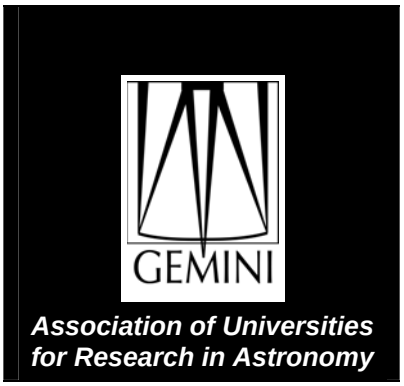


WFMOS PROJECT

90.00.00.01_15.10.00.00_ICD

Version: 4

WFMOS to PHSC PFU

ICD

Version:	**4**	**Date:**
Issued by:	Scot Kleinman	19Jun08
Approved by:	**Subaru Manager:**	
	Gemini Manager:	
	Gemini Engineering:	

90.00.00.01_15.10.00.00_ICD, Revision Control

Revision: 1, Scot Kleinman, 7Apr08

Revision: 2, Scot Kleinman, 15Apr08 – minor clarifications.

Revision: 3, Scot Kleinman 8May08 – updated PHC space and weight limits and added discussion of the instrument rotator as a Subaru Provided Element.

Revision: 4, Scot Kleinman 18Jun08 – new dimensions for PHSC and WFMOS weight limits. More details on instrument rotator. New version of drawing 15.10.00.00_DWG, Figure 1. Sections 4,5, and 6 are significantly revised.

Contents

1. Introduction

This document describes the interface between WFMOS and the PFU shared with HSC, PHSC. PHSC will house both the WFC along with either HSC or the WFMOS fiber positioner. The exchange between HSC and WFMOS will occur in the TUE room in the Subaru dome. Details about the TUE room are in document 90.00.00.01_30.00.00.00_ICD.

2. Related Documents

Document Number	Document Name
15.10.00.00_DWG	PHSC Schematic
90.00.00.01_30.00.00.00_ICD	WFMOS to Telescope Enclosure

3. PHSC

PHSC houses either HSC or the WFMOS fiber positioner along with the WFC. It is mounted to the telescope prime focus through the prime focus hub and secured into position by Subaru staff. It contains a hexapod that adjusts the position of the WFC/instrument together. There is no facility for adjusting the position of the instrument relative to the WFC within the PFU. (If you need this capability, it must be included in your instrument design.) It does not contain its own acquisition/guider system, wavefront sensor, or a cable wrap. If any of these components are deemed necessary for WFMOS, they will have to be included in the design and made to fit in along with the fiber positioner in PHSC.

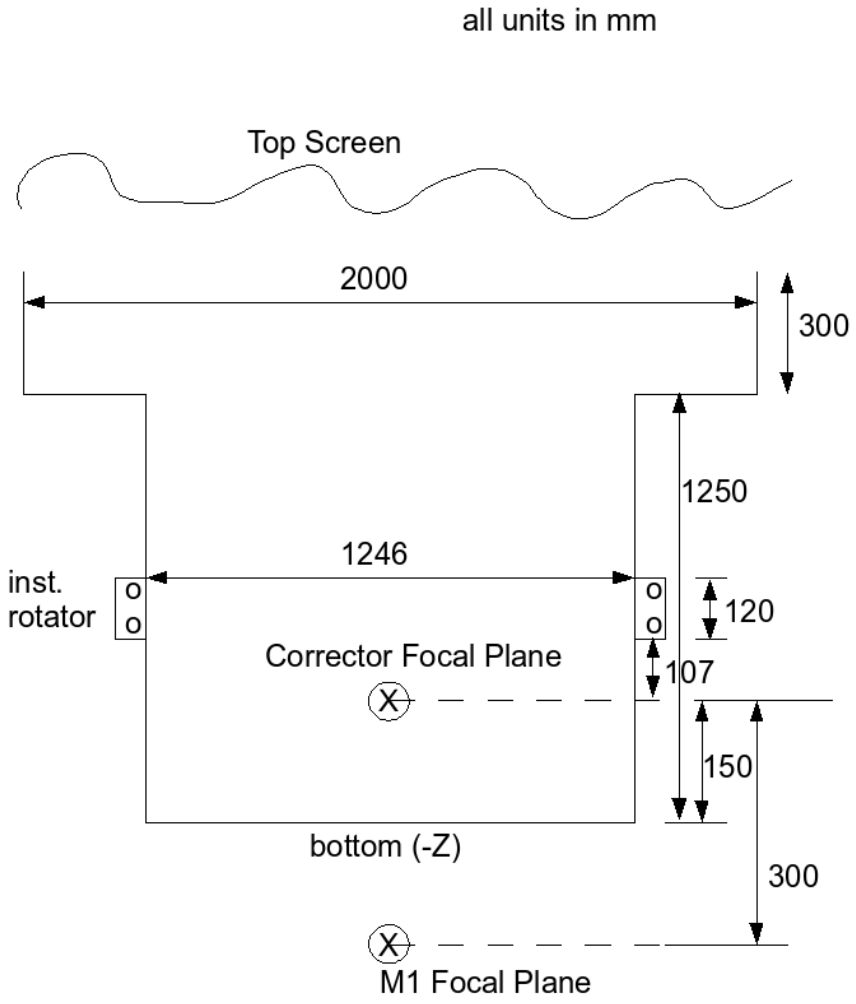
The instrument rotator is now a Subaru provided element and exists as an internal part of the PHSC, shared with HSC. It will rotate through +/- 250°. The instrument rotator weight is already taken into account in the determination of the weight budget allowed to WFMOS within the PHSC. That is, it is not charged against the WFMOS PHSC weight limit.

HSC will have a SH/WFS for optical alignment and Subaru experience suggests the values obtained by HSC will be good enough for WFMOS use as well.

Drawing 15.10.00.00_DWG shows a rough schematic of the space available in PHSC for the WFMOS instrument and is reproduced here as Figure 1. As the schematic shows,

the WFC focal position is offset 300mm in the +Z direction from the original primary mirror focus. The distance from the focal plane to the lowest (-Z) end of the space available to WFMOS is 150mm. The interior space available for WFMOS is a cavity 1246mm wide by 1250mm high. In addition, there is a 300mm high by 2000mm diameter space available above the top of the PFU before the instrument would hit the top screen or other parts of the enclosure. The primary instrument cavity is 1246mm in diameter.

Warning: Drawing NOT drawn to scale.



Warning: Drawing NOT drawn to scale.

Figure 1: A reproduction of 15.10.00.00_DWG, the PHSC schematic.

4. Weight Limits

The weight available to WFMOS within the PFU will be 1200kg, 400kg of which can be mounted within PHSC and mounted to the telescope with the TUE. Any weight above 400kg must be mounted separately from the PHSC/WFC/WFMOS combination. Details of possible ways to mount the instrument in two components are provided in the next section on Instrument Exchange. The center of gravity of the instrument should be at or below 400mm above the bottom of WFMOS PHSC cavity pictured above. The unbalanced torque should not exceed 100kg*m about the Z axis. Subaru believes the weight and center of gravity limits mean any unbalanced X and Y axis torque can be accommodated. There may be some capacity to accept deviations from all these values. Please contact the Aura Technical Representative if you need to change any of these constraints.

As Section 6, below, details, HSC is uses a passive cone mount inside PHSC to accommodate the expected WFC flexure. This cone mount weighs ~40kg and is mounted above the instrument rotator inside PHSC. Whether WFMOS chooses an active or passive system, the weight of the flexure compensation or other alignment system is charged against the allowable WFMOS weight limit.

5. Instrument Exchange

The exact mechanism for exchanging HSC with WFMOS in PHSC is not yet determined. It can be assumed, though, that the switch will occur somewhere in the TUE room and that services can be provided to WFMOS before/after the exchange, though probably not during. The TUE has a mass limit of 3000kg, and this is where the 400kg limit described above arises (the difference being the weight of PHSC, including the WFC and instrument rotator). Up to 400kg of WFMOS can be mounted in PHSC at the TUE platform and installed on the telescope with the TUE. The additional 800kg of allowed WFMOS mass must be installed separately, either via the TUE, with some adapter to properly interface with it, or the overhead 40-ton dome crane. There is 700mm clearance between the crane and the top of the PHSC, of which some may be required for a jig to interface between the crane and the WFMOS component.

6. Instrument Alignment

The PHSC does not rigidly support the WFC. Some flexure will occur. To accommodate this flexure, HSC is employing a passive cone mount within PHSC that will directly compensate for the WFC flexure. The table below details the center x,y and optical axis tilt of the corrector at various altitude angles of the telescope.

Altitude (°)	Δy (μm)	Δx (μm)	Δθ(")
90	12.1	-1005.1	2.62
60	-359.2	-871.3	-32.48
30	-634.3	-504.1	-58.87
0	-739.4	-1.8	-69.50

PHSC is aligned to the telescope with a hexapod alignment system. HSC will probably mount to PHSC using an interface conical piece that locates the mount point away from the HSC center of mass in a way that will allow passive correction of the relative flexure between HSC and the WFC. The HSC interface to PHSC is a kinematic mount, and is not adjustable.

The WFMOS design must include a way to guarantee alignment with PHSC (and the WFC) during mounting while also accounting for flexure of the WFC. The WFMOS alignment system will be included in the 400 kg weight limit (see Section 4 above).

7. Fibers / Cables

Since the WFMOS instrument will share PHSC with HSC, the fiber bundle must be able to be removed and re-connected to WFMOS within the PFU. Cable access to WFMOS within PHSC will be via an instrument-supplied cable wrap. It is also possible to run cables directly through the center of the cable wrap, if designed to handle the relevant rotation during observation. FMOS, for example, has some cables routed both within and through the center of its cable wrap.

8. Services

The following services will be available at prime focus:

8.1 Power – Prime Focus

Singe phase, 120V 9kVA power –UPS and generator backed up – is currently available. 208V and possibly more capacity are being considered for HSC.

8.2 Coolant – Prime Focus

A glycol coolant loop is available at PF. Currently the system runs at a nominal pressure of 0.26 MPa at 10 degrees altitude and 0.13 at 90 degrees altitude. The maximum pressure is 0.63MPa. The flow rate is 5.5 l/minute at 10 degrees and 5.6 l/minute at 90 degrees altitude. The outgoing temperature has been measured at -

3.2 degrees Celsius with the return at -0.7 degrees C. The system was originally designed to dissipate a total of 3kW, but the as-implemented capacity has not been measured.

8.3 Network – Prime Focus

10,100,1000 Gbit network (both copper and fiber) is available at the PF.

8.4 Misc.

Dry compressed air and nitrogen gas are currently being delivered to the PF. There are currently He lines plumbed to the PF, but they have not yet been used by any instrument. The capacity to use them, if needed, however, does exist.