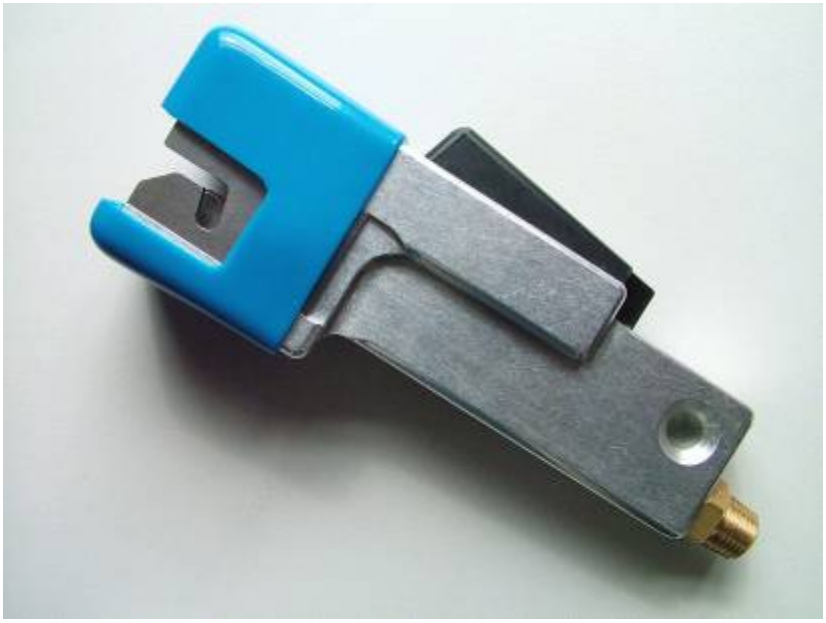
GTW Developments Ltd.

110 Series splicers

Splicers for heavy yarns and tows



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Getting started

Model 110 - getting started

Please read this section before you start operating the splicer. The rest of the manual deals with maintenance, and with details of products; those sections will not be needed immediately.

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Remove all packaging. For each splicer, you will have the appropriate splicing chamber – which will usually already be fitted.

Depending on what you have ordered, you will have some or all of the following:

- Splicer
- Additional splicing chamber(s)
- Optional carrying strap
- Optional buckle
- Optional hanger and screws
- Optional hanging clip

If they have been supplied, place the buckle and strap over the air union, before connecting the splicer to the air supply. The operator may then loop the strap round his wrist to reduce the likelihood of the splicer being dropped.

It may be useful to have a fixed place to store the splicer temporarily when the operator has finished. If it has been supplied, bolt the hanging clip to a convenient spot on a machine. Fix the hanger to the back of the splicer, using the screws provided. (This operation will involve the removal and replacement of the splicing chamber). The splicer can then be placed in the hanging clip when not in use. This reduces the likelihood of the splicer being dropped and damaged in service.

Connect the splicer to an air line. **(See Appendix 1 for compressed air Health and Safety issues)**

Under normal circumstances, the line pressure should be around 6 bar. The line should preferably be fitted with a pressure regulator so that adjustment may be made to suit local needs.

Hold the splicer with the trigger button facing the body, and press the trigger with the thumb.

- Look down into the splicer
- Press trigger part-way down - See the pad move until it hits the chamber
- Press trigger further - Listen for the air blast

Splicer threading

The Model 110 splicer is used for making long, "ends-opposed" splices in heavy count yarns, or other yarns which pose particular problems for conventional splicers. A Model 110 H splicer is shown below, as used by a right-handed operator. The splicer is held in the right hand, with the thumb on the trigger button.

1. Take the first yarn into the splicer, leaving a small length of yarn projecting from the left hand side.

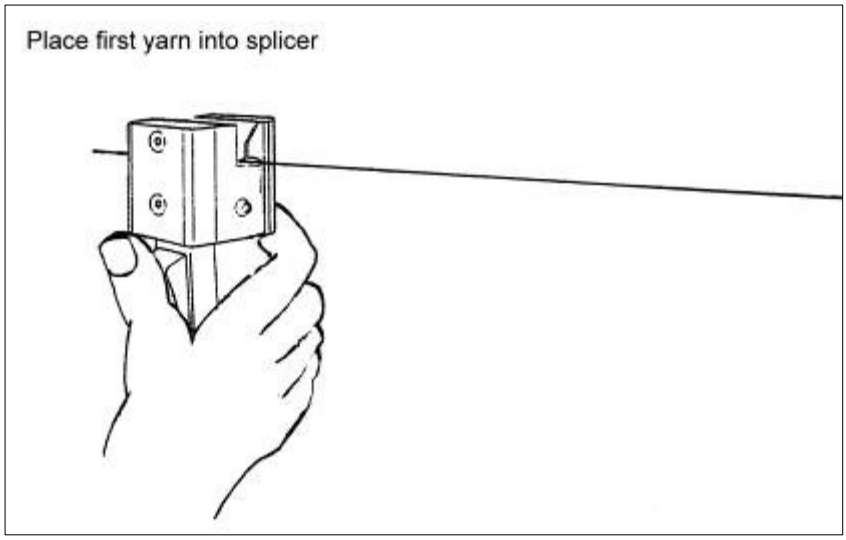


Figure 1

2. Overlap the two yarns to be joined by the desired amount. Normally, a joint in 2400 tex yarn should use around 100 – 150 mm of overlap.

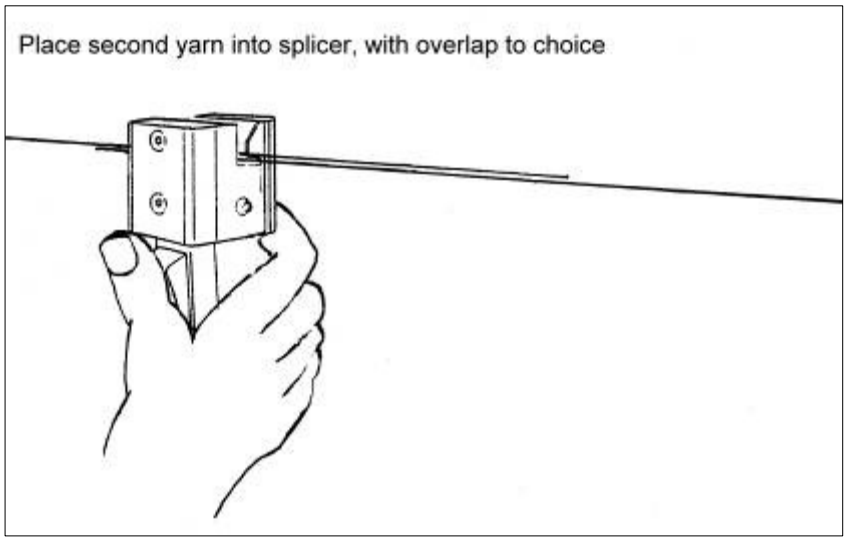


Figure 2

3. Press the trigger lightly, so that the pad closes, but no air blast emerges from the chamber.
4. Check that the position of the yarn in the chamber is correct, and that the yarn can move freely through the chamber.
5. Press the trigger fully, so that the air blast emerges from the chamber.

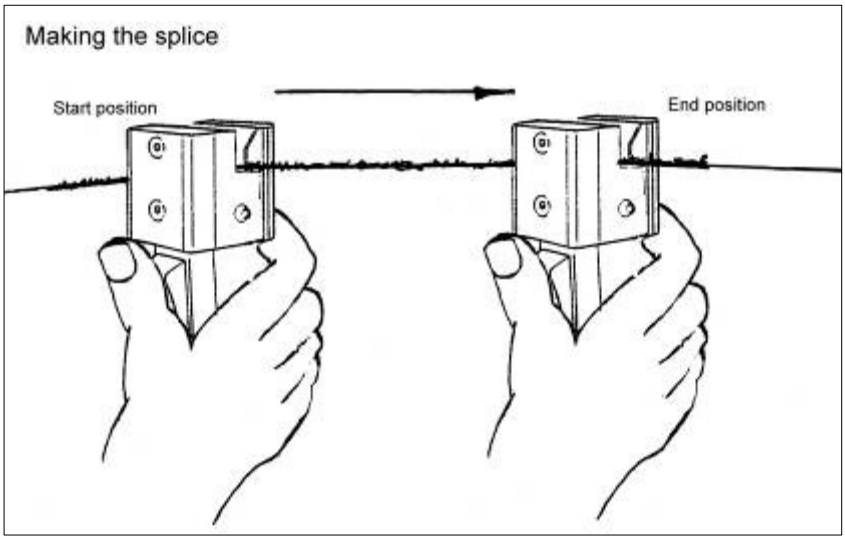


Figure 3

6. With the air blast still on, pass the splicer along the overlapped section as shown, OR draw the yarns through the splicer.
7. Once the whole overlapped section has been intermingled, release the trigger.
8. Withdraw the splice.
9. The splice should be the same length as the overlap in stage 1.
10. Trim the ends of the splice if necessary.

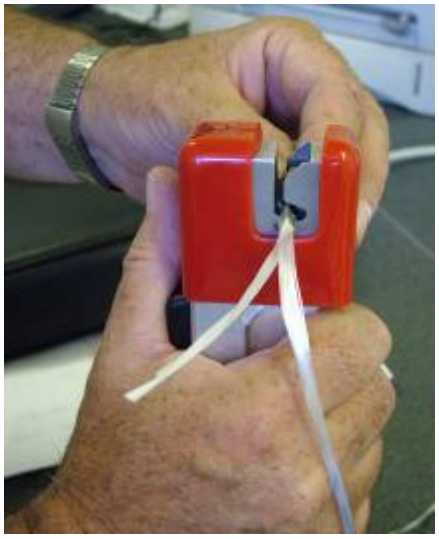


Figure 4

This photograph shows a real Model 110 H in use, with a length of yarn overlap of about 150 mm.

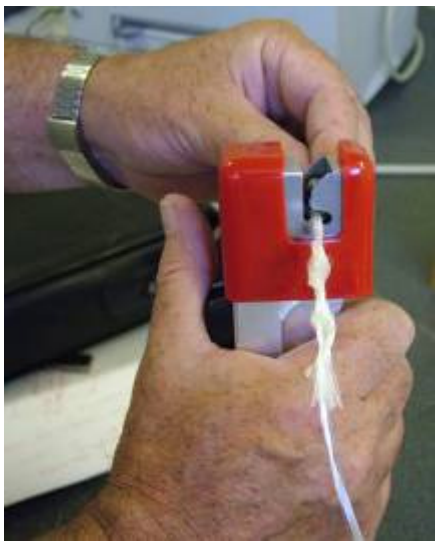


Figure 5

This photograph shows a real Model 110 H in use, showing the appearance of the intermingled section.

Figure 6

A long splice of about 180 mm. in glass fibre produced by the Model 110.

Optimising splicing performance

The operator has a number of operating parameters which can be changed at will, so that the optimum performance may be achieved for a given situation. The following variations are possible:

- Change of splicing chamber.
- Change of air pressure.
- Change of length of overlap.
- Change of speed at which the yarn bundle passes through the splicer.

Some examples follow.

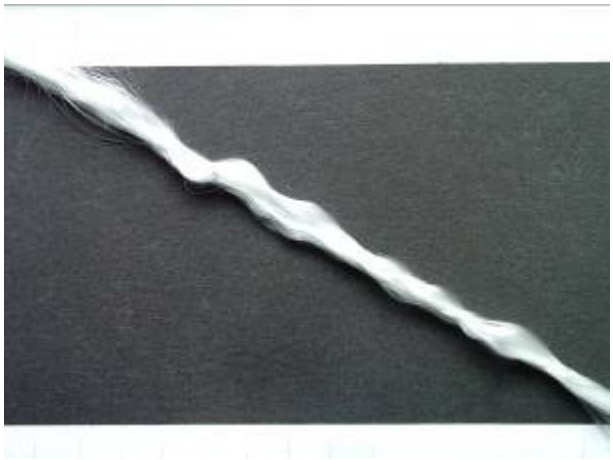
Figure 7

This illustration shows a very flat and attractive splice, 150 mm long, in a 2200 tex nylon yarn. The splice has very few loops and whorls.

The splice was made using a splicing chamber with a small cross-section. The small section was chosen to minimise filament motion.
Also, the yarn was drawn rapidly through the splicing chamber; the rapid movement was chosen to reduce the residence time, thereby reducing the amount of intermingling. By adopting these two strategies, a flat, quite weak splice was produced. This method should be used if appearance is of greater importance than strength.

Figure 8

This illustration shows a splice in the same yarn, with a greater degree of intermingling than the previous example. A slightly larger splicing chamber cross section was chosen, and the speed of motion of yarn through the chamber was reduced. By adopting these two strategies, a stronger splice has been produced. However, the splice appearance is more disturbed than the earlier example, This method should be used when strength is the priority.



Important maintenance information

Apart from accidental damage, the Model 110 requires very little attention. However, one aspect of maintenance should NEVER be neglected. The upper bore, in which the chamber pad moves, needs regular lubrication. The frequency of lubrication depends upon the nature of the factory environment and the workload on the splicer.

As a general rule, the cap and pad assembly should be removed and greased with Molykote 111 (available from the company) at least once per month. The service interval should be reduced if the splicer experiences very heavy work loads. The removal and maintenance of this component is shown in Figures 26 to 31, pages 19 to 21.

Model 110 – general product information

Introduction

With the development of high-performance yarns for industrial applications, there is an increasing need for making splices in yarns of very heavy count - typically glass fibre and carbon fibre rovings of up to 4800 tex. Counts are expected to exceed 10000 tex in the near future.

It made good technical sense for GTW Developments to design the new heavy-count splicer around the design features of the successful Model 101. The 101, originally a splicer for carpet yarns, was designed with durability and simple servicing in mind, and has proved its reliability over several years of service.

The result of the further development of the Model 101 was the Model 110 - simple, small and light like the 101, but capable of splicing neat, strong joints in rovings. The 110 has set a new standard as an effective and user-friendly tool for making extra-large splices in these very heavy yarns. After only a short production life, its performance is such that it has been accepted as a heavy-count splicer in countries across the world.

The 110 is already splicing 4800 tex as routine, and a development programme is under way to extend its range towards 10000 tex.

- Model 110 splicers have a simple straight-line string-up, and a simple and very strong construction. machined out of a solid block of alloy.
- The splicer's yarn guide plates are much stronger than is necessary for their function as guides; the thick stainless steel plates give the splicer a strong box-like structure.
- The Model 110 can be kept in active service with a minimum of regular voluntary maintenance.
- Simple construction leads to simple maintenance; the splicer in its basic form can be completely dismantled and re-assembled in about ten minutes.

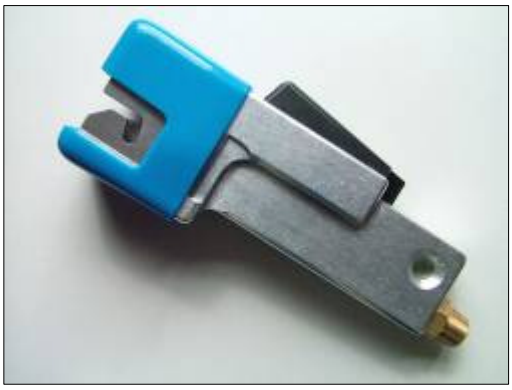
The Model 110 is currently available in three forms, the Model 110 H, the Model 110 HW, and the Model 110 HWB. Further variants are likely to be added to the range in the near future.

The splicer – more detail - Model 110 H

Figure 9

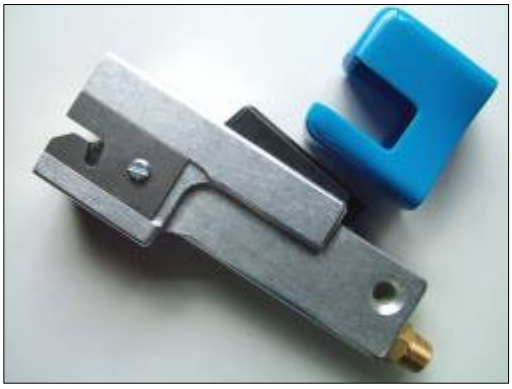
Model 110 H splicer. Shown here fitted with its protective cap, viewed from the right-hand side. This is the simplest, hand held splicer.

Figure 10



Model 110 H splicer. Shown here fitted with its protective cap, viewed from the left-hand side.

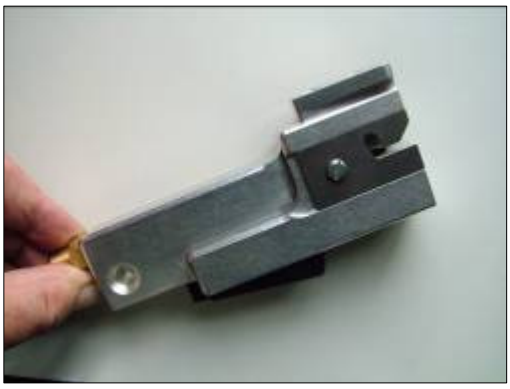
Figure 11



Model 110 H splicer. Shown here after removal of the protective cap, viewed from the left-hand side.

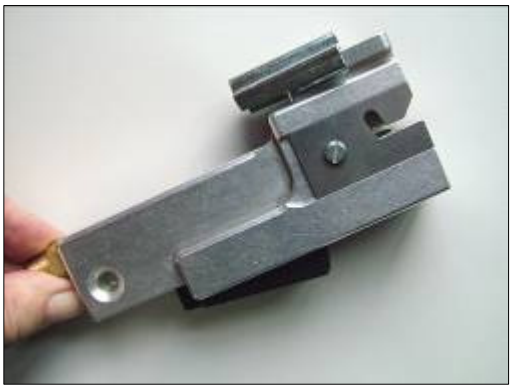
The splicer – more detail - Model 110 HW

Figure 12



Model 110 HW splicer. Shown here without its protective cap. The splicer is fitted with a wedge-shaped accessory, which, together with its matching hanging clip, allows the splicer to be "parked" in any convenient place when not in use.

Figure 13



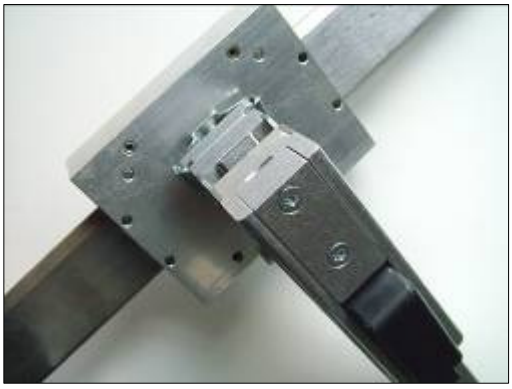
Model 110 HW splicer. Shown here with the hanging wedge partly fitted into the hanging clip. The hanging clip – or hanging clips if a number of storage positions is needed – is fixed to the textile machine in a convenient position, ready to receive the splicer when it need to be stored safely after use.

The splicer – more detail - Model 110 HWB

Figure14

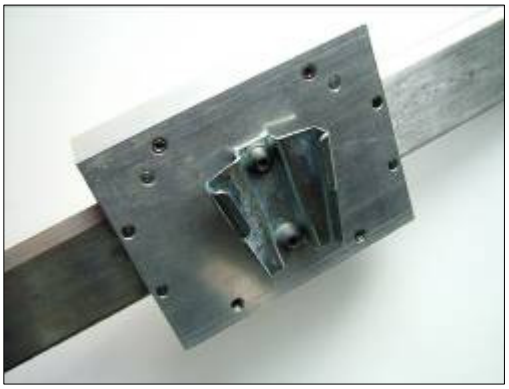
Model 110 HWB splicer. The 110 HWB is a splicer which can be moved along a horizontal rail. The splicer is fitted with a hanging wedge, like a 110 HW, but in this case the hanging clip is attached, not in a fixed position to the textile machine, but to a carriage, which itself can move along a rail.

Figure 15



Model 110 HWB splicer. Another view of the splicer, the carriage, and the rail.

Figure 16



Model 110 HWB splicer. Another view, in which the splicer has been removed, showing the hanging clip, the carriage, and the rail.

Model 110 - Maintenance

Changing splicing chambers

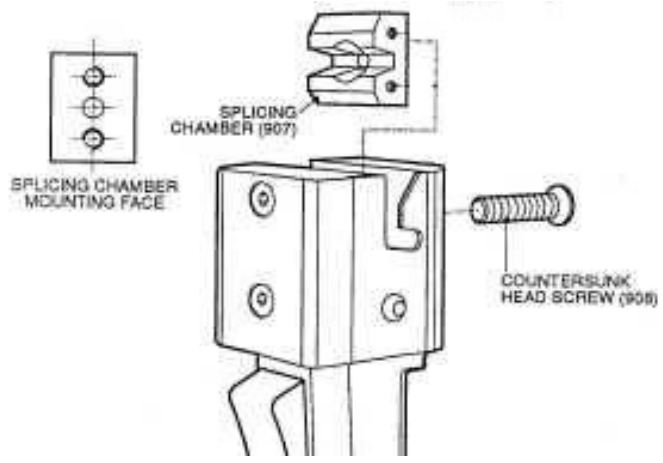
WARNING: If the splicing chamber is removed while the splicer is connected to the air supply DO NOT press the trigger; the pad will be blown out of the main chamber. There will almost certainly be damage to the extension spring.

Uniquely, the Model 110 is generally able to splice a very wide range of textile yarns on a single splicing chamber. Therefore it is rarely necessary to change chambers. Nevertheless, you will sometimes need to remove the splicing chamber - perhaps during routine maintenance, or perhaps because the interior of the splicer has become fouled with fibre particles.

Figure 17

To release the splicing chamber, remove the single fixing screw Item 908 from the rear of the splicer body, when the splicing chamber can be lifted clear of the splicer. Usually, it is not necessary to remove the yarn guide side plates, but if the interior of the splicer is particularly filthy, removal of the plates will help cleaning.

Figure 18



The splicer is shown here in a part-dismantled state.

To reassemble:

With the chamber in the splicer, attach the securing screw. Before tightening the screw, ensure that the chamber is fitted straight, with its top surface parallel to the top surface of the splicer. We recommend that a thread-securing material such as "Loc-tite" be used.

Splicer dismantling – guide plates

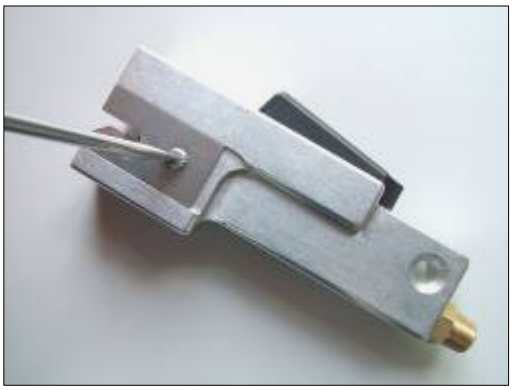
Figure 19

Removal of the yarn guide plate, entry side, Item 911. Remove the slotted button-head screw, Item 912.

Figure 20

Lift off the yarn guide plate. This exposes the side of the splicing chamber.

Figure 21



Removal of the yarn guide plate, exit side, Item 911. Remove the slotted button head screw (912).

Splicer dismantling – trigger assembly

Figure 22

The trigger assembly can be removed without disturbing the splicer cap and valve assembly.

The trigger is secured by a pivot pin, which terminates in a 2.5 mm hexagon socket. Using a hexagon wrench, unscrew the pivot pin. Withdraw the pivot pin through the right hand side of the splicer.

Figure 23

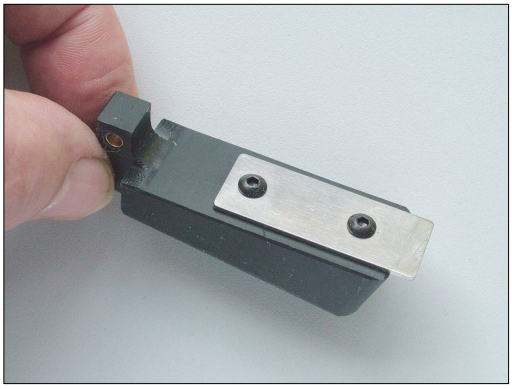
With the pivot pin withdrawn, the trigger assembly can be released.

Note the appearance of the pivot pin in this illustration; the pivot pin terminates in a threaded section, which allows the pin to be screwed into the splicer body.

Figure 24

The trigger assembly is here completely withdrawn. Just visible between the splicer body and the trigger is the trigger return spring, which fits into a circular recess in the splicer body.

Figure 25



Clearly visible are the two small screws which attach the steel trigger plate to the trigger. Assembly is the reverse of the dismantling procedure. Be careful about one point during assembly; the tip of the trigger plate MUST engage with the small slot in the end of the valve. This slot can be seen clearly at the extreme left of the valve, in Figure 34.

Splicer dismantling – chamber pad and spring assembly

Figure 26

The first stage of removing the pad assembly involves loosening the screws which secure the splicer cap. These screws are usually cross-head, as shown, but may have been replaced by slotted-head equivalents.

In either case, be careful in the use of the tool, whether hexagon wrench or screwdriver; mutilating the slot or the crosshead can make removal of the cap very difficult. Screws should always be discarded and replaced by new ones once removed.

Figure 27

With the screws removed, release the splicer cap. This should come away quite easily**.**

If it does not, then proceed with caution. If the cap is difficult to remove, then it is likely to be for one of the following reasons:

Figure 28

Perhaps the cap comes out freely at first, but then is restrained because the pad is stuck in the bore. This is easy to detect. Do not simply pull harder; there will be irreparable damage to the pad return spring. **Solution;** remove the splicing chamber to give access to the front of the chamber pad, through the other end of the main bore. With a suitable tool, gently push back on the pad. The assembly will slide out.

Figure 29

The cap may be free at the top or the bottom end, but stuck at the other end. This is invariably associated with damage to the exterior of the top end of the splicer. **Solution.** The top of the cap has a small slot machined into it. With a large-bladed screwdriver in the slot, work the tip of the driver until the cap is released. It is likely that pad return spring will be damaged during this exercise; check, and if necessary, replace, as described below.

Figure 30

Here the cap and pad assembly are removed. The pad and O-ring, is clearly visible, but the return spring is not. The spring is described in Figure 31. Clean and grease the assembly before replacement. For lubricants see Replacement Parts section.

Maintenance - chamber pad and spring assembly

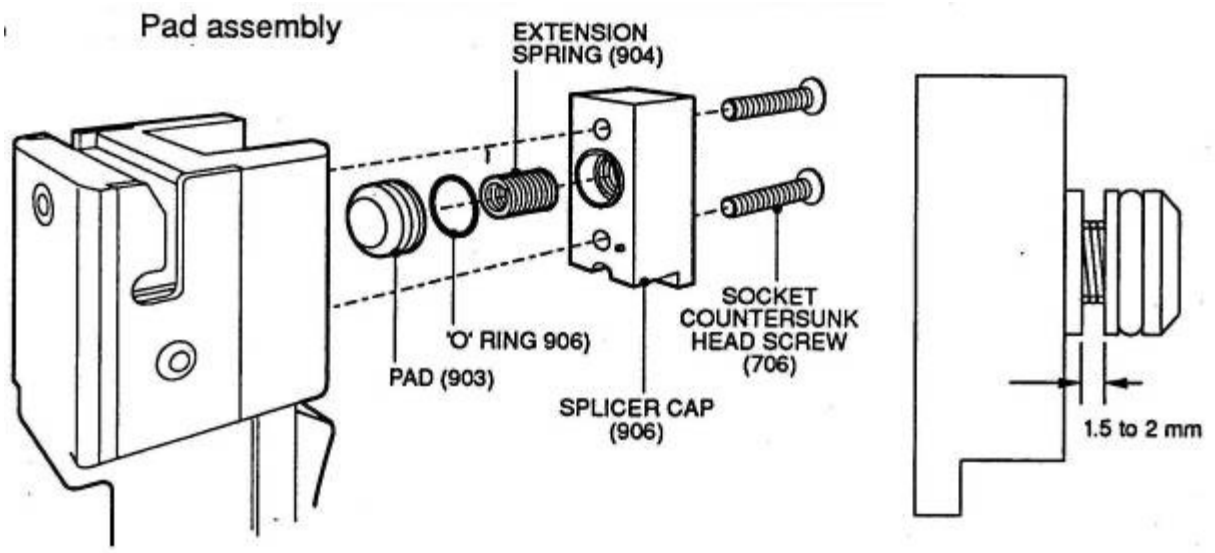


Figure 31

Withdrawing the two securing screws, Item 706, exposes the pad assembly in the cap. The pad is tethered to the cap by an extension spring. The extension spring is screwed into the cap, and the pad screwed to the spring. **We recommend that the spring always be replaced.**

Unscrew the pad from the spring, and the spring from the cap. Discard the spring. Thoroughly clean and de-grease the screw threads in the cap and pad. We recommend that a special flat-tipped M10 tab be used to clean out the threads in cap and pad.

Before reassembly, it is necessary to ensure that the cap, spring, and pad will fit together correctly. Therefore it is recommended that the components first be 'dry assembled'. Screw the spring into the cap until four or five coils of the spring remain exposed. Screw the pad onto the spring for a few turns. Check that the pad is approximately parallel to the cap and that a gap of 1.5 to 2.0 millimetres between cap and pad can be achieved. If the components are markedly out of parallel, discard the spring.

If the 'dry assembly' is satisfactory, dismantle and repeat the operation using adhesive. Apply a drop of Loctite Structural Adhesive 326 to the coils at one end of the spring, and screw the spring into the cap until four or five coils of the spring remain exposed. Allow the adhesive to cure for approximately 30 minutes.

Apply more adhesive to the exposed coils of the spring and screw the pad onto the spring, ensuring that the gap between cap and pad is roughly parallel and is between 1.5 and 2.0 millimetres. Allow the adhesive to cure for approximately 30 minutes.

Before replacing the assembly, lightly smear the 'O' ring groove in the pad with Molykote grease. Apply a small amount of grease to the semi-circular recess at the bottom of the cap to facilitate free movement of the air valve in the cap, and to the surface of the main bore.

Splicer dismantling – valve assembly

Figure 32

This shows the splicer with the cap and pad assembly removed.
The end of the valve assembly is visible, below the main bore. Also visible, just below the projecting valve, is the circular hole which is the housing for the trigger return spring.

Figure 33

The valve can now simply be withdrawn.
Surrounding the valve is a cluster of O-rings and air shells, which are assembled in a specific order. It is likely that some of the O-rings and shells will remain in the small bore after the valve has been removed, so the components should be carefully hooked out with a suitable soft tool, and then cleaned and re-greased before replacement. Use only recommended lubricants.

Figure 34

This shows the valve, and its associated air shells and O-rings, after removal from the small bore. Note the following:

- Small slot in the left-hand end of the valve stem. Reference to the slot is made in Figure 25; the tip of the trigger must engage in the slot for the splicer to function correctly.
- Brass spacer at extreme left. This spacer is important; it applies the correct compression to the O-rings, so that the assembly seals properly.
- Sequence of components: spacer; O-ring, shell, O-ring, shell, shell, O-ring, shell, O-ring.

Appendix 1 Compressed air

Pneumatic splicers are operated by compressed air. Therefore the air supply must be appropriate. The following points are important:

1. Splicers generally operate at a pressure between 3 and 8 bar.
2. Pressure may vary according to application, but it must be as uniform as possible.
3. The air supply should be reasonably dry and clean, with the lowest possible flow resistance.
4. Because the time taken to make a splice is short, transient pressure drops associated with other demands in the mill may become important,
5. When the splicer is operated, line pressure at the splicer head normally drops by about 1 bar. If there are restrictions in the line, air will not be replenished, so that the pressure drop will be greater; weak splices may result.
6. Compressed air installations should therefore be designed to minimise pressure drop.
7. Never use narrow-bore supply tube; this introduces resistance.
8. When there is doubt about the quality of the air supply system, a pressure gauge should be fitted - temporarily - as near as possible to the splicer, so that static pressure and pressure drop can be monitored. This is particularly desirable in an installation which uses long lengths of coiled hose; losses in such hoses then to be significant.
9. Sometimes, static line pressure is known to be adequate, but there are demonstrable problems with transients. Then it may be useful to fit a few meters of wide-bore pipe or other form of plenum, close to the splicer. This will act as a reservoir, to minimise pressure drops while the splicer is in use.
10. Do not fit lubricators in the line very near to the splicer; an excess of oil on the yarn may weaken the splice.

Compressed air and safety

All our splicers have been designed with safety in mind. The few moving parts have been enclosed or shielded to reduce the possibility of injury to the operator. In normal use, the only component which is in any way a source of hazard is the knife assembly. By design, however, the blades are difficult to reach, and are not dangerous in any normal circumstances. Knives represent a hazard only during removal and disposal. So, in normal use, the splicers present no risk.
However, the splicers do use compressed air, and that has the potential to cause injury.

1. Compressed air is dangerous: avoid any bodily contact with it.
2. Always follow the safety precautions recommended by the compressor manufacturer.
3. Always ensure that unions and connectors are fully tightened and sealed, and that there are no leaks.

4. Check the conditions of air supply lines on a regular basis. Always ensure that any flexible hoses are unblemished; if there are any cuts or abrasions to the outer surface of the hose, stop using the splicer and have the hose replaced by qualified personnel.
5. Do not look into the working parts of the splicer when it is being operated.
6. If a splicer malfunctions, do not use it until it has been repaired by qualified personnel.
7. For maintenance staff, additional advice is necessary. When cleaning or servicing is being carried out, access to the internal mechanism of the splicer is essential. Under these circumstances, maintenance engineers will be at greater risk than ordinary users. The engineer should adhere strictly to the following guidelines:
8. Before undertaking any service work, disconnect the splicer from the air supply.
9. During service work, exercise care while handling knives and springs.
10. Under normal circumstances, always refit safety covers before reconnecting the splicer to the air supply.
11. Under exceptional circumstances, it may be necessary - for test purposes - to reconnect the splicer to the air supply without its safety covers. While the splicer is being tested, wear protective gear and exercise due caution.

Compressed air and noise

A splicer uses compressed air, which for a brief period - about 1 to 2 seconds - is vented to atmosphere while the splice is being made. Air at perhaps 7 bar pressure escapes through a small blast hole, creating intense turbulence in a small volume. Noise is inevitable.

Typical maximum noise levels vary from 80 db to 98 db, depending on the splicing chamber. Some chambers are quieter than others, simply because they have a smaller blast-hole, and allow less air to escape.

Our noisiest splicer, with the biggest blast hole in our range, generates a noise spectrum as shown in the table below:

Hz	63	125	250	500	1000	2000	4000	8000	16000
dB	47	52	57	63	74	89	92	93	95

In practice, splicers are barely noticeable in a textile mill. This is because the other mill machinery tends to be very noisy, and the sound of the splicer is lost in the general noise. Also, the blast only lasts for about one second.

Nevertheless, in compliance with UK health and safety regulations, we recommend that ear defenders (to local standards equivalent to British Standard 6344 Part 1) be worn.

Appendix 2 Model 110 splicer - Parts

The internal components of the splicer are shown here. Certain components have been omitted; these are the those which have recently been redeveloped and improved. Recent design changes have been to the splicer body (a Series 1 body is shown in the drawing) and to the trigger assembly. The trigger assembly has been described in some detail in Figure 25, Page 19.

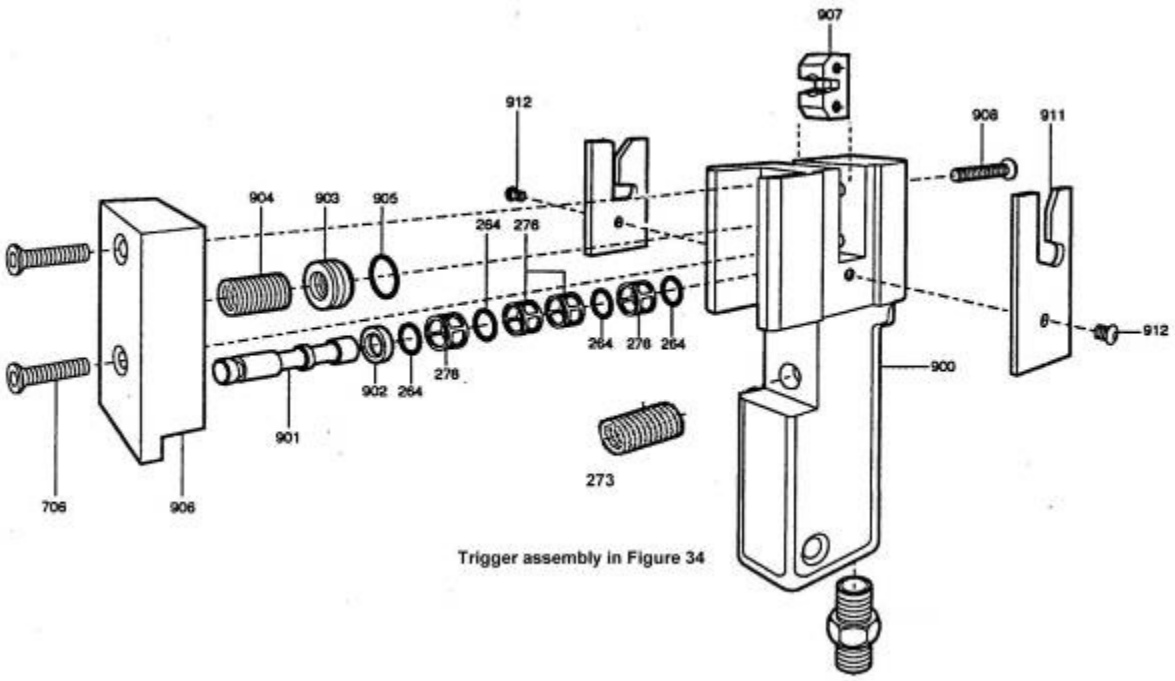
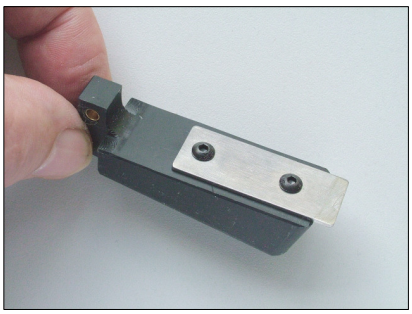


Figure 35

Figure 36



The new Series 2 trigger assembly is Item 940A. It consists of a trigger pad, Item 940, a trigger plate, Item 941, and two M3 x 6 socket screws which secure the plate. The trigger pad is fitted with thread inserts – for the socket screws and a brass bush to house the pivot pin. Finally, there is the trigger pivot pin, Item 942.

Model 110 Parts list

		Parts for all variants		
157		22000 - 04 - 04		1/4" BSP Taper to taper adaptor, EC - 04 - 04
254		15 - 44 - 06		M4 x 6 slotted pan head screw
264		01 - 10 - 10		'O' Ring , BS 010
273		10 - 136 - 011		Spring, trigger return 112808
276		2200 - 43 - 04		Shell for air valve
282		201 - 1256		Label - ear protection
706		12 - 44 - 20		M4 x 20 cross head countersunk screw
900		10 - 100 - 115		Splicer body, only
901		10 - 113 - 113		Valve
902		10 - 133 - 114		Spacing bush
903		10 - 113 - 112		Pad (with item 905) – Item 899 without 'O' Ring 905
904		10 - 136 - 113		Extension spring
905		02 - 14 - 20		'O' Ring, RM 0140 - 20
906		10 - 101 - 116		Splicer cap
907		10 - 101 - 116A		Splicer cap assembly (with chamber pad and spring)
907**		To be specified by customer		Splicing chamber
908		16 - 44 - 16		M4 x 16 countersunk Crosshead screw
911		10 - 105 - 140		Yarn guide plate
915		10 - 137 - 144		Pin
919		201 - 9993		Dow Corning Molykote 111 100 gram
922		201 - 9994		Loctite Super Glue Extra 20 gram
930		13 - 13 - 08		M3 x 8 socket button head screw
932		0693 - 13 -13		Flexible coupling, M/M
933		0691 - 13 - 13		Flexible coupling, M/F
935		10 - cap - 01		Protection cap blue
936		10 - cap - 02		Protection cap red
939		10 - 133 - 119		Trigger bush, trigger
941		10 - 118 - 109		Trigger plate,
942		10 - 137 - 147		Trigger pin
943		10 - 101 - 999		Trigger assembly, Series 2 (with items 224, 517, 939, 941, 944)
944		10 - 111 - 113		Trigger pad, Series 2 trigger

MODEL 110 Assembly