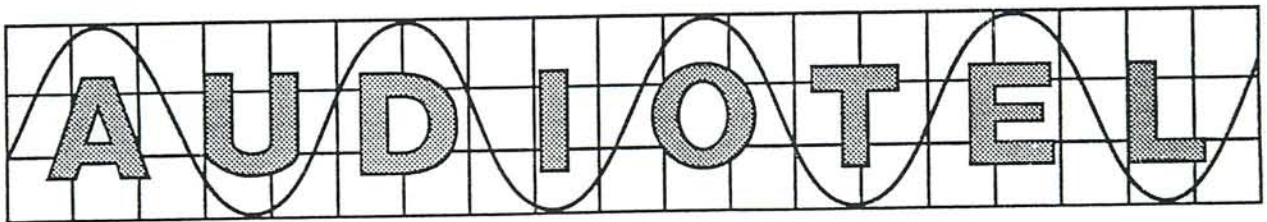


**Audiotel International Ltd**

# **Scanlock ECM**

## **Operators Manual**



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April 1991

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## Introduction

Scanlock ECM is a radio receiver designed for rapid detection, identification and location of hidden transmitters used for eavesdropping purposes.

Scanlock's advantage over conventional counter - surveillance equipment lies in its ability to automatically tune across a very wide frequency range quickly to a radio signal that, at the antenna input, is significantly stronger than any other signal. Once locked to this signal however, Scanlock continues to search for any new, stronger signal.

Suppose a low-powered transmitter is concealed at one end of a room. If Scanlock is located at the other end then at that position the strongest signal may be due to a local radio station. Thus the local radio station's transmission will be heard. As Scanlock is moved about the room a position will soon be reached where the strength of the low-powered transmitter is greater than that from the radio station due to the now diminished distance between Scanlock and the concealed transmitter. Scanlock will then tune automatically to this signal and the transmitter will be heard. Scanlock's facilities enable the operator to confirm the presence of an eavesdropping transmitter and to physically locate it with ease.

It is this combination of Scanlock's fast automatic tuning and the fact that it can be moved during the automatic tuning operation to minimise the distance between it and any concealed transmitter that makes Scanlock highly effective and easy to operate.

There are situations where background radio signals, due perhaps to a nearby broadcast station, are very strong and the distance between a very low-powered concealed transmitter and Scanlock may be too small to allow full protection to be gained through automatic operation only. For these situations Scanlock's SCAN mode is used. Due to Scanlock's sophisticated signal processing, the SCAN operation is very quick. The extra sensitivity gained through SCAN control offsets the fact that it is not practical to initially move Scanlock around the area under search during this operation.

In addition to detecting, identifying and locating conventional transmitters, that is, those which radiate their signals through an antenna into the surrounding space, Scanlock can detect 'mains carrier' or 'current carrier' devices and other low frequency transmitters that transmit along a pair of AC power cables (from which they normally draw their power) or other cable pair in preference to the surrounding space. The eavesdroppers receiver is connected at a distant point on the cabling. Generally, receivers to detect such transmitters are available only separately and may be expensive.

### Other Applications

Eavesdropping transmitters are not only used to eavesdrop on conversation, they can be used to check if a property is empty and therefore unguarded. Illegal entries into property using this technique to reduce risk have been reported in the national press.

Tracking transmitters attached to vehicles can be detected, identified and located using Scanlock.

### Guarantee

The equipment is guaranteed for a period of two years from the date of original purchase. Please refer to our Standard Terms and Conditions relating to claims under guarantee and return of equipment. These are available on request.

## **Servicing**

Equipment should be returned to Audiotel in the event of any need for servicing or repair. If this is impractical the servicing should only be carried out by qualified personnel. Servicing by the customer or his agent during the guarantee period may invalidate the guarantee.

## **Training Transmitters**

A conventional transmitter together with a mains carrier transmitter are invaluable aids in gaining familiarity with the operation.

Suitable transmitters are available for this purpose from Audiotel. The purchaser must check with the local Wireless licensing department as to the legality of operating such transmitters.

## Preparation for Use

### Unpacking

The shipping container should be inspected for any damage. If there is evidence of damage this should be retained until the equipment is checked and all accessories accounted for. This will assist in any claims of damage due to transit.

### Operating Environment

The operating environment should be within the following limits:

Temperature + 5 deg C to + 40 deg C

Humidity Less than 95% relative, non-condensing

### Storage and Shipment

When not in use the unit should be stored in a clean, dry environment. The permissible storage temperature range is 0 deg C to + 55 deg C

The original packing should be retained in case the unit needs to be returned to Audiotel. Before despatch of any equipment to Audiotel the Sales department must be contacted. The address, telephone, telex and fax numbers are listed at the front of this manual. If the original packing material is not available then a sturdy air-freight quality carton together with generous cushioning material must be used. The carton should be marked clearly with the destination and customer's name. 'FRAGILE' labels or markings should be attached.

### Accessories

Scanlock ECM is provided with the following accessories. These should be checked on unpacking.

refer to figure A

Accessory	Item	Quantity
HF Antenna	A	1
LF Antenna	B	1
HF Antenna Lead	C	1
BNC Lead	D	1
Remote Alarm	E	1
Remote Alarm Lead	F	1
Head-phones	G	1



Power Lead	H	1
Low Frequency Interface	J	1
Telephone Interface	K	1
Telephone Interface Lead	L	1
Telephone Interface Antenna Lead	M	1
Attache Case		1
BNC - Crocodile Clip Lead	P	1
Right Angle N Connector	R	1

Any shortages must be notified at once

### AC Operation

For re-charging the battery pack or for AC operation Scanlock ECM requires a power source of 110/120 or 220/240 VAC, 48-60 Hz, single phase.

### AC Voltage Selection

(Refer to figure B). Voltage selection is made by the rear panel switch (8). For selection of 220/240V operation slide switch such that 230V is visible.

### Power Cable

A three-wire power cable is supplied in accordance with international safety standards. When correctly connected this grounds the chassis of the unit. To avoid the possibility of injury or death, the chassis, via the cable supplied, must be grounded before AC power is supplied. Any extension cable or isolating transformer supply must provide a suitable earth connection.

Power cable connections are as follows:

Brown	=	Live
Blue	=	Neutral
Yellow/Green	=	Earth or Ground

### Battery Power Supply

The internal batteries in the unit will give 8 hours operation.

### Charging

When the power lead (H) is connected the battery will automatically charge. If the unit is switched off the unit will automatically fast charge until almost fully charged and then switch into trickle charge mode.

For full capacity it is recommended that the unit is left charging overnight.

### Switching On

The on-off switch is located on the right hand side of the unit above the power connector.



## Getting To Know Your Scanlock ECM

In order to familiarise yourself with the setting up and operation of Scanlock ECM follow the directions in **bold type** which will take you through the controls used to enter the various set-up and configuration modes. This section will not attempt to enter all modes, as access to all configuration modes is identical as are access to all operating modes are fundamentally similar. What the section aims to show, in a concise form, the methods of accessing the various modes. When the Scanlock ECM is switched on it will perform a self test / initialisation sequence which takes about 5 seconds. Immediately prior to completing this sequence it will carry out a battery test and display the condition for about 3 seconds.

### Switch Scanlock ECM on.

The front panel display will be as figure 1.

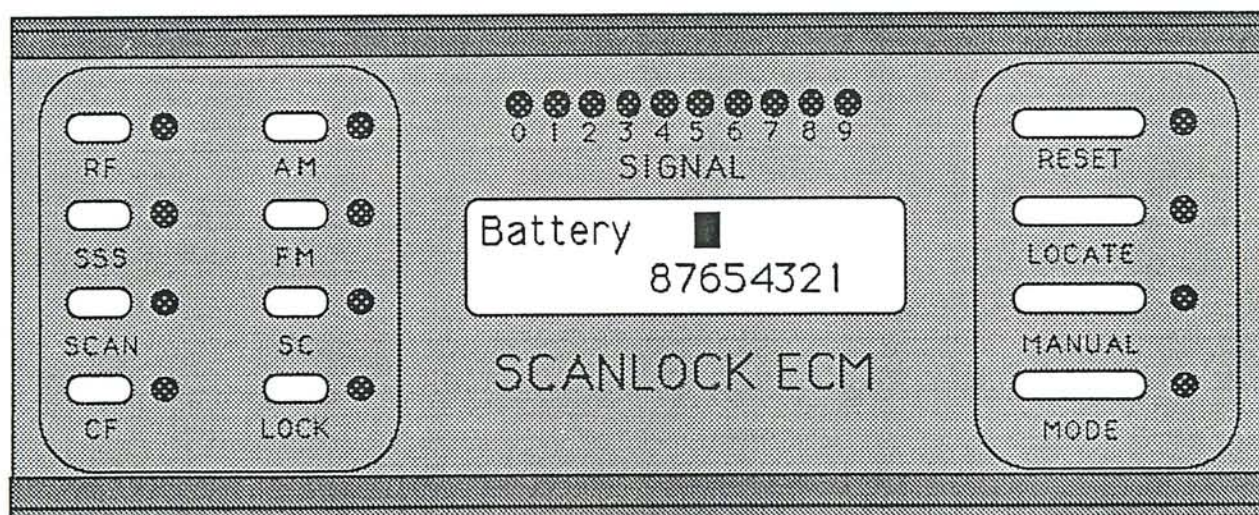


Figure 1

The numbers along the bottom line of the display represent hours. The marker above the hours indicates the number of hours use before the Scanlock ECM needs to be charged.

eg in figure 1 the Scanlock ECM has approximately 6 hours use before its batteries need to be charged.

During use, when the battery capacity falls below 1 hour, then the message —LOW BATTERY— will be displayed at regular intervals.

The battery condition may be checked at any time during use by selecting configure mode 14. ( see Set up and Configure Modes )



After the initialisation process the Scanlock ECM will enter the OPERATING MODES menu as figure 2 with the MODE led illuminated.

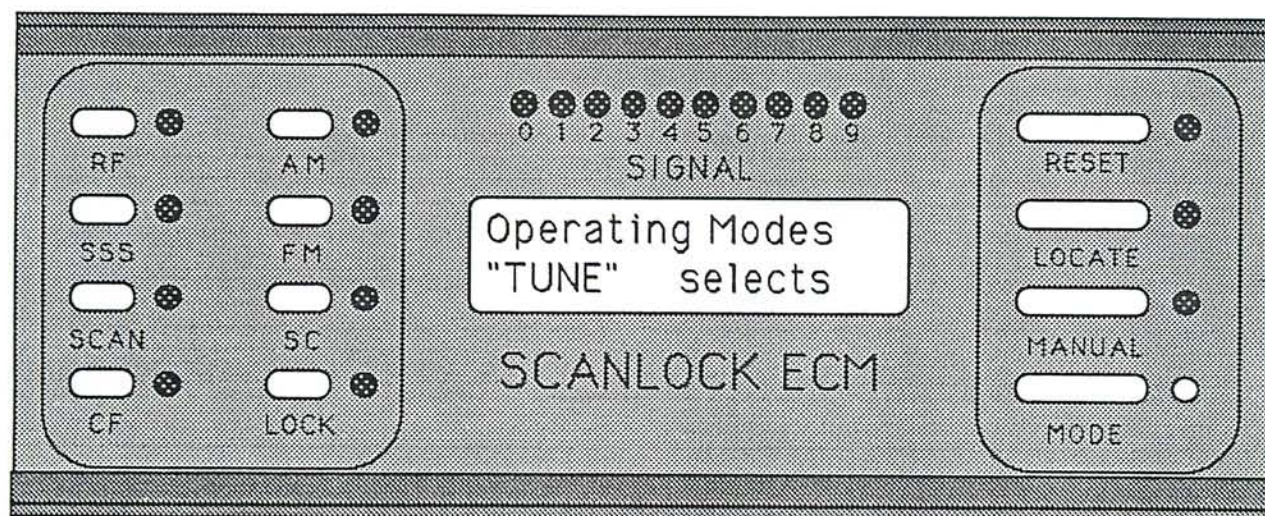


Figure 2

There are two menus available, the OPERATING MODES which allow the user fast access into operating modes and the CONFIGURATION MODES menu which allow the user to set specific parameters for a sweep.

Rotating the TUNE control anti-clockwise toggles between these two menus.

Rotating the TUNE control clockwise from the OPERATING MODES menu steps through the operating modes.

Rotating the TUNE control clockwise from the CONFIGURATION MODES menu steps through configuration modes.

We will first enter a set up mode.

**Select OPERATING MODES and rotate the TUNE one step clockwise.**

The Scanlock ECM should be as Figure 3



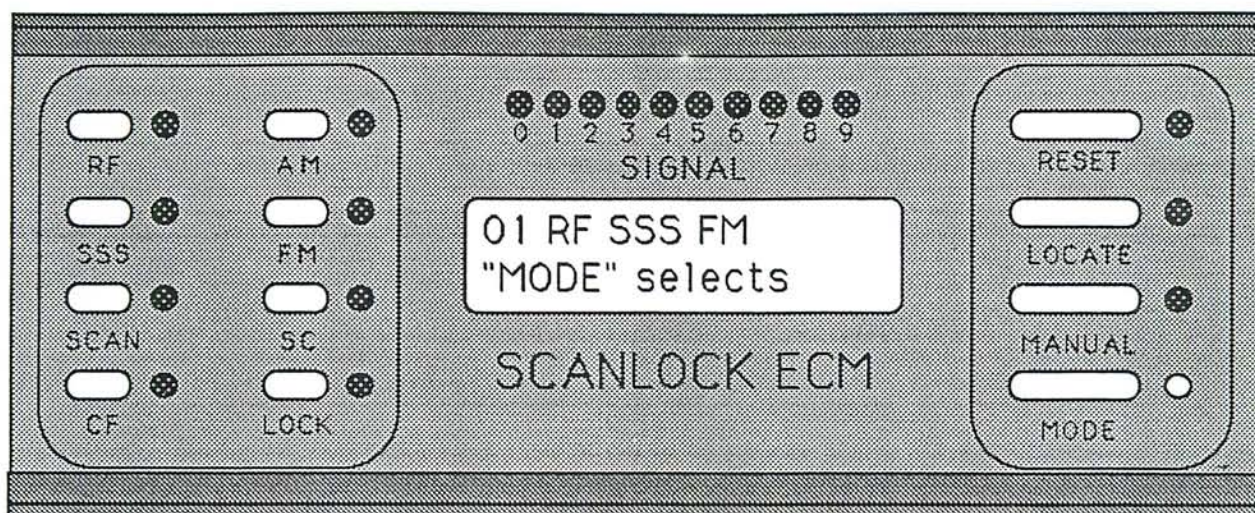


Figure 3

If you wish to select this mode press the MODE button.

If you have inadvertently entered mode selection pressing the RESET button will allow you to revert to the operational setup without making any changes.

**Turn TUNE control one step clockwise to mode 02 ( RF SCAN FM ) and press MODE button.**

Display should be as Figure 4 with the RF, SCAN and FM leds illuminated.

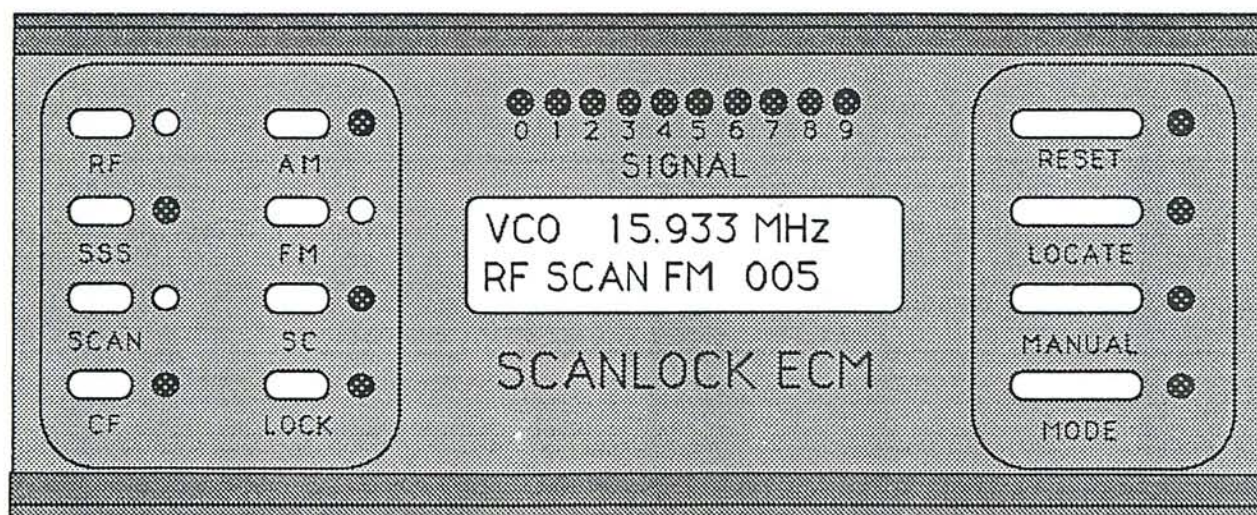


Figure 4

The top line of the display shows the VCO frequency which will be increasing.

*You have now entered a set up mode.*



The second line of the display shows the mode selected, in this case RF SCAN FM followed by the step size currently selected. The step size in this case is 5kHz but could be altered through the CONFIGURATION MENU.

*What we have learnt so far -*

1. Power up sequence and battery condition display.
2. How to enter and exit a set up mode.

We will now enter a configure mode ( step size adjustment ) and adjust a default setting.

**Press MODE button, turn the TUNE control anti-clockwise one turn to the CONFIGURE MODE menu then turn the TUNE control one turn clockwise.**

The display should be as figure 5.

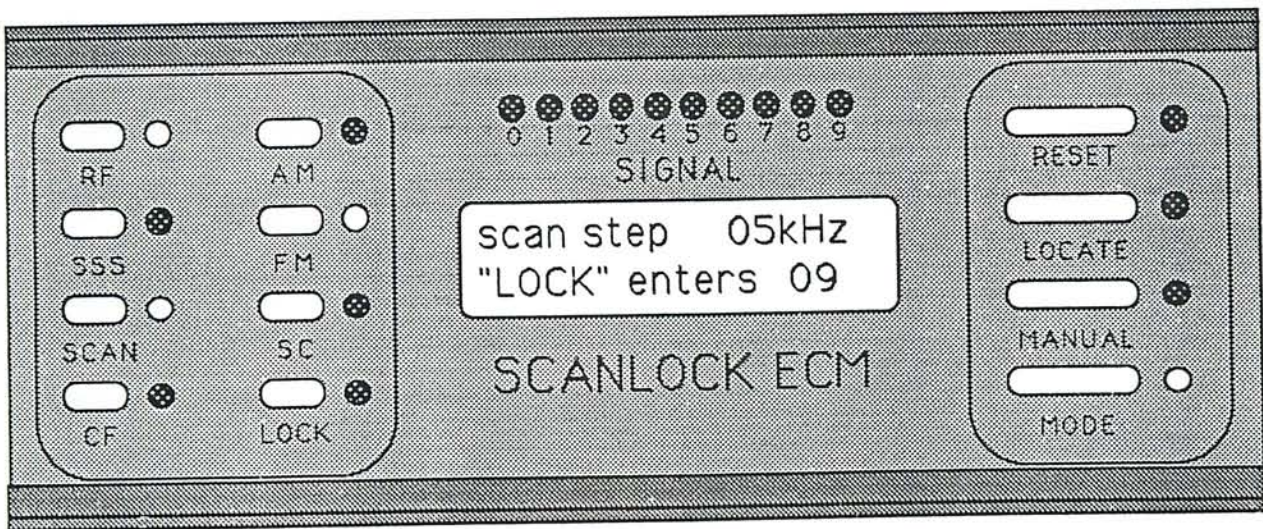


Figure 5

You have now entered scan step size adjustment in the configuration mode. To adjust the step size press the LOCK button. Note how the RF, SCAN & FM led's remain lit from the previous settings.

#### **Press the LOCK Button**

The bottom line of the display will change to "LOCK" exits. Turning the tune control changes the step size. When the required step size has been reached pressing the LOCK button selects that step size.

**Adjust the step size to 10 kHz and press the LOCK button.**



**Press the RESET button.**

The display will be as figure 4 but the step size at the bottom right hand of the display will have changed to 010 as Figure 6.

This setting will remain until it is changed again or the unit is switched off.

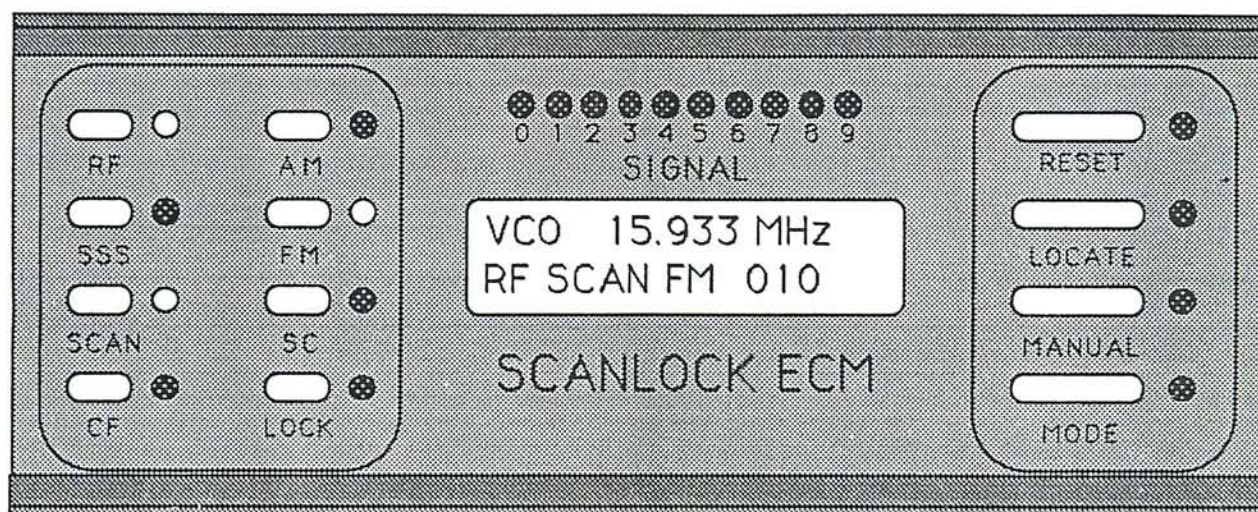


Figure 6

*We have now changed the step size for RF SCAN.*

**Press the MANUAL button and the display will change to Figure 7.**

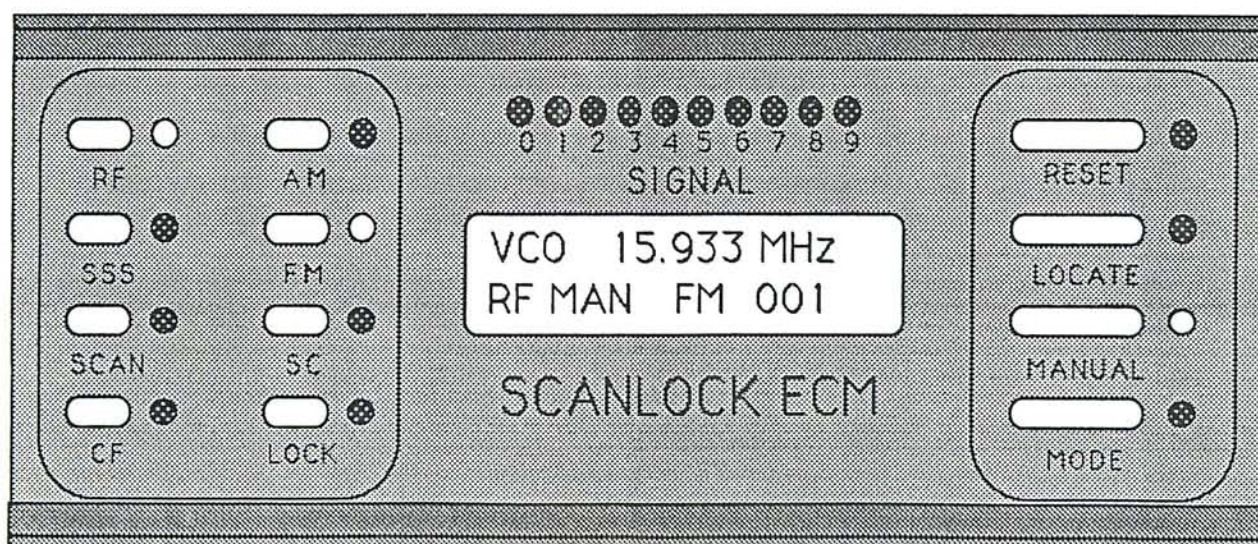




Figure 7

Note how the step size has changed to 001.  
Rotating the TUNE control steps the VCO in 1 kHz increments.

**Press and hold the MODE button. Whilst keeping the MODE button pressed press and release the SCAN button. Release the MODE button.**

Note how the step size has changed from 001kHz to 005kHz.

Other step sizes can be set in MANUAL tune mode by using the MODE button in conjunction with the 8 buttons in Figure 8.

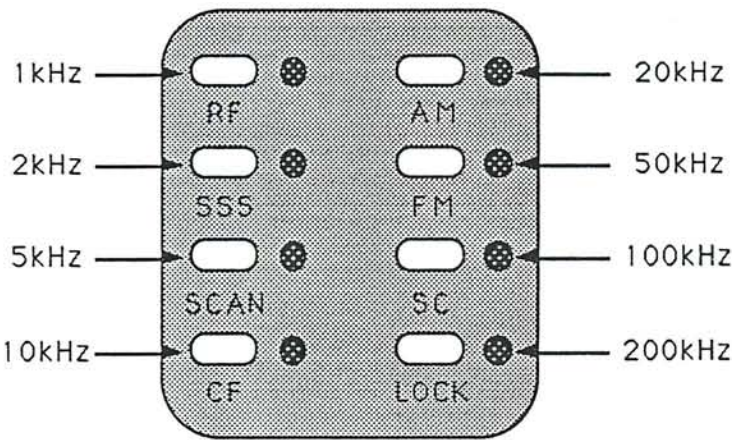


Figure 8

For detailed specification of all modes refer to 'Conducting a Sweep' section.



## Summary of Controls, Indicators and Outputs

### Front Panel (refer to figure B )

All buttons have an LED indicator located to the right. When a function is selected either by the mode control or manually operated the LED will illuminate to indicate selected function. Some controls have dual functions which depend upon the current operating condition of Scanlock ECM.

#### 1. 10 MHz + Input

Input for signals greater than 10 MHz. Use either Scanlock high frequency antenna or Scanlock telephone interface.

#### 2. SSS (Strong Signal Seeking)

This control selects the Strong Signal Seeking mode when in RF manual mode. The second function of this control is manual tune 2kHz step size.

#### 3. RF (10 MHz +)

Manual selection control for examining signals above 10 MHz. The second function of this control is manual tune 1kHz step size.

#### 4. AM

Manual selection control of AM (Amplitude Modulation) demodulation. Allows AM signals to be listened to. The second function of this control is manual tune 20kHz step size.

#### 5. FM

Manual selection control of FM (Frequency Modulation) demodulation. Allows FM signals to be listened to. The second function of this control is manual tune 50kHz step size.

#### 6. Signal Strength Display

This bar graph displays the signal strength. The higher the number of LED's illuminated then stronger the signal. The display is used in locate mode to assist in the location of the eavesdropping device and in detection mode to assist in the detection of a signal.

#### 7. Locate

The Locate control switches the Scanlock into locate mode. In this mode, the Scanlock will emit a 'clicking' tone which will rise in pitch with increasing field strength.

#### 8. Reset

This control is used in Scan or Manual Tune modes and is used to reset the Scanlock to minimum frequency. The control can also be used to exit from MODE selection.

### **9. Fine (Tune)**

This rotary control is used to fine tune a signal in Manual Tune mode. By bringing the detected signal to the centre of the IF may improve the quality of the detected signal and accurate readings may be taken.

### **10. Upper (Squelch)**

This control is in effect a 'negative squelch' that is it will mute the Scanlock ECM output when the signal strength is greater than that set by it.

### **11. Squelch Indicator**

When the signal strength of a signal acquired by Scanlock is between the levels set by the upper and lower squelch controls this indicator will illuminate and the audio output of Scanlock will be enabled.

### **12. Volume**

This rotary control is used to adjust the volume to a comfortable listening level.

### **13. AC Indicator**

The AC indicator will illuminate when the Scanlock is connected to a mains supply. When the indicator is illuminated the battery is automatically charging.

### **14. Headphones Output**

Socket for connection of headphones fitted with a 1/4" stereo jack plug.

### **15. Lower (Squelch)**

This control adjusts the squelch level, that is, when a signal is below the level set the audio output of the Scanlock ECM is muted.

### **16. Tune**

This is a continuously variable control which increments the frequency tuned to when rotated in a clockwise direction and decreases the frequency tuned to when rotated in an anti-clockwise direction. The control is also used in conjunction with the mode control to select one of the preset operating/configuration modes.

### **17. Mode**

This control is used in conjunction with the Tune control to select one of the preset operating/configuration modes also used in manual tune step size adjustment.

### **18. Manual**

The manual control is used to select manual tuning. The controls second function is Frequency. When a signal has been acquired, pressing Manual locks Scanlock ECM to that signal. Pressing the Manual button again causes the Scanlock ECM to measure the frequency of the signal.

### **19. LCD**

The LCD displays all current operating information for the Scanlock ECM.

**20. SC**

Manual selection control of SC (Sub-carrier Modulation) demodulation. Allows SC signals to be listened to. The second function of this control is manual tune 100kHz step size.

**21. Lock**

This control selects the Lock tone mode. The second function of this control is manual tune 200kHz step size.

**22. CF**

Manual selection control for examining signals below 10 MHz. The second function of this control is manual tune 10kHz step size.

**23. Scan**

Control for selection of Scan mode. The second function of this control is manual tune 5kHz step size.

**24. 10 MHz -**

Input for signals lower than 10 MHz. Use either Scanlock low frequency antenna or Scanlock low frequency interface.

**Rear Panel ( refer to figure C )****1. Remote Alarm**

Remote alarm socket for connection of remote alarm for real-time monitoring.

**2. 10.7 MHz Out**

10.7 MHz IF output for connection of expansion equipment.

**3. 2 MHz Out**

2 MHz IF output for connection of expansion equipment.

**4. 10MHz Out**

10MHz IF output for connection of expansion equipment.

**5. Recorder**

Recorder output for connection of tape recorder.

**6. DC Out**

Stabilised, current limited, DC voltage for powering external equipment.

**7. Squelch**

Pair of normally open contacts controlled by the squelch state.

**8. Power Selection**

115-120 / 220-240 mains voltage selection.



# Conducting a Sweep

## Search Procedure Basics

There are 3 steps to conducting a sweep for eavesdropping devices. These are:

### Detection

The detection of RF energy (signals). Any radio device will, by its very nature, emit radio frequency energy. In a given area there will be a certain amount of legitimate radio activity, say from local radio stations and emergency services etc. as well as that which is from eavesdropping devices. It is important to identify all signals in the sweep area.

### Verification

Once a signal has been detected it is necessary to analyse it to confirm its function.

### Location

Once a signal has been verified as an eavesdropping device it should then be located and disabled.

## Methods of Conducting a Sweep

### Frequency Range

The ECM will detect signals in the range 12kHz and 1.8GHz which is split into two bands. The lower band, or CF, is between 12kHz and 10MHz and the higher band, or RF, is between 10MHz and 1.8GHz.

As the design of a receiver with the capabilities of Scanlock ECM is extremely complex the two bands have separate antenna inputs, these being 10MHz - and 10MHz + respectively.

In the 10MHz + band the Scanlock ECM uses a harmonic tuning technique which effectively compresses the band allowing for rapid tuning.

### Detection

This is the identification of localised radio frequency energy which in turn can be verified as to whether it is an eavesdropping device and, if so, the source can be located.

There are three methods of tuning Scanlock ECM.

#### 1. Strong Signal Seeking

This mode of operation is only available in the RF ( 10MHz + ) band.

In this mode, as the name suggests, the Scanlock ECM, automatically tunes to the strongest signal.

The Scanlock ECM is moved around the sweep area automatically tuning to the strongest signal. In a given area there will be a certain amount of legitimate radio activity, say from local radio stations and emergency services etc. The strength of such signals will depend upon various factors, the main being the distance the sweep area is from the source. If there is an eaves-

dropping device in the sweep area and as the Scanlock ECM is moved around the area, and therefore closer to the eavesdropping device, the strongest signal will become that of the eavesdropping device.

## 2. Scan

In the SCAN mode the Scanlock ECM steps sequentially through the band selected. As it tunes through a radio signal, indicated by a change on the field strength display ( and/or a change in sound if a direct listening technique is employed ) the scan can be halted by selecting manual mode and verification carried out. After examination of the signal the scan can continue. The Scanlock ECM pauses at each step ( dwell time ) for approximately 0.7 seconds.

The Scanlock ECM in Scan mode defaults at switch on to a step size of 5 kHz. This may be set to any step size from 1 kHz to 99 kHz through the configuration menus. The step size affects the speed of scan and its coverage. For example, scanning at 1 kHz steps takes the longest but gives maximum protection whereas scanning at 99 kHz will be very quick but not as effective.

## 3. Manual

If the user so wishes they may override the Strong Signal Seeking or Scan modes for direct tuning control.

The step size in manual tuning mode defaults at switch on to 1 kHz. This can be adjusted between 1 kHz and 200 kHz ( see manual tuning step size adjustment ).

## Verification

When a signal has been detected it must be analysed to discover whether it is an eavesdropping device. This can be carried out in two ways.

### 1. Lock Tone

In the lock mode the Scanlock ECM emits a steady tone at about 2kHz. If there is an eavesdropping device in the area it will pick up this signal through its microphone and therefore transmit it. The Scanlock ECM, using a method described above, locks to this signal. The outputs of the Scanlock ECM's demodulators are analysed for this 2 kHz signal. If this signal is identified then the Scanlock ECM will chop this signal, ( signal will start to bleep..bleep...etc ) which will alert the user of a positive verification.

A useful feature of the Scanlock ECM in RF SSS LOCK or RF SCAN LOCK mode is that when there is a positive LOCK tone indication the unit will switch to MANUAL tune in preparation for the location process.

A further feature is that when in SSS LOCK mode a positive LOCK indication will initiate the Scanlock ECM's frequency measurement facility.

The frequency measurement facility is also available in SCAN mode but, due to the excellent sensitivity of the LOCK circuitry the Scanlock ECM needs to be tuned such that the signal is at the centre of the Scanlock ECM's IF. This is easily achieved by adjusting the TUNE control. When the signal is accurately tuned pressing the MANUAL button will start the frequency measurement process.

When in a CF mode the signal frequency is always displayed.

### 2. Direct Listening & Correlation Techniques

In the direct listening mode the user listens to the signal acquired through each demodulator in turn for evidence of room audio. This may be instantly recognisable but may also appear to be an unintelligible signal not immediately apparent as room audio. In these cases it is necessary to

analyse the signal further by correlation techniques as an exotic form of modulation may be used.)

( see section on correlation techniques )

### **Location**

When a signal has been verified using one of the above techniques then the Locate mode may be selected.

When in Locate mode the Scanlock ECM emits a 'Geiger' click whose frequency increases with increasing field strength. When the Scanlock ECM is moved closer to the eavesdropping device the signal strength will increase as will the locate tone. By locating the area of maximum field strength and a high pitch locate tone, the eavesdropping device can be found.



## Set-up & Configuration Modes

There are 8 set up modes, 5 configure modes and a battery condition check available.

The setup modes are

01            RF SSS FM

Mode 01 (RF SSS FM) is for strong signal seeking with direct listening. The Scanlock ECM is moved around the area under search. As a signal is acquired the user listens for evidence of room audio by selecting each demodulator in turn and by using correlation techniques.

02            RF SCAN FM

In this mode the Scanlock ECM is placed at one or more points central to the area under search. As the Scanlock ECM tunes to a signal the user halts the scan by selecting manual. The user listens for evidence of room audio by selecting each demodulator in turn and/or by using correlation techniques.

03            CF SCAN FM

This mode of operation is fundamentally the same as mode 02 except that the CF band is scanned.

04            MC SCAN FM

In the RF and CF modes the Scanlock ECM is looking for devices that use free space as the propagation medium. It is possible, however, that eavesdropping devices could use mains or other, possibly redundant, cabling as its propagation medium. One drawback in this method is that as the frequency of the device increases the cabling itself becomes an effective radiator and therefore the device becomes prone to detection in one of the above modes. This fact is utilised to enable a reduced scan band when examining mains wiring or cables, ( Mains or Cables hence MC ). In this mode the scan range of Scanlock ECM is limited to between 12kHz and 500kHz.

In the modes listed above the verification process employed is direct listening / correlation techniques. The following modes are identical to the above modes except that the LOCK tone is used as the verification technique.

05            RF SSS LOCK

06            RF SCAN LOCK

07            CF SCAN LOCK

08            MC SCAN LOCK

and configure modes

09            step size adjustment

When the Scanlock ECM is in a SCAN FM mode the scan rate defaults at switch on to 5 kHz. This figure has been set to give an optimum scan time/signal recognition ratio. As the Scanlock ECM scans through the band all signals in the area will be tuned through. The SCAN will not stop on a signal unless the user intervenes by pressing the MANUAL button. If the scan step size is set at a suitable size then the majority signals tuned through will be easily identifiable as they will be intelligible over a number of steps (effectively the speed over which the Scanlock ECM scans the signal). A more experienced user will be able to recognise a signal that passes through much quicker than this. In RF mode, due to the harmonic tuning there will be more tuning points at which any given signal will be tuned to and so the step size could be somewhat greater than 5 kHz. However, in CF mode, due to the direct signal conversion technique of the CF mode each signal in the band will have only one point at which the signal is tuned to and as such the step size adjustment is considerably more critical in this mode.

#### 10 RF min adjustment

The RF minimum adjustment allows the user to set the minimum VCO frequency used for RF SCAN.

#### 11 RF Max adjustment

The RF maximum adjustment allows the user to set the maximum VCO frequency used for RF SCAN. Used in conjunction with mode 10 allows the user to set a selection of frequencies to be scanned in the RF band.

#### 12 CF min adjustment

The CF minimum adjustment allows the user to set the minimum frequency used for CF SCAN.

#### 13 CF max adjustment

The CF maximum adjustment allows the user to set the maximum frequency used for CF SCAN. Used in conjunction with mode 12 allows the user to set a range of frequencies to be scanned in the CF band.

#### 14 Battery Condition

The battery condition may be checked at any time during the operation by selecting this mode.



# Practice of Conducting a Sweep

## Recognition of the Presence of a Signal

Presence of a signal can be identified in one or a combination of ways. These are,

- (i) Increase in field strength on field strength display.
- (ii) Room audio being heard through one of the demodulators.
- (iii) Change in audio through one of the demodulators.

The molecular structure of the universe is in a state of constant agitation. A result of this, and other electrical disturbances, is that there will be noise throughout the radio spectrum.

When there is no signal on a particular frequency noise will be heard through the demodulators. This noise will be fairly constant throughout the band.

If there is a signal on a particular frequency this will have the effect of changing the content of this noise.

If, when conducting a sweep, the background noise changes, ( this could be either an increase or decrease in the level ), is evidence of a signal on this frequency.

## Correlation Techniques

- (i) Some eavesdropping transmitters may use an exotic form of modulation which is not readily detectable using the Scanlocks demodulators.  
To identify such devices correlation techniques can be used. When the Scanlock has acquired a signal the user listens through the AM, FM and SC demodulators in turn whilst making a short, sharp sound (such as a hand clap) and listening for the audio changing in sympathy with this sound. Although the sound was initially identifiable as room audio the sympathetic changes will positively identify it.
- (ii) Eavesdropping devices may be contained in other electronic equipment ( such as telephones, facsimile machines, computers etc. ) which may only become active when the equipment is in use. The user should activate all such equipment whilst observing the field strength. If there is an increase in field strength when such equipment is activated is evidence of a device in the equipment,
- (iii) To determine whether the origin of a signal is within the sweep area, field strength readings should be taken at various points around the sweep area. If the strength increases as the user moves into the sweep area and peaks within the sweep area is strong evidence of a device.

## Detection and Verification

### RF SSS Sweep for Radio Devices

#### Connection of Equipment.

- Step 1 Attach fully extended HF antenna (A) to HF antenna lead (C) and connect to Scanlock 10 MHz+ input (1)
- Step 2 Select preset mode required (RF SSS LOCK or RF SSS FM). Set lower squelch to '0' and upper squelch to '9'.
- Step 3 Set volume control to a suitable level. ( for LOCK this would be approximately 7 and for direct listening set to a comfortable listening level).  
If conducting a silent search in RF SSS FM mode, connect headphones (G) to headphones socket (14).
- Step 4 Move about the area under search in such a way as to minimise the distance between Scanlock and any potential transmitter. All parts of the area under search should be checked. Do not assume that because a corner cupboard is difficult to reach that a transmitter will not be hidden there.
- LOCK If in LOCK mode the tone is interrupted at a regular rate, stop moving. The Scanlock ECM will have automatically switched to MANUAL tune and therefore be locked to the device. Now follow location procedure.
- Direct Listening As the Scanlock ECM is moved around the area observe the field strength display (6) and listen to the audio output from the Scanlock ECM. Switch between the demodulators and listen for evidence of a signal (see section **Recognition of the Presence of a Signal**).
- If there is a signal present analyse it to determine if it is an eavesdropping device ( see section **Verification of a signal using direct listening and correlation techniques**).  
If the signal is verified as an eavesdropping device follow the location procedure.

### RF or CF SCAN Sweep for Radio Devices

#### Connection of Equipment.

- Step 1 Attach fully extended HF antenna (A) to Scanlock 10 MHz+ input (1) for RF sweep  
or  
Attach fully extended LF antenna (B) to BNC~BNC lead (D) and connect to Scanlock 10MHz-input (24) for CF sweep
- Step 2 Select preset mode required (SCAN LOCK or SCAN FM). Set lower squelch to '0' and upper squelch to '9'.
- Step 3 Set volume control to a suitable level. ( for LOCK this would be approximately 7 and for direct listening set to a comfortable listening level).  
If conducting a silent search in RF SSS FM mode, connect headphones (G) to headphones socket (14).



- Step 4 Place the Scanlock ECM central to the area under search ( if a large area then use two or more positions). To start the scan press RESET (8).
- LOCK If in LOCK mode the tone is interrupted at a regular rate, stop the scan by pressing the MANUAL button (18). Use the TUNE (16) control to tune to the centre of the signal and confirm that the LOCK tone continues to be interrupted. Proceed to the location procedure.
- Direct Listening As the Scanlock ECM scans the band observe the field strength display (6) and listen to the audio output from the Scanlock ECM. Switch between the demodulators and listen for evidence of a signal (see section **Recognition of the Presence of a Signal**).  
To halt the scan at a particular point for detailed analysis of the signal tuned to press the MANUAL button (18). To resume the scan press the SCAN button (23).  
If there is a signal present analyse it to determine if it is an eavesdropping device ( see section **Verification of a signal using direct listening and correlation techniques**).  
If the signal is verified as an eavesdropping device follow the location procedure.

## Location

Select Locate (7) and adjust the volume control for comfortable listening. Observe the field strength display (6). Move Scanlock and its antenna about the area in the direction of increasing field strength and hence increasing intensity and pitch of the locate tone. Progressively collapse the antenna down to decrease the sensitivity of Scanlock until the locate tone rises sharply in intensity and pitch when the antenna is passed over a small localised area. Visually examine the area to locate the transmitter.

**Repeat the Sweep Method used earlier to remove any further eavesdropping devices**

## MC Sweep

### Mains Cables

- Step 1 Connect BNC-BNC lead (D) to Scanlock ECM 10 MHz-input (24) and to low frequency interface (J). Connect power lead (H) to low frequency interface (opposite end to antenna lead (D). Select L-N (Live, Neutral) on low frequency interface.

Select the preset mode required ( MC SCAN LOCK or MC SCAN FM ).

- Step 2 Place Scanlock close to the socket to be checked and connect mains lead to socket.

Set volume control to a suitable level. ( for LOCK this would be approximately 7 and for direct listening set to a comfortable listening level).  
If conducting a silent search in RF SSS FM mode, connect headphones (G) to headphones socket (14).

NOTE Ensure that all electrical items such as televisions or lamps are connected as these could contain a mains carrier transmitter. Turn lights on to activate any switched transmitters connected to the lighting circuits.

**LOCK** If in LOCK mode the tone is interrupted at a regular rate, stop the scan by pressing the MANUAL button (18). Use the TUNE (16) control to tune to the centre of the signal and confirm that the LOCK tone continues to be interrupted. Proceed to the location procedure.

**Direct Listening** As the Scanlock ECM scans the band observe the field strength display (6) and listen to the audio output from the Scanlock ECM. Switch between the demodulators and listen for evidence of a signal (see section **Recognition of the Presence of a Signal**).  
To halt the scan at a particular point for detailed analysis of the signal tuned to press the MANUAL button (18). To resume the scan press the SCAN button (23).  
If there is a signal present analyse it to determine if it is an eavesdropping device ( see section **Verification of a signal using direct listening and correlation techniques**).  
If the signal is verified as an eavesdropping device follow the location procedure.

**Step 3** Repeat steps 1 & 2 for L-E (Live-Earth) and N-E (Neutral-Earth) positions on the Low Frequency Interface.

### Other Cables

**BEFORE CONNECTING CROCODILE CLIPS TO ANY CABLE PAIR CHECK THAT THERE ARE NO DANGEROUS VOLTAGES PRESENT.**

**Step 1** Connect BNC-BNC clip lead (D) to Scanlock ECM 10 MHz-input (24) and to low frequency interface (J). Connect BNC-croc clip lead (P) to low frequency interface (opposite end to antenna lead (D)). Select Cable on low frequency interface. Select the preset mode required ( MC SCAN LOCK or MC SCAN FM ).

**Step 2** Place Scanlock close to cable to be checked and connect mains lead (H) to socket.  
Adjust the volume control (12) to approximately 7.

Set volume control to a suitable level. ( for LOCK this would be approximately 7 and for direct listening set to a comfortable listening level).  
If conducting a silent search in RF SSS FM mode, connect headphones (G) to headphones socket (14).

**LOCK** If in LOCK mode the tone is interrupted at a regular rate, stop the scan by pressing the MANUAL button (18). Use the TUNE (16) control to tune to the centre of the signal and confirm that the LOCK tone continues to be interrupted. Proceed to the location procedure.

**Direct Listening** As the Scanlock ECM scans the band observe the field strength display (6) and listen to the audio output from the Scanlock ECM. Switch between the demodulators and listen for evidence of a signal (see section **Recognition of the Presence of a Signal**).  
To halt the scan at a particular point for detailed analysis of the signal tuned to press the MANUAL button (18). To resume the scan press the SCAN button (23).  
If there is a signal present analyse it to determine if it is an eavesdropping device ( see section **Verification of a signal using direct listening and correlation techniques**).  
If the signal is verified as an eavesdropping device follow the location procedure.



## Location

Select a demodulator that gives the clearest audio.

If the location of the mains carrier transmitter is not obvious from the characteristics of the sounds heard through Scanlock ECM then selectively disconnect electrical items and turn lights off to locate device.

If this does not locate the device then move a sound source (a colleague talking or some tape recorded music etc.) around the room until it is obvious that the sound source is near the microphone of the transmitter.

**Repeat the Sweep Method used earlier to remove any further eavesdropping devices.**

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## Frequency Measurement

The Scanlock ECM will measure the frequency of a signal tuned to. Its accuracy will be to within 1KHz.

### Measuring the Frequency of a Signal

Ensure that the fine tune control is in the central position.

#### SSS Mode

If the Scanlock ECM is in SSS LOCK mode and there is a positive LOCK indication the Scanlock ECM will automatically enter MANUAL MODE and measure the frequency of the signal.

If the Scanlock ECM is in any other SSS mode (AM, FM or SC) the user must first lock to this signal by pressing the MANUAL button. If the MANUAL button is pressed again the Scanlock ECM will measure the frequency of the signal.

#### SCAN Mode

When a signal of interest is found, stop the scan by pressing the MANUAL button. Use the tune control to tune the signal to the centre of the IF. (Shown by peak signal reading and/or best signal). Press the MANUAL button again to measure the frequency of the signal.



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## Use of Squelch Controls

### LOWER

During an automatic search or during the location process (whether in the automatic or manual mode) the user may find the continual presence of audio (whether a locate or LOCK tone for example) very tiring. The lower squelch control mutes the audio output whenever the total field of radio signals present at Scanlock's antenna is less than the threshold set by the lower squelch control. If the squelch control is advanced fully clockwise for example then Scanlock would need to be very near to a transmitter in order that this threshold is exceeded and thus the audio output restored. As the field strength is on average greater nearest to a transmitter then the squelch control can be progressively advanced to limit the audio output during a search.

### UPPER

There are occasions when strong legitimate local signal are present which the user may wish to exclude from sweeps when using SCAN mode. The upper squelch control mutes the audio output whenever the total field of radio signal present at Scanlock's antenna is greater than the threshold set by the upper squelch control.

Sensible use of these controls allow the operator to set a 'window' of signal levels which the scanlock will examine.

The speed of SCAN will be affected by these controls.

## Checking Telephone Cables for Radio Devices

The Scanlock telephone interface enables Scanlock to check telephone lines for radio microphone taps. These taps will either be VOX or line voltage sensing, that is they will only switch on when the handset is lifted (off hook) or when there is audio on the line. The tap may either have a separate antenna or use the telephone cable itself as an antenna. Even in the first case a certain amount of the RF will be conducted by the telephone cable and as the tap may be some considerable distance from the telephone it will normally be stronger than the signal received by the Scanlock antenna. The interface seizes the exchange line (equivalent to lifting the handset), automatically cancels out the dial tone and puts the audio output of the Scanlock onto the telephone line. This allows all Scanlock functions to be used normally when the telephone cable is connected to Scan-Tel and is particularly useful in sound-wave mode. A switch enables both differential (D) and common mode signals (C) to be examined.

Before using the telephone interface, sweep the area first using a suitable method.

- Step 1      Attach fully extended HF antenna (A) to HF antenna lead (C) and connect to Scanlock 10MHz+ input (1)
- Step 2      Select mode RF SSS LOCK. Set the volume control (12) to approximately 7. Remove hand-set whilst watching the field strength display (6). An increase in field strength coupled with the lock tone being interrupted at a regular rate indicates an eavesdropping device connected to the line.  
To eliminate the telephone instrument replace it with a known "clean" instrument. Repeat the test. If the condition persists then this suggests that the device is not inside the telephone. If there is an increase in the field strength but no interruption of the lock tone. Then apply correlation techniques to identify it is an eavesdropping device.

To locate the device if it is not inside the telephone, physically trace the cable.

- Step 3      Connect the telephone interface antenna lead (M) to the rear panel of the telephone interface and to the Scanlock 10 MHz+ input (1). Connect the telephone interface audio lead to the rear panel of the telephone interface and to the Scanlock, rear panel, recorder output (5). Set the switch on the telephone interface towards the D position.
- Step 4      Select preset mode RF SSS LOCK. Set the lower squelch control to 0 and the upper to 9. Set the telephone interface line seize switch away from the line seize indicator. Disconnect the telephone from the socket and replace with the telephone interface.
- Step 5      Switch the line seize switch towards the line seize indicator and the indicator will light. This will seize the line and is equivalent to lifting the hand-set. An increase in field strength coupled with the lock tone being interrupted at a regular rate indicates an eavesdropping device connected to the line.

If there is an increase in the field strength but not interruption of the lock tone then apply correlation techniques to identify it as an eavesdropping device.  
To locate the device, physically trace the cable.

Set the switch on the telephone interface to the C position.  
Repeat step 5.



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# Continuous Protection Against Eavesdropping

## Devices

### Introduction

The precious hours taken to carry out a search for eavesdropping devices may be wasted if during a subsequent sensitive meeting a transmitter is remotely activated or carried into the meeting by hand or attache case.

Scanlock will give protection against such devices.

It is preferable if Scanlock and its antenna are placed within the sensitive area during the meeting. This is often impractical and so a location adjoining the sensitive area is chosen. If possible an extension lead (available from Audiotel) is used to place the antenna discreetly within the sensitive area.

### SCAN Check

This is the preferred method of providing continuous protection if it is not possible to place the unit or the antenna in the sensitive area.

The operator selects SCAN FM mode listening for any audio that originates from the sensitive area. This is repeated for SC and AM in turn. This procedure should be repeated at intervals throughout the duration of the sensitive meeting.

### SSS Check

The operator connects the remote alarm provided with the Scanlock to the Remote alarm socket on the rear panel. Before the meeting starts (and preferably immediately after the area has been checked) the lower squelch control is advanced until the audio is muted and the Squelch LED is extinguished. The slide switch is set to give a silent or audible alarm. If the radio field strength subsequently exceeds the squelch threshold then the alarm will be triggered alerting the operator who then may listen to the signal through the Scanlock ECM or via the headphones socket on the remote alarm.

Using direct listening the operator confirms whether the new signal is from a recently activated transmitter or from an intermittent legitimate source such as a taxi passing close by.

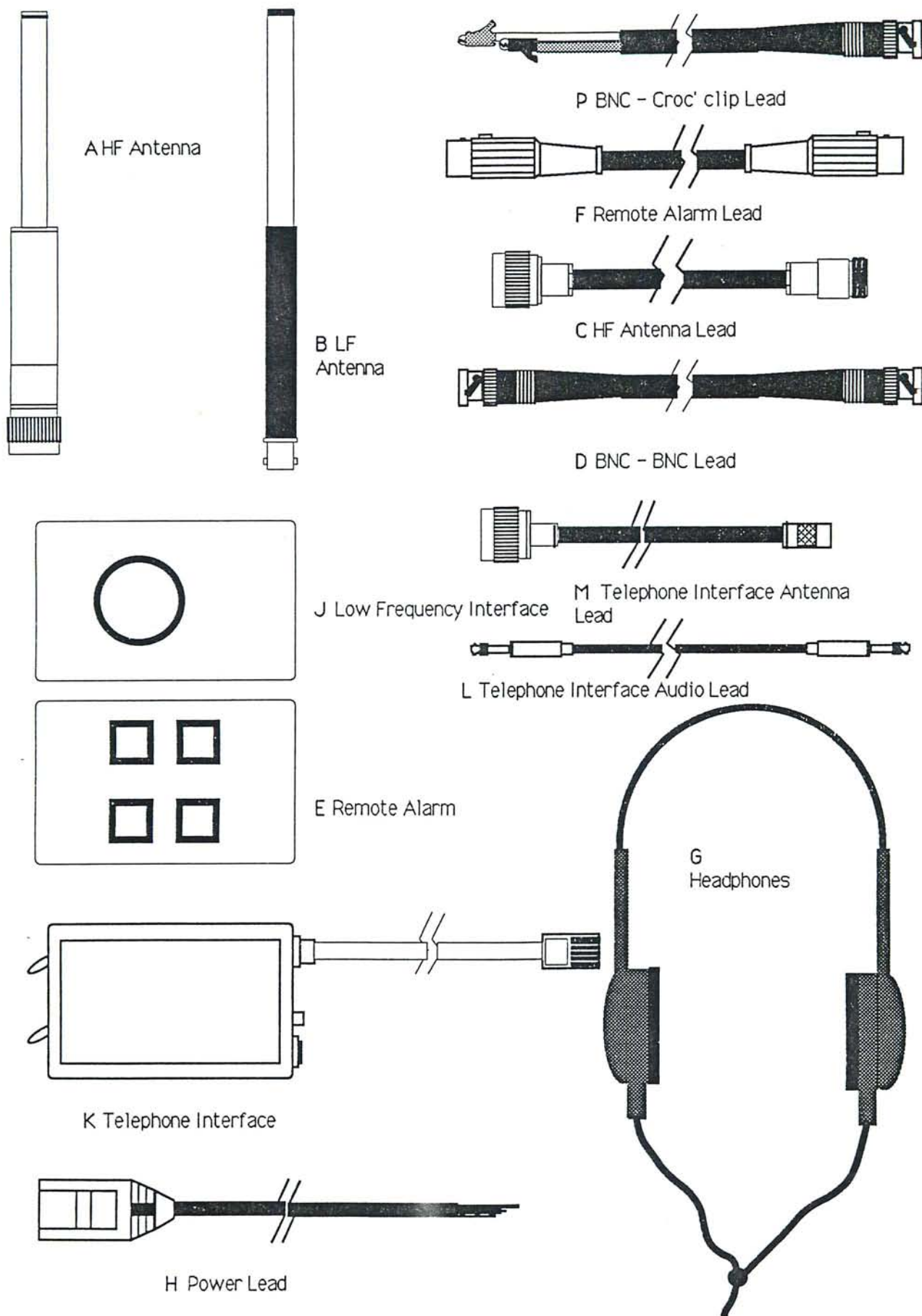


FIGURE A



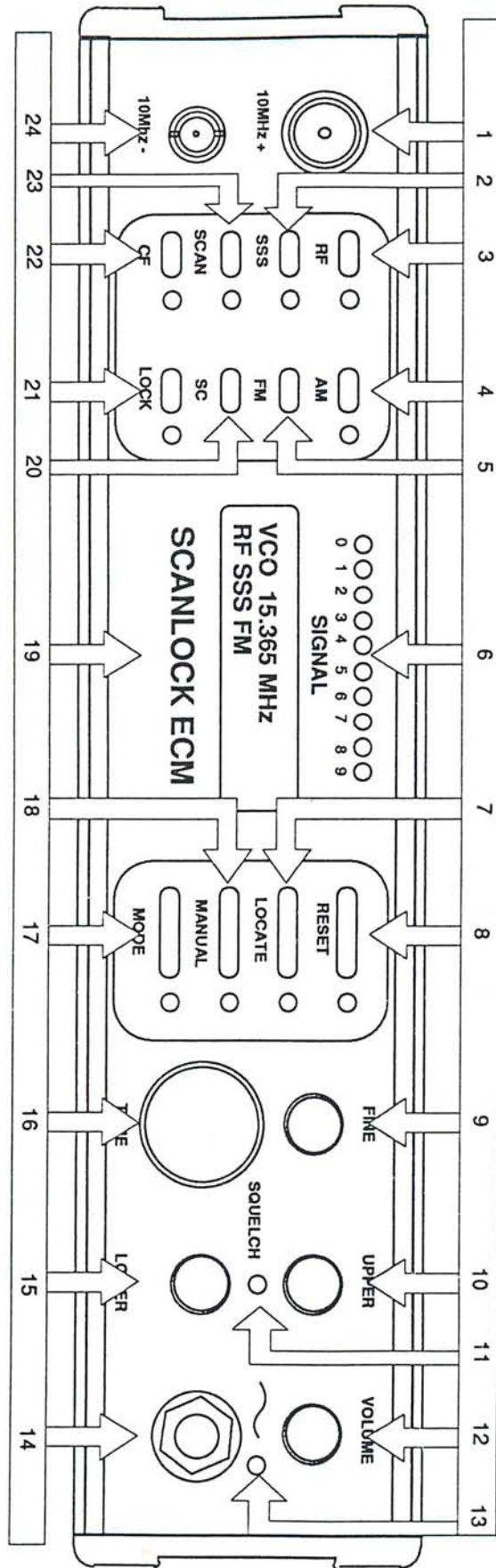


FIGURE B

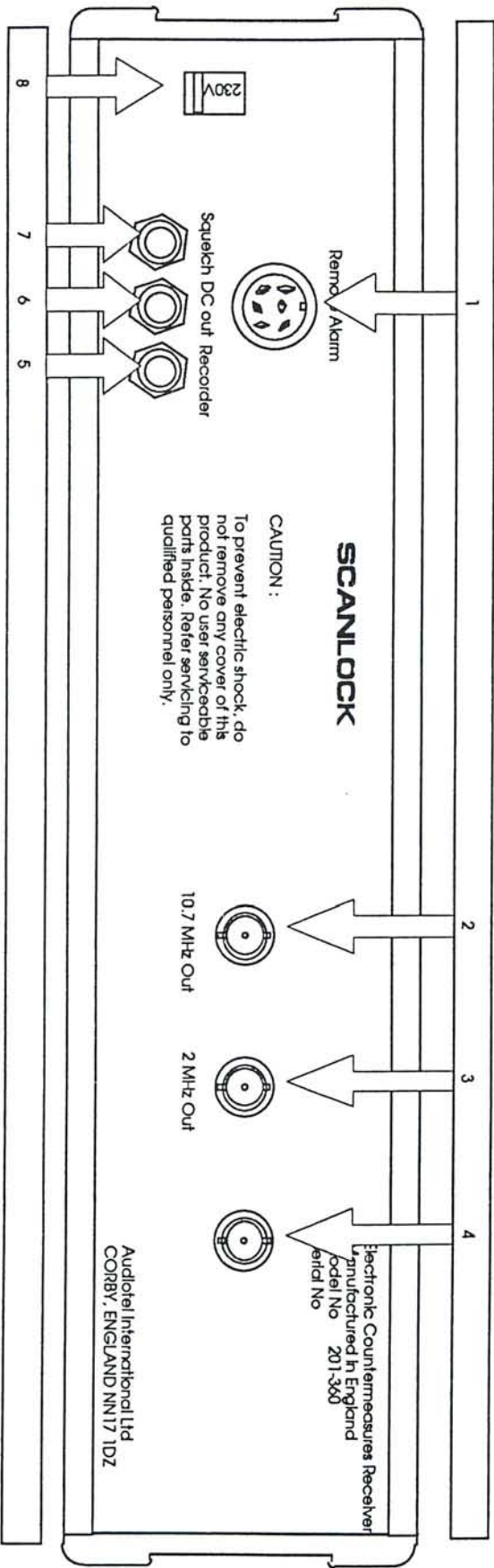


FIGURE C



**Notes**