PFIP Controller
Solaris Software User Guide

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INTRODUCTION

The control software for the prime focus instrument platform (PFIP) has been reengineered to function upon the UNIX operating system. Consequently all of the PFIP control applications which were previously hosted on the VAX computer system are now redundant. It was intended that all of the existing functionality of the previous VAX based system be transferred to the new Solaris based system. All control of the PFIP instrument therefore will now take place from the UNIX whitics console window on taurus.

This document outlines the new software which will be used to control the prime focus instrument platform and how the observer may utilise it for both observational and engineering purposes.
1.1 Definitions, acronyms and abbreviations

1.1.1 Instrument controller software
A central software-based server task which is hosted on the WHT ICS machine will be responsible for managing all of the communication along the serial line to the 4MS PFIP microprocessor. This is a pure Java application which permits client software such as the instrument control GUI to affect control on the 4MS system. It also provides the packet collection mechanism with the means to acquire PFIP related header information.

1.1.2 PFIP Control GUI
This is a graphical user interface (GUI) application which affords the user complete control over all aspects of the PFIP instrument control system.

1.1.3 Talker Log
An application which is used to monitor the messages which are produced by the software within the observing system by the observer.

1.1.4 Action
Any attempt by the Observer to control any aspect of the system will result in an action being started within the PFIP instrument controller task. Sometimes these actions will be quite simple such as moving the autoguider focus slide and other times, these will be complex compound actions such as the move of the main filter wheel which will result in not only the autoguider focus slide being changed but also the telescope focus as well.

1.1.5 PFIP Instrument Control Scripts
As with the VAX system, the new implementation of the control system contains a number of scripts which may be used by the Observer from the command line in place of using the control GUI. By and large the scripts are very similar to the existing scripts on the VAX system in an attempt to reduce the learning curve for new users of the revised system.

1.1.6 4MS Control Widget
A mechanism control widget. A standard set of widgets have been developed specifically to control 4MS mechanisms. The aim of this is to provide the Observer with a standard looking interface to all of the mechanisms irrespective of the 4MS instrument it is associated with.

1.1.7 Digi PortServer
A portserver permits RS232 based devices to be controlled over a standard local area network. Portservers are deployed in numerous stations around the W. H. T. and are used for conveying data backwards and forwards to network-aware applications such as the 4MS instrument controllers.

Each portserver can control up to 16 individual RS232 devices.

1.1.8 Parameter Noticeboard
The parameter noticeboard is a status monitor application which is hosted on the WHT ICS computer and contains a complete mirror of all the status information related to the PFIP instrument control
system. All third-party applications which require PFIP related status information will query this status monitor application in order to ascertain PFIP status. It will be the responsibility of the PFIP instrument control system to ensure that the status information which is contained in the parameter noticeboard is current.
2PFIP User Guide

This chapter is intended for the end-users of the system such as the observers and engineers. It provides a guide to all of the applications which may be used to affect control over the PFIP 4MS system from both an operational and engineering perspective.

2.1 Starting The System

If the observing system has been configured accordingly, starting the PFIP instrument controller system will simply be a case of executing a `startobssys` command from the WHT ICS console window. This will start up all necessary software responsible for the control of the PFIP instrument.

A trace of the software as it starts will be entered into the standard UNIX `talker` log.

2.2 Stopping the System

If the observing system has been configured accordingly, stopping the PFIP instrument controller system will simply be a case of executing a `shutdownobssys` command from the WHT ICS console window. This will stop all software responsible for the control of the PFIP instrument.

A trace of the software as it terminates will be entered into the standard `talker` log.

2.3 Error Reporting

All errors and warnings produced by the system will be logged automatically in the UNIX `talker` log. Critical errors will be entered into the `talker` log as alarms. The user will be informed of alarms by the `talker` log by means of a flashing dialogue box accompanied by an audible alarm.

When the user attempts to perform an action on the PFIP system using the PFIP GUI and there is an error, the user will be informed by means of a **dialogue window**. Furthermore, if the action that the user requested was associated with a mechanism, the **mechanism control widget** which is associated with that mechanism will be highlighted with a **red** background. Should an error occur when the user attempts to perform an action, one should assume that the action did not complete and should therefore verify the state of the system before proceeding.

Should a minor error occur whilst the system is attempting to perform an action, an error will be entered into the `talker` log. Should the warning be associated with a **mechanism** within the instrument, any mechanism control widget associated with that mechanism will be highlighted with a **yellow** background. A **warning** implies that the demanded action completed successfully and is reported for informational purposes only.

2.4 The PFIP Control GUI

The purpose of this application is to provide a graphical representation of the current status of the PFIP instrument control system and also to allow the user to **move** any of the mechanisms associated with the instrument or customise the behaviour of the instrument controller task. Control is afforded through a number of **standard control widgets** which are present on the interface. These controls function in a **predictable** and **standard** manner in order to facilitate the familiarity with the operation of not only this control interface but also of the control interfaces which are to be developed for the other 4MS control systems.
2.4.1 Starting the PFIP Control GUI

If the system is correctly configured for PFIP operation, the control GUI will be displayed automatically when the observing system is started. Should there be a need to start the control application independently it can be done using the following command from the WHT ICS console window:

4MSControl&

On initialisation, the application will attempt to ascertain the status of the PFIP instrument control system in order to present to the user an accurate representation of not only the 4MS system but also the instrument controller application. Any errors encountered on startup will be reported in the talker log. It is a prerequisite that in order for this application to start successfully that the software instrument controller system and the 4MS microprocessor are functioning correctly.

After a short delay, the following window will be displayed upon the WHT ICS console display. The control panel is broadly divided up into logical segments which control discrete parts of the PFIP system.

The following sections will detail each segment in more detail as well as outline common features prevalent throughout the interface.

![The Main PFIP Control Panel](image-url)
2.4.2 The Use of Icons

In order to reduce the amount of screen space used, standard graphical icons are used throughout the application. The semantics associated with each icon are intended to be identical irrespective of the instrument or mechanism that is being controlled. The intention is that once a user is familiar with one 4MS instrument control panel, he should be able to quickly establish how to operate the instrument control panel for a different instrument.

The semantics associated with each of the different icons which are used within the 4MS instrument control panels are outlined in the following subsections.

2.4.2.1 The Move Icon

The icon which contains a picture of two gear wheels is used to indicate that when this button is pressed, the associated mechanism will start moving to the user demanded position.

Normally associated with this icon will be an input field into which the user will enter a demand position for a mechanism. Depending on it's configuration, once a button containing this icon is pressed, confirmation from the user will be requested and subsequently the associated mechanism will start moving to the demanded position.

During the time that the mechanism is moving, the move button will remain insensitive to input from the user. Only once the mechanism has finished moving or it has returned an error state will the button once again be sensitive to user control.

Sometimes the associated mechanism may not actually be a physical mechanism inside of the instrument microprocessor was rather a pseudo mechanism contained within the instrument controller software.

2.4.2.2 The Initialisation Icon

The icon which contains a small circle with a vertical line represents a power on button. The semantics associated with such a button are as such. When pressed, the mechanism associated with the button will be sent an initialisation request. In the case of a hardware mechanism this will result in the mechanism attempting to datum itself. During the time that a mechanism is moving, the button will remain insensitive to Observer control. Once the mechanism has either completed moving or the mechanism returned an error, this button will once again be sensitive to Observer control.

2.4.2.3 The Reset Icon

The icon which contains two small arrows arranged in a circular manner can be used to reset a value which was entered into a demand position field to the actual current position of the associated mechanism.

For example, should the Observer using the main filter wheel control widget select a different filter to the one that is currently selected in the main filter wheel and then subsequently decides that he no longer wants to move the filter to this selected position, by pressing the button containing the two arrows, the field containing the user demand position will be reset to the actual position of the mechanism thus nullifying his change.
2.4.2.4 The Stop Icon

The icon which contains a red hexagon with a cross within the centre can be used to stop the movement of the associated mechanism.

This button can normally be pressed at any point whether the mechanism is either moving or is stopped.

2.5 The PFIP Engineering Panel

The engineering panel is intended to be used by engineers of the ING and not by the visiting astronomers. The purpose of the panel is to give the engineer complete control over the instrument and as such offers features which the casual user should not use. The user can select the engineering panel by clicking on the tab labeled PFIP at the top of the control panel.

The following sections outline the various parts of the engineering panel and how they may be used.

2.5.1 The Autoguider Probe Control Panel

Located at the top left of the PFIP control panel is the autoguider probe control panel. The autoguider on PFIP comprises of two mechanisms which can be used to move the autoguider probes in both the X and Y directions. The control panel consists of two controls which allow the independent movement of each of these mechanisms. Using the dials, the user can either turn the dial to change the demand position of the mechanism to the desired value. Alternatively, the user may modify the value which is displayed within the input field. Once the demand position has been entered, the user can request the movement of the mechanism by pressing the Move icon. Should the system establish that the demand position has been specified incorrectly, the text associated with the demand position will turn red and no movement will be affected.

The mechanism position for both of the probes is displayed in microns and noticeably, there is greater movement available in the X probe mechanism than there is in the Y probe mechanism.

Both control widgets are responsive to movement of the underlying mechanisms and will update in realtime should the underlying mechanisms be moved.
The autoguider probe control widgets support all of the standard mechanism commands which are represented by the standard 4MS control icons as detailed in section 2.4.2.

2.5.2 The Automatic Telescope Focus Adjustment Panel

This panel allows the user to specify whether or not the instrument controller software will automatically perform adjustments of the telescope focus when the filter in the main filter ring is changed. This feature can either be enabled or disabled depending on whether or not automatic adjustments are to take place.

The amount of adjustment which will be applied to the telescope focus is determined by the focus offset which is associated with the selected filter within the filter database. It is the responsibility of the support astronomer to ensure that the focus offsets which are associated with the filters which are located in the main filter ring are correctly specified in the filter database.

There is a button labeled Update Telescope Focus which when pressed will perform an immediate focus adjustment of the telescope in accordance with the focus offset associated with the current filter in the main filter ring. Normally the telescope focus update is only performed when the main filter is moved.

By default, when the system is started, automatic telescope focus adjustment is enabled by the system.

2.5.3 The ADC Control Panel

The PFIP instrument contains an atmospheric dispersion corrector (ADC) to compensate for the image distortion due to diffraction in a science image when the telescope is pointing away from the zenith position and subsequently through a greater air mass. The ADC consists of two independent optical elements which are controlled by discrete mechanisms which are known as the inner element and the outer element of the ADC. Each mechanism can be rotated in theta in the range -90° to 90°.
During normal operations, the positions of the inner and outer elements of the ADC will be set automatically by the PFIP instrument control system which monitors the zenith angle of the telescope and adjusts the positions of the two elements of the ADC accordingly in order to remove image aberrations. This feature can be enabled or disabled by pressing one of the buttons labeled Enable or Disable associated with the control labeled ADC Update. By default, on startup, the system will assume automatic control of the positioning of the ADC.

Should the user want to move either of the ADC elements individually, he may do so using either of the mechanism control widgets which are located within the ADC control panel. It should be noted though that in order to do this successfully, the user should have first disabled automatic ADC updates.

Using the standard icons associated with each of the ADC mechanism control widgets, the user can initialise, stop and move each of the ADC elements independently.

### 2.5.4 The Status Information Panel

The status information panel is reserved for reporting status information relating to the state of the PFIP instrument controller system.

![Status Information Panel](image)

The Status Information Panel

#### 2.5.4.1 Setting the PFIP Instrument Mode

PFIP can be operated in one of two modes. In PFIP mode the Observer may interact with any of the mechanisms which are present within the instrument. In ADC Mode, the Observer may utilise only the ADC mechanisms and any attempt to move any of the other mechanisms will result in an error being returned.

The current mode that the instrument is operating in is displayed by the status widget labeled Instrument Mode. By clicking on either of the buttons labeled PFIP or ADC, the Observer can request that the 4MS change the mode that it is operating in.
2.5.4.2 Refreshing the Filter List

Following an update of the details of the filters in the filter database by the support astronomer, the observer can press the button labeled Refresh Filter List in order to synchronize the filters displayed in the main filter and autoguider filter wheel control widgets with those of the filter database.

2.5.4.3 Setting The Monitor Mode of the 4MS

The 4MS microprocessor system communicates its status to the outside world by means of status messages which are sent from its RS232 serial communications port. In turn these are interpreted by the instrument control software. The number and type of status messages which are returned by the microprocessor system is determined by the level of the monitor mode which the system finds itself in.

The control widget labeled Monitor Mode allows the engineer to enable and disable monitor mode on the 4MS system. When monitor mode is enabled, the 4MS will deliver a stream of status messages when a mechanism has been requested to move.

It is important that if the engineer or observer wants real-time updates of the mechanism positions on the 4MS Control Panel as the mechanisms move, the engineer should ensure that monitor mode remains enabled at all times.

2.5.4.4 The Humidity Status

There exists a sensor inside of the PFIP 4MS system which reads the relative humidity and returns the reading as a percentage. This is displayed in the status field labeled humidity.

2.5.4.5 The Firmware Version

The status field labeled firmware version is used to display the version number of the Forth code which is currently running within the 4MS microprocessor system.

2.5.4.6 The Door Position

In order to access the main filter wheel to change the filters, there is a hatch on the instrument which may be opened by the Observer. When this door is open, the 4MS system will interlock the movement of the main filter wheel in order to prevent damage to the instrument. This status field will read either open or closed depending on the state of the main filter wheel hatch.

2.5.4.7 The Temperature Reading Label

Within the instrument is a thermocouple which reads the ambient temperature surrounding the instrument. This is displayed within the status field labeled Temperature and it is expressed in centigrade.

2.5.4.8 Monitor Mode Status Label

The status field labeled monitor mode represents the current status mode of the 4MS system. This value can be set to one of 0, 1 or 2 with the higher numbers representing an increased number of status messages returned by the 4MS module when the mechanisms associated with the instrument are moved.

2.5.4.9 Last 4MS Response Label

Once a minute, the instrument controller task will attempt to communicate with the 4MS system in order to establish whether or not the microprocessor system is still responding. This status label contains the time of the last successful handshake with the 4MS microprocessor system. Should the time
contained within this label differ significantly from the current time, it is a sure indication that either hardware communications or the microprocessor system has failed in some way. Normally it will be the responsibility of an engineer to resolve such a problem.

2.5.5 The Autoguider Focus Settings
The control panel labeled Autoguider Focus Settings permits the Observer to modify the position of the autoguider focus slide.

![Autoguider Focus Control Panel](image)

2.5.5.1 Setting the Position of the Autoguider Focus Slide
The position of the autoguider focus slide is displayed in units of microns and may have a position within the range 0 to 14,000. It is possible to change the position of the focus slide by either entering the desired position within the text entry field or by turning the dial until the desired position is reached. By pressing on the move icon, the 4MS microprocessor will be instructed to move the mechanism.

The autoguider focus slide control widget supports all of the standard mechanism commands which are represented by the standard 4MS control panel icons as detailed in section 2.4.2.

2.5.5.2 Enabling Automatic Readjustment of the Autoguider Focus Slide
When the main filter wheel is moved through the high-level software, automatic focus adjustment is performed on the autoguider focus slide to take into account that as part of the move of the main filter wheel, the telescope focus is also changed to account for the optical characteristics of the newly selected filter. This has implications for the focus of the autoguider. In order to compensate for this, as part of the move of the main filter wheel, in addition to modifying the telescope focus, the focus of the autoguider is modified also by an equal an opposite amount to compensate.

By default, the behaviour described above is enabled when the instrument controller system is started. It is possible to disable and enable this behaviour through the PFIP control panel using the control widget labeled AG Automatic Focus Update. By setting this value to enabled, automatic adjustment of the autoguider focus will be performed when the main filter wheel is moved. Conversely, when set to disabled, automatic adjustment of the autoguider focus will not be performed when the main filter wheel is moved.
2.5.5.3 Clearing the Focus Offset
In order that the instrument controller can modify the autoguider focus offset correctly after the move of the main filter wheel, it must always remember the previous offset that was applied to the autoguider focus slide. Should there be a case where the instrument controller system applies an incorrect focus offset to the autoguider focus after the move of the main filter wheel, it is possible to zero set the focus offset by pressing the button labeled Clear Focus Offset.

2.5.5.4 Current Autoguider Focus Offset
The current autoguider focus offset which has been applied to the autoguider focus slide as a result of movements of the main filter wheel is displayed in the status field labeled AG Focus Offset and is expressed in units of millimetres.

2.5.6 Moving the Main Filter Wheel
At the top of the PFIP control panel is a control widget labeled Main Filter. This control permits the Observer to change the currently selected filter in the main filter wheel.

The Main Filter Wheel Control Panel

The filter database is used by the PFIP instrument controller system in order to establish the filter identifiers of the filters which are currently deployed within the main filter wheel. Therefore, the user is presented with the names of the filters in the main filter wheel rather than simply a series of numbers corresponding to the positions in the filter ring.

Under the main filter wheel control widget is a list of all of the positions in the main filter wheel with the names of the filters which are currently residing in the filter holders.

The main filter control widget supports all of the standard mechanism commands which are represented by the standard 4MS control panel icons as detailed in section 2.4.2.

2.5.7 Changing the Autoguider Filter
At the top of the PFIP control panel, is a control widget labeled Autoguider Filter. Through the use of this widget, the Observer may change the filter in the autoguider which is currently in the light path.
The Autoguider Control Panel

The PFIP instrument controller interrogates the filter database in order to establish the filter identifiers of the filters which are currently deployed in the autoguider filter ring. Therefore it is possible for the Observer to select the name of the filter that he wants in the light path rather than having to specify the position in the filter ring of the autoguider.

Underneath the control which will be used to select the autoguider filter is a list of all of the positions in the autoguider filter ring and the names of the filters which are currently residing within them. This data has its origins in the filter management system.

The autoguider filter control widget supports all of the standard mechanism commands which are represented by the standard 4MS control panel icons as detailed in section 2.4.2.

2.6 The Observer Control Panel

The Observer Control Panel is intended to be used by a visiting Observer to control the PFIP instrument. It permits the control of a subset of the features of the prime focus instrument platform and provides a status summary of pertinent information relating to the instrument's readiness for observing.

The observer panel can be selected by clicking upon the tab labeled PFIP Observer which is located at the top of the display. The following sections outline the various parts of the observer panel and what they represent.
2.6.1 The Main Filter Wheel Control Panel

Located at the head of the display is a panel which can be used to control the main filter and its associated behaviour.

The details of the filters in each of the seven positions in the main filter wheel are displayed. The source of the filter data is the filter database so whenever there is a need to modify the names of the filters in the main filter wheel, the support astronomer must refer to the filter database in order to change the filter configuration.
Associated with each of the filter positions is a focus offset. The focus offset is defined in millimetres and is the focus offset which will be applied to the telescope when that filter is selected. It is possible to modify the focus offset associated with a filter by pressing on the corresponding button labeled Edit. In turn a dialogue window will be presented to the user into which he can enter the details of a new focus offset. This new focus offset will also be stored in the filter database.

The Observer can change the currently selected filter in the main filter wheel by selecting a filter in the drop-down menu found below filter list and then clicking on the move button.

The procedure for changing the filter in the main filter wheel is a compound action which consists of a number of discrete operations. In the first instance, the instrument controller system will request the PFIP 4MS system to move the main filter wheel to the demanded position. Following this, the instrument controller task will then interrogate the filter database in order to ascertain the associated focus offset for this filter. This focus offset will then be applied to the telescope delta focus (this is displayed as DFOCUS on the TCS info display). The process of changing the focus of the telescope however will result in the focus of the autoguider being changed also. Therefore, it is then necessary to modify the focus offset of the autoguider as well by an equal and opposite amount to what was applied to the focus of the telescope. The action takes a small amount of time to complete and whilst the action is in progress the drop-down menu which can be used to select filters will remain insensitive to user interaction.

The button labeled Refresh Filter List should be used after the details of the filters in the main filter wheel have been updated in the filter database. This will result in the details of the filters in the main filter control panel being updated.

In the box labeled Current Filter Offset is an indication of the last filter focus offset which was applied to the telescope focus.

In the box labeled Automatic Filter Focus Offset is an indication as to whether the telescope will be automatically refocused when the filter in the main filter wheel is changed. If this is disabled for any reason it will be highlighted with a red background. Automatic filter focus compensation of the telescope can be re-enabled in the engineering panel.

### 2.6.2 The ADC Status Panel

The status panel labeled ADC Status displays the current position of the two elements of the ADC which are expressed as an angle $\theta$ in units of degrees.

<table>
<thead>
<tr>
<th>ADC Status</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Element (degrees)</td>
<td>0.200</td>
</tr>
<tr>
<td>Outer Element (degrees)</td>
<td>0.200</td>
</tr>
<tr>
<td>ADC Auto-Update</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

Illustration 3ADC Display Panel

The status labeled ADC Auto-Update indicates to the Observer whether or not automatic ADC compensation is enabled. If this is not enabled it will be highlighted with a red background. During normal operations the ADC compensation should be enabled and this can accomplished from the engineering panel.

### 2.6.3 The Autoguider Status Panel

The status panel labeled Autoguider Status is used to provide status information relating to the autoguider unit which can be found in PFIP.
The *current positions* of the autoguider X and Y probes are displayed at the head of the status panel and are expressed in units of *microns*.

The current *focus* of the autoguider is displayed in the status window labeled *Focus* and is expressed in units of *microns*.

The current *focus offset* of the autoguider is displayed in the status window labeled *Focus Offset*. This represents the *focus offset in mm* which has been applied to compensate for the telescope focus shift which has been applied to *compensate* for the *filter* currently in the main filter wheel.

In the status window labeled *AGAutomatic Focus Update* is displayed whether or not the autoguider focus will automatically be updated to compensate for the change in focus of the telescope when the filter in main filter wheel is changed. When this is *disabled*, the background will be highlighted in *red*. To *re-enable* automatic refocus of the autoguider when the main filter wheel is changed, the user should use the engineering panel.

In the status window labeled *Current Filter* is displayed the name of the filter which is currently selected in the autoguider. The details of *which* filters are located in the autoguider filter wheel are to be found in the filter database.

### 2.6.4 The Message Console

The message console will be used to display to the user a *trace* of the behaviour of the GUI control application. It serves no other purpose but to inform the user of significant events that have occurred during the use of the application.
2.7 PFIP Observer Control Scripts

In addition to the PFIP control GUI, there exists a set of scripts which may be used to control most aspects of the PFIP system. These command line scripts themselves may be incorporated by observers into their own observing sequence scripts. The new scripts are intended to replicate the functionality that was provided as part of the script suite on the old VAX-based system.

The following sections outlined the purpose of each of the scripts and also how they may be used.

2.7.1 Prerequisites for Running the Scripts

Before the Observer can use any of the following scripts, it should be verified that the instrument controller task and the PFIP 4MS controller are both functioning correctly and that communications between the two systems are normal.

2.7.2 pfip_begin

The purpose of this script is to extract the current status of the PFIP 4MS controller and update any client applications which may be dependent on this status information. It is intended that this script be run immediately after the instrument controller task has been started to ensure that an accurate status image is available and that the system is ready for use by the Observer.

The script can be started from the Observer console window on the whtics machine by executing the following command from the command line.

```
pfip_begin
```

The command takes no arguments.

Normally this script will be run automatically when the observing system is started and configured for PFIP operation.

2.7.3 pfip_set

This script can be used to set the state of some of the observer controllable variables which influence the behaviour of the system. The script is invoked as following;

```
pfip_set -m <state variable> <demand value>
```

The state variable specified can be one of the following:

2.7.3.1 ADC

This allows the observer to enable and disable the automatic updating of the ADC position. The demand value can be either enable or disable.

2.7.3.2 GDFOC

This allows the observer to define whether or not automatic autoguider focus compensation will be performed when the main filter wheel is moved. The demand value can be either enable or disable.

2.7.3.3 FILTFOCUS

This allows the observer to define whether or not automatic telescope refocussing will be performed when the main filter wheel is moved. The demand value can be either enable or disable.
2.7.4 pfip_status
This command can be used from the command line to display a summary display of the status of the instrument. The command takes no arguments.

2.7.5 pfip_init
The purpose of this script is to permit the Observer to initialise (or datum) any of the mechanisms located on the PFIP instrument. Normally mechanisms on the PFIP do not need to be initialised but should there be a need to, this script may be used.

The script can be started from the Observer console window on the whtics machine by executing the following command from the command line.

pfip_init -m <mechanism name>

On successful completion of the action, the script will return 0 otherwise the script will return 1. Any error messages produced by the script will be sent to the talker log.

The mechanism name specified can be any of the following:

- ADI
  Corresponds to the inner element of atmospheric distortion corrector.

- ADO
  Corresponds to the outer element of atmospheric distortion corrector.

- FILTER
  Corresponds to the main filter wheel.

- AUTOFILT
  Corresponds to the autoguider filter mechanism.

- GDX
  Corresponds to the autoguider X probe.

- GDY
  Corresponds to the autoguider Y probe.

- GDFOC
  Corresponds to the autoguider focus slide.

- ALL
  This requests that each mechanism is initialised sequentially. This action will take a long time to complete. It should be noted that if the PFIP instrument is in ADC mode, only the ADC elements will be initialised.

2.7.6 pfip_init_all
This script can be used to initialise all mechanisms on the PFIP instrument simultaneously.

The script can be started from the Observer console window on the whtics machine by executing the following command from the command line.

pfip_init_all
The script takes no command line arguments.

2.7.7 pfip_update
This script can be used to request the PFIP 4MS system to return up-to-date status information for the mechanism that is specified.

The script can be started from the standard Observer console window on the whtics machine by executing the following command from the command line.

```
 pfip_update -m <mechanism name>
```

On successful completion of the action, the script will return 0 otherwise the script will return 1. Any error messages produced by the script will be sent to the talker log.

The mechanism name specified can be any one of the following mechanisms:

- **ADI**
  Corresponds to the inner element of atmospheric distortion corrector

- **ADO**
  Corresponds to the outer element of atmospheric distortion corrector

- **Filter**
  Corresponds to the main filter wheel

- **AUTOFIL**
  Corresponds to the autoguider filter mechanism.

- **GDX**
  Corresponds to the autoguider X probe.

- **GDY**
  Corresponds to the autoguider Y probe.

- **GDFOC**
  Corresponds to the autoguider focus slide.

- **All**
  This requests that status information for every mechanism should be retrieved from the 4MS microcontroller.

- **Mode**
  Corresponds to the PFIP mode.

- **Summary**
  This requests an instrument summary from the 4MS controller.

- **Monitor**
  This requests the current monitor mode from the 4MS controller.

- **Env**
  This requests the current environmental measurements from the 4MS microprocessor such as the temperature and humidity to be updated.

- **Door**
  This requests the current state of the main filter wheel hatch be updated.
Any application which is dependent on status information from the PFIP instrument controller will be updated with new status information once the above command has been executed.

### 2.7.8 pfip_move

This script can be used to request the PFIP 4MS system to move either a mechanism or change the behaviour of the instrument controller task in some way.

The script can be started from the standard Observer console window on the whtics machine by executing the following command from the command line.

```
pfip_move -m <mechanism name> <mechanism position>
```

An example of its use follows:

```
pfip_move -m ADO 45.4
```

On successful completion of the action, the script will return 0 otherwise the script will return 1. Any error messages produced by the script will be sent to the talker log.

The `mechanism name` specified can be one of the following mechanisms.

#### 2.7.8.1 ADI

Specifying ADI as the mechanism argument permits the movement of the inner element of the atmospheric distortion corrector. A further single argument is expected which is the rotation angle expressed in degrees as a real number between -90.0 and 90.0.

#### 2.7.8.2 ADO

Specifying ADO as the mechanism argument permits the movement of the outer element of the atmospheric distortion corrector. A further single argument is expected which is the rotation angle expressed in degrees as a real number between -90 and 90.

#### 2.7.8.3 Filter

By specifying filter as the mechanism, the Observer can perform a movement of the main filter wheel. A single additional argument is expected which is either the position in the filter ring to be selected (an integer between 1-7) or alternatively, a standard ING filter identifier. If the latter is specified, the Observer must ensure that the filter has been defined in the filter database as being positioned in the PFIP main filter wheel.

Following the movement of the main filter wheel, the telescope focus and the autoguider focus will be modified accordingly to take into account the optical characteristics of the new filter.

#### 2.7.8.4 GDX

By specifying GDX as the mechanism, the observer can perform a movement of the X probe of the autoguider. A single demand position is expected which should be expressed as an integer in units of microns and be in the range of 0 to 110000.

Depending on the current position of the autoguider probe, this action may take a little while to complete.
2.7.8.5 **GDY**

By specifying **GDY** as the mechanism, the observer can perform a movement of the $Y$ probe of the autoguider. A single demand position is expected which should be expressed as an integer in units of **microns** and be in the range of 0 to 20000.

Depending on the current position of the autoguider probe, this action may take a little while to complete.

2.7.8.6 **GDFOC**

By specifying **GDFOCPOS** as the mechanism, the observer can perform a movement of the autoguider focus slide. A single demand position is expected which should be expressed as an integer in units of **microns** and be in the range of 0 to 2000.

2.7.8.7 **Autofilt**

By specifying **AUTOFILT** as the mechanism, the observer can perform a movement of the autoguider filter wheel. A single additional argument is expected which is to be either the position in the filter ring to be selected (1-6) or alternatively, a standard ING filter identifier. If the latter is specified, the Observer must ensure that the filter has been defined in the filter database as being positioned in the PFIP autoguider filter wheel.

2.7.9 **The agfocus script**

The **agfocus** script can be used to set the focus of the autoguider focus slide from the command line. The syntax of the command is as follows;

```
agfocus <focus position in microns>
```

The specified position should be specified in microns and be in the range 0-14000.

2.7.10 **The pfilter script**

This script can be used to conveniently change the filter in the main filter wheel and have the telescope and autoguider focus adjusted according to the filter offset associated with the selected filter.

The syntax of the command is as follows;

```
pfilter <filtername or filter position>
```

e.g. pfilter 1 or pfilter V

If the **filter position** is specified it should be defined as an integer in the range 1-7. If the **filter name** is specified it should be entered *exactly* as entered in the filter database and displayed in the filter status display in the 4MSControl GUI application.

2.7.11 **The agprobe script**

This script can be used to set the position of both the $X$ and $Y$ autoguider probe simultaneously. This could be conveniently used by the telescope operator to set the position of the autoguider probes after reading the position of a guide star from the guide star catalogue. The TO should need to do nothing more that start a terminal on the whtics machine as whtobs and then execute the obssys script. The script should then be in the path.

The syntax of the command is as follows;
\texttt{agprobe} <X probe position> <Y probe position>

The value specified for the X position should be in the range 1-110000 and the value of the Y position should be in the range 1-20000. All units are expressed in microns.

\textbf{2.7.12 pfip\_cancel}

Each time an request is made of the instrument control system by the observer, an action will be started inside of the instrument controller. Some of these action may terminate quickly, others such as the compound action responsible for setting the main filter wheel, refocussing the telescope and the autoguider can take up to a minute to complete. Should in the unlikely situation that the observer attempt to instruct the instrument controller to do something via either the 4MS control GUI or a command line script and the action does not complete, it is possible to cancel the action in the instrument controller using the \texttt{pfip\_cancel} script.

Normally it should suffice to attempt to cancel all subactions in the controller using the \texttt{ALL} option. With expert knowledge of the system this is the advised course to take when it is necessary to cancel an outstanding action which appears to have hung.

The script is invoked using the following syntax

\texttt{pfip\_cancel -m \<mechanism name\> -a \<action\>}

Mechanism can be one of the following:

- \texttt{ADI}
  ADC Inner Element.

- \texttt{ADO}
  ADC Outer Element

- \texttt{ADC}
  Set both ADC elements

- \texttt{FILTER}
  Main Filter

- \texttt{AUTOFILT}
  Autoguider filter

- \texttt{GDX}
  Autoguider X Probe

- \texttt{GDY}
  Autoguider Y Probe

- \texttt{SETGDFOC}
  Enable automatic autoguider focus

- \texttt{GDFOC}
  Set autoguider focus position

- \texttt{SETFOCUS}
  Enable/disable or set automatic telescope refocus

- \texttt{MODE}
  PFIP mode
ALL
Cancel all outstanding subactions in the controller. Without expert knowledge of the system, the user should simply use this option.

Actions can be one of the following if specified

- MOVE
  Requests that an action which resulted in a mechanism moving be cancelled.

- STOP
  Requests that an action which requested that a mechanism stop be cancelled

- INIT
  Requests that an action which requested that a mechanism initialise be cancelled

2.7.13 pfip_stop
The purpose of this script is to allow the Observer to stop any of the mechanisms located on the PFIP instrument which may be moving. Should the mechanism specified not be moving, an error will be returned to that effect.

The script can be started from the Observer console window on the whtics machine by executing the following command from the command line.

`pfip_stop -m <mechanism name>`

On successful completion of the action, the script will return 0 otherwise the script will return 1. Any error messages produced by the script will be sent to the talker log.

The `mechanism name` specified can be any one of the following mechanisms:

- ADI
  Corresponds to the inner element of atmospheric distortion corrector.

- ADO
  Corresponds to the outer element of atmospheric distortion corrector.

- FILTER
  Corresponds to the main filter wheel.

- AUTOFILT
  Corresponds to the autoguider filter mechanism.

- GDX
  Corresponds to the autoguider X probe.

- GDY
  Corresponds to the autoguider Y probe.

- GDFOC
  Corresponds to the autoguider focus slide.

- ALL
  This requests that any hardware mechanism controlled by the 4MS microprocessor which is currently moving should be stopped immediately.

2.8 Changing filters
As part of the setup of the prime focus instrument platform, the Observer may need to change the filters which are located within the main filter wheel. After the physical change of the filters, it will then be the responsibility of the support astronomer to update the filter database to accurately record which filters are located within the main filter wheel. This is a most important step as the instrument controller system utilises the filter database in order to establish the filter identifiers associated with the positions within the filter ring on the main filter wheel. These identifiers are subsequently written into the image headers. Furthermore, the filter database is also used to establish the focus offsets associated with the filters which have been selected in the main filter ring.

A full description of the use of the filter database is outside of the scope of this document and is instead detailed in the document WHT-FILTDB-2 A User Guide to the Filter Management System.