

# Ioctl Numbers

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If you are adding new ioctl's to the kernel, you should use the `_IO` macros defined in `<linux/ioctl.h>`:

<code>_IO</code>	an	ioctl with no parameters
<code>_IOW</code>	an	ioctl with write parameters (copy_from_user)
<code>_IOR</code>	an	ioctl with read parameters (copy_to_user)
<code>_IOWR</code>	an	ioctl with both write and read parameters.

'Write' and 'read' are from the user's point of view, just like the system calls 'write' and 'read'. For example, a `SET_FOO` ioctl would be `_IOW`, although the kernel would actually read data from user space; a `GET_FOO` ioctl would be `_IOR`, although the kernel would actually write data to user space.

The first argument to `_IO`, `_IOW`, `_IOR`, or `_IOWR` is an identifying letter or number from the table below. Because of the large number of drivers, many drivers share a partial letter with other drivers.

If you are writing a driver for a new device and need a letter, pick an unused block with enough room for expansion: 32 to 256 ioctl commands. You can register the block by patching this file and submitting the patch to Linus Torvalds. Or you can e-mail me at <[mec@shout.net](mailto:mec@shout.net)> and I'll register one for you.

The second argument to `_IO`, `_IOW`, `_IOR`, or `_IOWR` is a sequence number to distinguish ioctls from each other. The third argument to `_IOW`, `_IOR`, or `_IOWR` is the type of the data going into the kernel or coming out of the kernel (e.g. 'int' or 'struct foo'). NOTE! Do NOT use `sizeof(arg)` as the third argument as this results in your ioctl thinking it passes an argument of type `size_t`.

Some devices use their major number as the identifier; this is OK, as long as it is unique. Some devices are irregular and don't follow any convention at all.

Following this convention is good because:

1. Keeping the ioctl's globally unique helps error checking: if a program calls an ioctl on the wrong device, it will get an error rather than some unexpected behaviour.
2. The 'strace' build procedure automatically finds ioctl numbers defined with `_IO`, `_IOW`, `_IOR`, or `_IOWR`.
3. 'strace' can decode numbers back into useful names when the numbers are unique.
4. People looking for ioctls can grep for them more easily when this convention is used to define the ioctl numbers.
5. When following the convention, the driver code can use generic code to copy the parameters between user and kernel space.

This table lists ioctls visible from user land for Linux/x86. It contains most drivers up to 2.6.31, but I know I am missing some. There has been no attempt to list non-X86 architectures or ioctls from drivers/staging/.

Code	Seq# (hex)	Include File	Comments
0x00	00-1F	linux/fs.h	conflict!
0x00	00-1F	scsi/scsi_ioctl.h	conflict!
0x00	00-1F	linux/fb.h	conflict!
0x00	00-1F	linux/wavefront.h	conflict!
0x02	all	linux/fd.h	
0x03	all	linux/hdreg.h	
0x04	D2-DC	linux/umsdos_fs.h	Dead since 2.6.11, but don't reuse these.
0x06	all	linux/lp.h	
0x09	all	linux/raid/md_u.h	
0x10	00-0F	drivers/char/s390/vmcp.h	
0x10	10-1F	arch/s390/include/uapi/scfp_ctl.h	
0x10	20-2F	arch/s390/include/uapi/asm/hypfs.h	
0x12	all	linux/fs.h linux/blkpg.h	
0x1b	all		InfiniBand Subsystem < <a href="http://infiniband.sourceforge.net/">http://infiniband.sourceforge.net/</a> >

Code	Seq# (hex)	Include File	Comments
0x20	all	drivers/cdrom/cm206.h	
0x22	all	scsi/sg.h	
0x3E	00-0F	linux/counter.h	< <a href="mailto:linux-iiio@vger.kernel.org">mailto:linux-iiio@vger.kernel.org</a> >
'!'	00-1F	uapi/linux/seccomp.h	
'#'	00-3F		IEEE 1394 Subsystem Block for the entire subsystem
'\$'	00-0F	linux/perf_counter.h, linux/perf_event.h	
'%'	00-0F	include/uapi/linux/stm.h	System Trace Module subsystem < <a href="mailto:alexander.shishkin@linux.intel.com">mailto:alexander.shishkin@linux.intel.com</a> >
'&'	00-07	drivers/firewire/nosy-user.h	
'1'	00-1F	linux/timepps.h	PPS kit from Ulrich Windl < <a href="ftp://ftp.de.kernel.org/pub/linux/daemons/ntp/PPS/">ftp://ftp.de.kernel.org/pub/linux/daemons/ntp/PPS/</a> >
'2'	01-04	linux/i2o.h	
'3'	00-0F	drivers/s390/char/raw3270.h	conflict!
'3'	00-1F	linux/suspend_ioctls.h, kernel/power/user.c	conflict!
'8'	all		SNP8023 advanced NIC card < <a href="mailto:mcr@solidum.com">mailto:mcr@solidum.com</a> >
','	64-7F	linux/vfio.h	
'='	00-3f	uapi/linux/ptp_clock.h	< <a href="mailto:richardcochran@gmail.com">mailto:richardcochran@gmail.com</a> >
'@'	00-0F	linux/radeonfb.h	conflict!
'@'	00-0F	drivers/video/aty/aty128fb.c	conflict!
'A'	00-1F	linux/apm_bios.h	conflict!
'A'	00-0F	linux/agpgart.h, drivers/char/agp/compat_ioctl.h	conflict!
'A'	00-7F	sound/asound.h	conflict!
'B'	00-1F	linux/cciss_ioctl.h	conflict!
'B'	00-0F	include/linux/pmu.h	conflict!
'B'	C0-FF	advanced bbus	< <a href="mailto:maassen@uni-freiburg.de">mailto:maassen@uni-freiburg.de</a> >
'B'	00-0F	xen/xenbus_dev.h	conflict!
'C'	all	linux/soundcard.h	conflict!
'C'	01-2F	linux/capi.h	conflict!
'C'	F0-FF	drivers/net/wan/cosa.h	conflict!
'D'	all	arch/s390/include/asm/dasd.h	
'D'	40-5F	drivers/scsi/dpt/dtpi_ioctl.h	
'D'	05	drivers/scsi/pmcraid.h	
'E'	all	linux/input.h	conflict!
'E'	00-0F	xen/evtchn.h	conflict!
'F'	all	linux/fb.h	conflict!
'F'	01-02	drivers/scsi/pmcraid.h	conflict!
'F'	20	drivers/video/fsl-diu-fb.h	conflict!

Code	Seq# (hex)	Include File	Comments
'F'	20	drivers/video/intelfb/intelfb.h	conflict!
'F'	20	linux/ivtvfb.h	conflict!
'F'	20	linux/matroxfb.h	conflict!
'F'	20	drivers/video/aty/atyfb_base.c	conflict!
'F'	00-0F	video/da8xx-fb.h	conflict!
'F'	80-8F	linux/arcfb.h	conflict!
'F'	DD	video/sstfb.h	conflict!
'G'	00-3F	drivers/misc/sgi-gru/grulib.h	conflict!
'G'	00-0F	xen/gntalloc.h, xen/gntdev.h	conflict!
'H'	00-7F	linux/hiddev.h	conflict!
'H'	00-0F	linux/hidraw.h	conflict!
'H'	01	linux/mei.h	conflict!
'H'	02	linux/mei.h	conflict!
'H'	03	linux/mei.h	conflict!
'H'	00-0F	sound/asound.h	conflict!
'H'	20-40	sound/asound_fin.h	conflict!
'H'	80-8F	sound/sfnt_info.h	conflict!
'H'	10-8F	sound/emul0k1.h	conflict!
'H'	10-1F	sound/sb16_csp.h	conflict!
'H'	10-1F	sound/hda_hwdep.h	conflict!
'H'	40-4F	sound/hdspm.h	conflict!
'H'	40-4F	sound/hdsp.h	conflict!
'H'	90	sound/usb/usx2y/usb_stream.h	
'H'	00-0F	uapi/misc/habanalabs.h	conflict!
'H'	A0	uapi/linux/usb/cdc-wdm.h	
'H'	C0-F0	net/bluetooth/hci.h	conflict!
'H'	C0-DF	net/bluetooth/hidp/hidp.h	conflict!
'H'	C0-DF	net/bluetooth/cmtp/cmtp.h	conflict!
'H'	C0-DF	net/bluetooth/bnep/bnep.h	conflict!
'H'	F1	linux/hid-roccat.h	< <a href="mailto:erazor_de@users.sourceforge.net">mailto:erazor_de@users.sourceforge.net</a> >
'H'	F8-FA	sound/firewire.h	
'T'	all	linux/isdn.h	conflict!
'T'	00-0F	drivers/isdn/divert/isdn_divert.h	conflict!
'T'	40-4F	linux/mISDNif.h	conflict!
'K'	all	linux/kd.h	
'L'	00-1F	linux/loop.h	conflict!
'L'	10-1F	drivers/scsi/mpt3sas/mpt3sas_ctl.h	conflict!

Code	Seq# (hex)	Include File	Comments
'L'	E0-FF	linux/ppdd.h	encrypted disk device driver < <a href="http://linux01.gwdg.de/~alatham/ppdd.html">http://linux01.gwdg.de/~alatham/ppdd.html</a> >
'M'	all	linux/soundcard.h	conflict!
'M'	01-16 and	mtid/mtid-abi.h drivers/mtid/mtidchar.c	conflict!
'M'	01-03	drivers/scsi/megaraid/megaraid_sas.h	
'M'	00-0F	drivers/video/fsl-diu-fb.h	conflict!
'N'	00-1F	drivers/usb/scanner.h	
'N'	40-7F	drivers/block/nvme.c	
'O'	00-06	mtid/ubi-user.h	UBI
'P'	all	linux/soundcard.h	conflict!
'P'	60-6F	sound/sscape_ioctl.h	conflict!
'P'	00-0F	drivers/usb/class/usbip.c	conflict!
'P'	01-09	drivers/misc/pci_endpoint_test.c	conflict!
'P'	00-0F	xen/privcmd.h	conflict!
'Q'	all	linux/soundcard.h	
'R'	00-1F	linux/random.h	conflict!
'R'	01	linux/rfkill.h	conflict!
'R'	C0-DF	net/bluetooth/rfcomm.h	
'R'	E0	uapi/linux/fsl_mc.h	
'S'	all	linux/cdrom.h	conflict!
'S'	80-81	scsi/scsi_ioctl.h	conflict!
'S'	82-FF	scsi/scsi.h	conflict!
'S'	00-7F	sound/asequencer.h	conflict!
'T'	all	linux/soundcard.h	conflict!
'T'	00-AF	sound/asound.h	conflict!
'T'	all	arch/x86/include/asm/ioctls.h	conflict!
'T'	C0-DF	linux/if_tun.h	conflict!
'U'	all	sound/asound.h	conflict!
'U'	00-CF	linux/uinput.h	conflict!
'U'	00-EF	linux/usbdevice_fs.h	
'U'	C0-CF	drivers/bluetooth/hci_uart.h	
'V'	all	linux/vt.h	conflict!
'V'	all	linux/video2.h	conflict!
'V'	C0	linux/ivtvfb.h	conflict!
'V'	C0	linux/ivtv.h	conflict!
'V'	C0	media/davinci/vpfe_capture.h	conflict!
'V'	C0	media/si4713.h	conflict!
'W'	00-1F	linux/watchdog.h	conflict!

Code	Seq# (hex)	Include File	Comments
'W'	00-1F	linux/wanrouter.h	conflict! (pre 3.9)
'W'	00-3F	sound/asound.h	conflict!
'W'	40-5F	drivers/pci/switch/switchtec.c	
'W'	60-61	linux/watch_queue.h	
'X'	all	fs/xfs/xfs_fs.h, fs/xfs/linux-2.6/xfs_ioctl32.h, include/linux/falloc.h, linux/fs.h,	conflict!
'X'	all	fs/ocfs2/ocfs_fs.h	conflict!
'X'	01	linux/pktcdvd.h	conflict!
'Z'	14-15	drivers/message/fusion/mptctl.h	
'I'	00-3F	linux/usb/tmc.h	USB Test and Measurement Devices < <a href="mailto:gregkh@linuxfoundation.org">mailto:gregkh@linuxfoundation.org</a> >
'a'	all	linux/atm*.h, linux/sonet.h	ATM on linux < <a href="http://lrcwww.epfl.ch/">http://lrcwww.epfl.ch/</a> >
'a'	00-0F	drivers/crypto/qat/qat_common/adf_cfg_common.h	conflict! qat driver
'b'	00-FF		conflict! bit3 vme host bridge < <a href="mailto:natalia@nikhef.nl">mailto:natalia@nikhef.nl</a> >
'c'	all	linux/cm4000_cs.h	conflict!
'c'	00-7F	linux/comstats.h	conflict!
'c'	00-7F	linux/coda.h	conflict!
'c'	00-1F	linux/chio.h	conflict!
'c'	80-9F	arch/s390/include/asm/chsc.h	conflict!
'c'	A0-AF	arch/x86/include/asm/msr.h conflict!	
'd'	00-FF	linux/char/drm/drm.h	conflict!
'd'	02-40	pcmcia/ds.h	conflict!
'd'	F0-FF	linux/digi1.h	
'e'	all	linux/digi1.h	conflict!
'f'	00-1F	linux/ext2_fs.h	conflict!
'f'	00-1F	linux/ext3_fs.h	conflict!
'f'	00-0F	fs/jfs/jfs_dinode.h	conflict!
'f'	00-0F	fs/ext4/ext4.h	conflict!
'f'	00-0F	linux/fs.h	conflict!
'f'	00-0F	fs/ocfs2/ocfs2_fs.h	conflict!
'f'	13-27	linux/fscrypt.h	
'f'	81-8F	linux/fsverity.h	
'g'	00-0F	linux/usb/gadgetfs.h	
'g'	20-2F	linux/usb/g_printer.h	
'h'	00-7F		conflict! Charon filesystem < <a href="mailto:zapman@interlan.net">mailto:zapman@interlan.net</a> >

Code	Seq# (hex)	Include File	Comments
'h'	00-1F	linux/hpet.h	conflict!
'h'	80-8F	fs/hfsplus/ioctl.c	
'i'	00-3F	linux/i2o-dev.h	conflict!
'i'	0B-1F	linux/ipmi.h	conflict!
'i'	80-8F	linux/i8k.h	
'i'	90-9F	<i>linux/iio/*.h</i>	IIO
'j'	00-3F	linux/joystick.h	
'k'	00-0F	linux/spi/spidev.h	conflict!
'k'	00-05	video/kyro.h	conflict!
'k'	10-17	linux/hsi/hsi_char.h	HSI character device
'l'	00-3F	linux/tcfs_fs.h	transparent cryptographic file system < <a href="http://web.archive.org/web/%2A/http://mikonos.dia.unisa.it/tcfs">http://web.archive.org/web/%2A/http://mikonos.dia.unisa.it/tcfs</a> >
'l'	40-7F	linux/udf_fs_i.h	in development: < <a href="https://github.com/pali/udftools">https://github.com/pali/udftools</a> >
'm'	00-09	linux/mmtimer.h	conflict!
'm'	all	linux/ntio.h	conflict!
'm'	all	linux/soundcard.h	conflict!
'm'	all	linux/synclink.h	conflict!
'm'	00-19	drivers/message/fusion/mptctl.h	conflict!
'm'	00	drivers/scsi/megaraid/megaraid_ioctl.h	conflict!
'n'	00-7F	linux/ncp_fs.h and fs/ncpfs/ioctl.c	
'n'	80-8F	uapi/linux/nlfs2_api.h	NILFS2
'n'	E0-FF	linux/matroxfb.h	matroxfb
'o'	00-1F	fs/ocfs2/ocfs2_fs.h	OCFS2
'o'	00-03	mtdev/ubi-user.h	conflict! (OCFS2 and UBI overlaps)
'o'	40-41	mtdev/ubi-user.h	UBI
'o'	01-A1	<i>linux/dvb/*.h</i>	DVB
'p'	00-0F	linux/phantom.h	conflict! (OpenHaptics needs this)
'p'	00-1F	linux rtc.h	conflict!
'p'	40-7F	linux/nvram.h	
'p'	80-9F	linux/ppdev.h	user-space parport < <a href="mailto:tim@cyberelk.net">mailto:tim@cyberelk.net</a> >
'p'	A1-A5	linux/pps.h	LinuxPPS < <a href="mailto:giometti@linux.it">mailto:giometti@linux.it</a> >
'q'	00-1F	linux/serio.h	
'q'	80-FF	linux/telephony.h linux/ixjuser.h	Internet PhoneJACK, Internet LineJACK < <a href="http://web.archive.org/web/%2A/http://www.quicknet.net">http://web.archive.org/web/%2A/http://www.quicknet.net</a> >

Code	Seq# (hex)	Include File	Comments
'r'	00-1F	linux/msdos_fs.h and fs/fat/dir.c	
's'	all	linux/cdk.h	
't'	00-7F	linux/ppp-ioct.h	
't'	80-8F	linux/isdn_ppp.h	
't'	90-91	linux/toshiba.h	toshiba and toshiba_acpi SMM
'u'	00-1F	linux/smb_fs.h	gone
'u'	20-3F	linux/uvccvideo.h	USB video class host driver
'u'	40-4f	linux/udmabuf.h	userspace dma-buf misc device
'v'	00-1F	linux/ext2_fs.h	conflict!
'v'	00-1F	linux/fs.h	conflict!
'v'	00-0F	linux/sonypi.h	conflict!
'v'	00-0F	media/v4l2-subdev.h	conflict!
'v'	20-27	arch/powerpc/include/uapi/asm/vas-api.h	VAS API
'v'	C0-FF	linux/meye.h	conflict!
'w'	all		CERN SCI driver
'y'	00-1F		packet based user level communications < <a href="mailto:zapman@interlan.net">mailto:zapman@interlan.net</a> >
'z'	00-3F		CAN bus card conflict! < <a href="mailto:hdstich@connectu.ulm.circular.de">mailto:hdstich@connectu.ulm.circular.de</a> >
'z'	40-7F		CAN bus card conflict! < <a href="mailto:oe@port.de">mailto:oe@port.de</a> >
'z'	10-4F	drivers/s390/crypto/zcrypt_api.h	conflict!
' '	00-7F	linux/media.h	
0x80	00-1F	linux/fb.h	
0x81	00-1F	linux/vduse.h	
0x89	00-06	arch/x86/include/asm/sockios.h	
0x89	0B-DF	linux/sockios.h	
0x89	E0-EF	linux/sockios.h	SIOCPRIVATE range
0x89	E0-EF	linux/dn.h	PROTOPRIVATE range
0x89	F0-FF	linux/sockios.h	SIOCDEVPRIVATE range
0x8B	all	linux/wireless.h	
0x8C	00-3F		WiNRADiO driver < <a href="http://www.winradio.com.au/">http://www.winradio.com.au/</a> >
0x90	00	drivers/cdrom/sbpcd.h	
0x92	00-0F	drivers/usb/mon/mon_bin.c	
0x93	60-7F	linux/auto_fs.h	
0x94	all	fs/btrfs/ioct.h and linux/fs.h	Btrfs filesystem some lifted to vfs/generic

Code	Seq# (hex)	Include File	Comments
0x97	00-7F	fs/ceph/ioctl.h	Ceph file system
0x99	00-0F		537-Addinboard driver < <a href="mailto:buk@buks.ipn.de">mailto:buk@buks.ipn.de</a> >
0xA0	all	linux/sdp/sdp.h	Industrial Device Project < <a href="mailto:kenji@bitgate.com">mailto:kenji@bitgate.com</a> >
0xA1	0	linux/vtpm_proxy.h	TPM Emulator Proxy Driver
0xA2	all	uapi/linux/acrn.h	ACRN hypervisor
0xA3	80-8F		Port ACL in development: < <a href="mailto:tlewis@mindspring.com">mailto:tlewis@mindspring.com</a> >
0xA3	90-9F	linux/dtlk.h	
0xA4	00-1F	uapi/linux/tee.h	Generic TEE subsystem
0xA4	00-1F	uapi/asm/sgx.h	< <a href="mailto:linux-sgx@vger.kernel.org">mailto:linux-sgx@vger.kernel.org</a> >
0xA5	01-05	linux/surface_aggregator/cdev.h	Microsoft Surface Platform System Aggregator < <a href="mailto:luzmaximilian@gmail.com">mailto:luzmaximilian@gmail.com</a> >
0xA5	20-2F	linux/surface_aggregator/dtx.h	Microsoft Surface DTX driver < <a href="mailto:luzmaximilian@gmail.com">mailto:luzmaximilian@gmail.com</a> >
0xAA	00-3F	linux/uapi/linux/userfaultfd.h	
0xAB	00-1F	linux/nbd.h	
0xAC	00-1F	linux/raw.h	
0xAD	00		Netfilter device in development: < <a href="mailto:rusty@rustcorp.com.au">mailto:rusty@rustcorp.com.au</a> >
0xAE	00-1F	linux/kvm.h	Kernel-based Virtual Machine < <a href="mailto:kvm@vger.kernel.org">mailto:kvm@vger.kernel.org</a> >
0xAE	40-FF	linux/kvm.h	Kernel-based Virtual Machine < <a href="mailto:kvm@vger.kernel.org">mailto:kvm@vger.kernel.org</a> >
0xAE	20-3F	linux/nitro_enclaves.h	Nitro Enclaves
0xAF	00-1F	linux/fsl_hypervisor.h	Freescale hypervisor
0xB0	all		RATIO devices in development: < <a href="mailto:vgo@ratio.de">mailto:vgo@ratio.de</a> >
0xB1	00-1F		PPPoX < <a href="mailto:mostrows@styx.uwaterloo.ca">mailto:mostrows@styx.uwaterloo.ca</a> >
0xB3	00	linux/mmc/ioctl.h	
0xB4	00-0F	linux/gpio.h	< <a href="mailto:linux-gpio@vger.kernel.org">mailto:linux-gpio@vger.kernel.org</a> >
0xB5	00-0F	uapi/linux/rpmsg.h	< <a href="mailto:linux-remoteproc@vger.kernel.org">mailto:linux-remoteproc@vger.kernel.org</a> >
0xB6	all	linux/fpga-dfl.h	
0xB7	all	uapi/linux/remoteproc_cdev.h	< <a href="mailto:linux-remoteproc@vger.kernel.org">mailto:linux-remoteproc@vger.kernel.org</a> >
0xB7	all	uapi/linux/nsfs.h	< <a href="mailto:Andrei.Vagin@openvz.org">mailto:Andrei.Vagin@openvz.org</a> >
0xC0	00-0F	linux/usb/iowarrior.h	
0xCA	00-0F	uapi/misc/cxl.h	
0xCA	10-2F	uapi/misc/ocxl.h	
0xCA	80-BF	uapi/scsi/cxlflash_ioctl.h	
0xCB	00-1F		CBM serial IEC bus in development: < <a href="mailto:michael.klein@puffin.lb.shuttle.de">mailto:michael.klein@puffin.lb.shuttle.de</a> >
0xCC	00-0F	drivers/misc/ibmvmc.h	pseries VMC driver
0xCD	01	linux/reiserfs_fs.h	
0xCE	01-02	uapi/linux/cxl_mem.h	Compute Express Link Memory Devices
0xCF	02	fs/cifs/ioctl.c	



Code	Seq# (hex)	Include File	Comments
0xDB	00-0F	drivers/char/mwave/mwavepub.h	
0xDD	00-3F		ZFCP device driver see drivers/s390/scsi/ < <a href="mailto:aherrman@de.ibm.com">mailto:aherrman@de.ibm.com</a> >
0xE5	00-3F	linux/fuse.h	
0xEC	00-01	drivers/platform/chrome/cros_ec_dev.h	ChromeOS EC driver
0xEE	00-09	uapi/linux/pfrit.h	Platform Firmware Runtime Update and Telemetry
0xF3	00-3F	drivers/usb/misc/sisusbvga/sisusb.h	sisfb (in development) < <a href="mailto:thomas@winischhofer.net">mailto:thomas@winischhofer.net</a> >
0xF6	all		LTTng Linux Trace Toolkit Next Generation < <a href="mailto:mathieu.desnoyers@efficios.com">mailto:mathieu.desnoyers@efficios.com</a> >
0xF8	all	arch/x86/include/uapi/asm/amd_hsmp.h	AMD HSMP EPYC system management interface driver < <a href="mailto:rchatrad@amd.com">mailto:rchatrad@amd.com</a> >
0xFD	all	linux/dm-ioctl.h	
0xFE	all	linux/isst_if.h	