



Built-In Test (BIT) Software

Product Brief

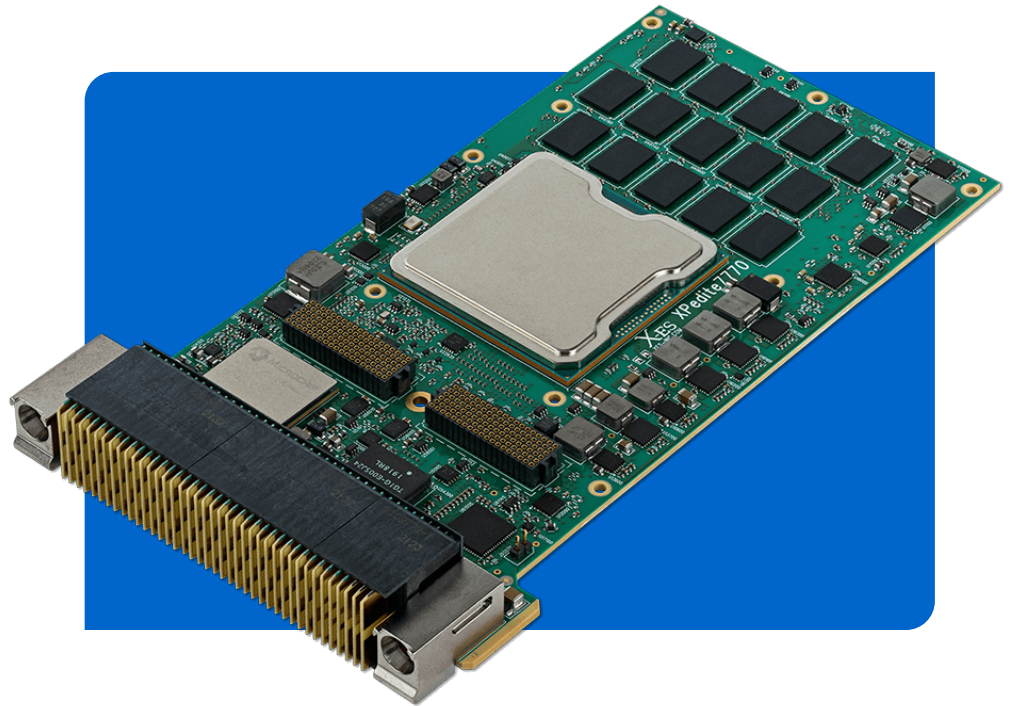
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① Built-In Test (BIT) Software

Extreme Engineering Solutions (X-ES) provides an extensive suite of Built-In Test (BIT) software to complement its diverse product lineup.

BIT is a library of diagnostic test routines with exceptional coverage to ensure confidence in the health of your system. Most X-ES processor boards for VxWorks and Linux support BIT.



BIT is delivered as a static library and comes with an exhaustive example console application in ANSI C source form. Accompanying instructions list system requirements, preview the usage and output of the application, and describe how to customize tests by adding devices.



Whether your goal is fault detection and isolation (FDI) coverage during deployment, qualification testing, or manufacturing reliability, X-ES has the BIT capabilities your project needs.



② BIT Types

BIT supports diagnostic test routines at three levels, each highly configurable and provided with detailed coverage analysis.

PBIT

Power-On BIT

Low-level tests executed in the boot firmware or in the operating system boot process. Examples include temperature sensor and device presence checks. The results are stored and can be retrieved later from the operating system. (Supported on select products; contact X-ES for details.)

- Configurable with firmware settings
- Early invasive testing yields high test coverage
- Data from firmware parsed on OS
- Visual and hardware signal failure indicators

CBIT

Continuous BIT

Non-invasive tests executed from a task within the operating system. Examples include error-correcting code (ECC) and device presence checks. CBIT is intended to be called periodically during normal operation and finish quickly, using minimal resources.

- Full source available on request
- Runs out-of-the-box
- Test result logging
- Health statistics
- Modular implementation
- Extensible
- IPMI integration

IBIT

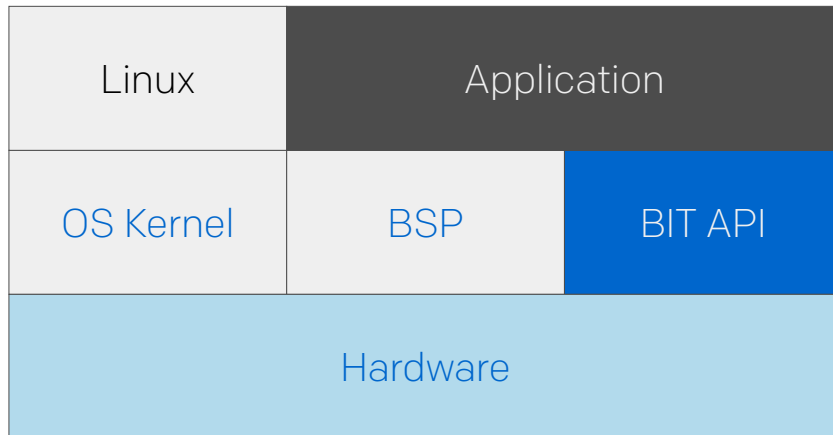
Initiated BIT

Resource-intensive tests executed at any time from the user application. Examples include Ethernet PHY loopback and BIOS CRC tests. Consisting of both non-destructive and destructive testing, IBIT is intended to help pinpoint the origin of system failures by extensively testing individual devices and functions.

- Full source available on request
- Comprehensive test set
- Offline device diagnostic testing
- IPMI integration



③ BIT Features

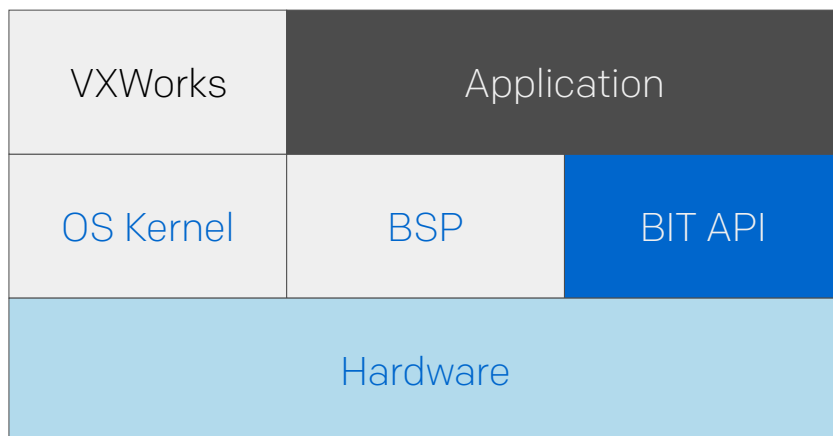


BIT API

The X-ES BIT Application Programming Interface (API) provides the user with the same consistent interface across processor boards, architectures, and operating systems.

For example, Intel®-based processor cards and NXP (formerly Freescale)-based processor cards alike support a common set of BIT tests for common device interfaces such as SDRAM, Ethernet, and non-volatile storage. This high degree of uniformity means you need fewer customizations in your system, which makes integrating BIT into your application consistent and straightforward.

Applications can query PBIT results, poll CBIT status, or execute IBIT procedures.



IPMI

BIT supports Intelligent Platform Management Interface (IPMI) integration on supported products, available as CBIT/IBIT tests and API functions.

BIT IPMI tests are a quick and easy way to check the health of each component in your system, and the BIT API provides a fully featured interface to both the on-board and system-wide IPMI controllers.



④ Test Coverage Example

X-ES provides BIT code that covers all the major functional blocks of a design. A BIT device coverage map is available with all X-ES products. Additional FDI analysis reports are available upon request.

An example of the standard analysis X-ES performs is provided in this BIT coverage map and the associated block diagram on the following page. All major functional elements are incorporated into the appropriate PBIT, CBIT, and IBIT routines.

Functional Block	Test	PBIT	CBIT	IBIT	Diagram Component
Thermal Sensors	Die Temperatures	X	X	X	1
	Board Temperatures	X	X	X	2
Software Image Integrity	BIOS Image CRC			X	3
	OS Image CRC			X	4
Bulk Storage	SATA Drive Presence		X	X	5
	MMC Device Presence	X	X	X	6
	File System Tests			X	7
RAM Memory	SDRAM Memory	X		X	8
	SDRAM ECC		X	X	9
ROM Memory	BIOS SPI NOR Flash ID Test	X	X	X	10
Ethernet	Ethernet Link		X	X	11
	Ping		X	X	12
	PHY Loopback			X	13
PCI / PCI Express / DMI	PCI Express Root Ports		X	X	14
	PCI Express Devices		X	X	15
	PCI Devices	X	X	X	16
	DMI	X			19
I2C	Device Presence	X	X	X	17
Real-Time Clock	RTC Running		X	X	18
Serial Ports	Serial Port Loopback	X		X	20
GPIO	GPIO Pin Read		X	X	21
	Boot Flash Detection	X			N/A
	Non-Volatile Address Parity	X			N/A
System Level	Geographical Address Parity	X	X	X	22
EEPROM	System EEPROM	X	X	X	23

(See page 6 for block diagram)



④ Test Coverage Example

