

516-65  
HL  
2/1/72

### SOME DIGITAL FILTER APPLICATION PROGRAMS

A few special purpose application programs have been written to solve some common digital filter conversion problems. One program is callable from the SYS? level, while the other two programs may be called from within an FSNAP program.

The CONVRT program is callable from the SYS? level and will convert a fraction to a specified number of rounded up binary bits and also give the equivalent decimal fraction of the rounded up result. The routine will round up any number in the range  $-8 < \text{number} < 8$  and print out its octal representation in enough digits to cover the required number of binary bits. The format of the decimal equivalent may be specified at any time by typing in e.g. %9.8 (the default format is %8.7). The user is first asked for the number of bits (1 to 44), followed by either a space or carriage return. A null response will exit him from the program. The user is then prompted with a "\*" at which point he may type in a fraction (terminated by a space). A null response will exit him up to the first question level. An example of the running of the program is attached.

The two programs, FSROND and FSTRUN, are directly callable from within an FSNAP program and perform the function of rounding up and truncating a number in the range  $-4 < \text{number} < 4$  to a specified number of binary bits, respectively. Both routines require two arguments as input:

1. number of binary bits
2. input number

and one argument as output:

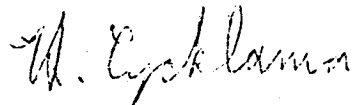
3. output number (rounded and truncated, respectively).

An example of the use of these routines is attached. The number of bits to which the input number may be rounded or truncated must be between 2 and 22 inclusive. In the example, the original number is saved in variable A. However, one may return the rounded up or truncated number back to A, by means of:

```
CALL FSROND (N,A,A)
```

```
CALL FSTRUN (N,A,A)
```

An attempt to round up or truncate a number larger than four will result in an error return from the called routine.



MH-1352-HL-JER

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Att. (2)

:516 TSS

PWD? HL

SYS? CONVRT

NO. OF BITS ?8

\* .0987 = 0.0620 = 0.0976563  
\* -.0987 = -0.0620 = -0.0976563  
\* .125 = 0.1000 = 0.1250000  
\* .124 = 0.1000 = 0.1250000  
\* .120 = 0.0760 = 0.1210933  
\* .122 = 0.0760 = 0.1210933  
\* .123 = 0.0760 = 0.1210933  
\* .1235 = 0.1000 = 0.1250000  
\* %9.6  
\* .123 = 0.0760 = 0.121094  
\*

NO. OF BITS ?9

\* .0987 = 0.06300 = 0.099609  
\* .120 = 0.07500 = 0.119141  
\* .121 = 0.07600 = 0.121094  
\* .122 = 0.07600 = 0.121094  
\* .123 = 0.07700 = 0.123047  
\* .124 = 0.07700 = 0.123047  
\* .125 = 0.10000 = 0.125000  
\* .126 = 0.10100 = 0.126953  
\* 1.126 = 1.10100 = 1.126953  
\*

NO. OF BITS ?25

\* %10.9  
\* .0987 = 0.0624214700 = 0.098699987  
\* .120 = 0.0753412200 = 0.120000005  
\* .121 = 0.0757473300 = 0.120999992  
\* .122 = 0.0763554440 = 0.122000009  
\* .123 = 0.0767635540 = 0.122999996  
\* .124 = 0.0773716700 = 0.124000013  
\* .125 = 0.1000000000 = 0.125000000  
\* .126 = 0.1004061100 = 0.125999987  
\* -1.245 = -1.1753412200 = -1.244999886  
\* 1.245 = 1.1753412200 = 1.244999886  
\*

NO. OF BITS ?6

\* %7.5  
\* .120 = 0.1000 = 0.12500  
\* .125 = 0.1000 = 0.1250A?8A:  
\* .130 = 0.1000 = 0.12500  
\* .150 = 0.1200 = 0.15625  
\* .1625 = 0.1200 = 0.15625  
\* .175 = 0.1300 = 0.17188  
\*

NO. OF BITS ?

SYS? 0

BYE

1516 TSS

WD? HL

SYS? F, TEST

SNAP- E

\*EDIT

P1,99

```

1 1 ASK !"NO. OF BITS=" N
2   IF(N=0) STOP
3 2 ASK ! "A=" A
4   IF(A=0) GOTO 1
5   CALL FSROND(N,A,B)
6   CALL FSTRUN(N,A,C)
7   TYPE ! %8.6 A "   ROUNDED   10"%2 N " BITS =" %8.6 B
8   TYPE ! %8.6 A "   TRUNCATED 10"%2 N " BITS =" %8.6 C
9   GOTO 2
10 <EOF>

```

X

FSNAP- G

NO. OF BITS=8

A=.0987

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.098700 | ROUNDED   | TO | 8 BITS = | 0.097656 |
| 0.098700 | TRUNCATED | TO | 8 BITS = | 0.097656 |

A=-0.0987

|           |           |    |          |           |
|-----------|-----------|----|----------|-----------|
| -0.098700 | ROUNDED   | TO | 8 BITS = | -0.097656 |
| -0.098700 | TRUNCATED | TO | 8 BITS = | -0.097656 |

A=.120

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.120000 | ROUNDED   | TO | 8 BITS = | 0.121094 |
| 0.120000 | TRUNCATED | TO | 8 BITS = | 0.117188 |

A=.122

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.122000 | ROUNDED   | TO | 8 BITS = | 0.121094 |
| 0.122000 | TRUNCATED | TO | 8 BITS = | 0.121094 |

A=.125

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.125000 | ROUNDED   | TO | 8 BITS = | 0.125000 |
| 0.125000 | TRUNCATED | TO | 8 BITS = | 0.125000 |

A=1.124

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 1.124000 | ROUNDED   | TO | 8 BITS = | 1.125000 |
| 1.124000 | TRUNCATED | TO | 8 BITS = | 1.121094 |

A=

NO. OF BITS=9

A=.0987

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.098700 | ROUNDED   | TO | 9 BITS = | 0.099609 |
| 0.098700 | TRUNCATED | TO | 9 BITS = | 0.097656 |

A=.120

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.120000 | ROUNDED   | TO | 9 BITS = | 0.119141 |
| 0.120000 | TRUNCATED | TO | 9 BITS = | 0.119141 |

A=.124

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.124000 | ROUNDED   | TO | 9 BITS = | 0.123047 |
| 0.124000 | TRUNCATED | TO | 9 BITS = | 0.123047 |

A=

NO. OF BITS=6

A=.120

|          |           |    |          |          |
|----------|-----------|----|----------|----------|
| 0.120000 | ROUNDED   | TO | 6 BITS = | 0.125000 |
| 0.120000 | TRUNCATED | TO | 6 BITS = | 0.109375 |