

## Optical Fiber Fusion Splicer

# Type-65M24

## Guide to Operation

### **WARNING -FOR YOUR SAFETY-**

To reduce the risk of fire, electric shock or injury to persons, please follow this operation manual.

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## IMPORTANT SAFETY PRECAUTIONS

This product has been designed and manufactured to assure personal safety. Improper use can result in fire, electric shock or injury to persons. Please read and observe all warnings instructions given in this operation manual.

Use your splicer only for its intended purpose.

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### ■ The meaning of these symbols

In this operation manual, symbols are used to highlight warnings and cautions for you to read so that accidents can be prevented. The meanings of these symbols are as follows:

#### **Warning**

This symbol indicates explanations about extremely dangerous matters. If users ignore this symbol and handle the splicer the wrong way, serious injury such as fire or electric shock, or death could result.

#### **Caution**

This symbol indicates explanations about dangerous matters. If users ignore this symbol and handle the splicer the wrong way, bodily injury and damage to the equipment could result.

---

#### **Warning**

1. Do not use a voltage other than the indicated power voltage. Doing so may cause a fire or electric shock.
2. Verify that the connected equipment does not exceed the rated output. Operation in overload may cause a fire.
3. To help prevent electric shock, be sure to plug the power cord into properly grounded electrical outlets.
4. **To reduce the risk of fire, electric shock or malfunction, do not get liquid such as water or a metallic object inside the splicer.** Check for condensation before operating. **If necessary, dry the splicer with a hair dryer before operation.**
5. Do not make mechanical or electrical modifications to the splicer since this may expose you to dangerous voltage or other hazards.
6. If water or other liquid, a metallic object or other foreign substance gets inside the splicer, immediately turn off the power and disconnect the power plug. Contact qualified service personnel.
7. This fusion splicer performs an arc discharge. Avoid the use of the splicer in a hazardous location in which inflammable gas can generate or only electrical apparatus for explosive gas atmosphere can be used.
8. Do not touch the heater or electrodes. Surfaces are hot and may cause personal injury or electric shock if touched.
9. If an abnormal condition such as unusual noise, smoke or unusual odor occurs, immediately turn off the power and disconnect the power plug. Next, contact our service maintenance division.

10. Nickel hydride battery provided with the splicer contains strong alkaline aqueous solution for electrolyte. If the electrolyte comes into contact with skin or clothes, wash skin or cloth with lots of clean water to prevent scalding from occurring. If the electrolyte should come into contact with the eyes, wash the eyes with lots of clean water and consult a physician immediately to prevent possible loss of sight.
  11. Only use the specified battery charger. Use of any other charger could damage the battery.
  12. Never dispose of batteries in a fire because it can explode.
  13. Never disassemble a battery because the released electrolyte is strong alkaline and can damage skin and clothes.
  14. Never attempt to short-circuit a battery. Do not directly connect the positive and negative terminals with a conductive material such as a wire. Improperly connecting or keeping the battery may cause heat or fire to occur.
  15. Always beware of an abnormality while charging the battery. Only use the specified battery charger. Quit charging the battery if the charge is not completed after the specified charge time, which can cause battery leakage or heat generation. When extremely high heat generates or other abnormalities are detected while charging the battery, quit the charge.
  16. Do not use the splicer and all other equipment when detecting an abnormality such as battery leakage, discoloration, deformation or heat generation.
  17. Do not keep the battery in an airtight container. The battery can generate inflammable gas which may cause an explosion.
  18. Do not lubricate any part of the splicer. Oil based residues on the V-grooves, electrodes or fiber chucks will limit the effectiveness of the equipment.
  19. Unplug the fusion splicer before attempting any electrical maintenance. Avoid contact with the high-voltage electrodes used to produce the arc.
  20. Do not use compressed gas (i.e., canned air) to clean the splicer, as it will contaminate the V-grooves, electrodes, and optics. Poor splice performance may result.
- 

### **Caution**

1. Avoid places with too much dust or dirt. Dirt or dust that can accumulate in the fusion splicer causes short circuit and insufficient cooling, which may result in fire or electric shock due to the splicer malfunction or deterioration.
2. Do not use and keep the splicer in the locations subjected to extremely high or low temperatures and high levels of humidity.
3. To reduce the risk of electric shock, do not plug/unplug the power cord or remove the battery with wet hands.
4. Disconnect the power cord by grasping the plug, not the cord.
5. The battery's optimum operating temperature range is 10 °C to 40 °C. Whenever possible, place the charger in a location that is within this temperature range. Do not charge the battery at extremely low temperature (below 0 °C). This may lead to deterioration in performance and battery leakage.
6. You should always turn off the power to the splicer and all other equipment before operation.
7. If you are not going to use the splicer for a while, remove the battery before storing it.
8. When transporting the fusion splicer, use its padded transport case to protect it from dust, dirt, moisture, shock and impact.
9. We recommend your splicer to be annually over-hauled to keep it in good condition.
10. Wear safety glasses at all times for protection from glass fibers.

11. Do not touch the reinforcing sleeve during and after heating operation. Surfaces are hot and may cause personal injury if touched.
12. Do not place the splicer on unstable cart, stand, bracket or table. The splicer may fall, causing serious injury to a person and serious damage to the splicer.
13. Only use alcohol to clean the splicer. To prevent malfunction and damage, do not use any other kind of chemicals.

**Caution** 

1. Avoid places with too much dust or dirt. Dirt or dust that can accumulate in the fusion splicer causes short circuit and insufficient cooling, which may result in fire or electric shock due to the splicer malfunction or deterioration.
2. Do not use and keep the splicer in the locations subjected to extremely high or low temperatures and high levels of humidity.
3. To reduce the risk of electric shock, do not plugging/unplugging the power cord or remove the battery with wet hands.
4. Disconnect the power cord by grasping the plug, not the cord.
5. The battery's optimum operating temperature range is 10°C to 50°C (50°F to 120°F). Do not place the charger in a location that is within the operating range. Do not charge the battery at extremely low temperatures (below 0°C). This may lead to deterioration of the battery and reduce its capacity.
6. You should always turn off the power to the splicer and all other equipment before operation.
7. If you are not going to use the splicer for a while, remove the battery before storing it.
8. When using heating the fusion splicer, use the padded support cradle to protect it from dust that moisture shock and heat.
9. The equipment must be kept to be regularly serviced. It is best to keep it in good condition.

# General

## 1.0 General

1.01 This manual contains all the necessary information required to unpack, setup and use the Type-65M24 Micro-Mass Fusion Splicer for creating low-loss optical fiber splices in the field. The Type-65M24 can be used to splice multi-fiber ribbons of up to 24 fibers and single optical fibers with a cladding diameter of 125  $\mu\text{m}$ . Factory or field constructed ribbons with a coating diameter and fiber pitch of 250  $\mu\text{m}$  are applicable.

**Note:** Before using the fusion splicer in the field for the first time, read this manual in its entirety and perform a few trial splices under controlled conditions.

1.02 The Type-65M24 is designed to splice a variety of optical fiber types including:

- ✓ Single mode (SMF)
- ✓ Multi-mode (MMF)
- ✓ Dispersion Shifted (DSF)

The acceptable cleave length is 10 mm. Identical 24 Count ribbon fiber splices require approximately 35 seconds, and average splice losses are typically 0.05 dB or less.

1.03 Dual microscopes allow the user to examine fiber alignment from two perspectives (X view and Y view), ensuring optimum fiber placement prior to splicing. When the AUTOMATIC MODE is selected the precision motors automatically position the fibers at the optimal distance for pre-fusing, and control the amount of fiber overlap during the splice operation. After splicing, the splicer automatically calculates an estimated splice loss for individual fibers based upon inspection data obtained before and after fusion. A proof test can then be performed to verify the strength and physical integrity of the splice. A shrinkable protection sleeve is then applied and shrunk in the built-in heater to protect the completed splice.



Figure 1. Type-65M24 Fusion Splicer

## 1.1 Unpacking the Fusion splicer

Please check to make sure that the following items have been included:

### ■ Standard Splicer Contents

Part name	Quantity	Model
● TYPE-65M24 main unit	1pc	
● Power supply unit (Battery charger with AC adapter)	1pc	PS-65
● AC Power Cord	1pc	PC-AC2
● Cooling tray	1pc	
● V-groove brush	1pc	
● Spare electrodes	1pair	ER-M24
● Operation manual	1pc	
● Carrying case	1pc	
● Mirror-protection glass(spare)	1pc	

### ■ Standard Accessories (Standard Kit Only)

Item	Model	Quantity	Remarks
Fiber holder	FH-025	1pair	For 0.25mm Single fiber
	RHS-12	1pair	For 12c ribbon fiber
	SS-50-24	1pair	For 24c ribbon fiber
Fiber Cleaver	FC-6M24-C	1unit	Fiber cleaver with off-cut collector for single fiber and up to 24c ribbon fiber.
Jacket Remover	JR-5M24	1unit	Automated jacket stripper for up to 24 count ribbon fiber.

For more information of other contents or detail attachments, apply to your consulting service personnel.

## 1.2 Specifications

### ■ Optical Fiber Requirements

Material	Silica Glass
Profile Type	Single-mode, Multi-mode, Dispersion Shifted
Fiber Diameter	125 μm
Fiber Coating Diameter	250 μm (250 or 900μm for single)
Fiber Pitch (ribbon fiber)	250 μm
Fiber Count	1, 2, 4, 6, 8, 10, 12, 16, 24 (Factory or Field Constructed Ribbons)
Cleave Length	10 mm

■ *Size and Weight*

Size	150W X 175H X 150D mm, (5.9W X 6.9H X 5.9D inches)
Weight	3.3 Kg (7.3lbs)
Display	Adjustable 5.6" Color LCD monitor

■ *Power Source*

AC	100 to 240V 50/60 Hz
DC	12V
Battery Type	NiMH (Approximately 10 to 15 splices including heat cycle per fully charged battery in a warm location around ground level)

■ *Environmental Conditions*

Operation Temperature	0° to 40°C (32° to 104°F)
Operation Humidity	95% RH Non-Condensing
Storage Temperature	-40° to 60°C (-40° to 140°F)
Altitude	0-3660 meters (12000 ft) for 12c ribbon 0-2500 meters (8200 ft) for 24c ribbon

■ *Standard Performance*

Typical Splice Loss (Identical Fibers)	SMF: 0.05 dB MMF: 0.03 dB DSF: 0.07 dB
Splice Cycle Time	35 Seconds (24c ribbon)
Heater Cycle Time	135 Seconds (24c ribbon, FPS-8)
Splice Data Storage	500 Splices

■ *External Terminals*

Data Communications	9 Pin D-Sub Connector RS-232C
12 VDC Output	Accessories (i.e. Heated Jacket Remover)
Video Output	RCA Jack – Video Signal

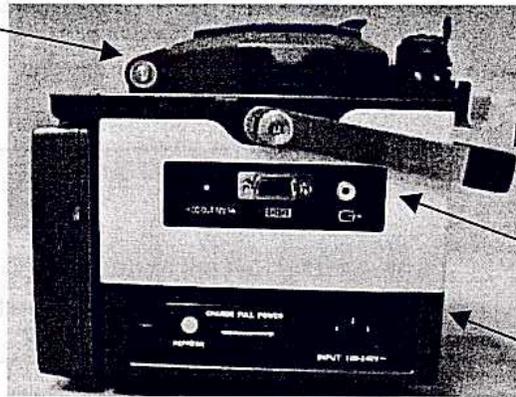
■ *Programs*

Splice programs	48 (Maximum)
Fusion Parameters	5 typical Arc Parameter etc.

### 1.3 Structure

#### 1) Main Body

Wind Protector Hood



Carrying Handle

Input/Output Panel

Power Module Slot

Figure 2. Side View

Keypad Control Panels

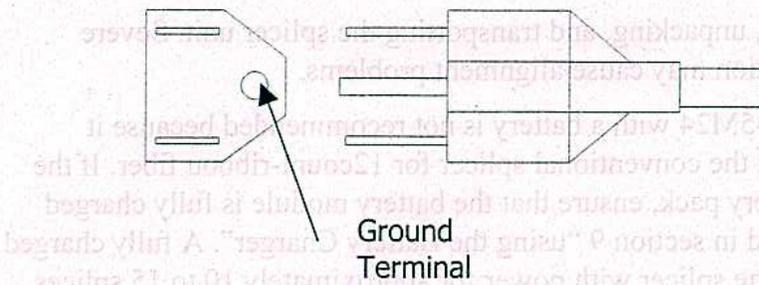


Fiber Protection Sleeve Heater

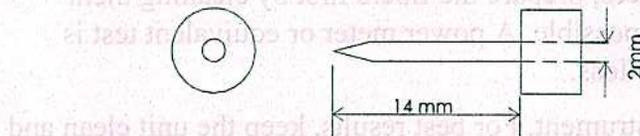
LCD Monitor

Figure 3. Top View

## 2) AC Power Cord [PC-AC2]



## 3) Electrode [ER-M24]



## 4) Input/Output Panel

The input/output panel is located on the lower right hand side of the fusion splicer's main body.

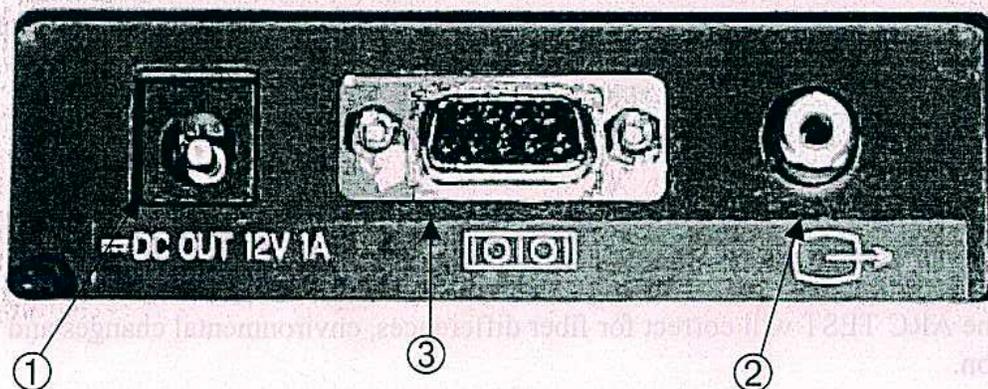


Figure 4. Input/Output Panel

No.	Item	Description
①	12V DC Output Terminal	Used to supply 12VDC power for JR-5. This terminal may not supply enough power for JR-5M24 during arc or heating process. Please use exclusive AC adapter for JR-5M24.
②	Video Output Terminal	An NTSC video signal is output from this terminal. Can be used to monitor fusion splicing process on an external video monitor, or to print screen image by connecting it to a video printer.
③	RS-232C Terminal	Can be used to download stored splice loss data when connected to a personal computer, or to print stored data.

## 1.4 Operating Recommendations

1.4.1 Exercise care when packing, unpacking, and transporting the splicer unit. Severe mechanical shock or excessive vibration may cause alignment problems.

1.4.2 Generally, the use of Type-65M24 with a battery is not recommended because it consumes more electrical power than the conventional splicer for 12count-ribbon fiber. If the splicer is to be powered on with battery pack, ensure that the battery module is fully charged according to the procedures contained in section 9 “using the Battery Charger”. A fully charged BU-65 battery (option) can provide the splicer with power for approximately 10 to 15 splices including heating cycles in a warm location around ground level.

1.4.3 To ensure low-loss and quality splices, prepare the fibers first by cleaning them carefully and then cleaving as accurately as possible. A power meter or equivalent test is recommended for final verification of splice loss.

1.4.4 The fusion splicer is a precision instrument. For best results, keep the unit clean and handle it with care.

1.4.5 Ensure the splicer is dry before operating it. If necessary, dry the splicer with a hair dryer before operation.

1.4.6 When cleaving the fibers, do not allow the waste fibers to build up around the fusion splicer and cleaver. Account for each loose fiber, pick it up with cello-tape, wrap it, and dispose of it properly.

1.4.7 When transporting the fusion splicer, use its padded transport case to protect it from dust, dirt, moisture, shock, and impact.

**Note:** Before starting each splicing session, perform an ARC TEST to ensure the proper arc settings and optimum splice quality.

1.4.8 The ARC TEST will correct for fiber differences, environmental changes and electrode deterioration.

Figure 4 Input/Output Panel

No.	Item	Description
①	12V DC Output Terminal	Used to supply 12VDC power for JR-2. This terminal may not supply enough power for JR-2M24 during arc or heating process. Please use exclusive AC adaptor for JR-2M24.
②	Vision Output Terminal	An NTSC video signal is output from the terminal. On the rear to monitor a fusion splicing process on an external video monitor or to print a video image by connecting it to a video printer.
③	RS-232C Terminal	Can be used to download stored splice log data when connected to a personal computer or to print stored data.

# Parts and Ordering Information

## 2.0 Parts and Ordering Information

Please order new items with the item description and the part number to our service personnel when you need.

### 2.1 Standard Equipment

Part name	Quantity	Model
●TYPE-65M24 main unit	1pc	
●Power supply unit (Battery charger with AC adapter)	1pc	PS-65
●AC Power Cord	1pc	PC-AC2
●Cooling tray	1pc	
●V-groove brush	1pc	
●Spare electrodes	1pair	ER-M24
●Operation manual	1pc	
●Carrying case	1pc	
●Mirror-protection glass(spare)	1pc	

### 2.2 Optional Accessories

Item	Model	Remarks
Fiber holder	FH-025	0.25 mm Single fiber
	FH-09	0.9 mm Single fiber
	SM-2U	2c Ribbon fiber Wave type
	SM-4U	4c Ribbon fiber Wave type
	SM-8U	8c Ribbon fiber Wave type
	TH-10	10c(Thick)Ribbon fiber Flat type
	TH-12	12c(Thick)Ribbon fiber Flat type
	SS-50-2	2c Ribbonised fiber
	SS-50-4	4c Ribbonised fiber
	SS-50-6	6c Ribbonised fiber
	SS-50-8	8c Ribbonised fiber
	SS-50-10	10c Ribbonised fiber
	SS-50-12	12c Ribbonised fiber
	RHS-12	12c(Thin)Ribbon fiber Flat type
	SS-50-16	16c Ribbon fiber type
	SS-50-24	24c Ribbon fiber type

Item	Model	Remarks
Fiber cleaver	FC-6M	For single fiber and up to 12c ribbon fiber offcut collector is available as option.
	FC-6MC	Fiber cleaver with offcut collector for single fiber and up to 12c ribbon fiber.
	FC-6M24-C	Fiber cleaver with offcut collector for single fiber and up to 24c ribbon fiber.
Jacket Remover	JR-5	For up to 12 count ribbon fiber
	JR-5M24	Automated Jacket Remover for up to 24 count ribbon fiber.
	JR-22	For 0.25, 0.9 mm single fiber
Battery	BU-65	Standard battery for Type-65/37 series.
Ribbonizer	FTA-02	Fiber arrangement tool for up to 12c ribbon fiber.
RS232C cable	PC-65	For DOSV-family PC
	PR-65	For PC98-family PC

### 2.3 Consumables

Item	Model	Remarks
Replacement Electrodes	ER-M24	Electrodes for Type-65M24
Fiber protection sleeve	FPS-1	1pack(50pcs.)Single fiber
	FPS-5	1pack(25pcs.)1 to 8c ribbon fiber
	FPS-6	1pack(25pcs.)10 to 12c ribbon fiber
	FPS-8	1pack(10pcs.)16 to 24c ribbon fiber
Consumable kit for FTA-02	FAC-24	Adhesive, Applicators, pick

# Setting the Splicer

## 3.0 Setting the Splicer

### 3.1 Splicing Accessories

3.1.1 Before splicing collect all of the necessary equipment:

- Cleaver
- Jacket Remover
- Fiber Holders
- Fiber cleaning supplies including 99% alcohol and lint-free gauze wipes
- Fiber Protection Sleeves

⤷ *Note: If using a heated jacket remover, allow the unit to heat up prior to use. (Refer to manual on JR-5)*

### 3.2 Adjusting the LCD Monitor

3.2.1 The Type-65M24 LCD monitor can be raised/lowered for optimum viewing angles. There are 2 possible locations:

- Operating Position
- Storage Position

3.2.2 Raising the monitor as shown in Figure 5 allows you to alternate between operation and storage positions.

⤷ *Note: Do not rotate the LCD monitor exceeding the maximum limit of 90 degrees.*

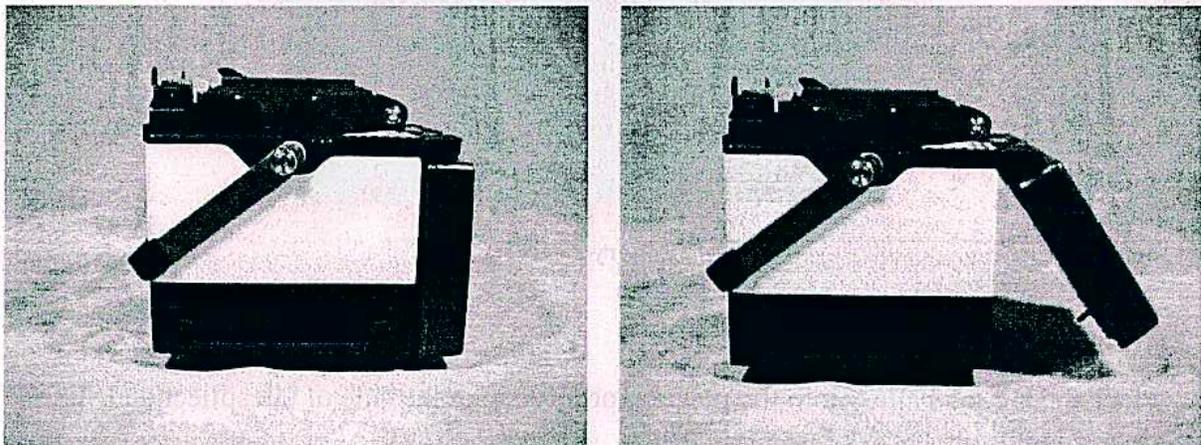


Figure 5. Positioning LCD Monitor

### 3.3 AC Operation

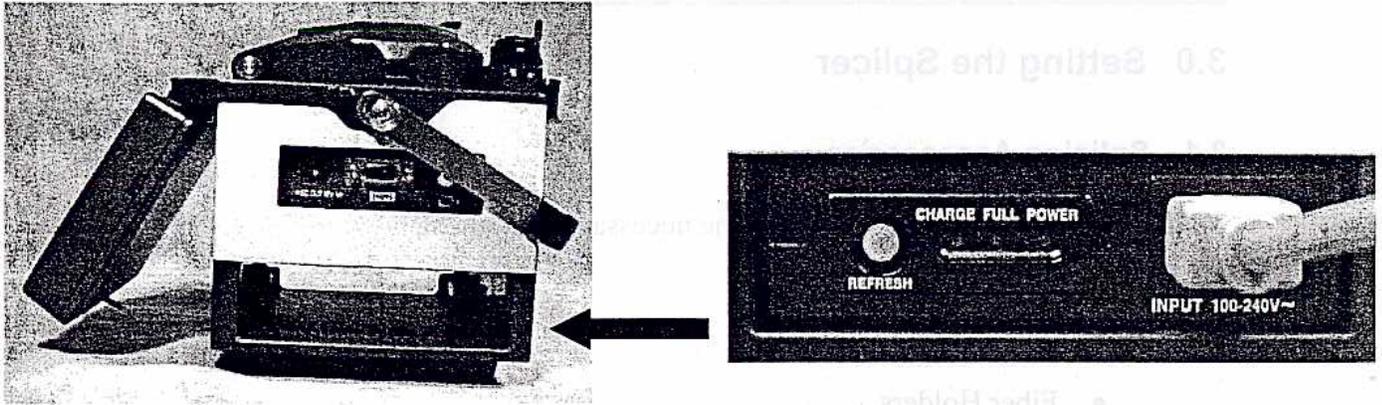


Figure 6. AC Operation

1. Insert the AC Power Supply/Charger into the power module slot and connect the power cord to AC input terminal. Next, insert the other end into an AC outlet.
2. On the right, top panel keypad, press the <I> button. When initialization is complete the splicer will display the SPLICE MODE screen.

### 3.4 Battery Operation

3.4.1 The Type-65M24 will operate on a fully charged battery pack. The battery level indicator is located in the lower left hand corner of the LCD monitor as shown in Figure 7. To help extend battery operation time refer to Section 12.6, *Power Management Functions*.

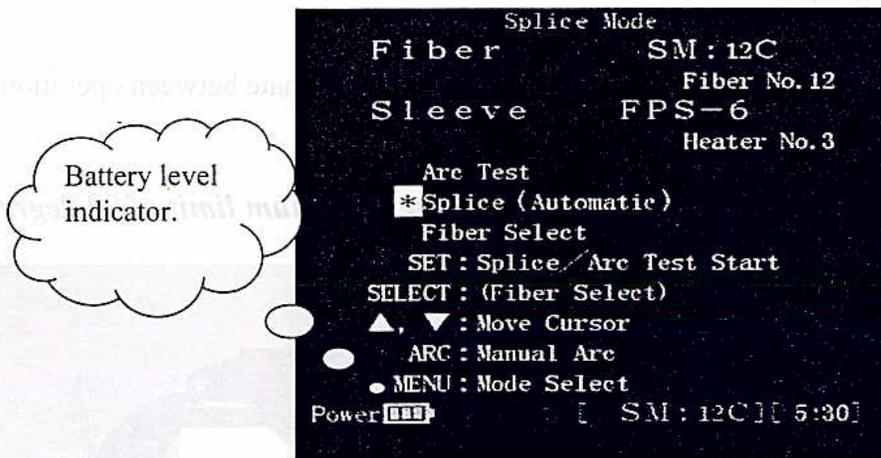
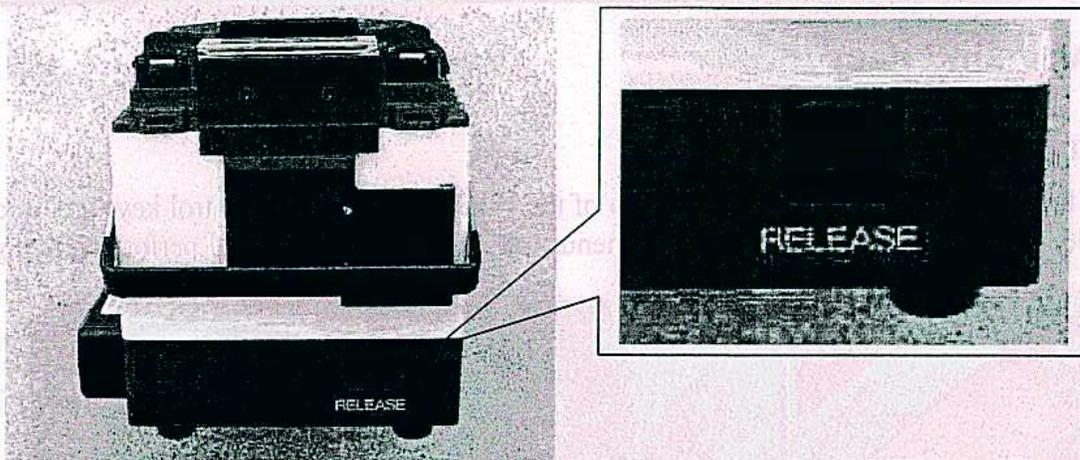


Figure 7. Battery Level Indicator

### Installation

1. Place the BU-65 battery into the power module slot on the side of the splicer and slide forward until the battery locks into place.
2. On the right, top panel keypad, press the <I> button. When initialization is complete the splicer will display the SPLICE MODE screen.

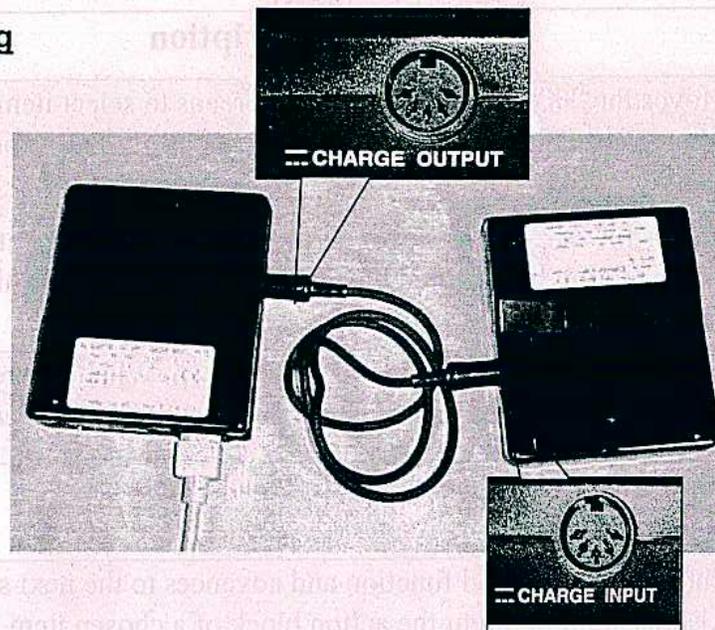
## Removal



**Figure 8. Battery Installation**

1. Remove the battery by pressing the RELEASE button located on the rear of the splicer.
2. While pressing the RELEASE button slide the battery out of the power module slot until it is free from the splicer.

## Battery Charging



**Figure 9. Battery Installation**

1. Plug the AC Power Module/Charger into an AC Outlet. Then, using the battery charger cord plug one end into the CHARGE OUTPUT terminal and the other end into the CHARGE INPUT terminal. Press the "Refresh" button to begin the charging process.
2. Charging will take approximately 2 hours, and an LED will indicate when charging is complete. Please refer to Section 9, *Using the Power Supply/Battery Charger*, for more detailed information on the charging process.

# Software Interface

## 4.0 Software Interface

### 4.1 Using the Keypad

The console keys shown below are located on top of the splicer unit. Keypad control keys are used to select highlighted menu options displayed in menus on the monitor screen and perform splicing operations.

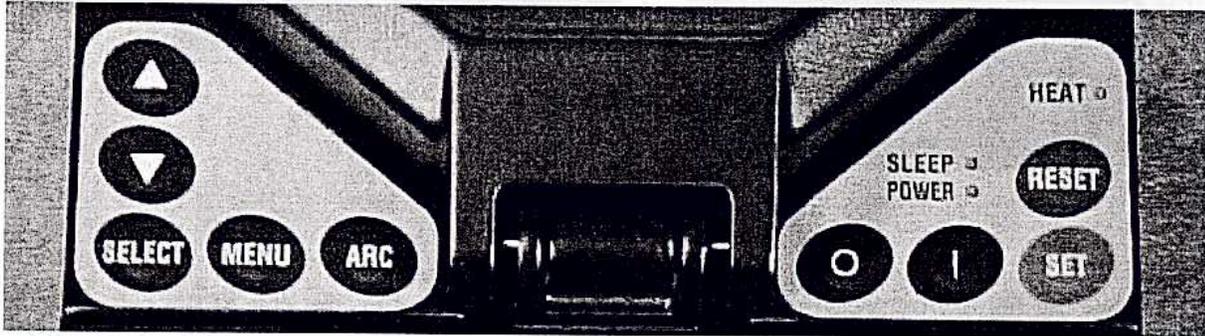


Figure 10. Key Pad

Key	Description
△	Moves the “*” cursor up, in menu screens to select items. When editing highlighted blocks this key is used to scroll through each available item.
▽	Moves the “*” cursor down, in menu screens to select items. When editing highlighted blocks this key is used to scroll through each available item.
MENU	Used to access the MENU SELECT screen. When entered into a MODE this key can be used to back space one step. (Ex. when entering numbers)
ARC	Used for manual re-arcng of a completed splice.
SELECT	Chooses the selected function and advances to the next screen. Also used to highlight the action block of a chosen item.
○	Turns splicer off. You should always turn off the power before starting a process.
	Turns splicer on.
SET	Begins splicing operation and ARC TEST.
RESET	Returns the splicer to the initial menu screen. Used to abort a splicing operation.
HEAT	Starts the protection sleeve heater. Orange LED illuminates during the heater operation.

**Caution:** Do not turn off the power during a memory writing yellow mark is appearing in right of the battery mark at the bottom of the screen, otherwise the splicer memory may be destroyed.

➤ **Note:** The “SLEEP” LED located at the top of the right keypad will illuminate green when power save mode is active. The splicer is re-activated by pressing any key.

## 4.2 Selecting and Editing Action Blocks

4.2.1 Action blocks are used to edit various functions and numeric inputs throughout the splicer menus. They are indicated on screen by a double bracket as show in Figure 11. For example, to change the available functions under HEATER CONDITION, perform the following procedure:

1. Press <SELECT> to highlight the action block.
2. Use the arrow keys to scroll through each function.
3. Press <SELECT> to accept a change or press <MENU> to return to the previous step.

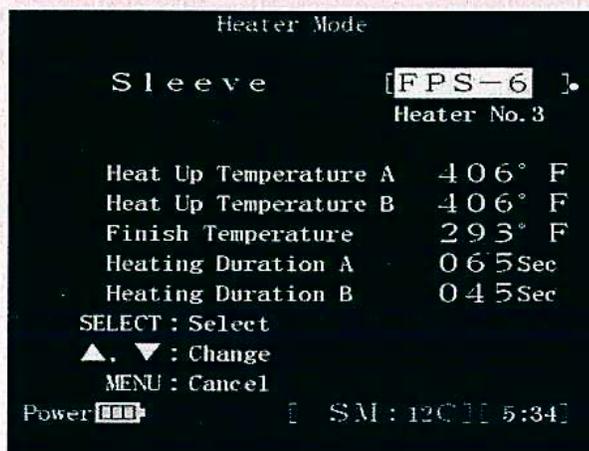


Figure 11. Editing Action Blocks

➤ **Note:** When editing action blocks or numeric values, press <RESET> at any time to cancel and return to the splice mode menu.

## 4.3 Editing Numeric Inputs

4.3.1 Entering numeric values is similar to editing a standard action block. For example, to edit a parameter input number, perform the following procedure:

1. As shown in Figure 12, the highlighted block indicates the active digit.
2. Use the arrow keys to increase/decrease the digit to desired value.
3. Press <SELECT> to accept change and advance to the next digit. Repeat Step 2 and 3 until last digit is entered.
4. When the final digit is chosen, pressing <SELECT> will advance the screen to the parameter entered.

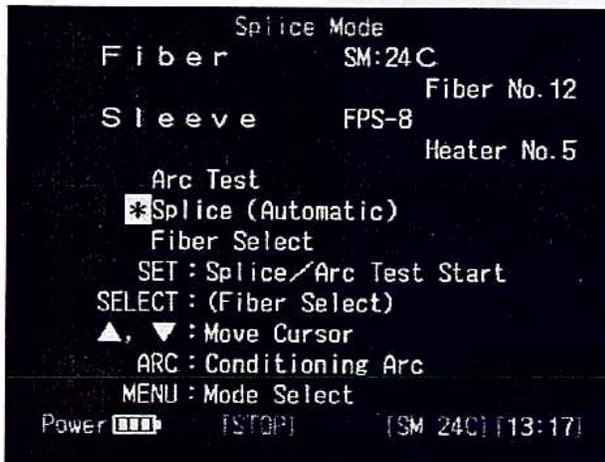


Figure 12. Editing Numeric Values

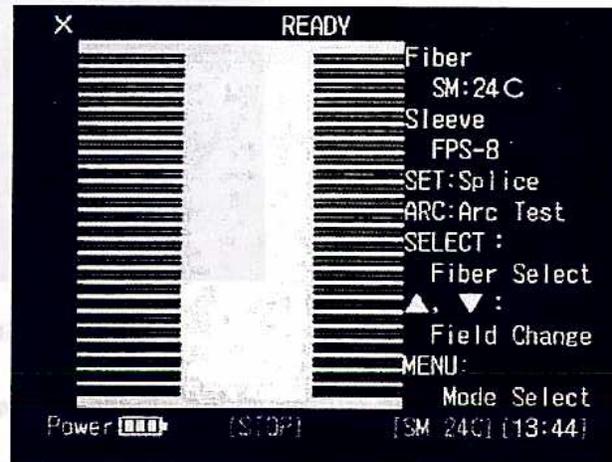
 **Tip:** If a digit was entered incorrectly pressing the <MENU> key will return to the previous step.

#### 4.4 Initial Screen

After the initialization of the splicer movement, splicer shows the initial screen. You can choose the initial screen by two styles; original Splice Mode screen with detail information or the screen with the fiber view window. To change style please refer to Section 12.6 Changing Fusion Splicer System.

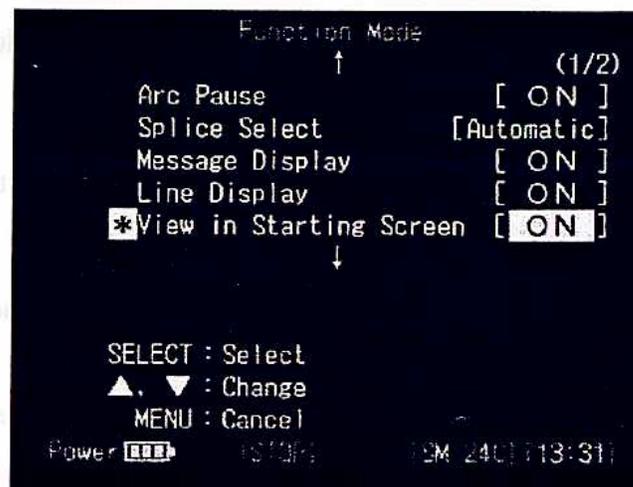


A) Detail Information Style



B) Fiber View Style

Figure 13. Initial Screen of Splice Mode



## 4.5 Self-inspection

If you allow the splicer to diagnose its hardware condition at the beginning of each use, the function of simple self-inspection is available.

Before starting an initialization by turning ON the power, the splicer performs the simple self-inspection to diagnose the hardware status as shown in Figure 15. Each square expresses the inspection item and the progress is checked by being painted. Do not open the hood till the process completes. If the splicer detects any defects, self-inspection stops with showing the error message and red mark of item.

To skip this self-inspection press “RESET” key. After completion of this self-inspection the splicer start initialization.

➤ **Note:** When the hood is open optical parts can not be inspected and error message appears. Close the hood and try again.

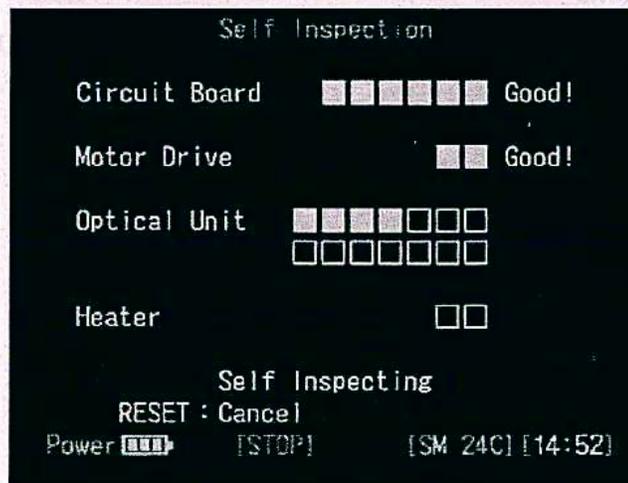


Figure 15. Self Inspection Screen

You can select whether or not to use this function by changing the following parameter. Regarding how to change a parameter, refer to Section 12.8.

Parameter No.	Name	ON	OFF
351	SELF INSPECTION	001	000

# Preparing the Operation

## 5.0 Preparing the Operation

### 5.1 Splicing Steps Summary

5.1.1 This procedure assumes the cable has already been prepared and the fibers have been separated and cleaned. The following is a summary of the steps required to make a splice with the fusion splicer:

- Turn the splicer on
- Plug in the heated jacket remover to its proper power source terminal and allow it to warm up for approximately 20 sec.
- Check/set the splice program that matched fiber being spliced
- Put a protection sleeve over one of the fibers
- Place the fibers into the appropriate fiber holders
- Remove the fiber jackets
- Clean the bare fibers
- Cleave the fibers
- Insert the fibers into the splicer
- Start the automatic splice process
- Slide the protection sleeve over the splice
- Reinforce the splice
- Remove the protected splice and store it.

### 5.2 Splice Mode Menu Functions

5.2.1 The SPLICE MODE menu is the screen the splicer will show when first turned on, or when the <RESET> key is pressed. This menu screen allows the fusion splicer to be set up to splice different types of fibers with various ribbon fiber counts or single fibers. Up to 48 splice programs (factory programmed) optimized for various splicing scenarios can be stored and recalled. Each program specifies five arc parameters: arc power, fusion duration, pre-fusion time, arc gap, and overlap, to accommodate a variety of fiber types and splicing conditions. The programs are retained when the splicer is turned off.

#### Splice

- **SPLICE (AUTO):** Sets automatic fusion splicing, and loss estimation.
- **ARC TEST:** Compensates for environmental changes by melting and measuring the fiber end faces to ensure proper arc power.

#### Splice Condition

- **FIBER SELECT:** Set up the splice program to be spliced. Select the matched fiber type and fiber count.  
Fiber types include SMF, MMF, DSF and NZDS.

### 5.3 Selecting a Fiber Type and Count

5.3.1 The current splice condition should match the type of fiber and the number of fibers to be spliced. The most recently used splice program is displayed when the splicer is turned on or when "RESET". To select or view a different splice program (i.e. SM, MM or 12C, 2C) follow these steps:

1. Case-1) [Detail Information Style]

Using the arrow keys move cursor to "Fiber Select", and press <SELECT>.

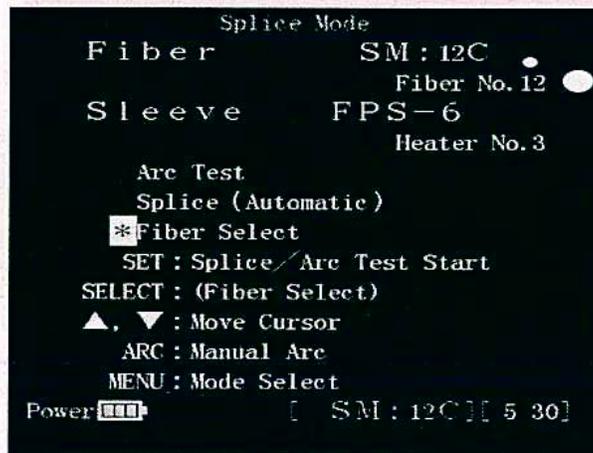
Case-2) [Fiber View Style]

Press <SELECT>.

2. Use the arrow keys to select the correct fiber type from SM, MM, DSM or NZDS settings.

Press <SELECT>.

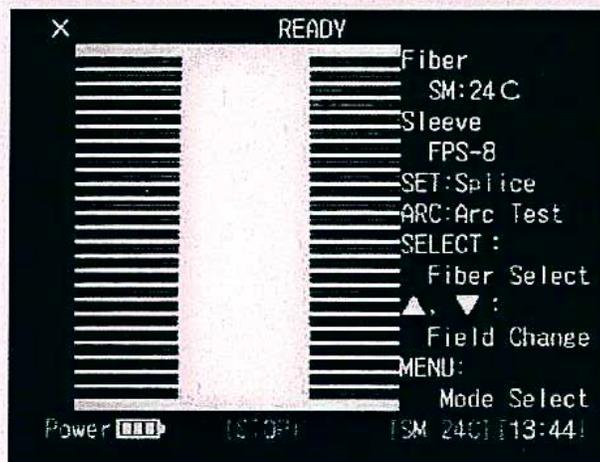
3. Use the arrow keys to select the correct fiber count to be spliced and press <SELECT>.



①

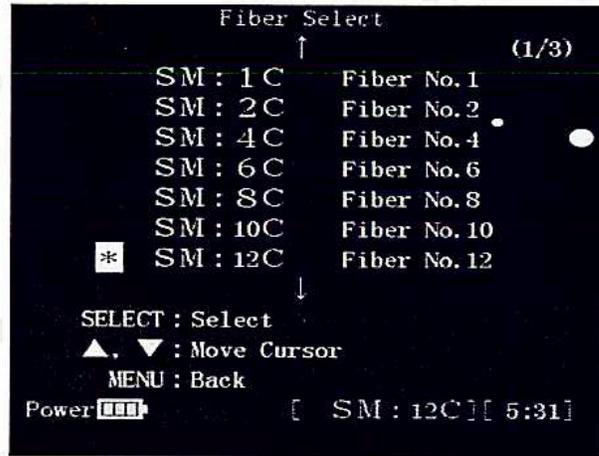
- 12C  
indicates  
number of  
fibers

A) Detail Information Style



B) Fiber View Style

②



-Indicates name of program.

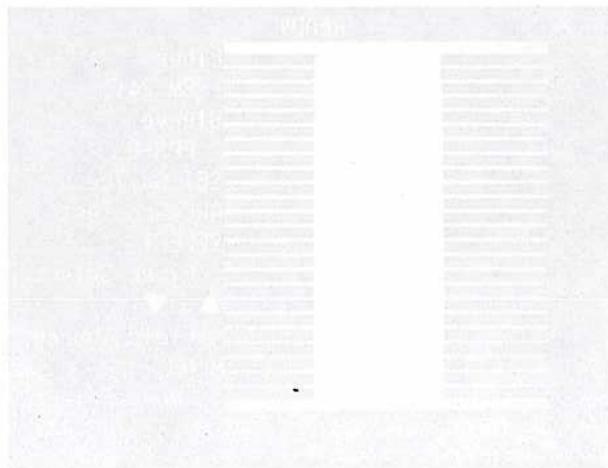
Figure 16. Selecting a Fiber Type

➤ **Note:** Program names are user definable. Refer to Section 12.7 Editing Fusion Program Names for information on customizing the name.

### 5.4 Checking a Heater Program

A current heater program is shown on SPLICE MODE screen. Check a heater program that matches with the protection sleeve to be used. To change the heater program, by referring to 12.5 “Selecting a Heater Program”, select the appropriate program to use.

- FPS-40/FPS-1: Single fiber
- FPS-5: 2-8c fiber ribbon
- FPS-6: 2-12c fiber ribbon
- FPS-8: 12-24c fiber ribbon



# Arc Test Procedure

## 6.0 Arc Test Procedure

### 6.1 When to perform an ARC Test

6.1.1 The fusion splicer has a built-in Arc Test function that should be used to ensure consistently high-quality splices. Situations that should prompt an arc test are:

- Changing fiber types or count
- Changing splice location
- Initial splicing set-up
- Use of splicer in extreme temperatures or humidity
- Poor splice performance
- Wear on electrodes
- Replacing or cleaning electrodes

6.1.2 Performing an arc test automatically adjusts the arc power level for the splice program selected, and will center the location of the fibers relative to the arc heat zone. The adjusted arc conditions are retained when the splicer is turned off.

6.1.3 This test requires two pieces of scrap fiber of the same type as that being spliced. To perform an Arc Test, perform the procedure described in the following section.

### 6.2 Preparing the Fiber

6.2.1 Sumitomo mass fusion splicing requires the use of a fiber holder system throughout the entire splice procedure. To begin, place the optical fiber in a fiber holder that corresponds to the number of fibers being spliced. Fiber holders are designed depending on the fiber coating size and fiber count. Select proper type for your use.

1. Place the optical fiber in the fiber holder with its ends protruding approximately 2.5 to 3 cm. (1 to 1 ¼ inches)

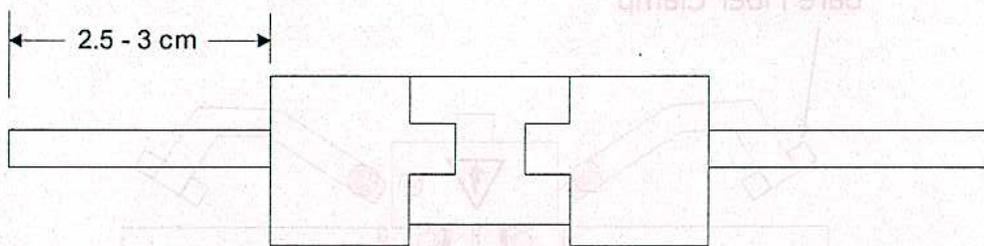


Figure 17. Placing Ribbon in Holder

2. Strip the fiber jacket using the hot jacket remover. To know how to use the jacket stripper, please refer to the manual that is provided for your stripper.

**Note:** To ensure best results do not remove fiber from fiber holders from this point.

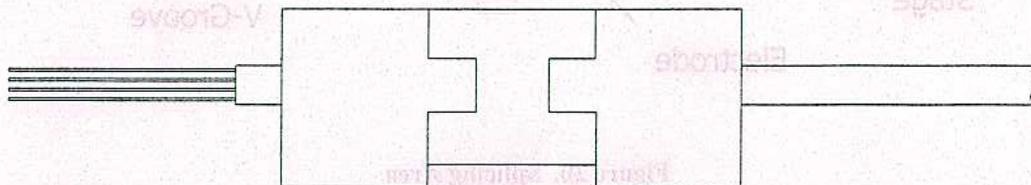


Figure 18. Ribbon With Coating Removed

- Clean the bare fibers with a lint-free gauze pad moistened with pure alcohol, and wipe 1-2 times to remove any coating residue.

⤷ *Note: For best results pay special attention when cleaning the section of fibers closest to the fiber holder. Any residue left will cause the fibers to fan out and increase chances for high splice losses.*

- Lay the fiber holder into the fiber cleaver ensuring the fibers lie flat and do not cross over each other. If crossovers are found, lightly brush the fiber ends with your fingers to fan out all fibers in a straight line. Referring to the procedures for use of the cleaver, cleave the fibers.

**WARNING: Glass-fiber fragments are extremely sharp and may puncture the skin.**

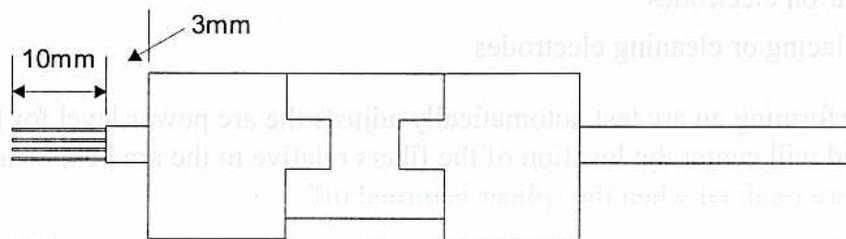


Figure 19. Cleaved Ribbon

⤷ *Note: Do not re-clean fibers after cleaving.*

- Immediately after cleaving the fibers place the fiber holder on the stage of the splicer to avoid chipping or damaging the delicate fiber end. Place the fiber holder so that its hinge is positioned toward the rear of the splicer or the label of the fiber holder is put in ordinary direction. If there is an arrow symbol on the fiber holder, make the symbol directed to the V-grooves.

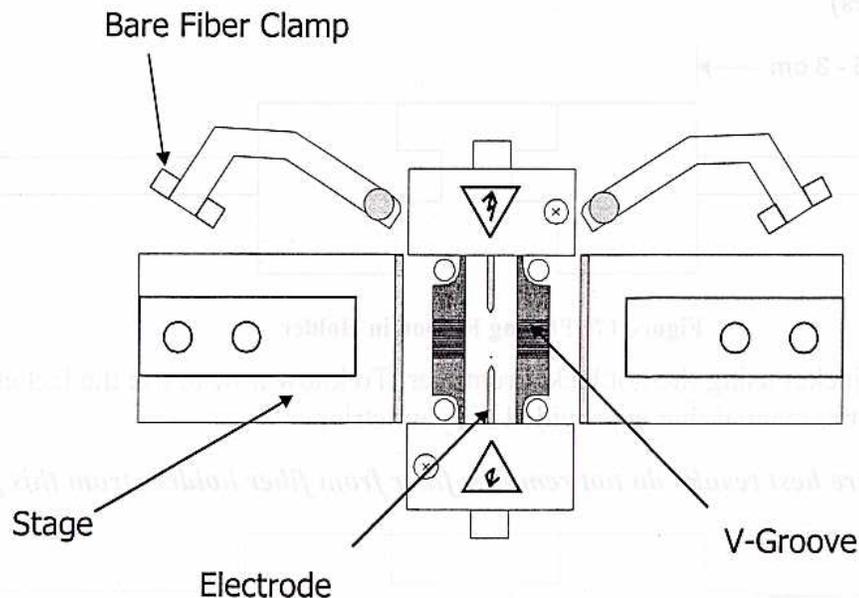


Figure 20. Splicing Area

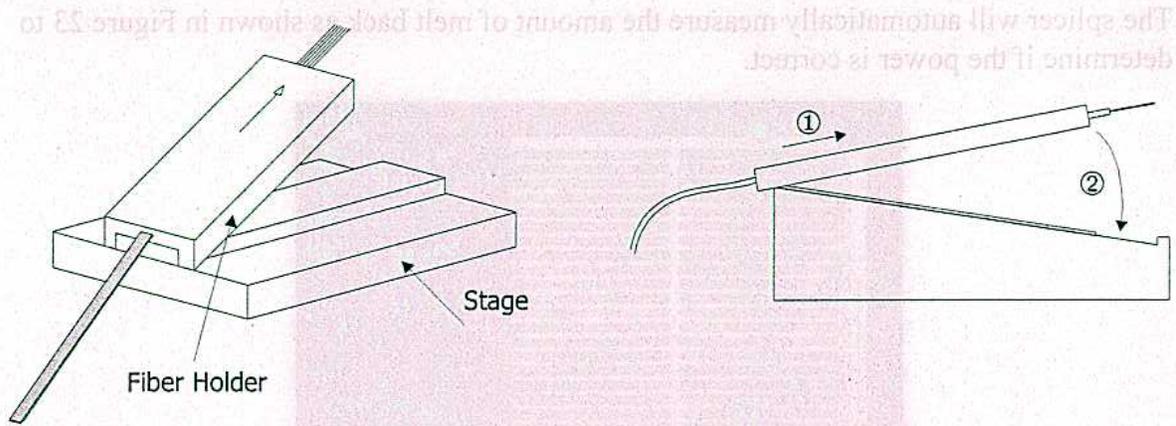


Figure 21. Positioning Fiber Holder

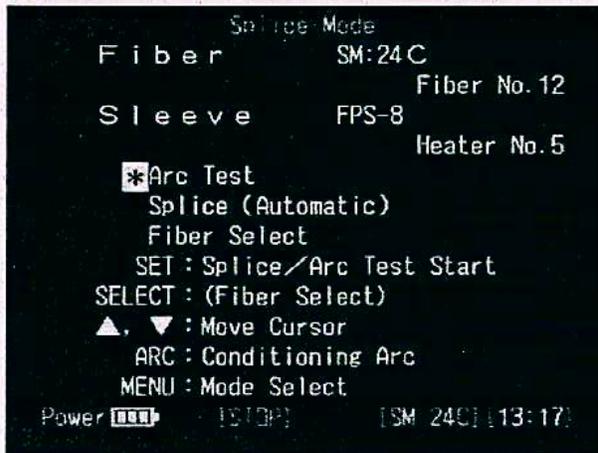
⤷ **Note:** Do not allow the fiber end faces to touch anything or slide horizontally in the bottom of the v-grooves. This will damage or contaminate the fiber end faces.

6. With the fiber holder seated on the stage, lowering the fiber holder and sliding it forward should place the fibers inside the v-grooves. Check to make sure the fibers are seated properly inside each v-groove. Moving the fiber holder slightly forward and backward 1 to 2mm will aid in verifying proper position.
7. Close the bare fiber clamps by lifting and rotating arm towards the v-grooves. Lock the fiber holder clamps to fix them.
8. Close the hood.

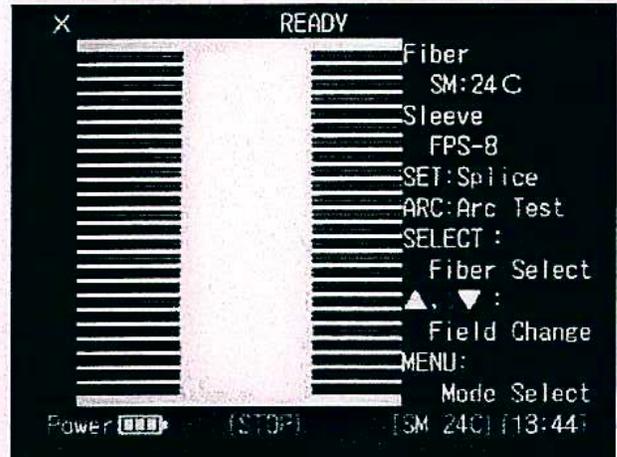
### 6.3 Performing an Arc Test

To perform an Arc Test, use the following procedure.

1. Select a fusion program to match the fiber type and count to be spliced. *Refer to Section 5.3*
2. Case-1) [Detail Information Style]  
From the SPLICE MODE menu screen, move the cursor to ARC TEST, and press <SET> to begin the test as shown in Figure 22.
- Case-2) [Fiber View Style]  
Press <ARC>.



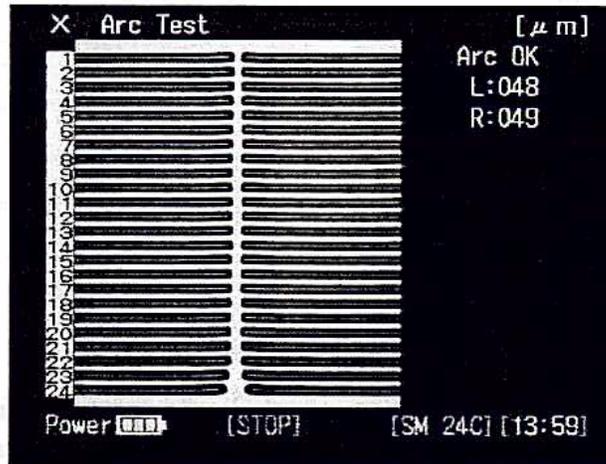
A) Detail Information Style



B) Fiber View Style

Figure 22. Initial Screen of Splice Mode

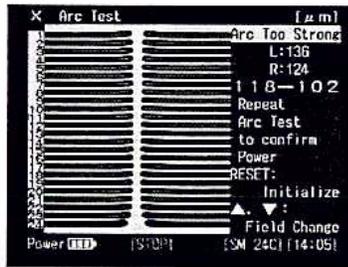
- The splicer will automatically measure the amount of melt back as shown in Figure 23 to determine if the power is correct.



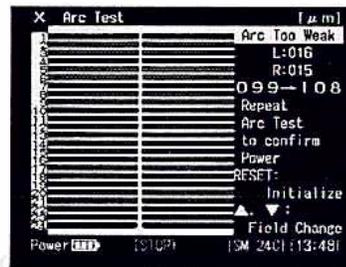
ARC OK

Figure 23. Performing an ARC Test

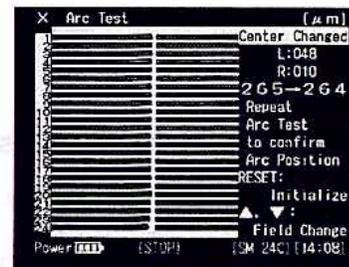
- If arc power was indicated to be “TOO WEAK” or “TOO STRONG” or “CENTER CHANGED”, the splicer will automatically self-adjust to the optimum level. Repeat the test until the words ARC OK appear.



Too Strong



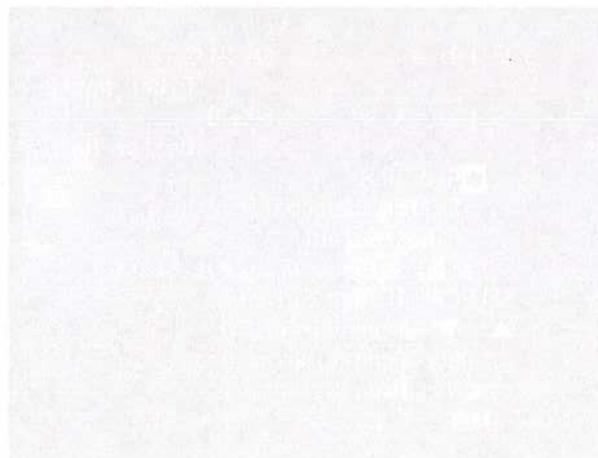
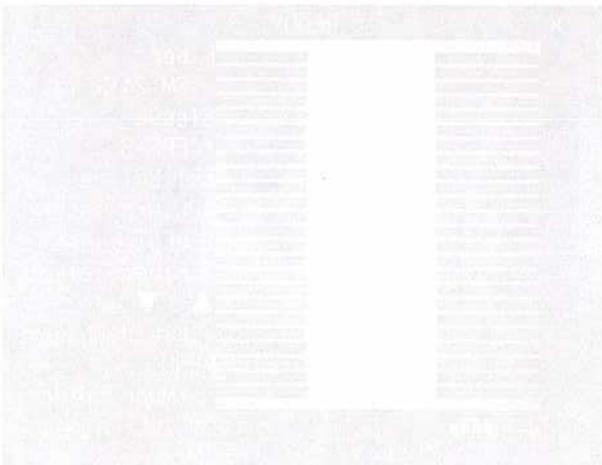
Too Weak



Center Changed

Figure 24. Performing an ARC Test

- When the words “ARC OK” appear the splicer will automatically reset and is ready to begin splicing.



# Splice Operation

## 7.0 Splice Operation

### 7.1 Preparing the fiber

To start the splice operation, prepare the fibers in the same way as in arc test. Be sure to slip the fiber protection sleeve over one of the fibers to be spliced before stripping and cleaving the fibers.

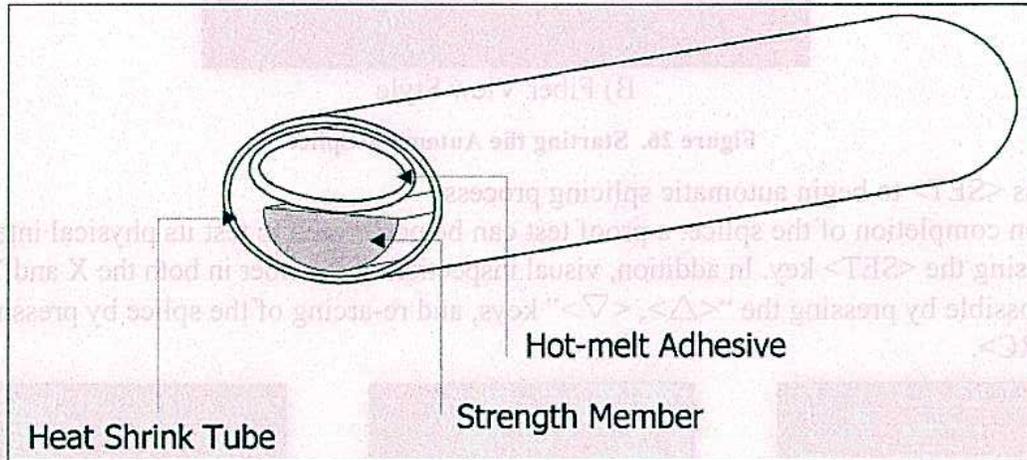
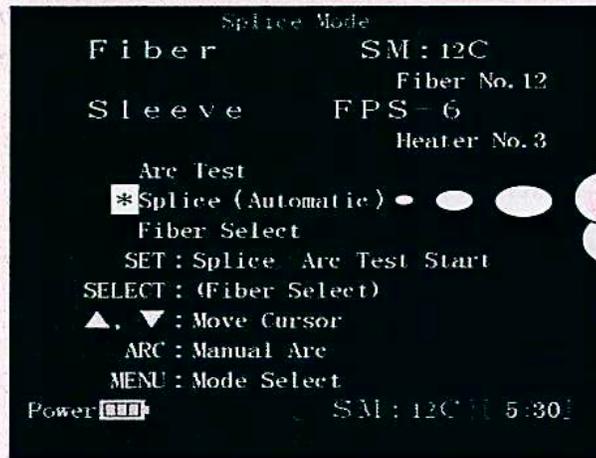


Figure 25. FPS-6 Fiber Protection Sleeve

### 7.2 Starting the Automatic Splice

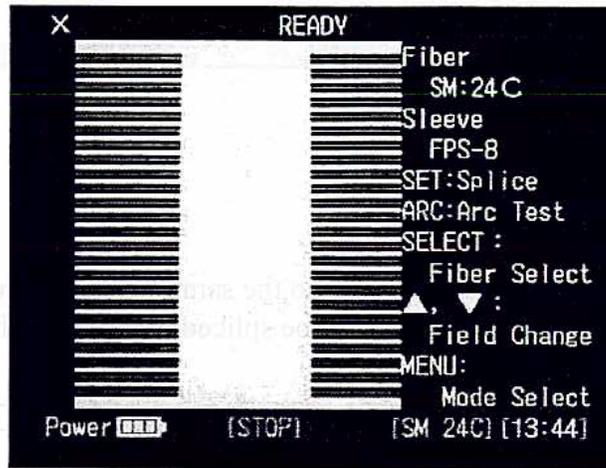
7.2.1 This process assumes the splicing mode has been set, a fiber protection sleeve has been installed and both fibers have been inserted in the splicer.

1. With the hood closed, and the splicer in the "SPlice MODE" menu screen, move the cursor to "SPlice" as shown in Figure 26.



Ensure (Automatic) is showing in brackets. Refer to Section 12.6.

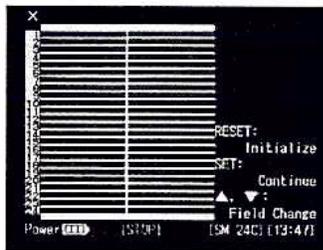
A) Detail Information Style



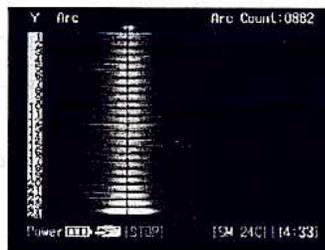
B) Fiber View Style

Figure 26. Starting the Automatic Splice

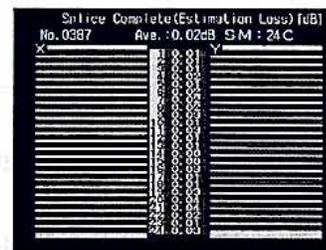
2. Press <SET> to begin automatic splicing process.
3. Upon completion of the splice, a proof test can be performed to test its physical integrity by pressing the <SET> key. In addition, visual inspection of the fiber in both the X and Y view is possible by pressing the “<△>, <▽>” keys, and re-arc-ing of the splice by pressing <ARC>.



a)



b)



c)

Figure 27. Splicing Process

⦿ Note:

- During the automatic splice the splicer will immediately move the fiber ends into place, and the magnified view will appear on the LCD screen.
- The fusion splicer automatically inspects and splices the fibers and provides a loss estimation. When you press “<△>”, “<▽>” upon completion of the splice, two times magnified images can be seen.
- When you press “MENU” upon completion of the splice, inspection data and images can be seen by following the on-screen instructions.



By selecting "Splice Data" you can see the inspection data.

Offset	CutL	CutR	Gap	Irregular (1/5)
1	0.7	1.5	1.2	021 L:030
2	1.0	0.6	0.6	027 R:013
3	1.1	1.2	1.1	028
4	1.2	1.0	0.6	024
5	1.1	1.6	1.1	035 ▲ :
6	1.4	2.1	2.2	046 Write Memo
7	1.5	1.6	2.2	044 SELECT :
8	1.2	2.2	1.2	050 Data Store
9	2.1	0.5	0.4	053 ARC :
10	1.4	0.2	0.7	046 Next Page
11	2.2	0.6	0.8	048 MENU:
12	1.0	1.2	1.2	058 Cancel
Power [ ] [STOP] [SM 24C] [14:35]				

A) 1-12 Data

Loss	(3/5)	
1	0.01	Fiber
2	0.01	SM : 24C
3	0.01	Fiber No. 12
4	0.02	Number 0387
5	0.01	Date 28/04/04 ▲ :
6	0.02	14:35 Write Memo
7	0.02	SELECT :
8	0.02	Data Store
9	0.03	ARC :
10	0.01	Next Page
11	0.03	Memo MENU:
12	0.01	Cancel
Power [ ] [STOP] [SM 24C] [14:35]		

B) 1-12 Loss Data

Offset	CutL	CutR	Gap	Irregular (2/5)
13	0.8	0.8	0.7	051 L:030
14	0.1	0.5	1.7	062 R:013
15	1.0	1.9	0.2	058
16	2.7	1.1	1.1	061
17	1.0	0.3	1.3	062 ▲ :
18	1.2	0.7	0.4	051 Write Memo
19	1.1	0.2	1.0	056 SELECT :
20	2.8	1.2	1.2	062 Data Store
21	2.5	1.4	1.2	058 ARC :
22	2.3	1.5	0.5	058 Next Page
23	1.2	0.7	1.1	058 MENU:
24	2.9	0.5	0.7	045 Cancel
Power [ ] [STOP] [SM 24C] [14:35]				

C) 13-24 Data

Loss	(4/5)	
13	0.01	Fiber
14	0.00	SM : 24C
15	0.00	Fiber No. 12
16	0.03	Number 0387
17	0.01	Date 28/04/04 ▲ :
18	0.01	14:35 Write Memo
19	0.03	SELECT :
20	0.04	Data Store
21	0.04	ARC :
22	0.02	Next Page
23	0.01	Memo MENU:
24	0.03	Cancel
Power [ ] [STOP] [SM 24C] [14:35]		

D) 13-24 Loss Data

Figure 29. Splice Inspection Data & View

- If you want to add a comment, press "▲" at data screen. Then the following "Write Memo" screen can be shown and you can write comment with up to 18 letters.

[A	]
ABCDEFGHI JKLMNOPQR STUVWXYZ abcdefghij klmnopqrstuvwxyzo1 23456789 !#\$%&() [] *+,-./<=>?@_:' [Enter]	
SELECT : Select	
▲, ▼ : Move Cursor    ARC : Next Line	
MENU : Cancel	
Power [ ] [STOP] [SM 24C] [14:35]	

Figure 30. Comment Screen

# Splice Protection

## 8.0 Splice Protection

The integrated heater unit is located at the rear top edge of the splicer. To reinforce the splice using a fiber protection sleeve perform the following steps:

1. Open both heater chucks. One heater chuck is attached to the heater door and will open with clamp.
2. Open the splicer hood and both bare fiber clamps.
3. Open the fiber holder lids in the order as shown in Figure 31, while maintaining a slight amount of tension on the free end of the fiber.

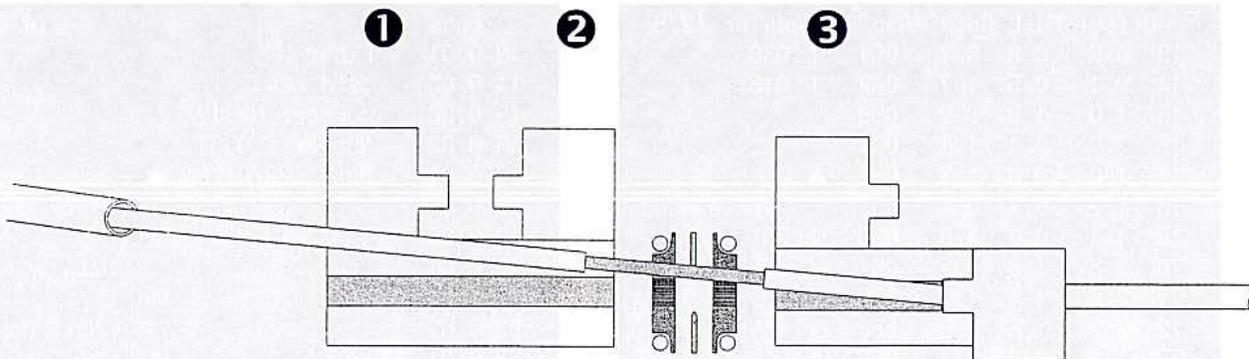


Figure 31. Opening Fiber Holder Covers

4. Keeping the last fiber holder lid closed, slide the protection sleeve toward the center of the spliced fiber.  
**Note:** *Maintain tension on free end of fiber to prevent bending or twisting of the spliced fiber which may cause the splice to break.*

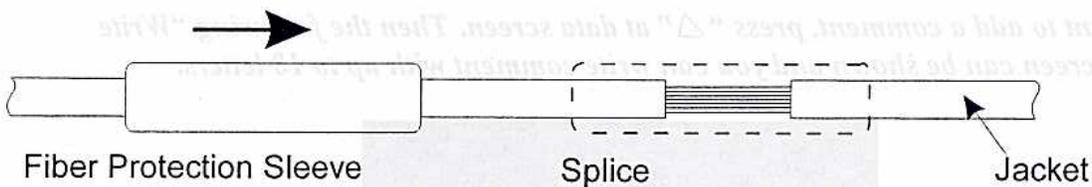


Figure 32. Sliding a Protection Sleeve

5. Open the last fiber holder lid and remove the spliced fiber from the splicer.

6. Making sure the fiber protection sleeve is centered over the spliced portion, maintain a slight tension on the fiber ends and lower the fiber onto the heater chuck arms and push down. The tension of the fiber on the clamp arms should close the heater chucks. When you use the fiber with 0.9 mm coating diameter, please be sure to press the heater chuck lids.

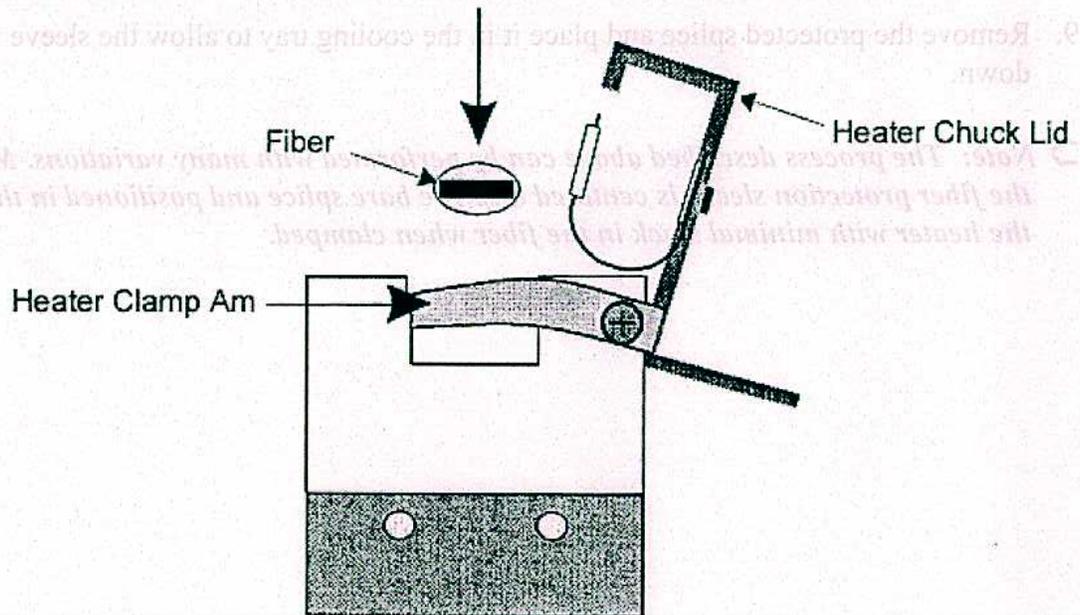


Figure 33. Closing the Heater Chucks

⤷ *Note: Make sure the strength member is resting against the heater element.*

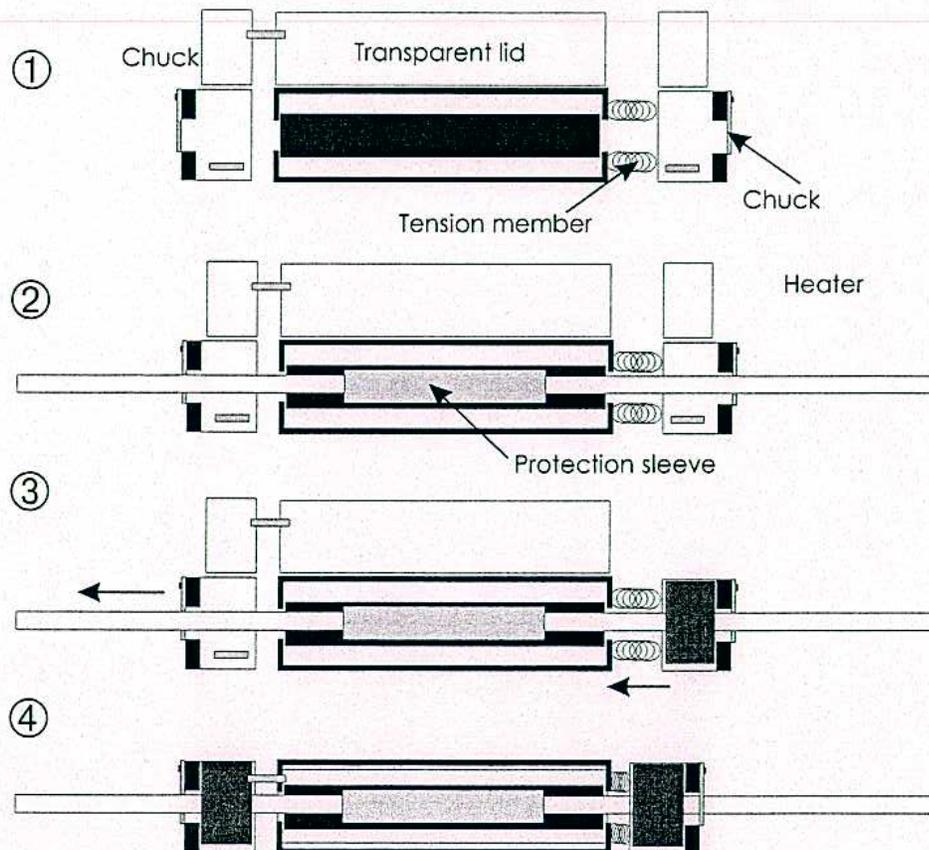


Figure 34. Placing the spliced fiber

7. The right side chuck has a built-in spring mechanism used to keep the fiber tight inside the fiber protection sleeve during the shrinking process. Referring to Figure 34, open the left heater chuck and pull the fiber to the left to activate the tension spring and close.
8. Press the <HEAT> key. An orange LED illuminates to show the heating process is carried out. When the shrinking process is finished the LED will go off and a beep will sound.
9. Remove the protected splice and place it in the cooling tray to allow the sleeve to cool down.

➤ **Note:** The process described above can be performed with many variations. Make sure the fiber protection sleeve is centered over the bare splice and positioned in the center of the heater with minimal slack in the fiber when clamped.

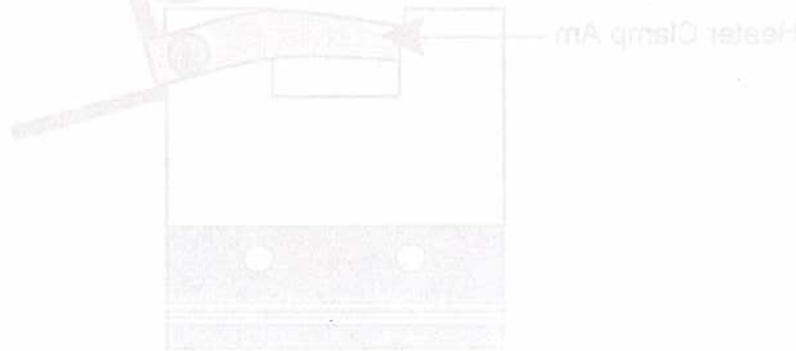


Figure 34. Closing the Heater Chucks

➤ Note: Make sure the strength member is facing against the heater chuck.

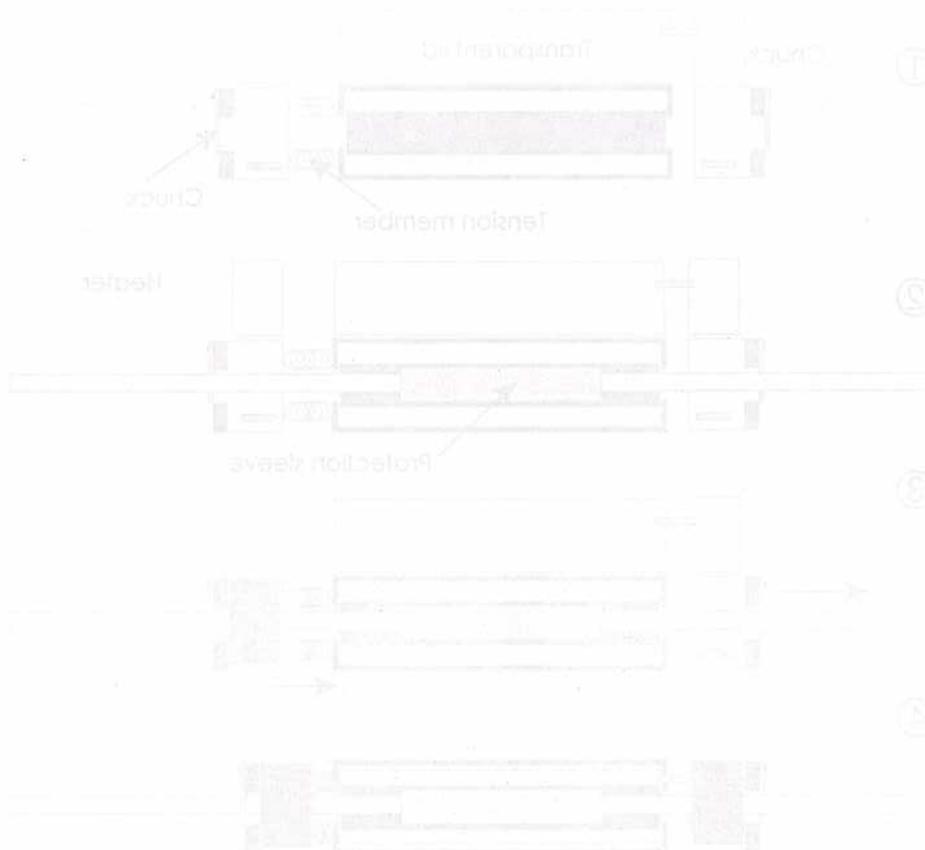


Figure 34. Fiber protection sleeve

# Using the Power Supply/Battery Charger

## 9.0 Using the Power Supply/Battery Charger

### 9.1 Description

BU-65 battery packs are re-charged using the PS-65 power supply/battery charger. The charger has 3 status LED's located on the front panel, that identify the stage of the charging process. Figure 35 describes the LED's and each various status condition.

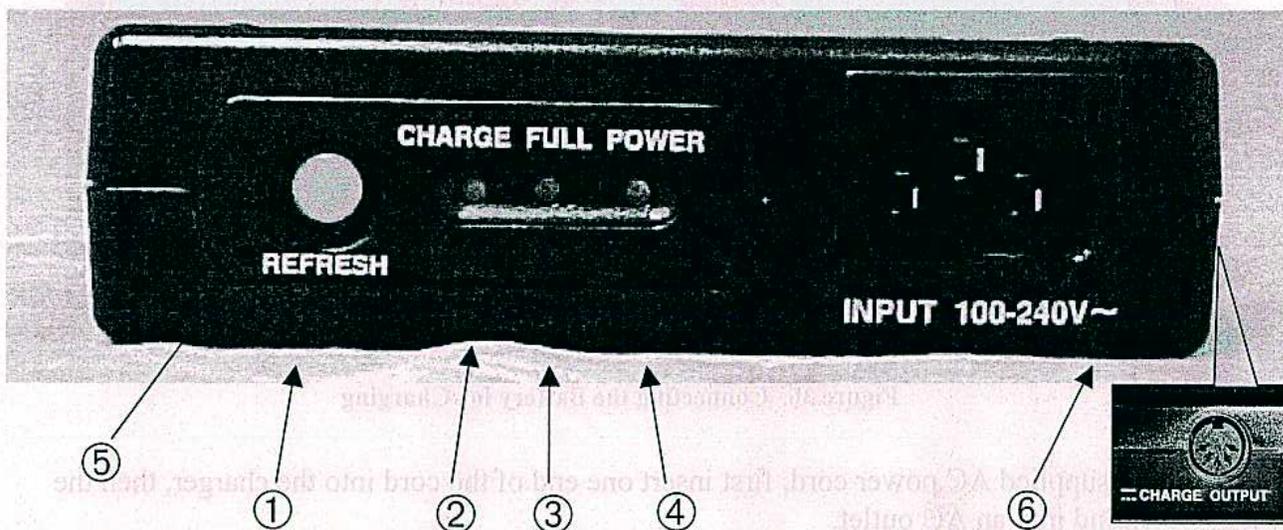


Figure 35. Battery Charger Status LED's

No.	Item	Description
①	Refresh	Used to drain any remaining battery power prior to beginning charging. When draining is complete charging automatically begins.
②	Charging (Status LED)	When lit, this LED indicates battery is being charged.
③	Full (Status LED)	When lit, this LED indicates battery is fully charged.
④	Power	When lit, this LED indicates power is on.
⑤	Refreshing (Status LED)	When lit, this LED indicates battery is being refreshed.
⑥	Charge Output	Connect battery to this terminal for charging.

⤷ **Note:** When the FULL or CHARGING LED's are flashing this indicates that using the quick charge procedure will not charge the battery effectively. Refresh battery prior to charging.

### 9.2 Charging

To extend battery life it is recommended that batteries be completely drained before re-charging. Since this is not always possible, the built in "REFRESH" function will drain any remaining power in the battery prior to charging. Approximate time required to charged a fully discharged BU-65 battery pack is 2.5 - 3 hours. To charge a battery perform the following procedure:

1. Referring to Figure 36, connect the charging cord between the “charge output” on the PS-65 battery charger and the “charge input” on the BU-65 battery.

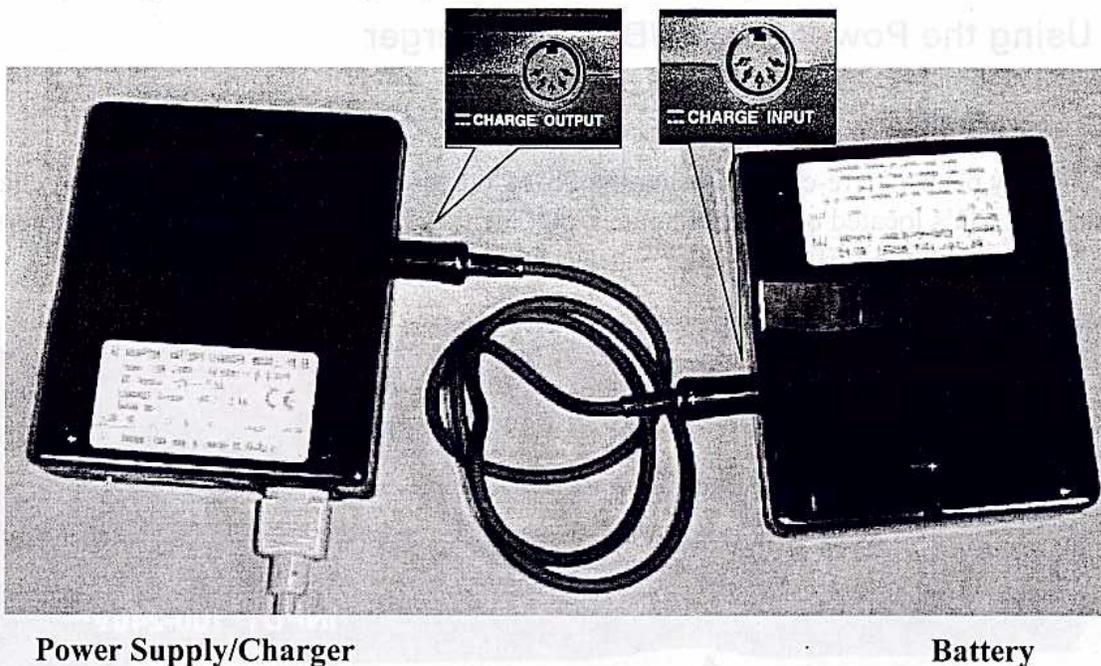


Figure 36. Connecting the Battery for Charging

2. Using supplied AC power cord, first insert one end of the cord into the charger, then the other end into an AC outlet.
3. Press the “REFRESH” button to drain any remaining power in battery.
4. When refreshing is complete the charging cycle will automatically begin. (Refer to Figure 35 for information on status LED’s.)
5. When charging is complete, the “FULL” LED will turn on.
6. Remove AC power, and disconnect battery from the charger.

### 9.3 LED Indication

LED indication status of PS-65 is as follows:

LED	Indication	Status
POWER	Lighting(Green)	When lit, this indicates AC power is supplied.
FULL	Lighting(Green)	When charge is finished.
CHARGE	Lighting(Green) Flashing	During charge (0.5sec ON/0.5sec OFF)When charge is abnormally finished. (0.3sec ON/0.2sec OFF)While waiting.
REFRESH	Lighting(Green) Flashing	While refreshing is performed. (0.5sec ON/0.5sec OFF)When charge is abnormally finished.

**Caution:** When charge is abnormally finished, try to charge the battery again. If charge is always abnormally finished, please contact our maintenance service section.

# Packing and Storage Instructions

## 10.0 Packing and Storage Instructions

The fusion splicer is a precision instrument. Its rugged shipping and storage case are custom designed to protect it from impact, dust, dirt, and moisture. Always store, transport, and ship the machine in its case. Perform the following procedure to pack the splicer unit for shipment.

1. Before packing the splicing machine, clean the critical parts: microscope lenses, LED's, clamps, and v-grooves. (Refer to Section 11.0 Maintenance)
2. Remove and store any attachments, such as cooling tray or jacket remover, from the splicer.
3. With the machine power off, replace shipping pads to protect the chucks during transit.
4. Reposition the LCD screen to front mounting position and lock monitor in place.
5. Unplug any external connectors from the input/output panel. Neatly coil up the power cords and store them in the padded carrying case.
6. Lift the fusion splicer by its handle and lower it into its padded transport case.
7. Pack any remaining accessory and consumable items.
8. Close the transport case lid and latch it.

**WARNING:** Discard the liquid solvent properly before packing the dispenser in the case.

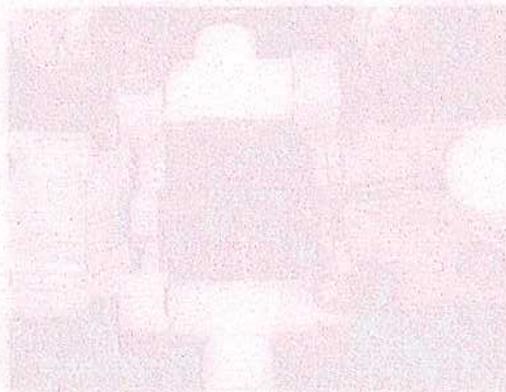


Figure 37. Cleaning the V-Grooves

# Maintenance

## 11.0 Maintenance

11.01 See Section 2, Parts and Ordering Information, for information about ordering parts, accessories, and about returning equipment to the factory.

11.02 To maintain accessory equipment such as the cleaver, refer to the maintenance section in the appropriate document in latter sections of this manual.

11.03 There are two types of maintenance covered in the following sections:

- Cleaning procedures to keep optimal performance during normal use.
- Replacing consumable parts such as the ER-M24 electrodes.

**WARNING:** Do not attempt repairs for which you are not qualified. Unauthorized repairs may void your warranty.

**WARNING:** Do not lubricate any part of the splicer.

⤵ **Note:** Before any maintenance is performed on the fusion splicer ensure the power is turned off.

### 11.1 Cleaning V-Grooves and Clamps

11.1.1 This section describes the cleaning procedure for the v-grooves and clamps. The procedure requires pure alcohol (99.5% pure or better) and the v-groove cleaning brush (supplied with splicer) and tight woven, lint-free cotton swabs.

11.1.2 V-grooves are the precision guides that keep the bare fibers aligned for splicing. Bare fiber clamps hold the fibers seated into the V-grooves. Tiny bits of dirt or coating residue in the grooves or on the clamps can cause the fiber diameters to be offset and will create poor splices.

*Procedure:*

1. Moisten the v-groove cleaning brush or lint-free cotton swab with alcohol and brush the v-grooves outwards from the electrodes to prevent dust falling on the microscope lens.

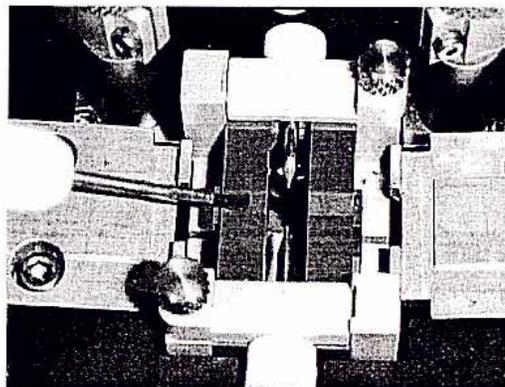


Figure 37. Cleaning the V-Grooves

2. Use firm pressure to clean the bare fiber clamps with a cotton swab moistened with alcohol.

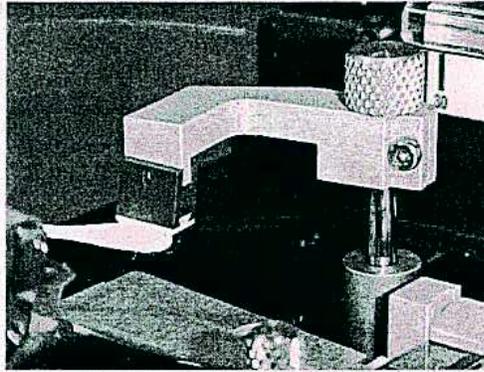


Figure 38. Cleaning the Bare Fiber Clamps

3. Go over the same area with a dry cotton swab to clean off the alcohol.

**WARNING:** "Canned Air" with Freon or Oil will contaminate the electrodes, so do not use such products to clean the fusion splicer.

## 11.2 Cleaning Mirror-protection Glass

This section describes the cleaning procedure for the mirror-protection glass in the hood. The procedure requires 99.5% alcohol, and lint free cotton swabs.

- (1) If the mirror-protection glass used inside the wind protector hood become dirty, black shadows or poor light levels may cause the splicer to operate poorly. To clean the mirror-protection glass moisten a cotton swab with 99.5% or better pure alcohol and gently wipe the mirror surface. Use a dry cotton swab to wipe off any excess alcohol.
- (2) If you can not take off the stain by cleaning, unscrew 4 screws with a screwdriver and then replace the provided mirror-protection glass.

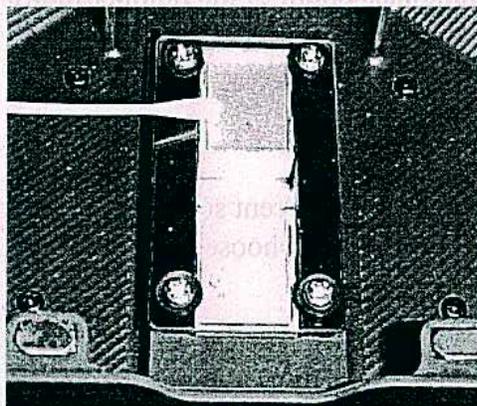


Figure 39. Cleaning the Mirror-protection Glass

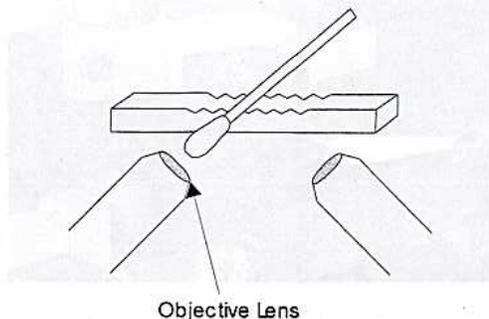
## 11.3 Cleaning the Microscope Objective Lenses

11.3.1 This section describes the cleaning procedure for the objective lens. The procedure requires 99.5% alcohol, and cotton swabs.

11.3.2 There are two microscopes under the V-grooves to observe the fibers. Dust on the microscope lens can reduce the fusion splicer's ability to inspect fibers and will yield inaccurate results.

*Procedure:*

1. Turn the fusion splicer off and open the hood covering the splicing area. Each lens lies below the electrodes at a 45° angle.



**Figure 40. Cleaning the Microscopes**

2. Remove the front and rear electrodes (Refer to Section 11.4, Replacing Electrodes) to expose the lens surfaces.
3. Gently clean each lens with a cotton swab moistened with a small amount of alcohol. Clean in a spiral motion from the center of the lens and working out to the edge. Wipe each lens again with a clean dry cotton swab to dry the alcohol, thus avoiding spots.

### 11.4 Replacing Electrodes

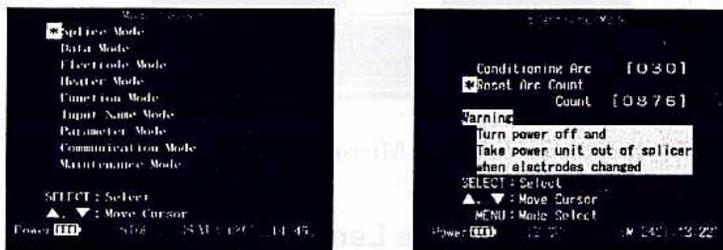
**WARNING: Unplug the power supply cord or take off the battery unit, before replacing electrode.**

11.4.1 This section covers electrode replacement. The electrodes will typically need replacing after approximately 1000 discharges.

11.4.2 The fusion splicer maintains a count of the number of arc discharges. This procedure includes instructions about resetting the counter to zero after replacing the electrodes and conditioning the tips.

*Procedure:* **Replacement**

1. To view the number of discharges on current set of electrodes, press the <MENU> key to access the MENU SELECT screen, and choose ELECTRODE MODE.



**Figure 41. Displaying Electrode Mode Screen**

2. Before beginning replacement, with the fusion splicer powered on press <RESET> on the keypad and wait for the splicer to reset. After it resets, turn off the fusion splicer and unplug its power cord.

- Using your fingers, loosen the thumb-screws to remove the electrode cover plates.

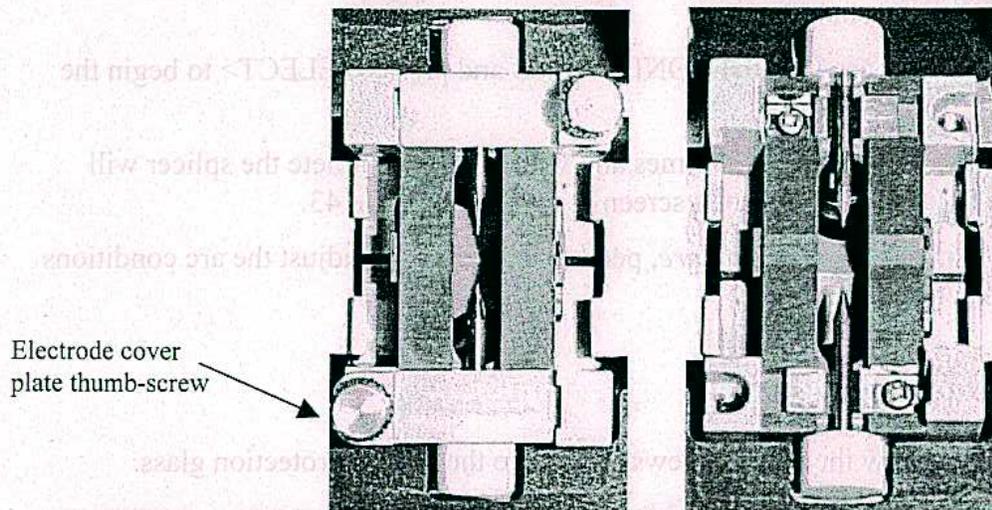


Figure 42. Removing Electrode Cover Plates

- Remove the old electrodes and discard.

⤷ **Note:** *When handling the electrodes avoid touching the metal portion with your skin. Skin oil left on the electrodes will deteriorate performance. If touched clean with alcohol and gauze.*

- Before installing new electrodes, gently clean the electrodes with pure alcohol and gauze wipes.
- Holding the electrode by the plastic button place the electrodes in the retaining groove.
- When replacing the electrode cover plates push the buttons forward against the clamps to place the electrodes at the correct distance. Ensure that the beveled edges on the electrode cover plates are facing inward.
- Gently tighten the retaining thumb-screws. **Do not over-tighten.**

11.4.3 After electrode replacement perform the following steps to perform a burn-in routine for conditioning the electrodes and reset the arc count.

⤷ **Note:** *Burning in the electrodes will condition the tips for optimal performance.*

#### Procedure: Electrode Tip Conditioning

- Plug the splicer and turn it on.
- Press the <MENU> key.
- Referring to Figure 41, choose ELECTRODE MODE and press <SELECT>.



Figure 43. Electrode Mode

4. From the ELECTRODE MODE menu screen choose RESET ARC COUNT and press <SELECT> to reset the arc count.
5. As shown in Figure 43, choose CONDITIONING ARC and press <SELECT> to begin the process.
6. The electrodes will automatically arc 30 times and when this is complete the splicer will return to the ELECTRODE MODE menu screen as shown in Figure 43.
7. Referring to Section 6.0 *Arc Test Procedure*, perform an arc test to adjust the arc conditions for the new set of electrodes.

### 11.5 Replacing mirror-protection glass

As shown in Figure 44, unscrew the fixing screws to remove the mirror-protection glass.

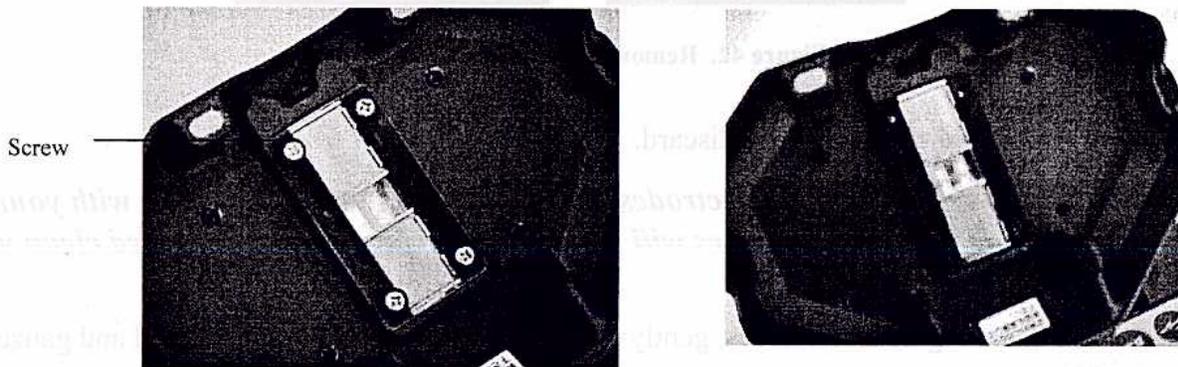


Figure 44. Replacing mirror-protection glass



Figure 45. Electrode Mode

# Software Functions and Menu Selections

## 12.0 Software Functions and Menu Selections

### 12.1 Splice Mode Menu

12.1.1 The Splice Mode Menu shown in Figure 45 is the normal mode of operation. This mode is used for all splicing operations. When the splicer is first turned on, or the <RESET> key is pressed the splice mode menu screen will appear. You will see either of the Splice Mode screens according to the system settings as described in 4.4 "Initial Screen" section.

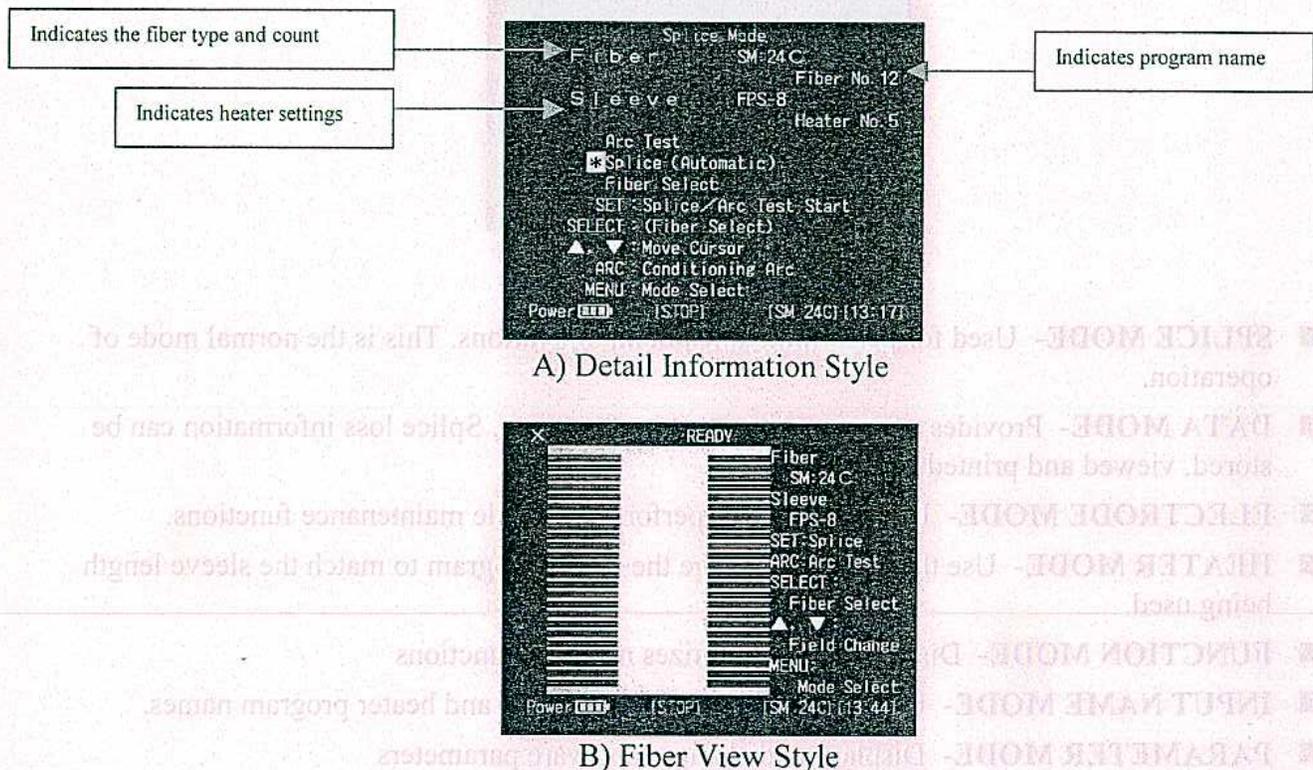


Figure 45. Splice Mode Menu Screen

12.1.2 The upper section of the Splice Mode Menu screen provides information regarding:

- The type of fiber (ex. SM or MM) and the number of fibers to be spliced... SM24c
- The fusion program selected ... FIBER No. 12
- The active heater program ... FPS-8

12.1.3 The middle section contains three options, arc test, splice and fiber select. Use the <△>, <▽> arrow keys to move the cursor to desired option. The following is a description of each function:

- **ARC TEST-** This function performs a calibration test to optimize the splicer based upon environmental condition and fiber type. (For more information on performing an ARC TEST refer to Section 6.0 Arc Test Procedure)
- **SPLICE-** This function initiates the splicing process. In Figure 44, (Automatic) indicates that the splicing process is set for automatic splicing. To change to manual splicing refer to Section 12.6 Changing Splicing Mode Operation.

- **FIBER SELECT-** This option is used to change the fusion program to match the fiber type and count being spliced. To enter this option press <SELECT> .  
*For more information on selecting a fiber type refer to Section 5.3, Selecting a Fiber Type.)*

## 12.2 The Menu Select Screen

12.2.1 To enter the MENU SELECT screen, press the <MENU> key. The MENU SELECT screen (Figure 45) provides access to the following mode functions:



Figure 46. Menu Select Screen

- **SPLICE MODE-** Used for performing all splicing operations. This is the normal mode of operation.
- **DATA MODE-** Provides access to data memory functions. Splice loss information can be stored, viewed and printed using this mode.
- **ELECTRODE MODE-** Use this mode to perform electrode maintenance functions.
- **HEATER MODE-** Use this mode to change the heater program to match the sleeve length being used.
- **FUNCTION MODE-** Displays and customizes machine functions
- **INPUT NAME MODE-** Use this mode to customize fiber and heater program names.
- **PARAMETER MODE-** Displays and changes software parameters
- **COMMUNICATION MODE-** Enables maintenance personnel to control the splicer's functions using an external computer terminal.
- **MAINTENANCE MODE –** This mode is used for running diagnostics and performing system upgrades.

## 12.3 Splice Data Storage Functions

12.3.1 The Type-65M24 has the capability to record splice loss information for each splice that is performed. A total of 500 splice data points can be stored. This splice loss data can then later be printed or downloaded to a PC for tracking and analysis. To enter the DATA MODE menu perform the following step:

1. From the MENU SELECT screen shown in Figure 46, choose DATA MODE and press <SELECT> to view the menu screen shown in Figure 47.

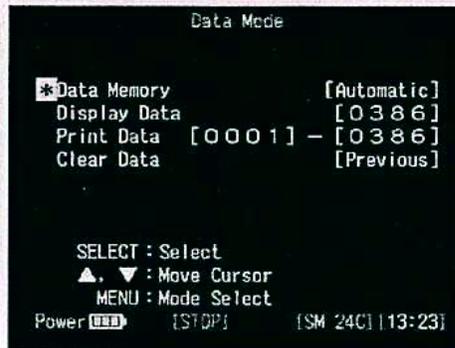


Figure 47. Data Mode Menu

12.3.2 **DATA MEMORY** allows you to choose from 1 of 3 splice data storage methods:

- **AUTO-** Splice loss data is stored automatically when splice is complete.
- **MAN.-** Following a completed splice you will be prompted with the option to store splice data.
- **OFF-** No splice loss data will be stored.

To change the method of data storage:

1. Move the cursor to DATA MEMORY as shown in Figure 47 and press <SELECT> to highlight the action block. (For detailed information on editing action blocks refer to Section 4.2)
2. Using the <▲>, <▼> arrow keys scroll through the available options and choose desired setting.
3. Press <SELECT> to accept change.

12.3.3 **DISPLAY DATA** allows you to display stored splice loss data. To view stored data:

1. From the DATA MODE menu shown in Figure 47, move the cursor to "Display Data". and press <SELECT> to highlight the numeric action block.

- Referring to Section 4.3 *Editing Numeric Inputs*, enter the memory location you would like to view and press <SELECT> to display the stored splice loss information.

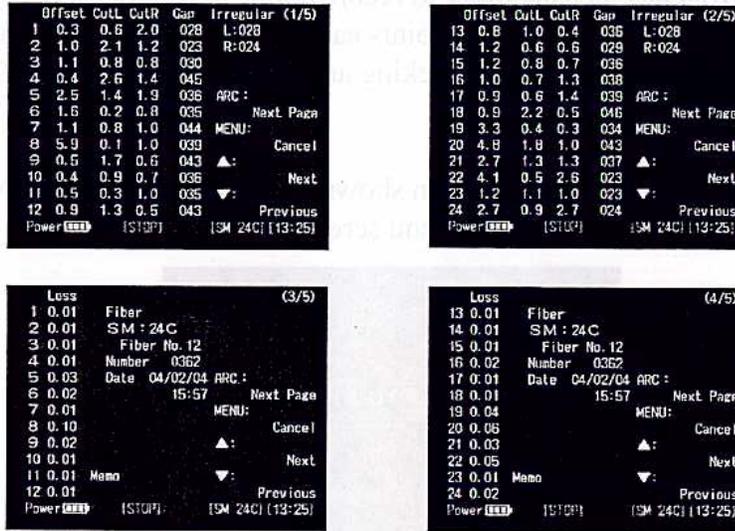


Figure 48. Stored Splice Data

- Figure 48 shows splice loss data for a 12-fiber ribbon splice.
- Use the <Δ>, <∇> arrow keys to scroll through the data memory and view different memory locations.

**Note:** Splicer can store 500 splice results. After 500 splice results, the earliest data is forcibly deleted so that the new data can be stored.

[For example]

0001	SPLICE DATA No.0001
0002	SPLICE DATA No.0002
0003	SPLICE DATA No.0003
0004	SPLICE DATA No.0004
0005	SPLICE DATA No.0005
	•
	•
	•
	•
0496	SPLICE DATA No.0496
0497	SPLICE DATA No.0497
0498	SPLICE DATA No.0498
0499	SPLICE DATA No.0499
0500	SPLICE DATA No.0500

② When splice data No.501 is entered, No.1 is forcibly deleted to store No.501.

0001	SPLICE DATA No.0501
0002	SPLICE DATA No.0502
0003	SPLICE DATA No.0503
0004	SPLICE DATA No.0504
0005	SPLICE DATA No.0505
	•
	•
	•
	•
0496	SPLICE DATA No.0996
0497	SPLICE DATA No.0997
0498	SPLICE DATA No.0998
0499	SPLICE DATA No.0999
0500	SPLICE DATA No.1000

① Splice data No.500 is stored.

\*After No.9999 is stored, No.1 is stored again.

12.3.4 **PRINT DATA**- allows you to print stored splice data to a printer or download to a PC. The numbers shown below indicate the range of stored data. To print stored data:

1. Connect the splicer with PC using RS-232C cable.  
If you use DOSV-family computer — PC-65 cable  
If you use PC98-family computer — PR-65 cable
2. From the DATA MODE menu shown in Figure 47, choose PRINT DATA and press <SELECT> to edit the start and stop printing range.
3. Referring to Section 4.3 *Editing Numeric Inputs*, enter the starting point where you would like the printing to begin then enter the ending point where you would like printing to stop.
4. After entering the ending point the screen shown in Figure 49 will be displayed.



Figure 49. Printing Splice Data

12.3.5 **CLEAR DATA**- allows you to delete stored splice data. Edit the action block to choose between deleting all stored splice data or the previously stored data. To delete stored splice data:

1. From the DATA MODE menu screen shown in Figure 47, choose "Clear Data" and press <SELECT> to edit the action block.
2. Referring to Section 4.2 *Editing Action Blocks* use the up down arrow keys to choose between ALL or PREV. and press <SELECT> to delete the data.

**ALL**- deletes all stored splice data

**Previous**- deletes the most recently stored splice data location

## 12.4 Electrode Mode

12.4.1 The electrode mode is entered from the MENU SELECT screen shown in Figure 45.

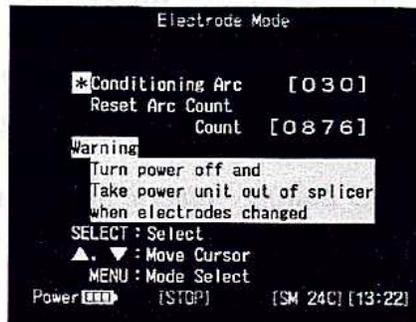


Figure 50. Electrode Mode Menu

12.4.2 **CONDITIONING ARC**- is used to discharge new electrodes and condition the tips for optimum performance. (For detailed information on using this function refer to Section 11.4 Replacing Electrodes.)

12.4.3 **RESET ARC COUNT**- is used to reset the internal arc counter to zero. Each time the electrodes arc an internal counter is incremented by 1, allowing you to track the number of discharges a pair of electrodes have made. Electrodes typically need replacement after 1000 arcs. To reset the arc count:

1. From the ELECTRODE MENU shown in Figure 50, choose RESET ARC COUNT.
2. Pressing <SELECT> will reset the internal arc counter to zero.

**Note:** When <SELECT> is pressed the arc counter is reset without further notification.

## 12.5 Selecting a Heater Program (Heater Mode)

12.5.1 The protection sleeve heater can be set up to optimally shrink various lengths of fiber protection sleeves. To select a heating program that matches your protection sleeve perform the following procedure:

1. Press the <MENU> key to display the MENU SELECT screen.
2. Choose HEATER MODE and press <SELECT> .

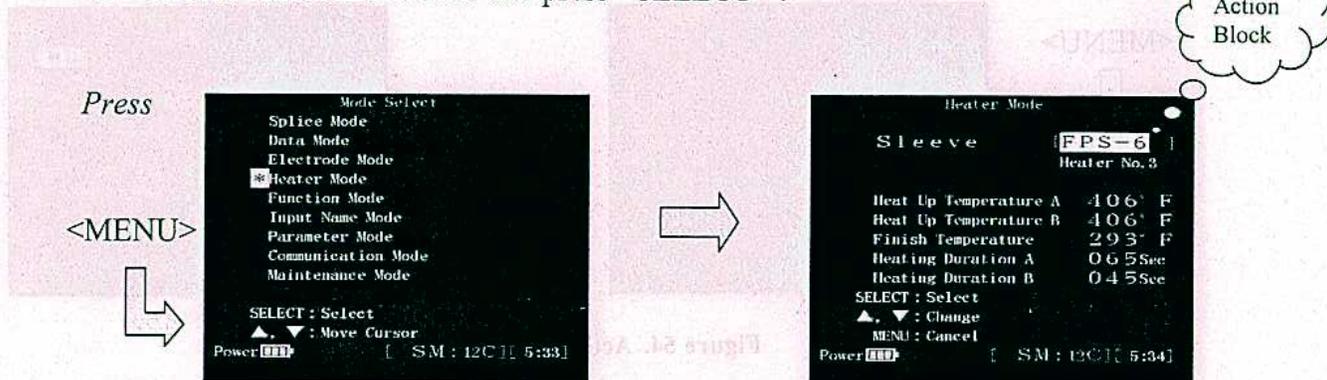


Figure 51. Entering Heater Mode

3. Press <SELECT> to edit the action block and use the <▲>, <▼> arrow keys to scroll through the available programs. As the heater program is changed, the heater condition shown below will also be changed to reflect the selected program.
4. Press <SELECT> to accept changes.
5. The active heater program is indicated on the SPLICE MODE MENU screen as shown in Figure 52.

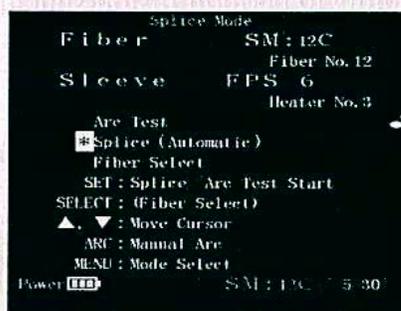


Figure 52. Active Heater Program

## 12.6 Changing Fusion Splicer System Settings (Function Mode)

12.6.1 Various features and functions can be activated/deactivated and changed by entering the FUNCTION MODE menu. To change system settings:



Figure 53. Entering Function Mode

## Arc Pause

During the splice operation at the final step before arc, the splicer can be programmed to stop and wait till an operator input to continue. This is called arc pause. When this feature is activated the operator must press <SET> to continue splicing operation. To activate ARC PAUSE perform the following steps:

Press

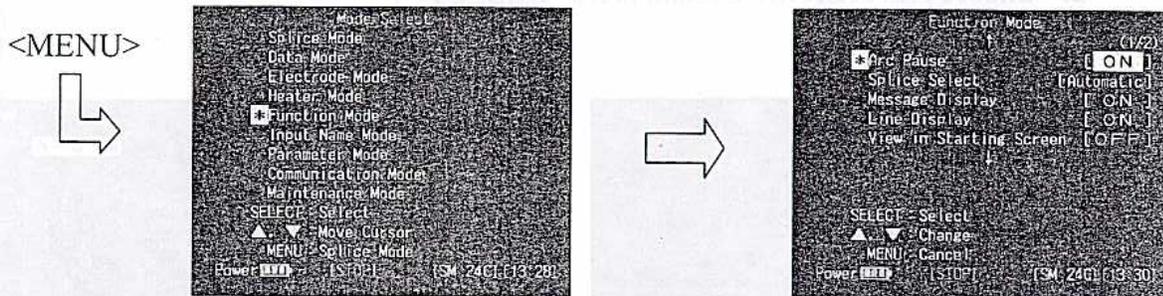


Figure 54. Activating Arc Pause

1. Referring to Figure 54, from the FUNCTION MODE menu choose ARC PAUSE and press <SELECT>.
2. Referring to Section 4.2 *Editing Action Blocks*, use the <△>, <▽> arrow keys to choose between OFF and ON.
3. Press <SELECT> to accept changes.

## Changing Splicing Mode Operation (Splice Select)

The Type-65M24 has the capability to perform fusion-splicing operations in 1 of 3 ways.

- Automatic
- Manual

On the SPLICE MODE menu shown in Figure 55, the mode of splicing operation is indicated beside SPLICE in brackets.

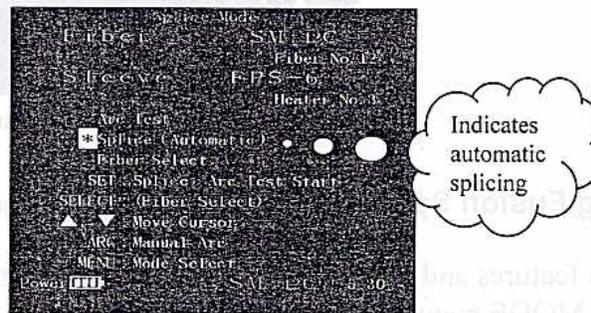


Figure 55. Splicing Mode of Operation

To change between automatic and semi-automatic splicing perform the following steps:

1. Press the <MENU> key.
2. Enter FUNCTION MODE.
3. Choose SPLICE SELECT and press <SELECT>.
4. Referring to Section 4.3 *Editing Numeric Inputs*, use the <△>, <▽> arrow keys to choose between AUTO and MAN. (*Note: "MAN." indicates semi-automatic splicing.*)
5. Press <SELECT> to accept changes. The mode of splicing indicated on the SPLICE MODE menu shown in Figure 55 will change to reflect the new setting.

Press

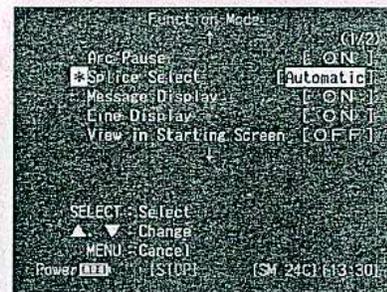
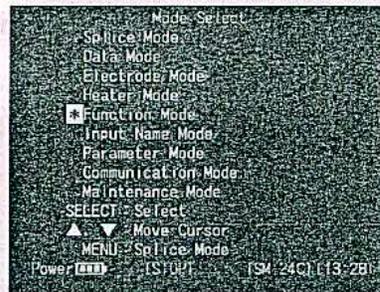
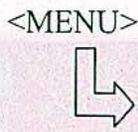


Figure 56. Changing Splice Mode Operation

- **Automatic-** This is the normal mode of operation. When the <SET> key is pressed all splicing operations will be performed automatically without pausing.
- **Manual-** When the <SET> key is pressed the splicing process will halt after the proceeding of a step. To proceed the next step press <SET>.

### Splice Operation Messages (Message Display)

During the splicing operation it is possible to display messages that indicate what phase of the splice the machine is currently performing. Figure 57 shows an example of the information being displayed while splicing. To enable the display of messages during the splicing operation perform the following procedure:

1. Referring to Figure 53, enter the FUNCTION MODE menu screen.
2. Choose MESSAGE DISPLAY and press <SELECT>.
3. Referring to Section 4.3 *Editing Numeric Inputs*, use the <△>, <▽> arrow keys to choose between, OFF and ON.
4. Press <SELECT> to accept changes.

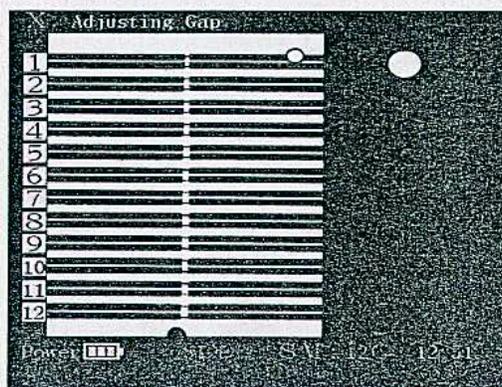


Figure 57. Splice Operation Messages

## Line Display

During the operation it is possible to overlay measuring lines on the fiber view. To enable the display of the lines during the operation perform the following procedure:

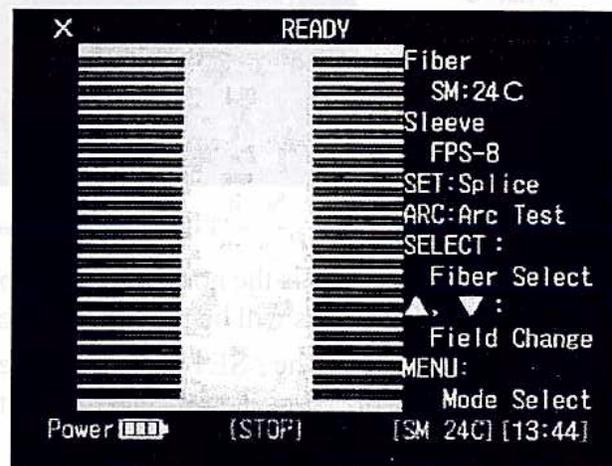
1. Enter the FUNCTION MODE menu screen.
2. Choose LINE DISPLAY and press <SELECT>.
3. Use the arrow keys to choose OFF or ON.
4. Press <SELECT> to accept changes.

## View in Initial Screen

You can choose the initial screen by two styles; Splice Mode screen with detail information or the screen with the fiber view window.



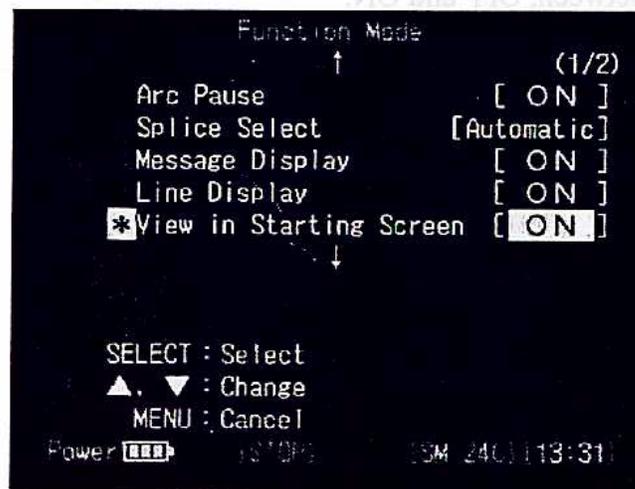
A) Detail Information Style



B) Fiber View Style

To change style perform the following procedure:

1. Enter the FUNCTION MODE menu screen.
2. Choose "View in Initial Screen" and press <SELECT>.
3. Use the arrow keys to choose between, OFF and ON. When you choose "Fiber View Style", select "ON", otherwise select "OFF".
4. Press <SELECT> to accept changes.



## Power Management Functions (Sleep/Auto Power off)

When operating from a battery source to minimize power consumption the Type-65M24 has a built in sleep mode and automatic power down feature, which can be activated if the splicer remains in-active for time intervals of up to 10 minutes. To access the power management functions:

1. Referring to Figure 53, from the MODE SELECT screen choose FUNCTION MODE and press <SELECT>.
2. Use the <△>, <▽> keys to scroll to the 2nd page.

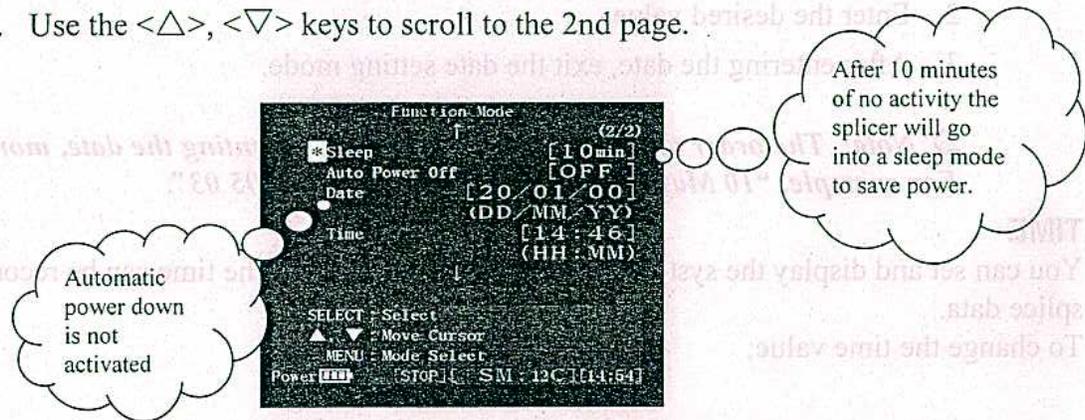


Figure 59. Power Management Features

- **SLEEP-** In Figure 59, the sleep timer is set for 10 minutes. After 10 minutes of no activity (no buttons pressed, splices being made or heater operation) the splicer will go into a sleep mode to reduce power consumption. During SLEEP mode the following will occur:
  - ➔ LCD Monitor will be turned off
  - ➔ Green SLEEP LED located at top of right key panel will be lit
  - ➔ 12VDC output will be turned off (*accessories being operated via the 12V output will not work*)

➤ **Note:** To wake up the splicer from SLEEP mode press any key, except OFF and ON.

To change or activate the SLEEP timer setting:

1. Press the <MENU> key and choose FUNCTION MODE.
  2. From the FUNCTION MODE menu choose SLEEP and press <SELECT>.
  3. Referring to Section 4.2 *Editing Action Blocks*, use the <△>, <▽> arrow keys to choose desired setting. (➤ **Note:** OFF is found after 010 and before 001.)
  4. Press <SELECT> to accept changes.
- **AUTO POWER OFF-** In Figure 59, the AUTO POWER OFF timer is not activated. The auto power off timer will begin counting down only after SLEEP mode has been activated. If SLEEP mode is not turned on AUTO POWER OFF will be activated following the programmed duration. Example:

*SLEEP timer = 1 minute & AUTO POWER OFF= 2 minutes*

*After 1 minute the splicer will go into SLEEP mode, 2 minutes later the splicer will turn off.*

## Setting Date and Time

### DATE

You can set and display the system date on the fusion splicer. The date can be recorded in the splice data.

To change the date value;

1. Select "Date" shown in figure 59 and press <SELECT>.
2. Enter the desired value.
3. After entering the date, exit the date setting mode.

⤷ **Note:** *The order of setting date is 2 digits representing the date, month and year. For example, "10 May 2003" can be entered as "10 05 03".*

### TIME

You can set and display the system time on the fusion splicer. The time can be recorded in the splice data.

To change the time value;

1. Select "Time" as shown in figure 59 and press <SELECT>.
2. Enter the desired value.
3. After entering the time, exit the time setting mode.

⤷ **Note:** *Use the 24-hour clock format only. For example, "10:43 p.m." can be entered as "22:43". The system date and time are maintained even when the splicer is powered off. Once you adjust the date and time in your time zone, you need not to set whenever you turn on the splicer.*

## 12.7 Editing Fusion Program Names (Input Name Mode)

12.7.1 Each fusion program name for all fiber types and count, and heater condition can be changed from the factory default setting to a name that is more meaningful to the user. After assigning specific fusion parameters to a fusion program a new name can be assigned for easier recognition. That fiber name will then appear in the FIBER SELECT menu when choosing fusion programs. To change a fusion program name follow these steps:

1. Referring to Figure 60, choose INPUT NAME MODE and press <SELECT>.

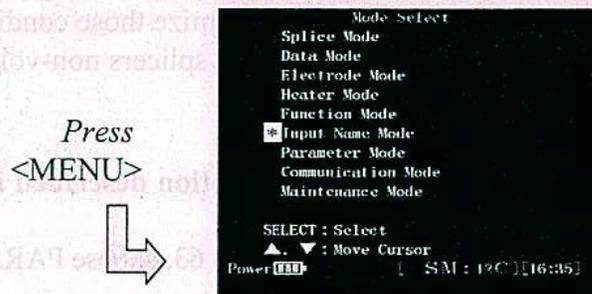


Figure 60. Entering Fiber Name Mode

2. Referring to Figure 61, select the fiber type and count for which you would like to change the fusion program name.

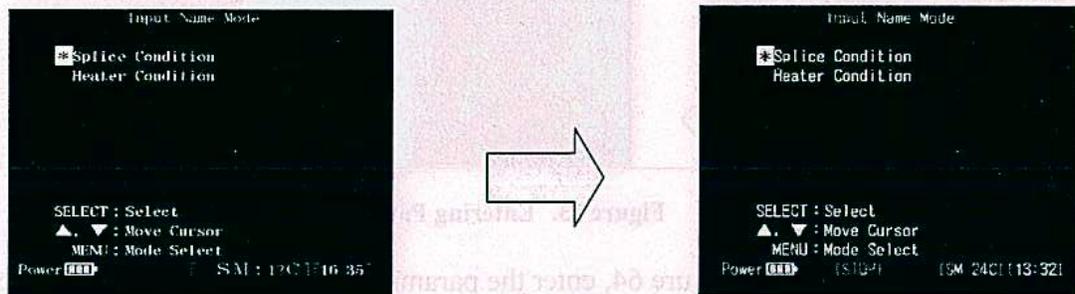


Figure 61. Fiber Name Mode

3. Referring to Figure 62, enter new desired name. For each letter use the <▲>, <▼> arrow keys to choose the desired character and press <SELECT>.

➤ *Note: A maximum of 18 characters may be entered.*



Figure 62. Entering Characters

4. When you have completed entering a new name move the cursor to [ENTER] and press <SELECT> to save the change.

## Tips!

- If an incorrect character was entered press the <MENU> key to erase it and try again.
- To quit entering a name without saving any changes press <RESET>.

## 12.8 Editing Parameters (Parameter Mode)

12.8.1 Parameters are information that the Type-65M24 fusion splicer uses to execute splicing operation. You can adjust splicing conditions by changing splicing parameters (fusion time, arc gap, pre-fusion, overlap, arc power), in order to optimize those conditions for specific fiber characteristics. To change/view parameters stored in the splicers non-volatile memory follow these steps:

🔗 **Note:** For more information, consult to our service section described in the back cover.

1. From the MENU SELECT screen shown in Figure 63, choose PARAMETER MODE and press <SELECT>.

Press  
<MENU>



Figure 63. Entering Parameter Mode

2. As shown in Figure 64, enter the parameter number you would like to change/view and press <SELECT>. (Refer to Section 4.3 for detailed information on entering numeric values.)



Figure 64. Entering Parameter Number

3. To change a parameter value press <SELECT> to edit the action block as shown in Figure 65.



Figure 65. Editing Parameters

- Referring to Section 4.3 *Editing Numeric Values*, change the parameter to desired setting and press <SELECT> to accept changes.

**Tips!**

- If an incorrect number was entered press the <MENU> key to erase it and try again.
- To quit entering a parameter without saving any changes press <RESET>.

## 12.9 Communication Mode

12.9.1 In this mode, entered from the MENU SELECT screen, an external computer console controls the splicer via an RS232C cable. The splicer screen will appear as show in Figure 64. To exit this mode you must press <RESET>.

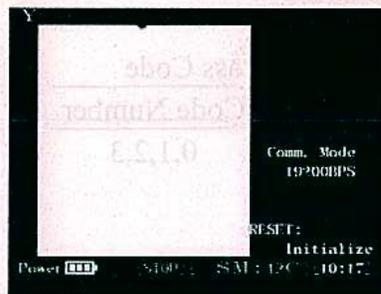


Figure 66. Communication Mode

**Note:** Communication mode requires Sumitomo's proprietary machine operating commands in order to access the CPU and memory; this mode is used primarily by trained factory service technicians for machine diagnostics.

## 12.10 Maintenance Mode

Maintenance Mode is mainly used to diagnose or change the splicer system settings. Please note some functions are restricted for users by different Pass Code and some restricted functions require user to operate under appropriate coach of our maintenance person or engineer.

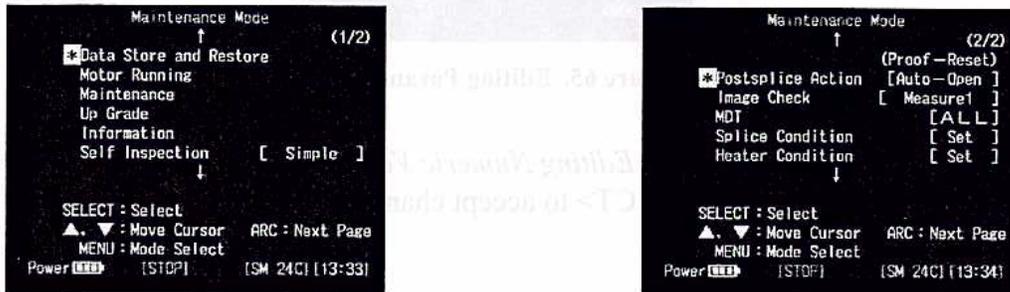


Figure 67. Maintenance Mode

You can use this mode with Maintenance Pass Code when you would like to use the following items. Maintenance pass code is different from Operation pass code used in other modes. Pass Code is shown in the following table.

- **Data Store and Restore** : This is to make a set of back-up parameter data in the splicer.
- **Postsplice Action** : This function allows you to change the settings concerning the start of proof test and stage reset.

Pass Code		
Type	Code Number	Key Operation
O-Code (Open/Operation)	0,1,2,3	“UP ARROW” “ARC” “DOWN ARROW” “SELECT”
M-Code (Maintenance)	1,3,1,3	“ARC” “SELECT” “ARC” “SELECT”

This item is possible for user to access with Maintenance Pass Code. Nevertheless this function requires user to operate under appropriate coach of our maintenance person or engineer.

- **Self Inspection** : This is used to diagnose the splicer.
  - [Simple] : Hardware
  - [Pre splice] : Inspection before Arc
  - [Splice] : Inspection of splice
  - [Total] : Total of Simple, Pre splice and Splice

The following items are restricted to use. A user is not allowed to access these items. Our maintenance service staffs use this function. Non-appropriate operation may cause the damage or malfunction of the splicer.

- Motor Running.
- Maintenance
- Up Grade
- Information
- Image Check
- MDT
- Splice Condition
- Heater Condition

### 12.10.1 Storing and Restoring the Parameter

The TYPE-65M24 Splicer can store one set of the whole parameter data in the memory of the splicer for a back-up purpose. To use this function press <SELECT> and input Maintenance Pass Code. The following screen appears.

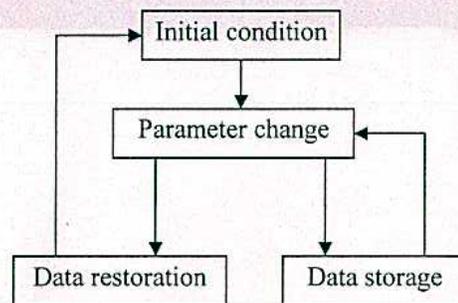


Figure 68. Selection Screen

#### Restore Stored Data

Move cursor to “Restore Stored Data” and press <SELECT>. When you are ready to do, press <SELECT>. To cancel this function, press <Menu>. If there is no stored data, splicer will inform you.

#### Store Present Data

Move cursor to “Store Present Data” and press <SELECT>. When you are ready to do, press <SELECT>. To cancel this function, press <Menu>.

### 12.10.2 Change post-splice action

This function allows you to choose the settings concerning the proof test and stage reset from two patterns. To change this settings press <SELECT> and input Maintenance Pass Code.

#### Settings

Proof-Reset	Proof Test	Reset
“Auto-Open”	Proof test starts by opening the hood	The splicer starts initialization 6 seconds after the hood is opened.
“Man-Close”	Proof test starts by pressing <SET>	The splicer starts initialization when the hood is closed.

# Changing conditions

## 13.0 Changing conditions

### 13.1 Viewing/Changing the Splice Conditions

1. From the SPLICE MODE, move the cursor to "Fiber Select" and press <SELECT>.
2. Move the cursor to the fiber which has the splice condition you would like to view or change and press <SET>.

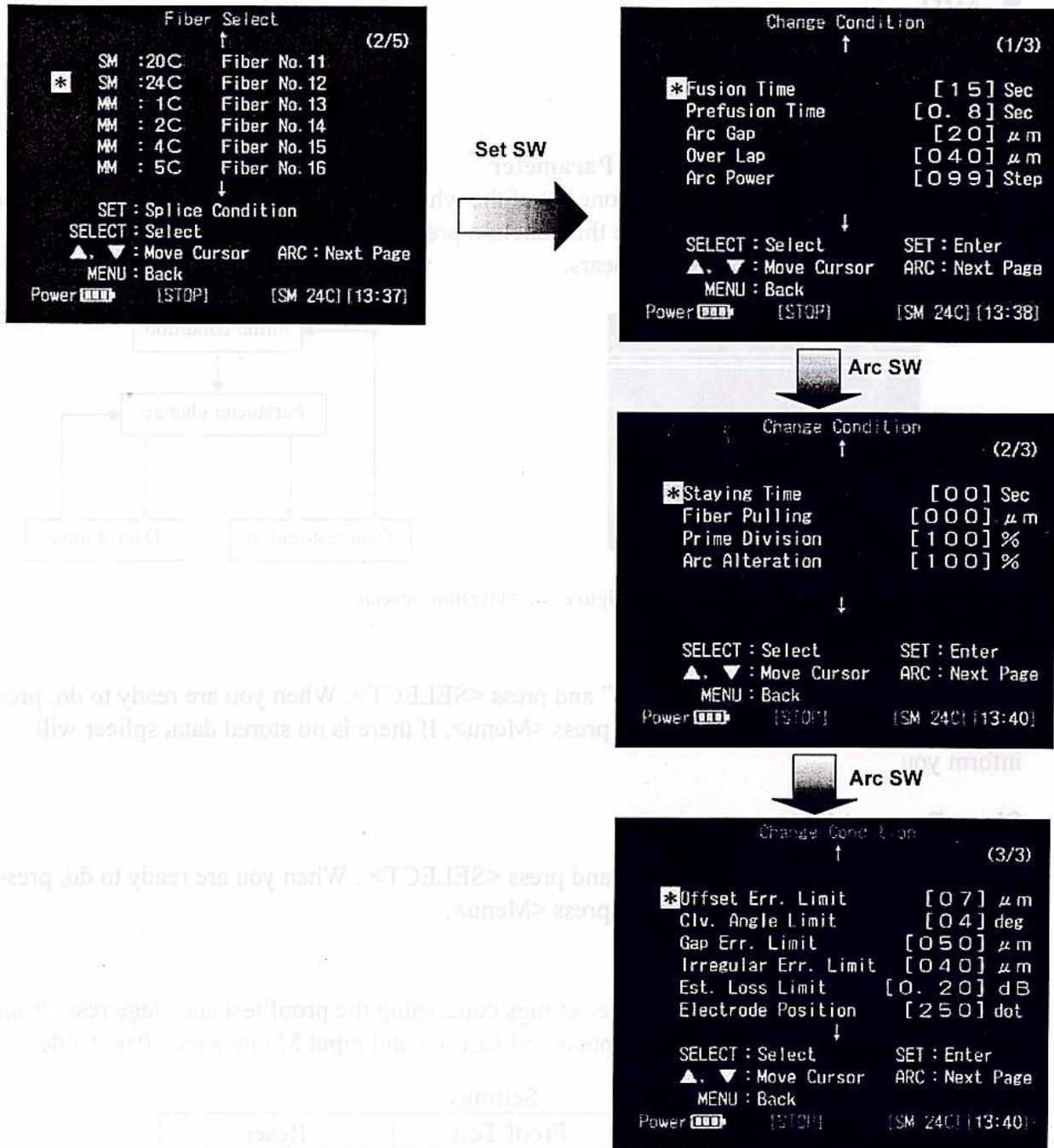


Figure 69. Viewing of splice conditions

3. To change the conditions, move the cursor to the item you would like to change and press <SELECT> .
4. Input the pass code by pressing the following keys in this order, “UP ARROW (▲)”, “ARC”, “DOWN ARROW (▼)”, “SELECT”.
5. Adjust the value using the arrow keys and press <SELECT> .
6. After adjustment, press <RESET> and you will see an initial screen.

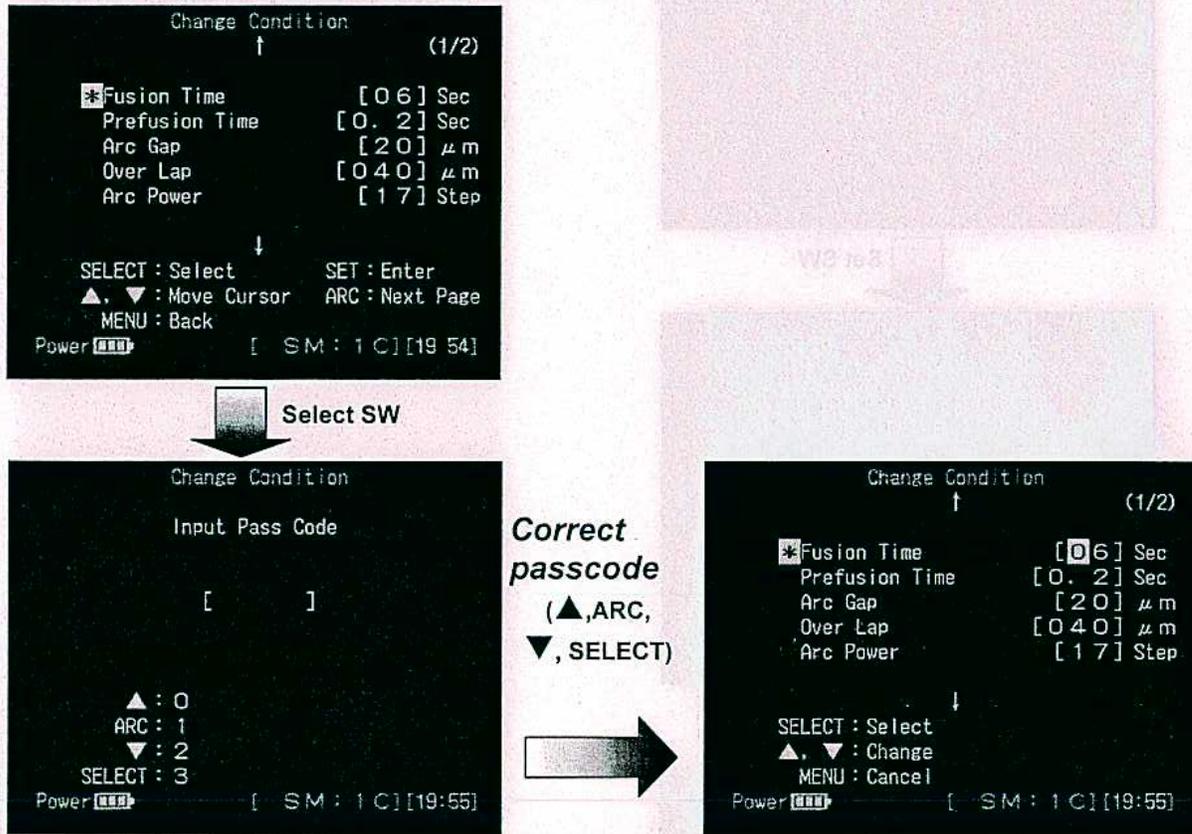


Figure 70. Method of changing splice condition

### 13.2 Changing Heater Condition (Figure 71)

We recommend the initial set value should be used. Perform the following procedure to change Heater condition.

1. From the initial screen, press <MENU> to select the HEATER MODE.
2. When the HEATER MODE screen appears, press <SET> .
3. Move the cursor to the item you would like to change and press <SELECT> .
4. Input the pass code by pressing the following keys in this order, “UP ARROW (▲)”, “ARC”, “DOWN ARROW (▼)”, “SELECT”.
5. Adjust the value using the arrow keys and press <SELECT> .

6. After adjustment, press <RESET> and you will see an initial screen.

```

Heater Mode
Sleeve [FPS-1 ]
60mm sleeve

Heat Up Temperature A 080° C
Heat Up Temperature B 200° C
Finish Temperature 163° C
Heating Duration A 000Sec
Heating Duration B 063Sec
SET : Change Heat Condition
SELECT : Select
MENU : Mode Select
Power [000] [ SM : 1 C ] [19 56]
    
```

Set SW

```

Change Heat Condition

*Heat Up TemperatureA [080] ° C
Heat Up TemperatureB [200] ° C
Finish Temperature [163] ° C
Heating Duration A [000] Sec
Heating Duration B [063] Sec

SELECT : Select      SET : Enter
▲, ▼ : Move Cursor
MENU : Back
Power [000] [ SM : 1 C ] [19 57]
    
```

Select SW

```

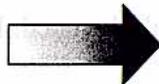
Change Heat Condition

Input Pass Code

[ ]

▲ : 0
ARC : 1
▼ : 2
SELECT : 3
Power [000] [ SM : 1 C ] [19 57]
    
```

**Correct  
passcode**  
(▲,ARC,  
▼,SELECT)



```

Change Heat Condition

*Heat Up TemperatureA [080] ° C
Heat Up TemperatureB [200] ° C
Finish Temperature [163] ° C
Heating Duration A [000] Sec
Heating Duration B [063] Sec

SELECT : Select
▲, ▼ : Change
MENU : Cancel
Power [000] [ SM : 1 C ] [19:57]
    
```

**Figure 71. Method of changing heater condition**

# Storing data into a computer

## 14.0 Storing data into a computer

### 14.1 Setting Up HyperTerminal

When the splicer communications with PC, communication software is needed. Please set up HyperTerminal, communication software that is distributed with Microsoft Windows(R), referring to information described below.

\*HyperTerminal is a product from Hilgraeve Inc. Microsoft and Windows are registered trade mark of Microsoft Corporation.

- ① Click on [Start], [Programs], [Accessories], [Communications], [HyperTerminal].
- ② Create new connection icon.
- ③ As shown in Table, perform Port setting.

Item	Set Value
Bits per second	19200
Data bits	8
Parity	None
Stop bits	1
Flow control	None

- ④ Open the HyperTerminal Window.
- ⑤ To perform detailed set up, please consult us.

#### Tips!

- Click “Send line end with line feeds”, “Echo typed characters locally” and “Append line feeds to incoming line ends” in “ASCII Setup” if they are not checked.

- ⑥ Before starting a data print for sending data to PC, change the following splicer parameter.

Parameter No.	Name	Standard value	Change value
310	PRINTOUT DELAY TIMER	0005	0000

\*Regarding how to change a parameter, refer to Section 12.8.

### 14.2 Executing the data transfer

- ① After setting the connection, Move the cursor to “Print Data” in Data Mode of the splicer and press <select>. Data will be loaded to PC.
- ② Open new text-style application to create a file into PC.
- ③ Copy log data from the HyperTerminal area to the file area.
- ④ To finish the connection, close the HyperTerminal and the text file after saving.

# Troubleshooting

## 15.0 Troubleshooting

15.01 This section provides troubleshooting information for the Type-65M24 fusion splicer. For repair and technical support, contact maintenance service section address described in the back cover.

### 15.1 Arc Problems

15.1.1 The electrodes typically need replacement after 1000 splices. Some common symptoms that indicate the electrodes need replacing are:

- Fluttering or unstable arc observed on the LCD monitor
- Sizzling noise while arcing
- Bubbles in the fibers after splicing
- Fiber burned in half
- Diameter faults
- High or inconsistent splice losses

15.1.2 Refer to Section 11.4 Replacing Electrodes for procedures. Always perform a burn-in routine after electrode replacement. Electrode problems can be caused by:

- Heavily relying on the spattering arc to clean the fibers
- Worn or pitted from excess use
- Excessive dirt on electrodes
- Using canned air
- Bent electrodes
- Handling with bare fingers (skin oil)

15.1.2 Due to the critical nature of the electrode shape, electrode cleaning is not recommended. The use of solvents and other cleaning fluids on the electrodes will leave a residue that will degrade performance and shorten the life of the electrodes.

### 15.2 Fibers Breaking

15.2.1 When the splicing process is complete a tensile strength may be applied to the fibers while in the fiber chucks. If the fibers are breaking when the tensile test is performed check the arc conditions to determine if there is a problem leading to a weak fusion splice. Perform an ARC TEST.

### 15.3 Splicer Does Not Power Up

15.3.1 If the fusion splicer fails to turn on when the ON button is pressed check the following:

- Verify the power plug is seated properly
- Verify the power source is supplying power by plugging another piece of equipment into the same outlet.
- If using battery operation ensure the battery is fully charged.

## 15.4 Splicing Process Errors

15.4.1 While the automatic splicing process is being performed if an error occurs various process error messages may be displayed to prompt you of the faulty condition. For fiber inspection errors (offset, irregularity, gap error) it is possible to override the fault condition and continue with the splicing process.

➤ *Note: Overriding inspection errors may result in poor splices.*

### Cut (Cleave Angle)

During the splicing process each individual fiber is examined for cleave quality. If a faulty condition is encountered the process will be stopped and the faulty fiber(s) will be indicated. To override the error and continue splice press <SET>. To solve the faulty cleave remove fibers and refer to the operation manual provided with your cleaver.

### Irregularity

During the splicing process each group of fibers (left and right side) are examined to verify the distance between the longest and shortest cleaved fibers is within a specified limit. If a faulty condition is encountered the process will be stopped and the faulty fiber(s) will be indicated. To override the error and continue the splice press <SET>. Check for the followings:

- Fibers are seated in the fiber holders correctly
- Fiber holders are inserted properly
- Re-cleave the fibers. If problems persist it will be necessary to clean and/or make adjustments to the fiber cleaver.

### Alignment

During the splicing process fibers are inspected to verify the offset between left and right fibers. If a faulty condition is encountered the process will be stopped and the faulty fiber(s) will be indicated. To override the error and continue the splice press <SET>. Check for the followings:

- Clean the v-grooves
- Clean the bare-fiber clamps
- Make sure the fibers are clean. Re-cleave and clean the fibers.

### Gap

During the splicing process the left and right fibers are inspected for the maximum difference between the largest and smallest gaps of two optical fiber end faces. If a faulty condition is encountered the process will be stopped and the faulty fiber(s) will be indicated. Press <SET> to override error and continue the splice. Check for the followings:

- Re-cleave the fibers. If problems persist it will be necessary to clean/make adjustments to the fiber cleaver.
- Fibers are seated in the fiber holders correctly

## **ZL/ZR Limit**

When the splicing process is started the fibers are moved into view of the microscope by the ZL and ZR motors. These motors have a reverse and forward limits within which they can travel. If the microscope does not see the fibers a forward limit error will be given. Check for the followings:

- Cleave length is 10mm
- Secure the locking levers holding the fiber holders in place
- Reseat the fiber holder and make sure it is positioned all the way forward

## **15.5 Heating Problem**

Refer to the section 13.2 for details of adjusting heater settings.

### **Under Shrink (Large Flare)**

- Increase heating duration B.

### **Over Shrink(Flows Out Ends)**

- Decrease heating duration A or B.

### **Bubbles at Splice(Remaining Air)**

- Increase heating duration A.

### **Flashing of Heat LED**

- Flashing of heat LED informs that heater starts cooling process.

### **Cancel of Heating Process**

- Press <HEAT> key on the key pad when heater LED is lighting. Cooling process will start.

## Remark Parameters

### FUSION TIME (seconds)

- Fusion time is the length or duration from the time to start completion of arc discharge

### PREFUSION TIME (seconds)

- Pre-fusion time is the time in seconds the fusion splicer waits after the arc discharge begins before beginning the overlap (feed) of the right fiber.

### ARC GAP (micrometers, $\mu\text{m}$ )

- Arc gap is the gap distance left between the left and right fibers before fusion takes place.

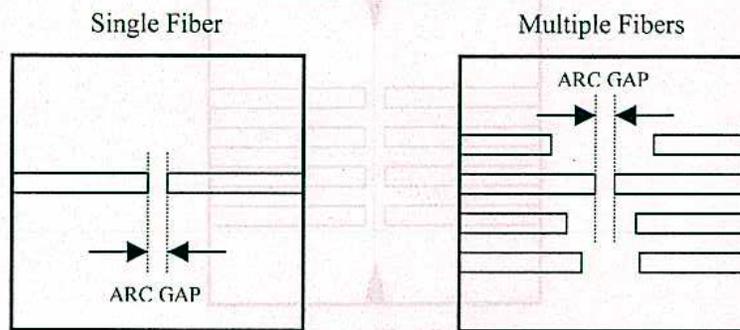


Figure 72. Arc Gap

### OVERLAP ( $\mu\text{m}$ )

- Overlap is the amount of overlap between the left and right fiber that occurs when the right fiber is fed forward during the arc discharge.

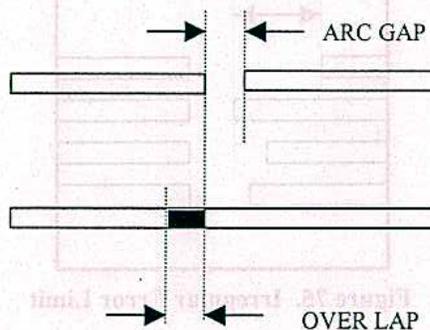


Figure 73. Overlap

### ARC POWER (step value)

- Arc power represents the amount of current used during the arc discharge. (This number is not shown directly in mA, rather in a unit-less value)

### STAYING TIME (Seconds)

- Staying time is the period of time after completing the overlap before beginning pulling during the arc fusion.

**FIBER PULLING (um)**

- Fiber pulling is the amount to pull the fiber that was fed during the arc fusion.

**PRIME DIVISION (%)**

- Prime division is the ratio of the period to keep the first arc power during the total duration of arc fusion.

**ARC ALTERATION (%)**

- Arc alteration is changing ratio of arc power from first arc power.

**ELECTRODE POSITION (pixel position)**

- Electrode point is an image processing line that is used to align the fibers about when adjusting arc gap. This line is positioned in the center of the electrode heat zone and is typically a straight line between the top and bottom electrodes.

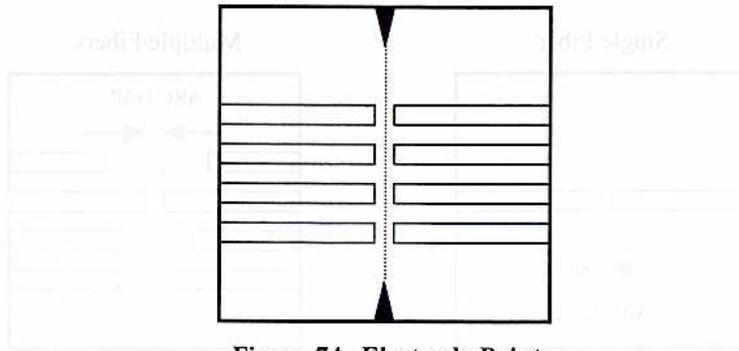


Figure 74. Electrode Point

**IRREGULAR ERROR LIMIT (um)**

- Irregular error limit represents the allowable value of a positional difference between one ribbon fiber end at the most forward position and another fiber end at the most backward position.

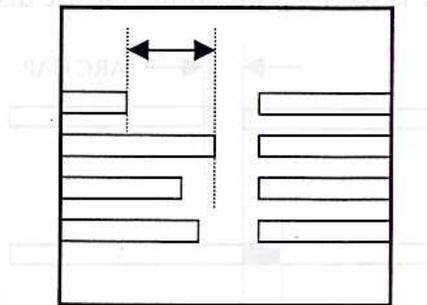
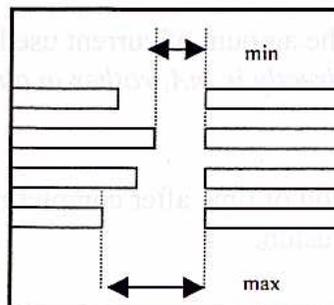


Figure 75. Irregular Error Limit

**GAP ERROR LIMIT (um)**

- Gap error limit represents the allowable value of difference between the largest and smallest gaps of two optical fiber end faces.



### CLEAVE ANGLE ERROR LIMIT (degrees)

- Cleave angle error limit shows the maximum allowable value of an optical fibers end face cleave angle when performing splicing process.

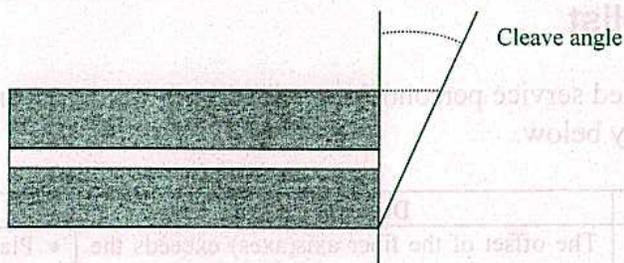


Figure 77. Cleave Angle

### OFFSET ERROR LIMIT (um)

- Offset error limit shows the maximum allowable value of offset between right and left optical fibers. Distances are calculated from the center of each fiber.

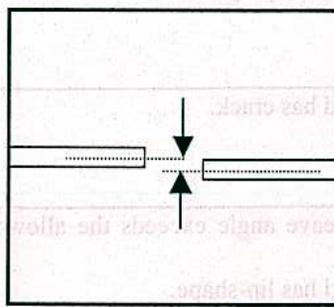


Figure 78. Offset Error Limit

### HEAT UP TEMPERATURE A (degree)

- Heater starts raising up to this temperature and maintain it by using pattern A whose heating zone is positioned around central area. Allowable inputting value is 240 degree at maximum.

### HEAT UP TEMPERATURE B (degree)

- Heater starts raising up to this temperature after pattern A is heated and keep it by using pattern B whose heating zone is positioned broad area. Allowable inputting value is 240 degree at maximum.

### FINISH TEMPERATURE (degree)

- This is the finish temperature to take out the sleeve. The flashing indication on the keypad stops at this temperature. If you increase finish temperature, please note you should wait till the sleeve has hardened and is sufficiently cool down to take out from the heater oven.

### HEATING DURATION A (seconds)

- This is heating duration of pattern A.

### HEATING DURATION B (seconds)

- This is heating duration of pattern B.

# Appendix

## Error message list

Please contact qualified service personnel described in the back cover when it is not recovered if you take the remedy below.

Error message	Description	Measure
Alignment Error	The offset of the fiber axis(axis) exceeds the allowable value.	<ul style="list-style-type: none"> <li>Place the fiber in the v-groove again.</li> <li>Clean the V-groove.</li> </ul>
Brightness Various Error Brightness Error LED Error	LED of image processing could not adjust adequate brightness.	<ul style="list-style-type: none"> <li>Clean the surface of the LED for image inspection and protection glass.</li> <li>Consult to our service section when this error continues.</li> </ul>
Cut Error (Projection)	The fiber end has projection.	<ul style="list-style-type: none"> <li>Cleave the fiber again.</li> <li>Clean the rubber surface of the clamp in your fiber cleaver.</li> </ul>
Cut Error (Crack)	The fiber end has crack.	<ul style="list-style-type: none"> <li>Cleave the fiber again.</li> <li>Clean the rubber surface of the clamp in your fiber cleaver.</li> </ul>
Cut Error (Angle) Cut Error (LIP)	Observed cleave angle exceeds the allowable value. The fiber end has lip-shape.	<ul style="list-style-type: none"> <li>Cleave the fiber again.</li> <li>Clean the rubber surface of the clamp in your fiber cleaver.</li> </ul>
DEVICE ERROR	Circuit board is abnormal or a system error occurred.	<ul style="list-style-type: none"> <li>Re-power on the splicer.</li> <li>Consult to our service section when this error continues.</li> </ul>
End Check Error Diameter Check Error Dust Error Image Processing Error	The splicer could not acquire the suitable inspection value due to (an) improper shadow(s).	<ul style="list-style-type: none"> <li>Wipe over the debris on the fiber after jacket stripping.</li> <li>Cleave the fiber again.</li> <li>Clean the surface of the LED for image inspection and protection glass.</li> </ul>
Fiber Check Error	Fibers are placed improperly in the V-grooves.	<ul style="list-style-type: none"> <li>Place the fiber in the v-groove again.</li> <li>Clean the V-grooves with a V-groove brush.</li> </ul>
Fiber Count Error Fiber Pitch Error	Mismatch of the selection and the number of fiber. Fibers have extraordinary gap.	<ul style="list-style-type: none"> <li>Place the fiber in the v-groove again.</li> <li>Select the appropriate program to be spliced.</li> </ul>
Gap_Error	The gap of the butting fibers exceeds the allowable value.	<ul style="list-style-type: none"> <li>Cleave the fiber again .</li> <li>Clean the rubber surface of the clamp in your fiber cleaver.</li> </ul>
Hood Open Error	A hood is not completely closed.	<ul style="list-style-type: none"> <li>Close the Hood (wind shield).</li> <li>Consult to our service section when this error continues.</li> </ul>
Image Processing Error	The splicer could not acquire the suitable inspection value due to (an) improper shadow(s).	<ul style="list-style-type: none"> <li>Wipe over the debris on the fiber after jacket stripping.</li> <li>Cleave the fiber again.</li> <li>Clean the surface of the LED for image inspection and protection glass.</li> </ul>

Message	Description	Remedy
Insertion Error Insertion Error	Fibers could not be inserted within driving time limit.	<ul style="list-style-type: none"> <li>• Check the fiber holders are fixed in correct way.</li> <li>• Check the fibers are laid by the fiber clamps in correct way.</li> </ul>
Irregularity Error	The irregularity of single fiber ribbon exceeds the allowable value.	<ul style="list-style-type: none"> <li>• Clean the upper surface of the clamp in your fiber cleaver.</li> <li>• Clean the fiber again.</li> </ul>
Splice Error (Splice) Splice Error (Thin) Splice Error (Thick) Splice Error (Bare) Splice Error (Bubble)	The diameter of the spliced portion is not suitable.	<ul style="list-style-type: none"> <li>• Perform Arc Test.</li> <li>• Clean or adjust your cleaver.</li> <li>• Take suitable measure for individual case referring to following description.</li> <li>• Thin Splice: (1) Too much offset (2) Too lean overlap (3) Too strong Arc power. • Thick: (1) Too much offset (2) Too much overlap (3) Too weak Arc power. • Bubble: (1) Too much offset (2) Bad quality of fiberized end. • Neck:</li> </ul>

### PRODUCT SUPPLIER / VENDOR

<ul style="list-style-type: none"> <li>• Refer power on the splicing machine.</li> <li>• Consult to our service station when this error continues.</li> </ul>		
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### SUMITOMO ELECTRIC SERVICE INFORMATION

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Error message	Description	Measure
Inserting Fiber Error	Fibers could not be inserted within driving time limit.	<ul style="list-style-type: none"> <li>• Press RESET.</li> <li>• Check the fiber holders are fixed in correct way.</li> <li>• Check the fibers are laid by the fiber clamps in correct way.</li> </ul>
Irregularity Error	The irregularity of single fiber ribbon exceeds the allowable value.	<ul style="list-style-type: none"> <li>• Cleave the fiber again .</li> <li>• Clean the rubber surface of the clamp in your fiber cleaver.</li> </ul>
Splice Error (Splice) Splice Error (Thin) Splice Error (Thick) Splice Error (Neck) Splice Error (Bubble)	The diameter of the spliced portion is not suitable.	<ul style="list-style-type: none"> <li>• Perform Arc Test.</li> <li>• Clean or adjust your cleaver.</li> <li>• Take suitable measure for individual case referring to following description.</li> <li>• Thin/Splice: 1) Too much offset 2) Too least overlap 3) Too strong Arc power</li> <li>• Thick: 1) Too much offset 2) Too much overlap 3) Too strong or weak Arc power</li> <li>• Bubble: 1) Too much offset 2) Bad quality of fiber cleaved end.</li> <li>• Neck: 1) Too much offset 2) Bad quality of fiber cleaved end.</li> </ul>
System abort Exception Error	A system error occurred.	<ul style="list-style-type: none"> <li>• Re-power on the splicer.</li> <li>• Consult to our service section when this error continues.</li> </ul>

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