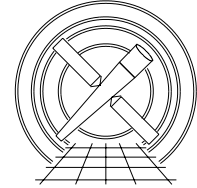




MIT  
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Chandra X-Ray Center

**MEMORANDUM**

August 15, 2002

**To:** Martin Elvis, SDS Group Leader  
**From:** Glenn E. Allen, SDS  
**Subject:** The computation of some of the values of QUERY\_VAL in hkp0.fits files  
**Revision:** 1.0  
**URL:** [http://space.mit.edu/~gea/docs/memo\\_hkp0\\_calibration\\_1.0.ps](http://space.mit.edu/~gea/docs/memo_hkp0_calibration_1.0.ps)  
**File:** /nfs/cxc/h2/gea/sds/docs/memos/memo\_hkp0\_calibration\_1.0.tex

This memo describes how to compute physically meaningful quantities for some of the entries in the column QUERY\_VAL from the number of digital units in the column QUERY\_VAL\_TU of Level 0 ACIS housekeeping files.

**1 Computations**

The following table lists the appropriate equation or value to use for QUERY\_VAL based on the values of CCD\_ID, QUERY\_ID, and QUERY\_VAL\_TU in the Level 0 hkp0.fits files.

| CCD_ID | QUERY_ID | MNEMONIC                | QUERY_VAL_TU/QUERY_VAL |       |           |        |             |      |    |
|--------|----------|-------------------------|------------------------|-------|-----------|--------|-------------|------|----|
|        |          |                         | Low                    | Valid | High      | Units  |             |      |    |
| 0-9    | 128      | DEAHOUSE_CCD_PIA_P      | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 129      | DEAHOUSE_CCD_PIA_M      | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 130      | DEAHOUSE_CCD_PFS_P      | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 131      | DEAHOUSE_CCD_PFS_M      | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 132      | DEAHOUSE_CCD_S_P        | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 133      | DEAHOUSE_CCD_S_M        | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 134      | DEAHOUSE_CCD_R_P        | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 135      | DEAHOUSE_CCD_R_M        | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 136      | DEAHOUSE_CCD_OG         | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 137      | DEAHOUSE_CCD_SCP        | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 138      | DEAHOUSE_CCD_RD         | $\leq 10$              | -999  | 11-4085   | eqn. 1 | $\geq 4086$ | +999 | V  |
| 0-9    | 139      | DEAHOUSE_CCD_DR0        | $\leq 10$              | -999  | 11-4085   | eqn. 2 | $\geq 4086$ | +999 | V  |
| 0-9    | 140      | DEAHOUSE_CCD_DR1        | $\leq 10$              | -999  | 11-4085   | eqn. 2 | $\geq 4086$ | +999 | V  |
| 0-9    | 141      | DEAHOUSE_CCD_DR2        | $\leq 10$              | -999  | 11-4085   | eqn. 2 | $\geq 4086$ | +999 | V  |
| 0-9    | 142      | DEAHOUSE_CCD_DR3        | $\leq 10$              | -999  | 11-4085   | eqn. 2 | $\geq 4086$ | +999 | V  |
| 0-9    | 144      | DEAHOUSE_CCD_TEMP_BOARD | $\leq 2199$            | -999  | 2200-3699 | eqn. 3 | $\geq 3700$ | +999 | °C |
| 0-9    | 145      | DEAHOUSE_CCD_TEMP_SRAM  | $\leq 2199$            | -999  | 2200-3699 | eqn. 3 | $\geq 3700$ | +999 | °C |
| 0-9    | 146      | DEAHOUSE_CCD_TEMP_ADC   | $\leq 2199$            | -999  | 2200-3699 | eqn. 3 | $\geq 3700$ | +999 | °C |
| 0-9    | 147      | DEAHOUSE_CCD_TEMP_ACTEL | $\leq 2199$            | -999  | 2200-3699 | eqn. 3 | $\geq 3700$ | +999 | °C |

| CCD_ID | QUERY_ID | MNEMONIC                         | QUERY_VAL_TU/QUERY_VAL |      |           |         |        |      | Units |
|--------|----------|----------------------------------|------------------------|------|-----------|---------|--------|------|-------|
|        |          |                                  | Low                    |      | Valid     |         | High   |      |       |
| 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. ?? | ≥ 4086 | +999 | V     |
| 10     | 26       | DEAHOUSE_CNTL_ADC_DEA24VDCA      | ≤ 10                   | -999 | 11-4085   | eqn. ?? | ≥ 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. ?? | ≥ 4086 | +999 | V     |
| 10     | 34       | DEAHOUSE_CNTL_ADC_DEA24VDCB      | ≤ 10                   | -999 | 11-4085   | eqn. ?? | ≥ 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

$$\text{QUERY\_VAL} = -14.592 + 7.125 \times 10^{-3} \text{QUERY\_VAL\_TU}, \quad (1)$$

$$\text{QUERY\_VAL} = -43.776 + 2.1375 \times 10^{-2} \text{QUERY\_VAL\_TU}, \quad (2)$$

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

where

$$x = \ln \left( \frac{1.0711 \times 10^7 + 5230 \text{QUERY\_VAL\_TU}}{3844.49 - \text{QUERY\_VAL\_TU}} \right), \quad (4)$$

$$\text{QUERY\_VAL} = -246.3 + 0.1863x + 1.415 \times 10^{-5}x^2 - 1.885 \times 10^{-9}x^3, \quad (5)$$

where

$$x = -1631.87 + 0.796813 \text{QUERY\_VAL\_TU}, \quad (6)$$

$$\text{QUERY\_VAL} = -2.5 + 1.22 \times 10^{-3} \text{QUERY\_VAL\_TU}, \quad (7)$$

$$\text{QUERY\_VAL} = -20.83 + 1.017 \times 10^{-2} \text{QUERY\_VAL\_TU}, \quad (8)$$

and

$$\text{QUERY\_VAL} = -41.90 + 2.044 \text{QUERY\_VAL\_TU}. \quad (9)$$

# References