

IAC80 and TCS TELESCOPE CONTROL MANUAL



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The telescope control system is common to the IAC80 and TCS so this manual is referred to both telescopes.

1. THE TELESCOPE CONTROL COMPUTER

The telescope is controlled by a PC running under a MS DOS environment. This computer has two monitors showing an informative panel and the telescope control interface (see **figures 1** and **2** for the IAC80 and TCS telescopes, respectively). The observer does not need to initialize this software but instead it is done by the night assistant.



Figure 1: IAC80 telescope control room.



Figure 2: TCS telescope control room.

2. CATALOGUES

Catalogues cannot be loaded from any external device but instead the users have to create their catalogues entering the coordinates of the targets using the telescope control PC keyboard. Catalogues can be saved and edited as many times as desired.

2.1. Creating a catalogue

- 1) Select the option **Catálogo** (catalogue) and **Objetos** (objects) in the PC menu.
- 2) Go to the menu by pressing **Alt A** and then select **Archivo** (file) and **Nuevo** (new)



Figure 3: Telescope control interface: catalogue menu.

- 3) A new catalogue is then created. Go to menu with **Alt A** and select **Editar** (edit), **Introducir** (input) and **Teclado** (keyboard). A panel appears where the user can write the name and coordinates of his/her targets (see figure 3). Optionally, the user can enter the proper motion (**Mp. Ar** and **Mp. Dec** for right ascension and declination, respectively), parallax (**Paralaje**), radial velocity (**Vel. Radial**) and tracking velocities in RA and DEC (**Vel. SegAr** and **Vel. SegDec**).
- 4) Save the input by pressing **Ctrl + Fin** in the keyboard. These steps can be repeated as many times as desired to enter all the inputs of the catalogue.
- 5) The observer can change the catalogue name with the option **Guardar como** (save as) in the **Archivo** (file) menu. Catalogues should be saved in binary mode (**Archivo Binario**) with the .usu extension.

- 6) Press **Esc** to exit the catalogue menu.

2.2. Opening a catalogue

- 1) Select the option **Catálogo** (catalogue) and **Objetos** (objects) in the PC menu.



Figure 4: Telescope control interface: open catalogue menu.

- 2) Go to the menu by pressing **Alt A** and select **Abrir** (open) in the **Archivo** (file) menu and then **Archivo Binario** (binary file).
- 3) A black window appears where the observer can write the name of the desired catalogue (see **figure 4**). Otherwise, she/he can access the file browser using the **Tab** key and navigate using the arrow keys and select the catalogue by pressing **Enter**.
- 4) The targets in the catalogue should be sorted by right ascension (see **figure 5**). If not, this can be done by selecting **Ordenar** (sort), **Cambiar Clave** (change key) and **Asc. Recta** (right ascension) in the menu (remember to go to the menu with the **Alt** key). **Note that only the targets marked in bold face will be read by the telescope control system.** To mark and unmark an object press **Enter** on the corresponding row.
- 5) Press **Esc** to exit the catalogue menu.

Nombre	Ra	Dec	Equi	Epoca	Habr	Hpdec	Par	Usar
315	00:06:59.00	-02:37:52.00	B	1985.0	1985.00	0.00	0.00	0.00
TPHE A	00:30:09.00	-46:31:22.00	J	2000.0	2000.00	0.00	0.00	0.00
2892	00:31:26.00	+01:06:13.00	B	1985.0	1985.00	0.00	0.00	0.00
-15_115	00:37:36.00	-15:04:51.00	B	1985.0	1985.00	0.00	0.00	0.00
FC0039+049	00:42:05.00	+05:09:44.00	J	2000.0	2000.00	0.00	0.00	0.00
-12_134	00:46:19.00	-11:57:32.00	B	1985.0	1985.00	0.00	0.00	0.00
-11_162	00:51:30.00	-10:44:49.00	B	1985.0	1985.00	0.00	0.00	0.00
72_235	00:53:16.00	+00:36:10.00	J	2000.0	2000.00	0.00	0.00	0.00
72_336	00:54:16.00	+00:42:36.00	B	1985.0	1985.00	0.00	0.00	0.00
72_342	00:54:24.00	+00:38:22.00	B	1985.0	1985.00	0.00	0.00	0.00
72_248	00:54:31.00	+00:40:20.00	J	2000.0	2000.00	0.00	0.00	0.00
72_253	00:54:54.00	+00:31:26.00	B	1985.0	1985.00	0.00	0.00	0.00
72_499	00:55:14.00	+00:56:07.00	J	2000.0	2000.00	0.00	0.00	0.00
72_498	00:55:57.00	+01:10:40.00	J	2000.0	2000.00	0.00	0.00	0.00
5505	00:56:05.00	+01:36:00.00	B	1985.0	1985.00	0.00	0.00	0.00
72_200	00:56:31.00	+00:31:55.00	B	1985.0	1985.00	0.00	0.00	0.00
F_11	01:03:30.00	+04:09:15.00	B	1985.0	1985.00	0.00	0.00	0.00

Figure 5: Example of catalogue. Only targets marked in bold face will be read by the telescope control system.

2.3. Editing a catalogue

- 1) Open a catalogue as explained in section 2.2.
- 2) To add a new target in the catalogue go to menu with **Alt A** and select **Editar** (edit), **Introducir** (input), **Teclado** (keyboard) and write the name and coordinates of the targets.
- 3) To modify a record, move to the target using the arrow keys and then go to the menu with **Alt A** and select **Editar** (edit), **Modificar** (modify), **Teclado** (keyboard) and correct the desired parameter.
- 4) Press **Esc** to exit the catalogue menu.

3. THE TELESCOPE

3.1. Pointing to a target of the user catalogue

To point the IAC80 and the TCS telescopes, users have first to create a catalogue with their targets of interest as explained in **section 2**. Then, select the **Apuntar <Usuario>** (point <user>) option in the **Telescopio** (telescope) menu, select the target and press **Enter** (see **figure 6**).

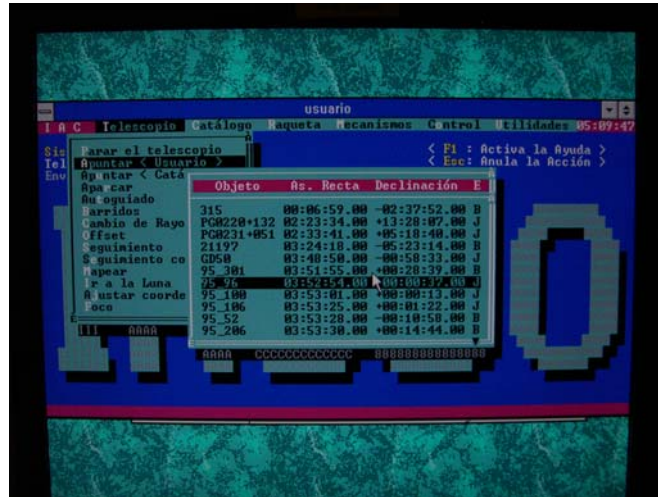


Figure 6: Pointing to a target of the user catalogue.

While the telescope is moving the status panel in the information panel shows **Apuntando** (pointing) and the values of RA and DEC left to reach the target position (see figure 7, red square, left). Once the telescope has pointed, the panel will show **Seguimiento** (tracking) in the status panel (see figure 7, red square, right).

NOTE: sometimes the telescope cannot reach the demanded position but instead blinks between to points around the final coordinates. In this case, select the option **Seguimiento** (tracking) in the **Telescopio** menu.

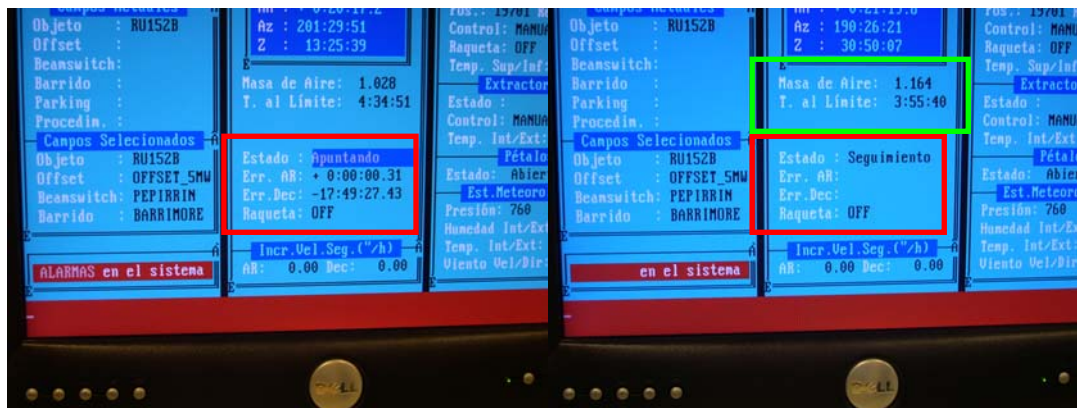


Figure 7: Pointing to a target of the user catalogue.

Two important fields to check are **Masa de Aire** (air mass) and **T. al límite** (time to the limit – figure 7, green square) showing the time remaining until the telescope reaches the limit. The last field will be highlighted when the telescope is less than 10 min close to the limit (see figure 8). The coordinates, hour angle, azimuth and zenith distance of the target will be displayed in the blue window above these parameters.



Figure 8: Display at less than 10 min to the limit.

3.2. Pointing to a target of the system catalogue

The user can point directly to any star in the Fundamental Star catalogue (FK) with the option **Apuntar <Catálogo>** (point <catalogue>) option in the **Telescopio** (telescope) menu. The system will ask for the identification of the star in the catalogue. A paper version of the FK catalogue is available in the control room (see figure 9). The Bright Star, Sao and Hipparcos catalogues are also available in the PC and also as paper copies.

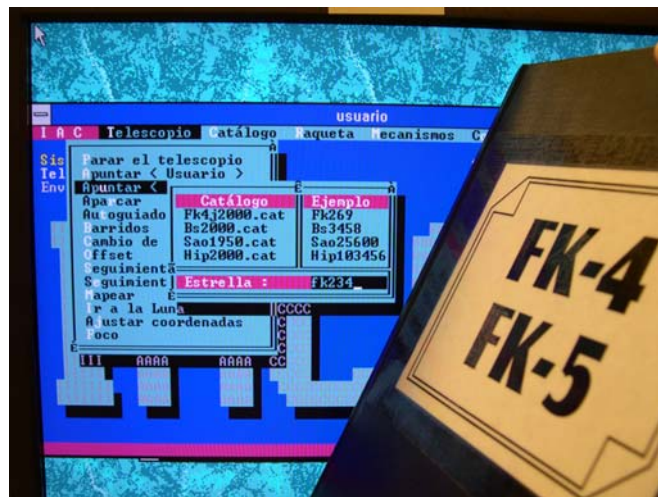


Figure 9: Pointing to a target of the Fundamental Star Catalogue (FK). A copy of this catalogue is available in the control room.

3.3. Parking the telescope

The option **Aparcar** (park) in the **Telescopio** menu has some pre-defined positions where to park the telescope. The more useful are **Zenit** (zenith) and **flats**, optimized to take dome flats (see figure 10). This last position, however, is not available in the TCS where dome flats are usually taken with the telescope parked in the zenith.



Figura 10: Parking positions.

3.4. Offsetting the telescope

Small offsets can be applied to the telescope by using the hand paddle (see **figure 11**). By default, the hand paddle buttons have the following functions: **F1: performs offsets of 1''**; **F2: offsets of 10''**; **F3: offsets of 1'**; F4 and F5 perform continuous motion (F5 faster than F4). The parameter **Raqueta** (hand paddle) should be **ON** (see **figure 7**).



Figure 11: hand paddle used to perform small offsets.

3.5. Stopping the telescope

To stop the telescope select the option **Parar el telescopio** (stop the telescope) in the **Telescopio** menu.

3.6. Focussing the telescope

The observer can change the telescope focus selecting the option **Foco** (focus) and **Posicionar** (positioning) in the **Telescopio** menu (see **figure 12**). Typical focus values are **20000 units for CAMELOT** and **21800 for TCP**. For focusing, try steps of 25 or 50 units.



Figure 12: Task *foco* in the *Telescopio* menu.

4. THE DOME

Although the night assistants are in charge of starting up and closing down the telescope all the nights of the run, the user should know how to close (and open) the dome in case of, for example, sudden bad weather.

4.1. Opening the dome

- 1) Check that **the mirror covers are closed before opening the dome**. If they are not, go the **Mecanismos** (mechanisms) menu and select the options **Pétalos** (mirror covers) and **Cerrar** (close) in the IAC80 telescope control PC (see **figure 13** top). In the TCS telescope, however, the mirror cover should be closed by hand into the dome.
- 2) Go to the **Mecanismos** (mechanisms) menu and select the option **Ventana** (upper hatch) and **Totalmente Abierta** (totally opened - see **figure 13** bottom left).
- 3) The lower hatch is coupled to the upper hatch so wait some seconds before opening it. Then, go again to the **Mecanismos** menu, select the option **Compuerta** (lower hatch) and **Abrirla** (open it – see **figure 13** bottom right).



Figura 13: *Mecanismos* tasks: mirror covers and upper and lower hatches.

4.2. Closing the dome

- 1) Check that **the mirror covers are closed before closing the dome**. If they are not, proceed as has been explained in section 4.1.
- 2) Go to the ***Mecanismos*** menu, select the option ***Compuerta*** (lower hatch) and ***Cerrarla*** (close it).
- 3) Again in the ***Mecanismos*** (mechanisms) menu select the option ***Ventana*** (upper hatch) and ***Totalmente Cerrada*** (totally closed).

4.3. Moving the dome

The dome window can be placed at any position using the options ***Cúpula*** (dome) and ***Posicionar*** (place) and then selecting the azimuth angle. The dome window is oriented to the North if the azimuth angle is 0° and to the East when this angle is 90° (see **figure 14** left).

4.4. Putting the dome in automatic mode

Remember to put the dome in automatic mode just after start working. Otherwise, the dome window will not follow the movement of the telescope. To do so, go to the ***Mecanismos*** menu and select the options ***Cúpula*** (dome) and ***Automática*** (automatic – see **figure 14** right).



Figure 14: Cúpula menu: moving and putting the dome in automatic mode.

5. THE INFORMATION PANEL

5.1. Informative mode

The information panel, shown in **figure 15**, displays the following fields:

1) Tiempo (time):

- **TU** (universal time)
- **TS** (sidereal time)
- **Fecha** (date)
- **Época** (epoch)
- **Día Jul** (Julian date)

2) Sistema de Control (control system)

- **AR** (right ascension)
- **DEC** (declination)
- **AH** (hour angle)
- **Z** (zenith distance)
- **Masa de Aire** (air mass)
- **T. al límite** (time to the limit): see **section 3.1**.
- **Estado** (status): see **section 3.1**.
- **Err. AR**: see **section 3.1**.
- **Err. DEC**: see **section 3.1**.
- **Raqueta** (hand paddle): see **section 3.4**.
- **Incr. Vel. Seg. ("/h)** [increase in tracking speed ("/h)]: see point 3 in **section 2.1**.



Figure 14: The information panel.

3) Cúpula (dome)

- **Az. Cup** and **Tel** (azimuth of the dome and telescope): when observing these angles should be similar. Otherwise the dome could vignette the images.
- **Ventana** (upper hatch): this value is 0 when the upper hatch is completely opened and 90 when it is closed.
- **Compuerta** (lower hatch): this field will display **Cerrada** or **Abierta** when lower hatch is closed and opened, respectively.
- **Foco, Pos** (focus): displays the current focus value.
- **Pétalos, Estado** (mirror covers): this field will display **Cerrado** or **Abierto** when mirror covers are closed and opened, respectively.
- **Est. Meteorológica** (weather station):



presión (pressure), **Hum Int/Ext** (inner/outer humidity), **Temp. Int/Ext** (inner/outer temperature), **Viento** (wind).

5.2. Guiding mode

When the autoguider is on, the panel changes to the image shown in **figure 16**. The histogram displays the error in guiding where the radius of the small circle is 1 arcsec.

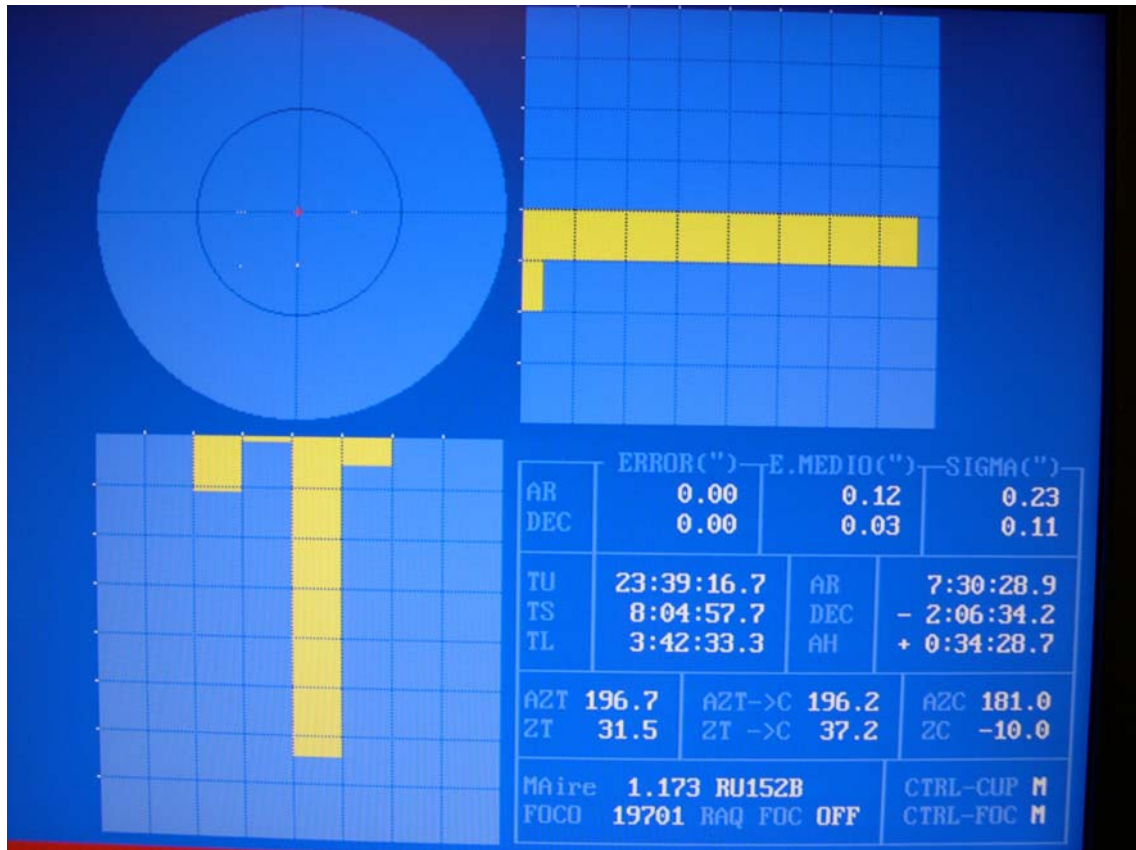


Figure 16: The information panel in guiding mode.

In any case, it is possible to come back to the information panel even when guiding is on. To do so, go to **Displays** in the main menu and select **Informativo** (informative – see **figure 17**). The panel will display **Guiando** (guiding) in the **Estado** (status) field.



Figure 17: Changing the display to the informative mode.

6. GLOSSARY OF TERMS SPANISH/ENGLISH

6.1. Telescope control

Spanish	English
Abrir	To open
Aceptar	Accept
AH (Ángulo Horario)	Hour Angle
Ajustar coordenadas	To fix coordinates
Aparcar	To park telescope
Apuntar (catálogo)	To point (catalogue)
Apuntar (usuario)	To point (user)
Archivo	File
Archivo binario	Binary file
Ascensión Recta (AR)	Right Ascension
Autoguiado	Autoguiding
Automático	Automatic
Barridos	Scans
Cambiar clave	Change key
Cambio de rayo	Beam changing
Catálogo	Catalogue
Cerrar	To close
Compuerta	Lower Hatch Shutter
Configurar	Setup
Control sistema Cúpula	Dome system control
Cúpula	Dome
Declinación	Declination
Día Jul	Julian Date
Editar	To edit
Eliminar Reg. Actual	Delete current entry
Eliminar Reg. Seleccionados	Delete selected entries
Época	epoch



Est. Meteorológica	Weather station
Estado	Status
Extractores	Dome extractor fans
Fecha	Date
Foco	Focus
Guardar	To save
Guardar como	To save as
Hum Int/Ext	Humidity internal/external
Introducir	To enter
Ir a la luna	To go to the moon
Mapear	To survey
Masa de Aire	Air Mass
Mecanismos	Mechanisms
Modificar	To modify
Nuevo	New
Objetos	Objects
Ordenar	To sort
Paralaje	Parallax
Parar Cúp, Comp y Vent	Stop dome, lower hatch and upper hatch
Parar el Telescopio	Stop tracking
Pétalos	Mirror Covers
Posicionar	To place/To position
Presión	Pressure
Raqueta Foco	Focus paddle
Raqueta telescopio	Telescope Paddle (hand paddle)
Seguimiento	Tracking
Seguimiento con bucle	Loop tracking
T. al limite	Time to the limit
Teclado	Keyboard
Temp. Int/Ext	Temperature internal/external
TS (Tiempo Sidéreo)	Sidereal Time
TU (Tiempo Universal)	Universal Time
Utilidades	Utilities
Vel. Radial	Radial velocity
Ventana	Upper Hatch Shutter
Viento	Wind
Z (Distancia al zenith)	Zenith Distance



6.2. FOVIA-II

Spanish	English
Aceptar	To accept
Activar	To put on
Autocámara	Autocamera
Autoenfoco	Autofocus
Autoguiado	Autoguiding
Autosensibilidad	Autosensitivity
Borar marcas	Delete Marks
Borrar ventanas	Delete Windows
Botonera	Button bar
Cámara	Camera
Cambio de rayo	Beam changing
Centroide	Centroid
Correlación	Correlation
Definir Home Cámara	Define Home camera
Definir Home Foco	Define Home focus
Desactivar	To put off
Distancia entre puntos	Distance between points
Foco	Focus
Frecuencia	Frequency
Ganancia	Gain
Guardar imagen como	To save image as
Histograma	Histogram
Incrementos Señal de Guiado	Increases in the guiding signal
Marcas	Marks
Máximo	Maximum
Método guiado	Guiding method
Número de Imágenes de Integración	Number of Integration Images
Opciones	Options
Posición cursor	Cursor position
Posición rayos	Beam position
Posición referencia	Reference position
Raqueta cámara	Camera Paddle
Salir	To exit
Sensibilidad	Sensitivity
Ventanas	Windows