converter_walkthrough

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1 Converter Walkthrough

$$\tilde{r}[n] = \frac{r[n] - 128}{128}, \ \mathcal{H}\{\tilde{r}\} \to z[n], \ s[m] = \text{resample}_{f_s \to f'_s}(z[n]e^{-j2\pi\Delta fn/f_s}), \ b = \mathcal{Q}_{u8}(\text{interleave}(\Re s, \Im s)).$$

$$\Lambda : \mathcal{F} \to \text{LineTable}, \quad \mathcal{F} = \texttt{scripts/convert\_dat\_to\_bin.py}.$$

$$\Lambda : \text{script} \mapsto \{(\ell_i, s_{\ell_i})\}_{i=1}^{M}, \quad \text{view lines via } \texttt{show\_lines}.$$

```python
from pathlib import Path
SCRIPT = Path('../scripts/convert_dat_to_bin.py')
LINES = SCRIPT.read_text().splitlines()

def show_lines(start, end):
    for no in range(start, end+1):
        print(f"{no:04d}: {LINES[no-1]}")
```

1.1 Config & dtype

$$\sigma : \text{YAML} \to (f_s, f'_s, f_c, f_0, \text{dtype}).$$

$$\text{up} = \text{num}\left(\frac{f'_s}{f_s}\right), \ \text{down} = \text{den}\left(\frac{f'_s}{f_s}\right).\text{chunk} = \frac{\text{bytes}}{\text{dtype size}}.$$

```python
show_lines(20, 78)
```

1.2 Chunk stream

$$x \to \mathcal{H}(x) \to e^{-j2\pi\Delta fn/f_s} \to \text{resample\_poly}.$$

```python
show_lines(93, 169)
```

1.3 Quantizer

$$\mathcal{Q}_{u8}(x) = \text{clip}(\lfloor(x+1)127.5\rfloor, 0, 255).$$

```
[ ]: show_lines(170, 205)
```

1.4 Metadata

$$\text{meta} \leftarrow (f_s, f'_s, f_c, f_0, \text{samples}, \max|s|).$$

```
[ ]: show_lines(210, 229)
```

1.5 Fraction check

$$\rho = \frac{f'_s}{f_s} = \frac{2048}{26000} = \frac{128}{1625}.\text{Implementation uses } \text{Fraction}(f'_s, f_s) \text{ to get } (\text{up}, \text{down}).$$

```python
[ ]: from fractions import Fraction
     import yaml
     cfg = yaml.safe_load(Path('../configs/pipeline.yaml').read_text())
     ratio = Fraction(int(cfg['signal']['fs_out']), int(cfg['signal']['fs_in']))
     print('fs_in:', cfg['signal']['fs_in'], 'fs_out:', cfg['signal']['fs_out'])
     print('up:', ratio.numerator, 'down:', ratio.denominator)
```