

U.S. Department of
Homeland Security

United States
Coast Guard



LIGHT LIST

Volume VI

PACIFIC COAST AND PACIFIC ISLANDS

Pacific Coast and outlying Pacific Islands

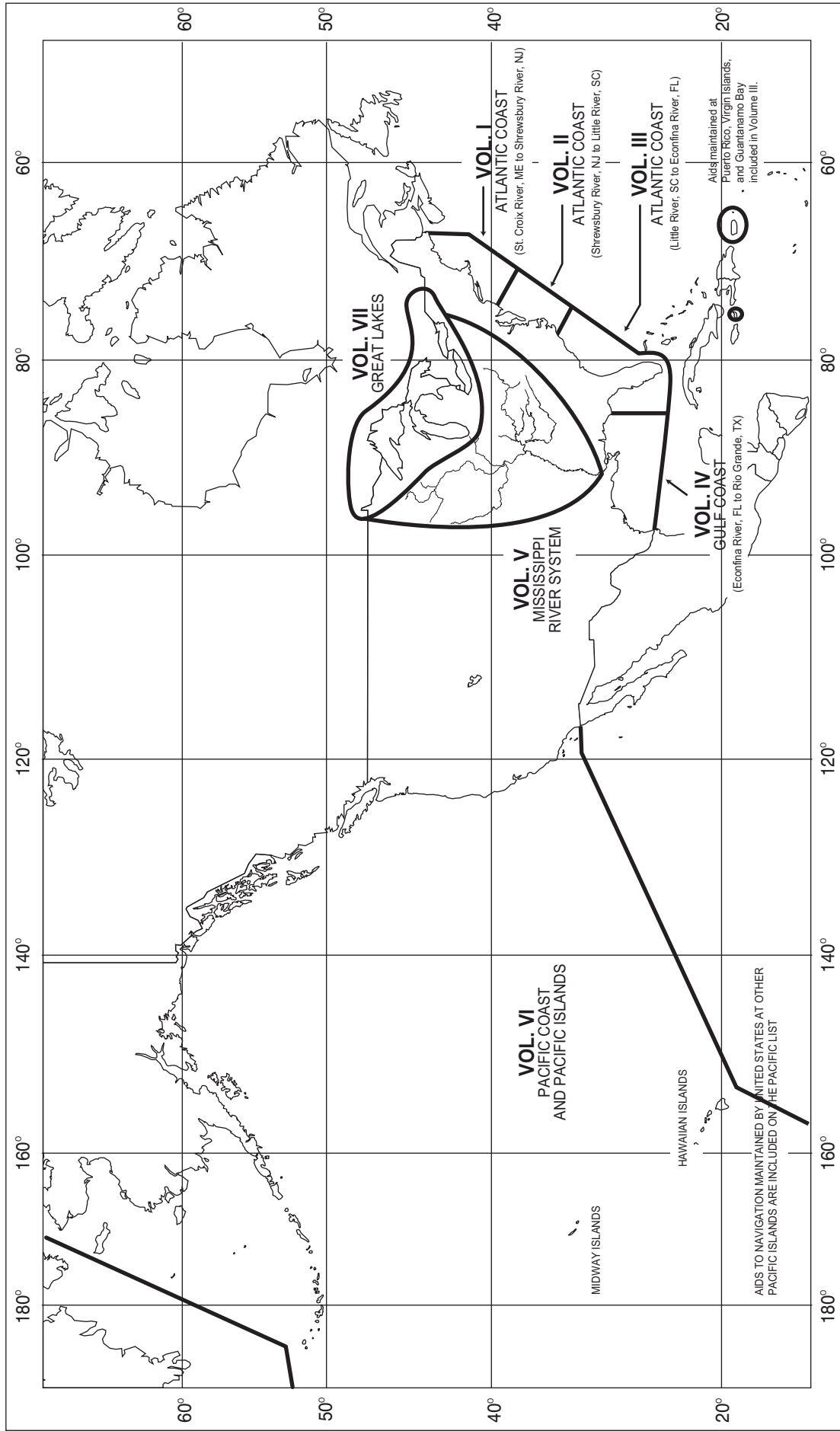
This publication contains a list of lights, sound signals, buoys, daybeacons, and other aids to navigation.

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

2017

COMDTPUB P16502.6

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

<p>PORT SIDE ODD NUMBERED AIDS</p> <p>GREEN LIGHT ONLY FLASHING (2) FLASHING OCCULTING QUICK FLASHING ISO</p>	<p>PREFERRED CHANNEL NO NUMBERS - MAY BE LETTERED</p> <p>PREFERRED CHANNEL TO STARBOARD TOPMOST BAND GREEN</p> <p>GREEN LIGHT ONLY</p> <p>COMPOSITE GROUP FLASHING (2+1)</p>	<p>PREFERRED CHANNEL NO NUMBERS - MAY BE LETTERED</p> <p>PREFERRED CHANNEL TO PORT TOPMOST BAND RED</p> <p>RED LIGHT ONLY</p> <p>COMPOSITE GROUP FLASHING (2+1)</p>	<p>STARBOARD SIDE EVEN NUMBERED AIDS</p> <p>RED LIGHT ONLY FLASHING (2) FLASHING OCCULTING QUICK FLASHING ISO</p>
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AIDS TO NAVIGATION HAVING NO LATERAL SIGNIFICANCE

<p>ISOLATED DANGER NO NUMBERS - MAY BE LETTERED</p> <p>WHITE LIGHT ONLY</p> <p>FI (2) 5s</p>	<p>SAFE WATER NO NUMBERS - MAY BE LETTERED</p> <p>WHITE LIGHT ONLY MORSE CODE</p> <p>Mo (A)</p>
<p>RANGE DAYBOARDS MAY BE LETTERED</p>	
<p>DAYBOARDS - MAY BE LETTERED</p> <p>WHITE LIGHT ONLY</p>	<p>SPECIAL MARKS - MAY BE LETTERED</p> <p>YELLOW LIGHT ONLY FIXED FLASHING LIGHT ONLY</p> <p>SHAPE OPTIONAL—BUT SELECTED TO BE APPROPRIATE FOR THE POSITION OF THE MARK IN RELATION TO THE NAVIGABLE WATERWAY AND THE DIRECTION OF BUOYAGE.</p>

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.

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)

EXPLANATION 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.

MAY SHOW WHITE REFLECTOR OR LIGHT

BOAT EXCLUSION AREA

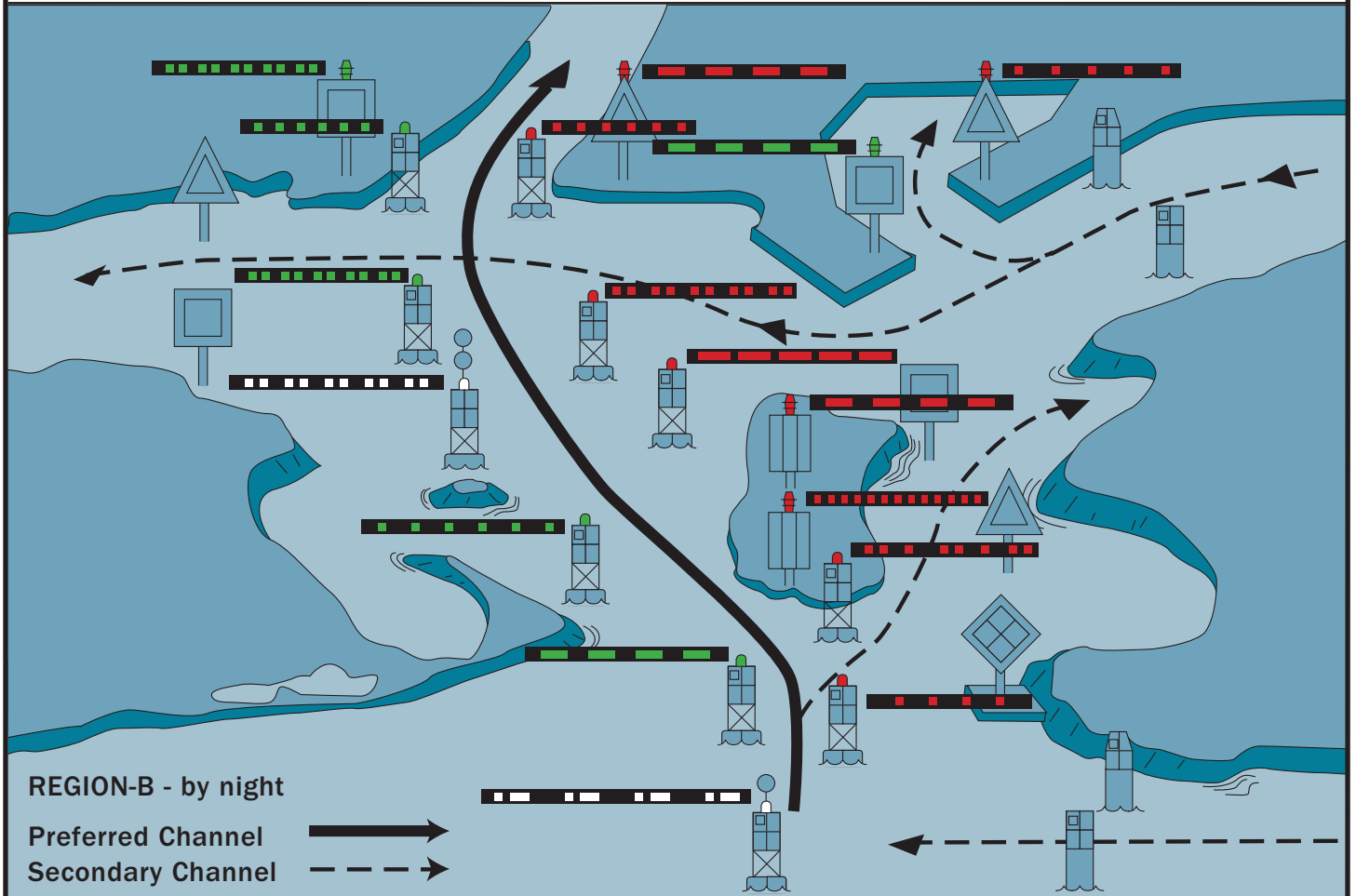
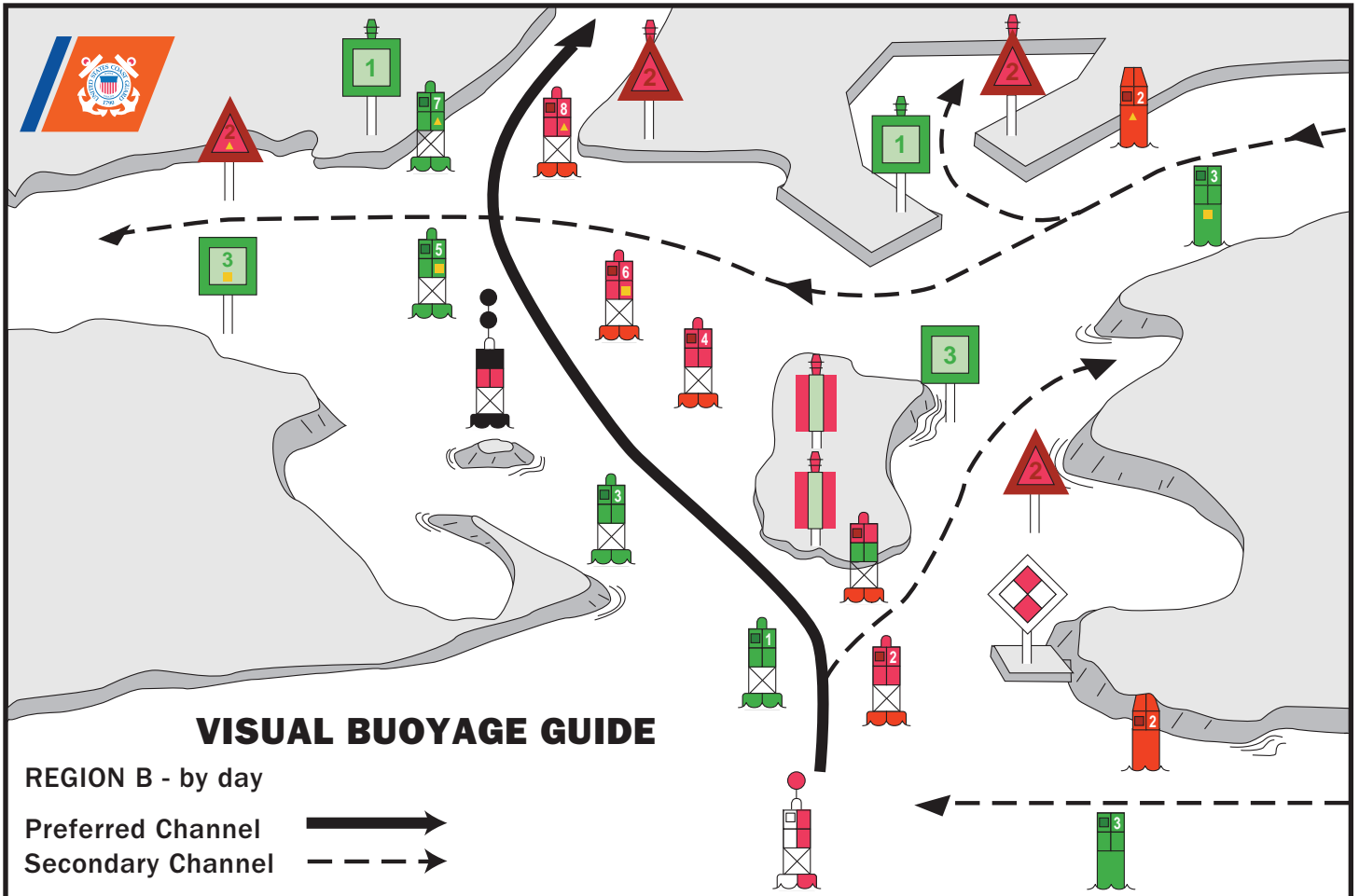
DANGER

CONTROLLED AREA

DANGER

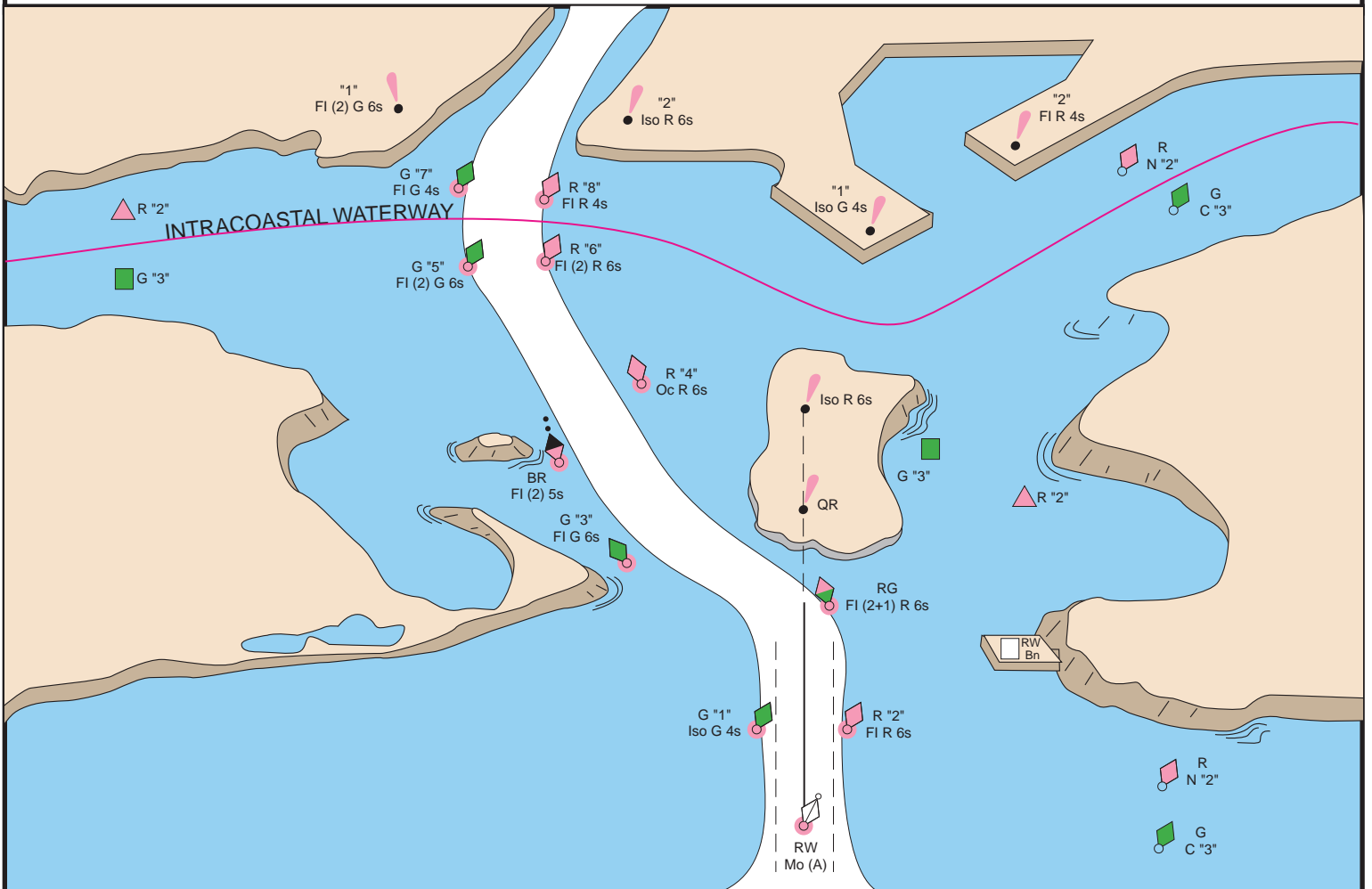
BUOY USED TO DISPLAY REGULATORY MARKERS

MAY SHOW WHITE LIGHT MAY BE LETTERED





FICTITIOUS NAUTICAL CHART





U.S. AIDS TO NAVIGATION SYSTEM

on the Western River System

AS SEEN ENTERING FROM SEAWARD

<p>PORT SIDE OR RIGHT DESCENDING BANK</p> <p>GREEN OR WHITE LIGHTS</p> <p>FLASHING ISO</p> <p>LIGHT LIGHTED BUOY CAN</p> <p>SG CNG</p> <p>PASSING DAYBEACON CROSSING DAYBEACON</p> <p>176.9 MILE BOARD</p>	<p>PREFERRED CHANNEL MARK JUNCTIONS AND OBSTRUCTIONS COMPOSITE GROUP FLASHING (2+1)</p> <p>PREFERRED CHANNEL TO STARBOARD TOPMOST BAND GREEN FI (2+1) G</p> <p>PREFERRED CHANNEL TO PORT TOPMOST BAND RED FI (2+1) R</p> <p>JG JR</p> <p>DAYBOARDS HAVING NO LATERAL SIGNIFICANCE</p> <p>MAY BE LETTERED WHITE LIGHT ONLY</p> <p>NB</p> <p>123.5 MILE BOARD</p>	<p>STARBOARD SIDE OR LEFT DESCENDING BANK</p> <p>RED OR WHITE LIGHTS</p> <p>FLASHING (2) ISO</p> <p>LIGHT LIGHTED BUOY NUN</p> <p>MAY BE LIGHTED TR CNR</p> <p>PASSING DAYBEACON CROSSING DAYBEACON</p> <p>123.5 MILE BOARD</p>
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SPECIAL MARKS--MAY BE LETTERED

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

DANGER

CONTROLLED AREA

INFORMATION

EXPLANATION 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.

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

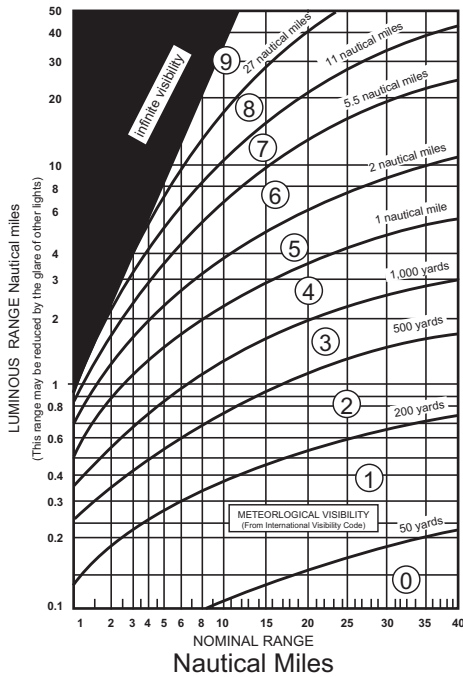
BLACK-STRIPED WHITE BUOY

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.



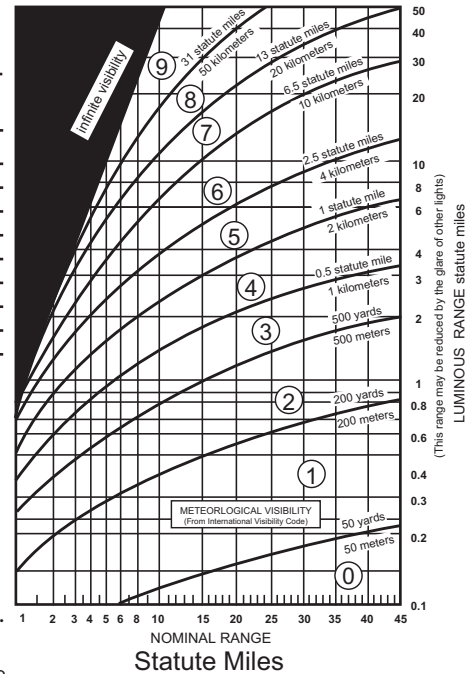
METEOROLOGICAL VISIBILITY (From International Visibility Code)

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 eye of 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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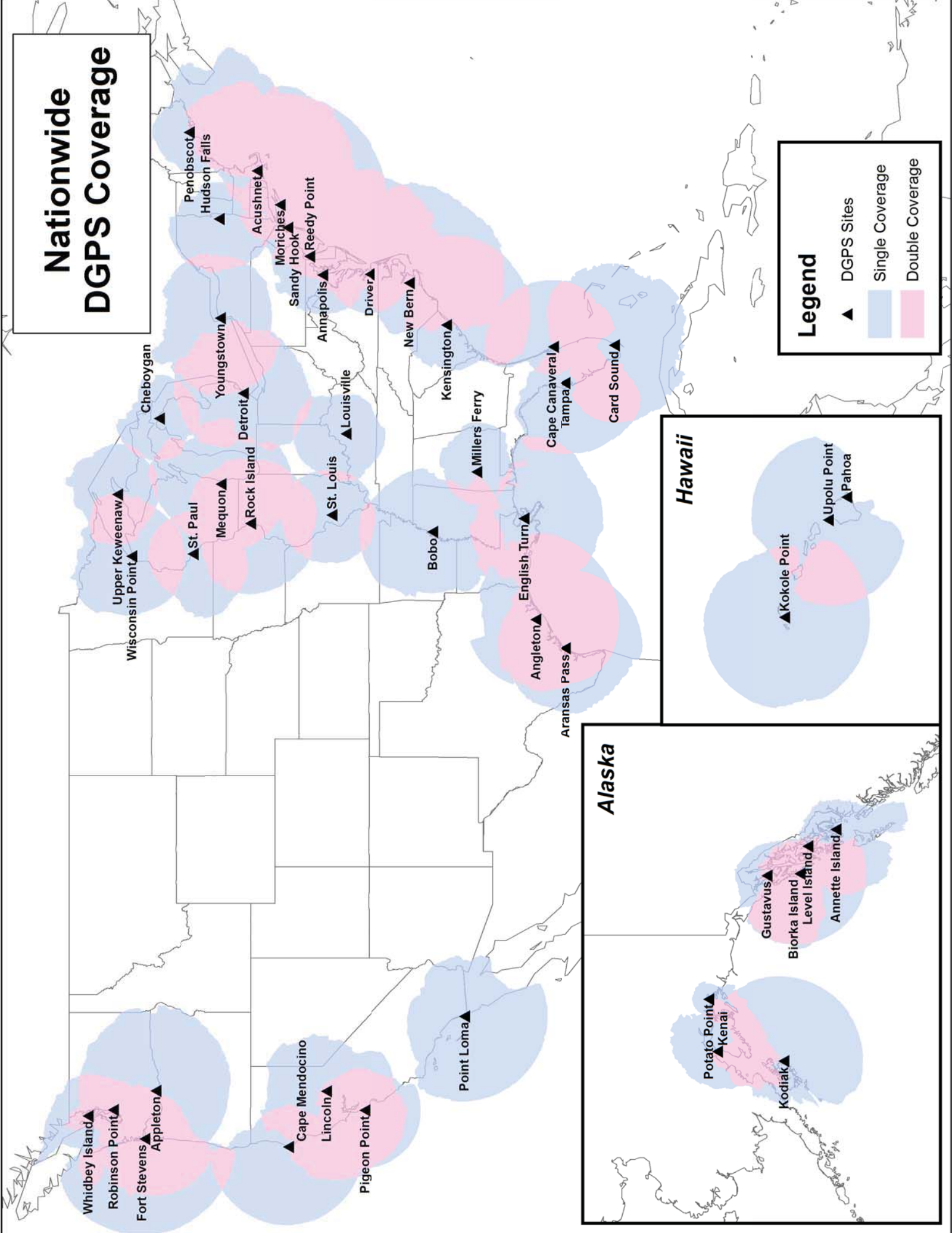
Nationwide DGPS Coverage

Legend

- ▲ DGPS Sites
- Single Coverage
- Double Coverage

Hawaii

Alaska



COAST GUARD DISTRICT COMMANDERS

DISTRICT	ADDRESS	WATERS OF JURISDICTION
FIRST	408 Atlantic Avenue Boston, MA 02110-3350 Tel: (617) 223-8351 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 431 Crawford Street Portsmouth, VA 23704-5004 Tel: (757) 398-6486 (757) 398-6552 http://www.uscg.mil/d5	Shrewsbury River, New Jersey to Delaware, Maryland, Virginia, District of Columbia, and North Carolina.
SEVENTH	Brickell Plaza Federal Building 909 SE 1st Avenue; Rm:406 Miami, FL 33131-3050 Tel: (305) 415-6752 (305) 415-6800 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 500 Poydras Street New Orleans, LA 70130-3310 Tel: (504) 671-2327 (504) 671-2137 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 Cleveland, OH 44199-2060 Tel: (216) 902-6060 (216) 902-6117 http://www.uscg.mil/d9	Great Lakes and St. Lawrence River above St. Regis River.
ELEVENTH	Coast Guard Island Building 50-2 Alameda, CA 94501-5100 Tel: (510) 437-2975 http://www.uscg.mil/d11	California, Nevada, Utah, Arizona.
THIRTEENTH	Federal Building 915 Second Avenue 35th Floor, Rm 3510 Seattle, WA 98174-1067 Tel: (206) 220-7270 (206) 220-7004 http://www.uscg.mil/d13	Oregon, Washington, Idaho, and Montana.
FOURTEENTH	Prince Kalaniana'ole Federal Bldg. 300 Ala Moana Blvd 9th Floor, Room 9-220 Honolulu, HI 96850-4982 Tel: (808) 535-3409 (808) 535-3414 http://www.uscg.mil/d14	Hawaiian, American Samoa, Marshall, Marianas, and Caroline Islands.
SEVENTEENTH	PO Box 25517 Juneau, AK 99802-5517 Tel: (907) 463-2029 (907) 463-2269 http://www.uscg.mil/d17	Alaska.

**U. S. COAST GUARD
ELEVENTH DISTRICT UNIT LISTING**

AIDS TO NAVIGATION TEAMS

ANT Humboldt Bay
Samoa, CA 95564-9999
Tel: (707) 269-2550

ANT Los Angeles/Long Beach
1001 South Seaside Avenue
Bldg 22
San Pedro, CA 90731
Tel: (310) 521-3890

ANT San Diego
2710 Harbor Drive North
San Diego, CA 92101-1079
Tel: (619) 683-6358

ANT San Francisco
Yerba Buena Island
San Francisco, CA 94130-5013
Tel: (415) 399-3515

BUOY TENDERS

USCGC ASPEN (WLB 208)
c/o Coast Guard Base
Yerba Buena Island
San Francisco, CA 94130-5013
Tel: (415) 399-3590/91/92

USCGC GEORGE COBB (WLM 564)
1001 South Seaside Avenue
San Pedro, CA 90731
Tel: (310) 521-4580

**U. S. COAST GUARD
THIRTEENTH DISTRICT UNIT LISTING**

AIDS TO NAVIGATION TEAMS

ANT ASTORIA
Tongue Point Facility
Astoria, OR 97103-2099
Tel: (503) 325-3301

ANT COOS BAY
PO Box 5650
Charleston, OR 97420-0627
Tel: (541) 888-3441

ANT KENNEWICK
434 Clover Island
Kennewick, WA 99336-3784
Tel: (509) 586-1110

ANT PUGET SOUND
1519 Alaskan Way South
Seattle, WA 98134-1192
Tel: (206) 217-6918

BUOY TENDERS

USCGC BLUEBELL (WLI-313)
6767 North Basin Avenue
Portland, OR 97217-3992
Tel: (503) 240-9362

USCGC FIR (WLB-213)
c/o CG Base Tongue Point
Astoria, OR 97103
Tel: (503) 325-1601

USCGC HENRY BLAKE (WLM-563)
Naval Station Everett
2000 West Marine View Drive
Everett, WA 98207
Tel: (425) 304-5740

**U. S. COAST GUARD
FOURTEENTH DISTRICT UNIT LISTING**

AIDS TO NAVIGATION TEAM

ANT Honolulu
400 Sand Island Access Road
Honolulu, HI 96819-4398
Tel: (808) 842-2851

BUOY TENDERS

USCGC KUKUI (WLB 203)
400 Sand Island Access Road
Honolulu, HI 96819-4398
Tel: (808) 842-2860

USCGC SEQUOIA (WLB 215)
FPO AP 96678-3922
Tel: (671) 355-4885

USCGC WALNUT (WLB 205)
400 Sand Island Access Road
Honolulu, HI 96819-4398
Tel: (808) 842-2865

**U. S. COAST GUARD
SEVENTEENTH DISTRICT UNIT LISTING**

AIDS TO NAVIGATION TEAMS

ANT KODIAK
P.O. BOX 195098
Kodiak, AK 99619-5098
Tel: (907) 487-5181

ANT SITKA
613 Airport Road
Sitka, AK 99835
Tel: (907) 966-5410

BUOY TENDERS

USCGC ANTHONY PETIT (WLM 558)
1340 Stedman Street
Ketchikan, AK 99901
Tel: (907) 228-0356

USCGC ELDERBERRY (WLI 65401)
PO Box 550
Petersburg, AK 99833-0550
Tel: (907) 772-4225

USCGC HICKORY (WLB 212)
4688 Homer Spit Rd.
Homer, AK 99603-8001
Tel: (907) 235-5233

USCGC MAPLE (WLB 207)
1480 Seward Avenue
Sitka, AK 99835-9454
Tel: (907) 966-5470

USCGC SPAR (WLB 206)
PO Box 190651
c/o CG ISC
Kodiak, AK 99169-0651
Tel: (907) 487-5344

USCGC SYCAMORE (WLB 209)
PO Box 300
Cordova, AK 99574
Tel: (907) 424-3434

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 on the Pacific Coast, Pacific Islands, and the Coast of Alaska.

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 electronically 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 (dpw)
Eleventh Coast Guard District
Building 50-2
Coast Guard Island
Alameda, CA 94501-5100

Commander (dpw)
Thirteenth Coast Guard District
915 2nd Avenue 35th Floor, Rm 3510
Seattle, WA 98174-1067

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

Commander (dpw)
Fourteenth Coast Guard District
300 Ala Moana Blvd.
Room 9-220
Honolulu, HI 96850-4982

Commander (dpw)
Seventeenth Coast Guard District
PO Box 25517
Juneau, AK 99802-5517

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 <https://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 A I W R).

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=AIMessages,
- 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
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South	S	Explosive Anchorage	EXPLOS ANCH
East	E	Fathom(s)	FM(S)
West	W	Foot/Feet	FT
Northeast	NE	Harbor	HBR
Northwest	NW	Height	HT
Southeast	SE	Hertz	HZ
Southwest	SW	Horizontal Clearance	HOR CL
		Hour	HR
<u>Months</u>		International Regulations for	
January	JAN	Preventing Collisions at Sea	COLREGS
February	FEB	Kilohertz	KHZ
March	MAR	Kilometer	KM
April	APR	Knot(s)	KT(S)
May	MAY	Minute (time, geo, pos)	MIN
June	JUN	Megahertz	MHZ
July	JUL	Moderate	MOD
August	AUG	Mountain, Mount	MT
September	SEP	Nautical Mile(s)	NM
October	OCT	Notice to Mariners	NTM
November	NOV	Obstruction	OBSTR
December	DEC	Occasion/Occasionally	OCCASION
		Operating Area	OPAREA
<u>Days of the Week</u>		Pacific	PAC
Monday	MON	Point(s)	PT(S)
Tuesday	TUE	Position	POS
Wednesday	WED	Position Approximate	PA
Thursday	THU	Pressure	PRES
Friday	FRI	Private, Privately	PRIV
Saturday	SAT	Prohibited	PROHIB
Sunday	SUN	Publication	PUB
		Range	RGE
<u>Various</u>		Reported	REP
Anchorage	ANCH	Restricted	RESTR
Anchorage Prohibited	ANCH PROHIB	River	RIV
Approximate	APPROX	Rock	RK
Atlantic	ATL	Saint	ST
Authorized	AUTH	Second (time, geo, pos)	SEC
Average	AVG	Signal Station	SIG STA
Bearing	BRG	Station	STA
Breakwater	BKW	Statute Mile(s)	SM
Broadcast Notice to Mariners	BNM	Storm Signal Station	S SIG STA
Canadian Aid	(C)	Temporary	TEMP
Captain of the Port	COTP	Thunderstorm	TSTORM
Channel	CHAN	Through	THRU
Code of Federal Regulations	CFR	True	T
Continue	CONT	Uncovers, Dries	UNCOV
Degrees (temp, geo, pos)	DEG	Universal Coordinate Time	UTC
Diameter	DIA	Urgent Marine Information Broadcast	UMIB
Edition	ED	Velocity	VEL
Effect/Effective	EFF	Vertical Clearance	VERT CL
Entrance	ENTR	Vessel Traffic Service	VTS

Visibility	VIS	Missouri	MO
Yard(s)	YD	Mississippi	MS
Warning	WARN	Mexico	MX
Weather	WX	Michigan	MI
Wreck	WK	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
<u>Countries and States</u>			
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		

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 or 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.

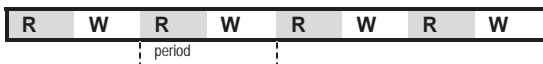
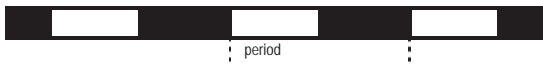
Winter Marker: An unlighted buoy without a sound signal, used to replace a conventional buoy when an aid to navigation is endangered by ice.

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

1. **FIXED.**
A light showing continuously and steadily.
2. **OCCULTING.**
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.**
An occulting light in which an eclipse is regularly repeated.
 - 2.2 **Group-occulting.**
An occulting light in which a group of eclipses, specified in numbers, is regularly repeated.
 - 2.3 **Composite group-occulting.**
A light, similar to a group-occulting light, except that successive groups in a period have different numbers of eclipses.
3. **ISOPHASE.**
A light in which all durations of light and darkness are equal.
4. **FLASHING.**
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.**
A flashing light in which a flash is regularly repeated (frequency not exceeding 30 flashes per minute).
 - 4.2 **Group-flashing.**
A flashing light in which a group of flashes, specified in number, is regularly repeated.
 - 4.3 **Composite group-flashing.**
A light similar to a group flashing light except that successive groups in the period have different numbers of
5. **QUICK.**
A light in which flashes are produced at a rate of 60 flashes per minute.
 - 5.1 **Continuous quick.**
A quick light in which a flash is regularly repeated.
 - 5.2 **Interrupted quick.**
A quick light in which the sequence of flashes is interrupted by regularly repeated eclipses of constant and long duration.
6. **MORSE CODE.**
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.
7. **FIXED AND FLASHING.**
A light in which a fixed light is combined with a flashing light of higher luminous intensity.
8. **ALTERNATING.**
A light showing different colors alternately

Abbreviation

- F
- Oc
- Oc (2)
- Oc (2+1)
- Iso
- FI
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F8364.00	.	30865	G3715.38	.	2190	G3875.74	.	2844	G4007.70	.	4151
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F8395.10	.	30670	G3760.00	.	2670	G3926.00	.	190	G4086.50	.	4500
F8395.50	.	30675	G3766.00	.	2615	G3927.00	.	3600	G4086.60	.	4545
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CROSS REFERENCE - INTERNATIONAL VS. U.S. LIGHT NUMBER

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G4142.26		5385	G4217		5975	G4302.00		6600	G4460.50		8805
G4142.27		5390	G4217.20		5980	G4302.2		6595	G4460.51		8810
G4142.28		5395	G4217.22		5990	G4302.40		6650	G4462.00		8845
G4146		4475	G4217.30		6000	G4302.60		6655	G4462.10		8850
G4156.00		4610	G4217.32		6010	G4302.80		7170	G4463.00		8855
G4156.10		4615	G4217.4		6020	G4356.00		385	G4463.10		8860
G4158.00		4620	G4217.42		6030	G4356.80		7770	G4464.00		8865
G4158.10		4625	G4217.50		6040	G4356.84		7775	G4464.10		8870
G4173.38		4890	G4217.55		6050	G4356.9		7785	G4466		8920
G4176.00		4755	G4217.6		6060	G4357.00		7790	G4474.00		9235
G4176.2		4760	G4217.7		6070	G4357.10		7800	G4474.10		9240
G4176.4		4765	G4218.38		5880	G4358.00		420	G4475		9255
G4176.6		4770	G4241.4		5885	G4362.00		450	G4475.20		9265
G4179.80		5130	G4242.00		5960	G4363.00		8080	G4483.21		9270
G4180		5155	G4244.00		5965	G4364.00		8100	G4484.00		9510
G4182		5175	G4249.00		5970	G4365.00		8105	G4486.00		635
G4183		5180	G4250.00		6090	G4365.10		8110	G4490.00		9580
G4183.2		5190	G4252.00		6095	G4366.00		8115	G4490.10		9585
G4183.30		5195	G4254.00		6100	G4367.00		8125	G4492.40		9605
G4183.40		5200	G4255.00		6105	G4382.00		8140	G4493.00		9635
G4183.5		5210	G4256.60		6110	G4383.00		8150	G4494.00		9620
G4183.6		5205	G4256.8		6115	G4384.00		8155	G4494.10		9625
G4183.7		5220	G4258.00		6120	G4385		8165	G4498.00		9660
G4183.86		5230	G4258.20		6125	G4395.5		8210	G4500		9665
G4183.90		5240	G4260.00		6215	G4396.20		8216	G4500.4		9670
G4191.00		5305	G4266.00		6220	G4396.5		8220	G4501.00		9675
G4191.1		5310	G4270.00		6225	G4397.00		8230	G4502.00		9680
G4191.6		5315	G4271.00		6230	G4401.50		8270	G4506.00		650
G4192.00		5480	G4272.00		6235	G4401.70		8275	G4508.00		9795
G4192.40		5400	G4274.00		6240	G4402.20		8245	G4509		9790
G4192.60		5490	G4279.00		6250	G4402.40		8250	G4519.00		9820
G4194.00		5670	G4292		6295	G4402.60		8255	G4520.10		9830
G4194.10		5675	G4294		6300	G4404.00		8265	G4521.00		9840
G4196.00		5760	G4296.00		6325	G4408.00		525	G4532.00		695
G4196.20		5765	G4296.20		6330	G4410.00		540	G4536.20		14420
G4203.20		5685	G4296.4		6335	G4415.00		550	G4536.4		14440
G4203.80		5710	G4296.8		6345	G4416.00		8390	G4536.5		14450
G4205.00		5715	G4297.00		6350	G4416.1		8395	G4537.00		14460
G4205.2		5720	G4297.40		6365	G4417.00		8385	G4537.5		14470
G4205.4		5725	G4297.60		6370	G4417.5		555	G4538		14480
G4205.6		5730	G4297.80		6375	G4424.00		8610	G4538.5		14490
G4216.00		5830	G4297.81		6380	G4424.10		8615	G4539.00		14500
G4216.10		5835	G4298.00		6390	G4426		8625	G4540.00		14510
G4216.3		5840	G4298.40		6440	G4428.00		8640	G4540.20		14515
G4216.40		5845	G4299		6465	G4430.00		8660	G4548.00		14610
G4216.5		5850	G4299.20		6470	G4432.00		595	G4550.00		14620
G4216.6		5855	G4299.21		6475	G4460.00		8785	G4551.00		14625
G4216.7		5860	G4300.00		6520	G4460.10		8790	G4552.00		14520

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G4553.00	.....	14525	G4643.00	.....	10585	G4686.10	.....	11035	G4709.00	.....	11700
G4555	.....	14530	G4644.00	.....	10590	G4686.40	.....	11040	G4709.10	.....	11720
G4556.00	.....	14535	G4644.20	.....	10595	G4687.00	.....	11050	G4710.00	.....	11710
G4564.00	.....	9995	G4644.30	.....	10600	G4687.20	.....	11055	G4710.6	.....	11725
G4565.00	.....	10005	G4647.00	.....	10625	G4687.40	.....	11060	G4711.00	.....	11730
G4570.00	.....	10025	G4647.20	.....	10630	G4690.00	.....	11065	G4711.10	.....	11735
G4587.00	.....	14720	G4648.00	.....	10635	G4690.20	.....	11130	G4711.60	.....	11745
G4587.20	.....	14725	G4649.00	.....	10640	G4690.40	.....	11135	G4712.60	.....	11775
G4588.00	.....	10105	G4650.00	.....	10650	G4691.00	.....	11140	G4718.00	.....	700
G4588.10	.....	10110	G4651.00	.....	10660	G4691.10	.....	11145	G4723.20	.....	15230
G4589.00	.....	10095	G4651.10	.....	10665	G4691.40	.....	11150	G4723.60	.....	15240
G4602.00	.....	10185	G4652.00	.....	10670	G4695.80	.....	14900	G4724.00	.....	15410
G4604.00	.....	10195	G4652.20	.....	10715	G4696.00	.....	14905	G4724.20	.....	15420
G4604.10	.....	10200	G4653.00	.....	10725	G4696.20	.....	14910	G4724.40	.....	15435
G4606.00	.....	10175	G4653.40	.....	10730	G4696.38	.....	14935	G4724.60	.....	15445
G4606.10	.....	10180	G4654.00	.....	10675	G4696.4	.....	14940	G4724.62	.....	15450
G4607.00	.....	10215	G4658.00	.....	10760	G4696.50	.....	14945	G4724.70	.....	15480
G4607.4	.....	10230	G4661.00	.....	10780	G4696.70	.....	14955	G4726.00	.....	720
G4608.00	.....	10235	G4661.10	.....	10785	G4697.40	.....	11270	G4730	.....	15990
G4608.10	.....	10240	G4663.00	.....	10805	G4698.00	.....	11280	G4730.2	.....	15995
G4608.40	.....	10260	G4666.00	.....	10820	G4698.10	.....	11285	G4731.00	.....	16005
G4609	.....	10270	G4666.10	.....	10825	G4698.30	.....	11290	G4731.20	.....	16010
G4610.00	.....	10275	G4668.00	.....	10832	G4698.60	.....	11305	G4731.40	.....	16015
G4616	.....	10350	G4670.00	.....	10845	G4699.00	.....	11405	G4731.50	.....	16020
G4617	.....	10365	G4671.40	.....	10850	G4699.10	.....	11410	G4731.52	.....	16025
G4618.40	.....	10355	G4672.00	.....	10860	G4699.30	.....	11415	G4732.00	.....	15610
G4618.41	.....	10360	G4673	.....	10870	G4701.50	.....	11470	G4732.10	.....	15615
G4619.00	.....	10380	G4674.00	.....	10875	G4701.80	.....	11475	G4732.30	.....	15635
G4620.00	.....	10385	G4674.10	.....	10880	G4702.00	.....	11480	G4732.40	.....	15685
G4620.10	.....	10390	G4675	.....	10885	G4702.10	.....	11485	G4734.90	.....	15850
G4621	.....	10400	G4676.00	.....	10890	G4702.40	.....	11490	G4734.91	.....	15855
G4621.20	.....	10405	G4677.00	.....	10895	G4702.50	.....	11495	G4735.20	.....	15880
G4621.30	.....	10410	G4682.20	.....	10935	G4702.80	.....	11505	G4735.30	.....	15870
G4622.00	.....	10415	G4682.40	.....	10940	G4703.00	.....	11510	G4735.31	.....	15875
G4623.00	.....	10420	G4682.50	.....	10945	G4703.10	.....	11515	G4735.40	.....	15885
G4624.00	.....	10425	G4682.80	.....	10950	G4703.50	.....	11530	G4735.60	.....	15900
G4625.00	.....	10430	G4682.81	.....	10955	G4703.60	.....	11535	G4741.00	.....	15955
G4625.10	.....	10435	G4683.00	.....	10970	G4703.80	.....	11545	G4741.1	.....	15950
G4626.30	.....	10445	G4683.40	.....	10975	G4704.00	.....	11550	G4750.00	.....	745
G4626.50	.....	10455	G4683.60	.....	10980	G4704.10	.....	11555	G4751.00	.....	16090
G4627.00	.....	10460	G4684.00	.....	10985	G4704.40	.....	11560	G4752.00	.....	16095
G4631.00	.....	10500	G4684.10	.....	10990	G4705.00	.....	11570	G4753.00	.....	16105
G4634.00	.....	10520	G4684.20	.....	11000	G4705.10	.....	11575	G4753.20	.....	16110
G4638	.....	10555	G4684.80	.....	11005	G4706.00	.....	11590	G4756.00	.....	760
G4639.00	.....	10560	G4685.00	.....	11010	G4706.20	.....	11600	G4760.00	.....	16160
G4640.00	.....	10565	G4685.10	.....	11015	G4708.10	.....	11665	G4768.00	.....	16280
G4641.00	.....	10570	G4685.40	.....	11025	G4708.6	.....	11695	G4769.20	.....	16300
G4642.00	.....	10580	G4686.00	.....	11030	G4708.90	.....	11705	G4769.80	.....	16310

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G4770.00	.....	16320	G4849.00	.....	17950	G4943.00	.....	17365	G5048.00	.....	19015
G4770.20	.....	16325	G4851	.....	17965	G4950.00	.....	17355	G5048.60	.....	18986
G4771.00	.....	16330	G4851.17	.....	17980	G4952.00	.....	17400	G5048.70	.....	19055
G4772.00	.....	16335	G4851.40	.....	17985	G4956	.....	17415	G5048.80	.....	19060
G4773.00	.....	16445	G4851.60	.....	17990	G4958.00	.....	17405	G5049.00	.....	19075
G4773.20	.....	16450	G4851.80	.....	17995	G4960.00	.....	17410	G5050.00	.....	19070
G4776.00	.....	16400	G4854.20	.....	16770	G4962.00	.....	17420	G5051.00	.....	19085
G4778.00	.....	16375	G4854.30	.....	16775	G4964	.....	17440	G5060.20	.....	19171
G4780.00	.....	16380	G4861.3	.....	18000	G4968.00	.....	17430	G5060.30	.....	19172
G4784.00	.....	16475	G4861.6	.....	18005	G4968.1	.....	17435	G5061.00	.....	19465
G4784.80	.....	16480	G4862.00	.....	18010	G4968.80	.....	17460	G5064.00	.....	19425
G4791.00	.....	17562	G4865.00	.....	16825	G4969.00	.....	17465	G5064.40	.....	19415
G4791.20	.....	17563	G4866.00	.....	16830	G4969.40	.....	17475	G5065.00	.....	19435
G4792.00	.....	17565	G4867.00	.....	16835	G4970.00	.....	17480	G5067	.....	19470
G4794.00	.....	17575	G4873.00	.....	16955	G4970.1	.....	17485	G5068.00	.....	19450
G4796.00	.....	17585	G4882.40	.....	16925	G4976.00	.....	18435	G5082.00	.....	19185
G4802.00	.....	16500	G4885.00	.....	16880	G4978.00	.....	18440	G5083.00	.....	19195
G4803.00	.....	16505	G4885.10	.....	16885	G4982	.....	18460	G5084.00	.....	19200
G4804.00	.....	16515	G4886.40	.....	16900	G4982.30	.....	18465	G5086.00	.....	19215
G4804.70	.....	17715	G4886.50	.....	16905	G4983.20	.....	18490	G5089.30	.....	19240
G4805.00	.....	17720	G4888.00	.....	16910	G4987	.....	18590	G5089.31	.....	19245
G4806.00	.....	17665	G4890.00	.....	16915	G4988.00	.....	18610	G5092.00	.....	19250
G4806.40	.....	17670	G4892.00	.....	18070	G4990.00	.....	18620	G5092.30	.....	19260
G4806.6	.....	17675	G4893.00	.....	18075	G5002	.....	18625	G5105.00	.....	19275
G4806.61	.....	17680	G4894.00	.....	18085	G5004.00	.....	18630	G5106.00	.....	19525
G4806.80	.....	17690	G4895.00	.....	18090	G5005.30	.....	18645	G5107.00	.....	19880
G4810	.....	16545	G4895.2	.....	18095	G5005.50	.....	18670	G5108.00	.....	19530
G4811.00	.....	17725	G4896.00	.....	18080	G5007	.....	18710	G5120.00	.....	19540
G4812.00	.....	17730	G4900.00	.....	16980	G5007.02	.....	18715	G5122.00	.....	19545
G4818.42	.....	17745	G4901.00	.....	17045	G5007.16	.....	18725	G5124.00	.....	19555
G4819.00	.....	17800	G4901.40	.....	17050	G5007.18	.....	18735	G5125.00	.....	19560
G4820	.....	17805	G4901.60	.....	17060	G5012.00	.....	18760	G5125.40	.....	19585
G4821.00	.....	17820	G4902.20	.....	17055	G5013.00	.....	18820	G5126.00	.....	19590
G4822.00	.....	17840	G4902.60	.....	17065	G5024.10	.....	18825	G5128.00	.....	19605
G4822.20	.....	17845	G4906.00	.....	17070	G5026.00	.....	18885	G5128.20	.....	19615
G4822.60	.....	17855	G4915.5	.....	17165	G5030.00	.....	18890	G5128.30	.....	19625
G4823.00	.....	17850	G4916.00	.....	17160	G5032.00	.....	18895	G5129.00	.....	19635
G4823.20	.....	17860	G4918	.....	17140	G5034.00	.....	19325	G5130.00	.....	19640
G4823.40	.....	17865	G4923.00	.....	17125	G5036.00	.....	19350	G5131.00	.....	19645
G4824.00	.....	17870	G4924	.....	17105	G5036.40	.....	19360	G5132.00	.....	19650
G4825.00	.....	17900	G4924.20	.....	17110	G5036.42	.....	19365	G5133.00	.....	19655
G4826.20	.....	17875	G4924.40	.....	17115	G5037.00	.....	19370	G5134.00	.....	19660
G4826.60	.....	17897	G4924.60	.....	17120	G5038.00	.....	19395	G5135.00	.....	19675
G4827	.....	17905	G4932.00	.....	17215	G5039.00	.....	18960	G5136.00	.....	19750
G4828.00	.....	16550	G4934	.....	17225	G5039.40	.....	18955	G5140.00	.....	19805
G4840.10	.....	16675	G4936.00	.....	17250	G5046.00	.....	18948	G5142.00	.....	19825
G4848.00	.....	17930	G4940.00	.....	17270	G5046.40	.....	18995	G5146.00	.....	19890
G4848.50	.....	17945	G4942.60	.....	17330	G5047.00	.....	19010	G5147.00	.....	19895

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G5147.40	.....	19900	G5382.00	.....	20395	G5920.00	.....	24365	G6043.00	.....	22265
G5147.5	.....	19905	G5383.00	.....	20390	G5928.00	.....	24420	G6044.00	.....	22280
G5148.00	.....	19920	G5384.00	.....	20385	G5930.00	.....	24430	G6045.00	.....	22295
G5149.00	.....	19930	G5386.00	.....	20400	G5935.00	.....	24435	G6046.00	.....	22300
G5152.00	.....	19965	G5388.00	.....	20450	G5936.00	.....	24440	G6048.00	.....	22305
G5154.00	.....	19950	G5394.00	.....	20435	G5938.00	.....	24395	G6052.00	.....	22330
G5154.50	.....	19955	G5394.10	.....	20440	G5940.00	.....	24410	G6060.00	.....	22350
G5160.9	.....	19775	G5400.00	.....	20470	G5944.00	.....	24450	G6063.00	.....	22340
G5161	.....	19970	G5401.00	.....	20480	G5947.00	.....	24465	G6064.00	.....	22335
G5172.00	.....	930	G5414.00	.....	20490	G5948.00	.....	24475	G6068.00	.....	22360
G5178.00	.....	925	G5419.00	.....	20510	G5949.00	.....	24485	G6070.00	.....	22365
G5198.00	.....	905	G5419.40	.....	20515	G5950.00	.....	24635	G6072.00	.....	22370
G5219.00	.....	860	G5420.00	.....	20520	G5950.20	.....	24625	G6097.00	.....	22445
G5224.00	.....	850	G5426.00	.....	20500	G5951.00	.....	24570	G6098.00	.....	22530
G5242.00	.....	820	G5485.00	.....	20525	G5958.00	.....	24730	G6098.40	.....	22540
G5246.00	.....	810	G5486.00	.....	20535	G5961.00	.....	24755	G6099.00	.....	22545
G5247.00	.....	805	G5488.00	.....	20540	G5962.00	.....	24780	G6100.00	.....	22460
G5249.00	.....	800	G5492.00	.....	20460	G5990.00	.....	22005	G6102.00	.....	22475
G5256.00	.....	790	G5807.00	.....	21770	G5992.00	.....	22000	G6105.00	.....	22470
G5257.00	.....	795	G5808.00	.....	21780	G5994.00	.....	22010	G6106.00	.....	22480
G5279.00	.....	785	G5808.20	.....	21785	G5996.00	.....	21995	G6108.00	.....	22490
G5280.00	.....	780	G5808.40	.....	21795	G5998.00	.....	21990	G6110.00	.....	22495
G5288	.....	770	G5813.00	.....	21805	G6002.00	.....	21840	G6112.00	.....	22510
G5295	.....	16210	G5814.00	.....	21820	G6002.40	.....	21920	G6118.00	.....	23445
G5300	.....	16225	G5816.00	.....	21825	G6003.00	.....	21925	G6123.00	.....	23425
G5306	.....	16245	G5818.00	.....	21830	G6004.00	.....	21930	G6124.00	.....	23405
G5328	.....	16265	G5820.00	.....	21810	G6006.00	.....	21940	G6126.00	.....	23385
G5334	.....	16270	G5822.00	.....	21815	G6008.00	.....	21935	G6128.00	.....	23380
G5335.00	.....	19695	G5826.00	.....	935	G6009.00	.....	21945	G6130.00	.....	23370
G5338.00	.....	19720	G5828.00	.....	940	G6012.00	.....	22030	G6132.00	.....	23295
G5340.00	.....	19790	G5854.00	.....	975	G6014.00	.....	22050	G6136.00	.....	23290
G5340.4	.....	19785	G5856.00	.....	980	G6015.00	.....	22055	G6138.00	.....	22730
G5357.4	.....	19800	G5857.00	.....	965	G6016.00	.....	22085	G6140.00	.....	22520
G5358	.....	19810	G5858.00	.....	970	G6016.20	.....	22090	G6141.00	.....	22745
G5360.00	.....	20370	G5859.00	.....	960	G6017.00	.....	22060	G6141.40	.....	22760
G5362.00	.....	20365	G5860.00	.....	955	G6018.00	.....	22120	G6156.40	.....	22700
G5364.00	.....	20355	G5861.00	.....	950	G6019.00	.....	22125	G6157.00	.....	22620
G5365.00	.....	20360	G5862.00	.....	945	G6020.00	.....	22115	G6158.00	.....	22610
G5366.00	.....	20345	G5863.80	.....	21870	G6032.00	.....	22135	G6160.00	.....	22600
G5367.00	.....	20350	G5864.00	.....	21860	G6034.00	.....	22225	G6162.00	.....	22570
G5368.00	.....	20325	G5866.00	.....	21865	G6034.50	.....	22235	G6164.00	.....	22555
G5369.00	.....	20335	G5884.00	.....	21880	G6035.00	.....	22205	G6166.00	.....	22670
G5371.00	.....	20320	G5888.00	.....	21900	G6035.20	.....	22200	G6166.20	.....	22675
G5373.00	.....	20330	G5889.00	.....	21905	G6035.30	.....	22215	G6166.40	.....	22685
G5378.00	.....	20380	G5910.00	.....	21850	G6035.40	.....	22210	G6168.00	.....	22825
G5378.60	.....	20410	G5914.00	.....	21855	G6035.60	.....	22220	G6170.00	.....	22830
G5379.00	.....	20405	G5916.00	.....	24350	G6038.00	.....	22245	G6171.00	.....	22835
G5380.00	.....	20420	G5918.00	.....	24360	G6042.00	.....	22255	G6172.00	.....	22840

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G6174.00	.....	22845	G6271.50	.....	23325	G6402.00	.....	25055	G6500.00	.....	24230
G6175.00	.....	22850	G6272.00	.....	23340	G6402.20	.....	25060	G6511.50	.....	24315
G6176.00	.....	22865	G6273.00	.....	23350	G6407.40	.....	25065	G6511.70	.....	24310
G6180.00	.....	22890	G6274.00	.....	23360	G6422.00	.....	23575	G6512.00	.....	25395
G6181.00	.....	22900	G6276.00	.....	23545	G6424.00	.....	23580	G6513.00	.....	25390
G6181.10	.....	22905	G6284.00	.....	23435	G6427.00	.....	23265	G6513.20	.....	25380
G6181.40	.....	22795	G6315.00	.....	23470	G6428.00	.....	23270	G6513.50	.....	25375
G6181.60	.....	22800	G6316.00	.....	23510	G6430.00	.....	23275	G6514.00	.....	1075
G6182.00	.....	22815	G6318.00	.....	23515	G6432.00	.....	23280	G6518.00	.....	1065
G6193.00	.....	22895	G6319.00	.....	23520	G6434.00	.....	23595	G6520.00	.....	1055
G6194.00	.....	22965	G6320.00	.....	23525	G6436.00	.....	23600	G6524.00	.....	23975
G6196.00	.....	22970	G6322.00	.....	23540	G6438.00	.....	23605	G6526.00	.....	23970
G6202.00	.....	22975	G6326.00	.....	23530	G6440.00	.....	23610	G6527.00	.....	23965
G6203.00	.....	22980	G6328.00	.....	23985	G6446.00	.....	23615	G6527.50	.....	23960
G6203.1	.....	22985	G6329.00	.....	23990	G6448.00	.....	23640	G6528.00	.....	23955
G6204.00	.....	22990	G6332.00	.....	25315	G6450.00	.....	23620	G6530.00	.....	23945
G6206.00	.....	23000	G6333.00	.....	25310	G6454.00	.....	23645	G6534.00	.....	23825
G6208.00	.....	23025	G6334.00	.....	25275	G6455.00	.....	23650	G6535.00	.....	23840
G6210.00	.....	23030	G6335.00	.....	25300	G6456.00	.....	23655	G6536.00	.....	23855
G6212.00	.....	23035	G6335.50	.....	25295	G6458.00	.....	23775	G6538.00	.....	23850
G6214.00	.....	23045	G6336.00	.....	25285	G6458.20	.....	23785	G6540.00	.....	23860
G6218.00	.....	23055	G6338.00	.....	25305	G6458.40	.....	23790	G6541.00	.....	23865
G6219.00	.....	23060	G6342.00	.....	25260	G6458.50	.....	23795	G6542.00	.....	23870
G6220.00	.....	23070	G6342.50	.....	25265	G6460.00	.....	23800	G6543	.....	23880
G6224.00	.....	23080	G6343.00	.....	25255	G6462.00	.....	23665	G6544.00	.....	23885
G6228.00	.....	23085	G6343.50	.....	25245	G6465.40	.....	23675	G6545.00	.....	23890
G6229.00	.....	23095	G6344.00	.....	25240	G6465.50	.....	23710	G6546.00	.....	23895
G6230.00	.....	23100	G6345.00	.....	25230	G6466.00	.....	23725	G6548.00	.....	23905
G6234.00	.....	23105	G6346.00	.....	25225	G6467.00	.....	23740	G6558.00	.....	23910
G6235.00	.....	23110	G6347.00	.....	25215	G6468.00	.....	23770	G6558.10	.....	25410
G6236.00	.....	23120	G6362.00	.....	24065	G6472.00	.....	23803	G6564.00	.....	25440
G6238.00	.....	23125	G6364.00	.....	24070	G6473.00	.....	23805	G6582.00	.....	1100
G6240.00	.....	23130	G6366.00	.....	24080	G6474.00	.....	23815	G6585.00	.....	25455
G6240.10	.....	23170	G6368.00	.....	24085	G6476.00	.....	24130	G6586.00	.....	25460
G6244.00	.....	23175	G6370.00	.....	24100	G6477.00	.....	24120	G6587.00	.....	25465
G6248.00	.....	23190	G6372.00	.....	24105	G6478.00	.....	24125	G6588.00	.....	25470
G6250.00	.....	22775	G6374.00	.....	24116	G6479.00	.....	24135	G6590.00	.....	25450
G6252	.....	22785	G6378.00	.....	24895	G6480.00	.....	24140	G6592.00	.....	1125
G6254.00	.....	23215	G6386.00	.....	24915	G6481.00	.....	24150	G6599.00	.....	25980
G6256	.....	23240	G6388.00	.....	24925	G6481.20	.....	24155	G6600.00	.....	25975
G6258.00	.....	23245	G6389.00	.....	24945	G6482.00	.....	24160	G6601.00	.....	25970
G6260.00	.....	23250	G6392.00	.....	24950	G6484.00	.....	24175	G6602.00	.....	25965
G6264.00	.....	23260	G6393.00	.....	24955	G6488.00	.....	24180	G6604.00	.....	25945
G6268.00	.....	23570	G6394.00	.....	24960	G6490.00	.....	24205	G6606.00	.....	25920
G6269.00	.....	23565	G6394.40	.....	24970	G6492.00	.....	24195	G6610.00	.....	25915
G6270.00	.....	23555	G6394.60	.....	24975	G6492.50	.....	24200	G6614.00	.....	25925
G6271.00	.....	23550	G6397.00	.....	25005	G6496.00	.....	24235	G6616.00	.....	25910
G6271.30	.....	23315	G6398.00	.....	25015	G6498.00	.....	24225	G6618.00	.....	25905

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G6620.00	.....	25860	G6710.00	.....	26230	G6854.00	.....	27125	G7088.00	.....	27975
G6622.00	.....	25865	G6714.00	.....	26250	G6858.00	.....	27120	G7090.00	.....	27980
G6624.00	.....	25870	G6724.00	.....	26275	G6860.00	.....	27080	G7102.00	.....	1355
G6632.00	.....	25875	G6725.00	.....	26255	G6862.00	.....	27105	G7106.00	.....	1360
G6633.00	.....	25845	G6726.00	.....	26280	G6863.00	.....	27110	G7119.00	.....	1365
G6634.00	.....	25850	G6727.00	.....	26300	G6874.00	.....	27130	G7120.00	.....	27985
G6636.00	.....	25535	G6728.00	.....	26285	G6876.00	.....	27135	G7124.00	.....	27995
G6640.00	.....	25560	G6728.40	.....	26295	G6878.00	.....	27145	G7127.00	.....	28000
G6640.50	.....	25565	G6729.00	.....	26310	G6880.00	.....	27155	G7200.00	.....	28050
G6641.00	.....	25570	G6731.00	.....	26325	G6882.00	.....	27170	G7202.00	.....	28060
G6642.00	.....	25545	G6731.40	.....	26340	G6885.00	.....	27180	G7202.10	.....	28065
G6643.00	.....	25650	G6732.00	.....	26345	G6886.00	.....	27185	G7209.00	.....	28040
G6645.00	.....	25605	G6733.00	.....	26335	G6887.00	.....	27190	G7210.00	.....	28030
G6646.00	.....	25625	G6740.40	.....	26410	G6888.00	.....	27195	G7212.00	.....	28025
G6647.00	.....	25610	G6740.41	.....	26415	G6890.00	.....	27230	G7214.00	.....	28020
G6648.00	.....	25630	G6740.60	.....	26435	G6892.00	.....	27220	G7218.00	.....	28015
G6650.00	.....	25510	G6740.61	.....	26440	G6896.00	.....	27205	G7222.00	.....	28010
G6651.00	.....	25525	G6764.00	.....	26465	G6897.00	.....	27300	G7226.00	.....	28325
G6651.50	.....	25530	G6766.00	.....	27050	G6897.20	.....	27325	G7228.00	.....	28270
G6652.00	.....	25655	G6770.00	.....	27035	G6897.40	.....	27405	G7229.00	.....	28285
G6653.00	.....	25665	G6776.00	.....	27010	G6897.60	.....	27410	G7229.10	.....	28290
G6654.00	.....	25670	G6778.00	.....	26505	G6898.00	.....	27415	G7229.20	.....	28310
G6655.00	.....	25705	G6784.00	.....	26490	G6899.00	.....	27420	G7229.30	.....	28315
G6655.20	.....	25715	G6786.00	.....	26495	G6899.20	.....	27425	G7229.40	.....	28320
G6655.30	.....	25725	G6788.00	.....	26510	G6902.00	.....	1200	G7230.00	.....	28220
G6660.00	.....	25780	G6790.00	.....	26525	G6912.00	.....	1220	G7231.00	.....	28215
G6660.20	.....	25785	G6792.00	.....	26535	G6916.00	.....	1230	G7232.00	.....	28195
G6660.60	.....	25800	G6794.00	.....	27020	G6920.00	.....	1235	G7232.40	.....	28205
G6661.00	.....	25815	G6795.00	.....	27025	G6922.00	.....	1240	G7234.00	.....	28185
G6661.20	.....	25820	G6808.00	.....	26925	G6956.40	.....	27530	G7236.00	.....	28150
G6661.40	.....	25825	G6809.00	.....	26935	G6956.60	.....	27540	G7240.00	.....	28145
G6662.00	.....	1145	G6811.00	.....	26910	G6960.00	.....	27555	G7242.00	.....	28140
G6666.00	.....	25995	G6813.00	.....	26855	G6960.30	.....	27560	G7248.00	.....	28130
G6668.00	.....	26000	G6813.20	.....	26860	G6961.00	.....	27575	G7249.00	.....	28135
G6669.00	.....	26005	G6813.40	.....	26865	G6961.30	.....	27580	G7254.00	.....	28410
G6670.00	.....	26020	G6813.80	.....	26875	G6962.00	.....	1245	G7258.00	.....	28405
G6671.00	.....	26025	G6820.00	.....	1185	G6976.00	.....	1250	G7260.00	.....	28415
G6671.20	.....	26040	G6821.00	.....	26630	G6984.00	.....	1260	G7262.00	.....	28420
G6671.30	.....	26050	G6821.50	.....	26640	G6990.60	.....	27785	G7262.10	.....	28425
G6671.40	.....	26045	G6822.80	.....	26745	G6992	.....	27795	G7266.00	.....	28460
G6674.00	.....	1150	G6822.82	.....	26740	G7000.00	.....	27810	G7267.00	.....	28470
G6678.00	.....	26055	G6826.00	.....	26680	G7000.1	.....	27815	G7267.10	.....	28475
G6704.00	.....	26075	G6828.00	.....	26765	G7004.00	.....	1285	G7270.00	.....	28330
G6704.20	.....	26170	G6828.10	.....	26770	G7009.00	.....	1290	G7274.00	.....	28340
G6707.00	.....	26190	G6830.00	.....	26590	G7046.00	.....	27920	G7274.10	.....	28345
G6708.00	.....	26200	G6831.00	.....	26580	G7048.00	.....	27925	G7280.00	.....	28350
G6709.00	.....	26210	G6832.00	.....	26560	G7082.00	.....	1340	G7282.00	.....	28355
G6709.40	.....	26225	G6844.00	.....	27060	G7084.00	.....	1345	G7286.00	.....	28385

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

Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.	Inter.	-	U.S.
G7288.00	.....	28390	G7394.00	.....	29495						
G7292.00	.....	28575	G7396.00	.....	29500						
G7296.00	.....	28670	G7398.00	.....	29525						
G7306.00	.....	28605	G7400.00	.....	29530						
G7306.10	.....	28610	G7410.00	.....	29510						
G7316.00	.....	28535	G7410.1	.....	29515						
G7318.00	.....	28555	G7414.00	.....	29570						
G7321.00	.....	28520	G7430.00	.....	29650						
G7322.90	.....	28715	G7442.00	.....	29675						
G7323.00	.....	28710	G7443.00	.....	29680						
G7323.10	.....	28720	G7443.10	.....	29685						
G7324.00	.....	28675	G7450.50	.....	29695						
G7325.40	.....	28810	G7482.00	.....	29755						
G7325.50	.....	28815	G7484.00	.....	29770						
G7325.70	.....	28825	G7488.00	.....	29700						
G7325.72	.....	28860	G7488.10	.....	29810						
G7325.75	.....	28875	G7498.00	.....	29740						
G7325.76	.....	28880	G7500.00	.....	29737						
G7326.00	.....	28925	G7502.60	.....	29910						
G7328.00	.....	29060	G7504.00	.....	29905						
G7332.00	.....	29100	G7508.00	.....	29865						
G7332.10	.....	29105	G7520.00	.....	29850						
G7338.00	.....	29170	G7540.00	.....	29935						
G7342.00	.....	29185	G7584.00	.....	29950						
G7342.10	.....	29190	G7584.10	.....	29955						
G7363.00	.....	29245	G806A.00	.....	27030						
G7363.10	.....	29250	K4573.00	.....	30240						
G7363.30	.....	29265	K4576.00	.....	30185						
G7363.50	.....	29275	K4580.00	.....	30190						
G7363.60	.....	29280	K4580.10	.....	30195						
G7363.70	.....	29290									
G7364.00	.....	29295									
G7364.20	.....	29300									
G7364.30	.....	29305									
G7364.40	.....	29310									
G7370.00	.....	29380									
G7370.10	.....	29385									
G7375.00	.....	29405									
G7376.00	.....	29410									
G7377.00	.....	29420									
G7378.00	.....	29430									
G7380.00	.....	29435									
G7382.00	.....	29440									
G7384.00	.....	29450									
G7386.00	.....	29455									
G7388.00	.....	29460									
G7390.00	.....	29465									
G7392.00	.....	29470									