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WHT ISIS Control System User Guide

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Table of Contents

Chapter 1 Introduction

The purpose of this document is to provide a user guide to the ISIS control system which is hosted upon the W. H. T. instrument control system. It outlines the syntax and the semantics of the command line scripts which can be used to retrieve status or effect control over the mechanisms which constitute the ISIS spectrograph and it's polarisation unit. It also describes the use of the graphical control application which can be used to coordinate the operation of the ISIS instrument.

The intended target audience of this document is the observer who will have to use the system operationally and the operations team engineers.

Chapter 2 Glossary

This section contains a glossary of the terms which are used throughout the document.

2.1 MIMIC

A **MIMIC** is *graphical* representation of a *system* which updates in realtime to continually reflect the current state of the underlying hardware system. There are many applications for such an application at the observatory, much of the hardware deployed at the ING benefits from a graphical representation of it's state.

2.2 GUI

A graphical interface which will permit the user to control the mechanisms which comprise the ISIS 4MS system in addition to reporting status associated with the 4MS microprocessor.

2.3 Cassgrain Acquisition and Guidance Box

The cassegrain acquisition and guidance box (CAGB) is an instrument which is physically located above the ISIS instrument and is used in conjunction with the ISIS spectrograph during night-time science operations. A user guide to the system is provided in the document [WHT-CAGB-6].

2.4 4MS

The mechanisms associated with the acquisition and guidance system are controlled by a 4MS embedded microprocessor system which is FORTH based. Communication between the high-level software control system and the embedded system is via a RS232 serial communications link.

2.5 EPICS system

EPICS is a software framework which is used for developing embedded systems and the applications which will be used to control them. EPICS is used in a number of systems within the WHT including the ISIS polarisation unit.

2.6 The ISISP Polarisation Unit

The ISISP polarisation unit is an EPICS based system which can be considered a subsystem of the ISIS system. The control electronics for ISISP are distinct from those that control the main ISIS spectrograph. Even though the systems are distinct, together they constitute the ISIS system and should be considered as a whole.

2.7 Filter management system

This is a database based system which is used to track the locations of all of the filters which are currently being used at the ING. Supports astronomers have the responsibility of ensuring that for each filter mechanism associated with the ISIS and CAGB instrumentation, the details of the filters which are located in those mechanisms is accurate.

For more information relating to the filter management system refer to the document [WHT-FILTDB-2]

2.8 Controls

In the context of the graphical user interface, a *control* is a *graphical device* upon the interface which can be used to *effect control* over some aspect of the instrument with which it is associated. These controls can take many different forms depending on the intended function of the control.

Chapter 3 Command line scripts

This chapter outlines the various command line based scripts which can be used from the instrument control system console (normally the *whtics* machine) to control components of the ISIS spectrograph.

3.1 Online Help Information

All of the commands listed in this chapter honour the **-h** option which when specified, will result in help information for the command being printed on the console.

3.2 Error reports

Any errors which are encountered by the ISIS system in response to a request from one of the command line scripts will be duly relayed back to the console and the *talker* log.

On successful completion of a command line script, the script will return a status of 0. Any other status value returned should be considered an *error* status.

Status relating to the progress of the commands will be sent to the *talker* log so there is a permanent record of what actions have been performed upon the ISIS system.

3.3 The *bcoll* command

This command can be used to position the collimator on the blue arm. The syntax of the command is as follows;

```
bcoll <demanded position>
```

The position should be specified in units of *microns* and be in the range of 0 to 52000.

3.4 The *bfilta* command

This command can be used to select a filter in the *blue filter A* mechanism. The syntax of the command is as follows :

```
bfilta <filter name|filter position>
```

Should the filter *position* be specified, it should be in the range of 1 to 3. Alternatively the user may specify the *name* of the filter in the filter mechanism. The name should correspond with the names of one of the filters which have been specified in the filter management system for this specific filter mechanism.

3.5 The *bfiltb* command

This command can be used to select a filter in the *blue filter B* mechanism. The syntax of the command is as follows :

```
bfiltb <filter name|filter position>
```

Should the filter position be specified, it should be in the range of 1 to 3. Alternatively the user may specify the name of the filter in the filter mechanism. The name should correspond with the names of one of the filters which have been specified in the filter management system for this specific filter mechanism.

3.6 The *bfold* command

The *bfold* command can be used to control the *blue fold* mechanism. The syntax of the command is as follows :

```
bfold <position>
```

The position can be specified either in engineering units in the range of 0..2 or the user may specify one of the three logical positions :

- Clear

- Mirror

- Dichroic

3.7 The *bgrat* command

The *bgrat* command can be used to position the blue grating mechanism.

The syntax of the command is as follows :

```
bgrat <position>
```

The desired position of the grating should be specified in units of 0.01 degrees. This command is principally an engineering command. The Observer should set the central wavelength for the blue arm using the *cenwave* command (see 3.9).

3.8 The *bhart* command

The *bhart* command can be used to control the blue Hartmann shutters.

The syntax of the command is as follows :

```
bhart <demanded position>
```

The position can be specified using an engineering value in the range of 0..2 or by specifying one of the following logical values :

Logical value	Engineering value	Semantics
Out	0	Remove the Hartmann shelter from the optical path.
L	1	Position the left Hartmann shutter in the optical path
R	2	Position the right Hartmann shutter in the optical path
LR	3	Position both Hartman shutters in the optical path.

3.9 The *cenwave* command

The *cenwave* command can be used to define the *central wavelength* for the specified arm for the current grating.

The syntax of the command is as follows :

```
cenwave red|blue <central wavelength specified in Ångstrom>
```

The actual positioning of the grating mechanism is determined by the physical characteristics of the grating (such as lines per mm). It is important to ensure that the observer has correctly declared to the system the names of the grating which are currently in the blue and red arm. This can be done using the *setgrating* command (see 3.62).

3.10 The *change* command

This command no longer exists under the UNIX control system as a *change* command already exists in the UNIX based ICS name space. Instead, the following commands can be used to change filters, gratings and dichroics.

- isis_change_filter (see 3.34)
- setgrating (see 3.62)
- setdichroic (see 3.59)

3.11 The *dekker* command

The *dekker* command can be used to select a given *dekker* in the dekker mechanism. The syntax of the command is as follows :

```
dekker <engineering position | logical name>
```

The *dekker* selected can be specified in engineering units in the range of 1..9 or by using one of the following logical values (for the **standard** dekker set) :

- Out

- 20arcsec

- 1.2arcsec

- twin

- barred

- 0.3arcsec

- clear6

- clear7

- clear8

The logical names which can be used depend on the dekker set which is currently deployed within the ISIS instrument.

3.12 The *setdekkerset* command

The *setdekkerset* command can be used to set the *name* of the dekker set which is deployed in the ISIS instrument. The command takes a *single* argument which is the name of the dekker set which is deployed. Currently there are two dekkers sets; *polarisation* and *standard.*

More dekker sets can be created but this must be done by the software group by adding to the database table **DEKKERSET** in the ICS RDBMS.

3.13 The *fcp_out* command

This is a convenience command which can be used to position the field-calcite-polaroid slide into the *clear* position. This command takes no arguments.

3.14 The *fcp* command

The *fcp* command can be used to control the field-calcite-polaroid slide mechanism in the ISIS instrument. The command takes a single argument which can be one of *clear, polaroid, fieldlens* or *calcite.*

3.15 The *hwin* command

This command can be used to position the nominated half waveplate slide in the polarisation unit *into* the optical path. Should automatic focus correction be *enabled*, the telescope focus and/or the cassegrain television focus will be modified accordingly.

3.16 The *hwout* command

This command can be used to *remove* the nominated half waveplate slide in the polarisation unit from the optical path. Should automatic focus correction be *enabled*, the telescope focus and/or the cassegrain television focus will be modified accordingly.

3.17 The *hwa* command

This command can be used to set the *angle* of the nominated half waveplate in the polarisation unit. The command takes a single argument which is the *demanded angle* in degrees and should be in the range 0..360.

3.18 The *hwprot* command

This command can be used to set the *rotation speed* of the nominated half waveplate mechanism in the polarisation unit. The command takes a single real argument which is the rotation speed in *Hertz* and should be in the range of 0..1.

Should the user want to *stop* the waveplate rotating, the value **stop** should be specified.

3.19 The *hwstop* command

This command can be used to *stop* the rotation of the nominated half waveplate mechanism in the polarisation unit.

3.20 The *imageslicer* command

The *imageslicer* command can be used to position the *image slicer* which is located in the slit unit mechanism into the light path.

3.21 The *inbcoll* command

The *inbcoll* command can be used to *initialise* the blue collimator mechanism.

3.22 The *inbfold* command

The *inbfold* command can be used to *initialise* the blue fold mechanism.

3.23 The *inbg* command

The *inbg* command can be used to *initialise* the blue grating mechanism.

3.24 The *indek* command

The *indek* command can be used to *initialise* the dekker mechanism.

3.25 The *infcp* command

The *infcp* command can be used to *initialise* the field calcite polarisation tray mechanism.

3.26 The *inhw* command

The *inhw* command can be used to *initialise* the nominated half waveplate angle mechanism. It does this by first stopping the rotation of the nominated half waveplate mechanism and then initialising it.

3.27 The *inqw* command

The *inqw* command can be used to *initialise* the nominated quarter waveplate angle mechanism. It does this by first stopping the *rotation* of the nominated quarter waveplate mechanism and then initialising it.

3.28 The *inrcoll* command

The *inrcoll* command can be used to *initialise* the red collimator mechanism.

3.29 The *inrfold* command

The *inrfold* command can be used to *initialise* the red fold mechanism.

3.30 The *inrg* command

The *inrg* command can be used to *initialise* the red grating mechanism.

3.31 The *inslit* command

The *inslit* command can be used to *initialise* the slit mechanism.

3.32 The *isis* command

This command can be used to start or stop **all** of the ISIS related software which is required to perform control of the ISIS and A&G instrumentation for observation purposes.

The syntax of the command is as follows :

```
isis start|stop
```

3.33 The *isis_begin* command

This command will be executed *after* the ISIS control system is started. It ensures that the mechanism status for the ISIS instrumentation is up-to-date in the instrument control system. Normally this command is executed automatically when the ISIS control system is started. It

also ensures that monitor mode has been enabled so that status from the 4MS instrument controller is continuously fed to the instrument control system.

3.34 The *isis_change_filter* command

The *isis_change_filter* command is a replacement for the *change* command which was present upon the VAX control system. The name of the command has been changed because of a name space clash within the UNIX instrument control system.

After executing the command, the slit door will be *unlocked* and the dekker mechanism will be positioned in the *out* position so as to facilitate access to the filter mechanisms for the Observer or engineer.

After the engineer/observer has changed the filter, the command will then *lock* the slit door mechanism and *reposition* the dekker mechanism back to its original position.

3.35 The *isis_config* command

The *isis_config* command can be used to conveniently set up the configuration of the ISIS instrument. It allows the observer to quickly specify the configurations of the red and blue fold mechanisms.

The command has the following syntax :

```
isis_config <position>
```

Where position can be one of the following values :

Value	*Semantic*
Red	Position the red fold in the mirror position and the blue fold in the clear position. All light will be reflected into the red arm.
Blue	Position the blue fold in the mirror position. All light will be reflected into the blue arm.
RedBlue	Position the red fold in the mirror position and the blue fold in the dichroic position. Light will be reflected into both the red and blue arms.
Fos	Position the blue and red fold into the clear position such that all light will pass to the FOS station (now redundant).

3.36 The *isis_end* command

This command will be executed when the ISIS control system is shut down when the observing system is stopped. On execution it will result in *monitor mode* on the ISIS 4MS controller being *disabled*. Normally this command is executed automatically by the system.

3.37 The *isis_filters* command

The *isis_filters* command can be used to display a summary of *all* of the filters which are currently positioned in the ISIS filter mechanisms.

3.38 The *isis_init* command

The *isis_init* command can be used to *initialise* the specified ISIS mechanism. The syntax of the command as follows :

```
isis_init -m <mechanism>
```

The mechanism specified can be one of the following :

- BLUECOLL
- BLUEFILTERA
- BLUEFILTERB
- BLUEFOLD
- BLUEGRATING
- FCPTRAY
- REDCOLL
- REDFILTERA
- REDFILTERB
- REDFOLD
- REDGRATING
- SLITUNIT

3.39 The *isisp_init* command

This command can be used to *initialise* any of the mechanisms which are to be found in the ISISP polarisation unit. The syntax of the command is as follows :

```
isisp_init -m <mechanism>
```

The list of valid mechanisms are as follows :

Mechanism name	Description
PHWSPIN	Half waveplate spin mechanism
PQWSPIN	Quarter waveplate spin mechanism
PHWANGLE	Half waveplate angle mechanism
PQWANGLE	Quarter waveplate angle mechanism
PQWSLIDE	Quarter waveplate slide mechanism
PHWSLIDE	Half waveplate slide mechanism

3.40 The *isis_move* command

This command can be used to position the specified mechanism to the demanded position. The syntax of the command is as follows :

```
isis_move – m <mechanism>  <position>
```

The following table details the valid mechanisms and the positions which can be specified for the *isis_move* command.

Mechanism	Valid positions
BLUECOLL	Position specified in microns in the range of 0..52000
BLUEFILTERA	Position specified in engineering units in the range of 0..2 or a valid filter name for that mechanism which has been defined in the filter management system (see [WHT-FILTDB-2])
BLUEFILTERB	Position specified in engineering units in the range of 0..2 or a valid filter name for that mechanism which has been defined in the filter management system.
BLUEFOLD	Position specified in engineering units in the range of 0..2 or one of the logical units; CLEAR, MIRROR or DICHROIC.
BLUEGRATING	Position specified in units of 0.001 degrees.
BLUEHARTMANN	Position specified in engineering units in the range of 0..2 or in one of the following logical units; OUT, L, R or LR.
DEKKER	The position specified in engineering units in

Mechanism	*Valid positions*
	the range of 0..9 or one of the following logical units; out, 20arcsec, 1.2arcsec, twin, barred, 0.3arcsec, clear6, clear7 or clear8.
FCPTRAY	The position specified in engineering units in the range of 0..3 or one of the following logical units; Clear, Polaroid, Fieldlens or Calcite.
MFSTRAY	The position specified in engineering units in the range of 0..1 or one of the following logical units; imageslicer or fibrefeed
MONITOR	The selected monitor mode which should be in the range of 0..2.
NET	No arguments need to be specified. Results in a reset of the network layer on the 4MS being performed.
REDCOLL	Position specified in microns in the range of 0..52000
REDFILTERA	Position specified in engineering units in the range of 0..2 or a valid filter name for that mechanism which has been defined in the filter management system.
REDFILTERB	Position specified in engineering units in the range of 0..2 or a valid filter name for that mechanism which has been defined in the filter management system.
REDFOLD	Position specified in engineering units in the range of 0..1 or one of the logical units CLEAR or MIRROR.
REDGRATING	Position specified in units of 0.001 degrees.
REDHARTMANN	Position specified in engineering units in the range of 0..2 or in one of the following logical units; OUT, L, R or LR.
RES	No arguments need to be specified. Results in the 4MS system resetting itself.
SLIT	Position specified in engineering units expressed in microns in the range 25..5000
SLITDOOR	Either LOCK or UNLOCK in order to lock

Mechanism	Valid positions
	or unlock the slit door.
SLITUNIT	Position specified in engineering units in the range of 0..1 logic or one of the following logical units; IMAGE_SLICER or LONG_SLIT.
SLITARC	Width of the slit expressed in specified in arc seconds.

3.41 The *isisp_move* command

This command can be used to *move* any of the mechanisms which are to be found in the ISISP polarisation unit. The syntax of the command is as follows :

```
isisp_move -m <mechanism> <demand value>
```

The list of valid mechanisms are as follows :

Mechanism name	Description	Demand Values
PHWSPIN	Half waveplate spin mechanism	Rotation speed expressed in *hertz* and in the range of 0..1
PQWSPIN	Quarter waveplate spin mechanism	Rotation speed expressed in *hertz* and in the range of 0..1
PHWANGLE	Half waveplate angle mechanism	Angle of waveplate expressed in the range of 0..360
PQWANGLE	Quarter waveplate angle mechanism	Angle of waveplate expressed in the range of 0..360
PQWSLIDE	Quarter waveplate slide mechanism	Demanded position which can be either *in* or *out*.
PHWSLIDE	Half waveplate slide mechanism	Demanded position which can be either *in* or *out*.

3.42 The *isis_reprogram* command

The *isis_reprogram* command can be used to reprogram the SMDM boxes which are used to control various mechanisms within the ISIS instrument. The command has the following syntax;

```
isis_reprogram -m <mechanism>
```

The mechanism specified can be one of the following;

- BLUECOLLIMATOR
- BLUEFILTERA
- BLUEFILTERB
- BLUEFOLD
- BLUEGRATING
- BLUEXDISP
- DEKKER
- FCPTRAY
- REDCOLLIMATOR
- REDFILTERA
- REDFILTERB
- REDFOLD
- REDGRATING
- REDXDISP
- SLITUNIT
- ALL

Each SMDM module controls up to four mechanisms. When one of the mechanisms associated with a SMDM module is reprogrammed, consequently **all** of the other mechanisms which are associated with that unit will be *reprogrammed* automatically. Before these mechanisms can subsequently used, they must **all** be re-initialised.

This command is only intended to be used by engineers.

3.43 The *isis_stop* command

The *isis_stop* command can be used to stop the movement of a mechanism which is already in motion. The syntax of the command is as follows :

```
isis_stop -m <mechanism>
```

The valid mechanisms which can be specified are outlined in the table 3.40

3.44 The *isisp_stop* command

This command can be used to stop any of the mechanisms found in ISISP from moving. The command has the following syntax associated with it :

isisp_stop -m <mechanism>

Where the mechanism can be one of the following :

Mechanism name	*Description*
PHWSPIN	Half waveplate spin mechanism
PQWSPIN	Quarter waveplate spin mechanism
PHWANGLE	Half waveplate angle mechanism
PQWANGLE	Quarter waveplate angle mechanism
PQWSLIDE	Quarter waveplate slide mechanism
PHWSLIDE	Half waveplate slide mechanism

3.45 The *isis_update* command

The *isis_update* command can be used to request from the ISIS 4MS a status update from the specified mechanism. The syntax of the command is as follows;

```
isis_update -m <mechanism>
```

The valid mechanisms which can be specified are outlined in the table 3.40

3.46 The *longslit* command

The *longslit* command can be used to position the slit unit into the *long slit* position. This is a replacement for the *lslit* command which was previously found on the VAX control system but the name of the command had to be changed to do a namespace clash with an existing command in the UNIX ICS.

3.47 The *mslit* command

The *mslit* command can be used to position the slit unit into the *image slicer* position.

3.48 The *qwin* command

This command can be used to position the *nominated* quarter waveplate slide in the polarisation unit *into* the optical path. Should automatic focus correction be enabled, the telescope focus and/or the cassegrain television focus will be modified accordingly.

3.49 The *qwout* command

This command can be used to *remove* the *nominated* quarter waveplate slide in the polarisation unit from the optical path. Should automatic focus correction be enabled, the telescope focus and/or the cassegrain television focus will be modified accordingly.

3.50 The *qwa* command

This command can be used to set the *angle* of the *nominated* quarter waveplate in the polarisation unit. The command takes a single argument which is the *demanded angle* in degrees and should be in the range 0..360.

3.51 The *qwprot* command

This command can be used to set the *rotation* speed of the *nominated* quarter waveplate mechanism in the polarisation unit. The command takes a single real argument which is the rotation speed in *Hertz* and should be in the range of 0..1.

Should the user want to *stop* the waveplate rotating, the value **stop** should be specified.

3.52 The *qwstop* command

This command can be used to *stop* the rotation of the *nominated* quarter waveplate mechanism in the polarisation unit.

3.53 The *rcoll* command

This command can be used to position the collimator on the red arm. The syntax of the command is as follows;

```
rcoll <position>
```

The position should be specified in units of *microns* and be in the range of *0* to *30000*.

3.54 The *rfilta* command

This command can be used to select a filter in the red filter A mechanism. The syntax of the command is as follows :

```
rfilta <filter name|filter position>
```

Should the filter position be specified, it should be in the range of 1 to 3. Alternatively the user may specify the name of the filter in the filter mechanism. The name should correspond with the names of one of the filters which have been specified in the filter management system for this specific filter mechanism.

3.55 The *rfiltb* command

This command can be used to select a filter in the red filter B mechanism. The syntax of the command is as follows :

```
rfiltb <filter name|filter position>
```

Should the filter position be specified, it should be in the range of 1 to 3. Alternatively the user may specify the *name* of the filter in the filter mechanism. The name should correspond with the names of one of the filters which have been specified in the filter management system for this specific filter mechanism.

3.56 The *rfold* command

The *rfold* command can be used to control the *red fold* mechanism. The syntax of the command is as follows :

```
rfold <position>
```

The position can be specified either in engineering units in the range of 0..1 or the user may specify one of the three logical positions ;

• Clear

• Mirror

3.57 The *rgrat* command

The *rgrat* command can be used to position the red grating mechanism. The syntax of the command is as follows :

```
rgrat <position>
```

The desired position of the grating should be specified in units of *0.01 degrees*.

This command is intended to be used for engineering purposes. The observer should set the central wavelength for the red arm using the *cenwave* command (see 3.9)

3.58 The *rhart* command

The *rhart* command can be used to control the red Hartmann shutters. The syntax of the command is as follows :

rhart <position>

The position can be specified using an engineering value in the range of 0..2 or by specifying one of the following logical values :

Logical value	Engineering value	Semantics
Out	0	Remove the Hartmann shelter

Logical value	Engineering value	Semantics
		from the optical path.
L	1	Position the left Hartmann shutter in the optical path
R	2	Position the right Hartmann shutter in the optical path
LR	3	Position both Hartman shutters in the optical path.

3.59 The *setdichroic* command

This command can be used by the observer or the engineer to define the name of the *dichroic* which is positioned in the blue fold. The name of the dichroic will subsequently be inserted into the FITS files which are created for the ISIS instrument.

The syntax of the command is as follows;

```
setdichroic <dichroic name>
```

3.60 The *setfocus* command

This command can be used to change the behaviour of the *automatic focus correction* when either of the polarisation waveplate slides are moved *in* or *out* of the optical path.

The syntax of the command is as follows :

```
set_focus <focus mode>
```

where the focus mode can be one of the following :

Focus Mode	Description
None	No automatic focus action will be taken when either of the waveplate slides are moved.
TV	The focus of the cassegrain television camera will be modified when either of the waveplate slides are moved.
Telescope	The focus of the telescope will be modified when either of the waveplate slides are moved.
Both	Both the focus of the telescope and the cassegrain television camera will be

Focus Mode	Description
	modified accordingly when either of the waveplate slides are moved.

The focus offset which will be applied is fixed and will have been determined during commissioning of the instrument.

3.61 The *set_top_waveplate* command

The ISISP subsystem has *two* physical waveplates which are designated *top* and *bottom*. Occasionally it is desirable to *swap* the control of the *top* and *bottom* waveplate such that the electronics which are used to control the top waveplate are connected to the bottom waveplate and vice versa.

In order to ensure clarity of operation, the user refers to the *top* and *bottom* waveplate as either the *quarter* or *half* waveplate depending on which waveplate is located where. The mapping between the *quarter* and *half* waveplate and the *top* and *bottom* waveplate is configured using the *set_top_waveplate* command and has the following syntax :

```
set_top_waveplate <QW|HW>
```

For example, should the engineer designate the top waveplate to be associated with the quarter waveplate, commands such as *inqw* when executed, will physically move the *top* waveplate.

This command is essentially an engineering command and after the mapping of the top waveplate has been changed, the observing system **will need to be restarted**. Furthermore, intervention on the part of a software engineer will be required to modify the ISIS and ISISP *mimics* such that the configuration of the waveplates is correct.

It is **strongly discouraged** that the Observer uses this command without first consulting the engineering team.

3.62 The *setgrating* command

The *setgrating* command can be used to specify the *name* of the grating which is positioned in either the *red* or the *blue* arm.

The syntax of the command is as follows;

```
setgrating red|blue <grating name>
```

When the command is run, it will prompt the user should he require access to the grating door so as to physically change the grating. Should he respond in the *affirmative*, the command will then position the associated grating mechanism in the access position of *35000* microns. Only then should the engineer/observer attempt to replace the grating.

It is the responsibility of the observer to ensure that the grating is in the correct position for observing after this command has completed.

The name of the grating specified **must** correspond to one of the valid gratings which is currently entered into the grating table WHT ICS database. Should the grating that you specify be rejected as a valid grating name, you **must** get in contact with one of the members of the software group in order to update the database to include your grating and it's physical characteristics.

3.63 The *setgratingoffset* command

As part of the calculation of the central wavelength, there is an *offset constant* which is included into the calculation. It is basically an *offset* which is added to the result of the *central wavelength calculation* prior to moving the grating mechanism.

The *default value* for this offset is 0. This value may be changed using this command to fine tune the result of the central wavelength calculation.

The syntax of the command is as follows;

```
setgratingoffset <red|blue> <offset>
```

The *offset* should be specified as an integer value.

3.64 The *setgratingorder* command

The *setgratingorder* command is used to set the *grating order* associated with the *central wavelength calculation*. By default this value is set to 1 and should **only** be changed by support astronomers. The consequence of setting this value incorrectly is that the result of the *central wavelength calculation* will be incorrect.

The syntax of the command is as follows;

```
setgratingorder <red|blue> <order>
```

The *order* should be specified as a positive integer.

3.65 The *slit* command

The *slit* command can be used to set the *width* of the slit jaws.

The syntax of the command is as follows

```
slit <demanded slit width>|stop
```

The *demanded slit width* should be specified in *microns* and be in the range 25..5000.

Should the user specify *stop* on the command line, the command will stop the slit mechanism from moving should it already be in motion.

3.66 The *slit_door* command

The *slit_door* command will be used to *lock* and *unlock* the slit door to allow access to the inside of the instrument for filter changes etc.

The command takes the following syntax;

```
slit_door [-h] unlock|lock
```

3.67 The *slitarc* command

The slitarc command can be used by the Observer to specify the *demanded slit width* in arc seconds.

The syntax of the command is as follows

```
slitarc [-h] <demanded slit width in arc seconds>
```

Chapter 4 ISIS and A&G GUI Control Application

In addition to being able to be controlled through the WHT ICS console command line, the ISIS and A&G instrument (see [WHT-CAGB-6]) may also be controlled by means of a graphical user interface (GUI).

The following sections detail the GUI control application which can be used in order to do this.

4.1 Starting the GUI

Normally, as part of the startup sequence of the observing system, the control GUI for the ISIS instrument will be started automatically providing that the ISIS has been configured into the observing system by the engineers.

Should the user need to start the application manually, this can be done using the following command from the WHT OCS console command line *after* the observing system has been started.

```
4MSControl –panels ΅IS IS CAGB" &
```

4.2 Colour Coding

When a status value associated with a mechanism is in an *error* state, the text associated with the status item will be highlighted in red.

When a mechanism is *moving*, the control associated with that mechanism will be insensitive to user interaction and any text associated with it will be coloured blue.

Should there be an outstanding *warning* associated with a mechanism, any status text field associated with that mechanism will be highlighted with a yellow background.

4.3 Icons

A number of icons buttons are used throughout the GUI in order to perform specific tasks. Care has been exercised to ensure that the *meanings* of each of the icons is *consistent* across not just the control panels which are used to operate the ISIS instrument, but also the rest of the other instruments which are controlled by the same application.

A summary of the icons which are used within the application follows.

Icon	*Semantics*
	This icon signifies that when this button is pressed, the associated mechanism will be *initialised*.
	This icon signifies that when this button is pressed, the associated mechanism will *move*

Icon	*Semantics*
	to the demanded position.

Icon	*Semantics*
	This icon signifies that when this button is pressed, the displayed position of the associated mechanism will be updated to that of the *current* mechanism position and as such, will override any *demand* position which may have been entered by the user.

Icon	*Semantics*
	This icon signifies that when this button is pressed, the associated mechanism will be ***stopped*** should it be moving.

4.4 The ISIS Engineering Panel

The intended purpose of the ISIS engineering display is to provide the operations team members with extensive control over all of the mechanisms which comprise the ISIS instrument. It is not intended that the observer will use this panel during operations.
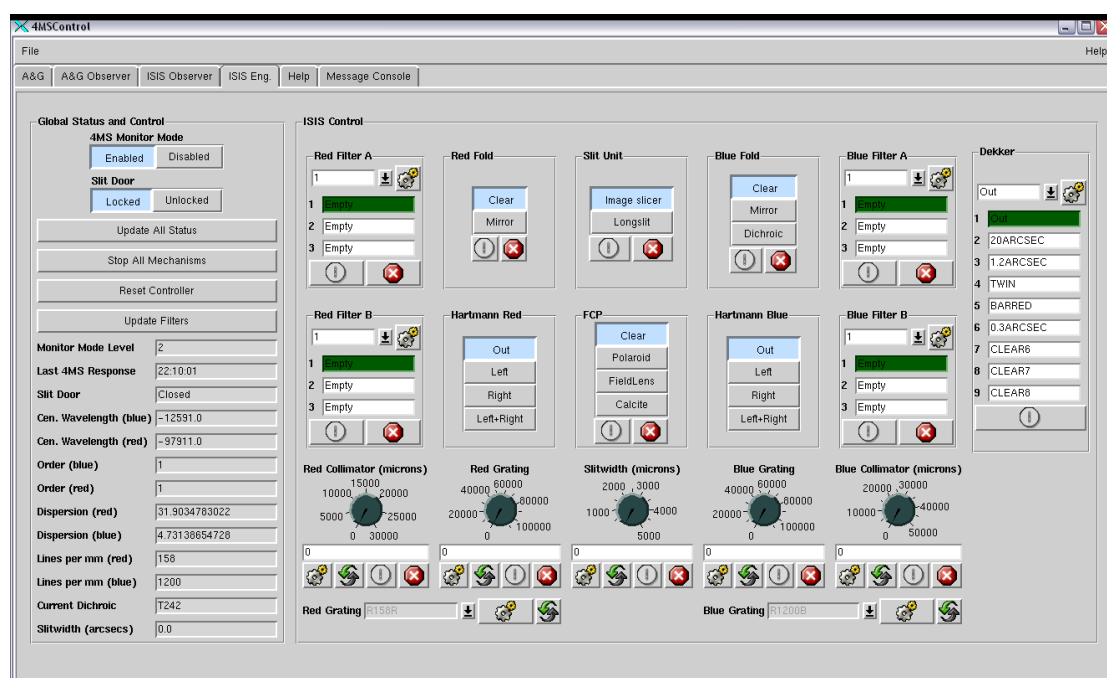
Illustration 1ISIS engineering panel

The panel is broadly divided into groupings of logically related sections. The following chapters outline each of the sections.

4.4.1 The Global Status & Control Section

From the *Global Status & Control* panel the user can review and control the global level commands and status associated with the ISIS instrument.

4.4.1.1 The *4MS Monitor Mode* Control

The user can *enable* or *disable* monitor mode within the 4MS mode. The normal mode of operation for the 4MS ISIS module is monitor mode *enabled*. With monitor mode *enabled*,

the embedded microprocessor system will *continually* report movements of mechanisms and thus allowing the high-level software to track the movements of the underlying mechanisms in the instrument.

The current value of the monitor mode is outlined in a status label at the bottom of the above panel. The highest level of monitor mode is *two* and the lowest is *zero*.

4.4.1.2 The *Slit Door* Control

The *slit door* control allows the user to *lock* and *unlock* the slit door located on the *side* of the ISIS instrument. The slit door needs to be unlocked in order to allow access to the inside of the instrument in order to change filters, gratings etc.

4.4.1.3 The *Update Filters* Control

The details of the *filter names* which are contained within the *filter mechanism graphical controls* in the instrument control panel are located in the filter management system. Should the support astronomer *change* a filter which is located in one of the mechanisms in the ISIS system in the filter management system, by pressing this button, the application will *refresh the names of the filters* which are presented in the filter controls on the control panel such that they are syncronised with those in the filter management system (see [WHT-FILTDB-2]).

4.4.1.4 The *Update All Status* Control

By pressing this button, the engineer can instruct the low-level embedded system to return the status of **all** of the mechanisms which are located within the instrument and subsequently update all of the displayed status in the ISIS related control panels and associated mimic.

4.4.1.5 The *Stop All Mechanisms* Control

By pressing the *Stop All Mechanisms,* the engineer can instruct the embedded microprocessor control system to stop all mechanisms which are currently in motion.

This command should be used with caution as certain mechanisms can lose their position as a consequence of being stopped and will subsequently need to be reprogrammed and reinitialised.

4.4.1.6 The *Reset Controller* Control

By pressing this button the engineer can instruct the 4MS embedded microprocessor control system to *reset* itself.

4.4.1.7 The *Last 4MS Response* Status Label

The ISIS software instrument controller system attempts to *handshake* with the 4MS embedded microprocessor system every 5 minutes. In the status field labelled *Last 4MS Response* is the time of the last successful handshake between the software controller and the instrument.

Illustration 2Global Status and Control Panel

4.4.2 The ISIS Engineering Control Panel

From the panel below, the observer or engineer will be able to control and review status for mechanisms which comprise the ISIS 4MS controlled system.
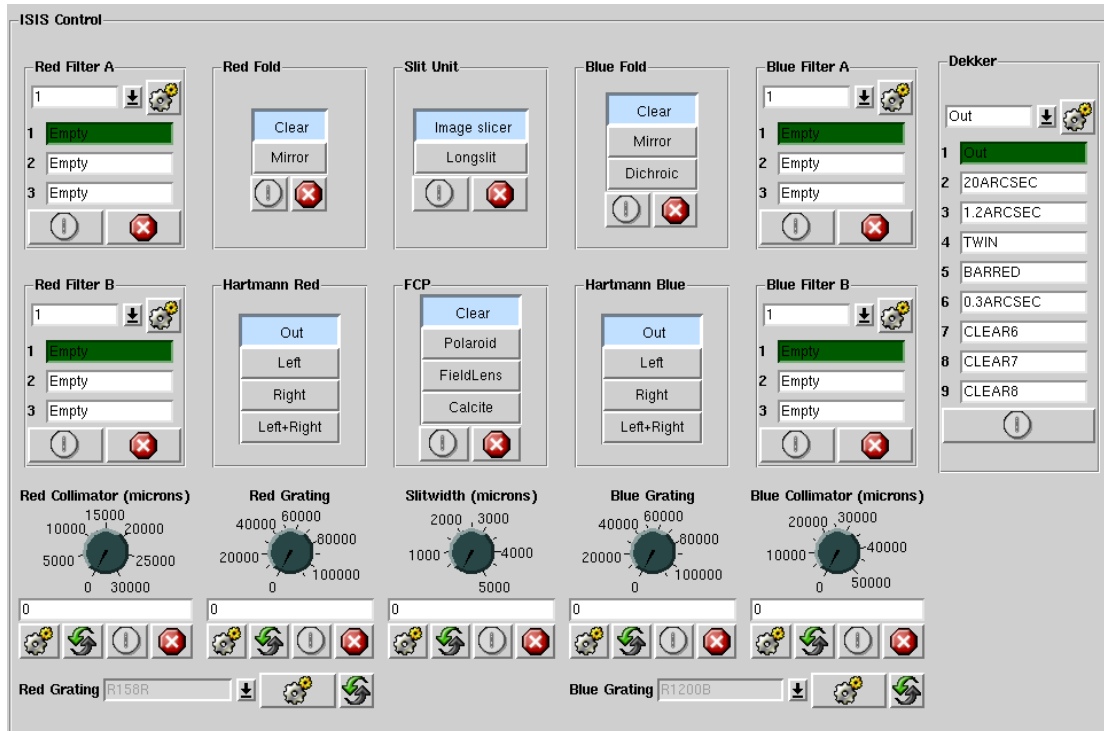
Illustration 3The ISIS mechanism control panel

4.4.2.1 The Filter Controls

All of the filters mechanisms located within the ISIS instrument are controlled in an identical manner. Each filter mechanism has three possible positions and the drop-down menu associated with each filter contains the names of the filters which are located in that specific mechanism.

The names of the filters which are displayed is determined by the filter management system (see [WHT-FILTDB-2]). It is the responsibility of the *support astronomer* to ensure that the names of the filters associated with these mechanisms is up to date.

4.4.2.2 The Blue Fold Control

The *blue fold control* will allow the engineer to position the *blue fold* mechanism.

The mechanism has three positions; *Dichroic*, *Clear* and *Mirror.* When the mechanism is in the *clear* position, *no* light is reflected into the blue arm of ISIS. Conversely, when the mechanism is in the *Mirror* or *Dichroic* position, light will be reflected into the blue arm.

4.4.2.3 The Red Fold Control

The *red fold control* will allow the engineer to position the *red fold* mechanism.

The mechanism has two positions; *Clear* and *Mirror.* When the mechanism is in the *clear* position, *no* light is reflected into the red arm of ISIS. Conversely, when the mechanism is in the *Mirror* position, light will be reflected into the red arm.

Note that in order to ensure that light reaches the red arm, it is also important to position the blue fold mechanism (see 4.4.2.2) into the *dichroic or clear* position also.

4.4.2.4 The Hartmann Shutter Controls

The *Hartmann shutters* which are associated with the red and the blue arms are controlled in an identical manner. The user may select either the *left* or *right* shutter or *both* of them by clicking on one of the buttons in the control and acknowledging the confirmation dialog that will subsequently be displayed.

It is important that prior to science operations, the observer or the engineer removes the Hartmann shutters from the optical path otherwise the amount of light reaching the science detectors will be reduced considerably.

The mimic which is associated with the ISIS instrument highlights the fact that the Hartmann shutters are in the optical path by *outlining* the light which is going into the science detectors in red.

4.4.2.5 The Slit Unit Control

The *slit unit* control allows the observer to position the slit unit in one of the two following positions; *long slit* or *image slicer*.

In order to select a new position, the Observer needs to simply click the button which is labelled with the desired position and then acknowledge the confirmation dialog which is subsequently displayed.

4.4.2.6 The FCP Tray Control

The FCP control allows the observer to control the position of the *field calcite polarisation tray* . The tray has four possible positions; *out, polaroid, calcite* and *fieldlens*.

In order to change the position of the mechanism the user should press on the button which is labelled with the desired position and then acknowledge the confirmation dialog which is subsequently displayed.

4.4.2.7 The *Collimator Position* Controls

The red and blue collimator controls are used to position the *collimator* mechanisms. Each of the controls behaves in exactly the same manner. The engineer can change the demand position of the collimator by either rotating the associated *dial* or entering the new position in the text field which is associated with the control.

The range of movement of the red collimator is *0-30000* microns and that of the blue collimator is *0-50000* microns.

4.4.2.8 The *Grating Position* Controls

The *red* and *blue grating controls* are used to position the gratings which are located in the red and blue arms. Each of the controls behaves in exactly the same manner. The engineer can change the *demand position* of the grating by either rotating the associated dial or entering the new position in the text field which is associated with the control.

The range of movement of the red grating is *0-100000* and that of the blue grating is *0-50000*. The units of movement are expressed in 0.001 degrees.

In order to position the gratings for science operations, the Observer should use either the *cenwave* command line script (see 3.9) or use the *cenwave* controls on the ISIS observer control panel (see 4.6).

4.4.2.9 The *Slitwidth* Control

The *slit width* control can be used by the engineer to adjust the *width* of the slit. The demand position for the width can be specified in *microns* and can be changed by rotating the control dial or by modifying the position in the text field which is associated with the control.

The range of movement for the slit width is *5-5000* microns.

4.4.2.10 The *Dekker* Control

The *dekker control* will allow the engineer to select a different dekker in the dekker tray. To change the position of the mechanism, the user needs to select the *demanded dekker position* from the drop-down menu associated with the control and then press the *move* button.

4.4.2.11 The *Grating Specifier* Controls

Located at the foot of the panel are two controls which allow the observer to specify the *names of the gratings* which are associated with the red and blue arm. It is **imperative** that the correct gratings are specified otherwise the central wavelength calculation will not function correctly.

When the name of a grating is changed, the ISIS instrument control system will re-calculate the position of the grating on the associated arm in accordance with it's physical characteristics so as the central wavelength for that arm is preserved.

The names of the gratings which can be selected are stored in the WHT ICS database and should the grating you require *not* be present in this list, you will need to contact a member of the software group in order to update the list of gratings.

4.5 The ISISP Engineering Control Panel

The purpose of this control panel is to provide engineering level of control of the ISISP subsystem of the ISIS spectrograph. All aspects of the ISISP control system can be controlled through this panel.
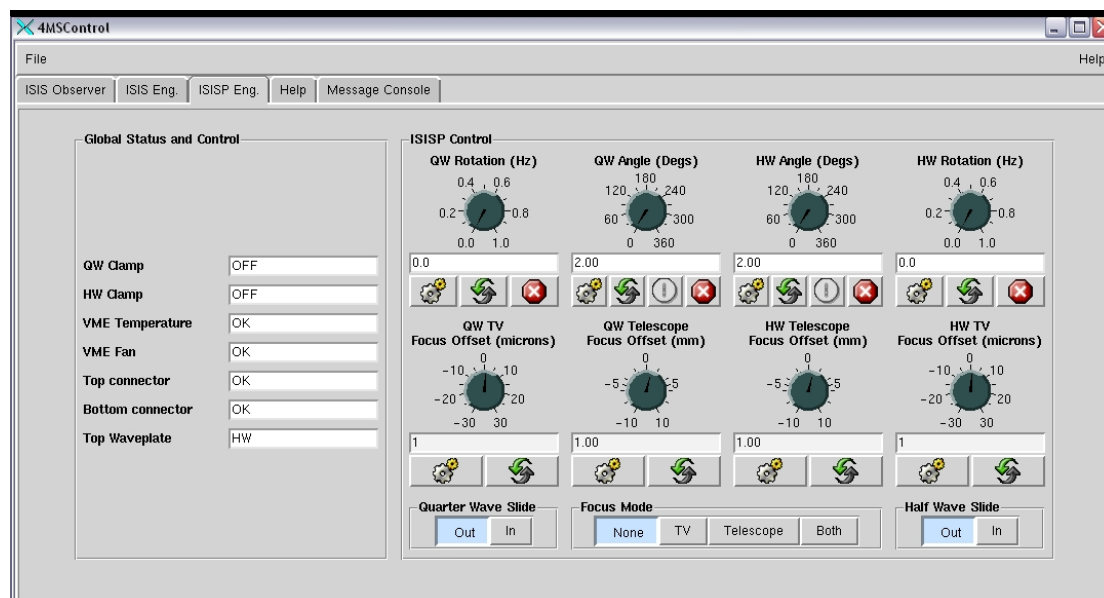

Illustration 4: ISISP Engineering Control Panel

4.5.1 The Global Status Panel

The purpose of this panel is to show read-only status information which comes back from the ISISP EPICS based instrument controller.
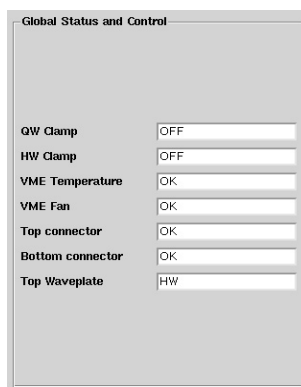

Illustration 5: ISISP Global Status Panel

4.5.1.1 The QW Clamp

This shows the state of the quarter waveplate clamp which can be either *on* or *off*.

4.5.1.2 The HW Clamp

This status item shows the state of the half waveplate clamp which can be either *on* or *off*.

4.5.1.3 The VME Temperature Status

This status item shows the temperature status of the VME chassis. The value displayed will be either *Ok* or *High* depending on whether the chassis temperature is within an acceptable range or not.

4.5.1.4 The VME Fan Status

This status item shows the fan status of the VME chassis. The value displayed will be either *Ok* or *Failed* depending on whether the fan within the VME chassis is working correctly.

4.5.1.5 The Top Connector Status

This status item shows the status of the *top connector* and whether it is okay or not.

4.5.1.6 The Bottom Connector Status

This status item shows the status of the *bottom connector* and whether it is okay or not.

4.5.1.7 The Top Waveplate Status

This status item shows the current configuration for the top waveplate mechanism. It shows whether the *quarter* or the *half waveplate* is positioned in the top waveplate mechanism.

4.5.2 The Quarter Waveplate Rotation and Angle Controls

These controls can be used to set the *angle* of the quarter waveplate or alternatively set the *rotation speed* of the quarter waveplate.

The controls look as follows :

Illustration 6: Quarter waveplate Rotation and Angle Controls

The quarter waveplate rotation speed is specified in *hertz* and can be in the range of 0 to 1. by specifying a rotation speed of *zero*, the user can stop the mechanism from rotating.

The quarter waveplate angle is specified in degrees and can be in the range of 0 to 360. Note that when the quarter waveplate mechanism is *rotating*, the value associated with the quarter waveplate angle is void.

4.5.3 The Half Waveplate Rotation and Angle Controls

These controls can be used to set the *angle* of the half waveplate or alternatively set the *rotation speed* of the half waveplate.
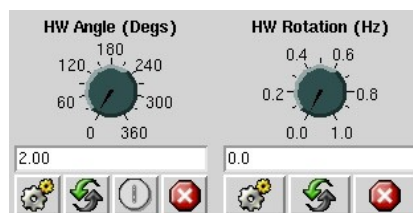
The controls look as follows :

Illustration 7: Half waveplate rotation and angle controls

The half waveplate rotation speed is specified in *hertz* and can be in the range of 0 to 1. by specifying a rotation speed of *zero*, the user can stop the mechanism from rotating.

The half waveplate angle is specified in degrees and can be in the range of 0 to 360. Note that when the half waveplate mechanism is *rotating*, the value associated with the half waveplate angle is void.

4.5.4 The Waveplate Slide Controls and Automatic Focus

The positioning of the waveplate slides *in* and *out* of the optical path can be performed using the waveplate slide control.
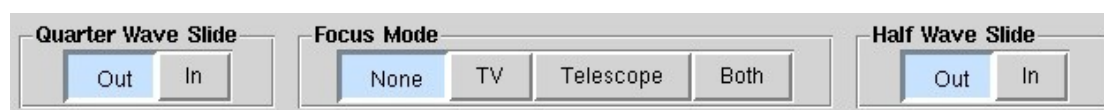

Illustration 8: Waveplate Slide Control

Automatic focus correction of the telescope and/or of the cassegrain television camera will be performed whenever one of the slides is positioned in or out of the optical path depending on the configuration of the automatic focus.

There are four modes of automatic focus correction available and these are listed in the following table :

Focus Mode	Description
None	No automatic focus action will be taken when either of the waveplate slides are moved.
TV	The focus of the cassegrain television camera will be modified when either of the waveplate slides are moved.
Telescope	The focus of the telescope will be modified when either of the waveplate slides are moved.
Both	Both the focus of the telescope and the cassegrain television camera will be modified accordingly when either of the waveplate slides are moved.

4.5.5 The Focus Offset Setting Controls

The engineer can specify the *focus offset* which is to be applied to the *telescope* and the *cassegrain television camera* when either of the quarter waveplate or half waveplate slides are positioned *in* or *out* of the optical path using the following control panel :
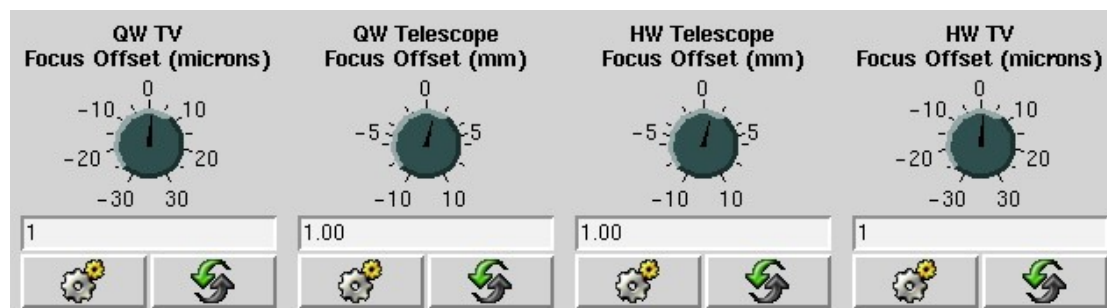
Illustration 9: Focus offset control panel

These values should be determined by an engineer at commissioning time and **should not be changed without first consulting the engineering team**.

The focus offset associated with the telescope should be specified as a positive or negative *real* value expressed in *millimetres*.

The focus offset associated with the cassegrain television camera should be specified as a positive or negative *integer* value which is expressed in *microns*.

4.6 The ISIS Observer Control Panel

The intended purpose of this panel is to provide the Observer with all of the controls which he will need to coordinate both the ISIS and A&G instrumentation during night-time science operations. This control panel contains a *subset* of the mechanism controls which are to be found on the engineering panels of both the ISIS and A&G instruments.

For more information relating to the control of the A&G instrument refer to [WHT-CAGB-6].

The following sections outline the controls which are to be found on this panel.

4.6.1 ISIS Related controls

Information relating to the operation of the majority of the ISIS specific controls in the *observer panel* can be found in the previous sections as they behave identically to those in the engineering panel.

4.6.1.1 The *slitwidth* Control

The *slitwidth* control will permit the Observer to specify the *width* of the slit expressed in arc seconds. The user can define the *demanded slit width* using the *dial* associated with the control and, by pressing the *move* button, can instruct the instrument control task to set the slit width accordingly.

4.6.1.2 The *Quarter Waveplate Rotation* Control

Using the *quarter waveplate rotation* control, the user can set the *speed* of rotation of the quarter waveplate mechanism. The demanded rotation speed should be specified in units of *hertz* and be in the range 0 to 1. By specifying a rotation speed of 0 hertz, the user can **stop** the movement of the mechanism. Once the demanded rotation speed has been specified, by pressing the *move* icon, the lower level ISIS polarisation unit will then start rotating the mechanism at the demanded speed.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.3 The *Quarter Waveplate Angle* Control

Using the *quarter waveplate angle* control, the user can set the *angle* of the quarter waveplate mechanism. The demanded angle position should be specified in degrees and be in the range of 0 to 360. Once the demanded angle position has been specified, by pressing the *move* icon, the low-level ISIS polarisation unit will position the mechanism accordingly.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.4 The *Half Waveplate Rotation* Control

Using the *half waveplate rotation* control, the user can set the *speed* of rotation of the half waveplate mechanism. The demanded rotation speed should be specified in units of *hertz* and be in the range 0 to 1. By specifying a rotation speed of 0 hertz, the user can stop the movement of the mechanism. Once the demanded rotation speed has been specified, by pressing the *move* icon, the low-level ISIS polarisation unit will then start rotating the mechanism at the demanded speed.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.5 The *Half Waveplate Angle* Control

Using the *half waveplate angle* control, the user can set the *angle* of the half waveplate mechanism. The demanded angle position should be specified in *degrees* and be in the range of 0 to 360. Once the demanded angle position has been specified, by pressing the *move* icon, the low-level ISIS polarisation unit will position the mechanism accordingly.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.6 The *Quarter Waveplate Slide* Control

The *quarter waveplate slide* control can be used to position the nominated quarter waveplate slide into and out of the optical path. Depending if the ISISP control system has been set up to perform *automatic focus correction*, the focus of the telescope and the cassegrain television camera will be adjusted accordingly.

The automatic focus mode to be used can be set using the *setfocus* command outlined in section 3.60.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.7 The *Half Waveplate Slide* Control

The *half waveplate slide* control can be used to position the nominated half waveplate slide into and out of the optical path. Depending if the ISISP control system has been set up to perform *automatic focus correction*, the focus of the telescope and the cassegrain television camera will be adjusted accordingly.

The automatic focus mode to be used can be set using the *setfocus* command outlined in section 3.60.

A confirmation window will be presented to the user prior to moving the mechanism to ensure that this was the intention.

4.6.1.8 The *cenwave* Controls

The red and blue *cenwave* controls can be used to define a *central wavelength* specified in Ångstroms for the blue and the red gratings. The user can define the *demanded wavelength* using dials associated with the controls and by pressing the *move* button, can instruct the instrument control task to calculate the position of the grating.

In order to perform this calculation correctly, it is **<u>important</u>** that the Observer has previously defined the gratings which are currently located in the red and the blue arm (see 3.62).

4.6.2 The A&G Mechanism Controls

The ISIS spectrograph is used in conjunction with the cassegrain Acquisition and Guidance system (A&G). It is therefore logical that the observer should be able to control both instruments from the same panel.

The following sections outline the controls upon the ISIS observer panel which are related to the A&G box (see [WHT-CAGB-6]).

4.6.2.1 The *Comparison Lamps ND Setting* Control

This control allows the user to specify a *demand neutral density setting* between zero and five. The user may specify the demand value either by turning the associated dial control or by entering the neutral density setting manually through the text field.

To affect the new neutral density setting, the user should press the *move* icon. The instrument controller will then attempt to select neutral density filters in the comparison system neutral density filter mechanisms such that the combined effect of *both* of the filters amounts to as close as possible, the neutral density setting demanded by the user.

4.6.2.2 The *AUX Filter* Control

This *AUX Filter* control allows the user to select which filter is currently selected in the auxiliary filter mechanism. The user should select the *demanded filter* from the drop-down menu and then press the *move* icon to effect the move.

4.6.2.3 The *Main Colour Filter* Control

This *main colour filter* control allows the user to select *which* filter is currently selected in the main colour filter mechanism. The user should select the *demanded filter* from the drop-down menu and then press the *move* icon to effect the move.

4.6.2.4 The *Main ND Filter* Control

This *main neutral density filter* control allows the user to select *which* filter is currently selected in the main neutral density filter mechanism. The user should select the *demanded filter* from the drop-down menu and then press the *move* icon to effect the move.

4.6.2.5 The *Lamps* Control

The *lamps control* allows the user to illuminate any combination of the *three* currently available lamps in the calibration system. The user can select the lamps that he wants illuminating by depressing the button with the corresponding lamp name. In order to effect the change, the user should press the *move* icon.

Due to a hardware problem in the low-level embedded microprocessor system, sometimes it will be necessary to repeat this process up to **two or three times** before the lamps will be illuminated.

4.6.2.6 The *Mirror* Control

Using the *mirror control,* the observer can specify *which* of the mirrors in the A&G system is to be positioned in the optical path. In order to position a mirror into the path of the beam, the user should press the button which is labelled with the desired mirror name. A confirmation window will be presented to the user prior to moving the mirror to ensure that this was the intention.
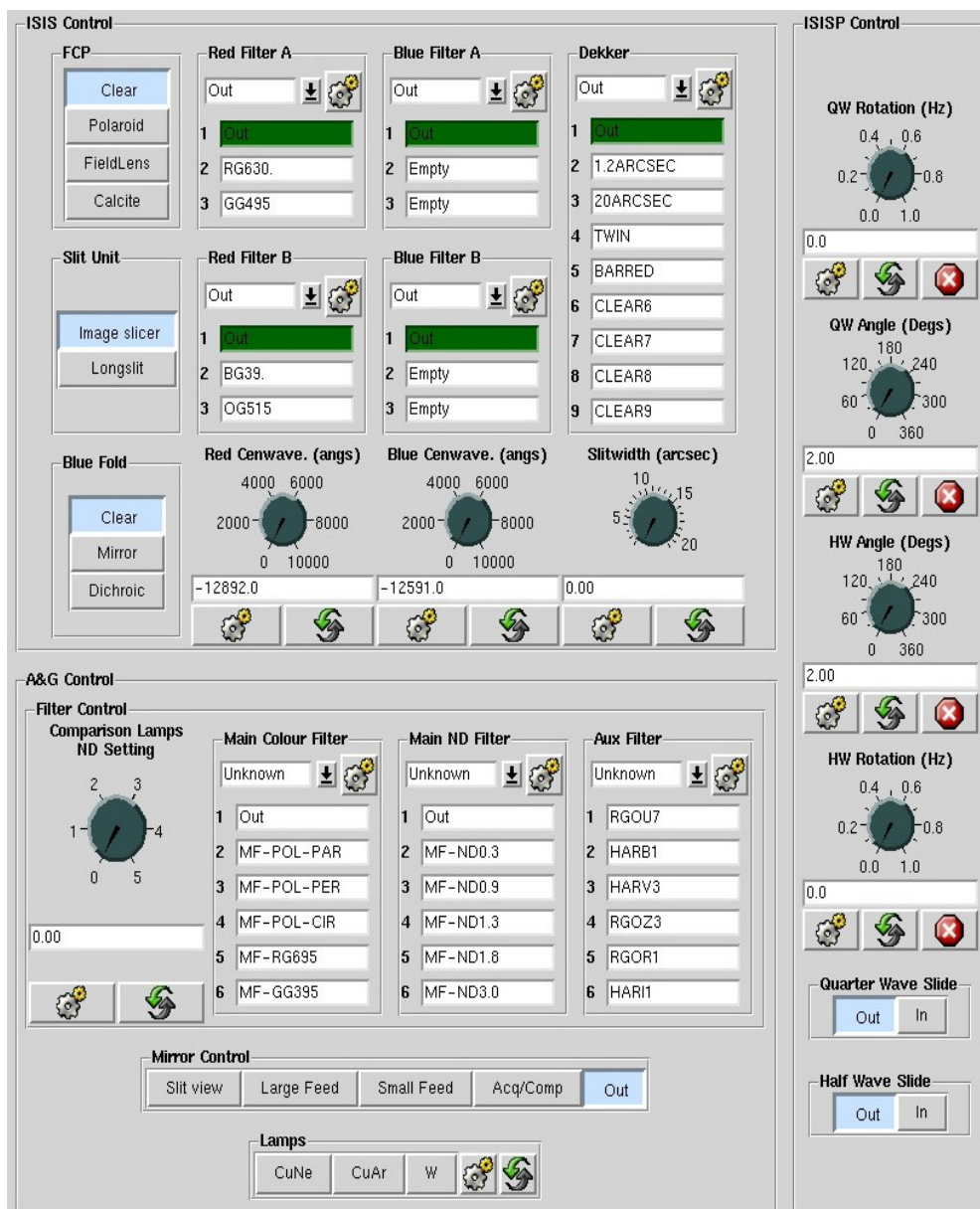
Illustration 10: ISIS Observer Control Panel

Bibliography

WHT-CAGB-6: Craige Bevil, WHT A&G System User Guide, 2005
WHT-FILTDB-2: Craige Bevil, User Guide to the Filter Management System, 2004