

NATIONAL RADIO ASTRONOMY OBSERVATORY  
SOCORRO, NEW MEXICO  
VERY LARGE ARRAY PROGRAM

VLA ELECTRONICS MEMORANDUM NO. 215

DATA SET 4 COMMAND AND MONITOR DATA

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Data set 4 controls the F rack in the VLA antenna vertex room. This rack operates the X-band front end and will operate future single-band front ends.

I. Front End command and monitor data

A. Noise cals:

The state of the noise cals is commanded at mux address 322. The command echo is read back at mux 222. Since the format of the readback depends slightly on the Modcomp program used to display it, it is given here as displayed by both "mw" and "tm".

Function	Mux 322	Mux 222 (via mw)	Mux 222 (via tm)
Both cals off	000	000000	00000000
Solar on continuously	020	000010	00001000
Normal on continuously	100	000040	00004000
Both on continuously	120	000050	00005000
Solar on, switching**	220	000090	00009000
Normal on, switching*	300	0000C0	0000C000
Both on, switching	320	0000D0	0000D000
	(octal)	(hex)	(hex)

\* Normal condition

\*\* Normal condition for solar observing

B. Heat/cool state:

Three parallel bits from the C-1 module could be used to command one of 5 possible cool/heat states at the F.E. The bits are labeled "X", controlling the vacuum pump, C, controlling the refrigerator, and "/H" ("not-H"), controlling the warm-up heater in the dewar.

In normal operation, however, the F.E. is left in "manual control". If it is desired to change the heat/cool state, or to enable remote control of the F.E., it must be done at the antenna.

The commands are listed here for reference. Commands are sent to mux address 323, the echo is read back at mux 223. Monitor bits for actual heat/cool status are read back as part of the combined status readback at mux 224.

Function	X C /H	Mux 323	Mux 223 (via mw)	Mux 223 (via tm)**
Off	1 0 1	005	00003D	00040093
Cool*	1 1 1	007	00003F	00040093
Stress	1 0 0	004	00003C	00040093
Heat	1 1 0	006	00003E	00040093
Pump	0 1 0	002	00003A	00040093
		(octal)	(hex)	(hex)

\* Normal operation

\*\* tm overlay does not read this mux address

### C. Combined Status:

Mux 224 reads back digital monitor information from the F.E. and the C-1. This information includes the F.E. frequency band, the F.E. serial number, the F.E. modification level, and status information about calcs, cryo and vacuum systems. The bits are assigned as follows:

Function	Weight(hex)	Bit no.
/H	1	0 = L.S. bit
C	2	1
X	4	2
Manual control	8	3
Pump	10	4
Vacuum valve	20	5
Solar cal	40	6
Normal cal	80	7
Mod level LS bit	100	8
Mod level MS bit	200	9
Serial no. LS bit	400	10
Serial no. 2 <sup>1</sup> bit	800	11
Serial no. 2 <sup>2</sup> bit	1000	12
Serial no. 2 <sup>3</sup> bit	2000	13
Serial no. 2 <sup>4</sup> bit	4000	14
Serial no. MS bit	8000	15
Freq. LS bit	1 0000	16
Freq. 2 <sup>1</sup> bit	2 0000	17
Freq. 2 <sup>2</sup> bit	4 0000	18
Freq. MS bit	8 0000	19
Spare	10 0000	20
Spare	20 0000	21
Spare	40 0000	22
Spare	80 0000	23 = M.S. bit

A typical readback for X-band F.E. serial no. 27 would be:  
 (via mw) (via tm)  
 F56C8F 00056C8F

This is decoded as:

F or 000		Ignore
5	0101	Band = 5 = X-band
6C	<u>0110 1100</u>	<u>SN = 27</u> Mod level = 0
8	1000	Normal cal
F	1111	Normal cryo status

As this is being written, most of the mux 224 readbacks are garbled. This is being corrected as time permits.

Frequency bands are indicated as follows:

Code	Frequency	Wavelength	Letter
0	75 MHz	4 m	
1	327/610 MHz	90/50 cm	P
2	1.5 GHz	20 cm	L
3	2.3 GHz	13 cm	S
4	4.9 GHz	6 cm	C
5	8.4 GHz	3.6 cm	X
6	10.7	3 cm	
7	14.9	2 cm	U (Ku)
8	23	1.3 cm	K
9	43	7 mm	
A	86	3.5 mm	

D. Analog readbacks:

Mux: (octal)	Function	Scale 1 V =	Nominal Value	Range (overlay)
060	Pump manifold vacuum	*	10	9.95/10.1
061	Dewar vacuum	*	0	-.2/.2
062	15K stage temperature	100 K	.15	.1/.2
063	50K stage temperature	100 K	.5	.4/.6
064	300K temperature	100 K	2.9	2.8/3.0
065	Refrigerator/heater current	.1 A	3.08	3.00/3.15
066	Gate bias, RCP stage 1	1 V	differs	-2/+1
067	Average bias, RCP stages >1	1 V	differs	-2/+1
070	Gate bias, LCP stage 1	1 V	differs	-2/+1
071	Average bias, LCP stages >1	1 V	differs	-2/+1
072	HEMT LED voltage	.5 V	5.2	5/5.5
073	Pump current	.1 A	0	
074	+15 volt critical power	.5 V	7.5	7.45/7.55
075	-15 volt critical power	.5 V	-7.5	-7.55/7.45
076	Normal cal current	10 mA	-.3	-.1/.6
077	Solar cal current	10 mA		

100	Analog ground	1 V	0	-.03/+ .03
101	+10 volt reference	1 V	10	9.97/10.03
102	Solar cal voltage	.25 V	7**	6.95/7.05
103	Normal cal voltage	.25 V	7	6.95/7.05
104	+15 volt non-critical	.5 V	7	7.45/7.55
105	-15 volt non-critical	.5 V	-7.5	-7.55/7.45
106	+5 volt non-critical	1 V	5	4.95/5.05
107	+28 volt non-critical	.25 V	7	6.95/7.05

\* 0 = 0u, 10 = Atmospheric pressure. See Fig. 1, page 6.  
 \*\* When in solar mode.

## II. F-12 Command and Monitor Data:

### A. F-12 Frequency:

The F-12 frequency is commanded through mux address 320. The command is echoed back at mux 220.

Frequency (GHz)	Mux 320	Mux 220 (via mw)	Mux 220 (via tm)
11.8	30	180018	00000018
12.2	42	220022	00000022
12.4	44	240024	00000024
12.8	50	280028	00000028
13.0	60	300030	00000030
13.4	64	340034	00000034
13.6	66	360036	00000036
14.0	100	400040	00000040
14.2	102	420042	00000042
14.6	106	460046	00000046
14.8	110	480048	00000048
15.2	122	520052	00000052
	(octal)	(hex)	(hex)

### B. F-12 Status:

F-12 status readback bits are read through mux address 221.

Function	Weight (hex)	Bit no.
Unused, read as 1	1 - 10 0000	2 <sup>20</sup> = L.S. bit
Lo lock warn	20 0000	2 <sup>21</sup>
Hi lock warn	40 0000	2 <sup>22</sup>
Local control	80 0000	2 <sup>23</sup> = M.S. bit

Readback: PLL lock status

(via mw)	(via tm)	
3FFFFFFF	00003FFF	Auto Hi Lock
5FFFFFFF	00005FFF	Auto Lo Lock
7FFFFFFF	00007FFF	Auto Lost Lock
BFFFFFFF	0000BFFF	Manual Hi Lock
DFFFFFFF	0000DFFF	Manual Lo Lock
FFFFFFF	0000FFFF	Manual Lost Lock

C. F-12 Analog readbacks:

Mux: (octal)	Function	Scale 1 V =	Nominal Value	Range (overlay)
040	Analog ground	1 V	0	-.02/.02
041	10 V reference	1 V	10.0	9.98/10.02
042	5 V non-critical	1 V	5	4.9/5.1
043	15 V non-critical	.5 V	7.5	7.4/7.6
044	-15 V non-critical	.5 V	-7.5	-7.6/-7.4
045	28 V non-critical	.25 V	7	6.9/7.1
046	Unused	-	-	-
047	IF level	1 V	5 (HI) -5 (LO)	1.5/6 -1.5/-6
050	Tuning voltage	1 V	-3.5	-3/-4
051	FM voltage	1 V	5	1/10
052	In-phase detector	1 V	0	-.05/.05
053	YIG current	1 V	Same as Tuning voltage	

III. DS 4 command and monitor data

A. Parity Errors

The usual parity information is available from Data Set 4:

Function	Mux address
Command parity readback	200
Monitor parity count	201
	(octal)

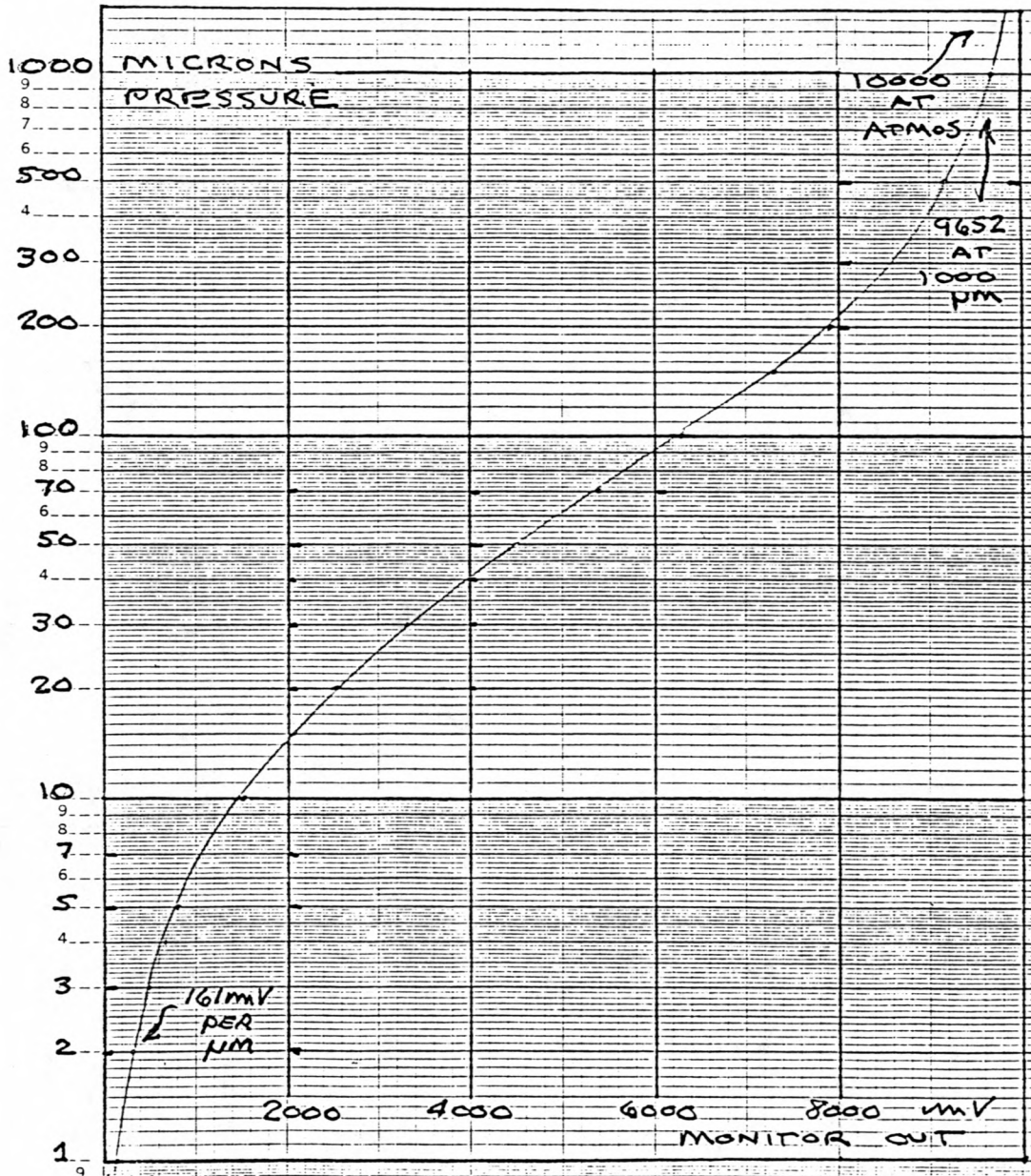


Fig. 1. Vacuum pressure as a function of monitor output voltage. From VLBA Technical Report No. 1, p. 42.