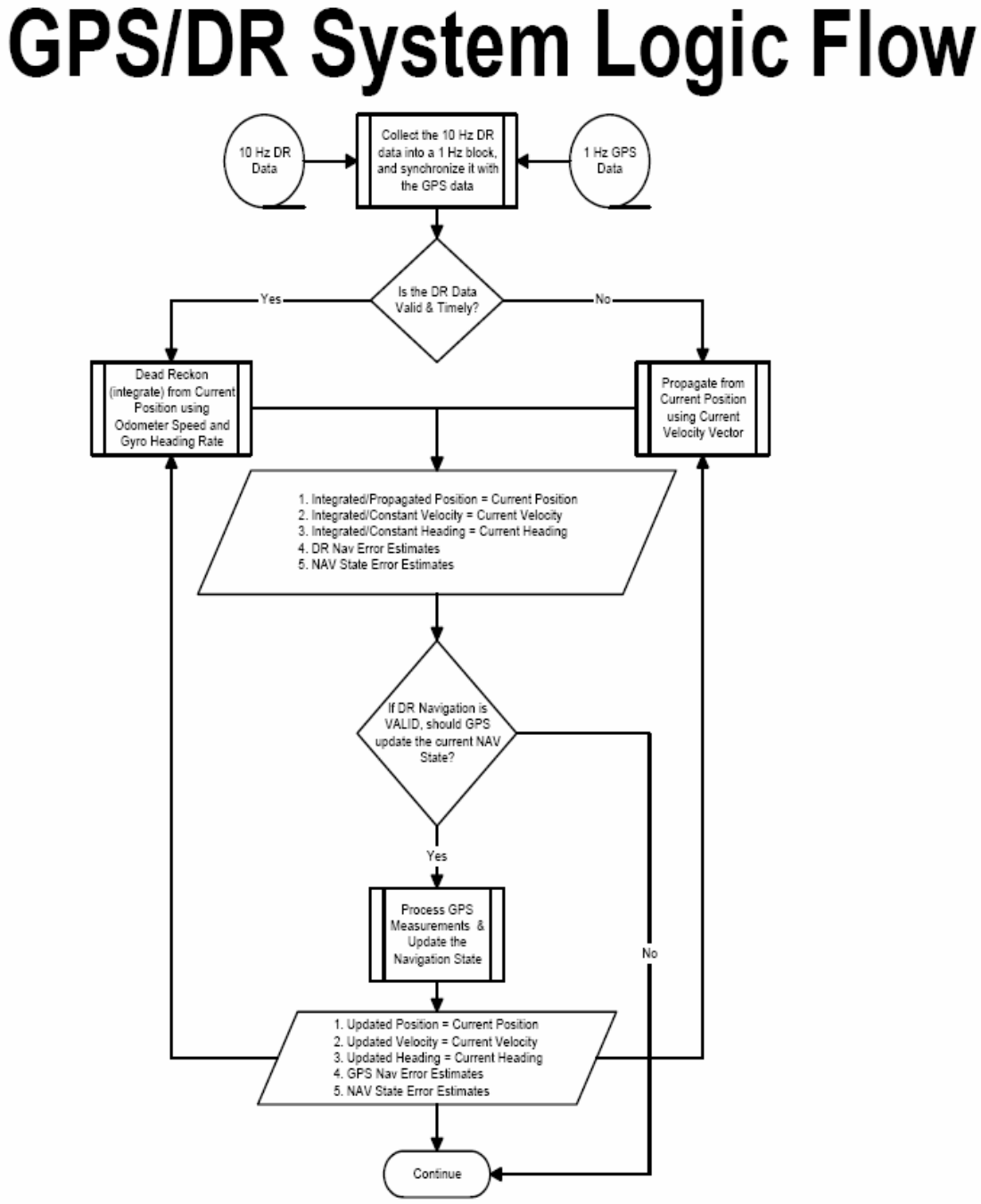
SiRFDRIVE - initialisation of stored parameters.



The most important factor is the detection of a power OFF/ON event that can affect the stored data due to no VBAT being supplied.

Following this it is advisable to periodically store the DR critical data so that it can be used to re-initialise the system on power ON. If possible the Ephemeris data can also be stored to help the GPS obtain a fast start-up if the stored ephemeris data is no more than 2-4 hours old.

The messages to periodically poll and to poll just before a controlled shut down are as follows:

MID41 (Position and heading)

MID 7 (Clock drift)

MID 172 subID7 (DR Sensor parameters) – system will respond with MID48 subID 7

If ephemeris assistance is to be used:

Mid 147 (Poll every half hour or just before shut down – 2-4 hour validity

Response – MID15

Cont'd

Initialisation procedure:

On power up

1) Set DR Sensor parameters with MID172 subID4.

2) Initialise GPS/DR Nav with MID172 subID1 (set reset configuration bits to 0x01).

3) If ephemeris assistance is possible (shut down less than 2-4 hours) set ephemeris with MID149 only when the at least one satellite is being received with a 3F status (check with MID 4).

As an example, if a tracking status of 33 (Hex) is seen, this means that satellite acquisition has been achieved, the delta-phase is valid, the carrier pull-in is complete, and the code has been locked onto. From a cold start you will typically see the following sequence of tracking status changes; 00→33→37→3F→BF. It only takes about 1 second to achieve a 37 status, approximately another 12 seconds to get to a 3F status, and finally another 20 seconds to achieve a BF status. The sequence and time frames may vary considerably between channels and sessions.

	Achieved Tracking Stage							
Tracking Status (Hex)	Ephemeris Data Available	Acquisition Failed	Code Locked	Carrier Pull-in Done	Sub-frame Sync Done	Bit-sync Done	Delta-phase Valid	Acquisition Success
00								
01								✓
03							✓	✓
21			✓					✓
23			✓				✓	✓
25			✓			✓		✓
27			✓			✓	✓	✓
2D			✓		✓	✓		✓
33			✓	✓			✓	✓
37			✓	✓		✓	✓	✓

- The system will update the position, velocity, and heading estimates once per second (1Hz)
- The following navigation modes are user specific:
  - ◇ GPS only navigation
  - ◇ DR navigation using stored DR sensor calibration, i.e. OK to do DR-only at start-up
  - ◇ DR navigation using current GPS-based calibration, i.e. no DR navigation after start-up until after calibration by GPS
  - ◇ Combined navigation mode; the integration of GPS measurements and sensor information
- The user has the ability to initialize the DR navigation by entering the Position and Heading data at start-up
- The user has the ability to upload the DR sensor calibration values

- The system has the capability of eliminating the gross DR sensor errors by means of a factory calibration procedure
- The user has the ability to enter the new DR sensor parameters based on the following:
  - ◇ Gyro scale factor (mV/°/s)
  - ◇ Wheel ticks per metre
- The system will compute and apply the true parameter values once GPS calibration becomes available, regardless of the parameter values being used to determine the DR sensor operation at start-up (whether they are default values or user-entered)
- If a DR sensor has failed, and GPS calibration is available, the system will detect and identify the following DR sensor failures, and then switch to GPS-only navigation:

  Gyro Sensor Failures:
  - ◇ High, Persistent Turn Rate
  - ◇ Low, Persistent Turn Rate
  - ◇ Gyro Turn Rate Residual is too large – Generally caused by discontinuities in heading rate data due to gyro or A/D failure

  DR Speed Failures:
  - ◇ DR Speed data == 0 when GPS speed != 0
  - ◇ DR Speed data != 0 when GPS speed == 0
  - ◇ DR speed data residual too large – Generally caused by discontinuities in DR speed sensor output

8.2.1 Message ID 0xAC; Sub-ID 0x01

DR NAV Initialization Input message

Byte No.	Field	Range	Resolution
1	Message ID	–	–
2	Sub-ID	–	–
3 – 6	Latitude	-90 – 90°	10^{-7}
7 – 10	Longitude	-180 – 180°	10^{-7}
11 – 14	Altitude (from Ellipsoid)	-2,000 to 100,000 m	0.01
15 – 16	Heading (True)	0 to 360°	0.01
17 – 20	Clock Offset	25,000 to 146,000 Hz	–
21 – 24	Time of Week	0 to 604,800 s	0.01
25 – 26	Week Number	0 to 1023	–
27	Number of Channels	1 to 12	–
28	Reset Configuration	Bit 0: Data valid flag (hot start) Bit 1: Clear ephemeris (warm start) Bit 2: Clear memory (cold start) Bit 3: Factory reset Bit 4: Enable raw track data Bit 5: Enable debug data for SiRF binary Bit 6-7: Reserved	

8.2.2 Message ID 0xAC, Sub-ID 0x02

DR NAV Mode Control Input message

Byte No.	Field	Details
1	Message ID	–
2	Sub-ID	–
3	DR Navigation Mode Control	Bit settings are exclusive. Bit 0: GPS navigation only Bit 1: DR navigation OK (with stored or default calibration) Bit 2: DR navigation OK with current GPS calibration Bit 3: DR navigation only Bit 4 – 7: Reserved

8.2.3 Message ID 0xAC, Sub-ID 0x03

Gyro Factory Calibration Control Input message

Byte No.	Field	Details
1	Message ID	–
2	Sub-ID	–
3	Gyro Factory Calibration Control*	Bit 0: Start gyro bias calibration Bit 1: Start gyro scale factor calibration†

*The bit map of the field variable controls the gyro factory calibration stages. The Gyro Factory Calibration procedure calls for the Gyro Bias Calibration to be done first while the gyro is stationary, and the Gyro Scale Factor Calibration to be done next while the gyro rotates smoothly through 360°.

† The individual bits are referenced by their offset from the start of the bit map, starting with offset 0 for the LSB of the least-significant byte.

8.2.4 Message ID 0xAC; Sub-ID 0x04

DR Sensor's Parameters Input message

Byte No.	Field	Range	Resolution
1	Message ID	–	–
2	Sub-ID	–	–
3	Baseline Speed Scale Factor	1 to 255 ticks/m (default: 4)	1
4 – 5	Baseline Gyro Bias	2.0 to 3.0 V (default: 2.5)	0.0001
6 – 7	Baseline Gyro Scale Factor	1 to 65 mV/°/s (default: 22)	0.001