



Approved UK Distributor for Ceyear

Visit: [www.mcs-testequipment.com](http://www.mcs-testequipment.com)

Email: [sales@mcs-testequipment.com](mailto:sales@mcs-testequipment.com)

Call: 01492 550 398

MCS Test  
New Vision Business Park  
Glascoed Road  
St Asaph  
LL17 0LP

# 6481A Optical Fiber Fusion Splicer User Manual

- Please read this Manual before operation
- Please keep this Manual together with the fusion splicer for future reference

## Preface

Thank you very much for choosing the 6481A Optical Fiber Fusion Splicer produced by China Electronics Technology Instruments Co., Ltd (abbreviated as CETI)! This product has higher price-performance ratio than other products alike due to the advanced design, robust structure and simple operation. Please read this Manual carefully for your convenience. We will do our utmost to meet your needs, provide you with high quality measurement instruments, as well as first-class after-sales service. With the principle of excellent quality and courteous service, we will provide satisfactory products and service to the users. We sincerely welcome your inquiry.

<b>Tel:</b>	<b>+86-0532-86896691</b>
<b>Website:</b>	<b><a href="http://www.ceyear.com">www.ceyear.com</a></b>
<b>Email:</b>	<b><a href="mailto:sales@ceyear.com">sales@ceyear.com</a></b>
<b>Address:</b>	<b>No. 98, Xiangjiang Road, Qingdao City, China</b>
<b>Post code:</b>	<b>266555</b>

This Manual introduces the applications, performance characteristics, basic principles, method of operation and cautions etc., of the 6481A Optical Fiber Fusion Splicer, to help you get familiar with and master the operation method of this device. Please read carefully and follow the instructions.

Owing to time constraints and the author's limited knowledge, errors and omissions of the Manual are inevitable. We implore every user to criticize and correct them! We sincerely apologize for the trouble caused by our mistakes.

**CONTENTS**

**SAFETY INSTRUCTIONS ..... I**

**WARNINGS ..... III**

**PRECAUTIONS ..... V**

**REPAIR AND MAINTENANCE ..... IX**

**1 OVERVIEW ..... 1**

**2 TERMINOLOGIES..... 3**

2.9 Reset..... 7

2.10 Core alignment..... 7

2.11 Propelling and overlap ..... 7

2.12 Estimated loss ..... 8

2.13 Protection sleeve ..... 8

**3 TECHNICAL PARAMETERS ..... 10**

3.1 Applicable fibers ..... 10

3.2	Fiber heater .....	10
3.3	Power supply.....	11
3.4	Dimensions and weight.....	11
3.5	Environmental conditions .....	12
3.6	Splice loss .....	12
3.7	Other .....	13
<b>5</b>	<b>STRUCTURE AND PANELS .....</b>	<b>16</b>
5.1	Structure.....	16
5.2	Panel instructions .....	16
5.3	Keyboard instructions .....	17
5.4	Port instructions .....	24
5.5	Standby interface instructions .....	25
<b>6</b>	<b>WORKING PRINCIPLES AND FUNCTION TESTS .....</b>	<b>27</b>
6.1	Working principles.....	27

6.2	Function tests of 6481A splicer.....	28
<b>7</b>	<b>FUNDAMENTAL OPERATION.....</b>	<b>32</b>
7.1	Power supply.....	32
7.2	Set up splice parameters.....	32
7.3	ARC power adjustment.....	38
7.4	How to load fibers.....	39
7.5	Operation modes.....	41
7.6	Splice evaluation.....	45
7.7	Heater utilization.....	48
<b>8</b>	<b>DAILY MAINTENANCE.....</b>	<b>51</b>
8.1	Anti-dust and clean.....	51
8.2	Avoid severe strike or vibration.....	53
8.3	Storage.....	54
8.4	Precautions.....	54

8.5	Common troubleshooting.....	55
	<b>APPENDIX A SYSTEM UPDATE.....</b>	<b>57</b>
	<b>APPENDIX B OPERATION OF MAINTENANCE MENU .....</b>	<b>59</b>
B.1	Enter ARC sub-menu .....	62
B.2	Enter the motor sub-menu .....	66
B.3	Enter the electrode sub-menu .....	70
B.4	Enter self-test sub-menu.....	75
	<b>APPENDIX C SET UP HEATER MODE .....</b>	<b>77</b>
C.1	Functions .....	78
C.2	Adjustment methods.....	78
	<b>APPENDIX D FUNCTION SETTING.....</b>	<b>80</b>
D.1	Pause 1 .....	82
D.2	Pause 2 .....	82
D.3	Auto start of wind-protector.....	83

D.4	Tension test .....	83
D.5	Auto reset .....	84
D.6	Heating type .....	84
D.7	Power saving .....	85
D.8	Lighting .....	85
D.9	Touch screen.....	86
<b>APPENDIX E SETUP .....</b>		<b>87</b>
E.1	Language setting.....	89
E.2	Time setting .....	90
E.3	Image setting .....	91
E.4	Touch screen calibration .....	95
E.5	Restore factory settings .....	96
<b>APPENDIX F INFORMATION .....</b>		<b>99</b>
F.1	Fusion records .....	100

F.2	Export records.....	101
-----	---------------------	-----

## **Safety Instructions**

The following safety instructions should be abided by during whole operation process of 6481A Optical Fiber Fusion Splicer (hereinafter referred as “splicer” ). In case any of these safety instructions, warnings and precautions are not strictly followed, the safety standards deployed by design, manufacture and operation of the splicer will be violated. China Electronics Technology Instruments Co., Ltd (hereinafter referred as CETI) shall not be liable for any consequential damages in connection with these violations !

### **● Operation environment and power supply**

Please refer to technical parameters defined in Chapter 3 for performing and storage environments and operation power supply of the fusion splicer. Please ensure matched power supply for the splicer before Power ON and all safety measures are taken.

## SAFETY INSTRUCTIONS

---

- **Do not use the splicer in a flammable and explosive environment**

Do not use the splicer in an environment with explosive gas or smoke.

- **Do not disassemble any parts of the splicer without permission**

Despite the parts allowed to be replaced by users in the Manual, any remaining parts should not be disassembled without permission. Only CETI or authorized engineers are eligible for parts replacement and internal adjustment.

## Warnings

- **AC/DC power adapter**

Output characteristics of AC/DC power adapter must conform to the following requirements: voltage: 13V ~ 14V; current $\geq$ 4.4A; polarity: center is positive. Excessively high voltage will damage the splicer. Input AC voltage of the AC/DC adapter is 100~240V, 50/60Hz. Any input voltage beyond this range will destroy the splicer permanently.

- **Built-in lithium-ion battery**

The splicer contains a dedicated lithium-ion battery as other batteries will damage it and threaten personal safety of users.

For the purpose of safety, do not disassemble the lithium-ion battery package to prevent a short circuit. The battery will explode if it is shocked violently, gets close

## WARNINGS

---

to or is thrown into sources of fire or intensive heat.

### ● **Operation of the fusion splicer**

Turn the splicer off immediately and unplug the adapter from the power input port in case the following conditions are seen:

- Fluid or unknown matters enter the splicer;
- The splicer suffers from severe shock and vibration.

No user serviceable parts inside. So do not dismantle it as any unqualified repair may cause permanent destroy of the splicer and even personal injury.

During ARC discharge of the electrodes, voltage between the two electrode bars reaches as high as thousands volt. Do not touch the electrodes to avoid damage to the splicer and personal injury.

## **Precautions**

### **● AC/DC adapter**

Please use the dedicated adapter provided by CETI as others may damage the splicer.

### **● Built-in lithium-ion battery**

1. The lithium-ion battery will come into sleep status when not in use for a long time. The capacity is lower than normal, and the operation time becomes short accordingly. Perform 2 to 3 cycles of charging and discharging to activate the battery and restore it back to the normal capacity. Charge the battery when necessary as it doesn't have memory.
2. The battery discharges automatically. The internal structure and service life of the battery will be shortened due to the auto discharging. 60% ~80% of the capacity is adequate for charging.

## PRECAUTIONS

---

3. When the battery is stored for a long period of time (more than 6 months), the temperature range is:  $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$ ; the temperature range is  $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$  during a short period of storage (less than or equal to 6 months).
4. For a safe charging, the charging temperature range of the built-in lithium-ion battery is  $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$ . When the ambient temperature exceeds this range, the charge will automatically terminate.

### ● **LCD monitor**

1. Do not touch the LCD monitor with sharp objects; do not knock on the LCD monitor with great force.
2. Do not drop organic solvents or pollutants on the LCD, such as acetone, oil, antifreeze, ointment etc; otherwise it may lead to abnormal performance of it.
3. Clean the LCD with silk or soft fabric.
4. Brightness of the LCD will be different due to diverse viewing angles. You may also see black, red, blue or green dots on the LCD, which are natural phenomenon

## PRECAUTIONS

---

but not failures of the LCD.

### ● **Operation of the fusion splicer**

1. The fusion splicer is used to fuse silica glass optical fibers. Other purposes are not applicable. Please read this Manual carefully before operation.
2. In a dusty room, keep the protective cover of the splicer closed.
3. Apply gradual heating when the splicer is transferred from a low temperature environment to an environment with high temperature, otherwise the instrument will be impacted by internal condensation.
4. In order to maintain the performance of the splicer, yearly maintenance of the whole instrument is recommended.
5. The fusion splicer should avoid severe vibration and shock as it is a calibrated precision instrument. Besides a portable case, a packing box filled with cushioning materials is required for a long-distance transportation.

### ● **Software update**

## PRECAUTIONS

---

1. Format of U disk for upgrade is FAT, other formats may not be recognized.
2. Don't pull out the U disk when the software is upgrading, otherwise it will not work normally.
3. Restart the splicer no matter whether the upgrade is successful or not, or it may not work normally.

## **Repair and Maintenance**

Over the warranty period, breakdowns of the splicer deserve free maintenance. However, the following circumstances are not covered by the warranty.

- Breakdowns or damages caused by force majeure, such as natural disasters.
- Instrument damage or performance degradation caused by violation of the Manual and mishandling.
- Vulnerable parts, such as lithium batteries and electrodes, enjoy separate warranty periods.
- Repair of the splicer should be performed by CETI or authorized repair units. Dismantling and repair by any other parties and personnel are illegal, and the warranty becomes invalid. CETI retains the right to pursue legal actions against any violators.
- In case the splicer should be returned back to the factory thanks to repair or maintenance needs, it should be put in the portable box and be transported in the original package. Any damages caused by improper packing will not be covered

## REPAIR AND MAINTENANCE

---

by the warranty

**Remarks:**

**CETI reserves the rights to modify the design and structure of the splicer, but not be liable for free improvement and replacement of the sold instruments.**

## **1 Overview**

This Manual is applicable to 6481A Optical Fiber Fusion Splicer (hereinafter referred to as “the splicer”). Mainly used for the permanent splice of optical fibers, it is widely applied in fiber communication projects and production test of passive optical devices. The splicer can splice diverse quartz optical fibers with the cladding diameter of  $80\mu\text{m} \sim 150\mu\text{m}$ , for instance, single-mode, multimode, non-zero dispersion, dispersion shifted and bending-loss insensitive fibers. As an instrument integrating optic, mechanical and electrical property, the splicer should be kept clean, and avoid severe vibration or shocks. Please refer to Fig. 1-1 for the appearance of 6481A Optical Fiber Fusion Splicer.

## OVERVIEW

---



Fig. 1-1 Appearance of 6481A Optical Fiber Fusion Splicer

## **2 Terminologies**

### **2.1 Single-mode Fiber**

Single Mode Fiber

### **2.2 Multimode Fiber**

Multimode Fiber

### **2.3 Dispersion Shifted Fiber**

Dispersion Shifted Fiber

### **2.4 Non-zero Dispersion Shifted Fiber**

Non-zero Dispersion Shifted Fiber

### **2.5 Bending-loss Insensitive Fiber**

Bending-loss Insensitive Fiber

### **2.6 Bare Fiber**

Removing the fiber coating, the core and the cladding are called as bare fiber; please refer to Fig. 2-1.

### **2.7 Cleaved fiber length**

Prepare a fiber with an end-face in good condition, as shown in Fig. 2-1; length of the bare fiber is the cleaved length. Please get this length under proper control when you cleave a fiber, a length between 10mm~16mm is ideal. Cleaved lengths of rubber-insulated fibers or jumper fibers should be no less than 14mm. Too short cleaved length will lead to abnormal operation of the splicer.

## TERMINOLOGIES

---

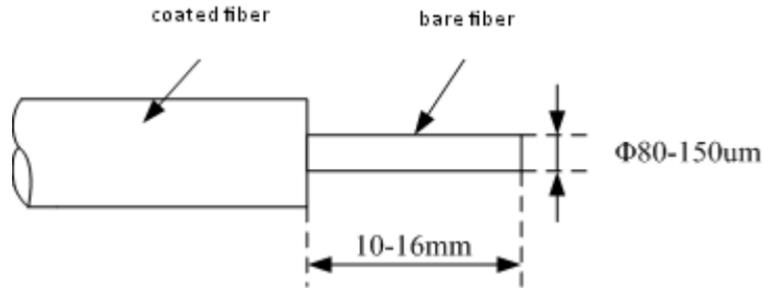


Fig. 2-1 Diagram of common coated fiber

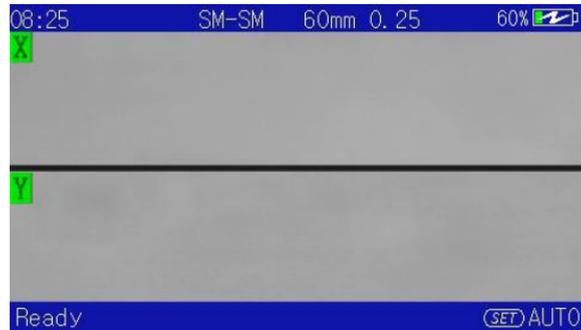
### 2.8 Interface

Menus of 6481A Optical Fiber Fusion Splicer use GUI graphical design, the main interface is shown in Fig. 2-2. The display has 4 types: vertical display in X/Y axis, horizontal display in X/Y, independent display in X axis and independent display of in Y axis. Fiber image of the vertical display in X/Y axis seen in the LCD is shown in Fig. 2-3.

## TERMINOLOGIES



Fig. 2-2 Main interface of the menu



## TERMINOLOGIES

---

Fig. 2-3 Fiber image of vertical display in X/Y axis

### **2.9 Reset**

The meaning of the Reset is to restore the mechanism parameters applied by the splicer to the default status. The instrument can splice fibers after reset. Reset time varies due to different locations of the operation mechanisms when a fiber is fused.

### **2.10 Core alignment**

The process of aligning the left and right axis of the optical fiber to be spliced is called the core alignment. If the two core axes are not aligned, the horizontal (X) and the vertical (Y) directions will see deviations, known as the radial deviation. The core alignment process is to adjust the radial deviation within the allowable range.

### **2.11 Propelling and overlap**

Movement of fibers along the axes is called propelling. Fibers propel during gap alignment and splice. Movement distance of a fiber at the right side during splice is called overlap.

### **2.12 Estimated loss**

The fusion splicer calculates loss of spliced points according to optical fiber images, which has certain deviation from the actual value. The loss estimation algorithm takes the single-mode fiber as the model and  $1.31\mu\text{m}$  as the transmission wavelength. The estimated loss is good for your reference but not sufficient for engineering acceptance.

### **2.13 Protection sleeve**

The sleeve protects spliced points of fibers, as shown in Fig. 2-4.

## TERMINOLOGIES

---

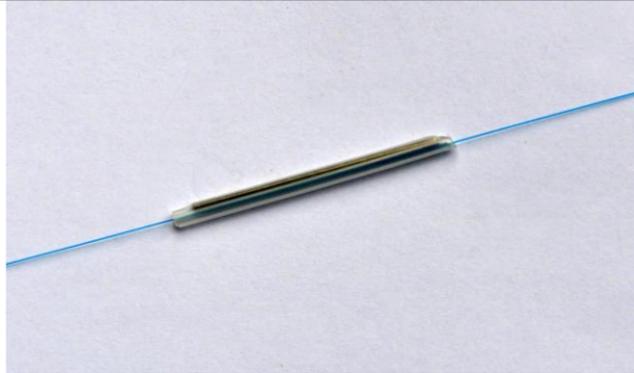


Fig.2-4 Picture of the protection sleeve

## 3 Technical Parameters

### 3.1 Applicable fibers

The fusion splicer can automatically splice fibers and erbium-doped fiber complying with ITU-T G.651 ~ G.655 and G.657 provisions. Other quartz fibers can also be fused but specifications after splicing cannot be guaranteed. In the case of loose fibers, use the instantaneous dry glue to adhere bare fibers to loose sleeves at the connection points for normal fusion.

- Material: quartz series
- Core quantity: single-mode
- Type: single-mode, multi-mode, dispersion shifted, non-zero dispersion shifted and erbium-doped fibers
- Cladding diameter: 80 $\mu$ m~150 $\mu$ m
- Coating diameter: 0.1mm~1.0mm, 2.0mm, 3.0mm, 2.0mm\*3.1mm

### 3.2 Fiber heater

- Effective heating length:  $\leq$ 60mm

## TECHNICAL PARAMETERS

---

- Heating time: 10s~255s, settable as required.
- Typical heating time:  $\leq 15$ s.

### 3.3 Power supply

- External DC power input  
Input voltage is  $13.5\pm 0.5$ V; input current  $\geq 4.4$ A; socket center is positive.
- Built-in lithium-ion battery for power supply.  
The lithium-ion battery is 11.1V,  $\geq 5.2$ Ah, full charging time is approx. 3.5h.

### 3.4 Dimensions and weight

- Dimensions:  $W\times H\times D=120\text{mm}\times 130\text{mm}\times 154\text{mm}$ (without vibration-free rubber pad)
- Weight: approx.2.1kg( with the lithium-ion battery), approx.1.8kg(without the lithium-ion battery).

## TECHNICAL PARAMETERS

---

### 3.5 Environmental conditions

- Operating temperature:  $-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$
- Temperature limit:  $-20^{\circ}\text{C} \sim +55^{\circ}\text{C}$
- Operating humidity: 95%RH and below (non-condensing)
- Max. wind speed: 15m/s
- Storage temperature:  $-40^{\circ}\text{C} \sim +80^{\circ}\text{C}$ ,
- Storage humidity: 95%RH and below (non-condensing).

### 3.6 Splice loss

Typical loss values of spliced points are (Measured by cut-back method relevant to ITU-T standards):

- Single-mode fiber: 0.02dB
- Multi-mode fiber: 0.01dB
- Dispersion shifted fiber: 0.04dB
- Non-zero dispersion shifted fiber: 0.04dB

### 3.7 Other

- Typical splice time: 7s(FAST mode, typical)
- Monitor: with touch screen function, 4.3 inch TFT color LCD
- USB port: system update and data transmission
- Real-time display of remaining battery capacity
- Built-in lighting with high brightness, for convenient loading of fibers

## CONFIGURATION

---

### 4 Configuration

Standard configuration of 6481A Optical Fiber Fusion Splicer is listed in Table 4-1.

Table 4-1 Standard configuration of 6481A Optical Fiber Fusion Splicer

No.	Name	Qty.	Remarks
1	6481A Optical Fiber Fusion Splicer	1 set	Host
2	Carrying case (with hand strap)	1 each	Accessory
3	AC power cord	1 pc	Accessory
4	Power adapter	1 each	Accessory
5	Standby electrodes	1 pair	Accessory
6	Cooling tray	1 each	Accessory

## CONFIGURATION

7	User Manual	1 copy	Accessory
8	Quick Start Guide	1 page	Accessory
9	Jacket remover	1 set	Accessory
10	Lithium-ion battery	L each	Accessory
11	Cleaver	1 set	Option
12	Stripper	1 each	Option

## **5 Structure and Panels**

### **5.1 Structure**

As a portable splicer, 6481A has a LCD monitor which can move flexibly and rotate, for easy observation of users.

### **5.2 Panel instructions**

#### **5.2.1 Wind-protector**

The wind-protector should be kept closed ordinarily and be opened up only when a fiber is placed in the splicer. Close the protector before your operation of the splicer. It comprises a reflecting mirror for lighting of the microscope and a small head which can stabilize bare fibers in the V-groove. The protector can also prevent wind and dust.

#### **5.2.2 Monitor**

4.3 inch TFT-LCD monitor with adjustable angle and brightness, and can rotate

## STRUCTURE AND PANELS

---

automatically. Please protect the monitor from being hurt by hard objects during utilization.

### 5.2.3 Power supply

For users' convenience, the splicer has two types of power supply, which are the built-in lithium-ion battery and the external DC power supply. When an AC adapter is used for external DC supply, the battery will be charged simultaneously.

### 5.2.4 Charging indicator

When the AC adapter is plugged in, the LED indicator light turns to red, which means the lithium-ion battery is now charging. The indicator turns to green after the charge.

## 5.3 Keyboard instructions

The keyboard is shown in Fig. 5-2. Two operation modes are available: menu and splice. ,  and  function in both modes. The functions are shown

## STRUCTURE AND PANELS

in Table 5-1. Keys capabilities are listed in Table 5-1 and Table 5-2 in the two modes



Fig. 5-2 Keyboard

## STRUCTURE AND PANELS

Table 5-1 Universal keys

Key	Function instruction
	Power switch. When the splicer is Power OFF, press this key and let it go to power the splicer On, and the blue indicator lights. Repeat the operation to power the splicer Off when it is ON. Working together with  to enter the status of software update.
	Heating key. Press it (corresponding red indicator lights) to perform an automatic heating. Closing the heater lid also enables an automatic heating. Set up heating time in the menu. Press this key to stop heating.
	Reset key. Press it to stop all current operations (heating is exceptional), and restore the parameters in the operational mechanism of the splicer to the original

## STRUCTURE AND PANELS

	status. The splicer is in the splice mode.
--	--

Table 5-2 Keys in the Menu Mode

Key	Function instructions
	<p>Power switch. When the splicer is Power OFF, press this key and let it go to power the splicer ON, and the blue indicator lights. Repeat the operation to power the splicer OFF when it is ON. Working together with  to enter the status of software update.</p>
	<p>Heating key. Press it (corresponding red indicator lights) to perform an automatic heating. Closing the heater lid also enables an automatic heating. Set up heating time in the menu. Press this key to stop heating.</p>

## STRUCTURE AND PANELS

	<p>Reset key. Press it to stop all current operations (heating is exceptional), and restore the parameters in the operational mechanism of the splicer to the original status. The splicer is in the splice mode.</p>
	<p>a. Return key, press it in the menu to return the menu to previous level. b. Menu key. Press it to enter the menu interface when the splicer is in standby state.</p>
	<p>OK key. Press it to enter the menu to next level; to switch move between left and right fiber during motor alignment; to confirm start of test in the test menu.</p>
	<p>Up key. Press it to move the cursor upwards in the menu; to move the cursor upwards during motor alignment; to review previous fusion records.</p>

## STRUCTURE AND PANELS

	Down key. Press this key to move the cursor down in the menu, to move the fiber downward during motor alignment; to check recent fusion records.
	Turning right key. Press it to move the cursor to the right side in the menu, to turn to next page in the multiple menus; to move the fiber forward during motor alignment and to increase parameter values in the menu.
	Turning left key. Press this key to move the cursor to the left side in the menu; to turn to previous page in the multiple menus; to move the fiber backwards during motor alignment; to decrease parameter values in the menu.

## STRUCTURE AND PANELS

Table 5-3 Keys for Splice Mode

Key	Function instructions
	Clean key. Press it to perform short ARC discharge of the two electrodes of the splicer, to clean fiber dust and alcohol, but cannot remove burrs on the fiber end-face.
	Gapping key. Press it to complete gap adjustment, including fiber push, fiber clean, judgment and display of fiber end-face angle, adjustment of fiber axial position as desired. After completion, The buzzer buzzes indicating the completion and the monitor displays OK.
	Core alignment key. Press this key to perform core adjustment and alignment of the fibers to be spliced. The buzzer buzzes indicating the completion and the monitor displays OK.
	ARC discharge key. Press it to perform ARC discharge splice

## STRUCTURE AND PANELS

	once again. After press it, thousands of voltage will be generated between the two electrodes. Users should not touch the electrodes for personal safety.
	Switch key. Press it to switch between display types of fiber images and magnification rate.
	Auto splice key. Press it to perform automatic fiber clean, gapping, core alignment, splicing, loss estimation, tension test etc.

### 5.4 Port instructions

Input and output ports are on the right side of the splicer as shown in Fig. 5-3. Table 5-4 gives all functions.



## STRUCTURE AND PANELS

Fig. 5-3 Picture of the right side panel

Table 5-4 Function instructions of the right side panel

Description	Instructions
POWER IN	DC power input through the adapter, 13.5V and 4.5A. The adapter performs both splicer charging and battery charging simultaneously.
CHARGE	Charging indicator. When it turns to red, the lithium-ion battery is charging. The charge completes when it turns to green.
USB	U disk interface for system update and data export.

### 5.5 Standby interface instructions

The interface is shown in Fig. 2-3. Use  to switch between display types of fiber images. The information displayed is real-time images of fibers, remaining

## STRUCTURE AND PANELS

---

capacity of the battery, current time and date, splice mode and heater mode etc.

## **6 Working Principles and Function tests**

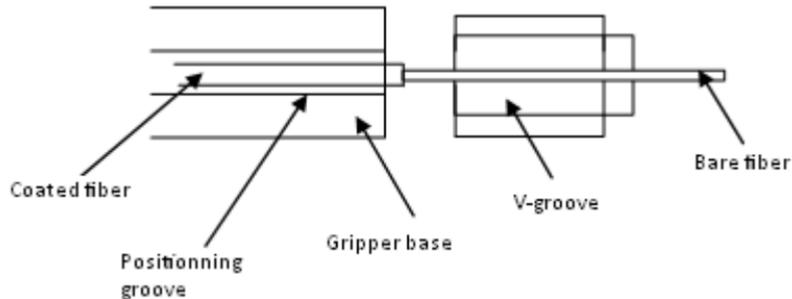
### **6.1 Working principles**

The splicer deploys a specific light source to illuminate fibers loaded, and then uses a dedicated microscope to project fiber images onto the image sensor. Images of the two fibers are processed by the center processor and then are sent to the monitor for display. The processor analyzes and processes the image signals and generates various kinds of information and control signals. The processor adjusts the fibers through the push, align and focusing motors driven by the circuit, to move the two fibers close to each other and align them in axial and radial directions. After the alignment, the processor sends out ARC signal. High voltage is generated by the high voltage circuit which penetrates air at two ends of the electrode and yields ARC. High temperature of the ARC is used to splice and fuse the fibers. Physical characteristics of the images after splicing is used to calculate current splice loss displayed in the monitor afterwards. When the splice is accomplished, center the spliced point in the protection sleeve and put them in the heater for heat-shrinkable

protection.

## 6.2 Function tests of 6481A splicer

- a) Open up the wind-protector to check if fixed parts of fibers have dust or other foreign matters on them (for instance chopped fibers, cotton fibrils etc), as shown in Fig. 6-1.
- b) Get a fiber on the left (or a fiber on the right) through the protection sleeve and cut it with a cleaver.



## WORKING PRINCIPLES AND FUNCTION TESTS

---

Fig. 6-1 Placement diagram of the left fiber in the left positioning groove

- c) Turn on the splicer and load the two fibers as shown in Fig. 6-1. Place the bare fibers in the V-groove when loading. Use the clamp to fix the fibers and make them straight. It's best to make the fibers visible in the monitor but not overlap. Close the protector slightly.
- d) Check functions of all keys. Please contact us in case you see any abnormalities.
- e) In the Splice Mode, press  to perform one gapping (gap adjustment), and the monitor displays OK. Press  to perform one time of core alignment and the monitor displays OK. Press  to execute one time of fiber splice. If any challenges are encountered during these processes, please check:  
If ARC is adequate?—— If not, perform ARC calibration or ARC test, to adjust ARC temperature to a proper status, please refer to Appendix B.

## WORKING PRINCIPLES AND FUNCTION TESTS

---

When altitude or temperature fluctuates a lot, the environment will change ARC temperature. So, ARC test is required to adjust ARC intensity and maintain it stable.

If fiber surfaces are clean? —— Clean them if not.

If the V-groove is clean? —— Clean it if not.

If fiber end-faces are in bad condition or contaminated? ——Re-cleave fibers if yes.

Fibers are not standard? —— Replace them with standard ones if yes.

Notice: please contact us if the challenges are not caused by the said reasons.

- f) In Auto Mode, reload fibers and press . The splicer is supposed to perform clean, end angle display, gapping, core alignment, loss estimation, tension test and other functions.
- g) Take the fibers off the clamp and center the spliced point in the

## WORKING PRINCIPLES AND FUNCTION TESTS

---

protection sleeve for heat-shrinkable protection. The whole sleeve should be transparent after heating. Ends on two sides should shrink completely without bubbles.

## 7 Fundamental Operation

### 7.1 Power supply

For users' convenience, the splicer deploys two supply modes, built-in lithium-ion battery and DC input supply. DC input supplies power through an AC adapter. DC input supplies power to both the splicer and the battery simultaneously. The battery suits better when the splicer works in field.

The battery mark on the upper right corner in Ready interface contains the following information:

 : only the AC adapter is used for power supply;

 : only the lithium-ion battery for power supply;

 : the lithium-ion battery is not full when the battery and the AC adapter are used together;

 : the battery is full.

### 7.2 Set up splice parameters

Turn on the splicer to let it perform self-test, after which the splicer starts to splice.

Load fibers following Fig.2-3.

### 7.2.1 Main menu

In the splice mode, press  to display the main menu. The items in light color are for selection. Press  or  or  or  to move the cursor, or choose in the menu by touching the screen. Contents in the main menu are as follows:

**Splice mode: choose types and modes of fibers to be spliced.**

**Heater mode: choose heater mode and adjust timing parameters of the heater.**

**Function setting: includes Pause 1, Pause 2, automated wind-protector, tension test, auto reset, heating operation type, power saving, lighting, auto monitor rotation, auto fiber push, fiber focusing, and other functions.**

**Setup: includes language setting, time and date setting, image setting, touch screen calibration and reset factory settings.**

## FUNDAMENTAL OPERATION

---

**Maintenance:** include ARC discharge, motors, electrodes, splicer self-test and remote diagnosis.

**Information:** include fusion records, export records, export pictures, splicer model number, software version, splicer serial number. In the main menu, press  or Reset key to return back to Ready interface.

## FUNDAMENTAL OPERATION

### 7.2.2 Sub-menu of splice mode setting

Splice Mode 2/38	
9 SM-SM	13 EDF
10 MM-MM	14 SM80
11 NZ-NZ	15 SM150
12 DS-DS	16 BIF
Return	Enter U/D L/R

Fig. 7-1 Splice mode

## FUNDAMENTAL OPERATION

Parameters SM-SM	
Pre-fuse Time 5	Gap 6
Fuse Time 14	Overlap 22
Pre-fuse Current 49	Cleave Limit 4
Fuse Current 49	Alignment Type Cladding
Return	Enter  U/D  L/R

Fig. 7-2 Splice parameters

In the main menu, press or to move the cursor to Splice Mode, and press to enter, as shown in Fig. 7-1. Press or to choose SM-SM and press to confirm the operation as shown in Fig. 7-2. Press to return back to the menu of Splice Mode, and press or to move the cursor to corresponding parameters and press to enable adjustment. Press or to

modify parameters as desired.

### 7.2.3 Menu instructions

Items in the splice parameters are listed in Table 7-1.

Table 7-1 Instructions of splice parameters

Item	Value range	Default splice parameters
Prefuse Time(10ms)	01~99	5
Fuse time(100ms)	01~26	14
Prefuse current(0.1mA)	01~250	40
Fuse current(0.1mA)	01~250	40
Gap(um)	01~15	6
Overlap (um)	01~30	22

## FUNDAMENTAL OPERATION

End Angle(0.5)	1~4	4
Alignment Type	Cladding/Core	Cladding

### 7.3 ARC power adjustment

Temperature, humidity and air pressure in the atmosphere are always changing, which makes the ARC temperature fluctuate. The splicer is equipped with temperature and pressure sensors, can feed parameters of the external environment back to the control system to adjust and maintain the intensity of discharge stable. Therefore, it is unnecessary to adjust the intensity of discharge. However, wear of the electrodes and bonding of fiber chips can change the discharge intensity which cannot be automatically corrected, and the discharge center will sometimes move to the left or the right. In this case, spliced point of the fibers will shift from the discharge center and the discharge intensity will change. An ARC discharge calibration is required to address this challenge based on the specific steps of the calibration.

### 7.4 How to load fibers

- a) Place the protection sleeve over one side of fibers to protect the joint after splicing.
- b) Strip the coating and clean the fibers. Strip the coating with a stripper. The stripped length should be approx. 30mm. Clean the bare fibers with cotton balls dipped in alcohol. 99% or better purity alcohol is recommended.
- c) Cleave the bare fibers with a cleaver.
- d) Load the fibers. Open the wind-protector and the fiber clamp, place one cleaved fiber in the V-groove. Hold the fiber and lay down the clamp gently. Make sure the fiber is placed at the bottom of the V-groove., replace it if not.
- e) Repeat the said procedure to load the other fiber and close the wind-protector slowly.

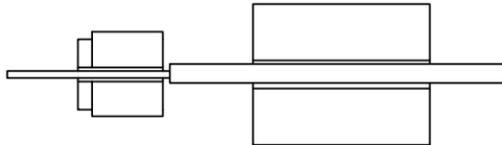
#### **Notice:**

FUNDAMENTAL OPERATION

---

- 1) **Be careful when you load fibers. Do not allow bare fiber end-faces to touch anything**
- 2) **End-faces of fiber coating should be pressed by edge of the gripper base as shown in Fig.7-3**

**Wrong gripping:**



**Correct gripping:**

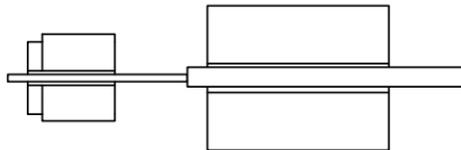


Fig. 7-3 Comparison between two gripping ways

- 3) **Suppress coated fibers with the clamp tightly. When you close the wind-protector, pay attention that it should suppress fibers at the shoulders at both sides.**

## **7.5 Operation modes**

The splicer offers Auto and Manual operation mode. Auto mode is recommended in project constructions. Manual mode is only applied when slicing special fibers or Auto mode is not applicable on site.

### **7.5.1 Manual mode**

- a) Open up the wind-protector carefully and place two well-prepared fibers as per Fig. 2-3. The fibers should be visible on the monitor but not overlap. Then close the protector slightly;
- b) Judge if end-faces are applicable. Dirty end-faces and end-faces with defects, burrs and too large angles are not suitable for splicing, as shown in Fig. 7-4.

## FUNDAMENTAL OPERATION

---

Users need to re-prepare fiber end-faces. In case fiber images blur or diverge from the screen center, reload the fibers and clean the bare fibers and the V-groove;



Fig. 7-4 Defected fiber end-faces

- c) Press  to clean fibers and perform gapping automatically;
- d) Press  to align two fibers automatically;
- e) Press  to finish splicing and estimate splice loss, as shown in Fig 7-5 and 7-6.

### 7.5.2 Auto mode

- a) The same with a) and b) in Manual mode.
- b) Close the wind-protector and press  to automatically finish fiber clean, gapping, core alignment, setup of ARC parameters, ARC splice, loss estimation, tension test and other operations.

#### Notice:

- 1) **Manual mode enables partial steps of fiber splice;**
- 2) **Both modes are capable of end-face inspection. Splice will be impacted in case end-face angles are too large. There exist four gears of angle thresholds for users' choices. Please refer to the section regarding parameters adjustment.**
- 3) **No matter which mode is chosen, press  to switch to fiber images and check spliced points after one time of splice is finished.**

## FUNDAMENTAL OPERATION

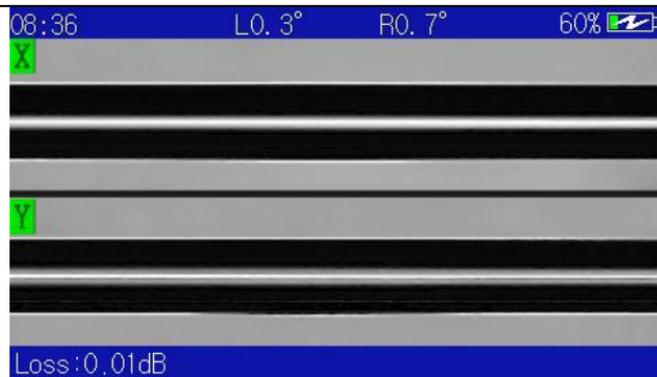


Fig.7-5 Loss estimation

## FUNDAMENTAL OPERATION

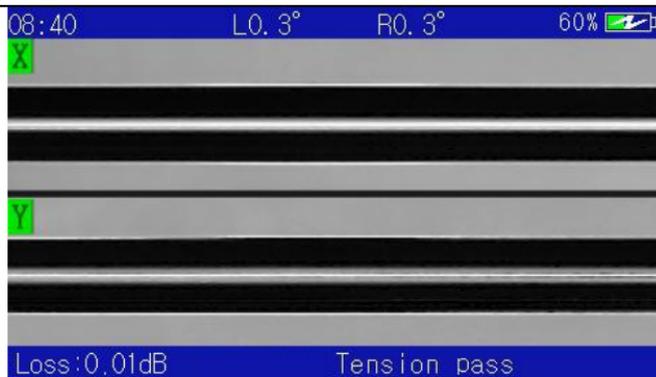


Fig. 7-6 Tension test

### 7.6 Splice evaluation

Users can analyze a whole splice process and spliced joints to judge if a splice is successful. If spliced fibers are found to be too fat, too thin or have bubbles, the splicer will display an error message. In case no such a message is sent out, but bad splice results are seen in the monitor, a new round of splice is recommended.

- a) Re-splice is required if phenomenon listed in Table 7-3 are seen at spliced

## FUNDAMENTAL OPERATION

---

points.

- b) When various fibers (different in diameters) or multi-mode fibers are spliced, a vertical line could be seen at some spliced point, which will not impact splice loss and joint strength.

Table 7-3 Phenomenon, reasons and solutions to bad splice

Phenomenon	Reason	Solution
Core axial offset 	V-groove is dirty or dust on fiber holder.	Clean V-groove and fiber presser foot.
Too thin	ARC power is inadequate.	Perform ARC calibration to adjust the power.
	Fiber overlap is inadequate.	Perform Overlap Calibration.

## FUNDAMENTAL OPERATION

<p>Black line</p> 	<p>Splice parameters are inadequate.</p>	<p>Adjust ARC power and time.</p>
	<p>Bad end –face.</p>	<p>Check if fiber cleaver can function well.</p>
<p>Core curve</p> 	<p>ARC power is too low or fiber overlap is excessive.</p>	<p>Perform ARC Calibration and Overlap Calibration</p>
<p>Bubble</p>	<p>Dust on end-face.</p>	<p>Check if fiber cleaver can function well.</p>
	<p>Low ARC power or inadequate ARC time.</p>	<p>Perform ARC test to increase ARC power.</p>

## FUNDAMENTAL OPERATION

Seperation	Fiber overlap is inadequate.	Adjust overlap and perform Overlap Calibration.
	ARC power is too high or ARC time is too long.	Perform ARC calibration to reduce ARC power.
Too fat 	Fiber overlap is excessive.	Perform Overlap Calibration.
	ARC power is inadequate.	Perform ARC test to adjust ARC power.

### 7.7 Heater utilization

- a) Load the protection sleeve before splicing. Open up the heater lid, the wind-protector, the right clamp and take out spliced fibers carefully.

## FUNDAMENTAL OPERATION

---

- b) Move the sleeve to a bare fiber and put them into the heat oven together. Center the sleeve in the oven. The placement position must be correct as shown in Fig.7-7.

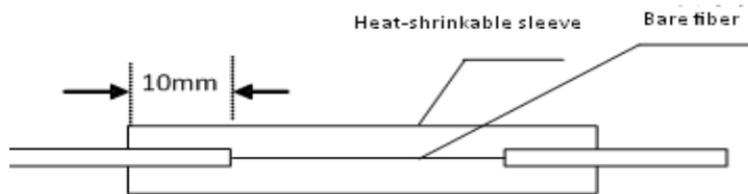


Fig. 7-7 Utilization of protection sleeve

- c) Close the heater lid gently to enable the heating function. The indicator lights. Do not bend fibers or move their positions inside the sleeve.
- d) When the indicator goes out and the buzzer buzzes, heating time runs out. Pre-set up heating time for each splice in the menu.
- e) Users can watch heating condition of the sleeve from the plastic window.

## FUNDAMENTAL OPERATION

---

When air in the sleeve is exhausted and it becomes more transparent, heating is finished. Then, open up the heater lid for cooling and take out fibers carefully. Do not pull fiber edges outside the sleeve with great force to avoid break-off a spliced fiber.

- f) In case heat shrinking is unsuccessful within a setting duration, restart heating or prolong time setting properly.

## **8 Daily Maintenance**

### **8.1 Anti-dust and clean**

Keep the positioning groove, the electrodes and the microscope clean. Close the wind-protector when not in use.

#### **8.1.1 Clean the V-groove**

If the V-groove is dirty inside, it is incapable of holding fibers correctly, which will increase splice loss. Hence, please check the V-groove frequently and clean it regularly. Clean it as follows:

- a) Open up the wind-protector;
- b) Move a cleaved fiber tail towards the same direction in the V-groove to get rid of dirty matters;
- c) If the fiber tail does not work, use a thin cotton swab dipped in alcohol to clean the bottom of the V-groove, and remove excess alcohol from it.

### **8.1.2 Clean and replacement of electrodes**

- a) If the electrodes are contaminated, enable the function of electrodes cleaning by clicking OK in Ready interface and wipe them with cotton swabs with alcohol slightly. Or use a piece of metallographic abrasive paper of 3mmx50mm to wipe the electrode tips. Pay attention to the tips and do not hurt them.
- b) Electrode life is long. Electrode replacement is required after one electrode is used over 3000 times. Please refer to specific steps for the replacement.

### **8.1.3 Clean lens**

If the lenses are dirty, normal check position of cores will be impacted, which will increase splice loss or bad fusion. Therefore, regular clean of the two lenses are

## DAILY MAINTENANCE

---

recommended or dust will accumulate relentlessly and cannot be removed at last. Please clean them as follows:

- a) Turn off the power before cleaning:
- b) Use thin cotton swabs with alcohol to wipe the lenses from the middle. Circularly move until the whole lenses are cleaned. Then remove excess alcohol with clean dry swabs.
- c) Turn on the power to make sure dust and lines cannot be seen on the monitor.

### **8.2 Avoid severe strike or vibration**

Be careful during movement or transportation of the splicer. Put it in the carrying case and the transportation box at first before a long-distance transportation.

### **8.3 Storage**

Turn on the splicer at least half a year when not in use for a long time. Turn it on frequently when temperature and humidity are high. Put drying agent inside the splicer case to prevent the microscope lens from getting mould.

### **8.4 Precautions**

- a) When using AC power, protect the adapter and ensure an adequate grounding.
- b) When ARC discharging, the electrodes will generate thousands of voltage. Do not touch them to avoid injury to the splicer and personnel.
- c) Inflammable and explosive gases are not allowable in the operational environment, to avoid bad splice or accidents.
- d) Use only 99% or better purity alcohol to clean the positioning groove and the microscope lens. Move cotton swabs towards one direction but not back and forth.

### 8.5 Common troubleshooting

Table 8-1 lists solutions to common breakdowns. Please contact us when you encounter tough issues.

Table 8-1 Common breakdowns and troubleshooting

Breakdowns	Reasons and troubleshooting
Monitor displays: “Left (Right) Fiber Not Found”	Inadequate cleave length of bare fibers, or fiber end-face is too far away from the electrodes. Make fibers visible in the monitor when loading them.
Monitor displays: “Splice Failed”	Improper choice of splice parameters or unstable ARC. Fiber overlap is inadequate or no push when splicing. Fibers are loaded badly.

## DAILY MAINTENANCE

Electrodes do not perform ARC or ARC is unstable	Possible reasons: Improper setting of ARC parameter; Electrodes are too dirty or the tips are damaged; Dirty fiber surfaces. Solutions: Choose proper ARC parameter; Clean or replace the electrodes; Reprocess fibers to be spliced.
Monitor displays: “Bad Left (Right) End-Face”	Bad end-face. Re-prepare fiber end-face; V-groove or fibers are dirty and need clean. Reload fibers.

## Appendix A System Update

System update is available for the splicer. Please refer to the following steps:

When the splicer is Power OFF, press  and hold, and then press  and let go. The update status will be enabled in 2s, as shown in Fig. A-1.

Insert the U disk containing update information into the USB port and the system will execute update automatically. The system will prompt Update Completed, Pull out U disk and restart after the update is accomplished.

If the U disk inserted is not in FAT format, the system will prompt Please insert update U disk.

If the U disk in FAT does not contain the update information. The system will prompt Please check U disk and update file.

Restart the splicer after the update is completed.

### Notice:

**1) U disks for update must be in FAT32 or FAT16 format, the system won't**

recognize other formats.

- 2) **During a system update, do not pull out the U disk in use or the system will fail in functioning normally.**
- 3) **The splicer must be restarted no matter an update is successful or not, or it may fails in functioning normally.**



Fig. A-1 System update interface

## Appendix B Operation of Maintenance Menu

The maintenance menu contains four parts: function tests of ARC discharge, motors and electrodes, as well as splicer self-check, as shown in Fig. B-1. Function test of ARC discharge is to detect and adjust the ARC power intensity. Function test of the motors is mainly to detect and calibrate fiber overlap while ARC splicing, and to detect motors operation. Function test of the electrodes mainly includes replacement of the electrodes, electrodes stabilization, as well as display and zero of discharge counts. The operation process is as follows:

- a) Choose Maintenance in the main menu, press  to enter, the maintenance menu displayed by the splicer is shown in Fig. B-1.
- b) Load two fibers with good end-faces before each test and close the wind-protector properly.
- c) Choose the desired test and press  to enter. After completion of all

## APPENDIX B OPERATION OF MAINTENANCE MENU

required operations based on test prompts, press  to return back one level after another, or  to return back directly.

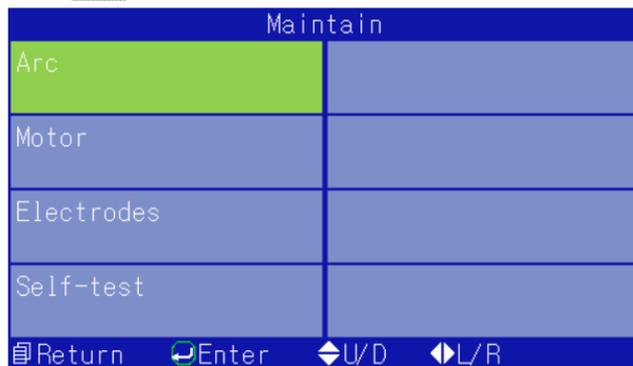


Fig. B-1 Maintenance menu

APPENDIX B OPERATION OF MAINTENANCE MENU

Table B-1 Menus of function tests

Item		Instructions
Function tests of ARC discharge	ARC calibration	Test value and position of the ARC power and adjust splice parameters and ARC position according to them.
	ARC test	Offers value of the existing current and deviation value of the ARC from the monitor center.
Function tests of motors	Overlap calibration	Test if overlap value and gap parameter of current splice program are proper, and adjust splice parameters automatically if not.
	Overlap test	Overlap test of the left fiber towards the right fiber during ARC splicing.
	Motors adjustment	Adjust initial positions of motors or check operation conditions of them.

## APPENDIX B OPERATION OF MAINTENANCE MENU

Function tests of electrodes	Electrodes replacement	Display replacement procedure.
	Stabilized electrodes	Perform electrodes stabilization.
	Clear of ARC discharge counts	Manual clear of ARC counts.

### B.1 Enter ARC sub-menu

Choose ARC in the maintenance menu and press  to enter as shown in Fig. B-2.

## APPENDIX B OPERATION OF MAINTENANCE MENU

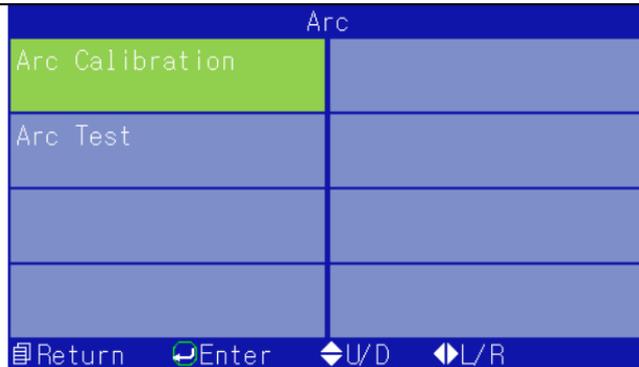


Fig. B-2 ARC sub-menu

### B.1.1 ARC calibration

ARC calibration is to optimize position and current intensity of ARC. Load a well-prepared fiber with a good end-face in the splicer and choose ARC Calibration. Press  to enter this mode and press this key again to confirm the operation to initiate the calibration, the procedure is as follows

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

- a) The splicer moves the fibers to the monitor center automatically and set up a proper gap;
- b) The splicer performs auto ARC, calibrates ARC position and adjust current intensity;
- c) In case one time of calibration fails in achieving the objective, replace two fibers with end-faces in good condition for test. Close the wind-protector and perform ARC calibration once again.

### B.1.2 ARC test

Choose ARC in the maintenance menu and press  to enter as shown in Fig. B-2. Then choose ARC test as shown in Fig. B-2 and press  to enter, press this key again to confirm and initiate the ARC test. Specific procedure is as follows:

- a) The splicer pushes the fibers to the monitor center and set up a proper gap to complete core alignment;
- b) The electrodes generate ARC through discharge. The right fiber stops

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

pushing and end-faces of the two fibers are burned to globular;

- c) The splicer calculates ARC position and current intensity according to deformation of the fibers spliced by high temperature and gives out the following information:

“To left/To right××× Current×××” indicates the ARC deviates to left/right.

Left / right deviation of ARC within 003 requires no adjustment, 008 ~ 012 is an appropriate range for current. Please perform ARC calibration and adjustment in case ARC position deviates a lot. Manual adjustment is required if the ARC calibration is not ideal. ARC position adjustment demands sophisticated technology which should be performed by professionals. In addition, users can determine if the applied splice parameters work well for splicing based on deformation of the fibers. When the test completes, the optimum gap between the two arc vertex showed in the monitor should stay within 5~6mm. A narrower gap indicates weak current and a wider gap reveals strong current. In case there is a need to adjust group number of

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

splice parameters and the parameters, please follow the parameters settings. Take the regulation of single-mode fibers in ITU-T G.652 as the standard to judge intensity of discharge current and that of other types of fibers is just for reference. Press  to return back level by level and  to return back directly after the test.

### **B.2 Enter the motor sub-menu**

Choose Motor in the maintenance menu and press  to enter as shown in Fig. B-3.

## APPENDIX B OPERATION OF MAINTENANCE MENU

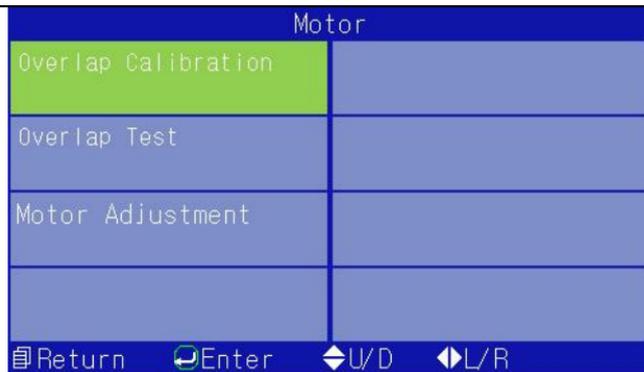


Fig. B-3 Motor sub-menu

### B.2.1 Overlap calibration

Load well-prepared fibers in the splicer and choose Overlap Calibration in the motor sub-menu. Press  to enter and press it again to initiate the test. The procedure is as follows:

- The splicer moves the fibers to the monitor center and setup gap;

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

- b) The splicer pushes the left fiber out and pushes the right fiber forward as per Overlap+Gap values;
- c) The splicer calculates the overlap value automatically and displays it. The overlap value displayed should be close to the parameters settings;
- d) The splicer can automatically judge if the overlap value is appropriate as per the value calculated. If it is inappropriate, the splicer automatically changes the overlap value in the splice parameters and repeat a), b), c) until the overlap calibration succeeds.

**Notice: Overlap calibration is used to adjust overlap to the optimum value, and it usually requires several calibrations. No need to prepare fibers again during the calibration.**

### B.2.2 Overlap test

Load well-prepared fibers in the splicer and choose Overlap Test in the motor

sub-menu. Press  to enter and press it again to initiate the experiment. The procedure is as follows:

- a) The splicer moves the fibers to the screen center and setup gap;
- b) The splicer pushes the left fiber out and pushes the right fiber forward as per Overlap+Gap values;
- c) The splicer calculates the overlap value automatically and displays it. The value displayed should be close to the parameters settings.

### **B.2.3 Motor drive**

In case the fiber positions are abnormal but the V-groove is clean, users can use motor drive to adjust the positions. The operation procedure is as follows:

- a) Choose Motor Adjustment in the motor sub-menu. Press  to enter the motor drive mode;
- b) Load well-prepared fibers as shown in Fig. 2-3 and close the wind-protector;

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

- c) Press  to choose left push motor, right push motor and focusing motor.  
Press  or  to adjust axial positions of the motors and press  or  to align cores or positions of the focusing motor;
- d) Press  to return back, and the alignment is completed.

### **B.3 Enter the electrode sub-menu**

Choose Electrode in the maintenance menu and press  to enter, as shown in Fig.B-4.

## APPENDIX B OPERATION OF MAINTENANCE MENU

Electrodes	
Replace Electrodes	Total Arc Counts 5
Stabilize Electrodes	
Arc Counts 5	
Clear Arc Counts	
Return	Enter  U/D  L/R

Fig. B-4 Electrode sub-menu

### B.3.1 Replace Electrodes

Qualified electrodes can generally function more than 3000 times. When application of the electrodes exceeds the number, they should be replaced in time, or fusion results could be impacted. In the state given by Fig. B-4, press or or

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

or  to move the cursor to Replace Electrodes Press  again to perform the replacement. Switch off the power to replace the electrode rods following the procedure below:

- a) Replacement of the electrode rods must be performed after Power OFF. The electrodes generate thousands of voltage during discharge which will cause personal injury;
- b) Open the wind-protector to find the electrodes;
- c) Loosen the electrode strip screw at first, pull out the electrode a little, and then screw off the screw, remove the electrode strip and the electrode. Do not let the electrode fall into the splicer and put the new electrode into the electrode groove. Insert the electrode strip into the fixed base and then screw the screw. Push the electrode forward to the end-face, and then tighten the screw;
- d) Replace another electrode as per step c).

Power the splicer ON after the replacement of new electrode rods and perform stabilization and ARC for multiple times.

**Notice:**

- 1) **Make sure the specified procedure for electrodes replacement are abided by to avoid personal injury.**
- 2) **Perform stabilization and ARC discharge as per the requirements to refrain new electrodes from seeing unstable ARC.**

**B.3.2 Stabilized electrodes**

Electrodes wear after long-term applications. Oxides of silicon and the main constituent of fibers will accumulate at electrode tips during discharge. Electrode replacement is recommended after discharge counts are over 3000. Electrode stabilization must be performed after the replacement to ensure stable ARC. In Fig.

B-4, press  or  or  or  to move the cursor to Stabilized

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

Electrodes and press  to execute. Press  to return back level by level or  to return back directly.

**Notice: do not open the wind-protector up during the electrodes stabilization!**

### B.3.3 ARC counts

ARC counts record total number of splice counts, clean ARC is exceptional. The max. counts could reach 60000 times. Users can review ARC counts and Total ARC Counts in the state showed in Fig. B-4.

### B.3.4 Clear ARC counts

Users can review 2 fusion records in the electrodes menu, which are ARC counts and Total ARC Counts. The ARC counts can be cleared manually. In the state showed in Fig. B-4, press  or  or  or  to move the cursor to Clear ARC Counts, and press  to confirm this operation as shown in Fig. B-5, then

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

ARC counts become 0. Press  to return back to the electrodes menu. Press  to return back level by level or press  for a straight return.



Fig.B-5 Confirmation menu of ARC counts clear-up

### B.4 Enter self-test sub-menu

Choose Self-test in the maintenance menu and press  to enter the sub-menu, as

## APPENDIX B OPERATION OF MAINTENANCE MENU

---

shown in B-6. Remove the fibers and close the wind-protector. Press  to perform the self-test, which includes inspections on the light path, motors and the mother board etc. The test succeeds if the monitor displays OK.

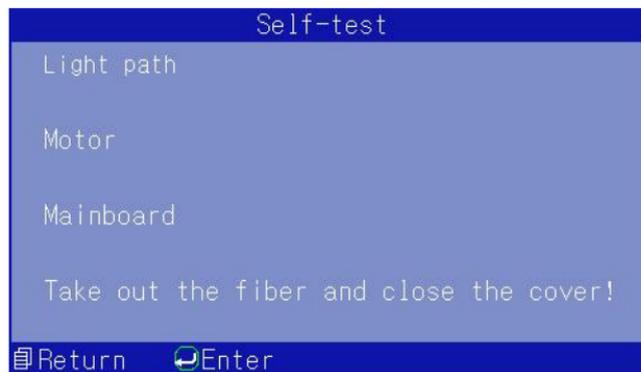


Fig.B-6 Self-test sub-menu

## Appendix C Set Up Heater mode

Heater of 6481A Optical Fiber Fusion Splicer supports various types of protection sleeves. The splicer offers 9 heater modes for sleeves frequently used and multiple user-defined modes as shown in Fig. C-1. Time adjustment ranges from 10s~255s in each mode.



Heater Mode 1/13	
1 40mm	5 60mm 0.25
2 40mm 0.25	6 60mm 0.9
3 40mm 0.9	7 60mm 3.0
4 40mm 3.0	8 25mm 0.4

Return Enter U/D L/R

Fig.C-1 Heater mode sub-menu

### C.1 Functions

Place fibers in the heater when you need to heat the protection sleeve. In case the Auto Heating is enabled, close the heater lid to perform the heating automatically. The indicator lights and the monitor displays countdown. The splicer buzzes when the setting time is up and the indicator runs out. When the splicer is heating, press  to stop it, and press  again to resume the heating. Operation of the heater won't interfere with other functions.

### C.2 Adjustment methods

Choose Heater Mode in the main menu. Press  or  or  or  to move the cursor to corresponding heater mode and press  to confirm. The desired mode is enabled once it is chosen and the mode will not be removed after Power OFF. Press  to enter the heating parameters menu as shown in Fig. C-2.

## APPENDIX C SET UP HEATER MODE

Press  to set up heating duration in this menu and press  or  to modify the duration.

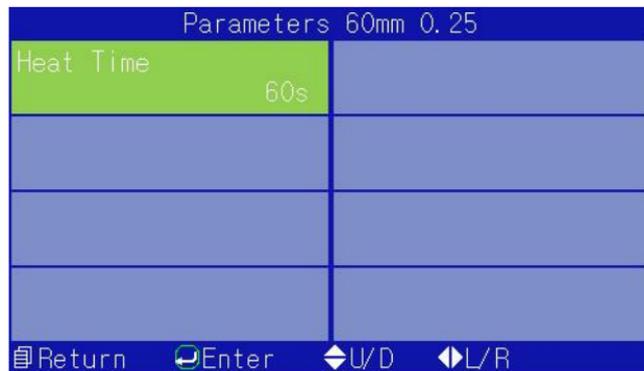


Fig.C-2 Heating parameters menu

## **Appendix D Function Setting**

The setting items include Pause 1, Pause 2, auto open of the wind-protector, tension test, auto reset, heating operation types, power saving function, lighting and touch screen. Choose Functions Setting in the main menu and press  to enter. Please refer to Fig. D-1 for the monitor display.

## APPENDIX D FUNCTION SETTING

Functions 1/2		Functions 2/2	
Pause 1	OFF	Auto Reset	10s
Pause 2	OFF	Heating Type	AUTO
Auto Start	OFF	Power Saving Mode	OFF
Tension Test	OFF	Work Lighting	ON
Return Enter U/D L/R		Return Enter U/D L/R	

Fig. D-1 Function setting menu

### D.1 Pause 1

When Pause 1 is enabled, the splicer stops after fiber gapping is finished, for convenient review of fiber cuts and images. Press  again to move to next operation. After this function is disabled, the splicer keeps running after the gapping is finished to enter the menu of function setting. Press  or  or  or  to move the cursor to the corresponding item and press  to switch statuses.

### D.2 Pause 2

When Pause 2 is enabled, the splicer stops after the core alignment, for convenient review of alignment of the two fibers. Press  again to move to next operation. When Pause 2 is disabled, the splicer keeps running after the core alignment and enter the menu of functions settings. Press  or  or  or  to move the cursor to the corresponding item and press  to switch statuses.

### D.3 Auto start of wind-protector

When the wind-protector is in automatic operation, the splicer automatically performs splice after the protector is closed (equivalent to pressing SET key). When the protector switch is turned off, the splicer stops running after the protector is closed and enters the menu of function setting. Press  or  or  or  to move the cursor to the corresponding item, and press  to switch the statuses.

### D.4 Tension test

Tension test performs 2N tensile force onto spliced points after the fibers are fused. When the test is enabled, the tension test starts automatically after the fusion is completed. When the test is disabled, the test stops after the fusion is completed and the system enters the menu of function setting. Press  or  or  or  to move the cursor to the corresponding item, and press  to switch the

statuses.

### D.5 Auto reset

Auto reset is to set up the motor reset time after the splice is completed and the wind-protector is opened up. The duration ranges from 5s to 20s. Enter the menu of function setting, press  or  or  or  to move the cursor to the corresponding item. Press  to enable the edit status and press  or  to modify the reset time.

### D.6 Heating type

When the heating type is Auto, load the fibers with protection sleeves in the heater and close the heater lid to initiate the heating. When the type is Manual, the splicer won't perform auto heating after the wind-protector is closed. Users need to press  to start heating. Enter the menu of functions setting and press  or  or

 or  to move the cursor to the corresponding item and press  to switch the statuses.

**Notice: The splicer performs heating in any status when the splicer is Power ON; press it again to stop heating.**

### D.7 Power saving

When the power saving function is enabled, the system will shut down automatically in case the splicer performs no operation in the setting time ranging from 1min to 15min. When this function is disabled, the splicer won't shut down except for Power OFF or a dying battery. Enter the menu of function setting, and press  or  or  or  to move the cursor to the corresponding item and press  to switch the statuses.

### D.8 Lighting

Lighting of high brightness is mainly for construction convenience at night. As it's

## APPENDIX D FUNCTION SETTING

---

unnecessary to use this function in daytime, only the function controlling the lighting switch is added. Press  or  or  or  to move the cursor to the corresponding item and press  to switch the statuses.

### D.9 Touch screen

The touch screen is for different operation habits. Please enable this function when you feel necessary. Enter Function Setting menu, press  or  or  or  to move the cursor to the corresponding item, and press  to switch the statuses.

### D.10 Auto Focus

When the auto focus is activated, the fusion splicer will focus the fiber core to a fixed position through the focusing motor before the alignment operation. Enter the function setting menu, move the cursor to the corresponding item with  or , or

---

 or  and press  to switch its state.

### D.11 Auto Monitor Rotation

Auto monitor rotation aims to cater to different operating habits. When the operator performs the fiber fusion at the relative position of monitor, he/she can rotate the screen by adjusting the angle of monitor. Enter the function setting menu, move the cursor to the corresponding item with  or , or  or  and press  to switch its state.

### D.12 Cross-Section Shaping

Cross-section shaping function is to shape the cross-section as required. The larger the discharge current is, the greater the ablation volume of cross-section is. After the function is turned on and  is pressed, the instrument stops and performs the discharge shaping after it moves to gap operation. Enter the function setting menu, move the cursor to the corresponding item with  or , or  or  and press  to switch its state.

## Appendix E Setup

The setting menu includes Language Setting, Time & Date, Image Setting, Touch Screen Calibration and Restore Factory Settings. Choose Setup in the main menu, press  to enter. Monitor display is shown in Fig.E-1.

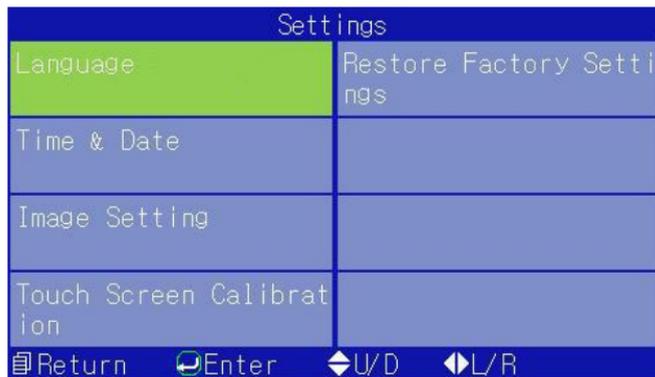


Fig. E-1 Setup menu

### E.1 Language setting

The setting is used to choose language displayed in the monitor. It offers Chinese and English for your choices as shown in Fig. E-2. Press  to enter Language Setting, press  or  to move the cursor to the desired language and press  to confirm.

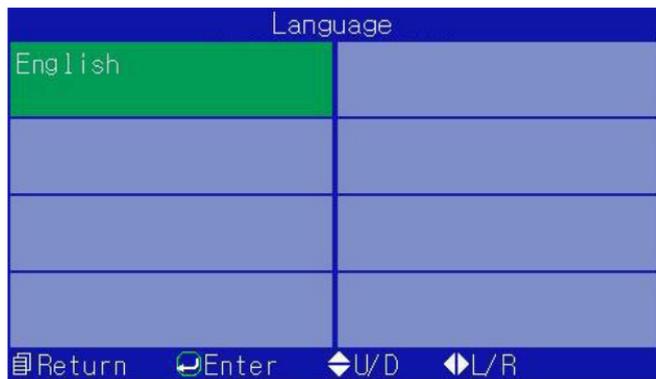


Fig. E-2 Language setting menu

## E.2 Time setting

The system clock is powered by the standby battery. Modified time will be remembered and won't be changed after Power OFF. Choose Time and Date in the setup menu. Press  to enter Time and Date interface as shown in Fig. E-3. Time adjustment procedure is as follows:

Move the cursor to the each blank requires modification;

Press  to edit and press  or  to increase or decrease numbers;

Modified time will be remembered after the calibration. Press  to return back level by level and  for a straight return.

## APPENDIX E SETUP

Time & Date			
Year	2017	Minute	34
Month	06		
Date	07		
Hour	08		
Return		Modify	

Fig.E-3 Time and date adjustment

### E.3 Image setting

Choose Image Setting in the setup menu. Press  to enter the Image Setting interface as shown in Fig. E-4. The setting mainly adjust gain value of CMOS and image position. Setting of gain value has Auto and Manual modes. Execute the Auto mode as per instructions.

#### Manual setting of CMOS gain value

**Manual setting of CMOS gain value is as follows:**

In Image Setting interface, move the cursor to Manual Gain Setting and press



to the setting interface as shown in Fig. E-5;

Press  again to choose image quadrant requires modification;

Press  or  to increase or decrease numbers;

After the adjustment, press  to return back level by level or  to perform a straight return.

**Image position**

Adjustment procedure of image position is as follows:

In Image Setting interface, move the cursor to Image Setting, press  to enter the adjustment interface as shown in Fig.E-6;

Press  again to choose image quadrant requires modification;

Press  or  to adjust the horizontal position and press  or  to

## APPENDIX E SETUP

---

adjust the vertical position;

After the image adjustment, press  to return back level by level or  to perform a straight return.



Fig. E-4 Image setting

## APPENDIX E SETUP



Fig. E-5 Manual setting of gain value

## APPENDIX E SETUP

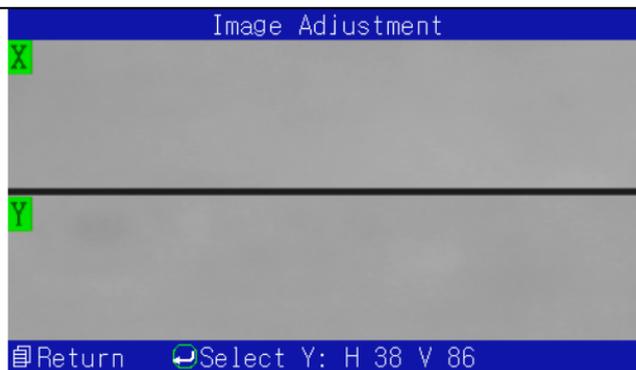


Fig. E-6 Image adjustment

### E.4 Touch screen calibration

During utilization, reading given by the touch screen could be inaccurate due to abnormalities or void operations, the touch screen needs being calibrated. In the state showed in Fig. E-1, move the cursor to Touch Screen Calibration and press  to enter dialog box of the calibration. Press  again to enter the calibration

## APPENDIX E SETUP

---

interface as shown in Fig. E-7. Perform the calibration following prompts on the screen. Data won't be saved in case the calibration is incomplete.



Fig. E-7 Calibration interface of the touch screen

### E.5 Restore factory settings

Move the cursor to Restore Factory Settings and press  to enter dialog box of this function, press  again to enter the setting status. Splice mode is SM-SM

## APPENDIX E SETUP

after the operation. Heating is in 60mm 0.25 mode and heating time is 45s. Pause 1, Pause 2, auto start of the wind-protector, tension test, power saving, lighting and touch screen functions are all disabled. Default fusion parameters of diversified types of fibers are shown in Table E-1.

Table E-1 Default splice parameters

Fiber types Values Parameters	Single-mode fiber	Multi-mode fiber	Non-zero dispersion fiber	Dispersion shifted fiber
Prefuse Time (10ms)	5	22	5	5
Fuse Time (100ms)	14	18	14	14

APPENDIX E SETUP

Prefuse Current (0.1mA)	40	40	40	40
Fuse Current (0.1mA)	40	40	40	40
Gap (um)	6	6	6	6
Overlap (um)	22	22	28	28
End Angle (0.5°)	4	4	4	4

## Appendix F Information

The information menu includes fusion conditions, export data, splicer information and other information. The fusion conditions contain fusion records and images; the export data includes output records and pictures; the splicer information includes splicer model number, software version and splicer serial number. Choose Information in the main menu and press  to enter the pages as shown in Fig. F-1.

## APPENDIX F INFORMATION

Information	
Fusion Records	Serial Number 17010060
Export Records	Software Version A.8
Fusion Images	
	Temperature&Pressure 26°C 1001hPa
Return	Enter U/D L/R

Fig. F-1 Information menu

### F.1 Fusion records

The fusion records are used to review relevant fusion information mainly includes splice parameters, estimated loss, splice time and other information. Move the cursor in Information to Fusion Records and press  to enter relevant interface as shown in Fig. F-2. Press  or  to check all fusion records. Press  to

## APPENDIX F INFORMATION

return back level by level. The memory can store 10000 groups of fusion results with sequence numbers from 0001~10000. After 10000 records are stored, old data will be removed by new data stored in sequence automatically.

Fusion Records	
No.8	2017-05-18 11:39
Pre-fuse Time	05
Fuse Time	14
Pre-fuse Current	40
Fuse Current	40
Gap	06
Overlap	22
Cleave Limit	0.5/0.2
Loss	0.01dB

Return Enter

Fig. F-2 Details of fusion records

### F.2 Export records

The function is used to export all information regarding fusion records so users can print and check easily. Choose Export Record in the Information interface and

press . The system will ask users to Insert U disk in case a U disk is not found by it, and records will be exported directly in case a U disk is inserted in the USB interface. The system will prompt Pull Out U Disk after the export is finished completely. Pull out the U disk, press  to return back level by level or  to perform a straight return.

**Notice: Please use U disks in FAT16 or FAT32 format to export records.**

### F.3 Fusion Images

Fusion images are used to view the related information of fiber image after fusion, mainly including the information such as fusion point image and fusion time. Move the cursor to "Fusion Image" in the "Information", and press  button to enter the fusion images interface as shown in Fig.F-3. User can view all the fusion images with  or  button and press  to return step by step. Memory can store up to 64 fusion images numbered from 1 to 64 in sequence. When 64 images are stored, the old image will be automatically overwritten by the new one in order.

## APPENDIX F INFORMATION

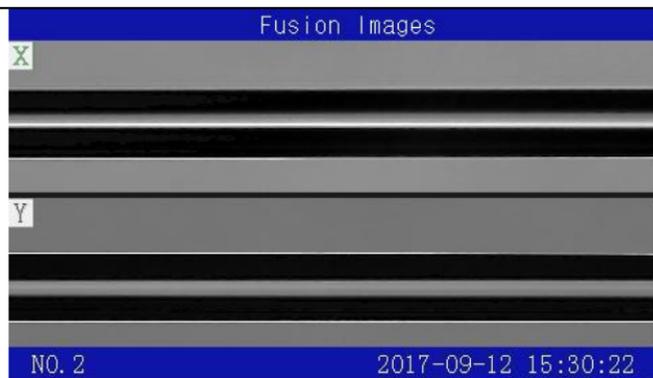


Fig. F-3 Fusion images display