



1.1. Digital Down Conversion (DDC)

The Analog-to-Digital Converter (ADC) block sub-samples Intermediate Frequency (IF) signals and a Digital Down Conversion (DDC) block converts the IF to base-band signal.

In normal cases, the tuner is high side mixing and the spectrum is inverted. The demodulator requires an inverse spectrum in the DDC (register *spec_inv*). In RTL2832U there is an adjacent channel canceller that is enabled or disabled by register *en_aci*. The initial IF frequency should be set by register *pset_iffreq*. This register setting depends on the crystal frequency. The equation of *pset_iffreq* is shown below:

$$pset_iffreq = -\text{floor} \left(\frac{f_{IF-D}}{f_{crystal}} \times 4194304 \right)$$

where:

f_{IF-D} : Intermediate Frequency (IF) after sub-sampling

$f_{crystal}$: Crystal frequency

Examples:

- $f_{IF}=4.57M, f_{ADC}=28.8M,$
 $pset_iffreq = -665554 \Rightarrow 2^{22} - 665554 = 3528750$ (two's complement) =
0x35D82E
- $f_{IF}=36.167M, f_{ADC}=28.8M, f_{IF-D}=36.167-28.8=7.367,$
 $pset_iffreq = -1072897 \Rightarrow 2^{22} - 1072897 = 3121407$ (two's complement) =
0x2FA0FF
- $f_{IF}=36.125M, f_{ADC}=28.8M, f_{IF-D}=36.167-28.8=7.367,$
 $pset_iffreq = -1066780 \Rightarrow 2^{22} - 1066780 = 3127524$ (two's complement) =
0x2FB8E4
- $f_{IF}=0M, f_{ADC}=28.8M,$

$pset_iffreq=0x0$

- DAB mode:

$pset_iffreq= -1066988 = 3127316$ (two's complement) = **0x2FB814**

Table 1. Digital Down Conversion (DDC)

Register Name	Page	Offset{MSB,LSB}	Bits Used	R/W	Default (Hex)	Description
spec_inv	1	0x15	[0]	R/W	0	1: Spectrum inversion 0: Spectrum non-inversion
en_aci	1	0x15	[1]	R/W	1	1: Enable adjacent channel rejection 0: Disable adjacent channel rejection
pset_iffreq	1	{0x19,0x1B}	[21:0]	R/W		Set IF frequency

1.2. Resampler

As the ADC sampling clock is larger than the symbol ratio, there is a re-sampler to convert data of sampling rate to symbol ratio. The ratio could be set by register “rsamp_ratio”. The *rsamp_ratio* is related with signal bandwidth and crystal frequency. The equation of *rsamp_ratio* is shown as below,

$$rsamp_ratio = floor \left(\frac{f_{crystal}}{f_{symbol}} \times 4194304 \right)$$

where $f_{crystal}$ = crystal frequency

f_{symbol} = symbol ratio of different bandwidths

BW: 8MHz → $f_{symbol}=64/7$ MHz, $f_{crystal}=28.8$ MHz

- $rsamp_ratio = 13212057$ (dec)= **0x C99999**

BW: 7MHz → $f_{symbol}=8$ MHz, $f_{crystal}=28.8$ MHz

- $rsamp_ratio = 15099494$ (dec)= **0x E66666**

BW: 6MHz → $f_{symbol}=48/7$ MHz, $f_{crystal}=28.8$ MHz

- $rsamp_ratio = 17616076$ (dec)= **0x 10CCCC**

DAB mode:

- $rsamp_ratio = 14745600$ (dec)= **0x E10000**

Register Name	Page	Offset{MSB,LSB}	Bits Used	R/W	Default (Hex)	Description
rsamp_ratio	1	{0x9F, 0xA2}	[27:2]	R/W	C99999	resampler ratio

