

Instruction manual

Fusion Splicer **19R+**



***Please read this instruction manual carefully
before operating the equipment.***

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

Keep this manual in a safe place.

There is a change without a previous notice.

***We are not responsible for the products which are not
purchased from our authorized distributors.***

Please consent beforehand.

The software equipped in splicer and its related documents are protected by copyright laws and international treaty provisions, and other intellectual property laws.

Copying some or all of instruction manual without notice is forbidden without explicit permission from our company. It cannot use on the Copyright Act except that it uses as an individual.

---Caution for Air Transport---

*This product contains Lithium Ion Battery.
Before shipping this product, inform the transport company that this product contains the lithium Ion battery, and follow their instructions.*

Do not remove the protector from the splicer, without first consulting an authorized distributor for instruction. Tightening the original screw without the protector present may damage mechanism inside.



Splicer stability decreases when the protector is detached.

Wireless communication function/Certification

- *The 19R+ uses a wireless communication.
When shipping from the factory, the wireless communication is set to OFF.*
 - *The wireless communication function shall be used based on the Radio Law/Telecommunication Business Act. These regulations are depended on the countries and the region.*
 - *Confirm certification of the 19R+ is in accordance with local regulations before turning the wireless communication function ON. You may be prosecuted for uncertified.*
 - *The latest status of the electromagnetic compliance certification is described in the product page on web site. Refer to “Wireless communication” section.*

If you have any questions, contact an authorized distributor.

| | |
|--|-----------|
| Safety Information | 1 |
| General information | 8 |
| Introduction | 8 |
| New function of 19R+ | 9 |
| Description of Product..... | 11 |
| Components of Splicer | 11 |
| Other Necessary Items for Splicing Operation | 13 |
| Description and Function of Splicer | 14 |
| Operation of Sheet Key | 16 |
| Basic Operation | 17 |
| Splicing work preparation | 17 |
| Power Supply | 19 |
| AC Operation | 20 |
| DC operation with external battery | 21 |
| Battery Operation | 22 |
| Turning Splicer ON/OFF | 25 |
| LCD brightness and wind protector | 26 |
| Splicer Settings Check | 27 |
| Change of the Operation Mode | 28 |
| Change of the Splice Mode | 29 |
| Change of the Heater Mode | 31 |
| Preparation of Ribbon fiber | 34 |
| Preparation of Single fiber | 39 |
| Arc Calibration | 44 |
| Splicing procedure | 46 |
| Storing splicing results | 50 |
| How to input Mode Title/Comment/Password | 50 |
| Fiber Proof Test..... | 51 |
| Heating protection sleeve..... | 51 |
| Wind-protector motion | 53 |
| Maintenance of Splicing Quality | 54 |
| Cleaning and Checking Before Splicing | 54 |
| Periodical Checking and Cleaning..... | 56 |
| Cautions were displayed | 57 |

| | |
|---|----------------|
| Splice Menu | 61 |
| Composition of Splice Menu..... | 61 |
| Splice Mode | 62 |
| Select Splice Mode | 63 |
| Splice Settings | 71 |
| Memory | 73 |
| Camera Image | 75 |
| Splice Memory Comment..... | 76 |
| Heater Menu | 77 |
| Composition of Heater Menu..... | 77 |
| Select Heater Mode | 78 |
| Tube-heating for Splice-on-connector | 82 |
| Tube-heating for Drop Cable | 82 |
| Maintenance | 83 |
| Maintenance Menu information | 83 |
| Replace Electrodes | 84 |
| Stabilize Electrodes..... | 85 |
| Clear Arc Count..... | 85 |
| Clear Cleaver Counter | 86 |
| Battery Discharge..... | 86 |
| Motor Drive | 87 |
| Diagnostic Test..... | 88 |
| Dust Check | 89 |
| Arc Calibration | 89 |
| Motor Calibration..... | 91 |
| Maintenance Info..... | 92 |
| Machine Settings..... | 93 |
| Supervisor Menu | 95 |
| Menu Lock Settings..... | 97 |
| Stripper Setting | 98 |
| Cleaver Settings..... | 100 |
| Wireless communication | 103 |
| Bluetooth Menu | 103 |
| How to check the status of Wireless connection..... | 103 |
| Built-in Instruction Manual..... | 109 |
| Guide/Promotion | 109 |

| | |
|--|-----|
| <i>Error Message List</i> | 111 |
| <i>Questions and Troubleshooting</i> | 118 |
| Power Supply | 118 |
| Splicing Operation | 119 |
| Tube-heating Operation | 120 |
| Wireless communication | 121 |
| Supervising | 121 |
| Other Functions | 122 |
| | 123 |
| <i>Guarantee and Contact Address</i> | 123 |
| Warranty | 123 |
| Contact Address | 124 |

The splicer has been designed for splicing Silica-based optical fibers for telecommunications. Do not attempt to use this machine for other applications. Fujikura Ltd. gives much consideration and regard to personal injury. Misuse of the machine may result in electric shock, fire and/or serious personal injury.

Follow all safety instructions

Read and understand all safety instructions.

Stop using it when it malfunctions

Ask our service centers for repair as soon as possible.

Instruction Manual

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

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



WARNING!

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



CAUTION!

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

Symbol means "Pay attention"



Pay attention to hot surface!

Symbol means "Must not do"



You must not disassemble!

Symbol means "Must do"



You must disconnect a plug!



WARNINGS!



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

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

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



AC adapter which be used for a splicer is only an adapter for exclusive use. Using an improper AC power source may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.



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



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



Never operate the splicer in an environment where flammable liquids or vapors exist. Risk of dangerous fire or explosion could result from the splicer's electrical arc in such an environment.



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



Do not touch the electrodes when the splicer is on and power is supplied to the unit. The electrodes generate high voltage and high temperatures that may cause a severe shock or burn.

Note Arc discharge stops when wind-protector is opened. Turn the splicer off and disconnect the AC power cord before replacing electrodes.



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



WARNINGS!

Use only proper power source.

- Proper AC power source is AC100-240V, 50-60Hz. Check the AC power source before use. Proper DC power source is DC10-12V. Improper AC or DC power source may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.
- AC generators commonly produce abnormally high AC output voltage or irregular frequencies. Measure the output AC voltage with a circuit tester before connecting the AC power cord. Such abnormally high voltage or frequency from a generator may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire. Make sure the generator is regularly checked and serviced.
- An AC adapter Protection Circuit is included in the AC adapter. If the "High AC Input" lamp of the AC adapter is lit or the protection circuit in the AC adapter is tripped, this indicates that the incoming voltage is dangerously high and may cause injury or damage to the equipment, as mentioned above. When using an AC generator with AC output voltage of AC220-240V especially, Fujikura Ltd. recommends the following measures to correct the condition.
 1. Connect a step-down transformer between the generator and the AC adapter in order to lower the AC voltage from AC220-240V to AC100-120V.
 2. Or, use an AC generator with AC output voltage of AC100V.
 3. Or, use an AC generator that has an inverter circuit to stabilize the output.



Do not modify, abuse, heat or excessively pull on the supplied AC cord. The use of a damaged cord may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.



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



Connect AC power cord properly to the splicer (inlet) and wall socket (outlet). When inserting the AC plug, make sure there is no dust or dirt on the terminals. Engage by pressing the female plug into the splicer (inlet) and the male plug into the wall socket (outlet) until both plugs are fully seated. Incomplete engagement may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.



Do not short-circuit the terminals of AC adapter and optional battery. Excessive electrical current may cause personal injury due to fumes, electric shock and equipment damage.



WARNINGS!



Do not touch the splicer, AC power cord and AC plugs with wet hands. This may result in electric shock.



Do not operate splicer near hot objects, in hot temperature environments, in dusty / humid atmospheres or when water-condensation is present on the splicer. This may result in electric shock, splicer malfunction or poor splicing performance.



When using optional battery, follow the instructions below.

Failure to follow these may result in explosion or personal injury.

- Do not charge battery with other methods than instructed.*
- Do not discard battery into an incinerator or fire.*
- Do not charge or discharge battery near a flame or under direct sunlight.*
- Do not excessively shake or jar the battery.*
- If battery leaks of liquid residue, be careful handling the battery so the liquid does not get in skin or eye contact. If it reaches contact, immediately wash skin or eyes thoroughly and see the doctor. Dispose of the battery and call the service center for replacement.*
- Do not stack battery on top of AC adapter while charging.*
- If charge did not complete in five hours or the "CHARGE" LED does not turn ON, immediately stop charging and call the service center for repair.*



When transporting the carrying case using the shoulder belt, check the belt and hooks for damage before use. Carrying the case with a damaged shoulder belt may cause the belt to break or come off and result in personal injury or equipment damage.



CAUTIONS!



Do not store splicer in any area where temperature and humidity are extremely high. Possible equipment failure may result.



Do not touch protection sleeve or tube-heater during heating or immediately after completion of heating. Their surfaces are very hot and touching these may result in skin burn.



Do not place the splicer in an unstable or unbalanced position. The splicer may shift or lose balance, causing the unit to fall. Possible personal injury or equipment damage may result.



The splicer is precision adjusted and aligned. Do not allow the unit to receive a strong shock or impact. Possible equipment failure may result. Use supplied carrying case for transportation and storage. The carrying case protects the splicer from damage, moisture, vibration and shock during storage and transportation.



CAUTIONS!



Follow the below listed instructions for handling electrodes.

- *Use only specified electrodes.*
- *Set the new electrodes in the correct position.*
- *Replace the electrodes as a pair.*

Failure to follow the above instructions may cause abnormal arc discharge. It can result in equipment damage or degradation in splicing performance.



Do not use any chemical other than pure alcohol (99% or greater) to clean the objective lens, V-groove, LCD monitor, etc., of the splicer. Otherwise blurring, discoloration, damage or deterioration may result.



The splicer requires no lubrication. Oil or grease may degrade the splicing performance and damage the splicer.



The equipment must be repaired or adjusted by a qualified technician or engineer. Incorrect repair may cause fire or electric shock. Should any problems arise, please contact the authorized distributor.

RECYCLING and DISPOSAL

In European Union



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

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

In other countries

[Recycling]

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

[Disposal]

This product can be disposed of same as the standard electric products. Follow your local disposal regulations.

Bluetooth® Wireless Technology

- The 19R+ uses the Bluetooth technology for wireless communication.



- The wireless communication is done at a frequency of 2400MHz frequency band, and employs the DSS modulation scheme. The estimated interference distance is 10m or less.



- The wireless data communications can be intercepted by Third parties.



CAUTION!



The 19R+ is compliant with the rules on the technical standard conformance of specified wireless equipment based on the Radio Law/ Telecommunications Business Act., as shown by the technical compliance mark depicted on the name plate. Do not remove the screws and alter the inside of the 19R+, as this voids the conformity certification. Use of uncertified equipment violates the law.



Do not use the 19R+ near a microwave oven or in environments where magnetism, electrostatic charge, or radio interference is generated. Also note the presence of other devices using the same 2.4GHz band may lower processing speeds.



Wearers of the electronic medical equipment such as implanted pacemakers or defibrillators must carry and use the 19R+ at least 22cm away from the implanted device. The signal from the 19R+ may interfere with operation of medical equipment.



When using the 19R+ near a medical facility or in the hospital, turn the wireless communication function of the 19R+ off. The signal from the 19R+ may interfere with operation of the medical equipment.



Turn the wireless communication function off near fire alarms, automatic doors and other automatic control equipment. Failure to do so may cause the equipment to fail or malfunction.



When shipping the 19R+ by air, detach the battery from the main body. The signal from the 19R+ may interfere with operation of the aircraft. Consult the specific airline for aircraft shipping instructions..



CAUTION!

When using the wireless communication function of the 19R+ in foreign countries,

- The wireless communication function shall be used in accordance with local electromagnetic emissions/susceptibility regulations.
- Confirm certification of the 19R+ is in accordance with local regulations before turning the wireless communication function ON. If you use it in the countries without the certification, you may be prosecuted.
- The status of the electromagnetic compliance certificate is described in the product web site. Please refer to it before using the wireless communication function.

19R+ product web site:

<https://www.fusionsplicer.fujikura.com/>

- If you have any questions, contact an authorized Fujikura distributor listed in the following web site:

<https://www.fusionsplicer.fujikura.com/service/index.html>

Typical wireless certifications are:

USA (Part 15 of the FCC Rules)

FCC ID : QOQBGM111

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.

CANADA (RSS-247 of the Industry Canada Rules)

IC : 5123A-BGM111

European Union (RE directive 2014/53/EU)

Safety : EN 61010-1

EMC : EN 301 489-1 v3.1.1

Spectrum : EN 300 328 v2.1.1

JAPAN (Article 38-24 paragraph 1)

Certification number: R209-J00192

Introduction

This fusion splicer 19R+ is designed for splicing 1~4 fiber ribbon and optical single fiber. It is small in size and lightweight, making it suitable for any operating environment. It is easy to operate and it splices fast while maintaining low splice loss. In order to master 19R+, please read this instruction manual.



Splice mode

The 19R+ has both standard and automatic splice modes. The automatic modes consist of [SM AUTO], [SWR AUTO], [MM AUTO], [NZ AUTO], [DS AUTO]. When using AUTO mode, the automatic arc calibration function is enabled.

The special modes consist of [SM] for SMF (ITU-T G652), [SWR] for Spider Web Ribbon fiber based on SMF (ITU-T G652), [NZ] for NZDSF (ITU-T G655), [DS] for DSF (ITU-T G653) and [MM] for MMF (ITU-T G651). Special modes require executing [Arc Calibration] before splicing.

Automatic arc calibration function

This function calibrates the arc power at every splice. When the automatic arc calibration function is enabled, performing the [Arc calibration] function before a splice operation is not necessary. The automatic arc calibration function works in AUTO modes only. It doesn't work in the standard splice modes. When using those modes, performing [Arc calibration] before splicing is strongly recommended.

New function of 19R+

Automatic wind-protector

The wind-protector operation during splicing can be selected by choosing the mode which wind-protector opens and closes.

New Heating system

When a protection sleeve is loaded, the heater lid will close automatically and the shrink process will start automatically.

Field Assembly Optical connector splice

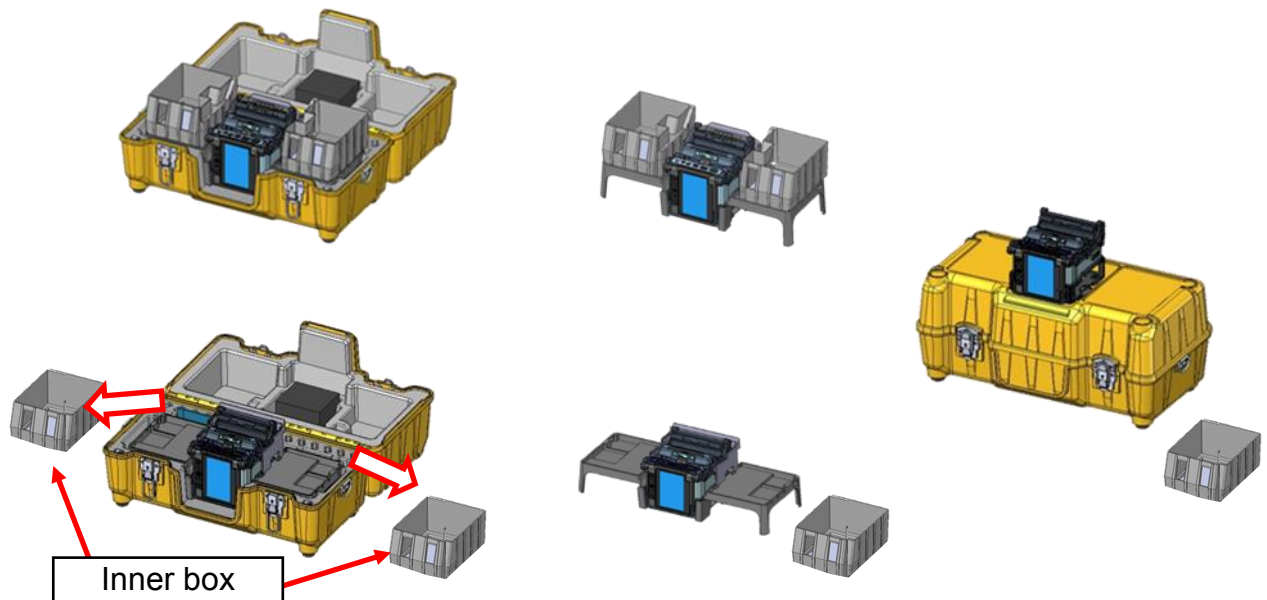
The connection of a field assembly optical connector using a protection sleeve can be performed by a 19R+.

Cleaver Counter

The status of the optical fiber cleaver currently used for splice preparation is monitored and displayed. Maintenance actions such as changing of the blade position and cleave quantity, are displayed by the splicer. Preventive maintenance can minimize down time by eliminating large cleave angle and cleave shape NG errors due to blade wear.

Use of the work tray

In the carrying case, there is a work tray and two inner boxes. The work tray enables immediate use of the 19R+. The inner boxes are used for storing tools, and, the carrying case can be used as a work table.



Upgrade of software

The software of 19R+ is upgradable from on the Internet. Please install Data Connection in attached CD.

Wireless communication function

The 19R+ wirelessly communicates with the RS02/03 ribbon stripper. After the wireless communication between 19R+ and RS02/03, 19R+ automatically adjusts the settings of the connected RS02/03 in accordance with the splice mode. To facilitate field work, the operator can change the settings of the RS02/03 with the 19R+ at any time.

Components of Splicer

Standard Equipment








The standard equipment of the splicer is the following. Check the equipment items mentioned of list.

Standard Package List.

| | | | | | |
|---|---|--|---|--|--|
|  | Fusion Splicer [19R+] | |  | Carrying Case [CC-30] | |
|  | AC adapter [ADC-18] | |  | AC cord [ACC-**] | |
|  | Instruction Manual [M-70+] | |  | USB Cable [USB-01] | |
| | | |  | Alcohol Pot [AP-01] | |
| | | |  | Screw Driver [SD-01] | |
|  | Quick Reference Guide [Q-19/70R+(E)] | |  | Spare Electrodes [ELCT2-20A] | |
| | | |  | Sleeve Loader [SL-01] | |
| | | |  | Warning and Caution [W-70-E] | |
| | | |  | V-groove cleaning brush [VCB-01] | |

Other Parts

Option List.

| | | |
|--|--|---|
|  |  |  |
| Battery Pack [BTR-09] | Battery Charge Cord [DCC-18] | Carrying Case [CC-24] |
|  |  | |
| DC Power Cord [DCC-13] | DC Power Cord [DCC-12] | |
|  |  | |
| J-plate [JP-06-TH] | J-plate [JP-06] | |









Using J-plate (JP-06 & JP-06TH)

Attach the J-plate onto the splicer by installing from upside.

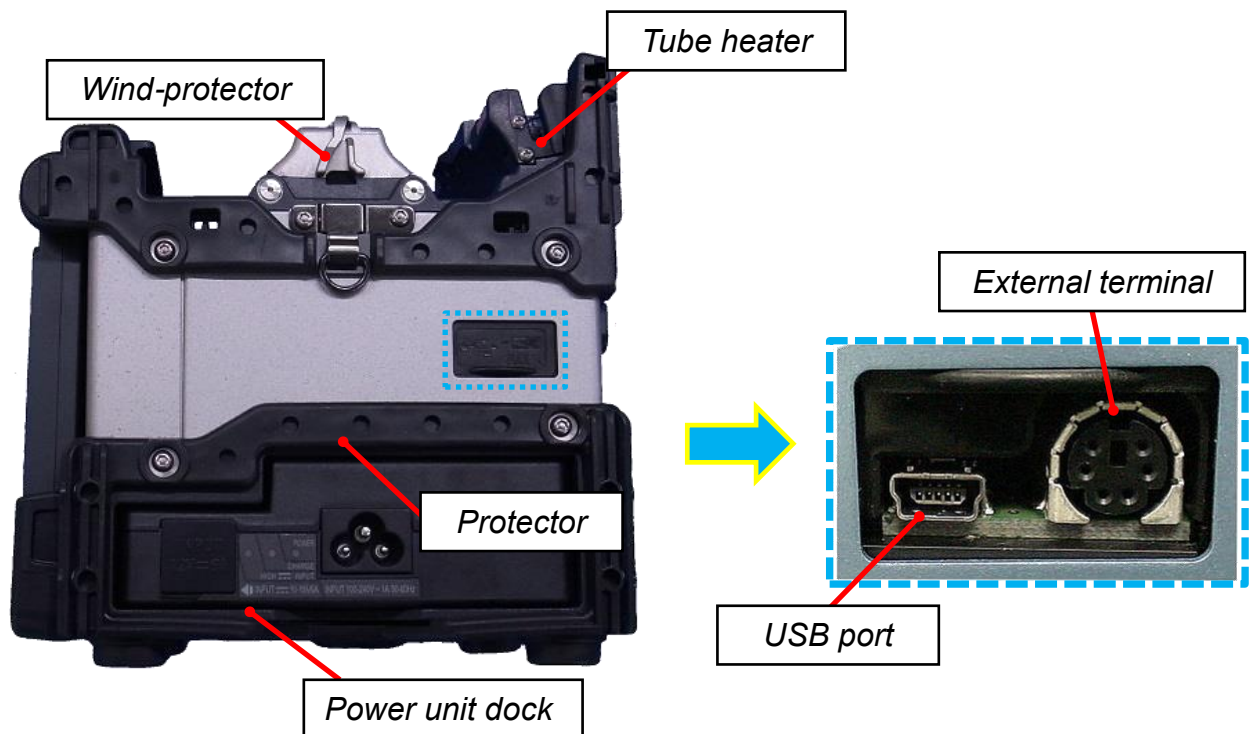


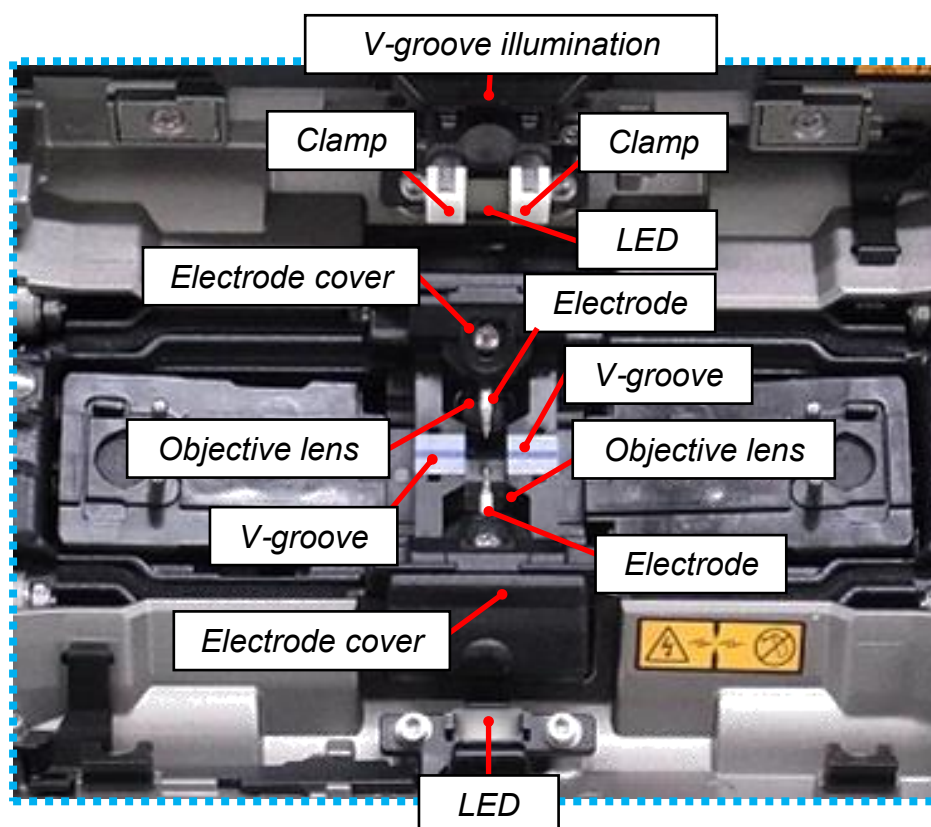
Other Necessary Items for Splicing Operation

Tools

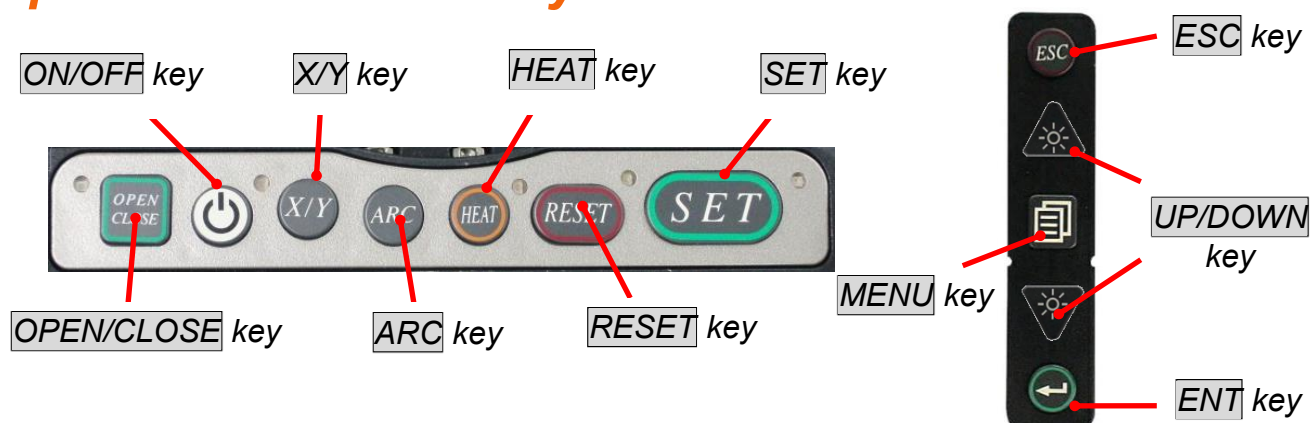
| Fiber coating diameter | For Ribbon Fiber | For Single Fiber |
|--------------------------|---|--|
| Fiber protection sleeves | <u>Standard sleeve</u> 40mm length [FP-04T]  | <u>Standard sleeve</u> 60mm length [FP-03] 40mm length [FP-03 (L = 40)]  |
| Fiber stripping tools | <u>Ribbon Stripper</u> [RS02/03]  | <u>Single Fiber Stripper</u> [SS03]  |
| Fiber Holder (Option) | [FH-70-4] or [FH-50-4]  | [FH-70] or [FH-50] series  |
| Fiber cleaving tools | <u>Fiber Cleaver</u> [CT50] Cleave length : 10mm fixed (Coating3mm + Glass10mm)  | |
| Fiber cleaning tools | <u>Alcohol Pot</u> [AP-01] with alcohol (purity > 99%) Lint-free tissue or gauze  | |

Description and Function of Splicer structure





Operation of Sheet Key

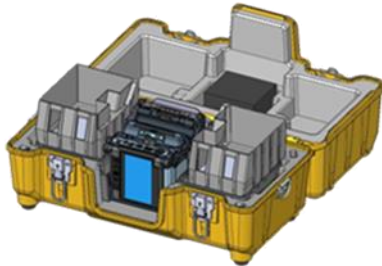


| Key Name | Key Function |
|---|---|
| OPEN/CLOSE Wind-protector key | To open and close the wind-protector. |
| ON/OFF Power key | To turn ON/OFF the power. |
| ARC Arc Key | TO discharge the arc manually. |
| X/Y X/Y Key | To toggle the X/Y view image and cycle through the "Ready", "Pause", "Finish" data. |
| HEAT Heat Key | To initiate the tube heating process. If the HEAT key is pressed once during heating, LED will blink. Heating operation will be stopped if the HEAT key is pressed again when the LED is blinking. |
| RESET Reset Key | To quit from any state except the tube heating process. After pressing this key, the splicer will return to the ready state with a beep sound. |
| SET Set Key | To start the splicing operation, or to go through to the PAUSE state. |
| ESC Escape Key | To go back to the previous page, or to quit from input data at the Menu state. |
| Up/Down Arrow Keys | To move the cursor for selecting the items at the menu state, or to edit splicing conditions or comments. During manual motor control, these arrows serve as the "Backward" and "Forward" keys to operate the motors. |
| MENU Menu Key | Open Main menu and go to next page. |
| ENT Enter Key | To select the commands or parameters. |

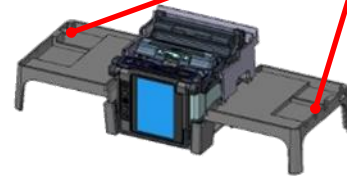
Splicing work preparation

Multiple work environment configurations can be created using the carrying case and work tray.

Use of work tray

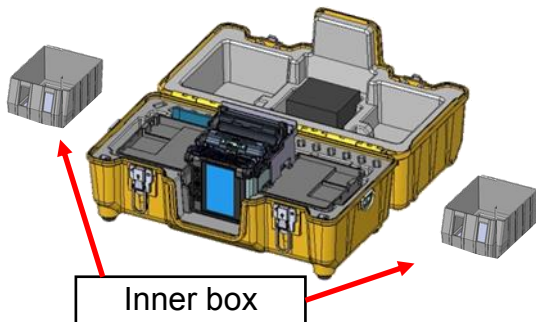


When the operator opens the carrying case, tools are stored in two inner boxes.



Position of belt to attach

If the work tray is taken out and a belt is used, the work tray is a simple work table.



Inner box



By taking the inner boxes out, the operator can individually do the preparation of fibers and splicing. Moreover, the operator can use the carrying case as Simple work table.



- Arrange safety belts/devices for equipment and accessories on the tray before use. If the equipment/accessories were dropped on a person under operation area, this could result in serious injury or fatal accident.

In the case of use only with splicer

Use in a location which does not have vibration, a shock, etc. at the time of performing fusion splice work. In work [at the unstable place where a main part is shaky], the possibility of damage from a fall becomes high.

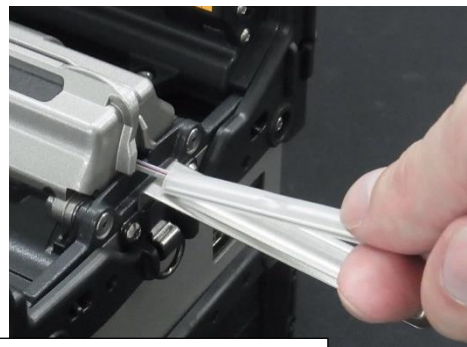
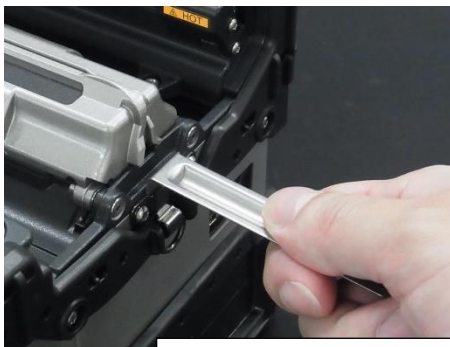
Sleeve Loader

Sleeve loader for holding the Protection sleeve during Splicing.

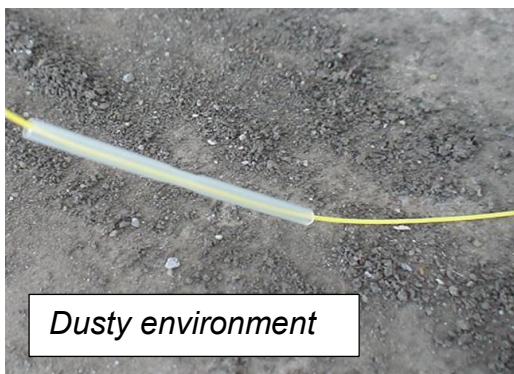
It is possible that there are dust, rain water, etc. depending on work environment, and garbage, moisture, etc. mix to the protection sleeve under splice.

Putting a protection sleeve on the ground etc. directly by using a sleeve loader is lost, and mixing of garbage or moisture can be prevented.

Moreover, since the protection sleeve was held near the connection position, workability also became good.



The right-and-left side of equipment can attach to both.



Power Supply

The power supply of a splicer can be operated with AC power supply and a battery.

Inserting or detaching power unit

Inserting power supply unit

Insert power unit into Power unit dock until it clicks into place.



Detaching power supply unit.

Turn off the splicer before removing the power unit. Press the release button, located on the side of the splicer body, and remove the unit from the other side of the release button.



AC Operation

*This section describes the procedures for using the power supply with the equipment. Splicer is operated with AC adapter (ADC-18) or the internal battery. Use the only external AC adapter (ADC-18) and AC Coad (ACC-**) with Splicer.*



AC Adapter [ADC-18]



AC Coad [ACC-**]

Insert AC cord into the AC inlet of the AC adapter. The power ON LED of the AC adapter changes green color when suitable AC voltage is supplied. If high AC Voltage is supplied, the AC adapter will immediately be damaged.



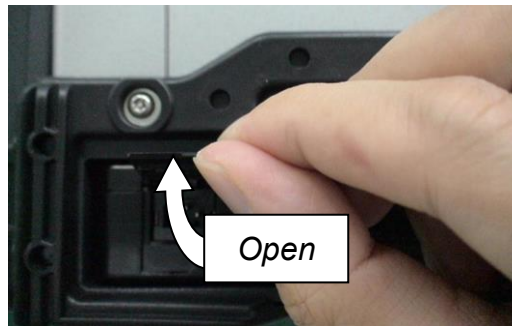
AC generators commonly produce abnormally high AC output voltage.

Measure the output AC voltage with a circuit tester before connecting the AC power cord. Such abnormally high voltage or frequency from a generator may cause fuming, electric shock or equipment damage and may result in personal injury, death or fire.



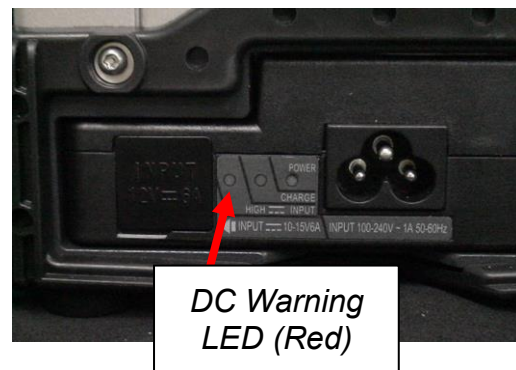
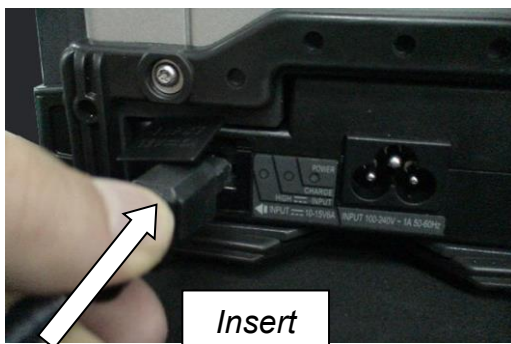
DC operation with external battery

Open shutter for DC inlet of AC adapter.



- Do not supply DC16V or greater, the AC adapter will be damaged immediately.

Plug DC cord (DCC-12 or DCC-13) into DC inlet of AC adapter. The ON LED turns on (green color) when suitable DC voltage is supplied. In case DC16V or greater is supplied, or polarity (positive / negative) is wrong, The AC adapter protection circuit shuts down the DC output and DC Warning LED [HIGH ~ INPUT] turns on (red color)



Battery Operation

Check the remaining battery capacity. If it is 20% or less before operation, splicer can only work a few times.

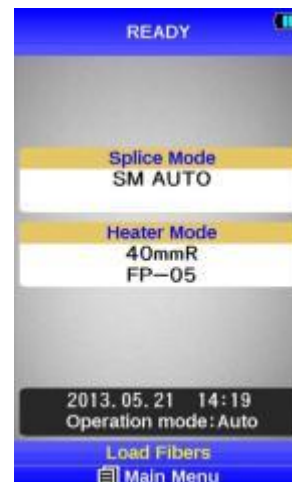


Keep below practices to prevent battery damage.

- The capacity of the battery gradually decreases as nature even if it is not used. If the battery discharges completely, the battery may no longer be able to be re-charged. Charge the battery before long time storage and after every use.
- If a battery is to be stored for a long time, periodical charge of every six months is recommended regardless of battery charge level of the battery.
- Follow below conditions
 - Operation : -10 degree C ~ 50 degree C
 - Charging : 0 degree C ~ 40 degree C
 - Storage : -20 degree C ~ 30 degree C

How to check remaining battery capacity

If splicer is already equipped with the battery, turn splicer ON. Power source of "Battery" is automatically identified and the remaining battery capacity is displayed on the "READY" screen.








READY screen

| Remaining battery capacity display | Remaining battery |
|------------------------------------|-------------------|
| | 95~100% |
| | 65~95% |
| | 40~65% |
| | 15~40% |
| <i>Flashing</i> | Less than 15% |

The residual quantity check method of a battery

If battery is not inserting in the splicer, simply press the battery check push button on the battery pack. The remaining battery capacity is indicated on the LED indicator.



| Remaining battery capacity indicator | Remaining battery |
|---|---------------------------------|
|  | 4 LED 95~100% |
|  | 3 LED 65~95% |
|  | 2 LED 40~65% |
|  | 1 LED 15~40% |
|  | 1 LED Flashing Less than 15% |

The battery residual quantity indicator on a screen is only as a guide.

Just after turning splicer ON, if battery capacity is not enough to do operation, a warning message appears in the LCD monitor. Then execute “Battery Discharge” in maintenance menu. After discharge, recharge battery.

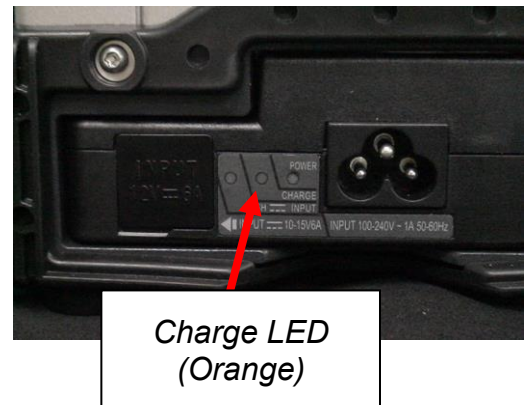
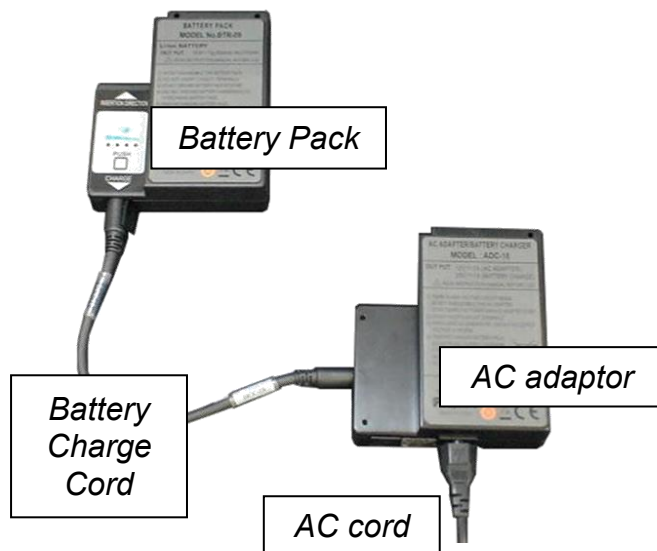
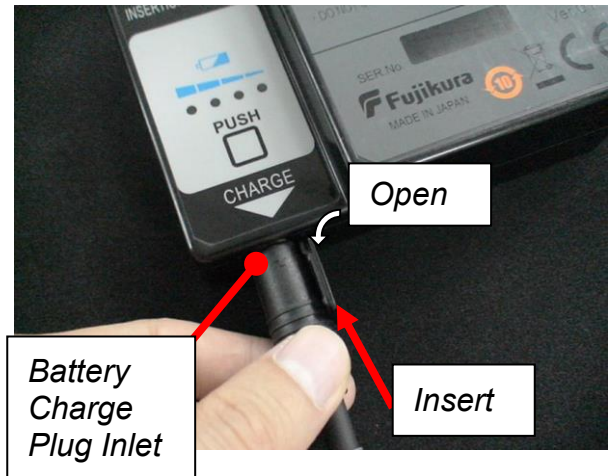


- In order to increase the number of fiber splices and times of heating, please change to a power-saving mode setup.

How to charge the battery

Open shutter for battery charge plug inlet of the Battery Pack. Plug the supplied battery charge cord (DCC-18) into both the battery charge inlet of the AC adapter (ADC-18) and the battery charge terminal located on the battery (BTR-09) side.

The CHARGE LED turns ON (orange color) and battery charging begins. Battery charge is completed in approximately five hours. After completion, disconnect battery charge cord, and then DC or AC cord.



- The battery pack can be charged also with AC and DC.



- When connecting the cords to AC adaptor, plug DC or AC cord before battery charge cord. When disconnecting them, unplug the battery charge cord before DC or AC cord.
- Do not place battery on top of AC adaptor or vice-versa. The battery can be charge while splicer is in use. Installed BTR-09 into power dock and connect to ADC-18 AC adapter/ battery charger. Exchange for a new battery pack.
- CHARGE LED turns off when battery charge is completed. If CHARGE LED flashes, replace the battery with a new one.
- If battery charge does not complete in five hours or CHARGE LED does not turn ON the battery, AC adaptor or both need replacement. Ask your service agent for further instruction.

Turning Splicer ON/OFF

Turning Splicer ON

Press **ON/OFF** key and hold it until the green LED turns on. The following warning screen is displayed.



- The license message is displayed twice a month when the splicer is turn on.
- There is a possibility that a language is fixed depending on the country of shipment.

The READY screen is displayed after all the motors are reset to their initial positions when you select [Agree]. The power source type is then identified. If the battery is used, the remaining battery capacity is displayed.

Turning Splicer OFF

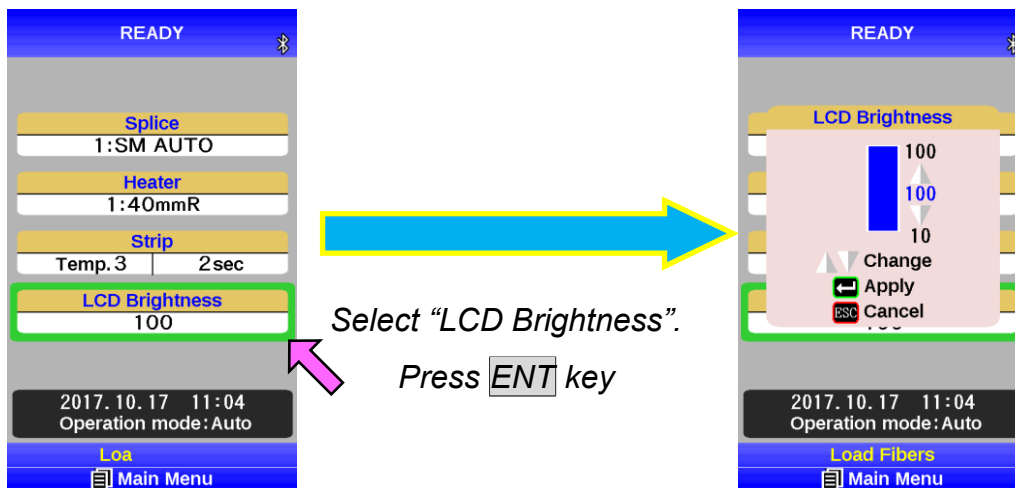
Press **ON/OFF** key and hold until the red LED turns off and then detach.



LCD brightness and wind protector

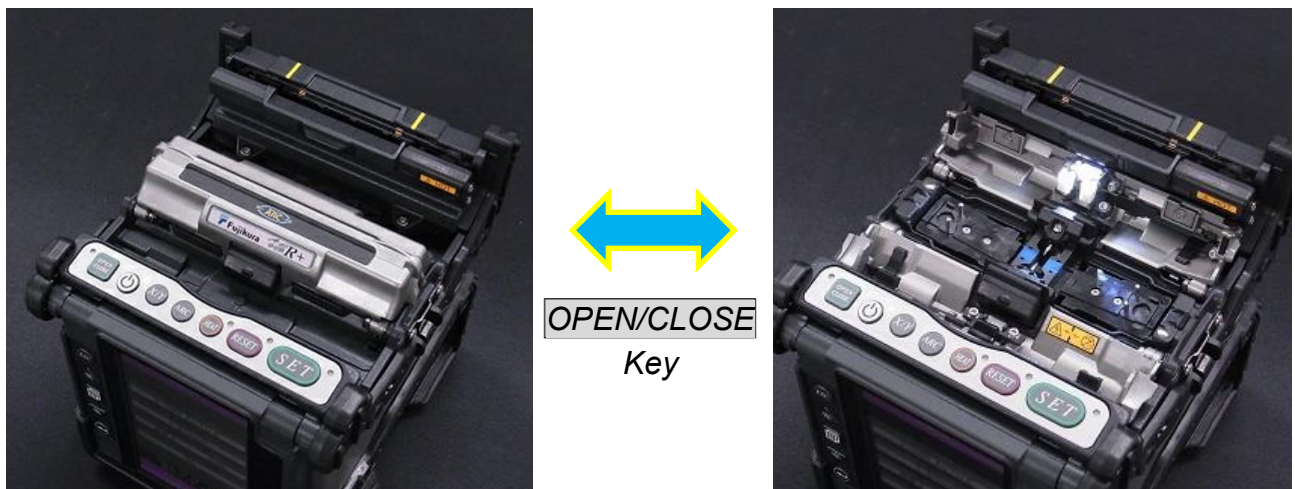
LCD brilliance control function

Move the cursor to the “LCD Brightness” window, then press the **ENT** key on the READY screen. This causes the “LCD Brightness” menu to appear. Monitor visibility changes depending on environmental conditions. To change monitor brightness, press **Up/Down** Arrow key to change value and press **ENT** key to set value.



Wind-Protector Automatic opening-and-closing function

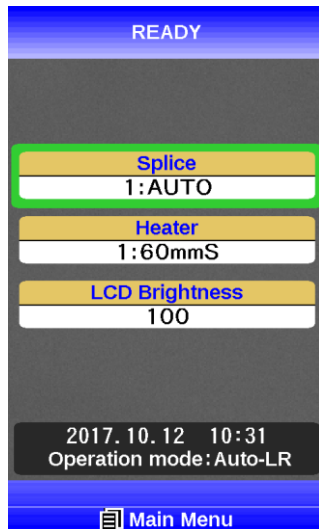
If the **OPEN/CLOSE** key is pressed on a READY screen, the wind-protector will open or close.



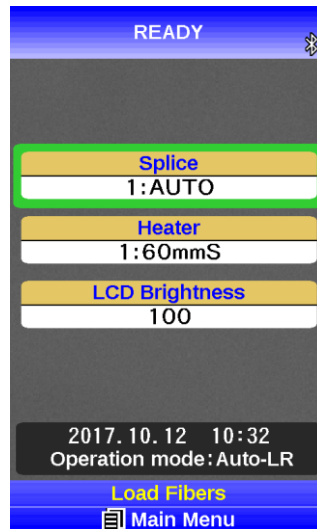
Splicer Settings Check

Composition of a READY screen

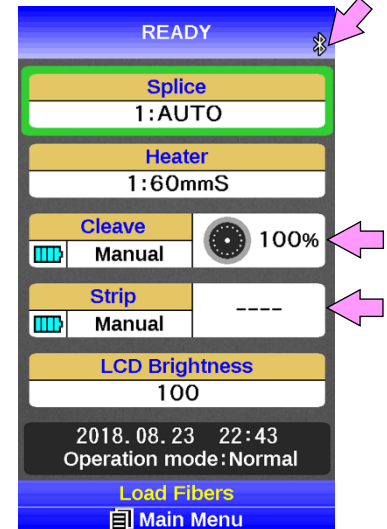
Wireless function "OFF"



Wireless function "ON"
Stripper in Bluetooth "OFF"
Cleaver in Bluetooth "OFF"



Wireless function "ON"
Stripper in Bluetooth "ON"
Cleaver in Bluetooth "ON"



Wireless communication sign

The symbol to the right is displayed in the upper right corner when [Splicer] in the Bluetooth menu turns "ON".



Symbol of the wireless communication

Splice window

Current splice mode is displayed on the READY screen. Select appropriate splicing mode for the specific fiber combination.

Heater window

Current heater mode is displayed on the READY screen. Select appropriate heating mode for the specific protection sleeve used.

Cleave window

This window shows the condition of the CT50. It will appear on the READY screen when [Cleave] in Bluetooth menu turns "ON".

Strip window

This window shows the setting of the RS02/03. It will appear on the READY screen when [Stripper] in Bluetooth menu turns "ON".

LCD brightness

The current LCD brightness is displayed.

Calendar

Calendar displayed the date and time on the screen.

Operation Mode

Select appropriate Operation mode for the specific wind-protector operation. Current mode is displayed on the READY screen.

Change of the Operation Mode

Selection of the operation mode

Each operation mode consists of parameters shown below so that operation of the equipment after the end of work can be set up.

The extraction work of a fiber can be smoothly done by working by changing the operation mode according to the contents of work.

| Parameter | Description |
|-----------------------|---|
| Operation Mode | |
| Auto | Wind-Protector opening and a proof test are simultaneously done after the end of connection. |
| Normal | If the SET key is pressed after the end of splice, wind-protector opening and a proof test will be carried out. |
| Manual | All the parameters in custom-made mode are in the state of OFF. |
| Customized | Operation Mode |
| | Auto Start Trigger |
| | Select of the "OFF", the "Fiber Set", "Cover Close", and "OFF" can be performed. |
| | Cover Close Reaction Time |
| | Time from setting fibers in the splicer until closing wind-protector can be set up. |
| | Wind-Protector Motion(At the time of Customized was selected) |
| | Power On |
| | Setup of wind-protector motion at the time of power on "open" or "close". |
| | Reset |
| | Setup of wind-protector motion at the time of Reset is pressed "open" or "close". |
| | Finish |
| | Setup of wind-protector motion after the end of splicing "open" or "close". |
| | Error |
| | Setup of wind-protector motion at the time of error "open" or "close". |

MENU key is pressed on the [READY] screen; a [Splice Menu] screen will be displayed. The **Down** key is pressed, [Splice Settings] is chosen and the **ENT** key is pressed.

Change of the Splice Mode

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

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

A series of optimal splice parameters for major fiber combinations are already stored in the splicer. These parameters are stored in the database area and can be copied to the user-programmable area. These splice parameters can be edited for a specific fiber combination.

How to select the Splice Mode



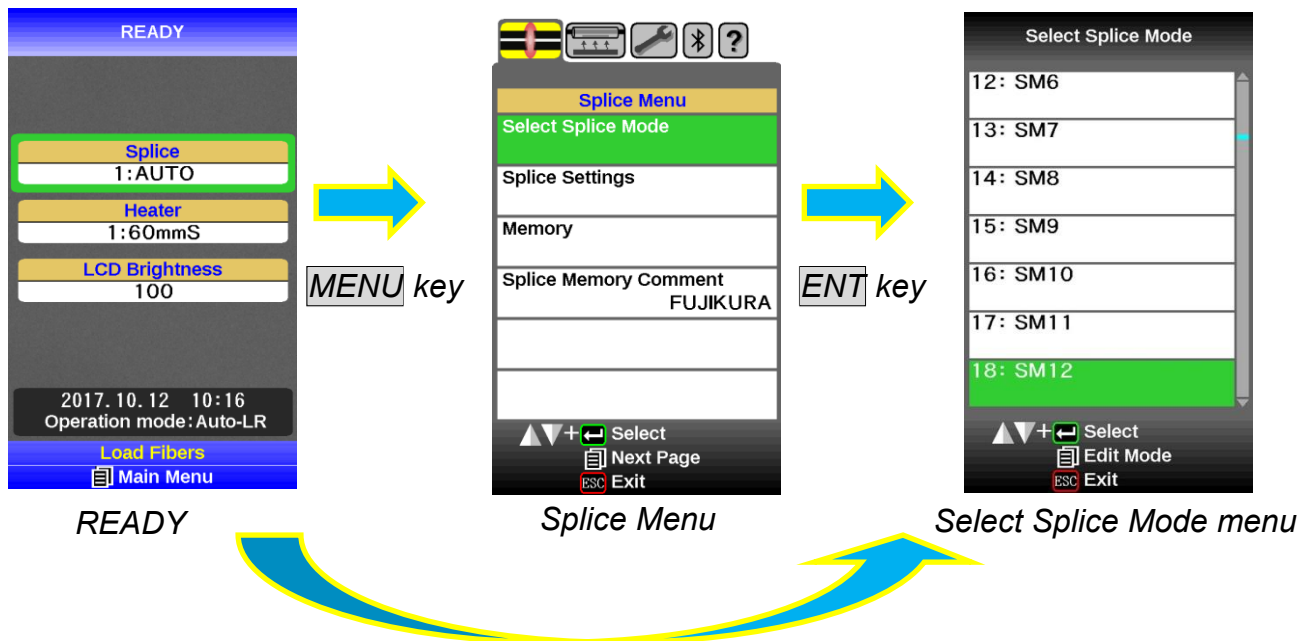
- [SM AUTO] and others
Use this mode if the fiber type is identified.
- [SM FAST] and others fast
Use this mode if the fiber type is identified and prefer quick splice with high yield to consistent splice loss.
- [SM] and others
For those who prefer the lowest possible splice loss to any other considerations. This mode selected, perform the “Arc Calibration” manually.

Splice Mode selection

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

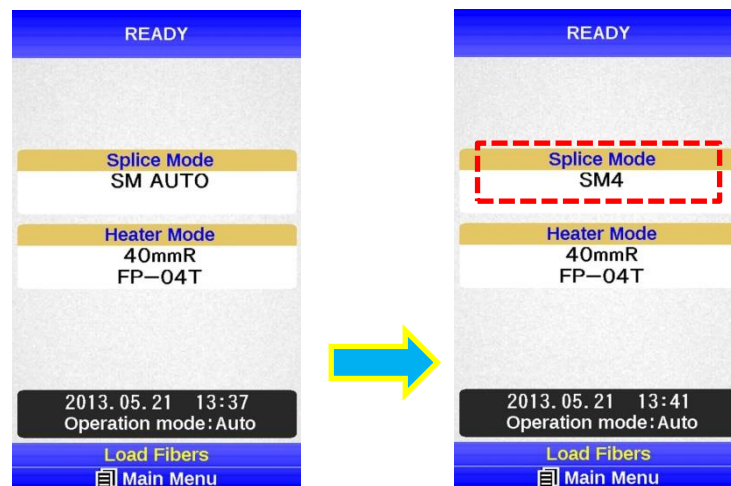
Procedure1.

1. Press **MENU** key at [READY], [PAUSE] or [FINISH] state to open [Splice Menu].
Select [Select Splice Mode] and the [Select Splice Mode] menu is displayed.
2. Move cursor by pressing **Up/Down** Arrow key and press **ENT** key to select [Splice mode].



Procedure2 In [READY] state, Select [Splice] window and press **ENT** key. This will immediately display the [Select Splice Mode] screen.

3. Splice Mode can be checked on a READY screen.



Change of the Heater Mode

Each tube-heating mode is optimized for a type of Fujikura protection sleeve. These modes can be found in database area for reference. Copy the appropriate one and paste it to the user-programmable area. The operator can edit the user-programmable modes. The parameter in Heater mode becomes an addition and change with upgrade of software.

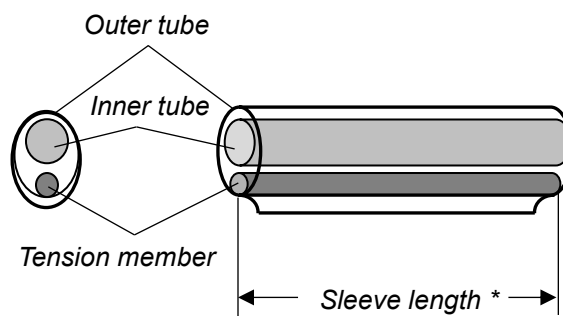
Data Base

| Parameter | Description |
|-------------------------|---|
| 60mmS FP-03 | For standard 60mm protection sleeve, Such as Fujikura FP-03 or FP-03M protection sleeves. |
| 40mmS FP-03(L=40) | For standard 60mm protection sleeve, Such as Fujikura FP-03 or FP-03M protection sleeves. Note : Cleave length 8mm. |
| 15mmS FPS01-400-15 | 400 or less um of diameters of coating. Splice of the interference length of 5 mm or less. |
| ** mmS FPS01-400-** | 400 or less um of diameters of coating. In addition, there are 20, 25, and 34 or 40 mm length. |
| 20mmS FPS01-900-20 | 900 or less um of diameters of coating. Splice of the interference length of 6 mm or less |
| ** mmS FPS01-900-** | 900 or less um of diameters of coating. In addition, there are 25, and 34 or 40 mm length. |
| 60mmS FPS01-DC-60 | For Splice of a drops cable. |
| FUSE2/3 ST-FC | For Fuse connect splice. |
| FUSE900 SC-LC-ST-FC | |
| FUSE2/3 SC-LC | |
| 40mmR FP-05 | For standard 40mm protection sleeve, Such as Fujikura FP-05 protection sleeves. |
| 40mmR FP-04T | For standard 40mm protection sleeve, Such as Fujikura FP-04T protection sleeves. |
| 28mmR FPS-08-28 | For standard 28mm protection sleeve, Such as Fujikura FPS08-28 protection sleeves. |
| 30mmR FPS-04-30 | For standard 30mm protection sleeve, Such as Fujikura FPS04-30 protection sleeves. |
| **mmS-L FPS01-900-** | 900 or less um of diameters of coating with Covering material of Hytrel. In addition, there are 25, and 34 mm length. |

The dimensions of the Protection Sleeve after heat shrink

| Form | Tension member | Sleeve length | Prepare fiber length | Diameter of an adaptation optical fiber | Diameter of a result |
|--------------|----------------|---------------|----------------------|---|----------------------|
| FP-03 | SUS | 60mm | 16mm or less | 250~900um | 3.1mm |
| FP-03(40mm) | SUS | 40mm | 10mm or less | 250~900um | 3.1mm |
| FP-04T | Glass ceramic | 40mm | 10mm or less | 250~900um | 4.0mm |
| FPS01-400-15 | SUS | 15mm | 5mm or less | ~400um | 1.5mm |
| FPS01-900-20 | SUS | 20mm | 6mm or less | ~900um | 2.3mm |

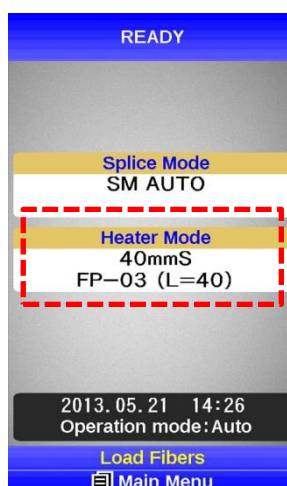
* The dimensions of the protection sleeve after shrink are varied depending on the diameter of the fiber.



Selecting Heater mode

How to check the current heater mode

The current heater mode is displayed on the OK screen.



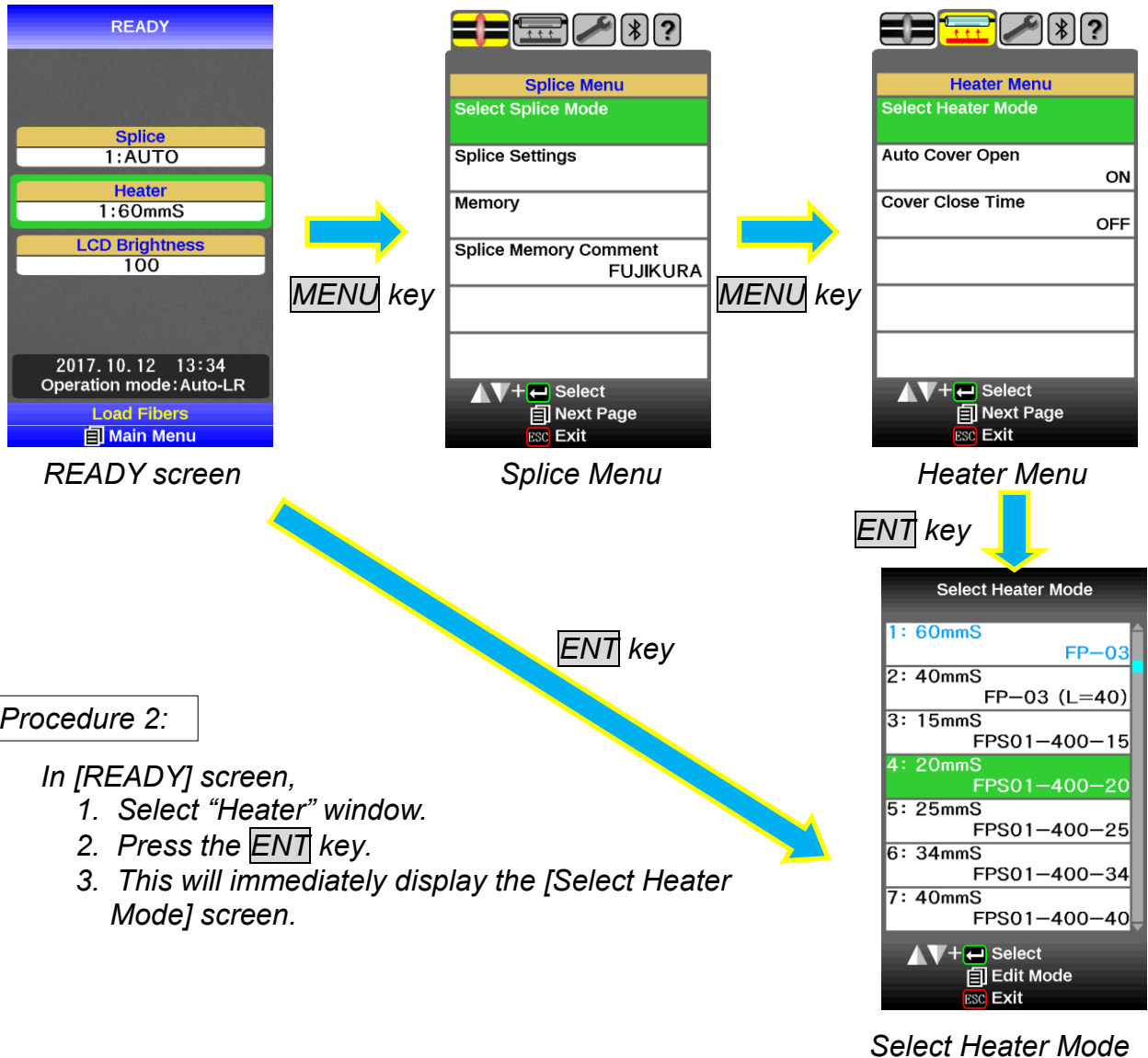
When a setup of "Auto Cover Open" is OFF, the cover will be in the state where it was closed. A cover opens, if the **HEAT** key is pressed once before doing heating work. Moreover, heater cover does not open automatically at the time of the end of heating. So please push **HEAT** key and take out the sleeve.

How to change the heater mode

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

Procedure 1:

1. Press **MENU** key in [READY], [PAUSE], [FINISH] state and press **MENU** key to display [Heater Menu].
2. Select [Select Heater Mode] in [Heater Menu]. [Select Heater Mode] menu is displayed.
3. Move cursor by pressing **Up/Down** Arrow key and press **ENT** key to select a heater mode.



Procedure 2:

- In [READY] screen,
1. Select "Heater" window.
 2. Press the **ENT** key.
 3. This will immediately display the [Select Heater Mode] screen.

4. Confirm the [Heater Mode] in READY screen.

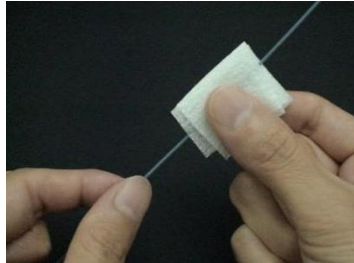


- When using a protection sleeve which is not made by Fujikura, please set parameters based on the specific sleeve.
- When the sleeve of another company is used, the durability of a protection point cannot be warranted.

Preparation of Ribbon fiber

Cleaning optical fiber

Clean optical fiber with alcohol-moistened gauze or lint-free tissue approximately 500mm from the tip. If left uncleaned, dust particles from the fiber coating surface can enter the protection sleeve and might result in a future fiber break or attenuation increase.

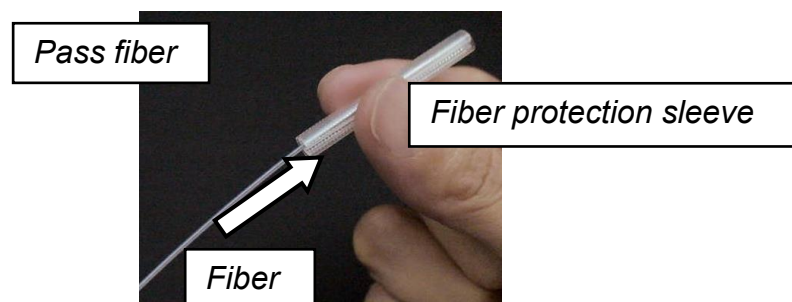


Placing protection sleeve over fiber

Place the protection sleeve over the Right side fiber.



- Following the convention of the operator holding the left fiber in their left hand, place the protection sleeve on the right side of the fiber.

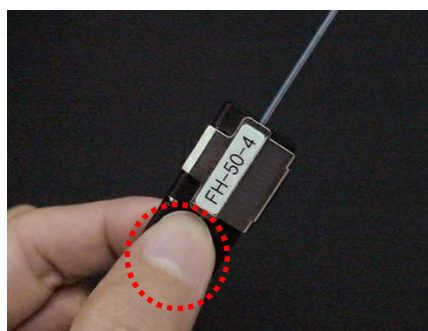


Set the ribbon fiber onto fiber holder

Set the fiber to a fiber holder after opening the lid of a fiber holder. Check that the fiber suits the slot in a fiber holder, and close a lid.



- Close the lid of a fiber holder while pressing down with a finger on the coating (refer to figure below).
- If fiber coating has some memory curl, place fiber so that the curve of memory is turned downwards.
- Use suitable fiber holders that match the number of fibers.
- When setting fiber in fiber holder, hold the fiber in place while closing the lid of fiber holder.



Adjusting fiber onto holder slit

Fiber coating stripping.(RS02/03)

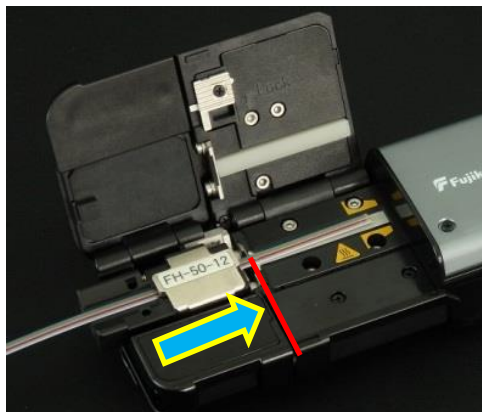
Power supply for RS02/03

RS02/03 is supplied power by connecting the cord (DCC-11) to the external terminal of the splicer.



Stripping fiber coating by RS02/03

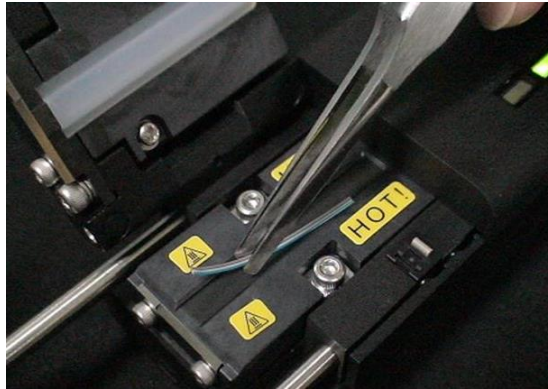
1. Set the fiber holder to RS02/03 on the correctly position. Refer to the below figure. And then close the lid of heater base. Press the red part in the figure until turning the green LED ON.



2. If a lid is closed, heating LED will light up to orange. After a while, since LED changes green and serves as an end of heating, a holder base portion is made to slide and fiber coating is removed.



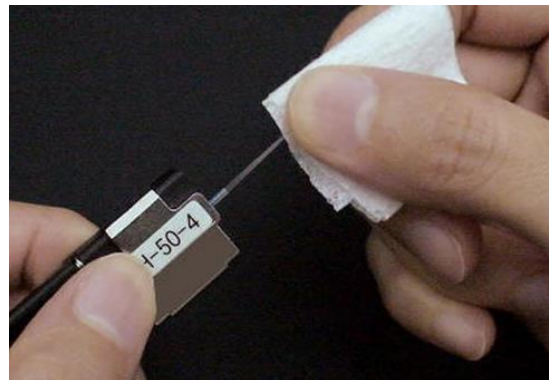
3. Take out the fiber holder from which coating was removed.
Remove after the covering waste which remained in the heater part also working.



- Since the heater immediately after heating gets hot, do not touch it.

Cleaning of bare fiber

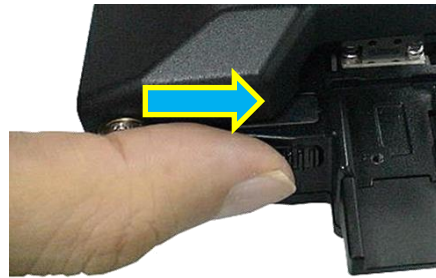
Clean the fiber with alcohol moistened gauze or lint-free tissue thoroughly. Frequently replace cleaning gauze to insure splice quality.



- Use a high-quality alcohol, greater than 99% purity.

Fiber Cleaving(CT-30)

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



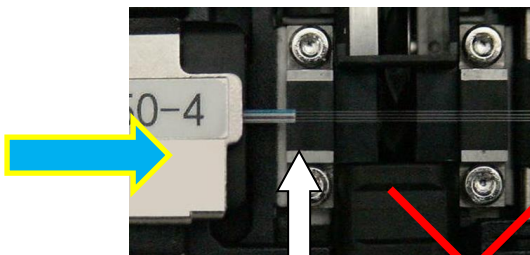
2. Push the slide button until it locks and set the stripped optical fiber on the cleaver.



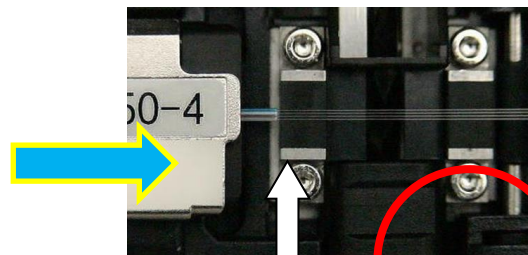
3. Press down the cutting lever. Release the pressure on the cutting lever. A spring force will bring it to its open position.



- Confirm the sheath of fiber is not on pad when fiber holder is used.



Not Good



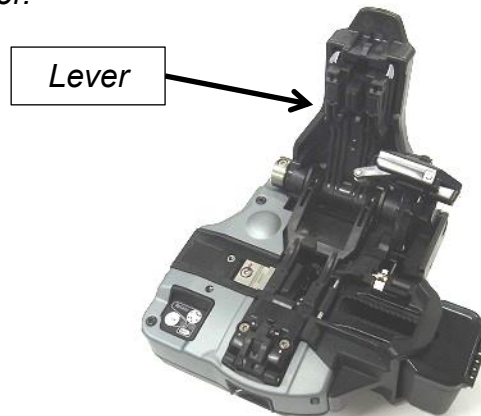
Good



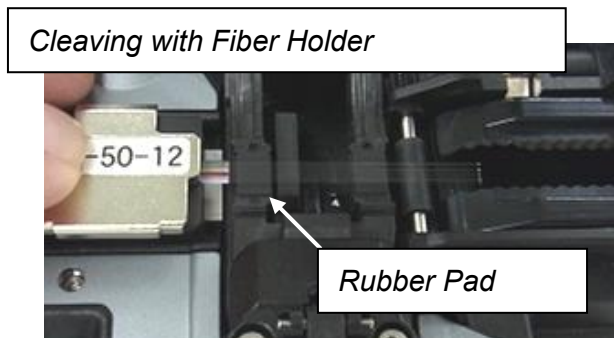
- Do not put fingers in the cleaving area as personal injury may result.

Fiber Cleaving(CT50)

1. Lift the Lever until it stops. The blade is automatically set at the start position and is now ready to cleave the fiber.



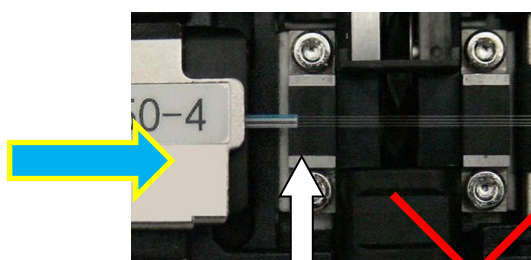
2. Push the fiber holder towards. Check the position of the fiber coating. If it sits on the rubber pad, adjust the fiber position in the Fiber Holder until it doesn't sit on the pad.



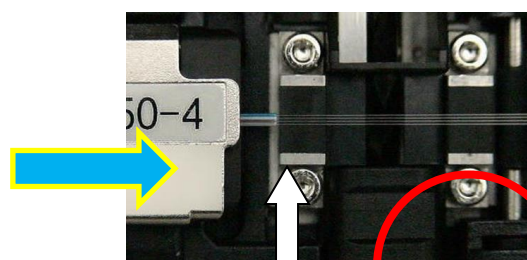
Verify the fiber coating does not sit on the rubber pad.



- Confirm the sheath of fiber is not on pad when fiber holder is used.



Not Good



Good

3. Close and gently push down on the Lever until it stops. The blade automatically moves and the fiber is cleaved. The scrap the cleaved fiber scrap is automatically deposited into the Fiber Scrap Box [FDB-05]. Properly dispose of the scrap by emptying the Fiber Scrap Box at an appropriate time.
4. Lift the Lever until it stops and remove the fiber from the cleaver. Be careful not to contaminate the end-face of the fiber by touching anything with it.



- Do not open the lid of the fiber holder before splicing. If it is opened, cleave length can be changed.

Preparation of Single fiber

Cleaning optical fiber

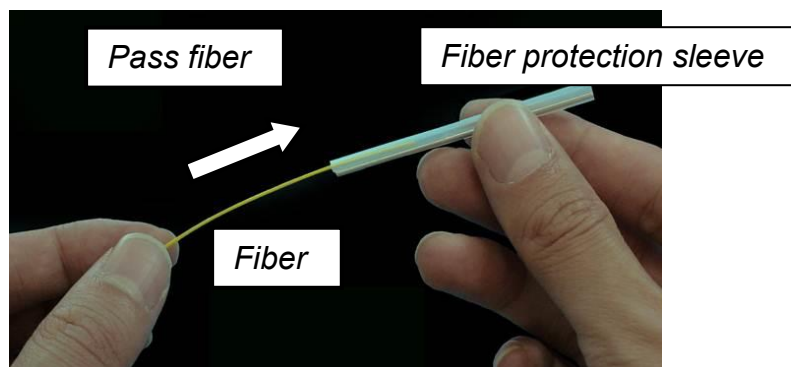
Clean optical fiber with alcohol-moistened gauze or lint-free tissue approximately 500mm from the tip. If left uncleaned, dust particles from the fiber coating surface can enter the protection sleeve and might result in a future fiber break or attenuation

Placing protection sleeve over fiber

Place the protection sleeve over the Right side fiber.



- Following the convention of the operator holding the left fiber in their left hand, place the protection sleeve on the right side of the fiber. mended.

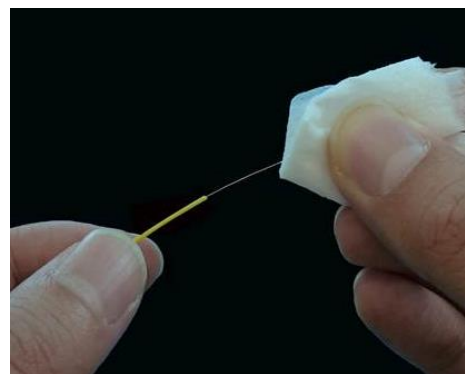
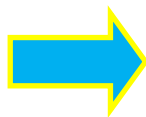


Fiber coating stripping and cleaning of bare fiber

Strip the outer coating 30 to 40 mm from fiber tip with a stripping tool. Clean the fiber with alcohol moistened gauze or lint-free tissue thoroughly. Frequently replace cleaning gauze to insure splice quality.



Stripping



Cleaning



- Use a high quality alcohol, greater than 99% purity.

Set the fiber onto fiber holder

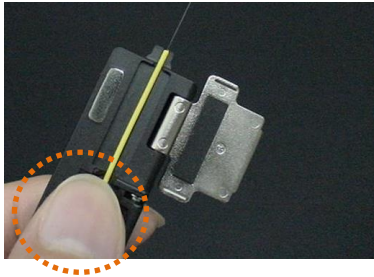
1. Open the lid of a fiber holder and then set the fiber onto the fiber holder.
2. Adjust the position of fiber and then close the lid of fiber holder. The position of the fiber is dependent on the fiber holder as shown below.



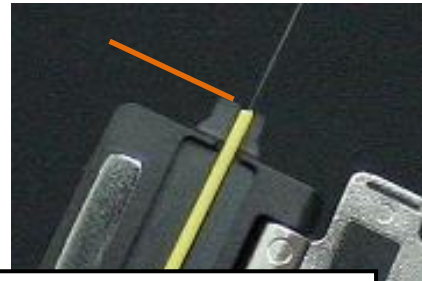
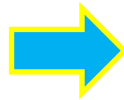
- Select a suitable fiber holder based on the fiber coating diameter.
- If fiber coating has some memory curl, place fiber so that the curve of memory is turned downwards.
- Close the lid of a fiber holder while pressing down with a finger on the coating (refer to figure below).

In case of using Fiber Holder “FH-50 series”;

Adjust the sheath edge at the edge of fiber holder.



Pressing down with a finger



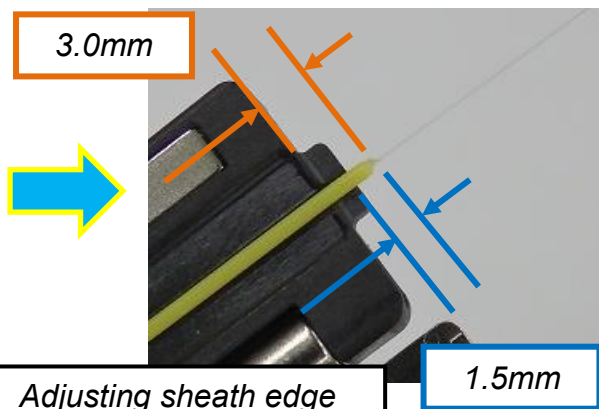
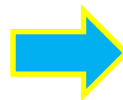
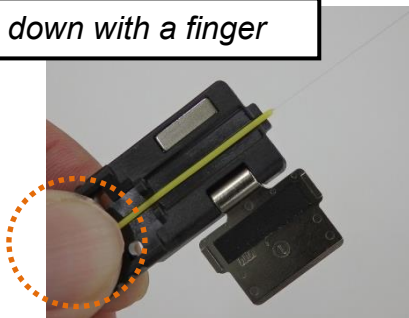
Adjusting sheath edge

In case of Fiber holder “FH-70 series”;

Use either the edge, or the extruded fiber support of the fiber holder as the reference point. Adjust the position of the sheath edge as follows:

- If the reference point is set as the edge of the fiber holder, set the fiber onto the fiber holder with the fiber sheath **3.0mm** from the edge of the fiber holder.
- If the reference point is set as the extruded fiber support of the fiber holder, set the fiber onto the fiber holder with the fiber sheath **1.5mm** from the extruded surface of the fiber holder.

Pressing down with a finger



Adjusting sheath edge

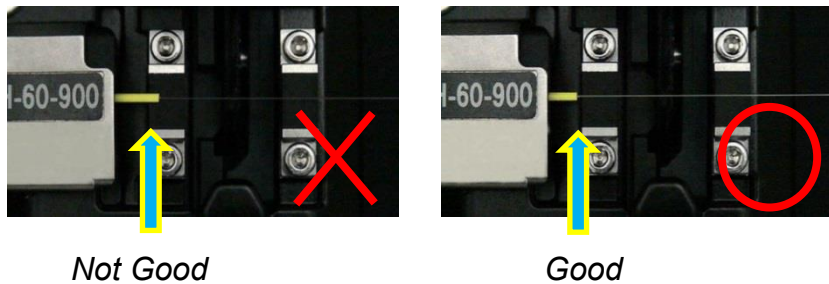
1.5mm

Fiber Cleaving(CT-30)

1. To unlock the cutting lever, press it gently and slide the stopper.
Push the slide button until it locks and insert the fiber holder with the stripped optical fiber on the cleaver.



2. Check to ensure only bare fiber sits on the pads (not jacket or coating). Adjust the fiber position or prepare it again if necessary.



3. Gently press down the cutting lever and release the cutting lever. A spring will restore it to its open position.



- Do not put fingers in the cleaving area as personal injury may result.
- Releasing pressure on the cutting lever before it is fully engaged may result in poor cleave quality.

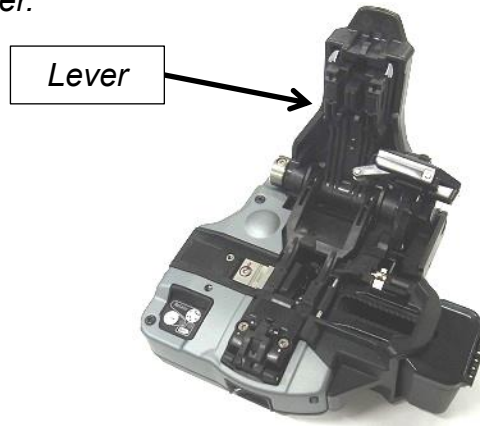
4. Remove the fiber holder from the cleaver. Be careful not to allow the fiber to come in contact with anything, as this can contaminate the end-face of the fiber.



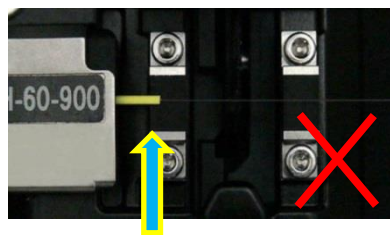
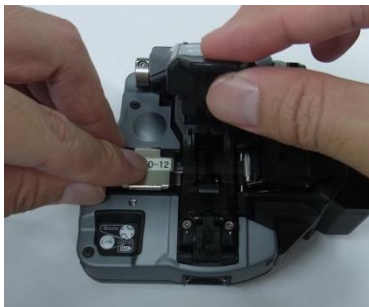
- Do not open the lid of the fiber holder before splicing. If it is opened, cleave length can be changed.

Fiber Cleaving(CT50)

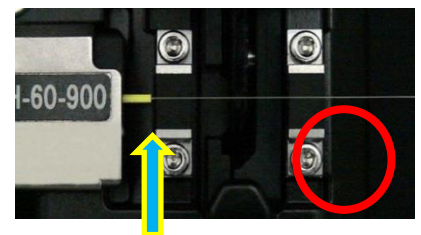
1. Lift the Lever until it stops. The blade is automatically set at the start position and is now ready to cleave the fiber.



2. Push the fiber holder towards. Check the position of the fiber coating. If it sits on the rubber pad, adjust the fiber position in the Fiber Holder until it doesn't sit on the pad.



Not Good



Good



- Confirm the sheath of fiber is not on pad when fiber holder is used.

3. Close and gently push down on the Lever until it stops. The blade automatically moves and the fiber is cleaved. The scrap the cleaved fiber scrap is automatically deposited into the Fiber Scrap Box [FDB-05]. Properly dispose of the scrap by emptying the Fiber Scrap Box at an appropriate time.



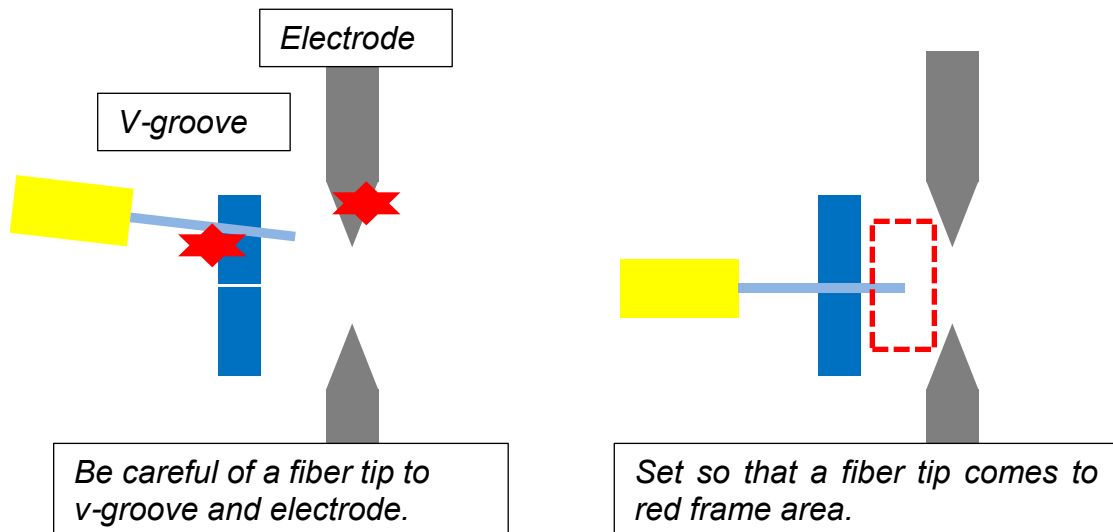
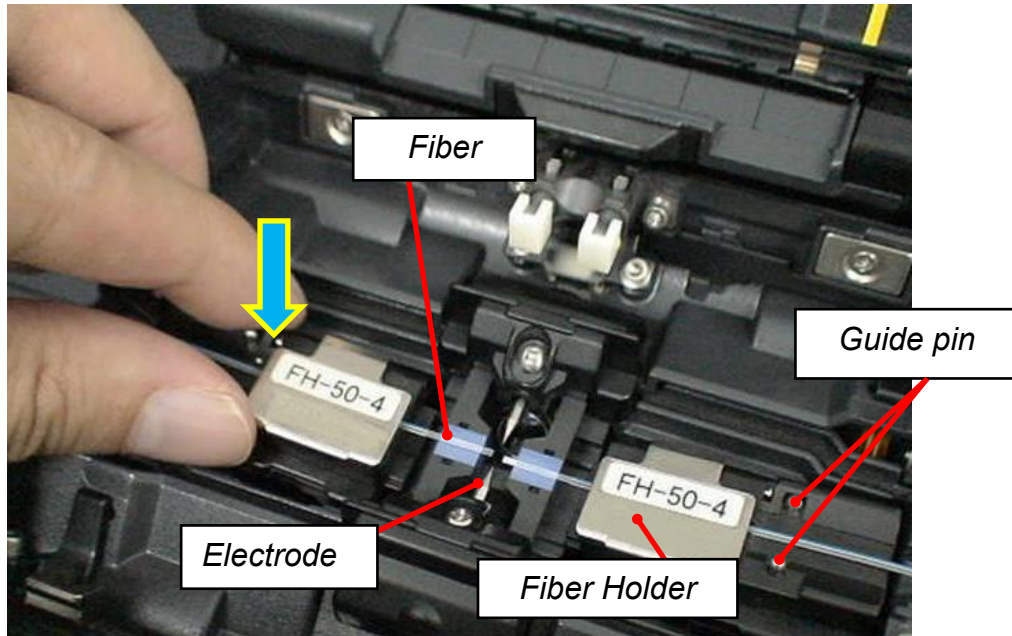
4. Lift the Lever until it stops and remove the fiber holder from the cleaver. Be careful not to contaminate the end-face of the fiber by touching anything with it.



- Do not open the lid of the fiber holder before splicing. If it is opened, cleave length can be changed.

Loading fiber to splicer

1. Open the wind protector.
2. Place fiber holders so that the guide pins on the stage go to guide-holes in the fiber.



- Be careful not to contact the prepared fiber tips into anything to maintain fiber end-face quality.

3. Close wind protector. Although a splicing starts connection operation automatically, we recommend you to carry out an arc discharge inspection before splicing. Refer to the following clause for the Arc Calibration inspection point.

Arc Calibration

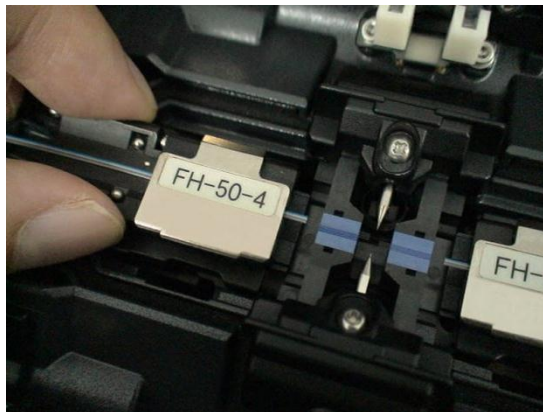
Atmospheric conditions such as temperature, humidity, and pressure are constantly changing, which creates variability in the arc temperature. This splicer is equipped with temperature sensor that is used in a constant feedback monitoring control system to regulate the arc power at a constant level. Changes in arc power due to electrode wear and glass adhesion cannot be corrected automatically. Also, the center position of arc discharge sometimes shifts to the left or right. In this case, the fiber splicing position has to be shifted in relation to the arc discharge center. It is necessary to perform an arc power calibration to eliminate both of these issues.



- Arc calibration is performed automatically using [AUTO] mode only. So arc calibration does not have to be performed when splicing in this mode.
- Execute [Arc calibration] before using non-auto mode.
- When Performing the [Arc Calibration] function change the arc power "factor" value. The factor value is used in the algorithm program for all splicing. The arc power value will not change in the splice modes.

Operation procedure

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



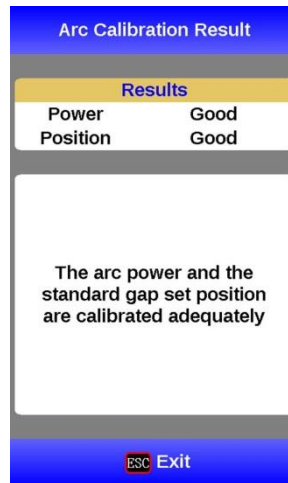
- For Arc Calibration, select the using splice mode. if it is MM Fiber, use standard MMF ITU-T G651 fiber. if it is SM Fiber, use standard SMF ITU-T G652 fiber.
- Use well prepared fibers for arc calibration. Dust on the fiber surface affects arc calibration.
- Cleave angle threshold does not link to the parameter "Cleave Limit" in splicing modes. Cleave angle threshold is independently set for arc calibration. See section [Machine Settings] to change cleave angle threshold.

3. The ARC Calibration will begin after pressing **ENT** key.

“Good” message

Arc power and splicing position calibration are successfully completed. Press **ESC** key to exit.

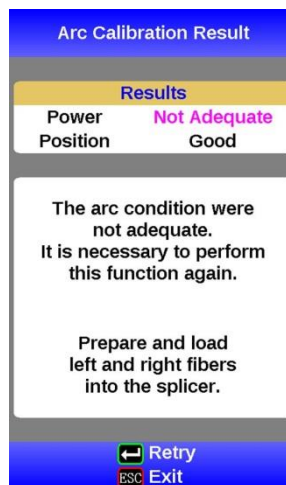
Result: Good



“Not Adequate” message

Arc power and splicing position calibration are completed but further calibration is strongly recommended, as the change from the previous arc calibration is too large. Press **ENT** key to perform arc calibration, or **ESC** key to exit even though arc calibration is not completed.

Result: Not Adequate

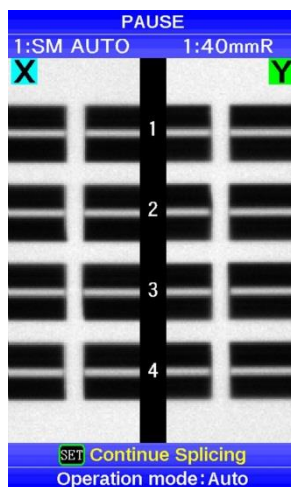


- In some cases, multiple iterations of arc calibration are needed until the calibration process is successfully completed and the "Test Finish" message is displayed. Arc calibration can be considered almost completed if multiple iterations are completed without receiving the message.
- Number threshold can be set so that "Test Finish" message is displayed after specific number of arc calibrations is performed. See section [Machine Settings] for detail.

Splicing procedure

To make a good splice, the optical fiber is observed with the image processing system equipped in the 19R+. However, there are some cases when the image processing system cannot detect a faulty splice. Visual inspection with the monitor is often necessary for better splicing yield. The instruction below describes standard operating procedure.

1. Fibers loaded in the splicer move forward toward each other. The fiber forwarding motion stops at a certain position shortly after the cleaning arc is performed.
2. Next, the cleave angle and end-face quality are checked. If the measured cleave angle is greater than its set threshold or fiber chipping is detected, the buzzer will sound and an error message warns the operator.



PAUSE
1:SM AUTO 1:40mmR

Fiber Offset

| No. | Cleave | | Offset | Gap |
|-----|--------|------|--------|------|
| | L | R | | |
| 1 | 1.1° | 0.7° | 0.5μm | 49μm |
| 2 | 1.2° | 0.6° | 0.5μm | 49μm |
| 3 | 1.4° | 2.0° | 1.1μm | 45μm |
| 4 | 1.8° | 0.9° | 0.9μm | 50μm |

Fiber Gap

Left and Right cleave angle

SET Continue Splicing
Operation mode: Auto

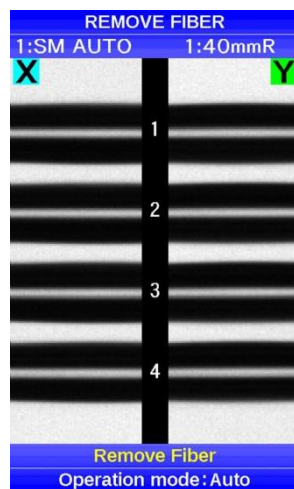
3. If no error message is displayed, the below stated end-face conditions are used for visual inspection. If observed, remove the fiber from the splicer and repeat fiber preparation. These visual defects may cause a faulty splice.

| Cleave Shape NG | | | | Large Cleave Angle |
|-----------------|-----|--|--|--------------------|
| | | | | |
| Chip | Lip | | | Angle |



- Pause after cleave angle check and fiber alignment can be set "disabled". See section [Splice Settings] for detail.
- The cleave angle threshold can be changed. See section [Splice Menu]
- The cleave angle error message can be ignored by pressing **SET** key to go on to the next step. To disable the cleave angle error. See section [Splice Settings] for detail.
- Cleave angle, during the splicing operation can be hidden. See section [Splice Settings] for detail.

4. After fiber inspection, arc discharge is performed to splice the fibers.
5. Estimated splice loss is displayed after completion of splicing. Splice loss is affected by certain factors stated. These factors are taken into account to calculate, or estimate, splice loss. The calculation is based on certain dimensional parameters, such as MFD.
 If either the cleave angle measured or the estimated splice loss exceeds its set threshold, an error message is displayed. If the spliced fiber is detected as abnormal, the "Fat", "Thin" or "Bubble" error message is displayed.
 If no error message is displayed but the splice looks poor by visual inspection through the monitor, it is strongly recommended to repeat the splice from the beginning.



| REMOVE FIBER | | |
|----------------------|--------|----------|
| 1:SM AUTO 1:40mmR | | |
| No. | Loss | Error(s) |
| 1 | 0.00dB | |
| 2 | 0.01dB | |
| 3 | 0.00dB | |
| 4 | 0.02dB | |
| Remove Fiber | | |
| Operation mode: Auto | | |

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

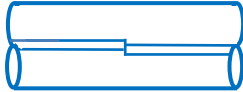

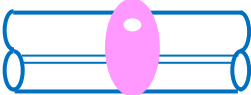
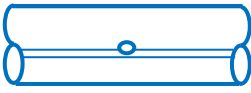
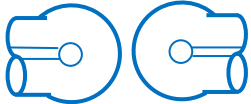





- Restriction of the number of times of additional arc discharge can be set up. Since excessive additional arc discharge becomes the cause of worsening splice intensity and a splice loss, it can forbid the arc discharge more than the suitable number of times. Refer to [Splice Settings] for details.



- Splice point sometimes looks a bit fatter than other parts. This is considered a normal splice, and does not affect splice loss.
- To change threshold for estimated splice loss or fiber angle, see section [Splice Mode].
- Error messages, such as "Estimated splice loss", "Splice angle", "Fat", "Thin" and "Bubble" can be ignored. This function can be set to "disabled". See section [Splice Settings] for detail.

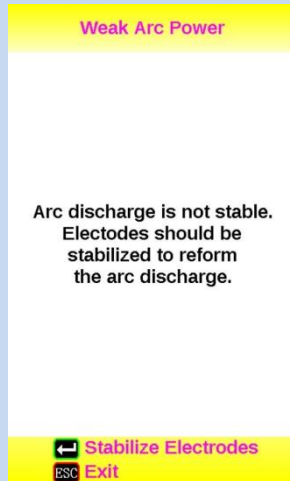
Splice loss increase: Cause and remedy

| Symptom | Cause | Remedy |
|--|--|--|
| Axial offset  | Dust on v-groove or fiber clamp chip | Clean v-groove and fiber clamp chip. |
| Fiber angle  | Dust on v-groove or fiber clamp chip | Clean v-groove and fiber clamp chip. |
| | Bad fiber end-face quality | Check if fiber cleaver is well conditioned. |
| Combustion  | Bad fiber end-face quality | Check the cleaver |
| | Dust still present after cleaning fiber or cleaning arc. | Clean fiber thoroughly or Increase [Cleaning Arc Time] |
| Bubbles  | Bad fiber end-face quality | Check if fiber cleaver is well conditioned. |
| | Prefuse power too low or prefuse time too short. | Increase [Prefuse Power] and/or [Prefuse Time]. |
| Separation  | Fiber stuffing too small | Perform [Motor Calibration] |
| | Prefuse power too high or prefuse time too long. | Decrease [Prefuse Power] and/or [Prefuse Time]. |
| Fat  | Fiber stuffing too much | Decrease [Overlap] and perform [Motor Calibration]. |
| Thin  | Arc power not adequate | Perform [Arc Calibration]. |
| | Some arc parameters not adequate | Adjust [Prefuse Power], [Prefuse Time] or [Overlap]. |
| Line  | Some arc parameters not adequate | Adjust [Prefuse Power], [Prefuse Time] or [Overlap]. |



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

A loss becomes high when the following errors occur.



Electric discharge may become unstable when usage environment changes significantly.
In such a case, please use it after performing "Stabilize Electrodes".

When **ENT** key has been pushed, "Stabilize Electrodes" is performed.
Please perform an "Arc Calibration" after the end of "Stabilize Electrodes" according to the directions on a screen.

Storing splicing results

Splicing results is stored in memory.



- After the 2000th result is stored, 2001st splice result is written over 1st result.

Storing results automatically

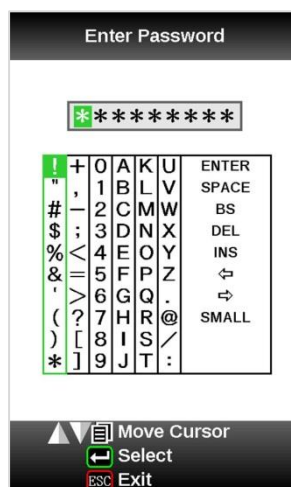
The splice result is automatically stored in memory when **RESET** is pressed upon completion of the splice at the [Finish] screen or when the wind-protector is opened upon completion of the splice at the [Finish] screen.

Once a certain comment is recorded, the same comment is recorded into subsequent splice results. To change comments, see the next paragraph.

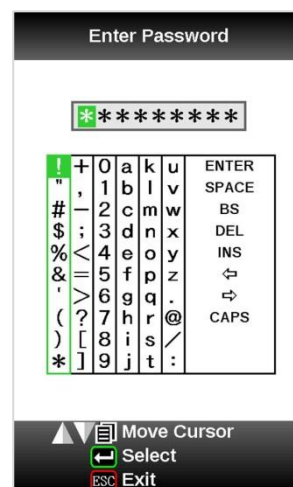
How to input Mode Title/Comment/Password

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

1. Move the cursor by pressing **Up/Down** Arrow key, **MENU** key, and press **ENT** key to input the selected character. If an incorrect character is inputted, move the cursor to [BS] and press **ENT** key to highlight the character, and then input the proper character over it.
2. Move cursor to [ENTER] on right side and press **ENT** key on completion of inputting characters.
3. In the case of Password input, the next screen image is displayed if the correct password is inputted. If the input password is incorrect, the previous screen image is displayed.



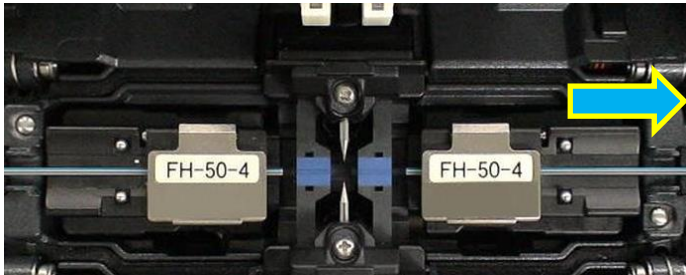
CAPS Characters



SMALL Characters

Fiber Proof Test

The strength of the splice point can be checked. After splicing when a proof-test is performed by pressing the **SET** key or opening wind-protector. If the operation mode is set to "Auto", a proof-test will be performed automatically.



A motion changes by the selected operation mode.

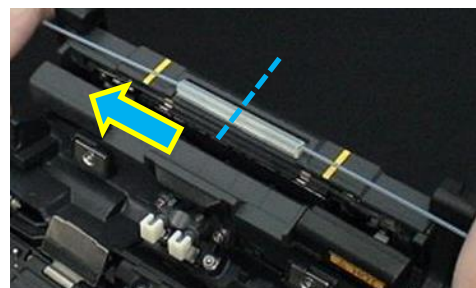
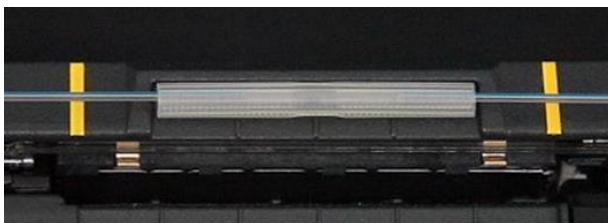
Heating protection sleeve

1. Hold left fiber with left hand at the edge of splicer.



- Keep holding fiber until fiber is completely transferred to tube heater.

2. Open the right side sheath clamp lid.
3. Place the protection sleeve over the Right side fiber to splice point.
4. Hold right fiber with right hand, and remove the splicer.
5. If a protection sleeve is put on the centering guide on the heater upper surface and a left position is moved in the case of the equipment left, a connection point will be moved focusing on a protection sleeve.



A protection sleeve is moved to a splice point, holding a fiber with the left hand.
Be careful there is no slack at a splice point.
However, excessive tension may also cause fracturing of the fiber.



- Check that the splice point is located in the center of a protection sleeve.
- Check whether the twist has occurred on the right-and-left fiber.
- Put a tension member below the splice point.

6. Optical fiber is conveyed to a heater unit, and it takes down to a heater part and holds.



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



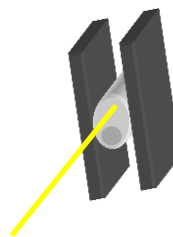
If a protection sleeve is not centered between yellow lines, the protection sleeve may not shrink completely. In this case, please set to a heater once again and perform re-heating.

7. Heater lid automatically closes when fiber is set. Do not remove hands from fiber until heater holds the fiber.

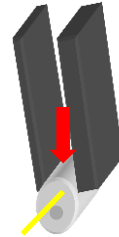


Apply tension to the fiber until heater holds the fiber.

Notes at the time of a sleeve set!!



Apply tension to the fiber until heater holds the fiber.



If a hand is lifted immediately, it will be installed in at the bottom, without being held at the heater, and will not be in contact.



- If **HEAT** key is pressed during tube heating, the HEAT LED blinks. If **HEAT** key is pressed again, the tube heating process is aborted.

8. If heat processing is completed, buzzer will sound and a heater lid will open automatically.



- Protection sleeve may stick to heater plate surface. Use a cotton swab to help remove sleeve from heater.
- Since it gets very hot in the heater and the sleeve will get hot, you should not touch the sleeve immediately after heating.

Visually inspect the finished sleeve to verify no bubbles or debris/dust is present in the sleeve.

Wind-protector motion

This unit has the Wind-Protector automatic opening-and-closing mechanism and switching action differs by the chosen operation mode.

| Operation Mode | Wind-protector motion | | | | | |
|----------------|--|--------|-------------------------|---|------------------------------|--------------------------|
| | When error occurred such as Fat, Thin, Loss etc. | | When Error not occurred | When error occurred except for having enumerated to the following | When the power supply starts | When RESET key is pushed |
| | end of splicing | Pause | end of splicing | | | |
| Auto | Closed | Open | | | | |
| Fast | | | | | | |
| Normal | | Closed | Open | | | Open |
| Customized | Closed | | Open/Closed | | | |

* When the power supply is off, "Wind-Protector" state is closed.
So please be sure to push a power button and to turn off a power supply.

Since "Wind-Protector" will open depending on the operation mode, we recommend you to set the operation mode as Normal mode if you want to use additional electric discharge etc. after end of splice.

Time after setting a fiber until "Wind-Protector" closes is short by "Auto" and "fast" mode, and is set up a little long by "Normal" mode.

Time after setting a fiber until "Wind-Protector" closes can be changed in "customized" mode

Cleaning and Checking Before Splicing

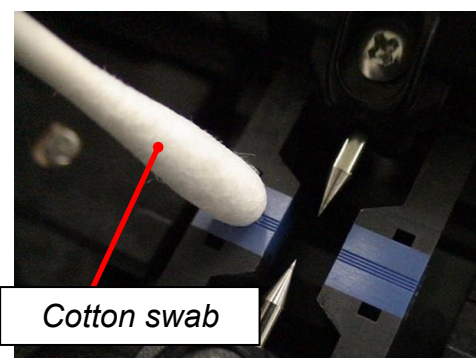
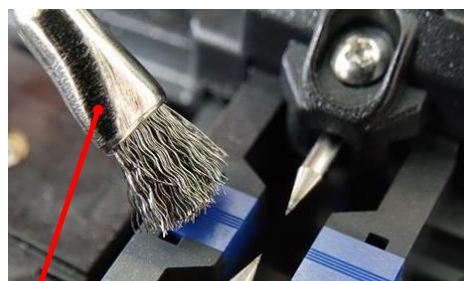
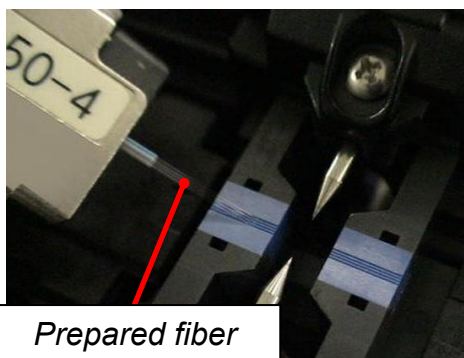
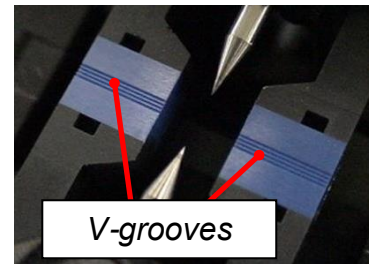
It is possible to maintain the performance of the splicer for a long time with proper cleaning and maintenance.

Critical cleaning points and maintenance checks are described below.

Cleaning V-grooves

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

1. Open the wind-protector.
2. Clean the bottom of the V-groove with an alcohol-moistened thin cotton swab. Remove excess alcohol from the V-groove with a clean dry swab.
3. If the contaminants in the V-groove cannot be removed with an alcohol-moistened thin cotton swab, use a cleaved fiber end-face to dislodge contaminants from the bottom of the V-groove. Repeat step section 2 after this procedure. Instead of the cotton swab, you can use the specialized V-groove cleaning brush: [VCB-01]. Use the brush in the same way you would use a cotton swab.

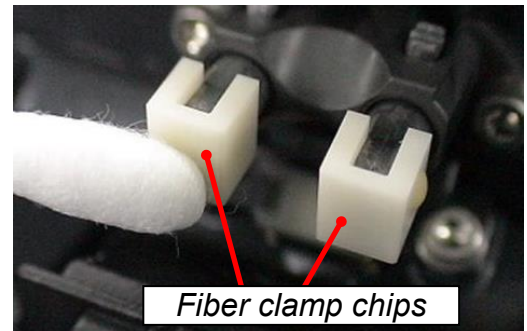


- Be careful not to touch the electrode tips.
- Execute [Arc Calibration] after cleaning.

Cleaning Fiber Clamp Chips

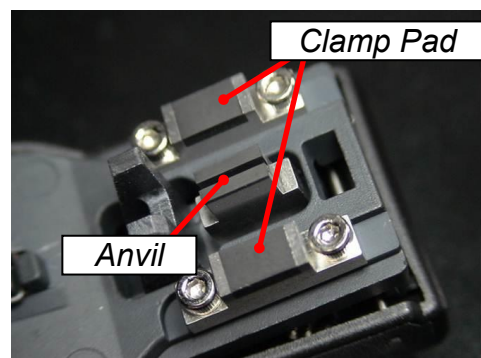
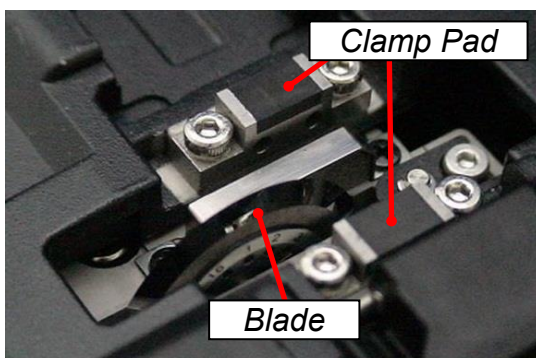
If contaminants are present on the clamp chips, proper clamping may not occur, resulting in poor quality splices. The fiber clamp chips should be frequently inspected and periodically cleaned during normal operation. To clean the clamp chips do the following:

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

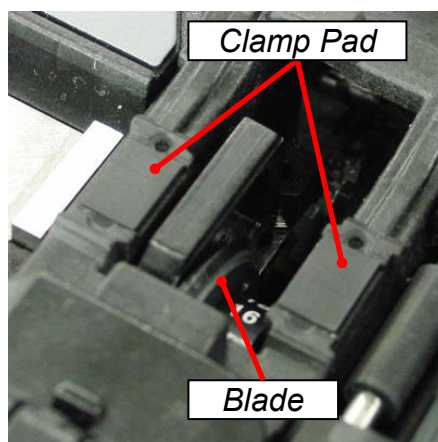


Cleaning Fiber Cleaver

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



CT-30



CT50

Arc Calibration

See Section [Arc Calibration].

Periodical Checking and Cleaning

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

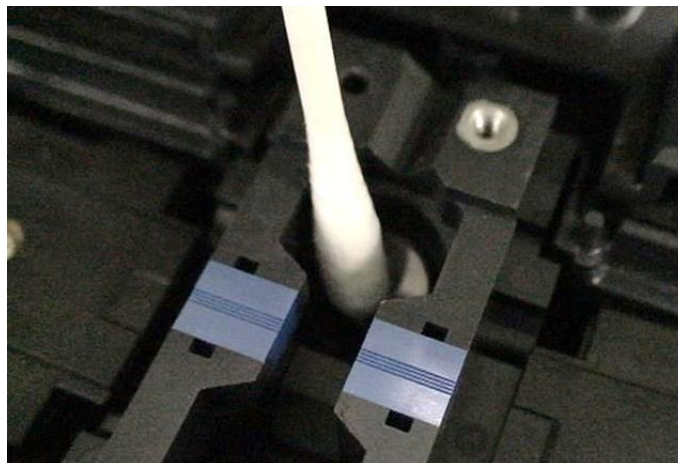
Cleaning of Objective Lens

If the surface of the objective lens becomes dirty, inaccurate observation of the fiber position may occur, resulting in higher splice loss or poor splicer operation. Therefore, clean objective lens. Otherwise, dirt may accumulate and become impossible to remove. To clean the objective lens, do the following:

1. *Before cleaning the objective lens, always turn off the splicer.*
2. *Gently clean the lens with an alcohol-impregnated thin cotton swab. Remove excess alcohol from the lens surface with a clean dry swab.*



- *Remove electrodes before cleaning objective lens.*
- *Do not hit or touch the tip of the electrode when cleaning.*



3. *The lens surface should be clean and free of streaks or smudges.*
4. *Turn on the power and make sure no smudges or streaks are visible on the monitor screen. Perform the Dust Check procedure.*

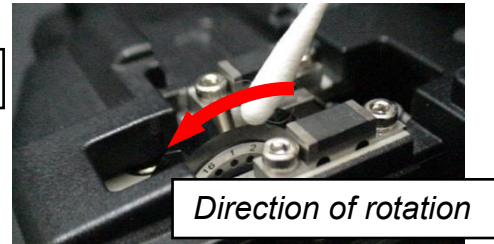
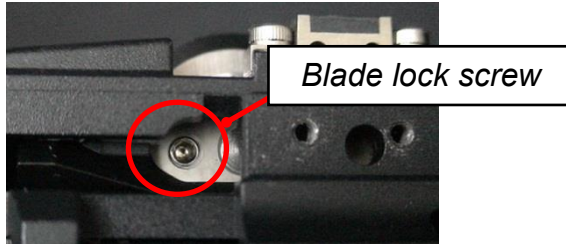
Cautions were displayed

Cleaver Blade Alarm displayed

Position Changing CT-30 Cleaver Blade

If the cleaver does not cleave properly, rotate the blade 1/16th of a turn to replace the worn out blade position with a sharp blade position. Blade life is normally 1000 cleaves per blade position. To rotate the blade, do the following:

1. Push the slide button until it locks. And using a 1.5mm hex wrench, loosen the blade lock screw.



2. Rotate the circular blade 1/16th of a turn. (Use Cotton Swab)
3. Tighten the blade lock screw.



- When rotating the blade, do not touch the cutting edge. Move the blade with a thin cotton swab, for easy and safe rotation.

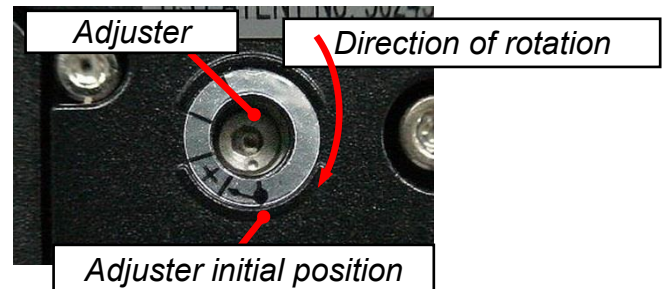
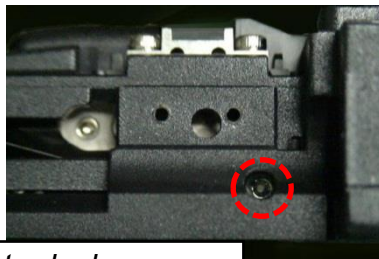
Blade Height changing of CT-30

After the circular blade has been rotated a complete revolution (16 positions), its height needs to be adjusted to compensate for the wear.

1. Push the slide button until it locks. And using a 1.5mm hex wrench, loosen the blade lock screw
2. Using a 1.5mm hex wrench, loosen the adjuster lock screw.
3. Using a 1.5mm hex wrench, turn the adjuster clockwise so that the reference dot aligns with the next position mark. Never attempt to rotate the adjuster more than 2 position marks.
4. Tighten the adjuster lock screw.



- After blade height adjustment, the 16 blade positions can be used again. If the cleaver does not cleave properly, rotate the blade.



Blade Replacement of CT-30

After the circular blade has been raised 2 times and rotated through all 3 positions (a total of approximately 48,000 fiber splices), it needs to be replaced. Contact the authorized distributor.

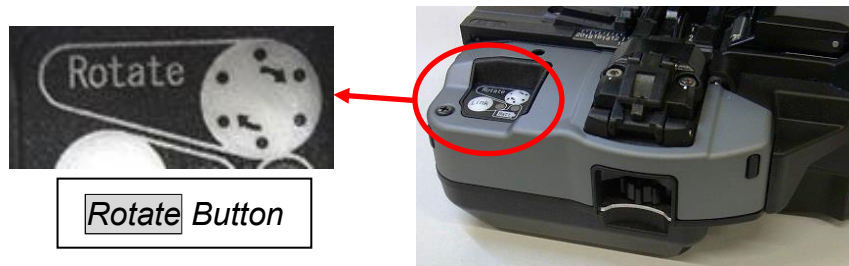
Maintenance of Splicing Quality

Repositioning the CT50 Cleaver Blade

The CT50 uses a circular blade that has 16 positions. Each position can cleave 1,250 fibers. Rotate to the next number for a new blade position after cleaving more than 1,250 fibers. Check the Blade Position Number printed to the side of the blade. This procedure describes how to rotate it by 3 methods.

Method1: Rotate the blade using the Rotate Button

4. Open the Lever until it stops.
5. Press **Rotate** button. The blade rotates during pressing the **Rotate** button.
6. Check the blade position number.



Method2: Rotate the blade using a Smartphone or splicer

1. Open the Lever until it stops.
2. Rotate the blade using the splicer or the application software "Splice+".

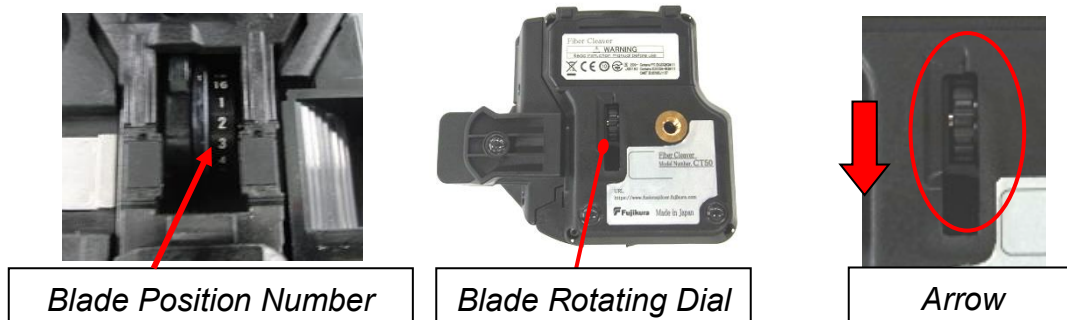


- In the Method2, the smartphone needs to connect the CT50 and splicer before rotating the blade.
- If an error occurs when attempting to rotate the blade, the Batt. LED indicator will blink red. In this case, close Lever and repeat. If same problem happens, contact a Fujikura authorized distributor.

Method3: Rotate the blade manually by Blade Rotating Dial

This method can rotate the blade without the battery. If battery power is low, use this method.

1. Close the Lever and then rotate the Blade Rotation Dial in the direction of the arrow until it clicks.
2. Check that the Blade Position has advanced to next number.



Blade Position Number and Blade Rotating Dial

Blade Height changing of CT50

The Blade height can be changed by rotating the Blade Height Dial located on the front of the cleaver. It can be raised a total of 2 times.

Method

1. Verify the position of the Blade Height Dial.
2. Rotate it to next number. Do not rotate more than one position at one time. Push the slide button until it locks. And using a 1.5mm hex wrench, loosen the blade lock screw



Front view



- Replace the blade after raising it 2 times, and after all 16 positions have been used.
- The Cleave Blade and Arm set for CT50 is user serviceable. Contact your Fujikura distributor for details.

Blade Replacement of CT50

After the circular blade has been raised 2 times and rotated through all 3 positions (a total of approximately 60,000 fiber splices), it needs to be replaced.

The cleaver blade is replaced by the service center. The blade of CT50 series user serviceable. Contact to Fujikura authorized distributor.

Clamp Arm Replacment of CT50

When the clamp pad is worn, it needs to be replaced.

If the user needs assistance in replacing the pad or with obtaining parts they should contact the nearest Fujikura authorized distributor.



Spare blade



Clamp Arm

Electrode Caution displayed

Replace Electrodes

See Section [Replace Electrodes].

Another error displayed

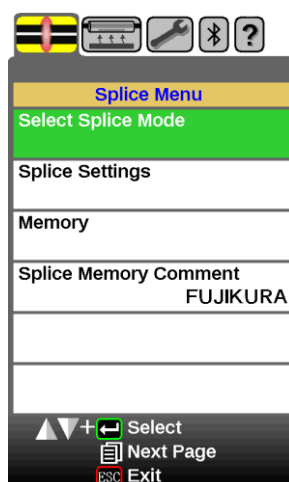
Diagnostic Test

See Section [Diagnostic Test].

Composition of Splice Menu

Common parameters for the modes for splicing and machine setting can be set.

1. Press **MENU** key at [READY], [PAUSE] or [FINISH] state to open [Splice Menu].
2. Move cursor by pressing **Up/Down** Arrow key to a parameter to be selected.
3. Press **ENT** key to change values and settings.



Setting parameters

| Parameter | Description |
|-----------------------|--|
| Select Splice Mode | Mode according to the fiber to splice can be chosen. |
| Splice Settings | Common parameters for all the modes for splicing and operation can be set. |
| Memory | A situation can be checked after splicing with this machine. |
| Splice Memory Comment | A comment can be added to the memory saved at the time of the end of connection. |

Splice Mode

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

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

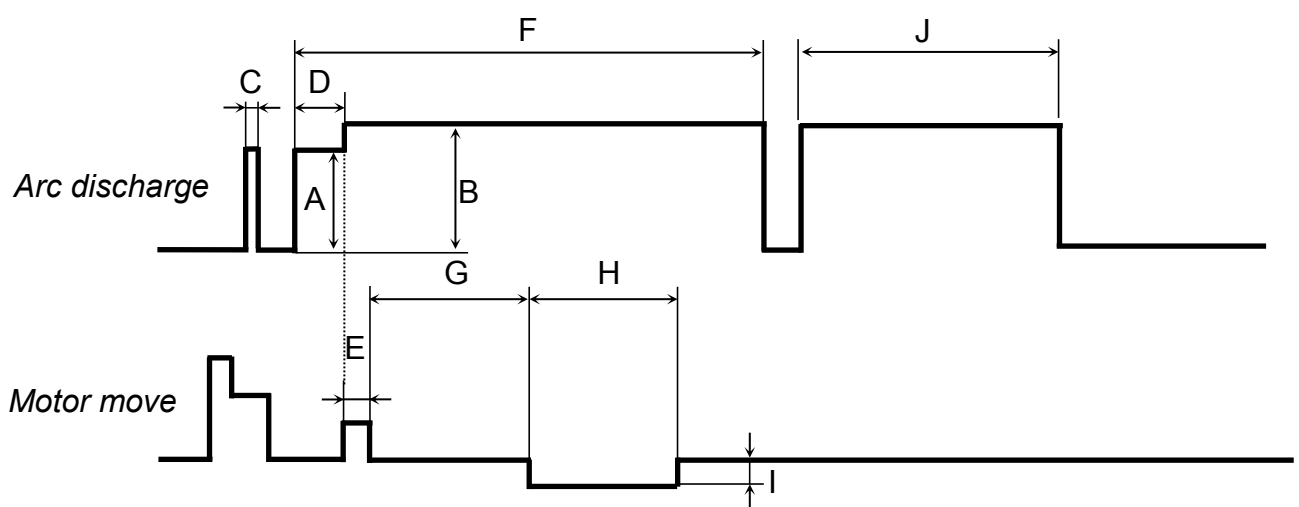
A series of optimal splice parameters for major fiber combinations are already stored in the splicer. These parameters are stored in the database area and can be copied to the user-programmable area. These splice parameters can be edited for a specific fiber combination.

How to select the Splice Mode



- [SM AUTO] and others
Use this mode if the fiber type is identified.
- [SM FAST] and others fast
Use this mode if the fiber type is identified and prefer quick splice with high yield to consistent splice loss.
- [SM] and others
For those who prefer the lowest possible splice loss to any other considerations. This mode selected, perform the "Arc Calibration" manually.

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



A: Prefuse Power,
D: Prefuse Time,
G: Taper Wait Time,
I: Taper Speed,

B: Arc Power,
E: Overlap,
H: Taper Time related to Taper Length,
J: Rearc Time

C: Cleaning Arc
F: Arc Time

Select Splice Mode

Database of splice mode (AUTO)

| Splice Mode | Description |
|-------------|--|
| AUTO | <p>This splice mode can splice standard telecommunications grade fiber, including SMF (ITU-T G.652), NZDSF (ITU-T G.655) and DSF (ITU-T G.653).</p> <p>The amount of heat applied to the fiber is calibrated in real time by analyzing the cladding illumination during arc discharge and adjusting the arc current accordingly. This splice mode does not require the operator to perform an arc calibration.</p> |
| SM AUTO | <p>This splice mode can splice the standard SM fiber (ITU-T G.652). The amount of heat applied to the fiber is calibrated in real time by analyzing the cladding illumination during arc discharge then adjusting The arc current accordingly. This splice mode does not require the operator to perform an arc calibration.</p> |
| SWR AUTO | <p>This splice mode can splice the <u>Spider Web Ribbon Fiber</u>.</p> <p>The operation and parameters (except for the parameters in “Stripper Menu”) are same as SM AUTO mode.</p> |
| MM AUTO | <p>This splice mode can splice the standard MM fiber (ITU-T G.651).</p> <p>The amount of heat applied to the fiber is calibrated in real time by analyzing the cladding illumination during arc discharge then adjusting The arc current accordingly. This splice mode does not require the operator to perform an arc calibration.</p> |
| NZ AUTO | <p>This splice mode can splice the standard NZDS fiber (ITU-T G.655).</p> <p>The amount of heat applied to the fiber is calibrated in real time by analyzing the cladding illumination during arc discharge then adjusting the arc current accordingly. This splice mode does not require the operator to perform an arc calibration.</p> |
| DS AUTO | <p>This splice mode can splice the standard DS fiber (ITU-T G.653).</p> <p>The amount of heat applied to the fiber is calibrated in real time by analyzing the cladding illumination during arc discharge then adjusting the arc current accordingly. This splice mode does not require the operator to perform an arc calibration.</p> |

Points to note: of **AUTO mode



- NZDS is specified using the splicing mode for standard NZDS fiber. However, for best results, it is recommended that the optimum splice mode be selected for a specific type of NZDS fiber. This is due to the variation in the NZDS fiber properties and optimum splicing parameters are different from one type of NZDS fiber to the next.

Database of splice mode (Special)

| Splice Mode | Description |
|-------------|--|
| SM | For splicing standard Single-mode fiber (ITU-T G652). The MFD is 9 to 10 μm at wavelength of 1310 nm. Automatic arc calibration doesn't work in this splice mode. |
| SWR | For splicing Spider Web Ribbon fiber. The operation and parameters (except for the parameters in "Stripper Menu") are same as SM mode. Automatic arc calibration doesn't work in this splice mode. |
| NZ | For splicing Non-zero dispersion-shifted fiber (ITU-T G655). The MFD is 9 to 10 μm at wavelength of 1550 nm. Automatic arc calibration doesn't work in this splice mode. |
| DS | For splicing Dispersion-shifted fiber (ITU-T G653). The MFD is 7 to 9 μm at wavelength near 1550 nm. Automatic arc calibration doesn't work in this splice mode. |
| MM | For splicing Multi-mode fiber (ITU-T G651). Core diameter : 50.0 to 62.5 μm Automatic arc calibration doesn't work in this splice mode. This mode is programmed to achieve the best splice loss of MM fiber. The appearance of splice point doesn't look fat |

Profile type

| | | |
|---------|------------|---|
| SMF : | ITU-T G652 | MFD : 9~10 μm , Wave length : 1310nm |
| NZDSF : | ITU-T G655 | MFD : 8~10 μm , Wave length : 1550nm |
| DSF : | ITU-T G653 | MFD : 7~9 μm , Wave length : 1550nm |
| MMF : | ITU-T G651 | Core : 50.0 μm , 62.5 μm |

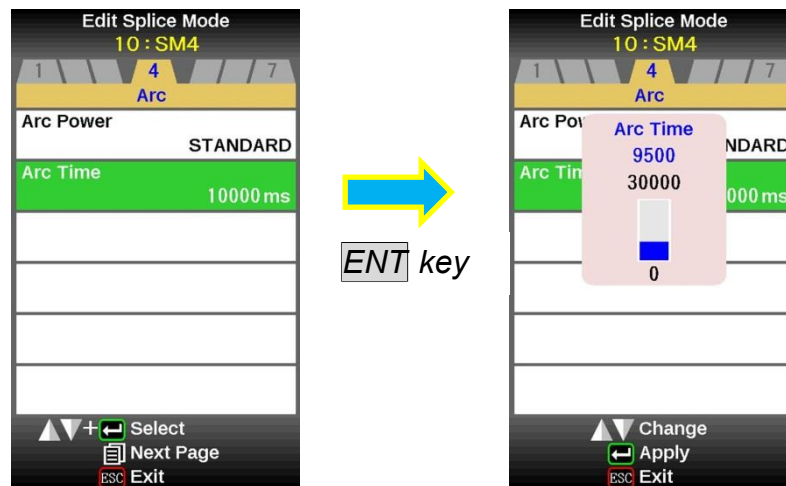
Database of splice mode (FAST)

| Splice Mode | Description |
|-------------|---|
| SM FAST | For splicing standard Single-mode fiber (ITU-T G652). The MFD is 9 to 10 μm at wavelength of 1310 nm. Automatic arc calibration doesn't work in this splice mode. Execute [Arc Calibration] before splicing. |
| SWR FAST | For splicing Spider Web Ribbon fiber. The operation and parameters (except for "Stripper") are same as SM FAST mode. Automatic arc calibration doesn't work in this splice mode. Execute [Arc Calibration] before splicing. |
| MM FAST | For splicing Multi-mode fiber (ITU-T G651). Core diameter : 50.0 to 62.5 μm Automatic arc calibration does not work in this mode. Execute [Arc Calibration] before splicing. |
| NZ FAST | For splicing Non-zero dispersion-shifted fiber (ITU-T G655). The MFD is 8 to 10 μm at wavelength of 1550 nm. Automatic arc calibration doesn't work in this splice mode. Execute [Arc Calibration] before splicing. |
| DS FAST | For splicing Dispersion-shifted fiber (ITU-T G653). The MFD is 7 to 9 μm at wavelength near 1550 nm. Automatic arc calibration doesn't work in this splice mode. Execute [Arc Calibration] before splicing. |

Referring or editing splice mode

Splicing parameters in each splice mode can be modified. Arc power and Arc time are considered the two most vital parameters. To edit parameters follow below steps:

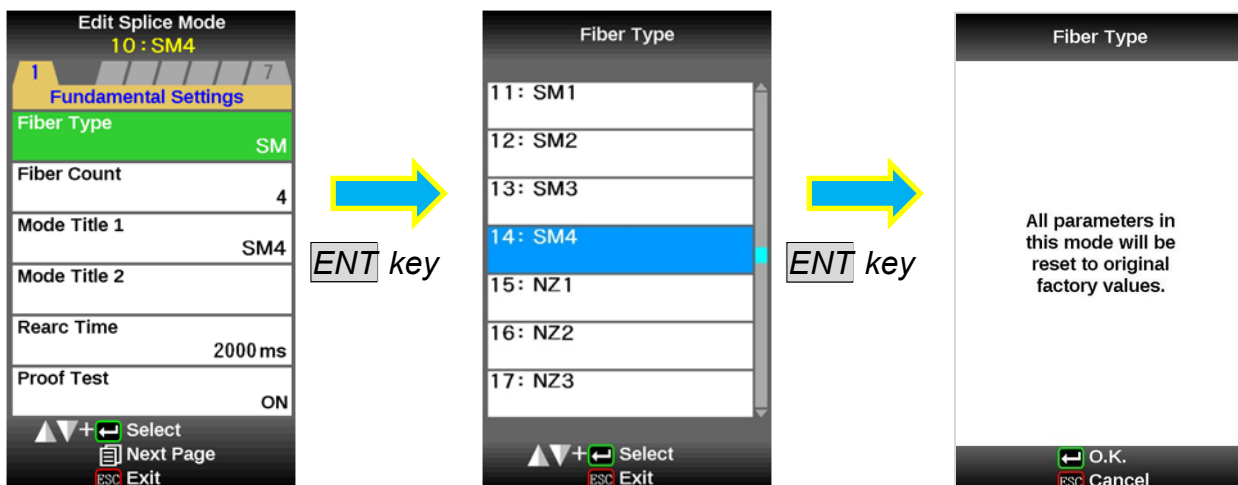
1. In [Select Splice Mode] menu, move cursor to a splice mode to be modified. Press **MENU** key to display [Edit Splice Mode] menu.
2. Move cursor by pressing **Up/Down** Arrow key to a parameter to be changed.



Initialization in the edited parameter

It can perform easily by returning mode to initial setting to return a preset value by package after changing a setup of each parameter.

1. The fiber classification of splice edit mode is chosen by the **ENT** key. Choose the same splice mode within splice mode.
2. Since the following display will come out if the **ENT** key is pressed after selection, Press the **ENT** key after a check.

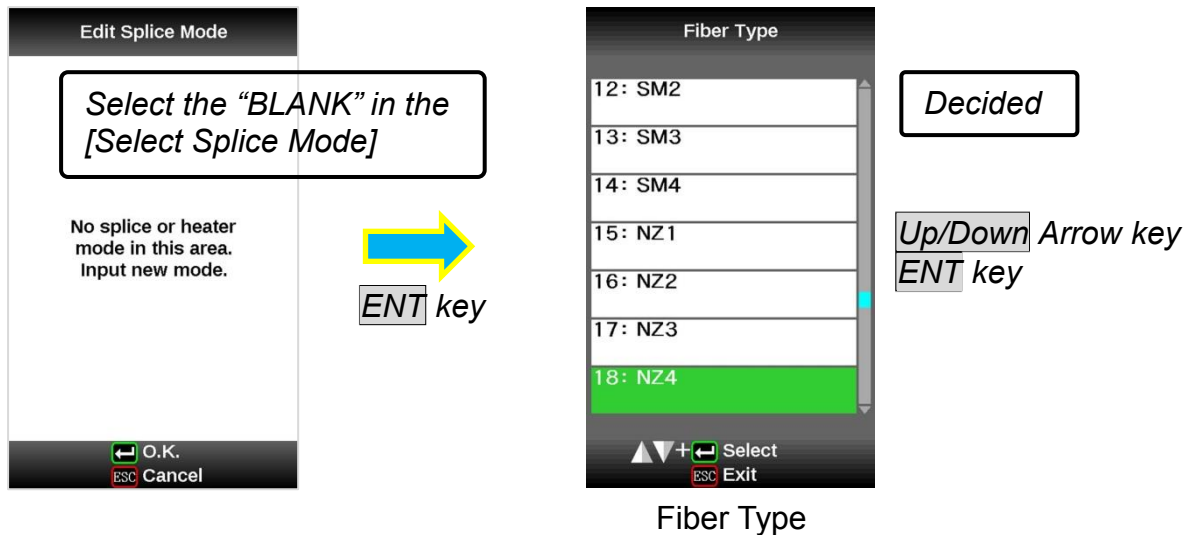


Editing or erasing splice mode

How to create splice mode

There are necessary splice modes stored when the splicer is first delivered, and all the other modes are displayed [BLANK]. Follow the below steps to add a splice mode.

Select a "BLANK" splice mode and press **MENU** key. Typical splice modes stored in the splicer database are displayed. Select one splice mode to be copied. Press **ENT** key to execute. Press **ESC** key to verify the fiber type is named in the specific splice mode.



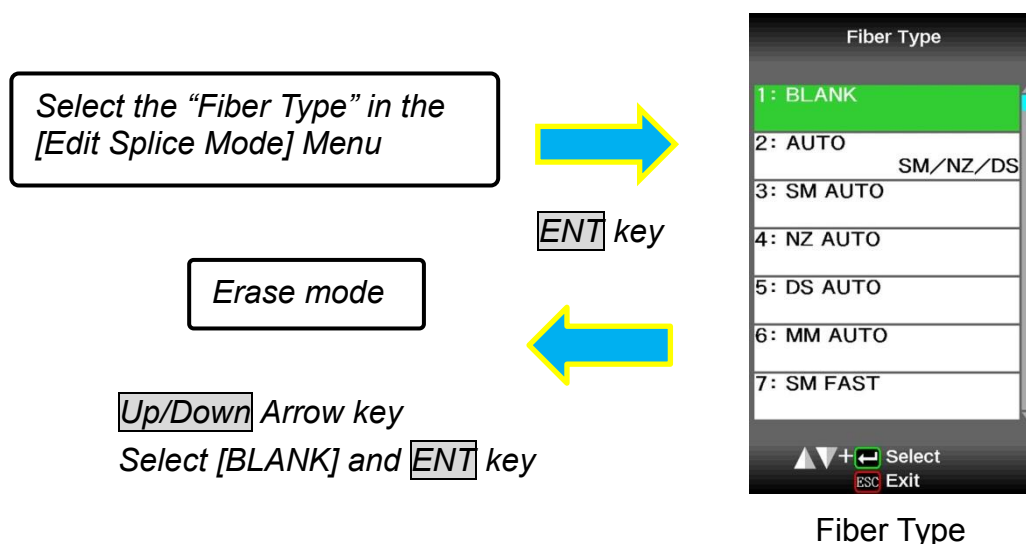
How to erase splice mode

Splice mode can be erased. Follow the below steps to erase splice mode.

1. Select the specific splice mode and press **MENU** key to go to [Edit Splice Mode] menu. Select [Fiber Type] by pressing **ENT** key.
2. Select the "BLANK" and press **ENT** key to execute.



- Mode No.1 cannot be erased.
- Mode No.1 is automatically selected after erasing a splice mode.



AUTO mode: [SM AUTO]], [SWR AUTO], [MM AUTO]], [NZ AUTO]], [DS AUTO]

Below is a list of Splicing parameters for AUTO modes

Only a limited number of parameters listed below are displayed for AUTO modes to simplify the operation. Additional hidden parameters are all fixed values set at the factory.

| Parameter | Description |
|-----------------------------|---|
| Fundamental Settings | |
| Fiber Type | List of splice modes stored in database is displayed. A selected splice mode stored in the database area is copied to a selected splice mode in the user-programmable area. |
| Fiber Count | The number of cores of the fiber to connect is chosen. |
| Mode Title1 | Title for a splice mode expressed in up to 11 characters. |
| Mode Title2 | Detail explanation for a splice mode expressed in up to 15 characters. Title2 is displayed at the [Splice Mode Select] menu. |
| Rearc Time | Splice loss may be improved by an additional “rearc” discharge in some cases. The duration of this additional arc can be changed by this parameter. |
| Proof test | An ON/OFF setup of the proof test done after splice is performed. |
| Arc | |
| Cleaning Arc | A cleaning arc removes dust on the surface of the fiber with an arc discharge for a short period of time. The duration of the cleaning arc can be changed by this parameter. |
| Arc Power | The Arc Power is fixed at STANDARD for AUTO modes. The Arc Power is changed automatically. |
| Arc Time | Arc Time is fixed at 6000ms. This is automatically set depending on the cladding illumination during Arc Discharge. |
| Error Limit | |
| Loss Limit | An error message is displayed if the estimated splice loss exceeds selected threshold (loss limit). |
| Offset Limit | An error message is displayed if the fiber offset exceeds the selected threshold (offset limit). |
| Cleave Angle Limit | An error message is displayed if the cleave angle of either the left or right fiber ends exceeds the selected threshold (cleave limit). |
| Cleave Shape Error | Error message is displayed if the cleaved end face of either left or right fiber exceeds the selected threshold (cleave shape). |
| Gap Difference Limit | The limit value of an end face irregular error is set up. An error will be displayed if one of end face intervals exceeds a limit value among the end face intervals after a gap set. |
| Stripper | |
| Heat Temperature Level | These are stripper parameters. They are automatically sent to the stripper if [Heater Parameter Control] in “Stripper Setting” menu is set to “Splice Mode”. See the detail in “Bluetooth” section. |
| Heat Finish Time | |



➤ Menus change when [Select Splice Mode] is set to [SM], [NZ], [DS] and [MM] mode.

Special mode: [SM], [SWR], [NZ], [DS], [MM]

Splicing parameters: special modes

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

| Parameter | Description |
|-----------------------------|---|
| Fundamental Settings | |
| Fiber Type | A list of splice modes stored in the splicer database is displayed. Upon inputting the appropriate mode, the selected splice mode stored in database area is copied to a selected splice mode in user-programmable area. |
| Fiber Count | The number of cores of the fiber to connect is chosen. |
| Mode Title1 | Title for a splice mode expressed in up to 11 characters. |
| Mode Title2 | Detail explanation for a splice mode expressed in up to 15 characters. Title2 is displayed at the [Splice Mode Select] menu. |
| Rearc Time | Splice loss may be improved by an additional "rear arc" discharge in some cases. The duration of this additional arc can be changed by this parameter. |
| Proof test | An ON/OFF setup of the proof test done after splice is performed. |
| Gap Setting | |
| Cleaning Arc | A cleaning arc removes dust on the surface of the fiber with an arc discharge for a short period of time. The duration of the cleaning arc can be changed by this parameter. |
| Gap | Sets the end-face gap between the left and right fibers at the time of aligning and pre-fusion discharge. |
| Gapset Position | Sets the relative position of the splicing location to the center of electrodes. Splice loss may be improved in the case of dissimilar fiber splicing by shifting [Gapset Pos] towards a fiber whose MFD is bigger than the other fiber MFD. |
| Prefuse And Stuff | |
| Prefuse Power | Sets the power of the prefuse arc, which is an arc discharge occurring from the beginning until the fibers begin stuffing. If [Prefuse Power] is set too low, axial offset may occur if cleaved angles are relatively poor. If [Prefuse Power] is set too high, fiber end faces are fused excessively and splice loss gets worse. |
| Prefuse Time | Sets the duration of the prefuse arc, which is arc discharge occurring from the beginning until the fibers begin stuffing. Longer [Prefuse Time] is synonymous with higher [Prefuse Power]. |
| Overlap | Sets the overlap amount of fibers at the fiber stuffing stage. Relatively small [Overlap] is recommended if the [Prefuse Power] is low, while relatively large [Overlap] is recommended if the [Prefuse Power] is high. |
| Arc | |
| Arc Power | Sets Arc Power. The arc intensity expressed in units of "bits". |
| Arc Time | Sets Arc time. The total arc discharge time including the prefuse time. |

A continuation of edit parameter list

| Parameter | Description |
|------------------------|---|
| Tapering | |
| Taper Splice | Splice loss is sometimes improved when the fiber is tapered (pulled) during arc discharge to make the splice thinner. This sets taper function "ON". The following three parameters determine the taper shape. |
| Taper Wait | Sets the taper wait time from the end of fiber stuffing until the start of pulling fiber. |
| Taper Speed | Sets the fiber pulling speed. |
| Taper Length | Sets the fiber pulling length. |
| Estimation | |
| Estimating Mode | Selects splice loss estimation to ON or OFF. |
| Minimum Loss | This amount is added to the estimated splice loss originally calculated. When splicing specialty or dissimilar fibers, a high actual splice loss may occur even with optimized arc conditions. To make the actual splice loss concur with the estimated splice loss, set the minimum value of estimate to the minimum optimized actual splice loss. |
| MFD | Sets MFD of the fibers. This MFD value is taken into account for estimating splice loss. |
| Core Bending Coef. | The influence which it has on an estimation loss value is set up. Adjust a value, when you unite an estimated loss. |
| Error Limit | |
| Loss Limit | An error message is displayed if the estimated splice loss exceeds selected threshold (loss limit). |
| Offset Limit | An error message is displayed if the fiber offset exceeds the selected threshold (offset limit). |
| Cleave Angle Limit | An error message is displayed if the cleave angle of either the left or right fiber ends exceeds the selected threshold (cleave limit). "OFF": Does not make judgment on cleave angle. |
| Cleave Shape Error | Error message is displayed if the cleaved end face of either left or right fiber exceeds the selected threshold (cleave shape). "OFF": Does not make judgment on cleave shape. |
| Gap Difference Limit | The limit value of an end face irregular error is set up. An error will be displayed if one of end face intervals exceeds a limit value among the end face intervals after a gap set. |
| Stripper | |
| Heat Temperature Level | These are stripper parameters. They are automatically sent to the stripper if [Heater Parameter Control] in "Stripper Setting" menu is set to "Splice Mode". See the detail in "Bluetooth" section. |
| Heat Finish Time | |



- Menus change when [Select Splice Mode] is set to [SM AUTO], [SWR AUTO], [NZ AUTO], [DS AUTO] and [MM AUTO] mode.

Splice Settings

Parameters common to all the splice modes can be set.

1. Press **MENU** key in [READY], [PAUSE], or [FINISH] state to display [Splice Menu].
2. Select [Splice Settings] in [Splice Menu] to display [Splice Settings] menu.
3. Select a parameter to be changed. Press **ENT** key to change values.
4. Change value by pressing **Up/Down** key, then press **ENT** key to enter.

Splicing Settings parameters

| Parameter | Description |
|------------------------------|---|
| Splice Operation | |
| Operation Mode | Automated wind-protector has several operation modes. Operation procedure before and after splicing can be selected. Refer to [Change of the Operation mode] for details. |
| Pause | If "Pause" is set to "ON", the splicing operation pauses when fibers are forwarded to gap-set position. Cleave angles are displayed during the pause. |
| Auto Reloading Function | When "Auto Reloading Function" is set to "ON" and "Offset" becomes higher than "Offset Limit", the splicer opens and closes the wind protector and the splicer attempts to reduce the offset. |
| Number of Attempts | "Number of Attempts" is displayed, when "Auto Reloading Function" is "ON". The splicer tries to reduce "Offset" this number of times. |
| Initial Offset Limit | "Initial Offset Limit" is displayed, when "Auto Reloading Function" is "ON". Even if "Offset" becomes higher than "Offset Limit" and "Offset" becomes higher than "Initial Offset Limit", the splicer displays the error without correcting "Offset". |
| Fiber Image on screen | |
| Gapset | Sets the method of displaying the fiber image on the screen during Splicing operation. |
| Arc | X : Enlarged display of X-axis image Y : Enlarged display of Y-axis image |
| Estimate | X▲▼Y : Composite display vertically of X-axis and Y-axis images |
| Pause | Sets the method of displaying the fiber image on the screen during Splicing operation. |
| Finish | X : Enlarged display of X-axis image Y : Enlarged display of Y-axis image X▲▼Y : Composite display vertically of X-axis and Y-axis images DATA : Display results of cleave angle and offset measurements. |

A continuation of edit parameter list

| Parameter | Description |
|-----------------------|--|
| Ignore Splicing Error | |
| Loss | Set to "Enable" or "Disable". Enable : An operator can accept and bypass an error shown on the left by pressing the SET key. Disable : An operator can't bypass an error shown on the left. |
| Bubble | |
| Fat | |
| Thin | |
| Cleave Angle | Set to "Enable" or "Disable". Enable : An operator can accept and continue with the error as shown on the left by pressing the SET key. Disable : An operator can't override the error as shown on the left. The unit repeats the alignment when the operator presses the SET key. |
| Cleave Shape | |
| Offset | |
| Gap Difference | |
| Others | |
| Max Num. of Rearcs | The re-arc process sometimes improves the splice loss. However, excessive re-arc may decrease the splice strength. With this function, it is possible to limit the number of re-arcs or to disable re-arc discharge. |
| Cleaver Counter Mode | Set to "OFF", "1" or "2". OFF : When splicing, the splicer does not increment the "Cleave Count". 1 : When splicing, the splicer increments the "Cleave Count" by the "Fiber Count". When the splicer splices 4 fiber ribbon, the splicer cleave count increases by 4. 2 : When splicing, the splicer increments the "Cleave Count" by twice the "Fiber Count". When the splicer splices 4 fiber ribbon, the splicer cleave count increases by 8. |

Memory

This splicer stores up to 2,000 splicing results. Contents of data stored are different depending on splicing mode.

Splice Results Reference or Elimination

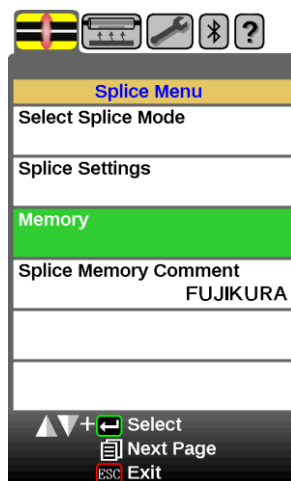
Splicing results stored in the memory can be displayed. Comments can be added or edited.



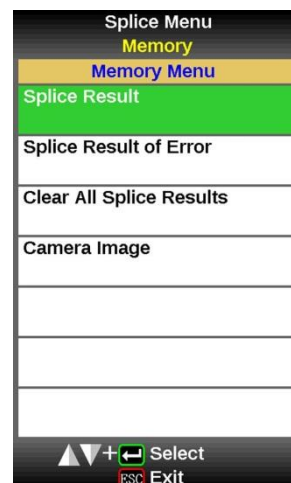
- Memory Data can be downloaded by USB. Refer to instruction manual of "Data Connection".

How to display the splice Result data

1. Select [Memory] in [Splice Menu] and select [Splice Results] and press **ENT** key to display [Splice Results] Menu.



ENT key

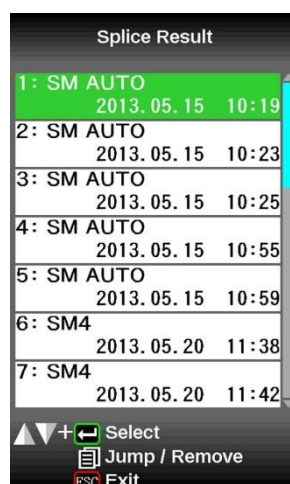


ENT key

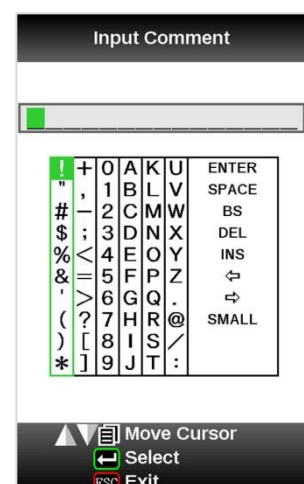
2. Splice memory is displayed.
3. Select memory number by moving cursor to a specific memory number and press **ENT** key. The selected splicing result is displayed.
Press **MENU** key to select a [Jump /Remove] option. Select the oldest data or Latest data by pressing **Up/Down** Arrow key. This can be removed by pressing **ENT**.
4. The selected splicing result is displayed. For adding or editing comments, press **ENT** key to display [Input Comment] screen.



MENU key

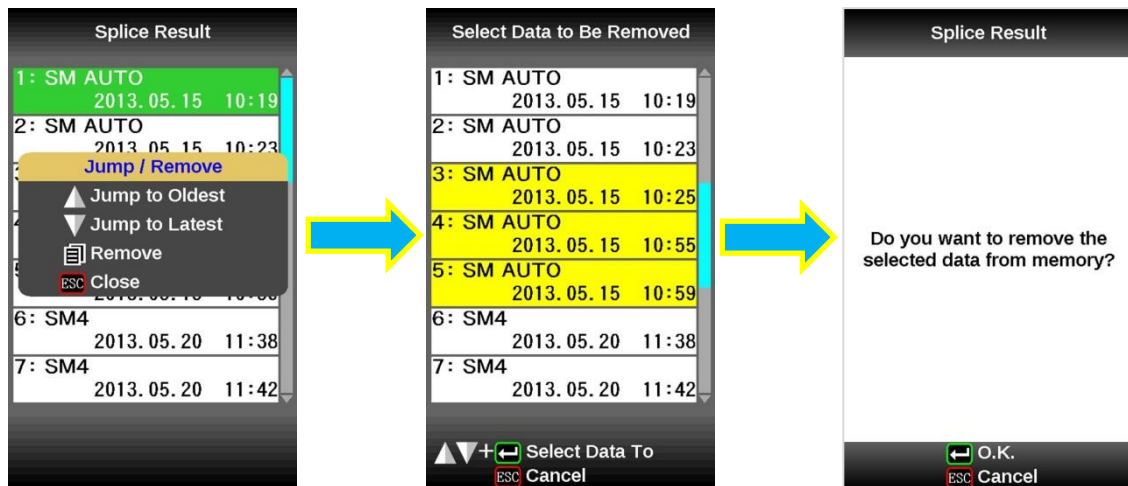


ENT key



How to Clear the Splice Results data

1. Press **MENU** key in [Splice Result] Menu.
2. Press **MENU** key in [Jump / Remove] Menu.
3. Select the first data in the range to be deleted by **ENT** key.
4. Select the last data in the range to be deleted by **Up/Down** arrow key.
5. Press **ENT** key to select the highlighted range. Press **ENT** key to delete the memory.



How to display the splice Result of error

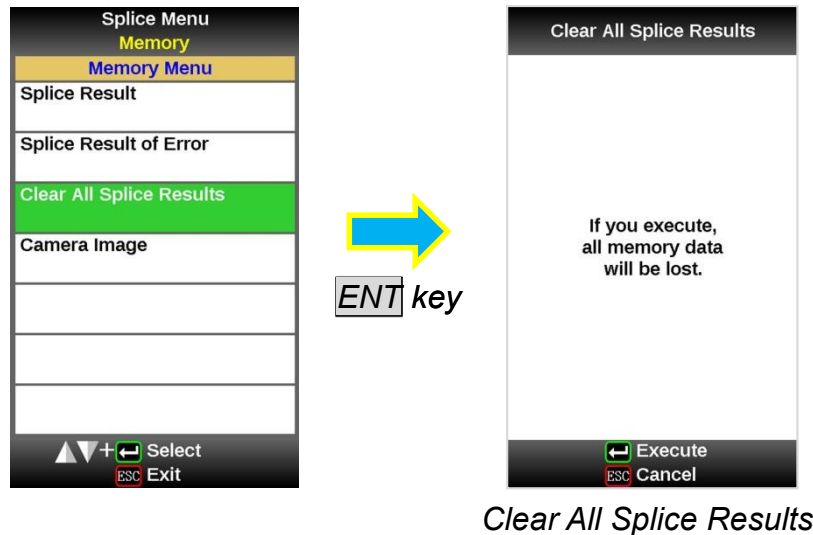
Only the memory which the error generated like the splice result memory display method can be displayed.

1. Select the splice result of error by pressing **ENT** key.
2. Only a memory with an error is displayed.

Clear All Splice Results

All splicing results can be cleared at once.

1. Move cursor to [Clear All Splice Result] in Memory Menu. And Press the **ENT** Key.
2. Press **ENT** key to display [Clear All Splice Result].



Clear All Splice Results

Camera Image

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

1. Select [Memory] in [Splice Menu].
2. Select [Camera Image] and press **ENT** key to display [Camera Image] Menu.

How to store the Camera Image Data

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



- Max number of image storage is 100, and the image cannot be over-written, so delete some images to store new images.

How to display Camera Image Data

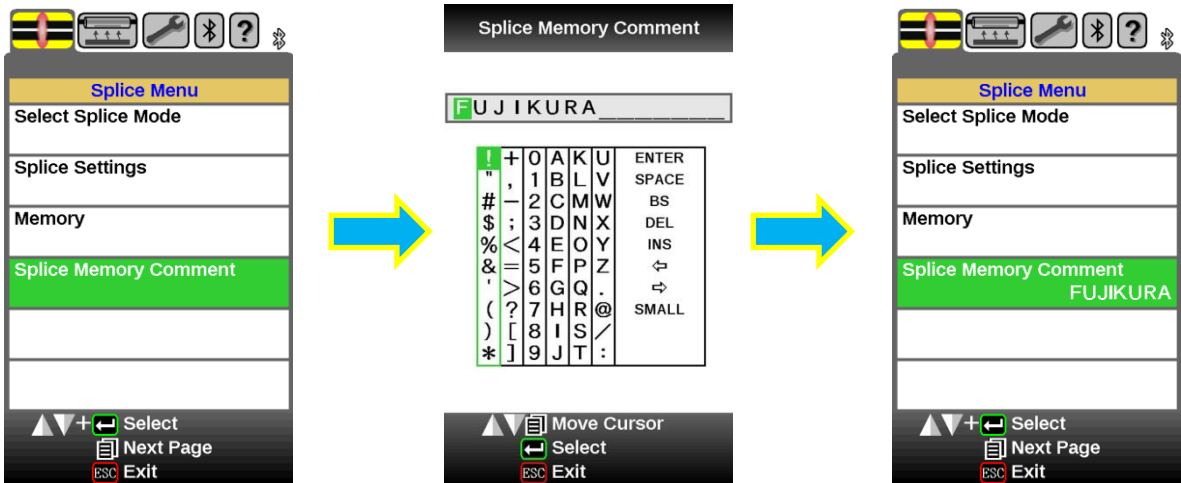
Select memory number by moving cursor to a specific memory number and press **ENT** key. The fiber image data is displayed.

How to delete Camera Image Data

Select the number in [Camera Image] and press the **MENU** key. The confirmation screens are displayed, and then press **ENT** key.

Splice Memory Comment

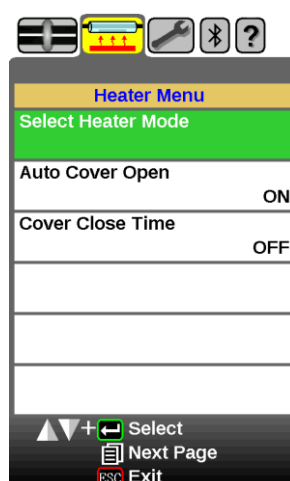
The splicing result is automatically stored in memory when **SET** or **RESET** is pressed upon completion of the splice at the [Finish] screen, or when the wind-protector is opened upon completion of the splice at the [Finish] screen. Once a comment is entered, the same comment is used for subsequent splice results.
At the time of shipment from factory, there is no comment inputted.



Composition of Heater Menu

Common parameters for all the heater modes and machine settings can be edited and set.

1. Press the **MENU** key while in the [READY], [PAUSE], or [FINISH] state and press the **MENU** key again to display the [Heater Menu].
2. Move the cursor by pressing the **Up/Down** Arrow key to highlight a parameter to be selected.
3. Press the **ENT** key to change values and settings.



| Parameter | Description |
|--------------------|--|
| Select Heater Mode | Select the heater mode most suitable for the splice protection sleeve to be used. |
| Auto Cover Open | The heater cover opens automatically when the heater operation is finished. |
| Cover Close Time | Sets the time delay for the heater cover to close automatically after the heater operation is finished. If set to OFF, the cover does not close automatically *Regardless of Cover Close Time setting, if the "Operation Mode" of the Splicer Operation is set to "Normal", the heater cover closes automatically after about 10 seconds have passed from the time the heating is finished. |

Select Heater Mode

Each tube-heating mode is optimized for a type of Fujikura protection sleeve. These modes can be found in database area for reference. Copy the appropriate one and paste it to the user-programmable area. The operator can edit the user-programmable modes. The parameter in Heater mode becomes an addition and change with upgrade of software.

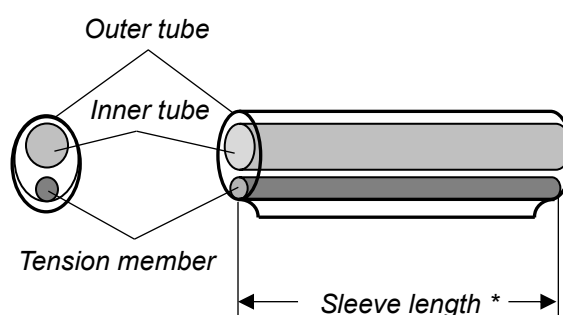
Data Base

| Parameter | Description |
|-------------------------|---|
| 60mmS FP-03 | For standard 60mm protection sleeve, Such as Fujikura FP-03 or FP-03M protection sleeves. |
| 40mmS FP-03(L=40) | For standard 60mm protection sleeve, Such as Fujikura FP-03 or FP-03M protection sleeves. Note : Cleave length 8mm. |
| 15mmS FPS01-400-15 | For 400 or less um of diameters of coating and splice of the interference length of 5 mm or less |
| ** mmS FPS01-400-** | For 400 or less um of diameters of coating. In addition, there are 20, 25, and 34 or 40 mm length. |
| 20mmS FPS01-900-20 | For 900 or less um of diameters of coating. Splice of the interference length of 6 mm or less |
| ** mmS FPS01-900-** | For 900 or less um of diameters of coating. In addition, there are 25, and 34 or 40 mm length. |
| 60mmS FPS01-DC-60 | For Splice of a drops cable. |
| FUSE2/3 ST-FC | For Fuse connect splice. |
| FUSE900 SC-LC-ST-FC | |
| FUSE2/3 SC-LC | |
| 40mmR FP-05 | For standard 40mm protection sleeve, Such as Fujikura FP-05 protection sleeves. |
| 40mmR FP-04T | For standard 40mm protection sleeve, Such as Fujikura FP-04T protection sleeves. |
| 28mmR FPS-08-28 | For standard 28mm protection sleeve, Such as Fujikura FPS08-28 protection sleeves. |
| 30mmR FPS-04-30 | For standard 30mm protection sleeve, Such as Fujikura FPS04-30 protection sleeves. |
| **mmS-L FPS01-900-** | 900 or less um of diameters of coating with Covering material of Hytrel. In addition, there are 25, and 34 mm length. |

The dimensions of the Protection Sleeve after shrink

| Form | Tension member | Sleeve length | Prepare fiber length | Diameter of an adaptation optical fiber | Diameter of a result |
|--------------|----------------|---------------|----------------------|---|----------------------|
| FP-03 | SUS | 60mm | 16mm or less | 250~900um | 3.1mm |
| FP-03(40mm) | SUS | 40mm | 10mm or less | 250~900um | 3.1mm |
| FP-04T | Glass Ceramic | 40mm | 10mm or less | 250~900um | 4.0mm |
| FPS01-400-15 | SUS | 15mm | 5mm or less | ~400um | 1.5mm |
| FPS01-900-20 | SUS | 20mm | 6mm or less | ~900um | 2.3mm |

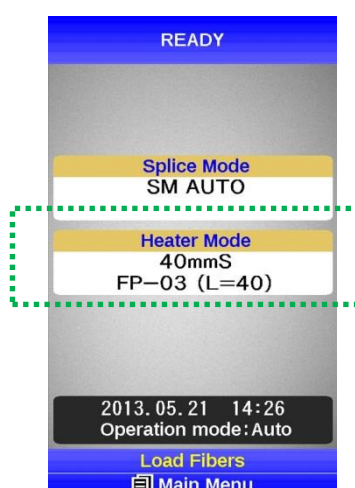
* The dimensions of the protection sleeve after shrink vary depending on the diameter of the fiber.



Selecting Heater mode

How to check the current heater mode

1. The current heater mode is displayed on the OK screen.



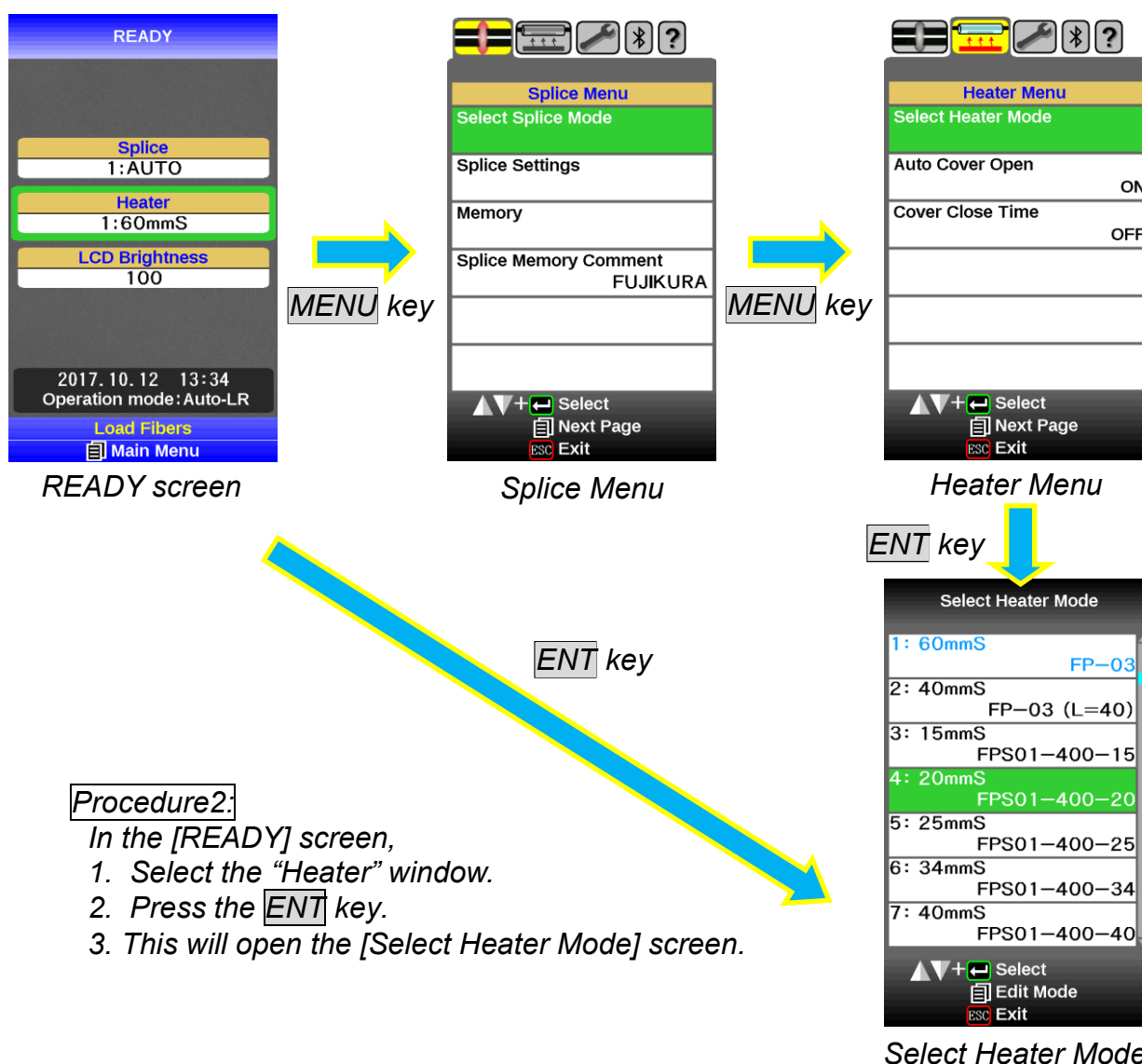
- When using a protection sleeve which is not made by Fujikura, please set parameters based on the specific sleeve.
- When the sleeve of another company is used, the durability of a protection point cannot be warranted.

How to change the heater mode.

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

Procedure1.

1. Press **MENU** key in [READY], [PAUSE], [FINISH] state and press **MENU** key to display [Heater Menu].
2. Select [Select Heater Mode] in [Heater Menu]. [Select Heater Mode] menu is displayed.
3. Move cursor by pressing **Up/Down** Arrow key and press **ENT** key to select a heater mode.



Procedure2.

- In the [READY] screen,
1. Select the "Heater" window.
 2. Press the **ENT** key.
 3. This will open the [Select Heater Mode] screen.

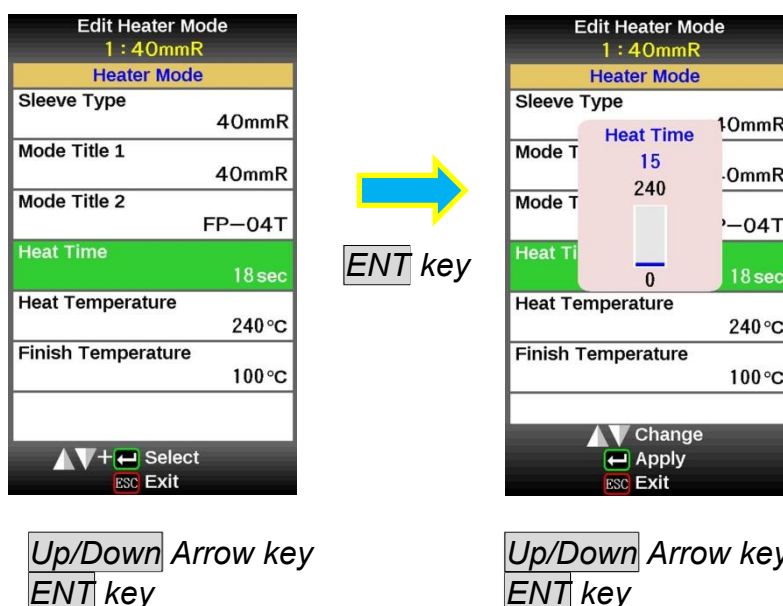
4. The check in the heater mode selected on the OK screen can be performed.

When a setup of "Auto Cover Open" is OFF, the cover will be in the state where it was closed. A cover opens, if the **HEAT** key is pressed once before doing heating work. Moreover, heater cover does not open automatically at the time of the end of heating. So please push **HEAT** key and take out the sleeve.

Referring to or Editing Heater Mode

Tube-heating conditions stored in heater mode can be edited or changed.

1. Move cursor and select a mode to be edited in [Select Heater Mode] menu. Press **MENU** key to display [Edit Heater Mode] menu.
2. Press **Up/Down** Arrow keys to move cursor to a parameter to be changed then press **ENT** key to enter.
3. Change value by pressing **Up/Down** key, then press **ENT** key to enter.



Heater mode parameters

| Parameter | Description |
|--------------------|---|
| Sleeve type | Sets sleeve type. List of all heating modes are displayed. Select a mode in the list and this is copied to a user-programmable mode. |
| Mode Title1 | Title of a heater mode that is displayed in the lower right part of the monitor during the splicing/heating process. Max number of characters used is 7. |
| Mode Title2 | Description of a heater mode in the [Sleeve Type] screen. Max number of characters used is 15. |
| Heat Time | Sets heating time from the beginning to the end (cool-down completion). Heating time is automatically adjusted with atmospheric conditions, such as ambient temperature. Heating time may be longer or shorter than [Heat time] set. |
| Heat Temperature | Sets heating temperature. |
| Finish Temperature | Sets the finish temperature. The buzzer beeps after completion of the heating. Caution Do not touch the shrunken sleeve after removing the fiber from the tube heater. It may be hot. Hot sleeves easily deform and can cause some residual stress at the splice point. Use J-plate to cool down the sleeve. |

Tube-heating for Splice-on-connector

This splicer can handle tube-heating for splicer-on-connector.

Fujikura Fuse Connect can be used by removing the right clamp of the heater and the heating operation can be performed normally.

Remove heater clamp

Loosen the screw in the right side of the heater and remove the clamp. Use attached screw driver (SD-01). Then, it enables to set the splice-on-connector with the connector holder.

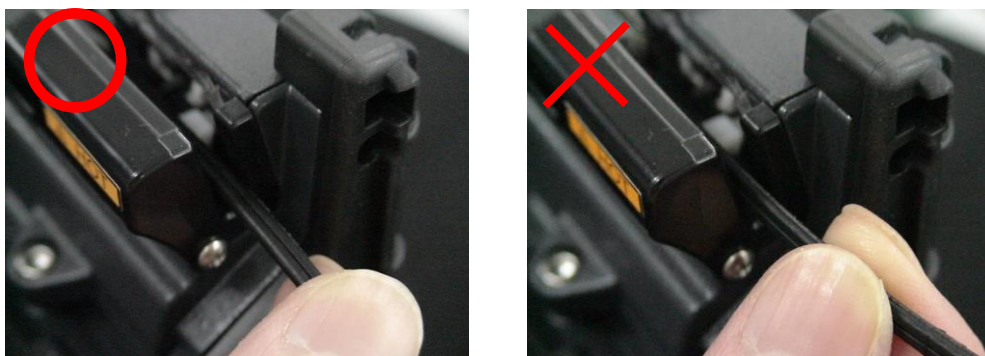


When using Fujikura Fuse Connect, where a clamp is removed, a connector holder is set to heater right-hand side, and heating can be performed.

Please press down a connector holder from a top in the yellow direction of a line, and attach a screw. Use attached screw driver (SD-01).

Tube-heating for Drop Cable

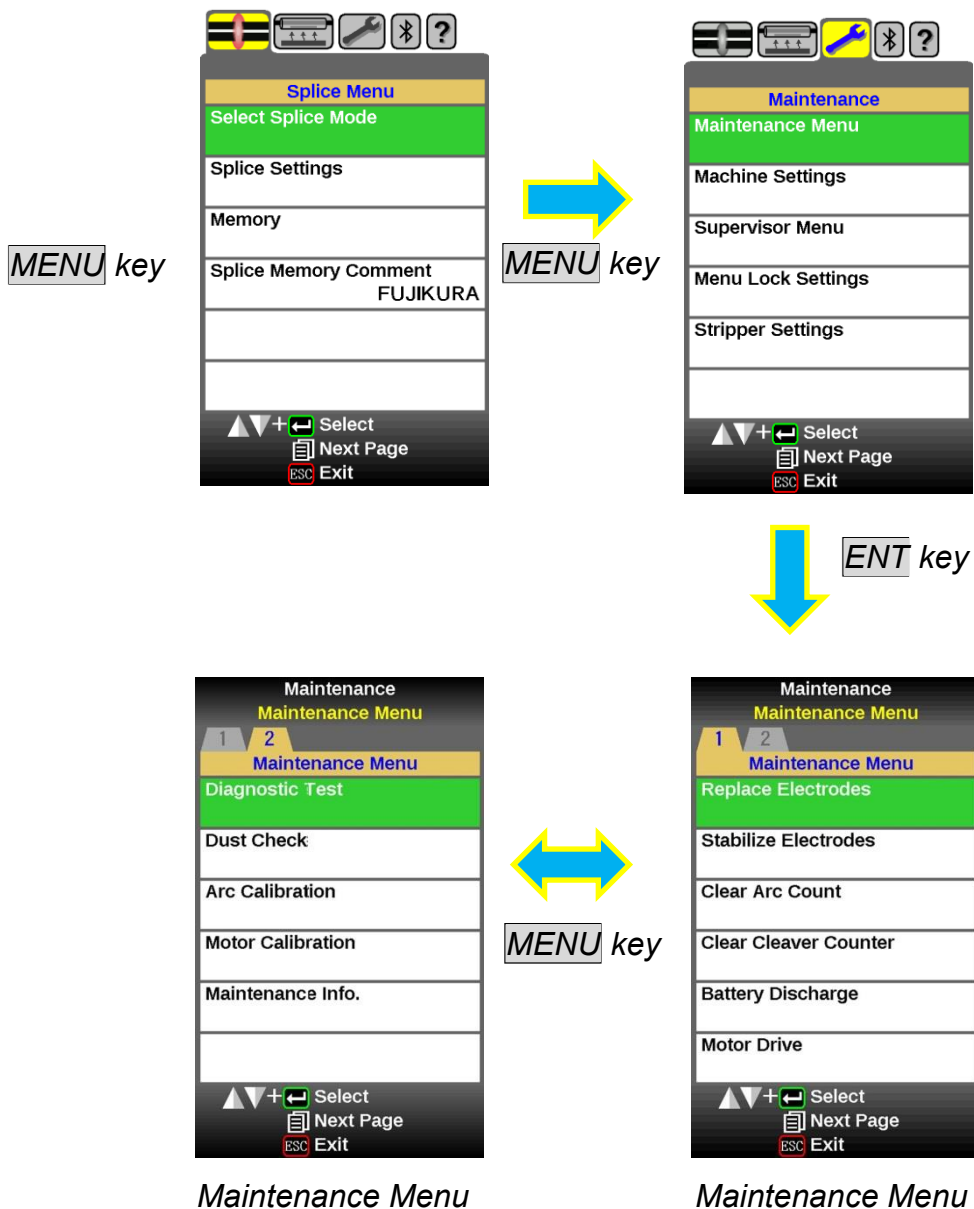
Use a carrying tool not to get the fiber twisted. if not using the tool, take care not to get the fiber twisted. Set so that a cable becomes flat at a right-and-left clamp part.



Maintenance Menu information

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

1. Press **MENU** key in [READY], [PAUSE] or [FINISH] state. Press **MENU** key to display [Maintenance]. Select the [Maintenance Menu] press **ENT** key.
2. Select a function to perform.



Replace Electrodes

When the number of arc discharges reaches a count of setting value a message prompting to replace the electrodes is displayed immediately after turning on the power. Using the worn electrodes will result in greater splice loss and reduced splice strength.

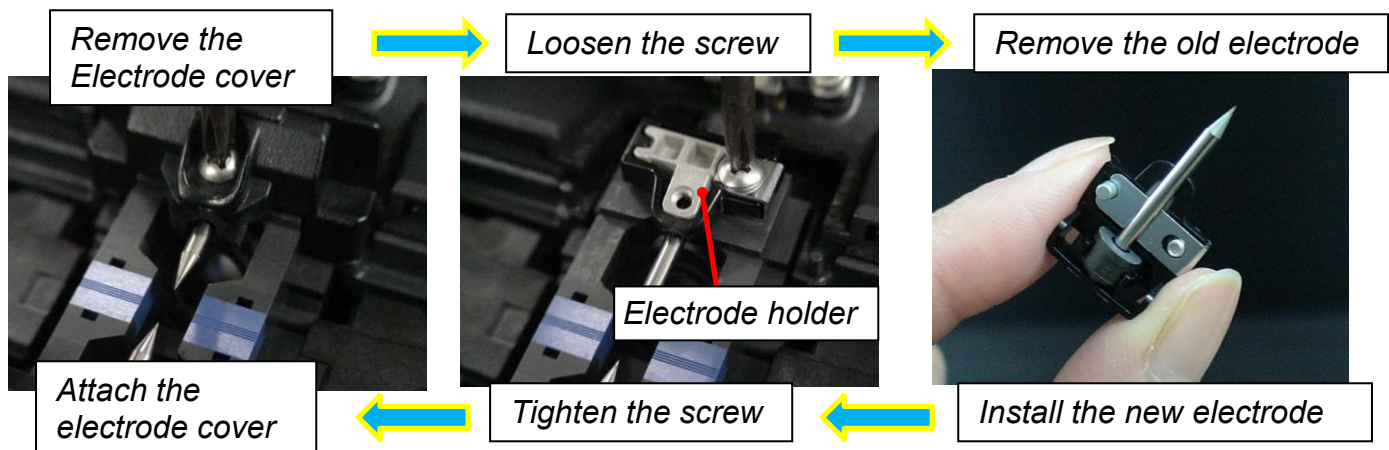
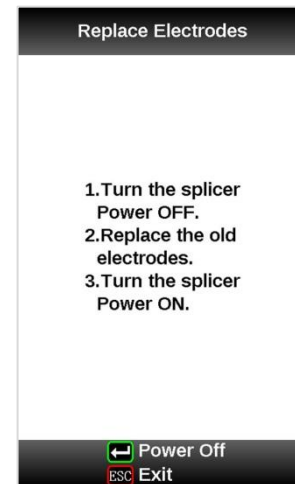
Use attached screw driver (SD-01).

Replacement Procedure

1. Execute [Replace Electrodes] in [Maintenance Menu].
2. Instruction messages will appear on the screen to turn off the power. Press and hold **ENT** key till the LED color changes from green to red.
3. Remove the old electrodes.

To remove and replace the electrodes:

- i. Remove the electrode cover and loosen screw located on electrode holder.
- ii. Take electrode out of electrode holder.
(Electrode is fit in electrode holder)



4. Install the new electrodes with care; do not hit the electrode tips.

- i. Fit the electrode in the electrode holder.
- ii. Place the electrode holder on the splicer and tighten screw.



- Apply tightening torque of 20cNm when tightening screw to fix electrode.
- Make sure the electrodes are attached firmly after tightening screws.

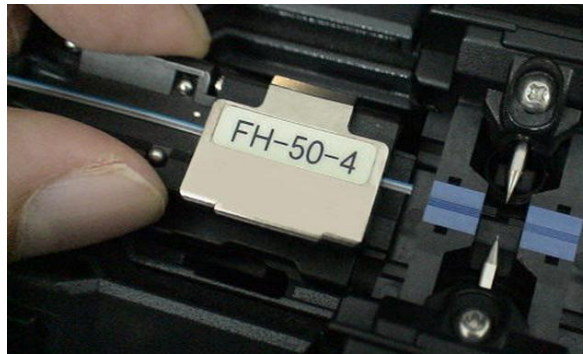
5. Turn on the power, prepare fibers into the splicer and press **ENT** key. After executing the arc calibration, the splicer will repeat arc discharge to stabilize the electrodes.
6. Upon completion of repeated arc discharge, the splicer executes an arc calibration again. The operator should repeat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

Stabilize Electrodes

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

Operation Procedure

1. Select the [Stabilize Electrodes].



2. Set the prepared long fibers onto both v-grooves.
3. Press **ENT** key and the splicer begins to stabilize the electrodes in the following ways:
4. After completing stabilization, always perform an additional [Arc Calibration].

Clear Arc Count

This function enables the stored number of arc discharges to be reset.

1. Select the [Clear Arc Count].
2. As the confirmation screen “Is it OK to clear?” appears, press **ENT** key to clear.



- This function is included in the [Replace Electrodes] function.
- The number of arc discharges in the “Total Arc Count” field displayed on the [Maintenance Info.] screen cannot be reset.

Clear Cleaver Counter

This function was the stored number of [Cleaver Counter] to be reset.

If "Cleaver" in the Bluetooth menu displays "ON", the cleaver counter of the connected CT50 cleaver can be reset with the following procedure.

1. Select the [Clear Cleaver Counter].
2. As the confirmation screen "Is it OK to clear?" appears, press **ENT** key to clear.

| Parameter | Descriptions |
|----------------|---|
| Cleave Count | The number of times of cleave is displayed. |
| Blade Position | The position of a blade is displayed. |
| Blade Height | The height of a blade is displayed. |

It performs, after adjusting Cleaver who is using it.

Battery Discharge

The battery pack (BTR-09) uses Li-ion cells. If the battery is repeatedly charged, the battery indicator may become different from the actual battery capacity. If such a phenomenon occurs, execute [Battery Discharge] to reduce the actual remaining capacity and the battery indicator to zero. Then, recharge the battery pack.



- The power saving function turns off automatically during [Battery Discharge].

Operation Procedure

1. Insert the battery pack inside the splicer that is intended to discharge completely, and turn on the power.
2. Change the screen from [Main Menu] to [Maintenance Menu] and execute [Battery Discharge].
3. The [Battery Discharge] screen is displayed, and the remaining battery voltage is indicated.
4. Upon completion of full discharge, the buzzer sounds and the power turn off.
5. Recharge the battery pack.



- If the battery pack is almost fully charged, it will take a significant amount of time to discharge it completely. It is recommended that this function be used after considerable time of use when the capacity is low.

Motor Drive

Some motors in a splicer can carry out manual operation separately. In the course of splicing, the motors can also be operated by calling this menu in the [PAUSE], or [FINISH] state.

1. Select the [Motor Drive].
2. Pressing **MENU** key changes motor selection. The name of the selected motor is displayed in the upper section of the screen.
3. Press **Up/Down** Arrow key to drive the motor in the desired direction.

| Motor | Up Arrow key | Down Arrow key |
|-----------|---------------------|-----------------------|
| ZL/ZR | Forward | Backward |
| Cover F/R | Wind protector open | Wind protector close |



- When the motor reaches the limit of the operating range, the buzzer sounds and the motor stops. Press the opposite arrow key to reverse and move the motor again.
- Display messages can be erased by pressing **ENT** key. The message can be displayed by pressing **ENT** key again.
- If the motor is moved too much with respect to the spliced fiber, the fiber may break.

Diagnostic Test

The 19R+ has a built in diagnostic test feature that allows the operator to perform a simple one step evaluation of splicer performance covering several different critical variables. Perform this function in the event of splicer operation trouble.

Operation Procedure

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

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



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

2. Upon completion of all checks and adjustments, a list of results is displayed. If the dust check result is not good, clean the objective lenses. In the case that cleaning cannot eliminate contamination, there is a possibility that the contamination may have entered the inside of the optical path. Please contact the authorized distributor for additional instructions.

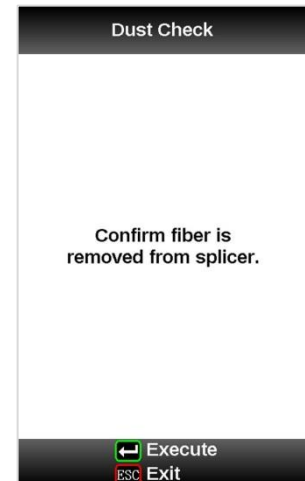
The dust check and Motor Calibration functions exist as independent instructions in [Maintenance Menu]. It is possible to execute them independently.

Dust Check

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

Operation Procedure

1. Select the [Dust Check] in the [Maintenance Menu].
2. If fibers are set in the splicer, remove them and press **ENT** key again. The splicer begins the dust check.
3. After observation, the location of contamination judged as a potential problem blinks. If contamination is discovered, clean the objective lenses cover and redo [Dust Check] for cleaning instructions.
4. Press **ESC** key to finish dust check.



- In case you have cleaned the objective lenses cover, and dirt or dust still remain, contact the authorized distributor.

Arc Calibration

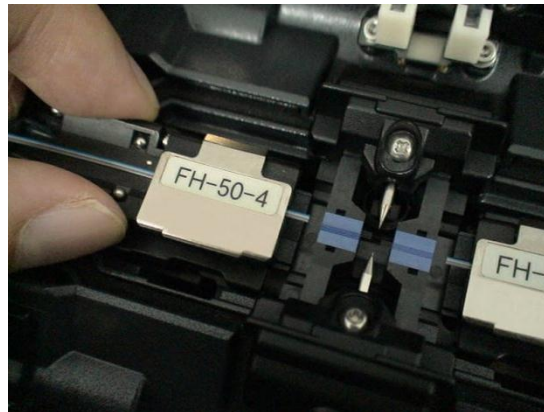
Atmospheric conditions such as temperature, humidity, and pressure are constantly changing, which creates variability in the arc temperature. This splicer is equipped with temperature sensor that is used in a constant feedback monitoring control system to regulate the arc power at a constant level. Changes in arc power due to electrode wear and glass adhesion cannot be corrected automatically. Also, the center position of arc discharge sometimes shifts to the left or right. In this case, the fiber splicing position has to be shifted in relation to the arc discharge center. It is necessary to perform an arc power calibration to eliminate both of these issues.



- Arc calibration is performed automatically using [AUTO] mode only. So arc calibration does not have to be performed when splicing in this mode.
- Execute [Arc calibration] before using non-auto mode.
- When Performing the [Arc Calibration] function change the arc power "factor" value. The factor value is used in the algorithm program for all splicing. The arc power value will not change in the splice modes.

Operation procedure

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



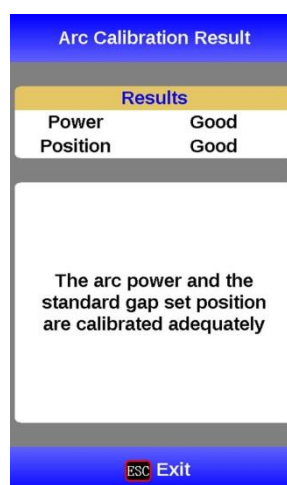
- For Arc Calibration, select the using splice mode. if it is MM Fiber, use standard MMF ITU-T G651 fiber. if it is SM Fiber, use standard SMF ITU-T G652 fiber.
- Use well prepared fibers for arc calibration. Dust on the fiber surface affects arc calibration.
- Cleave angle threshold does not link to the parameter "Cleave Limit" in splicing modes. Cleave angle threshold is independently set for arc calibration. See section [Machine Settings] to change cleave angle threshold.

3. The ARC Calibration will begin after pressing **ENT** key.

"Good" message

Arc power and splicing position calibration are successfully completed. Press **ESC** key to exit.

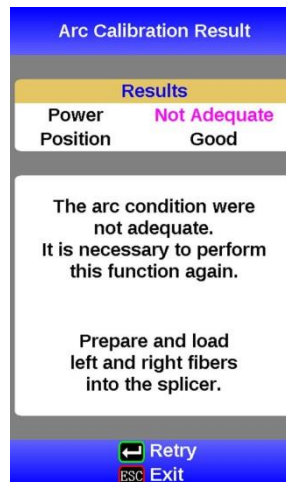
Result: Good



"Not Adequate" message

Arc power and splicing position calibration are completed but further calibration is strongly recommended, as the change from the previous arc calibration is too large. Press **ENT** key to perform arc calibration, or **ESC** key to exit even though arc calibration is not completed.

Result: Not Adequate



- In some cases, multiple iterations of arc calibration are needed until the calibration process is successfully completed and the "Test Finish" message is displayed. Arc calibration can be considered almost completed if multiple iterations are completed without receiving the message.
- Number threshold can be set so that "Test Finish" message is displayed after specific number of arc calibrations is performed. See section [Machine Settings] for detail.

Motor Calibration

Motors were adjusted at the factory before shipping. However, settings could change due to various reasons. This function automatically calibrates the speed of all motors.

Operation Procedure

1. Select the [Motor Calibration] in the [Maintenance Menu].
2. Load prepared fibers in the splicer and press **ENT** key.
3. Speeds for all motors are automatically calibrated.



- Perform this function when "Fat" or "Thin" error has occurred.

Maintenance Info

The maintenance information on this equipment can be checked.

| Maintenance Info. | |
|----------------------------|------------|
| Splicer | |
| Serial Num. | |
| Version | 01.15.B41 |
| Arc Count | 0 |
| Total Count | 0 |
| Last Authorized Service | 2017.09.14 |
| Next Authorized Service | 2018.09.14 |
| Power Source Type | AC Adapter |
| ▲▼ Change Page ESC Exit | |

| Maintenance Info. | |
|----------------------------|----------|
| Cleaver | |
| Machine Type | CT50 |
| Serial Number | 777777 |
| Firmware Ver | 01.01d5 |
| Device Name | FUJIKURA |
| Battery Remain | 100 % |
| Cleave Count | 60 |
| Blade Position | 1 |
| Blade Height | Low |
| ▲▼ Change Page ESC Exit | |

| Maintenance Info. | |
|----------------------------|----------|
| Stripper | |
| Machine Type | RS03 |
| Serial Num. | 123456 |
| Version | 01.01e |
| Device Name | Device 1 |
| Battery Remain | 39 % |
| Stripping Count | 856 |
| Total Stripping Count | 0 |
| ▲▼ Change Page ESC Exit | |

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

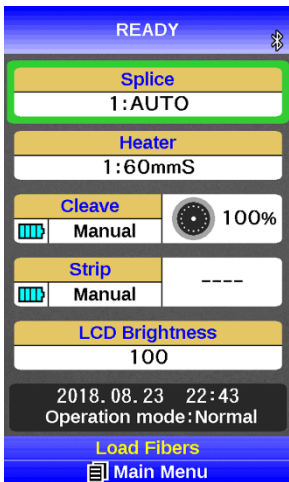
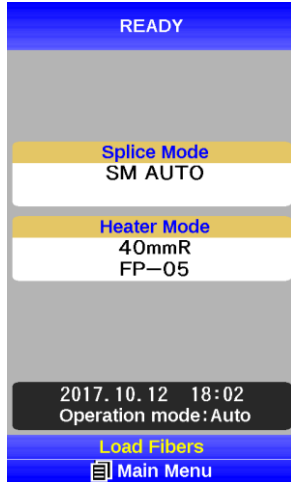
| Parameter | Description |
|-------------------------|---|
| Splicer | |
| Serial Num. | Displays the serial number of the splicer. |
| Version | Displays the version number of the software. |
| Arc Count | Displays the number of arc discharges after electrode replacement. Performing the function [Replacements Electrode] or [Clear Arc Count] resets this parameter to zero. |
| Total Count | Displays the total number of arc discharges. |
| Last Authorized Service | Displays the date of last authorized service. |
| Next Authorized Service | Displays the scheduled date of next authorized service. |
| Power Source Type | Displays the using Power Source. |
| Cleaver | |
| Machine Type | Displays the type of the cleaver. |
| Serial Num. | Displays the serial number of the cleaver. |
| Version | Displays the software version of the cleaver. |
| Device Name | Displays the device name of the cleaver. |
| Battery Remain | Displays the remaining battery life. |
| Cleave Count | Displays the total number of Cleave Count. |
| Blade Position | Displays the current Blade Position. |
| Blade Height | Displays the current Blade Height. |
| Stripper | |
| Machine Type | Displays the type of the stripper. |
| Serial Num. | Displays the serial number of the stripper. |
| Version | Displays the software version of the stripper. |
| Device Name | Displays the device name of the stripper. |
| Battery Remain | Displays the remaining battery life. |
| Stripping Count | Displays the number of strip operations performed since service. |
| Total Stripping Count | Displays the total number of strip operations performed. |

Machine Settings

The parameter about warning and a maintenance item can be changed.

1. Select [Machine Settings] in [Maintenance Menu] to display [Machine Settings] menu.
2. Select a parameter to be changed. Press **ENT** key to change values.
3. Change value by pressing **Up/Down** key, then press **ENT** key to enter.

Available to set the parameters about warning and maintenance item.

| Parameter | Description |
|-----------------------|--|
| Basic Settings | |
| Language | Sets a language to be displayed on the screen. Select a language to be displayed. The language that can be displayed changes by a software version and region code. |
| Buzzer Volume | Sets the sound volume of the buzzer. |
| Monitor Position | Sets the operational direction of splicer. [Front] is for front monitor operation. [Rear] is for rear monitor operation. [Auto] is switched to front monitor operation or rear monitor operation automatically. Refer to next page for detail. |
| V-groove illumination | ON/OFF setup of V-groove illumination when the wind protector opened. |
| Ready Screen Type | <p>Sets the Ready screen type to, "New" or "Old". When [Stripper] is ON in Bluetooth Menu, this parameter is set automatically to "New".</p> <p>[New]: (Recommended)</p> <ul style="list-style-type: none"> ➤ The setting of the splicer and the tool can be checked on the "READY" screen at the same time. ➤ It can go to [Select Splice Mode], [Select Heater Mode] and [Stripper Information] screen immediately from [READY] screen. Refer to the section of "Splice Menu" or "Heater Menu". <p>[Old]: The operation and information in "READY" screen is same as the previous model 19R.</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>New</p>  </div> <div style="text-align: center;"> <p>Old</p>  </div> </div> |

A continuation of edit parameter list


| Parameter | Description |
|----------------------------|--|
| Power Saving Timer | |
| Sleep(Battery) | Setting Sleep function turns off the power supply to the LCD Monitor if the splicer performs no operation after a certain period of time. When power-saving mode starts and the LCD monitor's power supply is turned off, LED of the SET key side blinks. When returning from a sleep state, it returns by pressing keys other than HEAT key. Automatically turns off the power supply to the splicer if it performs no operation for a certain period of time. The function serves to prevent the battery capacity from running low if the splicer is left on for an extended period of time. |
| Shut Down(Battery) | |
| Sleep(AC) | |
| Shut Down(AC) | |
| Power On Option | |
| Opening Title 1 | Sets the message to be displayed when the splicer power is turned on. Max number of characters: 15 |
| Opening Title 2 | |
| Electrode | |
| Electrode Caution | When the number of splices exceeds the selected [Electrode Caution] value, the caution message prompting the operator to replace the electrodes is displayed when the splicer power is turned on. When the number of splices exceeds the selected [Electrode Warning] value, the caution message changes to the warning message. |
| Electrode Warning | |
| Alarm Display during Reset | ON/OFF setup of displaying the above message when the splicer return to the ready state. |
| Cleaver Blade Alarm | |
| Blade Position Change | ON/OFF setup of the warning of the Cleaver counter can be performed. In OFF, warning is not indicated on a screen. |
| Blade Height Change | |
| Blade Replacement | |
| Arc Calibration | |
| Cleave Limit | Sets the threshold of the cleave angle error for the [Arc Calibration]. |
| Max Number of Tests | Enables setting a maximum number of Arc Calibration re-test cycles after which the [Arc Calibration] process is complete. This may be set to infinity for operators who need very precise [Arc Calibration]. |

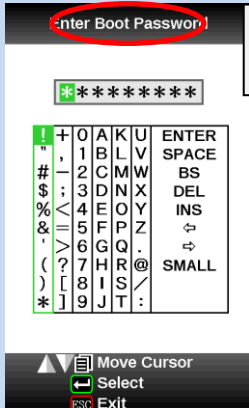
Supervisor Menu

Supervisor Settings: Used by an Administrator to limit operators from selecting or changing certain functions.

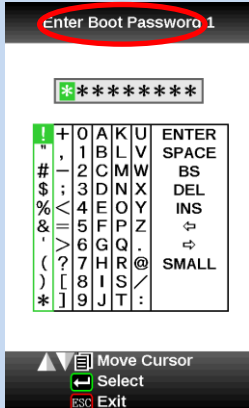
| Parameter | Description |
|------------------------------|---|
| Supervisor Settings | |
| Calendar | This function sets the date and time in the splicer calendar |
| Supervisor Password | Changes the password to access the [Supervisor Menu]. The default password is set to "0" when the splicer is delivered. |
| Boot Password | Changes the password to access the [Boot password]. The default password is set to "0" when the splicer is delivered. |
| Password Boot Lock From | Enables setting a date after which a password is required at splicer boot up in order to operate the splicer. |
| Boot Lock Message 1 | Sets the messages to be displayed on the boot password entry screen. |
| Boot Lock Message 2 | NOTE: The max number of message characters is 15 |
| Boot Password Variation | This function enables switching up to 12 "Boot Password" depending upon the date of splicer operation. For more details, refer to [About "Boot Password Variation"] on the following page. |
| Boot Password 1~12 | |
| Password Boot Lock From 1~12 | |

- Before editing the supervisor settings, the following windows may be displayed. In these windows, enter the "Boot Password" or "Boot Password 1~12".





Enter
"Boot Password"



Enter
"Boot Password 1"

About "Boot Password Variation"

"Boot Password Variation"

This parameter determines whether the boot password variation function is utilized or not.

"ON": The splicer displays "Boot Password 1~12" and "Boot Password Lock From 1~12".

"OFF": The splicer doesn't display Boot Password Variation information.

The default setting is "OFF".

"Boot Password 1"... "Boot Password 12"

Initial default password settings are all "0".

"Boot Password Lock From 1"... "Boot Password Lock From 12"

May be selected as "OFF", or dates may be entered to activate the password lock functions;

Initial default date settings for all Boot Passwords are "OFF".

Example

| | | | |
|------------------|----|----------------------------|------------|
| Boot Password | AA | Boot Password Lock From | 2015.05.01 |
| Boot Password 1 | BB | Boot Password Lock From 1 | 2015.06.01 |
| Boot Password 2 | CC | Boot Password Lock From 2 | 2015.07.01 |
| Boot Password 3 | DD | Boot Password Lock From 3 | 2015.08.01 |
| Boot Password 4 | EE | Boot Password Lock From 4 | 2015.09.01 |
| Boot Password 5 | FF | Boot Password Lock From 5 | 2015.10.01 |
| Boot Password 6 | GG | Boot Password Lock From 6 | 2015.11.01 |
| Boot Password 7 | HH | Boot Password Lock From 7 | 2016.01.01 |
| Boot Password 8 | II | Boot Password Lock From 8 | 2015.12.01 |
| Boot Password 9 | JJ | Boot Password Lock From 9 | 2016.02.01 |
| Boot Password 10 | KK | Boot Password Lock From 10 | 2016.02.01 |
| Boot Password 11 | LL | Boot Password Lock From 11 | 2016.03.01 |
| Boot Password 12 | MM | Boot Password Lock From 12 | 2016.04.01 |



NOTE1

NOTE2

If the present date (date of splicer operation) is between "2015.09.01" and "2015.9.30", the splicer displays "Enter Boot Password 4" at boot-up. Inputting "EE" unlocks the splicer in this case.

NOTE 1

It is not necessary to input dates in order. The splicer sorts the passwords by date. In this example, the splicer uses "Boot Password 8" before "Boot Password 7".

NOTE 2

If two or more date settings are the same, the splicer uses the password with the smallest suffix number. In this example, if the present date (date of splicer operation) is between "2016.02.01" and "2016.02.29", the splicer applies "Boot Password 9" for the boot-up password, and the splicer ignores "Boot Password 10".

Menu Lock Settings

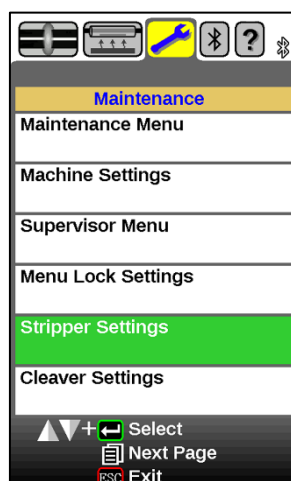
| Parameter | Descriptions |
|--------------------------|--|
| Password Setting | |
| Menu Lock Password | Changes the password to access the [Menu Lock Settings]. Password is set to "0" when the splicer is delivered. |
| Splice Mode | |
| Select Splice Mode | Setting to “Disable” prevents unauthorized editing and selecting of splice modes. |
| Edit Splice Mode | |
| Heater Mode | |
| Select Heater Mode | Setting to “Disable” prevents unauthorized editing and selecting of heater modes. |
| Edit Heater Mode | |
| Memory | |
| Clear All Splice Results | Setting to “Disable” prevents unauthorized erasing of splice result data on the memory. |
| Splice Settings | |
| Splice Operation | [Splice Settings] Menu cannot be edited if this is set to “Disable”. |
| Ignore Splicing Error | |
| Fiber Image on Screen | |
| Others | |
| Machine Settings | |
| Basic Settings | Setting to “Disable” prevents unauthorized editing of the [Machine Settings] menu. |
| Power Saving Timer | |
| Power On Option | |
| Electrode | |
| Cleaver Blade Alarm | |
| Arc Calibration | |
| Stripper | |
| Cleaver Setting | Setting to “Disable” prevents unauthorized editing of the [Cleaver Settings] menu. |
| Stripper Setting | Setting to “Disable” prevents unauthorized editing of the [Stripper Settings] menu. |
| Maintenance Menu | |
| Replace Electrodes | Setting to “Disable” prevents operation of various functions related to the [Maintenance Menu]. |
| Stabilize Electrodes | |
| Clear Arc Count | |
| Clear Cleaver Counter | |
| Battery Discharge | |
| Motor Drive | |
| Diagnostic Test | |
| Dust Check | |
| Arc Calibration | |
| Motor Calibration | |

Stripper Setting

This function selects the unit to change the parameters of the RS02/03.

When selecting “Splice Mode”, the RS02/03 heats the fiber with the splicer parameters set in [Splice Mode]. In this case, the all buttons except for the power button on the RS02/03 are disabled.

When selecting “Stripper”, the RS02/03 heats the fiber with using the parameters set in the memory inside the RS02/03. In this case, the operator changes the settings of the RS02/03 with the RS02/03 buttons.

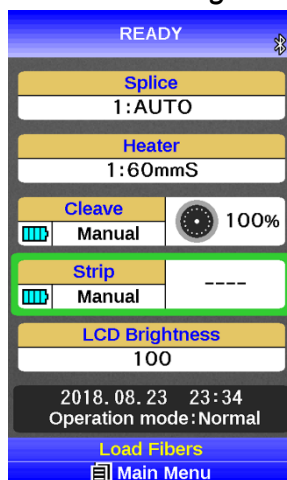


| Parameter | Description |
|-----------------------------|---|
| Heat Settings | |
| Heat Parameter Control | Selects the unit for heater parameter control. |
| Heat Temperature Level | Sets the heater temperature level of the stripper. |
| Heat Finish Time | Sets the heating time of the stripper. |
| ECO Setting | |
| ECO Mode Control By | Selects the unit for the ECO mode control. |
| ECO Mode | Toggles ECO mode ON/OFF. |
| Temperature Keeping | Sets the time delay before ECO mode initiates. |
| Buzzer Settings | |
| Buzzer Volume | Sets buzzer volume and under what conditions it is activated. |
| Power On (Only RS03) | |
| Power Off (Only RS03) | |
| Heat Finish | |
| Auto Shut Down (Only RS03) | |
| End of Charging (Only RS03) | |

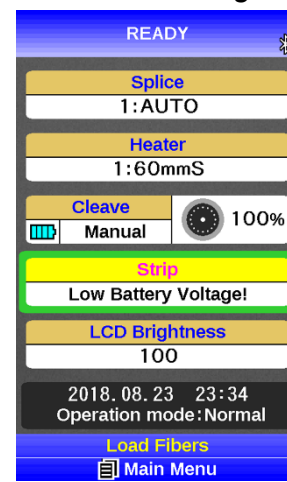
A continuation of the parameter list

| Alarm Setting | |
|----------------------------|--|
| Blade Replacement | Sets value for number of operations before blade replacement. The stripper informs the user of the need for replacement by changing the color of the “Strip window” in READY screen. |
| Low Battery (Only RS03) | Sets value for battery capacity before recharging. The stripper informs the user of the need for recharging by changing the color of the “Strip window” in READY screen. |

No alarming

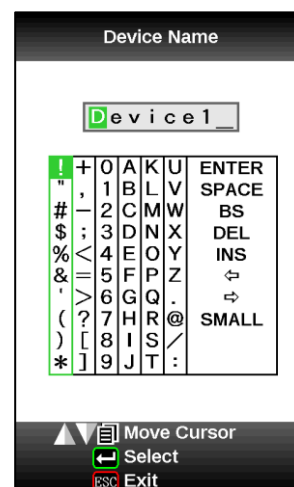
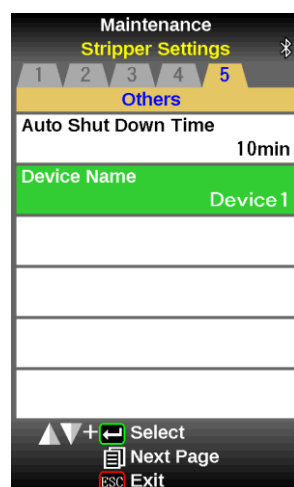


When alarming



Others

| | |
|---------------------|--|
| Auto Shut Down Time | Sets the time for automatic shutoff. This preserves battery life of the RS03 stripper if it is not being used. |
| Device Name | Sets the name of the RS02/03 stripper. |



Cleaver Settings

This function selects the unit to change the parameters of the CT50.

| Parameter | Description |
|-----------------------|---|
| Blade Settings | |
| Blade Position | Show cleaving counts at all blade positions of the cleaver. (48 positions) Changes the blade position of the cleaver. |

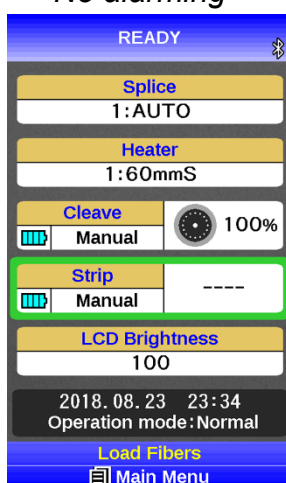

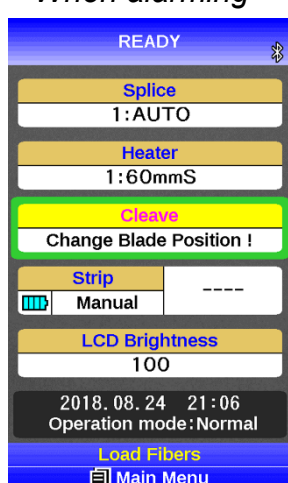
Select the position want to change. Then the cleaver blade rotate automatically.

BLUE cursor : Current blade position and height.
GREEN cursor : Blade position to change. User can move the cursor by **UP/DOWN** key and **MENU** key.

The sequence of screens is as follows:

- Initial state: Position 1 is selected (blue cursor) with height 60. Position 2 is highlighted (green cursor).
- Press **DOWN** key: The green cursor moves to position 2.
- Press **ENT** key: A confirmation dialog appears: "Do you change the blade position? 1 ⇌ 2". Options: Yes (left arrow), No (ESC).
- Press **ENT** key: The blade rotation begins.
- Rotating...: The screen shows "Rotating..." with the green cursor at position 2.
- Completed: The screen shows "Completed" with the green cursor at position 2.
- Final state: The blade position is changed. Position 2 now has a height of 60, and position 1 has a height of 0.

A continuation of the parameter list

| Parameter | Description |
|--|--|
| Blade Rotation Link to Alarm | <p>Sets the splicer's action when the splicer detected the cleaver blade worn.</p> <p>“Auto Without Confirmation” : Rotate the cleaver blade automatically without any confirmation.</p> <p>“Manual With Confirmation” : Show the message "Do you change the blade position?" When the operator select [Yes], the splicer will rotate the cleaver blade. When the operator select [No], the splicer will not rotate the cleaver blade.</p> <p>"OFF" : Do not rotate.</p> |
| Alarm Settings | |
| Blade Position Change | ON/OFF setup of the warning of the cleaver blade worn can be performed. In OFF, warning is not indicated on a READY screen. |
| Blade Height Change | |
| Blade Replacement | |
| <div><div><div>No alarming</div></div><div></div><div><div>When alarming</div></div></div> | |
| Blade Alarm Detection | <p>Sets how to detect the cleaver blade is worn.</p> <p>“Image Analysis” : Detects by the number of cleaving errors during specified number of splices.</p> <p>“Cleaving Count” : Detects by the number of cleaving counts.</p> <p>The splicer informs the user of the need for blade change or replacement by changing the color of the “Cleave window” in READY screen.</p> |

A continuation of the parameter list

| Alarm Settings | |
|-----------------------------------|---|
| <i>Cleaving Count</i> | <i>Sets value for number of cleaving counts to alarm the blade change or replacement.</i> |
| <i>Number of Cleaving Errors</i> | <i>Sets value for the number of cleaving errors during specified number of splices to alarm the blade change or replacement.</i> |
| <i>Number of Splices</i> | <i>ex. Set [Number of Cleaving Errors] to 3 and [Number of Splices] to 10. If the cleaving errors occur more than 3 times in the latest 10 splices, the splicer will show the cleaver blade worn alarm.</i> |
| <i>Incorrect Blade Position</i> | <i>ON/OFF setup of the warning of the cleaver blade height is wrong. In OFF, warning is not indicated on a READY screen.</i> |
| <i>Low Battery</i> | <i>Sets value for battery capacity before recharging. The cleaver informs the user of the need for replacing by changing the color of the "Cleave window" in READY screen.</i> |
| Others | |
| <i>Error Indicator on Cleaver</i> | <i>ON/OFF setup of the warning on the cleaver's error. In OFF, warning is not indicated on the cleaver.</i> |
| <i>Device Name</i> | <i>Sets the name of the CT50 cleaver.</i> |

Bluetooth Menu

This function configures the wireless communication with the RS02/03 ribbon stripper or CT50 cleaver.



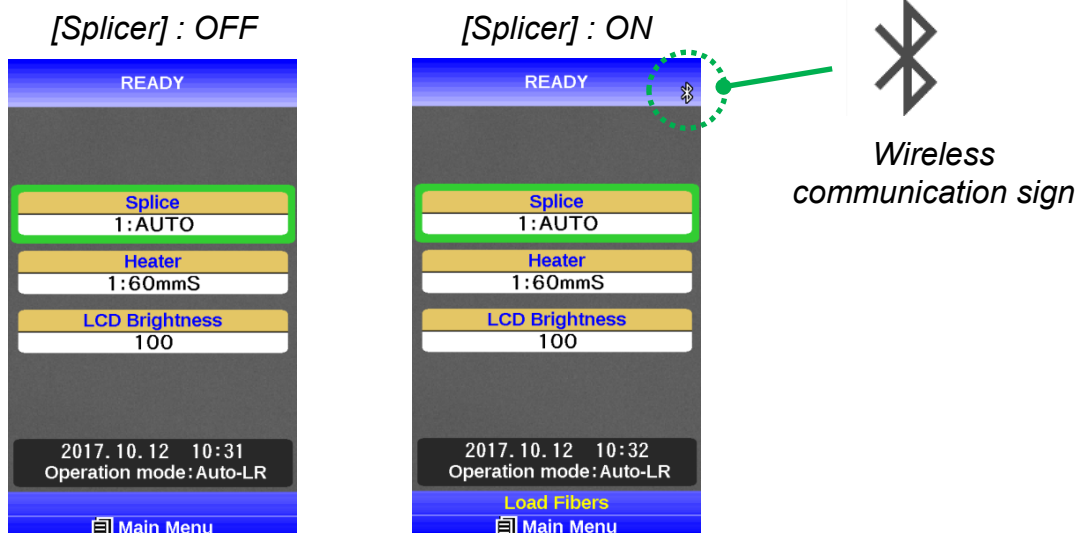
| Parameter | Description |
|-----------------------|--|
| Splicer | Turns the wireless communication function of the splicer ON/OFF. |
| Stripper | Turns the wireless connection with the RS02/03 ON/OFF. |
| Pairing With Stripper | Indicates the status of the wireless connection. Use this function to select the specific wireless stripper, as the splicer can only pair with a single stripper at a time. |
| Cleaver | Toggles ON/OFF the wireless connection with the CT50. |
| Pairing With Cleaver | Indicates the status of the wireless connection. Use this function to select the specific wireless cleaver, as the splicer can only pair with a single cleaver at a time. |

How to check the status of Wireless connection

Splicer

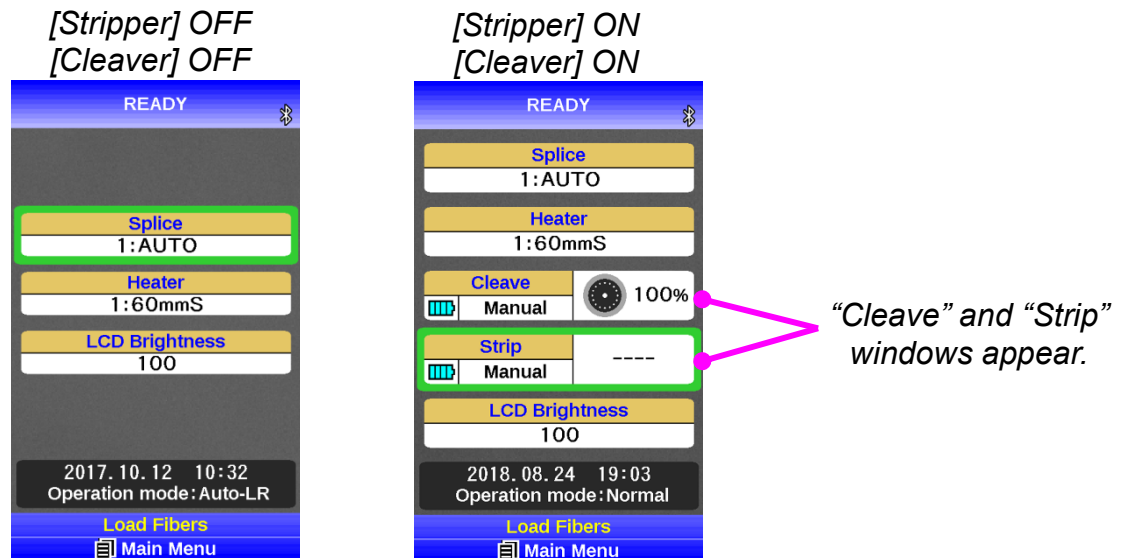
Wireless communication function of the splicer

When the [Splicer] in Bluetooth menu is set "ON", the wireless communication sign appears at the upper right corner.



“Strip” and “Cleave” window

1. Turn [Stripper] and [Cleave] in the “Bluetooth menu” ON, the “Strip” and “Cleave” windows appear in READY screen.

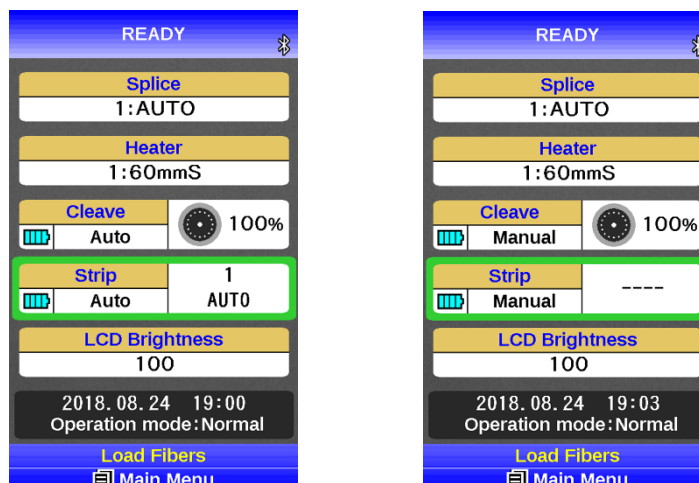


The “Cleave” window shows the information below.

- (1) Battery remaining
- (2) Whether the cleaver blade rotates automatically or not
 Auto : "Blade Rotation Link To Alarm" is set to "Auto Without Confirmation"
 Manual : "Blade Rotation Link To Alarm" is set to "Manual With Confirmation"
- (3) Ratio of the remaining cleaver blade positions
 ex. If the cleaver still have 47 usable positions, the splicer shows "97%"(=47/48).

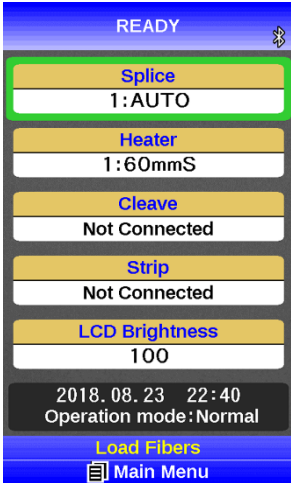
The “Strip” window shows the information below.

- (1) Battery remaining
- (2) Whether the heat settings of the stripper are controlled by the splice mode or not
 Auto : "Heat Parameter Control" is set to "Splice Mode"
 Manual : "Heat Parameter Control" is set to "Stripper"
- (3) Strip mode
 (2) is Auto : Strip mode is linked with splice mode
 (2) is Manual : Strip mode is blank (controlled by stripper)

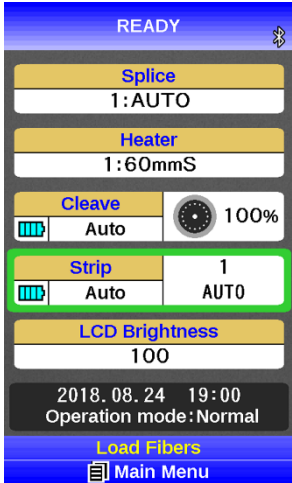


2. The “Strip” or “Cleave” window shows when the wireless connection is made between the splicer and the stripper or cleaver. If the stripper is connected, select “Strip” window in the READY screen, then press **ENT** key. This causes the stripper settings screen in Edit Splice Mode to appear. **ENT** key is valid only if [Heat Parameter Control] is set to “Splice Mode.” If the cleaver is connected select “Cleave” window in the READY screen, then press **ENT** key. This causes the blade position menu in Cleaver Settings to appear.


No connection




During connecting



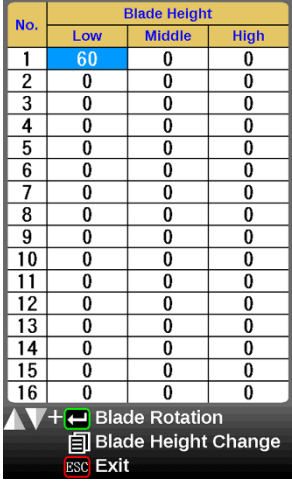
ENT key



**Select “Strip”
Stripper Settings
in Edit Splice Mode**



**Select “Cleave”
Blade Position Menu
in Cleaver Settings**

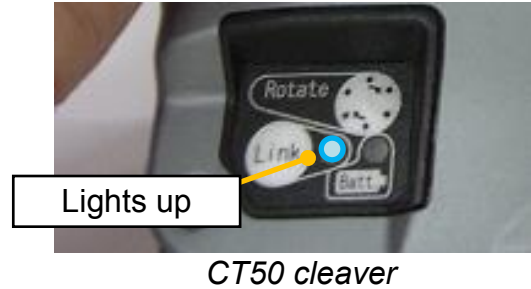
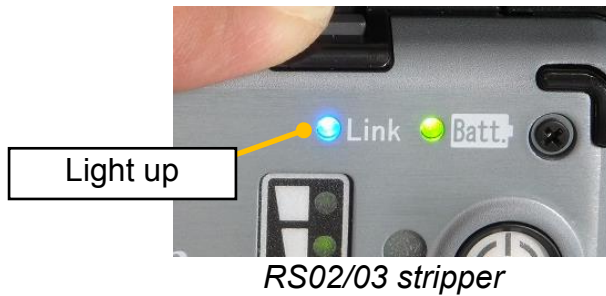


| No. | Blade Height | | |
|-----|--------------|--------|------|
| | Low | Middle | High |
| 1 | 60 | 0 | 0 |
| 2 | 0 | 0 | 0 |
| 3 | 0 | 0 | 0 |
| 4 | 0 | 0 | 0 |
| 5 | 0 | 0 | 0 |
| 6 | 0 | 0 | 0 |
| 7 | 0 | 0 | 0 |
| 8 | 0 | 0 | 0 |
| 9 | 0 | 0 | 0 |
| 10 | 0 | 0 | 0 |
| 11 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 |
| 13 | 0 | 0 | 0 |
| 14 | 0 | 0 | 0 |
| 15 | 0 | 0 | 0 |
| 16 | 0 | 0 | 0 |

3. If the “Strip” or “Cleave” window shows “Not Connected”, the wireless connection between the splicer and the stripper or cleaver is not made yet. Select the [Pairing With Stripper] or [Pairing With Cleaver] in Bluetooth menu to connect the splicer and the stripper or cleaver. Refer to **How to connect with the stripper** section on the next page.

Stripper & Cleaver

1. During the connection process, the Link LED on the RS02/03 or CT50 body lights up.



2. When the following parameter is set to "Splice Mode", each LED blinks during the connection process. (Only Stripper RS02/03)

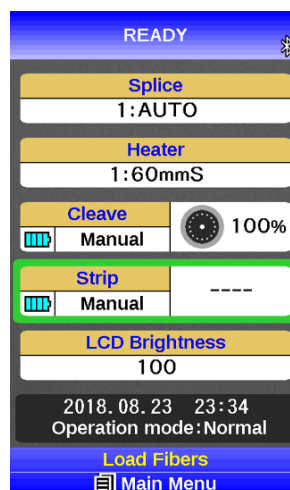
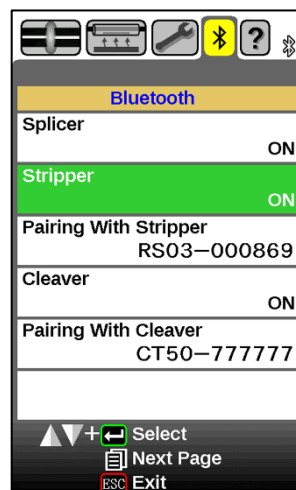
| [Heater Parameter Control] is set to "Splice Mode" | [Eco Mode Control] is set to "Splice Mode" |
|--|--|
| <p>The Temp LED blinks.</p> <p>blink</p> | <p>The Eco LED blinks.</p> <p>blink</p> |

How to connect with the stripper or cleaver

Re-connection

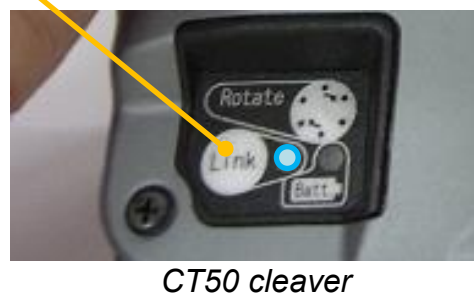
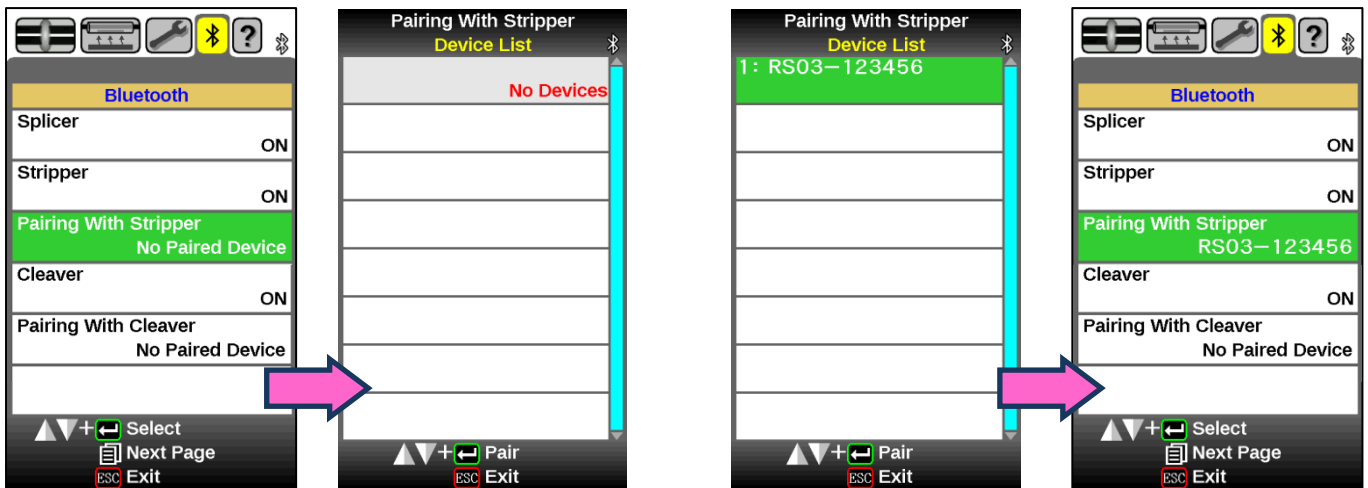
Once the wireless connection is made between the splicer and the stripper or cleaver, the splicer automatically connects with the stripper or cleaver the next time.

1. Turn the stripper or cleaver and the splicer "ON".
2. Turn [Splicer] and [Stripper] or [Cleaver] in Bluetooth menu "ON". The splicer automatically attempts to connect wirelessly with the stripper or cleaver it connected to most recently.



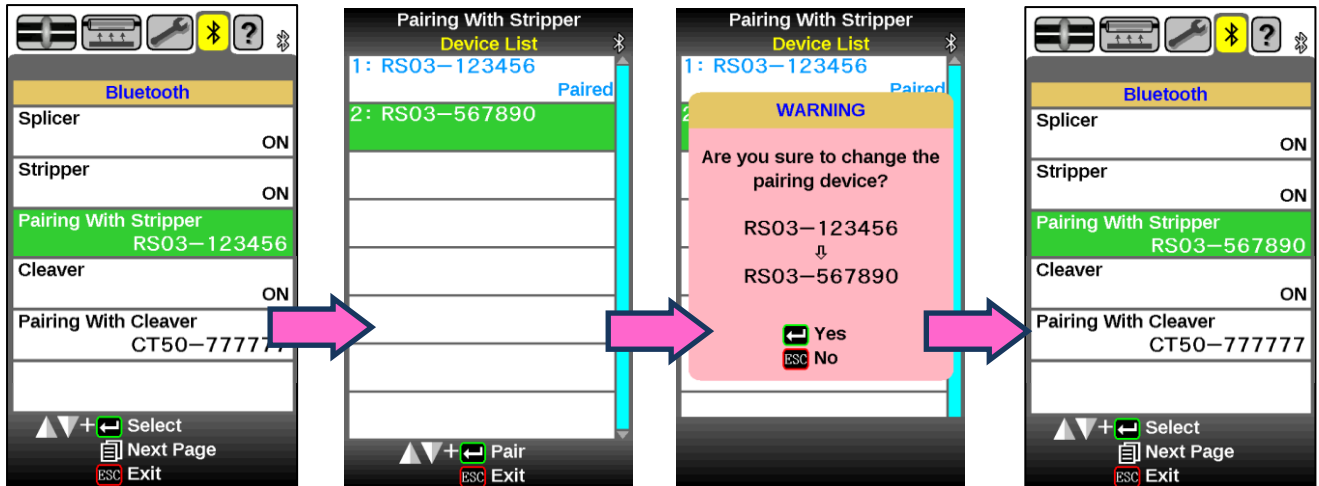
First time

1. Turn [Splicer] and [Stripper] or [Clever] in Bluetooth menu "ON".
2. Select [Pairing With Stripper] or [Pairing With Cleaver] in Bluetooth menu. Press **ENT** key. This will cause the [Device List] screen to appear.
3. If "No Devices" message appears, press and hold the **Wireless** button on the RS02/03 or CT50.
4. When the serial number of the RS02/03 or CT50 appears in [Device List], press **ENT** key.
5. This initiates the wireless connection with the stripper or cleaver.



Change the device

1. Turn [Splicer] and [Stripper] or [Cleaver] in Bluetooth menu "ON".
2. Select [Pairing With Stripper] or [Pairing With Cleaver] in Bluetooth menu. Press **ENT** key.
This will cause the [Device List] screen to appear.
3. Select the stripper or cleaver which you want to connect with. Then press **ENT** key.
4. This initiates the wireless connection with the new stripper or cleaver.



Guide/Promotion

The splicer has a built-in instruction manual, which shows basic operation of the splicer.

1. Press the **MENU** key while in the [READY], [PAUSE], or [FINISH] state and press the **MENU** key 3 times to display the [Guide].
2. Move the cursor by pressing the **Up/Down** Arrow key to highlight a parameter to be selected.
3. Press the **ENT** key to change values and settings.



| Item | Descriptions |
|---------------------------|--|
| New Features Introduction | |
| Automated Wind-Protector | Introduces the new features equipped to this machine and describes the splicer operation in each Operation Mode. |
| Operation Mode : AUTO | |
| Operation Mode : FAST | |
| Operation Mode : NORMAL | |
| Automated Tube-Heater | |
| Splice-On-Connector | |
| Short-Cleaved Splicing | |
| Power Supply | |
| Power Supply Setting | Describes how to supply power to the splicer and how to use battery. |
| AC Power Supply | |
| DC Power Supply | |
| Battery Power Supply | |
| Battery Level | |
| Battery Charge | |
| Splice & Heater Mode | |
| Splice Mode Selection | Describes how to select and set parameters of the splice or heater modes. |
| Splice Condition Setting | |
| Heater Mode Selection | |
| Heater Condition Setting | |

A continuation of instruction list

| Item | Descriptions |
|---|---|
| Single Fiber Splice | |
| Tools | Describes the tools and procedure of splicing single fiber and tube-heating. |
| Preparation | |
| Splicing Steps | |
| Protecting Splice Point | |
| Ribbon Fiber Splice | |
| Tools | Describes the tools and procedure of splicing ribbon fiber and tube-heating. |
| Preparation | |
| Splicing Steps | |
| Protecting Splice Point | |
| Daily Check | |
| Fusion Splicer | Describes how to check and clean the splicer and tools. |
| Cleaver Maintenance | |
| Blade Position | |
| Thermal Jacket Stripper | |
| Jacket Stripper | |
| Maintenance Menu | |
| Diagnostic Test | Describes how to perform tasks on the Maintenance Menu |
| Dust Check | |
| Electrode Replacement | |
| Arc Calibration | |
| Arc Stabilization | |
| Setting Menu | |
| Splice Settings | Describes the settings of the splicer and how to reference stored splice results. |
| Automated Wind-Protector | |
| Brightness / Monitor Angle | |
| Power save | |
| Data Storage | |
| PC Communication | |
| Describes the Data Connection utility software. | |
| Promotion Video | |
| Introduces the features of this machine with a video. | |

Press **ENT** when an error is shown on the monitor. The [HELP] screen displays the following:

When an error is in the list below, the splicer repeats the alignment when the operator presses the **SET** key.

- L-Too Long Fiber
- R-Too Long Fiber
- LR-Too Long Fiber
- L-Too Dusty Fiber
- R-Too Dusty Fiber
- ZL Motor Overrun (Forward)
- ZR Motor Overrun (Forward)
- ZL Motor Overrun (Backward)
- L/R-Bad Fiber Position

When an error is in the list below, the splicer carries out operation which changes with preset values of "Ignore Splicing Error", when the operator presses the **SET** key.
See Section [Splice Settings].

- Large Cleave Angle
- Cleave Shape NG
- Thin
- Fat
- Bubble
- Large Fiber Offset
- Large Gap Difference
- High Loss Estimated

Follow the solution precisely as shown in the list below. If it is not possible to eliminate the problem, the splicer may require service by a qualified service center. Consult the authorized distributor with the following information:

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

| Error Message | Reason | Solution |
|--------------------|--|---|
| L-Too Long Fiber | <ul style="list-style-type: none"> •The cleave length (bare fiber part) is too long. •Dust or dirt is on the objective lens. | <ul style="list-style-type: none"> •Confirm the setting position of the stripped fiber end on the fiber cleaver. Check the cleave length. •Execute the [Dust Check]. Clean the lens when dust or dirt exists. |
| R-Too Long Fiber | | |
| LR-Too Long Fiber | | |
| X-Dark Back Ground | <ul style="list-style-type: none"> •Dust or dirt is on the objective lens. •The LED or Camera might be damaged. • | <ul style="list-style-type: none"> •Execute the [Dust Check]. Clean the lens when dust or dirt exists. •Consult your distributor. |
| Y-Dark Back Ground | | |
| L-Too Dusty Fiber | <ul style="list-style-type: none"> •Dust or dirt is on the fiber surface. •Dust or dirt is on the objective lens. | <ul style="list-style-type: none"> •Completely prepare the fiber again (strip, clean and cleave). •Execute the [Dust Check]. Clean the lens if dust or dirt exists. |
| R-Too Dusty Fiber | | |
| | <ul style="list-style-type: none"> •[Cleaning Arc] time is too short or "OFF." | <ul style="list-style-type: none"> •Set the [Cleaning Arc] time to "120ms". When splicing carbon coated fibers, set to "200ms". |

| Error Message | Reason | Solution |
|--------------------------------------|--|--|
| ZL Motor Overrun (Forward) | <ul style="list-style-type: none"> •The fiber is not set correctly at the bottom of the V-groove. The fiber is not located in the Camera's field of view. •The cleave length (bare fiber part) is too short. | <ul style="list-style-type: none"> •Press RESET key, and set the fiber again to seat it correctly at the bottom of the V-groove. •Confirm the setting position of the stripped fiber end on the fiber cleaver. Check the cleave length. |
| ZR Motor Overrun (Forward) | | |
| ZL Motor Overrun (Backward) | <ul style="list-style-type: none"> •The taper speed or taper time is set too high. | <ul style="list-style-type: none"> •Adjust the taper parameters in the splice mode. |
| ZR Motor Overrun (Backward) | <ul style="list-style-type: none"> •Only occurs in manual motor operation. | |
| Cover Opened | <ul style="list-style-type: none"> •The wind-protector is opened during splicing operation. | <ul style="list-style-type: none"> •Press RESET key after closing the wind-protector. |
| ZL/ZR Heater Cover F/R Motor trouble | <ul style="list-style-type: none"> •Motor might be damaged. | <ul style="list-style-type: none"> •Consult the authorized distributor. |

Error Message List

| Error Message | Reason | Solution |
|------------------------|--|--|
| Strong Arc Power | •Unable to calibrate due to strong arc. | •Replace the electrodes by using the [Replace Electrodes] function in. If this does not eliminate the problem, consult the authorized distributor. |
| Weak Arc Power | •Unable to calibrate due to weak arc. | |
| Too Left /Right Arc | •Unable to calibrate due to poor arc field position (too far left or Right). | |
| Fiber Separation | •The fiber stuff amount is insufficient. | •Execute the [Motor Calibration] function. If using other splice modes, check the [Overlap] setting in the splice mode. |
| | •The pre-fuse power or pre-fuse time is set too high. | •Check the [Prefuse Power] and [Prefuse Time] settings in the splice mode. |
| L/R-Bad Fiber Position | •The fiber is not set correctly at the bottom of the V-groove. | •Press RESET key, and re-position the fiber again to seat it correctly at the bottom of the V-groove. |
| No Arc Discharge | •Arc Discharge did not occur. | •Assure the electrodes are in proper position. •Replace the electrodes. •Consult the authorized distributor. |

| Error Message | Reason | Solution |
|-----------------------|---|---|
| Large Cleave Angle | •Bad fiber end-face. | •Check the condition of the fiber cleaver. If the blade is worn, rotate the blade to a new position. |
| | •[Cleave Limit] is set too low. | •Increase the [Cleave Limit] to an adequate limit. |
| Cleave Shape NG | •Bad fiber end-face. | •Check the condition of fiber cleaver. If the blade is worn, rotate the blade to a new position. |
| Arc Discharge Delayed | •Arc Discharge is delayed | •Assure the electrodes are in proper position. •Execute the [Stabilize Electrode] function. •Replace the electrodes. |
| Thin Fiber | •Inadequate arc power | •Calibrate the arc power with the [Arc Calibration] function. |
| | •Prefuse power or time is set too high | •If using the Special mode, adjust or initialize [Prefuse Power] or [Prefuse Time] settings. For normal splice mode, the prefuse is fixed and cannot be adjusted. |
| | •Insufficient [Overlap] setting | •If using the Special mode, adjust or initialize [Overlap] setting. For normal splice mode, the overlap is fixed and cannot be adjusted. |
| Fat Fiber | •Too much [Overlap] setting | •Execute [Motor Calibration] function in the maintenance menu to calibrate the stuff amount. |
| Too Tapering Fiber | •Too much fiber taper. | •If using the taper splice function, the error message may appear meaning the fiber is tapered too much. |
| Bubble | •Bad fiber end-face. | •Check the condition of fiber cleaver. When the blade is worn, rotate the blade. |
| | •Prefuse power or time is set too low | •If using the Special mode, adjust or initialize [Prefuse Power] or [Prefuse Time] settings. For normal splice mode, the prefuse is fixed and cannot be adjusted. |
| Large Dust Burn | •Bad fiber end-face. | •Check the condition of the fiber cleaver. If the blade is worn, rotate the blade to a new position. |
| | •[Cleaning Arc] time is too short or "OFF." | •Dust still present after cleaning fiber or cleaning arc. Clean fiber thoroughly or Increase [Cleaning Arc Time] |

| Error Message | Reason | Solution |
|---------------------|---|---|
| High Estimated Loss | <ul style="list-style-type: none"> ·Insufficient fiber cleaning. | <ul style="list-style-type: none"> ·Dust or dirt on the fiber surface results in bad splice loss and low tensile strength. ·Clean the fiber surface sufficiently. ·Do not clean the fiber after cleaving to prevent dust on the fiber end-face. ·Avoid any contact with the fiber end-face. |
| | <ul style="list-style-type: none"> ·Bad fiber end-face. | <ul style="list-style-type: none"> ·Check the condition of fiber cleaver. If the blade is worn, rotate the blade to a new position. ·Confirm the [Cleave Limit] setting. 2.0° or less is recommended. |
| | <ul style="list-style-type: none"> ·Dust or dirt is on the V-groove or the clamp chip. | <ul style="list-style-type: none"> ·Dust or dirt on the V-groove or clamp chip causes poor fiber movement during fiber stuffing. Clean them periodically. |
| | <ul style="list-style-type: none"> ·Dust or dirt is on the lens | <ul style="list-style-type: none"> ·Execute the [Dust Check]. If dust or dirt exists, clean the lenses. |
| | <ul style="list-style-type: none"> ·Bad electrode condition. | <ul style="list-style-type: none"> ·Replace the electrodes if they appear worn (rounded tip shape), dirty or bent. |
| | <ul style="list-style-type: none"> ·Inadequate arc power. | <ul style="list-style-type: none"> ·Calibrate the arc power with the [Arc Calibration] function. |
| | <ul style="list-style-type: none"> ·Using unsuitable splice mode | <ul style="list-style-type: none"> ·Select a suitable splice mode for the fibers to be spliced. |
| | <ul style="list-style-type: none"> ·[Loss Limit] is set too low. | <ul style="list-style-type: none"> ·Increase [Loss Limit] to an adequate limit. |
| | <ul style="list-style-type: none"> ·Inadequate arc parameters in special modes | <ul style="list-style-type: none"> ·Confirm the arc parameters are adequate to splice the fibers. |
| | <ul style="list-style-type: none"> ·Inadequate estimating parameters in special mode | <ul style="list-style-type: none"> ·Confirm the estimating parameters are adequate to estimate the loss. The MFD mismatch function does not work for certain types of specialty fibers. In these cases, set the [MFD Mismatch] to "OFF". |

| Error Message | Reason | Solution |
|---|---------------------------------------|---|
| There is dust after executing Dust Check function | ·Dirt or dust exists in optical path. | <ul style="list-style-type: none"> ·Clean the objective lenses by referring see section [Cleaning of Objective Lens]. ·When the above processes cannot remove the dirt or dust, consult the authorized distributor. |
| X Camera Y Camera Trouble | ·The Camera may be damaged. | ·Consult the authorized distributor. |
| Heater Oven Trouble | ·Heater does not heat. | ·Consult the authorized distributor. |
| Communication error | ·Broken the internal device | ·Consult the authorized distributor. |
| Temperature Sensor NG | ·Temperature Sensor may be damaged. | ·Consult the authorized distributor. |
| Cover Trouble | ·Cannot Open and Close cover | <ul style="list-style-type: none"> ·Check sheath clamps are closed. ·Confirm obstructions and fibers are not around the cover. ·Confirm sheath clamps or fiber holders are set properly. |

Power Supply

- (1) Power does not turn on when pressing **ON/OFF** key
 - The battery may not be charged. Charge is performed.
- (2) Power does not turn off when pressing **ON/OFF** key
 - Press and hold the key until the LED color changes from green to red.
- (3) Few splices can be made with a fully charged battery pack
 - If the power saving function is not enabled, battery power degrades quicker. Always enable it to conserve power usage.
 - The battery pack has reached the end of its service life. Install a new battery pack.
 - The battery pack uses chemical reaction. The capacity decreases at low temperature, especially at lower than 0 degree C.
 - At high altitude, the arc discharge current is increased. In this condition, battery power degrades quicker due to large power consumption.
- (4) “CHARGE” LED on blinks during battery recharge
 - The battery pack has a fault or has reached the end of its service life. Install a new battery pack. If the LED blinks again after install, contact the authorized distributor.
 - The battery pack has been used under the environment (especially 40 degrees C or more) where temperature is high, or direct rays.
- (5) Method to change the power saving function settings
 - Refer to [Machine Settings] function.
- (6) Battery indicator is not displayed.
 - At the time of AC adaptor use, a battery indicator is not displayed on a screen.

Splicing Operation

- (1) Error message appears on monitor
 - Refer to [Error Message List] function.
- (2) Inconsistent splice loss / High splice loss
 - Clean the V-grooves, fiber clamps, and objective lenses.
 - Replace the electrodes.
 - “High Estimated Loss” error message section in the [Error Message List].
 - If the fiber has curl or bend memory, position the fiber so the crown (curve) of the memory is turned downward.
 - The splice loss varies according to the cleave angle, arc conditions and fiber cleanliness.
 - If the splice loss is still too high or inconsistent after performing the above-mentioned remedies, contact the authorized distributor. Regular service (at least once a year) is recommended to maintain high splicing quality.
- (3) Confirmation of splicing procedures
 - Refer to [Basic Operation] function.
- (4) Monitor suddenly turned off
 - The power saving function is automatically enabled when using a battery pack. The splicer switches to the power saving state after an extended period of splicer inactivity. Press any key to return to the normal state. To change the length of time before the splicer switches to the power saving state, Refer to [Machine Settings] function.
- (5) Splicer power suddenly turned off without “Low Battery” message
 - The power saving function is automatically enabled when using a battery pack. The splicer turns the splicer power off after an extended period of splicer inactivity. Press **ON/OFF** key to turn on the splicer again. To change the length of time before the splicer turns the splicer power off, section [Machine Settings] function.
- (6) Method to initialize arc condition of Splice mode
 - Refer to [Initialization in the edited parameter] in [Splice Menu].
- (7) Error message can be over-ridden
 - See Section [Splice Settings] to not allow error message override.
- (8) Unable to change Arc Power and Arc Time
 - The settings cannot be changed in AUTO modes.
 - If using the “Special Mode”, the Arc Power and Arc Time may be locked by administrator, preventing them from being changed.
- (9) Method to set Pause
 - See Section [Splice Menu] in [Splice Mode].

- (10) Method to display Cleave Angle, Fiber Angle / Offsets
·See Section [Splice Menu]. The fiber angle is not displayable in the SM, DS, MM or AUTO mode.
- (11) Incorrect splice mode selected and used in AUTO mode
·The AUTO mode can detect only standard SM, DS, MM and NZDS fibers. When splicing specialty fibers, the AUTO mode may identify them incorrectly.

Tube-heating Operation

- (1) Fiber protection sleeve does not shrink completely
·Fiber protection sleeve might not be set to the tube heater properly.
·When setting the fiber to the heater, do not remove hands from the fiber until the heater cover closes and the buzzer sounds. If releasing hands from the fiber rapidly, the protection sleeve may not be set to the heatable position.
·If the protection sleeve is not centered between yellow lines, the protection sleeve might not shrink completely.
·Extend the heating time.
·Refer to [Heater Mode].
- (2) Heater LED on panel keyboard blinks
·Pressing the **HEAT** key during heating causes the LED to blink. The tube heater is turned off if the **HEAT** key is pressed again. If, after 2 seconds have gone by without pressing the **HEAT** key again, the LED stays on continuously and the heater returns to its normal state. The LED will turn off when the heat cycle is completed.
·If the heating temperature does not reach its inputted setting, the LED blinks and the alarm sounds. If this happens, contact the authorized distributor.
- (3) Fiber protection sleeve adhered to heating plate after shrink
·Use a cotton swab or a similar soft tip object to push and remove the sleeve. If the black coating is removed, contact your authorized distributor.
- (4) Method to initialize heating condition of Heater mode
·See Section [Referring to or editing Heater Mode].
- (5) Method to cancel heating process
·**RESET** key does not cancel the heater. Press **HEAT** key twice to cancel the heating process.


Wireless communication

- (1) Bluetooth wireless connection is unsuccessful.
 - Check the power of RS02/03 stripper to ensure it is “ON”. If it is “Off”, turn the RS02/03 “ON”.
 - Check the Link LED of the RS02/03 stripper. If it is not lit, push and hold the **Wireless** button on the RS02/03. This will cause the Link LED of the RS02/03 to light and start the pairing process.
 - Check the [Splicer] and [Stripper] in Bluetooth menu of the splicer. If they are “Off”, turn them “ON”. Refer to the “**Stripper Setting**” section.
 - RS02/03 already connects with other splicer. Push and hold the **Wireless** button on the RS02/03. This will cause the Link LED of the RS02/03 to blink and start the pairing process. After this, try to connect with the stripper. Refer to **Wireless communication** section.
- (2) Cannot change the parameters of the RS02/03 with the splicer.
 - The RS02/03 may be already connected to another splicer. Push and hold the **Wireless** button on the RS02/03. This will cause the Link LED of the RS02/03 to blink and start the pairing process. After this, try to connect with the stripper. Refer to **Wireless communication** section.

Supervising

- (1) What functions can be disabled
 - See Section [Menu Lock Settings].
- (2) Method to lock “selection” or “editing” of Splice or Heater mode
 - See Section [Menu Lock Settings].
- (3) Method to set parameters of Splice or Heater mode from a PC
 - Refer to the communication software “Data Connection” included in CD-ROM.
- (4) Forgot password
 - Contact the authorized distributor.

Other Functions

- (1) Method to hide messages on [READY] screen
 - Change the fiber image from X/Y view to X magnified view or Y magnified view by pressing  key.
- (2) Too many repetitions until “Test Finish” indicated in [Arc Calibration]
 - The splicer needs to repeat the arc calibration after replacing the electrodes or when the environmental conditions change drastically. The number of arc calibrations can be set to a specific amount. When the splicer completes the set amount of calibrations, it indicates “Test Finish”. However, this does not mean it is completely calibrated.
- (3) “Test Finish” is never indicated after many repetitions in [Arc Calibration]
 - Execute [Stabilize Electrodes] function in [Maintenance Menu]. If the splicer still does not indicate “Test Finish”, replace the electrodes. See section [Replace Electrodes] function.
- (4) No arc power change after [Arc Calibration]
 - An internal factor is calibrated and adjusted for the specific arc power selected. The displayed arc power in each splice mode does not change.
 - The calibration results affect all splice modes.
- (5) Method to input different comments after each splice in splice results data
 - See section [Splice Memory Comment].
- (6) Method to download splice results from splicer to PC
 - Refer to the instruction manual “Data Connection” included in the CD-ROM. Press [F1] key after installing the software to display the instruction manual. Contact the authorized distributor for further inquiries.

Trademarks

Bluetooth® word mark and logos are the registered trademarks of Bluetooth SIG, Inc. This logo and word appearing in this manual are trademarks or registered trademarks of their respective owners. Any use of such marks by Fujikura Ltd is under license.

Warranty



1. Warranty period and limits

If the product fails due to defects or workmanship within the warranty period stipulated by the Fujikura-authorized distributor, they will repair it free of charge. Please ask the authorized distributor. However, note that repairs will be charged for the following regardless of the warranty period:

- (1) Failure due to natural disaster.*
- (2) Failure due to mishandling.*
- (3) Failure due to handling where the operating procedures or instructions described in the instruction manual were disregarded.*
- (4) Consumable items (discharge electrodes etc.)*
Please note that the memory of the splice results, parameters, etc. may be deleted during the repair.
- (5) Failure due to use of abnormal AC power.*
In most cases, damage to the AC adapter from an abnormal supply voltages occur within the warranty period. The specification of AC input voltage is up to AC240V (340V-peak).

2. Warranty item coverage

The warrantee covers the Splicer's and Accessories' standard package except for consumables like batteries or electrodes.

3. Before shipping the splicer

Please consult the authorized distributor first.

4. Information required for repair

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

- (1) Your full name, section, division, company, address, phone number, fax number and e-mail address.*
- (2) Model name and serial number of the splicer.*
- (3) Problems encountered*
 - What problems did your splicer encounter and when?*
 - What is its present operational state?*
 - the Observations, screenshots, files, images, pertinent error messages, etc. relating to the problem*

5. Transporting the splicer

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

6. Disclaimer

Please note the memory contents, such as splicing results, splice mode, etc., may be lost depending on the kind of repair.

Contact Address



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

Fujikura Europe Ltd.

*C51 Barwell Business Park
Leatherhead Road, Chessington, Surrey KT9 2NY
UK
Tel. +44-20-8240-2000 (Service: +44-20-8240-2020)
Fax. +44-20-8240-2010 (Service: +44-20-8240-2029)
URL <https://www.fujikura.co.uk>*

AFL

*260 Parkway East
Duncan, SOUTH CAROLINA 29334
U.S.A.
Tel. +1-800-235-3423 (Service: +1-800-866-3602)
Fax. +1-800-926-0007 (Service: +1-800-433-5452)
P.O.Box 3127 Spartanburg, SC 29304-3127
URL <https://www.AFLglobal.com>*

Fujikura Asia Ltd.

*438A Alexandra Road, Block A Alexandra Techno Park #08-03,
SINGAPORE, 119967
Tel. +65-6278-8955 Fax. +65-6273-7705
URL <http://www.fujikura.com.sg>*

Fujikura Ltd.

*1-5-1 Kiba, Koto-ku, Tokyo 135-8512
Japan
Tel. +81-3-5606-1131 Fax. +81-3-5606-1528
URL <https://www.fusionsplicer.fujikura.com>*

----- End of Document -----