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<thead>
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<td>Length (curvatur)</td>
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<td>Girth (pectoral)</td>
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<td>Setting protocol</td>
<td>Software specification for CTD_GEN_13A deployment (Standard CTD) Valid for dates in years 2013 to 2016</td>
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</tbody>
</table>

Valid for dates in years 2013 to 2016

Transmitting via ARGOS

Argos page transmission sequences:

Until day 1464: 0 0 1 0 0 2 3 0 0 4 5
An additional diagnostics page (6) is sent every 60 transmissions

Argos airtest for first 7 hours:
Transmission interval is chosen randomly between 48 and 72 seconds

Satellite availability (UTC):  
00: -- on --  
01: -- on --  
02: -- on --  
03: -- on --  
04: -- on --  
05: -- on --  
06: -- on --  

Transmission targets:

56000 transmissions after 365 days

Normal interval between Argos transmissions: 40 secs
In Haulouts: ON (one tx every 1 min 20 secs) for first 5 hours
then cycling OFF for 3 hours, ON for 2 hours

Check sensors every 4 secs
When near surface (shallower than 10m), check wet/dry every 1 sec
Consider wet/dry sensor failed if wet for 7 days or dry for 99 days
Dives start when wet and below 6m for 8 secs
and end when dry, or above 6m
Do not separate 'Deep' dives
A cruise begins if there has been no dive for 9 mins
A haulout begins when dry for 10 mins
and ends when wet for 40 secs

Dive shape (normal dives):
4 points per dive using broken-stick algorithm

Dive shape (deep dives):
none

CTD profiles: max 2000 dbar up to 4 dbar in 2 dbar bins.
Note: these values should now be given in cbar.
They have been auto-converted from dbar because CTD_HI_RES_PRESSURE is not specified

Temperature: Collected, Stored. Valid range: -2.5 to 30.2 degC
Conductivity: Collected, Not stored.
Salinity: Calculated, Stored. Valid range: 28.9 to 37.1
Fluorescence: Not collected.
Oxygen: Not collected.
Light level: Not collected.

Send the deepest upcast in each 6-hour period.
An upcast is collected if the depth exceeds:
  1000m in hour 1
  400m in hour 2
  200m in hour 3
  100m in hour 4
  50m in hour 5
  30m in hour 6
In addition, a replacement upcast is collected if the depth exceeds the depth of the current upcast by 20%.

During profile, sample CTD sensor every 2 seconds when deeper than 500 m, every 1 seconds when shallower than 500 m.
Each profile contains 16 cut points consisting of 8 fixed points, maximum depth, minimum depth, 6 broken-stick points
A set of fixed point is selected according to depth:
  10,12,14,16,18,20,24,30
  10,14,20,26,30,36,40,50
  10,20,30,40,50,60,70,75
  10,20,30,40,50,60,75,100
  10,20,30,50,75,100,125,150
  10,20,30,50,75,100,150,200
  10,20,30,50,100,150,200,300
  10,20,50,100,150,200,300,400
  10,20,50,100,200,300,400,500
  10,20,50,100,200,300,500,700
  20,50,100,200,300,500,700,1000
  50,100,200,300,500,700,1000,1500

No GPS data

TRANSMISSION BUFFERS (in RAM):
Dives in groups of 3 (10.4167 days @ 10mins/dive):
  500  = 2000 bytes
No 'deep' dives
Haulouts: 50  = 200 bytes
6-hour Summaries in groups of 3 (7.5 days): 10  = 40 bytes
No Timelines
Cruises: 50  = 200 bytes
No Diving periods
No Spot depths
No Emergence records
No Dive duration histograms
No Max depth histograms
No Depth & Temperature histograms
CTD casts (7.5 days): 30  = 120 bytes
No GPS fixes
No Spot CTD's
No Vemco VMT's

TOTAL 2560 bytes (of about 21000 available)
MAIN BUFFERS (in 8 or 24 Mb Flash):
Dive in groups of 3 (10.4167 days @ 10mins/dive):
500 x 104 bytes = 52000 bytes
No 'deep' dives
Haulout: 50 x 32 bytes = 1600 bytes
6-hour summaries in groups of 3 (7.5 days): 10 x 88
bytes = 880 bytes
No Depth & Temperature histograms
No timelines
Cruise: 50 x 32 bytes = 1600 bytes
No diving periods
No spot depths
No emergence records
No Max depth histograms
CTD casts (7.5 days): 30 x 160 bytes = 4800 bytes
No GPS fixes
No spot CTD's
No Vemco VMT's

TOTAL 59 kb (from 8192 kb available)

PAGE CONTENTS:

PAGE 0 (Argos, 247 bits):

PTT NUMBER OVERHEAD (28-bit code)
-------------[8 bits: 0 - 7]

PAGE NUMBER
-------------[3 bits: 8 - 10]

DIAGNOSTICS in format 0:

Max depth ever: Lookup with 128 bins:
<2.5, 2.5-5, 5-7.5, 7.5-10, 10-12.5, 12.5-15, 15-
17.5, 17.5-20, 20-22.5, 22.5-25, 25-27.5, 27.5-30, 30-
32.5, 32.5-35, 35-40, 40-45, 45-50, 50-55, 55-60, 60-65, 65-
70, 70-75, 75-80, 80-85, 85-90, 90-95, 95-100, 100-105, 105-
110, 110-115, 115-120, 120-125, 125-130, 130-135, 135-
140, 140-145, 145-150, 150-155, 155-160, 160-165, 165-
170, 170-175, 175-180, 180-185, 185-190, 190-195, 195-
200, 200-205, 205-210, 210-215, 215-220, 220-225, 225-
230, 230-240, 240-250, 250-260, 260-270, 270-280, 280-
290, 290-300, 300-310, 310-320, 320-330, 330-340, 340-
350, 350-360, 360-370, 370-380, 380-390, 390-400, 400-
425, 425-450, 450-475, 475-500, 500-525, 525-550, 550-
575, 575-600, 600-625, 625-650, 650-675, 675-700, 700-
725, 725-750, 750-775, 775-800, 800-825, 825-850, 850-
875, 875-900, 900-925, 925-950, 950-975, 975-1000, 1000-
1025, 1025-1050, 1050-1075, 1075-1100, 1100-1125, 1125-
1150, 1150-1175, 1175-1200, 1200-1225, 1225-1250, 1250-
1275, 1275-1300, 1300-1325, 1325-1350, 1350-1375, 1375-
1400, 1400-1425, 1425-1450, 1450-1475, 1475-1500, 1500-
1550, 1550-1600, 1600-1650, 1650-1700, 1700-1750, 1750-
1800, 1800-1850, 1850-1900, 1900-1950, 1950-2000, 2000-
2050, 2050-2100, 2100-2150, >2150 in units of 0.1 m
(range: 0 to 2150 m)

-----------[7 bits: 11 - 17]

DIVE group in format 0:
Normal dives transmitted in groups of 3
Time of start of last dive: max 5 days 12 hours @ 30 secs = 15840
(tx as raw 14 bits in units of 1
(recommended sell-by 5 days 11 hours,
actual: 5 days is OK)
Number of records: raw 2 bits in units of 1
(reason: 0 to 3 )
Reason for end: -- not transmitted --
Group number: -- not transmitted --
Max depth: -- not transmitted --
Dive duration: odlog 2/5 in units of 16 s
(range: 0 to 7608 s)
Mean speed: -- not transmitted --
Profile data (4 depths/times, 0 speeds):
   Depth profile: Lookup with 128 bins:
(range: 0 to 2150 m)
Profile times: raw 6 bits in units of 15.873 permille (range: 0 to 1000 permille)
Speed profile: -- not transmitted --
Profile data (4 depths/times, 0 speeds):
   Speed profile: -- not transmitted --
   Residual: -- not transmitted --
Calculation time: -- not transmitted --
Surface duration: odlog 2/4 in units of 2.5 s (range: 0 to 588.75 s)
   cf. cruise starts after 9 mins (540 secs)
Dive area: raw 6 bits in units of 15.873 permille (range: 0 to 1000 permille)
-----------[229 bits: 18 - 246]
Available bits used exactly
PAGE 1 (Argos, 247 bits):

PTT NUMBER OVERHEAD (28-bit code)
-----------------------[8 bits: 0 - 7]

PAGE NUMBER
-----------------------[3 bits: 8 - 10]

DIAGNOSTICS in format 1:

TX number: wraparound 11 bits in units of 32 (range: 0 to 65504 )
-----------------------[11 bits: 11 - 21]

CRUISE group in format 0:

Number of records: raw 1 bits in units of 1
(range: 0 to 1 )
Cruise number: wraparound 4 bits in units of 1
(range: 0 to 15 )
Start time: -- not transmitted --
End time: max 5 days 12 hours @ 2 mins = 3960
(tx as raw 12 bits in units of 1
(range: 0 to 4095 ) OK
(recommended sell-by 5 days 11 hours, actual: 5 days 4 hours is OK)
Duration: raw 9 bits in units of 120 s
(range: 0 to 61320 s)
cf. Max duration is 16 hours
Speed: -- not transmitted --
Reason for end: -- not transmitted --
-----------------------[26 bits: 22 - 47]

HAULOUT in format 0:

Number of records: raw 1 bits in units of 1
(range: 0 to 1 )
Haulout number: wraparound 3 bits in units of 1
(range: 0 to 7 )
Start time: -- not transmitted --
End time: max 5 days 12 hours @ 2 mins = 3960
(tx as raw 12 bits in units of 1
(range: 0 to 4095 ) OK
(recommended sell-by 5 days 11 hours, actual: 5 days 4 hours is OK)
Duration: raw 9 bits in units of 120 s
(range: 0 to 61320 s)
cf. Max duration is 16 hours
Reason for end: -- not transmitted --
Contiguous: -- not transmitted --
-----------------------[25 bits: 48 - 72]

SUMMARY group in format 0:

Transmitted in groups of 3
Record could be in buffer for 7 days 12 hours
End time: max 7 days 12 hours @ 6 hours = 30
(tx as raw 5 bits in units of 1
(range: 0 to 31 ) OK
(recommended sell-by 7 days 11 hours,
Cruising time: -- not transmitted --
Haulout time: raw 6 bits in units of 15.873 permille (range: 0 to 1000 permille)
Dive time: raw 6 bits in units of 15.873 permille (range: 0 to 1000 permille)
Deep Dive time: -- not transmitted --

Normal dives:

SD max dive depth: olog 2/4 in units of 5 m (range: 0 to 1177.5 m)
units of 16 s (range: 0 to 7608 s)
SD dive duration: odlog 1/4 in
units of 60 s (range: 0 to 2790 s)
Max dive duration: odlog 2/5 in
units of 16 s (range: 0 to 7608 s)
Avg surface duration: -- not transmitted
transmitted --
SD surface duration: -- not
transmitted --
Max surface duration: -- not
transmitted --
Avg speed in dive: -- not
transmitted --
Number of dives: odlog 1/4 in units of 2 (range: 0 to 93)
Deep dives:
transmitted --
Avg max dive depth: -- not
transmitted --
SD max dive depth: -- not
transmitted --
Max max dive depth: -- not
transmitted --
Avg dive duration: -- not
transmitted --
SD dive duration: -- not
transmitted --
Max dive duration: -- not
transmitted --
Avg surface duration: -- not
transmitted --
SD surface duration: -- not
transmitted --
Max surface duration: -- not
transmitted --
Avg speed in dive: -- not
transmitted --
Number of dives: -- not transmitted
--
Avg SST: -- not transmitted --
----------[174 bits: 73 - 246]

Available bits used exactly

End of page 1 ===

PAGE 2 (Argos, 247 bits):
PTT NUMBER OVERHEAD (28-bit code)
----------[8 bits: 0 - 7]

PAGE NUMBER
----------[3 bits: 8 - 10]

CTD PROFILE in format 0:

End time: max 7 days @ 10 mins= 1008
  tx as raw 10 bits in units of 1
  (range: 0 to 1023 ) OK
  (recommended sell-by 6 days 23 hours,
  actual: 6 days 18 hours is OK)
  CTD cast number: -- not transmitted --
  Note: these old-style dbar pressures are internally
Min pressure: -- not transmitted --
Max pressure: raw 10 bits in units of 2
dbar (range: 4 to 2050 dbar)

Min temperature: raw 15 bits in units of 0.001 (range: 2.5 to 35.267 = -2.5 to 30.267 °C in steps of 0.001 °C)
Max temperature: raw 15 bits in units of 0.001 (range: 2.5 to 35.267 = -2.5 to 30.267 °C in steps of 0.001 °C)

cf. Valid temperatures: -2.5 to 30.2 degC

Min salinity: raw 13 bits in units of 1 mPSU (range: 28900 to 37091 mPSU)
Max salinity: raw 13 bits in units of 1 mPSU (range: 28900 to 37091 mPSU)

cf. Valid salinity: 28.9 to 37.1

Number of samples: -- not transmitted --
8 profile points 0 to 7 (from total of 16 cut points):
  Temperature:
    Points 0 to 7 are at fixed pressure
    8 x Temperature: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)
    Temperature residual: -- not transmitted --

  Salinity:
    Points 0 to 7 are at fixed pressure
    8 x Salinity: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)
    Salinity residual: -- not transmitted --

  Temperature bounds: -- not transmitted --
  Conductivity bounds: -- not transmitted --
  Salinity bounds: -- not transmitted --
  Min fluoro: -- not transmitted --
  Max fluoro: -- not transmitted --
  Min DOxy: -- not transmitted --
  Max DOxy: -- not transmitted --
  Min Light: -- not transmitted --
  Max Light: -- not transmitted --

----------[236 bits: 11 - 246]

Available bits used exactly

*** End of page 2 ***
CTD PROFILE in format 1:

End time: max 7 days @ 10 mins = 1008 tx as raw 10 bits in units of 1 (range: 0 to 1023) OK
(recommended sell-by 6 days 23 hours, actual: 6 days 18 hours is OK)
CTD cast number: -- not transmitted --

Note: these old-style dbar pressures are internally converted to cbar
Min pressure: -- not transmitted --
Max pressure: -- not transmitted --
Min temperature: -- not transmitted --
Max temperature: -- not transmitted --
Min salinity: -- not transmitted --
Max salinity: -- not transmitted --
Number of samples: -- not transmitted --
8 profile points 8 to 15 (from total of 16 cut points):

Temperature:
Min pressure is sent separately
Max pressure is sent separately

6 broken stick pressure bins:
raw 10 bits in units of 1 bin (range: 0 to 1023 bin)
8 x Temperature: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)

Temperature residual: -- not transmitted --

Salinity:
Pressure already transmitted
8 x Salinity: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)

Salinity residual: -- not transmitted --

Temperature bounds: raw 2 bits in units of 1 lo/hi (range: 0 to 3 lo/hi)
Conductivity bounds: -- not transmitted --

Salinity bounds: raw 2 bits in units of 1 lo/hi (range: 0 to 3 lo/hi)

Min fluoro: -- not transmitted --
Max fluoro: -- not transmitted --
Min DOxy: -- not transmitted --
Max DOxy: -- not transmitted --
Min Light: -- not transmitted --
Max Light: -- not transmitted --

---------(234 bits: 13 - 246)

Available bits used exactly

--- End of page 3 ---

PAGE 4 (Argos, 247 bits):
PTT NUMBER OVERHEAD (28-bit code)
----------(8 bits: 0 - 7)
CTD PROFILE in format 2:

End time: max 3 days 6 hours @ 10 mins = 468 tx as raw 9 bits in units of 1
(rang: 0 to 511 ) OK
(recommended sell-by 3 days 5 hours,
actual: 3 days is OK)
CTD cast number: -- not transmitted --
Note: these old-style dbar pressures are internally converted to cbar
Min pressure: -- not transmitted --
Max pressure: raw 10 bits in units of 2
dbar (range: 4 to 2050 dbar)
Min temperature: raw 15 bits in units of 0.001 (range: 2.5 to 35.267 = -2.5 to 30.267 °C in steps of 0.001 °C)
Max temperature: raw 15 bits in units of 0.001 (range: 2.5 to 35.267 = -2.5 to 30.267 °C in steps of 0.001 °C)
cf. Valid temperatures: -2.5 to 30.2 degC
Min salinity: raw 13 bits in units of 1 mPSU (range: 28900 to 37091 mPSU)
Max salinity: raw 13 bits in units of 1 mPSU (range: 28900 to 37091 mPSU)
cf. Valid salinity: 28.9 to 37.1
Number of samples: -- not transmitted --
8 profile points 0 to 7 (from total of 16 cut points):

Temperature:
Points 0 to 7 are at fixed pressure
8 x Temperature: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)
Temperature residual: -- not transmitted --

Salinity:
Points 0 to 7 are at fixed pressure
8 x Salinity: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)
Salinity residual: -- not transmitted --

Temperature bounds: -- not transmitted --
Conductivity bounds: -- not transmitted --
Salinity bounds: -- not transmitted --
Min fluoro: -- not transmitted --
Max fluoro: -- not transmitted --
Min DOxy: -- not transmitted --
Max DOxy: -- not transmitted --
Min Light: -- not transmitted --
Max Light: -- not transmitted --
PAGE 5 (Argos, 247 bits):

PTT NUMBER OVERHEAD (28-bit code)
----------[8 bits: 0 - 7]

PAGE NUMBER
----------[3 bits: 8 - 10]

DIAGNOSTICS in format 2:

Number of resets: wraparound 2 bits in units of 1 (range: 0 to 3)
----------[2 bits: 11 - 12]

CTD PROFILE in format 3:

End time: max 3 days 6 hours 0 10 mins= 468 tx as raw 9 bits in units of 1 (range: 0 to 511 ) OK
(recommended sell-by 3 days 5 hours, actual: 3 days is OK)

CTD cast number: -- not transmitted --

Note: these old-style dbar pressures are internally converted to cbar

Min pressure: -- not transmitted --
Max pressure: -- not transmitted --
Min temperature: -- not transmitted --
Max temperature: -- not transmitted --
Min salinity: -- not transmitted --
Max salinity: -- not transmitted --

Number of samples: -- not transmitted --

8 profile points 8 to 15 (from total of 16 cut points):

Temperature:
Min pressure is sent separately
Max pressure is sent separately

6 broken stick pressure bins:
raw 10 bits in units of 1 bin (range: 0 to 1023 bin)
8 x Temperature: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)

Temperature residual: -- not transmitted --

Salinity:
Pressure already transmitted
8 x Salinity: raw 10 bits in units of 0.977517 permille (range: 0 to 1000 permille)

Salinity residual: -- not transmitted --

Temperature bounds: raw 2 bits in units of 1 lo/hi (range: 0 to 3 lo/hi)
Conductivity bounds: -- not transmitted --
Salinity bounds: raw 2 bits in units of 1 lo/hi (range: 0 to 3 lo/hi)
Min fluoro: -- not transmitted --
Max fluoro: -- not transmitted --
Min DOxy: -- not transmitted --
Max DOxy: -- not transmitted --
Min Light: -- not transmitted --
Max Light: -- not transmitted --

---------[233 bits: 13 - 245]

UNUSED
---------[1 bits: 246 - 246]

=== End of page 5 ===

PAGE 6 (special diagnostics page sent every 60 transmissions)

PTT NUMBER OVERHEAD (28-bit code)
---------[8 bits: 0 - 7]

PAGE NUMBER
---------[3 bits: 8 - 10]

TX number: wraparound 18 bits in units of 1
(range: 0 to 262143 )
Current state: raw 3 bits in units of 1
(range: 0 to 7 )
Tag time (mm:ss): raw 12 bits in units of 1
secs (range: 0 to 4095 secs)
ADC offset: raw 12 bits in units of 1 A/D
units (range: 0 to 4095 A/D units)
Tag hours: wraparound 16 bits in units of 1
hours (range: 0 to 65535 hours)
Aborted tx: wraparound 18 bits in units of
1 (range: 0 to 262143 )
Wet/dry status: raw 2 bits in units of 1
(range: 0 to 3 )
Wet/dry fail count: wraparound 8 bits in
units of 1 (range: 0 to 255 )
Body number: raw 16 bits in units of 1
(range: 0 to 65535 )
Max depth ever: raw 15 bits in units of 0.1
m (range: 0 to 3276.7 m)
Latest reset hour: raw 16 bits in units of
1 hours (range: 0 to 65535 hours)
Number of resets: wraparound 8 bits in
units of 1 (range: 0 to 255 )
Wettest (min wet/dry): raw 8 bits in units
of 1 (range: 0 to 255 )
Driest (max wet/dry): raw 8 bits in units
of 1 (range: 0 to 255 )
Number of depth spikes: wraparound 16 bits
in units of 1 (range: 0 to 65535 )
Number of CTD samples: wraparound 22 bits
in units of 1 (range: 0 to 4.1943e+06 )
---------[198 bits: 11 - 208]

UNUSED
---------[38 bits: 209 - 246]
### Deployment

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