dakota | ND |
| Northern Marianas | MP |
| Ohio | OH |
| Oklahoma | OK |
| Oregon | OR |
| Pennsylvania | PA |
| Puerto Rico | PR |
| Rhode Island | RI |
| South Carolina | SC |
| South Dakota | SD |
| Tennessee | TN |
| Texas | TX |
| United States | US |
| Utah | UT |
| Vermont | VT |
| Virgin Islands | VI |
| Washington | WA |
| West Virginia | WV |
| Wisconsin | WI |
| Wyoming | WY |

# GLOSSARY OF AIDS TO NAVIGATION TERMS

**Adrift**: Afloat and unattached in any way to the shore or seabed.

**Aid to Navigation**: Any device external to a vessel or aircraft specifically intended to assist navigators in determining their position or safe course, or to warn them of dangers or obstructions to navigation.

**Alternating Lights**: A rhythmic light showing light of alternating colors.

**Arc of Visibility**: The portion of the horizon over which a lighted aid to navigation is visible from seaward.

**Articulated Beacon**: A beacon-like buoyant structure, tethered directly to the seabed and having no watch circle. Called articulated light or articulated daybeacon, as appropriate.

**Assigned Position**: The latitude and longitude position for an aid to navigation.

**Beacon**: A lighted or unlighted fixed aid to navigation attached directly to the earth's surface. (Lights and daybeacons both constitute beacons.

**Bearing**: The horizontal direction of a line of sight between two objects on the surface of the earth.

**Bell**: A sound signal producing bell tones by means of a hammer actuated by electricity on fixed aids and by sea motion on buoys.

**Bifurcation**: The point where a channel divides when proceeding from seaward. The place where two tributaries meet.

**Broadcast Notice to Mariners**: A radio broadcast designed to provide important marine information.

**Buoy**: A floating object of defined shape and color, which is anchored at a given position and serves as an aid to navigation.

**Characteristic**: The audible, visual, or electronic signal displayed by an aid to navigation to assist in the identification of an aid to navigation. Characteristic refers to lights, sound signals, RACONS, and daybeacons.

**Commissioned**: The action of placing a previously discontinued aid to navigation back in service.

**Composite Group Flashing Light**: A group flashing light in which the flashes are combined in successive groups of different numbers of flashes.

**Composite Group-Occulting Light**: A light similar to a group occulting light except that the successive groups in a period have different numbers of eclipses.

**Conventional Direction of Buoyage**: The general direction taken by the mariner when approaching a harbor, river, estuary, or other waterway from seaward, or proceeding upstream or in a direction of the main stream of flood tide, or in the direction indicated in appropriate nautical documents (normally, following a clockwise direction around land masses).

**Daybeacon**: An unlighted fixed structure which is equipped with a dayboard for daytime identification.

**Dayboard**: The daytime identifier of an aid to navigation presenting one of several standard shapes (square, triangle, rectangle) and colors (red, green, white, orange, yellow, or black).

**Daymark**: The daytime identifier of an aid to navigation. (See column 7 of the Light List)

**Diaphone**: A sound signal which produces sound by means of a slotted piston moved back and forth by compressed air. A "two-

tone" diaphone produces two sequential tones with a second tone of lower pitch.

**Directional Light**: A light illuminating a sector or very narrow angle and intended to mark a direction to be followed.

**Discontinued**: To remove from operation (permanently of temporarily) a previously authorized aid to navigation.

**Discrepancy**: Failure of an aid to navigation to maintain its position or function as prescribed in the Light List.

**Discrepancy Buoy**: An easily transportable buoy used to temporarily replace an aid to navigation not watching properly.

**Dolphin:** A minor aid to navigation structure consisting of a number of piles driven into the seabed or riverbed in a circular pattern and drawn together with rope.

**Eclipse**: AN interval of darkness between appearances of a light.

**Emergency Light**: A light of reduced intensity displayed by certain aids to navigation when the main light is extinguished.

**Establish**: To place an authorized aid to navigation in operation for the first time.

**Extinguished**: A lighted aid to navigation which fails to show a light characteristic.

**Fixed Light**: A light showing continuously and steady, as opposed to a rhythmic light. (Do not confuse with "fixed" as used to differentiate from "floating".)

**Flash**: A relatively brief appearance of a light, in comparison with the longest interval of darkness in the same characteristic.

**Flash tube**: An electronically controlled high-intensity discharge lamp with a very brief flash duration.

**Flashing Light**: A light in which the total duration of the light in each period is clearly shorter than the total duration of the darkness and in which the flashed of light are all of equal duration. (Commonly used for a single-flashing light which exhibits only single flashes which are repeated at regular intervals.)

**Floating Aid to Navigation**: A buoy, secured in its assigned position by a mooring.

**Fog Detector**: An electronic devise used to automatically determine conditions of visibility which warrant the activation of a sound signal or additional light signals.

**Fog Signal**: See sound signal.

**Geographic Range**: The greatest distance the curvature of the earth permits an object of a given height to be seen from a particular height of eye without regard to luminous intensity or visibility conditions.

**Global Positioning System (GPS)**: A satellite based radio-navigation system providing continuous worldwide coverage. It provides navigation, position, and timing information to air, marine, and land users.

**Gong**: A wave actuated sound signal on buoys which uses a group of saucer-shaped bells to produce different tones.

**Group Flashing Light**: A flashing light in which a group of flashes, specified in number, is regularly repeated.

**Group Occulting Light**: An occulting light in which a group of eclipses, specified in number, regularly repeated.

**Horn**: A sound signal which uses electricity or compressed air to vibrate a disc diaphragm.

**Inoperative**: Sound signal or electronic aid to navigation out of service due to a malfunction.

**Interrupted Quick Flash**: A quick flashing light in which the rapid alternations are interrupted at regular intervals by eclipses of long duration.

**Isolated Danger Mark**: A mark erected on, or moored above or very near, an isolated danger which has navigable water all around it.

**Isophase Light**: A rhythmic light in which all durations of light and darkness are equal.

**Junction**: The point where a channel divides when proceeding seaward. The place where a distributary departs from the main stream.

**Lateral System**: A system of aids to navigation in which characteristics of buoys and beacons indicate the sides of a channel or route relative to a Conventional Direction of Buoyage (usually upstream).

**Light**: The signal emitted by a lighted aid to navigation. The illuminating apparatus used to emit the light signal. A lighted aid to navigation on a fixed structure.

**Light Sector**: The arc over which a light is visible, described in degrees true, as observed from seaward towards the light. May be used to define distinctive color difference of two adjoining sectors, or an obscured sector.

**Lighted Ice Buoy (LIB)**: A lighted buoy without a sound signal, and designed to withstand the forces of shifting and flowing ice. Used to replace a conventional buoy when that aid to navigation is endangered by ice.

**Lighthouse**: A lighted beacon of major importance.

**Local Notice to Mariners**: A written document issued by each U.S. Coast Guard district to disseminate important information affecting aids to navigation, dredging, marine construction, special marine activities, and bridge construction on waterways within that district.

**LORAN**: An acronym for Long Range Navigation, is an electronic aid to navigation consisting of shore-based radio transmitters. The LORAN system enables users equipped with a LORAN receiver to determine their position quickly and accurately, day or night, in practically any weather.

**Luminous Range**: The greatest distance a light can be expected to be seen given its nominal range and the prevailing meteorological visibility.

**Mark**: A visual aid to navigation. Often called navigational mark, including floating marks (buoys) and fixed marks (beacons).

**Meteorological Visibility**: The greatest distance at which a black object of suitable dimension could be seen and recognized against the horizon sky by day, or in case of night observations, could be seen and recognized if the general illumination were raised to the daylight level.

**Mileage Number**: A number assigned to aids to navigation which gives the distance in sailing miles along the river from a reference point to the aid to navigation. The number is used principally in the Mississippi River System.

**Nominal Range**: The maximum distance a light can be seen in clear weather (meteorological visibility of 10 nautical miles). Listed for all lighted aids to navigation except range lights, directional lights, and private aids to navigation.

**Occulting Light**: A light in which the total duration of light in each period is clearly longer than the total duration of the darkness and in which the intervals of darkness (occultations) are all of equal duration. Commonly used for single occulting light which exhibits only single occultations which are repeated at regular intervals.

**Ocean Data Acquisition System (ODAS)**: Certain very large buoys in deep water for the collection of oceanographic and meteorological information. All ODAS buoys are yellow in color and display a yellow light.

**Off Shore Tower**: Monitored light stations built on exposed marine sites to replace lightships.

**Off Station**: A floating aid to navigation that is not on its assigned position.

**Passing Light**: A low intensity light which may be mounted on the structure of another light to enable the mariner to keep the latter light in sight when passing out of its beam during transit.

**Period**: The interval of time between the commencement of two identical successive cycles of the characteristic of the light or sound signal.

**Pile**: A long, heavy timber driven into the seabed or riverbed to serve as a support for an aid to navigation.

**Port Hand Mark**: A buoy or beacon which is left to the port hand when proceeding in the "Conventional Direction of Buoyage".

**Preferred Channel Mark**: A lateral mark indicating a channel junction or bifurcation, or a wreck or other obstruction which after consulting a chart, may be passed on either side.

**Primary Aid to Navigation**: An aid to navigation established for the purpose of making landfalls and coastwise passages from headland to headland.

**Quick Light**: A light exhibiting very rapid regular alternations of light and darkness, normally 60 flashes per minute.

**RACON**: A radar beacon which produces a coded response or radar paint, when triggered by a radar signal.

**Radar**: An electronic system designed to transmit radio signals and receive reflected images of those signals from a "target" in order to determine the bearing and distance to the "target".

**Radar Reflector**: A special fixture fitted to or incorporated into the design of certain aids to navigation to enhance their ability to reflect radar energy. In general, these fixtures will materially improve the aid to navigation for use by vessels with radar.

**Range**: A line formed by the extension of a line connecting two charted points.

**Range lights**: Two lights associated to form a range which often, but not necessarily, indicates the channel centerline. The front range light is the lower of the two, and nearer to the mariner using the range. The rear light is higher and further from the mariner.

**Rebuilt**: A fixed aid to navigation, previously destroyed, which has been restored as an aid to navigation.

**Regulatory Marks**: A white and orange aid to navigation with no lateral significance. Used to indicate a special meaning to the mariner, such as danger, restricted operations, or exclusion area.

**Relighted**: An extinguished aid to navigation returned to its advertised light characteristics.

**Replaced**: An aid to navigation previously off station, adrift, or missing, restored by another aid to navigation of the same type and characteristics.

**Replaced (temporarily)**: An aid to navigation previously off station, adrift, or missing restored by another aid to navigation of a different type and/or characteristic.

**Reset**: A floating aid to navigation previously off station, adrift or missing, returned to its assigned position (station).

**Rhythmic Light**: A light showing intermittently with a regular periodicity.

**Sector**: See light sector.

**Setting a Buoy**: The act of placing a buoy on assigned position in the water.

**Siren**: A sound signal which uses electricity or compressed air to actuate either a disc or a cup shaped rotor.

**Skeleton Tower**: A tower, usually of steel, constructed of heavy corner members and various horizontal and diagonal bracing members.

**Sound Signal**: A device which transmits sound, intended to provide information to mariners during periods of restricted visibility and foul weather.

**Starboard Hand Mark**: A buoy or beacon which is left to the starboard hand when proceeding in the Conventional Direction of Buoyage.

**Topmark**: One or more relatively small objects of characteristic shape and color placed on aid to identify its purpose.

**Traffic Separation Scheme**: Shipping corridors marked by buoys which separate incoming from outgoing vessels. Improperly called SEA LANES.

**Watching Properly**: An aid to navigation on its assigned position exhibiting the advertised characteristics in all respects.

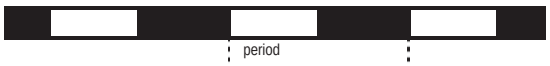
**Whistle**: A wave actuated sound signal on buoys which produces sound by emitting compressed air through a circumferential slot into a cylindrical bell chamber.

**Winter Marker**: An unlighted buoy without a sound signal, used to replace a conventional buoy when an aid to navigation is endangered by ice.

**Winter Light**: A light which is maintained during those winter months when the regular light is extinguished. It is of lower candlepower than the regular light, but usually the same characteristic.

**Withdrawn**: The discontinuance of an aid to navigation or equipment on an aid to navigation during severe ice conditions or for the winter season.

## CHARACTERISTICS OF LIGHTS

| Illustration | Type Description | Abbreviation |
|---|---|---|
|  | 1. FIXED.<br>A light showing continuously and steadily. | **F** |
| | 2. OCCULTING.<br>A light in which the total duration of light in a period is longer than the total duration of darkness and the intervals of darkness (eclipses) are usually of equal duration | |
|  | 2.1 Single-occulting.<br>An occulting light in which an eclipse is regularly repeated. | **Oc** |
|  | 2.2 Group-occulting.<br>An occulting light in which a group of eclipses, specified in numbers, is regularly repeated. | **Oc (2)** |
|  | 2.3 Composite group-occulting.<br>A light, similar to a group-occulting light, except that successive groups in a period have different numbers of eclipses. | **Oc (2+1)** |
|  | 3. ISOPHASE.<br>A light in which all durations of light and darkness are equal. | **Iso** |
| | 4. FLASHING.<br>A light in which the total duration of light in a period is shorter than the total duration of darkness and the appearances of light (flashes) are usually of equal duration. | |
|  | 4.1 Single-flashing.<br>A flashing light in which a flash is regularly repeated (frequency not exceeding 30 flashes per minute). | **Fl** |
|  | 4.2 Group-flashing.<br>A flashing light in which a group of flashes, specified in number, is regularly repeated. | **Fl ( 2 )** |
|  | 4.3 Composite group-flashing.<br>A light similar to a group flashing light except that successive groups in the period have different numbers of | **Fl ( 2+1 )** |
| | 5. QUICK.<br>A light in which flashes are produced at a rate of 60 flashes per minute. | |
|  | 5.1 Continuous quick.<br>A quick light in which a flash is regularly repeated. | **Q** |
|  | 5.2 Interrupted quick.<br>A quick light in which the sequence of flashes is interrupted by regularly repeated eclipses of constant and long duration. | **I Q** |
|  | 6. MORSE CODE.<br>A light in which appearances of light of two clearly different durations (dots and dashes) are grouped to represent a character or characters in the Morse code. | **Mo ( A )** |
|  | 7. FIXED AND FLASHING.<br>A light in which a fixed light is combined with a flashing light of higher luminous intensity. | **F Fl** |
|  | 8. ALTERNATING.<br>A light showing different colors alternately | **Al RW** |

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## O



## P



## Q



## R



## S

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## U



## V



## W



## Y

**CROSS REFERENCE - INTERNATIONAL VS. U.S. LIGHT NUMBER**

| Inter. - U.S. | Inter. - U.S. | Inter. - U.S. | Inter. - U.S. |
|---|---|---|---|
| J0024.00 . . . . . 1120 | J0152.00 . . . . . 6070 | J0270.20 . . . . . 9675 | J0377.00 . . . . . 13150 |
| J0028.00 . . . . . 1390 | J0156.00 . . . . . 6100 | J0270.40 . . . . . 9695 | J0382.00 . . . . . 13275 |
| J0030.00 . . . . . 1305 | J0157.00 . . . . . 6120 | J0270.6 . . . . . 9715 | J0383.00 . . . . . 13270 |
| J0034 . . . . . 1735 | J0158 . . . . . 6125 | J0270.80 . . . . . 9740 | J0384.00 . . . . . 13285 |
| J0038.00 . . . . . 1785 | J0160.00 . . . . . 6135 | J0271.00 . . . . . 9765 | J0384.20 . . . . . 13290 |
| J0040.00 . . . . . 1865 | J0160.10 . . . . . 6140 | J0271.20 . . . . . 9795 | J0386.00 . . . . . 485 |
| J0046.00 . . . . . 2045 | J0166.00 . . . . . 6145 | J0272.00 . . . . . 9835 | J0390.00 . . . . . 500 |
| J0048.00 . . . . . 5 | J0172.00 . . . . . 6440 | J0274.00 . . . . . 290 | J0394.00 . . . . . 525 |
| J0052.00 . . . . . 2295 | J0173.00 . . . . . 6580 | J0276.00 . . . . . 295 | J0404.00 . . . . . 545 |
| J0054.00 . . . . . 2335 | J0174.00 . . . . . 6700 | J0280.00 . . . . . 330 | J0406.00 . . . . . 555 |
| J0056.00 . . . . . 2595 | J0176.00 . . . . . 40 | J0282.00 . . . . . 9855 | J0412.00 . . . . . 15150 |
| J0058.00 . . . . . 2700 | J0178.00 . . . . . 6845 | J0284.00 . . . . . 9895 | J0414.00 . . . . . 15205 |
| J0062.00 . . . . . 2750 | J0180.00 . . . . . 7145 | J0288.00 . . . . . 350 | J0416.00 . . . . . 15160 |
| J0064.00 . . . . . 3325 | J0182.00 . . . . . 7280 | J0290 . . . . . 10000 | J0416.10 . . . . . 15165 |
| J0068.00 . . . . . 3360 | J0191.00 . . . . . 7690 | J0290.10 . . . . . 10005 | J0422 . . . . . 13860 |
| J0072.00 . . . . . 3070 | J0194.00 . . . . . 7620 | J0294.00 . . . . . 10090 | J0423 . . . . . 14050 |
| J0074.00 . . . . . 3885 | J0195.00 . . . . . 7610 | J0295.00 . . . . . 10100 | J0424.00 . . . . . 14065 |
| J0078.00 . . . . . 3455 | J0198.00 . . . . . 7605 | J0306.00 . . . . . 10580 | J0425.00 . . . . . 14085 |
| J0080.00 . . . . . 3510 | J0200.00 . . . . . 7225 | J0306.20 . . . . . 10585 | J0425.40 . . . . . 14170 |
| J0082.00 . . . . . 3530 | J0204.00 . . . . . 7575 | J0306.40 . . . . . 10595 | J0426.00 . . . . . 14450 |
| J0086.00 . . . . . 3585 | J0206.00 . . . . . 7565 | J0306.60 . . . . . 10615 | J0428.00 . . . . . 14540 |
| J0090.00 . . . . . 4405 | J0208.00 . . . . . 60 | J0306.80 . . . . . 10620 | J0432.00 . . . . . 14741.21 |
| J0094.00 . . . . . 4340 | J0214.00 . . . . . 95 | J0310.00 . . . . . 390 | J0438.00 . . . . . 13715 |
| J0096.00 . . . . . 4310 | J0218.00 . . . . . 105 | J0314.00 . . . . . 425 | J0440.00 . . . . . 15420 |
| J0100.00 . . . . . 4280 | J0220.00 . . . . . 8165 | J0318.00 . . . . . 11430 | J0444.00 . . . . . 15460 |
| J0102.00 . . . . . 4130 | J0222.20 . . . . . 8210 | J0322.00 . . . . . 11440 | J0446.00 . . . . . 13745 |
| J0104.00 . . . . . 4105 | J0226.00 . . . . . 125 | J0324.00 . . . . . 10795 | J0448.00 . . . . . 15480 |
| J0110.00 . . . . . 3965 | J0228.00 . . . . . 155 | J0333.00 . . . . . 10890 | J0449.00 . . . . . 15525 |
| J0112.00 . . . . . 3760 | J0233.00 . . . . . 8305 | J0337.00 . . . . . 10800 | J0450.00 . . . . . 13775 |
| J0113.00 . . . . . 3715 | J0233.10 . . . . . 8310 | J0340.00 . . . . . 11065 | J0451.00 . . . . . 14830 |
| J0114.00 . . . . . 3235 | J0234.00 . . . . . 8330 | J0346.00 . . . . . 11675 | J0452.00 . . . . . 15030 |
| J0115.00 . . . . . 3250 | J0235.00 . . . . . 8345 | J0350.00 . . . . . 11710 | J0454.00 . . . . . 15110 |
| J0116.00 . . . . . 10 | J0237.00 . . . . . 8355 | J0351.00 . . . . . 11715 | J0456.00 . . . . . 15560 |
| J0120.00 . . . . . 4540 | J0237.10 . . . . . 8360 | J0356.00 . . . . . 11650 | J0458.10 . . . . . 15690 |
| J0122.00 . . . . . 4580 | J0238.00 . . . . . 8375 | J0360.00 . . . . . 440 | J0460.00 . . . . . 15725 |
| J0124.00 . . . . . 4780 | J0239.00 . . . . . 8460 | J0361.00 . . . . . 12185 | J0461.20 . . . . . 15740 |
| J0128.00 . . . . . 20 | J0240.00 . . . . . 8465 | J0361.20 . . . . . 12195 | J0463.00 . . . . . 15750 |
| J0132.00 . . . . . 4980 | J0240.2 . . . . . 8470 | J0361.40 . . . . . 12205 | J0464.00 . . . . . 15775 |
| J0134.00 . . . . . 5145 | J0242.00 . . . . . 8520 | J0361.60 . . . . . 12215 | J0465.00 . . . . . 15810 |
| J0136.00 . . . . . 5420 | J0242.20 . . . . . 8525 | J0362.00 . . . . . 465 | J0470.00 . . . . . 15580 |
| J0140.00 . . . . . 5520 | J0242.40 . . . . . 8530 | J0366.00 . . . . . 12545 | J0472.00 . . . . . 15955 |
| J0142.00 . . . . . 5485 | J0244.00 . . . . . 8785 | J0368.00 . . . . . 12580 | J0480.00 . . . . . 630 |
| J0144.00 . . . . . 5665 | J0248 . . . . . 8880 | J0369.00 . . . . . 12925 | J0484 . . . . . 16295 |
| J0145.00 . . . . . 5565 | J0255.00 . . . . . 9025 | J0369.20 . . . . . 12955 | J0490.00 . . . . . 17470 |
| J0145.40 . . . . . 5705 | J0256.00 . . . . . 9070 | J0372.00 . . . . . 13050 | J0492.00 . . . . . 16040 |
| J0146.00 . . . . . 35 | J0266.00 . . . . . 9315 | J0374 . . . . . 13080 | J0500.00 . . . . . 16830 |
| J0148.00 . . . . . 6025 | J0268.00 . . . . . 9615 | J0374.10 . . . . . 13085 | J0502.00 . . . . . 16085 |
| J0150.00 . . . . . 6050 | J0270.00 . . . . . 9660 | J0376.00 . . . . . 13135 | J0504.00 . . . . . 17095 |

| Inter. | U.S. | Inter. | U.S. | Inter. | U.S. | Inter. | U.S. |
|---|---|---|---|---|---|---|---|
| J0510.00 | 16095 | J0665.00 | 20175 | J0754.00 | 23400 | J0867.20 | 26365 |
| J0510.10 | 16100 | J0666.00 | 20185 | J0756.00 | 23395 | J0879.00 | 26555 |
| J0512.00 | 16145 | J0671.00 | 20085 | J0757.00 | 23405 | J0880.00 | 26870 |
| J0512.40 | 16150 | J0676.00 | 20510 | J0758.00 | 23455 | J0884.00 | 25115 |
| J0512.80 | 16165 | J0678.00 | 20155 | J0762.00 | 21170 | J0884.10 | 25120 |
| J0513.00 | 16170 | J0680.00 | 20145 | J0764.00 | 21150 | J0890.00 | 25195 |
| J0514.00 | 16185 | J0681.00 | 20875 | J0766.00 | 21650 | J0892.00 | 21375 |
| J0515.00 | 16205 | J0690.00 | 660 | J0767.00 | 21680 | J0894.00 | 25225 |
| J0516.00 | 16225 | J0694.00 | 19880 | J0771.00 | 23935 | J0896 | 25230 |
| J0517.00 | 16250 | J0696.00 | 19875 | J0771.10 | 23940 | J0896.10 | 25235 |
| J0520.00 | 16670 | J0698.00 | 27790 | J0773.00 | 21180 | J0898.00 | 25270 |
| J0524.00 | 17590 | J0699.00 | 27795 | J0774.00 | 21185 | J0904.00 | 21400 |
| J0530.00 | 17795 | J0701.00 | 28195 | J0775.00 | 23970 | J0906.00 | 25365 |
| J0532.00 | 17815 | J0702.00 | 28245 | J0778.00 | 24020 | J0908.00 | 25545 |
| J0540.00 | 17850 | J0704.00 | 28255 | J0778.10 | 24025 | J0910.00 | 25550 |
| J0547.00 | 17910 | J0706.00 | 28310 | J0780.00 | 21210 | J0914.00 | 27065 |
| J0552.00 | 17960 | J0708.00 | 28325 | J0782.00 | 24065 | J0915.00 | 27110 |
| J0555.00 | 18005 | J0708.20 | 28355 | J0782.20 | 24070 | J0916.00 | 21440 |
| J0566.00 | 18125 | J0708.40 | 28375 | J0784.00 | 21215 | J0920.00 | 21480 |
| J0570.00 | 18145 | J0710.00 | 28050 | J0786.00 | 24080 | J0922.00 | 21500 |
| J0572.00 | 18150 | J0716.00 | 28870 | J0790.00 | 24125 | J0923.00 | 21505 |
| J0574.00 | 18900 | J0716.30 | 28885 | J0794.00 | 24205 | J0924.00 | 27165 |
| J0574.10 | 18905 | J0717.00 | 27725 | J0798.60 | 24230 | J0926.00 | 25720 |
| J0576.00 | 18925 | J0717.40 | 27705 | J0804.00 | 24330 | J0927.00 | 25765 |
| J0577.00 | 18930 | J0718.00 | 21095 | J0808.40 | 24385 | J0927.40 | 25770 |
| J0580.00 | 18190 | J0722.00 | 21090 | J0808.60 | 24405 | J0929.00 | 25945 |
| J0582.00 | 18180 | J0730.00 | 21825 | J0810.00 | 21230 | J0930.00 | 25965 |
| J0583.00 | 18240 | J0732.00 | 21845 | J0812.00 | 21260 | J0934.00 | 21520 |
| J0584.00 | 18275 | J0737.2 | 21860 | J0816.00 | 26070 | J0936.00 | 27215 |
| J0590.00 | 18305 | J0737.4 | 21865 | J0818.00 | 26135 | J0940.00 | 27250 |
| J0592.00 | 18345 | J0737.50 | 21890 | J0819.00 | 26145 | J0944 | 27495 |
| J0600.00 | 18455 | J0737.52 | 21895 | J0820.10 | 26160 | J0946.00 | 27515 |
| J0602.00 | 18555 | J0737.54 | 21900 | J0828.00 | 24610 | J0952.00 | 27635 |
| J0604.00 | 18580 | J0737.55 | 21905 | J0830.00 | 24615 | J0958.00 | 27265 |
| J0608.00 | 19345 | J0737.60 | 21945 | J0832.00 | 24635 | J0962.00 | 27650 |
| J0610.00 | 19135 | J0737.66 | 21960 | J0838.00 | 24690 | J0964.00 | 27640 |
| J0612.00 | 19145 | J0737.70 | 21995 | J0839.00 | 24725 | J0976.00 | 27285 |
| J0628.00 | 19450 | J0737.80 | 22055 | J0839.10 | 24730 | J0978.00 | 27290 |
| J0631.00 | 19485 | J0738.00 | 21070 | J0840.00 | 21290 | J0982.00 | 27300 |
| J0632.00 | 19490 | J0744.00 | 21115 | J0842.00 | 24785 | J0984.00 | 27295 |
| J0636.00 | 19500 | J0746.00 | 22520 | J0844.00 | 24800 | J0990.00 | 27315 |
| J0638.00 | 19505 | J0747.00 | 22595 | J0850.00 | 24930 | J0994.00 | 27325 |
| J0644.00 | 19720 | J0748.00 | 22610 | J0852.00 | 24935 | J0994.10 | 27330 |
| J0646.00 | 19725 | J0749.00 | 22675 | J0856.00 | 25030 | J0998.00 | 675 |
| J0650.00 | 640 | J0750.00 | 22870 | J0858.00 | 25060 | J1000.00 | 29040 |
| J0654.00 | 19750 | J0750.10 | 22880 | J0860.00 | 25010 | J1005.00 | 29105 |
| J0658.00 | 19795 | J0751.40 | 22890 | J0862.00 | 24990 | J1021.00 | 30890 |
| J0664.00 | 20170 | J0752.00 | 21560 | J0867.00 | 26360 | J1024.00 | 31500 |

| Inter. | U.S. |
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| J1032.00 | 35025 |
| J1036.00 | 35040 |
| J1040.00 | 35190 |
| J1046.00 | 35595 |
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| J1139.00 | 38000 |
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