User Guide to the Jacobus Kapteyn Telescope

D.H.P.Jones R.W.Argyle C.D.Pike

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Contents

1 OVERVIEW

1.1 SYSTEM DESCRIPTION

The telescope and its controls are made up of the following parts.

1.1.1 The telescope hardware

This comprises the tube, motors, optics and encoders.

1.1.2 The Control Desk

This is located in the control room and contains the TV screens, user keyboard and engineering controls.

1.1.3 The Clip Centre

This is located in the room underneath the control room. It contains the control computer, power amplifiers, contactors (power switching relays), time service and air conditioning plant.

1.1.4 CAMAC

This is the means of interfacing between the telescope, control desk, Clip centre and computer. There are three crates at present in the control system. One system crate located in the Clip Centre 3210 rack and two branch crates. Branch crate 1 is the lower of the two crates in the Clip Centre. Branch crate 2 is in the telescope control console at the left hand end.

1.2 PRINCIPLES OF OPERATION

There are two modes of operation:

1.2.1 Engineering Mode

It is possible when in engineering mode to move the telescope hardware without needing the computer. It is used by technical staff to move the telescope for such jobs as top end changes or by the astronomer for the initial setting up at the start of the night. The telescope is protected from being driven too far by the use of limit switches. See Section 9.2 for the procedure to use in the event that these limit switches are activated. The relays that protect the telescope are set so that it is only possible to drive away from trouble. Note however that hitting limits is regarded as an unusual case. In these circumstances, the computer loses control over the hardware and so when a limit has been reached it is impossible for the computer to drive out. It is then necessary to use Engineering Mode and no guarantee of the accuracy of the telescope position is made until the encoders have been freshly zeroset. Engineering Mode is the default mode on powering up the system.

1.2.2 Computer Mode

The second mode of operation is computer mode. In this mode, the computer is allowed access to the servo amplifiers at full power and to the focus drive.

1.3 THE DRIVE SYSTEM

Each axis of the telescope has a main power amplifier which is connected to the drive motor. Each axis also has a second amplifier and motor which counteracts the effects of backlash.

1.3.1 Position Encoding

The position of each axis is measured by an optical disc encoder which is attached to a shaft carrying the worm gear, drive motor and flywheel. The flywheels stop lockup in the gears. The encoder gives out a train of pulses which are counted (up or down) by a Hytec CAMAC module. There is one module for each axis.

Every tenth of a second, a strobe pulse comes from the time service and goes into the Hytec modules. This strobe causes a fresh copy of where the telescope is positioned to be copied into a register which in turn is readable by the computer.

This same strobe pulse goes into the computer which is interrupted from what it is doing and goes to look at the encoder position. The encoder position is compared with where the computer calculates that the telescope ought to be and it then applies a correction, as necessary, to the demanded drive voltages on the servo amplifiers. This procedure involves a CAMAC module which does a digital to analogue conversion. (DAC module). The voltage from the DAC is applied to the preamplifiers which in turn drive the main "Inland" power amplifiers.

The program that does the job above also drives the red Beckmann displays on the console which display the current Right Ascension, Declination, Zenith distance, Sidereal Time and Universal Time. Note that the Universal Time is effectively GMT whilst the Sidereal Time is local and has been corrected for the longitude of La Palma. The value used in the software is 1h 11m 30.3s West. The time is corrected at regular intervals by radio time signals and the clock is normally kept to UTC within an accuracy of a few millisecs.

The Beckmann displays do not work unless the control computer programs are fully running. This means that they will read random garbage until startup time. There are circles on the telescope to help you get within a fraction of a degree if necessary while in engineering mode. There is a diagnostic display unit on top of the control console. The two right hand displays therein give the current tracking errors . Ignore the most significant digit. The upper display is for the RA, the lower for the DEC. The units are 0.05 arcsec (colloquially called "Baldwins").

1.3.2 Telescope Driving

After an object has been selected, the telescope slews as quickly as the hardware will allow to the object. When the telescope gets within a few hundred arcsecs it switches into a tracking mode and attempts to track to the demanded position as best as it can. Note that it takes a few seconds after tracking mode has been selected before the telescope is tracking sufficiently well for an exposure to begin. Check that things are sensible by looking at the diagnostic display which should be displaying numbers less than ten.

The telescope may be guided by means of either the handset attached to the telescope or the buttons on the control console.

The actions of the 'handset' buttons either on the observing floor or on the control console are determined by which mode is set on the SET/GUIDE/INCREMENT buttons on the console and by what value appropriate to each mode was set by the user interface. It is impossible to change modes from the observing floor.

The focus control buttons on the observing floor handset are under computer control when the handset is plugged into the 'Observer' socket which is normal. When the handset is plugged into the 'Engineering' socket the focus is under engineering control.

1.4 COMMUNICATING WITH THE T/S CONTROL COMPUTER

The user issues commands to the control computer in three ways.

1. Typing into the computer system terminal.
2. Typing into the keyboard of the telescope control console.

3. Pressing buttons on the control console or the handset.

The buttons on the console are of two types. The first type are single action. i.e. one push will set a flag that makes the telescope perform some action. These buttons are attached to antibounce cards which ensure you only set the flag once even though a trembling hand actually depresses the key more than once. The second kind of button is continuous action such as guider buttons. Almost all of the buttons acknowledge that they have been pressed by lighting up. Sometimes there can be a little delay for the computer to reply. However a wait of more than a second or so is exceptional and probably indicates a fault.

The choice of what to do next, or changing some parameter is done through the USER terminal. Every job, e.g. choosing a new set of coordinates, offsets , differential tracking rates and so on is broken down into a set of specific commands. The software which runs these screens is known as the User Interface or UI for short.

Lastly, there is a handset which controls the RA and Dec and the focus drive. The handset is on a detachable cord and can be plugged into the right hand end of the console or sockets on the telescope near the finder eyepiece. There is a second location on the telescope for the handset which is used in engineering mode. The two sockets are clearly marked. When observing, the handset must be plugged in to the "observer" station on the telescope. The Cassegrain instrument rotator is only controllable from push buttons on the telescope primary cell. You must release the mechanical clamp before rotation and re-clamp afterwards.

1.5 ALARMS AND STATUS LIGHTS

There is a set of lamps at the right hand end of the console which indicate major changes of status or alarms. Alarms are of various types but upon no account should any be ignored. You will be unable to ignore an alarm anyway since when an alarm occurs and puts on the warning light the system trips a relay which sounds a high pitched, loud and very irritating whistle. You may cancel this by pressing the button marked "CANCEL". The alarm will remain lit but the noise will cease. Just to confuse you there is another whistle of similar pitch which comes from the Interval Timer. You can stop the noise from this by pressing the yellow button marked " RESET " on the timer panel.

2 THE DOME AND RISING FLOOR

2.1 CONTROL OF THE DOME, SHUTTERS AND WIND SCREEN

Access to the roof and the outside of the dome is via the aluminium door at the top of the stairs near the control room. At present there is no easy way of closing this door from outside (the only way is to take the key with you and lock it).

In winter inspect the outside of the dome during daylight for icing on the shutters before attempting to open them. It is a good plan to rotate the dome during the day so that the Sun melts as much ice as possible. Wear a hard hat (provided near roof exit door) and a safety harness when climbing the dome. It is strictly forbidden for any ice to be cleared from the dome unless supervised by a person without astronomical interests - see LP Office Notice 4/86.

If there is no power to the building see Section 2.4, otherwise you can rotate the dome and raise/lower the wind screen from either the grey control panel mounted on the inside wall of observing floor or (if the local/remote switch thereon is set to remote) via buttons on the upper left of the telescope control console in the control room. At both stations the buttons must be kept depressed for the mechanism to work.

Even though it may not appear so, the shutters do open to a full 2 metres.

The dome rotation is normally set to maximum speed (one 360° rotation takes 3.5 minutes). Please leave the speed control (lower right of control panel in dome) set at maximum.

Remember, during hours of darkness, to switch the dome lights off before opening for fear of feeding unwanted light into the INT and WHT.

2.2 CONTROL OF THE RISING FLOOR

To facilitate access to the telescope, the dome is provided with a rising floor. Control of this is achieved through a control panel (yellow) which although on a 4 metre extension lead is normally left hanging on a post below the dome rotation control panel. Four buttons give fast raise and lower (the upper - i.e. near cable input - two buttons) and slow raise and lower (bottom 2 buttons). The floor control has 2 circuit breakers, 1 power switch and for safety reasons, 3 micro switches and 3 emergency stop buttons (apart from the upper and lower level limit switches) which can disable the floor operation. The procedure for investigating rising-floor malfunctions is explained in Section 2.3 below.

Of the 3 micro switches by far the most troublesome is that on the gate giving access to the observing floor. The gate must be fully closed in order for the floor to be operative. At present the vibration of moving the floor is sufficient to 'open' the gate and the floor will stop for no apparent reason. The other micro switches, which are less likely to be of concern, detect whether the rising floor hatches are open and whether the ladder of the rising floor is in place.

Three emergency stop buttons are also provided one by the gate, one on the floor control paddle, and one near the under floor access next to the control room door. These can be depressed accidentally. If the floor fails, check these stops are fully out - particularly the one by the gate.

2.3 MALFUNCTION OF THE RISING FLOOR

If the rising floor does not work but power is present to other things e.g. shutters then:

1. Check micro-switches on gate, hatches, ladder.
2. Check all three emergency stops are fully out.
3. Check switch and circuit breaker under the floor (follow the cables from the large motor to identify these).
4. Check circuit breaker in basement (on the large panel of switches to the left of the Buffer Set in the plant room there is one labelled for the rising floor).

2.4 RESTORATION OF RAW AND SMOOTHED MAINS TO THE JKT BUILDING

1. Ascertain the reason for the lack of power - in particular check that it has not been deliberately turned off while maintenance work is carried out. It is a local rule that any work of this nature should be entered in the Telescope Operations Log Book which is kept on the console. People carrying out work likely to endanger themselves or others must always write the nature of their work in this book and countersign it when their work is finished so that subsequent users know the telescope is safe again.

2. If the reason was a "normal" power failure then the mains will come back automatically when power is available.

3. If (2) was true and the mains is now back (lights and A/C on) but the computers are still dead (i.e. there is no power to the special red outlet sockets) then the mains frequency stabilizer and smoother (the Buffer Set) needs to be restarted. Don't be in a hurry to do this as power cuts often come in bursts. Contact the Duty Officer by means of an F9 call on the intercom before proceeding further. He should be able to advise you of what will be about to happen. In particular he may put the site on to local generator power for the rest of the night.

4. Proceed to the plant room off the basement (down the spiral staircase). The Buffer Set is the LARGE GREEN BOX opposite the door.

   Follow the instructions (to the letter) as given on the notice. If in doubt call the duty officer or duty technician.

5. Even though the Air Conditioning may be blowing a gale both in the control room and in the Clip centre, make sure that it is also COOLING properly since it is possible for the A/C to restart with the cooling disabled. If this is the case contact the duty technician. If you cannot find the duty technician in an emergency switch the A/C off in the Clip Centre, press RESET and switch on again. If no illuminated warnings come up, you are safe.

6. If the restart of the Buffer set was successful then proceed IMMEDIATELY to check the status of the computers, their disc drives and the control computer CAMAC modules. See Section 2.5.

2.5 CHECKING OF CAMAC AFTER A BUFFER SET RESTART

There are three crates to check. The system crate and branch crate 1 are in the Clip Centre rack to the right of the 3220. They are in the bottom of the rack and you have to remove the front panels to reach them. Check they have power on by looking for a light on the ON/OFF switch. Next press the toggle switch on the system crate at the right hand end marked C/Z (Clear) once in each direction. You need to do the same with the branch crate (lower crate) but there is a switch above the C/Z switch which must be OFF before you can do the C/Z (Clear). It lifts and pulls. This is a switch which puts the crate on or off-line. You cannot clear the crate until it is off- line. Check that the red light goes out when in the off-line state. Now do C/Z. Return the switch into the ON state. The light should be on.

Go upstairs to the CAMAC crate inside the left hand end of the console. Check that the power is on. If not, put the power on with the white power switch. If it still has not come on then check that the main power switch to the desk (silver handle below the crate) is on and that all the circuit breakers are up. If these have been off you will probably find that you get the audible warning alarm up from the console. This is loud and monotonous so to shut it up, press the red CANCEL key in the right hand bay of the console. Also press RESET on the timer unit (2nd bay top row). Now do a C/Z to the CAMAC crate as you did to the other branch crate. Remember to put the crate back on-line.

3 POWERING UP THE JKT ITSELF

3.1 NORMAL PROCEDURE IN DETAIL

The telescope can only be powered up from the control console (CC) in the control room.

1. Turn on the key labelled TELESCOPE POWER. It is on the upper right of the CC. A green light indicates ON.

2. Switch on the oil pump which lubricates the telescope drive by depressing the button marked OIL PUMP RUN on the upper left of the CC. The oil may take up to a minute to reach pressure depending on when it was last used. When ready the green switch will light and will usually be accompanied by an ear-piercing shrill from the alarm section (lower right of CC). Stop this by depressing the CANCEL button (left most red button of the ALARMS - lower right of CC).

3. Press the green RESET button which is alongside the big red EMERGENCY STOP button (upper right on CC). The green light should go out.

4. Check no further alarms are showing on the array of red alarms (lower right on CC). If there are any, seek the advice of the duty technician.

   The telescope is now capable of being moved so make sure all obstacles are removed from the rising floor and that all instrument cables, hand sets, etc. are firmly stowed. Note that a handset MUST ALWAYS be plugged into the OBSERVER socket at the telescope. If not you will experience a slow telescope runaway with a constant in the drive error display.

5. The telescope may now be moved using the control buttons labelled HA+, HA-, DEC+, DEC- on the left centre of the CC. The rotary potentiometers next to the push buttons allow the speed of slew to be varied but only when under engineering control. This is a convenient time to move the telescope so that when the f/8 corrector is mounted its cover can be removed.

6. Open the mirror cover petals by pressing the console button MIRROR COVERS OPEN. When fully open the green light will illuminate. Sometimes the covers stick closed. If this happens go to the telescope and look for the chain around the mirror cell which drives the petals. Attached to the chain are drive shafts at various points which have rubber covers over the couplings. Rotate any one of these anticlockwise (looking up the telescope). The mirror petals will open under their own power once past the sticking point. Note that in the event of a power failure, the mirror covers close and will need to be reopened on startup.

7. Position the telescope ready for encoder initialization. This means having it slightly (about a degree in each axis) away from the zenith park position. Follow the User Interface instructions in Section 7. for zeroset.

3.2 SUMMARY FOR EXPERTS

1. Telescope power On
2. Oil pump On
3. Cancel alarm (when it sounds)
4. Press RESET next to emergency stop knob
5. Check for other alarms
6. Check for obstructions on observing floor
7. Move telescope so that you can get corrector cover off if necessary.

8. Open dome.
9. Open mirror covers
10. Move to position ready for encoder initialization

3.3 INSTRUMENT ROTATOR

1. The rotator position angle is conventionally zero for most instruments but 270. for Wide Field Camera.
2. It is usually difficult to rotate an instrument because of the cable ties put on by the daylight staff. If you envisage rotating the instrument please ask them or your support astronomer to arrange sufficiently long free leads to rotate as far as you want; usually +/- 90 degrees. It is wise to rehearse this manouevre in daylight before attempting at night.
3. First zenith park the telescope. None of our instruments is exactly balanced in rotation and may swing out of control when the telescope isn't in the zenith.
4. Go to the observing floor and undo the rotation clamp.
5. Rotate to the desired angle using the push buttons. Watch the cables carefully throughout because even if they are long enough they may still get tangled.
6. Reclamp
7. Return to console and continue observing. The control computer can read the rotator position angle so no further action on the observer's part is needed.

4 THE PE 3220 CONTROL COMPUTER & TELESCOPE POSITION ENCODERS

4.1 HOW THE SYSTEM WORKS

The movement of the telescope is controlled by a Perkin-Elmer 3220 computer which is located downstairs in the computer room usually called the CLIP centre. Its system terminal (CST) is the furthest of the two VT220 VDUs to the left of the console in the telescope control room. Once the night's work has started you will rarely if ever want to use this terminal. You will use the VT220 on the telescope console which is where the User Interface (UI) appears. Immediately to the right of this VDU you will see the information display which is a continuously updated report of the status of the whole system. The working of the control program is completely transparent to the user but in outline it works as follows. When a star position is demanded from the User Interface the computer invokes a subroutine called MODEL which allows for the geometrical and empirical errors of the telescope mounting. The errors themselves depend on whether the telescope is East or West of the pier and whether the f/8 or f/15 top end is mounted. The errors are held in the files F15E, F15W and F8E. F8W doesn't exist but could easily be set up in response to user demand. From here on the telescope is under control of the subroutine TNHZ which polls all the encoders ten times a second. If TNHZ detects a large difference between where the telecope is and where it wants to be it tries to eliminate the difference by slewing at the maximum rate allowed by the hardware. Once the difference is less than an arcsecond it drops into tracking mode. If the autoguider is running it injects its errors into TNHZ at this stage. You can follow all this happening by watching the information display which is updated as opportunity offers but about once a second.

The information display is largely self-explanatory but two mechanisms require comment. When the telescope is slewing it pre-computes where the dome should be on arrival at source and keeps the dome turning until it has reached that value. Once the telescope is tracking it ignores the dome until its azimuth is wrong by 3.3 degrees whereupon it corrects it. The dome can turn only at one speed, full, and is either off or on. There is one position near the zenith where the dome has to turn through 180 degrees in about a minute. This results in the dome going into a stop/go mode which can be alarming to a new observer. New observers should also remember that because of the nature of its mounting the telescope is never at the centre of the dome and in general the telescope azimuth and the dome azimuth will be several degrees apart. The drive program knows all about this so don't worry.

It is possible at large hour angles East with the telescope East to point the telescope so that it is partially vignetted by the dome wall and similarly Telescope West. At the moment the drive programme does not allow for this so you should consult the appendix to this manual or the circular graph on the notice-board when in doubt. It is planned to include this problem in the drive program at a later date.

There is a thermistor on the telescope steelwork whose temperature is displayed at the bottom right hand corner of the information display. This temperature is updated only every five minutes and the value displayed during the first five minutes after startup is wrong. When the drive program detects that the focus has changed by half a degree or more it will adjust the focus according to an internal calibration. The program has no absolute calibration; the initial focus is set by the observer using the FOCUS command from the User-Interface or SETFOCUS from the instrumentation computer usually following a focus run. Once the initial focus has been set the program follows the temperature from that point onwards. Although the control 3220 and the instrumentation 3210 are quite distinct computers they can communicate by an Inter-Processor Link (IPL). Thus the Instrumentation computer can set the focus and the telescope control computer can provide the co-ordinates of a source to the Instrumentation computer to enter a data file descriptor.

4.2 NORMAL STARTUP PROCEDURE IN DETAIL

Normally the computer is marked off when not in use so a few instructions are needed to get it to take control of the telescope. Proceed as follows:

1. Ensure that the telescope power and oil pump are switched on, and that the oil pressure warning light and Emergency Stop reset buttons are out.

2. Hit the RETURN button on the CST. If an asterisk response is obtained then all is potentially well and so proceed to step (3). If there is no response then a slight diversion to Section 4.3 is required - so follow instructions therein. If there is a response

3. Type D D <cr>.

   Look down list of devices and find FX16:. If it is OFF, type

   MA FX16:,ON,,CD=ALL

   and wait for the one line response, then type

   GO JKT

   and wait for the message LOADJKT: END OF TASK 0. If it says FX16:SYS type

   GO JKT and wait for message, either LOADJKT:END OF TASK 0 or CONTROL SYSTEM is already running.

   If this is the first startup after an end-change or reversing the telescope then GO JKT,F15E,COMPILE or F15W or F8E as appropriate.

4. What should happen on the USER screen is that a display saying

   JACOBUS KAPTEYN TELESCOPE

   should appear followed by the user interface UI> prompt. You can then zeroset, input source positions, initialise T/S parameters or any other User Interface Command.

5. Occasionally the user interface terminal hangs up and you will be unable to get a response from it. First, check the system terminal. It may say that Task USER (or any other named task) has failed with an error. In this case type in the following (substituting the task name as appropriate)

   RESTART USER <cr>

   The user interface (or other task) should now restart. If it doesn't then try again.

6. Ensure that the speeds on the engineering panel are set to the recommended values. Position the telescope within about a degree of the zenith. Then at the user-interface type Z(EROSET) and follow the prompts.

7. Switch the control console from engineering (manual) mode to computer control by turning the key labelled ENGINEERING FACILITY clockwise. It should spring back and the green COMP half of the associated button should light up.

8. Use HA/S, HA/G and HA/I to select required set/guide/increment rates (see Section 7). Press SET, GUIDE and INCREMENT on the System Control Panel to enable these operations. If you omit this step it isn't disastrous as the control program has the sensible defaults 30, 3 arcsec/sec and 30 arcsec.

9. If the telescope is now creeping, set a position on the USER terminal near the telescope's current position and press STOP and SOURCE. The telescope should now track on a fixed RA and Dec position. If you press STOP it should stop completely.

Point to note. To switch back to engineering mode, just press the illuminated switch don't try to turn the key anticlockwise!

The telescope is now totally under the influence of commands entered at the USER terminal or the set/guide buttons either on the control console or the telescope handset.

4.3 HOW TO REVERSE THE TELESCOPE

How to reverse the telescope from East to West of the Axis. The reverse operation is carried out by interchanging West for East.

1. Press 'Zenith Park'
2. Turn off TV and Autoguider
3. Close dome, open blind and switch on lights
4. At TCS Console type 'FINISH' This is the furthest VDU from the left of the Telescope Console
5. Switch to engineering Control
6. Turn the speed knobs on the engineering panel to their maximum allowed values. This will be marked against the knobs and may be substantially slower than the maximum physically possible.
7. Watching through the window use the engineering controls to move the telescope to the pole and over the axis. When the telescope reaches the pole carry on turning in Hour Angle until the telescope is well to the West of the polar axis. Continue turning in HA and restart the declination motion in the same direction so that the telescope comes near to the Zenith West of the axis.
8. Return to TCS console and type GO JKT,F15W,COMPILE (F15E if moving from West to East, F8E if observing at f/8. There is no F8W for the present.)
9. When the user-interface appears on the telescope console carry out the zeroset and then switch to computer control.
10. Switch off lights, close blind and open dome.
11. Turn on TV and Autoguider
12. SNAFU
13. Carry on observing; both the TV and CCD displays will appear to have rotated through 180 degrees.

4.4 SUMMARY FOR EXPERT USERS

1. Check T/S and oil pump are on.
2. Check control computer is up (asterisk response). If it is not, see the instructions in Section 4.3. Check the control programs are not running - if it is running go to step 5).
3. Type at the computer system terminal
   GO JKT
4. Run ZEROSET.
5. Switch to computer control.

6. If you want to work with the telescope West of the pier see the instructions 4.2 above.
7. Energise the handset. (Press SET, GUIDE and INCREMENT).
8. Set Telescope to first Source. It is wise to SNAFU on a source of accurately known position first.

4.5 COLD RESTART OF THE PE 3220 CONTROL COMPUTER

The PE 3220 control computer is located in the CLIP centre directly beneath the control room. If there has been a power failure, or the system has hung up irretrievably it is necessary to initialise the computer. To do this, and to subsequently bring the computer to life, follow the instructions given below.

In the CLIP centre ...

1. Find the consolette on top of the 3220 computer rack and ensure the 'enable/disable' switch is at 'disable'. Press the INIT button on the consolette and then initialize CAMAC crates (see Section 2.5).

   In the control room ...

2. Go to the control computer system terminal in the control room. On the screen there should be a list of devices followed by

   "Device=". Type C13F. It should respond with:

   "File=". Type FX163220.LPO being careful to distinguish between zero and letter 'Oh'.

   Wait for the message END OF ENVIRONMENT CONFIGURATION.

3. If the reason for the cold restart was the effects of a power failure, then it is advisable at this stage to follow the instructions of Section 4.4 on the checking of the CAMAC crates.
4. If things are OK, then you may now join the normal start up procedure at step (3) of Section 4.1 or at step (3) in Section 4.2.
5. If the "information display" screen (right most screen in the control console) is displaying garbage you will need to reset its controller. This is in the CLIP centre mounted high in the CAMAC crate. It is a blue box with an on/off switch on the back (facing you). Switch it off and on again to reset.

4.6 CHECKING THE STATUS OF THE CAMAC CRATES

At the system terminal type

CAMTST <cr>

The terminal will reply with a message about CAMTST and return a prompt > Give the command....

STATUS <cr>

CAMTST will give a list of all crates that are present and the line that concerns you is the one beginning with BRANCH 4. Crates 1 and 2 both need to be ON. If crates 1 and 2 of branch 4 are not on then recheck that you have the crates on line (Section 2.5). If so then there is a CAMAC fault so get help. If you did happen to leave them off-line then put it on-line and repeat the command STATUS to check that things are OK.

To exit from CAMTST type:

END <cr>

CAMTST will reply " END OF TASK 0 ".

4.7 POINT

It is possible to keep a log of the directions in which the telescope was pointed throughout the night using the program POINT. This is particularly valuable for analysing the geometrical errors of the mounting. Pointing tests are always done with the catalogue PTGRID.CAT which is permanently on disc. To make this catalogue available type IN PTGRID.CAT at the User-Interface. To use POINT at the Control System Terminal type

* POINT JKT

The * is the usual 3220 prompt. The output file for this program is POINT.DAT. If the computer responds "POINT.DAT" already exists" then rename it.

* REN POINT.DAT, OLDPO.DAT

Report this action to the Software Manager so that the old file can be archived or deleted as appropriate. Don't forget to do this or the disc will become littered with old pointing files. However don't delete the file yourself unless you are positive that it is of no interest.

Thereafter press 'LOG' on the console every time you centre a star. It should light up for a brief moment.

At the end of the night you can print the file. First stop the POINT program by typing ENDPOINT and then switch the printer to INSTRUMENT 3220 and press the ON-LINE button to re-initialise the interface.

* PRINT POINT.DAT

should print the file but if it doesn't, type

* STARTSPL

If this still doesn't work write a 'Software Error Report' (SER). If the control system is running (in particular if task TNHZ is active) then printing is very slow, so be patient!

4.8 CLOSING DOWN THE PE 3220 CONTROL COMPUTER

1. At the TCS type FINISH
2. Wait for about a screen full of messages
3. Type MA FX16:,OFF

5 THE PE 3210 INSTRUMENT COMPUTER

5.1 INTRODUCTION AND NORMAL START UP

The PE 3210 is a more powerful version of the PE 3220. A complete guide to the PE 3220 machines and their peripherals is given in the document 'A guide to the La Palma Perkin-Elmer 3220 series computers' by L R Jones which is in the same binder as the ADAM manual. This should be consulted for any further details. There is also the PE Documentation in the control room but this is not entirely complete and some manuals refer to an earlier implementation of the Operating System to that now in use.

The normal practice at the JKT is to leave the PE 3210 computer (the instrument computer) closed down with its Eagle disc powered off when not in use. There are up to three terminals connected to the system at present, all of which are in the telescope control room. The computer itself is in an enclosure at the end of the control room. The disc drive does not like dust whether it has travelled all the way from the Sahara or not - so keep the door to the computer enclosure FIRMLY SHUT whenever possible.

ON NO ACCOUNT SHOULD THE DOOR AT THE TOP OF THE STAIRS BE USED FOR OTHER THAN EMERGENCY ACCESS TO THE COMPUTER ROOM. It must never be locked as it is a fire escape.

Two of the PE3210 terminals are the system terminal (to the right of the telescope control computer VDU) and the user terminal which is located opposite the telescope control console.

The normal procedure to begin using this machine is as follows:-

1. Go to the EAGLE disc drive and locate the two toggle switches on its front panel. Set the start switch 'On' and the protect switch 'Off'. Wait for the disc to reach running speed when there will be three red LEDs shining next to the switches

2. At the system terminal type MA EGLE:,ON,,CD=ALL

3. After about a minute and one line of output, type

   STARTUP

   which will give you about a screen full of messages, followed by 'End of Environment Configuration'

4. Check that the PE3210 is alive by pressing the RETURN key on the user terminal. An asterisk response indicates all is well in which case proceed to step (4). If there is no response, divert to Section 5.2.

5. Sign on to the computer by using the user terminal.

   In general, the form of the sign on command is :

   SI[GNON] ABC,n,n <cr>

   where ABC are the initials of the current user. n is the account number (1-8) and the second 'n' is the password which is the same as the account number.

   If your sign-on is accepted, a number of system messages will be generated and you will be ready to run the instrument control software for whichever instrument is mounted but that is another story altogether........

5.2 COLD STARTUP OF THE PE 3210 INSTRUMENT COMPUTER

A cold (ie from the very beginning) startup of the PE 3210 will be needed if there has been a power failure or if the system has been deliberately or accidentally closed down. Under this latter category comes the inadvertent pressing of the INIT key as described in item (3) below. If there has been a mains power failure, check that the smoothed mains supply (i.e. the buffer set) is now available - see Section 2.4.

Then....

1. Check that the mains switch (high on the wall) is on - i.e. turned to '1'. This switches on everything except the CPU and printer. These are switched on from a 'red' socket in the wall behind the CPU.

2. The 400 Mbyte Eagle disk is located below magnetic tape drive number 1. Make sure the 'ON/OFF' switch is at 'ON' and the 'protect' switch is at 'OFF'. If the EAGLE is off it takes about a minute to reach speed after being switched on. There will then be three red LEDs shining on its front panel.

3. Go to the computer rack with the 'Perkin Elmer 3210' label. Press down two finger catches at the top so that the front panel comes away in your hands to reveal the consolette at the top inside. Check that the 'Enable/Disenable' switch is in the 'Disenable' position and then depress the INIT toggle switch. This initialises the computer. Replace the front panel.

4. At the system console you must then answer four prompts. Controller Device Address? FB <cr> Selch Address? F0 <cr> Drive No. (0,1,2,3)? 2 <cr> VOL=SYS FILE= EGLE3210.LPO <cr> Be careful to distinguish between zero and letter 'Oh'.

5. If all is well many system messages will be generated for about three minutes about discs being checked together with warnings of possible lost data (safe to ignore!) but the punch line you are looking for is -

   END OF ENVIRONMENT CONFIGURATION

   (If the line printer is off-line, an additional message ".SPL: I/O error A009 on LP1 - Please correct" will appear. This is just a warning and can again be ignored until you wish to use the printer.)

6. Breathe a sigh of relief if the above message appears because the system is up and running and you may now proceed to the normal sign on procedure as described at stage (3) of Section 5.1.

5.3 SUMMARY FOR EXPERTS

WARM RESTART (after a controlled shutdown)

1. D D <cr> at system terminal check that EGLE: is on as SYS. There should be three LEDs shining on front of EAGLE. If not, switch ON and DEPROTECT and wait for three LEDs to come on.

2. If EGLE: is OFF then type

   MA EGLE:,ON,,CD=ALL It will take more than a minute to get a one-line response....then

3. STARTUP <cr>

4. SI[GNON] ABC,nn,DEF at the USER terminal

COLD RESTART (system off or re-initialised)

1. check mains supply on
2. check Eagle disc powered up and running
3. INIT the PE3210. Answer FB,F0,2,EGLE3210.LPO to prompts and await "End of Environment Configuration'.
4. SI ABC,nn,DEF at the user terminal

5.4 ADVANCED USE OF THE 3210

The Common User instruments are provided with their own software packages on the 3210 instrumentation computer. However it is also available to private instruments in consultation with the local staff. The following notes are intended to assist such private use.

The full description of a file is DISK:name (< 8 chars).ext/account e.g. SYS:PHOCDP.001/8. There is only one disk SYS:

5.4.1 EDITOR

See PE Manual for details!

EDIT FILE.EXT (.FTN assumed if left blank)

AF/string/newstring/range	AFter
AL	ALters a line, in the O NOBIOC mode
@ deletes	
/replace by space	
AL	Alters a line when O NOBIOC not selected

Ctrl+Z=end of line
Ctrl+B=move cursor left
Ctrl+F=move cursor right
=switches on the insert mode,
and switches it off when not wanted
Ctrl+ =deletes characters, and closes gaps
Ctrl+C=forget last edit

AP	APpends at end
BE/string/newstring/range	BEfore
BO	BOttom of File
CH/string/,/newstring/,range	CHange all occurrences of string
CO n,/*/,range	COlumn e.g.n,=*
DE n	DElete n
DO	DO edits DONE to File and exits
END	ENDS edit without change
FI/string/,range	FInds all occurrences of string
INC n,File,range	Includes after line n, range from file
INC ,,30-40	INCludes lines 30-40 of current file at current position.
INS n	INSert after line n, if n omitted insert after current line. Two RETURNS to leave this mode.
MO n,m	MOve after line n, line m
O NOBIOC	Option nobioc–easier for editing
O :1=H or A	Mode of list = HEX or ASCII
RU	RUler–gives column numbers
SA *	SAve file, renumbering without EXIT (DO=SA * +END

SC	SCreen Print
SU/string/newstring/range	SUbstitute first occurrence of string in line/s.
TO	TOp of file
T range	Type line/s
+/- n	go forward or back n lines
T 1-	Types whole file

Range is of form n-m, n- is from line 'n' to end of file. If not given, default is current line.
HELP * gives list of edit comments
HELP MNEMONIC gives short description of that command

To CONCATENATE files A,B,C using the editor
EDIT A
BO
INC,B,1-
INC,C,1-
DO

5.4.2 OS COMMANDS +CSS FILES* (MTM)

CA	Cancel which you have to use if a task pauses with an error condition and you wish to abandon. CA taskname from system console for a job caught in a tight loop or similar condition.
CO	Continue which you use if a task pauses and you wish to continue it.
D D	Display Devices
D F	Display Files
D L	Display Logical Units
D M	Display Memory
D T	Display Time
D V,VOL	Display Volume – shows how much left This only works from the system console.
D F,-.-/*	displays all the files on that disk
D F,-.FTN	displays all the .FTN files and similarly for other extensions.
D F,DONKEY.-	displays all the DONKEY files whatever their Extension
D F,DONKEY.FTN/-	displays all the DONKEY.FTN files whatever their private account numbers.
DE FILENAME	Deletes
DESTROY -.-	deletes all files in the private account, querying each in turn.
DESTROY -.-,Q=NONE	deletes all without query

You can RENAME FILE.EXT/PR1,FIL2.EX2/PR2 but you can't do this from Disk to Disk

You can COPY FILEDESCRIPTOR,FILEDESCRIPTOR leaving out the V(olume) and PRI currently set, for the appropriate file, and this works DISK>DISK. You can leave the DISKs off if both files are on the same disk. You have to delete the old FILEDESCRIPTOR otherwise you will have two copies of the file.

MA FX16:,OFF	Mark FX16 off (system console)
MA FX16:,ON,,CD=ALL	Mark FX16 on (" ")
OFF - mark off all discs except SYS	(" ")
ON will mark on discs	(" ")
PRINT FILE.EXT	Prints file on LP
.MTM REM VDU3:	if MTM has a VDU which you want to remove (system console)
REN VDU3:,TEK1:	say to rename (" ")
ADD VDU3:	if you wish to introduce a third VDU (" ")
SE TI DD/MM/YY,HH:MM:SS	to set computer time
SE PRI n	sets the private account number
STOPALL	stops all activity in Computer (system console)
STARTALL	restarts .MTM and other essential tasks (" ")
V	tells you what volume loaded
V OBS	loads VOLUME OBS

To analyse a strange magnetic tape MTANAL MAG1: (or 2)
To copy from a magnetic tape which you have just MTANAL-ed:
COPY MAG1:,FILE.EXT,RECL=xx,NF=1,SKIP=yy (default 0) If you don't want to SKIP omit this descriptor entirely SKIP=0 gives you an error NF=ALL copies the whole tape into the file specified
COMPILE, FORTRAN AND LINK
To Compile a FORTRAN Program and display the process on the Terminal

    FORT FILE,CON:

You don't need the .FTN File extension. You can direct the output to the printer by

    FORT FILE,LP:

or if you are confident you can omit the output altogether. Exactly the same applies to LINKing

    LINK FILE,CON:

If you have several files to LINK you can put them in a FILE.LNK file and the LINK will find this file without further instruction. After successful compile and link then

    LO FILE
    ST

5.4.3 FASTBACK

This is a quick and efficient method of backing up discs and transporting data. It is very economic of tape but can be read only by other Perkin-Elmer machines with OS32 so don't take your data home this way unless you have a PE at home. Fastback works disc to tape or contrariwise. If you intend to work tape to disc remove the "write protect" ring from your tape or a minute's inattention may corrupt an irreplaceable tape.

The commands for FASTBACK are, at any VDU after SIGNON

LO FASTBACK
*ST
> BA for disc to tape
RES for tape to disc
> Copy from unprotected disc? Y(ES)
> Vol or DEVN: e.g. SYS:
> Tape MAG1: or MAG2:
> ! GO will transfer all the files on the tape or disc, and verify.

If you wish to you can work through the options but you can !GO at any time you wish to abandon this approach.

If you only want a selection of tapes then type @ which allows you to select files from the Console. Run through the Q and A taking the default option at every line until you are prompted for a list of files. You can either type in a list of files followed by dot slash "./" or use wild cards like "-.FTN", "HSP.-" or "-.-/60" followed by "./". REN = -.-/60 allows you to change the account number. Alternatively if you want to omit the -.OBJ files for instance then (!-.OBJ/-) - but first you must have requested all files.

To BAckup files since a certain date, go through questions and answers until you get
> DEFAULT AGE answer = Y <cr>
> SInce = 18/APR/84
> !GO

If you wish to abandon at any stage, send STOP.

FASTBACK doesn't work from disc to disc and you have to use BACKUP instead
LO BACKUP
ST, I=RM5A:,0=RM5B:,LI=CON:,VER[,SEL=CON:]

to copy for example for an RM5A: to RM5B:, listing on console, verify, [,selected files typed in on console, ending "./"

Be sure to LABEL TAPE with the DATE and whether FASTBACK or BACKUP.

5.5 CLOSING DOWN THE PE3210

1. SIGNOFF at all terminals
2. STOPALL at Systems Terminal
3. OFF at Systems terminal and wait for about six lines of messages.
4. MA EGLE:,OFF

5.6 CAMAC

The CAMAC branch crate is intended for private instruments as well as common user ones. If you want to use CAMAC in this way please consult the local staff or those at Herstmonceux. They will advise on what is or isn't possible and make sure that nothing is done to prejudice the common user instruments. Before removing or inserting a CAMAC module always

1. Close Down the PE3210
2. Switch off CAMAC crate
3. Remove or insert modules, then
4. Switch on CAMAC
5. Warmstart the 3210

6. When all discs marked on, SIGNON as required.

6 THE TV ACQUISITION CAMERA

6.1 INTRODUCTION AND WARNINGS

The acquisition and guide box (A & G) currently used on the JKT features a travelling flat mirror which when in place directs the telescope beam to a high gain TV camera. This is a very powerful system in many senses of the word and so care must be taken in its use. The best way to ensure that you do not damage the TV and what is more get the most out of its facilities is to READ THE REST OF THIS SECTION which is an expanded version of Dave Thorne's original guide.

****WARNING*********WARNING********WARNING********WARNING****

The very high-gain TV camera can be quickly and permanently DAMAGED BY OVER- ILLUMINATION. Do not, therefore, operate the TV until you have read all of this Section and preferably have also been shown how to use it.

****WARNING*********WARNING********WARNING********WARNING****

6.2 LOOKING AFTER THE SAFETY OF THE TV

1. Ensure that all dome lights, including torches, are turned off before turning on the camera. The fluorescent lights are interlocked so that they cannot damage the TV but not so the variable Tungsten lamps controlled from outside the control room door.
2. Always view a field in DIRECT mode first, NEVER in AVERAGE.
3. Turn the gain up SLOWLY: there is a lag of about 3 seconds between operating the gain control and the full effect being seen.
4. Never do a long integration with a bright star in the field.
5. Always turn the camera gain off BEFORE MOVING the telescope. You just never know which first-magnitude star is lurking around the corner.
6. DO NOT TWIDDLE knobs at random. Think about what you are doing and if you don't understand some function look it up in the manual (here!).
7. If in doubt, press the FREEZE button and turn the gain down. This ensures that the TV read beam is not blanked and therefore any over- illumination is discharged. Other panic measures, e.g. hitting the red OFF button, do not guarantee this and so should be avoided. It is always safer to turn the gain control to its clicked-off position than to operate the OFF button.

6.3 POWERING UP THE TV SYSTEM

The TV control box is at present in Bay 1 of the telescope control console. There are two monitors associated with the TV. The first is the 'raw video' monitor which is on top of the control console and secondly there is the all-singing, all-dancing Grinnell monitor which is incorporated into the control console to the left of the main GD4K display. Below the Grinnell monitor is an array of feature-selection buttons. These are described in detail in Section 6.4. The final piece of hardware in the TV system is a joystick controller box which normally resides on the telescope control console desk - or nearby.

Nowadays the TV Camera is mostly used with the CCD Camera. Typing TV at the instrumentation computer will bring the TV flat in, in about seven seconds. Similarly it can be removed by typing CCD. The TV flat's position can be seen on the MIMIC display.

Another use for the TV Camera is with the People's Photometer where it is mounted so as to view the rear of the Photometer apertures. Different aperture plates can be mounted and selected under pneumatic control from the instrumentation computer in about a second. It is usual to leave one aperture plate position empty so that the TV can view a field of about 3x4 arcmins for acquisition.

The TV can also be used with the old A & G Box, now mostly confined to the Richardson-Brealey spectrograph. The old A & G box control box is available at the desk. Only two of the illuminated double-action switches are relevant to the operation of the TV. The first from the left on the top row ACQN/COMP MIRROR (IN/OUT) is used to move the flat mirror into or out of the beam. The movement takes approximately 15 secs each way. Successful parking of the mirror is indicated by the ACQN/COMP switch which illuminates either IN or OUT. While the mirror is in motion, the adjacent PROBE MOVING switch will illuminate.

To operate the system follow these steps:

1. Make sure all lights are out in the dome.
2. Turn on the power to the two monitors of the TV system and let them warm up, so that you can see if any image is on the TV camera.
3. Ensure that the gain control of the TV control box is turned fully off (turn anti-clockwise until it clicks).
4. Press the black ON power button on the control box. The two lights labelled DELAY & RESET will come on. Wait (about 15 secs) until they go out and the green ON light comes on. If RESET does not go out, press OFF, check step (3) and try again. If these lights are still reluctant to go off a gentle anti-clockwise turn on the gain control switch will usually do the job.
5. The TV control box has two scan reverse toggle switches (which allow the orientation of the TV display to be changed to match finding charts for example.) Initially, however, they can be used to test the status of the system. When the monitors are powered up, and adjusted in brightness to give a visible background, switching the toggle switches will, if the system is OK, result in the bright edge of the TV cathode traversing the screen. If this is not seen then check the monitor brightness settings. If there is still no response then call for help.
6. Depress the ACQN/COMP button on the A & G controller to move the flat mirror into the beam. With the CCD Camera type 'TV' and with People's Photometer select the particular aperture position.

6.4 FURTHER SAFETY RULES

1. Before viewing a source, select the DIRECT viewing mode on the Grinnell buttons.
2. When pointing at a field, even if you know it only contains 18th magnitude objects, turn up the gain SLOWLY whilst observing the effects on the direct (raw video) TV camera monitor.
3. As the object or field of interest appears on the direct screen, adjust the gain control to give a sensible picture on the Grinnell monitor.
4. If the gain control reaches maximum without ill-effects on the direct screen and further gain is required, then select AVERAGE mode on the Grinnell and adjust the number of frames of integration ONE step at a time waiting between steps to see the resultant image. When the Grinnell is in the AVERAGE mode, the direct monitor will flash the integrated signal with a period equal to the integration time.

   Finally, at the risk of being boring, be EXTREMELY CAREFUL ON BRIGHT STARS - if an object looks too bright in the monitor then it IS too bright so turn down the gain p.d.q.

6.5 THE GRINNELL TV CONTROLS

The main 3x3 block of controls reading left to right and top to bottom have the following functions:

1. AVERAGE - Recursively filters on-target integrations. On-target integrations are selected by the INTEGRATION rotary switch.
2. T-INT - ON-target summation of 2**n frames. Selected via the INTEGRATION rotary switch.
3. DIRECT - Real time digitisation at normal frame rates.
4. FILL - Fills in the alternate lines of a stationary (FROZEN) picture. Considerably improves the appearance of faint, extended objects.

5. FREEZE - Freezes the current picture.
6. HARDCOPY - Put up full screen crosswire.
7. OVERLAY-ONE - Enables/disables the first graphics overlay plane (i.e. the border, the orientation and the scale).
8. OVERLAY-TWO - Enables/disables the second graphics overlay plane (i.e. the integration, tau, background and contrast information).
9. ARCHIVE - Not yet implemented.

The three rotary switches below the panel buttons act as follows

INTEGRATION - The absolute position of this switch determines the number of frames of integration.

BACKGROUND - Makes the background blacker or whiter. There is no absolute position, the effect is determined by the direction and number of steps moved.

CONTRAST - As for the BACKGROUND switch but it controls the contrast i.e. softens or enhances.

Off to the left of the rotary switches are three more push buttons labelled MENU, SELECT and RESET. Pressing the MENU button will freeze the image and cause page 1 of a 2-page image processing menu to be displayed. A cursor is also displayed and may be positioned on the menu by multiple depressions of the SELECT button. The joystick may be used instead of the SELECT key for menu selection if preferred. The joystick controller box also contains the buttons to enable and disable the movement of any displayed cursor. Press the ENTER button on the joystick controller to enter the menu selection. The functions available from the menu are described in Section 6.5. The RESET button causes a complete reset of the system - all overlays etc will be lost.

6.6 FUNCTIONS AVAILABLE FROM THE GRINNELL MENU

When the menu is displayed on the Grinnell TV monitor, move the cursor to the function required and press the ENTER button on the joystick controller to process the selection. When the function selected requires further positional information, up to 4 cursors can be enabled on the screen depending on the function. When they appear they may well be overlaid and so only appear as one. On the joystick controller the cursor switches determine which cursor(s) the joystick will control at any one time (for these switches, UP is ON). Once the cursors have been positioned as desired, ensure that at least cursor switch 1 is ON, and then press ENTER again to initiate the processing. A quick guide to the menu is given overleaf:

1. DRAW RESTRICTED PROFILE -	Requires TWO cursors to be positioned in either the X or Y plane and draws the profile of the data contained in the displayed image between the 2 cursor points. At the start the cursors are overlaid. This function is used for seeing estimates as it gives the FWHM of a star image in arcsecs. The profile is automatically erased when DIRECT is pressed.
2. SET PHOTOMETER APERTURE	- Enables the size of a circle which can be used to mark photometer apertures to be set numerically. The size (in arc seconds is displayed in the bottom right hand corner of the screen). The default value is 14" To change this value i) Put FUN B UP ii) Put FUN A UP to increase the aperture size, DOWN to decrease. iii) Press ENTER n times. This will result in a change of n arcsecs. Limits of 5 and 30 arcseconds have been set. iv) To exit, press ENTER with both FUN A & B DOWN. The set value will be retained until specifically changed.
3. DRAW PHOTOMETER APERTURE	- i) Move cursor 1 to the required position. ii) Press ENTER Multiple cursors can be drawn (without going back to MENU) by ensuring that FUN A or B is UP. A single aperture is drawn if both are down and this is also the exit mode. Apertures have to be specifically eased using ERASE OVERLAY.
4. CALCULATE MAGNITUDE	- Requires one cursor to be positioned over the object, and displays the integrated magnitude of the object. There is an arbitrary zero point for the magnitude scale.
5. DRAW CCD O/L	draws the outline of the CCD chip on the TV screen

6. CALCULATE DISTANCE	- Calculates the distance in arcsecs between 2 cursor positions.
7. INITIALISE	- Initialises the TV system. No cursors. Resets Parameters to f/15 focus.
8. ERASE ALPHANUMERICS	- Clears the areas of the overlay planes used for displaying information.
9. ERASE OVERLAY	- Erases overlay plane number 2.
10. ERASE IMAGE	- Erases the image plane.
11. ERASE PROFILE	- Erases that area of overlay used to display the profiles.
12. NEXT PAGE ...	- Displays the second page of the menu which consists of ...
13. TEST PATTERN 0,1,2,3	- Displays the Grinnell test patterns.
14. ERASE TEST PATTERNS	- Erases a test pattern.
15. INTEGRATION PARAMETERS	- Displays the current integration parameters (i.e.the status of the rotary switches).
16. DRAW SLIT	- Requires all 4 cursors to be positioned independently and then joins them up. Intended to be used for marking slits, but can be used to draw any quadrilateral.
17. DRAW CIRCLE	- Requires 2 cursors to be positioned to define the diameter of a circle which is then drawn. Useful for defining the position of photometer apertures.
18. DRAW BOX	- Two cursors are enabled which are used to define the side of a rhombus. The line joining the two points must have a positive gradient in the X-Y plane of the screen. If the 2 cursors have the same Y position, they will define the top side of a square. If they have the same X position, they define the left hand side of a square.

19. ZOOM	- Zoom factors are determined by the state of the function switches FUN A & FUN B on the cursor controller. Setting one or both of these switches followed by ENTER causes a new zoom factor to become operational. The factors are : FUN A set, zoom = 4 FUN B set, zoom = 2 FUN A+B set, zoom = 8 The zoomed image can be panned via the joystick. To exit from zoom, turn both function (FUN) switches off (down) and press ENTER. This facility requires the TRACK switch to be up (on).
20. F/8 FOCUS	- Changes the scale of the displayed image to correspond to the scale at the F/8 focus. Never needed as there is no TV at f/8. To return to f/15 do a MENU initialise.
21. FINDER	- As above but for the finder telescope. (irrelevant for the JKT)

6.7 COMPLETE RESTART OF THE TV CONTROL SYSTEM

If the TV system has been completely shutdown then check that the following units are on.

1. The large Grinnell systems unit at the base of the CAMAC rack (power switch bottom left).
2. The Westinghouse camera control unit (front switch).
3. The rack immediately below (2) - power switch at the back.

The camera control software is now held in ROM and the only startup/reset procedure consists of pressing the RESET button on the Grinnell control panel.

7 TELESCOPE USER INTERFACE

7.1 INTRODUCTION

7.1.1 Background

The telescope user interface is used for two main purposes: the ENTRY OF DATA which are then transferred to the on-line part of the control system by the action of pressing a button on the system control panel and the CHANGING OF OPERATING MODES. At present, the philosophy is that no action occurs until a button is pressed, except for the two most commonly used commands (GO and STOP) which can be issued either from the user interface or from the control panel. It is likely that all of the button functions will eventually be duplicated within the user interface, but a clear distinction between data input and action will remain. For example, the operations of entering the RA and Dec of an object and slewing to it are separate. An operating mode determines the way in which the control system responds to a command, for instance whether the telescope or guide probe is moved during autoguider acquisition or whether an object is to be observed with the JKT East or West of its pier.

7.1.2 Starting the Program

Section 4 describes the commands needed to start the telescope control software. Successful starting results in the User Interface displaying the name of the telescope.

The user interface program is ready to accept input when the terminal prompts with

UI->

In what follows, words in capital letters represent commands. These are abbreviable to at most 3 letters. In the text, commands are given in full, but the permissible abbreviations are listed in section 2.2.

7.1.3 How the program deals with input

Character strings separated by spaces are entered at the User Console and sent to the program USER by pressing RETURN. USER's command processor first attempts to identify the first string as a command name by comparing it with its internal dictionary of such names. If it is successful in making a match, one of two things may happen: a command which does not take any arguments (e.g. GO) is executed immediately; however, if the command takes arguments (e.g. RA), the program will go on processing the input line until the requisite number of acceptable arguments have been analysed, at which time the command is executed. If the input line is not exhausted the next character string delimited by spaces is processed in the same manner. When the command processor is not able to match a character string with a command name, the program outputs a message and ignores the rest of the input line. Commands may have up to 7 qualifiers and 5 parameters. Most require a control panel button to be pushed for any action to occur. The full specification of an action could therefore be of the form:

UI->COMMAND/QUALIFIER PARM1 PARM2

followed by pressing a control panel button. Note that occasionally parameters are associated with only one qualifier. Section 2.2 gives a complete list of commands, their qualifiers, parameters and any required control panel interaction. For all commands which take qualifiers the first given is the default. If the user interface requires a parameter which has not been specified it will request it with the prompt:

UI-Parm>

If you have changed your mind and don't want to give a value, just press Return and the old value is kept.

7.1.4 Catalogue entries

There is an internal catalogue containing the names, positions and guide star references for up to 500 objects. The user deals with 3 special entries: the EDIT source is the catalogue entry whose parameters (RA, Dec, equinox, proper motions, guide object) are presently being modified; the CURRENT source is the object being observed and the NEXT source is the object that will be observed when the TELESCOPE-DOME SOURCE button is pressed or the GO command is typed (at which point it also becomes the CURRENT source). Modifications to the CURRENT source's parameters do not affect the operation of the telescope directly. This is only altered when a button is pressed or GO is typed, in which case the parameters of the NEXT source are always picked up. When a new catalogue entry is defined using the SOURCE command, it automatically becomes the EDIT source.

7.2 SUMMARY OF COMMANDS

COMMAND	QUALIFIERS	PARAMETER	CONSOLE BUTTON
SO(URCE)	/I(NPUT)	sourcename	None
	/MA(RK)	sourcename	None
AC(QUIRE)	/PR(OBE)	None	Autoguider AG
	/TE(LESCOPE)		
AD(VISE)	/S(OURCE)	sourcename	None
	/E(DIT)	None	None
	/N(EXT)	None	None
	/CU(RRENT)		None
	/T(EL)	None	None
	/CAT	None	None
	/UI	None	None
AP(ERTURE)	/A	x y	BEAMSWITCH
	/B	x y	either
		(both arcsec)	NOM, A or B
AU(TOFFSET)	/B(OTH)	RA Dec Offsets	None
	/R(A)	RA Offset	
	/D(EC)	Dec Offset	
B(EAMSWITCH)	/A		BEAMSWITCH
	/B		either
			NOM, A or B
D(EC)	None	+/- dd mm ss.s	None
DEL(ETE)	/F(ROM)	source1 source2	
	/A(LL)		
	/S(EQ)	seq.no 1 seq.no 2	
DIF(F_RATES)	/B(OTH)	RA Dec Rates	
	/R(A)	rate in secs/sec	Differential track
	/D(EC)...........	rate in arcsec/sec	
E(DIT)		sourcename	
E(QUINOX)	None	B/J date in years or A = apparent	None
F(OCUS)	None	focus position in mms	FOCUS NOMINAL
GO(TO)	/N(EXT)	none	equivalent to Telescope/ Dome Source
	/SO(URCE)		

EXPLANATION OF COMMAND	EXPLANATION OF PARAMETERS
Define a new catalogue entry	/ replaces . -makes new entry in catalogue / takes RA and Dec from telescope position
Acquire star by	/ moving guide probe / moving telescope
Give parameters of the Lists names in catalogue Gives parameters of the	/ named source / edit source / next source to be observed / source currently being observed / telescope (Replaces T(EL)) / Replaces SHOW/CAT / USER
Set up collimation offset for	/ aperture A / aperture B
Moves telescope by required offset and guide probes in reverse	/ RA Dec both arcsec / RA / Dec
Set up collimation offset for	/ aperture A / aperture B (synonym for APERTURE)
Declination of edit source is	
Deletes (replaces CLEAR)	/ from source1 to source2 (if source2 / omitted deletes only source1) / deletes whole catalogue / from seq no 1 to seq no 2
Non-sidereal tracking rate	/ in Both is / in RA is / (Replaces DI(FFERENTIAL-RATE) / in Dec is
Selects given source as the	/ Edit source
The equinox for coordinates is	Byear or Jyear (Mean) or A=(apparent) (Replaces APPARENT and MEAN/B,MEAN/J)
Requested focus position is	
Slew telescope and dome to the NEXT object	(same as GO) GO to sourcename !NOT TESTED!

COMMAND	QUALIFIERS	PARAMETER	CONSOLE BUTTON
GU(IDE-OBJECT)	None	object name	A & G autoguider
HA(NDSET)	/A(LL) /S(ET) .... /G(UIDE) .... /I(NCREMENT) ...	setrate,guiderate increment arcsec/sec rates in increment step in arcsec	Control Panel Handset or Buttons
H(ELP)	None	command name/ qualifier	None
I(NPUT)	/N(ORMAL) /P(ROMPT)	file name device name	None
L(IST)	/A(LL) /F(ROM) .... /PR(INTER)	 source1 source2	 None
N(EXT)	/NA(ME) .... /SEQ(UENCE)	source name sequence number	Telescope/ Source button or GO command
O(FFSET)	/B(OTH) /R(A) /D(EC)	RA Dec Offsets offsets in arcsecs	 OFFSET(nominal) or offset)
P(ROPER_MOTION)	/B(OTH) /R(A) /D(EC)	pm RA,Dec proper motion (s/yr) proper motion (arcsec/yr)	None
R(A)	None	hh mm ss.s	None
SA(VE)	None	file name	None
SC(AN)	/ALL /D(URATION) .... /L(ENGTH) .... /A(NGLE) .... /N(UMBER) .... /S(EPARATION) ..	5 values on 1 line total time in secs of scan length of line in arcsecs PA of lines in degrees number of lines in scan separation between lines in arcsec	SCAN/TRAIL START/CONTINUE HOLD,BACK,ABORT SCAN/TRAIL

EXPLANATION OF COMMAND	EXPLANATION OF PARAMETERS
Guide star associated with the edit source is	
Handset	/ Can give all values on one line / setting rate is (arcsec/sec) / guiding rate is (arcsec/sec) / increment is (arcsec)
Provide helpful information about a command	
Input from file or device	/ without UI-> prompt / with UI-> prompt
List catalogue entries	/ for whole catalogue / from source1 to source2 on screen / to the line printer
Next source	/ is called / is number
Offset	/ can give both values on one line / in RA is / in Dec is
Proper motion	/ in both is / in RA is / in Dec is
Right ascension of edit source is	
Save current catalogue to disc	
Raster scan	/ Can give all values on one line / duration is / line length is / position angle is / no of lines is / number of lines is / separation between lines is

COMMAND	QUALIFIERS	PARAMETER	CONSOLE BUTTON
SE(T)	/LST /UT /NOW	hh mm ss hh mm ss	
SN(AFU)	/N(OMINAL) /A /B	None	Handset/guider button and ACKNOWLEDGE
STOP	None	None	None
T(ELESCOPE)	/O(VER-POLE) /U(NDER-POLE) /E(AST) /W(EST)	None	None
TR(AIL)	/ALL /D(URATION) ..... /L(ENGTH) ..... /A(NGLE)	val val val duration of trail in secs length in arcsecs position angle in degrees	SCAN/TRAIL SELECT SCAN/TRAIL START, HOLD,BACK, CONTINUE
Z(EROSET)	/A(UTO) /M(ANUAL)		

EXPLANATION OF COMMAND	EXPLANATION OF PARAMETERS
	/ set the sidereal time used by ADVISE / set up UT for ADVISE / ADVISE will use current time
Set	/ collimation errors in HA and Dec / aperture offset for aperture A / aperture offset for aperture B
Stop the telescope and dome	
Telescope to work	/ above the Pole (INT - default) / below the Pole (INT) / East of the pier (JKT - default) / West of the pier (JKT)
Trail	/ can give all values on one line / duration is / length on sky is / position angle is
Zeroset drive encoders	replaces SET/ZERO - NOT DEBUGGED

7.3 DETAILS OF INDIVIDUAL COMMANDS

Remember the on-line help facility; in most cases it will solve your problem more quickly than searching in the manual.

*** (text)**

In a line of input to the user interface, all characters following an asterisk are ignored by the command processor. In prepared or SAVEd files it is often useful to indicate the purpose or significance of the commands that follow, to flag and date amendments or to indicate the source of the data values appearing as arguments of commands. Comments may be in blocks of lines, each with an asterisk in column 1, or as in-line comments following a command and its argument.

At the console the text is ignored and the user is prompted for further input; in a file the command processor ignores the text and moves on to interpret the next line.

There are no qualifiers.

.(SOURCE)

is now obsolete and has been replaced by SO(URCE).

AC(QUIRE)

defines the autoguider acquisition mode and is used to tell the system whether to move the guide-probes or the telescope when acquiring a guide star.

AC(QUIRE)/PR(OBE) moves the guide probes until the guide-star is centred while the telescope remains fixed (tracking). It is used when the object of interest is already positioned in the TV or on the CCD chip and should stay where it has been put. The position of the guide star will probably not be known very accurately and moving the telescope rather than the probe would cause the target to move.

AC(QUIRE)/TE(LESCOPE) moves the telescope to acquire the star while the guide-probe remains fixed in the focal plane of the telescope. It is used when the guide star position is known *a priori* ; either because it has been observed before and the probe position is known or because the offset between it and the target has been measured in advance. It is the usual mode for the WFC.

TRAP FOR OLD PLAYERS. These two definitions were previously reversed.

ADVISE

gives details of a source, telescope or UI parameters, or lists the source-names in the resident catalogue. AD(VISE)/S(OURCE) source-name

gives details of source-name and times to rise and set from a given time. This time is input using SET/LST or SET/UT. If no time has been set, the current time is used.

AD(VISE)/E(DIT)

gives details of the edit source and times to rise and set from a given time. This time is input using SET/LST or SET/UT. If no time has been set, the current time is used.

AD(VISE)/N(EXT)

gives details of the next source and times to rise and set from a given time. This time is input using SET/LST or SET/UT. If no time has been set, the current time is used.

AD(VISE)/CU(RRENT)

gives details of the current source and times to rise and set from a given time. This time is input using SET/LST or SET/UT. If no time has been set, the current time is used.

AD(VISE)/T(EL)

gives all telescope parameters such as SET/GUIDE/INCREMENT rates, offsets, focus position and the like.

AD(VISE)/CAT

gives a list of the source-names and sequence-numbers in the resident catalogue.

AD(VISE)/UI

gives co-ordinates of the edit, current and next sources, acquisition and telescope modes and the time set by SET.

AP(ERTURE)/A x y (arcsecs) sets aperture A **AP(ERTURE)/B** x y (arcsecs) sets aperture B

sets up aperture offsets defined in an X-Y coordinate system fixed in the instrument rotator. These can be used, for example, to locate an object within a particular aperture or detector pixel. An aperture offset is executed by pushing one of the beamswitch buttons on the control desk.

If it is required to beam-switch (for example on a two channel photometer), then the apertures can be set up using the qualifiers /A and /B with X-Y offsets in arcsecs as input parameters. The control panel BEAMSWITCH buttons are then used to select between either aperture or the nominal position. If the required aperture offsets are not known *a priori* then the /A and /B qualifiers for SNAFU *(q.v.)* may be used to set them up interactively.

APERTURE is applied as a pointing correction, so it is not reflected in the displayed telescope position: conceptually, applying an aperture offset causes the SAME object to be observed using a DIFFERENT area of the instrument whereas an RA/Dec offset causes a DIFFERENT object to be observed on the SAME part of the detector and therefore causes the displayed position to change. The RA & DEC displacements corresponding to a particular aperture offset will vary with the turntable rotator position angle (unlike that for an RA/Dec offset, of course), but the displacement on anything attached to the rotator (TV, CCD, IPCS) will remain constant. All of the aperture offsets are calculated relative to a nominal aperture position which is specified in the system startup (.STD) file and corresponds to an easily visible reference position (the Grinnell crosswires or the centre pixel of an imaging CCD). This is because the reference position does not usually coincide with the rotator axis (which defines the origin of coordinates). The displacement between the reference position and the rotator axis (the base aperture offset) must be calibrated from time to time. For the INT at prime focus, the reference point is in the centre of the CCD chip (10 arcmin off-axis), but for the Cassegrain systems on both telescopes, SNAFU is usually done on the Grinnell cross wires so the reference aperture offset is set up to be the (small) difference between the turntable centre of rotation and the Grinnell cross-wires with the TV in the centre/acquisition position.

APPARENT

This command has been removed. See EQUINOX

AUTOFFSET

AU(TOFFSET)/B(OTH) RA Dec AU(TOFFSET)/R(A) RA AU(TOFFSET)/D(EC) Dec

sets up the telescope offsets in arcsecs in RA, Dec or both according to the qualifier. These are defined in a tangent plane projection centred on the current position of the telescope. The telescope begins to move as soon as RETURN is pressed. As the telescope moves to the OFFSET the autoguider automatically follows the reverse vector so that it does not lose the guide star.

CL(EAR)

has been replaced by DELETE.

CURRENT

has been removed.

D(EC)

D(EC) dd mm ss.s

enters the declination for the current edit source. The format is degrees minutes seconds. The seconds and minutes may be omitted but then the command must be terminated explicitly either by a carriage return or by a semi-colon. There are no qualifiers.

DELETE

deletes sources from the catalogue according to the qualifier.

DEL(ETE)/F(ROM) source-name source-name

deletes the sources in the resident catalogue between and including the given source-names. If only one sequence number is given, only that source will be deleted.

DEL(ETE)/A(LL)

deletes all sources in the resident catalogue except the first three; .DEFAULT, .GUIDE and .LINK
.

DEL(ETE)/S(EQ) sequence-number sequence-number

deletes sources in the resident catalogue between and including the given sequence numbers. If only one sequence number is given, only that source will be deleted.

DIFF_RATES

DIF(F_RATES)/B(OTH) RA-rate (sec/sec) Dec-rate (arcsec/sec)

DIF(F_RATES)/R(A) rate(secs/sec)

DIF(F_RATES)D(EC) rate(arcsecs/sec)

sets up differential tracking rates in RA,Dec or both (according to the qualifier). This will be actioned by pressing the DIFFERENTIAL TRACK button on the control panel. Note that this mode is switched off upon source change.

DISPLAY

DIS(PLAY). This command is not yet implemented.

DOME

DO(ME) sets up the required dome azimuth. At present there is no button to action a dome move, so this command is nugatory.

EDIT

ED(IT) Source-name

selects the given source as the edit source. There are no qualifiers

ENABLE

has been removed. No commands need to be enabled.

END

is not implemented.

EQUINOX

EQ(UINOX) Byear

EQ(UINOX) Jyear

EQ(UINOX) A

sets up the mean co-ordinate system (B for Besselian or J for Julian) and the equinox (year) for the edit source. The equinox for apparent co-ordinates is assumed to correspond to the current date. FK4(B1950.0) and FK5(J2000.0) will eventually be supported, but at the moment only FK4 is implemented. This command combines the old EQUINOX, MEAN and APPARENT commands.

EPOCH

EP(OCH) year.y

This command is not yet implemented. For the time being the EPOCH is assumed equal to the EQUINOX.

FOCUS

F(OCUS) position (mm)

Sets the required focus position. The telescope focus will be driven to this value when the FOCUS-NOMINAL button on the control desk is pressed. The FOCUS-STOP button halts the focus drive. Once the focus drive has been set it will track to follow any change in tube temperature. There are no qualifiers.

GOTO

GO(TO)

slews the telescope to the NEXT or given source and initiates tracking.

GO(TO)/N(EXT)

is equivalent to the TS/DOME (SOURCE) button on the control panel. It slews the telescope to the NEXT source and initiates tracking.

GO(TO)/SO(URCE) source-name

slews the telescope to the named source and initiates tracking. NOT YET TESTED.

GUIDE_OBJECT

GU(IDE_OBJECT) guide-name

defines a guide object for the edit source by linkage to an existing entry in the catalogue containing the co-ordinates of the guide star. When the telescope is slewed to a new source and the GUIDE TO GUIDE-STAR button is pressed on the SYSTEM CONTROL panel, the probes will drive to the position of the guide object if it is at a position. This procedure is used when the co-ordinates of a guide star are known in advance. There are no qualifiers. This command is not yet working on the JKT.

HANDSET

HA(NDSET)/A(LL) set-rate guide-rate increment

HA(NDSET)/S(ET) set-rate (arcsec/sec) (0-75)

HA(NDSET)/G(UIDE) guide-rate (arcsec/sec)

HA(NDSET)/I(NCREMENT) increment (arcsec)

inputs the set and guide rates and the increment step to be actioned by the handset and the guide buttons on the control desk. The new rate or increment will not be effective until the corresponding SET/GUIDE/INCREMENT selector has been pressed.

H(ELP)

H(ELP) Command

provides on-line help information about a specific command from the file USERHELP.TXT. There are no qualifiers.

INPUT

I(INPUT)

inputs commands from a specified disc file or device.

I(NPUT)/N(ORMAL) file-name

This will normally be a catalogue file but may be a file of user-interface commands like GO and WAIT in order to set up an observing sequence. If no extension of the file-name is given then .CAT is assumed. If a large file is to be input it is advisable to pause the TNHZ task if the telescope is not tracking. This will speed up the input considerably.

I(INPUT)/PROMPT device name:

This is used on startup of the user-interface to select input from this terminal interactively.

LIST

L(IST)

will list the source names and coordinates from the resident catalogue.

L(IST)/A(LL)

will list the whole resident catalogue to the screen, pausing after each page to ask whether more output is wanted.

L(IST)/F(ROM) source1 source2

will list from source1 to source2 on the screen.

L(IST)/PR(INTER)

will list the whole resident catalogue to the line printer.

MEAN

has been removed. See EQUINOX.

NEXT

N(EXT)/NA(ME) source-name

N(EXT)/SEQ(UENCE) sequence-number

defines the next source to be observed, selected by name or sequence number according to the qualifier used. .DEFAULT is number 1, .GUIDE is number 2 and so on through the catalogue.

OFFSET

O(FFSET)/B(OTH) RA-Offset Dec-Offset

O(FFSET)/R(A) RA-Offset (arcsecs)

O(FFSET)/D(EC) Dec-Offset (arcsec)

sets up the telescope offsets in arcsec in RA,Dec or both (according to the qualifier). These are defined in a tangent-plane projection centred on the current position of the telescope. They are actioned by the control panel OFFSET button. The OFFSET NOMINAL button will return the telescope to the original position. The offsets in use are displayed on the information display.

PARALLAX

PA(RALLAX) pi

This command is not yet implemented.

PROPER_MOTION

P(ROPER_MOTION)/B(OTH) RA Dec

P(ROPER_MOTION)/R(A) RA (secs/year)

P(ROPER_MOTION)/D(EC) Dec (arcsec/year)

sets the proper motion of the edit source in RA,Dec or both. The corresponding epoch is assumed to be the same as the equinox. NOTE THE DIFFERENCE IN UNITS

RA

R(A) hh mm ss.s

sets up the Right Ascension for the edit source. This format is hours minutes seconds. As with D(EC) the last two are optional but the command must be terminated with a semi-colon if they are omitted. There are no qualifiers.

RADIAL_VEL

RAD(IAL_VEL) rv

This command is not yet implemented.

REPORT

has been removed

ROTATOR

Cannot be used on the JKT as the Turntable Rotator is not under computer control. See 3.3 for method of operating the Rotator manually.

SAVE

SA(VE) Filename

saves the catalogue in memory to a user-specified disk file, which must have a .CAT extension, whatever extension was entered. There are no qualifiers.

SCAN

SC(AN)/ALL duration length angle separation number

SC(AN)/D(URATION) total scan time (secs)

SC(AN)/L(ENGTH) length of line (arcsec)

SC(AN)/A(NGLE) position angle of line (degrees)

SC(AN)/S(EPARATION) separation between lines (arcsec)

SC(AN)/N(UMBER) number of lines in scan

*** N.B. THIS IS NOT YET DEBUGGED ***

Sets up the parameters of a raster scan. It is actioned by the control panel SCAN/TRAIL buttons as follows:

to start a scan press SCAN/TRAIL - START & CONTINUE

to pause a scan press SCAN/TRAIL - HOLD

to reverse a scan direction press SCAN/TRAIL - BACK

to stop a scan or return to the start position press SCAN/TRAIL - ABORT

Note that to select between SCAN and TRAIL *(q.v.)* press the SCAN/TRAIL button so that it is lit for SCAN and unlit for TRAIL; TRAIL is the default mode.

SET

sets up various UI parameters according to the qualifier

SET/LST hh mm ss
sets up the Local Sidereal Time for use by the ADVISE command.
SET/UT hh mm ss
sets up the UT for use by the ADVISE command
SET/NOW
ADVISE will use the current time (this is the default on startup) **SHOW**

has been replaced by an amplified ADVISE

SNAFU

sets up the telescope index errors or the aperture offsets.

SNAFU/NOMINAL
sets the collimation and index errors.
The sequence of events is as follows:

1. slew the telescope to an accurately-known source position;
2. Type SN(AFU) and follow the instructions on the terminal i.e. press RETURN and ....
3. use the set/guide/increment functions to position the object on a reference mark (either the Grinnell cross-wires or the centre of a CCD chip) - see APERTURE
4. press the ACKNOWLEDGE button on the control panel.

SNAFU/A and SNAFU/B
The qualifiers /A and /B enable the different aperture positions to be recorded by the system for use by the BEAMSWITCH button.
The procedure is:

1. set an object on the reference mark (see above) using the guide buttons or the handset;
2. type SNAFU/A on the user interface console;
3. move the object to the desired aperture position, again using the handset or desk buttons;
4. press the ACKNOWLEDGE button and then BEAMSWITCH NOMINAL to restore the object to the reference position.

/B sets the aperture offset for beamswitch B in the same way.

SOURCE

SO(URCE)
defines a new entry in the source catalogue. The first three entries cannot be erased: .DEFAULT, .GUIDE and .LINK. A newly defined entry automatically becomes the EDIT source, so its parameters (RA, DEC etc.) can be entered immediately.

SO(URCE)/I(INPUT) source-name
This command provides the source with default values for RA, DEC, EQUINOX, co-ordinate type (MEAN or APPARENT) and PROPER-MOTION in both co-ordinates. The default values for all these quantities are copied from the source which is called .DEFAULT . This is the first entry in the catalogue and has its parameters set on start up. Until a new SOURCE command is issued, any

commands which set or alter any of the above mentioned quantities will update the values associated with the 'source-name'.

SO(URCE)/M(ARK) Source-Name
This command provides values for RA,DEC, EQUINOX and co-ordinate type from the current position of the telescope: proper motions are set to zero. This provides the means to log the positions of objects with poor or unknown co-ordinates measured at the telescope. Until a new SOURCE command is issued, any commands which set or alter any of the above-mentioned quantities will update the values associated with the 'Source-Name'.

ERROR-CHECKS
Checks are made to see if the source-name is already in the catalogue; whether the maximum number of catalogue entries has been exceeded; whether the storage allocated to the dictionary of source-names has been filled; or whether the name of the source is too long. Appropriate messages are displayed in each case and no catalogue entry is made.

STATUS
Has been removed.

STOP
STOP
is the equivalent of the T/S Dome STOP button on the control panel. It stops both the telescope and the dome. There are no qualifiers.

TELESCOPE
T(ELESCOPE)/O(VER-POLE)
T(ELESCOPE)/U(NDER-POLE)
T(ELESCOPE)/E(AST)
T(ELESCOPE)/W(EST)
is used to set the mode of telescope operation according to the qualifier; ie working either East or West of the pier. E(AST) is the default mode for the JKT. OVER and UNDER-POLE refer to the INT.

TITLE
TI(TLE)
is only used for input from files. The text following the command is printed on the terminal. It is used for instance to output the initial messages for the user interface. There are no qualifiers.

TRAIL
TR(AIL)/ALL duration length angle
TR(AIL)/D(URATION) duration (secs)
TR(AIL)/L(ENGTH) length (arcsecs)
TR(AIL)/A(NGLE) position-angle (degrees)
sets up the parameters for a trail and is very similar to SCAN *(q.v.)*. It is actioned by the associated SCAN/TRAIL control console buttons. For both SCAN and TRAIL, the starting position is where the telescope is set at the time the begins. There is no offset to a central position. The trail can be reversed, paused or aborted as with SCAN.

TURNTABLE
TU(RNTABLE) position angle (degrees)
Cannot be used on the JKT because there is no computer control over the turntable rotator.

WAIT
has been removed.

ZEROSET
is used to zeroset the incremental encoders.

Z(EROSET)/A(UTO)

sets the incremental encoder readings to zero when the telescope slews past a hardware marker. The sequence of operations is:

1. Move telescope to within about a degree of the zero set position but not exactly on it;
2. Press <cr> when ready to continue
3. The green handset lamps on the control panel will light up
4. Use the engineering-mode telescope control buttons to move the telescope through the zeroset position at the speed marked on the control potentiometers (about 1 deg/sec) in each of the coordinates successively. As each axis is zero-set the appropriate console light will go out indicating successful completion for that axis.

To get out of this procedure at any time, press the ACKNOWLEDGE button on the control desk. There are no qualifiers.

Z(EROSET)/M(ANUAL)

This replaces SET/ZERO but is not yet debugged. It is used when the hardware zeroset is broken. In this case, move the telescope to the zeroset position at the zenith (HA = 0; Dec = latitude) as indicated by the synchros (INT) or setting circles (JKT) and enterZ(EROSET)/M(ANUAL). This effectively does a SNAFU operation assuming that the telescope is at the zeroset position.

GENERAL

Character strings separated by spaces are entered at the User Console and sent to the programme USER by pressing RETURN. USER's command processor attempts to identify the first string as a command name by comparing it with its internal dictionary of such names. If it is successful in making a match, one of two things may happen: a command which does not take any arguments (e.g. GO) is executed immediately; however, if the command takes arguments (e.g. R(A)) the program will go on processing the input line until the requisite number of acceptable arguments have been analysed, when the command is executed. If the input line is not exhausted the next character string delimited by spaces is processed in the same manner. If the commandprocessor cannot match the character string with a command name, an error message is output and the rest of the line is ignored.

Many commands have qualifiers as well as parameters and some require the activation of a control panel button after the UI command has been entered. The full specification of a command could therefore be of the form:

UI->COMMAND/QUALIFIER PARM1 PARM2

followed by pressing a control panel button. Note that occasionally parameters are associated with only one qualifier.

HELP

This command displays the HELP information held in a set of modular hierarchical Help libraries in an interactive manner which allows a degree of browsing through the structure by the user. This facility is activated by entering the following command to the User Interface:- HELP [/LIB(RARY)=libname]

[item1 [item2 [... [item10] ...]]

When the HELP command is active the user is prompted for further input to guide the search through the library structure:- 'prompt for input' item1 [item2 [... [item10] ...]] 'prompt for input'

command

Where the 'prompt for input' reflects the current position within the library structure.

HELP/LIBRARY = libname

The use of this parameter enables information held within libraries other than the default library to be enquired after. If this parameter is used it MUST be the first entry after the HELP command but it need not be separated from the HELP by a space. It will cause the Help Library with filename ¡libname¿ to be searched instead of yhe default library.

If this parameter is omitted, or ¡libname¿ is blank, then the default library TCS.HLB is assumed. If the "=" sign is also missing then the "/LIB.." which has been entered is assumed to be ¡item1¿. libname

This is a standard Perkin Elmer file name of the form:- [vol:]name[.ext][/acct]

vol a 1 to 4 character volume name
name a 1 to 8 character file name
ext a 0 to 3 character file extension
acct a 1 to 5 character numerical account

However the volume name and account number portions, if given, are ignored and the library is looked for in account 0 of the SYS volume. If the file extension is omitted then 'HLB' is assumed. Notes

It is usually not necessary to use this parameter since the Help Library architecture supported by this software is modular and hierarchical and all the help libraries within the TCS and ICS can be reached via the default. Its only uses would be to refer to libraries not within the hierarchy (for example, private libraries or new versions of existing libraries) or to shorten the item search path, though this latter reason is not of particular importance. item ¡n¿

When entered as part of the HELP command this is the nth level enquired item relative to the initial HELP Library which is level 0. If no item is given then all topics at level 1 in the library are listed.

When entered in response to a prompt from HELP it is the nth level item below the current level. The maximum number of enquired items is ten. Inputting a sequence of enquired items specifies a path down the HELP hierarchical structure from the current level. This path may fail at any point due to the non-existence of a particular ¡item¿ and in this case a warning message is produced together with a list of topics at the lowest valid level on the path. In addition, a separate log of such failures is maintained to give an indication of what HELP information , according to the user's perception may be lacking. command

There are four single character commands which can be entered in response to a prompt from the HELP system:- '?' list all topics below the current level

' ' move one level up the hierarchy - terminates HELP at level 0
'!' terminate the HELP command immediately
'-' move one level up the hierarchy (don't use)

7.4 EXAMPLES

It is desired to observe three objects, as follows:

1. A star called HD 1234 at RA 07h 08m 09.32s, Dec. +17 14 44.1" at equinox 1950.0. This has annual proper motions of 0.034 secs of time in RA and -0.127" in Dec.

2. A galaxy called NGC 3456 at RA 10h 11m 12.3s, Dec -03 07 14" at equinox 1900.0.

3. A nearby star, to be used as a standard, HD 2345 at RA 10h 13m 15.7s Dec -04 05 06" at equinox J2000.0.

   HD 1234 is to be observed first and then the main object will be NGC 3456 with HD 2345 as the standard.

The UI commands may be used to enter an object name and details in the following way (minimum abbreviations are used):

Command	Comment
UI->.HD1234	* Object name
UI->R 07 08 09.34	* RA
UI->D 17 14 44.1	* Dec
UI->E 1950	* Equinox (Besselian assumed)
UI->P/R 0.034	* RA Proper Motion (sec /year)
UI->P/D -0.0127	* Dec Proper Motion (” /year)

Source names may be defined with any letters inside brackets used as optional descriptors, e.g. AL(VIN) may be recalled as ALVI, ALV or AL.

An alternative way of entering commands is to put all of them on a single line leaving spaces between each trailing field and the next command word. NGC3456 may be input, using minimum abbreviations, as follows:

UI->. NGC3456 R 10 11 12.3 D -03 07 14 E 1950

The character ; (semi-colon) may be used as an alternative to RETURN as a command terminator. For example, each of the commands RA and DEC expect 1 sexagesimal argument with 3 fields (hrs mins secs or degs mins secs), but right ascension 1 hour, declination +30 deg and equinox 1950 is abbreviable to:

UI->R 1;D 30;E 1950

The command processor ceases looking for further arguments for R and D on detecting the semi-colon and begins processing afresh at the next character. The standard HD 345 can be input as the 'guide' star, .GUIDE, by:

UI->.G R 10 13 15. 7 D - 04 05 06 E 2000 ME(AN)/JU(LIAN)

(N.B. DEFAULT, GUIDE and LINK are permanent entries which cannot be erased). To check that the coordinates have been typed in correctly, we can LIST the target objects and their positions on the screen:

Name	RA	Declination	Equinox	PM-RA	PM-Dec	Guide-Object
NGC3456	10:11:12.300	-03:07:14.000	B1950.0	0.000	0.000	.GUIDE
.GUIDE	10:13:15.700	-04:05:06.000	J2000.0	0.000	0.000	Not specified
HD1234	07:08:09.340	17:44:44.100	B1950.0	0.034	-0.127	.GUIDE

The catalogue information for individual sources may be displayed by:

UI->SHOW/EDIT	for the entry now being edited
UI->SHOW/NEXT	for the next source to be observed
UI->SHOW/CURRENT	for the source currently being observed

Data for up to 500 sources may be input. The STATUS command tells the user how many entries are currently stored and also indicates the extent to which the buffer which stores the object names has been filled - a list containing lots of long source names will be terminated before 200 entries. The command SHOW/CATALOGUE lists just the source names. Section 6.5 gives a list of the currently stored catalogues.

USER maintains various pointers to keep track of catalogue entries and which objects are of current interest. Three of these pointers are manipulated by the user: that to the "current" source, to the "next" source and to the "edit" source. Each time a .SOURCE command (naming a new entry to the catalogue) is issued the "edit" pointer switches to the next available slot in the catalogue and any data which follow are associated with that catalogue entry. However, this does not happen in the case of a MARK source. The edit pointer is also changed if an existing source name is input. Thus any data input will always be associated with the edit source until the pointer is changed by a .SOURCE or an already defined source name. The parameters of the edit source may be displayed at the user console by typing S(HOW)/ED(IT). Any source parameters which are not specifically entered will be picked up from the first entry in the catalogue .D(EFAULT) so that, for example, to enter a whole list of stars with 1900.0 coordinates one would only have to type:

UI->.D E 1900

UI->. STAR R 12 34 56 D 12 34 56

and the equinox of all following entries will be 1900 until changed.

The "next" pointer points to the catalogue entry containing the coordinates of the object to which the observer wishes to move next, i.e. when GO is typed, USER looks at the entry specified by NEXT and moves the telescope there. Once the telescope arrives at a specified position and begins tracking the "current" pointer points to the entry concerned and the "next" pointer remains unchanged until another NEXT command is issued.

At STARTUP all three pointers point to .D(EFAULT). It is therefore, possible to observe by merely entering R and D commands (each new entry going into .D) and pressing GO at the end of the observation. By this means the pointers are never reset and no source entries are accumulated in the catalogue.

When the same objects are to be observed on different nights SA(VE) will store the current internally held catalogue and this can then be recalled on any subsequent occasion. The contents of the catalogue are stored as commands so that restoring the catalogue allows objects in it to be acquired immediately without resort to any other commands apart from GO.

1. To save the catalogue in a file STAR.CAT:

   UI->SA(VE) STAR * All SAVE files are given the extension .CAT by USER

   The catalogue can be listed on the line printer using the command:

   UI->L(IST)/PRI(NTER) * and wait for a few seconds.

   (you must ensure that the line printer selector switch is switched to TCS and NOT ICS.) This command must be issued on the UI console.

   If nothing happens, type D M (on the 3220 telescope system console) to check that the spooler is not Paused. If it is type:

   *T .SPL

   *CO

   (also on the system console) and try again.

   If .SPL is not loaded, type STARTSPL on system console.

   To restore the catalogue type:

   UI->I(NPUT) STAR.CAT

You can remove objects from a catalogue by using the command:

UI->CL(EAR)/F(ROM) HD1234

this removes all the objects in the catalogue from HD1234 onwards. It is not possible to remove individual entries, except the last! You must EN(ABLE) CL(EAR)/ALL clears the whole catalogue except the first 3 entries.

2. To move the telescope

   Indicate which source is to be observed by using the NEXT command.

   UI->NEXT NGC3456 *Select NGC3456 as "next" object

   UI->GO *Move telescope to "next" object

   NOTE. You can also use the T/S DOME GO button on the control desk. The telescope is halted by STOP.

7.5 STANDARD CATALOGUES

Catalogue files available on disc

7.5.1 Catalogue format

A catalogue for the telescope computer is a set of user interface commands and as such can be in free format. For legibility and neatness, however, it is worth adhering to a more rigid tabular format with one object per line of the file. The guidelines for generating catalogues may be divided into essential rules (disregard of which will cause the interface to be unable to read in the file) and conventions (which are guidelines for producing catalogues which may be read in as quickly as possible and are easy to maintain).

7.5.2 Essential rules

The following rules MUST be followed.

1. The file should consist of 80-byte records. Consequently, no more than 80 characters per line are allowed.
2. There should be no non-alphanumeric characters (carriage returns, line feeds, etc.) anywhere in the file.
3. The last command in the file must be END.
4. The filename must consist of 8 alphanumeric characters or less, starting with a letter, and must have the extension .CAT.
5. There should be no more than 200 objects in the file, as this is the maximum number that can be held in memory at once.

7.5.3 Conventions

1. Every standard catalogue should start with a comment line describing its contents and giving the name of the originator and
2. If all of the objects in the catalogue have the same equinox, then this should be given at the beginning of the file, not repeated for every object.

3. The format should be as given in the examples below, i.e.:

   SOURCE OBJECT R hh mm ss.ss D +dd mm ss.s P/R +s.ssss P/D +s.sss EQ Jyyyy.y

   with the equinox omitted if it does not change from line to line.

4. The coordinate type (JULIAN, BESSELIAN or APPARENT) should be specified at the beginning of the file.

5. It is expected that each catalogue file will have an associated documentation file with the same name but with the extension .DOC.

6. Catalogues should be split by Right Ascension in order to minimise the number of records to be read in - there is no point storing objects if they are invisible.

7.5.4 Coordinate systems

The restrictions on coordinate types are as follows:

1. Coordinates may be either mean or geocentric apparent. Only FK4 (default B1950) coordinates are supported at present.

2. Geocentric apparent coordinates refer to the current date and time.

3. The epoch for the proper motions is assumed equal to the equinox for mean coordinates.

7.5.5 List of standard catalogues

PTGRID	Grid of stars with accurately-known positions for pointing tests The following four catalogues are subsets of PTGRID and contain stars which pass through the zenith. They are to be used for setting the encoder zeropoints of the telescope (SNAFU) and for measuring the seeing.
SEE0006	0 hr < RA < 6 hr
SEE0612	6 hr < RA < 12 hr
SEE1218	12 hr < RA < 18 hr
SEE1824	18 hr < RA < 24 hr
SPECPHOT	Spectrophotometric flux standards
	The following six catalogues contain stars from Landolt's list of equatorial standards for UBVRI photometry. There are two overlapping sets, one with photometry by D.H.P. Jones & J.E. Sinclair (from SAAO) and the other with photometry by Landolt (from KPNO). Users should be warned that there are differences between the two datasets in the U and B bands, as is discussed further in the .DOC files. All of the positions have, however, been checked and/or remeasured. There is a further division between stars suitable for CCD's (V > 10) and those which should only be used with photoelectric photometers.
UBVRIRG	Jones & Sinclair photometry; no magnitude restriction
UBVRIRGB	Jones & Sinclair photometry; V < 10
UBVRIRGF	Jones & Sinclair photometry; V > 10
UBVRIKP	Landolt photometry; no magnitude restriction
UBVRIKPB	Landolt photometry; V < 10
UBVRIKPF	Landolt photometry; V > 10

8 CLOSING DOWN THE T/S AND COMPUTERS

The closing down sequence of the JKT is considerably easier than the start up and less can, and does, go wrong. Moreover at this stage any problems never seem quite so important!

The recommended procedure is as follows -

1. Completely switch off the acquisition TV by turning down the gain control until it clicks and pressing the red STOP button. Retract the old A/G box mirror to OUT. Turn off the Auto-Guider. Both the TV and Auto-Guider are interlocked with the fluorescent dome lights.

2. Close the mirror covers.

3. Close the dome shutters.

4. Rotate the dome to avoid any expected bad weather.

5. Make safe any instrument (eg close the dark slides) and switch on the dome lights.

6. Press button Z.P. to zenith park the telescope. Shut down Telescope Control Computer.

   Type FINISH, wait for the final message then type MA FX16:,OFF.

7. After raising the black-out blind so you can see the telescope, switch the telescope control to ENGINEERING mode (button to right of key on upper right of console) and drive the telescope (buttons centre left of console) so as to replace any covers as necessary (usually applicable to f/8 only) then park the telescope at the zenith.

8. Turn off the 'TELESCOPE POWER' key on the console.

9. Cancel the alarm that sounds (left button of panel at lower right of console).

10. It is always wise to put your data on tape at the end of the night as head crashes in the Disk Drives are not unknown. When these are FITS tapes put the 'D' tape in the tray to be copied (fill out a copy request as well). The 'C' tape is for you to take away, the 'D' tape is for the La Palma data archive.

11. When you have finished printing files or copying data as appropriate, type SHUTDOWN to exit from ADAM and then type SIGNOFF <cr> at the user terminal of the instrument computer. ('SO' will do).

12. Shutdown the instrument computer. The procedure is (at the system console):

13. STOPALL <cr>

14. OFF <cr>

15. MA EGLE:,OFF <cr>

Go to the EAGLE diskand switch the PROTECT switch to protect and the right hand switch to READY.

1. If appropriate, refill the CCD cryostat with liquid nitrogen.

2. The Nightly Report Form. You must fill in the Nightly report form at the end of your night's work. Most of the entries are self- explanatory but note the following: The hours observed is most easily found by subtracting the time of the first useful observation (not flat field) from the time of the last observation. Astr.T. means Astronomical Twilight. The times can be found from the NAO booklet 'Astronomical Data for La Palma' or the table pinned to the Notice-Board. Enter the UT values, not sidereal, for the end of astronomical twilight in the evening and the

beginning of astronomical twilight in the morning. You should be taking seeing measurements roughly every two hours throughout the night and entering them in the JKT Observers Log Book; and duplicate them to Dave Carter's form for logging the seeing. You can measure the seeing from the TV but it is much more reliable to use STARFIT on a short CCD exposure, especially the best of a focus run. Pay no attention to the 'seeing' displayed by the autoguider. Clouds (0-8) refers to the standard meteorological definition of cloud cover in eighths.

Dust (0-2) is on an arbitary scale where 0 means horizon clean and hard, Teide easily visible 1 means horizon ill-defined, Teide seen with difficulty if at all. 2 means no perceptible horizon, Teide totally invisible, view across Caldera substantially impaired. 3 means you should lie down in the lee of your camel Complete the log book and leave any SERs or hardware fault cards or mag tape copy requests in the tray provided. (Duty Officer collection). (IF THEY ARE NOT LEFT IN HERE, NOTHING WILL HAPPEN.)

3. Make sure the intercom is off (depress the .<- key so that the red light goes out).

4. Lock the outside door as you leave.

9 TROUBLE SHOOTING

9.1 TELESCOPE RUNAWAY

One of the most worrying problems that can occur with the telescope control is that the telescope begins to slew uncontrollably. In this event, having read the following few actions in advance may save a lot of panic and, who knows, may even help to stop the telescope before the limit switches do. The actions are listed in order of seriousness.

1. Press the T/S DOME stop button (next to the set/guide buttons on the console).
2. Clear the console CAMAC by switching it off-line and pressing the clear switch to left and right. See Section 2.5 and know how to do it in advance.
3. Press the large red EMERGENCY STOP button (upper right of control console). There is a second emergency stop button on the telescope primary cell which works equally well.
4. Check that the handset is plugged into the "observer" socket. If it is there must be some other problem. Call for help.

N.B. The emergency stop buttons for the rising floor have no effect on the telescope!

9.2 RELEASING TELESCOPE FROM THE LIMIT SWITCHES

If the actions of Section 9.1 fail, or more likely if you weren't watching or were too slow, then the telescope will be stopped by the horizon limit switches. To get away from this proceed as follows:

1. Switch telescope to engineering mode.
2. Press the clear alarm button.
3. Turn the key marked LIMITS NORM/OVERRIDE clockwise and keep it turned whilst simultaneously pressing whichever of the HA+, HA-, DEC+, DEC- buttons is required. The telescope should now rise away from the limits.

The encoder readings for RA & Dec will probably be corrupted entailing a fresh SNAFU or zeroset.

9.3 ALARMS AFTER A POWER FAILURE IN FLIGHT

If a power failure occurs during observing, then when the mains is restored there will be an almighty din in the control room. To quieten things down press the CANCEL alarm button on the lower right of the control console (pretty obvious) but ALSO press the RESET button on the TIMER panel.

9.4 DOME

If the dome won't turn:

1. Check grey panel on dome wall is ON
2. Check it is switched to remote/local, whichever you want. (Remote = control from the control room).
3. Check that the speed control is at maximum.

If the dome turns but the reading on the information display doesn't change:

1. Check interface next to the grey panel is switched on.
2. Check the gear wheel is still located in the chain (North end of dome
3. Call duty technician.

9.5 CONTROL COMPUTER/USER INTERFACE

If the telescope control computer (UI) has hung up, see Section 4.1.5 but if that is no use then call the Duty Technician as the terminal may not be plugged in correctly. If the UI hangs up because the 'Break' key was pressed go to the system console and type

T USER;CO

Trouble with Rising Floor? See Section 2.3.

10 STOP PRESS

Please record any new quirks of the system below. If they turn out to be long lived then they will be incorporated into the manual.

1. The telescope is affected by movement on the rising floor. It amounts to a movement of the image of a few arcsecs if the observer jumps up and down. Keep off the rising floor when exposing unless absolutel necessary.

2. Be sure to get a number allocated for your D tapes, i.e. the tapes that remain here, before taking copy tapes (C) away.

3. If the air conditioning fails, normally heralded by an ear-piercing warbling noise signal from the CLIP centre, try resetting the A/C unit by 1) switching it off, 2) pressing the reset button, 3) switching on again. If this clears all fault indications everything is well. If not, then contact the duty technician. The computers must not be left running for more than 15 minutes without air-conditioning. If this seems likely to happen follow the instructions in Section 10 on closing down the computers.

11 QUICK REFERENCE GUIDE FOR NORMAL START-UP

11.1 STARTUP OF TELESCOPE AND 3220 TELESCOPE CONTROL COMPUTER

1. Telescope power ON.
2. Oil pump ON.
3. Cancel alarm (when it sounds). Occasionally it doesn't but you know you have passed this point when the Red 'Alarm Cancel' at bottom of RH bay goes out and green light in (4) comes on.
4. Press RESET next to emergency stop knob (green light goes OUT).
5. Check for other alarms.
6. Check for obstructions on observers' floor.
7. Move telescope so that you can get corrector cover off. (Only necessary at f/8.)
8. Type D D <cr>.

   Look down list of devices and find FX16:. If it is OFF, type

   MA FX16:,ON,,CD=ALL

   and wait for the one line response, then type

   GO JKT

   and wait for the message LOADJKT: END OF TASK 0. If it says FX16:SYS type

   GO JKT and wait for message, either LOADJKT:END OF TASK 0 or CONTROL SYSTEM is already running.
9. the telescope computer system terminal check control computer is up (asterisk response). If it is not, see the instructions in Section 4.3 of the JKT User Guide.
10. If you want to work with the telescope West of the pier refer to section 4.3 but you must ask the support astronomer or duty technician first.
11. Make sure telescope is about a degree away from the zenith in both axes using the engineering mode controls.
12. Type Zeroset on the UI. Move telescope through the meridian and the zenith to initialise encoders.
13. Switch to computer control.
14. If you do not want the default values, set the handset set, guide and increment parameters by typing

    HA/S xx <cr> (arcsec/sec)

    HA/G xx <cr> "

    HA/I xx <cr> (arcsec)

    where xx are values according to taste. The startup values are 30, 3 and 30 respectively.

    Energise the handset by pressing SET/GUIDE/INCREMENT buttons in succession.
15. Dome lights off.

16. Close blind in control room.
17. Open Dome Shutters and mirror petals, in that order.
18. Select a bright star and enter the coordinates to the user interface. Drive to that object. Activate the TV - see no. 25.
19. Use SNAFU to correct coordinate zero points.
20. When star has been centred press the ACK button on the control desk until it goes out.

11.2 STARTUP OF 3210 INSTRUMENT CONTROL COMPUTER

1. Check for asterisk response. If none go to Section 5.2.
2. SIgnon ABC,n,n at the USER terminal.

11.3 STARTUP OF THE TV

1. Make sure all lights are out in the dome. Both the TV and the Auto-Guider are interlocked with the dome fluorescent lights.
2. Ensure that the gain control of the TV control box is turned fully off (turn anti-clockwise until it clicks).
3. Press the black ON power button on the control box. The two lights labelled DELAY & RESET will come on. Wait until the green ON light comes on.
4. Turn on the power to the two monitors of the TV system and let them warm up.
5. Depress the ACQN/COMP button on the A & G controller to move the flat mirror into the beam.

11.4 CLOSE DOWN OF THE TELESCOPE AND COMPUTERS

1. Retract Mirror on old A/G box (leave at OUT).
2. Zenith park the telescope - but otherwise leave the telescope control program running.
3. Close the dark slides (photometer) or corresponding feature of other instrument, if such exist.
4. Completely switch off the acquisition TV by turning down the gain control until it clicks and pressing the red STOP button. Turn off the autoguider.
5. Close the mirror covers.
6. Close the dome shutters.
7. Switch on the dome lights.
8. Replace dust covers as necessary.
9. Turn off the 'TELESCOPE POWER' key on the console.
10. Cancel the alarm that sounds (left button of panel at lower right of console).
11. When you have finished printing files or copying data as appropriate; SHUTDOWN to get out of ADAM, then Sign off (SO <cr> will do) at the user terminal of the instrument control computer.

12. Complete the log (night assistant) book and leave any SERs or hardware fault cards in the tray above the Lexidata.
13. Make sure the intercom is off (depress the .<- key so that the red light goes out).
14. If appropriate, if you are using the CCD then refill the cryostat with liquid nitrogen and note the time done on the notice board in the control room.
15. Lock the outside door as you leave.

11.5 SUMMARY OF COMMANDS FOR NEW USER INTERFACE

.	defines a new source name
*	comment line in a command file
AC(QUISITION-MODE)	defines the autoguider acquisition mode
A(DVISE)	get advice on rising, setting times, ZD, parallactc angle for input sidereal time (?)
AP(ERTURE)	sets positions of apertures
APP(ARENT)	source coordinates are apparent
CL(EAR)	clear entries from list in memory
C(URRENT)	selects the currently observed source for editing
D(EC)	set declination for source being edited
DI(FFERENTIAL-RATE)	set differential tracking rate
EN(ABLE)	enables ZEROSET and SNAFU
END	terminates file input
E(QUINOX)	set equinox of coordinates for current source
F(OCUS)	sets the focus position
GO	drives the telescope to the NEXT source
GU(IDE-OBJECT)	defines a guide-object for the source being edited
HA(NDSET)	sets the handset set, guide rates and increment
H(ELP)	provides help on commands
I(NPUT)	inputs commands and data from a disc file
L(IST)	lists the source names, coordinates etc currently n memory
ME(AN)	sets mean place coordinates
N(EXT)	indicate the next source to be observed
O(FFSET)	set the telescope offsets, relative to current position
P(ROPER-MOTION)	sets the proper motions of the source being edited
R(A)	sets right ascension for source being edited
RE(PORT)	causes both source and telescope status to be reported
SA(VE)	saves catalogue in memory to a named file
SC(AN)	sets parameters for a telescope scan
SE(T)	sets zeroset at current position/time/log
S(HOW)	displays parameters of selected source
SI(ZE)	gives size of catalogue in memory
SN(AFU)	sets the telescope collimation errors
ST(OP)	stops the telescope
T(ELESCOPE)	reports telescope parameters and sets E/W or over/under pole
TI(TLE)	writes the text following the command to the consoe
TR(AIL)	sets the telescope trail parameters
TU(RNTABLE)	sets the turntable position
W(AIT)	waits for a button to be pressed
Z(EROSET)	zerosets the encoders using the hardware zerosets

12 GUIA PARA USARIOS CUANDO TODO VA BIEN

12.1 PUESTA EN FUNCIONAMIENTO DE LA COMPUTADORA DEL TELESCOPIO/CONTROL

1. Telescope power ON (llave arriba derecha)
2. Oil pump ON (boton arriba izquierda)
3. Apage la alarma, si suena (abajo derecha). A veces no suena, pero se puedes pasar al proximo punto si la luz roja de "alarma cancel" (abajo en la consola de la derecha) se apaga y se enciende una luz verde en (4).
4. Pulse el boton de RESET, cerca del boton de EMERGENCY STOP (se apaga la luz verde).
5. Compruebe otras alarmas.
6. Compruebe si hay obstrucciones en el piso de la cupola, cerca del telescopio
7. Mueve el telescopio para quitar las cubiertas del buscador (y corrector). (Solo necesario en f/8).
8. Compruebe que el Terminal de Control del Sistema (CST) del telescopio funciona: Carriage Return <CR> es contestado con "*". Si no, lea la Seccion 4.3 de la Guia para el usuario del JKT. Teclea D D <cr>.

   Mire al final de la lista hasta encontran FX16:. Si esta OFF, teclea:

   MA FX16:,ON,,CD=ALL

   y espere para el mensaje one line response, entonces teclee:

   GO JKT

   y espere el mensaje LOADJKT: END OF TASK 0. Si dice FX16:SYS teclee:

   GO JKT y espere un mensaje, ya sea LOADJKT:END OF TASK 0 o CONTROL SYSTEM IS ALREADY RUNNING.
9. Asegurese que el telescopio esta unos grados fuera del zenit en los dos ejes utilizando los controles del modo de Engineering.
10. Teclee Z(EROSET) EN EL TERMINAL DE USER.
11. Mueva el telescopio a traves del meridiano y el cenit para inicializar los encoders.
12. Cambiae al modo de Computadoras.
13. Si no quiere usar los parametros usuales, es posible utilizar los parametros del control manual tecleando

    HA/S xx <CR> (arcsec/sec)

    HA/G xx <CR> (arcsec/sec)

    HA/I xx <CR> (arcsec)

    xx son valores que usted pone. Los valores de startup (puesta en funcionamiento) son 50, 3 y 10 respectivamente. Active el control manual presionando los botones SET/GUIDE/INCREMENT sucesivamente (en el centro, parte mas inferior).
14. Apage las luces de la cupula, OFF (parte superior derecha).
15. Cierre la persiana en la sala de control.

16. Abra la cupula y las cubiertas de los espejos (parte superior izquierda) en este orden.
17. Seleccione una estrella brillante e introduzca las coordenadas en la Interface de Usuario (UI). Dirige el telescopio hacia aquel objeto. Activa la TV - ver 12.3).
18. Use SNAFU para corregir las coordenadas del punto cero, teclee EN(ABLE) SN(AFU) ANTES de volver a centrar el objeto en el reticulo de TV.
19. Cuando la estrella esta centrada presione dos veces el boton ACK en la consola (parte mas baja, en el centro) hasta que se apague.

12.2 PUESTA EN FUNCIONAMIENTO DE LA COMPUTADORA DE INSTRUMENTOS

1. Compruebe que Carriage Return <CR> es contestado con "*". Si no, lea la seccion 5.2.
2. SIgnon ABC,n,n en el terminal del USUARIO.

12.3 PUESTA EN FUNCIONAMIENTO DE LA TV

1. Asegurese que todas las luces en la cupula esten apagadas.
2. Verifique que la ganancia de la caja de control de la TV este bien apagada (gire en direccion contrario al sentido horario hasta que se oiga un clik).
3. Pulsa el boton negro de energia ON de la caja de control. Las dos luces DELAY y RESET se encenderan. Espere hasta que se encienda la luz verde ON.
4. Enciende los dos monitores del sistema de TV y deje que se calienten.
5. Pulse el boton ACQN/COMP del controlador del A & G para mover el espejo plano dentro del rayo.

12.4 CIERRE DEL TELESCOPIO Y LOS COMPUTADORAS

1. Retire el espejo en la caja de A & G (deja en OUT).
2. Apunte el telescopio al zenit - pero deje en funcionamiento el programa de control del telescopio.
3. Cierre los obturadores (dark slides).
4. Apage completamente la pantalla de TV bajando la ganancia hasta que se oye un clik y presione el boton rojo STOP.
5. Cierre los cubreespejos.
6. Cierre la cupula.
7. Encienda las luces de la cupula.
8. Ponga las tapas contra el polvo si es necesario.
9. En la consola ponga en OFF "Telescope Power".
10. Apage la alarma que suena (boton de la izquierda en el panel abajo a la derecha de la consola).
11. Cuando haya terminado de imprimir o copiar los datos: SHUTDOWN para salir de ADAM, y Sign off (SO <CR> es suficiente) en el terminal del usuario de la computadora de control de instrumento.
12. Complete el Registro (libro de observadores).