## Lenovo Global Technology

### ThinkSystem SE360 V2
(2.00 GHz, Intel Xeon D-2775TE)

#### SPECrate®2017 fp_base = 117

#### SPECrate®2017 fp_peak = 123

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### Hardware

- **CPU Name:** Intel Xeon D-2775TE
- **Max MHz:** 3100
- **Nominal:** 2000
- **Enabled:** 16 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chip
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **Cache L2:** 1.25 MB I+D on chip per core
- **Cache L3:** 25 MB I+D on chip per chip
- **Orderable:** None
- **Memory:** 128 GB (4 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)
- **Other:** None
- **Storage:** 1 x 960 GB M.2 NVME SSD
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)
- **Kernel:** 5.14.21-150400.22-default
- **Compiler:** C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
- **Parallel:** No
- **Firmware:** Lenovo BIOS Version IYE105O 2.10 released Oct-2023
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS and OS set to balance power and performance
---

**Lenovo Global Technology**

ThinkSystem SE360 V2  (2.00 GHz, Intel Xeon D-2775TE)

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**SPEC CPU®2017 Floating Point Rate Result**

**Copy of SPEC CPU®2017 Floating Point Rate Result**

Lenovo Global Technology

ThinkSystem SE360 V2

(2.00 GHz, Intel Xeon D-2775TE)

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**Results Table**

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**Submit Notes**

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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 = "/home/cpu2017-1.1.9-ic2023.0-2/lib/intel64:/home/cpu2017-1.1.9-ic2023.0-2/je5.0.1-64"
MALLOC_CONF = "retain:true"
```

---

**General Notes**

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM

Memory using Red Hat Enterprise Linux 8.4

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
```

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)

(Continued on next page)
General Notes (Continued)

is mitigated in the system as tested and documented.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

Sysinfo program /home/cpu2017-1.1.9-ic2023.0-2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Mon Oct 16 17:32:32 2023

SUT (System Under Test) info as seen by some common utilities.

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1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numacli --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysctl
16. /sys/kernel/mm/transparent_hugepage
17. /sys/kernel/mm/transparent_hugepage/khugepaged
18. OS release
19. Disk information
20. /sys/devices/virtual/dmi/id
21. dmidecode
22. BIOS

1. uname -a
Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
x86_64 x86_64 x86_64 GNU/Linux

2. w
17:32:32 up 0 min, 1 user, load average: 0.57, 0.19, 0.07
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root tty1 - 17:32 7.00s 1.49s 0.01s -bash

3. Username
From environment variable $USER: root

4. ulimit -a
core file size (blocks, -c) unlimited

(Continued on next page)
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
-bash
-bash
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --c
ic2023.0-lin-core-avx512-rate-20221201.cfg --define smt-on --define cores=16 --define physicalfirst
--define no-nrma --tune base,peak -o all --define drop_caches fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --configfile
ic2023.0-lin-core-avx512-rate-20221201.cfg --define smt-on --define cores=16 --define physicalfirst
--define no-nrma --tune base,peak --output_format all --define drop_caches --nopower --runmode rate --tune
base:peak --size refrate fprate --nopreenv --note-preenv --logfile
SPEC/tmp/CPU2017.007/templogs/preenv.fprate.007.0.log --lognum 007.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-ic2023.0-2

6. /proc/cpuinfo

  model name : Intel(R) Xeon(R) D-2775TE CPU @ 2.00GHz
  vendor_id : GenuineIntel
  cpu family : 6
  model : 108
  stepping : 1
  microcode : 0x1000230
  bug(s) : spectre_v1 spectre_v2 spec_store_bypass swapgs
  cpu cores : 16
  siblings : 32
  1 physical id (chips)
  32 processors (hardware threads)
  physical id 0: core ids 0-15
  physical id 0: apicids 0-31
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems. Use the above data carefully.

7. lscpu

From lscpu from util-linux 2.37.2:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 46 bits physical, 57 bits virtual
Byte Order: Little Endian

(Continued on next page)
Lenovo Global Technology
ThinkSystem SE360 V2
(2.00 GHz, Intel Xeon D-2775TE)

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECrate®2017_fp_base = 117
SPECrate®2017_fp_peak = 123

Test Date: Oct-2023
Hardware Availability: Jul-2023
Software Availability: Dec-2022

Platform Notes (Continued)

CPU(s): 32
On-line CPU(s) list: 0-31
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) D-2775TE CPU @ 2.00GHz
CPU family: 6
Model: 108
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 1
Stepping: 1
BogoMIPS: 4000.00

Flags:
fpu vme de pse tsc msr pae mce cmov pat pse36
clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelbg rdtscp
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology
nonstop_tsc cpuid aperffperf tsc_known_freq pni pclmulqdq dtes64 monitor
des cpl vmx smx est tm ts ms fmar28paralleled cx16 xtpr pdcm pcid dca
sse4_1 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
lahf_lm abm 3dnowprefetch cpuid_fault ebcd_l2t 1invpcid_single ssbd ibrs
ibpb stibp ibrs_enhanced tpr_shadow vmmi flexpriority ept vpid ept_ad
fsgabase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid l3t cmqm
avx512f avx512dq rdseed adx smap axby fma clflushopt clwb intel_pt
avx512cd sha_level1 axv512bw avx512vl xsaveopt xsavec xgetbv1 xsave

cqm� l1l cqm_mib_total cqm_mib_local split_lock_detect wbnoinvd

Virtualization: VT-x
L1d cache: 768 KiB (16 instances)
L1i cache: 512 KiB (16 instances)
L2 cache: 20 MiB (16 instances)
L3 cache: 25 MiB (1 instance)
NUMA node(s): 1
NUMA node 0 CPU(s): 0-31
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 48K 768K 12 Data 1 64 1 64
L1i 32K 512K 8 Instruction 1 64 1 64
L2 1.3M 20M 20 Unified 2 1024 1 64
L3 25M 25M 20 Unified 3 20480 1 64

------------------------------------------------------------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 1 nodes (0)
node 0 cpus: 0-31
node 0 size: 128402 MB
node 0 free: 124601 MB
node distances:
node 0
0: 10

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Lenovo Global Technology

ThinkSystem SE360 V2 (2.00 GHz, Intel Xeon D-2775TE)

SPEC CPU® 2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology

SPECrater® 2017_fp_base = 117
SPECrater® 2017_fp_peak = 123

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Oct-2023
Tested by: Lenovo Global Technology
Hardware Availability: Jul-2023
Software Availability: Dec-2022

Platform Notes (Continued)

9. /proc/meminfo
   MemTotal: 131484056 kB

10. who -r
    run-level 3 Oct 16 17:32

11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
    Default Target Status
    multi-user running

12. Services, from systemctl list-unit-files
    STATE UNIT FILES
    enabled YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ haveged irqbalance iscsi
    issue-generator kbdsettings lvm2-monitor nscd nvmefc-boot-connections postfix
    purge-kernels rollback rsyslog smartd sshd wicked wicked-da auto4 wickedd-hcp6 wickedd-hcp7 wickedd-nanny
    enabled-runtime systemd-remount-fs
    disabled autofs autostart-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
    chrony console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
    firewall gsd grub2-prepareipmi ipmi ipmi-dev iscsi-init iscsi-target iscsiui
    issue-add ssh-keys kexec-load lvmmask man-db-create multipathd nfs nfs-bfs blkmap nmb ntp-wait
    ntpd nvmf-autoconnect rdisc rcptbind rpmconfcheck rsyslog serial-getty@
    smartd_generate_opts smb snmpd snmptrapd systemd-boot-check-no-failures
    systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd
    generated ntp_sync
    indirect wickedd

13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
    root=UUID=3b09241f-dfe9-4f77-a91b-5c9e94738f47
    splash=silent
    mitigations=auto
    quiet
    security=apparmor

14. cpupower_frequency-info
    analyzing CPU 0:
    Unable to determine current policy
    boost state support:
    Supported: yes
    Active: yes

15. sysctl
    kernel.numa_balancing 0
    kernel.randomize_va_space 2
    vm.compaction_proactiveness 20
    vm.dirty_background_bytes 0
    vm.dirty_background_ratio 10
    vm.dirty_bytes 0
    vm.dirty_expire_centisecs 3000
    vm.dirty_ratio 20
    vm.dirty_writeback_centisecs 500

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology
ThinkSystem SE360 V2
(2.00 GHz, Intel Xeon D-2775TE)

SPECrate®2017_fp_base = 117
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Platform Notes (Continued)

vm.dirtytime_expire_seconds     43200
vm.extrfrag_threshold           500
vm.min_unmapped_ratio           1
vm.nr_hugepages                 0
vm.nr_hugepages_mempolicy       0
vm.nr_overcommit_hugepages      0
vm.swappiness                   60
vm.watermark_boost_factor       15000
vm.watermark_scale_factor       10
vm.zone_reclaim_mode            0

16. /sys/kernel/mm/transparent_hugepage
   defrag always defer defer+madvice [madvice] never
   enabled [always] madvice never
   hpage_pmd_size 2097152
   shmem_enabled always within_size advise [never] deny force

17. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs 60000
   defrag 1
   max_ptes_none 511
   max_ptes_shared 256
   max_ptes_swap 64
   pages_to_scan 4096
   scan_sleep_millisecs 10000

18. OS release
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP4

19. Disk information
   SPEC is set to: /home/cpu2017-1.1.9-ic2023.0-2
   /dev/nvme0n1p3 xfs 893G  32G  861G   4% /

20. /sys/devices/virtual/dmi/id
    Vendor: Lenovo
    Product: ThinkEdge SE360 V2 CPU Planar
    Product Family: ThinkSystem
    Serial: 1234567890

21. dmidecode
    Additional information from dmidecode 3.2 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:
    4x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933

22. BIOS
    (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor: Lenovo

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

- **BIOS Version**: IYE1050-2.10
- **BIOS Date**: 10/04/2023
- **BIOS Revision**: 2.10
- **Firmware Revision**: 2.10

**Compiler Version Notes**

```
<table>
<thead>
<tr>
<th>C</th>
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Lenovo Global Technology
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SPECrate®2017_fp_base = 117
SPECrate®2017_fp_peak = 123

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Oct-2023
Hardware Availability: Jul-2023
Software Availability: Dec-2022

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx

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.llvm_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:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)
Lenovo Global Technology
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SPEC CPU®2017 Floating Point Rate Result
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SPEC Newsletter

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Base Optimization Flags (Continued)

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

(Continued on next page)
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Peak Compiler Invocation (Continued)

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes
544.nab_r: -w -std=c11 -m64 -Wl, -z, mdefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int
-qopt-zmm-usage=high -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
508.namd_r: basepeak = yes
510.parest_r: -w -std=c++14 -m64 -Wl, -z, mdefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
503.bwaves_r: basepeak = yes
549.fotonik3d_r: basepeak = yes
554.roms_r: -w -m64 -Wl, -z, mdefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs

(Continued on next page)
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Peak Optimization Flags (Continued)

554.roms_r (continued):
-align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:

521.wrf_r: -w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int
-nostandard-realloc-lhs -align array32byte -auto
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-AA.xml

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Tested with SPEC CPU®2017 v1.1.9 on 2023-10-16 05:32:31-0400.
Report generated on 2023-11-07 18:44:05 by CPU2017 PDF formatter v6716.
Originally published on 2023-11-07.