

TSDSUTIL Quick Reference

Version 1.0.1 Assumes familiarity with IBM System/370 assembler. Syntax: [] optional · / alternative · ... repetition.

1. TSDSUTIL Program Rules

Data/code — All data definitions precede **START**. After **START**, no new data definitions except literals.

Minimum program — **START** , ... **END** ,

Code base — None. TSDSUTIL does not assemble machine code; a base register for **CODE** is neither required nor supported.

USING — DSECTs only. **DROP Rn[,Rn...]** removes active DSECT **USING** associations (R1–R15).

Addressing — Symbolic address or S/370 D(B) / D(X,B) where allowed.

Source — * in column 1 = comment; trailing + = continuation; continuation inserts no punctuation (required commas remain explicit); adjacent quoted fragments concatenate; symbols are case-insensitive.

Labels — 1–63 chars; first A–Z @ \$ # _; remaining may also contain digits; globally unique.

Character set — EBCDIC CP037 default.

Addressing model — 24-bit virtual addresses; 32-bit GPRs; unaligned operands generally permitted.

Storage — LOWMEM 000000–000FFF read-only; **DATA** starts 001000; **CODE** F00000–FFFFFF, first instruction F00002.

Quoted text: Single (') and double (") quotes are interchangeable delimiters. The other quote character may appear literally inside the string. Double the delimiter to include it literally; e.g. " '", ' "', ' '' ', " "" ".
"

DC / DS: C | X | B | H | F | D | FD | A | AL1 | AL2 | AL3 | AL4 | CLn | P | PLn

CL/XL/BL/PL explicit lengths also accept an immediate absolute expression, e.g. CL(FLEN) or XL(L'AREA+8).

DS 0type may define aligned code labels · EQU length 0 · ORG data/DSECT only · literals e.g. =C'ABC', =F'10'.

2. Built-in Macros

\$ASSERT left,EQ | NE | GT | GE | LT | LE,right — Assertion failure ABENDs **SYSTEM** **EEE**.

\$DFMT dsect,address — Display storage using DSECT; explicit address, **USING** ignored.

\$DUMP address,length — Dump storage.

\$EOJ value | \$EOJ (register) | \$EOJ , — Terminate and set completion code. Null operand uses current R15; **\$EOJ , = \$EOJ (R15)**.

\$LINENO , — Current source/listing line returned in **R15**.

\$PRINT 'quoted-text' | \$PRINT text-address,text-length — Print EBCDIC text plus newline.

\$RAND , — Next 32-bit pseudo-random value returned in **R1**; R15 is unchanged.

\$READ dcb,buffer,max-length — Read one **physical tape block**. **R1=full block length; R15=status**. See §7.

\$CONTROL dcb,TYPE=BSB | BSF | FSB | FSF[,COUNT=value | (register)] or **dcb,TYPE=REWIND** — Physical AWS tape positioning for an open BLP R | W | RW DCB. **R15=status**; 40=BOT boundary, 16=EOT/EOI boundary, 12=tape mark on block spacing.

\$REGS , — Display R0–R15; registers/CC unchanged.

\$RESTORE , — Restore all 16 GPRs from the top **\$SAVE** frame and pop that frame; CC unchanged.

\$RETURN [(r1 [,r2])] — Restore registers from previous **\$SAVE**, then return through restored R14. Listed register(s) are **not restored**. Exceptions are limited to R15, R0, R1 and supported combinations.

\$SAVE , — Push all 16 GPRs; registers/CC unchanged.

DEVTYPE ddname,return-area

Returns an 8-byte simulated device description for the DDNAME in an 8-byte blank-padded field. R15=0 for a defined DD and R15=4 if the DDNAME is undefined. Resource values are 3210800300007FF8 for 3420-style AWS tape, 0000010200007FF8 for DATA/simulated SYSIN, 0000010300007FF8 for Linux/PATH, and all zero for defined DUMMY. The return area is cleared before DD lookup.

RDJFCB dcb,jfcb-area

Returns a zero-initialized 176-byte JFCB-compatible copy for the DCB's current DD allocation. R15=0 on success and R15=4 when the valid DCB has no usable/currently allocated DDNAME. Selected fields are JFCBDSNM, JFCBLTYP, JFCBFLSQ,

JFCDSORG, JFCRECFM, JFCBLKSI, JFCLRECL, JFCBNVOL, and JFCBVOLS. #COPY \$_JFCB supplies the built-in 176-byte DSECT with JFCBLEN=176. Post-OPEN effective values persist across CLOSE for later RDJFCB calls.

\$SHOWDCB DCB=dcb,FIELDS=field | (field,...),AREA=address,AREALEN=bytes — Fields: LRECL | BLKSIZE | DDNAME; R15 status.

\$SLEEP seconds | (register) — Suspend for whole seconds; registers/CC unchanged.

\$SRAND (register) — Seed PRNG. **R0 requests host-derived seed**; any other GPR supplies its exact 32-bit seed.

\$TESTDCB DCB=dcb,RECFM=value | LRECL=value | BLKSIZE=value | DDNAME=name | OPEN=YES | OPEN=NO — One test; R15 status; success sets CC=0 match / CC=1 no match.

\$MODDCB DCB=dcb[,DDNAME=name][,RECFM=value][,LRECL=n][,BLKSIZE=n][,OPENEXIT=address|0] — Normally changes the closed-DCB baseline. During active OPENEXIT, only RECFM/LRECL/BLKSIZE may be changed; DDNAME or OPENEXIT then causes SYSTEM EEE. Outside the exit, OPENEXIT installs/disables the next OPEN exit. R15: 0 success, 4 open, 8 invalid value, 12 invalid DCB/other.

TIME DEC — IBM-style local date/time. **R0=HHMMSSth; R1=0CYDDDF**. Honors configured timezone/DST.

\$VALDATE TYPE=JDATE | GDATE,DATE=operand — Validate date; R15=0 valid, 4 invalid JDATE, 8 invalid GDATE.

\$VALTIME TIME=operand — Validate HHMMSSth; R15=0 valid, 12 invalid.

\$CVTDATE FROMTYPE=JDATE|GDATE|STIME|STCK|STCKE, FROM=operand, TOTYPE=... ,TO=operand[,FROMTIME=operand][,TOTIME=operand] — Convert civil/date/timestamp forms. FROMTIME defaults to midnight for civil-to-timestamp; TOTIME is optional timestamp-to-civil output.

\$DAYDIFF jdate1,jdate2 — **R1=signed calendar days jdate1-jdate2**; R15 status.

\$DAYADJ jdate,signed-days,result — Add/subtract calendar days; result is JDATE. Range failure R15=20; output unchanged.

\$TIMEADJ stime,result[,SECONDS=s][,MINUTES=m][,HOURS=h][,DAYS=d] — Add elapsed UTC seconds. STIME operands are storage-only; adjustment keywords are signed assembly-time expressions; DAYS=1 is exactly 86400 seconds.

\$EXPDATE jdate,area — Build 37-byte EBCDIC expanded date. Built-in mapping: #COPY \$_EXPDATE.

\$FMDATE jdate[,time],FORMAT='literal'|'literal',AREA=area,AREALEN=n or storage format with FORMAT=address,FMTLEN=n — EBCDIC formatted date/time; TIME defaults midnight; RC 36 area too small, 40 invalid format.

\$TIMEUSD , — **R0=CPU time; R1=elapsed time**, integer milliseconds; CC unchanged.

\$TRACE ON | OFF — Enable/disable executable runtime tracing.

\$WRITE dcb,buffer,length — Write one **physical tape block**. R15=status; see §7.

\$WRITE dcb,TYPE=TM — Write one **physical tape mark**. R15=status; see §7.

ABEND code | (register)[,DUMP][,STEP][,USER | SYSTEM][,REASON=value | (register)] — Abnormal termination; code low 12 bits. Default USER, no DUMP/STEP, REASON=0. User codes display decimal; system codes hexadecimal.

CLOSE dcb | **CLOSE** (dcb[, (REWIND|FREE)]...) — Close DCB(s); flush/complete output as required; R15 status.

FREEMAIN R | RC,LV=value | (register),A=(register) — Release exact live GETMAIN allocation. R failure is fatal; RC returns nonzero R15.

GET dcb,buffer — Read one logical record. R15=0 record, 4 EOF, 8 error. If EODAD is supplied, EOF branches there; otherwise RC is returned.

GETMAIN R | RC,LV=value | (register) — Allocate virtual storage; **allocated storage address is returned in R1**. R success does not define/clear R15; RC form returns nonzero R15 on allocation failure; R form failure is fatal.

OPEN (dcb[,INPUT | OUTPUT | EXTEND])[,...] — Open DCB(s); omitted option = INPUT. **R15=0 success; R15=8021 DDNAME not allocated. All other OPEN errors ABEND SYSTEM EEE.**

PUT dcb,buffer — Write one logical record; blocking performed as required; R15 status.

WTO 'message' | **WTO** text-address,text-length — Write operator/terminal message; maximum 126 bytes. Linux uses /dev/tty.

WTOR 'message',reply-address,reply-length | WTOR text-address,text-length,reply-address,reply-length —
Write operator/terminal message and read reply; message maximum 126 bytes, reply maximum 119 bytes. Linux uses /dev/tty.

Important register effects: \$LINENO→R15 · \$RAND→R1 · TIME DEC→R0,R1 · \$TIMEUSD→R0,R1 · \$DAYDIFF→R1,R15 · \$READ→R1,R15 · \$CONTROL→R15 · GETMAIN→R1 (and R15 for RC status) · \$SHOWDCB/\$TESTDCB→R15 · GET/PUT→R15 · OPEN→R15. CC is preserved unless specifically documented.

3. #PRAGMA / Conditional Source

Pragmas occur in the source preamble before the first ordinary source statement; blank/comments do not end the preamble. Trailing + continues long pragmas.

```
#PRAGMA CODE_LISTING | NO_CODE_LISTING
#PRAGMA RUNTIME_LISTING | NO_RUNTIME_LISTING
#PRAGMA RUNTIME_RC_MESSAGES | NO_RUNTIME_RC_MESSAGES      default ON
#PRAGMA PERFORMANCE | NO_PERFORMANCE                      default OFF
#PRAGMA EXECUTE | NO_EXECUTE
#PRAGMA TRACE | NO_TRACE
#PRAGMA TRACE_ACTIVE                                     disable with NO_TRACE
#PRAGMA GETMAIN_DEBUG | NO_GETMAIN_DEBUG
#PRAGMA XREF | NO_XREF
#PRAGMA XREF_LONG | NO_XREF_LONG

#PRAGMA TIMEZONE_OFFSET=+HH:MM | -HH:MM      default +00:00
#PRAGMA DST | NO_DST                        default NO_DST
#PRAGMA DST_OFFSET=+HH:MM | -HH:MM          default +01:00
#PRAGMA DST_BEGIN MONTH=n,WEEK=n,DAY=ddd,TIME=HH:MM
#PRAGMA DST_END   MONTH=n,WEEK=n,DAY=ddd,TIME=HH:MM

#PRAGMA LISTING_WIDTH n
#PRAGMA MAX_INSTRUCTIONS n          0 = unlimited; forces PERFORMANCE off
#PRAGMA MAX_SOURCE_DEPTH n
#PRAGMA MAX_CONDITIONAL_DEPTH n
#PRAGMA ABEND_STATUS n
#PRAGMA PARM value
#PRAGMA TRACE_FILE path             (Linux config files only)
#PRAGMA GETMAIN_FILL X'xx'
#PRAGMA DEFINE name[=value]
#DEFINE name[=value]
#UNDEFINE name                      removes the active definition; older overridden values do not reappear
```

TIMEZONE_OFFSET is the base offset added to UTC to obtain local standard time (positive = east/ahead of UTC; negative = west/behind UTC). DST_OFFSET is an additional adjustment applied only while DST is active; it is not an absolute time-zone offset.

Performance: #PRAGMA PERFORMANCE adds an end-of-run summary plus STORAGE, I/O, descending instruction profile, and descending service profile. It also reports after runtime ABEND. TRACE affects timing but not counts.

Conditional source:

```
#IF expression
#ELIF expression
#ELSE
#ENDIF
```

Operators: ! | == | != | < | <= | > | >= | && | || | (); bare name tests definedness.

Definition precedence: BUILTIN < SYSTEM < PRAGMA < CLI < SOURCE.

#PRAGMA DD

Host file:

```
#PRAGMA DD ddname,PATH='path'[,RECFM=...][,LRECL=n][,BLKSIZE=n][,TRIM=YES|NO]
```

Linux in-stream input:

```
#PRAGMA DD,ddname,DATA[,DLM=cc][,RECFM=F|FB|V|VB][,LRECL=n][,BLKSIZE=n]
...data records...
#PRAGMA COMMENT END DATA
```

Linux null DD:

```
#PRAGMA DD,ddname,DUMMY[,RECFM=F|FB|V|VB][,LRECL=n][,BLKSIZE=n]
```

DATA defaults to FB/80/3280, is INPUT-only, and restarts after CLOSE/re-OPEN. DUMMY GET returns EOF; valid logical PUT records are discarded. DATA DEVTYPE is 0000010200007FF8; DUMMY DEVTYPE is all zero.

AWS tape:

```
#PRAGMA DD ddname,UNIT=TAPE,PATH='aws-file',DSN=name,VOL=SER=volser,
    LABEL=SL | NL | BLP[,LBLNO=n][,RECFM=...][,LRECL=n],
    [BLKSIZE=n][,MACRF=...],
    [EXPDT=YYDDD | YYYY/DDD | RETPD=days][,EXPCHK=BYPASS]
```

RECFM, LRECL, BLKSIZE are valid for tape **and non-tape** DDs. TRIM=YES trims trailing blanks only when fixed-format logical records are written to Linux host text files; default NO. It is ignored for INPUT, variable/undefined formats, and tape. EXPDT and RETPD are mutually exclusive; RETPD 0-9999. EXPDT is calendar validated; 1999/365 and 1999/366 mean never expire.

Storage configuration

Storage-region pragmas configure DATA/control/literal/GETMAIN layout in the preamble. Fixed regions must leave a nonzero GETMAIN region below CODE. See full guide for exact pragma names/ranges.

4. DCB / Logical I/O

```
name DCB DSORG=PS,MACRF=R | W | RW | GM | PM,
    DDNAME=ddname[,RECFM=F | V [B] [A | M] | U]
    [,LRECL=n][,BLKSIZE=n][,EODAD=label][,OPENEXIT=address]
```

DSORG=PS is the **only** valid DSORG. EODAD is optional for INPUT.

GM | PM = logical GET/PUT processing, including tape blocking/deblocking.

R | W | RW = physical tape \$READ/\$WRITE interface.

With nonzero OPENEXIT, supplied attributes are merged before the exit and generic defaults are delayed until after BR R14. Entry uses R1=DCB and R14=X'00FFFFFFE'. DATA contributes intrinsic FB/80/3280 defaults before the exit; unsupplied PATH/DUMMY/new-tape fields remain zero; existing labeled tape contributes label attributes. While open, \$SHOWDCB/\$TESTDCB see final effective values; CLOSE restores baseline DCB values while the persistent JFCB retains final OPEN values.

5. AWS Tape Operations

Operation	Summary
OPEN INPUT	Mount/open selected tape data set for input.
OPEN OUTPUT	Mount/open selected tape data set for output.
GET / PUT	Logical records; TSDSUTIL handles blocking/deblocking.
\$READ / \$WRITE	Physical blocks; requires MACRF=R W RW.
\$WRITE ...,TYPE=TM	Write physical tape mark in BLP mode.
CLOSE	Complete data set; flush blocks/write required tape completion; final close permits unmount.
EOJ/ABEND	Open DCBs automatically closed during termination.
Sharing	Same PATH/VOLSER shares one mounted volume.

6. Runtime / Operational Notes

- TRACE records instructions/macros and relevant register/storage operands.
- XREF includes symbols, definitions/references, undefined symbols, and optional unreferenced entries.

- Default instruction limit: 10,000,000; zero = unlimited. Limit ABEND: TSDS8028E.
- Self-branch protection ABEND: TSDS8029E.
- GETMAIN debug reports allocation/free activity; fill defaults to X'00'.
- Deferred expression failure TSDS4001E recursively follows deferred EQU chains to root unresolved symbol name(s) when determinable; repeated names are deduplicated. V93 resolves valid deferred EQU chains to a fixed point before reporting failure.
- EX modifies target instruction with the low-order byte of the EX register.
- Linux configuration: /etc/tsdsutil.conf, then \$HOME/.config/tsdsutil.conf; CLI/source have higher precedence as defined in the guide.

Date/time

JDATE = packed 0CYDDDF, with C=0-9 for 1900-2899; GDATE = unsigned packed YYYYMMDD; TIME = HHMMSSth. STIME = unsigned 8-byte whole seconds since 1900-01-01 UTC. STCK is classic 8-byte UTC TOD with the 2042 rollover; STCKE is 16-byte extended TOD.

Date/time RCs: 0 success · 4 invalid JDATE · 8 invalid GDATE · 12 invalid TIME · 16 invalid STIME/STCK/STCKE · 20 range · 24 invalid runtime operand/parameter · 28 nonexistent DST time · 32 ambiguous DST time · 36 output too small · 40 invalid format. Nonzero recoverable date/time RCs emit a runtime warning by default; suppress with NO_RUNTIME_RC_MESSAGES.

Timestamp conversion summary:

From	To	TZ/DST	Time
JDATE/GDATE	STIME/STCK/STCKE	Yes	FROMTIME= input; default midnight
STIME/STCK/STCKE	JDATE/GDATE	Yes	optional TOTIME= output
STIME/STCK/STCKE	STIME/STCK/STCKE	No	none

\$FMTCDATE: %Y %y %m %d %j %A %a %B %b %H %I %M %S %p %%; %h is TSDSUTIL hundredths.

Linux CLI

tsdsutil [options] < source

```
-h | --help
--execute | --no-execute
--listing=path
--parm=value
--define NAME[=VALUE]
--define=NAME[=VALUE]
--max-instructions=n
--performance | --no-performance
--trace | --trace-active | --no-trace
--trace-file=path
-Lpath | -L path
--ddDDNAME=path          empty path removes/masks association
```

Source is read from standard input. --parm= is limited to 100 bytes. Up to 128 --define operands, 64 -L include paths, and 64 --dd... associations are accepted. DDNAME in --ddDDNAME=path empty path removes/masks association is 1-8 characters. Invalid or unknown options terminate with RC=16.

7. Physical Tape Return Codes

\$READ dcb,buffer,max-length

R15	Meaning
0	Data block successfully read
4	Logical EOF for SL/NL
8	Block longer than buffer; prefix copied, residual discarded

