

A Advanced splicing parameters

Mode field diameters: LEFT MFD and RIGHT MFD

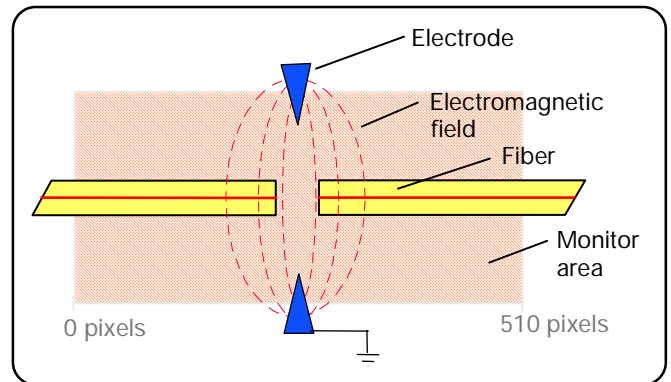
In order to obtain good splice loss estimation it is important to correctly set the mode field diameters for your fibers. The mode field diameters are listed in the specifications for fibers, and the adjacent table gives some representational values. Nevertheless, if possible, it is also a good idea to test your fibers by comparing measured and estimated splice losses over a series of splices.

| Fiber Type | Wavelength (nm) | | | | | |
|---------------------|-----------------|-----|-----|----------|------|------|
| | 488 | 633 | 850 | 980/1060 | 1300 | 1550 |
| Single mode | 3.7 | 4.3 | 5.7 | 6.6 | 9.3 | 10.5 |
| High NA Single mode | - | 3.3 | 4.3 | 5.3 | 6.6 | 7.8 |
| Dispersion Shifted | - | - | - | - | - | 8.1 |

Arc offset: SET CENTER POSITION

The *SET CENTER POSITION* parameter allows you to distribute different energy levels to left and right fiber during splicing. This is useful when splicing two different kinds of fibers requiring different temperatures for melting.

The value of the parameter represents the number of pixels from the left to the right end of the monitor, from 0 to 510 pixels, and the position where you want the fiber ends to splice. The default value is 255 pixels. This is in the absolute center of the monitor and the position where the energy, or heat, from the arc is at its maximum. If you use a lower value than 255, the right fiber will therefore have a higher temperature than the left, and the opposite, if the value is set higher.



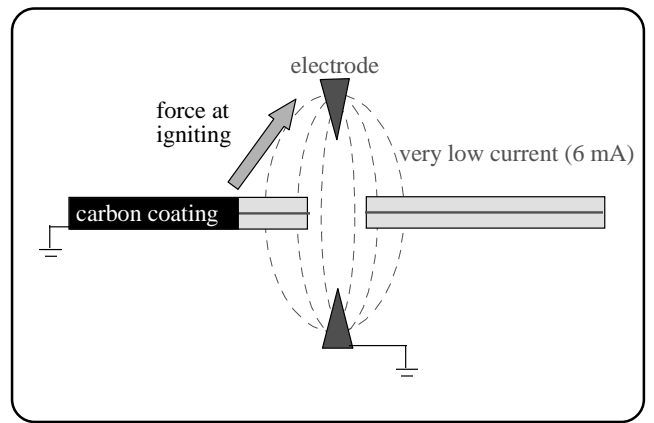
Setting the *SET CENTER POSITION* parameter

Note that the two global parameters GLOBAL XCT and AUTOXCT OFFSET also affects the position where the fiber ends will splice, that is, the splicing position. The following formula shows how to calculate the splicing position for the forthcoming splice:

$$\text{Splicing position} = \text{GLOBAL XCT} + (\text{SET CENTER POSITION} - 255) + \text{AUTOXCT OFFSET}$$

Arc-on alignment: AOA CURRENT

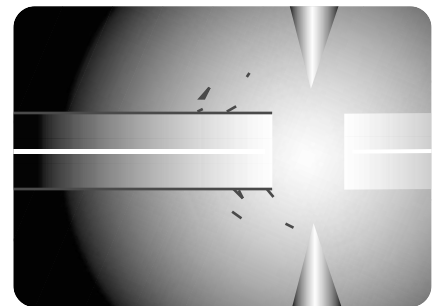
At arc ignition an electromagnetic field is established that exerts force on the fibers, bending them out of alignment (see adjacent picture). After initial ignition, the force disappears, and most fibers comes back into place. However, carbon coated and small core fibers are pulled to a significantly different degree than other fiber types , so with these fibers, it is particularly likely that the fibers will lose their alignment at arc ignition. To compensate for this problem, the FSU 995 FA is equipped with the option of setting a low current that can be ignited during fine alignment. This ensures that the alignment is done according to the position that the fibers will be in during splicing. The default value of the AOA CURRENT parameter is 6.5 mA, and it is important not to deviate too far from the default value. Too high of a current will lead to matchsticking. Too low of a current can permanently damage the electrical equipment in such a way that the arc won't be able to ignite.



Increased force because of the conductivity of carbon coating

Prefusion before alignment: EARLY PREFUSION

The parameter EARLY PREFUSION is specifically designed for the problems associated with carbon coated fibers. The carbon coating has a tendency to give off more material during arc ignition, and thus cause more build-up on the electrodes. To avoid this, you can set EARLY PREFUSION to ON, and the prefusion will occurs before the fibers are brought close to the electrodes during alignment.



Increased build-up on electrodes from carbon coated fiber

Alignment accuracy: ALIGN ACCURACY

Alignment is executed with the degree of accuracy specified in this parameter. There may be cases, however, where the splicing combination demands, or allows for, a greater, or lesser, degree of accuracy than the default of 0.15 μm . You should keep in mind, though that increased accuracy is paid for in terms of the increased time it takes for the splicer to align the fibers.

Splice loss calibration: LOSS SHIFT

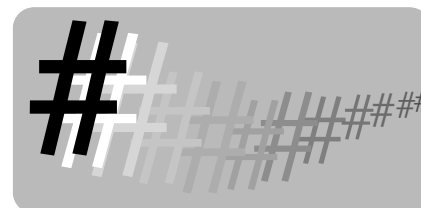
Use the parameter LOSS SHIFT to calibrate the FSU995 when there is a consistent mismatch between measured and estimated splice loss. Set the parameter to a value that reflects the average difference between the measured loss, shown on the external measuring equipment, and the estimated loss, calculated by the FSU 995.

Automatic arc re-centering : AUTO ARC CENTER

Automatic Arc Re-centering is an automatic function that prevents high splice losses caused by uneven distribution of energy between left and right fibre during arc ignition. The reason for the uneven energy distribution is that material from the fibres are deposited on the electrodes when splicing, changing the electromagnetic field of the arc. This may, as a result, cause high splice losses. To avoid this to happen, the splicing position is automatically adjusted, before every splice, with an offset to compensate for the predicted arc change. It is this offset that is displayed in the parameter AUTOXCT OFFSET (p.62).

B Service functions: #-button

If you press the #-button while in splicing mode you gain access to yet another group of operations and parameters. The following section outlines them in the order they come up during editing. However, if you want a more precise overview of the organization of these parameters, see the flow chart in Appendix C.



Current test for hot core alignment: CURRENT TEST?

If you have chosen a program with hot core alignment as its process, the first question that will come up when you press the (#) button is whether you want to run the current test. The current test is used to set the RTC CURRENT parameter, which is described on page 29. The following outlines the procedure you must follow if you want to run the current test and store the resulting value in a hot core alignment program.

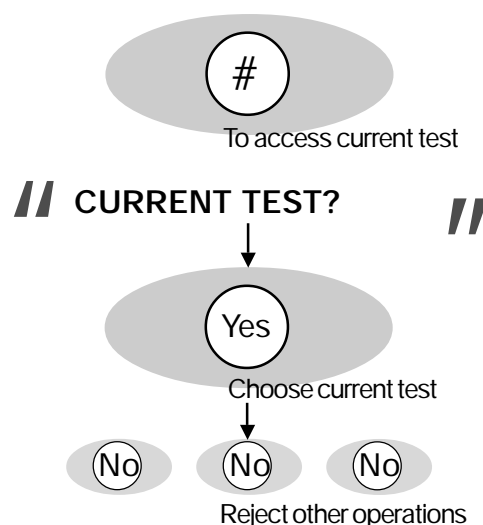
1 Choose a program that uses the hot core alignment process. Note that, though you can run the current test with the pre-defined program 05, the resulting value can not be stored in it, so it is best to copy it to another slot by following the instructions on page 45.

| ECCENTRIC TEST | |
|--------------------|---------|
| HOT CORE ALIGNMENT | |
| MAX ECCENTRICITY | 1.0 UM |
| RTC CURRENT | 12.5 MA |
| ACCEPTABLE OFFSET | 0.3 UM |

Example of a program with hot core alignment in the screen-viewer. The parameter values have been copied from P05 into a new slot and the program renamed.

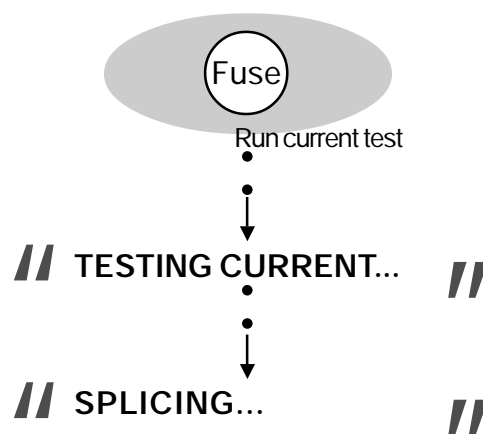
2 Press the (#) button.

3 Press the (Yes) button to say you want to run the current test. You will subsequently have to answer No three times, in order to reject the other operations available via the #-button--namely "Clean electrodes?" "Splicelist handling?" and "Enter service mode?"



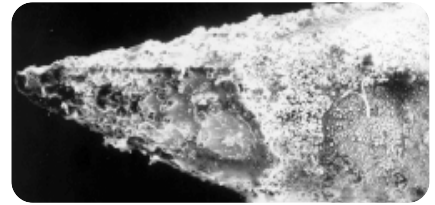
4 The splicer will then instruct you that in order to start the current test, you must press the FUSE button.

5 The splicer will then run the current test, store the value for RTC CURRENT, and carry out the splicing sequence to its completion. If the splicer can not splice the tested fibers (because they became damaged during the test), it will display the fault message "REPLACE FIBERS," and you will have to replace the fibers before splicing. If you run the test using Program 05, the splicer can not save a value for RTC CURRENT and will display "CHANGES NOT SAVED."

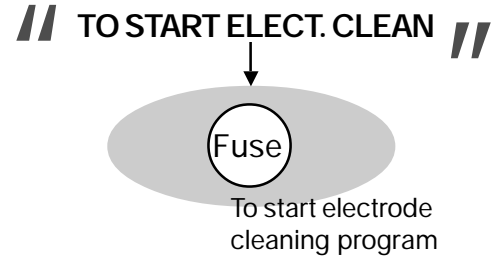


Electrode cleaning program: CLEAN ELECTRODES?

If you press the (#) button, and you do not have a hot core alignment program in memory, the first question will be asked is whether you want to "Clean electrodes?". This is something that should be done every time you brush off or replace the electrodes, and is a recommended measure after every twenty splices. If you want to run the cleaning program press (Yes). To then start the cleaning program, press FUSE. To repeat the program (which is recommended), press FUSE again when the program ends. When done cleaning the electrodes, restart the splicer by pressing ON/OFF twice.



Magnified electrode tip with deposits



Splice-list handling

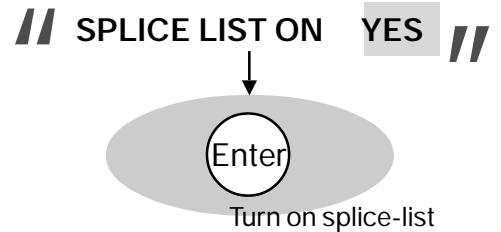
If you press the (#) button, and reply No to the question of whether you want to clean the electrodes, you will gain access to splice-list handling. The splice-list handling procedure occurs in three stages.

1 Turn on splice-list handling

You first must turn splice-list handling on by turning on the binary parameter SPLICE LIST:

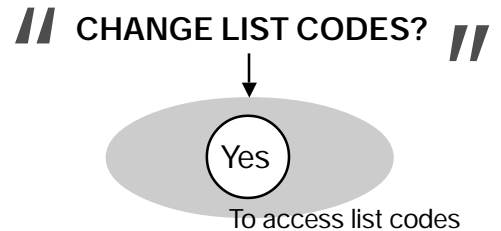
#-button > "Clean electrodes?" > NO > "Splicelist handling?" > YES > "Change list On/Off" > YES > "Splice list On." If necessary, press Yes again, so the parameter reads "Splice list On Yes."

Then press ENTER.

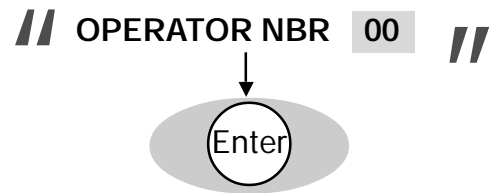


The splicer will then give you the opportunity of setting three organizational parameters by asking "Change list codes?"

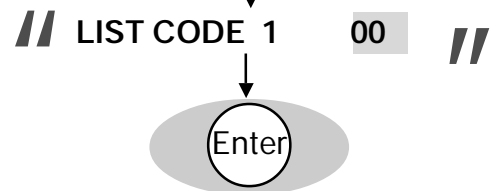
If you say (Yes), you will have a chance to specify codes that can be used to organize your splicing data.



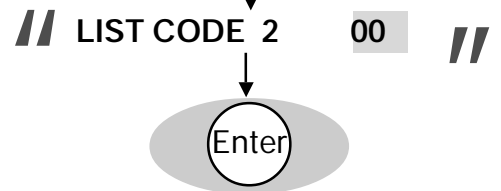
OPERATOR NBR is intended to specify who it is that is creating the splicing data. It can be changed during data collection, so that operators can be compared. You must assign the numbers yourself.



LIST CODE 1 is the first two entirely open areas where you can tag data with additional information that might be important for later analysis. An example might be if you want to have a set of codes for different splicing sites.



LIST CODE 2 is the second of the two user-definable data tags. Remember that the coding system is your own, and you can return to this parameter during data collection and change its value.

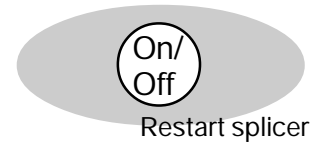
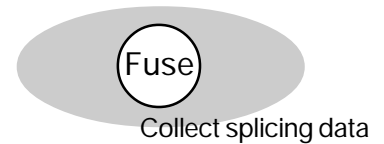


2 Collect data

The next step is to collect the splicing data that will form the content of your splice-list. If you have chosen to make use of the operator number and list codes, be sure to be consistent and change their values throughout the data collection stage.

You can collect data for up to 50-60 splices, and it need not be all in one splicing session or on one day. However long it takes, though, you must turn off and on again the splicer before printing the data out.

If at some point, you make a splice you are not happy with, you can delete it by following the steps listed below for printing out a splice-list, but answering "No" when asked whether you want to print out the list. The splicer will then ask if you want to SKIP LAST SPLICE. To do so, press **Yes**.



// SKIP LAST SPLICE? //

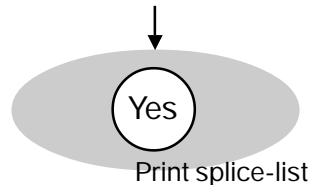
3 Print out splice list

You can connect a printer to the splicer via the RS 232 connector (see technical data, p. 74), and the splicer will send the data to it in the form of a spreadsheet. The command that effectuates this process is PRINT SPLICELIST?:

#-button > "Clean electrodes?" > "Splicelist handling?" > YES > "Change list On/Off" > NO > "Change list codes?" > NO > "Print splicelist?"

At this point you can press **Yes** to print out the splice-list.

// PRINT SPLICELIST? //



// PRINTING..... //

The splicer will then ask you if you want to "Clear splicelist?" As you can clear a splice-list ONLY when you print it out, you should seriously consider clearing it once you have a good print-out. You press **Yes** to clear the splice-list, making it possible for you to collect new data points.

// CLEAR SPLICELIST? //

Reading your splice-list

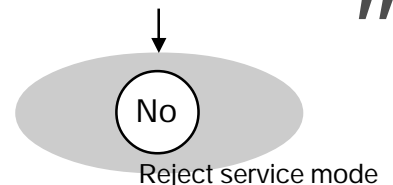
Splice-lists are organized according to the adjacent diagram.

| SPLICE NUMBER | DATE | TIME | "A" for Automode "M" for Manual mode | | LOSS DB | Fiber type "SD" for Standard single fiber | | |
|---------------|-------------|-------|---|------|---------|--|--------|--------|
| | | | MODE | TYPE | | OPERATOR NUMBER | CODE 1 | CODE 2 |
| 01 | 1999-MAR-14 | 16:43 | M,SD | | 0.03 | 12 | 04 | 05 |
| 02 | 1999-MAR-14 | 17:02 | A,SD | | 0.02 | 12 | 04 | 05 |
| 03 | 1999-MAR-15 | 10:33 | M,SD | | 0.08 | 10 | 04 | 06 |
| 04 | 1999-MAR-15 | 11:26 | M,SD | | 0.05 | 10 | 03 | 06 |

Service mode: ENTER SERVICE MODE?

At various points within the tree of operations under the **#** button, there is an opportunity to pass into service mode: "Enter service mode?" This is intended for authorized service personnel only, so you should always just press **No**.

// ENTER SERVICE MODE? //



C Advanced hot image analysis

On pages 21-22 we talked about hot images and hot image analysis. In short, after splicing the FSU 995 FA automatically calculates a splice loss estimation and makes available two hot images. To see analysis of these hot images, press HOT IMAGE when one of the cold images is on the screen. The hot image that comes up will indicate which of the two images it is---here, "1st Image."

To do advanced hot image analysis, press ENTER.

This will bring up the first of the three levels of advanced hot images. The first includes light intensity curves, which can be used to determine the type of fiber being spliced. We have seen them earlier in the section on fiber types on pages 26-7. The "1ST IMAGE" indicates that it is the first of the two hot images taken during the splicing sequence.

Press ENTER to go to the next level of hot image analysis.

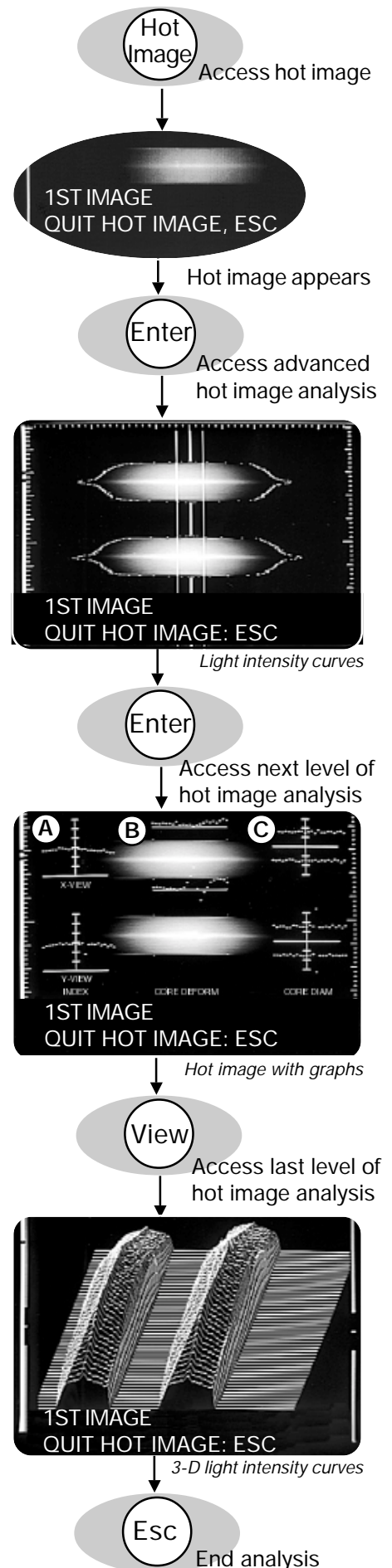
The next level of analysis includes three sets of graphs:

- (A) On the far left are two graphs showing the hot fiber index level from the upper view and the lower view.
- (B) In the center are found two graphs that show the core deformations (dotted line) and the base line tilting (solid line) at a magnification of 15x, measured both longitudinally (top) and transversally (bottom).
- (C) On the far right are two graphs that measure the core diameter as seen from the top and bottom.

Press VIEW to access the final level of analysis.

The final level of advanced hot image analysis are three-dimensional light intensity curves. The scale is 20 μm between ticks along the longitudinal axis of the fiber and 15 μm between ticks along the transversal axis of the fiber.

Press ESC when you want to exit from advanced hot image analysis.



D Quick character selection

The character selection method described for defining a program name (p. 47) is effective but can be a little slow, so it is advantageous to learn the adjacent shorthand. Quick character selection can not be used in isolation since not all characters are available, but it can facilitate entering information into the splicer.

*Do **NOT** press the buttons ON/OFF, ENTER or FUSE when using quick character selection.*

| Button | Corresponding character |
|--------------|-------------------------|
| Yes | Y |
| No | N |
| 0-9 (left) | A |
| 0-9 (middle) | O |
| 0-9 (right) | & |
| Select | S |
| + | + |
| - | - |
| View | V |
| Esc | E |
| Mode | M |
| Hot image | H |
| Gap | space |

E Global parameters: Program 00

If you set the program number to 00 (follow instructions on page 14) and enter the key number "99.5," you gain access to the global parameters, which are the parameters that control the general functioning of the splicer. The organization in sub-groups is repeated by the order of editing you will find in flow chart form in Appendix C.

Note that a change to a global parameter will affect all splicing programs!

| Parameter | Function | Range | Default |
|--------------------|---|-------------------|--------------|
| ENGLISH VERSION? | Multiple value parameter for the language of display. Different splicers have different sets of languages. | 0 to 12 | ENGLISH (=0) |
| DISPLAY GAP ANGLE* | Stop during alignment to display the view and gap angles. | ON/OFF | OFF (=NO) |
| ALTITUDE* | For current compensation at altitudes other than sea level. | -2.00 to +8.00 km | 0.00 km |
| MAX GAP ANGLE | If gap angle greater than this parameter's value, a warning is given. | 0° to 9.9° | 2.0° |
| MAX VIEW ANGLE | If view angle greater than this parameter's value (because of dust in V-grooves or fiber bending) a warning is given. | 0° to 9.9° | 0.6° |
| STOP AT FUSION | If ON, the splicing sequence will be paused after alignment. | ON/OFF | OFF (=NO) |

Continued on the following page →

* DISPLAY ANGLES and ALTITUDE will be described in greater detail on pages 63 and 64.

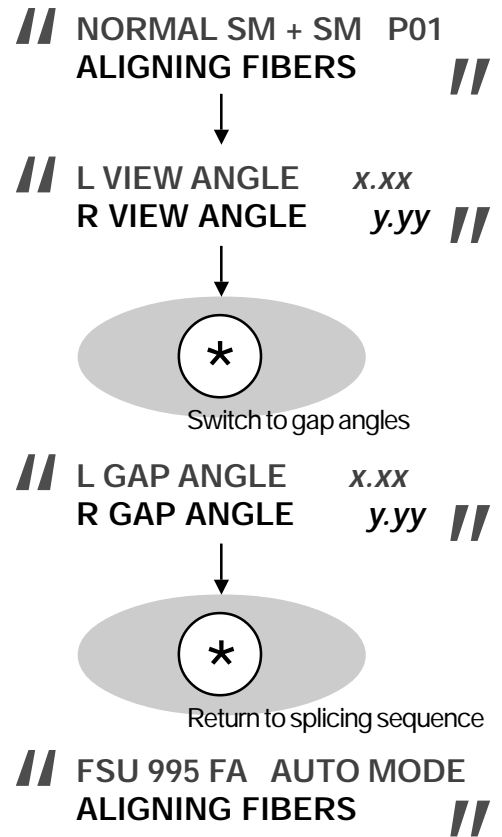
| | Parameter | Function | Range | Default |
|-----------------------|---------------------|---|---|--------------------------|
| Estimation parameters | LOSS EST. LEV | Gives you the option of deciding in what cases you want the splicer to estimate the splice loss. 0 = No loss estimation 1 = Estimation only when in Automode 2 = Always do loss estimation | 0 to 2 | 2 |
| | SHOW LOSS TO | When the estimated loss exceeds this value the splicer will display "BAD SPLICE." | 0.0 to 49.9 dB | 2.0 dB |
| | MACROBENDING | A proportionalizing factor that is used to optimize estimation of loss due to macrobending. | 0.0 to 9.9 | 0.3 |
| Offset parameters | AUTOXCT OFFSET | Gives the offset to the set splicing position (see also <i>AUTO ARC CENTER</i> on p. 56). | -90 to +90 pixels | 0 pixels |
| | GLOBAL XCT | Allows you to change the splicing position (see also <i>SET CENTER POSITION</i> on p.55) | 150 to 360 pixels | 255 pixels |
| | WEIGHT FACTOR | A factor that sets the grade of impact for measured data in the equation used by the <i>Automatic Arc Re-centering</i> function. | 0.00 to 0.99 (0.00 = low 0.99 = high) | 0.25 |
| Current | RTC CURR LOL | Low limit for RTC current. | 0 to 29.9 mA | 14.5 mA |
| | RTC CURR HIL | High limit for RTC current. | 0 to 29.9 mA | 15.5 mA |
| CPU settings | SPLICES TOTAL: | The total number of splices made by the splicer: UNEDITABLE. | 0 to x | x |
| | SPLICES: | Splice counter. | 0 to x | x |
| | RESET SPLICES? | Resets splice counter to 0. Use after you have replaced electrodes. | YES/NO | NO (=0) |
| | WAIT TIME | Time of inaction before splicer turns off automatically. | 0.0 to 4.9 MN | 1.0 MN |
| | ELECTROD WARNING | Number of splices before splicer warns you that it is time to replace the electrodes. | 00 to 99 HS (HS = hundred splices) | 20 HS (=2000 splices) |
| | TURN OFF | Enable/Disable the function that automatically turns off the splicer | YES/NO | YES (=1) |
| | YEAR | The current year. | 00 to 99 | set in factory |
| | MONTH | The current month. | 00 to 12 | set in factory |
| | DAY | The current day. | 00 to 31 | set in factory |
| | HOUR | The current hour. | 00 to 24 | set in factory |
| MIN | The current minute. | 00 to 59 | set in factory | |

DISPLAY GAP ANGLE parameter

If you set the parameter DISPLAY GAP ANGLE to YES, the splicer will stop during fine alignment and show you the gap angles (cleave angles) and view angles (angular deviation of fibers in camera's viewing plane, see also figure below). If you follow the adjacent diagram you see that the splicer first pauses and shows you the view angle offsets, where: L VIEW ANGLE is the view angle offset in the lower view, and R VIEW ANGLE is the view angle offset in the upper view.

You then press the \odot button to see the gap angles, where: L GAP ANGLE is the cleave angle of the left fiber, and R GAP ANGLE is the cleave angle of the right fiber.

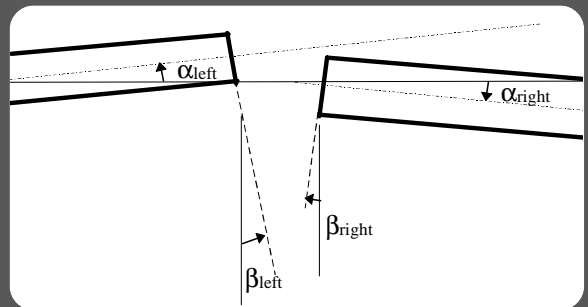
By pressing the \odot button again the splicer resumes the splicing procedure.



Definitions of angles

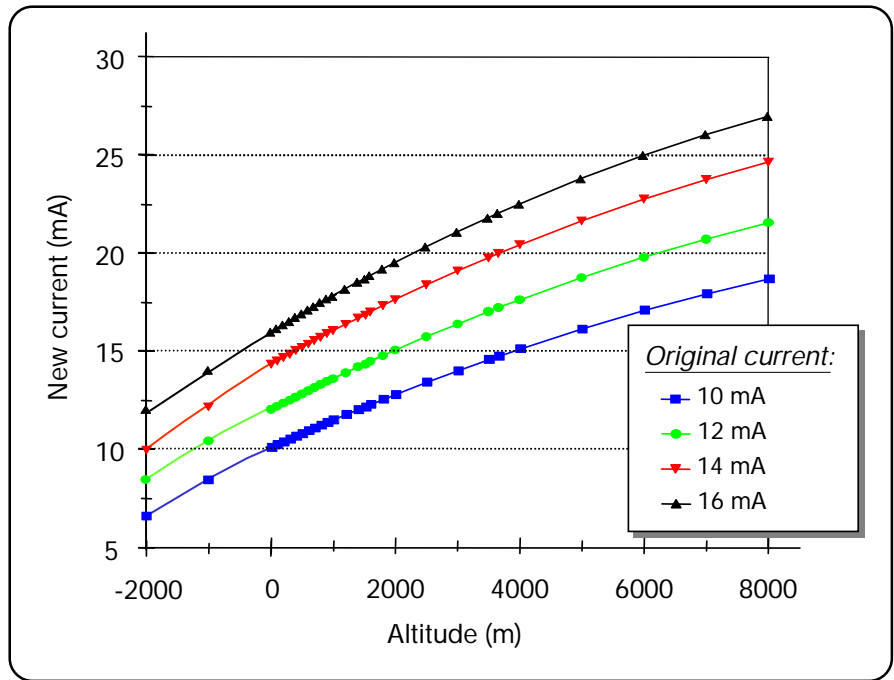
Counter-clockwise angles (eg. α_{left} and β_{left}) are measured as positive.

Clockwise angles (eg. α_{right} and β_{right}) are measured as negative.



ALTITUDE parameter

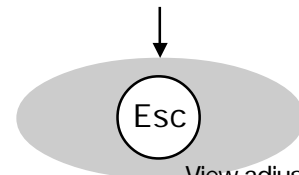
When working at altitudes significantly higher, or lower, than sea level, it is important to adjust the electrode currents to compensate for the decreased, or increased, air density. If you fill in the ALTITUDE parameter with your working altitude in kilometers, the FSU 995 FA will automatically recalibrate the prefusion current and the three fusion currents to your actual work conditions. The adjacent graph shows such an adjustment for original currents of 10, 12, 14 and 16 mA.



Adjusted currents to compensate for altitude

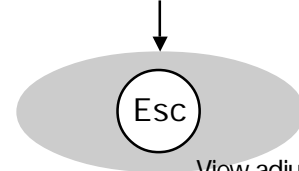
If you are using the ALTITUDE parameter, you can view the adjusted currents by pressing ESC before splicing.

**// FSU 995 FA AUTO MODE
PRESS FUSE BUTTON //**



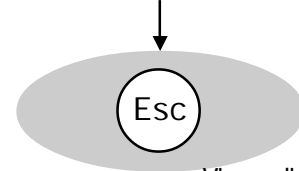
View adjusted
PREFUSE CURRENT

**// CU0 P=+10.0 F=+11.2
SET ALTITUDE +1.00 KM //**

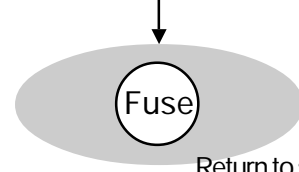


View adjusted
FUSION CURRENT 1

**// CU1 P=+10.4 F=+11.7
SET ALTITUDE +1.00 KM //**



View adjusted
FUSION CURRENT 2



Return to splicing

The information will be displayed in the *mode field* according to the following abbreviations:

CU0 = PREFUSE CURRENT P = Current without compensation
 CU1 = FUSION CURRENT 1 F = Current with compensation
 CU2 = FUSION CURRENT 2
 CU3 = FUSION CURRENT 3

And in the *message field* you will see the current setting for the ALTITUDE parameter.

In this example, the ALTITUDE is set for 1 km above sea level, the adjusted prefusion current is 11.2 mA, and the adjusted fusion current 1 is 11.7 mA.

To switch from one current to the next, you successively press ESC. So to get from the information for FUSION CURRENT 1 to FUSION CURRENT 2, press ESC, and from FUSION CURRENT 2 to 3, you press ESC again.

When you are done viewing the adjusted currents, you can press FUSE and continue with the splicing sequence.

Upload / Download Software

The Upload/download software is a Microsoft Excel application that greatly facilitates the handling of the FSU 995 FA. It automatically collects and stores all parameters and other data from splices made by the FSU 995 FA, and presents the output in a Microsoft Excel spreadsheet. This allows you to monitor the performance of the splicer over time, resulting in an overall improvement of splice quality as well as an increased life cycle for the FSU 995 family of splicers.

Splicing program editing is also facilitated in that the software allows you to edit and store programs on a PC and then download these to individual splicers as needed.



A Power connection

There are several maintenance tasks connected with keeping the FSU 995 FA supplied with power.

Fuses

The fuses are located in the rear panel of the splicer (see diagram, p. 7). There is a 6A fuse intended for the splicer and heat oven, and a 2A fuse related to the outlet marked AUX. Both of them are delayed action fuses. When they must be replaced, you should carefully remove them with a screwdriver (see adjacent picture), and replace them with delayed action fuses of the correct amperage.



Battery

The battery is delivered uncharged, so the first thing you must do with it is to charge it. To charge it, you should connect it to the power supply (input 90-264 V AC, output 12V DC). Note that it takes approximately ten hours to charge an empty battery, so plan in advance. Do not charge the battery for a longer period of time, since this will shorten the battery's lifetime. The other thing to note is that the battery will slowly discharge even when unused, so you should plan to routinely charge it once a month.



FSU 995 FA battery

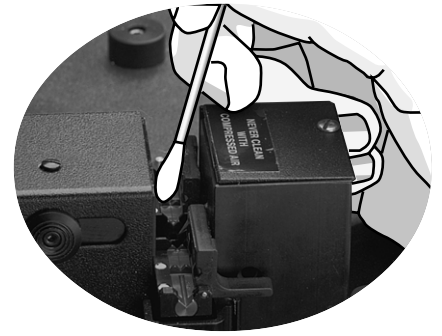
While the battery is in use, the splicer will display the warning **LOW BATTERY** when the battery voltage is under 11.0 V. This is a signal to you that you will soon have to stop splicing with it, and recharge it. You can also check the battery voltage at any time by connecting it to the splicer, selecting manual mode (with the MODE button, see p. 14) and holding down the (#) button until the battery voltage is displayed.

// LOW BATTERY //

B Fiber clamps and V-grooves

Cleaning

In the case of both the fiber clamps and V-grooves, cleanliness is very important. Before starting work each day, you should clean them with a cotton swab dipped in propanol or ethanol. After you have finished cleaning them, you should also ensure that you have not left behind any strands of cotton. For V-grooves that become heavily dirtied, we recommend that you clean them in an ultrasonic cleaner.



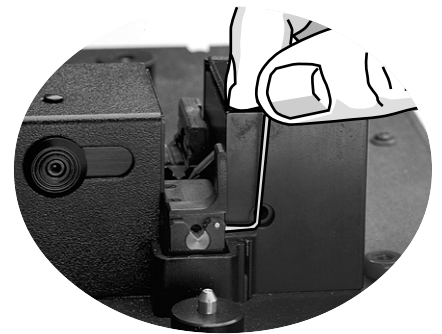
Do's and do not's when cleaning

- 1 Do NOT clean either the fiber clamps or the V-grooves with compressed gas. The combination of high pressure air and dust acts like a sandblaster on their precision surfaces.
- 1 Do NOT use any sort of hard tool to clean either the fiber clamps or the V-grooves.
- 1 ONLY clean with pure propanol or ethanol.

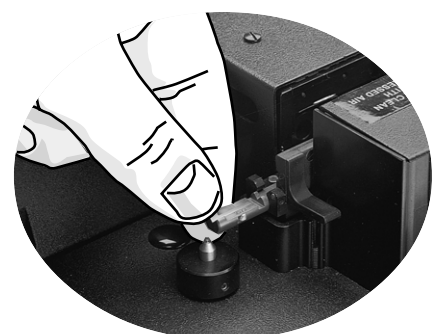
Changing V-grooves

The FSU 995 comes with two pairs of V-grooves, blue and black, and based on the kind of fiber you are splicing you will have to periodically exchange them. To do so:

- ① Open the safety shield.
- ② Loosen the screw that fastens the V-grooves with the hex wrench supplied with the splicer (see first adjacent picture).
- ③ Pull out the old V-groove (see second adjacent picture).
- ④ Insert the new V-groove, making sure that the number printed on the V-groove agrees with the number indicated on the label behind the operator panel (see sample label below).
- ⑤ Tighten screw that holds V-groove. Do not fasten too tight.
- ⑥ Repeat procedure for the other V-groove.



Unfasten screw



Exchange V-grooves

V-groove numbers

Every FSU 995 V-groove has its own unique number, and can be used only with its particular FSU 995 splicer. The label behind the operator panel (see adjacent picture) identifies the V-grooves that go with that splicer. The reason for this specificity lies in the high precision of fabrication dimensions, and it means you cannot exchange V-grooves between splicers.

| V-groove numbers | | |
|------------------|-------|-------|
| | Left | Right |
| Blue | 12345 | 56789 |
| Black | 54321 | 98765 |

C Electrodes

Cleaning

The electrodes can be cleaned in two different ways. The first is to run the electrode cleaning program (see also p. 58), which is accessed as follows:

#-button > "Clean electrodes?" > YES

The electrode cleaning program should be a part of your daily splicing routine, and we recommend it as a start-up procedure. You should also run it after every 20th splice.

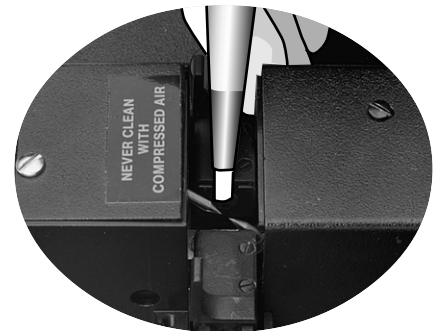
While the electrode cleaning program is running, you should listen for a sizzling sound. If you hear it, you should run the program several times until it subsides. If the sound does not subside you should switch to the second way of cleaning the electrodes.

The second way of cleaning the electrodes is to make use of the electrode brush that comes with the splicer (see adjacent picture). You first brush away excessive deposits with this brush, and then run the electrode cleaning program. This cleaning procedure should be a more seldom activity, averaging around every 200th splice.

If a sizzling sound persists even after cleaning the electrodes with the brush and the electrode cleaning program, you probably have to replace them, which is explained subsequently.



To access electrode cleaning program



Keep in mind that the electrode tips are **very fragile**, and thus you should never clean them with a hard object, and you should even keep to a minimum the frequency with which you clean them with the electrode brush.

Changing

Under normal splicing conditions the electrodes must be replaced around every 2000th splice. However, if you are using certain types of fiber, such as carbon coated fiber, you will have to replace them more often.

As discussed on page 62, the FSU 995 FA has a built-in splice counter. When this counter reaches the value indicated in the global parameter ELECTROD WARNING, the splicer will display the warning CHECK ELECTRODE WEAR. This is your signal that you should probably change the electrodes using the procedure outlined on the next page. Don't forget that after you have changed them you must also run the electrode cleaning program several times and reset the splicing counter (to find it, see flow chart, p. 76).

“CHECK ELECTRODE WEAR”

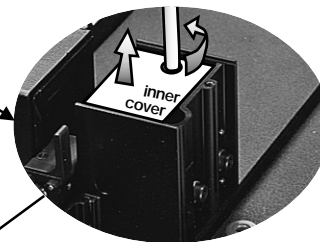
Accessing electrodes:

Upper electrode (steps 1 - 4)

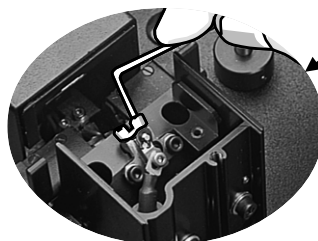
- ① Loosen the screw that holds in place the outer cover of the electrode block. Remove the outer cover.
- ② Loosen the screw that holds in place the inner cover of the electrode block. Remove the inner cover.
- ③ With the hex wrench that comes with the splicer, loosen the two screws that fasten the upper electrode.
- ④ Lift the upper electrode out with the electrode tweezers that come with the splicer.



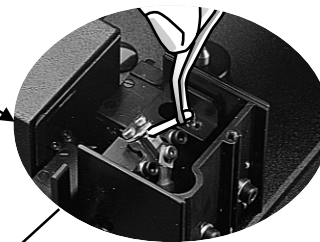
① Unscrew outer cover



② Unscrew inner cover



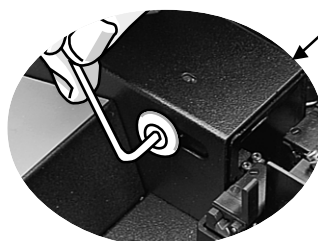
③ Loosen upper electrode



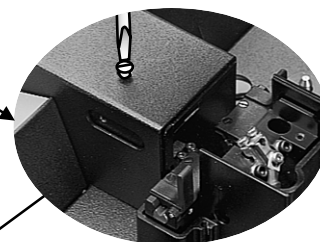
④ Remove upper electrode

Lower electrode (steps 5 - 8)

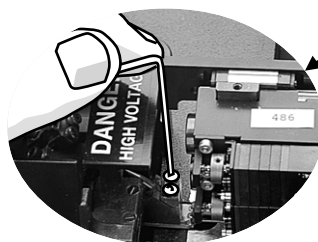
- ⑤ Loosen and remove the knob on the right side of the cover over the optical house using the hex wrench that comes with the splicer.
- ⑥ Loosen the screws on top of the cover over the optical house. Remove the cover.
- ⑦ With the hex wrench that comes with the splicer, loosen the two screws that fasten the lower electrode.
- ⑧ Lift the lower electrode out with the electrode tweezers that come with the splicer.



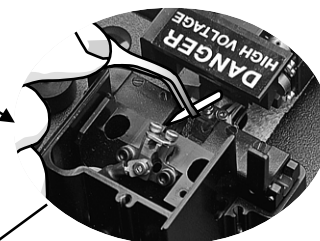
⑤ Remove knob



⑥ Remove optical cover



⑦ Loosen lower electrode



⑧ Remove lower electrode

Keep in mind...

1 The electrode tips are fragile, and you should avoid touching them.

1 There is risk of damage to precision parts if you drop the electrodes into the splicer.

1 You must reset the splicer counter yourself after replacing the electrodes.

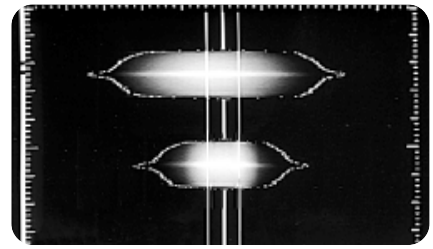
Install the new electrodes by following the same procedure in reverse, starting with step 8 and going backwards to 1.

1 Run the electrode cleaning program several times.

2 Reset the splicing counter to 0 (see flow chart, p. 73).

D Mirror one (cleaning)

Because of the position of the mirrors in the FSU 995 FA there is a tendency for mirror one (positioned at a 45° angle) to become dirty with build-up in the same way the electrodes do. This build-up manifests itself as a gradual darkening of the image in the lower view, as well as in the contraction of the hot image light intensity curves for this same view. YOU SHOULD NOT TRY TO CLEAN THE MIRROR YOURSELF, but rather should deliver the splicer to an authorized Ericsson representative for cleaning.



Ex. of contraction of lower light intensity curve due to build-up on mirror one.

E Maintenance time table

Maintenance should be an important part of your daily routine with the FSU 995 FA. To make it easier for you to keep in mind all of the various maintenance tasks, the following time table organizes these tasks according to how often you should do them.

| How often | Maintenance tasks |
|-----------------------|---|
| Beginning of each day | Clean the electrodes using the electrode cleaning program. Clean the V-grooves with a cotton swab dipped in alcohol. |
| Every 20 splices | Clean the electrodes using the electrode cleaning program. |
| Every 200 splices | Clean the electrodes using the electrode brush and then the electrode cleaning program. |
| Every 1000 splices | Check mirror one for build-up. |
| Every 2000 splices | Replace the electrodes. |

Appendix A - Troubleshooting

The following three tables present the fault messages that will appear when there is a problem, along with possible causes and suggested corrective messages. The first table applies to all splicing processes; whereas, the other two are specific to mode field matching and attenuator making respectively.

| Fault message | Possible causes | Suggested corrective measures |
|-----------------------|---|--|
| LOW BATTERY | <ol style="list-style-type: none"> 1. The battery needs charging. 2. The power supply is faulty. 3. The splicer is measuring the battery charge incorrectly. | <ol style="list-style-type: none"> 1. Charge the battery. 2. Service the power supply. 3. Service the splicer. |
| CHECK ELECTRODE WEAR | The number of splices indicated in the global parameter "Electrode warning" have been executed. | <ol style="list-style-type: none"> 1. Reset splice counter to zero if electrodes does not need to be changed. 2. Change electrodes and reset counter. |
| NO FIBER FOUND | <ol style="list-style-type: none"> 1. The fibers are not in the cameras' field of vision. 2. The fibers are out of focus. 3. The optical system is faulty. | <ol style="list-style-type: none"> 1. Insert the fibers so that they are clearly visible in the monitor. 2. Adjust the focus. 3. Service the splicer. |
| NO LEFT FIBER FOUND | See NO FIBER FOUND. | See NO FIBER FOUND. |
| NO RIGHT FIBER FOUND | See NO FIBER FOUND. | See NO FIBER FOUND. |
| NO GAP FOUND | The splicer can not locate the end faces, or the gap between them. | Insert the fibers into the clamps again, and/or adjust the focus. |
| BAD LEFT GAP | The splicer cannot locate the end of the left fiber because of dirt or a poor cleaved end faces. | Adjust the focus, and if the problem persists, re-prepare the left fiber. |
| BAD RIGHT GAP | The splicer cannot locate the end of the right fiber because of dirt or a poor cleaved end faces. | Adjust the focus, and if the problem persists, re-prepare the right fiber. |
| BAD LEFT GAP ANGLE | The cleave angle of the left fiber is too large. | Re-prepare the left fiber paying special attention to cleaving. |
| BAD RIGHT GAP ANGLE | The cleave angle of the right fiber is too large. | Re-prepare the right fiber paying special attention to cleaving. |
| BAD FIBERS | <ol style="list-style-type: none"> 1. Monitor out of focus. 2. The fibers are dirty. 3. Poor end faces. | <ol style="list-style-type: none"> 1. Adjust the focus. 2. Re-prepare the fibers. 3. Re-prepare the fibers paying special attention to cleaving. |
| DIRTY FIBERS | The fibers are dirty. | Re-prepare the fibers paying special attention to properly cleaning them, and clean the V-grooves. |
| DIRTY LEFT FIBER | See DIRTY FIBERS. | See DIRTY FIBERS. |
| DIRTY RIGHT FIBER | See DIRTY FIBERS. | See DIRTY FIBERS. |
| CAN'T ALIGN VERY GOOD | <ol style="list-style-type: none"> 1. Monitor out of focus. 2. Internal splicer error. | <ol style="list-style-type: none"> 1. Adjust the focus. 2. Service the splicer. |

Continued on the next page →

General fault messages (cont.)

| Fault message | Possible causes | Suggested corrective measures |
|----------------------|--|---|
| CAN'T MAKE SHARP | <ol style="list-style-type: none"> 1. Monitor out of focus. 2. Internal splicer error. | <ol style="list-style-type: none"> 1. Adjust the focus. 2. Service the splicer. |
| BAD VIEW ANGLE | <ol style="list-style-type: none"> 1. The V-grooves are dirty. 2. The V-grooves are out of alignment. | <ol style="list-style-type: none"> 1. Clean the V-grooves. 2. Service the splicer. |
| INTERNAL ERROR | Splicer needs service. | Service the splicer. |
| CANNOT ESTIMATE LOSS | <ol style="list-style-type: none"> 1. Bad splice picture. 2. Wrong parameters used in program. 3. If it happens very frequently, it means the optical system is faulty. | <ol style="list-style-type: none"> 1. Re-fuse the fibers. 2. Check the program and program parameters, and then re-splice. 3. Service the splicer. |
| BAD SPLICE | Unsuccessful splice. | Re-splice the fibers. |
| XCT OUTSIDE RANGE | <ol style="list-style-type: none"> 1. Bad conditions of electrodes 2. Light emissions from right and left fibre differ too much 3. Splicer needs service | <ol style="list-style-type: none"> 1. Clean electrodes (see p.68) 2. Try splicing other fibres to see if problem persists 3. Service the splicer |

Mode field matching fault messages

| Fault message | Possible causes | Suggested corrective measures |
|---|--|--|
| SELECT # NOT PRESSED COMPUTE THRESHOLD? | During the threshold type test, the #-button was not pressed, and thus no new loss data was saved. | Redo threshold type test. |
| NO THRESHOLD FOUND DO SELECT NEXT TIME | Insufficient data for calculating a threshold type. | Re-do the test, paying special attention to taking data for splice loss measurement. |
| NO THRESHOLD FOUND TRY REDUCE TIME 2 | Insufficient data for calculating a threshold type. | Reduce FUSION TIME 2 and re-do test. |
| NO THRESHOLD FOUND TRY INCREASE CURR. 2 | Insufficient data for calculating a threshold type. | Increase FUSION CURRENT 2 and re-do test. |
| NO THRESHOLD FOUND TRY REDUCE CURR. 2 | Insufficient data for calculating a threshold type. | Reduce FUSION CURRENT 2 and re-do test. |
| NO THRESHOLD FOUND TRY NORMAL PROCESS | Insufficient differences in index profiles to calculate a threshold type. | Try splicing with the normal splicing process. |

When you have gotten a fault message and made note of what you should do, you can then return to the on-going procedure by pressing the ESC button.



Attenuator making fault messages

| Fault message | Possible causes | Suggested corrective measures |
|----------------------|--|--|
| CANNOT ESTIMATE | Splicer can not estimate splice loss as something has gone wrong with the splice. | Check hot image to see reason of fault. |
| FUSION CURR TOO HIGH | Fusion current 2 is too high, or the fusion time 2 too long, to allow RTC control. | Reduce FUSION CURR 2 by at least 1.0 mA. |
| RTC CURRENT TOO HIGH | Fusion current 3 is too high to allow RTC control. | Reduce FUSION CURR 3 by at least 1.0 mA. |
| RTC CURRENT TOO LOW | Fusion current 3 is too low to achieve the target offset. | Increase FUSION CURR 3 by at least 1.0 mA. |
| ECF FACTOR TOO SMALL | The ECF factor is too small to allow RTC control. | Increase ECF FACTOR by 0.2. |

Observable faults

There are also a set of possible problems in the operation of the splicer that you may observe visually. The following table outlines them as well as their possible causes and suggested solutions.

| Problem | Possible causes | Suggested corrective measures |
|--|--|---|
| Arc unstable, splutters, or yellow in color. | <ol style="list-style-type: none"> 1. Electrodes dirty. 2. Fibers dirty. | <ol style="list-style-type: none"> 1. Clean and/or change the electrodes. 2. Clean the fibers. |
| Fibers bend out of alignment. | Fusion current too low. | Increase FUSION CURR 2. |
| One fiber out of focus | <ol style="list-style-type: none"> 1. Fiber out of alignment in other view. 2. Dirt on primary coating, V-grooves, and/or fiber. | <ol style="list-style-type: none"> 1. Align fiber in other view. 2. Re-prepare the fibers paying special attention to cleaning both the fibers and V-grooves. |
| Fibers twist up or down when inserted in clamps | Dirt on primary coating, V-grooves, and/or fiber. | Re-prepare the fibers paying special attention to cleaning both the fibers and V-grooves. |
| Splicer turns off or resets unexpectedly | <ol style="list-style-type: none"> 1. Battery run down. 2. Power supply faulty. 3. Main power unstable. | <ol style="list-style-type: none"> 1. Charge the battery. 2. Service the power supply. 3. Use the battery. |
| Fibers in hot images too close | <ol style="list-style-type: none"> 1. Dirt on primary coating, V-grooves, and/or fibers. 2. Optical system faulty. | <ol style="list-style-type: none"> 1. Re-prepare the fibers paying special attention to cleaning both the fibers and V-grooves. 2. Service the splicer. |
| Image in monitor dim or dirty | Mirrors are dirty. | Service the splicer. |
| White vertical line at splice point (see also p. 22 for other splice problems) | <ol style="list-style-type: none"> 1. Poor cleave end faces. 2. Wrong current 3. Bad cleaning liquid | <ol style="list-style-type: none"> 1. Re-cleave the fibers. 2. Adjust current. 3. Be sure you are only using pure propanol or ethanol. |

Appendix B - Technical data

FSU 995 FA Technical data

| | |
|------------------------------|---|
| Fibers | Single fiber with a cladding diameter: 30 - 270 μm in Automode (automatic alignment) 30 - 400 μm in Manual mode (manual alignment) Single fiber with coating diameter up to 2000 μm Special single fibers including erbium, dispersion shifted and multimode |
| Splice loss | Typical value using identical single mode fibers: 0.02 dB |
| Fiber clamping | On bare fiber with blue V-grooves On primary coating with black V-grooves |
| Power supply | 90 - 264 V AC, 50 - 60 Hz 13.2 V DC |
| Battery | Splicer only: greater than 100 splices per charge Splicer and heat oven: greater than 50 splices per charge Recharging time: 10 hours |
| Operating environment | 0 - 40°C, 0 - 95% RH (non-condensing) |
| Storage environment | -40 - 60°C, 0 - 95% RH (non-condensing) |
| Monitor | 3" high-resolution LCD monitor |
| Video output | 1 V p-p positive, 75 ohms/CCIR |
| Size | 37 x 22 x 14.5 cm (W x D x H) (approx. 14.6 x 8.7 x 5.7 in) |
| Weight | 6.45 kg (without power supply) (approx. 14.2 lbs.) |
| Transport casing | Rugged cabin-sized case with space for all necessary accessories (54.5 x 42.5 x 25.5 cm (approx. 21.5 x 16.7 x 10 in) W x D x H, upright) |

AUX-connector pin description

| | |
|---|--|
| 1 | Power ground |
| 2 | Not used |
| 3 | Not used |
| 4 | Not used |
| 5 | Not used |
| 6 | Disable FSU 995 FA OFF-button (active low) (To prevent external units from losing power when using internal power from FSU 995 FA) |
| 7 | Optional |
| 8 | Not used |
| 9 | Power: +12 V DC, Fuse 2A |

The AUX-connector is intended for external units such as a larger monitor.

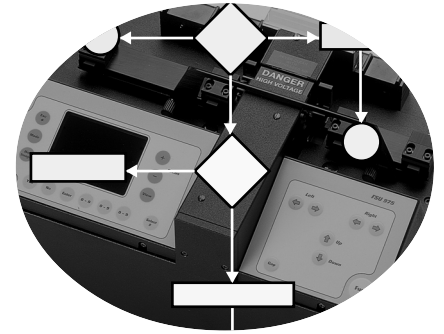
RS 232 pin description

| | |
|---|----------------------------|
| 1 | Power ground |
| 2 | T x D (Transmit data) |
| 3 | R x D (Receive data) |
| 4 | RTS (Request to send) |
| 5 | To CPU-board (No function) |
| 6 | To CPU-board (EXTM-signal) |
| 7 | Not used |
| 8 | CTS (+12 V, pull-up 1 ko) |
| 9 | Power: +12 V DC, Fuse 2A |

The RS 232 is intended for serial communication with a PC or printer.

Appendix C - Parameter and program editing flow charts

The following flow charts are provided to the advanced user as a concise summary of the capabilities of the FSU 995 FA. With a mastery of the FSU 995 FA interface and technique, one can use these flow charts to quickly locate parameters and functionality within the splicer's software.



Below is a key to understand the symbols used within the flow charts. The flow charts themselves are presented in the following order:

| | |
|-------------------------|----|
| Global parameters | 76 |
| Program editing | 77 |
| Service functions | 79 |

Key to flow charts

Splicelist handling?

Questions that require a YES or NO answer as response are indicated with a rectangle.

Fusion current 1 10.5 mA

Quantitative parameters that require you to enter a value and then press ENTER are indicated with an oval. The editable area is indicated with a grey box.

Binary parameters which you toggle off and on with the YES and NO buttons and then select a state by pressing ENTER, are indicated in the same fashion.

Open!?
Read Only?
Confidential?

Parameters with multiple values that require you to scroll through the list by pressing NO, and then selecting the desired value by pressing ENTER (see p. 54), are indicated by a rounded box including the list of possible parameter values.

Y

YES button

N

NO button

E

ENTER button

#

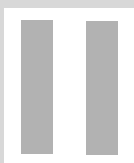
#-button

"Parameter updating..."

Any messages the splicer displays that don't require responses will be indicated in quotations marks.

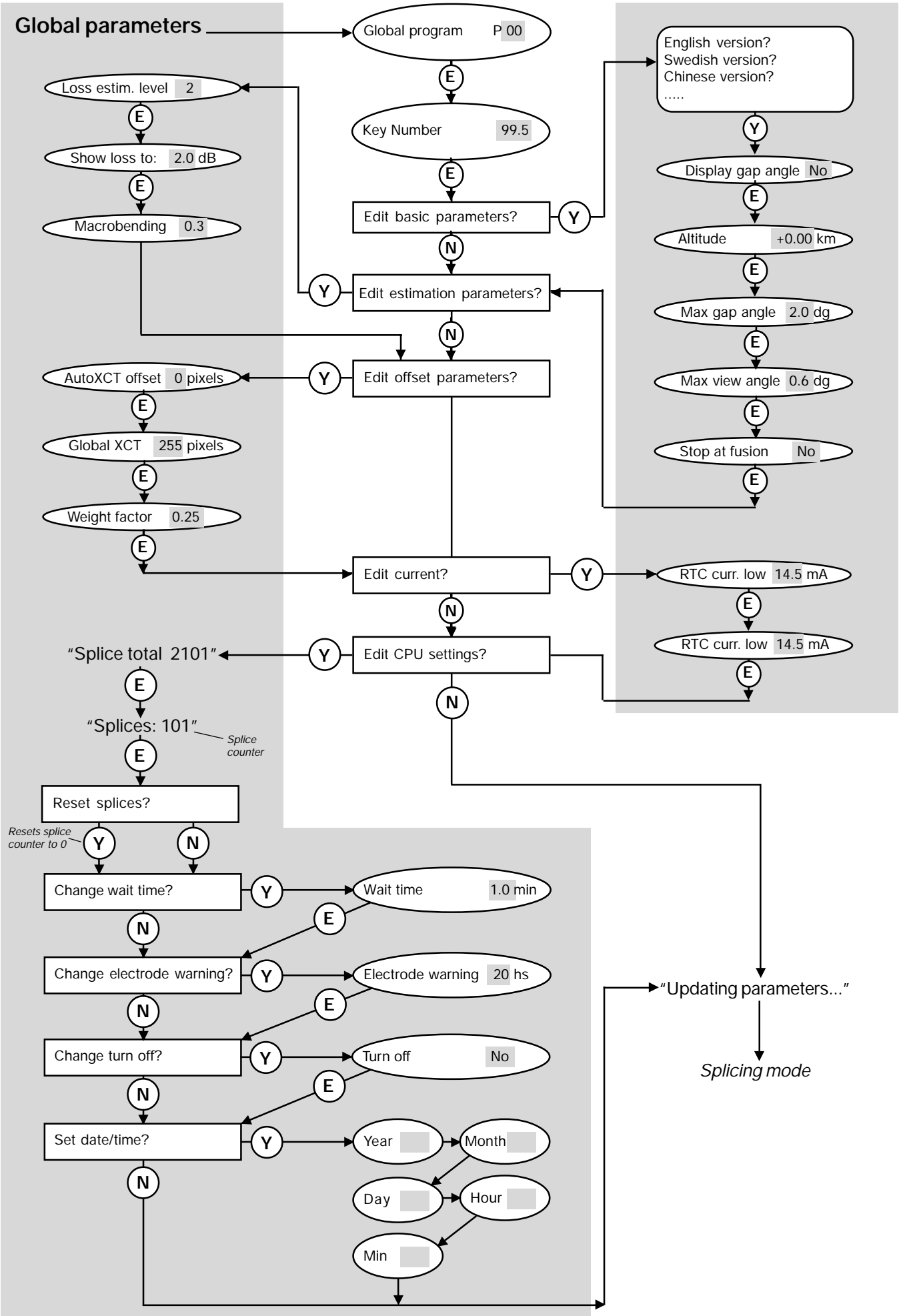
Resets splice counter to 0

Any explanatory information will be indicated with italics.

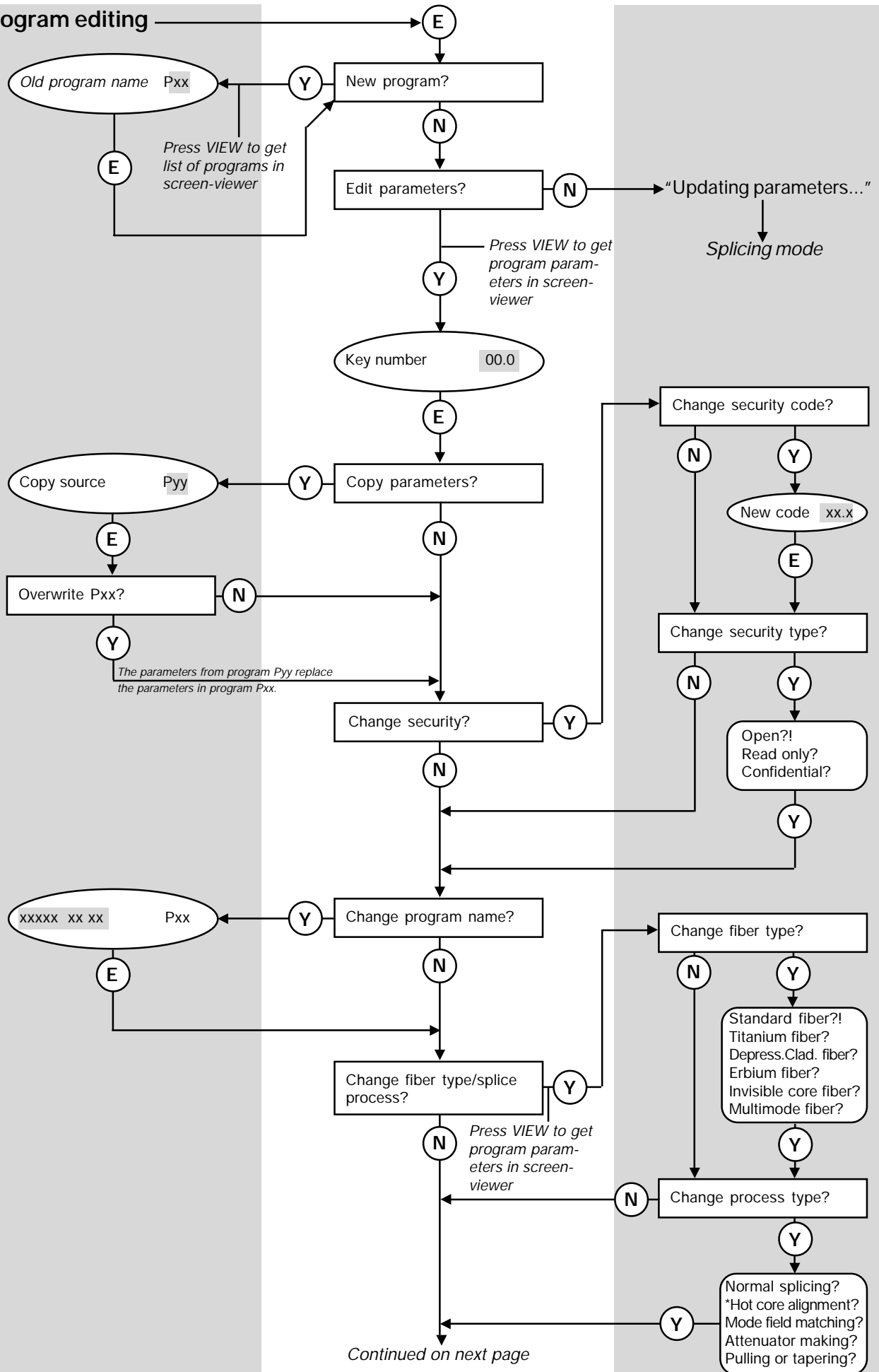


The pages are organized with white areas which contain the main editing blocks, and grey areas which present the editable parameters within each of these blocks. (For more about navigation, see p. 53)

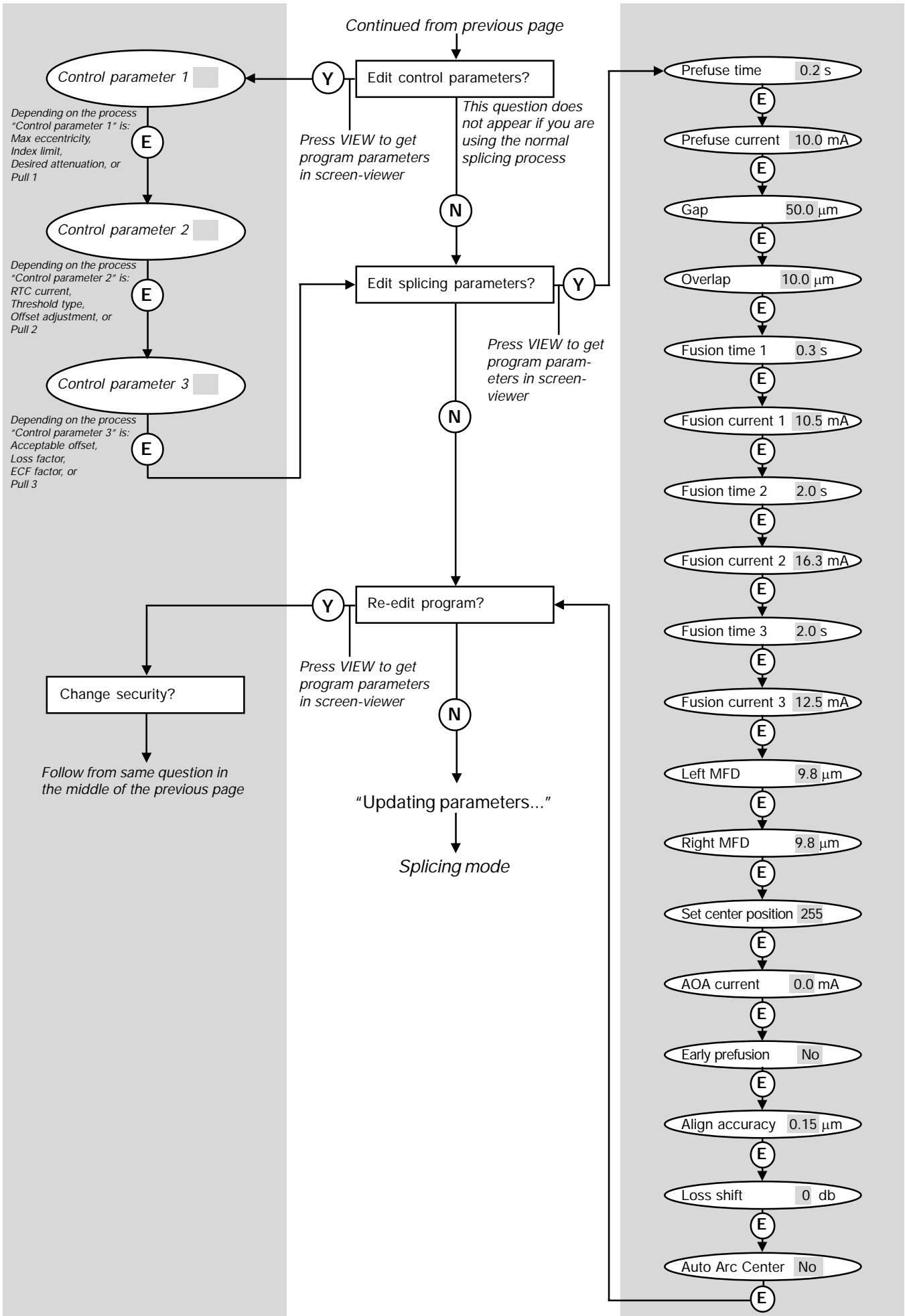
Global parameters



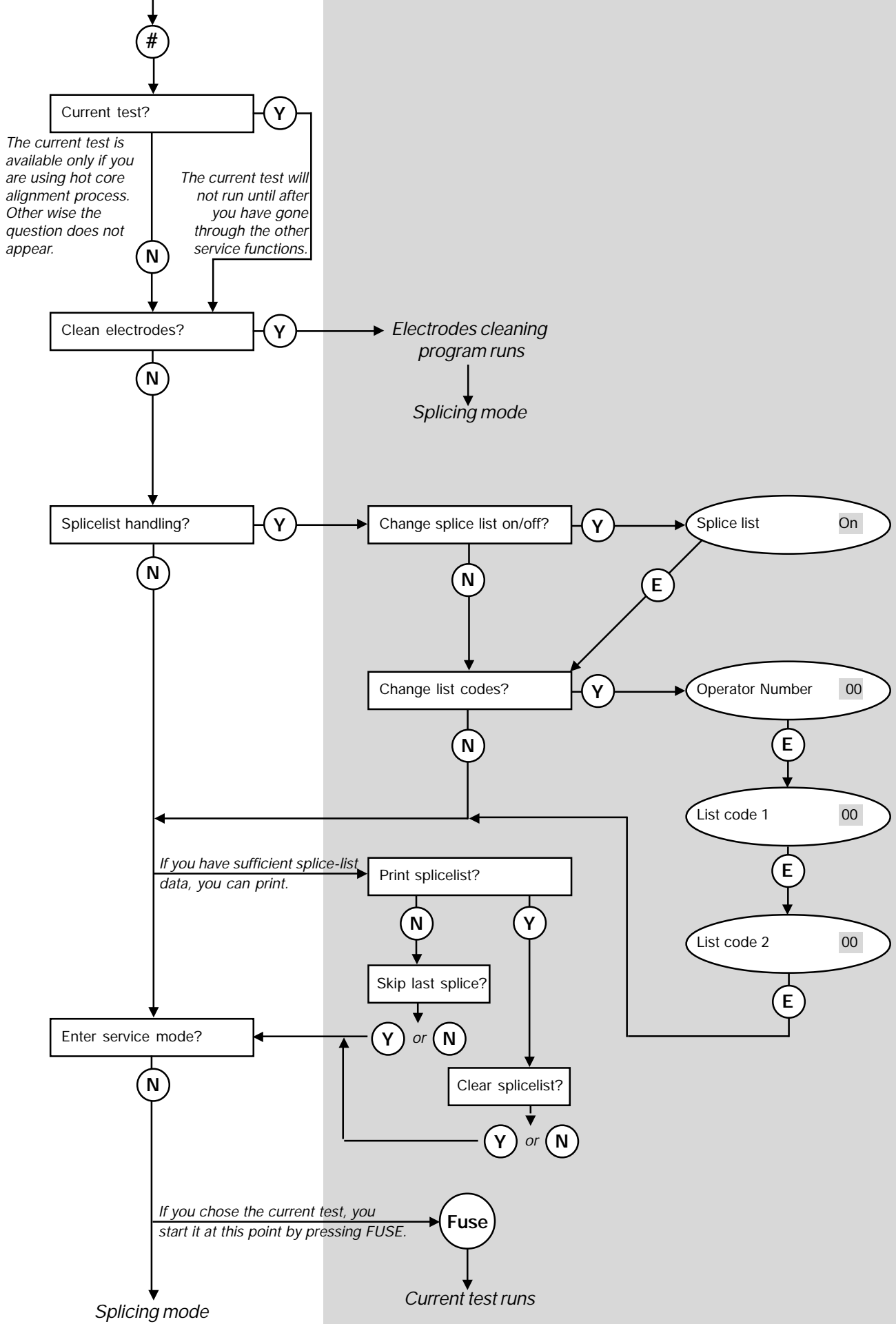
Program editing



* Select Hot core alignment to access the Small core alignment process



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