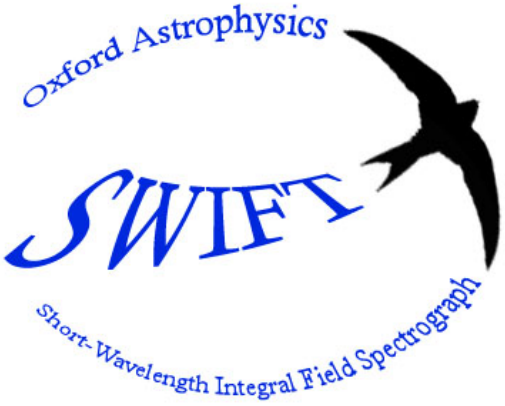

SWIFT: Palomar Installation Manual

SWF-MAN-001
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Version: 1.0
Date: 2009-10-02

Version	Date	Author	Comments
1.0	2009-10-02	FCl	Created.

Contents

1 Introduction

This manual aims to describe the installation process for the Oxford-SWIFT instrument on the Palomar 200-inch. The instrument is mounted on the PALAO bench, in a similar manner to P1640.

1.1 Instrument Team contact information

If you are unsure of any procedure, please contact one of the instrument team;

	Office	Cell	email
Fraser Clarke	+44-1865-283140	+44-7743-932776	fraser.clarke@physics.ox.ac.uk
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Niranjan Thatte			thatte@astro.ox.ac.uk

Table 1: Instrument team contact details

2 Overview

Sequence of procedures.
Check list

3 Pre-run setup

SWIFT is stored warm in the instrument bays. A few days before the run, the cryostats should be pumped down and cooled.

3.1 Cryostat pump down

Normal cryostat pumping down procedures apply. The vacuum valve handles are removed from the instrument during operation for safety. They are usually stored in a small box on the instrument trolley. They are attached to the valve by a small grub screw on the side of the shaft – please remove them again when you have finished pumping the instrument.

The table below gives the typical pressures for the SWIFT cryostats. If you feel the cryopumps need regenerated, please contact the Oxford instrument team for instructions.

3.2 Cool down

The SWIFT cryostats are LN2 cooled. There is a specific SWIFT stinger, which should be on the instrument trolley. It has a small lip at the end to hook over the fill tube. The cryostats are designed to have maximum hold time during operations (i.e. when inverted). As such, the fill tube extends 80% of the way into the cryostats, and it is most efficient to cool the instrument with the instrument inverted. The cryostats typically require 3 fills and 12 hours to reach operating temperature. The cool down rate is slow enough to not damage

Before the run	
	Pump down the cryostats
	Cool the cryostats
Installation on telescope	
	rotate cass ring to 180 degrees
	mount SWIFT to PALAO using clamps. Ensure instrument is in good contact with AO pads before clamping
	remove SWIFT from cart – take care to lock side plates before removing bolts
	rotate cass cage to 0 degrees for cabling
	mount electronics cabinet on SE corner of cage
	cable instrument – carabiner on main umbilical clips onto eyebolt between SDSU mounts. Make sure rack is connected to power, and SDSU controllers connected to power supplies (but turned off!) before connecting up CCD
	lay cable to avoid strain relief and attach to cass floor
	perform rotation test to check for cable strain
	leave cass ring at default SWIFT angle of 15.9 degrees
	power on electronics cabinet
	route CCD fibers to appropriate data room panel
	move computer desk to data room – watch for tight clearance through doors
	connect CCD fibers to numbered ports on back of `swiftlcu`
Removal from telescope	
	power off SDSUs, but leave connected.
	remove CCD connectors, and immediately replace with grounding plugs
	decable rest of instrument
	coil instrument cables into electronics rack
	mechanically remove instrument from telescope (as above). Take care to get the cart the right way round.
After the run	
	store instrument in instrument bay. Please cover with a cloth if possible
	return computers to AO lab. Please reconnect and power on (don't reconnect CCD fibres)

Table 2: Quick overview/checklist for the SWIFT installation procedures

Mode	Timescale	Typical pressure (mbar)
Backing pump	20 min	$\sim 10^{-2}$
Turbo pump	2 hr	$\sim 5 \text{x} 10^{-4}$
Cryo pump	24 hr	10^{-6}

Table 3: Typical SWIFT cryostat pressures

the detectors, and the cryostats can be cooled without the thermal control loop running.

4 Mechanical Installation

This is performed by the Palomar technical staff.

SWIFT is mounted on the PALAO bench at the same location as PHARO. Unlike PHARO, the AO bench *cannot* be transported with SWIFT installed, and PALAO must be installed on the telescope before SWIFT is installed.

4.1 Procedure

The instrument is mounted onto the AO bench from the North side of the cass cage, and the AO bench must be rotated to 180 degrees. All of PHAROs mounting points *except the FM3 mount* are removed from the AO bench. The four SWIFT/P1640 mounting pads are *never* removed from the instruments or the AO bench. SWIFT is brought onto the hydraulic ram, and aligned under the AO bench with the cryostats to the West. The handling cart should be raised $\sim$2 feet with the foot pump (west side) before lifting the instrument up into the cass cage. The fit through the cass cage is tight.

To be finished – but I think you know what you're doing with the mechanical mounting!

Please see below for a description of each component.

4.2 Components

4.2.1 Handling cart

The SWIFT handling cart has a foot pump at the cryostat end, which can raise the frame 4 foot above the base level. For mounting, the frame is usually raised 2 foot before lifting the instrument into the cass cage on the telescope hydraulic ram. The pump is lowered by tapping the small release valve to the right (**check**) of the pump. The instrument cart will come down quickly when the instrument is mounted on it. Small taps of the release valve are recommended.

Make sure the foot pump lever is down before the frame is fully lowered, otherwise it will get stuck inside the frame, and you will have to dismantle the lever to remove it!

4.2.2 Pads

The SWIFT baseplate has four pads which mate to four matching pads on the AO bench. The pads are held together with two part clamps. Each pad has a centering boss which helps to locate the instrument when it is initially offered up to the AO bench.

The pads should **never** *be removed from the instrument or the AO bench. If they are, a full realignment for all instruments using the pads will be needed.*

4.2.3 Clamps

The clamps work like K-clamps on vacuum fittings. The clamp around the 45 degree faces of the pads, and hold the instrument onto the AO bench. You should ensure the instrument is well pushed up onto the AO bench before tightening the screws on the clamps. The screws are not strong enough to pull the instrument up to the AO bench, so it is good to have some positive pressure on the AO bench before clamping. The clamps are tightened with two M5 screws, requiring a 4mm allen wrench. There is a wooden "hook" tool which is very useful for maneuvering the clamps in the tight space between the instrument and AO benches.

4.2.4 Side plates

The side plates hold SWIFT onto the cart. Each plate has 8 M6 bolts (require 5mm allen wrench). The plate at the east side of the instrument (away from the cryostats) has a loose 10mm shim between it and the instrument. Each side plate is mounted onto a bearing, so that the instrument can be rotated in the handling frame. To stop the instrument rotating, and hold it in the right orientation, a brass pin screws through a hole on each side plate. Removing these pins when the instrument is offered up to the AO bench can help the mounting procedure (giving an extra degree of freedom to mate with the AO), but they should be replaced before the side plates are full unbolted from the instrument, as the side plates are unstable (top heavy) in the default position, and could swing violently down when released from the instrument.

4.3 Electronics rack

The electronics rack is usually mounted on the SE corner of the Cassegrain cage.

4.4 Telescope balance

The default telescope balance for SWIFT+AO is:

4.5 Rotation angle

The default Cassegrain rotator angle for SWIFT is 15.9 degrees.

5 Electrical Installation

SWIFT uses a single electronics rack, which is usually mounted on the SE corner of the Cassegrain cage. Figures 1 and 2 show the "umbilical" cable, the electronics

rack and identify most of the components. The instrument is connected to the rack with an large "umbilical" cable which carries the majority of the cables. The umbilical also carries a number of cables which connect the back end of the instrument (i.e. cryostats) to the main patch panel at the front end (preoptics) of the instrument. The power cables for the SDSUs are separate to the umbilical, as are the CCD optical fibers and imaging camera network cables, which don't go to the rack.

Figure 1: SWIFT electronics rack with umbilical cable coiled on top of upper shelf. From top to bottom, the electronics are 1) (under cables; see figure 2) Arc lamp power supplies, terminal server, pressure monitor, 2) Lakeshore 218 and 325, 3) Power strip 4) Motor controller 5) Network power supply 6) SDSU power supplies 7) general power supply

5.1 Procedure

To cable the instrument, the Cassegrain cage should be rotated to 0 degrees. The umbilical cable should be removed from the rack and place on the cass cage floor. There are two power cables in the rack, which should be run to the UPS power supply on the SW of the cage. The two network cables attached to the rack should run to the network switch in the SW of the cage. Below is a quick list of the cabling procedure;

- Remove cables from rack
- Connect power cables (two) from rack to UPS power
- Connect network cables (two) from rack to network
- Clip the carabiner on the umbilical cable to the eye bolt between the two SDSU controllers on the instrument (Figure 3)

Figure 2: Top shelf of electronics rack with out cables. Showing Arc lamp power supplies, terminal server and pressure monitor. Power cables (orange and black) and network cables (blue) can be seen going off to connections on the other side of the cage.

- Take front end of umbilical cable towards pre-optics, separate off cryostat end connectors
- Add further strain relief by attaching velcro strap to handle on instrument baffle (Figure 4)
- Add final strain relief to the front end of the umbilical, but clamping it to the instrument. There should be a metal clamp which goes around the cable and screws into the pre-optics end of the instrument. The screws are (**check**) #8-32. Leave enough free to be able to connect the front end cables to the breakout panel.
- Connect all of the front end cables to the breakout panel. All cables should be labeled and keyed. It is easiest to start with the motor cables (DB37 connectors) and work outwards (Figure 5 shows the final result; the strain relief clamp is just visible around the cable to the left).
- Connect cables at the cryostat end of the instrument to the appropriate connectors (they should be labeled). **do not connect detector cables yet**
- Connect the SDSU power cables, taking care to make sure the Master power supply goes to the Master controller (closest to the AO system) and vice-versa for the Slave power supply/controller. **do not turn on the SDSU power supplies yet!**
- Connect fibres from the SDSUs and run them to the patch panel on the West of the cass cage. The fibres and ports are numbers 13–16.

- Connect the patch fibres through to sensible ports in the data room (AO side)
- Connect a network cable from the USB terminal server on top of the Slave SDSU to the network switch on the West of the cass cage.
- Power on the temperature/pressure monitors, and make sure they are reading sensible temperatures. This also ensures the SDSU power supplies are connected and hence earthed.
- Connect the CCDs
  - Read the more detailed description in §5.2
- Make the cables neat, secure to the cass floor, and perform a rotation test to check for any snagging.

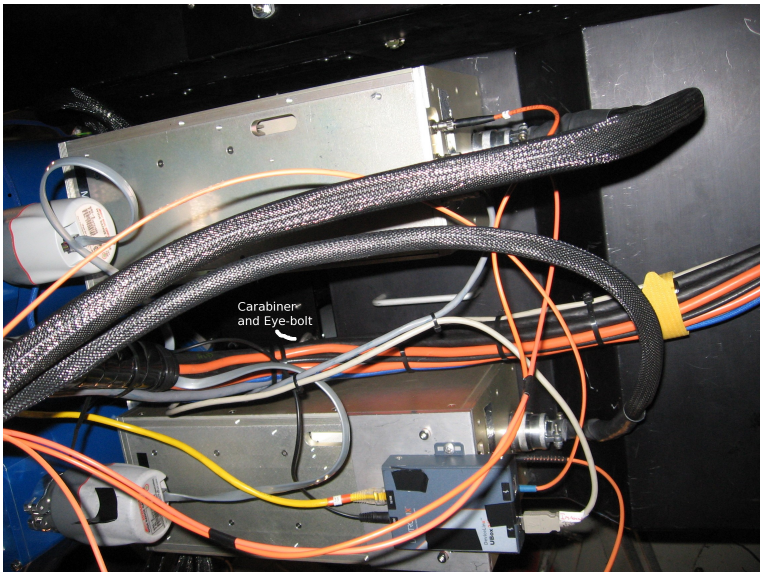

Figure 3: Cabled instrument viewed from below showing Umbilical cable (multi-colored) attached to eye-bolt with carabiner, SDSU power cables (black), CCD fibres (orange), pressure gauge cables (grey) and imaging camera network cable (yellow)

5.2 SWIFT detector hardware setup

As you will all have heard the SWIFT detectors are a little sensitive to static. So care is needed to make sure neither the hardware nor any individuals connecting cables up are charged to 10kV.

1. Before the CCDs are connected up make sure the CCD controller power supplies are connected to the mains and the controller power cable is connected between the power supply and controller itself. This will ensure the controller is grounded. Do NOT turn the controller power on at this point.

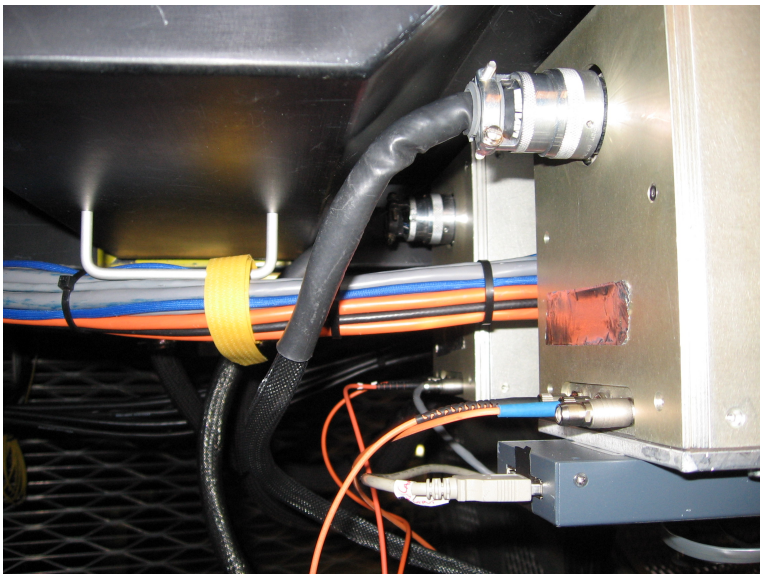

Figure 4: Additional strain relief by strapping front end of umbilical cable to handle on instrument baffle. SDSU cables and imaging camera USB cables connected also.

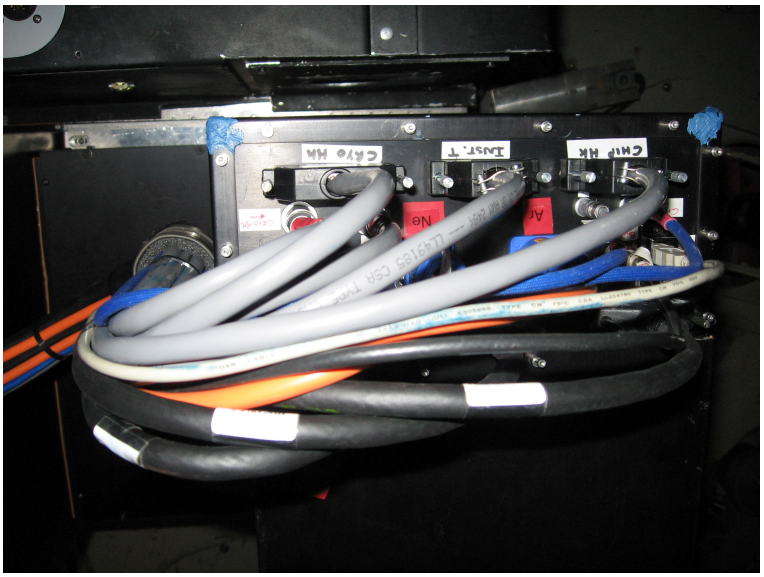

Figure 5: View of the cables installed at the pre-optics end of the instrument (taken from the cass cage floor). The foam padded strain relief clamp is just visible around the cable of the left. It is secured to the preoptics plate with (**check**) #8-32 screws.

2. Take sensible ESD precautions. Do NOT do anything else if you are wearing nylon or polyester clothing, with rubber soled shoes.

3. Roll/pull up your sleeves.

4. Short yourself between the cryostat connector plate (the outside of the cryostat is powder coated and so not very conductive; Figure 6 and controller housing by touching both at the same time with each hand. This should ensure both are at equal potential (which will be ground potential as the controller power cables are connected).

5. Remove the grounding plugs from the cryostat and plug in the CCD connectors. The connectors are labeled and keyed. Feel free to short electrical plate and controller housing together via yourself again to be safe. Ensure connectors are pushed fully home.

6. Tape the grounding plugs to the SWIFT baseplate to keep them out of the way.

7. Power on the contollers. Two green LEDs should be visible on the front of both controller and their internal cooling fans should be audible.

8. To remove the CCD connectors, reverse the proceedure.

N.B. Using a clip lead between the cryostat eletrical plate and controller would be a sensible precaution during this process; and it's easy to attach. A wrist strap clipped to the controller housing would be helpful to avoid doubt.

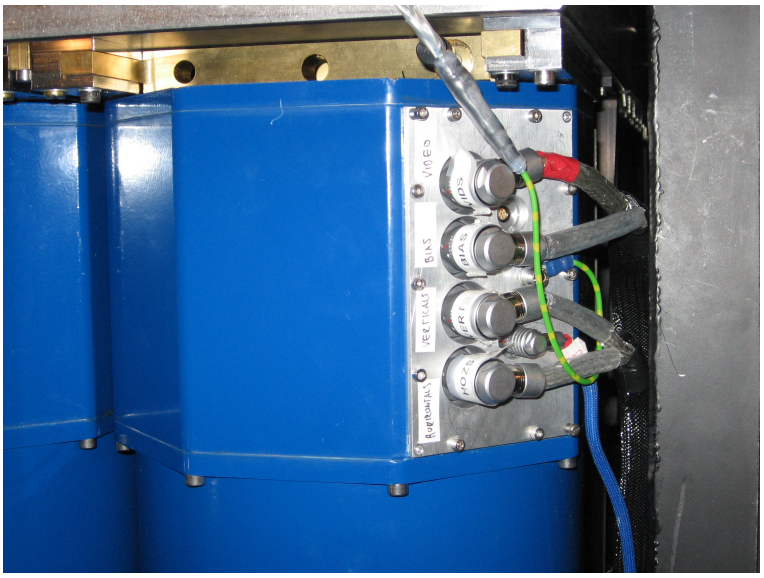

Figure 6: Detector connector panel showing CCD cables installed. The grounding plug is the yellow-green wire.

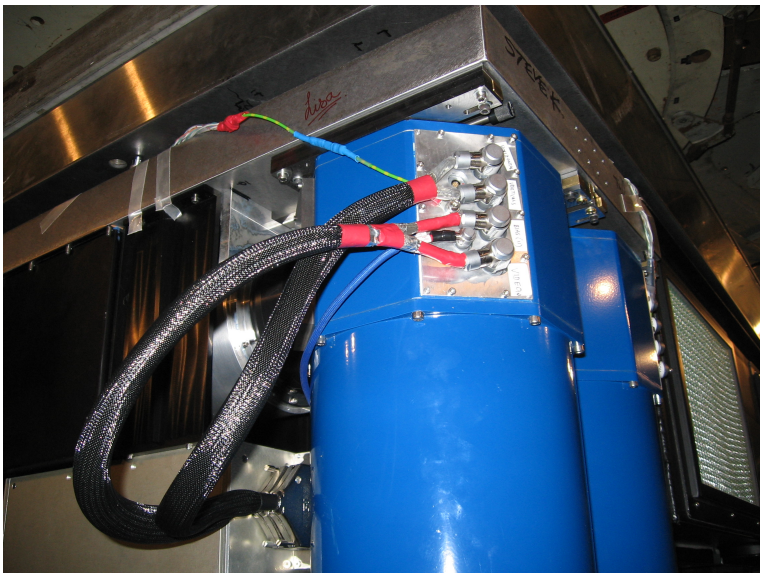

Figure 7: Detector cables installed. The grounding plug is the yellow-green wire.

6 Computer Installation

PHARO (ezra2) should be disconnected from the network when SWIFT is on the telescope

SWIFT is currently using the same IP addresses as CWI – check there is not a conflict

The SWIFT computer desk is stored in the AO lab. The desk holds two computers – `swiftws` on the left and `swiftlcu` on the right (in the rack-mountable case). Setup is simple. You may need to disconnect some cables to get the computer desk through the doors of the control room. The speakers should be connected to `swiftlcu`. The CCD fibres should be connected to the appropriate ports in the patch panel. The inputs on the back of `swiftlcu` have the same numbers as the outputs on the SDSU controllers on the instrument, and should be connected 1:1

6.1 Passwords

Passwords for the main SWIFT accounts are written inside the door of `swiftws`

7 Daily/Nightly maintenance

The SWIFT cryostats have a 30hr hold time when on the telescope. They should be filled every day during the day.

The astronomer should check the free disc space on `swiftlcu`, and remove the oldest directories from `/home/swift/data/` until at least 8Gb is available.

8 End of run

The cryostats can be left to run out and warm up. The electronics cabinet can be left disconnected and powered off.

Please return the SWIFT computer desk to the AO lab, reconnect the computers and power them up. It is often useful for the Oxford team to log into the computers between runs.