



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

GIGA-BYTE TECHNOLOGY CO., LTD.

SPECrate®2017_int_base = 301

E252-P30-00 (Ampere Altra Q80-33 3.0 GHz)

SPECrate®2017_int_peak = 306

CPU2017 License: 9082

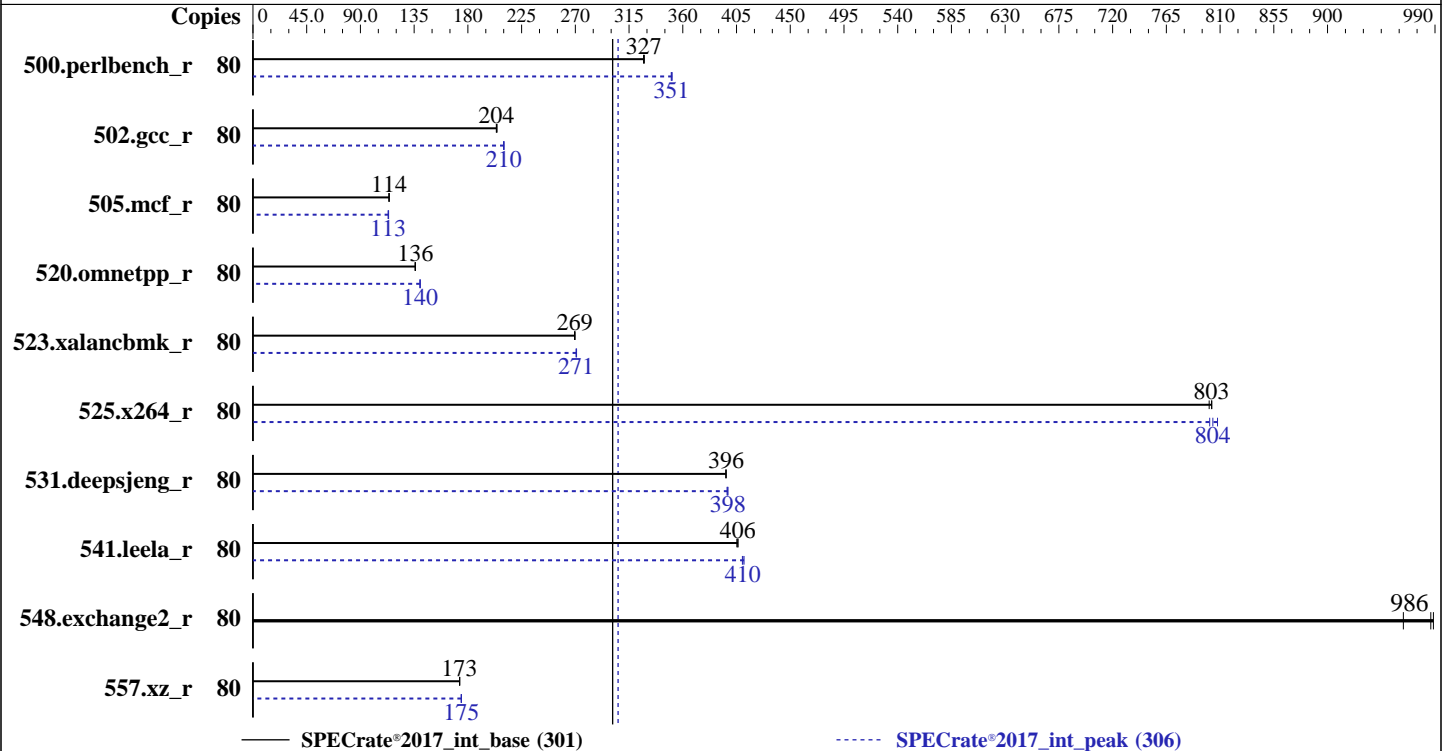
Test Date: Feb-2021

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

Hardware Availability: Mar-2021

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

Software Availability: Dec-2020



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: 811 GB, NVME, M.2, PCIe Gen3
 Other: None

Software

OS: CentOS Linux release 8.3.2011
 4.18.0-240.1.1.el8_3.aarch64
 Compiler: C/C++/Fortran: Version 10.2.1 of Ampere GCC
 Parallel: No
 Firmware: Version F05 released Jan-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	389	327	389	328	389	327	80	363	351	363	351	364	350
502.gcc_r	80	556	204	554	204	555	204	80	539	210	539	210	540	210
505.mcf_r	80	1133	114	1134	114	1135	114	80	1138	114	1141	113	1141	113
520.omnetpp_r	80	773	136	772	136	771	136	80	750	140	749	140	750	140
523.xalancbmk_r	80	314	269	313	270	314	269	80	312	271	312	271	312	271
525.x264_r	80	174	803	175	801	174	803	80	175	801	174	804	173	808
531.deepsjeng_r	80	231	396	231	396	231	396	80	231	397	231	398	231	398
541.leela_r	80	327	405	326	406	326	406	80	322	411	323	410	323	410
548.exchange2_r	80	212	989	212	986	218	964	80	212	989	212	986	218	964
557.xz_r	80	499	173	499	173	499	173	80	495	175	495	174	495	175

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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 8.3

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 runcpu`

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/lib:/home/ampere_spec2017/gcc/install/lib64:/home/ampere_spec2017/jemalloc/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 > Set to Quadrant

Sysinfo program `/home/ampere_spec2017/spec2017/bin/sysinfo`
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost.localdomain Thu Feb 18 11:32:15 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#sysinfo>

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
- *
- *
- * 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
Model:            1
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: 64513 MB
node 0 free: 63887 MB
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: 65459 MB
node 1 free: 64983 MB

```

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Platform Notes (Continued)

```

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: 65122 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: 65424 MB
node 3 free: 64415 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:          267117312 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

```

```

/usr/bin/lsb_release -d
CentOS Linux release 8.3.2011

```

```

From /etc/*release* /etc/*version*
centos-release: CentOS Linux release 8.3.2011
centos-release-upstream: Derived from Red Hat Enterprise Linux 8.3
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 8.3.2011
system-release: CentOS Linux release 8.3.2011
system-release-cpe: cpe:/o:centos:centos:8

```

```

uname -a:
Linux localhost.localdomain 4.18.0-240.1.1.el8_3.aarch64 #1 SMP Thu Nov 19 22:13:39
UTC 2020 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 Feb 18 10:42

SPEC is set to: /home/ampere_spec2017/spec2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/cl-home	xfs	811G	119G	692G	15%	/home

From /sys/devices/virtual/dmi/id

```
Vendor: GIGABYTE
Product: E252-P30-00
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:

```
1x Array 1 Manufacturer 10 Array 1 Part Number 10
1x Array 1 Manufacturer 12 Array 1 Part Number 12
1x Array 1 Manufacturer 14 Array 1 Part Number 14
1x Array 1 Manufacturer 16 Array 1 Part Number 16
1x Array 1 Manufacturer 2 Array 1 Part Number 2
1x Array 1 Manufacturer 4 Array 1 Part Number 4
1x Array 1 Manufacturer 6 Array 1 Part Number 6
1x Array 1 Manufacturer 8 Array 1 Part Number 8
8x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200
```

BIOS:

```
BIOS Vendor: GIGABYTE
BIOS Version: F05
BIOS Date: 01/19/2021
BIOS Revision: 5.15
Firmware Revision: 1.3
```

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Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

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



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Base Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_AARCH64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
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
```

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Base Other Flags (Continued)

C++ benchmarks:

-Wl,-Map,mapfile

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
```

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Peak Optimization Flags (Continued)

```
502.gcc_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
-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
```

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Peak Optimization Flags (Continued)

520.omnetpp_r (continued):

```
-L/home/ampctest/ampere_spec2017/jemalloc/install/lib
-fprofile-generate -fprofile-use -g -Ofast
-mcpu=neoverse-nl -funroll-loops -flto=32
--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-nl -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[®]2017 Integer Rate Result

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SPECrate[®]2017_int_base = 301

E252-P30-00 (Ampere Altra Q80-33 3.0 GHz)

SPECrate[®]2017_int_peak = 306

CPU2017 License: 9082

Test Date: Feb-2021

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

Hardware Availability: Mar-2021

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

Software Availability: Dec-2020

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

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