## Dell Inc. PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Jun-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

### SPECrate®2017_fp_base = 111  
### SPECrate®2017_fp_peak = 116

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<td>554.roms_r</td>
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</tbody>
</table>

---

### Hardware

- **CPU Name:** Intel Xeon Gold 6208U  
- **Max MHz:** 3900  
- **Nominal:** 2900  
- **Enabled:** 16 cores, 1 chip, 2 threads/core  
- **Orderable:** 1 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 1 MB I+D on chip per core  
- **Cache L3:** 22 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 192 GB (12 x 16 GB 2Rx8 PC4-2933V-R, running at 2933)  
- **Storage:** 1 x 1.92 TB SATA SSD  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.1  
- **Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux  
- **Compiler:**  
- **Firmware:** Version 2.7.7 released May-2020  
- **File System:** tmpfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** None  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
### Benchmark Results

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</tbody>
</table>

SPECrater®2017_fp_base = 111

SPECrater®2017_fp_peak = 116

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

### Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux. The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

### Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

### Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH = 
    "/mnt/ramdisk/cpu2017-ic19.1u1/lib/intel64:/mnt/ramdisk/cpu2017-ic19.1ul
    /je5.0.1-64"
MALLOC_CONF = "retain:true"
```
General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)
is mitigated in the system as tested and documented.
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk"
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS settings:
Sub NUMA Cluster enabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub set to standard
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /mnt/ramdisk/cpu2017-ic19.1u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbbe6e46a485a0011
running on rhel-8-1-sut Sat Jun  6 15:41:44 2020

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
https://www.spec.org/cpu2017/Docs/config.html#sysinfo
SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)

<table>
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<tbody>
<tr>
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<td>Software Availability:</td>
<td>Apr-2020</td>
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</table>

**SPECrate®2017_fp_base = 111**

**SPECrate®2017_fp_peak = 116**

---

**Platform Notes (Continued)**

From /proc/cpuinfo

model name : Intel(R) Xeon(R) Gold 6208U CPU @ 2.90GHz
1 "physical id"s (chips)
32 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 16
siblings : 32
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu:

Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              32
On-line CPU(s) list: 0-31
Thread(s) per core:  2
Core(s) per socket:  16
Socket(s):           1
NUMA node(s):        2
Vendor ID:           GenuineIntel
CPU family:          6
Model:               85
Model name:          Intel(R) Xeon(R) Gold 6208U CPU @ 2.90GHz
Stepping:            7
CPU MHz:             3405.589
CPU max MHz:         3900.0000
CPU min MHz:         1200.0000
BogoMIPS:            5800.00
Virtualization:      VT-x
L1d cache:           32K
L1i cache:           32K
L2 cache:            1024K
L3 cache:            22528K
NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
Flags:               fpu vme de pse tsc msr pae mce cx8 8x87 pmovmsk pxsr ss pt pd
                    mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb
                    rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl apic ndx tsc ept 64bit
                    vm x86_64UCK xsave lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 cdp_l3
                    invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow
                    vnmi flexpriority ept vpid fsgsbase tsc_adjtime mcmi hle avx2 smep bmi2  ersed invpcid
                    rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
                    avx512bw avx512vl xsaveopt xsavec xsetbv xsavec cqm_llc cqm_occapi_llc cqm_mbm_total

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result
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Dell Inc.
PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)

SPECrate®2017_fp_base = 111
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Jun-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Platform Notes (Continued)

```
cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld
arch_capabilities

/proc/cpuinfo cache data
        cache size : 22528 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
        available: 2 nodes (0-1)
        node 0 cpus: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
        node 0 size: 95306 MB
        node 0 free: 85919 MB
        node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
        node 1 size: 96738 MB
        node 1 free: 96059 MB
        node distances:
        node   0   1
        0:  10  11
        1:  11  10

From /proc/meminfo
        MemTotal:       196654116 kB
        HugePages_Total:       0
        Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
        os-release:
                NAME="Red Hat Enterprise Linux"
                VERSION="8.1 (Ootpa)"
                ID="rhel"
                ID_LIKE="fedora"
                VERSION_ID="8.1"
                PLATFORM_ID="platform:el8"
                PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
                ANSI_COLOR="0;31"
                redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
                system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
                system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
        Linux rhel-8-1-sut 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019 x86_64
        x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
```

(Continued on next page)
## Platform Notes (Continued)

<table>
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<th>CVE-2017-5754 (Meltdown):</th>
<th>Not affected</th>
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<tr>
<td>CVE-2018-3639 (Speculative Store Bypass):</td>
<td>Mitigation: Speculative Store Bypass disabled via prctl and seccomp</td>
</tr>
<tr>
<td>CVE-2017-5753 (Spectre variant 1):</td>
<td>Mitigation: usercopy/swapgs barriers and __user pointer sanitation</td>
</tr>
<tr>
<td>CVE-2017-5715 (Spectre variant 2):</td>
<td>Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling</td>
</tr>
</tbody>
</table>

**run-level 3 Jun 6 10:28 last=5**

**SPEC is set to:** /mnt/ramdisk/cpu2017-ic19.1u1

**Filesystem** | **Type** | **Size** | **Used** | **Avail** | **Use%** | **Mounted on**
--- | --- | --- | --- | --- | --- | ---
tmpfs | tmpfs | 150G | 4.3G | 146G | 3% | /mnt/ramdisk

**From /sys/devices/virtual/dmi/id**

- **BIOS:** Dell Inc. 2.7.7 05/04/2020
- **Vendor:** Dell Inc.
- **Product:** PowerEdge R640
- **Product Family:** PowerEdge
- **Serial:** FPFXCH2

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SM BIOS" standard.

**Memory:**

- 6x 002C069D002C 18ASF2G72PDZ-2G9E1 16 GB 2 rank 2933
- 4x 00AD00B300AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933
- 2x 00AD063200AD HMA82GR7CJR8N-WM 16 GB 2 rank 2933
- 12x Not Specified Not Specified

(End of data from sysinfo program)

## Compiler Version Notes

```
C                  | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                      | 544.nab_r(base, peak)
```

**Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1**

**NextGen Build 20200304**

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```
C++                 | 508.namd_r(base, peak) 510.parest_r(base, peak)
```
Dell Inc.  SPEC CPU®2017 Floating Point Rate Result

PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)  SPECCore®2017_fp_base = 111
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CPU2017 License: 55  Test Date:  Jun-2020
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Compiler Version Notes (Continued)

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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C++, C  | 511.povray_r(base) 526.blender_r(base, peak)

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NextGen Build 20200304
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C++, C  | 511.povray_r(peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
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C++, C  | 511.povray_r(base) 526.blender_r(base, peak)

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C++, C  | 511.povray_r(peak)

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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306

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Compiler Version Notes (Continued)

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==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
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NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
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Compiler Version Notes (Continued)

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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)

CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Jun-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs

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### Dell Inc.

**PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)**

<table>
<thead>
<tr>
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**SPEC CPU®2017 Floating Point Rate Result**

| SPECrate®2017_fp_base = 111 | SPECrate®2017_fp_peak = 116 |

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### Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
- `align array32byte -auto -mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using both C and C++:
- `-m64 -qnextgen -std=c11`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse`
- `-funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64 -qnextgen -std=c11`
- `-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse`
- `-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div`
- `-qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs`
- `-align array32byte -auto -mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

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### Peak Compiler Invocation

**C benchmarks:**
- `icc`

**C++ benchmarks:**
- `icpc`

**Fortran benchmarks:**
- `ifort`

Benchmarks using both Fortran and C:
- `ifort icc`

Benchmarks using both C and C++:
- `icpc icc`

Benchmarks using Fortran, C, and C++:
- `icpc icc ifort`
Dell Inc.

PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)

**SPECrate®2017_fp_peak = 116**

**SPECrate®2017_fp_base = 111**

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### Peak Portability Flags

Same as Base Portability Flags

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### Peak Optimization Flags

**C benchmarks:**

- 519.lbm_r: basepeak = yes
- 538.imagick_r: basepeak = yes
- 544.nab_r: basepeak = yes

**C++ benchmarks:**

- 508.namd_r: basepeak = yes

**Fortran benchmarks:**


- 549.fotonik3d_r: basepeak = yes

- 554.roms_r: Same as 503.bwaves_r

**Benchmarks using both Fortran and C:**


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Dell Inc.  

PowerEdge R640 (Intel Xeon Gold 6208U, 2.90 GHz)  

SPEC CPU®2017 Floating Point Rate Result  

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SPECrate®2017_fp_base = 111  
SPECrate®2017_fp_peak = 116  

Peak Optimization Flags (Continued)  

521.wrf_r (continued):  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc  

527.cam4_r: basepeak = yes  

Benchmarks using both C and C++:  

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3  
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-multiple-gather-scatter-by-shuffles  
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc  

526.blender_r: basepeak = yes  

Benchmarks using Fortran, C, and C++:  

507.cactuBSSN_r: basepeak = yes  

The flags files that were used to format this result can be browsed at  

You can also download the XML flags sources by saving the following links:  
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml  

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.  

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