Fiber Fox

MINI 6S⁺
User Manual

Rev.0.03

This User Manu explains the use, p rformance characteristics, and cautions about MINI6S+ fusion splicer and how to install and operate it. The primary goal of this manual is to make the user as familiar with the splicer as possible.

Preface

Thank you for choosing MINI6S+ Arc Fusion Splicer. This product delivers ultra fast splicing time and has an incredibly short shrinking time. It uses the profile alignment technique and extremely accurate alignment process to ensure precise splice loss estimation. A new shrinking technology makes that the shrink time is greatly reduced, thus resulting in an extremely fast total cycle time. The splicer is designed to withstand harsh environmental conditions. Its lightweight, yet robust, compact and ergonomic design allows users to easily carry or move. MINI6S+ has a menu-driven user interface with dynamic function buttons and a fully automatic splice process. For more information of MINI6S+, please contact local agent or visit our official website.
www.fiberfox.co.kr

Contents

Contents

Chapter 1 Technical Parameters

1.1 Applicable Fiber Type

- SM(ITU-TG.652&G.657)/MM(ITU-TG.651)/DS(ITU-TG.653)/NZDS(ITU-TG.655) /ITU-TG.657A/ITU-TG.657B
- Fiber count: Single
- Applicable fiber / cable diameter: 0.25mm/0.9mm/2.0mm/2.4mm/3.0mm/ Indoor Cable
- Applicable fiber diameter: Cladding diameter: 80mm to 150μm / Coating diameter:100 to 3000μm

1.2 Splice Loss

Same fiber is spliced, measured by insertion method relevant to ITU-T standard. The typical values of splice loss are:

- SM:0.02dB
- MM:0.01dB
- DS:0.04dB
- NZDS:0.04dB
- G.657:0.02dB

1.3 Splice Mode

- 128 kinds of splice modes; 38 kinds of preset splice mode
- It can store up to 10,000 records and 2,000 Splice images.
- Splice time: 10s average SM / SM, 6s Quick mode.

1.4 Heat Oven

- 3 kinds of applicable protection sleeve: 40mm, 60mm, SC Connector
- Heating time: 8 to 900s optional.
- Cooling time: 0 to 180s optional
- Typical heating time: 10s, micro Sleeve 60mm coating dia. 250um 5s
- Heating mode: 32 in-built heat modes available; 9 kinds of preset heating mode
- Heater: Specific heater for MINI6S+ fusion splicer.

1.5 Power Supply

- AC 100-240V input or DC 9-14V
- Lithium battery: 11.1V, 5.3Ah
- Typical 220 cycles(Splice&Heat) / Single battery < 2 Batteries Standard >

1.6 Size and Weight

- Size：Length×width×height= 124mm×123.2mm×138mm
- weight：1.52kg (without battery)

1.7 Environmental Conditions

- Operating conditions: altitude: 0 to 5000m, relative humidity: 0 to 95%, temperature: -10 to 50 ℃ , the maximum wind velocity: 15m／s;
- Storage conditions: relative humidity: 0 to 95%, temperature: -20 to 60 ℃ , battery: -20 to 40 ℃ for long-term storage

1.8 Others

- Observation and display: Two cameras (orthogonally view), 4.3-inch color LCD touch screen
- 320x magnification for single X or Y view, or 160x magnification for both X and Y view.
- Tension test：1.96 to 2.25N.
- Terminals:

Port	Descriptions
SD card	Inside the inner device, SD card drive, program for storage
USB	External outside the device, data encryption function and image save

Chapter 2 Installation

2.1 Safety Warning and Precautions

As MINI6S+ is designed for fusion splicing silica glass optical fibers, it is very important that the splicer should not be used for any other purposes. The splicer is a precision instrument and must be handled with caution. Therefore, you must read the following safety rules and general precautions in this manual regarding the use and handling of MINI6S+ at any time. Any behaviors that do not follow the warnings and cautions will break the safety standard about design, manufacture, and usage of the fusion splicer. The users will be liable for any consequences incurred from violation of the related requirements!

2.2 Operational Safety Warnings

① Never operate the splicer in an environment where flammable liquids or vapors exist.

② DO NOT touch the electrodes when the splicer is on.

Note: Only use specified electrodes for the fusion splicer. Select [Replace electrode] in maintenance menu to replace electrodes, or turn off the splicer and disconnect the AC power source or remove battery before replacing electrodes. Discharging is prohibited before the electrodes are placed as a pair.

③ DO NOT disassemble or modify any components of the splicer without approval, except for the permitted-to-disassemble / modify components or parts by users stated in this manual. Component replacement and its internal adjustment must be implemented by authorized technicians or engineers.

④ Handle the main supply cable carefully. Pull out the cable from the electrical socket by holding only the wall plug and not by pulling the cable. Always ensure this cable to be in good condition. Otherwise, there is a risk of fire or electrical shock.

⑤ To prevent any fire or electrical shock, do not expose the splicer to rain or damp conditions.

⑥ Safety glasses should always be worn during fiber preparation and splicing operation. Fiber fragments can be extremely dangerous if they come into contact with the eye, skin, or are ingested.

⑦ Turn off the fusion splicer immediately, and disconnect the adapter from the port of power supply input on the splicer if user observes the following the following faults, to avoid malfunction or beyond repair:

- Fumes, bad smell, abnormal noise or over heat.
- Liquid or other matter falls into cabinet
- The splicer is damaged or dropped.

If any of these faults occurs, please contact our service center immediately. Leaving the splicer in a damaged state without any prompt measures may cause equipment failure, electric shock, or fire and may result in injury or death.

⑧ Do not use compressed gas or canned air to clean the splicer. They may contain flammable materials that could ignite during the electrical discharge.

⑨ Please use MINI6S+ specific standard AC adapter only. Using an improper AC power source may cause fuming, electric shock or equipment damage and may even result in fire, injury or death.

⑩ Please use MINI6S+ specific AC power cord only. Do not place any heavy objects on the AC power cord. Keep the power cord away from heat source. Do not modify the power cord. Using an improper cord or a damaged cord may cause fuming, electric shock or equipment damage and may even result in fire, injury or death.

2.3 Maintenance and External Care Precautions

① Always avoid using hard objects to clean V-grooves and electrodes.

② Always avoid using acetone, thinner, benzol or alcohol when cleaning any part of the splicer, except for the places advised.

③ Use a dry cloth to remove dust and dirt from the splicer.

④ If the outside of the splicer is dirty, plunge a soft cloth into diluted neutral washing up liquid, wring out the cloth and clean. Dry the splicer with a dry cloth but DO NOT use furniture polish or other cleaning agents.

⑤ Always follow the maintenance instructions in this manual.

2.4 Transport and Storage Precautions

① When the splicer is moved from cold to warm environment, you should allow the splicer to warm up gradually. Otherwise, the condensation generated inside will bring harmful effects to the splicer.

② Pack the fusion splicer well for long time storage.

③ Keep the splicer clean and dry.

④ The splicer is precision adjusted and aligned. Always keep the splicer in its carrying case to protect from damage and dirt. Put cushion package outside the carrying case for long distance transportation.

⑤ Always avoid leaving the splicer in direct sunlight or expose to excessive heat.

⑥ Keep the humidity to a minimum level where the splicer is stored. The humidity must not exceed 95%.

2.5 Installation

Important! Follow these instructions carefully.

Unpacking the Splicer

Hold the handle upwards, and then lift the splicer out of the carrying case. As shown below.

2.6 Splice Overview

Heat oven

Handle

Battery

Indicator

On/off button

Display

USB **port**

Port of battery charge

2.7 Power Supply Method

Following is the way of installing a battery.

Insert the battery
Insert the battery into the power unit dock until it clicks into place.

Take out the battery
Shut off fusion splicer. Press on release button at lateral, drawing power supply unit out of the fusion splicer.

2.8 Charging Process

The battery indicator will be illuminated one by one along with increasing electric quality until battery is fully charged upto 100%.

2.9 Charging Methods

When battery is connected with fusion splicer, charging method is as follows:

When battery is separated from fusion splicer, charging method is as follows:

Note: Try your best not to charge battery when the battery is working for the running fusion splicer which is splicing or heating fibers for fear of shortening the battery's life.

2.10 Battery Status

There are 2 ways for viewing battery level.
① If the battery is connected to the slicer, then its level will be displayed on the upper right side of the screen.
② Battery level is indicated by battery LED indicator. As shown below:

2.11 Battery Refresh Cycle

The battery should be refreshed or activated periodically for fear of aging caused by battery memory effect. The method is as follows:
Keep the splicer in power-on status to discharge until the splicer switched off automatically due to completely discharging. Then go on to charge until fully charging completes. Battery refreshing process completes.

2.12 Heat Oven

Heat oven lid open

Chapter 3 Basic Operation

3.1 Power Connection

Follows are 2 ways of power supply for the fusion splicer, of which the inner slot for power supply unit is able to support:

1. AC adapter, if external power source supply adopted;
2. Removable battery, if battery power supply adopted.

Insert battery
Place battery into power unit slot until it clicks into the right place.

Draw battery out
Shut off fusion splicer. Press on release button at lateral, drawing battery out of the fusion splicer.

3.2 Battery Check

Before fusion splicer operation, Please check and ensure the residual electric quality of the battery, which should be equal to 20% or more. Otherwise the battery is not able to support fusion splicing and heating operations of the fusion splicer.(As to the ways of electric quality check for battery, please refer to chapter2 for battery status in detail)

3.3 Turn On the Splicer

Press [Power] key on the operation
panel, and wait the splicer to be
turned on and move to Workbench
page.

Present Time

Selected Splice Mode

Selected Heater Mode

Battery Capacity

Look into Fiber
image on screen

Run Splice
Function

SM Quick Mode

All function Return

Return to Menu

Heating Function

3.4 Adjust Monitor Position

Users can adjust the monitor position by moving it with a desired angle for the
clearest display.

3.5 Adjust LCD Backlight Brightness

Enter into Power save option
interface, and select LCD
Brightness option to adjust LCD
backlight brightness until you
find the clearest position.

Note: The LCD monitor is a precise component produced by manufacturing factory under strict quality control. However, some tiny dots in different colors may still remain on the screen. Meanwhile, the screen brightness may not appear uniform, depending on its viewing angles. Note that these symptoms are not defects, but are natural phenomenon.

3.6 Preparing the Fiber

3 steps should be carried out before splicing:.

1.Stripping

Remove at least 50mm of secondary coating (valid for both tight and loose tube secondary coating) and approximately 30~40mm of primary coating with an appropriate stripper.


Note: always remember to slip a heat-shrinkable sleeve onto either end of the fibers at the beginning of each fiber preparations.

2. Clean bare fibers with pure alcohol-soaked gauze or lint-free tissue.

3. Cleave the fiber

In order to ensure the best splicing result, cleave the fibers with high quality cleaver such as DC-09 fiber cleaver, and strictly control the cleaving lengths shown as below.
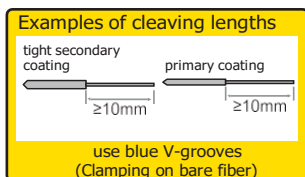
Important!

From this moment, you must be very careful with the fibers to ensure that they do not become dirty again.(For example, avoid putting them down on a dusty working surface, or even waving them around in the air). Also check if the V-grooves are clean, if not, wipe them clean.
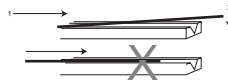
3.7 How to Make a Splice

① Open the safety shield.

② Raise the fiber clamps. Position the fibers into V-grooves. Make sure the fiber ends are between the V-groove edges and the electrode tip.

Note: Make sure to avoid sliding the fibers along V-grooves, but rather position them over V-grooves and tilt them down into place (as shown in the picture).
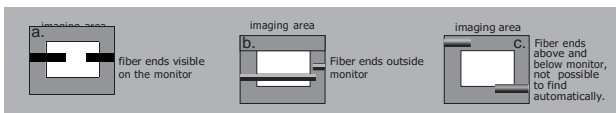
③ Clamp the fiber in position by lowering both sets of fiber clamps.

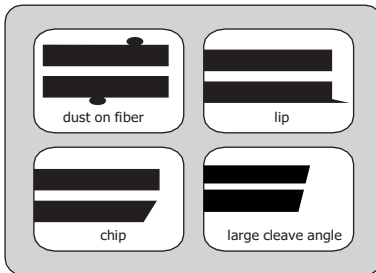

④ Close the safety shield.

3.8 Inspecting the Fibers

① Before continuing with splicing, inspect the fibers whether they are clean and well-cleaved.

② To change between Front View and Back View, adjust Monitor position.

③ If you find any defects as shown in the following pictures, remove the fiber and prepare again.

dust on fiber

lip

chip

large cleave angle

Note: The fibers are checked automatically when you press Splice button. The splicer automatically focuses the fibers and checks for damage or dust particles.
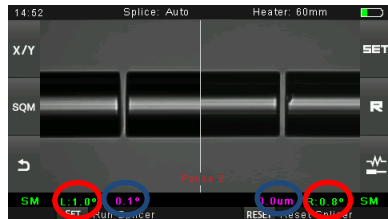
3.9 Splicing

① Select any appropriate splice mode.

② Start splicing by pressing **SET** button.
- Core Angle (Red Circle)
  : Alternate angle of both cores
- Offset Distance (Blue Circle)
 : The difference in height
    of both cores

Note: If the splicer is set as "Auto mode", splicing will start automatically once the safety shield is closed.
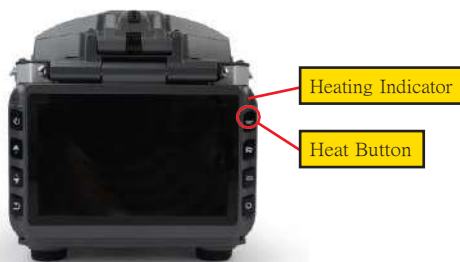
3.10 How to Protect the Splice

After splicing, protect the joint by using a heat-shrink sleeve and the heat oven which is mounted onto the splicer. "Shrink" process can be activated via pressing the "HEAT" key.
① Open the heat oven lid
② Raise left and right fiber clamps on the splicer. Hold the heat-shrink tube, lift the spliced fibers and hold them taut, move the heat-shrink tube so that it is centered over the splice point.
③ Move both the fibers and the heat-shrink tube over to the heat oven and place them in the oven clamps.

Open the heat oven lid
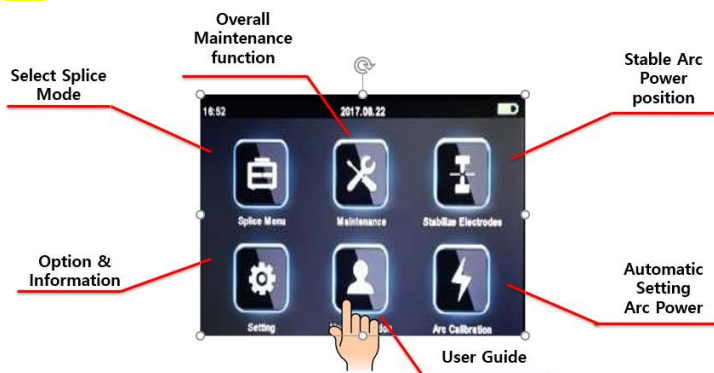
Position of splices

Moving the fiber into heat oven
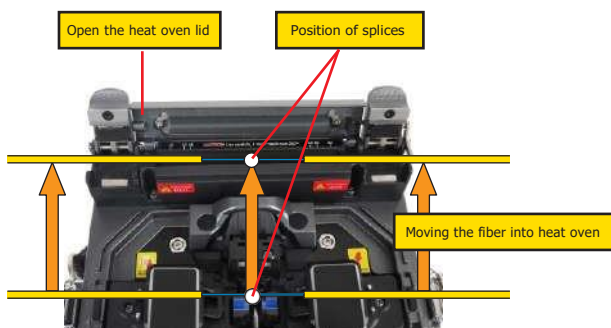
④ Press the "HEAT" key to begin heating, when the heating process is finished, the heating indicator will be turned off automatically and companied by prompt sound of the buzzer.

Heating Indicator

Heat Button

Display Manual

To select the mode menu what you want

Overall Maintenance function

Select Splice Mode

Stable Arc Power position

Option & Information

Automatic Setting Arc Power

User Guide

POWER LED

Heater LED

POWER Button ON/OFF

Splice / Sub-list Button

UP / DOWN Key With adjust Brightness

Retrieve Splice task Button Move to Splice Screen

Heater Button ON/OFF

Menu / Return Key Move to Menu Screen Back to Splice Screen

Enter Button Confirmation

<Splicing Display Monitor – SM Auto>

Chapter 4 Splice Mode

MINI6S+ has an intuitive and simple but very powerful program structure to operate. Splice programs define arc currents, splice times as well as various parameters used when performing a splice. Therefore, it is essential to select the correct splice program.

There are a number of "Preset" splice programs for common fiber combinations. Therefore, it is much easier to modify and further optimize the parameters for more unusual fiber combinations.

Factory Pre-set Mode	38 ea
User Mode	128 ea
Delete Splice Mode	-

4.1 Displaying the Active Splice Program

The active splice program is always displayed at the top of the screen (see below).

4.2 Selecting a Splice Program

To select another splice program other than the active one, you must enter Select splice mode menu.
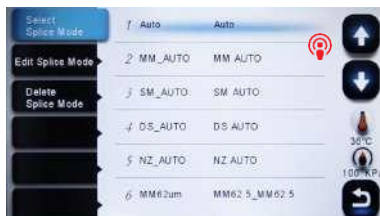① Enter main menu

② Select Splice Mode

③ Highlight the program you want to select.

④ Back to initial interface

Select Splice Mode	description
Auto Mode (SM/NZ/DS/MM)	This splice mode can splice standard telecommunications grade fiber, including SMF (ITU-T G.652), NZDSF (ITU-T-G.655) and DSF (ITU-T G.653). The amount of heat applied to the fiber is calibrated in real time by analyzing the fiber during discharge and adjusting the are current accordingly. *Auto Mode Due to all verification procedures required for splicing, need approximately 10 sec time. But this mode is most optimize system.
SM Auto	This splice mode can splice the standard SM Fiber (ITU-T-G.652). The amount of heat applied to the fiber is calibrated in real

	time by analyzing the fiber during discharge and adjusting the are current accordingly. ***SM _ Auto Mode** The mode does not operate to Fiber recognize system. If use only one of type Fiber, be available in a short time rather than Auto Mode
MM_Auto	This splice mode can splice the standard MM Fiber (ITU-T-G.651). The amount of heat applied to the fiber is calibrated in real time by analyzing the fiber during discharge and adjusting the are current accordingly.
NZ_Auto	This splice mode can splice the standard NZDS Fiber (ITU-T-G.655). The amount of heat applied to the fiber is calibrated in real time by analyzing the fiber during discharge and adjusting the are current accordingly.
DS_Auto	This splice mode can splice the standard DS Fiber (ITU-T-G.653). The amount of heat applied to the fiber is calibrated in real time by analyzing the fiber during discharge and adjusting the are current accordingly.
Quick	This mode is only available in SM Fiber type The Mode install optimized SM Fiber mode system. And prefer quick splice with high yield to consistent splice loss. Therefore splicing available within shortest time (7 sec needs) Fiber recognize, cleave angle, Fiber align system does not operate.
SM_ATT	(SM_ATT) creates an intentional core axial offset and splices fibers. SM_ mode ((ITU-T-G.652) provides an estimated splice loss, but this should be regarded as a reference as the estimated splice loss may not be correct in some case, depending on fiber properties. * In this case different type Fiber calibration. Target loss limit measure value difference between Auto mode and this mode Fiber align mode system does not operation.
MM_ATT	(MM_ATT) creates an intentional core axial offset and splices fibers. SM_ mode ((ITU-T-G.651) provides an estimated splice loss, but this should be regarded as a reference as the estimated splice loss may not be correct in some case, depending on fiber properties. * In this case different type Fiber calibration. Target loss limit measure value difference between Auto mode and this mode Fiber align mode system does not operation.

4.3 General Splicing Steps

This section explains the steps involved in automatic splicing process and describes how various program parameters are related to this process. The normal splicing process can be divided into two sections: pre-fusion and fusion.

Pre-Fusion

During pre-fusion, the splicer performs automatic alignment and focusing, where the fibers are subjected to a low pre-fusion current for cleaning purposes; a pre-fusion image is also taken. At this point, the user is informed of any problems recognized in the pre-fusion image, such as a poorly prepared fiber. The splicer will then issue a warning before the fibers are fused together.

Fusion

During fusion, the fibers are joined together and subjected to five different currents as illustrated below. An important parameter, which changes during splicing, is the distance between the fibers. During Pre-fusion, the fibers are apart. With the current phase changing, fibers are spliced gradually.

Splicing Process

The most important splicing parameters are the time and current, each current phase is shown below, that the name and function and other parameters are important to the splice process are described under "Parameters for Normal Splicing Process" on the next page.

The following figure shows the discharge conditions (The relationship between the "discharge intensity" and "motor move"). We can change the splicing parameters listed below to change the discharge conditions.
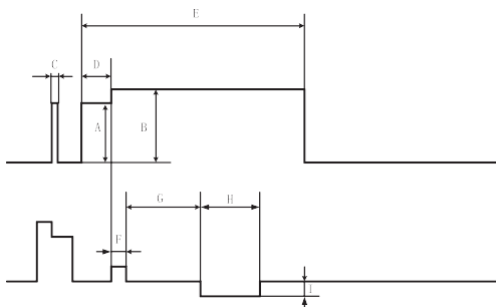

Diagram of ARC discharge condition

A: pre-fuse power   B: Arc power   C: cleaning Arc
D: pre-fuse time   E: Arc time   F: Overlap
G: Taper wait time   H: Taper time related to taper length   I: Taper speed

4.4 Parameters for Normal Splicing Process
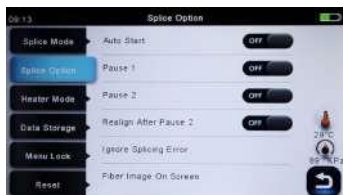
parameter	description
Template	A list of splice modes stored in the splicer database is displayed. Upon inputting the appropriate mode, the selected splice mode stored in database area is copied to a selected splice mode in user-programmable area.
Name	Title for a splice mode expressed in up to seven characters.
Note	Detailed explanation for a splice mode expressed in up to 15 characters. It is displayed at "Select splice mode" menu.
Focus-L	Set the focus parameter for lens X.
Focus-R	Set the focus parameter for lens Y.
Arc adjust	Set to adjust arc power according to the fibers' conditions.
Pull test	If "Proof test" is set to "ON", a pull-test is performed upon opening the windproof cover or by pressing the SET button after splicing.
Loss estimate	Loss estimate should be regarded as a reference. Since the loss is calculated upon the fiber image, there is certain difference with the real value. The estimate method is based on a single mode fiber and calculates at the wavelength of $1.31\,\mu$m. The estimated value can be a valuable reference, but cannot be used as the basis of acceptance.
Minimum loss	This amount is added to the estimate splice loss originally calculated. When splicing specially or dissimilar fibers, a high actual splice loss may occur even with optimized arc conditions. To make the actual splice loss concur with the estimated splice loss, set the actual splice loss to minimum value (minimum loss).
Loss Limit	An error message is displayed if the estimated splice loss exceeds the selected threshold (loss limit).
Core angle limit	An error message is displayed if the bend angle of the two fibers spliced exceeds the selected threshold (Core angle limit).
Cleave angle limit	An error message is displayed if the cleave angle of either the left or right fiber ends exceed the selected threshold (cleave limit).

parameter	description
Gap position	Set the relative position of the splicing location to the center of electrodes. Splice loss may be improved in the case of dissimilar fiber splicing by shifting [Gap position] towards a fiber whose MFD is bigger than the other fiber MFD.
Gap	Set the end-face gap between the left and right fibers at the time of aligning and pre-fusion discharge.
parameter	description
Overlape	Set the overlap amount of fibers at the fiber propelling stage. Relatively small [Overlap] is recommended if [Preheat Arc Value] is low, while relatively large [Overlap] is recommended if [Preheat Arc Value] is high.
Cleaning Arc time	A cleaning arc burns out micro dust on the surface of the fiber with an arc discharge for a short period of time. The duration of the cleaning arc can be changed by this parameter.
Preheat Arc value	Set the pre-fuse arc power from the beginning of arc discharging to the beginning of fibers propelling. If "Preheat Arc Value" is set too low, axial offset may occur if cleaved angles are relatively poor. If "Preheat Arc Value" is set too high, fiber end faces are fused excessively and splice loss gets worse.
Preheat Arc time	Set the pre-fuse arc time from the beginning of arc discharging to the beginning of fibers propelling. Long [Preheat Arc Time] and high [Preheat Arc Value] lead to the same results.
Fuse Arc value	Set Arc power.
Fuse Arc time	Set Arc time.

Chapter 5 Splice Option

As to the Splice Mode setting.
① Select [Splice option] in menu from main menu.
② Select a parameter to be changed.

parameter	description
Auto start	If "Auto start" is set to ON, splicing starts automatically as soon as the wind protector is closed. Fibers should be prepared and placed into the splicer in advance.
Pause 1	If "Pause 1" is set to ON, splicing operation pauses when fibers are forwarded to gap-set position. Cleave angles are displayed during the pause.
Pause 2	If "Pause 2" is set to ON, splicing operation pauses after fiber alignment is completed.
Realign after pause 2	Alignment failure may appear after "Pause2" for a long period. Therefore, realign after "Pause2" is needed. Setting to "OFF" will prevent the implementation of realign function. Manual splicing, rather than setting the realign to "OFF", is recommended when there is an axial displacement of the splicer
Ignore splice error	
Cleave end	
Cleave angle	Setting to "OFF" ignores the faults and continues to complete the splicing even if the message "Cleave Angle Error" appears.
Core angle	Setting to "OFF" ignores the faults and continues to complete the splicing even if the message "Core Angle Error" appears.
Loss	Setting to "OFF" ignores the faults and continues to complete the splicing even if the message "Loss Error", "Cleave Shape Error", "Fat Error", or "Thin Error" appears.
Fat	
Thin	
Fiber immage on screen	
Paulse 1	Set the displaying method of the fiber image on the screen during splicing operation.
Align	X : Enlarged display of X-axis image
Paulse 2	Y : Enlarged display of Y-axis image
Arc	X/Y : Composite display vertically of X-axis and Y-axis images
Estimate	
Gap set	

Chapter 6 Heater Mode

The splicer provides max 32 heat modes including 10 heat modes preset by factory and the rest that can be defined by users. Select a heating mode that best matches with the protection sleeve used.

For each type of protection sleeve, MINI6S+ has its optimum heating mode. These modes can be found in the database area for reference. Copy the appropriate mode and paste it to the user – programmable area. Users can edit those parameters.

Factory Pre-set Mode	9 ea
User Mode	32 ea
Delete Splice Mode	-

6.1 Heater Template

Parameters	Description	Set Value
60mm	For standard protection sleeve of 60mm	230℃, 10sec
40mm	For standard protection sleeve of 40mm	230℃, 10sec
33mm	For standard protection sleeve of 33mm	165℃, 40sec

Note: Our SM Mode Heating Time (10 sec) is calculated on standard protection sleeve length of 60mm with sleeve tube diameter of a (3mm) and Tension member/Steer bar (Diameter : 1mm). * The demensions of the protection sleeve after shrink are varied depending on the diameter of the fiber.
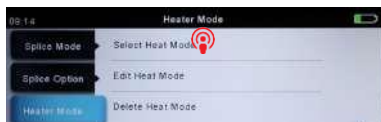
6.2 Select Heat Mode

To select another heating mode other than the active one, you must enter Select heat mode menu.
① Enter main menu

② Select Heater Mode
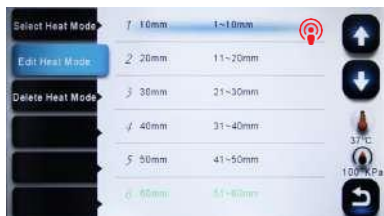

30

③ Touch on Select Heat mode

④ Back to original interface

6.3 Edit Heat Mode

Tube-heating conditions stored in heating mode can be edited or changed.
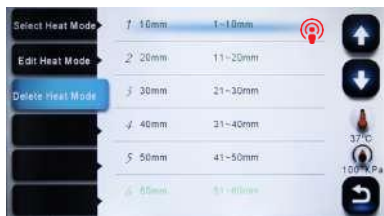① Enter edit heat mode menu via touching on heater mode menu.

6.4 Deleting Heat Mode

① Select Heater mode menu.
② Select Delete Heat Mode.
③ Select the heat mode to be deleted

Note: The gray mode (60mm) is the system preset initial heat modes which cannot be deleted.

6.5 Heat Mode Parameters

parameter	description
Template	Set sleeve type. List of all heat modes are displayed. Selected mode will be copied to a user-programmable area.
Name	Title for a heat mode.
Note	Title of the heat mode displayed in the bottom right corner of the monitor during splicing or heating process. Max number of characters used is 15.
Heater control	Set the length of heat-shrink sleeve. Long: protection sleeves over 30mm. Short: 30mm protection sleeves or below.
Heater temperature	Sets heating temperature.
Heater time	Sets heating time from the beginning to the heating completed.
Cooling time	Cooling fan operating Time

Chapter 7 Maintenance Menu

The splicer has a function to perform routine maintenance. This section describes how to use the maintenance menu.
① Press Menu button, and select [Maintenance menu].
② Select a function to perform.

7.1 Replace Electrodes

As electrodes are worn out during the splicing process, oxide generated on the tips of electrodes should be regularly eliminated. It is recommended that the electrodes should be replaced after 4500 arc discharges. When the number of arc discharges reaches a count of 4500, a message prompting to replace the electrodes is displayed immediately after turning on the power. Using the electrodes without a replacement will result in greater splice loss and reduced splice strength.
Replacement Procedure
① Select [Replace electrodes] in [Maintenance Menu].
② Instruction messages will appear on the screen to turn off the power. Click on OK until LCD shuts down to continue.
③ Remove the old electrodes.
 ⅰ) Loosen screw located on electrode cover.
 ⅱ) Take electrodes out of the electrode covers. (Electrodes are fixed in electrode cover)
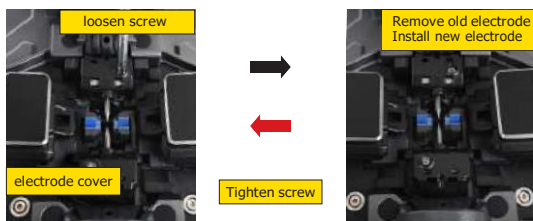
④ Clean the new electrodes with alcohol-impregnated clean gauze or lint-free tissue, and install them in the splicer.
 ⅰ) Insert the electrodes in the electrode covers.
 ⅱ) Place the electrode covers on the splicer, and tighten the screws.

⑤ We recommend all users to do stabilizing electrodes and arc calibration after electrodes replacing to keep good splice results and splice strength (Details are described below).

7.2 Stabilize Electrodes

In the event of sudden change in environmental conditions, especially when the splicer is moved from lower altitudes to higher altitudes, the arc power may become unstable, resulting in higher splice loss. In such case, it takes time for arc power to be stabilized. In this case, stabilizing electrodes will expedite the process to set the arc power stable. If many tests are needed until the "**Operation Complete**" message appears in [Arc calibration], use this function as well.

< Stabilized Electrodes Process Images>
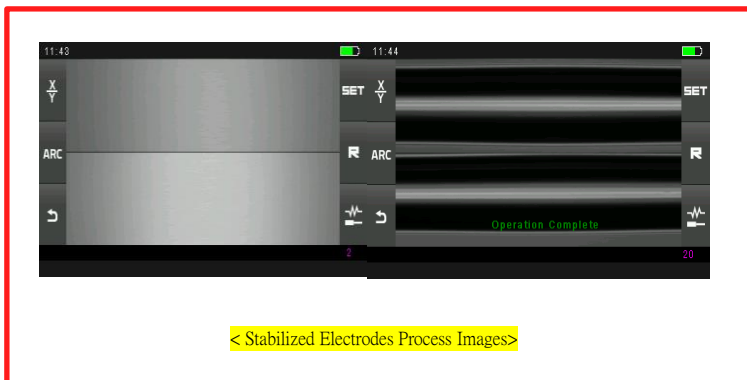
Operation Procedure
① Select [Stabilize electrodes].
② Place prepared fibers into the splicer for splicing.
③ Press [SET] button, and the splicer will begin to stabilize the electrodes automatically in the following procedures:
· Repeat arc discharge five times to measure the arc position.
· Perform splicing rapidly.
· Perform stabilizing electrodes **20 times** consecutively to precisely locate the electrodes position.

7.3 Diagnostic Test

MINI6S+ has a built-in diagnostic test function that allows the user to evaluate several critical variable parameters with only one simple step. Perform this function in case of splicer operation fault.

Operation Procedure
① Select [Diagnostic Test] in [Maintenance Menu]
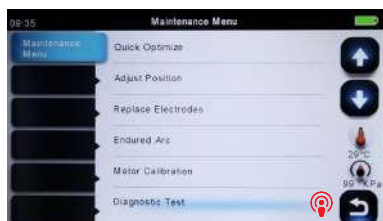
② Execute [Diagnostic test], then the following checks will be made.

	Parameter	Description
1	LED calibration	Measure and adjust the brightness of the LED.
2	Dust check	Check the optical path for dust or dirt and judges whether they disturb fiber observation. If contamination exists, press the return button twice to display the location.
3	Motor Calibration	Automatically calibrate the speed of 6 motors.
4	Arc Calibration	Automatically calibrate the arc power factor and fiber splicing position.

7.4 Dust Check

Through image acquisition, the splicer detects dust and contaminants on the splicer, camera, and objective lenses that may disturb normal observation of fibers and result in improper splicing. This function checks the optical path for the presence or absence of contaminants, and judges whether they will affect the quality of fiber splicing.

Operation Procedure

① Select [Dust check] in [Maintenance menu].

② If fibers are set in the splicer, remove them and press [SET] again to start the dust check.

③ If no dust exists, splicer will prompt out message for operation completion. If dust is detected during the dust check process, the message "Found Dust On The Lens" will be displayed on screen. Press the return button twice, and the location of contamination will be shown on the screen. Then clean the objective lenses, and [Dust check] until the message "Operation Complete" is shown on screen.

Note:

If contamination still exists after cleaning the objective lenses, please contact your nearest sales agent

7.5 Motor Calibration
7.6

Motors are adjusted at the factory before shipping. However, settings may be changed in various reasons. This function automatically calibrates the speed of 6 motors.

Operation Procedure

① Select "Motor Calibration" in "Maintenance Menu".

② Load prepared fibers in the splicer and press "SET" button.

③ Speeds for all motors are automatically calibrated. Upon completion, message will be displayed.

Note:

 Perform this function when "Fat " or "Thin" error occurs, or fiber aligning or focusing takes too much time.

7.7 Fiber Training

There are three types of fiber that you can calibrate: **MM, SM, NZ and BIF(G657A) fibers**. These functions are for **Auto Splice Mode** recognition where contained on MINI 6S+ model. In order to recognize different type of splicer, you need to set as the same as fiber with fiber's study. Generally, It was adapted by factory preset.

7.8 Arc Calibration

Atmospheric conditions such as temperature, humidity and pressure are constantly changing, which creates variability in the arc temperature. MINI6S+ is equipped with temperature and pressure sensors that are used in a constant feedback monitoring control system to maintain the arc power at a stable level. However, changes in arc power due to electrode wear and glass adhesion cannot be calibrated automatically. Also, the center position of arc discharge sometimes shifts to the left or to the right. In this case, the fiber splicing position has to be shifted in relation to the arc discharge center. It is necessary to perform an arc power calibration to eliminate those problems.

< Arc Calibration Process Images>

<Arc Calibration Completed>
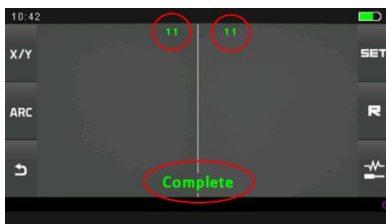
Note：

* Arc calibration is performed automatically in SM mode only. So, arc calibration does not have to be performed when splicing in SM mode.
* Performing Arc Calibration function changes the arc power value. The arc power value is used in the algorithm program for all splicing. The arc power value will not be changed in the splice modes.

37

Operation procedure

① Select [Arc Calibration] in [Maintenance Menu] to display arc calibration on the screen.

② Place prepared fibers into the splicer, and press [SET] to perform arc calibration.

③The splicer will show up two values on the screen after each arc calibration. **If the value shown on the right-hand side meets 11±2, the message "Operation Complete"** will be shown on screen. Otherwise, set prepared fibers on the splicer again and redo arc calibration until the message "Operation Complete" is displayed.

Note：

* Use standard SM、DS or MM fiber for arc calibration.

* Ensure clean fibers for arc calibration. Dust on the fiber surface affects arc calibration.

7.9 Electrode Setting

Set the electrode change warnings. We recommend replacing the electrodes every 2500 discharge to ensure the best splice results.

① Select [Electrode Setting] in [Maintenance Menu].

② Set the electrode caution and electrode warning.

Parameter	Description
Electrode caution	If actual arc discharge exceeds the set value, a message "Caution! Replace Electrodes" is displayed when turning on the splicer. Fiber Fox recommends that this parameter should be set to "4500"
Electrode warning	If actual arc discharge exceeds the set value, a message "Warning! Replace Electrodes" is displayed when turning on the splicer. Fiber Fox recommends that this parameter should be set to "5500".

7.10 Quick Optimize

MINI6S+ fusion splicer bares optimizing function inside. The operator just need carry out simple operation for adjusting 6 motors' calibration of fusion splicer.
1 Select quick optimize in maintenance menu.

2 Follows are the optimizing functions in Quick optimize.

parameter	description
Adjust position	Adjust the motor's position automatically.
Motor calibration	Adjust 6 motor speeds automatically.

7.11 Motor Drive

This function is used to test if 6 motors of the fusion splicer operate normally.

① Select "Motor Calibration".
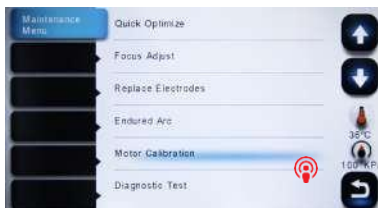
② Touch screen to select motor.

③ Touch the icons of L press and R press to drive motor, observing if the motor can be driven normally.

7.12 Update Software

① Select "update software" in "Maintenance Menu".
② Connect the USB driver with the copy of upgrade files to the USB port
③ Press "OK", and then the splicer will process the update automatically. Upon completion, the splicer will restart automatically.

Chapter 8 Other Functions & Utilities

8.1 Data Storage

This splicer stores up to 10,000 splicing results. Contents of data stored are different depending on splicing mode.

8.2 Display Splice Record

Splicing results stored in the splicer can be displayed.
Select Data Storage Menu and Select Display Splice Record to view.

8.3 Delete Splice Record

Splicing results can be cleared by part or whole.
① Select "Delete Splice Record", and then input specific number (Start Splice Record and End Splicer Record) of splicing results to be cleared.
② Select Delete Splice Record and press confirm key to conform. Selected splicing results are cleared and replaced with following splicing results.

8.4 Cancel Data Storage

If you don't want to store the records, press the "ON" button in the "Cancel the data storage" Menu.

8.5 Menu Lock

If you want lock each menu of system, press the "ON" button in the "Splice, Heater, Records and Password Lock" on the Lock Menu.

Splice Mode Lock	ON: Disable 'Splice mode' edit
	OFF: Enable 'Splice mode' edit
Heater Mode Lock	ON: Disable 'Heat mode' edit
	OFF: Enable 'Heat mode' edit
Records Delete Lock	ON: Disable 'Record mode' edit
	OFF: Enable 'Record mode' edit
Password Lock	ON: Disable to change the password
	OFF: Enable to change the password

8.6 System Setting

This menu is used to change settings in detail, or for an administrator to limit functions for operator to select or change.

parameter	description
Buzzer	Sets the sound volume of the buzzer
Automatic heating	If select "On", when the fiber is placed into heat oven, which will automatically execute heating.
Language	Sets a language to be displayed on the screen.
Monitor position	Sets the operational direction of splicer. "Front" is for front monitor operation. "Rear" is for rear monitor operation. Refer to next page in detail.
Power Save Option	Sets the time of Monitor Shut Down, time of Splicer Shut Down and LCD brightness.
Set Calendar	Sets the system time.
Password	Changes the password to access some menus as "Power on Option" and "Menu Lock". At the time of shipment from the factory, the password is set as "0000". If you have forgotten your password after you changed another one, contact the nearest sales agency.
Pull test	If you select "ON", pull test will be performed after fusion splicing completion.
Dust check	Dust check: check dust and contaminants in optical path to avoid optical fiber inspection disturbance. If contaminants exist, press confirm key to display the contaminants' position.
Password lock	"On" : passwords are needed to input for entering into the fusion splicing window when power on. "OFF" : No passwords are needed when power on.
System information	Display fusion splicer's basic information: Machine serial NO., Software version, FPGA version, total Arc count, current Arc count, Last maintenance, Production date, Sales Region, Product OEM.

8.7 Monitor Position

The direction of the splicer display before shipping from the factory is set to "Front", but users can change it to "Rear". When [Monitor position] is changed, the direction of the arrow keys is reversed.

Changing monitor position
① Select "Monitor Position" in "System setting" menu.
② Select the desired monitor position (front/ rear).

8.8 Power Save Option

This function is important for power conservation. If the power saving function is not set during battery pack use, the number of splice cycles will be reduced.

(1) Insert a power unit and turn on the splicer.

(2) Select "Power Save Option" in "System Setting" menu.

(3) Change values of "Monitor Shut Down" and "Splicer Shut Down".

parameter	description
Monitor Shut Down	To avoid power loss when battery is used, setting this function turns off the power supply to the LCD monitor if the splicer does not operate after a certain period of time. When the power supply for monitor turns off, the LED near the power key blinks. Press any key to turn on the LCD monitor.
Splicer Shut Down	Automatically turns off the power supply of the splicer if it performs no operation for a certain period of time. The function serves to prevent the battery capacity from running low if the splicer is left on for an extended period of time.
LCD Brightness	Adjust LED backlight brightness.

8.9 System Information

Select "System information". The following information is displayed.

parameter	description
Machine Serial Number	Display the fusion splicer's serial number.
Software Version	Display the fusion splicer's software version.
FPGA	Display FPGA's version.
Total Arc Count	Display total number of arc discharges.
Current Arc Count	Display the number of arc discharges after electrode replacement. Performing [Replace Electrode] resets this parameter to zero.
Last Maintenance	Display the date of last maintenance.
Sales Region	Display sales region of the machine.
Product OEM	Display the manufacturer of the machine.

1. Pass the cable through a sleeve, a boot, and a boot cap.
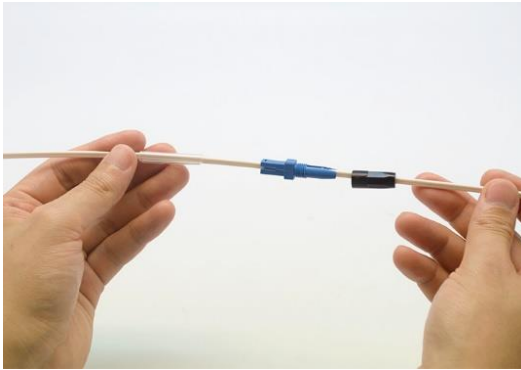
2. Strip the indoor cable with a stripper

3. Clean the stripped cable with alcohol-soaked tissue.

46

4. Cleave it with a cleaver and put the stripped cable on the right holder.
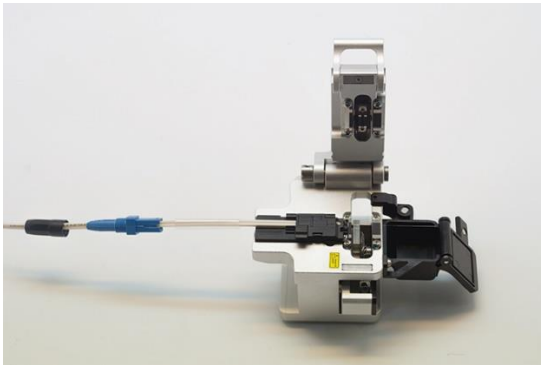
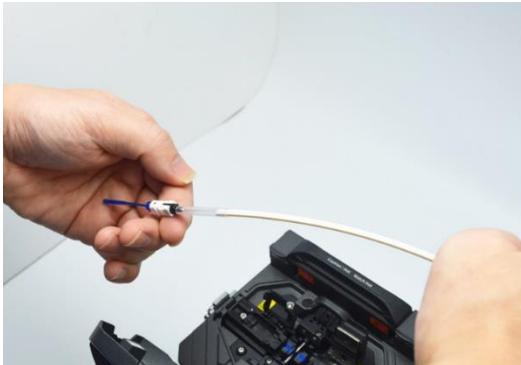5. Take the ferrule fiber cap off.
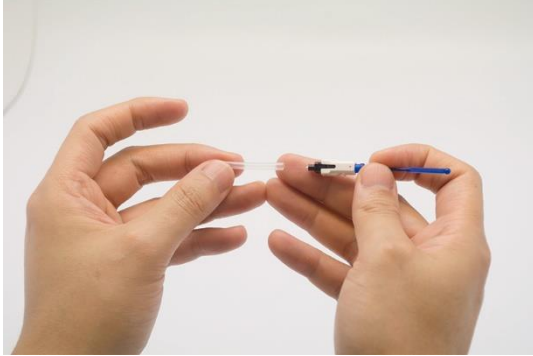
6. Put the ferrule part on the left holder.
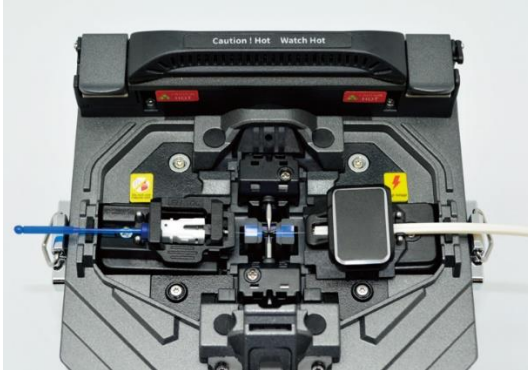
7. Proceed with splicing process.

8.   Slide the sleeve at the end of ferrule part.
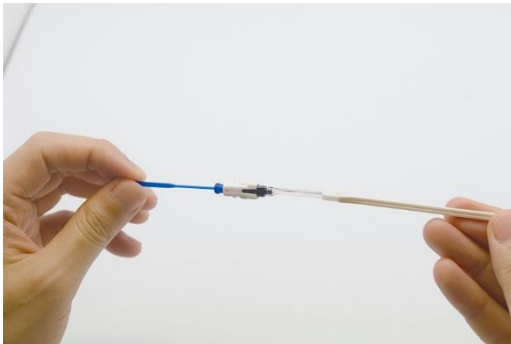

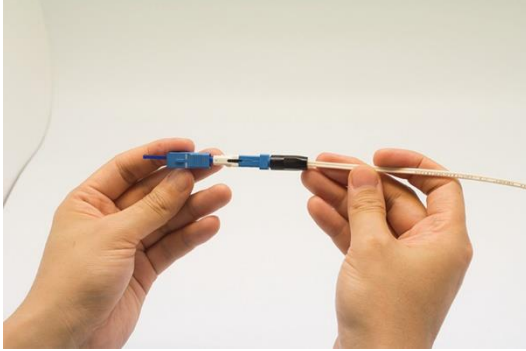9.   Put the cable in the oven.

10. Set the heating Menu.

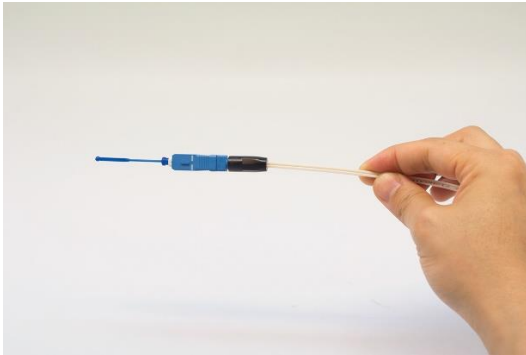11. Touch the heating icon for heating process.

12. Cool it down after the heating is completed.

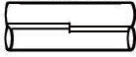13. Assemble the boot, the boot cap and the housing.
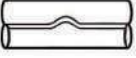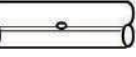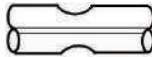
14. Complete.

Appendix A

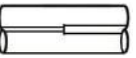High Splice loss: Cause and solutions

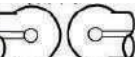| Symptom	Name	Cause	Remedy
	Fiber core axial offset	There's dust in V-grooves and fiber hammer	Clean the V-grooves and fiber hammer
	Fiber core angle error	There's dust in V-grooves and fiber hammer	Clean the V-grooves and fiber hammer
		Bad fiber end-face quality	Check the cleaver
	Fiber core bending	Bad fiber end-face quality	Check the cleaver
		Pre-fuse power too low or pre-fuse time too short.	Increase [Pre-fuse Power] and/or[Pre-fuse Time].
	The mode field diameters mismatch	Arc power not adequate	Increase [Pre-fuse Power] and/or[Pre-fuse Time].
	Dust combustion	Bad fiber end-face quality	Check the cleaver
		Dust still present after cleaning fiber or cleaning arc.	Clean fiber thoroughly or increase[Cleaning Arc Time]
	Bubbles	Bad fiber end-face quality	Check the cleaver
		Pre-fuse power too low or pre-fuse time too short.	Increase [Pre-fuse Power] and/or[Pre-fuse Time].
	Separation	Fiber stuffing too small	Perform [Arc Calibration].
		Pre-fuse power too high or pre-fuse time too long.	Decrease [Pre-fuse Power] and/or [Pre-fuse Time].

	Fat	Fiber stuffing too much	Decrease [Overlap] and Perform [Arc Calibration].
	Thin	Arc power not adequate	Perform [Arc Calibration].
		Some arc parameters not adequate	Adjust [Pre-fuse Power], [Pre-fuse Time] or [Overlap].
	Splicing line	Some arc parameters not adequate	Adjust [Pre-fuse Power], [Pre-fuse Time] or [Overlap]

Note:

A vertical line sometimes appears at the splice point when MM fibers or dissimilar fibers (different diameters) are spliced. We call it as "Splicing line". This does not affect splice quality (such as splice loss and tensile strength).

Appendix B

High Splice loss: Cause and solutions

During the splice operating process, if the error messages are shown on the screen, please follow the solution precisely as shown in the list below. If it is not possible to solve the problem, the splicer may require service by a qualified service center. In this case, please contact sales agents.

Error Message	Cause	Solution
Left Fiber Place Error	The fiber end-face is placed on the electrode centerline.	Press RESET button, and reload the fibers to make sure that fiber end face is placed between V-groove and the centerline of electrodes.
Right Fiber Place Error		
Press Motor Distance Over Limit	The fiber is not set correctly at the bottom of the V-groove, which results in that the fiber offsets beyond motor formation range.	Press the "RESET" button; correctly re-position the fiber at the bottom of the V-groove.
Press Motor Error	Motor might be damaged.	Consult your nearest sales agent.
Search Fiber End face Failed	The fiber is not set correctly at the bottom of the V-groove.	Press the "RESET" button; correctly re-position the fiber at the bottom of the V-groove.
Arc Failure	Arc discharge does not occur.	Confirm the electrodes are in proper position; Replace the electrodes.
Align Motor Distance Over Limit	The fiber is not set correctly at the bottom of the V-groove.	Press the "RESET" button; correctly re-position the fiber at the bottom of the V-groove.
Search Fiber Clad Failed	The fiber is not set correctly at the bottom of the V-groove.	Press the "RESET" button; correctly re-position the fiber at the bottom of the V-groove.
Fiber Border Position Wrong	There's dust or dirt on the fiber surface	Prepare the fiber (stripping, cleaning, and cleaving) again; clean the lens; redo [Dust Check]
Unknown Fiber Type	There's dust or dirt on the fiber surface	Prepare the fiber (stripping, cleaning, and cleaving) again.
	Different fiber types on two sides.	Use an appropriate splice mode other than AUTO splice mode to re -splice.
	Non-standard optical fibers	AUTO splice mode can only detect the standard SM, MM, NZ fibers.
Fiber Clad Over Limit	Fiber edge is not located in the camera range.	Adjust the fiber position and perform "motor calibration".

Error Message	Cause	Solution
Focus Motor Home position Error	Shock occurred to the splicer during the splicing process.	Carry out "motor calibration". If the problem still exists, please contact sales agent.
Fiber End face Gap Wrong	Too much [Overlap] setting	Adjust [Overlap] parameter setting.
	The motor is not calibrated	Perform [Motor Calibration].
Focus Motor Distance Over Limit	The fiber is misplaced.	Press the "RESET" button; re-position the fiber correctly at the bottom of the V-groove.
	There's dust or dirt on the fiber surface	Prepare the fiber (stripping, Cleaning and cleaving) again.
	There's dust or dirt on the lenses.	Execute the [Dust Check] after cleaning the lenses and mirrors.
Fiber Mismatch, Continue?	Different fiber types on two sides.	It may result in large splice loss if you continue to splice, Please use the proper splice mode corresponding to the fibers.
Cleave Angle Over Limit	Bad fiber end-face	Check the condition of the fiber cleaver. If the blade is worn, rotate the blade to a new position or change a new one, and then re-prepare the fibers.
	[Cleave Angle Limit] is set too low.	Increase the "Cleave Angle Limit" to an adequate limit. (standard value: 3.0°).
Core Angle Over Limit	[Core Angle Limit] is set too low.	Increase the "Core Angle Limit" to an adequate limit. (standard value: 1.0°).
	Dust or dirt is on the V-groove or fiber holders.	Clean the V-groove and the fiber holders. Prepare and reload the fiber again.
Fiber Axis Align Failed	Too large axial offset (>0.4 μ m)	Prepare the fiber (stripping, cleaning, and cleaving) again.
	The motor is not calibrated	Perform "Motor Calibration".
Fiber is Dirty	There's dust or dirt on the fiber surface	Prepare the fiber (stripping, cleaning, and cleaving) again.
	Dust or dirt is on the lenses	Perform the "Dust Check" after cleaning the lenses.
	"Cleaning Arc time" is too short	Set the "Cleaning Arc time" to 180ms
	It is difficult to identify the fiber core by using the method of core alignment to splice.	Use MM splice mode (clad alignment) to splice the unidentified fiber core.

Error Message	Cause	Solution
Fat Splicing Point	Too much [Overlap] setting	Adjust "Overlap" parameter setting.
	The motor is not calibrated.	Perform "Motor Calibration".
Thin Splicing Point	Arc power is too low	Perform "Arc Calibration".
	The level of pre-discharge is set too high	Decrease pre-discharge or pre-discharge time.
	Insufficient "Overlap" setting	Adjust "Overlap" parameter setting

Appendix C

Questions and Troubleshooting

The following gives the solution of some of the common problems for reference. If you cannot solve the problems, please contact the manufacturer directly.

1 .Power does not turn off when press "ON/OFF" button.
· Press and hold the key "ON/OFF" until the LED flashes, release the button, and the splicer will be turned off.

2. Few splices can be made with a fully charged battery pack
· Enable it to conserve power usage.
· The battery power degrades due to memory effects and Long-term storage. Recharge the battery after a fully discharging.
· The battery pack has reached the end of its service life. Install a new battery pack.
· Don't use the battery at a low temperature.

3. Error message appears on monitor
· Refer to appendix 2.

4. High splice loss
· Clean the V-grooves, fiber clamps, wind protector LEDs, and objective lenses.
· Replace the electrodes.
· Refer to appendix 1.
· The splice loss varies according to the cleave angle, arc conditions and fiber cleanliness.

5. Monitor suddenly turned off
· when you enable the power saving function, the splicer will switch to the power saving state after an extended period of splicer inactivity. Press any key to return to the normal state.

6. Splicer power suddenly turned off
· when you enable the power saving function, the splicer will turn the splicer power off after an extended period of inactivity.

7. Mismatch between Estimated splice loss and Actual splice loss
· The estimated loss is a calculated loss, so it can be used for reference only.
· The optical components of the splicer may need to be cleaned.

8. Fiber protection sleeve does not shrink completely
· Extend the heating time.

9. Method to cancel heating process
· Press the "HEAT" button to cancel the heating process. And the LED will be

turned off

10. Fiber protection sleeve adhered to heating plate after shrinking

· Use a cotton swab or a similar soft tip object to push and remove the sleeve.

11.Forgot passwords

· Contact your nearest sales agency.

12. No arc power change after [Arc Calibration]

· An internal factor is calibrated and adjusted for the specific arc power selected. The displayed arc power in each splice mode does not change.

13. Forget to put the optical fiber during the process of maintenance function

· It is invalid to press the return key. You need to open the wind cover and put the prepared fibers and press the "SET" or "RESET" button to continue

14. Fail to upgrade

· When users use the "new" U-disk to upgrade, the splice may not be able to correctly identify the upgrade program file; you need to reset the U-disk, and restart the splicer.

· Check whether the upgrade file name and the format are correct.

· If you cannot solve the problems, please contact the manufacturer directly.

Battery precautions

1.Do not touch or hit battery with pointed or sharp items.

2.Do not transport or store the battery together with metals.

3.Do not throw, drop, impact, or bend battery, or any knock or stomp on the battery is forbidden.

4.Do not connect the anode and cathode terminals of the battery with metals such as electric wire for fear of short circuit trouble.

5.Do not allow battery's anode or cathode terminal to touch with the aluminum layer of package made from aluminum laminated plastic film material for fear of short-circuit.

6.In no case the battery cell can be dismantled.

7.Do not immerse the battery into water or seawater, because the battery cell cannot bear moist environment.

8.Do not place or use the battery beside or near the heat source such as fire or heater.

9.Do not heat battery or throw it into water.

10.Do not directly solder the battery.

11.Do not charge battery near or beside the fire or in a very hot environment.

12.Do not place the battery into microwave oven or any high pressure vessel.

13.Do not allow the battery work or place it in hot temperatures such as in strong sunshine or hot environment in car for a long time, for fear that battery might be overheated, on fire, weakened functionally, or shortened in life.

14.Any usage of the damaged battery is forbidden. The battery should be kept away from fire source when electrolyte leakage occurs or the battery emits electrolyte smell for fear battery might catch on fire or explode.

15.If there is electrolyte contacting with your skin or into other part of body due to leakage, please rinse with water immediately. If the eye is contacted with electrolyte, rinse with water immediately and go to see a doctor nearest.

The End