S185 Series FUSION SPLICER

USER MANUAL

Issue 1

FURUKAWA
ELECTRIC

Contents

1. Safety Information and Instructions

This manual contains the complete operating and maintenance instructions for the S185 Fusion Splicer. Please review the manual carefully before operation.

1.1 Safety Information

The following safety instructions must be observed during the operation, service or repair of the S185 fusion splicer. Failure to comply with any of the instructions or warning contained in the User's Manual is a direct violation of the design, manufacture and intended standard use of the instrument. Furukawa Electric Co., Ltd. assumes no liability for the customer's failure to comply with these safety requirements.

1.2 Safety Messages

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

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

In no case will 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.

1.3 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.
Only use the cords supplied with 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 using incineration. Disposal of this device must be carried out by a qualified person.
Never touch the electrodes when the fusion splicer is turned on. Doing so may cause electric shock. A warning symbol ⚠ is placed on the windshield as a notification.
Do not operate the fusion splicer without electrodes.
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 if any of the bottom screws are disturbed.
Avoid soaking the fusion splicer with water. Doing so may cause fire, electric shock or malfunction.
Do not use an inappropriate input voltage. Doing so may cause fire, electric shock or malfunction.

⚠️ **WARNING**
Do not insert or drop any metal or any flammable material into the main body through any gap. Doing so may cause fire, electric shock or malfunction.
Avoid direct skin contact with the heating section. This may result in burns or injury. A warning symbol ⚠️ is placed on the lid of the protection sleeve heater as a notification.
Do not remove the bottom cover of the fusion splicer. Some parts generate high voltage. Removing the panels may cause electric shock.
If abnormal sounds or extra high temperatures are observed, turn off the power, disconnect the power cord, remove the battery from the fusion splicer, and contact Furukawa Electric Co., Ltd. or your local representative. Continued operation under these conditions may cause fire or electric shock.
Do not use a damaged power cord where the inner cable is exposed or severed. Doing so may cause fire or electric shock.
If water is spilled into the fusion splicer, turn off the power switch, disconnect the power cord, remove the battery, and contact Furukawa Electric Co., Ltd. or your local representative. Continuing to operate under these conditions may cause fire or electric shock.
If smoke or strange smells are observed, turn off the power switch, disconnect the power cord, remove the battery, and contact Furukawa Electric Co., Ltd. or your local representative. Continuing to operate under these conditions may cause fire, electric shock or malfunction.
If the fusion splicer is dropped and damaged, turn off the power switch, disconnect the power cable, remove the battery, and contact Furukawa Electric Co., Ltd. or your local representative. Continuing to operate may cause fire or electric shock.
Do not look into a fiber with your bare eye during operation. The wearing of protection goggles is recommended.

⚠ 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 battery, and contact your local 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.

The S185 complies with the following tests:
  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)
  External Impact resistance – IK07 rating external impact proof (exposed to 500g weight dropping from 40cm height)
Above tests were performed at Furukawa Electric 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 could fall and cause injury.
Disconnect all cords when moving the fusion splicer. Failure to do so may damage the cords and result in fire or electric shock.
Do not place the cords around any heating instrument. Doing so may damage the cords and result in fire or electric shock.
Do not connect or disconnect cords with wet hands. Doing so may cause fire or electric shock.
Do not pull the cord to disconnect. Doing so may damage the cords which may cause fire or electric shock. Hold the plug section and disconnect the cord.
Do not put heavy items on the cords. Doing so may damage the cords and result in fire or electric shock.

⚠️ **CAUTION**
Do not modify or tamper with the cords. Excessive twisting, bending or stretch the cords may cause fire or electric shock.
Ensure that the cords are disconnected and the batteries are removed from the machine's main body when storing the fusion splicer.
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 vastly different from the operating temperature (even if the environment temperature is within the operating temperature limit), please use only after the splicer body has acclimatized to near the operating temperature. Otherwise, the splicer might not work normally.
Do not disconnect AC cable from fusion splicer even if there is enough battery capacity when heater is in operation. This operation will cause the machine to shut down.

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

⚠️ **CAUTION**
Do not dispose of the battery in a fire, or leave the battery near an object of high-temperature. Doing so may cause fire or explosion.
Do not short-circuit the recharging connector or the output terminal of the splicer. Doing so may cause fire.
Charge the S947 battery by using the S185. Charging using other equipment that is not suitable for charging the S947 battery, may cause fire.
Avoid soaking the battery with water. Doing so may cause fire or electric shock.

<table>
<tr><td colspan="2"><h1>⚠ <mark>CAUTION</mark></h1></td></tr>
<tr><td colspan="2">Do not disassemble the battery. Avoid damage by not dropping or subjecting it to heavy shock. Doing so may cause fire or electric shock. If the inner cells rupture and electrolytic solution leaks outside, it may cause inflammation to your skin or eyes.</td></tr>
<tr><td colspan="2">Disposal of used batteries must be carried out according to disposal regulations established by law. For instructions, contact Furukawa Electric Co., Ltd. or your local representative.</td></tr>
</table>

<table>
<tr><td colspan="2"><h1>NOTES</h1></td></tr>
<tr><td></td><td>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!</td></tr>
</table>

<table>
<tr><td>This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
FCC CAUTION
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.</td></tr>
</table>

NOTES
This Class A digital apparatus complies with Canadian ICES-003. Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

1.4 Power Requirements

The S185 fusion splicer can also operate from an AC power source with the SXXX AC/DC adapter. The SXXX adapter can accept an AC power source with voltage between 100~240V at a frequency of 50~60Hz. The SXXX internal battery is charged by the S185 through the SXXX AC adapter

⚠️ WARNING
To avoid the risk of injury or death, ALWAYS observe the following precautions before initializing the S185 fusion splicer. ● **If using a voltage-reducing auto-transformer to power the S185 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 S185 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).** ● **Deliberately interrupting the protective ground connection is prohibited.**

1.5 Toxic Hazards

The S185 fusion splicer presents no toxic hazards (under normal conditions of use, storage, and handling). However, under the following conditions, certain precautions are necessary.

1.5.1 Incineration

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

1.5.2 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.

1.5.3 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.

2. Getting Started

2.1 Unpacking and Initial Inspection

1. Inspect the shipping container for any indication of excessive shock to its contents.
2. Ensure that the carrying case is the correct side up before opening.
3. Remove the S185 carrying case from the shipping container, and open the case.
4. Inspect the contents to ensure that the shipment is complete.
5. Lift the S185 fusion splicer out of the carrying case, and place the instrument on a flat, smooth surface.
6. Visually inspect the S185 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 S185 fusion splicer components are damaged, defective, or if the S185 fusion splicer does not pass the initial inspection.

A thin protection film is covering the LCD cover, the switch panel and the label. Please peel this off before using the S185.

⚠️ **WARNING**
To avoid electric shock, do not initialize or operate the S185 fusion splicer if it shows any signs of damage to any section of its exterior surface, such as the outer cover or panels.

3. Operating Specifications and Components

3.1 Specifications

The specification of S185 splicer is listed in the following table.

Item		Specification and Features		
		PM	HS	LDF
Applicable fibers*[1]		SM/MM/DS/BIF High⊿/EDF/PMF	SM/MM/DS/BIF High⊿/EDF	SM/MM/DS/BIF High⊿/EDF/LDF
Clad diameter		80~150µm		125~500µm
Coating diameter		160~1300µm	160~2000µm	
Cleave length		3~5mm (Coating clamp splice) 8~11m (cladding clamp splice)		
Typical Insertion Loss*[2]		SM : 0.014dB DS : 0.024dB		
Typical Extinction Ratio		PANDA -40dB/0.6deg	–	
Environmental Conditions	Operation	Temperature : 0~40℃ Humidity : 0~90%(Non-condensation)		
	Storage	Temperature : -40~60℃ Humidity : Below 95%		
Power		AC : 100~240V 50/60Hz		
Dimension		210W×180D×140H		
Weight(Without Battery)		4.75kg		4.5kg
Input/output terminals		USB 2.0TypeA ×1 mini USB ×1 LAN (10BASE-T) ×1		
Maximum storage capacity		Splice history : 1000(include fiber image) Capture image : 100		
Number of programs		Splice : 200 Heat : 100		
Splicing Time		SM : 15sec		
Heating Time		35sec(S922: 40mm sleeve)		

*1: Applied to ITU-T standard
*2: Tested in a laboratory environment with similar fibers. Not guaranteed results.

13

3.2 Components

3.2.1 Standard Components

The S185 Fusion Splicer comes with the following items as standard.

Confirmation of their presence is advised before operation. The

components along with their order reference number are shown below.

Components	Model Number	QTY
S185 Main Body	S185PM/HS/LDF	1
AC Adapter	S981A	1
AC Cable Cord	-----	1
Z Stage Lock	ZL-01	1 pair
Spare Electrodes	ELR-03	1 pair
Electrode Sharpener	D51111	1
Cleaning Brush	VGC-01	1
User Manual	FTS-B562	1

3.2.2 Optional Components

Components	Model Number	QTY
160μm Coating Fiber Holder	S713S-160	1 pair
250μm Coating Fiber Holder	S713S-250	1 pair
400μm Coating Fiber Holder	S713S-400	1 pair
650μm Coating Fiber Holder	S713S-650	1 pair
900μm Coating Fiber Holder	S713S-900	1 pair
1300μm Coating Fiber Holder	S713S-1300	1 pair
Customized Fiber Holder	S713S-XXX	1 pair
Built-in Battery Pack	S947B	1
Hard Carrying Case	HCC-12	1
USB Cable	USB-01	1
Wifi Dongle	WFD-01	1

3.3 Optional Accessories

Contact Furukawa Electric Co., Ltd. or your local representative for more detailed specifications of the following;

- S218R-Plus Hot Stripper
- 3SAE Thermal Stripper
- S326S80 High Precision Optical Fiber Cleaver
- S326A High Precision Optical Fiber Cleaver
- NorthLab ProCleave LD
- 3SAE Ultrasonic Cleaner
- S921　60mm Splice Length Protection Sleeves for Single fiber
- S922　40mm Splice Length Protection Sleeves for Single fiber
- S928A 20/25/35　Mini Sleeves

3.4 Recommended Consumables

Keep a supply of the following items with the S185 fusion splicer at all times.

- Tweezers
- Protective eye goggles
- Denatured alcohol
- Lint-free tissues or swabs
- Sharps bin for disposal of scrap fiber
- Cotton swab

4. External Description

4.1 Main Body

<Front>

Windshield

Protection Sleeve Heater

Operation Keys

LCD Monitor

<Side>

DC Power Port

Ethernet Port

USB mini-B Port
(For PC)

USB 2.0TypeA

<Splicing area>

Fiber holder bases

Fiber clamps

Clamp lift motors

Electrode holder

Electrodes

Lens

V-Groove

Electrode holder
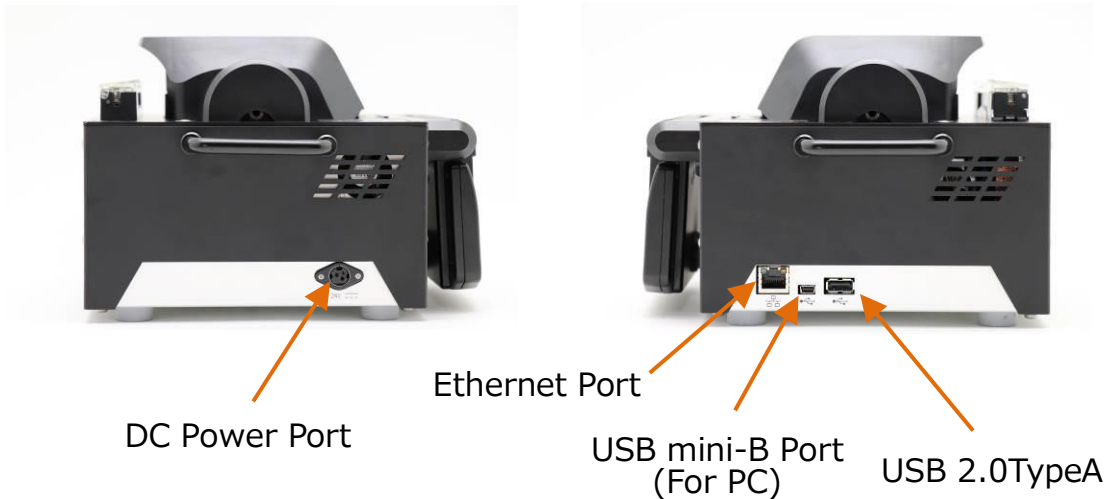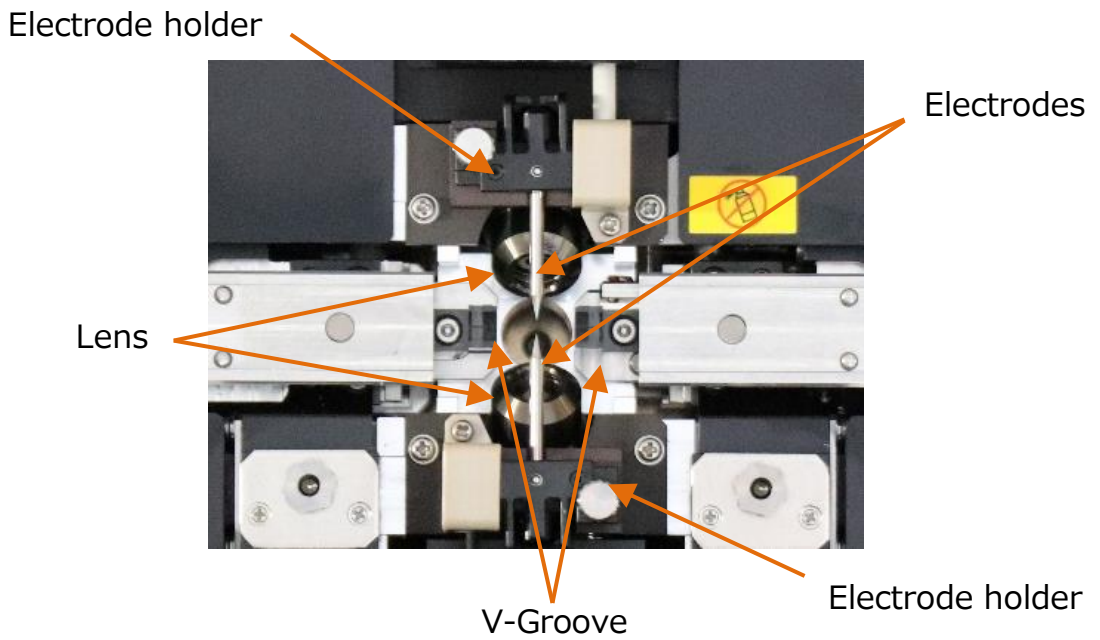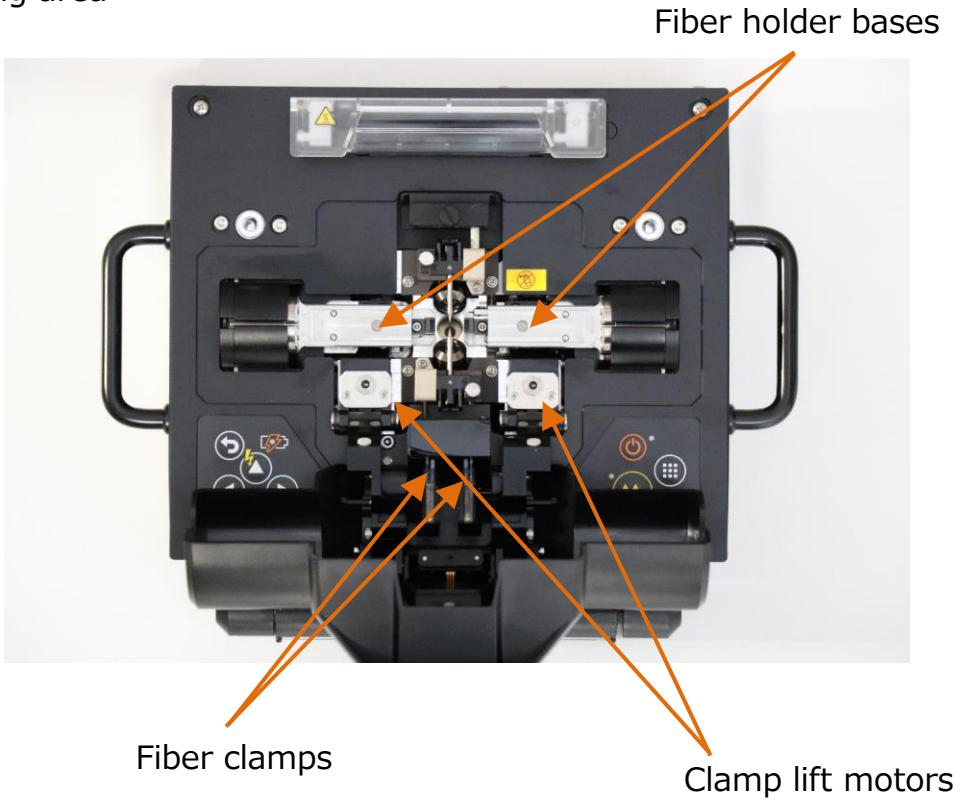
4.2 Operation Keys and Status LED

4.2.1 Operation Keys

Indicator	Name	Main Functions
(Power)	Power	Turn on/off the power when long press / Back to the previous screen when short press
(Start)	Start	Start / Pause / Restart the splicing process
(Heating)	Heating	Start heating / Stop heating
(Menu)	Menu	Show the menu
(Escape)	Escape	Cancel the current action.
(Enter)	Enter	Select the menu item / Determine the value
(Up)	Up	Move upward / Add additional arc
(Down)	Down	Move downward / LCD Brightness control when ready status
(Right)	Right	Move right
(Left)	Left	Move left

18

4.2.2 LED Indicators

Indicator	Name	Color	Main Functions
	Power LED	Green	Lit : Turned on Blinking : Sleep mode
	Heater LED	Red	Lit : During heating Blinking : During cooling
	Charge LED	Orange	Lit: During charging Blinking: Error

4.2.3 Buzzer

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

- Operation keys: One beep
- Machine reset completed: One beep
- Error occurred: Three beeps
- Splicing finished: A series of beeps
- Pause: Two beeps
- Heating process finished: One long beep

4.3 Heater

The S185 has several heater programs that are made for different types of protection sleeves.

4.4 Screens

4.4.1 Ready Screen

Once the S185 fusion splicer is powered up and initialized, the "Ready" screen is displayed.
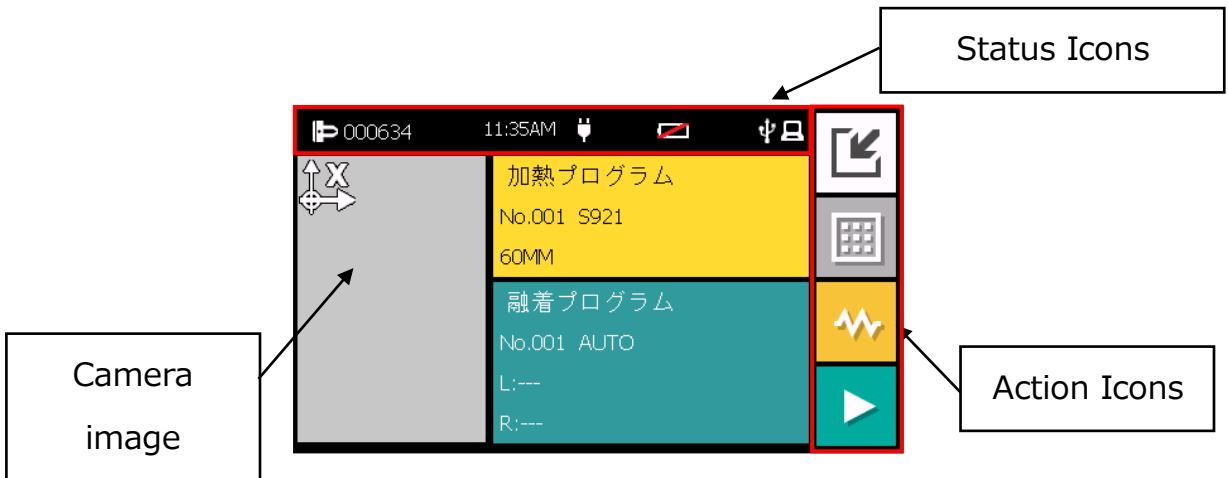
ⓘ	Touch the camera image to change the display magnification to 1.5 times, 2 times.
ⓘ	Touch the part 🔀 to change the from the X axis camera to the Y axis camera.

20

4.4.2 Action Icons

Touch ⬐ to expand the stored icon. The function of each action icon is as shown in the table.
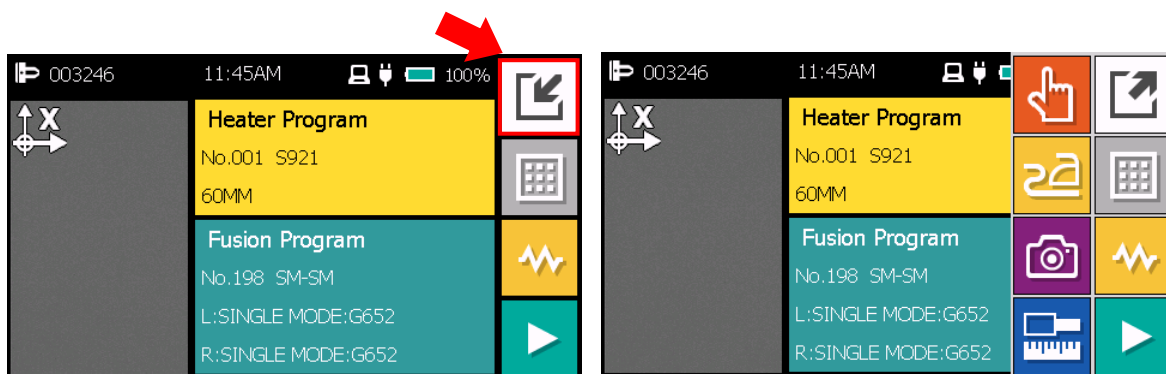
Icon	Function
⬐	Expand the icon window.
⬏	Store the icon window.
▶	Start splicing.
∿	Start heating.
▦	Show the menu.
☝	Start manual splicing.
౭౩	Start curl remove heating.
◎	Capture the camera images.
▭	Move fiber condition screen.

4.4.3 Status Icons

The meaning of each status icon is as shown in the table.

Type	Icon	Content
Battery status		The level of the battery is displayed in a percentage next to the battery icon.
		Battery is not installed.
		Charging battery.
System status		Using external power.
		Connected to the PC.
		USB storage device is connected.
		Wi-Fi available (Not connected to AP) Wi-Fi available (Connected to AP)
		Back-up battery is very low.

5. Basic Operation

5.1 Preparations for Power Supply

5.1.1 Connecting the power cable to the AC the adapter

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

AC Adapter

5.1.2 Charging the Battery

After connecting the power cable to the AC adapter and plugging the
power cable into the AC outlet, the charging process starts.
(When splicing and heating, the charging process stops temporarily, due to
this the charging time will take longer. Charging is recommended when
powered-off.)

Charge Icon

Charge LED
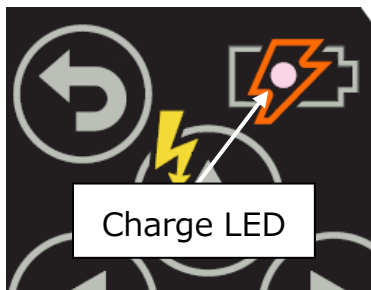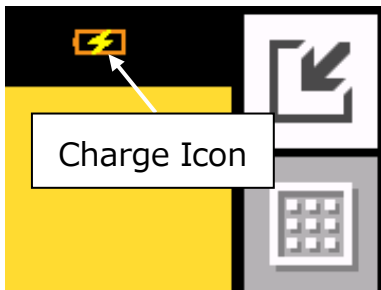
	S947 battery is a lithium ion type rechargeable battery; it can be recharged at any time, regardless of its current capacity (empty or still with some residual power). If storing the battery for a long time, the power level will becomes very low due to self-discharging and the battery may degrade. Recharging the battery at least every 2 months is recommended when not in use.

> It is possible that the battery may not be fully charged, if it is moved from a cold place (<5°C) to a warm place (around 20°C) and then immediately charged. In this case, make sure the battery is in the new environment for a short while to equalize the temperature, and then charge the battery. When charging the battery, the room temperature must be in the range of 5~30°C. (5~35°C when powered off.)
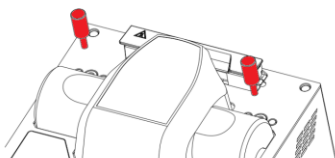
5.1.3 Z stage lock

Remove the Z stage lock from the S185 fusion splicer. The Z Stage Lock prevents the z units moving during transportation.
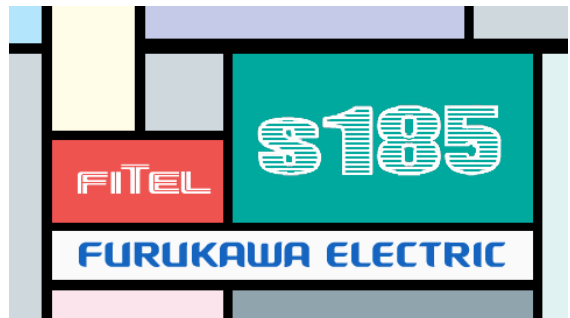
Z stage lock

5.1.4 Turn on the fusion Splicer

1. Press ⏻ key (for about 1 seconds) to turn on the unit. After turning on the unit, opening screen is displayed on the screen.

2. After a while, a confirmation message of Z stage unlock is displayed on the screen, press ⏻ key again.

3. Resetting is finished, the "Ready screen" is shown on the screen.

Push Power key after removing Z stage lock

ℹ️	System Reset will not be executed if the windshield is opened. Close the windshield before turn on the unit.
ℹ️	Turn on the fusion splicer, you hear a sound like extraordinary noise. But it is motor reset sound so there is no problem.

5.1.5 Turn off the fusion Splicer

1. Press ⏻ key (for about 1 seconds) to turn off the unit.

2. While the ending screen is displayed, the motor automatically returns to the reset position.
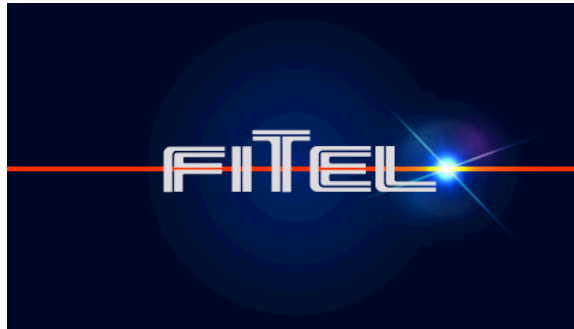
ℹ️	System Reset will not be executed if the windshield is opened. Close the windshield before turn off the unit.

5.1.6 Direction of Monitor

S185 fusion splicer is capable of changing the direction of image on the monitor upside down. Direction of the monitor will change automatically depending on the LCD angle. (For details, see "7.6.5 Display")

Front	Rear

5.2 Load programs

Install appropriate programs before operation. The S185 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.

5.2.1 Fusion Program

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

1. Tap the fusion program area on the touchscreen, or press ⊞ key and select fusion program menu.
2. Select the proper program by pressing 🔼 🔽 key.
3. Tap the fusion program to install fusion program.

A fusion program can also be select from the list of recently used programs, program group or by using the word search function.
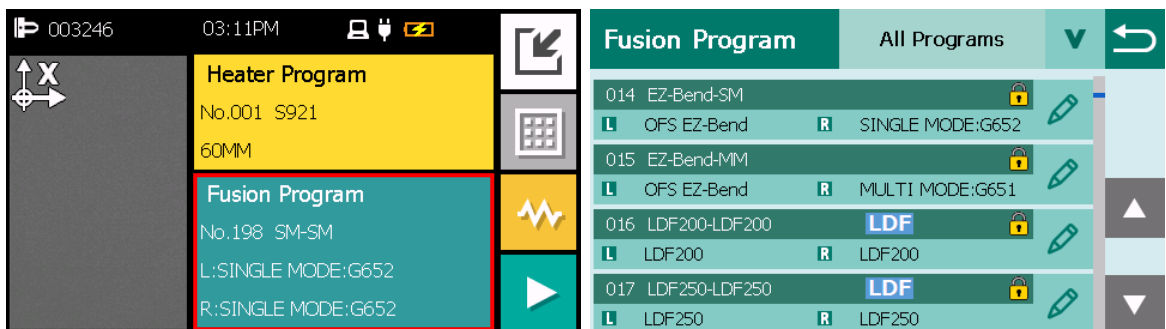
> ℹ️ PM and LDF icons are displayed in the fusion program dedicated to PMF and LDF.

5.2.2 Fusion Program List

The following fusion programs have been installed in S185, before shipping to any customers from factory.

No.	Left	Right	Description	PM	HS	LDF
Group: General						
001	DISSIMILAR AUTO		Automatically splices with adjusting the arc duration from the information of the fiber image.	◯	◯	◯
002	AUTO		Estimate the fiber type and jump to the corresponding fusion program	◯	◯	◯
003	SM	SM	Fusion program for splicing Single-mode fibers.	◯	◯	◯
004	SM(G657)	SM(G657)	Fusion program for splicing Single-mode fibers.	◯	◯	◯
005	MM	MM	Fusion program for splicing Multi-mode fibers.	◯	◯	◯
006	DS	DS	Fusion program for splicing Dispersion-shifted fibers.	◯	◯	◯
007	NZDS	NZDS	Fusion program for splicing Non Zero Dispersion-shifted fibers.	◯	◯	◯
008	SM	SM(G657)	Fusion program for splicing single mode fiber and Single mode fiber (G657).	◯	◯	◯
009	SM	MM	Fusion program for splicing Single mode fiber and Multi-mode fiber.	◯	◯	◯

28

010	SM	DS	Fusion program for splicing Single mode fiber and Dispersion-shifted fiber.	○	○	○
011	SM	NZDS	Fusion program for splicing Single mode fiber and Non Zero Dispersion-shifted fiber.	○	○	○
012	MM	NZDS	Fusion program for splicing Multi-mode fiber and Non Zero Dispersion-shifted fiber.	○	○	○
013	EZ-Bend	EZ-Bend	Fusion program for splicing OFS EZ-Bend fibers.	○	○	○
014	EZ-Bend	SM	Fusion program for splicing OFS EZ-Bend fiber and Single mode fiber.	○	○	○
015	EZ-Bend	MM	Fusion program for splicing OFS EZ-Bend fiber and Multi-mode fiber.	○	○	○

No.	Left	Right	Description	PM	HS	LDF
Group: PM						
016	PANDA01-Glass Clamp	PANDA01-Glass Clamp	Fusion program for splicing common PANDA fibers with glass clamp.	○	–	–
017	PANDA01-Coating Clamp	PANDA01-Coating Clamp	Fusion program for splicing common PANDA fibers with Coating clamp.	○	–	–
018	PANDA02-Glass Clamp	PANDA02-Glass Clamp	Fusion program for splicing common PANDA fibers with glass clamp.	○	–	–
019	PANDA02-Coating Clamp	PANDA02-Coating Clamp	Fusion program for splicing common PANDA fibers with Coating clamp.	○	–	–
020	PANDA80	PANDA80	Fusion program for splicing common 80μm PANDA fiber.	○	–	–
021	BOWTIE01	BOWTIE01	Fusion program for splicing Fibercore Bow-tie HB1500 fibers.	○	–	–
022	BOWTIE02	BOWTIE02	Fusion program for splicing Fibercore Bow-tie HB1500T fibers.	○	–	–
023	PANDA01	BOWTIE02	Fusion program for splicing common PANDA fiber and Fibercore Bow-tie HB1500T fiber.	○	–	–
024	PANDA01	ELLIPSE01	Fusion program for splicing common PANDA fiber and OFS EDF-25-PM fiber.	○	–	–
025	PM	SM	Fusion program for splicing PM fiber and Single-mode fiber.	○	–	–

No.	Left	Right	Description	PM	HS	LDF
			Group: LDF (Large Diameter Fiber)			
027	LDF200	LDF200	Fusion program for splicing LDF with 200µm clad diameter fibers.	—	—	○
028	LDF250	LDF250	Fusion program for splicing LDF with 250µm clad diameter fibers.	—	—	○
029	LDF360	LDF360	Fusion program for splicing LDF with 360µm clad diameter fibers.	—	—	○
030	LDF400	LDF400	Fusion program for splicing LDF with 400µm clad diameter fibers.	—	—	○
031	LDF500	LDF500	Fusion program for splicing LDF with 500µm clad diameter fibers.	—	—	○
032	LDF200	LDF125	Fusion program for splicing LDF with 200µm and 125µm clad diameter fiber.	—	—	○
033	LDF250	LDF125	Fusion program for splicing LDF with 250µm and 125µm clad diameter fiber.	—	—	○
034	LDF400	LDF125	Fusion program for splicing LDF with 400µm and 125µm clad diameter fiber.	—	—	○

31

No.	Left	Right	Description	PM	HS	LDF
Special						
035	PCF	PCF	Fusion program for splicing Photonic crystal fibers.	○	○	○
36	PCF	SM	Fusion program for splicing Photonic crystal fiber and Single-mode fiber.	○	○	○
037	ATTN	ATTN	Fusion program for splicing standard Single-mode fibers with 5dB attenuation at 1310nm wavelength.	○	○	○
038	OFFSET	OFFSET	Fusion program for splicing any kind of fibers with 5μm clad axis offset.	○	○	○
039	80SM	80SM	Fusion program for splicing standard Single-mode fibers with 80μm clad diameter fiber.	○	○	－
040	80SM	SM	Fusion program for splicing standard Single-mode fibers with 80μm clad diameter fiber and Single-mode fibers with 125μm clad diameter fiber.	○	○	－
041	HI980	HI980	Fusion program for splicing Corning HI980 fibers.	○	○	○
042	HI1060	HI1060	Fusion program for splicing Corning HI1060 fibers.	○	○	○
043	HI1060F	HI1060F	Fusion program for splicing Corning HI1060 flex fibers.	○	○	○
044	CL980-16	CL980-16	Fusion program for splicing OFS ClearLite 980 16 fibers.	○	○	○

045	CL980-20	CL980-20	Fusion program for splicing OFS ClearLite 980 20 fibers.	○	○	○
046	HI980	SM	Fusion program for splicing Corning HI980 fiber and Single-mode fiber.	○	○	○
047	HI1060	SM	Fusion program for splicing Corning HI1060 fiber and Single-mode fiber.	○	○	○
048	HI1060F	SM	Fusion program for splicing Corning HI1060 flex fiber and Single-mode fiber.	○	○	○
049	CL980-16	SM	Fusion program for splicing OFS ClearLite 980 16 fiber and Single-mode fiber.	○	○	○
050	CL980-20	SM	Fusion program for splicing OFS ClearLite 980 20 fiber and Single-mode fiber.	○	○	○
051	MP980	SM	Fusion program for splicing OFS MP980 Erbium Doped Fiber and Single-mode fiber.	○	○	○
052	MP980	HI980	Fusion program for splicing OFS MP980 Erbium Doped Fiber and Corning HI980 fiber.	○	○	○
053	MP980	HI1060	Fusion program for splicing OFS MP980 Erbium Doped Fiber and Corning HI1060 fiber.	○	○	○
054	MP980	HI1060F	Fusion program for splicing OFS MP980 Erbium Doped Fiber and Corning HI1060 flex fiber.	○	○	○

055	MP980	CL980-16	Fusion program for splicing OFS MP980 Erbium Doped Fiber and OFS ClearLite 980 16 fiber.	○	○	○
056	MP980	CL980-20	Fusion program for splicing OFS MP980 Erbium Doped Fiber and OFS ClearLite 980 20 fiber.	○	○	○
057	HE980	SM	Fusion program for splicing OFS HE980 Erbium Doped Fiber and Single-mode fiber.	○	○	○
058	HE980	HI980	Fusion program for splicing OFS HE980 Erbium Doped Fiber and Corning HI980 fiber.	○	○	○
059	HE980	HI1060	Fusion program for splicing OFS HE980 Erbium Doped Fiber and Corning HI1060 fiber.	○	○	○
060	HE980	HI1060F	Fusion program for splicing OFS HE980 Erbium Doped Fiber and Corning HI1060 flex fiber.	○	○	○
061	HE980	CL980-16	Fusion program for splicing OFS HE980 Erbium Doped Fiber and OFS ClearLite 980 16 fiber.	○	○	○
062	HE980	CL980-20	Fusion program for splicing OFS HE980 Erbium Doped Fiber and OFS ClearLite 980 20 fiber.	○	○	○

ⓘ	If you want to fusion splice a special fiber that is not installed, please contact our service center.
ⓘ	S185 may not be able to handle some "unknown" PM fibers. In that case, please change another similar PM program and try again. In case of PANDA type PM fiber, please select No.016 program and try again.
ⓘ	It had better to set up the fiber on the side as program name has indicated. For example, at SM-DS program, set up SM fiber on left side and DS fiber on right side. Especially, when splice requires the rotational adjustment, it is imperative to set the fiber on the side as fiber program has indicated.

5.2.3 Dissimilar Auto mode

If the fiber type is unknown at splicing dissimilar fiber, user can try to select the <Splicing Dissimilar fiber>. Fusion splicer automatically adjusts the arc duration depending on a combination of the fiber at the time of splice. However, in most of case, the splice performance in the manually selected program is better than in splice performance.

ⓘ	Do not use Dissimilar Auto mode in splice of similar fiber. This mode is not proper for the application to splice similar fiber.

5.2.4 Auto mode

Fusion program No. 002 AUTO is automatically selection the appropriate fusing program (SM (G652) / SM (G657) / NZDS / MM / EZBD) from fiber image information. Please use this program when splicing the same fibers which are unknown type.

ℹ️	Do not use <Auto Selection> mode in splice of dissimilar fiber. In splice of dissimilar fiber, select <Splicing Dissimilar Fiber> mode or programs manually.
ℹ️	Misidentifying splice program may occur in auto-mode due to the variation of fiber natures. In such case, select appropriate fusion program manually.

5.2.5 Fiber Condition

To operate S185 correctly, the fiber dimensions information is required, because the positions of V-grooves in S185 are decided based on the fiber dimensions. There are two ways to go into the Information screen to set up fiber dimensions before carrying on the splicing.

- From "Ready screen", press 🖳 Icon.
- Selecting fusion program, "Fiber condition screen" prompts before going to "Ready screen".
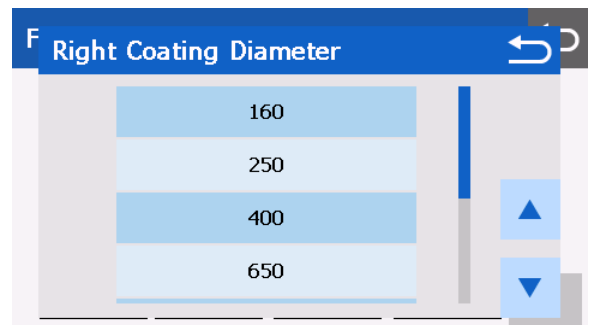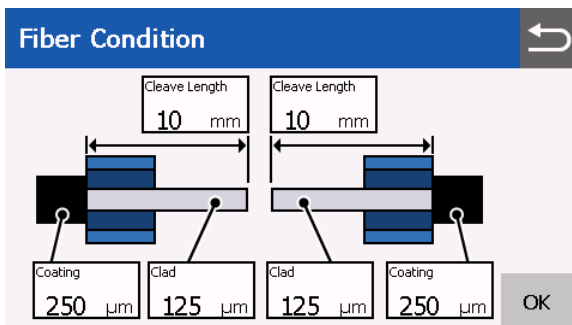
1. Use ⬆ ⬇ ◀ ▶ key to select the item to be changed. After being selected, then press ↵ key.
2. Select proper dimension, then press ↵ key.
3. Confirm the setting of the item is changed.

Coating Diameter [µm]	Clad Diameter [µm]	Cleave Length [mm]
160	80*1	3
250	125	4
400	200*2	9
650	250*2	10
900	360*2	
1300	400*2	
2000	500*2	
Other	Other	

*1: Only S185 PM and S185HS.

*2: Only S185 LDF.

i	You can enter any number by selecting "Other".
i	Please select cleave length to 3mm or 4mm, when operation high strength splicing (see "6.4.2").

5.2.6 Heater Program

Install an appropriate heater program for specific sleeves.

1. Tap the heater program area on the touchscreen, or press ⊞ key and select the heater program menu.

2. Select the proper program by pressing 🔼 🔽 key.

3. Tap the heater program to install the heater program.

ℹ	When the S185 is turned on, the last program used is selected automatically.
ℹ	The curl-remove program can be selected from the heater program menu. Additionally, it can be selected by holding down the heating key. It automatically returns to the previously selected heater program when the curl-remove process has ended. When using curl-remove function, set the unprepared fiber in the heater. Please close both side of the clamp and cover as usual.

5.2.7 Heater Program List

The following heater programs have been installed in S185, before shipping to any customers from factory.

No.	Name	Length	Description
001	S921	60MM	Heater program for S921 protection sleeve.
002	S921POWER	60MM	Heater program for S921 protection sleeve with pre-heating. *1
003	SMOUV	60MM	Heater program for 60mm SMOUV protection sleeve.
004	SMOUV POWER	60MM	Heater program for 60mm SMOUV protection sleeve with pre-heating. *1
005	OTHER	60MM	Heater program for 60mm length protection sleeve.
006	CONTINUOUS	60MM	Heater program for 60mm length protection sleeve continuous heating.
007	S922	40MM	Heater program for S922 protection sleeve.
008	S922 POWER	40MM	Heater program for S922 protection sleeve with pre-heating. *1
009	SMOUV	40MM	Heater program for 40mm SMOUV protection sleeve.
010	SMOUV POWER	40MM	Heater program for 40mm SMOUV protection sleeve with pre-heating. *1
011	OTHER	40MM	Heater program for 40mm length protection sleeve.
012	S928	20-35MM	Heater program for S928 protection sleeve.
013	OTHER	20-35MM	Heater program for 20-35mm length protection sleeve.
014	OTHER	10-15MM	Heater program for 10-15mm length protection sleeve.
015	CURL REMOVE	-	Removing fiber curl.

*1: Pre-heating warms the heater to shorten the heating time in advance, before the heating program starts. Pre-heating starts after arc discharge and heating process.

5.2.8 Selecting the Operating Language

The S185 fusion splicer can be set to provide operating prompts in several languages. The default operating language is English.

1. In the Ready screen, press ⊞ key to access the menu screen.
2. Select "Settings"→ "General"→ "Language" by pressing ⬆ ⬇ key.
3. A pop-up window shows the current language. Select your language by Pressing ⬆ ⬇ key.
4. Press ↩ key and the pop-up window will confirm the change. Select "Yes" to confirm the change, or "No" to cancel the operation.
5. Press ↩ key repeatedly until the Ready screen is displayed.

# 6. Fusion Splicing

6.1 Arc Check

Fusion splicing is used to melt the glass of two optical fiber ends by arc discharging, and joins them together by butting the ends together. Fibers melt or fuse at different temperatures. It is necessary to adjust the arc power in order to ensure the optimum splicing results are achieved. In addition, electrode wear, environmental conditions, e.g., temperature, humidity, altitude, can affect the splicing results.

The arc check function inspects the arc power, and adjusts it to a correct value. At the arc check, the splicer melts the fiber ends without joining them together, in order to check the melting condition

The arc check should be performed as follows. In addition, when splice errors occur continuously, perform the arc check to check whether Arc Power value is correct or not.

- At the beginning of daily operation
- When the environmental condition has changed considerably
- After replacing or cleaning electrodes

1. Open the windshield and load the prepared fibers. Ensure that the fibers are properly stripped, cleaned and cleaved.

2. Close the windshield.

3. Select "Arc Check".

4. The S185 fusion splicer automatically feeds the fibers and discharges the arc.
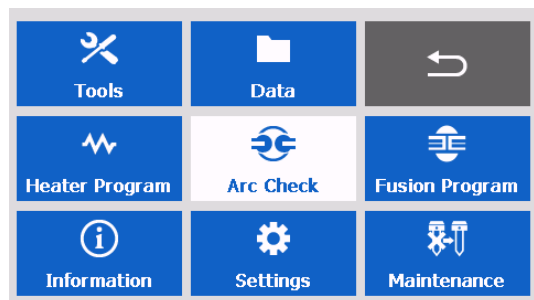
   - The environment compensation is performed based on the time when arc check is performed and passed.

- 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 "Continue" or ⤺ key to return to the menu screen.
- If the results are negative, "Result NG" is displayed. Press "Continue" or ⤺ key and the machine will automatically adjust the arc power, and then return to the Menu screen.

Message	Error
Result OK.	Status NG. Remove fibers, and retry arc check.
▼ ↵ Continue	▼ ↵ Continue
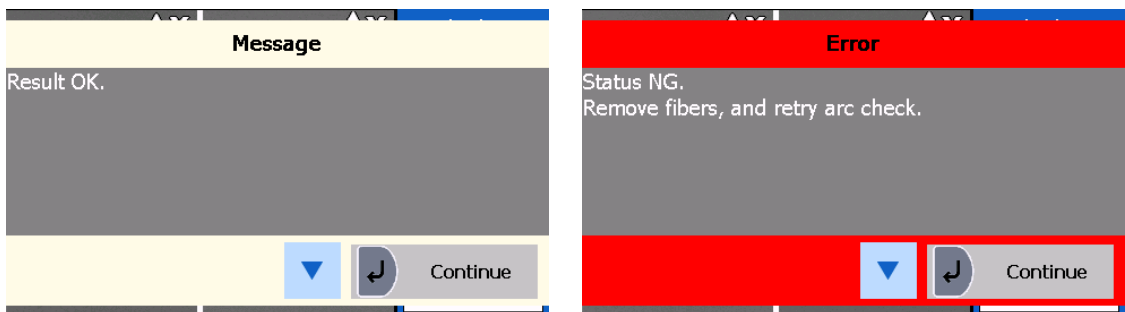
5. If result is FAIL, repeat the arc check until the new values are acceptable. It is necessary to remove the fibers and prepare them again with a new cleave. If unsatisfactory results are obtained after 4 arc check attempts, inspect the electrodes for wear or damage, and replace them if necessary.
    - 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.
    - Pressing ▼ key after the arc check, displays the detailed arc check data.

42
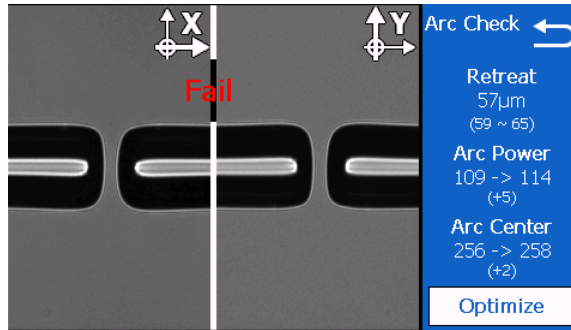
■ Retreat AAAμm (BBB-CCC)

    AAA: Distance of the left side fiber to right side fiber
    BBB: Lowest allowable value
    CCC: Highest allowable value

■ Arc Power DDD→EEE (FFF)

    DDD: Current arc power
    EEE: Recommended arc power
    FFF: Compensation value

■ Arc Center GGG→HHH (III)

    GGG: Current arc center
   HHH: Recommended arc center
    III: Compensation value

● If the arc check result data output setting is OFF, the above screen will be displayed after the arc check. To change the discharge intensity, press the 🔄 key or touch "Optimize", and if you do not want to change, press the ↩ key or touch the cancel icon.

6.2 Preparing the Fiber

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

Prepare a single fiber according to the following procedure.

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

Insert

Protection sleeve
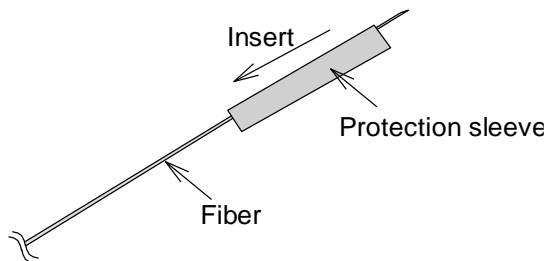
Fiber

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

Single fiber

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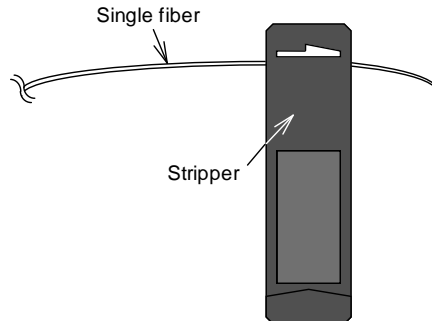
3. Wipe the bare fiber with a lint-free tissue soaked with denatured alcohol.

Cleaning cotton
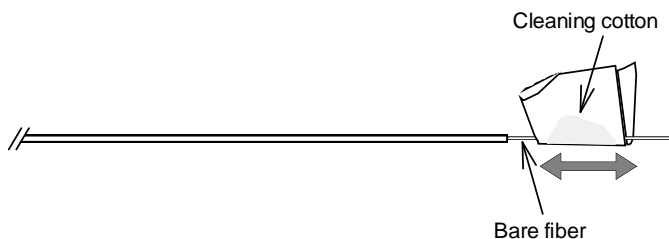
Bare fiber

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

4. Cleave the fiber so a proper length of bare fiber extends past the fiber coating (depending on the fiber holder type). Refer to the manual of the cleaver for the 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.

⚠ **WARNING**
Do not look into a fiber with the naked eye during operation. Wearing protection goggles is recommended.

6.2.1 Loading the Fiber

1. Open the windshield.

2. Open the fiber holder lid and carefully place the cleaved fiber in the fiber holder.

3. Close the fiber holder lid, while carefully holding the fiber at the proper position.

4. Prepare the second fiber and set it on the other side.

5. Close the windshield, READY screen is displayed.

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

- Make sure that the fiber tips are positioned between the center of the electrodes and the V-groove.

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

6.3 Fusion Splicing

1. Ensure that the "READY" screen is displayed on the monitor.
2. Press ▶ key to initiate the fusion splicing cycle.
3. The S185 fusion splicer performs the following functions automatically. To pause the S185 fusion splicer during any of these functions, press ▶ key. The message PAUSE will be displayed on the monitor. To restart the operation, press ▶ key 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 20 μm between the ends.
- The screens are zoomed up.
- The fibers are inspected for axis offset and cleave condition.
- The cores of the fibers are aligned on the X and Y view screens.
- The electrodes discharge.
- The splice is inspected.
- The splice loss is estimated and displayed on the LCD monitor as shown in the picture.
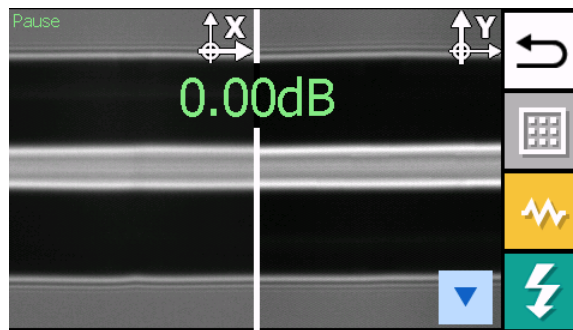
4. While in Pause status, pressing ⊞ displays options available in the process. To resume the process, press ⟲ key.
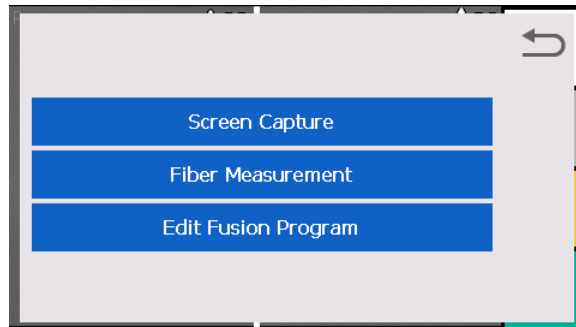
- Screen Capture: Capture the fiber image and store it.
- Fiber Measurement: Performs an auto or manual inspection of the fiber with regards to clad and core offset, relative eccentricity, gap, fiber tilt and relative cleave angle.
- Edit Fusion Program : Edit parameters of fusing program.

5. After displaying the estimation loss, the following operations are available.
- Press ⚡ key or touch ⚡ icon to discharge an additional arc. Splice inspection and loss estimation are re-performed.
- Press ⟳ key to switch the fiber view between X and Y.
- Touch ▼ icon to hide the estimated loss.

6. Tension test is performed by pressing ⟲/▶ key or opening the windshield.

- If the fibers fail the cleave criteria inspection, the fusion cycle is paused and an appropriate error message is displayed as below. Press ▼ key to temporarily hide message and check the state of the fiber. Press "Retry" or ↩ key, 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 "Continue" or press ↵ key.

	Error	
CLEAVE ANGLE ERROR		
Left angle exceeds inspection criteria.		
Angle:6.49 [deg.]		
Continue splice?		
CLEAVE ERROR LEFT 3		
↩ Retry		↵ Continue
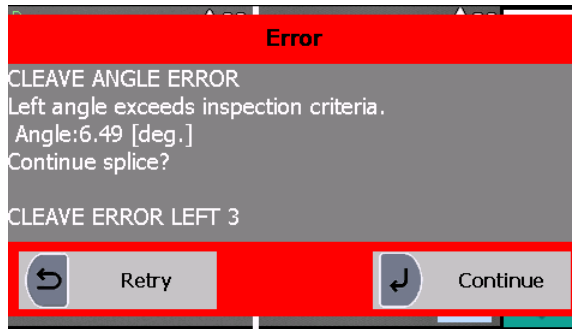
> After splicing, the splicer inspects the splice state by image processing. However, please also check the image by viewing it on the LCD screen.

6.3.1 Splicing Defects

Defects	Possible Cause	Action
Bubbling	Wrong Fusion Program 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.
Not spliced or Neck-down	Wrong Fusion Program selected	Select the correct Fusion Program, and repeat fusion splicing.
	Bad cleave	Repeat fiber preparation and fusion splicing.
	Excessive arc current	Perform an arc check to adjust arc power.
	Insufficient fiber feed	Adjust the fiber feed amount.
	Degradation of electrodes	Replace the electrodes.
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 to 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.

6.3.2 Removing the Spliced Fiber

1. Open heater cover before removing the fiber.

2. Open the windshield. A tension test (1.96N) is performed on the fibers.

3. A 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 S185 fusion splicer is resetting. Load the fibers only after the reset operation is complete and the READY screen is displayed.

6.3.3 Reinforcing the Fusion Splice

1. Slide the splice protection sleeve over the splice.

2. Place the spliced fiber in the specified position on the heater.

3. Heater cover closes automatically.

60mm S921
40mm S922

20mm S928A-20
25mm S928A-25
35mm S928A-35
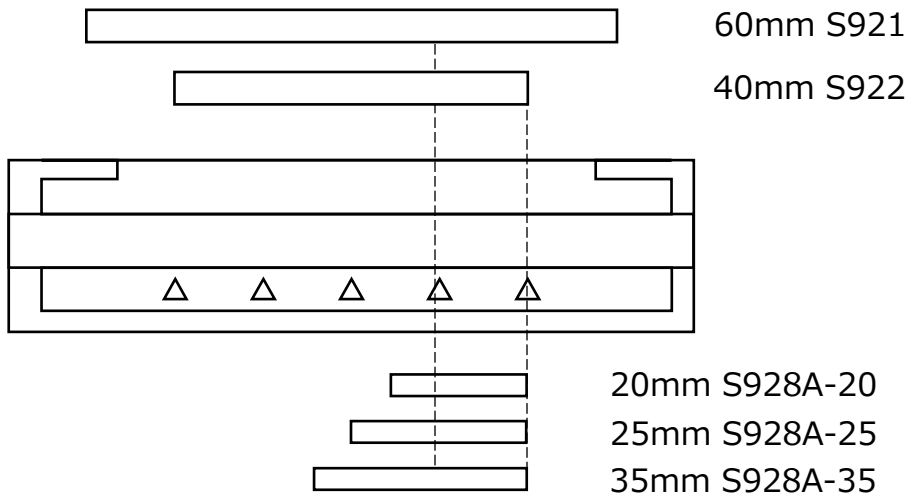
> If protection sleeve is placed in the incorrect position when heating, this may cause a shrinking error.

4. When the fiber is set and the heater cover is shut, the heat LED turns on red and the heating starts automatically. (When the auto start for heater setting is "OFF", press 〰 key to activate the heater.)

   The heating process is displayed on the LCD monitor with heater button as below. When the heating and cooling operations are completed, a beep sound is heard.

Type	Icon	Content
Heater Status	〰	Ready Mode
	〰	Heating Mode
	🌀	Cooling Mode
	✕	Error Occurring

- To stop the heating operation (when the HEAT LED is lit), press ⊛ key. The heating will stop immediately.

- When the ambient temperature is lower than 10°C, the heating time is automatically extended by approximately 5 to 20 seconds.

<table>
<tr><td>ⓘ</td><td>During the heating cycle, do not open the heater clamp or lid. This may cause a shrinking error.</td></tr>
</table>

5. Remove the fiber from the heater, and inspect the splice protection sleeve.
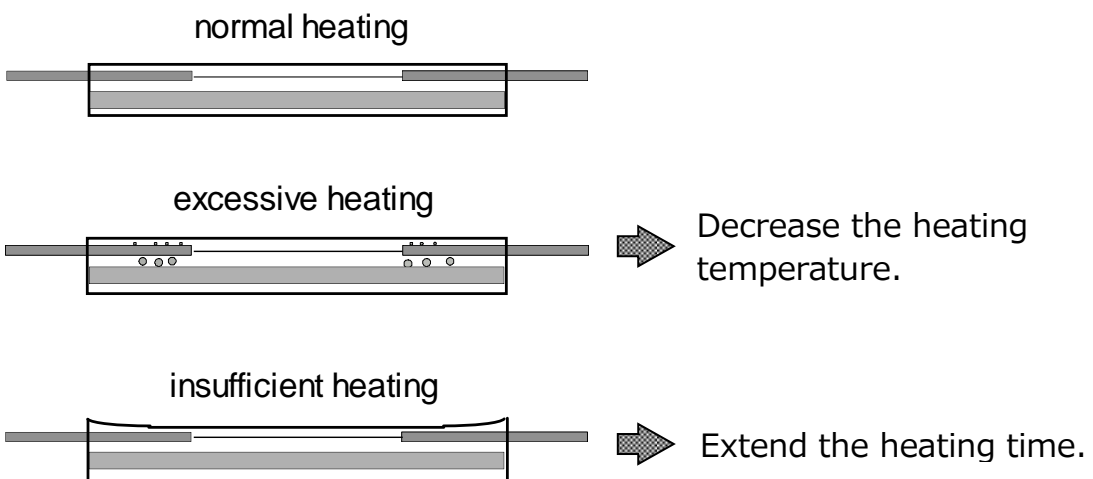
normal heating

excessive heating

  ⇨ Decrease the heating temperature.

insufficient heating

  ⇨ Extend the heating time.

<table>
<tr><td colspan="1">⚠ WARNING</td></tr>
<tr><td>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 battery, and contact your local service center.</td></tr>
<tr><td>DO NOT touch the heater element during the heater cycle and right after the heating process is completed. The element is very hot and may burn you.</td></tr>
</table>

53

6.4 Splicing of special fibers

6.4.1 Dissimilar fiber splicing

S185 is installed with many kinds of dissimilar fiber splicing programs, such as SM-DS program to splice. For dissimilar fiber splicing, additional arc will occur after main arc process, by observing the image of spliced fiber, if the core sizes are different. The additional arc will automatically stop when the estimated loss meets certain criteria.

1. Select the fusion program "No.001 DISSIMILAR AUTO" and prepare the fiber.
2. Load the prepared fibers, and start to splicing process.
3. Splicer feeds and inspects fibers, then splices by discharging the ARC.
4. After arc discharging, splicer inspects the splicing condition.
5. Splicer repeats several arc discharging actions until the splice loss is smallest one by its image processing criteria.

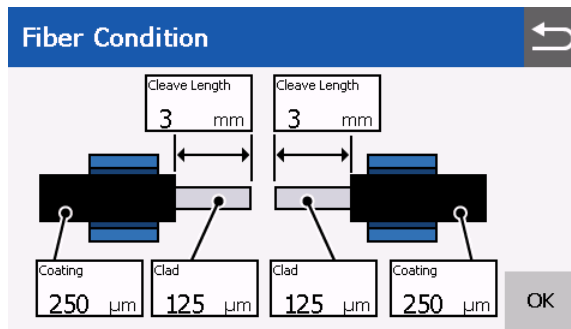|	
	When the user splices dissimilar fibers and if the fiber type is unknown, user can try to select the "DISSIMILAR AUTO". However, if the types of the optical fibers are known and machine has default program for the specific combination of the splicing, it is better to use the special program, since it has been optimized.
	"DISSIMILAR AUTO" is not proper for the application to splice similar fiber.

6.4.2 High Strength splicing

Optical fiber is very strong with regard to the stretching and bending it can withstand. As fusion splicing melts the ends of fibers to join them, it also can join them together strong. However if there is a small crack or some dust on the surface of the fiber, the optical fiber will be fissured and even a little stress will cause it to break. When we splice the optical fiber, we need to strip the coating, to expose the glass part. And as the clad is put in the V-groove for alignment, the strength may be decreased, and more so if we have poor handling procedures.

S185 fusion splicer can splice by putting the fiber coating on the V-groove to facilitate high strength splicing. By this way that the glass part touches nothing directly, so there is no fear of damaging it. In addition, if we use the high strength tools for preparing the fibers, we can get rid of the cause for declining the strength at the fiber preparation process.

Fiber Clamp

V Groove
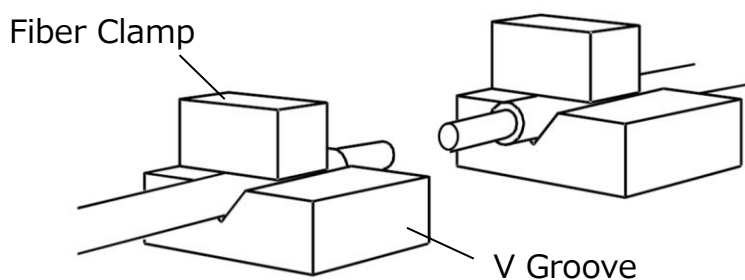
Splicing method of High Strength Splicing
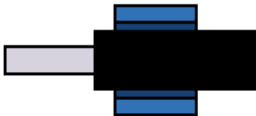
1. Select the fusion program.

2. After selecting fusion program, or tap 🖥 icon to display "Fiber Condition".

3. Select "Cleave Length" as 3mm or 4mm.

ℹ		The picture changes according to the "Cleave Length" setting.

| Cleave Length	3mm, 4mm	9mm, 10mm
Image		

4. Start fusion splicing. (For detail, see "6.3 Fusion Splicing")

6.4.3 PM fiber splicing (S185PM)

S185PM is installed with many kinds of PM fiber programs to handle Polarization Maintaining fibers splicing tasks. For PM fiber splicing, S185PM rotates both fibers to match the profiles of PM fibers and aligns fibers with cladding alignment method in X and Y axis directions.

Splicing method of PM fiber

1. Select the proper fusion program and prepare the fiber.
2. Load the prepared fibers, and start to fusion.
3. Splicer feeds and inspects fibers, then rotates the fiber to match the profile of PM fibers.
4. After matching the profile of PM fibers, splicer aligns the fibers with cladding alignment method in X and Y axis directions, then splice occurs with discharging the arc.
5. After arc discharging process, splicer inspects the splicing condition. Then S185PM will estimate splice loss along with extinction ratio value.
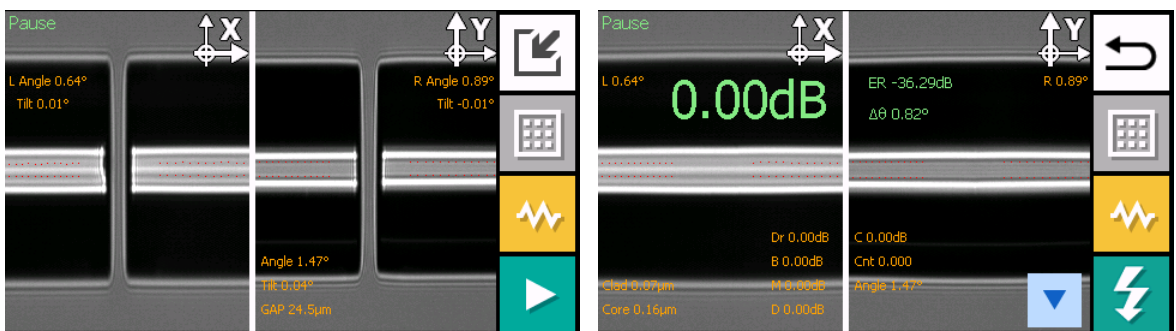
6. Press the ⟲ key to perform the tension test. After that, the left and right Z stage rotates to return the right fiber holder to reset position. When the right fiber holder returns to reset position, message is displayed.

7. Open the windshield, open the lid of the right fiber holder and close the windshield.
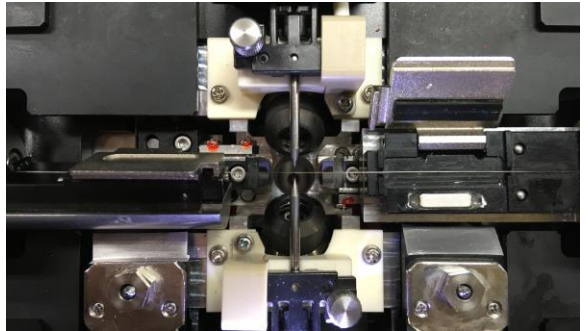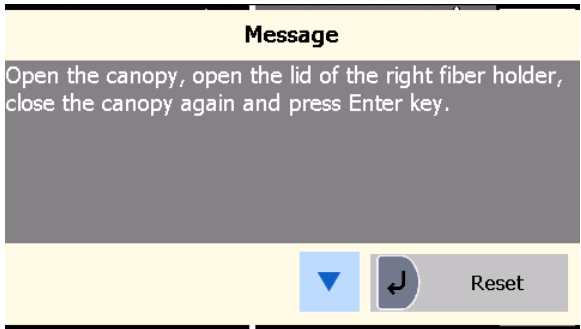
8. When you close the windshield, the left Z stage rotates to return the left fiber holder to the reset position.

9. Finish the rotation, open the windshield and eject the fiber holders.

	If the fiber has curls or bending, S185PM cannot match the profile of PM fiber or align the fibers. Please remove its curls or bending before preparing the fibers, and then place it in the V grooves. When user remove a fiber curls, select Heater program No.016 or ㄹㄹ icon and use it.
	When PM fiber is spliced, its splice point may appear to have a streak, resulting from the stress material in the fiber. Therefore it is difficult for the S185PM splicer to detect the defects or bubbles at the splice point, so please check them visually.
	During resetting process, don't open the windshield. If the windshield is opened, the resetting process will stop.

How to change the "Rotate method"

1. Copy & paste the base fusion program.（For details, see "7.3.3 Copy & Paste"）
2. Touch 🖉 icon to select the "Fiber Rotate method".
3. Select the left rotate method.
4. Select the right rotate method.
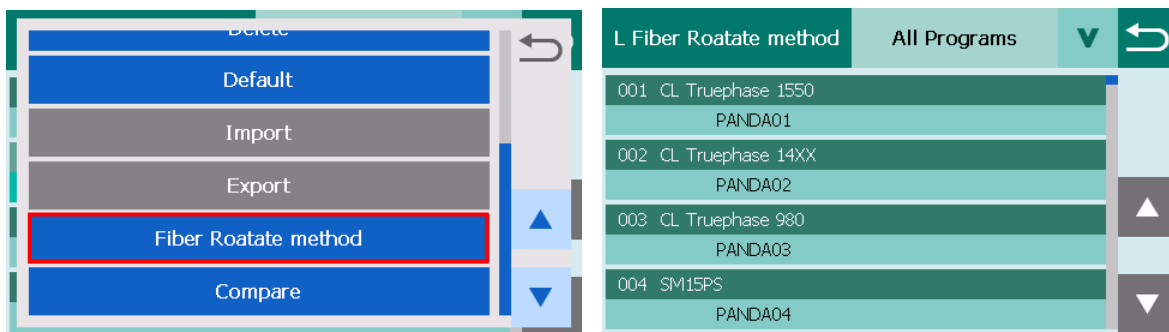
PM fusion program, the rotation method in each PM fiber is set by default.
Refer to the following table for each rotation method.

No.	Rotate Method	Program Name	Description
1	PANDA01	PANDA01-Glass Clamp	Rotation method for splicing common PANDA fiber with glass clamp.
2	PANDA01	PANDA01-Coating Clamp	Rotation method for splicing common PANDA fiber with coating clamp.
3	PANDA02	PANDA02-Glass Clamp	Rotation method for splicing common PANDA fiber with glass clamp.

4	PANDA02	PANDA02-Coating Clamp	Rotation method for splicing common PANDA fiber with Coating clamp.
5	PANDA80	PANDA80-Glass Clamp	Rotation method for splicing common 80µm PANDA fiber.
6	BOWTIE01	Bow-tie HB1500	Rotation method for splicing Fibercore HB1500 Bow-tie fiber.
7	BOWTIE02	Bow-tie HB1500T	Rotation method for splicing Fibercore HB1500T Bow-tie fiber.
8	ELLIPSE01	Elliptical Core EDF25-PM	Rotation method for splicing OFS Elliptical Core EDF25-PM fiber.
9	POLYGON01	Polygonal fiber	Rotation method for splicing polygonal clad fiber.

🛈	If rotational adjustment fails with PANDA01 program, please select PANDA02 program.
🛈	S185 might not be able to match the profile of PM fibers or align the fibers with existing PM program, if it is unknown profiled fibers. In that case, please change another similar PM program and try again.

6.4.4 LDF splicing (S185LDF)

S185LDF can splice the large diameter fiber (LDF) up to 500μm cladding diameter.

1. Select the right rotate type. Select the proper fusion program and set fiber holder to fusion splice.
2. Splicer feeds and inspects fibers, splicer aligns both fibers by cladding to cladding, and then splice is done with arc discharging.
3. After arc discharging, splicer inspects the splicing condition.
4. Press ⟲ key, or open the windshield to reset the machine. After resetting, remove the spliced fiber.

ℹ	Depending on fiber combination, there may be some streaks at the splicing point, but they are not always splice error.
ℹ	For splicing LDF, S185LDF needs high power for arc discharging. Therefore, after arc discharging, S185LDF is designed not to discharge for 2 minutes.
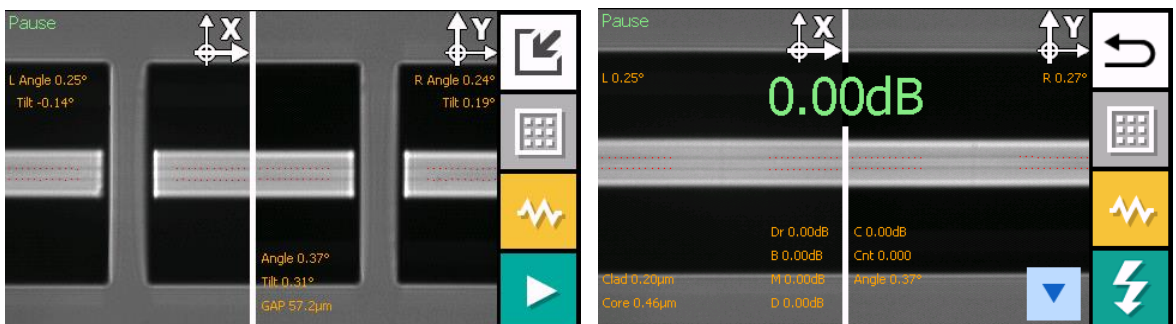
7.1 Menu

To start, the user needs to access each function through the menu screen.

1. Press ⊞ key or menu icon to access the menu screen. The menu icon is available in the ready screen.

2. Menu screen is displayed as shown in below. Press ↩ key to return the previous screen.
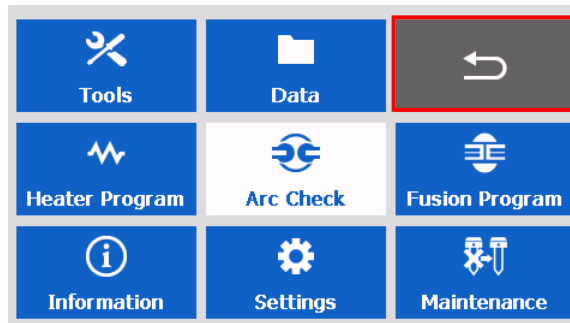
The following table is a list of functions available to the operator for customization programming and maintenance.

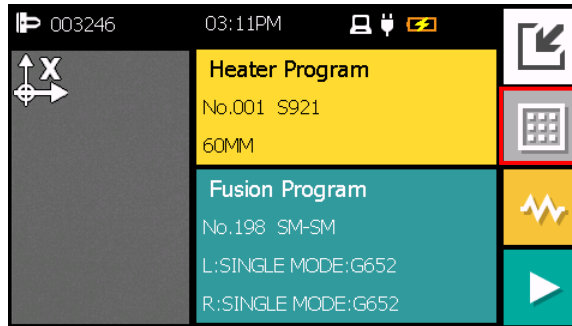| Menu	Features	Contents
Tools	Self Check	Automatically diagnose condition of machine.
	Fiber Measurement	Measure and indicate fiber's clad diameter, core diameter, core offset between fibers, cleaving angles and/or gap between fibers.
	Manual Splice	Manually control entire splicing cycle.
	Screen Capture	Store, record or erase fiber image.
	Shrink Sleeve Adjustment	Adjusting the shrinking condition of the sleeve.
	Backup	Create a backup file.
	Import	Import each program stored in external storage.
Heater Program	Display heater program list.	List all available heater programs for fiber reinforcement. User can select any from the list. Change heat temperature, heat duration, and/or program name.
Information	Machine	Machine's manufacturer S/N, software version.
	Sensor	Display temperature and atmospheric pressure.
	Counter	Arc counter, splice counter.
Data	Splice History	Previous splice data.
	Arc Check History	Previous arc check data.
	Captured Image	Manually capture fiber image.
	Failure Data History	Splicing data failure history.

Menu	Features	Contents
Arc Check	Perform arc check	Check arc intensity and automatically optimize to a proper level. See "Arc Check, Getting Started".
Settings	Set up parameters	Set up default language, sleep function, splicing start pattern, etc.
Fusion Program	Show fusion program list	List all available fusion splicing programs. User can select any from the list. Change parameter values in the program, adjust inspection criteria for the splicing process or change program name.
Maintenance	Quick Guide	Step-by-step tutorial that illustrates how to replace/clean the electrodes,
	Update	Update software from external storage.
	Contact Address	Display information about the agency.
	Initialize	Default to factory setting. Clear the data history, the image data, and the counter.
	Regulatory	Display regulatory information.

7.2 Tool Menu

This menu provides multiple utility functions.

7.2.1 Self Check

1. A pop-up message prompts the user to remove the fiber from the machine. Follow the messages and press "Continue" or ⟳ key.

2. The S185 automatically checks for dust on the camera and verifies the motor movements. A Pop-up screen then prompts the user to set the fiber in place.

3. Prepare and set the fibers on both sides and press "Continue" or ⟳ key to initiate the remaining checks.

4. The S185 then automatically performs the remaining checks and a pop-up message prompts the user to perform an arc check.

5. After the machine check is complete, the pop-up screen shows "Result OK". Press ⟳ key to finish the check.

6. If the machine fails the machine check, a pop-up screen shows "Result NG. Call the Service Center". Please call your local representatives or Furukawa Electric for further assistance.

7. Select "Yes" or "No" to perform the arc check.

8. If the arc check fails, a pop-up screen shows "Status NG. Remove fibers, and retry Arc Check". Perform another arc check to optimize the arc power.

> When executing the "Self Check" function, please use fibers that have been stripped, cleaned and cleaved correctly.

7.2.2 Fiber Measurement

The S185 performs an auto or manual inspection of the fiber (specifically, the clad and core offset, relative eccentricity, gap, fiber tilt and relative cleave angle).

1st Result Screen (Bilateral measurement)

Parameter	Description
Clad Offset	Amount of clad offset between the two fibers.
Core Offset	Amount of core offset between the two fibers.
Rel. Eccentricity	Difference in eccentricity between the two fibers.
Gap	The gap between the two fibers.
Fiber Tilt	Angle at which the fibers come into the screen.
Rel. Angle	The relative cleave angle between the two fibers.

2nd and 3rd Result Screen (Right and Left fiber measurement)

Parameter	Description
Eccentricity	Eccentricity of the fibers in micrometers.
Cleave Angle	Cleave Angle of the fiber in degrees.
Clad Tilt	Angle of Clad.
Clad Width	Measurement of clad width in micrometers.
Core Tilt	Angle of Core.
Core Width	Measurement of core width in micrometers.
Focus	Focus value (%).

7.2.3 Manual Splice

Manual splice enables the entire splicing process to be operated manually using the keypad. There are two items of manual splice, "Manual" and "Semi Auto". You can select "Manual" and "Semi Auto" from the tool screen. It is only "Semi-Auto" from the [icon] icon.

- Manual: All operations are done manually following the procedures.
- Semi Auto: Fibers are automatically fed and stopped at pre-splice position.
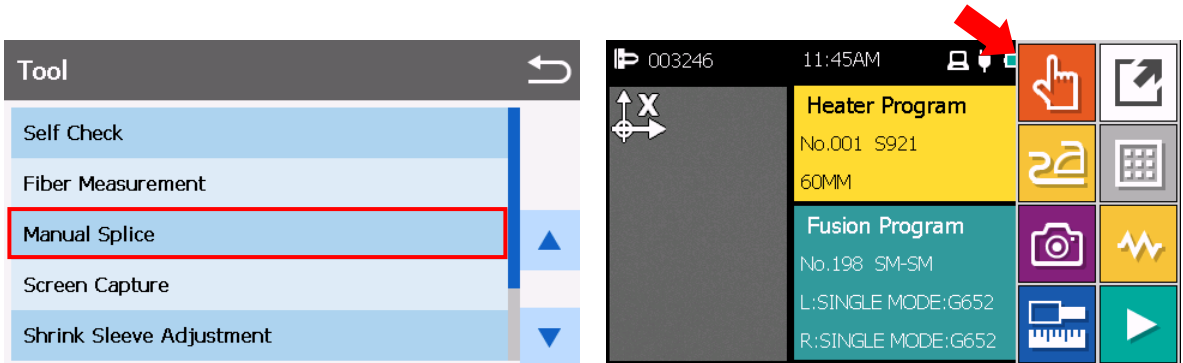
Manual splice screen

Motor movement icon

Motor pulse
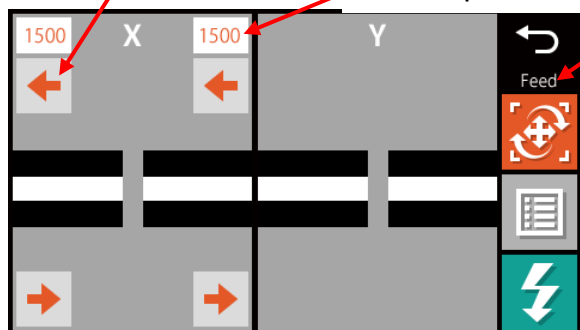
Setting motor

Manual splicing icon

1500	X	1500	Y	↩ Feed

Key	Function
▶	Select and execute the discharge.
⊞	Show the menu.
↩	Terminate the manual splice.
↵	Determine the function.
▲ ▼	Motor operation (X/Y Align, Focus, Rotate) Cursor movement (Feed)
◀ ▶	Motor operation (Feed) Cursor movement (X/Y Align, Focus, Rotate)

Icon	Content
⬑	Terminate the manual splice. Select whether to reset the motor position.
🔄	Switch the motor to operate. ・Feed : Fiber feed motor ・X/Y Align : X/Y axis alignment motor ・Focus : Focusing motor ・Rotate*1 : Theta rotate motor
▦	Show the menu.
⚡	Select and execute the discharge. Clean : Cleaning discharge Arc : Arc discharge (For splicing) Add : Additional discharge

*1: Only S185PM.

ⓘ	Remove fiber before resetting the motor position. It may cause a broken fiber.

● Feed: Fiber feed motor
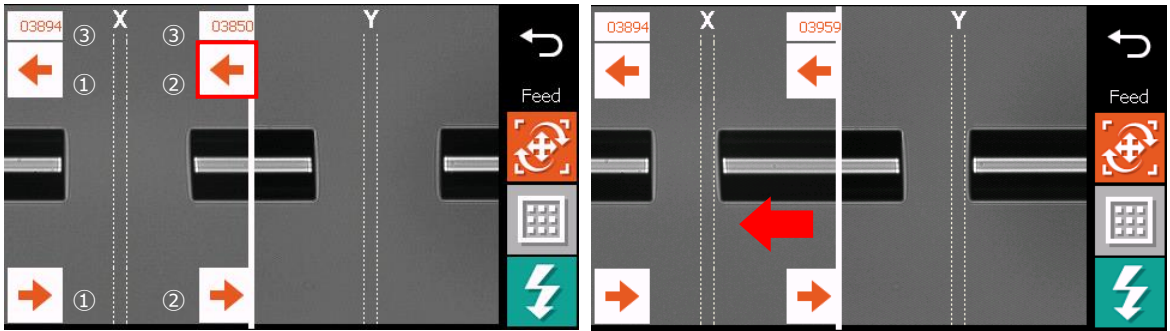
① : Feed the left fiber in the arrow direction.

② : Feed the right fiber in the arrow direction.

③ : Pulse number of fiber feed motor position.

● X/Y Align : X/Y axis alignment motor
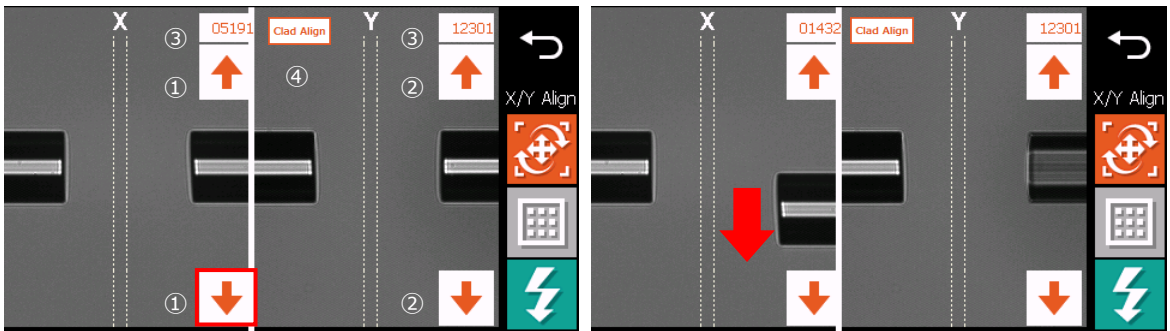
① : Feed the right fiber of X camera side in the arrow direction.

② : Feed the right fiber of Y camera side in the arrow direction.

③ : Pulse number of X/Y axis alignment motor position.

④ : Execute clad aligning adjust.

● Focus : Focusing motor
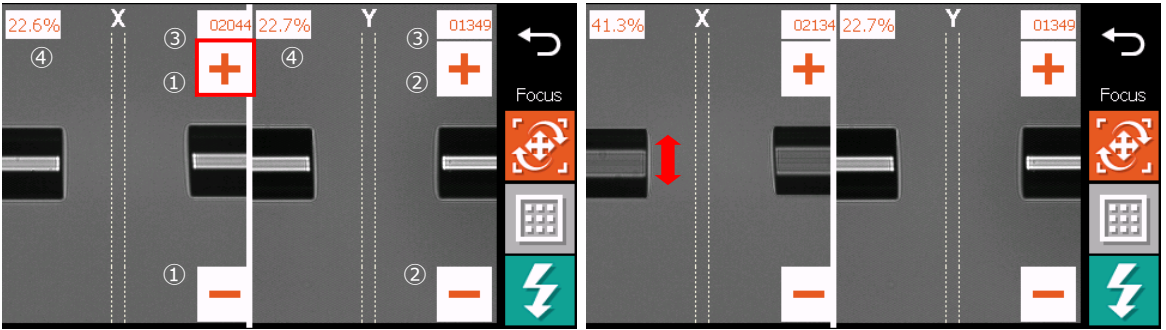
① : Focus on the fibers of X camera side

② : Focus on the fibers of Y camera side

③ : Pulse number of focusing motor position.

④ : Focus value.*1

*1: Refer to the ratio of the width of the bright part to the clad diameter of the fiber image.

● Rotate : Theta rotate motor
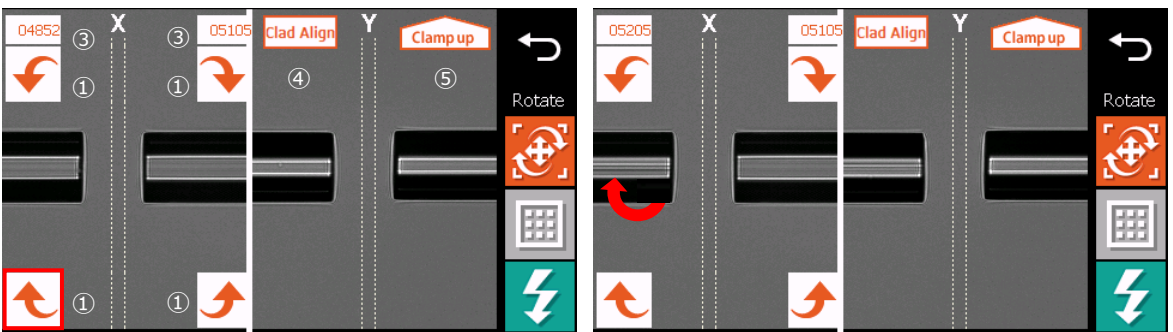
① : Rotate the left fiber in the arrow direction.

② : Rotate the right fiber in the arrow direction.

③ : Pulse number of theta rotate motor position.

④ : Execute clad aligning adjust.

⑤ : Raise and lower the fiber clamp.

Function menu

Function list for Manual Splice

Content		Description
Zoom		Magnification of the fiber image
Motor Step		Select the motor step.
Capture		Capture the fiber image.
Measurement		Measure the fibers.
Fusion Program		Select the fusion program.
Fiber Condition		Set the fiber condition.
Auto Align	Clad Align	Automatically clad aligning adjust.
	Core Align	Automatically core aligning adjust.
	Theta Align*1	Automatically PM fiber rotational position adjust.
	Auto Focus	Automatically camera focusing adjust.
Line	Line X	Display the auxiliary line in X camera.
	Line Y	Display the auxiliary line in Y camera.
	Line XY	Display the auxiliary line in XY camera.
Combine Image		Display the assumed image of splicing fibers.
Motor Reset		Reset the motor position.

*1: Select fusion Program for PM fiber.

● Zoom

Magnification of the fiber image. The magnification is 3 patterns of 1 time, 1.5 times, 2 times.

> You can also enlarge the fiber image by touching the part of the fiber image on the screen.
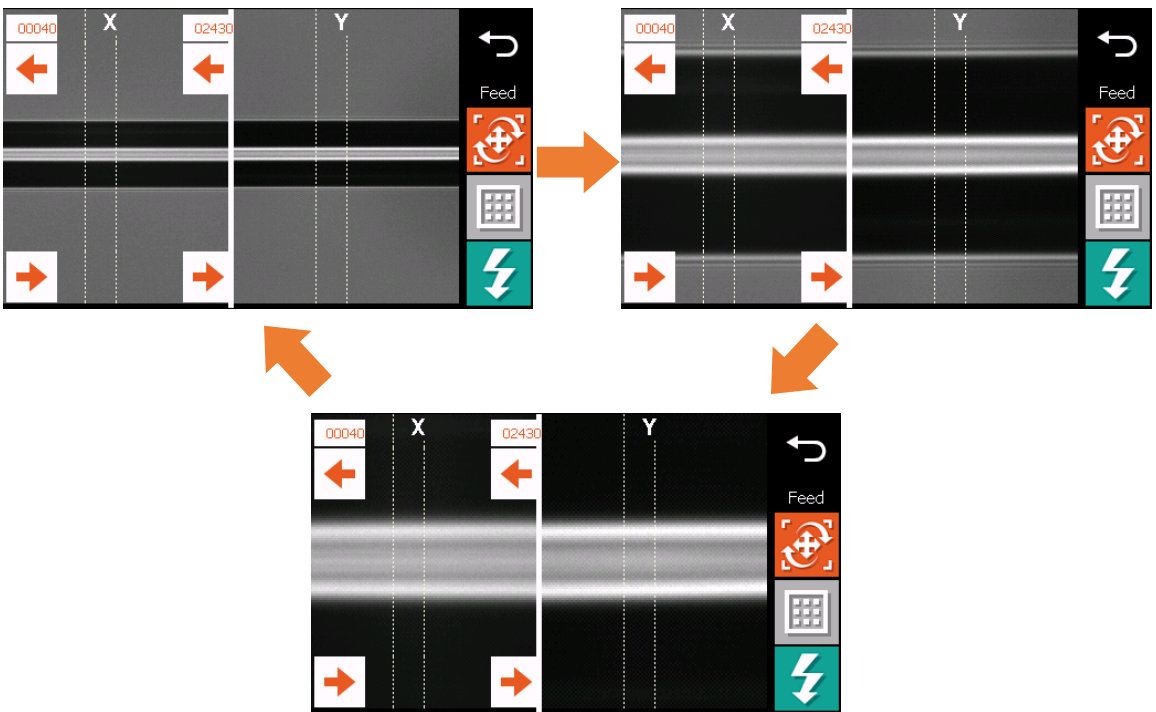
- Motor Step

  Select the motor steps. The steps of each motor and resolution are shown in the table below.

Motor	Unit	Step	Resolution
Feed	μm	Free/5/50/150	0.8 [μm/pulse]
X/Y Align	μm	Free/0.1/1/5	0.028 [μm/pulse]
Focus	pulse	Free/5/10/15	0.512 [μm/pulse]
θ	degree	Free/1/10/30	0.09 [deg./pulse]

- Capture

  Capture the fiber image. For details, see "7.2.4 Screen Capture".

- Measurement

  Measure the fibers. For details, see "7.2.2 Fiber Measurement".

- Fusion Program

  Select the fusion program. For details, see "5.2.1 Fusion Program".

- Fiber Condition

  Set the fusion condition. For details, see "5.2.5 Fusion Condition".

● Auto Align

・Clad Align: Automatically clad aligning adjust. The alignment precision depends on the parameter of the fusion program.

・Core Align: Automatically clad aligning adjust. The alignment precision depends on the parameter of the fusion program.

・Theta Align: Automatically PM fiber rotational position adjust.

・Auto Focus: Automatically camera focusing adjust.

| | If the focus value is too small or too large, the fusion splicer may not be able to recognize the core properly. |

⚫ Line

Display auxiliary lines on the selected screen. Touch the arrow icon or press the cross key to control the auxiliary line.
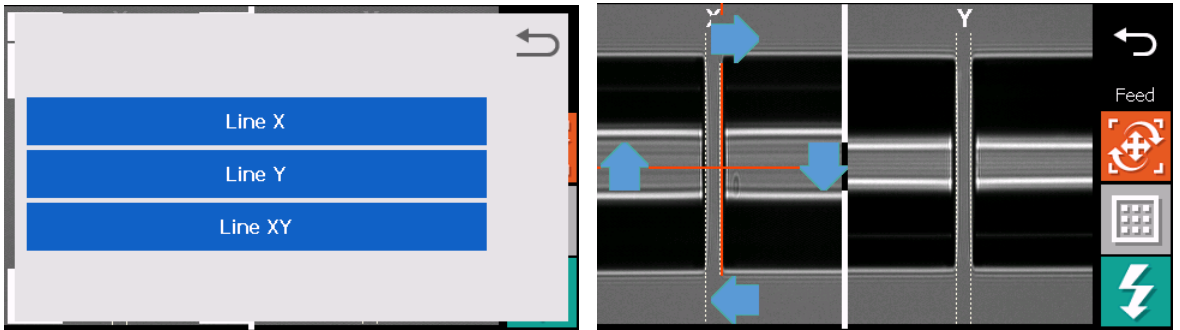
> When "Line XY" is selected, push ⊞ key to move the cursor the X icon or touch the X icon to switch the operation of the auxiliary lines.
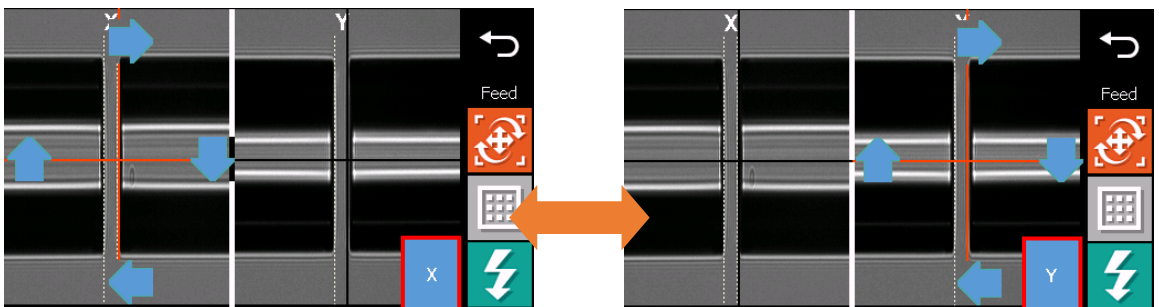
⚫ Combine Image

Create false synthetic images after fusion splicing from fiber images. Please use to confirm that fiber alignment or rotation adjustment is correct.
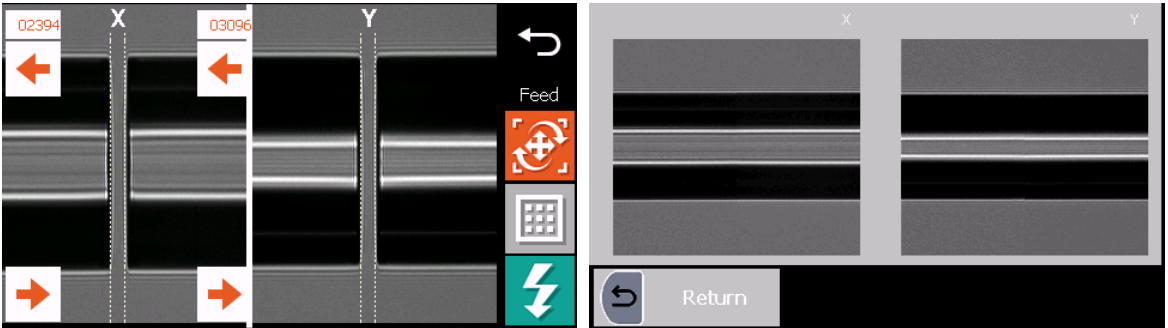
⚫ Reset

Reset the motor position.

・ALL: Reset all motor positions.

・Select: Reset the position of the selected motor.

Discharge menu

⚫ Clean : Cleaning discharge

This feature discharges the cleaning arc based on setting of the selected fusion program.
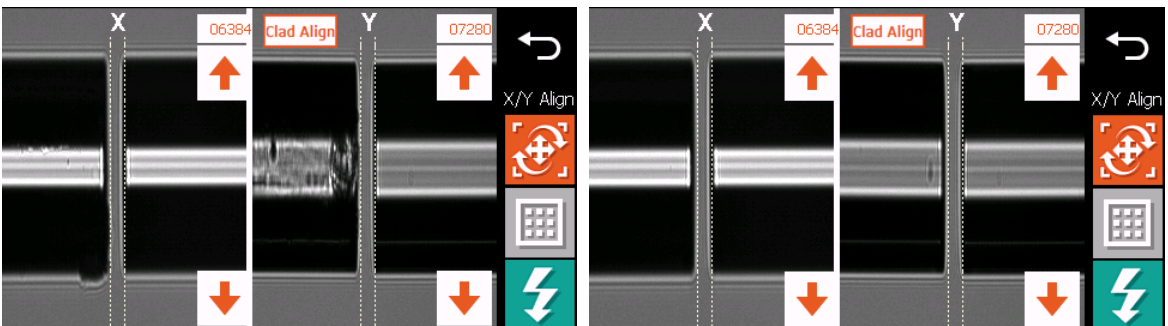
- Arc : Arc discharge

  This feature splices fibers with discharging the arc based on setting of the selected fusion program.
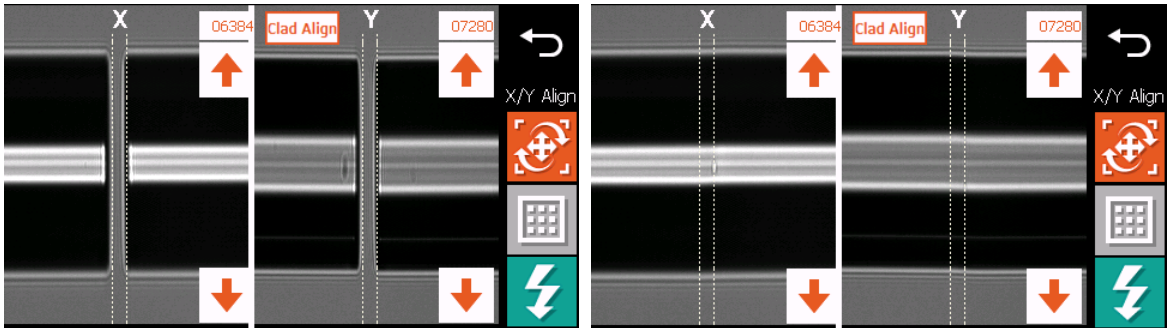
- Add : Additional discharge

  This feature discharges the additional arc based on setting of the selected fusion program.
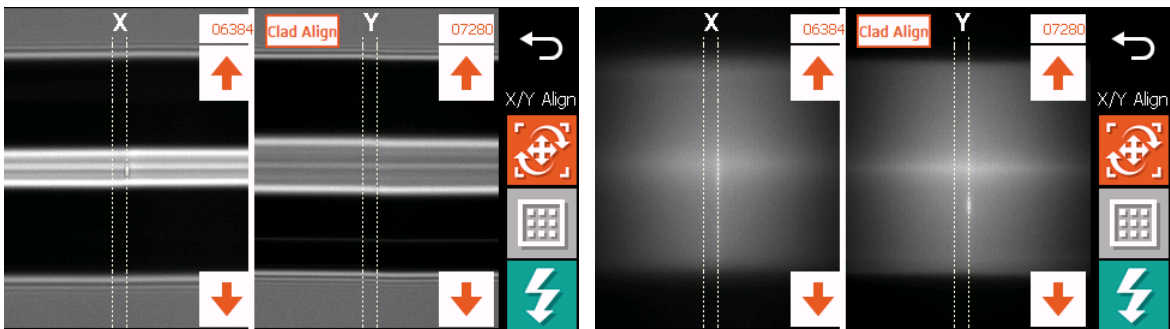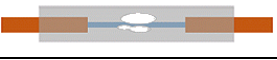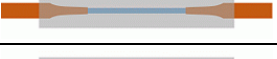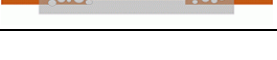
7.2.4 Screen Capture

S185 allows the user to store and view fiber images. The stored images can be seen in the data management menu.

7.2.5 Shrink Sleeve Adjustment

Optimize shrinking condition for the sleeve.

1. Select "Sleeve Shrink Adjustment".
2. Select the image that is similar to the current condition of the shrunk sleeve.

Condition of Sleeve	
	Not shrunk enough at the sleeve end
	Bubbles in the sleeve center
	Fiber coating melts
	Sleeve melts too much
Default to the factory setting	

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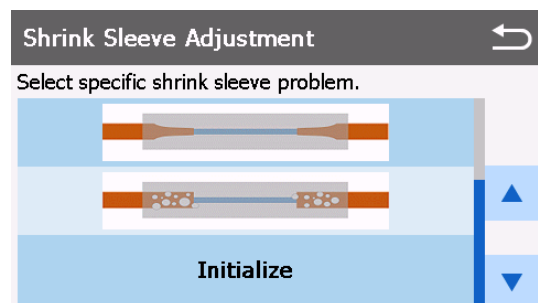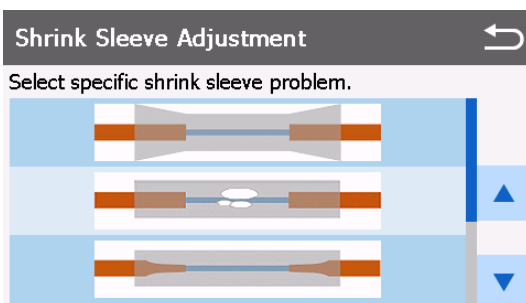
7.2.6 Backup

You can store and restore programs and settings in the backup file.

Backup file store method

1. Select the "Make Backup File".

2. If the external storage is connected, select the destination to save.

3. Displayed "Backup Completed", saving is completed.

Backup ↩	Backup ↩
Make Backup File Expansion Backup File	Internal Storage Exteranal Storage
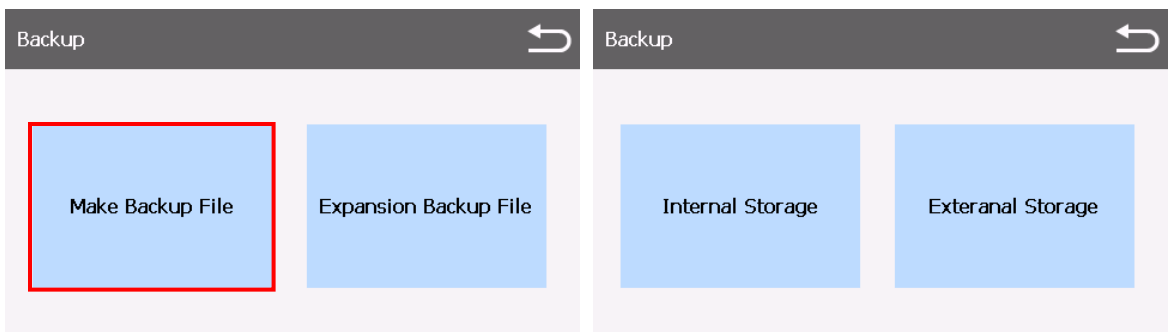
Backup file restore method

1. Select the "Expansion Backup File".

2. If the external storage is connected, select the destination to save.

3. Check the items you want to expand.

4. Select "OK".

5. Displayed "Expansion Completed", expansion is completed.

Backup ↩	Backup ↩
Make Backup File **Expansion Backup File**	Fusion ✓ Heater ✓ System ✓ OK
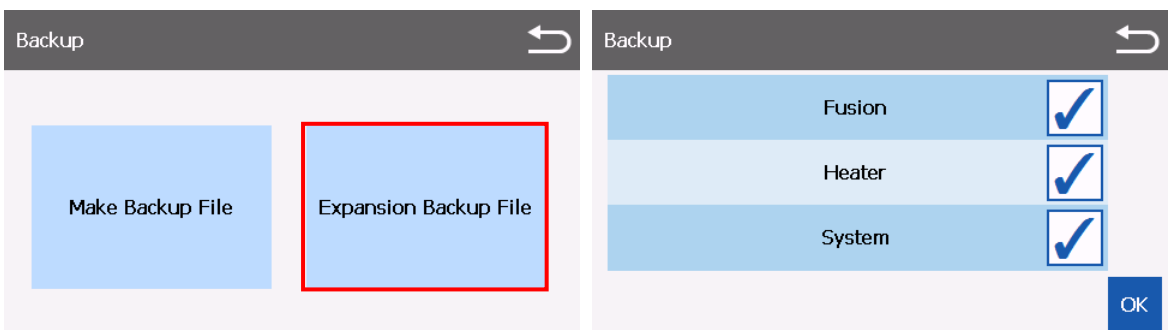
7.2.7 Import

Import each program stored in external storage. If you do not connect external storage, this function cannot be selected.

1. Select the "Import".
2. Select the program to import.
3. Select the location to import.
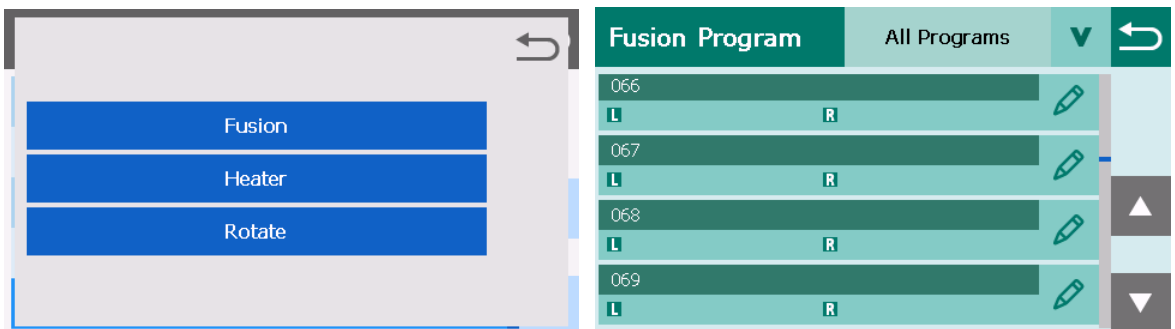
4. Programs stored in external storage is displayed, select the program to import.
5. Message is displayed, select "YES".
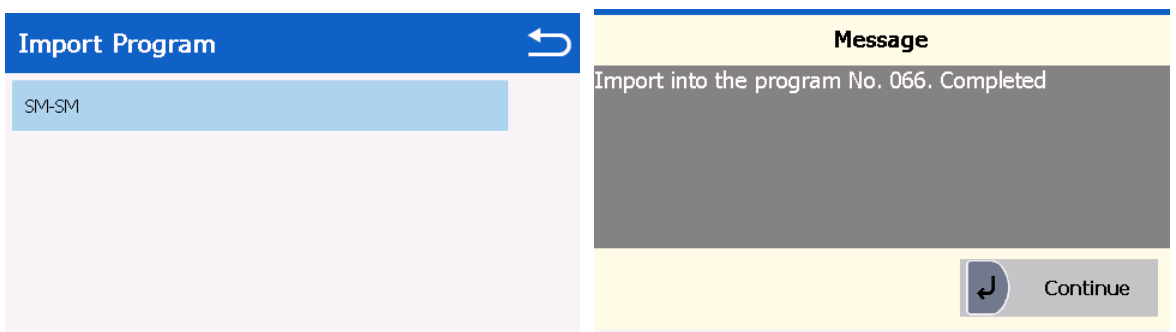
7.3 Program Edit

1. Select "Fusion Program" or "Heater Program" menu.

   The following procedures and pictures are for Fusion program editing; however, the same procedure can be applied to the Heat programs.

2. Select a program to be modified by pressing 🖉 or pressing ⊞ key and to access to pop-up menu. Select a function.

   - Edit: Modify parameters.
   - Copy: Copy the program data.
   - Paste: Paste the program data.
   - Delete: Erase the program from the program list.
   - Default: Return the parameters to default value.
   - Import: Load the program data from the external memory.
   - Export: Save the program data to the external memory.
   - Fiber Rotate method*1 : Select the PM fiber rotate method.
   - Compare: Compare the parameters between 2 programs.

   *1: Display only PM fusion program.
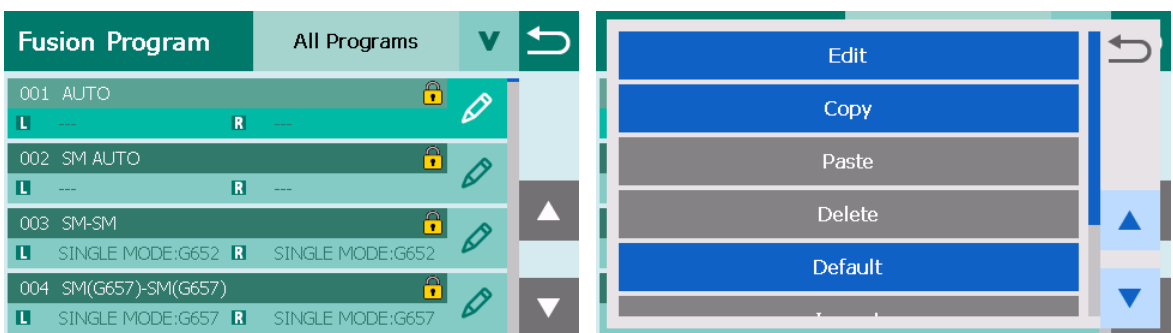
ℹ️	Pre-installed fusion program is protected, it cannot edit or delete. To edit pre-installed fusion program, copy the program to another program, and edit it.

7.3.1 Edit

1. Select "Edit" in the pop-up menu.
2. Select the parameter to change with ⬆⬇ key.
3. Edit Parameter or name. Program where the key icon is displayed cannot be edited.

FUSION SETTING	No.003 ↩
Program Name	SM-SM
Left Fiber	SINGLE MODE:G652
Right Fiber	SINGLE MODE:G652
Arc Power	100
Arc Duration	750ms

Arc Power	↩
100	1 2 3
(0~200)	4 5 6
	7 8 9 DEL
	. 0 - OK
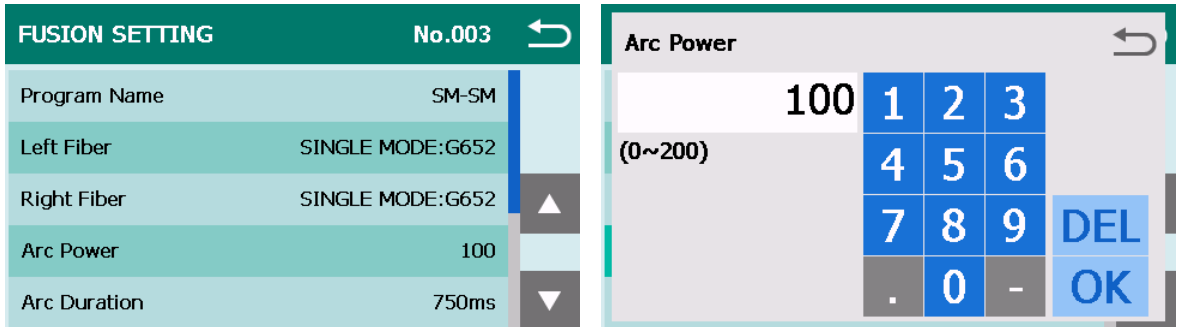
4. Press "OK" button or ↩ key.
5. Press ↩ button after editing a parameter.
6. The pop-up menu will show up and ask to overwrite.

Message
Overwrite parameters?
↩ NO	↵ YES
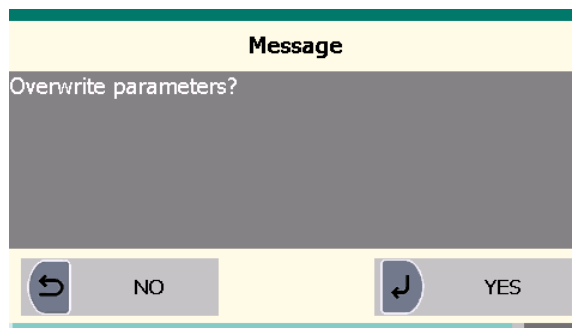
7.3.2 Advanced Setting

1. Select "Advanced Setting" in the parameter edit list.

FUSION SETTING	No.300	↰
Arc Duration	1000ms	
Cleave Angle	2.0deg	
Loss Limit	0.20dB	▲
Group	Nothing	
Advanced Setting		▼

2. A more detailed set of parameters is available. The setting method is the same as "Edit".

Advanced Setting	No.300	↰
1st Arc Start Power	100	
1st Arc End Power	100	
1st Arc Duration	1000ms	▲
2nd Arc Start Power	0	
2nd Arc End Power	0	▼

> ⓘ ⊞ key: Move to previous page.
> ▶ key: Move to next page.

85

7.3.3 Copy & Paste

Follow the procedures shown below to copy the selected program.

1. Select "Copy" in the pop-up menu.

2. Select a new destination for the program.

3. Select "Paste" in the pop-up menu. You cannot paste into the protected program.
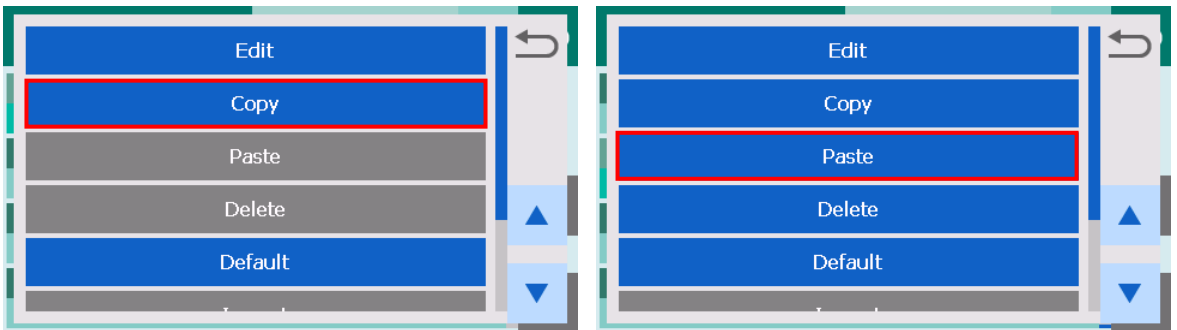
7.3.4 Delete

Follow the procedures shown below to delete the selected program.

1. Select "Delete" in the pop-up menu.

2. Select "Yes" or press 🔄 key to delete program. Otherwise select "No" or press 🔙 key to cancel the operation. The factory pre-installed programs cannot be deleted.
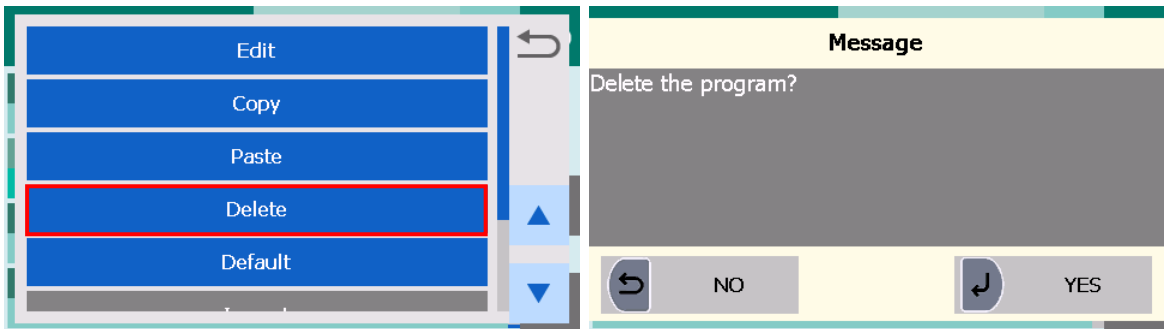
ℹ️	If the current program is deleted, No.001 program will be selected.

7.3.5 Default

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

1. Select "Default" in pop-up menu
2. Select "Yes" or press ⏎ key to default parameters. Otherwise select "No" or press ↩ key to cancel the operation.
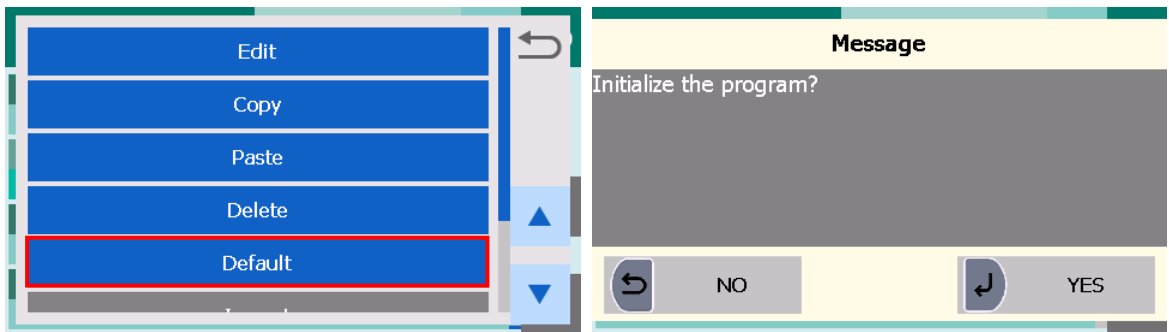
7.3.6 Import

Follow the procedures shown below to Import program from external storage.

1. Connect the storage device into USB A connector.
2. Select "Import" in the pop-up menu.
3. Select the program to import, and touch "YES" or press ⏎ key.
4. After import, touch "Continue" or press ↩ key.
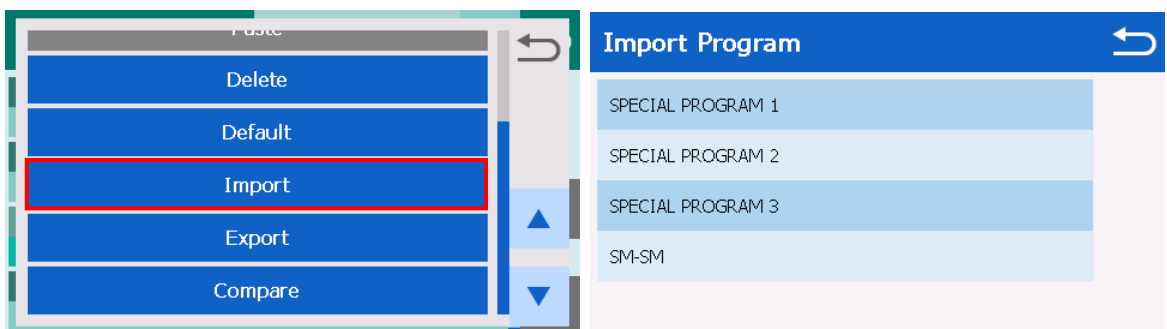
7.3.7 Export

Follow the procedures shown below to export a program to external storage. Exported data is able to be import to another S185 splicer.

1. Connect the storage device into USB A connector.

2. Select "Export" in the pop-up menu.

3. After export, touch "Continue" or press ⏎ key.
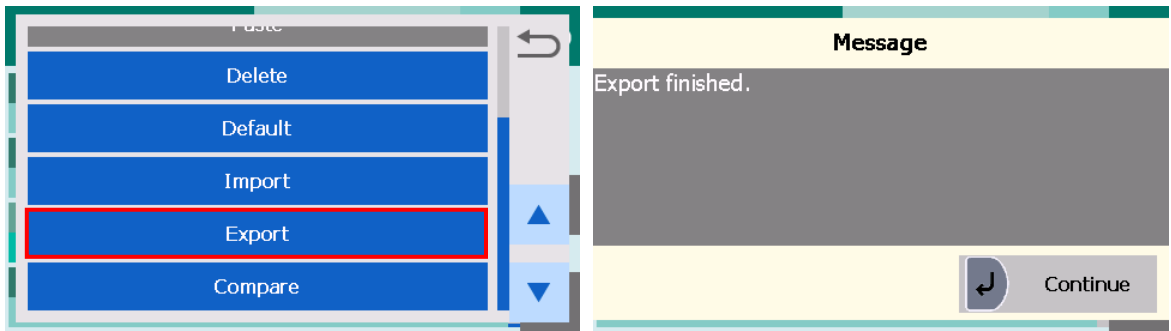
7.3.8 Fiber Rotate method

Follow the procedures shown below to change the PM fiber rotation method.

1. Select "Fiber rotation method" in the pop-up menu.
2. Select left fiber rotate method.
3. Select right fiber rotate method.
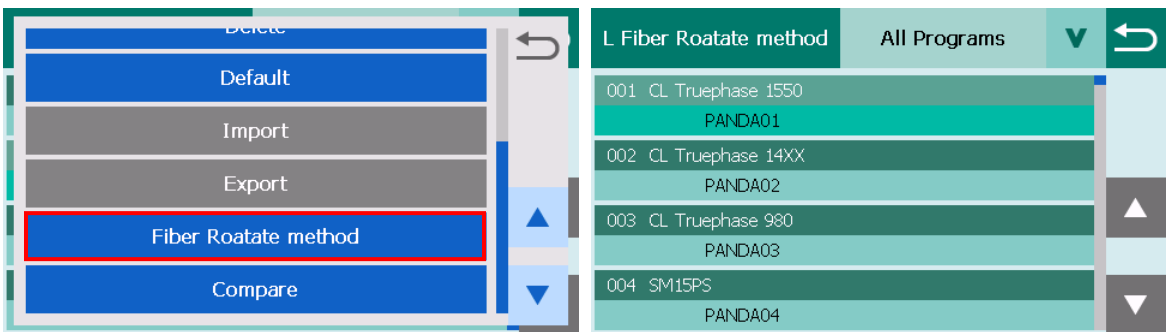
ℹ️	Changing the fiber rotate method will change the fusion program display.
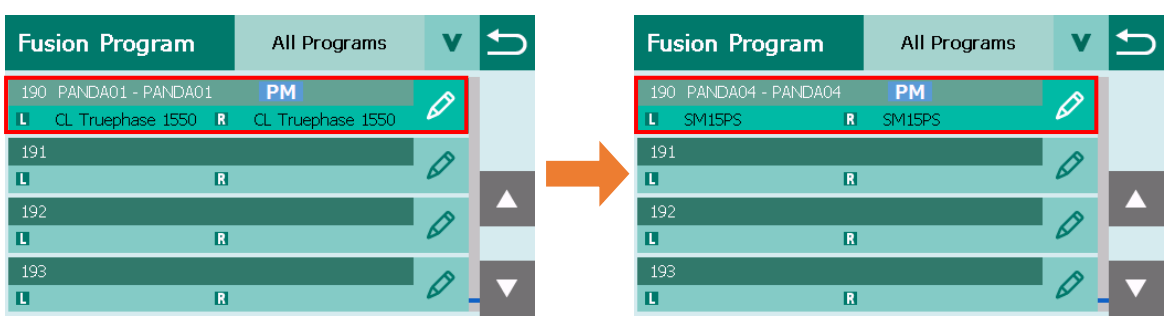
7.3.9 Compare

Follow the procedures shown below to compare the parameters between two programs.

1. Select "Compare" in the pop-up menu.
2. Select the program to compare.
3. The parameters of two programs are displayed. Item name is displayed in red if parameter is different.
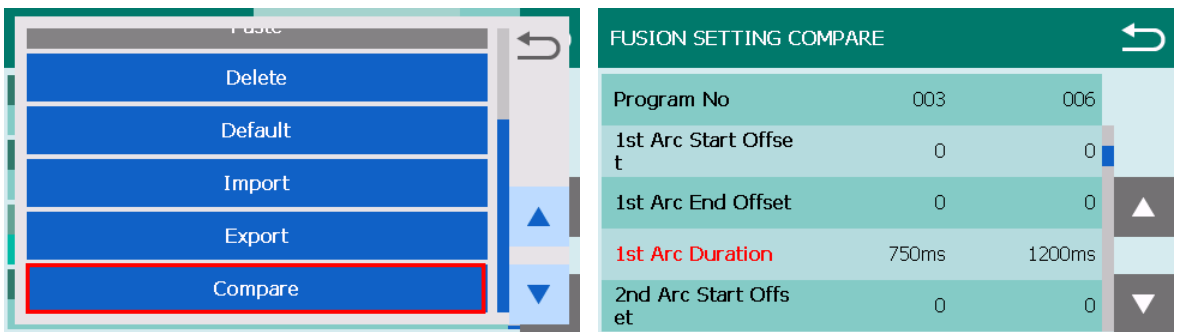
7.3.10 Parameter Table

Parameter Table for Splice 1

Parameter Name	Unit	Description
1st Arc Start Offset	-	Starting arc power offset of 1st arc discharge.
1st Arc End Offset	-	Ending arc power offset of 1st arc discharge.
1st Arc Duration	ms	Arc duration of 1st arc.
2nd Arc Start Offset	-	Starting arc power offset of 2nd arc discharge.
2nd Arc End Offset	-	Ending arc power offset of 2nd arc discharge.
2nd Arc Duration	ms	Arc duration of 2nd arc.
Cleaning Offset	-	Arc power offset for cleaning discharge.
Cleaning Duration	ms	Arc duration for cleaning discharge.
Pre Arc Duration	ms	Time between arc starting and fibers first butting.
Gap	µm	Gap for the final alignment position before splicing.
Z Push Type	-	Fiber movement at the time of arc discharge. Left Fiber / Right Fiber / Both
Z Push Length	µm	Overlapping distance from fibers first butting position.
Z Pull Start Time	ms	Start Time to pull back the fiber.
Z Pull Length	µm	Pull back distance from the final overlapping position.
Pulse ON Time	ms	ON duration of pulse arc discharge in 2nd arc discharge.
Pulse OFF Time	ms	OFF duration of pulse arc discharge in 2nd arc discharge.
Attenuation	dB	Function to allow attenuation splicing.
Axis Offset	µm	Function to allow clad offset splicing.
Arc Offset	µm	Function to allow arc offset splicing.
Alignment Type	-	Defines the function of the machine to "core align" or "clad align" the fiber. Core / Clad / Core→Clad

Parameter Table for Splice 2

Parameter Name	Unit	Description
Auto Re Arc	times	Limit number of automatic additional arcs.
Re Arc Number	times	Allowable number of repeat arcs in programmed additional arc mode.
Auto Re Arc	times	Limit number of automatic additional arcs.
Re Arc Number	times	Allowable number of repeat arcs in programmed additional arc mode.
Re Arc Duration	ms	Duration of additional arc.
Re Arc Interval	ms	Interval between additional arc and additional arc.
Re Arc Offset	-	Arc power offset for additional arc discharge.
Theta Rotate Type	-	Theta rotate side. Not Rotate / Both / Left / Right
Offset Theta Angle	deg.	Theta rotation offset angle for PM splicing.

Fiber Clamp Mode	-	Conditions for fiber clamp up.
		   Not up／During rotation
		   After splicing／Both

Cleave Angle	deg.	Maximum allowable angle of cleaved fiber end for splicing to continue
Loss Limit	dB	Maximum loss allowed for machine not to give a splicing error.
Fiber Tilt	deg.	Maximum allowable angle of fiber tilt for splicing to continue.
Wavelength	nm	Based on the wavelength, each fusion program is optimized.
Left Fiber MFR	µm	Mode field radius of left side fiber. (No meaning between Left and Right)
Right Fiber MFR	µm	Mode field radius of right side fiber. (No meaning between Left and Right)
Core Threshold	µm	Maximum permissible fiber core offset.
Clad Threshold	µm	Maximum permissible fiber clad offset.
Estimated Extinction Ratio	dB	Initial extinction ratio value for calculation of the estimated extinction ratio.

Time chart of fusion parameters
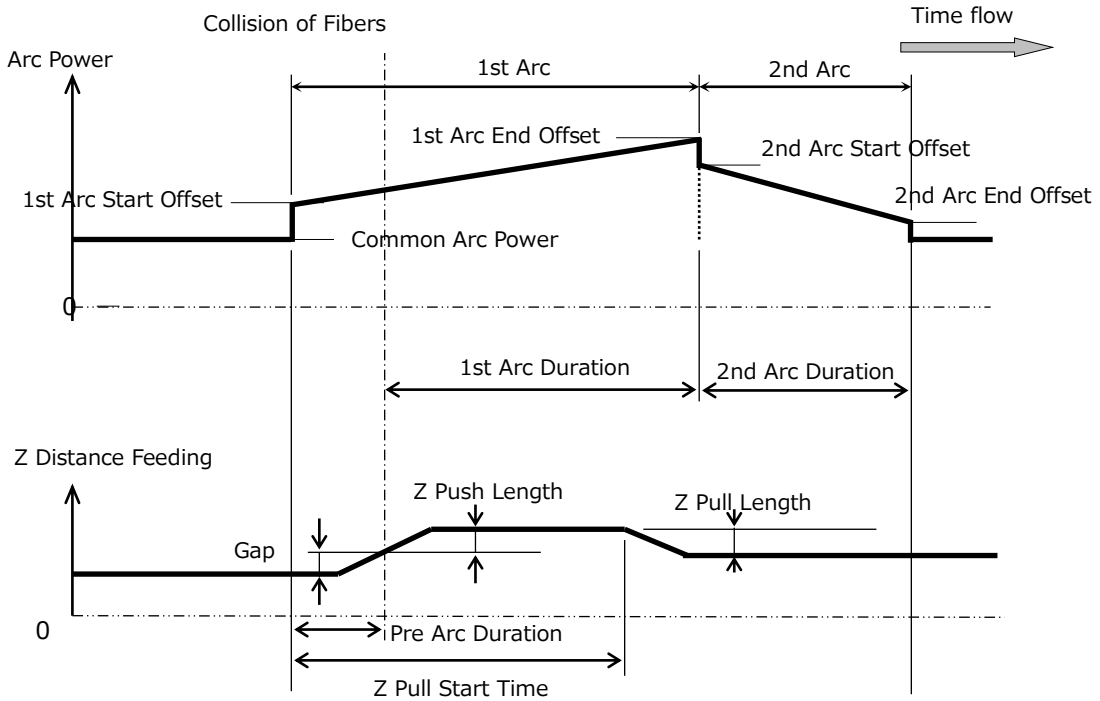
Arc Power Compensation Table

Arc Power	Cleaning Arc Power	Fusion Arc Power	Repeat Arc Power
Cleaning Offset *1	+	0	0
Common Arc Power	+	+	+
Arc Power Offset *1	0	+	0
Eccentric Compensation	0	+(eccentric core fiber) 0(concentric core fiber)	0
Re Arc Offset *1	0	0	+
Pressure Compensation	+	+	+

The items marked with "+" are added at the time of calculating each arc power.
*1 : This is a parameter of the splicing program, and can be changed.

Parameter Table for Heater Program

Parameter	Unit	Description
1st Heat Temp IN	°C	Temperature of INNER heater for the first half.
1st Heat Temp OUT	°C	Temperature of OUTER heater for the first half.
1st Heat Duration	sec	Operation time of the first half.
2nd Heat Temp IN	°C	Temperature of INNER heater for The latter half.
2nd Heat Temp OUT	°C	Temperature of OUTER heater for The latter half.
2nd Heat Duration	sec	Heating time after 1st heating
Pre Heat Temp IN	°C	Temperature of INNER heater for preliminary heat cycle. Preliminary heating temperature before the first half.
Pre Heat Temp OUT	°C	Temperature of OUTER heater for preliminary heat cycle. Preliminary heating temperature before the first half.
Pre Heat Duration	sec	Operation time of preliminary heat cycle after the end of cooling process or before the first half.
Cooling Temp	°C	Final temperature at the end of cooling process.
Cooling Duration	sec	Operation time of the cooling process.
Auto Start Heater	-	Setting for automatic start function. OFF : Manual start operation. ON : When the fiber set and left clamp is shut, heater starts automatically. *1

*1 : Do not leave the protection sleeve in the heater after the protector is shrunk. The coating may melt.

Time chart of heater parameters

Temperatur

1st Heat Temp. IN

1st Heat Temp. OUT

2nd Heat Temp. IN

2nd Heat Temp. OUT

Pre Heat Temp. IN

Pre Heat Temp. OUT

Cool Temp.

Time

Pre Heat Time   1st Heat Time   2nd Heat Time

発熱体の配置

INNER Heater   OUTER Heater
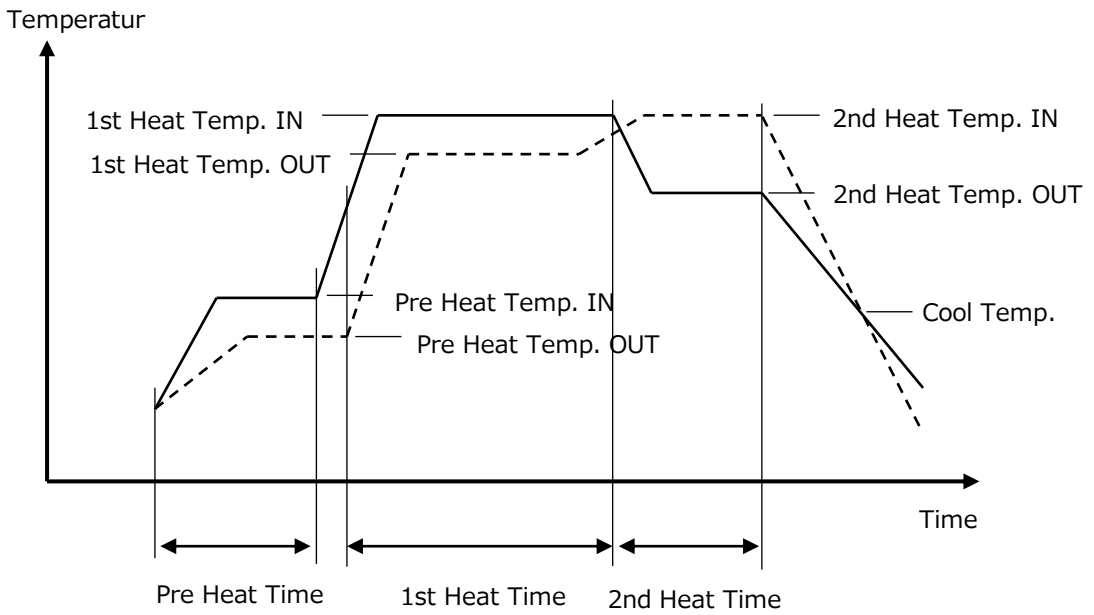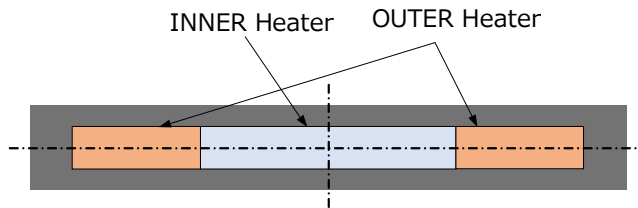
7.4 Information Menu

In this menu, various machine information is shown.

7.4.1 Machine Information

Machine-specific information such as serial numbers and version

information is displayed.
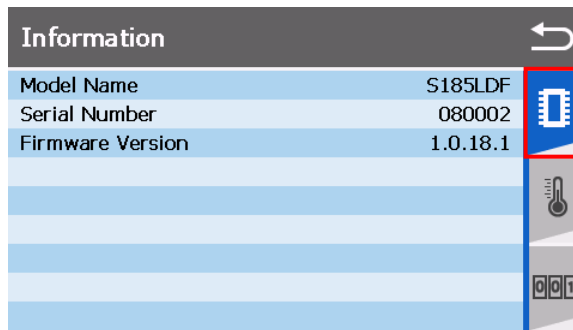
7.4.2 Environment Information
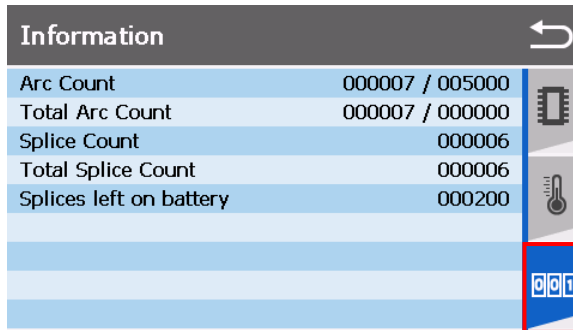
The S185 allows the user to view environmental conditions.

1. Select "Information" in the menu screen.

2. Touch the thermometer symbol or press ▶ key. The chamber

    temperature and atmospheric pressure are displayed.

3. Press ↺ key to return to the previous screen.
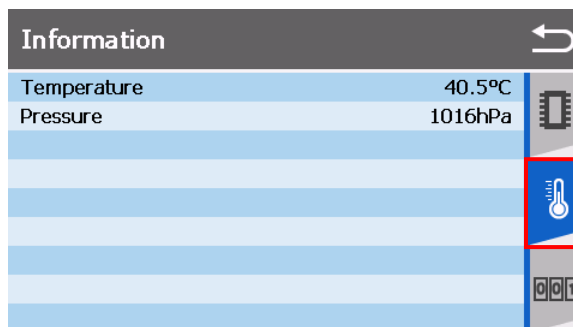
7.4.3 Counter Information

Touch the counter symbol or press ▶ key twice.

● Arc Count

Displays arc count and alarm count of the arc discharge. The cleaning arc discharge is not included. The alarm count is set in the settings menu.

This count can be cleared in the settings menu. (Initialize -> Counter Reset.)

● Total Arc Count

Displays total arc count and alarm count of the total arc discharge. The alarm count is set in the settings menu.

● Splice Count

Displays splice count. This count can be cleared in the settings menu. (Initialize -> Counter Reset.)

● Total Splice Count

Displays total splice count.

● Splices left on battery

Based on the current battery capacity, the number of times you can splice is displayed.

7.5 Data Management Menu

By selecting "Data Management" in the Menu screen, the user can access
the detailed splice data, arc check history and archived images.

1. On the Menu screen, select "Data
   Management".
2. Select "Splice History", "Arc
   Check History", "Captured
   Image" or "Failure Data History".
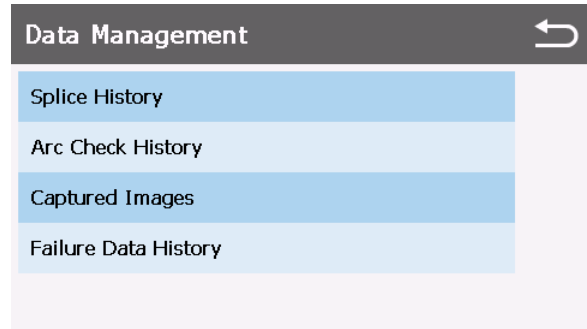
7.5.1 Splice History

Browse the splice history. The maximum number of saved is 1000.

1. If "Splice History" is selected, a list of the previous splice data is
   displayed on the screen.
2. Select a target date to obtain the details of the data as shown in the
   picture.
3. Press ▶ to display the detailed data of each fiber as follows.
4. The splice history data can be exported to an external storage. After
   attaching the storage, touch the 📥 icon or press the ⊞ key.

Parameter Table for Splice History

Data Title	Description
Arc Count	Arc count when splice was performed.
Date	Date and time of when the splice was performed.
Temperature/ Pressure	Temperature and pressure when the splice was performed.
Program name	Name of fusion program.
Left Fiber	Type of fiber on the left.
Right Fiber	Type of fiber on the right.
Left Fiber Type	Rotate method of the left fiber.
Right Fiber Type	Rotate method of the right fiber.
Firmware Version	Firmware version.
Arc Power	Value of the power of the electric discharge.
Estimated Loss	Estimated splice loss.
Estimated Extinction Ratio	Estimated extinction ratio.
Relative Theta Angle	Relative Theta Angle.
Gap	Gap length before splicing.
Left Cleave Angle	Cleave angle of the left fiber.
Right Cleave Angle	Cleave angle of the right fiber.
Relative Angle	Relative cleave angle between left and right fibers.
Align Type	Type of align.
Before Core Offset	Core offset value of the before splicing.
After Core Offset	Core offset value of the after splicing.
Before Clad Offset	Clad offset value of the before splicing.
After Clad Offset	Clad offset value of the after splicing.
Model Name	Name of fusion program.
Serial Number	Serial number of S185.
Splice Result	Error codes and additional arc.

	The display of the "Splice Result" column is as follows.
	• Loss: Estimated loss exceeds the target value. • Thin: Splice point is thin. • Thick: Splice point is thick. • Streak: Streak at the splice point or not spliced. • Bubble: bubble at the splice point or not spliced. • Angle: Cleave angle exceeds the criteria. • Edge: Cleave end face has excessive defects. • Gap: Gap difference exceeds the criteria. • Cladding: Execute clad alignment • Add: Additional arc was applied.

7.5.2 Arc Check History

Browse the Arc Check history. The maximum number of saved is 100.

1. The list of previous arc checks is shown on the same screen as splice data.
2. Select a time period to display the detail of the data.
3. Press ▶ key to display the detailed data of each fiber as follows.
4. The arc check data can be exported to an external storage. After attaching the storage, touch the 🗅 icon or press ⊞ key.

Parameter Table for Arc Check History

Data Title	Description
Arc Count	Arc count when arc check was performed.
Date	Date and time for the arc check performed.
Temperature/ Pressure	Temperature and pressure when image capture was performed.
Program Name	Name of fusion program.
Arc Power (Before Arc Check)	Value of arc power.
Arc Power (After Arc Check)	Value of arc power after arc check.
Retreat	Value of how far the fibers melt back.
Arc Center	Value of the centered position that the fibers have melted back.

7.5.3 Captured Image

Browse the capture image. The maximum number of saved is 100.

1. The list of captured images is shown on the same screen as splice data.

2. Select a time period to display the image as shown in the picture.

3. The fiber image can be zoomed by touching the image or pressing the ![key] key.

4. The image data can be exported to the external storage. After attaching the storage, touch the ![icon] icon or press ![key] key.
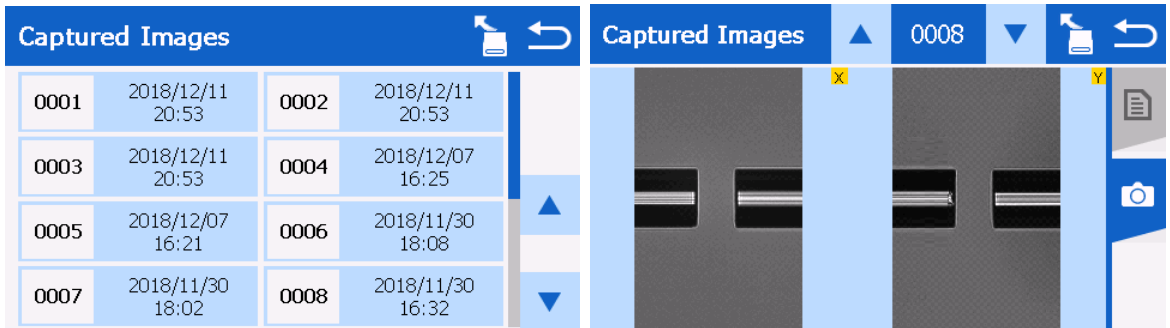
Parameter Table for Capture image

Data Title	Description
Arc Count	Arc count when arc check was performed.
Date	Date and time for the arc check performed.
Temperature/ Pressure	Temperature and pressure when image capture was performed.
Program Name	Name of fusion program.
Left Fiber	Type of fiber on the left.
Right Fiber	Type of fiber on the right.
Left Fiber Type	Rotate method of the left fiber.
Right Fiber Type	Rotate method of the right fiber.
Firmware Version	Firmware version.

7.5.4 Failure Data History

Browse the failure data history. The maximum number of saved is 200.

1. The failure list is shown on the same screen as the splice data.
2. Select a time period to display the detail of the failures as shown in the picture.
3. Press ▶ key to display the detailed data of each fiber as follows.
4. The failure data can be exported to an external storage. After attaching the storage, touch the 📇 icon or press ⊞ key.
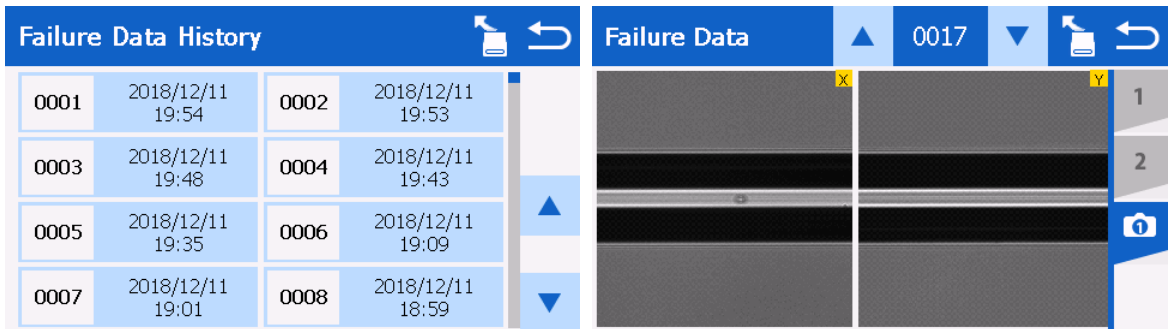
Parameter Table for Failure Data History

Data Title	Description
Arc Count	Arc count when arc check was performed.
Date	Date and time for the arc check performed.
Temperature/ Pressure	Temperature and pressure when image capture was performed.
Program Name	Name of fusion program.
Left Fiber	Type of fiber on the left.
Right Fiber	Type of fiber on the right.
Left Fiber Type	Rotate method of the left fiber.
Right Fiber Type	Rotate method of the right fiber.
Firmware Version	Firmware version.
Error Code	Error code.
Error Info.	Error information.

7.6 Settings Menu

1. Select "Settings" in the menu.

2. The parameter list and the current setting are displayed. Press ▲ ▼ keys to scroll through the available settings.

3. Press ⤺ key after editing the parameter.

4. The pop-up menu will display up and ask to overwrite.

    - YES: Replace the parameter with the edited value.

    - NO: Cancel the change and return to the previous screen.

5. Repeatedly press ⤺ key until the Ready screen is displayed.

🛈	⊞ : Move to previous page. ▶ : Move to next page.
🛈	The following key can be used to select YES / NO. ⏎ : YES. ⤺ : NO.

7.6.1 Parameters

The following functions are available in Settings.

Parameter Setting Items 1

Setting Item		Contents
Easy Setup		Set the recommended parameters (simple format)
General	Language	Select the display language.
	Date and Time	Set the date and time.
	Stepping Action	Set splice operation mode.
	Tension Test	Activate the tension test function.
	Soft Landing	Select the soft landing.
	Z Lock Message	Select the Z lock message.
	Eco Charge	Select the charging mode for the battery.
	Ignore Error	Select the operation at the error.
Common Arc Power		Set common arc power.
Display	Brightness	Set brightness of LCD monitor.
	Sleep	Set sleep function.
	Sleep Time	Set the sleep time.
	Auto Shutdown	Set auto shutdown function.
	Auto Shutdown Time	Set the time to shutdown automatically.
	Screen Style	Select the display format.
	Reverse Monitor	Select monitor direction.
	Touchscreen	Set touchscreen function.
	Camera Sleep	Set camera sleep mode.
Sound	Buzzer Volume	Set the buzzer volume.
	Buzzer Tone	Select the buzzer tone.
	Key Sound	Set the button touch sound.

Parameter Setting Items 2

Setting Item			Contents
Data Output	Before Splice	Cleave Angle	Select the parameter to be displayed Before splice.
		Clad Offset	
		Core Offset	
		Gap	
		Arc Information	
		Fiber Tilt	
	After Splice	Cleave Angle	Select the parameter to be displayed after splice.
		Clad Offset	
		Core Offset	
		Estimated Loss	
		Detailed Information	
		Estimated Extinction Ratio	
		Relative Theta Angle	
	Arc Check		Select the display mode in the arc check.
Auto Start	Auto Start for Fusion		Select start mode of fusion splice.
	Auto Start for Heater		Select start mode of heater.
Security	Password Lock		Set the password lock function.
	Password		Set the password.
	Wi-Fi Unlock		Select unlock on Wi-Fi connect.
Work Light			Switch the work light.
Sensor	Temperature Unit		Select the unit temperature.
	Pressure Unit		Select the unit pressure.
	Barometer / Altimeter		Select the pressure or altitude.
Group Name			Edit the group name.

Parameter Setting Items 3

Setting Item		Contents
Arc Alarm	Arc Count Alarm	Set the alarm counter of the arc.
	Total Arc Count Alarm	Set the total alarm counter of the arc.
	Arc Check Message	Select the arc check recommended message function.
	Environment Change Message	Select the Environment Change Message.
Wi-Fi Setup	Wi-Fi	Enable Wi-Fi function.
	SSID	Set the network name.
	Password	Set the password for the network.
	IP Address	IP address of fusion splicer is displayed.
	MAC Address	MAC address of Wi-Fi adapter is displayed.
Ethernet	IP Address	Set the IP Address.
	Subnet	Set the Subnet for the network.
	Gateway	Set the Gateway for the network.

7.6.2 Easy Setup

Set the recommended parameters at once. The recommended parameters are below.

Fusion Program: No.001 DISSIMILAR AUTO

Auto start for Fusion: Full Auto

Auto start for Heater: Active

Stepping Action: Full Auto

Tension Test: ON

7.6.3 General

● Language

Select the display language.

● Date and Time

・Year / Month / Day / Hour / Minute / Second

Set the date and time manually.

・Date Format

Set the display style of the date on the screen

YY/MM/DD	Year Month Day (e.g. 2014/11/24)
MM/DD/YY	Month Day Year (e.g. 11/24/2014)
DD/MM/YY	Day Month Year (e.g. 24/11/2014)

・24 Hour Format

Setting the time display style on the screen

12H	Hour : Minute AM/PM (e.g. 05:30PM)
24H	Hour : Minute (e.g. 17:30)

- Stepping Action

    Select splice operation mode.

Full Auto	No pause. However, if there are any errors, pauses will occur and error message will be displayed.
Step1	Pauses before splicing. (Press ▶ to resume the process)
Step2	Pauses at every step in the process. (Press ▶ to resume the process)

- Tension Test

    Select tension test exists or not.

ON	Tension test starts when the windshield is opened. Tension is 1.96N. Reset has been completed, unless the optical fiber is broken, the tension test is passed. Then remove the spliced fiber carefully.
OFF	Cancel tension test.

- Soft Landing

    Select soft landing exists or not.

ON	After sensing the closure of the windshield, lower the fiber clamp. It prevents the optical fiber from breaking by slam the windshield.
OFF	Cancel soft landing.

- Z Lock Message

    Select the Z lock message exists or not.

ON	Display the Z lock message when turning on the power. If you do not remove the Z lock, the motor may break down.
OFF	Do not Display the Z lock message.

- Eco Charge

    Select the charging mode of the battery.

ON	Battery charging stops at 80~90%. Charge time is shorter, but the number of splices that can be performed decreases. This mode prolongs the battery life.
OFF	Charge the battery to full capacity.

- Ignore Error

    Select the operation error process.

ON	You can select whether to retry or continue when an error is displayed.
OFF	You cannot continue if an error is displayed.

7.6.4 Common Arc Power
Any value from 0 to 400. This value affects all fusion programs.

7.6.5 Display

● Brightness

Set the brightness of LCD from 1 to 7. To increase the brightness intensity, increase the value.

● Sleep

Activate the power saving mode.

● Sleep Time

Time until switching to power saving mode, can be set from 1 to 10 minutes.

● Auto Shutdown

Activate the auto shutdown function.

● Auto Shutdown Time

Time until switching to auto shutdown, can be set from 10 to 30 minutes.

- Screen Style

    Select the screen style from the following options:

Dual (vertical)
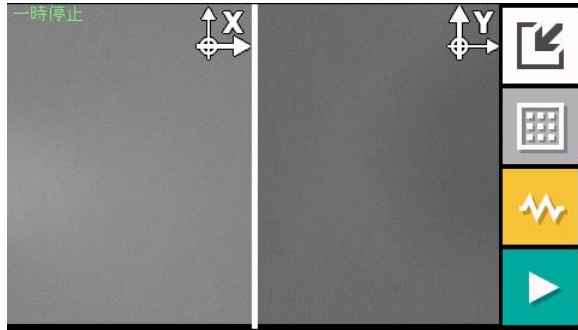
Dual (horizontal)
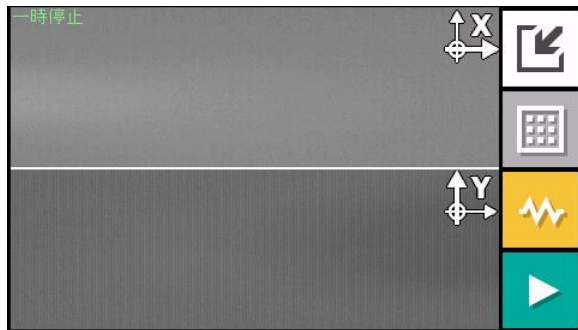
Single X

Single Y
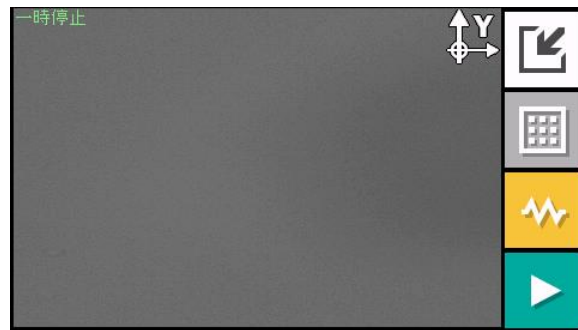
● Reverse Monitor

Select the direction of LCD screen.

Normal	Normal display.
Reverse	Reverse display.
Auto	Direction of the display will change depending on the LCD angle.

● Touchscreen

Disable the touchscreen.

● Camera Sleep

The power consumption is reduced by stopping the camera when the windshield is opened

7.6.6 Sound

● Buzzer Volume

Set Buzzer volume from 0 to 3. 0. (With 0 being silent.)

● Buzzer Tone

Select the buzzer tone form High / Middle / Low.

● Key Touch Sound

Set the sound when pressing the key.

7.6.7 Data Output

Setting the display of inspection data.

Before Splice	Cleave Angle [degree] Clad Offset [μm] Core Offset [μm] Gap [μm] Arc Information [Arc Power] Fiber Tilt [degree]
After Splice	Cleave Angle [degree] Clad Offset [μm] Core Offset [μm] Estimated Loss [dB] Detailed Information Estimated Extinction Ratio [dB] Relative Theta Angle [degree]
Arc Check	Result

7.6.8 Auto Start

- Auto Start for Fusion

OFF	Auto start function does not work.
Semi Auto	The fibers move to the center of the screen when the windshield is closed. After the fibers are set and they temporarily stop. The advance to the next process by pushing ▶ key and the splicing is completed.
Full Auto	After setting fibers, even if you do not press the start key, the splicing process is started by closing the windshield.

- Auto Start for Heater

OFF	Auto Start function does not work. Press 🔆 to activate.
Auto	Start is set in accordance to the selected heater program.
Active	When a fiber is set to the heater, heating starts automatically.

7.6.9 Security

● Password Lock

Lock S185 by using a password. If activated you need to enter the password during the start-up process.

● Password

Set password with 6-digit number. Enter the same number to confirm the input password.

● Wi-Fi Unlock

Unlock the password without entering the password by connecting to Wi-Fi.

7.6.10 Work Light

Adjust the brightness of the work light. The light illuminates the V-groove from the windshield. To increase the light brightness, increase the value. (i.e. if 0 is set the light is turned off).

7.6.11 Sensor

● Temperature Unit

Select the temperature unit from Celsius and Fahrenheit.

● Altimeter

Select the unit of atmospheric pressure from hPa and mmHg.

● Pressure / Altimeter

Convert the atmospheric pressure to altitude. This altitude is different from the actual altitude because it converts to altitude from atmospheric pressure simply. Less than 0 m is displayed 0 m.

7.6.12　　　Group Name

Edit the group name of the fusion program.

7.6.13　　　Arc Alarm

● Arc Count Alarm

　The alarm message is displayed when the arc count reaches this number.

● Total Arc Count Alarm

　The alarm message is displayed when the total arc count reaches this number.

● Arc Check Message

　Select the arc check recommendation function. A message recommending an arc check will pop up after the splicer is turned on.

7.6.14 Wi-Fi Setup

The specified Wi-Fi adapter is required to use the Wi-Fi connection function.

TP-LINK TL-WN725N

Set Wi-Fi parameter according to the following procedure.

1. Insert the Wi-Fi adapter into the USB connector. Turn on the power.
2. Set "Wi-Fi" to ON.
3. Select SSID to connect. SSID can be inputted manually.
4. Select "Password". Input the password, and touch the "ENTER" key.
5. Press 🔙 key twice. The pop-up menu will show up and ask to overwrite.

To check the Wi-Fi connection, return to the Wi-Fi setup menu and confirm that the IP address is displayed.

7.6.15 Ethernet

Setting for the Ethernet parameters.

- IP Address
- Subnet
- Gateway

7.7 Maintenance Menu

This menu provides various kinds of maintenance functions.

Contents	Function
Quick Guide	Introduce each maintenance method and how to use Wi-Fi.
Update	Update the software of S185.
Contact Address	Display the contact address.
Initialize	Reset the factory setting and erase the history data.
Regulatory	Display regulatory information of FCC and ICES.

7.7.1 Quick Guide

The S185 allows the user to obtain procedures and pictures for maintenance.

1. Select "Quick Guide" in the maintenance menu.
2. Select an item from following list.
   - Changing Electrodes
   - Cleaning Lenses
   - Cleaning V-grooves
   - Connecting Wi-Fi (AP)
   - Connecting Wi-Fi (Hotspot)

3. The maintenance procedures are displayed with text instructions and photographic examples. Press ⬆⬇ to switch pages. Follow the instruction to perform the maintenance.
4. Press ↩ to return to the previous screen.
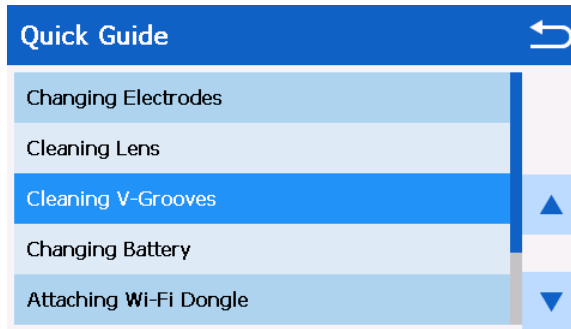
7.7.2 Update

The firmware of S185 can be updated by this menu.

1. Copy the update file to the USB storage device.

2. Open the battery cover.

3. Connect the storage device into USB A connector.

4. Select "Update" and select "Yes".

5. The file is automatically copied.

6. You must restart the S185 after "Please re-start splicer" when displayed.

7. When the update is completed, remove the USB storage device and close the battery cover.

7.7.3 Contact Address

The contact address is displayed. Press ⬆⬇ key to switch the pages.

```
Contact Address                    ↩

           Europe:
           Furukawa Electric Europe Ltd.
  FITEL    Furukawa House 77-85 Fulham
           Palace Road, London W6 8JD,
           United Kingdom
           TEL. +44-20-7313-5300      ▲
           FAX. +44-20-7313-5310
           www.furukawa.co.uk
           splicers@furukawa.co.uk    ▼
```

7.7.4 Initialize

● Factory Reset

Restore to the factory setting.

● Clear History Data

Delete the entire history of splices, arc checks and failures.

● Clear Captured Image

Delete the entire captured image record.

● Counter Reset

Reset arc count and splice count. Total arc count and total splice count are

not cleared.
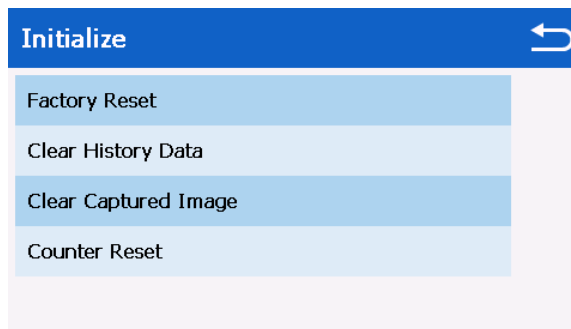
7.7.5 Regulatory

Display regulatory information of FCC and ICES.

8. Error Messages and Maintenance

8.1 Error Messages

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

Error Code	Cause of Error	Action
CLEAVE ANGLE ERROR (Cleaving error are found)	Exceeding the inspection criteria for cleave quality	Prepare the fiber again and retry.
	Incorrect parameters setting for cleave quality.	Check and correct the parameters.
OVERRUN ERROR (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.
	Defects 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.
FOCUS MOTOR ERROR	Defect in the image processing system.	Contact service center.
ALIGN MOTOR ERROR		
FIBER SETTING ERROR	Fibers are too close.	Load the fiber at the proper position.
LOW BATTERY	Battery has no power remaining.	See "Recharging Battery".
SPLICE DEFECTS	See "Splicing Defects, Fusion Splicing".	
FOCUS ERROR (Unable to focus on the fiber)	Fiber is dirty.	Start the splice from the beginning. Make sure to clean the bare portion of the fiber.
	Inappropriate fiber program is selected.	Check and correct the program.
	Incorrect parameter setting for FOCUS and FIELD.	Check and correct the parameters.
	Defect in the image processing system.	Contact service center.
	The optics are dirty.	See maintenance chapter.

Error Code	Cause of Error	Action
DETECTION ERROR (The image process cannot find the clad line, or find the core line while inspecting.)	Fiber is dirty.	Start the splice from the beginning. Make sure to clean the bare portion of the fiber.
	Inappropriate fiber program is selected.	Check and correct the program.
	Incorrect parameter setting for FOCUS and FIELD.	Check and correct the parameters.
	Defect in the image processing system.	Contact service center.
	Optics is dirty.	See Maintenance chapter.
OUT OF SPECIFIATION (The fiber is out of applicable range.)	Inappropriate fiber program is selected.	Check and correct the program.
	Cladding diameter is out of applicable range.	Cannot splice with S185.
CAMERA POSITION ERROR	The position of the built-in camera has been changed by a strong impact.	Contact service center.
ALIGN ERROR	Defect in the image processing system.	Contact service center.
	The optics are dirty.	See maintenance chapter.
EDGE DETECTIG ERROR	Fiber is dirty.	Start the splice from the beginning. Make sure to clean the bare portion of the fiber.
	Fiber is not in the proper position.	Load the fiber at the proper position.
	Defect in the image processing system.	Contact service center.
	The optics is dirty.	See maintenance chapter.

Error Code	Cause of Error	Action
MFD MISSMATCH ERROR	Fiber is dirty.	Start the splice from the beginning. Make sure to clean the bare portion of the fiber.
	Inappropriate fiber program is selected.	Check and correct the program.
	Incorrect parameter setting for MFD.	Check and correct the parameters.
	Defect in the image processing system.	Contact service center.
	The optics are dirties	See maintenance chapter.
HEATER ERROR Failed to reach the required temperature. Charge the battery.	Inappropriate heater program is selected.	Check and correct the parameters.
	Low voltage	Use AC power or charge battery
HEATER ERROR Over heat detected. Stop heater.	Faulty protection sleeve heater	Contact service center.
HEATER ERROR Heater short circuit detected. Stop heater.	Faulty protection sleeve heater	Contact service center.
HEATER ERROR Heater open circuit detected. Stop heater	Faulty protection sleeve heater	Contact service center.

In case of any error message not included in the table above, please turn the splicer off immediately. Wait a moment before turning the splicer on again. If the same message appears repeatedly, please turn off the splicer again and contact your technical support center or your distributor.

8.2 Maintenance

8.2.1 Arc Check

Perform an arc check whenever high splice losses are observed

8.2.2 Electrode Maintenance

Inspect the electrodes for dirt, wear and damage before using the S185. Dust and other particles can be cleaned off by removing the electrodes from the splicing machine 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:

- Electrode is bent
- Electrode end has become extremely rounded
- Abnormal noise occurs during fusion splicing

When the Arc Counter number exceeds 5,000, the S185 automatically displays a message to prompt replacing the electrodes at when powered on (when The Counter Alarm is ON). The S185 asks whether to reset counter. 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. Turn off the switch and replace or clean the electrodes by using the electrode sharpener. When "No" is selected, the prompting message will be displayed again when power is turned on.

- Always replace or clean both electrodes, even if only one electrode is damaged.

- Ensure the power is switch off before starting maintenance. Never touch the electrode while the power is on.
- Longer arc durations used in dissimilar fiber splicing require 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 electrode holder. The electrode is raised together with the electrode holder. Be careful not to drop the electrodes into the machine.
2. Carefully pull and remove the electrodes from the electrode holder by grasping the electrode knob. Make sure nothing touches the electrodes tips.
3. Clean or replace the electrodes, as necessary.
4. Set the electrode holder after attaching the cleaned electrode or new electrode into the electrode holder.
5. Tighten the screws of the holding plates uniformly. Do not over tighten the screws.
6. Lower the windshield and press ⚡ key at least 5 times to burn off any residue remaining on the electrodes.

● How to clean the Electrodes by using the electrode sharpener

a) Firmly push the tip of the electrode (approx. 0.5~1.0mm) into the electrode sharpener and twist the electrode 3~4 times.

Attention: Don't grasp the electrode knob (if possible, grasp the mid-section of the rod).

b) In an effort to clean the electrode tip, wipe it softly with BEMCOT covered in alcohol.
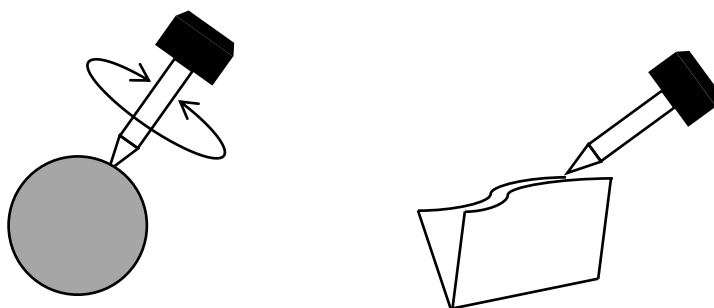
⚠ **CAUTION**
You can use all faces of the electrode sharpener.   **Extreme treatment distorts the electrode tip and can possibly move the knob position.**

Instructions for replacing the electrodes

・Insert the metal plate of electrode holder in the groove of electrode terminal.

・After that tighten the mounting screw of the electrode holder.

Groove

Metal plate

Mounting screw
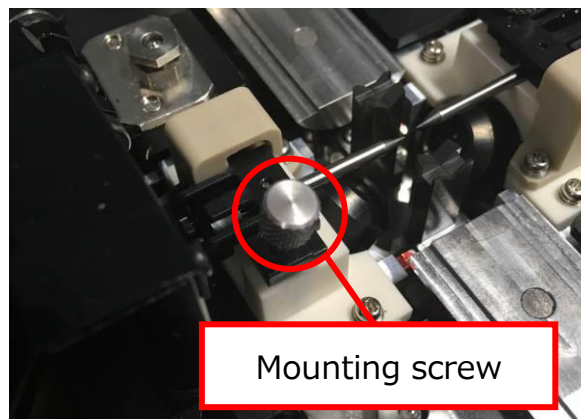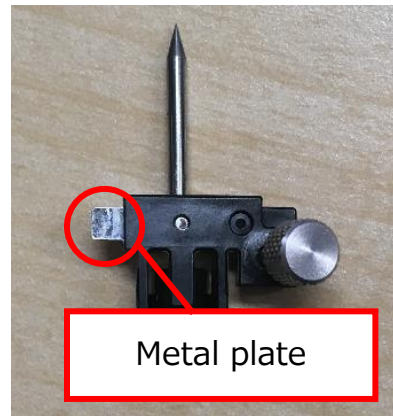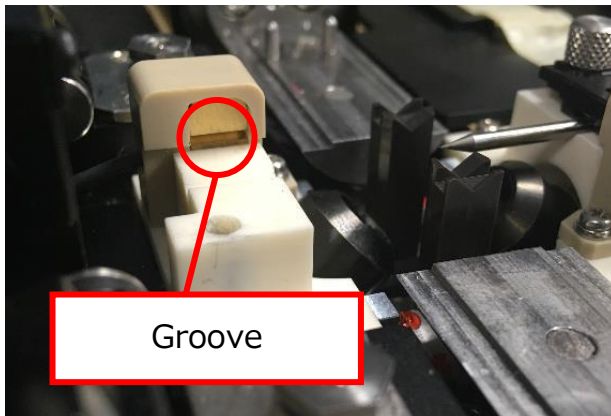
⚠ **CAUTION**
There is a possibility that the discharge current leak if the electrode is not assembled properly.

8.2.3 Cleaning the objective lenses

1. Remove the electrodes.

2. Wipe the lens with a cotton swab soaked with denatured alcohol.

3. A dirty or damaged lens may prevent the splicer from performing a splice or may produce incorrect splice loss information.

Cleaning is best performed once a month. Shorten the cleaning cycle interval if dirt is prominent.

8.2.4 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. Prepare a piece of fiber and cleave it approximately 10mm from the end.

2. Hold the fiber at a 45° angle.

3. 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.

The cleaning process is best performed once a month. Shorten the cleaning interval if dirt is more prominent.

8.2.5 Cleaning the 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.
As Freon gas might contaminate camera lens, DO NOT use a spray including Freon gas or alternatives for cleaning.
Do not use a gas spray on the splicer. The hazardous gas may come out by electric discharge. It may cause a fire and machine failure.

8.2.6 Cleaning the Fiber Holder

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

V-groove   Rubber

Fiber Holder
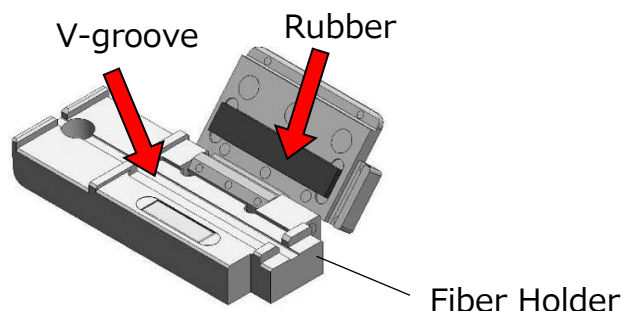
8.3 Backup Battery

S185 has a backup battery in addition to the battery that operates the splicer. The backup battery is for the calendar. The backup battery is designed to have a 10 years lifespan.

When the voltage of the backup battery becomes too low, the following icon is displayed.

8.4 Storing and Shipping

To maintain optimum operating reliability, do not store the S185 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 battery is removed from machine's main body when storing the fusion splicer. Ensure that these temperatures and humidity requirements are also met whenever the S185 fusion splicer is shipped.

8.5 Claims and Repackaging

Immediately inform 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 S185 fusion splicer or any of its components are damaged or defective. Likewise, if the fusion splicer fails during operation. In the event of carrier responsibility, Furukawa Electric Co., Ltd. will allow for the repair or replacement of the S185 fusion splicer or component while a claim against the carrier is being processed.

8.6 Return Shipments to Furukawa Electric Co., LTD.

Furukawa Electric Co., Ltd. will only accept returns for which an approved Return Material Authorization (RMA) has been issued by Furukawa Electric Co., Ltd. customer service personnel. This number must be obtained prior to shipping any material back to Furukawa Electric Co., Ltd. The owner's name and address, the model number and full serial number of the S185 fusion splicer, the RMA number, and an itemized statement of claimed defects must be included with the return material. Never ship the S185 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 S185 fusion splicer and, if necessary, the RMA number on any accompanying documentation.

9. Recycling and Disposal

When you dispose of the S185 fusion splicer or standard components, follow your local disposal regulations, or contact 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.

S185 has a backup battery (lithium button cell battery) for backup calendar. How to remove the battery is indicated below. This should only be done at the end of the machines life.

Removing the backup battery

Remove the circled screw and remove the cover.

134
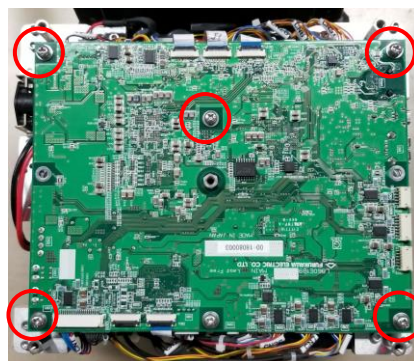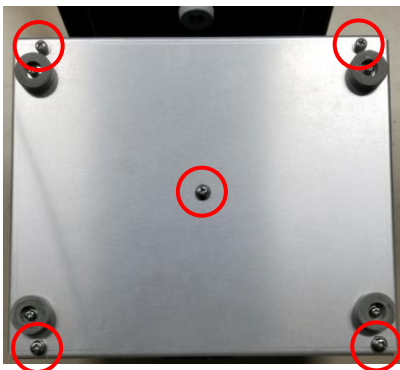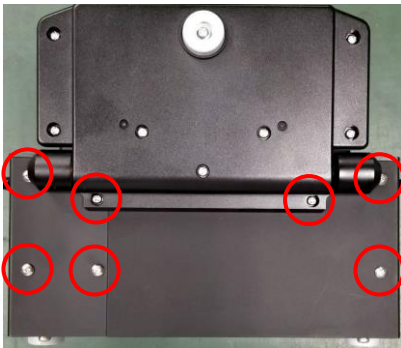
For sales and service information,

Contact FURUKAWA ELECTRIC CO., LTD.

Or your local representative.

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