Argo program IDG SOLOII Engineering Table
Manual/Decoder Version 1.3
Last updated Dec 18th, 2013   Adapted from SOLO2_Xformat_v1.3_31Jul12.doc
John Gilson
Applicable ROMS: 602 09Aug12,17Aug12

	ID=0xe0, Engineering message in first diagnostic dive at start of mission
Byte	**Contents**
0	ID/Mission phase = 0xe0
1-2	Number of bytes= 76 = 0x4C
3	Engineering message version
4	# packets in current cycle
5-6	empty
7-8	empty
9-10	empty
11-12	EP -> SatTime (seconds float connected to satellite)
13-14	DP->Vcpu: CPU battery voltage counts (0.01V), on surface at start of Xmit after data processed ARGO TECHNICAL NAME: VOLTAGE_BatteryCPUStartXmit_volts
15-16	DP->Vpmp: Pump battery counts at surface (0.01V) ARGO TECHNICAL NAME: VOLTAGE_BatterySurfaceNoLoad_volts
17-18	DP->Vple: Pump battery counts at end of last pump on ascent (0.01V) ARGO TECHNICAL NAME: VOLTAGE_BatteryPumpLastValueAsAscends_volts
19-20	Btvac: Built-in-Test vacuum at startup (0.01 inHg)
21-22	DP->Air[1]: Pressure case vacuum before filling bladder on surface (0.01 inHg) ARGO TECHNICAL NAME: PRESSURE_InternalVacuumAtStartSurface_inHg
23-24	DP->Air[2]: Pressure case vacuum after filing bladder on surface (0.01 inHg) ARGO TECHNICAL NAME: PRESSURE_InternalVacuumOilBladderFull_inHg
25-26	DP->ISRID: i.d. of last interrupt
27-28	DP->HPavgl: Average pump motor current taken at start of ascent (LSB=1ma) ARGO TECHNICAL NAME: CURRENT_BatteryAvgPumpOnStartAscent_mA
29-30	DP->HPmaxl: Maximum pump motor current taken at start of ascent (LSB=1ma) ARGO TECHNICAL NAME: CURRENT_BatteryMaxPumpOnStartAscent_mA
31-32	Total seconds pumping to get to the surface
33-34	seconds pumped at the surface
35-36	DP -> P[5]: Surface pressure counts at end of ascent (LSB = 0.04 dbar)
37-38	SPRX: Surface pressure before resetoffset (pertains to BIT) (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetBeforeReset_dbar or ...Reset_4mBarResolution_dbar
39-40	SPRXL: Surface pressure after resetoffset (pertains to BIT) (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetAfterReset_dbar or ...Reset_4mBarResolution_dbar
41-42	diagP[0]: Pressure when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199
43-44	diagT[0]: Temperature when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199

45-46	diagS[0]: Salinity when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199
47-48	Snnscan: # scans recorded by SBD (1 Hz): // -1 (0xFFFF) indicates unable to get scan count from SBE // -2 (0xFFFE) indicates SBE never started so SBE didn't reset scan count before returning an old value ARGO TECHNICAL NAME: TIME_ToAscend_seconds
49-50	Compacted Sbntry, Sbstrt, Sbstop status (see misspec.h) ((DP->SBntry&0xF) | ((DP->SBstrt&0x3)<<2) | DP->SBstop&0x3))
51-52	diagP[1]: Shallowest CTD Pressure reading upon ascent Argo MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin avearages the profile [bin mode=2], diagP1 will be corrupted.
53-54	diagT[1]: Shallowest CTD Temperature reading upon ascent Argo MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin avearages the profile [bin mode=2], diagT1 will be corrupted.
55-56	diagS[1]: Shallowest CTD Salinity reading upon ascent Argo MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin avearages the profile [bin mode=2], diagS1 will be corrupted.
57-58	Btvac: Built-in-Test vacuum at startup (0.01 inHg)
59-60	BTavgl: Built-in-Test motor current OUT at startup (LSB = 1ma)
61-62	BTPsec: Built-in-Test pump seconds
63-64	BTPvac: Built-in-Test pump vacuum
65-66	BTVple: Built-in-Test pump battery at startup (0.01V)
67-68	BTVcpu: Built-in-Test CPU battery at startup (0.01V)
69-70	Exception Flags (see 0xe2 message below)
71	Vent (air bubble) data: # 0.1 seconds vent motor ran
72	Vent (air bubble) data: LLD status before and after vent ran
73-74	AbrtCd = Code for what caused abort_miss
75	; terminator

	ID=0xE2, Engineering message in normal dive cycle
Byte	**Contents**
0	ID/Mission phase = 0xe2
1-2	Number of bytes= 98 = 0x62
3	Engineering Message Version...IDG ID for the decoding of this engineering message
4	#packets in current surface session
5-6	#tries to connect in previous surface session
7-8	parse_X_reply status in previous surface session
9-10	ATSBD return status in previous surface session
11-12	EP->sattime: seconds taken in previous surface session to send all SBD messages
13-14	DP->Vcpu: CPU battery voltage counts (0.01V), on surface at start of Xmit after data processed ARGO TECHNICAL NAME: VOLTAGE_BatteryCPUStartXmit_volts
15-16	DP->Vpmp: Pump battery counts at surface (0.01V) ARGO TECHNICAL NAME: VOLTAGE_BatterySurfaceNoLoad_volts
17-18	DP->Vple: Pump battery counts at end of last pump on ascent (0.01V) ARGO TECHNICAL NAME: VOLTAGE_BatteryPumpLastValueAsAscends_volts
19-20	DP->Air[0]: Pressure case vacuum during sinking at 50db (0.01 inHg) ARGO TECHNICAL NAME: PRESSURE_InternalVacuumDuringDescent50dbar_inHg
21-22	DP->Air[1]: Pressure case vacuum before filling bladder on surface (0.01 inHg) ARGO TECHNICAL NAME: PRESSURE_InternalVacuumAtStartSurface_inHg
23-24	DP->Air[2]: Pressure case vacuum after filing bladder on surface (0.01 inHg) ARGO TECHNICAL NAME: PRESSURE_InternalVacuumOilBladderFull_inHg
25-26	DP->ISRID: i.d. of last interupt
27-28	DP->HPavgl: Average pump motor current taken at start of ascent (LSB=1ma) ARGO TECHNICAL NAME: CURRENT_BatteryAvgPumpOnStartAscent_mA
29-30	DP->HPmaxl: Maximum pump motor current taken at start of ascent (LSB=1ma) ARGO TECHNICAL NAME: CURRENT_BatteryMaxPumpOnStartAscent_mA
31-32	Total seconds pumping to get to the surface
33-34	seconds pumped at the surface
35-36	SPRX: Surface pressure before resetoffset (pertains to previous dive) (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetBeforeReset_dbar or ...Reset_4mBarResolution_dbar
37-38	SPRXL: Surface pressure after resetoffset (pertains to previous dive (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetAfterReset_dbar or ...Reset_4mBarResolution_dbar
39-40	diagP[0]: Pressure at the start of ascent ARGO MEASUREMENT_CODE=499
41-42	diagT[0]: Temperature at diagP[0] ARGO MEASUREMENT_CODE=499
43-44	diagS[0]: Salinity at diagP[0] ARGO MEASUREMENT_CODE=499
45-46	diagP[1]: Shallowest CTD Pressure reading upon ascent ARGO MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin averages the profile [bin mode=2], diagP1 will be corrupted.
47-48	diagT[1]: Shallowest CTD Temperature reading upon ascent

	ARGO MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin avearages the profile [bin mode=2], diagT1 will be corrupted.
49-50	diagS[1]: Shallowest CTD Salinity reading upon ascent ARGO MEASUREMENT_CODE=599 Note: In ROM 09Aug12, if the HC12 board (i.e. the float) bin avearages the profile [bin mode=2], diagS1 will be corrupted.
51-52	Sbnbad: # scans that had bad data and were not sent from float

53-54	Snnscan: # scans recorded by CTD (1 Hz):
	  // -1 (0xFFFF) indicates unable to get scan count from SBE
	  // -2 (0xFFFE) indicates SBE never started so SBE didn't reset scan count before returning an old value
	ARGO TECHNICAL NAME: TIME_ToAscend_seconds

55-56	Compacted Sbntry, Sbstrt, Sbstop status (see misspec.h) ((DP->SBntry&0xF) | ((DP->SBstrt&0x3)<<2) | DP->SBstop&0x3))
57-58	DP->P[0]: Pressure counts before begin of descent to park (LSB = 0.04 dbar)
59-60	DP->P[1]: Pressure counts at end of descent to park (LSB = 0.04 dbar)
61-62	DP->P[2]: Pressure counts at beginning of drift (park) (LSB = 0.04 dbar)
63-64	DP->P[3]: Pressure counts at end of drift (park) (LSB = 0.04 dbar)
65-66	DP->P[5]: Surface pressure counts at end of ascent (LSB = 0.04 dbar)
67-68	DP->PAVG[0]: Average pressure over first half of drift ARGO MEASUREMENT_CODE=296
69-70	DP->TAVG[0]: Average temperature over first half of drift ARGO MEASUREMENT_CODE=296
71-72	DP->SAVG[0]: Average salinity over first half of drift ARGO MEASUREMENT_CODE=296
73-74	DP->PAVG[1]: Average pressure over second half of drift ARGO MEASUREMENT_CODE=296
75-76	DP->TAVG[1]: Average temperature over second half of drift ARGO MEASUREMENT_CODE=296
77-78	DP->SAVG[1]: Average salinity over second half of drift ARGO MEASUREMENT_CODE=296
79-80	DP-> fall_time = seconds from open air valve (surface) to end of sink ~ 50dbar
81-82	DP-> fall_rate = avg mm/sec while sinking during fall_time to ~50dbar
83-84	DP->SeekT= tenths of pumping in first seek of drift ARGO TECHNICAL NAME: TIME_PistonRanDuringFirstSeek_seconds
85-86	DP->SeekP = change of depth (signed 0.1dbar) in first seek ARGO TECHNICAL NAME: PRESSURE_ChangeInFirstSeek_dbar
87-88	Exception flags (can be added to) 0x0001 Valve failed to open 0x0002 Valve failed to close 0x0004 Questionable pressure 0x0008 Antenna was toggled 0x0010 Antenna switch failure (no satellites even after toggling) 0x0020 GPS communication error (can talk to GPS unit) 0x0080 Float took too long to leave the surface (toggled valve) 0x1000 Valve failure during sinking phase 0x2000 Valve failure during ascend phase of mission
89	Vent (air bubble) data: # 0.1 seconds vent motor ran

Byte	Contents
90	Vent (air bubble) data: LLD status before and after vent ran
91-92	SBE P offset (times 800): Cumulative auto-pressure offset correction ARGO TECHNICAL NAME: PRES_SensorAutoAdjustment_dbar
93-94	PP->SeekSc: # of seconds pumped to target (park) depth
95-96	Number of Packets sent previous cycle
97	; terminator

ID=0xe3, Engineering message following mission abort	
Byte	**Contents**
0	ID/Mission phase = 0xe3
1-2	Number of bytes= 30 = 0x1e
3	Engineering message version
4	#packets in previous surface session
5-6	#tries to connect in previous surface session
7-8	parse_X_reply status in previous surface session
9-10	ATSBD return status in last surface session
11-12	seconds taken in sending last SBD message
13-14	current CPU battery voltage Counts (0.01V)
15-16	current pump battery counts (0.01V)
17-18	DP->Air[1]: pressure case vacuum at beginning of abort (0.01inHg)
19-20	DP->Air[0]: pressure case vacuum at end of last xmit (previous cycle) (0.01inHg)
23-24	DP->ISRID: i.d. of last interrupt

25-26	AbrtCd = code for what caused abort mission
	   0 = no error
	   1 = current time is later than RTCabort
	   2 = unable to WakeOST
	   3 = unable to Send dive number to SOLOII (LodiveNo)
	   4 = Iridium ground station commanded to go to abort
	   5 = Final dive was completed. Mission is done.
	   6 = Diagnostic dive ailed to get GPS fix, pressure never > dbarGo, or unable to send message to Iridium
	   7 = pressure sensor failure

29	; terminator

ID=0xe5, Engineering message following BITest	
Byte	**Contents**
0	ID/Mission phase = 0xe5
1-2	Number of bytes= 58 = 0x3a
3	Engineering message version = 2
4	#packets in current surface session
5-6	SBE P offset(*800)
7-8	CPU battery voltage (0.01V)

9-10	no load pump battery voltage (0.01V)
11-12	Pump battery voltage at end of last pump (0.01V)
13-14	DP->HPavgl = average pump current at bottom, LSB=1mA
15-16	seconds pumped out during test
17	Oil Vacuum before filling bladder 0.01inHg
18	Oil Vacuum after filling bladder 0.01inHg
19-20	DP → Air[0] = Pcase Vacuum at beginning of BIT (Oil bladder Empty) 0.01 inHg
21-22	DP → Air[1] = Pcase Vacuum at end of BIT with air bladder inflated 0.01 inHg
23	Number of tries needed to open valve
24	Number of tries needed to close valve
25-26	i.d. of last interrupt
27-56	string returned from SBE pt command
57	; terminator

	ID=0xf0 Argo cycle configuration (mission)
Byte	**Contents**
3	Data Version: Matches Decoder/Manual to use
4-5 (i)	Target profile depth Argo CONFIG name: CONFIG_ProfilePressure_dbar
6-7	Target parking depth Argo CONFIG name: CONFIG_ParkPressure_dbar
8-9 (a)	Maximum rise time Argo CONFIG name: CONFIG_AscentToSurfaceTimeOut_hours
10-11 (b)	Target (maximum) fall to parking depth time Argo CONFIG name: CONFIG_DescentToParkTimeOut_hours
12-13 (c)	Maximum fall-from-parking-to-profile depth time Argo CONFIG name: CONFIG_DescentToMaxPresTimeOut_hours
14-15 (d)	Target drift time Argo CONFIG name: CONFIG_ParkTime_hours
16	Float Type == 0 for SOLOII
17 (e)	Target ascent rate while profiling Argo CONFIG name: CONFIG_TargetAscentSpeed_cm/s
18-19 (f)	Number of Seeks Argo CONFIG name: CONFIG_SeeksToParkPeriods_COUNT
20-21 (g)	Surface Time Argo CONFIG name: CONFIG_SurfaceTimeOut_hours
22-23 (h)	Seek Period Argo CONFIG name: CONFIG_SeeksToParkPeriodsIntervals_seconds
CONFIG_CycleTime_hours can be computed as (after converting to same units): $min((a), (i)/(e))+(b)+(c)+(d)+(f)*(h)+(g)$. This will be greater than the actual cycle time.	

	Argo program MEASUREMENT_CODEs (MC)		
Code (timing)	**SOLO II Variable**	**Description**	**Units**
100 (DST)	Cy>0: Fall ID=0x40	First T,P pair [taken as valve opened to leave surface]	Time,P(0.04db)
199	Cy=0: Eng ID=0xe0	P,T,S triplet taken when float realizes it is under the surface and pumps to return to the surface (Eng ID=0xe0 bytes 41-46)	P(0.04db),T(0.001 ^{o}C), S(0.001psu)
189/190	Cy>0: Fall ID=0x40	All T,P Fall pairs pre-DET not assigned to other MC (189 indicates buoyancy adjustment)	Time,P(0.04db)
200 (DET)	Cy>0: Fall ID=0x40	Choice of T,P pair that is first within 3% of pressure at beginning of drift (see Eng ID=0xe2 bytes 67-68)	Time,P(0.04db)
489	Cy=1: Fall ID=0x40 or any cycle without park phase	If n is the number of stabilizations (see Argo ID=0xf0), the T,P n+1 from end of Fall record is a stabilization. Each later T,P pair excluding the last will be an additional stabilization.	Time,P(0.04db)
239	Cy>1: Fall ID=0x40		
250 (PST)	Cy>0: Fall ID=0x40	Last T,P Fall pair when Park Phase follows	Time,P(0.04db)
296	Cy>0: Eng ID=0xe2	Drift broken into two averaged halves. Stored in Eng ID=0xe2 bytes 67-78; Time estimated from the last Fall ID=0x40 T,P pair [note: not DET] and first Rise ID=0x50 T,P pair	P(0.04db),T(0.001 ^{o}C), S(0.001psu)
if profile pressure > drift pressure (typical) NOTE: DPST is never defined in SOLO/SOLOII			
300 (PET)	Cy>0: Rise ID=0x50	First T,P Rise pair [taken as valve opened]	Time,P(0.04db)
390	Cy>0: Rise ID=0x50	All pre-AST T,P Rise pairs	Time,P(0.04db)
400 (DDET)	Cy>0: Rise ID=0x50	DDET is determined by a) 2nd derivative of Rise pair series or b) within 3% of profile depth (see Eng ID=0xe2 bytes 39-40).	Time,P(0.04db)
490	Cy>0: Rise ID=0x50	All post-DDET/pre-AST T,P Rise pairs	Time,P(0.04db)
500 (AST)	Cy>0: Rise ID=0x50; Eng ID=0xe2	AST is determined by 2nd derivative of Rise pair series. P,T,S triplet taken at start of ascent (Eng ID=0xe2 bytes 39-44) Note: triplet is corrupted in ROM 09Aug12	Time,P(0.04db); P(0.04db),T(0.001 ^{o}C), S(0.001psu)
else (Cy=0 or float rises from drift depth)			
500 (AST)	Cy=0: Rise ID=0x50;	First T,P Rise pair [taken as valve opened]	Time,P(0.04db);
	Cy>0: Rise ID=0x50; Eng ID=0xe2	AST is determined by 2nd derivative of Rise pair series. P,T,S triplet taken at start of ascent	Time,P(0.04db); P(0.04db),T(0.001

		(Eng ID=0xe2 bytes 39-44)	$^\circ$C), S(0.001psu)
endif			
589/590	Cy>-1: Rise ID=0x50	All T,P Rise pairs post AST excluding last; 589 indicates buoyancy adjustment.	Time,P(0.04db)
599	Cy=0: Eng ID=0xe0	last P,T,S triplet taken before turning off CTD (Eng ID=0xe0 bytes 51-56)	P(0.04db),T(0.001 $^\circ$C), S(0.001psu)
	Cy>0: Eng ID=0xe2	last P,T,S triplet taken before turning off CTD (Eng ID=0xe2 bytes 45-50)	P(0.04db),T(0.001 $^\circ$C), S(0.001psu)
600 (AET)	Cy>-1: Rise ID=0x50	Last T,P Rise pair	Time,P(0.04db)
703	Cy=0: GPS ID=0x00	GPS Fix	Time, Position
	Cy>0: GPS ID=0x02	GPS Fix	Time, Position
700 (TST) 702 (FMT)	Time in SBD email	Time of first SBD message	Time
704 (LMT) 800 (TET)	Time in SBD email	Time of last SBD message	Time
703	Cy>0: GPS ID=0x01	GPS Fix	Time, Position