



**Full credit is given to the above companies including the Operating System (OS) that this PDF file was generated!**

### ***Rocky Enterprise Linux 9.2 Manual Pages on command 'sg\_write\_x.8'***

**\$ man sg\_write\_x.8**

SG\_WRITE\_X(8) SG3\_UTILS SG\_WRITE\_X(8)

#### NAME

sg\_write\_x - SCSI WRITE normal/ATOMIC/SAME/SCATTERED/STREAM, ORWRITE commands

#### SYNOPSIS

```
sg_write_x [--16] [--32] [--app-tag=AT] [--atomic=AB] [--bmop=OP,PGP] [--bs=BS] [--com?
bined=DOF] [--dld=DLD] [--dpo] [--dry-run] [--fua] [--generation=EOG,NOG] [--grpnum=GN]
[--help] --in=IF [--lba=LBA[,LBA...]] [--normal] [--num=NUM[,NUM...]] [--off?
set=OFF[,DLEN]] [--or] [--quiet] [--ref-tag=RT] [--same=NDOB] [--scat-file=SF]
[--scat-raw] [--scattered=RD] [--stream=ID] [--strict] [--tag-mask=TM] [--timeout=TO]
[--unmap=U_A] [--verbose] [--version] [--wrprotect=WPR] DEVICE
```

Synopsis per supported command:

```
sg_write_x --normal --in=IF [--16] [--32] [--app-tag=AT] [--bs=BS] [--dld=DLD] [--dpo]
[--fua] [--grpnum=GN] [--lba=LBA] [--num=NUM] [--offset=OFF[,DLEN]] [--ref-tag=RT]
[--strict] [--tag-mask=TM] [--timeout=TO] [--wrprotect=WPR] DEVICE
```

```
sg_write_x --or --in=IF [--16] [--32] [--bmop=OP,PGP] [--bs=BS] [--dpo] [--fua] [--genera?
tion=EOG,NOG] [--grpnum=GN] [--lba=LBA] [--num=NUM] [--offset=OFF[,DLEN]] [--strict]
[--timeout=TO] [--wrprotect=OPR] DEVICE
```

```
sg_write_x --atomic=AB --in=IF [--16] [--32] [--app-tag=AT] [--bs=BS] [--dpo] [--fua]
[--grpnum=GN] [--lba=LBA] [--num=NUM] [--offset=OFF[,DLEN]] [--ref-tag=RT] [--strict]
[--timeout=TO] [--wrprotect=WPR] DEVICE
```

```
sg_write_x --same=NDOB [--16] [--32] [--app-tag=AT] [--bs=BS] [--dpo] [--fua] [--grp?
num=GN] [--in=IF] [--lba=LBA] [--num=NUM] [--offset=OFF[,DLEN]] [--ref-tag=RT] [--strict]
[--timeout=TO] [--unmap=U_A] [--wrprotect=WPR] DEVICE
```

```

sg_write_x --scattered=RD --in=IF [--16] [--32] [--app-tag=AT] [--bs=BS] [--dld=DLD]
[--dpo] [--fua] [--grpnum=GN] [--lba=LBA[,LBA...]] [--num=NUM[,NUM...]] [--off?
set=OFF[,DLEN]] [--ref-tag=RT] [--scat-file=SF] [--scat-raw] [--strict] [--tag-mask=TM]
[--timeout=TO] [--wrprotect=WPR] DEVICE

sg_write_x --stream=ID --in=IF [--16] [--32] [--app-tag=AT] [--bs=BS] [--dpo] [--fua]
[--grpnum=GN] [--lba=LBA] [--num=NUM] [--offset=OFF[,DLEN]] [--ref-tag=RT] [--strict]
[--tag-mask=TM] [--timeout=TO] [--wrprotect=WPR] DEVICE

```

## DESCRIPTION

This utility will send one of six SCSI commands, all associated with writing data to the given DEVICE. They are a "normal" WRITE, ORWRITE, WRITE ATOMIC, WRITE SAME, WRITE SCAT? TERED or WRITE STREAM. This utility supports the 16 and 32 byte variants of all six commands. Hence some closely related commands are not supported (e.g. WRITE(10)). All 32 byte variants, apart from ORWRITE(32), require the DEVICE to be formatted with type 1, 2 or 3 Protection Information (PI), making all logical blocks 8 bytes (or a multiple of 8 bytes) longer on the media.

The command line interface is a little crowded with over thirty options. Hence the SYNOPSIS, after listing all the (long) options, lists those applicable to each supported command. For each command synopsis, the option that selects the SCSI command is shown first followed by any required options. If no command option is given then a "normal" WRITE is assumed. Even though the --scat-file=SF option can be given for every command, it is only shown for WRITE SCATTERED where it is most useful. If the --scat-file=SF option is given then neither the --lba=LBA[,LBA...] nor the --num=NUM[,NUM...] options should be given. Only the first item of the --lba=LBA[,LBA...] and the --num=NUM[,NUM...] options (or first pair (or quintet) from the --scat-file=SF option) is used for all but the WRITE SCATTERED command. All commands can take --dry-run and --verbose in addition to those shown in the SYNOPSIS.

The logical block size in bytes can be given explicitly with the --bs=BS option, as long as BS is greater than zero. It is typically a power of two, 512 or greater. If the --bs=BS option is not given or BS is zero then the SCSI READ CAPACITY command is used to find the logical block size. First the READ CAPACITY(16) command is tried and if successful the logical block size in the response is typically used as the actual block size for this utility. The exception is when PROT\_EN is set in the response and the --wrprotect=WPR option is given and non-zero; in which case 8 (bytes) is added to the logical block size to

yield the actual block size used by this utility. If READ CAPACITY(16) fails then READ CA?

PACITY(10) is tried and if that works then the logical block size in the response is used as the actual block size.

The number of bytes this utility will attempt to read from the file named by IF is the product of the actual block size and the number\_of\_blocks (NUM or the sum of NUM arguments). If less bytes are read from the file IF and the --strict option is given then this utility exits with an exit status of SG\_LIB\_FILE\_ERROR. If less bytes are read from the file IF and the --strict option is not given then bytes of zero are substituted for the "missing" bytes and this utility continues.

Attempts to write multi megabyte data with a single command are likely to fail for one of several reasons. First the operating system might object to allocating a buffer that large. Next the SCSI pass-through usually limits data blocks to a few megabytes or less. Finally the storage device might have a limited amount of RAM to support a write operation such as atomic (as it may need to roll back). The storage device can inform the application client of its limitations via the block limits VPD page (0xb0), with the maximum atomic transfer length field amongst others.

A degenerate LBA (Logical Block Address) range descriptor with no PI has an LBA and NUM of zero. A degenerate LBA range descriptor with PI additionally has its RT, AT and TM fields set to zero (note: that is not the default values for RT, AT and TM). They are degenerate in the sense that they are indistinguishable from a pad of zeros that follow the scatter list in the data-out buffer. SBC-4 makes clear that a degenerate LBA range descriptor is valid. This may become an issue if RD given in the --scattered=RD option has the value 0. In this case the logic may need to scan the user provided data to calculate the number of LBA range descriptors which is required by the WRITE SCATTERED cdb. In the absence of other information the logic will take a degenerate LBA range descriptor as a terminator of the scatter list.

The current reference for these commands is draft SBC-4 (T10/BSR INCITS 506) revision 15 dated 9 November 2017. All six SCSI commands are described in that document. WRITE ATOMIC was added in SBC-4 revision 3; WRITE STREAM was added in SBC-4 revision 7; WRITE SCATTERED was added in SBC-4 revision 11 while the others are in the SBC-3 standard.

## OPTIONS

Arguments to long options are mandatory for short options as well. The options are arranged in alphabetical order based on the long option name.

-6, --16

send the 16 byte cdb variant of the selected SCSI command. If no command is selected then the (normal) SCSI WRITE(16) command is sent. If neither this option nor the --32 option is given then this option is assumed.

-3, --32

send the 32 byte cdb variant of the selected SCSI command. If no command is selected then the (normal) SCSI WRITE(32) command is sent. If neither this option nor the --16 option is given then the --16 option is assumed. If both this option and the --16 option are given then this option takes precedence. Note that apart from ORWRITE(32) all other 32 byte cdb variants require a DEVICE formatted with type 1, 2 or 3 protection information.

-a, --app-tag=AT

where AT is the "expected logical block application tag" field found in most of the 32 byte cdb variants (the exception is ORWRITE(32)). AT is a 16 bit field which means the maximum value is 0xffff. The default value is 0xffff .

-A, --atomic=AB

selects the WRITE ATOMIC command and AB is placed in the Atomic Boundary field of its cdb. It is a 16 bit field so the maximum value is 0xffff. If unsure what value to set, try 0 which will attempt to write the whole data-out buffer in a single atomic operation.

-B, --bmop=OP,PGP

where OP and PGP are the values to be placed in ORWRITE(32)'s BMOP and 'Previous Generation Processing' fields respectively. BMOP is a 3 bit field (ranges from 0 to 7) and PGP is a 4 bit field (ranges from 0 to 15). Both fields default to 0.

-b, --bs=BS

where BS is the logical block size or the actual block size which will be slightly bigger. The default value is zero. If this option is not given or is given with a BS of zero then the SCSI READ CAPACITY(16) command is sent to DEVICE. If that fails then the READ CAPACITY(10) command is sent. The logical and actual block size will be derived from the response of the READ CAPACITY command.

This section assumes BS is greater than zero. If BS is less than 512 (bytes) or not a multiple of 8, a warning is issued and the utility continues unless the --strict option is also given. If BS is a power of two (e.g. 512) then the logical and ac?

tual block size is set to BS (e.g. 512). If BS is not a power of two (e.g. 520) then the logical block size is set to the closest power of two less than BS (e.g. 512) and the actual block size is set to BS (e.g. 520).

If the logical and actual block size are different then a later check will reduce the actual block size back to the logical block size unless --wrprotect=WPR is greater than zero.

#### **-c, --combined=DOF**

This option only applies to WRITE SCATTERED and assumes the whole data-out buffer can be read from IF given by the --in=IF option. The whole data-out buffer is the parameter list header, followed by zero or more LBA range descriptors, optionally followed by some pad bytes and then the data to be written to the media. If the --lba=LBA[,LBA...], --num=NUM[,NUM...] or --scat-file=SF options are also given then an error is generated. The DOF argument should be the value suitable for the 'Logical Block Data Offset' field in the WRITE SCATTERED cdb. This is the offset in the data-out buffer where the data to write to the media commences. The unit of that field is the actual block size which is the logical block size plus a multiple of 8, if protection information (PI) is being sent. When WPR (from --wrprotect=WPR) is greater than zero then PI is expected. SBC-4 revision 15 does not state it but it would appear that a DOF value of 0 is invalid. It is suggested that this option be used with the --strict option while experimenting as random or incorrect data fed in via the --in=IF option could write a lot of "interesting" data all over the DEVICE. If DOF is given as 0 the utility will scan the data in IF until RD LBA range descriptors are found; or if RD is also 0 until a degenerate LBA range descriptor is found.

#### **-D, --dld=DLD**

where DLD is the duration limits descriptor spread across 3 bits in the SCSI WRITE(16) and the WRITE SCATTERED(16) cdb. DLD is between 0 to 7 inclusive with a default of zero. The DLD0 field in WRITE(16) and WRITE SCATTERED(16) is set if (0x1 & DLD) is non-zero. The DLD1 field in both cdb is set if (0x2 & DLD) is non-zero.

The DLD2 field in both cdb is set if (0x4 & DLD) is non-zero.

#### **-d, --dpo**

if this option is given then the DPO (disable page out) bit field in the cdb is set. The default is to clear this bit field. Applies to all commands supported by

thus utility except WRITE SAME.

**-x, --dry-run**

this option exits (with a status of 0) just before it would otherwise send the selected SCSI write command. It may still send a SCSI READ CAPACITY command (16 byte variant and perhaps 10 byte variant as well) so the DEVICE is still required. It reads the data in and processes it if the --in=IF and/or the --scat-file=SF options are given. All command line processing and sanity checks (e.g. if the --strict option is given) will be performed and if there is an error then there will be a non zero exit status value.

If this option is given twice (e.g. -xx) then instead of performing the selected write SCSI command, the data-out buffer is written to a file called `sg_write_x.bin`. If it doesn't exist then that file is created in the current directory and is truncated if it previously did exist with longer contents. The data-out buffer is written in binary with some information about it written to stdout. For writes other than scattered the filename and its length in bytes is output to stdout. For write scattered additionally its number of LBA range descriptors and its logical block data offset written to stdout.

**-f, --fua**

if this option is given then the FUA (force unit access) bit field in the cdb is set. The default is to clear this bit field. Applies to all commands supported by thus utility except WRITE SAME.

**-G, --generation=EOG,NOG**

the arguments for this option are used by the ORWITE(32) command only. EOG is placed in the "Expected ORWgeneration" field while NOG is placed in the "New ORW? generation" field. Both are 32 bits long and default to zero.

**-g, --grpnum=GN**

sets the 'Group number' field to GN. Defaults to a value of zero. GN should be a value between 0 and 63.

**-h, --help**

output the usage message then exit. Use multiple times for more help. Currently '-h' to '-hhhh' provide different output.

**-i, --in=IF**

read data (in binary) from a file named IF in a single OS system call (in Unix:

read(2)). That data is placed in a continuous buffer and then used as the data-out buffer for all SCSI write commands apart from WRITE SCATTERED(16 or 32) which may include other data in the data-out buffer. For WRITE SCATTERED (16 or 32) the data-out buffer is made up of 3 or 4 components in this order: a parameter list header (32 zero bytes); zero or more LBA range descriptors, optionally some pad bytes (zeros) and then data to write to the media. For WRITE SCATTERED IF only provides the data to write to the media unless --combined=DOF is given. When the --combined=DOF option is given IF contains all components of the WRITE SCATTERED data-out buffer in binary. The data read from IF starts from byte offset OFF which defaults to zero and no more than DLEN bytes are read from that point (i.e. from the file byte offset OFF). If DLEN is zero or not given the rest of the file IF is read. This option is mandatory apart from when --same=1 is given (that sets the NDOB bit which stands for "No Data Out Buffer"). In Unix based OSes, any number of zeros can be produced by using the /dev/zero device file.

IF may be "-" which is taken as stdin. In this case the --offset=OFF,DLEN can be given with OFF set to 0 and LEN set to a non-zero value, preferably a multiple of the actual block size. The utility can also deduce how long the IF should be from NUM (or the sum of them in the case of a scatter list).

-l, --lba=LBA[,LBA...]

where the argument is a single Logical Block Address (LBA) or a comma separated list of LBAs each of which is the address of the first block written by the selected write command. Only the WRITE SCATTERED command can usefully take more than one LBA. Whatever number of LBAs is given, there needs to be an equal number of NUMs given to the --num=NUM[,NUM...] option. The first given LBA joins with the first given NUM to form the first LBA range descriptor (which T10 number from zero in SBC-4). The second LBA joins with the second LBA to form the second LBA range descriptor, etc. A more convenient way to define a large number of LBA range descriptors is with the --scat-file=SF option. Defaults to logical block 0 (which could be dangerous) while NUM defaults to 0 which makes the combination harmless. LBA is assumed to be in decimal unless prefixed with '0x' or has a trailing 'h'.

-N, --normal

the choice of a "normal" WRITE (16 or 32) command can be made explicitly with this option. In the absence of selecting any other command (e.g. --atomic=AB ), the

choice of a "normal" WRITE is the default.

**-n, --num=NUM[,NUM...]**

where the argument is a single NUMber of blocks (NUM) or a comma separated list of NUMs that pair with the corresponding entries in the --lba=LBA[,LBA...] option. If a NUM is given and is not provided by another method (e.g. by using the --scat-file=SF option) then it defaults to the number of blocks derived from the size of the file named by IF (starting at byte offset OFF to the end or the file or DLEN). Apart from the --combined=DOF option, an LBA must be explicitly given (either with l--lba=LBA or via --scat-file=SF), if not NUM defaults to 0 as a safety measure.

**-o, --offset=OFF[,DLEN]**

where OFF is the byte offset within the file named IF to start reading from. The default value of OFF is zero which is the beginning of file named IF. DLEN is the maximum number of bytes to read, starting at byte offset OFF, from the file named IF. Less bytes will be read if an end of file occurs before DLEN is exhausted. If DLEN is zero or not given then reading from byte offset OFF to the end of the file named IF is assumed.

**-O, --or**

selects the ORWRITE command. ORWRITE(16) has similar fields to WRITE(16) apart from the WRPROTECT field being named ORPROTECT with slightly different semantics and the absence of the 3 DLD bit fields. ORWRITE(32) has four extra fields that are set with the --bmop=OP,PGP and --generation=EOG,NOG options. ORWRITE(32) is the only 32 byte cdb command in this utility that does not require a DEVICE formatted with type 1, 2 or 3 PI (although it will still work if it is formatted with PI).

**-Q, --quiet**

suppress some informational messages such as the ones associated with errors when this utility is about to exit. The exit status value is still returned to the operating system when this utility exits.

**-r, --ref-tag=RT**

where RT is the "expected initial logical block reference tag" field found in the 32 byte cdb variants of WRITE, WRITE ATOMIC, WRITE SAME and WRITE STREAM. The field is also found in the WRITE SCATTERED(32) LBA range descriptors. It is a 32 bit field which means the maximum value is 0xffffffff. The default value is

0xffffffff.

**-S, --same=NDOB**

selects the WRITE SAME command with the NDOB field set to NDOB which stands for No Data-Out Buffer. NDOB can take values 0 or 1 (i.e. it is a single bit field). When --same=1 all options associated with the data-out buffer are ignored.

**-q, --scat-file=SF**

where SF is the name of an auxiliary file containing the scatter list for the WRITE SCATTERED command. If the --scat-raw option is also given then SF is assumed to contain both the parameter list header (32 bytes of zeros) followed by zero or more LBA range descriptors which are also 32 bytes long each. These components are as defined by SBC-4 (i.e. in binary with integers in big endian format). If the --scat-raw option is not given then a file of ASCII hexadecimal is expected as described in the SCATTERED FILE ASCII FORMAT section below.

If this option is given with the --combined=DOF option then this utility will exit with a syntax error. SF must not be "-", a way of stopping the user trying to redirect stdin.

**-R, --scat-raw**

this option only effects the way that the file named SF from the --scat-file=SF option for WRITE SCATTERED is interpreted. By default (i.e. without this option), SF is parsed as ASCII hexadecimal with blank lines and line contents from and including '#' to the end of line ignored. Hence it can contain comments and other indications. When this option is given, the file named SF is interpreted as binary. As binary it is assumed to contain 32 bytes of zeros (the WRITE SCATTERED parameter list header) followed by zero or more LBA range descriptors (which are 32 bytes each). If the --strict option is given the reserved field in those two items are checked with any non zero bytes causing an error.

**-S, --scattered=RD**

selects the WRITE SCATTERED command with RD being the number of LBA range descriptors that will be placed in the data-out buffer. If RD is zero then the logic will try and determine the number of range descriptors by other means (e.g. by parsing the file named by SF, if there is one). The LBA range descriptors differ between the 16 and 32 byte cdb variants of WRITE SCATTERED. In the 16 byte cdb variant the 32 byte LBA range descriptor is made up of an 8 byte LBA, followed by a 4 byte num?

ber\_of\_blocks followed by 20 bytes of zeros. In the 32 byte variant the LBA and number\_of\_blocks are followed by a RT (4 bytes), an AT (2 bytes) and a TM (2 bytes) then 12 bytes of zeros.

This paragraph applies when RD is greater than zero. If RD is less than the number of LBA range descriptors built from command line options, from the --scat-file=SF option or decoded from IF (when the --combined=DOF option is given) then RD takes precedence; so RD is placed in the "Number of LBA Range Descriptors" field in the cdb. If RD is greater than the number of LBA range descriptors found from the provided data and options, then an error is generated.

-T, --stream=ID

selects the WRITE STREAM command with the STR\_ID field set to ID. ID can take values from 0 to 0xffff (i.e. it is a 16 bit field).

-s, --strict

when this option is present, more things (e.g. that reserved fields contain zeros) and any irregularities will terminate the utility with a message to stderr and an indicative exit status. While experimenting with these commands, especially WRITE SCATTERED, it is recommended to use this option.

-t, --tag-mask=TM

where TM is the "logical block application tag mask" field found in the 32 byte cdb variants of WRITE, WRITE ATOMIC, WRITE SAME and WRITE STREAM. The field is also found in the WRITE SCATTERED(32) LBA range descriptors. It is a 16 bit field which means the maximum value is 0xffff. The default value is 0xffff.

-I, --timeout=TO

where TO is the command timeout value in seconds. The default value is 120 seconds. If NUM is large on slow media then these WRITE commands may require considerably more time than 120 seconds to complete.

-u, --unmap=U\_A

where U\_A is OR-ed bit values used to set the UNMAP and ANCHOR bit fields in the WRITE SAME (16 or 32) cdb. If U\_A is 1 then the UNMAP bit field is set; if U\_A is 2 then the ANCHOR bit field is set; if U\_A is 3 then both the UNMAP and ANCHOR bit fields are set. The default value for both bit fields is clear (0); setting U\_A to 0 will also clear both bit fields.

-v, --verbose

increase the degree of verbosity (debug messages). These messages are usually written to stderr.

**-V, --version**

output version string then exit.

**-w, --wrprotect=WPR**

sets the WRPROTECT field (3 bits) in all sg\_write\_x commands apart from ORWRITE which has a 3 bit ORPROTECT field (and the synopsis shows OPR to highlight the difference). In all cases WPR is placed in that 3 bit field. The default value is zero which does not send any PI in the data-out buffer. WPR should be a value between 0 and 7.

## SCATTERED FILE ASCII FORMAT

All commands in this utility can take a --scat-file=SF and that option can be seen as a replacement for the --lba=LBA[,LBA...] and --num=NUM[,NUM...] options. If both the --scat-file=SF and --scat-raw options are given then the file named SF is expected to be binary and contain the parameter list header (32 bytes of zeros for both the 16 and 32 byte variants) followed by zero or more LBA range descriptors, each of 32 bytes each. This section describes what is expected in SF when the --scat-raw option is not given.

The ASCII hexadecimal "scatter file" (named by SF) can contain comments, empty lines and numbers. If multiple numbers appear on one line they can be separated by spaces, tabs or a single comma. Numbers are parsed as decimal unless prefixed by "0x" (or "0X") or have a suffix of "h". Ox is the prefix of hexadecimal number in the C language while T10 uses the "h" suffix for the same purpose. Anything from and including a "#" character to the end-of-line is ignored, so comments can be placed there.

For the WRITE SCATTERED (16) command, its LBA range descriptors contain two items per descriptor: an 8 byte LBA followed by a 4 byte number\_of\_blocks. The remaining 20 bytes of the descriptor are zeros. The format accepted is relatively loose with each decoded value being placed in an LBA and then a number\_of\_blocks until the end-of-file is reached. The pattern starts with a LBA and if it doesn't finish with a number\_of\_blocks (i.e. an odd number of values are parsed) an error occurs. So the number of LBA range descriptors generated will be half the number of values parsed in SF.

For the WRITE SCATTERED (32) command, its LBA range descriptors contain five items per descriptor: an 8 byte LBA followed by a 4 byte number\_of\_blocks, then a 4 byte RT, a 2 byte AT, and a 2 byte TM. The last three items are associated with protection information (PI).

The accepted format in the SF file is more constrained than the 16 byte cdb variant. The items for each LBA range descriptor must be found on one line with adjacent items being comma separated. The first two items (LBA and number\_of\_blocks) must be given, and if no more items are on the line then RT, AT and TM are given their default values (all "ff" bytes). Spaces and tabs may appear between items but commas are the separators. Two commas with no value between them will cause the "missing" item to receive its default value.

## NOTES

Various numeric arguments (e.g. LBA) may include multiplicative suffixes or be given in hexadecimal. See the "NUMERIC ARGUMENTS" section in the sg3\_utils(8) man page. In Linux, prior to lk 3.17, the sg driver did not support cdb sizes greater than 16 bytes. Hence a device node like /dev/sg1 which is associated with the sg driver would fail with this utility if the --32 option was given (or implied by other options). The bsg driver with device nodes like /dev/bsg/6:0:0:1 does support cdb sizes greater than 16 bytes since its introduction in lk 2.6.28 .

## EXIT STATUS

The exit status of sg\_write\_x is 0 when it is successful. Otherwise see the sg3\_utils(8) man page.

## EXAMPLES

One simple usage is to write 4 blocks of zeros from (and including) a given LBA according to the rules of WRITE ATOMIC with an atomic boundary of 0. Since no cdb size option is given, the 16 byte cdb will be assumed (i.e. WRITE ATOMIC(16)):

```
sg_write_x --atomic=0 --in=/dev/zero --lba=0x1234 --num=4 /dev/sdc
```

Since --bs=BS has not been given, then this utility will call the READ CAPACITY(16) command on /dev/sdc to determine the number of bytes in a logical block. If the READ CAPACITY(16) command fails then the READ CAPACITY(10) command is tried. Let us assume one of them works and that the number of bytes in each logical block is 512 bytes. So 4 blocks of zeros (each block containing 512 bytes) will be written from (and including) LBA 0x1234 .

Now to bypass the need for the READ CAPACITY command(s) the --bs=BS option can be used:

```
sg_write_x --atomic=0 --bs=512 --in=/dev/zero --lba=0x1234 --num=4 /dev/sdc
```

Since --bs= is given and its value (512) is a power of 2, then the actual block size is also 512. If instead 520 was given then the logical block size would be 512 (the highest power of 2 less than 520) and the actual block size would be 520 bytes. To send the 32 byte variant add --32 as in:

```
sg_write_x --atomic=0 --32 --bs=512 --in=/dev/zero --lba=0x1234 --num=4 /dev/sdc
```

For examples using 'sg\_write\_x --same=NDOB' see the manpage for sg\_write\_same(8). The syntax is a little different but the semantics are the same.

To send a WRITE STREAM(32) with a STR\_ID of 1 use the following:

```
sg_write_x --stream=1 --32 --bs=512 --in=/dev/zero --lba=0x1234 --num=4 /dev/sdc
```

Next is a WRITE SCATTERED(16) command with the scatter list, split between the --lba= and --num= options, on the command line:

```
sg_write_x --scattered=2 --lba=2,0x33 --num=4,1 -i /dev/zero /dev/sg1
```

Example of a WRITE SCATTERED(16) command with a degenerate LBA range descriptor (first element to --lba= and --num=):

```
sg_write_x --scattered=2 --lba=0,0x33 --num=0,1 -i /dev/zero /dev/sg1
```

Example of a WRITE SCATTERED(16) command with the scatter list in scat\_file.txt

```
sg_write_x --scattered=3 -q scat_file.txt -i /dev/zero /dev/sg1
```

Next a WRITE SCATTERED(16) command with its scatter list and data in a single file. Note that the argument to --scattered= is 0 so the number of LBA range descriptors is calculated by analyzing the first two blocks of scat\_data.bin (because the argument to --combined= is 2) :

```
sg_write_x --scattered=0 --combined=2 -i scat_data.bin /dev/sg1
```

When the -xx option is used, a WRITE SCATTERED command is not executed but instead the contents of the data-out buffer are written to a file called sg\_write\_x.bin . In the case of WRITE SCATTERED that binary file is suitable for supplying to a later invocation to do the actual write to media. For example:

```
sg_write_x --scattered=3 -q scat_file.txt -xx -i /dev/zero /dev/sg1
```

Wrote 8192 bytes to sg\_write\_x.bin, LB data offset: 1

Number of LBA range descriptors: 3

```
sg_write_x --scattered=0 --combined=1 -i sg_write_x.bin /dev/sg1
```

Notice when the sg\_write\_x.bin is written (and nothing is written to the media), a summary of what has happened is sent to stdout. The value shown for "LB data offset:" (1) should be given to the --combined= option when the write to media actually occurs (i.e. the second invocation shown directly above).

## AUTHORS

Written by Douglas Gilbert.

## REPORTING BUGS

Report bugs to <dgilbert at interlog dot com>.

## COPYRIGHT

Copyright ? 2017-2020 Douglas Gilbert

This software is distributed under a FreeBSD license. There is NO warranty; not even for  
MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

## SEE ALSO

sg\_readcap,sg\_vpd,sg\_write\_same,sg\_stream\_ctl(sg3\_utils)

sg3\_utils-1.45

June 2020

SG\_WRITE\_X(8)