

Argo program IDG SOLOII Engineering Table**Manual/Decoder Version 2.0****Last updated Dec 1st, 2014 Adapted from SOLO2_Xformat_v2.0_20Mar2014.doc****John Gilson****Applicable ROMS: 602 23Apr14, 28Apr14, 21Jul14, 22Jul14, 22Sep14, 09Oct14, 13Nov14;**

Byte	Contents
	ID=0xe0, Engineering message in first diagnostic dive at start of mission
0	ID/Mission phase = 0xe0
1-2	Number of bytes= 80 = 0x50
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->HPavgI: Average pump motor current taken at start of ascent (LSB=1mA) ARGO TECHNICAL NAME: CURRENT_BatteryAvgPumpOnStartAscent_mA
29-30	DP->HPmaxI: 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 BIT) (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetBeforeReset_dbar or ...Reset_4mBarResolution_dbar
37-38	SPRXL: Surface pressure after resetoffset (pertains to BIT) (dbar) ARGO TECHNICAL NAME: PRES_SurfaceOffsetAfterReset_dbar or ...Reset_4mBarResolution_dbar
39-41	diagP[0]: Pressure when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199
42-44	diagT[0]: Temperature when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199
45-47	diagS[0]: Salinity when "in water" sensed by float after deployment Argo MEASUREMENT_CODE=199

ID=0xE2, Engineering message in normal dive cycle	
Byte	Contents
0	ID/Mission phase = 0xe2
1-2	Number of bytes= 102 = 0x66
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 (low order byte: number of messages; upper byte bit field of errors)
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 interrupt
27-28	DP->HPavgI: Average pump motor current taken at start of ascent (LSB=1ma) ARGO TECHNICAL NAME: CURRENT_BatteryAvgPumpOnStartAscent_mA
29-30	DP->HPmaxI: 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
39-41	diagP[0]: Pressure at the start of ascent ARGO MEASUREMENT_CODE=399 or 499
42-44	diagT[0]: Temperature at diagP[0] ARGO MEASUREMENT_CODE=399 or 499
45-47	diagS[0]: Salinity at diagP[0] ARGO MEASUREMENT_CODE=399 or 499
48-50	diagP[1]: Shallowest CTD Pressure reading upon ascent ARGO MEASUREMENT_CODE=599
51-53	diagT[1]: Shallowest CTD Temperature reading upon ascent ARGO MEASUREMENT_CODE=599

54-56	diagS[1]: Shallowest CTD Salinity reading upon ascent ARGO MEASUREMENT_CODE=599
57-58	Sbnbad: # scans that had bad data and were not sent from float
59-60	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
61-62	Compacted Sbntry, Sbstrt, Sbstop status (see misspec.h) ((DP->SBntry&0xF) ((DP->SBstrt&0x3)<<2) DP->SBstop&0x3))
63-65	DP->PAVG[0]: Average pressure over first half of drift ARGO MEASUREMENT_CODE=296
66-68	DP->TAVG[0]: Average temperature over first half of drift ARGO MEASUREMENT_CODE=296
69-71	DP->SAVG[0]: Average salinity over first half of drift ARGO MEASUREMENT_CODE=296
72-74	DP->PAVG[1]: Average pressure over second half of drift ARGO MEASUREMENT_CODE=296
75-77	DP->TAVG[1]: Average temperature over second half of drift ARGO MEASUREMENT_CODE=296
78-80	DP->SAVG[1]: Average salinity over second half of drift ARGO MEASUREMENT_CODE=296
81-82	DP-> fall_time = seconds from open air valve (surface) to end of sink ~ 50dbar
83-84	DP-> fall_rate = avg mm/sec while sinking during fall_time to ~50dbar
85-86	DP->SeekT= tenths of pumping in first seek of drift ARGO TECHNICAL NAME: TIME_PistonRanDuringFirstSeek_seconds
87-88	DP->SeekP = change of depth (signed 0.1dbar) in first seek ARGO TECHNICAL NAME: PRES_ChangeInFirstSeek_dbar
89-90	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
91	Vent (air bubble) data: # 0.1 seconds vent motor ran
92	Vent (air bubble) data: LLD status before and after vent ran
93-94	SBE P offset (times 800): Cumulative auto-pressure offset correction ARGO TECHNICAL NAME: PRES_SensorAutoAdjustment_dbar
95-96	PP->SeekSc: # of seconds pumped to target (park) depth
97-98	Number of Packets sent previous cycle
99	Ice-detect status [off=0, no ice=1, ice mixedlayer=2, ice breakup=3]
100	Compacted binning mode (upper nibble), subcycle number (lower nibble) BM=2 controller binning, all other values CTD binning
101	; 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	AbtCd = 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
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->HPavgI = 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=0xe6, Engineering message following BITest when test fails
Byte	Contents
0	ID/Mission phase = 0xe6
1-2	Number of bytes= 60 = 0x3c
3	Engineering message version
4	#packets in current surface session
5-6	BITest status register
7-8	SBE P offset(*800)
9-10	CPU battery voltage (0.01V)
11-12	no load pump battery voltage (0.01V)
13-14	Pump battery voltage at end of last pump (0.01V)
15-16	DP->HPavgl = average pump current at bottom, LSB=1mA
17-18	seconds pumped out during test
19	Oil Vacuum before filling bladder 0.01inHg
20	Oil Vacuum after filling bladder 0.01inHg
21-22	DP → Air[0] = Pcase Vacuum at beginning of BIT (Oil bladder Empty) 0.01 inHg
23-24	DP → Air[1] = Pcase Vacuum at end of BIT with air bladder inflated 0.01 inHg
25	Number of tries needed to open valve
26	Number of tries needed to close valve
27-28	i.d. of last interrupt
29-58	string returned from SBE pt command
59	; 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_DescentToProfTimeOut_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
24-25	Pressure scaling gain; Modifiable
26-27	Pressure scaling offset; Modifiable
28-29	Temperature scaling gain; Modifiable
30-31	Temperature scaling offset; Modifiable
32-33	Salinity scaling gain; Modifiable
34-35	Salinity scaling offset; Modifiable
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)			
This is an example of a 'typical' float mission. Each cycle may or may not have all MC due to programmed mission. Data attached to each MC may have to be computed differently if float behavior dictates.			
Code (timing)	SOLO II Variable	Description	Units
100 (DST)	Cy>0: Fall ID=0x40 (variable code=1)	Typically first T,P pair, although not always [taken as valve opened to leave surface]	Time,P(dbar)
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 39-47)	P(dbar),T(degC), S(psu)
150 (FST)	Cy>0: Fall ID=0x40 (variable code=2)	T,P Fall pair ~100dbar with variable code =2	Time,P(dbar)
139/140	Cy>0: Fall ID=0x40 (e.g. var code=10)	All T,P Fall pairs pre-FST not assigned to other MC	Time,P(dbar)
189/190	Cy>0: Fall ID=0x40 (e.g. var code=10)	All T,P Fall pairs pre-DET not assigned to other MC (189 indicates buoyancy adjustment)	Time,P(dbar)
200 (DET)	Cy=0: Rise ID=0x50 Cy>0: Fall ID=0x40	Typically first rise T,P pair Choice of T,P pair that is first within 3% of pressure during drift (e.g. Eng ID=0xe2 bytes 63-65)	Time,P(dbar)
489	Cy=1: Fall ID=0x40 or any cycle without park phase	Typically 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. Note that if there are stabilizations during drift then the above must be modified	Time,P(dbar)
239	Cy>1 with park phase: Fall ID=0x40		
250 (PST)	Cy>0 with park phase: Fall ID=0x40	Typically, last T,P Fall pair when Park Phase follows. Note that if there are stabilizations during drift then the above must be modified	Time,P(dbar)
296	Cy>0 with park phase: Eng ID=0xe2	Drift broken into two averaged halves. Stored in Eng ID=0xe2 bytes 63-80; Time can be estimated from the last Fall ID=0x40 T,P pair [note: not DET] and first Rise ID=0x50 T,P pair	P(dbar),T(degC), S(psu)
290	Cy>0 with park phase Drift ID	P,T,S data recorded during park; packed in profile format. Time must be estimated.	P(dbar),T(degC), S(psu)
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(dbar)
390	Cy>0: Rise ID=0x50	All pre-AST T,P Rise pairs	Time,P(dbar)

400 (DDET)	Cy>0: Rise ID=0x50	DDET is determined by a) 2 nd derivative of Rise pair series or b) within 3% of profile depth (see Eng ID=0xe2 bytes 39-41).	Time,P(dbar)
490	Cy>0: Rise ID=0x50	All post-DDET/pre-AST T,P Rise pairs	Time,P(dbar)
500 (AST)	Cy>0: Rise ID=0x50; Eng ID=0xe2	AST is determined by 2 nd derivative of Rise pair series. P,T,S triplet taken at start of ascent (Eng ID=0xe2 bytes 39-41) NOTE: Due to batteries float might continue to sink after 'ascent mode' is begun. If so MC500 will not be taken at the same time as the P,T,S triplet.	Time,P(dbar); P(dbar),T(degC), S(psu)
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(dbar);
	Cy>0: Rise ID=0x50; Eng ID=0xe2	AST is determined by 2 nd derivative of Rise pair series. P,T,S triplet taken at start of ascent (Eng ID=0xe2 bytes 39-41)	Time,P(dbar); P(dbar),T(degC), S(psu)
endif			
589/590	Cy>-1: Rise ID=0x50	All T,P Rise pairs post AST excluding last; 589 indicates buoyancy adjustment.	Time,P(dbar)
599	Cy=0: Eng ID=0xe0	last P,T,S triplet taken before turning off CTD (Eng ID=0xe0 bytes 48-56)	P(dbar),T(degC), S(psu)
	Cy>0: Eng ID=0xe2	last P,T,S triplet taken before turning off CTD (Eng ID=0xe2 bytes 48-56)	P(dbar),T(degC), S(psu)
600 (AET)	Cy>-1: Rise ID=0x50	Choice of T,P Rise pair after reaching surface	Time,P(dbar)
689/690	Cy>=0: Rise ID=0x50	T,P Rise pairs after MC600	Time,P(dbar)
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