MEMO

January 7, 2004

To: John D'Auria

From: Joel Rogers

Re: DRAGON/Midas Software Maintenance

The purpose of this memo is to provide the information needed to allow the skilled user to modify and repair the existing DRAGON/Midas DAQ software. Such repair may be needed in case of Midas-library updating.

Users documentation, midmes01:/home/dragon/online/login.doc, describes how to start/run the two DRAGON specific clients, dragon.pro and analyzer.pro. A non-specific client, Logger, is also created by the above startup procedure. The Online Database, ODB, contains values which are read by dragon, Analyzer, and Logger at the beginning of a run, so that each run is characterized by a unique ODB configuration. The ODB configuration is written to the .mid file by Logger at "start" and "stop" times.

Analyzer receives bank data from "dragon" and forms it into shared memory histograms. Analyzer also receives periodically banks of scaler data which it sums and stores in the ODB to provide a run summary.

DRAGON-specific source files, dragon.h, dragon.c, analyzer.h, analyzer.c, adccalib.c, hicalib.c, scaler.c, and histogram.c are required to compile dragon and analyzer clients. The Linux compilation procedure is:

```
cd /home/dragon/online
(edit .h and/or .c files with editor vi and ODB with ODBEdit)
odb -c make
make -f Makefile.hyt clean
make -f Makefile.hyt
```

This creates executables dragon and analyzer, which must be debugged and then copied to append .pro (= "production"), i.e. by "mv dragon dragon.pro", etc.

Bank names are referenced by index from an array defined in dragon.h:

```
static char bank_name[15][5] =\
{"GAMA","CGAM","GADC","GCFD","GLED","GLRF","HION","CHIO","HADC","HTDC"\
,"","GMEM","CGME","HMEM","CHME"};\
```

The first 10 names above, GAMA, ..HTDC, carry indexed arrays of event parameters from Analyzer's unpacking routines, adccalib.c and hicalib.c, to Analyzer's histogram.c module. Correspondence between index number and ascii name is made via "BANK_Name" tables in the ODB, where "BANK" can be any one of the 10 names. Banks GMEM, CGME, HMEM, and CHME transfer data from the dragon frontend client to Logger and Analyzer. The structure of the data in these 4 banks duplicates the Camac data in the gamma- and H-memories, which use Lecroy ECLbus standard bit-packing. Data from Camac scalers, read once per second, is passed to scaler.c via a bank named "SCLR", not in the above list.

While a run is in progress, Midas utility routine mdump can be used to monitor bank data from the dragon.c frontend. To monitor data from a particular Camac source, an Event i.d. may be specified using the -i flag; Events from gamma-memory LAM have i.d.=1, H-memory LAM i.d.=4, and scalers i.d.=2. Identical copies of each coincidence event exist both in GMEM/HMEM and CGME/CHME banks. The following is a vi-edited portion of typical mdump output from the two pulsers:

```
-1.9.1 -- Enter <!> to Exit ------- Midas Dump ---
----------------------- Event# 2 -----------------------
Evid:0004- Mask:000f- Serial:888- Time:0x4002d061- Dsize:72208/0x11a10
#banks:4 - Bank list:-GMEMCGMEHMEMCHME-

Bank:GMEM Length: 14370(I*1)/3592(I*4)/7185(Type) Type:Integer*2
   1-> 0xe007 0x5909 0x5819 0x5908 0x5824 0x5904 0x58ee 0x5900
   9-> 0x5832 0x710d 0x70dd 0x7109 0x703d 0x7100 0x7022 0xe408
  17-> 0x5b00 0x5a6c 0x7300 0x725f 0x7901 0x785c 0x7900 0x78b3
  25-> 0x7f0a 0x7e63 0x7d09 0x7c2f 0x900a 0x3350 0x67ff 0xe807
  33-> 0x2900 0x282c 0xec08 0x2b00 0x2a66 0x7901 0x7896 0x7900
  41-> 0x78ed 0x7f0a 0x7e64 0x7d09 0x7c31 0x8809 0x5078 0xf007
  49-> 0x1900 0x1860 0x1d08 0x1c9d 0x1d00 0x1c23 0x3509 0x346c
7185-> 0x109e
Bank:CGME Length: 14372(I*1)/3593(I*4)/7186(Type) Type:Integer*2
   1-> 0xe007 0x5909 0x5819 0x5908 0x5824 0x5904 0x58ee 0x5900
   9-> 0x5832 0x710d 0x70dd 0x7109 0x703d 0x7100 0x7022 0xe408
  17-> 0x5b00 0x5a6c 0x7300 0x725f 0x7901 0x785c 0x7900 0x78b3
  25-> 0x7f0a 0x7e63 0x7d09 0x7c2f 0x900a 0x3350 0x67ff 0xe807
  33-> 0x2900 0x282c 0xec08 0x2b00 0x2a66 0x7901 0x7896 0x7900
  41-> 0x78ed 0x7f0a 0x7e64 0x7d09 0x7c31 0x8809 0x5078 0xf007
  49-> 0x1900 0x1860 0x1d08 0x1c9d 0x1d00 0x1c23 0x3509 0x346c
7185-> 0x109e 0x8007

Bank:HMEM Length: 24642(I*1)/6160(I*4)/12321(Type) Type:Integer*2
   1-> 0xf812 0x7901 0x7894 0x7900 0x78eb 0x7900 0x7842 0x7d44
   9-> 0x7cc8 0x8813 0x00ff 0x0c8b 0x1e2a 0x2ecb 0x3e8e 0x4e42
  17-> 0x5e67 0x6ed8 0x7eb3 0x8814 0x00ff 0x0e1a 0x1e80 0x2ef9
  25-> 0x3ece 0x4e1f 0x5ef5 0x6e55 0x7d1e 0xc012 0x6d02 0x6c07
  33-> 0x7901 0x7850 0x7900 0x78a7 0x8115 0x0001 0x0e1e 0xc812
  41-> 0x6d02 0x6c0a 0x7901 0x789f 0x7900 0x78f6 0x7900 0x784c
  49-> 0x8115 0x0001 0x0e1c 0xd012 0x7901 0x7823 0x7900 0x7879
  57-> 0x7d44 0x7cc6 0x8813 0x00ff 0x0c97 0x1e3a 0x2edc 0x3e9d
  65-> 0x4e52 0x5e74 0x6ee7 0x7ec6 0x8814 0x00ff 0x0e2c 0x1e8e
  73-> 0x2f0c 0x3ede 0x4e2f 0x5f04 0x6e65 0x7d2e 0xd812 0x7901
12321-> 0x7d28

Bank:CHME Length: 18746(I*1)/4686(I*4)/9373(Type) Type:Integer*2
   1-> 0xf812 0x7901 0x7894 0x7900 0x78eb 0x7900 0x7842 0x7d44
   9-> 0x7cc8 0x8813 0x00ff 0x0c8b 0x1e2a 0x2ecb 0x3e8e 0x4e42
  17-> 0x5e67 0x6ed8 0x7eb3 0x8814 0x00ff 0x0e1a 0x1e80 0x2ef9
  25-> 0x3ece 0x4e1f 0x5ef5 0x6e55 0x7d1e 0xd012 0x7901 0x7823
  33-> 0x7900 0x7879 0x7d44 0x7cc6 0x8813 0x00ff 0x0c97 0x1e3a
  41-> 0x2edc 0x3e9d 0x4e52 0x5e74 0x6ee7 0x7ec6 0x8814 0x00ff
  49-> 0x0e2c 0x1e8e 0x2f0c 0x3ede 0x4e2f 0x5f04 0x6e65 0x7d2e
  57-> 0xd812 0x7901 0x7882 0x7900 0x78d9 0x7900 0x782f 0x7d44
  65-> 0x7cc8 0x8813 0x00ff 0x0caf 0x1e57 0x2ef9 0x3ebe 0x4e72
  73-> 0x5e95 0x6f09 0x7eeb 0x8814 0x00ff 0x0e4f 0x1eac 0x2f27
9369-> 0x3ed4 0x4e23 0x5ef5 0x6e5c 0x7d28
----------------------- Event# 3 -----------------------
Evid:0002- Mask:0000- Serial:1777- Time:0x4002d063- Dsize:64/0x40
#banks:1 - Bank list:-SCLR-

Bank:SCLR Length: 48(I*1)/12(I*4)/12(Type) Type:Unsigned Integer*4
```


The above listing was edited with vi to remove all but one Event, named "Event# 2" by mdump. The "Event" in mdump parlance refers to the data

/data/dragon/data0/100thresh.odb", which produces a 1-MeV-gamma threshold at the usual full-scale = 10 Mev array gain calibration.

/Equipment/gTrigger/Settings/ChangeHV : n
when true (="y") indicates to hvcontrol routine that gamma-array high-voltage settings should be copied from the HV array (c.f. below) to hardware via the controller at C14. See login.doc for how to use the hvcontrol utility routine.

/Equipment/gTrigger/Settings/Detectors : 30
specifies the number of gamma detectors = number of gamma ADC's, etc.

/Equipment/gTrigger/Settings/HI_TOF_delay_ns : 9500
sets the output width of the gate generator at C5(2) which in turn sets the (gamma . H) resolving time i.e. the maximum H time-of-flight.

/Equipment/gTrigger/Settings/HV_Monitor_Interval_s : 0
selects the period of the HV checks done by hvcontrol. Usually = 0.

/Equipment/gTrigger/Settings/HV :
[0] : 1269
[29] : 1506
specifies the high-voltage of each of 30 gamma detectors. These values are put into this array by the array calibration procedure, c.f. gamma_array.doc, and checked vs. the actual h/w values at "start" time.

/Equipment/gTrigger/Settings/LED_TDC_range_ns : 1800
specifies the full-scale time range of the TDC at C7, long enough to accommodate the cable delay and variations in PMT transit times among the 30 detectors.

/Equipment/gTrigger/Settings/LED_threshold : 100
sets the trigger level of all 30 gamma LED's at C3/C4. Since the level is common to all detectors, it is normally set much lower than the CFD levels e.g. to produce a "Gamma-Sum-LED" rate 2X higher than the "Gammas_presented" rate, c.f. /Equipment/Scaler/Sums below.

/Equipment/gTrigger/Settings/Pedestals :
[0] : 24
[29] : 47
sets 30 pedestal, i.e. zero-offset, values in the 30 gamma ADC's. The ADC hardware subtracts these set-value from the raw conversions to adjust for dc-bias in the ADC. These pedestal values are computed in the get_pedestals subroutine of dragon.c and stored in the ODB as /Equipment/gTrigger/Variables/Pedestals. See also Poffset below.

/Equipment/gTrigger/Settings/Poffset : 10
defines a software offset added to each pedestal value calculated by get_pedestals (c.f. above), to shift the energy=0 value to negative ADC channel. This shifting causes hardware suppression of small ADC values which saves space in gamma memory and in the .mid files. The value of Poffset should be chosen as large as possible while still keeping useful gamma energies. At a typical array gain giving 10 MeV full scale, Poffset=51 would shift 511 keV gammas just off scale, thereby suppressing RIB-decay gamma rays. Changing Poffset requires recalibrating the gamma array, c.f. gamma_array.doc.

/Equipment/gTrigger/Settings/Prescale_factor : 50
sets a software prescale factor which is very important for overall DAQ deadtime. Because of beam-related background, the gamma-memory