The Intel® Processor Diagnostic Tool Windows® - User Guide

LEGAL INFORMATION

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1 Purpose of Intel® Processor Diagnostic Tool

The purpose of the Intel® Processor Diagnostic Tool is to verify the functionality of an Intel® microprocessor. The diagnostic checks for brand identification, verifies the processor operating frequency, tests specific processor features and performs a stress test on the processor.

The diagnostic can be configured to execute in one of two modes, presence test mode or verification mode. Additionally, it can be configured to enable (run) or disable (skip) individual default configurations are used for this mode of operation. For more details see Appendix-A: Features and Parameters

2 IPDT Test System Requirements

Multiprocessor Systems
The Intel® Processor Diagnostic Tool is compatible with multiprocessor systems. It is essential that only one Intel® processor is tested at a time in this system configuration. Intel® Processor Diagnostic Tool does not support multiple processors inserted into a multiprocessor system configuration.

Motherboard & Processor
It is essential that the motherboard you use to test your processor is fully compatible with your Intel® processor. Consult your motherboard manufacturer's support to ensure the motherboard supports your processor. If you are using an Intel® Motherboard please use this utility Intel® Processors and Boards Compatibility Tool

Motherboard BIOS
It is essential that the motherboards BIOS is at the minimum BIOS revision specified to support your Intel® processor. Consult your motherboard manufacturer's support to ensure the BIOS revision is at the correct revision.

Motherboard Architecture
IPDT is only compatible with motherboards built using Intel® Architecture.

Over-Clocking
Over-Clocking should be disabled while running Intel® Processor Diagnostic Tool.

Power Management
Some power management features (e.g. Intel SpeedStep® technology) throttle or reduce the operating frequency of components within the system. These types of power management features may result in very low tested frequency results. This does not mean that the processor is operating at degraded performance levels. It means that the enabled power management feature is optimizing the efficiency of the processor, either to save power or reduce heat within the system.

We recommend you disable any power management features such as Intel SpeedStep® technology and configure your system to its optimal power management settings, when running Intel® Processor Diagnostic Tool. For instructions on how to disable these power management features, please contact your system manufacturer.

Operating Systems

The Windows® version of the Intel® Processor Diagnostic Tool is compatible with the following operating systems:

- Windows 7® 32 Bit
- Windows Vista® 32 Bit
- Windows XP® Home/Professional 32 Bit
- Windows 2000® Professional/Server/Advanced Server 32 Bit
- Windows Server 2008® 32 Bit
- Windows Server 2003® Standard/Enterprise 32 Bit

- Windows 7® 64 Bit (all versions)
- Windows Vista® 64 Bit (all versions)
- Windows XP® 64 Bit Home/Professional
- Windows 2000® 64 Bit Professional/Server/Advanced Server
- Windows Server 2008® 64 Bit Standard/Enterprise
- Windows Server 2003® 64 Bit Standard/Enterprise

3 Acronyms

Acronym	Definition
CPU	Central Processing Unit
FSB	Front Side Bus
IMC	Integrated Memory Controller
IPDT	Intel® Processor Diagnostic Tool
MSR	Model Specific Register
OS	Operating System

4 Software Required

The following software is required to run IPDT in the Windows® environment and must be installed prior to installing IPDT

- Microsoft® Visual C++ 2008 Runtime Libraries. Click here to download or copy the following URL into the browser

http://www.microsoft.com/downloads/details.aspx?FamilyID=9b2da534-3e03-4391-8a4d-074b9f2bc1bf&displaylang=en

- Windows® Installer 3.1 Redistributable (v2). Click here to download or copy the following URL into the browser

http://www.microsoft.com/downloads/details.aspx?familyid=889482fc-5f56-4a38-b838-de776fd4138c&displaylang=en

- Microsoft® .NET Framework Version 2.0 Redistributable Package (x86). Click here to download or copy the following URL into the browser

http://www.microsoft.com/downloads/details.aspx?FamilyID=0856eacb-4362-4b0d-8edd-aab15c5e04f5&displaylang=en

Java Runtime Environment (select the 32Bit 64Bit version based on your operating system). Click here to download or copy the following URL into your browser
http://www.java.com/en/download/index.jsp

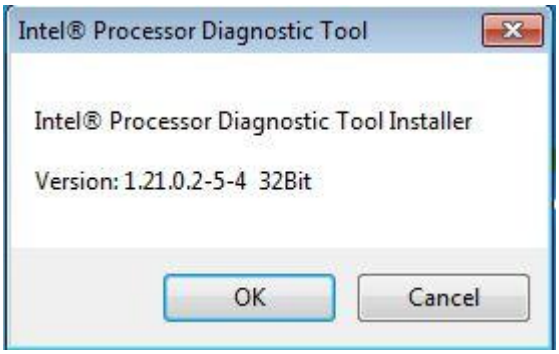
The IPDT Installer program will check for the presence of the above prerequisites on your system. If your system is connected to the internet the prerequisites will be downloaded and installed on your system. If your system is not connected to the installation will not complete. You will have to manually obtain and install these prerequisites prior to running the installation procedure

If these prerequisites are already installed, the installer will proceed with installing the diagnostic.

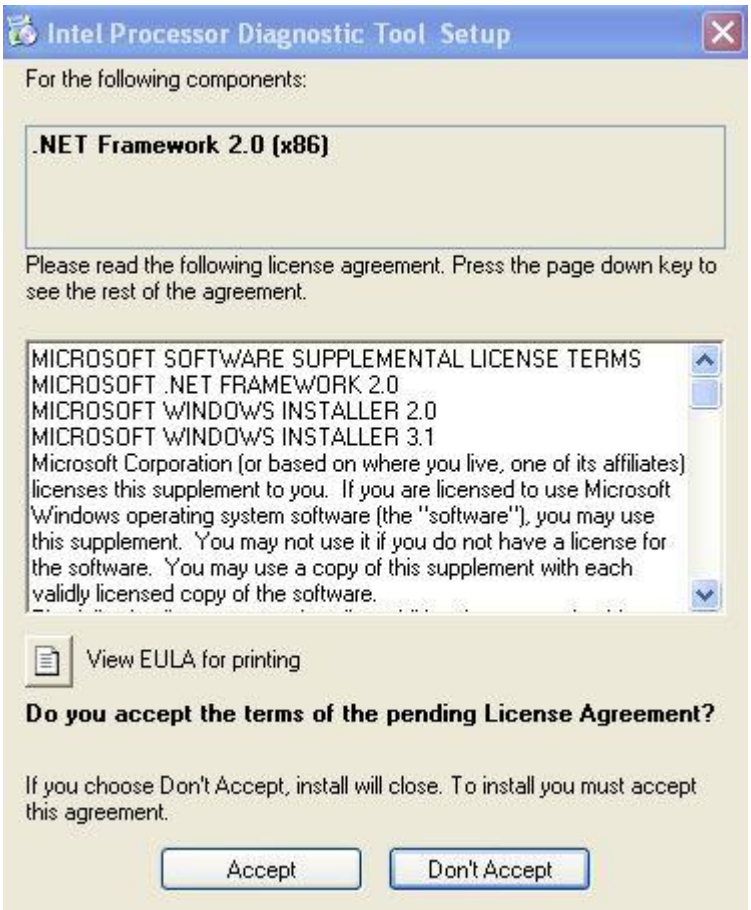
5 Installing IPDT in the Windows Environment

Installation Process

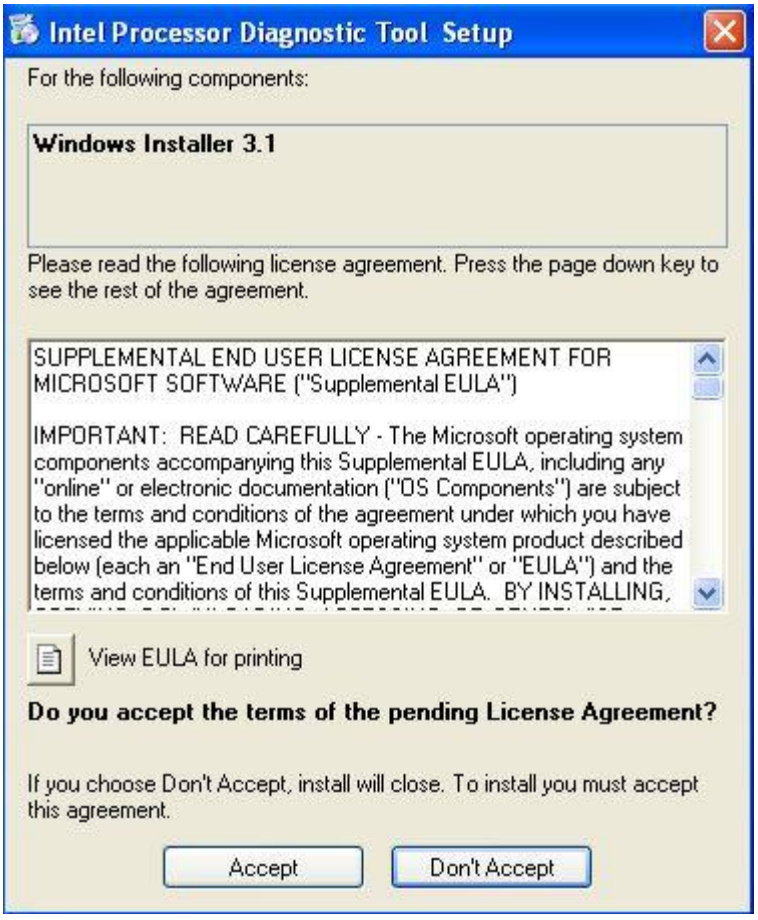
Copy the IPDT Installer program to the desktop. Double-click on it and the dialog box below will be shown.



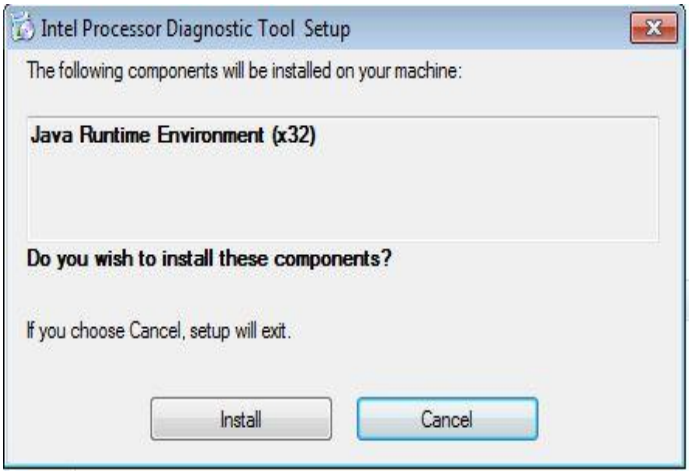
Click Ok to continue to the IPDT prerequisite check.



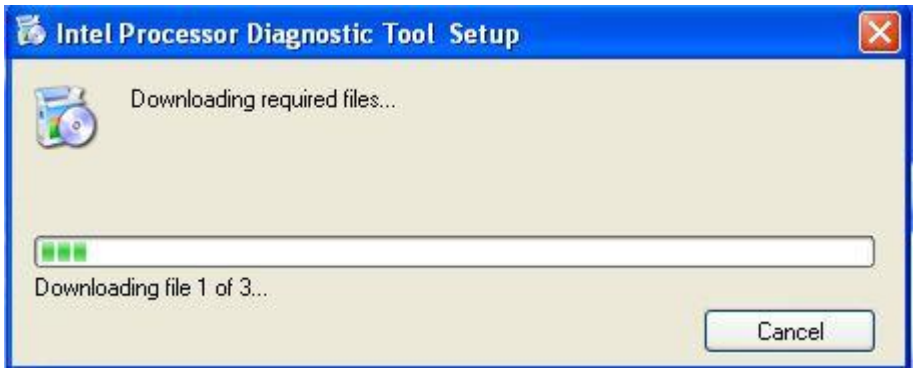
Click Accept to install .net prerequisite.



Click Accept to install Windows Installer 3.1 prerequisite.



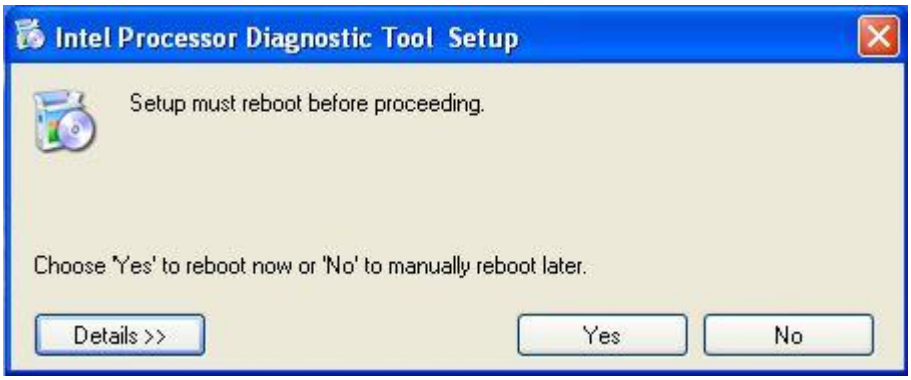
Click Install to install any prerequisite software needed to run Intel Processor Diagnostic Tool.



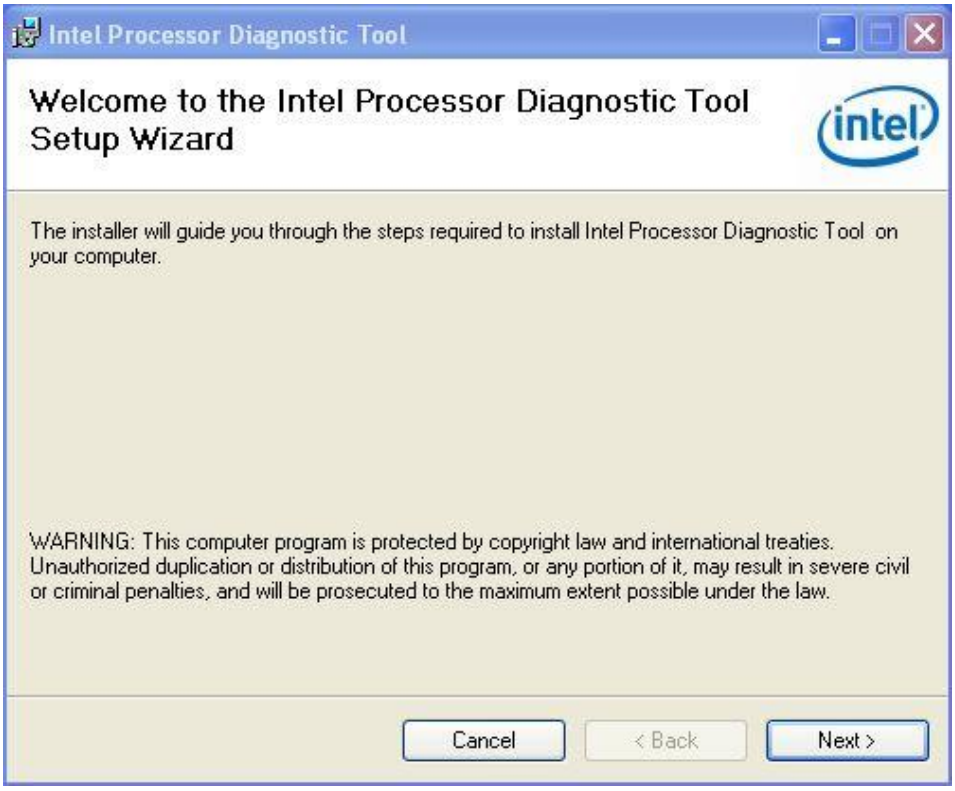
IPDT prerequisites will start downloading from the internet.

If Java Runtime Environment is required please install by clicking the Install button. Do not select "Change destination folder"

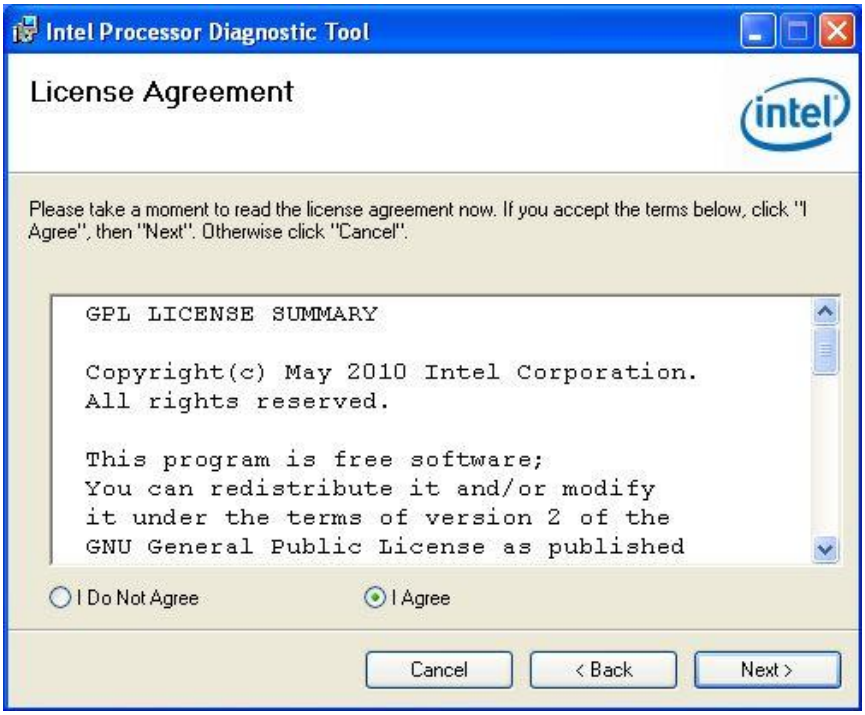
Click on Close button to proceed.



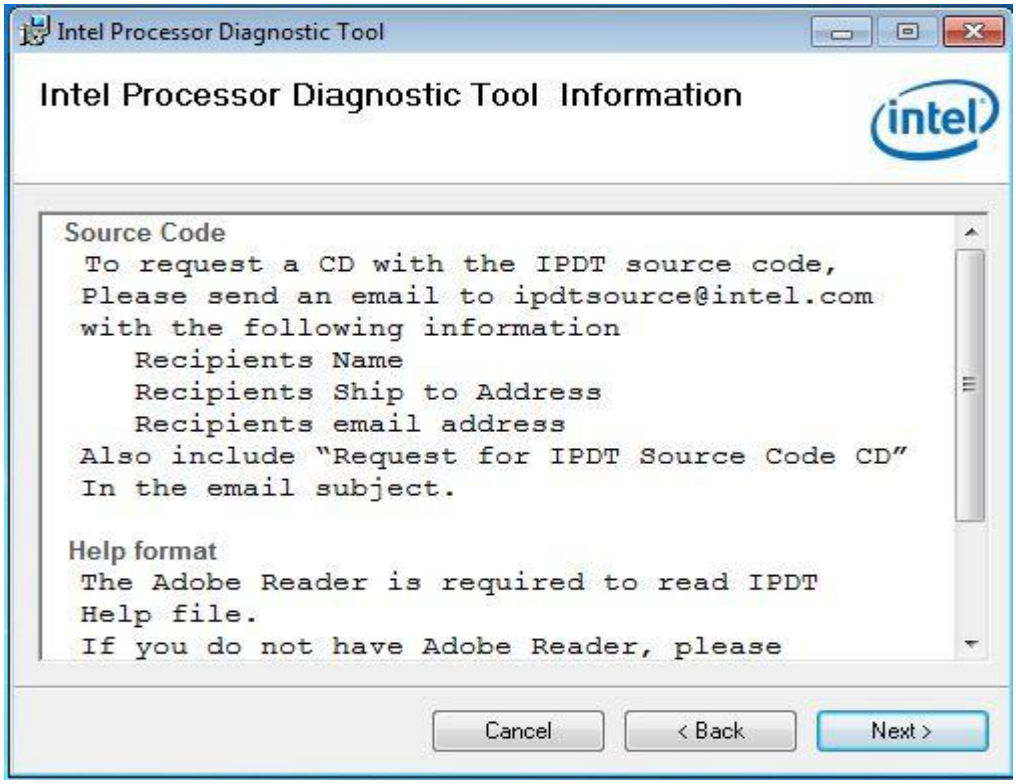
Click “Yes” to reboot your system if required.



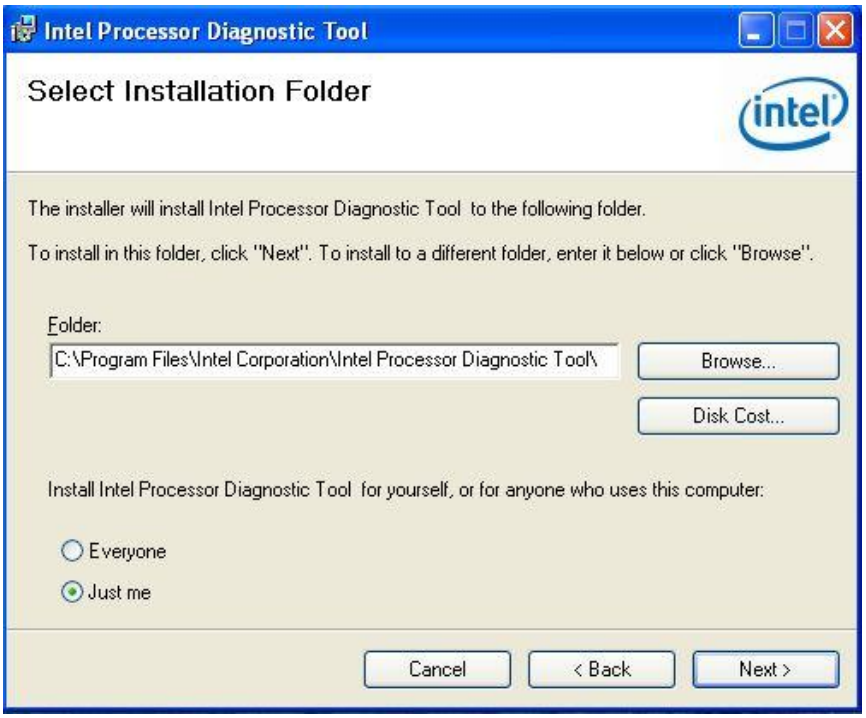
Click "Next" to continue IPDT installation.



Read License Agreement & Select "I Agree", click "Next" button to continue. You must click Agree in order for the installation process to continue.

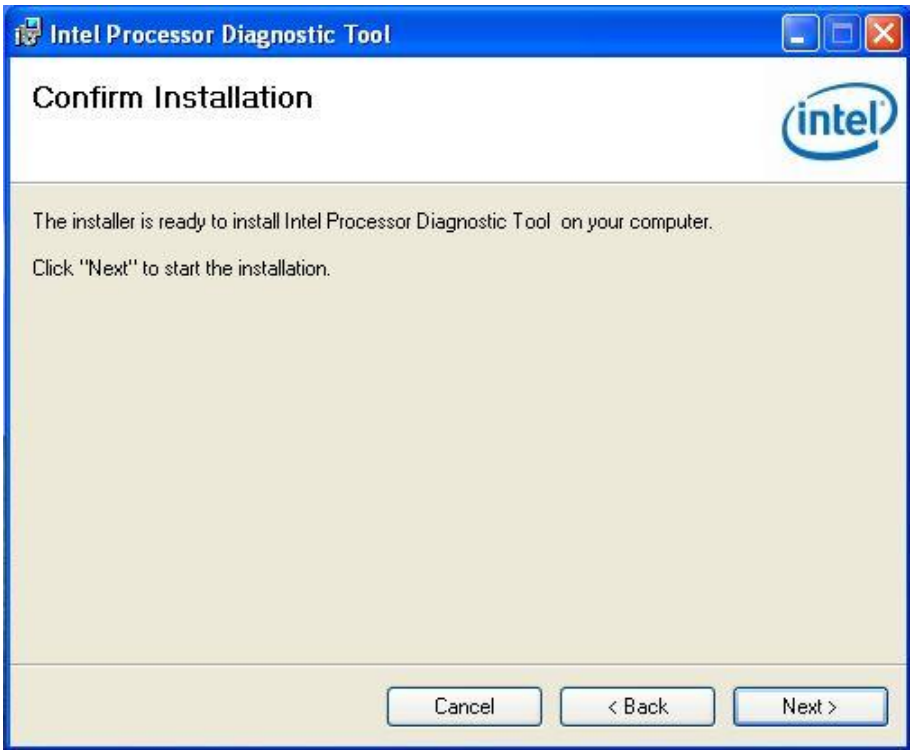


Intel Processor Diagnostic Tool source code is available by requesting the source code cd from ipdtsource@intel.com.
Adobe Reader is required to view the Intel Processor Diagnostic Tool help file.

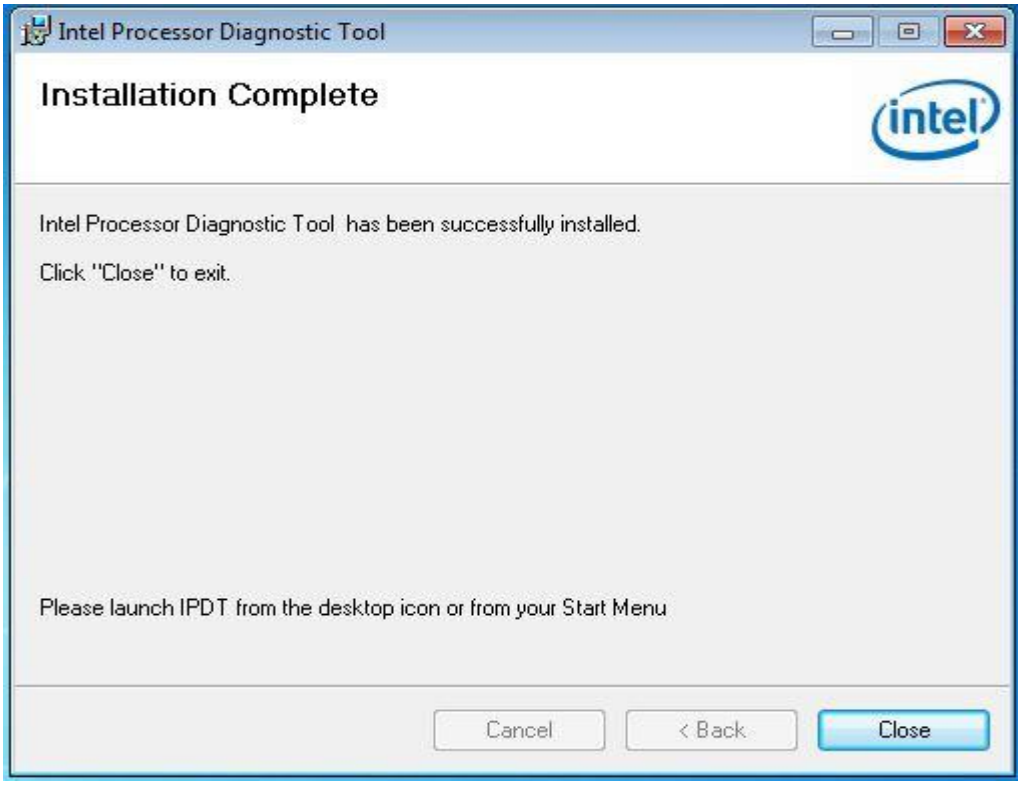


The Select Folder location is now displayed. Additionally, there is an option to allow IPDT to be run by
"Everyone" (all users on the computer) or "Just me" (the user that is performing the installation).

Choose your selections then click “Next” to continue.



Click “Next” button to continue installation.



Click “Close” button to complete installation.

6 Using IPDT

Running IPDT

IPDT can be launched by double-clicking on the Intel® Processor Diagnostic Tool Icon located on the desktop or by selecting Start → Programs → Intel Corporation → Intel Processor Diagnostic Tool.

When IPDT is launched the IPDT Control Window shown below will open and IPDT starts testing the CPU using the default configuration.

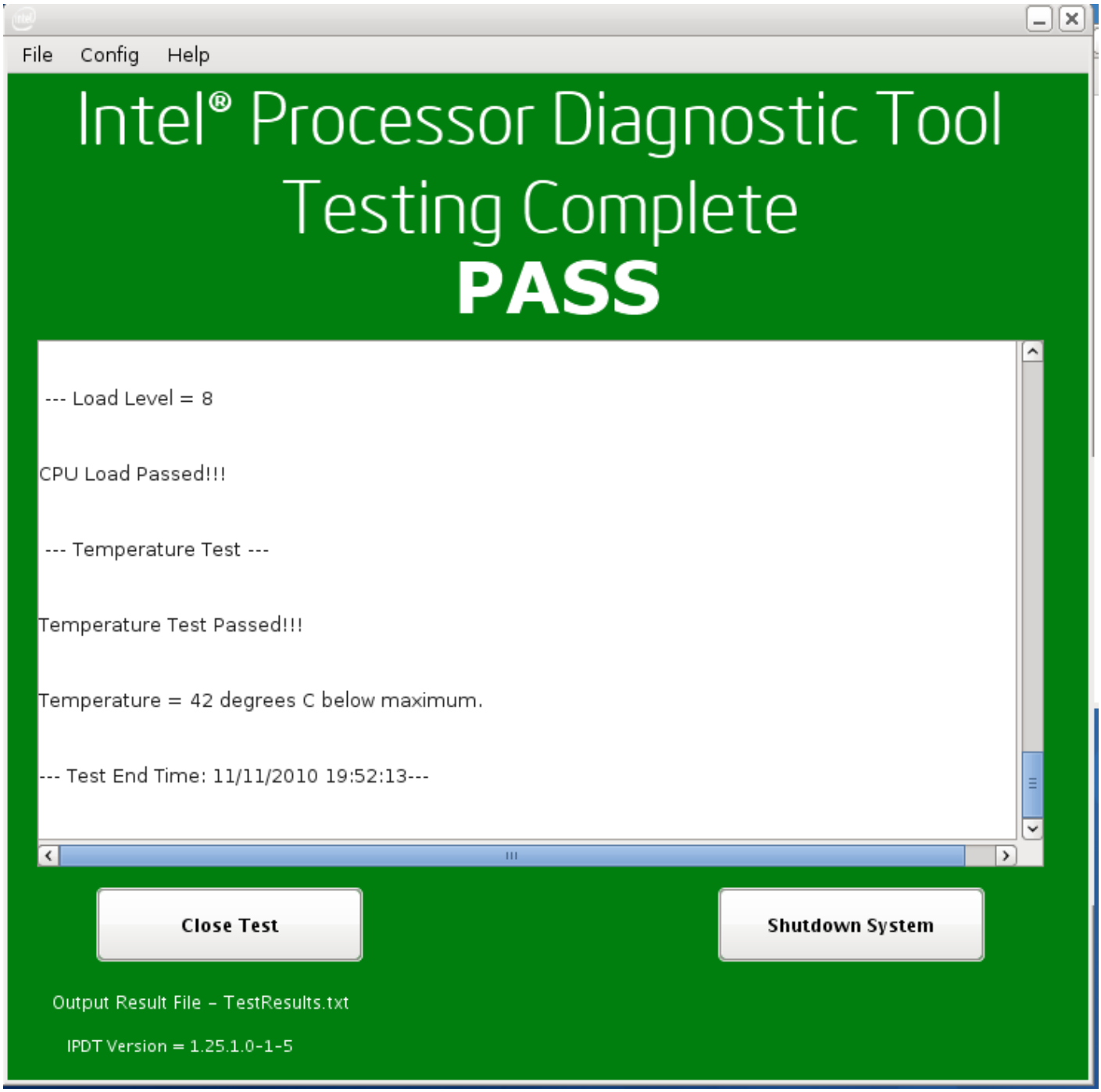
A progress bar is shown across the top of the control window. Also, there is a console window with a scroll bar.

IPDT is executing in the console window. At the bottom left of the control window is a list of Features which show the tests are enabled in the default configuration.

At the bottom center is a list of the default parameters used during the test.

The version of IPDT and the test time or duration is listed at the top right of the control window.

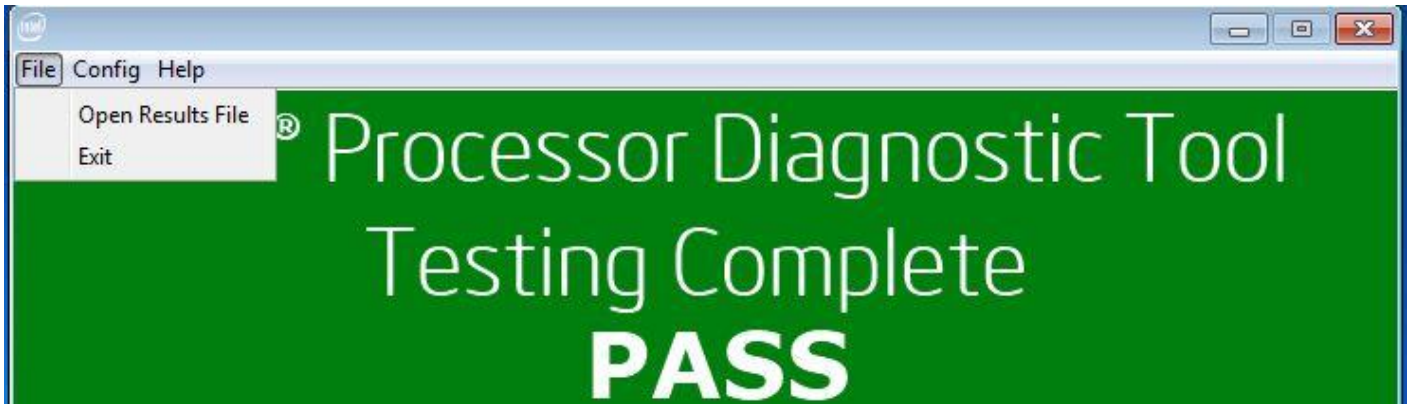
When IPDT completes running the progress bar will be converted to display either a PASS or FAIL. The PASS screen is shown below.



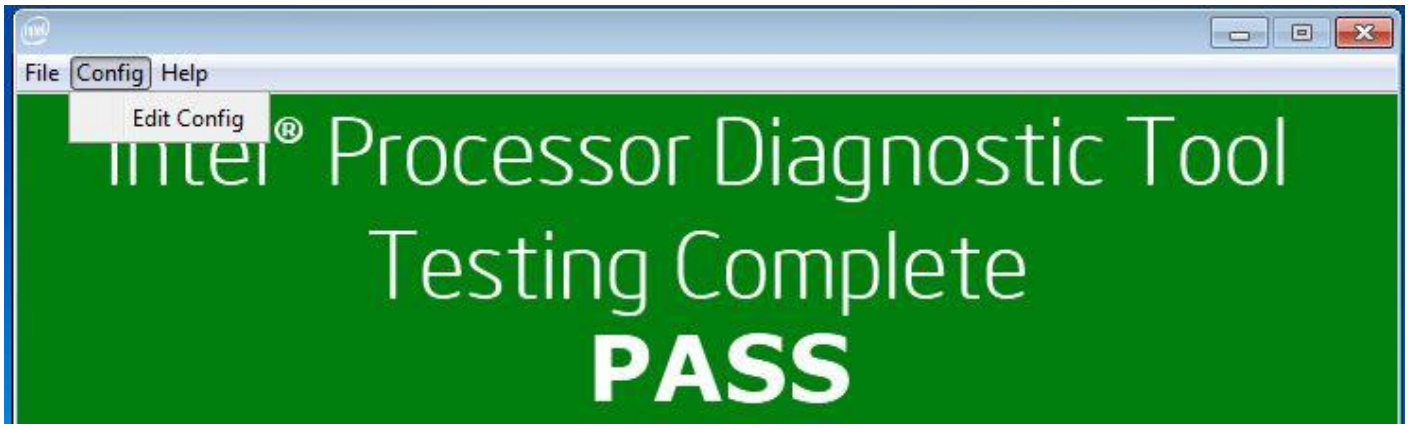
Now the console window shows the output of IPDT starting at the beginning with the version number.
Now there are two new buttons.

The button on the left will close IPDT and the button on the right will turn off the power (shutdown) your computer.

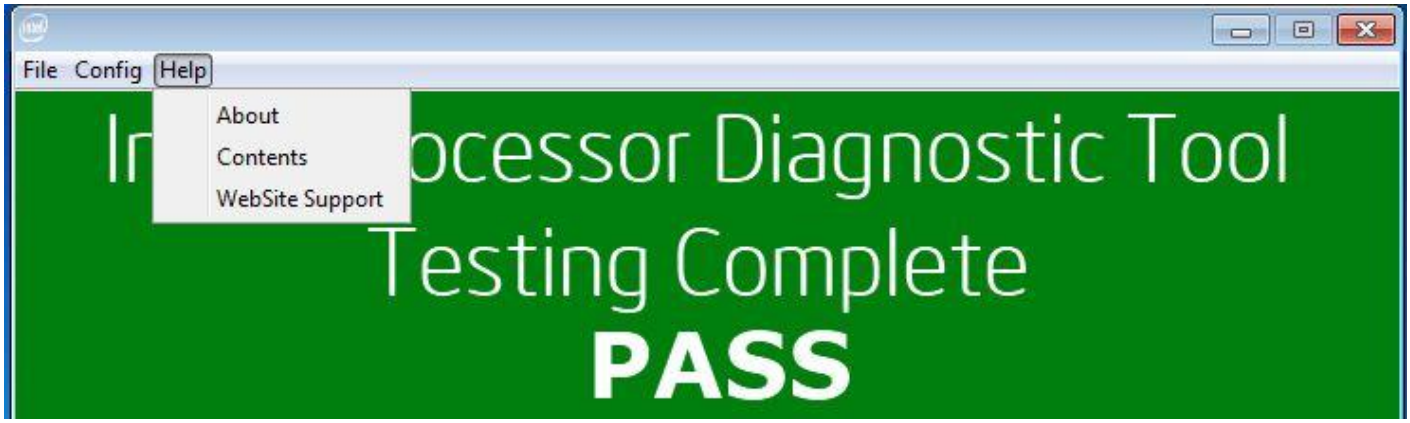
At the top of the Window is a Menu Bar. The File Menu allows you to open the TestResults.txt file using Notepad, and allows you to exit IPDT. See below



Config will open the configuration menu page for editing. See below

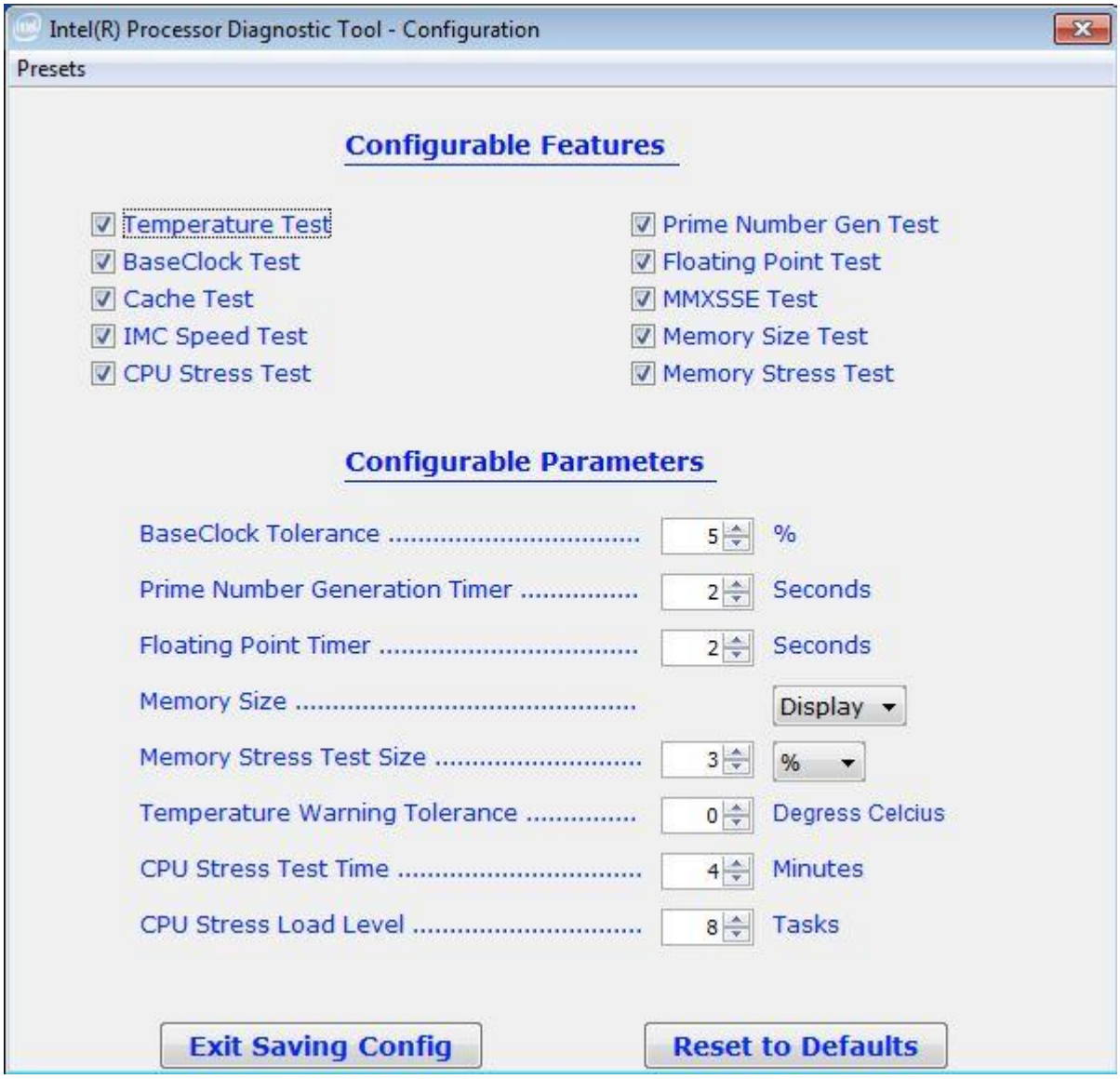


Help Menu includes About, Contents, and Support information. See below.



7 Edit Configuration File

When IPDT is launched it will start testing using the default configuration.
After IPDT finishes testing, the Config Menu will be available from the pass/fail screen.
Select Config → Edit config and the following will be displayed



Configurable Features
This section lists the individual tests which can be enabled (executed) or disabled (skipped).
The individual tests have a check box which is used to enable or disable the particular test.

Configurable Parameters
This section lists the parameters which are configurable for a specific test. When a test has been disabled, the parameter is removed from the list.

Click the “Exit Saving Config” button to save any changes.
Click “Restore Defaults” to return to the default configuration.
Click Close “X” at the top of the right of the window to close the window and return to the PASS/FAIL Screen.

8 IPDT Features & Parameters

Test Library	CPU Manufacturer Test
Description	The purpose of CPU Manufacturer test library is to validate the CPU being tested is a "GenuineIntel" processor. This is done by reading the contents of the EBX, ECX, and EDX registers, and joining the contents together to construct the Manufacturer name to ensure it equals "GenuineIntel".
Options	None
Parameters	None
Default Settings	N/A

Test Library	CPU Brand String Test
Description	CPU brand string test library determines which Intel® CPU is being tested using one of two modes, presence test mode or verification mode. The mode being used is determined by the SkipConfig parameter in the IPDTconfig.xml configuration file found in the IPDT folder. If the value of SkipConfig parameter is set to "Yes" (i.e. SkipConfig="Yes"), then the presence mode is being used and the test library will report the CPU Brand String extracted from the CPU registers extracted. If the value of SkipConfig parameter is set to "No" then the verification mode is being used and the test library will compare what was extracted from the CPU registers to a known list of brand string names (not, including trademarks, etc)
Options	SkipConfig="Yes", SkipConfig="No"
Parameters	None
Default Settings	SkipConfig="Yes"

Test Library	CPU Frequency Test
Description	CPU Frequency test library will validate CPU operating frequency is within test limits of expected CPU frequency listed in the CPU Brand String for the CPU unit under test. This is done by extracted Brand String from the CPU registers and parsing the CPU Frequency from the string, then using the RDTSC instruction to perform a calculation to determine if calculated CPU Frequency is within limits. The limits are currently +/- 5%. This test can be impacted when the test platform is not configured to meet the system requirements specified in section 2. To handle this, the Site parameter is used by this test to indicate that the test platform meets all the system requirements. This is achieved when the parameter is Site=”Depot”. Now, if the detected frequency is outside the limits, the test will stop execution, and display following error message "CPU Frequency Test Failed!!!" When a test platform is not configured per test system requirements specified in section 2 due to over clocking or power management features, the value must be Site=”Other”. Now if the detected frequency is outside the limits, the test will continue execution, however the following message will be displayed "CPU Frequency Test Passed with Warning!!!"
Options	Site="Depot", Site="Other"
Parameters	None
Default Settings	Site="Other"

Test Library	Front Side Bus Test
Description	The Front Side Bus (FSB) test library tests the FSB frequency for processor which supports the front side bus. Front Side Bus (FSB) test library executes either in presence test mode or verification mode. The mode being used is determined by the SkipConfig parameter in the IPDTconfig.xml configuration file. If the value of SkipConfig parameter is set to “Yes” (i.e. SkipConfig=”Yes”), then the presence mode is being used and the test library will read CPU Model Specific Register and validate that the FSB is within test limits via lookup tables. The limits are currently +/- 2%. If the value of SkipConfig parameter is set to “No” then the verification mode is being used and the test library will read CPU Model Specific Register and compare against the BUSSpeed parameter listed in the CPU node list section of the configuration file.
Options	SkipConfig="Yes", SkipConfig="No"
Parameters	None
Default Settings	SkipConfig="Yes"

Test Library	Temperature Test
Description	The purpose of Temperature library is to monitor the temperature of the processor. This is accomplished by reading the DTS value of the processor from the MSR, if supported by the processor. The library determines if the DTS sensor is enabled using CPUID instruction. The value of DTS is an offset value measured in degrees C and is not the actual temperature of the processor. The DTS is the delta between the current temperature and the maximum junction temperature of the die (Tj) which is referenced by the processor as 0. Tj values vary among processors and are not read directly from the processor. If the DTS value is supported and enabled, The DTS value is read and translated as "x degrees C from max temperature," and reported. The initial execution of temperature library and the following message is after the CPU Manufacturer Test Library has confirmed that a Genuine Intel® processor is being tested. Then it is executed after each test library to monitor the temperature of the processor. The final temperature read it reported at the end of IPDT. Both the initial temperature and the final temperature is saved in TestResults.txt file
Options	TemperatureTest="Enable", temperatureTest="Disable"
Parameters	Numerical value in Degrees Celcius
Default Settings	TemperatureTest="Enable"; TemperatureWarningTolerance= "0"

Test Library	BaseClock Test
Description	The Base Clock Test verifies the accuracy of the base clock used to calculate the Integrated Memory Controller (IMC) link speed and the Quick Path Interconnect (QPI) link speed for Intel® Core i7 and i5 Processor, Intel® Xeon Processor 5500 series and Intel® Xeon Processors based on Intel® Micro architecture (Nehalem). The test compares the detected value to the expected default base clock of 133MHz. The expected value is calculated by using value of the Maximum Non-Turbo Ratio, IA32_PERF_GLOBAL_CTRL, IA32_FIXED_CTR_CTL, IA32_FIXED_CTR1 & IA32_FIXED_CTR2 registers from Model Specific Register.
Options	BaseClock="Enable", BaseClock="Disable"
Parameters	Tolerance value from 1% - 100%
Default Settings	BaseClock="Enable"; BaseClockTolerance="5%"

Test Library	Cache Test
Description	The purpose of CPU Cache test library is to verify the size of the L1, L2, and L3 Cache, whichever is present. The CPUID instruction is used to read ECX register. The L1, L2, & L3 Cache size is in 1024-byte units. The test retrieves the L1, L2, and L3 Cache size information and compare with entry in configuration file for CPU unit under test. The cache is tested using one either presence test mode or verification mode. Which mode is used is determined by the SkipConfig parameter in the IPDTconfig.xml configuration file. If the value of SkipConfig parameter is set to "Yes", then the test library will simply report the cache size. If the value of SkipConfig parameter is set to "No" then the test library will verify the L2 or L3 cache size detected against the expected cache size using the L2Cache or L3Cache parameter found in the CPU node list section of the configuration file.
Options	CacheTest="Enable", CacheTest="Disable"; SkipConfig="Yes", SkipConfig="No"
Parameters	N/A
Default Settings	CacheTest="Enable"; SkipConfig="Yes"

Test Library	Prime Number Generation Test
Description	The purpose of this test library is to test how fast the CPU can search for Prime numbers, reported as operations per second. Prime number generation will be based on the Sieve of Eratosthenes algorithm. The test program will test for unsigned integer type and within the numbers of 0-2^{32} for 32 bit platform. Random comparison will be done to make sure the prime number generated is a valid prime number.
Options	PrimeNumber="Enable", PrimeNumber="Disable"
Parameters	Time in seconds
Default Settings	PrimeNumber="Enable"; PrimeNumberTimer="2"

Test Library	Floating Point Test
Description	The purpose of this test is to perform addition, subtraction, multiplication and division, to test how fast the CPU can perform mathematical floating point numbers operations, and do a sum comparison to make sure the floating point is giving the correct sum value at the end of each cycle. The test program will display Million Floating Point Operations per Second (MFLOPS), time started, cycle completed and quantity of errors detected.
Options	FloatingPoint="Enable", FloatingPoint="Disable"
Parameters	Time in seconds
Default Settings	FloatingPoint="Enable"; FloatingPointTimer="2"

Test Library	MMX/SSE Test
Description	This test detects which MMX & SSE, SSE2, SSE3, SSSE3, SSE4 instruction sets are supported on the processor being tested. If the instruction set is supported then the test will execute all MMX & SSE instructions for the supported instruction sets. The test will display which features were detected and thus tested.
Options	MMXSSE="Enable", MMXSSE="Disable"
Parameters	N/A
Default Settings	MMXSSE="Enable"

Test Library	Integrated Memory Controller Test
Description	The purpose of Integrated Memory Controller (IMC) Test Library is to test Integrated Memory Controller functionality which is included in Intel® Core i7 and i5 Processor, Intel® Xeon Processor 5500 series and Intel® Xeon Processors based on Intel® Micro architecture (Nehalem). This library targets the memory controller speed, memory size, and it performs memory stress test
SubTest	Integrated Memory Controller Test - Speed Subtest
Description	The memory controller speed subtest detects memory controller speed from PCI Configuration Space and compares it with speed from performance counter in processor Model Specific Register. This parameter can be used to enable (execute) or disable (skip) the memory controller speed subtest.
Options	IMCSpeedTest="Enable", IMCSpeedTest="", IMCSpeedTest="Disable"
Parameters	N/A
Default Settings	IMCSpeedTest="Enable"
SubTest	Integrated Memory Controller Test - Memory Size Subtest
Description	The memory size subtest uses the MemorySize parameter located in the global parameter section in the IPDTconfig.xml configuration file. This parameter can be used to enable (execute) or disable (skip) the memory size subtest. If the MemorySize = Enable or ”” (no value), then the memory is in the first bank only and report it. This is the default value.
Options	MemorySize="3GB", MemorySize="512MB", MemorySize="256KB", MemorySize="Enable", MemorySize="", MemorySize="Disable" (values shown as example only)
Parameters	Size GB, MB, KB,
Default Settings	MemorySize="Enable"; MemorySize=""
Test Library	Integrated Memory Controller Test - Memory Stress Subtest
Description	The memory stress subtest reads and writes using sliding zeros, sliding ones moving inversion algorithms. This subtest uses the MemoryStressTestSize parameter located in the global parameter section in the IPDTconfig.xml configuration file. Setting MemoryStressTestSize will determine how much available free memory is tested during the Stress subtest
Options	MemorySize="Enable", MemorySize="Disable"
Parameters	% of total memory Size or a specific amount of Memory in GB, MB, KB, Byte
Default Settings	MemorySize="Enable"; MemoryStressTestSize="3%"

Test Library	Integrated Graphics Device - IGD
Description	The purpose of Integrated Graphics Device is to validate that there is a functioning Intel(R) Integrated Graphics Device on the CPU unit under test. Verifying the presence of the Intel(R) IGD and will list information obtained from reading specific registers from the IGD. Information returned will contain the following: VID2, DID2, RID2, GTTMMADR, GMADR, SVID2, SID2, ROMADR, GMS, IVD, and Frame Buffer Size determined from GMS register value.
Options	N/A
Parameters	N/A
Default Settings	N/A

Test Library	Multi-core/Multi-threaded Test Library
Description	The Multi-core, Multi-thread test library will stress the CPU cores for a given period of time using Intel® Threading Building Blocks. This test uses the StressTestTime and StressLoadLevel parameters both located in the global section in the IPDTconfig.xml configuration file. The StressLoadLevel parameter is a numerical value which represent the number of tasks required to sufficiently load the cores. The StressTestTime parameter is used to set the duration of this test library, thereby, extending the total test time for the diagnostic.
Options	StressTest="Enable", StressTest="Disable"
Parameters	Number of Tasks; Test Time;
Default Settings	StressTest="Enable"; StressLoadLevel="8"; StressTestTime="4"

Test Library	Test Results Files Name
Description	The parameter "OutputResultsText" is used to set the name of the output file
Options	N/A
Parameters	Name of File
Default Settings	Default file name is TestResults.txt

Test Library	Test Results Files Format
Description	The value of paramter "OutFileFormat" is used to store the test results in text file format or XML file format.
Options	Text / XML
Parameters	N/A
Default Settings	Test
Test Library	Output Pass Text File (OutputPassText)
Options	Name of File
Parameters	pass.txt
Default Settings	
Description	Used to support internal legacy test processes. Sets filename flag creation when IPDT passes test

Test Library	OutputFailText
Options	Filename
Parameters	fail.txt
Default Settings	
Description	Used to support internal legacy test processes. Sets filename flag creation when IPDT fails test