

S179+ FUSION SPLICER USER MANUAL

Issue 2

**FURUKAWA
ELECTRIC**

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1. Safety Information and Instructions


This manual contains the complete operating and maintenance instructions for the S179+ 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 S179+ 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 S179+ 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 shutdown.

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 S179+. 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.



CAUTION

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.

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.

NOTES



This symbol mark is for EU countries only.

This symbol mark is according to the directive 2006/66/EC Article 20 Information for end-users and Annex II.

This symbol means that batteries and accumulators, at their end-of-life, should be disposed of separately from your household waste.

If a chemical symbol is printed beneath the symbol shown above, this chemical symbol means that the battery or accumulator contains a heavy metal at a certain concentration. This will be indicated as follows:

Hg: mercury (0.0005%), Cd: cadmium (0.002%), Pb: lead (0.004%)

In the European Union there are separate collection systems for used batteries and accumulators. Please, dispose of batteries and accumulators correctly at your local community waste collection/recycling centre.

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

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.

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 S179+ fusion splicer can also operate from an AC power source with the S979 AC/DC adapter. The S979 adapter can accept an AC power source with voltage between 100~240V at a frequency of 50~60Hz. The S947 internal battery is charged by the S179+ through the S979 AC adapter



WARNING

To avoid the risk of injury or death, **ALWAYS** observe the following precautions before initializing the S179+ fusion splicer.

- If using a voltage-reducing auto-transformer to power the S179+ 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 S179+ 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 S179+ 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 S179+ carrying case from the shipping container, and open the case.
4. Inspect the contents to ensure that the shipment is complete.
5. Lift the S179+ fusion splicer out of the carrying case, and place the instrument on a flat, smooth surface.
6. Visually inspect the S179+ 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 S179+ fusion splicer components are damaged, defective, or if the S179+ 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 S179+.



WARNING

To avoid electric shock, do not initialize or operate the S179+ 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 S179 splicer is listed in the following table.

Item		Specification and Features
Applicable fibers* ¹		SMF / MMF / DSF / NZDSF / BIF / UBIF
Fiber cleave length		5 ~ 16mm for 0.25mm fiber 10 ~ 16mm for 0.9mm fiber tight buffer
Coating diameter		0.1 ~ 3.0mm
Clad diameter		80 ~ 150μm
Applicable sleeve length		20 / 40 / 60mm
Power* ²		DC : 11 - 24V AC : 100 - 240V 50/60Hz (AC Adaptor)
Weight		Main Body: 2.0kg (Including Battery)
Environmental Conditions	Operation	Temperature: -10 - +50 °C Humidity: Below 90% (No condensation)
	Storage	Temperature: -40 - +60 °C Humidity: Below 95%
Typical Insertion Loss* ³		SMF: 0.01 dB MMF: 0.01 dB DSF: 0.03dB NZDSF: 0.04dB
Splicing Time		6sec (fast mode), 9sec (regular mode)
Typical heating time* ⁴ * ⁵ (when using AC adapter)		9sec: Tyco SMOUV1120-01 (Power mode) 13sec: FITEL S921 250μm (Power mode) 15sec: FITEL S921 900μm (Power mode)
Number of programs available		Splice: 300 / Heat: 100
Maximum storage capacity		Splice: 20,000 / Fiber Image: 100
Input/output terminals		Data input/output : USB 2.0

*1: Applied to ITU-T standard

*2: Do not use an inappropriate input voltage. Doing so may cause fire, electric shock or malfunction.

*3: Tested in a laboratory environment with similar fibers. Not guaranteed results.

*4: When operating with the battery, the heating time might be longer than typical heating time. The heating time may increase depending on the environmental conditions.

*5: The heating time may increase depending on the sleeves used.

3.2 Components

3.2.1 Standard Components

The S179+ 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
S179+ Main Body	S179+	1
Battery Pack (Built-in)	S947A / S947B	1
AC Adapter	S979A	1
AC Cable	-	1
Cooling Tray	CTX-03	1
Spare Electrodes	ELR-01	1
Electrode Sharpener	D5111	1
Cleaning Brush	VGC-01	1
Hard Carrying Case	HCC-05	1
Tool Case	TCC-01	1
Manual CD	UMC-06	1
Quick Reference Guide	FTS-B628	1
Fiber holders are dependent on the splicer configuration ordered.		

3.2.2 Optional Components

Components	Model Number	QTY
USB Cable	USB-01	1
Battery Charger	S980A	1
Soft Carrying Case	SCC-01	1
Car Cigarette Cable	CDC-04	1
Angle Stand	AGS-02	1
Working Belt	WBT-01	1
Fiber Holder for 250µm	S712S-250	1pair
Fiber Holder for 500µm	S712S-500	1pair
Fiber Holder for 900µm	S712S-900	1pair

3.3 Optional Accessories

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

- S211B Stripper
- S218R Hot Stripper
- S326 High Precision Cleaver
- S921 60mm Splice Length Protection Sleeves for Single fiber
- S922 40mm Splice Length Protection Sleeves for Single fiber
- S928A 20/25/35 Mini Sleeves
- HBS-01 Heater Clamp Base for SOC

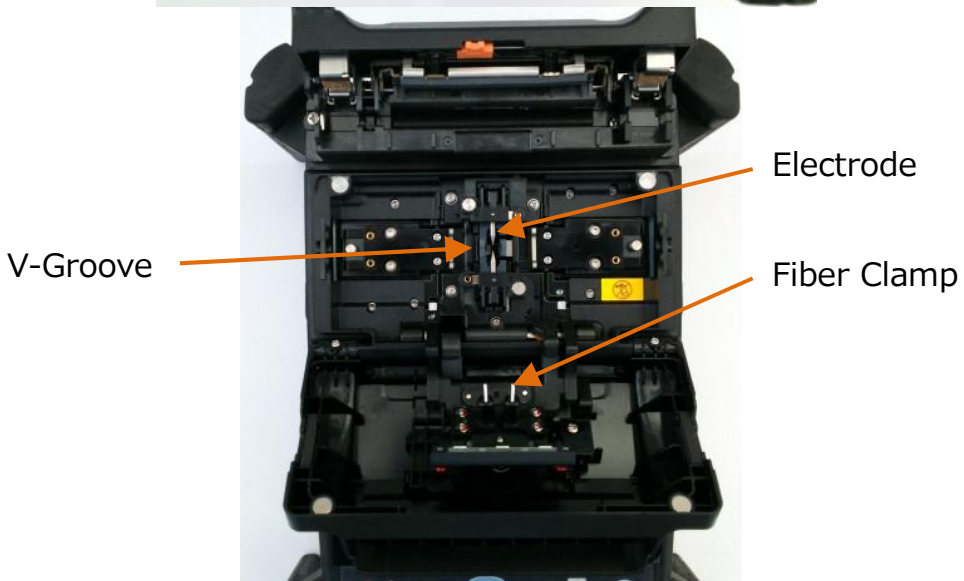
3.4 Recommended Consumables

Keep a supply of the following items with the S179+ 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






4.2 Operation Keys and Status LED

4.2.1 Operation Keys



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

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

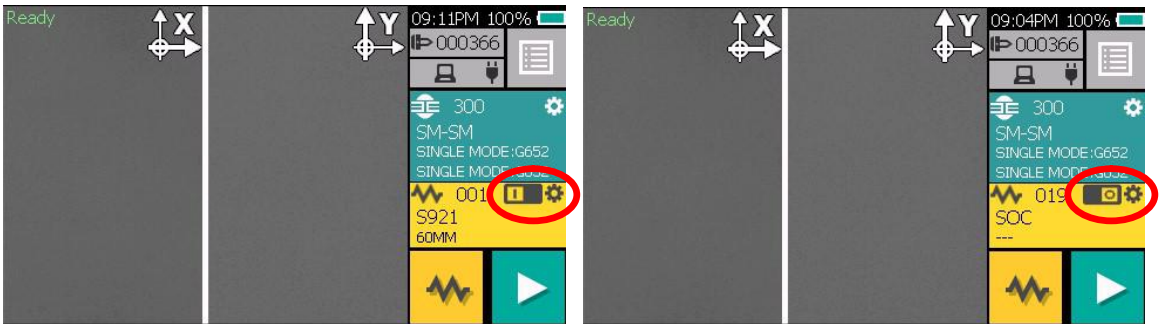
4.2.3 Buzzer

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

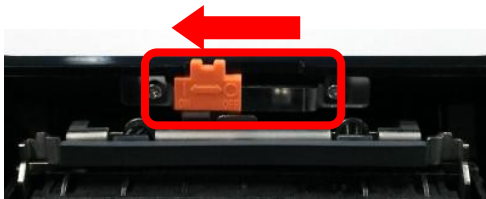
- Operation keys: One beep
- Machine reset completed: One beep
- Error occurred: Three beeps
- Splicing finished: A series of beeps
- Pause: Two beeps
- Heating process finished: One long beep

4.3 Heater

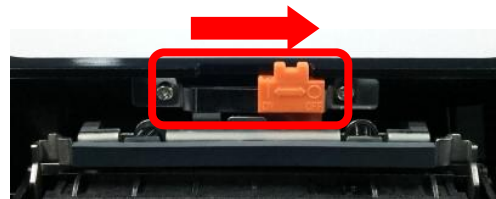
The S179+ has several heater programs that are made for different types of protection sleeves. There is a switch for fast heating, located under the heater lid. It is important to set this switch to the position appropriate for the heater program selected. When necessary to change the switch position, the S179 will display the switching method. Slide the switch according to the screen.



Set the switch to the left



Set the switch to the right

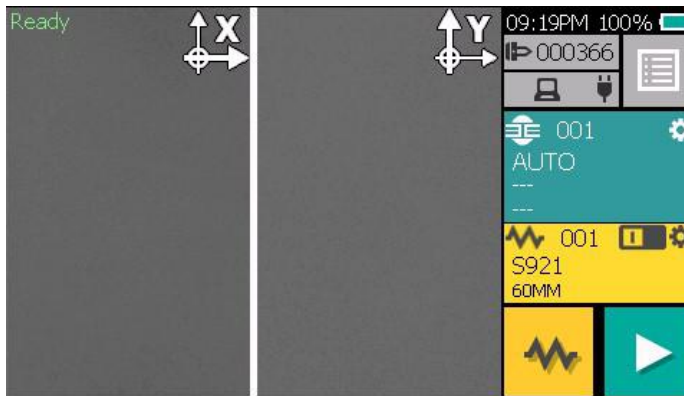


Switching Method Screen

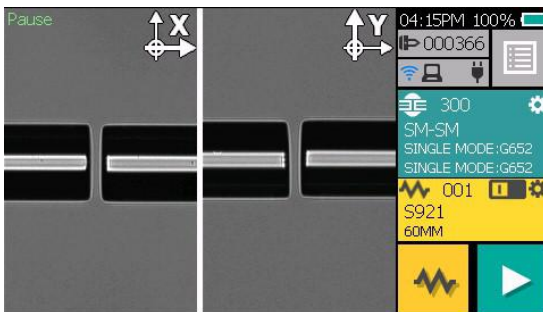
4.4 Screens

4.4.1 Ready Screen

Once the S179+ fusion splicer is powered up and initialized, the “Ready” screen is displayed.

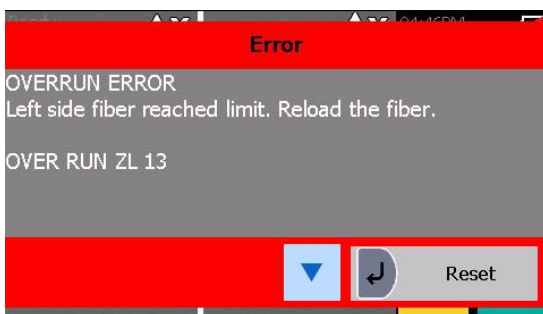


4.4.2 Screen during Splice



Fiber Image














X from front camera and Y from back camera. X and Y views can be switched by touching the X/Y icon.



Pop-up Window

These pops-ups appear when there is a message. They also show warning and error messages. You can hide this window by pressing ▼ key. Press ▲ key to display again.

4.4.3 Status Icons

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.
Heater status		Ready mode
		Heating mode. Heating progress is displayed
		Cooling mode *
		Error Occurring

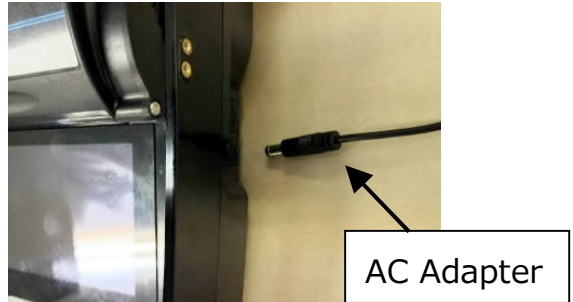
*) The cooling fan will temporarily pause during splicing, but the cooling mode icon remains displayed. After splicing is completed, the cooling fan will restart if the temperature remains too high.

5. Basic Operation

5.1 Preparations for Power Supply

5.1.1 Connecting the power cable to the AC the adapter

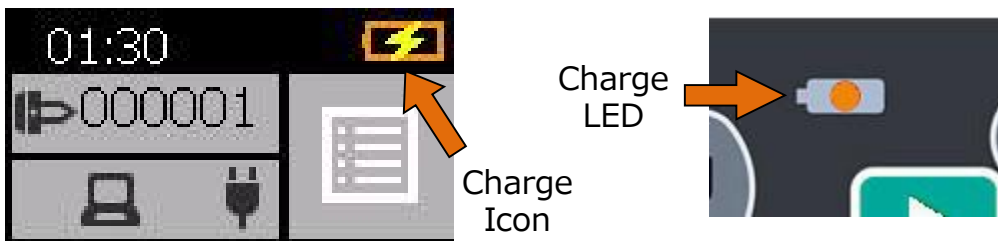
Connect the AC adapter to the DC Power port of the Splicer, and plug the AC adaptor into an AC outlet.




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.)



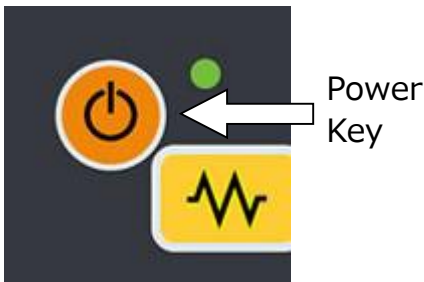
	<p>S947 battery is a lithium ion type rechargeable battery; it can be recharged at any time, regardless of its current capacity (empty or still with some residual power).</p> <p>If storing the battery for a long time, the power level will becomes very low due to self-discharging and the battery may degrade. Recharging the battery at least every 2 months is recommended when not in use.</p>
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It is possible that the battery may not be fully charged, if it is moved from a cold place ($<5^{\circ}\text{C}$) 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 $5\sim 30^{\circ}\text{C}$. ($5\sim 35^{\circ}\text{C}$ when powered off.)

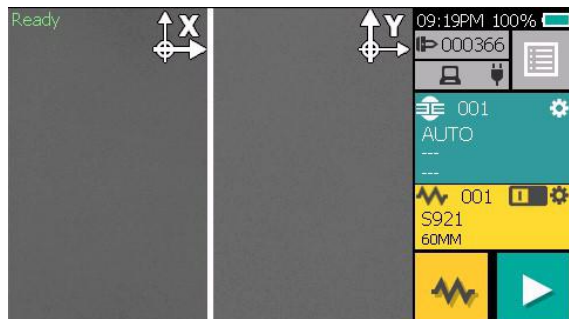
5.1.3 Turning the Splicer ON and OFF

Keep pushing power key (for about 1 seconds) to turn on/off.



Turning ON power

The opening message will appear on the LCD screen for a short while, before the ready screen is shown.



Turning OFF power



The LCD screen is turned off.
The power supply cuts after all motors have performed the reset operation.

5.2 Load programs

Install appropriate programs before operation. The S179+ 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.

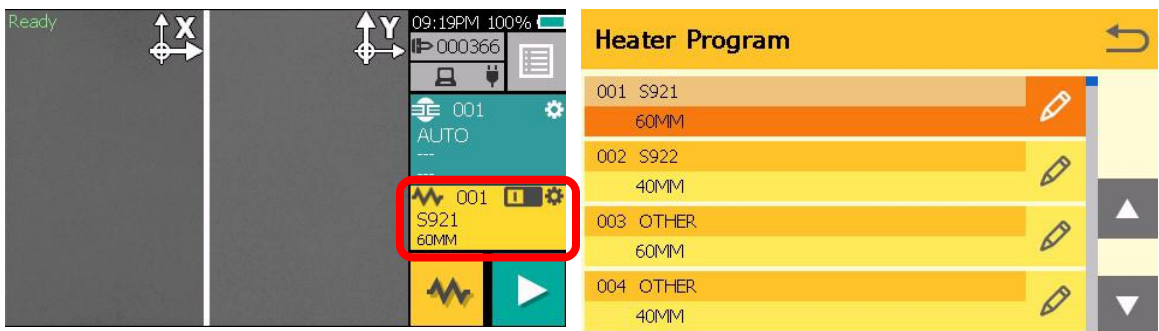
A fusion program can also be select from the list of recently used programs, program group or by using the word search function.





5.2.2 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.

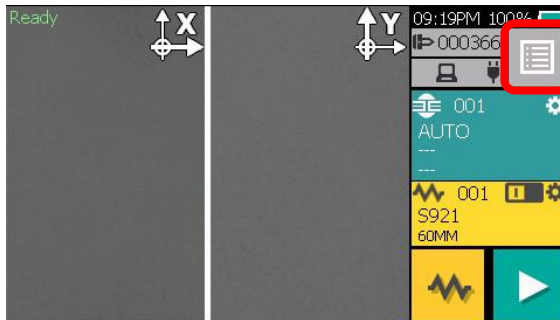






	<p>When the S179+ is turned on, the last program used is selected automatically.</p>
	<p>The curl-remove program can be selected from the heater program menu. Additionally, it can be selected by holding down the heating key. It automatically returns to the previously selected heater program when the curl-remove process has ended.</p> <p>When using curl-remove function, set the unprepared fiber in the heater. Please close both side of the clamp and cover as usual.</p>

5.2.3 Selecting the Operating Language

The S179+ 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 "Setting".
3. Select "Language" by pressing  key.
4. A pop-up window shows the current language. Select your language by Pressing  key.
5. Press  key and the pop-up window will confirm the change. Select "Yes" to confirm the change, or "No" to cancel the operation.
6. Press  key repeatedly until the Ready screen is displayed.



6. Fusion Splicing

6.1 Arc Check

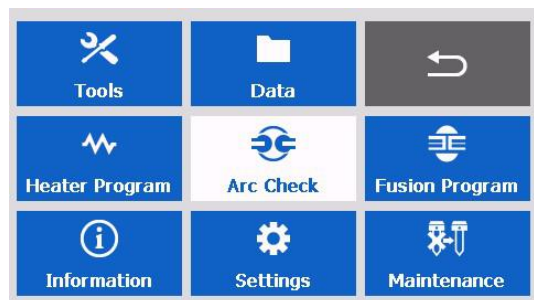
Fusion splicing is used to melt the glass of two optical fiber ends by arc discharging, and joins them together by butting the ends together. Fibers melt or fuse at different temperatures. It is necessary to adjust the arc power in order to ensure the optimum splicing results are achieved. In addition, 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.

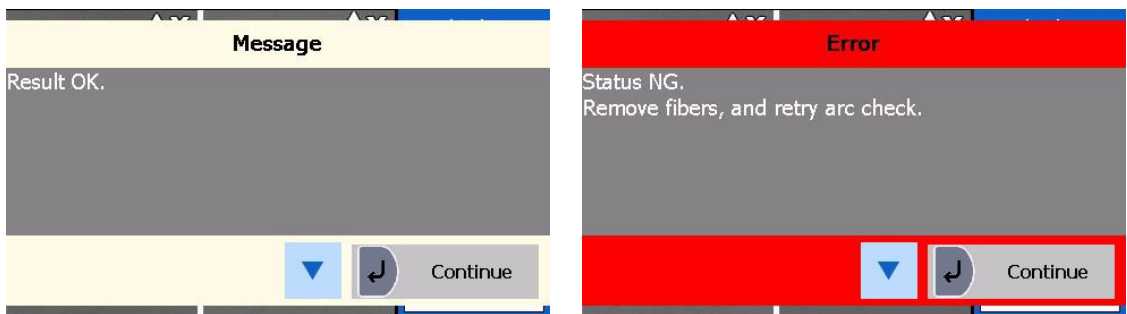
- At the beginning of daily operation
 - When the environmental condition has changed considerably
 - After replacing or cleaning electrodes
1. Open the windshield and load the prepared fibers. Ensure that the fibers are properly stripped, cleaned and cleaved.

2. Close the windshield.
3. Select "Arc Check".
4. The S179+ fusion splicer automatically feeds the fibers and discharges the arc.

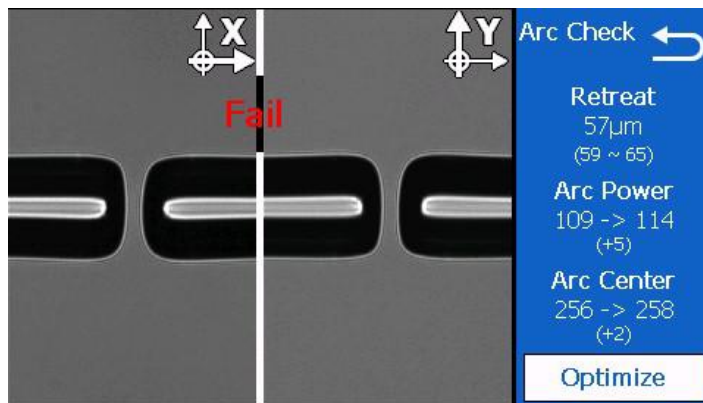


- The environment compensation is performed based on the time when arc check is performed and passed.

- 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.



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 ▲. Electrode discharge should produce a straight and steady arc. Swaying in the arc indicates that the electrodes require either cleaning or replacing.



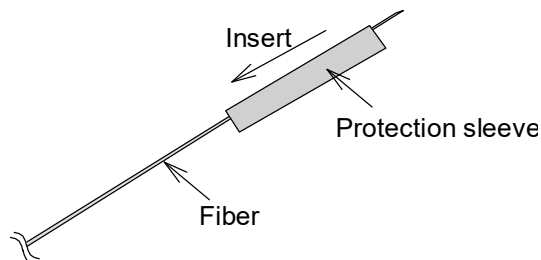
- Pressing ▼ key after the arc check, displays the detailed arc check data.
 - Retreat AAAµm (BBB-CCC)
 - AAA: Distance of the left side fiber to right side fiber
 - BBB: Lowest allowable value
 - CCC: Highest allowable value
 - Arc Power DDD→EEE (FFF)
 - DDD: Current arc power
 - EEE: Recommended arc 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

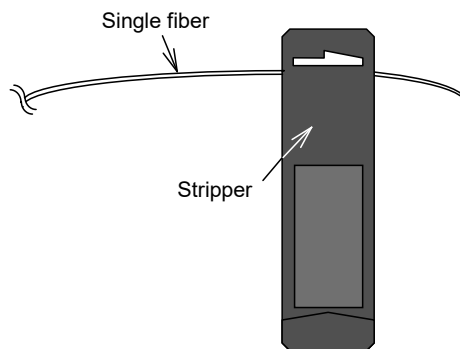
Splice loss is directly affected by the quality of the fiber preparation. For the best results, ensure that the V-grooves are clean and that the fiber ends are properly cleaned and cleaved.

Prepare a single fiber according to the following procedure.

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



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



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



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

4. 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.

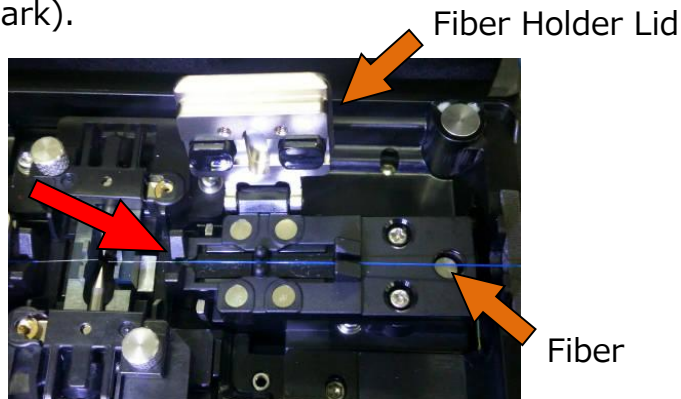


WARNING

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 as shown in below, ensure that nothing touches the bare fiber tip and place the coating end at the end stop inside the fiber holder (Red arrow mark).



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.
- The end plate only stops the end of 900 μ m coating. The 250 μ m coating is free.
- When performing a dissimilar fiber splice, the orientation of the fibers is of no concern. Either fiber can be placed on the left or right side of the S179+.
- When setting loose tube fiber, aim to clamp the fiber part by the inside clamp of the holder lid and to clamp the tube part by the outside clamp of the holder lid. When performing the tension test, enough force might not be applied for the loose tube fiber.

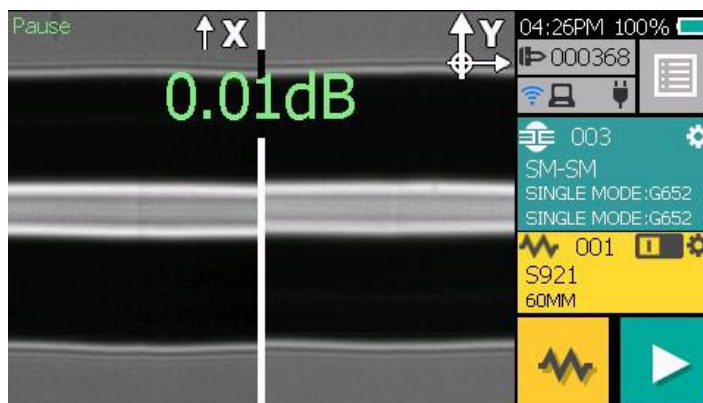




WARNING

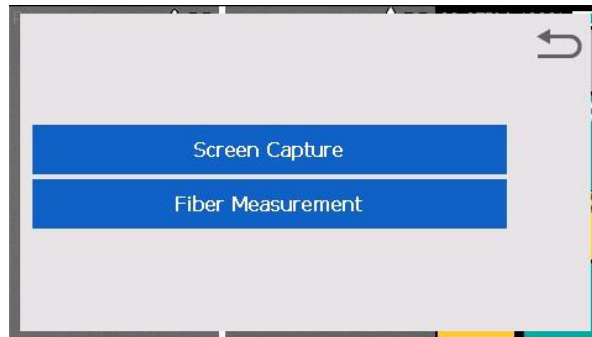
When placing fibers on V-grooves, take care not to break them by hitting them against the V-groove or other parts of the splicer. Broken fiber may get into your eyes.

6.3 Fusion Splicing

1. Ensure that the "READY" screen is displayed on the monitor.
 2. Press  to initiate the fusion splicing cycle.
 3. The S179+ fusion splicer performs the following functions automatically.
To pause the S179+ fusion splicer during any of these functions, press . The message PAUSE will be displayed on the monitor. To restart the operation, press  again.
- The right and left fiber ends appear on the LCD monitor.
 - A cleaning arc is discharged to clean the fiber ends.
 - The fibers are set with a gap of about 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  .



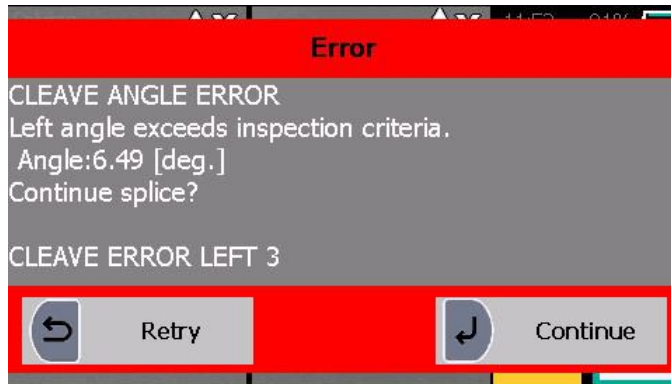
- Screen Capture: Capture the fiber image and store it.
- Fiber Measurement: Performs an auto or manual inspection of the fiber with regards to clad and core offset, relative eccentricity, gap, fiber tilt and relative cleave angle.


5. After displaying the estimation loss, the following operations are available.

- Press  to discharge an additional arc. Splice inspection and loss estimation are re-performed.
- Press  to switch the fiber view between X and Y.

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 ▼ 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.



	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.
Thickening	Degradation of electrodes	Replace the electrodes.
	Excessive fiber feed	Adjust the fiber feed amount.
	Excessive arc current	Perform an arc check to adjust arc power.
	Wrong Fusion Program selected	Select the correct Fusion Program, and repeat fusion splicing.
Streak	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.

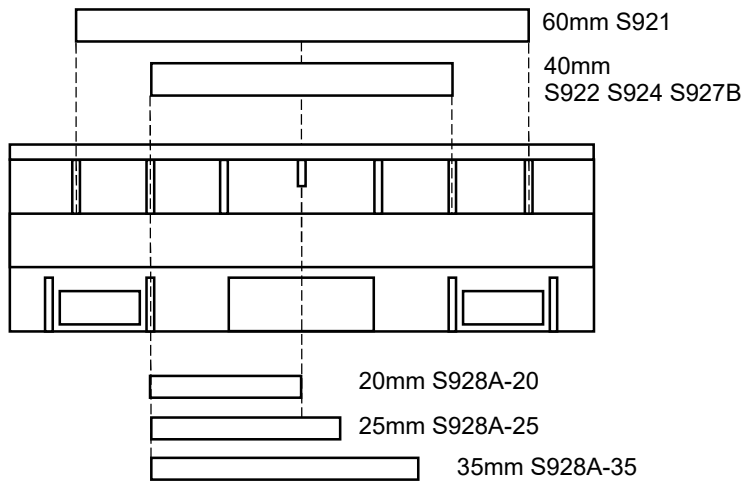


CAUTION


Do not attempt to load fibers while the S179+ 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.




i 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  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.

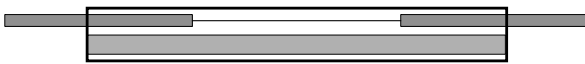
Type	Icon	Content
Heater Status		Ready Mode
		Heating Mode
		Cooling Mode
		Error Occurring

- To stop the heating operation (when the HEAT LED is lit), press . 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.

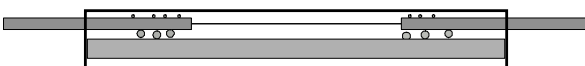
 During the heating cycle, do not open the heater clamp or lid. This may cause a shrinking error.

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

normal heating

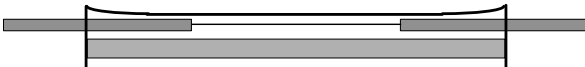


excessive heating



Decrease the heating temperature.

insufficient heating



Extend the heating time.



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 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.

6.3.4 Splice On Connector

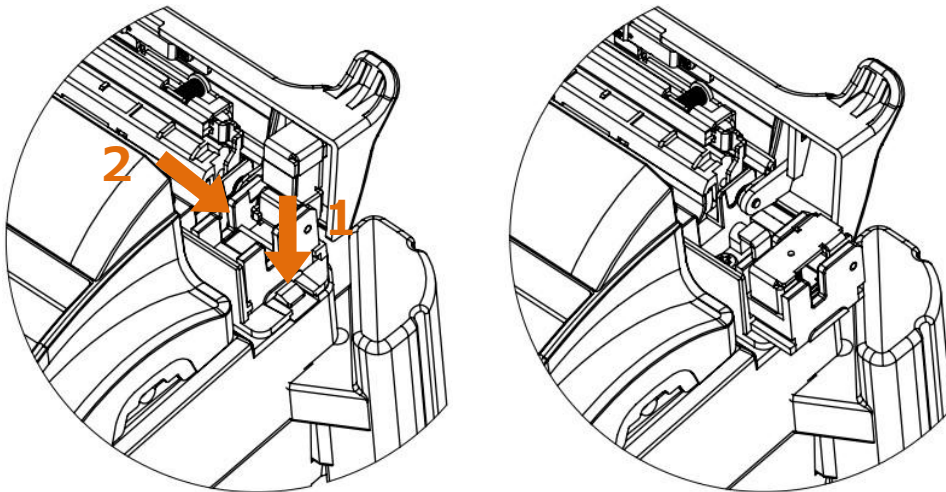
The heater of the S179+ supports “Splice On Connector (SOC)”.

The right side clamp must be replaced with the SOC clamp (HBS-01) before using SOC. The SOC clamp is an optional accessory.

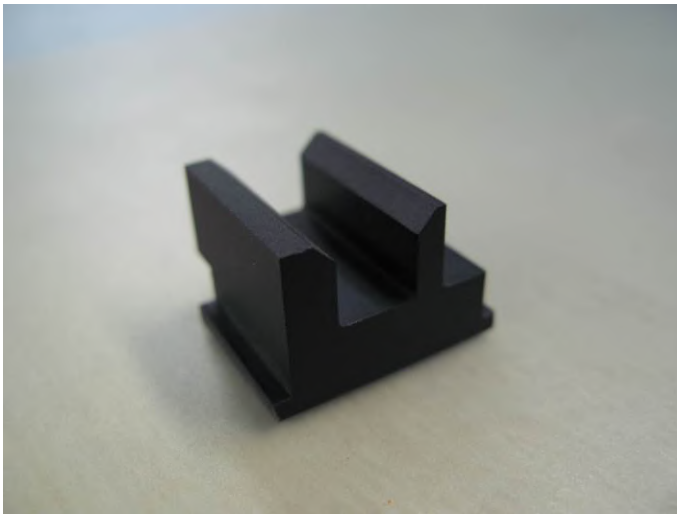
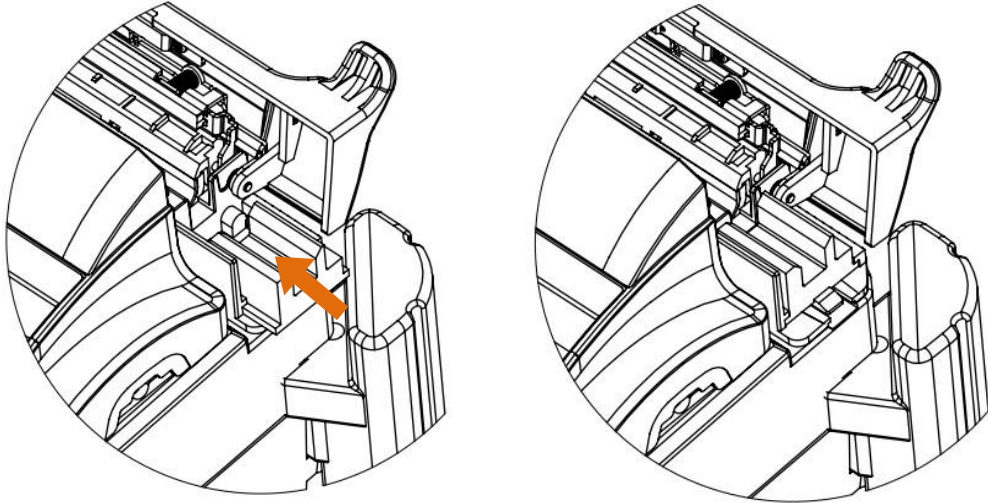


How to remove the clamp:

Please slide the clamp from heater block while pressing the catch.



Please ensure you insert the SOC clamp in the correct direction, as shown in the picture below. Push the SOC clamp until the catch engages.




Optional accessory HBS-01: Heater Clamp Base for SOC

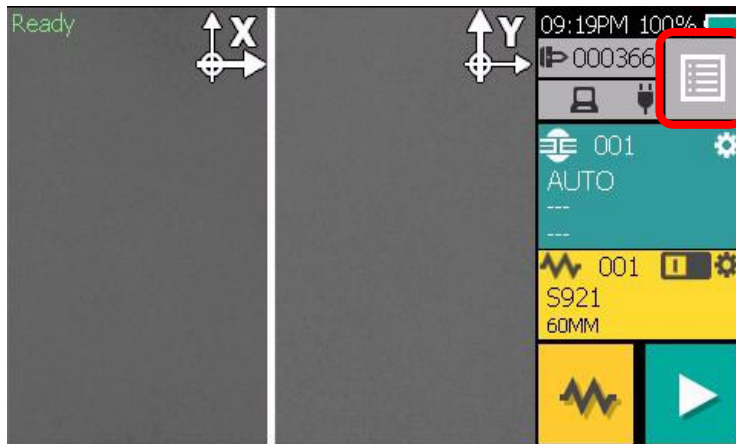
Do not operate the heater for shrinking sleeve without the heater clamp.


7. Programming Guide

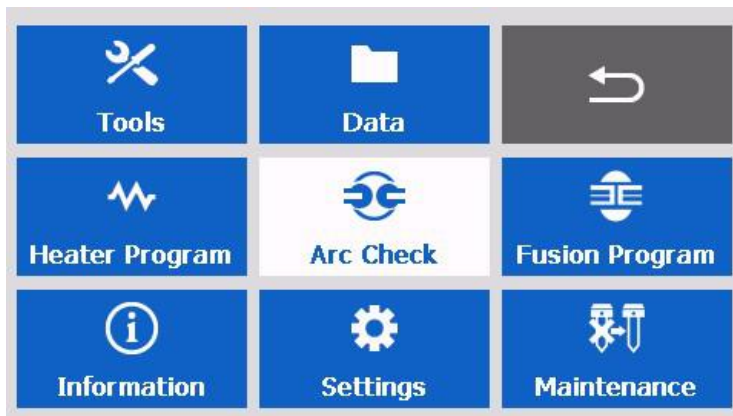
7.1 Menu

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



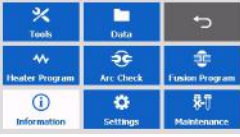

1. Press  key or menu icon to access the menu screen. The menu icon is available in the ready screen.







2. Menu screen is displayed as shown in below. Press  to return to the previous screen.



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

Menu	Features	Contents
 <p>Tools</p>	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.
 <p>Heater Program</p>	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.
 <p>Information</p>	Machine	Machine's manufacturer S/N, software version.
	Sensor	Display temperature and atmospheric pressure.
	Counter	Arc counter, splice counter.
 <p>Data</p>	Splice History	Previous splice data.
	Arc Check History	Previous arc check data.
	Captured Image	Manually capture fiber image.
	Failure History	Splicing data failure history.

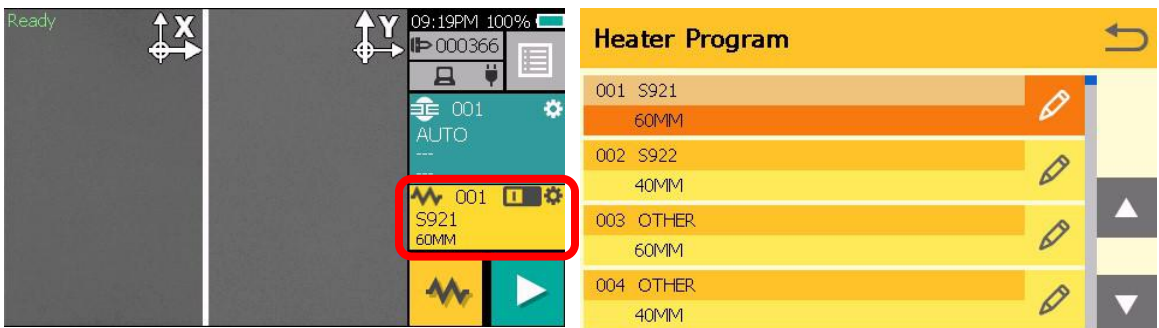
Menu	Features	Contents
 <p>Arc Check</p>	Perform arc check	Check arc intensity and automatically optimize to a proper level. See "Arc Check, Getting Started".
 <p>Settings</p>	Set up parameters	Set up default language, sleep function, splicing start pattern, etc.
 <p>Fusion program</p>	Show fusion program 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.
 <p>Maintenance</p>	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 Programming Function

To start a program, the user needs to access each function through the program selection screen. Tap the program area on the touchscreen, or select “Fusion Program / Heater Program” in the menu screen.



Fusion Program





Heater Program

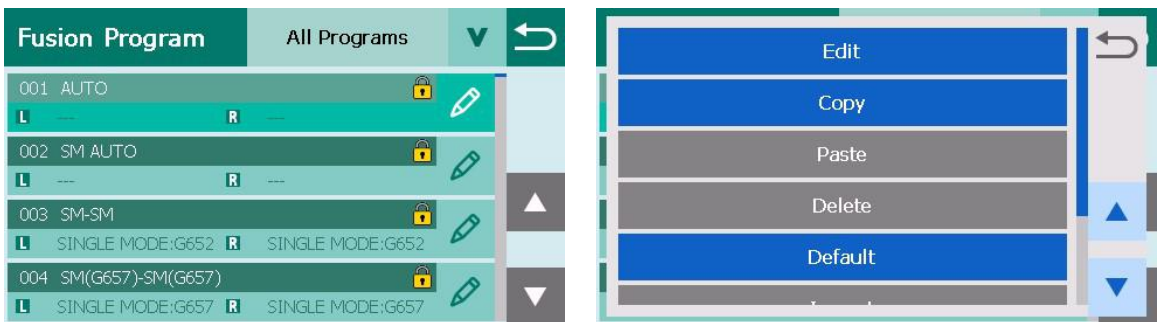
7.3 Program Edit

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.

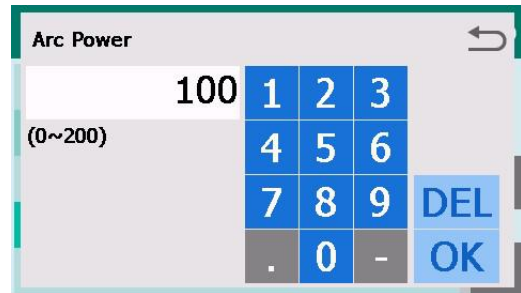
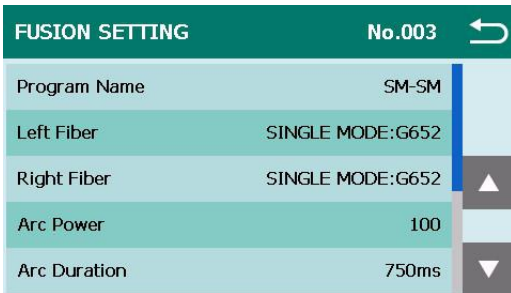
- Edit: Modify parameters.
- Copy: Copy the program data.
- Paste: Paste the program data.
- Delete: Erase the program from the program list.
- Default: Return the parameters to default value.
- Import: Load the program data from the external memory.
- Export: Save the program data to the external memory.
- Compare: Compare the parameters between 2 programs.



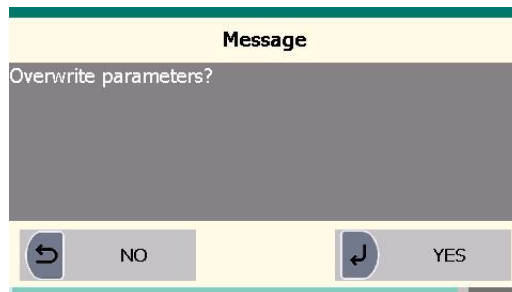
Pre-installed fusion program is protected, it cannot edit or delete. To edit pre-installed fusion program, copy the program to another program, and edit it.

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.

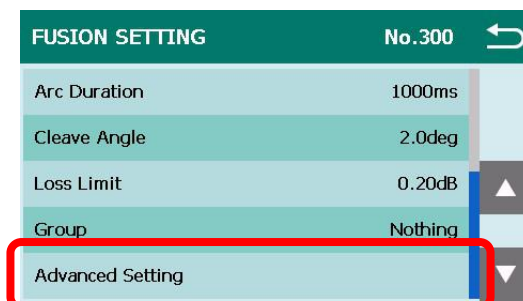


4. Press "OK" button or ↵ key.
5. Press ↵ button after editing a parameter.
6. The pop-up menu will show up and ask to overwrite.






7.3.2 Advanced Setting

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



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

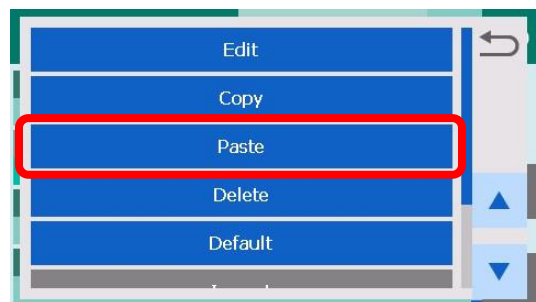
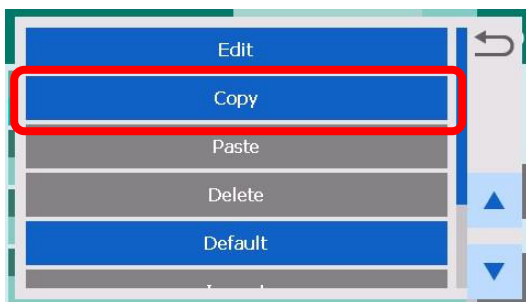
Advanced Setting		No.300	↩
1st Arc Start Power	100		
1st Arc End Power	100		
1st Arc Duration	1000ms		▲
2nd Arc Start Power	0		
2nd Arc End Power	0		▼

	Press  : Move to previous page.
	Press  : Move to next page.

7.3.3 Copy & Paste



Follow the procedures shown below to copy the selected program.

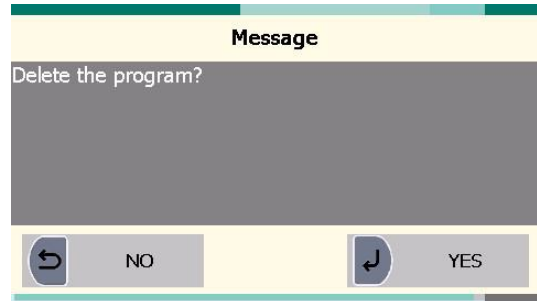
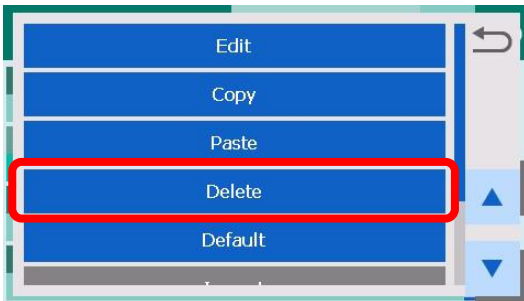
1. Select "Copy" in the pop-up menu.
2. Select a new destination for the program.
3. Select "Paste" in the pop-up menu. You cannot paste into the protected program.




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.

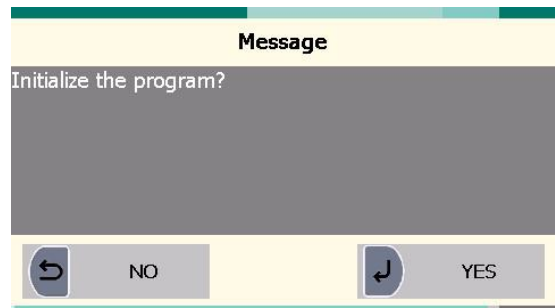
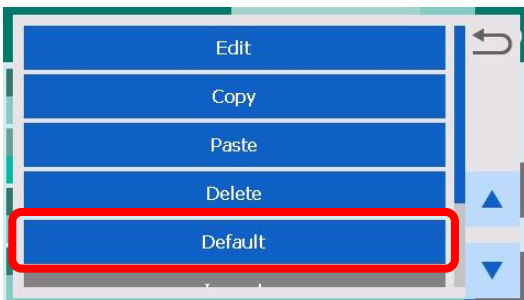


 If the current program is deleted, No.001 program will be selected.

7.3.5 Default



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

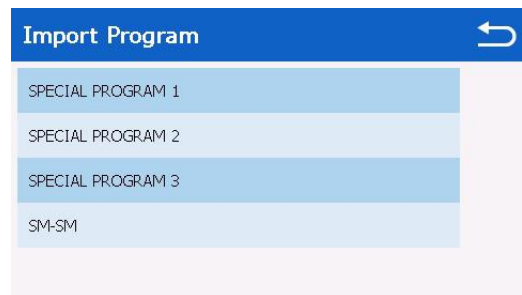
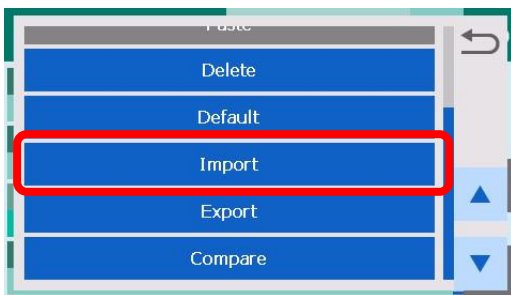
1. Select "Default" in pop-up menu
2. Select "Yes" or press  key to default parameters. Otherwise select "No" or press  key to cancel the operation.



7.3.6 Import


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

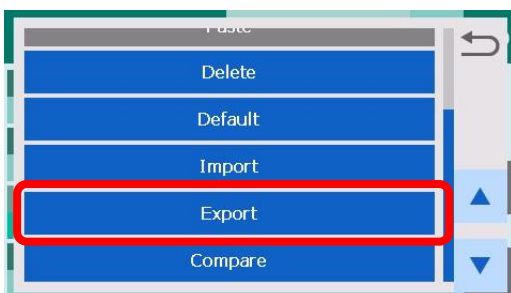
1. Open the battery cover.
2. Connect the storage device into USB A connector.
3. Select "Import" in the pop-up menu.
4. Select the program to import, and touch "YES" or press  key.
5. After import, touch "Continue" or press  key.



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 S179+ splicer.

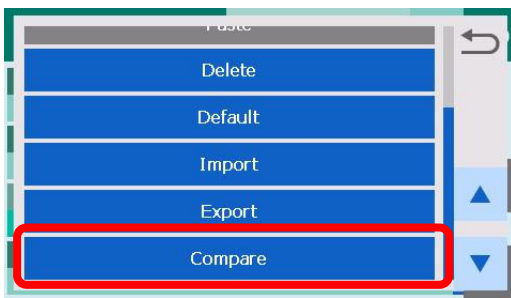
1. Open the battery cover.
2. Connect the storage device into USB A connector.
3. Select "Export" in the pop-up menu.
4. After export, touch "Continue" or press  key.



7.3.8 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.



FUSION SETTING COMPARE		
Program No	003	005
1st Arc Start Power	100	100
1st Arc End Power	100	100
1st Arc Duration	750ms	3000ms
2nd Arc Start Power	0	0

7.3.9 Parameter Table

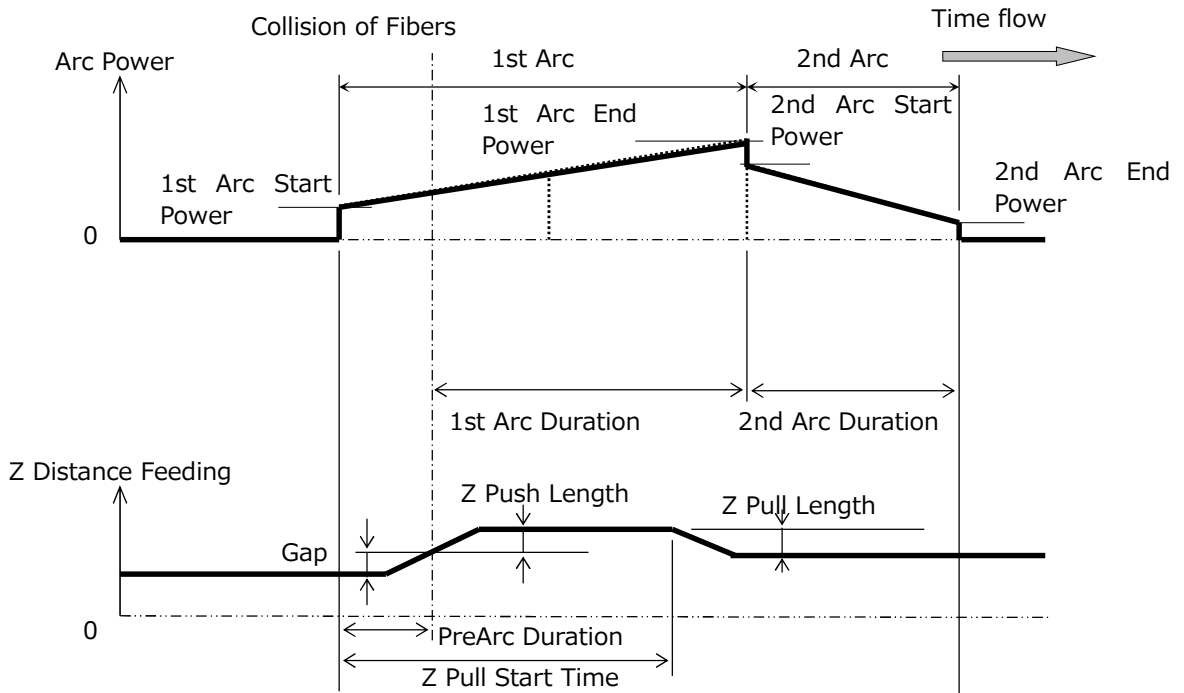
Parameter Table for Splice 1

Parameter Name	Unit	Description
1 st Arc Start Power	-	Starting arc power of 1 st arc discharge.
1 st Arc End Power	-	Ending arc power of 1 st arc discharge.
1 st Arc Duration	ms	Arc duration of 1st arc.
2 nd Arc Start Power	-	Starting arc power of 2 nd arc discharge.
2 nd Arc End Power	-	Ending arc power of 2 nd arc discharge.
2 nd Arc Duration	ms	Arc duration of 2 nd arc.
Cleaning Offset	-	Additional arc power for cleaning purposes.
Cleaning Duration	ms	Arc duration for cleaning.
Pre Arc Duration	ms	Time between arc starting and fibers first butting.
Gap	µm	Gap for the final alignment position before splicing.

Parameter Table for Splice 2

Parameter Name	Unit	Description
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 2 nd arc discharge.
Pulse OFF Time	ms	OFF duration of pulse arc discharge in 2 nd 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 0: Core 1: Clad
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 Power	-	Power of additional arc.
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.
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.
Reset Position Offset	μm	Right fiber offset distance. (For SOC)

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 - 100	+	+	+
Arc Power -100 ^{*1}	0	+	+
Eccentric Compensation	0	+(eccentric core fiber) 0(concentric core fiber)	0
Re Arc Power -100 ^{*1}	0	0	+
Pressure Compensation ^{*2}	+	+	+
Power Compensation ^{*2}	0	+	0
Clad Diameter Compensation	0	+	+

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.

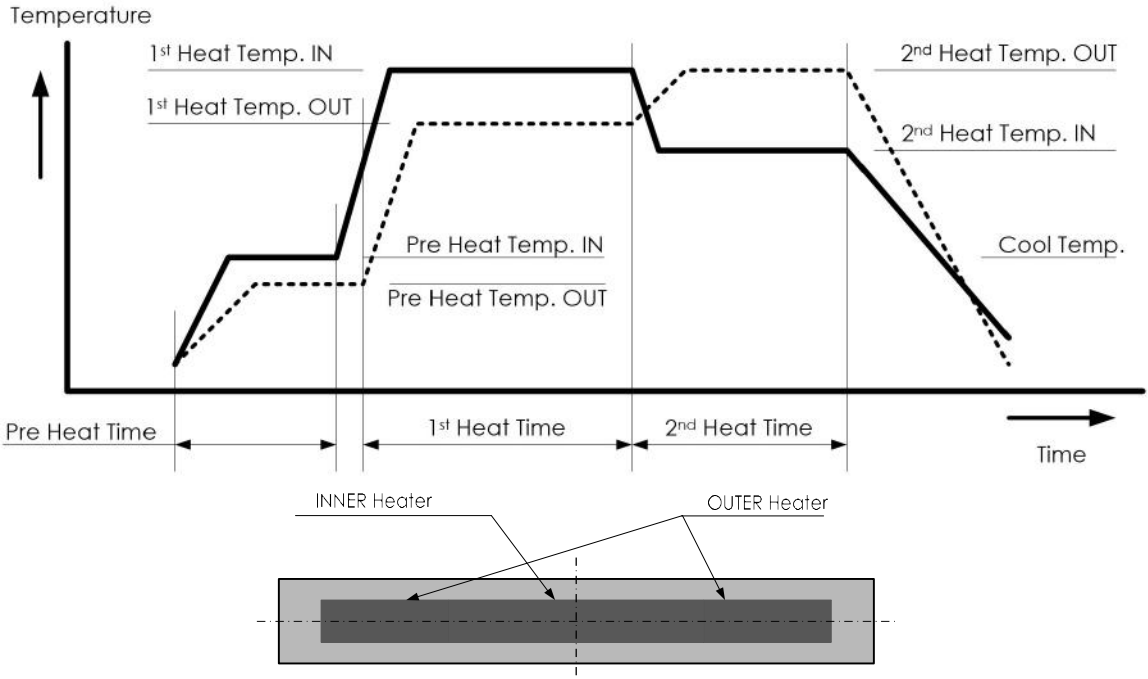
*2 Possible to change to "Active" or "Cancel" in "Setting". Added when set to "Active".

Parameter Table for Heater Program

Parameter	Unit	Description
1 st Heat Temp IN	°C	Temperature of INNER heater for the first half.
1 st Heat Temp OUT	°C	Temperature of OUTER heater for the first half.
1 st Heat Duration	sec	Operation time of the first half.
2 nd Heat Temp IN	°C	Temperature of INNER heater for The latter half.
2 nd Heat Temp OUT	°C	Temperature of OUTER heater for The latter half.
2 nd Heat Duration	sec	Heating time after 1 st 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.*
Quick Heating	-	Setting for sleeve pressing function. OFF : Sleeve not pressed (Normal Mode). ON : Sleeve pressed (Quick Mode).

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


Time chart of heater parameters





7.4 Tool Menu

This menu provides multiple utility functions.


7.4.1 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 S179+ 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 S179+ 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.
---	---

7.4.2 Fiber Measurement

The S179 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 (%).

7.4.3 Manual Splice

Manual splice enables the entire splicing process to be operated manually using the keypad.

1. Select “Manual Splice” in the maintenance menu.
2. Select the preferred operating mode. Load fibers before selecting “Auto Feeding”.
 - Manual: All operations are done manually following the procedures.
 - Semi Auto: Fibers are automatically fed and stopped at pre-splice position.



3. The fibers are fed to the pre-splice position (if “Semi Auto” is selected).
4. The left window shows the fiber image, and the right window displays the motion control commands.
5. Select the motion control command by pressing  or  key.
6. Press  to change the value when pressing  key.
7. Press  to return to the previous screen.

Command	Item	Description
Position	(value)	Current pulse position of the selected motor
Motor	Z_L	Activate left fiber feeding
	Z_R	Activate right fiber feeding
	FCS_X	Activate X-axis camera focusing
	FCS_Y	Activate Y-axis camera focusing
	ALN_X	Activate X-axis aligning
	ALN_Y	Activate Y-axis aligning
Speed	High	Select high speed motor movement
	Low	Select low speed motor movement
Distance	Free	Drive the motor step by step by pressing ▲▼key.
	(Value) [μm]	Motor moves based on pre-set value. Selections from: Z: 5/50/500 FCS: 0.5/5.0/50.0 ALN: 0.1/1.0/20.0
Arc	Clean	Cleaning arc
	Arc	Fusion splice arc
	Add	Additional arc
Zoom	x1	Display image in x1 size
	x2.5	Display image in x2.5 size
	x5	Display image in x5 size
Camera	X	Display X-axis image
	Y	Display Y-axis image
Reset	Z/FCS/ALN	Reset the selected motor
	All	Reset all the motors



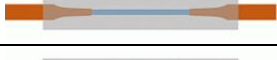

7.4.4 Screen Capture

The S179+ allows the user to store and view fiber images. The stored images can be seen in the data management menu.

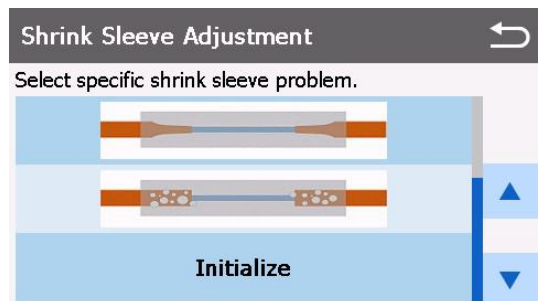
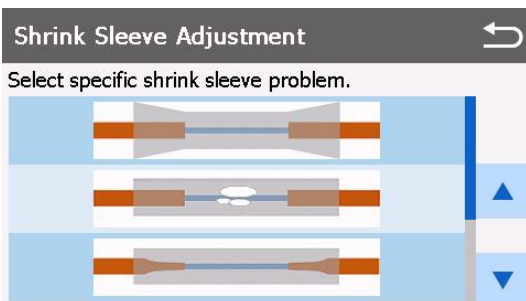
7.4.5 Shrink Sleeve Adjustment

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	

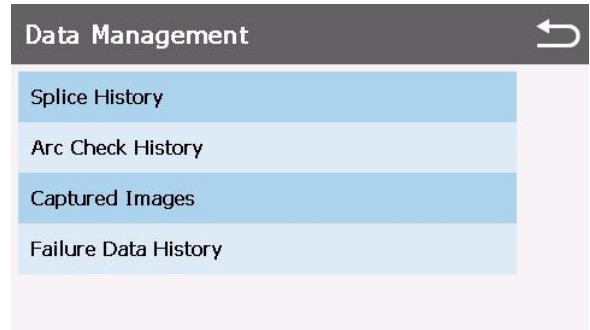
3. The heating condition is adjusted so that the shrinking condition for the sleeve becomes better.
4. If the adjustment is insufficient, repeat the above operation.




7.5 Data Management Menu

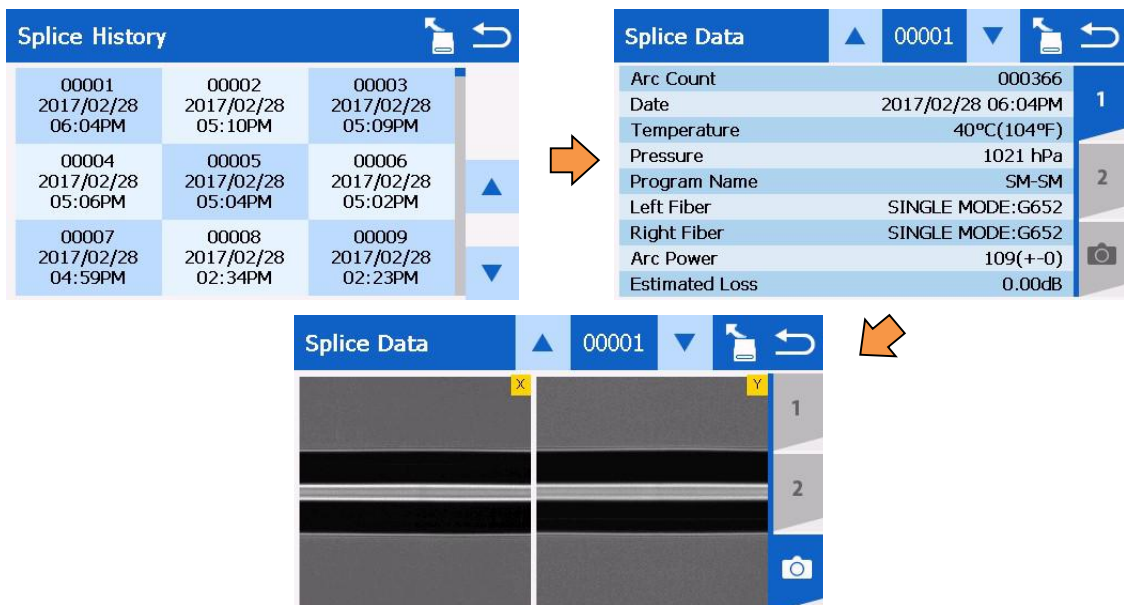
By selecting “Data Management” in the Menu screen, the user can access the detailed splice data, arc check history and archived images.

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

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.



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	Temperature when the splice was performed.
Pressure	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.
Arc Power	Value of the power of the electric discharge.
Estimated Loss	Estimated splice loss.
Gap	Gap length before splicing.
Left Angle	Cleave angle of the left fiber.
Right Angle	Cleave angle of the right fiber.
Relative Angle	Relative cleave angle between left and right fibers.
Result	Error codes and additional arc. 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. Add: Additional arc was applied.

The splice data can be exported to the external storage. After connecting the storage, touch the icon or press  key.

Splice History		
00001 2017/02/28 06:04PM	00002 2017/02/28 05:10PM	00003 2017/02/28 05:09PM
00004 2017/02/28 05:06PM	00005 2017/02/28 05:04PM	00006 2017/02/28 05:02PM
00007 2017/02/28 04:59PM	00008 2017/02/28 02:34PM	00009 2017/02/28 02:23PM

Splice Data		00001
Arc Count		000366
Date		2017/02/28 06:04PM
Temperature		40°C(104°F)
Pressure		1021 hPa
Program Name		SM-SM
Left Fiber		SINGLE MODE:G652
Right Fiber		SINGLE MODE:G652
Arc Power		109(+ -0)
Estimated Loss		0.00dB

7.5.2 Arc Check History


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  to display the detailed data of each fiber as follows.

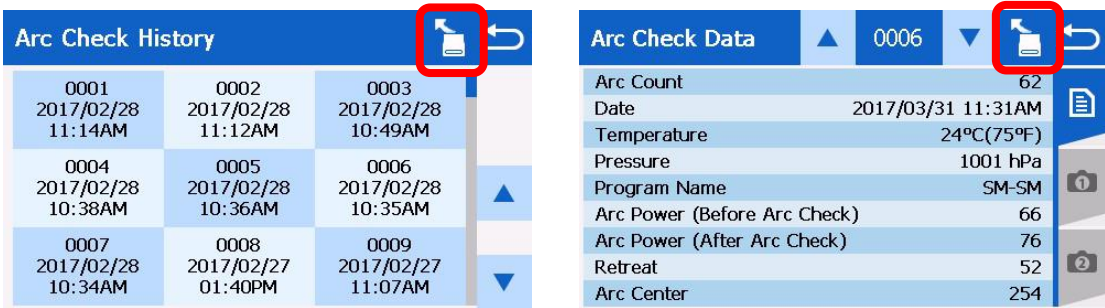
Arc Check History			Arc Check Data	
0001 2017/02/28 11:14AM	0002 2017/02/28 11:12AM	0003 2017/02/28 10:49AM	0006	
0004 2017/02/28 10:38AM	0005 2017/02/28 10:36AM	0006 2017/02/28 10:35AM		
0007 2017/02/28 10:34AM	0008 2017/02/27 01:40PM	0009 2017/02/27 11:07AM		

Arc Count	62
Date	2017/03/31 11:31AM
Temperature	24°C(75°F)
Pressure	1001 hPa
Program Name	SM-SM
Arc Power (Before Arc Check)	66
Arc Power (After Arc Check)	76
Retreat	52
Arc Center	254

Parameter Table for Arc Check History

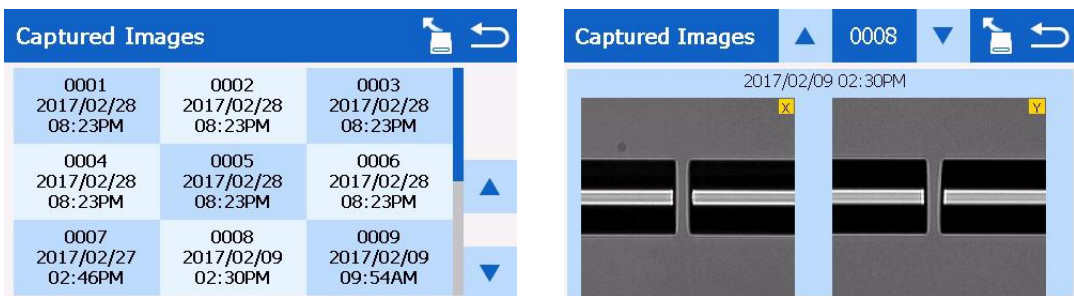
Data Title	Description
Arc Count	Arc count when arc check was performed.
Date	Date and time for the arc check performed.
Temperature	Temperature when arc check was performed.
Pressure	Pressure when arc check was performed.
Program Name	Name of fusion program.
Arc Power (Before Arc Check)	Value of arc 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.


The arc check data can be exported to an external storage. After attaching the storage, touch the icon or press  key.




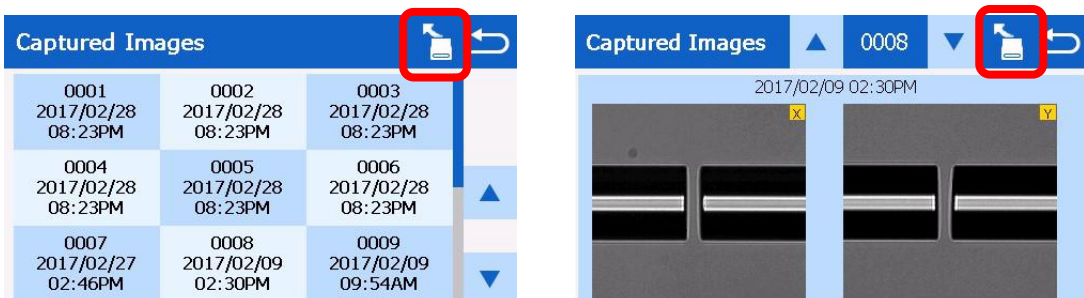
7.5.3 Captured Image

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.



The fiber image can be zoomed by touching the image or pressing the  key.

The image data can be exported to the external storage. After attaching the storage, touch the icon or press  key.





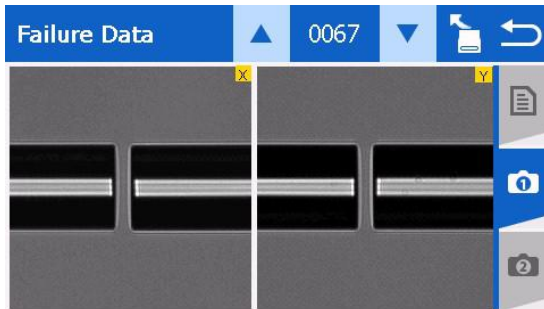
7.5.4 Failure Data History

1. The failure list is shown on the same screen as the splice data.
2. Select a time period to display detail of the failures as shown in the picture.

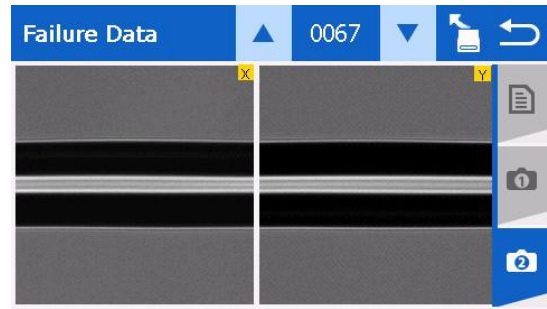
Failure Data History		
0001 2017/02/28 05:06PM	0002 2017/02/28 05:01PM	0003 2017/02/28 04:38PM
0004 2017/02/28 02:02PM	0005 2017/02/28 11:22AM	0006 2017/02/28 10:38AM
0007 2017/02/27 04:36PM	0008 2017/02/27 04:35PM	0009 2017/02/27 02:28PM

Failure Data		0067
Arc Count	000004	
Date	2016/12/17 10:04PM	
Temperature/Pressure	41°C(106°F)/1016hPa	
Program Name	SM-SM	
Left Fiber	SINGLE MODE:G652	
Right Fiber	SINGLE MODE:G652	
Error Code	SPlicing DEFECTS(L)2	
Error Info.	0.28[dB]	
Firmware Version	1.0.4	


Touching tab or pressing  or  key will display the image before splicing and the image after splicing.



(1) Image before splice



(2) Image after splice

The failure data can be exported to the external storage. After attaching the storage, touch the icon or press  key.

Failure Data History		
0001 2017/02/28 05:06PM	0002 2017/02/28 05:01PM	0003 2017/02/28 04:38PM
0004 2017/02/28 02:02PM	0005 2017/02/28 11:22AM	0006 2017/02/28 10:38AM
0007 2017/02/27 04:36PM	0008 2017/02/27 04:35PM	0009 2017/02/27 02:28PM

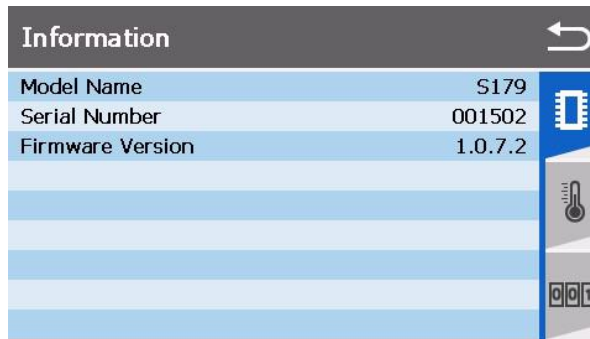
Failure Data		0067
Arc Count	000004	
Date	2016/12/17 10:04PM	
Temperature/Pressure	41°C(106°F)/1016hPa	
Program Name	SM-SM	
Left Fiber	SINGLE MODE:G652	
Right Fiber	SINGLE MODE:G652	
Error Code	SPlicing DEFECTS(L)2	
Error Info.	0.28[dB]	
Firmware Version	1.0.4	

7.6 Information Menu

In this menu, various machine information is shown.



7.6.1 Machine Information

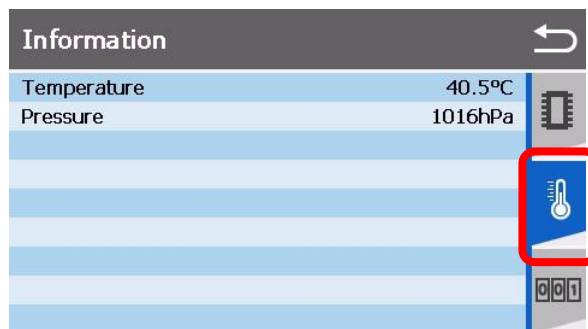
Machine-specific information such as serial numbers and version information is displayed.




7.6.2 Environment Information

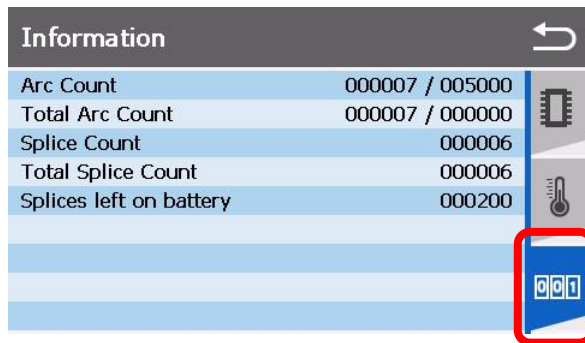
The S179+ allows the user to view environmental conditions.

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  to return to the previous screen.



7.6.3 Counter Information

Touch the counter symbol or press  key twice.



Information	
Arc Count	000007 / 005000
Total Arc Count	000007 / 000000
Splice Count	000006
Total Splice Count	000006
Splices left on battery	000200

- 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.

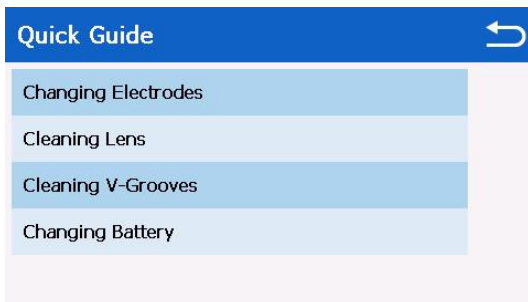
7.7 Maintenance Menu

This menu provides various kinds of maintenance functions.

7.7.1 Quick Guide

The S179+ 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
 - Charging Battery
 - Attaching Wi-Fi Dongle
 - 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 S179+ 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 S179+ 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 ▲▼ to switch the pages.



7.7.4 Initialize

- Factory Reset

Restore to the factory setting.

- Clear History Data

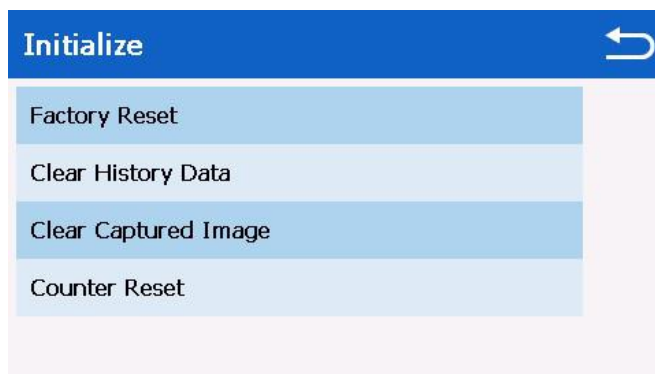
Delete the entire history of splices, arc checks and failures.

- 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.

7.8 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.

	Press  : Move to previous page. Press  : Move to next page.
	The following key can be used to select YES / NO. Press  : YES. Press  : NO.

7.8.1 Parameters

The following functions are available in Settings.

Parameter Setting Items 1

Setting Item		Contents	
Easy Setup		Set the recommended parameters (simple format)	
Common Arc Power		Set common arc power.	
Stepping Action		Set splice operation mode.	
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.	
Language		Select the display language.	
Data Output	Before Splice	Cleave Angle	Select the parameter to be displayed before splice.
		Clad Offset	
		Core Offset	
		Gap	
		Arc Information	
	After Splice	Cleave Angle	Select the parameter to be displayed after splice.
		Clad Offset	
		Core Offset	
		Estimated Loss	
		Detailed Information	
Arc Check		Select the display mode in the arc check.	

Parameter Setting Items 2

Setting Item		Contents
Auto Start	Auto Start for Fusion	Select start mode of fusion splice.
	Auto Start for Heater	Select start mode of heater.
Tension Test		Activate the tension test function.
Auto Compensation	Arc Power Compensation	Set the arc power compensation.
	Position Compensation	Set the position compensation of the arc.
Security	Password Lock	Set the password lock function.
	Password	Set the password.
Date and Time	Year	Set the date and time.
	Month	
	Day	
	Hour	
	Minute	
	Second	
	Date Format	Select the date format.
	24 Hour Format	Select the time format.
Work Light	Upper Light	Switch the upper light.
	Lower Light	Switch the lower light.
	Label Light	Switch the label 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.

Setting Items of Parameter 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.
Wi-Fi Setup	Wi-Fi Enable	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.
Eco Charge		Select the charging mode for the battery.
Ignore Error		Select the operation at the error.

7.8.2 Easy Setup

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

Fusion Program: No.001 AUTO

Auto start for Fusion: Full Auto

Auto start for Heater: Active

Stepping Action: Full Auto



Tension Test: ON

7.8.3 Common Arc Power

Any value from 0 to 255. This value affects all fusion programs.

7.8.4 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)

7.8.5 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.

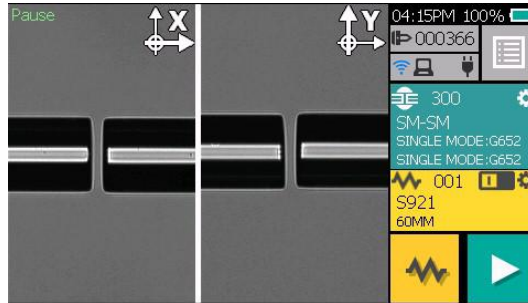
- Auto Shutdown Time

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

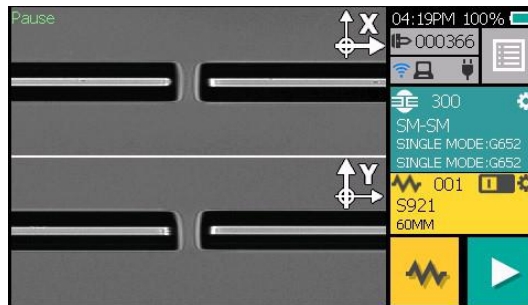
- Screen Style

Select the screen style from the following options:

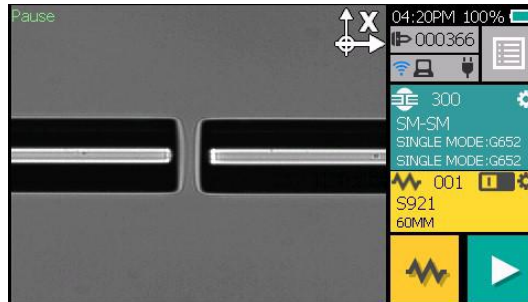
Dual (vertical)



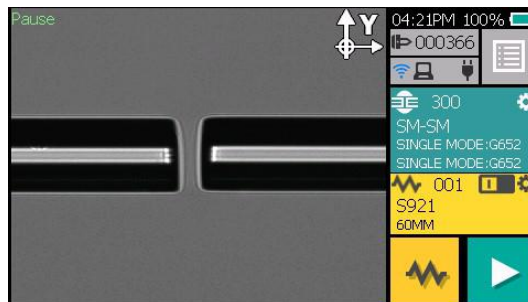
Dual (horizontal)



Single X



Single Y



- Reverse Monitor

Select the direction of LCD screen.

- Touchscreen

Disable the touchscreen.

- Camera Sleep

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

7.8.6 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.

7.8.7 Language

Select the display language.



7.8.8 Data Output

Select display mode (display or hide) inspection data.

Before Splice	Cleave Angle [degree] Clad Offset [μm] Core Offset [μm] Gap [μm] Arc Information [Arc Power]
After Splice	Cleave Angle [degree] Clad Offset [μm] Core Offset [μm] Estimated Loss [dB]
Arc Check	Result of arc check

7.8.9 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 the start 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 heating key 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.

7.8.10 Tension Test

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.

7.8.11 Auto Compensation

- Arc Power Compensation

The arc discharge power is corrected by the image of arc discharge.

- Position Compensation

The center of the arc discharge is corrected automatically.

The S179+ has an automatic arc compensation function. However, due to some factors, such as the poor preparation of the spliced fiber, and some environmental factors, it may not always be fully functional. Therefore it is recommended to perform a manual arc check whenever the estimated and actual loss results become unsatisfactory. Please refer to the arc check section of this manual.

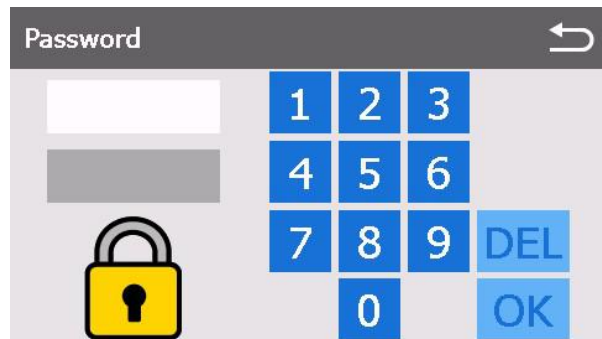
7.8.12 Security

- Password Lock

Lock S179+ 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.



7.8.13 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)

7.8.14 Work Light

- Upper Light

Adjust the brightness of the upper 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).

- Lower Light

Adjust the brightness of the lower work light. The light illuminates the fiber from inside the machine. To increase the light brightness, increase the value. (i.e. 0 is set the light turned off.

- Label Light

Turn on/off the label light (blue LED) in the center of windshield.

7.8.15 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.

7.8.16 Group Name

Edit the group name of the fusion program.

7.8.17 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.

7.8.18 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

7.8.19 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.

7.8.20 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.

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
CleaveError (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 (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.
FocusMotorError	Defect in the image processing system.	Contact service center.
AlignMotorError		
FiberSettingError	Fibers are too close.	Load the fiber at the proper position.
LowBattery	Battery has no power remaining.	See "Recharging Battery".
SPLICE DEFECTS	See "Splicing Defects, Fusion Splicing".	
FocusingError (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
VisualError (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.
SpecOutFiber (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 S179+.
CameraPositionError	The position of the built-in camera has been changed by a strong impact.	Contact service center.
AligningError	Defect in the image processing system.	Contact service center.
	The optics are dirty.	See maintenance chapter.
FiberAxisError	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
MFDMissError	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

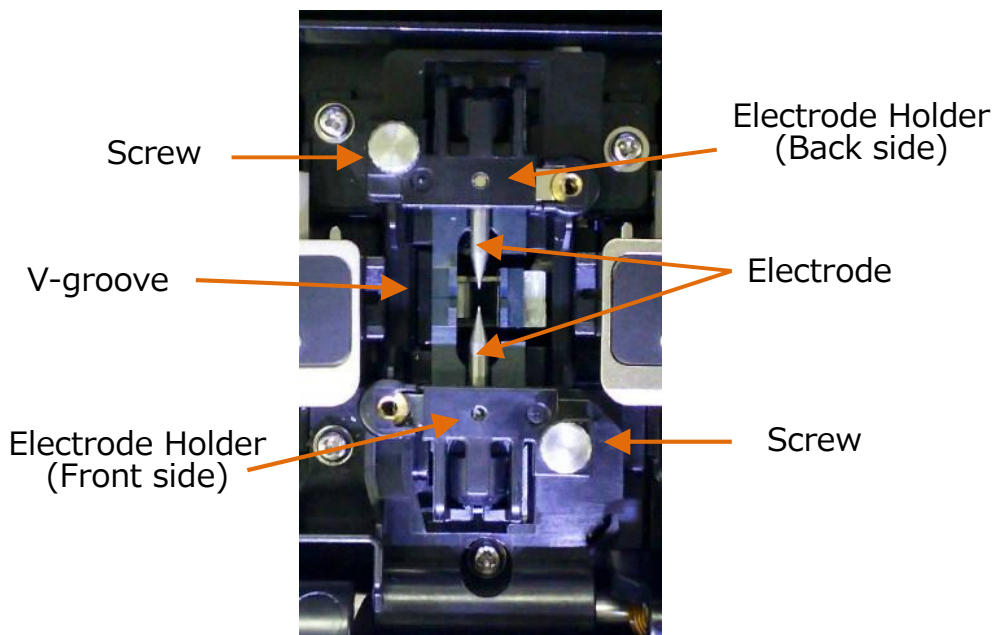
Inspect the electrodes for dirt, wear and damage before using the S179+. Dust and other particles can be cleaned off by removing the electrodes from the splicing machine and polishing the surface of each electrode with the electrode sharpener. Over the course of normal operation, the electrodes can be 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 S179+ automatically displays a message to prompt replacing the electrodes at when powered on (when The Counter Alarm is ON). The S179+ 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.

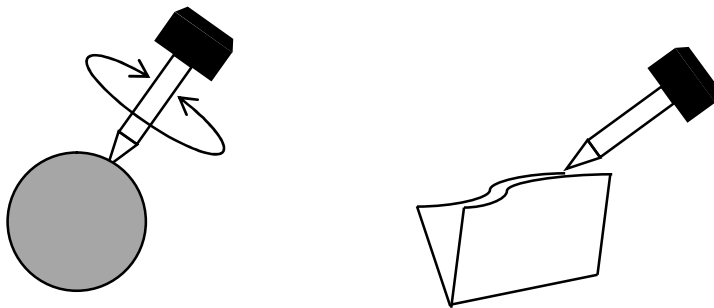
- Always replace or clean both electrodes, even if only one electrode is damaged.

- 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.



Attach the electrode holder in order from the front side to the back side. If you do not do that, the fiber position might slide.

- 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.

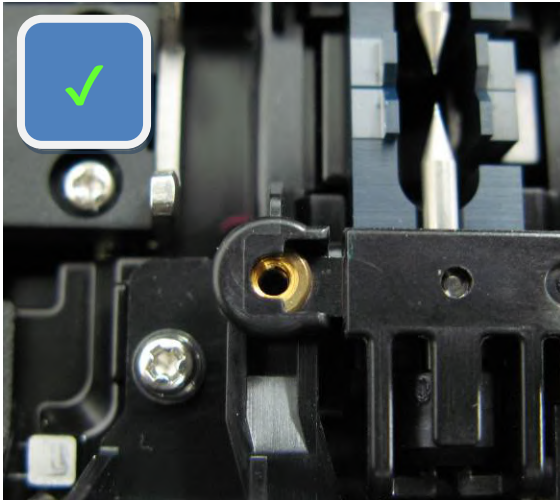


< Attention >

- You can use all faces of the electrode sharpener.
 - Extreme treatment distorts the electrode tip and can possibly move the knob position.
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 ARC at least five (5) times to burn off any residue remaining on the electrodes.

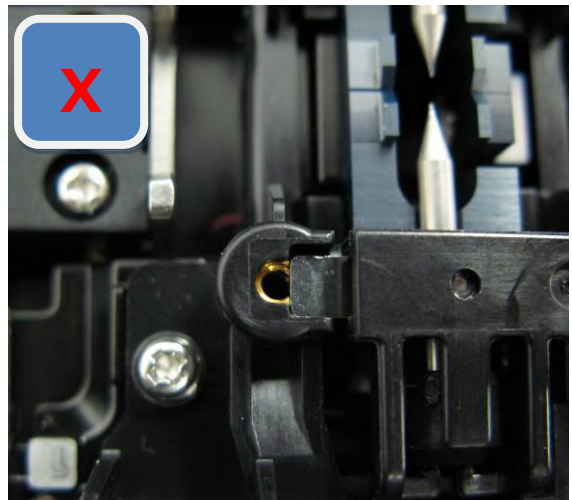
Instructions for replacing the electrodes

- Insert the silver plate into the slot in the brass nut.
- Tighten screw on right side.



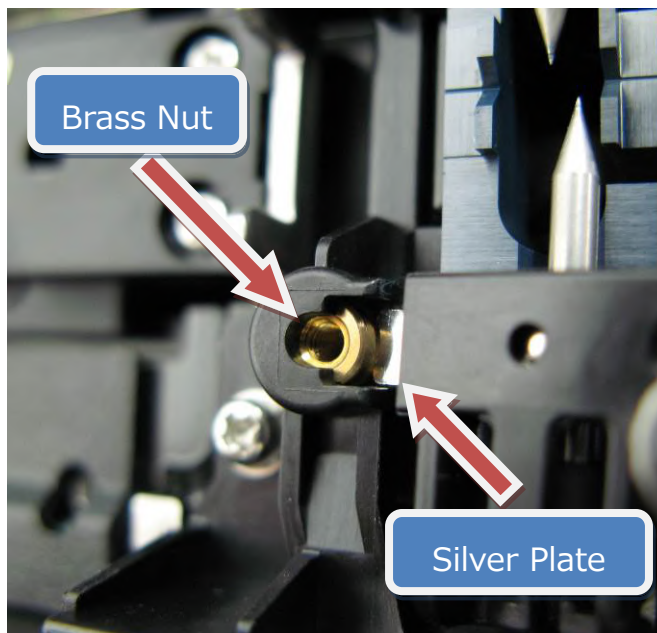
Correct

Upside nut, downside plate



Wrong

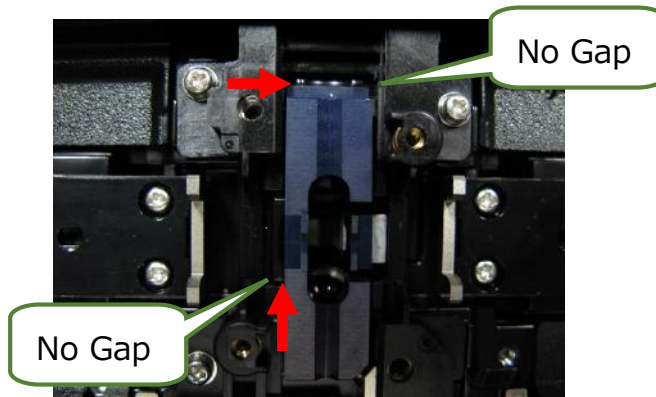
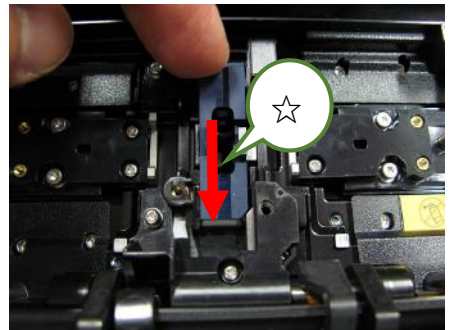
Downside nut, upside plate



Insert silver plate into brass nut

8.2.3 Remove and Reattach the V-groove

1. After removing the electrodes, lightly push in the direction of the arrow(☆) in the right figure, the V-groove can be easily removed.
2. When attaching the V-groove again, insert the direction of the arrow(☆) first and set so that there is no gap between the back side wall and the left side wall.



3. Finally, attach the electrodes according to the above procedure.

8.2.4 Cleaning the objective lens

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.

8.2.5 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.

8.2.6 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.



CAUTION

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





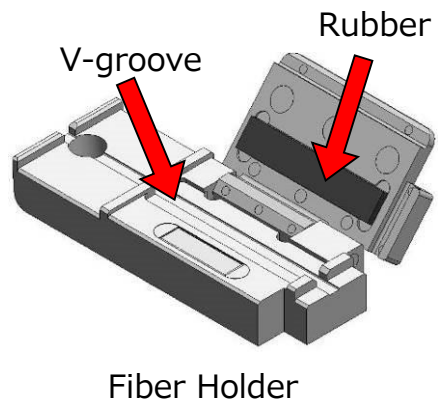
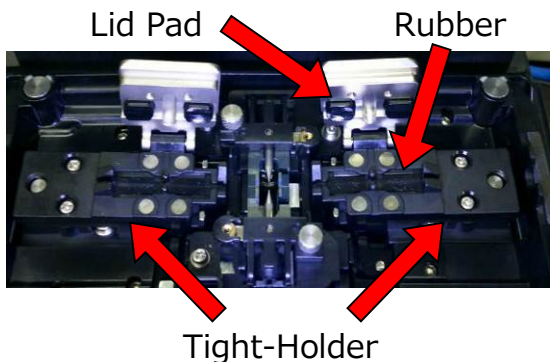
CAUTION

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.



8.2.7 Cleaning the Tight-holder and 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.



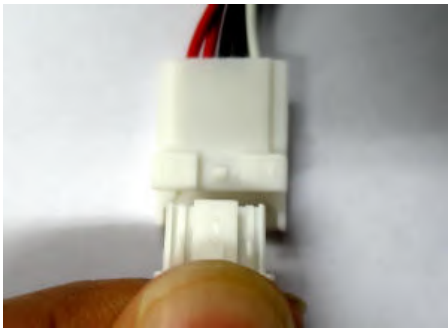
8.3 Removing the Battery



1. Loosen the screws of the battery cover, and remove the battery cover.



2. Pull out the battery connector.



3. Remove the connector while pressing the latch.



4. Pull the battery straight in the battery slot of fusion splicer.

8.3.1 Installing the Battery

How to attach the battery is the opposite of the removal procedure.




CAUTION

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

8.4 Backup Battery

The S179+ 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.

8.5 Storing and Shipping

To maintain optimum operating reliability, do not store the S179+ fusion splicer in locations where the temperature falls below -40°C or rises above $+60^{\circ}\text{C}$. 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 S179+ fusion splicer is shipped.

8.6 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 S179+ 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 S179+ fusion splicer or component while a claim against the carrier is being processed.

8.7 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 S179+ fusion splicer, the RMA number, and an itemized statement of claimed defects must be included with the return material. Never ship the S179+ 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 S179+ fusion splicer and, if necessary, the RMA number on any accompanying documentation.

9. Optional Components

9.1 Battery Charger :S980A

S980A battery charger for charging S947A battery.



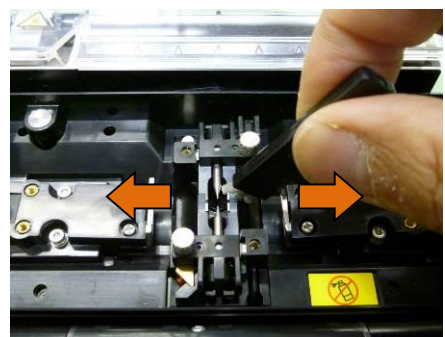
9.2 Spare Battery: S947A/S947B

Spare battery for S179+. If the number of splices is significantly reduced, replace the battery.



9.3 Cleaning Brush: VGC-01

This brush is used to remove the dust and dirt that stick to the V-groove and fiber clamp.



10. Recycling and Disposal

When you dispose of the S179+ 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.

S179+ 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 built-in battery



1. Loosen the screws, and remove the battery cover.

2. Remove 8 screws, and remove the bottom cover.



3. Remove all wiring connected to the electric board. And remove 2 screws which fix the board.

4. There is a built-in battery in the back of the board. Take off the battery from its holder.



For sales and service information,
Contact FURUKAWA ELECTRIC CO., LTD.
Or your local representative.

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Global Sales & Marketing

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