GRAAL shift instructions V11 23.02.2001

Motto: There is never time to do things right, but always time to do them again.

1 General rules

IN CASES OF DOUBT:

0. If there is any doubt that strange things happen, switch off HV (MIDDLE position switch) or the whole supply crate (green button at right side of crate) and think and/or phone for help.

1. ALL operations on the Cones (attachment of light sources, change of pointing position etc.) have to be done WITH CLOSED DOORS for security reasons. At start of night NO OBJECTS must lie on the floor of the hut. Put Cone covers, aluminum bottom covers cable boxes etc. to walls and edges of hut.

2. When the high voltage on the Cones is ON (yellow lights on left hand module in upper crate) the hut has to be DARK, NO light sources of any kind (also no torches) permitted. The automatic HV security switch off (when current surpasses 35 μA or the solar cell in the hut detects a too high light level) is only for accidents. With light and HV on the current can cycle up to above 35 μA every 10 seconds when the solar cell does not cut. This decreases the quality of the PMTs (increased afterpulsing etc.). Sunlight with HV on destroys the PMTs.

ALL AUTOMATIC SYSTEMS CAN FAIL AND DO NOT ENSURE A GOOD DATA QUALITY. THE PERSONS ON SHIFT HAVE TO PAY ATTENTION DURING THE NIGHT FOR

-UNUSUAL LIGHT SOURCES(MOON,CARS STANDING ON STREET WITH LIGHTS ON ETC.)

-RAIN , WIND WHICH CAN DAMAGE THE DETECTORS

- AT THE MORNING THAT THE HV IS SWITCHED OFF

3. Please make ALWAYS sure that the security HV switch off system are active:

- 4 cables from HV monitor to control module labeled “do not remove” must be on. Red light on control module (labeled “red light must be off” must be OFF. Push in if red. If there is any problem with these parts, switch off HV immediately by hand (middle position between manual and auto).

4. The DAQ program and settings are explained in detail in file READMEDAQ (see appendix).

2 Shift instructions

GENERAL - PLEASE ALWAYS KEEP IN MIND

- Do not run or stop immediately if there is any indication of a thunder storm in the area (weather lighting, radio reports, flashes), the static electricity can destroy the electronics (has happened in HEGRA).
- When on site you MUST carry the graal mobile phone powered on (telefon numbers see appendix). A. Castro-Tirado will call this phone in case a well localised GRB visible to us occurs. If he announces a GRB which is above horizon put the position in cs.def (off: +2.625 deg in alpha), prepare an orden.def (10.5 min on/off uns) and run on it as long as it is above horizon. The files cs.def and orden.def can be found on the Win95 PC used to control the heliostats (mounted as /mnt/win on the Linux PCs).
- For security reasons you MUST carry a walky-talky powered on the channel of the operator when staying in the tower. Also ask the operator to call you on the walky-talky when you have been in the tower for more than 2 hours.
- Do not rely on the auto-switch off for rain and wind. Check the conditions regularly (directly or indirectly).

1. Before shift

0. In daq@graal1 the alias 'start-meteo' starts a cron (crontab /graal21/daq/daq/meteo/get-meteo.cron) which get (using wget) the meteosat picture D2.JPG at UTC hours 1,3,5,7,21,23 and then is renamed using the format $d2_m m_d d_y y_h h$: $mm.jpg$ corresponding to the time when the file was written in the web (it was taken by the meteosat usually one hour before as can be seen in the picture itself)).

Meteo conditions necessary for data-taking nights. Previous experience with data-analysis has shown that nights with a humidity higher than 75 % and/or with an initial cloud cover with "normal" (cumulus) clouds of more than about 50 % at nightfall were always useless to detect gammas. There were however "hazy" nights or nights with cirrus clouds which WERE useful. Decide according to these criteria at nightfall whether to take data. Once you took a decision, keep taking data as long as possible within SAFETY limits (ie do not stop when the humi surpasses 75 % but only when it surpasses 96 %).

Check if all input files for the night are ready and uncorrupted. On Win95 PC in the folder C:Graal99 (mounted as /mnt/win on the Linux PCs) copy present helis.def file to helis.def.date. 1. Correct/check (if made by operators in auto mode) heliostat offsets in helis.def and make sure they are available on control PC in C:Graal99 directory. New offsets should be determined by the operators once a week when possible. Ask the night operator to remind the day shift.

orden.def must contain the program for the night

cs.def must contain the source number of orden.def
Of.def must contain the correct OF positions for orden.def
Due to Win - Linux problems it has happened that the files on the Win95 PC are corrupted. They no longer exist under their name but only name"special characters". This can lead to serious errors.
After sun set start helistat program with correct orden.def (to save time. Check if field is working). Mirrors are sent to 100 100 (see below 7.).

2. At start of shift

1. Check/adjust clock time on heli control PC and graal1 PC to UT via radio clock in control room to 1 second precision. You may use the command "vncviewer 193.146.147.198:0" to display the screen of the Heli PC on the graal1 monitor (ask for the necessary password, see appendix). The clocks should be syncronized already because there are programs running that do it, but if the network is down they don't work. On heli ctrl PC via e.g. "set time 23:30:00". The graal2 clock has to be reset in the BIOS after restart!
At the moment graal2 auto-connects to outside ntp time servers and is synchronised if there is a connection to the spanish time servers (automatically).
The heli ctrl PC has to synchronise to graal2. Maria installed one program in hel ctrl computer, which connects to GRAAL2 in order to keep both computers syncronized in time. It is started at boot-up, but in case it doesn't work:
In directory /graal99/d4/ of hel ctrl computer, you have to write d4 and then, a window pops-up which displays the server to which the computer syncronizes the time, at what time it did it for the last time and how big was the correction. This window must remain opened (it can be lowered to the bottom of the screen, but NOT closed). If closed, the program doesn't actualize the time.
If there is any difference in time on any computer check:
Do "netdate slug.ctv.es" or "netdate hora.roa.es" or "netdate 134.107.2.100" on the GRAAl2 PC
If the netdate commands fail you have to correct the times on BOTH graal1 and the heli ctrl PC by hand. Check if the net to the outside is down completely. Note all this down in daylog. **The standard is that d4 works on the heli PC and synchronises to graal2 where netdate synchronises the time to the outside net. Make sure this is the case directly on graal2 and checking on heli-PC (in person or via asking the operator) EVERY night. Clock corrections by hand should be done only in emergency cses and must be noted on the daylog. Clocks wrong by more than 3 seconds lead to a loss of data.**
4. At nightfall BEFORE COMPLETE DARKNESS, open door using the program "doorpower1" on GRAAL2 (see appendix).

5. ON FIRST NIGHT OF SHIFT

7. If night is completely dark, measure:

rates on NIM scalers. Do NOT usually measure directly with voltmeter at rack.

All parameters are monitored automatically into the bmo file which can be read with bmo monitor (see below). For making the daylog NO REMOVAL of any cables is necessary!

If you need to us the voltmeter for some reason:

a.Make absolutely sure no cables are confused

b.The voltmeter output needs 20 minutes warm-up time after HV switch on to measure the correct values. Before they are lower!

Compare rates with values of previous nights.

Reasonable values for settings:

HV: ca. 1400-1650 V, NEVER above 1700V

Currents about 12 - 24 μ A, **never above 35 μ A**.

Singles 1-4 around 300-500 kHz, Sequence 1,2 around 50 Hz, Q1, Q2 around 1 kHz, Q3, Q4 around 50 kHz, total trigger around 3-5 Hz.

Under cloudy or hazy conditions all rates can fall. A possible sign that something is wrong is when the total rate is very small (below 2 Hz) while the other rate are in the normal range and the source is high in the sky (<45 degree zenith angle).

Rates far above the quoted rates (e.g. singles > 1 Mhz indicate a problem, e.g. some source of light, or wring voltages.

8. Put first line of daq in.in (/graal21/daq/daq) to 0

9. Start daq run with *exe_daq* in /usr/daq/daq on GRAAL2. **The HV is controlled by the PC and is run up when the daq program starts!!! The switch on the HV modules has to be on AUTO not MANUAL. The black settings screws are no longer used**

10. If on graal2 from graal1, run /graal21/daq/daq/graphics2. This command will call to a script

(graal1:/graal21/daq/daq/graphics2) which opens automatically 7 windows on your screen, which must remain opened during the night and will give you constant information about weather, voltages, currents and rates. If you click on each window, you can get the actual value of the variables displayed in the window. The information read by these windows is given by the exe_daq as it is running, at the moment the daq is stopped, the values are not longer actualized. On another PC run /graal21/daq/daq/graphics and do (with bash shell) export DISPLAY="ip.address".

To close the windows run from graal1: /graal21/daq/daq/graph stop.

If you want to run the same script in a remote way, but only copying the numbers to be

ploted you can find it in /usr/users/daq/graph/
You can start it with start monitor psa and stop it with stop monitor psa.
11. Run bmo_monitor (/usr/daq/daq), enter file that is being just written (can be done without stopping the run). Read voltages,currents,rates each hour, put them in daylog file.

7.1 Things to be checked

A. check that screen display on helictrl program has currently correct (from orden.def) CS and OF values
B. check one .bda file with data taken in this night using daread_disx (see below, x for the newest version), check showers up to second calibration period (due 300 seconds after start of run), are there peaks in all 4 traces? are the LED calibration pules (chan 4) and charge injection pulses (chan 1-4) present?
C. have a look at the "*.bmo2" file which containes error messages and log messages during data taking
D. measure rates with NIM modules (scaler with red numbers) and compare to the ones measured automatically in the .bmo files
E. Check site "$http://gcn.gsfc.nasa.gov/gcn/gcn3$
$archive.html''$ "Latest circulars". (updated in real time) for announcements of recent well localised (better than 0.1 deg) GRBs visible to us (decl -20 - 60), if one occured perform actions as described above in "General" after phone call.

7.2 During night:

Keep an electronic daylog file for each day. The infos here do NOT have to bbe written in the paper book. Use **only** the newest template on graal2 /usr/daq/daylog/dayx-xx-00.log and fill out blanks. Do not use old daylog files. Any other problems/information should be noted down here, detailed with times when they occured.
IMPORTANT:
The weather info has to DETAILED, i.e. NOT "some clouds" BUT "cloudy (cirrus) in the south west, coverage ca. 40 %, less clouds ca. 10 % in the north. It has to repeated at least 3 times in a night, also if the weather is good.
The operators also keep a daylog using the template /mnt/win/operadores/modelo3 informe.txt. It should be filled after each night with observations.

3. New runs

The DAQ runs continuously during the night. Subruns with 10000 events each are written. Start a new run only if major changes are necessary (e.g. exchange of module) or an error occured (e.g. HV was not correct after star run.

4. At end of shift

1. The daq program should close the door, switch off the NIM crate and run down the voltages at the eon. **Check that the NIM crate is really off and the door is really**

closed. If this did not happen there is a serious malfunction and MUC should be notified.

2. Check time on graal2, note down in runbook differences of more than 1 second.

3. Computer copy of data taken (EON)

One thing to do before running this script is:

go to GRAAL1 and there, in the directory /mnt/win/ and rename the .hea, .heb, .hec and .log files, so that in case of trouble the days are not mixed up. For instance, if at the end of the night of the 20th-21st September, we have in the directory /mnt/win the files:

21 30 29.HEA, 21 30 29.HEB, 21 30 29.HEC and 21 30 29.LOG

make: mv 21 30 29.HEA 20 09 99-21 30 29.HEA

mv 21 30 29.HEB 20 09 99-21 30 29.HEB

mv 21 30 29.HEC 20 09 99-21 30 29.HEC

mv 21 30 29.LOG 20 09 99-21 30 29.LOG

and then, you can already perform EON (see modifications.borque.140899).

(I wanted to introduce already the date in the name initially, but Windows doesn't allow more than 8 characters before the dot) start eon (End Of Night script) in /graal21/daq/daq.

- This is an alias you have to run from graal1. It will execute awk -f / graal11/daq/eon.awk, an script that will store the data and program files that a re in graal1, graal2 and the control PC into its final directories and then copy everything to both Madrid and Munich.

- The script assumes you are running it in the morning in order to gener ate the names of the directories where the data is going to be stored. The forma t of this directories is, p.e.: $date = 12-130899 (night 12th to 13th of August of 1999) $datewin = 120899 (night of 12th of August of 1999)

- Prior to storing all the data, the script mounts both /graal21 and /mnt/win. If there is any problem you'll have to login as root and execute

> mount /graal21

> mounthel

To check that everything is alright:

> df

- This script may give some warnings, check that none is important (usually file naming warnings). Make sure all files are copied and the transfers to Madrid and Munich have started. If the net is down you may have problems with this part (Borque's note: I couldn't check this. If it happens to you contact me).

The latest version can be executed to store the data taken any night (previous versions only worked for the current night). To save data from other date just introduce the date of the night you want to store in the format dd-dd/mm/yy (2 digits per mumber).

8.4. Check time of helictr PC note down differences of more than 1 second.

8.5 Switch off dat device each night after finishing the shift. Reboot the computer next day and make sure the dat is switched on before doing so.

5. Trouble shooting

DO NOT CHANGE ANYTHING IN COMPUTER/HARDWARE WITHOUT BEING ABSOLUTELY SURE THAT YOU CAN REVERT IT. NOTE DOWN ON PAPER EVERY STEP YOU MAKE.

THE DATA ACQUISITION PROGRAM STOPS AFTER 100 SEC WITHOUT ANY DATA. IT says Error 6: Could not read data from osc,trace 1,GPIB cleanup

In such a case: look with the NIM ratemeters (black modules with red numbers) whether master events occur. If this is not the case, for some reason no events are taken (e.g. HV off, doors closed, covers not removed). If all rates except the master are normal, the error is in the trigger electronics. If the master has triggers the cable to the Le Croy scope is disconnected.

1. If data taking does not proceed normally, try to switch CAMAC crate on/off. Was CAMAC driver installed after reboot (see READMEDAQ, appendix)? Try to remove PS7120 module from CAMAC bus (slide out a bit). If this helps, leave it removed and modify daq:change -undef NPHIL- into -define NPHIL- recompile doing "gcc daq" in /usr/daq.

Check if red light on CAMAC controller is continously on, or if all the red lights lights on the Caen 219 are on. In such cases problems with the CAMAC crate are most likely.

Check with scope if master triggers come out of the NIM module distributing the master signal. If yes the DSO/computer side has problems. If no, follow the pulses from the initial discriminator output (no cables have to be removed for that) and identify the malfunctioning module or cable.

Check if message "LAM received" appears on the screen during the initial calibration. If not, check if Caen 219 module sends NIM pulses on output 15. If not exchange this module.

6. Data checks

Display of event traces on the scope

1. cd to directory /usr/daq/display
2. daread dis2 (the program creates an ASCII file with the event info)
3. when asked "Which data file?" enter *bda data file with directory, e.g. /usr/daq/data/9-100999/00257Sep0922:05:4699001.bda

answer: "Do you want to scan waveforms(1=y), ASCII file out(1=y)" with "1 1"

answer "first last event?" with the range of event numbers you want e.g. 1 100 if you want the first 100 events, or 1 1000000 if you want all

asnwer "perform analysis?" with 1

Data are now sorted and raw analysed. 1st number is mean light level (first 80 chans), 2nd number stand. deviation (first 80 chans), 3rd number total net charge in trace(adc val x

chan), largest peak (adc val), position of largest peak (chan), number of chans with ADC val > 20. All results are in an ASCII file with the same name an extension .bdaa. This file can be directly looked at (more *.bdaa or with editor).
mv /datadir/filename.bdaa /datadir/runnumber.bdaa
e.g. "mv /usr/daq/data/9-100999/00257Sep0922:05:4699001.bdaa /usr/daq/data/9-100999/257.bdaa"
paw
exec daqpaw5
give any label (only for display)
enter file name with directory e.g. /usr/daq/data/9-100999/257.bdaa
enter 1 when ip is asked, events are displayed consecutively other options for ip are explained.
2. /usr/daq/daq/bmo monitor
Enter *.bmo file you want to analyse. The read out data are displayed on the screen.

7. Heliostat control program

0. vnc program:

All the following operations can be done from a Linux computer. There is a program installed in both the hel-ctrl computer (server) and linux computers (client), that allows this connection. The program can be called running on the linux PC: vnc (a system defined alias, if not available try "vncviewer 193.146.147.198:0"). It asks for a password, and you should know it (ask David if you don't). In order to work there must be the server part of the program running on the hel.ctrl. computer. It should be started at boot-up. In case there are problems, the program is /graal99/vnc/WINvnc.exe.
Before running the helctrl program now, check that d4 is running on the hel-crtl computer (icon in the lower bar, to the right), which connects to GRAAL2 in order to keep both computers syncronized in time. If it is not running you'll have to write d4 in directory /graal99/d4/ of hel ctrl computer and then, a window pops-up which displays the server to which the computer syncronizes the time, at what time it did it for the last time and how big was the correction. This window must remain opened (it can be lowered to the bottom of the screen, but NOT closed). If closed, the program doesn't actualize the time. After doing this you have to go to directory /graal99 and write GRAAL99_ (there was a 2 afterwards, but the computer didn't take it). You also can start it with a direct access icon 'graal99' place at the bottom left of the screen.
It is EXTREMELY IMPORTANT to start GRAAL99_ after the time given for the first C command in orden.def. Otherwise it will not work properly!
KEEP THE FOLLOWING RULE: when starting the tracking for the first star (i.e. CS, NOT MM or FP), stop and immediately restart GRAAL99_. Otherwise the binary files are wrongly written.

1. Commands used in the helictrl program:

CC: Computer **C**ontrol

Synopsis: CC

Description: All the commands are introduced with the 'Orden.def' file. The commands CS, FP, OF, and MM can't be used with the keyboard, but commands STOP, CC, and MC are still avaliable. There is a green display 'Modo CC' at the bottom of the screen when it's in use.

CS: Change **S**tar

Synopsis: CS [number from the CS.def file]

Description: Changes the object that heliostats are looking at (look the CS.def file for more detail).

FP: Fixed **P**oint

Synopsis: FP [number from the FP.def file]

Description: Changes the point (x,y,z) that heliostats are looking at (look the FP.def file for more detail). There is a program in /graal11/borque/stardrift , it is used to calculate the x,y,z position for a FP command so that at a given time a given star will be focused in the cones. The input file is stardrift.in, and the input fields are explained therein. (In the future it would be nice to incorporate this as an internal command to the heliostat-control program)

MC: Manual **C**ontrol

Synopsis: MC

Description: It disables the CC Mode. All commands can be used.

MM: Manual **M**ouvement

Synopsis: MM [1st number] [2nd number]

Description: It sends all the heliostats to the position (Az: 1st,Elev: 2nd), this numbers are in PSA units (as the units that appear on the screen).

NF: New **F**iles

Synopsis: NF

Description: It REreads all the def files.NOTE: This command changes to OF 1 (although is not in the screen, it can be seen in the relatives OF). Try not to use it, it may not work properly.

OF: On **F**ocus

Synopsis: OF [number from the OF.def file]

Description: It changes the position of the images formed (look the OF.def file for more detail). OF 1 is always the right position (each field forms the image in its cone).

STOP

Synopsis: STOP

Description: It stops the program.

2. Files used by the Helictrl program:

2.1 Input files (.def):

At the end of all .def files,except orden.def, there should be: '99 999. 999. 999.' to say that is the last line to be read. After this line are the comments for each line. If you change/add anything, please write it there.

CS.def: Change **S**tar

Description: [number of CS] [ra] [decl] [depth]

FP.def: Fixed **P**oint

Description: [number of FP] [x] [y] [z]

HELIS.def: heliostats configuration

Description: 1st line: Fiducial core position (for convergent viewing)

2nd line: [number of heliostats]

3rd-end lines: [Heli number(PSA)] [Heli number] [x pos] [y pos] [z pos] [Az offset] [Elev offset] [type: 1 for odd row, 2 for even row] [cone]

OF.def: On **F**ocus

Description: [number of OF] [x cone1] [y cone1] [z cone1] [x cone2] [y cone2] [z cone2] [x cone3] [y cone3] [z cone3] [x cone4] [y cone4] [z cone4]

ORDEN.def:

Description: [hour] [min] [sec] [letter] [1st number] [2nd number]

The letters are:

C: for 'CS (1st number)'. The 2nd number doesn't have any meaning.

F: for 'FP (1st number)'. The 2nd number doesn't have any meaning.

M: for 'MM (1st number) (2nd number)'.

O: for 'OF (1st number)'. The 2nd number doesn't have any meaning.

E: for the last order. This line should be '99 99 99 E 9 9'

There is a program in /graal21/daq/orden check to check if the files are right. The program is orden check. The files for the input of this program are the ones in /mnt/win. There is also another version which takes the files (*.def) in the same directory. There is also a readme.txt.

WHAT DOES THIS PROGRAM CHECK?

If you execute this program several messages appear on the screen, let's explain them:

1.- Checking for typing errors ...

In this point the program checks the posible typing errors made. If a command is different from the allowed options, if an hour is greater than 23, minutes greater than 60, etc.

2.- Checking for first command ...

If the first command in the orden.def file is not a M 100 100 this gives an error.

3.- Checking for last command ...
If the last command in the orden.def file is not a M 100 100 this gives an error.
4.- Checking for temporal order ...
If the temporal order is not preserved in the orden.def file then an error message will appear.
5.- Searching for cs data ...
If the CS number is not found in the cs.def file then an error message will appear.
6.- Searching for fp data ...
If the FP number is not found in the fp.def file then an error message will appear.
7.- Searching for Of data ...
If the OF number is not found in the Of.def file then an error message will appear.
8.- Checking Of changes ...
If first and last Of values are not one a warning message will appear. If Of values are different from 1 or 2 a warning message will appear. If an Of value different from 1 is active for more than 30 minutes a warning message will appear.
9.- Checking CS changes ...
If more than 10.5 minutes passed between consecutive CS numbers (on and off, but notice this can lead to some mistakes if the new source has a consecutive number to the old one) then a warning message will appear.
10.- Checking elevation and azimut ...
For the day, month and year introduced with the keyboard the program runs the positions for the sources, giving the messages:
Warning: If the source is at the North. Error: If the source is below the horizon.
2.2 Output files:
(starting time).hea: This file in ASCII contains: time, alt, az, dec, ra, and for the 63 heliostats: number of heliostat, Elev, Azim, and a number (1 if it's on the right position and 0 if not).
(starting time).heb: The same as the .hea file but in binary. Some times a heliostat is repeated and the file is useless.
(starting time).hec: This binary file contains only: time, ra, dec, ze and az.
(starting time).log: This ASCII file has all the commands that are made with its times and with all the values (instead of 'CS 1' it writes all the values for CS 1)

8. Remote control of experiment

1. Web cameras

The web cameras are read out by graal3 and written to a subdirectory in graal1 (/graal11/WWW/public_html/images/). This means that /graal11 MUST be mounted in

graal3 for this to work. The web camera that takes the pictures in the office is connected to graal1, and the images are stored in the same directory.
The images can be viewed over the web on http://193.146.147.187/index.html and graal1.html. These pages are autoloaded every 5 minutes from the browser, though a new picture is taken every 2 min. So if you want a newer picture, first try to press the reload button in your browser.
In adition to this, each hour the image taken by the web cam at the office is stored in /graal11/WWW/public_html/images/hourly/ and not deleted. At the end of the day all these images are stored in a compressed file in the same directory.
To perform the following instructions, you must be root.
In order to have the videum card installed, some modules must be loades. This is done automatically at startup, but in case there is some problem, to load them up, just execute:
insmod videodev
insmod wnv
insmod wnvvid
The pictures are taken with a script that is started every 2 min by crontab of user root. This crontab can be seen with crontab -l. Once you type this as root, something like this should show up:
DO NOT EDIT THIS FILE - edit the master and reinstall.
(/graal11/WWW/crontab-webcam-graal1 installed on Fri Jun 23 20:13:01 2000)
(Cron version – $Id: crontab.c,v 2.13 1994/01/17 03:20:37 vixie Exp $)
MAILTO = ""
/2 * * * * /graal11/WWW/public_html/cgi-bin/imagegen-graal1.awk

If this does NOT show up, restart the crontab as explained near end of this section. So now, if you run/graal11/WWW/public_html/cgi-bin/imagegen-graal1.awk, you will take a picture and the webpage will be updated accordingly. with the extension -graal1 the same thing funcitions on graal3. This action will take just ONE set of pictures. Remember to press reload on your web brower to have the new picture downloaded. Remember that those scripts have to be run on the computers where the WebCams are (graal3 for the tower, graal1 for the office). Don't abuse the manual operation, because it interferes with auto operation and problems may rise.
One can also acces the cameras on raw level. Start "xawtv" , use left mouse button to switch between cameras or use "i" for IR handy cam, "w" for web cam (if problems: right mouse button calls control panel, put on XCV for web cam, video/comp for IR handy cam. hit grab frame ppm, hit overlay, image appears) stored in *.ppm file. The IR handy CAM watches C2 and the door opening. The web cam watches the tower wall door and the main

crate.
Take into account that 2 programs cannot access /dev/video0 device at the same time (that is the device the webcam is assigned to). This means that if xawtv is running, the images for the webpage will not be generated (and some error could show). So please try to use this to the minimum. If you have to, you can login as root in graal3 and remove the crontab:
> crontab -r
After you are finished with xawtv (or whatever) you can restart crontab with:
> crontab /gral11/WWW/crontab-webcam

You can use gqview (xv on SusE machines) /graal11/WWW/public_html/images/*.gif to view grabbed frames from the video cameras.
Another error that might appear is that the webpage does not exist/has 0 data. To solve this, copy the backup copy of the page (*.bkp) to the good one(*.html) in the correspoding directory:
> cp /graal11/WWW/public_html/graal1.bkp /graal11/WWW/public_html/graal1.html
> cp /graal11/WWW/public_html/index.bkp /graal11/WWW/public_html/index.html
DO NOT MOVE them

2. Remote control

Crate power is switched on with /usr/daq/daq/doorpwer1 (see appendix). If enabled by an option, the data acquisition program switches on these power at startup. BE SURE TO NEVER DIRECT DAQ OUTPUT TO REMOTE SITES, THIS WILL SLOW DOWN THE DAQ! Rather use > file, and look at the file remotely.
The door of the tower hut is then opened also with /usr/daq/daq/doorpwer1 (see appendix).

3. Emergency power

With CAMAC and PC there is 20 minutes persistance from the UPS. In case of a power fail emergency power will be put to door with a 10 second delay. In this case the three phase current generator is auto-switched on (hissing noise). This generator send strong electronic noise into the electronics. The door will then be closed automatically **without** any command by computer etc in this case. The close command will be active as long as the outside power is off. When the power returns the door will be put on outside power automatically again.

Never try to open the door with emergency power. Things are arranged in such a way that this is impossible, and trying it might damage the motor.

4. Emergency stop by operator

In case the internet connection to the experiment is down for more than 10 minutes the operator must be asked to close down the experiment. The following steps should be tried in this order.

Action 1 (emergency run stop):

There is an account for the operator: operador(passwd:graal1) which, when started in Xwindows will show 3 icons on the desktop. Two of the are for the modem (see below), but the 3rd one is for the EMERGENCY STOP. If the operator double clicks this icon, the program stop will be started. If the operator can not login with Xwindows, ask him to switch to console mode (Ctrl+Alt+F1) and login. Then, at the prompt he should type "alto" to start the stop program.

The program "stop.c" closes the door, runs down the voltages, switches off the NIM and stops the daq program. He should then check on the IR cam that the door is closed. If this is NOT the case he should take action 2.

Action 2 (PC independent door closure):

The operator should switch off the fuse T5, this shuts off the power in the tower and activates the emergency-power door closure. **When the door is closed he must put the switch back.**

Action 3 (absolute emergency)

The door can closed with the red buttons near the door in the tower. If the power is present and this does not work, one has to try to connect the big black power cable with a red three phase plug from the hut (supply for door) directly to the plug in the back of the power division box. Nomrmally it goes to the white plastic box at the side of rack. The steps to do this are labelled in Spanish on the boxesand cables.

Action 4 (brute force)

It is planned to install a hand operation to close the door. Ask the operator to remove the power via removing T5 and somebody in the mmorning to close the hut-door manually.

4. Auto control

When graal2 is booted the demon cam_con2 is started which **must run all the time**. It checks the enviromental parameters every 20 minutes and writes the results into /usr/daq/daq/date.bmo3. If certain safety limits (at the moment > 96 % humidity and $>$ 35 km/h wind speed) are surpassed the experiment is closed down. The daq program checks these parameters every second and takes the same actions in case they are surpassed. If safety limits are changed, this must be done in daq graal1.c and cam conx (x=4 presently) at the same time. The exectutable cam con4 has to put be mv to /usr/sbin/cam con2 to enable to auto start of can con at system restart.

5. Remote shifts

At beginning of night call operator to start the field. Phone him always on the GRAAL handy to be sure he has it powered up. **Be sure to always have your GRAAL mobile phone powered up (numbers see appendix)**. In case of questions first phone the GRAAL mobile phones rather than personal numbers. Stay up the whole night until EON.
ca. 30 minutes before start of run open the door, switch on light, via /usr/daq/daq/doorpower1.
Check during the whole night:
with doorpower1 (command 15: "input levels"):
Status of door
There are 2 sensors, one that sends "active is door not closed" the other "active is door closed". If BOTH are off something is wrong and you know NOTHING about the door!! "not closed" is not "open" it might be open only a slit. **The door is properly closed ONLY if "active door closed" is reported. If this is not reported, something is seriously wrong, even if the camera image looks OK. It is then probably still a bit open which is very dangerous during the day.**
Light sensor
if "light sensor blocks" is reported, either the PMTs or the solar cell have switched off the HV. If this happens longer than 10 minutes there is some light source. Look in IR cam/ask the operator whether he see the reason.
Power fails
If a power fail happened (door closed without surpassing of environmental safety limts) do not run anymore in this night. A less restrictive rule will be introduced only when we control the charge state of the UPS.

6. Procedures to connect the GRALL PCs to the outside internet via telephone

This is what you should do in case the net is down (in Almeria/PSA) and you cannot reach graal* from yourcomputer in Madrid/Munich/home because the internet connection of the PSA is down. There are 2 possible procedures. The first one is to connect graal1 to outside via a Spanish internet provider (1. below). You have to ask the operator to do this on remote shifts. If this fails a direct dial up to graal2 is envisaged (2. below), but this method does not yet work (10.00) though hard- and software are installed.

6.1 Dial-up of graal1 to internet provider 1. Graal1 has been provided with a outside modem (box in graal office). There is a program at $/home/operador/modem/setuid-start$ that can be activated to start the connection. The operator should login in graal1 with his OWN account (user:operador, passwd:graal1). After startup on the desktop 3 icons should show. One labelled START MODEM and the other one STOP MODEM, and a 3rd one for emergency-stop (see up). Double-clicking on the START MODEM should run a program (/home/operador/modem/setuid-start) that will start the modem connection after a few seconds and quite a lot of noise (make sure that the modem is powered on and connected).

If something goes wrong, double-click on STOP MODEM and afterwards the operator can try again with START MODEM. In case he can not login in Xwindows, you can ask him to follow this procedure:
- Ctrl+Alt+F1 (go to console)
- login as operador (passwd:graal1)
- type and execute: *conectar*
If this does not work ask him to login as root, go to /root/modem and execute *start − inicia.awk*
To stop the connection AND leave everything as it was, you must:
- double click on STOP-MODEM, or;
- type and execute desconectar, or;
- execute as root /root/modem/stop-inicia.awk
depending on the way you started the connection.
Remember to execute STOP-MODEM before retrying the START-MODEM.

6.1 Direct dial to daq PC - NOT YET FUNCTIONING

The direct dial up - described in this section - is not properly working yet (october 2000), graal2 hangs up shortly after answering the call.
Graal2 also has a modem! But this one is set ONLY for emergency. It will answer calls to the tower phone (now with the same number as the office +34-950-387936). You have to run the script provided by David (connect.graal2) from a computer with modem, and if nothing goes wrong you will connect directly to graal2. Take into account that the telephone bill is running!!
The script you need are:
- the connection script itself:
!/bin/sh
/usr/sbin/pppd connect '/usr/sbin/chat -v -t 200 "" ATS7=200L0DT0950387904 CONNECT " n" ogin: ppp word: graal2' /dev/modem 38400 193.146.147.190:193.146.147.188 lock debug crtscts modem defaultroute
(there is an inverted bar before n, it does not show in latex)
in an executable file (connect.graal2).
Besides, in /etc/ppp the options file should be:
nodetach
netmask 255.255.255.128
noauth
- /usr/sbin/pppd should have -rwsr-sr-s permissions and /dev/modem should be a link to /dev/ttyS* (depends on your modem), with permissions crw-rw—-.

7. The "PC calls mobile phone" auto-warning system

Basic idea: At the beginning of the shift a process "start-call.awk" is started at a PC in home institution/town of the person on shift. This PC should be reachable to the shift leader, if necessary "in person" during the night. This process checks regularly a file talarm.dat on graal2. talarm.dat is set to 0 regularly by data-taking process daq_graalx if it detects no malfunction or deteriorating weather conditions. If there is a malfunction a number is written to the file which indicates the malfunction or bad weather. If the condition is dangerous the run is stopped and the door is closed automatically. All actions are written to *bmo2. This $emergency - call.awk$ script is the core of the idea, as it tries to connect to Almeria, gets the *talarm.dat* file, checks it, and in case of problems (no connection, bad *talarm.dat* file, alarm in *talarm.dat*) calls the chosen phone.

If talarm.dat contains !=0 or if the connection to graal2 breaks down the GRAAL handy in the respective town is called.

Explanation

1: power fail detected

2: bright light detected

if NBLOCKLIM (180) times the monitor period NMONTIME+1 the voltage is turned off by the light monitor, talarm message 2 is set, if it happens NBLOCKLIMSER (600) times, the run is stopped.

3: humi safety limit (XHUMLIM typical 96 %) surpassed

4: wind safety limit (XWLIM presently 35 km/h) surpassed

5: total rate higher than possible in normal operation (XTOTLIM typical 20 Hz)

6: master does not increase after NRATELIM monitor tasks (typical 200 sec)

7: one q does not increase after NRATELIM monitor tasks (typical 200 sec)

The process to be started to activate the alarm-system is

only Mad: /usr/users/daq/calling/start-call.awk,

Muc: telnet pcgraal3 as daq and go to directory /usr/home/daq/emergency-call/ then, execute ./start-call.awk

This program will prompt you for some data:

- IP address of graal1: Enter means the usual one, but you can enter a new one in case graal1 is connected through the modem.
- Telephone to ring
- Working directory of the emergency-call script: depends on your location.
- Frecuency of lookup: The frecuency (in min) to make the file check (whether everything is ok)

After start it will make a a test-phone call to check that everything works, if the phone rings, you must do 'ctrl - C' and then it asks whether it is ringing or not.

If the phone call is correct then you can choose the "everything correct" option and this script will install a crontab for the user, that will start the $emergency - call.awk$ script every x minutes.
If everything is allright, the script begins to work. You don't have to worry about anything.
Munich only: If the phone rings during the night, to tell you that something is going wrong, after checking what's going wrong... you must kill all the telnet processes to extgraal2.mppmu.mpg.de generated by the script, otherwise, the script keeps calling and it doesn't copy a new file. So, you have to do:
" /sbin/pidof 'telnet extgraal2.mppmu.mpg.de' "
and then kill all the processes which appear. (kill -9 'name of the process'). Then, the talarm.dat will be refreshed again with the frequency specified at the beginning. At the end of the night, if you want to stop the script, you have to do 'crontab -r'. Be sure that no crontab is running before starting again start-call.awk, otherwise, the computer can block.
This $emergency - call.awk$ script is the core of the idea, as it tries to connect to Almeria, gets the *talarm.dat* file, checks it, and in case of problems (no connection, bad *talarm.dat* file, alarm in *talarm.dat*) calls the chosen phone.
Every check generates an output that is written to *output* file, and can be checked to watch what happened in the last check.
To stop the emergency-call script you have to delete the crontab, which is done with:
$> crontab - r$

Appendix A: Telephon

GRAAL PSA mobile phone: +34-610839605 (secret code 4737)
GRAAL MAD mobile phone: +34-600840194 (secret code 1967)
GRAAL MUC mobile phone: +49-178-5182489 (secret code 6354)
GRAAL tower: +34-950-387904 (shared with REFOS tower room)
GRAAL office: +34-950-387936
Operator CESA-1: +34-950-387910(CESA) and 387962(SPSS)
Guard (to open and close the entrance): +34-616958062

F.Arqueros office:
+34-91-3944681
F.Arqueros mobile: 696309932
F.Arqueros home:
+34-91-4504277

D.Borque office:
+34-91-3944681
D.Borque mobile:
656739685
D.Borque home:
+34-91-5430624

M.Diaz MPI office: +49-89-32354-421
M.Diaz home: +49-89-32455986

J.Gebauer MPI office: +49-89-32354-224
J.Gebauer mobile: +49-171-2478084
J.Gebauer home: +49-8141-94623

R.Plaga MPI office: +49-89-32354-224
R.Plaga home: +49-89-335495
R.Plaga private mobile +49-175-1000925
E.Vendrell office:
+34-91-3944681
E.Vendrell home:
+34-91-8039342

A.Valverde office:
950 - 38 79 45
J.Ballestrin office:
950 - 38 79 56
PSA
Telephone: 950-387900
FAX: 950 - 365300
M.Berenguel
office: 34-950-215683

Appendix B: Computers and Passwords

PCs used for GRAAL:

GRAAL1 in the office:
Linux, graal1.psa.es, 193.146.147.187
Tasks: control plots during data taking, data transfer to Mad, Muc., modem connection to Inicia, ypserver

GRAAL2 in the tower:
Linux, graal2.psa.es, 193.146.147.188
Tasks: data taking, dial-in modem

GRAAL3 in the tower:
Linux, graal3.psa.es, 193.146.147.189
Tasks: Readout of cameras

W_TSA in heli control room:
Win95, 193.146.147.198
Tasks: steering of heliostats

Before going to the PSA for shifts ensure that you know the necessary passwords (the ones you used before may be outdated):

User daq on Linux-PCs (graal1, 2 , 3)
Root on Linux-PCs (su) (graal1, 2, 3)
vnc connection to Heli-PC

Appendix C: READMEDAQ

GRAAL data acquisition. technical notes
Status 6.2.2000

Actions after new start of computer:

These actions are now automatically performed at uptime by a script /sbin/init.d/camac, the instrucitons are left here only as info.
1. install CAMAC driver:
go AS ROOT (as superuser) to /usr/daq/drivers-card (not /root/driver!!) and do "insmod cc16_lp"
check in: /proc/modules, /proc/ioports, /proc/devices that the driver "cc16_lp" exists
2. go the /usr/daq/daq (base directory for GRAAL DAQ)

3. do "crate_ini"

now programs which CAMAC functions should work return values in CAMAC programs of 0 and 2 indicate normal operation, 7 is return code if the driver is installed but the CRATE cannot be accessed (e.g. no power) "crate initilaisation error" indicates a non-installed driver
crate_ini should also be performed in case of problems, it resets the CAMAC crate

further remarks:
there are two version of the CAMAC driver, the one in /root/driver is an older one, which assumes NCRATE_NUMBER=1. The one in /usr/home/plaga/WIENER99/JUAN/driver is a newer one, it assumes NCRATE_NUMBER=0. It conforms to all standards in the manual for the CC16 crate controller and is therefore preferable.
There are also two versions for the libcc16.h library file which contains the C CAMAC functions which operate the driver in /home/plaga/WIENER99/JUAN/driver libcc16.h.170499.original which performs CAMACZ on crate reset i.e. all module contents are reset to 0 on crate_ini libcc16.h which does not do that.

Basic tasks:

the main data acquisition program is
/graal21/daq/daq/daq_graal1.c (compiled with shell script "gcc_daq1")
do "exec_daq" older versions are kept as /graal21/daq/daq/old-versions/daq_graal1.c.date

The daq program reads out:
1. Hytec 727 scaler (all 32 chans a 4 byte)
2. 2 Hytec 506LC (64 chans a 2 byte)
3. LRS 2249W ADC (all 12 chans a 2 byte)

It sets the CAEN 219 output register CAEN 221 DAQ (voltages for 4 PMTs are set according to input in daq_in.in 4 numbers in first line). The I/O register CAEN C219 is operated with the inputs listed in /graal21/daq/daq/use_of_camac_inputs.dat (out channel 5 = set system dead, 6-9 lightpulser Lp1-4 etc.)

The event data are written to *.bda (the name * is automatically given according to data and runnumber/subrunnumber).
Every ()seconds the slow ADC and the scaler are completly read out and written to a *.bmo file.

exec_daq is properly stopped with "daq_stop" in the same directory.

The main task to operate the I/O register DAQ C221 independent of data acquisition is doorpower1.c in /graal21/daq/daq (compiled with gcc_doorpower).
do:
"doorpower1"
a menue appears:
put in a number corresponding to the menue: e.g. 1/2 door open/Close
This means:
if a 1 is put in the I/O input corresponding to door open/close (according to use_of_camac_inputs.dat) is set to "high" and 2 puts this input to "low".

high/low – red LED on channel on/off
the assingments of the channels are in use_of_camac_inputs.dat

green LED on (off) means: this channel is out (in) register

---

avoid to operate doorpower and
daq_graal at the same time

The set values on the outregister are automatically stored and used by exec_daq and consecutive calls of doorpower. I.e. the only way to reset a outout high is by resetting it in doorpower!

Input files:
daq_in.in (/graal21/daq/daq). This file is read by exec_daq!
1 st line:
Usually set to 0. Set to 1 if the run is a test run, there will be no run number up counting, all bda and bmo files are called "test.*". Existing files will be overwritten without warning.
2 nd line:
PM voltages in Volts, PM 1-4.
3 rd line and following:
Change of PM HV during the run. The format is
month day hour(UTC!) minute second command HV-change(PM 1-4)
Special values for (month day) are (99 99) which meaning each day. Presently two command are existing: change HV (1), shutdown everything (2).
lc564.in (/graal21/daq/daq). this file is read by the scope!
Scope settings in the format required for the Le Croy LC564 (see comments in file and RCM manual of LC 564)

run_number.dat (/graal21/daq/daq):
contains the actual run number, DO NOT MANIPULATE!!

Data structure
.bda (binary data) name structure:
run (5)date(5)time(7)year(2)subrun(3).bda

file structure binary (number of bytes):
1. Nbeginlabel(4)
meaning:

normal event:9999999
calibration Lp 1: 101
calibration Lp 2: 102
calibration Lp 3: 103
calibration Lp 4: 104
charge injection: 2000000+nadcc where nadcc is the ADC value omn PS7120
time injection: not used presently (same calculation,see calibration_task() in daq_graal1.c)
hv sweep: 3000000+voltage of first Cone
2. time (4) (unix format)

3. event clock time (4)

4. 32 scaler channels a 4

5. 12 fast ADC channels a 4

6. 64 slow ADC channels a 4

7. 500 (if seq on 1000) or 1000 (if seq on 2500) chans LC564 1st chan a 1

8. 500 or 1000 chans LC564 1st chan a 1

9. 500 or 1000 chans LC564 1st chan a 1

10. 500 or 1000 chans LC564 1st chan a 1

---

next event

.bmo (binary dat monitor) nam struct:run (5)date(5)time(7)year(2)subrun(3).bmo
1. counter 4
meaning:
normal monitor task (every NMEANRATE seconds):
running number of task
calthresh_task() threshold sweep (every performed NRATESET calibration period):
1st occurence: NEGATIVE running number of task

2nd occurence(after NRATEPER sec): current threshold adjusted on DAC 221

2. time in unix units 4

3. 32 scaler channels a 4

4. 64 slow ADC channels a 4
(ONLY in normal monitor task)

5. input register 4
(ONLY in normal monitor task)

---

next event

.bmo2
ASCII readable file to find errors in DAQ. File gives ERROR messages which only indicate serious errors and all program induced run stops. LOG messages are given at calibration time and HV change time together with scaler positions at the LOG time.
.bmo3 nam struct:0date(5)time(7)year(2).bmo3
ASCII readable file, output of cam_con2 demon that controls parameters every NCMACONINT (1200 presently) seconds environmental parameters are written to this file, if door was closed reasons are given here
.bmo24 name struct: as .bmo
binary file that contains the results of the threshold sweep calthresh_task() threshold sweep (every performed NRATESET calibration period
1. integer counter for task (negative) 4

2. time in unix units 4

3. usec time 4

4. 32 scaler values a 4

5. threshold in C221 DAC values over NLOWTHRESH 4

6. time unix after NRATEPER wait 4

7. usec time 4

8. 32 scaler values a 4

next calibration

Appendix D: Spanish-English

Please check clock time on windows pc

Por favor compruebe el tiempo (el reloch) en el ordendor de Windows.

Is there dew?

Hay rocio en los heliostates?

Please start (stop) the field.

Por favor enceder,leventar (appagar) el campos de heliostatos.

Startthe tracking.

Conience el seguimento.

Hows the weather?

Como sta el tiempo?

Please (de)activate the dial-up for graal1.

Por favor, des(conecte) la conexion por modem de graal1.

Please stop the experiment with the command on graal1.

Por favor, pare el experimento con el comando de graal1.

Please remove the fuse for the electricity in the tower so that the door will close.

Por favor, quite el cable que da electricidad a la torre, de modo que la puerta se cierre.

We will not operate the experiment longer tonight.

No operaremos hoy durante mas tiempo/ Paramos la operacion por hoy

Please stop the field, we finish for tonight.

Por favor, pare el campo de heliostatos, acabamos por hoy.

Is the door closed?

Esta la puerta cerrada?

Did the power fail?

Ha habido fallos/cortes en la corriente/electricidad?

Is the wind-speed limit exceeded?

Se ha sobrepasado la velocidad del viento?

(In worst-case scenario when everything failed): Please go up and switch all crates (everything except the PC) off.

Por favor, vaya arriba (a la torre) y apague todo (excepto el ordenador).

Please make sure that tomorrow morning the field will not be activated until Fidel closes the door manually (with a handle with no electric power, he knows how to do it).

Por favor, compruebe que manhana por la manhana, el campo de heliostatos no se levante hasta que Fidel cierre la puerta manualmente (el sabe hacerlo con una manilla/palanca, no con electricidad).