UC SANTA BARBARA
OASIS *Protofab*

Fiberpro IFA-600 Optical Alignment System **SOP#: OAS-PF-0310-00**

User Responsibility, Training, and Consequences of Misuse

OASIS prototyping facility, Protofab, operates as a shared research and prototyping facility. All users are expected to follow this SOP, facility policies, and applicable safety guidelines to ensure safe operation, equipment longevity, and equitable access for all users.

This SOP is not a substitute for hands-on training or tool qualification. Refer to User's Manual and Guides for details.
Users must complete required Protofab training and receive authorization prior to independent tool use. In the event of misuse, unintentional error, or non-compliance, corrective actions will be educational, proportional, and focused on preventing recurrence, taking into account the user's experience level and the nature of the issue.

Corrective actions may include:

- Clarification or coaching on proper tool use
- Additional training or temporary supervision
- Temporary suspension of independent tool access
- Restriction to supervised use until competency is re-established

Users may be held responsible for repair, cleaning, or downtime costs only in cases of negligence or repeated misuse.

1. Purpose

This Standard Operating Procedure (SOP) defines the safe and proper use of the Fiberpro IFA-600 Optical Alignment system within Protofab. This tool is used to align, couple and attach optical components to optoelectronic devices.

2. Scope

This SOP applies to standard methods of alignment and epoxy-based attach procedures. Non-standard bonding methods and configurations, maintenance, or hardware modifications are outside the scope of this SOP and require prior approval from Protofab staff.

2. Safety & EHS

- PPE such as protective eyewear is mandatory except while using microscope eyepieces. Refer to facility rules for details.

- Hot Surface: The center chuck may be set to an elevated temperature during operation. Contact with heated surfaces can result in skin burns. Users should assume all heated components remain hot until confirmed otherwise.
- Sharp Objects: Fibers and electrical probes sample edges may be sharp. Contact with these components can result in cuts or puncture injuries. Tweezers, and other hand tools used during setup also present puncture hazards.
- Shrapnel/Flying Debris: Improper clamping and collision coursed movement functions may generate small fragments or debris. These fragments may become airborne at close range and pose a risk to eyes.
- Mechanical Motion: The alignment stages move during operation and may pinch or strike hands.

3. System Overview

1. Total 24 motorized stages including 21 high precision motorized stages for active alignment.
    - 6-axis independent alignment stage assemblies (Left, Right, S1)
    - 3-axis center stage assembly
    - 3-axis tool positioner assembly which places cameras, epoxy syringe, and UV heads at desired locations.
2. Multi-channel built-in power meter/current meter for optical and electrical measurement.
    - Compatible with various external instruments.
3. Precise gap control and angle alignment of fiber blocks based on displacement sensor.
4. 3 digital cameras for vision processing and process monitoring and stage control.
5. Precise temperature control from +15 ºC to +75 ºC.
6. Fixtures with detachable mechanism for handling the coupling methods including:
    - Edge coupling with optical fiber / fiber block
    - Vertical coupling with optical fiber / fiber block
    - Free space lens alignment
    - Electric probing
7. Automatic epoxy dispensing & UV curing for device assembly.
8. Stages and Travel Ranges (LEFT/RIGHT, S1 and CENTER)

Left & Right stage assemblies

Axis name	Total Travel Length/Angle	Stage Resolution (1/50 microstep)
X	30 mm	≤ 0.1 µm
Y	20 mm	≤ 0.1 µm
Z	30 mm	≤ 0.1 µm
ThX (Pitch)	16° (±8°)	≤ 0.001°
ThY (Yaw)	16° (±8°)	≤ 0.001°
ThZ (Roll)	16° (±8°)	≤ 0.001°

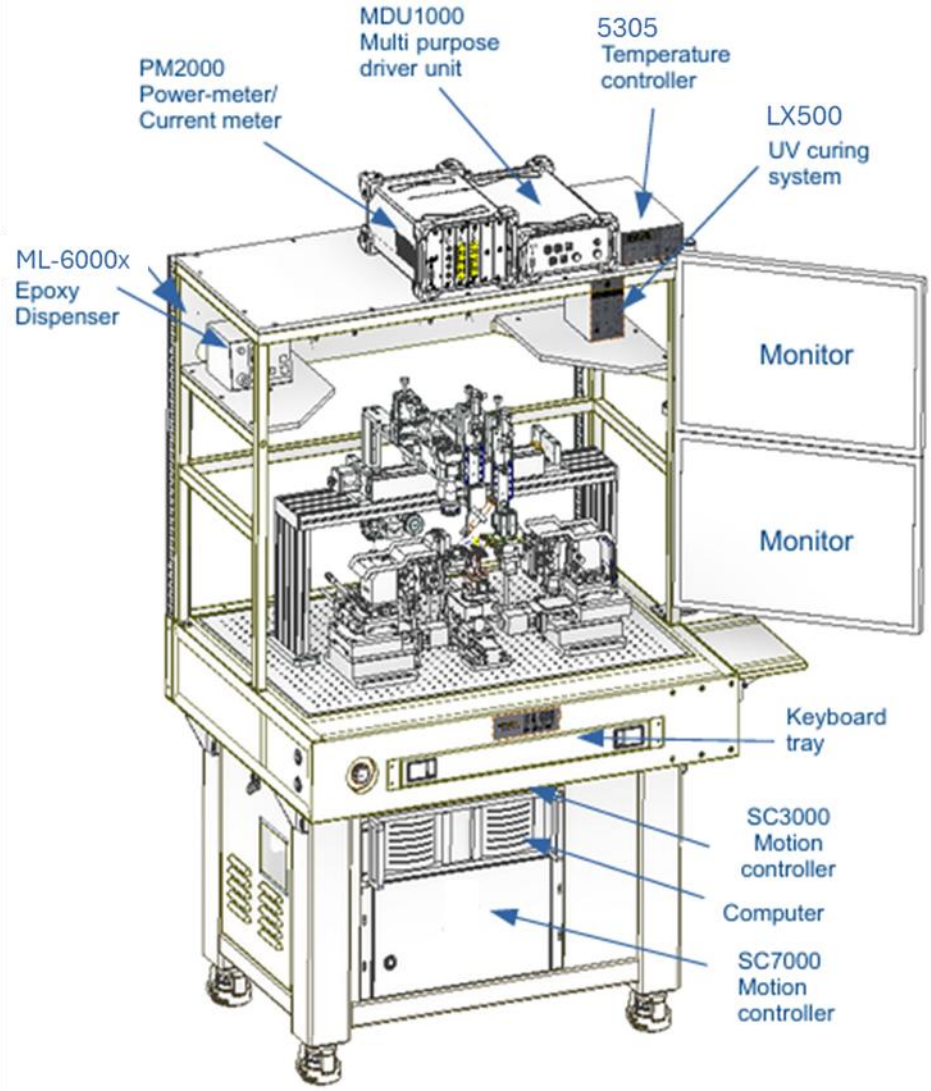
S1 stage assembly

Axis name	Total Travel Length/Angle	Stage Resolution (1/50 microstep)
X	30 mm	≤ 0.1 µm
Y	20 mm	≤ 0.1 µm
Z	30 mm	≤ 0.1 µm
ThX (Pitch)	16° (±8°)	≤ 0.001°
ThY (Yaw)	12° (±6°)	≤ 0.001°
ThZ (Roll)	10° (±5°)	≤ 0.001°

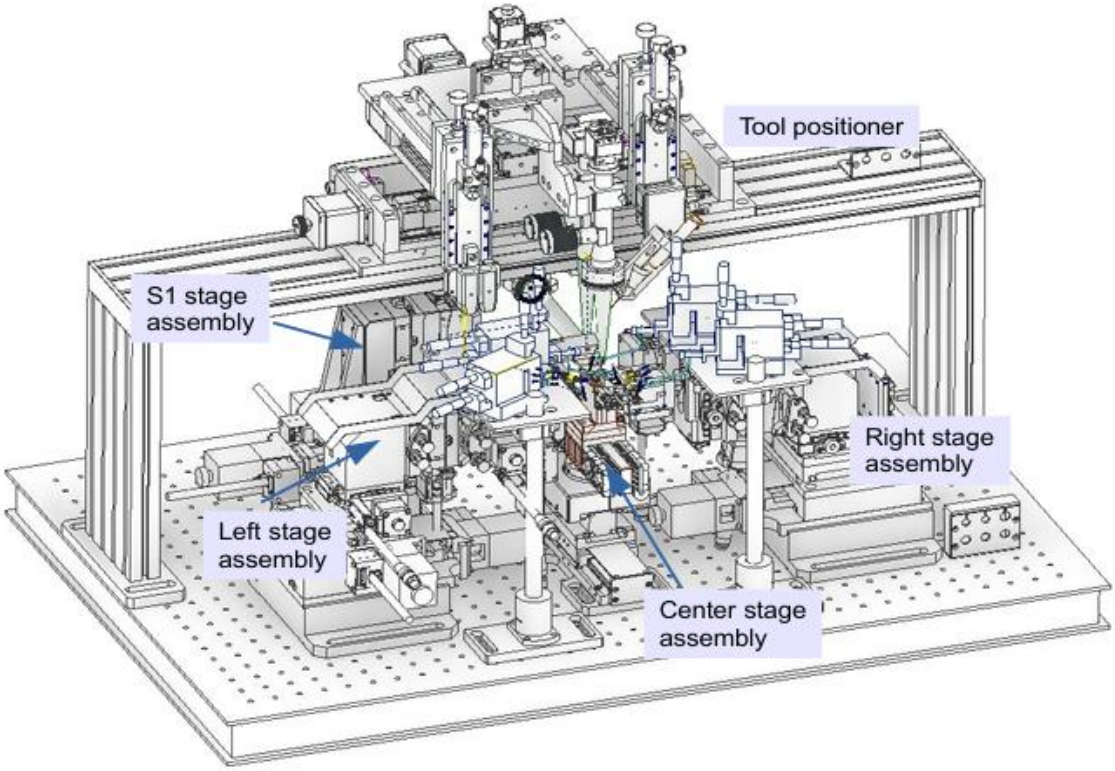
2 linear motorized stages (X, Y) & 1 rotational motorized stage (ThY)

Axis name	Total Travel Length/Angle	Stage Resolution (1/50 microstep)
X	100 mm	≤ 0.1 µm
Y	4 mm	≤ 0.1 µm
ThY	±20°	≤ 0.001°

9. System components

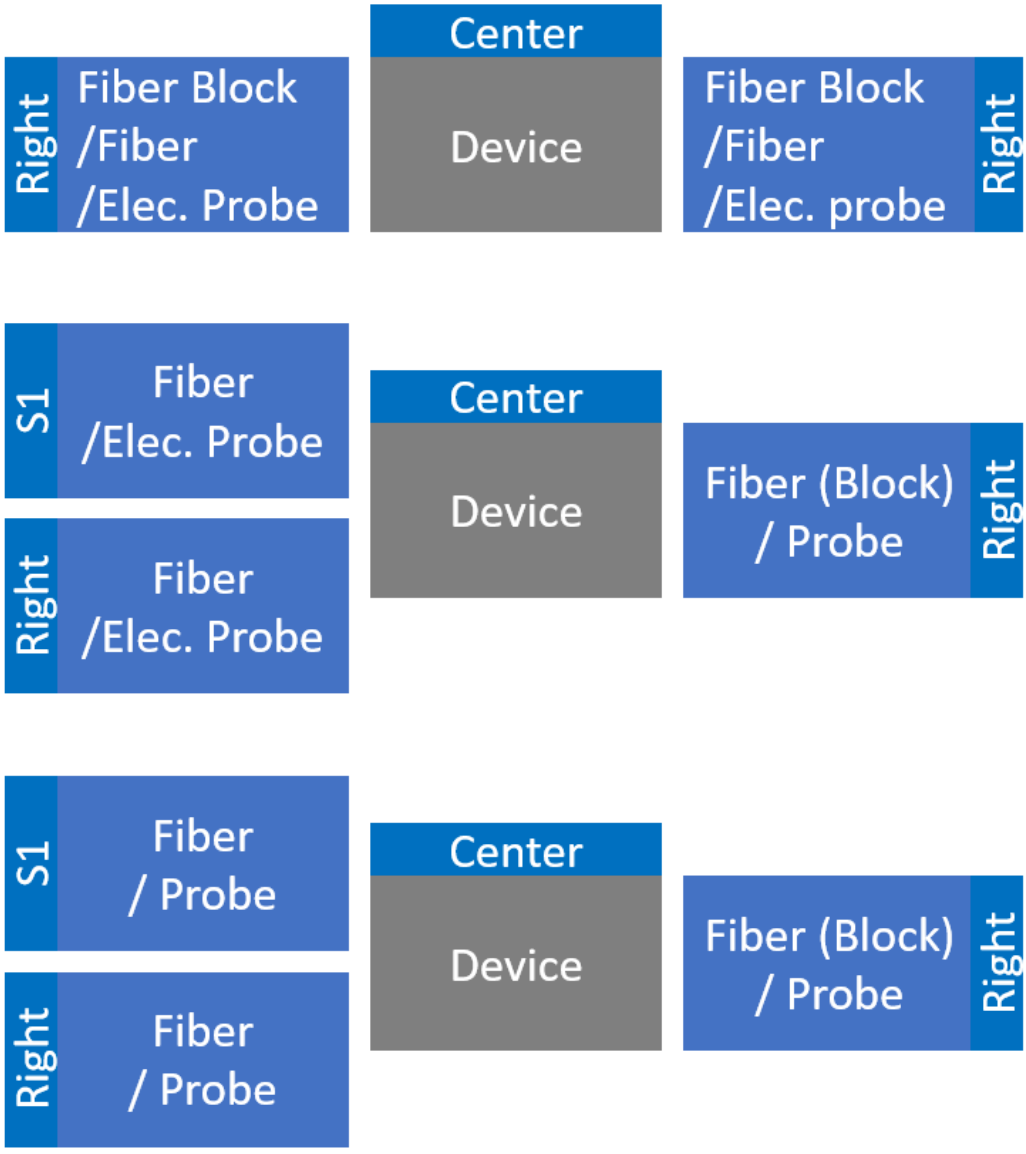


10. Alignment and Process Stage Assemblies



4. Application

Device Assembly/Test with straight or U-bend interfaces using the active alignment w/ the optical & electrical signals. Below are the possible configurations. Options depend on die size and constraints.



5. Pre-use checks (before every run)

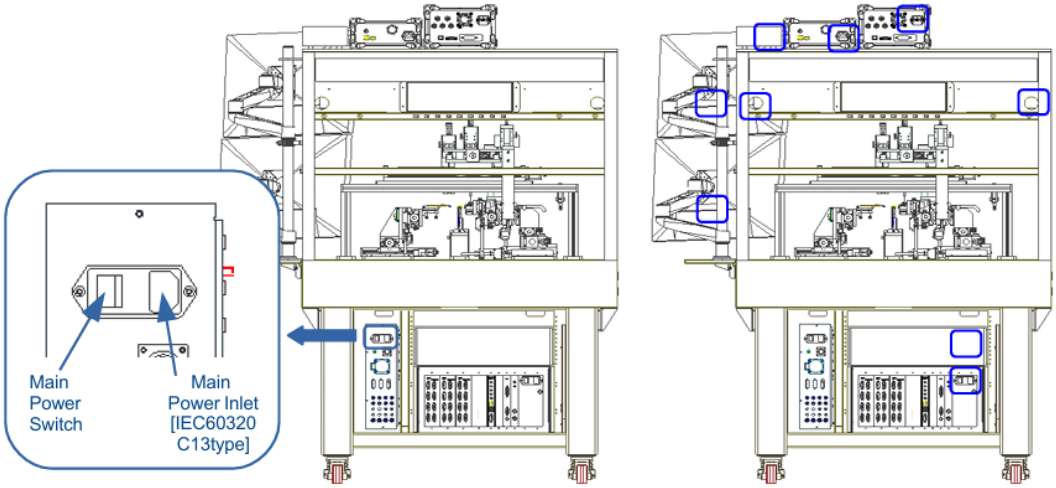
- Verify utilities (CDA/vacuum) in range
- Visual inspection / cleanliness such as epoxy residue, broken or fallen components along movement path.
- Loose adapters and fixtures.
- Mounted components from previous user which may be on collision course.

6. Standard operating procedure

6.1 Startup

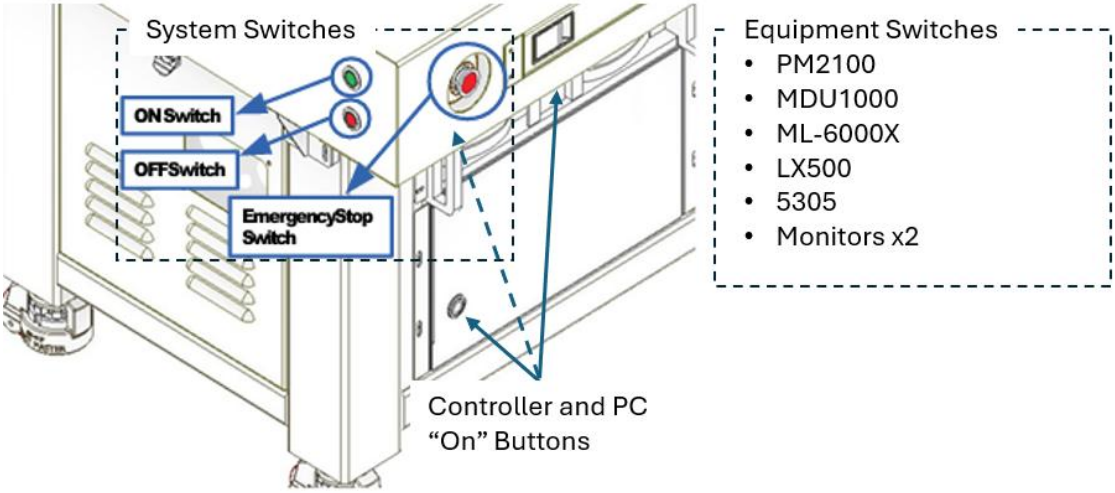
a) Connect a power cable to the main power inlet (refer to the figure below)
b) Check the power cable connections of all the components
c) Turn on the main power switch and check the light of the “power off “switch is on.
d) Push the “power on” switch to supply power to the system and check the light of the button is on.
e) Power on all the components and equipment.

Power Connections (inlets)



(a) Main power inlet and switch (b) power inlets

Switches



6.2 Initialization

a) Run the software by clicking the icon with the “IFA-600 GUI” label.

b) Enter an ID and a password when the login window appears.

c) After the login, an initialization window appears and shows the status of the peripherals such as PM2100, Motion Controller, DAQ, MCE100, UV Curing System, MDU1000.

d) Make sure all the icons on the right are green, and press confirm button. If any of icons are in red, close the window first and check the power status and connections.

e) If a message window requires homing process, press the homing button to run the home process. The skip button is only for maintenance purposes and MUST NOT be used for the normal operation. [NOTE: The homing process is a very important process to synchronize the coordinates of the stages with reference sensors. Controlling the system without homing process may damage the system.]

6.3 Graphic User Interface

The main window layout has four major sections. For full description refer to the User's Manual.

1. Menu & Toolbar: Mainly used to load, edit the sequence and Homing.
2. Operation & Position: Process Parameters and Stage/Tool Positions (Toggle Tab Panel)
3. Control Panel: Controlling Stage movement and Tools (UV/Epoxy)
4. Sequence Manager & Jog Controller: Lists sequence command and stage control (Toggle Tab).

6.4 Operating

- The software allows to run a series of commands("Sequence"). Normally a sequence for the specific processes is saved in a file. A user can load a sequence file by pressing the "Load SQF" button in the sequence bar and selecting a file (*.SQF). The path of the selected file is shown in the sequence bar.
- A user can run the selected sequence by pressing the "RUN" button on the right bottom side of the window. Pressing the "STOP" button interrupts the command currently under operation. Pressing the "RESUME" button restarts the sequence from the command selected/marked by a green icon. The user can select a command in the sequence window by double-clicking a command.
- The command execution window can be used to execute a command by entering the command with parameters into the edit window and pressing the "EXE" button. Double-clicking one of the commands in the sequence manager loads the selected command onto the edit window.
- **The system has advanced commands and image processing capabilities for automated operations and alignment. Refer to the User's Manual for the details.**

6.5 Shutdown

a) Press the “RELOAD” button on the main window to moves all the stages to the predefined position for reloading process and wait for all the stages to stop moving.
b) Close the software and turn off the MS window operating system.
c) Turn of all the peripherals including the computer, SC7000, SC3000, ML-6000X, LX500, PM2100, MDU1000 and 3505.
d) Shutdown the power by pressing the power-off switch on the left side of the system.

7. Process recipes & Sequences

- Refer to procedure page to one of existing alignment sequences.
- Refer to the User’s Manual to compile application specific sequence.

8. Change log

- Date / author / summary