

# Tuners and Modulators

## Tuners

Video input devices can have one or more tuners demodulating a RF signal. Each tuner is associated with one or more video inputs, depending on the number of RF connectors on the tuner. The `type` field of the respective struct `:type:'v4l2_input'` returned by the `ref:'VIDIOC_ENUMINPUT'` ioctl is set to `V4L2_INPUT_TYPE_TUNER` and its `tuner` field contains the index number of the tuner.

**System Message: ERROR/3** (D:\onboarding-resources\sample-onboarding-resources\linux-master\Documentation\userspace-api\media\v4l\linux-master) (Documentation) (userspace-api) (media) (v4l) tuner.rst, line 13); [backlink](#)

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Radio input devices have exactly one tuner with index zero, no video inputs.

To query and change tuner properties applications use the `ref:'VIDIOC_G_TUNER <VIDIOC_G_TUNER>'` and `ref:'VIDIOC_S_TUNER <VIDIOC_G_TUNER>'` ioctls, respectively. The struct `:type:'v4l2_tuner'` returned by `ref:'VIDIOC_G_TUNER <VIDIOC_G_TUNER>'` also contains signal status information applicable when the tuner of the current video or radio input is queried.

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### Note

`ref:'VIDIOC_S_TUNER <VIDIOC_G_TUNER>'` does not switch the current tuner, when there is more than one. The tuner is solely determined by the current video input. Drivers must support both ioctls and set the `V4L2_CAP_TUNER` flag in the struct `:type:'v4l2_capability'` returned by the `ref:'VIDIOC_QUERYCAP'` ioctl when the device has one or more tuners.

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## Modulators

Video output devices can have one or more modulators, that modulate a video signal for radiation or connection to the antenna input of a TV set or video recorder. Each modulator is associated with one or more video outputs, depending on the number of RF connectors on the modulator. The `type` field of the respective struct `:c:type:'v4l2_output'` returned by the `ref:'VIDIOC_ENUMOUTPUT'` ioctl is set to `V4L2_OUTPUT_TYPE_MODULATOR` and its `modulator` field contains the index number of the modulator.

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Radio output devices have exactly one modulator with index zero, no video outputs.

A video or radio device cannot support both a tuner and a modulator. Two separate device nodes will have to be used for such hardware, one that supports the tuner functionality and one that supports the modulator functionality. The reason is a limitation with the `ref:'VIDIOC_S_FREQUENCY <VIDIOC_G_FREQUENCY>'` ioctl where you cannot specify whether the frequency is for a tuner or a modulator.

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To query and change modulator properties applications use the `ref:'VIDIOC_G_MODULATOR <VIDIOC_G_MODULATOR>'` and `ref:'VIDIOC_S_MODULATOR <VIDIOC_G_MODULATOR>'` ioctl. Note that `ref:'VIDIOC_S_MODULATOR <VIDIOC_G_MODULATOR>'` does not switch the current modulator, when there is more than one at all. The modulator is solely determined by the current video output. Drivers must support both ioctls and set the `V4L2_CAP_MODULATOR` flag in the struct `:c:type:'v4l2_capability'` returned by the `ref:'VIDIOC_QUERYCAP'` ioctl when the device has one or more modulators.

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## Radio Frequency

To get and set the tuner or modulator radio frequency applications use the `ref:VIDIOC_G_FREQUENCY` `<VIDIOC_G_FREQUENCY>` and `ref:VIDIOC_S_FREQUENCY` `<VIDIOC_G_FREQUENCY>` ioctl which both take a pointer to a struct `c:type:v4l2_frequency`. These ioctls are used for TV and radio devices alike. Drivers must support both ioctls when the tuner or modulator ioctls are supported, or when the device is a radio device.

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