PART 6 - DIAGNOSTIC DATA

CONTENTS

Para		Page
6.1	FFD DIAGNOSTICS	6-3
6.1.1	Diagnostic Function Selection	6-3
6.1.2	Key Test	6-4
6.1.3	Display	6-4
6.1.4	Network	6-4
6.1.5	RAM	6-4
6.1.6	PROM	6-5
6.1.7	EEPROM	6-5
6.1.8	Lighting	6-5
6.1.9	Debug	6-5
6.1.10	RES-SYS	6-5
6.1.11	Versions	6-6
6.1.12	Errors	6-6
6.1.13	Remote	6-6
6.2	MAIN PROCESSOR	6-7
6.2.1	Masthead Unit	6-7
6.3	DEPTH SOUNDER	6-8
6.3.1	Yacht Stationary	6-8
6.3.2	Yacht Moving	6-9
6.3.3	Consistently Shows Shallow Depth	6-10
6.3.4	Random Deep Depths	6-11
6.4	ERROR MESSAGES	6-12
6.4.1	Error Messages	6-12
6.5	HALCYON 2000 COMPASS	6-13
6.5.1	Shows Heading and CAL Flashing	6-13
6.5.2	Heading Shows ERR	6-13
6.5.3	Heading or COMP CAL Shows PHS	6-13
6.5.4	Two Headings Flashing Alternately	6-14
6.5.5	True Wind Direction, Tide Set or DR Course Not Functioning Correctly	6-14
6.6	NMEA Alphabetical Index Hydra 2000	6-15
6.6.1	NMEA Input Summary	6-15

6.6.2 NMEA Output Summary 6-16
6.6.3 NMEA Sentences 6-17

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PART 6 - DIAGNOSTIC DATA

6.1 FFD DIAGNOSTICS

The FFD contains a number of diagnostic functions. These allow the FFDs own keys, display and memory to be tested and also perform some checks on other parts of the system via the network. One of the more useful of these tests enables the user to determine the software version numbers of the Processor Units in the system. This information will often be useful when liaising with service agents.

6.1.1 Diagnostic Function Selection

To use the diagnostic functions they must be selected on the required FFD when the system is switched on as follows:

(1) Power up the system by simultaneously pressing the **Power/Lights** and **Enter** Keys until DIAGNOST appears on the upper text in an otherwise blank display.

(2) Press **Enter** and the first test option that appears is KEYTEST.

(3) The required test can then be selected using the **Scroll Up** and **Scroll Down** Keys (see below for details of the tests).

(4) Press **Enter** to start the test.

(5) On completion of each test, press **Scroll Up** or **Scroll Down** to scroll to the next test. Press **Enter** to start the test.

(6) To return the display back to normal operation press the **Page** Key.

(7) Provided that the power is not switched OFF or a system reset performed, the diagnostics can be re-entered by holding **Enter** down and pressing the **Power/Lights** Key.

The 12 Options in the DIAGNOSTICS Menu are described in the following Paragraphs (6.1.2 to 6.1.13)

6.1.2 Key Test

The display requests the user to press each key in turn as follows:

Key 1	Enter
Key 2	Scroll Down
Key 3	Scroll Up
Key 4	Page
Key 5	Power/Lights
Key 6	Navigation
Key 7	Wind
Key 8	Speed/Depth

If it does not detect the key being pressed in a short time then the message TIME OUT is displayed.

6.1.3 Display

The **Scroll Up** Key can be used to step the display through a sequence that puts on single segments in all characters, blanks the display and turns on all segments. When all segments are turned on 16 characters are displayed at the top and bottom of the display. In the rest of the test and in normal operation only 10 are used as the unused segments are all connected together. To stop the display test press the **Enter** Key.

6.1.4 Network

This tests some of the FFDs circuitry for communicating on the network. At the end of the test the display will show a PASS or a value if failed.

6.1.5 RAM

This tests the correct operation of the FFD's internal RAM. If the test passes RAM PASS OK is displayed. If the test fails then RAM FAIL is displayed and correct operation of the unit cannot be guaranteed.

6.1.6 PROM

This tests the correct operation of the FFD's program memory and calculates its checksum by adding all the individual bytes of memory together. The total is displayed in hexadecimal in the bottom half of the display and the last two digits are the software version number. If this test fails then if possible, FATAL ER 02 is displayed, and further operation of the FFD cannot be accurately defined. The upper half of the display shows the FFD's network node number.

6.1.7 EEPROM

This tests the correct operation of the FFD's non-volatile memory where the display's settings are stored when power is switched OFF. If this fails FATAL ER 03 or FATAL ER 04 will be displayed. The display's page configuration and possibly the text for some functions will be lost.

6.1.8 Lighting

This test checks the correct operation of the display lighting control cycles through the red and green lighting at the three illumination levels.

6.1.9 Debug

CAUTION: This test is not for normal use, since it may seriously affect the operation of the Hydra 2000 System.

6.1.10 RES-SYS

CAUTION: Do not use this option during normal operation as all calibration values will be lost.

This allows individual units or the entire system to be reset. The network node address of the unit to be reset is selected using the **Scroll Up** and **Scroll Down** Keys and then **Enter** pressed. The node allocations are as follows:

01 - Depth Board	05 - Wind Board
0D - Expansion Board	FF - Entire System

Note
When the system is reset all calibration, damping and alarm values will be set back to default settings, all log values and trip functions will be reset to zero. All display units will reset to their default page settings. After a delay of about 20 seconds the system should be switched OFF and then back ON twice to complete the reset procedure.

6.1.11 Versions

This option allows the user to obtain the software version numbers for the FFD (DISPLAY), Depth board (DEPTH), Wind board (WIND), Expansion Unit (EXP UNIT) and Pilot, if fitted. With 'VERSIONS' flashing on the display, press **Enter**. Then use the **Scroll Up** Key to select the option whose version number is required and press **Enter** to display the software checksum of the appropriate unit, in the bottom display. The last two digits of the checksum are the software version number.

6.1.12 Errors

This test is used chiefly to interrogate the Hydra 2000 network and is designed mainly for use by service technicians to ascertain levels of interference that may be present. For example interference may be induced by an SSB transmitter or radar. The display shows the number of messages that have not been transmitted correctly first time. Between 10 and 20 errors per minute is quite normal. A higher number of errors can also be an indication that the network terminators are not correctly fitted.

6.1.13 Remote

This facility allows the user to invoke internal RAM, PROM and basic network checks on any remote processor node on the network, and display the appropriate error messages on the FFD. Node numbers are allocated when the system is switched ON for the first time or after a system reset.

In the Hydra 2000 System the numbers will be:

Depth board 1
Wind board 5

In a system with additional processor nodes it may be necessary to determine the individual node numbers by disconnecting nodes in turn and running the remote PROM test. If no pass or fail message is displayed within 10 seconds then it can be assumed the node being tested is not in the system. The REMOTE tests for the currently selected node can be exited by holding **Enter** down and pressing the **Power/Lights** Key.

6.2 MAIN PROCESSOR

The main processor contains two circuit boards: the wind board and the depth board. The depth board is responsible for boat speed, sea temperature and depth measurement. The wind board is the main sensor responsible for wind functions and also drives the analogue meters. It has special inputs for the Masthead Unit, Super Halcyon compass, air temperature, battery voltage and four linear inputs that can be connected to a variety of other sensors (see Part 4 - Installation Instructions).

6.2.1 Masthead Unit

If there appears to be a problem with wind speed or wind angle first check the cable connections at the main processor and at the mast base junction box. The easiest way to test the MHU cable is by substituting a spare cable. If the cable is damaged in the mast the cause of the damage should be ascertained and the mast re-rigged or new conduit installed before replacing the cable. The Masthead Unit should always be removed before the mast is un-stepped to avoid damage. It should be stored in its original packing box with the vane and cups removed.

Note
The Masthead Unit's bearings should not be oiled as they are of a sealed pre-lubricated type and additional oil may cause chemical breakdown of the existing lubricant.

6.3 DEPTH SOUNDER

Fault finding on the depth sounder is often difficult as depth sounder performance is dependent on many factors: transducer type and installation, boat speed, electrical noise, sea state, sea bed conditions, air and plankton in the water. Indications of problems with the depth sounder normally manifest themselves in one of three ways:

(a) display shows (Floating Bars)

-
- -
-

(b) display locks down showing depths in the range 0 to 1.5m, or

(c) display shows random deep depths

All of the above symptoms can be caused by external conditions so care and additional tests should be performed before concluding that the fault lies within the depth sounder. There are two values output by the depth sounder that can be of assistance in diagnosing problems, these are receiver gain and noise that can be found in the PARAMTR Menu on a FFD.

6.3.1 Yacht Stationary

Symptom: Display consistently shows (Floating Bars) when well within the range of the sounder with the yacht stationary in the water:

-
- -
-

This is an indication that no consistent signal is being received by the depth sounder.

Possible Causes:

(a) The transducer is not connected.

(b) The transducer is not in its housing.

(c) If sounding through the hull there is not enough oil in the housing or the hull material is not suitable to sound through.

(d) The transducer is faulty or has been damaged. The transducer should be checked for any damage, barnacle growth or thick layers of paint. If it needs cleaning this should be done with a scrubbing brush. The face of the transducer may have a thin coat of anti-fouling applied to it making sure no air bubbles are trapped in the paint. The cable should be checked for damage. The resistance between the orange/green cores should be in the region of 0.5 to 5 Ohms and resistance between the screen and the cores should be infinity.

Resistance measurements should only be made with the transducer disconnected from the Processor Unit.

(e) The gain of the receiver has been set too low. It is possible to adjust the maximum gain via CAL VAL1 on gain. This is normally set to 30 and should not be adjusted.

6.3.2 Yacht Moving

Symptom: Display shows (Floating Bars) when yacht is moving:

-
- -
-

This is most often an indication of difficult sounding conditions, but can also indicate a badly positioned transducer.

Possible Causes:

(a) Difficult sounding conditions and or depth sounder unable to track rapidly changing bottom. If coming into shallow water yacht should slow down and proceed with caution.

(b) Aeration in the water, most often caused by the wake of another vessel. This can persist in the water for a long

period after the passing of the vessel. In some instances the depth sounder will indicate the depth of the aeration layer caused by a large vessel.

(c) Poorly sited transducer. Determine what conditions cause the problem by doing some manoeuvring trials in an area that has a relatively uniform depth, a solid bottom and is clear of the wake from other boats. First determine the maximum speed at which reliable soundings can be made when traveling in a straight line. Then repeat the tests when turning to port and starboard. If better results can be obtained when turning it is possible that there is something in front of the transducer causing aeration. This may be a hull fitting like a water outlet in which case the transducer or the hull fitting should be moved. If there seems little difference whether turning or not, the position of the transducer should be reviewed. It may be coming out of the water at high speed or in rough water. It is impossible to give specific instructions on where to re-site the transducer as it is so dependent on the design of boat. Generally, better results will be obtained nearer the centre line of the boat. If there is only a problem when heeled, consider fitting two transducers with a changeover switch.

6.3.3 Consistently Shows Shallow Depth

Symptom: Display consistently shows a shallow depth between 0 and about 1.5m.

Possible causes:

(a) Faulty transducer. Transducer rings for too long after the transmit pulse is sent and the ringing is interpreted as a shallow return by the depth sounder. On a deep keeled yacht it may be possible to overcome this problem by increasing the minimum depth to just less than the draft of the yacht. The minimum depth is adjusted by changing CAL VAL1 on NOISE.

PARAMTR→NOISE, **CALBRATE→CAL VAL1** (**MIN DPTH M**)

The default setting for minimum depth is 0.7 metres.

(b) Keel echoes. If the transducer has been installed too close to the keel it is possible to get consistent echoes from the keel. The transducer should be re-sited further away from the keel. If this is impossible then increasing the minimum depth to just below the keel can solve the problem but may result in poor performance when the bottom is shaded by the keel. Marginal cases are sometimes caused by side lobes from the main beam from the transducer and may be cured by rotating the transducer in the housing.

(c) Following or crossing the path of another vessel which has left an aerated layer in the water.

6.3.4 Random Deep Depths

Symptom: Display shows random deep depths.

Possible Causes:

(a) Electrical noise. The depth sounder contains circuits and software to reduce its susceptibility to electrical noise, however this can still be a problem if not installed carefully or other equipment is not correctly suppressed. The depth sounder measures the ambient noise and this can be found for display by looking under the PARAMTR Menu. When the boat is stationary electrical equipment should be switched ON and OFF in turn while looking at the depth and noise displays to try and determine the source of the problem.

(b) Acoustic Interference. Other depth sounders and sonar can cause problems. However this is generally only when very close to other boats for example when moored alongside in a crowded marina. Also acoustic noise can be generated by water flow past the transducer and various bits of mechanical machinery.

(c) Mid-water echoes. When outside the range of the depth sounder it is possible that random depths are

displayed due to mid-water echoes from shoals of fish or aeration layers.

6.4 ERROR MESSAGES

6.4.1 Error Messages

Following is a list of error messages output on the displays.

Er01	Error detected reading the analogue to digital converter on the depth sounder board. This can be an indication of a fault on the board or that the sea water temperature or the compass signals are outside their normal range. Try disconnecting the sensors in turn.
Er02	Error detected when writing to the analogue to digital converter on the depth sounder board. This can indicate the same problems as Er01.
Err.3	Syntax or parity error on received NMEA data.
Err.4	Checksum error on received NMEA 0183 data.
CAL	Alternating with a function value indicates that it has yet to be calibrated. This will happen after a system reset or if the internal battery is exhausted.
NO SPACE	FFD memory full, too many functions have been declared.
NOT FOUND	New function declared without text.

6.5 HALCYON 2000 COMPASS

6.5.1 Shows Heading and CAL Flashing

Symptom: Display flashes a Heading and CAL

Possible Causes:

(a) The memory in the Halcyon 2000 is empty or has been corrupted. This may be due to a System Reset being performed or the first time the compass has been installed and not yet been calibrated. Perform a calibration swing to restore normal operation.

(b) After a calibration swing the result is always **FAIL**. There is a source of magnetic deviation near to the Halcyon 2000 compass. Try re-positioning the compass and perform the calibration.

6.5.2 Heading Shows Err

Possible Cause:

The signal from the fluxgate sensor is too big or too small. Try re-positioning the compass. If still showing **Err** set NAVIGATE→COMP CAL, CAL VAL 2 (**RES CAL**) to 1. This will reset the compass. All previous calibrations will be lost and the compass will require a compass swing.

6.5.3 Heading or COMP CAL Shows PHS

Possible Cause:

The compass is in the middle of resetting. The display should show heading and CAL flashing after 20 seconds. A calibration swing will be required.

6.5.4 Two Headings Flashing Alternately

Symptom: Pilot or Halcyon Displays shows two headings flashing alternately

Possible Cause:

The Pilot has not been set to use the Halcyon 2000 as its heading source. Pilot Heading Node must be set to Node 16. If the Halcyon 2000 is not to be the source of heading then it must be unplugged from the network.

6.5.5 True Wind Direction, Tide Set or DR Course Not Functioning Correctly

Symptom: True Wind Direction, Tide Set and DR Course functions are inoperative

Possible Cause:

The Main Processor has not been set to use the Halcyon 2000 as the heading source. Set NAVIGATE→COURSE, CAL VAL 1 (**HDG NODE**) to 16.

6.6 NMEA Alphabetical Index Hydra 2000

6.6.1 NMEA Input Summary

APA	Autopilot Format A
APB	Autopilot Format B
BEC	Bearing and Distance to Waypoint, Great Circle, dead reckoned
BER	Brg. and Distance to W/point, Rhumb, dead reckoned
BOD	Brg. to destination Waypoint from origin W/point
BWC	Brg. and distance to Waypoint, Great Circle measured
BWR	Brg. and distance to Waypoint, Rhumb measured
BWW	Bearing to Waypoint from Waypoint
GGA	Global Positioning System Fix Data
GLL	Latitude and Longitude (versions 1.5 and 2.0)
GLP	Loran C present fix
HDM[1]	Present heading, Magnetic
HDT[2]	Present heading, True
HSC[3]	Heading, steering
HVD	Magnetic variation, automatic
HVM	Magnetic variation, manually set
MTA	Air Temperature, °Centigrade
MTW	Water Temperature, °Centigrade
RMA	Recommended min. implementation sentence, Loran C
RMB	Recommended min. implementation sentence, Generic
RMC	Recommended min. implementation sentence, GPS
VHW	Heading and Water Speed
VTG	Actual Track and Ground Speed
WBD	Bearing and Distance to Waypoint
WCV	Waypoint Closure Velocity
WDC	Distance to Waypoint, Great Circle
WDR	Distance to Waypoint, Rhumb
XTE	Measured Track Error
XTR	Dead Reckoned Cross Track Error
ZDL	Time and Distance to Layline
ZLZ	Time of Day
ZTG	Time to Waypoint

Notes

1. Function repeated when no B&G fluxgate connected to system. Not used by Autopilot.
2. Displayed when no B&G fluxgate connected to system. Can be used by Autopilot.

3. Re-transmitted only. Not used by Hydra 2000.

6.6.2 NMEA Output Summary

DBT	Depth Below Transducer
GLL	Latitude and Longitude
HDM	Present heading, Magnetic
HDT	Present heading, True
HSC	Heading Steering Command
MTA	Air Temperature, °Centigrade
MTW	Water Temperature, °Centigrade
MWD	Surface Wind Direction and Velocity
MWV	Wind Speed and Angle
VHW	Heading and Water Speed
VLW	Log mileage, Water referenced
VPW	Velocity parallel to true wind, device measured
VTG	Actual Track and Ground Speed
VWR	Wind Relative Bearing and Velocity
VWT	Wind True Bearing and Velocity
XTE	Measured Cross Track Error

Notes

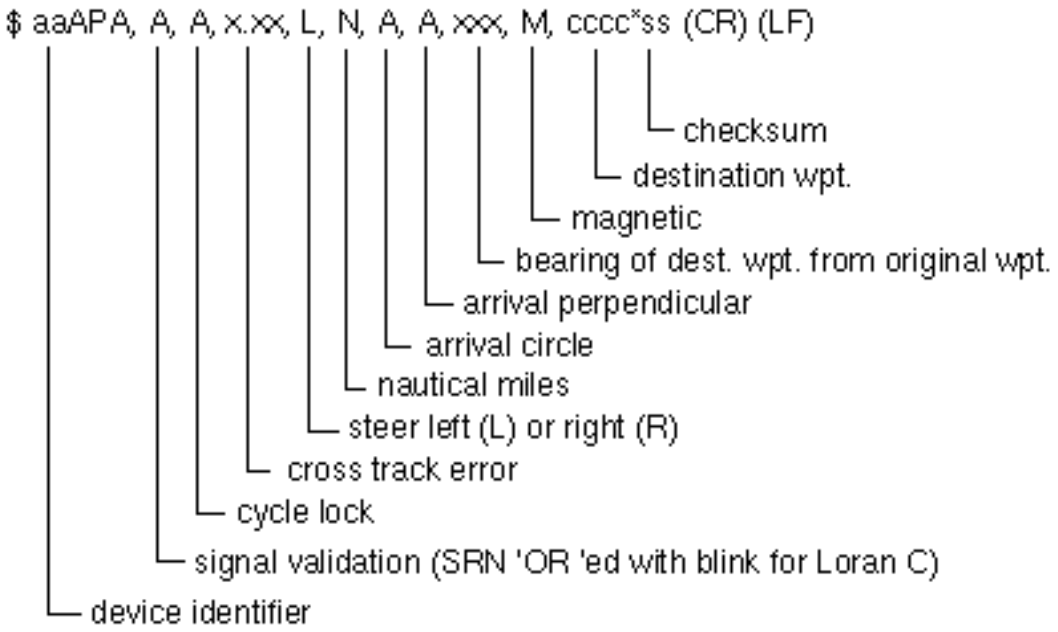
1. NMEA output data is subject to the appropriate sensor or NMEA sentence being connected to the system.

2. Data is not necessarily extracted from all NMEA fields. This avoids the same information being repeated twice on the system.

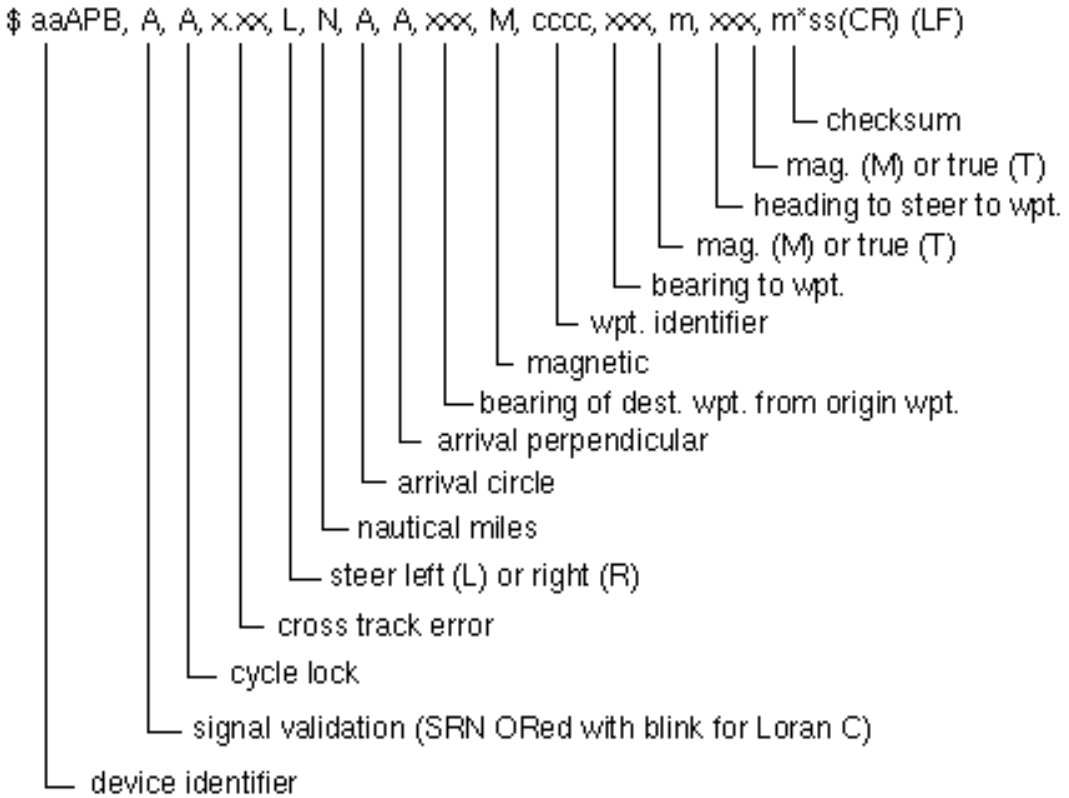
NMEA Sentences

The following diagrams show the structure of the various NMEA sentences.

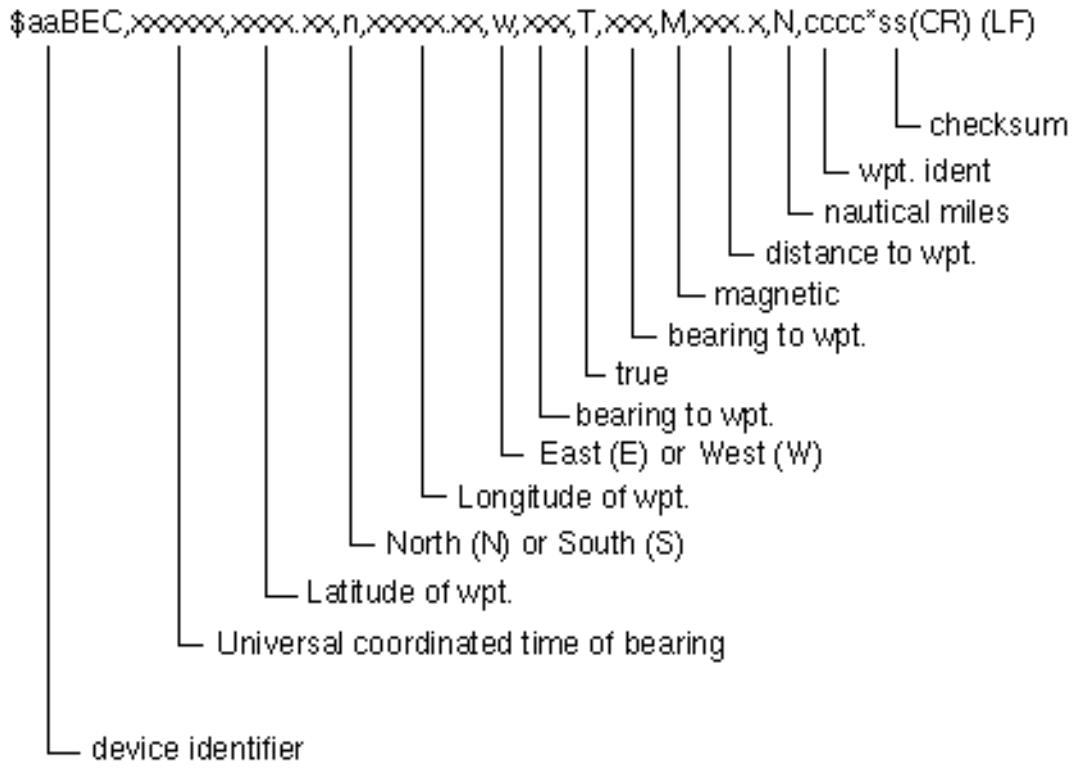
1 Autopilot format A (APA)



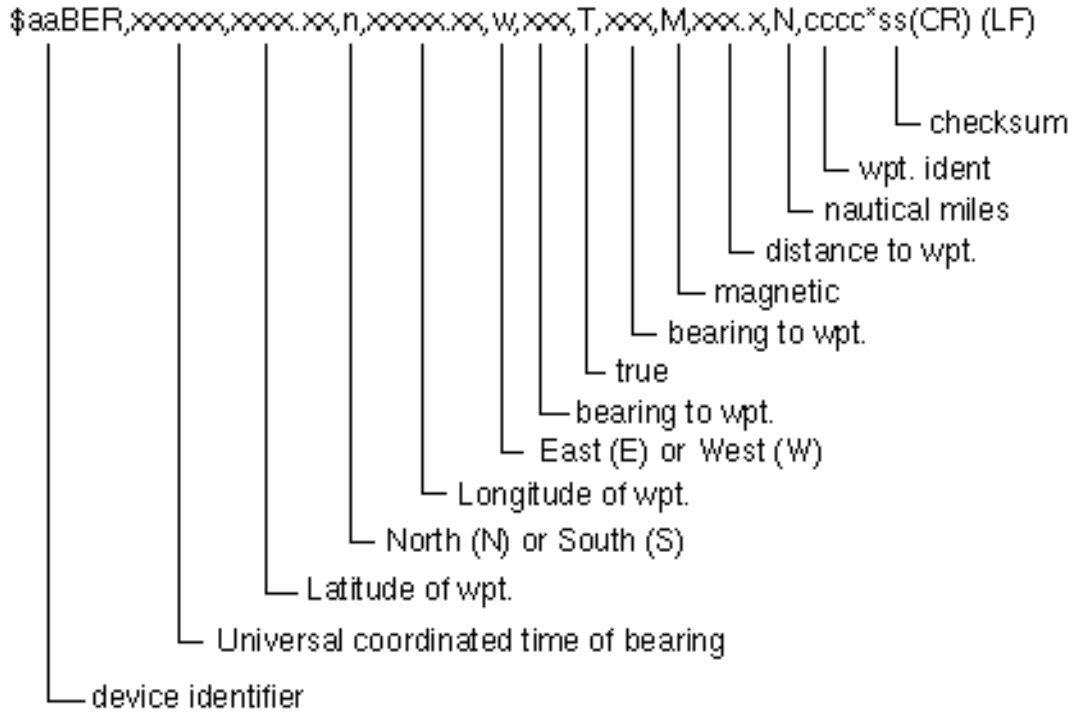
2 Autopilot format B (APB)



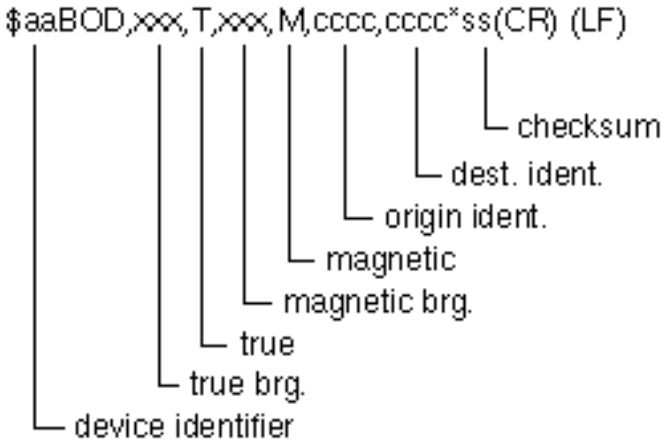
3 Bearing and distance to waypoint, great circle, dead reckoned (BEC)



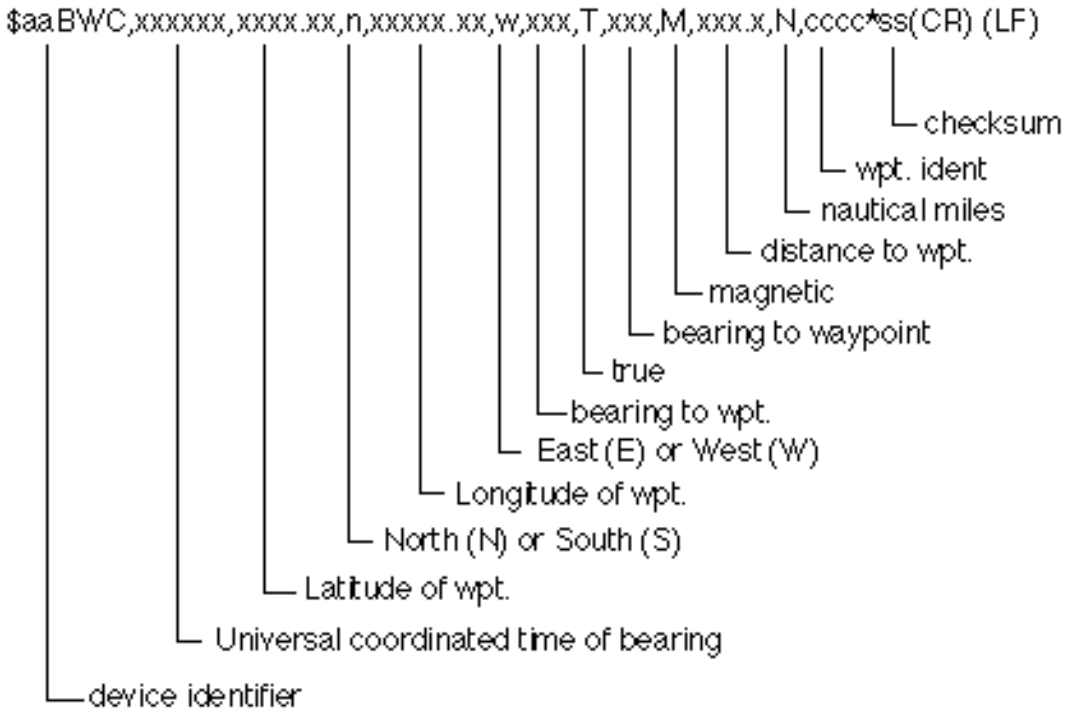
4 Bearing and distance to waypoint, rhumb, dead reckoned (BER)



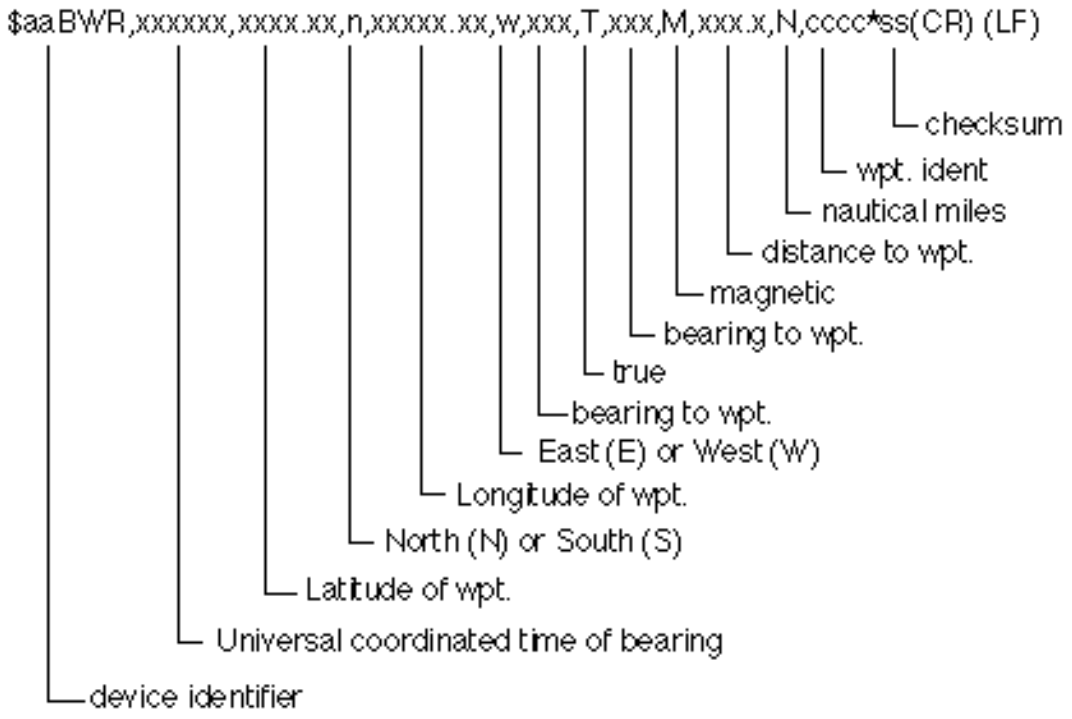
5 Bearing to destination waypoint from origin waypoint, true or magnetic (BOD)



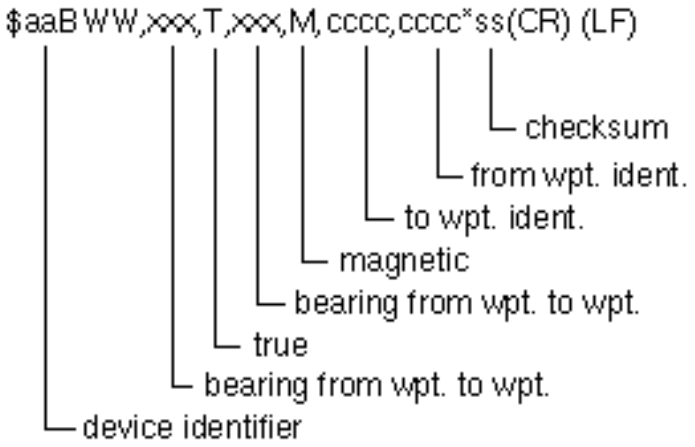
6 Bearing and distance to waypoint, great circle, measured (BWC)



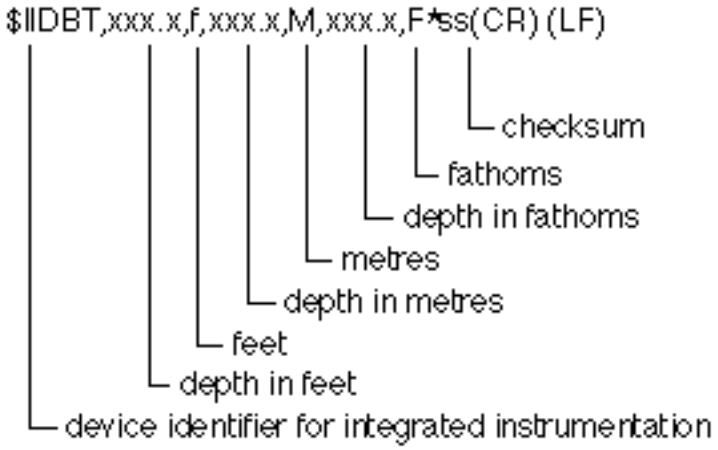
7 Bearing and distance to waypoint, rhumb line, measured (BWR)



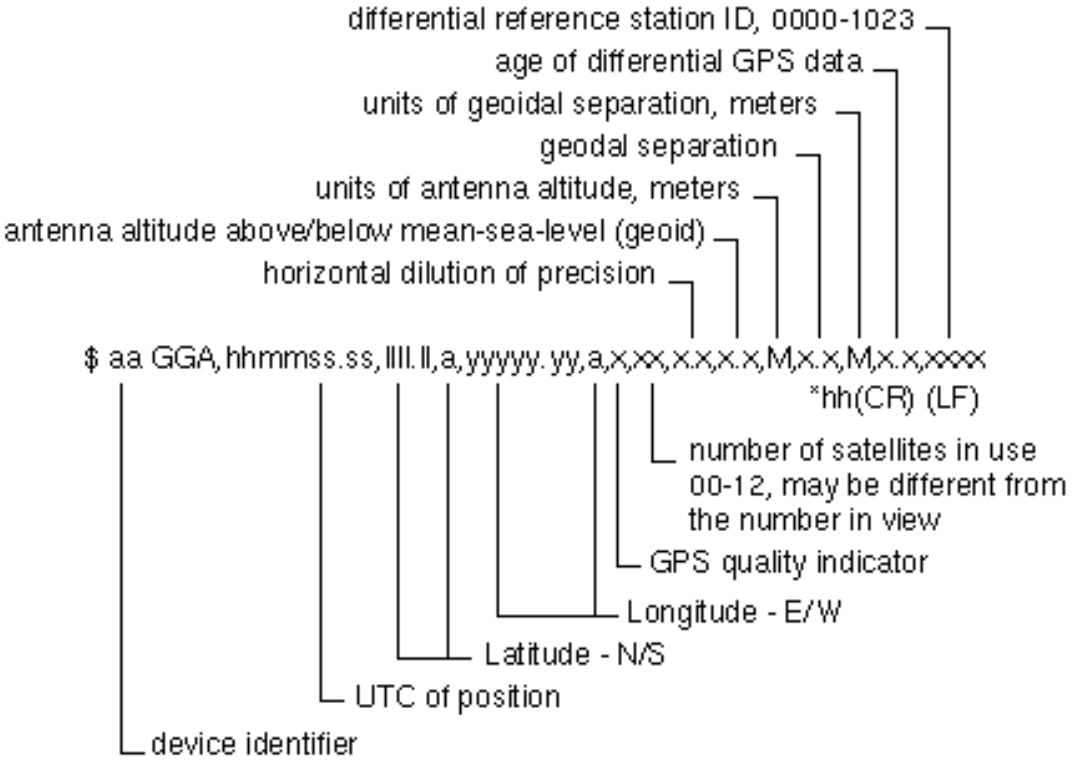
8 Bearing to waypoint from waypoint, true and magnetic (BWW)



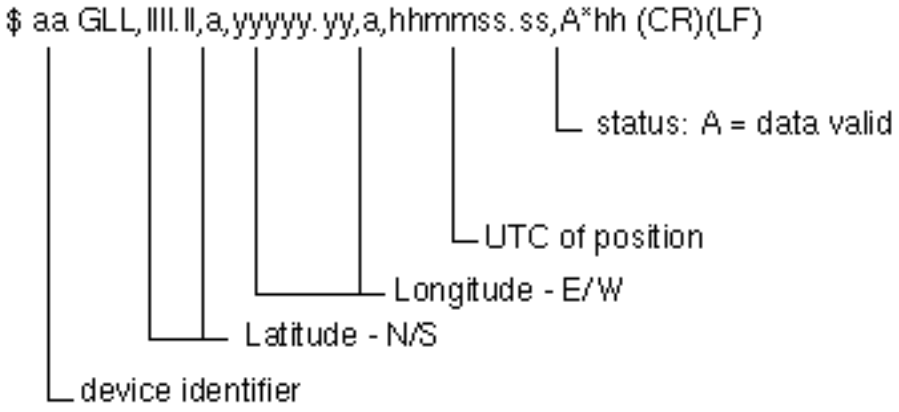
9 Depth of water below transducer (DBT)



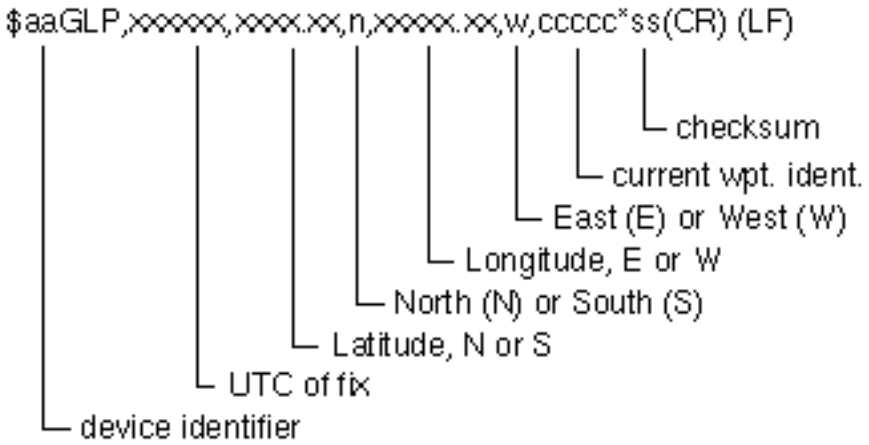
10 Global positioning fix data (GGA)



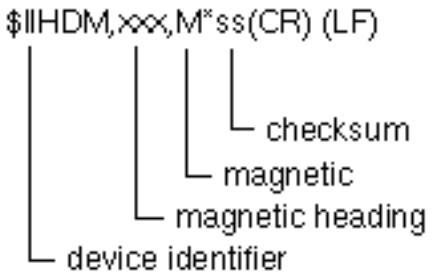
11 Present fix position (GLL)



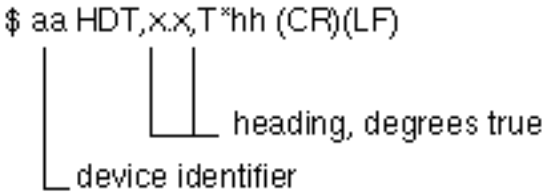
12 Present position fix, Loran - C (GLP)



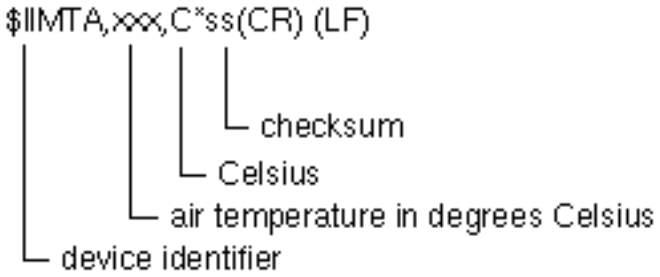
13 Present heading magnetic (HDM)



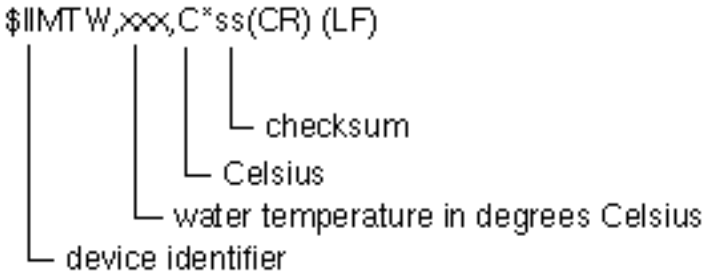
14 Heading degrees, true (HDT)



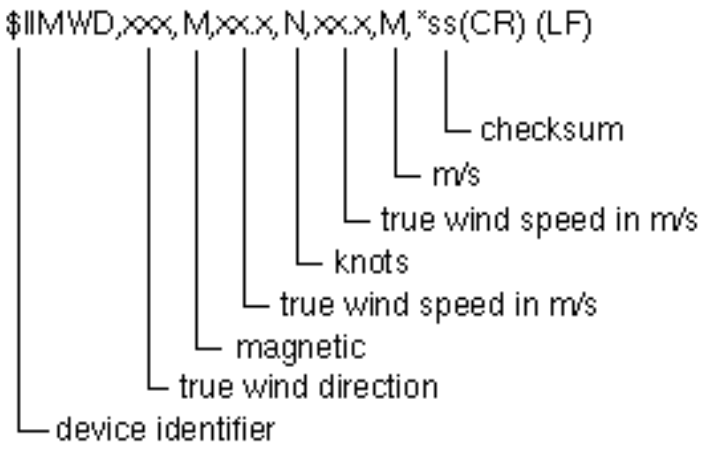
15 Air temperature, Celsius (MTA)



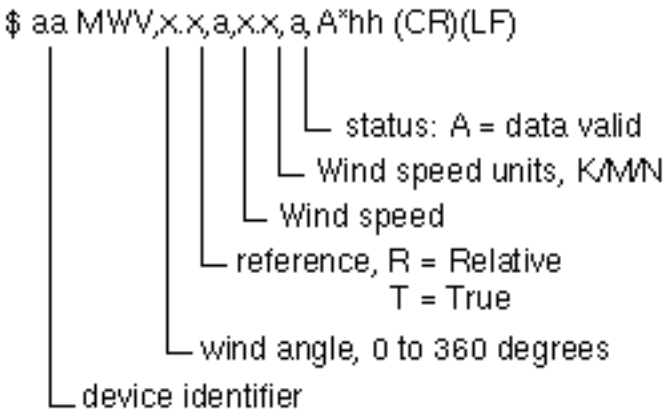
16 Water temperature (MTW)



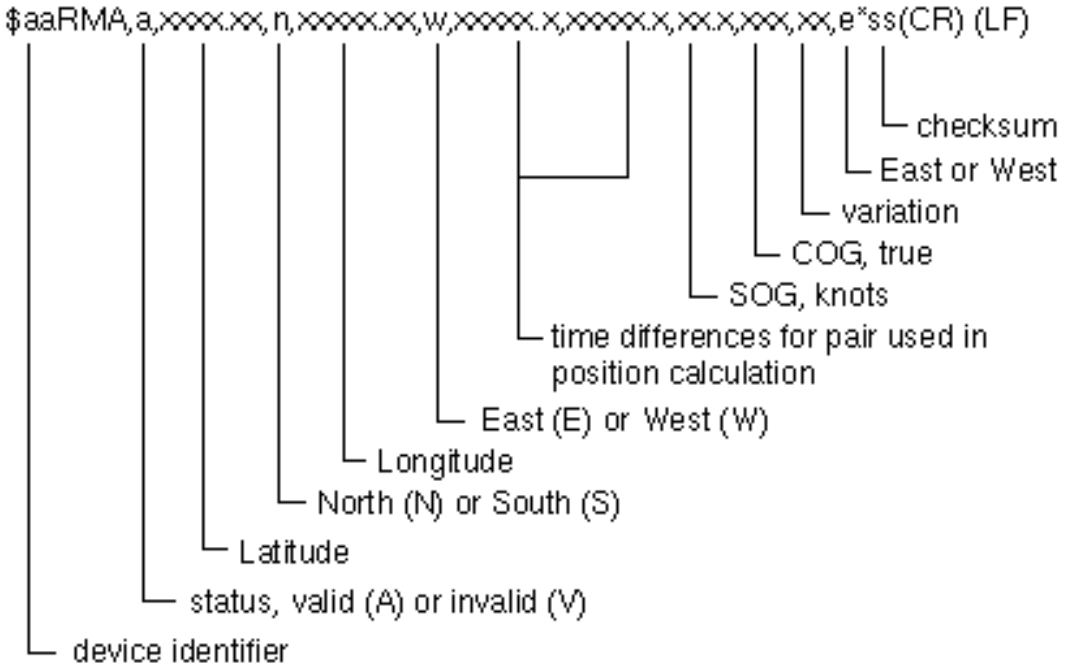
17 Surface wind, direction and velocity (MWD)



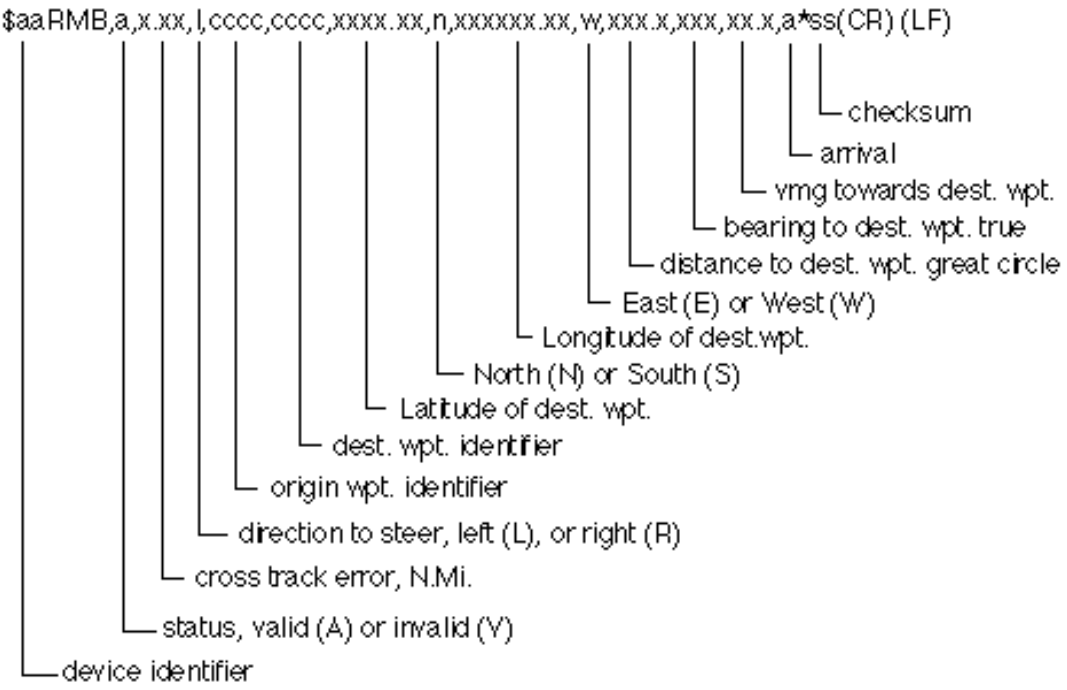
18 Wind speed and angle (MWV)



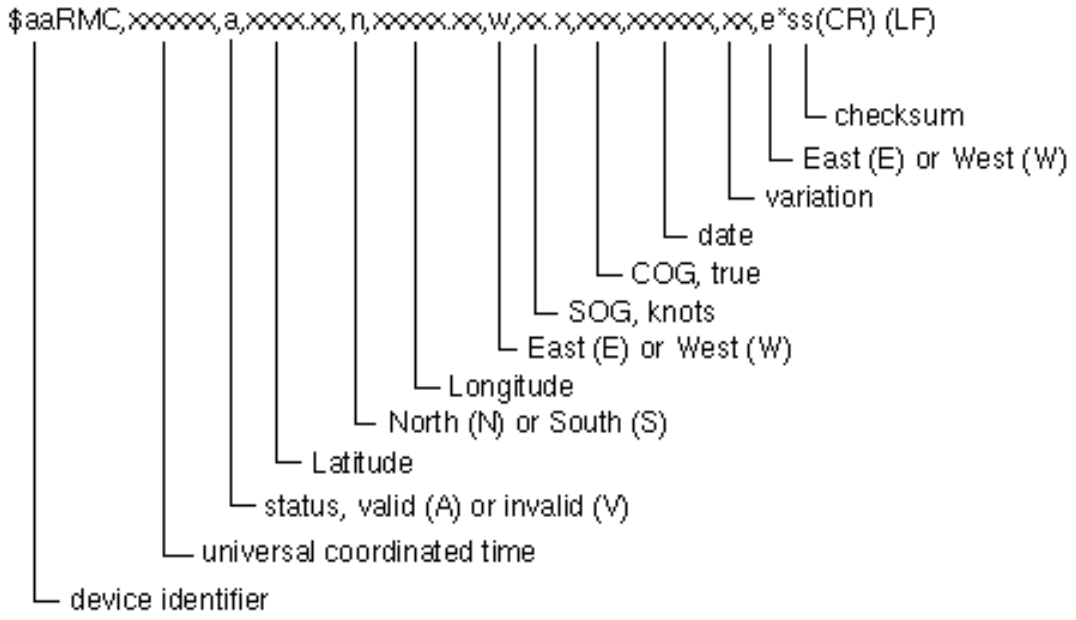
19 Recommended minimum implementation sentence, Loran - C (RMA)



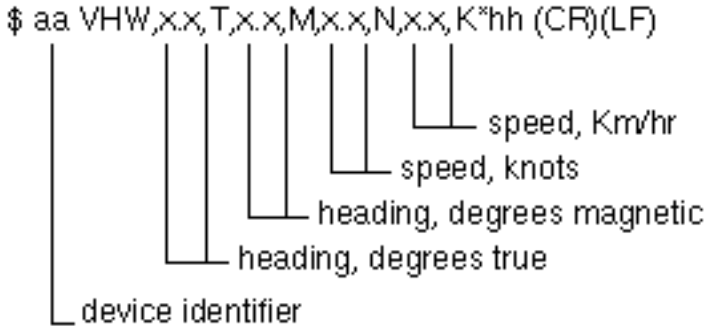
20 Recommended minimum implementation sentence, navigation information (RMB)



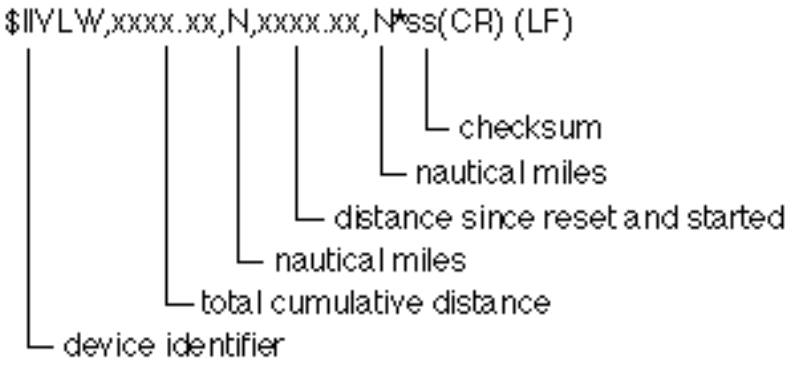
21 Recommended minimum implementation sentence, GPS or transit specific (GPS) (RMC)



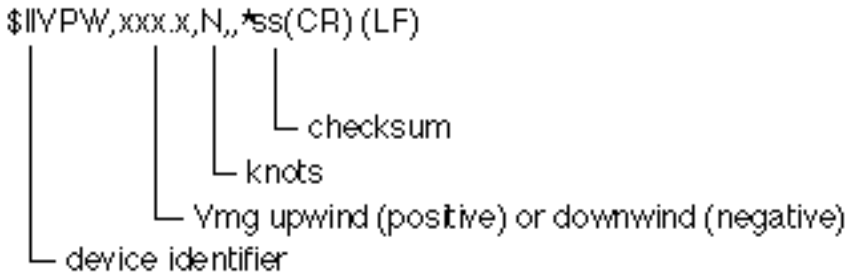
22 Water speed and heading (VHW)



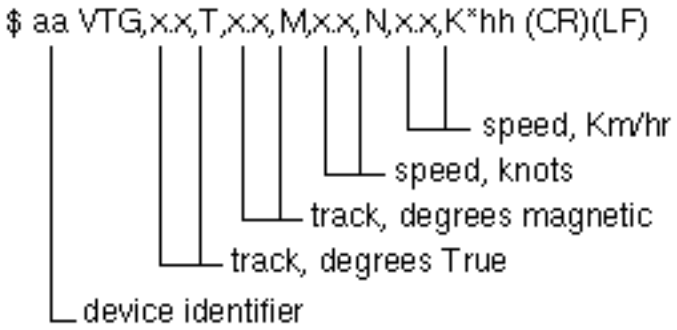
23 Water referenced log mileage (VLW)



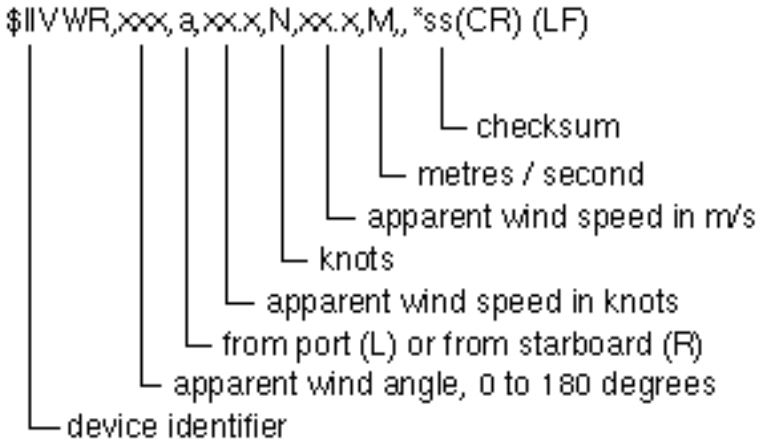
24 Device measured velocity parallel true wind (VPW)



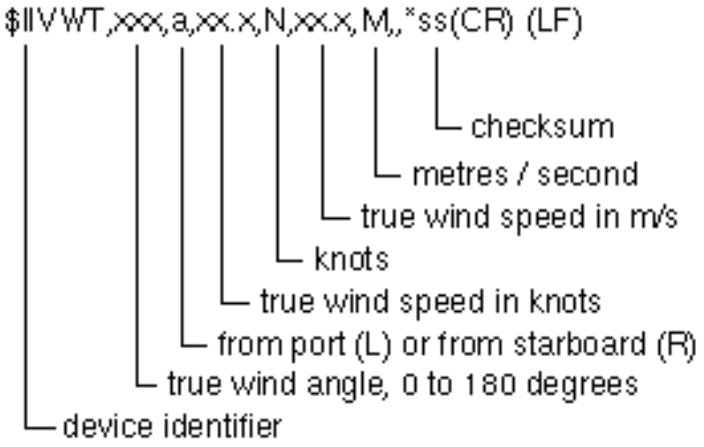
25 Actual track and ground speed (VTG)



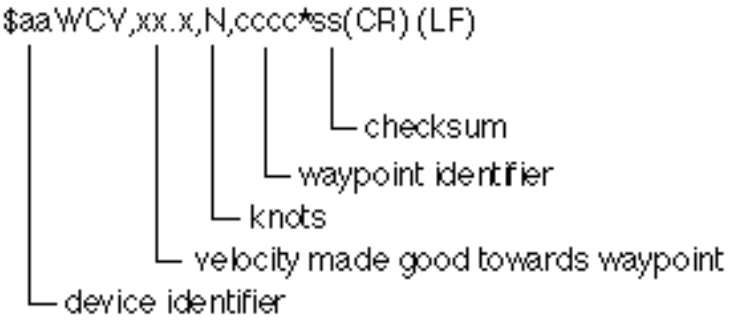
26 Wind relative bearing and velocity (VWR)



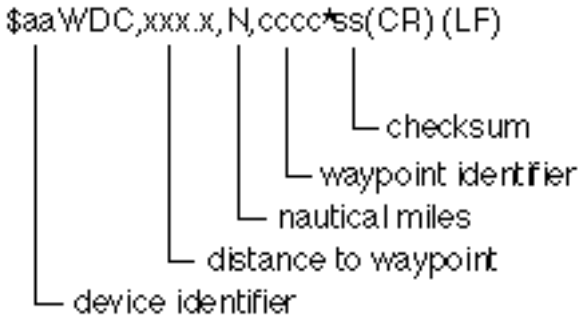
27 True wind relative bearing and velocity (VWT)



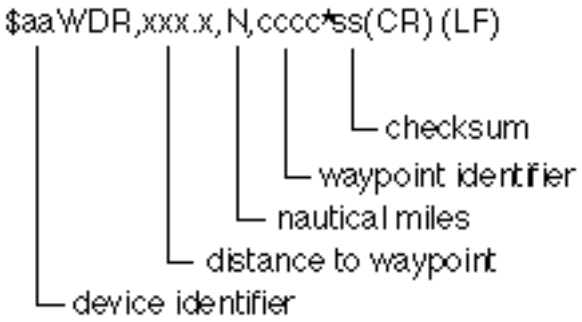
28 Waypoint closure velocity (WCV)



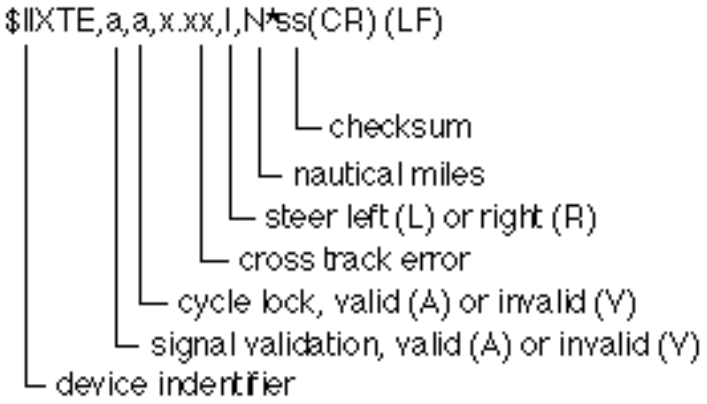
29 Distance to waypoint, great circle (WDC)



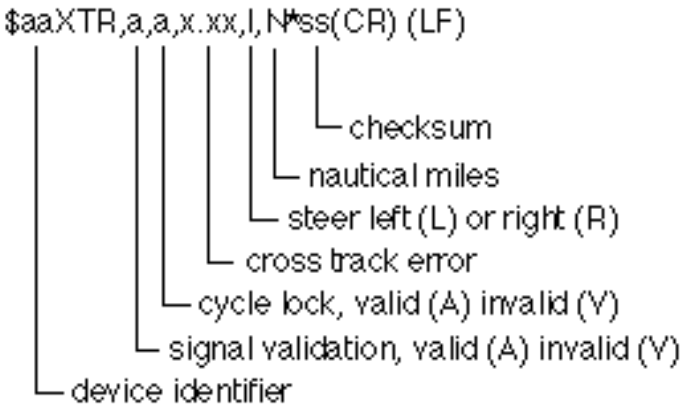
30 Distance to waypoint, Rhumb (WDR)



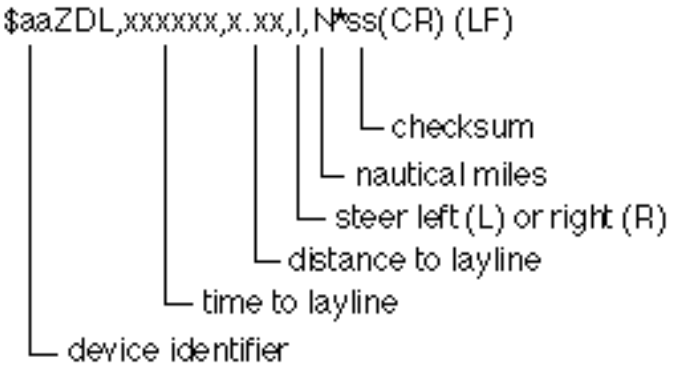
31 Measured cross track error (XTE)



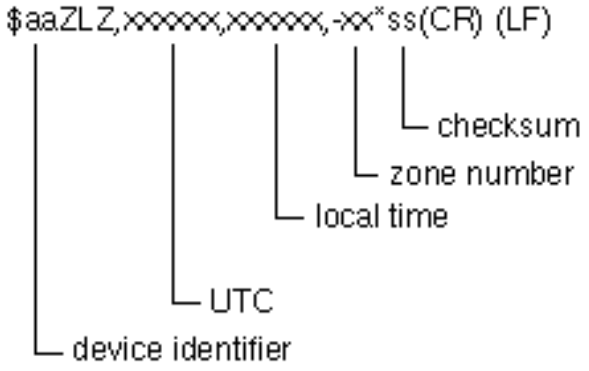
32 Dead reckoned cross track error (XTR)



33 Time and distance to layline (ZDL)



34 Time of day (ZLZ)



35 Time to waypoint (ZTG)