

INSTRUCTION MANUAL

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HIGH STRENGTH  
ARC FUSION SPLICER

**FSM-30SF**

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## WARNING and CAUTIONS

### WARNING

Fujikura Ltd. accepts no responsibility for personal injury and/or equipment damage resulting from improper use or modification.

- (1) Do not attempt to use or operate this equipment before reading this instruction manual. Read and follow all safety instructions and cautions contained in the manual.
- (2) This equipment is designed for splicing the optical glass fiber for telecommunication. Do not attempt to splice any materials other than the optical glass fibers.
- (3) Safety glasses should always be worn during the fiber preparation and the splicing process. A glass fiber fragment can be extremely dangerous if it comes into contact with the eye, skin, or is ingested.
- (4) Use the only attached power cord. An improper power cord can cause fire and/or equipment damage.
- (5) The appliance inlet is used to disconnect the power cord when using the equipment. Be sure to position the equipment so that it is easy to disconnect the power cord.
- (6) If the side ventilation holes are covered, high temperature inside the equipment may result in damage. Confirm the clearance of 2 inches between the ventilation holes and wall when placing the equipment.
- (7) Check the AC or DC power source before turning on the equipment. Proper power source is AC100-240V 50-60Hz (Max.3A) or DC12V (Max.6A). Using power source out of the proper range can cause personal injury and/or equipment damage.
- (8) When using an AC power generator, check AC output voltage with a tester which can measure AC voltage. The AC output voltage from the generator must be within AC100-240V, 50-60Hz. Generating wrong high voltage above the specification is a common fault. Measuring the AC output voltage is necessary before every use.
- (9) Do not remove or bypass any electrical or mechanical devices (e.g., a fuse or safety switch) incorporated into the design and manufacturing of this equipment.

(10) Never operate the equipment in an environment where flammable liquids, or vapor exists. Extremely dangerous fire and explosion could result from the splicer's electrical arc in such an environment.

(11) Spilled solvent or alcohol causes a fire hazard.

(12) Never use a canned air type cleaner to remove dust, or to clean the equipment. The electrical arc may ignite any remaining gas mixture.

(13) During arc discharge, the electrodes generate very high voltage. The following measures will prevent personal injury and/or equipment damage from the high electrical voltage.

- Make sure no water or liquid is present on the equipment.

- Never touch the electrodes.

- Before operation, connect the equipment to the electrical ground (earth).

- When using an AC power source, use the included AC power cord. It connects to electrical ground through the third pin of the AC plug.

- When using DC power source or an AC socket with no ground terminal, connect a cable from the ground terminal on the equipment side panel to ground.

- Make sure the power switch is off when the power cord is plugged in or out.

- Turn the power switch off and disconnect the power cord before the electrodes, the fuse or the up/down mirror is replaced.

(14) Dangerous electrical voltages are present inside this equipment. Failure to maintain the equipment properly can result in personal injury and/or equipment damage.

- The cover panel and/or any electrically operated accessories should never be opened or removed except by an authorized engineer.

- Maintenance should only be performed by the authorized engineer, except the replacement of electrodes, up/down mirror and fuse.

- Only authorized replacement parts must be used on this equipment.

(15) When carrying the carrying case using the shoulder belt, check the belt and hook for damage beforehand. Carrying the case with a damaged belt will cause the belt to break or come off and result in personal injury or equipment damage.



## CAUTION

- (1) Attach the top cover to the equipment during the transportation. The top cover includes a mechanism which secures the movable parts of the equipment. Transportation without the top cover may result in damage to the movable parts.
- (2) Use the carrying case to transport and store the equipment. The carrying case will protect the equipment from damage, vibration, shock and moisture during storage and transportation.
- (3) A transparent film has been put on a monitor screen to protect the screen when this equipment arrives from the factory. Before using this equipment, put an adhesive tape on the corner of the film, and tear off the tape with the film. Do not use a hard or sharp object to remove the film because such an object could scratch or damage the monitor.
- (4) Set the electrodes to the correct position during replacement. Failure to place the new electrodes into the proper position will result in abnormal discharge, may be dangerous, and result in damage to the equipment.
- (5) Always replace the electrodes as a pair.
- (6) Use only alcohol to clean the objective lens, mirrors, v-groove, sheath clamp, fiber clamp, LCD monitor and body. Any other chemicals may cause blurring, discoloration or deterioration.
- (7) Keep the equipment free from sand or dust. Never clean the v-groove with a hard material or rough object. Doing so will damage the surface, and degrade the performance.
- (8) Precise adjustment and alignments have been made to all parts of this equipment by factory personnel. Do not loosen any screws or make any modifications to the equipment other than electrodes, up/down mirror and fuse replacements. If you encounter some problem with the equipment, please contact a sales agency or the factory.
- (9) Do not store in any area where extreme heat and humidity are present. Do not use with the condensing on the any devices. It may cause equipment damage.
- (10) This equipment requires no lubrication. Oil will degrade the performance and damage the equipment.
- (11) The equipment must not be placed on an unstable place. In a case of falling to the ground, it can cause personal injury and/or equipment damage.



# 1. GENERAL

The FSM-30SF high strength arc fusion splicer is designed to splice optical glass fiber for telecommunications, and can be used for high tensile splicing by a non-touch method. When using a non-touch method, the coated part of the fiber is set on the V-groove rather than the un-coated part. In conventional splicing, the un-coated part of the fiber is set on the V-groove, which may cause micro scratches on the fibers surface, reducing the tensile strength of the splice. The non-touch method eliminates micro scratches and results in a high strength splice. When using the non-touch method, V-groove and fiber clamp sizes are selected according to the fiber coat diameter. Different diameter coated fibers can be spliced. Also, conventional splicing can be done on the FSM-30SF, by using a  $\phi 125 \mu\text{m}$  V-grooves and clamps. The features are described below:

- Normal single-mode fiber(SM), multi-mode fiber(MM), dispersion shifted fiber(DS), cutoff shifted fiber(CS) and Erbium doped fiber(ED) are applicable for splicing. Carbon coated fiber and Titan fiber are also applicable.
  
- The splicer performs the fiber gap set, core/cladding alignment, splicing and loss estimation automatically by image processing by an internal microprocessor. A core alignment method is used for the SM mode, DS mode and CS mode. A cladding alignment method is used for the MM mode. On the ED mode, it is possible to select the core alignment method or the cladding alignment method on the arc condition menu.
  
- There are three kinds of ambient environmental sensors that are built into the splicer: a pressure sensor, a thermometer and a hygrometer. Those sensors adjust the arc power in order to compensate for various of altitude/atmospheric pressure, temperature and humidity.
  
- The splicer can be equipped with a built-in tube heater as an option.
  
- The splicer is powered by AC 100-240V 50-60Hz (Max. 3A) or DC 12V (Max. 6A).

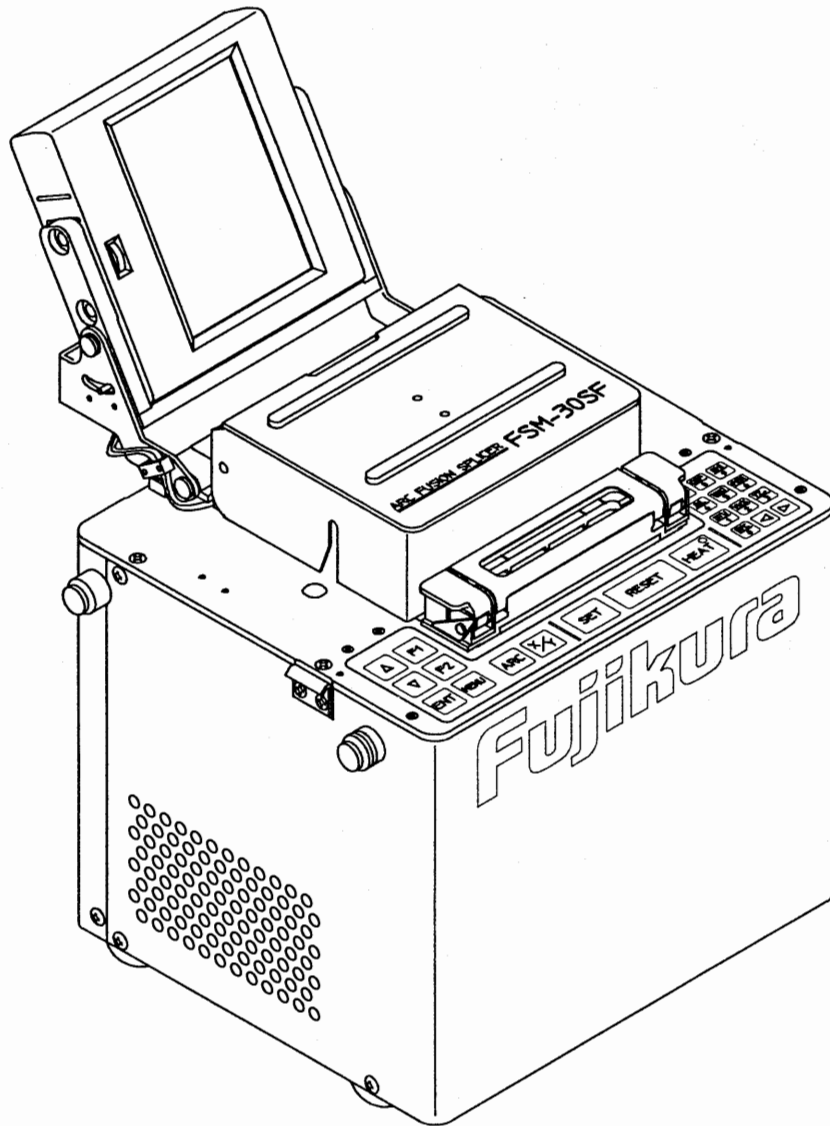


Figure Exterior View of FSM-30SF

## 2. CONSTRUCTION

### 2.1 Components

The components comprising the FSM-30SF are shown in Table 2.1.

Table 2.1 Components of the FSM-30SF

Name	Quantity	Model	Note
Splicer Main Body	1pc		
AC Power Cord	1pc	ACC-01	
Carrying Case	1pc		
Spare Electrodes	1 pair	ELCT1-25	
Spare Mirror	1pc	UDM-02	
Spare Fuses	1pc		DC6.3A(20mm length) Time Lag Type
	1pc		AC3.15A(20mm length) Time Lag Type
Hexagonal Wrench	2pc		for changing up-down mirror
			for changing V-groove and fiber clamp
Tweezers	1pc		for changing up-down mirror
Instruction Manual	1pc		

## 2.2 Optional Accessories

The optional accessories are available as shown in Table 2.2.

Table 2.2 Optional accessories of the FSM-30SF

No.	Name	Model	Note
1	High Strength Fiber Cleaver	CT-03HT	
2	Primary coat Stripper	PS-02	
3	Jacket Stripper	JS-01	
4	High Strength Stripper	HTS-11	
5	Ultrasonic Cleaner	VS-20	
6	Fiber Holder Attachment For Ultrasonic Cleaner	VS-20FH	
7	Fiber Holder * * *	FH-30PF-250H	For 0.25mm coating fiber
		FH-30PF-400H	For 0.4mm coating fiber
8	Working Table Support	WTS-1	
		WTS-2	
9	Working Table	WT-4	
10	Built -in Heater		Factory built as an option * *
11	Splice Protector	FP-3M FP-03 FP-03(40mm)	
12	Portable Battery Pack	FBP-05-110	Connect by DCC-01.
		FBP-05-230	
13	High Capacity Battery	FBP-02	Connect by DCC-01. for FBP-02 / 05
		DCC-01	
14	DC Power Cord	DCC-04	for a motor car
15	Memory Card Slot with PCMCIA Data read out Software *	MCS-01	Prepare PCMCIA(Type I & II) S-RAM CARD. It needs neither the attribute memory nor the secondary battery. From 64kbits to 1Mbits.

\* Concerning the memory card adapter and the download software, refer to Section 5.6.1 .

\* \* This option must be specified when ordering the FSM-30SF.

\* \* \* The fiber holder is necessary to use HTS-11 and VS-20FH.

### 3. DESCRIPTION OF PRODUCTS

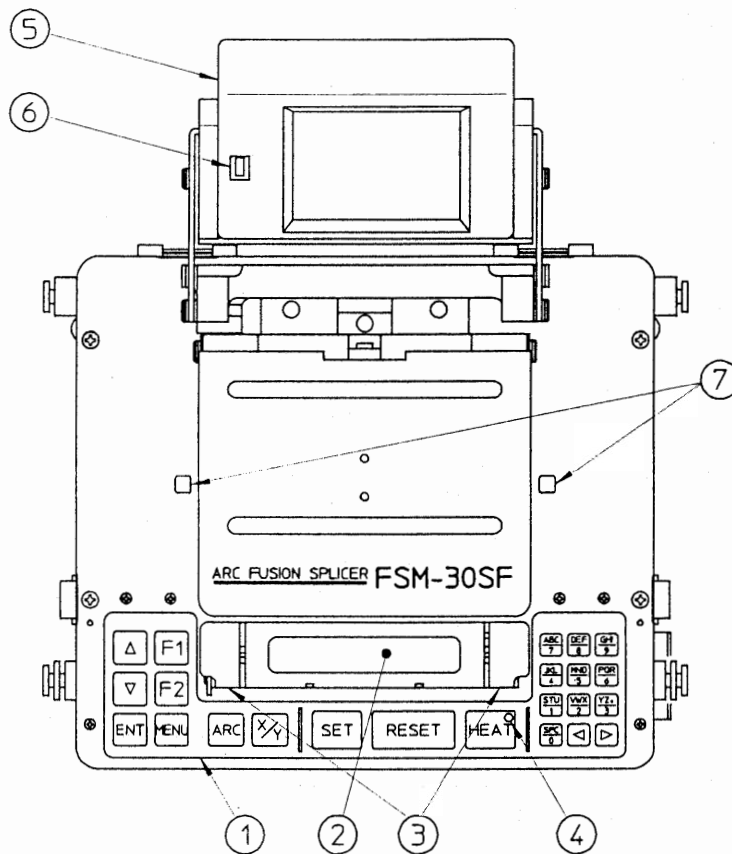


Figure Top View of the Main Body

No.	Name	Function
1	Panel Keyboard	Used to operate the splicer (See this section on page 10).
2	Tube Heater (OPTION)	To heat and shrink the splice protector. The 40mm or 60mm protector can be switched in the menu commands (See Section 5.4 on the page 49).
3	Tube Heater Clamp	To hold the optical fiber during the heating process.
4	Heating Indicator	This LED lamp is illuminated on during the heating process.
5	Internal Monitor	Allows the operator to view the fibers during the automatic splicing process.
6	Brightness Adjuster	To adjust the brightness of the monitor screen.
7	Z-unit Binder	The top cover engages this binder to secure the Z-units. To protect the Z-units from damage by vibration, the top cover must be attached during transportation.

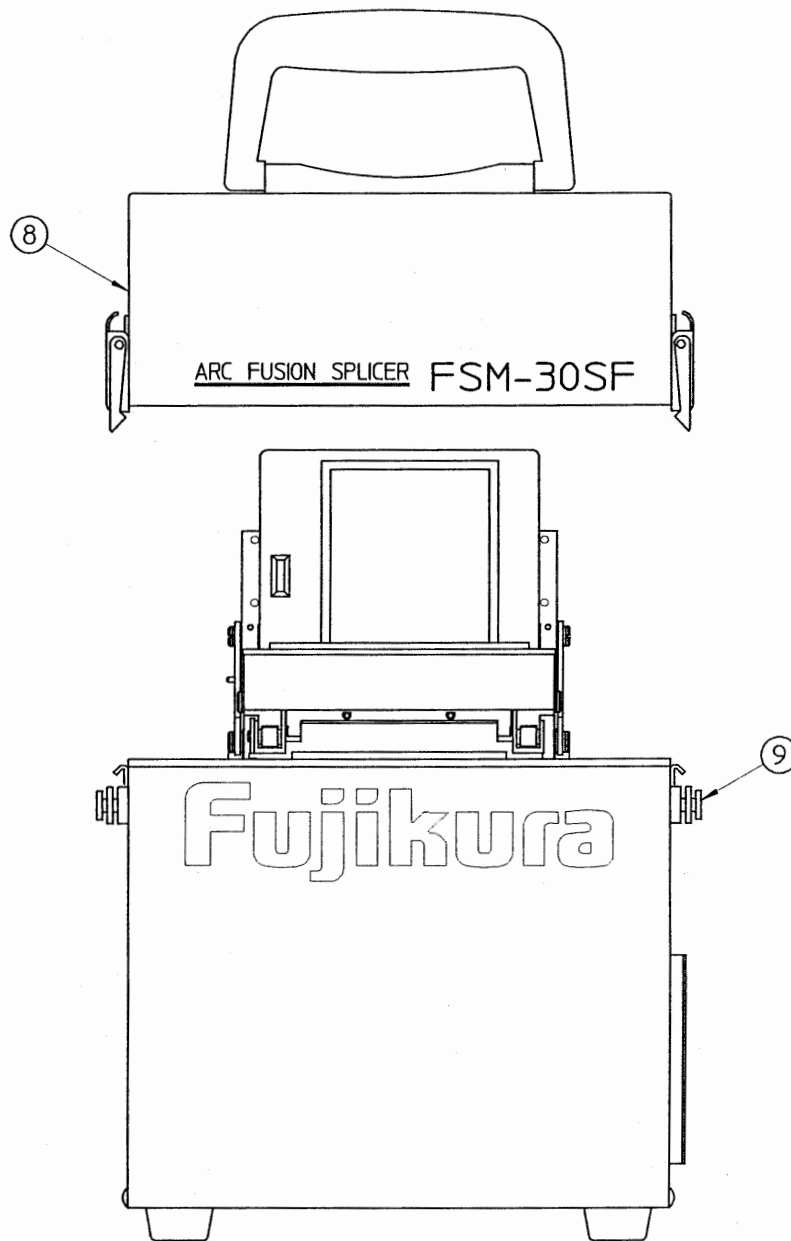


Figure Front View of the Main body

8	Top Cover	Protects the precise parts when not in use. Also, it secures the Z-unit by pushing the Z-unit binder on the top panel. To protect the Z-unit from damage by vibration, the top cover must be attached during transportation.
9	Work Table Support (Option)	To support an optional work table.

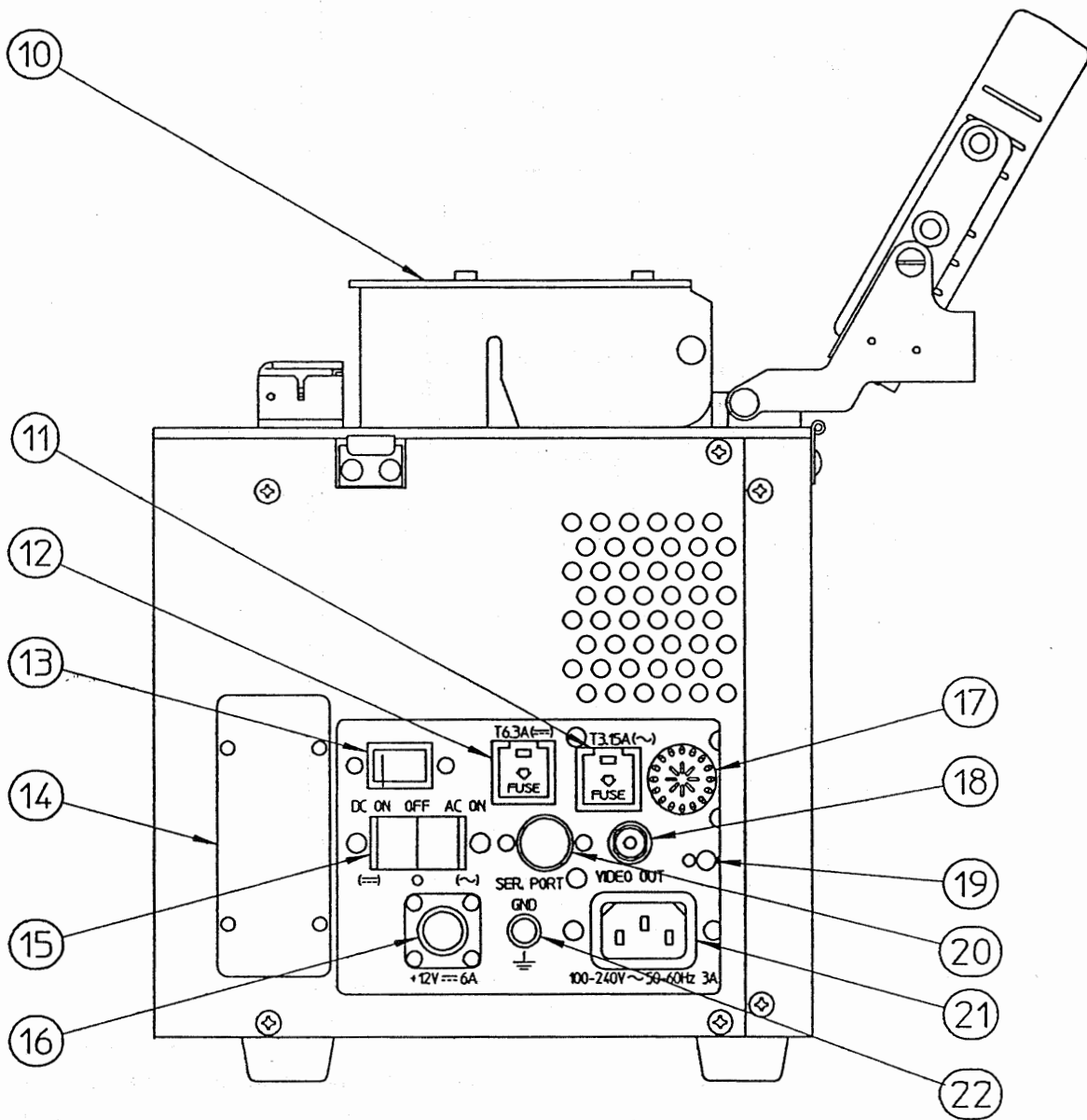


Figure Side View of the Main Body

10	Wind Protector	Protects the arc discharge from wind because the wind may cause an abnormal arc discharge. It also works as a safety switch. The arc is automatically prevented by opening this wind protector.
11	AC Input Fuse Holder	The 3.15A time lag fuse (20mm length) is used.
12	DC Input Fuse Holder	The 6.3A time lag fuse (20mm length) is used.
13	DC Input Voltage Indicator	Indicates the DC input voltage (Green: adequate, Red: Too high or too low)
14	Memory Card Cover	Protects the memory card slot. Remove this cover to insert the IC memory card in the case of a splicer equipped with the optional memory card adapter.
15	Power Switch	This switch has three positions (DC ON - OFF - AC ON).
16	DC Power Terminal	To connect the DC power cord when using an external battery. Input range is DC 12V (Max.6A).
17	Hygrometer	To measure humidity.
18	Video Output Terminal	For output of the NTSC video signal (manufacturer use).
19	Thermometer	To measure temperature.
20	RS-232C Terminal	Input and output of data based on the RS-232C protocol (manufacturer use).
21	AC Power Terminal	To connect the AC power cord when using an AC power source. Input range is AC 100-240V 50-60Hz (Max. 3A).
22	Ground Terminal	When using the DC power source (or an AC power source with no ground terminal at the AC socket), connect a cable from this terminal to electrical ground (earth).

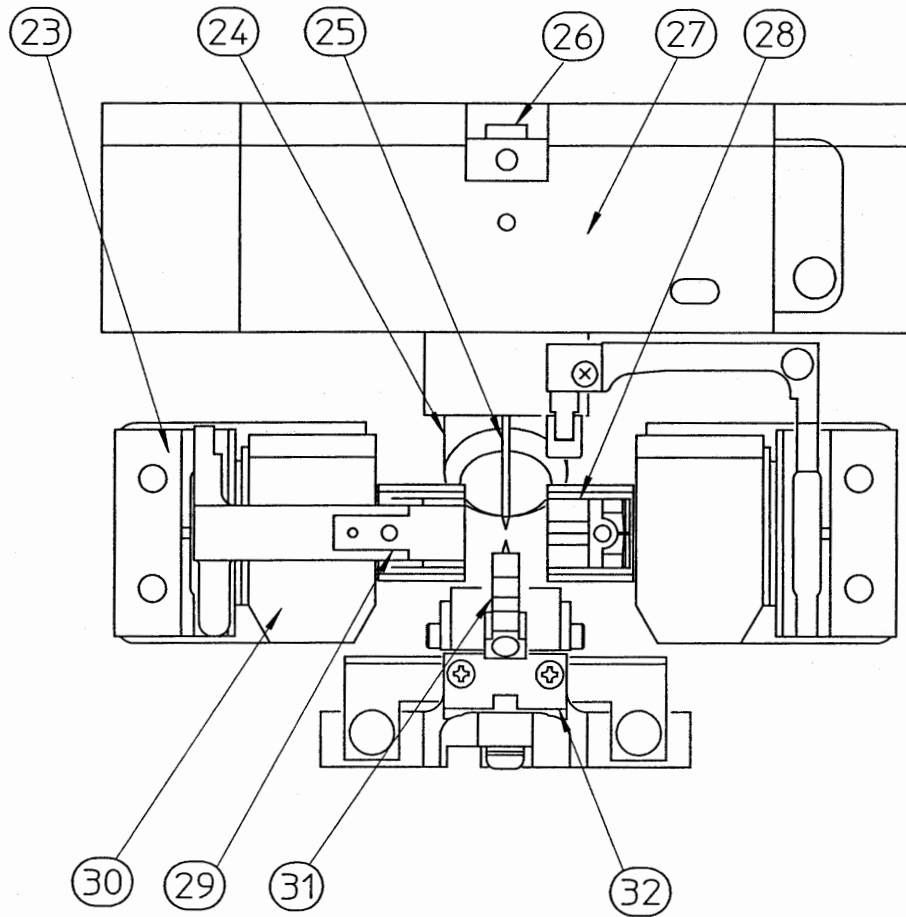


Figure Top View of the V-Groove Area

23	Z-Unit	This Z-unit consists of the V-groove, sheath clamp and fiber clamp.
24	Objective Lens	Magnifies the fiber image.
25	Discharge Electrode	Used to produce the arc discharge for fiber splicing.
26	LED Lamp	To illuminate the fibers for image processing.
27	Electrode Cover	Designed to protect the electrode (anode) during operation.
28	Changeable V-groove	Precision V-groove can be changed according to fiber coat diameter.
29	Changeable Fiber Clamp	Used to secure the optical fiber in the V-groove.
30	Sheath Clamp	Keeps the fiber in the correct position by clamping the fiber coating.
31	Up/Down Mirror	To observe the fiber from X and Y views. It moves up and down synchronized with the wind protector.
32	Electrode Fixture	Used to align and secure the electrodes in the correct position.

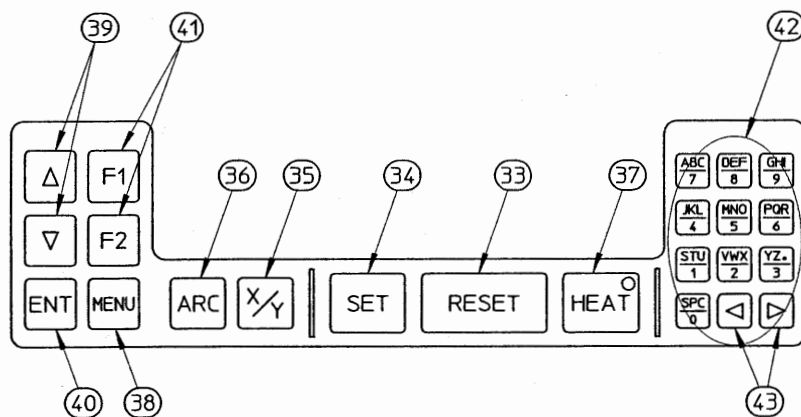


Figure Panel Keyboard

33	RESET	To quit from any state except the heating process by tube heater. After pressing this key, the splicer will return to the ready state with a beep sound.
34	SET	To start the splicing operation, or to go through to the PAUSE state.
35	X/Y	Changes the focus from the X view to the Y view, or the Y view to the X view.
36	ARC	Performs the arc discharge when "READY," "FIBER OK?" (after gap setting), "ALIGNING OK?" (after fiber aligning) and "FINISHED" (after splicing) messages are displayed on the screen. In the "FIBER OK?" and "ALIGNING OK?" state, the splicer performs the arc discharge as well as the fiber stuffing and loss estimation when the "ARC" key is pressed. Only the arc discharge occurs if the "ARC" key is pressed in the "READY" state. In the "FINISHED" state, pressing the "ARC" key results in the rearc and recalculation of the estimated loss.
37	HEAT	To start the heating process by the tube heater. An LED lamp is illuminated during heating, and blinks on and off during the cooling process.
38	MENU	To show the main menu on the screen, or to quit from a current display to a previous display.
39	Δ(UP), ∇(DOWN)	During menu commands, these arrows are used to move the "*" symbol for selecting the items, or to change the value or letter of the discharge conditions and comments. During manual motor control, these arrows serve as the "Backward" and "Forward" keys to operate the motors.
40	ENT	During menu commands, this key serves as an item selector, a confirmation key, and so on.
41	F1, F2	During menu commands, these keys serve for variable functions.
42	Alphabetical & Numerical Keyboard	Used for entering the letter or numeral into parameters or comments.
43	◀ (LEFT) ▶ (RIGHT)	During menu commands, these arrows are used to move the input position of the comment characters. It is also used for calendar setting and electrode center positioning.

## 4. OPERATION

### WARNING

- (1) This splicer is designed to splice optical glass fiber for telecommunication. Do not attempt to splice any material other than the optical glass fiber.
- (2) Safety glasses should always be worn during the fiber preparation and splicing process. A glass fiber fragment can be extremely dangerous if it comes into contact with the eye, skin, or is ingested.
- (3) Use the only attached power cord. An improper power cord can cause fire and/or equipment damage.
- (4) The appliance inlet is used to disconnect the power cord when using the equipment. Be sure to position the equipment so that it is easy to disconnect the power cord.
- (5) If the side ventilation holes are covered, high temperature inside the equipment may result in damage. Confirm the clearance of 2 inches between the ventilation holes and wall when placing the equipment.
- (6) Check the AC or DC power source before turning on the equipment. Proper power source is AC100-240V 50-60Hz (Max.3A) or DC12V (Max.6A). Using power source out of the proper range can cause personal injury and/or splicer damage.
- (7) When using an AC power generator, check AC output voltage with a tester which can measure AC voltage. The AC output voltage from the generator must be within AC100-240V, 50-60Hz. Generating wrong high voltage above the specification is a common fault. Measuring the AC output voltage is necessary before every use.
- (8) Never operate the splicer in an environment where flammable liquids, or vapor exists. Extremely dangerous fire and explosion could result from the splicer's electrical arc in such an environment.

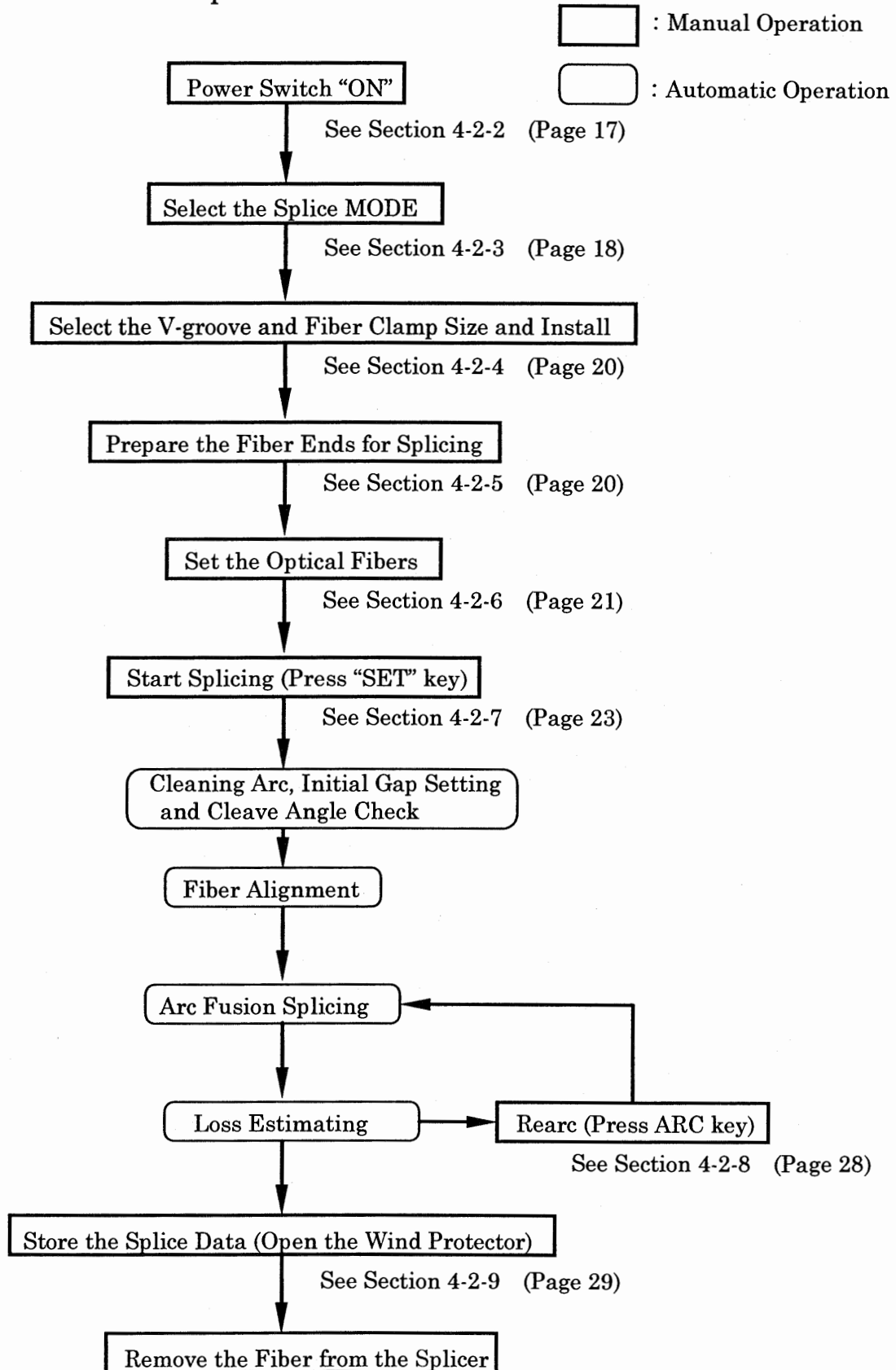
## WARNING

- (9) During discharge, the electrodes generate very high voltage. The following measures will prevent personal injury and/or splicer damage from the high electrical voltage.
- Make sure no water or liquid is present on the equipment.
  - Never touch the electrodes.
  - Before operation, connect the equipment to the electrical ground (earth).
  - When using an AC power source, use the included AC power cord. It connects to electrical ground through the third pin of the AC plug.
  - When using DC power source or an AC socket with no ground terminal, connect a cable from the ground terminal on the equipment side panel to ground.
  - Make sure the power switch is off when the power cord is plugged in or out.
  - Turn the power switch off and disconnect the power cord before the electrodes, the fuse or the up/down mirror is replaced.

## CAUTION

- (1) The fiber setting position on the sheath clamp depends on the fiber cleave length. Set the fiber correctly by referring to the label inside the wind protector. This splicer may not achieve optimum performance if the fiber setting position is incorrect.
- (2) Keep the splicer free from sand or dust. Never clean the v-groove with a hard material or rough object. Doing so will damage the surface, and degrade the performance.
- (3) Precise adjustment and alignments have been made to all parts of this equipment by factory personnel. Do not loosen any screws or make any modifications to the equipment other than electrodes, up/down mirror and fuse replacements. If you encounter some problem with the equipment, please contact a sales agency or the factory.
- (4) The equipment must not be placed on an unstable place. In a case of falling to the ground, it can cause personal injury and/or equipment damage.

## 4.1 Flowchart for Operation



## 1. Turn the Splicer ON

After connecting the splicer to the AC or DC power source, press the power switch on. The "READY" message appears on the screen of the LCD monitor.

## 2. Select the Splice Mode

The name of the current splice mode is displayed underneath the screen of the LCD monitor. Jump to the next procedure when the current MODE is suitable for the fiber. If it is unsuitable, press the "MENU" key and enter the "MODE SELECT" state to change the splice mode.

## 3. Select the V-groove and Fiber Clamp and Install

V-grooves and fiber clamps are selected and installed, according to coated fiber diameter in order to set the fiber in its correct position.

## 4. Prepare the Fiber Ends

Prepare the fiber ends by using the suitable methods of the high strength splicing.

The length of bare fiber (cleave length) is 3~6mm, when the coat-clamp method

is used. The length of bare fiber (cleave length) is 10~16mm, when the glass-clamp method is used.

## 5. Set the Fibers

Set the first fiber on the V-groove, and close the sheath clamp and fiber clamp carefully.

## 6. Start the splice

Press the "SET" key to proceed.

At first, the fibers move toward each other. During the forward movement, a short arc occurs to clean the fiber surface. The splicer stops forward movement when the gap between the fiber ends is proper. After the initial gap setting, the splicer measures and displays the cleave angle.

After the initial gap setting, the cladding and/or core alignment is performed. Then, the splicer reduces the gap (a final gap setting), and generates a high voltage discharge for the arc fusion along with stuffing the left side fiber into the right side fiber.

Finally, the microprocessor calculates and indicates the estimated loss on the screen.

## 7. Rearc

In a case that the estimated loss is higher than expectation, press the "ARC" key to generate the rearc. After the additional arc discharge, the splicer estimates and displays the loss again.

## 8. Remove the Fiber

By opening the wind protector, the splicer stores the splice data result that includes the splice mode, date, estimated loss and so on. Also, a proof test is automatically performed when the proof test function is "ON" in the menu commands. Please make sure that the proof test function is "OFF" when doing high strength splicing. Proof testing for high strength splicing will be done on different machine.

After opening the wind protector, remove the fiber from the splicer.

## 4.2 Splicing Procedure

### WARNING

- (1) Safety glasses should always be worn during the fiber preparation and the splicing process. A glass fiber fragment can be extremely dangerous if it comes into contact with the eye, skin, or is ingested.
- (2) Use the only attached power cord. An improper power cord can cause fire and/or equipment damage.
- (3) The appliance inlet is used to disconnect the power cord when using the equipment. Be sure to position the equipment so that it is easy to disconnect the power cord.
- (4) If the side ventilation holes are covered, high temperature inside the equipment may result in damage. Confirm the clearance of 2 inches between the ventilation holes and wall when placing the equipment.
- (5) Check the AC or DC power source before turning on the equipment. Proper power source is AC100-240V 50-60Hz (Max.3A) or DC12V (Max.6A). Using power source out of the proper range can cause personal injury and/or equipment damage.
- (6) When using an AC power generator, check AC output voltage with a tester which can measure AC voltage. The AC output voltage from the generator must be within AC100-240V, 50-60Hz. Generating wrong high voltage above the specification is a common fault. Measuring the AC output voltage is necessary before every use.
- (7) During/after heating the splice protector, do not touch the ceramic heater and the splice protector. The high temperature may cause personal injury.

### CAUTION

- (1) Keep the splicer free from sand or dust. Never clean the V-groove with a hard material or rough object. Doing so will damage the surface, and degrade the performance.
- (2) Precise adjustment and alignments have been made to all parts of this equipment by factory personnel. Do not loosen any screws or make any modifications to the equipment other than electrodes, up/down mirror and fuse replacements. If you encounter some problem with the equipment, please contact a sales agency or the factory.
- (3) The equipment must not be placed on an unstable place. In a case of falling to the ground, it can cause personal injury and/or equipment damage.

### 4.2.1 Connecting of Power Cord

#### 1. Ensure that the Power Switch is OFF

Confirm the power switch is off before connecting the power source.

#### 2. Connecting the Power Cord

##### (1) AC Power Source

Plug the AC power cord in to the inner part of AC power terminal.

##### (2) DC Power Source

Plug the DC Power cord in to the inner part of DC power terminal.

## 4.2.2 Power ON/OFF Procedure

### 4.2.2.1 Power ON Method

#### 1. Checking the Input Voltage

The input voltage must be AC100-240V (50-60Hz, Max.3A) or DC12V (Max.6A). Check the voltage fluctuation and the power factor when an AC power generator supplies AC power to the splicer.

**NOTE1** In using a DC power source, it is possible to check the input voltage by the DC input voltage indicator on the splicer side panel. However, the splicer may be damaged if the input voltage is too high.

**NOTE2** The DC input voltage indicator does not show the AC input voltage.

#### 2. Pressing the Power Switch ON

##### (1) AC Power Source

Press the power switch on to the "AC ON" position.

##### (2) DC Power Source

Press the power switch on to the "DC ON" position.

#### 3. Checking the Input Voltage Indicator and Monitor Screen

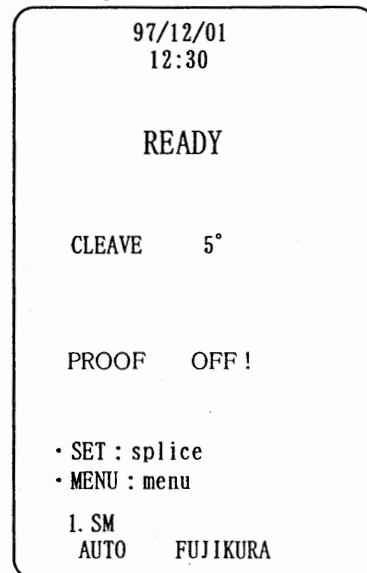
##### (1) DC Input Voltage Indicator

A needle of the voltage indicator should point to the green range in both the AC power and DC power.

##### (2) Monitor

The monitor should indicate a "READY" message after a self-diagnostic test. (Display 1)

Display 1



### 4.2.2.2 Power Off Method

#### 1. Press the "RESET" key

#### 2. Open the Wind Protector

#### 3. Turn the Power Switch off after opening the Wind Protector

#### 4. Close the wind protector, and attach the top cover.

**NOTE3** By the above procedure, the splicer will be turned off with the up/down mirror lifted up. This will prevent possible electrode damage inside the mirror from a strong shock. Follow the above procedure when turning the splicer off.

### 4.2.3 Splice Mode Selection

The FSM-30S can splice many kinds of fibers by changing the arc condition and splicing method. Thirty programmable splicing conditions are available. The splicing condition is called "Splice Mode." Select a suitable splice mode from the internal memory as below.

#### 1. Display the "MAIN MENU"

Ensure the splicer is in the "READY," "PAUSE" or "FINISHED" state. Then, press the "MENU" key. The main menu is displayed on the screen as shown in Display 1.

Move the "\*" symbol next to the "MODE SELECT" by using the "△" or "▽" arrow, and press the "ENT" key.

#### 2. Select the "MODE SELECT"

With the "\*" symbol next to "MODE SELECT," press the "ENT" key to enable the mode selection (Display 2).

Display 1

```
[MENU]
* MODE SELECT
  ARC COND.
  OTHER COND.
  TUBE HEATER
  MOTOR MOVE
  MEMORY
  UTILITY
  MAINTENANCE
•Δ▽ then ENT
•MENU:exit
1.SM          AUTO
FUJIKURA
```

#### 3. Select the splice Mode

There are seven pages for the 30+4 modes, and each page contains five (or four) splice modes. It is possible to select a suitable splice mode from the 30 modes. Last four splice modes (No.[1]-[4]) cannot be selected.

Move the "\*" symbol next to a suitable splice mode by using the "△" or "▽" arrow, and press the "ENT" key to change the splice mode to the new one. The new splice mode is displayed at the bottom of the screen.

Display 2

```
[MODE SELECT]
—PAGE 1 of 7—
* 1.SM          AUTO
  FUJIKURA
  2.SM          AUTO
  Fujikura
  3.SM          AUTO
  FUJIKURA SM
  4.SM          AUTO
  FUJIKURA
  5.SM          AUTO
  TANSIN
•Δ▽ then ENT
•F1:page 7 of 7
•F2:page 2 of 7
•MENU:exit
1.SM          AUTO
FUJIKURA
```

#### **NOTE1** "SM AUTO", "DS AUTO" and "CS AUTO" Modes

The splicer automatically adjusts the arc power every splicing. By observing a fiber state before and after splicing, the splicer changes the current arc power to the most suitable arc power. Usually, use this auto mode.

**NOTE2** The fiber types of each splice modes (No.1-30) can be individually changed into the SM, DS, CS, MM or ED mode in the "ARC COND." menu. The arc parameters of each splice mode can be also changed individually in "ARC COND." menu. To change the fiber type and arc conditions, refer to Section 5 on page 35.

SM : Single-Mode fiber (Wavelength = 1.31um)  
 DS : Dispersion Shifted fiber (Wavelength = 1.55um)  
 CS : Cutoff Shifted fiber (Wavelength = 1.55um)  
 MM : Multi-Mode fiber  
 ED : Erbium Doped fiber

Concerning the detail of splice mode, see the section 6.5 on page 80.

**NOTE3** Last four splice modes (No.[1]-[4]) are the original settings pre-programmed at the factory. It is impossible to select or change these factory pre-set parameters.

**NOTE4** Copying and moving functions for the splice modes are available in the "MODE EDIT" menu. See the section 5.7.1 on page 61.

**NOTE5** Initial settings programmed at the factory are as below:

Mode Number	Memory Type	Fiber Type	Notes
No.1-5	Programmable	SM AUTO mode	Same Arc Power as the No.[1]
No.5-10	Programmable	SM mode	Same settings as the No.[1]
No.11-15	Programmable	DS AUTO mode	Same Arc Power as the No.[2]
No.16-20	Programmable	DS mode	Same settings as the No.[2]
No.21-25	Programmable	MM EST.ON	Same settings as the No.[3]
No.26-30	Programmable	MM EST.OFF	Same settings as the No.[3]
No.[1]	Read Only	SM mode	Original setting
No.[2]	Read Only	DS mode	Original setting
No.[3]	Read Only	MM mode	Original setting
No.[4]	Read Only	CS mode	Original setting

**NOTE6** For Carbon coated fiber, the cleaning arc time should be longer than the normal setting value. See Section 5.2.4 .

**NOTE7** For splicing Erbium doped fiber to dispersion shifted fiber, see Section 6.6 .

#### 4.2.4 Selection and Installation of V-groove and Fiber Clamp Assemblies

V-grooves and fiber clamps must be changed according to fiber coat diameter. 2 types of V-groove and fiber clamp assemblies are included,

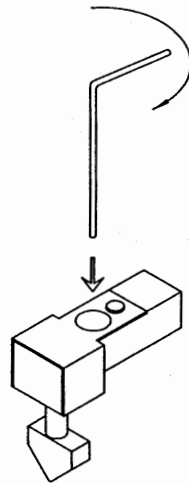
the "125" fiber glass clamp for  $\phi$  125  $\mu$ m fibers,

the "125" fiber coat clamp for  $\phi$  250  $\mu$ m fibers.

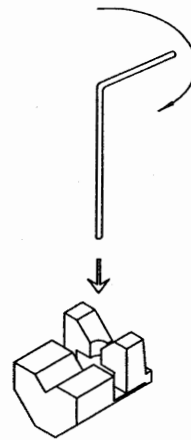
During installation, first select the correct size V-groove and fiber clamp. Use the hexagonal wrench, which is included with the FSM-30SF, to loosen the built-in screws of the V-groove and clamp to be removed. Next remove the V-groove and clamp. Then install the new V-groove and clamp and tighten the built in screws with the hexagonal wrench.

#### CAUTION

Do not tighten the screws too tightly or else the screw heads may be stripped and damaged.



(Fiber clamp)



(V-groove)

#### 4.2.5 Preparation of Fiber Ends

Before splicing, proper preparation of the fiber ends is necessary. This operation includes the stripping, cleaning and cleaving processes. It is important for high strength splicing that the fiber glass surface is not damaged and is cleaned properly. The cleave length must be 3~6mm for fiber sheath clamp splicing, and 10~16mm for fiber glass clamp splicing.

**NOTE1**

The FSM-30SF can splice only single fibers. In a case of ribbon fiber, divide the ribbon fiber into single fibers.

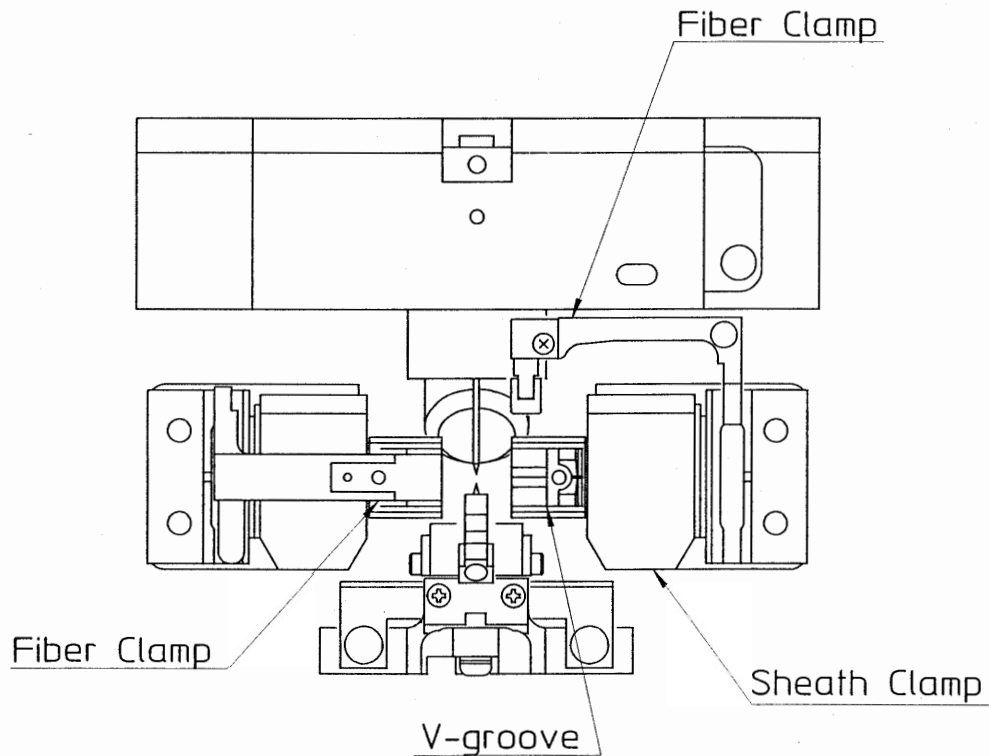
#### 4.2.6. Setting of Fibers

Set the prepared fiber on the splicer as below.

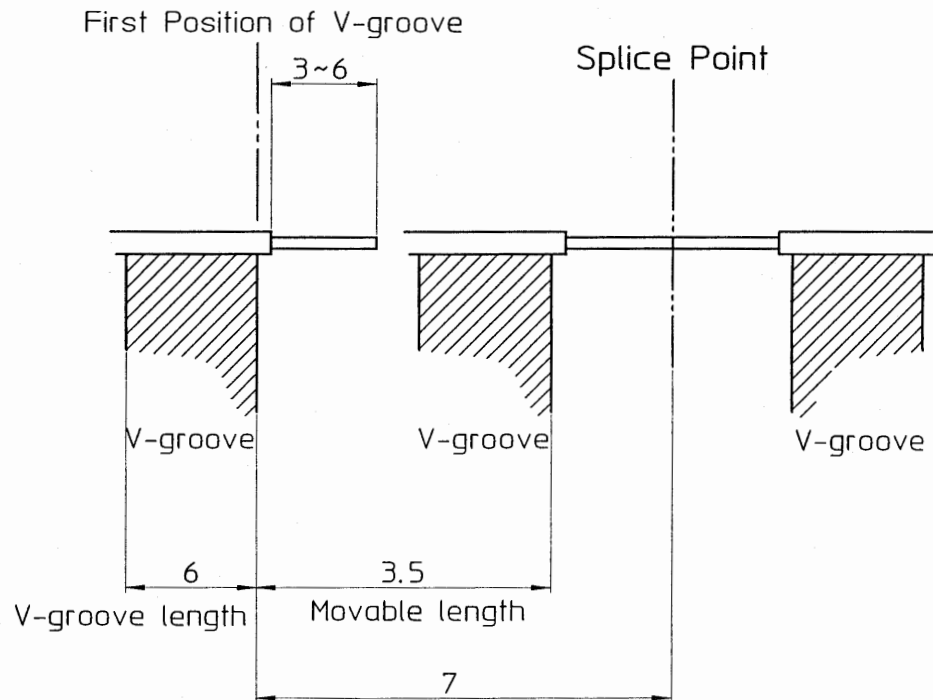
1. Open the Wind Protector

2. Set the Fiber on the V-groove and sheath clamp

(1) Open the left and right side sheath clamps. The fiber clamps are lifted up automatically by the sheath clamps.



- (2) Put the fiber on the V-groove. When placing the fiber in position, be careful to ensure that the cleaved fiber end does not touch the V-groove surface, or any other surface or object (such as the up/down mirror) which might contaminate the cleaved fiber end.



- (3) Close the sheath clamp while holding the fiber, and ensure that the fiber is touching the bottom of the v-groove. If the fiber does not touch the bottom, set the fiber in place again.

**NOTE** In a case that the fiber has a bend, it is easy to set the bent fiber properly into the bottom of the V-groove by turning the bending direction of the fiber down.

- (4) Set the other side fiber by the procedure above.  
(5) Close both left and right side fiber clamps gently.

### 3. Close the Wind Protector

#### 4.2.7 Automatic Splicing Procedure

The automatic splicing procedure is described below.

##### 1. Confirmation of the "READY" message

Check to ensure that the "READY" message is shown on the screen (Display 1). Press the "MENU" or "RESET" key to enter the "READY" state if the "READY" message does not appear.

##### 2. Cleaning Arc, Initial Gap Setting and Cleave Angle Check

Press the "SET" key to start the automatic splicing process.

###### (1) Starting the Initial Gap Setting

At first, the splicer moves the fibers forward (Display 2).

###### (2) Cleaning Arc

During the fiber forward motion, a short arc occurs to clean the fiber surface.

###### (3) Initial Gap Setting

The splicer sets the proper gap between fiber ends.

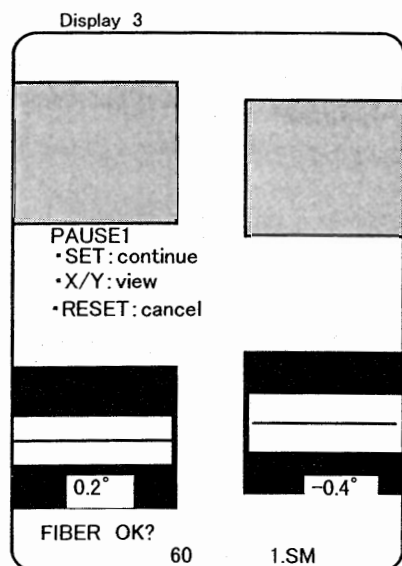
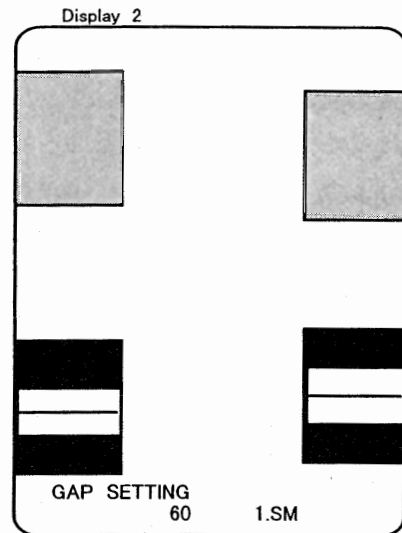
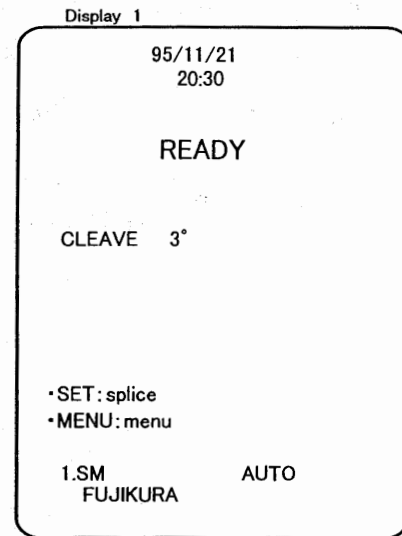
And then, splicer aligns out lines of cladding in both X and Y views simultaneously.

###### (4) Cleave Angle Check

After the gap setting, the splicer measures and indicates the cleave angle on the screen.

**NOTE1** Observe the condition of fiber ends by your eyes. In the case that the condition is bad as shown in figure on next page, press the "RESET" key to cancel, and then prepare the fiber ends again, i.e., stripping, cleaning and cleaving.

**NOTE2** The splicer cannot detect the dust on the fiber surface sometimes. If there is visible dust, press the "RESET" key to cancel and then prepare the fiber ends again, i.e., stripping, cleaning and cleaving. The dust may cause high splice loss.



**NOTE3** The splicer will be in a pause state after the gap setting if "PAUSE1" is "ON" in the "OTHER COND." menu. In the pause state, the splicer displays a "FIBER OK?" message on the screen (Display 3).

(Concerning the "PAUSE1" function, see Section 5.3)

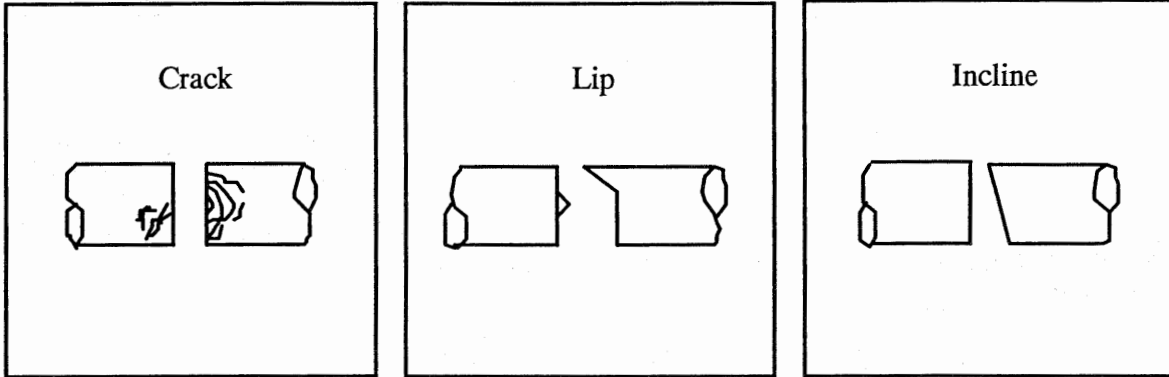


Figure End Face View of Optical Fiber

### 3. Automatic Core/Cladding Alignment

Press the "SET" key to continue the splicing operation when the splicer is in the pause state ("PAUSE1").

The cladding and core alignments are performed in the SM, DS or CS mode. In the MM or ED mode, only cladding alignment is performed.

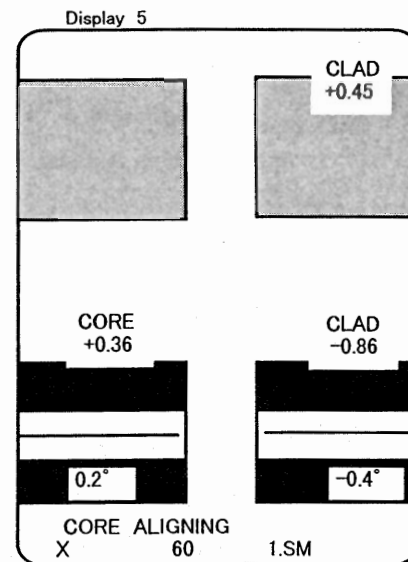
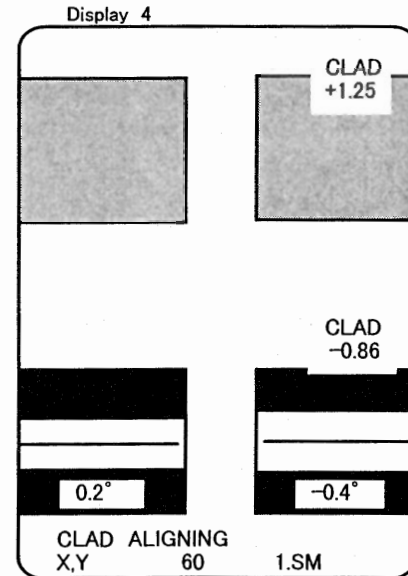
Following illustrations describe the case of the SM, DS or CS mode splicing.

- (1) At first, the splicer aligns outlines of the cladding in both X and Y views simultaneously.

**NOTE4** The Cladding axial offset value is displayed as shown in display 4 if "DATA DISPLAY" is "ON" in the "OTHER COND." menu. Regarding the "DATA DISPLAY," see Section 5.3 on Page 45.

(A positive axial offset value would indicate that the right side fiber position is above the left side fiber position, and vice versa.)

- (2) The splicer aligns the cores in the field of view which is properly focused (X view in display 5). The core axial offset value is also displayed if "DATA DISPLAY" is "ON" in the "OTHER COND." menu.



(3) Next, the core alignment is performed at the other field of view (Display 6).

**NOTE5** After the alignment process, the splicer will be in a pause state if "PAUSE2" is "ON" in the "OTHER COND." menu. During the pause state, the splicer shows an "ALIGNING OK?" message on the screen (Display 7). (Regarding the "PAUSE2" function, see Section 5.3.)

#### 4. Arc Fusion Splicing and Loss Estimation

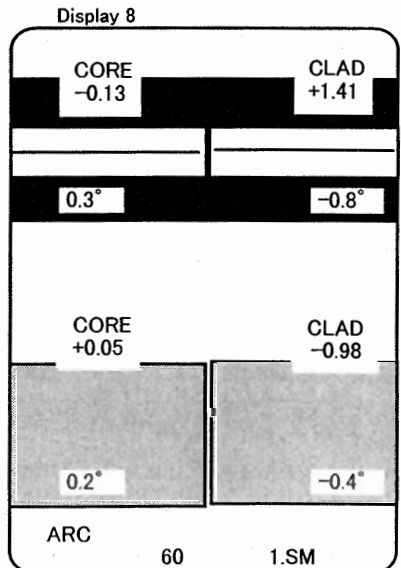
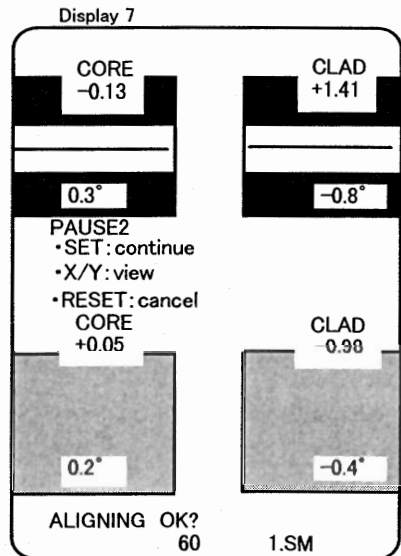
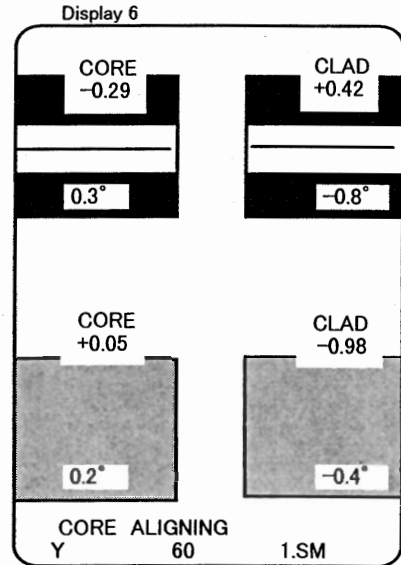
Press the "SET" key to continue the splicing process when the splicer is in the pause state ("PAUSE2").

(1) Both fibers move toward each other again. The splicer sets a narrow gap between the fiber ends. The width of the narrow gap is the same as the "GAP" value in the "ARC COND." menu (Display 8).

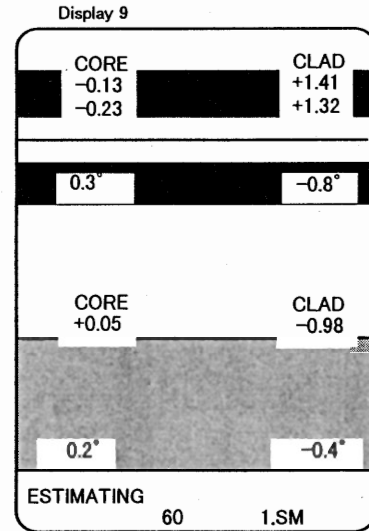
**NOTE6** It is possible to confirm the arc conditions including the "GAP" value in "ARC COND." menu. See Section 5.2 on Page 39.

(2) The splicer generates a high voltage discharge for the arc fusion, and stuffs the left side fiber into the right side fiber.

**NOTE7** The arc power is automatically compensated for ambient conditions by the pressure sensor, thermometer and hygrometer.

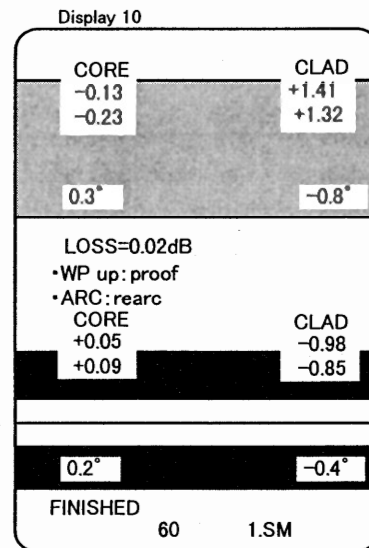


(3) After the arc fusion splicing, the splicer measures the core axial offset value, and observes the splicing point. The core axial offset value after splicing is displayed beneath the axial offset value before splicing (Display 9).

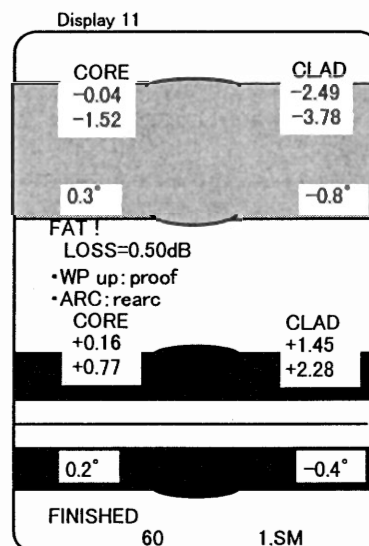


(4) The microprocessor calculates the splice loss.

(5) "FINISHED" message and the estimated loss appear on the screen (Display 10).



(6) If the splicer detects a problem at the splice point, an error message is indicated above the estimated loss (Display 11).



List of Error Messages: BUBBLE !  
 FAT !  
 THIN !

For detail, refer to Section 8.2 page 104.

(7) Observe the splice point visually. The splicer cannot always detect every splice defect. If any of the following problems as shown in figure are present, take the appropriate measure by referring to the table below.

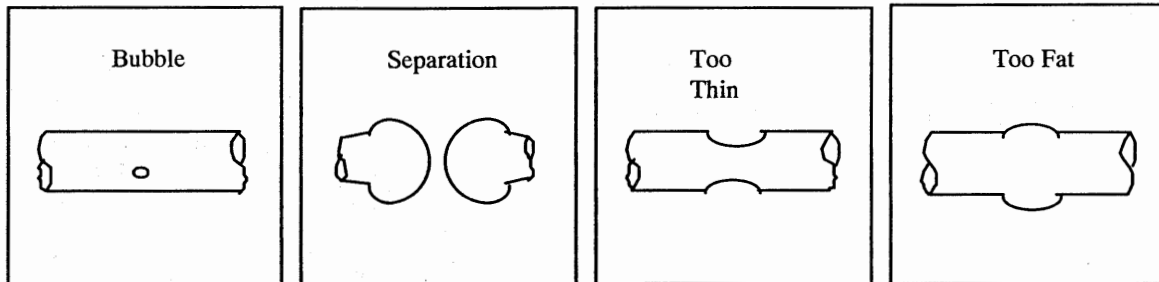


Table Treatment of Defective Spliced Results

PROBLEM	CAUSE	MEASURE
Bubble	Bad fiber end	Prepare the fiber end again, or check the fiber cleaver.
	Dirt on fiber end	Prepare the fiber end again.
	Chipping the edge of fiber end	Prepare the fiber end again, or check the fiber cleaver.
	Short prefuse time (only in MM mode)	Adjust the prefuse time. See Section 5.2.4 on page 43.
Separation	Lack of stuff amount	Carry out the "STUFF CHECK" command to check it. See the section 5.8.1 on page 69.
	Strong Arc power	Reduce the arc power. See Section 5.2 on page 37.
	Long prefuse time	Adjust the prefuse time. See Section 5.2.4 on the 43.
Too Thin	Taper function "ON"	Ensure the "TAPER" function off.
	Lack of stuff amount	Carry out the "STUFF CHECK" command to check it. See Section 5.8.1.
	Strong Arc power	Reduce the arc power. See Section 5.2 on page 39.
Too FAT	Large stuff amount	Carry out the "STUFF CHECK" command to check it. See the section 5.8.1.

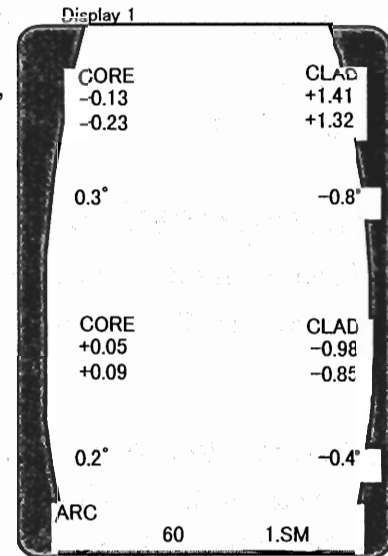
## 4.2.8 Rearc

In a case that the estimated loss is higher than acceptable, there is a possibility of improving the loss by use of the rearc.

### 1. Rearc

Press the "ARC" key to perform the rearc when the "FINISHED" message is present on the screen. The splicer generates an arc discharge again (Display 1).

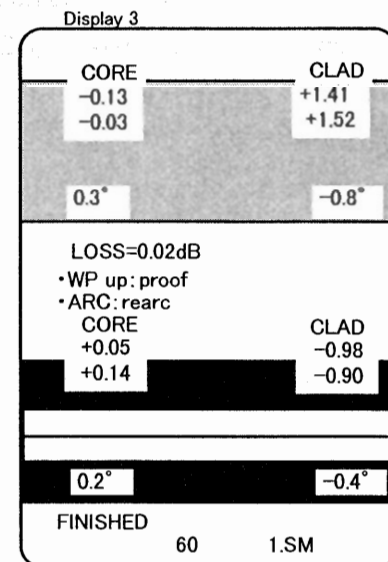
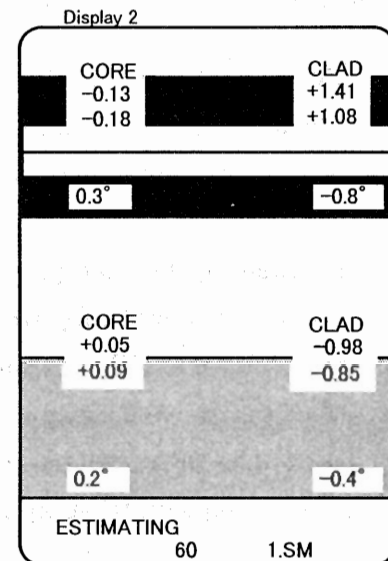
**NOTE** The rearc time can be adjusted in the "ARC COND." menu. See Section 5.2.4 .



### 2. Loss Estimation

(1) The splicer measures and displays the core axial offset value again (Display 2).

(2) The new estimated loss appears on the screen (Display 3).



## 4.2.9 Storing of Splice Data

By opening the wind protector, the splicer automatically stores the splice data accompanied by a beeping sound.

### 1. Proof Test "OFF" state

(1) Open the sheath clamps and the fiber clamps and then remove the fiber carefully from the V-groove.

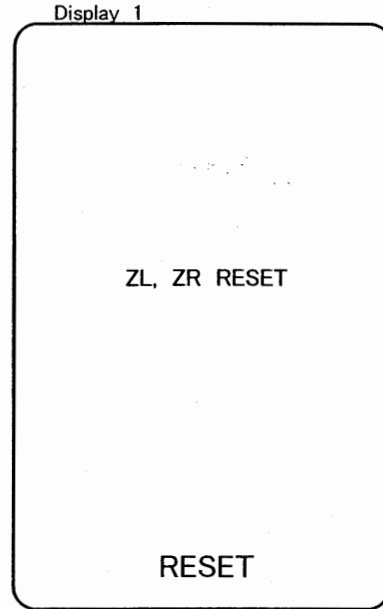
(2) Press the "RESET" key to move the Z-units backward to the home positions. Without pressing the "RESET" key, a "SET ERROR," "ZL OVER RUN" or "ZR OVER RUN" error will occur in the next splicing operation.

### 2. Proof Test "ON" state

(Please make sure that the proof test function is "OFF" when doing high strength splicing.)

(1) By opening the wind protector, the splicer starts the proof test automatically when the "PROOF" is "ON" in the "OTHER COND." menu. At that time, the ZL and ZR motors move backward to give the tensile strength test to the fiber. On the screen, the "ZL/ZR RESET" message appears (Display 1).

(2) Open the sheath clamps and the fiber clamps and then remove the fiber carefully from the V-groove.



#### 4.2.10 Fiber Reinforcement with the Tube Heater (option)

##### 1. Open the Heater Cover

##### 2. Slide the Splice Protector over the Splice Point

The center of the splice protector should be at the center of bare fiber region. Incorrect position may result in the bubble inside the splice protector.

##### 3. Turn a Tension Member down

A metal tension member inside the splice protector should be down toward the ceramic heater as shown in figure below.

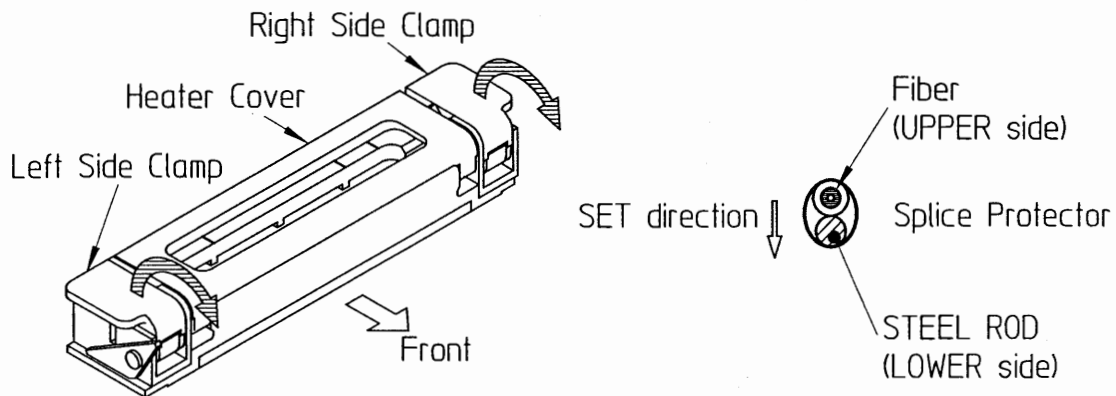
**NOTE** The weight of the metal tension member will naturally tend to align it on the bottom.

##### 4. Set the Splice Protector

Stretch and hold the fiber with your right and left hands. After placing the fiber on the left side clamp of the tube heater, the left side clamp is automatically closed. Release the left side fiber.

Close the right side clamp (heater cover) using your left hand while maintaining slight rightward tension with your right hand. This will ensure that the fiber is straight when clamped in the tube heater.

**NOTE** The center of the splice protector must be at the center of the ceramic heater.



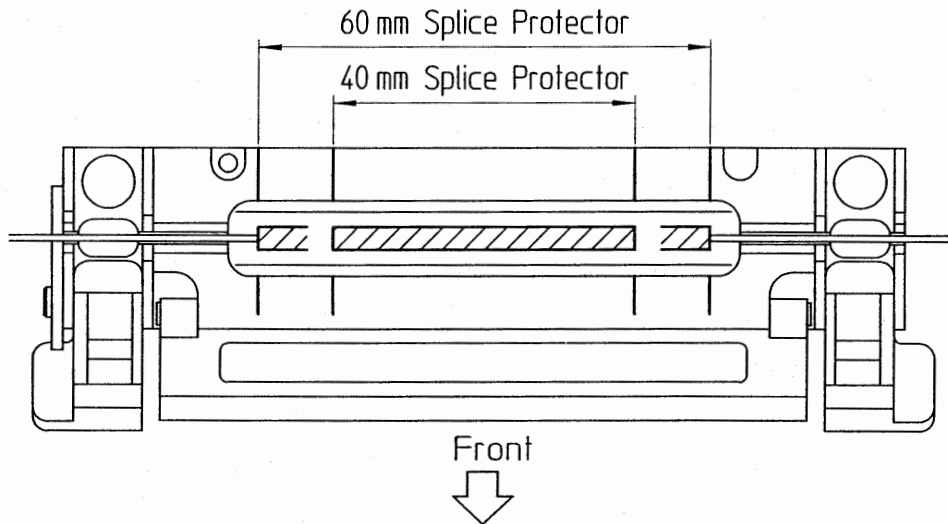
### 5. Press the "HEAT" Switch

An LED lamp is illuminated to indicate the start. After about two minutes, the splicer stops heating, and starts a cooling process by use of an internal fan. During the cooling process, the LED lamp blinks on and off. The LED lamp illumination ends with a beep when the heating process has been completely finished.

### 6. Remove the Reinforced Fiber

Finally, remove the fiber from the tube heater. At that time, do not touch the protector and ceramic heater because they are both hot.

The internal fan continues to run for twelve seconds after the end of the tube heater cycle in order to continue cooling the ceramic heater. However, it is possible to start the next heating process even if the fan is still running.



## 4.2.11 Manual Operation

### 1. Manual Alignment with Automatically Initial GAP Setting

#### 1.1 Preparation of Splicer and Fibers

1.1.1 Prepare the splicer and fibers according to “Section 4.2.1 Connecting of Power Cord” to “Section 4.2.6 Setting of Fibers”.

1.1.2 Turn on the “PAUSE1” according to “Section 5.3 Other Condition Setting”.

#### 1.2 Initial GAP Setting (Auto)

Press the “SET” key to set the initial GAP. During the setting, the splicer performs the cleaning arc and the cleave angle check. Then “PAUSE1” message appears on the monitor. (Display 1)

#### 1.3 Start Manual Operation Program

Press the “F1” key and “F2” key simultaneously. The manual operation program is started. (Display 2)

#### 1.4 Alignment of Fiber axes

##### 1.4.1 X axis Alignment

(1) Select the “X MOTOR” using “◀” key or “▶” key.

(2) Adjust the fiber position at X axis using the following keys.

“△” key : Up      “F1” key : Up slowly

“▽” key : Down    “F2” key : Down slowly

##### 1.4.2 Change of Focusing Axis

Press the “X/Y” key to change the focusing Axis from X axis to Y axis.

##### 1.4.3 Y axis Alignment

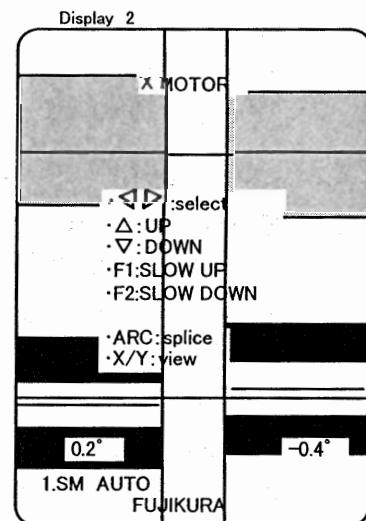
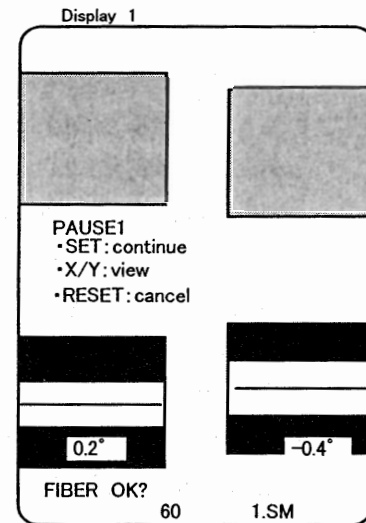
(1) Select the “Y MOTOR” using “◀” key or “▶” key.

(2) Adjust the fiber position at Y axis the same as X axis adjustment.

#### 1.5 Arc Fusion Splicing and Loss Estimation

Press the “ARC” key. The splicer performs the arc discharge as well as the fiber stuffing and loss estimation.

After that, operate the splicer according to “Section 4.2.8 Rearc” to “Section 6 Remove the Reinforced Fiber”.



## 2. Manual Initial GAP Setting and Manual Alignment

### 2.1 Preparation of Splicer and Fibers

Prepare the splicer and fibers according to “Section 4.2.1 Connecting of Power Cord” to “Section 4.2.6 Setting of Fibers”.

### 2.2 Start Manual Operation Program

Press the “F1” key and “F2” key simultaneously. The manual operation program is started. (Display 1)

### 2.3 Initial GAP Setting (Manual)

2.3.1 Setting of Right-hand Fiber position at Z axis using the following keys.

- (1) Select the “ZR MOTOR” using “◀” key or “▶” key.
- (2) Adjust the right-hand fiber position at Z axis using the following keys.

“△” key : Up

“F1” key : Up slowly

“▽” key : Down

“F2” key : Down slowly

2.3.2 Setting of Left-hand Fiber Position at Z Axis

- (1) Select the “ZL MOTOR” using “◀” key or “▶” key.
- (2) Adjust the left-hand fiber position at Z axis the same as the right-hand fiber adjustment.

“△” key : Up

“F1” key : Up slowly

“▽” key : Down

“F2” key : Down slowly

### 2.4 Alignment of Fiber axes

#### 2.4.1 X axis Alignment

- (1) Select the “X MOTOR” using “◀” key or “▶” key.
- (2) Adjust the fiber position at X axis using the following keys.

“△” key : Up

“F1” key : Up slowly

“▽” key : Down

“F2” key : Down slowly

#### 2.4.2 Change of Focusing Axis

Press the “X/Y” key to change the focusing Axis from X axis to Y axis.

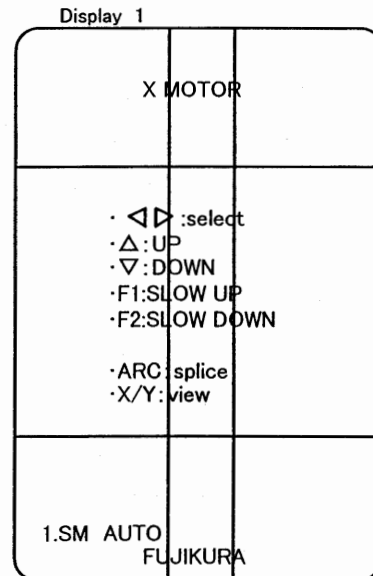
#### 2.4.3 Y axis Alignment

- (1) Select the Y motor using “◀” key or “▶” key.
- (2) Adjust the fiber position at Y axis the same as X axis adjustment.

### 2.5 Arc Fusion Splicing and Loss Estimation

Press the “ARC” key. The splicer performs the arc discharge as well as the fiber stuffing and loss estimation.

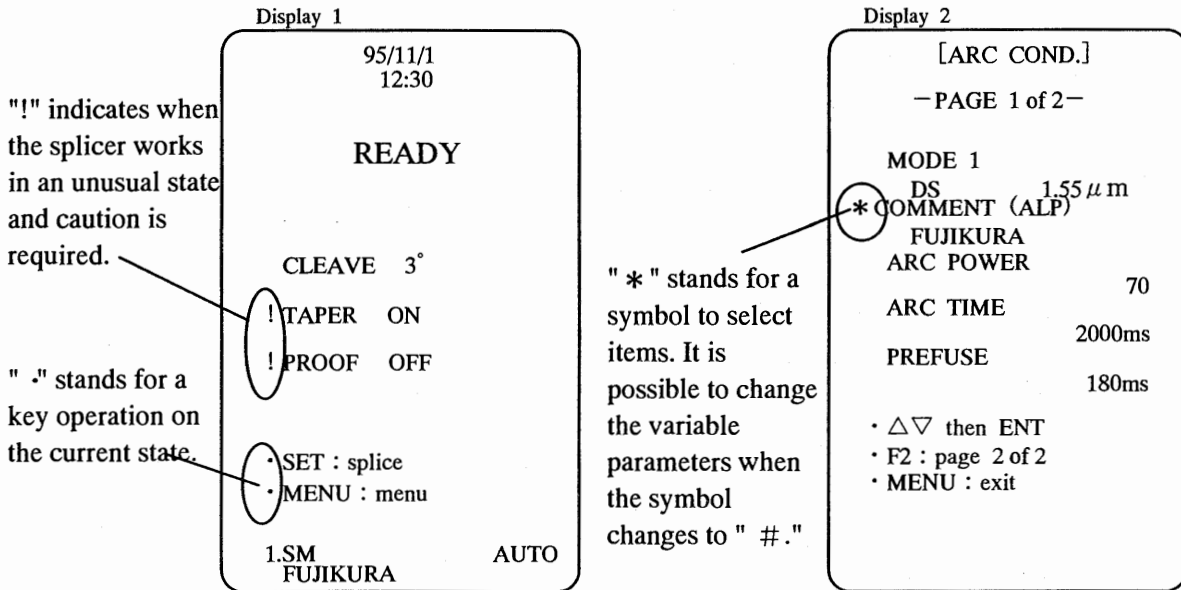
After that, operate the splicer according to “Section 4.2.8 Rearc” to “Section 6 Remove the Reinforced Fiber”.



## 5. MENU COMMAND

This splicer maintains conditions and splice data results in a non-volatile memory. Functions used for settings and maintenance are also maintained. All operations are accessed through the menu commands.

Display 1 and Display 2 explain the meanings of basic symbols mean.

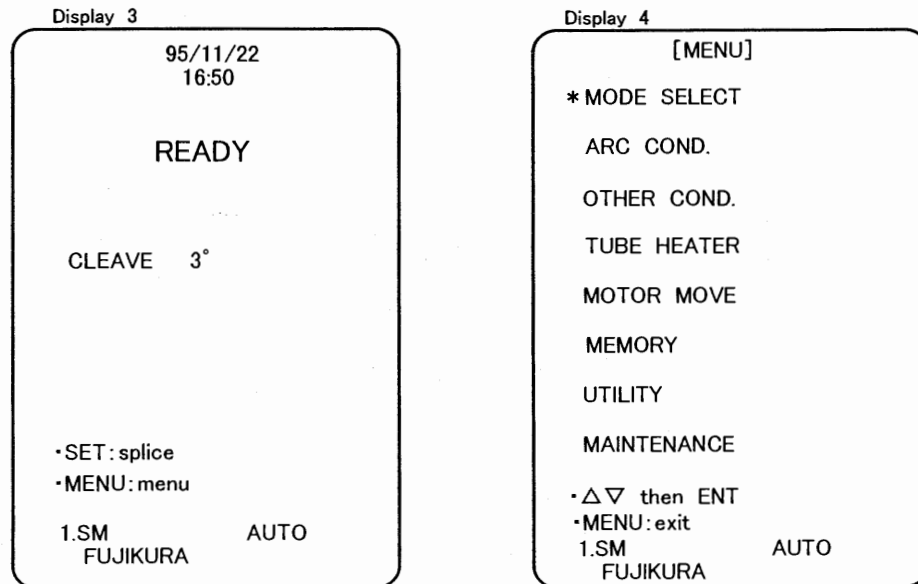


### NOTE

In this splicer manual, "!" indicates the name of menu or the parameter on the screen. The name of the control key on the panel keyboard is also expressed by this sign.

Display 4 is the main menu on the screen. Following describes how to display the main menu:

1. Ensure the "READY" message is on the screen (Display 3).
2. Press the "MENU" key. The main menu appears as shown in display 4. (The up/down mirror is in the up position to aid visibility of the menu.)



Functions of each item are shown in the following table.

Items	Contents
MODE SELECT	<p>The FSM-30SF has thirty programmable splice modes and four non-programmable splice modes for the normal single-mode fiber(SM), multi-mode fiber (MM), dispersion shifted fiber (DS), cutoff shifted fiber (CS) and Erbium doped fiber (ED).</p> <p>Before starting the splicing operation, select a suitable splice mode in this menu.</p>
ARC COND.	<p>The fiber type (SM, DS, CS, MM or ED) and its arc parameters can individually be preset on each splice mode.</p> <p>In this menu, it is possible to see and change the fiber type and arc parameters of a current splice mode. In a case that splice loss is higher than acceptable, try to adjust the arc parameters.</p>
OTHER COND.	<p>The other conditions except the fiber types and arc conditions are changeable in this menu. These conditions are common settings for all splice modes. Check the status before splicing. In particular, improperly set "TAPER" and "PROOF" settings sometimes degrade the splicing quality.</p>
TUBE HEATER	<p>Heating temperature and time are changeable in this menu.</p> <p>In a cold climate, adjustments of these parameters are required. Usually, the initial conditions work well for shrinking a standard splice protector.</p> <p>There is also an option to select the splice protector length. Select the proper length when the length of the splice protector is changed.</p>
MOTOR MOVE	<p>The FSM-30SF has six motors to perform the splicing. From this menu, a manual splicing operation is possible by moving motors individually after the gap setting.</p>
MEMORY	<p>The splicer can store one hundred splicing results in the internal memory. This menu has data displaying, data deleting and data printing functions.</p> <p>If the splicer is equipped with the optional memory card adapter, an IC memory card can be attached. The IC memory card can memorize a maximum of 24,000 splice data sets.</p>
UTILITY	<p>Mode edit, language selection, baud rate setting and splicing as in-line attenuator functions are available in this menu.</p> <p>It is also possible to see the date, time, temperature, humidity and pressure values.</p>
MAINTENANCE	<p>In a case of periodical maintenance or in a fault, enter this menu to check the situation.</p> <p>Also, use this menu to reset the arc count when the electrodes are replaced.</p>

## 5.1 Splice Mode Selection

The "MODE SELECT" menu contains 34 splice modes as shown on next page. Each mode has a mode number. 30 splice modes from No.1 to No.30 are programmable data areas, and four splice modes from No.[1] to No.[4] are read only data areas. Initial setting values were installed for all modes in advance before shipping from the factory.

In the "ARC COND." menu, it is possible to see and change the arc conditions in splice mode No.1-30.

In the "MODE SELECT" menu, it is possible to see the arc conditions in splice mode No.[1]-[4], however, impossible to change or use those conditions. If it is necessary to change or use arc conditions, copy the read only mode (No.[1]-[4]) to the programmable

Display 1

[MODE SELECT]  
 -PAGE 1 of 7-

\* 1.SM            AUTO  
 FUJIKURA  
 2.SM            AUTO  
 FUJIKURA  
 3.SM            AUTO  
 FUJIKURA  
 4.SM            AUTO  
 FUJIKURA  
 5.SM            AUTO  
 FUJIKURA

•△▽ then ENT  
 •F1:page 7 of 7  
 •F2:page 2 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 2

[MODE SELECT]  
 -PAGE 2 of 7-

\* 6.SM    1.31 μ m  
 FUJIKURA  
 7.SM    1.31 μ m  
 FUJIKURA  
 8.SM    1.31 μ m  
 FUJIKURA  
 9.SM    1.31 μ m  
 FUJIKURA  
 10.SM   1.31 μ m  
 FUJIKURA

•△▽ then ENT  
 •F1:page 1 of 7  
 •F2:page 3 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 3

[MODE SELECT]  
 -PAGE 3 of 7-

\* 11.DS    AUTO  
 FUJIKURA  
 12.DS    AUTO  
 FUJIKURA  
 13.DS    AUTO  
 FUJIKURA  
 14.DS    AUTO  
 FUJIKURA  
 15.DS    AUTO  
 FUJIKURA

•△▽ then ENT  
 •F1:page 2 of 7  
 •F2:page 4 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 4

[MODE SELECT]  
 -PAGE 4 of 7-

\* 16.DS   1.55 μ m  
 FUJIKURA  
 17.DS   1.55 μ m  
 FUJIKURA  
 18.DS   1.55 μ m  
 FUJIKURA  
 19.DS   1.55 μ m  
 FUJIKURA  
 20.DS   1.55 μ m  
 FUJIKURA

•△▽ then ENT  
 •F1:page 3 of 7  
 •F2:page 5 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 5

[MODE SELECT]  
 -PAGE 5 of 7-

\* 21.MM    EST.ON  
 FUJIKURA  
 22.MM    EST.ON  
 FUJIKURA  
 23.MM    EST.ON  
 FUJIKURA  
 24.MM    EST.ON  
 FUJIKURA  
 25.MM    EST.ON  
 FUJIKURA

•△▽ then ENT  
 •F1:page 4 of 7  
 •F2:page 6 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 6

[MODE SELECT]  
 -PAGE 6 of 7-

\* 26.MM    EST.OFF  
 FUJIKURA  
 27.MM    EST.OFF  
 FUJIKURA  
 28.MM    EST.OFF  
 FUJIKURA  
 29.MM    EST.OFF  
 FUJIKURA  
 30.MM    EST.OFF  
 FUJIKURA

•△▽ then ENT  
 •F1:page 5 of 7  
 •F2:page 7 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 7

[MODE SELECT]  
 -PAGE 7 of 7-

\*[1] SM    1.31 μ m  
 ORIGINAL  
 [2] DS    1.55 μ m  
 ORIGINAL  
 [3] MM    EST.ON  
 ORIGINAL  
 [4] CS    1.55 μ m  
 ORIGINAL

•△▽ then ENT  
 •F1:page 6 of 7  
 •F2:page 1 of 7  
 •MENU:exit

1.SM            AUTO  
 FUJIKURA

Display 8

[ARC COND.]  
 -PAGE 1 of 3-

MODE [1]  
 SM    1.31 μ m  
 COMMENT (ALP)  
 ORIGINAL  
 ARC POWER                   70  
 ARC TIME                    2000ms  
 PREFUSE                     180ms

•F1: last page  
 •F2: next page  
 •MENU:exit

Display 9

[ARC COND.]  
 -PAGE 2 of 3-

FORWARD  
 GAP                           40ms  
 ECF                           8line  
 CLEANING ARC                0.30  
 REARC TIME                   20ms  
                                  1000ms

•F1: last page  
 •F2: next page  
 •MENU:exit

## 5.2 Arc Condition Setting

This section describes methods of changing the arc conditions. In the "ARC COND." state, only the current splice mode can be changed. If an adjustment for another splice mode is necessary, change the mode by using the "MODE SELECT" menu.

In a case of splicing Erbium doped fiber, refer to Section 6.6 on page 81. For the SM, DS, CS or MM modes, read this section.

### 5.2.1 Entering the "ARC COND." menu

In the main menu, move the "\*" symbol by using "△"(UP) or "▽"(DOWN) arrow and press the "ENT" key to enter the "ARC COND." state (Display 1, 2, 3, 4, 5 and 6).

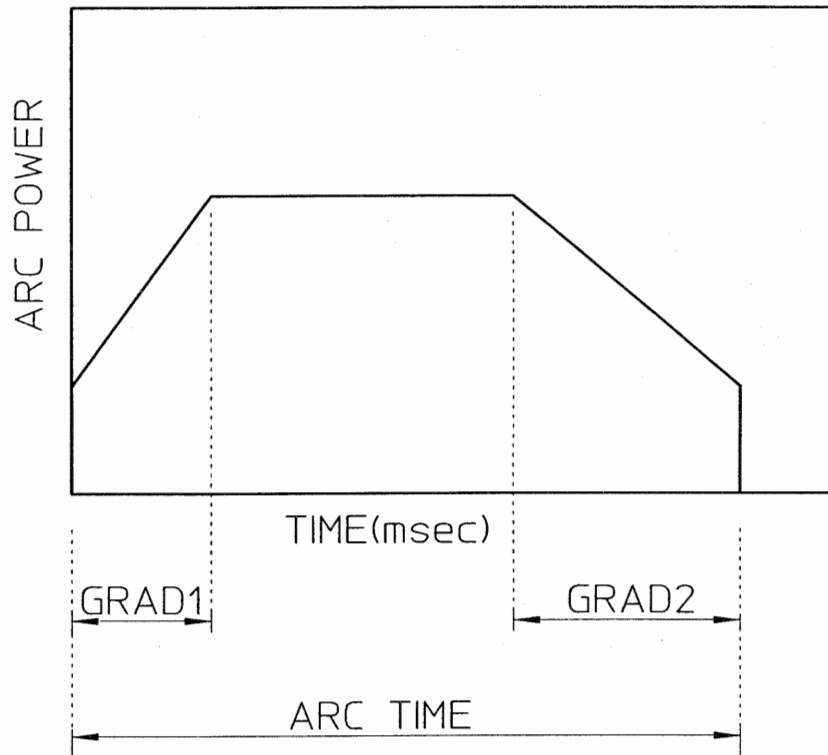
<p>Display 1 (Auto Mode)</p> <pre>[MENU] MODE SELECT *ARC COND. OTHER COND. TUBE HEATER MOTER MOVE MEMORY UTILITY MAINTENANCE •△▽ then ENT •MENU:exit 1.SM          AUTO FUJIKURA</pre>	<p>Display 2 (Auto Mode)</p> <pre>[ARC COND.] -PAGE 1 of 2- *MODE 1 SM      AUTO COMMENT(ALP) FUJIKURA ARC POWER          70 CLEANING ARC      20ms REARC TIME        1000ms •△▽ then ENT •F1: last page •F2: next page •MENU:exit</pre>	<p>Display 3 (Auto Mode)</p> <pre>[ARC COND.] -PAGE 2 of 2- *GRAD1 GRAD2          100ms CLEANING ARC POWER 600ms REARC POWER    70</pre> <p>•△▽ then ENT •F1: last page •F2: next page •MENU:exit</p>
<p>Display 4 (Normal Mode)</p> <pre>[ARC COND.] -PAGE 1 of 3- *MODE 6 SM      1.31 μm COMMENT(ALP) FUJIKURA ARC POWER          70 ARC TIME          2000ms PREFUSE           180ms •△▽ then ENT •F1: last page •F2: next page •MENU:exit</pre>	<p>Display 5 (Normal Mode)</p> <pre>[ARC COND.] -PAGE 2 of 3- *FORWARD GAP          40ms ECF          8line CLEANING ARC TIME 0.30 REARC TIME    20ms               1000ms •△▽ then ENT •F1: last page •F2: next page •MENU:exit</pre>	<p>Display 6 (Normal Mode)</p> <pre>[ARC COND.] -PAGE 3 of 3- *GRAD1 GRAD2          100ms CLEANING ARC POWER 600ms REARC POWER    70 •△▽ then ENT •F1: last page •F2: next page •MENU:exit</pre>

The meanings of each parameter are shown below.

Table Meanings of each Parameters in the "ARC COND." menu.

Parameter	Meaning
MODE	This parameter shows the fiber type (SM, DS, CS, MM or ED). Concerning the splicing method relating with each fiber type, refer to the section 5.2.2.
COMMENT	It is possible to name the mode using this item. Eleven characters can be stored with a capital letter, small letter or numeral. The comment is useful to distinguish the modes by specific fiber type or combination, for example.
ARC POWER	This parameter indicates the power of arc discharge. A "bit" mathematically related to the arc discharge current is the unit of arc power. In the SM AUTO, DS AUTO and CS AUTO modes, the splicer adjusts the power automatically. The arc power should not be changed in those cases.
ARC TIME	It indicates the time of the arc discharge.
PREFUSE	Before stuffing the fiber together, the fiber end surfaces must be slightly melted by preheating. "PREFUSE" indicates the preheating time before stuffing. Usually, there is no need to change this value.
FORWARD	It indicates the fiber forward movement time during the arc discharge. If the fiber stuff amount is not suitable, adjust this parameter.
GAP	It indicates the distance between the left and right side fiber ends just before the arc discharge. "Line" is the unit of the "GAP" value. One line is approximately 1.85um. Normally, there is no need to adjust.
ECF	"ECF" is the acronym for Eccentricity Correct Factor. Concerning the detail of the ECF factor, refer to section 6.4 on page 83. Enter a value to two decimal places in the case of adjustment. It is usually unnecessary to change this value.
CLEANING ARC	During the initial gap setting, a short arc discharge occurs to clean the fiber surface. "CLEANING ARC" indicates the time of the cleaning arc. To splice Carbon coated fiber, the cleaning arc time must be longer than the standard value.
REARC TIME	This indicates the duration of the "REARC," which may be used to administer a second arc to a completed splice.

Parameter	Meaning
GRAD1	This parameter indicates the slope of power for starting arc discharge, refer to the graph on page 40.
GRAD2	This parameter indicates the slope of power for ending arc discharge, refer to the graph on page 40.
CLEANING ARC POWER	This parameter indicates the power for cleaning arc discharge.
REARC POWER	This parameter indicates the power for rearc discharge.



graph Transition for Arc Power

## 5.2.2 Fiber Type (MODE)

### 1. Select the "MODE"

Move the "\*" symbol next to "MODE" by using " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow. By pressing the "ENT" key, the "\*" symbol is replaced by "#" (Display 1).

### 2. Change the Fiber Type

Press the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to toggle the fiber types as below (Display 2).

SM(AUTO) - SM(1.31 $\mu$ m) - DS(AUTO) - DS(1.55 $\mu$ m)  
-MM (EST.ON)- MM (EST.OFF) - CS(AUTO)  
- CS(1.55 $\mu$ m) - ED

### 3. Store the Changed Fiber Type

Press the "ENT" key to store the changed comment to the internal memory and then the "#" symbol is replaced by "\*."

Display 1

```
[ARC COND.]
-PAGE 1 of 3-

*MODE 1
DS 1.55  $\mu$  m
COMMENT(ALP)
FUJIKURA
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

• $\Delta\nabla$  then ENT
•F1: last page
•F2: next page
•MENU:exit
```

Display 2

```
[ARC COND.]
-PAGE 1 of 3-

#MODE 1
SM 1.31  $\mu$  m
COMMENT(ALP)
FUJIKURA
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

• $\Delta\nabla$ :select
•ENT:finish
```

Display 3

```
[ARC COND.]
-PAGE 1 of 3-

*MODE 1
SM 1.31  $\mu$  m
COMMENT(ALP)
FUJIKURA
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

• $\Delta\nabla$  then ENT
•F1: last page
•F2: next page
•MENU:exit
```

### 5.2.3 Mode Name (COMMENT)

#### 1. Select "COMMENT"

Move the "\*" symbol next to "COMMENT" by using "△" (UP) or "▽" (DOWN) arrow. By pressing the "ENT" key, the "\*" symbol is replaced by "#," and then the background of the first character changes to a black square (Display 1).

**NOTE** If the black square is not visible, adjust the brightness of the monitor.

#### 2. Change the Comment

(1) Move the position of the black square by using "◀" (LEFT) or "▶" (RIGHT) arrow to the desired position, where the character of the comment will be changed.

(2) By pressing "F1" key, the input mode is toggled as below.

"ALP" (Capital Letter)

"alp" (Small Letter) - "NUM" (Numeral)

Press a key on the alphabetical and numeric keyboard to input a character. In the capital or small letter modes, the one key on the keyboard is used to select one of three letters. Press the key several times to toggle to the desired letter.

It is also possible to input a character without using the alphabetical/numeric keyboard by toggling with the "△" (UP) or "▽" (DOWN) arrow until the desired character is indicated.

(3) After changing the character, move the gray square to a next desired position by using "◀" (LEFT) or "▶" (RIGHT) arrow.

#### 3. Store the Changed Comment

Press the "ENT" key to store the changed comment to the internal memory and then the "#" symbol is replaced by "\*".

Display 1

```
[ARC COND.]
-PAGE 1 of 3-

MODE 1
SM 1.31 μm
# COMMENT (ALP)
FUJIKURA
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

·F1: shift
(ALP-alp-NUM)
·KEYBOARD
or △▽
:letter
·◀▶: cursor
·ENT: finish
```

Display 2

```
[ARC COND.]
-PAGE 1 of 3-

MODE 1
SM 1.31 μm
# COMMENT (NUM)
FUJIKURANo1 ■
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

·F1: shift
(ALP-alp-NUM)
·KEYBOARD
or △▽
:letter
·◀▶: cursor
·ENT: finish
```

Display 3

```
[ARC COND.]
-PAGE 1 of 3-

MODE 1
SM 1.31 μm
* COMMENT (NUM)
FUJIKURANo1
ARC POWER 70
ARC TIME 2000ms
PREFUSE 180ms

·△▽ then ENT
·F1: last page
·F2: next page
·MENU: exit
```

### 5.2.4 Arc Parameter

The following eight parameters control the arc discharge conditions.

Arc Power, Arc Time, Prefuse Time, Fiber Forwarding Time,  
Gap Value, ECF factor, Cleaning Arc Time, Rearc Time,  
GRAD1, GRAD2, Cleaning Arc Power and Rearc Power

The procedure for changing each parameter is described as below.

#### 1. Select the Parameter

Move the "\*" symbol next to a parameter to be changed by using "△"(UP) or "▽"(DOWN) arrow (Display 1). By pressing the "ENT" key, the "\*" symbol is replaced by "#" (Display 2).

#### 2. Change the Value

Press a numeric key on the keyboard to input new value. It is also possible to input a new value by toggling with the "△"(UP) or "▽"(DOWN) arrow.

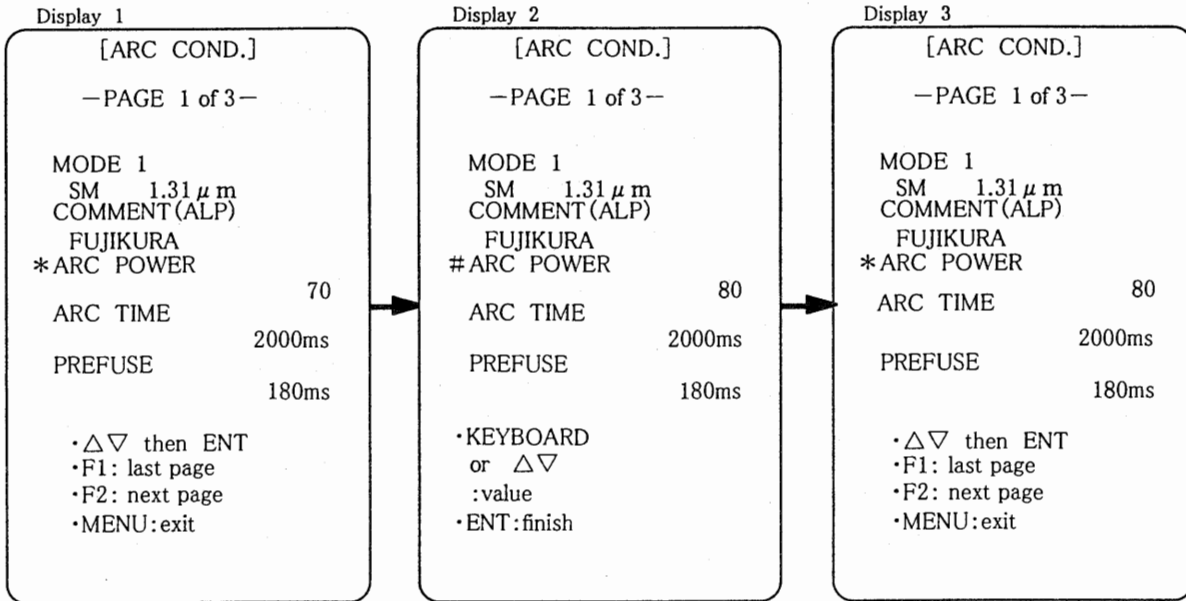
Concerning the ranges and steps of each parameter, refer to the table, which follows.

#### 3. Store the Changed Value

Press the "ENT" key to store the changed value to the internal memory and then the "#" symbol changes to "\*" (Display 3).

Parameter	Minimum Value	Maximum Value	Step	Unit
Arc Power	1	200	1	bit
Arc Time ※	0	10000	50	msec
Prefuse Time ※	0	1000	10	msec
Fiber Forwarding Time ※	0	1000	5	msec
Gap Value ※	6	32	2	line
ECF factor ※	OFF (0)	1.00	0.05	
Cleaning Arc Time	OFF (0)	1000	10	msec
Rearc Time	0	3000	100	msec
GRAD1	0	2500	10	msec
GRAD	0	2500	10	msec
Cleaning Arc Power	1	200	1	bit
Rearc Power	1	200	1	bit

※ : In the SM AUTO, DS AUTO and CS AUTO modes, those parameters are not displayed on the screen.



### 5.3 Other Condition Setting

The other conditions are common settings for the all of the splice modes.

In the main menu, move the "\*" symbol next to "OTHER COND." by using the "△"(UP) or "▽"(DOWN) arrow.

Press the "ENT" key to enter the "OTHER COND." menu (Display 1).

Display 1

[OTHER COND.]	
* CLEAVE ANGLE	3°
DATA DISPLAY	OFF
PAUSE1	OFF
PAUSE2	OFF
TAPER	OFF
PROOF	ON
<ul style="list-style-type: none"> <li>•△▽ then ENT</li> <li>•MENU: exit</li> </ul>	
CONDITION FOR ALL MODE	

Table Meanings of each Functions on "OTHER COND."

Functions	Meaning
CLEAVE ANGLE	It indicates the maximum permissible total relative cleave angle (between right and left fiber) in the cleave angle inspection. The setting range is from 0° to 5° . It is possible to turn the inspection off by entering "0" value. If the measured value is larger than the set value, an "ERROR4 BAD CLEAVE" message appears on the screen.
DATA DISPLAY	When this function is "ON," the splicer indicates the core and cladding axial offset value on both the X view and Y view.
PAUSE1	After the initial gap setting, the splicer will pause if this function is "ON." In "PAUSE1" state, the cleave angle and a "FIBER OK?" message are displayed on the screen.
PAUSE2	After the alignment, the splicer pauses if this function is "ON." In "PAUSE2" state, the cleave angle, axial offset value and an "ALIGNING OK?" message are displayed on the screen.
TAPER	When this function is "ON," the splicer slightly pulls the fiber back during the arc discharge. It may be helpful to reduce mode field diameter mismatch or misalignment. However, taper splicing may degrad tensile strength at the tapered splice point. Usually, there is no need to use this function, because low loss can be achieved by normal splicing procedures. Concerning the detail of "TAPER", see Section 5.3.3.
PROOF	By opening the wind protector, the splicer starts the proof test automatically when this function is turned on. Then, ZL and ZR motors move backward to the home position. If this function is off, the proof test is not performed. In this case, in order to reset the ZL and ZR motor's position, press the "RESET" key. Without pressing the "RESET" key, "SET ERROR," "ZL OVER RUN" or "ZR OVER RUN" errors will occur on the next splicing operation.

### 5.3.1 Cleave Angle

#### 1. Select the Function

Move the "\*" symbol next to the function to be changed by using "△"(UP) or "▽"(DOWN) arrow.(Display 1)

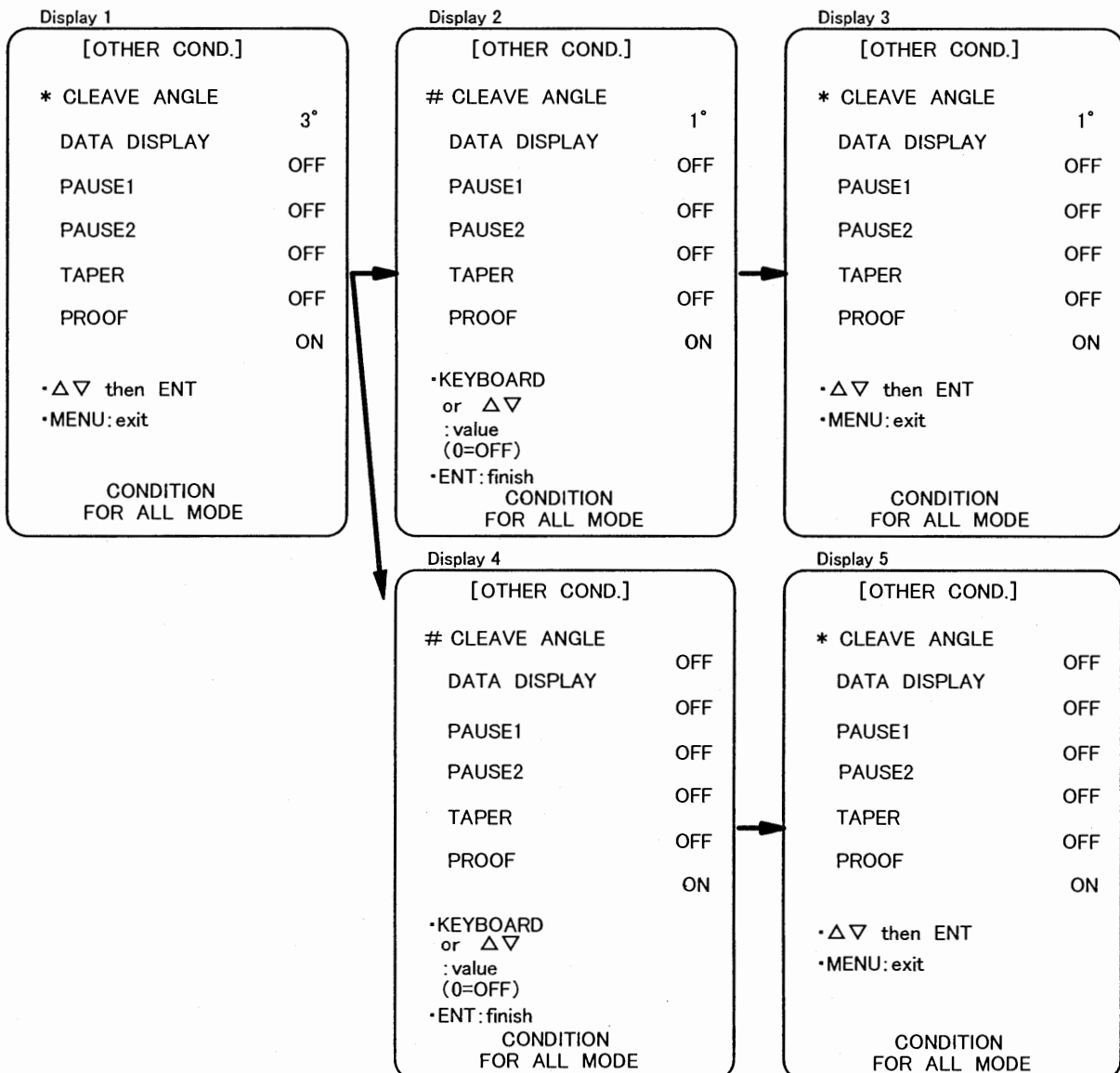
#### 2. Change the Value

(1) With the "\*" symbol next to "CLEAVE ANGLE," press the "ENT" key. The "\*" symbol is replaced by "#" (Display 2).

(2) Enter a new maximum permissible angle by pressing the numeric key on the keyboard, or by pressing the "△"(UP) or "▽"(DOWN) arrow (Display 2). In a case of entering "0," the cleave angle inspection is turned off (Display 3).

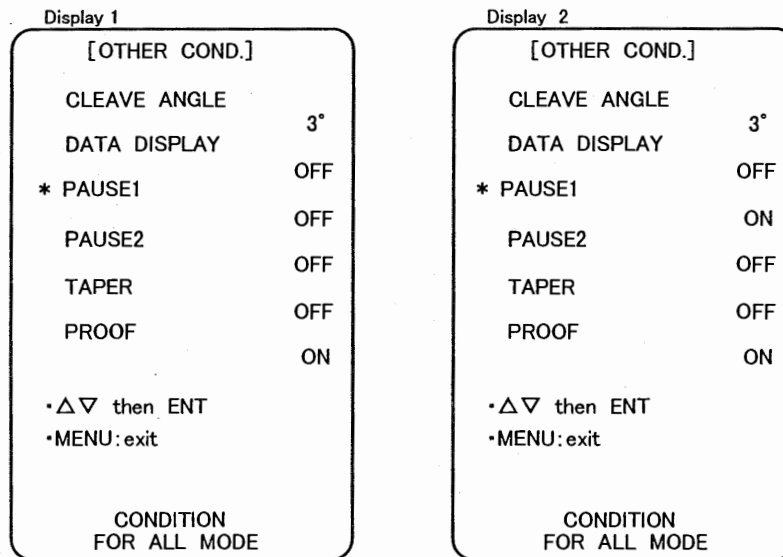
#### 3. Store the Changed Value

The splicer stores the new setting by pressing the "ENT" key, and then the "#" symbol changes back to "\*." (Display 3 & 5)



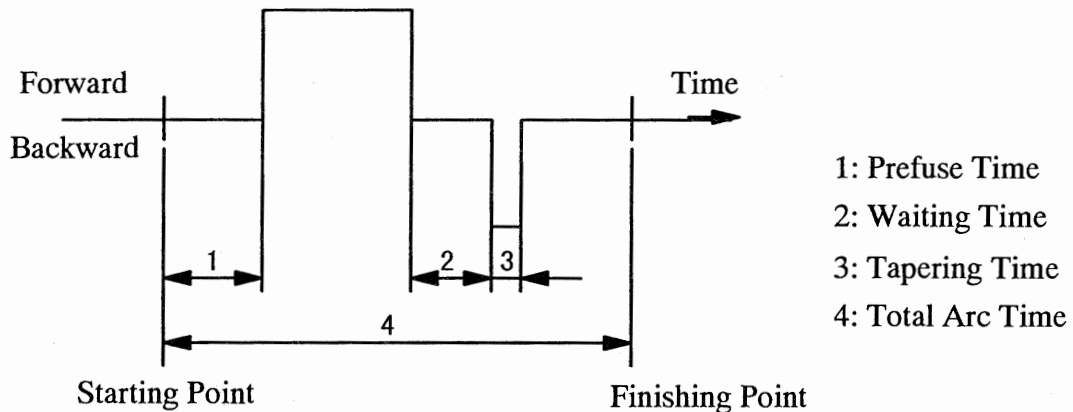
### 5.3.2 Pause1, Pause2, Data Display and Proof Test

Press the "ENT" key to toggle "ON" and "OFF" when the "\*" symbol is next to the parameter to be changed.



### 5.3.3 Taper Splicing

During taper splicing, the splicer pulls the fiber back slightly during the arc discharge. The ZL motor motion during taper splicing is shown in the following figure.



There are three parameters of the taper function. The following table shows the detail of each parameter.

Parameter	Meaning	Min.	Max.	Step	Unit
TAPER SPEED	It indicates the speed of the ZL motor during the tapering.	0	255	5	bit
TAPER WAIT	After stuffing the fiber, a waiting period until starting the tapering can be set by this parameter.	0	1000	10	msec
TAPER TIME	It indicates the period of the pulling time.	0	1000	10	msec
INITIALIZE	This command restores all taper parameters to the initial settings.				

## 1. Enter the Taper Menu

With the "\*" symbol next to "TAPER," press the "ENT" key. The taper menu appears on the screen (Display 1).

## 2. Setting of the Parameters

### (1) Select the Parameter

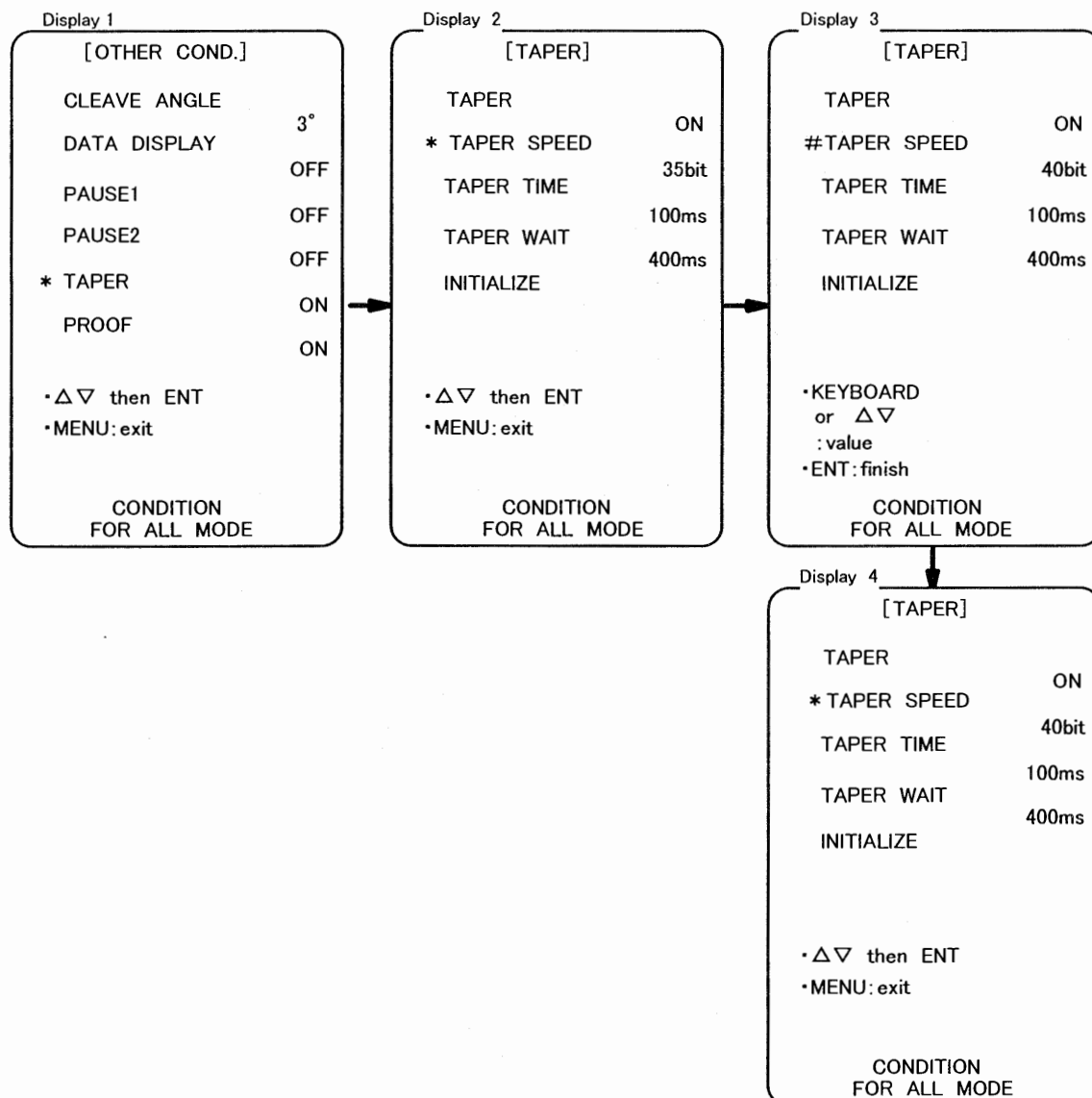
Move the "\*" symbol next to the parameter to be changed by using the "△" (UP) or "▽" (DOWN) arrow (Display 2).

### (2) Change the Value

By pressing the "ENT" key, the "\*" symbol is replaced by "#". Input a new value by using the keyboard, or by pressing the "△" (UP) or "▽" (DOWN) arrow (Display 3).

### (3) Store the Parameters

The splicer stores the setting when the "ENT" key is pressed. Then, the "#" symbol changes to the "\*" (Display 4).



### 3. Initialization of the Taper Parameters

This command restores the all taper parameters to the initial settings.

- (1) Move the "\*" symbol next to the "INITIALIZE" by using the "△"(UP) or "▽"(DOWN) arrow (Display 1).
- (2) After pressing the "ENT" key, a message appears on the screen as display 2 to confirm the initialization.

#### 3.1 To execute the initialization

Press the "ENT" key. After initializing, the taper menu is displayed again on the screen (Display 3).

#### 3.2 To cancel the initialization

Press the "MENU" key. Without the initialization, the taper menu is displayed again on the screen (Display 1).

Display 1

[TAPER]	
TAPER	
TAPER SPEED	ON
TAPER TIME	40bit
TAPER WAIT	100ms
TAPER WAIT	400ms
* INITIALIZE	
·△▽ then ENT	
·MENU: exit	
CONDITION FOR ALL MODE	

Display 2

[TAPER]	
INITIALIZE	
OK?	
·ENT: execute	
·MENU: cancel	
CONDITION FOR ALL MODE	

Display 3

[TAPER]	
TAPER	
* TAPER SPEED	OFF
TAPER TIME	35bit
TAPER WAIT	100ms
TAPER WAIT	400ms
INITIALIZE	
·△▽ then ENT	
·MENU: exit	
CONDITION FOR ALL MODE	

## 5.4 Tube Heater Condition

This splicer can be equipped with a optional built-in tube heater to heat the heat-shrinkable type splice protection sleeve.

The applicable sleeve length is 60mm or 40mm. If the cleave length is less than 11mm, the 40mm sleeve cannot be used. On the screen when the splicer displays the "READY" message, it is possible to confirm the sleeve length setting.

Following procedures describe the method for setting the tube heater conditions.

### 1. Enter the "TUBE HEATER" menu

In the main menu, place the "\*" symbol next to "TUBE HEATER" (Display 1).

Press the "ENT" key. The heater menu appears on the screen (Display 2).

### 2. Select the Parameter

Move the "\*" symbol next to the parameter to be changed by using the "△"(UP) or "▽"(DOWN) arrow.

### 3. Change the Value

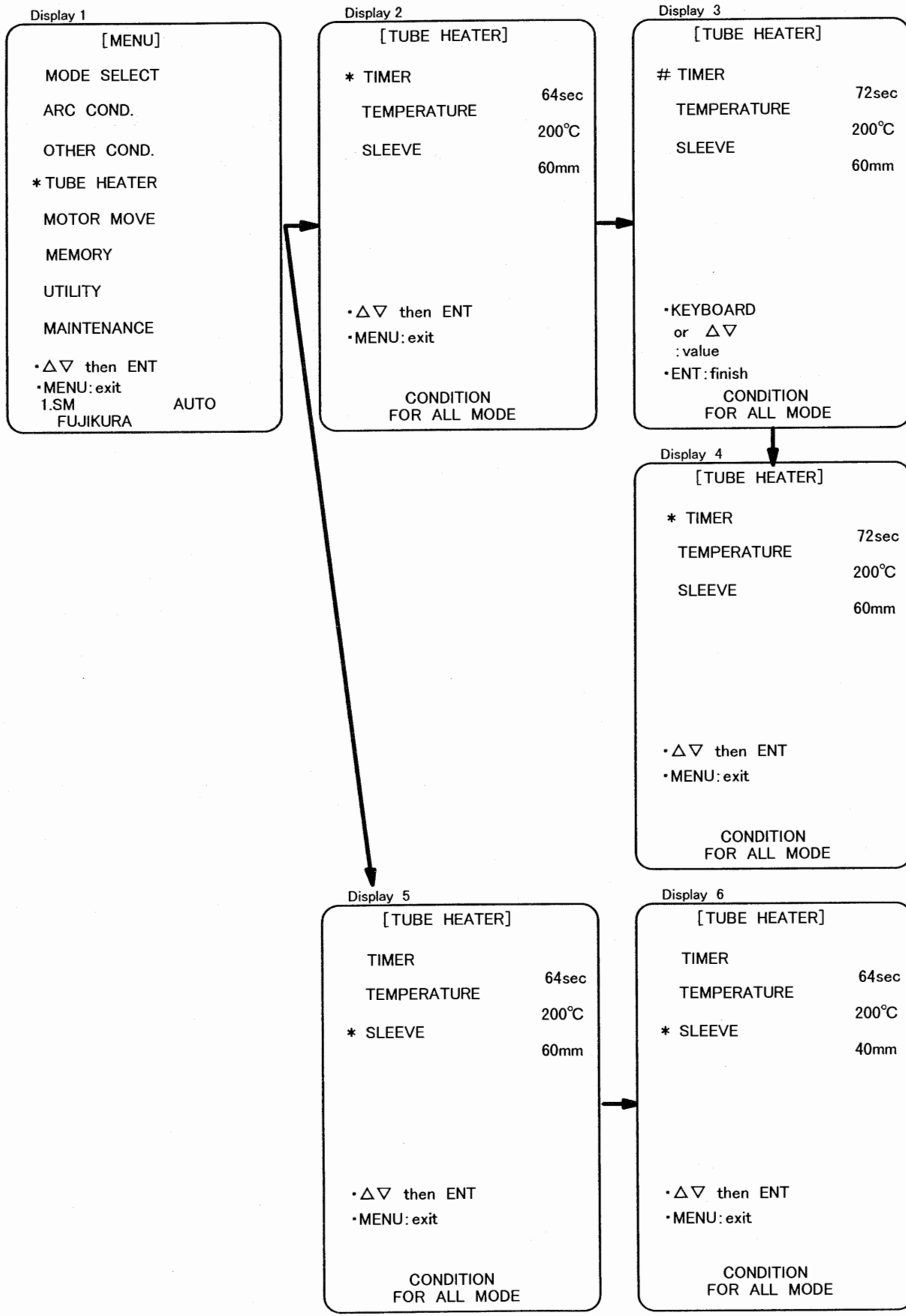
By pressing the "ENT" key, the "\*" symbol is replaced by "#" (Display 3). Input a new value by using the numeric keyboard, or by pressing the "△"(UP) or "▽"(DOWN) arrow. To toggle the "SLEEVE" length, press the "ENT" key.

A following table shows the detail of each parameters.

Parameter	Meaning	Std.	Min.	Max.	Step	Unit
TIMER	It indicates the heating time.	64	64	120	8	sec
TEMPERATURE	It indicates the heating temperature.	200	150	200	5	℃
SLEEVE	It indicates the sleeve length. By changing this parameter, the splicer switches between two heaters on the ceramic plate.	60 or 40				mm

### 4. Store the Parameters

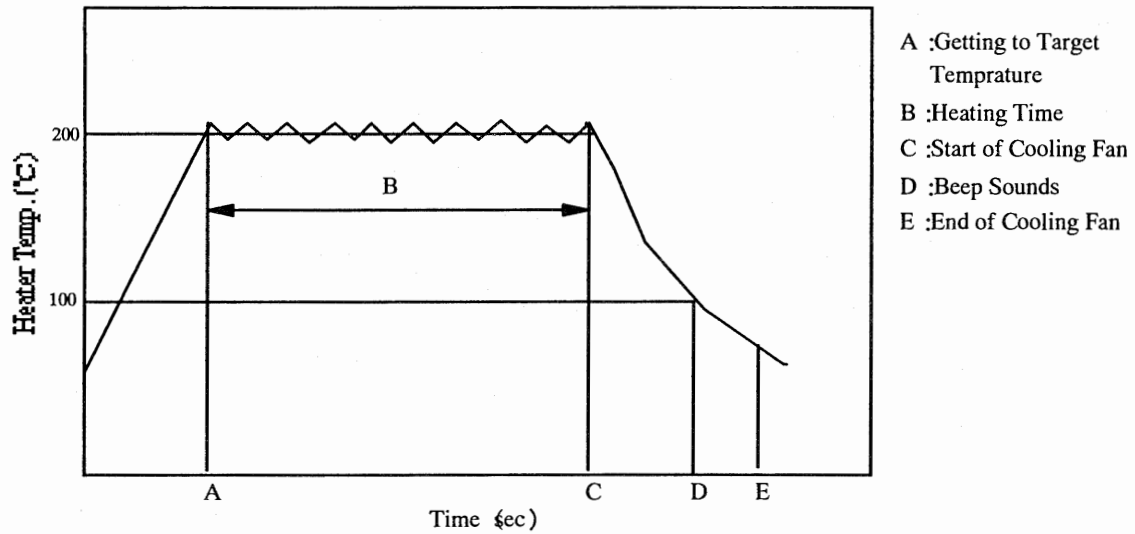
The splicer stores the setting when the "ENT" key is pressed. Then, the "#" symbol changes to the "\*" (Display 4).



### Explanation of the Tube Heater Cycle:

An LED lamp is illuminated to indicate the start. After about two minutes, the splicer stops heating, and starts cooling by use of an internal fan. During the cooling process, the LED lamp blinks on and off. The LED lamp illumination ends with a beep when the heating process has been completely finished.

The internal fan continues to run for twelve seconds after the end of the tube heater cycle. It runs to continue to cool the ceramic heater. However, it will be possible to start the next heating process even if the fan is still running.



## 5.5 Manual Motor Operation

The motor operation sub-menu provides the ability to manually operate six motors.

A following table shows each motor's motions.

Table Motor Motion

Motor	$\Delta$ (UP) key	$\nabla$ (DOWN) key
X motor	On the X view, the right side fiber moves upward.	On the X view, the right side fiber moves downward.
Y motor	On the Y view, the left side fiber moves upward.	On the Y view, the left side fiber moves downward.
ZL motor	The left side fiber moves forward.	The left side fiber moves backward.
ZR motor	The right side fiber moves forward.	The right side fiber moves backward.
FOCUS motor	The objective lens approaches the fiber.	The objective lens moves away from the fiber.
MIRROR motor	To set the mirror down	To lift the mirror up

The following describes the method to operate motors manually:

### 1. Select the "MOTOR MOVE"

On the main menu, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to place the "\*" symbol next to "MOTOR MOVE" (Display 1). Press the "ENT" key to enter the motor operation menu (Display 2).

### 2. Select the Motor

Use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol to the left side of a motor to be operated. Press the "ENT" key to enable manual operation of the selected motor.

### 3. Manual Operation

Use the " $\Delta$ "(FORWARD) or " $\nabla$ "(BACKWARD) arrow to move the motor (Display 3). During pressing of the " $\Delta$ " or " $\nabla$ " arrow, the motor continues to move. When pressure is released, the motor stops moving.

**NOTE1** In moving the focus motor, the motor is stopped with a beep at a boundary between the X and Y views.

**NOTE2** During the motor movement, if a limit switch (to preventing a motor overrun) is struck, the splicer will display an "OVER RUN" message with a beep. Then, the motor is automatically stopped and returned to the home position.

Display 1

[MENU]

MODE SELECT

ARC COND.

OTHER COND.

TUBE HEATER

\*MOTOR MOVE

MEMORY

UTILITY

MAINTENANCE

•Δ▽ then ENT

•MENU:exit

1.SM AUTO

FUJIKURA

Display 2

[MOTER MOVE]

X MOTOR

Y MOTOR

\*ZL MOTOR

ZR MOTOR

FOCUS MOTOR

MIRROR MOTOR

•Δ▽ then ENT

•MENU:exit

1.SM AUTO

FUJIKURA

Display 3

[MOTER MOVE]

ZL MOTOR

•Δ: forward

•▽: backward

•MENU: exit

1.SM AUTO

FUJIKURA

## 5.6 Memory Function

The splicer can store one hundred splice data results into the internal memory. If the splicer is equipped with the optional memory card adapter, the IC memory card may be installed. The IC memory card has maximum 24,000 splice data record capacity.

The memory menu has a data displaying, data deleting and data printing functions.

**NOTE1** Once the one hundred memory spaces are filled, the next splice results will be stored at the memory number 001. The previous splice results at No.001 will be deleted.

**NOTE2** Applicable IC Memory Card : PCMCIA Type I or II (64KB~1MB)

The following sentences describes the method to operate.

On the main menu, use the "△"(UP) or "▽"(DOWN) arrow to place the "\*" symbol to the left side of "MEMORY" (Display 1). Press the "ENT" key to enter the memory menu (Display 2).

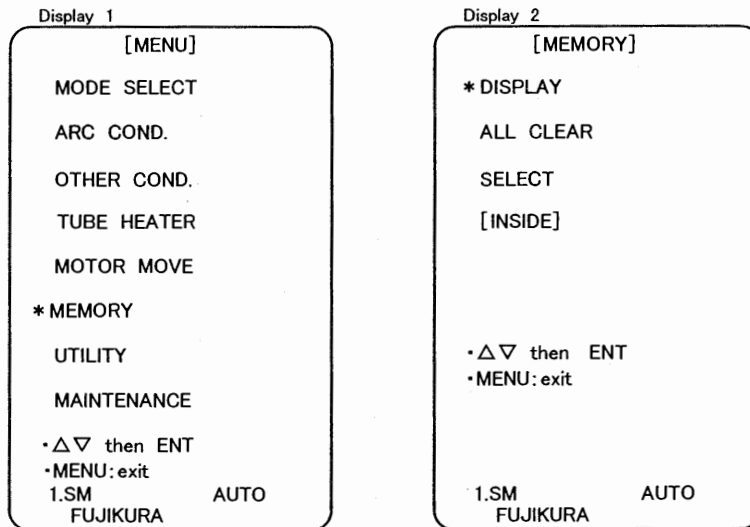


Table Meanings of each Functions

Functions	Meaning
DISPLAY	By this function, it is possible to display the splice results one by one on the screen.
ALL CLEAR	May be used to delete all splice results in the internal memory.
SELECT	In a case that the splicer has the optional memory card adapter, the internal memory or the optional IC memory card can be chosen by this command. When the IC memory card is selected, the splicer shows the memory size and battery condition on the screen.

## 5.6.1 Data Display Function

### 1. Select the "DISPLAY"

Ensure the splicer is in "MEMORY" state. Use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to "DISPLAY" (Display 1).

### 2. Display of Stored Splice Results

Press the "ENT" key. The current memory number and splice result is displayed on the screen.

#### 2.1 In the case of using the internal memory

The splice result includes the memory number, spliced date, and estimated loss (Display 2).

#### 2.2 In the case of using the optional IC memory card

The splice result includes the splice time, date and arc conditions in addition to the information in the internal memory (Display 3).

Symbols for the Arc parameters are explained in the following table.

Table Symbols for Arc Parameters

Symbol	Arc Parameter	Reference
ANGLE L or R	Left or Right Cleave Angle	See Section 4.2.6 on page 23.
P	Arc Power	See Section 5.2.1 on page 39.
T	Arc Time	
F	Forwarding Time	
PF	Prefuse Time	
G	Gap	

Display 1	Display 2	Display 3
<p style="text-align: center;">[MEMORY]</p> <p>* DISPLAY</p> <p>ALL CLEAR</p> <p>SELECT</p> <p>[INSIDE]</p> <p>•△▽ then ENT</p> <p>•MENU:exit</p> <p style="text-align: center;">1.SM                      AUTO</p> <p style="text-align: center;">FUJIKURA</p>	<p style="text-align: center;">[INSIDE]</p> <p>No.20</p> <p>MODE 1</p> <p>95/11/4</p> <p>LOSS=0.02dB</p> <p>•F1:pre. page</p> <p>•F2:next page</p> <p>•MENU:exit</p>	<p style="text-align: center;">[CARD]</p> <p>No.100</p> <p>MODE 15</p> <p>95/11/4</p> <p>11:58</p> <p>COMMENT</p> <p>LOSS=0.02dB</p> <p>ANGLE L 0.3</p> <p style="padding-left: 100px;">R 0.5</p> <p>P 125</p> <p>T 2000                      F 40</p> <p>PF 180                      G 8</p> <p>•F1:pre. page</p> <p>•F2:next page</p> <p>•ENT:comment</p> <p>•MENU:exit</p>

### 3. Display of Past Splice Result

Use "△"(UP) or "▽"(DOWN) arrow to turn the data page to be displayed.

**NOTE1** The splicer will store the next splice result in the data area directly following the current data area that is displayed currently. Therefore, when quitting from this "DISPLAY" function, display the original data area that has the latest splice result. Otherwise, the splicer overwrites and deletes the past splice result.

### 4. Comment Setting

**NOTE2** This function is available only in the case that the splicer is equipped with the optional memory card adapter and the optional IC memory card.

Press the "ENT" key to enable comment input and then the "■" cursor appears at the first character location.

(Display 1)

Move the "■" cursor location by using "◀"(LEFT) or "▶"(RIGHT) arrow to the desired position. By pressing "F2" key, an input mode is toggled between capital letters, small letters or numerals.

Press a key on the alphabetical and numeric keyboard to input a character. After entering the characters, move the "■" cursor to the next desired position by using "◀"(LEFT) or "▶"(RIGHT) arrow.

Finally, press the "ENT" key to store the comment into memory. A maximum of eleven alphabetical or numeric characters can be stored as one comment.

**NOTE3** If your personal computer (PC/AT compatible) has a memory card slot (PCMCIA), download from the IC memory card to the personal computer is possible by use of an optional data collection software program. In this case, a printer connected to the personal computer is useful for printing the data.

**NOTE4** If the cursor "■" is not visible, adjust the brightness of the monitor.

```
Display 1
[CARD]
No.10
MODE 15
95/11/4
11:58 ALP
COMMENT
LOSS=0.02dB
ANGLE L 0.3
R 0.5
P 125
T 2000 F 40
PF 180 G 8
•F1: shift
(ALP-alp-NUM)
•KEYBOARD
or △▽
: letter
•◀▶: cursor
•ENT: finish
```

## 5.6.2 Data All Clear Function

### 1. Select "ALL CLEAR"

In the "MEMORY" menu, use the "△"(UP) or "▽"(DOWN) arrow to place the "\*" symbol next to the "ALL CLEAR" function. (Display 1) Press the "ENT" key to enable the all clear function.

### 2. Delete the All Data

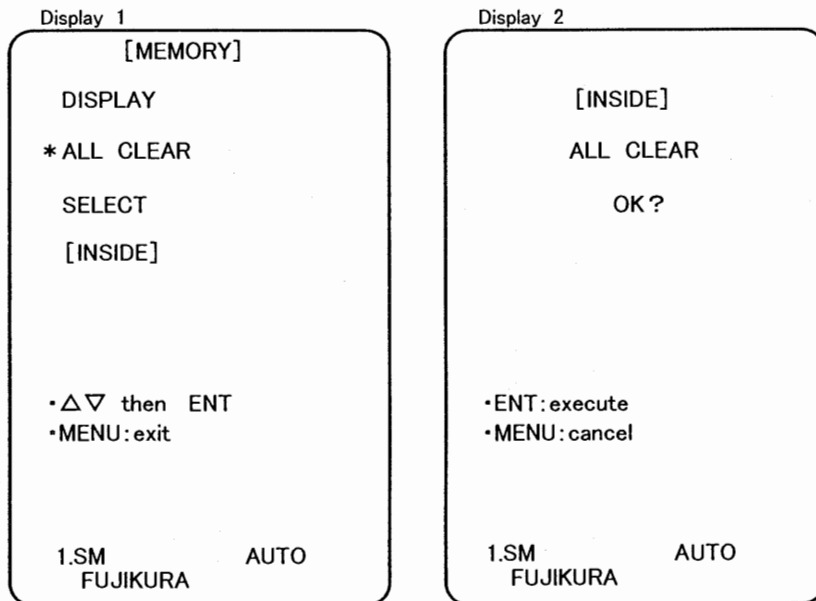
A confirmation message appears on the screen as shown in display 2.

#### 2.1 In a case of execution

Press the "ENT" key to delete all of the splice results.

#### 2.2 In a case of cancellation

Press the "MENU" or the "RESET" key to cancel the operation.



### 5.6.3 Memory Selection

This function is useful to select between the internal memory or an IC memory card.

**NOTE** This function is available only case in the that the splicer is equipped with the optional memory card adapter and an optional IC memory card.

#### 1. Select memory "SELECT"

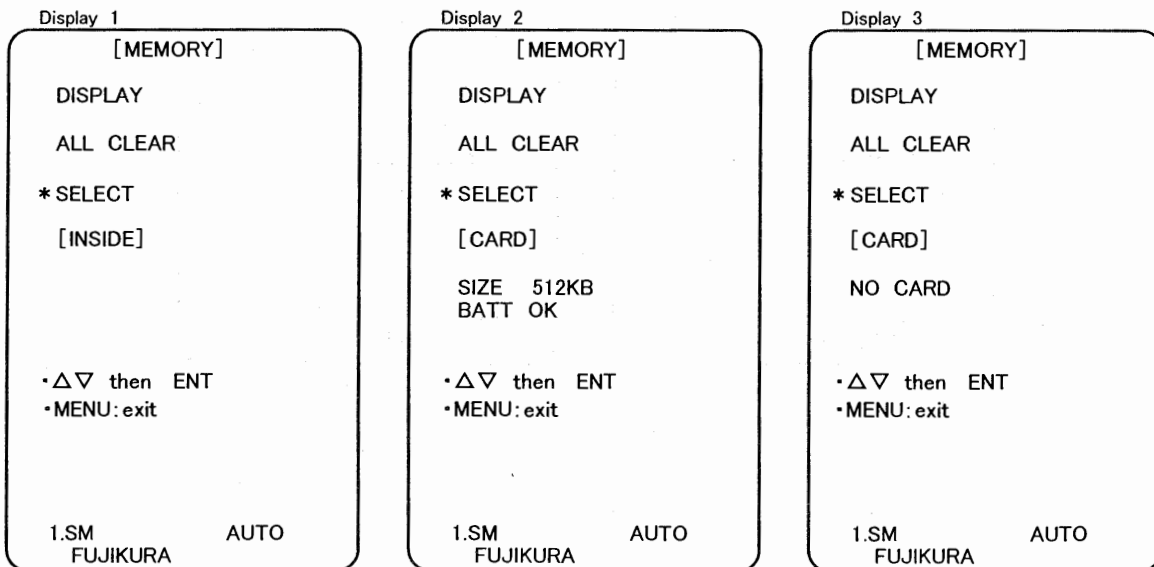
In the "MEMORY" menu, use the "△"(UP) or "▽"(DOWN) arrow to place the "\*" symbol next to the "SELECT" function. (Display 1) Press the "ENT" key to enable the select function.

#### 2. Select the Memory

Press the "ENT" key to toggle between the internal memory or the IC memory card. When the IC memory card is chosen, the splicer indicates a memory "SIZE" and "BATT"(battery) condition of the IC memory card (Display 2).

#### 3. No Memory Card

If there is no IC memory card, a "NO CARD" message appears on the screen. In such a case, change from the memory card to the internal memory, or insert the IC memory card if the splicer is equipped with the memory card adapter.

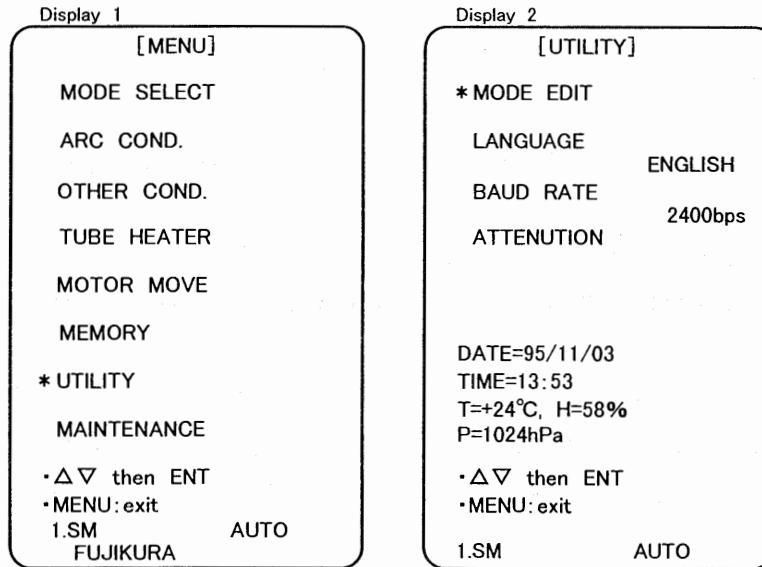


## 5.7 Utilities

Various functions are available on this menu. It is also possible to see the date, time and environmental values.

Select "UTILITY" as below.

In the main menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "UTILITY" (Display 1). Then, press the "ENT" key to display the utility menu as shown in display 2.



A following table shows the functions of each commands

Table Commands and Functions in Utility Menu

Command	Functions
MODE EDIT	A mode editing function for splice modes is available by using this command. One editing method is a move (cut & insert), the other is a copy (copy & paste).
LANGUAGE	The language displayed on the screen is selectable by this command.
BAUD RATE	The data speed for the RS-232C port is selectable.
ATTENUATION	Use this command if the splicing point needs a selected high loss.
ENVIRONMENT	It is possible to see the date, time, temperature, humidity and pressure values on the screen. As these sensors are equipped inside the splicer, the values displayed may sometimes be different from current environmental conditions outside of the splicer.

### 5.7.1 Mode Edit Function

This function can be used to perform a move (Cut & Insert) or a copy (Copy & Paste) of the splice modes.

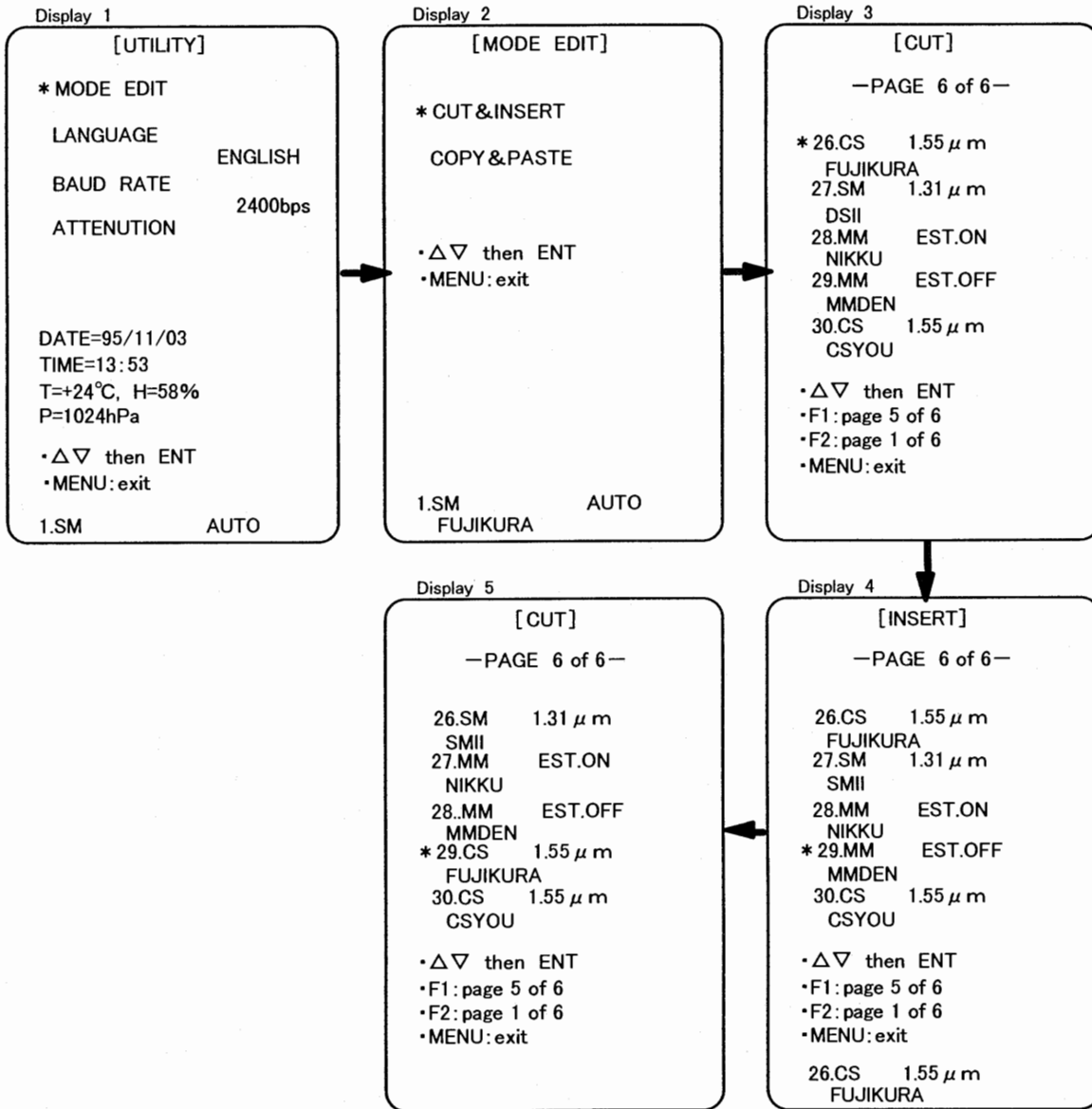
#### 1. Select the "MODE EDIT"

In the utility menu, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol next to the "MODE EDIT" and then press the "ENT" key to display the mode edit menu (Display 1).

#### 2. Cut & Insert

It is possible to rearrange the 30 programmable splice modes (Mode No.1 to 30).

- (1) In the mode edit menu, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol to the left side of "CUT&INSERT." Then, press the "ENT" key (Display 2).
- (2) The 30 splice modes are displayed in six pages. Use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol next to a splice mode to be cut. Press the "ENT" key to cut the desired mode. Then the clipped mode is displayed at the bottom of the screen (Display 3).
- (3) To insert the clipped mode, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol to a left side of splice mode location where the clipped mode will be inserted (Display 4). Press the "ENT" key to insert. The splicer inserts and displays the clipped mode on the screen (Display 5) at the selected splice mode location. Other splice modes are automatically moved to new splice mode locations (and are renumbered) to fill in the old splice mode location.



### 3. Copy & Paste

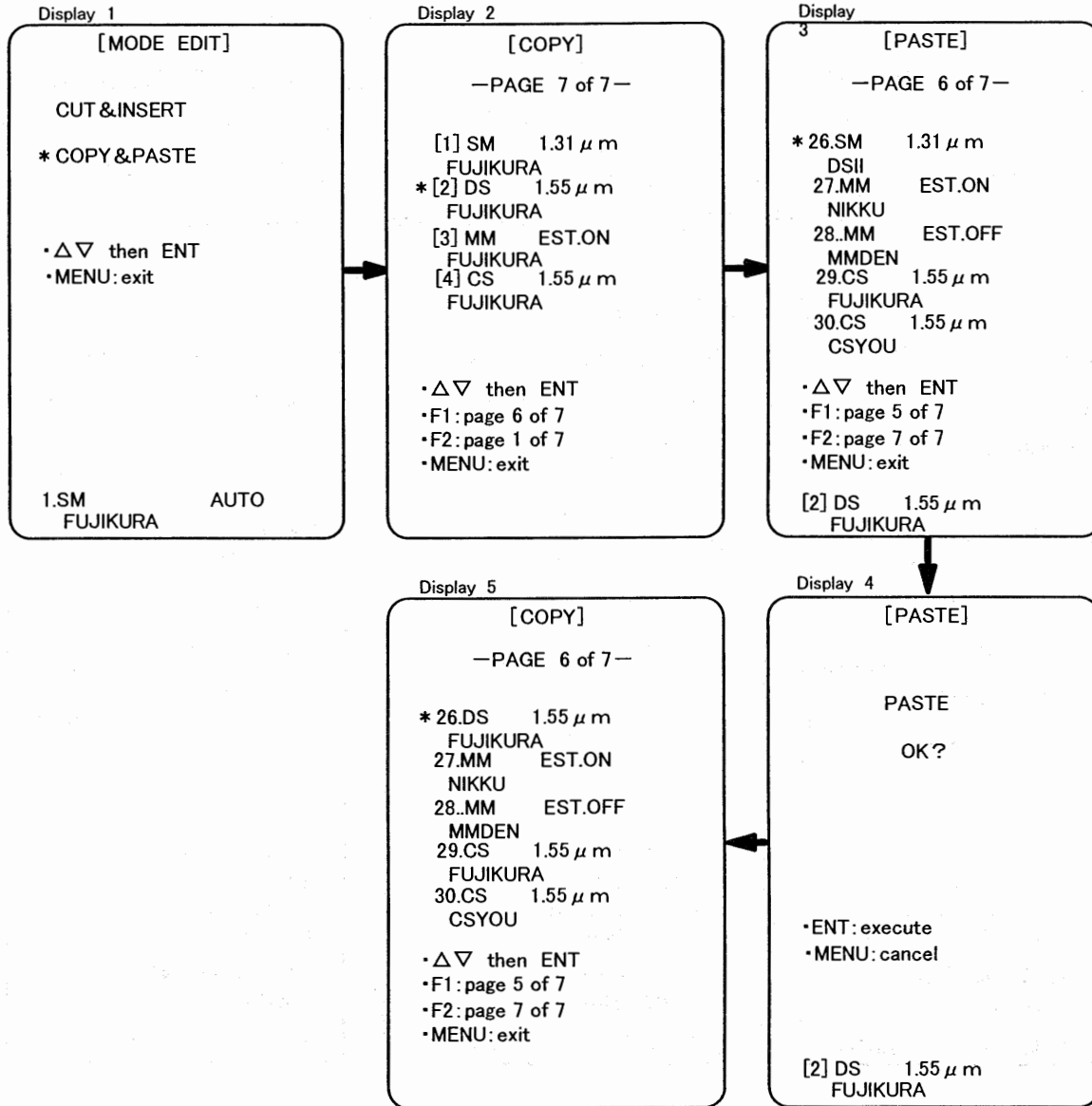
This command performs pasting (overwriting not inserting), therefore, a former splice mode will be deleted and will be overwritten with the copied and pasted mode. Be careful carrying out this command, in order to ensure that you do not overwrite a useful splicing mode.

**NOTE** It is possible to copy the four read only data areas (No.[1]-[4]), however, it is impossible to paste data onto those four data areas.

- (1) In the mode edit menu, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol to the left side of "COPY&PASTE." Then, press the "ENT" key (Display 1).
- (2) The 34 splice modes are displayed in seven pages. Use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol next to the splice mode to be copied (Display 2). Press the "ENT" key to copy, and then the copied mode is displayed at the bottom of the screen (Display 3).
- (3) To paste the copied mode, use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol to a left side of splice mode location where the copied mode will be pasted (Display 3). Press the "ENT" key to insert, then, the splicer indicates a confirmation message as shown in display 4.

**NOTE** Remember that the existing splicing mode in this memory location will be eliminated and replaced by the paste mode.

- (4) If you want to paste in the copied mode (and eliminate the existing splicing mode), press the "ENT" key. If you decide to cancel, press the "MENU" key.
- (5) The splicer pastes and displays the copied mode on the screen (Display 5).



## 5.7.2 Language and Baud Rate Setting

### 1. Language Selection

Use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to "LANGUAGE" in the utility menu (Display 1). Press the "ENT" key to change the "\*" symbol into the "#" symbol. Select a desired language by using the "△"(UP) or "▽"(DOWN) key (Display 2). Then, press the "ENT" key to change the language mode (Display 3).

### 2. Baud Rate Setting for the RS-232C Terminal

Use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to "BAUD RATE" in the utility menu. Press the "ENT" key to toggle the data transmission speed between 9600bps or 2400bps.

Display 1

```
[UTILITY]
MODE EDIT
* LANGUAGE          ENGLISH
BAUD RATE          2400bps
ATTENUATION

DATE=95/11/03
TIME=13:53
T=+24°C, H=58%
P=1024hPa
-△▽ then ENT
-MENU:exit
1.SM              AUTO
```

Display 2

```
[UTILITY]
MODE EDIT
#LANGUAGE          ENGLISH
BAUD RATE          2400bps
ATTENUATION

DATE=95/11/03
TIME=13:53
T=+24°C, H=58%
P=1024hPa
-△▽:select
-ENT:finish
1.SM              AUTO
```

Display 3

```
[UTILITY]
MODE EDIT
* LANGUAGE          日本語
BAUD RATE          2400bps
ATTENUATION

DATE=95/11/03
TIME=13:53
T=+24°C, H=58%
P=1024hPa
-△▽ then ENT
-MENU:exit
1.SM              AUTO
```

### 5.7.3 Splicing to produce an in-line Attenuator

In the normal splicing state, the splicer tries to achieve a low splice loss. However, high loss splicing as an in-line attenuator is sometimes necessary for a special application.

By setting an "ATTENUATION" parameter, the splicer makes an axial offset intentionally to obtain a high splice loss.

**NOTE** The arc condition in the read only splice mode is used for this splicing, so, it cannot be changed.

#### 1. Enter the "ATTENUATION" state

Use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "ATTENUATION" in the utility menu (Display 1). Press the "ENT" key to enter the "ATTENUATION" state (Display 2).

Display 1

```
[UTILITY]

MODE EDIT

LANGUAGE          ENGLISH
BAUD RATE         2400bps
* ATTENUATION

DATE=95/11/03
TIME=13:53
T=+24°C, H=58%
P=1024hPa

•△▽ then ENT
•MENU:exit

1.SM              AUTO
```

Display 2

```
[ATTENUATION]

* START SPLICE

      SET BUTTON
      from
      this menu

ATTENUATION      5dB
MODE              SM
FACTOR           1.0
CLEANING ARC     100ms

•△▽ then ENT
•MENU:exit
```

Table Parameters and Meanings in "ATTENUATION" Menu

Parameter	Meaning
START SPLICE	This command is for initiating the splice operation with high attenuation. By selecting this item, or by pressing the "SET" key in the "ATTENUATION" menu, the splicer starts the automatic splicing procedures for producing the large axial offset value, and high attenuation.
ATTENUATION	This indicates the target splice loss. This may range from 1dB to 15dB and is selectable. The target axial offset will be calculated from this value, a factor and the splice mode.
MODE	Select the SM or DS mode, depending upon which type of fiber will be used. Because the mode-field diameter of SM fiber is different from DS fiber, the needed offset is calculated differently for each fiber type.
FACTOR	If the mode-field diameter or the fiber's characteristic is different from standard fiber, the attenuation loss will be shifted from the target loss value. In such a case, adjust this value to optimize. In the case of increasing this value, the attenuation loss will increase. The setting range is from 0.00 to 2.00 (standard value: 1.00).
CLEANING ARC	This is a time parameter for the short arc discharge to clean the fiber surface. The setting range is from OFF(0) to 1000ms. For Carbon-coated fiber, increase this value.

## 2. Setting of Parameters (ATTENUATION, FACTOR and CLEANING ARC)

### (1) Select the Parameter

Use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to the parameter to be selected (Display 1).

### (2) Set the Parameter

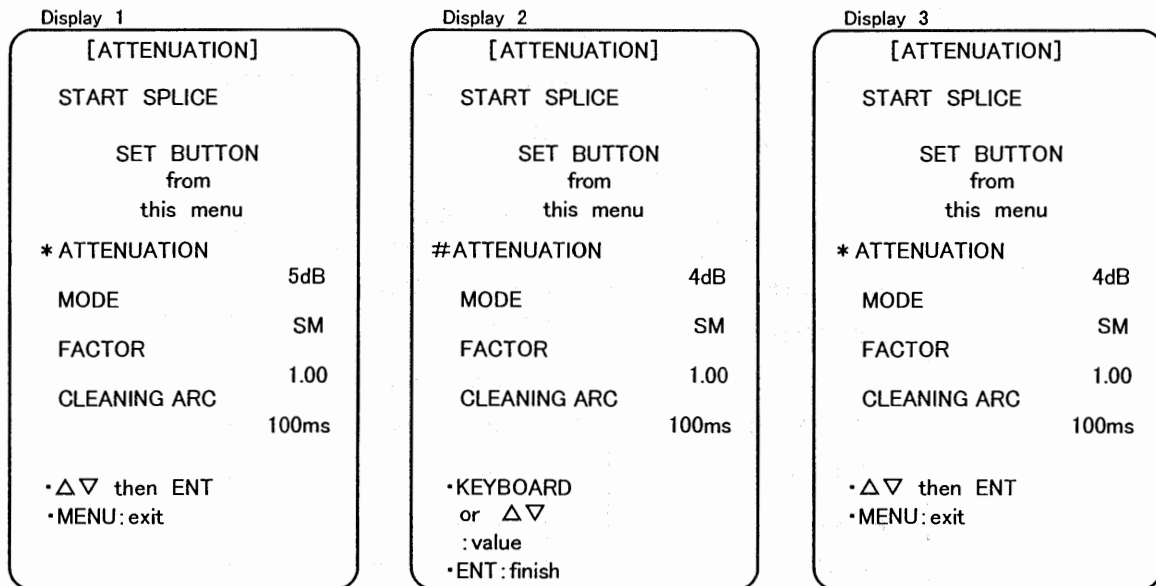
By pressing the "ENT" key, the "\*" symbol changes to "#." Enter a new value from the numeric keyboard, or by pressing the "△"(UP) or "▽"(DOWN) key to toggle to the desired value (Display 2).

The ranges of each parameter are shown in a following table:

Parameter	Minimum	Maximum	Step	Unit
ATTENUATION	1	15	1	dB
FACTOR	0.00	2.00	0.01	Arbitrary
CLEANING ARC	OFF (0)	1000	100	msec.
MODE	SM or DS			

### (3) Store the Parameters

Press the "ENT" key to store the parameters into internal memory. Then, the "#" symbol will be replaced by "\*."



### 3. Setting of Parameters (MODE)

Use the "Δ"(UP) or "∇"(DOWN) arrow to move the "\*" symbol to the left side of "MODE." By pressing the "ENT" key, the mode is toggled to "SM" or "DS" mode.

### 4. Start Splicing as in-line Attenuator

(1) After setting the fibers into the splicer properly, move the "\*" symbol next to "START SPLICE" by using the "Δ"(UP) or "∇"(DOWN) arrow.

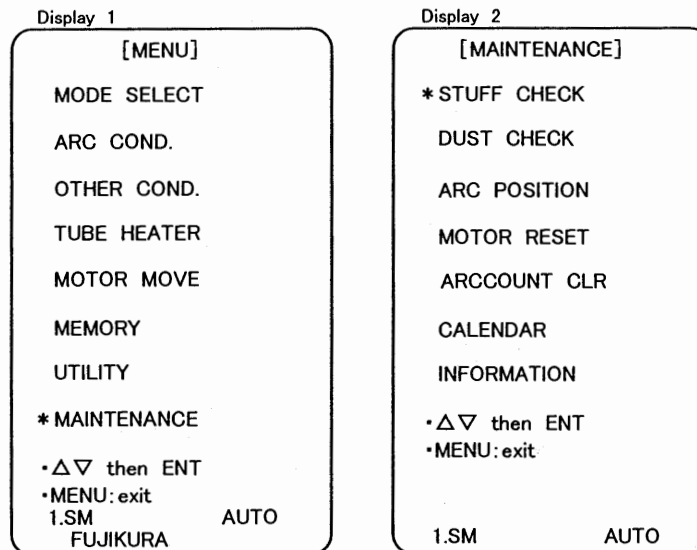
(2) Press the "ENT" or "SET" key to start.

## 5.8 Maintenance Mode

This menu is useful for period maintenance. This menu also has functions to reset the arc count, to adjust the calendar, etc.

The following describes how to operate these commands.

Select "MAINTENANCE" in the main menu by using the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol (Display 1) to the left side of the "MAINTENANCE." Press the "ENT" key to display the maintenance menu (Display 2).



### 5.8.1 Stuff Check Function

This function can measure the stuffing amount of left side fiber. The left fiber automatically stuffs into the right fiber during splicing. The stuff amount is important to splicing quality.

#### 1. Selection of "STUFF CHECK"

On the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to the "STUFF CHECK" (Display 1). After pressing the "ENT" key, a confirmation message appears on the screen.

#### 2. Execution of the "STUFF CHECK"

Before starting the "STUFF CHECK," set both left and right side fibers on the v-grooves. The fiber ends must be cleaved precisely.

Press the "ENT" key to start the automatic stuff check process.

### 3. Stuff Check Process

The splicer automatically proceeds with the following steps.

#### (1) Cleaning Arc

A short discharge arc occurs during the fiber forward movement.

#### (2) Gap Setting

The splicer stops forward movement when the distance between the fiber ends is set proper (Display 2).

#### (3) Stuffing

After moving the right side fiber backward, the splicer stuffs the left side fiber without the arc discharge.

#### (4) Stuff Amount Measurement

The splicer measures and displays the stuff amount of the left side fiber by image processing (Display 3). In order to eliminate the effect of any variability of the stuff amount, perform the STUFF CHECK at least 5 times, and average the results. An acceptable mean stuff amount is from 25.5um to 31.5um.

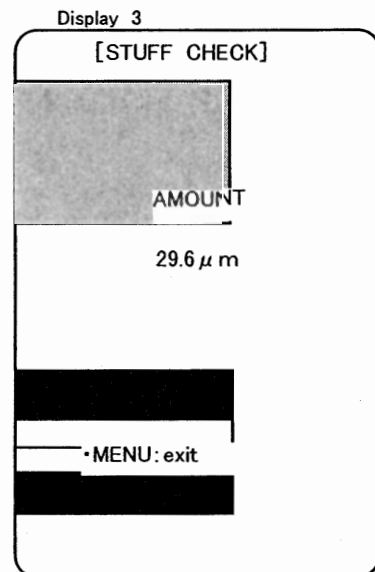
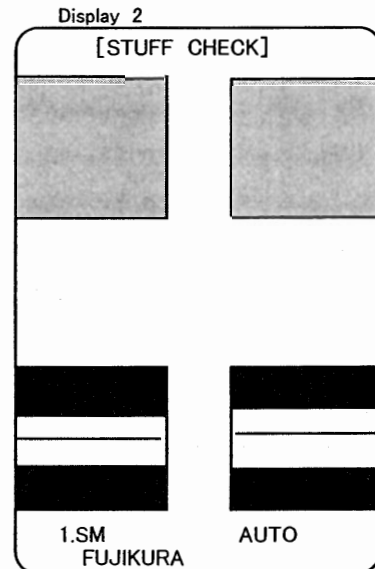
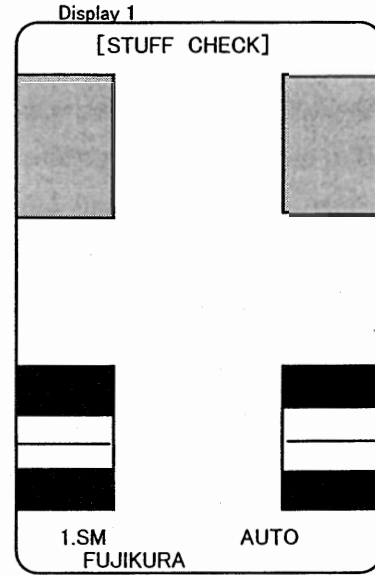
**NOTE** If the stuff amount varies widely, please consult the sales agency or the factory.

### 4. Adjustment of Stuff Amount

It is necessary to adjust the fiber "FORWARD" movement motion time. Concerning adjustment of the "FORWARD" parameter, refer to Section 5.2.4 on page 43.

### 5. Quit from the Stuff Check Function

Press the "RESET" key.



## 5.8.2 Dust Check Function

The dust or dirt in the optical path degrades the splicing quality because the splicer may misinterpret the core position. This function can check the cleanliness of the CCD camera and optical system automatically. The splicer then displays a number representing the amount of dirt or dust present in the optical path.

### 1. Selection of "DUST CHECK"

On the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to "DUST CHECK" (Display 1). After pressing the "ENT" key, a confirmation message appears on the screen.

### 2. Execution of the "DUST CHECK" Function

Press the "ENT" key again to start the automatic dust check process.

### 3. Dust Check Process

The splicer automatically proceeds with the following steps.

#### (1) Dust Check

By image processing, the splicer checks and counts the amount of dust or dirt. During the inspection, a "WAIT" message appears on the screen (Display 2).

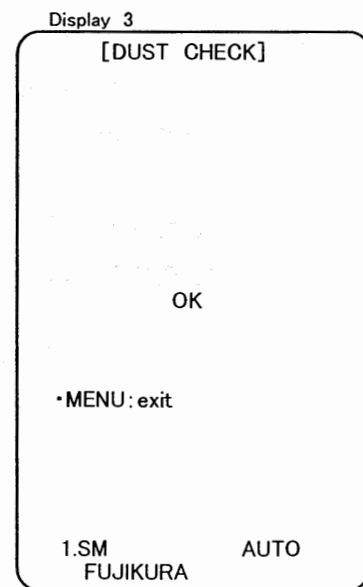
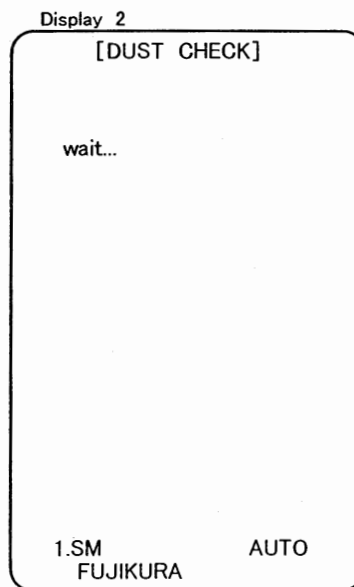
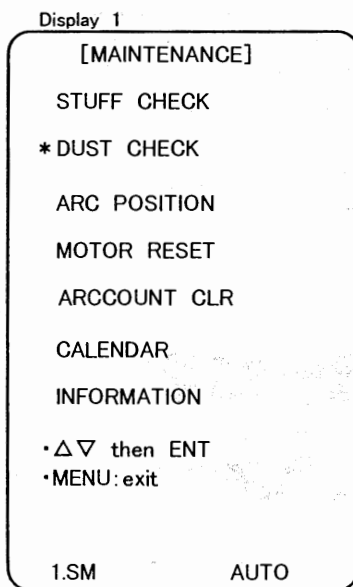
#### (2) Display of the Results

In a case that both the size and number of dust are acceptable, the splicer displays an "OK" message (Display 3). If not acceptable, the splicer displays a "NG" message on the screen. In such a case, execute the dust check again after cleaning the up/down mirror, wind protector mirror and lens (Refer to the section 7.1 on page 87).

**NOTE** If the splicer indicates "NG" again after cleaning, please consult your sales agency.

### 4. Quit from Dust Check

Press the "RESET" key.



### 5.8.3 Arc Position Check Function

This function measures the center position of the arc discharge.

After the measurement, the splicer indicates the correct electrode position on the screen.

**NOTE** The electrode position relates with the gap setting position. The electrodes are produced precisely, however, the center position is sometimes shifted by replacing the electrodes. To eliminate the effect of any variability of the electrode position, repeat this function several times.

#### 1. Selection of "ARC POSITION"

In the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "ARC POSITION" (Display 1). Then, press the "ENT" key.

A confirmation message appears on the screen.

#### 2. Execution of the "ARC POSITION"

Press the "ENT" key again to start the automatic checking process.

#### 3. Measurement of the Arc Position

The splicer automatically proceeds with the following steps.

##### (1) Arc Discharge

The splicer generates the arc discharge, and measures the center position of arc discharge by using the image processing.

##### (2) Indication of the Results

The splicer indicates a current electrode position (center of the arc discharge) under the former electrode position (Display 2).

#### 4. Change of Electrode (Gap Setting) Position

##### (1) In order to change the electrode position:

Press the "ENT" key to store the new position into the internal memory. The revised position is displayed on the screen (Display 3). Press the "MENU" key to quit from this function. The new electrodes position will now be used to set the fiber gap at the center of the arc discharge.

##### (2) In the case of no change:

Press the "MENU" key to quit from this function.

Display 1

```
[MAINTENANCE]
STUFF CHECK
DUST CHECK
*ARC POSITION
MOTOR RESET
ARCCOUNT CLR
CALENDAR
INFORMATION
•△▽ then ENT
•MENU: exit

1.SM          AUTO
```

Display 2

```
[ARC POSITION]

ELECTRODE
115

ADEQUATE
POSITION
117

•ENT: change
•MENU: cancel

1.SM          AUTO
FUJIKURA
```

Display 3

```
[ARC POSITION]

ELECTRODE
117

•MENU: exit

1.SM          AUTO
FUJIKURA
```

#### 5.8.4 Motor Reset Function

This function is for resetting all motors to their respective home positions. Use this function when the motor does not move properly during a splicing operation, which may be caused by varying the motor home position.

##### 1. Selection of "MOTOR RESET"

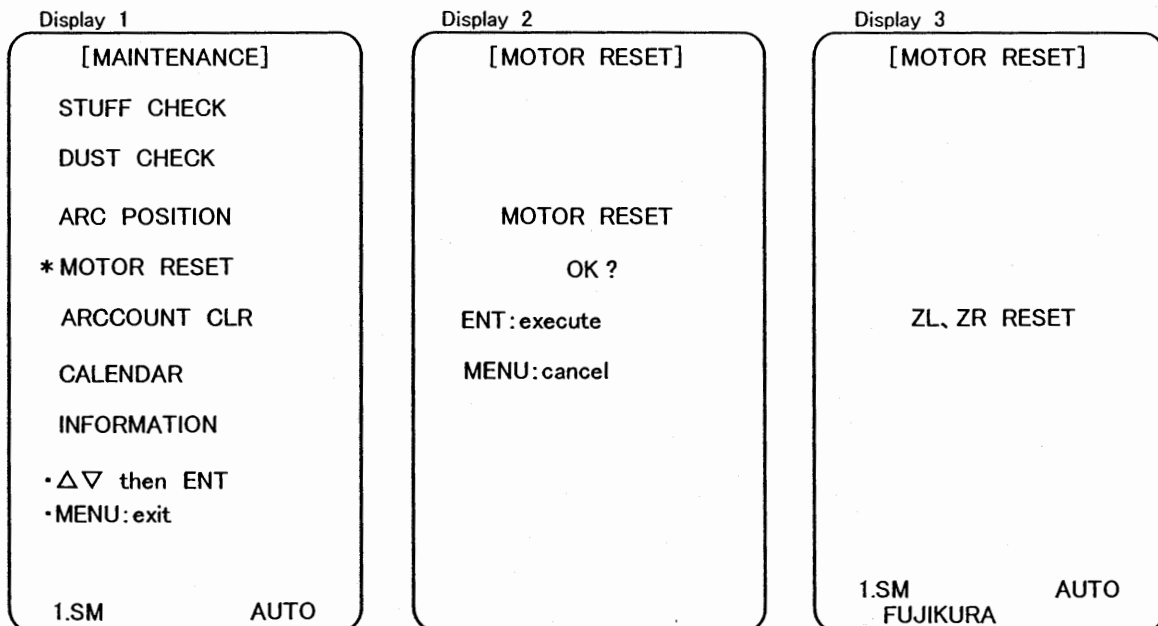
On the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "MOTOR RESET" (Display 1). Then, press the "ENT" key. A confirmation message appears on the screen (Display 2).

##### 2. Execution of the "MOTOR RESET"

Press the "ENT" key again to reset the following motors in turn.

- 1st : ZL motor and ZR motor
- 2nd : FOCUS motor
- 3rd : X motor and Y motor

In the reset process, resetting motor names appears as shown in Display 3.



### 5.8.5 Arc Count Clear Function

There are two kinds of arc counts. One is a resettable arc count which should be reset to zero when the electrodes are replaced. The other is a non-resettable arc count which indicates the total cumulative arc count. Regarding the total arc count, refer to section 5.8.7 on page 76.

The following describes how to reset the resettable arc count. Always carry out this function after electrode replacement.

#### 1. Selection of "ARCCOUNT CLR"

In the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "ARCCOUNT CLR" (Arc Count Clear) as shown in Display 1.

Then, press the "ENT" key.

#### 2. Reset of the Arc Count

A confirmation message appears on the screen (Display 2).

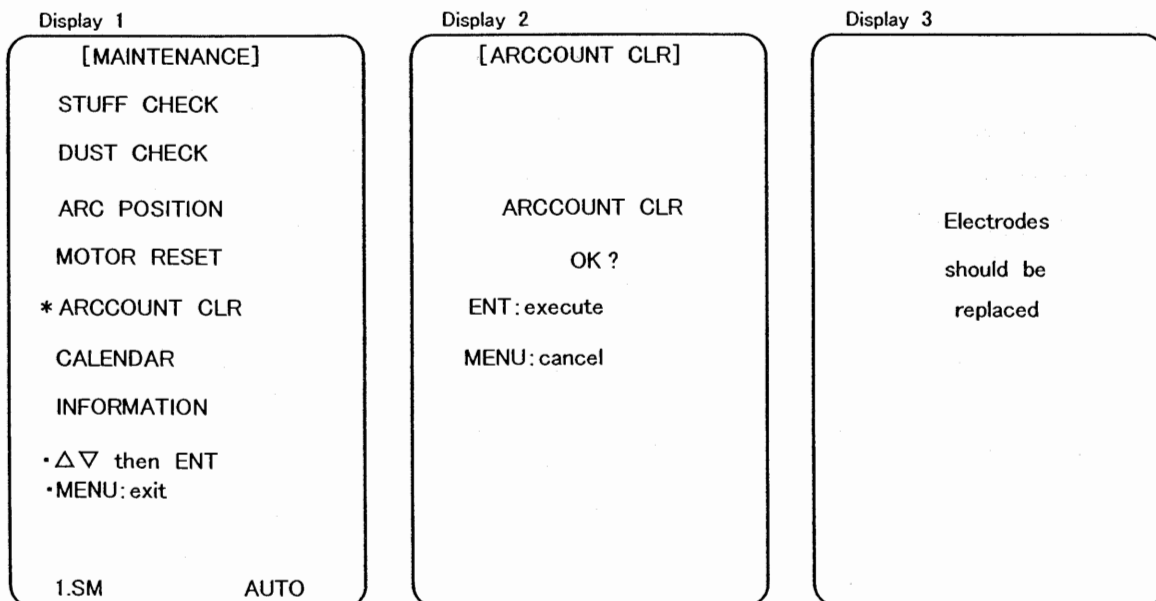
##### (1) In order to reset the arc count:

Press the "ENT" key. After clearing the arc count, the splicer displays the maintenance menu again.

##### (2) In a case of the cancellation:

Press the "MENU" key. Then, the maintenance menu will be displayed again.

In general, the life time of electrodes is approximately 1000 arc discharge. When the splicer is turned on, a caution display as shown below (Display 3) appears on the screen if the arc count is greater than 1000. Of course, it may be possible to splice using these electrodes, however, it will degrade the splicing quality gradually. Therefore, replace the electrodes if the message appears on the screen.



### 5.8.6 Calendar Setting

This function is to correct the date and time. Use this function when the time or date is set incorrectly.

#### 1. Selection of "CALENDAR"

In the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "CALENDAR" (Display 1). Press the "ENT" key to enable the function.

#### 2. Correction of the Calendar

A "■" cursor appears at the location at which corrections may be performed (Display 2).

- (1) Move the "■" cursor by using the "◀"(LEFT) or "▶"(RIGHT) arrow to the position requiring correction.
- (2) Press the numeric key to input the correct number, or use the "△"(UP) or "▽"(DOWN) arrow to toggle to the correct number.

**NOTE** If the "■" cursor is not visible, adjust the brightness of the monitor.

#### 3. Storing the Settings

- (1) After making any needed changes by the method above, press the "ENT" key to finish.
- (2) Press the "MENU" key to quit.

Display 1	Display 2	Display 3
<p>[MAINTENANCE]</p> <p>STUFF CHECK</p> <p>DUST CHECK</p> <p>ARC POSITION</p> <p>MOTOR RESET</p> <p>ARCCOUNT CLR</p> <p>* CALENDAR</p> <p>INFORMATION</p> <p>•△▽ then ENT</p> <p>•MENU:exit</p> <p>1.SM                  AUTO</p>	<p>[CALENDAR]</p> <p>95/11/06</p> <p>19:25</p> <p>•◀▶ :cursor</p> <p>•KEYBOARD</p> <p>or △▽</p> <p>:value</p> <p>•ENT:finish</p> <p>1.SM                  AUTO</p> <p>FUJIKURA</p>	<p>[CALENDAR]</p> <p>95/11/06</p> <p>20.25</p> <p>•◀▶ :cursor</p> <p>•KEYBOARD</p> <p>or △▽</p> <p>:value</p> <p>•ENT:finish</p> <p>1.SM                  AUTO</p> <p>FUJIKURA</p>

### 5.8.7 Maintenance Information

Following information for the period maintenance is displayed when "INFORMATION" is selected.

#### 1. Selection of "INFORMATION"

In the maintenance menu, use the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol to the left side of "INFORMATION." By pressing the "ENT" key, the splicer displays the maintenance information (Display 1).

#### 2. Meaning of the Information

Refer to the following table.

Item	Meaning
ARC COUNT	Indicates the number of the arcs discharged by the current electrodes.
TOTAL ARC	Indicates the number of total arcs discharged by this equipment. This value cannot be reset.
LAST MAINTE.	Indicates the date of the last maintenance performed by an authorized engineer.
NEXT MAINTE.	The period maintenance by an authorized engineer is necessary once a year in order to ensure the best operating condition. Please consult the sales agency or the factory.

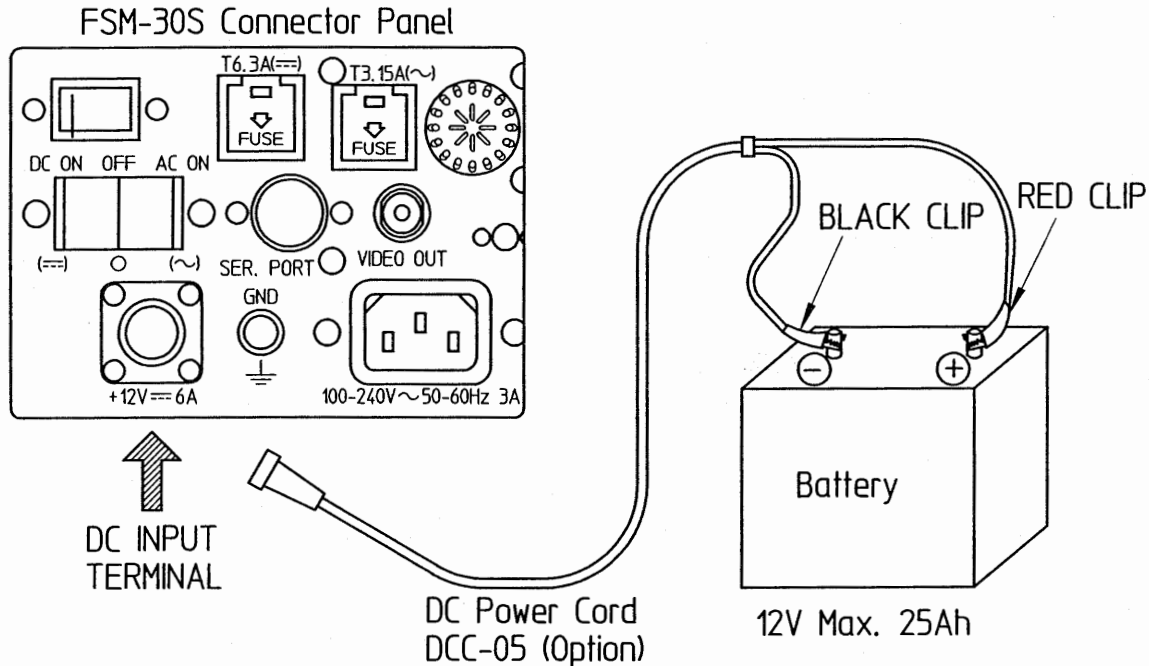
Display 1

[INFORMATION]	
ARC COUNT	325
TOTAL ARC	32534
LAST MAINTE.	95/09/15
NEXT MAINTE.	96/09/15
	95/11/06
	19:32
-MENU:exit	

## 6. OTHERS

### 6.1 DC Power Source

To allow operation of the splicer at where there is no AC power supply, Fujikura can provides an optional DC power cord. Connect the cord as below.



### ⚠ WARNING

- (1) A short circuit of the battery is extremely dangerous.
- (2) A fault connection of the DC power cord is dangerous. Confirm the red clip is connecting to the positive terminal of battery, and black clip is connecting to the negative terminal before the splicer is turned on.

### 6.2 Splicer Operation in Cold Climate

In a cold climate or condition, pay attention to operate the splicer as below.

#### 1. Dew

If warm and moist air covers the splicer after storing it in cold place, the splicer will be wet with dew. In such a case, it will not work properly because of dew-covered objective lens, mirrors and electrical components.

To remove the dew, leave the splicer in a power on state. The dew will disappear due to the splicer's self-heating. However, it will take a long time.

To protect the splicer from the formation of dew fundamentally, the splicer's temperature should be equal or higher than the temperature at the work place. Keep the splicer in a warm place during storage or some time before starting operation.

**NOTE1** Clean the objective lens and mirrors after the dew disappears.

**NOTE2** Do not touch a wet splicer in the power on state.

## 2. Cold Climate

The splicer works at 0°C without any problem. However, warm-up time is necessary if the temperature at the work place is less than 0°C. To reduce the warm-up time, close the air intake on the right panel of the splicer. This will allow heat generated within the splicer to more quickly warm up the splicer.

## 6.3 Storage and Transportation

### 1. Storage

#### CAUTION

##### (1) Temperature

Range of the storage temperature is from -40°C to 80°C. Do not store in any area where extreme heat is present.

##### (2) Humidity

Humidity should be less than 95% for storage. Use the carrying case during storage in order to protect the splicer from moisture.

### 2. Transportation

#### CAUTION

##### (1) Top Cover

Attach the top cover to the splicer during transportation.

The top cover is equipped with a mechanism that fixes the Z-units. Transportation without the top cover can result in damage of the movable parts, due to vibration or shock.

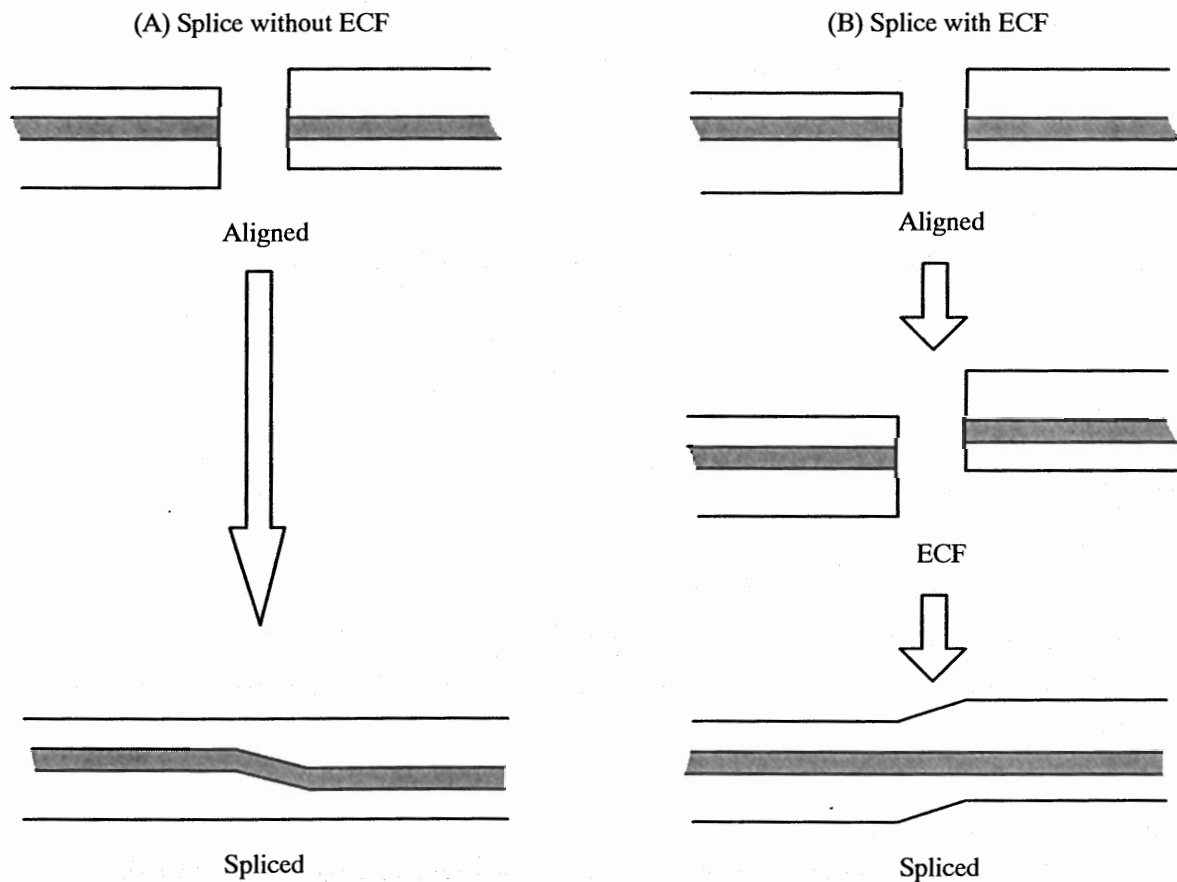
##### (2) Carrying Case

Use the carrying case to transport the splicer. The carrying case will protect the splicer from damage, vibration and shock during transportation.

## 6.4 Eccentricity Correcting Function (ECF)

When optical fibers are spliced, surface tension of the molten glass tends to draw the cladding into alignment. If core eccentricity is present, the splicer core alignment process (before the splice) will align the fiber cores. Because of the eccentricity, the cladding will therefore be misaligned. The surface tension of the molten glass during the fusion arc will tend to draw the cladding into self-alignment, causing the loss of core alignment, and high splice loss, as in (A) below.

To compensate for this tendency, this splicer is provided with the Eccentricity Correction Function (ECF). With the use of the ECF function, the splicer calculates the amount of cladding self-alignment motion which will occur due to surface tension. The splicer therefore corrects for the surface tension by applying an intentional core offset during the alignment process. The intentional core offset will be eliminated by the surface tension motion effect, resulting in perfect core alignment at the end of the fusion arc, as shown in (B) below.



## 6.5 Applicable Fibers and Splicing Methods

Six types of fibers can be selected in each splice mode.

The following table specifies the splicing methods for each fiber type.

Fiber Type	Splicing Method
SM (1.31um) Single-mode fiber	Core to core alignment is performed. The splicer estimates the splice loss assuming that the mode field diameter is 9.5um at a wavelength of 1.31um.
DS (1.55um) Dispersion shifted fiber	Core to core alignment is performed. The splicer estimates the splice loss assuming that the mode field diameter is 8um at a wavelength of 1.55um.
CS (1.55um) Cutoff shifted fiber	Core to core alignment is performed. The splicer estimates the splice loss assuming that the mode field diameter is 8um at a wavelength of 1.55um.
MM (Estimate ON) Multi-mode fiber	Cladding to cladding alignment is performed because of the large core diameter. Any core eccentricity usually has no affect upon the splice loss. The splicer estimates the splice loss assuming that the core diameter is 50um.
MM (Estimate OFF) Multi-mode fiber	The aligning method is the same as the above. The splicer skips the loss estimation process.
ED Erbium doped fiber	This splice mode is used to compensate for mode field diameter mismatch. The core to core alignment or the cladding to cladding alignment are selectable on the arc condition menu. The splicer does not indicate the estimated loss. (Refer to the section 6-6.)

## 6.6 Erbium Doped Fiber Splicing Mode

This mode is designed to compensate for MFD (mode field diameter) mismatch between two different types of the fibers. Splicing of an EDF (Erbium doped fiber) and a DSF (dispersion shifted fiber) is one example of many combinations. If the MFD of fiber on one side is the same as the other side, it will not be necessary to use this mode even if these two fibers are EDFs.

Compensation for MFD mismatch can be achieved by a long time arc. During the long arc discharge, diffusion of doping material in the core causes expansion of the MFD.

This splicer cannot generate a long time arc of more than 30 seconds because of the design of the high voltage generating circuit. Therefore, if an arc time of more than 30 seconds is required, the splicer can be programmed to repeat arcs in order to achieve the required total arc time, using the ED splicing mode as described below.

### 1. Open the Main Menu

After ensuring the "READY" message on the screen, press the "MENU" key. The main menu appears as shown in display 1.

### 2. Selection of the Splice Mode

Use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow to move the "\*" symbol next to "MODE SELECT." Press the "ENT" key to display the mode selection menu (Display 2).

Use the " $\Delta$ "(UP) or " $\nabla$ "(DOWN) arrow again to move the "\*" symbol to a left side of the splice mode to be selected. Press the "ENT" key to select the desired mode. Then, press the "MENU" key to quit from the "MODE SELECT" menu.

Display 1	Display 2	Display 3
[MENU] *MODE SELECT ARC COND. OTHER COND. TUBE HEATER MOTOR MOVE MEMORY UTILITY MAINTENANCE • $\Delta$ $\nabla$ then ENT •MENU:exit 1.SM            AUTO FUJIKURA	[MODE SELECT] —PAGE 2 of 7— * 6.SM    1.31 $\mu$ m FUJIKURA 7.SM    1.31 $\mu$ m FUJIKURA 8.SM    1.31 $\mu$ m FUJIKURA 9.SM    1.31 $\mu$ m FUJIKURA 10.SM   1.31 $\mu$ m FUJIKURA • $\Delta$ $\nabla$ then ENT •F1:page 1 of 7 •F2:page 3 of 7 •MENU:exit 6.SM    1.31 $\mu$ m FUJIKURA	[MENU] MODE SELECT *ARC COND. OTHER COND. TUBE HEATER MOTOR MOVE MEMORY UTILITY MAINTENANCE • $\Delta$ $\nabla$ then ENT •MENU:exit 6.SM    1.31 $\mu$ m FUJIKURA

### 3. Selection of the Arc Condition

On the main menu, press the "△"(UP) or "▽"(DOWN) arrow to move the "\*" symbol next to "ARC COND." (Display 3). Press the "ENT" key to display the arc condition menu of the selected splice mode (Display 3).

#### 3-1. Fiber Type Setting

Move the "\*" symbol next to "MODE." After pressing the "ENT" key, toggling the fiber types will be possible by use of the "△"(UP) or "▽"(DOWN) arrow. Change the fiber types to the ED mode (Display 4).

#### 3-2. Arc Condition Setting

The arc condition menu for the ED mode consists of three pages of parameters (Display 4,5,6 and 7). Concerning the method of setting the parameter values, refer to Section 5.2 .

Display 4

[ARC COND.]	
—PAGE 1 of 4—	
*MODE 6	
ED	
COMMENT(ALP)	
FUJIKURA	
ALIGNING	
ARC POWER	CORE
	70
PREFUSE	180ms
FORWARD	40ms
•△▽ then ENT	
•F1: last page	
•F2: next page	
•MENU:exit	

Display 5

[ARC COND.]	
—PAGE 2 of 4—	
GAP	8line
[MAIN ARC]	
* ARC TIME	1000ms
	{INTERVAL}
	92sec
NUM. OF ARC	5
PAUSE	OFF
•△▽ then ENT	
•F1: last page	
•F2: next page	
•MENU:exit	
6.ED	

Display 6

[ARC COND.]	
—PAGE 3 of 4—	
[REARC]	
* REARC TIME	1000ms
NUM. OF REARC	5
PAUSE	ON
CLEANING ARC	100ms
ARC TIMER	ON
•△▽ then ENT	
•F1: last page	
•F2: next page	
•MENU:exit	
6.ED	

Display 7

[ARC COND.]	
—PAGE 4 of 4—	
[REARC]	
* GRAD1	100ms
GRAD2	100ms
CLEANING ARC POWER	70
REARC POWER	70
•△▽ then ENT	
•F1: last page	
•F2: next page	
•MENU:exit	
6.ED	

A following tables shows the meaning and setting range of each parameters.

Table Meaning of the Parameters

Parameter	Meaning
[MAIN ARC] ARC TIME	Indicates the arc discharge time of the main arc. (This main arc time may be repeated by using more than one arc.)
[INTERVAL]	Interval time between the repeated main arc discharges is displayed under the "ARC TIME." The interval time is for preventing the high voltage generator from overheating, and is determined by the splicer automatically. Therefore, it cannot be changed.
NUM. OF ARC	Indicates the number of main arc discharges.
PAUSE	By setting this function "ON," the splicer will pause after each main arc discharge. Press the "ENT" key to toggle on or off after placing the "*" symbol next to this function.
[REARC] ARC TIME	Indicates the arc discharge time of the rearc. (The rearc may also be repeated by using more than one REARC.)
NUM. OF ARC	Indicates the number of rearcs.
PAUSE	By setting this function "ON," the splicer will pause after each rearc discharge. Press the "ENT" key to toggle on or off after placing the "*" symbol next to this function.
ARC TIMER	There is an arc timer to measure and display the total arc time of the repeated arcs. During the arc discharge, this arc timer is displayed at the center of the screen if this function is "ON." During the arc discharge, by pressing the "ENT" key, a lap time is displayed under the arc timer. The lap time is the lapse of time from when starting the arc to when pressing the "ENT" key. This function is useful to find the best arc time. When an optial power meter indicates maximum value, press the "ENT" key.

Table Setting Ranges of the Parameters

Parameter	Minimum	Maximum	Step	Unit
[MAIN ARC] ARC TIME (t1)	0	30000	50	msec.
INTERVAL (i1)	It cannot be set.		1	sec.
NUM. OF ARC (n1)	OFF(0)	99	1	times
[REARC] ARC TIME (t2)	0	10000	50	msec.
NUM. OF ARC (n2)	OFF(0)	99	1	times

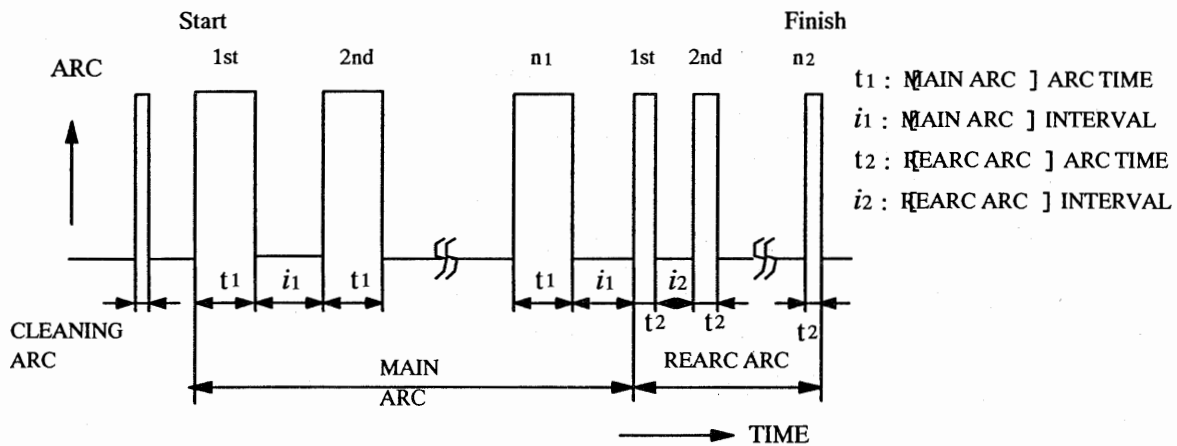


Figure Time Chart of Splicing Process

i2: Interval Time between the Rearcs

(This time is determined by the splicer, and is not displayed on the screen.)

#### 4. Splicing

Refer to Section 4.2 on page 16.

#### NOTE

If a long rear arc time is set in the "ARC COND." menu of the ED mode, the rear arc time generated by pressing the "ARC" key after the splice will be also long as the same as the setting value. The rear arc time in the "ARC COND." menu should be short.

For example, if the best arc time is 47 seconds, set the arc time as shown below.

Main Arc Time	: 23 seconds
Num. of Main Arc	: 2 times
Rearc Time	: 1 second
Num. of Rearc	: 1 time + $\alpha$ times

## 6.7 Character Table for Comment Setting

	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	^	_
'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{		}	—	。
「	」	、	・	ヲ	ア	イ	ウ	エ	オ	ヤ	ユ	ヨ	ツ	ー	ア
イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ	シ	ス	セ	ソ	タ	チ
ツ	テ	ト	ナ	ニ	ヌ	ネ	ノ	ハ	ヒ	フ	ヘ	ホ	マ	ミ	ム
メ	モ	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ン	・	。		

## 7. MAINTENANCE



### WARNING

- (1) During arc discharge, the electrodes generate a very high voltage. The following measures will prevent personal injury and/or equipment damage from the high electrical voltage.
  - Make sure no water or liquid is present on the equipment.
  - Never touch the electrodes.
- (2) Dangerous electrical voltages are present inside this equipment. Failure to maintain the equipment properly can result in personal injury and/or equipment damage.
  - The cover panels and/or any electrically operated accessories should never be opened or removed except by an authorized engineer.
  - Maintenance should only be performed by an authorized engineer, except the replacement of electrodes, up/down mirror and fuse.
  - Only authorized replacement parts must be used on this equipment.



### CAUTION

- (1) Set the electrodes to the correct position during replacement. Failure to place the electrodes into the proper position will result in abnormal arc discharge, may be dangerous, and could result in damage to the splicer.
- (2) Always replace the electrodes as a pair.
- (3) Use only alcohol to clean the objective lens, mirrors, v-groove, sheath clamp, fiber clamp, LCD monitor and body. Any other chemicals may cause blurring, discoloration, or deterioration.
- (4) Keep the equipment free from sand or dust. Never clean the v-groove with a hard material or rough object. Doing so will damage the surface, and degrade the performance.
- (5) Precise adjustment and alignments have been made to all parts of this equipment by factory personnel. Do not loosen any screws or make any modifications to the equipment other than electrodes, up/down mirror and fuse replacements. If you encounter some problem with the equipment, please contact the sales agency or the factory.

This equipment consists of very precise parts and a high resolution image processing unit in order to observe and align the fiber cores precisely. Dust and dirt on the mechanical and optical parts may affect the splicing quality dramatically.

To maintain the best operating condition, daily or period maintenance is very important.

## 7.1 Cleaning

### 7.1.1 V-groove

#### WARNING

- (1) Turn the splicer off before cleaning the v-grooves.
- (2) Spilled solvent or alcohol causes a fire hazard.
- (3) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.

#### CAUTION

- (1) Use only alcohol to clean the v-groove. Any other chemicals may leave residue or contamination.
- (2) Keep the equipment free from sand or dust. Never clean the v-groove with a hard material or rough object.

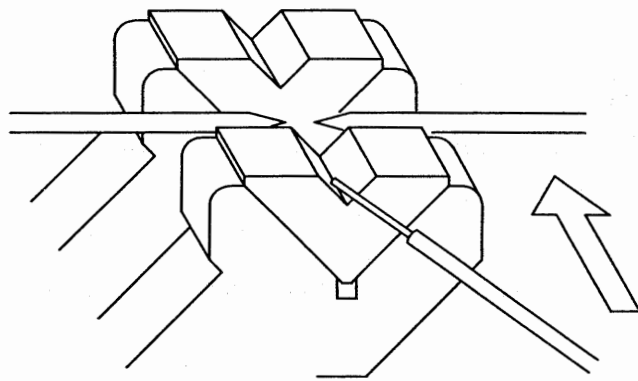
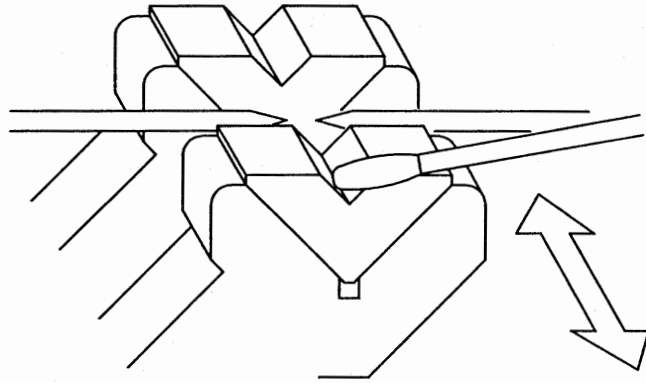
#### 1. Turning the Splicer Off

- (1) Open the wind protector to raise the up/down mirror to the up position.
- (2) Turn the splicer off and raise the fiber clamps.

**NOTE** The alcohol must be 99% or greater in purity. Low purity alcohol causes dirt, impurities, or residue to remain in the v-groove.

#### 2. Cleaning the V-groove

- (1) Wipe the v-groove with an alcohol dampened cotton swab.
- (2) An alternate procedure is to scrape the bottom of the V-groove with the end face of a cleaved fiber as shown below.



## 7.1.2 Objective Lens

### WARNING

- (1) Turn the splicer off before cleaning the objective lens.
- (2) Spilled solvent or alcohol causes a fire hazard.
- (3) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.

### CAUTION

Use only alcohol to clean the objective lens. Any other chemicals may cause a blur, or leave residue.

#### 1. Turn the Splicer Off

- (1) Open the wind protector to raise the up/down mirror to the up position.
- (2) Turn the splicer off and raise the fiber clamps.

#### 2. Open the wind protector.

#### 3. Sliding the Positive Electrode

See the figure on the next page.

- (1) Remove the electrode cover.
- (2) Loosen two screws(A) which secures the electrode fixture. Slide the positive electrode backwards to expose the objective lens.

**NOTE1** Just loosen the two screws, and do not remove the v-groove fixture or the screws.

#### 4. Wiping the Objective Lens

- (1) Examine the surface of the objective lens. If there is any large visible dirt or dust particles, blow these off with an air bulb.

**NOTE2** Never use a canned air type cleaner to remove the dust.

- (2) Wipe the objective lens with a cotton swab dampened with alcohol on one end. Use the dry end of the swab to wipe away any remaining alcohol residue.

**NOTE3** The alcohol must be 99% or greater in purity. Low purity alcohol causes dirt, impurities, or residue on the objective lens.

## 5. Setting the Electrode in Place

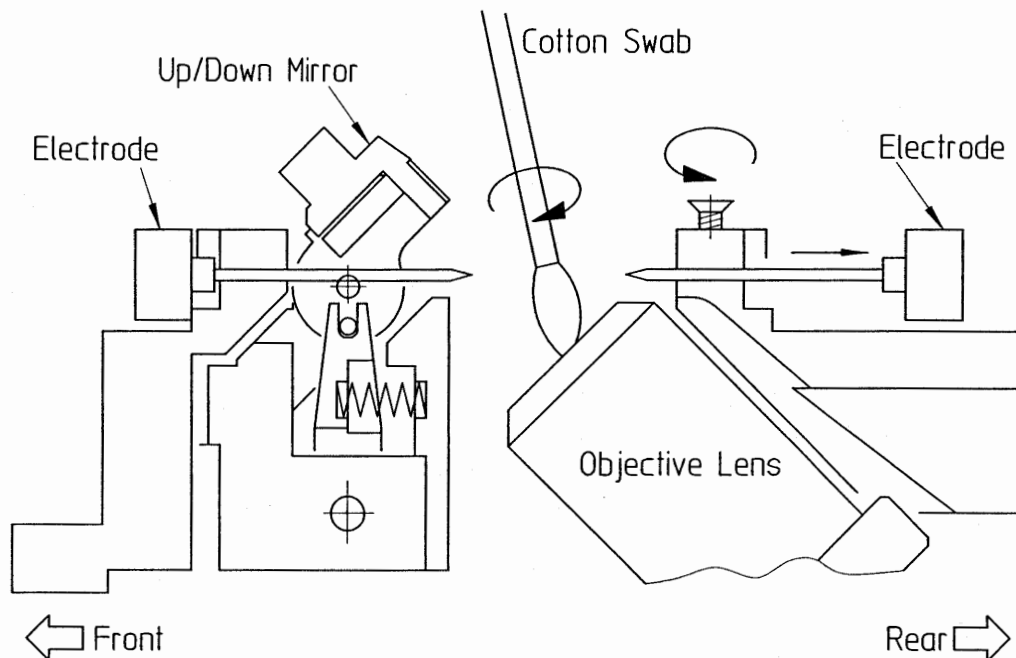
- (1) Push the electrode back into proper position on the V-groove of the electrode base, and gently tighten the two screws. Be careful not to over-tighten the screws.

**NOTE4** When tightening the two mounting screws (A), continue to push the electrode flange against the electrode base. Failure to secure the electrode in the proper position will result in abnormal arc discharge.

- (2) Attach the electrode cover.  
(3) Close the fiber clamps and the wind protector.

## 6. Examination

- (1) After turning the splicer on, ensure that there is no dust or dirt on the monitor screen.  
(2) Press the "ARC" key several times to check the arc discharge.



### 7.1.3 Mirrors

#### WARNING

- (1) Turn the splicer off before cleaning the mirrors.
- (2) Spilled solvent or alcohol causes a fire hazard.
- (3) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.

#### CAUTION

Use only alcohol to clean the mirrors. Any other chemicals may cause a blur, or leave residue.

This splicer is equipped with two mirrors:

- (1) The up/down mirror
- (2) The mirror inside the wind protector

Dirt or dust on the mirrors interferes the fiber image. Keep the mirrors clean by referring to the following procedures.

#### 1. Turning the Splicer Off

- (1) Open the wind protector to raise the up/down mirror to the up position.
- (2) Turn the splicer off and raise the fiber clamps.

#### 2. Open the Wind Protector

#### 3. Cleaning the Mirrors

- (1) Examine the surface of the mirrors. If there is any large visible dirt or dust particles, blow these off with an air bulb.

**NOTE1** Never use a canned air type cleaner to remove the dust.

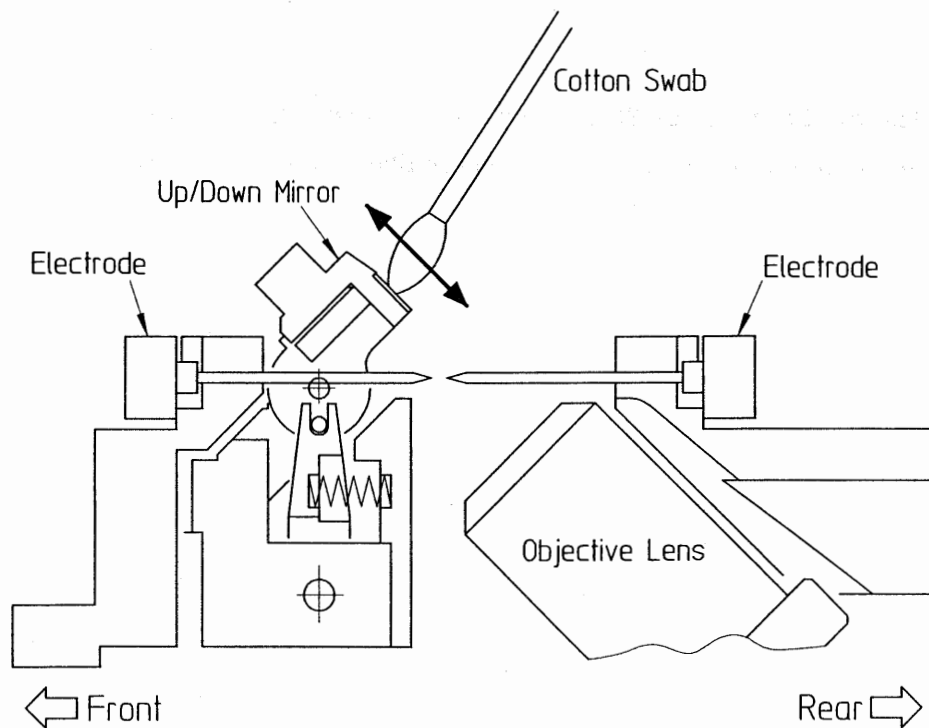
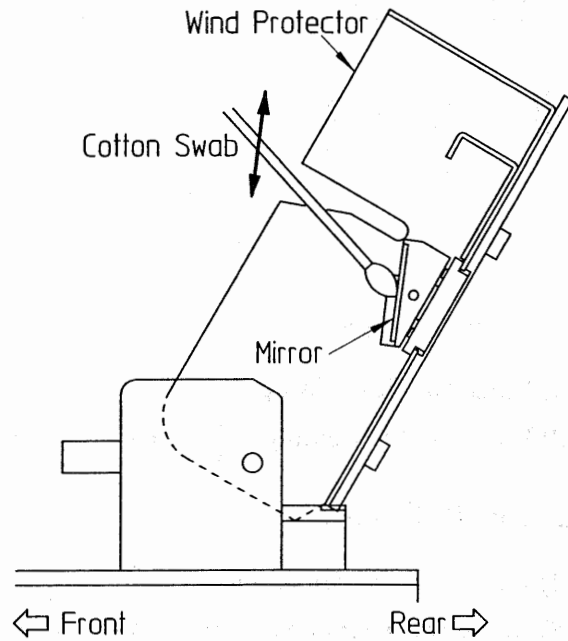
- (2) Wipe the mirror with a cotton swab dampened with alcohol on one end. Use the dry end of the swab to wipe away any remaining alcohol residue.

**NOTE2** The alcohol must be 99% or greater in purity. Low purity alcohol causes dirt, impurities, or residue on the mirrors.

- (3) Inspect and clean the mirror surface again if there is any dirt or dust remaining.
- (4) Close the wind protector.

#### 4. Examination

After turning the splicer on, ensure that there is no dust or dirt on the monitor screen.



#### 7.1.4. Fiber Clamp and Sheath Clamp

##### **WARNING**

- (1) Spilled solvent or alcohol causes a fire hazard.
- (2) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.

##### **CAUTION**

Use only alcohol to clean the clamps. Any other chemicals may leave residue or contamination.

#### 1. Fiber Clamps

- (1) Raise the fiber clamps.
- (2) Wipe the fiber clamp chips with a cotton swab dampened with alcohol.

#### 2. Sheath Clamps

- (1) Raise the sheath clamps.
- (2) Wipe the rubber pads (top pad and bottom pad) with a cotton swab dampened with alcohol.

**NOTE** The alcohol must be 99% or greater in purity. Low purity alcohol causes dirt, impurities, or residue to remain on the fiber clamps or sheath clamps.

### 7.1.5 Monitor Screen

#### WARNING

- (1) Turn the splicer off before cleaning the screen.
- (2) Spilled solvent or alcohol causes a fire hazard.
- (3) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.

#### CAUTION

Use only alcohol to clean the screen. Any other chemicals may cause a blur, leave residue, or cause deterioration of the surface.

#### 1. Turning the Splicer Off

#### 2. Cleaning the Screen

Wipe the screen with a clean lint-free tissue dampened with alcohol. Use a dry tissue to wipe away any remaining alcohol residue.

**NOTE** The alcohol must be 99% or greater in purity. Low purity alcohol causes dirt, impurities, or residue to remain.

## 7.2 Replacement of Expendable Items

### 7.2.1 Electrodes



#### WARNING

- (1) Turn the splicer off before replacing the electrodes. Only authorized replacement parts must be used on this equipment.
- (2) Spilled solvent or alcohol causes a fire hazard.
- (3) Never use a canned air type cleaner to remove dust, or to clean the equipment. The arc discharge ignites any remaining gas mixture.



#### CAUTION

- (1) Be careful when handling the electrodes. If the tip is deformed or bent, dangerous or abnormal discharge will occur.
- (2) Set the electrodes into the correct position during replacement. Failure to place the new electrodes into the proper position will result in abnormal arc discharge, which may be dangerous, and could result in damage to the splicer.
- (3) Always replace the electrodes as a pair.

The electrodes are worn slightly by each arc discharge, and the tip shape will gradually become spherical. In such a case, high splice loss, abnormal discharge or fiber separation may occur. Replace the electrodes as a pair if the number of arc discharges exceeds 1000. The following describes the replacement procedure.

#### 1. Turn the Splicer Off

- (1) Open the wind protector to raise the up/down mirror to the up position.
- (2) Turn the splicer off.

#### 2. Open the wind protector.

#### 3. Replacing the Electrode

See the figure on the next page.

- (1) Remove the electrode cover.
- (2) Loosen four screws (A) which secures the electrode fixtures. Remove the old electrodes.

#### NOTE1

Just loosen the four screws, and do not remove the V-groove fixtures or the screws.

- (3) Clean the new electrodes with alcohol to remove the oil on the surface.

- (4) Insert the new electrodes into proper position in the v-groove of the electrode base, and gently tighten the four screws. Be careful not to over-tighten the screws.

**NOTE2** While tightening the electrode mounting screws (D), push the flange of the rear electrode all the way forward against the electrode base, and push the flange of the front electrode all the way to the rear against the front electrode base. Failure to secure the electrodes in the proper position will result in abnormal arc discharge.

**NOTE3** Be careful to ensure that the tips of the new electrodes are not damaged or bent, and do not contact or touch any part of the splicer.

- (5) Attach the electrode cover.  
(6) Close the wind protector.  
(7) Turn the splicer on.

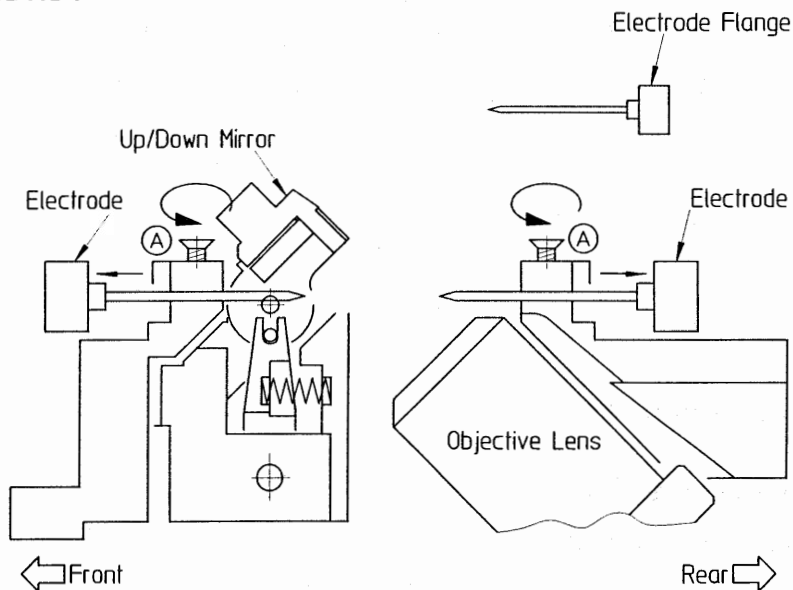


Figure Electrode Replacement Method

#### 4. Resetting the Arc Count

Reset the arc count to zero. For details of this operation, refer to the Arc Count Clear Function of the maintenance menu, section 5.8.5 on page 75.

#### 5. Adjustment of the Arc Position

Adjust the center of the arc position for the new electrodes. Refer to the "ARC POSITION" function of the maintenance menu in section 5.8.3 on page 72.

#### 6. Adjustment of the Arc Power

If "AUTO" mode is not used, adjust the arc power by performing several splices.

## 7.2.2 Up/Down Mirror



### WARNING

- (1) Be careful when handling the electrodes. If the tip is deformed or bent, dangerous or abnormal discharge will occur.
- (2) Set the electrodes into the correct position during replacement. Failure to place the new electrodes into the proper position will result in abnormal arc discharge, which may be dangerous, and could result in damage to the splicer.
- (3) Always replace the electrodes as a pair.



### CAUTION

- (1) Be careful not to drop the mirror or the mounting screw into the inside the splicer.
- (2) Do not hit the mirror against the tip of the electrode. Abnormal arc discharge caused by the deformed or bent electrode is dangerous, and results in equipment breakdown.

The up/down mirror should be replaced when non-removable dirt, a crack, a pit, or a broken point is observed. The splicer may not work properly if such defects are present.

#### 1. Turn the Splicer Off

- (1) Close the wind protector to lower the mirror to the down position.
- (2) Turn the splicer off.

#### 2. Open the wind protector.

#### 3. Sliding the Electrode Back

See the figure on the next page.

- (1) Remove the electrode cover.
- (2) Loosen the four screws (D) which secure the electrode fixtures. Slide both of the electrodes backwards, away from the up/down mirror.

#### NOTE

Just loosen the four screws, and do not remove the V-groove fixtures or the screws.

#### 4. Installing the New Mirror

- (1) Loosen the up/down mirror mounting screw (A) by using the hexagonal wrench included with the splicer. Remove the screw and the old defective mirror.
- (2) Set the new up/down mirror (B) onto the mirror base (C).

- (3) Tighten the screw (A) while pushing the mirror in the direction indicated by the arrow marked (E).

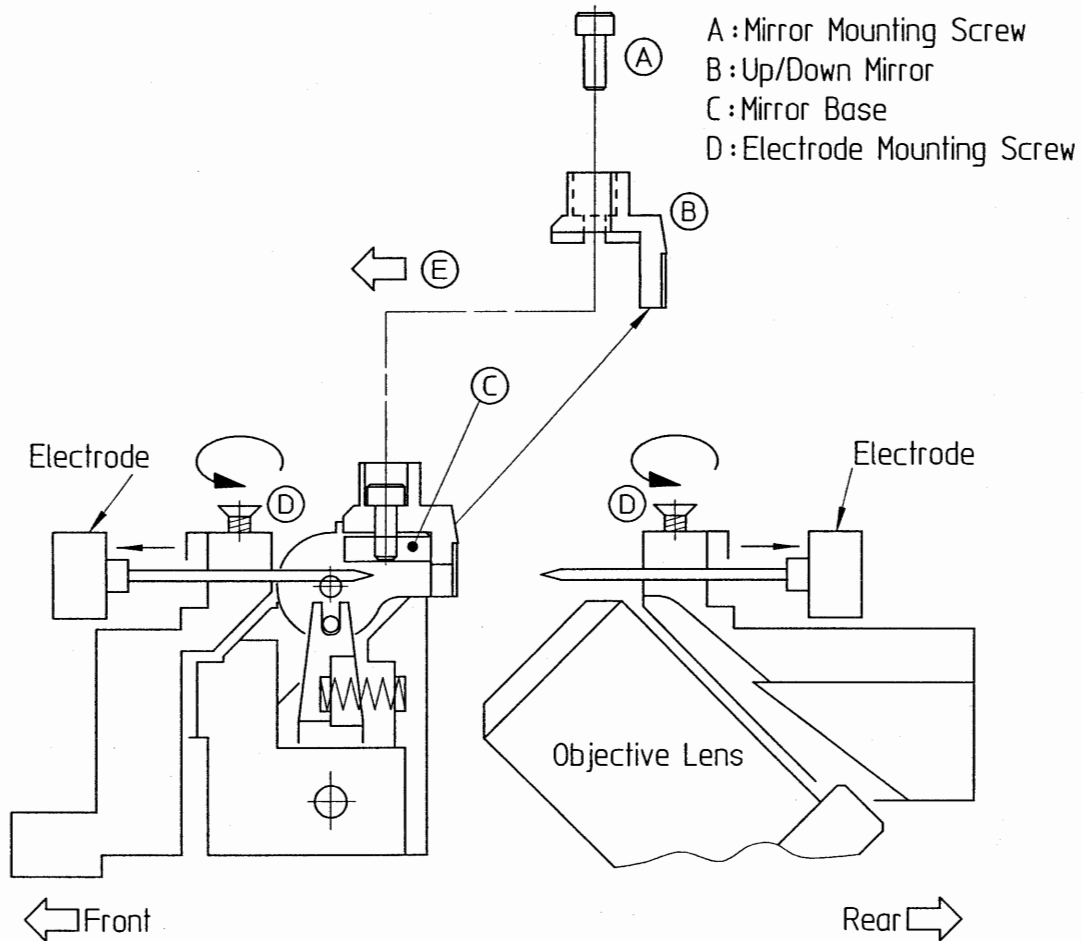


Figure Replacement of the Mirror

## 5. Setting the electrode into place

- (1) Push the electrodes back into proper position on the V-groove of the electrode base, and gently tighten the four screws. Be careful not to over-tighten the screws.

**NOTE** While tightening the electrode mounting screws (D), push the flange of the rear electrode all the way forward against the electrode base, and push the flange of the front electrode all the way to the rear against the front electrode base. Failure to secure the electrodes in the proper position will result in abnormal arc discharge.

- (2) Attach the electrode cover.  
(3) Close the wind protector.  
(4) Generate arc discharges several times to check the condition.

### 7.2.3 Fuse



#### **WARNING**

- (1) Turn the splicer off before replacing the fuse. Only authorized replacement parts must be used on this equipment.
- (2) Remove the power cord out the splicer.

#### 1. Turning the Splicer Off

- (1) Turn the splicer off.
- (2) Remove the power cord from the socket on the side panel of the splicer.

#### 2. Replacement of the Fuse

- (1) Open a cap of the fuse holder.
- (2) In the case of replacing the AC fuse, install a 3.15A time lag fuse (20mm length). In the case of replacing the DC fuse, install a 6.3A time lag fuse (20mm length).

**NOTE1** Be careful not to insert the wrong fuse.

**NOTE2** If a 6.3A fuse is set into the AC fuse holder, the fuse cannot protect the splicer from damage or ignition due to electrical overloading.

- (3) Close the cap of the fuse holder.

#### 3. Turning the Splicer On

- (1) Install the power cord.
- (2) Press the power switch toward the AC side or the DC side, depending upon which power source will be used.

**NOTE3** If the fuse is blown again, consult the sales agency or the factory. This could be an indication of an internal electrical short circuit, or some other problem requiring factory attention.

## 8. TROUBLE SHOOTING

### 8.1 Typical Problems and Trouble Shooting

If a trouble occurs, check the following points as indicated below.

#### Trouble 1

Cannot turn the splicer on, or no display on the screen.

- The DC power indicator does not point to the green range. Check the following points.
  - The power switch was pressed to the wrong position. It has three positions (AC-OFF-DC).
  - No power from the AC or DC power source. Or, the power cord was not plugged in completely.
  - The fuse blew. See section 7.2.3 on page 99 to replace it.
- One of the two cables that supply the video signal and power from the splicer to the monitor is disconnected or loose.

#### Trouble 2

Cannot set the fiber correctly on the splicer, or the splicer indicates an error message during gap setting.

- Perform the all motor reset function. See section 5.8.4 on page 73.
- The fiber cleave length is shorter than the acceptable length.  
(8-16mm for  $\phi$  250um coated fiber, 16mm for  $\phi$  900um coated fiber)
- Some 900um jacketed fiber curls due to the 900um plastic coating. If this is encountered, orient the fiber such that it curls downward (toward the V-groove) when loading the fiber into the splicer.
- In a case of a bent  $\phi$  0.9mm fiber, turn the bending direction down to be set.
- The fiber clamp does not catch the fiber securely in the V-groove. In such a case, consult the sales agency or the factory. There may be mechanical misalignment or other problems.

#### Trouble 3

The splicer cannot align the fiber.

- MM fiber cannot be aligned in the SM, DS or CS splicing mode. Check to ensure the proper splicing mode is used for the fiber being spliced.
- In a case of Carbon coated fiber, the cleaning arc time must be longer than normal to ensure proper operation of the core alignment image processing system.

## Trouble 4

### Splice loss is high.

- The condition of the optical fiber cleaver is not good. Check the condition and operation of the cleaver.
- There is a chip or crack on the fiber end face. Prepare the fiber ends again.
- The cleave angle is not perpendicular, and the cleave angle inspection function is off. Enable the cleave angle inspection as described in section 5.3 on page 45.
- Dirt or dust is on the fiber end face. Prepare the fiber ends again.
- The fiber setting position on the sheath clamp is wrong. Refer to the label inside the wind protector.
- The arc position is not correct. Check the arc position by the arc position checking function as described in section 5.8.3 on page 72.
- The tips of the electrodes are worn or deformed. Check the tip of the electrode and the arc count. Concerning the arc count, refer to section 5.8.7 on page 76. If the arc count is more than 1000, replace the electrodes. Refer to section 7.2.1 on page 95.
- Dirty v-groove, clamps, mirrors or objective lens. Clean each part by referring to section 7.1 on page 87.
- The splicing mode used is not proper for the fiber being spliced. For instance, if SM fibers are spliced in a MM splicing mode, the splicer will not align the cores.
- The arc parameters are substantially different from the standard values. Refer to the read only splice modes (No.[1]-[4]) programed at the factory. It is also possible to copy the read only modes. Refer to section 5.7.1 on page 61.

## Trouble 5

### Estimated loss is not accurate.

- The splicing mode used is not proper for the fiber being spliced. Each splice mode has different estimation methods.
- Dirty up/down mirror, wind protector mirror or objective lens. Clean each part by referring to section 7.1 on page 87.

## Trouble 6

### Abnormal discharge occurs.

- Check the arc power. If it is too low, abnormal discharge will occur.
- The electrodes were not installed correctly. Refer to section 7.2.2 on page 97 and section 5.
- The electrodes are worn. Replace the electrodes.
- Check the arc count. Concerning the arc count, refer to section 5.8.7 on page 76. If the arc count is more than 1000, replace the electrodes.

### Trouble 7

A line exists at the boundary of the spliced point.

- A line at the splice point is typical when splicing MM fiber. A faint line is also common with many other fibers such as CS, Titan fiber, or when splicing two different fiber types together (Such as splicing a matched clad type SM fiber to a depressed clad SM fiber).
- The arc power is weak, or the prefuse time is short. Adjust these arc parameters in the arc condition menu.
- Core eccentricity is very large. A line cannot be avoided in some such cases.

### Trouble 8

The splice point is thin.

- The taper function is on. See section 5.3 on page 45.
- The arc power is much too high or the forward movement is too low. Check the splicing parameters. Refer to section 5.2 on page 39.

### Trouble 9

No proof test after opening the wind protector.

- The proof test function is off. See section 5.3 on page 45.

### Trouble 10

Splice protector cannot be shrunk perfectly, or a bubble remains in the splice protector.

- The sleeve length setting is wrong. Check this parameter by referring to section 5.4 on page 50.
- The heating temperature or time is not proper. Check these settings in the heater menu. See the section 5.4 on page 50.

### Trouble 11

Something was dropped inside the splicer.

- Turn the splicer off immediately, and consult the sales agency or the factory.

## 8.2 Error Messages

When an error message appears on the screen, note the message. Press the "RESET" key, and then refer to the table which follows to check possible causes and remedies.

Message	Reason	Remedy
ERROR 1 SET ERROR	Fiber overhang from the V-groove is too long.	Set the fiber again in the proper place. Refer to the label inside the wind protector.
	Cleave length is too long.	Strip, clean, cleave and set the fiber again.
	Dirty lens or mirrors	Clean the objective lens, up/down mirror and wind protector mirror.
ERROR 2 TOO DARK	Wind protector is opened.	Close the wind protector completely.
	Dirty lens or mirrors	Clean the objective lens, up/down mirror and wind protector mirror.
	Up/down mirror does not move.	Consult the sales agency or the factory.
	Insufficient illumination	Consult the sales agency or the factory.
ERROR 3 DIRTY FIBER OR MIRROR	Dirty fiber surface, lens or mirrors Strip, clean, cleave and set the fiber again.	Clean the objective lens, up/down mirror and wind protector mirror.
	Cleaning arc is turned off, or time is too short.	Increase the cleaning arc time if necessary.
ERROR 4 BAD CLEAVE	Cleave angle is larger than threshold value.	Strip, clean, cleave and set the fiber again. Confirm the condition of the cleaver if another bad cleave occurs.
ERROR 5 MIRROR TROUBLE	Mirror motor does not work properly.	Consult the sales agency or the factory.
	Limit switch of the mirror is faulty.	Consult the sales agency or the factory.
ERROR 6 Z/ZL/ZR TROUBLE	Z motor unit is faulty.	Consult the sales agency or the factory.
ERROR 7 IC CARD ERROR	No IC memory card	Ensure that the IC memory card is in the slot.
	IC memory card is out of PCMCIA standard	Check the specification of memory card.
OVER RUN	Cleave length is short.	Strip, clean, cleave and set the fiber again.
	Fiber set position is wrong.	Set the fiber again in the proper place.
	Dirty V-groove	Clean the V-groove.

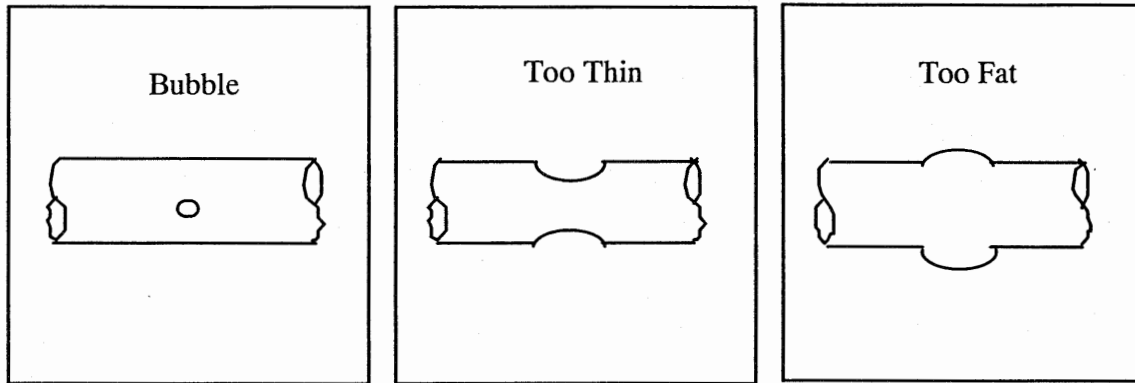


Table Treatment of Defective Spliced Results

Message	Reason	Measure
BUBBLE	Bad cleave fiber end	Prepare the fiber end again, or check the fiber cleaver.
	Dirt on fiber end	Prepare the fiber end again.
	Chipping the edge of fiber end	Prepare the fiber end again, or check the fiber cleaver.
	Short prefuse time (only in MM mode)	Adjust the prefuse time. See Section 5.2.4 on page 43.
THIN	Taper function is "ON"	Ensure the "TAPER" function off.
	Lack of stuff amount	Carry out the "STUFF CHECK" command to check it. See Section 5.8.1. on page 69.
	Strong Arc power	Reduce the arc power if the auto mode is not used. See Section 5.2 on page 39.
FAT	Large stuff amount	Carry out the "STUFF CHECK" command to check it. See the section 5.8.1.

## WARRANTY PERIOD

If your machine fails to function within one year after the date of the original purchase, we will remedy the defect without charge to you with the exception of charges for replacement of worn electrodes or mirrors. Damage due to misuse, abuse, or natural causes are not covered by this warranty.

## REPAIR & ADJUSTMENT

Defective machinery must be returned to the sales agency or one of our factories which are equipped with the necessary precision measurement and calibration equipment. When shipping a machine for repairs, please include a description of the exact nature of the problem and inform us whether you have all the necessary parts of the machine.

Inquiries concerning products should be made to one of the sales agency or the following:

Fujikura Europe Ltd.  
C51 Barwell Business Park  
Leatherhead Road,  
Chessington,  
Surrey KT9 2NY  
England  
Tel. +44-181-240-2000 (Service: +44-181-240-2020)  
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