

Instruction Manual

Specialty Arc Fusion Splicer

FSM-100 series

**Read this instruction manual carefully
before operating the equipment.**

**Adhere to all safety instructions and warnings
contained in this manual.**

Keep this manual in a safe place.

**Contents in this manual may change without prior notice due to
improvements in product features and specifications.**





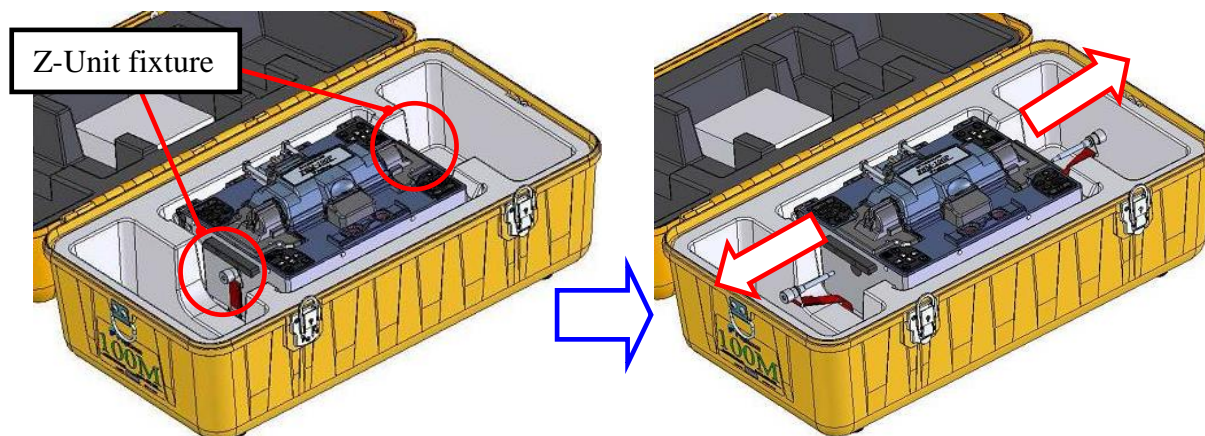
FSM-100M/P series.



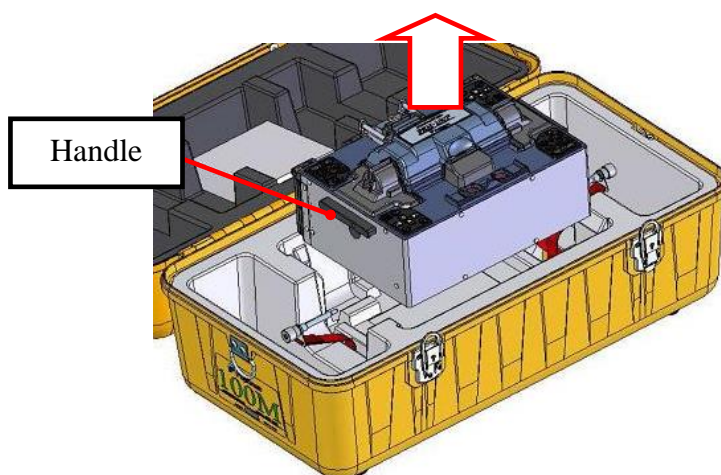
FSM-100M+/P+ series.

《Removing the splicer from the carrying case, after transportation.》

- (1) Open the lid of the carrying case.
- (2) Detach the Z-unit fixture from both sides of the splicer.



- (3) Take the splicer out of the carrying case by holding the left and right handles.



Please grip the handles firmly so the splicer will not be dropped when it is removed from the carrying case.
It may cause personal injury and equipment damage.

Warning and Caution

《Placing the splicer in the carrying case, before transportation.》

Caution:

Transport the splicer in the following order. Otherwise, it may cause equipment damage. Moreover, the guarantee may not be applied in this case.

(1) Turn off the power to the splicer.

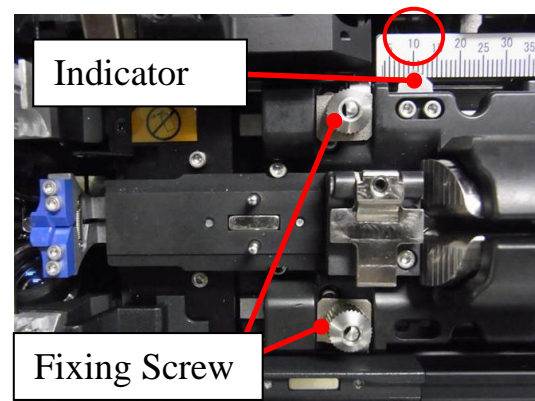


- Before placing the splicer in the carrying case, please turn off the power using the **ON/OFF** button. Detach the power supply cord before placing splicer in carrying case.
- If the power is turned off without using the **ON/OFF** button, the splicer may not be ready for transportation. Please do not insert the Z-Unit fixture by force as this may cause equipment damage.

Case of FSM-100M+/P+

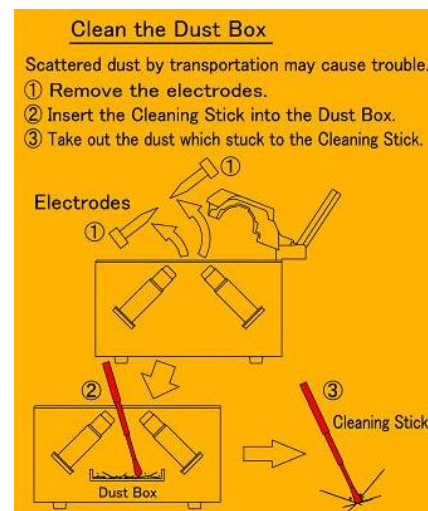
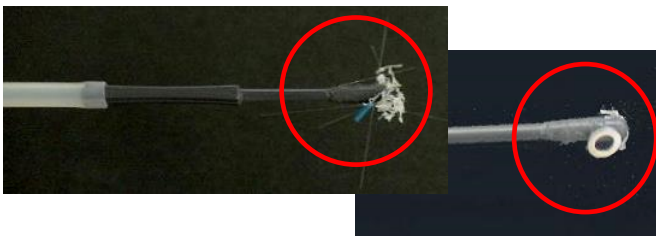


- Tighten the Fixing Screws when the indicator is aligned with 「10」 on the scale. Please confirm that the “Lock function” has been activated.
- The splicer might break down during transportation if the “Lock function” has not been activated.



(2) Remove the electrodes.

- (3) Insert the Cleaning Stick into the Dust Box and clean the area.
Remove the dust adhering to the Cleaning Stick.



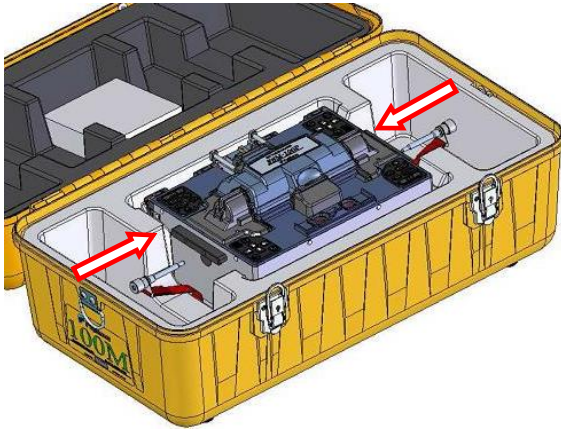
- Insert the Cleaning Stick into the Dust Box and clean. Take out the dust and debris which has stuck to the end of the stick
- Dust can spread to sensitive machine parts during transportation. As a result, the splicer might not operate smoothly and repairs may be needed.
- Do not detach the belt & Z-Unit fixture.

(4) Replace the electrodes.

Warning and Caution

(5) Place the splicer in the carrying case.

(6) Insert Z-Unit fixture and turn until tightened.



(7) Close the lid of the carrying case.

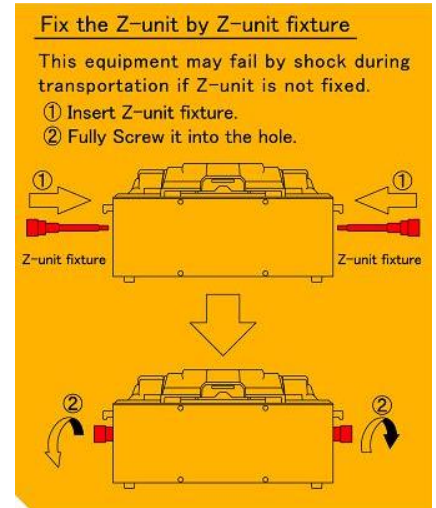


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The FSM-100 Series has been designed for splicing Silica-based optical fibers. Do not attempt to use this machine for other applications.

Fujikura Ltd. gives careful consideration and regard to personal injury. Misuse of the machine may result in electric shock, fire and/or serious personal injury.

Follow all safety instructions

Read and understand all safety instructions.

Stop using if unit malfunctions

Ask our service centers for repair as soon as possible.

Instruction Manual

Read this instruction manual carefully before operating this machine. Store this instruction manual in a safe place.

Images / letters in the screen shown in this manual may differ from the actual image on the monitor on the splicer.

The following alert symbols are used in this instruction manual and machine to indicate warnings and caution for safe use. Understand the meanings of these symbols.



WARNING

There is a possibility of death or serious injury resulting from improper use by ignoring this indication.



CAUTION

There is a possibility of personal injury or physical loss resulting from improper use by ignoring this indication.



Symbol means "Pay attention"



Pay attention to hot surface!



Symbol means "Must not do"



You must not disassemble!



Symbol means "Must do"



You must disconnect a plug!

Warning and Caution

WARNINGS

Disconnect the AC power cord from the DC inlet or the wall socket (outlet) immediately if user observes the following or if the splicer receives the following faults:



- Fumes, bad smell, noise, or over-heating occurs.
- Liquid or foreign matter falls into cabinet.
- Splicer is damaged or dropped.

If this occurs, ask our service center for repair. Leaving the splicer in a damaged state may cause equipment failure, electric shock or fire and may result in personal injury, death or fire.

Use only a proper power source.



- AC generators commonly produce abnormally high AC output voltage or irregular frequencies. Measure the output AC voltage with a circuit tester before connecting the AC power cord. Such abnormally high voltage or frequency from a generator may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire. Make sure the generator is regularly checked and serviced. When using an AC generator with AC output voltage of AC220~240V especially, Fujikura Ltd. recommends the following measures to correct the condition.

(1) Connect a step-down transformer between the generator and the AC adapter in order to lower the AC voltage from AC220~240V to AC100~120V.

(2) Or, use an AC generator with AC output voltage of AC100V.










Do not disassemble or modify the splicer. In particular, do not remove or bypass any electrical or mechanical device (e.g. a fuse or safety switch) incorporated into the design and manufacturing of this equipment. Modification could cause damage that may result in personal injury, death, electric shock or fire.












Use the supplied AC power cord. Do not place heavy objects on the AC power cord. Use of an improper cord or a damaged cord may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.



The splicer uses a three-prong (core) AC cord that contains an earthed ground safety mechanism. The splicer **MUST** be Grounded. Use only the supplied three-prong (core) AC power cord. **NEVER** use a two-prong (core) power cord, extension cable or plug.

 WARNINGS	
	Never operate the splicer in an environment where flammable liquids or vapors exist. Risk of dangerous fire or explosion could result from the splicer's electrical arc in such an environment.
	Do not use compressed gas or canned air to clean the splicer. They may contain flammable materials that could ignite during the electrical discharge.
	Do not touch the electrodes when the splicer is on and power is supplied to the unit. The electrodes generate high voltage and high temperatures that may cause a severe shock or burn. Note Arc discharge stops when wind protector is opened. Turn the splicer off and disconnect the AC power cord before replacing electrodes.
	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 eyes, skin, or are ingested.
	Don't touch the splicer, AC power cord, or AC plugs with wet hands. This may result in electric shock.
	Do not operate splicer near hot objects, in hot temperature environments, in dusty / humid atmospheres or when water-condensation is present on the splicer. This may result in electric shock, splicer malfunction or poor splicing performance.

Warning and Caution

 CAUTIONS	
	Do not store splicer in any area where temperature and humidity are extremely high. Possible equipment failure may result.
	Do not touch protection sleeve or tube-heater during heating or immediately after completion of heating. These surfaces are very hot and touching these may result in skin burn.
	Do not place the splicer in an unstable or unbalanced position. The splicer may shift or lose balance, causing the unit to fall. Possible personal injury or equipment damage may result.
	The splicer is precision adjusted and aligned. Do not allow the unit to receive a strong shock or impact. Possible equipment failure may result. Use supplied carrying case for transportation and storage. The carrying case protects the splicer from damage, moisture, vibration and shock during storage and transportation.
	<p>Follow the below listed instructions for handling electrodes.</p> <ul style="list-style-type: none">➤ Use only specified electrodes.➤ Set the new electrodes in the correct position.➤ Replace the electrodes as a pair. <p>Failure to follow the above instructions may cause abnormal arc discharge. It can result in equipment damage or degradation in splicing performance.</p>
	Do not use any chemical other than pure alcohol (99% or greater) to clean the objective lens, V-groove, mirror, LCD monitor, etc., of the splicer. Otherwise blurring, discoloration, damage or deterioration may result.
	The splicer requires no lubrication. Oil or grease may degrade the splicing performance and damage the splicer.
	The equipment must be repaired or adjusted by a qualified technician or engineer. Incorrect repair may cause fire or electric shock. Should any problems arise, please contact the authorized distributor.

RECYCLING and DISPOSAL

In European Union



In accordance with the European Parliament Directive 2002/96/EC, electrical parts and materials that can be re-used and/or recycled have been identified in order that the use of new resources and the amount of waste going for landfill can be minimized.

In the European Union, do not discard this product as unsorted municipal waste. Contact your local authorities.

In other countries

[Recycling]

To recycle this product, disassemble it first, sort each part separately by material components and follow your local recycling regulations.

[Disposal]

This product can be disposed of in a similar manner as standard electric products. Follow your local disposal regulations.

Notes

LCD (Liquid Crystal Display) monitor

The splicer is equipped with a LCD monitor, manufactured in a high quality-controlled factory environment. However, some black dots may appear, or red/blue/green dots may remain on the screen. The screen brightness may not appear uniform depending on the viewing angle. Note that these symptoms are not defects, but are the nature of LCD.

Quick Start Guide

1. Splice Mode Selection

A variety of splice modes are already installed in the FSM-100M/P and FSM-100M+/P+. Some typical splice modes are shown below.

1-1. FSM-100M / FSM-100P

Fiber Combination	G652SM Fiber Both sides	G655NZDS Fiber Both sides	EDF special Either side	LDF Both sides	
Clad Diameter	125μm	125μm	125μm	400μm	1000μm
Recommended Splice Mode	SM AUTO1	NZ AUTO1	BASIC 1	SM 400	SM 1000
Auto Stuff Control	ON	ON	ON	ON	ON
Electrode Gap	1mm	1mm	1mm	3mm	3mm
V Height Shift	0μm	0μm	0μm	0μm	0μm
Arc Calibration Method See Section 2-1	STD (Standard)	STD (Standard)	STD (Standard)	SP (Special)	
Alignment Mode	Core	Core	Core	CLAD	CLAD
Focus Settings	0.25	Auto	Auto	Auto	Auto
Fiber Type Compare See Section 3-1	A more accurate splice becomes possible by using the memory function of the core profile data specific to each fiber.			OFF	OFF
Auto Arc Calibration See Section 2-2 & 3-2	SM mode	Memorized mode	OFF	OFF	OFF
	A more accurate calibration can be realized by memorizing the calibration factor obtained by the fiber data learning function.			OFF	OFF
Auto Time Comp See Section 2-6	ON	OFF	OFF	OFF	OFF
Arc Center Compensation See Section 4	ON	ON	OFF	OFF	OFF
Axis Offset	Core	Core	Core	CLAD	OFF
Core Bending	ON	ON	ON	ON	OFF
MFD Mismatch See Section 2-3	OFF	OFF	WSI/CSI	OFF	OFF
Note	The splicer calibrates the arc power at each splice.		Please change the arc time at the splice mode for a special fiber.	This mode is for Large Diameter Fiber splicing. Please execute SP arc calibration.	

SM1000: FSM-100M+/P+ Only

1-2. FSM-100P / 100P+

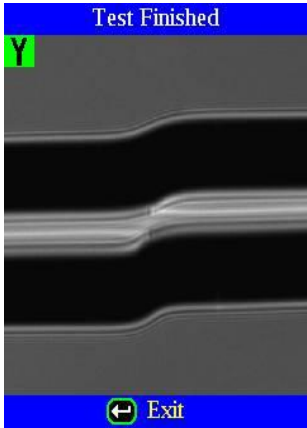
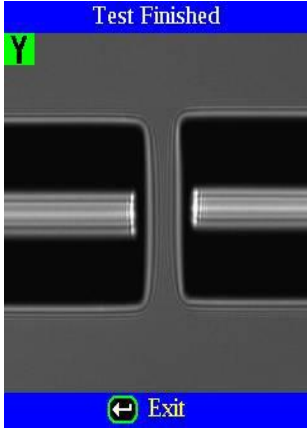
Fiber Combination	PANDA Both sides	Excluding PANDA Both and Either side	LDF PMF	PM Fiber
Clad Diameter	125μm	125μm	400μm	125μm
Recommended Splice Mode	PANDA 1	PM AUTO 1	PANDA 4	PANDA8
Auto Stuff Control	ON	ON	ON	ON
Electrode Gap	1mm	1mm	3mm	1mm
V Height Shift	0μm	0μm	0μm	0μm
Arc Calibration Method See Section 2-1	STD (Standard)	STD (Standard)	SP (Special)	Depend on fiber type
Alignment Mode	Clad	Clad	Clad	Clad
Focus Settings	0.32	Auto	Auto	Auto
Fiber Type Compare See Section 3-1	-			
Auto Arc Calibration See section 2-2	OFF	OFF	OFF	OFF
Auto Time Comp See Section 2-6	OFF	OFF	OFF	OFF
Arc Center Compensation See Section 4	OFF	OFF	OFF	OFF
Alignment See Section 2-4	PAS	IPA	PANDA	EV
Axis Offset	Clad	Clad	Clad	Clad
Core Bending	OFF	OFF	OFF	OFF
MFD Mismatch	OFF	OFF	OFF	OFF
Note	The PANDA fiber is spliced accurately at the shortest time. If clamping on the coating, alignment time is longer.	All PM fibers can be aligned by using the data of the fiber prepared beforehand, although it is longer. Moreover, it is applied to splice dissimilar fiber types.	This mode is for Large Diameter Fiber splicing. Please execute SP arc calibration.	This mode is for PM Fiber splicing with end-view observation system. Note FSM-100P+Only

The splice setting of the FSM-40F/PM series and the FSM-45F/PM series can be converted into the FSM-100 series. Please refer to the Excel file that exists in CD.

2. Convenient Functions

2-1. Arc Method and Arc Calibration

The relation between the arc method and the arc calibration is shown below.

Parameter	Arc Calibration	Special Arc Calibration	No Calibration
Arc Calibration Method	STD(Standard) If STD is not selected, it doesn't operate.	SP(Special) If SP is not selected, it doesn't operate.	NC (No Calibration) No calibration function
Electrode Gap	1.0mm	Existing value	Existing value
V Height Shift	0μm	Existing value	Existing value
Clad Diameter	125μm	Existing value	Existing value
Arc Center Compensation	Installed	Installed	Not Installed
Calibration Result	In all modes when STD is selected, the result of the arc calibration is updated to the arc power.	The result of the arc calibration is updated to the arc power in selected mode. However, it is necessary to optimize the arc power according to the fiber.	-
Other Setting	[Electrode Gap 1.0mm] [V Height Shift 0μm] [Clad Diameter 125μm] When the arc calibration is executed, each parameter automatically sets above mentioned. Please execute Special Arc Calibration when needed to execute the calibration in other settings. 	[Electrode Gap] [V Height Shift] [Clad Diameter] The arc calibration is executed without changing each setting of the splice mode that has been selected. 	-

2-2. Auto Arc Calibration

This function calibrates the arc power at splice. Whenever this function is on, the arc power is automatically corrected. The correction value is used in the next splice.

➤ See section [Function Introduction][Auto Arc Calibration]

2-3. Estimate WSI/CSI

WSI or CSI can be selected for the method of estimating the MFD mismatch.

WSI method is suitable for fiber without depressed cladding like fluorine.

CSI method is suitable for fiber with depressed cladding.

※ WSI (Warm Splice Image)

※ CSI (Cold Splice Image)

➤ See section [Function Introduction][MFD Mismatch]

2-4. IPA Data (FSM-100P/P+ Only)

The splicer aligns theta by using the memorized IPA data of each fiber.

PAS is recommended for PANDA fiber alignment. This alignment method is fast and accurate.

Please use the IPA mode when the standard alignment is not accurate.

※PAS (Profile Alignment System)

※IPA (Interrelation Profile Alignment)

➤ See section [IPA Data (FSM-100P/100P+ Only)]

2-5. End-View Observation System (FSM-100M+/P+ Only)

Optical fiber is observed in axial direction by a means of a mirror for fine alignment.

Uniquely structured fibers, such as PM, multi-core or non-circular fibers can now be more precisely aligned. However, conventional PAS (Profile Alignment System) is recommended for PANDA fiber splicing for fast and accurate alignment.

In the case that certain fibers show poor theta alignment with PAS, use IPA or end-view observation system.

➤ See section [Function Introduction] [End-View observation syst]

2-6. Auto Time Comp. (ECF/AUTO Control)

This function is used for G652 SMF splicing.

Arc power is optimized according to core concentricity-error.

If [ECF] is set to "OFF", this function is not available.

➤ See section [Function Introduction][Auto Time Comp.]

3. Fiber Data Learning

3-1. Fiber Type Compare

The feature of each fiber core profile can be memorized.

- See section [**Function Introduction**][**Fiber Type Compare**]

3-2. Auto Arc Calibration

The arc brightness of each fiber can be memorized as a calibration value.

- See section [**Function Introduction**][**Auto Arc Calibration**]

3-3. IPA Data

The feature of IPA of each optical fiber can be memorized.

- See section [**Function Introduction**][**IPA Data (FSM-100P/100P+ Only)**]

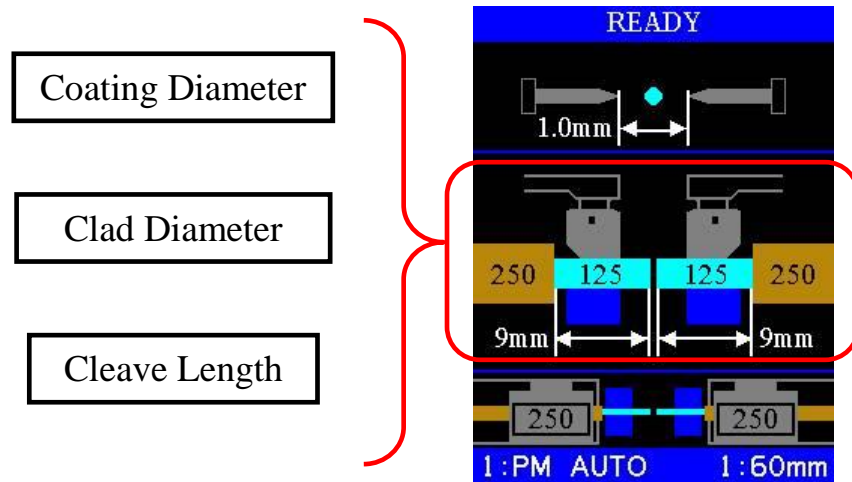
4. Input Fiber Data

In the FSM-100 series, the V-groove and clamp are adjusted automatically for a variety of fibers.

Each parameter can be changed in the [Fiber Information]. (Left/Right)

Input Data

The input value is displayed in the Sub-monitor.



➤ See section [Editing Splice Mode]



- When splicing large diameter fibers, enter correct cladding diameter. Software automatically decides the adjusting method based on the numerical value.
- There is a possibility to generate axis offset when a correct numerical value is not input.
- Please use the proper fiber holder to place the large diameter fiber on the V-groove.

Description of Products

1. Splicer Components

The components comprising the FSM-100 series are shown in below.

Name	Model	Qty	Note	FSM-100			
				M	P	M+	P+
Splicer Main Body	FSM-100M	1pc	-	●			
	FSM-100P				●		
	FSM-100M+					●	
	FSM-100P+						●
Heater	Sleeve Heater	1pc	Either the Sleeve Heater or the Fiber Straightener	▲	▲	▲	▲
	Fiber Straightener			▲	▲	▲	▲
Fiber Holder	FH-100-250	1pair	-	●	●	●	●
	FH-100-400	1pair	-	-	●	-	●
	FH-100-250-EV	1pair	For End-View Observation System	-	-	●	●
	FH-100-400-EV	1pair		-	-	-	●
AC Adapter	ADC-15	1pc		●	●	●	●
AC Power Cord for AC Adapter	ACC-01~04	1pc	Depend on country	●	●	●	●
Spare Electrodes	ELCT2-25	1pair		●	●	●	●
	ELCT3-25-LDF	1pair		-	-	●	●
End-view Light Source	EV-LS01	2pc		-	-	●	●
Electrode Cleaner	EC-01	1pc		-	-	●	●
Splicing Report	SR-01-E	1pc		●	●	●	●
Instruction Manual	M-100MP-E	1pc		●	●	●	●
Warnings and Cautions	W-100MP-E	1pc		●	●	●	●
USB Cable	USB-01	1pc	USB(A)-USB(Mini-B) 0.9m	●	●	●	●
Dust Cleaning Stick	DCS-01	1pc		●	●	●	●
Carrying Case	CC-27	1pc	Key, Z-Unit fixture	●	●	●	●
Rubber Pads	RP-01	1pair	Vibration reduction	-	-	●	●

2. Optional Components

Fiber Holder

Name	Model	Note	
Fiber Holder	FH-100-060	60μm	Applicable Diameter: 55~71μm
	FH-100-100	100μm	Applicable Diameter: 94~117μm
	FH-100-125	125μm	Applicable Diameter: 118~39μm
	FH-100-150	150μm	Applicable Diameter: 140~169μm
	FH-100-180	180μm	Applicable Diameter: 170~199μm
	FH-100-210	210μm	Applicable Diameter: 200~239μm
	FH-100-250	250μm	Applicable Diameter: 240~289μm
	FH-100-300	300μm	Applicable Diameter: 290~339μm
	FH-100-350	350μm	Applicable Diameter: 340~389μm
	FH-100-400	400μm	Applicable Diameter: 390~489μm
	FH-100-500	500μm	Applicable Diameter: 490~589μm
	FH-100-600	600μm	Applicable Diameter: 590~689μm
	FH-100-700	700μm	Applicable Diameter: 690~789μm
	FH-100-800	800μm	Applicable Diameter: 790~889μm
	FH-100-900	900μm	Applicable Diameter: 890~1000μm
	FH-100-****	****um	Applicable Diameter: 1000~2000μm
	FH-40-LT900	900μm Loose Tube	

Fiber holder placement for fibers with cladding larger than 250μm



- Please change the direction of the fiber holder as shown below when the size of the fiber cladding is larger than 250μm. Better alignment and splicing performance will be achieved for such large diameter fibers (LDF) when there is a longer distance between the fiber holder clamps and the splicer's alignment V-grooves.
- Fiber holder position can be reversed on FSM-100M/P. Use this function to allow fiber holder to be placed as far as possible from v-groove so that the fiber ends are aligned accurately.



Set the fiber holder in reverse direction

Description of Products

End View Holder

Use FH-100-XXX-EV for “end-view observation”. This fiber holder has a mirrored part so that LED light is bounced through to the fiber for “end-view observation”.



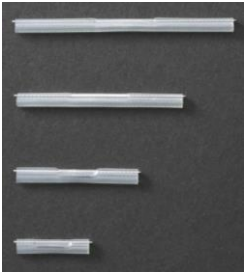

FH-100-XXX-EV fiber holder



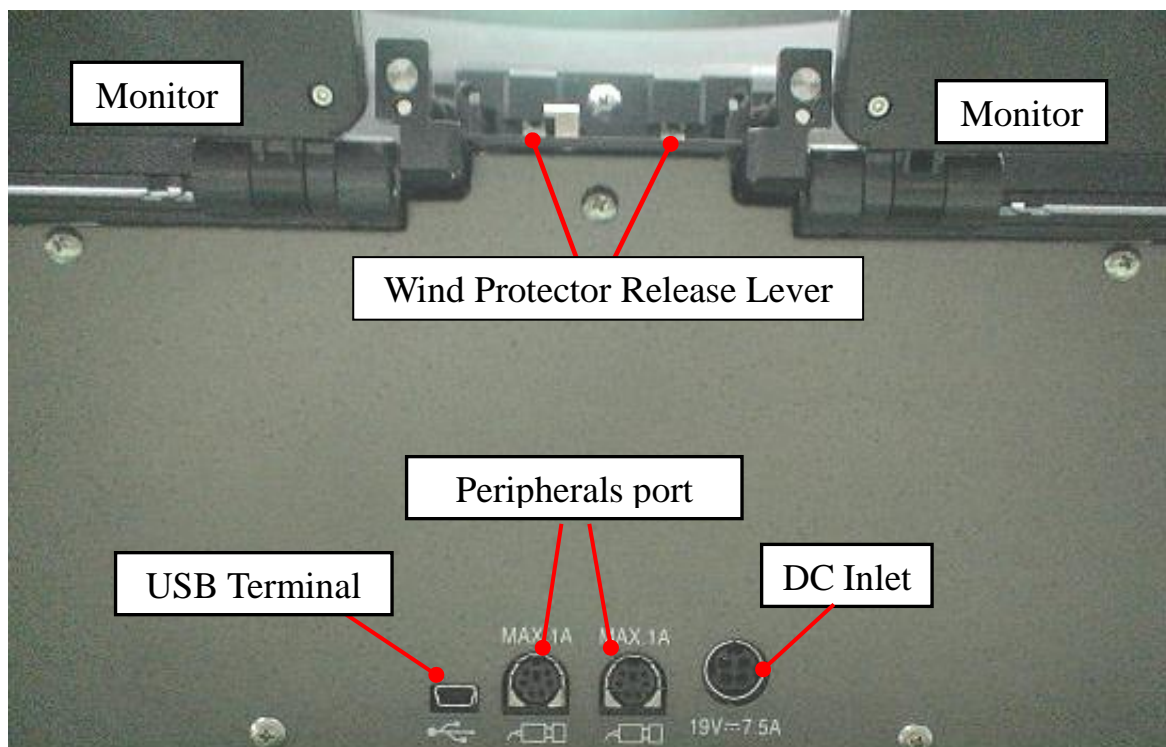
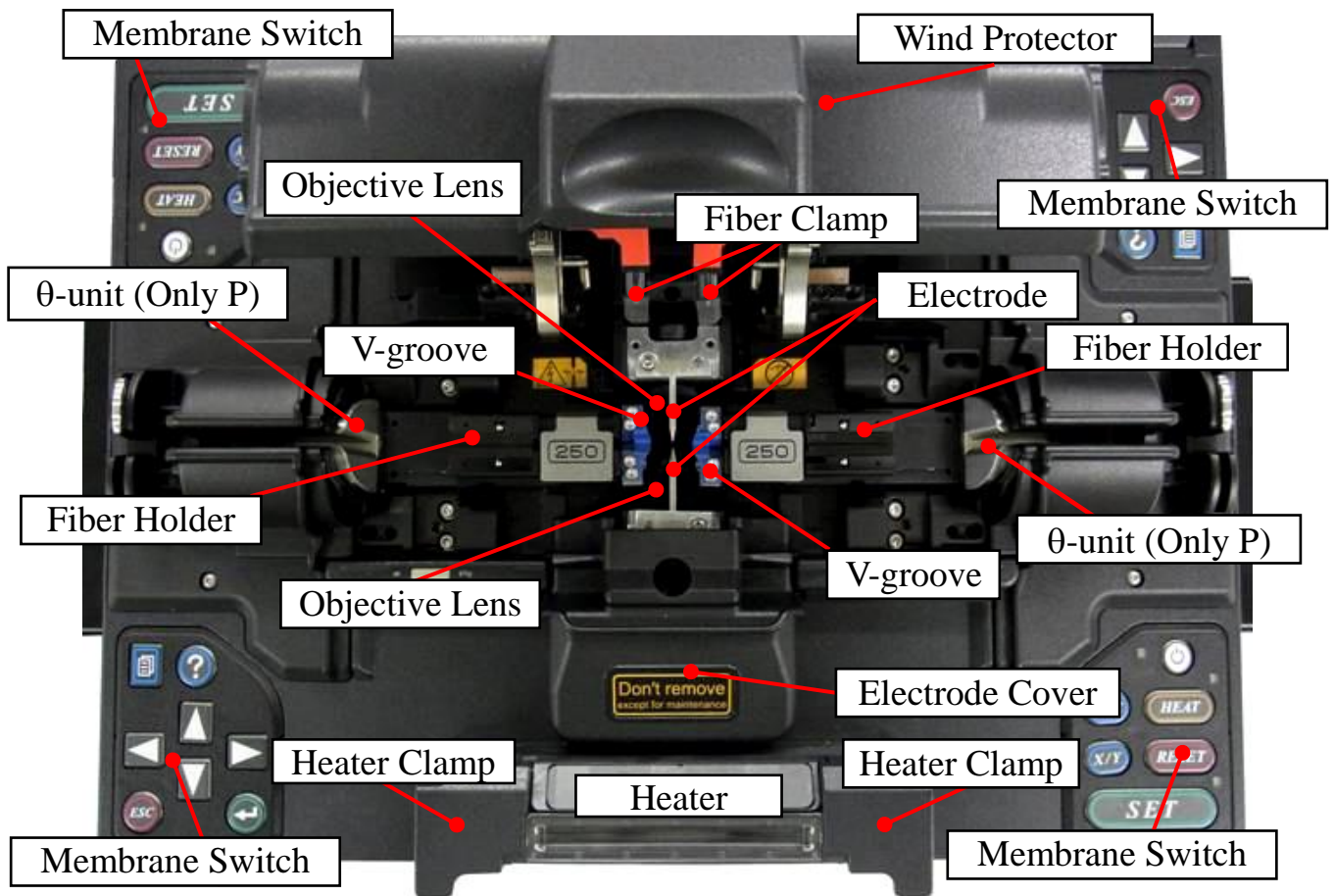
FH-100-XXX fiber holder

The FH-100-XXX-EV fiber holder has a mirrored part so that the LED light transmits through. There are a variety of FH-100-XXX-EV fiber holders to accommodate 60 to 2000 um coating diameter fibers.

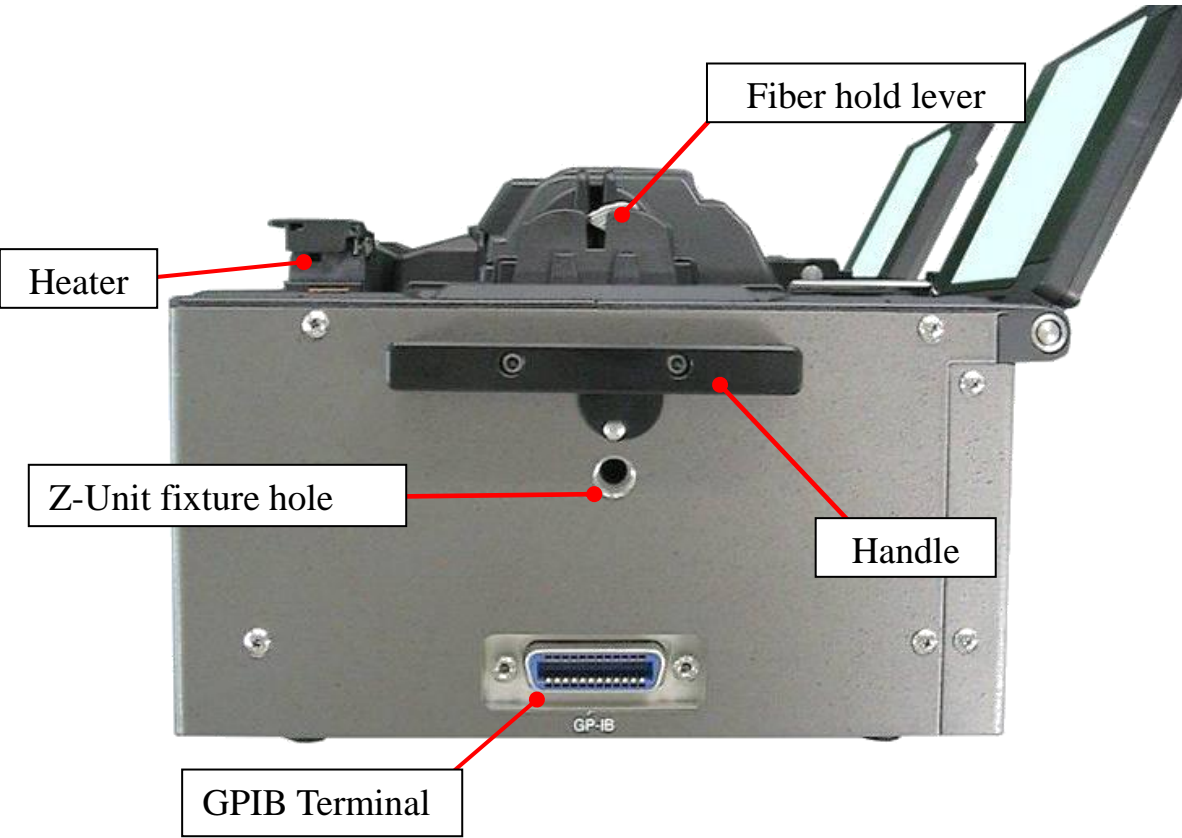
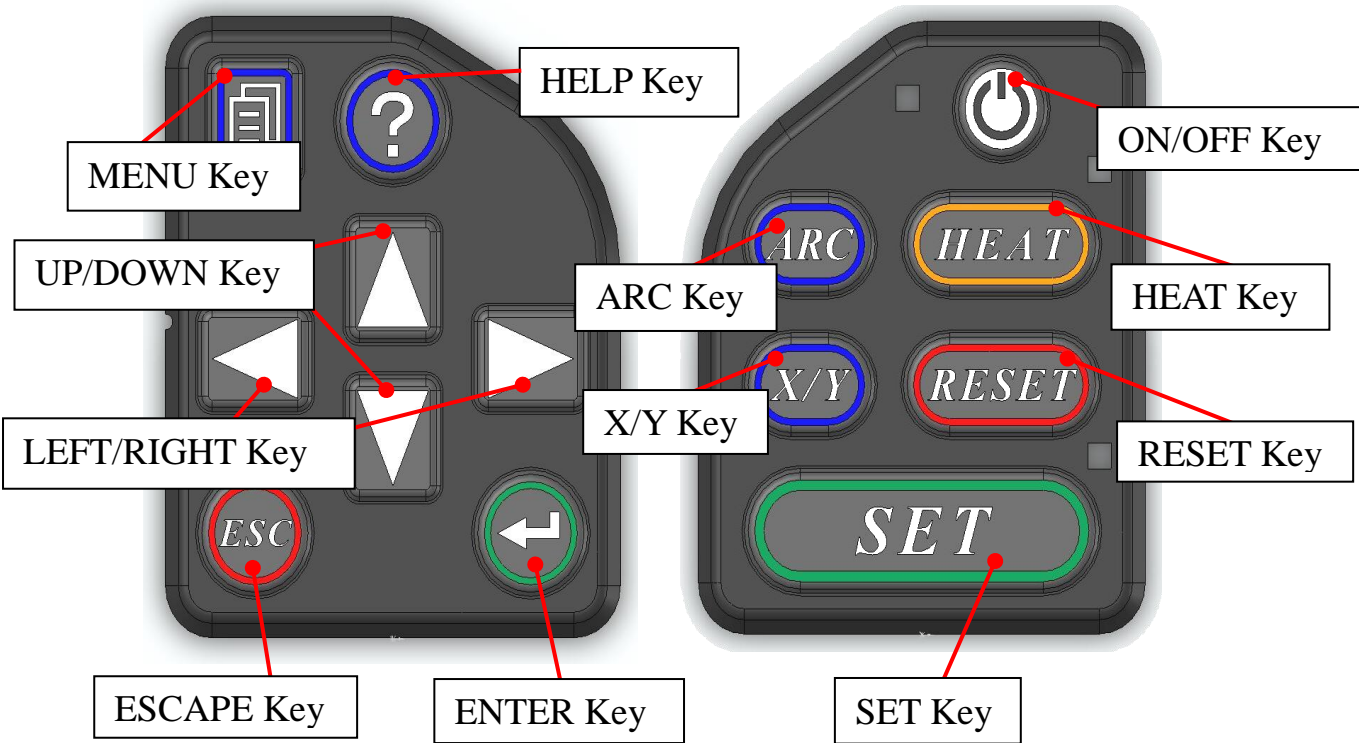
Fiber Protection Sleeves

Fiber Protection Sleeves	<div><div>•Micro Sleeve</div><div>FPS01-400-40 FPS01-400-34 FPS01-400-25 FPS01-400-20 FPS01-400-15 FPS01-400-12 FPS01-900-45 FPS01-900-34 FPS01-900-25 FPS01-900-20 FPS01-900-15</div></div>	
	<div><div>FPS01-AAA-BB</div><div>AAA: Coating diameter of the fiber.</div><div>BB: Length of the Sleeve</div></div>	
	<div><div>Standard Sleeve</div><div>FP-03 FP-03 (L=40)</div></div>	

3. Description and Function of Splicer



Description of Products



1. Attaching Power Supply to Splicer

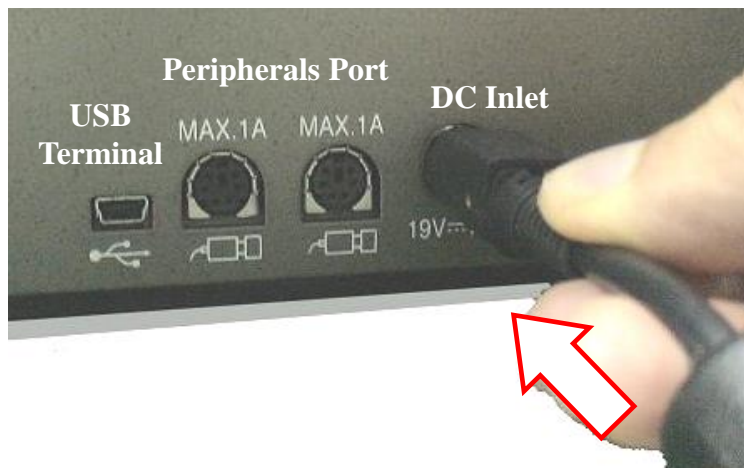
Only the ADC-15 is acceptable for the power supply of the FSM-100 Series.

- (1) Confirm voltage before operation.



- Make sure the power source is 100 → 240 VAC, 50 or 60 Hz. When connecting to an AC generator, always check the output voltage of the generator with a circuit tester before connecting the AC power cord.
- Make sure the AC power cord is free from damage, etc.

- (2) Connect the AC adapter.
Connect the DC cord of the AC adapter to the DC inlet of the splicer.



- (3) Connect the AC power cord to the AC adapter.
Plug the AC power cord into the AC adapter inlet. Make sure the plug is fully seated and in the correct position.
- (4) Connecting the AC power cord to the AC power source.
Plug the AC power cord into the wall socket (outlet). Make sure the plug is fully seated and in the correct position.



- During extended operation using the AC adapter, the surface of the AC adapter will become warm. This is normal and will not result in any loss of performance.

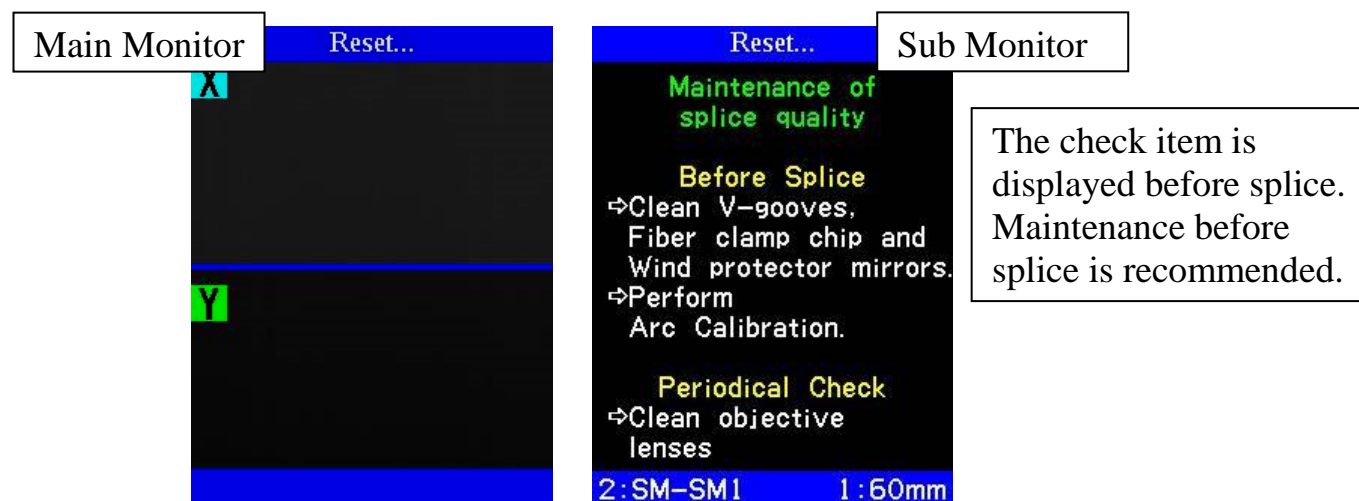
Basic Operation

2. Turning Splicer “ON”

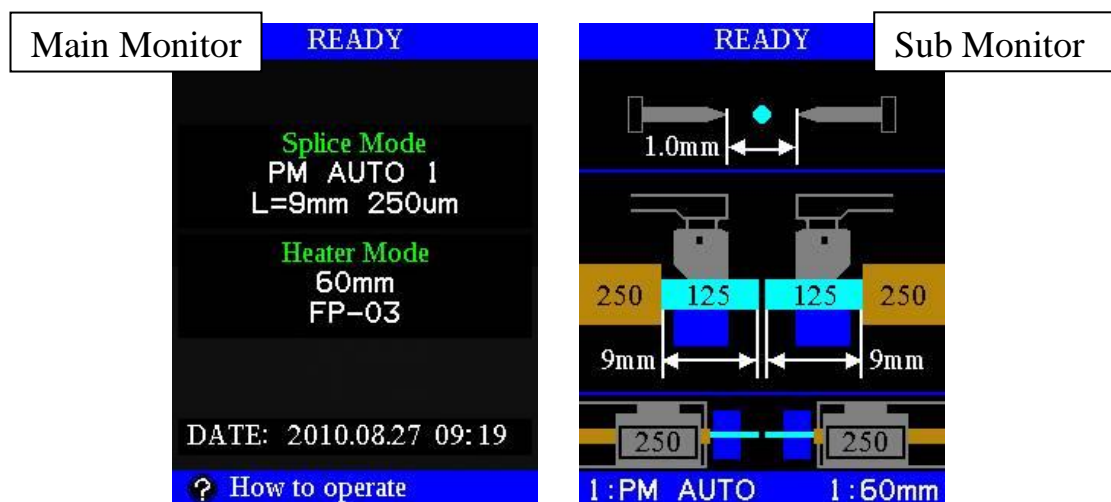
Pressing **ON/OFF** turns on the power to the splicer and the following image is displayed on the monitor.



All of the motors go to their home position and are reset.



The startup sequence of screens is [Fiber Set Diagram] and [READY].



Fiber Set Diagram

Main Monitor (Left)

Currently selected splice mode and heater mode.

Splice Mode

Currently selected splice mode.

Heater Mode

Currently selected heater mode.

Calendar (Additional Date Area)

Present date and time is displayed.



※ About Additional Date Area

Item to be displayed on READY screen is selectable.

→ See section [Setting Menu] [Maintenance Settings]

Cleave Limit

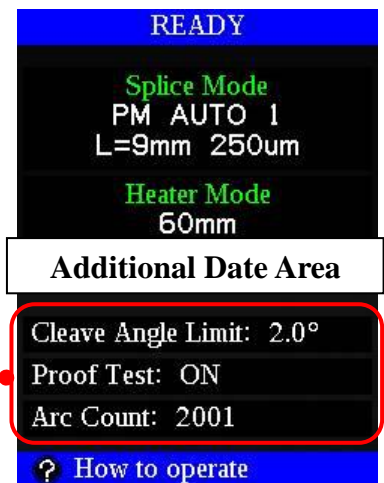
The threshold of the cleave angle limit is displayed.

Proof Test

Proof test status [ON or OFF] is displayed.

Arc Count

Arc count is displayed.



Basic Operation

Sub Monitor (Right)

Each setting of the selected [Splice Mode] is displayed.

[Electrode Gap], [V Height Shift], [Cleave Length], [Coating Diameter], [Clad Diameter], [Fiber Holder] These setting are displayed.

[Electrode Gap], [V Height Shift]···A

The setting of [Electrode Gap] and [V Height Shift] is displayed.

When the setting of [V Height Shift] is not displayed, [V Height Shift] is 0 um.

[Cleave Length], [Coating Diameter], [Clad Diameter]···B

The setting of [Cleave Length] and [Coating Diameter] and [Clad Diameter] is displayed.

[Use holder]···C

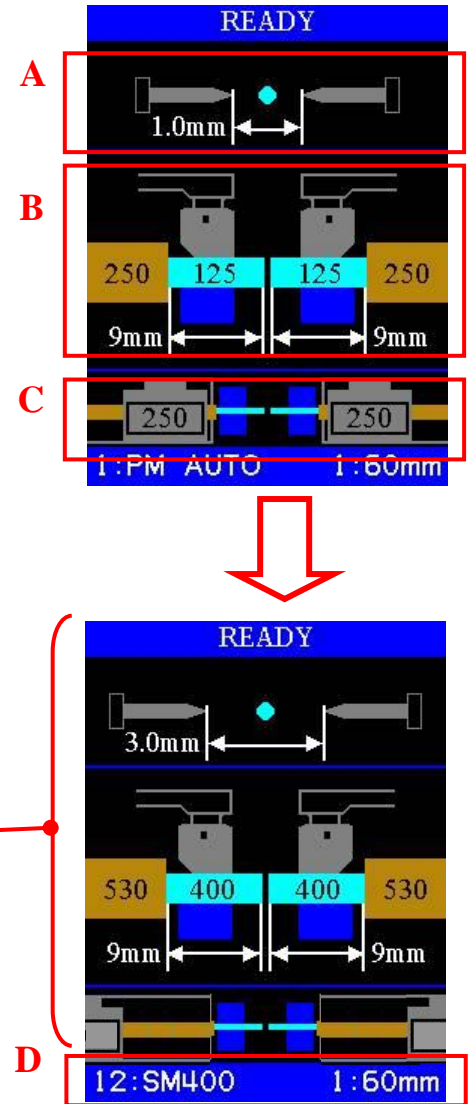
The setting of [Fiber Holder] is displayed.

When setting is changed by [Edit Splice Mode], the display on the monitor is changed.

Confirm the setting by the display before splice.

When setting is changed by [Edit Splice Mode], the display on the monitor is changed.

Confirm the setting by the display before splice.···D



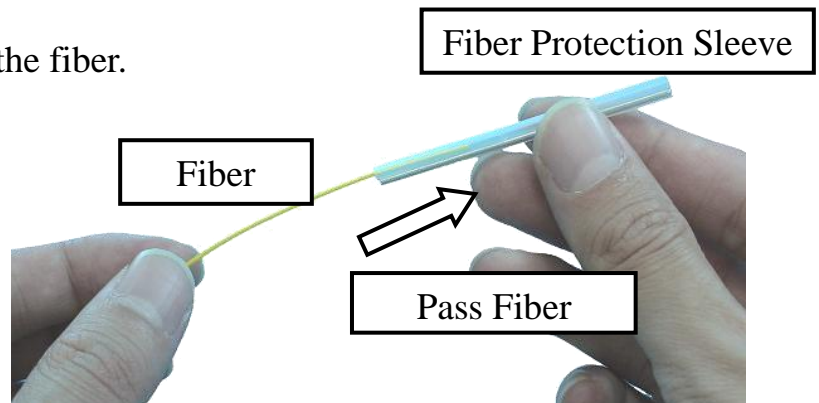
•If [Dust Check] or [Arc Calibration] is needed at once after turning on the power supply, see section [Machine Settings].

3. Cleaning Optical Fiber

Clean optical fiber with alcohol-moistened gauze or lint-free tissue approximately 100mm from the tip. Dust particulates from the fiber-coating surface can enter inside the protection sleeve and might result in a future fiber break or attenuation increase.

4. Placing Protection Sleeve over Fiber

Place the protection sleeve over the fiber.

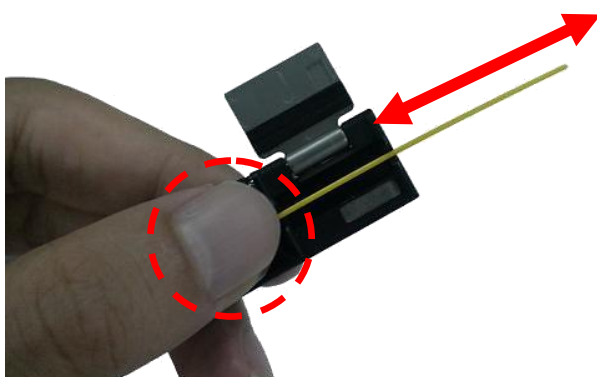


5. Setting the Fiber onto the Fiber Holder

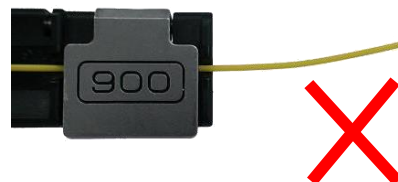
Set the fiber onto the fiber holder with 25 to 35 mm protruding from the end of the fiber holder and then close the fiber holder lid.



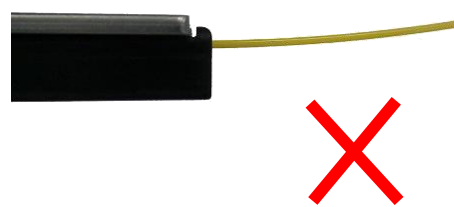
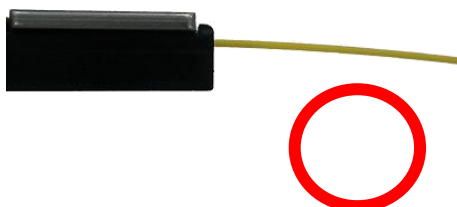
- Close the lid of the fiber holder while pressing down with a finger on the coating (refer to figure below).
- Select a suitable fiber holder based on the fiber coating diameter.



Fiber length 25 from 35 mm.
No curving at the fiber.



Example of curved fiber (09NY).



Basic Operation

6. Stripping and Cleaving Fiber

6-1. Stripping

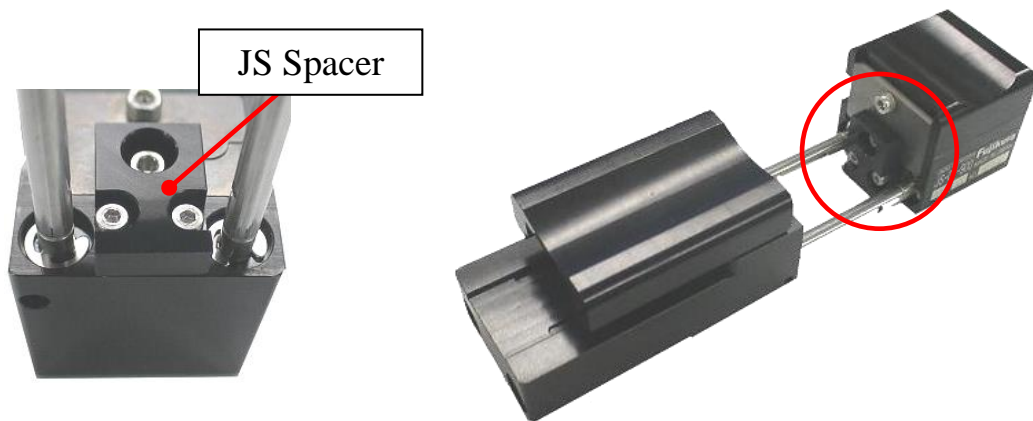
Using Jacket Stripper JS-02-900

The 900 μ m-coated fiber is stripped with the JS-02-900.

- (1) Attachment of the JS spacer.

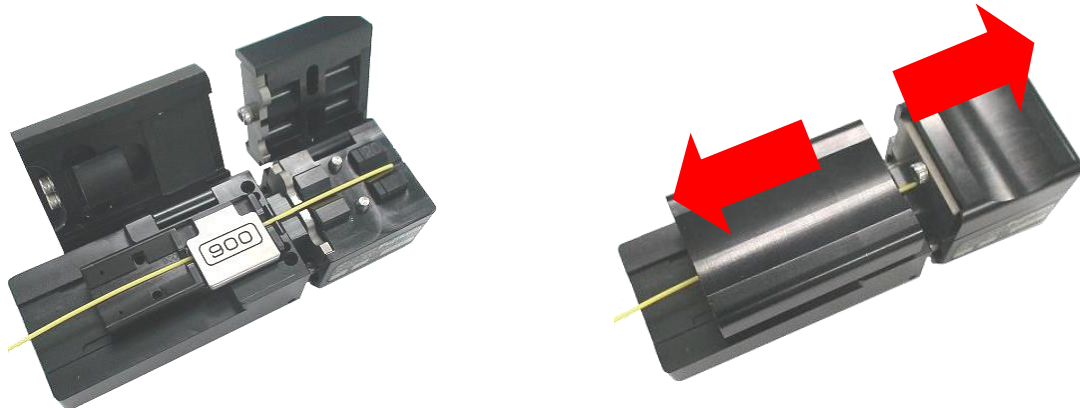
Attach the JS spacer for 3~5mm cleave length.

Rotate stripper upright on base and then fix the spacer with the two screws. Do not attach the spacer with an inclination.



- (2) Fiber stripping.

Slide the holder base inwards so that it touches the fiber base, then place the fiber holder (with the fiber) into the holder base. After verifying that the fiber position is in the center of the blade, close the holder clamp.



Pull the holder base slowly to strip the fiber coating.



• See the JS-02-900 instruction manual for more details.

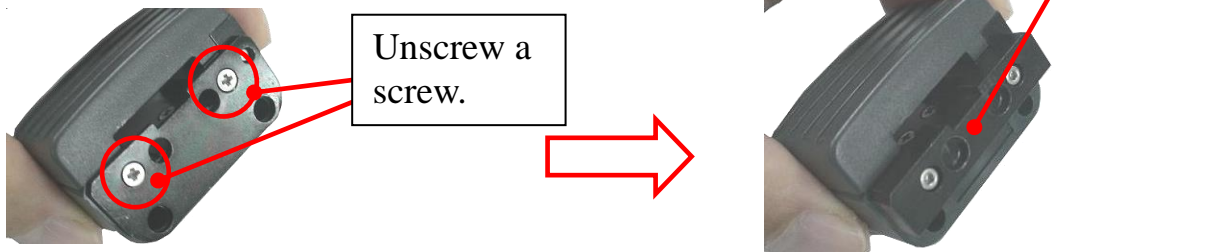
Using Hot Jacket Stripper HJS-02

The 250μm and 400μm coated fiber is stripped with the HJS-02.

- (1) Attachment of the HJS spacer.
Attach the HJS spacer for 3→5mm cleave length.

- (2) To attach the HJS spacer, remove the fiber holder base by loosening two screws.

- (3) Attach the HJS spacer to the fiber holder base by two long screws as below.



- (4) Attach the fiber holder base to the HJS-02 by two screws as below.



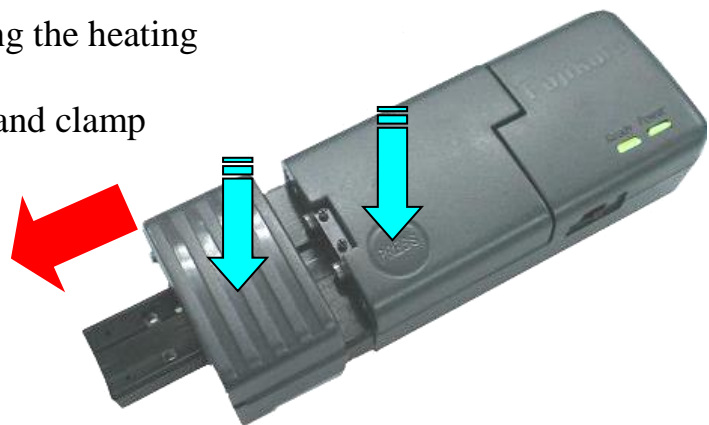
- Be sure to attach the washers for the two screws at the end of the rods.

- (5) Fiber Stripping.

Set the fiber holder onto a hot jacket stripper. Then, strip the coating.

Hold this point firmly during the heating and sliding.

Slide the fiber holder base and clamp gently.

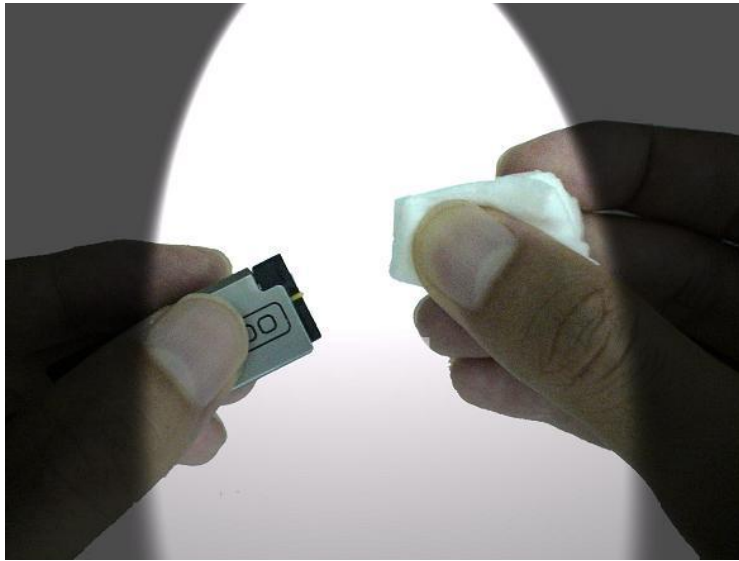


- An AC adapter is needed to use the HJS-02.
- See the HJS-02 instruction manual for more details.

Basic Operation

6-2. Cleaning Optical Fiber

Clean the bare part of the fiber with alcohol-moistened gauze or lint-free tissue.



- After this operation, handle the fiber with care so as not to damage or contaminate the bare glass.
- Use a high quality alcohol, greater than 99% pure.

6-3. Fiber Cleaving (Use of the CT-30)

- (1) To unlock the cutting lever, press it gently and slide the stopper.



- (2) Push the slide button until it locks. Set the stripped optical fiber on the cleaver.
- (3) Press down on the cutting lever.
- (4) Release the pressure on the cutting lever. A spring will return it to its open position. The scrap collector rollers drive the fiber scrap into the fiber scrap container box automatically when the cutting lever is raised.
- (5) When storing the cleaver, press the cutting lever down until the stopper can slide into place to lock the anvil lever.



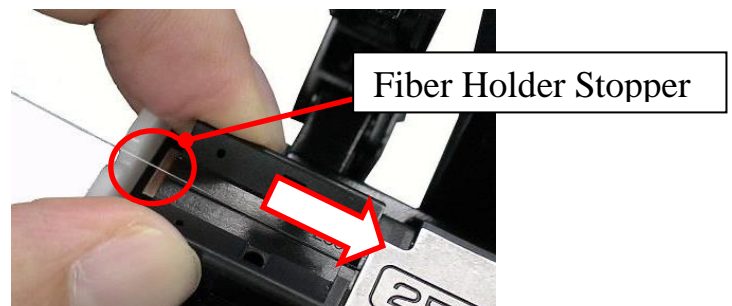
• See the CT-30 instruction manual for more details.

Basic Operation

6-4. Fiber Cleaving

(How to use CT-100 Cleaver)

- (1) Confirm the power is supplied and push the right lever forward. The clamp unit will move to home position.
 - *Clamp will not move if it is already at the home position.
 - *Even if the power is supplied after pushing the right lever, clamp unit will move to the home position.
- (2) Push the left lever forward and set the prepared optical fiber with the fiber holder

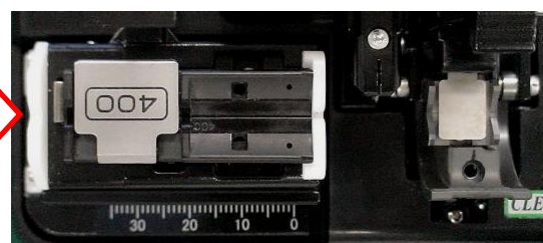


Check if the fiber holder is pushed forward by the holder stopper

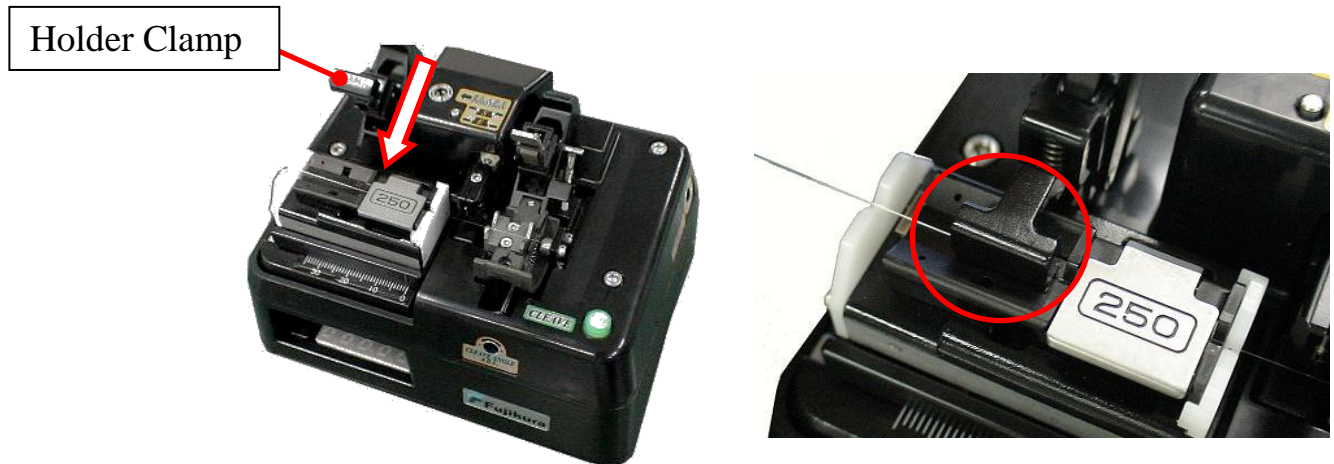
How to use CT-100 cleaver with FSM-100M/P series.



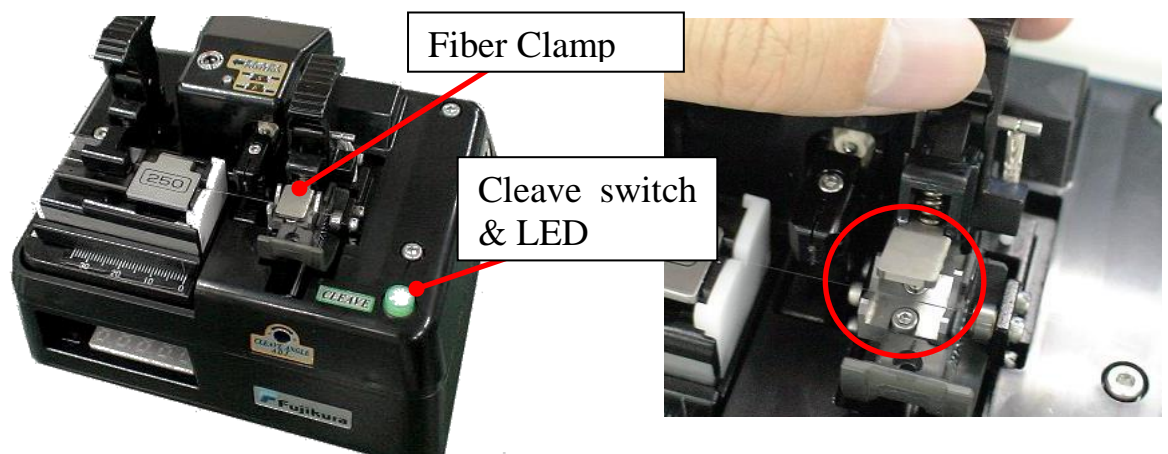
- If 250um or larger cladding diameter fiber is used, reverse fiber holder as show below.
- Set fiber holder at “18mm” in the cleaver for 9mm cleave length splicing, which is the standard cleave length for FSM-100M/P.



- (3) Pull back the left lever to firmly clamp the optical fiber with the holder clamp.
If the fiber is thin and does not require much tension for cleaving, this action can be skipped.



- (4) Pull back the right lever to clamp optical fiber with the fiber clamp.



- (5) Press the “Cleave Button” to perform cleaving.
LED in the cleave button shows the status of the cleaving as shown in Table 7-1.

Table 7-1. LED in the cleave button

LED	Status of the cleaving
ON	Cleaving
OFF	Error, Power off
□□□... Blinking three times	Finished

- (6) Tilt the left lever back to take the fiber holder off the cleaver.
(7) Tilt the right lever and take the fiber scrap out of the claver. The clamp unit automatically comes back to home position.

Basic Operation

In case of cleaving an optical fiber which has a stress applying region, such as a PANDA fiber.

There is a possibility of a cleave failure as show below after cleaving the optical fiber which has a stress applying region, such as a PANDA fiber. Please lower the tension slightly and cleave the optical fiber again.



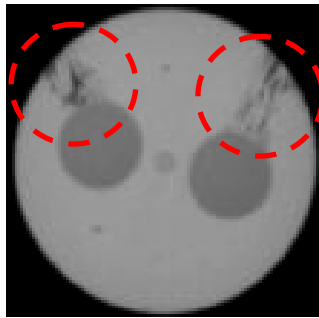
e.g.) PANDA Fiber cladding diameter: 125um

Tension : 240gf→150gf

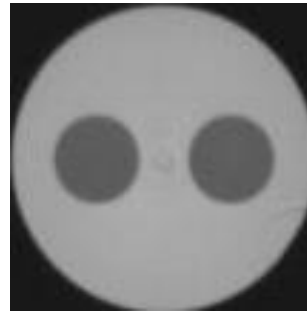
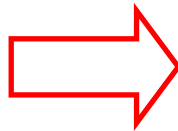
If the optical fiber is cleaved correctly, the end face is shown like below.

✖ There is a possibility of not cleaving an optical fiber instantly, when a cleaving blade is in touch with the optical fiber. Adjust tension accordingly and check cleave quality.

e.g.) PANDA Fiber cladding diameter: 125um



Tension : 240gf



Tension : 150gf

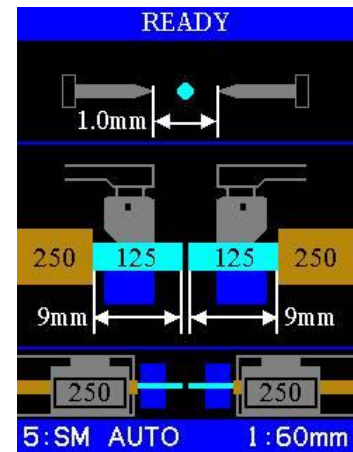
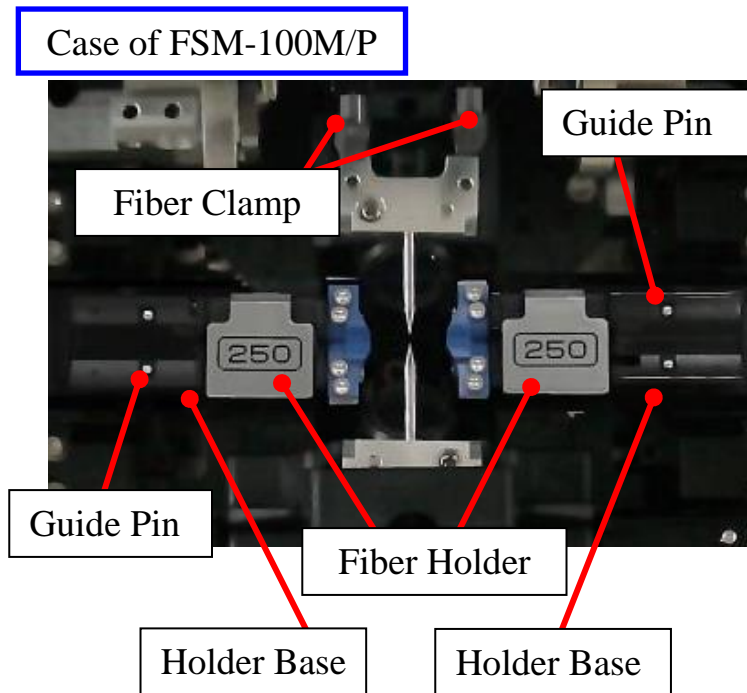


• See CT-100 instruction manual for detail.

7. Placing Fiber Holders onto Splicer

7-1. How to load fiber holder to FSM-100M/P

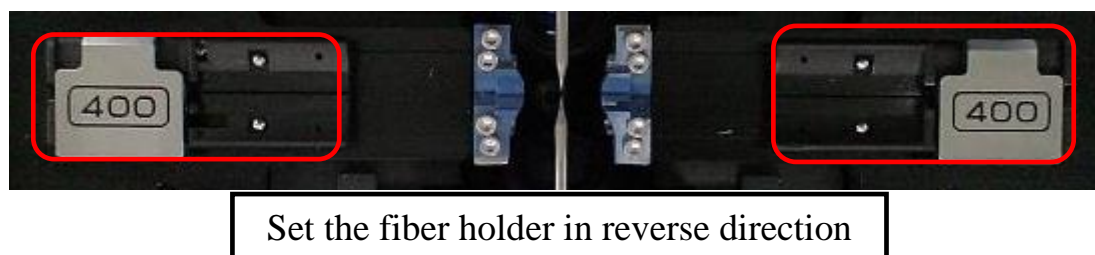
- (1) Open the wind protector.
- (2) Lift up the left and right fiber clamps. Lower the fiber holder with guide holes onto the base guide pins and position the fiber holder onto the fiber holder base.



Confirm the splice setting by the display.

Fiber holder placement for fibers with cladding diameter larger than 250 μ m:

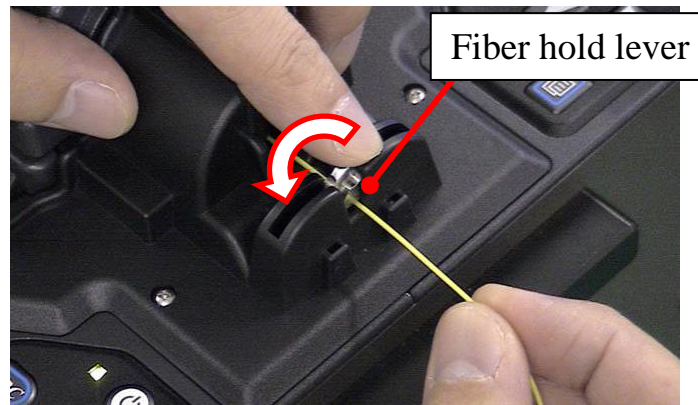
Please reverse the direction of the fiber holder in the splicer as shown below when the fiber cladding is larger than 250 μ m. Better alignment and splicing performance will be achieved for such large diameter fibers (LDF) when there is a longer distance between the fiber holder clamps and the splicer's alignment V-grooves.



- (3) Set the optical fiber on both sides in the same manner.
- (4) The fiber clamp is lowered at the same time the wind protector is closed.

Basic Operation

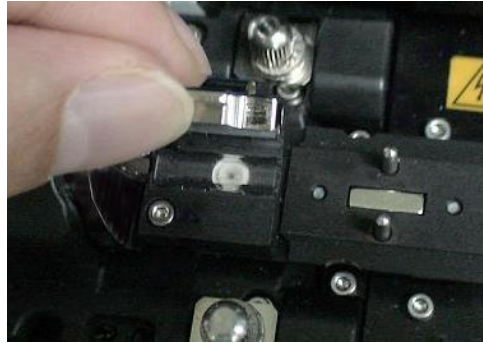
(5) Use "Fiber hold lever", when you make splice which θ unit drives. It prevents the fiber from snagging and cutting.



- Observe fiber position in the V-groove. The fiber should rest in the bottom of the V-groove. Reload the fiber holder if it does not rest properly.
- Care should be taken to prevent damage or contamination of the fiber end-face. Fiber end-face contact on any item including the V-groove bottom may result in poor quality splices.
- The fiber end-face should rest between the V-groove tip and electrode centerline. It is not necessary that the fiber end-face be exactly at the midpoint.

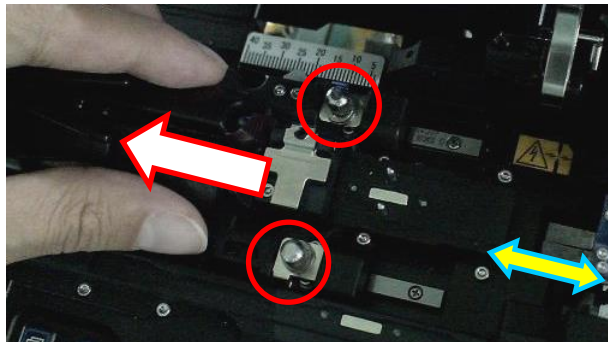
7-2. How to load fiber holder to FSM-100M+/P+

- (1) Open the wind protector.
- (2) Open the LED unit lid.



Open/Close LED unit lid

- (3) Loosen the fixing screw of Z-slide unit and move them back when LDF is loaded.



Move Z-slide unit back as much as possible when LDF is spliced.

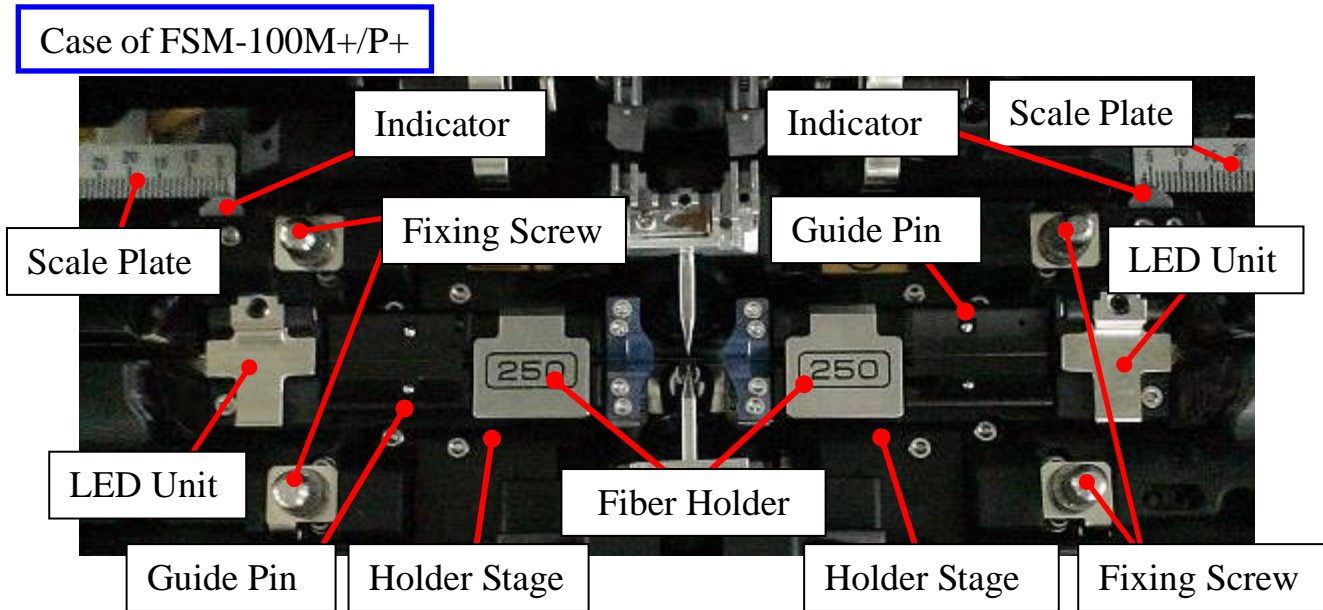
How to load LDF to FSM-100M+ /P+



- When the cladding diameter of the fiber is over 250μm, adjust z-slide holder. Allow as much distance as possible between fiber holder and v-groove. This is to reduce fiber angle at splice point, which may increase splice loss.
- Z-Slide is fixed to the position [10] of the scale with the screw when shipping. This “Locking function” is used for transportation. When you move the Z-slide unit the first time after the splicer is delivered, you need to loosen the fixing screw enough and release the “Locking function”.

Basic Operation

(4) Set fiber holder using guide pins as shown below.

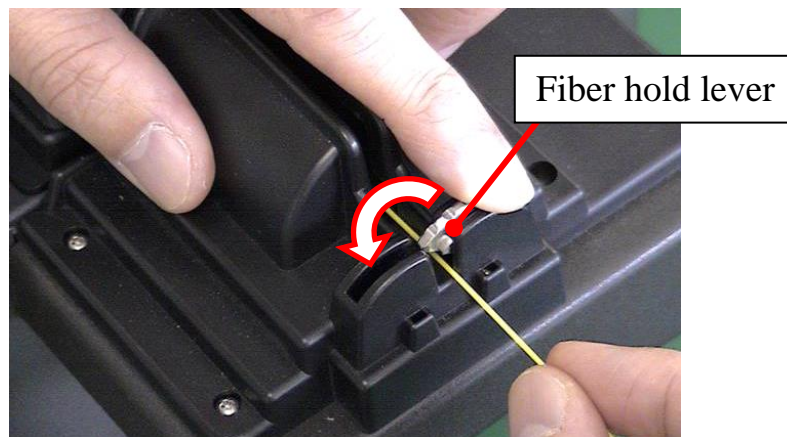


(5) Follow the same to set the other fiber.

(6) Close the LED unit lid.

(7) Fiber clamps move over the fiber automatically by closing the wind protector.

(8) Use "Fiber hold lever", when you make splice which θ unit drives. It prevents the fiber from snagging and cutting.

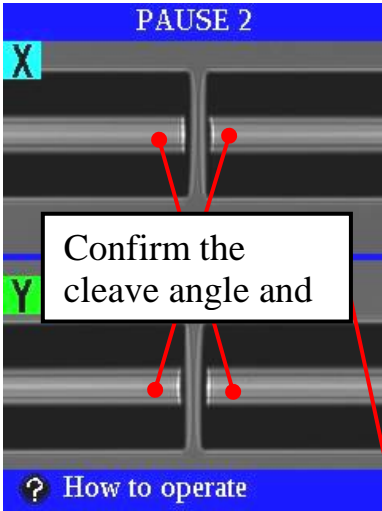


8. Splicing Procedure

To assure a good splice, the optical fiber is observed with the image processing system equipped in the FSM-100M/P/M+/P+. However, there are some cases when the image processing systems cannot detect small particles and defects. Visual inspection with the monitor is often necessary for better splicing evaluation.

Procedure below describes standard operating procedure.

- (1) Press **SET**, the fibers loaded in the splicer move forward toward each other. The fiber forward motion stops at a certain position shortly after the cleaning arc is performed. Next, the cleave angle and end-face quality are checked. If the measured cleave angle is greater than its set threshold, the buzzer will sound and an error message warns the operator. The splicing procedure pauses. If no error message is displayed, the below stated end-face conditions are used for visual inspection. If defects are observed, remove the fiber from the splicer and repeat fiber preparation. These visual defects may cause a faulty space.



PAUSE 2

X

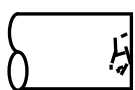
Y

Confirm the cleave angle and


? How to operate

PAUSE 2		
Axis Offset Data		
	Core	Clad
X	+0.0	+0.0
Y	+0.0	+0.0
XY	0.0	0.0
Cleave Angle / Shape		
L	R	
0.7° / O.K.	1.2° / O.K.	
Fiber Angle		
L	L-R	R
0.1°	0.3°	0.3°
5:SM AUTO		1:60mm

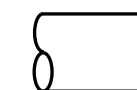
Chip



Lip



Incline



Clad Axis Offset

Core Axis Offset

Cleave Angle

Fiber Angle

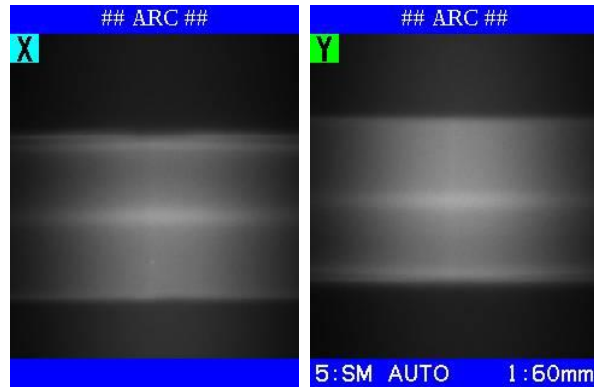
- (2) After fiber inspection, the fibers are aligned core-to-core or cladding-to-cladding depending on the splice mode. Cladding axis offset and core axis offset measurements can be displayed.
 - The pause after cleave angle check and fiber alignment can be disabled.
 - The cleave angle threshold can be changed. See [Checking or Editing Splice Mode] for details.
 - The cleave angle error message can be ignored by pressing the **SET** key to go on to the next step. To disable the cleave angle error; see [Configurations] for details.

Basic Operation

- (3) After completion of fiber alignment, the arc discharge is performed to splice the fibers. During arc discharge, observe the fiber image on the monitor screen. If some part of the image exhibits an extremely bright glow (hot spot), which is created by burning contaminants located on the surface or end-face of the glass, there is a possibility that the fiber core will be deformed. Although deformation can be detected by the loss estimation function, a re-splice is recommended.

Both main monitor and sub monitor display the image of the arc discharge.

Confirm there is no burning dust.



If a set value of the Arc Power is too low, the arc discharge may be abnormal. In this case, the following action is recommended.

- Increase the value of the Arc Power. Moreover, adjust the V height Shift, and keep away the fiber from the arc discharge.

Or



- In the sequence of arc discharge, for example, Prefuse and Main Arc, set the higher value of the Prefuse Arc power for the stable arc discharge during the Main Arc.

When the value of the Arc Power is too low even if the above-mentioned action is done, the arc discharge may be abnormal.

- (4) Estimated splice loss is displayed upon completion of splicing. Splice loss is affected by certain factors stated on the next page. These factors are taken into account to calculate, or estimate, splice loss. The calculation is based on certain fiber dimensional parameters, such as MFD.

If either the measured cleave angle or the estimated splice loss exceeds its set threshold, an error message is displayed. If the spliced fiber is detected as abnormal, such as “Fat”, “Thin” or “Bubble”, an error message is displayed. If no error message is displayed but the splice image looks poor by visual inspection, it is strongly recommended to repeat the splice from the beginning.

Splice loss may be improved in some cases by additional arc discharges. Press **ARC** key for an additional arc discharge (re-arc). Splice loss estimate and splice check are performed again.

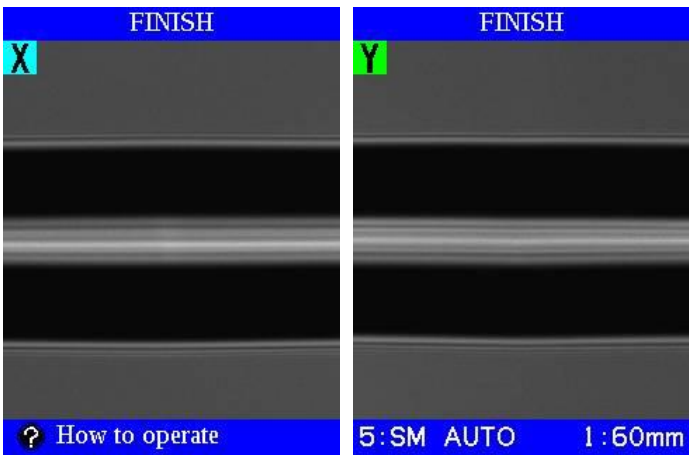
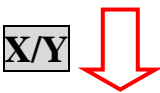
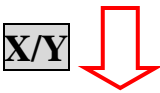


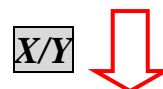
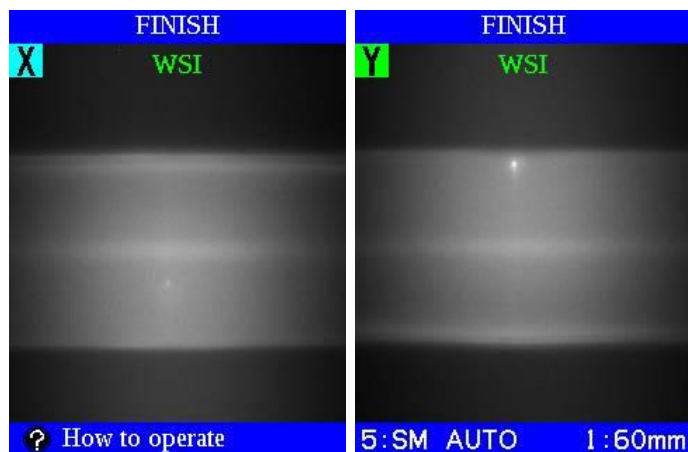
- The splice point sometimes looks a bit fatter than other parts. This is considered a normal splice and does not affect splice loss.
- To change the threshold for estimated splice loss or cleave angle, see the [Checking or Editing Splice Mode] for details.
- To change the “Loss Est.” or “Angle Offset” and to change the threshold of loss error, Angle Offset error, or core angle error, see the [Checking or Editing Splice Mode].
- Error messages, such as “High estimated splice loss”, “Splice angle”, “Fat”, “Thin” and “Bubble” can be ignored. This function can be set to “disabled”. See the [Splice Setting] for details.

Basic Operation

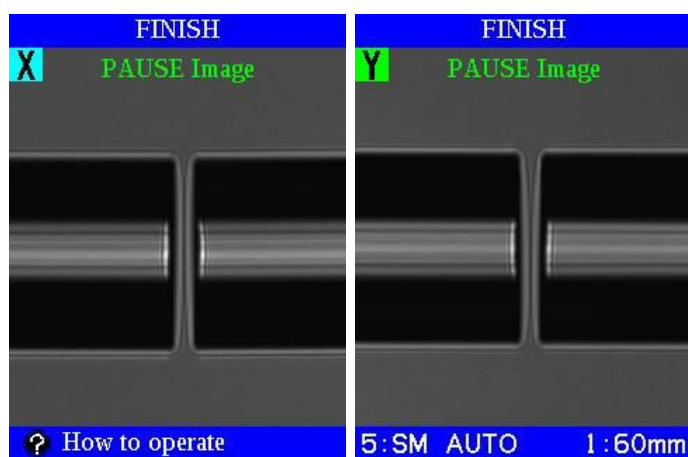
9. Display after the finished splice.

The default display setting is the following. The display can be switched with **X/Y** button.





Main Monitor (L)	Sub Monitor (R)
WSI (X)	WSI (Y)



Main Monitor (L)	Sub Monitor (R)
PAUSE Image (X)	PAUSE Image (Y)

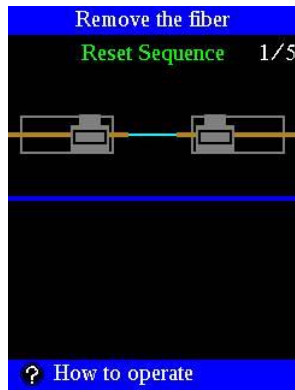


- The display setting is programmable. See section [Editing Splice Mode].

Basic Operation

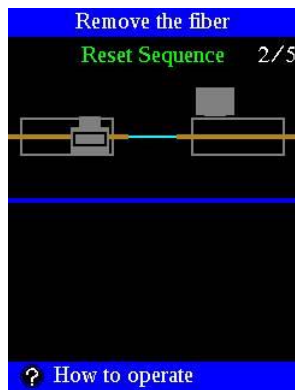
When the wind protector is opened after the splice, the instruction animation is automatically displayed.

Take out the fiber from the splicer as shown in the instruction.

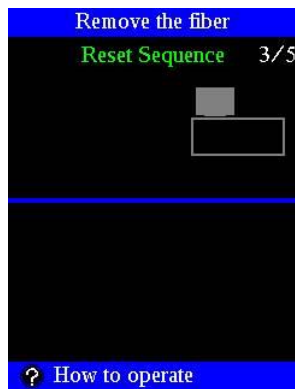


In the case of the splice with theta alignment, the instruction animation is started after the wind protector is opened and **SET** button is pushed.

The wind protector is opened after the splice.



Open the lid of the fiber holder.

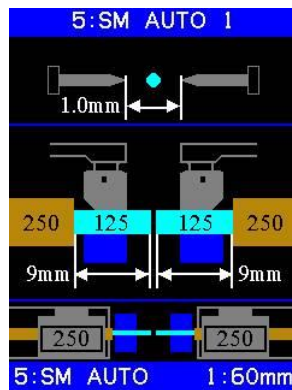
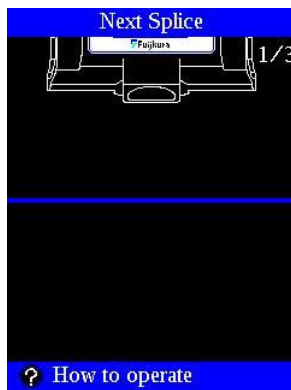


Take out the fiber from the splicer.



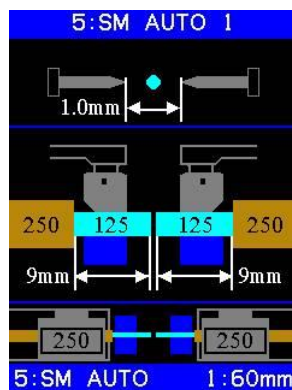
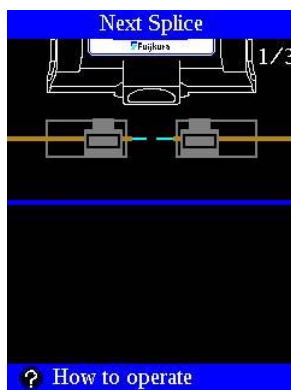
Push the **SET** button.
The instruction animation is started for the next splice.

The instruction animation is displayed for the next splice.

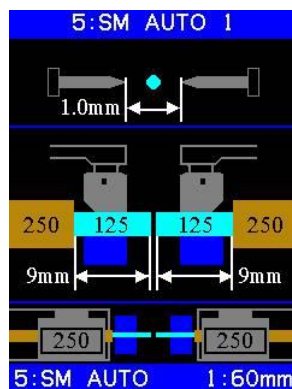
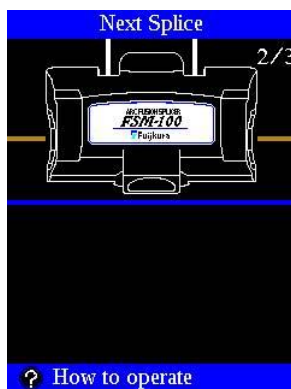


A current splice setting is displayed in the sub monitor.

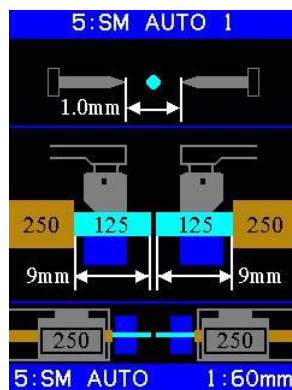
The **MENU** key can change the splice setting.



Place the fiber on both sides.



Close the wind protector.



Push **SET** key.
The splice is started automatically.

Basic Operation

10. Fiber Image

Zoom in and out of the fiber image

The magnification of the PAS and WSI fiber image can be changed by the **UP** **DOWN** key.

The fiber image at the gap set

Check the contamination and cleave shape, etc.

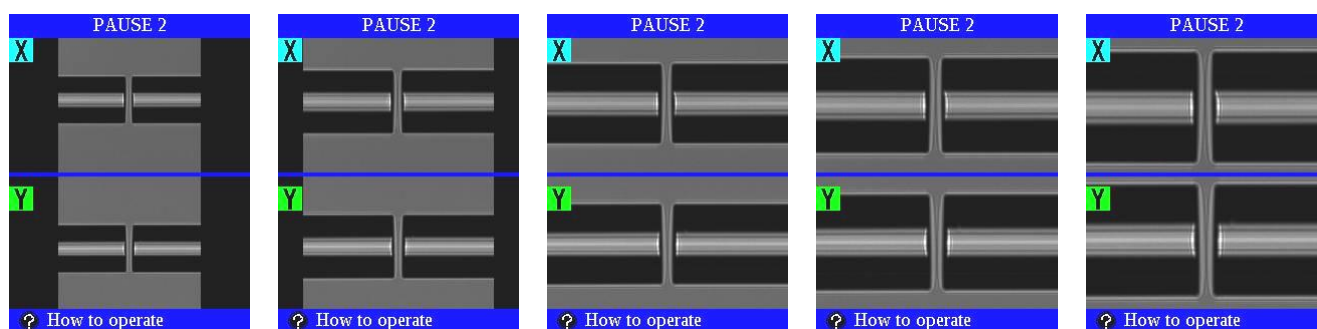
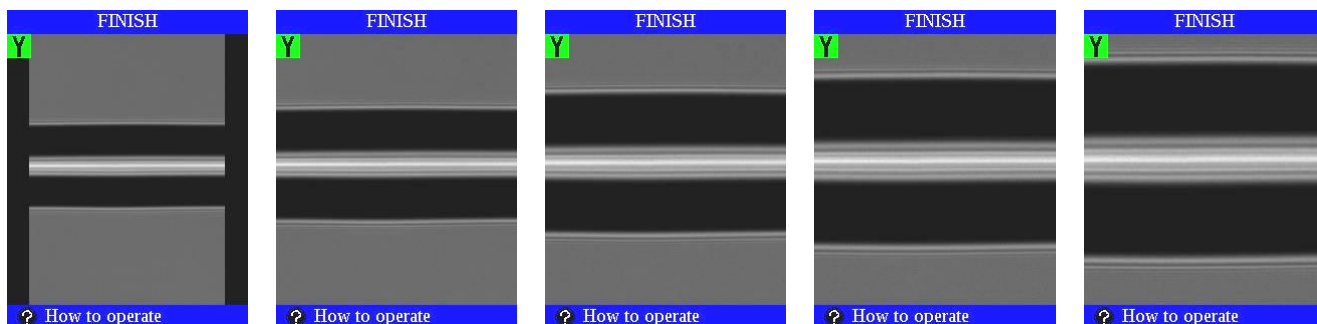


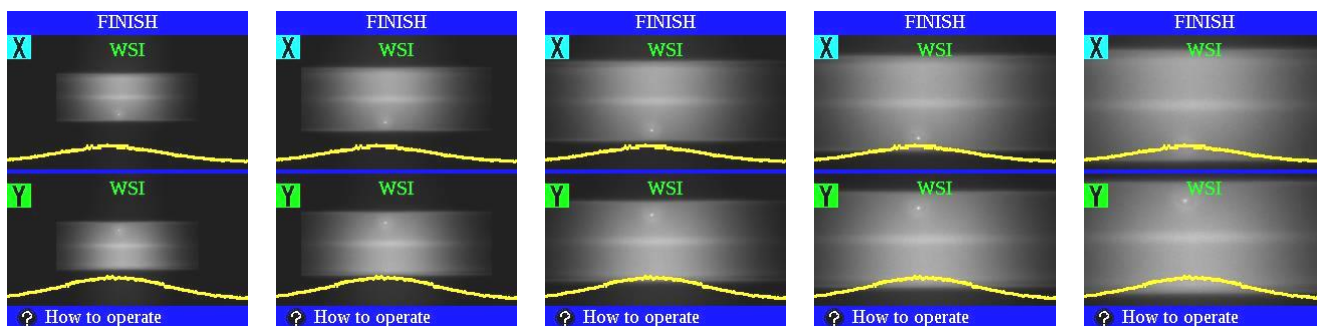
Image of spliced fiber

Check the image after fiber is spliced.



WSI image

Check the burning dust during arc discharge.



How to enter Mode title / Comments / Password

Character list below is displayed by selecting Mode Title / Comments / Password.

- (1) Move the cursor by pressing $\Delta \nabla \leftarrow \rightarrow$, and press **ENT** key to input the selected character. Move the cursor to \Leftarrow and press **ENT** key to highlight the character, and then enter the proper character over it.
- (2) Move cursor to [ENTER] and press **ENT** key on completion of entering characters. In the case of Password input, the next screen image is displayed if the correct password was entered. If the password is incorrect, the previous screen image is displayed.

At the time of shipment from factory, the password is set at "0".



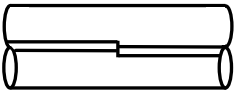


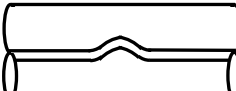
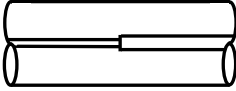
Edit display of mode title.

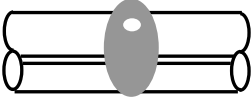
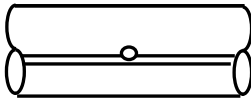
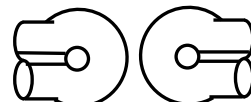
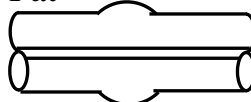
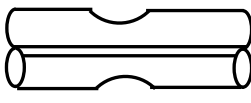
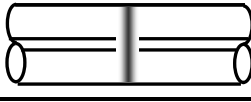


Edit display of password.

Basic Operation

Splice loss increase: Cause and remedy

Symptom	Cause	Remedy
Core axial offset 	Dust on V-groove or fiber clamp chip	Clean V-groove and fiber clamp chip.
Core angle 	Dust on V-groove or fiber clamp chip	Clean V-groove and fiber clamp chip.
	Bad fiber end-face quality	Check if fiber cleaver is functioning properly.
Core step 	Dust on V-groove or fiber clamp chip	Clean V-groove and fiber clamp chip.
Core curve 	Bad fiber end-face quality	Check if fiber cleaver is functioning properly.
	Prefuse power too low or prefuse time too short	Increase [Prefuse Power] and/or [Prefuse Time].
MFD Mismatch 	Arc power too low	Increase [Arc Power] and/or [Arc Time].

Symptom	Cause	Remedy
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 if fiber cleaver is functioning properly
	Prefuse power too low or prefuse time too short	Increase [Prefuse Power] and/or [Prefuse Time]
Separation 	Fiber stuffing too small	Perform [Motor Calibration]
	Prefuse power too high or prefuse time too long	Decrease [Prefuse Power] and/or [Prefuse Time]
Fat 	Fiber stuffing too high	Decrease [Overlap] and perform [Motor Calibration]
Thin 	Arc power not adequate	Perform [ArcCalibration]
	Some arc parameters not adequate	Adjust [Prefuse Power], [Prefuse Time] or [Overlap]
Line 	Some arc parameters not adequate	Adjust [Prefuse Power], [Prefuse Time] or [Overlap]



- A vertical line sometimes appears at the splice point when MM fibers, or dissimilar fibers (different diameters), are spliced. This does not affect splice quality, such as splice loss or tensile strength.

Maintenance of Splicing Quality

1. Cleaning and Checking before Splicing

Critical cleaning points and maintenance checks are described below.

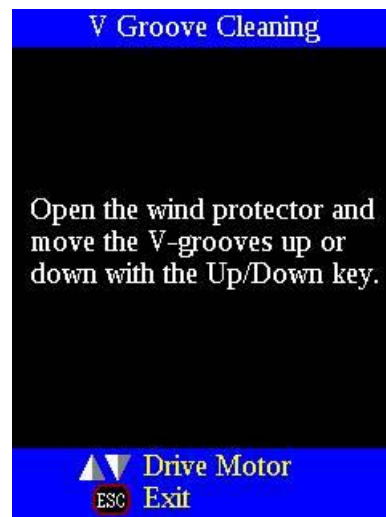
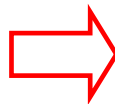
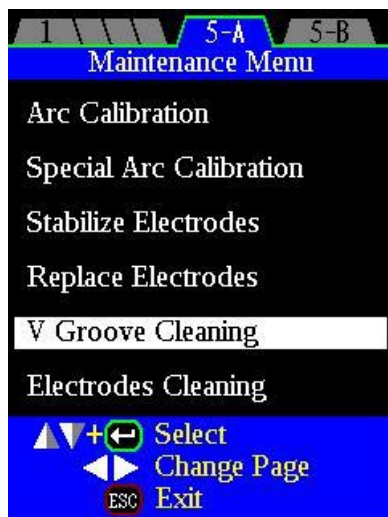
1-1. Cleaning V-grooves

If contaminants are present in the V-grooves, proper clamping may not occur, resulting in higher splice loss. The V-grooves should be frequently inspected and periodically cleaned during normal operation.

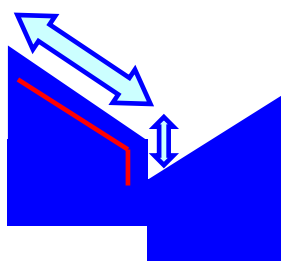
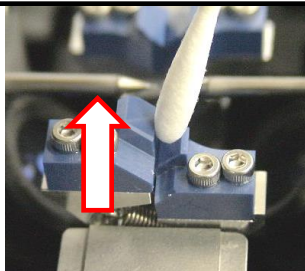
- (1) Press **MENU** select [V-Groove Cleaning] from [Maintenance Menu].
 - (2) Open the wind protector, move the V-groove by the **UP** **DOWN**.
 - (3) Clean the bottom of the V-groove with an alcohol-moistened thin cotton swab.
- Remove excess alcohol from the V-groove with a clean dry swab.



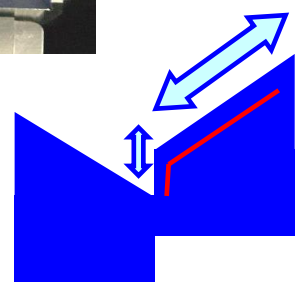
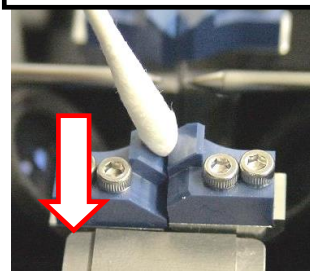
- Be careful not to contact the electrode tips.
- Do not use excessive force when cleaning the V-groove.
The V-groove arm may get damaged.



V-groove Va side



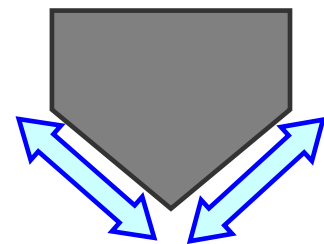
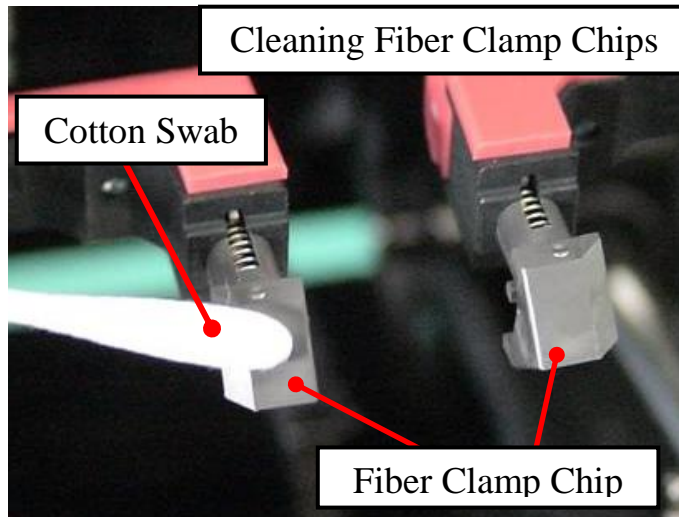
V-groove Vb side



1-2. Cleaning Fiber Clamp Chips

If contaminants are present on the clamp chips, proper clamping may not occur, resulting in poor quality splices. The fiber clamp chips should be frequently inspected and periodically cleaned during normal operation. To clean the clamp chips do the following.

- (1) Open the wind protector.
- (2) Clean the surface of the chip clamp with an alcohol-moistened thin cotton swab. Remove excess alcohol from the chip clamp with a clean dry swab.

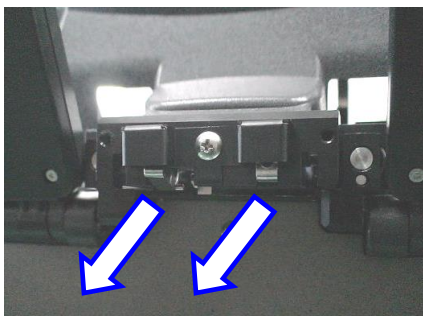


Clean this area with Cotton Swab.

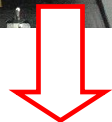
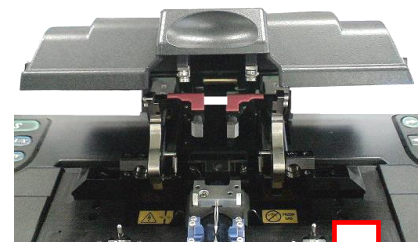
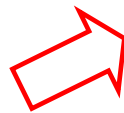
1-3. Cleaning Wind Protector Mirrors

If the wind protector mirrors become dirty, the fiber core position may be incorrect due to decreased optical path clarity, resulting in higher splice loss.

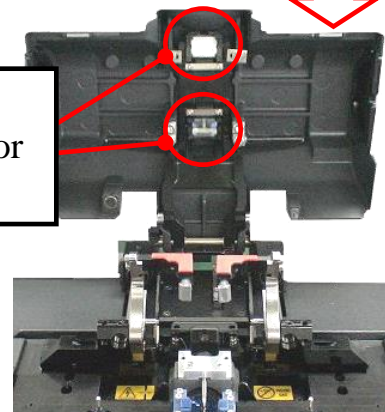
Clean the wind protector mirror installed in the wind protector.
Remove the stopper.



The wind protector is opened while pulling the wind protector release lever on the wind protector hinge side forward.



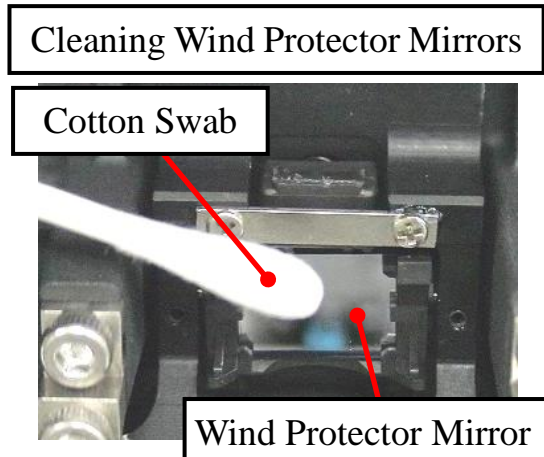
WPM-08
Wind Protector
mirrors



Maintenance of Splicing Quality

- (1) Clean the mirror surface with an alcohol- moistened thin cotton swab.
Remove excess alcohol from the mirror surface with a clean dry swab.
- (2) Mirror should appear clean with no streaks or smudges.
- (3) Turn on the power and make sure no smudges or streaks are visible on the monitor screen. Press **X/Y** key to change the screen and check the state of the lens surface on both the X- and Y-screens.
Perform dust check.

In addition, [**Dust Check**] test is recommended.

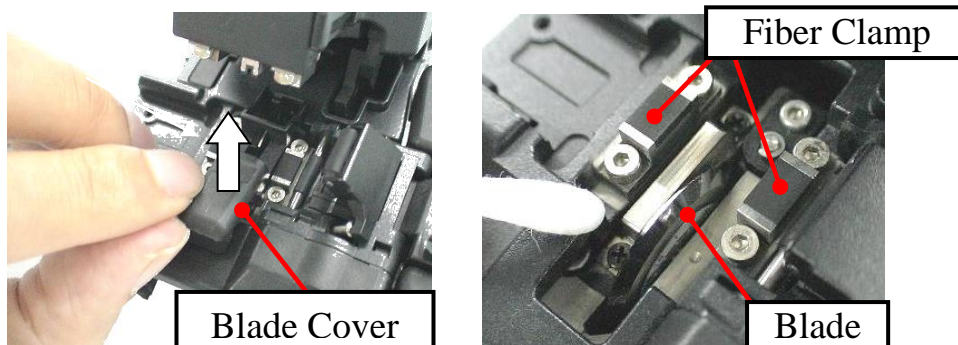


1-4. Cleaning Fiber Cleaver

If the circular blade or clamp pads of the fiber cleaver become contaminated the cleaving quality could degrade. This may lead to fiber surface or end-face contamination, resulting in higher splice loss.

CT-30 Series

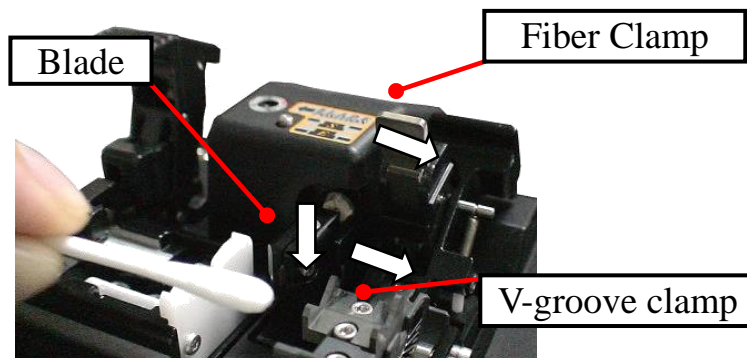
Clean the circular blade or clamp pads with a cotton swab moistened with alcohol.



CT-100

Clean the circular blade, clamp and V-grooves with a cotton swab moistened with alcohol.

* Move cotton swabs along the white arrows shown in the picture below.



1-5. Arc Calibration

Arc Calibration is recommended before splice. See section [**Arc Calibration**].

2. Periodic Checking and Cleaning

In order to maintain the splicing quality of the splicer, periodic inspection and cleaning are recommended.

2-1. Cleaning Objective Lenses

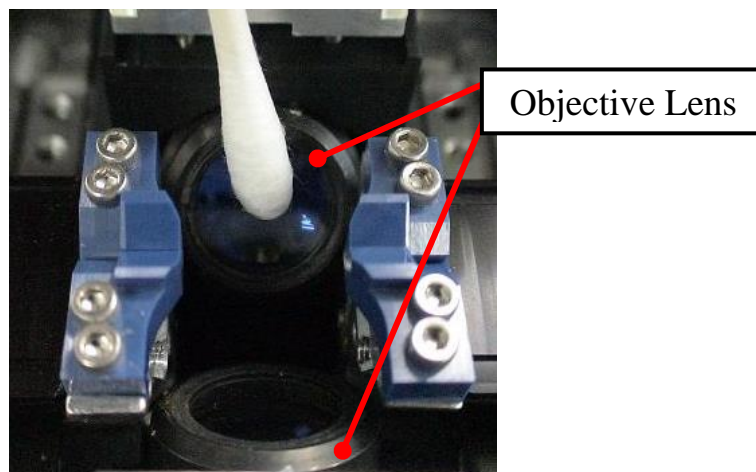
If the objective lens' surface becomes dirty, normal observation of the core position may be incorrect, resulting in higher splice loss or poor splicer operation. Therefore, clean both lenses at regular intervals. Otherwise, dirt may accumulate and become impossible to remove.

To clean the objective lenses do the following:

- (1) Before cleaning the objective lenses, always turn off the splicer.
- (2) Gently clean lenses' (X-axis and Y-axis) surface with an alcohol-moistened thin cotton swab. Using the cotton swab, start at the center of the lens and move the swab in a circular motion until you spiral out to the edge of the lens surface. Remove excess alcohol from the lens surface with a clean dry swab.



- Fujikura recommends cleaning the objective lens when replacing electrodes.
- Remove electrodes before cleaning objective lens.
- Do not hit or touch tip of electrode when cleaning it.



- (3) The lens surface should be clean and free of streaks or smudges.
- (4) Turn on the power and make sure no smudges or streaks are visible on the monitor screen. Press **[X/Y]** key to change the screen and check the state of the lens surface on both the X- and Y-screens. Perform dust check.

2-2. Electrode Replacement

- See section **[Replace Electrodes]**.

2-3. Diagnostic Test

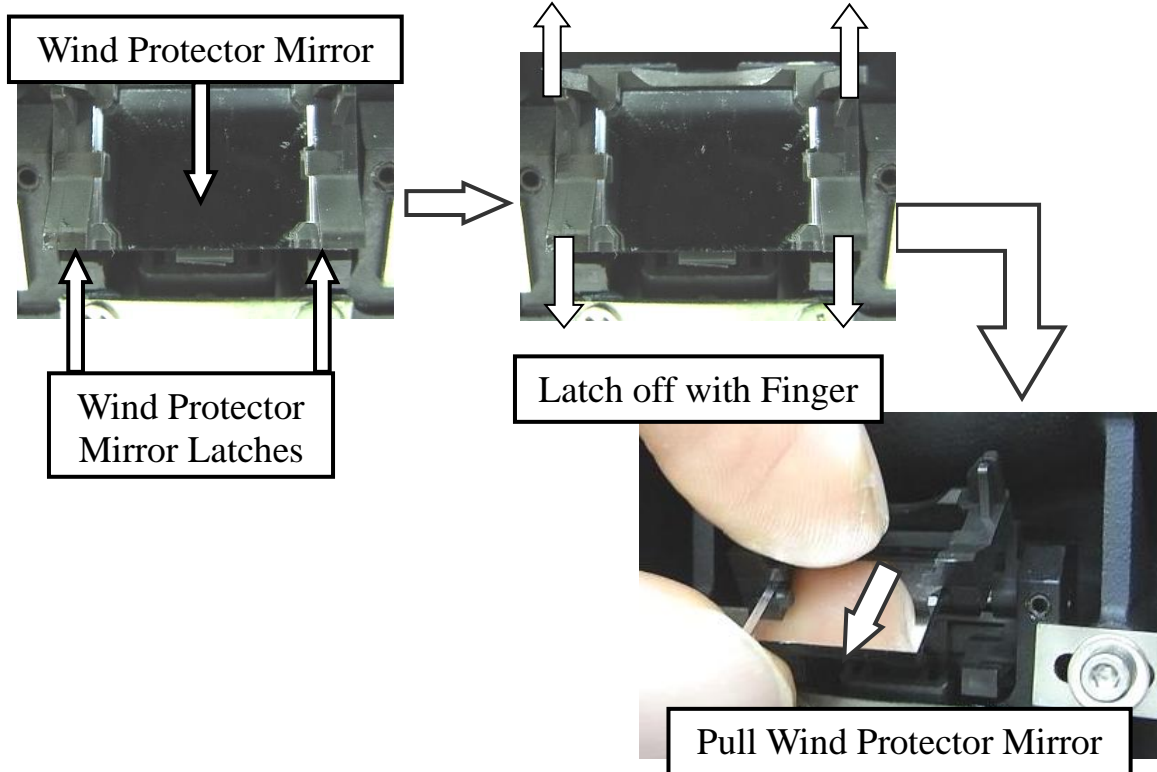
- See section **[Diagnostic Test]**.

Maintenance of Splicing Quality

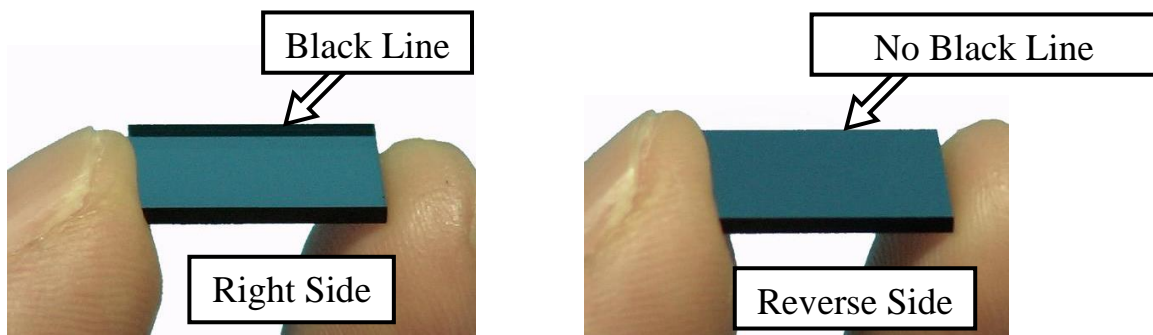
2-4. Replace Wind Protector Mirror

Replace the wind protector mirror if it cannot be cleaned or if it remains clouded.
To replace, do the following.

- (1) Turn the splicer power off.
- (2) Open the wind protector. Pull and unlock wind protector mirror latch with fingers. While still pulling on mirror latch, use other hand's fingers to pull on wind protector mirror frame. The frame should raise and rotate back. Pull out the mirror from its frame.



- (3) Insert the new mirror into the frame. The clear glass side should face upward while inserting mirror into the frame. Look into the mirror obliquely to identify. If it is the correct side, the black line can be seen.



- Make sure the wind protector mirror is inserted the correct way. If not, the fiber cannot be observed correctly.
- Wind protector mirror Fujikura part number is **WPM-08**.

1. Fiber Type Compare

1-1. The Fiber identification function

Using the fiber identification function ensures repeatable results for production splicing applications. The fiber identification function identifies fiber that is about to be spliced from core profile data that is stored in splicer memory.

Therefore, it is necessary to install the core profile data of the fiber into splicer memory beforehand. This fiber identification function can prevent accidental splicing with the wrong splicer mode and parameters (not optimized for that particular fiber), and also prevents splicing the wrong fibers.

Installation of the core profile of the fiber

MENU → [Fiber Data Learning] → [Fiber Type Compare]

Put the cleaved fiber on the left side.

With the FSM-100P/P+:

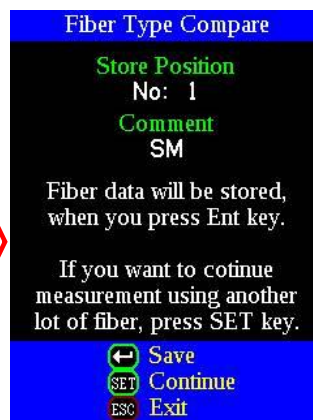
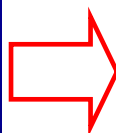
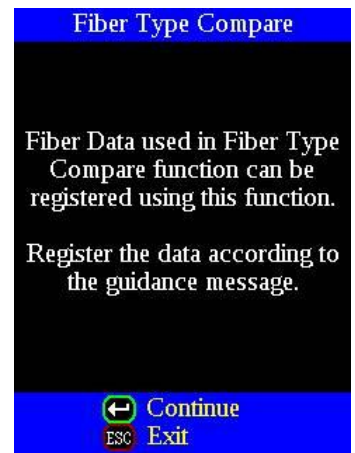
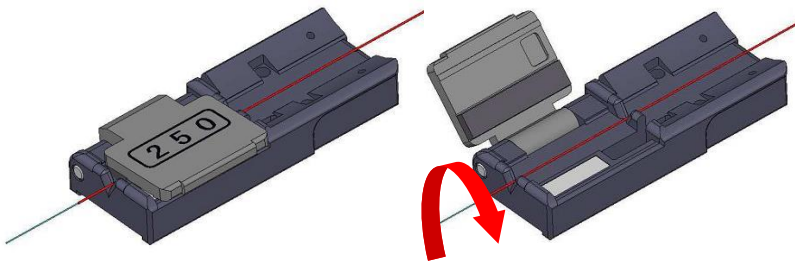
The core profile of the fiber is installed automatically. (The fiber will be rotated during the process.)

With the FSM-100M/M+:

If the message is displayed on the screen, set the fiber again. Before resetting the fiber, note that the fiber should be rotated inside the fiber holder.

Manual Rotation with the FSM-100M/M+

Rotation requires opening the fiber holder lid, rotating the fiber, closing the lid and recording the image; rotation angles are random.



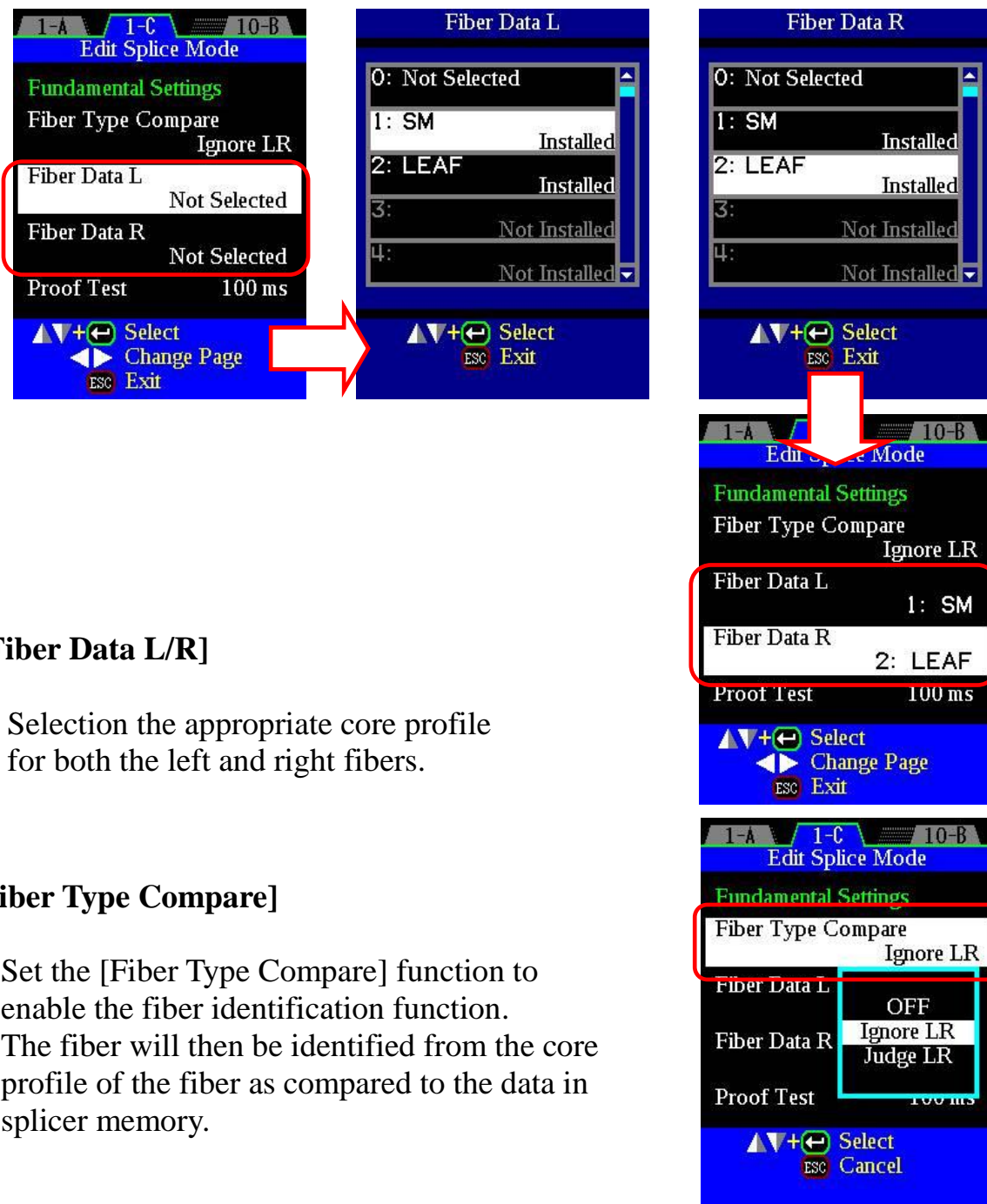
Select the memory area at the [Select Where to Save] screen, assign a fiber name and save. Data can be deleted by pushing the **MENU** key.

Function Introduction

1-2. Using the core profile of the fiber

The splicing time can be shortened by using the core profile of the fiber.

Enter [Edit Splice Mode] for the splice mode and edit [Fiber Data L/R].
Load the core profile data of the fiber on screen.



[Fiber Data L/R]

Selection the appropriate core profile for both the left and right fibers.

[Fiber Type Compare]

Set the [Fiber Type Compare] function to enable the fiber identification function.
The fiber will then be identified from the core profile of the fiber as compared to the data in splicer memory.

Setting	Description
Ignore LR	If the combination of the fiber is corresponding to the settings for the fiber types, splicing will proceed regardless of left/right fiber placement. (Ex.: Left: SM/Right: LEAF or Left: LEAF/Right:SM)
Judge LR	Even if the combination of fibers is correct, the splicer will only enable splicing is the fibers are placed with the correct left/right orientation. (Ex.: Only Left: SM, Right: LEAF when the setting is an above figure)

2. Auto Arc Calibration

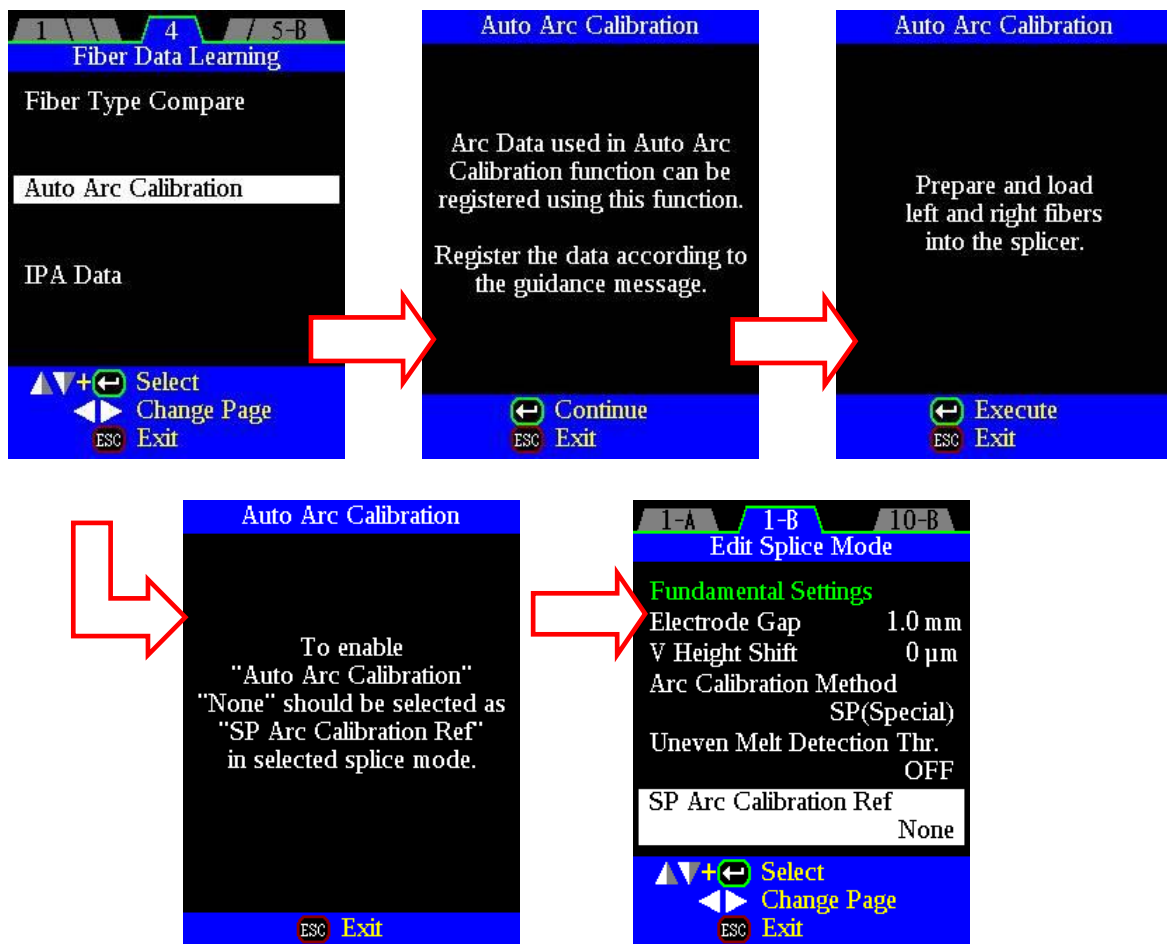
2-1. [Auto Arc Calibration]

This function is used to analyze the Arc Brightness of the optical fiber during the arc discharge and use the brightness data to automatically correct the arc power value. It is necessary to “teach” the splicer the proper brightness for a particular fiber type. This is easily accomplished using the procedure below.

2-2. Registration of Auto Arc Calibration data

MENU → [Fiber Data Learning] → [Auto Arc Calibration]

Put the cleaved fiber on the right and left.



Please change the [SP Arc Calibration Ref] to [None] when [SP (Special)] is selected as [Arc Calibration Method].

Auto Arc Calibration doesn't perform when [None] is not selected.

Function Introduction

Select the memory area in the [Select Where to Save] screen, assign the appropriate name (based on fiber type) and save.

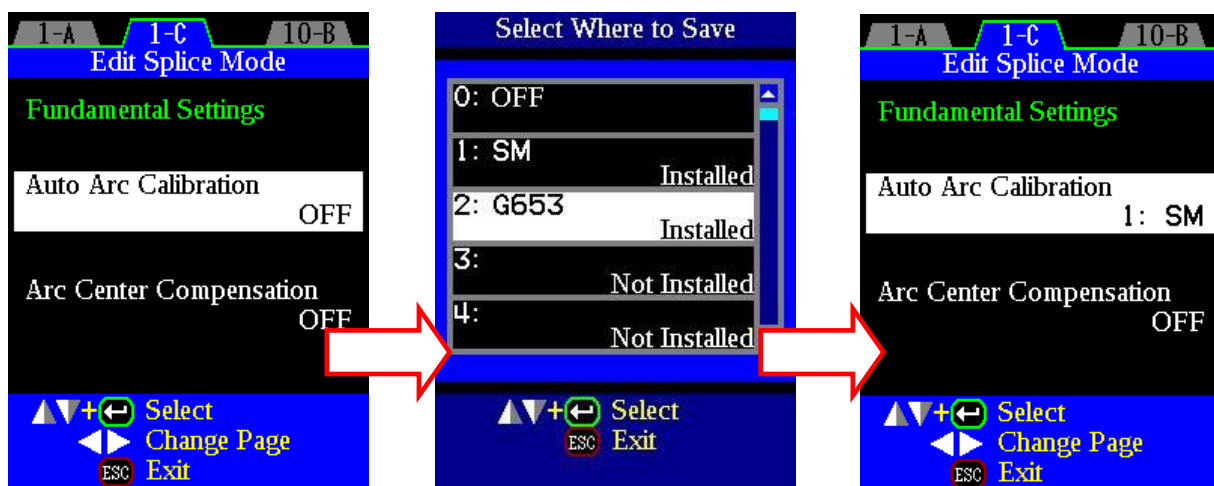
If “FINISH” is displayed, press the **ENT** key to save the data.



2-3. Using the Auto Arc Calibration data

Enter [Edit Splice Mode] for the appropriate splice mode and select [Auto Arc Calibration].

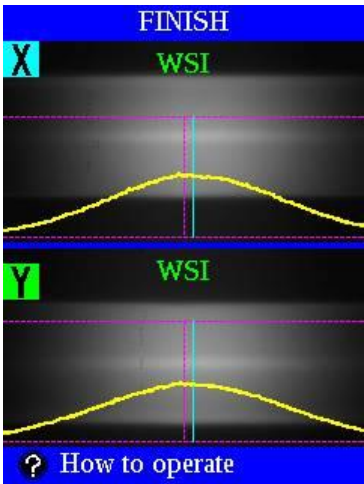
Select the proper [Auto Arc Calibration] profile from the drop-down menu for the fiber being spliced in this splice mode.



2-4. Auto Arc Calibration

This function calibrates the arc power during the splice. Whenever this function is on, the arc power is automatically corrected based on fiber image brightness data. The arc power correction value is applied prior to the next splice.

After the splice, arc information is displayed by pressing the **X/Y** key.



FINISH		
Arc Information		
Power : STD[222] bit (-2)		
Time : 3349 ms (+1349)		
Center : L-1		
Axis Offset Data		
	Core	Clad
X	+0.0↔+0.0	+0.1↔+0.2
Y	+0.0↔-0.1	+0.1↔-0.1
XY	0.1↔ 0.1	0.2↔ 0.2
5:SM AUTO 1:60mm		

The calibration value is displayed.

Function Introduction

3. IPA Data (FSM-100P/100P+ Only)

3-1. IPA Data

The splicer aligns theta by using the memorized IPA data of each fiber.

PAS is recommended for the PANDA fiber alignment. The alignment of high speed and accuracy is enabled.

Please use the IPA mode when PANDA alignment is impossible.

Method of acquiring Fiber Profiling Data

The fiber to memorize the profile data is set on the left side with glass clamping. On the right side, the PM fiber that profiled data is already memorized in the splicer with glass clamping. More accurate align can be done by connecting with the light source and the power meter and executing this IPA data. To acquire more accurate IPA data, use the light source and PER meter for precise alignment.


- (1) Select the IPA Data in the Fiber Data Learning menu.

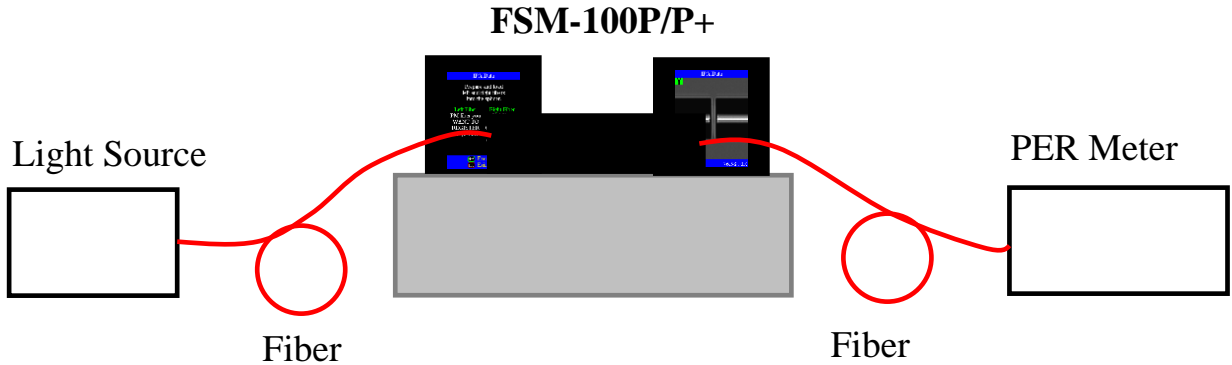
Select the saving area for the IPA data and input the data name.

Execute the acquiring of IPA data according to the guidance.



The fiber is rotated.
And, fiber information is memorized.

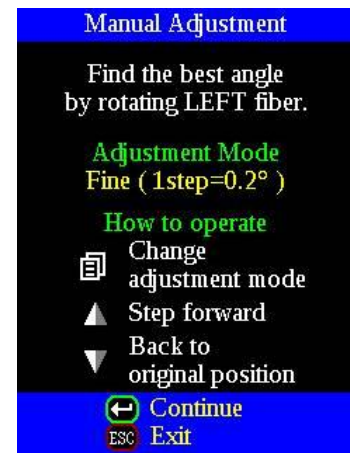
- (2) After data acquisition of the profile, the fiber is aligned by the splicer. To align more precisely, use the light source and PER meter for manual alignment. To push  Step forward the fiber rotates. The rough tuning or fine-tuning is selectable by pushing MENU. Search the most suitable fiber angle by the measured value of the PER meter.




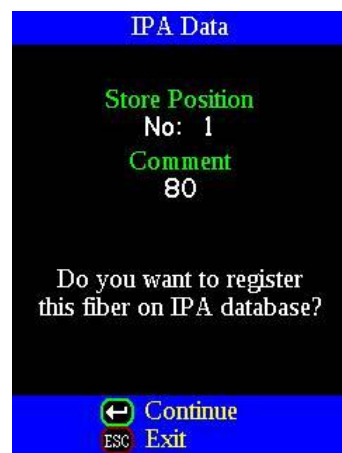
Push 

Rough
5.0deg

Fine
0.2deg



- (3) After the manual alignment is fulfilled with light source and PER meter, push  key to save the IPA data to the splicer.



When the IPA is selected in the [Alignment Mode],
The splicer aligns the fiber with referring to the IPA data.

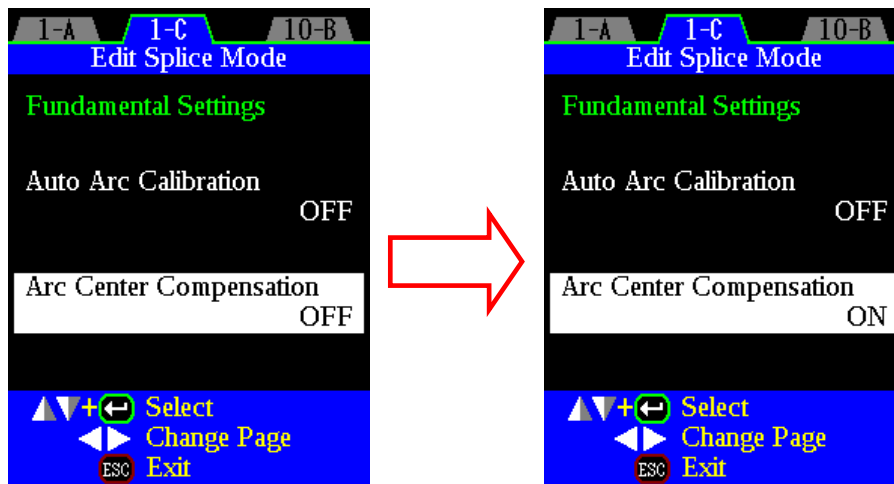
Function Introduction

4. Arc Center Compensation

4-1. Arc Center Compensation Function

This function is used to analyze the arc brightness of fiber during arc discharge, which is used to establish the arc discharge center position.

MENU → [Edit Splice Mode] → [Arc Center Compensation] → [ON].



During arc discharge the arc centers about the fibers and is saved. See screens below.



The value will be updated afterwards

5. Auto Time Comp.

5-1. Auto Time Comp. Function

This function is used for G652 SMF splicing.
Arc power is optimized according to core concentricity-error.
If [ECF] is "OFF", this function is not available.

MENU → [Edit Splice Mode] → [Auto Time Comp.] ON.

[Alignment Mode] Only the Core value is displayed.



Arc discharge time is optimized and displayed on the screens below.



The corrected time is displayed on the screen.

6. MFD Mismatch

6-1. MFD Mismatch Estimation Function

This function is the estimation of MFD Mismatch Loss after splicing. MFD Mismatch Loss is caused by mismatch of MFD (Mode Field Diameter) between different kinds of fibers.

If you splice the same kind of fibers, this function is not available.



- (1) **MENU** → [Edit Splice Mode] → [MFD Mismatch] WSI or CSI.

WSI (Warm Splice Image) means that estimating the MFD Mismatch Loss by an image during arc. And CSI (Cold Splice Image) means that estimating by an image after finished splicing.

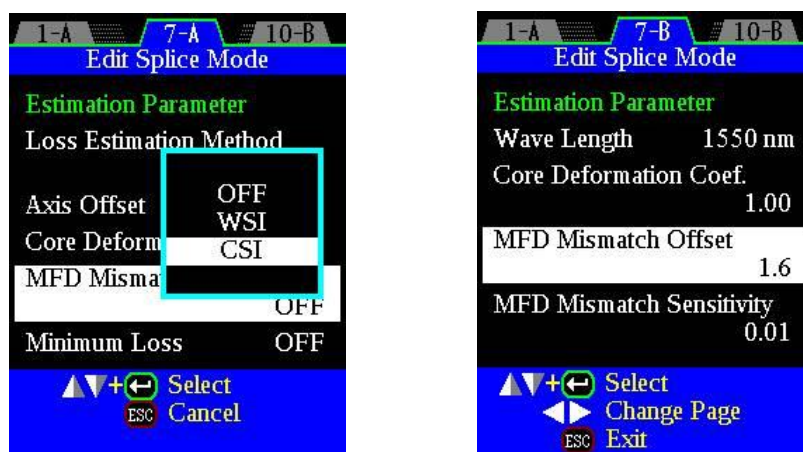
WSI method is suitable for fiber without depressed cladding like fluorine.

CSI method is suitable for fiber with depressed cladding.

- (2) When you use this function, you need to set two parameters, [MFD Mismatch Offset] and [MFD Mismatch Sensitivity].

[MFD Mismatch Offset] means the standard value of estimating the MFD Mismatch Loss.

[MFD Mismatch Sensitivity] means the sensitivity of the MFD Mismatch Loss.



6-2. MFD Mismatch Offset / MFD Mismatch Sensitivity

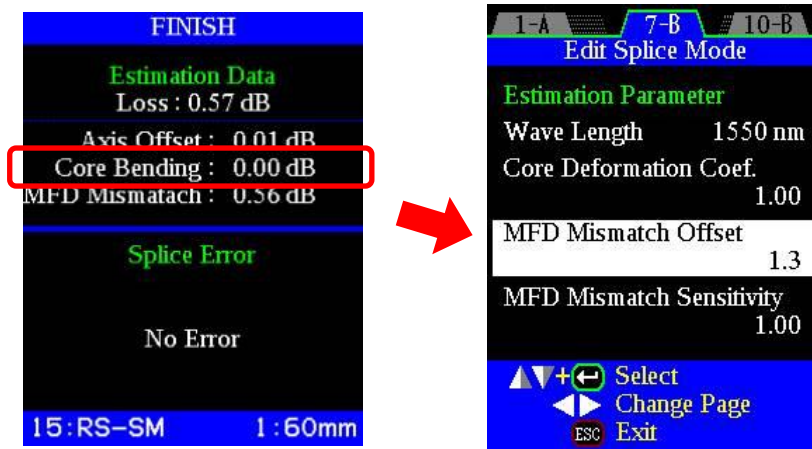
You need to optimize these parameters according to the following steps, because [MFD Mismatch Offset] and [MFD Mismatch Sensitivity] depend on property of fibers.

- (1) First, input the initial value as below.

[MFD Mismatch Offset] : 0.0
[MFD Mismatch sensitivity] : 1.00



- (2) Next, splice the fiber by using suitable setting. Input the value of MFD Mismatch after splicing as the MFD Mismatch Offset in the Edit Splice Mode.



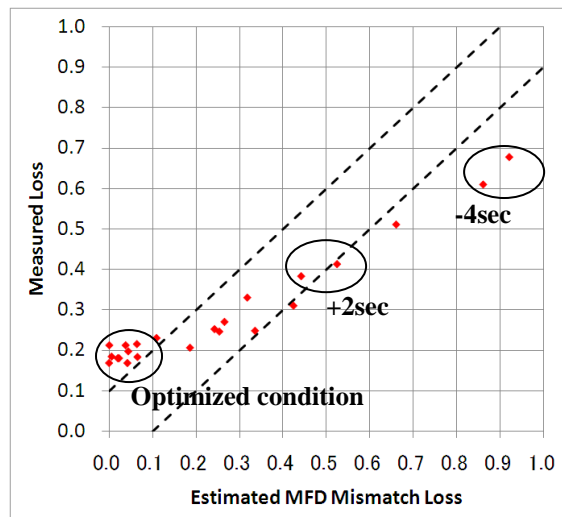
Function Introduction

- (3) Next, splice the fibers under various conditions to acquire the data.
Measured splice loss and estimated MFD Mismatch data are needed under conditions as the following.

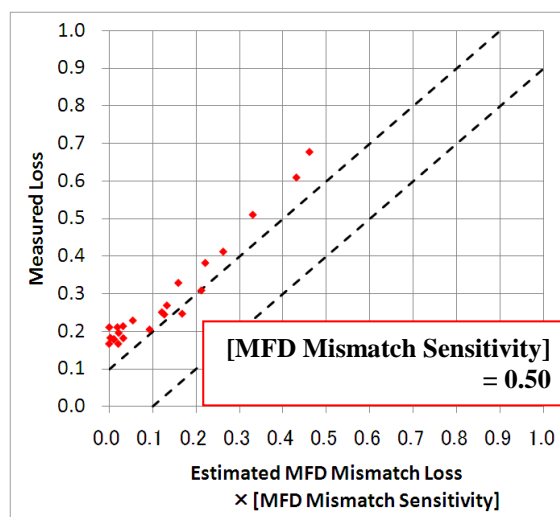
Conditions:

Main Arc Time +/-4000ms, +/-3000ms, +/-2000ms, +/-1000ms (8 splicing data)

FINISH	
Estimation Data	
Loss : 0.57 dB	
Axis Offset : 0.01 dB	
Core Bending : 0.00 dB	
MFD Mismatch : 0.56 dB	
Splice Error	
No Error	
15:RS-SM	1:60mm

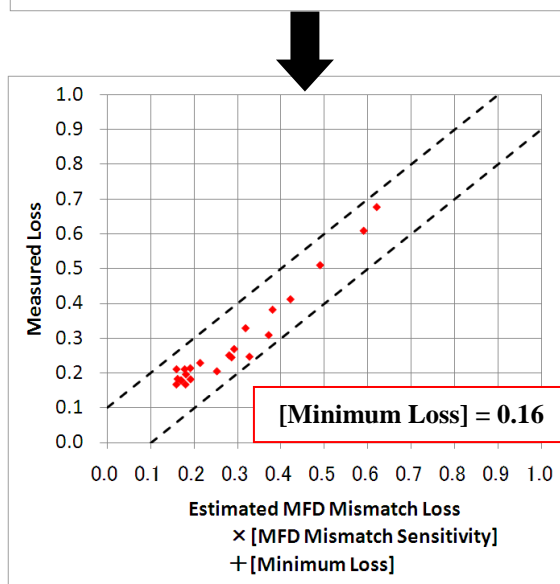


- (4) Optimize the MFD Mismatch Sensitivity so that the dotted line in the graph becomes same tendency to the sampled data.



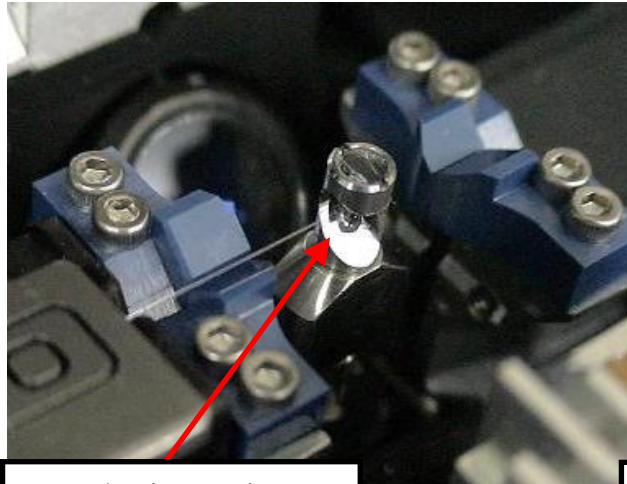
- (5) Finally, optimize the value of Minimum Loss so that almost all of the sampled data is in the range of the dotted line in the graph.

1-A	7-A	10-B
Edit Splice Mode		
Estimation Parameter		
Loss Estimation Method		
	New	
Axis Offset		
	Core	
Core Deformation		
	ON	
MFD Mismatch		
	CSI	
Minimum Loss		
	0.16 dB	
▲▼+← Select		
▶◀ Change Page		
ESC Exit		

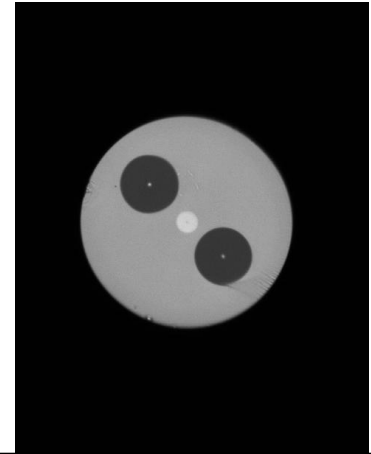


7. End-View observation system

The cleaved ends of the optical fiber are observed in the axial direction by a means of a mirror that directs the fiber end image into the camera system. This allows precise alignment and splicing of uniquely structured fibers, such as PM, multi-core, non-circular (hexagonal, octagonal, etc.) or micro-structured “holey” fibers. This system is available only in the FSM-100M+ and FSM-100P+ models.

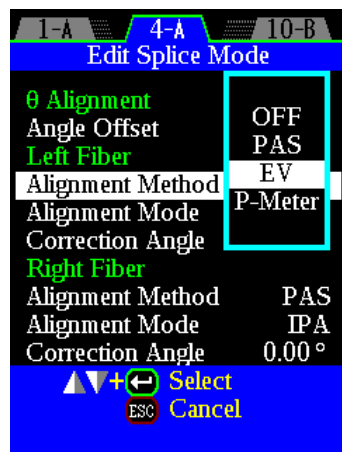


End-View Mirror



Fiber End Face of End-View

- (1) Select the [Edit Splice Mode] → [θ Alignment] → [Alignment Method] then [EV].



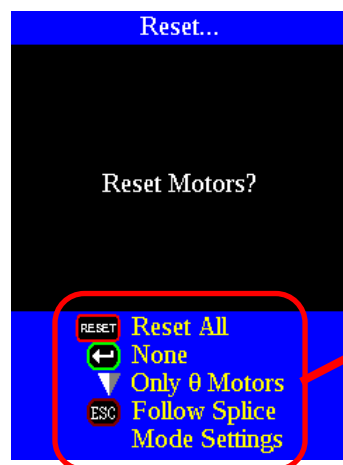
- (2) Press **SET** key, then fibers move forward and stop at certain position after cleaning arc. When [EV] is selected, End view observation is performed for theta alignment.

Function Introduction

8. Selective Reset Function

Normally, when the **RESET** key is pressed, the splicer resets all motors to the home position and returns to the [READY] condition. This will happen if the **RESET** key is pressed just briefly (for example, for 1 second or less). If the operator presses the **RESET** key continuously for 3 seconds a reset selection menu appears as shown below. This menu allows various options for selectively controlling which motors reset to home position and which motors remain stationary and do not move during the reset operation. This can be very useful for special splicer operations. The reset options are shown at the bottom of the screen.

NOTE: In certain conditions, the End-View mirror motor of the FSM-100M+/P+ splicer models will be reset regardless of the reset menu selection. This may be required in order to protect the End-View mirror.



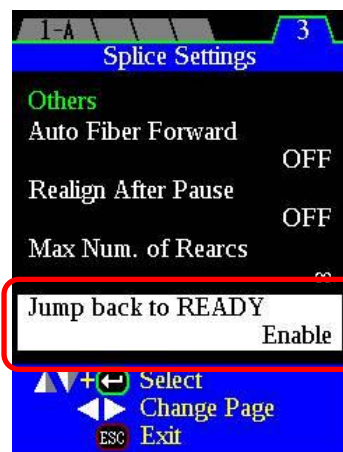
Reset Selection Menu

Selection	Description
Reset All	All motors are reset
None	No motors are reset except the End-View mirror motor (necessary to protect the mirror)
Only θ Motors	Only θ motors are reset
Follow Splice Mode Settings	Motor reset is controlled by the [Clamp Action], and the [Sweep Initial Position], [Except Z stages] and [Z Stages] stage positions settings in the [Fundamental Settings] section of the [Edit Splice Mode] menu.

9. Jump Back to READY

During splicer operation, when the splicer reaches [PAUSE1], [PAUSE2], [PAUSE θ], and [FINISH], it is possible to jump back to the “READY” condition without resetting any motors. This action is taken by pressing the **LEFT** arrow key.

This function is normally disabled. To enable it, the [Jump back to Ready] parameter on page 3 of the [Splice Settings] menu must be enabled, as shown below.



The [Jump Back to READY] function must be enabled in the [Splice Settings] menu

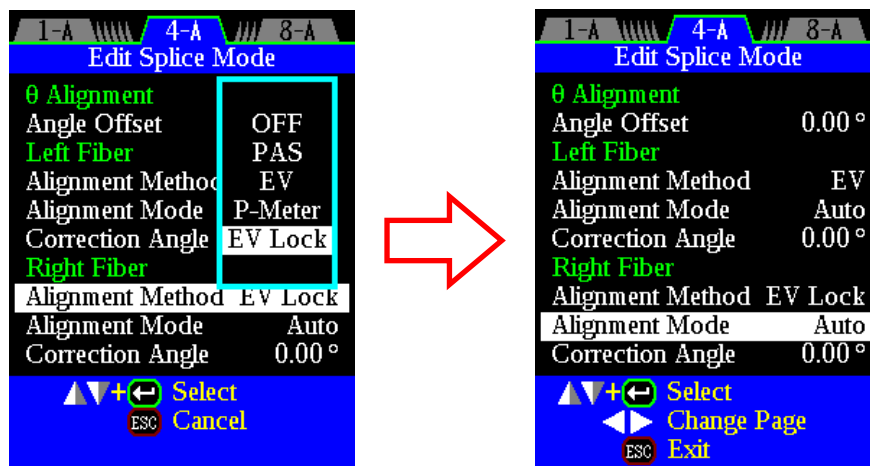
10. Theta Alignment by Rotating 1 Fiber Only (FSM-100P+ Only)

Normally, when PM fibers or other fibers are rotationally aligned by the splicer theta motors, both right and left fibers rotate in order to perform the alignment. However, in some cases a fiber may have a component that may be damaged by θ rotation (such as a pump combiner) or a fiber may have only a short available length that cannot withstand rotational motion for θ alignment, and might be damaged or even broken by rotation. In this case, it is helpful if that fiber is held stationary in the splicer and the only the opposite fiber is rotated.

With conventional PAS theta alignment, it is always necessary to rotate the fiber so the camera system can observe the side images of the fiber at different rotational position. However, with the End-View system in the FSM-100P+, it is possible to observe the End-View image of one fiber without rotating it, analyze the image and determine relative angular orientation of the polarization axis (or other fiber features), and rotate the opposite fiber to match the angle orientation of the stationary fiber. The [EV Lock] Alignment Method is used to perform this operation.

The [EV Lock] Alignment Method is selected for the fiber that will not be rotated. Therefore, the opposite side fiber must be rotated to match. Therefore, [EV Lock] may be selected for either the right or left fiber, **but not for both fibers**. If [EV Lock] is selected for one fiber, the opposite side fiber may be aligned to it using [EV] or the [PAS] theta alignment method.

- (1) Select [Edit Splice Mode] → [θ Alignment] → [Alignment Method] then [EV Lock] for the fiber to be held stationary. Select [θ Alignment] → [Alignment Method] and then either [EV] or [PAS] for the opposite fiber.



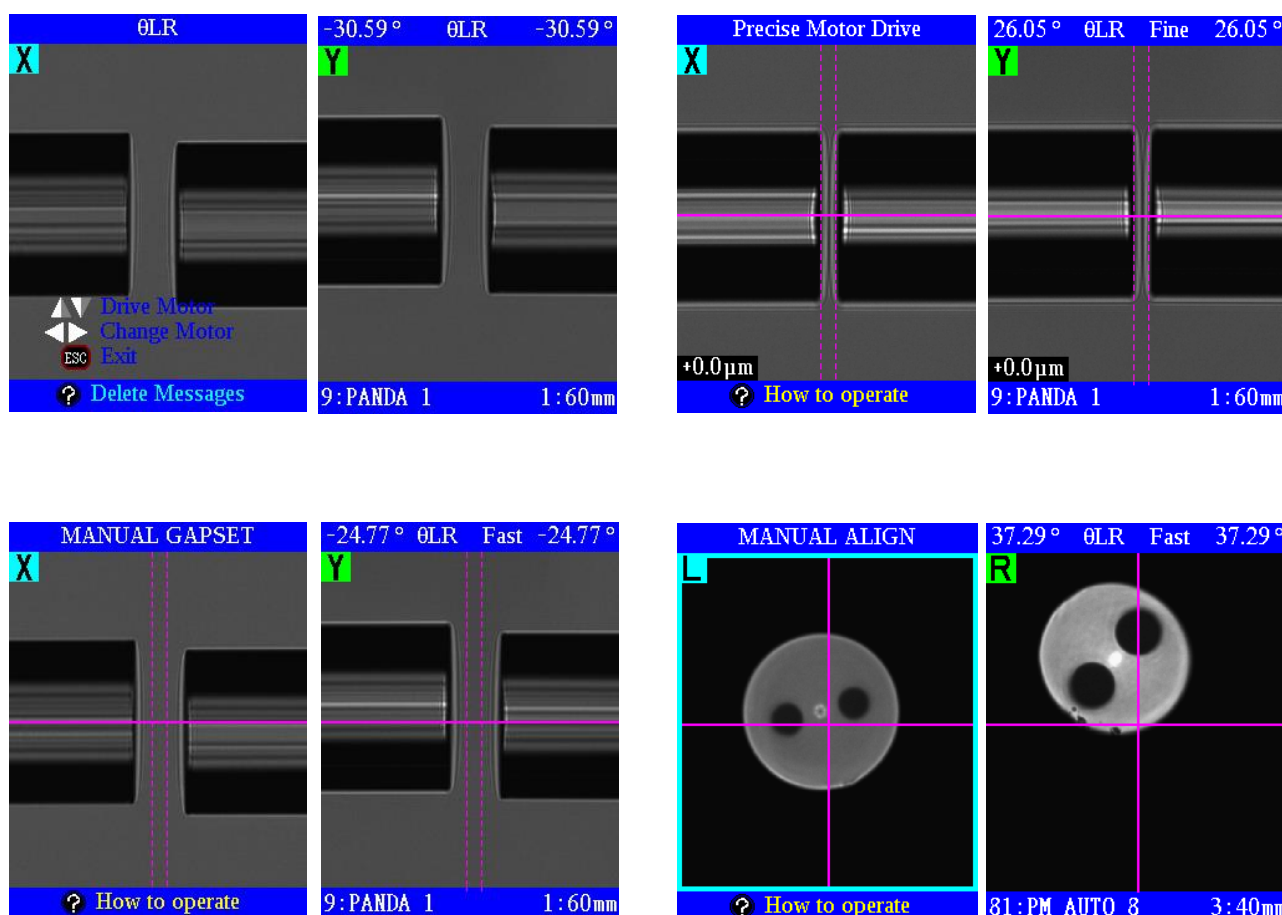
- (2) Press the **SET** key. Both fibers move forward and stop after the cleaning arc. End-View analysis will be performed for the stationary fiber.
- (3) The opposite fiber will be analyzed and rotated to match the orientation of the stationary fiber, using the selected [Alignment Method] ([EV] or [PAS]).
- (4) After theta and X/Y alignment, the fibers will be spliced together.

11. Synchronized θL and θR Motor Drive (FSM-100P/100P+ Only)

In some cases it may be useful to simultaneously rotate the left and right fibers in order to inspect the fiber orientation before splicing or to inspect a completed splice without risk of inducing torsion which might break the splice point. In the FSM-100P and FSM-100P+ splicers it is possible to manually rotate the θL and θR motor in unison.

In any situation in which motors may be selected for operation, it is possible to select θLR in order to perform synchronized operation of the left and right theta motors. Motors driving operation may be performed by accessing [Motor Drive] in the [Maintenance Menu] in the [PAUSE1], [PAUSE2], [PAUSE θ], and [FINISH] state. Motor operation is also possible when using the [Precise Motor Drive] function, or whenever performing manual splicing operations such as when [Gap Set] or the fiber [Alignment Mode] are set to [Manual].

Operation is the same as manual operation of any individual motor. Use the Left/Right arrow keys to select θLR . Use the UP/DOWN arrow keys to rotate the left/right fibers in unison.

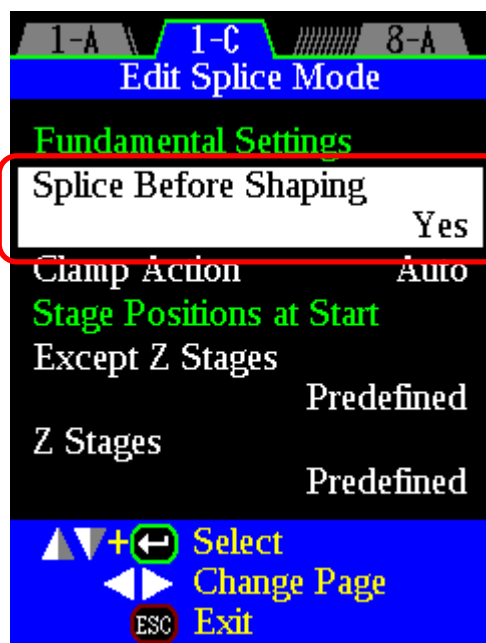


12. Splice Before Fiber Shaping

The FSM-100 series splicers have three operating modes, [Basic] splicing mode, [Full] splicing mode (with many more parameters and capabilities than [Basic] splicing mode), and [Fiber Shaping] mode. The operating mode is selectable for any programmable splice mode in the [Edit Splice Mode] menu.

Normally the [Fiber Shaping] mode has been used for shaping a single fiber, such as creating a ball lens on the end of a fiber. For more complicated operations that first involve performing a splice between and left and right fiber, followed by a fiber shaping operation, the [Full] splicing mode can be used. For example, and coreless fiber can initially be spliced to a single mode fiber, and then the splice point can be moved to one side so that a second arc can be used to cut off most of the coreless fiber and generate a ball lens with the remaining section of coreless fiber. This results in a pure silica glass ball lens on the end of a single mode fiber. However, performing this operation using the [Full] splicing mode may cause many problems due to error messages when the splicer inspects the splice quality for splice loss and defects, and this also results in a slower process.

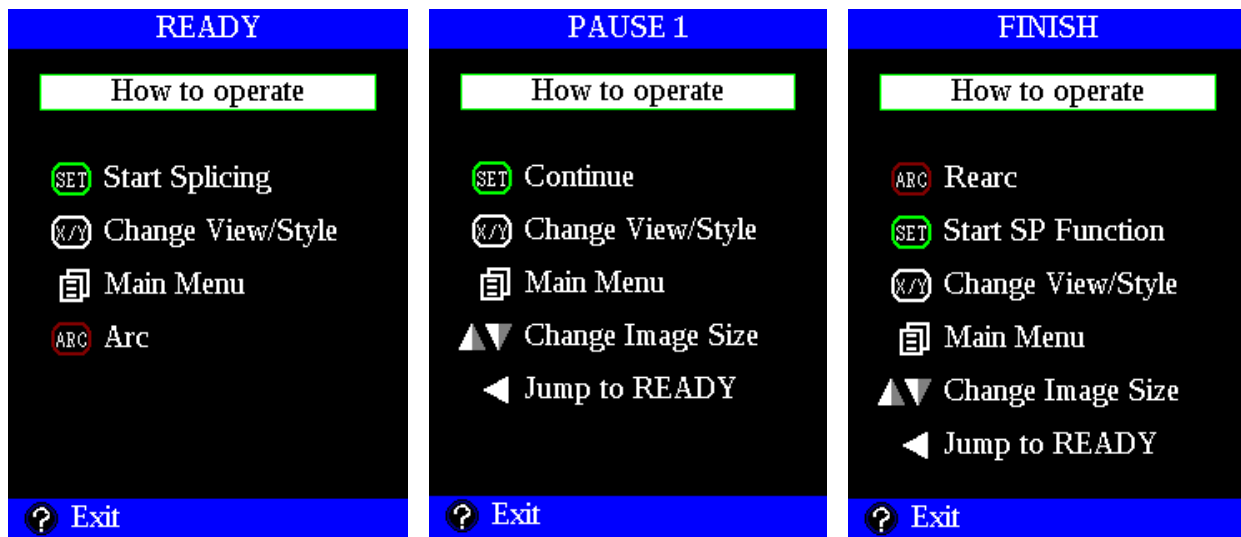
These problems are avoided by using the [Fiber Shaping] mode to perform all operations. If a splice must be performed prior to the fiber shaping operation, First setup a splice mode by selecting [Fiber Shaping] as the [Operating Mode] in the [Fundamental Settings] of the [Splice Mode Edit] menu. Next, select [Yes] for the [Splice Before Shaping] parameter. The [Splice Before Shaping] parameter is also in [Fundamental Settings] of the [Splice Mode Edit] menu, but the [Splice Before Shaping] parameter only appears after [Fiber Shaping] has been selected as the [Operating Mode].



Select [Yes] for [Splice Before Shaping]

13. Help Key

During splicer operation, when the splicer reaches [PAUSE1], [PAUSE2], [PAUSE 0], and [FINISH], a [How to operate] menu is displayed as shown below when the **HELP** key is pressed. This menu shows options for the next step in splicer operation.



1. The necessity of arc calibration

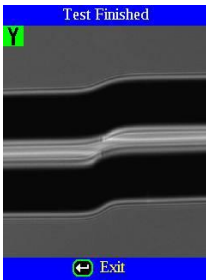
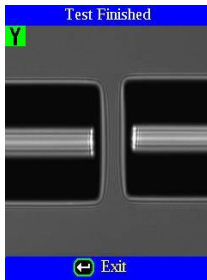
Atmospheric conditions such as temperature, humidity, and pressure are constantly changing, which creates variability in the arc temperature. This splicer is equipped with temperature and pressure sensors that are used in a constant feedback monitoring control system to maintain the arc power at a constant level. Changes in arc power due to electrode wear and glass adhesion cannot be corrected for automatically. Also the center position of arc discharge may shift left or 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 either of these issues.



If the strength of arc discharge has changed due to significant change of atmospheric pressure, an error may occur during arc calibration. To solve this problem, perform [Stabilize Electrode].

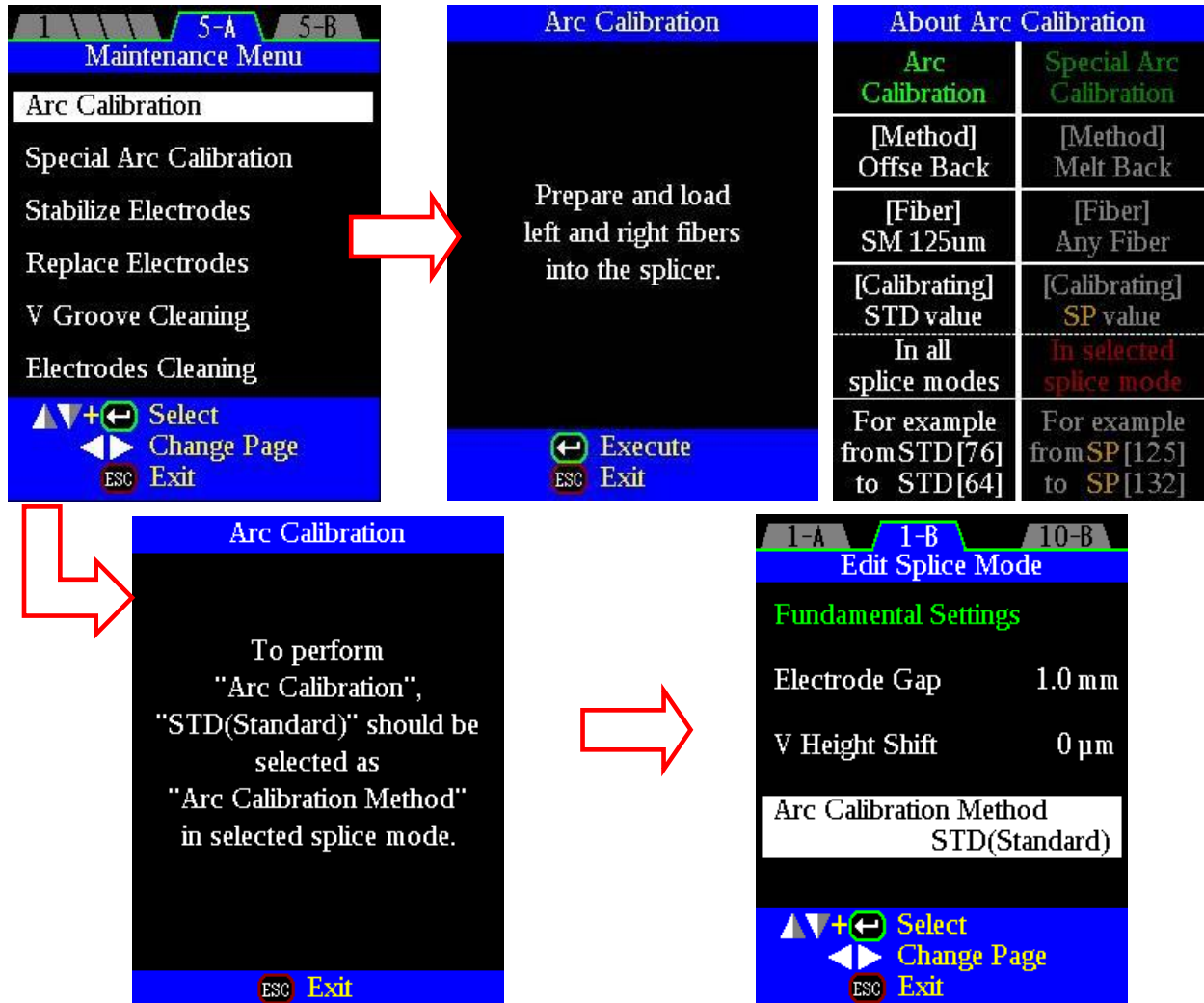
This machine has two kinds of calibration functions. [Arc Calibration] & [Special Arc Calibration]. Generally, the standard [Arc Calibration] is used for normal 125 μm fibers spliced under standard arc settings (such as 1 mm electrode gap). For large diameter fibers, other fibers that require a larger electrode gap or other special conditions such as V Height Shift (vertical displacement of the fiber location up or down relative to the electrodes), or small or heat-sensitive fibers, the [Special Arc Calibration] should be used. This is summarized in the table below. Please refer to the previous section [Function Introduction] for details concerning [Auto Arc Calibration], [Arc Center Compensation], and [Auto Time Comp.] which are related functions.

Arc Calibration

Item	Arc Calibration	Special Arc Calibration
Arc Calibration Method	STD (Standard) If STD is not selected, it doesn't operate.	SP (Special) If SP is not selected, it doesn't operate.
Electrode Gap	1.0 mm	Any Edited Value
V Height Shift	0 μm	Any Edited Value
Clad Diameter	125 μm	Any Edited Value
Arc Center Compensation	Calibration Provides Correction	Calibration Provides Correction
Calibration Result	Arc power is calibrated. The result is applied to <u>all</u> splice modes that utilize the standard [STD] Arc Calibration.	Special Arc Calibration [SP] result is used to calculate and set appropriate arc power <u>only for the selected splice mode</u> . Further arc power optimization may be required for best performance.
[Electrode Gap] [V Height Shift] [Clad Diameter]	[Electrode Gap]: 1 mm only [V Height Shift]: 0 μm only [Clad Diameter]: 125 μm only Each parameter is limited. 	[Electrode Gap]: selectable [V Height Shift]: selectable [Clad Diameter]: selectable Each parameter is programmable 

2. Arc Calibration Mode

- (1) Select [Arc Calibration] in [Maintenance Menu] to display [Arc Calibration] screen.



Select [STD (standard)] as [Arc Calibration Method].

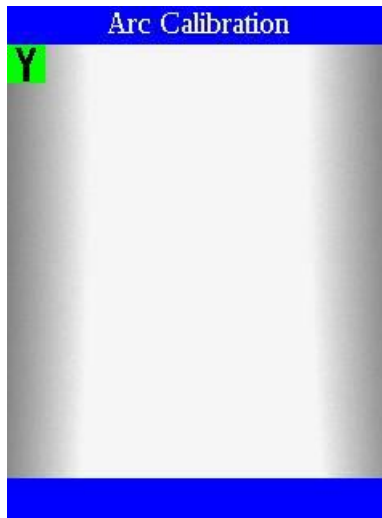
Special Arc Calibration doesn't work when [SP (Special)] or [NC] is selected.



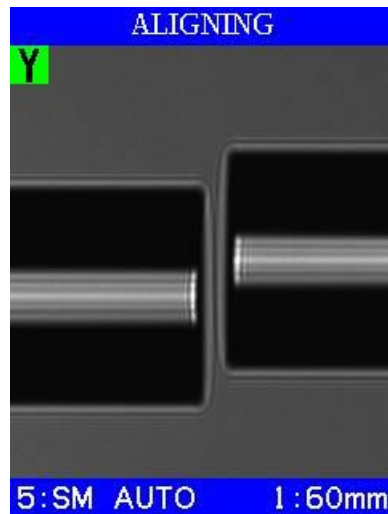
- Use standard SM or DS fiber for arc calibration.
- Use well prepared fibers for arc calibration. Dust on the fiber surface affects arc calibration.

Arc Calibration

- (2) Place prepared fibers in the splicer.
- (3) The following is performed after pressing **ENT** key.

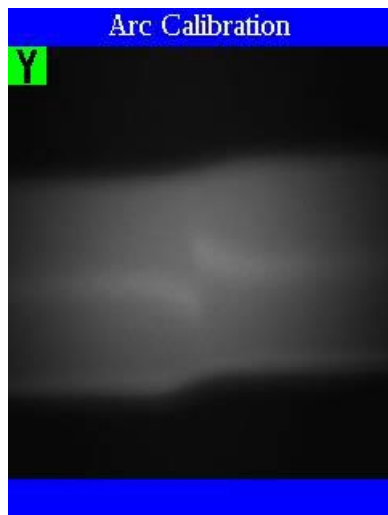


Arc discharge is performed without fibers in the view screen to detect the center of arc discharge and adjust the gapset position.



Fibers are spliced with an intentional axis offset for arc power calibration.

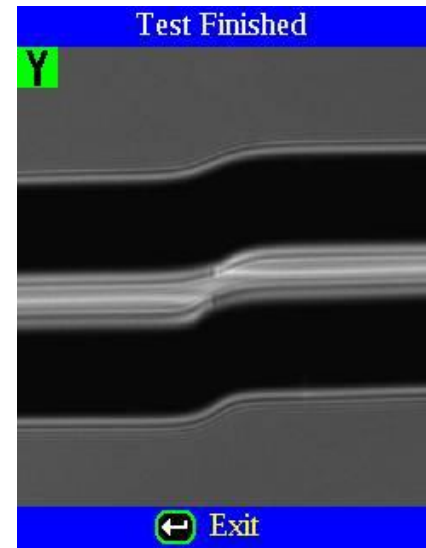
Axial offset decreases by the surface tension effect when multiple re-arcs are performed. During the process, the change of axial offset amount is measured and this is taken into consideration to calibrate arc power.



(4) The calibration result is displayed after completion.

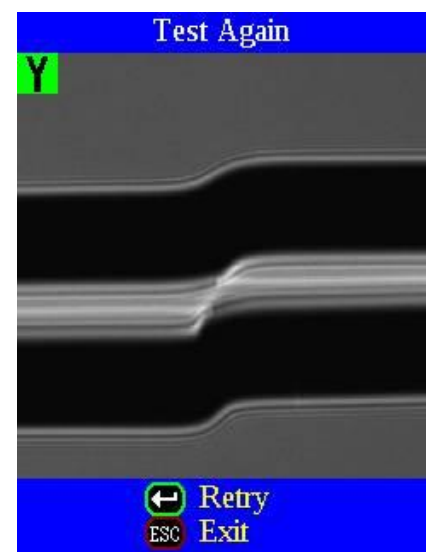
“Test Finished” message

After arc power and splicing position calibration are successfully completed press the **ENT** key to exit.



“Test Again” message

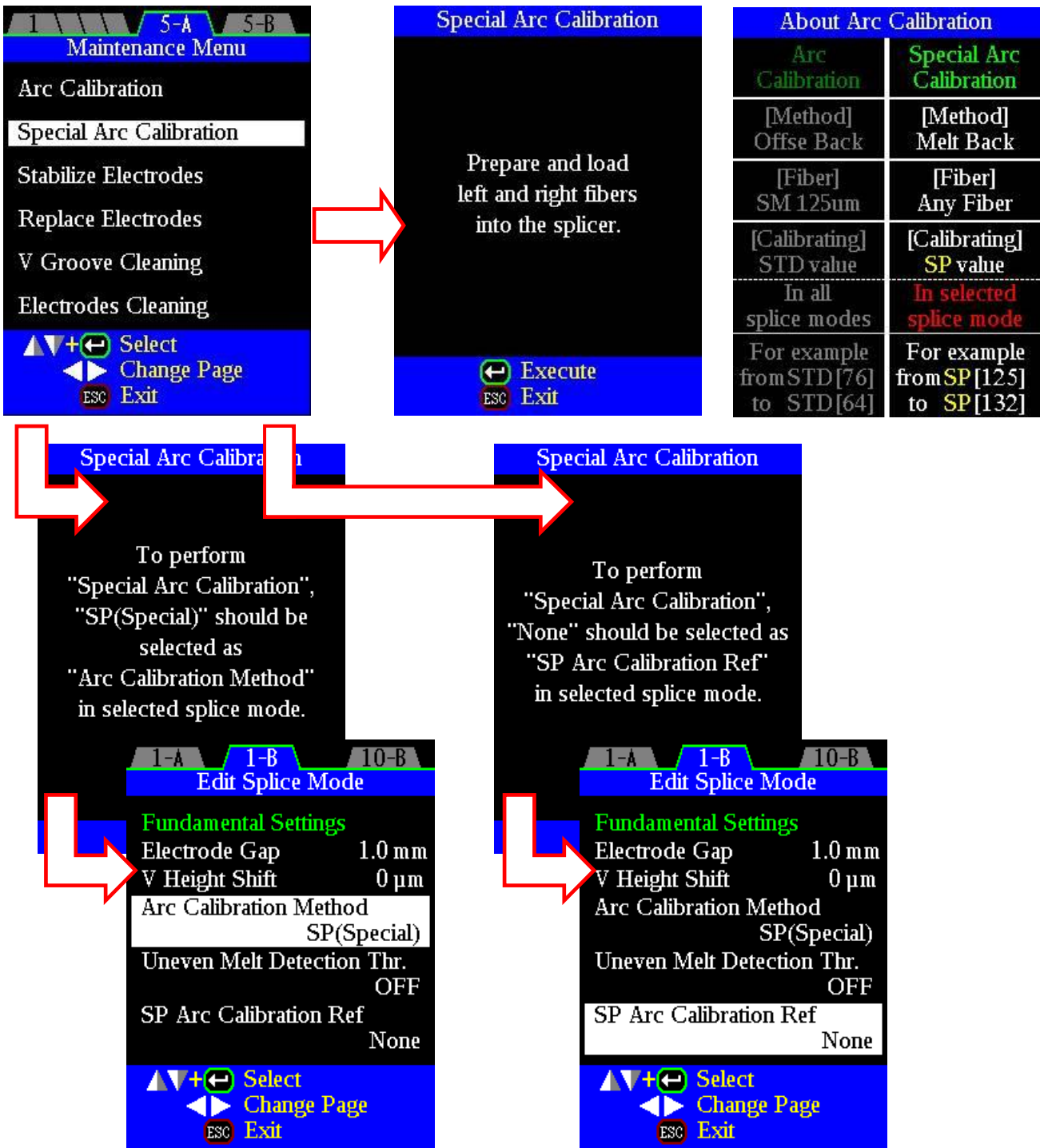
Arc power and splicing position calibration are completed but further calibration is strongly recommended, as the difference between the previous arc calibrations may be too large. Press **ENT** key to perform arc calibration, or **ESC** key to exit and stop arc calibration.



- In some cases, multiple iterations of arc calibration are needed until the calibration process is successfully completed and the “Test Finish” message is displayed. Arc calibration can be considered almost completed if multiple iterations are completed without receiving the message
- A maximum number of tests can be set so that “Test Finish” message is displayed specific number of arc calibrations are performed. See the **[Maintenance Settings]** for detail.

3. Special Arc Calibration Mode

- (1) Select [Special Arc Calibration] in [Maintenance Menu] to display [Special Arc Calibration] screen.

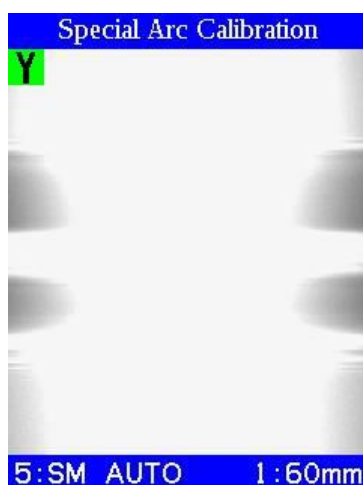
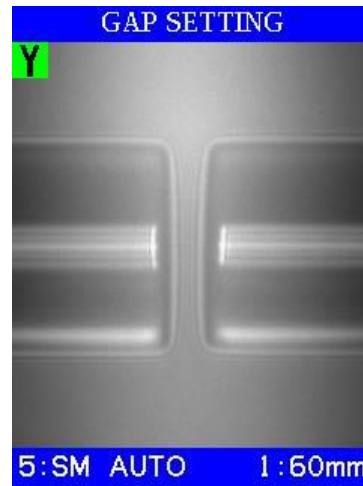
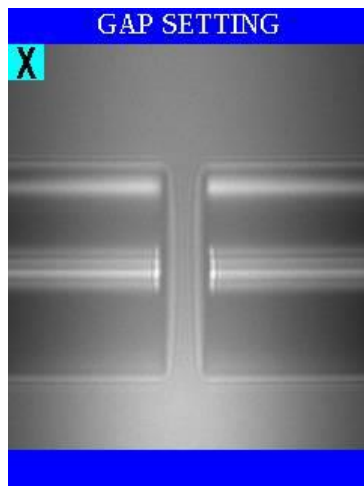


Select [SP (Special)] as [Arc Calibration Method].
Special Arc Calibration doesn't work when [STD (Standard)] or [NC] is selected.

Select [None] as [SP arc Calibration Ref] to perform Special Arc Calibration.
Special Arc Calibration doesn't work when [None] is not selected.

- Use the assigned fiber.
- Use glass clamping.
- Use cleaned fibers for arc calibration. Dust affects arc calibration.

- (2) Place prepared fibers in the splicer.
- (3) Press **ENT** and perform the following.



Right and left fibers advance.
The electrical discharge is observed.

During additional electrical discharges, the electrical discharge power is adjusted after measuring the round end face shape.



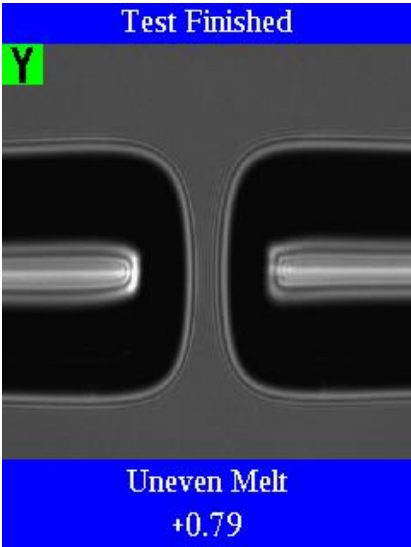
Cleave angle threshold does not link to the parameter “Cleave Limit” in splicing modes. Cleave angle threshold is independently set for arc calibration. See the **[Maintenance Settings]** to change cleave angle threshold.

Arc Calibration

(4) The calibration result is displayed after completion.

“Test Finished” message

Indicates that the standard electrical discharge calibration and the calibration of the connecting location have ended accurately. Press **ENT**

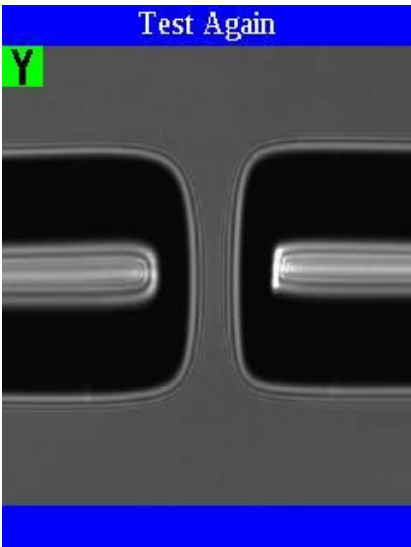
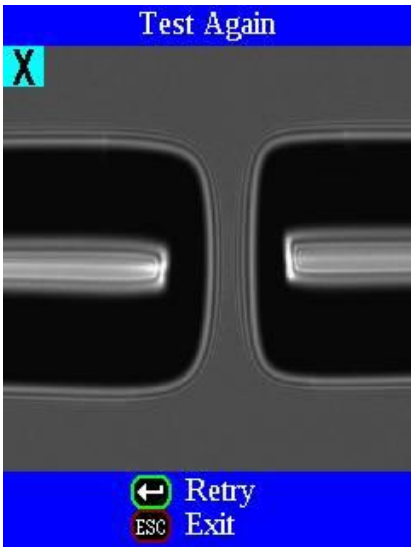


“Test Again” message

Indicates that the standard electrical discharge calibration and the calibration of the connecting location have ended and the arc discharge power could not be calibrated.

When **ENT** is pushed, the standard electrical discharge calibration is executed again.

ESC ends this function.

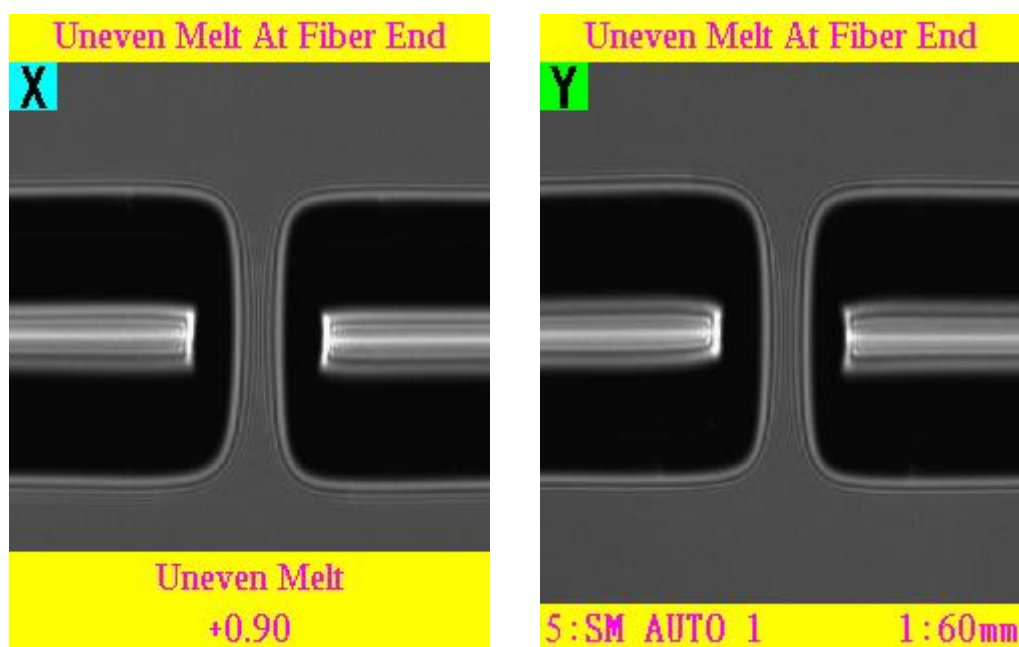


"Uneven Melt At Fiber End" message

If [Uneven Melt Detection Thr.] is set, this message appears when uneven melt of the fiber at the fiber end is detected.

The value at the bottom of the screen shows difference of melt amount between upper and lower side of the fiber. Positive value means the upper side melted more than the lower side and negative value means the lower side melted more than the upper side.

If this error occurs, perform [Stabilize Electrodes] or [Replace Electrodes]. If these functions don't solve the problem, please consult with your nearest authorized distributor.

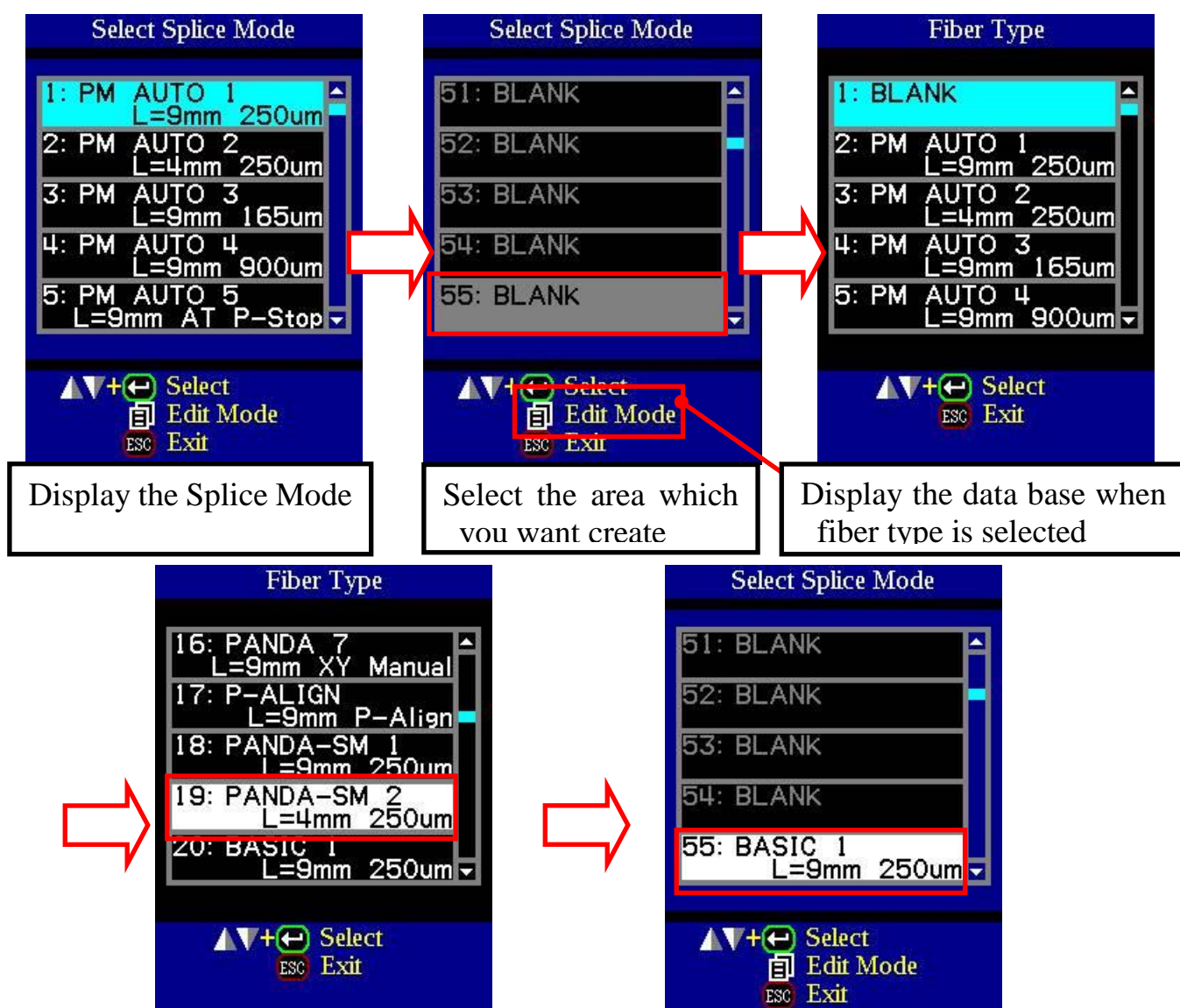


Splice Mode

The optimum splice setting for a specific fiber combination consists of the splicing parameters listed below. In other words, the optimum splicing parameters depend on the fiber combinations and are different from fiber to fiber.

- Parameters for controlling arc discharge / heating.
- Parameters for calculating estimated splice loss.
- Parameters for controlling fiber alignment and splicing procedures.
- Threshold for error messages.

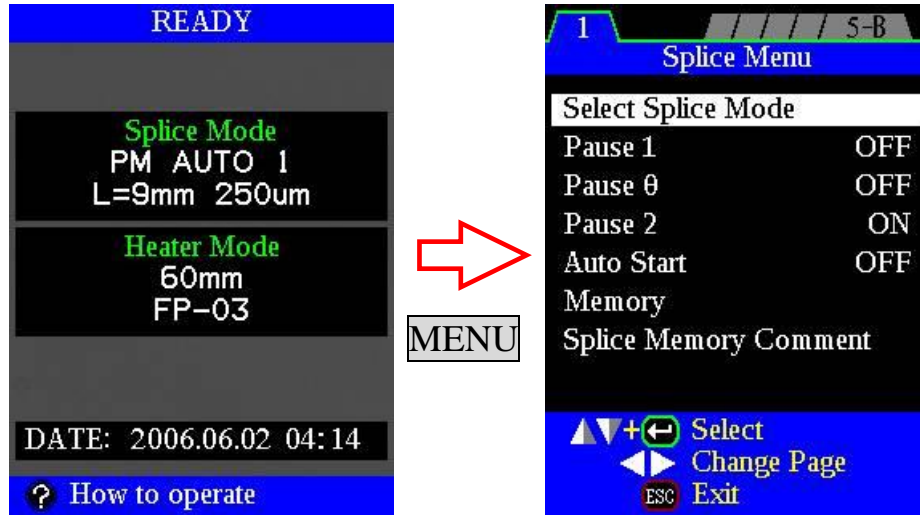
A series of optimum splice parameters for major fiber combinations are already stored. These parameters are stored in the database area and can be copied to the user-programmable area. These splice parameters can be edited for a specific fiber combination. When the [Fiber Type] is selected from the splice setting of “Database area”, the factory default settings are overwritten on the splice mode being edited. When operating Mode is selected and it changes to Full, Basic, and Fiber Shaping displayed menu composition changes. When you want to do a detailed setting select [Full] mode.



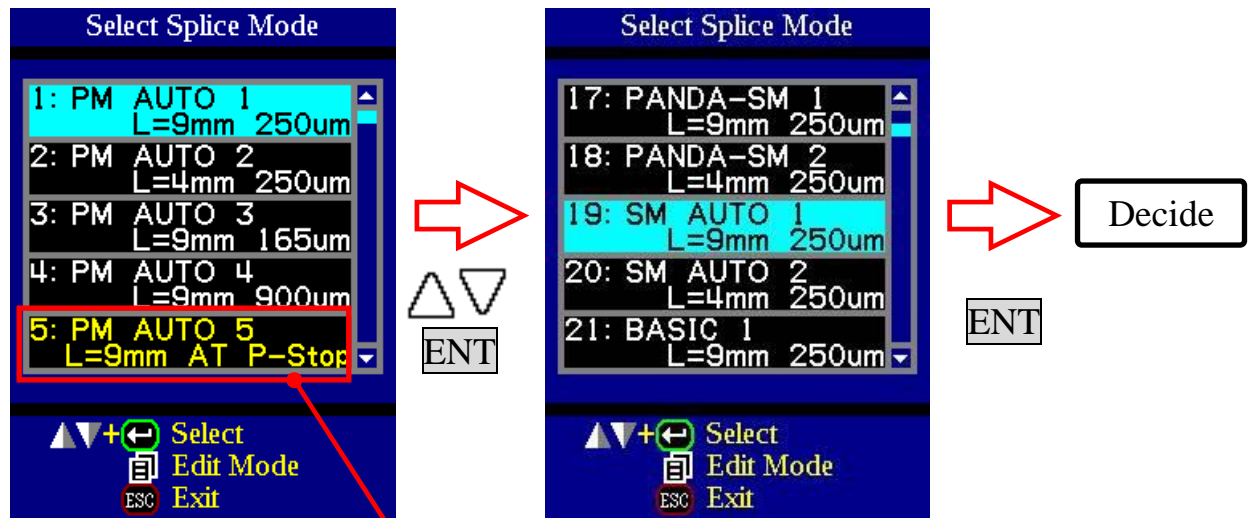
1. Splice Mode Selection

Select an appropriate splice mode for type of fiber to be spliced.

- (1) Press **MENU** key at [READY] state to open [Splice Menu]. Select [Select Splice Mode] is displayed.



- (2) Move cursor by pressing Δ , ∇ and press **ENT** key to select [Splice Mode].



- When [Auto Stuff Control] is set to [OFF], Splice Mode is displayed in yellow. The displayed color can select [Yellow letters] or [White letters]. See Section[Machine Settings]

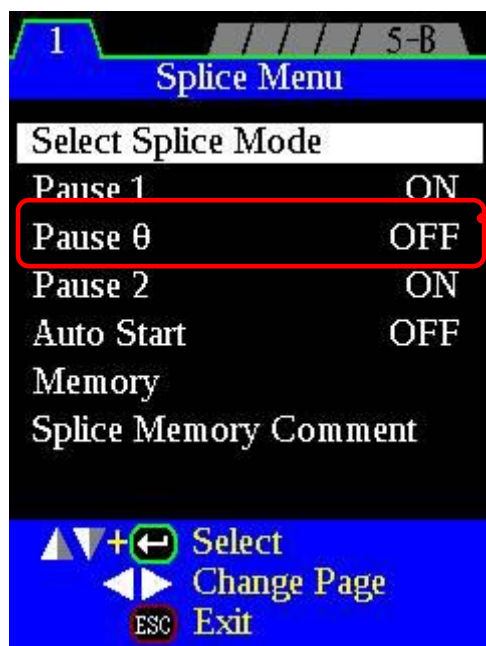
- (3) Please confirm whether the selection is correct on the READY screen.

Splice Mode

2. Splice Option

This parameter is a set value common to all modes.

- (1) Press **MENU** key at [READY], [PAUSE] or [FINISH] state.
- (2) Move cursor by pressing Δ , ∇ keys to a parameter to be changed.
- (3) Press **ENT** key to select parameter and change the parameter.



For the FSM-100P/P+,
Pause θ is displayed.
For the FSM-100M/M+
Pause θ is not displayed and
is not available because
those splicers do not have θ
rotation capability

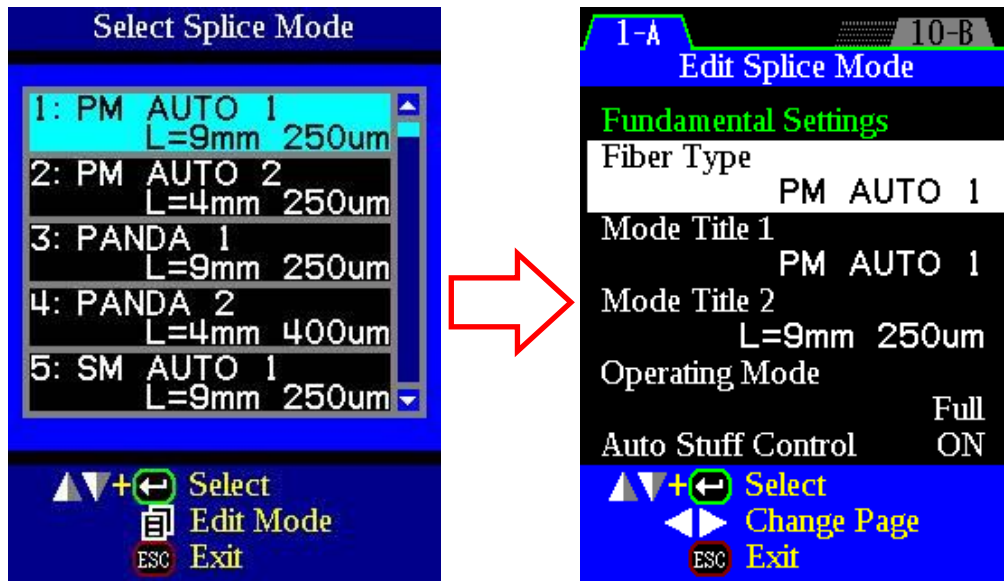
Splice Menu Parameter

Parameter	Description
Select Splice Mode	Refers to selected condition parameter.
Pause1	Pauses after Gap Set are measured.
Pause θ	Pauses after θ when "ON".
Pause2	Pauses after ECF function when "ON".
Auto Start	When [Auto Start] is "ON", the selected operation starts automatically after the fibers have been loaded and the wind protector closed.
Memory	Refers to a previously stored result.

3. Editing Splice Mode

Splicing parameters in each splice mode can be modified. Arc power and arc time are considered the two most vital parameters. To edit these parameters do the following:

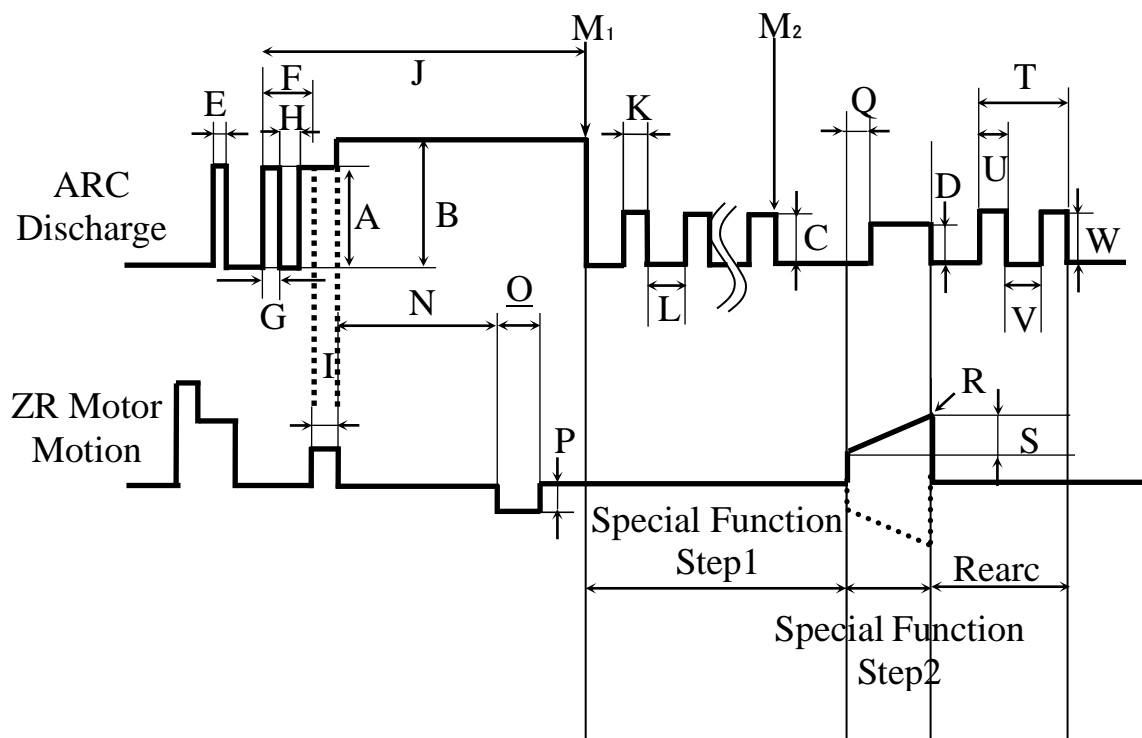
- (1) In [Select Splice Mode], move cursor to a splice mode to be modified. Press **MENU** key to display [Edit Splice Mode] menu.



- (2) Move cursor by pressing **Δ**, **▽** keys to a parameter to be changed.
- (3) Press **ENT** key to select Parameter. Press **Left/Right** key to change its value. Press **ENT** key to accept changed values.


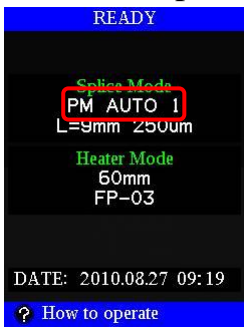
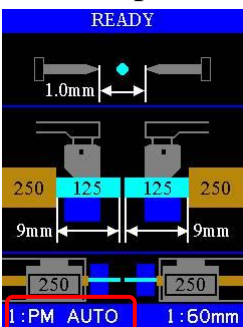



Splice Mode

Below is a figure showing the arc discharge conditions (relationship between “Arc power” and “Motor motion”). The conditions can be edited by changing the splicing parameters listed below. Depending on splice mode, certain parameters cannot be changed.

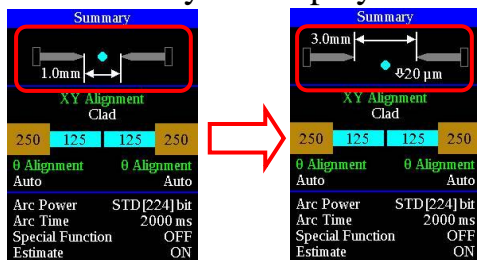


A: Prefuse Power	B: Arc Power	C: Arc Power (Special Function Step1)
D: Arc power (Special Function Step2)	E: Cleaning Arc Time	
F: Prefuse Time	G: Prefuse On Time	H: Prefuse Off Time
I: Forward Time related to Overlap	J: Arc Time	
K: On-Time (Special Function Step1)	L: Off-Time (Special Function Step1)	
M ₁ : Start Time (Special Function Step1)	M ₂ : Finish Time (Special Function Step1)	
N: Taper Wait	Q: Taper Length	P: Taper Speed
Q: Start Time (Special Function Step2)	R: Start Time (Special Function Step2)	
S: Acceleration	T: Rearc Time	U: Rearc On Time
V: Rearc Off Time	W: Rearc power	

In other splice modes in the user-selectable database, the user can select one from a series of factory-set splicing modes for various splicing combinations. Below are the descriptions of the various parameters used in these modes.

Parameter	Description
Fundamental Settings	
Fiber Type	<p>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.</p> <p>✖The parameter doesn't exist according to the model because this chapter explains in the Full mode.</p> <div>  <ul style="list-style-type: none"> The menu composition changes when the mode is changed and selected with Operating Mode. </div>
Mode Title 1	<p>Title for a splice mode expressed in up to nine characters.</p> <div>   <p>Edit display</p>  </div>
Mode Title 2	<p>Detail explanation for a splice mode expressed up to 15 characters.</p>
Operating Mode	<p>[Full] [Basic] [Fiber Shaping] selected [Edit Splice Mode] of The composition of the parametrical expression changes.</p> <div>  <p>Use [Full] mode when you want to do a detailed setting</p> <p>The Basic mode doesn't include the Special Function mode.</p> <p>The Fiber Shaping mode can be used for the roller end face processing etc.</p> </div>
Auto Stuff Control	<p>[Prefuse Power] and [Prefuse Time] change to the recommended value when [ON] is selected and the splicer controls [Stuff Speed] at the optimum speed.</p> <p>This function doesn't operate when [OFF] is selected.</p> <p>White display indicates [ON]. Yellow display indicates [OFF].</p> <div>  <ul style="list-style-type: none"> The splice loss will be inconsistent for specific types of fiber combinations when not using [Auto Stuff Control] function. </div>

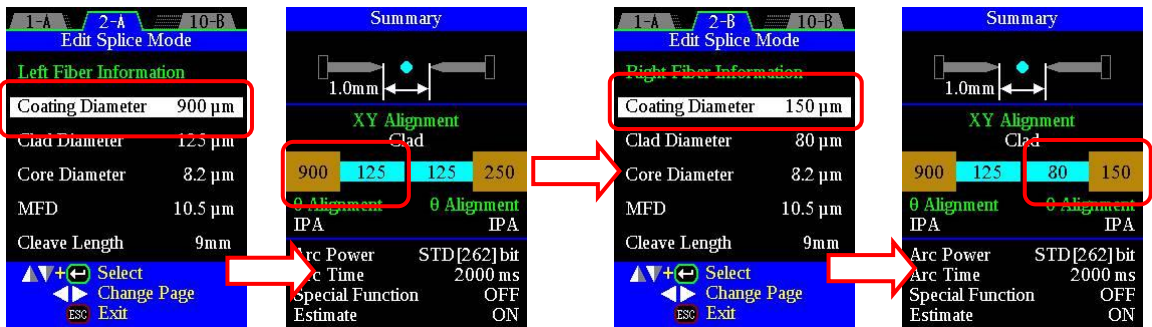
Splice Mode

Parameter	Description	
Fundamental Settings		
Electrode Gap	Sets the gap between electrodes "3mm" is recommended for splicing larger than 400μm cladding diameter fiber.	<div>A change in the parameter is confirmed by the display.</div> <div></div>
V Height Shift	Sets height of V-groove.	
Arc Calibration Method	Select STD (Standard) or SP (Special) or NC (No Calibration)	
	STD (Standard) Arc power is updated by arc calibration in <u>all modes</u> , and is highlighted in white on the display.	
	SP (Special) Arc power is updated by arc calibration in a <u>selected mode</u> , and is highlighted in yellow on the display.	
	NC (No Calibration) This item is highlighted in red.	
Uneven Melt Detection Thr.	Sets the detection threshold of "Uneven Melt At Fiber End" error. For more detail, refer to [Special Arc Calibration Mode]	
SP Arc Calibration Ref	The splicer displays the parameter when [SP (Special)] is selected as [Arc Calibration Method]. The parameter indicates Splice Mode number to refer to SP arc power, or [None]. When [None] is selected, the splicer refers to SP arc power in the same Splice Mode. When a splice mode number is selected, the splicer refers to SP arc power of the referenced splice mode. Mode # option list for [SP Arc Calibration Ref] includes only the modes that use [SP (Special)] as [Arc Calibration Method] as well as [None] as [SP Arc Calibration Ref].	
Auto Arc Calibration	This function calibrates the arc power at splice. Whenever this function is on, the arc power is automatically corrected. The correction value is used in the next splice. Select fiber data. [Fiber Data Learning]→[Auto Arc Calibration]	
Arc Center Compensation	The center of the arc discharge is calculated and the [Gapset Position] is automatically adjusted by selecting ON.	

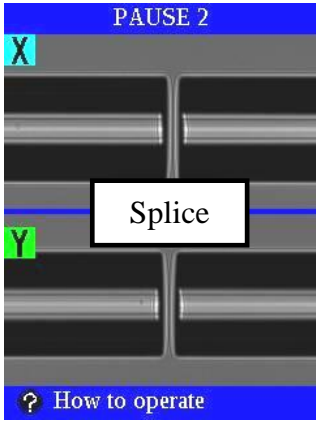
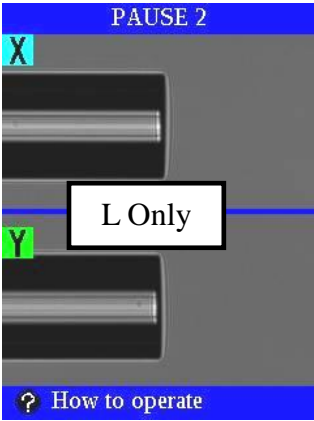
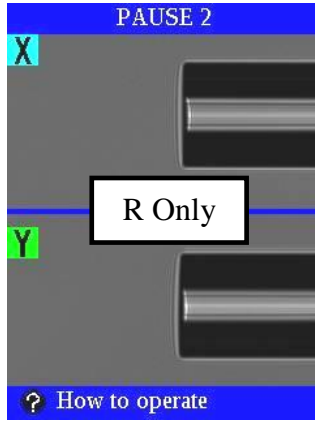
Parameter	Description
Fundamental Settings	
Fiber Type Compare	<p>[Fiber Type Compare]: Fiber image data is used to ensure that the correct types of fiber are loaded for a particular splice mode.</p> <p>[Ignore LR]: The splicer ensures the correct fiber types have been loaded, but ignores left/right fiber position</p> <p>[Judge LR]: The splicer confirms correct fiber type and also ensures that the fibers are set on the correct side of the splicer</p> <p>[Fiber Data]: Select and link appropriate fiber recognition data from the [Fiber Type Compare] database.</p> <p>See section [Function Introduction][Fiber Type Compare]</p>
Fiber Data L	[Fiber Data Learning]→ [Fiber Type Compare]: Load fiber data.
Fiber Data R	
Precise Motor Drive	This function enables enhanced motor movement precision for certain manual operations. When this function is ON, if the X/Y motor is moved, the PAS camera system measures the exact fiber movement to ensure the movement distance is correct. When [Precise Motor Drive] is ON, the Precise Motor Drive menu appears just after automatic X/Y alignment.
Proof Test	Selects Proof Test settings.
Electrode Wear Coef.	Sets an increasing ratio of [Electrodes Time Used]. The value is determined by multiplying the arc time and this coefficient and is added to [Electrodes Time Used] on every arc discharge.
Splice Before Shaping	<p>If this parameter is set to [Yes], a splice of a left and right fiber will be performed (according to the programmed splice mode parameters) at the first step when [Fiber Shaping] has been selected as the [Operating Mode].</p> <p>Splice quality will not be inspected, loss estimation will not be performed and error messages such as “Thin Fiber”, “Fat Fiber” (etc.) will not appear. Instead, the splicer will proceed to the [Fiber Shaping] steps as programmed in the [Special Function] parameters.</p> <p>This capability is useful for various special activities, such as an automated operation to splice a coreless fiber to a SM fiber, and then automatically generate a ball lens with the coreless fiber.</p> <p><u>NOTE:</u> This parameter only appears if [Fiber Shaping] has been selected as the [Operating Mode].</p>
Clamp Action	<p>This parameter determines what action is taken by Va and clamp motors during [Reset] or when the wind protector is opened.</p> <p>[Auto]: Fiber clamps and Va motors reset automatically</p> <p><u>NOTE:</u> [Auto] is the default condition</p> <p>[Fixed]: Fiber clamps and Va motors remain stationary at the preset positions determined by left/right fiber data (such as fiber cladding and coating diameter) unless these motors have been moved manually</p>

Splice Mode

Parameter	Description
Stage Positions at Start	
Sweep Initial Position	When the splicer resets or an operator changes the splice mode, the sweep motor moves to the indicated position.
Except Z Stages	<p>These parameters determine what action is taken by Z Stage motors and all other motors (with the exception of End-View mirror motor, Va and clamp motors) during [Reset] or when the splice mode setting is changed.</p> <p>[Predefined]: Motors move back to predefined “home” positions automatically</p>
Z Stages	<p><u>NOTE:</u></p> <p>[Predefined] is the default condition</p> <p>[Keep]: Motors remain stationary at their present positions even if set to that position manually or by other operations such as automatic alignment. The present motor position will be maintained if [Reset] is performed or if the wind protector is opened.</p> <p>When the operator sets a value except [Center] to [Sweep Initial Position], the splicer doesn’t display [Z stages] and executes as [Predefined].</p>

Parameter		Description
Fiber Information		
Left Fiber	Coating Diameter	Sets the fiber coating diameter.
	Clad Diameter	Sets the fiber cladding diameter.
	<p>The change in the parameter can be confirmed by the display.</p> <p>[Coating Diameter] [Clad Diameter]</p> <div style="border: 1px solid black; padding: 10px; margin: 10px 0;"> <p>«FSM-100M+/P+ only»</p> <ul style="list-style-type: none"> • Use adequate electrodes according to the fiber diameter. Splicing 501um and over fiber: Use ELCT3-25-LDF electrodes Splicing 500um and under fiber: Use ELCT3-25 electrodes • Perform [Stabilize Electrodes] and [Arc Calibration] when exchanging electrodes. • To prevent the electrode unit from damage by hitting the fiber and electrode unit, set [Electrode Gap] to 1.5mm or larger when splicing 800um and larger fibers. </div>	
	 <p>Setting of the Left Fiber is changed. Setting of the Right Fiber is changed.</p>	
Right Fiber	Core Diameter	Sets the fiber core diameter.
	MFD	<ul style="list-style-type: none"> • When the MFD settings of the left and right fibers are different, the ratio of the one MFD to the other MFD is used for estimating. Normally, the fiber entered in the parameter [MFD-L] can be placed on either the left or the right side. • If the [Gapset Pos.] is shifted from “Center,” the operator may be required to place the correct fiber in the specified side. • When splicing the left and right fibers with the same MFD, both the parameters [Left Fiber MFD] and [Right Fiber MFD] must be set to the same value.
	Cleave Length	Sets the cleave length (bare fiber part length).

Splice Mode

Parameter	Description
Gapsetting	
Gap Set	<p>[Splicing] [L Only] [R Only] [Manual] changes Gap Set</p> <div style="display: flex; justify-content: space-around;">    </div> <p>Both left and right fibers move to the gap set position.</p> <p>Left fiber moves to the gap set position.</p> <p>Right fiber moves to the gap set position.</p>
Cleaning Arc Power <small>Note1</small>	Sets the Cleaning Arc Power. [STD] or [SP] or [NC] is selected automatically in Arc Calibration Method.
Cleaning Arc Time <small>Note1</small>	Adjusts duration of the cleaning arc. The arc power of [Cleaning Arc] is the power set in the field [Prefuse Power].
Gap	Sets the end-face gap between the left and the right fibers at the time of aligning and prefusion discharge. When splicing fibers of small outside diameter, fusing by prefusion discharge can be reduced by diminishing this gap. Adjusting the prefuse power and prefuse time is usually easier method.
Gapset Position	Sets 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 [Gapset Position] towards a fiber whose MFD is bigger than the other fiber MFD.

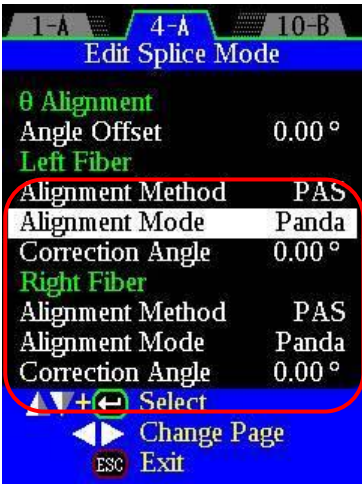
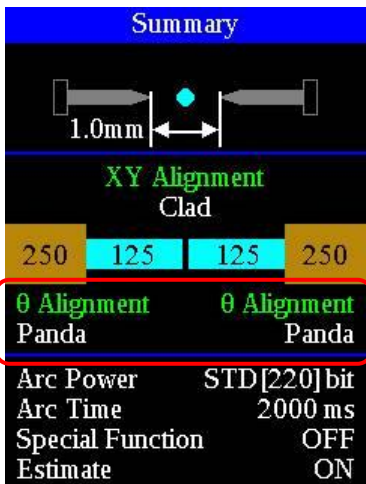
Note 1: FSM-100M/P only


FSM-100M +/-P +/-Only

Parameter	Description
Cleaning Arc	
Cleaning Arc Power	Sets the Cleaning Arc Power [STD] or [SP] or [NC] is selected automatically in Arc Calibration Method.
Cleaning Arc Time	Adjusts duration of the cleaning arc. The arc power of [Cleaning Arc] is the power set in the field [Prefuse Power].
Electrode swing	Set ON or OFF. 2 items below are needed when ON is selected.
Swing home position	This is to set swing home position.
Swing stroke	This is to set electrode swing stroke

Parameter	Description
θAlignment [FSM-100P /P+ Only]	
Angle Offset	<p>Sets Angle Offset.</p> <p>After theta alignment, one fiber rotates to the Angle Offset position: Selectable between 0 and 360 degrees.</p> <p>Example: Select 45° to generate a depolarizer, or select 90° degrees to align the slow axis of one fiber to the fast axis of the other fiber.</p>
Left Fiber / Right Fiber [FSM-100P/P+ Only]	
Alignment Method	<p>Can be set to [PAS] [P-Meter], [EV], [EV Lock] or [OFF].</p> <p>NOTE 1: [EV] and [EV Lock] are available only with the FSM-100P+.</p> <p>NOTE 2: A different alignment method can be selected for the right and left fibers. For example, [PAS] can be selected for the right fiber and [EV] can be selected for the left fiber.</p> <p>NOTE 3: When splicing a PM fiber to a non-PM fiber such as SM, it may be useful to perform θ alignment with the PM fiber. This will help to provide a consistent and uniform X/Y image of the completed fiber splice because the PM fiber will always be aligned relative to the splicer X/Y cameras. There will be no actual benefit for optical quality, but confusion on a production line may be reduced because of consistent splice appearance. To perform a splice by this method, select [PAS] or [EV] for the PM fiber, and select [OFF] for the SM fiber.</p> <p>NOTE 4: Special [EV Lock] Alignment Method:</p> <ul style="list-style-type: none"> • [EV Lock] is a special alignment method useful for critical needs. When [EV Lock] is selected, the End-View system image processing will be used to analyze the rotational orientation of the fiber. However, the fiber using [EV Lock] as the [Alignment Method] will not rotate. It will remain stationary. Instead, the opposite side fiber will be rotated to match the stationary rotational position of the [EV Lock] fiber. • Since the fiber with [EV Lock] alignment will not be rotated, the opposite fiber must be rotated to match. Therefore, [EV Lock] may be selected for either the right or left fiber, but not for both fibers. • If [EV Lock] is selected for one fiber, the opposite side fiber may be aligned to it using [EV] or the [PAS] method • Use of the [EV Lock] can be very beneficial if one fiber has a component that may be damaged by θ rotation (such as a pump combiner) or if one fiber has only a short fiber length that cannot withstand rotational motion for θ alignment. In this case, select [EV Lock] for the fiber that might be damaged by rotation, and select another alignment method for the other fiber.

Splice Mode

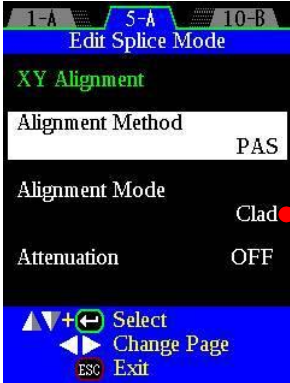
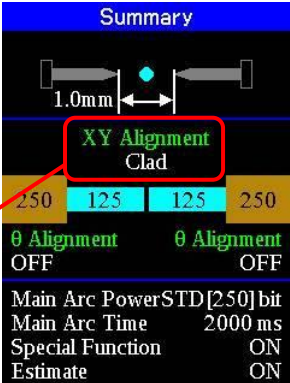
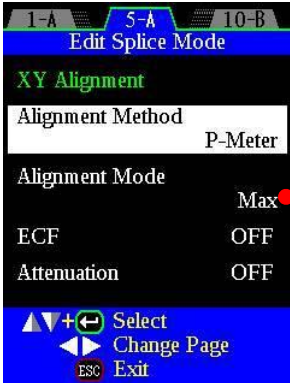
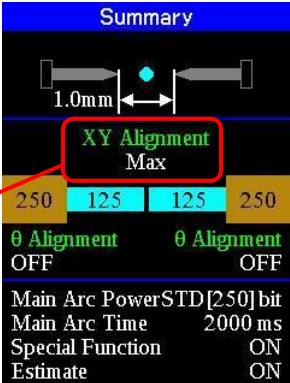
Parameter	Description								
Left Fiber / Right Fiber [FSM-100P/P+ Only]									
Alignment Mode	<p>When [PAS], [Powermeter], [EV] or [EV Lock] is selected as the [Alignment Method], the following screen image is displayed to enable selection of an [Alignment Mode] to correspond to the [Alignment Method].</p> <ul style="list-style-type: none"> • Select [Panda], [IPA], [B1500T], [Angle], [D-Shape], [Panda2], [Ecc] or [Manual] when [PAS] is selected as the [Alignment Method]. • Select [Max], [Min] or [Manual] when [Powermeter] is selected as the [Alignment Method]. • Select [Auto], [Panda], [Bowtie], [Tiger], [PCF], [MCF], [PM-PCF], [DC-Panda], [Octagon] or [Manual] when [EV] is selected as the [Alignment Method]. • Select [Auto], [Panda], [Bowtie], [Tiger], [PCF], [MCF], [PM-PCF], [DC-Panda], or [Octagon] when [EV-Lock] is selected as the [Alignment Method]. 								
	<div>  <p>The alignment method is shown on the display.</p> <p>If the alignment mode is OFF, "OFF" is shown on the display.</p>  </div>								
<p>NOTE 1: [EV] and [EV Lock] are available only with the FSM-100P+</p> <p>NOTE 2: If [PAS] is selected as the [Alignment Method], many Panda type fibers as listed below are very quickly and accurately aligned using [Panda] as the [Alignment Mode]. Some other low-contrast Panda fibers as well as fibers listed below under "IPA" are best aligned using [IPA] as the [Alignment Mode].</p> <p>Panda</p> <table> <tr> <td>Fujikura</td><td>SC37-PS-U40A、SC48-PS-U40A SM63-PS-U40A、SM85-PS-U40A、SM98-PR-U25A SM98-PS-U40A、SM13-PR-U25A、HA13-PS-U25A SM13-PS-U40A、SM15-PR-U25A SM15-PS-U40A、DS15-PS-U40A、ED15-PS-U25A</td></tr> <tr> <td>Nufern</td><td>PM980、PM14XX、PM1550、PM980C、PM14XXC</td></tr> </table> <p>IPA</p> <table> <tr> <td>Fibercore</td><td>HB1500、HB1500T、HB980T</td></tr> <tr> <td>StockerYale</td><td>PMF-1550-B1、PMF-820-B1 PZF-820-B1</td></tr> </table>		Fujikura	SC37-PS-U40A、SC48-PS-U40A SM63-PS-U40A、SM85-PS-U40A、SM98-PR-U25A SM98-PS-U40A、SM13-PR-U25A、HA13-PS-U25A SM13-PS-U40A、SM15-PR-U25A SM15-PS-U40A、DS15-PS-U40A、ED15-PS-U25A	Nufern	PM980、PM14XX、PM1550、PM980C、PM14XXC	Fibercore	HB1500、HB1500T、HB980T	StockerYale	PMF-1550-B1、PMF-820-B1 PZF-820-B1
Fujikura	SC37-PS-U40A、SC48-PS-U40A SM63-PS-U40A、SM85-PS-U40A、SM98-PR-U25A SM98-PS-U40A、SM13-PR-U25A、HA13-PS-U25A SM13-PS-U40A、SM15-PR-U25A SM15-PS-U40A、DS15-PS-U40A、ED15-PS-U25A								
Nufern	PM980、PM14XX、PM1550、PM980C、PM14XXC								
Fibercore	HB1500、HB1500T、HB980T								
StockerYale	PMF-1550-B1、PMF-820-B1 PZF-820-B1								

Parameter	Description
Left Fiber / Right Fiber [FSM-100P/P+ Only]	
Correction Angle	<p>The splicer rotates both left and/or right fibers through an additional correction angle if one is programmed for either fiber.</p> <p>NOTE: A correction angle may sometimes be useful to improve alignment accuracy for a particular type of PM fiber or for a particular fiber production lot.</p> <div>  •θAngle Adj. can be used, even if [θ Align] is “OFF”. </div>
IPA Settings [FSM-100P /P+ Only]	
Rotation Step Angle	<p>Sets rotation step angle of IPA operation.</p> <p>Can be selected the resolution between 1 and 10 degrees.</p>
Total Rotation Angle	<p>Sets total rotating angle of IPA operation.</p> <p>Can be set to [180°] or [360°].</p>
Left Fiber / Right Fiber [FSM-100P/P+ Only]	
Method	Can be set to [Auto], [Diff.Fiber] or [Same Fiber].
Reference Model	<p>Can be set to [Find Best], [*PANDA], [*BOWTIE], [*PANDA-S1], [*PANDA-S2], or [IPA Data] registered by [Fiber Data Learning].</p> <p>For the details, see section [IPA Data].</p>
Additional θ Alignment [FSM-100P/P+ Only]	
θ Motor Drive [EV]	If [θ Motor Drive [EV]] is set to "ON", "θ Motor Drive [EV]" screen appears after gap set or θ alignment. At "θ Motor Drive [EV]" screen rotational position of the fiber can be adjusted manually while the fiber end is shown on the screen.
Focus Control	If [Focus Control] is set to "ON", focus is adjusted automatically when the "θ Motor Drive [EV]" screen appears or the view for the fiber is changed on "θ Motor Drive [EV]" screen.



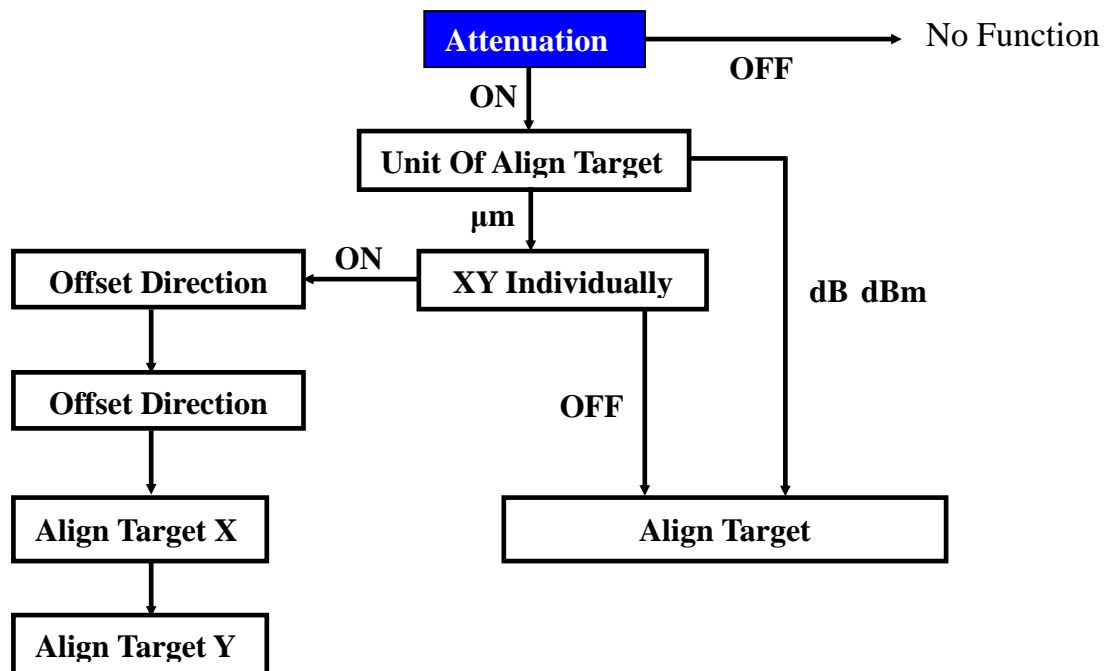
- The IPA Settings of [θ Alignment] and [Angle Offset Estimation] are common settings. If the IPA Settings of [θ Alignment] are changed, the settings for [Angle Offset Estimation] are also automatically changed to the same settings.

Splice Mode


Parameter	Description
XY Alignment	
Alignment Method	<p>Selects XY Alignment [OFF], [PAS], [EV] or [P-Meter] Note : [EV] is able to be only FSM-100M+/P+</p> <div>   </div> <p>XY Alignment: [PAS]</p> <p>Selects Alignment Mode [Core], [Clad] or [Manual]</p>
Alignment Method	<div>   </div> <p>Alignment Method: [P-Meter]</p> <p>Selects Alignment Mode [Max], [Min] or [Manual]</p>
Alignment Mode	<p>Alignment Method: [PAS] Alignment Modes [Core] [Clad] [Manual] Alignment Method: [EV] Note : FSM-100M+/P+ Only Alignment Modes [Core] Alignment Method: [P-Meter] Alignment Modes: [Max(P-Meter)], [Min(P-Meter)], [Manual]</p>
ECF	<p>Only for Alignment Mode: [Core] Set the ECF ON or OFF. Set the axial offset ratio for ECF.</p>
Attenuation	<p>Set the Attenuation ON or OFF. If Attenuation is ON, the following setting is ready to edit.</p>
Unit Of Align Target	<p>Sets the units for align target for attenuation splice.</p>
XY Individually	<p>Set the XY Individually ON or OFF. *Only if the [μm] is selected, the setting of XY Individually is available.</p>
Align Target	<p>Align Target units [μm], [dB], and [dBm]. *The setting of XY Individually is available in the following conditions Unit Of Align Target:[dB] [dBm] [μm] XY Individually: [OFF]</p>

[Attenuation]		
Parameter	Description	
XY Individually	Sets XY Individually ON or OFF.	
[Unit Of Align Target]: [μm]	XY Individually: [OFF]	XY Individually: [ON]
<div><div><div>1-A 5-B 10-B</div><div>Edit Splice Mode</div><div>XY Alignment</div><div>Unit Of Align Target</div><div>dB</div><div>Align Target 0.0 dB</div><div>▲▼+↩ Select</div><div>◀▶ Change Page</div><div>ESC Exit</div></div><div>↔</div><div><div>1-A 5-B 10-B</div><div>Edit Splice Mode</div><div>XY Alignment</div><div>Unit Of Align Target</div><div>μm</div><div>XY Individually OFF</div><div>Align Target 0.0 μm</div><div>▲▼+↩ Select</div><div>◀▶ Change Page</div><div>ESC Exit</div></div><div>↔</div><div><div>1-A 5-B 10-B</div><div>Edit Splice Mode</div><div>XY Alignment</div><div>Unit Of Align Target</div><div>μm</div><div>XY Individually ON</div><div>Offset Direction X UP</div><div>Offset Direction Y UP</div><div>Align Target X 0.0 μm</div><div>Align Target Y 0.0 μm</div><div>▲▼+↩ Select</div><div>◀▶ Change Page</div><div>ESC Exit</div></div></div>		
Offset Direction X	[XY Individually] ON,- [Offset Direction X] and [Offset Direction Y] are available.	
Offset Direction Y	Select the direction of X and Y offset.	
Align Target X	[XY Individually ON, - [Align Target X] and [Align Target Y] are available.	
Align Target Y	Set the target value of X and Y.	


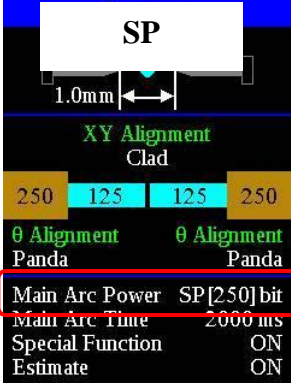

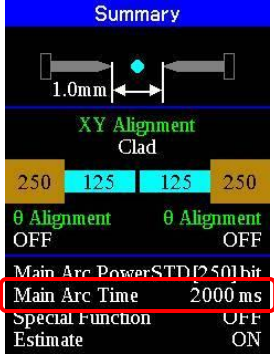
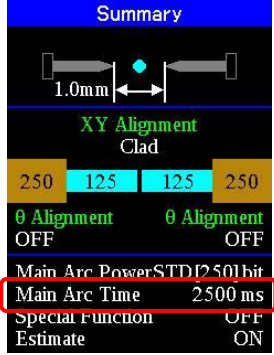
Attenuation Parameter composition



Splice Mode

Parameter	Description
Focus Settings	
Focus LX	Views a fiber in one of the four focus settings. The focus moves toward the core when the [Focus] value is increased. “Auto” focus is strongly recommended, focusing independently if they are different fiber types (dissimilar fiber splicing).
Focus LY	
Focus RX	
Focus RY	
Prefuse	
Prefuse Power	Prefuse arc power adjustment. If [Prefuse Power] is set too low, axial offsets may occur if the cleave angles are off. If [Prefuse Power] is set too high, fiber the end faces are exposed to excessive heat and splice losses may be high. Arc Calibration Method [STD] [SP] or [NC] are selected automatically.
Prefuse Time	Sets duration of the prefuse arc, which until the fibers begins stuffing. Longer [Prefuse Time] is equivalent to higher [Prefuse Power].
Prefuse On Time	During prefuse discharge, the heat supplied by the arc can be reduced by changing the duty cycle, time on to time off of the discharge. The period in which prefuse discharge is turned on is set in this field. <div> •Adjust the prefuse power by adjusting the [Prefuse On Time] and [Prefuse Off Time].</div>
Prefuse Off Time	Sets the time prefuse discharge is off.
Electrode swing <small>Note:1</small>	Set On or OFF. Below 2 items are needed when ON is selected.
Swing home position <small>Note:1</small>	This is to set swing home position.
Swing stroke <small>Note:1</small>	This is to set electrode swing stroke
Overlap	
Overlap	Sets the overlap amount for stuffing. [Overlap] should be small when the [Prefuse Power] is weak or the [Prefuse Time] is short and large when the [Prefuse Power] is strong or the [Prefuse Time] is long.
Stuff Speed	Set the Stuff Speed at the splice. Setting is not available when [Auto Stuff Control] is [ON].


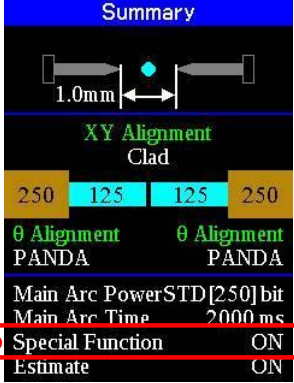
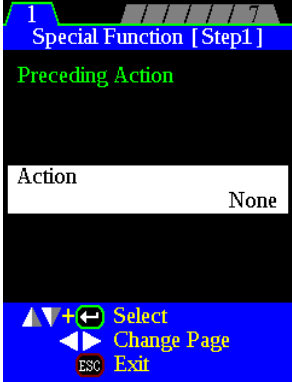
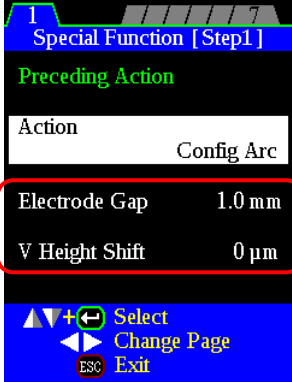
Note1: FSM-100M+/P+ Only

Parameter	Description
Main Arc	
Main Arc Power	<p>Set the Main Arc Power. See Section [Arc Method and Arc Calibration]</p> <p>Depending on the selected Arc Calibration Method, [STD] or [SP] or [NC] is selected automatically.</p> <div>    </div>
Main Arc Time	<div>  <p>The setting of the Main Arc Time is displayed.</p>  </div>
Electrode swing <small>Note:1</small>	Set On or OFF. Below 2 items are needed when ON is selected. While [Main Arc Time] is set to "P-Meter", the electrode swing function is inactive.
Swing home position <small>Note:1</small>	This parameter sets home position of the electrode swing.
Swing stroke <small>Note:1</small>	This parameter sets stroke of the electrode swing.
Auto Time Comp	If the [Alignment Mode] is [Core], the setting of [Auto Time Comp] is available. This function is to optimize the arc discharge time according to the fiber core position. See Section [Auto Time Comp.]

Note1: FSM-100M+/P+ Only

Splice Mode

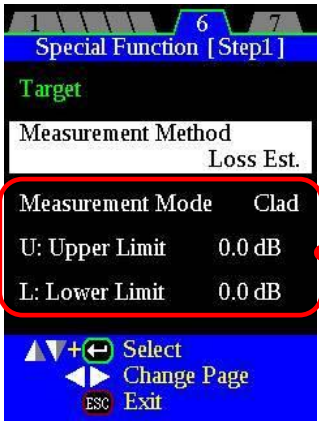
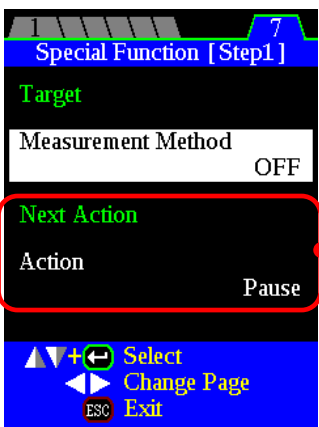
Parameter	Description
Tapering	
Taper Splice	[ON] enables Taper Splice function Splice loss is sometimes improved when the fiber is tapered (pulled) during arc discharge making the spliced fiber slightly thinner. The following three parameters determine the taper shape.
Taper Wait	If the [Taper Splice] is [ON], the setting of [Taper Wait] is available. Used to establish the taper wait time from the end of the fiber stuffing process to the start of the pulling process.
Taper Speed	If the [Taper Splice] is [ON], the setting of [Taper Speed] is available. Sets the fiber pulling speed.
Taper Length	If the [Taper Splice] is [ON], the setting of [Taper Length] is available. Sets the fiber pulling time.
Special Function	
Edit Special Function	Edit for Special Function

[Special Function]	
Parameter	Description
Step [1~10]	
Edit Control Parameter	<p>Press the [ENT] key to edit Special Function parameters. Parameters may be edited for Step 1 to Step 10 of a Special Function sequence.</p> <div>  <p>Edit Control Parameter</p> </div> <div>  <p>Special Function: ON</p> </div>
Preceding Action	
Action	<p>Select [None], [Config Arc], or [Pause] as the Preceding Action.</p> <div>  <p>[None]</p> </div> <div>  <p>[Config Arc]</p> </div> <p>[Electrode Gap] & [V Height Shift] parameters appear only if [Config Arc] is selected as Preceding Action</p> <p>[None]: No preceding action is taken. This step proceeds normally.</p> <p>[Config Arc]: If selected, the [Electrode Gap] and/or [V Height Shift] parameters may be used to change the arc configuration from the previous setup.</p> <p>[Pause]: If selected, the splicer pauses before proceeding with this step. The pause allows the operator to select options for how to proceed.</p> <p>NOTE: Details concerning use of pause during Special Function operation is shown at the end of the Special Function section</p>
Electrode Gap	<p>Set the [Electrode Gap] from 1 mm up to 3 mm. This allows changing the [Electrode Gap] from the previous setting. This parameter appears only if [Config Arc] is selected as the [Action].</p>
V Height Shift	<p>Set the [V Height Shift] to change the fiber vertical position relative to the electrodes. This allows changing fiber vertical position from the previous setting. This parameter appears only if [Config Arc] is selected as the [Action].</p>

Splice Mode

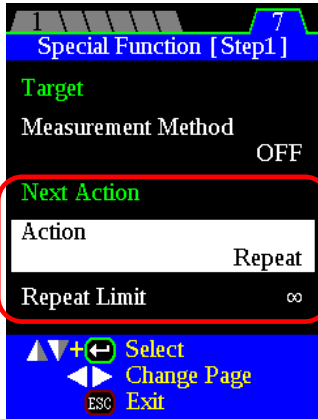

[Special Function]	
Parameter	Description
ARC	
Arc Power	Set the Arc Power. Depending on the selected Arc Calibration Method, [STD], [SP], [NC], the Arc Power may be set automatically.
Start Time	Set the starting time of the arc discharge.
Finish Time	Set the ending time of the arc discharge.
On-Time	Set the On-Time of the arc discharge (for pulsed arcing).
Off-Time	Set the Off-Time of the arc discharge (for pulsed arcing).
Electrode swing <small>Note:1</small>	Set "ON" or "OFF". When "ON" is selected it is necessary to set the following 2 [Electrode Swing] parameters. While [Measurement Method] is set to "P-Meter", the electrode swing function is inactive.
Swing home position <small>Note:1</small>	This is to set the electrode swing home position.
Swing stroke <small>Note:1</small>	This is to set the electrode swing up/down stroke distance
Motor [1 • 2 • 3 • 4]	
Motor	Select the Sweep, ZL, ZR, X, Y, θ L, or θ R motor. Up to 4 motors may be selected and controlled for each Special Function step. Motor settings for all 4 motors may be controlled independently using the parameters below.
Direction	[Direction] Set the direction of motor motion.
Start Time	[Start Time] Set the motor motion start time.
Finish Time	[Finish Time] Set the motor motion ending time.
Initial Speed	[Initial Speed] Set the initial motor speed.
Acceleration	[Acceleration] Set motor speed acceleration.
Acceleration Type	Select the types of acceleration, [Type 1], [Type 2+], [Type 2-], [Type 3+] or [Type 3-]. [Type 1]: Constant acceleration [Type 2+], [Type 2-], [Type 3+], [Type 3-]: These are special types of acceleration used for tapering. * For details, see section [Splice Mode] [Special Function settings for tapering].

Note1: FSM-100M+/P+ only

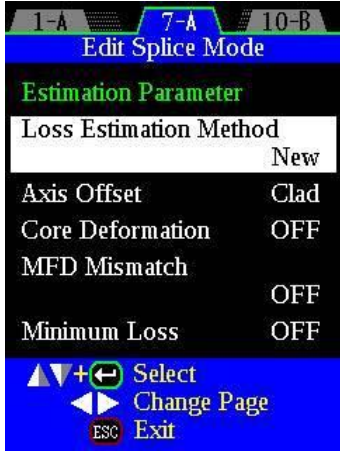
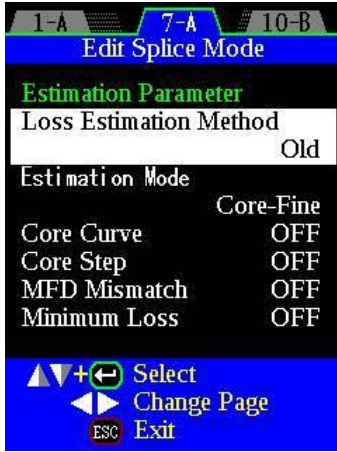
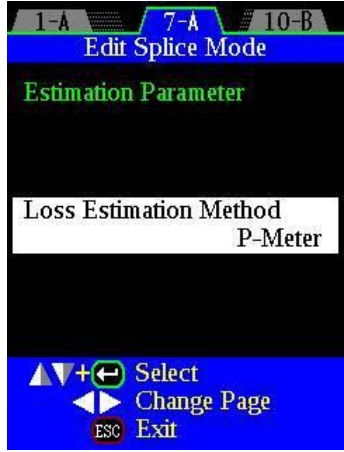
[Special Function]	
Parameter	Description
Target	
Measurement Method	<p>Select [Loss Est], [P-Meter], [Axis Offset], or [Diameter] for a Target [Measurement Method] to be utilized at the end of this Special Function step, or select [OFF] (no measurement at the end of this step).</p>  <p>Selection of a [Measurement Method] enables use of a [Measurement Mode] and [Upper/Lower Limit] parameter (shown here) to control how the Special Function sequence will proceed at the end of this step.</p> <p>These parameters are displayed only if a [Measurement Method] is selected.</p> <p>The [Next Action] after this step will be determined by the result of the measurement.</p> <p>[Loss Est]</p>
	 <p>If [OFF] is selected for [Measurement Method], no measurement will be conducted at the end of this step, and [Measurement Mode] & [Upper/Lower Limit] parameters are not available.</p> <p>[Next Action] selection is displayed if [Measurement Method] is [OFF]</p> <p>Instead, the [Next Action] parameter appears and this will guide the action following completion of this step (without any measurement)</p> <p>[OFF]</p>
	<p>While [Measurement Method] is set to "P-Meter", the electrode swing function is inactive.</p>
Measurement Mode	<p>Select a [Measurement Mode] to correspond with the selected [Measurement Method].</p> <ul style="list-style-type: none"> For [Loss Est] or [Axis Offset], select either [Core] or [Clad] as the [Measurement Mode]. For [P-Meter] select [dB] or [dBm] as [Measurement Mode]. (NOTE: Power Meter communications by GPIB must be set up properly.) For [Diameter], select [Average], [Maximum] or [Minimum] as the [Measurement Mode]. NOTE: Fiber image is scanned left-to-right to take diameter measurements to determine [Average], [Maximum] or [Minimum] diameter.)
L: Lower Limit	Set Lower and Upper Control Limit value for the Target Measurement.
U: Upper Limit	<ul style="list-style-type: none"> For [Axis Offset] and [Diameter]: Control limit values in μm For [Loss Est]: Control limit values in dB For [P-Meter]: Control limit values in dB or dBm

Splice Mode

[Special Function]	
Parameter	Description
Next Action	([Next Action] Determined by Measurement Result)
Value < L	<p>When [Loss Est], [P-Meter], [Axis Offset], or [Diameter] are selected for the Target [Measurement Method], the measurement result will determine the next step. There are 3 possible results:</p> <ul style="list-style-type: none"> • Measurement result is lower than selected [Lower Limit] • Measurement result is between [Lower Limit] and [Upper Limit] • Measurement result is greater than selected [Upper Limit] <p>For each case, select a desired [Next Action]. Available choices are as follows:</p> <ul style="list-style-type: none"> • [Finish]: Special Function process is terminated • [Next Step]: Proceed to next step in Special Function process • [Error]: Process is terminated, Error Message appears • [Repeat]: Repeat current step NOTE: If [Repeat] is selected, a [Repeat Limit] parameter appears to allow control of how many times the step can be repeated. • [Jump]: Jump to another step in the Special Function process NOTE: If [Jump] is selected, a [Step Increment] parameter appears. This enables control of how many steps forward or backward the process will jump. [Step Increment] can be set to jump forward up to 9 steps or backwards up to 9 steps.
Value L to U	
Value > U	<p>Because [Repeat] is selected for [Value < L], the [Repeat Limit] parameter is available to control the maximum number of repeats</p> <p>Because [Jump] is selected for [Value > U], the [Step Increment] parameter is available to control the step to which the process will jump</p>

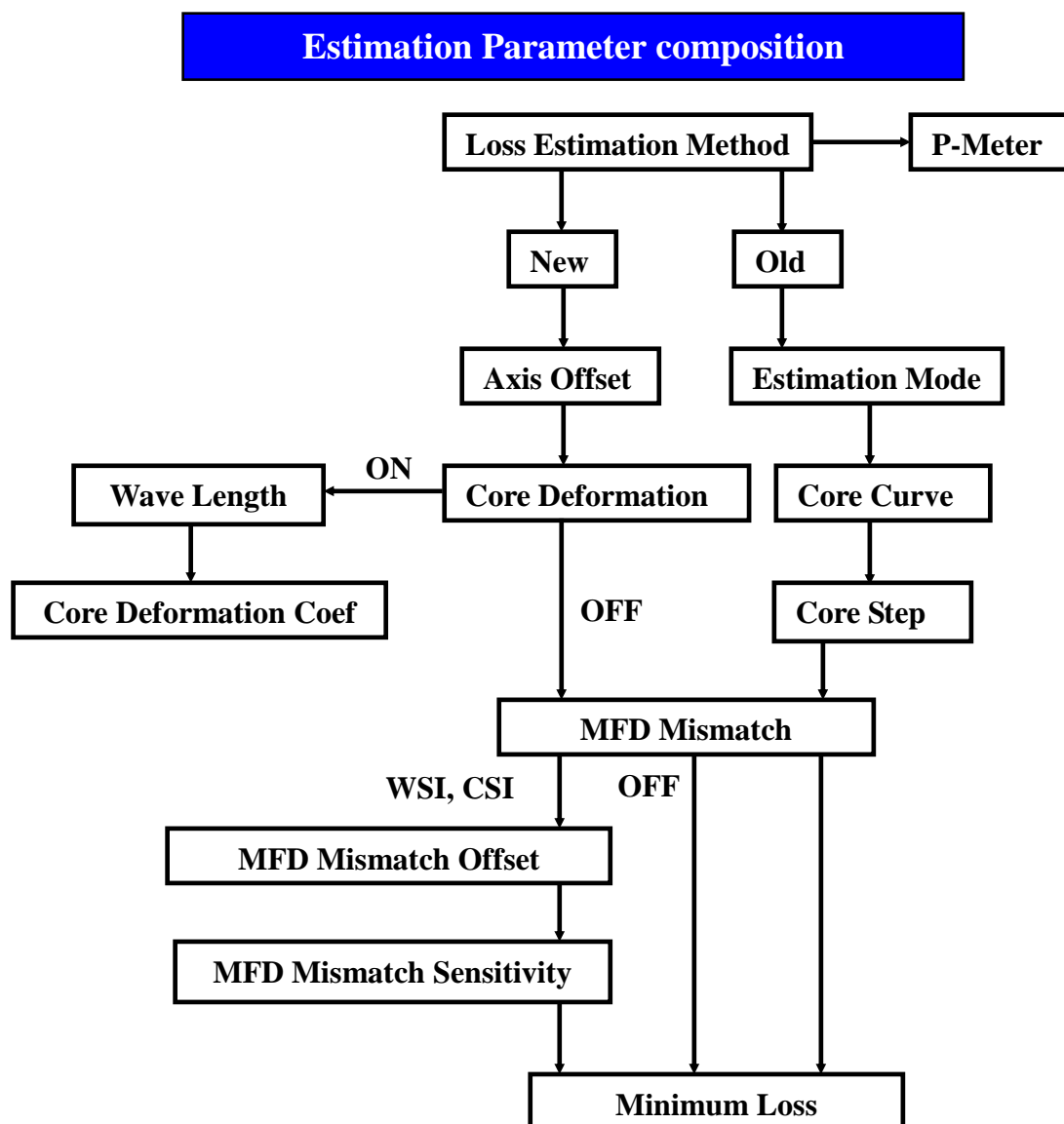
[Special Function]	
Parameter	Description
Next Action	<p>([Next Action] setting when [Measurement Method] is [OFF])</p> <p>When [OFF] is selected as the Target [Measurement Method], the [Next Action] parameter appears (and there will be no measurement performed at the end of a step).</p> <p>In this case, the [Next Action] is selected independently to determine what action takes place when the step is completed.</p> <p>Select a desired [Next Action] from the following choices:</p> <ul style="list-style-type: none"> [Finish]: Special Function process is terminated [Next Step]: Proceed to next step in Special Function process [Pause]: The splicer pauses at the end of the current step. This allows the operator to select options for how to proceed. NOTE: Details concerning use of pause during Special Function operation is shown at the end of the Special Function section [Repeat]: Repeat current step NOTE: If [Repeat] is selected, a [Repeat Limit] parameter appears to allow control of how many times the step can be repeated. [Jump]: Jump to another step in the Special Function process NOTE: If [Jump] is selected, a [Step Increment] parameter appears. This enables control of how many steps forward or backward the process will jump. [Step Increment] can be set to jump forward up to 9 steps or backwards up to 9 steps.
Next Action	<div>  <p>Because [Repeat] is selected for [Next Action], the [Repeat Limit] parameter is available to control the maximum number of repeats</p> </div> <div>  <p>Because [Jump] is selected for [Next Action], the [Step Increment] parameter is available to control the step to which process will jump</p> </div>

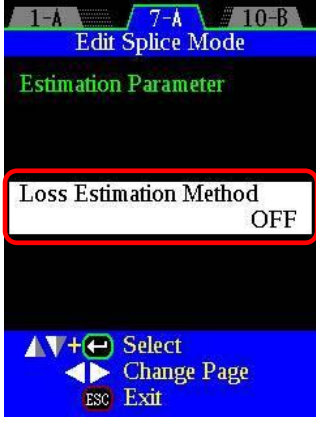

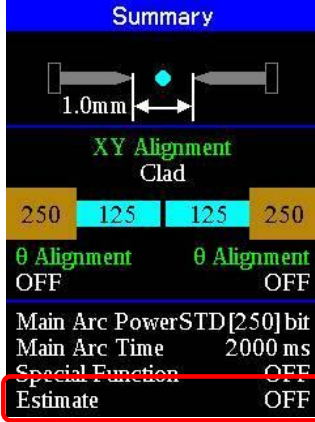
[Special Function]	
Parameter	Description
Pause	([Pause] selected as [Preceding Action] or [Next Action])
Pause	<p>The [Pause] function may be selected as a [Preceding Action] at the beginning of a step or as a [Next Action] at the end of a step. At [Pause], pressing the HELP key will display the [Pause] menu showing options for next operations as shown.</p> <div data-bbox="354 537 671 956" data-label="Image"> </div> <p>[Pause] Menu</p> <p>Press SET key: [Continue] → Operation will continue. If [Pause] is a [Preceding Action] at the beginning of a step, operation will continue with that step. If [Pause] is a [Next Action] at the end of a step, operation will proceed to the next step, or it will be finished if there is no next step in the Special Function process.</p> <p>Press ARC key: [Return to Step 1] → The operation will jump back to the beginning of Step 1 of the Special Function process.</p> <p>Press ENT key: [Jump to] → A new screen is opened to offer options to jump to any desired step in the Special Function process. <i>See details below.</i></p> <p>Press ESC key: [Finish] → The Special Function process is terminated, even if there are other steps not yet completed.</p> <p>NOTE: It is not necessary to display the [Pause] menu to navigate to the [Jump to] screen. As soon as {Pause} is reached ENT will access [Jump to].</p>
Jump to	<p>When the [Pause] state is reached during Special Function operation, pressing the ENT key opens the [Jump to] selection dialog screen. This enables selection of any step in the Special Function process sequence as the next operation.</p> <div data-bbox="354 1543 671 1962" data-label="Image"> </div> <p>[Jump to] Screen</p> <p>The [Jump to] selection dialog screen will display the present step number and basic settings. To “Jump to” this step and proceed, press the ENT key.</p> <p>To navigate to another step in the Special Function process, press the Right key to display a higher step number, or press the Left key to display a lower step number. Once the desired step is shown, press the ENT key to “Jump to” this step.</p> <p>Press the ESC key to terminate the Special Function process.</p>

Parameter	Description
Estimation Parameter	
Loss Estimation Method	<p>Select [OFF] or [New] or [Old] or [P-Meter]</p> <div>    </div> <p>[New] [Old] [P-Meter] Differs depending on each setting.</p>
Axis Offset	If Loss Estimation Method is [New], the following prompts are available. Select the [OFF], [Core], or [Clad]
Core Deformation	If Loss Estimation Method is [New], the following prompts are available. Select the Core Deformation ON or OFF
Estimation Mode	If Loss Estimation Method is [Old], the following prompts are available. Select the [Clad], [Core], or [Core-Fine]
Core Curve	If Loss Estimation Method is [Old], the following prompt is available. Set the value of Core Curve.
Core Step	If Loss Estimation Method is [Old], the following prompt is available. Set the value of Core Curve.
MFD Mismatch	If Loss Estimation Method is [New] or [Old], the following prompts are available. Select the [OFF], [WSI] or [CSI] See Section [Estimate WSI/CSI]
Minimum Loss	<p>If Loss Estimation Method is [New], the following prompts are available. Select the [OFF], [Core], or [Clad]</p> <p>Set the additional value to the loss estimation. If the error margin of the loss estimation is large, substitute the minimum value of an actual splice loss.</p> <p>The error margin of the loss estimation might be large depending on the splice combination of fiber.</p>

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Parameter	Description
Estimation Parameter	
Wave Length	Set Wave Length. If Loss Estimation Method is [New], this setting is available.
Core Deformation Coef.	Set Core Deformation Coef. If Loss Estimation Method is [New], this setting is available.
MFD Mismatch Offset	If Loss Estimation Method is [WSI], [CSI] the following prompt is available. Set MFD Mismatch Offset.
MFD Mismatch Sensitivity	If Loss Estimation Method is [WSI], [CSI] the following prompt is available. Set MFD Mismatch Sensitivity.



Parameter	Description
Angle Offset Estimation [FSM-100P /P+ Only]	
Angle Offset Est. Method	<p>Select the [OFF] or [PAS] or [IPA]</p> <div style="display: flex; justify-content: space-around;">    </div> <p>If the [Loss Estimation Method] and [Angle Offset Estimation Method] is [OFF], Estimate is OFF</p>
Angle Offset Est. Mode	Select the [Deg & CT] or [Deg & PER]
Ref.PER	If [Angle Offset Est . Mode] is [Deg & PER], Ref.PER is displayed. Sets the reference value in this field.
IPA Settings [FSM-100P /P+ Only]	
Rotation Step Angle	Sets rotation step angle of IPA operation. Can be selected the resolution between 0 and 10 degrees.
Total Rotation Angle	Sets total rotating angle of IPA operation. Can be set to [180°] or [360°].
Repeat	Sets the repeat count of IPA operation.
Left Fiber Right Fiber [FSM-100P/P+ Only]	
Method	Can be set to [Auto], [Diff.Fiber] or [Same Fiber].
Reference Model	Can be set to [Find Best], [*PANDA], [*BOWTIE], [*PANDA-S1], [*PANDA-S2], or [IPA Data] registered by [Fiber Data Learning]. For the details, see section [IPA Data].



- The IPA settings of [θ Alignment] and [Angle Offset Estimation] are common. If the IPA settings of [Angle Offset Estimation] are changed, the IPA settings of [θ Alignment] are also automatically changed to same settings.

Splice Mode

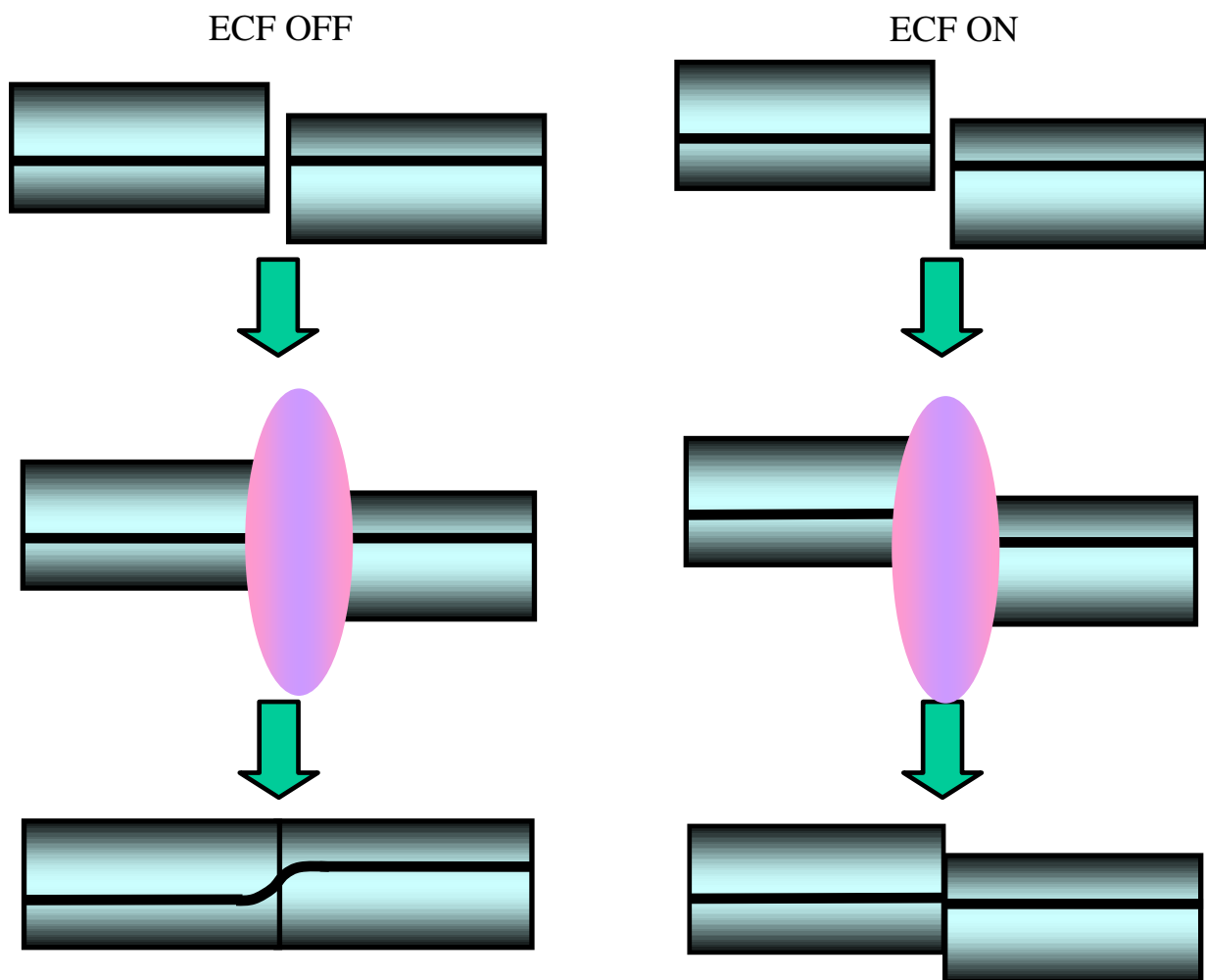
Parameter	Description
Rearc	
Rearc Power	Set the Rearc Power Depending on the selected Arc Calibration Method, [STD] or [SP] or [NC] is selected automatically.
Rearc Time	Set the rearc time.
Rearc On Time	Set the rearc on time.
Rearc Off Time	Set the rearc off time.
Electrode swing <small>Note:1</small>	Set On or OFF. Below 2 items are needed when ON is selected.
Swing home position <small>Note:1</small>	This is to set swing home position.
Swing stroke <small>Note:1</small>	This is to set electrode swing stroke

Parameter	Description
Error Limit Threshold	
Cleave Angle Limit	An error message is displayed if the cleave angle of either the left or right fiber ends exceeds the selected threshold (cleave limit). “OFF”: Does not make judgment on cleave angle.
Cleave Shape Error	Set the threshold of Cleave Shape Error limit. “OFF”: Does not make judgment on fiber angle.
Fiber Angle Limit	An error message is displayed if the bend angle of the two fibers spliced exceeds the selected threshold (Fiber Angle Limit). “OFF”: Does not make judgment on fiber angle.
Loss Limit	An error message is displayed if the estimated splice loss exceeds the selected threshold (loss limit). “OFF”: Does not make judgment on splice loss.
Angle Offset Limit	If [Angle Offset Method] is ON. Set the threshold of estimated Angle Offset error. When the estimated Angle Offset is higher than threshold, an error message is displayed. “OFF”: Will not scrutinize estimated Angle Offset.
Arc Center Limit	An error message is displayed if the center of the arc discharge exceeds the selected threshold (Arc Center Limit). If the value increases, it is easier to detect.
Bubble Sensitivity	Set the bubble error threshold. When the bubble is higher than the threshold, an error message is displayed.
Fat Sensitivity	Set the fat error threshold. When a bulge in the splice is higher than the threshold, an error message is displayed.
Thin Sensitivity	Set the thin error threshold. When a thin area of the splice is higher than the threshold, an error message is displayed.
Hot Spot Sensitivity	An error message is displayed if the arc discharge is abnormal (Hot Spot Sensitivity). If the value increases, it is easier to detect.

4. ECF

When fibers having some core concentricity-error are aligned using the core-to-core method, their outer claddings are not aligned in line with each other as shown below. However, surface tension created during arc discharge aligns the fibers cladding-to-cladding due to the viscous self-centering effect. This results in high splice loss due to the fact that the cores of the fibers are offset during the process.

The ECF (Eccentricity Correct Function) prevents the high splice loss from happening. The amount of offset expected due to this surface tension phenomenon is calculated in advance, and this is taken into account to determine an intentional core axis offset amount that is added after the fiber cores are aligned. With this function, the fibers are core-to-core spliced even with the effect mentioned above. Some “Core Step” may remain at splice point but this gives much lower splice loss than core axial offset. A long arc discharge counteracts ECF, because surface tension eventually aligns and splices fibers cladding-to-cladding. Canceling [ECF] by setting this “OFF” reduces core step amount and increases core axial offset.

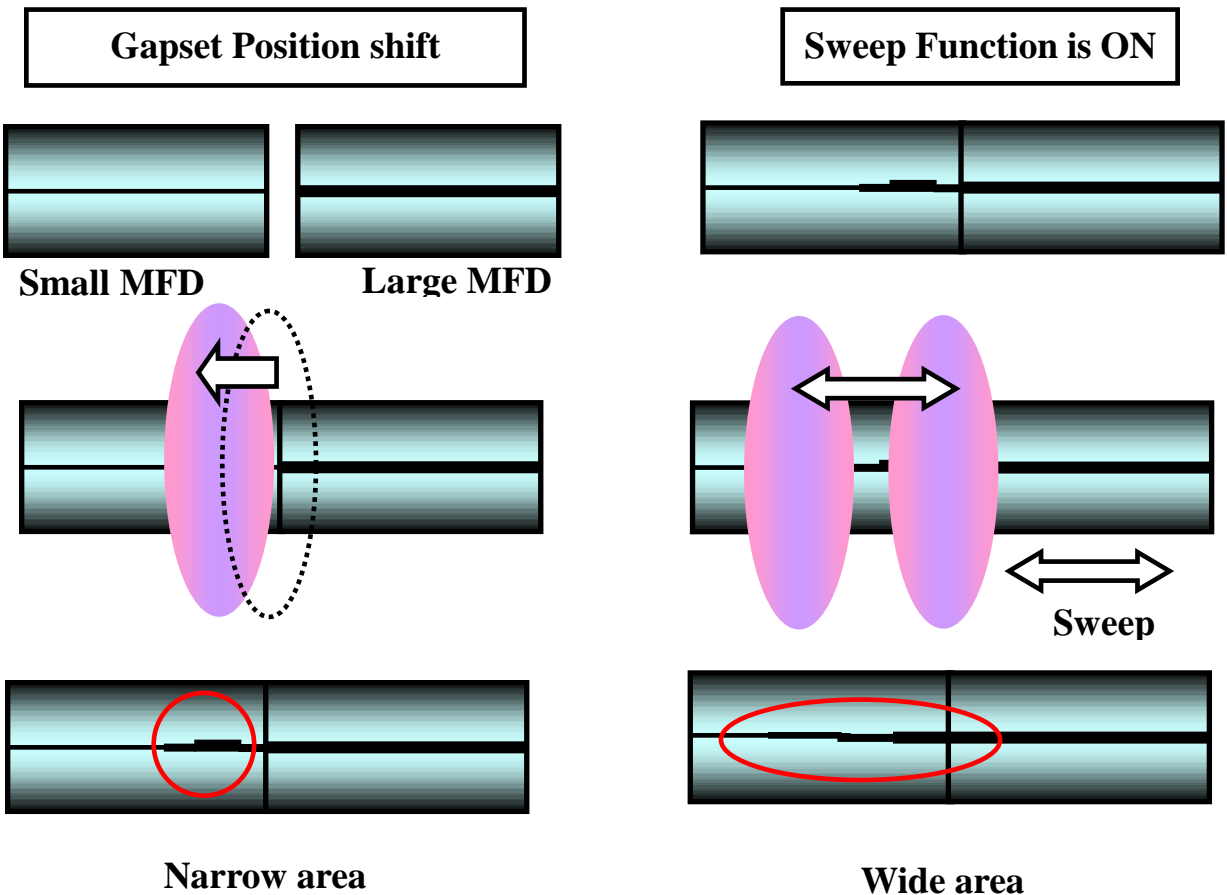
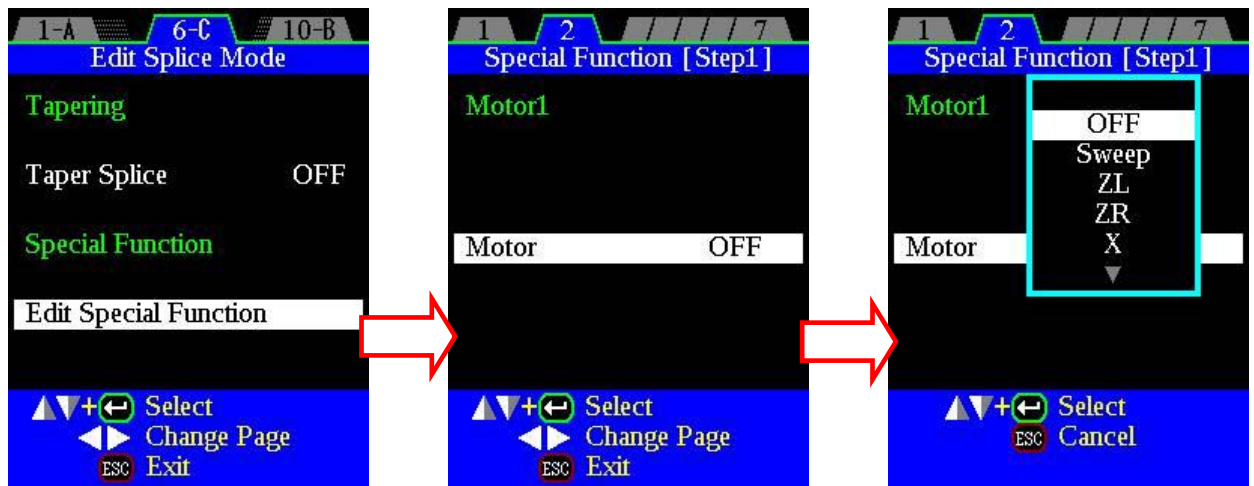


5. Sweep Function

This function heats the small MFD fiber by moving (sweeping) the Z-motor during an arc discharge. This function is effective for dissimilar MFD fiber splicing. The splice loss can be improved by heating the fiber if the MFD is small.

Set the Sweep Function

Select [Edit Splice Mode] → [Special Function] → [Step1] → [Motor] → [Sweep]



6. Manual Splicing Operations

6-1. Manual Splicing Options

The operations required to perform fiber splicing may be performed manually with the FSM-100 series fusion splicers. The following actions can be performed either automatically or manually:

(1) Gap Set:

Advance the left/right fibers forward to set the pre-splice gap position using the ZL (Z-Left) & ZR (Z-Right) motors.

NOTE: For manual gap set, select [Manual] as the Gap Set method parameter.

(2) X/Y Axial Alignment:

Perform alignment of either the fiber cladding or cores using the X & Y motors.

NOTE: For manual X/Y alignment, select [PAS] as the XY Alignment Method and select [Manual] as the XY Alignment Mode.

(3) θ Alignment:

Perform rotational θ alignment of PM or other specialty fiber using the θ R (right theta) and θ L (left theta) motors.

NOTE: For manual θ alignment, select [PAS], [Powermeter], [EV], or [EV Lock] for the left and right fiber θ Alignment Method and select [Manual] for the θ Alignment Mode.

IMPORTANT NOTE #1:

Selection of [Manual] operation for Gap Set automatically requires **Full Manual Mode Operation**, including manual X/Y Alignment and θ Alignment (if required for a PM fiber). Even if the parameters for X/Y Alignment and θ Alignment are not set to [Manual], X/Y Alignment and θ Alignment are ignored, and only manual alignment is possible once {Manual} Gap Set is selected.

IMPORTANT NOTE #2:

If **ANY** manual operation is selected (Manual Gap Set **or** Manual X/Y Alignment **or** Manual θ Alignment) the splicer will not perform both loss estimation and extinction ratio estimation.

IMPORTANT NOTE #3:

If Gap Set is performed automatically (if [Manual] Gap Set is ***not*** selected) X/Y Alignment and θ Alignment may independently be selected for [Manual] operation. Either X/Y Alignment or θ Alignment or both may be set to [Manual], and operation proceeds as described below:

(1) Automatic θ Alignment, Manual X/Y Alignment (Automatic Gap Set):

Gap is set automatically → θ rotation and alignment is performed automatically → Splicer pauses and displays manual alignment grid lines so operator can perform manual X/Y alignment → Operator presses **SET** key and fusion splicing is completed.

(2) Manual θ Alignment, Automatic X/Y Alignment (Automatic Gap Set):

Gap is set automatically → Splicer pauses and displays manual alignment grid lines so operator can perform manual θ rotation and alignment → Operator presses **SET** key and (a) Automatic X/Y alignment is performed and (b) fusion splicing is completed.

(3) Manual θ Alignment, Manual X/Y Alignment (Automatic Gap Set):

Gap is set automatically → Splicer pauses and displays manual alignment grid lines so operator can perform manual X/Y alignment and also manual θ rotation and alignment → Operator presses **SET** key and fusion splicing is completed.

6-2. Splicing Using Manual Gap Set (Full Manual Mode)

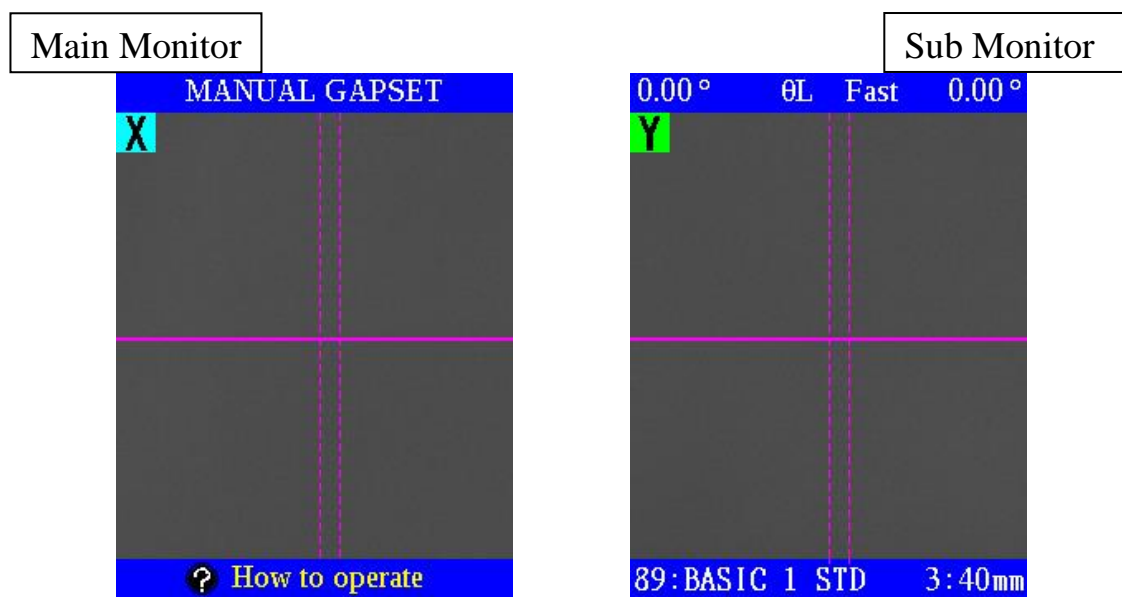
Setting the gap between to fiber ends manually is sometimes desirable. For example, some micro structured “holey” fibers have a dark image that may be difficult for the PAS image analysis to detect accurately. For this method, the Gap Set parameter is set to [Manual].

Please note that even though the gap set operation will be performed manually, an appropriate value (in microns) must be selected for both the [Gap] and [Gapset Position] parameters. The [Gap] and [Gapset Position] parameters will determine the position of two vertical grid lines that will appear on the splicer X/Y video images. These grid lines provide a guide to enable accurate setting of the starting gap between the fibers by manual motor movement.

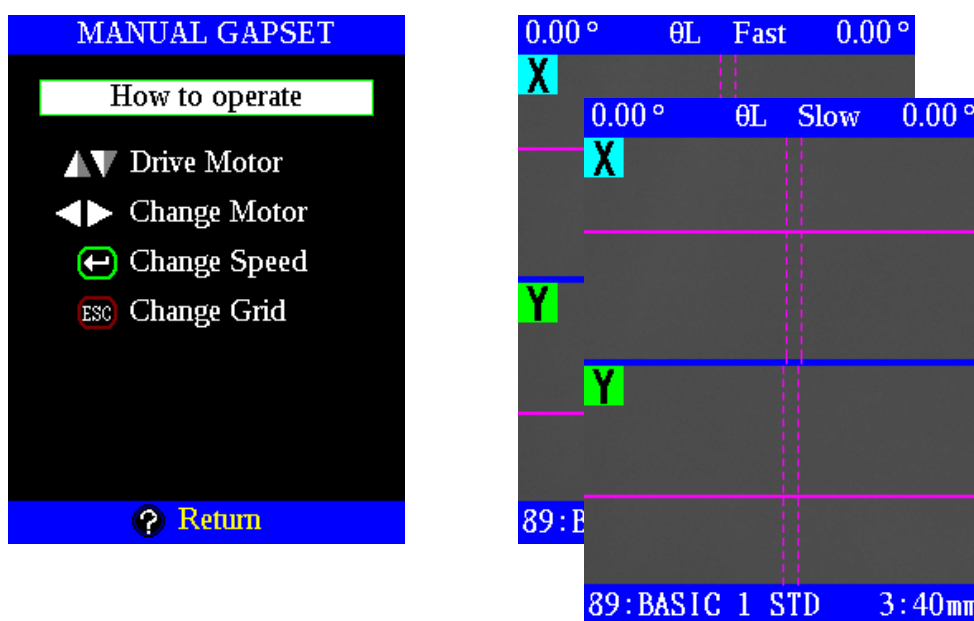
Splice Mode

Operation proceeds as follows:

- (1) When the **SET** key is pressed, the images below appear on the splicer monitors (but the fibers do not move forward or appear on the screen).

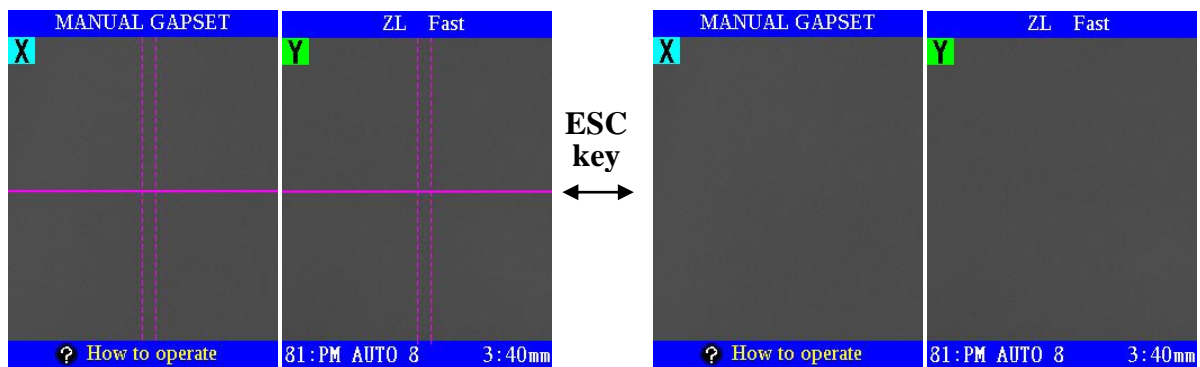


- (2) By pressing the **HELP** key, the manual gap set menu appears as shown below. Select the ZL motor for operation. Note that “ZL” will be displayed at the top of the monitor to indicate the selected motor.



- (3) Press the **Up/Down** key to move the ZL motor forward or backward to align the cleaved end of the left fiber with the left vertical grid line position. Change motor speed from “Fast” to “Slow” as required by pressing the **ENT** key. Use of the slow motor speed can help set the gap accurately.
- (4) Use the **Right/Left** key to select the ZR motor. Press the **Up/Down** key to drive the right fiber forward to the proper gap position indicated by the right vertical grid line.

- (5) After the manual gap set operation is completed, the fibers must be manually aligned. Select a motor to be manually moved by pressing the **Right/Left** key. The X Motor may be used to align the fibers in the X camera view on the splicer monitor. The Y Motor can be used to align the fibers in the Y camera view.
- (6) If rotational alignment of the fiber is required, select the θR motor to rotate the right fiber, and the θL motor to rotate the left fiber.
- (7) After X/Y and θ alignment, check to ensure that the gap set position is still correct. If necessary, use the ZL and ZR motors to readjust the gap set positions to the fiber cleaved ends are accurately aligned with the 2 vertical grid lines
- (8) The grid lines can be toggled ON and OFF by using the **ESC** key as shown below.



- (9) When alignment is complete, press the key to splice the fibers. The fusion arc will occur and the fibers will be automatically pushed together according



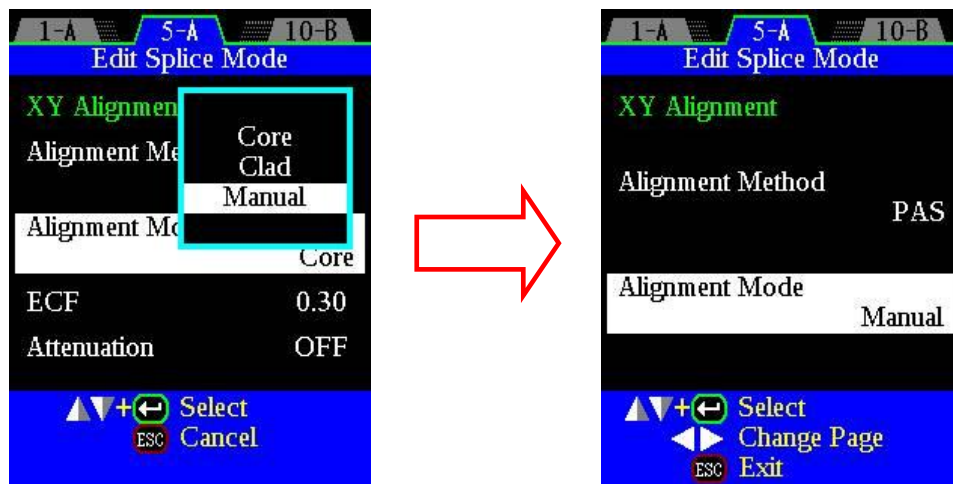
- During manual motor movement, the beeper sounds if the motor reaches its limit and the stops. Press the opposite arrow key to move the motor again.
- Displayed messages can be erased by pressing **ENT** key. Erased messages can be recovered by pressing the **ENT** key again.

Motor	UP	DOWN
ZL/ZR	Forward	Backward
X/Y	Upward	Downward
Focus X/Focus Y	Lens moves nearer fiber.	Lens moves away from fiber.
Theta L/Theta R	Forward	Backward

Splice Mode

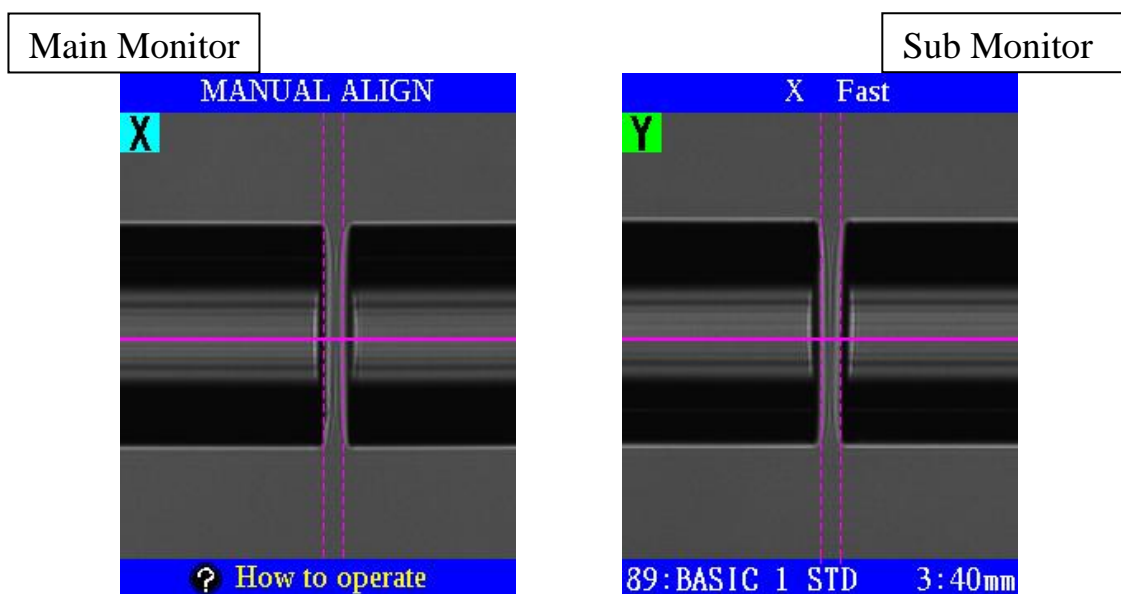
6-3. Splicing Using Manual X/Y Alignment

This method is to manually align and splice fibers. The following procedure uses automatic gap set of the fibers, as in the case of fully automatic splicing. However, X/Y alignment is performed manually. For this method, the Gap Set parameter is set to [Splicing], and other parameters of automatic gap set are utilized. The X/Y Alignment Method is set to [PAS] and the Alignment Mode is set to [Manual], as shown in the screen images below.

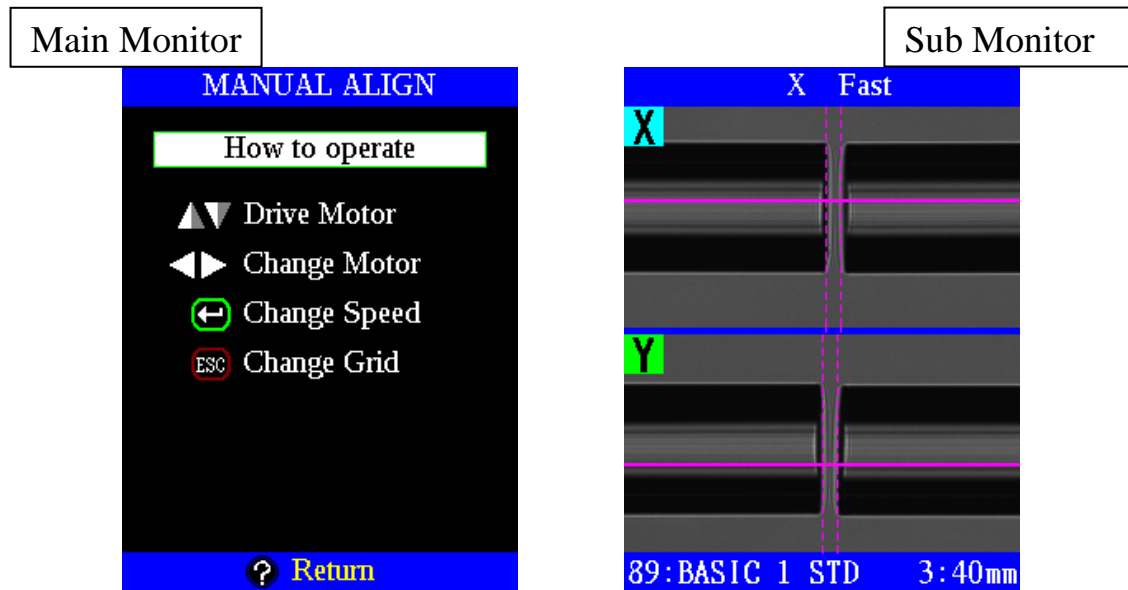


Operation proceeds as follows:

- (1) Press the **SET** key to drive the fibers forward automatically. The fibers stop moving forward at the programmed gapset position. The screen images below will appear.



- (2) By pressing the **HELP** key, the following display appears to guide manual alignment operation.



- (3) Select a motor to be manually moved by pressing the **Right/Left** key. The selected motor is displayed in the monitor. Motor speed can be set to “Fast” or “Slow” by pressing the **ENT** key. Press the **Up/Down** key to move the selected motor to drive the fibers forward or backward.
- (4) During manual alignment, the vertical and horizontal grid lines on the X/Y fiber image display are present to help guide alignment. The horizontal grid line helps guide lateral alignment of the fibers using the X and Y motors. The two vertical grid lines show the proper gap set positions for the left and right fiber cleaved ends. When automatic gap set is initially performed, the fiber ends will be aligned with the vertical grid lines. If the fiber end positions move slightly during X and Y motor movement as the fibers are manually aligned, by switching to the ZL motor the left fiber can be realigned to the left vertical grid line and the ZR motor can be used to realign the right fiber to the right vertical grid line. The grid lines can be toggled ON and OFF by using the **ESC** key.
- (5) After manual alignment is completed, press the **SET** key to perform the fusion arc and splice the fibers. The splicing process will then proceed according to the splice mode parameters that have been programmed for [Prefuse], [Overlap] and [Main Arc]. Loss estimation will not be performed.

7. Attenuation Splice Mode

This is a special mode to produce axial offsets during splicing in order to make attenuators. Attenuation splice mode is selected when the following selections are met; [Attenuation] on, [Unit Of Align Target] selected with [XY Alignment] in [Edit Splice Mode] selected.

μm Mode

Select [μm] in [Unit Of Align Target] and enter the offset amount in [Align Target (μm)]. Using the preset [Arc Power] and [Arc Time], a series of shorter duration arcs is used to help the fibers creep toward the fiber centers to the [Atten. Target (μm)] during each arc. The splicer does not estimate the splice loss in this mode.

dB Mode

Select [dB] in [Unit Of Align Target] referring to the amount entered in [Align Target (dB)] and [MFD] with core alignment. The splicer uses the preset [Arc Power] and [Arc Time] to complete the splice.

In [dB Mode], the estimated splice loss is displayed on the screen. In some cases, the correct value of estimated loss is not displayed because unidentified fibers have been spliced together. Therefore, it is recommended that a power meter be used to confirm the splice loss.

dBm Mode

Select [dBm] in [Unit Of Align Target] referring to the amount entered in [Align Target (dBm)] with power meter feedback. The splicer produces the first-arc discharge at the preset [Arc Power] and [Arc Time]. Next, short duration arcs are enabled until the power meter value corresponds with the value of [Atten.Target (dBm)]. The splicer then displays the power meter reading.



- [μm Mode] provides more stable performance than [dB Mode], but some variation may inevitably occur. To decrease variations, set the [Cleave limit] as low as possible.
- Attenuation splices made with [dB Mode] and [μm Mode] are not as accurate as [dBm Mode] or power meter attenuation feedback splicing.
- If [θAlign] is made effective, it is also possible to make PM fiber attenuators.

8. Power Meter Feedback Alignment

The FSM-100 series can be connected to a power meter via GP-IB port and USB port. Therefore, the RIDS alignment method can be used with power meter and polarizer/depolarizer.

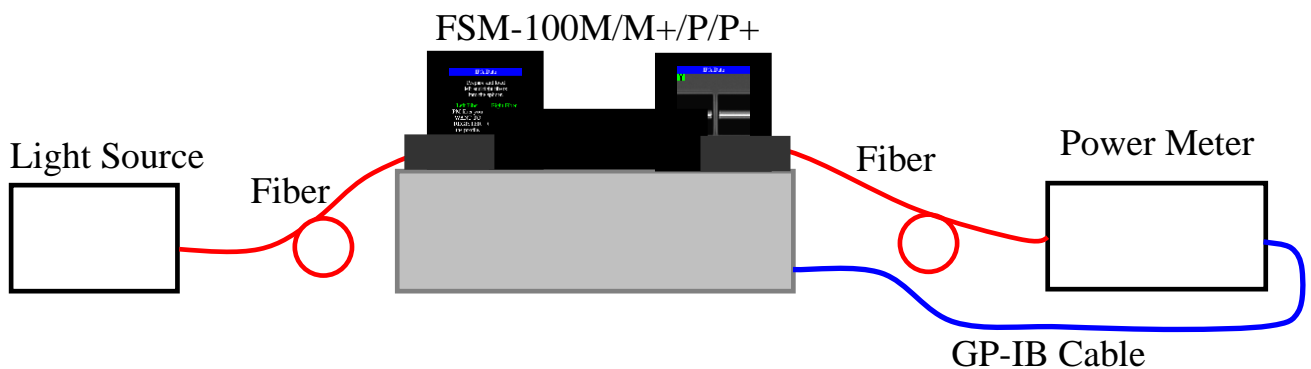
Power Meter Alignment by the GP-IB Port

Set the GP-IB address and type of the optical power meter at the [Machine Settings].

- See Section [Machine Settings] → [Power Meter Alignment]

XY Align with Power Meter Feedback

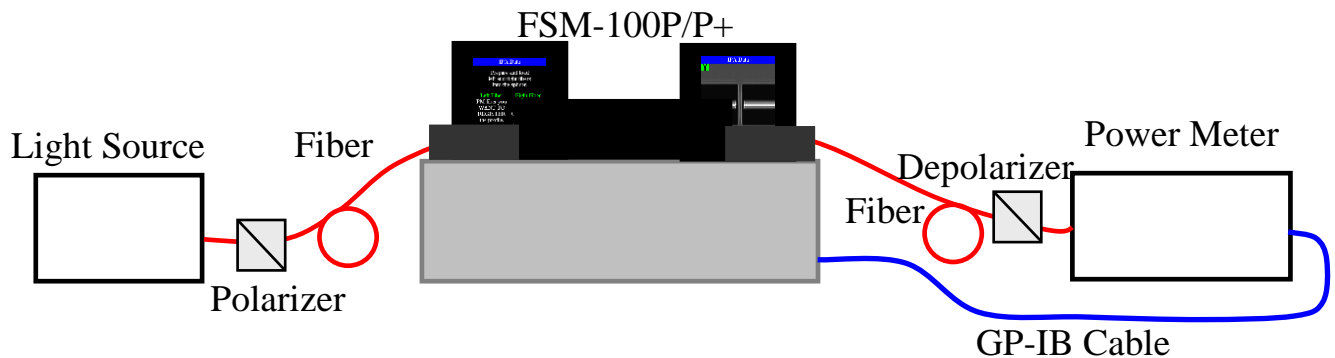
Connect the splicer, light source, and power meter as shown.



The splicer aligns X- and Y-axis to make the power meter value as strong (weak) as possible MAX (MIN).

θ Align with Power Meter Feedback

Connect the splicer, light source, power meter, polarizer, and depolarizer as shown.



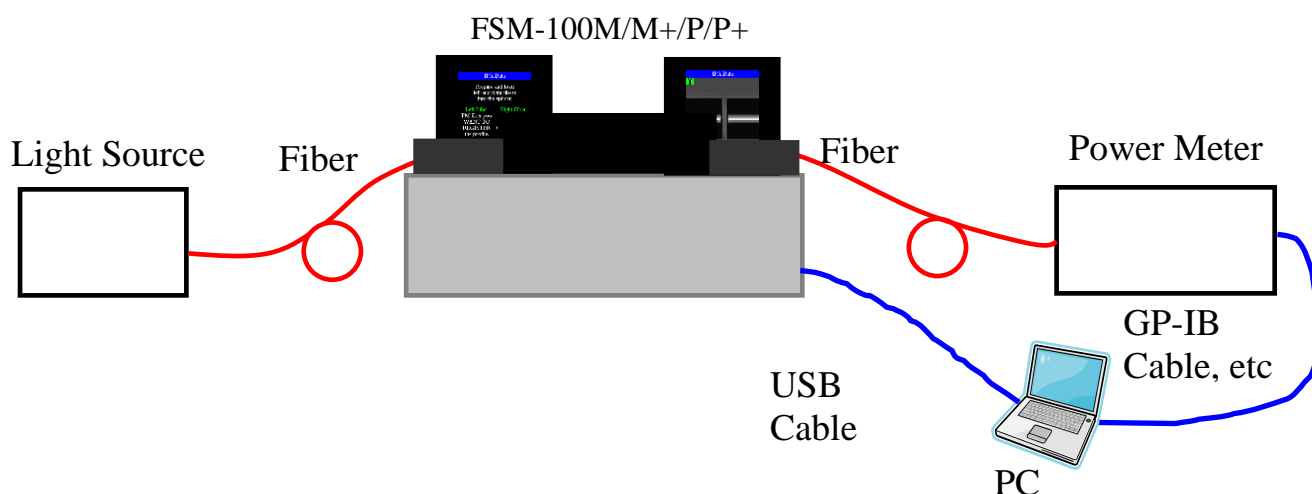
Set [θ Align] to [P Max] or [P Min]. See [Checking or Editing Splice Mode]. In case of [P Max], the splicer aligns θ -axis to make the power meter value as high as possible, MAX. On the other hand, in case of [P Min], the splicer aligns θ -axis to make the power meter value as low as possible, MIN.

Power Meter Alignment by the USB port

Set [External Instrument] to [USB] in [Machine Settings]. Connect the PC, the splicer, and the power meter. The splicer executes power meter alignment by the USB port. For the detailed information of the communication method of the PC and the splicer, see the documents "Fsm100_Command ReferenceManual(*).pdf", "UsbFsm100Server_Manual(*).pdf" in the folder "\API" on the Instruction CD. For the detailed information of the communication method of the PC and the power meter, see the power meter's manual.

XY Align with Power Meter Feedback

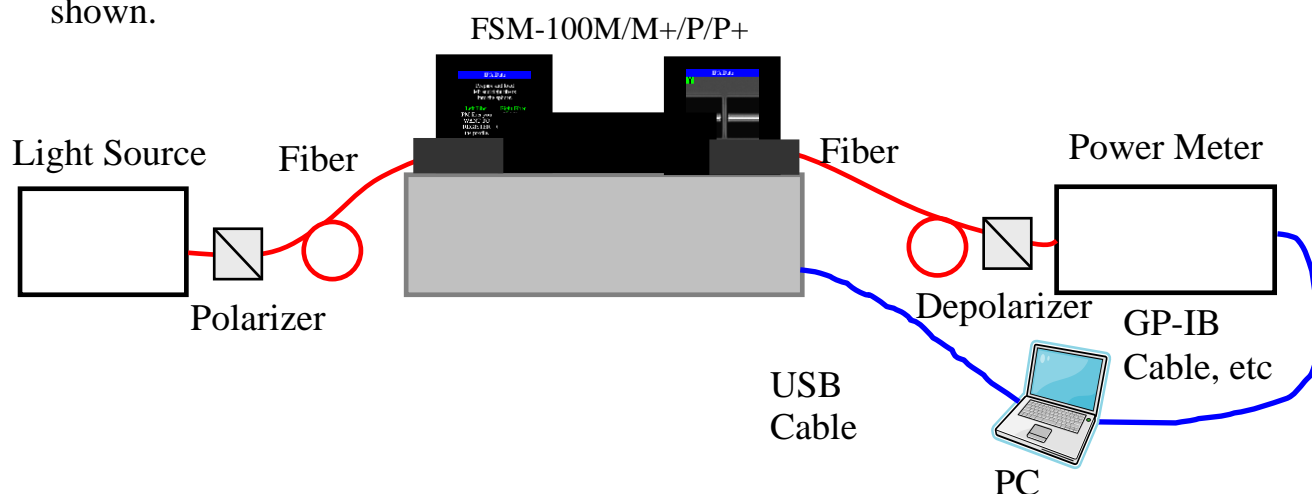
Connect the PC, the splicer, light source, and power meter as shown.



The splicer aligns X- and Y-axis to make the power meter value as strong (weak) as possible MAX (MIN).

θ Align with Power Meter Feedback

Connect the PC, the splicer, light source, power meter, polarizer, and depolarizer as shown.



Set [θ Align] to [P Max] or [P Min]. See [Checking or Editing Splice Mode]. In case of [P Max], the splicer aligns θ -axis to make the power meter value as high as possible, MAX. On the other hand, in case of [P Min], the splicer aligns θ -axis to make the power meter value as low as possible, MIN.

For [P Max]

Before θ -axis aligning, adjust the polarizer and the depolarizer so that the value of the power meter is at maximum.


For [P Min]

Before θ -axis aligning, adjust the polarizer and the depolarizer so that the value of the power meter is at minimum.

For [XY Align] – [P Meter], and [θ Align] – [P Min]

Before θ -axis aligning, adjust the polarizer and the depolarizer so that the value of the power meter is at minimum. After finishing θ -axis aligning, the splicer will pause. At this pause, adjust the polarizer and the depolarizer so that the value of the power meter is at maximum for XY-axis aligning.

[P Min] aligning can align θ -axis more accurately than [P Max] aligning, because the power level change more pronounced, sensitive, at the minimum level. However, for [P Min] aligning, the power meter must measure the power level to less than -80dBm.

- See the instruction manual of the power meter for details of the power meter parameter settings.
- When using HP8153A/8163, set the sampling time of the selected channel to 20ms. The indicated power level on the HP8153A/8163 is sometimes locked.  This problem is caused by an HP8153A/8163 characteristic. Even if the indicator is locked, the power meter feed back function works correctly. To prevent the indicator locking, disconnect the unused channel or set the sampling time of the unused channel to 60min.

9. Special Function settings for tapering

The splicer has the ability to taper the fiber with the special function.

There are two methods to taper the fiber as below.

- i) Tapering by ZR and ZL motors
- ii) Tapering by Sweep and ZR (or ZL) motors

Since the max taper length and processing accuracy are different from the method each, please select the suitable method for your purpose.

- i) Tapering by ZR and ZL motors

Max taper length: 5 mm for FSM-100M/P and 18 mm for FSM-100M+/P+

Accuracy: High

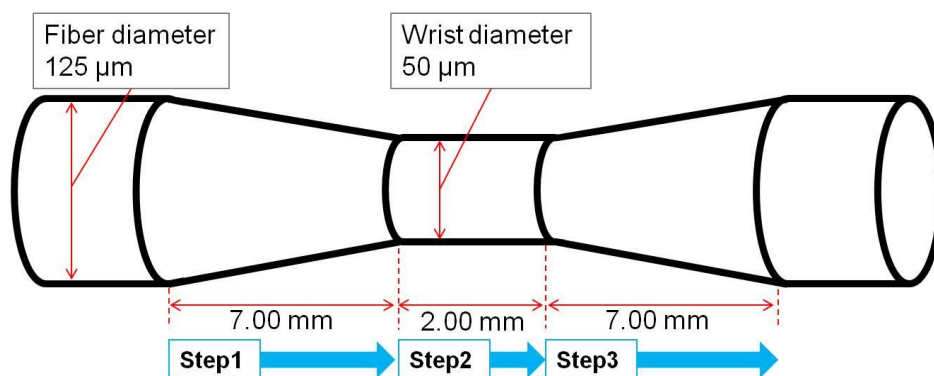
- ii) Tapering by Sweep and ZR (or ZL) motors

Max taper length: 10 mm for FSM-100M/P and 36 mm for FSM-100M+/P+.

Accuracy: Normal

Parameter Settings for tapering

This section describes how to use special function for tapering with specific examples.



For the above taper, you need to set three steps, [Step 1], [Step 2] and [Step 3] in [Special Function]. The fiber shape is changed step by step.

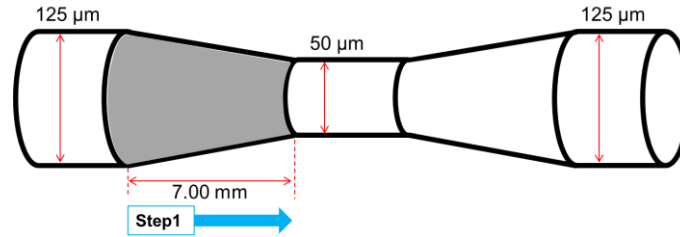
[Step 1]: The fiber is tapered from 125um to 50um in diameter for 7.00mm in length.

[Step 2]: The fiber is pulled constant in diameter for 2.00mm in length.

[Step 3]: The fiber is tapered from 50um to 125um in diameter for 7.00mm in length.

In the following pages, show you how to set up specific parameters for [Step 1], [Step 2] and [Step 3].

[Step 1]: The fiber is tapered from 125μm to 50μm in diameter for 7.00mm in length.



Set the parameters for [Step 1] in [Special Function] as table below.

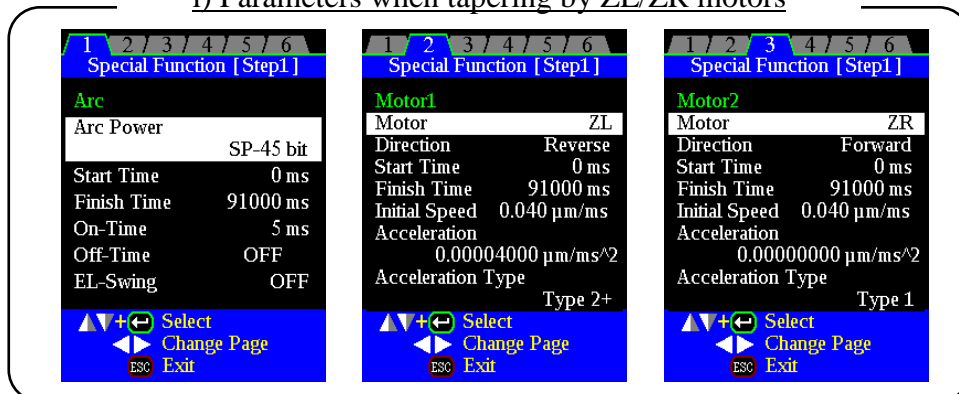
	i) Tapering by ZL/ZR motors		ii) Tapering by Sweep/ZR motors	
Parameter	Arc		Arc	
Arc Power	SP – 45 bit		SP – 45 bit	
Start Time	0 ms		0 ms	
Finish Time	$T_1 = L_1 \times (R^2 + R + 1) / (3 \times V_{\text{feed}})$ $= 7000 \times (0.4^2 + 0.4 + 1) / (3 \times 0.04)$ $= 91000 \text{ ms}$		$T_1 = L_1 \times (R^2 + R + 1) / (3 \times V_{\text{feed}})$ $= 7000 \times (0.4^2 + 0.4 + 1) / (3 \times 0.04)$ $= 91000 \text{ ms}$	
Parameter	Motor1	Motor2	Motor1	Motor2
Motor	ZL	ZR	Sweep	ZR
Direction	[Reverse]	[Forward]	[Left]	[Reverse]
Start Time	0 ms	0 ms	0 ms	0 ms
Finish Time	T_1	T_1	T_1	T_1
Initial Speed	V_{feed}	V_{feed}	V_{feed}	V_{feed}
Acceleration	$a_1 = R/10000$ $= 0.4/10000$ $= 0.00004000$	0.00000000 (OFF)	$a_1 = R/10000$ $= 0.4/10000$ $= 0.00004000$	$a_1 = R/10000$ $= 0.4/10000$ $= 0.00004000$
Acceleration Type	[Type 2+]	[Type 1]	[Type 2+]	[Type 3+]

L_1 : taper section length in [Step 1] = 7.0mm = 7000 μm

R : taper ratio = wrist diameter/fiber diameter = 50/125 = 0.4

V_{feed} : fiber feeding speed = 0.04 μm/ms (default value)

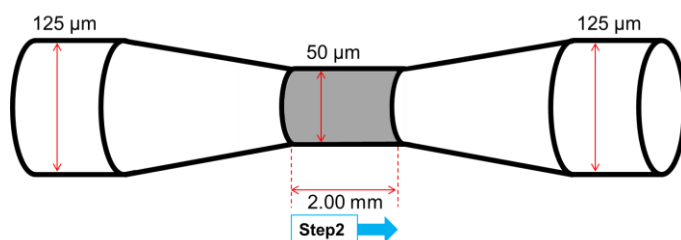
i) Parameters when tapering by ZL/ZR motors



• If you are not able to taper as designed in the above settings, please change the “arc power” or “fiber feeding speed”.

Splice Mode

[Step 2]: The fiber is pulled constant in diameter for 2.00mm in length.



Set the parameters for [Step 2] in [Special Function] as table below.

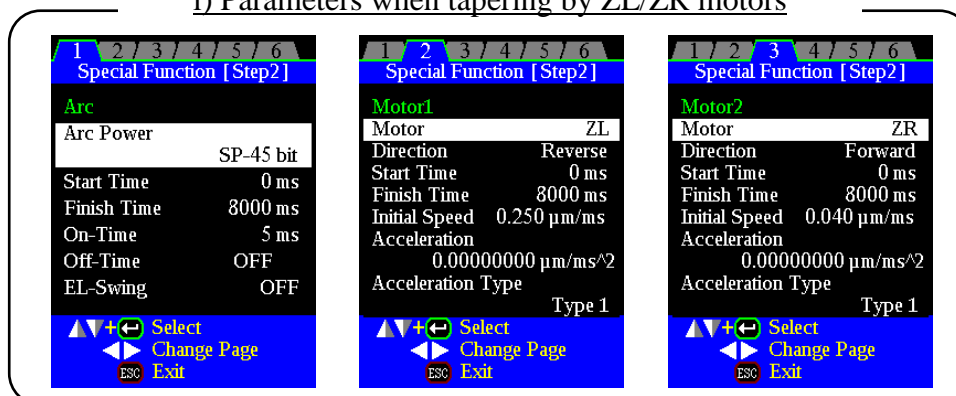
	i) Tapering by ZL/ZR motors		ii) Tapering by Sweep/ZR motors	
Parameter	Arc		Arc	
Arc Power	SP – 45 bit		SP – 45 bit	
Start Time	0 ms		0 ms	
Finish Time	$T_2 = L_2/V_L$ $= 2000/0.25$ $= 8000 \text{ ms}$		$T_2 = L_2/V_{swp}$ $= 2000/0.25$ $= 8000 \text{ ms}$	
Parameter	Motor1	Motor2	Motor1	Motor2
Motor	ZL	ZR	Sweep	ZR
Direction	[Reverse]	[Forward]	[Left]	[Reverse]
Start Time	0 ms	0 ms	0 ms	0 ms
Finish Time	T_2	T_2	T_2	T_2
Initial Speed	$V_L = V_{feed}/R^2$ $= 0.04/0.4^2$ $= 0.25$	V_{feed}	$V_{Swp} = V_{feed}/R^2$ $= 0.04/0.4^2$ $= 0.25$	$V_Z = V_{Swp} - V_{feed}$ $= 0.25 - 0.04$ $= 0.21$
Acceleration	0.00000000 (OFF)	0.00000000 (OFF)	0.00000000 (OFF)	0.00000000 (OFF)
Acceleration Type	[Type 1]	[Type 1]	[Type 1]	[Type 1]

L_2 : taper section length in [Step 2] = 2.0mm = 2000 μm

R: taper ratio = wrist diameter/fiber diameter = 50/125 = 0.4

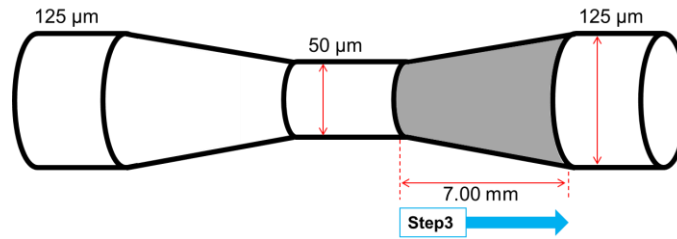
V_{feed} : fiber feeding speed = 0.04 $\mu\text{m}/\text{ms}$ (default value)

i) Parameters when tapering by ZL/ZR motors



• If you are not able to taper as designed in the above settings, please change the “arc power” or “fiber feeding speed”.

[Step 3]: The fiber is tapered from 50μm to 125μm in diameter for 7.00mm in length.



Set the parameters for [Step 3] in [Special Function] as table below.

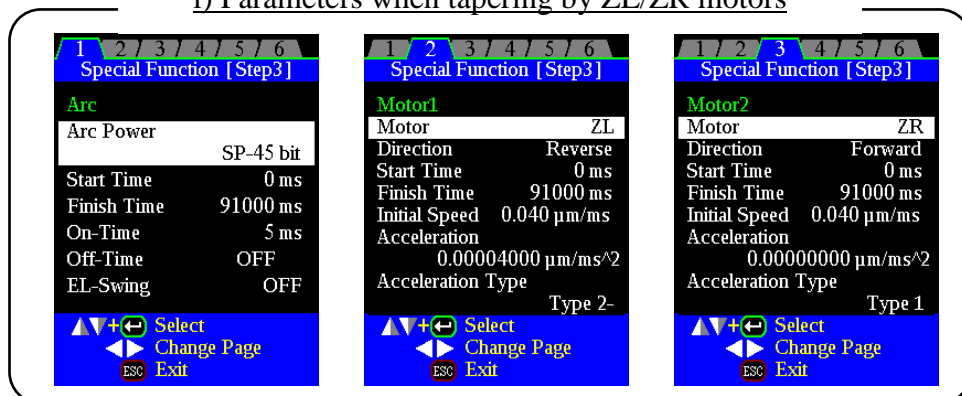
	i) Tapering by ZL/ZR motors		ii) Tapering by Sweep/ZR motors	
Parameter	Arc		Arc	
Arc Power	SP – 45 bit		SP – 45 bit	
Start Time	0 ms		0 ms	
Finish Time	$T_3 = L_3 \times (R^2 + R + 1) / (3 \times V_{\text{feed}})$ $= 7000 \times (0.4^2 + 0.4 + 1) / (3 \times 0.040)$ $= 91000 \text{ ms}$		$T_3 = L_3 \times (R^2 + R + 1) / (3 \times V_{\text{feed}})$ $= 7000 \times (0.4^2 + 0.4 + 1) / (3 \times 0.040)$ $= 91000 \text{ ms}$	
Parameter	Motor1	Motor2	Motor1	Motor2
Motor	ZL	ZR	Sweep	ZR
Direction	[Reverse]	[Forward]	[Left]	[Reverse]
Start Time	0 ms	0 ms	0 ms	0 ms
Finish Time	T_3	T_3	T_3	T_3
Initial Speed	V_{feed}	V_{feed}	V_{feed}	V_{feed}
Acceleration	$a_3 = R/10000$ $= 0.4/10000$ $= 0.00004000$	0.00000000 (OFF)	$a_3 = R/10000$ $= 0.4/10000$ $= 0.00004000$	$a_3 = R/10000$ $= 0.4/10000$ $= 0.00004000$
Acceleration Type	[Type 2-]	[Type 1]	[Type 2-]	[Type 3-]

L_3 : taper section length in [Step 3] = 7.0mm = 7000 μm

R : taper ratio = wrist diameter/fiber diameter = 50/125 = 0.4

V_{feed} : fiber feeding speed = 0.04 μm/ms (default value)

i) Parameters when tapering by ZL/ZR motors



• If you are not able to taper as designed in the above settings, please change the “arc power” or “fiber feeding speed”.

Cleave length Settings for tapering

To make a long taper, we need to pull the fiber from one side and feed fiber from the other side. At feeding side, we need to make sure that there is enough fiber length for the feeding. If the feeding or pulling distance is not enough, one of the motor will run out of space and we shall see the “Motor Overrun” error. There are many different ways to set the initial position for fiber tapering. As a general method, cleave length can be used for the setting. The same taper example described above will be used.

$$R: \text{taper ratio} = \text{wrist diameter} / \text{fiber diameter} = 50/125 = 0.4$$

$$L: \text{total taper length} = L_1 + L_2 + L_3 = 7.0 \text{ mm} + 2.0 \text{ mm} + 7.0 \text{ mm} = 16 \text{ mm}$$

$$L_{1\text{feed}} = L_1 \times (R^2 + R + 1) / 3 = 7.0 \times (0.4^2 + 0.4 + 1) / 3 = 3.64 \text{ mm}$$

$$L_{2\text{feed}} = L_2 \times R^2 = 2.0 \times 0.4^2 = 0.32 \text{ mm}$$

$$L_{3\text{feed}} = L_3 \times (R^2 + R + 1) / 3 = 7.0 \times (0.4^2 + 0.4 + 1) / 3 = 3.64 \text{ mm}$$

$$L_{\text{feed}} = L_{1\text{feed}} + L_{2\text{feed}} + L_{3\text{feed}} = 3.64 + 0.32 + 3.64 = 7.6 \text{ mm}$$

i) For tapering by ZL and ZR motors

Left side cleave length should be always standard, i.e., 9 mm for cladding clamping and 4 mm for coating clamping.

Right side cleave length should be 9 mm plus integer of total feeding length. In our example, the cleave length = $9 + \text{Int}(L_{\text{feed}}) = 9 + \text{Int}(7.6) = 16 \text{ mm}$.

ii) For tapering by Sweep and ZR motors

In this case we need to move the sweep motor to right direction by half to total taper length ($L/2$). So, the cleave length parameter setting and actual cleave length is not the same.

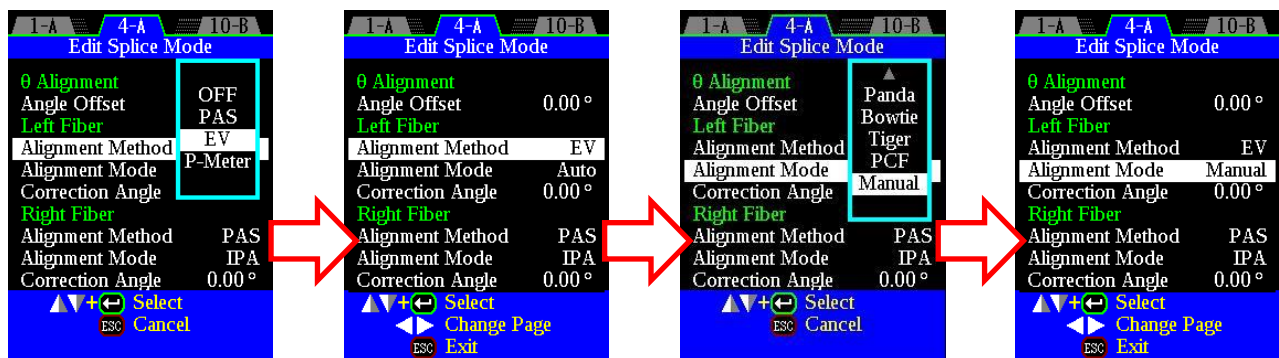
For the left side cleave length parameter setting, it should be 9 mm plus half of total cleave length. In our example, the left cleave length setting = $9 + \text{Int}(L/2) = 9 + \text{Int}(16/2) = 16 \text{ mm}$. But the actual left side fiber cleave length is still 9 mm.

For right side cleave length parameter setting it should be 9 mm plus half of total taper length minus total feeding length. In our example, the cleave length setting = $9 + \text{Int}(L/2 - L_{\text{feed}}) = 9 + \text{Int}(16/2 - 7.6) = 9 \text{ mm}$. But the actual cleave length should be total feeding length. In our example, the actual cleave length = $9 + L_{\text{feed}} = 9 + 7.6 = 16.6 \text{ mm}$.

10. Manual fiber alignment using End-view observation system (FSM-100P+ only)

FSM-100P+ has the capability to enable θ alignment of the optical fibers manually using the End View observation system during splicing.

In order to activate the manual θ alignment function with EV observation, go to the page 4-A [θ Alignment] of the Edit Splice Mode menu and then set [Alignment Method] to [EV] and [Alignment Mode] to [Manual] (FSM-100P+ only).



- If you use End-View observation system, you must use the special End-View fiber holders with model numbers FH-100-***EV. *** indicates the coating diameter of the fiber to be used.

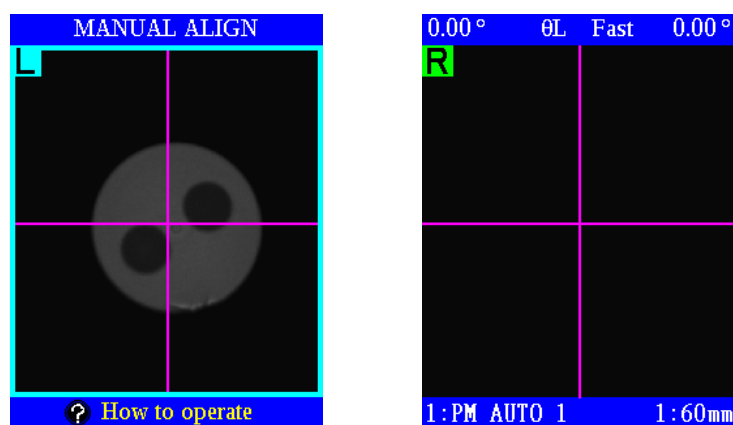
Splice Mode

The procedure of manual alignment using the EV observation system is very different from the ordinary manual alignment procedure.

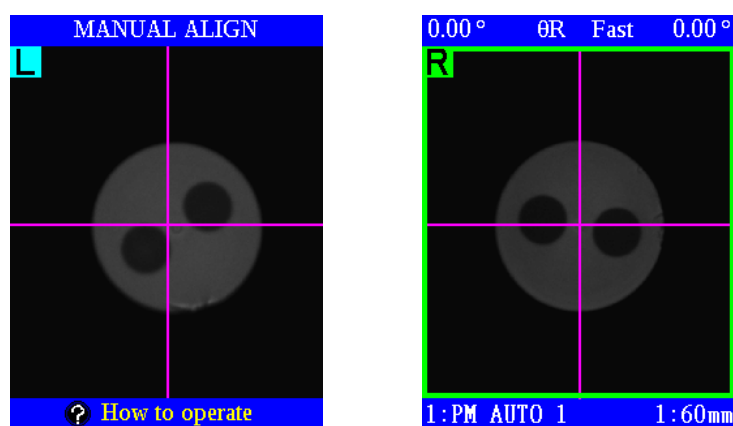
If manual alignment with EV observation is selected, you should follow the procedure as shown below at the time of MANUAL ALIGN status during splicing.

- (2) Press **SET** so that left and right optical fibers move forward until they reach the proper positions. Then [MANUAL ALIGN] is displayed at the top of the left monitor.

The end face of the left fiber will be shown on the left monitor. The end face of right fiber is not shown at this time.

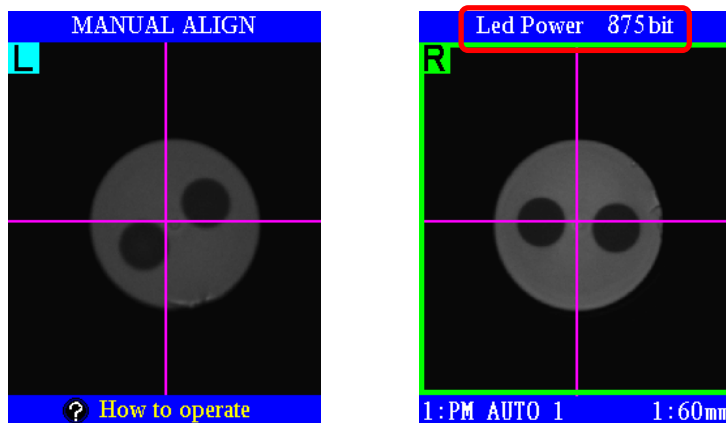


- (2) The target view that the EV system observes is changed to the opposite side fiber if **X/Y** is pressed. The end face of the right fiber will be shown on the right monitor when the **X/Y** key is pressed. Only the image of the selected side is updated in real-time. The image of the other side is frozen until **X/Y** is pressed again to switch back to active observation of that fiber.



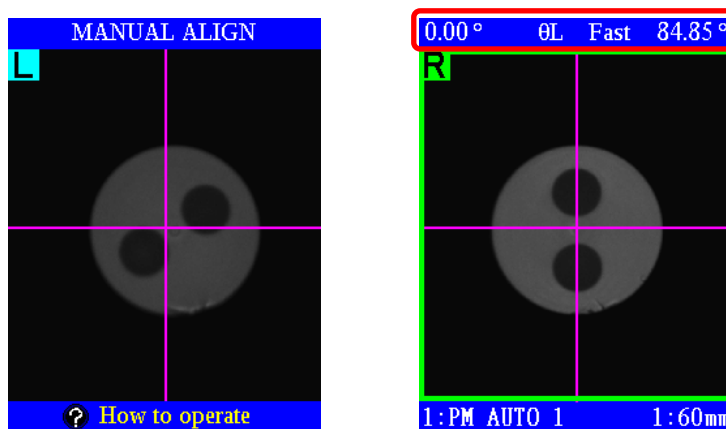
•**IMPORTANT NOTE:** Only the image of the selected side is updated in real-time. You cannot observe the change of fiber position if the target side for observation and the target side for motor operation do not match each other.

- (3) If the **Menu** key is pressed once, the splicer displays the illumination brightness data. The current LED power that determines the brightness of the images is displayed at the top of the right monitor. You can adjust the brightness using the **UP** and **DOWN** keys. The splicer exits from the brightness adjustment mode if the **MENU** key is pressed again.



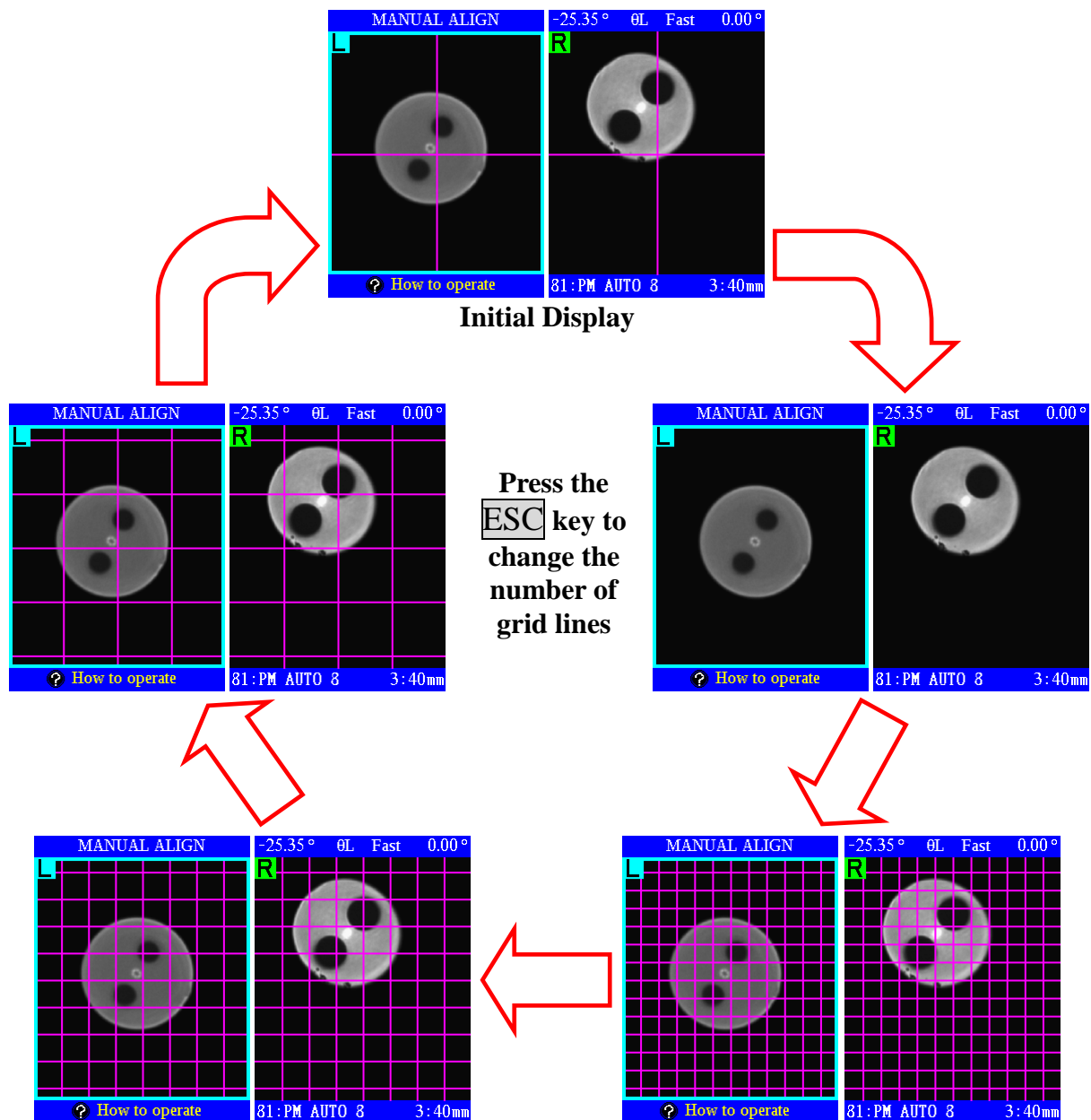
- If the external LED light source is connected to the rear of the splicer, the LED power of the external light source is adjusted by the brightness adjustment mode as explained above.

- (4) If the splicer is not in the brightness adjustment mode, you can operate X, Y, θ L and θ R motors forward or reverse using the **UP** and **DOWN** keys. The motor to be operated is selected by using the **LEFT** and **RIGHT** keys. If a θ motor is selected, the rotation angles for each fiber are displayed at the top of the right monitor. The number on the right side is the rotation angle of the right fiber. The number on the left side is the rotation angle of the left fiber.



Splice Mode

- (5) The number of grid lines shown in the left and right fiber End-View images can be changed by pressing the **ESC** key, as shown below. Initially, only one vertical and one horizontal grid line are displayed in each End-View image. By pressing the **ESC** key once, the grid lines disappear. When the **ESC** key is pressed again, the maximum number of grid lines appears. After that, each time the **ESC** key is pressed, the number of grid lines decreases until there is once again only one vertical and one horizontal grid line.



- (6) After alignment is finished, press the **SET** key and the splicer will exit the **[MANUAL ALIGN]** menu and continue the splicing process.

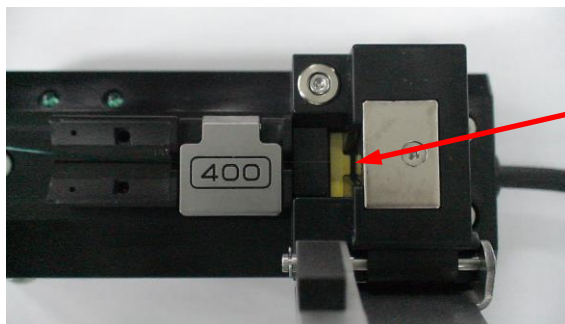


- “End-view observation” normally uses light launched by an LED located in the splicer just outside the fiber holder position. However, color-coated fiber may not function well with the internal LED. If the internal LED cannot provide sufficient illumination for a good End-View image, use external light source provided in the standard accessory set.

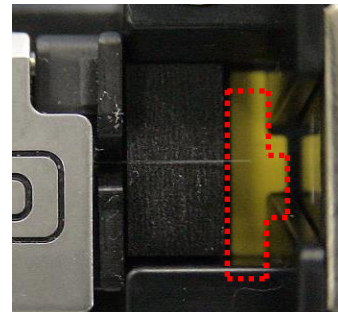
- (1) Connect the LED cord to the external power port behind the splicer.
- (2) Set prepared fiber into the light source.
- (3) Open the external light source lid.



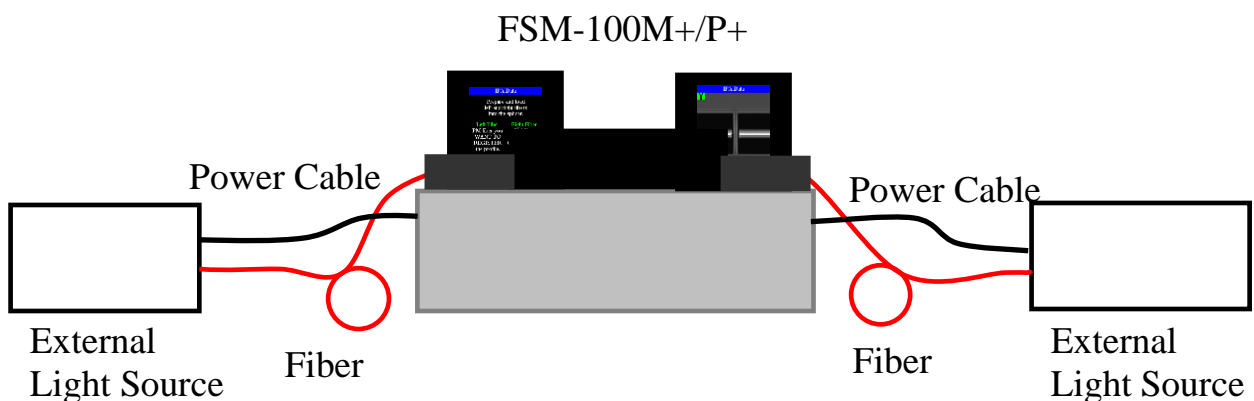
- (4) Set the fiber so that the cleaved end is in the yellow area.



If the fiber is not correctly set, the fiber's cleaved end may hit the LED and may damage the LED.



- (5) Close the external light source lid.



Heater Mode

1. Heater Type

A Sleeve Heater or an optional Fiber Straightener is installed on the splicer.

The Sleeve Heater is for heat shrinking splice protection sleeves.

Sleeve Heater



For heat shrinking the splice protection sleeve



Fiber Straightener is for straightening the coating fiber (eliminating fiber curl).

Fiber Straightener



For eliminating fiber curl by relaxing the fiber coating before splicing



2. Heater Menu (Sleeve Heater)

There are 30 user-programmable heating modes. Select the most suitable mode for the protection sleeve used.

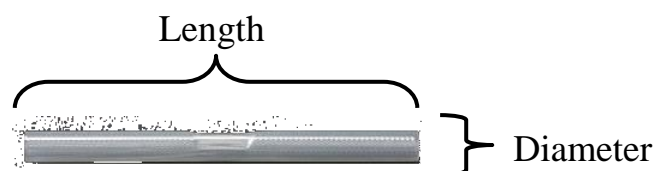
Each tube-heating mode is optimized for a type of Fujikura protection sleeve. These modes can be found in the database area for reference. Select the most appropriate database mode for the Sleeve Type in the Edit Heater Mode menu in order to paste it to the user-programmable area. The operator can edit the user-programmable modes as required (for example, to optimize for non-Fujikura sleeves, or a special length or type of sleeve).

Parameter	Description
60mm	For standard 60mm protection sleeves, such as the Fujikura FP-03 or FP-03M protection sleeve.
60Ny8	For standard 60mm protection sleeves, such as the Fujikura FP-03 or FP-03M protection sleeve. Note: This mode is optimized for fibers with a 900um jacket such as Nylon or Hytrel. It is also optimized for an 8mm cleave length.
40mm	For standard 40mm protection sleeves, such as the Fujikura FP-03 (L=40).
45mmC	For 45mm micro sleeves, such as the Fujikura FPS01-900-45.
34mmC	For 34mm micro sleeves, such as the Fujikura FPS01-900-34.
25mmC	For 25mm micro sleeves, such as the Fujikura FPS01-900-25.
40mmB	For 40mm micro sleeves, such as the Fujikura FPS01-400-40.
34mmB	For 34mm micro sleeves, such as the Fujikura FPS01-400-34.
25mmB	For 25mm micro sleeves, such as the Fujikura FPS01-400-25.
20mmB	For 20mm micro sleeves, such as the Fujikura FPS01-400-20.

Dimensions of the protection sleeve after shrinking:

- Example of FP-03 (60)

Length : 60~62mm
Diameter : 3.3~3.7mm

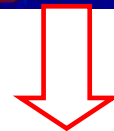
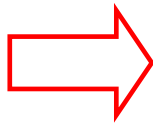


- The dimensions of the splice protection sleeve after the heat shrink operation will vary depending on the diameter of the fiber and fiber coating.

Heater Mode

2-1. Heater Mode (Sleeve)

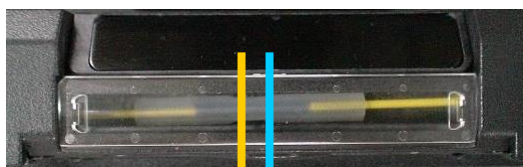
Select the heater mode most suitable for the protection sleeve to be used.



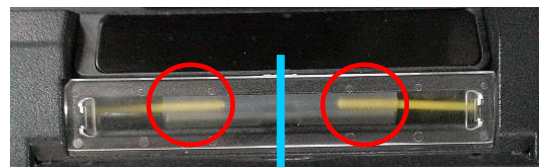
Make sure the splice point is located in the center of the protection sleeve.



《Fiber setting for Sleeve Heater》



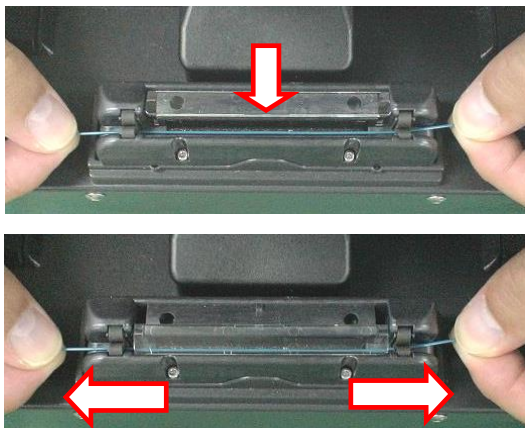
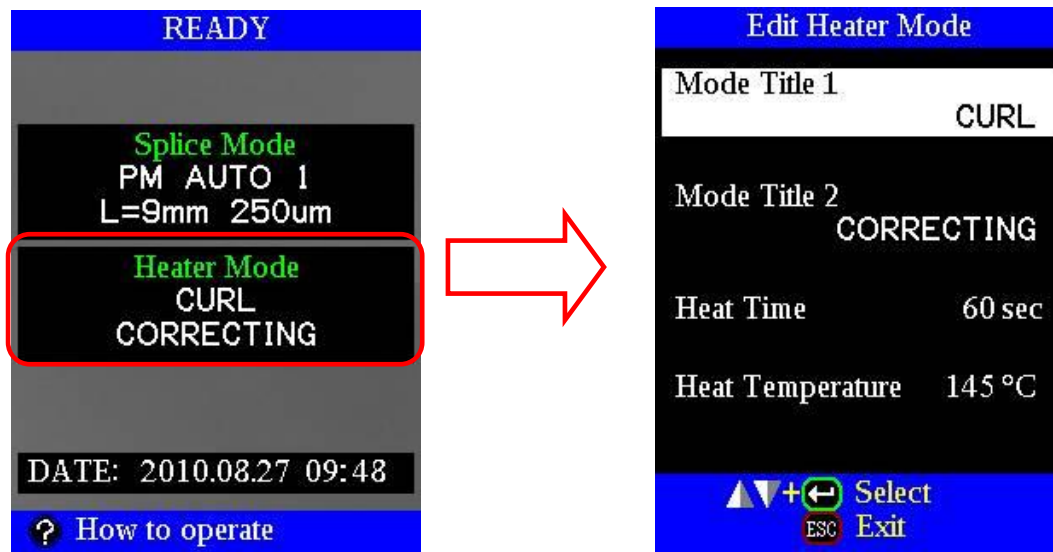
Set the sleeve at the center of the sleeve heater.



Set the sleeve at the center of the splice point.

3. Heater Menu (Fiber Straightener)

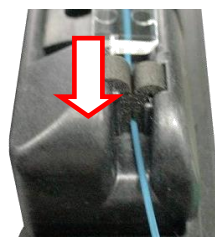
The mode setting of the Fiber Straightener is as follows.



Set the fiber coating into the heater.

Press the **HEAT** key.

The fiber curl will be eliminated by the heating process to straighten the fiber.



Push down on the fiber to insert it completely down into the foam slots at each end of the heater. The fiber must be down at the bottom of the foam slot as shown. Pull the fiber straight and taut so it will be straightened by the heating process.

Heater Mode

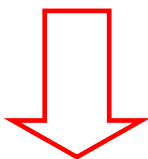
4. Heater Mode Setting

Tube-heating conditions in the user-programmable heater modes can be edited or changed.

- (1) Move the cursor and select a mode to be edited in the [Select Heater Mode] menu. Press the **MENU** key to display the [Edit Heater Mode] menu. Press the **Up/Down** keys to move the cursor to a parameter to be edited, and then press the **ENT** key to enable editing of that parameter.
- (2) Change the parameter value by pressing the **Up/Down** key Next press the **ENT** key to store the new value. (Press the **ESC** key to exit without changing the parameter value.)

[Select Heater Mode] menu

Up/Down key highlights parameter
ENT key enables editing



Edit Heater Mode menu
For sleeve heater

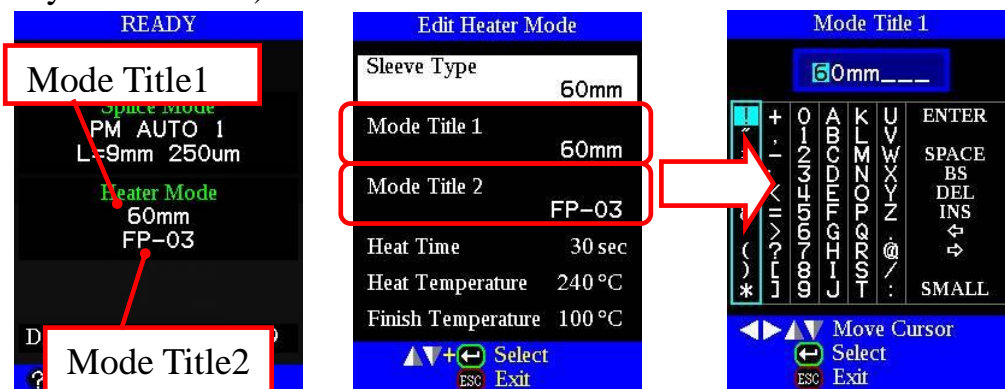
Edit Heater Mode	
Sleeve Type	60mm
Mode Title 1	60mm
Mode Title 2	FP-03
Heat Time	30 sec
Heat Temperature	240 °C
Finish Temperature	100 °C
▲▼+↵ Select ESC Exit	

Edit Heater Mode menu
For Fiber Straightener

Edit Heater Mode	
Mode Title 1	CURL
Mode Title 2	CORRECTING
Heat Time	60 sec
Heat Temperature	145 °C
▲▼+↵ Select ESC Exit	

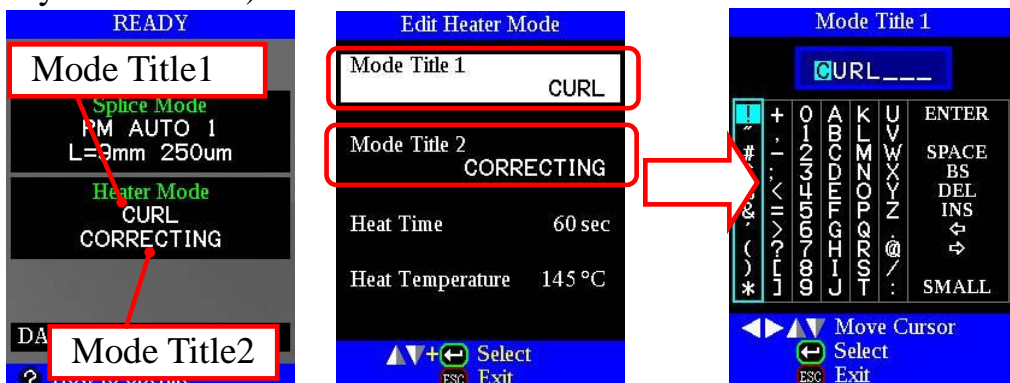
Heater mode parameters (Sleeve Heater)

Parameter	Description
Sleeve Type	Selects a sleeve type. A database of heating modes is displayed. Select a mode in the database and this is copied to a user-programmable mode.
Mode Title1	Alphanumeric characters may be selected to create a mode title that is displayed on the screen as a detailed explanation of the heater mode (may 7 characters).
Mode Title2	Alphanumeric characters may be selected to create a second mode title that is displayed on the screen as a detailed explanation of the heater mode (max 15 characters).
Heat Time	Sets heating time from the beginning to the end (cool-down completion). Heating time is automatically adjusted with atmospheric conditions, such as ambient temperature. Therefore the operational heating time may be longer or shorter than the programmed [Heat Time].
Heat Temperature	Sets the heating temperature that is used for the duration of the [Heat Time].
Finish Temperature	Selects the temperature of the heater at which the “Finish” buzzer sounds during the cool down phase after sleeve heating.



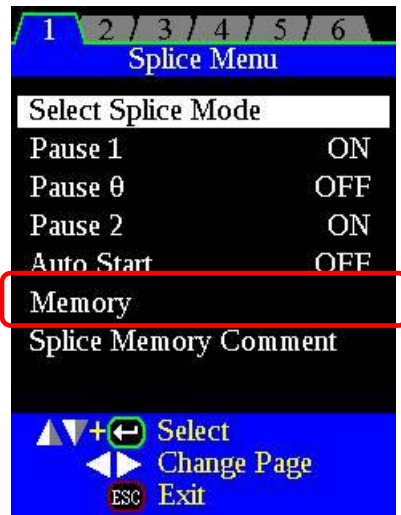
Heater Mode

Heater mode parameters (Fiber Straightener)

Parameter	Description
Mode Title1	<p>Alphanumeric characters may be selected to create a mode title that is displayed on the screen as a detailed explanation of the heater mode (may 7 characters).</p> 
Mode Title2	<p>Alphanumeric characters may be selected to create a second mode title that is displayed on the screen as a detailed explanation of the heater mode (max 15 characters).</p>
Heat Time	<p>Sets heating time from the beginning to the end (cool-down completion). Heating time is automatically adjusted with atmospheric conditions, such as ambient temperature. Therefore the operational heating time may be longer or shorter than the programmed [Heat Time].</p>
Heat Temperature	<p>Sets the heating temperature.</p>

1. Save Splice Results in Memory

This splicer stores up to 2000 splicing results. The contents of the data stored are different depending on the splicing mode. No results are stored for “attenuation splicing”.



Press the **MENU** key

Select [Memory] and press the **ENT** key

Select [Splice Result] and press the **ENT** key.



After every splice, the splice result is stored in memory.
To view the splice data for any splice, use the **Up/Down** key to highlight that splice. Press the **ENT** key to display the splice data.

Splice Result Memory

1-1. List of Splicing Results

Splicing results stored in the memory can be displayed. Comments can be added or edited.

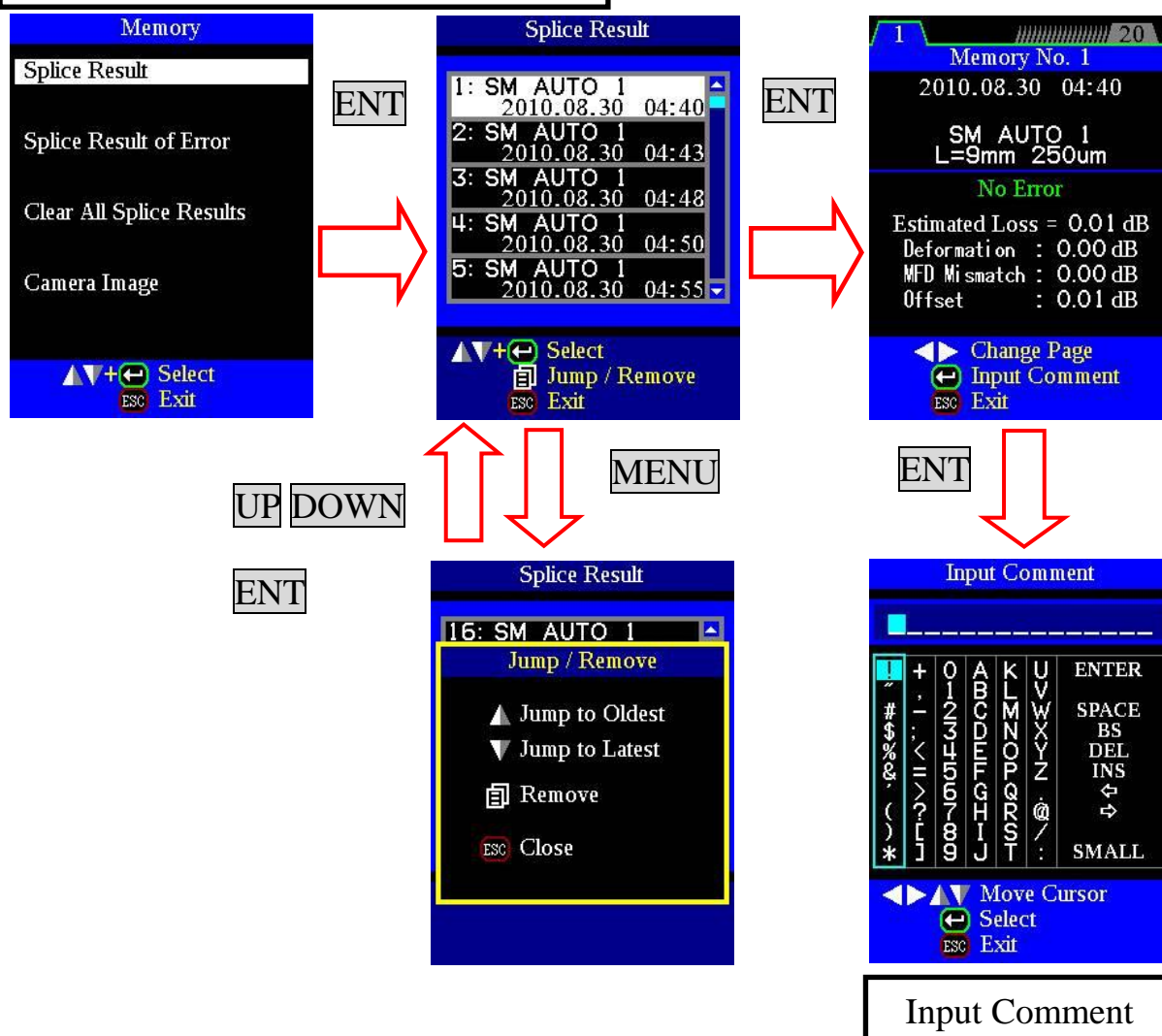


- Memory data can be downloaded to a PC by USB. Refer to the instruction manual “FSM Data Connection”.

How to display the splice result data

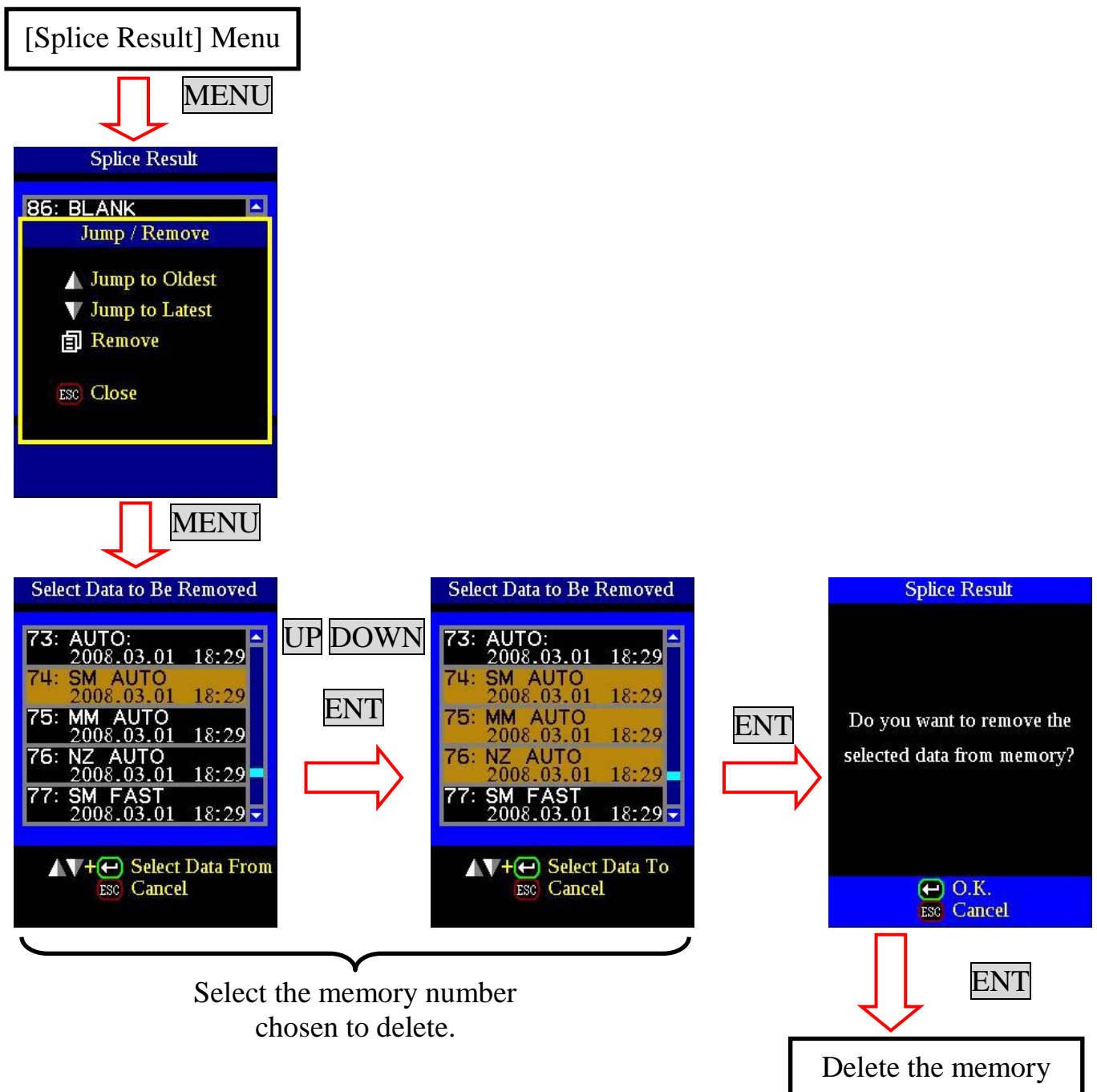
- (1) Select [Memory] in the [Splice Menu].
- (2) Select [Splice Result] and press the **ENT** key to display the [List of Splice Results] menu.
- (3) Move the cursor to a desired specific memory number and press the **ENT** key. The selected splicing result is displayed.
A [Jump To] function may be accessed by pressing the **Menu** key in the [Splice Result] menu. It enables jumping to another memory record.
- (4) Once the desired splicing result is displayed, press the **ENT** key to display the [Input Comment] screen. It is then possible to add or edit comments.

Select [Memory] in the [Splice Menu]



How to clear the splice results data

- (1) Press the **MENU** key in the [Splice Result] menu.
- (2) Press the **MENU** key in [Jump / Remove] menu.
- (3) Select the memory location number of the beginning of the range that should be deleted by pressing the **ENT** key.
- (4) Select the memory location number of the end of the range that should be deleted by pressing the **ENT** key.
- (5) Press **ENT** key to select the range of data for deletion. Press the **ENT** key again to confirm and execute deletion of the memory data.



Splice Result Memory

1-2. Splice Result of Error

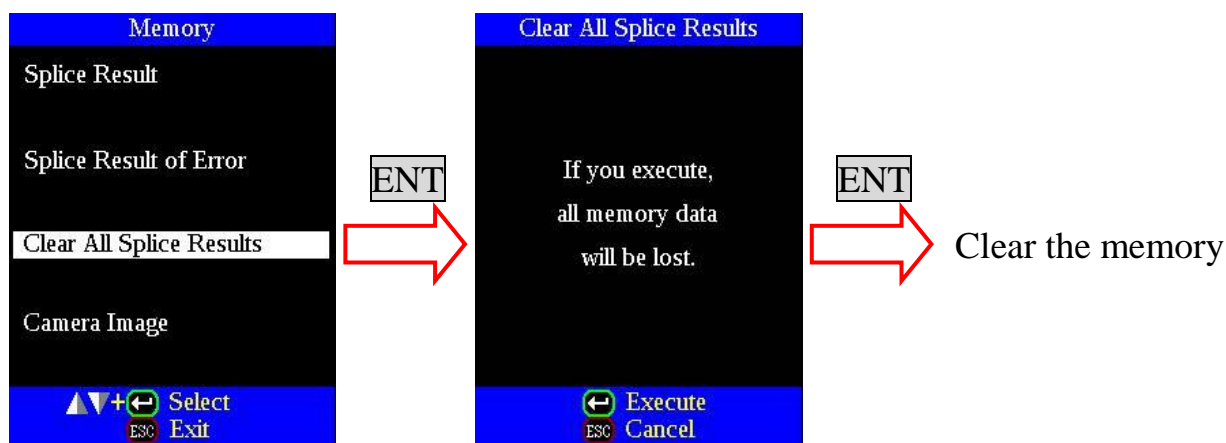
In this case, only splice result data with the error are displayed. From the [Memory] menu, select [Splice Result of Error]. Following this, the method of display and deletion is the same as previously described for [Splice Result].



1-3. Clear All Splice Results

All splicing results can be cleared at once.

- (1) Move the cursor to [Clear All Splice Results] in the [Memory] menu. Press the **ENT** key.
- (2) Press the **ENT** key again to confirm and execute the data deletion.



1-4. Camera Image

This function is used to store the fiber image after the splice or when an error has occurred. A total of 100 images can be stored.

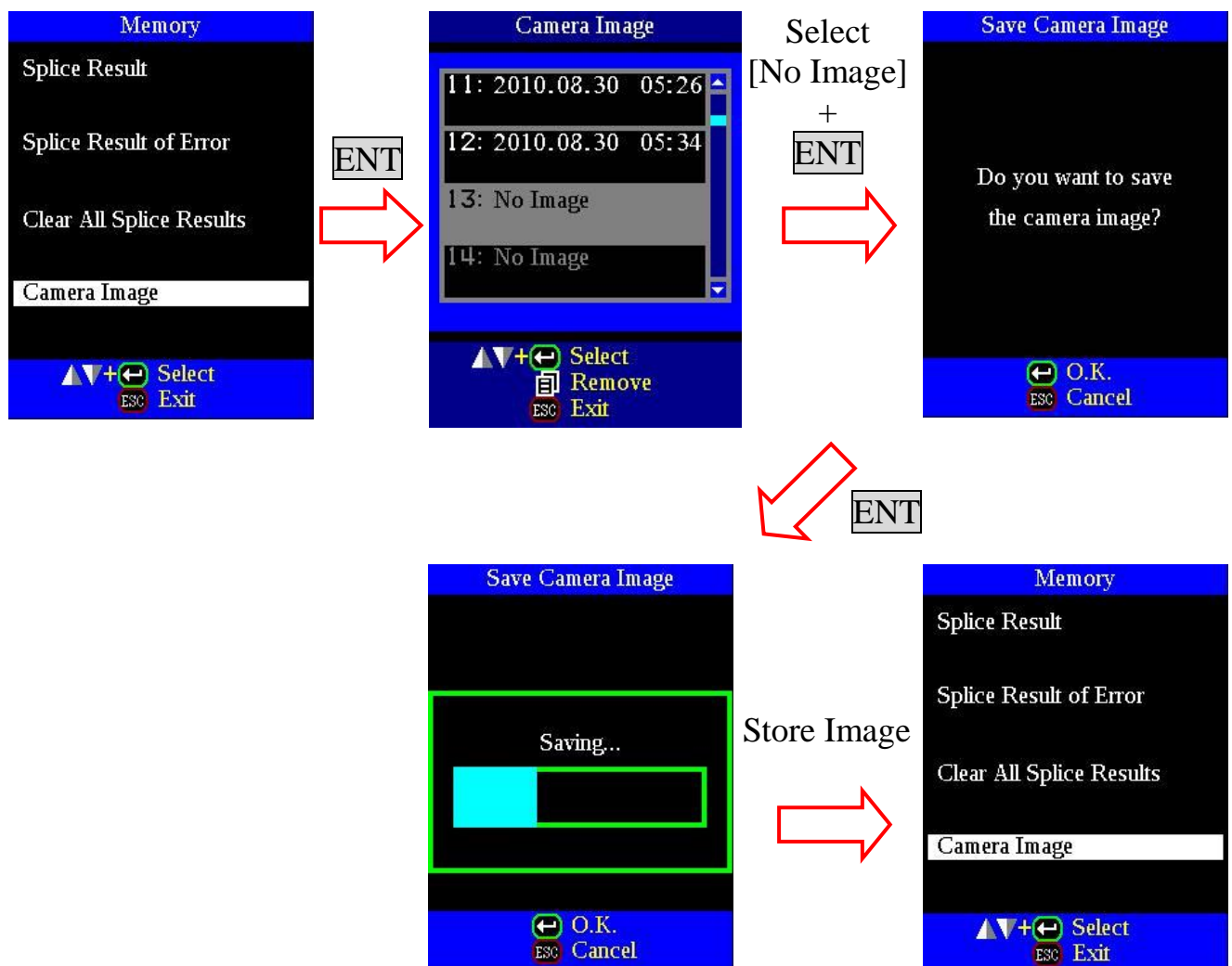
- (1) Select [Memory] in the [Splice Menu].
- (2) Select [Camera Image] and press the **ENT** key to display the [Camera Image] menu.

How to store the Camera Image Data

Select [No Image] by moving the cursor to a specific memory number and pressing the **ENT** key. The fiber image data is stored.



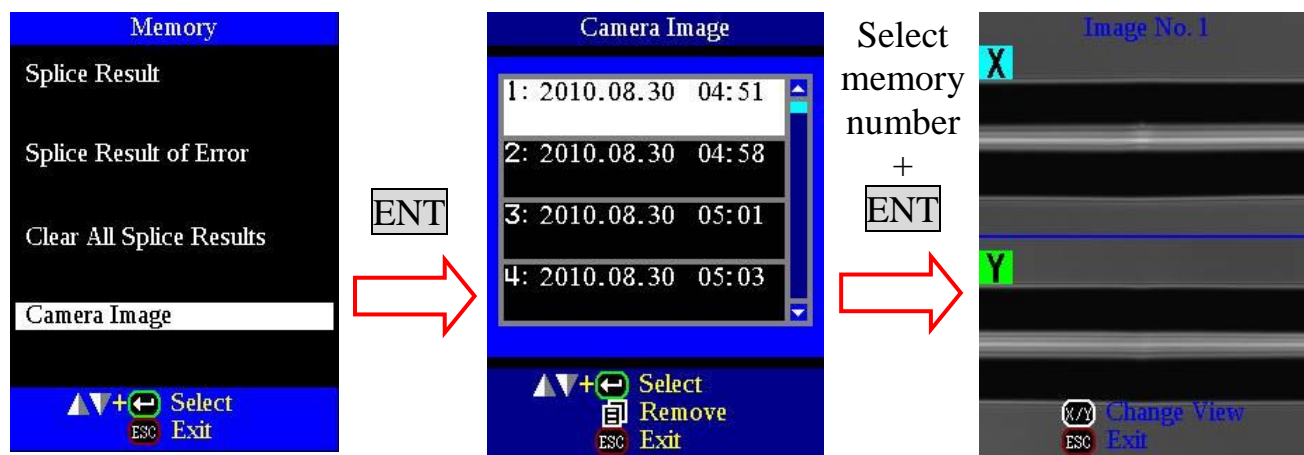
- A maximum of 100 images may be stored. Images cannot be over-written. Delete some old images in order to store new images.



Splice Result Memory

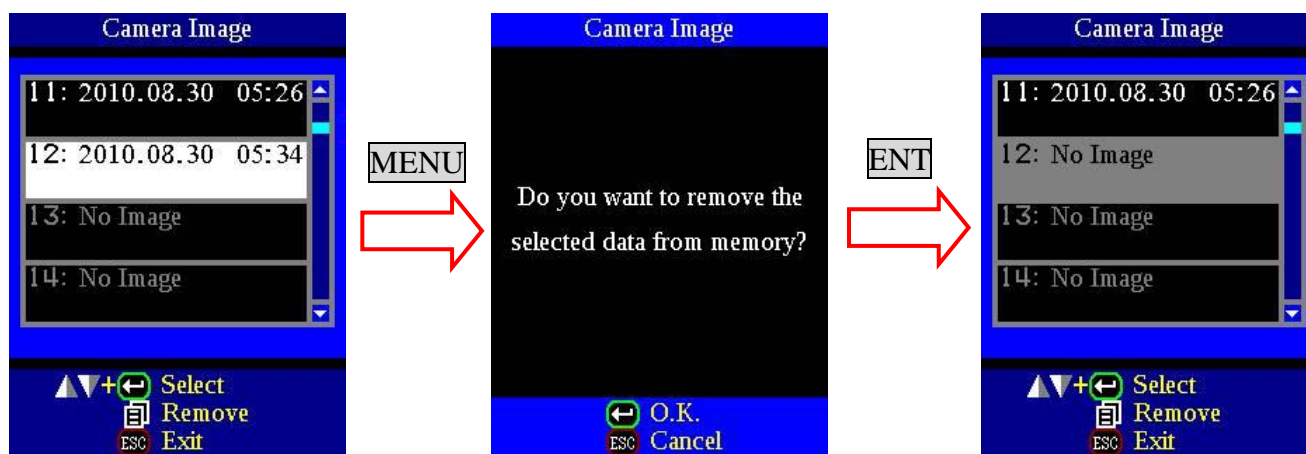
How to display camera image data

Select the desired image by moving the cursor to a specific memory number and press the **ENT** key. The fiber image data is displayed on the monitor.



How to delete camera image data

Select the appropriate number in [Camera Image] and press the **MENU** key. Press the **ENT** key to confirm and execute deletion.



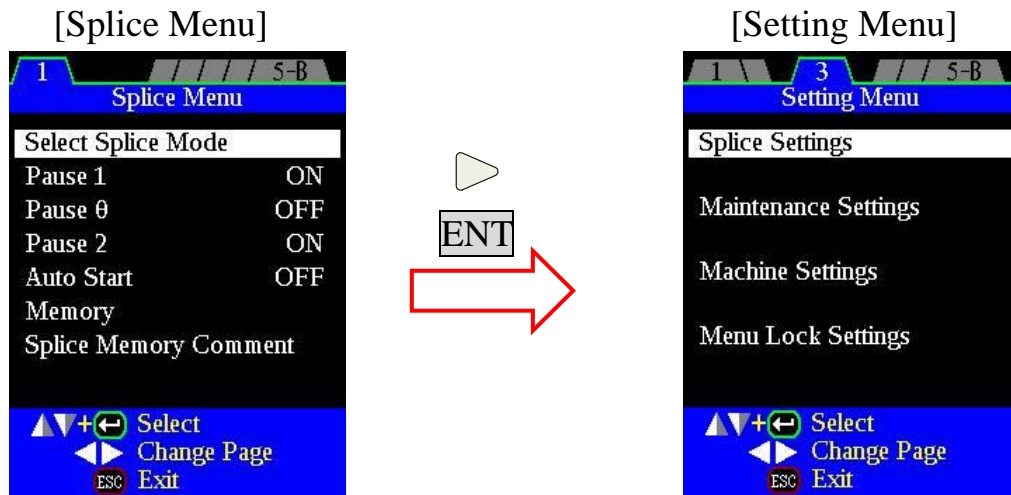
2. Comments of Splice Results

Splicing results data is automatically stored in memory when the **SET** or **RESET** key is pressed upon completion of the splice at the [FINISH] screen, or when the wind protector is opened upon completion of the splice at the [FINISH] screen. Once a comment has been input, the same comment will automatically be input into subsequent splice results. To change comments, see the section [How to input Mode Title / Comment / Password] for instruction on comment input. At the time of shipment from the factory, there is no default comment input.

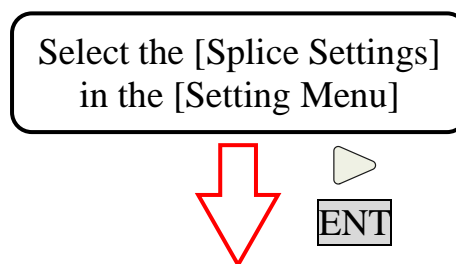
1. Splice Settings

Common parameters for all the splicing modes for can be set in the [Settings Menu]. Since these are common global parameters, they apply to all splicing operations.

- (1) Press the **MENU** key in the [READY], [PAUSE], and [FINISH] state and press the **Left/Right** key to display [Setting Menu].



- (2) Select [Splice Settings] in the [Setting Menu] to display the [Splice Settings] menu.
- (3) A password is required to enter [Splice Settings]. Enter the correct password.
- (4) Select a parameter to be changed and then press the **ENT** key to enable editing.
- (5) Change the parameter value by pressing the **Up/Down** key and then press the **ENT** key to confirm and store the new value.



Setting Menu

Parameter	Description
Ignore Splicing Error	
Cleave Angle	Setting these functions to “Disable” prevents the splicer from continuing the splice sequence when such an error occurs. In this case, the operator must press the RESET key and re-prep fibers.
Cleave Shape	
Fiber Angle	
Loss	
Angle Offset	
Arc Center	Setting these functions to “Disable” prevents the splicer from finishing its operation when such an error occurs. Splice loss estimation is not displayed and the operator must press the RESET key to continue (start the splice sequence over).
Bubble	
Fat	
Thin	
Hot Spot	

Parameter	Description
Display Settings	
Gapset	<ul style="list-style-type: none"> The images and data displayed on both the [Left Monitor] and [Right Monitor] during these operating sequences can be selected.
θ Align	<ul style="list-style-type: none"> For each operating sequence select the display [Style] for both monitors.
XY Align	<ul style="list-style-type: none"> The [Full] display [Style] may be selected to display a single image or data set as the display [Content] for that monitor.
Arc	<ul style="list-style-type: none"> The [Up/Down] display [Style] may be selected to display two types of display [Content], one on the top half of the monitor and the other on the bottom half of the monitor.
Special Function	<ul style="list-style-type: none"> If [Full] is selected, the options for display [Content] are as follows: <u>OFF, PAS(X/Y), Splice Settings</u>
Estimate	<ul style="list-style-type: none"> If [Up/Down] is selected, there are additional options for display [Content] as follows: <u>Cleave data, Fiber Angle Data, Axis Offset Data, Cleave & Fiber Angle, Fiber Data</u> For the [Estimate] display, additional [Content] options are as follows: <u>Splice Error</u>
Pause 1	<ul style="list-style-type: none"> The images and data displayed on both the [Left Monitor] and [Right Monitor] during these operating sequences can be selected. For [Pause 1] and [Pause θ] 3 sequential display steps may be selected.
Pause θ	<ul style="list-style-type: none"> For [Pause 2] 4 sequential display steps may be selected. For [Finish] 5 sequential display steps may be selected. For each operating sequence and each step, select the display [Style] for both monitors.
Pause 2	<ul style="list-style-type: none"> The [Full] display [Style] may be selected to display a single image or data set as the display [Content] for that monitor. The [Up/Down] display [Style] may be selected to display two types of display [Content], one on the top half of the monitor and the other on the bottom half of the monitor.
Finish	<ul style="list-style-type: none"> If [Full] is selected, the options for display [Content] are as follows: <u>OFF, PAS(X/Y), PAUSE(X/Y), Splice Settings</u> If [Up/Down] is selected, there are additional options for display [Content] as follows: <u>Cleave data, Fiber Angle Data, Axis Offset Data, Cleave & Fiber Angle, Fiber Data</u> For the [Finish] display, additional [Content] options are as follows: <u>WSI(X/Y), Estimate Loss Data, Arc Information, Splice Error, Splicer Settings</u>

Setting Menu

Parameter	Description
Manual Operation	
θ Rotation w/o Clamp	When the parameter is “ON”, the splicer releases the fiber clamps during θ Rotation. This function may help to prevent fiber twisting caused by clamping during rotation.
Others	
Auto Fiber Forward	If “Auto Fiber Forward” is “ON”, fibers are automatically moved closer to gapset as soon as the wind protector is closed.
Realign After Pause	After a long time in the [PAUSE2] state, alignment accuracy may sometimes be lost. If [Realign After Pause] is “ON”, the splicer realigns the fibers after the end of [PAUSE2] state. Setting this function to “OFF” bypasses the realignment.
Max. Num. of Rearcs	The re-arc process sometimes improves splice loss, but sometimes worsens it. This function can be utilized to limit the number of permissible rearcs or to turn the rearc capability completely “OFF”.
Jump back to READY	If this function is enabled, when the splicer is at the [PAUSE1], [PAUSE2], [PAUSE0] or [FINISH] state, pressing the Left key causes the splicer to jump back to the [READY] condition without the motors moving or resetting to home position. NOTE: The End-View mirror motor may reset to the home position in order to protect the End-View mirror, but other motor will not move.


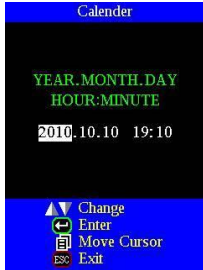
2. Maintenance Settings


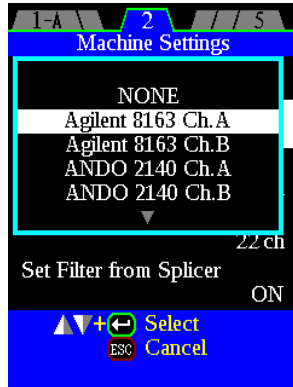
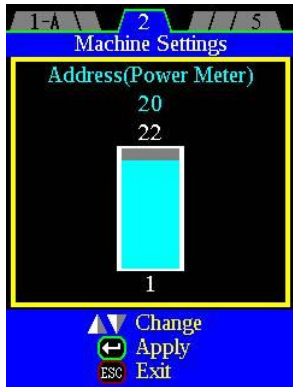
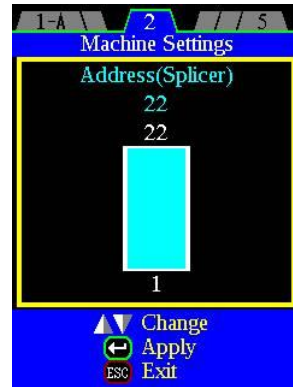
Parameter	Description
Electrode Caution	
Arc Count	When the [Arc Count] exceed this setting, the splicer shows a caution message that encourages replacing electrode. "2500" is set as default value for 125μm cladding fiber splicing. However, depending on fiber type and environment, it is possible that the electrodes may wear out earlier than this count. Replacing electrodes is recommended in this case.
Arc Time	When the [Electrodes Time Used] exceed this setting, the splicer shows a caution message that encourages replacing electrode. "OFF" is set as default. The wearing speed of electrode depends on fiber type and environment. The increase amount of [Electrodes Time Used] on every arc discharge can be adjusted by changing [Electrodes Wear Coef.] of splice mode parameter.
Electrode Warning	
Arc Count	When the [Arc Count] or [Total Arc Time] exceeds these values, warning message appears instead of above caution message.
Arc Time	Defaults value are; Arc Count: "3500" Arc Time: "OFF"
Arc Calibration	
Cleave Limit	Sets the threshold of cleave angle error for the [Arc Calibration].
Max Number of Tests	Sets the number tests to finish the [Arc Calibration] and display the “Test Finished” message. The maximum number can be set to infinity for critical splicing operations with heat sensitive splice recipes. In this case the operator may be required to perform mode [Arc Calibration] steps before the “Test Finished” message is displayed, and the calibration will be held to a strict standard. For general splicing operations, it may be acceptable to select a small number of tests such as 2 or 3. In this case the resulting [Arc Calibration] may not be quite as strict but general splicing performance should still be good.
Motor Drive	
θ Rotation w/o Clamp	When the parameter is “ON”, the splicer releases the fiber clamps during θ Rotation. This function may help to prevent fiber twisting caused by clamping during rotation.

Setting Menu



3. Machine Settings

- (1) Press the **Menu** key at the [READY], [PAUSE], or [FINISH] screen and press the **Left / Right** key to display [Setting Menu].
- (2) Select [Machine Settings] in the [Setting Menu].
- (3) Select a parameter to be changed.

Parameter	Description
Basic Settings	
Language	Select a language to be displayed.
Buzzer Volume	Set the sound volume of the buzzer.
Monitor Position	Set the operational direction of splicer. Select [Front] for splicer operation with the front monitor position. Select [Rear] for splicer operation with the monitors in the rear position. If [Auto] is selected, the splicer will automatically orient the monitor data display correctly regardless of splicer operation with the monitor in the front or the rear.
LCD Brightness	Set the LCD Brightness.
Arc Power Unit	Select either [bit] or [mA] for the Arc Power unit of adjustment and programming.
Caution to Auto Stuff OFF	The character color of the display can be set to [Yellow letters] or [White letters].The set character color is reflected in "Select Splice Mode" screen.
Remote Control	Set the permission of the PC communication.
Password Setting	Change the password to access the [Splice settings], [Maintenance Settings], [Machine Settings], [Menu Lock Settings] menus. The password is also used to unlock the power-on password lock. Maximum characters: 9 At the time of shipment from the factory, the default password is set to "0". In the event you have forgotten your password, contact the authorized distributor.
Calendar	This function sets the date and time in the calendar incorporated in the splicer. The year, month, day and time are displayed on the [Calendar] screen. Press the MENU key to move the cursor to the desired parameter, and then press the Up/Down arrow key to adjust the numerical values. After completion of calendar setting, press the ENT key. The revised date and time are stored. <div style="display: flex; justify-content: space-around; align-items: flex-end;">   </div>

Parameter	Description
Power Meter Alignment	
External Instrument	<div>   </div> <p>This function is used to select the proper GPIB communications protocols for a particular power meter to be used for direct power meter feedback splicing functions. Various power meter options are available, and for some of them it is necessary to select the power meter type as well as the power meter channel (for power meters with dual channel capability). Choose from the following options: [NONE] [Agilent 8163 Ch.A] [Agilent 8163 Ch.B] [ANDO 2140 Ch.A] [ANDO 2140 Ch.B] [ADVANTEST 8221 Ch.A] [ADVANTEST 8221 Ch.B] [NEWPORT 2832C Ch.A] [NEWPORT 2832C Ch.B] [ANRITU 9810 Ch.A] [ANRITU 9810 Ch.B] [ILX 8200] [UDT 370] [USB]</p>
Address (Power Meter)	<p>Sets the GP-IB address of the power meter. Setting Range: 1 ~ 22ch NOTE: The internal GP-IB address of the power meter must be set to match the selected value for the power meter in the splicer menu. Consult the operation manual for the power meter in use for instructions.</p> 
Address (Splicer)	<p>Sets the GP-IB address of the splicer Setting Range: 1 ~ 22ch</p> 

Setting Menu

Parameter	Description
Power On Option	
Opening Title1	<p>Sets the message to be displayed when the splicer power is turned on. Max number of characters: 15 (Opening Title 1) 15 (Opening Title 2)</p>  <p>Opening Title 1 and Opening Title 2 are displayed during splicer boot-up.</p>
Opening Title2	
Arc Calibration	<p>Selects whether or not these functions are available immediately after boot-up when the splicer power is turned on.</p>
Dust Check	
Password Boot Lock From	<p>The use of this function allows selection of a starting date, after which, a password is required at splicer boot up in order to operate it.</p>  <p>Input date</p> <p>The password is the same as that set in the [Machine Settings] menu</p>

Parameter	Description
Ready Display	
Splice Mode	Select if the Splice Mode is displayed or not at the “Ready” condition.
Heater Mode	Select if the Heater Mode is displayed or not at the “Ready” condition.
Additional Data1	Select optional data that may be displayed at the “Ready” condition. The options for additional data display are as follows: <u>Cleave Limit or Proof Test or Calendar or Arc Count</u>
Additional Data2	
Additional Data3	

[Ready Display]

Main Monitor (Left)

Selected [Splice Mode] and [Heater Mode] are displayed.

Splice Mode

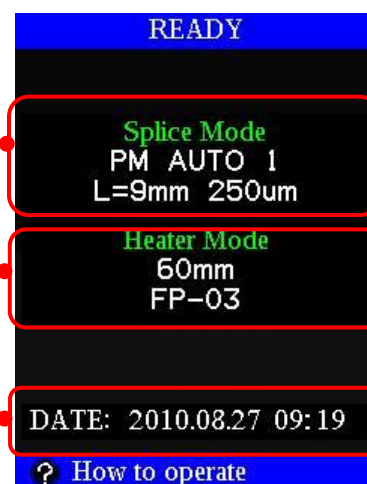
Currently selected splice mode.
Confirm the splice mode.

Heater Mode

Currently selected heater mode.
Confirm the heater mode.

Calendar (Additional Data Area)

Present date and time are displayed.



About the Additional Data Area:

Items to be displayed on the READY screen are selectable.

Cleave Limit

The threshold of the cleave angle limit is displayed.

Proof Test

Selection of the proof test (“ON” or “OFF”) is displayed.

Arc Count

Arc count is displayed.



Setting Menu

Parameter	Description
Short Cut	
Ent Key	<p>Two short cut functions are available, one for Ent and one for Esc. If shortcut key function is enabled, the Ent and/or Esc key may be used as a shortcut to one of the menus below. The short cut option is available at the READY condition.</p> <p>Short cut options are as follows:</p> <ul style="list-style-type: none"> [OFF] (The short cut function is not enabled) [Select Splice Mode] [Select Heater Mode] [Splice Settings] [Maintenance Settings] [Machine Settings] [Menu Lock Settings]
Esc Key	<ul style="list-style-type: none"> [Fiber Type Compare] [Auto Arc Calibration] [IPA Data] [Arc Calibration] [Special Arc Calibration] [Stabilize Electrodes] [Replace Electrodes] [V Groove Cleaning] [Cleaning Electrode] [Diagnostic Test] [Dust Check] [Motor Calibration] [Motor Drive] [Initialize] [Maintenance Info.]
Turn-Off Time	
Monitor	Setting a time for this function sets the splicer such that the power to the LCD monitor turns off automatically if the splicer has been ideal for the selected period of time. When the power to the LCD monitor turns off, the LED near the SET key blinks. Pressing any key turns the LCD monitor back on.
Splicer	Setting a time for this function will set the splicer such that splicer power automatically turns off if it the splicer has been idle for the selected time.

4. Menu Lock Settings

Parameter	Description
Splice Mode	
Edit	Setting to “Disable” prevents unauthorized editing and/or selecting of splice modes.
Select	
Heater Mode	
Edit	Setting to “Disable” prevents unauthorized editing and/or selecting of heater modes.
Select	
Splicer Memory	
Access/Clear	Setting to “Disable” prevents unauthorized accessing and/or erasing of splice data results in the splicer memory.
Splice Settings	
Ignore Splice Error	Setting to “Disable” prevents unauthorized editing and selecting of [Splice Settings]. This can be used to prevent to operator from ignoring splice errors.
Display Settings	
Others	
Maintenance Settings	
Electrode	Setting to “Disable” prevents unauthorized editing of the [Maintenance Settings] menu.
Arc Calibration	
Machine Settings	
Basic Settings	Setting to “Disable” prevents unauthorized editing of the [Machine Settings] menu.
Power Meter	
Alignment	
Turn-Off Time	
Power On Option	
Ready Display	
Short Cut	

Setting Menu

Parameter	Description
Fiber Data Learning	
Fiber Type Compare	Setting to “Disable” prevents operation of various functions related to the [Fiber Data Learning].
Auto Arc Calibration	
IPA Data	
Maintenance Menu	
Arc Calibration	Setting to “Disable” prevents operation of various functions related to the [Maintenance Menu].
SP Arc Calibration	
Stabilize Electrodes	
Replace Electrodes	
V Groove Cleaning	
Cleaning Electrode	
Diagnostic Test	
Dust Check	
Motor Calibration	
Motor Drive	
Initialize	

1. Fiber Type Compare

The feature of each fiber core profile can be memorized.

➤ See section [**Function Introduction**][**Fiber Type Compare**]

2. Auto Arc Calibration

The arc brightness of each fiber can be memorized as a calibration value.

➤ See section [**Function Introduction**][**Auto Arc Calibration**]

3. IPA Data (FSM-100P/P+ Only)

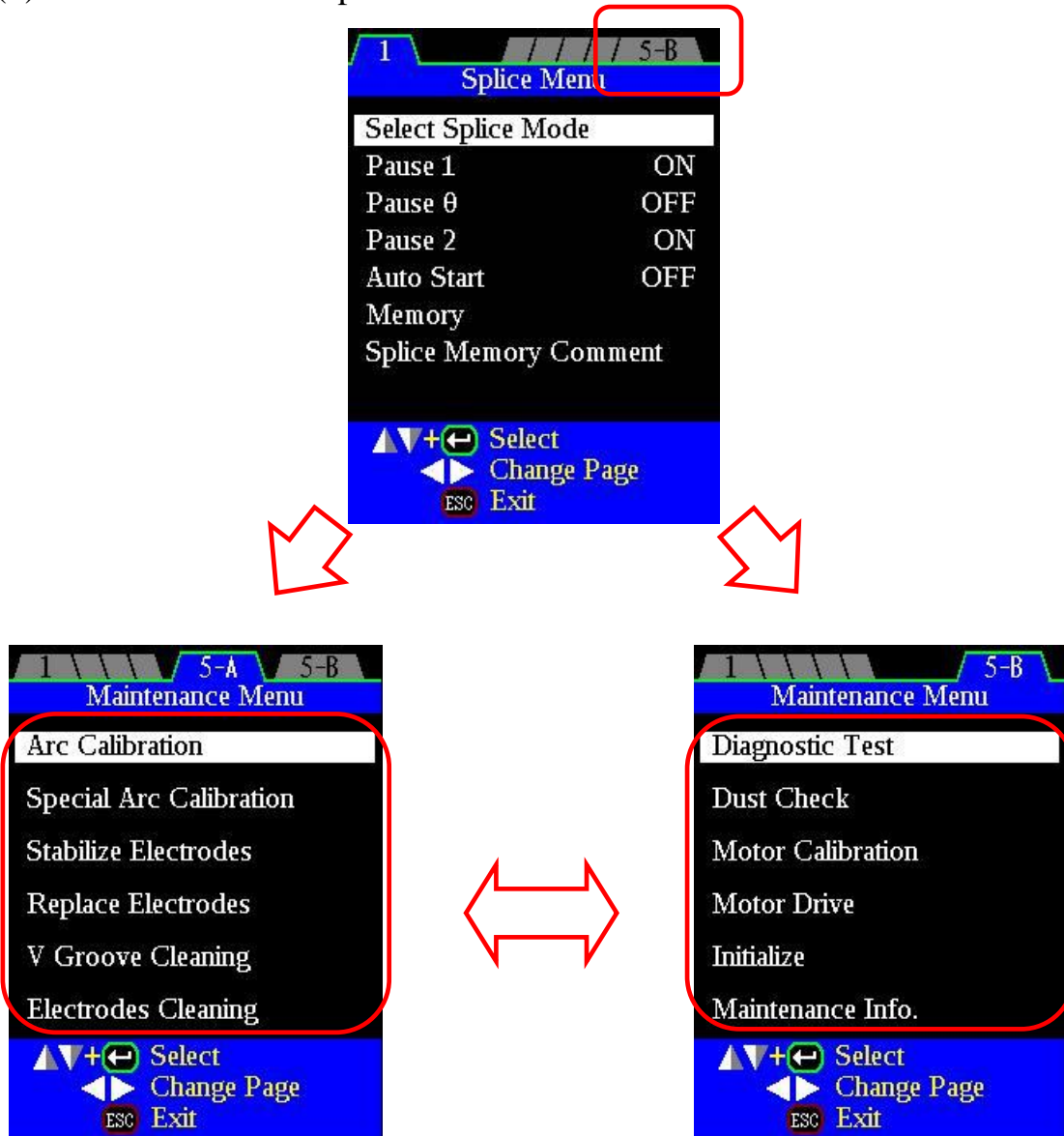
The feature of IPA of each optical fiber can be memorized.

➤ See section [**Function Introduction**][**IPA Data (FSM-100P/100P+ Only)**]

Maintenance Menu

The splicer has the ability to perform routine maintenance. This section describes how to use the maintenance menu.

- (1) Press **MENU** key in [READY], [PAUSE], and [FINISH] state. Press **MENU** key to display [Maintenance Menu].
- (2) Select a function to perform.



Select the needed item at the [Maintenance Menu].
Refer to the following clause about details of each item.

1. Arc Calibration

- (1) Select [Arc Calibration] in [Maintenance Menu] to display [Arc Calibration] screen.
- (2) Set prepared fibers in the splicer.

1 5-A 5-B

Maintenance Menu

Arc Calibration

Special Arc Calibration

Stabilize Electrodes

Replace Electrodes

V Groove Cleaning

Electrodes Cleaning

▲▼+↵ Select

↵ Change Page

ESC Exit

➡

Arc Calibration

Prepare and load left and right fibers into the splicer.

↵ Execute

ESC Exit

About Arc Calibration

Arc Calibration	Special Arc Calibration
[Method] Offse Back	[Method] Melt Back
[Fiber] SM 125um	[Fiber] Any Fiber
[Calibrating] STD value	[Calibrating] SP value
In all splice modes	In selected splice mode
For example from STD[76] to STD[64]	For example from SP[125] to SP[132]

➤ See section [Arc Calibration].



- Use standard SM or DS fiber for arc calibration.
- Glass clamping is strongly recommended for arc calibration. The error margin of the calibration value may be larger in case of the coating clamping.
- The error margin of the calibration value may be larger when the surface of the fiber is dusty. Set the cleaved fiber again if the surface of the fiber is dusty.

Maintenance Menu

2. Special Arc Calibration

- (1) Select [Special Arc Calibration] in [Maintenance Menu] to display [Special Arc Calibration] screen.
- (2) Set prepared fibers in the splicer.

1 5-A 5-B

Maintenance Menu

Arc Calibration

Special Arc Calibration

Stabilize Electrodes

Replace Electrodes

V Groove Cleaning

Electrodes Cleaning

▲▼+↩ Select

◀▶ Change Page

ESC Exit

Special Arc Calibration

Prepare and load left and right fibers into the splicer.

↩ Execute

ESC Exit

About Arc Calibration

Arc Calibration	Special Arc Calibration
[Method] Offse Back	[Method] Melt Back
[Fiber] SM 125um	[Fiber] Any Fiber
[Calibrating] STD value	[Calibrating] SP value
In all splice modes	In selected splice mode
For example from STD[76] to STD[64]	For example from SP[125] to SP[132]

➤ See Section [Special Arc Calibration].



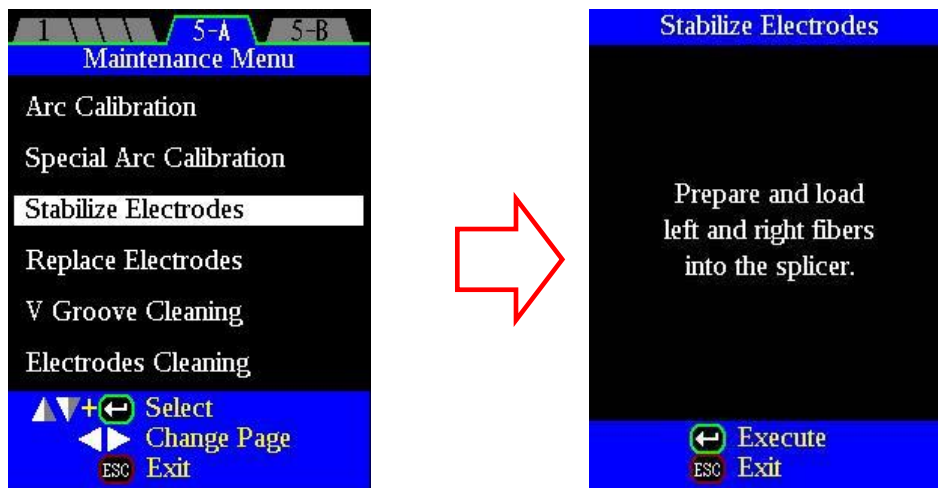
- Use the fiber to be spliced.
- Glass clamping is strongly recommended for arc calibration. The error margin of the calibration value may be larger in case of the coating clamping.
- The error margin of the calibration value may be larger when the surface of the fiber is dusty. Set the cleaved fiber again if the surface of the fiber is dusty.

3. Stabilize Electrodes

In the event of sudden change in environmental conditions, etc., the arc power sometimes becomes unstable, resulting in higher splice loss. Especially when the splicer is moved from lower altitudes to higher altitudes, more time is needed for the arc power to stabilize. In this case, stabilizing electrodes will expedite the process of making the arc power stable. If many tests are needed until the “Test OK” message appears in [Arc Calibration], use this function as well.

Operating Procedure

- (1) Select the [Stabilize Electrodes] in [Maintenance Menu].



- (2) Set prepared fibers in both sides of the splicer as in the case of splicing.
- (3) Press **ENT** key and the splicer begins to stabilize the electrodes in the following ways:
 - Repeat short arc discharge to measure the arc position.
 - Perform [Arc Calibration] to calibrate the arc power.
 - Perform continuous discharge to stabilize the electrodes.
- (4) After completing stabilization, always perform an additional [Arc Calibration].

4. Replace Electrodes

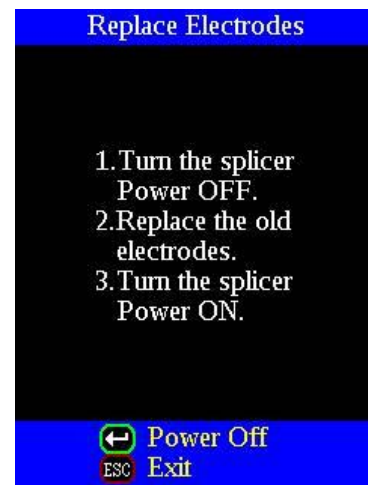
It is recommended that the electrodes be replaced after 2,500 arc discharges. When the number of arc discharges reaches a count of 3,500, a message prompting to replace the electrodes is displayed immediately after tuning on the power. Using the electrodes without a replacement will result in greater splice loss and reduced splice strength. In certain high strength applications, cleaning the electrodes can be beneficial. Contact your local authorized distributor for information on these applications.



- The message of “Replace Electrodes” is displayed when the arc count exceeds the setting threshold value. This threshold value can be changed.

Replacement Procedure

- (1) Execute [Replace Electrodes] in [Maintenance Menu].
- (2) Instruction messages will appear on the screen to turn off the power. Press and hold **ENT** key till the LED color changes from green to red.
- (3) Remove the old electrodes.
 1. Remove the electrode cover.
 2. Loosen the screw located on electrode fixture. Take out the electrode.
 3. Clean the new electrodes with alcohol-moistened clean gauze or lint-free tissue and install them in the splicer.
 4. Fit the electrode in the electrode fixture.
 5. Place the electrode fixture on the splicer and tighten screw.



- To secure the electrodes, tighten screw while pushing the electrode collar to the electrode fixed base.

6. Place the electrode cover.



- Do not pull out wiring when replacing electrode.

- (4) Turn on the power, prepare and load fibers into the splicer and press **ENT** key. After executing the arc calibration, the splicer will repeat the arc discharge in succession to stabilize the electrodes. Upon completion of the arc discharge process, the splicer executes arc calibration again. The operator should repeat arc calibration until the “Test Finish” message appears. For details of the arc calibration, see section: [Arc Calibration]

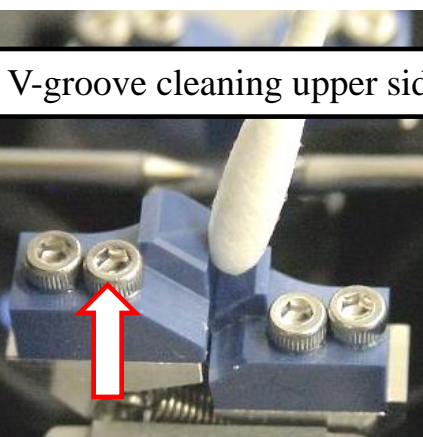
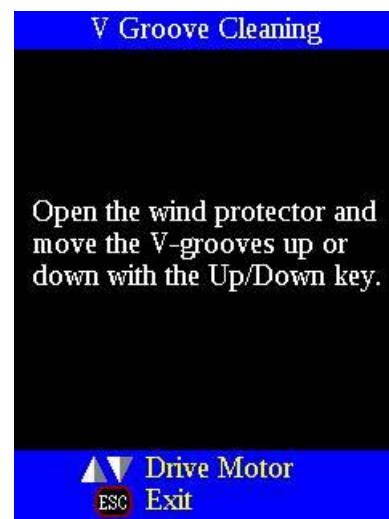
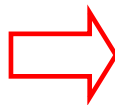
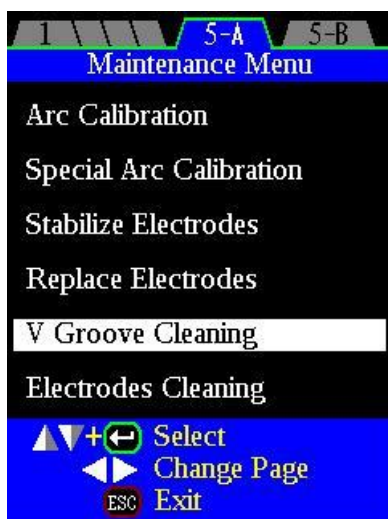
5. V-Groove Cleaning

If contaminants are present in the V-grooves, proper clamping may not occur, resulting in higher splice loss. The V-grooves should be frequently inspected and periodically cleaned during normal operation. To clean the V-grooves do the following:

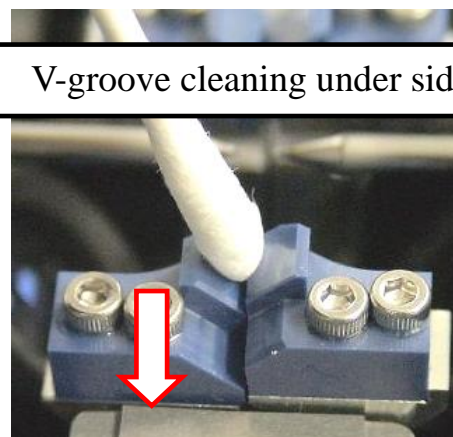
- (1) Press **MENU** key, and select [V-Groove Cleaning] in [Maintenance Menu].
- (2) Open the wind protector and move the V-grooves up or down with the **Up/Down** key.
- (3) Clean the bottom of the V-groove with an alcohol-moistened swab and dry the V-grooves with a clean dry swab.



- Be careful to not contact the electrode tips.
- Do not use excessive force when cleaning the V-grooves. The V-groove arms may become damaged.



V-groove cleaning upper side



V-groove cleaning under side

Clean V-grooves moving up and down also right too left during this procedure.

Clean V-grooves like shown in the above picture moving the swab right and left.

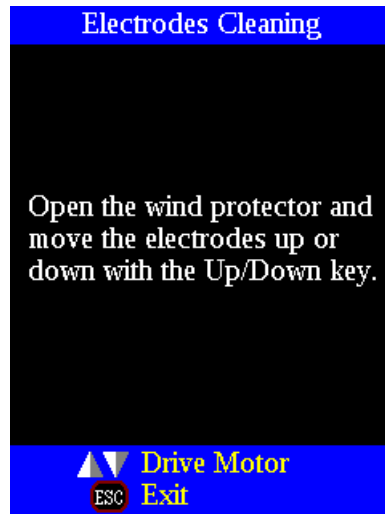
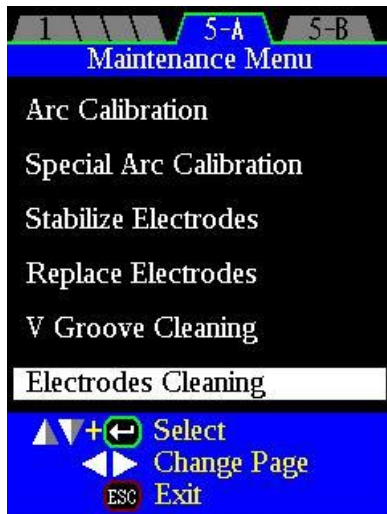
Maintenance Menu

6. Cleaning Electrode (FSM-100M+/P+ Only)

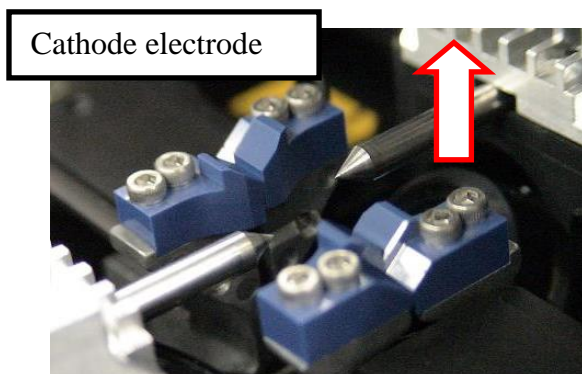
- This function is applicable to LDF electrode (ELCT3-25LDF, 60 degrees tip) for FSM-100M+/P+.
- 💡 • Do not use this function for cleaning the electrode (ELCT3-25). Because electrode tip will end and arc discharge is not stable when it is cleaned. Replacement is necessary.
- It is recommended that the electrodes are cleaned after 100 arc discharges.

Operation Procedure

- (1) Press **MENU**, select the [Cleaning Electrode] in [Maintenance Menu].
- (2) Open the wind protector, up/down the electrodes with pressing the UP DOWN key.



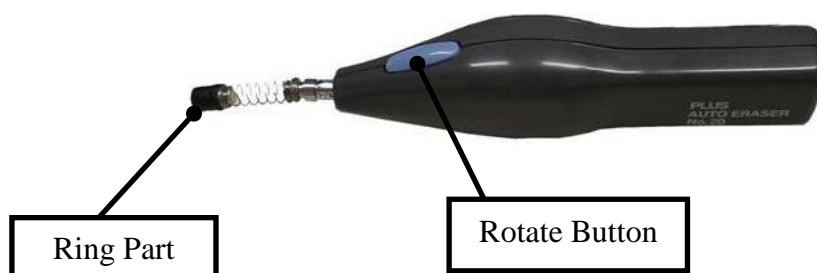
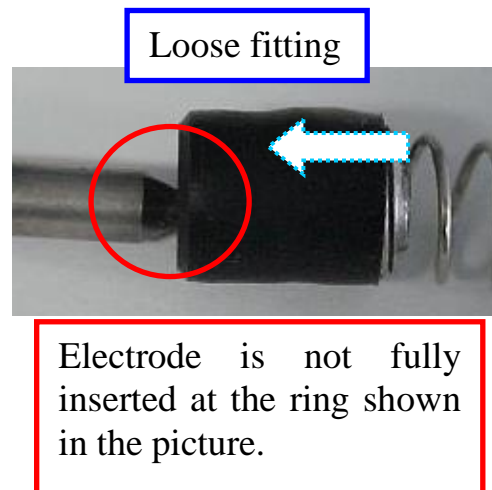
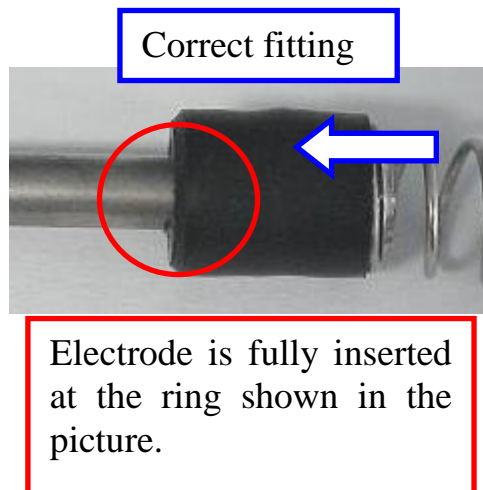
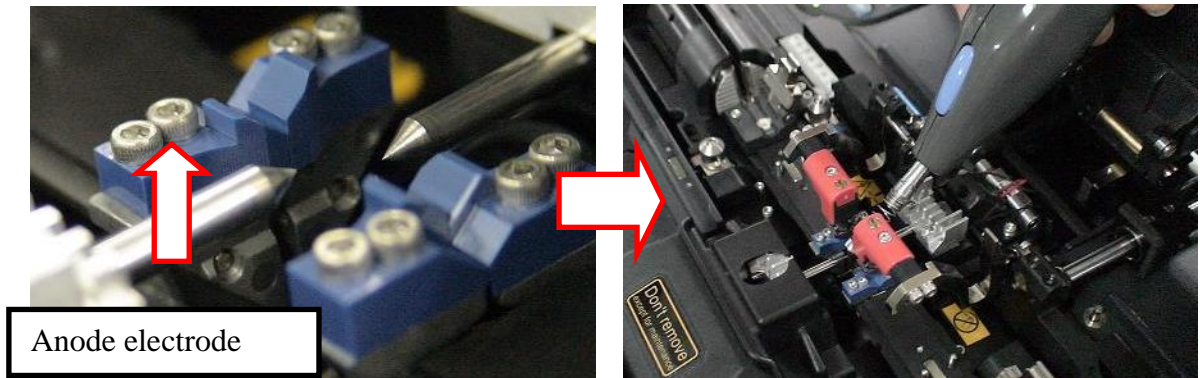
- (3) Clean the electrode tip using the electrode cleaner.



Make sure if the electrode is inserted fully at the cleaner ring part, then push the cleaner to the electrode and press “ON” button on the cleaner.
If the electrode is NOT fully inserted, cleaner head may hit v-groove and lens, and result in damage.
Please carefully check if the electrode is fully inserted.

- (4) When Anode electrode is to be cleaned, fully open the wind protector by pushing “wind-protector open lever”, and close the fiber clamp manually. Open the wind protector anode electrode.

See [Cleaning Wind Protector Mirrors] in [Maintenance of Splicing Quality] for detail how to open the wind protector.



Clean electrode tip when electrode tip is found worn, rounded, or glass particle is found at the tip, or arc discharge is not stable. Electrode stabilizing after cleaning is recommended.

LDF electrode is to be replaced every 1000 arc discharges (1000um cladding dia.)

Electrode may degrade depending on situation, so earlier electrode replacement is sometimes recommended.

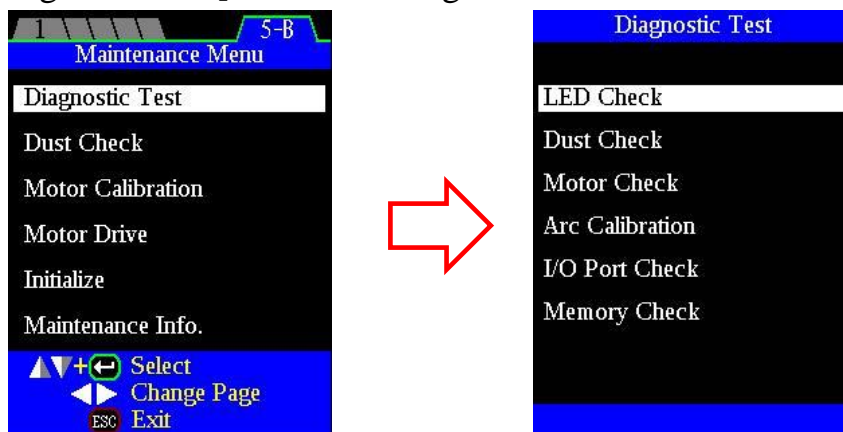
Maintenance Menu

7. Diagnostic Test

The FSM-100 series has a built in diagnostic test feature that allows the operator to perform a simple one step evaluation of splicer performance covering several different critical variables. Perform this function in the event of splicer operation trouble.

Operation Procedure

- (1) Select the [Diagnostic Test] in the [Maintenance Menu] and execute [Diagnostic Test]. The following checks will be made.



Check Item	Description
LED Check	Measures and adjusts the brightness of the illumination LED.
Dust Check	Checks the optical path for dust or dirt and judges whether this disrupts the fiber observation. If communication exists, this function indicates the location.
Motor Check	Check the Motor Limit Sensor.
Arc Calibration	Automatically calibrates the arc power factor and fiber splicing position.
I/O Port Check	Checks for normal operation of the input or output terminals of the internal circuit.
Memory Check	Checks the memory of the internal circuit.

- (2) Upon completion of all checks and adjustments, a list of results is displayed.
If the Dust Check result is not good, clean the objective lenses. In the case that cleaning cannot eliminate contamination, there is a possibility that the contamination may have entered the inside of the optical path. Please contact the authorized distributor for additional instructions.
The Dust Check and Motor Calibration functions exist as independent instructions in [Maintenance Menu]. It is possible to execute them independently.



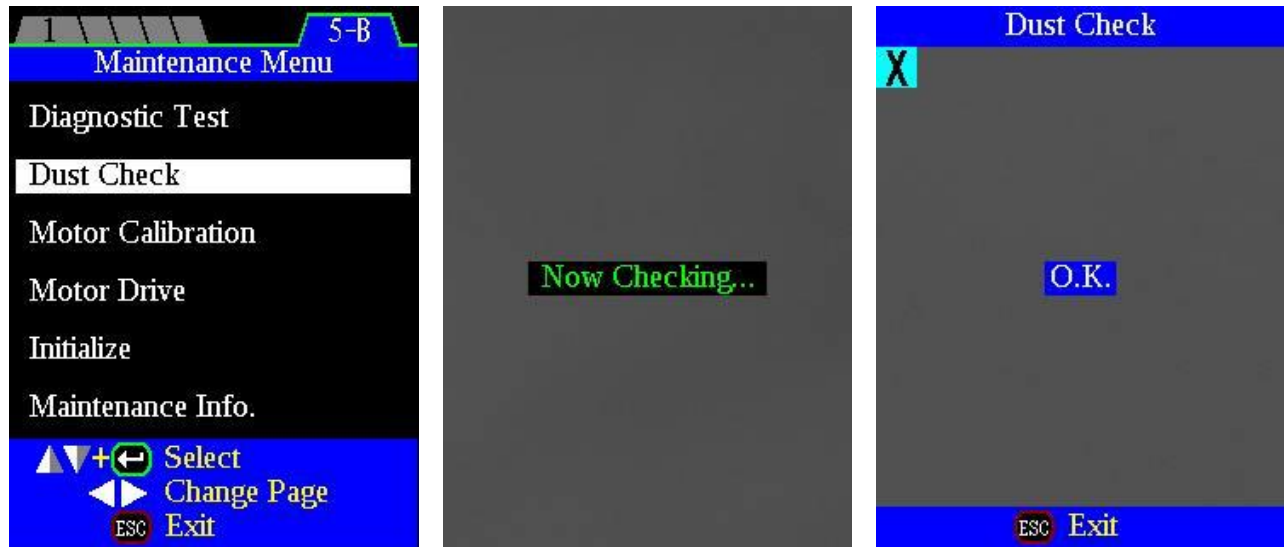
- Before the start of the test, remove the fibers from the splicer.
- When the Motor Check is completed, prepare and load the fibers into the splicer and press **ENT** key.

8. Dust Check

The splicer observes fibers through image processing. Dust or contaminants on the cameras, lenses and wind protector mirrors disturb normal observation of fibers and may result in improper splicing. This function checks the optical path for the presence or absence of contaminants and judges whether they cause trouble for fiber splicing.

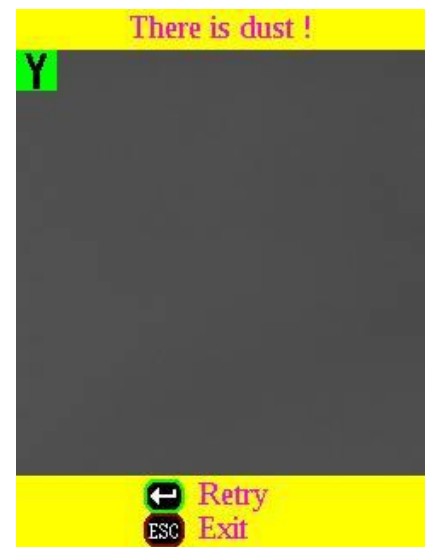
Operation Procedure

- (1) Select the [Dust Check] in the [Maintenance Menu].



- (2) If fibers are set in the splicer, remove them and press **ENT** key again. The splicer begins the dust check.
- (3) The message [Now Checking...] is displayed in the middle of the screen. After observation, the location of contaminants is judged as a potential problem and blinks. If contaminants are detected, clean the wind protector mirrors and objective lenses and redo [Dust Check]. See the section of **[Maintenance of Splicing Quality]** for cleaning instructions.

- (4) Press to finish dust check.



- In case you have cleaned or replaced the wind protector mirrors, and have cleaned the objective lenses, and dust or dirt still remains, contact the authorized distributor.

Maintenance Menu

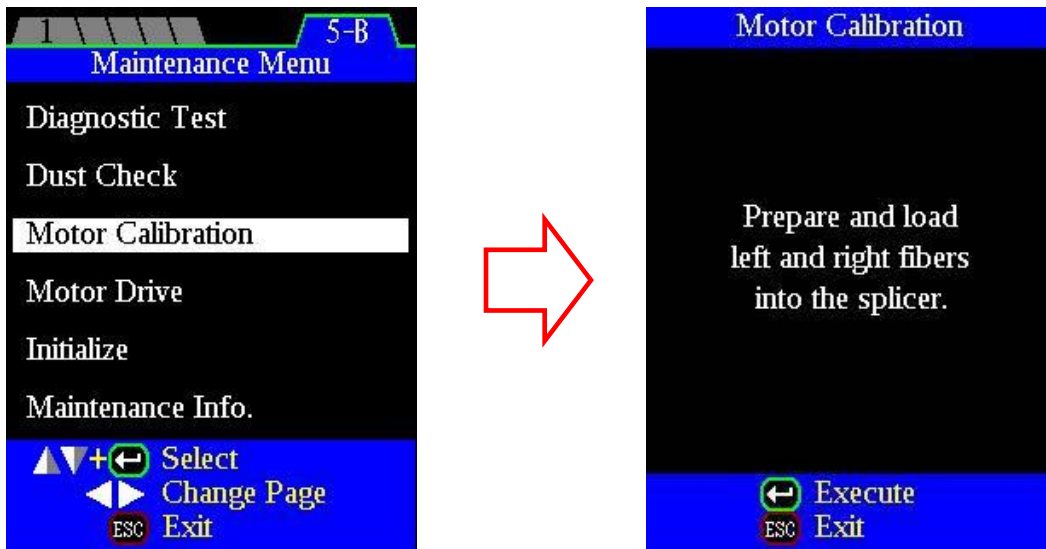
9. Motor Calibration

(ZL/R, X/Y, FcsX·Y, θ L/R, Sweep)

Motors are adjusted at the factory before shipping. However, these settings could have changed due to various reasons. This function automatically calibrates the speed of all motors. (Z, XY, Focus, θ , Sweep)

Operation Procedure

- (1) Select the [Motor Calibration] in the [Maintenance Menu].



- (2) Load prepared fibers in the splicer and press **ENT** key.
- (3) Speeds for all motors are automatically calibrated. Upon completion, [Maintenance Menu] is displayed.

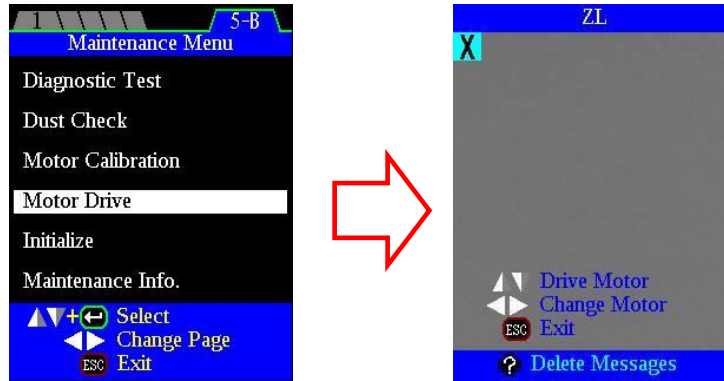


- Perform this function when “Fat” or “Thin” error has occurred, or fiber aligning or focusing is taking too much time.

10. Motor Drive

The motors incorporated in the splicer can be manually operated individually. In the course of splicing, the motors can also be operated by selecting this menu in the [PAUSE1], [PAUSE2] or [FINISH] state.

- (1) Select the [Motor Drive].



- (2) Pressing **Left/Right** key changes motor selection. The name of the selected motor is displayed in the upper section of the screen.
- (3) Press **Up/Down** Arrow key to drive the motor in the desired direction.

Motor	Δ	∇	M	P	M+	P+
ZL/ZR	Forward	Backward	O	O	O	O
X/Y	Upward	Downward	O	O	O	O
FocusX/FocusY	Lens moves nearer fiber.	Lens moves away from fiber.	O	O	O	O
VAL/VAR	Upward	Downward	O	O	O	O
VBL/VBR	Upward	Downward	O	O	O	O
Electrode Gap A Electrode Gap C	Forward	Backward	O	O	O	O
Clamp L/Clamp R	Upward	Downward	O	O	O	O
θ L, θ R & θ LR (θ Motor) Note 1	Moves θ -axis downward.	Moves θ -axis upward.	—	O	—	O
Sweep	Right	Left	O	O	O	O
EV	Upward	Downward	—	—	O	O

NOTE 1: Selection of θ LR will enable simultaneous synchronized rotation of both left and right θ motors.

- When the motor reaches the limit of the operating range, the buzzer sounds and the motor stops. Press the opposite arrow key to reverse and move the motor again.
- Display messages can be erased by pressing the **HELP** key. The message can be displayed by pressing the **HELP** key again.
- If you finish this operation by pressing **RESET**, the motor will return to the reset position. To finish the operation with the motor held in the adjusted / present position press the **EXIT** key.
- If the motor moves too much with respect to the spliced fiber, the fiber may break.

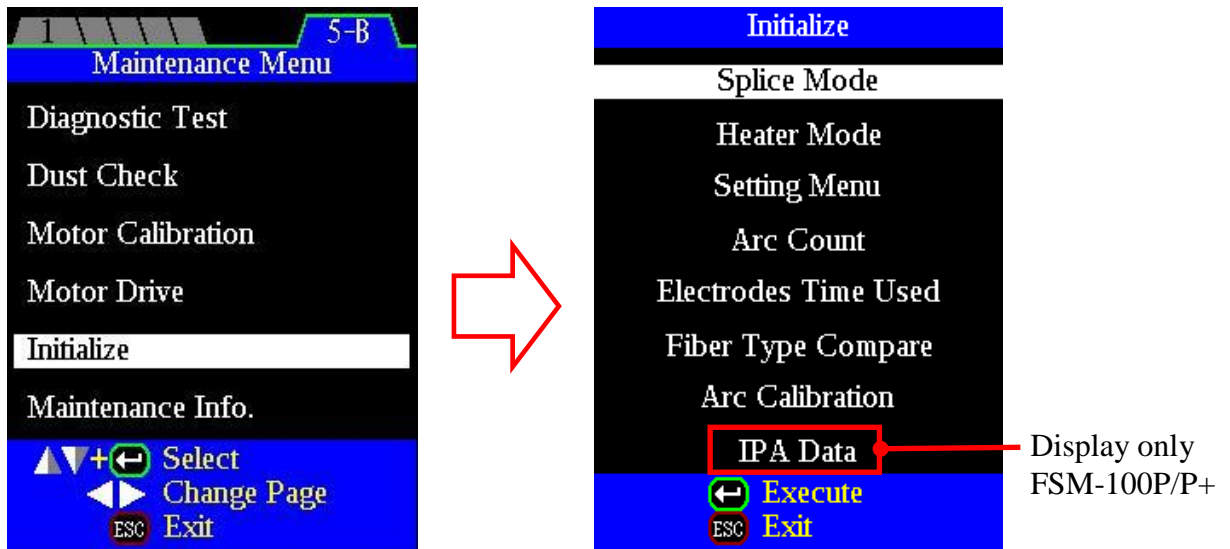
Maintenance Menu

11. Initialize

(SpliceMode, HeaterMode, Setting Menu, Arc Count, Electrodes Time Used, Fiber Type Compare, Arc Calibration, IPA Data (FSM-100P/P+ only))

To reset the factory default values;

- (1) Select the [Initialize] in [Maintenance Menu].



- (2) Select the item.

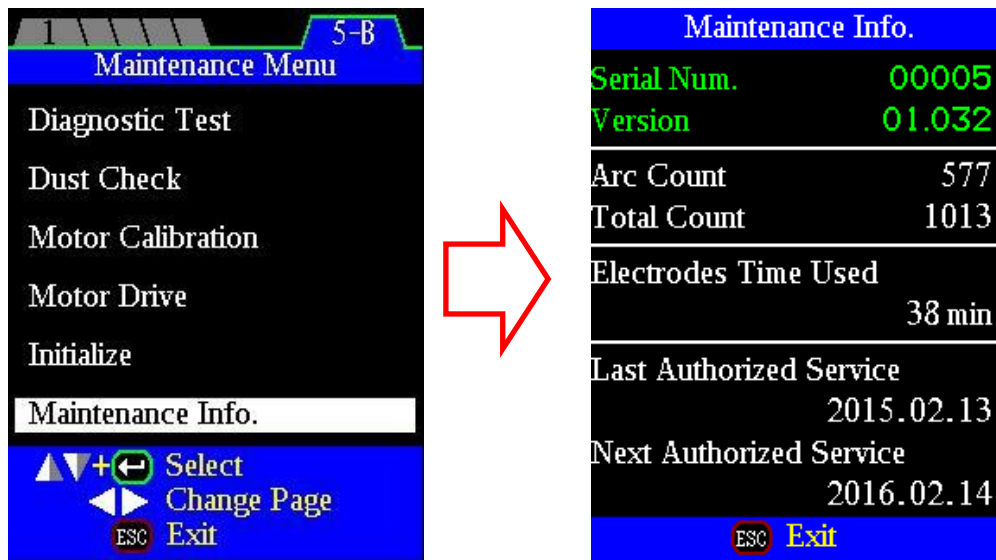
- (3) Initialize.



- The functions to initialize [Arc Count] and [Electrode Time Used] are included in the [Replace Electrodes] function.
- The number of arc discharges in the “Total Arc Count” field displayed on the [Maintenance Info.] screen cannot be reset.

12. Maintenance Info.

Select the [Maintenance Info]. The following information is displayed.



Parameter	Description
Serial Num.	Displays the serial number of the splicer.
Version.	Displays the version number of the software.
Arc Count	Displays the number of arc discharges after electrode replacement. Performing the function [Replace Electrodes] or [Arc Count Clear] resets this parameter to zero. This value is highlighted in yellow when it exceeds the [Electrode Caution] or in red when it exceeds the [Electrode Warning].
Total Count	Displays the total number of arc discharges.
Electrodes Time Used	Displays the time of arc discharge after electrode replacement. Performing [Replace Electrodes] or [Arc Count Clear] resets this value to zero. This value is highlighted in yellow when it exceeds the [Electrode Caution] or in red when it exceeds the [Electrode Warning].
Last Authorized Service	Displays the date of last authorized service.
Next Authorized Service	Displays the scheduled date of next authorized service.

Personal Computer Communication Function

The splicer can communicate with a personal computer via the USB port.

For the detailed information of the communication method, See the documents "Fsm100_Command ReferenceManual(*).pdf" and "UsbFsm100Server_Manual(1).pdf" in the folder "\API" in the Instruction CD.

Program samples written in C# and Excel VBA are also available in the Instruction CD. See the "AboutSamples.pdf" in the folder "\API" in the Instruction CD for reference.

The splice setting of the FSM-40F/PM series and the FSM-45F/PM series can be converted into the FSM-100 series. Please refer to the Excel file that exists in CD.

If you need further information about the communication between PC and the splicer, please contact to your nearest authorized distributor.

Error is displayed on the monitor.

Refer to the below list to confirm the solution precisely. If it is impossible to solve the problem, please contact the authorized distributor with the following information.

- Model name of the splicer
- Serial number of the splicer
- Error message
- Situation when the error occurs

Error Message	Reason	Solution
Too Long Fiber	<ul style="list-style-type: none">• [Cleave Length] setting is wrong.• The cleave length (bare fiber region) is too long.• Dust or dirt on the objective lens or the wind protector mirror.	<ul style="list-style-type: none">• Confirm [Cleave Length] setting.• Confirm the setting position of the stripped fiber end on the fiber cleaver. Check the cleave length.• Execute the [Dust Check]. Clean the lens or the mirror if dust or dirt exists.• In case the error is displayed again after you had tried the measurement, contact the authorized distributor.
Dark Back Ground	<ul style="list-style-type: none">• Dust or dirt on the objective lens or the wind protector mirror.• Wind protector mirror is not attached properly.• The LED or Camera does not work properly.	<ul style="list-style-type: none">• Execute the [Dust Check]. Clean the lens or the mirror if dust or dirt exists.• Confirm the position of wind protector mirror.• In case the error is displayed again after you had tried the measurement, contact the authorized distributor.

Error Message List

Error Message	Reason	Solution
Too Dusty Fiber	<ul style="list-style-type: none"> • Dust or dirt is on the fiber surface. • Dust or dirt is on the objective lens or the wind protector mirror. • [Focus] Setting value is not adequate. • [XY Align] is set to “Core” to splice indistinct core fiber. 	<ul style="list-style-type: none"> • Splicer cannot observe the fiber correctly because of dirt on fiber surface. Prepare and set fiber again. • Execute the [Dust Check]. Clean the lens or the mirror if dust or dirt exists. • Set [Focus] to “AUTO”. • Set [XY Align] to “AUTO” to splice indistinctive core fibers (i.e. PM fiber / MM fiber). • In case the error is displayed again after you had tried the measurement, contact the authorized distributor.

Error Message List

Error Message	Reason	Solution
θL Motor Overrun (Forward)	<ul style="list-style-type: none">•θ align parameter is not adequate for the chosen PM fibers.•The chosen fibers are not PM fibers.•The fiber is not set correctly at the bottom of the V-groove. The fiber misses the camera's field of view.	<ul style="list-style-type: none">• Confirm that θ align parameter is adequate for the chosen PM fibers.• In case that you use loose tube fiber, Please use loose fiber dedicated holder.• Press RESET, and set the fiber again to seat it correctly at the bottom of the V-groove.• Confirm the [Coating Diameter] setting and the [Clad Diameter] setting.• In case of coating clamping, if edge of coating is on V-groove, prepare the fiber again. If edge of coating is still on the V-groove after above operation, confirm setting of Tools. If possible, use the glass clamping mode due to increased stability.
θR Motor Overrun (Forward)		
θL Motor Overrun (Backward)		
θR Motor Overrun (Backward)		
ZL Motor Overrun (Forward)	<ul style="list-style-type: none">•The end surface of fiber is far from the splicing point. Therefore Z stage doesn't move to splicing point.•The fiber is not set correctly at the bottom of the V-groove. The fiber is not located in the Camera's field of view.•The cleave length (bare fiber part) is too short.	<ul style="list-style-type: none">• If position of Z slide board is set to backward, then set the Z slide board position to the forward position. (FSM-100P+/M+ only)• Press RESET key, and re-position the fiber again.• Confirm the [Coating Diameter] setting and the [Clad Diameter] setting.• Confirm the setting position of the end surface of the fiber cleaver. Check the cleave length.
ZR Motor Overrun (Forward)		
ZL Motor Overrun (Backward)	<ul style="list-style-type: none">•The taper speed or taper time is too high.	<ul style="list-style-type: none">• Confirm condition of taper splice
ZR Motor Overrun (Backward)	<ul style="list-style-type: none">• This error only occurs in manual motor operation.	

Error Message List

Error Message	Reason	Solution
Focus X Motor Overrun (Forward)	<ul style="list-style-type: none"> •The fiber is not set correctly at the bottom of the V-groove. The fiber position is out of focus range. •Dust or dirt is on the fiber surface resulting in focus failure. •Dust or dirt is on the objective lens or the wind protector mirror. 	<ul style="list-style-type: none"> •Press RESET key, and re-position the fiber again to seat it correctly at the bottom of the V-groove. •If clamping onto coating and the edge of coating is in the V-groove, prepare the fiber again. If edge of coating is still on the V-groove after above operation, confirm setting of Tools. If possible, use the glass clamping mode to increase stability. •Confirm the [Coating Diameter] setting and the [Clad Diameter] setting. •Prepare the fiber again. •Execute the [Dust Check]. Clean the lens or mirror if dust or dirt exists.
Focus X Motor Overrun (Backward)		
Focus Y Motor Overrun (Forward)		
Focus Y Motor Overrun (Backward)		
X-Motor Overrun (Upward)	<ul style="list-style-type: none"> •The fiber is not set correctly at the bottom of the V-groove. The fiber is offset too far and it exceeds the X or Y motor range. 	<ul style="list-style-type: none"> •Press RESET key, and re-position the fiber again to seat it correctly at the bottom of the V-groove. •Confirm the [Coating Diameter] setting and the [Clad Diameter] setting. •If clamping onto coating and the edge of coating is in the V-groove, prepare the fiber again. If edge of coating is still on the V-groove after above operation, confirm setting of Tools. If possible, use the glass clamping mode to increase stability.
X-Motor Overrun (Downward)		
Y-Motor Overrun (Upward)		
Y-Motor Overrun (Downward)		

Error Message List

Error Message	Reason	Solution
VAL Motor Overrun (Upward)	•There may be some fault.	• Power off and restart the splicer. If error message continues to display, consult the authorized distributor.
VAL Motor Overrun (Downward)		
VAR Motor Overrun (Upward)		
VAR Motor Overrun (Downward)		
CL Motor Overrun (Upward) (Downward)	•There may be some fault.	• Power off and restart the splicer. If error message continues to display, consult the authorized distributor.
CR Motor Overrun (Upward) (Downward)		
Cover Open	• The wind protector is opened during splicing.	•Press RESET key after closing the wind protector.
Motor Trouble	•Motor does not work correctly.	• Power off and restart the splicer. If error message continues to display, consult the authorized distributor.
Remote Control Disabled	•[Remote Control] is set to "Disable"	•Set the [Remote Control] to "Enable".
Uneven Melt At Fiber End	•Unable to calibrate the arc power because difference of melt amount between upper and lower sides of the fiber is too large.	<ul style="list-style-type: none"> •Check that the electrodes are set correctly. •Perform the [Electrode Stabilization]. •Please set the [Uneven Melt Detection Thr.] to "OFF". •Replace the electrodes and perform [Replace Electrodes] function. If this doesn't solve the problem, consult with your nearest authorized distributor.

Error Message List

Error Message	Reason	Solution
Strong Arc Power	•Unable to calibrate because arc power is too high.	<ul style="list-style-type: none"> •Check that the electrode is set correctly. •Execute the “Electrode Stabilization”. •When both L and R fibers are different type or diameter, arc center is shifted easily. Please set the [Arc Center Compensation] to “OFF”. •Replace the electrodes and execute [Replace Electrodes] function. If this does not solve the problem, consult with your nearest authorized distributor.
Weak Arc Power	•Unable to calibrate because arc power is too low.	
Too Left Arc	•Unable to calibrate because Arc Position is too far from the arc center.	
Too Right Arc	•Unable to calibrate because Arc Position is too far from the arc center.	
Bad Fiber Position	•The fiber is not set correctly at the bottom of the V-groove.	<ul style="list-style-type: none"> •Press RESET key, and re-position the fiber again to seat it correctly at the bottom of the V-Groove. •If clamping onto coating and the edge of the coating is in the V-groove, prepare the fiber again. <p>If edge of coating is still on the V-groove after above operation, confirm setting of Tools.</p> <p>If possible, use the glass clamping mode to increase stability.</p>
Different Fiber	•The fiber is not the correct fiber.	<ul style="list-style-type: none"> •In case of [Judge LR] mode, confirm if the left and right fibers are correct. •Confirm fiber data.
Fiber Data Not Installed	•The fiber is not registered.	•Register the fiber data by executing the “Learning Mode”.
No Arc Discharge	•Position of the electrodes may be not proper.	•Confirm position of the electrodes.
Camera Trouble	•Camera does not work properly.	•Power off and restart the splicer. If error message continues to display, consult the authorized distributor.
Heater Oven Trouble	•Heater doesn’t work properly.	•Consult the authorized distributor.
Temperature Sensor NG	•Temperature Sensor doesn’t work properly.	•Consult the authorized distributor.
Communication Error	•Sending failure	•Confirm the connection and settings of the power meter.
	•Receive failure	
	•Wrong channel	

Error Message List

* You can select whether operator can continue to splice or not when some kinds of error occur with the settings as following.

Error Message	Reason	Solution
Large Cleave Angle	Bad fiber end-face.	Check the condition of the fiber cleaver. If the blade is worn, rotate the blade to a new position.
	[Cleave Limit] is set too low.	Increase the [Cleave Limit] to an adequate limit.
Cleave Shape NG	Bud shape of end-face.	Check the condition of the fiber cleaver. If the blade is worn, rotate the blade to a new position.
Large Fiber Angle	[Core Angle Limit] is set too low.	Increase the [Core Angle Limit] to an adequate limit. (1.0 degree is standard)
	Dust or dirt is on the V-groove or the clamp chip.	Clean the V-groove and clamp chip.
	Clad diameter too large.	In case of setting the clad diameter value of the fiber greater than 250μm, set fiber holder with reverse orientation. (100M/P only)
	In case of coating clamp.	Fiber coating has curl. If curl ratio is too big, fiber angle error might happen. If possible, use the glass clamping mode to increase stability.
Thin Fiber/ Fat Fiber	Inadequate arc power	Calibrate the arc power with the [Arc Calibration] function.
	Prefuse power or time is too high	If using the Other mode, adjust or initialize [Prefuse Power] or [Prefuse Time] settings.
	Insufficient [Overlap] setting	If using the Other mode, adjust or initialize [Overlap] setting. The overlap value is fixed and cannot be adjusted in "Normal Splice Mode".
Too Tapering Fiber	Too much fiber taper.	Confirm setting of taper splice.
Bubble	Bad fiber end-face.	Check the condition of fiber cleaver. When the blade is worn, rotate the blade.
	Prefuse power or time is set too low	If using the Other mode, adjust or initialize [Prefuse Power] or [Prefuse Time] settings.
Fiber Separation	The fiber stuff amount is insufficient.	Check the [Overlap] settings in the splice mode.
	The prefuse power or prefuse time is too high.	Check the [Prefuse Power] and [Prefuse Time] settings in the splice mode.

Error Message List

Error Message	Reason	Solution
High Estimated Loss	Insufficient fiber cleaning.	Dust or dirt on the fiber surface result in high splice loss and low tensile strength. <ul style="list-style-type: none"> •Clean the fiber surface sufficiently. •Do not clean the fiber after cleaving to prevent dust on the fiber end-face. • Avoid any contact with the fiber end-face.
	Bad fiber end-face.	Check the condition of fiber cleaver. If the blade is worn, rotate the blade to a new position. Confirm the [Cleave Limit] setting. 2.0 degree or less is recommended.
	Dust or dirt is on the V-groove or the clamp chip.	Clean the V-groove and Clamp.
	Dust or dirt is on the lens or mirror	Execute the [Dust Check]. If dust or dirt exists, clean the lenses or mirrors.
	Bad electrode condition.	Replace the electrodes if they appear worn (rounded tip shape), dirty or bent.
	Inadequate arc power.	Calibrate the arc power with the [Arc Calibration] function.
	Using unsuitable splice mode	Select a suitable splice mode for the fibers to be spliced.
	[Loss Limit] is set too low.	Increase [Loss Limit] to an adequate limit.
	Inadequate arc parameters	Confirm the arc parameters are adequate to splice the fibers.
	Inadequate estimating parameters	Confirm the estimating parameters are adequate to estimate the loss. The MFD mismatch function does not work for certain types of specialty fibers. In such cases, set the [MFD Mismatch] to “OFF”.
Large Fiber Offset	Dust or dirt is on the V-groove or the clamp chip.	Clean v-groove and clamp chip. Check setting “Coating Diameter” and “Clad Diameter”.
	Edge of coating is on the V-groove.	Check cleaved length of the fiber.

Error Message List

Error Message	Reason	Solution
Hot Spot Detected!	Insufficient fiber cleaning.	Dust or dirt on the fiber surface result in bad splice loss and low tensile strength. <ul style="list-style-type: none"> •Clean the fiber surface sufficiently. •Do not clean the fiber after cleaving to prevent dust on the fiber end-face. • Avoid any contact with the fiber end-face.
High Crosstalk Estimated	Using unsuitable splice mode.	If you cannot confirm the fiber type, select “IPA” mode.
Not Reached to the Target	Setting is strict.	Check setting. In case the setting is strict, relax the setting value.
Arc Center Shifted	Electrode is worn	Replace with new electrodes.
	Position of electrode isn't proper.	Attach the electrode correctly.
	Splice different type or different diameter fibers.	When both L and R fibers are different type or diameter, arc center is shifted easily. Please set the [Arc Center Compensation] to “OFF”.
Estimation Failure	Setting of Estimation Loss isn't proper.	Check setting of Estimation loss. If splicing point was too thin or fat, estimation error occur easily. When the fiber shape is deformed by using [Special Function], set [Loss Estimation Method] and [Axis Offset] to “OFF”.

Content of errors keep updating. Therefore monitor may display the error that is not described in above table.

If it is hard to understand an error, please consult with the authorized distributor.

Questions and Troubleshooting

1. Power Supply

- (1) Power does not turn off when pressing **ON/OFF** key
 - Press and hold the key until the LED color changes from green to red.
- (2) Method to change the power saving function settings
 - See section [**Machine Settings**] function.

2. Splicing Operation

- (1) Error message appears on monitor
 - See section [**Error Message List**].
- (2) Confirmation of splicing procedures
 - See section [**Basic Operation**].
- (3) Monitor suddenly turned off / No key response
 - If the power saving function is enabled, the splicer switches to the power saving state after an extended period of splicer inactivity. Press any key to return to the normal state. To change the length of time before the splicer switches to the power saving state, see [**Machine Settings**] on.
- (4) Method to initialize arc condition of Splice mode
 - See section [**Initialize**].
- (5) Method to change error thresholds for Cleave angle, Splice loss and Fiber angle
 - See section [**Splice Settings**].
- (6) Error message can be over-ridden
 - See section [**Editing Splice Mode**] to not allow error message override.
- (7) Method to set Pause
 - See section [**Setting Menu**].
- (8) Method to display Cleave Angle, Fiber Angle and Core/Cladding Offsets
 - See section [**Editing Splice Mode**]
- (9) The fiber is aligned again even if the manual operation is executed in Pause2.
 - There is a method of using a manual alignment mode. See section [**Editing Splice Mode**]

(10) Inconsistent splice loss / High splice loss

- Clean the V-grooves, fiber clamps, wind protector mirrors, and objective lenses. See the [**Maintenance of Splicing Quality**].
- Replace the electrodes. See the [**Replace Electrodes**].
- See the “High Estimated Loss” error message section in the [**Error Message List**].
- If the secondary coated fiber has a curl or bend memory, set the fiber in such a manner that the crown (curve) of the memory is turned upward. In particular, Nylon coated fiber has a strong curl memory and then the splicer cannot clamp such fiber with the coating clamp without resulting in high splice losses. In this case, splice the Nylon coating fiber with bare fiber clamp.
- The splice loss varies according to cleave angle, arc conditions and fiber cleanliness.
- If the splice loss is still too high or inconsistent after performing the above-mentioned remedies, contact your nearest authorized distributor. Regular service (at least once a year) is recommended to maintain high splicing quality.
- In the case of splicing loose tube fiber with a coating clamp, the inside fiber is not clamped well even if circumference part could be clamped. Consequently, it causes high splice loss. In this case, clamp coating of the inside fiber or splice with a glass clamp.
- If the coating of fiber is soft and the fiber is stripped with HJS-02 with HJS spacer, the cleave length sometimes becomes longer due to the coating stretch (e. g. 3mm to 2mm). In this case, the splice loss becomes high because of the coating deformation due to the discharge heat. More than 4mm cleave length is recommended for such coating fiber.
- If a fiber with heat sensitive coating, is spliced with 3mm cleave length, fiber axis offset will occur due to coating deformation with discharge heat. In this case, more than 4mm cleave length is recommended. If you use 3mm cleave length, confirm that the splice loss performance is acceptable.
- If cleaving fiber with CT-03HT-06, about 50gf tension is necessary when fiber is set to the cleaver. Too little or too strong tension causes bad cleaves and high splice losses.

(11) 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.
- When splicing specialty fibers, adjust [MFD-L], [MFD-R], [Core Step] and [Core Curvature]. When splicing dissimilar fibers, also adjust [Min. Loss] and [MFD Mismatch]. To adjust these parameters, refer to parameter settings of the other splice modes stored in the database area.

(12) Method to operate Focus motor after splicing

- Use the [Motor Drive] function in [Maintenance Menu] while in [PAUSE1], [PAUSE 2] or [Finish] states. Press **Up/Down** Allow key to adjust the focus.

Questions and Troubleshooting

(13)The fiber vibrates on the monitor

- Another machine near the splicer could be creating a vibration, which causes the fiber to vibrate. In this case, please place four rubber pads under the machine which is creating vibration and the problem will be solved.



Rubber Pads (RP-01)

3. Arc Calibration

(1) What kind of fiber is available for Arc Calibration?

- SM fiber based upon ITU-T G652, DS G653 and NZDS G655 fiber is available. Do not use the PANDA or EDF, which is highly doped. If a fiber is only lightly doped, it can be used for Arc Calibration (e.g. Corning CS980, Flex core).

(2) Is Arc Calibration with “Clamp on coating” is possible?

- It is possible. However, confirm the results of “Coating Clamp” and “Glass Clamp” arc calibrations are the same for the particular fiber and coating being used.

(3) Too many repetitions until “Calibration Finish” indicated

- The splicer needs to repeat the arc calibration after replacing the electrodes or when the environmental conditions change drastically.
- Confirm the correct installation of “Electrodes”.
- Confirm that the tips of the electrodes are not bent and that a large amount glass is not attached. If either case exists, execute “Electrode Stabilize”.
- To set a maximum number of calibrations, see the [Maintenance Settings]. When the number of calibrations exceeds the setting, the splicer indicates “Test Finish” even when it is still not perfect.

(4) “Calibration Finish” is never indicated after many repetitions

- Execute [Stabilize Electrodes] function in [Maintenance Menu]. If the splicer still does not indicate “Calibration Finish”, replace the electrodes. See [Replace Electrodes] section.

(5) 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.
- The calibration results affect all splice modes.

Questions and Troubleshooting

4. Tube-heating Operation

(1) Fiber protection sleeve does not shrink completely

- Extend the heating time. See section [**Heater Menu (Sleeve Heater)**].

(2) Heater LED on panel keyboard blinks

- Pressing the HEAT key during heating causes the LED to blink. The tube heater is turned off if the HEAT key is pressed again. If, after 2 seconds have gone by without pressing the HEAT key again, the LED stays on continuously and the heater returns to its normal state. The LED will turn off when the heat cycle is completed.
- If the Heating temperature does not reach its inputted setting, the LED blinks and the alarm sounds. If this happens, contact the authorized distributor.

(3) Fiber protection sleeve adhered to heating plate after shrink

- Use a cotton swab or a similar soft tip object to push and remove the sleeve. If the black coating is removed, contact your authorized distributor.

(4) Method to initialize heating condition of Heater mode

- See section [**Initialize**].

5. Supervising

(1) What functions can be disabled

- See section [**Menu Lock Settings**].

(2) Method to lock “selection” or “editing” of Splice or Heater mode

- See section [**Menu Lock Settings**].

(3) Forgot password

- Contact the authorized distributor.

6. Other Functions

(1) Method to execute [Arc Calibration] automatically after turning power on

- See section [**Machine Settings**].

(2) Method to hide messages on [READY] screen

- Change the fiber image from X/Y view to X magnified view or Y magnified view by pressing **X/Y** key.

(3) Method to input different comments after each splice in splice results data

- See section [**Splice Result Memory**].

(4) Method to input the same comments automatically in splice results data

- See section [**Splice Result Memory**].

(5) Method to cancel storing splice results in internal memory

- See section [**Splice Result Memory**].

(6) Method to download splice results from splicer to PC

- Contact the authorized distributor.

1. Guarantee



1. Guarantee period and limits

If the splicer becomes out of order within one year from the date of delivery, we will repair it free of charge. However, note that repairs will be charged for the following cases regardless of the guarantee period:

- (1) Trouble or damage due to natural disaster.
- (2) Trouble or damage due to mishandling.
- (3) Trouble or damage due to handling in disregard of the operating procedures or instructions described in the instruction manual.
- (4) Consumable items (discharge electrodes etc.)

Please note that the memory of the splice results, parameters, etc. may be deleted during the repair.

2. Necessary information needed for repair

Include documentation with the splicer informing us of the details listed below.

- (1) Your full name, section, division, company, address, phone number, fax number and e-mail address.
- (2) Model name and serial number of the splicer.
- (3) Problems encountered
 - What problems did your splicer get into and when?
 - What is its present operational state?
 - What is the state of the display monitor and the contents of the relevant error message etc...

3. Transporting the splicer

Since the splicer is a high-precision machine, always use the original carrying case for transportation and storage in order to protect it against humidity, vibration and shock. When requesting splicer repair, please send it, along with its accessories, in its original carrying case.

Refer to an address on the next page.

2. Contact Address



Inquiries concerning products should be made to the authorized distributor or one of the following:

Fujikura Europe Ltd.

C51 Barwell Business Park

Leatherhead Road, Chessington, Surrey KT9 2NY

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Fax. +44-20-8240-2010 (Service: +44-20-8240-2029)

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