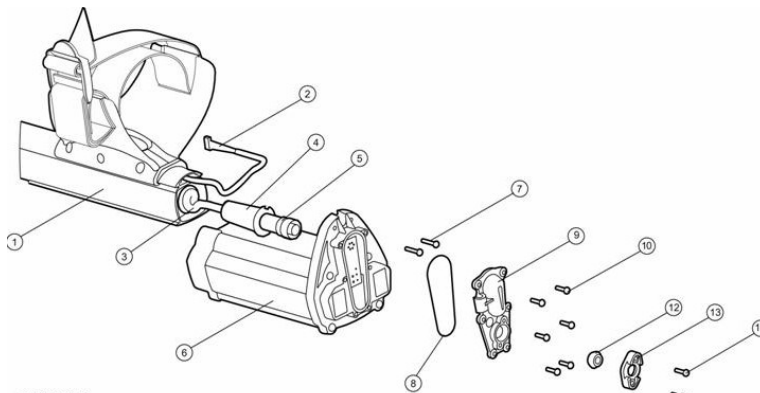
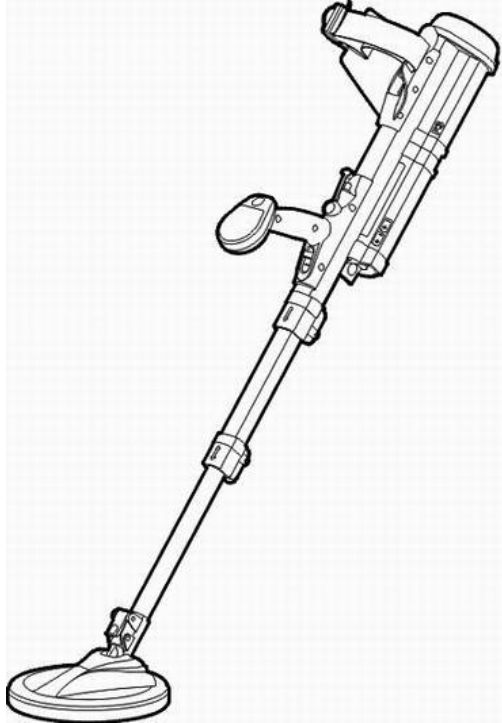


# F3 Metal Mine Detector



**SERVICE MANUAL**

Version 4: February 2010  
Part No: 4904-0004



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## 1. Introduction

- a. Servicing the F3 Series of detectors comprises fault finding, repair and maintenance and is designed to be simple and fast thereby reducing the amount of time a detector is unusable. Repair and maintenance is based on line replaceable units which can be fitted to a detector without the need for adjustment or calibration. Additionally, serviceable line replaceable units can be exchanged between detectors as required.
- b. Servicing the F3 can be conducted within the field (under clean and dry conditions) or at local depots. No special tools are required, but it is recommended that the F3 Service Tool Kit be used.
- c. Servicing the F3 is restricted to the exchange of line replaceable units following the identification of a faulty sub-assembly. Servicing **DOES NOT** include any repairs to printed circuit boards as this is only conducted at a Minelab facility.
- d. This manual should be read in conjunction with the F3 Operations Manual. Additionally, from time to time, Minelab will issue Technical Service Notes which serve to supplement the information contained in this manual.
- e. Any questions regarding this manual or any repair procedure can be directed to Minelab via the following internet link: <http://minelab.com/>

## 2. Mechanical & Functional Testing

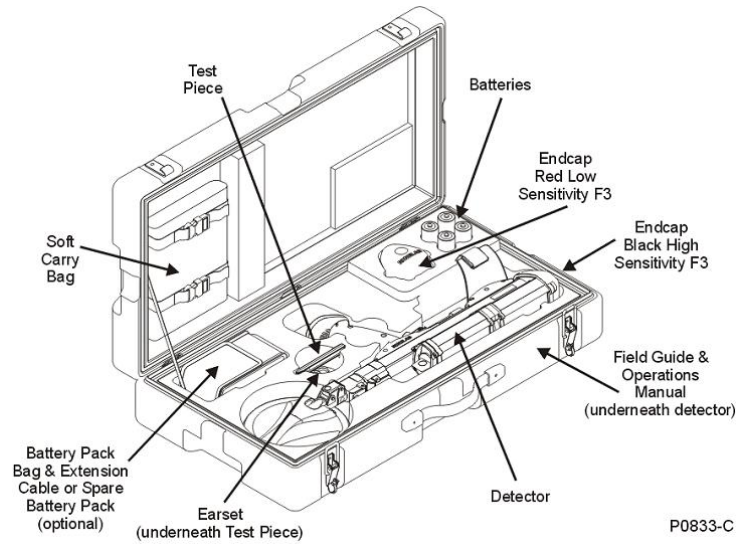


Figure 1: F3 Packed in its Hard Case

a. Whenever a detector is returned for servicing, mechanical and functional tests must be completed to confirm and/or identify the fault. Figure 1 illustrates the complete detector when packed in its hard case. A visual inspection should be conducted to ensure all parts are present and any missing items noted and replaced as necessary.

b. To assist in identifying a faulty component, it is useful to have serviceable line replaceable units on hand. Subsequently, by exchanging a suspect component with a serviceable assembly, the fault can be confirmed and the faulty line replaceable unit identified.

### NOTE

*At the completion of any servicing procedure, ALL functional tests must be completed to confirm the detector is working correctly and no faults remain.*

2.1 **Mechanical Testing.** Confirm that all components are present in the hard case and unpack, fully extend and insert batteries into the F3 as described in the F3 Operations Manual. Figure 2 identifies the major components of the F3. During mechanical testing check the:

- detector for any obvious signs of damage
- sensitivity endcap is correctly positioned and in good condition
- battery pack lid O-ring is present, clean and in good condition
- tether attaching the battery pack lid to the battery pack is present and in good condition
- coil can be tilted smoothly, rotates and holds its position without drooping
- skid plate is firmly attached and in good condition
- shafts extend smoothly to their full extension and that the camlocks hold the coil and shafts in position
- earset dustcaps (on detector earset socket and earset) are in good condition
- armrest camlock and ensure the armrest slides smoothly
- armstrap is in good condition
- shafts can be collapsed smoothly and without any snagging

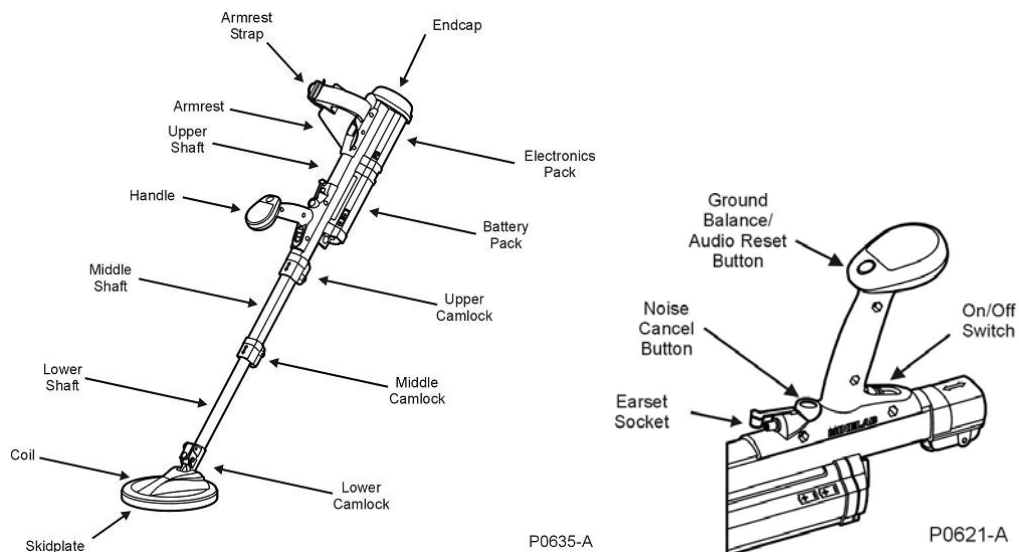


Figure 2: F3 Major Components & Handle Controls

a. To replace any worn or damaged parts found during mechanical testing refer to Section 4.

2.2 **Functional Testing.** Functional testing is used to confirm the serviceability of an F3 before it is returned to the field for use and whenever doubt exists about the serviceability of an F3. The F3 must pass all tests to be considered serviceable and ready for use in operations. Whenever a line replaceable unit is replaced, all functional testing must be completed.

a. Functional testing requires a ground balance test piece. The ground balance test piece simulates mineralised ground which results in an alarm from the F3. A mineralised “hot” rock or adequate amounts of local mineralised soil is suitable. Alternatively, a floor tile may be suitable for use as a ground balance test piece.

**NOTE**

*Do not use any metal object as a ground balance test piece.*

b **Switch ON Test.** The Switch ON Test checks that power is correctly supplied to the electronics pack and internal diagnostics discover no system fault. The test is conducted as follows:

- Extend the lower shaft at least 150mm (6ins).
- Hold the coil at least 600mm (24ins) from the ground and away from any metallic objects and switch on.
- Ensure that four rising tones occur over approximately 12 seconds. A steady threshold tone should be heard a few seconds after the rising tones finish.

**NOTE**

*On occasion, it is possible that more than four rising tones occur. This does not represent a fault provided the rising tones finish and a steady threshold tone is produced.*

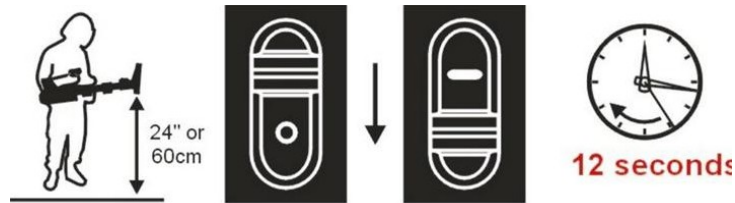


Figure 3: Switch ON Test

- If the correct tones are not heard, check that good batteries are being used and that the batteries are fitted correctly.
- If the correct tones are still not heard refer to Section 4 for faultfinding procedures.

c. **Noise Cancel Test.** The test ensures the F3 successfully completes the noise cancel procedure required whenever local electrical interference is present. During the test, the Noise Cancel button, wiring loom and electronics pack are checked for correct operation. The test is conducted as follows:

- Hold the coil stationary and at least 600mm (24ins) above the ground and away from any large metal objects during the test.
- Press and immediately release the Noise Cancel button. (Figure 4)

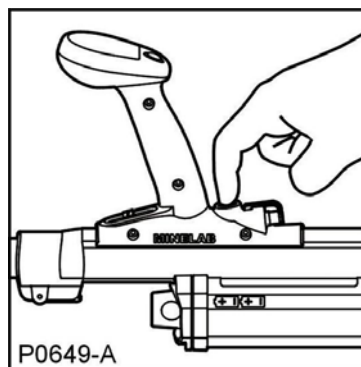


Figure 4: Noise Cancel

**NOTE**

*The coil should not be moved nor should metallic objects be brought near the coil during this procedure.*

- If functioning correctly, Noise Cancel will commence with two single beeps followed by 45 seconds of sharp double beeps and finishing with four single beeps.

- During the 45 seconds, the detector scans the environment searching for the source of any electrical interference. Once detected, the F3 will automatically select a different operating frequency to eliminate or reduce the interference.
- If the correct sequence of Noise Cancel beeps is not heard, refer to Section 4 for faultfinding procedures.

d. **Audio Reset Test.** This test confirms the audio reset button (also the ground balance button), wiring loom and electronics pack are functioning correctly. The objective is to ensure the Threshold Tone returns to its correct volume if altered from its steady state. The test is conducted as follows:

- Hold the coil at least 600mm (24ins) off the ground and away from any metallic objects.
- Induce a Threshold Tone rise in volume by collapsing the lower shaft into the middle shaft. Alternatively, slowly move the coil toward a metal object and once the Threshold Tone increases in volume, hold the detector stationary.
- Once the Threshold Tone has increased in volume, press and immediately release the green ground balance button. (Figure 5)

**NOTE**

*If the ground balance button is not immediately released, the F3 will commence the Ground Balance procedure.*

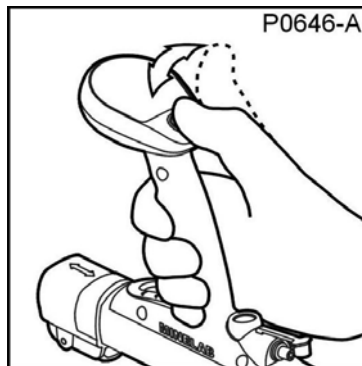


Figure 5: Audio Reset

- Within two seconds the Threshold Tone should return to its correct level.
- If the threshold tone does not return to the correct level, refer to Section 4 for faultfinding procedures.

e. **Ground Balance Test.** This test confirms the detector is capable of ground balancing against mineralised ground. In doing so, it confirms the correct operation of the ground balance button, wiring loom and coil. The test is conducted as follows:

- Ensure hands and arms are free of metallic objects (watches, rings etc), and that no other metallic objects are near the coil.
- Keeping the detector stationary, press and hold the ground balance button for five seconds then release the button.

**NOTE**

*This action will cause the F3 to delete the previously stored ground balance condition. Unless this is done, the detector will remember its last ground balance condition regardless of the unit being switched off or the batteries removed.*



- Slowly move the ground balance test piece from approximately 150mm (6ins) above the centre of the coil towards the centre of the coil and confirm that a rise in Threshold Tone occurs. This confirms that the F3 is detecting the mineralised content of the ground balance test piece.
- Press down and hold the ground balance button whilst slowly moving the ground balance test piece from approximately 150mm (6ins) above the centre of the coil towards the centre of the coil (and touching the coil). Then move the ground balance test piece away from the centre of the coil to a distance of 150mm (6ins).
- Repeat this process until the 'Ground Balance OK' tone consisting of a short high-pitched double beep occurs. This tone confirms the ground balance procedure has been completed correctly.
- Release the ground balance button and confirm that a steady, low volume Threshold Tone remains.
- Confirm the ground balance is correct by moving the ground balance test piece from approximately 150mm (6ins) above the centre of the coil towards the centre of the coil. If there is no alarm from the ground balance test piece, the ground balance procedure is functional.
- If an alarm occurs, repeat the above procedure. If ground balance cannot be achieved, refer to Section 4 for faultfinding procedures.

**NOTE**

*Where the Ground Balance Test is conducted using local soil, Figure 6 illustrates the procedure to be followed*

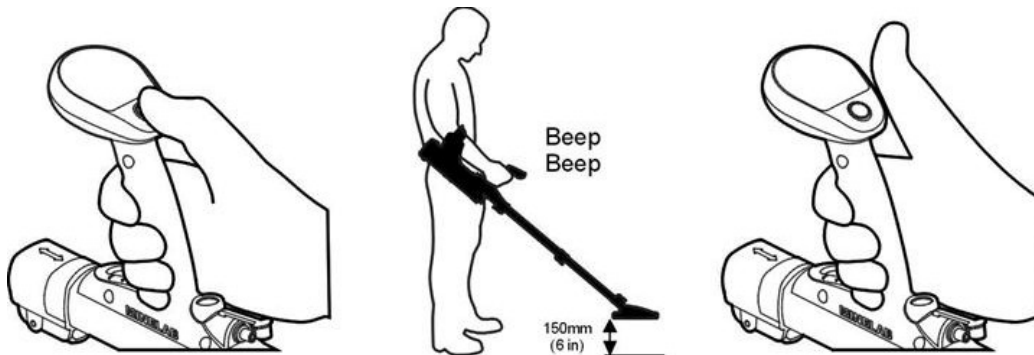


Figure 6: Ground Balance

**NOTE**

*Successful ground balancing occurs within 5 to 10 seconds. Where the ground balance test piece or local ground conditions are not sufficiently mineralised, the 'Ground Balance OK' tones may take a longer time to occur.*

f. **Earset Test.** This test confirms the earset is operating correctly and is conducted as follows:

- Plug the earset into the detector as shown in Figure 7.

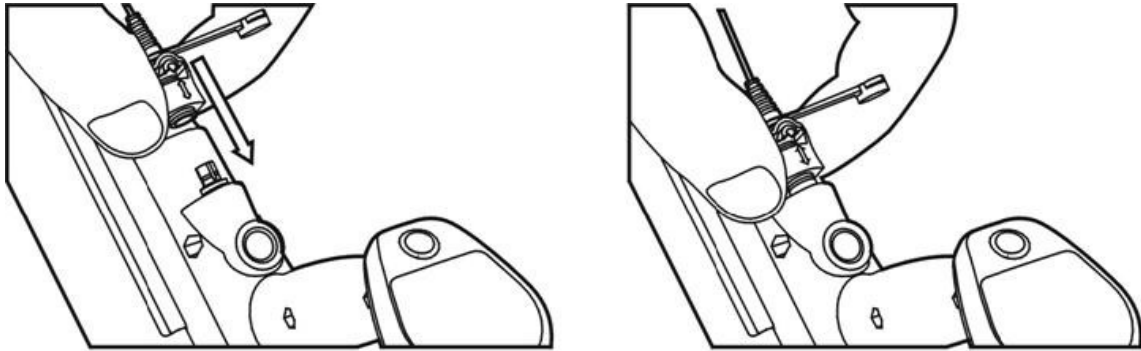


Figure 7: Connecting the Earset

- Switch the F3 on and confirm the Threshold Tone is audible.
- If an earset 'speaker on' (4523-0027) is being tested, check that tones can also be heard from the detector loudspeaker.
- If an earset 'speaker off' (4523-0025), identified by green band on earset cable near the plug is being tested, check that no tones can be heard from the detector loudspeaker.

**NOTE**

*If the detector being serviced is an F3L configuration (contains LEDs on handle assembly), the LEDs should illuminate when using an earset 'speaker on' and extinguish when using an earset 'speaker off'.*

- If a fault is discovered, refer to Section 4 for faultfinding procedures.
- g. **Alarm Tone Test.** This test will produce an alarm when either the red endcap or yellow endcap is dislodged. This is a safety feature designed to ensure the detector operates at the correct level of sensitivity. To conduct the test:
- With a red or yellow endcap fitted and the detector switched on, remove the endcap and confirm that a continuous cycling alarm tone is produced.
  - If an alarm tone does not occur refer to Section 4 for faultfinding procedures.

**NOTE**

*The red and yellow endcaps are detected by the electronics pack due to magnets located within the endcaps. The black endcap has no magnets and represents the default sensitivity of the F3. This means the black endcap, if dislodged, will not cause an alarm because the detector is already operating at the default sensitivity.*

h. **F3L - LED and Volume Control Test.** For the F3L configuration, LED and volume control is tested as follows:

- Turn on the detector with the black endcap fitted.
- Conduct the test piece test and note the number of LEDs that light up and the tone and volume of the audio.
- Increase the volume to maximum by pressing the ⊕ button five times listening for the longer beep on the fifth press.
- Recheck the detector with the test piece, confirming an increased number of LEDs light up and the tone is louder.
- Decrease the sensitivity to normal by pressing the ⊖ button five times listening for the double beep on the fifth press. This indicates the detector sensitivity has returned to its default setting.

- Decrease the detector sensitivity to minimum by pressing the ⊖ button five times listening for the longer beep on the fifth press.
- Check the detector with the test piece and confirm there is no audio or LED indication to the test piece with detector set to its minimum sensitivity.
- If the correct LED/volume responses are not achieved, refer to Section 4 for faultfinding procedures.

**NOTE**

*Regardless of minimum sensitivity, at least one LED will remain illuminated provided an earset speaker off is not connected to the detector.*

- Switch the F3 off and on – this will revert the detector to default sensitivity. Move the detector coil over a large metal target checking that the LEDs light up in the correct way.
- Check that the LEDs can be extinguished by pressing and holding ⊖ button then quickly pressing and releasing the green ground balance button.
- Once extinguished, check the LEDs can be illuminated by pressing and holding the ⊕ button and quickly pressing and releasing the green ground balance button.
- If any fault is detected, refer to Section 4 for faultfinding procedures.

i. **Test Piece Test.** This is a critical test and should be conducted last to confirm the detector is performing correctly and at an acceptable sensitivity level. It should be conducted in an environment that is free from electrical interference and an earset must be connected. The test is conducted as follows:

- Ensure hands and arms are free of metallic objects (watches, rings etc), and that no other metallic objects are near the coil. Switch the detector on and confirm a steady threshold tone is present.

**NOTE**

*Maximum sensitivity is only available 30 seconds after the threshold tone is heard. Do not test the detector with the test piece until 30 seconds after the threshold tone is heard.*

- **Black Endcap.** Ensure the black endcap is securely fitted to the electronics pack. Conduct the test as follows:
  - Hold the test piece above the middle of the coil with the rounded end (containing metallic target) **away** from the coil.
  - Move the test piece towards the centre of the coil until it lightly touches the coil then move it sideways off the coil. (Figure 8)
  - Confirm a faint but clear response (change in threshold tone volume and pitch) is heard.

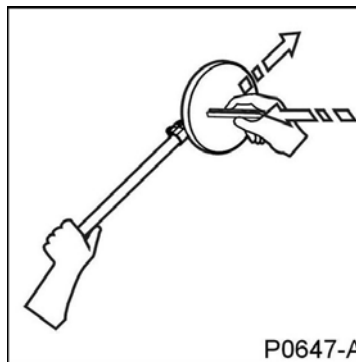


Figure 8: Test Piece Test

- If the test piece is not heard conduct audio reset and repeat the test.
- If the test piece is still not heard, refer to Section 4 for faultfinding procedures.
- **Red Endcap.** Ensure the red endcap is securely fitted to the electronics pack, switch on and wait until the steady threshold tone is heard. Conduct the test as follows:
  - Hold the test piece above the middle of the coil with the rounded end (containing the metallic target) **towards** the coil.
  - Move the test piece towards the centre of the coil until it lightly touches the coil then move it sideways off the coil.
  - Confirm a faint but clear response (change in threshold tone volume and pitch) is heard.
  - If the test piece is not heard conduct audio reset and repeat the test.
  - If the test piece is still not heard, refer to Section 4 for faultfinding procedures.

**NOTE**

*When using a yellow endcap volume and sensitivity levels can be customised using Minelab's application software. The Test Piece Test as described above is not suitable for use with the F3 and a yellow endcap. Where sensitivity testing is to be conducted using a specific customised configuration, it is the responsibility of the user to provide an appropriate target with which to confirm the sensitivity of the detector satisfies operational requirements.*

- j. Provided the detector passes all functional tests, it is serviceable and ready for operations. The detector can now be packed into the hard case ensuring batteries are removed and stowed and all accessories are in place.

### 3. Disassembly & Reassembly Procedures

3.1 **Introduction.** This section describes the procedures required to exchange line replaceable units. Whenever a unit is replaced, mechanical and functional testing as described in Section 2 must be completed.

3.2 **F3 Tool Kit.** The F3 Tool Kit (Part No 3004-0018) is required to disassemble and reassemble the F3. The tool kit (Figure 9) comprises:

- | • Minelab Part No | Description                          |
|-------------------|--------------------------------------|
| • 0005-0014       | Silicon Grease (100g tube)           |
| • 0005-0010       | Silicon Sealant (75g tube)           |
| • 8701-0009       | Tubular Spanner 7/8"                 |
| • 8701-0010       | F3 Coil Cable Pull Through           |
| • 8701-0011       | Screwdriver Pozidrive No 1           |
| • 8701-0018       | Hex Key T Handle 2.5mm               |
| • 8701-0012       | Hex Key T Handle 3.0mm               |
| • 8701-0013       | Flat blade screwdriver 6.5mm x 150mm |

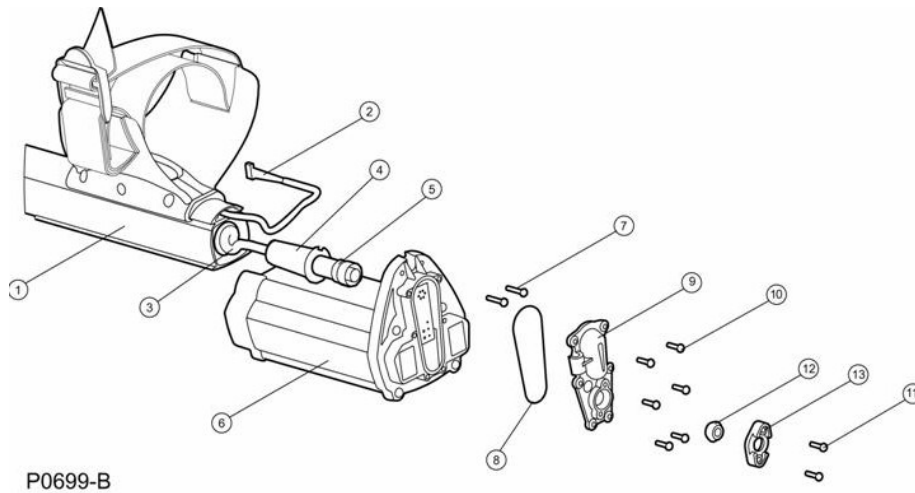


Figure 9: F3 Tool Kit

#### NOTE

*All tools except the F3 Coil Cable Pull Through are commercially available. If necessary, a length of string can be used as the F3 Coil Cable Pull Through.*

3.3 **Electronics Pack.** Figure 10 illustrates the major parts involved in removing and replacing the electronics pack. The F3 and F3L use different electronics packs and should not be interchanged unless the correct speaker pods (F3L requires the speaker pod with LED display) are also fitted.



1	8007-0023	UPPER SHAFT BLACK F3
2	9511-0097	WIRING LOOM F3 SHAFT/HANDLE
3		COIL CABLE (PART OF 2021-0054 COIL F3)
4	8009-0007	RETAINER PLUG F3
5		COIL PLUG (PART OF 2021-0054 COIL F3)
6	3004-0036	ELECTRONICS PACK KIT SVC F3L
6	3004-0001	ELECTRONICS PACK KIT SVC F3
7	4003-0101	SCREW M3x20 SKT CAP
8	4309-0039	O-RING BULKHEAD 50MM
9	0703-0095	COVER BULKHEAD F3
10	4003-0084	SCREW NO 3X16 POSI SS
11	4003-0084	SCREW NO 3X16 POSI SS
12	4309-0071	GROMMET BULKHEAD F3 CUT
13	0703-0097	COVER RIBBON CABLE F3

Figure 10: Electronics Pack

**NOTE**

*The F3L electronics pack can be identified by a yellow dot on the rear of the housing.*

a. **To remove the electronics pack:**

- Remove battery pack and sensitivity endcap.
- Undo and remove the six screws (Part 10) holding the bulkhead cover (Part 9) to the electronics pack rear panel.
- Pull the bulkhead cover away from the electronics pack.
- Gently unplug the wiring loom plug from the electronics pack printed circuit board. (Figure 11)

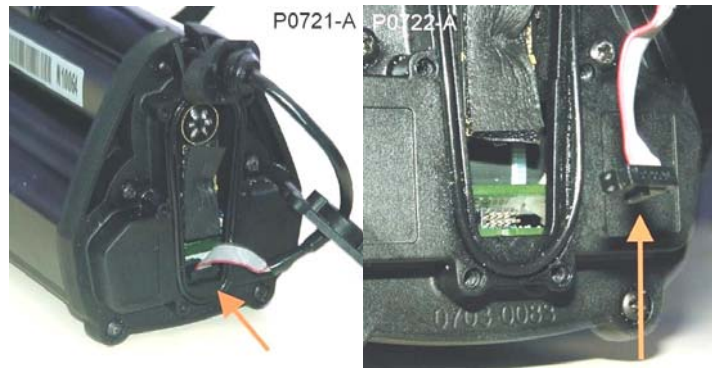


Figure 11: Removal of Wiring Loom from Electronics Pack

**NOTE**

*Extreme care must be taken when removing the wiring loom plug from the electronics pack. **DO NOT** use excessive force as this may cause damage to the connector on the printed circuit board.*

- Undo and remove the upper two screws (Part 7) securing the electronics pack to the upper shaft.
- Slide the electronics pack back along the upper shaft (avoid snagging the wiring loom) approximately 10cms (4ins) exposing the coil plug (Part 5).
- Using the retainer plug (Part 4), if fitted, gently unscrew the coil plug (Part 5).

**NOTE**

*If fitted, the retainer plug will stop the coil cable from being retracted down the shafts once the coil plug is unscrewed from the electronics pack. If a retainer plug is not fitted connect the coil cable pull through from the F3 Tool Kit to secure the coil cable. Alternatively, the cable can be secured by tying the plug to a length of string.*

- Remove the electronics pack from the upper shaft.
- b. **To fit an electronics pack:**
- Slide the electronics pack on to the upper shaft until the coil socket is within 10cm (4ins) of the end of the upper shaft.
  - Apply a small amount of silicon sealant to the coil socket thread.
  - If necessary, remove coil pull through from the coil plug ensuring that the coil cable does not untwist.
  - Reconnect the coil plug (Part 5) to the electronics pack using the coil plug retainer (Part 4) or fingers. **DO NOT OVERTIGHTEN.**
  - Remove excess sealant.
  - Slide the electronics pack all the way along the upper shaft, ensuring the wiring loom cable lays in the cut out at the top of the electronics pack rear cover.
  - Refit the two screws (Part 7) securing the electronics pack to the upper shaft.
  - Check the condition of the O-ring (Part 8) and apply a small amount of silicone grease as required.
  - Ensure the O-ring (Part 8) is positioned correctly in the groove under the bulkhead cover in the electronics pack rear panel.
  - Ensure that the keyway on the wiring loom plug (Figure 12) is towards the bottom of the electronics pack then plug the main wiring loom into the socket on the printed circuit board inside the electronics pack.

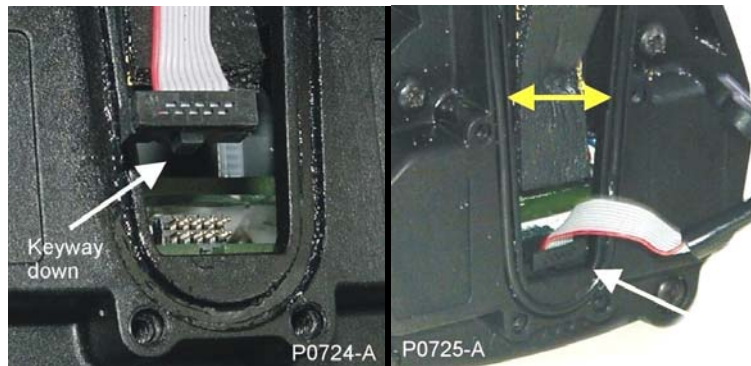


Figure 12: Correct Fitting of the Wiring Loom into the Electronics Pack

**NOTE**

*Take great care when connecting the wiring loom plug to the electronics pack. DO NOT force the connection because this could damage or break the connector on the printed circuit board.*

- Fold excess wiring loom cable into the electronics pack above the plug.

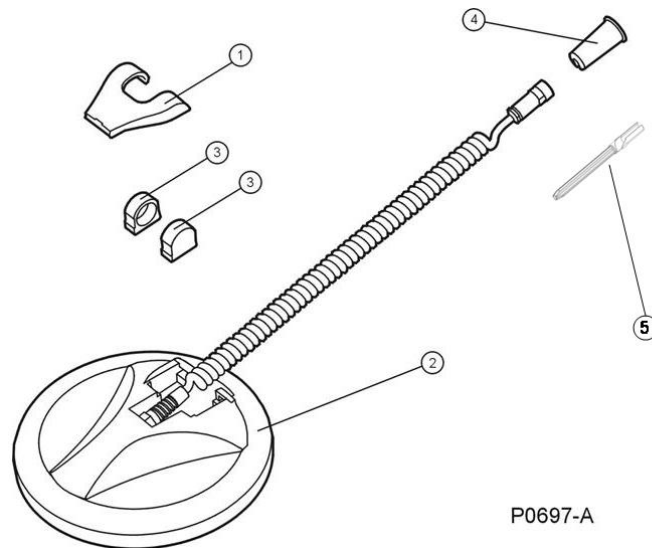


Figure 13: Excess Wiring Loom Cable Folded Correctly & Cable Router

- Refit the bulkhead cover with six screws.
- Route the wiring loom around the cable router on the side of the bulkhead cover. (Figure 13)
- Refit the sensitivity endcap.



3.4 **Coil.** Figure 14 illustrates the major parts involved in removing and replacing the coil.



P0697-A

	3004-0003	COIL KIT SVC F3
	3004-0038	KIT SVC COIL RETAINER, contains pt 1 & 3
1	2004-0037	RETAINER COIL BLACK F3
2	2021-0054	COIL F3
3	4005-0039	BLOCK FRICTION COIL F3
4	8009-0007	RETAINER PLUG F3
5	4308-0012	PIN COIL CABLE

Figure 14: Coil

a. **To remove the coil:**

- Retract the shafts and remove the battery pack.
- Remove the electronics pack as described in Section 3.3.a. However, there is no need to remove the electronics pack from the upper shaft.
- Remove the coil plug retainer, if fitted, from around the coil plug. (Figure 15)
- Allow the coil cable to retract into the shafts.



P0729-A

Figure 15: Removing Coil Plug Retainer

- Maintaining firm downward pressure on the 6.5mm screwdriver, carefully lever the coil retainer cover off the coil top and remove it. (Figure 16)

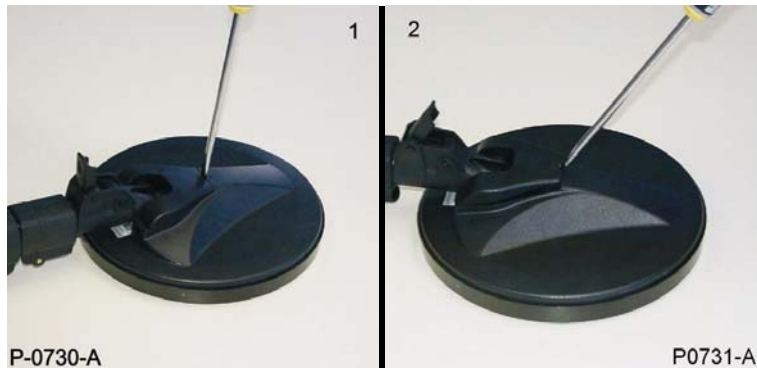


Figure 16: Removing the Coil Retainer

- Lift the lower shaft with lower camlock assembly out of the coil top.
- Carefully pull the coil cable out from inside the shafts.
- If necessary, remove the coil pin for use with the replacement coil.

**NOTE**

*If there is any damage to the coil or coil cable, the coil must be replaced. There are no repairable parts on the coil.*

b. **To fit a new coil:**

- Ensure a skid plate is fitted to the coil.
- If necessary connect a coil pin by: (Figure 17)
  - inserting the coil pin into the top spirals of the coil cable
  - positioning the coil pin so that the straight portion of cable is aligned with the channel in the coil pin
  - pressing the coil pin onto the coil cable, so that it is firmly held in position



Figure 17: Inserting the Coil Pin

**NOTE**

*Once a coil pin is fitted to a coil cable, it is not necessary to fit a coil plug retainer.*

- Connect the coil cable pull through to the coil plug. (Figure 18)



Figure 18: Coil Pull Through Connected to Coil

**NOTE**

*If a coil pull through is not available a length of string can be used.*

- Prior to threading the cable through the shafts, ensure the cable has 52 turns in the coil cable curly section. (Figure 19)

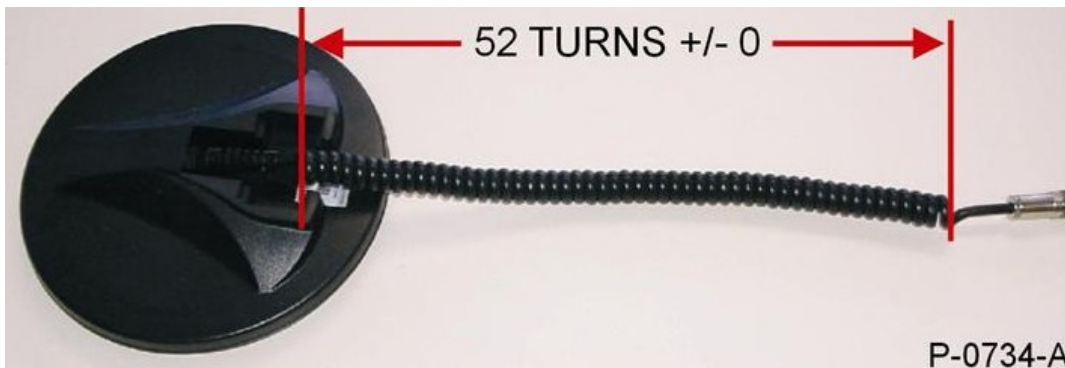


Figure 19: Coil Cable with 52 Turns

- Slide the coil cable pull through the shafts starting from the lower end until the lower camlock assembly is resting above the coil. (Figure 20)



Figure 20: Using the Pull Through to Thread Cable Through Shafts

**NOTE**

*It is important that the curly cable or coil cable pull through is not twisted, as this will change the number of turns in the curly cable. If the correct number of turns is not present, the curly cable may stop the shafts from retracting correctly.*

- Refit the lower camlock assembly to the coil top. The flat sides on the friction blocks should be facing down into the coil top. (Figure 21)

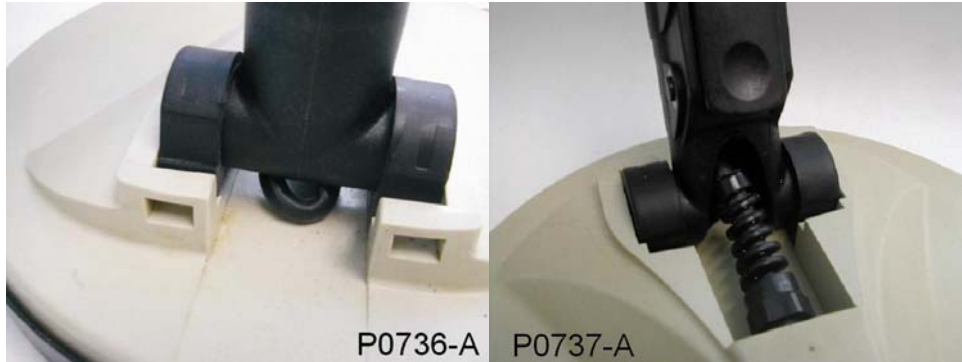


Figure 21: Lower Camlock Assembly Showing Friction Block Fitment

- Position the two tabs at the rear of the coil retainer cover (Figure 22) into the cut-outs in the rear of the coil top.

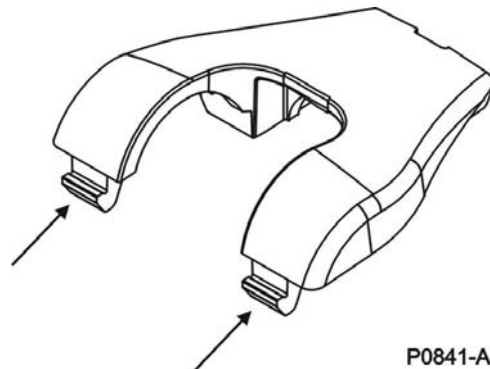


Figure 22: Coil Retainer with Tabs Indicated

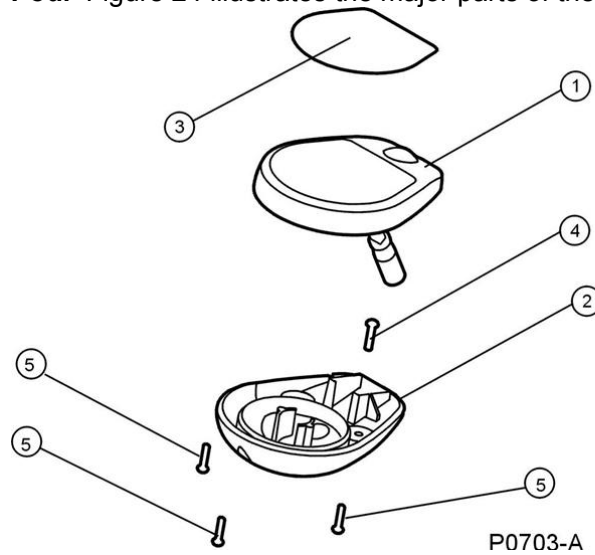
- Maintaining downward pressure on the coil retainer, pivot the front of the coil retainer cover down towards the coil top.
- Use the palm of the hand to snap the coil retainer cover into the coil top. (Figure 23)



Figure 23: Fitting the Coil Retainer

- Reconnect the electronics pack to the coil cable as described in Section 3.3.b.

3.5 **Speaker Pod.** Figure 24 illustrates the major parts of the speaker pod.



	3004-0017	KIT SVC SPEAKER POD ASSY F3
	3004-0037	KIT SVC F3L SPEAKER POD ASSY
1	0705-0019	SPEAKER UPPER ASSY F3
2	0708-0001	ENCLOSURE SPEAKER LOWER F3
3	2701-0092	DECAL SPEAKER/HANDLE F3
4	4003-0083	SCREW M3X10 SS (fine pitch thread)
5	4003-0084	SCREW NO 3X12 SS

Figure 24: Exploded View of Speaker Pod

**NOTE**

*Depending on the version of speaker pod, there may be five instead of three Screw No 3x12 SS (Part 5)*

a. **To remove the speaker pod:**

- Remove battery pack and sensitivity endcap from the detector.
- Remove three (or five depending on pod version) screws (Part 5) on underside of speaker pod.

- Remove the top half of the speaker pod by lifting the pod gently upward until the speaker pod plug comes clear of the handle.
- Using fingers support the main wiring loom socket against the lower half of the speaker pod and disconnect the speaker pod plug from the main wiring loom.

**NOTE**

*Do not try and remove the loudspeaker, ground balance/audio reset button or wiring from the upper half of the speaker pod, these components are permanently sealed into the upper half of the speaker pod.*

- Remove the screw (Part 4) (Figure 25) which secures the lower half of the speaker pod to the handle. The nut for this screw sits in a recess between the two handle halves. This screw is a unique screw and cannot be used on any other part of the detector.

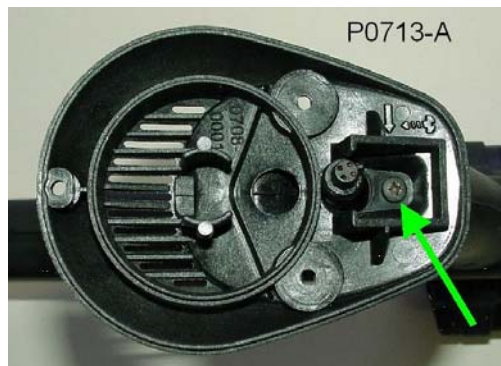


Figure 25: Lower Section of Speaker Pod Showing Unique Screw (Part 4)

- Remove the lower half of the speaker pod by lifting the rear of the pod upwards.
- b. **To replace the speaker pod.** When replacing or reassembling speaker pods it is important to note that an F3L speaker pod is only functional on an F3L configured detector. Similarly, the standard F3 speaker pod is only functional on the F3 detector. To reassemble the speaker pod:
  - Ensure that the handle has been fully assembled and the wiring loom is in place. (See Section 3.6)
  - Peel back the shroud at the end of the speaker pod plug as shown in Figure 26.

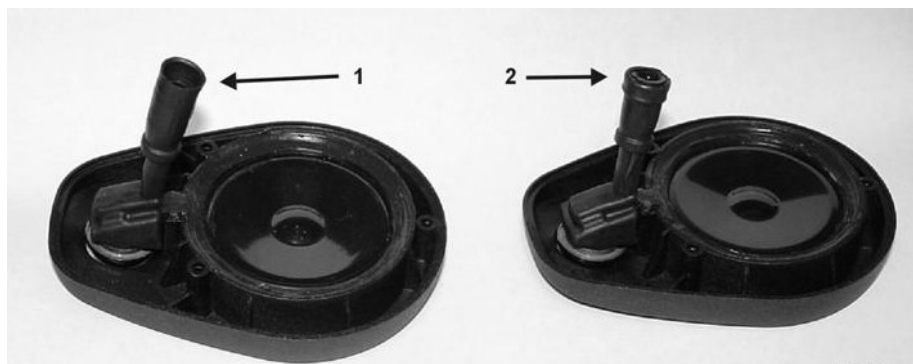


Figure 26: Upper Shell of Speaker Pod Showing Shroud Peeled Back

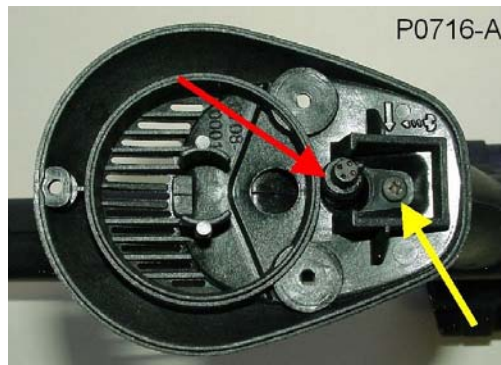
- Refit the lower half of the speaker pod by inserting the tongue at the front top of the handle into the recess in the lower half of the speaker pod. (Figure 27)



P0715-A

Figure 27: Fitting Speaker Pod onto Handle

- Ensure the wiring loom plug emerges from the handle into the speaker pod in the correct position as shown in Figure 28.



P0716-A

Figure 28: Correct Position of Wiring Loom Plug (Red Arrow)

- Using the unique screw (Part 4) secure the speaker pod to the handle.
- If the speaker pod socket is dry, smear a small amount of silicon grease around the shroud to assist in maintaining a waterproof seal.
- By securing the wiring loom plug between thumb and forefinger, gently snap the speaker pod socket onto the plug and roll back the shroud onto the wiring loom socket. (Figure 29).

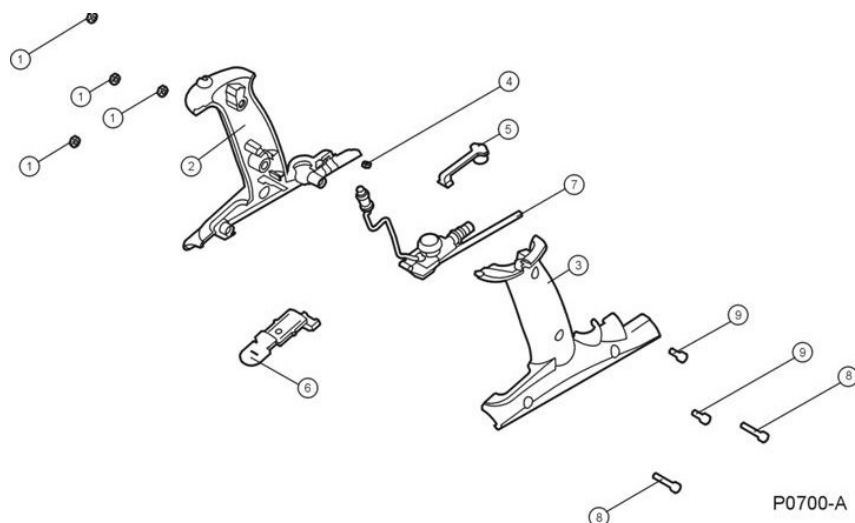


Figure 29: Connecting Speaker Pod to Wiring Loom

- Gently push the upper half of the pod down towards the handle until both halves of the pod are correctly mated.

- Refit the three (or five depending on speaker pod version) screws (Part 5) which hold the pod halves together.
- Refit sensitivity endcap and battery pack.

3.6 **Handle.** Figure 30 illustrates the major parts of the handle.



	8013-0001	HANDLE ASSEMBLY F3
1	4002-0023	NUT M4 NYLOC SS
2	3004-0016	RIGHT HANDLE HALF (part of HANDLE L+R KIT F3)
3	3004-0016	LEFT HANDLE HALF (part of HANDLE L+R KIT F3)
4	4002-0038	NUT STANDARD SS F3
5	4309-0037	DUSTCAP EARSET F3
6	8301-0031	SWITCH ASSY SLIDER F3
7	9511-0097	WIRING LOOM F3 SHAFT/HANDLE
8	4003-0062	BOLT M4X20 SKT SS
9	4003-0061	BOLT M4X10 SKT SS

Figure 30: Exploded View of Handle

**NOTE**

*The noise cancel button and earset connector are an integral part of the main wiring loom and this assembly is waterproof. Do not try to disassemble the main wiring loom. It is not repairable.*

a. **To disassemble the handle:**

- Remove the speaker pod (Section 3.5.a).
- Undo and remove the four nuts and bolts holding the handle halves together.
- Carefully separate the left handle half from the upper shaft.
- Remove the nut (Part 4) that secures the lower speaker pod screw to the handle.
- Remove the earset dustcap. (Part 5).
- The wiring loom (Part 7) and on/off switch assembly slider (Part 6) can now be removed from the right handle half if required.



b. **To assemble the handle:**

- Position the right handle half onto the upper shaft.
- Lay the wiring loom into the cable channels and ensure the wiring loom plug exits the top of the handle in front of the upper screw boss. (Figure 31)

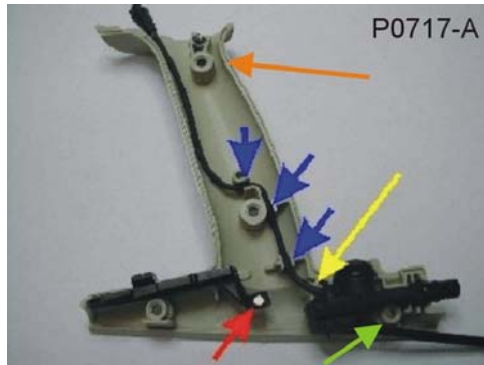


Figure 31: Right Handle with Wiring Loom Correctly Positioned

- Ensure the lower portion of the wiring loom cable sits under the rear handle screw boss and cannot be snagged by the bolts once the handle is assembled.
- Ensure the on/off switch slider is correctly positioned.
- Place the nut (Part 4) which secures the speaker pod assembly to the handle into the recess near the top of the handle. (Figure 32)

**NOTE**

*Ensure the nut remains in place during the rest of the assembly procedure; otherwise it will not be possible to secure the speaker pod onto the handle.*



Figure 32: Nut (Part 4) Correctly Positioned in Handle Recess

- Fit the earset dustcap into the recess in the handle just forward of the earset plug. (Figure 33)



Figure 33: Recess for Earset Plug Dustcap

- Carefully fit the left handle half to the right handle half and upper shaft. Ensure both halves are secured to the upper shaft.

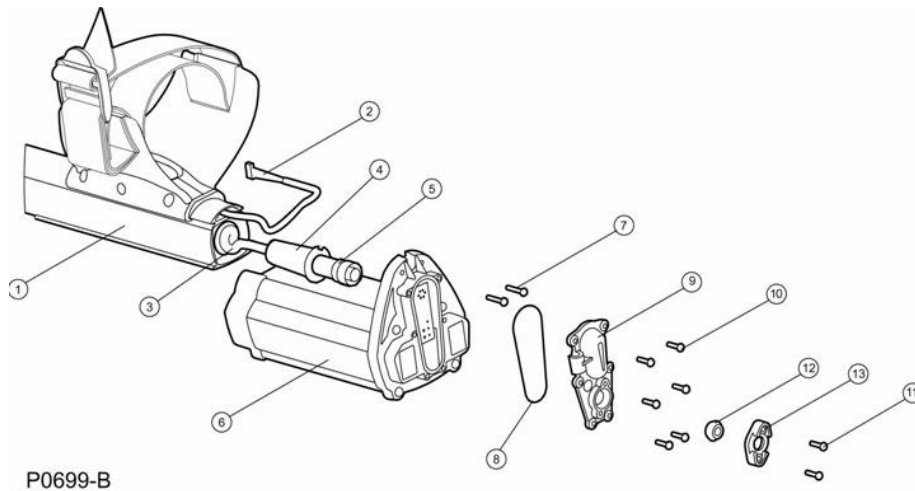
**NOTE**

*Hold the handle together tightly until the first two bolts have been fitted otherwise the internal nut or main wiring loom may become dislodged. The four bolts should initially only be done up loosely.*

- Tighten the four bolts.

**3.7 Wiring Loom.** To remove and exchange the wiring loom, it is necessary to remove the speaker pod, disassemble the handle and disconnect the electronics pack from the upper shaft.

- To remove the speaker pod, follow the instructions given in Section 3.5.a.
- To disassemble the handle, follow the instructions given in Section 3.6.a.
- To disconnect the electronics pack, refer to Figure 34 and proceed as follows:



1	8007-0023	UPPER SHAFT BLACK F3
2	9511-0097	WIRING LOOM F3 SHAFT/HANDLE
3		COIL CABLE (PART OF 2021-0054 COIL F3)
4	8009-0007	RETAINER PLUG F3

5		COIL PLUG (PART OF 2021-0054 COIL F3)
6	3004-0036	ELECTRONICS PACK KIT SVC F3L
6	3004-0001	ELECTRONICS PACK KIT SVC F3
7	4003-0101	SCREW M3x20 SKT CAP
8	4309-0039	O-RING BULKHEAD 50MM
9	0703-0095	COVER BULKHEAD F3
10	4003-0084	SCREW NO 3X16 POSI SS
11	4003-0084	SCREW NO 3X16 POSI SS
12	4309-0044	GROMMET BULKHEAD F3
13	0703-0097	COVER RIBBON CABLE F3

Figure 34: Electronics Pack

**NOTE**

*The F3 and F3L use different electronics packs and should not be interchanged unless the correct speaker pods (F3L requires the speaker pod with LED display) are also fitted.*

- Remove battery pack and sensitivity endcap.
- Undo and remove the two screws (Part 11) holding the ribbon cable cover (Part 13) to the bulkhead cover (Part 9).
- Carefully pull back the ribbon cable cover releasing the split grommet (Part 12) from the bulk head cover.
- Undo and remove the six screws (Part 10) holding the bulkhead cover (Part 9) to the electronics pack rear panel.
- Pull the bulkhead cover away from the electronics pack.
- Gently unplug the wiring loom plug from the electronics pack printed circuit board. (Figure 35)



Figure 35: Removal of Wiring Loom from Electronics Pack

**NOTE**

*Extreme care must be taken when removing the wiring loom plug from the electronics pack. DO NOT use excessive force as this may cause damage to the connector on the printed circuit board.*

- Undo and remove the upper two screws (Part 7) securing the electronics pack to the upper shaft.
- Slide the electronics pack back along the upper shaft (avoid snagging the wiring loom) approximately 10cms (4ins).
- Remove the bulk head cover (Part 9), split grommet (Part 12) and ribbon cover (Part 13) from the wiring loom.

**NOTE**

To remove the split grommet, use fingers to open the split wide enough for the ribbon cable to slide through.

- Gently pull the wiring loom through the spine of the upper shaft toward the handle and remove it.
- With a new wiring loom, gently push the cable (connector first) through the spine of the upper shaft (Figure 36) emerging at the opening at the end of the upper shaft.

**NOTE**

The connector on the wiring loom should **NEVER** be pulled or forced because this could cause damage to the ribbon connection. The wiring loom is designed to slide through the spine with ease, but if necessary, apply a small amount of silicone grease to assist the movement of the wiring loom through the spine.



Figure 36: Pushing the Wiring Loom Through the Upper Shaft Spine

- Having threaded the new wiring loom, attach the ribbon cable cover, split grommet and bulkhead cover in the order shown in Figure 37.

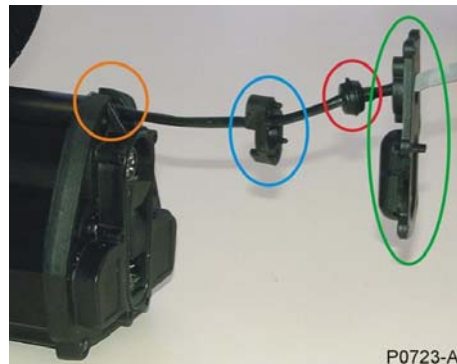


Figure 37: Correct Placement of Wiring Loom (Orange), Ribbon Cover (Blue), Split Grommet (Red) and Bulkhead Cover (Green)

- Slide the electronics pack all the way along the upper shaft, ensuring the wiring loom cable lays in the cut out at the top of the electronics pack rear cover.
- Refit the two screws (Part 7) securing the electronics pack to the upper shaft.
- Check the condition of the O-ring (Part 8) and apply a small amount of silicone grease as required.
- Ensure the O-ring (Part 8) is positioned correctly in the groove under the bulkhead cover in the electronics pack rear panel.
- Ensure that the keyway on the wiring loom plug (Figure 38) is towards the bottom of the electronics pack then plug the main wiring loom into socket on the printed circuit board inside the electronics pack.

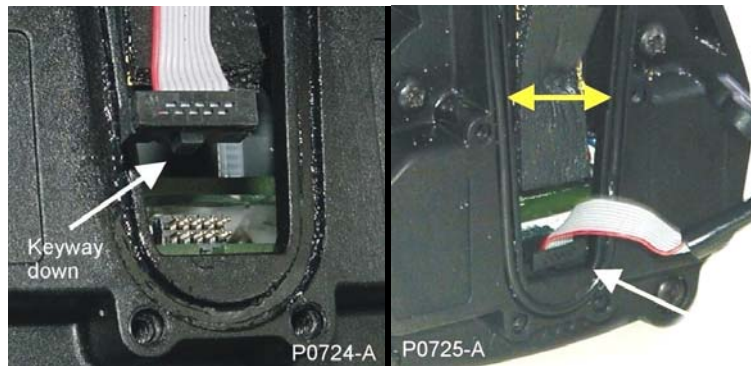


Figure 38: Correct Fitting of the Wiring Loom into the Electronics Pack

**NOTE**

*Take great care when connecting the wiring loom plug to the electronics pack. DO NOT force the connection because this could damage or break the connector on the printed circuit board.*

- Fold excess main wiring loom cable into the electronics pack above the plug. (Figure 39)



Figure 39: Excess Wiring Loom Cable Folded Correctly

- Refit the bulkhead cover with six screws.
- If necessary, apply a light covering of silicone grease to the split grommet and fit it into the opening on the bulk head cover (Figure 40) and secure it into place with the ribbon cover and two screws.

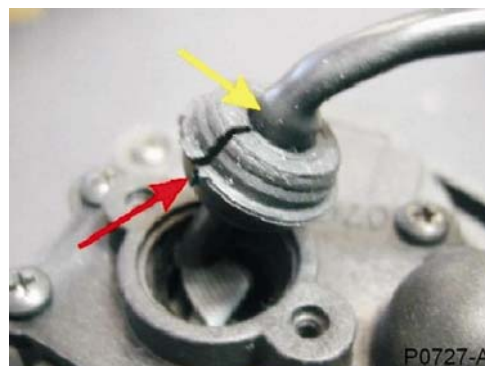


Figure 40: Split Grommet & Bulk Head Cover Opening

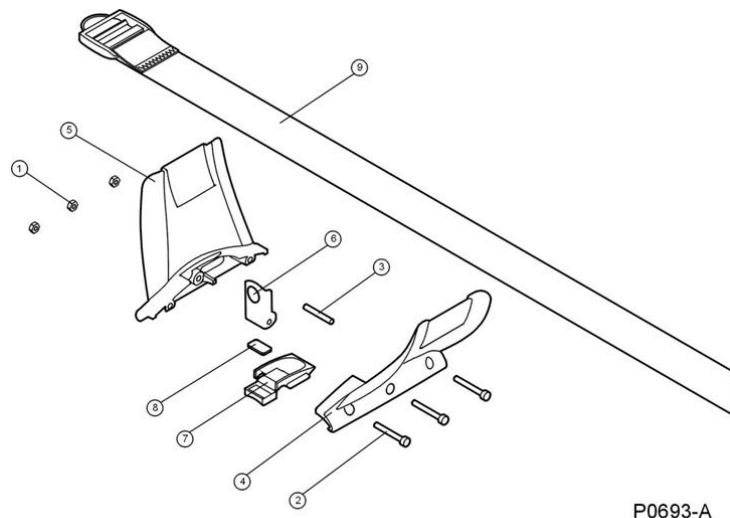
- Route the wiring loom around the cable router on the side of the bulkhead cover. (Figure 41)



Figure 41: Wiring Loom Routing

- Refit the sensitivity endcap.
- d. To assemble the handle, follow the instructions given in Section 3.6.b.
- e. To assemble the speaker pod follow the instructions given in Section 3.5.b.

3.8 **Armrest.** Figure 42 illustrates the major parts of the armrest



P0693-A

	8013-0002	ARMREST ASSEMBLY F3
1	4002-0023	NUT M4 NYLOC SS
2	4003-0063	BOLT M4X30 SKT SS
3	4308-0003	CAMLEVER PIVOT PIN
4	3004-0015	LEFT ARMREST HALF (part of ARMREST L+R F3)
5	3004-0015	RIGHT ARMREST HALF (part of ARMREST L+R F3)
6	8008-0005	CAM LEVER F3
7	8008-0026	PRESSURE BLOCK ARMREST F3
8	8008-0030	WEAR PLATE F3
9	8005-0018	STRAP ARMREST F3

Figure 42: Armrest Component Parts

a. **To disassemble the armrest:**

- Unlace the armrest if required.
- Undo and remove the three bolts and nuts holding the armrest halves together.
- Carefully pull the armrest halves apart exposing the cam lever, (Part 6), cam lever pivot pin (Part 3), and armrest pressure block (Part 7).
- Inspect and replace parts as required.

b. **To assemble the armrest:**

- Position the right half of the armrest onto the upper shaft.
- Fit the armrest pressure block, cam lever pivot pin and cam lever into the right armrest half.
- Carefully fit the left armrest half to the right armrest half and upper shaft.
- Refit the three bolts and nuts.

**NOTE**

*If the armrest is difficult to slide on the upper shaft, the middle bolt may need to be loosened.*

c. **To refit the armstrap use Figure 43 as a guide:**

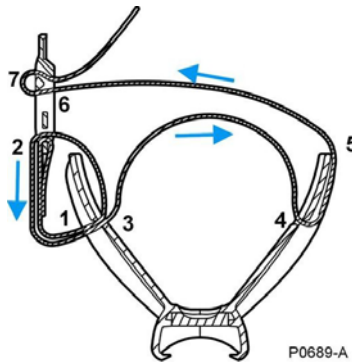


Figure 43: Lacing the Armstrap (View from Coil)

3.9 **Shafts.** The following procedures detail shaft disassembly/assembly and should be followed in order until the component to be replaced is accessible. Figure 44 illustrates the components of the shaft assembly.

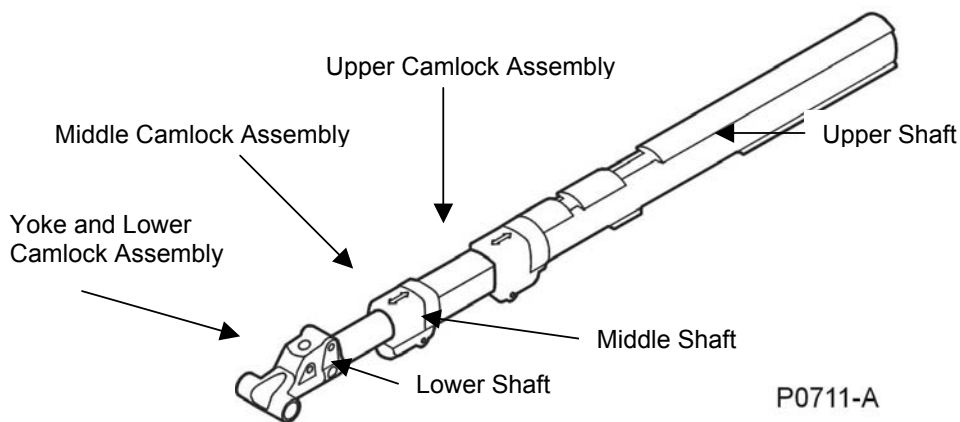
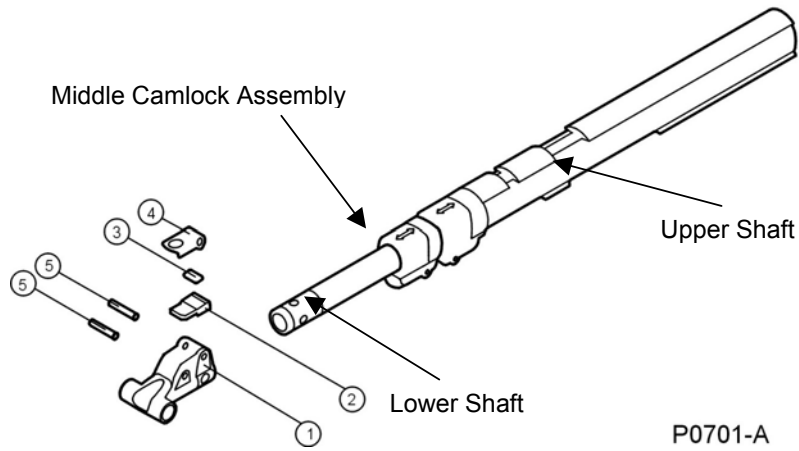


Figure 44: Shaft Assembly Components

a. **To disassemble lower camlock and lower shaft:**

- Remove the electronics pack (Section 3.3.a) and coil (Section 3.4.a)
- Using Figure 45 as a guide, use the 3mm T handle hex driver from the Tool Kit to push out the two lower camlock pins (Part 5).
- Remove the lower camlock body (Part 1) from the lower shaft.
- Remove the lower shaft by pushing it back through the upper/middle shafts.



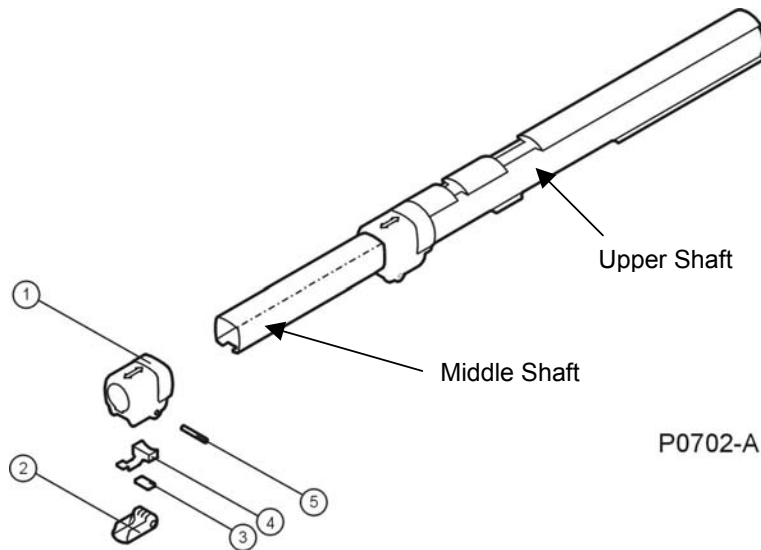


	3004-0011	CAMLOCK KIT LOWER SHAFT F3
1	8007-0022	CAMLOCK BODY LOWER F3
2	8008-0031	PRESSURE BLOCK LOWER F3
3	8008-0030	WEAR PLATE F3
4	8008-0029	CAM LEVER LOWER CAMLOCK F3
5	4308-0008	PIN LOWER CAMLOCK F3

Figure 45: Lower Camlock Assembly

b. **To disassemble the middle camlock and shaft:**

- Using Figure 46 as a guide, use the 3mm T handle hex driver to push out the cam lever pivot pin (Part 5) from the middle camlock body (Part 1).
- Remove the cam lever.
- Remove the pressure block by pushing it out from inside the shaft.
- Remove the middle shaft by pushing it back through the upper shaft.



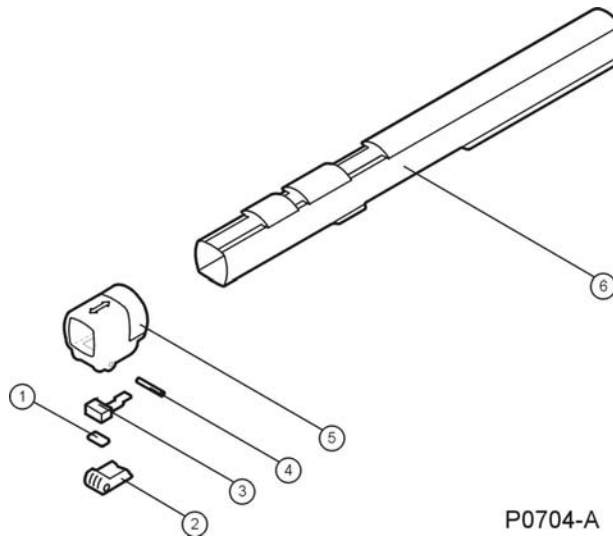
	3004-0012	CAMLOCK KIT MIDDLE SHAFT F3
1	8008-0023	CAMLOCK BODY MIDDLE F3

2	8008-0005	CAM LEVER F3
3	8008-0030	WEAR PLATE F3
4	8008-0024	PRESSURE BLOCK MIDDLE CAMLOCK F3
5	4308-0003	CAM LEVER PIVOT PIN

Figure 46: Middle Camlock Assembly

c. **To disassemble the upper camlock:**

- Using Figure 47 as a guide, use the 3mm T handle hex driver to push out the cam lever pivot pin (Part 4) from the upper camlock (Part 5).
- Remove the cam lever.
- Remove the upper pressure block by pushing the block out from inside the shaft.
- Remove the upper camlock body from the upper shaft.



	3004-0013	CAMLOCK KIT UPPER SHAFT F3
1	8008-0030	WEAR PLATE F3
2	8008-0005	CAM LEVER F3
3	8008-0022	PRESSURE BLOCK UPPER F3
4	4308-0003	CAMLEVER PIVOT PIN
5	8008-0021	CAMLOCK BODY UPPER F3
6	8007-0023	UPPER SHAFT BLACK F3 (not part of Camlock Kit)

Figure 47: Upper Camlock Assembly

d. **To reassemble the upper camlock:**

- Refit the upper camlock body to the upper shaft, ensuring that the square hole in the camlock body is aligned with the cut-out in the upper shaft. (Figure 48)



Figure 48: Upper Camlock Positioned on Upper Shaft

- Place the tail of the upper pressure block into the recess in the rear of the upper camlock body and push the block down into the square hole. (Figure 49)

**NOTE**

*Ensure that the pressure block does not protrude too far into the shaft. If necessary push it back into the camlock body otherwise difficulty may be encountered when fitting the middle shaft.*

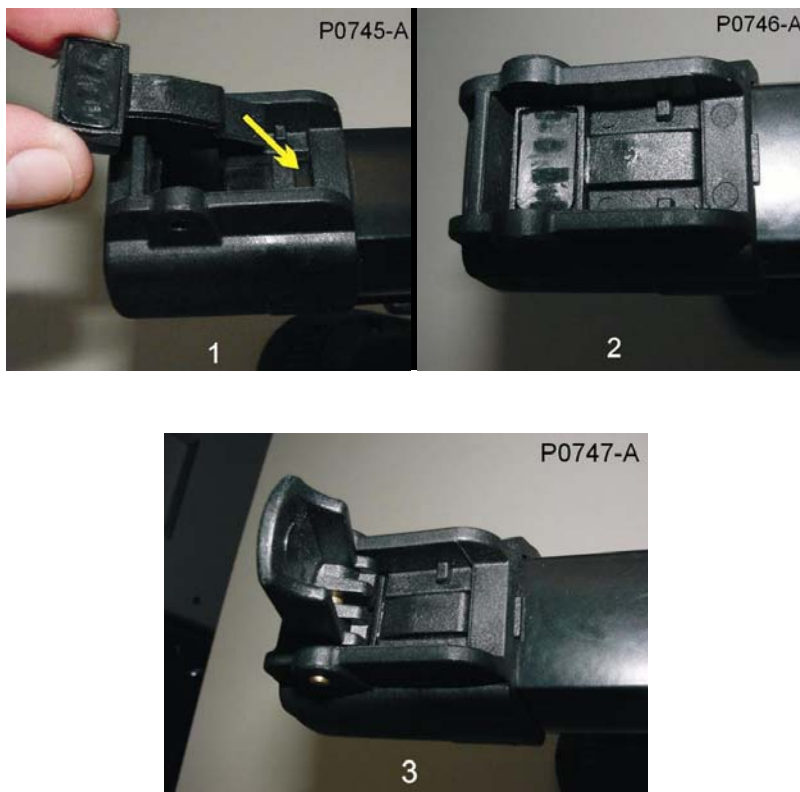
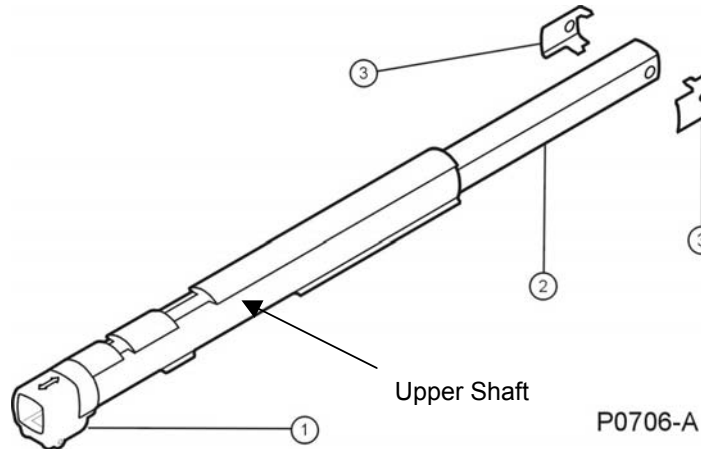


Figure 49: Reassembling the Upper Camlock Assembly

- Hold the cam lever in place whilst the cam lever pivot pin is pushed into the camlock body.
- Open the upper cam lever.

e. **To reassemble the middle camlock assembly:**

- Using Figure 50 as a guide, attach the two collar shafts (Part 3) to the rear of the middle shaft.



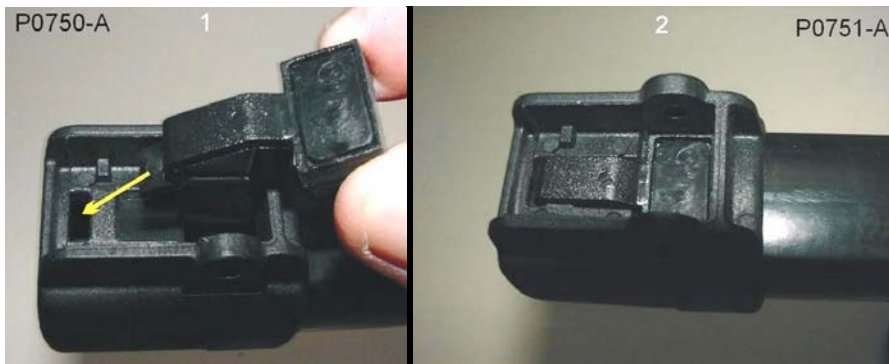
	3004-0008	MIDDLE SHAFT KIT SVC BLACK F3
1	3004-0012	CAMLOCK KIT MIDDLE SHAFT F3 (not shown – see next figure)
2	8007-0024	MIDDLE SHAFT BLACK F3
3	8003-0019	COLLAR SHAFT MIDDLE F3

Figure 50: Fitting the Middle Shaft

- Slide the middle shaft into the rear of the upper shaft with the square hole facing down.
- Place the tail of the middle pressure block into the recess in the front of the middle camlock body and push the block into the square hole.
- Refit the cam lever and cam lever pivot pin. (Figure 51)

**NOTE**

*Ensure that the pressure block does not protrude too far into the shaft. If required, push it back into the camlock body otherwise difficulty may be encountered when fitting the lower shaft.*



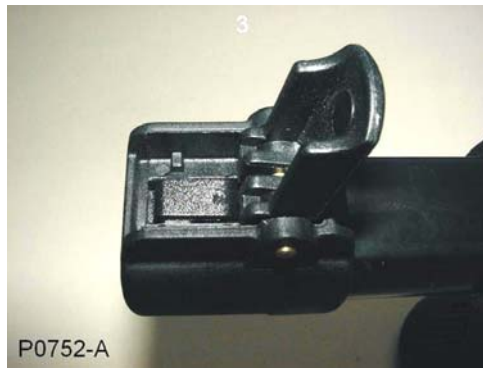


Figure 51: Reassembling Middle Camlock Assembly

- Slide the middle shaft all the way into the upper shaft and close the upper cam lever.
  - Open the middle cam lever.
- f. **To reassemble the lower camlock and shaft:**
- Refit the cam lever with a lower camlock pin into the camlock body. Open the lower cam lever. Place the lower pressure block into the lower camlock body. (Figure 52)

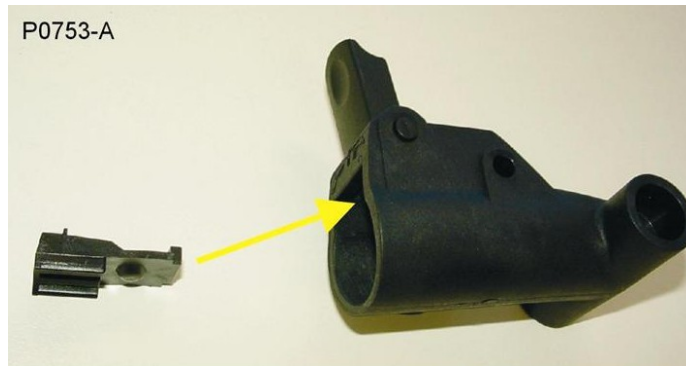


Figure 52: Fitting Lower Pressure Block into Lower Camlock

- Slide the lower shaft through the upper/middle shafts, protruding section at front of the lower shaft uppermost. (Figure 53)

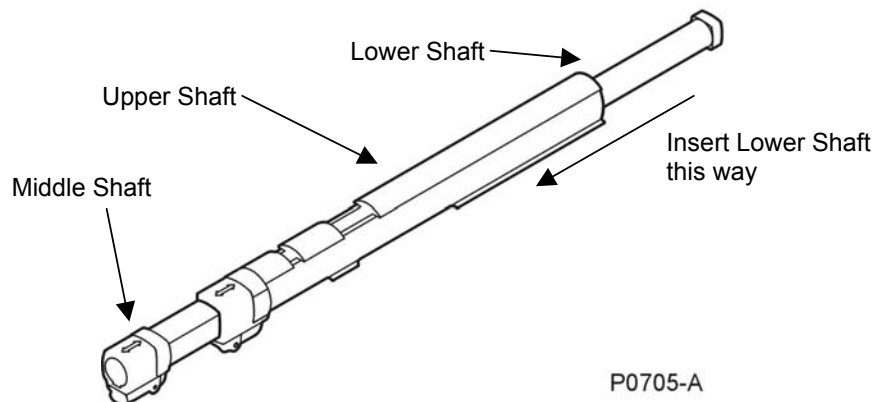


Figure 53: Inserting the Lower Shaft

- Holding the detector and lower camlock assembly upside down (to prevent the lower pressure block falling out) slide the lower camlock assembly fully onto the lower shaft with a twisting motion.

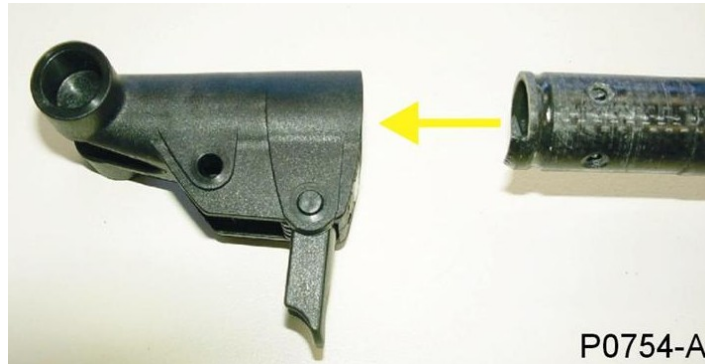


Figure 54: Attaching Lower Camlock

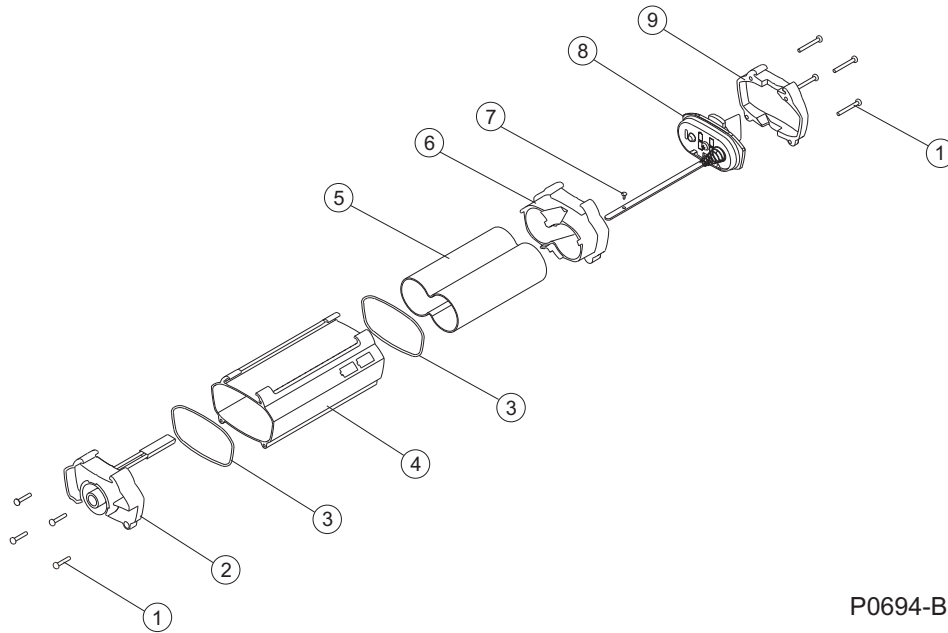
- Turn the detector back over and ensure that the lower camlock assembly is positioned on the lower shaft with the cam lever uppermost.
- Refit the other lower camlock pin. (Figure 55)



Figure 55: Connected Lower Camlock

- Refit the friction blocks to the lower camlock body. The flat side of the friction blocks should face down.
- Connect coil (Section 3.4.b), electronics pack (Section 3.3.b) and wiring loom as applicable.

3.10 **Battery Pack.** The battery pack is a line replaceable unit and is not normally disassembled for repair. The major component parts of the battery pack are shown in Figure 56.



P0694-B

	0311-0018	BATTERY PACK F3 BLACK
1	4003-0101	SCREW M3X20 SKT CAP
2	0705-0016	PANEL ASSY CAP REAR BP F3
3	4309-0040	O-RING ENDCAP BP EP F3
4	0701-0030	HOUSING BP BLACK F3
5	0703-0126	BATTERY TUBE BP F3
6	0703-0079	CAP FRONT BP F3
7	3004-0005	RIVET (part of TETHER WITH RIVET KIT SVC BP F3)
8	0705-0015	PANEL ASSY LID BP F3 (BATTERY PACK LID)
9	0703-0098	FACEPLATE CAP FRONT BP F3

Figure 56: Battery Pack Component Parts

## 4. Fault Finding Procedures

4.1 **Introduction.** A functional test failure (Section 2.2) can generally be repaired by replacing one or all of the following line replaceable units:

- Coil
- Wiring Loom
- Electronics Pack

a. The F3 is designed so that line replaceable units can be exchanged between detectors without the need to calibrate. This means that where spare parts are not available and more than one detector is faulty, then parts from one detector can be used to make another serviceable. For example, if detector # 1 has an unserviceable coil and detector # 2 has an unserviceable electronics pack, then the coil from detector # 2 can replace the coil on detector # 1 thereby producing a serviceable detector.

b. Whenever a line replaceable unit is exchanged, follow the applicable procedure described in Section 3.

c. Where the source of a fault is unknown, due to the ease of replacement it is recommended that line replaceable units be exchanged in the following sequence:

- Electronics Pack
- Coil
- Wiring Loom

4.2 **Trouble Shooting Table.** The following table identifies a number of faults and provides recommended solutions. The suggested solutions should be investigated in the order they are listed.

Problem	Recommended Solutions
F3 will not switch on	<ul style="list-style-type: none"> <li>● check batteries are installed correctly</li> <li>● replace batteries with fresh batteries</li> <li>● remove and refit battery pack</li> <li>● replace battery pack</li> <li>● replace wiring loom</li> <li>● replace electronics pack</li> </ul>
F3 will not switch off	<ul style="list-style-type: none"> <li>● remove battery pack and refit</li> <li>● check magnet on ON/OFF slide has not been dislodged and connected to the wiring loom overmould</li> <li>● replace wiring loom</li> <li>● replace electronics pack</li> </ul>
After switching on the F3 makes no sound from speaker	<ul style="list-style-type: none"> <li>● check for tone using the earset</li> <li>● if there is tone through earset - replace speaker pod</li> <li>● if there is no tone through earset - replace wiring loom</li> <li>● if there is no tone through earset - replace electronics pack</li> </ul>
Threshold tone is intermittent (including LEDs for F3L)	<ul style="list-style-type: none"> <li>● replace wiring loom</li> </ul>
Threshold Tone is too loud	<ul style="list-style-type: none"> <li>● ensure area is free from local electromagnetic interference</li> <li>● conduct Audio Reset</li> <li>● conduct Noise Cancel</li> <li>● replace coil</li> <li>● replace electronics pack</li> <li>● replace wiring loom</li> </ul>



On switch on, the “Coil Fault” tone occurs - “low pitched double tone every five seconds”	<ul style="list-style-type: none"> <li>● check the coil plug is firmly secured to the electronics pack</li> <li>● inspect coil cable for damage – if no damage replace electronics pack</li> <li>● if damaged replace with new coil</li> </ul>
On switch on, the “Equipment Fault” tone occurs – “low pitched slow oscillating tone (ee-aww, ee-aww)”	<ul style="list-style-type: none"> <li>● check endcap is secure</li> <li>● replace electronics pack</li> </ul>
After working in hot conditions, detector makes a loud noise	<ul style="list-style-type: none"> <li>● conduct Audio Reset</li> <li>● replace coil</li> <li>● replace electronics pack</li> <li>● replace wiring loom</li> </ul>
Ground Balance does not work	<ul style="list-style-type: none"> <li>● replace speaker pod</li> <li>● replace wiring loom</li> <li>● replace coil</li> <li>● replace electronics pack</li> </ul>
Noise Cancel does not work (no Noise Cancel tones emitted)	<p>Note: Noise Cancel may not completely remove the effects of interference if the source is powerful or in close proximity</p> <ul style="list-style-type: none"> <li>● repeat Noise Cancel</li> <li>● replace wiring loom</li> <li>● replace electronics pack</li> </ul>
Audio Reset does not work	<ul style="list-style-type: none"> <li>● replace speaker pod</li> <li>● replace wiring loom</li> <li>● replace coil</li> </ul>
LEDs do not illuminate (F3L only)	<ul style="list-style-type: none"> <li>● ensure detector is F3L configuration - if not speaker pod is incorrectly matched</li> <li>● pressing and hold the ⊕ button and quickly press and release the green ground balance button.</li> <li>● replace speaker pod (F3L version)</li> </ul>
Cannot hear the Test Piece	<ul style="list-style-type: none"> <li>● ensure detector has been switched on for 30 secs before conducting the test</li> <li>● conduct Audio Reset</li> <li>● fit and use an earset</li> <li>● if using an F3L ensure volume level is set to default</li> <li>● conduct Noise Cancel</li> <li>● ensure coil plug is securely fitted to electronics pack</li> <li>● replace electronics pack</li> <li>● replace coil</li> </ul>
Start Up tones keep repeating	<ul style="list-style-type: none"> <li>● insert new batteries</li> <li>● replace electronics pack</li> <li>● replace wiring loom</li> </ul>
In the collapsed position the detector makes a loud noise when coil is tilted	<ul style="list-style-type: none"> <li>● conduct Audio Reset</li> <li>● extend shafts</li> <li>● conduct Audio Reset</li> </ul>
Earset does not work	<ul style="list-style-type: none"> <li>● replace earset</li> <li>● replace wiring loom</li> </ul>
Shafts will not collapse	<ul style="list-style-type: none"> <li>● fully extend (leave for five minutes) very slowly collapse shafts</li> <li>● remove coil and remove any dirt located in the shaft and on the cable – inspect cable for any damage – if none ensure the coil has 52 turns and assemble back into the detector – fit coil pin if not present</li> <li>● if cable damaged replace with new coil</li> </ul>

ON/OFF slide is very difficult to move	<ul style="list-style-type: none"> <li>● disassemble handle and remove dust and dirt</li> </ul>
Armrest will not move	<ul style="list-style-type: none"> <li>● loosen middle bolt</li> <li>● disassemble armrest and clean</li> <li>● replace armrest</li> </ul>
Coil does not remain in place (floppy)	<ul style="list-style-type: none"> <li>● replace friction blocks</li> </ul>
Coil falls off lower shaft	<ul style="list-style-type: none"> <li>● refit camlock pins</li> <li>● replace lower shaft</li> </ul>
Water found inside battery pack	<ul style="list-style-type: none"> <li>● clean battery lid and apply silicone grease to battery lid O-ring</li> </ul>
Camlocks will not stop shafts from collapsing	<ul style="list-style-type: none"> <li>● replace camlock pressure blocks</li> </ul>
Battery Lid will not close	<ul style="list-style-type: none"> <li>● remove and clean O-ring</li> <li>● replace swollen batteries if applicable</li> </ul>

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