

Lightel GPST-1000

Gliding - Plasma Based Fiber Coating Stripper

User's Manual

(Rev. 1.1)



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I. INTRODUCTION

Based on our Gliding-Plasma Striping Technology, Lightel has developed the GPST-1000 stripper for quick and easy optical fiber coating stripping. The GPST-1000 allows operators to automatically strip almost all types of fiber coatings, from soft coating materials to hard coating materials and from single-layer coating to multi-layer coatings.

1.1 GPST-1000 APPLICATION AND FEATURES

The GPST-1000 supports both end-stripping and window-stripping with adjustable stripping lengths. The strip is clean with sharp edges and its non-contact process eliminates the risks associated with chemical stripping and blade-based mechanical systems.

It is ideal for fiber preparation before fusion splicing, fiber connectorization, and the writing of fiber Bragg gratings.

The GPST-1000 features include

- Strips almost all types of fiber coatings for all fiber sizes
- Supports either window-stripping or end-stripping
- Adjustable stripping length from 2mm up to 100mm
- Adjustable scanning speed up to 5mm/s
- Sharp stripping edges
- Harm free: No chemical etching or possible mechanical damage to the fiber
- Simultaneous cleaning by the hot flow of gliding plasma
- Software adjustable parameters
- Fully automated with storage up to 12 programs
- Multiple fiber stripping options
- Works under normal ambient condition
- Low maintenance required
- CE certified

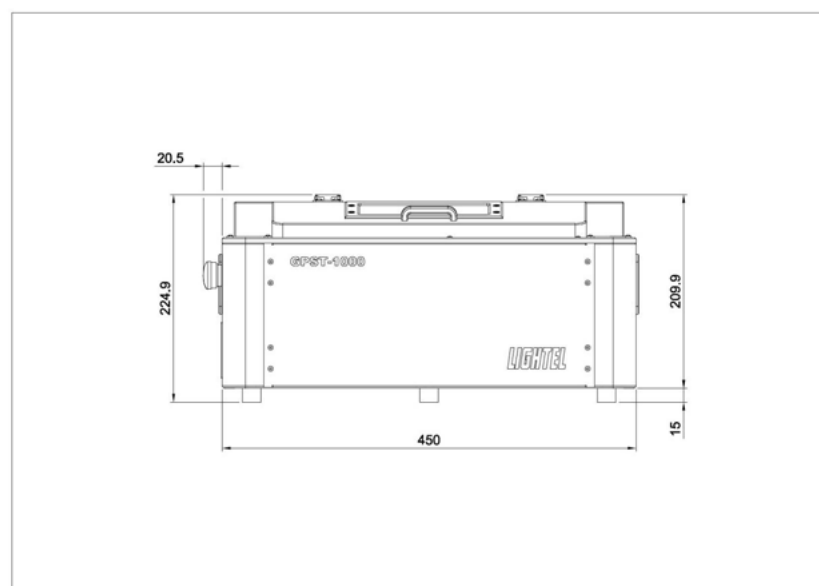
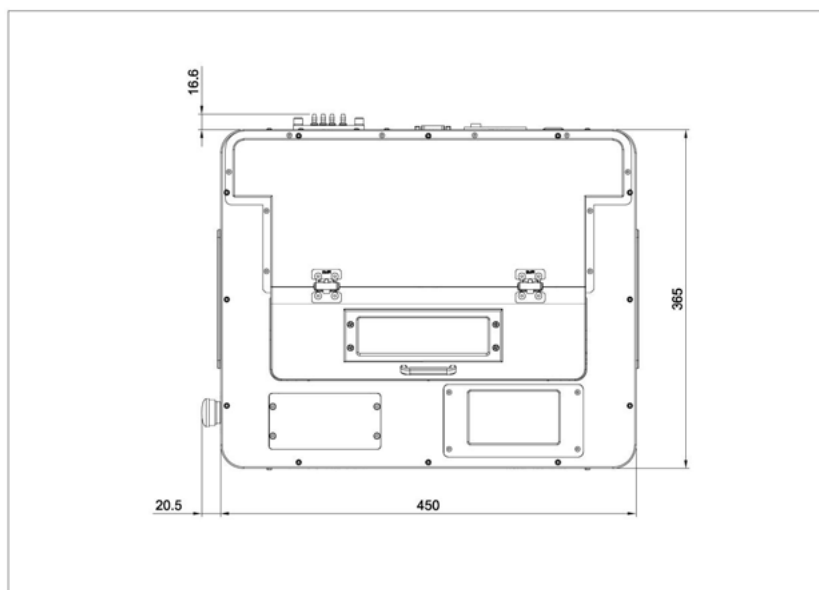
1.2 SPECIFICATIONS & DIMENSIONS

1.2.1 Specifications

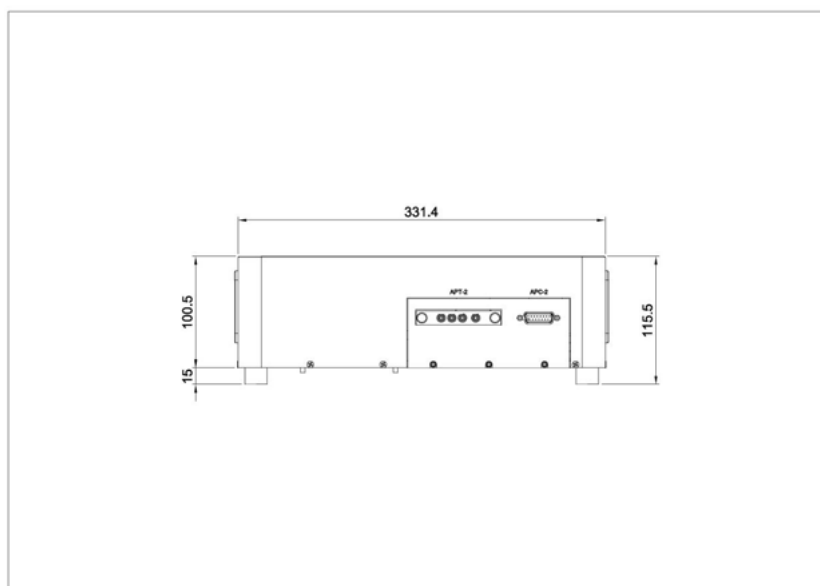
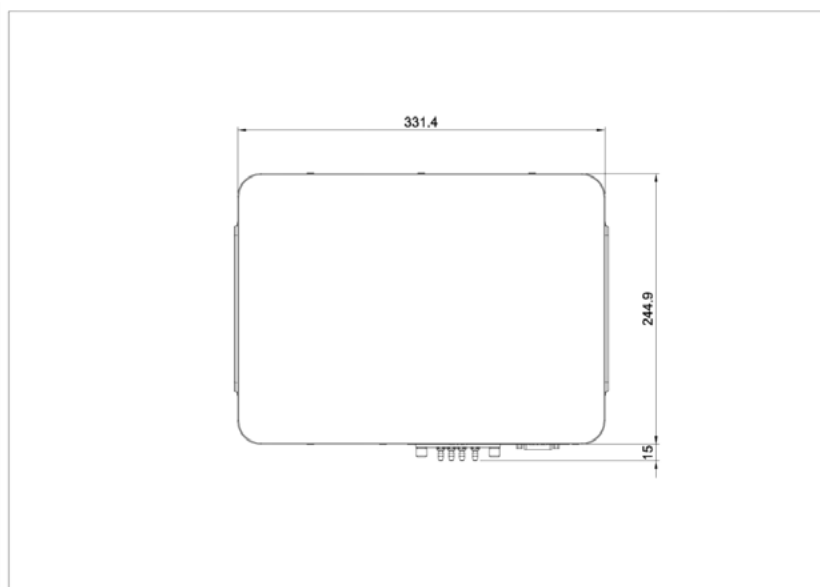
Applicable Coating	Polyimide / Hard polymer / Silicone / Acrylate/ Carbon/Metal / etc.
Cladding Diameter Range	80 ~ 1200 μ m
Window Strip Length	5 ~ 100 mm
End Strip Length	2 ~ 15 mm
Stripping Time	Acrylate: ~ 15s for 10mm Hard Polymer: ~ 15s for 10mm Polyimide: ~ 125s for 10mm
Fiber Strength	125 μ m > 400kpsi / 80 μ m > 250kpsi for 15mm (for Acrylate)
Operation Interface	4.3 inch Touch Panel
Power Input	AC 100V ~ 264V (50 or 60 Hz)
Power Consumption	350 W
Dimensions	Main: 471(W) x 365(D) x 225(H) (in mm) Air Pump Module: 332(W) x 245(D) x 116(H) (in mm)
Weight	Main: 18.5Kg / Air Pump Module: 5.6Kg

1.2.2 Dimensions

Main Unit (471mm x 365mm x 225mm)



Air Pump Module (332mm x 245mm x 116 mm)



II. GPST-1000 SETUP

2.1 CHECK ITEMS

- GPST-1000 main unit	x 1
- Air Pump Module (APM) unit	x 1
- AC power cable	x 1
- APC cable 15 pins D-Sub _1.5m (Male to Male)	x 1
- APT cable 4 color pipe _1.5m (Male to Male)	x 1
- Box with plasma-head cleaning brushes & a fuse	x 1
- User's manual	x 1

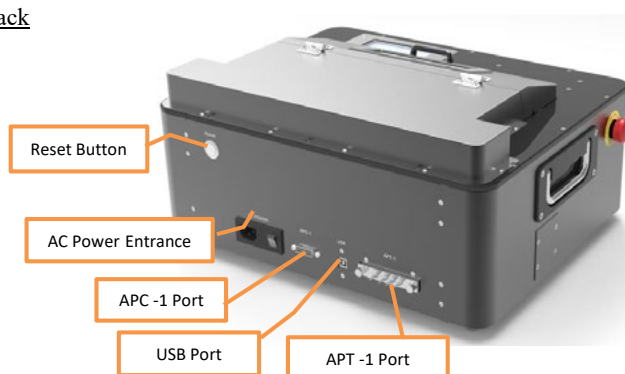
2.2 CONNECTIONS

2.2.1 GPST-1000 Main Unit

Front



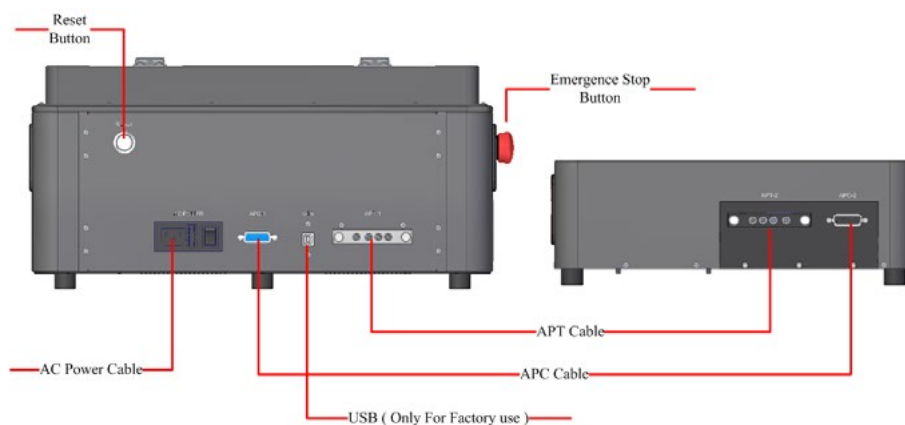
Back



2.2.2 Air Pump Module (APM) Unit



2.2.3 Connecting the Main Unit and the APM Unit



2.3 PREPARE CLEANING CONSUMABLES

In many cases, after a scan by the gliding plasma stream, through a non-combustive explosion or a vaporization process the fiber coating material becomes loose and debris is separated from the fiber cladding surface. In these cases, all the coating scraps can be easily carried by the plasma stream flow and brought into the scrap collection bin and no further action is needed by the operator.

However, in some cases, the plasma will only embrittle the coating material and the coating scraps are still held on the fiber (this often happens with rather thick and soft coating materials). Consequently, a manual cleaning will be necessary by wiping off the friable coating fragments. Thus, the following cleaning consumables are recommended:

- Lint-free wipers
- Ethyl alcohol or methanol with acetone

2.4 SAFETY MEASURES AND PRECAUTIONS

2.4.1 Electromagnetic and UV Radiation Protection

In order to protect the operators and surroundings from any electromagnetic and UV radiation during plasma arc discharging, the GPST-1000 stripper is housed in an iron enclosure. A viewing window is located in front in order to allow workers to monitor the stripping process. This window is made up of a conductive coated glass, plus a layer of metal mesh, so as to keep this area radiation-insulated. In addition, through this viewing window, the high brightness of the plasma stream is greatly attenuated to eliminate any concerns regarding eye safety.

For further protection, the cover of this apparatus is interlocked, meaning that an arc discharge cannot be triggered if the cover is not tightly closed.

2.4.2 High Voltage Protection

The GPST-1000 includes a high voltage module, up to 20KV. Since the GPST-1000 cover is interlocked, the high voltage will be immediately shut down if the cover is suddenly opened during operation.

Precautions:

- The high voltage module unit is located on the right side of the bottom of GPST-1000, and should only be opened by factory personnel.

- There are two fans around the high voltage module, forming an air flow channel for heat dissipation. One is on the bottom of GPST-1000 (air in), and the other is on the right side of GPST-1000 (air out). Always make sure that the GPST-1000 unit is placed in an open area so that the air passages are not blocked.
- **The GPST-1000 uses a three-wire power cord. Always make sure that the AC power receptacle has a reliable grounding connection.** So once the GPST-1000 is plugged into the AC power receptacle, its chassis becomes grounded. In the unlikely event you notice any voltage leakage during operation, remember to immediately press the Emergency Stop Button on the left side of the unit to stop the operation.

2.4.3 Chemical Protection

As mentioned in Section 2.3, in some cases a fiber cleaning step is necessary after plasma scanning. When using these chemicals to wipe through the fiber, always remember to wear lab gloves or finger cots. Also, keep good air circulation in your working area.

III. LCD TOUCH PANEL

3.1 TURNING ON THE UNIT

Upon turning on the power switch on the back of GPST-1000, the LCD touch panel is lit as shown in Fig. 3.1.1 and an Initial Check is started. This Initial Check includes motor position initiations and status checks on all sensors (such as interlock sensor, current sensor, air flow sensor, temperature sensor, position limit sensor, etc.)



Figure 3.1.1

After a few seconds, the screen is ready for the operator to enter (Fig. 3.1.2):



Figure 3.1.2

After pressing the Enter key, a password input panel is displayed (Fig. 3.1.3):



Figure 3.1.3

A 4-digit password should be entered (Fig. 3.1.4). After entering the password, press the  key.

Note: The default password set by the factory is 1111. If you would like to change password, refer to Section 3.2.3.



Figure 3.1.4

3.2 MAIN MENU

The Main menu is shown in Fig. 3.2.1 and appears on the screen after the password is entered. The three keys in the Main menu correspond to three operation categories, 'Program Selection', 'Program Setting', and 'Option'.



Figure 3.2.1

3.2.1 'Program Selection'



Figure 3.2.2

The GPST-1000 allows users to store up to 12 operation programs, and the 'Program Selection' allows users to easily retrieve the stored operation programs. Pressing the 'Program Selection' key, a 'Select Program' page will appear with the 12 program numbers for you to choose, as shown in Fig. 3.2.3. The **Back** key allows you to return back to the Main menu.



Figure 3.2.3

For example, open program #1. (Fig. 3.2.4)

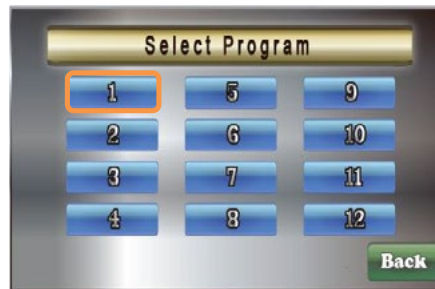


Figure 3.2.4

In the opened program-01 menu, a coating material type (here the example is Acrylate) is displayed on the program ID bar. (Fig. 3.2.5)

Note: Due to the limited space on the program ID bar, detailed fiber information cannot be included. But in fact, for a given coating material, different fiber designs (such as fiber sizes, coating thicknesses, numbers of layers, etc.) may require different stripping recipes. This means that a few programs may display the same coating material on their ID bars but they correspond to different stripping recipes. Thus, it is recommended for users to maintain their own notes about the target fiber details under each program.

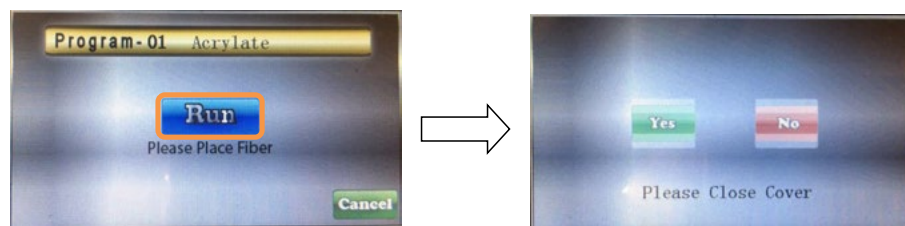


Figure 3.2.5

Once the program is selected, the stripping process can be started:

- (1) Place and clamp the to-be-stripped fiber to the proper position, then press the  key. A “reminder” pop-up will be displayed requesting the user to close the GPST-1000 cover.
- (2) Make sure the cover is closed and then press the  key. [If  key is pressed, the screen will return back to the Main menu (Fig. 3.2.1).]
- (3) The program recipe will appear as shown in Fig. 3.2.6, and the operation starts.

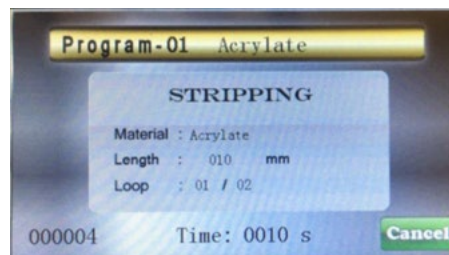


Figure 3.2.6

- (4) After the process finishes, the following page will appear. (Fig. 3.2.7)



Figure 3.2.7

- (5) If selecting the  key, the screen will return to the Main menu (Fig. 3.2.1)
If selecting the  key, the screen will turn to the Select Program menu (Fig. 3.2.3) for the next stripping process.

If the operator wants to stop the job during processing, he/she can press the **Cancel** key at anytime, and a confirmation menu will be followed as shown below (Fig. 3.2.8):

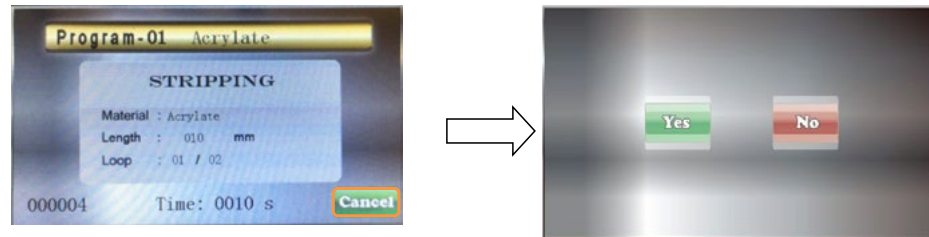


Figure 3.2.8

If pressing **Yes**, the process will be immediately terminated and the screen will return back to the Main menu, as shown in Fig. 3.2.9.

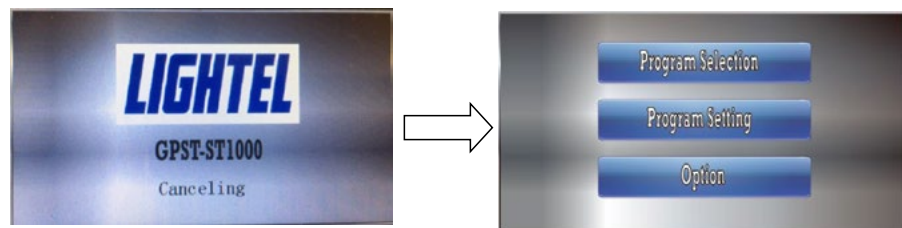


Figure 3.2.9

If pressing **No**, the process will continue until completion.

[Note: If the GPST-1000 cover is opened during the process, the program will be forced to stop and the screen will return back to the Main menu.]

3.2.2 'Program Setting'

Selecting the 'Program Setting' key, a 'Modify Program' menu will appear (Fig. 3.2.10):

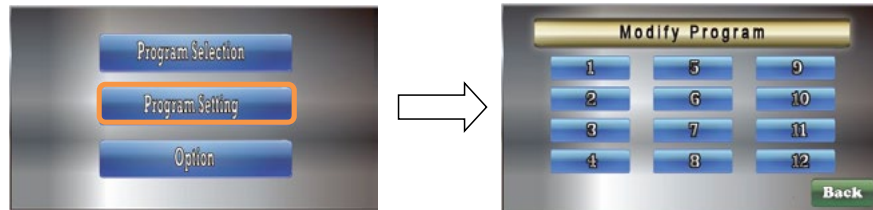


Figure 3.2.10

This menu is for users to initialize or modify the 12 program settings. For example, selecting program #1 and the P-01-Setting menu appears (Fig. 3.2.11).

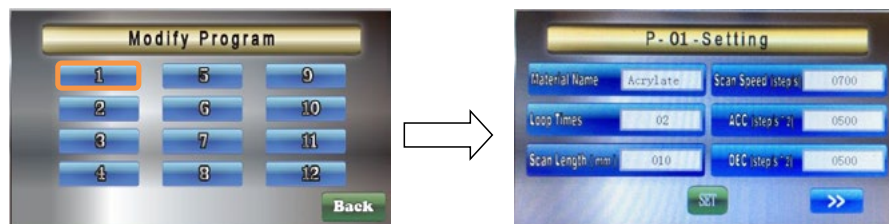


Figure 3.2.11

There are two Setting menus involving 10 parameters to be set. By hitting >> and << keys, you can switch between the two menus. (Fig. 3.2.12)



Figure 3.2.12

How to set: For example, upon selecting the 'Material Name' box, it will start flashing indicating it is ready for a new setting. After hitting the **SET** button, a setting window will pop up for you to enter the coating material name (Fig. 3.2.12). After entering, hit the **←** key.



Figure 3.2.12

- The entry allows up to 12 characters (letter or digit).
- If you want to cancel the modification during setting, simply hit the **ESC** key in the setting window. The screen returns back to the Setting menu with the previous value.
- On the second Setting menu, there is an **Exit** key. After finishing all the parameter settings, hit this **Exit** key to return back to the Main menu. (Fig. 3.2.13)

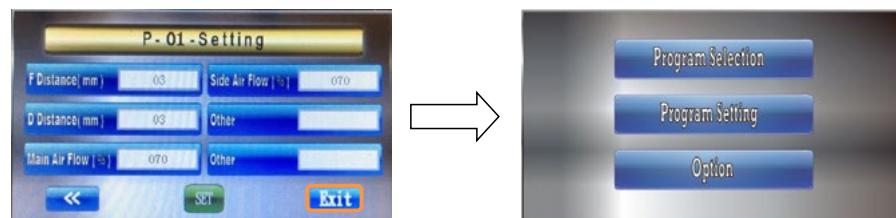


Figure 3.2.13

Parameter Explanations

- (1) **'Material Name'**
Fiber coating material type
- (2) **'Loop Times'**
The number of round trips for the plasma stream to scan through the fiber section
- (3) **'Scan Length' (mm)**
Scanning distance of the plasma stream, i.e. the fiber stripping length

(4) **'Scan Speed'** (step/s)

The scanning speed of the plasma head during stripping process
Can be set within 10-1000 step/sec (0.005mm/step)

(5) **'ACC'** (step/s²)

Acceleration speed
Can be set within 10-1000 step/s²

[This is used at the two ends of the plasma round trip for quickly reaching the 'Scan Speed'.]

(6) **'DEC'** (step/s²)

Decelerated plasma scanning speed
Can be set within 10-1000 step/s²
[This is used at the two ends of the plasma round trip for a quick U-turn.]

(7) **'F Distance'** (mm)

Forwarding distance of the plasma head - from its home position to its work position
Can be set within 0-20mm. [Refer to Appendix A for the axis definition]

(8) **'D Distance'** (mm)

Downward distance of the plasma head - from its home position to its work position
Can be set within 0-6mm. [Refer to Appendix A for the axis definition]

(9) **'Main Air Flow'** (%)

Set the relative strength of the Main Air Flow (the air source for gliding plasma), which determines the ion density (thus the temperature) of the plasma stream.
Can be set within 60% -100%

[Based on the principle of gliding plasma, a higher air flow will result in a lower plasma ion density, thus a lower plasma temperature. As an example, a 100% of flow setting in GPST-1000 leads to a temperature about 20% lower than the 60% setting. But, during the stripping process, a 100% Main Air Flow is more powerful in terms of bringing the stripped coating scraps from fiber to the scrap collection bin.]

(10) **'Side Air Flow'** (%)

Set the relative strength of Side Air Flows, which are used to control the plasma stream shape.
Can be set within 50% - 70%

[Surrounding the gliding-plasma stream channel, there are two side-air flows to confine the plasma shape in the vertical dimension. Once the 'Main Air Flow' parameter is determined, try to find a proper 'Side-Air Flow' parameter until the plasma stream shape and its overall stability are optimized.

The two **'Other'** boxes are reserved for other possible parameters.

3.2.3 'Option'

Selecting the 'Option' key, an 'Option' page will appear (Fig. 3.2.14):

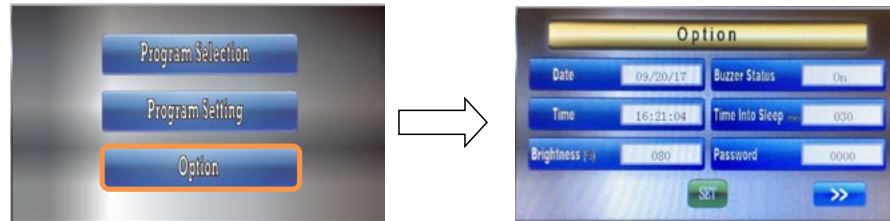


Figure 3.2.14

There are two Option menus with 12 non-processing parameters. By hitting the  and  keys, you can switch between the two pages. (Fig. 3.2.15)



Figure 3.2.15

The way to change the settings in the Option pages is similar to the 'Parameter Setting' in Section 3.2.2. For example, upon selecting the 'Date' box, it starts flashing indicating it is ready for operator input. After hitting the  button, a setting window will pop up for you to enter the coating material name (Fig. 3.2.12). After finishing enter  it the key. (Fig. 3.2.16)

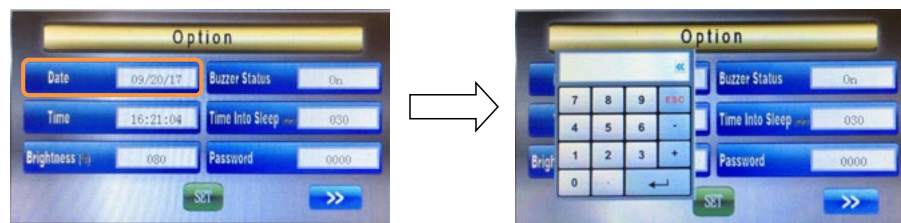


Figure 3.2.16

If you want to cancel the modification during setting, simply hit the  key in the setting window. The screen returns back to the setting page with the previous value.

On the second setting page (see Fig. 3.1.15), there is an  key. After finishing all the parameter settings, hit this  key and return back to the Main page.

Parameter Explanations

- (1) **'Date'**
MM/DD/YY
[For a new setting, the 1st hit allows you to enter MM. After 'MM' setting, hit the Date box again and it will be for 'DD' entry, and then again for 'YY' entry.]
- (2) **'Time'**
H/M/S
[For a new setting, the 1st hit allows you to enter 'Hour'. After 'Hour' setting, hit the Time box again and it will be for 'Minute' entry, and then again for 'Second' entry.]
- (3) **'Brightness'**
The brightness on LCD panel
Can be set within 10~100%
- (4) **'Buzzer Status'**
Buzzer in the touch panel: ON or OFF
- (5) **'Time into Sleep'**
Touch panel goes into sleep mode after a defined idle time period
Can be set within 1~30min (the touch panel will immediately wake up upon any touch)
- (6) **'Password'**
Set a 4-digit password for GPST-1000 turning ON & waking up from sleep mode.
Can be set within 0001-9999 [**If setting '0000', it means no password.**]
- (7) **'Count Number'**
Counting the operation times on this machine
[The number displayed in this box is not settable by user. However, by pressing the 'Count Reset to 000000' button (right side), the user can reset the count to zero. This is useful as a maintenance reminder based on machine usage.]
- (8) **'P/N'**
Part number "GPST-1000", factory setting

(9) 'S/N'

Unit serial number "GPST-xx-xxxx", factory setting

(10) 'Count Reset to 000000'

Reset the operation counting number to zero.

(11) 'Default'

If selecting this box, both the 'Program Setting' menu and the 'Option' menu will return back to the original factory default settings.

This action is secured by password:

- Once the 'Default' box is selected, a data entry window pops up for you to input the password. (Fig. 3.2.17)

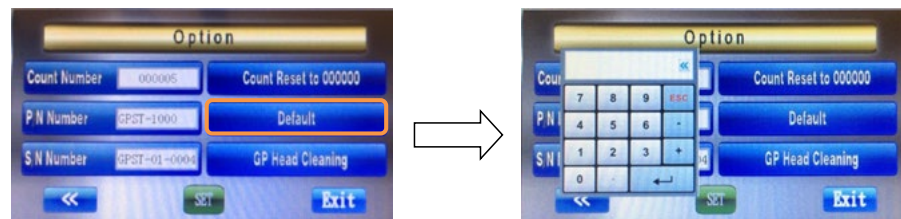


Figure 3.2.17

- The password is **4321**. After a correct input, press  key. Then, all data will go back to the factory default settings.

(12) 'Cleaning'

The inside of the GPST-1000 plasma head should be cleaned after certain usage (e.g. after 300 operations).

Selecting the 'Cleaning' menu, a procedure for Plasma Head cleaning can be initiated. It will include two steps: (Fig. 3.2.18)

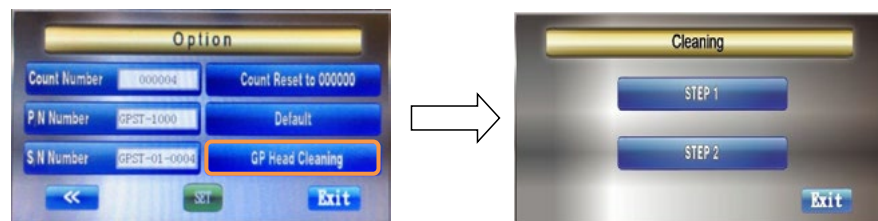


Figure3.2.18

- a) Open the GPST-1000 cover, and manually move the left fiber-clamp fixture to the far end (i.e. let the needle point to the 120mm position, as shown in Fig. 3.2.19)



Figure 3.2.19

- b) Press 'STEP 1' key. The plasma head will move to the center position. (Fig. 3.2.20)

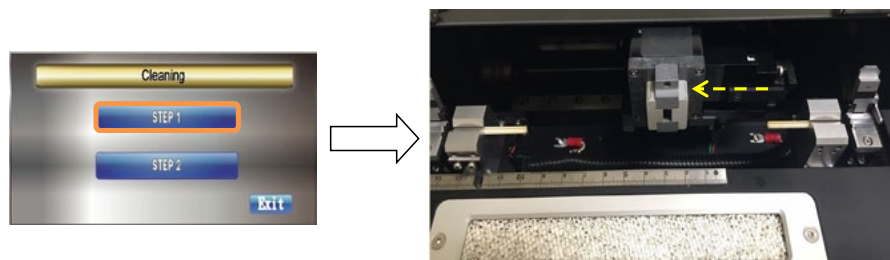


Figure 3.2.20

- c) The 'STEP 1' key turns to grey now, meaning the plasma head is ready for cleaning. Take a plasma-head cleaning brush (provided), and insert it into the front opening of the plasma head as shown in Fig. 3.2.21.

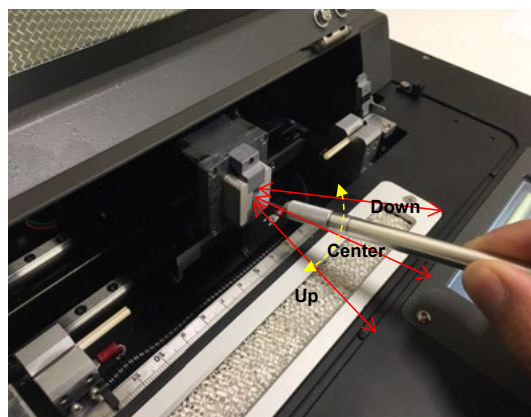


Figure 3.2.21

Referring to the indications in Fig. 3.2.21, try to brush the inside of the plasma head from different angles (pointing up, pointing flat, and pointing down) for about 30 seconds in total.

- d) After brushing, close the GPST-1000 cover. Then press the 'STEP 2' key. The machine will start a gliding-plasma discharge; the strong plasma flow (100% main air flow setting) will bring all brushed particles into the scrap collection bin.
- e) This 'Step 2' takes ~20 seconds. Upon finishing, the 'STEP 2' key will turn to grey indicating the cleaning job completion. (Fig. 3.2.22)



Figure 3.2.22

- f) Press **Exit** key to exit the Cleaning page and go back to the GPST-1000 initial ENTER page. (Fig. 3.2.23)

[Each time after experiencing such a Cleaning procedure, the 'Count Number' under the 'Option' page will be automatically reset to zero for next usage counting.]

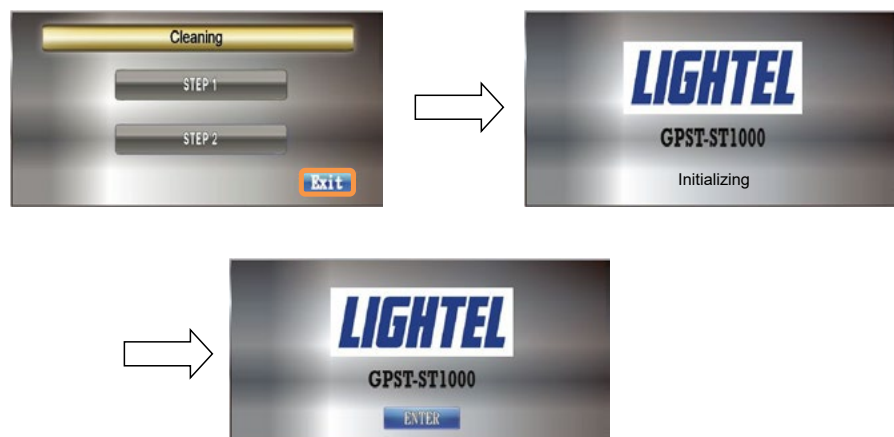


Figure 3.2.23

IV. GPST-1000 OPERATION

4.1 DAILY PLASMA-HEAD CLEANING

As already mentioned about plasma-head Cleaning above, it is recommended to clean after every ~300 operation counts. But, to those operators who intensively use the GPST-1000 machine daily, it is also recommended to clean the plasma head every morning before daily operation. Refer to the last paragraph in Section 3.2.3 for detailed cleaning procedure.

Alert: *The cleaning must be performed after the plasma-head is cooled down to room temperature.* If cleaning under a high temperature, the brush bristles could be stuck onto the plasma electrodes causing malfunction of the plasma discharge.

4.2 PROGRAM SELECTION

According to the fiber coating material type, select a correct program from 'Program Selection' (Section 3.2.1) in the main page. [Create a new program if this coating type is not covered in the list.]

Under this program, hit the 'Scan Length' key for stripping length setting.

[Window stripping: 5~100 mm

End stripping: 2~15 mm (for fiber coating diameter ϕ in 130-500 μ m)
2~30 mm (for fiber coating diameter ϕ in 500-1300 μ m)]

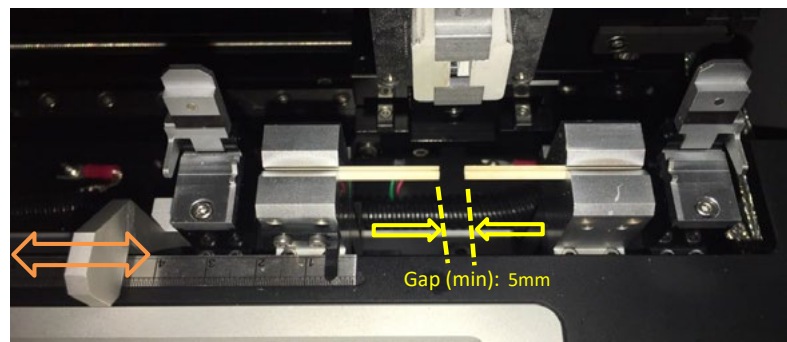
4.3 STRIPPING PROCESS

4.3.1 Clamp Positioning

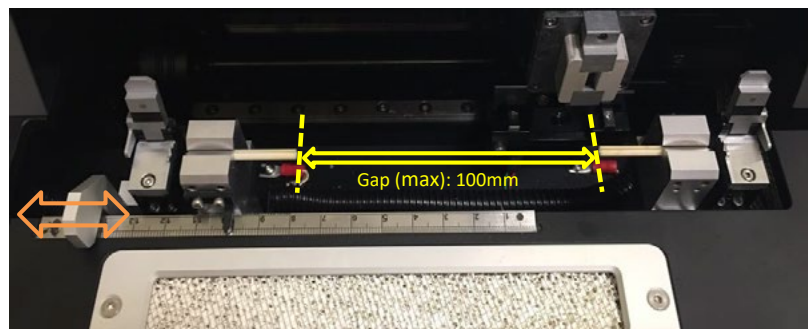
As shown in Fig. 4.3.1, GPST-1000 has two fiber clamp fixtures, left and right. The right one is at a fixed position while the left one is movable along the horizontal axis. For end-stripping, only the right fiber clamp is in use. But for window-stripping, both clamps are needed. By moving the left clamp (holding the handle), the length of the stripping window can be adjusted.

Each of these two clamp fixtures has a C-shape ceramic tube sticking out from its inner side. As can be seen from Fig. 4.3.1, these two tubes are aligned collinear and pointing each other. The open slot on the tube top allows an easy fiber-loading from top side. More importantly, the ceramic material can well block the plasma stream (coming from side) so that a fiber stripping section can be clearly confined, resulting in sharp edges at the two stripped ends.

The spacing gap between the two tube edges defines the stripping length, which can be set from a minimum 5mm (Fig. 4.3.1 (a)) up to a maximum 100mm (Fig. 4.3.1 (b)) in the GPST-1000. It can be seen that the needle reading on the ruler equals the tube gap (i.e. the stripping length), thus offering a convenient tool for accurate stripping-length settings.



(a)



(b)

Figure 4.3.1

4.3.2 Fiber Loading

- (1) Open the GPST-1000 cover.
- (2) Before loading a fiber, ensure that both clamps (outside the two ceramic tubes) are opened, i.e. their covers are lifted, as shown in Fig. 4.3.2(a).
- (3) Hold the fiber straight, and ready to load the sample from the top side of the two ceramic tubes. Bring the fiber down into the tubes through their top openings.

- (4) In the meantime, press the right side fiber-tail on the 'guiding bar' of the right side clamp. The cover of the right side clamp will be pushed close, as show in Fig. 4.3.2(b).
- (5) Next, straighten the fiber and close the left side clamp cover in the same way (Figure 4.3.2(c)).
- (6) Close the GPST-1000 cover. (Figure 4.3.3 (a))

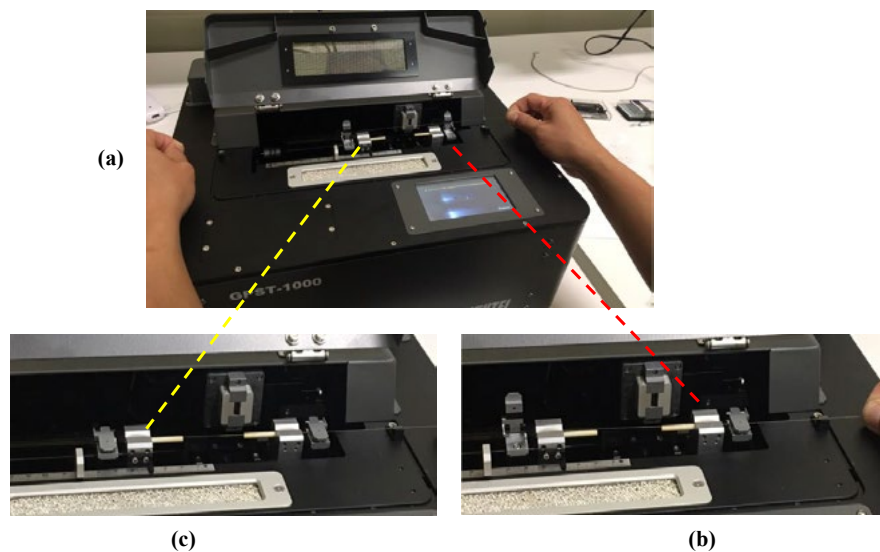


Figure 4.3.2

4.3.3 Fiber Stripping

- (1) Make sure the GPST-1000 cover has been securely closed as shown in Fig. 4.3.3(a). (otherwise, the program will be stopped. During stripping, opening the cover will also stop the process.)
- (2) Press the 'Run' key (Fig. 4.3.3(b)) on the touch panel, and a confirmation page will appear (Fig. 4.3.3(c)). After selecting 'Yes', the stripping process starts. During processing, you can watch the process through the viewing window (Fig. 4.3.4)

[If encountering anything abnormal during process, immediately press the emergency button on the left side of GPST-1000 to shut down the electrical power.]

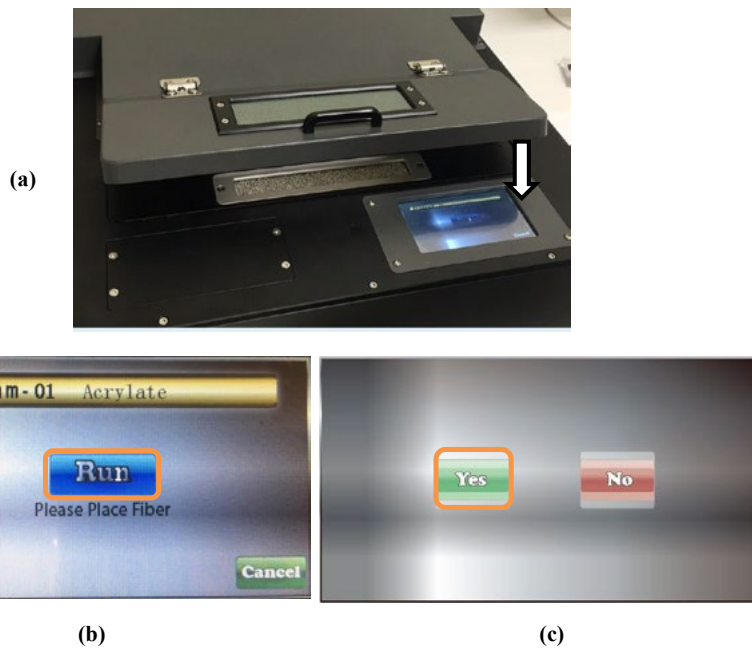


Figure 4.3.3



Figure 4.3.4

- (3) Along with the process progress, a few parameters in the touch panel display are dynamically updated (see circled in Fig. 4.3.5), including the time counting, the loop cycle counting, and the operation number counting upon finishing the process.

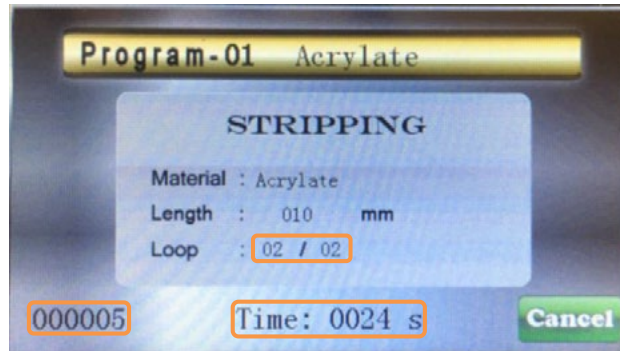


Figure 4.3.5

- (4) After the process is finished, a 'Finished' page will be displayed (Fig. 4.3.6) with the total time information. Before opening the GPST-1000 cover, wait for a 5-sec continuous air flow (both the main air flow and side air flow) that is 'cold' blowing for further cleaning of the plasma working area.



Figure 4.3.6

- (5) Open the cover, and refer to the sequence in Figure 4.3.7 to unload the fiber.

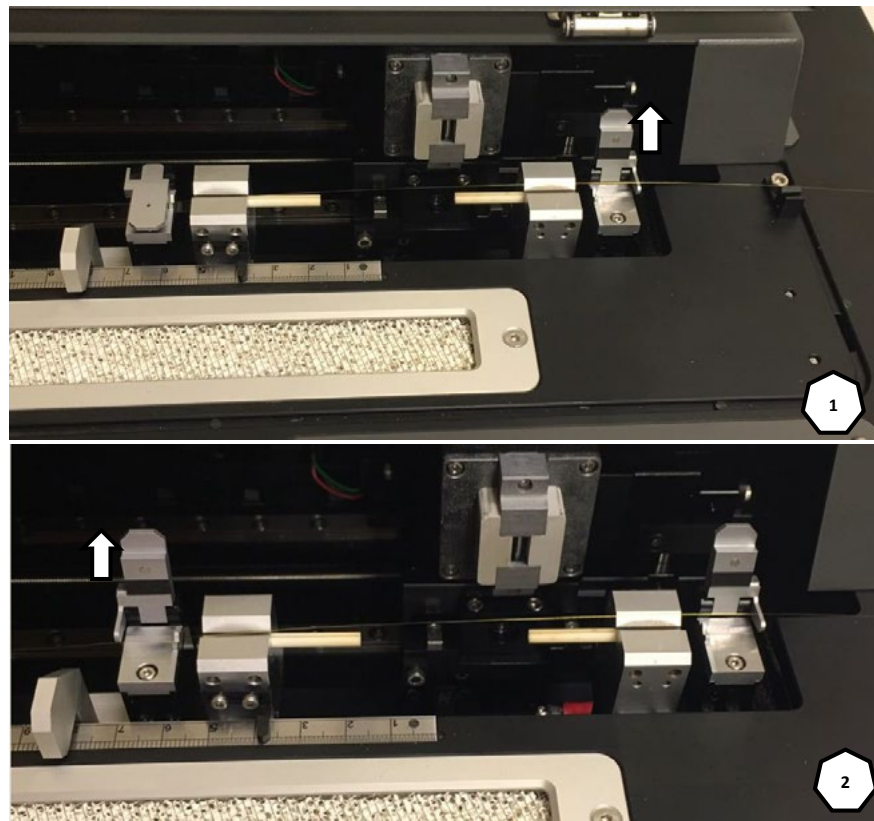


Figure 4.3.7

- (6) Refer to the last part of Section 3.2.1 (from Fig. 3.2.7 to Figure 3.2.9) for your next action.

Note: For *end stripping*, simply deliver the fiber from right side of the unit and clamp the fiber using the right side clamp only. The portion of the fiber sticking out of the ceramic tube will be stripped. Use the edge of the left-side tube as a measurement tool for the stripping length.

V. MAINTENANCE

Other than the plasma-head cleaning routine (Section 4.1), the GPST-1000 also require certain part replacements after extended usage, such as the coating scrap collection filter replacement, the air flow filter replacement, and the C-shape ceramic tube replacement. In addition, this section will also include the fuse replacement.

5.1 FUSE REPLACEMENT

Fuse replacement steps:

- (1) Turn off the GPST-1000 Main Unit and unplug the power cord.
- (2) Use a slotted screwdriver to open the Fuse box (Fig. 5.1.1)



Figure 5.1.1

- (3) Replace the fuse with a new one (3.15A / 250Vac Fast Acting), then install the fuse box back. (Fig. 5.1.2)

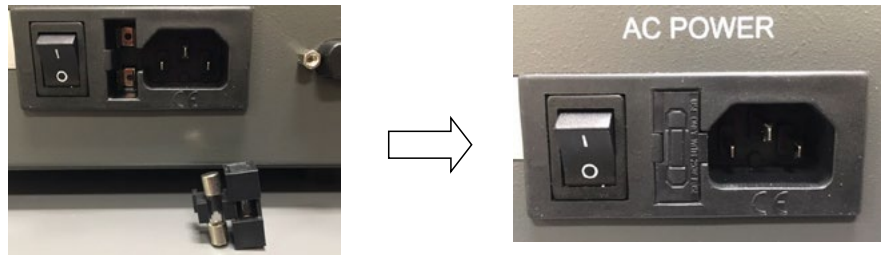


Figure 5.1.2

5.2 COATING SCRAP FILTER REPLACEMENT

The GPST-1000 uses a high-temperature resistant ceramic filter (white foam). During the stripping process, the high-temperature plasma flow enters this filter slot. This ceramic filter will not only block all the fiber coating scraps (cleaning up the air loop) but also greatly reduce the air flow temperature thus protect the air-loop parts.

This filter is recommended to be replaced every 50,000 operations.

Filter replacement steps (Fig. 5.2.1):

- (1) Use a 2mm hex screwdriver to open the cover plate first.
- (2) Take out the plate (#1), the net cover (#2), and the filter (#3) in turn.
- (3) Put a new filter into the slot, and then the net cover and the plate.
- (4) Screw back the plate.

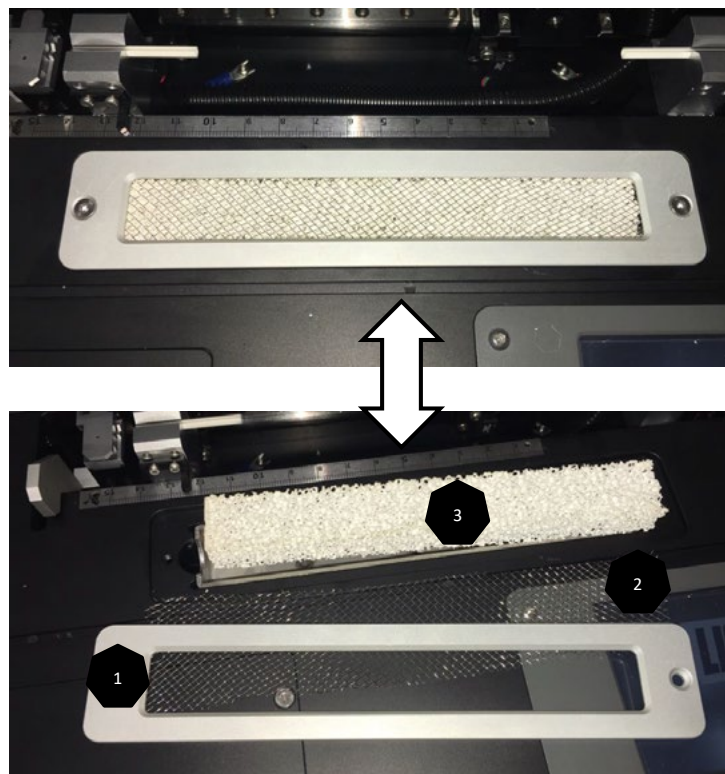


Figure 5.2.1

5.3 AIR FLOW FILTER REPLACEMENT

In terms of the air flow sequence, the Air Flow filter (Fig. 5.3.1) is located after the Coating Scrap Collection filter. This filter is made of acticarbon so as to further absorb the gas odor and remaining impurities.

This filter (Active Carbon + HEPA) is recommended to be replaced every 10,000 operations.

Filter replacement steps:

- (1) Use a 2mm hex screwdriver to open the cover plate (Fig. 5.3.2(a))
- (2) Replace the filter (Fig. 5.3.2(b))
- (3) Screw back the cover plate.

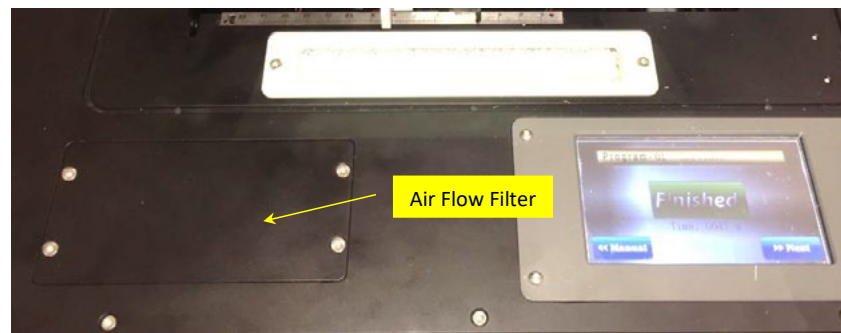


Figure 5.3.1



Figure 5.3.2

5.4 C-SHAPE CERAMIC TUBE REPLACEMENT

The C-shape ceramic tube (refer to Section 4.3.1) may be damaged after extensive usage; e.g. a broken tube is shown in Fig. 5.4.1.

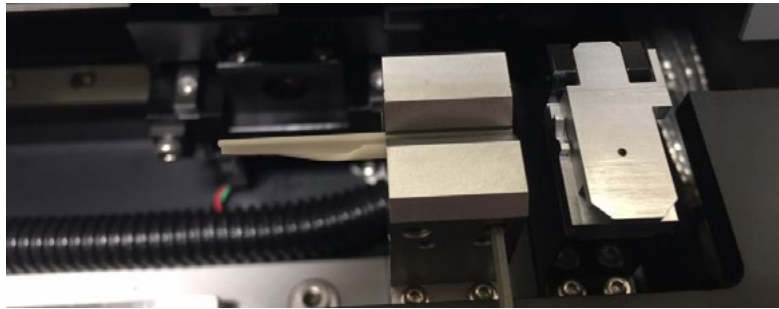


Figure 5.4.1

Tube replacement steps:

- (1) Use a 1.5mm hex screwdriver to remove the set screws that lock the ceramic tube (Fig. 5.4.2)



Figure 5.4.2

- (2) Replace the ceramic tube with a new one (Fig. 5.4.3). During tube installation, make sure that (a) the outer side of the tube is aligned to the outer side of the fixture (see the red dash line), and (b) the opening of the C-shape tube is facing up.

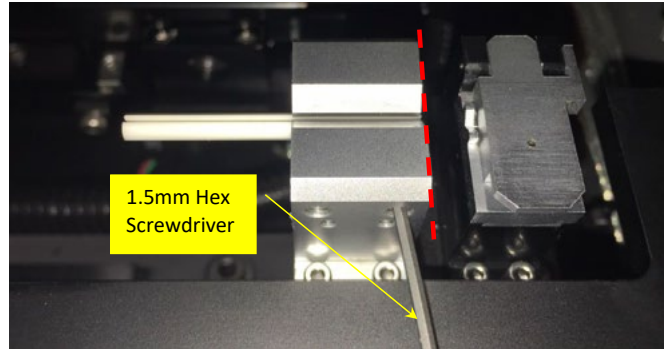


Figure 5.4.3

- (3) Put the set screws back and use a 1.5mm hex screwdriver to fix the tube.

Note: Avoid any further tightening once the tube is fixed in position. An excessive locking force may damage the brittle ceramic tube.

5.5 LONG-TERM STORAGE

Before putting the GPST-1000 Main unit and the Air Pump Module unit away for a long-term storage, for safety sake, Lightel suggests disconnecting all the parts attached to the units (such as the AC power cord, the APC cable, the APT cable, etc.). Place the units and all accessories back into their original boxes.

VI. TROUBLESHOOTING GUIDE

No.	Problem or Symptom	Possible Cause	Suggestion
1	No Power	- Emergency Stop button pressed - Fuse blown	- Release the Emergency Stop button - Replace the fuse
2	LCD Touch Panel cannot turn ON	- Emergency Stop button pressed - Fuse blown - LCD touch panel failed	- Release the Emergency Stop button - Replace the fuse - Replace the LCD panel
3	No air flow	- Bad APT cable connection - Bad APC cable connection - One or more pumps in the Air Pump module failed	- Check APC cable connection - Check ATC cable connection - Contact Lightel for Air Pump module repair
4	Coating debris stuck on fiber cladding surface	- Temperature too low - Scan Speed too fast - Insufficient Scan Loops - Insufficient Forward Distance	- Reduce Main Air flow percentage - Reduce Scan Speed - Increase Scan Loops - Increase Forward Distance
5	Coating burnt at the stripped window ends	- ACC and DEC values set too low - Temperature too high	- Increase ACC and DEC values - Increase Main Air flow percentage
6	Burning smell during stripping	- Temperature too high - Scan Speed too slow.	- Increase Main Air flow percentage - Reduce Forward Distance - Reduce Scan Speed
7	Polyimide / Carbon / Metal coatings after stripping still leave debris on fiber cladding surface	- Temperature too low - Scan Speed too fast - Insufficient Scan Loops - Insufficient Forward Distance	- Reduce Main Air flow percentage - Reduce Scan Speed - Increase Scan Loops - Increase Forward Distance
8	No response when pressing LCD panel keys	- Electrical malfunction - LCD touch panel failed	- Restart or press Reset button - If restart & pressing reset button do not help, contact Lightel for repair
9	Plasma head not moving	Electrical malfunction	- Restart or press Reset button - If restart & pressing reset button do not help, contact Lightel for repair

Appendix A Forward/Downward Distance

Figure A-1 shows a typical gliding-plasma stream ejected from the GPST-1000 plasma head. Its visible portion appears with a tongue shape, having a width of ~5mm and a length of 15~17mm.

This plasma stream forms a thermal field with certain temperature distribution. From the exit plane of the plasma head, the temperature is gradually decreasing along the stream forward direction. However, along the 'tongue' width, the temperature is gradually increasing from the central line to the two sides.

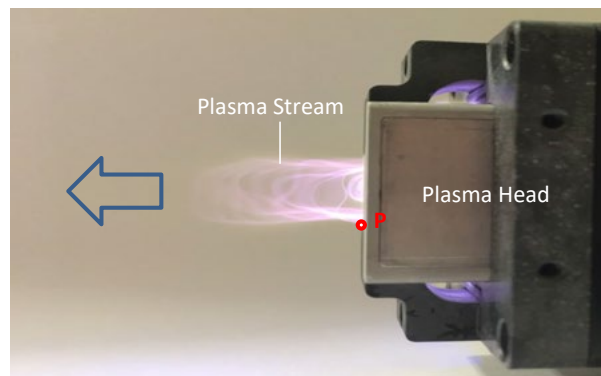
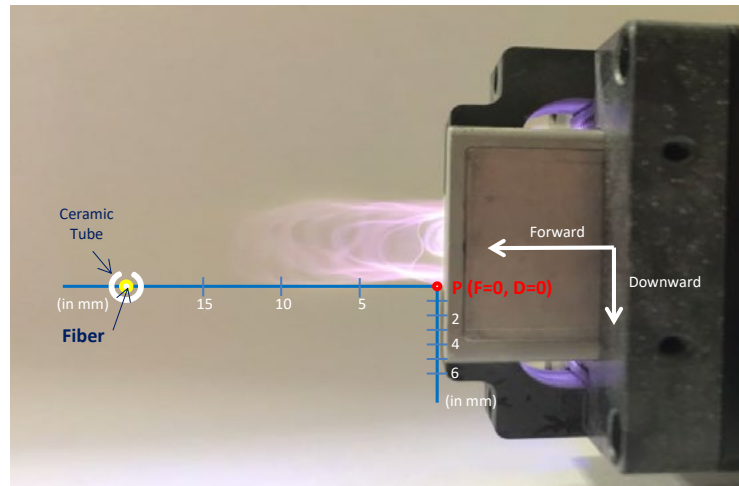


Figure A-1

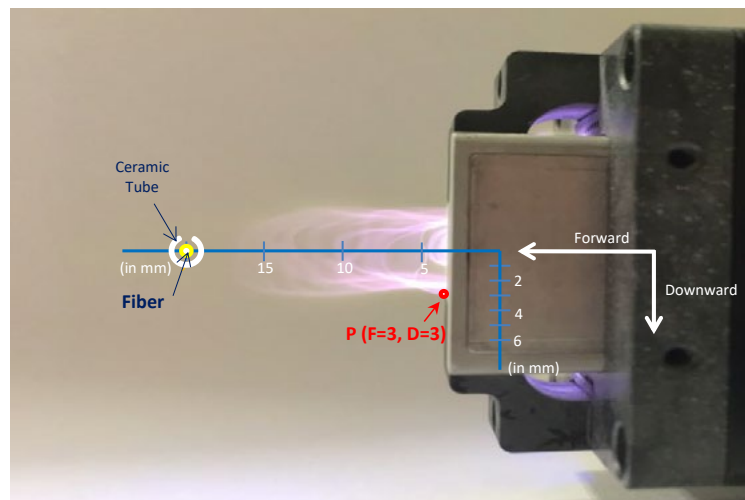
In the GPST-1000, the fiber position is fixed, while the plasma head is movable. By changing the plasma head position, the fiber can fall in different spots in the plasma stream field. Since stripping different types of fiber coating materials may require very different temperatures, two parameters of 'F Distance' and 'D Distance' must be defined in each stripping program (see Section 3.2.2). The former indicates how much the plasma head should move forward from its origin position, while the latter indicates how much to move down from origin.

In order to be able to clearly define the plasma head position, Lightel chose an edge point P at the stream lower side (next to the hottest spot of the flame – see Figure A-1) as a reference point. Figure A-2 shows the original position of the plasma head, relative to the fiber. At this original position, the P-point is at origin ($F=0$, $D=0$), and the fiber is 20mm away from the plasma head front.

**Figure A-2**

As an example, Figure A-3 shows a case with setting of 'F Distance'=3mm and 'D Distance'=3mm. In this case, the fiber becomes 17mm away from the plasma head front and also aligned to the stream central line. As described above, with such a setting, the fiber is under a rather low temperature. A higher temperature can be obtained with a greater 'F Distance'. Moreover, offsetting the fiber from the stream central line (e.g. $D=2$, or even $D=1$) can offer even higher temperature.

(Refer to Appendix B for recommend recipes for different types of coating materials.)

**Figure A-3**

Appendix B Stripping Recipe Reference

Process Parameter Reference guide for Lightel GPST-1000

Program No.	Coating Name	Parameter										
		Loop Times	Scan Length (mm)	Scan Speed (step / s)	ACC (step / s ²)	DEC (step / s ²)	F Distance (mm)	D distance (mm)	Main Air Flow (%)	Side Air Flow (%)	Wipe Cleaning	Zone *
1	Acrylate	1 ~ 2	*	700	500	500	0~3	3	70	70	Yes	A
2	Accutether	1 ~ 2	*	700	500	500	8	3	70	70	No	B
3	Polymer	2 ~ 3	*	600	300	300	7 ~ 10	3	70	70	Yes	B
4	Polyimide	8 ~ 15	*	500	300	300	13 ~ 16	3	70	70	No	C
5	Carbon	5 ~ 10	*	300	200	200	15 ~ 18	2 ~ 3	65	65	No	D
6	PEEK - Polyimide	3 ~ 5	*	300	300	300	15	1 ~ 3	65	65	Yes	E
7	Metal	10 ~ 15	*	500	500	500	15	1 ~ 3	65	65	No	E
8	Custom 01	—	—	—	—	—	—	—	—	—	—	—
9	Custom 02	—	—	—	—	—	—	—	—	—	—	—
10	Custom 03	—	—	—	—	—	—	—	—	—	—	—
11	Custom 04	—	—	—	—	—	—	—	—	—	—	—
12	Custom 05	—	—	—	—	—	—	—	—	—	—	—

Note:

- As can be seen in the table, under each given coating material, some parameters are suggested with a range. This is intended to cover most fiber coatings with the same primary material but different designs (e.g. different coating thicknesses, different coating material mixes, etc.) Users need to find optimal parameters based on their particular fiber conditions.
- Custom recipes will be needed for specially designed coatings.

* The Zones indicate the fiber locations relative to the plasma head

