CCD Imaging with the Philip Wetton Telescope

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Version 0.5

Revision History

Version	Date	Author	Changes
0.5	2012/02/03	FCl	Added teamviewer info. Updated settings file location. Added summary section. Added more information on setup. Created new settings file.
0.4	2012/01/20	FCl	Corrected some bits.
0.3	2012/01/03	FCl	Revised structure and updated information for 2012 MPhys projects
0.2	2011/11/18	FCl	Added more information on operations from GJW documents
0.1	2010/12/12	FCl	First release

1 Summary

This document is a guide to CCD Imaging with the Philip Wetton telescope at the University of Oxford. It is intended as a guide and reminder for user who've already had some training on the system. Section 2 gives and overview of the system and describes the initial set-up required to use it. Section 3 highlights some of the health and safety issues specific to the telescope and dome. Section 4 describes how to change the telescope to CCD from eyepiece, and vice-versa. Section 5 outlines how normal operations work, and section 0 gives information on how to judge the observing conditions and weather. Finally section 7 lists common problems and how to fix them.

2 Overview & Getting Started

2.1 System description

Overview of the system

<mark>System diagram</mark>

A windows machine called "wettonpc1.physics.ox.ac.uk", located in the dome, runs the main control programmes and communicates with the hardware. This machine communicates with the hardware via RS232 and USB cables to a USB hub located under the telescope. The connection to the dome is via a USB connection to a wireless control pad. This communicates with the controller boxes mounted on the dome.

The main programme is called "MaximDL". This controls the telescope and the dome via a server programme called "POTH". POTH also takes care of sychronising the dome position with the telescope. MaximDL communicates directly with the CCD camera, guide camera and the focuser. MaximDL and POTH run on wettonpc1. When images are saved from MaximDL, they are written to a directory on the astrophysics AstroDAQ shared disc. They are then visible from any machine in astrophysics accessing this share. A new directory is created for each day, at midday.

A secondary machine called "wettonpc2.physics.ox.ac.uk", also located in the dome, controls the all sky camera, temperature monitoring, and cloud/rain sensor. You should not have to log in to this machine.

2.2 Computing

The telescope is now controlled from a Windows machine called "WettonPC1". Anyone with a PHYSICS account can log into this machine locally and control the telescope. However, to log in remotely, and write data to the shared disc, you must be added as a member of the "Wetton Users Group" by central physics IT (ITsupport@physics.ox.ac.uk).

2.2.1 Data location

The default storage location for Wetton data is;

```
afp://asfs02.phsycis.ox.ac.uk/AstroDAQ/Wetton/
```

This location can be mounted as a share from your department Mac, so it is easy to copy data off for analysis. All members of the department should have read access to these directories. Only members of the "Wetton Users Group" have write access to these directories. No data should ever be deleted/modified in these directories. When you are reducing data, please make a separate copy in another location before starting.

This share is also available from the wettonpc1 desktop via the "Wetton Data" directory icon.

2.2.2 First log in

Some software set-up needs to be run the first time you use the CCD with MaxImDL. Follow the steps below.

1. Start-up MaxImDL by clicking on the Desktop icon. This will create the default start-up/settings directories. These should be in "My Documents\MaxIm DL 5\". Close MaxImDL down.
2. Copy the file Settings_PWT_20120203.zip from;

    Desktop\Wetton Data\Settings\

    to

    My Documents\MaxIm DL 5\

    and unzip the file in this directory. This will create a set of files called "XXX,Wetton Imaging.txt" in the Settings directory.
3. Now restart MaxImDL and go to "File->Configurations..." to open up the config window.
4. Select & load "Wetton Imaging" (or other appropriate configuration). This will restart MaxIm, and load the default configurations for the CCD.
5. To put your own name into the FITS header, go to "File->Settings..." and then select the "FITS header" tab from the window (Figure 1). Click on "OBSERVER" and enter your own name in the "Value" field. Click "Set" to enter the data, and Apply & OK to finalise.
6. To fix an apparent bug in POTH initialisation... Connect to the telescope to start POTH (look at the windows task bar). Open up POTH and click on "Setup" (Figure 2) and then "Setup" on Dome Connection panel (Figure 3). This brings up another window. Check that Set Park Position is at 230 degrees, and COM Port Number is COM7. Click OK (on both windows).
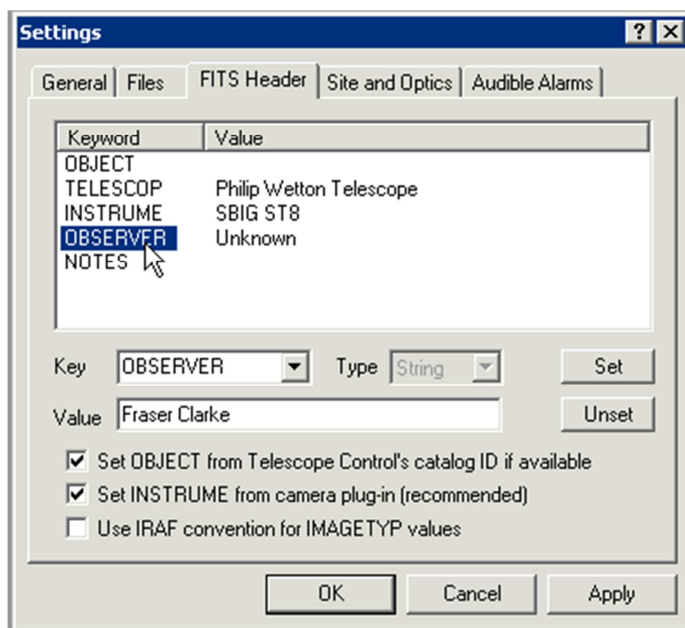
Figure 1: Changing the default OBSERVER name in MaxImDL via the File->Settings window.
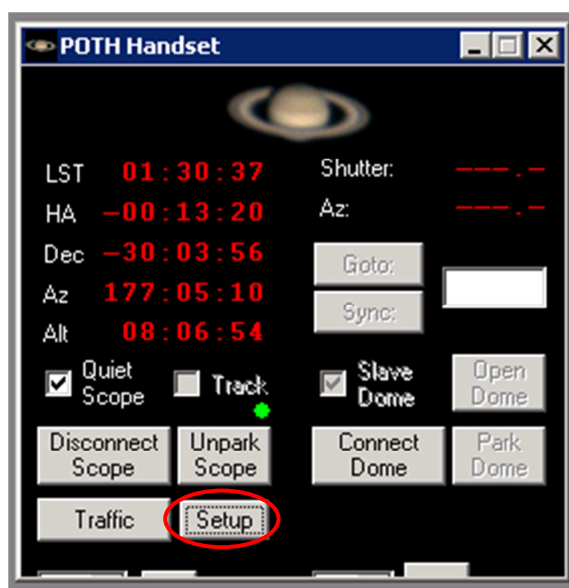
Figure 2: POTH window showing telescope connected and dome not connected. Click on "setup" to bring up telescope/dome setup window.
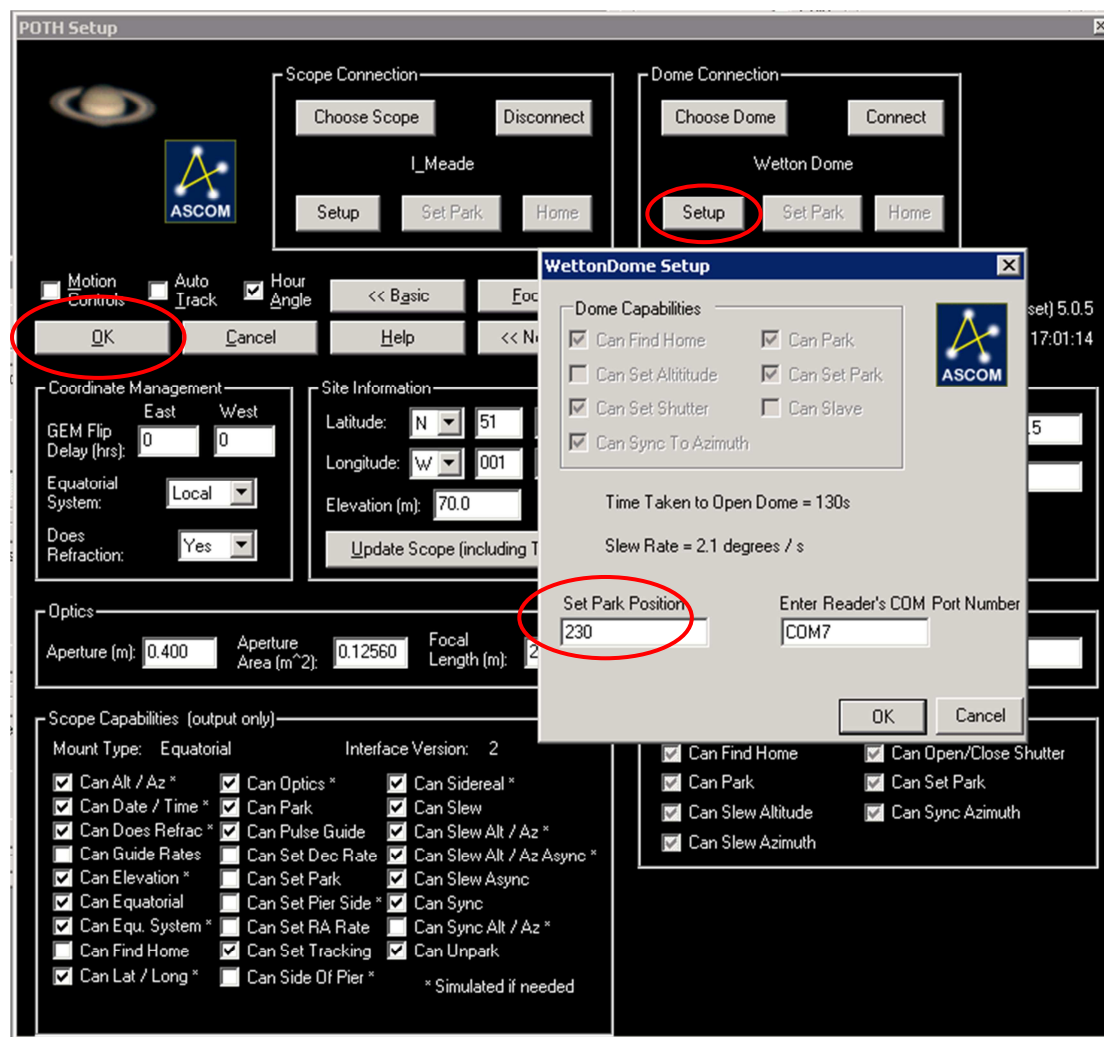
Figure 3: POTH telescope/dome control setup. Click "Setup" on Dome Connection area to bring up dome setup window. This needs to be run once before POTH will connect to the dome (even if you don't change anything!)

MaxIm should now be set-up for CCD imaging by default. Any parameters you change whilst you are using MaxIm should be automatically stored in the configuration files and be available at set-up next time.

2.3 Wiki

The PWT has a wiki-site, which contains more information on the telescope/reference data/schedules etc. It is available at;

http://astrowiki.physics.ox.ac.uk/PWT/

Please make use of the Wiki to store information on your project, etc. This helps other people to make observations for you if you need.

3 Safety

3.1 Personnel safety

Please take normal health and safety into account when working in the dome. Below are a few points in particular which are specific to the telescope dome.

3.1.1 Ladders

The dome contains a short library type stepladder to help you reach the top of the telescope (i.e. to remove the lens caps). The ladder is rather wobbly and does not have a full hand rail. Please take extra care when using this.

3.1.2 Lone working

The department's health and safety guidelines permit lone working at night for 'general office duties'[1], which covers normal observing from your office/lab. If you need to physically go up to the dome during the night, you should consider this an increased risk and take appropriate action – specifically; what will happen if you trip/fall on the stairs? An appropriate risk reduction strategy may be to let someone know that you are going up to the dome, and when you return to your office/lab. If you are overdue, they would know to come and look for you.

3.1.3 High voltage

The dome track contains an exposed 240V track. The power to this **MUST** be turned off whenever the dome track is open. If the cover of the dome track is taken off for any length of time, the power switch must be locked off with a padlock.

3.1.4 Cables

Take care to avoid the cables running between the telescope and the computer.

3.2 Equipment safety

If in doubt, close the dome.

3.2.1 Telescope

The telescope is relatively robust. Take care however when removing/replacing the telescope covers. Take care with the cables to/from the telescope and the handset controller.

3.2.2 Dome park position

The dome should be parked at end of each observing session. This places the dome slit at 230 degrees (i.e south-west) and means the drips from the back of the dome fall

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[1] https://www-cmphys.physics.ox.ac.uk/Healthsafety/2007/13.1-%2013.2%20Risk%20Assessments.pdf

harmlessly onto the floor. Other park positions could allow the dome to drip onto the computers.

4 Installation and set-up

The telescope set-up should only be changed by an experienced operator.

4.1 Eyepiece to CCD

*** To add pictures ***

1. Put the telescope to the park position and turn off the power
2. Unscrew the 4-inch thread adaptor from the back of the telescope, including the 45-degree fold & eyepiece.
3. Store all parts in the cupboard (right hand side)
4. Screw the moonlite focuser onto the 4-inch thread. The focuser should be snugged up in the thread only, with the motor axis roughly horizontal
5. Feed the CCD power cable and two USB cables through the fork, so that the cables run smoothly out to the South.
6. Carefully place the CCD nosepiece into the focuser, and insert it up fully up to the lip. The SX guider should be approximately vertical above the main CCD. Tighten in turn the three silver thumbscrews to secure the camera to the focuser. Make sure the camera is well held and stable in the focuser. Note, this step can be quite fiddly – the camera should feel very solid when properly mounted.
7. Cable up the instruments
    a. Plug in the camera USB cable to the SBIG camera (black USB cable)
    b. Plug in the camera power cable to the SBIG camera
    c. Plug in the guider USB cable (care! Fragile connector!)
    d. Plug in the white RJ45 guide cable to the telescope ("CCD Guider" port)
    e. Plug in (and screw in strain reliefs) the grey DB9 serial cable to the focuser (this cable is fixed to the focuser control box, and coiled under the telescope)
8. Move the counterweight from the 'eyepiece' position to the 'ST8' position. Take care when loosening the mounting screw and be sure to hold the counterweight.
9. Carefully screw the mirror tension spring into the back of the mirror. Be very careful to make sure the screw seats properly into the nut – it takes a little bit of feel to judge this. Do *not* tighten the screw down yet.
- *The final sections can only be done at night*
10. Start-up and home the telescope as normal
11. Slew to a bright star, about 2—3 magnitude.
12. Take a short (1s) exposure on the CCD, you should see an out-of-focus "doughnut" on the image. If you do not see the star, the pointing is probably off. Check with the finder scope (see below) and fix the pointing before going any further.
13. Set the moonlite focuser to the middle of its range (see §5.1.5.1.2.1)
14. Set MaxImDL to take continuous short exposures (0.1s or so, such that you can see the star).
15. Focus the telescope using the mirror focus screw until you get the star roughly in focus. Be sure that the mirror lock screw is not tightened when you are doing this. You may need to adjust the telescope pointing to keep the star in the field of view.

16. Once the star is in focus (get it as close as you can), tighten down the mirror lock screw completely.
17. Stop the continuous images and do a focus run with MaximDL (§5.2.5)

4.2 CCD to Eyepiece

TBC

5   Operations

This section gives an overview of how to start-up, observe with and shut-down the system. It is split into 3 main sections;

- Start-up
- Observing
- Shut-down

5.1 Start-up

A quick reminder of the system start-up;

- Check the telescope, CCD and focuser are powered on
- Uncover the telescope and home it
- Make sure dome controllers are in "remote"
- Decide which part of the dome is open (upper or lower) and open the dome
- Log in to wettonpc1 computer
- Start-up MaximDL
- Connect to Telescope (starts up POTH)
- Connect to Dome
- Connect to Focuser
- Connect to CCD and turn on coolers

The sections below provide more details on each of these steps.

5.1.1 Telescope

Carefully remove and store the plastic sheet covering the telescope. Be careful the sheet doesn't get caught on the guider telescope and rip.

Leave the mirror caps on for just now. Once the dome is opened, remove the mirror caps (main telescope is a pull-off cap, the guider telescope is a screw-off cap) and store on the desk.

Switch on the telescope plug at the back of the pier (South side), and then power on the telescope with slide switch on the main panel (***photo***). The system takes about 15 seconds to start-up. When it is ready, the hand controller shows **** (photo?).

5.1.1.1 Homing the telescope

The telescope must be "homed" after it is turned on, or it will not point accurately. To do this via the handset controller, go to "TELESCOPE"->"HOME"->"FIND". The telescope will then move in both axes for ~60 seconds to find it's reference position. When finished, the handset should say "Home search complete". If the home search fails, make sure the telescope is near it's default location (23 hours HA and 0 degrees declination) and try again.

5.1.2 CCD

The CCD is usually left on to keep the cooling stable. If not, switch on the ST8 plug at the back of the pier (South side), and then turn on power supply brick mounted on the South of the telescope mount (note, this is usually just left on). If the CCD is connected to the USB port of the computer, the fan should start to spin.

Note that when the CCD cooling is turned on, ice may form on the detector. This usually clears after several hours, so it is worth turning the CCD cooling on early in the day.

5.1.3 Focuser

The focuser is usually left switched on. If not on, switch on the focuser plug at the back of the pier (South side). Check the red light is illuminated on the small focuser controller box under the telescope.

5.1.4 Dome

Turn on the key power to both the dome controller boxes, and set them both to "Remote". (***photo ***)

5.1.5 Software

Log into the telescope control computer at `wettonpc1.physics.ox.ac.uk` with your PHYSICS username and password. If you are in the Wetton Users Group, you can log in remotely via RemoteDesktop (available from SelfService on the dept macs). There are several telescope specific programmes (MaxImDL, POTH and DS9), which should be available on the Desktop, and in the "Wetton Telescope" folder at the top of the All Programs list. See Figure 4 below.
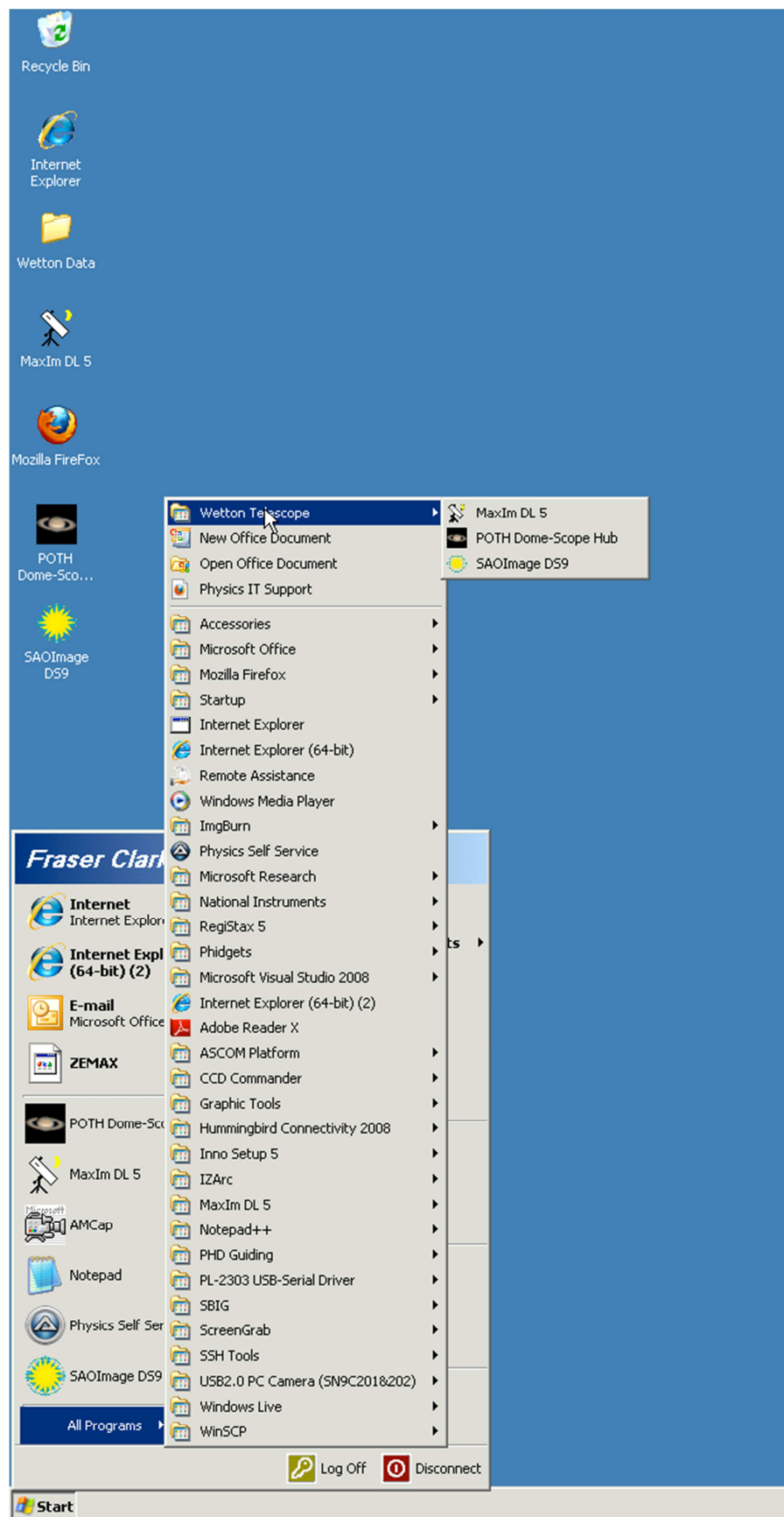
Figure 4: Screen grab of the Wetton icons and folder on wettonpc1. Of interest are MaxIm DL 5, POTH, DS9 and the 'Wetton Data' directory.

5.1.5.1 MaxImDL

MaxImDL is an extensive package with many features. We recommend you use the in-built help files (Figure 5) both for problem solving, and to learn the capabilities of features. In this section we provide details on the features most commonly used in standard PWT observing.
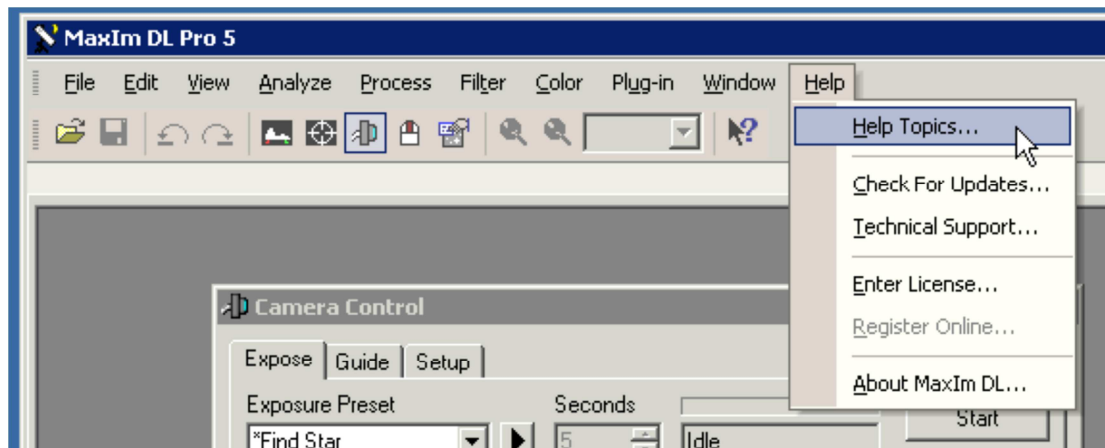

Figure 5: Accessing the MaxImDL help package

Start-up MaxImDL by double clicking the desktop icon, or from the Wetton Telescope folder on the start menu. MaxImDL should start-up with the main windows open, but if it doesn't you can open them easily. There are four main windows to control MaxImDL;

1. Screen Stretch

2. Information

3. Camera Control

4. Observatory Control

They are opened by clicking the four buttons on the "Standard" toolbar (if this is not visible: View->Toolbars->Standard). This will bring up four new windows, which you need to distribute prettily around the screen (this is very annoying and the windows keep getting in each other's way, sorry!).
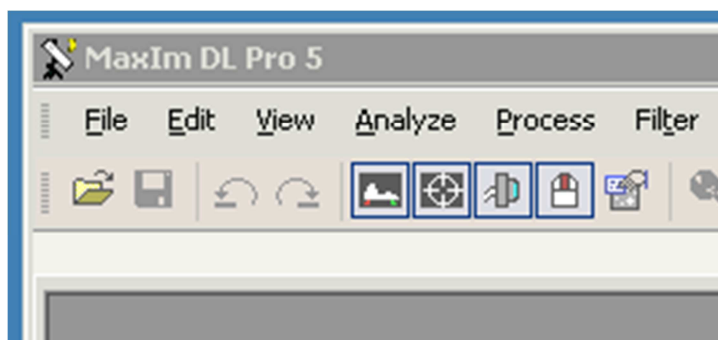

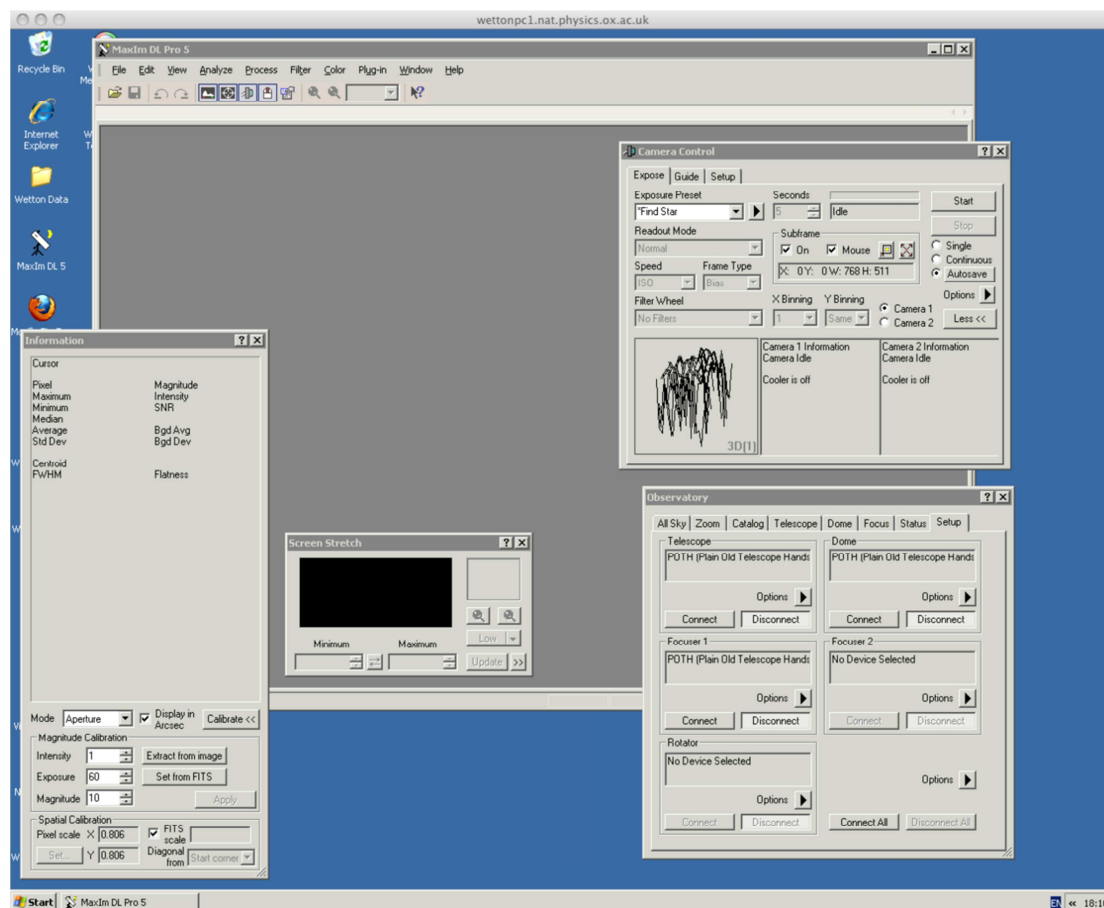**Figure 6: Buttons to open the four main windows of MaxImDL.**

Figure 7: Four main MaxImDL windows open

With the windows open, we need to connect the software to the devices (camera and telescope). In the Observatory and Camera Control, choose the "Setup" tab. Click on "Connect"/"Connect All". If you haven't started it already, this will start POTH.

5.1.5.1.1 Connecting the Telescope

From the Observatory window, go to the Setup tab and click "Connect" on the telescope subsection (Figure 8). This will open up the POTH programme in the background, and should connect to the telescope (see §7.1.3 for a relatively common connection problem at this point). Check in the "Telescope" tab to see if the information from the telescope is now available (Alt/Az etc).
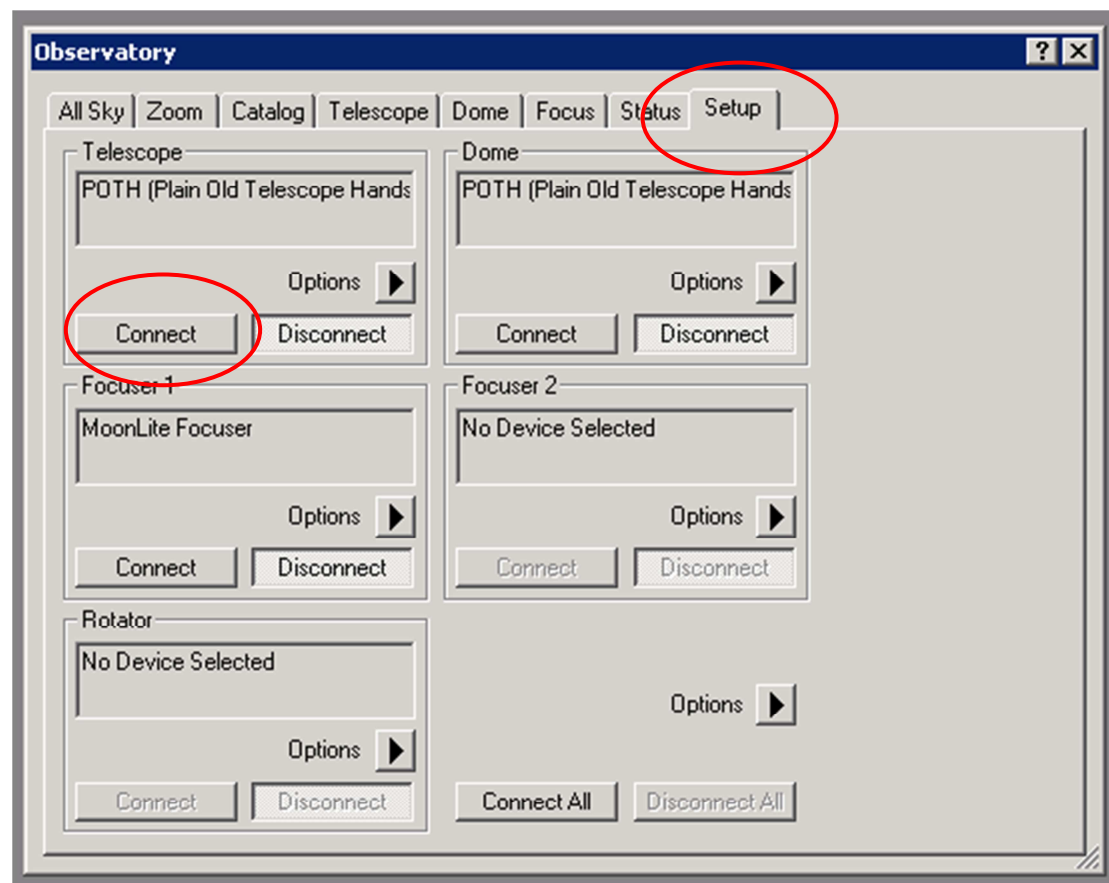
Figure 8: Telescope/Dome/Focuser connection subsection of the observatory window. Click "connect" to connect to the telescope etc.

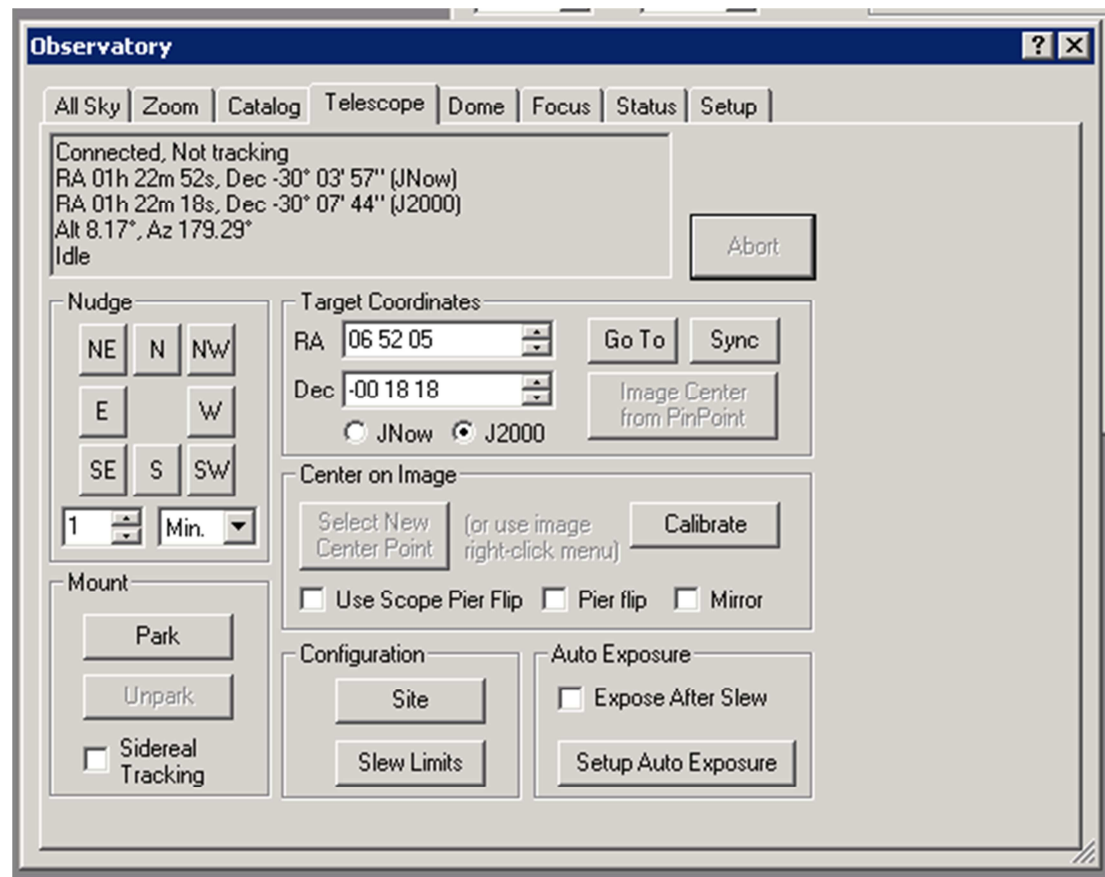You can also click "Connect" on Dome and Focuser at the same time.

Figure 9: Telescope subsection in Observatory window. When connected, information is displayed in the upper box. The telescope here is current not tracking. Check the "sidereal tracking" box to turn on tracking.

5.1.5.1.2 Connecting the Focuser

Click "connect" on the Focuser 1 subsection of the Observatory Setup tab (see above). The moonlight focuser should now be connected and report its position in the "Focuser" tab.

5.1.5.1.2.1 Zeroing the focuser

This step only needs to be done occasionally.

The moonlight focuser is an absolute focuser, and will keep its position after a power-off. However, it is possible for the focuser tube to slip in the motor, and therefore lose its position. If this happens, re-zero the focuser with the following steps (it's worth doing this each time the telescope set-up is changed, before you focus the telescope at night);

1. Disconnect the focuser and click on the "setup" option (right arrow above "disconnect"; Figure 10)
2. Type in the current position as 5000 counts, and click "set" (Figure 11)
3. Reconnect the focuser, and via the focuser tab, move the focus to 0 counts with the "absolute" position setting (Figure 12). This will run the focuser into its lower limit. Check visually that the motor keeps running once the tube stops moving – you should hear the motor noise change.

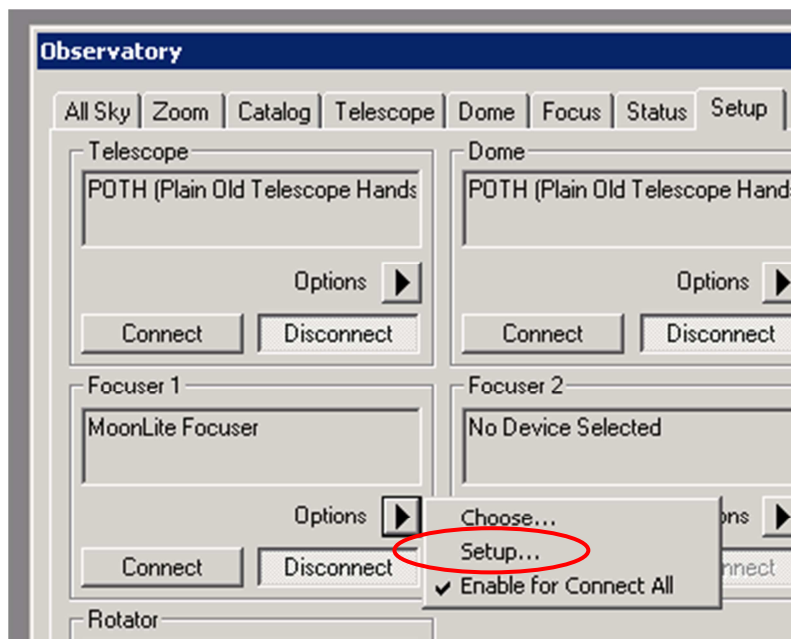4. Now back the focuser out to 2500 counts to put it in the middle of its range.

Figure 10 : Focuser setup option
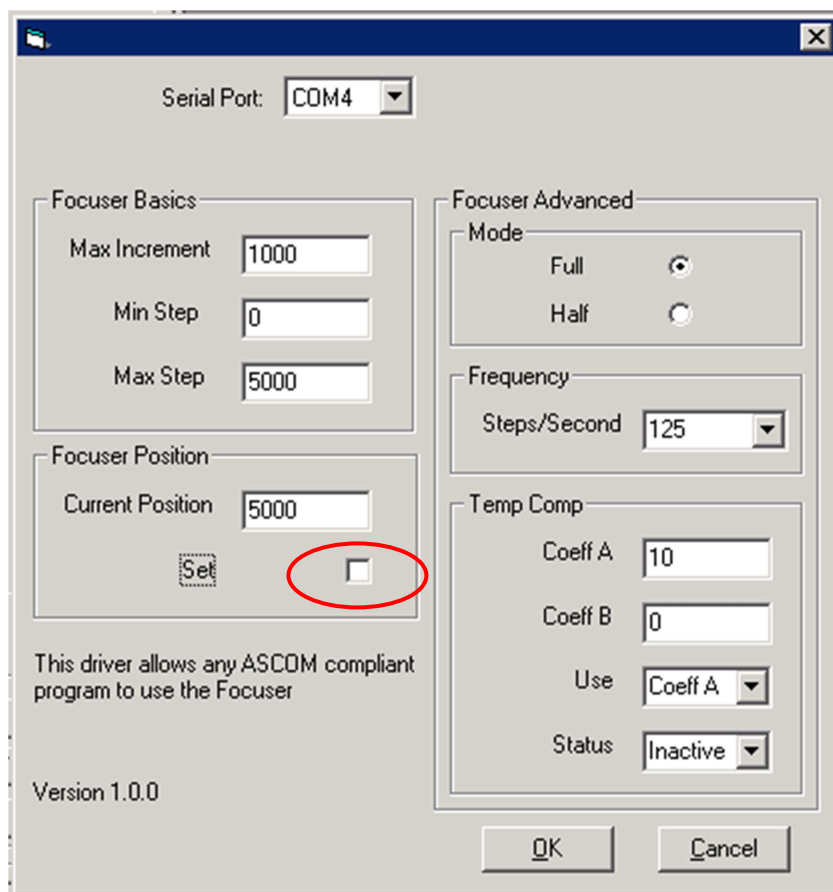
Figure 11: Setting the focuser position to 5000 to enable the focuser to zeroed at the hardware limit. Tick the "set" box highlighted, then OK.
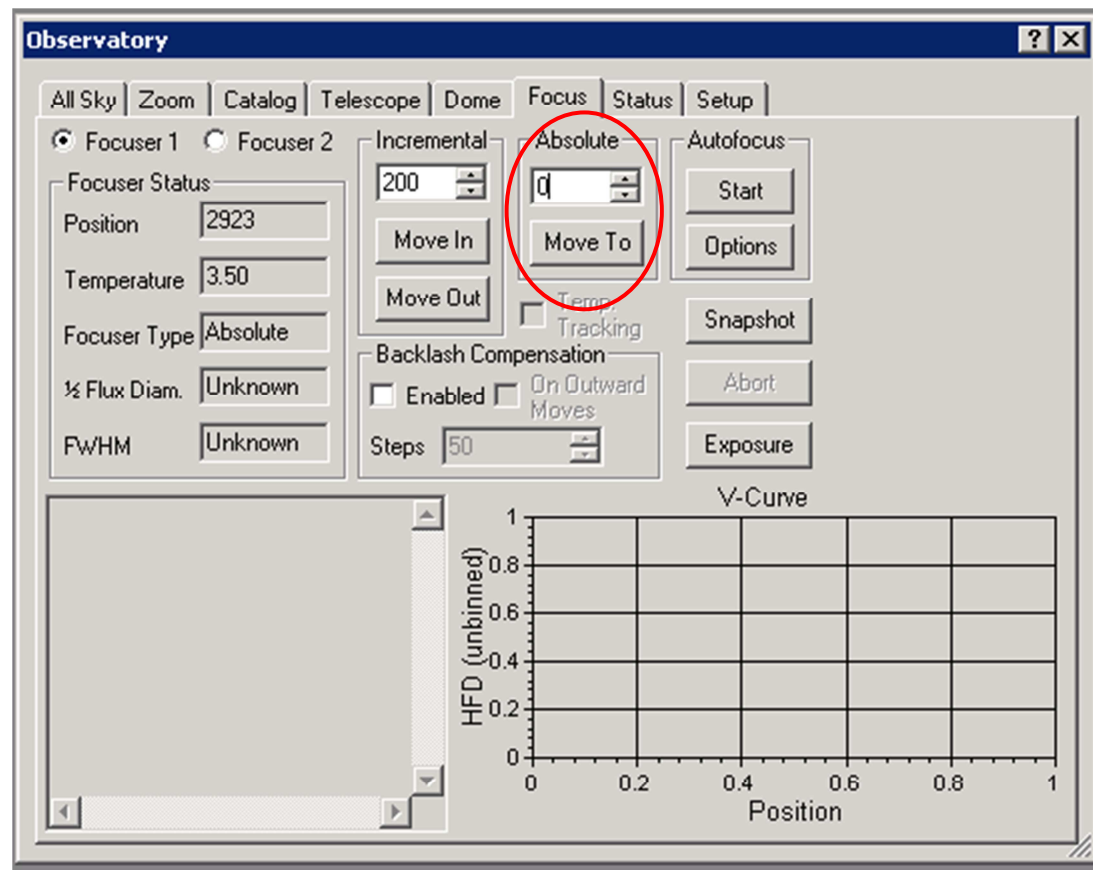
Figure 12: Focuser control subsection in the observatory window. The "absolute" feature highlighted allows you to move the focuser between 0 and 5000.

5.1.5.1.3 Connecting the Dome

Click "Connect" on the Dome subsection of the Observatory Setup tab (see above). If POTH is not already open, it should now open. The dome may move slightly as it looks for its reference.

In POTH, once the dome and telescope are connected, tick the "Slave to scope" button. The dome will now track the telescope. (Figure 13)

Note - POTH will be unresponsive whilst the dome is moving.

Figure 13: POTH window showing connection to telescope and dome. Dome is currently not slaved to the telescope, and the telescope isn't tracking ("Track" and "Slave Dome" boxes are unchecked)

5.1.5.1.4 Connecting the CCD

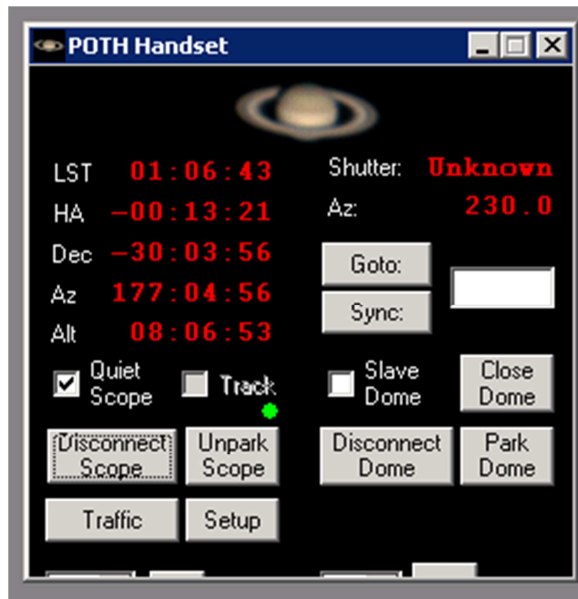The CCD is started-up from the "Camera Control" window. In the Set-up tab, click "connect". The cameras should be set as ST8 (Camera 1) and SX (Camera 2).

5.1.5.1.4.1 Cooling temperature

Click on "cooler" and set the cooling temperature to –20C. Turn the coolers on.

5.2 Observing

5.2.1 Pointing the telescope

TBC

5.2.2 Centering targets

TBC

5.2.3 Guiding

TBC

5.2.4 Observing sequences

MaxImDL allows you to build sequences of observations (i.e. 10 exposures of the same object), which it will then carry out automatically without intervention. This is a great help and avoids you having the click on the computer every 2 minutes!

To access the autosave menu, click the small "AutoSave" at the right hand side of the Expose tab in the Camera Control window (see Figure 14).
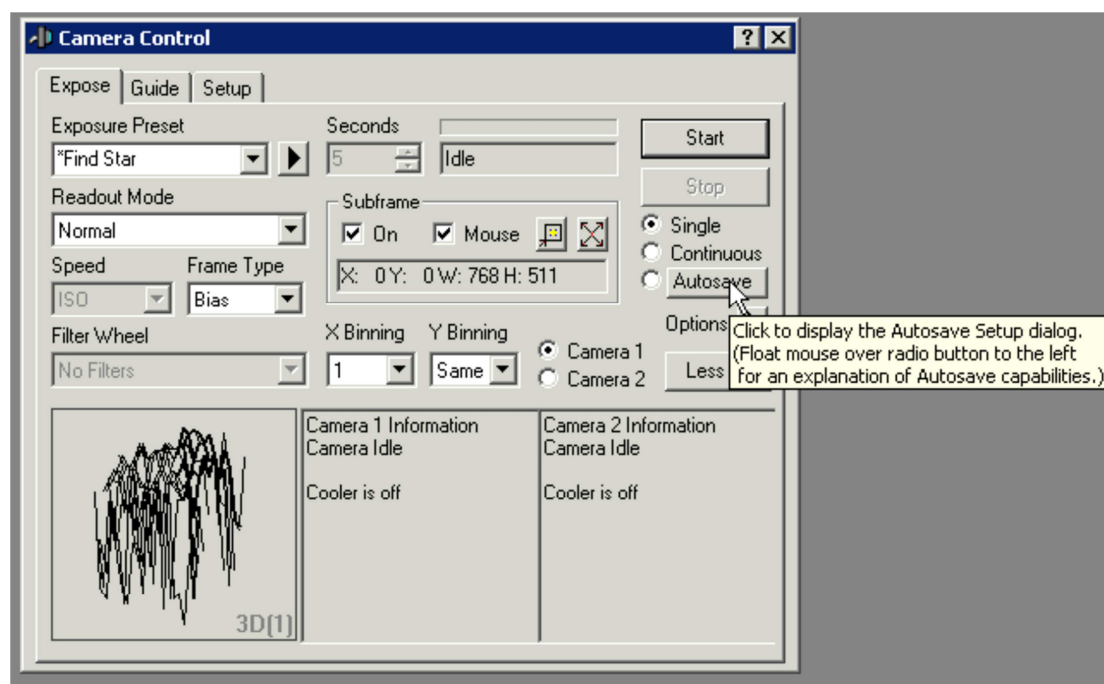
Figure 14: Location of the autosave button.

This will open a new window which holds the AutoSave configuration information. Figure 15 shows the AutoSave window set up to take a sequence of 10 bias frames.
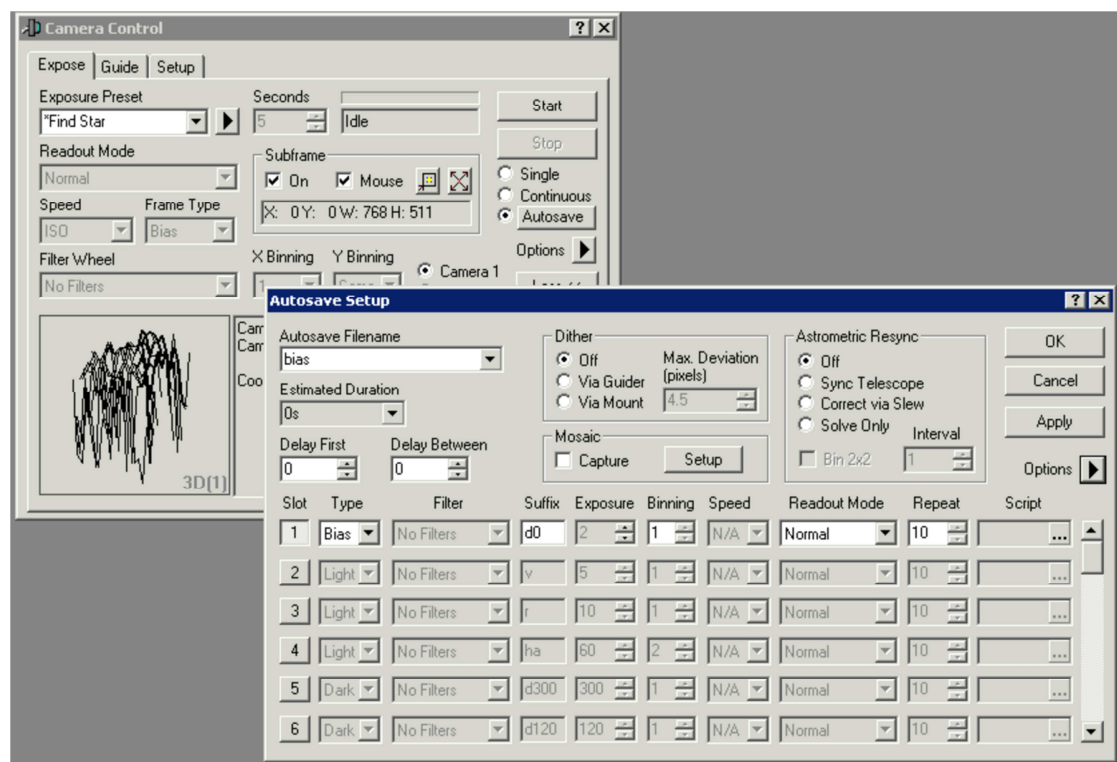
Figure 15: AutoSave configuration window set-up to take a sequence of 10 bias frames.

There are many settings in the AutoSave window, and we suggest you look through the MaxImDL manual to find out more details on them. A few particular points are worth highlighting;

1. Click on a slot's number to activate/deactivate it.

2. The base save name of the file is controlled by the "Autosave Filename" parameter in the top-left of the window – choose a sensible name for this based on either the type of exposure (e.g. bias/dark/flat), or the name of the object (e.g. M42). The files will then take the form, e.g. base-NNNx.fits, where 'base' is the base file name, 'NNN' is a sequential number, and 'x' is "Suffix" given in the autosave form.

3. "Delay First" does not seem to work…

4. Turn off "Dither" (top-middle of window) when doing dark/bias calibrations.

5. It is worth setting the default execution mode to "Group By Slot" (see Figure 16) in the "Options" menu (right arrow). This means the software will execute all of the observations in slot 1 before moving on to slot 2, rather than executing one observation from each slot in a loop. This is more efficient if the slots use different filters, for example.

6. Check there are no active slots "hiding" below the bottom of window (you can have up to 30 slots).
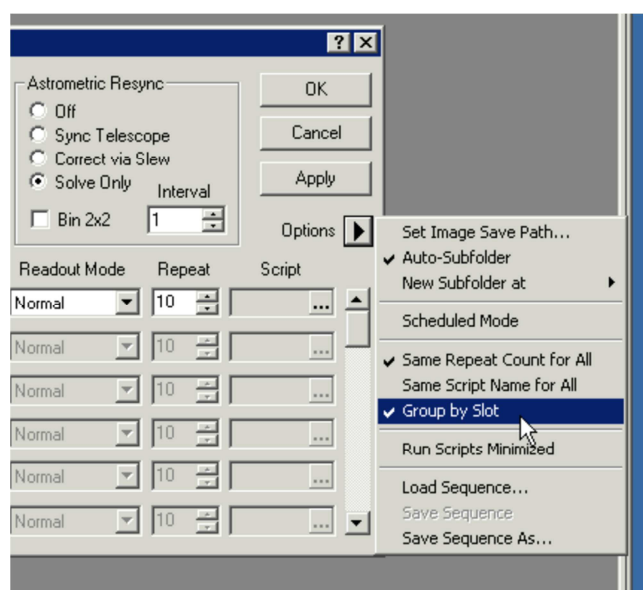
Figure 16: Setting the "Group By Slot" parameter

To close the AutoSave window, click "Apply" and "OK". To start an AutoSave sequence, click the "Start" button on the Exposure panel of the Camera Control window. The programme will then execute all the exposures in the sequence. ***Note*** *to enable "autosave" exposures, you need to make sure the radio button next to the autosave button is selected.*

5.2.4.1 Storing sequences

It is possible to store common sequences in a file, so that the can be loaded quickly in the future. This is particularly useful for frequently repeated observations, such as flat fields

or common objects. Once a sequence has been defined, save it via the "Save Sequence As" option on the "Options" menu (Figure 17). This will open up a file browser window. Select a directory to store the sequence files, and choose a sensible name. You should see a lot of existing sequence files in default directory location.

You can later reload the sequence file via the "Load Sequence" option (again see Figure 17). Loading a sequence file will set *all* parameters in the AutoSave window (including base file name, dithering, etc) to the stored values.
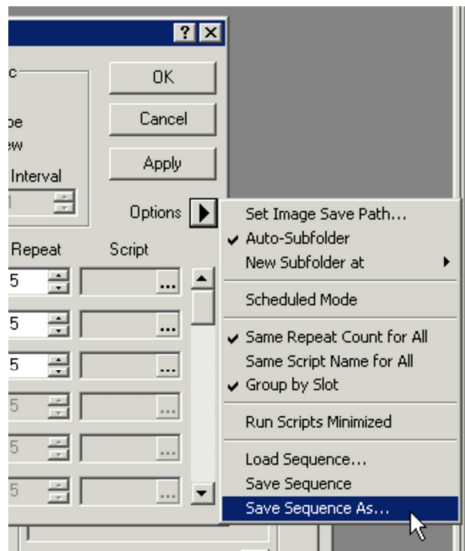
Figure 17: Save Sequence As option in AutoSave window

5.2.5 Focusing

MaximDL has an automatic focus routine, which can be accessed via the "Focus" tab in the "Observatory" window.

TBF. Rough procedure.

1. Slew to star ~7th mag

2. Take a 'snapshot' and check the programme finds the right star

3. Click "Start" and the programme will take images at different focuses, and fit the best position. It will move the focuser to the best position
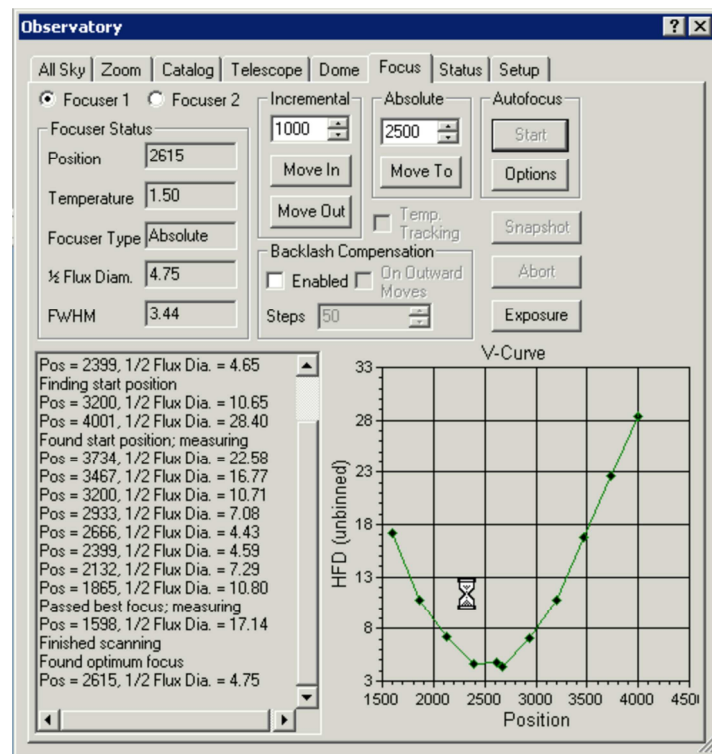
Figure 18: Focusing panel of the Observatory window, showing the results of a successful focus run. The "V-curve" is clean and well defined, and the software has found a focus point at the minimum.

5.2.5.1 Autofocus settings

The auto-focus settings *should* be set by the configuration file, but sometimes it doesn't seem to work. If you're having problems with autofocusing, it's worth checking the settings. In the focus tab on the Observatory window, click on the "options" button, which will bring up the Autofocus Settings window (see Figure 19). Check that the setting agree (at least roughly) with the values in Table 1 for your configuration.
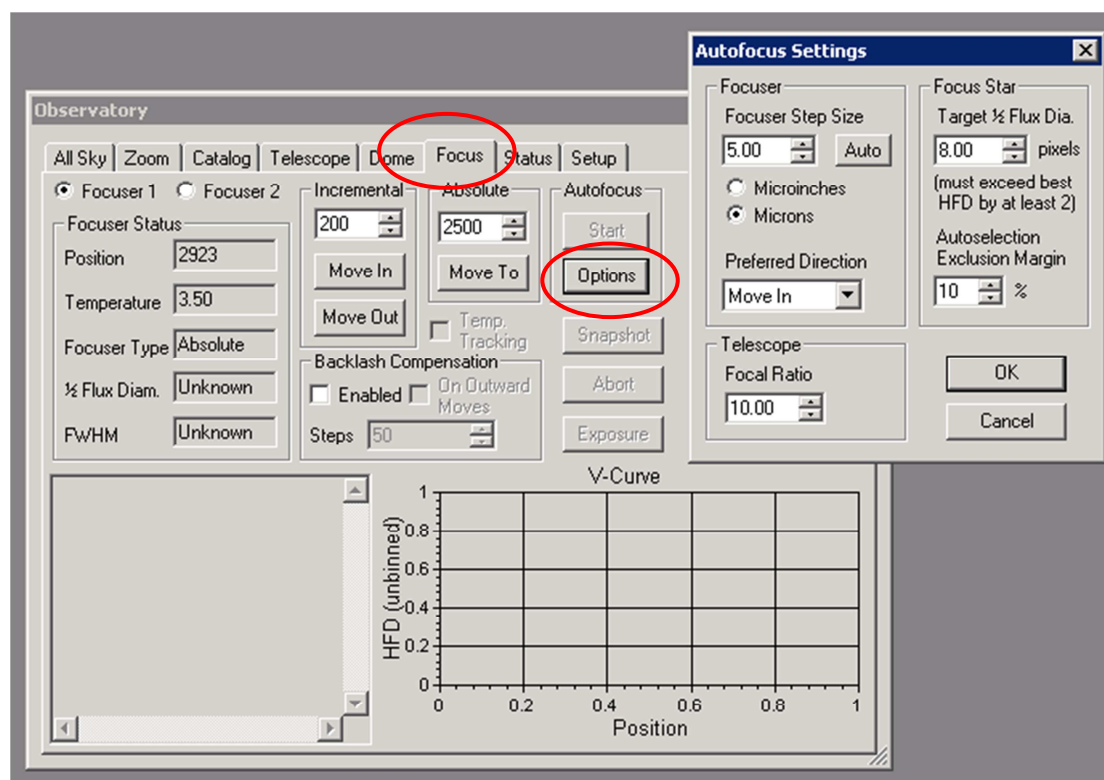
Figure 19: Autofocuser settings menu. Check the parameters are right for the specific configuration you are using (see Table 1).

Configuration	Focuser Step Size (microns)	Focal Ratio	Target ½ Flux Dia
f/6.3 Imaging	5.0	6.3	6.0
f/10 Imaging	5.0	10.0	8.0

Table 1: Autofocus settings for different configurations.

5.2.6 Calibration

This section provides an overview of the typical calibrations taken for PWT observations.

5.2.6.1 Photometric standard stars

Photometric standard stars allow you to calibrate your photometry to a standard magnitude system so that you can compare your data with other observations from different telescopes. They also give information on how clear (transparent) the observing conditions are. You should try to take a standard star observation at least once during the night.

As a default, we use the Landolt equatorial standard stars. A list of "standard star of the month" is available on the PWT Wiki[2] – these stars are visible in the early evening in that

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[2] http://astrowiki.physics.ox.ac.uk/PWT/ST8CCD

month. If you cannot take the standard star data at the beginning of the night, choose one of the other stars from the list.

For standard star data, take 5 exposures in each filter (B, V and R) with 2x2 binning. Typical exposure times are about 10-20 seconds, depending on the brightness of the star. Sequence files exist for most standard stars, so you can just load and execute the relevant sequence.

5.2.6.2 Darks

Dark files are used to calibrate the electronic noise in the CCD detector. You should take a set of dark frames to match the data you've taken throughout the night. Take at least 10 frames for each CCD configuration (binning) and exposure time used. Darks are independent of filters, and the same darks can be used for all filters.

Normally you can set up the darks to run after you have finished observing and closed for the night. They should run unattended OK and be ready when you come in the next day.

5.2.6.3 Flats

Flat fields correct the uneven illumination of the detector. This comes from dust particles on the optics, vignetting of the telescope field, and pixel-to-pixel sensitivity variations in the CCD itself. To correct these you should take flat field frames. Flats should be taken as often as possible, though if the telescope/CCD configuration has not been touched you should be able to use flats from one day to calibrate data from another. If the CCD is removed from the telescope, you will need new flat field data.

Flat fields should be taken for every binning and filter combination you have/plan to use.

5.2.6.3.1 Sky flats

The best way to take flat fields is to use the clear twilight sky (note, flats taken when there are passing clouds are notoriously unreliable). You can do this in the evening just after sunset, or in the morning just before sunrise.

Point the telescope away from the sun, and at an altitude of about 70-80 degrees. Try to avoid pointing at the galactic plane (look on the all-sky image in MaxImDL).

There is a sequence file saved (`SkyFlat_mosaic.seq`) which runs a mosaic sequence to take 9 images at slightly different pointings. Taking data with this sequence file will allow you to remove any stars from the final flat field.

5.2.6.3.1.1 Evening flats

Evening twilight flats can be started about 5 minutes after sunset if you need narrowband flats (H-alpha, SII or OIII). The rough procedure is;

1. Select the narrowband filter (H-alpha, SII, OII)
2. Take a 1 second exposure of the sky and measure the average flux with the "Information" tool in MaxImDL (***FIGURE***). Calculate how long an exposure

you need to get ~40,000 counts. If it is less than 2 seconds, wait until the sky gets a bit darker. If it is longer than 20 seconds, you've probably missed your chance!

3. Take a sequence of frames using `SkyFlat_mosaic.seq`, aiming to have the average flux between 20-40,000 counts. "Comment out" all the other filters.

If you only need broadband flats (BVR), then you can start ~15-20 minutes after sunset. The procedure is the same as above, but in the evening start with the R band filter and wait until you have ~40,000 counts in 2 seconds. You can then run R, V and B (in that order) with exposure times of 2,3 and 4 seconds respectively. The flats should all be at the right level.

5.2.6.3.1.2 Morning flats

The same procedures apply as for evening flats, but reverse the order of the filters. Start with B and work up to H-alpha as the sky gets brighter. Be very careful that the dome is pointing to the West and you will not accidently let the Sun shine on the telescope when it rises.

5.2.6.3.2 Dome flats

If you cannot get twilight flats for some reason (i.e. cloud), you can take dome flats using the internal flat field screen. This is better than nothing, but not as good as sky flats. Follow the procedure below;

1. Move the dome to ~350 degrees (TBC) to bring the flat field screen in front of the telescope
2. Park the telescope, turn off tracking, and slew the telescope to -15 degrees declination. The telescope should now be pointing at the flat field screen. You may have to adjust the dome pointing slightly to line it up.
3. Turn on the flat field lamp, which is mounted in a clamp on the South side of the telescope mount. Adjust the lamp position so it illuminates the flat field screen as evenly as possible
4. Load and execute the `dome_flat.seq` (either 1x1 or 2x2 binning, depending on your data). Check the count levels are ~40,000 and adjust the exposure time if necessary.
5. Turn everything off, park the telescope and the dome after taking the flats.

5.3 Shut-down

This section provides an overview of the steps to shut down the observatory at the end of the night.

5.3.1 Telescope

The telescope can be "shut down" to two different levels.

5.3.1.1 Quick closure

This method allows you to close the telescope remotely without going to the dome, and is appropriate if the weather is OK (no heavy rain forecast) and you're likely to be observing again the following night.

Find out the local sidereal time from MaximDL (Observatory Window -> Status).

Slew the telescope to the right ascension equal to the local sidereal time, and a declination of -30 degrees.

Turn off the telescope tracking on POTH

(The telescope is now parked horizontal, pointing south, with the corrector plate best protected from anything falling from above)

Close and park the dome.

5.3.1.2 Full closure

If you won't be using the telescope the following night, or bad weather is forecast, you should close down the telescope fully.

From the telescope tab in MaxImDL, "park" the telescope. Go up to the dome, turn the telescope off at the mount (slide switch) and put the covers on.

Close and park the dome.

5.3.2 CCD

The CCD can be left running.

5.3.3 Dome

Once the telescope is parked in a safe location, close the dome on POTH (or MaximDL "dome" window). The dome takes 2 minutes to close. Make sure POTH sets the dome status to "closed". "Park" the dome in POTH. You can also check the all sky camera to confirm the dome slit is closed (see Figure 20).
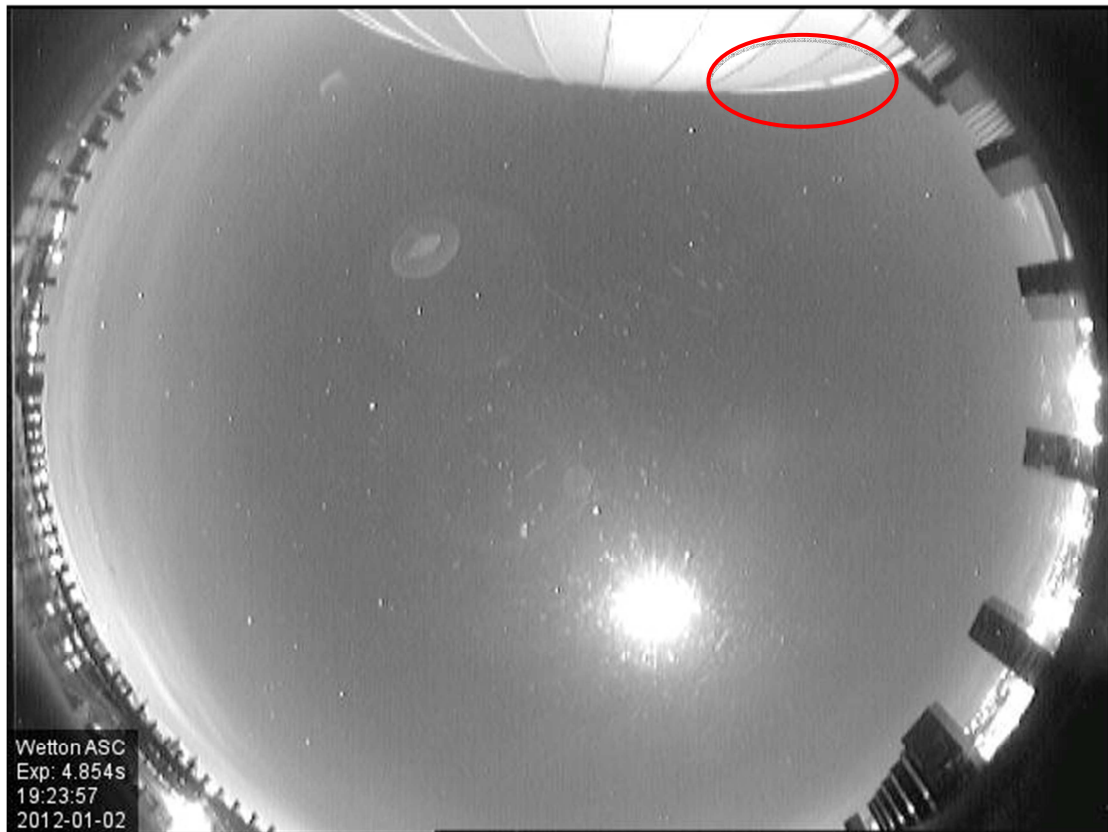
Figure 20: All Sky Camera image showing a parked and closed dome. The red oval highlights the edge of the dome slit, where you can check that the dome is closed.

6 Weather

6.1 Weather limits

The observatory does not currently have any automatic detection of weather (specifically rain). You are responsible for monitoring the weather, and shutting the dome if conditions require.

6.1.1 Rain

The dome should be closed if there is any rain. If the radar suggests rain in the immediate area (50km), only observe if you are absolutely sure it is clear and dry in Oxford. In this situation, go outside regularly to check on conditions. If in doubt, close the dome.

6.1.2 Wind

The dome should be closed if the wind speed is above 30 mph (TBC). Be aware that the wind speed reported by the PWT weather station is probably an under estimate of the wind speed at the dome (http://weather.globaljetwatch.net/oxford).

6.1.3 Humidity

The dome should be closed if humidity is above 97% (TBC). If the local humidity is above 90%, check dome for condensation (feel metal surfaces of the mount, and the telescope tube). If there is any sign of condensation on the telescope, or inside the dome, the dome should be closed. Internal dome humidity (and temperatures) are measured every 5 minutes and reported here;

http://www-astro.physics.ox.ac.uk/~fclarke/WettonObserver/temperatures.html

6.1.4 Temperature

There are no limits on operating temperature, but take care on the stairs if it is below freezing.

6.1.5 Snow/Ice

The dome should not be opened if there is any snow or ice on the dome.

6.2 Conditions

There are several useful webpages to check on the current weather conditions.

6.2.1 All Sky Camera

The all sky camera located on the stairwell outside the dome is the most valuable resource. This takes an image of the sky every minute during the day and night;

- http://www-astro.physics.ox.ac.uk/~fclarke/ASC/

6.2.2 Cloud/rain monitor

We are currently (December 2011) testing a new cloud and rain monitor, which is located outside the dome next to the all sky camera. The status is not yet available online however.

6.2.3 Satellite images

IR satellite images updated every 15 minutes are available at;

- http://www.sat24.com/gb?ir=true (animation of last two hours)
- http://www.metoffice.gov.uk/public/pws/invent/weathermap/ (becoming increasing useful for plotting multiple information)

6.2.4 Radar images

Radar images are available from;

- http://www.metoffice.gov.uk/weather/uk/radar/index.html (updated every 30 minutes)
- http://www.sat24.com (updated every 15 minutes)

6.2.5 Local conditions

There is a weather station installed on the level 6 roof (below and east of the dome). The information from the weather station can be viewed at;

- http://weather.globaljetwatch.net/oxford/ (do be careful to check the date on the graphs, as the station does occasionally crash not update information)
- http://www-astro.physics.ox.ac.uk/~fclarke/WettonObserver/temperatures.html for current dome internal conditions (including humidity!)

7 Trouble-shooting

7.1 Common problems

7.1.1 "Home search failed"

This usually happens if the telescope is too far away from it's default location when you start a home search. Drive the telescope to ~0 degrees declination and pointing due South (23hr HA). Re-run the home search.

7.1.2 MaxImDL keeps trying to run its installer

Not sure why this happens!! There is a problem with the permissions and installer location somewhere, but I'm not sure where yet. Click "cancel", and most things will work anyway.

November 2011 – think this has been fixed… please let fraser.clarke@physics.ox.ac.uk know if you come across this problem again.

7.1.3 MaximDL won't connect to the telescope

This problem occurs when you try to connect to the telescope from MaximDL, it starts POTH and connects to the telescope, but then MaximDL reports an error claiming it cannot connect to the telescope. Trying again sometimes works, but if not the only solution I've found so far is to reboot wettonpc1.

7.1.4 POTH crashes and refuses to restart

Start the task manager and look for the task "MeadeExDriver" and kill this. Try POTH again.

If it still fails, try closing and restarting MaxImDL.

If it still fails, you'll probably need to reboot wettonpc1.

7.1.5 How do I start "TaskManager" over a remote desktop?

"Start->Windows Security" brings up the options you'd get by pressing Ctrl-Alt-Del on the local machine.

7.2 Remote Support

wettonpc1 has "teamviewer" software installed, which allows someone to connect remotely and see the user's desktop. This is very helpful for remote troubleshooting. Note that teamviewer cannot be used at the same time as remote desktop. To use teamviewer;

- Observer starts teamviewer from the icon on the desktop
- Observer lets remote supporter know ID (872051022) and password (changes each session). See Figure 21.
- Observer may have to disconnect from their remote desktop session, if applicable. Observer could reconnect using teamviewer if desired.

- Supporter connects to 872051022 through their teamviewer using password, and can now control wettonpc1 without logging out the observer.
- Once problem is fixed, supporter logs off from teamviewer and observer can reconnect via remote desktop (or continue connection through teamviewer).
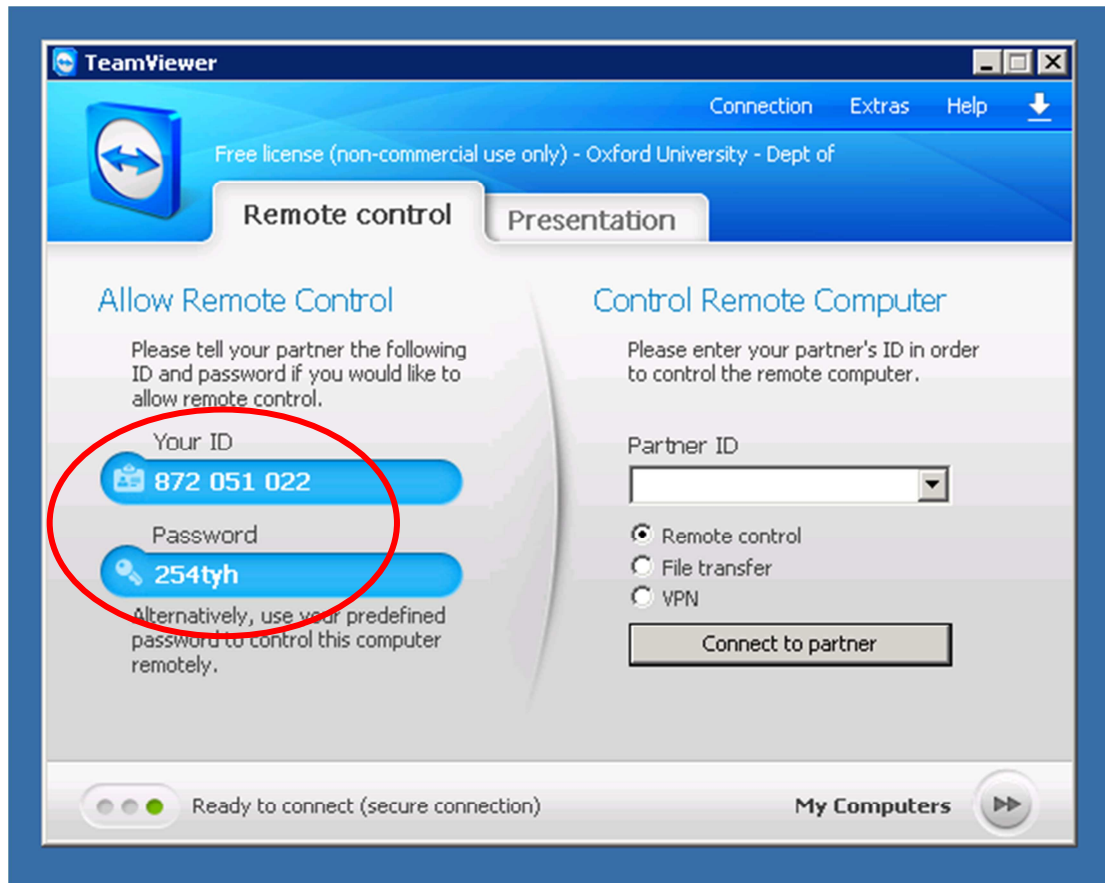
Figure 21: Teamviewer started up showing User ID and Password. The password changes each session.

7.2.1 Downloading teamviewer

http://www.teamviewer.com has versions for Windows, Mac and Linux.

7.3 Contact information

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