Zodiac GPS Receiver Built-In Test Results

The Zodiac chipset firmware commands a Conexant Global Positioning System (GPS) receiver to conduct a Built-In Test (BIT) whenever commanded to do so by an Original Equipment Manufacturer's (OEM's) external application software or firmware. When the receiver is in Conexant binary protocol mode, results of the BIT are reported as a serial message 1100. When the receiver is in National Marine Electronics Association (NMEA) protocol mode, results of the BIT are reported as a NMEA BIT message (refer to the Zodiac GPS Receiver Family Designer's Guide for detailed information about these two messages). This Application Note describes the testing process and gives a definition of reported failures.

The BIT checks up to seven elements of the system and reports the current status of each of the serial ports. The results are stored in 10 consecutive words (9 through 18) of the binary 1100 message and the NMEA BIT message.

Each word is a 16-bit, unsigned integer. If the result for a test is reported as zero, the associated device has passed the test. Non-zero test results mean a device has failed a test. The last four words in both serial and NMEA messages are counters that indicate the status of the two serial ports. Table 1 provides the order and a description of these tests.

Table 1. Zodiac Binary And NMEA BIT Descriptions

Word (Binary)	Word (NMEA)	Test Order	Test Reported	Test Description
9	1	1	ROM or Flash ROM Checksum	The receiver keeps a checksum on each 32 Kword block of ROM or flash ROM (for flash ROM, the first 32 Kword block test excludes the boot loader located in the first 0x2000 words of the block). If all ROM blocks pass, this word is set to 0. If any block fails the checksum, a bit is set in this word that corresponds to the particular block (e.g., if the lowest block fails, bit 0 is set to 1).
10	2	2	RAM Write/Read	RAM is tested by writing a long (32 bit) value and reading it back. This is repeated in several places in RAM. The value written is 0xA5A5 5A5A. Any failure is reported as a 1.
11	3	4	EEPROM Status	The EEPROM is tested by verifying the validity of contained data and the current write status. Devices that have been successfully read and are not in a locked write state are considered operational. This is reported by setting the word to 0. A device that fails this check is reported by setting the word to 2. If the device is either not present, or totally non-functioning, the word is set to 1.
12.0		3	Dual-Port RAM	This test is not currently implemented. The receiver always reports a pass (0) in this bit for this test.
12.1	4	7	Magna	For firmware that supports the Magna Hardware Accelerator, this bit is set to 1 if the device fails its test or is not present. Otherwise it is set to 0.
12.2 to 12.15		N/A	These bits are not used and are always set to 0	
13	5	5	DSP Functional	The Zodiac Digital Signal Processor (DSP) is used to implement the 12 channels of the receiver. Each channel is tested in several ways to verify proper operation. If any receiver channel fails any of the tests, a corresponding bit is set. Channel 1 failure is reported by setting bit 0, channel 2 failure reported by setting bit 1, etc. Channel 12 is reported by setting bit 11.
14	6	6	Real-Time Clock	The Real-Time Clock (RTC) is tested by saving the current time and then writing a new time into it. The receiver then waits 2.5 seconds and reads the RTC again. The new time is set as 1 second before midnight, December 31, 1999. After 2.5 seconds, the RTC should have rolled over to 1.5 seconds after midnight on January 1, 2000. After the test, the saved time is restored to the RTC (without adjusting for the 2.5 seconds elapsed time). If the RTC fails any part of this process, the result is reported as a 1.
15 16	7 8	N/A N/A	Serial Port 1 Receive Error Count Serial Port 2 Receive Error Count	These counters report how many bytes have been received by the associated serial ports with either parity or framing (i.e., an incorrect number of bits) errors since the last reset. These counters typically contain 0 at power-up, but may contain a small number (1 or 2) if the system is in a noisy environment. Large error counts indicate that the serial data link is probably not working well, with either extra noise being observed or bits being dropped.
17 18	9 10	N/A N/A	Serial Port 1 Receive Byte Count Serial Port 2 Receive Byte Count	These counters report how many bytes have been received on the associated serial ports since the last reset. At power-up, the count is usually 0. For commanded tests, these counters give a count (modulo 65536) of the number of bytes that have been received from the OEM's processor.