

PULSE COUNTING FM DISCRIMINATOR

WZAEW

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- FM DEMODULATOR THAT DOESN'T RELY ON TUNED CIRCUITS LIKE THE TRADITIONAL FM RATIO DETECTOR OR FOSTER-SEELEY DISCRIMINATOR

• HOW IT WORKS:

- GENERATE NARROW FIXED-WIDTH PULSES AT FM CARRIER (IF) FREQUENCY (AT ZERO-CROSSING, FOR EXAMPLE)

- THE DUTY-CYCLE VARIES WITH THE CARRIER (IF) FREQUENCY

- INTEGRATE / AVERAGE THE PULSES TO RECREATE THE BASEBAND (AUDIO)

- WHEN f_c IS LOW...

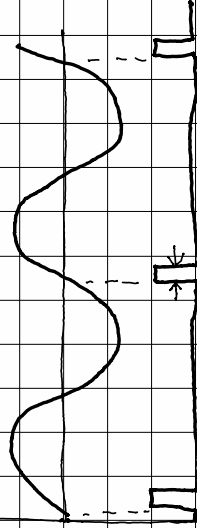
... FEWER PULSES, AVERAGE VOLTAGE IS LOW



- WHEN f_c INCREASES...

... MORE PULSES, AVERAGE VOLTAGE INCREASES



FIXED PULSE WIDTH
 $\frac{1}{2}$ PERIOD OF CARRIER



PULSES CAN BE
POSITIVE  OR
NEGATIVE 

PULSE COUNTING FM DEMODULATOR - MORE DETAILS

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- ALMOST ALWAYS REQUIRES DOWN-CONVERSION FROM ORIGINAL CARRIER FREQUENCY INTO A LOWER FREQUENCY f_{IF} (INTERMEDIATE FREQ)

WHY?

- PEAK-TO-PEAK FREQUENCY DEVIATION IS TYPICALLY MUCH, MUCH, MUCH SMALLER THAN CARRIER FREQUENCY

∴ THE DUTY-CYCLE VARIATION OF THE PULSE TRAIN IS VERY SMALL

EXAMPLE: $f_c = 100 \text{ MHz}$ $f_{DEV} = 50 \text{ kHz}$

(FREQ VARIES FROM 99.95 MHz TO 100.05 MHz)

- WHEN YOU DOWN-CONVERT...
 - CARRIER FREQUENCY IS REDUCED
 - DEVIATION REMAINS THE SAME

∴ THE P-P FREQUENCY DEVIATION IS A LARGE PORTION OF f_{FREQ} .

EXAMPLE: $f_{IF} = 100 \text{ kHz}$ $f_{DEV} = 50 \text{ kHz}$

(FREQ VARIES FROM 50 kHz TO 150 kHz)

PRACTICE TIPS

- $f_{IF} >$ PEAK DEVIATION
- LOWER f_{IF} → LARGER BASEBAND ω/f
- HIGHER f_{IF} → EASIER TO FILTER

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CIRCUITS

