FTS-B419

S123M8/M12 FUSION SPLICER
User's Manual

- **Please read entire manual prior to usage.**
- **This manual must be kept with the S123 Fusion Splicer.**

Issue 2

FURUKAWA ELECTRIC CO., LTD.

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1. Introduction

The FITEL Fusion Splicer S123 series are compact designed fusion splicer.
S123M12/M8 Ver.2 Fusion Splicer splices single fiber and ribbon fiber. After setting the prepared fibers, S123M12/M8 Ver.2 automatically feeds the fiber ends and inspects their cleave condition, axis offset. Then the S123M12/M8 Ver.2 discharges the arc to melt the glass and butts the end together. The S123 M12/M8 Ver.2 has the heater applied 40mm and 60mm protection sleeve for reinforcing the spliced fiber.
The S123 M12/M8 Ver.2 can be powered by the AC adaptor and Battery. The Battery is made of Li-ion cells and is charge by the S123 M12/M8 Ver.2 body and the special charger.

2. Safety Information and Instructions

This manual contains complete operating and maintenance instructions for THE S123M8/M12 FUSION SPLICER. Please review this manual carefully before operating.

2.1. Safety Information

The following safety instructions must be observed during S123 fusion splicer operation, serviced or repaired. Failure to comply with any of these instructions or with any precaution or warning contained in the User's Manual is in direct violation of the standards of design, manufacture and intended use of the instrument. Furukawa Electric Co., Ltd. assumes no liability for the customer's failure to comply with these safety requirements.

2.2. Safety Messages

The following messages may appear in the User's Manual. Please observe all safety instructions that are associated with the message.

	Refer to the User's Manual for instructions on handling and operating the instrument safely.
WARNING	**The procedure can result in serious injury or loss of life if not carried out in proper compliance with all safety instructions. Ensure that all conditions necessary for safe handling and operation are met before proceeding.**
CAUTION	**The procedure can result in serious damage to or destruction of the instrument if not carried out in compliance with all instructions for proper use. Ensure that all conditions necessary for safe handling and operation are met before proceeding.**

- Please contact The Furukawa Electric Co., Ltd. or your local representative with any questions relating to any subject described within this manual.

In no case will The Furukawa Electric Co., Ltd. be liable to the buyer, or to any third parties, for any consequential or indirect damage which is caused by product failure, malfunction, or any other problem.

2.3. WARNINGS and CAUTIONS

⚠ WARNING
◆ **The power cord supplied with this equipment must be connected to a power socket, which provides a reliable protective ground. Or, ground it with the Ground terminal on the fusion splicer.**
◆ **Use only the cords attached to the fusion splicer. Connecting inappropriate cords or extending the cords may cause them to heat up abnormally and may cause fire.**
◆ **This product contains a Lithium Cell. The device is identified by a warning label. Do not dispose of in fire. Disposal of this device must be carried out by qualified personnel.**
◆ **Never touch the electrodes when the fusion splicer is powered on. Doing so may cause electrical shock. ⚠ Warning symbol is placed on the windshield for notification.**
◆ **Do not operate the fusion splicer without electrodes.**

⚠ WARNING

- **Do not disassemble the instrument except as described in the maintenance section of this manual. The fusion splicer contains no user serviceable parts. Warranty on this product will be void f any of the potted nuts are disturbed.**
- **Avoid soaking the fusion splicer with water. Doing so may cause fire, electrical shock or malfunction.**
- **Do not use inappropriate input voltage. Doing so may cause fire, electrical shock or malfunction.**
- **Do not insert or drop any metal or any flammable material into the main body through any aperture. Doing so may cause fire, electrical shock or malfunction.**
- **Avoid direct skin contact with the heating portion. This may cause burn or injury. ⚠ Warning symbol is placed on the lid of the protection sleeve heater for notification.**
- **Do not remove the panels of the fusion splicer. Some parts generate high voltage. Removing the panels may cause electrical shock.**

⚠ WARNING

- **If abnormal sounds or extra high temperatures are observed, turn off the power, disconnect the power cord, remove the batteries, and contact The Furukawa Electric Co., Ltd. or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.**
- **Do not use a damaged power cord where the inner cable is exposed or severed. Doing so may cause fire or electrical shock.**
- **If water is spilled into the fusion splicer, turn off the power switch, disconnect the power cord, remove the batteries, and contact The Furukawa Electric Co., Ltd. or your local representative. Continuing to operate under these conditions may cause fire or electrical shock.**
- **If smoke or strange smells are observed, turn off the power switch, disconnect the power cord, remove the batteries, and contact The Furukawa Electric Co., Ltd. or your local representative. Continuing to operate under these conditions may cause fire, electrical shock or malfunction.**

⚠ WARNING

- **If the fusion splicer is dropped and damaged, turn off the power switch, disconnect the power cable, remove the batteries, and contact The Furukawa Electric Co., Ltd. or your local representative. Continuing to operate may cause fire or electrical shock.**
- **Do not look into a fiber with naked eye during operation. Wearing a protection glass is recommended.**
- **STOP using the fusion splicer when problems are experienced with the protection sleeve heater. Turn off the power immediately, disconnect the power cord, remove the batteries, and contact service center.**
- **Do not use a gas spray to the splicer. The hazardous gas may come out by electric discharge. It may cause a fire and machine failure.**

⚠ WARNING

◆ **The S123 passed the following test conditions:**

Drop resistance – 76cm drop from 5 different angles *. Water resistance – IPX2 rating drip proof (exposed to 3mm/min drip for 10 min with 15° tilt) *. Dust resistance – IP5X rating dust proof (exposed to dust particles with a diameter of 0.1 to 25μm for 8 hours) *

***Above tests were performed at Furukawa Electric Co,. Ltd laboratories and do not guarantee that the machine will not be damaged when subjected to these conditions.**

⚠ CAUTION

- **Do not place the fusion splicer on an unstable or inclined surface. There is a possibility that the fusion splicer will fall and cause injury.**
- **Disconnect all cords when moving the fusion splicer. Failure to do so may damage the cords which may cause fire or electrical shock.**
- **Do not place the cords around any heating instrument. Doing so may damage the cords which cause fire or electrical shock.**
- **Do not connect or disconnect cords with wet hands. Doing so may cause fire or electrical shock.**
- **Do not pull the cord to disconnect. Doing so may damage the cords which may cause fire or electrical shock. Hold the plug portion and disconnect the cord.**
- **Do not put heavy items on the cords. Doing so may damage the cords which may cause fire or electrical shock.**
- **Do not modify the cords and do not over-bend, over-twist, or over-stretch the cords. Doing so may cause fire or electrical shock.**

⚠ CAUTION

- **Ensure that the cords are disconnected and the batteries are removed from machine's main body when storing the fusion splicer.**
- **Never use aerosol dust cleaners or alcohol-based solvents to clean the electrodes.**
- **Non oil-based solvents should be used to clean the optical lenses.**
- **Store the fusion splicer in a cool dry place.**
- **When the temperature of the splicer body is different from the operating temperature limit extremely even if the environment temperature is in the operating temperature limit, please use after the temperature of the splicer body near the operating temperature. Or, the splicer might not work normally.**
- **Close the heater cover when the splicer is carried by the hard case. Or the heater is damaged.**

The S943B Battery is made of Li-ion battery cells. Refer to following safety instructions on handling and operating the Battery safety.

⚠ WARNING
◆ **Do not dispose the Battery in fire, or leave the Battery near a high-temperature object. Doing so may cause fire or explosion.**
◆ **Do not short-circuit the recharging connector or the output terminal for splicer. Doing so may cause fire by generation of heat.**
◆ **Charge the S943B Battery by the S958B Battery Charger. If charging by other equipment that is not suitable for charging S943B, it may cause fire.**
◆ **Avoid soaking the Battery with water. Doing so may cause fire or electrical shock.**
◆ **Do not disassemble the Battery. Avoid damage by dropping or heavy shock. Doing so may cause fire or electrical shock. If inner cells rupture and electrolytic solution leaks outside, it may cause inflammation to your skin or eyes.**

⚠ WARNING

- **Disposal of used Battery must be carried out according to disposal established by Law. For instructions, contact The Furukawa Electric Co., Ltd. or your local representative.**

⚠ CAUTION

- **Do not charge the Battery, when the Battery has a full charge. Doing so, will decrease battery life.**
- **Immediately after the battery has been charged it may have a high temperature. Take care of handling the Battery.**

Notes

This symbol mark is for EU countries only.
This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.
This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.
If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the
battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:
Hg: mercury (0.0005%), Cd: cadmium (0.002%), Pb: lead (0.004%)
In the European Union there are separate collection systems for used batteries and accumulators.
Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

Please, help us to conserve the environment we live in!

2.4. Power Requirements

The S123 fusion splicer has the S943B internal battery for battery operation and the battery is charged by the S958C Battery Recharger through S967A and S977A AC adapter with AC power source that supplies between 100-240 V at a frequency of 50-60 Hz. The S123 fusion splicer can also operate using AC power with the S976A AC adapter.

 **WARNING**	**To avoid the risk of injury or death, ALWAYS observe the following precautions before initializing the S123 fusion splicer.** ◆ **If using a voltage-reducing auto-transformer to power the S123 fusion splicer, ensure that the common terminal connects to the grounded pole of the power source.** ◆ **Use only the type of power cord supplied with the S123 fusion splicer.** ◆ **Connect the power cord to a power outlet equipped with a protective ground contact only (never connect to an extension cord that is not equipped with this feature).** ◆ **Willfully interrupting the protective ground connection is prohibited.**

2.5. Toxic Hazards

The S123 fusion splicer presents no toxic hazards (under normal conditions of use, storage, and handling). However, under the following conditions, certain precautions are necessary.

2.5.1. Incineration

Some of the electronic components included in the assembly are constructed with resins and other chemicals that produce toxic fumes during incineration.

2.5.2. Acidic or caustic compounds

Some of the electronic components included in the assembly, particularly electrolytic capacitors, contain acidic or caustic compounds. In the event that a damaged component comes in contact with the skin, wash the affected area immediately with cold water. In the event of eye contamination, wash thoroughly with a recognized eye-wash and seek medical assistance.

2.5.3. Physical damage

Some of the components used in the assembly may contain very small quantities of toxic materials. There is a remote possibility that physically damaged electronic components may present a toxic hazard. As a general precaution, avoid unnecessary contact with damaged electronic components, and arrange for disposal in accordance with local regulations.

3. Getting Started

3.1. Unpacking and Initial Inspection

1. Inspect the shipping container for any indication of excessive shock to the contents.
2. Remove the S123 carrying case from the shipping container, and open the case.
   Ensure that the carrying case is right side up before opening. (It applies in the package form with the carrying case.)
3. Inspect the contents ensure that the shipment is complete.
4. Lift the S123 fusion splicer out of the carrying case, and place the instrument on a flat, smooth surface.
5. Visually inspect the S123 fusion splicer and all accompanying components for structural damage that may have occurred during shipping.

Immediately inform Furukawa Electric and the carrier, if the contents of the shipment are incomplete, or if any of the S123 fusion splicer components are damaged, defective, or if the S123 fusion splicer does not pass the initial inspection.

- *Protection sheet is pasted on the surface of LCD cover, the surface of the switch panel, and the surface of the label. Please peel off before using S123.*

⚠ **WARNING**	**To avoid electrical shock, do not initialize or operate the S123 fusion splicer if it bears any sign of damage to any portion of its exterior surface, such as the outer cover or panels.**

4. Operating Specifications and Components

4.1. Product Line Up

S123 fusion splicer series provides following model types, depending on the application.
This manual describes two models, S123M8Ver.2 and S123M12Ver.2. Please refer to the right operation guide accordingly.

Model	Application
S123M8 Ver.2	Splicing for single fiber to 8-fiber ribbon using Fiber Holder System
S123M12 Ver.2	Splicing for single fiber to 12-fiber ribbon using Fiber Holder System

4.2. Specifications

The specifications of each splicer are referred the following table.

Item	Specification and Features
Fiber type*[1]	SM / MM / DS / NZDS / BIF / UBIF
Fiber count	Single Fiber and 2, 4, 6, 8-fiber Ribbon (S123M8) Single Fiber and 2, 4, 6, 8, 10, 12-fiber Ribbon (S123M12)
Coating diameter	0.25, 0.9mm for Single Fiber 0.28 – 0.4mm (thickness) for Ribbon
Clad diameter	0.125mm
Applicable sleeve length	40mm, 60mm
Power	DC：11 - 17V AC：100 – 240V (50/60Hz) (Using AC Adaptor S976A)
Weight	Main Body: 1.6kg, Battery: 170g
Power Consumption	AC: Maximum: 56W Normal operation: 7.0W DC: Maximum: 49W Normal operation: 5.0W

Item	Specification and Features	
Environmental Conditions	Operation	Environment temperature: -10 - +50 °C Environment Humidity: Below 90% at 38°C (No condensation)
	Storage	Environment temperature: -40 - +60 °C Environment Humidity: below 95%
Average Splice Loss*2	SMF: 0.05 dB, MMF: 0.03 dB DSF: 0.08 dB, NZDS: 0.08dB	
Typical Splicing Time	13s for Single Fiber, 15s for 12-fiber Ribbon	
Typical Heating Time*3 (in the AC Adaptor use)	40mm Ribbon Fiber: Approx. 35s	
Program Number Available	Splice: 150 / Heat: 18	
Maximum Number for Data Storage	Splice: 1,500 / Fiber Image: 24	
Input/Output Terminals	Data Input/Output：USB 2.0	

*1: Applied to ITU-T standard

*2: Testing done in a laboratory environment with similar fibers. Not guaranteed results.

*3: In the battery use, the heating time might be longer than typical heating time. The heating time might be longer depending on the environment too.

4.3. Components

4.3.1. Standard Components

The S123 Fusion Splicer comes with the following standard equipment. Be sure to confirm their presence before starting any operation.
The component is difference by ordering number.

品名	型式	S123M8	S123M12
S123M8 Main Body	S123M8-X-A-0001	1	ー
S123M12 Main Body	S123M12-X-A-0001	ー	1
AC Adapter for Splicer	S976A	1	
Cleaning Brush	VGC-01	1	
Hard carrying Case *	HCC-01	1	
Li-Ion Battery	S943B	1	
Electrode (pair)	S969	1	
Electrode Cleaning Disk	D5111	1	
Manual	FTS-B361	1	
Fiber Reformer(4)(12)		1	1

*) Shut the windshield and the lid of the protection sleeve heater, when you store the splicer in the Hard carrying case. When transported, the windshield and the lid of heater might be damaged.

4.3.2. Optional Components

Item	Part Number	Quantity
Soft Carrying Case *1	SCC-01	1
Cooling Tray	CTX-01	1
Angle Stand	AGS-01	1
Working Belt	WBT-01	1
USB Cable	USB-01	1
Car Cigarette Cable *2	CDC-01	1
Cleaning Brush	VGC-01	1
Li-Ion Battery	S943B	1
Battery Recharger	S958C	1
AC Adapter for Battery Recharger	S977A	1
AC Adapter for Splicer	S976A	1
Fiber Holder for 250um coating diameter fiber	S712S-250	1 pair
Fiber Holder for 500um coating diameter fiber	S712S-500	1 pair
Fiber Holder for 900um coating diameter fiber	S712S-900	1 pair

*1)Please do not give a big impact when you carry with Soft case or Working belt . The storage thing might be damaged by the impact. Soft case and Working belt don't guarantee damage by the fall and the impact.

*2FUSE:125V-7A Normal

4.4. Optional Accessories

Contact the Furukawa Electric Co., Ltd. or your local representative for a more detailed specification.

- S210 Stripper
- S218R Hot Stripper
- S326 High Precision Cleaver
- S921 60mm Splice Length Protection Sleeves for Single fiber
- S922 40mm Splice Length Protection Sleeves for Single fiber
- S924 40mm Splice Length Protection Sleeves for Ribbon fiber

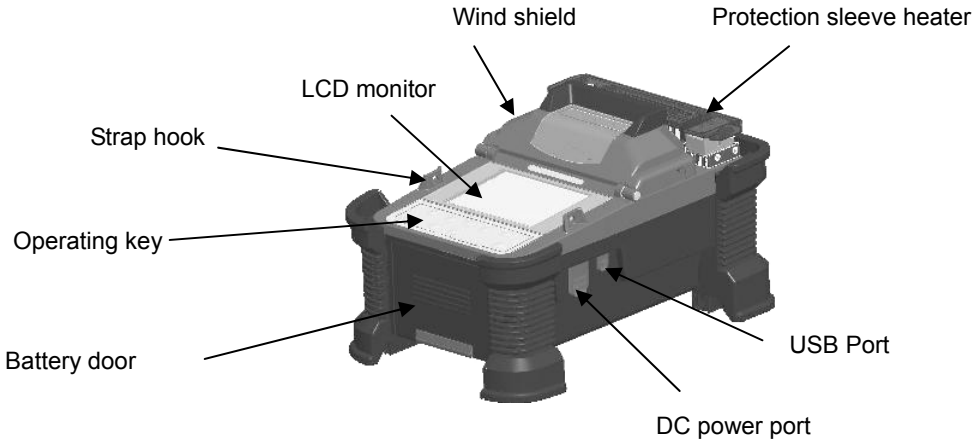
4.5. Recommended Consumable

Keep a supply of the following items with the S123 fusion splicer at all times.

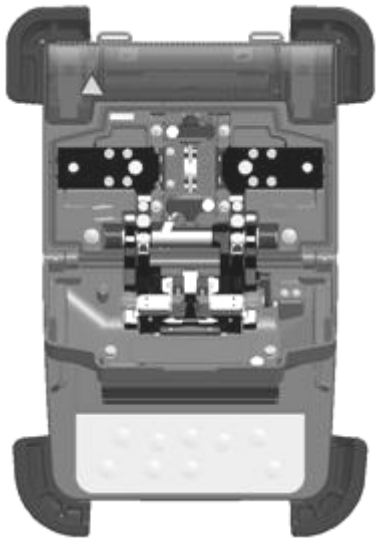
- Tweezers
- Protective eye glasses
- Denatured alcohol
- Lint-free tissues or swabs
- Container for disposal of scrap fiber

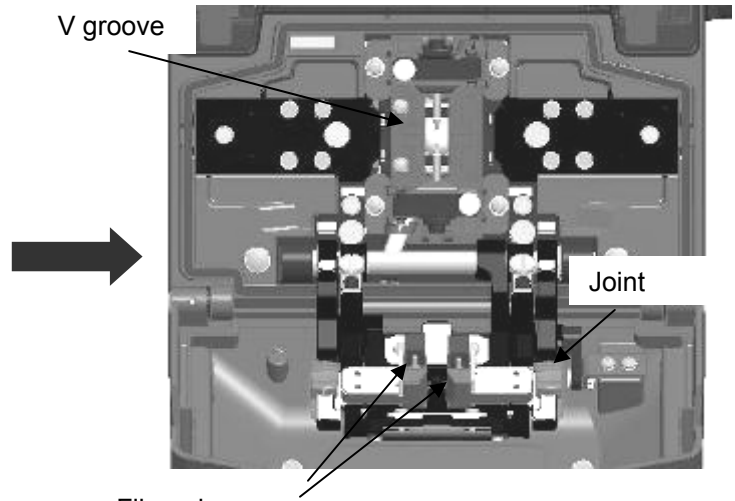
5. External Description

5.1. Main Body



S123M8Ver.2/M12Ver.2

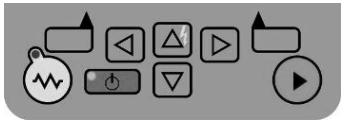




Fiber clamp
It can be a switch of
non-synchronization/synchronization with the joint.

5.2. Operating Keys and Status LED

5.2.1. Operating Keys



Indicator	Name	Main functions
	Start	Start/Pause/Restart the splicing process
	Function 1	Selecting the function(s) shown on left bottom corner of LCD.
	Function 2	Selecting the function(s) shown on right bottom corner of LCD.
	Up	Move upward／Increase value／Add additional arc
	Down	Move downward／Reduce value Up & Down Fiber clamp

Indicator	Name	Main functions
	Left	Move left
	Right	Move right
	Heating	Start heating／Stop heating
	Power	Turn on/off the power

5.2.2. LED Indicators

Indicator	Name	Color	State
	Power LED	Green	LED is on when power is turned to “on”. LED flashes when it is in “sleep” mode.
	Heater LED	Red	LED is on when heater is in “on” mode.

5.2.3. Buzzer

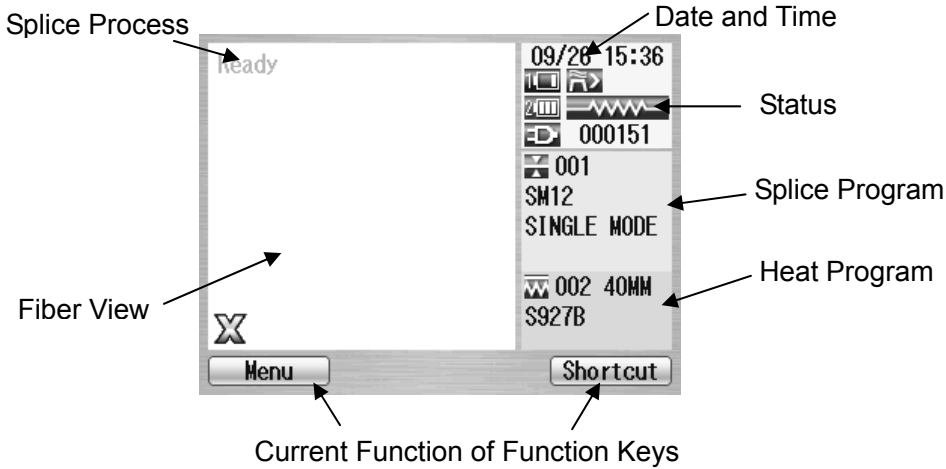
Buzzer will ring whenever any key is pressed. In addition, the following buzzer patterns indicate status of operation.

- Operating key: one beep
- Completing machine reset: one beep
- Error occurred: three beeps
- Splicing finished: a series of beeps
- Saving data: two beeps
- Heating process finished: one long beep

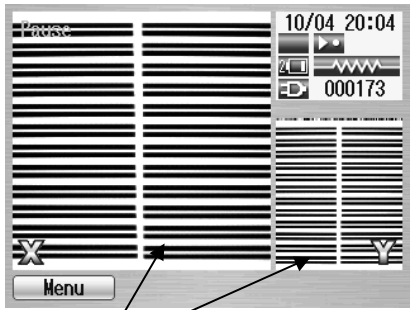
5.3. Screens

5.3.1. Ready Screen

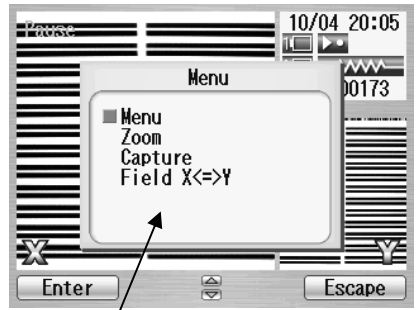
Once the S123 fusion splicer is powered up and initialized, the “Ready” screen is displayed.



5.3.2. Screen during Splice

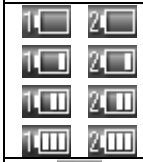


Fiber Images
X from front camera and Y from back camera. X and Y views can be switched.
In S123M12, 12 fibers are displayed in the order from bottom to top (1-12).



Pop-up Window
Pop up when new functions are selected. Also, shows warning and error messages.

5.3.3. Status Icons

Type	Icon	Content
Power		Using external power
		Using internal battery. The level of battery has four stages. The lamp will start to flash when the level is very low. The splicer has two battery slots. Upper slot is called 1, the other is number 2.
		No battery
		Charging
Back-up battery warning *[1]		The lamp will be “on” when back-up battery (for storing parameters and data) is very low.
Heater Status		Blue: In ready mode. Red: In heating mode. Orange: In preliminary heating mode.
		In cooling mode. *[2]
		Error occurring.

Type	Icon	Content
Running mode	In this mode, splicing is triggered by closing the wind shield.	
		Splicing process goes on until the end of splicing.
		Splicing process pauses once before arc discharge.
		Splicing process pauses at each sub-step.
	In this mode, splicing is triggered by closing wind shield and then pressing the Start key.	
		Splicing process goes on until the end of splicing.
		Splicing process pauses once before arc discharge.
		Splicing process pauses at each sub-step.
		Semi-Auto mode is effective. The fiber is loaded to the center of the screen by closing windshield, and stops temporarily. Splicing is triggered by pressing the Start key.
Data output		In this mode, various measurement and calculation information is shown on the fiber image area.

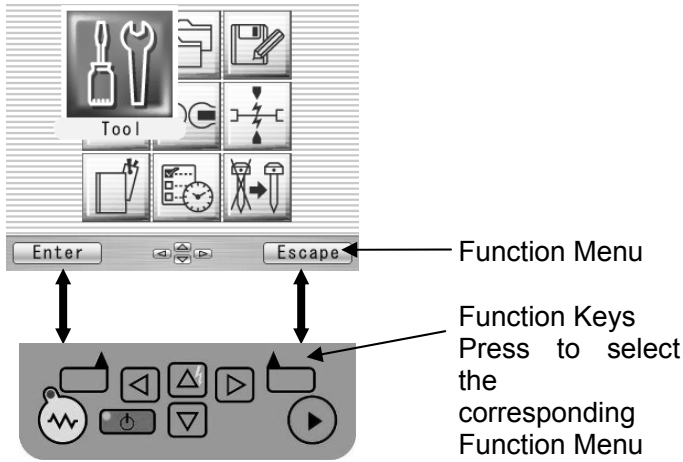
*1) If the backup battery empties completely, the data memorized in the memory is deleted. Please turn on the splicer to charge the backup battery, when not splicing.

*2) The heater cooling fan pauses regardless of the its icon status, when heating and splicing are done at the same time. Splicing is completed, the cooling fan works again.

5.3.4. Menu Screen

Press ◄ ► and ▲ ▼ keys to access to the desired menu and the pointed menu pop-ups to large icon. Press Enter to select the menu.

Function keys are provided to initiate current available functions displayed above the function keys.

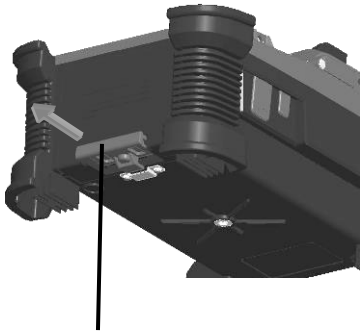

Tool
Enter
Escape
Function Menu
Function Keys
Press to select the corresponding Function Menu

6. Basic Operation

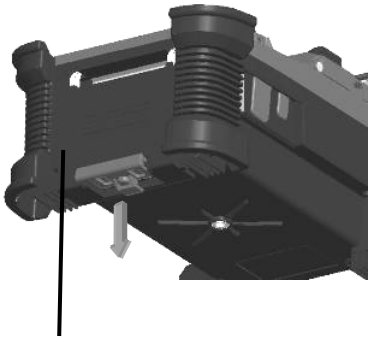
6.1. Preparations for Power Supply

6.1.1. Installing Battery

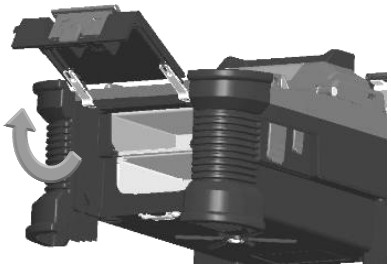
Insert S943B battery as shown below.



1. Pull the Battery Door Lock.

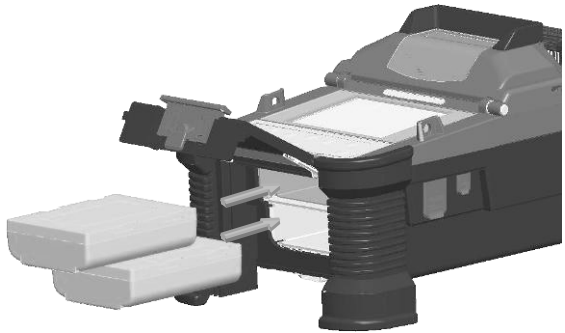


2. Lower the Battery Door a little.



3. Open the Battery Door Lock.

4. Insert the battery straight in the battery slot of the fusion splicer in the correct direction.
After closing the battery door, lock the door lock surely.



Don’t pull out the battery when power is turned on.
The power supply might fall.

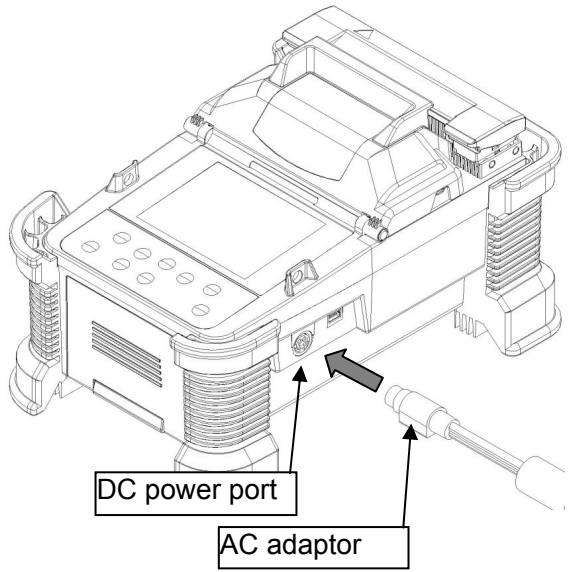
6.1.2. Removing Battery

How to detach the battery is a procedure opposite to the installation.

 **CAUTION**	**Be sure to turn off the Power switch before removing the battery. When installing and/or removing the battery, be careful not to drop the battery.**

6.1.3. Connecting the power cable to AC adapter

Connect the AC adaptor to DC Power port of the Splicer, and plug the AC adaptor into AC outlet.



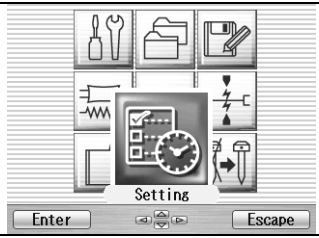
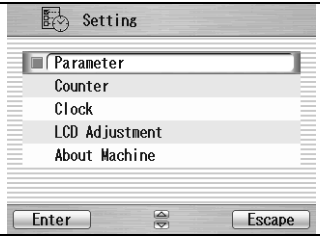
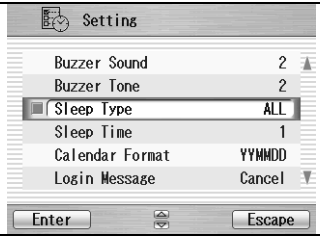
6.1.4. Charging the Battery

When charging battery in the S178 Ver.2 splicer
After connecting the power cable to AC adapter and plugging the power cable into AC outlet,
Turn the splicer on. Charging process starts.
(When arc-discharging, charge process stops temporarily. The charge time will be longer. And the charge time will vary depending on the remaining power level of battery.)

Charging, Battery indicator is red.

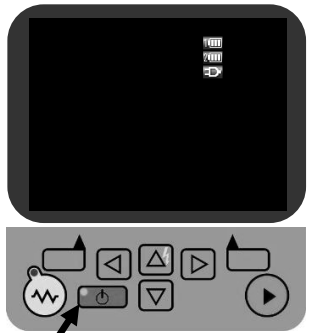
	In case "Sleep Type" is set to "ALL", Splicer is turned off automatically when it is not operated for a while after the charge is completed.

How to set the Sleep mode

		
Select “Setting” on the menu screen	Select “Parameter”	Set “Sleep Type” to All”. Splicer is turned off automatically without being operated for awhile.

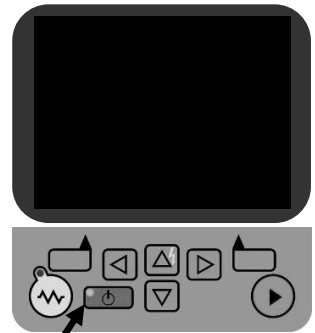
Screen display during charging

When "Sleep Type" is set to "LCD" or "ALL", the LCD screen changes into the following display, after non-operation continues.



Green lamp blinks

After non-operation continues, the backlight of LCD is turned off. Only Battery indicator and AC-power supply indicator are displayed.



Green lamp blinks

After a while, Battery indicator and AC-power supply indicator disappear.

When set to “ALL”, Splicer is turned off automatically in a few minutes.

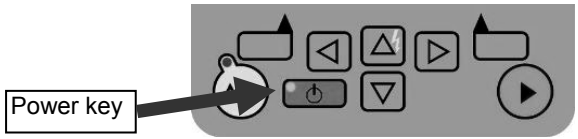
When charging battery with the external charger
Follow the procedure below to charge the S943B battery.

1. Place the S958C Charger on a flat surface and connect to AC power source with AC adapter. When a power supply is connected, the power lamp turns on green steady light.
2. Insert the S943B battery to charge slot on the S958C charger. 2 batteries can be inserted in the S958C charger. The S958C charger charges with two batteries at the same time.
3. The red light on the S958C charger illuminates while recharging. It takes approximately 2 hours to recharge an empty battery.
4. The light changes to green when the recharge is completed. Remove the S943B battery.
5. Disconnect the S958C charger from AC power source.

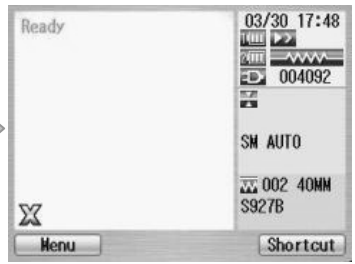
	S943B battery is lithium ion type rechargeable battery; it can be recharged at any time, regardless if it is fully empty or still with some residual power. If storing battery for a long time, the power level becomes very low caused by self-discharging and the battery may be degraded. Be sure to recharge the battery at least every 2 months even when not in use.
	It is possible that the battery could not be fully charged, if moving the battery from a cold place (<5°C) to a warm place (around 20°C) and then immediately charging it. In this case, make sure battery is in the new environment for a short while to equalize the temperature, then charge the battery. When charging battery, the room temperature must be in the range of 5 - 40°C.

6.1.5. Turn Splicer ON and OFF

Turning ON/OFF the power : Keep pushing power key (for about 2 seconds)



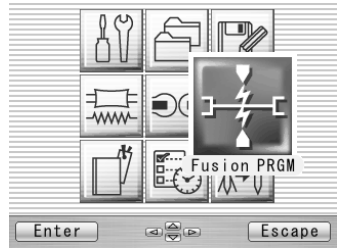
Turning ON power
The opening massage will appear on the LCD screen for a short while, before the ready screen showing up.



Turning OFF power
The LCD screen is turned off.
The power supply cuts after all motors perform the reset operation.

6.2. Load programs

Install appropriate programs before operation. The S123 fusion splicer already has pre-defined programs installed for major fiber types and protection sleeves. Select the program for fusion and heat, or edit and store a new program.



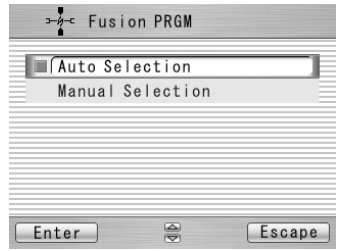
6.2.1. Fusion Program

S123M4 has two splicing program mode, one is “Auto Selection” and another is “Manual Selection”.
At “Auto Selection” mode, S123M4 is automatically selected the suitable fusion program depending on the fiber count.

A. Auto Selection mode

Select an appropriate fiber type for specific fibers to be spliced, and S123M4 is automatically selected the suitable fusion program depending on the fiber count.
This mode is selected at the factory setting.

1. Press Menu key to call the Menu screen.
2. Select “Fusion PRGM” and press Enter key, and the Fusion PRGM screen is displayed.



3. Select “Auto Selection”, and press Enter key, and the Fiber type screen is displayed.
4. Select the proper fiber type by pressing ▲ ▼ keys and press the Select key.
5. “Ready” screen is displayed, and “AUTO” is displayed for the splicing program.

B. Manual Selection mode

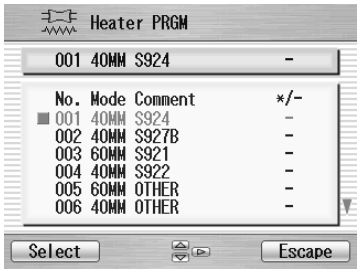
Install an appropriate fusion program for specific fibers to be spliced.

1. Press Menu key to call the Menu screen.
2. Select “Fusion PRGM” and press Enter key, and the Fusion PRGM screen is displayed.
3. Select “Recent Programs” to select from the programs recently used, or “All Programs” to select from all the programs installed.
4. Select the proper program by pressing ▲ ▼ keys and press the Select key. A comment of the pointed program is displayed by pressing ► key, and will disappear by pressing ◄ key.

M8	M12	Mode	Comment	Description
---	001	SM12	SINGLE MODE	Splicing for standard SM12 fibers
---	002	SM10	SINGLE MODE	Splicing for standard SM10 fibers
001	003	SM8	SINGLE MODE	Splicing for standard SM8 fibers
002	004	SM6	SINGLE MODE	Splicing for standard SM6 fibers
003	005	SM4	SINGLE MODE	Splicing for standard SM4 fibers
004	006	SM2	SINGLE MODE	Splicing for standard SM2 fibers
005	007	SM1	SINGLE MODE	Splicing for standard SM1 fibers
---	008	MM12	MULTI MODE	Splicing for standard MM12 fibers
---	009	MM10	MULTI MODE	Splicing for standard MM10 fibers
006	010	MM8	MULTI MODE	Splicing for standard MM8 fibers
007	011	MM6	MULTI MODE	Splicing for standard MM6 fibers
008	012	MM4	MULTI MODE	Splicing for standard MM4 fibers
009	013	MM2	MULTI MODE	Splicing for standard MM2 fibers
010	014	MM1	MULTI MODE	Splicing for standard MM1 fibers
---	015	DS12	DISPERSION SHIFT	Splicing for standard DS12 fibers
---	016	DS10	DISPERSION SHIFT	Splicing for standard DS10 fibers
011	017	DS8	DISPERSION SHIFT	Splicing for standard DS8 fibers
012	018	DS6	DISPERSION SHIFT	Splicing for standard DS6 fibers
013	019	DS4	DISPERSION SHIFT	Splicing for standard DS4 fibers
014	020	DS2	DISPERSION SHIFT	Splicing for standard DS2 fibers

M8	M12	Mode	Comment	Description
015	021	DS1	DISPERSION SHIFT	Splicing for standard DS1 fibers
---	022	NZ12	NON ZERO DS	Splicing for None-Zero DS12 fiber
---	023	NZ10	NON ZERO DS	Splicing for None-Zero DS10 fiber
016	024	NZ8	NON ZERO DS	Splicing for None-Zero DS8 fiber
017	025	NZ6	NON ZERO DS	Splicing for None-Zero DS6 fiber
018	026	NZ4	NON ZERO DS	Splicing for None-Zero DS4 fiber
019	027	NZ2	NON ZERO DS	Splicing for None-Zero DS2 fiber
020	028	NZ1	NON ZERO DS	Splicing for None-Zero DS1 fiber

6.2.2. Heat Program



1. Press the Menu key to display the menu screen.
2. Select “Heater PRGM” and press Enter key, and the Heater PRGM screen is displayed.
3. Select the proper program by pressing ▲ ▼ keys and press the Select key.
4. Press the Escape key repeatedly until the Ready screen is displayed.

The S123 Fusion Splicer is installed the factory-set Heat Programs as follows.

No	Mode	Comment	Description
1	40MM	S924	Shrinking for Furukawa S924 sleeve (40mm length)
2	40MM	S927B	Shrinking for Furukawa S927B sleeve (40mm length)
3	60MM	S921	Shrinking for Furukawa S921 sleeve (60mm length)
4	40MM	S922	Shrinking for Furukawa S922 sleeve (40mm length)
5	60MM	OTHER	Shrinking for 60mm length sleeve
6	60MM	OTHER	Shrinking for 40mm length sleeve

No	Mode	Comment	Description
7	----		vacant
8	----		vacant
9	60MM	CONTINUOUS	Heating continuously for 60mm
10	----	CURL REMOVE	Removing fiber curl
11	----		vacant
12	----		vacant
13	----		vacant
14	----		vacant
15	40MM	S922 POWER	Shrinking for Furukawa S922 sleeve (40mm length) with pre-heating
16	60MM	S921 POWER	Shrinking for Furukawa S921 sleeve (60mm length) with pre-heating
17	40MM	S927B POWER	Shrinking for Furukawa S927B sleeve (40mm length) with pre-heating
18	40MM	S924 POWER	Shrinking for Furukawa S924 sleeve (40mm length) with pre-heating

	When the S123 is turned on, the last program used is selected automatically.
	The curl removing program is installed in program No.010. The curl-removing program can be selected from the heater program menu. Additionally, it can be selected by long pressing the heating key, when the heating status icon is blue. It automatically returns to the heating program of the previous state, when all processes of curl-removing end once. When doing curl-removing heating, set the fiber which isn't prepared in a heater. Please close the clamp in both sides and the cover like usual heating.

6.2.3. Selecting the Operating Language

The S123 fusion splicer can be set to provide operating prompts in several languages. The default operating language is English.

1. From the Ready screen, press Menu key to access the Menu screen.
2. Select “Setting” and press Enter key.
3. Select “Parameter” sub-menu and press Enter key.
4. Select “Language” and press Enter key.
5. Pop-up window shows the current language. Press ▲ ▼ keys to scroll the languages and press Set key to change.
6. Press Escape key and the pop-up window will confirm the change. Select “Over write” to confirm the change, or “Cancel” to cancel the operation and press Enter.
7. Press the Escape key repeatedly until the Ready screen is displayed.

7. Fusion Splicing

7.1. Basic Splicing

7.1.1. Arc check

The arc power on the S123 splicer is optimized in the factory before shipment. The S123 uses a "Real Time Arc Control System" or RTAC to compensate the arcing parameters based on the environmental conditions, wear of electrodes, and fiber characteristics. This allows the operator to operate the splicer without using the arc check function in most cases.
However, it is recommended to perform an Arc Check when replacing electrodes, when extreme high loss is observed, or when there has been an extreme change in the environmental condition (i.e. large change in altitude).

1. Open the windshield and load fibers. Ensure that the fibers are properly stripped, cleaned and cleaved. Refer to "Preparing the Fiber" for detail.
2. Close the windshield.
3. Select "Arc Check" in the Menu screen and press Enter key.
4. The S123 fusion splicer automatically feeds the fibers and discharges an arc.

- During the arc discharge, the fiber feeding motors of the S123 fusion splicer remains idle, preventing the fiber ends from butting. As a result, the fiber ends melt back.

- The arc check function inspects how far the fibers melt back and the centered position of the fiber. If the arc check results are good, the message “RESULT: OK” is displayed in the pop-up window. Press OK key to return to the Menu screen.

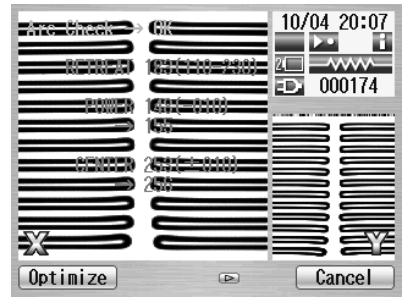
- If the results of the arc check fails, “RESULT: NG Try again” is displayed. Press Retry and the machine will automatically adjust the arc power, and then return to the Menu screen.

5. When NG, repeat the arc check to determine that the new values are acceptable. It is necessary to remove the fibers and prepare them again with a new cleave. If unsatisfactory results are obtained after 5 – 4 arc check attempts, inspect the electrodes for wear or damage, and replace them if necessary.

- *A visual arc check can be made by viewing the arc on the monitor by pressing ⚡ key. Electrode discharge should produce a straight and steady arc. Swaying in the arc indicates that the electrodes require either cleaning or replacing.*

- *When the "Data Output" in the "Parameter" of "Setting" menu is set "Active" or "PC", detailed arc check data is shown in the result. Pressing Optimize key enables automatic adjustment of the arc power, while Cancel key does not adjust or complete the arc check.*

  - RETREAT AAA(BBB-CCC)
    AAA: Melt back value
    BBB: Lowest allowable value
    CCC: Highest allowable value
  - POWER DDD(+EEE)→FFF(+EEE)
    DDD: Recommended arc power
    EEE: Compensated value for environment changes
    FFF: Current arc power
  - CENTER GGG (±HHH)→III
    GGG: Recommended arc center
    HHH: Allowable range of arc center
    III: Current arc center



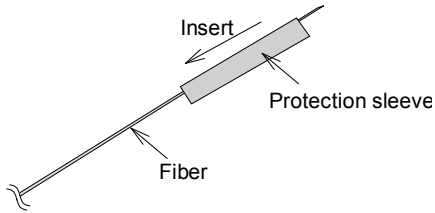
The Arc Check usually passes within three times.
However, when the condition using the splicer is greatly different last time, The Arc Check might be necessary three times or more until the Arc Check passes.

7.1.2. Preparing the Fiber

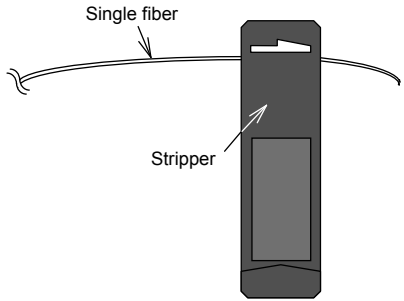
Splice loss is directly affected by the quality of the fiber preparation. For best results, ensure that the V-grooves are clean and that the fiber ends are properly cleaned and cleaved.

Preparing the single fiber according to the following procedure.

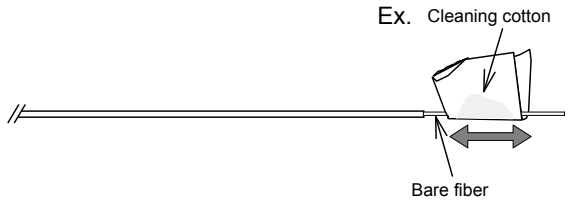
1. Insert a splice protection sleeve onto either the right or the left fiber.



2. Strip off a portion of fiber coating by using the fiber stripper. For the detail, refer to the manual of the stripper.

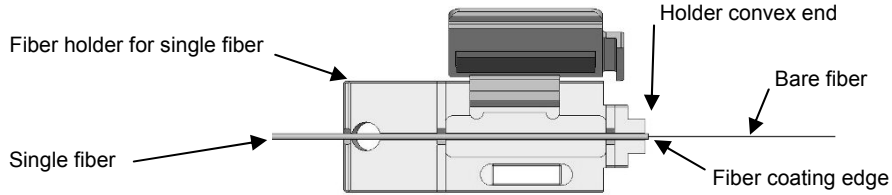


3. Wipe the bare fiber with a lint-free tissue soaked with denatured alcohol.



Please use ethanol of more than 99% of purity for cleaning fiber.

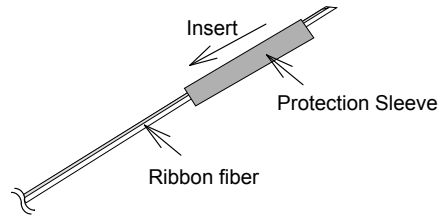
4. Make sure to use the suited fiber holder according to the diameter of the fiber coating. Place the fiber in such a manner that the fiber coatings removal edge matches the holder convex end as below.



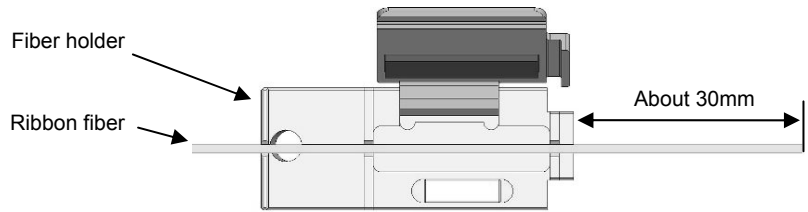
Clean the fiber carefully, especially around the ragged edge of the coating to remove the residue.
If the residue remains at edge and such fiber is put into the V-groove, it may cause the axis offset subsequently.

Prepare the ribbon fiber according to the following procedure.

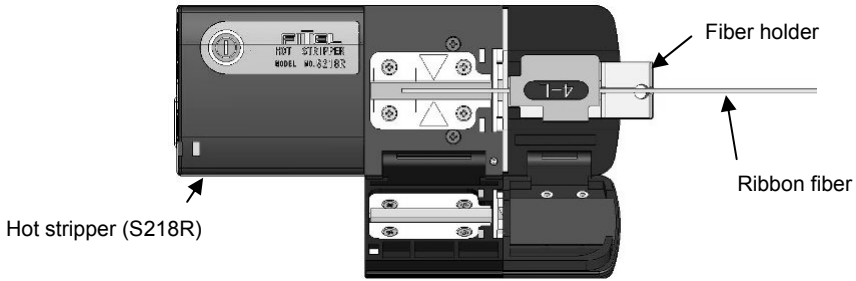
1. Insert a splice protection sleeve onto either the right or the left fiber.



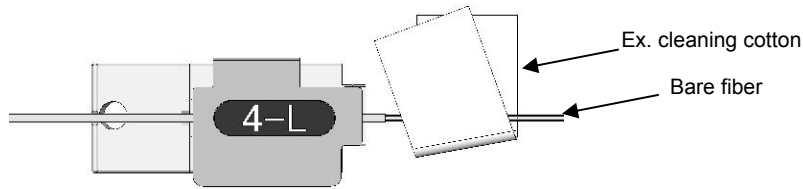
2. Place the ribbon fiber to the fiber holder in such a manner that the ribbon fiber tracers are in the same direction. In this case, set the length so that the ribbon fiber end projects about 30 mm from the holder.



3. Strip off a portion of coating by using the Hot stripper.
   For the details, refer to the manual of the Hot stripper.

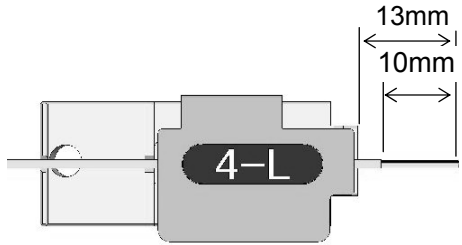


4. Wipe the bare fiber with a lint-free tissue soaked with denatured alcohol.



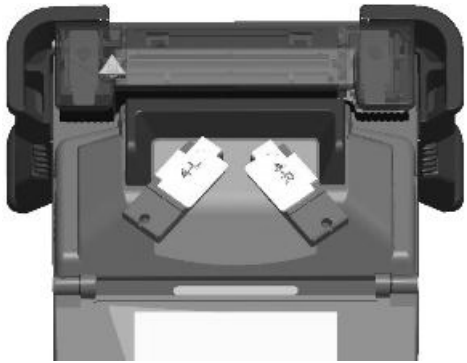
Please use ethanol of more than 99% of purity for cleaning fiber.

5. Cleave the fiber so that 10mm length of bare fiber extends past the fiber coating. Refer to the manual of the cleaver for details.

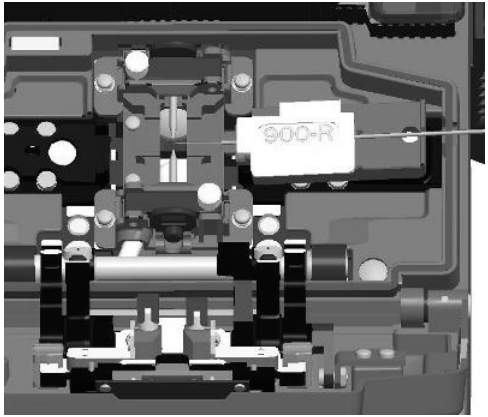


- *Do not clean the bare fiber after it has been cleaved.*
- *Do not let the bare fiber tip come in contact with any surfaces.*
- *Do not look into a fiber with the naked eye during operation. Wearing protection glasses is recommended.*

	Fiber holder can stick to splicer's windshield magnetically. But, be careful not to drop a fiber holder.



7.1.3. Loading the Fiber

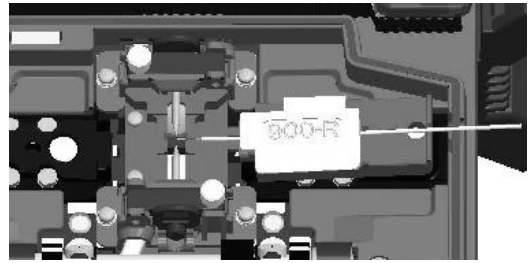


1. Open the windshield.
2. Set the fiber holder by inserting the hole on the fiber holder to the pin on the fusion splicer as shown in the picture. Be sure that nothing touches the bare fiber tip.
3. Make sure the bare fiber is placed right on the V-groove. If not, remove the fiber holder and set again.
4. Repeat process for other fiber holder.
5. Close the windshield, then READY screen is displayed.

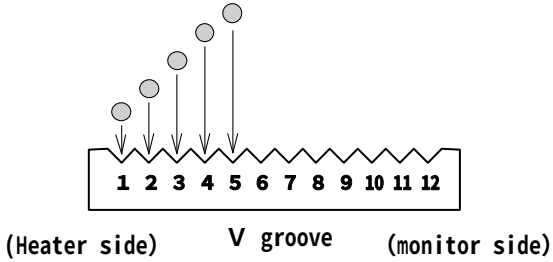
- *Do not slide the tips of the fiber ends through the V-groove tracks.*

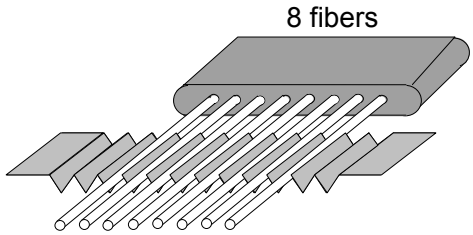
⚠ **WARNING**	**When placing fibers on V-grooves, take care not to break them by hitting them against V-groove or other parts of splicer. Broken fiber may get into your eyes.**

	In case of splicing 900μm coating fiber, if the fiber has curls or bending, it may be difficult to put such fiber on to V-groove such that the fiber jumps out from the V-groove. In such case, it might be better to put the fiber edge in a downward direction (flip fiber with 180 degree).



	S123M12 has 12 V-grooves, put the first fiber into the first V-groove as shown the figure at next page.





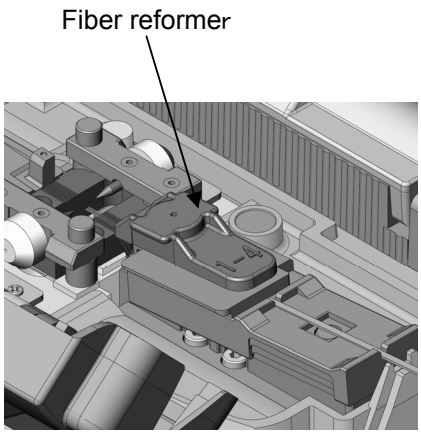
fiber	Number of V groove											
	1	2	3	4	5	6	7	8	9	10	11	12
1					1							
2 ribbon					1	2						
4 ribbon					1	2	3	4				
8 ribbon			1	2	3	4	5	6	7	8		
12 ribbon	1	2	3	4	5	6	7	8	9	10	11	12

If the fiber has curls or bending, it may make it difficult to sit properly in the v-groove. Please remove the curls or bending before preparing the fibers, and then place it in the V-grooves.

7.1.4. Using the Fiber Reformer

Use the Fiber reformer when the fiber has severe curl preventing the fiber from resting correctly in the V-groove.

1. Prepare fiber in fiber holder per normal procedure.
2. Put the fiber reformer on the fiber holder, the guide of reformer makes contact with the fiber coating.
   The reformer is fixed by magnet.
3. Move the reformer to guide the fiber into the proper V-groove.
4. When the fiber is in the proper V-groove, close the windshield leaving the reformer in place, then splice.
5. After splice, remove reformer, then remove fibers by opening the lid of fiber holders.

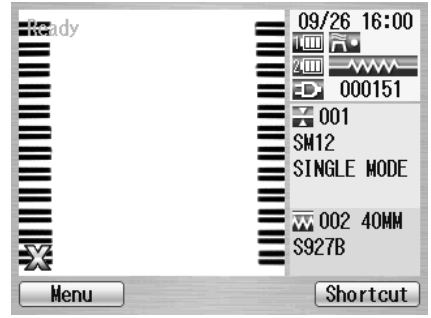


	Take care not to break fiber when positioning the Fiber reformer.
	The fiber reformers cannot remedy all fiber curl, when the fiber curls is very severe and the reformer is not successful, re-prepare the fiber and try again.

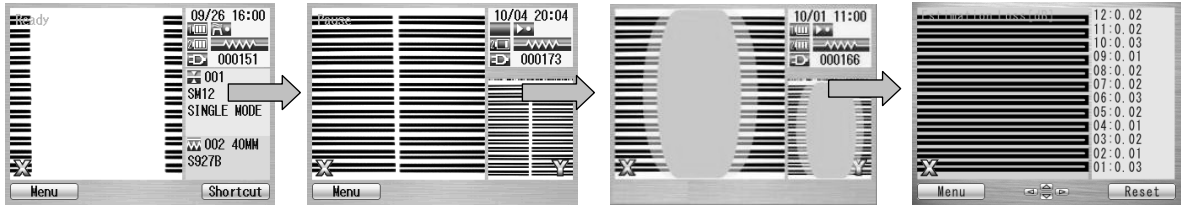
7.1.5. Fusion Splicing

1. Ensure that the “READY” screen is displayed on the monitor.
2. Press ▶ to initiate the fusion splicing cycle.
3. The S123 fusion splicer performs the following functions automatically. To pause the S123 fusion splicer during any of these functions, press ▶. The message PAUSE will be displayed on the monitor. To restart the operation, press ▶ again.

- The right and left fiber ends appear on the LCD monitor.
- A cleaning arc is discharged to clean the fiber ends.
- The fibers are set with a gap of about 30 μm between the ends.
- The fibers are inspected for axis offset and cleave condition.
- The electrodes discharge.
- The splice is inspected.
- The splice loss is estimated and displayed on the LCD monitor as shown in the picture.

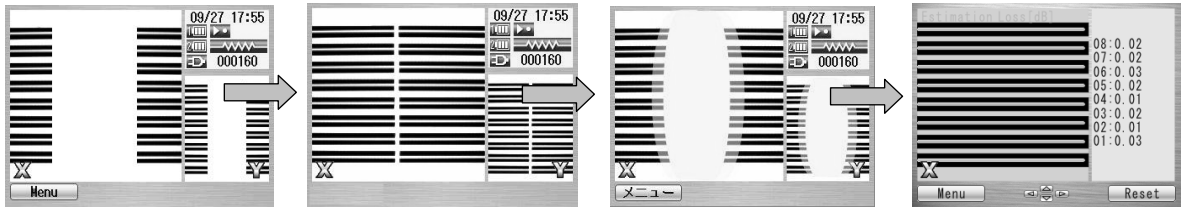


<Splicing flow, when splicing 12-ribbon fiber at S123M12>



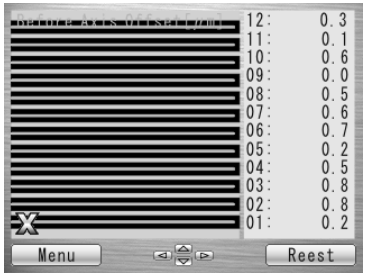
Feeding fibers　Inspecting　Arc discharging　Estimation loss

<Splicing flow, when splicing 8-ribbon fiber at S123M8>



Feeding fibers　Inspecting　Arc discharging　Estimation loss

4. After displaying the estimation loss, the following operation is available.

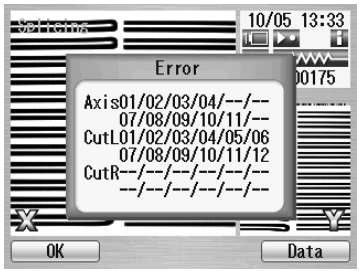


   - Press ◄ ► keys to switch the screen of X ⇔ Y.
   - Press ▲ key to discharge an additional arc, splice inspection and loss estimation are re-performed
   - Press▼ key to display the inspecting data before and after splicing.

5. While in Pause status, pressing Menu key displays options available in the process. To resume the process, press ▶ again.

   - Menu: Display the Menu Screen.
   - Zoom: Zoom in on the fiber image.
   - Capture: Capture the fiber image and store it with the splice data.
   - Field Change: Switch the fiber view between X and Y.

- *If the fibers fail the inspections for cleave criteria, the fusion cycle is paused and an appropriate error message is displayed as below. ▼key, an error massage will be un-displaying and you will be able to see the state of fiber. Open the windshield, remove the fibers after READY is displayed and retry the splice by repeating the entire procedure, starting from the fiber preparation process. To ignore the error and continue the cycle, press ▶ again.*



After splicing, The splicer inspects the splicing state by image processing. However, please also check viewing on the LCD screen.

For the cause or countermeasure of Error, see “Splicing Defects” on 7-197.1.6

7.1.6. Splicing Defects

Defect	Possible Causes	Action
Bubbling	Wrong fiber type selected	Select the correct Fusion Program, and repeat fusion splicing.
	Faulty cleave	Repeat fiber preparation and fusion splicing.
	Dirty fiber end	Repeat fiber preparation and fusion splicing.
	Degradation of electrodes	Replace the electrodes.
Bubbling (MMF)	Depending on fiber	Increase “Pre_fuse_time” in the Fusion Program (e.g. Increase by 50[msec])
Not spliced or Neck-down	Wrong Fusion Program selected	Select the correct Fusion Program, and repeat fusion splicing.
	Faulty cleave	Repeat fiber preparation and fusion splicing.
	Excessive arc current	Perform an arc check, and adjust arc power.
	Insufficient fiber feed	Adjust the fiber feed amount.
	Degradation of electrodes	Replace the electrodes.

Defect	Possible Causes	Action
Thickening	Wrong Fusion Program selected	Select the correct Fusion Program, and repeat fusion splicing.
	Excessive fiber feed	Adjust the fiber feed amount.
	Degradation of electrodes	Replace electrodes.
	Excessive arc current	Perform an arc check, and adjust arc power.
Streak	Wrong Fusion Program selected	Select the correct Fusion Program, and repeat fusion splicing.
	Degradation of electrodes	Replace the electrodes.
	Weak arc	Perform an arc check and adjust arc power, or apply an additional arc.

7.1.7. Removing the Spliced Fiber

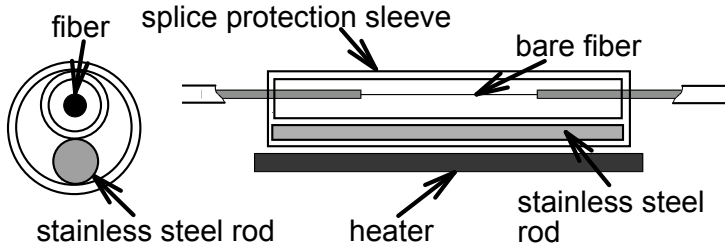
1. Raise both heater clamps before removing the fiber.
2. Open the windshield. A tension test (1.96N) is performed on the fibers.
3. Buzzer beeps once when the tension test is completed.
4. Open the lid of both fiber holders.
5. Remove the spliced fiber, pulling slightly so that the fiber is taut.

♦ *Handle the spliced fiber carefully. Do not twist the fiber.*

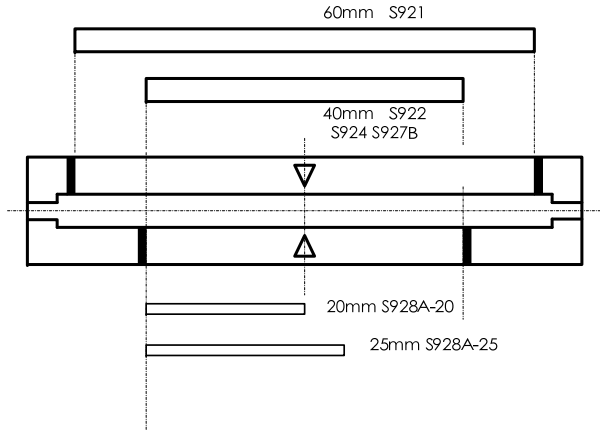
 **CAUTION**	**Do not attempt to load fibers while the S123 fusion splicer is resetting. Load the fibers only after the reset operation is complete and the READY screen is displayed.**

7.1.8. Reinforcing the Fusion Splice

1. Slide the splice protection sleeve over the splice.
2. Place the spliced fiber in the heater – Right-side first – to force the Right heater clamp to close.
3. Ensure that the splice protection sleeve rests in the middle section of the heater and that the stainless steel rod in the sleeve faces down.



4. Keeping the fiber taut with the left hand, lower the spliced fiber to force the left heater clamp to close.



If protection sleeve is placed incorrect position during heater cycle, this may cause a shrinking error.

5. Close heater cover.
6. When fiber is set and left clamping is shut, the HEAT LED turns on red and the heating starts automatically.
   (When auto start function is invalid, press key to activate the heater.)

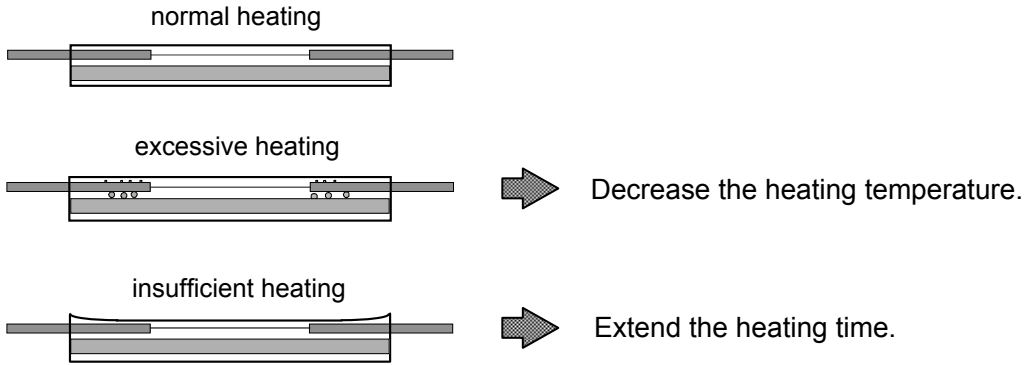
The heating process is displayed in the LCD monitor with status icons as below. When the heating and cooling operations are completed, a beep sound is heard.

Indicator	State
	Blue：In ready mode. Red：In heating mode. Orange: In preliminary heating mode.
	In cooling mode.
	Error occurring.

- *To stop the heating operation (the HEAT LED is lit), press . The heating stops immediately.*
- *While the ambient temperature is lower than 10 °C, the heating time is automatically extended by app. 5 to 20 seconds.*

During the heater cycle, do not open the heater clamp or lid. This may cause a shrinking error.

7. Remove the fiber from the heater, and inspect the splice protection sleeve.



WARNING	**STOP using the fusion splicer when problems are experienced with the protection sleeve heater. Turn off the power immediately, disconnect the power cord, remove the batteries, and contact service center.**
WARNING	**DO NOT touch the heater element during the heater cycle and right after the heat process is complete. The element is very hot and may burn you.**

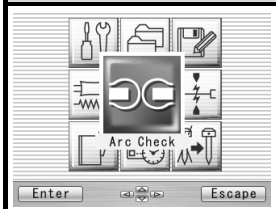
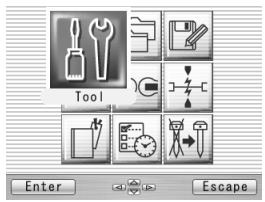
8. Programming Guide

8.1. Programming Functions and Menu

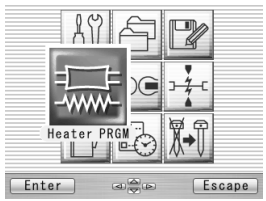
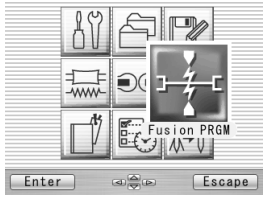
To start programming, user needs to access each function through Menu screen.

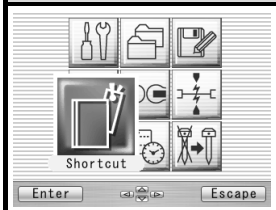
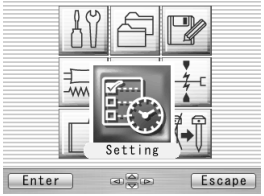
1. Press Menu (function) key to access the Menu screen. Menu key is available in the Ready screen and splice screens. When Menu is displayed in a pop-up screen, select the Menu and press Enter key.
2. Menu screen is displayed as shown (in picture to the right). Press Escape (function) key to return to the previous screen.

The following table is a list of functions available to the operator for programming and maintenance.

Menu Item	Features	Content
 Arc Check	Perform arc check	Check arc intensity and automatically optimize to proper level. See “Arc Check, Getting Started”.
 Tool	Perform a self machine check	Automatically diagnose condition of machine.
	Measure fiber	Measure and indicate fiber’s clad diameter, core diameter, core offset between fibers, cleaving angles and/or gap between fibers.
	Measure environment condition	Measure and indicate ambient temperature, pressure, as well as heater temperature.
	Manually splice fiber	Allows operator to manually control entire splicing cycle (using the keypad).
	Capture image	Store, record or erase fiber image

Menu Item	Features	Content
	Fiber edge check	Check and measure of the fiber edge.
 History	Manage Splice Data	Check previous splicing data, add comment, erase the data or transfer the data to PC.
	Obtain arc check data	Check arc data, add comment, erase the data or transfer the data to PC.
	Manager Fiber Image	Check fiber image, add comment, erase the image or transfer the image to PC.
 Program Edit	Edit splicing programs	Change parameter values in the program, adjust inspection criteria for the splicing process or change program name.
	Edit heating programs	Change heat temperature, heat duration, and/or program name.

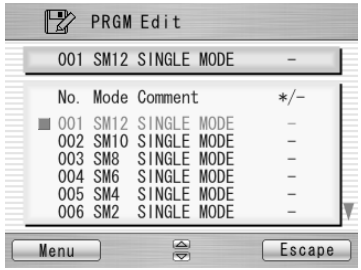
Menu Item	Features	Content
 Heater PRGM	Show heat program list.	List all available heat programs for fiber reinforcement. User can select any from the list. See “Load programs”.
 Fusion PRGM	Show fusion program list	List all available fusion splicing programs. User can select any from the list. See “Load programs”.

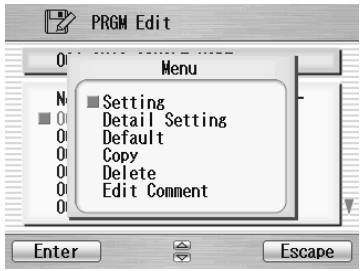
Menu Item	Features	Content
 Short Cut	Set up short cut key	Save frequently used screen with short cut key, so user can immediately access desired screen, when necessary.
 Setting	Set up parameters	Set up default language, login name, sleep function, splicing start pattern, etc.
	Set up counter	Get arc discharge times and/or splice counts. Set up recommended splice counts for the replacement/cleaning of electrodes.
	Adjust Date/Time	Adjust the date and time. Change the timer format indicating date and time.
	Control of LCD	Adjust the LCD contrast, brightness, back-light.
	Check machine info	Get machine's manufacturer S/N, software version.

Menu Item	Features	Content
 Maintenance	Replace/Clean electrodes	Step-by-step tutorial that illustrates how to replace/clean the electrodes, clean lens or clean V-grooves & fiber clamps.
	Clean lens	
	Clean V groove and fiber clamp.	
	Clean main body.	
	Agent, representative information	Information of agent or representative

8.2. Program Edit

1. Select “PRGM Edit” in the Menu screen and press Enter key.
2. Select “Fusion” or “Heater” and press Enter key.
   The following procedures and pictures are for Fusion program editing; however, the same procedure can be applied to the Heat programs.
3. Stored program list is displayed (as shown in picture to the right). Comment for highlighted program can be displayed by pressing ► key, and turned off by pressing◄ key.
4. Select a program to be modified by pressing enter key and press Menu key to access to pop-up menu. Select a function and press Enter key.
   - Modify: Modifying parameters.
   - Default: Return the parameters to default value.
   - Copy: Copy the program and store with a new name.
   - Delete: Erase the program from the program list.
   - Edit: Editing comment of the program.



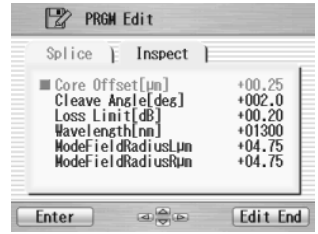


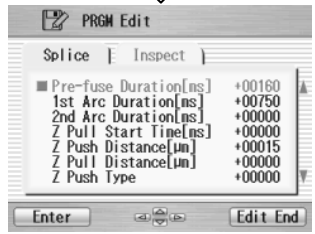
8.2.1. Setting

1. Select “Modify” and press Enter key in the pop-up menu.
2. Select “Splice” or “Inspect” tab with◄ ► keys. Select parameters with ▲ ▼ keys and press Enter to edit.
3. Change the parameter with ◄ ► keys (increase/decrease appropriate digits) and/or ▲ ▼ keys (actual value) , and press Set key.
4. Press Edit End, the pop-up menu will show and ask following questions.
   - Over Write: Replace the parameter with the edited value.
   - Other Location: Store the program with new/changed parameter to a new location as a new program.
   - Cancel: Cancel the change and return to the previous screen.
5. Return to the parameter list. Select another parameter for editing or press Escape to complete the edit.

8.2.2. Detail Setting

1. Select “Detail Setting” and press Enter key in the pop-up menu.
2. A more detailed set of parameters is possible. The setting method is the same as "Setting".



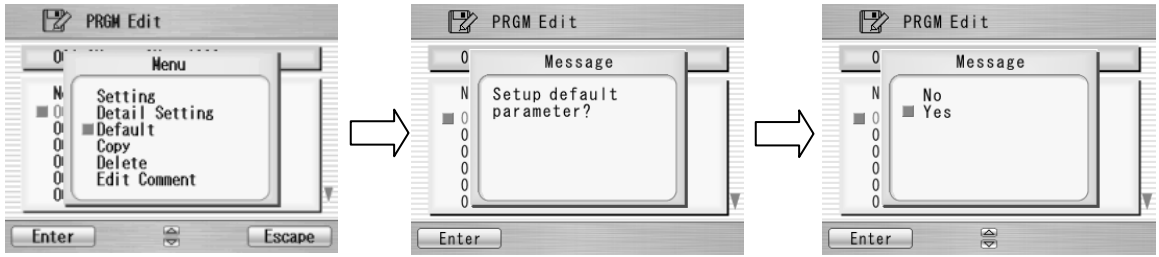


Press ▲ ▼ keys : to move one by one item
Press Enter key : to move to next page

8.2.3. Default

Follow the procedures shown below to reset the modified program to the default parameters.

1. Select “Default” from Menu screen and press Enter key in the pop-up menu. The pop-up message window appears.
2. Press Enter key.
3. Select “Yes” and press Enter key to reset parameters to default parameters; or select “No” and press Enter key to cancel the operation.

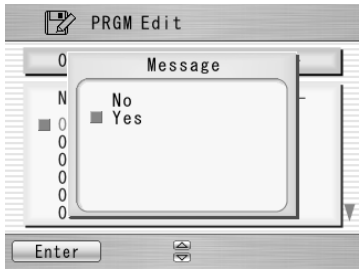


8.2.4. Copy

Follow the procedures shown below to copy the selected program and paste it to a new location.

1. Select “Copy” and press Enter key in the pop-up menu.
2. Select a new destination for the program. The locations of the factory pre-installed programs can not be selected.
3. Press Enter key to paste the program.

8.2.5. Delete



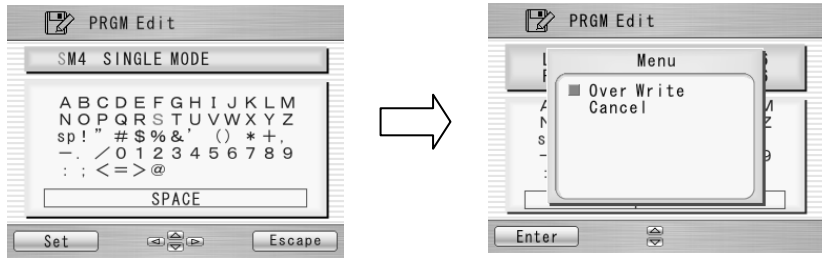
Follow the procedures shown below to delete the selected program.

1. Select “Delete” and press Enter key in the pop-up menu.
2. Pop-up message will be displayed on the screen asking “Delete Program?”. Press Enter Key to proceed with the operation.
3. Select “Yes” and press Enter key to delete the program; or select “No” and press Enter key to cancel the operation. The factory pre-installed programs can not be deleted.

8.2.6. Edit Comment

Follow the procedure shown below to edit the comment of the selected program.

1. Select “Edit Comment” and press Enter key.
2. The screen shows current comment in the upper window and characters available for editing in the lower window.
3. Select a character in the lower window with ◄ ► and ▲ ▼. Press Set key to choose the character. The character with red color in the current comment is replaced with the selected character.
4. Press Escape key after new comment is edited.
5. The pop-up menu shows and asks following questions
   - Over Write: Replace the current comment with the edited one.
   - Cancel: Cancel the change and return to the previous screen.
6. Select “Over Write” and press Enter to save edited comment; or select “Cancel” and press Enter to cancel the operation.



S123 splicer can store a maximum of 150 fusion programs.

- *Optimizing fusion parameters may call for other precise procedures, especially in the case of splicing various unlisted types of fibers. There are several hidden parameters which need to be taken into account when adjusting for optimum parameters. Contact FURUKAWA ELECTRIC CO.,LTD. or your local representative to get more information.*

8.2.7. Parameter Table

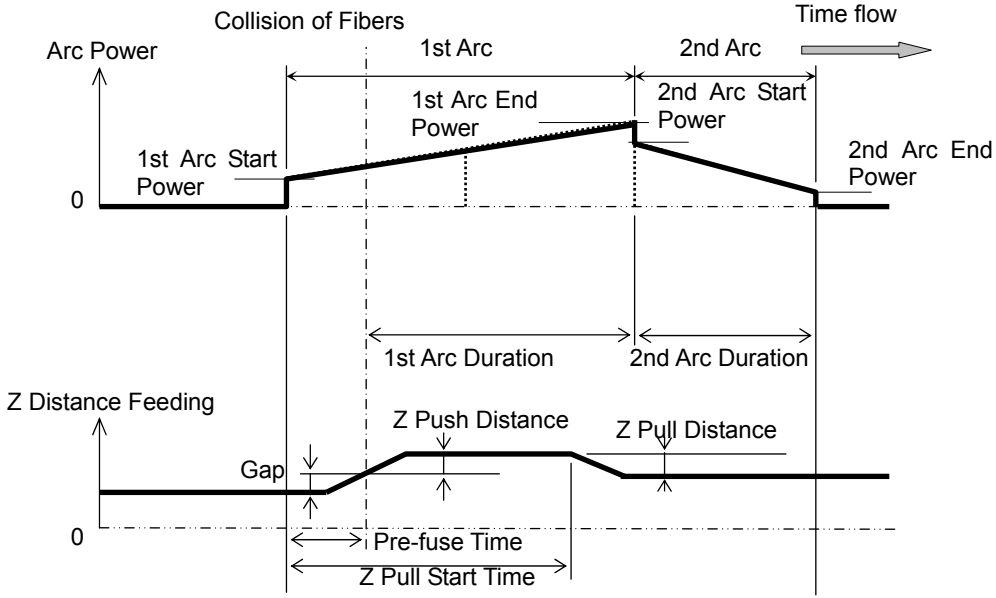
Parameter Table for Fusion Program

Parameter name	Min	Max	Description
For Splice			
1st Arc Start Power	0	200	Starting arc power in 1st arc discharge
1st Arc End Power	0	200	Ending arc power in 1st arc discharge
2nd Arc Start Power	0	200	Starting arc power in 2nd arc discharge
2nd Arc End Power	0	200	Ending arc power in 2nd arc discharge
Cleaning Arc Power Offset	-127	128	Additional Arc Power for cleaning purposes
Cleaning Duration [ms]	0	32767	Arc duration for cleaning [msec]
Pre-fuse Duration [ms]	0	32767	Time between arc starting and fibers first butting [msec]
1st Arc Duration [ms]	0	32767	1st arc time duration [msec]
2nd Arc Duration [ms]	0	32767	2nd arc time duration [msec]
Z Pull Start Time [ms]	0	32767	Time to start to pull back the fiber [msec]
Z Push Distance [µm]	0	32767	Overlapping distance from fibers first butting position [µm]

Parameter name	Min	Max	Description
Z Pull Distance [μm]	0	32767	Pulling back distance from the final overlapping position [μm]
Z Push Type	0	2	Z motor moving when splicing 0:ZL, 1:ZR, 2:Both
Re Arc Times [times]	0	255	Allowable numbers for the repeat arc in programmed additional arc mode
Re Arc Duration [ms]	0	32767	Duration of additional arc [msec]
Re Arc Interval [ms]	0	32767	Interval between additional arcs and [msec]
Repeat Arc Power Offset	-127	128	Power of additional arc is Arc Power added by Repeat Arc Power Offset
Re Arc Power	0	255	Power of additional arc
Gap [μm]	0	184	Gap for the final position tuning before the splicing [μm]
For Inspect			
Offset [μm]	0	99.99	Maximum permissible fiber offset [μm]
Cleave Angle [deg]	0	90.0	Maximum permissible angle of cleaved fiber end for splicing to continue [deg]
Loss Limit [dB]	0	15.0	Maximum loss allowed for machine not to give a splicing error [dB]

Parameter name	Min	Max	Description
Gap Difference [µm]	0	99.99	Maximum permissible gap difference before splicing [µm]

Time chart of fusion parameters



Arc power compensation table

Arc Power	Cleaning Arc Power	Fusion Arc Power	Repeat Arc Power
Cleaning Power Offset	+	0	0
Repeat Arc Power Offset	0	0	+
Environment sensor Compensation	+	+	+
Real Time Arc Control (*1)	0	+	+

“+” marked terms are taken account to calculating each arc power

(*1)This function can choose “Active” or “Cancel”. Only when it's “Active”, that's added.

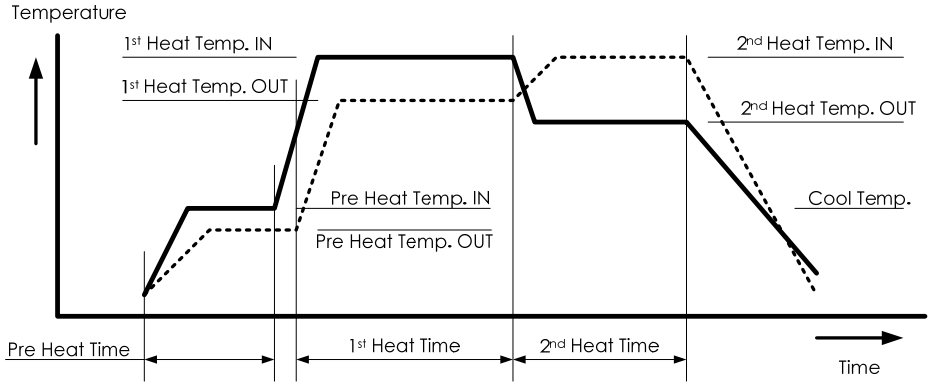
Parameter Table for Heater Program

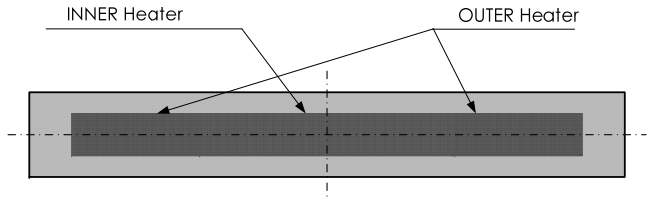
Parameter name	Min	Max	Description
1st Heat Temp IN [deg.C]	0	280	Temperature of INNER heater for the first half.
1st Heat Temp OUT [deg.C]	0	280	Temperature of OUTER heater for the first half.
1st Heat Time [sec]	0	300	Operation time of the first half.
2nd Heat Temp IN [deg.C]	0	280	Temperature of INNER heater for The latter half.
2nd Heat Temp OUT [deg.C]	0	280	Temperature of OUTER heater for The latter half.
2nd Heat Time [sec]	0	300	Heating time after 1st heating
Cool Temp [deg.C]	0	280	Temperature to arrive at end of cooling process.
Pre Heat Temp IN [deg.C]	0	280	Temperature of INNER heater for preliminary heating. Preliminary heating temperature before the first half.
Pre Heat Temp OUT [deg.C]	0	280	Temperature of OUTER heater for preliminary heating. Preliminary heating temperature before the first half.
Pre Heat Time [sec]	0	300	Operation time of preliminary heating after the end of cooling process or before the first half.

Parameter name	Min	Max	Description
Auto Start	0	2	Setting for automatic start function. [0] : The non-operation. Manual start operation. [1]]: The operation. When fiber set and left clamping is shut, the heating start automatically.*) [2]: The operation. Consecutive heating operation.
Compensation Auto Start	0	10	Expansion time of the automatic operation.

* *Do not leave the protection sleeve in a heater after finish of shrinkage. There is the case that coating melts.*

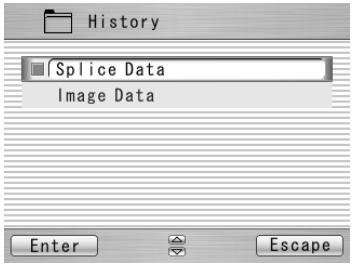
Time chart of heater parameters





8.3. History

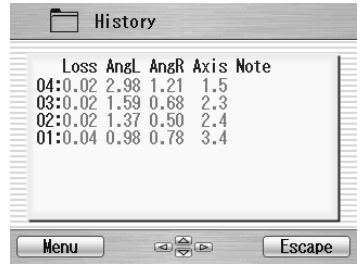
By selecting “History” in the Menu screen, the operator can access detailed splice data, arc check history and image archives; user can also add comments to each individual data point. The data also can be transferred/ uploaded to PC or deleted from memory.



1. In the Menu screen, select the “History” and press Enter key.
2. Select “Splice Data” or “Image Data” and press Enter key to get the stored data.

8.3.1. Splice Data

1. If “Splice Data” is selected, a list of previous splice data is displayed on the screen (as shown in the picture right).
   ◎As for the history with “＊”, the splice image is preserved automatically.
2. Select a targeted date and press Enter key to obtain the detail of the data as shown in the picture.
3. Press ► key to display the detail data of each fiber as follows.



Data Title	Description
CMNT	Comment of the data, which can be edited.
No.	No. 1 is the data for the last splice and the number increases for older splices.
Arc Count	Arc Count when splice was performed.
Date	Date and time for the splice performed.
Env.	The environmental temperature and the air pressure, when Splicing was done.
PRGM	Name of Fusion Program.

Data Title	Description
Arc Power	Value of the strength of the electric discharge when splicing (It is calculated from each program on the basis of the value of “Common arc power” in Setting menu.)
Retreat	Retreat value in arc check
Center	Retreat center position in arc check
Loss	Estimated splice loss
AngL	Cleave angle of the left fiber
AngR	Cleave angle of the right fiber
Axis	Axis offset before splice
Note	Error codes and additional arc memo if any. The data with error is highlighted. L: Estimated loss exceeds the target value S: Streak or bubble at the splice point or not spliced A: Cleave angle exceeds the criteria C: Cleave end face has excessive defects G: Gap difference exceeds the criteria +: Additional arc is applied

4. Press Enter key and the pop-up shows available functions. Select desired function and press Enter to initiate the operation.
   - Comment Edit: Edit the Comment of the data.
   - PC-OUT: Transfer/Uploading the data to PC.
   - Delete: Delete the data.

Comment Edit

Refer to 8.2.6 for how to edit comment.

PC-OUT

When you first connect the S123 to a PC, install driver software for S123 on your PC. Ask your representative or The Furukawa Electric to obtain the driver software.
Follow the procedures shown below to upload the data to PC.

1. Turn on S123 and PC.
2. Connect S123 to PC with USB cable.
3. Open the termination emulator such as “HYPER TERMINAL” of windows.
   For explanation, this manual uses HYPER TERMINAL of Windows XP.
4. In “Connection Description” screen, name “S123 CONNECTION” in the box for the name of new connection and select Dial-up icon.

5. Select an appropriate communication port (COM2, for example) from “Connect To” screen.
6. Cancel the “Port Setting” window.
7. In HYPER TERMINAL menu. Select Transfer then Capture Text.
8. Name TEST for example. And remember location that TEST will be stored in. (Default would be C: / Program files/ Accessory/Hypertext.)
   Now HYPER TERMINAL is ready for receiving data.
9. Select “PC-OUT” in the pop-up menu of S123 and press Enter key.
10. Select “Current” for the desired/selected data or “All” for all the stored data and press Enter key. S123 will send data through HYPER TERMINAL to PC and you will see data in the window.
11. Select Stop in Capture text in Transfer menu when transfer is finished.

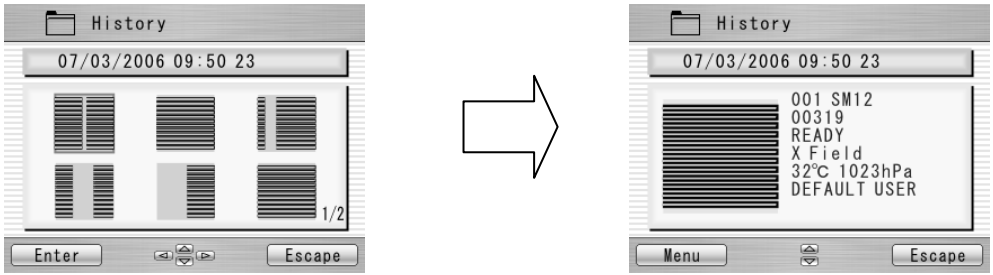
Delete

1. Select “Delete” and press Enter key.
2. Select “Current” for deleting desired/selected data only, or “All Data” for all the stored data and press Enter key. The selected data is then deleted.

- *1,500 splice data entries can be stored on the S123. Data older than 1,500 splices is automatically erased.*
- *When the splice is performed with an additional arc, the data shows final results after the additional arc.*
- *The splicer save automatically fiber image(X and Y view) on latest 50 splices.*

8.3.2. Image Capture

1. The list of the captured photos is displayed.
2. Select a photo and press Enter key to show the image and data as shown in the picture.



3. Press Menu key and the pop-up shows available functions. Select desired function and press Enter to initiate the operation.

   - Full Screen: Display the image in the full screen size.
   - PC-OUT: Transfer image to PC.
   - Delete: Delete the data.
   - Edit Comment: Edit the Comment of the data.

Follow the same procedure for Spice Data.

The data displayed are as follows;

Sample	Description
001 SM12	Name of the Fusion Program
00319	Arc Count when splice was performed.
READY	Splicing process when the image is captured.
X Field/Y Field	X or Y image
32 °C 1023hPa	Temperature and ambient pressure when splice was performed.
DEFAULT USER	Comment (Editable)

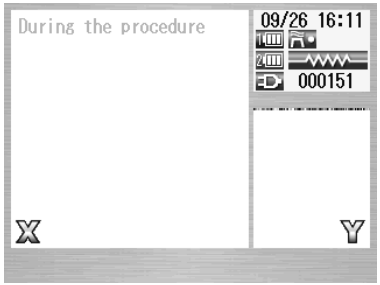
8.4. Tool

This menu provides with various kinds of utility functions.

1. Select “Tool” in the Menu screen and press Enter key.
2. Select a Sub-Menu in the table below and press Enter key.
3. Press the Escape key repeatedly to return to the Ready screen.

Sub-Menu	Function
Machine Check	Perform a self check of the machine condition.
Fiber Measuring	Performs an auto or manual inspection of the fiber with regards to clad and core offset, relative eccentricity, gap, fiber tilt and relative cleave angle.
Environment	View ambient temperature, pressure, as well as heater temperature.
Manual Splicing	Allows operator to manually control entire splicing cycle (using the keypad)
Image Capture	Store and delete the fiber image.
Fiber edge inspection	Measuring cleave angle. (It doesn't guarantee the cleave angle.)

8.4.1. Machine Check



1. A pop-up message prompts the user to remove the fiber from the machine. Follow the message and press OK key.
2. S123 automatically checks for dust in the camera and verify the motor movements (see sample screen to the right). Then, a pop-up screen prompts the user to set the fiber in place.
3. Set the fibers on both sides and press ▶ to initiate the remaining check.
4. S123 automatically performs the remaining check and a pop-up message prompts the user to perform an arc check.
5. Press Enter key and select “Execute” or “Cancel” to perform the arc check. In the pop-up screen, press Enter key again.
6. After the machine check is complete, the pop-up screen shows “Status OK”. Press Escape key to finish the check.
7. If the machine fails Machine Check, the pop-up screen shows “Status NG. Call the Service Center”. Please call your representatives or The Furukawa Electric for further assistance.
8. If arc check fails, pop-up screen shows “Status NG. Remove fibers, and retry Arc Check”. Perform an arc check to optimize the arc power.

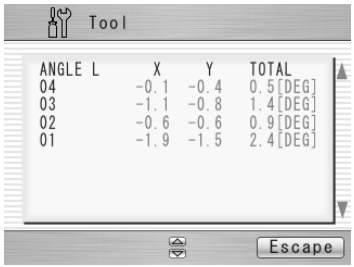
	When carrying out "Machine Check" function, please use fibers by which stripping, cleaning and cleaving were performed right.
	When the result is “Status NG “, please refer to “9. Maintenance and Handling Instruction” about disposal.

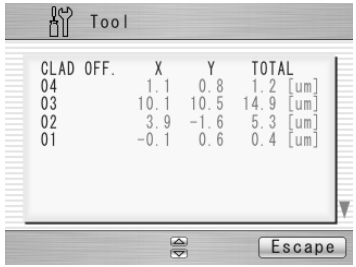
8.4.2. Fiber Measuring

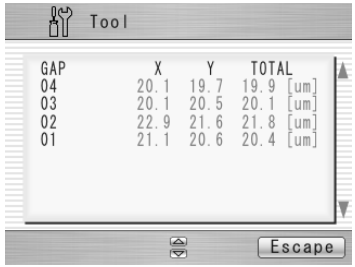
The S123 performs an auto or manual inspection of the fiber (specifically, the clad offset, gap, fiber tilt and relative cleave angle).

1. Select “Fiber Measuring” in the “Tool” screen and a sub-menu is displayed.
   - Fiber feed & Measuring: Fiber is fed automatically at the measuring position, machine measures the fiber and display the result.
   - Fiber Measuring: Performs the measurement only. Fibers must be placed at an acceptable position manually. The results will be displayed after the measurement.
   - Motor Manual Move: Allows the measuring process to be done manually.
2. Load fiber on the machine.
3. Select “Fiber Feed & Measuring” and press Enter key. The machine automatically feeds and measures the fibers, and then displays the result.
4. Repeatedly press Escape key until the Ready screen is obtained.
5. The same content of results are displayed when the measuring is performed, using “Fiber Measuring” sub-menu. Be sure to place the fiber at an acceptable position before selecting the sub-menu.
6. Refer to 8.4.4 (Manual Splicing) for operating the “Motor Manual Move”.

Measuring results (example 4 ribbon fibers)







The results are shown as the pictures.
The following parameters are measured. Press ▲▼ keys to change the parameters.

PARAMETER	DESCRIPTION
CLAD OFF	Amount of CLAD OFFSET between the two fibers [μm]
ANGLE L	Cleave angle of the left fiber [degree]
ANGLE R	Cleave angle of the left fiber [degree]
REL.ANGLE	RELATIVE cleave angle between the two fibers [degree]
GAP	GAP between the two fibers [μm]

PARAMETER	DESCRIPTION
CLAD W L	Clad width of the left fiber [μm]
CLAD W R	Clad width of the right fiber [μm]
TILT L	Tilt angle of the left fiber clad center [degree]
TILT R	Tilt angle of the right fiber clad center [degree]

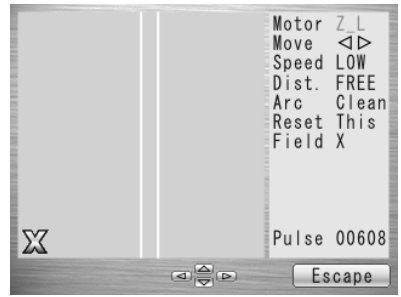
8.4.3. Environment

The S123 allows the user to view environmental conditions.

1. Select “Environment” in the Tool menu screen and press Enter key.
2. “Temperature” and Ambient “Pressure” are displayed. Press °C<=>F key to convert the temperature unit.
3. Press Escape key to return to the previous screen.

8.4.4. Manual Splicing

It allows the entire cycle of splicing to be operated manually using the keypad.



1. Select “Manual Splicing” in the Tool menu screen and press Enter key.
2. Select the preferred operating mode and press Enter key. Load fibers before selecting “Semi Auto”.
   - Semi Auto: Fibers are automatically fed and stopped at pre-splice position. Splice must be done by manual operation as described below.
   - Manual: All operations must be done manually following the procedures below.
3. The fibers are fed to the pre-splice position by pressing Enter key in the “Semi Auto” mode.
4. Select “Manual” and press Enter key to initiate manual operation (see picture to the right). The left window shows the fiber image, and the right window displays the motion control commands
5. The active motion control command is highlighted in red. Move to other motions by pressing ▲▼ keys. Press ◄ ► keys to change the value or to activate the function. In “Arc” and “Reset”, press Execute key to activate the action.
6. Press Escape key to return to the previous screen.

Variables which can be manipulated

Command	Setting Menu	Description
Motor	Z_L	Activate left fiber feeding
	Z_R	Activate right fiber feeding
	CLP	Activate up-down fiber clamp
Move	◄	Drive the motor leftward
	►	Drive the motor rightward
Speed	HIGH	Selecting high speed for motor movement
	LOW	Selecting low speed for motor movement
Dist.	FREE	Drive the motor step by step by pressing ◄ ► key.
	(Value) (μm)	Motor moves based on pre-set value. Selections from: 5/50/500
Arc	Clean	Selecting cleaning arc
	Arc	Selecting fusion splice arc
	Add	Selecting additional arc
Reset	Current	Reset the activated motor
	All	Reset all the motors
Field	X	Displaying X-axis image
	Y	Displaying Y-axis image
Pulse	(Value)	Showing current pulse position of the activated motor

8.4.5. Image Capture

The S123 allows the user to store and delete fiber images.

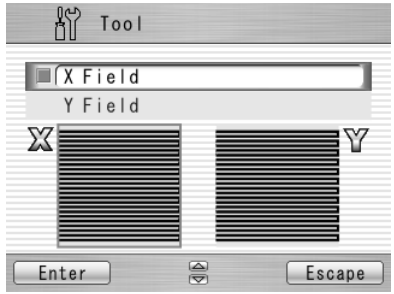
1. Select “Image Capture” and press Enter key.
2. Select “Capture” to capture and store image or “Delete data” to delete the image and press Enter key.

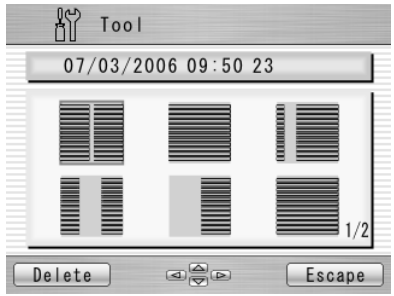
<Capture>

1. Select “X Field” or “Y Field” to store the image. Press Enter key (the image is then stored).
2. Press Escape key to return to the previous screen.

<Delete Data>

1. Select data with ▲▼ and ◄ ► keys and press “Delete” to erase it.
2. Press Escape key to return to the previous screen.





8.4.6. Adjusting shrinking condition of sleeve

Optimizing shrinking condition for the sleeve

1. Select “Sleeve Shrink Adjustment“.
2. Select a pattern (A-E) that is similar to the current shrinking condition of the sleeve. And press Enter key.

Code	Condition of sleeve / Content
A	Not shrinking enough at sleeve end
B	Bubble in the center of sleeve
C	Fiber coating melts
D	Sleeve melts too much
E	Default to the factory setting

3. The heating condition is adjusted so that the shrinking condition for the sleeve become better.
4. If the adjustment is insufficient, repeat the above operation.

8.4.7. Fiber edge inspection

Measuring cleave angle.

1. Select ”Fiber edge inspection“ and press Enter key.
2. Set the fiber you want to measure. And, close the windshield and press ▶ key.
   Then, fibers are fed. And cleave angles are displayed on the right side of the screen after cleaning arc discharge.
   A result of measurement is judged based on a chosen splice program. If the measurement angle is bigger than the check limit value, the angle is indicated by the red character. Even when the fiber edge is bad, it's displayed as an error.
3. When you measure other fibers, please press Next key. When ending, please press Escape key.

The inspection is possible only at one side. Please set fiber in either and measure.

When choosing “Auto Selection” in fusion program, you can measure in spite of the number of fiber.

8.5. Setting

The following functions are available in Setting.
The initial setting is following **bold character** setting.

1. Select “Setting” in the Menu screen and press Enter key.
2. Select Sub-Menu and press Enter key.
3. Select Setting item and press Enter key.
4. Follow the procedure below for setting each item.
5. Press Escape to return to the previous screen.

Sub-Menu	Setting item	Contents
Parameter	Language	Selecting default language **English**, Japanese, Chinese, Portuguese, French, German, Dutch, Spanish, Czech, Danish, Finnish, Italian, Swedish, Polish, Russian, Korean and Norwegian etc
	Auto Start for Fusion	Selecting auto start mode Auto / Semi Auto / **Cancel**

Sub-Menu	Setting item	Contents
Parameter	Auto Start for Heater	Activating auto start mode **Active**(It depends on the Auto-start mode of the selected heating program) / Auto(It doesn't depend on the heating program. Heating starts automatically.) / Cancel (It doesn't depend on the heating program. Auto-start is invalid.) *)In 60/40mm CONTINUOUS heating program, it doesn't start automatically. Push heating start SW.
	Data Output	Activating data output mode **Cancel** / Active / PC
	Stepping Action	Selecting splice operation mode **Cancel** / Type 1 (Stops at before splice) / Type 2 (Stops at every process) (Press ▶ to resume the process)
	Common Arc Power	Setting common arc power Any value from 0 to 255. Select a digit with ◄ ► and press ▲ ▼ to increase/decrease the value. When "+ "is selected, press ▲ key to jump to 255 or press ▼ key to jump to 0.
	Buzzer Sound	Adjusting buzzer volume **+2** / +1 / 0

Sub-Menu	Setting item	Contents
Parameter	Buzzer Tone	Selecting buzzer tone **+2** / +1 / 0
	Sleep Type	Selecting power save mode ALL / **LCD** / OFF
	Sleep Time	Setting time for auto power off 1/ 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / **10** (min.)
	Calendar Format	Selecting calendar format **YYMMDD** / MMDDYY / DDMMYY
	Login Massage	Activating login password **Cancel** / Active
	Sensor	Activating environmental compensation **Active** / Cancel
	Real Time Arc Control	Activating RTAC mode Active / **Cancel**
	Zoom Image	Selecting Fiber image at splicing **Type 1** / Type 2 (This function is not used in “C(A)” type)
	Display Image	Activating fiber image during arc discharging **Cancel** / Active

Sub-Menu	Setting item	Contents
	Tension Test	Activating tension test **Active** / Cancel
	Direction of Monitor	Selecting direction of LCD screen **Front** / Rear
	Clamp Up & Down	Activating Fiber Clamp moving **Active** / Cancel (Active: The fiber clamp moves up and down automatically when the axis offset is large.)
	Battery mode	Selecting battery use type. **2 Batt**.(parallel use) ⇔ 1 Batt.(serial use)
	Illumination Lamp	Activating LED light. (Weak ⇔ Strong) OFF to **15**
	Arc Counter	Displaying and editing arc count Displaying the current count and can be adjusted to any count (up to 32767). Select a digit with ◄ ► and press ▲ ▼ to increase/decrease the value. When "+ "is selected, press ▲ key to advance to 32767 or press ▼ key to advance to 0.
	Total Arc Counter	Displaying total arc count Only displays the current count and cannot be edited.

*) The fiber seemed to have jumped up on the LCD screen when clamping was gone up and down. It is because clamping is temporarily opened. It is not abnormal.

Sub-Menu	Setting item		Contents
Counter	Arc	Counter Reset	Reset counter to zero
		Alarm	Activating alarm
		Alarm Count	Setting alarm count
	Cleaving	Counter Reset	Reset counter to zero
		Alarm	Activating alarm
		Alarm Count	Setting alarm count
	Stripping	Counter Reset	Reset counter to zero
		Alarm	Activating alarm
		Alarm Count	Setting alarm count
	Splicing	Counter Reset	Reset counter to zero
		Alarm	Activating alarm
		Activating alarm	Setting alarm count
	Total Arc	Alarm	Activating alarm
		Alarm Count	Setting alarm count
		Estimation Loss	Activating data display
		Detailed Loss	Activating data display

Sub-Menu	Setting item	Contents
Clock		Setting date and time
LCD Adjustment		Adjustment LCD backlight, brightness and contrast
About Machine		Information on machine Machine serial Number Software version

8.5.1. Parameter

1. Select a Setting item in the “Parameter“ list and press Enter key.
2. Pop-up window shows the current setting. Press ▲ ▼ keys to scroll the available settings and press Set key to change.
3. Press Escape key and a pop-up window will ask the operator to confirm the change. Select “Overwrite” to confirm the change, or “Cancel” to cancel the operation and press Enter.
4. Repeatedly press Escape key until the Ready screen is displayed.

- Language
  Select the display language

- Auto Start for Fusion

『Cancel ⇔ Active ⇔ Semi Auto』

『Cancel』	Auto Start function does not work.
『Active』	After setting fibers, even if you do not press the start key, splicing process is started by closing the windshield.
『Semi-Auto』	The fibers move to the center of the screen when the windshield is closed after the fibers are set and they stops temporarily. Then, it advances to the next process by pushing the start key and the splicing is done.

- Auto Start for Heater

『Auto ⇔ Cancel ⇔ Active』

『Auto』	When Fiber is set to the heater, heating start automatically.
『Cancel』	Auto Start function does not work. Press heating key.
『Active』	Setting Auto/Cancel is dependent on the individual heater programs.

● Data Output

Select display mode (display or hide) inspection data

『Cancel ⇔ Active ⇔ PC』

『Cancel』	Not display
『Active』	The data is displayed on the LCD screen.
『PC』	Output the data with the PC connected by USB cable.

● Stepping Action

『Type1 ⇔ Type2 ⇔ Cancel』

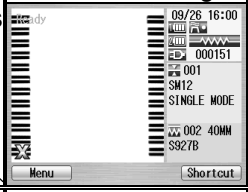
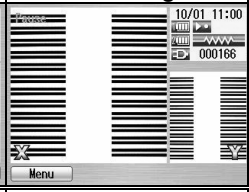
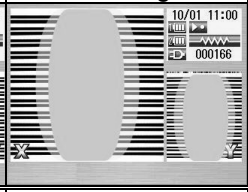
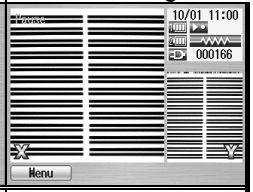
『Type 1』	Pause at before splice. (Press ▶ to resume the process)
『Type 2』	Pauses at every process. (Press ▶ to resume the process)
『Cancel』	It doesn't pause. If there is an error, it pause and an error message is displayed.

● Common Arc Power

Any value from 0 to 255. Select a digit with ◄ ► and press ▲ ▼ to increase/decrease the value. When “+ “is selected, press ▲ key to jump to 255 or press ▼ key to jump to 0.

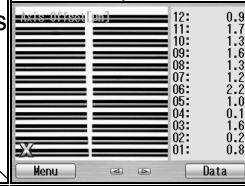
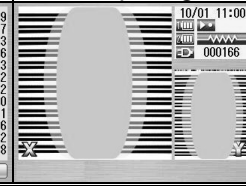
Splicing flow by Parameter setting

Splicing process and display image by setting of “Stepping Action”, “Data Output” and “Auto Start” are as follows.

Parameter setting \ Process		1. Fiber setting	2. 1st Setting line	3. Cleaning Arc	4. 2nd Setting line
					
Stepping Action	Cancel	Press key to start	→→→→→	→→→→→	→→→→→
	Type1	Press key to start	→→→→→	→→→→→	Pause*1
	Type2	Press key to start	Pause*1	→→→→→	Pause*1
Data Output	Cancel	Press key to start	→→→→→	→→→→→	→→→→→
	Active*2	Press key to start	→→→→→	→→→→→	→→→→→
Auto Start for Fusion	Cancel	Press key to start	→→→→→	→→→→→	→→→→→
	Active	Close the windshield to start	→→→→→	→→→→→	→→→→→

*1: Press key to restart.

*2: Setting “PC” is same process as “Active” setting.

Parameter setting \ Process		5. Inspection	6. Splicing	7. Complete
				
Stepping Action	Cancel	➔➔➔➔➔	➔➔➔➔➔	Complete
	Type1	Pause[*1]	➔➔➔➔➔	Complete
	Type2	Pause[*1]	➔➔➔➔➔	Complete
Data Output	Cancel	➔➔➔➔➔	➔➔➔➔➔	Complete
	Active[*2]	Pause and display the data[*1]	➔➔➔➔➔	Complete
Auto Start for Fusion	Cancel	➔➔➔➔➔	➔➔➔➔➔	Complete
	Active	➔➔➔➔➔	➔➔➔➔➔	Complete

*1: Press key to restart.
*2: Setting “PC” is same process as “Active” setting.

● Buzzer Sound
Setting Buzzer volume
『2 ⇔ 1 ⇔ 0』

『2 ⇔ 1 ⇔ 0 』
Laud ⇔ Small ⇔ Mute

● Buzzer Tone
Selecting the buzzer tone.
『2 ⇔ 1 ⇔ 0』

● Sleep Type
Selecting the power save type
『LCD ⇔ ALL ⇔ OFF』

『LCD』	Only LCD turns off. The Power LED blinks at the power saving. It returns from the power saving state by the operation of opening the windshield or pressing any key.
『ALL』	Splicer turns off automatically without being operated for a while (=Sleep Time).
『OFF』	Cancel power save.

● Sleep Time

Time until shifting to the state of the power saving is set from 1 to 10 minutes.

『10 ⇔ 9 ⇔ 8 ⇔ ・・・・・⇔ 1』

● Calendar Format

Setting the display style of the date on the screen

『YYMMDD ⇔ MMDDYY ⇔ DDMMYY』

『YYMMDD』	Year Month Day (Eg. 2012 05 31)
『MMDDYY』	Month Day Year (Eg. 05 31 2012)
『DDMMYY』	Day Month Year (Eg. 31 05 2012)

● Login Message

『Cancel ⇔ Active』

When the log in message is set, the comment is displayed in the data of Splice history.

『Cancel』	Cancel
『Active』	Turning on, the setting screen of “Login Message” is displayed. The default setting is “DEFAULT USER". When the comment is changed, Change the characters with the keys (◄ ►, ▲ ▼, and Execute) It returns to the ready screen when the Return key is pressed.

● Sensor

『Active ⇔ Cancel』

『Active』	Depending on the change in barometric pressure of the environment, the strength of the arc discharge is corrected automatically.
『Cancel』	Cancel

● Real Time Arc Control

Activating Real Time Arc Control.

『Cancel ⇔ Active』

● Zoom Image

『Cancel ⇔ Active』

At the splicing 4-ribbon, 2-ribbon, and single fiber, the fiber image is magnified on the center of the screen before arc discharge.

● Display Image

Activating fiber image during arc discharging

『Type 1 ⇔ Type 2』

● Tension Test

『Active ⇔ Cancel』

『Active』	Tension test starts by opening the windshield. Tension is 1.96N. Reset has been completed, unless the optical fiber is broken, the tension test is passed. Remove the spliced fiber carefully.
『Cancel』	Cancel tension test

● Direction of Monitor

Selecting direction of LCD screen

『Front ⇔ Rear』

『Front』	The lower side of the LCD screen is the operating key.
『Rear』	The lower side of the LCD screen is the Heater. It is a direction that looks normal in the top and bottom of the screen when seeing from a rear side of the splicer.

● Illumination Lamp

Adjusting the brightness of the lamp. (The lamp that illuminates V-groove)

『15、14、13、・・・・OFF（turn off）』
Bright ⇔ Dark OFF（turn off）

● Clamp Up & Down

『Active ⇔ Cancel』

Activating Fiber Clamp moving

(Active: The fiber clamp moves up and down automatically when the axis offset is large.)

● Battery Mode

『2 batt. ⇔ 1 batt.』

Selecting use type, 2batt.(parallel) or 1batt.(serial)

● Illumination Lamp

Adjusting the brightness of the lamp. (The lamp that illuminates V-groove)

『15、14、13、・・・・OFF（turn off）』
Bright ⇔ Dark OFF（turn off）

● Arc Counter

Displaying and editing arc count

Displaying the current count and can be adjusted to any count (up to 32767).

Select a digit with ◄ ► and press ▲ ▼ to increase/decrease the value.

When "+ "is selected, press ▲ key to advance to 32767 or press ▼ key to advance to 0.

● Total arc Counter
Displaying total arc count
Only displays the current count and cannot be edited.

● Charge Select
The priority settings for the battery to be charged
『Low ⇔ High』

『Low』	Lower residual voltage battery is charged with priority.
『High』	Higher residual voltage battery is charged with priority.

● Charge Mode
Select the amount of battery level to be charged.
『100⇔ 80[%]』

『100』	To charge up to 100% of battery capacity. 2 Batteries are charged up to 100% one by one.
『80』	To charge up to 80% of battery capacity. After one battery is charged by 80%, charging the other battery begins. 2 batteries are charged early, though batteries are not fully charged.

8.5.2. Counter

1. Select a Setting item in the “Counter“ list and press Enter key.
2. Pop-up window shows available functions. Press ▲ ▼ keys to select desired function and press Enter key.
3. Pop-up window shows available setting. Press ▲ ▼ keys to select desired setting and press Enter key.
4. Press Escape key and a pop-up window prompts the operator to confirm the change. Select “Over write” to confirm the change, or “Cancel” to cancel the operation and press Enter.
5. Repeatedly press Escape key until the Ready screen is displayed.

Available settings for each Item

Setting Title	Functions		
	Counter Reset	Alarm On/Off	Alarm Count
● Arc ● Cleaving ● Stripping ● Splicing	Do not Reset Reset	Off On	Displaying the current count can be adjusted to any count. Select a digit with ◄ ► and press ▲▼to increase/decrease the value. When "+ " is selected, press ▲ key to advance to 32767 or press ▼ key to advance to 0.
Total Arc	Not Available		

8.5.3. Clock

1. The setting screen is displayed as shown in the picture to the right.
2. Press ▲ ▼ keys to select setting item (Day/Month/Year/Hour/Minute) and press Adjust key.
3. Select a digit with ◄ ► and press ▲ ▼ to increase/decrease the value, and press Set key.
4. Repeatedly press Escape key until the Ready screen is displayed.

8.5.4. About Machine

Various information of the machine is displayed as shown in the right picture.

8.6. Shortcut

The S123 allows the user to register a frequently used screen onto a “Shortcut”, and advance to that particular screen quickly.

<Registering>

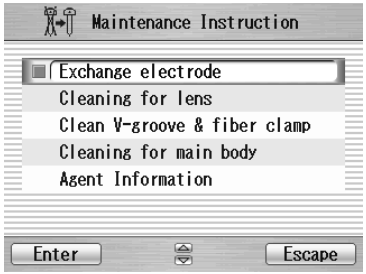
1. Select “Shortcut” in the Menu screen and keep pressing Enter key until the second beep sounds.
2. Select a shortcut menu in the screen. Press ▲▼ to scroll the menu item (highlighted in red color) and ◄ ► to change the page.
3. Press Set key to set the shortcut menu. Two short beeps will sound and the display returns to Menu screen.

<Executing>

1. Select “Shortcut” in the Menu screen and press Enter key. The screen changes to the registered one.

8.7. Maintenance

The S123 allows the user to obtain procedure and pictures for maintenance.



1. Select “Maintenance” in the Menu screen and press Enter key.
2. Select item from following list and press Enter key.
   - Replace/Clean electrodes
   - Cleaning for lens
   - Cleaning V groove and fiber clamp
3. The maintenance procedures are displayed with text instructions and photographic examples. Press ◄ ► to switch the pages. Follow instruction to perform the maintenance.
4. Press Escape key to return to the previous screen.

9. Maintenance and Handling Instructions

9.1. Error Messages

The following is a list of major error messages that can be observed. Refer to the following table for trouble-shooting.

Error Messages	Error Description	Cause of the error	Action
NUMBER ERROR	Fiber counts are wrong	Wrong Fusion program	Check and correct the program.
		Fiber is broken	Prepare the fiber again and retry.
CUT ERROR (with side of the failed fiber)	Cleaving error is found in left fiber, right fiber, or both left and right fibers.	Exceeding the inspection criteria for cleave quality	Prepare the fiber again and retry.
		Incorrect parameters setting for cleave quality.	Check and correct the parameters.

Error Messages	Error Description	Cause of the error	Action
AXIS ERROR	Axis offset is high.	Fiber clamps do not hold the fibers.	Push the button to move fiber clamps for correcting axis offset, or put the fiber on the V-groove again after opening the windshield, and retry inspection.
		V-groove or Fiber clamps are dirty	Clean the V-groove and the Fiber clamps.
		Fiber is dirty	Cleave again with care not to soil the fibers.
		Fiber bent	Set the fiber again with reforming its bending.
		Other	Confirm the setting of Inspection Criteria.
GAP ERROR	The difference of each fiber gap is high.	Exceeding the criteria for the gap between each fiber.	Prepare the fibers again to make sure of no difference between each fiber length. Confirm the setting of Inspection Criteria.

Error Messages	Error Description	Cause of the error	Action
SPLICE DEFECTS	See “Splicing Defects, Fusion Splicing”.		
FEEDING ERROR (with name of the failed motor)	The motor does not stop after the time limit from the start.	Defect in the motor driving system.	Contact service center.
OVER-RUN (with name of the failed motor)	The motor detected the overrun limit when running forward.	Fiber is not loaded or not in the proper position.	Load the fiber at the proper position.
		Inappropriate fiber program is selected.	Check and correct the program.
		Bad cleaving quality.	Prepare the fiber again and retry.
		Defect in the image processing system.	Contact service center.
		Defect in the motor driving system.	Contact service center.
		V-groove is dirty	Clean the V-groove.
HEAT TIME OUT	The temperature does not reach the set value within the time limit from heating start up.	Incorrect parameter is set for heating.	Check and correct the parameters.
		Defect in the heating system.	Contact service center.

Error Messages	Error Description	Cause of the error	Action
Heater Error No.13	The temperature does not reach the set value within the time limit from heating start up. (*)	Incorrect parameter is set for heating.	Check and correct the heating parameters.
Heater Error No.17		Incorrect parameter is set for heating.	Check and correct the heating parameters.
		Voltage decrease	Recharge the battery.
			Use the AC adaptor
Heater Error No.18		Incorrect parameter is set for heating.	Check and correct the heating parameters.
Heater Error No.23		Incorrect parameter is set for heating.	Check and correct the heating parameters
Heater Error No.27		Incorrect parameter is set for heating.	Check and correct the heating parameters.
		Voltage decrease	Recharge the battery.
			Use the AC adaptor
Heater Error No.28		Incorrect parameter is set for heating.	Check and correct the heating parameters.
COOL TIME OUT	The temperature does not decrease to the set value within the time limit from cooling start.	Incorrect parameter is set for cooling.	Check and correct the parameters.
		Defect in the heating system.	Contact service center.

Error Messages	Error Description	Cause of the error	Action
OVER TEMP.	The temperature exceeds the set value while heating.	Defect in the heating system.	Contact service center.
OUT OF SPEC	The fiber is out of applicable range.	Inappropriate fiber program is selected.	Check and correct the program.
		Cladding diameter is out of applicable range.	Can not splice with S123.
LOW BATTERY	Battery has no power remaining.	Battery has no power remaining.	See “6.1.4Recharging Battery”.
Inappropriate arc Please perform arc check and retry splicing.	The "Real Time Arc Control" function does not work normally.	Since the environment changed a lot, the arc power had to be adjusted more than the adjustable range. When the arc check was done, the correction reference was not able to be correctly acquired because of dirt of the electrode etc.	Please perform arc check and retry splicing by the optical fiber which pretreated normally.

Error Messages	Error Description	Cause of the error	Action
Inappropriate arc Please perform arc check and retry splicing.	The "Real Time Arc Control" function does not work normally.	Electric discharge became unstable under the influence of dirt, degradation of the electrode, or wind etc.	Please set up “Real Time Arc Control” function “Cancel”.

(*)The Heater consumes a lot of electric power to shrink the protection sleeve fast. Therefore, the battery output voltage descends. In the battery that repeats 300-times electrical charge and discharges or more, the voltage descent under heating is large. When the voltage decent of the battery is large, the heating time is long, and the heater error 17 or the heater error 27 might be displayed. If the battery is charged full and the same error message is displayed, the battery might be weakening. Please use a new battery or use the AC adaptor.

9.2. Maintenance

9.2.1. Arc Check

Perform an arc check whenever high splice losses are observed (see 7.1.1).

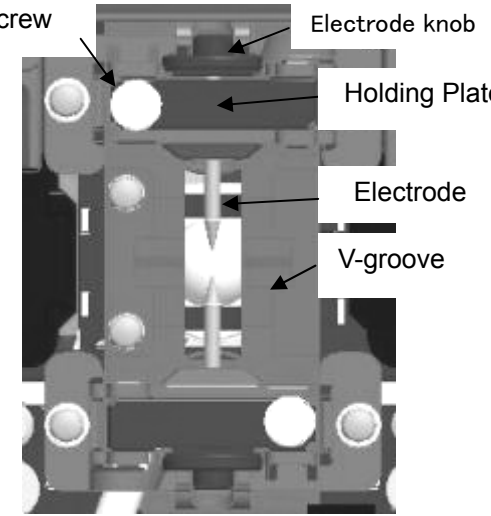
9.2.2. Electrode Maintenance

Inspect the electrodes for dirt, wear and damage before using the fusion splicer. Dust and other particles can be cleaned off by removing the electrodes from the splicing mechanism and polishing the surface of each electrode with the electrode sharpener. Over the course of normal operation, the electrodes can be cleaned & maintained for up to 5,000 splices.
Replace the electrodes if any of the following conditions exist:

- an electrode is bent
- an electrode end has become extremely rounded
- abnormal noise occurs during fusion splicing

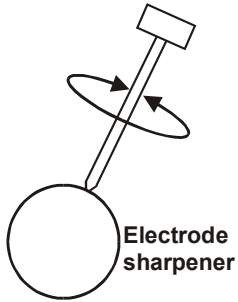
When the Arc Counter number exceeds 1,000, the S123 automatically displays a message to prompt replacing the electrodes at power on (when The Counter Alarm is “Active”.(*)). Turn off the switch and replace or clean the electrodes by using the electrode sharpener. The S123 asks if the electrodes are replaced after prompting the action. Select “Yes” if replaced and “No” if not. When “Yes” is selected, the Arc Counter is reset to 0 and the message will not appear at power on. When “No” is selected, the prompting message will be displayed again when power is turned on.
(*)Please refer “7.5.2 Counter”.)

- *Always replace or clean both electrodes, even if only one electrode is damaged.*
- *Be sure to turn off the Power switch before starting maintenance. Never touch the electrode while the Power is on.*
- *Longer arc duration used in dissimilar fiber splicing requires the electrodes to be cleaned and replaced more often. Frequent electrode maintenance is recommended for dissimilar fiber splicing programs.*



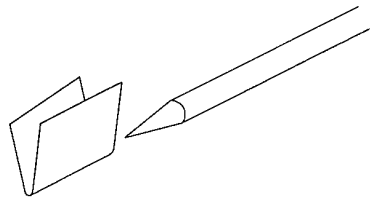
1. Loosen the screws of the Holding Plates, and raise the plates. The Electrode is raised together with the holding plate. Be careful not to drop the Electrodes into the machine.
2. Carefully pull and remove the Electrodes from the Holding Plates by grasping the Electrode Knob. Make sure nothing touches the Electrodes tips.
3. Clean or replace the Electrodes, as necessary.

- How to clean the Electrodes by using the electrode sharpener.



a) Firmly stick the tip of an electrode (approx. 0.5 – 1.0 mm) into the electrode sharpener and turn/twist the electrode 3-4 times.
Attention: Don't grasp the electrode knob (if possible, grasp a section of the electrode rod).

b) In an effort to clean the electrode tip, wipe it softly with BEMCOT dipping ethyl alcohol.



< Attention >

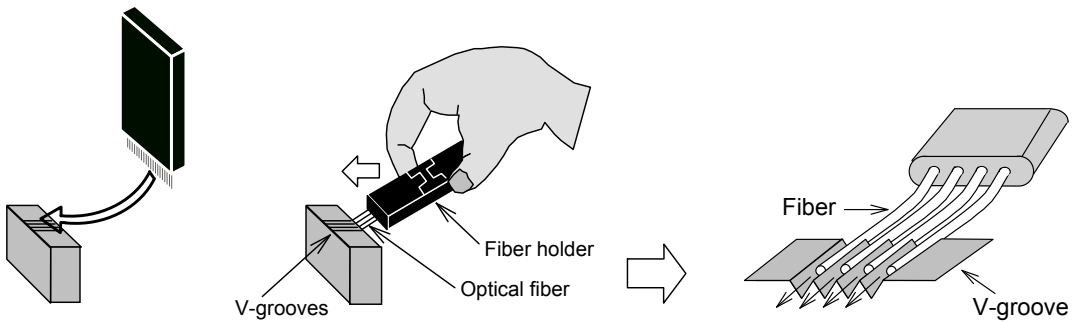
- You can use all faces of the electrode sharpener.
- Extreme treatment distorts the electrode tip and can possibly move the knob position.

4. When loading the electrodes into the splicer, push the electrode knob flush with the holding plate to ensure correct position.
5. Tighten the screws of the Holding Plates uniformly. **Do not overtighten the screws**.
6. Lower the windshield, and press ARC at least five (5) times to burn off any residue remaining on the electrodes.

9.2.3. Cleaning the V-grooves

- *Dirt on the V-grooves or fiber clamps will offset the alignment of the fibers or cause stress points on the glass, making the fiber weak.*

1. At first, please clean up the V groove by cleaning brush(VGC-01) in the standard components.
2. Prepare a piece of fiber and cleave it approximately 10mm from the end.
3. Hold the fiber at a 45° angle.
4. Run the cleaved end back and forth along each groove to scrape off any debris.



- *If the V-grooves are extremely contaminated, it may also be necessary to wipe the grooves with a cotton swab soaked with denatured alcohol.*

9.2.4. Cleaning the V-groove Fiber Clamps

1. Two Fiber Clamps are located in the windshield to help press the fiber into the V-grooves. Open the windshield.
2. Clean the top of the fiber clamps with a cotton swab soaked with denatured alcohol. (Use ethanol of more than 99% purity.)

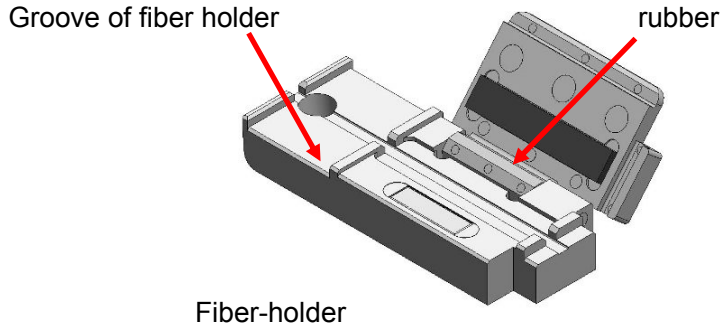
CAUTION	**The V-groove is made of a brittle ceramic material. Clean the V-groove carefully. DO NOT use any abrasive tools such as metal to clean.**

CAUTION	**As Freon gas might contaminate camera lens, DO NOT use spray including Freon gas or alternatives for cleaning.**	

WARNING	**Do not use a gas spray to the splicer. The hazardous gas may come out by electric discharge. It may cause a fire and machine failure.**	

9.2.5. Cleaning the Fiber Holder

Keep the rubber and groove of the fiber-holder clean. When they are dirty, fiber is sometimes slippery at the tension test. Wipe the rubber and groove with a lint-free tissue and a cotton bud, etc soaked with denatured alcohol. Clean the coating of fiber put on the holder, too.



9.3. Backup Battery

S123 has the backup battery other than the battery that operates the splicer. The backup battery is for the calendar and the memory preservation. The backup battery is rechargeable. When the S123 is turned on, the backup battery is charged. The backup battery can be used during about half a year by the full charge of 14 hours.

When the backup battery residual quantity decreases, the mark  is displayed.
Please turn on the splicer to charge the backup battery, when not splicing.
If the backup battery empties completely, the data memorized in the memory is deleted.

9.4. Storing and Shipping

To maintain optimum operating reliability, do not store the S123 fusion splicer in locations where the temperature falls below -40°C or rises above +60°C. Also, avoid any environmental conditions that can result in internal condensation. Ensure that the power cord is disconnected and the batteries are removed from machine's main body when storing the fusion splicer. Ensure that these temperatures and humidity requirements are also met whenever the S123 fusion splicer is shipped.

9.5. Claims and Repackaging

Immediately inform The Furukawa Electric Co., Ltd. or your local sales representative and, if necessary, the carrier, if the contents of the shipment are incomplete, or if the S123 fusion splicer or any of its components are damaged or defective, or if the fusion splicer fails during operation. In the event of carrier responsibility, The Furukawa Electric Co., Ltd. will allow for the repair or replacement of the S123 fusion splicer or component while a claim against the carrier is being processed.

9.6. Return Shipments to Furukawa Electric Co.

The Furukawa Electric Co., Ltd. will only accept returns for which an approved Return Material Authorization (RMA) has been issued by The Furukawa Electric Co., Ltd. customer service personnel. This number must be obtained prior to shipping any material back to The Furukawa Electric Co., Ltd. The owner's name and address, the model number and full serial number of the S123 fusion splicer, the RMA number, and an itemized statement of claimed defects must be included with the return material. Never ship the S123 fusion splicer without or outside its carrying case.

- *If possible, return material in its original shipping container and packing material.*

1. Seal the shipping container securely and clearly mark FRAGILE on its surface.
2. Always provide the model and serial number of the S123 fusion splicer and, if necessary, the RMA number on any accompanying documentation.

10. Option

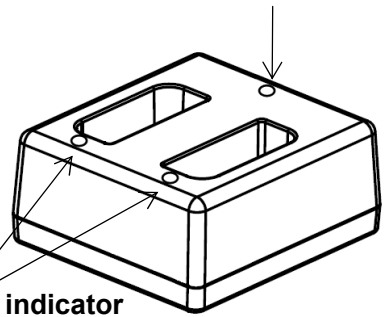
10.1. Battery Charger : S958C

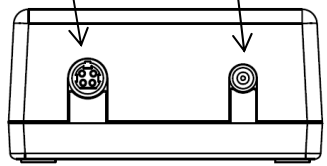
Charger for S943(B) battery

Input jack for S976A

Input jack for S977A

Power indicator
Green lighting : Turning ON
Red & Green blinking : Power trouble





CHARGE indicator
Red lighting : During charge
Green lighting: Charge complete
Red & Green blinking : Trouble of battery

★Charging

The number of the battery which S958C charger can charge at the same time depends on the AC adapter.

Therefore, the S958C charger has two kinds of jacks that connect the AC adaptor.

Chage mode	AC adaptor	contents
Parallel	S976A	The two batteries are charged at the same times.
Serial	S977A	The battery is charged only one side. The battery of the remainder is charged when completing it.

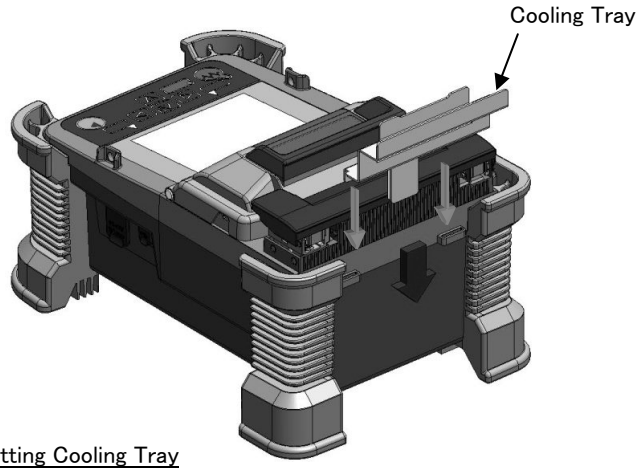
When both S976A and S977A adaptors are connected, S958C charges batteries by S976A in the parallel charge mode.

 **CAUTION**	**Never insert any other equipment except S943B (or S943) battery in S958C charger.**
 **CAUTION**	**Do not use AC adaptors other than S976A (or S977A) for the S958C charger When using AC adapter, do not use any voltage other than indicated. Doing so may result in fire, electric shock, or injury.**

	For charging the Battery, insert the Battery pack squarely into the slot of the charger. If the battery pack sits in the charger at an angle, the battery may not charge and charging errors may occur. In such a case, remove the battery pack, and replace into the charger taking care to seat it correctly.
	The charging errors may occur for the battery not charged with for a long time. In such a case, remove AC adaptor from out let once, and insert it again. And strat charging.
	It is necessary to attach a ferrite core to the line-out, when using the S977A AC Adapter.

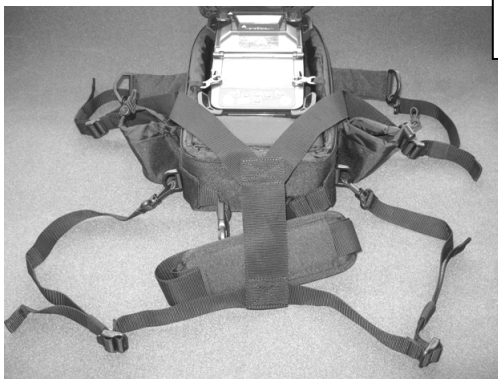
10.2. Cooling Tray：CTX-01

Tray to cool sleeve after heating
Set it in the back of the main body.

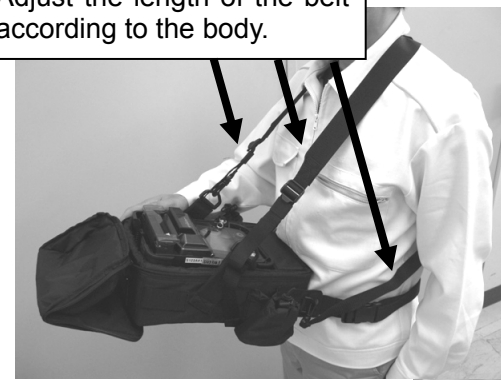


Setting Cooling Tray

10.3. Working Belt：WBT-01



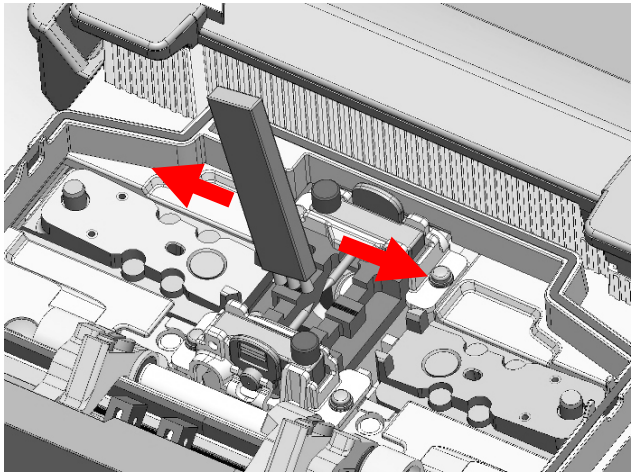
Adjust the length of the belt according to the body.



Connect each belt on each hook, put the fusion splicer, and fix with metal fittings.

10.4. Cleaning Brush : VGC-01

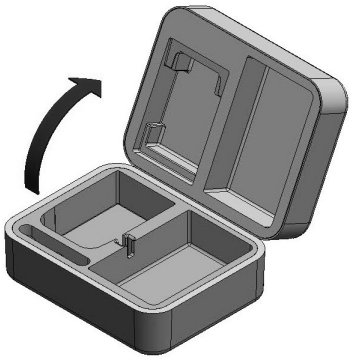
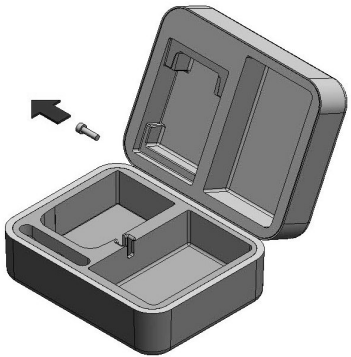
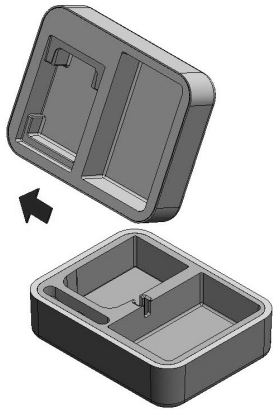
It is used to remove the garbage that adheres to V-groove and the fiber clamp.



10.5. Hard carrying case：HCC-02

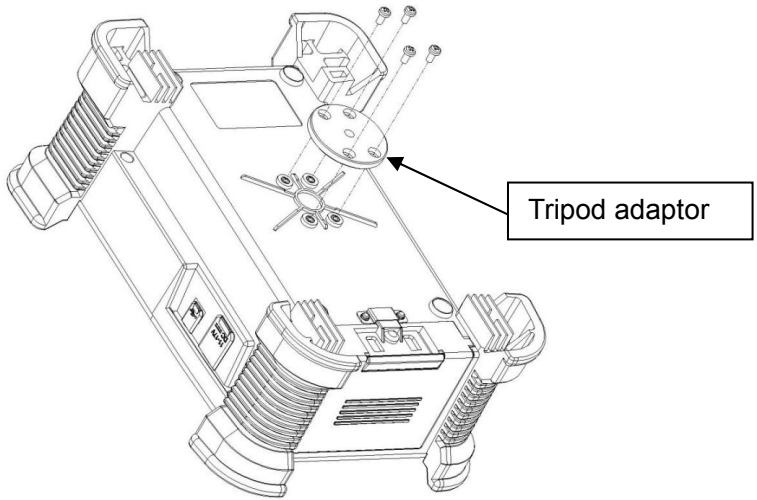
The lid of the Hard carrying case can be remove.

How to remove is as follows.

		
Open the case.	Remove the stopper screw	Slide the lid and remove.

10.6. Tripod adaptor：TPA-01

Fix Tripod adaptor to the rear surface of the Bottom case with 4 screws.



11. Recycling and Disposal

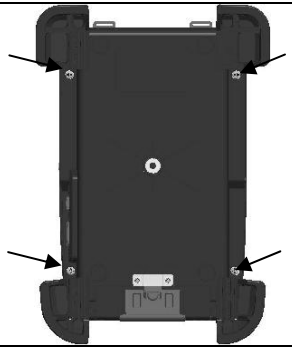
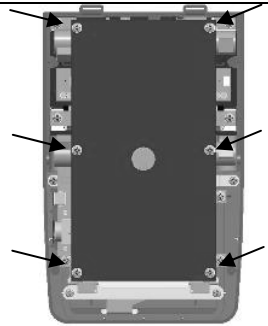
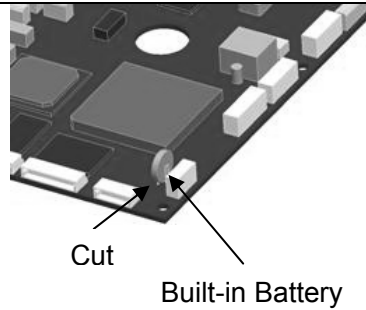
When you dispose S123 fusion splicer or standard components, follow your local disposal regulations, or contact the Furukawa Electric Co., LTD or your local representative.

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

Especially for 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 can be minimized.

S123 has a backup battery for backup memory and calendar.
How to take off a battery is indicated in the following.

Removing the built-in battery

		
1. Remove the 4 screws, and remove the bottom case.	2. Remove all wiring connected to the electric board. And remove 6screws which fix the board.	3. There is the built-in battery in the back of the board. Please cut fittings off and tear the battery away.

For sales and service information,
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