Iridium transmission formats for buoys

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The present document describes a list of dataformats which should be used to report buoy observations through Iridium. These dataformats are the results of experiences got within the Iridium Pilot Project.

1. Common characteristics

Each dataformat starts with a 8-bit identifier which characterizes the type of the buoy : SVP-B drifter with or without GPS, SVP-BS drifter (salinity), SVP-BTC drifter (fitted with a thermistor chain), basic Ice buoy… A new dataformat should be drawn soon for the SVP-BW drifter (Wind).

The format identifier is followed by the observation timestamp (year, month, day, hour, minute), then basic measurements carried out by SVP-B drifters (air pressure, SST, barometer tendency, submergence – or strain gauge – count, battery voltage).

Then, two technical parameters of the Iridium transmission are reported. Although the first should be the Iridium transmission duration in seconds, the second parameter is left in manufacturer's hands (see § 3).

Excepted for the SVP-B drifters which are not fitted with a GPS[1], the next block of all other dataformats contains the GPS position, its age (time delay) in minutes, as well as a couple of technical parameters which are left in manufacturer's hands (see § 3).

Important:

It is recommended to fill up the rooms of missing parameters with <u>all bits to "1"</u> excepted for the GPS position. In case a GPS fix is not available at the observation time, the previous position is reported with its time delay in minutes (reference is the time of observation for the other parameters). In case the most recent position is older than 4094 minutes, 4095 is reported in the message (i.e. all bits fitted to "1").

In order to save energy on drifting buoys, GPS fixes may be get less frequently than other parameters (e.g. every thre hours instead of hourly). The GPS fix time delay is then different from zero. On ships, GPS fixes must be get at the same time than observed parameters.

2. List of dataformats

Ident.	Platform type
000	SVP-B with GPS
001	SVP-B without GPS
002-019	Reserved for buoys
020	SVP-BS (salinity drifter)
021-029	Reserved for buoys
030	SVP-BTC (thermistor chain)
031-039	Reserved for buoys
040	Basic Ice Buoy
041-049	Reserved for buoys
050	SVP-BW (WOTAN buoy – *to be designed*)
051-099	Reserved bor buoys
100-199	Reserved (see Iridium dataformats for ships)
200-255	Reserved

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[1] The Iridium position is used instead.

Format #000 - SVP-B with GPS
(20 bytes)

Parameter	Bits	Pos	Offset	Max	Formula
Format identifier	8	0	0	254	Forced to 0 in present version
Year	7	8	2000	2126	Year = n + 2000
Month	4	15	0	12	Month = n
Day	6	19	0	31	Day = n
Hour	5	25	0	23	Hour = n
Minute	6	30	0	59	Minute = n
Air pressure	11	36	850.0	1054.6	AP (hPa) = n*0.1 + 850
SST	12	47	-5.00	35.94	SST (°C) = n*0.01 - 5
Pressure tendancy	9	59	-25.5	25.5	dP (hPa) = n*0.1 - 25.5
Submergence count	6	68	0	100	Subm. (%) = n * 1.6129
Battery voltage	6	74	5	17.4	Vbat (V) = n*0.2 + 5
Iridium transmission duration	8	80	0	254	SBDT (s) = n
2nd Iridium Tech. parameter	8	88	0	254	*See § 3*
GPS fix time delay	12	96	0	4094	Delay (min) = n
GPS Latitude	20	108	-90	90	Lat (deg) = n*0.0002 - 90
GPS Longitude	21	128	-180	180	Lon (deg) = n*0.0002 - 180
1st GPS Technical parameter	7	149	0	126	*See § 3*
2nd GPS Technical parameter	4	156	0	14	See § 3

Format #001 - SVP-B without GPS
(12 bytes)

Parameter	Bits	Pos	Offset	Max	Formula
Format identifier	8	0	0	254	Forced to 1 in present version
Year	7	8	2000	2126	Year = n + 2000
Month	4	15	0	12	Month = n
Day	6	19	0	31	Day = n
Hour	5	25	0	23	Hour = n
Minute	6	30	0	59	Minute = n
Air pressure	11	36	850.0	1054.6	AP (hPa) = n*0.1 + 850
SST	12	47	-5.00	35.94	SST (°C) = n*0.01 - 5
Pressure tendancy	9	59	-25.5	25.5	dP (hPa) = n*0.1 - 25.5
Submergence count	6	68	0	100	Subm. (%) = n * 1.6129
Battery voltage	6	74	5	17.4	Vbat (V) = n*0.2 + 5
Iridium transmission duration	8	80	0	254	SBDT (s) = n
2nd Iridium Tech. parameter	8	88	0	254	*See § 3*

Format #020 - SVP-BS (salinity)
(24 bytes)

Parameter	Bits	Pos	Offset	Max	Formula
Format identifier	8	0	0	254	Forced to 20 in present version
Year	7	8	2000	2126	Year = n + 2000
Month	4	15	0	12	Month = n
Day	6	19	0	31	Day = n
Hour	5	25	0	23	Hour = n
Minute	6	30	0	59	Minute = n
Air pressure	11	36	850.0	1054.6	AP (hPa) = n*0.1 + 850
SST	12	47	-5.00	35.94	SST (°C) = n*0.01 - 5
Pressure tendancy	9	59	-25.5	25.5	dP (hPa) = n*0.1 - 25.5
CT temperature[2]	12	68	-5.00	35.94	CT_temp (°C) = n*0.01 - 5
Salinity	12	80	15.00	55.94	SST (psu) = n*0.01 + 15
CT sensor error	1	92	0	1	Err = n
Submergence count	6	93	0	100	Subm. (%) = n*1.6129
Battery voltage	6	99	5	17.4	Vbat (V) = n*0.2 + 5
Iridium transmission duration	8	105	0	254	SBDT (s) = n
2nd Iridium Tech. parameter	8	113	0	254	*See § 3*
GPS fix time delay	12	121	0	4094	Delay (min) = n
GPS Latitude	20	133	-90	90	Lat (deg) = n*0.0002 - 90
GPS Longitude	21	153	-180	180	Lon (deg) = n*0.0002 - 180
1st GPS Technical parameter	7	174	0	126	*See § 3*
2nd GPS Technical parameter	4	181	0	14	See § 3
Spare (unused)	7	185			All bits forced to « 1 »

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[2] Sea temperature measured by the conductivity sensor

Format #030 - SVP-BTC (thermistor chain)

Parameter	Bits	Pos	Offset	Max	Formula
Format identifier	8	0	0	254	Forced to 30 in present version
Year	7	8	2000	2126	Year = n + 2000
Month	4	15	0	12	Month = n
Day	6	19	0	31	Day = n
Hour	5	25	0	23	Hour = n
Minute	6	30	0	59	Minute = n
Air pressure	11	36	850.0	1054.6	AP (hPa) = n*0.1 + 850
SST	12	47	-5.00	35.94	SST (℃) = n*0.01 - 5
Pressure tendancy	9	59	-25.5	25.5	dP (hPa) = n*0.1 – 25.5
Submergence count	6	68	0	100	Subm. (%) = n*1.6129
Battery voltage	6	74	5	17.4	Vbat (V) = n*0.2 + 5
Iridium transmission duration	8	80	0	254	SBDT (s) = n
2nd Iridium Tech. parameter	8	88	0	254	*See § 3*
GPS fix time delay	12	96	0	4094	Delay (min) = n
GPS Latitude	20	108	-90	90	Lat (deg) = n*0.0002 - 90
GPS Longitude	21	128	-180	180	Lon (deg) = n*0.0002 - 180
1st GPS Technical parameter	7	149	0	126	*See § 3*
2nd GPS Technical parameter	4	156	0	14	See § 3
Number of temp. probes	5	160	0	30	NbT = n
Number of press. probes	3	165	0	6	NbP = n
Depth of temp. probe T1	8	168	0	254	DT1 (m) = n
Temp. of probe T1	12	176	-5	35.94	T1 (℃) = n*0.01 - 5
Depth of temp. probe T2	8	188	0	254	DT2 (m) = n
Temp. of probe T2…	12	196	-5	35.94	T2 (℃) = n*0.01 - 5
Position[3] of press. probe P1	8		0	254	PP1 (m) = n
Pressure of probe P1…	8		0	254	P1 (m[4]) = n

The length of the message is equal to:

(21 bytes + NbT * 2.5 bytes + NbP * 2 bytes)

… where NbT is the number of temperature probes and NbP is the number of pressure probes. For instance, the length of the message for a buoy having 16 temperature probes and one pressure sensor – at the bottom of the string – will be 63 bytes.

The real depth of each temperature probe is normally provided by the buoy. However, it may be re-computed thanks to the pressure probes.

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[3] Distance from the pressure probe to the buoy.
[4] Equivalent to 10^4 Pa.

Format #040 - Basic Ice Buoy
(21 bytes)

Parameter	Bits	Pos	Offset	Max	Formula
Format identifier	8	0	0	254	Forced to 40 in present version
Year	7	8	2000	2126	Year = n + 2000
Month	4	15	0	12	Month = n
Day	6	19	0	31	Day = n
Hour	5	25	0	23	Hour = n
Minute	6	30	0	59	Minute = n
Air pressure	11	36	850.0	1054.6	AP (hPa) = n*0.1 + 850
Hull temperature	10	47	-60.0	42.2	HT (°C) = n*0.1 - 60
Pressure tendency	9	57	-25.5	25.5	dP (hPa) = n*0.1 - 25.5
Air Temperature	10	66	-60.0	42.2	AT (°C) = n*0.1 - 60
Battery voltage	6	76	5	17.4	Vbat (V) = n*0.2 + 5
Iridium transmission duration	8	82	0	254	SBDT (s) = n
2nd Iridium Tech. parameter	8	90	0	254	*See § 3*
GPS fix time delay	12	98	0	4094	Delay (min) = n
GPS Latitude	20	110	-90	90	Lat (deg) = n*0.0002 - 90
GPS Longitude	21	130	-180	180	Lon (deg) = n*0.0002 - 180
1st GPS Technical parameter	7	151	0	126	*See § 3*
2nd GPS Technical parameter	4	158	0	14	See § 3
Spare (unused)	6	162			All bits forced to « 1 »

3. Iridium and GPS technical parameters

Manufacturer	2nd Iridium parameter	1st GPS parameter	2nd GPS parameter
Marlin	Iridium transm. retry	Time to first GPS fix[5]	Nb of GPS satellites
Metocean	Unused	Time to first GPS fix[5]	GPS S/N ratio[6]
Pacific Gyre	Unused ?	Time to first GPS fix[5] ?	2D or 3D GPS fix

Examples of manufacturer's choices for Iridium and GPS technological parameters

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[5] $\quad$ TTFF(s) = n * 2
[6] $\quad$ GPS S/N (dB) = n * 4