The NMEA 0183 Protocol

Note that the material presented in this document has been compiled from a variety of sources. It is thus neither to be regarded a complete nor error-free description of the NMEA 0183 standard.

SELECTED Sentence Identifiers and Formats:

AAM Waypoint Arrival Alarm

```
$--AAM,A,A,x.x,N,c--c*hh
1) Status, BOOLEAN, A = Arrival circle entered
2) Status, BOOLEAN, A = perpendicular passed at waypoint
3) Arrival circle radius
4) Units of radius, nautical miles
5) Waypoint ID
6) Checksum
```

ALM GPS Almanac Data

```
$--ALM,x.x,x.x,xx,x.x,hh,hhhh,hh,hhhh,hhhh,hhhhhh,hhhhhh,hhhhhh,hhhhhh,hhh,hhh,*hh
1) Total number of messages
2) Message Number
3) Satellite PRN number (01 to 32)
4) GPS Week Number: Date and time in GPS is computed as number of weeks
from 6 January 1980 plus number of seconds into the week.
5) SV health, bits 17-24 of each almanac page
6) Eccentricity
7) Almanac Reference Time
8) Inclination Angle
9) Rate of Right Ascension
10) Root of semi-major axis
11) Argument of perigee
12) Longitude of ascension node
13) Mean anomaly
14) F0 Clock Parameter
15) F1 Clock Parameter
16) Checksum
```

APA Autopilot Sentence "A"

```
$--APA,A,A,x.xx,L,N,A,A,xxx,M,c---c*hh
1) Status
V = LORAN-C Blink or SNR warning
A = general warning flag or other navigation systems when a reliable
fix is not available
2) Status
V = Loran-C Cycle Lock warning flag
A = OK or not used
3) Cross Track Error Magnitude
4) Direction to steer, L or R
5) Cross Track Units (Nautic miles or kilometres)
6) Status
A = Arrival Circle Entered
7) Status
A = Perpendicular passed at waypoint
8) Bearing origin to destination
9) M = Magnetic, T = True
10) Destination Waypoint ID
11) checksum
```

APB Autopilot Sentence "B"

```
$--APB,A,A,x.x,a,N,A,A,x.x,a,c--c,x.x,a,x.x,a*hh
1) Status
V = LORAN-C Blink or SNR warning
A = general warning flag or other navigation systems when a reliable
fix is not available
2) Status
V = Loran-C Cycle Lock warning flag
A = OK or not used
3) Cross Track Error Magnitude
4) Direction to steer, L or R
5) Cross Track Units, N = Nautical Miles
6) Status
A = Arrival Circle Entered
7) Status
A = Perpendicular passed at waypoint
8) Bearing origin to destination
9) M = Magnetic, T = True
10) Destination Waypoint ID
11) Bearing, present position to Destination
12) M = Magnetic, T = True
13) Heading to steer to destination waypoint
14) M = Magnetic, T = True
15) Checksum
```

BEC Bearing & Distance to Waypoint – Dead Reckoning

```
$--BEC,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,M,x.x,N,c--c*hh
1) Time (UTC)
2) Waypoint Latitude
3) N = North, S = South
4) Waypoint Longitude
5) E = East, W = West
6) Bearing, True
7) T = True
8) Bearing, Magnetic
9) M = Magnetic
10) Nautical Miles
11) N = Nautical Miles
12) Waypoint ID
13) Checksum
```
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BOD Bearing – Waypoint to Waypoint

```
$--BOD,x.x,T,x.x,M,c--c,c--c*hh
1) Bearing Degrees, TRUE
2) T = True
3) Bearing Degrees, Magnetic
4) M = Magnetic
5) TO Waypoint
6) FROM Waypoint
7) Checksum
```

BWC Bearing and Distance to Waypoint – Latitude, N/S, Longitude, E/W, UTC, Status

```
$--BWC,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,M,x.x,N,c--c*hh
1) Time (UTC)
2) Waypoint Latitude
3) N = North, S = South
4) Waypoint Longitude
5) E = East, W = West
6) Bearing, True
7) T = True
8) Bearing, Magnetic
9) M = Magnetic
10) Nautical Miles
11) N = Nautical Miles
12) Waypoint ID
13) Checksum
```

BWR Bearing and Distance to Waypoint – Rhumb Line Latitude, N/S, Longitude, E/W, UTC, Status

```
$--BWR,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x.x,T,x.x,M,x.x,N,c--c*hh
1) Time (UTC)
2) Waypoint Latitude
3) N = North, S = South
4) Waypoint Longitude
5) E = East, W = West
6) Bearing, True
7) T = True
8) Bearing, Magnetic
9) M = Magnetic
10) Nautical Miles
11) N = Nautical Miles
12) Waypoint ID
13) Checksum
```

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BWW Bearing – Waypoint to Waypoint

```
$--BWW,x.x,T,x.x,M,c--c,c--c*hh
1) Bearing Degrees, TRUE
2) T = True
3) Bearing Degrees, Magnetic
4) M = Magnetic
5) TO Waypoint
6) FROM Waypoint
7) Checksum
```

DBK Depth Below Keel

```
$--DBK,x.x,f,x.x,M,x.x,F*hh
1) Depth, feet
2) f = feet
3) Depth, meters
4) M = meters
5) Depth, Fathoms
6) F = Fathoms
7) Checksum
```

DBS Depth Below Surface

```
$--DBS,x.x,f,x.x,M,x.x,F*hh
1) Depth, feet
2) f = feet
3) Depth, meters
4) M = meters
5) Depth, Fathoms
6) F = Fathoms
7) Checksum
```

DBT Depth Below Transducer

```
$--DBT,x.x,f,x.x,M,x.x,F*hh
1) Depth, feet
2) f = feet
3) Depth, meters
4) M = meters
5) Depth, Fathoms
6) F = Fathoms
7) Checksum
```

DPT Heading – Deviation & Variation

```
$--DPT,x.x,x.x*hh
1) Depth, meters
2) Offset from transducer;
positive means distance from transducer to water line,
negative means distance from transducer to keel
3) Checksum
```

FSI Frequency Set Information

```
$--FSI,xxxxxx,xxxxxx,c,x*hh
1) Transmitting Frequency
2) Receiving Frequency
3) Communications Mode (NMEA Syntax 2)
4) Power Level
5) Checksum
```

GGA Global Positioning System Fix Data. Time, Position and fix related data for a GPS receiver

```
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,a,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx*hh
1) Time (UTC)
2) Latitude
3) N or S (North or South)
4) Longitude
5) E or W (East or West)
6) GPS Quality Indicator,
0 - fix not available,
1 - GPS fix,
2 - Differential GPS fix
7) Number of satellites in view, 00 - 12
8) Horizontal Dilution of precision
9) Antenna Altitude above/below mean-sea-level (geoid)
10) Units of antenna altitude, meters
11) Geoidal separation, the difference between the WGS-84 earth
ellipsoid and mean-sea-level (geoid), "-" means mean-sea-level below ellipsoid
12) Units of geoidal separation, meters
13) Age of differential GPS data, time in seconds since last SC104
type 1 or 9 update, null field when DGPS is not used
14) Differential reference station ID, 0000-1023
15) Checksum
```

GLC Geographic Position, Loran-C

```
$--GLC,xxxx,x.x,a,x.x,a,x.x,a.x,x,a,x.x,a,x.x,a*hh
1) GRI Microseconds/10
2) Master TOA Microseconds
3) Master TOA Signal Status
4) Time Difference 1 Microseconds
5) Time Difference 1 Signal Status
6) Time Difference 2 Microseconds
7) Time Difference 2 Signal Status
8) Time Difference 3 Microseconds
9) Time Difference 3 Signal Status
10) Time Difference 4 Microseconds
11) Time Difference 4 Signal Status
12) Time Difference 5 Microseconds
13) Time Difference 5 Signal Status
14) Checksum
```

GLL Geographic Position – Latitude/Longitude

```
$--GLL,llll.ll,a,yyyyy.yy,a,hhmmss.ss,A*hh
1) Latitude
2) N or S (North or South)
3) Longitude
4) E or W (East or West)
5) Time (UTC)
6) Status A - Data Valid, V - Data Invalid
7) Checksum
```
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GSA GPS DOP and active satellites

```
$--GSA,a,a,x,x,x,x,x,x,x,x,x,x,x,x,x.x,x.x,x.x*hh
1) Selection mode
2) Mode
3) ID of 1st satellite used for fix
4) ID of 2nd satellite used for fix
...
14) ID of 12th satellite used for fix
15) PDOP in meters
16) HDOP in meters
17) VDOP in meters
18) Checksum
```

GSV Satellites in view

```
$--GSV,x,x,x,x,x,x,x,...*hh
1) total number of messages
2) message number
3) satellites in view
4) satellite number
5) elevation in degrees
6) azimuth in degrees to true
7) SNR in dB
more satellite infos like 4)-7)
n) Checksum
```

GTD Geographic Location in Time Differences

```
$--GTD,x.x,x.x,x.x,x.x,x.x*hh
1) time difference
2) time difference
3) time difference
4) time difference
5) time difference
n) Checksum
```

HDG Heading – Deviation & Variation

```
$--HDG,x.x,x.x,a,x.x,a*hh
1) Magnetic Sensor heading in degrees
2) Magnetic Deviation, degrees
3) Magnetic Deviation direction, E = Easterly, W = Westerly
4) Magnetic Variation degrees
5) Magnetic Variation direction, E = Easterly, W = Westerly
6) Checksum
```

HDM Heading – Magnetic

```
$--HDM,x.x,M*hh
1) Heading Degrees, magnetic
2) M = magnetic
3) Checksum
```

HDT Heading – True

```
$--HDT,x.x,T*hh
1) Heading Degrees, true
2) T = True
3) Checksum
```

HSC Heading Steering Command

```
$--HSC,x.x,T,x.x,M,*hh
1) Heading Degrees, True
2) T = True
3) Heading Degrees, Magnetic
4) M = Magnetic
5) Checksum
```
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LCD Loran-C Signal Data

```
$--LCD,xxxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx,xxx*hh
1) GRI Microseconds/10
2) Master Relative SNR
3) Master Relative ECD
4) Time Difference 1 Microseconds
5) Time Difference 1 Signal Status
6) Time Difference 2 Microseconds
7) Time Difference 2 Signal Status
8) Time Difference 3 Microseconds
9) Time Difference 3 Signal Status
10) Time Difference 4 Microseconds
11) Time Difference 4 Signal Status
12) Time Difference 5 Microseconds
13) Time Difference 5 Signal Status
14) Checksum
```

MSK MSK Receiver Interface (for DGPS Beacon Receivers)

```
$GPMSK,xxx.x,xx,xxx,xx,N*hh
1) Frequency in kHz (283.5 to 325.0)
2) Frequency Selection
M1 = Manual
A1 = Automatic (field 1 empty)
3) MSK bit rate (100 or 200)
4) Bit Rate Selection
M2 = Manual
A2 = Automatic (field 3 empty)
5) Period of output of performance status message, 0 to 100 seconds ($CRMSS)
6) Checksum
```

MTW Water Temperature

```
$--MTW,x.x,C*hh
1) Degrees
2) Unit of Measurement, Celcius
3) Checksum
```
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MWV Wind Speed and Angle

```
$--MWV,x.x,a,x.x,a*hh
1) Wind Angle, 0 to 360 degrees
2) Reference, R = Relative, T = True
3) Wind Speed
4) Wind Speed Units, K/M/N
5) Status, A = Data Valid
6) Checksum
```

OSD Own Ship Data

```
$--OSD,x.x,A,x.x,a,x.x,a,x.x,x.x,a*hh
1) Heading, degrees true
2) Status, A = Data Valid
3) Vessel Course, degrees True
4) Course Reference
5) Vessel Speed
6) Speed Reference
7) Vessel Set, degrees True
8) Vessel drift (speed)
9) Speed Units
10) Checksum
```

ROO Waypoints in Active Route

```
$--ROO,c---c,c---c,....*hh
1) waypoint ID
...
n) checksum
```

RMA Recommended Minimum Navigation Information

```
$--RMA,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,x.x,x.x,x.x,a*hh
```
1) Blink Warning
2) Latitude
3) N or S
4) Longitude
5) E or W
6) Time Difference A, µS
7) Time Difference B, µS
8) Speed Over Ground, Knots
9) Track Made Good, degrees true
10) Magnetic Variation, degrees
11) E or W
12) Checksum
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RMB Recommended Minimum Navigation Information

```
$--RMB,A,x.x,a,c--c,c--c,llll.ll,a,yyyyy.yy,a,x.x,x.x,x.x,A*hh
```
1) Status, V = Navigation receiver warning
2) Cross Track error - nautical miles
3) Direction to Steer, Left or Right
4) TO Waypoint ID
5) FROM Waypoint ID
6) Destination Waypoint Latitude
7) N or S
8) Destination Waypoint Longitude
9) E or W
10) Range to destination in nautical miles
11) Bearing to destination in degrees True
12) Destination closing velocity in knots
13) Arrival Status, A = Arrival Circle Entered
14) Checksum

RMC Recommended Minimum Navigation Information

```
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,a,x.x,x.x,xxxx,x.x,a*hh
```
1) Time (UTC)
2) Status, V = Navigation receiver warning
3) Latitude
4) N or S
5) Longitude
6) E or W
7) Speed over ground, knots
8) Track made good, degrees true
9) Date, ddmmyy
10) Magnetic Variation, degrees
11) E or W
12) Checksum

ROT Rate Of Turn

```
$--ROT,x.x,A*hh
```
1) Rate Of Turn, degrees per minute, "-" means bow turns to port
2) Status, A means data is valid
3) Checksum

RPM Revolutions

```
$--RPM,a,x,x.x,x.x,A*hh
1) Source; S = Shaft, E = Engine
2) Engine or shaft number
3) Speed, Revolutions per minute
4) Propeller pitch, % of maximum, "-" means astern
5) Status, A means data is valid
6) Checksum
```
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RSA Rudder Sensor Angle

```
$--RSA,x.x,A,x.x,A*hh
1) Starboard (or single) rudder sensor, "-" means Turn To Port
2) Status, A means data is valid
3) Port rudder sensor
4) Status, A means data is valid
5) Checksum
```

RSD RADAR System Data

```
$--RSD,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,a,a*hh
9) Cursor Range From Own Ship
10) Cursor Bearing Degrees Clockwise From Zero
11) Range Scale
12) Range Units
14) Checksum
```

RTE Routes

```
$--RTE,x.x,x.x,a,c--c,c--c, ..... c--c*hh
1) Total number of messages being transmitted
2) Message Number
3) Message mode
c = complete route, all waypoints
w = working route, the waypoint you just left, the waypoint you're heading to,
then all the rest
4) Waypoint ID
x) More Waypoints
n) Checksum
```

SFI Scanning Frequency Information

```
$--SFI,x.x,x.x,xxxxxx,c .......... xxxxxx,c*hh
1) Total Number Of Messages
2) Message Number
3) Frequency 1
4) Mode 1
n) Checksum
```

STN Multiple Data ID

```
$--STN,x.x,*hh
1) Talker ID Number
2) Checksum
```
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TTM Tracked Target Message

```
$--TTM,xx,x.x,x.x,a,x.x,x.x,a,x.x,x.x,a,c--c,a,a*hh
```
1) Target Number
2) Target Distance
3) Bearing from own ship
4) Bearing Units
5) Target speed
6) Target Course
7) Course Units
8) Distance of closest-point-of-approach
9) Time until closest-point-of-approach "-" means increasing
10) "-" means increasing
11) Target name
12) Target Status
13) Reference Target
14) Checksum

VBW Dual Ground/Water Speed

```
$--VBW,x.x,x.x,A,x.x,x.x,A*hh
```
1) Longitudinal water speed, "-" means astern
2) Transverse water speed, "-" means port
3) Status, A = data valid
4) Longitudinal ground speed, "-" means astern
5) Transverse ground speed, "-" means port
6) Status, A = data valid
7) Checksum

VDR Set and Drift

```
$--VDR,x.x,T,x.x,M,x.x,N*hh
```
1) Degress True
2) T = True
3) Degrees Magnetic
4) M = Magnetic
5) Knots (speed of current)
6) N = Knots
7) Checksum

VHW Water Speed and Heading

```
$--VHW,x.x,T,x.x,M,x.x,N,x.x,K*hh
```
1) Degress True
2) T = True
3) Degrees Magnetic
4) M = Magnetic
5) Knots (speed of vessel relative to the water)
6) N = Knots
7) Kilometers (speed of vessel relative to the water)
8) K = Kilometres
9) Checksum

VLW Distance Traveled through Water

```
$--VLW,x.x,N,x.x,N*hh
```
1) Total cumulative distance
2) N = Nautical Miles
3) Distance since Reset
4) N = Nautical Miles
5) Checksum

VPW Speed – Measured Parallel to Wind

```
$--VPW,x.x,N,x.x,M*hh
1) Speed, "-" means downwind
2) N = Knots
3) Speed, "-" means downwind
4) M = Meters per second
5) Checksum
```

VTG Track Made Good and Ground Speed

```
$--VTG,x.x,T,x.x,M,x.x,N,x.x,K*hh
1) Track Degrees
2) T = True
3) Track Degrees
4) M = Magnetic
5) Speed Knots
6) N = Knots
7) Speed Kilometers Per Hour
8) K = Kilometres Per Hour
9) Checksum
```
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VWR Relative Wind Speed and Angle

```
$--VWR,x.x,a,x.x,N,x.x,M,x.x,K*hh
1) Wind direction magnitude in degrees
2) Wind direction Left/Right of bow
3) Speed
4) N = Knots
5) Speed
6) M = Meters Per Second
7) Speed
8) K = Kilometers Per Hour
9) Checksum
```

WCV Waypoint Closure Velocity

```
$--WCV,x.x,N,c--c*hh
1) Velocity
2) N = knots
3) Waypoint ID
4) Checksum
```

WNC Distance – Waypoint to Waypoint

```
$--WNC,x.x,N,x.x,K,c--c,c--c*hh
1) Distance, Nautical Miles
2) N = Nautical Miles
3) Distance, Kilometers
4) K = Kilometers
5) TO Waypoint
6) FROM Waypoint
7) Checksum
```

WPL Waypoint Location

```
$--WPL,llll.ll,a,yyyyy.yy,a,c--c*hh
1) Latitude
2) N or S (North or South)
3) Longitude
4) E or W (East or West)
5) Waypoint Name
6) Checksum
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```

XDR Cross Track Error – Dead Reckoning

```
$--XDR,a,x.x,a,c--c, ..... *hh
1) Transducer type
2) Measurement data
3) Units of measurement
4) Name of transducer
x) More of the same
n) Checksum
```

XTE Cross-Track Error – Measured

```
$--XTE,A,A,x.x,a,N,*hh
1) Status
V = LORAN-C blink or SNR warning
A = general warning flag or other navigation systems when a reliable
fix is not available
2) Status
V = Loran-C cycle lock warning flag
A = OK or not used
3) Cross track error magnitude
4) Direction to steer, L or R
5) Cross track units. N = Nautical Miles
6) Checksum
```

XTR Cross Track Error – Dead Reckoning

```
$--XTR,x.x,a,N*hh
1) Magnitude of cross track error
2) Direction to steer, L or R
3) Units, N = Nautical Miles
4) Checksum
```

ZDA Time & Date – UTC, Day, Month, Year and Local Time Zone

```
$--ZDA,hhmmss.ss,xx,xx,xxxx,xx,xx*hh
1) Local zone minutes description, same sign as local hours
2) Local zone description, 00 to +/- 13 hours
3) Year
4) Month, 01 to 12
5) Day, 01 to 31
6) Time (UTC)
7) Checksum
```

ZFO UTC & Time from Origin Waypoint

```
$--ZFO,hhmmss.ss,hhmmss.ss,c--c*hh
1) Time (UTC)
2) Elapsed Time
3) Origin Waypoint ID
4) Checksum
```

ZTG UTC & Time to Destination Waypoint

```
$--ZTG,hhmmss.ss,hhmmss.ss,c--c*hh
1) Time (UTC)
2) Time Remaining
3) Destination Waypoint ID
4) Checksum
```