



# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

GIGA-BYTE TECHNOLOGY CO., LTD.

SPECrate®2017\_int\_base = 300

R272-P30-00 (Ampere Altra Q80-33 3.0 GHz)

SPECrate®2017\_int\_peak = 305

CPU2017 License: 9082

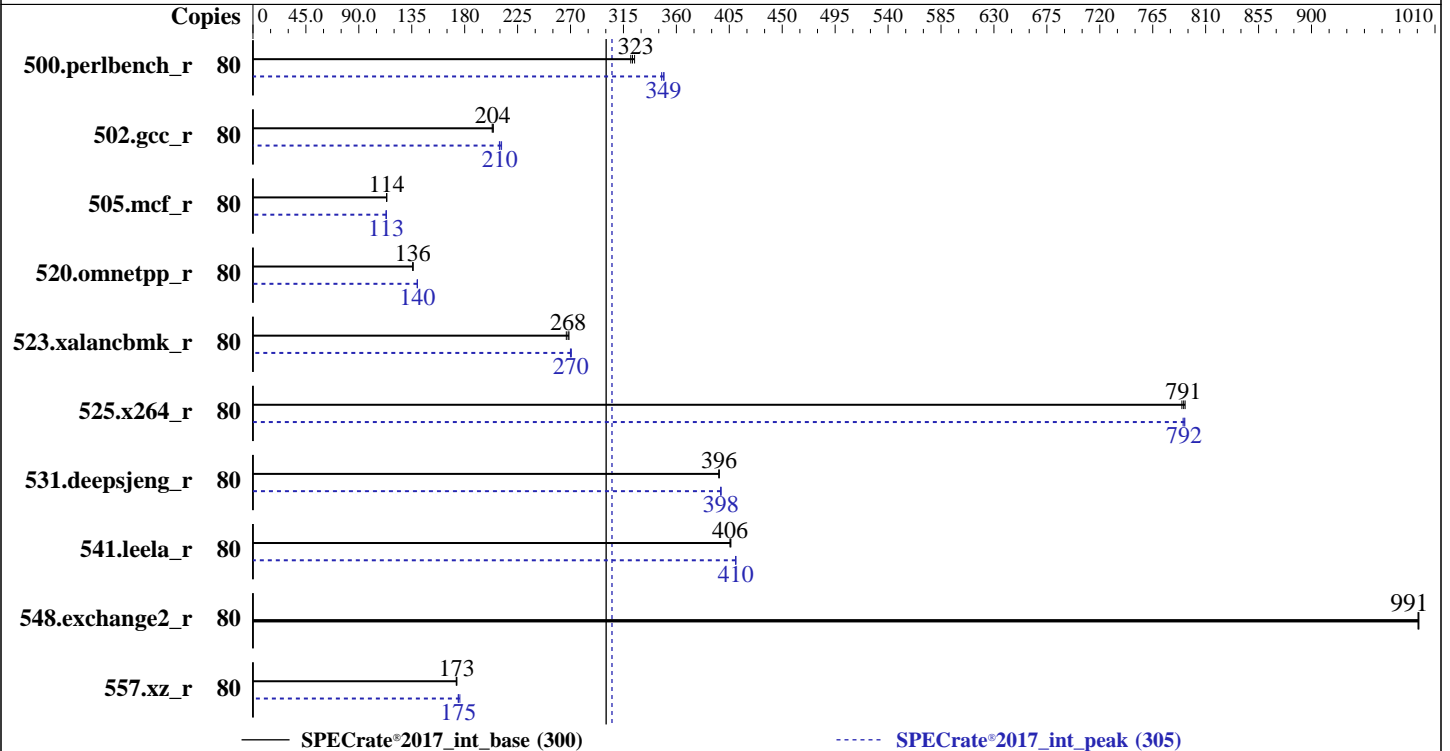
Test Date: Jul-2021

Test Sponsor: GIGA-BYTE TECHNOLOGY CO., LTD.

Hardware Availability: Jun-2021

Tested by: GIGA-BYTE TECHNOLOGY CO., LTD.

Software Availability: Jun-2021



## Hardware

CPU Name: Ampere Altra Q80-33  
 Max MHz: 3300  
 Nominal: 3000  
 Enabled: 80 cores, 1 chip  
 Orderable: 1 chips  
 Cache L1: 64 KB I + 64 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 32 MB I+D on chip per chip  
 Other: None  
 Memory: 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)  
 Storage: 819 GB, NVME, M.2, PCIe Gen 3  
 Other: None

## Software

OS: CentOS Linux release 8.4.2105  
 4.18.0-305.7.1.el8\_4.aarch64  
 Compiler: C/C++/Fortran: Version 10.2.1 of Ampere GCC  
 Parallel: No  
 Firmware: Version F16e released Jun-2021  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: Jemalloc memory allocator library v5.2.1  
 Power Management: OS set to prefer performance at the cost of additional power usage



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	80	<b>395</b>	<b>323</b>	396	321	393	324	80	367	347	364	350	<b>365</b>	<b>349</b>
502.gcc_r	80	557	203	554	204	<b>555</b>	<b>204</b>	80	536	211	<b>539</b>	<b>210</b>	541	210
505.mcf_r	80	1137	114	1138	114	<b>1137</b>	<b>114</b>	80	1141	113	1140	113	<b>1141</b>	<b>113</b>
520.omnetpp_r	80	<b>772</b>	<b>136</b>	771	136	773	136	80	752	140	<b>751</b>	<b>140</b>	751	140
523.xalancbmk_r	80	317	266	<b>315</b>	<b>268</b>	314	269	80	<b>313</b>	<b>270</b>	312	271	313	270
525.x264_r	80	177	790	<b>177</b>	<b>791</b>	177	793	80	177	791	177	792	<b>177</b>	<b>792</b>
531.deepsjeng_r	80	231	396	<b>231</b>	<b>396</b>	231	396	80	230	398	230	398	<b>230</b>	<b>398</b>
541.leela_r	80	326	406	<b>326</b>	<b>406</b>	327	406	80	323	410	<b>323</b>	<b>410</b>	323	411
548.exchange2_r	80	211	991	212	991	<b>211</b>	<b>991</b>	80	211	991	212	991	<b>211</b>	<b>991</b>
557.xz_r	80	499	173	<b>499</b>	<b>173</b>	500	173	80	495	175	491	176	<b>495</b>	<b>175</b>

SPECrate®2017\_int\_base = **300**

SPECrate®2017\_int\_peak = **305**

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

## Compiler Notes

Binaries were compiled on a system with 2x Ampere Altra Q80-33 CPU chips + 256 GB memory using CentOS 8.4

Ampere GCC 10.2.1 is available via <https://github.com/AmpereComputing/ampere-gcc/releases>

## Submit Notes

The config file option 'submit' was used.  
'numactl' was used to bind copies to the cores.

## Operating System Notes

'ulimit -s unlimited' was used to set environment stack size  
Set dirty\_ratio=8 to limit dirty cache to 8% of memory  
i.e. echo 8 | sudo tee /proc/sys/vm/dirty\_ratio  
Set swappiness=1 to swap only if necessary  
i.e. echo 1 | sudo tee /proc/sys/vm/swappiness  
Set zone\_reclaim\_mode=1 to free local node memory and avoid remote memory  
i.e. echo 1 | sudo tee /proc/sys/vm/zone\_reclaim\_mode  
Set drop\_caches=3 to reset caches before invoking runcpu  
i.e. echo 3 | sudo tee /proc/sys/vm/drop\_caches  
Set numa\_balancing=0 to disable automatic numa balancing  
i.e. echo 0 | sudo tee /proc/sys/kernel/numa\_balancing  
Switch off all ktune and tuned settings  
i.e. sudo tuned-adm off

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## Operating System Notes (Continued)

Transparent huge pages set to 'never'  
i.e. `sudo bash -c "echo never > /sys/kernel/mm/transparent_hugepage/enabled"`

`runcpu` command invoked through `numactl` i.e.  
`numactl --interleave=0-3 run intrate`

## Environment Variables Notes

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

```
LD_LIBRARY_PATH =  
"/home/ampctest/ampere_spec2017/jemalloc/install/lib:/home/ampctest/ampere  
_spec2017/gcc/install/lib64:/home/ampctest/ampere_spec2017/gcc/install/l  
ib:/home/ampere_spec2017/gcc/install/lib64:/home/ampere_spec2017/jemall  
oc/install/lib:"
```

## General Notes

Jemalloc v5.2.1 is available via  
<https://github.com/jemalloc/jemalloc/releases/download/5.2.1/jemalloc-5.2.1.tar.bz2>  
It was built on CentOS 8.3 using Version 10.2.1 of Ampere GCC with configure options  
`--prefix=/home/ampctest/jemalloc/install --with-lg-quantum=3`

- NA: 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.
- 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.
- NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

## Platform Notes

BIOS settings:

Chipset > ANC Mode > Quadrant

Systeminfo program `/home/ampere_spec2017/spec2017/bin/systeminfo`  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on localhost.localdomain Mon Jul 5 09:37:34 2021

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#systeminfo>

From `/proc/cpuinfo`

\*

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## Platform Notes (Continued)

\* Did not identify cpu model. If you would  
 \* like to write your own sysinfo program, see  
 \* [www.spec.org/cpu2017/config.html#sysinfo](http://www.spec.org/cpu2017/config.html#sysinfo)  
 \*  
 \*  
 \* 0 "physical id" tags found. Perhaps this is an older system,  
 \* or a virtualized system. Not attempting to guess how to  
 \* count chips/cores for this system.  
 \*  
 80 "processors"  
 cores, siblings (Caution: counting these is hw and system dependent. The following  
 excerpts from /proc/cpuinfo might not be reliable. Use with caution.)

From lscpu:

```

Architecture:      aarch64
Byte Order:        Little Endian
CPU(s):            80
On-line CPU(s) list: 0-79
Thread(s) per core: 1
Core(s) per socket: 80
Socket(s):         1
NUMA node(s):     4
Vendor ID:         ARM
BIOS Vendor ID:   Ampere(R)
Model:             1
Model name:        Neoverse-N1
BIOS Model name:   Ampere(R) Altra(R) Processor
Stepping:          r3p1
CPU max MHz:       3300.0000
CPU min MHz:       1000.0000
BogoMIPS:          50.00
L1d cache:         64K
L1i cache:         64K
L2 cache:          1024K
NUMA node0 CPU(s): 0-19
NUMA node1 CPU(s): 20-39
NUMA node2 CPU(s): 40-59
NUMA node3 CPU(s): 60-79
Flags:              fp asimd evtstrm aes pmull sha1 sha2 crc32 atomics fphp asimdhp
cpuid asimdrdm lrcpc dcpop asimddp ssbs

```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```

available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
node 0 size: 64522 MB
node 0 free: 63396 MB

```

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## Platform Notes (Continued)

```

node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
node 1 size: 65420 MB
node 1 free: 64530 MB
node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
node 2 size: 65459 MB
node 2 free: 64734 MB
node 3 cpus: 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
node 3 size: 65426 MB
node 3 free: 64871 MB
node distances:
node  0  1  2  3
  0: 10 11 11 12
  1: 11 10 12 11
  2: 11 12 10 11
  3: 12 11 11 10

```

```

From /proc/meminfo
MemTotal:      267088384 kB
HugePages_Total:      0
Hugepagesize:    524288 kB

```

```

/sbin/tuned-adm active
No current active profile.

```

```

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
performance

```

```

From /etc/*release* /etc/*version*
centos-release: CentOS Linux release 8.4.2105
centos-release-upstream: Derived from Red Hat Enterprise Linux 8.4
os-release:
NAME="CentOS Linux"
VERSION="8"
ID="centos"
ID_LIKE="rhel fedora"
VERSION_ID="8"
PLATFORM_ID="platform:el8"
PRETTY_NAME="CentOS Linux 8"
ANSI_COLOR="0;31"
redhat-release: CentOS Linux release 8.4.2105
system-release: CentOS Linux release 8.4.2105
system-release-cpe: cpe:/o:centos:centos:8

```

```

uname -a:
Linux localhost.localdomain 4.18.0-305.7.1.el8_4.aarch64 #1 SMP Tue Jun 29 21:32:00
UTC 2021 aarch64 aarch64 aarch64 GNU/Linux

```

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## Platform Notes (Continued)

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):	Not affected
CVE-2018-3620 (L1 Terminal Fault):	Not affected
Microarchitectural Data Sampling:	Not affected
CVE-2017-5754 (Meltdown):	Not affected
CVE-2018-3639 (Speculative Store Bypass):	Mitigation: Speculative Store Bypass disabled via prctl
CVE-2017-5753 (Spectre variant 1):	Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Not affected
CVE-2020-0543 (Special Register Buffer Data Sampling):	Not affected
CVE-2019-11135 (TSX Asynchronous Abort):	Not affected

run-level 3 Jul 5 17:29

SPEC is set to: /home/ampere\_spec2017/spec2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/cl-home	xfs	819G	43G	776G	6%	/home

From /sys/devices/virtual/dmi/id

```
Vendor:      GIGABYTE
Product:     R272-P30-JG
Product Family: Server
Serial:      01234567890123456789AB
```

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 SMBIOS" standard.

Memory: 8x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

```
BIOS:
  BIOS Vendor:      GIGABYTE
  BIOS Version:     F16e (SCP: 1.06.20210615)
  BIOS Date:        06/30/2021
  BIOS Revision:    5.15
  Firmware Revision: 1.6
```

(End of data from sysinfo program)

## Compiler Version Notes

```
=====
C      | 500.perlbench_r(base, peak) 502.gcc_r(base, peak) 505.mcf_r(base,
```

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## Compiler Version Notes (Continued)

| peak) 525.x264\_r(base, peak) 557.xz\_r(base, peak)

-----  
gcc (Ampere Computing Build 11923 20201215) 10.2.1 20201216  
Copyright (C) 2020 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
-----

=====  
C++ | 520.omnetpp\_r(base, peak) 523.xalancbmk\_r(base, peak)  
531.deepsjeng\_r(base, peak) 541.leela\_r(base, peak)

g++ (Ampere Computing Build 11923 20201215) 10.2.1 20201216  
Copyright (C) 2020 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
-----

=====  
Fortran | 548.exchange2\_r(base, peak)  
-----

GNU Fortran (Ampere Computing Build 11923 20201215) 10.2.1 20201216  
Copyright (C) 2020 Free Software Foundation, Inc.  
This is free software; see the source for copying conditions. There is NO  
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.  
-----

## Base Compiler Invocation

C benchmarks:

gcc

C++ benchmarks:

g++

Fortran benchmarks:

gfortran

## Base Portability Flags

500.perlbench\_r: -DSPEC\_LINUX\_AARCH64 -DSPEC\_LP64

502.gcc\_r: -DSPEC\_LP64

505.mcf\_r: -DSPEC\_LP64

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## Base Portability Flags (Continued)

```
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
```

## Base Optimization Flags

C benchmarks:

```
-mabi=lp64 -std=c99 -L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96 --param max-inline-insns-auto=64
--param inline-unit-growth=96 -fgnu89-inline -ljemalloc
```

C++ benchmarks:

```
-mabi=lp64 -std=c++03 -L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=256 --param max-inline-insns-auto=128
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

Fortran benchmarks:

```
-mabi=lp64 -L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g -O3
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param ipa-cp-eval-threshold=1 --param ipa-cp-unit-growth=80
--param ipa-cp-max-recursive-depth=8 -fno-inline-functions-called-once
-fstack-arrays -flto-partition=one -ljemalloc
```

## Base Other Flags

C benchmarks:

```
-fcommon -Wl,-Map,mapfile
```

C++ benchmarks:

```
-Wl,-Map,mapfile
```

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## Base Other Flags (Continued)

Fortran benchmarks:  
-Wl, -Map, mapfile

## Peak Compiler Invocation

C benchmarks:  
gcc

C++ benchmarks:  
g++

Fortran benchmarks:  
gfortran

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -mabi=lp64 -std=c99
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -fno-strict-aliasing
-fno-unsafe-math-optimizations -fno-finite-math-only
-ljemalloc
```

```
502.gcc_r: -mabi=lp64 -std=c99
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib
```

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## Peak Optimization Flags (Continued)

502.gcc\_r (continued):

```
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -fno-strict-aliasing
-fgnu89-inline -ljemalloc
```

505.mcf\_r: -mabi=lp64 -std=c99

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64
-L/home/ampptest/ampere_spec2017/gcc/install/lib
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -fno-strict-aliasing
-ljemalloc
```

525.x264\_r: -mabi=lp64 -std=c99

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64
-L/home/ampptest/ampere_spec2017/gcc/install/lib
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib -g
-Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -ljemalloc
```

557.xz\_r: -mabi=lp64 -std=c99

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64
-L/home/ampptest/ampere_spec2017/gcc/install/lib
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=96
--param max-inline-insns-auto=64
--param inline-unit-growth=96 -ljemalloc
```

C++ benchmarks:

520.omnetpp\_r: -mabi=lp64 -std=c++03

```
-L/home/ampptest/ampere_spec2017/gcc/install/lib64
-L/home/ampptest/ampere_spec2017/gcc/install/lib
-L/home/ampptest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-n1 -funroll-loops -flto=32
```

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## Peak Optimization Flags (Continued)

520.omnetpp\_r (continued):

```
--param early-inlining-insns=256
--param max-inline-insns-auto=128
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

523.xalancbmk\_r: Same as 520.omnetpp\_r

```
531.deepsjeng_r: -mabi=lp64 -std=c++03
-L/home/ampctest/ampere_spec2017/gcc/install/lib64
-L/home/ampctest/ampere_spec2017/gcc/install/lib
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib -g
-Ofast -mcpu=neoverse-n1 -funroll-loops -flto=32
--param early-inlining-insns=256
--param max-inline-insns-auto=128
--param inline-unit-growth=256 -ffinite-loops -ljemalloc
```

541.leela\_r: Same as 520.omnetpp\_r

Fortran benchmarks:

548.exchange2\_r: basepeak = yes

## Peak Other Flags

C benchmarks (except as noted below):

```
-Wl,-Map,mapfile
```

525.x264\_r: -fcommon -Wl,-Map,mapfile

557.xz\_r: -w -Wl,-Map,mapfile

C++ benchmarks:

```
-Wl,-Map,mapfile
```

Fortran benchmarks:

```
-Wl,-Map,mapfile
```

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

<http://www.spec.org/cpu2017/flags/gcc.2021-07-21.html>

<http://www.spec.org/cpu2017/flags/GIGA-BYTE-platform-settings-Altra-rev.2.html>



# SPEC CPU<sup>®</sup>2017 Integer Rate Result

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SPECrate<sup>®</sup>2017\_int\_base = 300

R272-P30-00 (Ampere Altra Q80-33 3.0 GHz)

SPECrate<sup>®</sup>2017\_int\_peak = 305

**CPU2017 License:** 9082

**Test Date:** Jul-2021

**Test Sponsor:** GIGA-BYTE TECHNOLOGY CO., LTD.

**Hardware Availability:** Jun-2021

**Tested by:** GIGA-BYTE TECHNOLOGY CO., LTD.

**Software Availability:** Jun-2021

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/gcc.2021-07-21.xml>

<http://www.spec.org/cpu2017/flags/GIGA-BYTE-platform-settings-Altra-rev.2.xml>

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