

F3 Metal Mine Detector



SERVICE MANUAL

Revision 5: July 2022

Part No: 4904-0004



WARNING

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2 Introduction

2.1 System Overview

The Minelab F3 is a robust hand held metal detector designed to detect landmines, cluster munitions, unexploded ordnance and other buried threats. The F3 ensures user safety through high performance in all soils and its simple intuitive operation.

2.2 Warnings

Use caution and common sense when operating the F3 metal Detector.

- a. Minelab recommends that an Earset is always used when operating the F3 Metal Detector, particularly when there are minimum metal mines present.
- b. Emission of non-ionising radiation. The F3 Detector emits low power magnetic fields and radio frequencies from the coil, the radiated power is lower than that emitted by a mobile phone. The F3 is a pulse induction metal detector that transmits a Bi-Polar Multi Period signal which is designed to not initiate magnetic influence mines.
- c. Internal High Voltages. Voltages potentially capable of causing electric shock are present inside the F3 electronics pack and coil. Do not use the F3 detector if the coil or coil cable is damaged with exposed conductors. Do not turn on the F3 whilst the electronics pack is opened and internal circuits are exposed.
- d. Battery Hazards. Do not use damaged batteries.
- e. Speaker/Earset Audio Volume. Exposure to very loud audio can cause discomfort and hearing loss. The F3 Metal Detector is designed so that maximum sound pressure levels do not exceed safe levels.

2.3 Mine Detecting Set

The F3 is supplied as a complete mine detecting set comprising:

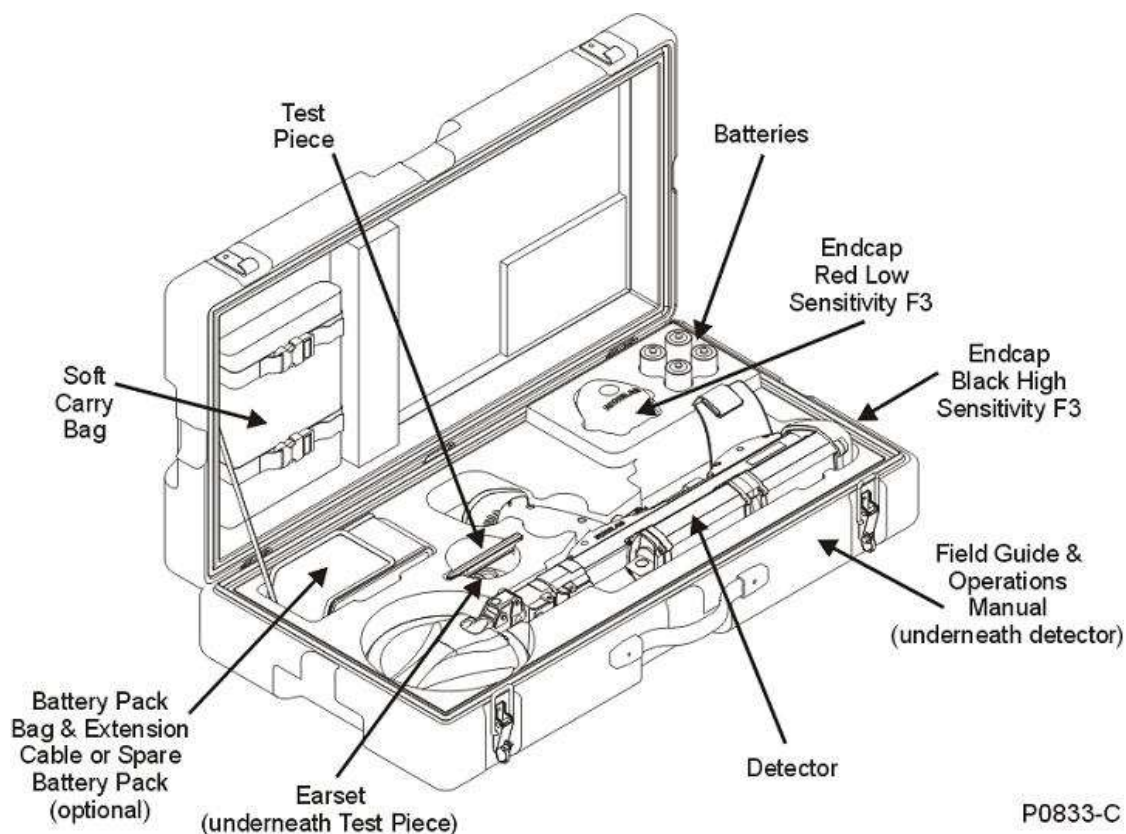


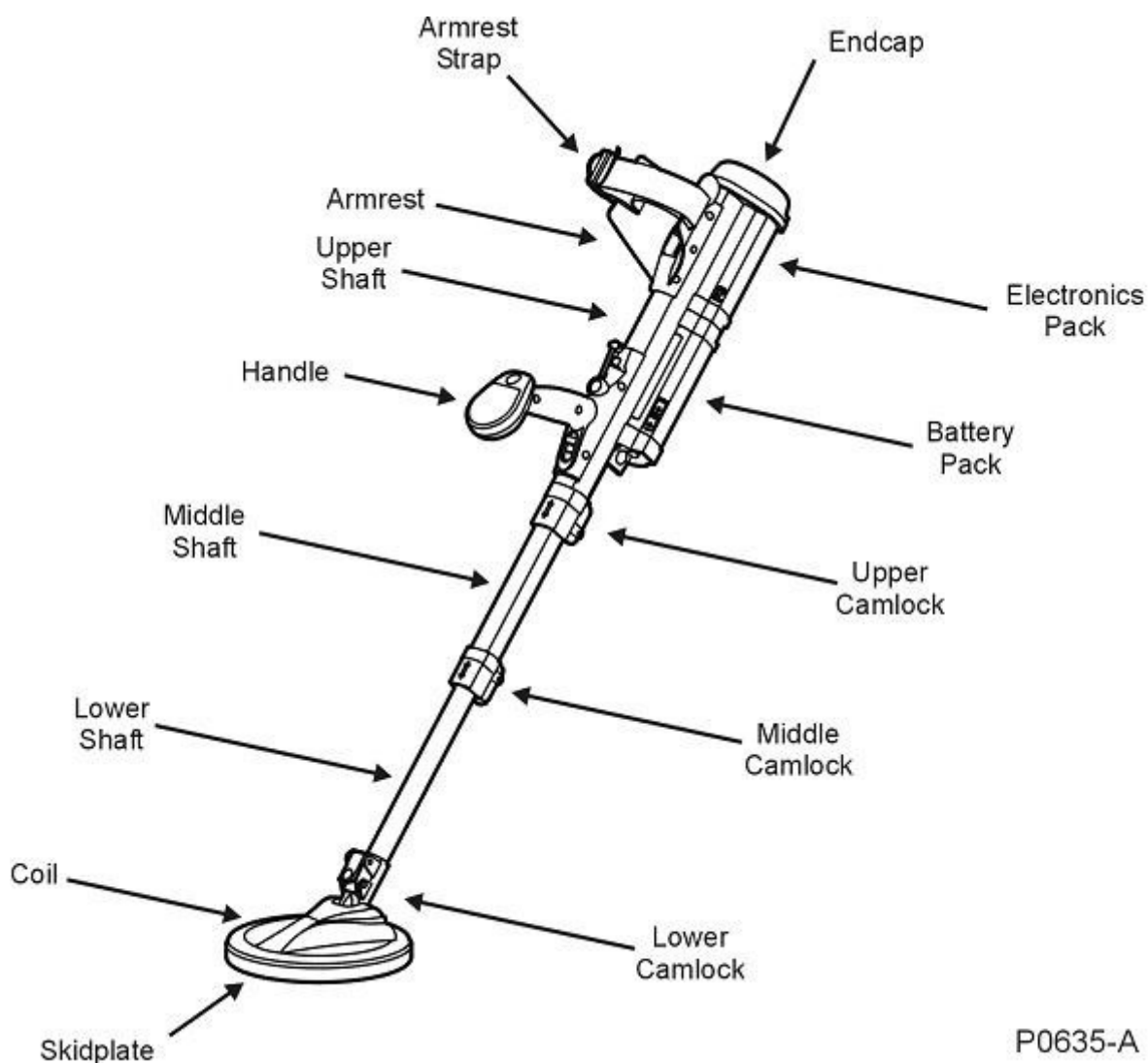
Figure 1: F3 Packed in its Hard Case

Table 1: F3 Detecting Set

3111-0602	F3 Metal Detector Set (complete)
3015-0000	F3 Detector (detector only)
5305-0058	Case F3 Transport
3001-0037	Bag F3 Carry
4523-0027	Earset F3 Speaker On (other options available)
0703-0096	Endcap Black High Sensitivity
0703-0101	Endcap Red Low Sensitivity
0703-0100	Endcap Yellow Customisable Sensitivity (optional)
0303-0040	Battery D-Cell Rechargeable 1.2v 7Ah NiMH
8701-0006	Test Piece
4901-0043	Operations Manual F3
4903-0025	Field Guide F3

2.4 F3 Main Components

Figure 2 identifies the main components of the F3 which comprise:



P0635-A

Figure 2: F3 Major Components & Handle Controls

2.5 F3 Accessories

The F3 has a range of accessories and ancillary equipment to support it in the field this includes:

Table 2: Accessories

4523-0027	Earset Speaker On. Standard earset used in humanitarian demining, The detectors internal speaker is not muted.
4523-0025	Earset Speaker Off. Tactical Earset which will mute the detectors internal speaker and disable the LED display (F3L only).
3011-0306	Earset Generic. A two piece Earset that uses a generic off the shelf 3.5mm(1/8in) inline audio connector to the Earset.

3011-0096	Kit F3S Software and Cables. Programing cables and software used to customise sensitivity and volume using the yellow endcap.
0703-0100	Yellow Endcap. Optional endcap that is used for customising volume profiles.
IMC Battery Charger.	Intelligent Multi Charger is a versatile and robust battery charger capable of charging two sets (total 8 cells) of F3 rechargeable batteries.
0303-0040	Battery D-Cell Rechargeable 1.2v 7Ah NiMH. Minelab approved rechargeable battery for the F3 detector.
78-02019	Universal Smart Battery Charger. A small versatile battery charger that can charge one set (total 4 cells) of F3 batteries.
9511-0019	Cable Battery Pack F3, battery extension cable
3001-0036	Bag Battery Pack F3, used with battery cable.
3011-0097	Coil Kit F3 UXO. A kit including a large UXO coil that enables an F3 (small coil) to be converted to an F3 UXO detector.
3004-0018	Tool Kit F3.

Specifications of F3 Metal Detector

Table 3: Specifications of the F3 detector

Manufacturer	Minelab Electronics Pty. Ltd
Model	F3, F3L and F3 UXO
NSN	6665 66 1580722
Description	Pulse Induction Metal Detector
Transmission	Bi-Polar Multi Period Sensing
Transmit Frequency	1.25 Khz +/- 3% Pulse Repetition Frequency
Coil Configuration	Standard small coil is circular mono-loop with 20cm diameter: UXO (large) Coil is circular mono-loop with 44cm diameter
Output Audio	Internal Loudspeaker; Earset (three variants)
Output Visual	13 LED display (F3L only)
Output Data	RS 232
Batteries	Four D-Cell batteries either; Alkaline LR20 or Rechargeable D-cell (NiCad or NiMH)
Battery Protection	Reverse Polarity protection and High temperature cut off. Low battery alarm
Operating Temperature	-30°C to 60°C; -22°F to 140°F
Storage Temperature	-30°C to 80°C; -22°F to 176°F
UV Resistance	One year visually and 5 years mechanically
IP Rating (Ingress Protection)	IP 67 Water Proof to 1 meter
Environmental Resistance	Certified to MIL STD 810F
Operating Length	150cm to 75cm; 59.4in to 30in
Operating Weight (with batteries)	3.2kg; 7lb
Packed Weight (in transit case with batteries and accessories)	10.5kg; 23lb

2.6 Introduction to F3 Service and Repair

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 (LRUs) which can be fitted to a detector without the need for adjustment or calibration. Additionally, serviceable LRUs (Line Replaceable Units) can be exchanged between detectors as required.

a. LRUs (Line Replaceable Units) are components or sub-assemblies of the F3 that can be purchased from Minelab for the purpose of repairing the F3. Line replaceable units include the following:

Table 4; LRUs (Line Replaceable Units)

Minelab Part Number	Description
3004-0001	Electronics Pack Kit F3
3004-0036	F3L Electronics Pack Kit
3004-0003	Coil Kit
3004-0038	Coil Retainer Kit
3004-0006	Shaft Kit (no upper shaft)
3004-0011	Camlock Kit Lower F3
3004-0008	Middle Shaft Kit F3
3004-0012	Camlock Kit Middle F3
3004-0013	Camlock Kit Upper F3
3004-0035	Battery Pack Kit
3004-0004	Lid Kit Battery Pack
3004-0034	Armrest Kit F3
3004-0032	Handle Kit F3
3004-0033	F3L Handle Kit
3004-0039	Wiring Loom Kit
3004-0037	F3L Speaker Pod Kit
3004-0017	Speaker Pod Kit F3

b. The F3 detector can be repaired and serviced in 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:
<https://www.minelab.com/countermine>
- f.** Alternately Minelab can be contacted through the following email address:
countermine@minelab.com.au

3 Mechanical & Functional Testing

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

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.

3.1 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 3 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 the camlocks hold the coil and shafts in position
- armrest camlock and ensure the armrest slides smoothly
- armstrap is in good condition
- shafts can be collapsed smoothly and fully without any snagging

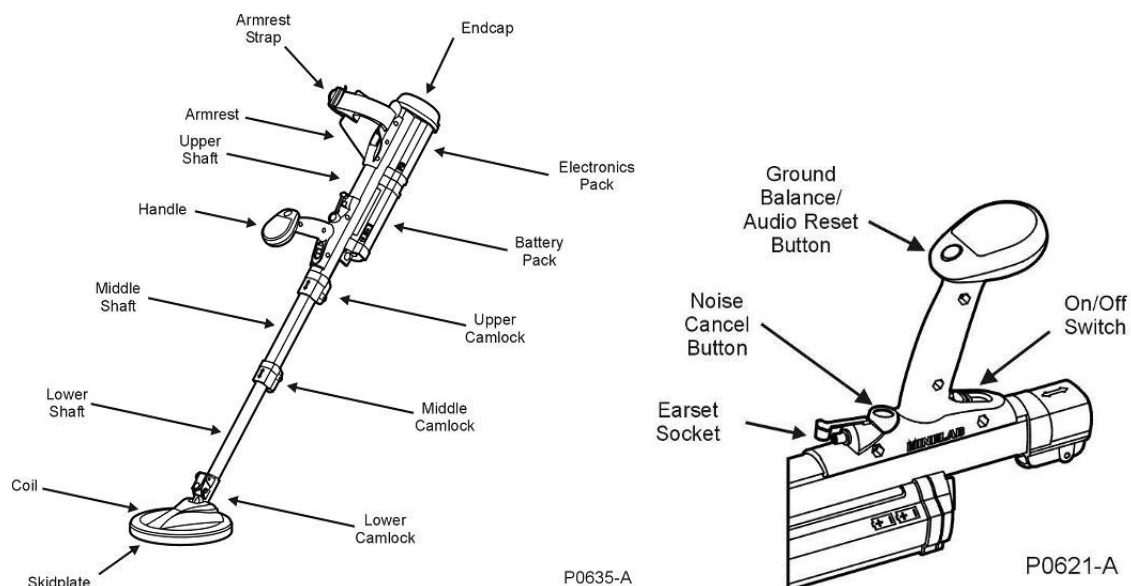


Figure 3: F3 Major Components & Handle Controls.

To replace any worn or damaged parts found during mechanical testing refer to section [4 Disassembly & Reassembly Procedures](#).

3.2 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.

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 Ceramic or clay) may be suitable for use as a ground balance test piece.

NOTE

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

a. 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 15cm (6ins).
- Hold the coil at least 60cm (24ins) from the ground and away from any metallic objects and switch on.
- Ensure that a series of rising tones occurs over approximately 12 seconds. A steady threshold tone should be heard a few seconds after the rising tones finish.

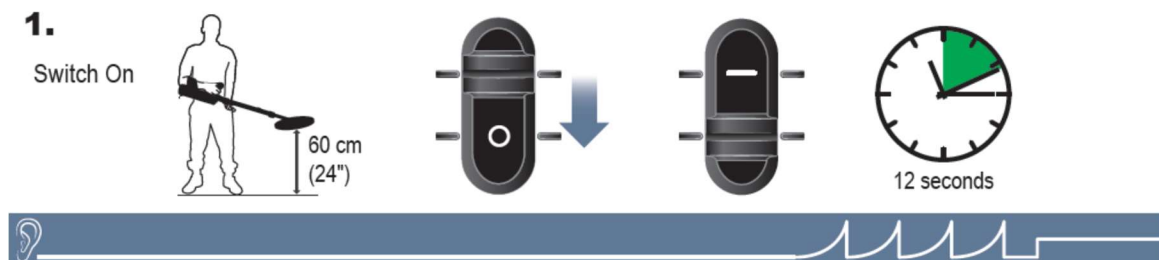


Figure 4: Switch ON Test

- If the correct tones are not heard, check that good batteries are being used and that the batteries are correctly inserted.
- If the correct tones are still not heard refer to section [5 Fault Finding Procedures](#).

b. Noise Cancel Test. This 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 60cm (24ins) above the ground and away from any large metal objects during the test.

- Press and immediately release the black Noise Cancel button, as shown in figure 5.

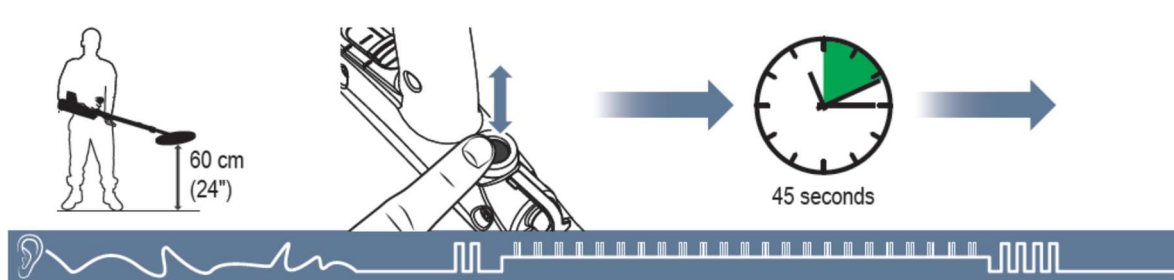


Figure 5: Noise Cancel

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 [5 Fault Finding Procedures](#).

c. Audio Reset Test. This test confirms the green 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 60cm (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 to initiate an audio reset, as shown in figure 6

NOTE

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

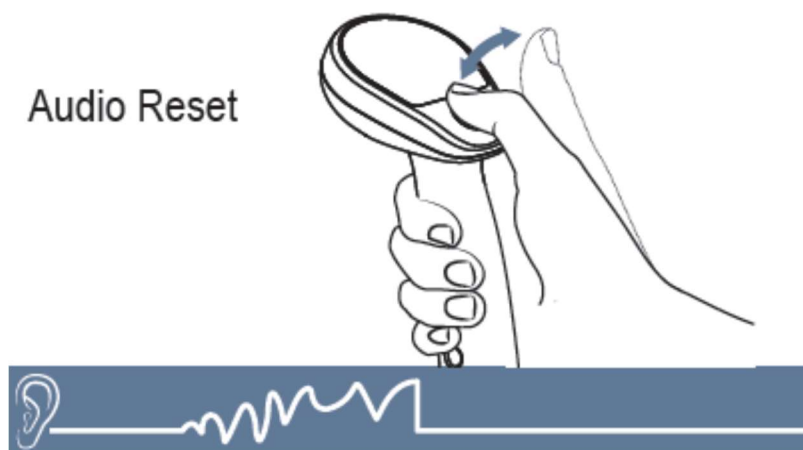


Figure 6: Audio Reset.

- 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 [5 Fault Finding Procedures](#).
- d. 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 green ground balance button, wiring loom, coil and electronics pack. 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 green 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 15cm (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 green ground balance button whilst slowly moving the ground balance test piece from approximately 15cm (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 15cm (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 green 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 15cm (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 [5 Fault Finding Procedures](#).

NOTE

Where the Ground Balance Test is conducted using local soil, Figure 7 illustrates the procedure to be followed



Figure 7: 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.

e. 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 8.

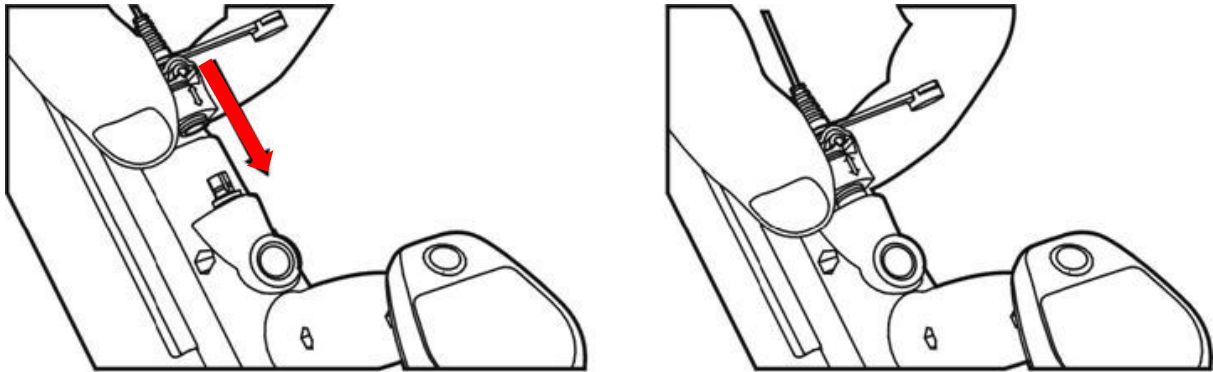


Figure 8: Connecting the Earset.

- 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 be heard from both the detector loudspeaker and the Earset.
- 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 and the audio tones can be heard only from the earset.

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 [5 Fault Finding Procedures](#).

f. 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 [5 Fault Finding 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.

g. F3L - LED and Volume/Sensitivity Control Test. This test will confirm the LEDs and the Volume/Sensitivity controls are operating correctly. For the F3L configuration, LED and volume control is tested as follows:

- Turn on the detector with the black endcap attached.
- Conduct the test piece test and note the number of LEDs that light up as well as 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 (indicating maximum Volume/Sensitivity).
- 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 (Indicating lowest Volume/Sensitivity).
- 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 [5 Fault Finding 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 sequence.
- 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 [5 Fault Finding Procedures](#).

h. 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, as shown in figure 9.
 - Confirm a faint but clear response (change in threshold tone volume and pitch) is heard.

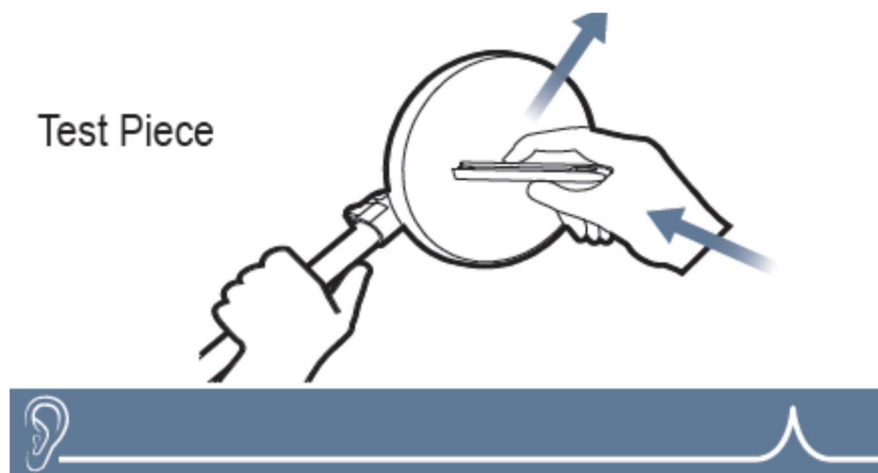


Figure 9: Test Piece Test.

- 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 [5 Fault Finding 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 an audio reset and repeat the test.
- If the test piece is still not heard, refer to section [5 Fault Finding 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

k. 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.

3.3 Detector Field Test

Once the detector has passed the mechanical and function tests a patch of ground should be searched with the detector in the same way that it would be used in operations. Several different buried targets must be detected then pinpointed to confirm the detector is fully operational. The detector must not be used until the correct operation is confirmed.

Provided the detector passes all tests, it is serviceable and ready for operations.

4 Disassembly & Reassembly Procedures

4.1 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 [3 Mechanical and Function Testing](#) must be completed.

4.2 F3 Tool Kit

The F3 Tool Kit (Part No 3004-0018) is required to disassemble and reassemble the F3. The tool kit (Figure 10) comprises:

Table 5: Tools

Minelab Part No	Description
71-0005-0006	Silicon Grease (100g tube)
71-0005-0010	Silicon Sealant (75g tube)
75-8701-0009	Tubular Spanner 7/8"
8701-0010	F3 Coil Cable Pull Through
75-8701-0011	Screwdriver Pozidrive No 1
75-31400-010	Hex Driver 2.5mm
75-31400-011	Hex Driver 3.0mm
75-8701-0013	Flat blade screwdriver 6.5mm x 150m
4904-0004	Service Manual F3



Figure 10: Tool Kit.

NOTE

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

4.3 Electronics Pack

Figure 11 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.

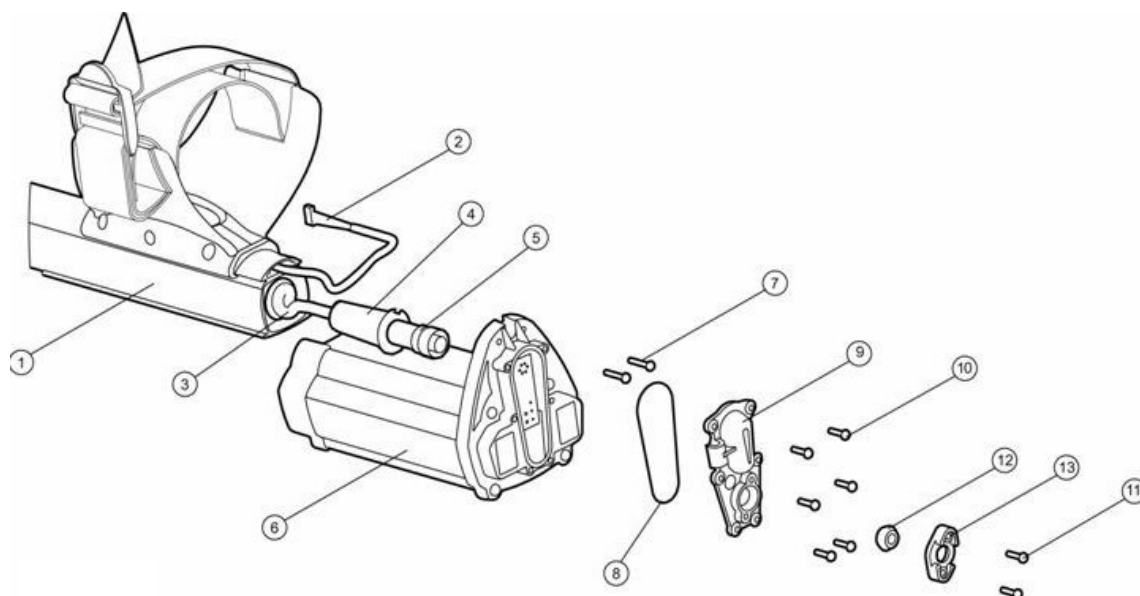


Figure 11: Electronics Pack

Table 6: Electronics Pack.

6	3004-0001	Electronics Pack Kit F3
1	8007-0023	Upper Shaft
2	3004-0043	Wiring Loom
3		Coil Cable (Part Of 2021-0054 Coil F3)
4	8009-0007	Retainer Plug
5		Coil Connector (Part Of 2021-0054 Coil F3)
7	31-23020-980	Screw M3x20 Skt Cap
8	30-4309-0039	O-Ring Bulkhead 50mm
9	0703-0095	Cover Bulkhead EP
10 & 11	4003-0084	Screw No 3x12 Posi
12	4309-0071	Grommet Bulkhead Split EP
13	0703-0097	Cover Ribbon Cable EP
6	3004-0036	F3L Electronics Pack Kit (only used on F3L)

NOTE

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

a. To Remove the Electronics Pack:

- Remove battery pack and sensitivity endcap.
- Remove the six screws (Part 10) holding the cover bulkhead (Part 9) to the electronics pack rear panel.

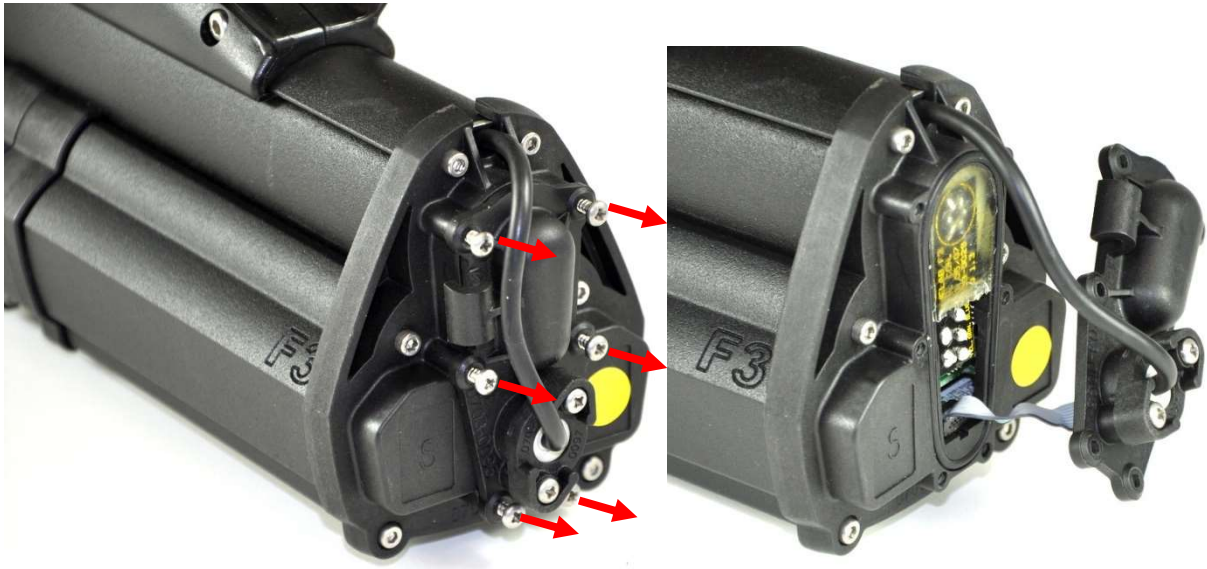


Figure 12: Removing cover bulkhead from the Electronics Pack.

- Pull the cover bulkhead away from the electronics pack.
- Gently unplug the wiring loom plug from the electronics pack, as shown in Figure 13.

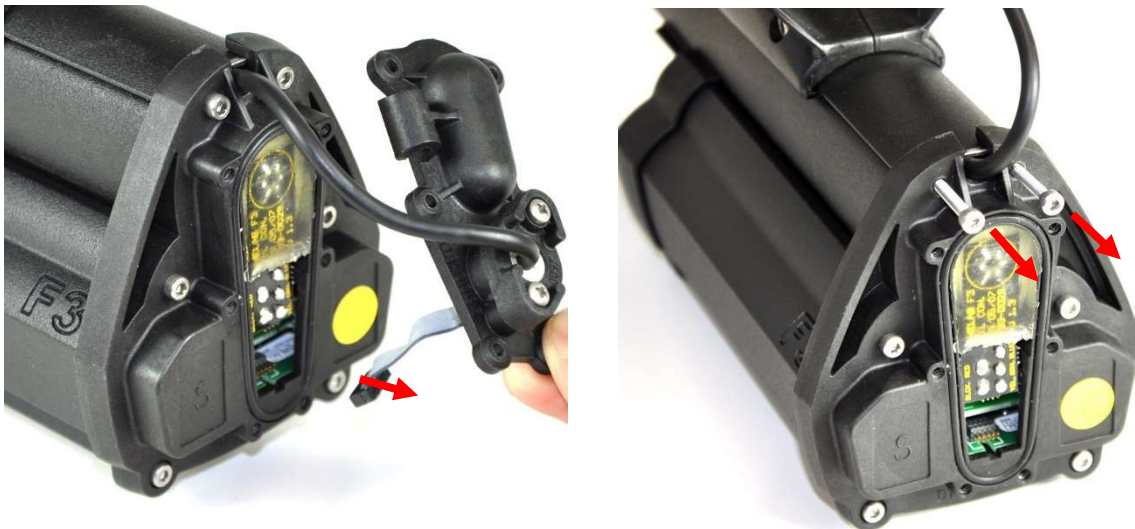


Figure 13: Removal of Wiring Loom from Electronics Pack.

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) that secure 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 cable (Part 5).
- Using the retainer plug (Part 4), if fitted, unscrew the coil plug (Part 5).
- Remove the electronics pack from the upper shaft.

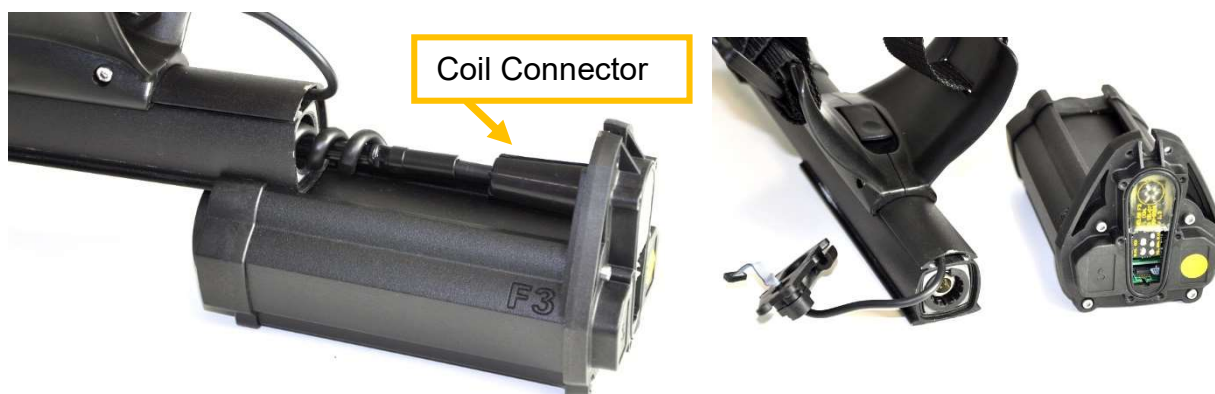


Figure 14: Unscrew coil connector

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.

b. To Connect 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.
- Make sure the coil cable slides in and out of the shafts without any snagging or obstruction.
- Reconnect the coil plug (Part 5) to the electronics pack using the coil plug retainer (Part 4) or fingers. Do Not Over Tighten.
- Remove excess sealant.



Figure 15: Connecting Electronics Pack to shaft and connect coil.

- Slide the electronics pack along the upper shaft into place, 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. Shown in Figure 15.
- 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 cover bulkhead in the electronics pack rear panel.
- Ensure that the keyway on the wiring loom plug is towards the bottom of the electronics pack then plug the main wiring loom into the connector in the electronics pack. Refer to Figure 16.

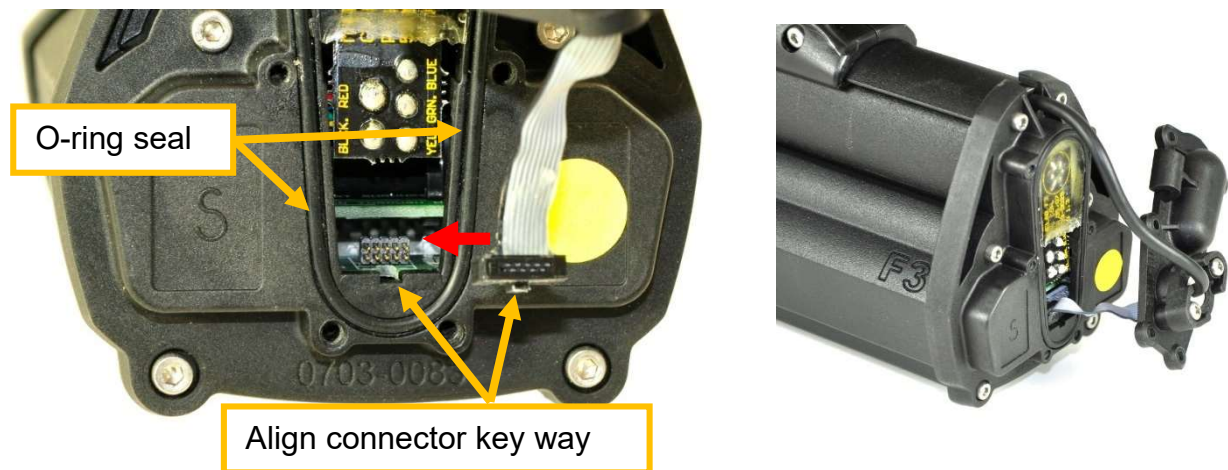


Figure 16: Connecting Wiring Loom into the Electronics Pack.

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.

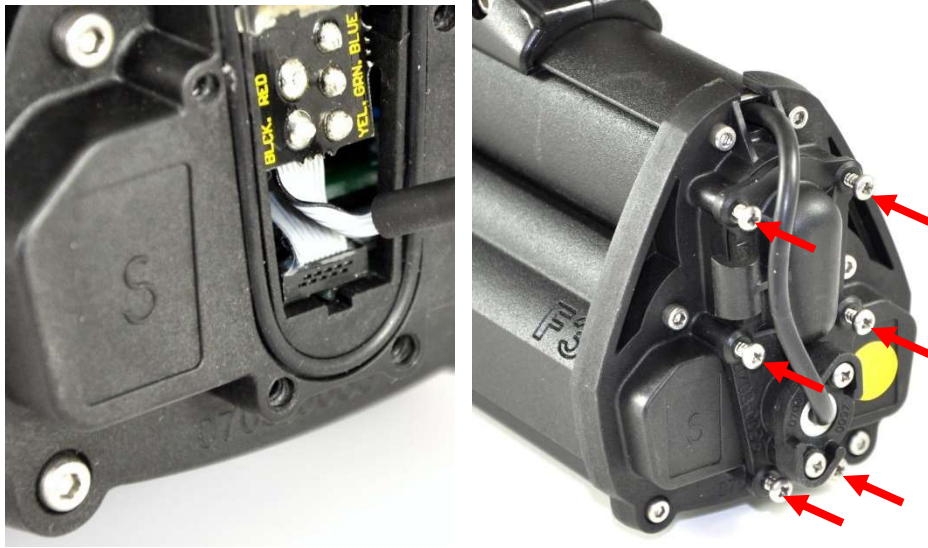


Figure 17: Wiring Loom Cable positioned and 6 screws inserted.

- Fold excess wiring loom cable into the electronics pack above the plug. Show in Figure 17.
- Refit the bulkhead cover with six screws.
- Route the wiring loom around the cable router on the side of the bulkhead cover, as shown in Figure 18.
- Attach the sensitivity endcap.



Figure 18: Wiring Loom under cable router.

c. Electronics Pack Circuit Boards

- The F3 detectors electronics pack contains circuit boards that control power supplies, transmit, receive and microprocessors. The electronics pack is an LRU (Line Replaceable Unit).
- The F3 circuit boards inside the electronics pack have shorting links (switches) that are used to configure the detector during manufacturing. The shorting links can be adjust to configure the electronics pack for an F3 or an F3L (with LEDs). The F3 detector will have a threshold confidence tone or a heartbeat confidence tone depending on the adjustment of the shorting links on the printed circuit board.
- Minelab supply electronics pack LRUs (Line Replaceable Unit) for the F3, F3L. The electronics pack LRUs are assembled and tested in Minelab's factory. Provided that the correct electronics pack is used there is no requirement to open the electronics pack.

d. Electronics Pack Compatibility

- An F3 electronics pack can only be used on an F3 detector and similarly, an F3L electronics pack can only be used on an F3L detector.
- It is possible to open the electronics pack and convert an F3 electronics pack to F3L electronics pack and likewise convert an F3L electronics pack to F3 electronics pack.

e. To Open the Electronics Pack:

- Remove the electronics pack from the detector, refer to section [4.3.a To remove the electronics pack.](#)
- Remove four screws from the bulkhead of the electronics pack, as shown in Figure 19.



Figure 19: Opening the Electronics Pack

- Remove the 7/8 in battery connector mounting nut, as shown in Figure 19.
- Remove the battery connector locking mechanism, as shown in Figure 20.



Figure 20: Removing battery connector locking mechanism.

- Slide the electronics pack housing backward exposing the circuit boards.



Figure 21: Removing the Electronics Pack housing.

- The circuit boards and internal components of the electronics pack can now be checked and the configuration links (switches) can be adjusted or checked.
- The top circuit board (ps/tx pcb) with the larger components is the power supplies and transmitter, the bottom circuit board (controller pcb) has the microprocessors and signal processing circuitry.
- Identify and check the configuration links on the micro pcb, refer to Figure 22.

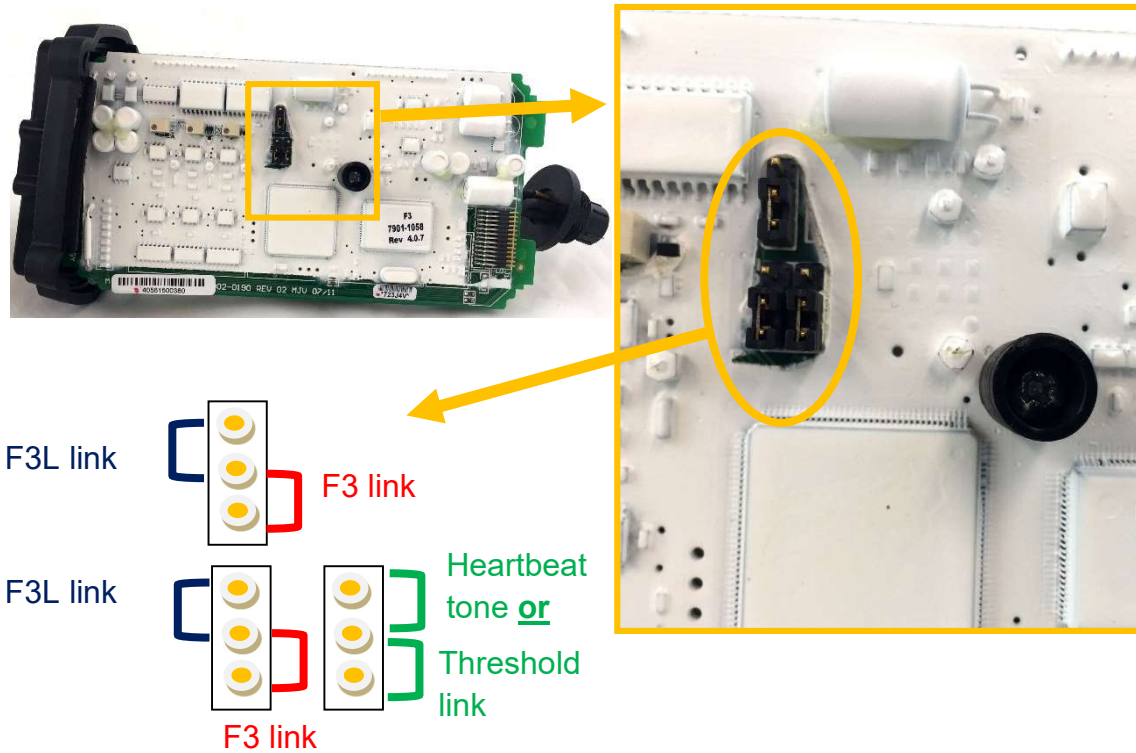


Figure 22: Configuration links.

- Three configuration links must be connected, two links set the detector to F3 or F3L. One link sets the confidence tone to threshold tone or Heartbeat tone.
 - If the detector has an LED display on the handle then the configuration links must be set to F3L.
 - If the detector does not have an LED display on the handle then the configuration links must be set to F3.
- f. To Close the Electronics Pack:**
- Check the configuration links are correctly set refer to Figure 22.
 - Attach the electronics pack housing, battery connector locking mechanism and the bulkhead screws. Assembly is in the reverse order described in section [4.3.e Opening the electronics pack](#)

4.4 Coil.

Figure 23 illustrates the major parts involved in removing and replacing the coil.

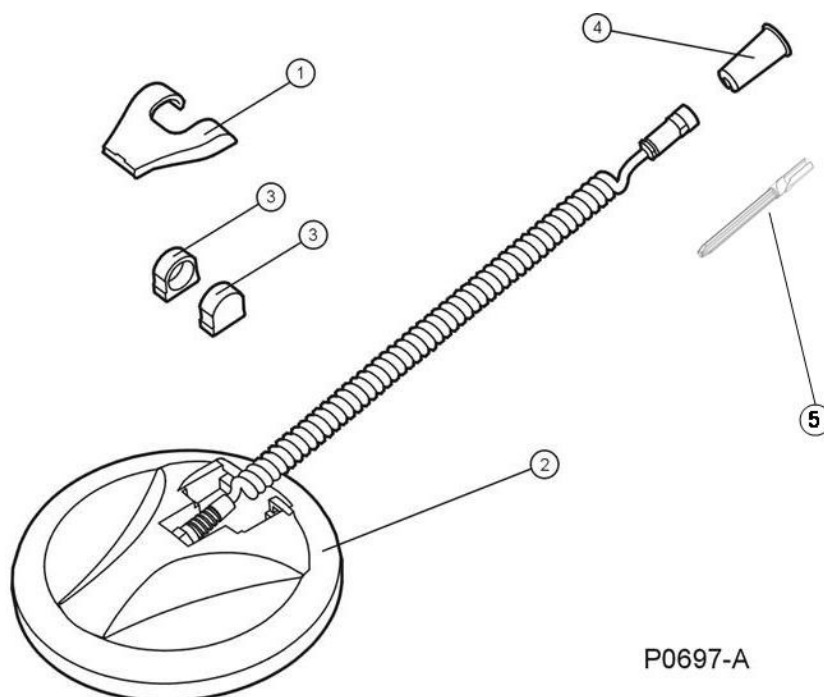


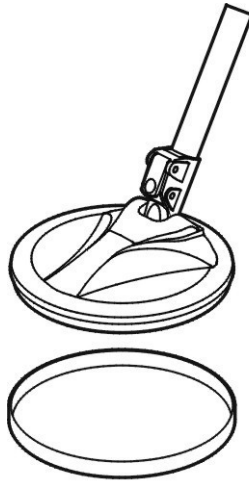
Figure 23: Coil.

Table 2: Coil

	3004-0003	Coil Kit F3 , includes all items in this table
	3004-0038	Coil Retainer Kit , Contains Pt 1 & 3
1	2004-0037	Retainer Coil
3	4005-0039	Block Friction Coil
2	2021-0054	Coil F3
4	8009-0007	Retainer Plug
5	4308-0012	Pin Coil Cable
	2003-0043	Skid Plate

a. To Replace the Skid Plate:

- All Minelab coils should have a skid plate attached to the underside of the coil, the skid plate is designed to protect the coil from wear and tear caused by contact with the ground. The skid plate may need replacing particularly after prolonged heavy use. There is no requirement to remove the skid plate to clean inside during routine maintenance.
- To remove the skid plate use fingers to lever it from the coil. To attach a skid plate to the coil it must be pressed onto the bottom of the coil.



P0654-A

Figure 24: Replacing the Skid Plate.

b. To remove the coil:

- Retract the shafts and remove the battery pack and endcap.
- Remove the electronics pack as described in section [4.3a To remove the electronics pack](#). However, there is no need to remove the electronics pack from the upper shaft.
- Remove the retainer plug from the coil cable, if fitted, as shown in Figure 25.
- Allow the coil cable to retract into the shafts.



Figure 25: Removing Retainer Plug.

- Maintaining firm downward pressure on the 6.5mm screwdriver, carefully lever the coil retainer cover off the coil top and remove it, as shown in Figure 26.

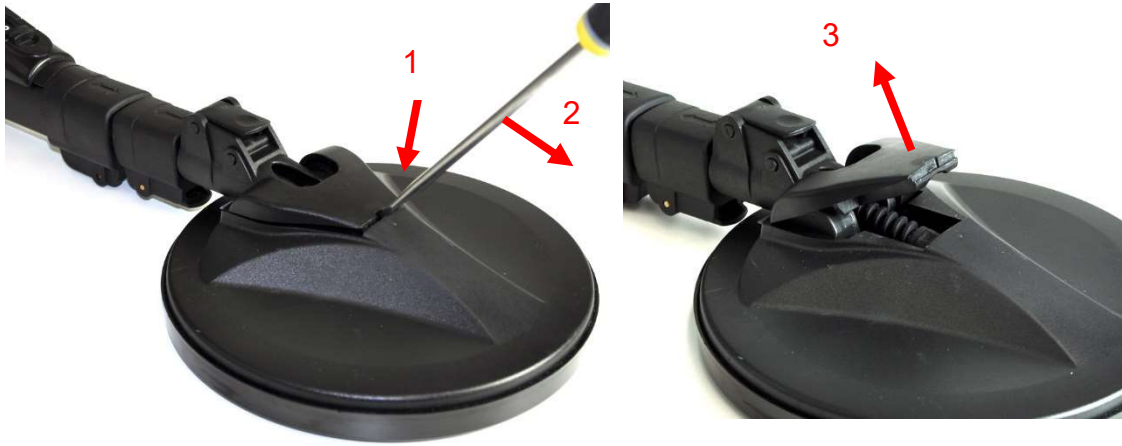


Figure 26: Removing the Coil Retainer

- Lift the lower shaft with lower camlock assembly out of the coil top.
- Carefully pull the coil cable out from inside the shafts, as shown in Figure 27.
- If necessary, remove the coil pin for use with the replacement coil.



Figure 27: Removing the 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 (other than the skid plate)

c. To Connect a Coil:

- Ensure a skid plate is fitted to the coil.



Figure 28: Coil.

- Attach a coil pin into the spirals of the coil cable as shown in Figure 29:
 - inserting the coil pin into the top spirals of the coil cable.
 - position 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 29; Pin Cable Support.

NOTE

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

- Connect the coil cable pull through to the coil plug.

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. Shown in Figure 30

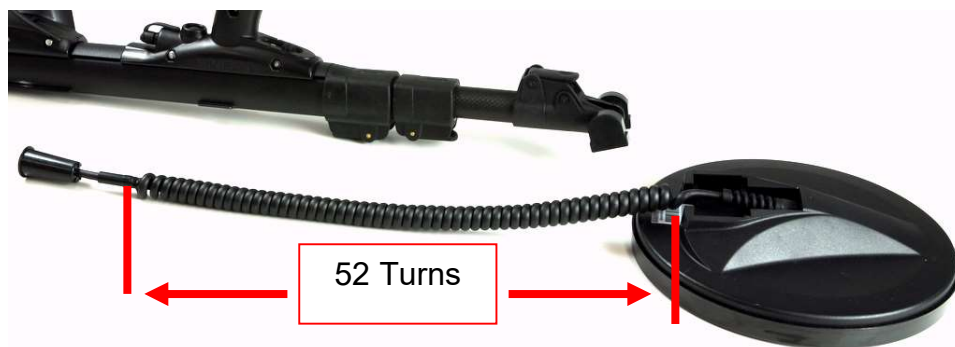


Figure 30: Coil Cable with 52 Turns.

- The coil cable needs to have the correct number of turns in the coil cable so that it doesn't bind or obstruct the shafts when they are extended and collapsed. Turn the connector end of the coil cable to add or remove turns from the coil cable to achieve the correct number of turns.
- Insert the coil cable into the lower shaft, as show in figure 31.

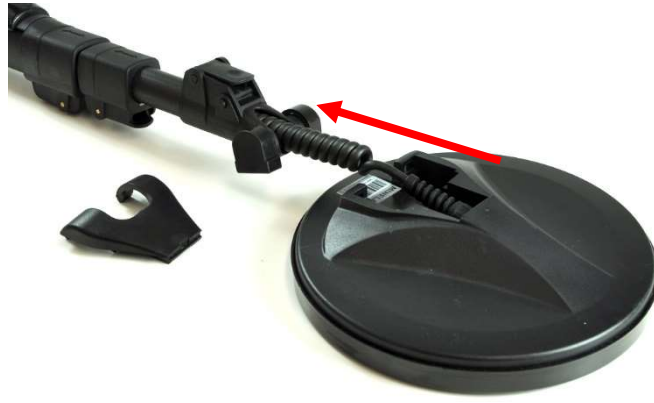


Figure 31: Threading Coil Cable through Shafts.

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 27)



Figure 32: Lower Camlock Assembly Showing Friction Blocks

- 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.

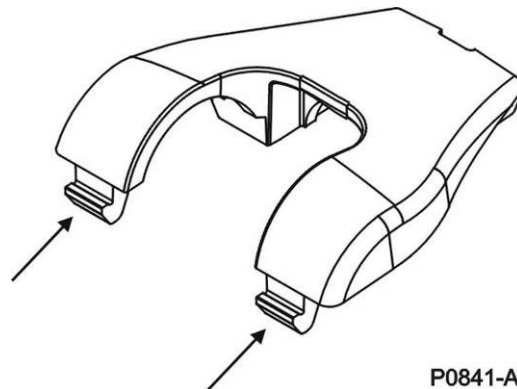


Figure 33: Coil Retainer with Tabs Indicated.

- 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, as shown in figure 34.



Figure 34: Attaching Coil Retainer.

- Reconnect the electronics pack to the coil cable as described in Section [4.3.b.To connect an Electronics Pack.](#)

4.5 UXO Coil

The standard coil for the F3 detector is a 20cm (8inch) mono loop coil, This is ideal for searching for very small metal targets, in particular minimum metal mines. However, when there are no minimum metal mines in the area of operations and the targets being sought are large and deep a larger coil size will often give better results. The F3 UXO coil is a 44cm (18inch) mono loop coil, this will give a stronger signal and greater depth of detection for large metal targets but a weaker signal for very small targets.

An F3 detector with the 20cm (8in) coil can be converted to an F3 UXO detector by removing the 20cm coil and connecting the 44cm (18in) UXO coil. Alternately an F3 UXO detector can be converted to an F3 by removing the 44cm UXO coil and replacing it with a 20cm (8in) coil. Changing coils on the F3 detector requires the correct tools and a level of technical competence. Figure 24 shows the parts of the UXO coil.

Note.

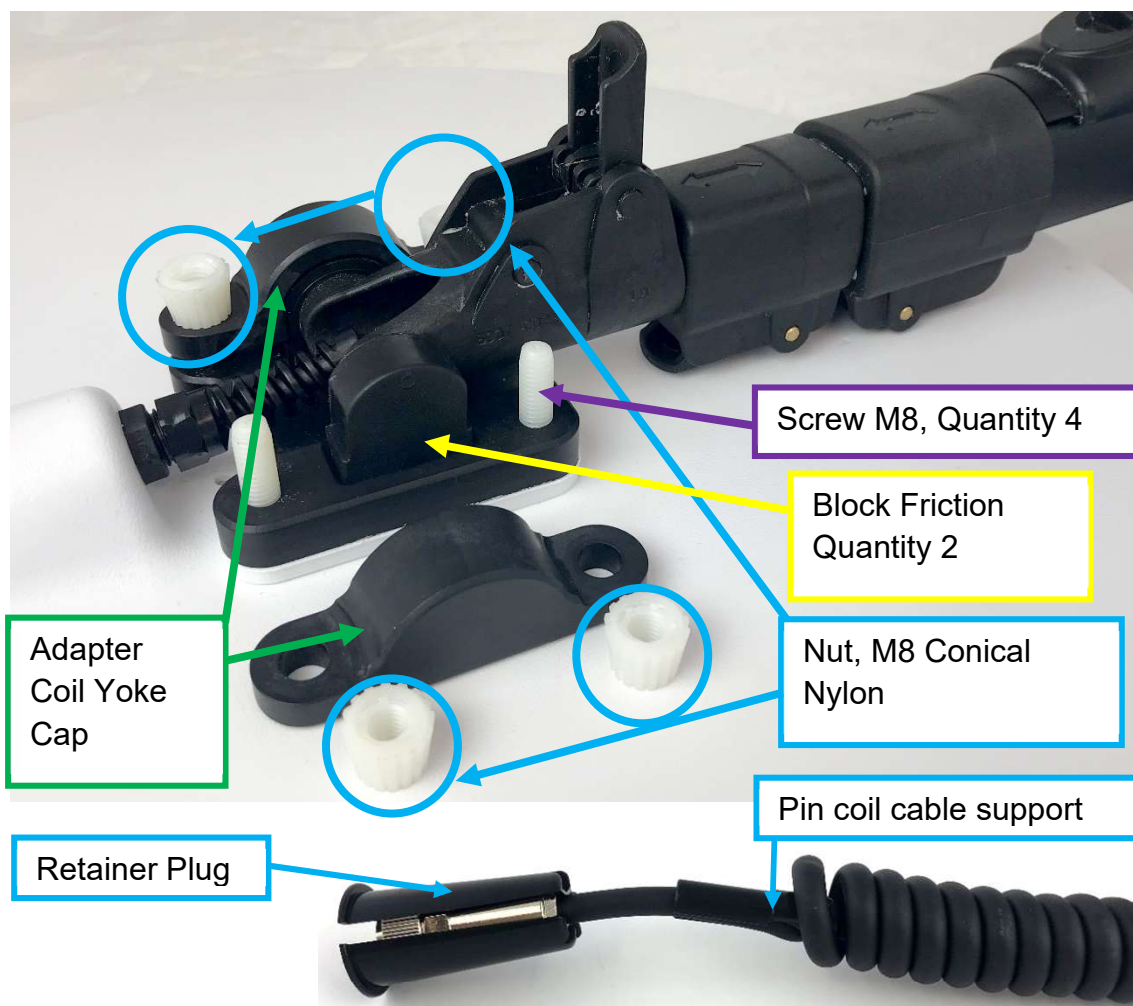
Do not use the F3 UXO coil if there is any possibility of minimum metal mines in the area of operations.

4.5.1 F3 UXO Coil MkII

Parts of 3011-0380 Coil F3 UXO Mk2

Every Coil UXO Mk2 includes all the hardware to mount and connect it to any F3 detector:

3011-0380	Coil Assembly F3 UXO Mk2	Qty
4308-0012	Pin coil cable support	1
8099-0007	Retainer plug	1
2004-0019-002	Skid Plate UXO F3 White	1
8008-0094	Adapter, coil yoke cap	2
4005-0039	Friction Block F3	2
32-26040-990	Screw hex M8x40 Nylon	4
32-00800-990	Nut, M8 Conical Nylon	4



F3 UX0

Coil Change-Over Instruction Sheet

For technical use only – refer to Service Manual:
www.minelab.com/countermine/maintenance



To Remove Small Coil

1. Prepare a clean workspace.
2. Remove the battery pack and endcap from the F3 Detector.
3. Remove the **six screws** holding the bulkhead cover.



4. Unplug the wiring loom.



5. Remove **two upper screws**.
6. Slide the electronics pack rearwards.



7. Unscrew the **coil connector**.
8. Remove the retainer plug.



9. Remove the coil retainer.



10. Pull coil cable out of shafts.

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To Connect UXO Coil

11. UXO Coil adapter yoke.



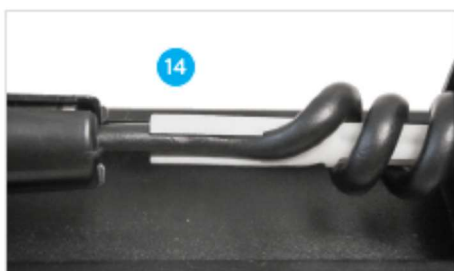
12. Thread coil cable through the shafts. A piece of string can be used.



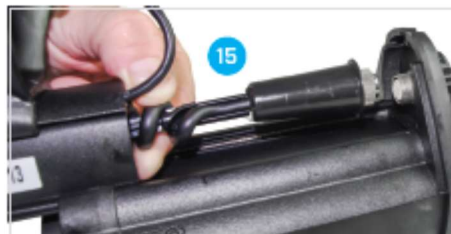
13. Mount the coil to the shaft.



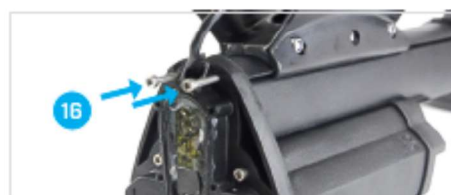
14. Fit coil cable pin.



15. Connect the coil cable and fit the retainer plug.



16. Slide the electronics pack back into place, **replace two screws.**



17. Carefully connect the wiring loom.



18. Replace cover and insert **six screws.**



19. Connect endcap and battery pack then check and test the F3 UXO Detector.

4.5.2 F3 UXO Coil.

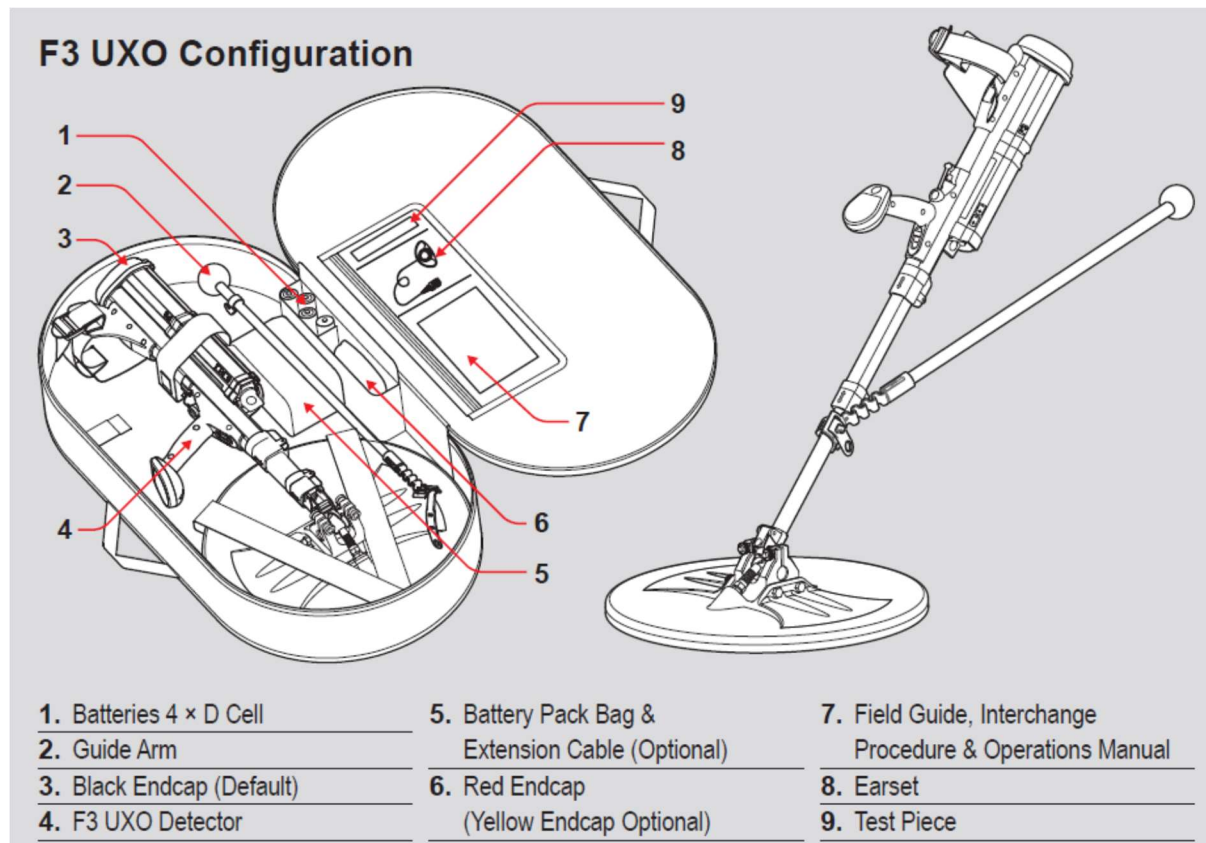


Figure 35: F3 UXO detector.

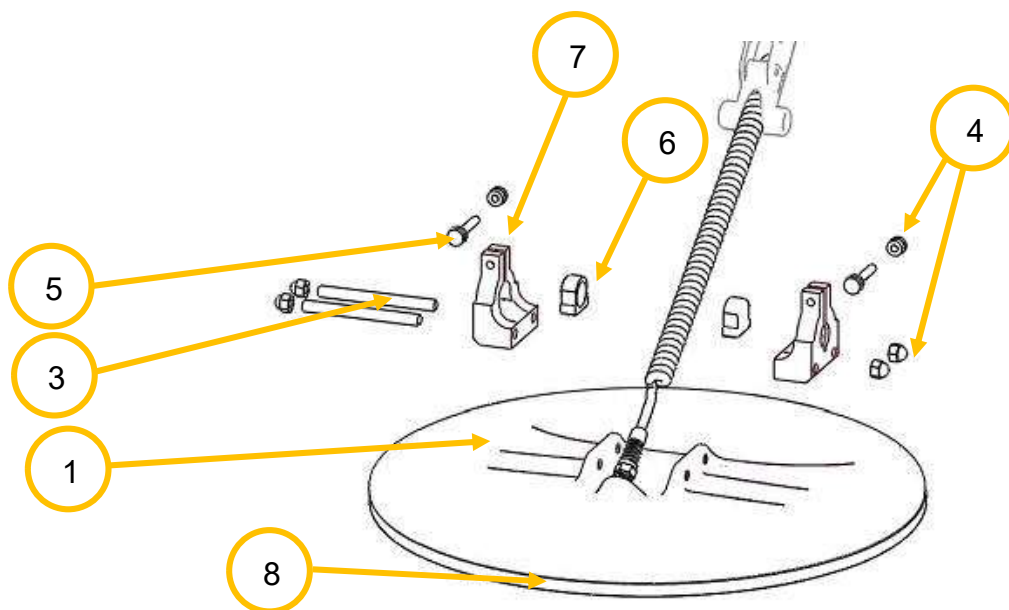


Figure 36: UXO Coil.

Table 3: UXO Coil.

	3011-0097	UXO Coil Kit
1	2021-0086	Coil UXO
	3001-0062	Bag Carry F3-UXO

3	32-31016-999	Bolt Nylon 5/16-18 X 4.0 Hex Hd
4	32-31000-922	Nut Nylon 5/16-18 Knurled
5	32-31006-922	Screw Nylon 5/16-18 X1.5 Knurled
6	4005-0039	Friction Block Coil
7	8008-0052	Adapter Coil Yoke UXO
	3011-0293	Guide Arm
	3011-0294	Kit GA-10 hinge/strap
8	2004-0009	Skid Plate F3 UXO

a. To Connect the UXO Coil to an F3:

- First remove the 20cm coil as described in section [4.4.a. To remove a coil.](#)
- Attach the friction blocks (6) to the lower camlock body at the end of the lower shaft of the F3 detector and then fit the adapter coil yoke (10) on to the friction blocks. As shown in figure 37.



Figure 37: Coil Adapter.

- Connect the coil cable to the coil cable pull through tool or use a piece of string to thread the coil cable through the shafts of the F3 detector.
- Prior to threading the cable through the shafts, ensure the cable has 52 turns in the coil cable curly section.
- Feed the coil cable into the detector shafts as shown in figure 38.
- Attach the coil adapter to the top of the UXO coil. Thread the long nylon bolts through the coil adapter and coil then attach the nylon nuts to the bolts.



Figure 38: Attaching UXO Coil.

- Reconnect the electronics pack to the coil cable as described in Section [4.3.b To Connect an Electronics Pack](#).

Note

The Skid Plate of the UXO coil is held in place by a small amount of silicone glue. The UXO Skid Plate should only ever be removed from the coil when a new replacement is to be fitted.

4.6 Speaker Pod.

Figure 39 illustrates the major parts of the speaker pod.

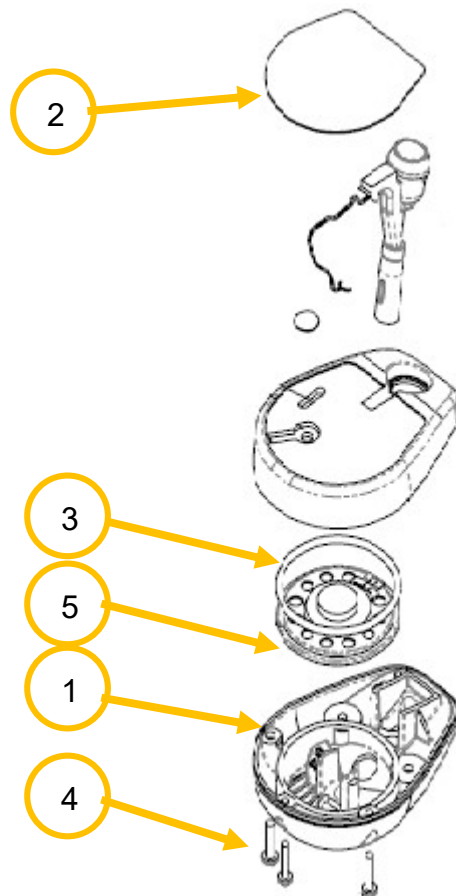


Figure 39: Speaker Pod.

Table 4: Speaker Pod

	3004-0017	Speaker Pod Kit F3 (includes all items in this table) for F3/no LED display
	3004-0037	F3L Speaker Pod Kit (includes all items in this table) for F3L with LED display
1	0708-0005	Enclosure Speaker Lower
2	2701-0092	Decal Speaker/Handle, F3 only
3	30-29011-133	O-Ring Speaker
4	31-03512-580	Screw M3.5X12 Pozi2 Quantity 5
5	CMINE0390	Speaker 0.4W 8 Ohm

NOTE

The Speaker Pod has been upgraded, older versions of the Speaker Pod will only have three screws (part 4 of Figure 27) and will not have the O-Ring.

a. To Remove the Speaker Pod:

- Remove battery pack and sensitivity endcap from the detector.
- Remove five (or three depending on pod version) screws (Part 4 of figure 39) 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 handle and disconnect the speaker pod plug from the main wiring loom.

NOTE

Do not try and remove the 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.

- Older F3 Speaker Pods only. Remove the screw (Figure 28) 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.

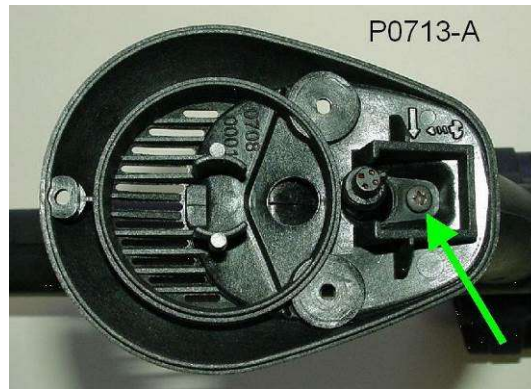


Figure 40: Old Speaker Pod.

- Remove the lower half of the speaker pod by lifting the rear of the pod upwards.
- b. To Connect 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. Refer to section [4.7.b. To Assemble the Handle](#).
 - Peel back the shroud at the end of the speaker pod plug as shown in Figure 41.

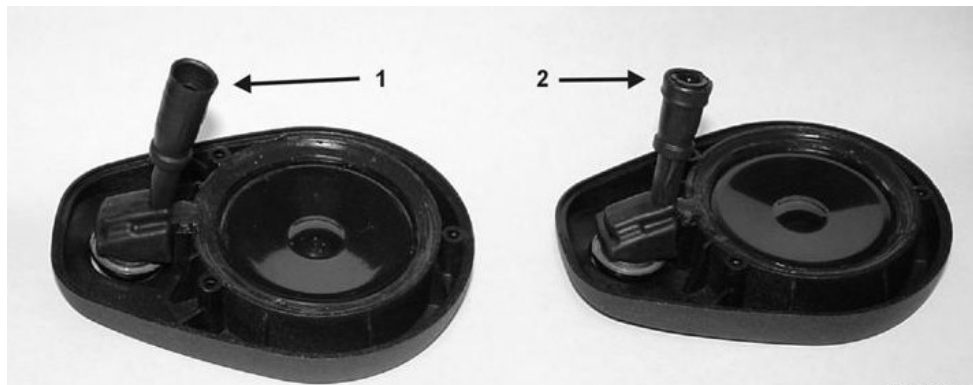


Figure 41: Speaker Pod connector shroud.

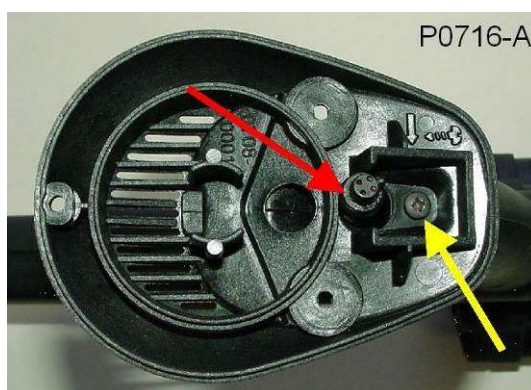
- Attach the lower half of the speaker pod by inserting the tongue at the front top of the handle into the recess in the lower half of the speaker pod. As shown in figure



P0715-A

Figure 42: Attaching Speaker Pod to Handle.

- Ensure the wiring loom plug emerges from the handle into the speaker pod in the correct position as shown in Figure 43.



P0716-A

Figure 43: Correct Position of Wiring Loom Plug (Red Arrow).

- On older F3 speaker pods, using the unique screw (Figure 43) secure the speaker pod to the handle. Newer F3 detectors do not require this screw.
- 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. Shown in Figure 44.



Figure 44: Connecting Speaker Pod to Wiring Loom.

- Ensure the O-Ring is clean, lightly greased and in the correct position, next to the speaker.
- Gently push the upper half of the pod down towards the handle until both halves of the pod are correctly mated.
- Refit the five (or three depending on speaker pod version) screws (Part 5) which hold the pod halves together.
- Refit sensitivity endcap and battery pack.

4.7 Handle.

Figure 45 illustrates the major parts of the handle.

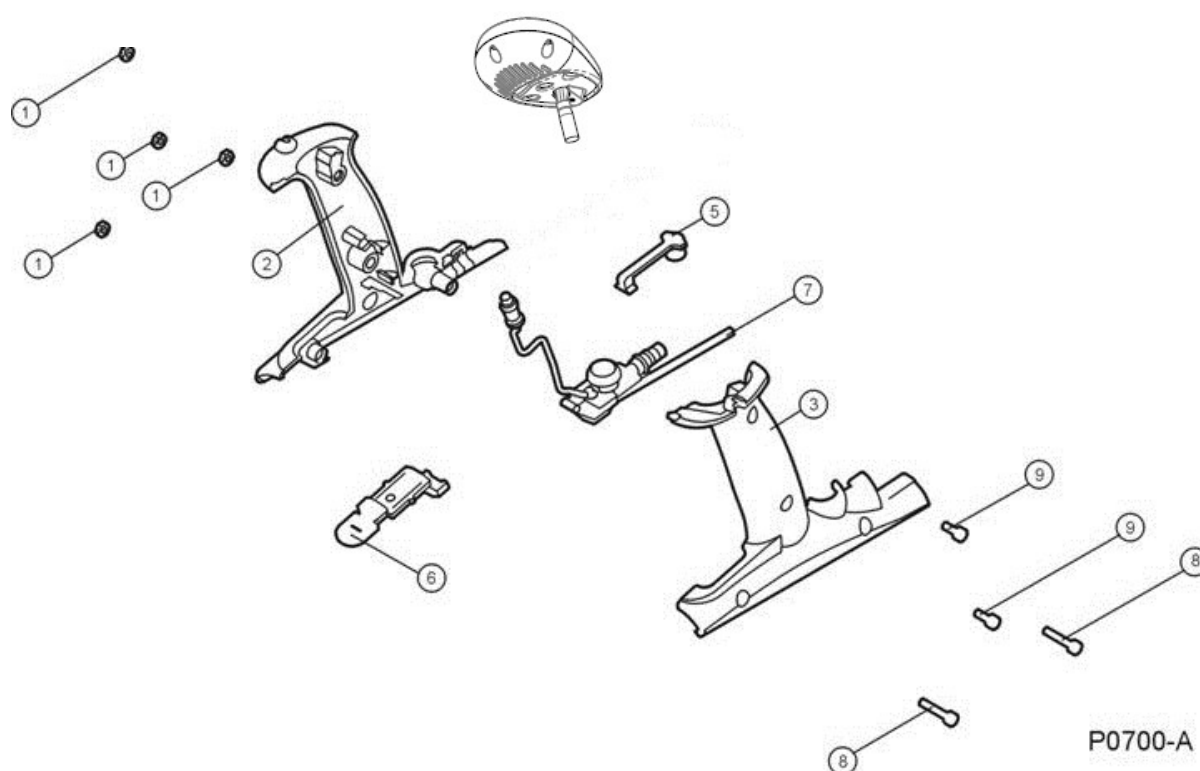


Figure 45: Handle.

Table 5: Handle Kit.

	3004-0032	Handle Kit F3 (for F3 only)
7	3004-0043	Wiring Loom
	3004-0017	Speaker Pod Kit F3
1	4002-0023	Nut M4 Nyloc Ss
2&3	3004-0016	Handle Left & Right Kit
5	4309-0037	Dustcap Earset
6	8301-0031	Switch Slider On/Off
8	31-24025-980	Bolt M4x25 Skt Cap
9	31-24010-980	Bolt M4x10 Skt Cap
	3004-0033	F3L Handle Kit (only used on F3L with LED display)
	3004-0037	F3L Speaker Pod Kit (only used on F3L)

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 wiring loom. It is not repairable.

a. To Disassemble the Handle:

- Remove the speaker pod. Refer to section [4.6.a. To Remove the Speaker Pod](#).
- Undo and remove the four nuts and bolts holding the handle halves together using a 3mm Hex Driver (Allen key).
- Carefully separate the left handle half from the upper shaft.
- Remove the earset dust cap. (Part 5).
- Old F3 detectors only remove the captive nut.
- 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. As shown in Figure 46.

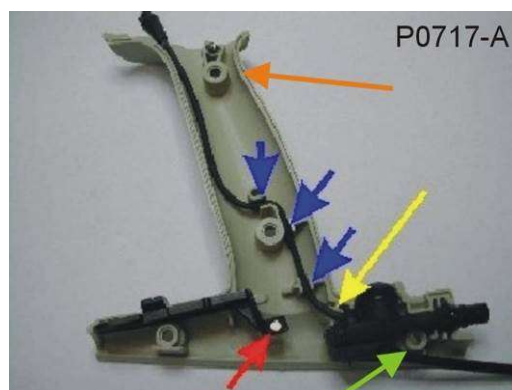


Figure 46: Handle with Wiring Loom correctly positioned.

- 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 (Part 6) is correctly positioned.
- Fit the earset dust cap into the recess in the handle just forward of the earset plug. Shown in Figure 47.
- Old F3 detectors only, place the captive nut in the top of the handle.



Figure 47: Recess for Dust Cap.

- 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 in the handle.

4.8 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.

a. To Remove the Wiring Loom:

- Remove the speaker pod, follow the instructions given in section [4.6.a. To Remove the Speaker Pod.](#)
- Disassemble the handle, follow the instructions given in section [4.7.a. To Disassemble the Handle.](#)

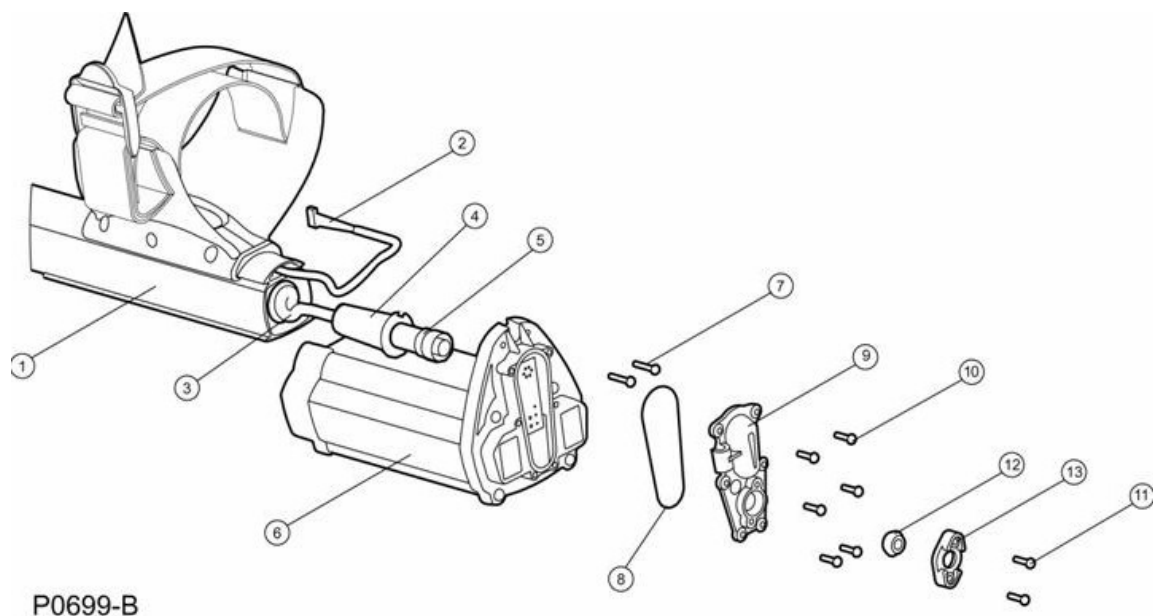


Figure 48: Wiring Loom and electronics pack.

Table 6: Wiring Loom and electronics pack

6	3004-0001	Electronics Pack Kit F3
1	8007-0023	Upper Shaft F3
2	3004-0043	Wiring Loom F3
3		Coil Cable (Part Of 2021-0054 Coil F3)
4	8009-0007	Retainer Plug F3
5		Coil Connector (Part of 2021-0054 Coil F3)
7	31-23020-980	Screw M3x20 Skt Cap
8	30-4309-0039	O-Ring Bulkhead 50mm
9	0703-0095	Cover Bulkhead EP
10 & 11	4003-0084	Screw No 3x12 Posi
12	4309-0071	Grommet Bulkhead Split EP
13	0703-0097	Cover Ribbon Cable EP
6	3004-0036	F3L Electronics Pack Kit (only used on F3L)

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 six screws holding the bulkhead cover to the electronics pack rear panel. Shown in Figure 49.

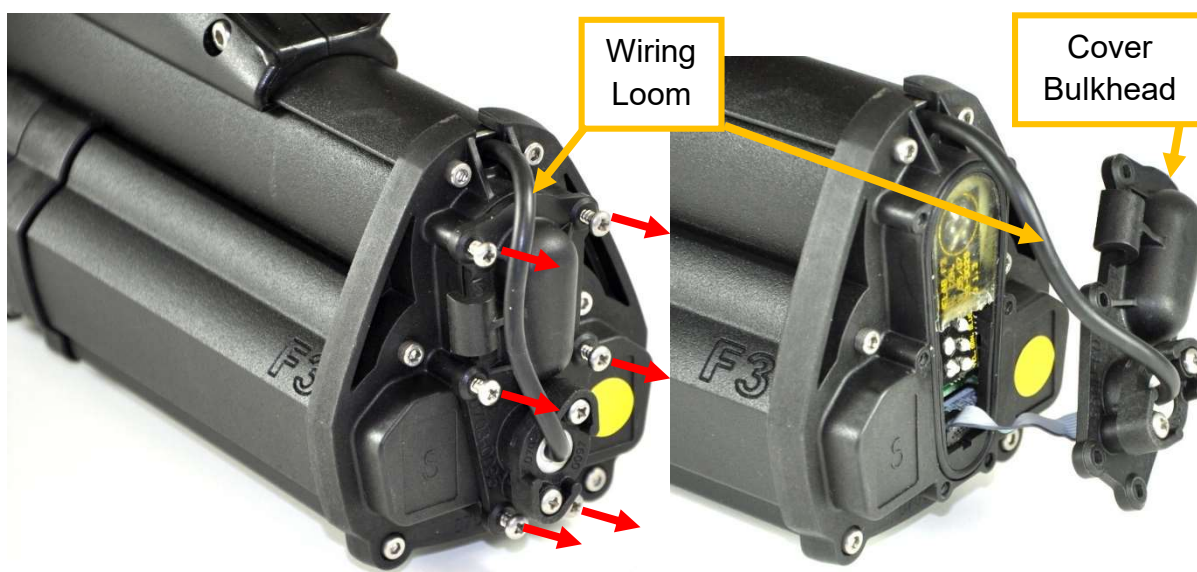


Figure 49: Removal of Cover Bulkhead from the Electronics Pack.

- Pull the Cover Bulkhead away from the electronics pack.
- Gently unplug the wiring loom plug from the electronics pack printed circuit board, as shown in Figure 50.

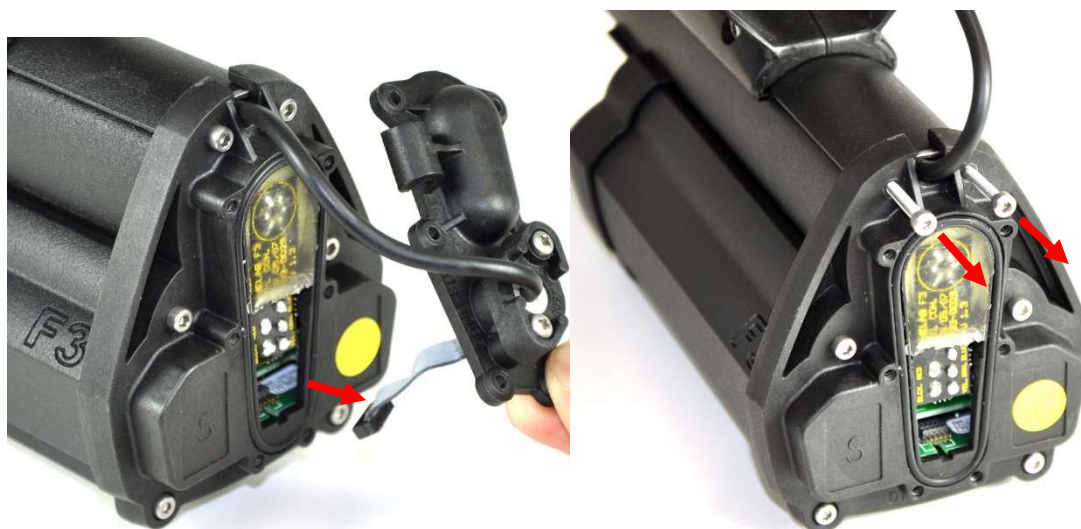


Figure 50: Disconnecting wiring loom.

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 securing the electronics pack to the upper shaft. Shown in Figure 50.

- Slide the electronics pack back along the upper shaft (avoid snagging the wiring loom) approximately 10cms (4ins) exposing the coil cable.
- Remove the two screws holding the cover ribbon cable to the cover bulkhead. Shown in Figure 51.
- Carefully pull back the Cover Ribbon Cable releasing the split grommet from the Cover Bulkhead.

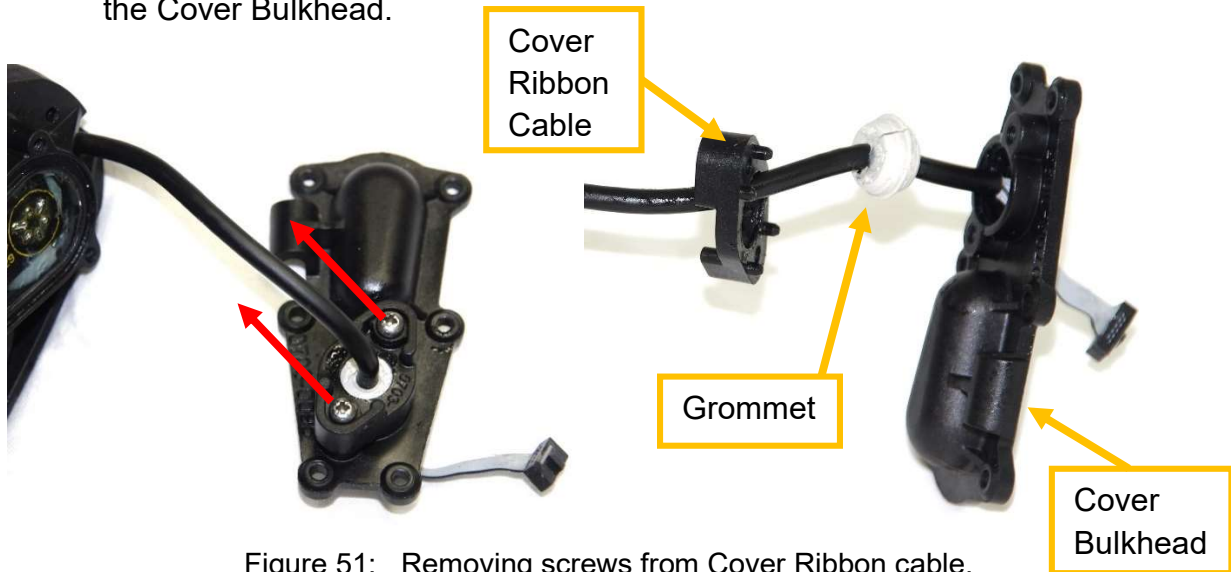


Figure 51: Removing screws from Cover Ribbon cable.

NOTE

*Extreme care must be taken when handling the wiring loom connector. **DO NOT** use excessive force as this may cause damage to the connector or the wiring loom.*

- The cover bulkhead, and cover ribbon cable can be threaded over the connector on the wiring loom and off the wiring loom.
- The grommet is removed from the wiring loom by gently prying open the split in the grommet with finger nails then lift off of the wiring loom.
- Gently pull the wiring loom through the spine of the upper shaft toward the handle and remove it.
- The wiring loom is removed from the F3 and can now be replaced if required.

b. To Connect the Wiring Loom:

- With a new wiring loom, gently push the cable (connector first) through the spine of the upper shaft emerging at the opening at the end of the upper shaft. Shown in Figure 52

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.

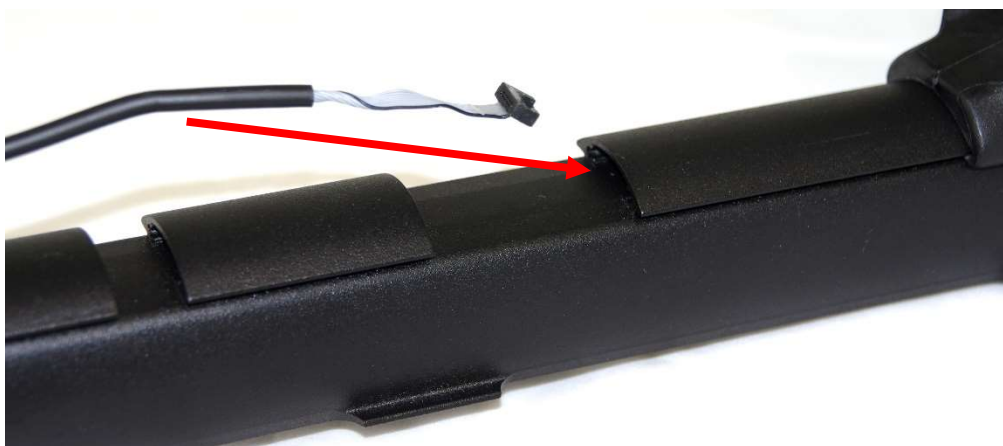


Figure 52: Inserting wiring loom.

- Thread the cover ribbon cable and cover bulkhead over the wiring loom connector and onto the wiring loom.
- The grommet is attached to the wiring loom by prising open the split in the grommet with finger nails to get on to the wiring loom. Shown in Figure 53.

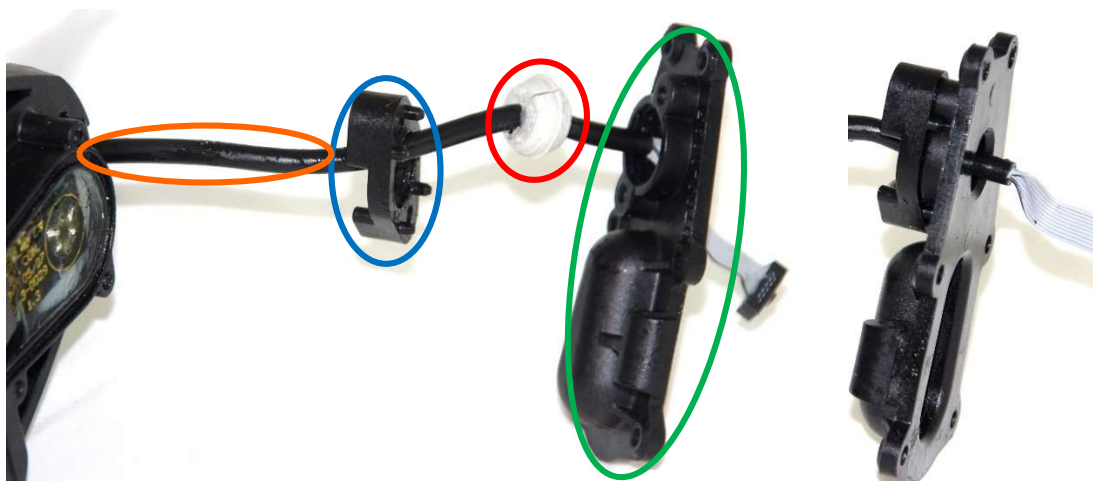


Figure 53: Correct Placement of Wiring Loom (Orange), Cover Ribbon Cable (Blue), Grommet (Red) and Cover Bulkhead (Green).

- Clean and lightly grease the grommet.

- Fasten two screws into the cover ribbon cable. Shown in Figure 54. Tightening these screws squeezes the grommet around the wiring loom creating a water tight seal.

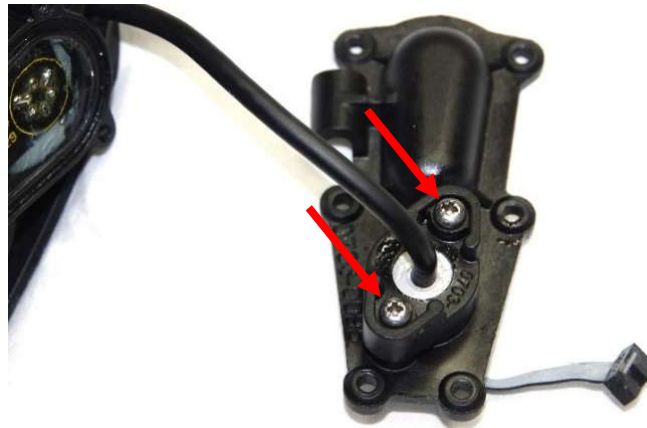


Figure 54: Cover Bulkhead.

- 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.
- Insert the two screws securing the electronics pack to the upper shaft.



Figure 55: Connecting the Electronics Pack to the shaft.

- Clean and lightly grease the O-ring (Part 8).
- 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 is towards the bottom of the electronics pack then plug the wiring loom into the connector in the electronics pack. Shown in Figure 56.

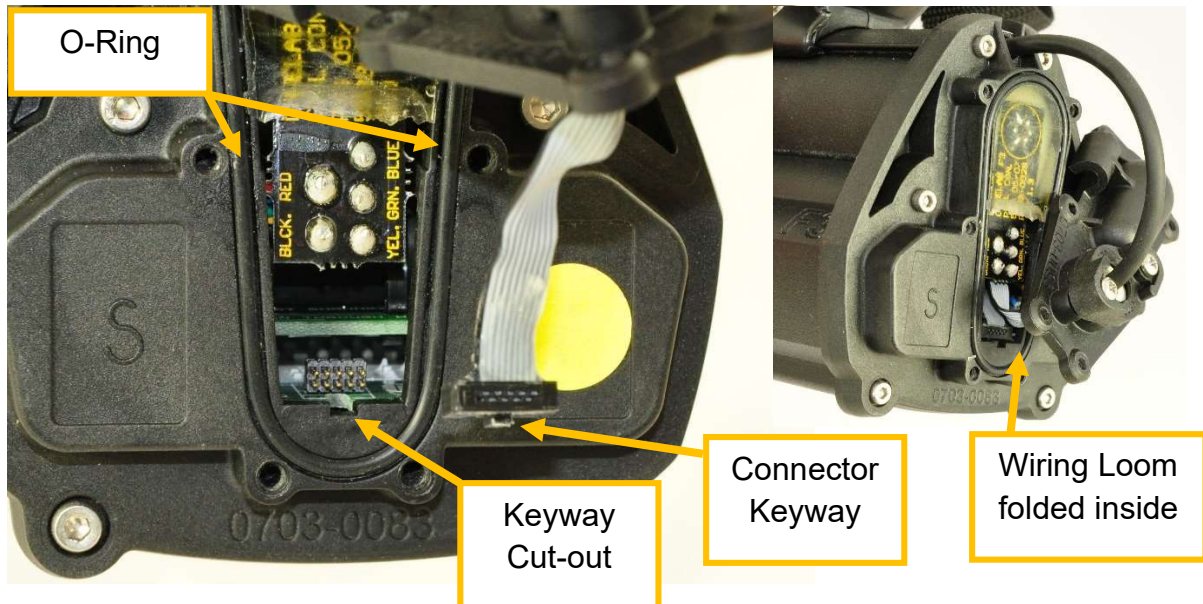


Figure 56: Connecting Wiring Loom to the Electronics Pack.

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. Shown in Figure 56.
- Attach the bulkhead cover with six screws. Route the wiring loom under the cable router on the side of the bulkhead cover. Shown in Figure 57.

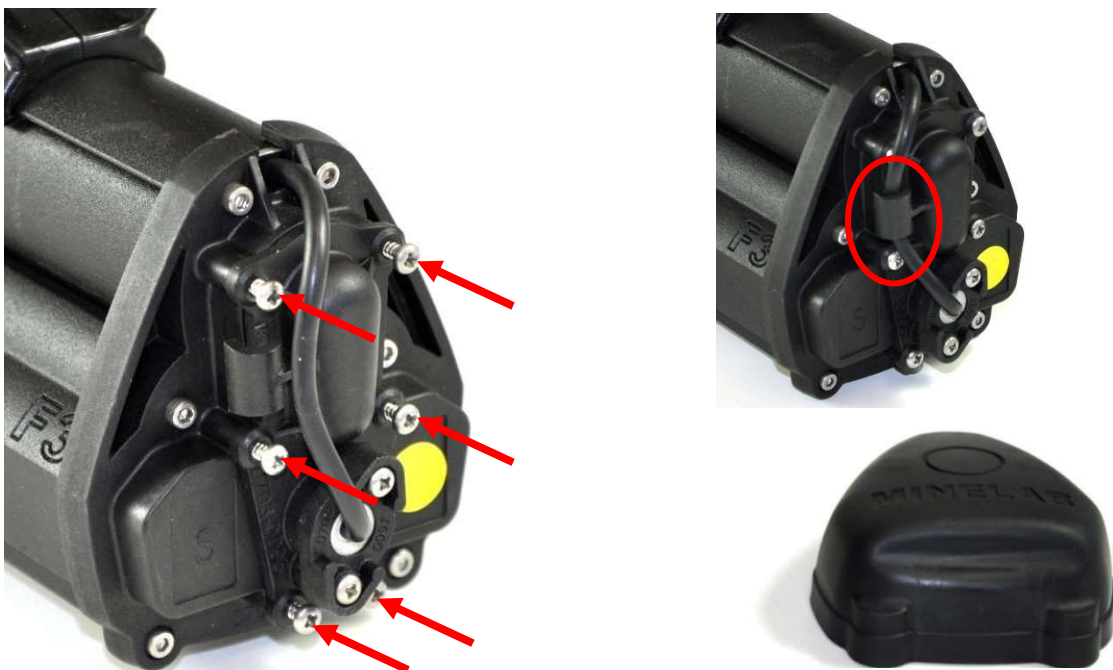


Figure 57: Attaching the Cover Bulkhead and routing of Wiring Loom

- Connect the sensitivity endcap.

- Assemble the handle, follow the instructions given in Section [4.7.b.To Assemble the Handle.](#)
- The Wiring loom has been replaced, conduct the functional and mechanical testing of the F3 before using the detector.

4.9 Armrest.

Figure 58 illustrates the major parts of the armrest.

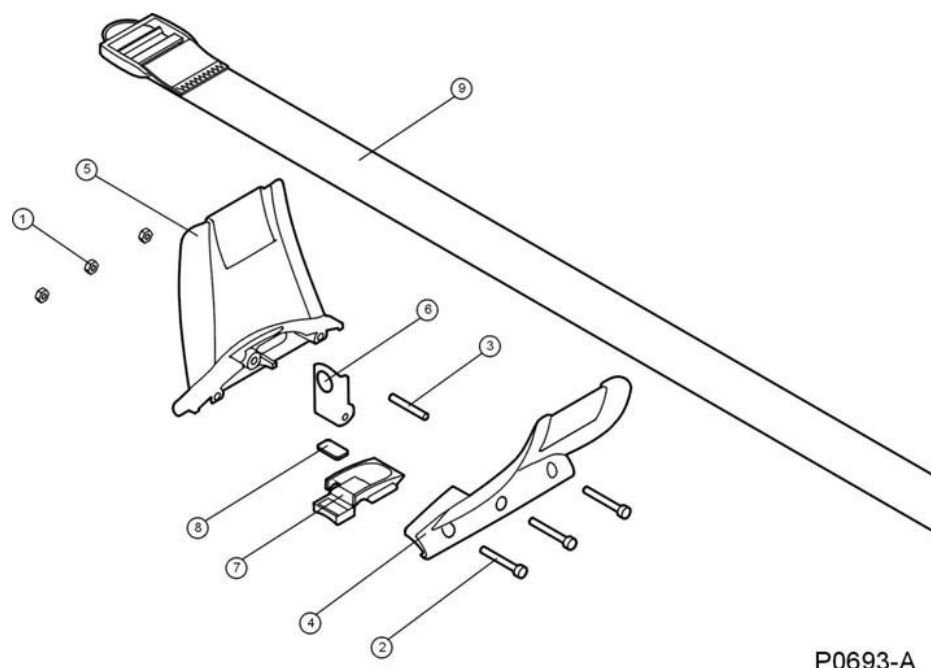


Figure 58: Armrest.

Table 7: Armrest.

	3004-0034	Armrest Kit F3, All items in this table
1	31-24000-780	Nut M4 Nyloc
2	31-24030-980	Bolt M4x30 Skt Cap
3	4308-0003	Pin Cam Lever
4&5	3004-0015	Armrest Left & Right
6	8008-0005	Cam Lever
7	8008-0070	Pressure Block Armrest
8	8008-0030	Wear Plate
9	8005-0018	Strap Armrest

a. To Disassemble the Armrest:

- Remove the armrest if required. If the electronics pack has been removed the armrest can be slid off the upper shaft.
- 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 Replace the Armstrap:

- Thread the armstrap as shown in Figure 59.

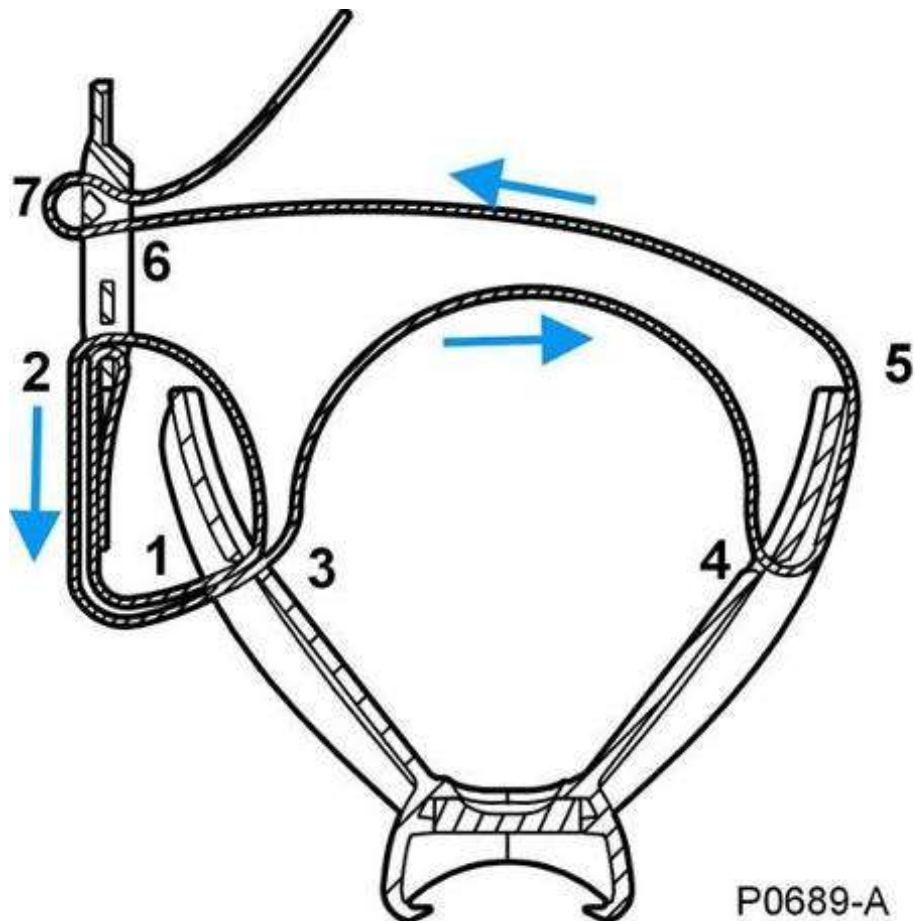


Figure 59: Threading the Armstrap, view from coil.

4.10 Shafts.

The following procedures detail shaft disassembly/assembly and should be followed in order until the component to be replaced is accessible. Figure 60 illustrates the components of the shaft assembly.

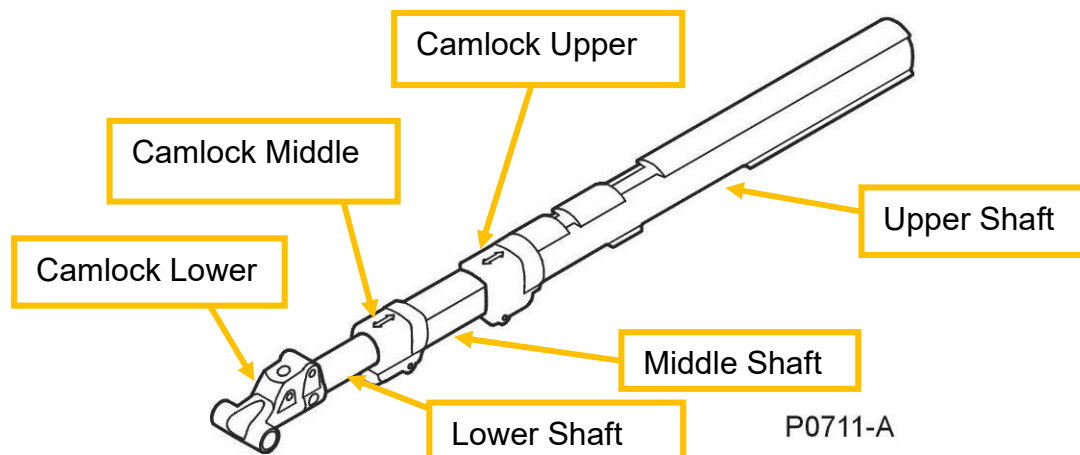


Figure 60: Shafts

a. To Disassemble Camlock Lower and Lower Shaft:

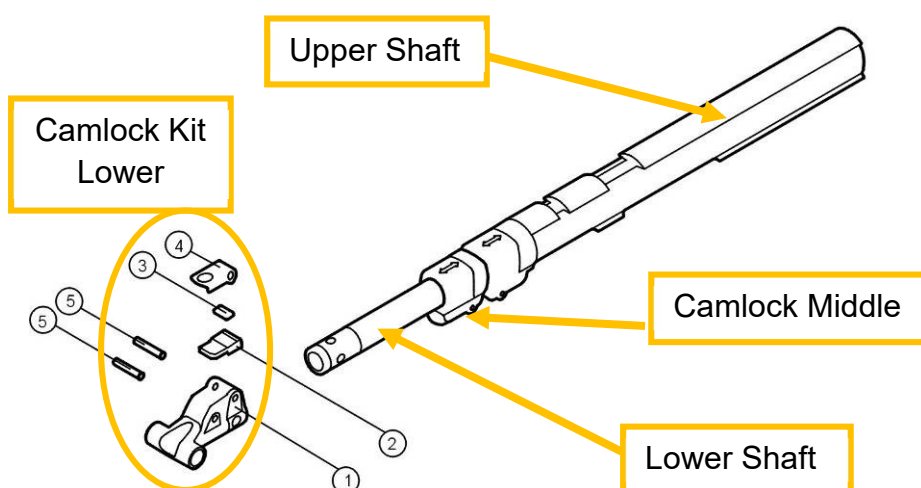


Figure 61: Camlock Lower.

Table 8: Camlock Kit Lower

	3004-0011	Camlock Kit Lower, contains items 1 to 5
1	8007-0022	Camlock Body Lower
2	8008-0071	Pressure Block Lower (include wear plate)
3	8008-0030	Wear Plate
4	8008-0029	Cam Lever Lower
5	4308-0008	Pin Lower Camlock
	8007-0028	Lower Shaft (not part of camlock kit lower)

- Remove the electronics pack. Refer to section [4.3.a. To Remove the Electronics Pack](#)
- Remove the coil. Refer to section [4.4.a. To Remove the Coil](#).
- Using Figure 61 as a guide, use the 3mm hex driver (Allen key) or punch to push out the two pins (Part 5) from the camlock lower
- Remove the camlock body lower (Part 1) from the lower shaft.
- Remove the lower shaft by pushing it back through the upper/middle shafts.

Note

The pressure block can be replaced without the need to remove the electronics pack and coil. Press out the pin through the camlock lever then remove the camlock lever to directly access the pressure block.

b. To Disassemble the Camlock Middle and Middle Shaft:

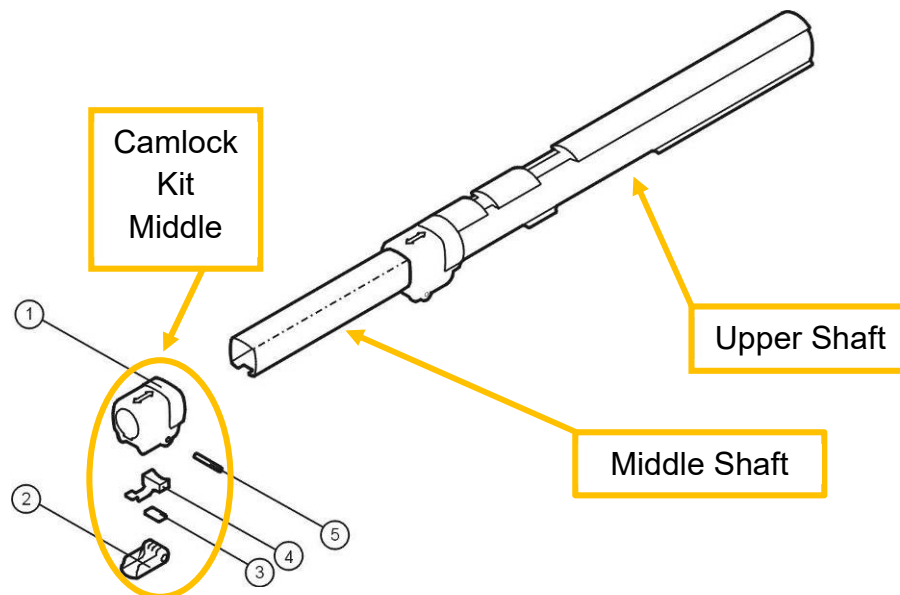


Figure 62: Camlock Middle.

Table 9: Camlock Kit Middle.

	3004-0012	Camlock Kit Middle , contains items 1 to 5
1	8008-0023	Camlock Body Middle
2	8008-0005	Cam Lever
3	8008-0030	Wear Plate
4	8008-0069	Pressure Block Middle (include wear plate)
5	4308-0003	Pin Cam Lever
	8007-0024	Middle Shaft (not part of camlock kit middle)

- Using Figure 62 as a guide, use the 3mm hex driver (Allen key) or punch to push out the pin (Part 5) from the camlock middle.
- 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.

c. To Disassemble the Camlock Upper:

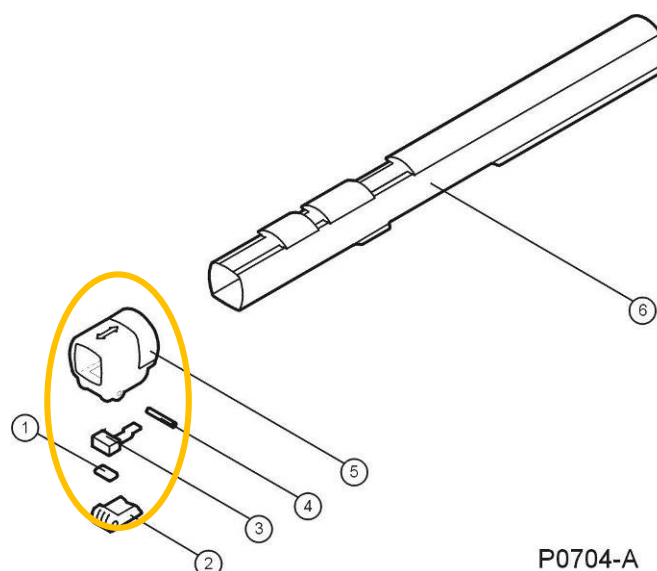


Figure 63: Camlock Upper.

Table 10: Camlock Kit Upper

	3004-0013	Camlock Kit Upper , contains items 1 to 5
1	8008-0030	Wear Plate
2	8008-0005	Cam Lever
3	8008-0068	Pressure Block Upper (includes wear plate)
4	4308-0003	Pin Cam Lever
5	8008-0021	Camlock Body Upper
6	8007-0023	Upper Shaft (Not Part Of Camlock Kit)

- Using Figure 63 as a guide, use the 3mm hex driver (Allen key) or punch to push out the pin cam lever pivot (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 camlock body upper from the upper shaft.

d. To Reassemble the Camlock Upper:

- Press the camlock body upper on to the upper shaft, ensuring that the square hole in the camlock body is aligned with the cut-out in the upper shaft. Shown in figure 64.



Figure 64: Camlock Upper.

- Place the tail of the pressure block upper into the recess in the rear of the camlock body upper and push the block down into the square hole. Shown in figure 64.

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.

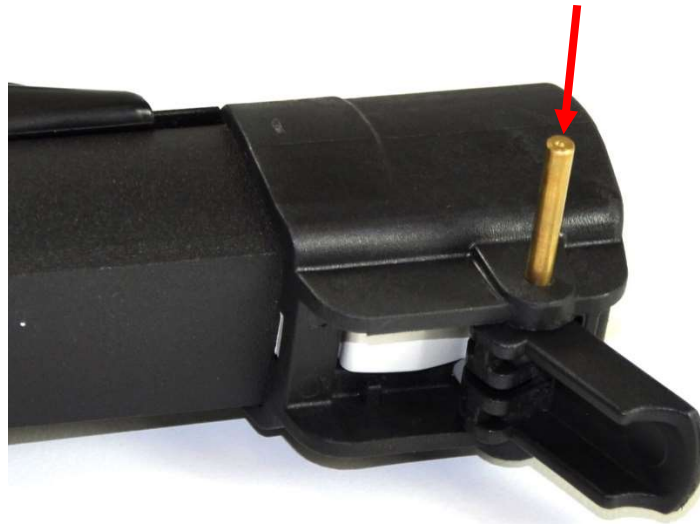


Figure 65: Reassembling the Camlock Upper.

- Hold the cam lever in place whilst the pin is pushed into the camlock. Shown in Figure 65.
- Open the cam lever upper.

e. To Reassemble the Camlock Middle and Middle Shaft:

- Using Figure 66 as a guide, attach the two collars (Part 3) to the rear of the middle shaft.

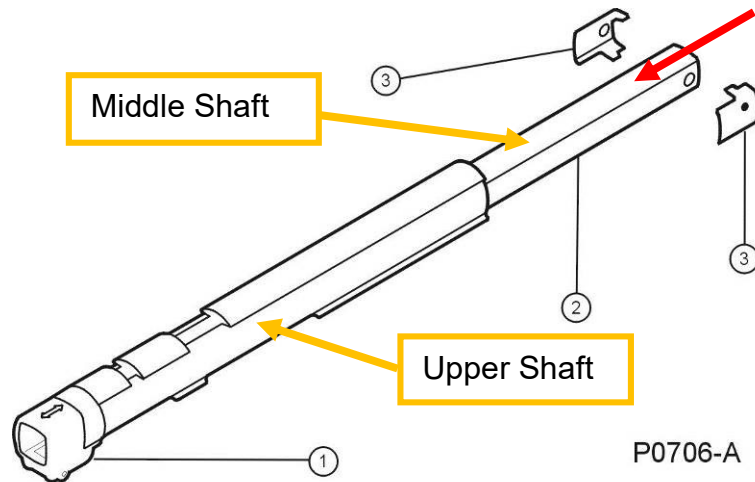


Figure 66: Middle Shaft.

- Slide the middle shaft into the rear of the upper shaft with the square hole facing down.
- Open the camlock upper and feed the middle shaft through the camlock upper then close the camlock.
- Align the camlock body middle so that its square hole lines up with the hole in the middle shaft then press the camlock body onto the middle shaft. Shown in Figure 67.
- Place the tail of the pressure block middle into the recess in the front of the camlock body and push the pressure block into the square hole.

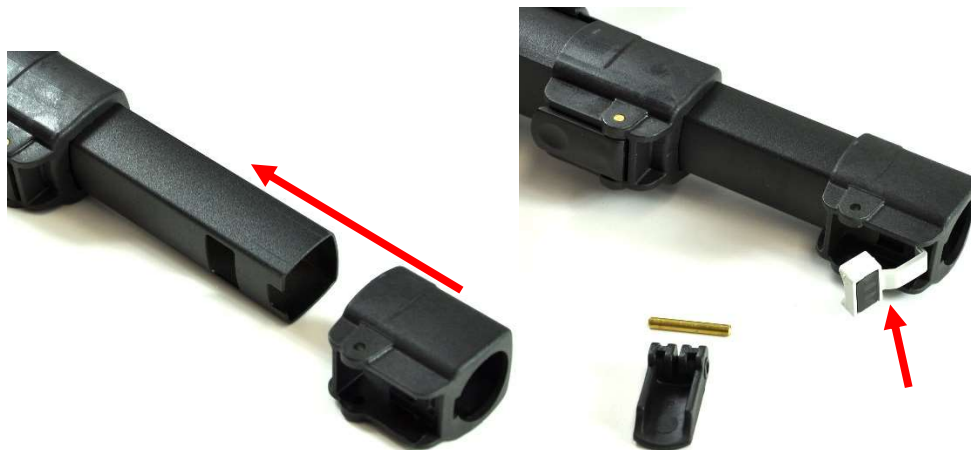


Figure 67: Reassembling Camlock Middle.

- Position the cam lever and then press pin cam lever into place. Shown in Figure 68.

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 68: Pushing Pin Cam Lever in.

- Check the middle camlock operates correctly.
 - Open the cam lever middle.
- f. To Reassemble the Camlock Lower and Lower Shaft:**
- Position the cam lever then push the pin lower camlock into the camlock body. Open the lower cam lever. Place the lower pressure block into the lower camlock body. Refer to Figure 69.

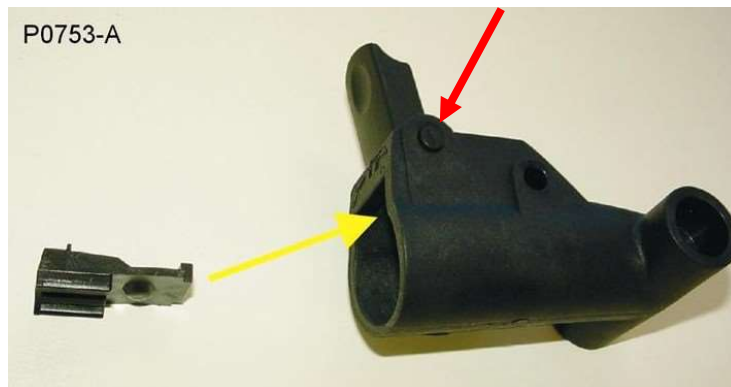


Figure 69: Inserting Pressure Block Lower into Camlock Lower.

- Slide the lower shaft through the upper/middle shafts, protruding section at front of the lower shaft uppermost. Shown in Figure 71.

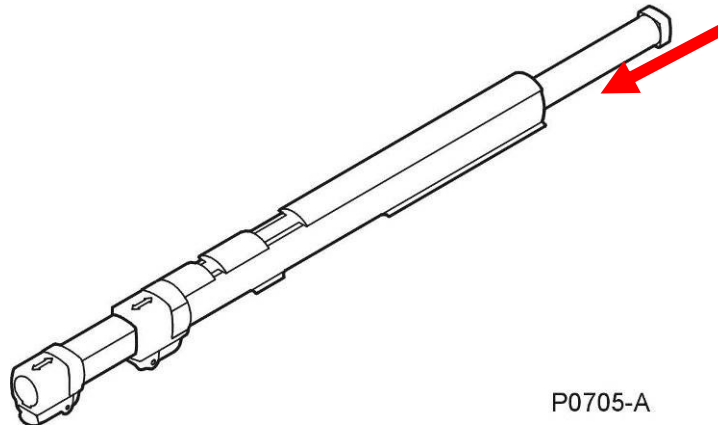


Figure 70: Inserting the Lower Shaft.

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



Figure 71: Connecting the Camlock Lower to the Lower Shaft.

- Turn the detector back over and ensure that the lower camlock assembly is positioned on the lower shaft with the cam lever uppermost.
- Push the pin into the camlock lower. Shown in Figure 72.

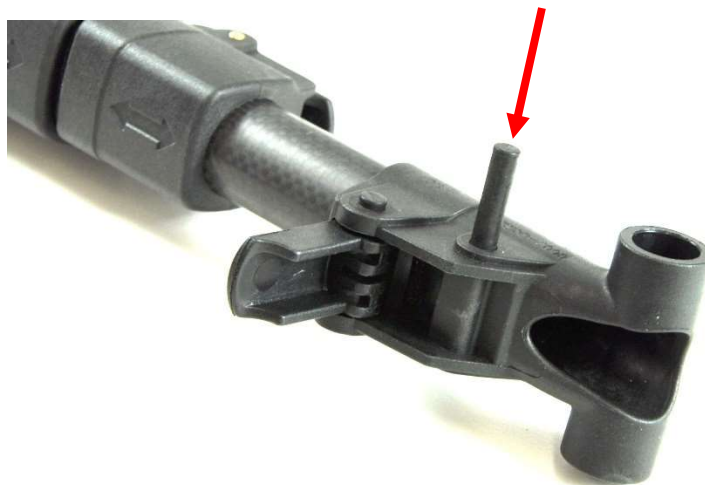


Figure 72: Inserting Pin Lower Camlock.

- Refit the friction blocks to the camlock lower. The flat side of the friction blocks should face down. Shown in Figure 73.

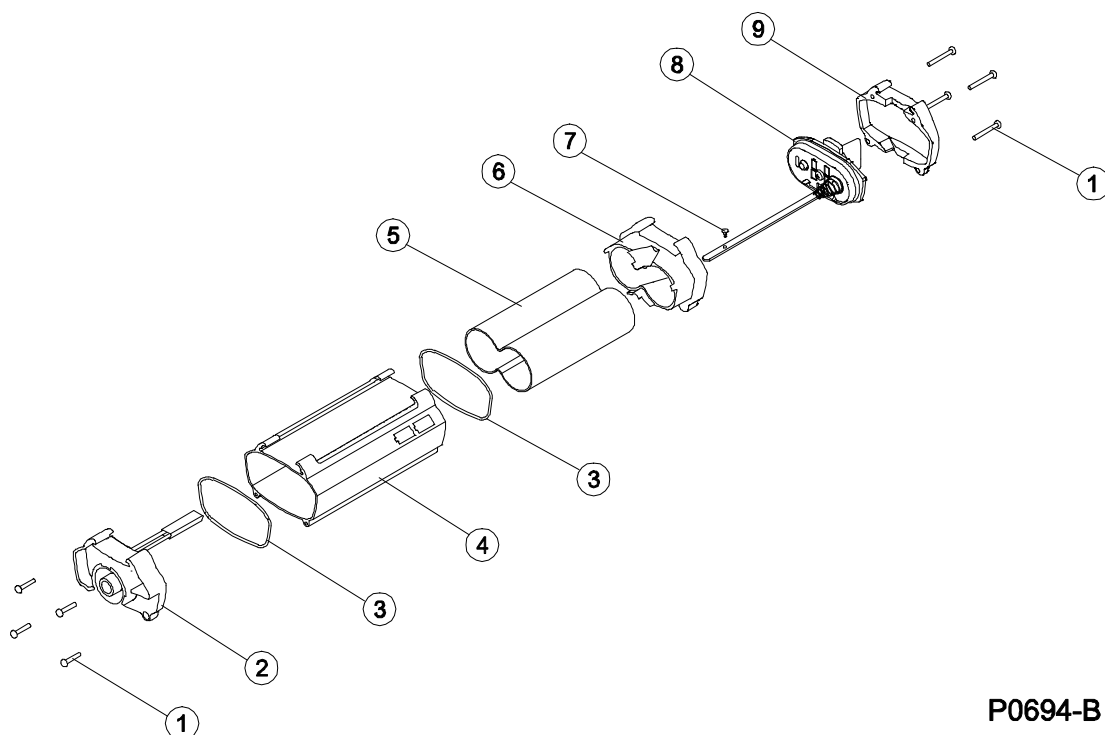


Figure 73: Connecting Friction Blocks.

- Connect the coil, refer to section [4.4.c To Connect a Coil](#). Connect the electronics pack, refer to section [4.3.b To Connect an Electronics Pack](#).

4.11 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 74.



P0694-B

Figure 74: Battery Pack.

Table 11: Battery Pack.

	3004-0035	Battery Pack
1	31-23020-980	Screw M3x20 Skt Cap
2	0705-0016	Panel Assy Cap Rear BP
3	4309-0040	O-Ring Endcap Bp Ep
4	0701-0030	Housing BP
5	0703-0126	Battery Tube Bp
6	0703-0079	Cap Front Bp
7	3004-0005	Tether Kit Lid
8	3004-0004	Lid Kit Battery Pack
9	0703-0098	Faceplate Cap Front Bp

5 Fault Finding Procedures

5.1 Introduction.

A functional test failure (section [3.2. Functional Testing](#)) can generally be repaired by replacing one or all of the following line replaceable units:

- Coil
- Wiring Loom
- Electronics Pack

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.

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

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

5.2 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"> • check batteries are installed correctly • replace batteries with fresh batteries • remove and refit battery pack • replace battery pack • replace wiring loom • replace electronics pack
F3 will not switch off	<ul style="list-style-type: none"> • remove battery pack and refit • check magnet on ON/OFF slide has not been dislodged and connected to the wiring loom • replace wiring loom • replace electronics pack

After switching on the F3 makes no sound from speaker	<ul style="list-style-type: none"> • check for tone using the earset • if there is tone through earset - replace speaker pod • if there is no tone through earset - replace wiring loom • if there is no tone through earset - replace electronics pack
Threshold tone is intermittent (including LEDs for F3L)	<ul style="list-style-type: none"> • replace wiring loom
Threshold Tone is too loud	<ul style="list-style-type: none"> • ensure area is free from local electromagnetic interference • conduct Audio Reset • conduct Noise Cancel • replace coil • replace electronics pack • replace wiring loom
On switch on, the “Coil Fault” tone occurs - “low pitched double tone every five seconds”	<ul style="list-style-type: none"> • check the coil plug is firmly secured to the electronics pack • inspect coil cable for damage – if no damage replace electronics pack • if damaged replace with new coil
On switch on, the “Equipment Fault” tone occurs – “low pitched slow oscillating tone (ee-aww, ee-aww)”	<ul style="list-style-type: none"> • check endcap is secure • replace electronics pack
After working in hot conditions, detector makes a loud noise	<ul style="list-style-type: none"> • conduct Audio Reset • replace coil • replace electronics pack • replace wiring loom
Ground Balance does not work	<ul style="list-style-type: none"> • replace speaker pod • replace wiring loom • replace coil • replace electronics pack

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"> • repeat Noise Cancel • replace wiring loom • replace electronics pack
Audio Reset does not work	<ul style="list-style-type: none"> • replace speaker pod • replace wiring loom • replace coil
LEDs do not illuminate (F3L only)	<ul style="list-style-type: none"> • ensure detector is F3L configuration - if not speaker pod is incorrectly matched • pressing and hold the ⊕ button and quickly press and release the green ground balance button. • replace speaker pod (F3L version)
Cannot hear the Test Piece	<ul style="list-style-type: none"> • ensure detector has been switched on for 30 secs before conducting the test • conduct Audio Reset • fit and use an earset • if using an F3L ensure volume level is set to default • conduct Noise Cancel • ensure coil plug is securely fitted to electronics pack • replace electronics pack • replace coil
Start Up tones keep repeating	<ul style="list-style-type: none"> • insert new batteries • replace electronics pack • replace wiring loom
In the collapsed position the detector makes a loud noise when coil is tilted	<ul style="list-style-type: none"> • conduct Audio Reset • extend shafts • conduct Audio Reset
Earset does not work	<ul style="list-style-type: none"> • replace earset • replace wiring loom
Shafts will not collapse	<ul style="list-style-type: none"> • fully extend (leave for five minutes) very slowly collapse shafts

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

6 Maintenance Plan for F3 Detectors.

6.1 Daily Maintenance

Conduct standard procedure every time the detector is switched on as follows:

- Switch on
- Ground Balance
- Check detector with test piece

Operator is to check detector for damaged or missing parts at the start of every day.

At the completion of the day's work the operator must clean the detector and check the detector for any damaged or missing parts, as described in the Operations Manual. Do not use any chemicals or solvents to clean the detector.

Supervisor must ensure all operators conduct the above daily maintenance and that all detectors are kept clean and good working order.

6.2 Weekly Maintenance

Conduct [Mechanical & Functional Testing](#).

Supervisor to confirm that all detectors pass [Mechanical & Functional Testing](#).

6.3 Action When a Detector Fault is Discovered

When the operator discovers the detector is faulty or if the operator has suspicions the detector is not working at full capacity the operator must immediately stop work and remove the detector from operations.

The faulty detector must immediately be reported to the supervisor.

The supervisor is to conduct the Mechanical & Functional Testing. If the supervisor confirms the detector is faulty a Detector Fault Report must be completed.

Faulty detectors must be clearly marked/labelled so it is clear to everyone that it must not be used, the detector fault report must stay with the detector.

Faulty detectors should be removed from the area of operation when practical.

6.4 Scheduled Maintenance.

a. Scheduled Maintenance must be conducted at least once every six months. This will normally be planned to coincide with the demining teams leave or stand down. If higher fault rates are experienced on the detectors scheduled maintenance should be conducted more often, as considered necessary.

b. Scheduled Maintenance is to be conducted by a trained technician with appropriate spare parts and tools at hand. Scheduled Maintenance is a higher level of maintenance than [Daily Maintenance](#) and [Weekly Maintenance](#) and is required for detectors that have spent a long time in the field. Scheduled maintenance should be conducted by a trained technician who has appropriate spare parts and tools at hand. Scheduled Maintenance is best conducted during stand down of operators.

c. Scheduled Maintenance is very similar to the [Mechanical Testing](#) but is much more thorough and focuses on parts of the detector that may need attention after prolonged use in the field. This Scheduled Maintenance should be used in conjunction with the Service Manual.

d. First conduct the [Mechanical & Functional Testing](#) of the detector making sure to record or fix any fault discovered. Scheduled Maintenance is conducted as follows:


- Carefully inspect the skid plate for cracks, holes or damage and ensure it stays in place and is not easily dislodged. Replace the skid plate if required. It is normal that the skid plate will become worn and need replacing when used for prolonged periods on hard rocky ground. It is not necessary to remove the skid plate for cleaning.
- Inspect the coil for damage, if there are any holes or cracks in the coil that can permit moisture or water inside the coil then it must be replaced.
- Tilt the coil forwards and backwards checking for firmness. If the coil tilt motion is loose causing the coil to flop out of position during use of the detector the coil friction blocks must be replaced.
- Open and close the lower camlock checking for firmness. Check that the coil rotates through 270 degrees and that it doesn't rotate all the way around. Check that when the camlock is closed the coil is held firmly. Ensure the coil is not easily dislodged from the shaft of the detector. If there are problems push out the camlock pins and remove the lower camlock body (and coil) from the shaft. Inspect the lower shaft if it is cracked or damaged it must be replaced. Replace the pressure block in the lower camlock. This part will wear out with normal use.
- Open and close the middle camlock checking for firmness. Check that when opened the lower shaft can be extended and closed without obstruction and when the camlock is closed the lower shaft is held firmly in place without slipping. If there is a problem with the middle camlock replace the pressure block in the middle camlock. This part will wear out with normal use.

- Open and close the upper camlock checking for firmness. Check that when opened the shafts can be extended and closed without obstruction and when the camlock is closed the middle shaft is held firmly in place without slipping. If there is a problem with the upper camlock replace the Pressure block in the upper camlock. This part may wear out with normal use.
- Open middle and upper camlocks and fully extend and close the shafts several times making sure there is no snagging or obstruction. In particular check that the shafts fully close with no obstruction. It is possible for dirt to build up inside the shafts and compact around the coil connector. If there is any doubt the electronics pack should be removed so that the inside of the shafts can be checked for obstructions.
- Inspect the battery lid. Remove, clean, lubricate then replace the battery lid O ring.
- Check the battery lid tether and replace if it is damaged or misshapen. If the battery tether is not straight and in good condition it may fold up between the battery and the battery terminal causing the detector to turn off and on.
- Check the inside of the battery pack and clean if necessary, don't use water or chemicals just a dry cloth or brush. Check the battery contacts are clean and are not corroded. Do not bend, stretch or modify the battery spring terminal.
- Check that the battery pack can be removed from and attached to the detector.
- Remove the endcap and check all screws in the electronics pack are in place and tight.
- Check that the wiring loom under the endcap is undamaged and not loose where it enters the grommet into the electronics pack.
- Check the armrest for any cracks or damage. Open the armrest camlock and slide the armrest up and down then close the camlock making sure the armrest is held firm.
- Check the arm strap is correctly attached to the armrest, if the arm strap is damaged and no longer effective replace the strap.
- Check the handle for damage. Check the on/off switch moves back and forth correctly if there is a build-up of dirt the handle will need to be opened to clean around the on/off slider.
- Give the detector a good clean.
- Check all accessories are present and in good working order.
- Check the detector hard case for damage.
- Conduct the [Functional Testing](#).

- Complete documentation, record the serial number of the detector serviced. A service log should be kept so that there is a record of when each detector is serviced or checked.
 - If a detector is missing its serial number label the serial number can be replaced on the upper shaft using a paint pen or similar. There is a secondary serial number under the battery pack. If the original serial number cannot be found then a new serial number must be created for future use.
- e.** Scheduled Maintenance has now been completed. The detector can now be returned to the field.

6.5 Detector Fault Report.

When an F3 detector is faulty and a repair is carried out it is essential that good records are kept of the faults encountered, the parts used and the corrective actions (work done) the following form provides a template of a detector Fault Report:

Detector Fault Report											
Date: dd/mm/yy		Detector Serial Number:			Model:			Unit/Location:			
		N			F3, F3L, F3C, F3 UXO						
Time: hhmm		Operator:					Supervisor:				
Fault Description, Operator:								Mechanical Test:			
								Function Test:			
Items Missing:								Field Test:			
Supervisor Check Detector and Describe Fault:								Supervisor Sign:			
Date: dd/mm/yy		Repair Centre:									
Faults found:											
Work Done:											
Parts Used:											
Part Number		Qty		Name							
Repair Centre Check and Test:											
Mechanical Test:											
Function Test:											
Field Test:											
Date: dd/mm/yy		Name, technician:							Sign:		

oOo