MIT
Center for Space Research

Chandra X-Ray Center

MEMORANDUM
August 27, 2002

To:	Martin Elvis, SDS Group Leader
From:	Glenn E. Allen, SDS
Subject:	The Computation of Some of the Values in the Column QUERY_VAL in ACIS Level 0 Housekeeping Files
Revision:	1.0
URL:	http://space.mit.edu/~gea/docs/memo_hkp0_query_val_1.0.ps
File:	/nfs/cxc/h2/gea/sds/docs/memos/memo_hkp0_query_val_1.0.tex

ACIS housekeeping data is stored in Level 0 housekeeping files (*hkp0.fits). Some of this information represents measurements of either a voltage or a temperature. The data in the column QUERY_VAL_TU are the integer-valued digital outputs of these measurements (in adu). The data in the column QUERY_VAL are the corresponding real-valued estimates of the voltage (in V) or temperature (in °C). The values of −999 and +999 for QUERY_VAL represent unphysically small and large values of QUERY_VAL_TU, respectively. If an element of the column QUERY_VAL = "NaN," then the associated element of QUERY_VAL_TU (e.g. a relay setting or a bit flag) has no meaningful real-valued counterpart.

1 Computations

The following table lists the equation or value to use for QUERY_VAL based on the values of CCD_ID, QUERY_ID, and QUERY_VAL_TU. For combinations of CCD_ID, QUERY_ID, and QUERY_VAL_TU that are not included in this table, the appropriate value of QUERY_VAL_TU is "NaN."

			QUERY_VAL_TU/QUERY_VAL						
CCD_ID	QUERY_ID	MNEMONIC	Low		Valid		High		Units
0–9	128	DEAHOUSE_CCD_PIA_P	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	129	DEAHOUSE_CCD_PIA_M	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	130	DEAHOUSE_CCD_PFS_P	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	131	DEAHOUSE_CCD_PFS_M	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	132	DEAHOUSE_CCD_S_P	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	133	DEAHOUSE_CCD_S_M	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	134	DEAHOUSE_CCD_R_P	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	135	DEAHOUSE_CCD_R_M	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	136	DEAHOUSE_CCD_OG	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	137	DEAHOUSE_CCD_SCP	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	138	DEAHOUSE_CCD_RD	≤ 10	−999	11–4085	eqn. 1	≥ 4086	+999	V
0–9	139	DEAHOUSE_CCD_DR0	≤ 10	−999	11–4085	eqn. 2	≥ 4086	+999	V
0–9	140	DEAHOUSE_CCD_DR1	≤ 10	−999	11–4085	eqn. 2	≥ 4086	+999	V
0–9	141	DEAHOUSE_CCD_DR2	≤ 10	−999	11–4085	eqn. 2	≥ 4086	+999	V
0–9	142	DEAHOUSE_CCD_DR3	≤ 10	−999	11–4085	eqn. 2	≥ 4086	+999	V

			QUERY_VAL_TU/QUERY_VAL						
CCD_ID	QUERY_ID	MNEMONIC	Low		Valid		High		Units
0–9	144	DEAHOUSE_CCD_TEMP_BOARD	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
0–9	145	DEAHOUSE_CCD_TEMP_SRAM	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
0–9	146	DEAHOUSE_CCD_TEMP_ADC	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
0–9	147	DEAHOUSE_CCD_TEMP_ACTEL	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	1	DEAHOUSE_CNTL_ADC_TMP_BEP_PCB	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	2	DEAHOUSE_CNTL_ADC_TMP_BEP_OSC	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	3	DEAHOUSE_CNTL_ADC_TMP_FEP0_MONG	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	4	DEAHOUSE_CNTL_ADC_TMP_FEP0_PCB	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	5	DEAHOUSE_CNTL_ADC_TMP_FEP0_ACTEL	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	6	DEAHOUSE_CNTL_ADC_TMP_FEP0_RAM	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	7	DEAHOUSE_CNTL_ADC_TMP_FEP0_FB	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	8	DEAHOUSE_CNTL_ADC_TMP_FEP1_MONG	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	9	DEAHOUSE_CNTL_ADC_TMP_FEP1_PCB	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	10	DEAHOUSE_CNTL_ADC_TMP_FEP1_ACTEL	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	11	DEAHOUSE_CNTL_ADC_TMP_FEP1_RAM	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	12	DEAHOUSE_CNTL_ADC_TMP_FEP1_FB	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	13	DEAHOUSE_CNTL_ADC_SUBAHK	≤ 2199	-999	2200-3699	eqn. 3	≥ 3700	$+999$	°C
10	15	DEAHOUSE_CNTL_ADC_FPTEMP_12	≤ 2199	-999	2200-3699	eqn. 5	≥ 3700	$+999$	°C
10	16	DEAHOUSE_CNTL_ADC_FPTEMP_11	≤ 2199	-999	2200-3699	eqn. 5	≥ 3700	$+999$	°C
10	17	DEAHOUSE_CNTL_ADC_DPAGNDREF1	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V
10	18	DEAHOUSE_CNTL_ADC_DPA5VHKA	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	19	DEAHOUSE_CNTL_ADC_DPAGNDREF2	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V
10	20	DEAHOUSE_CNTL_ADC_DPA5VHKB	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	25	DEAHOUSE_CNTL_ADC_DEA28VDCA	≤ 10	-999	11-4085	eqn. 9	≥ 4086	$+999$	V
10	26	DEAHOUSE_CNTL_ADC_DEA24VDCA	≤ 10	-999	11-4085	eqn. 9	≥ 4086	$+999$	V
10	27	DEAHOUSE_CNTL_ADC_DEAM15VDCA	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	28	DEAHOUSE_CNTL_ADC_DEAP15VDCA	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	29	DEAHOUSE_CNTL_ADC_DEAM6VDCA	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	30	DEAHOUSE_CNTL_ADC_DEAP6VDCA	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	31	DEAHOUSE_CNTL_ADC_RAD_PCB_A	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V
10	32	DEAHOUSE_CNTL_ADC_GND_1	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V
10	33	DEAHOUSE_CNTL_ADC_DEA28VDCB	≤ 10	-999	11-4085	eqn. 9	≥ 4086	$+999$	V
10	34	DEAHOUSE_CNTL_ADC_DEA24VDCB	≤ 10	-999	11-4085	eqn. 9	≥ 4086	$+999$	V
10	35	DEAHOUSE_CNTL_ADC_DEAM15VDCB	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	36	DEAHOUSE_CNTL_ADC_DEAP15VDCB	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	37	DEAHOUSE_CNTL_ADC_DEAM6VDCB	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	38	DEAHOUSE_CNTL_ADC_DEAP6VDCB	≤ 10	-999	11-4085	eqn. 8	≥ 4086	$+999$	V
10	39	DEAHOUSE_CNTL_ADC_RAD_PCB_B	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V
10	40	DEAHOUSE_CNTL_ADC_GND_2	≤ 10	-999	11-4085	eqn. 7	≥ 4086	$+999$	V

The equations to use for QUERY_VAL include

$$\mathrm{QUERY\_VAL} = -14.592 + 7.125 \times 10^{-3}\mathrm{QUERY\_VAL\_TU}, \tag{1}$$

$$\mathrm{QUERY\_VAL} = -43.776 + 2.1375 \times 10^{-2}\mathrm{QUERY\_VAL\_TU}, \tag{2}$$

$$\mathrm{QUERY\_VAL} = -273.16 + \left(1.4733 \times 10^{-3} + 2.372 \times 10^{-4}x + 1.074 \times 10^{-7}x^3\right)^{-1}, \tag{3}$$

where

$$x = \ln\left(\frac{-1.071104 \times 10^7 + 5230\mathrm{QUERY\_VAL\_TU}}{3844.49 - \mathrm{QUERY\_VAL\_TU}}\right), \tag{4}$$

$$\mathrm{QUERY\_VAL} = -246.3 + 0.1863x + 1.415 \times 10^{-5}x^2 - 1.885 \times 10^{-9}x^3, \tag{5}$$

where

$$x = -1631.87 + 0.796813\mathrm{QUERY\_VAL\_TU}, \tag{6}$$

$$\mathrm{QUERY\_VAL} = -2.5 + 1.22 \times 10^{-3}\mathrm{QUERY\_VAL\_TU}, \tag{7}$$

$$\mathrm{QUERY\_VAL} = -20.83 + 1.017 \times 10^{-2}\mathrm{QUERY\_VAL\_TU}, \tag{8}$$

and

$$\mathrm{QUERY\_VAL} = -41.90 + 2.044 \times 10^{-2}\mathrm{QUERY\_VAL\_TU}. \tag{9}$$

References

Ford, P. G., 2002, /nfs/acis/h2/pgf/acis/pmon/pmon.c, Rev. 1.39 (see also ftp://acis.mit.edu/pub/dea.xls.hqx)