

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
HAYSTACK OBSERVATORY
 WESTFORD, MASSACHUSETTS 01886

December 1, 2004

Telephone: 978-692-4764
Fax: 781-981-0590

To: SRT Group

From: Alan E.E. Rogers

Subject: GrayChip configuration settings

1] Observing modes

The new SRT supports 3 modes:

Mode	# Chans	Bandwidth MHz	Output data
sing	1	1.25	1024 point 16 bit spectra
doub	2	0.833	1024 point 16 bit spectra
vlbi	1	4	1bit/sample clipped

2] GrayChip filters

For the sing and doub modes the FIR filters coefficients (see pages 57 and 58 of GC4016 Rev 1.0 Aug 27, 2001 datasheet) are cfir-80 and pfir-80 while the filters for the vlbi modes are cfir-150 and pfir-150.

3] Setting the GrayChip configuration parameters

The default parameters are in the file run.dat which is initially loaded by the firmware running in the ADSP-21161N. Changes to these default parameters are made by sending the keyword “gcfg” followed by the starting location, number of locations and new data via a 64 byte USB bulkout transfer followed by the key word “gset” in an other USB transfer to load the revised table into the GrayChip.

4] Table of parameter changes

Parameter	Table address start 0x	GC pages	Gc address	Name	Value	Mode
L.O. phase	8	6,22	17	Phase MSB	0x0	All
		14,30	17		0x40	All
L.O. phase	9	6,14,22,30	18	Byte 0	K0	All

				FREQ		
L.O. Freq	a	6,14,22,30	19	Byte 1 FREQ	K1	all
L.O. Freq	b	6,14,22,30	20	Byte 2 FREQ	K2	all
L.O. Freq	c	6,14,22,30	21	Byte 3 FREQ	K3	all
Decimation	15	7, 15, 23,31	21	DEC LSB	0x0f	sing
Decimation	15	7,15,23,31	21	DEC LSB	0x17	doub
Decimation	15	7,15,23,31	21	DEC LSB	0x09	vlbi
C1C scale	17	7, 15, 23,31	23	Scale bigscale	0x79	sing
C1C scale	17	7,15,23,31	23	Scale, bigscale	0x71	doub
C1C scale	17	7,15,23,31	23	Scale, bigscale	0x79	vlbi
splitQ	18	7,23	24	Scale, bigscale	0x30	sing,doub
		15,31	24		0x50	sing, doub
		7,31	24		0x50	vlbi
Neg-ctl		15,23	24		0x5f	vlbi
	19	7, 15,23,31	25		0x40	sing,doub
Qdly-cfir		7,23	25		0x42	vlbi
		15,31	25		0x40	vlbi
	20	7, 15,23,31	26		0x00	sing, doub
Qdly-pfir		7, 15	26		0x02	vlbi
		23,31	26		0x00	vlbi
Input	2c	7,15,23,31	27		0x83	vlbi
		7, 15	27		0x83	sing,doub
		23,31	27		0x82	sing,doub
Resampler	c4	64	16		0x21	sing, doub
		64	16		0x20	vlbi
Chan map		64	20		0x50	sing, doub
		64	20		0x00	vlbi
Output control	df	98	18		0xcb	sing, doub
			18		0x56	vlbi

In terms of GrayChip named variables:

Name	A	B	C	D	A	B	C	D	A	B	C	D
SplitQ	1	1	1	1	1	1	1	1	1	1	1	1
Phase	0	40	0	40	0	40	0	40	0	40	0	40
Qdly-cfir	0	0	0	0	0	0	0	0	1	0	1	0

Qdly-pfir	0	0	0	0	0	0	0	0	1	1	0	0
Neg-ctl	0	0	0	0	0	0	0	0	0	f	f	0
Ionly	1	0	1	0	1	0	1	0	0	0	0	0
Qonly	0	1	0	1	0	1	0	1	1	1	1	1
Chan map	50	50	50	50	50	50	50	50	0	0	0	0
Reverse_iq	0	0	0	0	0	0	0	0	1	1	1	1
Nc	1	1	1	1	1	1	1	1	0	0	0	0
Input_sel	3	2	3	2	3	2	3	2	3	3	3	3
Big_scale	7	7	7	7	6	6	6	6	7	7	7	7
Coarse	4	4	4	4	4	4	4	4	4	4	4	4

5] Relation to D1 array

Since the SRT uses the same digital board as the D1 array all the other GrayChip parameters are those given in D1 array memo #014.

6] Data transfer modes

The keywords “sing”, “doub”, and “vlbi,” sent to the ADSP-21161N via a 64 byte USB transfer. These keywords change the operating parameters of the DSP as follows:

Keyword	Nchan	Bufs per second	Packet size
sing	1	1000	4096
doub	2	680	4096
vlbi	1	1600	512

7] Digital gain

The GrayChip gain is given by

$$N^5 2^{(SHIFT+SCALE+6 \times BIG_SCALE-62)} 2^{COARSE}$$

Mode	Final_shift	Shift	Scale	Big_scale	Coarse	N	G	GdB
Deuterium	5	4	3	5	0	40	0.76	-8
sing	5	4	1	7	4	8	2.0	0
doub	5	4	1	6	4	12	1.90	0
vlbi	5	4	1	7	4	5	1.53	-2

- Notes: 1] FINAL_SHIFT = 5 bypasses the resampler
2] G in dB includes 6 dB digital mixer loss