

# Software Defined Radio Interface (SDR)

SDR is an abbreviation of Software Defined Radio, the radio device which uses application software for modulation or demodulation. This interface is intended for controlling and data streaming of such devices.

SDR devices are accessed through character device special files named `/dev/swradio0` to `/dev/swradio255` with major number 81 and dynamically allocated minor numbers 0 to 255.

## Querying Capabilities

Devices supporting the SDR receiver interface set the `V4L2_CAP_SDR_CAPTURE` and `V4L2_CAP_TUNER` flag in the `capabilities` field of struct `:c:type:'v4l2_capability'` returned by the `:ref:'VIDIOC_QUERYCAP'` ioctl. That flag means the device has an Analog to Digital Converter (ADC), which is a mandatory element for the SDR receiver.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\linux-master [Documentation] [userspace-api] [media] [v4l]dev-sdr.rst, line 21); [backlink](#)

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Devices supporting the SDR transmitter interface set the `V4L2_CAP_SDR_OUTPUT` and `V4L2_CAP_MODULATOR` flag in the `capabilities` field of struct `:c:type:'v4l2_capability'` returned by the `:ref:'VIDIOC_QUERYCAP'` ioctl. That flag means the device has an Digital to Analog Converter (DAC), which is a mandatory element for the SDR transmitter.

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At least one of the read/write, streaming or asynchronous I/O methods must be supported.

## Supplemental Functions

SDR devices can support `:ref:'controls <control>'`, and must support the `:ref:'tuner'` ioctls. Tuner ioctls are used for setting the ADC/DAC sampling rate (sampling frequency) and the possible radio frequency (RF).

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The `V4L2_TUNER_SDR` tuner type is used for setting SDR device ADC/DAC frequency, and the `V4L2_TUNER_RF` tuner type is used for setting radio frequency. The tuner index of the RF tuner (if any) must always follow the SDR tuner index. Normally the SDR tuner

is #0 and the RF tuner is #1.

The `ref`VIDIOC_S_HW_FREQ_SEEK`` ioctl is not supported.

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## Data Format Negotiation

The SDR device uses the `ref`format`` ioctls to select the capture and output format. Both the sampling resolution and the data streaming format are bound to that selectable format. In addition to the basic `ref`format`` ioctls, the `ref`VIDIOC_ENUM_FMT`` ioctl must be supported as well.

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To use the `ref`format`` ioctls applications set the `type` field of a struct `:ctype:`v4l2_format`` to `V4L2_BUF_TYPE_SDR_CAPTURE` or `V4L2_BUF_TYPE_SDR_OUTPUT` and use the struct `:ctype:`v4l2_sdr_format`` `sdr` member of the `fmt` union as needed per the desired operation. Currently there are two fields, `pixelformat` and `buffersize`, of struct `:ctype:`v4l2_sdr_format`` which are used. Content of the `pixelformat` is V4L2 FourCC code of the data format. The `buffersize` field is maximum buffer size in bytes required for data transfer, set by the driver in order to inform application.

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master\Documentation\userspace-api\media\v4l\linux-master] [Documentation] [userspace-api] [media] [v4l]dev-sdr.rst, line 81)

Unknown directive type "c.type".

```
.. c:type:: v4l2_sdr_format
```

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Unknown directive type "tabularcolumns".

```
.. tabularcolumns:: |p{4.4cm}|p{4.4cm}|p{8.5cm}|
```

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Unknown directive type "flat-table".

```
.. flat-table:: struct v4l2_sdr_format
:header-rows: 0
:stub-columns: 0
:widths:      1 1 2

* - __u32
  - __pixelformat
  - The data format or type of compression, set by the application.
    This is a little endian
    :ref:`four character code <v4l2-fourcc>`. V4L2 defines SDR
    formats in :ref:`sdr-formats`.
* - __u32
  - __buffersize
  - Maximum size in bytes required for data. Value is set by the
    driver.
* - __u8
  - __reserved[24]
  - This array is reserved for future extensions. Drivers and
    applications must set it to zero.
```

An SDR device may support `ref`read/write <rw>`` and/or streaming (`ref`memory mapping <nmap>`` or `ref`user pointer <userp>``) I/O.

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