

March 1985

A User's Guide for the MK-III K-Coronameter Data System

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PREFACE

Access to the data obtained with the High Altitude Observatory's Mk-III K-coronameter is through the Boulder Colorado ha (PDP-11/70) computing facility. Data are archived both on magnetic recording tape and on the NCAR TBM device; data reduction codes operate on the CA and C1 (Cray-1) machines. Outputs, pictorial, graphical, and numerical, are produced at a variety of NCAR and HAO machines: High resolution, gray-scale images are made at the NCAR DICOMED facility, while graphics and color images are produced on the HAO ha (PDP-11/70) and hv (PDP-11/750 image processing facility) machines. The purpose of this Technical Note is to document the steps required to take data from the observing site, 1600 bpi magnetic tapes, through the complex of data processing equipment located in Boulder. The present data processing system, although using a number of different codes on a collection of three machines, is relatively simple to operate and has proven to be remarkably reliable in comparison to the system described in NCAR TN-187+STR, a manual for the old (and no longer extant) data reduction system.

The codes described below were written by J. W. Chalmers over the winter and spring of 1984, with the advice and assistance of R. Munro. Questions concerning the operation of this system may be directed to either R. Fisher or D. Sime at the High Altitude Observatory.

R. Fisher

High Altitude Observatory

Boulder, CO and Hilo, HI

The following is a description of what is hoped to be a user friendly and efficient system to provide scientists access to the MARK III K-coronameter data. Insulating the scientist from as many nitty gritty details of the processing steps which must occur on the various computers used, as well as the vagaries of the 'real world' data with which they are dealing has been attempted.

MARK III K-coronameter

The MARK III data base consists of two main sections, daily data and synoptic data. The daily data are sequences of images from one day in which the observers noted a 'interesting' event. The synoptic data is comprised of one or two images for each day that observations were performed. At present the data exists in three forms; 1.) in magnetic tape as delivered from the Mauna Loa Observatory, 2.) Copies of this raw data on the NCAR TBM, and 3.) the current archival system also residing on the NCAR TBM. The current system keeps track of what is where, so all you need know is the dates of interest. The center of this system currently resides on the 11/70 in the directory '/u2/cordyn/mk3'.

In the following descriptions, what **you type** will be emboldened, what the *system responds* will be in italics, otherwise it will be commentary.

Finding the data you want

The program *extract* finds your data and converts it to a 'usable' form. By usable, I mean in the form expected by the other programs described subsequently. Normally it will print a brief reminder of what it expects; however, this will obscure the presentation, so it is being suppressed.

First you must get into the *extract* interface program. Since I wish to exclude the unnecessary prompts at this point, I will use the '-q', quiet, flag. Also, I do not want an actual job to be sent, so the '-DEBUG' flag is also in order.

extract -q -DEBUG

Suppose you wish to look at the streamer on Mar 25, 1981. To see if there is data for that day you must enter that date.

3/25/81

Default Calibration 3/25/81 18:49

There may be others to follow.

If you would rather use one of those, you should type

calib date time

to identify it completely.

Calibration 3/25/81 19:20

19:56:22.04 is too short with only 144 rays

This says that two calibrations were taken on this day, and hence, you have a choice. If you would prefer to use the 19:20 calibration, you should type:

calib 19:20

since this unambiguously describes the calibration to use. *Extract* will not use partial scans which are too small, arbitrarily and capriciously set to be 200 rays, or about one third of a scan. If it is vital that you see that data, see the author.

Extract is fairly flexible in its understanding of dates. In particular, the day of year could have been used.

84 '81

would produce the same results.

Feb 5, 1984

would elicit the response

*There is no daily data for 2/5/1984 in the archive
It can be found in the synoptic data, 2/ 5/84 - 2/11/84*

If no data was found for that date, it means that none has been entered into the system. You must consult with Dick Fisher to see if any data exists for that day, and, if so, you must run *archive*, which is described later.

Now, if you have your heart set on seeing the data for Feb 5, 84, you must use a subtle subterfuge. That is, you must have *extract* look at the synoptic, instead of the daily data. One way of doing this is to type:

2/5/84 for 1 days

Default Calibration 2/04/84 19:42

At this point, however, you can not be guaranteed to have the desired data. You must go on to the next step. But first, a few more examples of synoptic data access.

As I mentioned, *extract* is fairly fluent in understanding of dates, and date ranges. You shouldn't have to remember exact syntax. To illustrate that point, here are a few examples:

feb 5-9,84

2/5-9/84

for 5 days beginning 5 feb 84

In case you are still lost, type **help**.

Getting exactly the data you want

It is usually the case that the user does not want or need all of the data specified by the specific request. In the case of daily data, the time of an individual event of interest is usually known, and this interval may be just part of the data for that day. The synoptic data usually has two scans for each day, when one is sufficient. If this is not the case, you should use **quick**, see below. You are always placed in an editor with the list of all the scans found. This is to encourage you to pare down the data request further. ("Vi" is the default editor, but this may be changed with the **editor** command, see below.) These will just be by time for daily data, by date and time for synoptic. A complete transaction follows.

extract -q

2/5-6/84

Default Calibration 2/04/84 19:42

go

At this point you are placed in the editor with the following list.

2/05/84 19:23

2/05/84 19:26

2/06/84 20:06
2/06/84 20:09

Since you were really only interested in the 5th, you delete the last two lines, write the file, and exit.

Now, *extract* prints out the list of scans requested. It also assigns a temporary filename for this data.

The following records will be processed
2/05/84 19:23:08.81
2/05/84 19:26:13.88

The tmpfile for this job is m
Please remember it

If you disagree with his list, you should abort the request **immediately**, by typing

^C

Extract writes a brief description of your request into a file in the temps subdirectory, 'temps/mk3tmm' in this case. This is where you should go looking, in case you forget. Now a job will be sent to the Cray to do all the dirty work. Eventually, we hope, there will be a response in the form of the Cray log file, pr####, and a second temps file, 'temps/MK3TMM'. This file is used for your picture and density requests discussed below.

What can I do with this stuff

There are currently three forms in which to display you data. Pictures of the corona are produced as greyscale images on 35mm microfilm by the Dicomed D48 Graphic Recorder. Electron densities or average pB between specified angular limits may be computed and printed. A graphical representation is also produced for subsequent display on any of several devices in house. It is also possible to send the *extract*'ed data to the Image Processing VAX where you can use *zodiac* to fondle it to your heart's content.

1. Pictures

Probably the most useful first step, maybe I should say second step, is to get pictures of the corona to look at. Among its advantages is to further limit the scans of interest. The sequence of pictures and/or differences produced are rescaled to use the full 8-bit greyscale available.

To get pictures, you only need to type:

picture

Temp file name?

If you have forgotten, it is best to just type ?. Otherwise

c

extract tmp file c
requested by munro on Thu Mar 29 14:53:47 1984

You will now be placed in the editor
with two copies of the record times.
One for standard pictures, the other
for difference images. Please append
the desired base frame time to the
'Base:' line.

Delete those times which you do not want from the appropriate sections.

Once in the editor, your screen will look something like

```
19:19  19:40  20:17  20:39  21: 1  21:22  21:47  22: 9
19:22  19:43  20:20  20:42  21: 4  21:25  21:50  22:12
19:25  19:54  20:24  20:45  21: 7  21:32  21:53  22:15
19:28  20: 5  20:27  20:48  21:10  21:35  21:57  22:18
19:31  20: 8  20:30  20:51  21:13  21:38  22: 0  22:21
19:34  20:11  20:33  20:54  21:16  21:41  22: 3  22:25
19:37  20:14  20:36  20:58  21:19  21:44  22: 6  22:28
```

Base:

```
19:19  19:40  20:17  20:39  21: 1  21:22  21:47  22: 9
19:22  19:43  20:20  20:42  21: 4  21:25  21:50  22:12
19:25  19:54  20:24  20:45  21: 7  21:32  21:53  22:15
19:28  20: 5  20:27  20:48  21:10  21:35  21:57  22:18
19:31  20: 8  20:30  20:51  21:13  21:38  22: 0  22:21
19:34  20:11  20:33  20:54  21:16  21:41  22: 3  22:25
19:37  20:14  20:36  20:58  21:19  21:44  22: 6  22:28
```

Picture is able to discern whether you want pictures, difference images, or both, by what you have left in the edited file. Deleting the lines from *Base:* through the end, will result in only pictures. Deleting the lines up to, but not including *Base:*, will generate only differences. When you write out your request, and exit the editor, *picture* will type the list of scans to be processed. the values listed are the extrema for the scan. The addition to *extract* of the ability to detect and eliminate 'bugs' and other erroneous data, has left them of dubious usefulness.

The following records will be processed

```
base 3/14/84 19:19:13.78 values -265 - 792
3/14/84 19:22:18.13 values -251 - 761
3/14/84 19:28:26.89 values -281 - 765
3/14/84 19:34:38.74 values -288 - 861
3/14/84 19:40:49.59 values -310 - 826
3/14/84 19:54:37.46 values -323 - 874
3/14/84 20:08:36.11 values -351 - 908
3/14/84 20:14:48.71 values -380 - 904
3/14/84 20:20:59.73 values -364 - 881
3/14/84 20:27:09.58 values -375 - 902
3/14/84 20:33:19.33 values -409 - 915
3/14/84 20:39:29.41 values -341 - 930
3/14/84 20:45:39.51 values -309 - 894
3/14/84 20:51:49.78 values -324 - 911
3/14/84 20:58:00.16 values -317 - 902
3/14/84 21:04:11.01 values -325 - 893
3/14/84 21:10:24.89 values -349 - 914
3/14/84 21:16:37.54 values -319 - 892
3/14/84 21:22:50.08 values -344 - 908
3/14/84 21:32:08.38 values -368 - 911
3/14/84 21:38:20.74 values -353 - 874
3/14/84 21:44:33.38 values -369 - 857
3/14/84 21:50:47.19 values -325 - 887
```

Dicomed instructions will be written to tape B02517

You must submit a Dicomed Processing Request to the SCD Operations staff. This is for 35mm RASTER output. You may title it as you wish.

Operating on the biting edge of technology, as we do here at NCAR, you must now walk down stairs to SCD's computer room, and fill out an Official **Dicomed Processing Request** complete with **valid** Scientist and Project numbers. This informs the operators that they are to take your in. magnetic tape, **named above**, over to the Dicomed to be processed at some unspecified time in the not-so-near future. In case you forget, cordyn is 9077 92420003.

It should be noted that the basic problem with the Dicomed is that it is overloaded and the SCD refuses to make a decision as to what to do about it. We are still forced to use tapes, because of a feud between the systems and graphics groups.

2. Densities

Density is almost exactly like *picture* in how it is used. (See the above discussion.) Once again you will be prompted for the temp file name and placed inside an editor. When you exit the editor, *density* will list the scans you have selected. You will then be prompted:

please enter the angular range:

To which you should reply with the heliocentric angular limits in which you are interested. They are the minimum and maximum modulo 360° . Id est moving counter clockwise. Thus:

160 - -160

or, equivalently

160 - 220

is the 40° interval centered at the south pole, while

-160 - 160

is the 320° remainder.

please enter the angular increment or zero:

If you wish the densities for the whole area, simply type

0

Otherwise you may specify an angular increment, referred to as $\Delta\Theta$ below, at which to evaluate the densities. Here we will use every 5°

5

and you will receive the next prompt

please enter the averaging interval or zero:

0

will generate the sequence of densities 157.5° to 162.5° , 162.5° to 167.5° , ...
Otherwise you will specify 2ϵ , with the resulting sequence

$$\Theta_{\min} + i \Delta\Theta - \epsilon \text{ to } \Theta_{\min} + i \Delta\Theta + \epsilon \text{ for } i = 0, 1, \dots, N_{\Theta_{\max}}$$

3. pB

There are two ways to get pB values. The first is to use *density* with the '-p', or if you prefer, the '-pB' flag. Thus:

density -pB

starting you on the same route as discussed above.

On the other hand, if you wish to fondle pB values with, say, *zodiac*, you can have *extract* do the work for you. By saying

pB

when in *extract*, will cause the resultant output to be in $\text{pB} \times 10^{10}$ instead of the raw q values normally produced.

Using the Vax

As a temporary solution, there are two programs on the image processing Vax, hv, to facilitate using MARK III data which has been *extracted*. The first, *mk3fetch*, will fetch a mk3tmp file from the cray into your current directory. **A word of caution, MAKE SURE THERE IS ENOUGH DISK SPACE.** The second, *mk3get*, extracts the individual fields from the tmpfile.

Suppose you want display, on the Grinnell, the scans which were *extracted* to temp file k.

mk3fetch -ca k

will fetch file **mk3tmk** from CA into your current directory. If it is not on the Cray disks, a job will be sent, and you will be notified when it arrives.

Assuming the mk3tmk has arrived,

mk3get -srq mk3tmk > sumry.k

will write the header information into 'sumry.k' and create the following files:

17:50.srq	17:57.srq	18:03.srq	18:12.srq
17:53.srq	18:00.srq	18:09.srq	

These are the raw q values transformed to cartesian coordinates and rescaled to the the range [0, 255].

rm mk3tmk

At ~ half a megabyte per image, it is rather important to free up the disk space. *Zodiac* can then be invoked to display them with, for example

```
zod
q = seq(256) - 1
wlut(q,'a')
disp(0)
chrestore ( "17:50.srq", 1, "ru" )
disp(1)
chrestore ( "17:53.srq", 1, "ru" )
```

Or, an alternative method which uses a new *zodiac* command written specifically for K-coronameter data may be used with the same effect:

```
zod
disp(0)
seemk3("17:50.srq")
disp(1)
seemk3("17:53.srq")
```

Further information on using *Zodiac* and the Grinnell must be found elsewhere. A more complete description of the mk3get options may be found in the Manual page.

Archiving new or used data

Archive is probably the easiest program to run. All it needs are tape names, but it does make it easy for you. It was designed to take all its arguments from the command line, however if no tapes are specified, it will read stdin.

```
archive v67235 - 41 v61417
```

```
This list of tapes has been sent to operations
Please be sure these tapes are in the SCD machine room
V67236
V67238
V61417
```

You will note that only three tape names appear here. This is not an error. I have a list, and check it twice, of all the old tapes which were read in a previous life by the late, great, CDC 7600; and are still enshrined on the TBM. Not only is it less costly to convert than reading the actual tape, but, many of the old data tapes have been scribbled on. In this example, only three actual tapes must be read. Of course, any data more recent than 1982, will have to be read directly from tape.

In case *archive* is unable to deliver the tape list to the SCD operations staff, via the network, you will be informed, and you should submit one when you take the tapes downstairs.

Expediting your requests

Normally both *archive* and *extract* are run in background on the Cray. Both take significant resources, lots of I/O wait time in the case of *archive*, and CPU time for transforming the scan to rectangular coordinates for *extract*, together with the inherent delay in mounting a dedicated TBM volume, make the added delay of waiting in the background queue worth the cost savings. However if you are in a rush, both these programs may be run in foreground.

```
archive -f...
```

```
or as input
```

```
fast
```

```
or
```

```
foreground
```

will run the job in foreground.

Density is normally run in foreground, but it can be run in express class provided the data is on the Cray disks. In this case you must use the command line flag '-f'. Thus

```
density -f
```

Picture can only be run in foreground. It is too fast to bother with background.

Both *archive* and *extract* normally do not save files on the Cray disks. It is hardly worth it, since they are usually aged off between the time the job runs some time during the night, and the time normal people get to work. Both understand

save

Archive also has the command line argument '-s'.

I don't understand Vi

Vi is the editor of choice, i.e. the default. If you are unfamiliar with its use, any of the other editors available on the system may be used. For *extract*, the command

editor abe

will place you into 'abe' when the time comes.

In the case of *picture* and *density*, the command line argument '-e' must be used

density -e abe

or

picture -e abe

Note, that there is a space between '-e' and 'abe'.

C1 is down.

The default Cray to use is **C1**, serial 3. In case it is down, full, or you just don't like it, you can specify that **CA**, serial 14, may be used. For *archive*, *picture*, and *density* the command line argument, '-CA', must be used.

archive -CA ...

picture -CA ...

density -CA ...

Extract and *Archive* understand the command

rcid CA

or

CA

Murphy's Law

One thing that surely will go wrong, is with *archive*. Suffice it to say, that synoptic tapes should be processed separately from the daily data. The error that will occur is when tape **n** comprising data for some day **m** is followed by a synoptic tape, **n+1**, whose first entry is also for day **m**. In this case, the initial synoptic entry for day **m** is written to the daily data archive volume instead of to the new synoptic data archive volume.

At some point, the dedicated TBM volume we are currently writing the archived data to will become full. When that occurs, I expect *archive* to abort. When this happens, the name of the TBM volume should be changed in the **tbtxt** data statement in 'Archive/dispatch.r' somewhere around line 30, currently, and the program remade by 'make ARCHIVE'. I have a program which is run occasionally by *remind*(1) which will notify Dick Fisher that this is about to happen.

Currently, there are five tapes used by *picture*. That means that only five *picture* runs can be queued, awaiting Dicomed processing. This shouldn't be too much of a problem, but more tapes can be allocated if the need arises. To achieve this, just add empty files in the subdirectory tapes, and 'touch' everything else.

What did you do to my data?

This section briefly describes the processing that mungs up your data. First, the calibration must be processed to decide which detectors are being used, and working, where North is, and the

coefficients necessary to convert the raw q values into either pB or densities. Second, the detection and removal of individual rays contaminated by the numerous flying inhabitants of Mauna Loa or spurious glitches of unknown origin. Third, the transformation to rectangular coordinates is mentioned. Fourth, the actual computations of pB and density will be described.

1. Calibration

Exactly what the calibration at the instrument is, and its relation to the numbers you get is beyond the scope of this discussion, see Dick Fisher. This is strictly a description of the steps that *extract* takes. Essentially, we are trying to find the best fit, in a least squares sense of a_i , b_i , and ϕ_i to

$$q_{i,j} = a_i + b_i \cos(2(\Theta_j + \phi_i)) \text{ for } i = 1, \dots, 128 \text{ for } j = 1, \dots, n_{rays}$$

where: Θ_j is the barrel-angle and $q_{i,j}$ is the raw q data

ϕ_i is thus a function of the diode array being used. While a_i and b_i are the zero and range, respectively, of the individual diodes. Diodes which are not 'working' have a large residual. Let

$$\epsilon_i = \| q_{i,j} - a_i + b_i \cos(2(\Theta_j + \phi_i)) \|_2$$

Then, if $\epsilon_i/b_i > 1.5$, one of those nice empirically derived constants, the diode is considered defective. Actually a five-point running mean is used, and the first diode, i , proceeding from the middle, $i = 64$, which exceeds the threshold 1.5 causes the diode limit to be set to $i \pm 2$ depending on direction. If fewer than 80 diodes are found to be working, the channel is declared to be inoperative and the run is aborted.

It is still possible to extract the data on that channel by telling *extract*

force

in which case, the diode limits of 10 through 110 will be used, and all warranties are declared null and void. In any case, all the raw data is preserved but it will be ignored in any computations.

Finally the phase angle for the channel is just the weighted mean of the ϕ_i , as there is very little skew.

2. Cleaning

The Coronameter at Mauna Loa, is an excellent instrument, however, it must observe whatever happens to be in front of it, be it the sun, cirrus clouds, or nixeous (sp?) bugs. The presence of bugs or the occasional glitches that appear, make the automation of picture scaling impossible, since the signal from the corona is then at or below the noise level. It is possible to specify the scaling to be used by *picture*, but that violates my definition of user friendly.

The following empirically derived algorithm, though not perfect, does a reasonably good job of detecting and removing such contaminated rays. First, compute

$$N_j = \left(\sum_{i=d}^{D-1} (q_{i+1,j} - q_{i,j})^4 \right)^{\frac{1}{4}} \text{ for } j = 1, \dots, n_{rays}$$

where d and D are the diode limits discussed above. This is essentially the arc length of the given ray, with a heavy emphasis given to long segments. Thus rays containing a spike, or the characteristic signal of bug wing flaps, have significantly larger values than the remainder of the scan's rays.

The standard deviation of the N_j , σ_j , is then computed. The largest of the N_j is deleted and the standard deviation of the remainder, σ_{j-1} , is computed. Now if the relative change to the standard deviation

$$\frac{\sigma_j - \sigma_{j-1}}{\sigma_{j-1}}$$

is large, it is probable that we were seeing something other than the corona. So the ray j is

marked for deletion, and the process is repeated for the next largest N_j . In the course of examining several days data from 1980 through early 1984, it appeared that a .5% relative change was a good threshold to use. There was one day in 1981, during a period where the instrument appeared to be having problems, that increasing this limit to 2% was necessary to preserve data which, if not 'good', at least couldn't be called 'bad'. By telling *extract*

cleanish

the 2% limit will be used. To prevent the algorithm from getting carried away when faced with such garbage, no more than 15% of the rays will be excised. The number of rays excised for each scan is duly reported in the output of *extract* and is indicative of the data quality. It is still possible to preserve all the garbage by telling *extract*

no clean

This will, of course, make programs like *picture* more difficult to use.

3. The Transformation

The mapping of the raw q data or pB values from their native cylindrical coordinates is performed by using cubic splines under tension. The rectangular array is 512×512 sun centered, extending to $\pm 2.33r_\odot$ with south east in the lower left, (0, 0), corner and north at the top. Values outside the diode range, see above, are set to -32768. The p-angle correction is supplied with the data from Mauna Loa, while the correction, ϕ for which diode array is connected to a particular channel was discussed in **Calibration** above. This is a rather costly way of transforming the data, but it should allow differencing between scans taken in differing directions or between channels. This capability was deficient in the previous system. It is possible to cut the processing time from ~ 13 seconds per scan to ~ 4 by telling *extract*

quick

in which case the value used for each point will be that from a 'near by' point. This is especially useful when a large number of scans need to be examined in order to choose a few for fuller study. A subsequent *extract* of this subset can then be performed.

4. pB and Density calculations

In *extract*, the value for pB is calculated by

$$pB_{i,j} = 2.1 \times 10^{-7} \frac{(q_{i,j} - a_i)}{b_i}$$

before the transformation to rectangular coordinates. The values a_i and b_i were discussed in Calibration above. Actually $int(pB \times 10^{10})$ is used, saving the 16-bit results. In *density*, however, the average is computed over the requested interval.

The density computations are the weighted sum over the interval $\Delta\theta$.

$$M_i = \frac{1}{\Delta\theta} \sum_{\theta_j \in \Delta\theta} \chi_i \left\{ \frac{(q_{i,j} - a_i)}{b_i} \right\} \frac{\Theta_{j+1} - \Theta_{j-1}}{2}$$

where:

$$\chi_i = \frac{2 \times 10^{-24} \cdot 4.28 \times 10^{19} \cdot 10.6}{960 pB_e^i}$$

with

$$2 \times 10^{-24} \text{ Mass of the corona / electron}$$

$$4.28 \times 10^{19} \approx r_E^2 \cdot \frac{1/2\pi}{180}$$

$$10.6^{\hat{n}} / diode$$

$$960^{\hat{n}} / r_E$$

$pB_e^i \approx pB$ of one electron in the plane of the sky at 1 AU

Housekeeping

As with every thing else, there is some housekeeping which must be done occasionally. It is necessary to login as cordyn every once in a while to

- (1) Read the mail, most of which is junk.
- (2) Remove netlog.
- (3) In the mk3 subdirectory, remove the ACCNT* and pr* files which are no longer needed.
- (4) Also in the mk3 subdirectory, the program *setarch* should be run. *Setarch* archives the current mk3 subtree on cordyn's pstore. It is especially important after a large number of files have been *archieved*.

NAME

archive - enter MARK III data tapes into the database

SYNOPSIS

archive [?] [-s] [-f] [-CA] [tape] [tape-tape]

DESCRIPTION

Archive accepts a list of tapes containing MARK III coronameter data to be reformatted and entered into the database.

The command line options are:

- ? Print the command summary.
- s Preserves the archived volumes on the Cray disks as well as descending them to the mass store.
- f Causes the job to run in foreground. Normally run in background to lessen the cost of staging in the tapes, and because it is difficult to get a dedicated TBM volume mounted for writing.
- CA Run the job on Serial 14. Serial 3, C1, is the default.
[tape...] [tape - tape]
Raw data tape names or abbreviated sequence of names.
- n Prevents the archival volumes from being descended to the TBM. Primarily used for debugging as the archive is apt to disappear.
- d -D Debug arguments for net send.

Arguments will be read from standard input if no tapes have been specified. Options read are just expanded forms of the above: **?** , **help** , **notbm** , **save** , **CA** , **fast** , tapes.

The local interface for **ARCHIVE** takes the list of tape names, or an abbreviated sequence, e.g. V67238-43, and sends off the job to run on either Cray. Since it is less costly to retrieve the old data tapes from the TBM and because some of the original tapes have been destroyed, **archive** checks the list of tapes, *tbmlist*. The tapes which are not found there must be taken down to the SCD machine room. This program also delivers a list of these tapes to the Operations staff via one of the SCD printers. If said list can not be delivered, the user is notified.

AUTHOR

Jay W. Chalmers

FILES

tbmlist	List of raw data tapes already on the TBM
banner	Banner to attract the attention of the Operations staff
idx/M?3???	Summary of what was archived is written for each day.

SEE ALSO

Control/archive.c Archive/*

NAME

extract - get specific MARK III data from the database in a 'useful' form.

SYNOPSIS

extract [?] [-D] [-q]

DESCRIPTION

Extract performs the costly job of turning the raw MARK III data into something **PICTURE** and **DENSITY** can use.

The command line options are:

- ? Print the command summary.
- D write the net send input to a file.
- q Suppress the printing of some not to informative messages.

Extract provides the user with a flexible means of specifying the MARK III data he is interested in. An individual day's data is specified simply by giving the date or the day of year. The synoptic data may be accessed by specifying a range of dates or a starting day with some number of days. Date specification is quite flexible, so if **extract** objects, try typing it another way, or ask for **help**. For example:

84 '84 Day of year 84 of 1984, i.e. March 24, 1984.

24 Mar 84 Equivalently.

3/24/84 Also.

2/5-9/81 Synoptic data for five days.

2/5/81 + 4 Likewise.

Other things that **extract** 'understands' are

calib 19:20 Use the calibration at 19:20 instead of the default.

chan 0 1 Extract both channel 0 and channel 1

editor abe Use the **abe** editor instead of **vi**.

fast Run the job in foreground.

rcid ca Use Cray serial 14 vis serial 3.

save Save the temporary file on the Cray disks.

cleanish Be less strict about what is garbage data.

no clean Preserve all the data.

quick Be quick and dirty in transforming to rectangular coordinates.

pB Convert to pB * 10e10 instead of raw q values.

force Consider the requested channels to be working in the range [10,110], despite what the calibration says.

AUTHOR

Jay W. Chalmers

FILES

idx/M?3??? Summary of what is where in the database.
temps/* Who did what, used by picture density and forgetful users.
ed.file File to edit.

SEE ALSO

Control/* **Extract/***

NAME

picture - create grayscale images suitable for framing, on the Dicomed. density - calculate and plot the electron density for part of the corona

SYNOPSIS

picture [?] [option] [-e editor] [tmp]

density [?] [option] [-e editor] [tmp] [ang-ang] [ainc=#] [dela=#]

DESCRIPTION

Picture generates Dicomed instructions from the image data produced by **EXTRACT**. **Density** calculates and plots the electron density within given angular limits from the raw data preserved by **EXTRACT**. Both programs can calculate differences.

The command line options are:

- ? print the command summary.
- p In **picture**, pictures only. Saves on editing. In **density**, compute pb instead of electron mass.
- D densities only.
- d differences only.
- [tmpname]
tempfile name (letter)
- [ang [-] ang]
angular limits measured counterclockwise, west to east, for densities or pB's.
- [ainc=#]
- [dela=#]
compute densities or pb values at several angles between the angular limits. I.e. (amin - dela / 2, amin + dela / 2), then (amin + ainc - dela / 2, amin + ainc + dela / 2), etc.
- r prompt for picture scaling parameters.
- f run densities in Express class
- e editor of choice.
- CA Run the job on Serial 14. Serial 3, C1, is the default.

Picture and **Density** place the user in the editor with the list of the records on the tmpfile. For differences, the record to be used as the base should immediately follow the 'Base:' line. Any necessary parameters, like the tmpfile name, will be prompted for if not specified. **Picture** will rescale the sequence of images and/or differences appropriately. This can be overridden with the -r flag, in which case you will be prompted for max and min values which will map to greyscale values 0 and 255.

N.B. The user must submit a Dicomed processing request to the Operations staff.

AUTHOR

Jay W. Chalmers

FILES

temps/* Who did what and where its at.
ed.file File to edit.
tapes/* list of tapes to write dicomed instructions to

SEE ALSO

Control/* Picture/* Density/*

NAME

mk3fetch - Fetch a MARK III temp files from the Cray.

SYNOPSIS

mk3fetch [-CA] [file]

DESCRIPTION

The purpose of the *mk3fetch* command is to fetch the MARK III temp file from the Cray. If the temp file is not currently on the Cray disks, a job will be sent, and you will be notified when it arrives. The temp file will be placed in your current directory.

FILES

mk3tm? the requested temp file

AUTHOR

Jay W. Chalmers

NAME

`mk3get` - extract the various fields from a MARK III file

SYNOPSIS

`mk3get [-q] [-rq] [-srq] [file]`

DESCRIPTION

The purpose of the *mk3get* command is to extract various fields from a MARK III temp file which has been acquired from the Cray. The summery information about each scan is printed on stdout. *Mk3get* generates unique informative names for each of the scans. For example, daily data is named with the scan time, while synoptic data with only one scan per day is named with the date. If multiple channels were extracted, '#' is added. Finally the name of the field is added.

-q will extract both the raw q data along with the b-angles for each scan. These are integer*2 arrays, b(nrays) and q(128,nrays), where nrays is the number of rays in the scan.

-rq extracts the raw q data transformed to a 512 x 512 array. Again, these are integer*2 values. The first point is at the lower left, moving to the right and up.

-srq takes the rectangular q data and rescales each frame to the range 0 - 255, and stores the resultant bytes. These can then be used directly by **zodiac** with

```
chrestore("17:50.srq",1,"ru")
```

for example.

FILES

mk3tm?

AUTHOR

Jay W. Chalmers