RedWave

Communication protocol specification

version 2.00 rev. b

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Content

1 TNT NMEA Protocol

1.1 Naming

'device' - RedNODE underwater acoustic navigational receiver
'host' - a consumer system, which is connected to a RedNODE receiver
D2H - 'Device to host'
H2D - 'Host to device'

1.2 Sentence format

Full protocol description can be found in official NMEA 0183 2.x protocol specification.

About NMEA 0183 briefly:

ASCII-based protocol.

Sentence start - '$'

Sentence end - <CR><LF>

Checksum delimiter - '*'

Parameters delimiter - ','

WARNING: *special formats for integer numbers (e.g. 'x', 'xx', 'hh') should be understood literally, for example 'xx' means two digits (with leading zeros if necessary).*

1.3 Sentence: '0' IC_D2H_ACK

Device response (negative/positive acknowledgement). Informs host whether request has/has not been accepted by device. Returns an error code.

Sentence format: $PTNT0,x*hh <CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
0	Sentence identifier
errorCode	Error code
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.4 Sentence: '1' IC_H2D_FLD_GET

Request for a configuration field value. Device responses with IC_D2H_FLD_VAL (if succeeded) or IC_ACK with an error code (if not succeeded).

Sentence format: $PTNT1,xx,00*hh <CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
1	Sentence identifier
Field ID	Configuration field identifier
Reserved	Always should be '00', reserved
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.5 Sentence: '2' IC_H2D_FLD_SET

Request for a configuration field value change. Device responses with IC_D2H_FLD_VAL (if succeeded) or IC_ACK with an error code (in other cases).

Sentence format: $PTNT2,xx,xx*hh<CR><LF>	
Field	**Сообщение**
$	NMEA sentence start
PTNT	Proprietary TNT
2	Sentence identifier
Field ID	Configuration field identifier
Field value	Value to set, 0..99
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.6 Sentence: '3' IC_D2H_FLD_VAL

Device response to FLD_GET and FLD_SET requests.

Sentence format: $PTNT3,x,x<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
3	Sentence identifier
Field ID	Configuration field identifier
Field value	Field value, 0..99
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.7 Sentence: '4' IC_H2D_LOC_DATA_GET

Request for device's local data.

Sentence format: $PTNT4,xx,00*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
4	Sentence identifier
Requested data ID	Data identifier
Reserved	Reserved, '00'
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.8 Sentence: '5' IC_D2H_LOC_DATA_VAL

Ответ устройства на запрос IC_H2D_LOC_DATA_GET и IC_H2D_SET_VAL.

Sentence format: $PTNT5,x,x<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
5	Sentence identifier
Requested data ID	Data identifier
Value	Data value
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.9 Sentence: '!' IC_D2H_DEV_INFO_VAL

Response to IC_D2H_LOC_DATA_GET with requested data ID = LOC_DATA_DEV_INFO.

Sentence format: $PTNT!,c--c,x,x,c--c,x,c--c<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
!	Sentence identifier
System moniker	Name of the system
System version	System version (BCD)
Communication subsystem moniker	Communication core moniker with a release name in square brackets
Communication subsystem version	Communication core version (BCD)
Device type	Device type
Serial number	Unique 96-bit device ID
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.10 Sentence: '6' IC_H2D_ACT_INVOKE

Request for an action invocation.

Sentence format: $PTNT6,xx,00*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
6	Sentence identifier
Action ID	Function ID
Reserved	Reserved, '00'
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of NMEA sentence

1.11 Sentence: 'C' IC_D2H_NEW_PFIX_UPDATE

Device has updated its own geographic position.

Sentence format: $PTNTC,x,x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x,x.x*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
C	Sentence identifier
Own location - latitude	Latitude, degrees signed
Own location - longitude	Longitude, degrees signed
Own location - depth	Depth, meters
Radial error	Radial error (Horizontal dilution of precision), meters
Buoy #1 latitude	RedBASE №1 latitude, degrees signed
Buoy #1 longitude	RedBASE №1 longitude, degrees signed
Buoy #2 latitude	RedBASE №2 latitude, degrees signed
Buoy #2 longitude	RedBASE №2 longitude, degrees signed
Buoy #3 latitude	RedBASE №3 latitude, degrees signed
Buoy #3 longitude	RedBASE №3 longitude, degrees signed
Buoy #4 latitude	RedBASE №4 latitude, degrees signed
Buoy #5 longitude	RedBASE №4 longitude, degrees signed
Temperature	Ambient temperature, ˚C
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.12 Sentence: 'N' IC_D2H_DPTTMP_VAL

Depth and temperature**.**

Sentence format:

$PTNTN,x.x,x.x*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
N	Sentence identifier
Depth	Device's depth, meters
Temperature	Device's temperature (ambient), ˚C
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.13 Sentence: 'M' IC_D2H_BUOY_STATUS

Buoys status.

Sentence format $PTNTM,x.x,x.x,x.x,x,x.x,x.x,x.x,x,x.x,x.x,x.x,x,x.x,x.x,x.x,x.x,x*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
M	Sentence identifier
Buoy #1 latitude	RedBASE №1 latitude, degrees signed
Buoy #1 longitude	RedBASE №1 longitude, degrees signed
Buoy #1 SNR	RedBASE №1 Signal to noise ratio, dB
Buoy #1 status	RedBASE №1 status
Buoy #2 latitude	RedBASE №2 latitude, degrees signed
Buoy #2 longitude	RedBASE №2 longitude, degrees signed
Buoy #2 SNR	RedBASE №2 Signal to noise ratio, dB
Buoy #2 status	RedBASE №2 status
Buoy #3 latitude	RedBASE №3 latitude, degrees signed
Buoy #3 longitude	RedBASE №3 longitude, degrees signed
Buoy #3 SNR	RedBASE №3 Signal to noise ratio, dB
Buoy #3 status	RedBASE №3 status
Buoy #4 latitude	RedBASE №4 latitude, degrees signed
Buoy #4 longitude	RedBASE №4 longitude, degrees signed

Buoy #4 SNR	RedBASE №4 Signal to noise ratio, dB
Buoy #4 status	RedBASE №4 status
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.14 Sentence: 'O' IC_D2H_PRETMP_VAL

Pressure and temperature.

Sentence format: $PTNTO,x.x,x.x*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
O	Sentence identifier
Pressure	Pressure (ambient), mbar
Temperature	Temperature (ambient), ˚C
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.15 Sentence: 'P' IC_H2D_SET_VAL

Request for a local value set.

Sentence format: $PTNTP,x,x.x<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
P	Sentence identifier
Value ID	Local data identifier
Value	Local data value to set
*	NMEA checksum delimiter

hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.16 Sentence: 'GGA'

Standard NMEA sentence - Global Positioning System Fix Data.

Sentence format $GNGGA,hhmmss.sss,ddmm.mmm,N|S,yyymm.mmm,E|W,x,xx,x.x,x.x,M,x.x,M,xx,xxxx*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
GN	Standard talker ID
GGA	Sentence identifier
UTC Time	UTC, hhmmss.sss
Latitude	Latitude, ddmm.mmmmmm
N|S	Hemisphere ID
Longitude	Longitude, dddmm.mmmmmm
E|W	Hemisphere ID
Fix Type	Type of fix
Satellites in view	Number of satellites (always 4)
HDOP	Horizontal dilution of precision, meters
Altitude	Altitude (means depth for RedNODE), meters
M	M - meters
Geoidal separation	Not supported
Age of data	Not supported
Reference station ID	Not supported
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.17 Sentence: 'RMC'

Standard NMEA sentence - Recommended minimum, sentence 'C'

Sentence format: $GNRMC,hhmmss.sss,A|V,ddmm.mmm,N|S,dddmm.mmm,E|W,x.x,x.x,ddmmyy,,,A|D|V*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
GN	Standard talker ID
RMC	Sentence identifier
UTC time	UTC, hhmmss.sss
Data quality indicator	A - data valid
Latitude	Latitude, ddmm.mmmmmm
N|S	Hemisphere ID
Longitude	Longitude, dddmm.mmmmmm
E|W	Hemisphere ID
Speed	Not supported
Course	Not supported
Date	ddmmyy Date, Month and Year
Magnetic variation	Not supported
E|W	Not supported
A	Positioning mode, A - GNSS
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.18 Sentence: 'MTW'

Standard NMEA sentence - Mean temperature of water

Sentence format: $GNMTW,x.x,C*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
GN	Standard talker ID
MTW	Sentence identifier
Temperature	Temperature, ˚C

C	C - Celsius
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

1.19 Sentence: 'Q' IC_H2D_SNT_ENABLE

Set enable or disable state for specified sentences.

Sentence format: $PTNTQ,b,b,b,b,b,b,b*hh<CR><LF>	
Field	**Description**
$	NMEA sentence start
PTNT	Proprietary TNT
Q	Sentence indentifier
isMTW	MTW sentence flag (0 - disabled, 1 - enabled)
isGGA	GGA sentence flag (0 - disabled, 1 - enabled)
isRMC	RMC sentence flag (0 - disabled, 1 - enabled)
isM	TNTM sentence flag (0 - disabled, 1 - enabled)
isC	TNTC sentence flag (0 - disabled, 1 - enabled)
isN	TNTN sentence flag (0 - disabled, 1 - enabled)
isO	TNTO sentence flag (0 - disabled, 1 - enabled)
*	NMEA checksum delimiter
hh	NMEA checksum (hexadecimal)
<CR><LF>	End of message

2 Appendix

2.1 Configuration fields

Field ID	Name	Description	Range
'0'	FLD_SOUND_SPEED	Speed of sound	'00'..'99'

		OBSOLETE	Calculates as: 1400 + FLD_VALUE*2
'1'	FLD_IS_DEBUG_INFO	-	Not supported
'2'	FLD_DS_MODE	-	Not supported
'3'	FLD_SUB_ID	-	Not supported
'4'	FLD_IS_AUTO_OUT	-	If '1' device sends information over UART

2.2 Device types

Value	Name	Description
'0'	DEVICE_REDBASE	RedBASE GNSS-equipped sonobuoy
'1'	DEVICE_REDNODE	RedNODE navigational receiver
'2'	DEVICE_REDNAV	RedNAV diver's navigator
'3'	DEVICE_REDGTR	RedGTR code modem

2.3 Error codes

Value	Name	Description
'0'	NO_ERROR	Success, no errors
'1'	INVALID_SYNTAX	Syntax invalid
'2'	UNSUPPORTED	Request not supported
'3'	TRANSMITTER_BUSY	Acoustic transmitted busy
'4'	ARGUMENT_OUT_OF_RANGE	Argument out of range
'5'	INVALID_OPERATION	Requested operation invalid
'6'	UNKNOWN_FIELD_ID	Unknown/unsupported configuration filed ID
'7'	VALUE_UNAVAILIBLE	Requested value unavailable at this moment
'8'	RECEIVER_BUSY	Acoustic receiver waits for a remote system response

2.4 Local data identifiers

Value	Name	Description	RO/RW
'0'	DEVICE_INFO	System name, version, acoustic subsystem name and version, device type and serial number	RO
'1'	MAX_REMOTE_TIMEOUT	Max. remote timeout, msec	RO
'2'	MAX_SUBSCRIBERS	Not supported	RO
'3'	DEPTH	Built-in depth sensor value, meters	RO
'4'	TEMPERATURE	Built-in temperature sensor value, ˚C	RO
'5'	BAT_CHARGE	Not supported	RO
'6'	PRESSURE_RATING	Max. allowed hydrostatic pressure, bar	RO
'7'	ZERO_PRESSURE	Pressure above water surface, bar	RW
'8'	WATER_DENSITY	Water density[1], kg/m3	RO
'9'	SALINITY	Water salinity, ppm	RW
'10'	SOUND_SPEED	Speed of sound[2], м/с	RW
'11'	GRAVITY_ACC	Gravity acceleration[3] (g), m/s2	RO
'12'	YEAR	Current year	RW
'13'	MONTH	Current month	RW
'14'	DATE	Current date	RW
'15'	HOUR	Current hour	RO
'16'	MINUTE	Current minute	RO
'17'	SECOND	Current second[4]	RO

2.5 Functions

Value	Name	Description
'0'	LOC_INVOKE_FLASH_WRITE	Save settings to internal flash

[1] Updates internally according to current temperature, pressure and salinity
[2] Updates internally (if not set manually) according to current temperature, pressure and salinity
[3] Updates internally according to current geographic location (WGS-84 ellipsoid)
[4] Hour, minute and second updates from buoy's navigational signal

‘1’	LOC_INVOKE_CLEAR_WAYPOINTS	Not supported
‘2’	LOC_INVOKE_CLEAR_TRACK	Not supported
‘3’	LOC_INVOKE_CLEAR_NDTABLE	Not supported
‘4’	LOC_INVOKE_DPT_ZERO_ADJUST	Set current pressure value as zero pressure (above water surface)

2.6 Fix type

Value	Name	Description
'0'	NO_FIX	Geographic position not available
‘1’	GNSS_FIX	Geographic position based on GNSS data

2.7 Buoy status

Value	Name	Description
'0'	BSTS_NO_DATA	Buoy state unknown
‘1’	BSTS_TIMEOUT	Buoy timeout
‘2’	BSTS_DISCHARGED	Buoy is OK, but its battery in "yellow" zone
‘3’	BSTS_OK	Buoy is OK
‘4’	BSTS_ALIVE	Buoy is OK, but battery state is not available yet