AS II

User's Guide

Copyright Notice

Safety Information & Precautions

- The AS II must only be used for stripping optical fibers with a coating diameter up to 600um. Any attempts to use the device for any other purposes could cause injury to the operator or impair the AS II
- For the AS II to work properly, clean air must be supplied. Unclean air can reduce the cleanliness and strength of the stripped fiber and also can impair the operation of the AS II
- Always use eyeglasses to protect from fiber shatter
- The use of a ventilation system is recommended
- This device is plugged into a standard 115V or 230V outlet. As with any electrical device, reasonable care is required to avoid electrical shock. If the fuses need to be replaced, disconnect the unit from the wall outlet and used exact replacements
- Never remove any covers or parts from the unit. Only trained authorized personnel are allowed to service the AS II
- The heated air generated by the AS II is extremely hot. It can reach temperatures up to 960°C *(1760°F)*. It is hot enough to melt the coating on the fiber and cause severe burns to the operator if reasonable care is not taken or instructions are not followed. The heater nozzle and exhaust system are not accessible during normal operation. The surfaces of these components can also cause burns
- 3SAE does not recommend increasing the temperature past 960°C *(1760°F)*; damage can be done to the AS II and heater
- The AS II uses pneumatics and electrical actuators. Never operate the unit without the covers, as this may cause injury to the operator
- Always dispose of fiber scraps properly
- Never use spray cleaner or compressed gas. Never pour liquid cleaner on the AS II

- Use of the unit should be restricted to personnel that:
  - ✓ Have been appropriately trained in the handling of optical fiber and related materials.
  - ✓ Have read, understood, and will follow all usage and safety instructions in this manual.

Note: It is the responsibility of the user to use this product for its intended purpose and according to this manual. 3SAE Technologies cannot be responsible for damages or injury resulting from failure to follow these instructions

Transportation & Storage

The AS II must be protected against humidity, vibrations, and shock during transportation and storage.

Save the packaging materials and locking screw for future use and always transport the AS II in its original packaging material and secure the heater with the locking screw to prevent damage.

Keep the AS II clean and dry.

Introduction to the AS II

The use of chemicals for fiber stripping is past history

The AS II is a unique product utilizing the patented “Burst Technology” for fast and chemical free window stripping of optical fibers with coatings up to 600um diameter.

The AS II was developed to meet the industry’s needs for variable window strip lengths with high strength and ultra cleanliness.

The Burst Technology instantly vaporizes the fiber coating; the result is a stripped fiber, perfectly clean, with high strengths.

The AS II is equipped with a built in tensile tester, which can pull up to 20N.

To ensure high quality, repeatability, and a high production yield, all critical processes and parameters such as stripping distance, burst temperature, burst speed, and strength test are controlled by built in microprocessors.

The fibers are easily placed in the correct position by guided linear clamps and a “One Touch” go button that starts the stripping process automatically.

Operational Features

- Chemical free stripping
- Easy low maintenance bench top design
- Fast cycle time
- High 1st pass yield
- Accommodates fibers with coatings up to 600um
- Accommodates ribbon fibers from 4, 8, and 12 (with optional nozzle)
- Software adjustable parameters
- RS232 interface

- Automated linear fiber clamps
- Variable strip length from 3mm to 150mm
- Built in high force linear tensile test

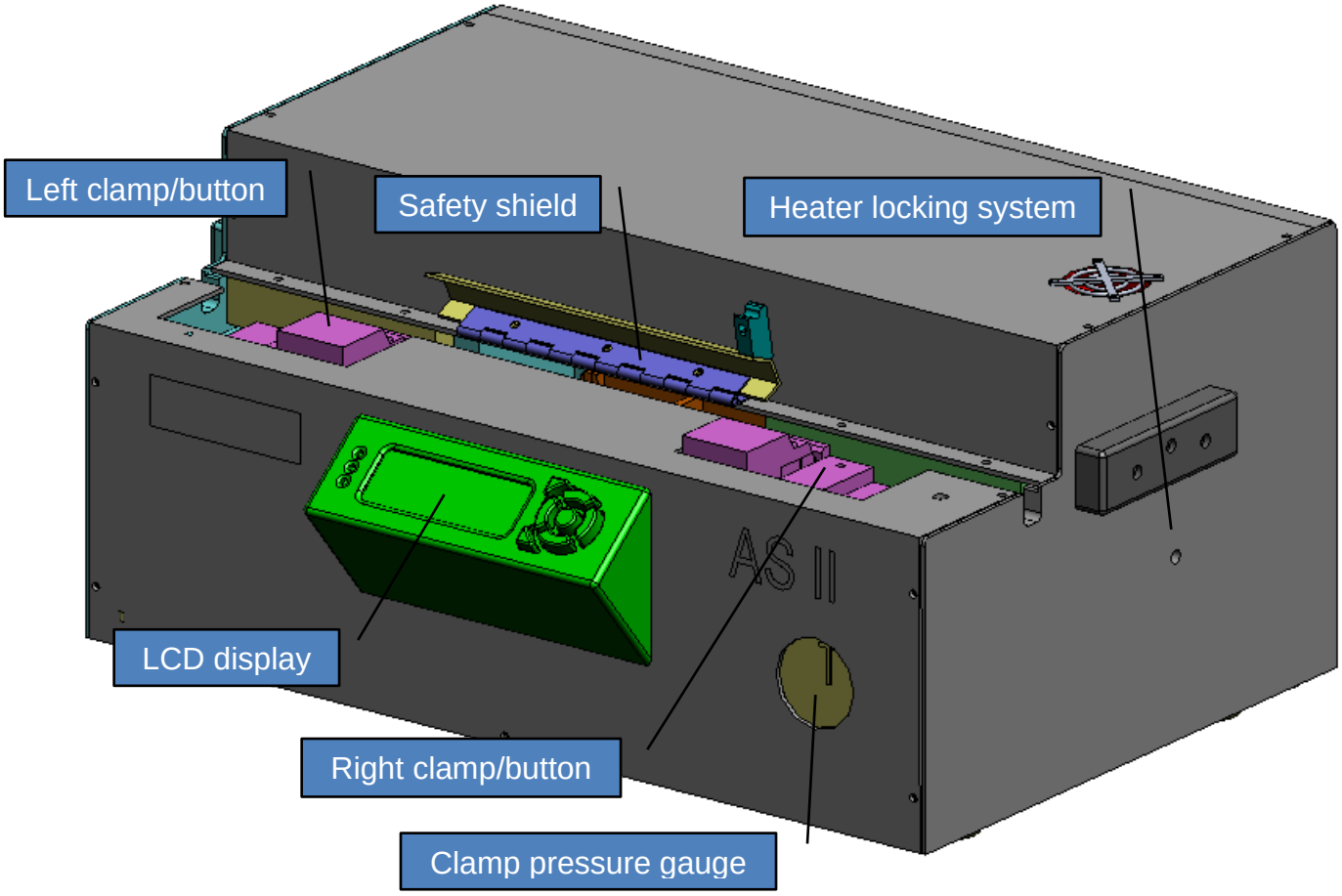
Safety Features

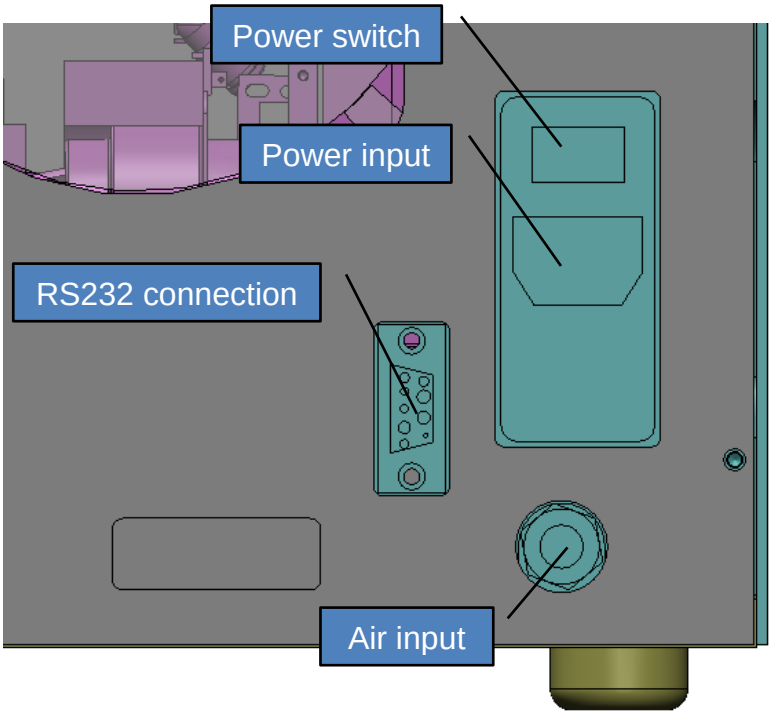
- All stripping processes are done inside the unit. Exposure to moving parts, hot gases, and surfaces by user is extremely limited
- Safety shield to protect the operator from broken fiber shatter
- Exhaust systems with air filter for organic vapors
- Built in battery driven cooling fan allows the heater temperature to cool down slowly even if the unit is disconnected from the wall outlet
- Fused for electrical protection

Unboxing the AS II

1. Begin by opening the box.
2. Remove the AS II unit.
3. Remove all of the included accessories.
4. Compare the contents of the package with the *Accessories Included* list and the packing slip to verify that everything has been received.

The AS II comes standard with the following features & add-ons.




Power switch
Power input
RS232 connection
Air input

Accessories Included

The AS II comes standard with the following accessories.

Item	***What it's used for***
Power cord	Connect the power cord to the AS II, then plug into a standard power outlet
Air-line *(8mm)* w/fitting	Connect the air-line to the AS II, then plug the fitting to an air supply
Quick start guide	Quick setup guide and operation guide for the ASII
Hex shank bit	Used to adjust the clamp pressure *(SPT-10-1326)*
Rubber pad *(x2)*	Used to help secure fiber coatings during stripping *(SPT-10-0898)*

Optional Accessories

Load cell validation kit	Used to verify/adjust the AS II load cell system *(ACC-01-0601)*

Basics

The AS II LCD provides access to all user controls.

AS II Firmware Compatibility

This manual is compatible with the following firmware and above: v1.7

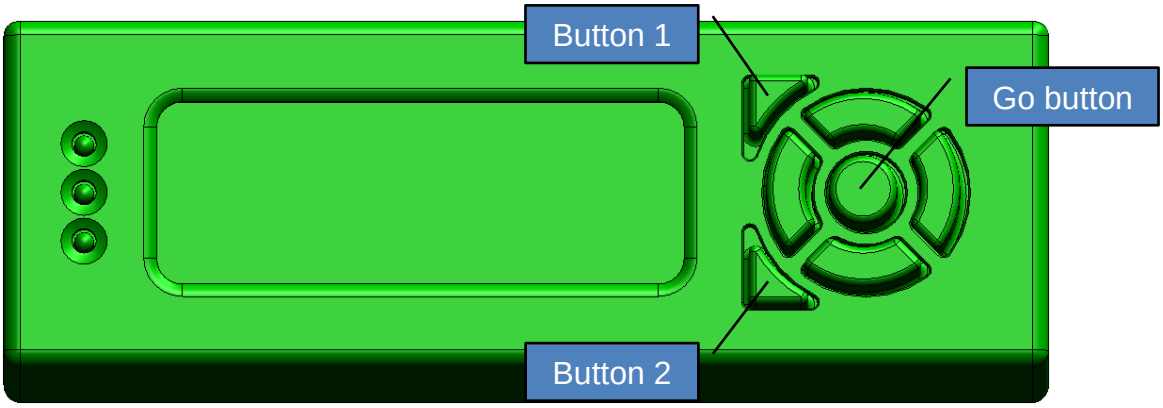
AS II Home Screen

The AS II home screen provides the end user with the following information

- Current program number
- Current status
- Edit option
- Zero option
- Current set temperature
- Real time load cell reading

AS II Buttons

The AS II buttons allow the end user the ability to



- Access new programs
- Make changes to programs
- Access global parameters
- Zero the load cell

AS II LEDs

The AS II LEDs indicate to the end user the following:

Top LED

- This will be solid green to represent that the unit is on and waiting on the operator. Red indicates that the unit is in use and the clamps are closed

Middle LED

- Not used

Bottom LED

- Red during heater ramping up and will flash green when the heater is at temperature

Heater Lock

The heater locking system is a new safety feature. The lock secures the heater assembly during shipping.

Note: Do not power on the unit prior to removing the locking screw, **THIS CAN** damage the AS II

1 Spin the locking screw CCW to remove.
2 Insert the protective cap where the locking screw was.
3 Save the locking screw for future shipping.

Safety Shield

The AS II safety shield has a sensor installed for additional security.

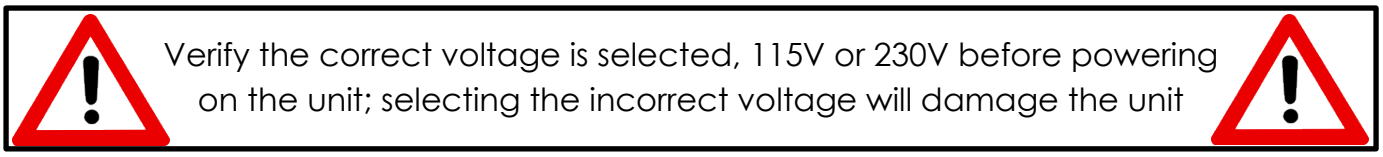
- If the safety shield is open, the AS II will not perform an operation
- During a cycle, if the safety shield is opened, the AS II will stop the cycle immediately

Providing Air

Use of an external pressure regulator is required if the line pressure is greater than 95psi. Set input pressure to 90-95ps before connecting compressed air line to the AS II.

- The AS II is equipped with an 8mm instant push-in fitting
- Push the supply hose into the fitting, making sure that the hose is fully inserted. When the hose reaches the bottom of the fitting, it will be locked in place
- To remove the hose, push the locking ring in and pull the hose out

Powering the AS II



1 Connect the power cord to AS II and then plug it into a standard power outlet.
2 Toggle the power switch from off to on.

Upon power-up, the AS II will perform a number of internal tests; if successfully completed, the top LED on the AS II LCD will become solid green. If unsuccessful, the top LED will become solid red.

Setting Heater Temperature

The heater temperature is displayed on the front of the unit in real time.

To change the heater temperature:

1 Select the program number that the temperature needs to be changed on.
2 Press *Button 2 (labeled Edit)*.
3 Cycle the *Right Arrow Button* until 'Heater temp' is displayed.
4 Using the *Up and Down Arrow Buttons*, the temperature can be changed. The *Go Button* changes the value from 1 to 100 to accommodate a larger change.
5 Press *Button 2 (labeled Save)* to keep the current change.

- Allow some time for the heater to adapt for the new temperature setting

Note: If the heater value is set to 0°, then the heater will be turned off

Zero Load Cell Response

- Press B*utton 2* to zero out the load cell
- If the tension fluctuates 10%, zero out the load cell

Clamp Pressure

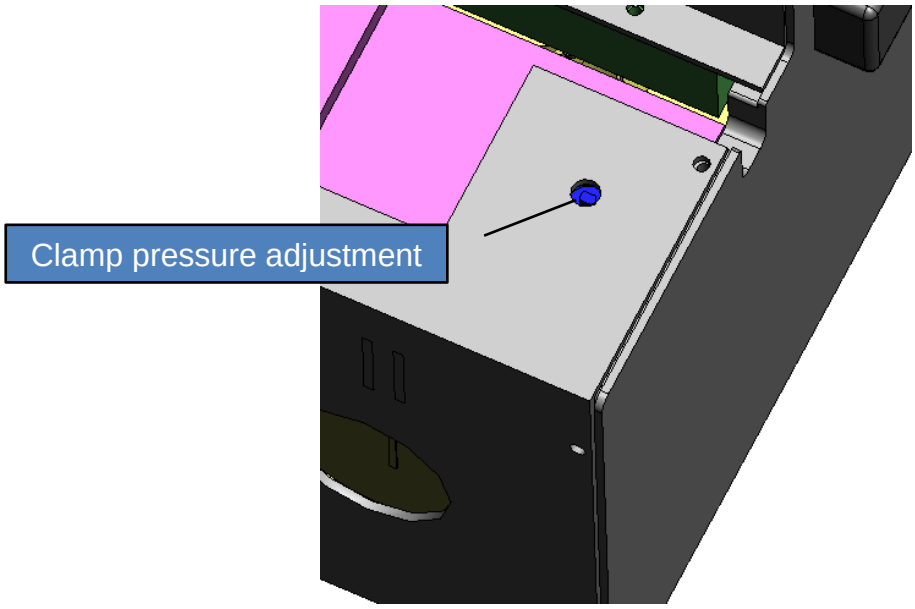
The clamp pressure is factory set to 50.

It may be necessary to adjust the clamp pressure for:

- A smaller or larger diameter fiber
- Specialty coated fibers
- When ‘Fiber Slipping’ occurs

- Hex shank bit

1 Adjust the clamp pressure as needed *(hex shank bit)*.
   a Turn the dial CW to increase the clamp pressure.
   b Turn the dial CCW to decrease the clamp pressure.
   c **DO NOT** over tighten the dial when making adjustments.



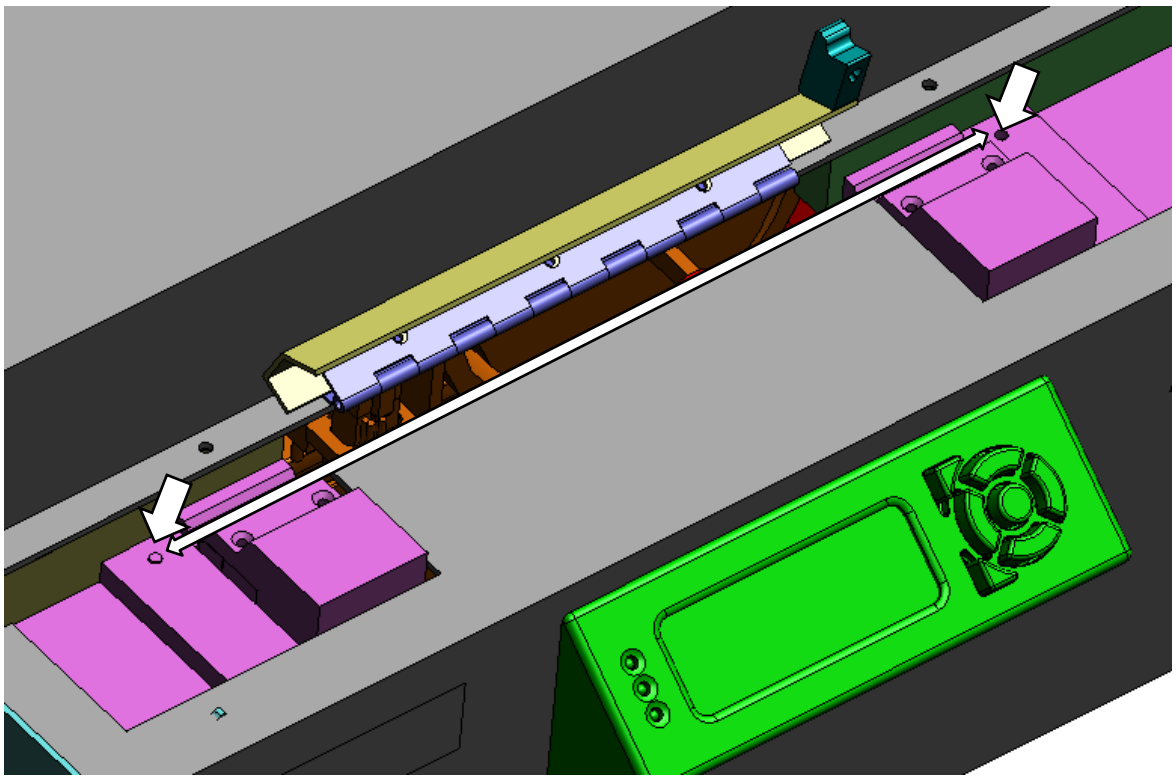
General Use

This section describes the standard operation procedures for using the AS II.

1 Power on the AS II.
2 Choose/verify the program for the fiber diameter/coating.
3 Allow the heater time to reach the operating temperature and stabilize *(5 – 10 min)*.

Loading the fiber

4 Open the safety shield to the AS II.
5 Load a fiber across both clamps.
   a Make sure that the fiber is flat and taught.
   b Make sure that the fiber length passes the buttons.
6 Press both buttons simultaneously.
7 Close the safety shield.



The display will read
Press Start

8 Press the *Go Button*.

Note: The proof-test information will only be displayed if that feature is enabled

The display will read
ProofTest Ok (display value here)

The display will read
Done

The display will read
Release Fiber

9 Open the safety shield.
10 Remove the fiber by pressing both buttons simultaneously.
   a Make sure to hold the fiber prior to pressing the buttons.

Proof-Test Only

1 Open the safety shield to the AS II.
2 Load a fiber across both clamps.
3 Press both buttons simultaneously.
4 Close the safety shield.

The display will read
Press Start

5 Press the *Go Button*.

The display will read
ProofTest Ok (display value here)

The display will read
Done

The display will read
Release Fiber

Programs

The AS II comes with 1 standard programs and the ability to add 9 additional programs.

Selecting a Program

1 Press the *Go Button.*
2 Press either the *Up or Down Arrow Button* to cycle to a new program.

Editing a Program

1 Press *Button 2.*
2 Press the *Left or Right Arrow Button* to cycle to a program parameter.
3 Press the *Up or Down Arrow Button* to edit the parameter.

Note: Press the G*o Button* to change the increments from ***x1*** to ***x100***

4 Press *Button 1* to save the program parameters.
5 Press *Button 2* to exit.

The AS II comes standard with 1 factory program that is designed for SMF28.

Parameter	Value
Mode	0
# of Windows	1
Heater Temp	920
Strip Tension	3.5
Zero Mov't Length	1
Prooftest Tension	10
ProofTest Speed	2
Clamp Delay	200
Prooftest hold time	0
Preheat time	3000
Readjust tension off/on	0
Air on position	0
Strip Start position	0
Strip End Position	20
Fiber up position	0
Air off position	0
Vacuum pre delay	500
Air pre delay	50
Start Speed	15
Strip Speed	20
Ramp Time	20
Air post delay	0
Vacuum post delay	2000

The AS II control software allows the user to change the variables which ultimately change the cleanliness and strength of the stripped fiber. These instructions assume all mechanical adjustments on the unit have already been checked and set properly.

Some of the parameters are simply used to control the location and length of the stripped fiber section such as *Gap Movement* and *Strip Movement*. These parameters do not affect the cleanliness or strength of the stripped fiber.

As the heater ages, there may be a change in performance. This will vary depending on the amount of use.

Mode
This can be set to 0 for stripping only, 1 for proof testing only, or 2 to strip and proof test.

# of Windows
The AS II has the capability to strip 3 individual windows within a single cycle.

Heater Temp
Heater temperature is one of the critical parameters. The typical operating range of the heater is from 850°- 920°C. A thermocouple sensor is located inside the heater core so that air temperature can be monitored and controlled quite accurately.

Strip Tension
Tension must be applied across the fiber so that the fiber does not move excessively during the burst process. The input side of the heater receives about 80psi of pressure which is very forceful when exiting the heater against the side of the fiber. Therefore, the recommended tension for most fibers is 4N or greater. The maximum value allowed is 40N. The maximum setting recommended is less than 20N.

Note: The heater nozzle should be no more than .5mm from the fiber at any time during the stripping process. Setting the tension too low could cause the cleanliness to degrade because the fiber would be located too far from the heater nozzle. To ensure that the fiber does not move too far from the heater nozzle, a stop screw has been placed next to fiber along the length of travel

Zero Movement Length
This parameter sets a distance in relation to a stripped fiber without any translation of the heater.

Proof Test Tension
This is the tension set for performing a tensile test on the unit.

Proof Test Speed
This is the speed at which the tensile test will reach the set proof test tension.

Clamp Delay
This parameter creates a delay for the proof test. Once the fiber is loaded in the clamps and the lid is closed, the set delay will occur at this point.

Proof Test Hold Time
This parameter will hold the fiber for the set time once the set proof test tension has been met.

Preheat Time
The heater nozzle must go through a pre-heating cycle so that the air temperature at the nozzle end is equivalent to the air temperature inside the heater near the thermocouple. The suggested range is from 4 to 8 seconds. Increasing the time will increase the nozzle temperature closer to actual heater temperature giving more repeatable results. However, pre-heating the nozzle longer than 8 seconds does not appear to increase the nozzle temperature any more but rather only wastes the air volume and time.

Re-adjust Tension
When set to 1, this causes the AS II to re-adjust the tension on the fiber after moving to the down position just prior to the burst process. This ensures that the tension is correct during the strip process. When set to 0, this feature is turned off.

Air on Position
This is a distance from the home position that will tell the heater when to turn on the burst. This can be set to a value either before or after the strip start position. This will affect the right-side interfaces. When set to 0, this feature is turned off.

Strip Start Position
This parameter moves the location of the stripped area from the home position. The default setting is 0.00mm to stay at the home position.

Strip End Position
The strip end position is the length of the window strip. Currently, a window strip can be created ranging from 2mm to 150mm using the translating nozzle *(1.5mm ID)*. When this length is set to 0.00mm, the strip window will still be 2mm which is the width of the burst air column.

Note: The burst stripping process creates a transition from coated fiber to uncoated fiber typically in a taper shape less than 375um long. The strip movement may need to be adjusted to compensate for this taper on each side of the window to create a specific length of the window strip

Fiber Up Position
This is a distance from the home position that will tell the elevator to raise the fiber out of the path of the heater. This will affect the left side interfaces. When set to 0, this feature is turned off.

Air Off Position
This is a distance from the home position that will tell the heater when to turn off the burst. This can be set to a value either before or after the strip end position. This will affect the left side interfaces. When set to 0, this feature is turned off.

Vacuum Pre Delay
This parameter sets a delay for the vacuum/exhaust system. Setting this will turn on the exhaust before the stripping process.

Air Pre Delay
This is the length of time the heater is allowing hot air flow before it starts to translate down the fiber. If this value is set to 0ms, the heater air flow will turn on and the heater will translate immediately. The purpose of this parameter is to change the transition shape. Increase this parameter in increments of 10ms from 0ms to create a sharper transition. A longer time will give a straight interface instead of a taper. However, a longer pre-delay time will also decrease the strength of the fiber. Therefore, start at 0ms and increase this only if needed.

Start Speed
This is the heater movement speed during the ramp time. The heater starts at this speed and ramps to the set strip speed parameter. For most applications, this value should be equal to the strip speed.

Strip Speed
This parameter sets the speed at which the nozzle travels down the length of the fiber. A faster strip speed will essentially strip faster if enough heat transfer is present. The heat transfer is composed of temperature and time because flow is considered a fixed setting from the factory. Exposure time is a function of the strip speed. Each small section of the fiber receives some specific heating time depending on the speed of the nozzle. For example, the same strip results of high strength and clean fiber could be achieved using either high speed high temperature, or low speed low temperature. Both cases result in the same heat transfer to the fiber. On the fixed nozzle version, the heat transfer is controlled by temperature and time directly.

Ramp Time
This parameter is the time allowed for the heater to ramp to strip speed.

Air Post Delay
Just as the pre-delay is the time the heater waits to translate after the air flow starts, the post-delay is the time the heater flow stays on after the translation has stopped. As with the pre-delay, a longer post-delay will generate a sharper transition but strength degrades more with time.

Vacuum Post Delay
The vacuum post delay is similar to the hot-air delay at the start of the stripping process. This parameter controls when the vacuum is turned off after the heater flow has been turned off. A negative value is not allowed. The common value is 1s to ensure that the harmful gases are all removed and filtered using the vacuum.

Global Parameters

The global parameters are factory set and should not be changed without first contacting an engineer at 3SAE.

Note: Steps 1 through 3 are a button combination, disregard what is on the LCD until Step 4

1 Press the *Go Button*.
2 Press the *Right Arrow Button*.
3 Press *Button 1*.
    a The AS II will beep confirming access to the global parameters.
    b The global parameters will now be displayed starting with 'Fast Position Speed'.
4 Press the *Left or Right Arrow Button* to cycle to a global parameter.
5 Press the *Up or Down Arrow Button* to edit the parameter.

Note: Press the *go button* to change the increments from ***x1*** to ***x100***

6 Press *Button 1* to save the changes.
7 Press *Button 2* to exit.

Parameter	Value
Fast Position Speed	40
Slow Position Speed	20
Pos. Ramp Time	10
Tension Max Move	4500
Tension Speed	2
Valve delay	10
Elevator delay	500
Fiber too tense	3
Load Cell Ratio	129
Max force deviation	1.5
Loadcell zero	41.3

Fast Position Speed
This is the fast movement of the heater when it is not homing or stripping.

Slow Position Speed
This is the speed when the heater is homing, this speed is used.

Pos. Ramp Time
This is the ramp time of the heater movements for positioning.

Tension Max Move
This is the extent of travel for the stepper motor.

Tension Speed
This is the value of which the load cell moves during tensile test.

Valve Delay
This is the delay after every valve state change.

Elevator Delay
This is the time after waste is turned on, time for elevator to drop to flag and time out.

Fiber Too Tense
This is the maximum tension allowed when the fiber is loaded.

Loadcell Ratio
This is the load cell value.

Max Force Deviation
If readjust tension is activated, this is the maximum deviation to cause a readjust.

Loadcell Zero
This is the automatic offset value that is loaded when load cell is zeroed.

Optimizing

Introduction to Optimizing

- In one step, the fiber coating gets removed and the fiber surface becomes cleaned. Fiber strengths can reach virgin strength. The burst process uses a large flow *(≈2 CFM)* of air *(or nitrogen)* at high temperature *(850° ≈ 920°C)* directed onto the coated fiber held in place between two pneumatic clamps

- The burst process is composed of three main variables; air temperature, flow rate and exposure time. Together, these factors compose the "heat transfer" required to remove the acrylate coating. Under enough heat transfer, the acrylate fiber coating can be removed from the glass fiber without touching the fiber thus maintaining near virgin strength

- In the burst stripping process, two extremes exist. One extreme is a perfectly clean fiber with some strength degradation which is the result of too much heat transfer. Opposite to this, the other extreme is virgin strength with some coating still present which is the result of insufficient heat transfer. The ideal situation is a combination of both cleanliness and strength. This can be achieved by adjusting the three parameters for heat transfer. It is difficult to control three parameters simultaneously so typically the flow is set at the factory. Therefore, the two parameters remaining are air temperature and exposure time. First, the air temperature can easily be controlled by adjusting the heater temperature. Second, the exposure time is a function of strip speed for the translating nozzle or controlled directly on the fixed nozzle

- It is possible to have different combinations of temperature and strip speed *(or exposure time)* while achieving the same results

Optimizing a Fiber

1 For most applications, the goal is to create a recipe of the parameters which results in a strong, clean fiber with acceptable transitions on the edges of the strip area. Each fiber manufacturer uses a different process and/or slightly different material for coating a glass fiber. Therefore, start at a higher temperature and lower strip speed with a moderate strip length of around 10mm to first create a clean fiber. This is an aggressive recipe which generally cleans well but significantly degrades the strength of the fiber from its maximum.

2 The first step is to strip a fiber and examine the cleanliness and strength. At this point, do not be concerned with the transition area but rather focus on the two main criteria listed above. In some cases, the result is an unclean fiber that is strong which occurs because of too little heat transfer, most likely to little flow. This requires a precise adjustment of the flow through the heater. Fortunately, there is usually a recipe that produces a clean fiber with high strength. If not, a compromise must be found between these two. It is not uncommon to see as much as 800 kpsi strength in the stripped fiber. An average strength is around 450 kpsi.

3 Reduce the amount of heat transfer so that the fiber can also be strong. As stated earlier, there are many combinations of temperature and strip speed *(exposure time)* which can create acceptable results. Therefore, the spectrum of possibilities must be tested. For each change in the recipe, test two or three trials to find an average strength. The fiber strength could reach 800 kpsi so have the proper equipment to test the fiber tensile strength. Start by adjusting the temperature down in increments of 25 C until the fiber strength is at a maximum while maintaining a clean fiber. Once this temperature range has been found, adjust the temperature in increments of 5 C until the fiber strength is maximized.

4 The next adjustment is to further increase fiber strength if possible. Increase or decrease the strip speed by increments of 1 mm/s until the maximum strength is achieved with no change in the cleanliness. This should now be the optimum program which yields high strengths with a clean fiber.

5 The final step is to adjust the pre-delay or post-delay until the transition is the desired shape for your application. In most cases, the transition is adequate for the recoating process and does not need adjustment. However, if the transition must be sharper, increase the time for pre-delay *(right transition)* and/or post delay *(left transition)*. Remember, adding more time here could affect the strength. Always test the fiber strength for each adjustment made in either delay time.

Maintenance

Maintenance can be done to help keep the AS II running normally.

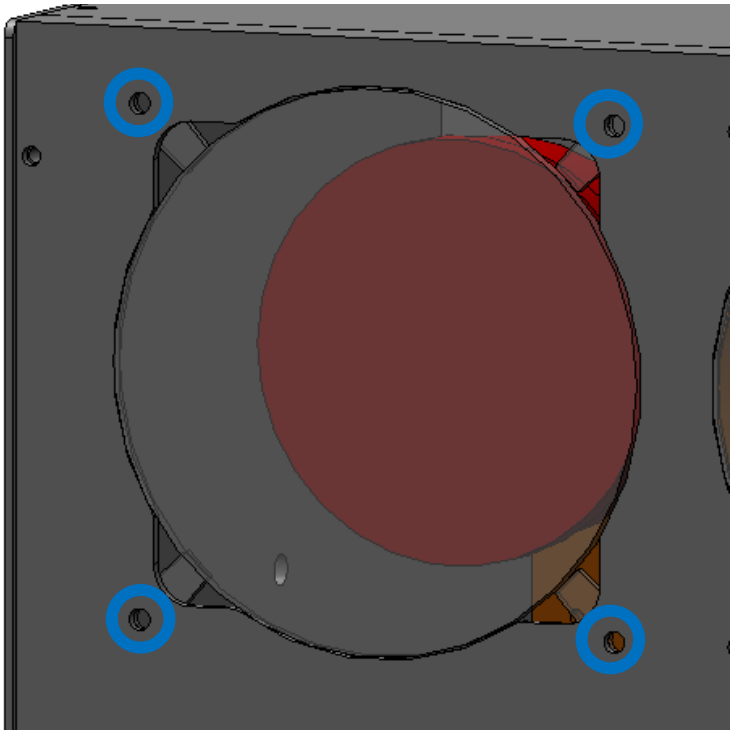
Replacing the Filter

Replace the exhaust air filter every second month or as needed; this varies depending on use.

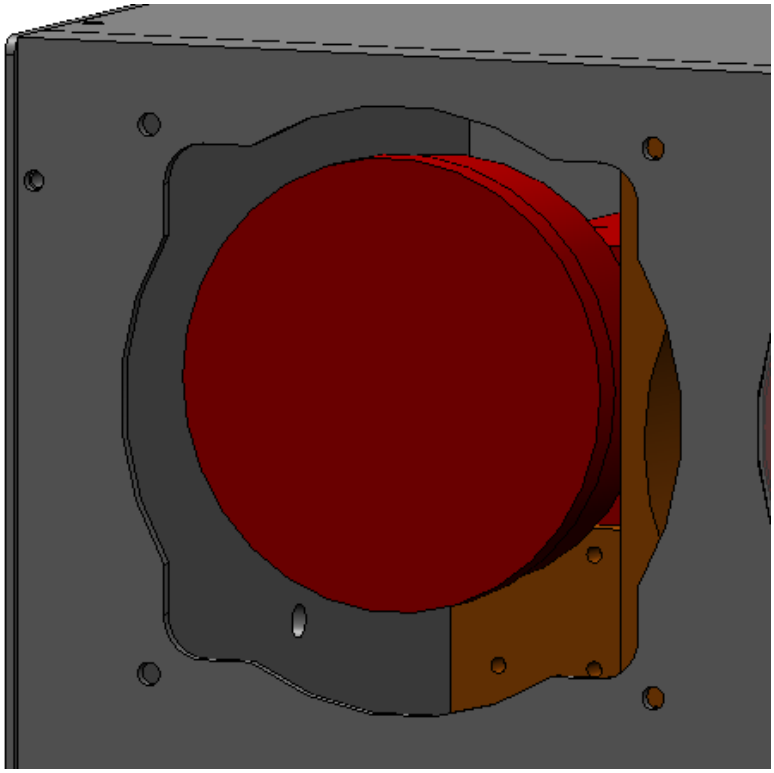
Note: For safety purposes, the power should be off on the AS II and the power cord unplugged from the unit

- 2mm hex wrench

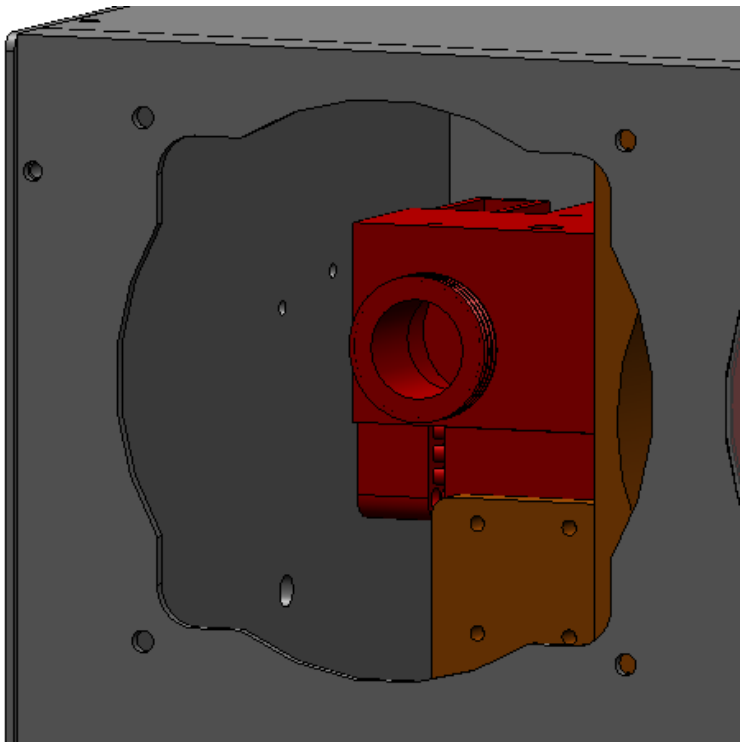
1. Remove the *(farthest left)* fan cover *(2mm)*.



2 Physically slide the filter/fan assembly so that the fan is accessible.



3 Spin the filter ***CCW*** to remove.



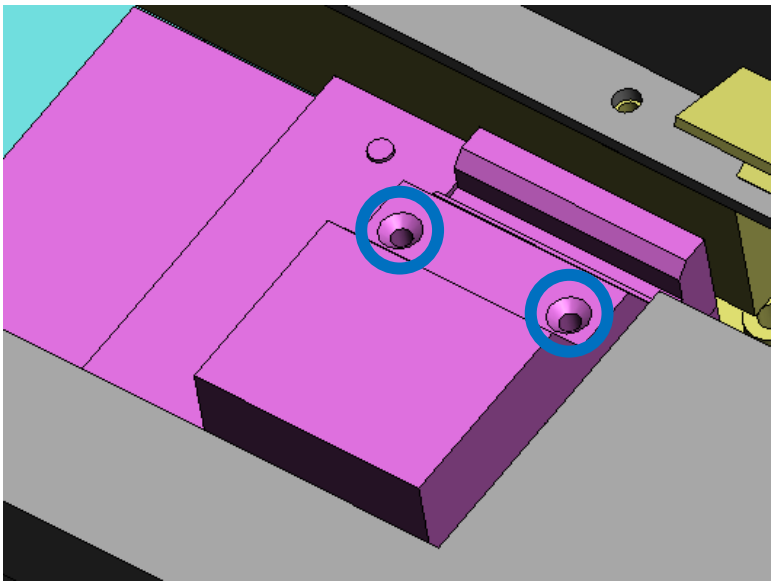
4 Install a new filter, spin ***CW*** to attach.
    a. Do not over-tighten.
5 Re-attach the fan cover.

Cleaning Linear Clamps

Clean the fiber clamps and grooves *(using Kim Wipes and/or a cotton swab using IPA)* after 200 fiber strips or as needed, this will vary based on use/fiber type.

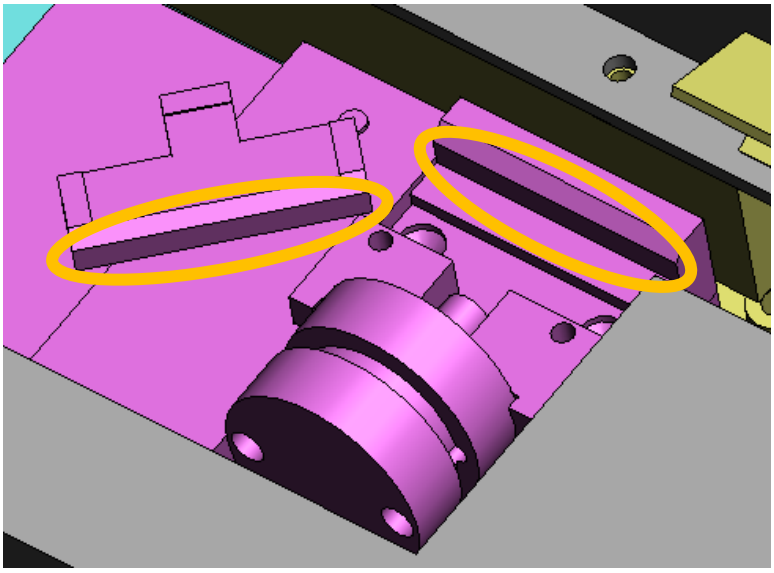
- 2mm hex wrench
- Cotton swab
- IPA
- Kim Wipe

1 Remove the *(left/right)* clamp cover.



2 Slide the clamp out by lifting it straight up.

3 Clean the clamp and clamp base edges using a cotton swab/Kim Wipe and IPA.



6 Re-attach the clamp.
7 Re-attach the clamp cover.

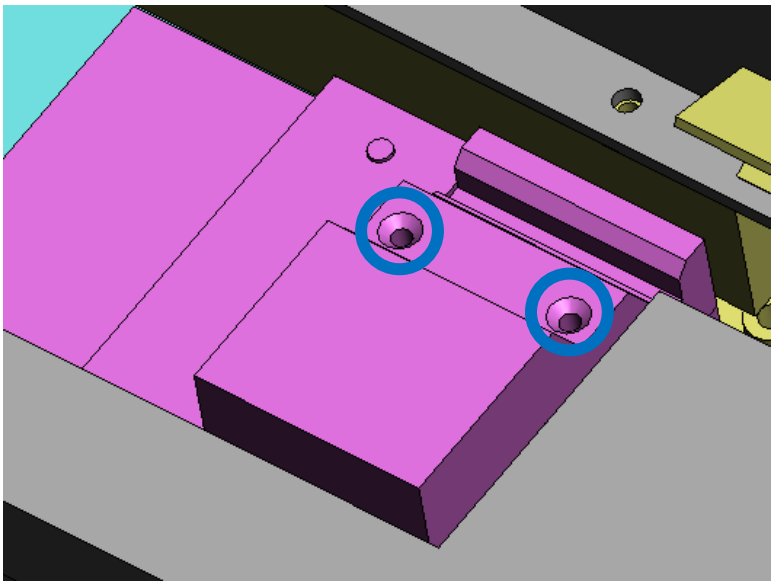
Replacing Rubber Pads (optional)

The AS II linear clamps can be modified by installing rubber pads on one or both surfaces. This rubber minimizes delaminating of the fiber coating for sensitive fiber types.

Note: When using rubber in the clamps, this will affect the maximum tension that can be achieved during the proof-test. It may not be possible to achieve the 20N maximum

- 2mm hex wrench
- Cotton swab
- IPA
- Kim Wipe

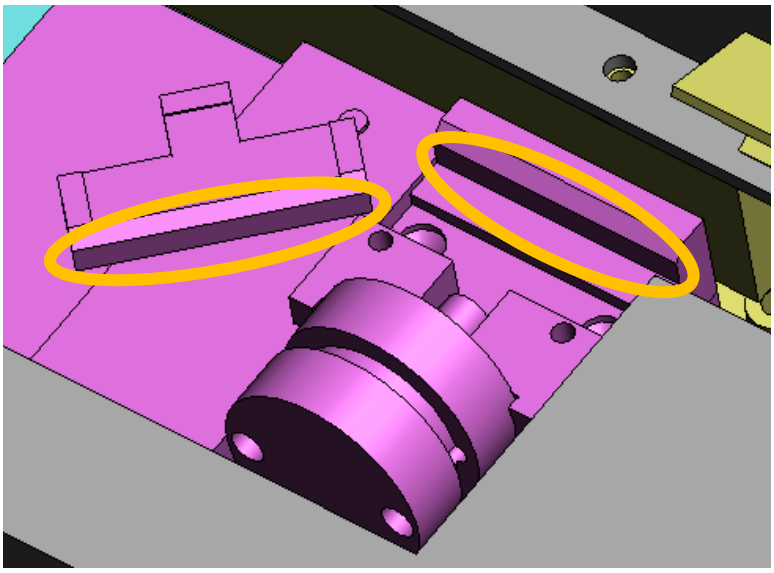
1 Remove the *(left/right)* clamp cover.



2 Slide the clamp out by lifting it straight up.

3 *(if applicable)* Remove the old rubber pad the clamp and clamp base.

a Clean the clamp and clamp base edges using a cotton swab/Kim Wipe and IPA.



4 Attach a new rubber pad to the clamp and clamp base.

5 Re-attach the clamp.

6 Re-Attach the clamp cover.

Replacing Fuses

If the AS II does not power on when connected to power, it could be related to the fuses. The fuses are located on the rear panel of the unit.

Note: Use the exact match when replacing *(8A 250V)*

Note: For safety purposes, the power should be off on the AS II and the power cord unplugged from the unit

- Flathead screwdriver

1. Using a flathead screwdriver, remove the fuse holder.

2. Replace the fuse*(s)*.
3. Re-attach the fuse holder.
    a. Make sure the arrows line up with the correct voltage is selected.

AS II Errors

The AS II will display error codes when there is a problem with the strip or proof-test.

Clamp Slipping

When the AS II tries to pull the fiber to the set tension value and that value cannot be achieved, the unit will display ‘Clamp Slipping’.

Note: When using rubber in the clamps, this will affect the maximum tension that can be achieved during the proof-test. It may not be possible to achieve the 20N maximum

1 Press the *Go Button* to clear the error.
2 Press the *Clamp Buttons* to release the fiber.

Fiber Too Tight

This will only occur when proof-testing. If the fiber is loaded into the clamps and the fiber is too tight, the AS II will beep once *(for the closing of the clamps)*, then beep 3 more times and display ‘Release Fiber’. Release the fiber and try loading again.

Broken Fiber

When a fiber breaks during the proof-test process, the ‘Broken Fiber’ error will be displayed.

1 Press the *Go Button* to clear the error.
2 Press the *Clamp Buttons* to release the fiber.

PC Interface

HyperTerminal is only required when upgrading or troubleshooting the AS II.

1 Connect the AS II to a PC using a RS232 Null Modem cable.
2 Open HyperTerminal on the PC.
3 Select ‘New Connection’ within HyperTerminal.
4 Enter a new name for the connection.
5 In ‘Connect To’, connect using the following parameters:

Bits per Second – 19200
Data Bits – 8
Parity – None
Stop Bits – 1
Flow Control – None

Tech Support

Please refer below to contact 3SAE Technologies, Inc. with questions regarding your AS II.
http://www.3sae.com/products/3saeautostrip2.php

Email	info@3sae.com service@3sae.com
Website	www.3SAE.com
Technical Support Lines	Monday - Friday, 8:00 AM to 5:00 PM CST 615-778-8812 Service Support, Extension 2 Technical Support, Extension 3 Engineering Support, Extension 4
After Normal Business Hours	800-846-1404