Note: This document is an excerpt from the POS MV Installation and Operation Guide. Currently the only formats being logged on the Healy are $INGGA, $INHDT, $INVTG, $INGST, $PASHR and $INZDA.

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NMEA Data Formats

The PCS uses any one of the five COM ports to output data using the National Marine Electronics Association (NMEA) 0183 format at rates up to fifty sentences per second. POS MV makes eleven different sentence formats available:

1. $INGGA: global system position fix data
2. $INGGK: time, position, position type and DOP values

3. $INHDT: heading - true data
4. $INVTG: course over ground and ground speed data
5. $INGST: GPS pseudorange noise statistics
6. a) $PASHR: attitude data
   b) $PASHR-TSS: attitude data (TSS indicates the use of the TSS standard instead of the Tate-Bryant standard, see page 4-19 for a description)
7. a) $PRDID: attitude data
   b) $PRDID-TSS: attitude data (TSS indicates the use of the TSS standard instead of the Tate-Bryant standard, see page 4-19 for a description)
8. $INZDA: time and date
9. $UTC: time and date
10. $INPPS: time and offset

Use the MV-POSView Controller program to set the system to output from one to nine of these sentences, as well as to set the output frequency of these sentences.

Note: $PASHR and $PASHR-TSS are mutually exclusive; as are $PRDID and $PRDID-TSS.

NMEA Sentence Formats

1. $INGGA: Global Positioning Fix Data

Time and position fix related data. POS MV supplies information using the following American Standard Code for Information Interchange (ASCII) NMEA 0183 sentence format.

$INGGA,hhmmss.sss,llll.llll,a,yyyyy.yyyyy,b,t,nn,v.v,xxxxx.xx,M,,,ccc,rrrr*hh<CRLF>

Table 10: $INGGA Sentence Format

Item	Definition	Value	Units (If Applicable)
$INGGA	Header	$INGGA	
hhmmss.sss	UTC time of position	N/A	hours|minutes|seconds|decimal seconds 2 fixed digits for hours 2 fixed digits for minutes 2 fixed digits for seconds 3 digits for decimal seconds
llll.llll	Latitude	0 to 90	degrees|minutes|decimal minutes 2 fixed digits for degrees 2 fixed digits for minutes 5 digits for decimal minutes
a	N (North) or S (South)	N or S	
yyyyy.yyyyy	Longitude	0 to 180	degrees|minutes|decimal minutes 3 fixed digits for degrees 2 fixed digits for minutes 5 digits for decimal minutes
b	E (East) or W (West)	E or W	

$INGGA,hhmmss.sss,llll.llll,a,yyyyy.yyyyy,b,t,nn,v.v,xxxxx.xx,M,,,ccc,rrrr*hh<CRLF>

Table 10: $INGGA Sentence Format

Item	Definition	Value	Units (If Applicable)
t	GPS quality indicator	0 = fix not available or invalid 1 = C/A standard GPS; fix valid 2 = DGPS mode; fix valid 3 = GPS PPS mode; fix valid 4 = RTK fixed 5 = RTK float 6 = free inertial	
nn	Number of satellites used in the fix	0 to 32	
v.v	Horizontal dilution of precision		
xxxxx.xx	Altitude above or below mean sea level; a negative value indicates below sea level	N/A	metres
M	Units of measure = metres	M	
Null	Null		
Null	Null		
ccc	Age of differential corrections in seconds since last RTCM-104 message	0 to 999	seconds

$INGGA,hhmmss.sss,llll.llllll,a,yyyyy.yyyyy,b,t,nn,v.v,xxxxx.xx,M,,,ccc,rrrr*hh<CRLF>

Table 10: $INGGA Sentence Format

Item	Definition	Value	Units (If Applicable)
rrrr	DGPS reference station identity	0000 to 1023	
*hh	Checksum		
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items, including null fields. The information is valid at the location of the vessel frame.

2. *$INGGK: Time, Position, Position Type and DOP Values*

The message string is shown below.

$INGGK,hhmmss.ss,mmddyy,llll.lllllll,a,yyyyy.yyyyyyyy,b,t,nn,v.v,x.xxx,M*hh<CRLF>

Table 11: $INGGK Sentence Format

Item	Definition	Value	Units (If Applicable)
$INGGK	Header	$INGGK	
hhmmss.ss	UTC of position fix	N/A	hours|minutes|seconds|decimal seconds 2 fixed digits for hours 2 fixed digits for minutes 2 fixed digits for seconds 2 digits for decimal seconds
mmddyy	UTC date of position	N/A	month|day|year 2 fixed digits for month 2 fixed digits for day 2 fixed digits for year

$INGGK,hhmmss.ss,mmddyy,llll.lllllll,a,yyyyy.yyyyyyyy,b,t,nn,v.v,x.xxx,M*hh<CRLF>

Table 11: $INGGK Sentence Format

Item	Definition	Value	Units (If Applicable)
llll.lllllll	Latitude	0 to 90	degrees|minutes|decimal minutes 2 fixed digits for degrees 2 fixed digits for minutes 8 digits for decimal minutes
a	Direction of latitude	N or S	
yyyyy.yyyyyyyy	Longitude	0 to 180	degrees|minutes|decimal minutes 3 fixed digits for degrees 2 fixed digits for minutes 8 digits for decimal minutes
b	Direction of longitude	E or W	
t	GPS quality indicator	0 = fix not available or invalid 1 = C/A standard GPS; fix valid 2 = RTK float 3 = RTK fixed 4 = DGPS mode; fix valid 5 = free inertial	
nn	Number of satellites used in GPS solution	0 to 32	
v.v	DOP of fix		
x.xxx	Ellipsoid height of fix (vessel height above WGS84 ellipsoid)	N/A	metres|decimal metres 1 fixed digit for metres 3 fixed digits for decimal metres

$INGGK,hhmmss.ss,mmddyy,llll.lllllll,a,yyyyy.yyyyyyyy,b,t,nn,v.v,x.xxx,M*hh<CRLF>

Table 11: $INGGK Sentence Format

Item	Definition	Value	Units (If Applicable)
M	Ellipsoid height	N/A	metres
*hh	Checksum		
<CRLF>	Carriage return and line feed	<CRLF>	

3. $INHDT: Heading - True Data

True vessel heading is in degrees. POS MV supplies information in the following ASCII NMEA 0183 sentence format.

$INHDT,xxx.x,T*hh<CRLF>

Table 12: $INHDT Sentence Format

Item	Definition	Value	Units (If Applicable)
$INHDT	Header	$INHDT	
xxx.x	True vessel heading in the vessel frame	000.0 to 359.9	degrees|decimal degrees 3 fixed digits for degrees 1 digit for decimal degrees
T	True	T	
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

4. $INVTG: Course Over Ground and Ground Speed Data

Actual course and speed relative to the ground. POS MV supplies information in the following ASCII NMEA 0183 sentence format.

$INVTG,xxx.x,T,,M,n.n,N,k.k,K*hh<CRLF>

Table 13: $INVTG Sentence Format

Item	Definition	Value	Units (If Applicable)
$INVTG	Header	$INVTG	
xxx.x	True vessel track in the vessel frame	000.0 to 359.9	degrees|decimal degrees 3 fixed digits for degrees 1 digit for decimal degrees
T	True	T	
Null	Not supported	null	
M		M	
n.n	Speed in the vessel frame	N/A	knots
N	Knots	N	
k.k	Speed in the vessel frame	N/A	km/h
K	Kilometres per hour	K	
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items, including null fields.

5. $INGST: GPS Pseudorange Noise Statistics

GPS pseudorange noise statistics indicate the quality of the position solution delivered by the integrated navigation solution. POS MV

supplies information in the following ASCII NMEA 0183 sentence format.

$INGST,hhmmss.sss,,smjr.smjr,smnr.smnr,ooo.o,l.l,y.y,a.a
*hh<CRLF>

Table 14: $INGST Sentence Format

Item	Definition	Value	Units (If Applicable)
$INGST	Header	$INGST	
hhmmss.sss	UTC time of position	N/A	hours|minutes|seconds|decimal seconds 2 fixed digits for hours 2 fixed digits for minutes 2 fixed digits for seconds 3 digits for decimal seconds
Null	Not supported	null	
smjr.smjr	Standard deviation of semi-major axis of error ellipse	N/A	metres
smnr.smnr	Standard deviation of semi-minor axis of error ellipse	N/A	metres
ooo.o	Orientation of semi major axis of error ellipse	000.0 to 359.9	degrees from true north
l.l	Standard deviation of latitude	N/A	metres
y.y	Standard deviation of longitude	N/A	metres

$INGST,hhmmss.sss,,smjr.smjr,smnr.smnr,ooo.o,l.l,y.y,a.a
*hh<CRLF>

Table 14: $INGST Sentence Format

Item	Definition	Value	Units (If Applicable)
a.a	Standard deviation of altitude	N/A	metres
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

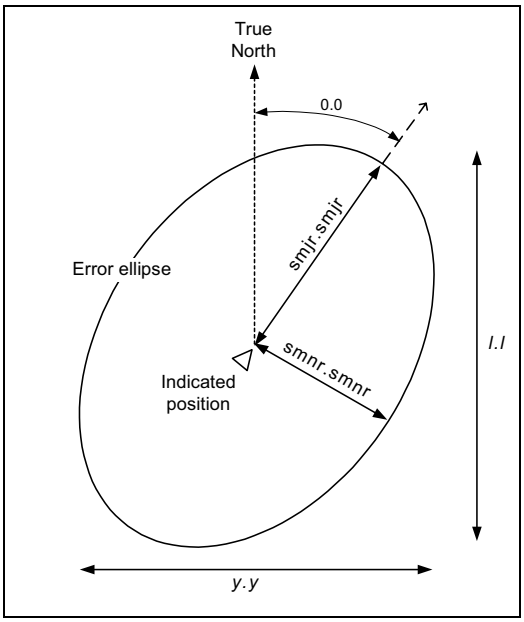

Figure 12: $INGST Sentence Nomenclature

6. $PASHR ($PASHR-TSS): Attitude Data

POS MV supplies attitude data information in the following ASCII NMEA sentence format.

$PASHR,hhmmss.sss,xxx.xx,T,RRR.RR,PPP.PP,HHH.HH,
a.aaa,b.bbb,c.ccc,d,e*hh<CRLF>

Table 15: $PASHR Sentence Format

Item	Definition	Value	Units (If Applicable)
$PASHR	Header	$PASHR	
hhmmss.sss	UTC time of data string	N/A	hours|minutes|seconds|decimal seconds • 2 fixed digits for hours • 2 fixed digits for minutes • 2 fixed digits for seconds • 3 digits for decimal seconds
xxx.xx	True vessel heading	0 to 359.99	degrees
T	True	T	
RRR.RR	Roll	-90.00 to +90.00	degrees
PPP.PP	Pitch	-90.00 to +90.00	degrees
HHH.HH	Heave	-99.00 to +99.00	metres
a.aaa	Accuracy roll	0 to 9.999	degrees
b.bbb	Accuracy pitch	0 to 9.999	degrees
c.ccc	Accuracy heading	0 to 9.999	degrees

$PASHR,hhmmss.sss,xxx.xx,T,RRR.RR,PPP.PP,HHH.HH,
a.aaa,b.bbb,c.ccc,d,e*hh<CRLF>

Table 15: $PASHR Sentence Format

Item	Definition	Value	Units (If Applicable)
d	Flag - accuracy heading	0, 1, 2	0 = no aiding 1 = GPS aiding 2 = GPS & GAMS aiding
e	Flag - IMU	0, 1	0 = IMU out 1 = satisfactory
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items. Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the other uses TSS angles. Use the MV-POSView Controller program to set the required angle convention. Refer to COM Ports Configuration on page 4-17 for instructions and for a definition of the Tate-Bryant and the TSS formulas. The information is valid in the vessel frame, except for heave, which is valid in the sensor 1 frame.

7. $PRDID ($PRDID-TSS): Attitude Data

POS MV supplies attitude data information in the following ASCII NMEA sentence format.

$PRDID,PPP.PP,RRR.RR,xxx.xx*hh <CRLF>

Table 16: $PRDID Sentence Format

Item	Definition	Value	Units (If Applicable)
$PRDID	Header	$PRDID	
PPP.PP	Pitch	-90.00 to +90.00	degrees
RRR.RR	Roll	-90.00 to +90.00	degrees
xxx.xx	Sensor heading	0 to 359.99	degrees

$PRDID,PPP.PP,RRR.RR,xxx.xx*hh <CRLF>

Table 16: $PRDID Sentence Format

Item	Definition	Value	Units (If Applicable)
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items. Two attitude data strings are available. The strings are identical except for the definition of roll and pitch angles. One string uses Tate-Bryant angles and the other uses TSS angles. Use the MV-POSView Controller program to set the required angle convention. Refer to COM Ports Configuration on page 4-17 for instructions and for a definition of the Tate-Bryant and the TSS formulas. The information is valid at the sensor 1 location.

8. $INZDA: Time and Date

POS MV supplies time and date information in the following ASCII NMEA sentence format.

$INZDA,hhmmss.ssss,DD,MM,YYYY,,*hh<CRLF>

Table 17: $INZDA Sentence Format

Item	Definition	Value	Units (If Applicable)
$INZDA	Header	$INZDA	
hhmmss.ssss	UTC time	N/A	hours|minutes|seconds|decimal seconds • 2 fixed digits for hours • 2 fixed digits for minutes • 2 fixed digits for seconds • 4 digits for decimal seconds
DD	Day of month	01 to 31	
MM	Month of year	01 to 12	
YYYY	Year		
Null	Null		

$INZDA,hhmmss.ssss,DD,MM,YYYY,,*hh<CRLF>

Table 17: $INZDA Sentence Format

Item	Definition	Value	Units (If Applicable)
Null	Null		
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items.

9. $UTC: Time and Date

POS MV supplies UTC time and date information in the following ASCII NMEA sentence format.

$UTC,YYYYMMDD,hhmmss.ssss,*hh<CRLF>

Table 18: $UTC Sentence Format

Item	Definition	Value	Units (If Applicable)
$UTC	Header	$UTC	
YYYY	Year		
MM	Month	01 to 12	
DD	Day	01 to 31	
hhmmss.ssss	UTC time	000000.0000 to 235959.9999	hours|minutes|seconds| decimal seconds • 2 fixed digits for hours • 2 fixed digits for minutes • 2 fixed digits for seconds • 4 digits for decimal seconds
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

Note: Commas separate all items.

10. $INPPS: Time and Offset

POS MV supplies UTC time and GPS time offset information in the following ASCII NMEA sentence format.

$INPPS,hhmmss.ssss,d,wwww,uu.uu,pppp,*hh<CRLF>

Table 19: $INPPS Sentence Format

Item	Definition	Value	Units (If Applicable)
$INPPS	Header	$INPPS	
hhmmss.ssss	UTC time	000000.0000 to 235959.9999	hours|minutes|seconds|decimal seconds • 2 fixed digits for hours • 2 fixed digits for minutes • 2 fixed digits for seconds • 4 digits for decimal seconds
d	Offset day[N1]	0 to 6	
wwww	GPS week number	0000 to 9999	
uu.uu	Offset of GPS time from UTC time[N2]	00.00 to 99.99	seconds|decimal seconds • 2 fixed digits for seconds • 2 digits for decimal seconds
pppp	PPS count[N3]	1 to n	
*hh	Checksum	N/A	
<CRLF>	Carriage return and line feed	<CRLF>	

[N1] First day of week (Sunday) = 0.
[N2] GPS time = UTC time + UTC offset.
[N3] Variable length.

Note: Commas separate all items.