

BirdDeter

Radar-activated systems

User Manual

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“Thank you for choosing BirdDeter’s pest control program!”

Please read this page

This User Manual has been compiled to save you time and to help you get the best possible results. It is based on years of practical experience with the BirdDeter program and we therefore strongly recommend that you take the time to at least browse through it before you set up your system!

BirdDeter Customer Support

Our company is dedicated to customer service. We provide a full range of consulting services and our experienced staff are happy to advise on the selection, installation, deployment and commissioning of BirdDeter systems. If urgently needed, our Customer Services Manager, Gavin Lake, can be contacted after hours at 0407 150 227.

You can obtain comprehensive technical support by contacting John Muehlebach, our Technical Manager, at the Customer Hotline numbers shown below, between 8.30 am and 5.30 pm, Monday to Friday. Your request for technical assistance will be serviced within 24 hours.

Customer Hotlines

**Tel (650) 610-7900
Fax (650) 593-0118**

* * *

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INTRODUCTION

A Unique Approach to Pest Control

Your BirdDeter equipment is part of a unique control program for managing pest birds and flying foxes. The BirdDeter control program consists of using the world's most advanced bird control technology combined with strategic know-how. The *equipment* incorporates the latest breakthroughs in detection and deterrent technologies. Of course to produce the best results possible, the equipment has to be properly set up. This means it must be deployed strategically and, importantly, at the right time. BirdDeter advisers have gained this *deployment know-how* over years of fine-tuning the total program in a very wide range of situations.

We should emphasise one particular point. The BirdDeter program is *totally different* to traditional pest control techniques such as scarecrows and noisemakers. Many growers with experience of bird or bat problems recognise that the main shortcoming of these methods is that pests commonly become accustomed to them: in other words, they *habituate*. Once this occurs, these techniques become ineffective. In contrast, the BirdDeter program keeps on working because it solves the habituation problem. How? By ensuring the pests are exposed to the deterrents only when they will have the greatest impact. This is why the system has been designed so that it is actually switched on by the pests themselves.

BirdDeter's method of deterring pests has two steps: firstly, *detection* using radar which is set up in a carefully selected area; and secondly, *deterrance*: scaring the pests away using their own alarm and distress calls, together with calls of predators. Visual deterrents can also be added if needed. The radar detection system is very sophisticated and 'ignores' slow-moving objects such as branches of trees. This feature ensures that inappropriate triggering or 'false alarms' is kept to the minimum.

Pests soon learn that flying into the protected area causes them distress and repeated stressful experiences train them to avoid such an area completely. This unique approach is far more effective than continuous, random or repetitious techniques for scaring birds or flying foxes because it delivers the scaring message with optimal timing.

In summary, BirdDeter radar-activated systems offer these unique features:

- 1 Deterrent system activated by radar
- 2 Computer controlled deterrents
- 3 Digital recordings of natural bird or fruit bat calls
- 4 VHF radio link
- 5 Habituation prevented
- 6 Solar power standard
- 7 Minimal noise pollution
- 8 Easily transportable
- 9 Low maintenance

HOW THE SYSTEM WORKS

2

Overview

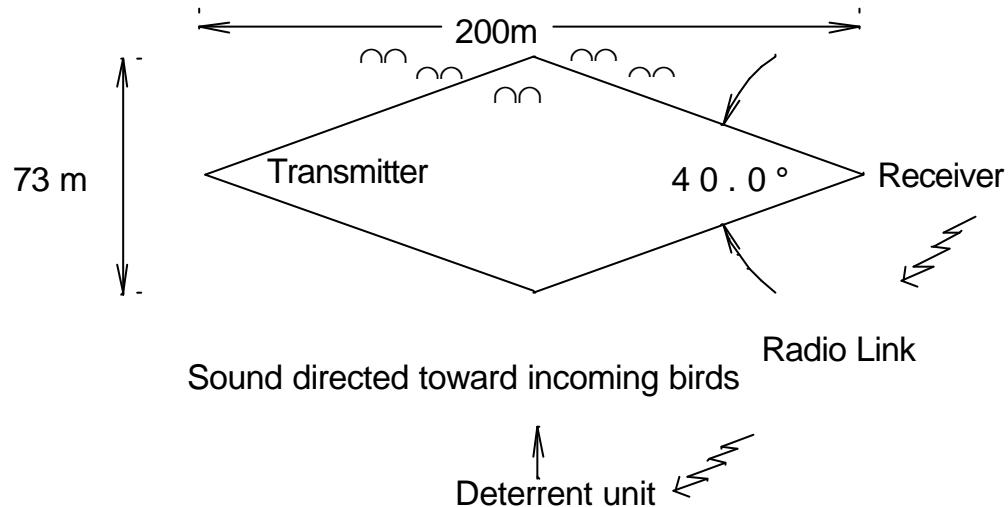
A standard BirdDeter system consists of three separate components: a radar transmitter, a radar receiver and one deterrent module. These components are each powered by twelve-volt battery and solar panel. The deterrent module can deliver up to 120 watts of audio power thus providing coverage of between four and forty hectares (ten to one hundred acres). One person can normally install this system in approximately half a day.

Here is a more detailed description of how the total system operates:

1. The radar receiver recognises the entry of pests into a 'detection zone' and automatically switches on a small radio transmitter. This transmits a radio signal.
2. This radio signal is 'picked up' by a radio receiver which is built into each deterrent module. The deterrent system is immediately switched on and plays a randomly selected group of distress and predator calls.

The 'detection zone' consists of two cone-shaped areas of radar waves created between the radar Transmitter and Receiver components as shown below.

Fig 1.



When a bird enters the detection zone, microwaves from the radar transmitter are reflected from the bird back to the radar receiver. The radar receiver electronically "recognises" the reflected microwaves as a bird. (However, microwaves reflected from slow-moving objects such as tree branches, crops or farm machinery are not normally "viewed" as birds by the detection system because its electronics are designed to ignore such reflections).

Because radio is used to 'link' radar and deterrent components, any number of deterrent modules can be activated by any number of radar detection systems. An optional hand-held remote control unit can also be used to activate deterrent modules as well as, or instead of radar equipment.

The performance of deterrent units can be enhanced by the addition of optional visual deterrents such as an electro-mechanical hawk effigy, or strobe lights.

Why use radar?

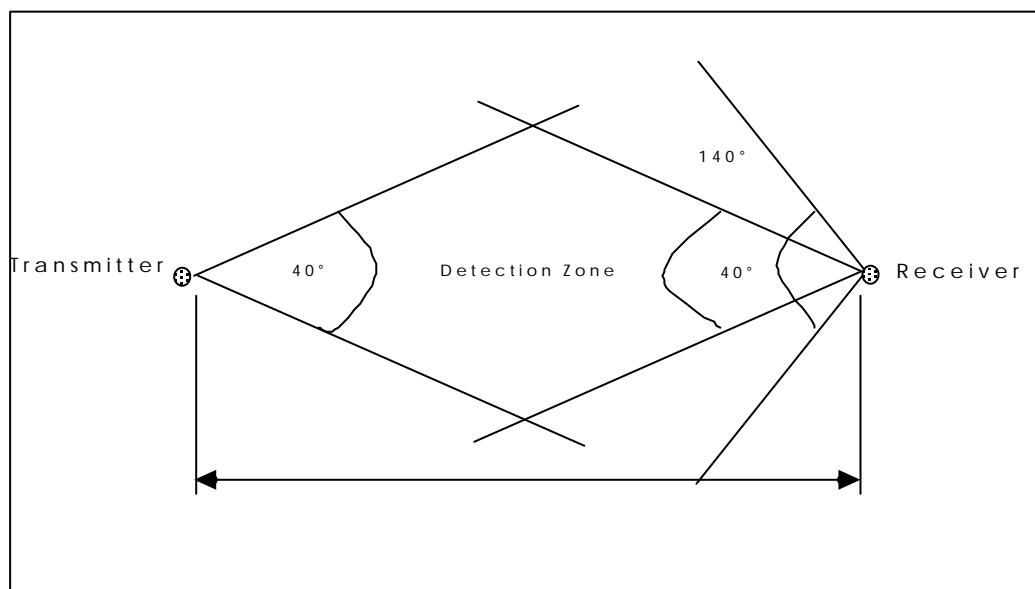
BirdDeter was designed to overcome the shortcomings of conventional approaches to bird and bat control. High on the list was the problem that birds are commonly active when humans are not present to see them and take action. The BirdDeter solution was to select radar to detect pests cost-effectively and in a timely way, that is just as they approach a crop. In short, radar performs the detection task automatically and without the need for human intervention. Here are some specific advantages of using a radar detection system:

- Playback of sounds is only required for short periods;
- Most birds will start to respond to a distress call within a few seconds of hearing it;
- Birds are unlikely to habituate to the deterrents;
- Pest are trained to stay away;
- The deterrent system's battery holds its charge longer because the system uses power only when pests have been detected;
- The system minimises noise pollution.

Radar at work

The radar technology utilised by BirdDeter completely safe to both humans and birds. Radar units may be placed up to 500 metres apart, but the actual spacing required in a given situation will depend on local conditions.

Fig 2.



The beam angle from both the transmitter and receiver is effectively 40 degrees.

In plan view, the detection area is diamond shaped, whereas in three dimensions, it consists of two cones being widest (and highest) in the middle of the detection zone. Any bird flying through the main forty-degree beam is detected at the radar receiver. However, some movements outside the main beam can be detected. To be completely 'invisible' to the radar system, an object (such as a passing truck on a nearby roadway) must be outside the 140 degree beam angle, as show above. Radar receivers should face away from traffic.

False alarms minimised

Movement of crops or nearby trees caused by wind could be expected to activate the entire system, in other words to create false alarms. With this in mind, the radar's control system was designed to automatically desensitise when such movements are detected. So, when wind speed (and therefore crop movement) increases, the radar becomes less sensitive. It's true that birds are less likely to be detected under very windy conditions, but at these times they are less likely to be in crops anyway.

Should the radar be too sensitive or not sensitive enough, the system's sensitivity can be adjusted, as outlined on page 35.

VHF radio link

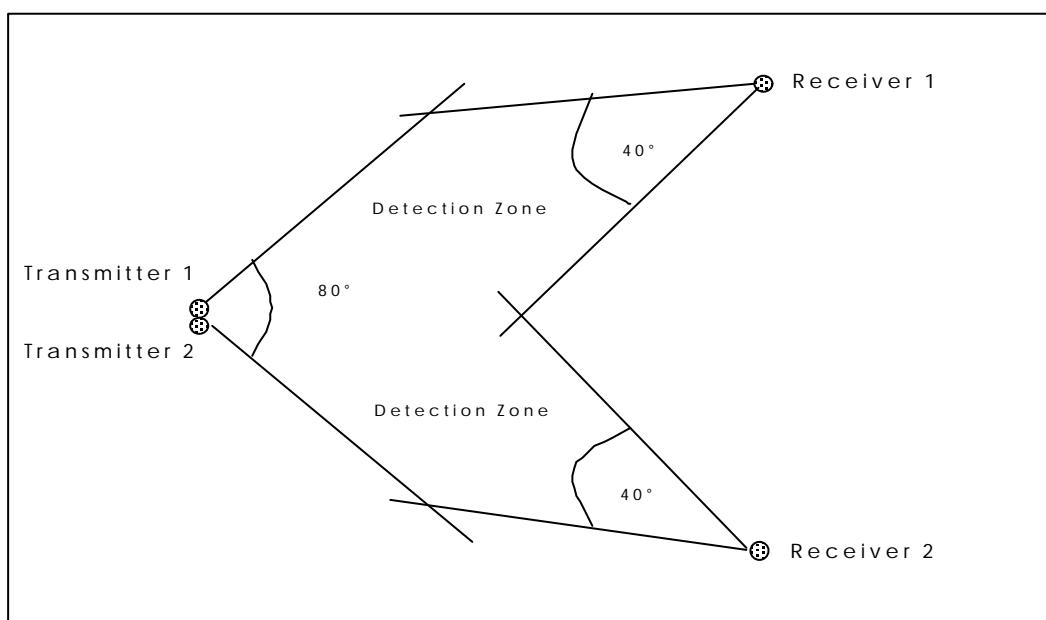
Radar systems and *deterrant modules* are usually placed several hundred metres distant from each other. To avoid the need for connecting wires, radio-controlled switching is standard. This feature also permits maximum flexibility for positioning the components. The 'radio link' operates in the Very High Frequency (VHF) band and does not need to be licensed. For best performance, each Deterrent module should be able to "see" its nearest Radar Receiver unit. In other words, there should be 'line-of-sight' between each of them. This 'rule' also applies when using an optional hand-held remote control unit.

Expanding the system

The standard system can be expanded using additional radar transmitters. This simply requires extra transmitter antennas (the white horn-shaped waveguides), as the transmitter Control System can handle as many as six of these antennas.

If multiple radar systems are installed, each receiver should be located so that it can 'see' only one transmitter within its 40 degree detection beam, as shown below (Fig. 3).

Fig 3.



Multiple radar receiver and transmitter units can be used to increase size of detection zone

Deterrent System

The deterrent or scaring system provides two 'scaring' strategies. One uses sounds recorded from nature (technically known as bioacoustics). The other scaring methods are visual and rely on the pests' sense of sight. Here is a detailed explanation of both strategies.

The *acoustic* or sound deterrent strategy utilises an electronic sound playback unit which is controlled by computer. Three audio amplifiers drive the outdoor-type loudspeakers. The complete sound system is housed in the deterrent module's Control Box, as are memory 'chips' which contain recordings of appropriate birdcalls. The chips are attached to a 'sound card' which can be changed over if necessary (for example, if new birds arrive later in the season).

As explained previously, each deterrent module is switched on by a radar system or hand-held remote control (via VHF radio link). Every time the deterrent system is activated, the sounds are played for thirty seconds; the group of calls selected for playback is also varied at each activation.

Certain excitable bird species, such as rosellas and lorikeets, may need *visual* deterrents to supplement the birdcalls and the 'Electric Hawk' option was especially developed for use against these particular members of the parrot family.

The Electric Hawk device consists of a plastic imitation hawk which is raised into the air and remains visible for a short time. A hawk effigy is bolted to the end of a fibreglass rod and this assembly is raised and lowered by an electric motor and gearbox: hence the name "Electric Hawk".

Whenever the deterrent system is activated, the sounds are played and then the rod plus hawk is raised from a horizontal resting position to vertical. As a result, the hawk appears to 'hover' over the crop for approximately two minutes, then it is smartly lowered back to the horizontal position, where it stays - virtually invisible - until it is raised again when the deterrent system is re-activated.

Powerful strobe lights are also available as an optional visual deterrent. These can be particularly effective against dawn- and dusk-feeders, as well as flying foxes (fruit bats) which are normally most active after dusk. A minor modification to the deterrent's computer program is needed for operation at night and this is performed at the factory prior to despatch.

'Strategy' saves on equipment

At first acquaintance with the BirdDeter program, it might seem necessary to use numerous BirdDeter systems to cover large areas, and this could add up to considerable expense. However, our personnel have found ways to optimise the amount of BirdDeter equipment needed and these are explained in greater detail immediately below and on the next page.

Firstly, to achieve excellent results with the fewest possible components, *they must be set up strategically*. This means that you need to know about the pests' behaviour and habits in order to work out which are the best places to install the radar and deterrent equipment.

Where and when to install

To start with, the *radar system* should be set up either where birds actually fly into the crop or where they are most likely to enter. This is typically around the edge of the crop, especially from large trees, powerlines, watercourses and dams or from near the ripest fruit.

Next, the *deterrent module* should be placed either in the centre of the crop, or at another place within the crop to which birds are most likely to fly if they are disturbed at their first feeding point.

There is another issue which is so crucial to success that its importance can hardly be over-emphasised. Here it is: *make sure the equipment is 'up and running' before pests arrive in numbers*. If the system is installed at the right time (so that all the 'early birds' are deterred), your whole pest management program will have the best possible start. However, if installation is left too late, it will be very difficult to achieve a satisfying result.

Tricks of the trade

In some situations where growers have adjoining cropping areas, they have located one deterrent module in the crop protected by radar, then set up a second deterrent module in the nearby crop. This strategy has kept birds out of both sites even though only one radar system was used. Why? Because *both* deterrent modules were activated by one lot of birds.

With strategic placement of system components (based on observation of the birds' behaviour), pests can also be 'coerced' or 'marshalled' into flight paths through the detection zone. This is highly desirable as it will both shorten the pests' 'training' period and optimise the number of radar systems needed.

Let's tackle a 'worst case' situation as an example. This crop is surrounded by bushland with birds entering from all sides. So firstly, we look for the area of heaviest bird traffic. The aim is to locate the radar at the place where the majority of pests fly in. This will probably be where there is riper fruit, taller trees, thicker scrub or easy access. Once this area has been found, a radar detection zone should be set up *across* the bird's flight path (for an illustrated example, see Fig. 4).

The deterrent module should then be placed so that sound is loudest at the other boundaries (those without radar). The sound will discourage birds from coming in from these directions. But do keep in mind that the sounds heard back at the radar detection zone should still be sufficiently loud to also drive these birds back out. In other words, don't set up the deterrents so far away from the radar that these 'main' birds will not be deterred!

Setting up components this way will have two effects: firstly, birds that have entered the crop through the radar are far less likely to attempt flying in again, perhaps using another route. Secondly, if birds around the crop dare to enter at a later stage, they are more likely to do so through the radar, which is desirable. This strategy also relies on the fact that *feeding times* for all birds will be much the same, regardless of where they enter the crop.

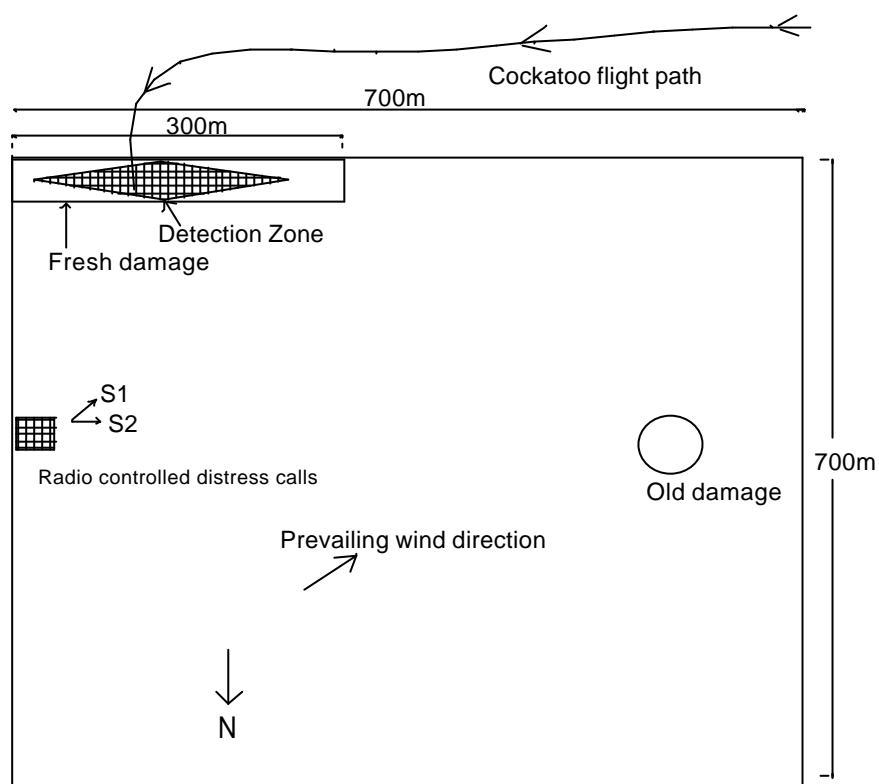
An example from the field

The diagram below (Fig. 4) illustrates a real example of how a forty hectare (100 acre) field crop was protected using *strategic* placement of the various components.

Pests in this case were cockatoos. The behaviour of these birds had been carefully observed and it was known that they used only one regular flight path into the crop, through the southern boundary. So it was decided that the best strategy was to place one radar detection system across this flight path to detect the birds and activate the deterrent module as they flew into the crop.

The deterrent module was also carefully placed, so that prevailing winds would carry the sounds to the southern end of the crop. Cockatoos continued flying into the detection zone until they were trained to stay away. It is worth highlighting that the birds behaved as if the whole crop was protected by numerous BirdDeter systems simply because the deterrents were activated every time the birds flew in. In effect, they became victims of their own habits: this behaviour was cleverly exploited to work to the grower's advantage.

Fig 4.



If you need any assistance in deciding where to place your equipment please don't hesitate to contact one of our advisors on 07 4667 0491.

Installation Precautions

Large amounts of movement in or around the 'detection zone' will cause radar to automatically desensitise. For this reason, it is recommended that the detection zone be located as far away as possible from busy roads. The radar system should also be set up so that tree branches or any other moving object do not cross the 'line of sight' between the radar transmitter and receiver horn antennas.

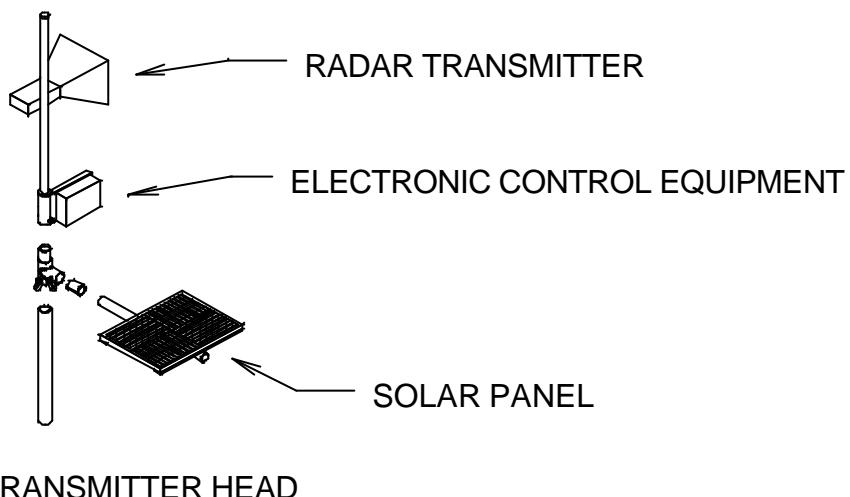
SYSTEM COMPONENTS

The following diagrams are provided to allow you to easily *identify* the various pieces and to *understand* how BirdDeter system components function and fit together. The pieces are numbered and their related 'Key to System Components' can be found on Page 11.

We have provided two diagrams of E1 units below. These units, namely Series 2000 and Series 3000, are interchangeable as the differences are only mechanical. Note also that the microwave transmitters and receivers used for the radar are now housed inside PVC tubes, instead of brass horn antennas as depicted below in the drawings.

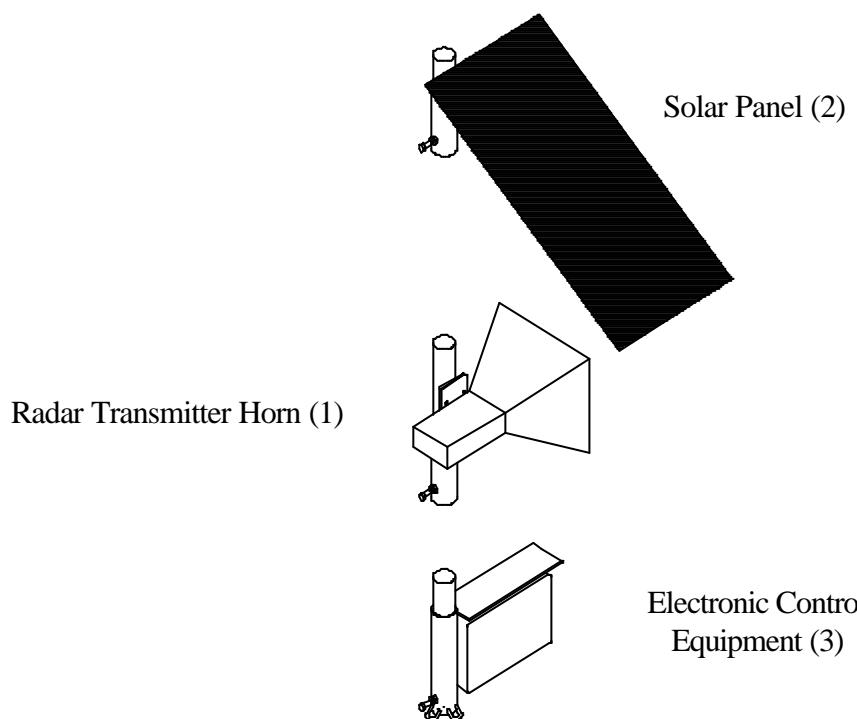
■ Series 2000 E1 Radar Transmitter and control unit

Fig 5.



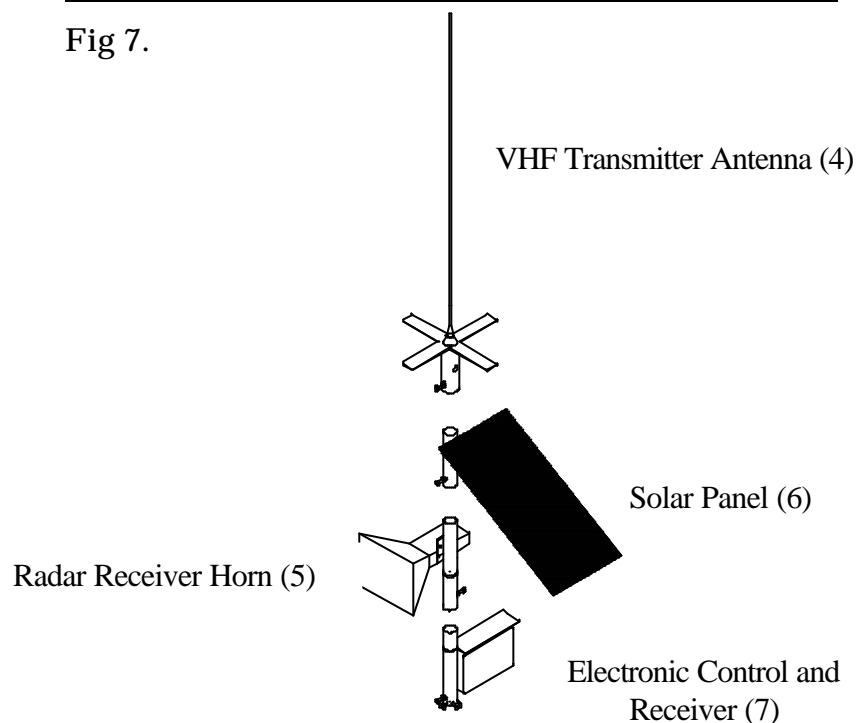
■ Series 3000 E1 Radar Transmitter and control unit

Fig 6.



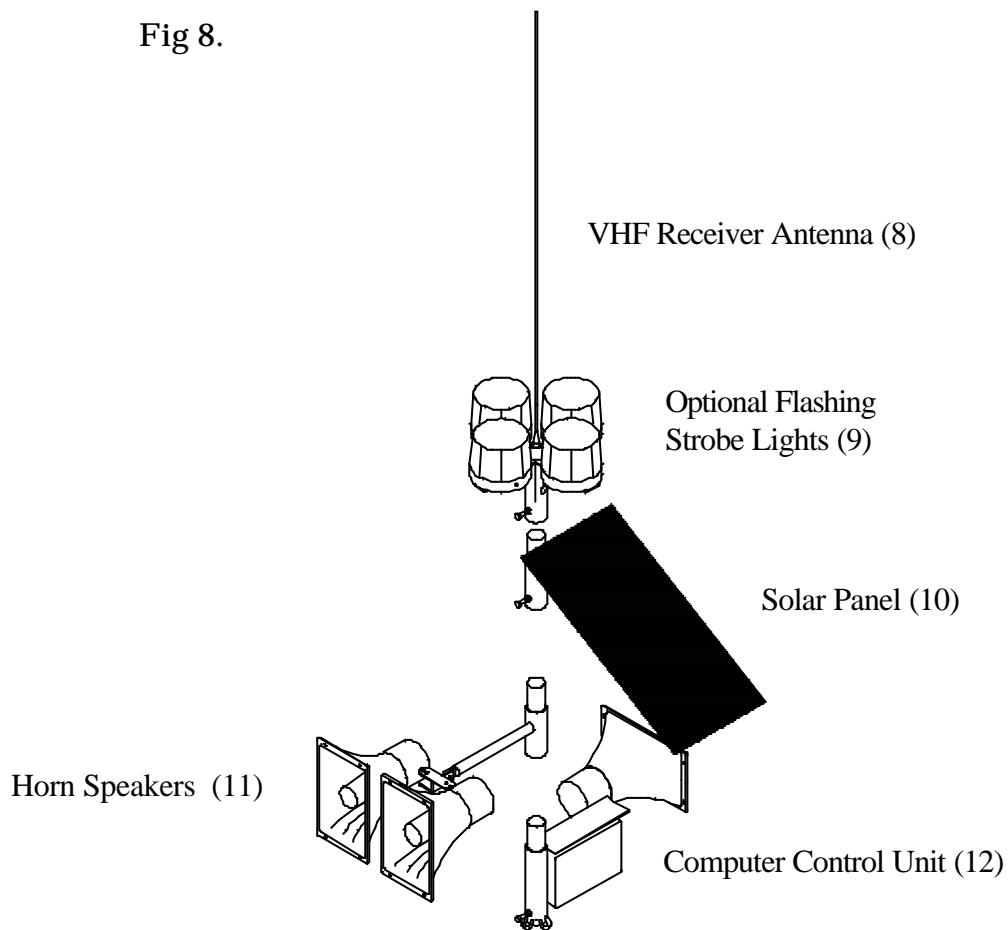
■ **E2 Radar Receiver unit with inbuilt VHF radio transmitter**

Fig 7.



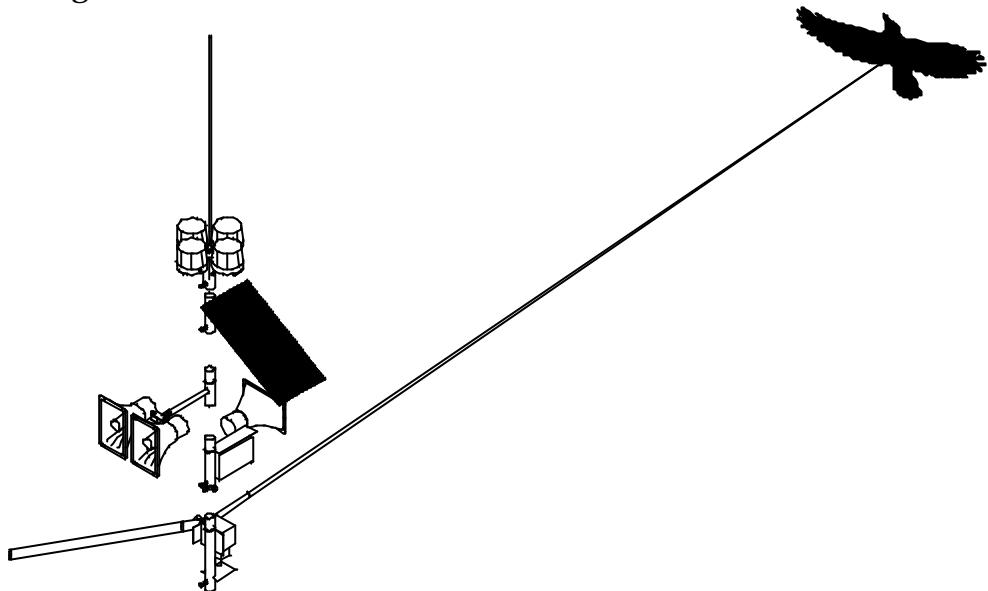
■ **E3 Deterrent Module with inbuilt VHF radio receiver**

Fig 8.



■ Optional Electric Hawk

Fig 9.



Key to System Components

1. **Radar Transmitter Horn** – Microwave transmitter, part of E1. This unit looks identical to the Radar Receiver horn (5), however it can be identified because it doesn't have a LED next to the connector on the bottom.
2. **4 watt Solar Panel** - part of E1. This panel may look identical to the 6 watt panel. The power rating is visible on the rear of the panel.
3. **Electronic Control Equipment** - part of E1 and can be identified by serial number details on the front panel of the plastic case.
4. **VHF (Radio) Transmitter Antenna** - part of E2 and identical to and interchangeable with the VHF Radio Receiver Antenna (8).
5. **Radar Receiver** – Microwave receiver, part of E2. This unit looks the same as the Radar Transmitter (1) but can easily be distinguished because it has a LED next to the connector on the bottom.
6. **6 watt Solar Panel** - part of E2. This panel may appear identical to the 4 watt panel. The higher power rating is visible on the rear of the panel.
7. **Electronic Control and Receiver** - part of E2. This unit can be identified by serial number details on the front panel of the plastic case.
8. **VHF (Radio) Receiver Antenna** - part of E2. It is identical to and interchangeable with the VHF Transmitter Antenna (4).
9. **Flashing Strobe Lights** (optional on E3) – Between 1 and 4 lights are needed per system if it is configured to control flying fox or other nocturnal species.
10. **10 watt Solar Panel** – part of E3. This higher powered panel is needed for the heavy demand of the Deterrent module. Power rating is visible on rear of panel.
11. **Horn Speakers** – three 40 watt horn speakers are supplied with each system.
12. **Computer Control Unit** – this is the ‘nerve centre’ of each deterrent module as it controls all operations. Includes VHF radio receiver and audio equipment.
13. **Electric Hawk** – this option provides extra visual deterrence for certain species such as lorikeets and rosellas.

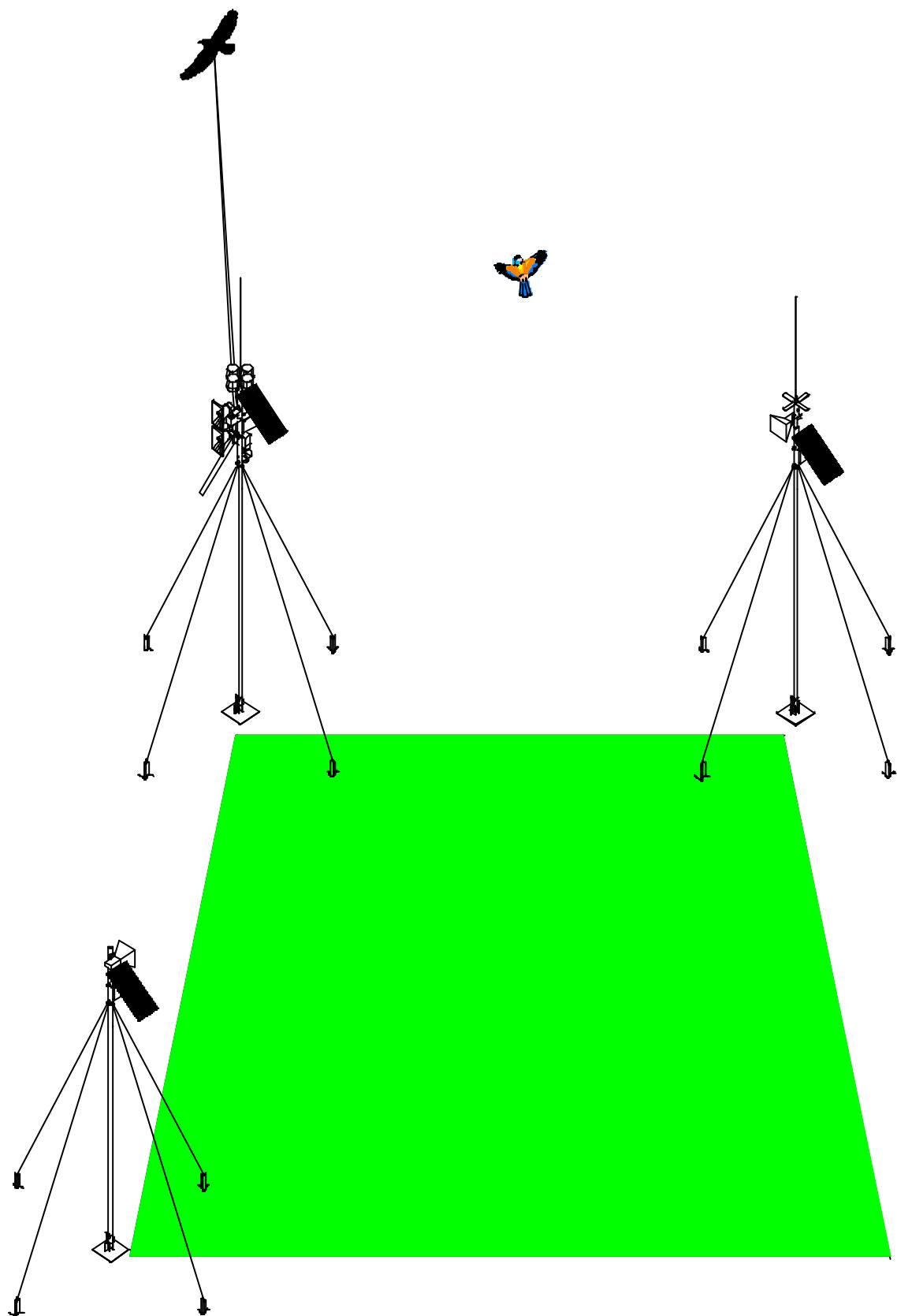
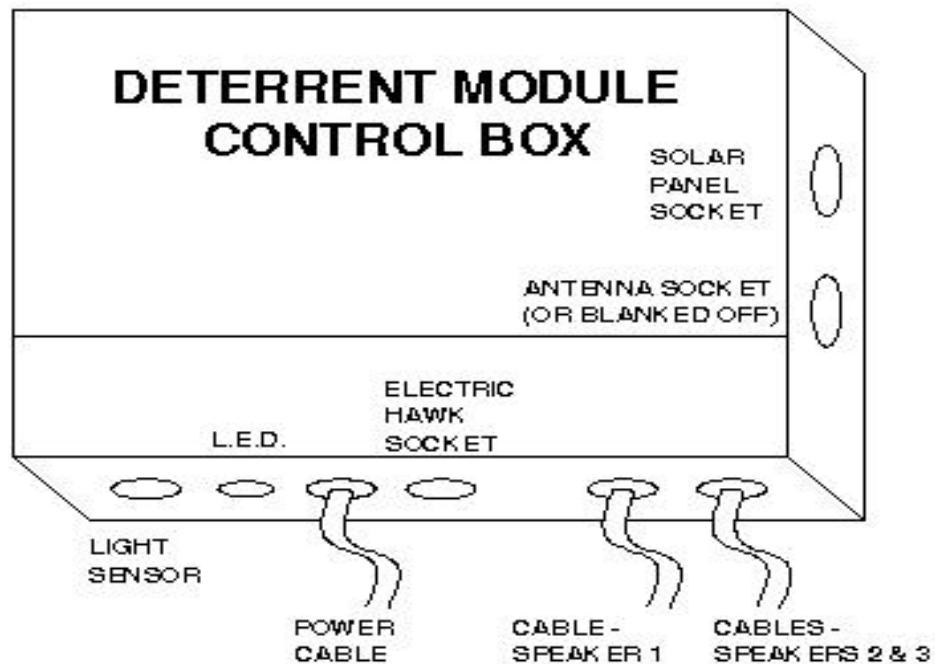


Fig. 10 Fully-optioned BirdDeter system including Electric Hawk



PARTS LIST

5

A BirdDeter system consists of the three components listed below and these are packed and despatched in their own cartons. If you have ordered additional components, they will be packed separately, as will optional equipment such as the Electric Hawk.

E1 – Radar Transmitter

E2 – Radar Receiver (includes VHF radio transmitter)

E3 – Deterrent Module (includes Control System & VHF radio receiver)

Each of the above components is assembled from a number of pieces and these are detailed in the following tables. Please use these lists during unpacking and set-up to ensure all pieces have been included.

If you find that pieces are missing or damaged, please notify our staff immediately and we will rectify the situation as quickly as possible.

Please refer as needed to the ‘Notes’ which are included on Page 17.

E1 – Radar Transmitter

Qty	Description
1	Base Plate
1	Electronic Controller and transmitter
1	Solar Panel 4 watt with bracket
1	Solar panel mount
1	Radar transmitter Horn and Mount
1	Radar Horn Mount
4	Ropes (Note A)
1	Accessories Bag

Contents of E1 Accessories Bag

Qty	Description
1	“R” Clip
6	M8 x 20 Hex Bolts
2	M8 Flat Washers
2	M8 Spring Washers
2	M6 x 20 Hex Bolts
2	M6 Flat Washers
2	M6 Spring Washers
8	“D” Shackles

E2 – Radar Receiver (including VHF radio transmitter)

Qty	Description
1	Base Plate
1	Electronic Controller
1	Solar Panel 6 watt with bracket
1	Solar panel mount
1	Radar Receiver Horn and Mount
1	Radar Horn Mount
1	VHF Antenna Mount
4	Ropes (Note A)
1	Accessories Bag
1	VHF Antenna (Despatched in separate tube)

Contents of E2 Accessories Bag

Qty	Description
1	“R” Clip
6	M8 x 20 Hex Bolts
1	M8 Flat Washers
1	M8 Spring Washers
2	M6 x 20 Hex Bolts
2	M6 Flat Washers
2	M6 Spring Washers
8	“D” Shackles

E3 – Deterrent Module

Qty	Description
1	Base Plate
1	Electronic Controller
1	Solar Panel 10 watt with bracket
2	Solar panel/Speaker mounts
1	2 Speaker Assembly
1	Single Speaker
1	VHF Antenna Mount
4	Ropes (Note A)
1	Accessories Bag
1	VHF Antenna (Despatched in separate tube)
1	Manual

Contents of E3 Accessories Bag

Qty	Description
1	“R” Clip
7	M8 x 20 Hex Bolts
2	M8 Flat Washers
2	M8 Spring Washers
1	M6 x 45 Hex Bolts (& optional nut if attaching single speaker to antennae mount instead of control box)
1	M6 Flat Washers
1	M6 Spring Washers
4	“D” shackles
1	PVC Tape for taping cables

Optional Equipment

Electric Hawk

The BirdDeter Electric Hawk is available as an option for use with the E3 Module to provide additional visual deterrence for problem birds. The following items are provided:

Qty	Description
1	Electric Hawk Mechanism
1	4.5 m Fibreglass Rod
1	M8 x 20 Hex Bolt

Strobe lights

Flashing strobe lights are available as an option and they are highly recommended to control night-active species such as flying foxes (fruit bats). You will be supplied with between one and four strobe lights, depending on your order, and they are packed in the E3 (Deterrent Module) carton.

Qty	Description
1 - 4	Flashing Lights

Items to be supplied by you

To minimise freight costs, you will have been requested to obtain certain items yourself such as batteries, star pickets and steel poles. Here are further details about these items:

For tree crops

5	Star pickets	
1	12 volt 17AHr sealed lead acid battery	(Note B.)
1	Std length of 32 mm NB galv. steel tubing (maximum outside diameter = 42 mm)	(Note C.)

For other crops

NOTES

UNPACKING AND ASSEMBLY

6

Introduction

IMPORTANT – We recommend that you store the cartons and all internal packaging in a safe place so it is available for repacking the components at the end of the season.

As a general comment regarding set-up of BirdDeter radar equipment, once it's installed, there must be a clear microwave 'path' between the radar transmitter and radar receiver.

This is especially important for installation in tree crops, where the radar components are mounted on tall poles. The pole height must be set to ensure components are located *above the tree line* so the microwave 'path' is clear. *Before starting to erect poles, we strongly recommend that you double-check that appropriate sites have been selected for each component. For further details on site selection, refer to Section 3: 'Setting up in your crop'.*

Please note that it is easiest to erect the poles with the system components already attached.

The following section details how the components are best removed from their packaging and assembled onto their poles. Part numbers given throughout these instructions refer to diagrams contained in Section 7 (which deals with packing components for storage or return).

How to erect pole-mounted components

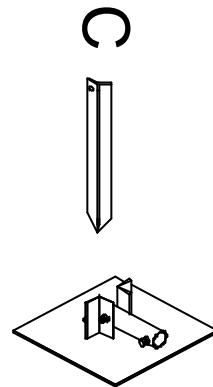
1. The base plate for each component should be removed from the carton and set up on the ground. Here are details for each:

- **E1 Radar Transmitter** – Refer Figure 28, on Page 30
- Open the box and remove the top layer of foam rubber (Part 13) and put aside. Remove and set aside the four ropes and accessories bag (Part 12). Remove the next foam assembly (Part 11). This will allow the base plate (Part 4) to be lifted from the box.
- **E2 Radar Receiver** – Refer Figure 29, on Page 31
- Open the box and remove the top layer of foam rubber (Part 13) and put aside. Remove the antenna mount (Part 14) and lay carefully beside the box. Remove and set aside the four ropes and accessories bag (Part 12). Remove the next foam assembly (Part 11). This will allow the base plate (Part 4) to be lifted from the box.
- **E3 Deterrent Module** – Refer Figure 30, page 32
- Open the box and remove the top layer of foam rubber (Part 15) and put aside. Remove and set aside the solar panel (Part 14). Remove the next foam

assembly Part 9). This will allow the base plate (Part 2) to be lifted from the box.

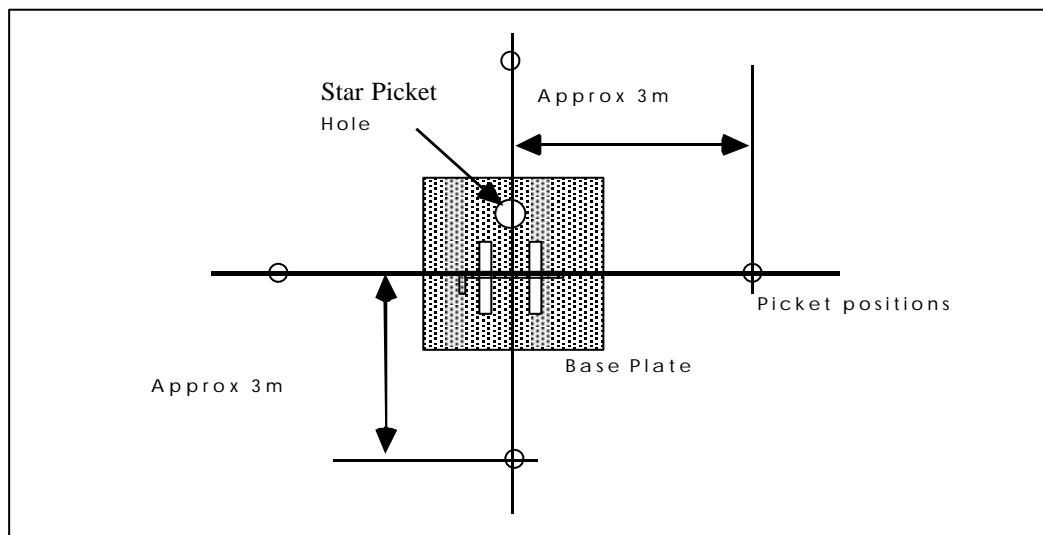
2. Place a star picket through the hole provided in the base plate (see Fig.11 below). Remove the "R" clip from the accessories bag and push the "R" clip through one of the holes near the centre of the star picket. Hammer the star picket in until the "R" clip is flush with the top of the base plate.

Fig 11.



3. Four star pickets are used to anchor guy-ropes (for holding the pole in position). Locate these around the base plate and drive them into the ground. See Fig. 12 below.

Fig 12.

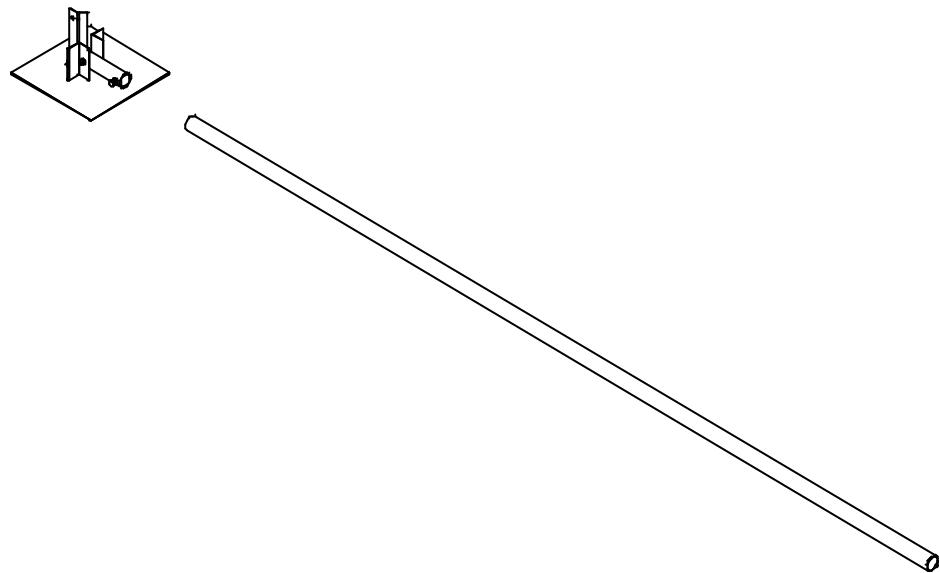


4. If an Electric Hawk is included in your system, it will need a counter balance made from pipe. Cut a 1.2m length from the deterrent module's mounting pole. (If the pipe gauge is 'heavy', the counter balance arm will need to be only 1.1 m long). The mounting pole should then be cut to size to ensure that the speakers will sit just above the upper most level of the crop.

NB Poles for mounting the radar components should not be cut.

Slide the pole into the base plate tube and tighten the mounting bolt. Refer Fig 15 below. Mounting bolts M8 x 20 can be found in any of the accessories bags.

Fig 13.



5. The following three drawings illustrates the remaining sequence of steps required to prepare the pole to receive the system component.

Fig 14. If needed, a shortened star picket is driven into the ground and the optional 'assembly aid' placed on top.

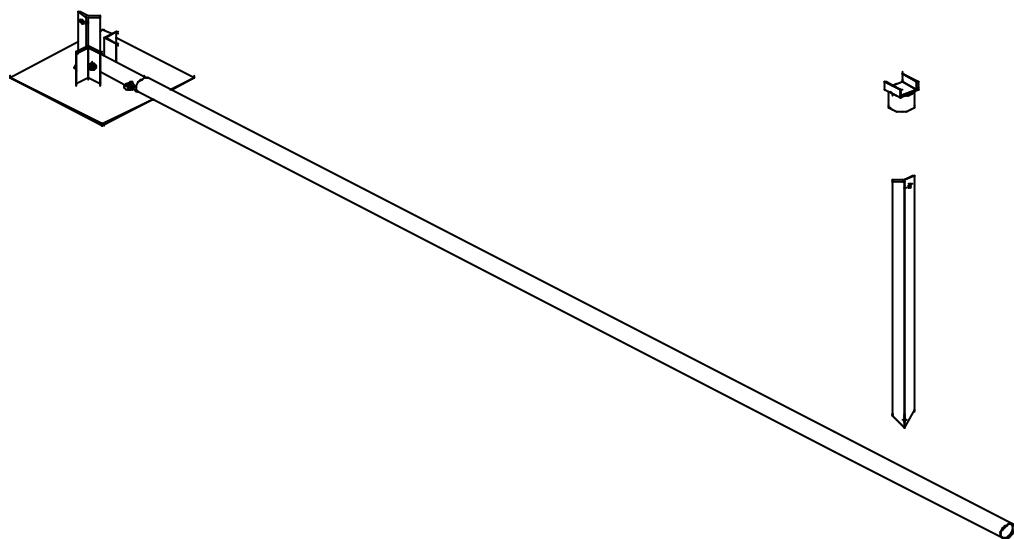


Fig 15. The pole is lifted and placed on the assembly aid.

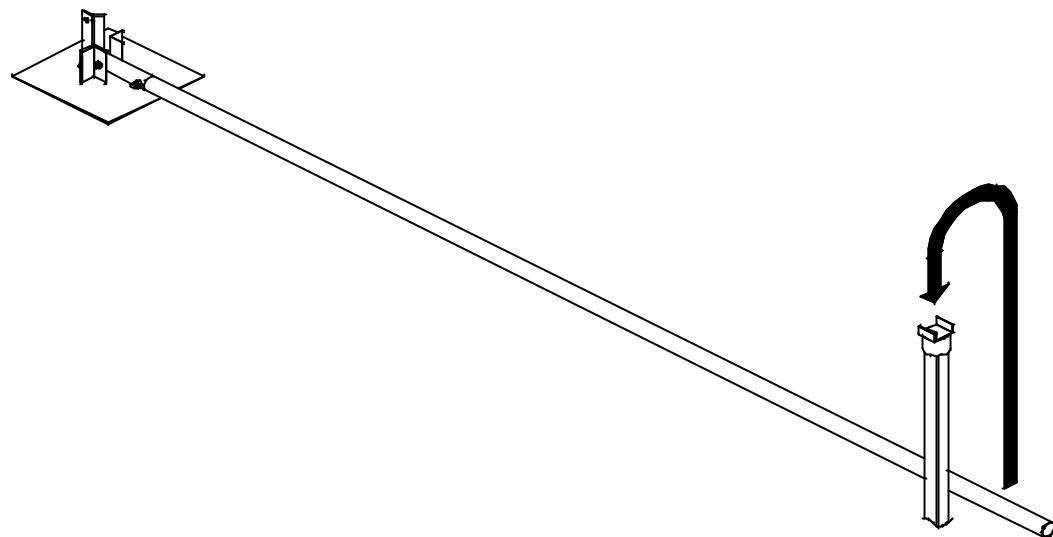
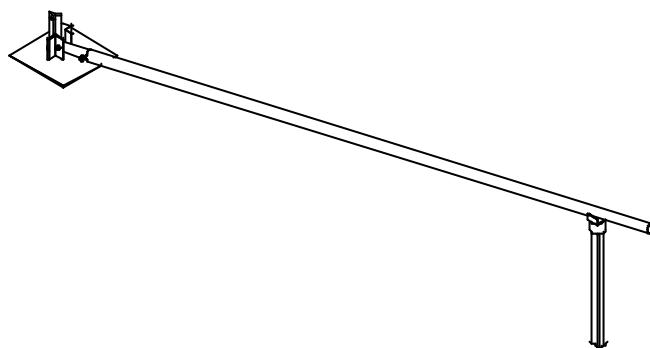


Fig 16. The pole is now ready to receive the system component.

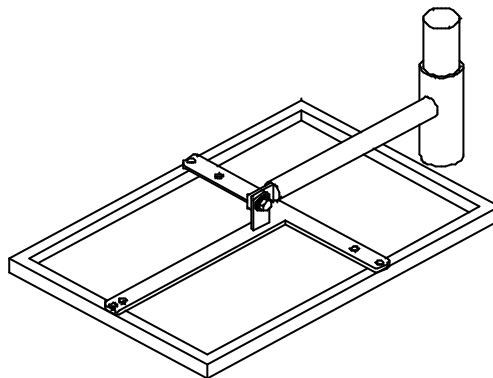


6. **Unpack the component and assemble onto the pole, referring to the instructions below. It is best to place the packing carton close to the end of the pole before proceeding.**

E1 Radar Transmitter Refer Figure 28 (page 29)

- Lift the radar horn mount and the radar horn (Part 10) from the box and set aside.
- Remove the next foam packaging assembly (Part 8) to give access to the control unit and solar panel mount (Part 6).
- Lift the Control unit and the solar panel mount from the box and slide directly onto the pole.
- Remove the solar panel mount from the assembly and set aside.
- The radar horn mount (Part 9) can now be mounted over the control unit and the radar horn attached using the M6 x 20 Hex bolts with flat and spring washers. The connector on the radar horn must point towards the ground after the pole is erected.
- Fit the solar panel mount over the radar horn mount pointing toward the ground and the solar panel mount oriented with the arm horizontal with the nut on the end of the arm pointing down.
- Remove the solar panel (Part 2) from the box and attach to the mount. An M8 x 20 Hex bolt with a spring and then a flat washer is used for this purpose. Fig 17 shows orientation.

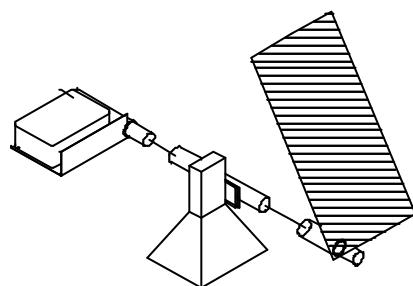
Fig. 17



- The components of the unit should now be adjusted to their correct orientation. The radar horn must point to the radar receiver the solar panel must face north and be angled at the appropriate angle for maximum sunlight. The orientation of the control unit is not important.
- **NB If orientations are not correct once the pole has been raised, the pole can easily be rotated by up to 45 degrees. Simply loosen the bolt holding the pole into the base plate, rotate into position and retighten. Should the situation arise where it is required that both the solar panel and the radar horn face directly north, a right angle bracket is supplied with the E1 to be fitted between the solar panel and its mount to make this possible. It may be necessary to use this angle bracket in the radar receiver unit if the radar transmitter faces directly south.**
- Connect the solar panel lead to the socket in the control unit and plug the lead into the radar horn.

The complete assembly attached to the pole is now ready to be erected.

Fig. 18. – Assembly of E1 Unit



E2 Radar Receiver Refer Figure 29 (page 31)

- Lift the radar horn mount (Part 9) and the radar horn (Part 10) from the box and set aside.
- Remove the next foam packaging assembly to give access to the control unit and solar panel mount (Part 6).
- Lift the Control unit and the solar panel mount from the box and slide directly onto the pole.
- Remove the solar panel mount from the assembly and set aside.
- The radar horn mount (Part 9) can now be mounted over the control unit and the radar horn attached using the M6 x 20 Hex bolts with flat and spring washers. The connector on the radar horn must point towards the ground after the pole is erected.
- Fit the solar panel mount over the radar horn mount.
- Fit M8 x 20 Hex bolts into nuts on mounts and tighten with the control unit pointing toward the ground and the solar panel mount oriented with the arm horizontal with the nut on the end of the arm pointing down.
- Remove the solar panel (Part 2) from the box and attach to the mount. An M8 x 20 Hex bolt with a spring and then a flat washer is used for this purpose. Fig 17 shows orientation.
- The VHF antenna mount(Part 14) can now be located over the radar horn mount. The M8 x 20 bolt should be fitted and the VHF antenna screwed onto the antenna base
- The components of the unit should now be adjusted to their correct orientation. The radar horn must point to the radar transmitter, the solar panel must face north and be angled at the appropriate angle for maximum sunlight. The orientations of the control unit and the VHF antenna mount are not important.

NB. If orientations are not correct once the pole has been raised, the pole can easily be rotated by up to 45 degrees. Simply loosed the bolt holding the pole into the base plate, rotate into position and retighten. Should the situation arise where it is required that both the solar panel and the radar horn face directly north, a right angle bracket is supplied with the E1 to be fitted between the solar panel and its mount to make this possible. It may be necessary to use this angle bracket in the radar transmitter unit if the radar receiver faces directly south.

- Connect the solar panel lead to the socket in the control unit and plug the lead into the radar horn. The unit is now ready to be erected on the pole.

Fig. 19 – Assembly of E2 Unit

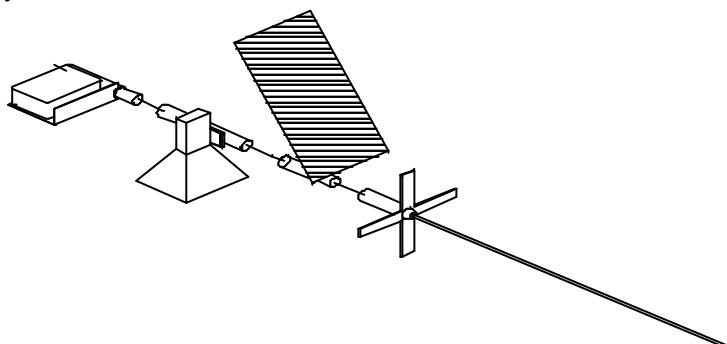
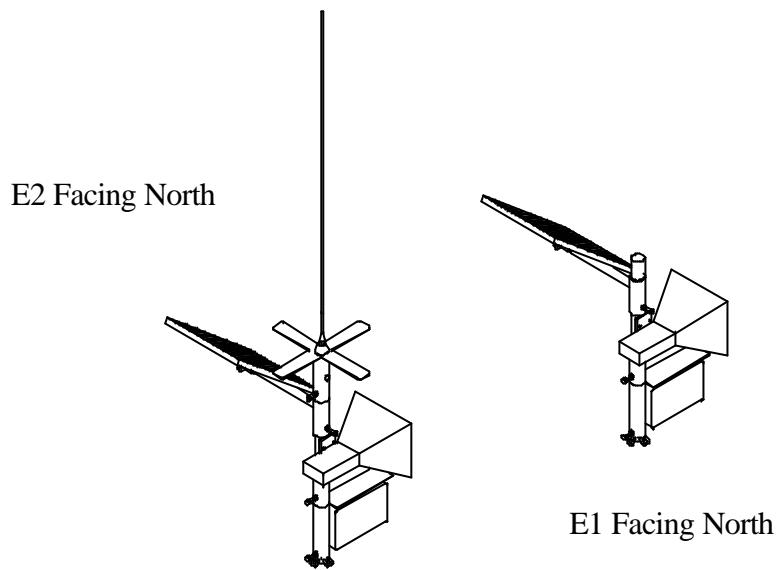


Fig. 20 – Assembly of E1 or E2 with orientation of solar panel to the north. Right angle bracket used in solar mount.



E3 – Deterrent Unit Refer Figure 30 (page 32)

If an electric hawk is to be fitted as part of the deterrent system, it should be fitted prior to the E3 unit proper.

- Position the E3 box under the end of the pole so that the computer control unit (Part 8) can be lifted directly into position.
- Lift the computer control unit into position with the VHF receiver antenna mount and lights if fitted attached.
- Lift single speaker (Part 7a) from box and attach in position on the computer control unit mount using the M6 x 45 bolt with flat and spring washers.
- Remove the antenna mount and fit both the speaker mount (Part 10) and the solar panel mount (Part 11). Replace the antenna mount.
- Lift the two speaker assembly (Part 7b) from the box and attach to the lower of the two mounts using the M8 x 20 with flat and spring washers.
- The solar panel (Part 14) is now attached to the remaining mount again using an M8 x 20 bolt with flat and spring washers.
- If lights are part of the deterrent options and are fitted to the antenna mount, they should now be removed one at a time and re-affixed to the top of the mount. Having done this the VHF antenna can be screwed on to the base.
- The components of the unit should now be adjusted to their correct orientation. The solar panel must face north and be angled at the appropriate angle for maximum sunlight. The speakers must be directed toward the area where the birds are expected. The orientations of the control unit and the VHF antenna mount are not important unless an electric hawk is fitted and then due care must be exercised.
- Connect the solar panel lead to the socket in the control unit.
- The unit is now ready to be erected on the pole unless an Electric Hawk is fitted.

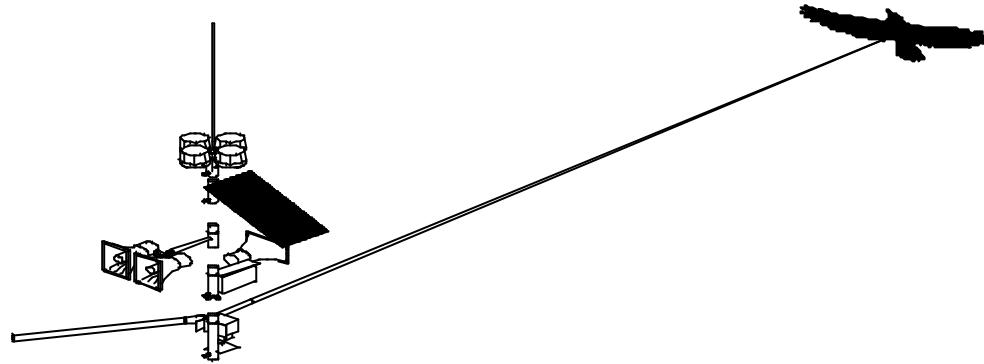


Fig. 21 - E3 Deterrent Unit with Electric Hawk

Electric Hawk

7

- Remove the Electric Hawk from its box and fit to pole.
- Ensure orientation is correct and tighten to pole securely.

NB The E3 should be assembled on to pole above Electric Hawk with reference to instructions above, before proceeding with the following steps.

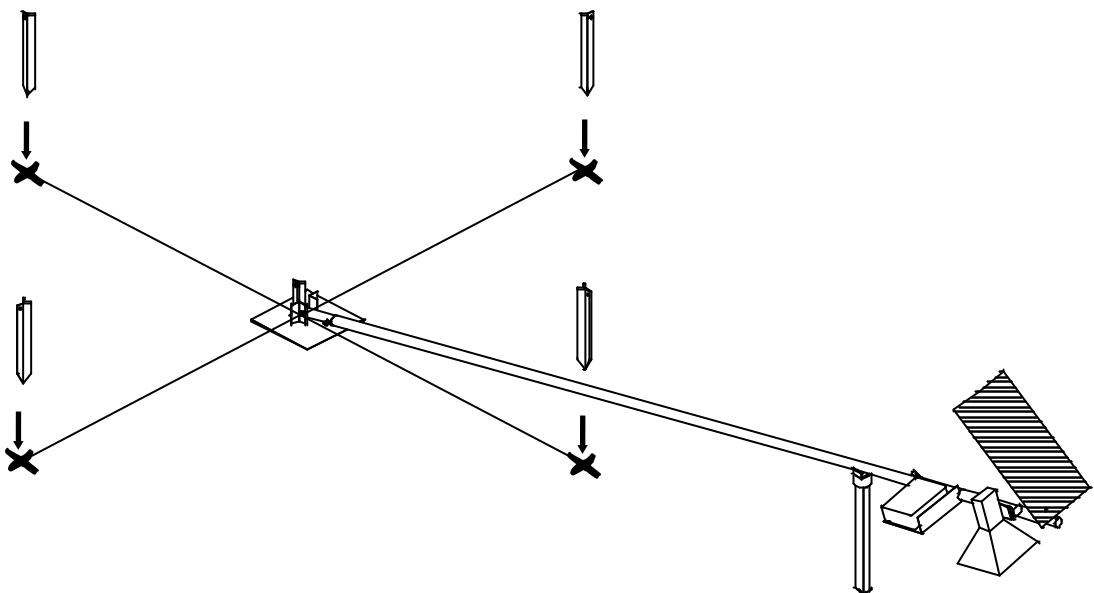
- Fit boom into socket and fix in place with clamp.
- Fit 1.2 metre length of pole into counterbalance socket end lock in position.
- Fit hawk effigy to other end of pole.
- Plug hawk lead into control unit.

The complete assembly is now ready to be erected.

NB If the pole gauge used is heavier than light gauge, the counter balance arm will need to be shortened. Medium gauge pipe will need to be shortened to 1.1m.

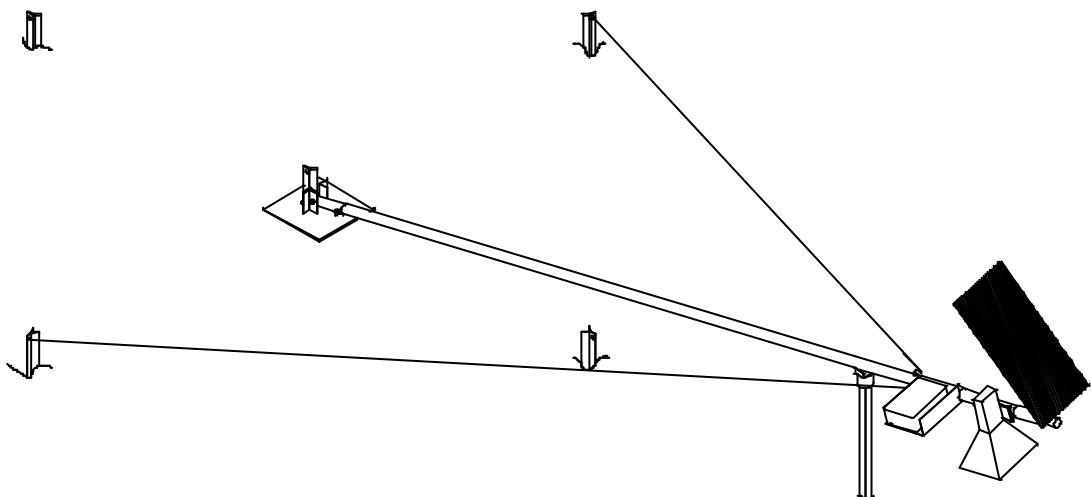
How to erect complete assemblies on poles

Fig 22. Pole with E1 unit fitted. ready to be erected



7. Tie two ropes (supplied) from the rope collar at the base of the head to the two side star pickets as shown below in Fig 19. Ropes are usually supplied with loops in one end. These loops should be slipped through the metal loops on the rope collar. The remaining rope can then be slipped through the protruding end of the loop. No knot tying is therefore necessary. Tension these two ropes.

Fig. 23.



8. Tie a third rope to the star picket as shown below. Find the length of rope required between the pole and star picket when the unit is fully erect by measuring the length from one of the side ropes. Then tie the rope to the star picket as shown below at this length.

Fig. 24.

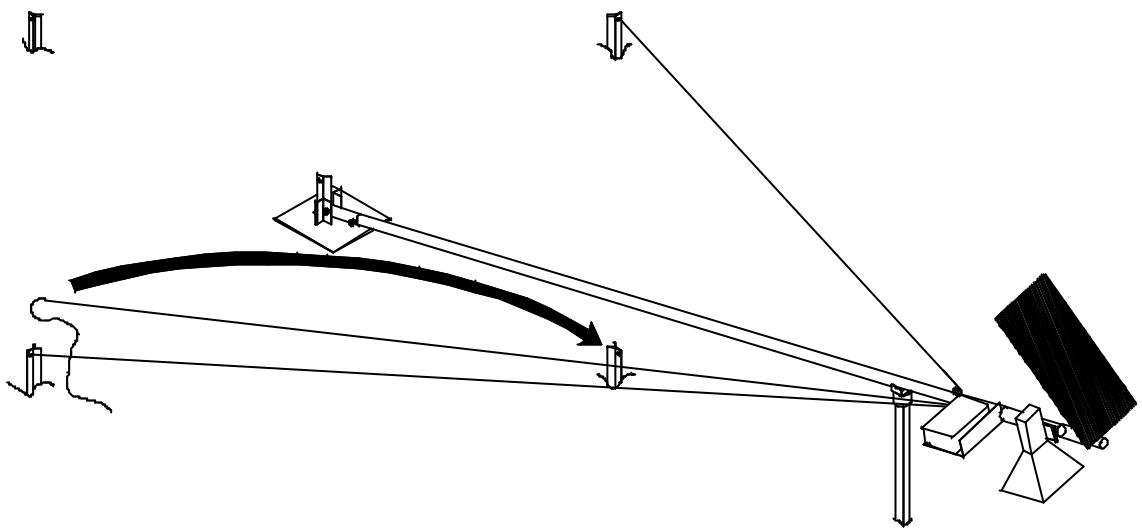
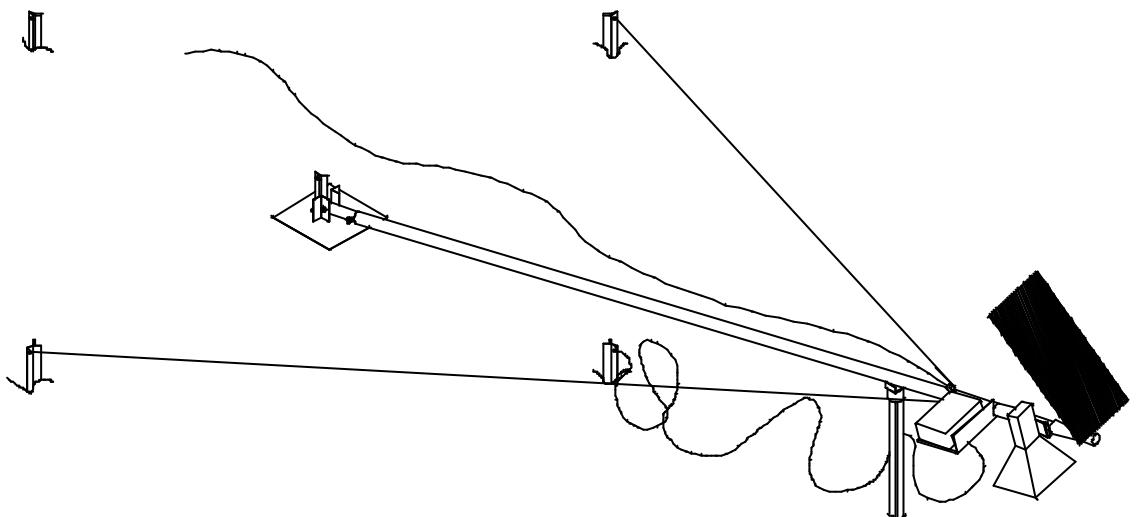
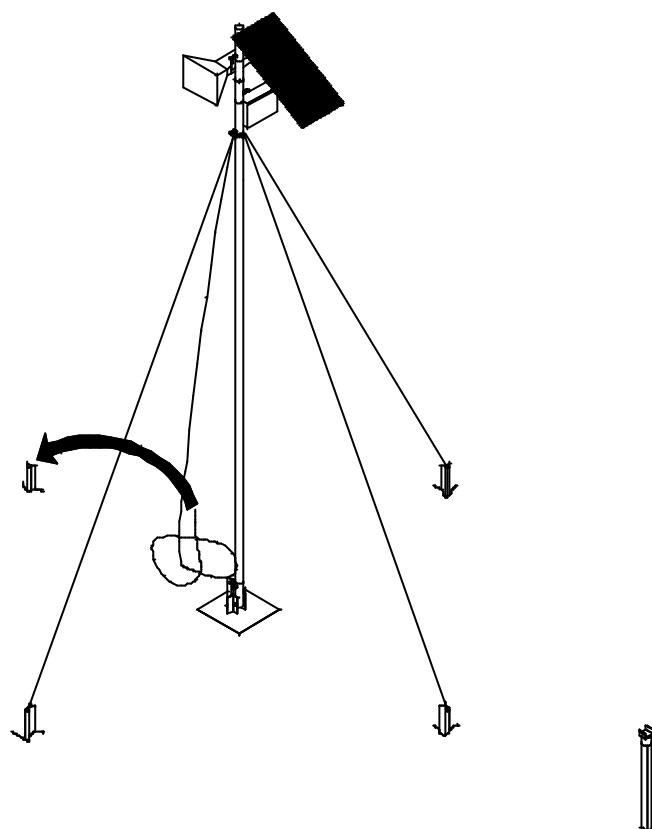


Fig 25. - The fourth rope is attached to the unit in preparation for raising the pole



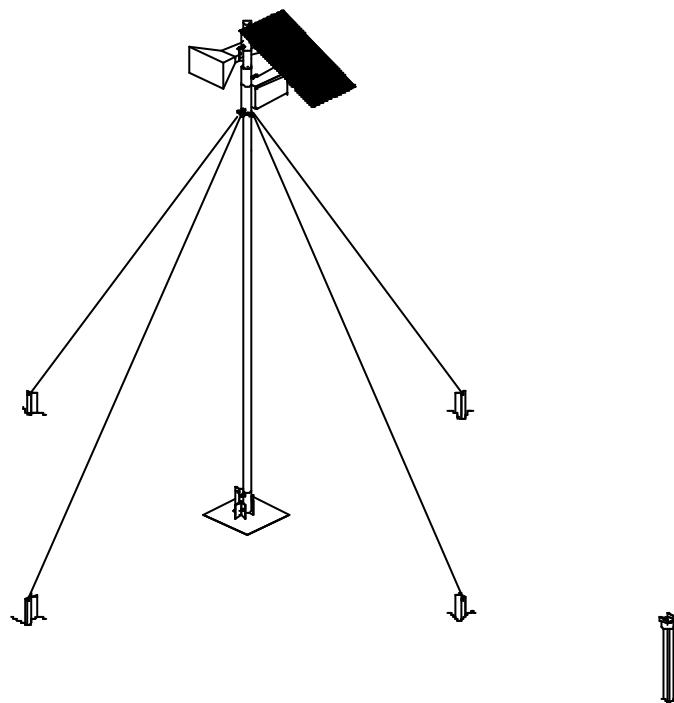
9. Using the tape supplied, tape the battery cable down the pole, ready for connection to the battery. Ensure that the R-clip has been placed through the star picket in the base plate. This is an important safety feature to ensure that the base plate does not slip off the star picket as the pole is raised. The pole can then be raised as in Fig. 26 :

Fig 26.



10. Tie-off the remaining guy rope. Tension all the remaining guy ropes so that the unit is vertical as shown in figure 27.

Fig 27.



The radar units are sufficiently light in weight that one person should be able to lift the poles vertically. If you are raising these poles for the first time, we recommend that you arrange to have an additional person on hand to assist.

The deterrent module may require two people to raise it. If the deterrent unit also contains an Electric Hawk, at least three people will be required to lift the unit.

Battery Connection

Batteries should be placed at the bottom of each pole and connected to cable terminals with the correct polarity. (Please note that connection with the incorrect polarity will not destroy the component being connected).

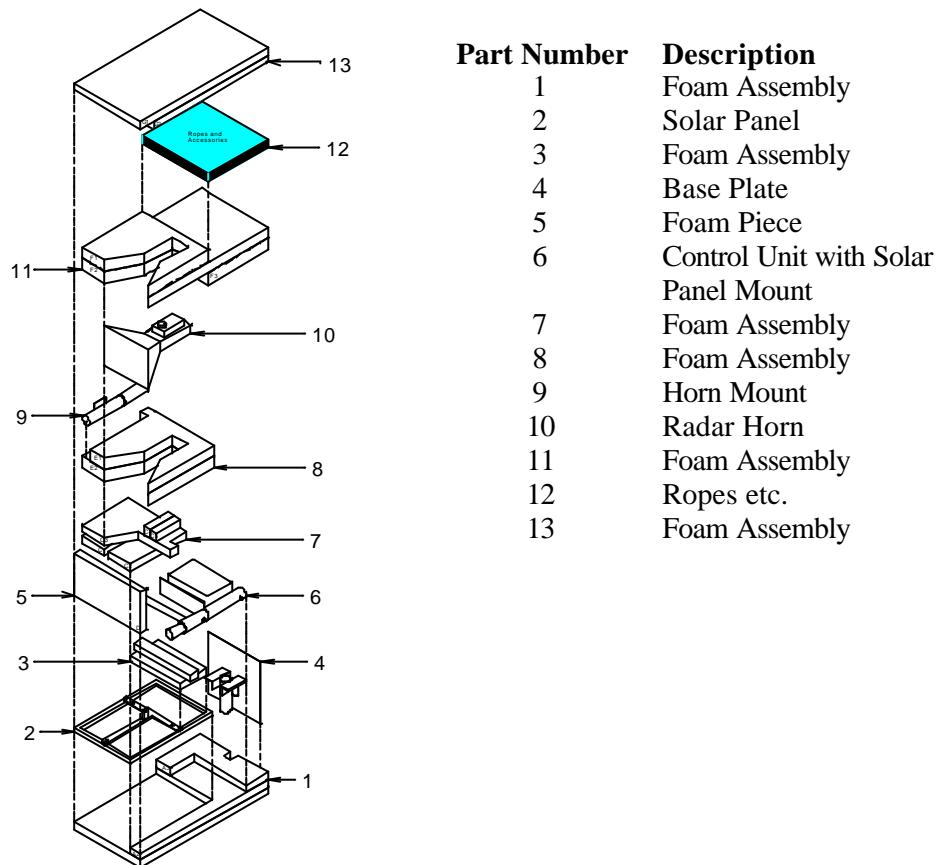
The battery management systems of all components require that the voltage of any battery connected initially must be in excess of 12.0 Volts. If the battery voltage drops below 12 volts on any of the units, then that particular unit will shut down. This will be indicated by the 'battery status light' fitted to each of the units (please refer to Section 8: Solving Technical Problems).

PACKING COMPONENTS FOR STORAGE

The following diagrams illustrate how your BirdDeter system should be packed in the original cartons for storage.

E1 – Radar Transmitter

Fig. 28. – Exploded view of E1 Packaging.

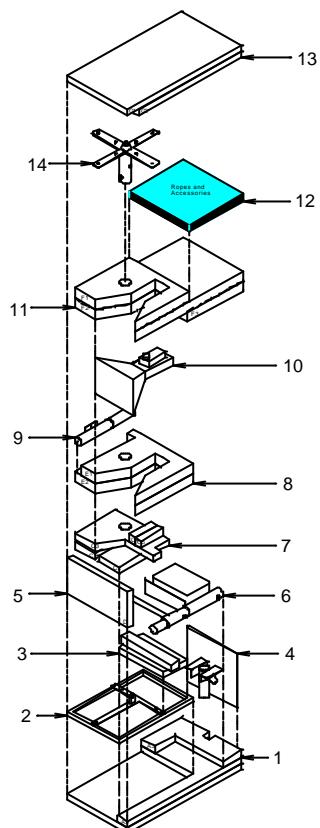


The mast should be lowered to the ground and the unit dismantled and packaged as follows:

- While maintaining tension, untie the guy rope, which was the last to be tied during erection of the pole.
- Lower the pole to the ground.
- Dismantle the unit from the pole, unplugging all electrical connectors.
- Remove pole and star picket from the base plate.
- Untie and coil ropes neatly.
- Unbolt the Solar Panel from its mount.
- Unbolt the Radar Horn from its mount.
- Remove all bolts as fitted during assembly.
- Remove all the packaging from the box except the foam assembly (Part 1).
- Replace all components into the box in the order indicated in Figure 28 above.
- Loose bolts etc should be placed in the plastic bag before packing with ropes.

E2 – Radar Receiver

Fig 29. – Exploded view of E2 Packaging.



Part Number	Description
1	Foam Assembly
2	Solar Panel
3	Foam Assembly
4	Base Plate
5	Foam Piece
6	Control Unit with Solar Panel Mount
7	Foam Assembly
8	Foam Assembly
9	Horn Mount
10	Radar Horn
11	Foam Assembly
12	Ropes etc.
13	Foam Assembly
14	Antenna Mount

The pole should be lowered to the ground and the unit dismantled and packaged as follows:

While maintaining tension, untie the guy rope which was the last to be tied during erection of the pole.

Lower the pole to the ground.

Dismantle the unit from the pole, unplugging all electrical connectors.

(Note Antenna is hardwired and remains attached to the Control Unit.)

Remove pole and star picket from the base plate.

Untie and coil ropes neatly.

Unscrew Antenna from Base.

Unbolt the Solar Panel from its mount.

Unbolt the Radar Horn from its mount.

Remove all bolts as fitted during assembly.

Remove all the packaging from the box except the foam assembly (Part 1).

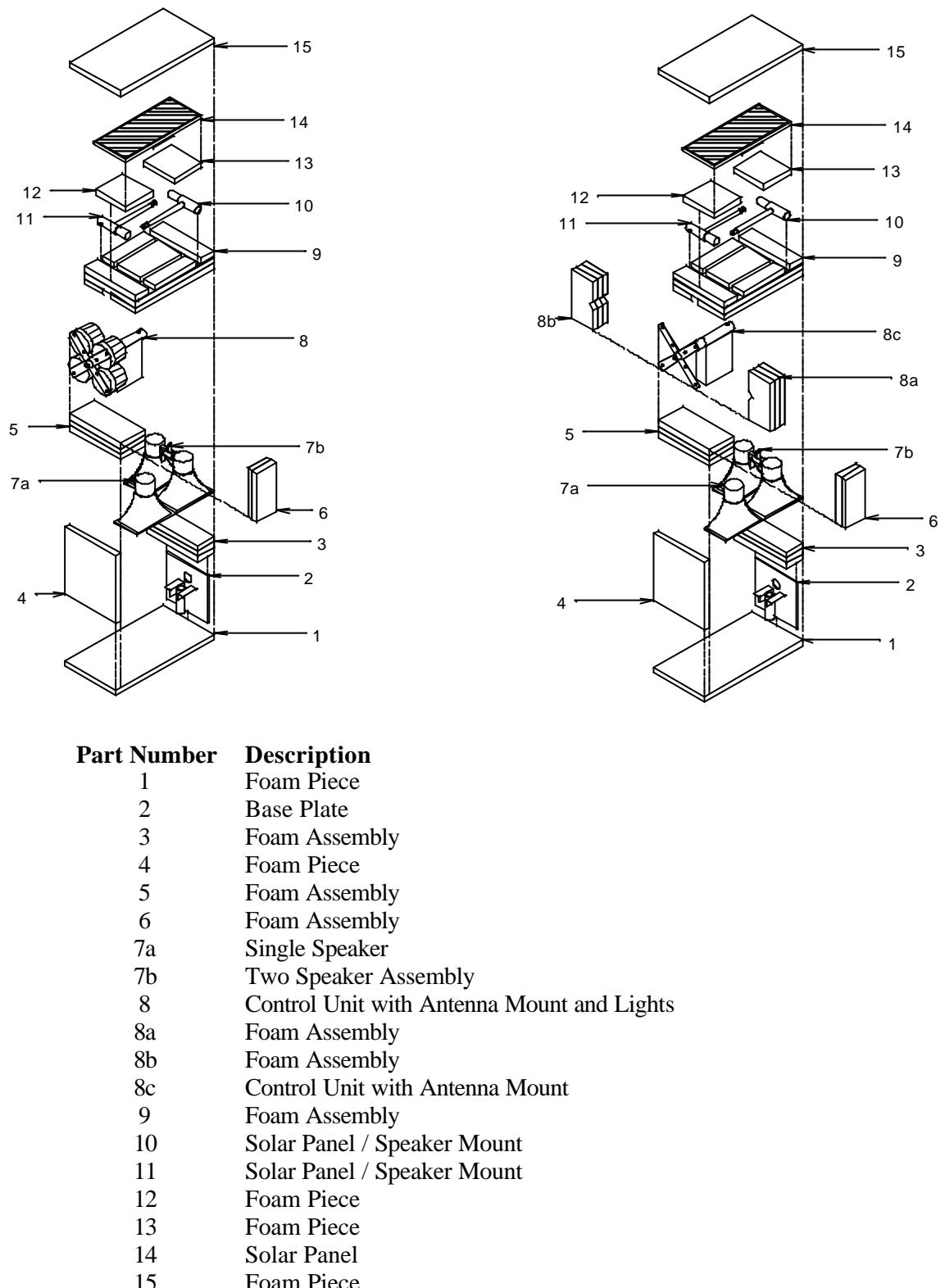
Replace all components into the box in the order indicated in Figure 29 above.

Package Antenna in tube as supplied.

Loose bolts etc should be placed in the plastic bag before packing with ropes.

E3 – Deterrent Module

Fig. 30 – Exploded view of E3 packaging.



E3 – Deterrent Module (continued)

The pole should be lowered to the ground and the unit dismantled and packaged as follows:

While maintaining tension, untie the guy rope which was the last to be tied during erection of the pole.

Lower the pole to the ground.

Dismantle the unit from the pole, unplugging all electrical connectors.

(Note Antenna and Speakers are hardwired and remain attached to the Control Unit.)

Remove pole and star picket from the base plate.

Untie and coil ropes neatly.

Unscrew Antenna from Base.

Unbolt the Solar Panel from its mount.

Unbolt the Radar Horn from its mount.

Remove all bolts as fitted during assembly.

Remove all the packaging from the box except the foam assembly (Part 1).

Replace all components into the box in the order indicated in Figure 30 above.

Package Antenna in tube as supplied.

Loose bolts etc should be placed in the plastic bag before packing with ropes.

SOLVING TECHNICAL PROBLEMS

8

Check the system daily

The following information is provided to help you diagnose and solve any problems of a technical nature. Remembering the old maxim that “prevention is better than cure,” we strongly recommend that all components of the system are checked daily. The aim here is to ensure that if a problem arises, it is found and rectified as quickly as possible.

If at any stage you find the system is not working properly, whether during installation or at some later date, please contact our office immediately if you are unable to solve it yourself. Early attention will help to minimise crop exposure to pests and also shorten downtime while a solution is being found. Contact telephone numbers are (07) 4667 0491 during business hours and 0407 150 227 after hours.

Diagnosing faults requires careful observation of the little lights or LED's (Light Emitting Diodes) which are found on the base of each component's Control Box, and in the case of the Radar Receiver, under the radar receiver horn antenna as well. When any of these LED's is 'on', it glows a bright red colour. This glow can be continuous, flickering or intermittent. Details of correct functioning of each component are provided below.

Radar Transmitter

1. The **Radar Transmitter (E1)** control box has one LED. This will be 'on' if the battery is connected and has sufficient voltage to operate the unit. If this LED is 'off', firstly check battery *connections*: clean terminals of battery and/or cable if necessary. If the battery voltage measures below 12 volts, the battery should be charged. If your system uses a '3000 Series' E1 unit, this LED will switch 'off' when it is dark, as 'daytime-only' operation is standard.
2. Sometimes the radar system will not work simply because the radar transmitter horn's cable has not been plugged into the E1 control box. Here is a cross-check. When you are looking at the Radar Receiver (E2) control box, if you notice that the 'Receive Signal' (LED 2) is 'off', and Step One above has been checked, then make sure the radar transmitter horn's connecting cable has been plugged in. The LED 2 on the Radar Receiver control box should then be rechecked.

Radar Receiver

Under the **Radar Receiver** Control Box there are four LEDS. In the following notes these are referred to as LED 1 to 4: LED 1 is closest to the mounting pole and LED 4 is furthermost from the mounting pole. When glowing, they indicate the following conditions:

LED 1. Battery O.K. When the battery is first connected this light will come 'on' if the battery voltage exceeds 12V. If the battery voltage subsequently drops below 11.6V this light will go off.

LED 2. Radar receiver unit has detected a bird-like signal. This LED comes on for one second. If the unit is detecting signals more than once every 50 seconds for a period of 5 minutes or more, this LED will remain on continuously. The unit can be returned to its original one-blink-per-second mode by disconnecting the unit from the battery, briefly shorting the battery cables together, then reconnecting the cables to the battery.

Radar Receiver (cont.)

LED 3. This will come on shortly after LED 2 turns off and will remain on for a further 50 seconds. During this time the radar receiver's VHF transmitter cannot be activated. This in turn stops the deterrent unit being activated during this period. If LED 2 blinks again within this 50 second period this deactivation time is further extended for 50 seconds. If LED 2 blinked at a rate greater than once every 50 seconds the deterrent unit will never be activated and the VHF transmitter at the radar receiver unit will never transmit. This feature guards the system against false alarms caused by setting the sensitivity to high, radio interference or farm machinery.

LED 4. Radar transmitter signal is being received. If this LED is off or flickering, the radar transmitter may not be on. To confirm this a further LED under microwave receiver horn will either be blinking slowly or be off (see signal strength LED below). If this is the case see radar transmitter diagnostics. This LED will turn off briefly or flicker if the receiver and transmitter are too close. To confirm this the signal strength LED described below will be flickering at a high rate or appear to be continuously on. This LED will also turn off at night if the unit shuts down at night.

Signal Strength Indicator A further LED, located under the radar receiver horn, acts as a signal strength indicator. It should flash slowly or be off if the radar transmitter is off or not directed toward the receiver. It should flash quickly or appear almost continuously on if the radar transmitter is on and within range of the receiver. If the radar receiver is not in view of the transmitter, this light can be used to assist in the alignment of the transmitter and the receiver. The receiver pole can be easily rotated if the bolt holding the mounting pole in the base plate is loosened. This leaves the mounting pole free to rotate.

False Alarms

A false alarm rate will not contribute to habituation if it varies randomly between once every twenty minutes to once an hour: this rate is acceptable. Because deterrents are only activated for thirty seconds, a few false alarms will not detract from the essential function of the unit, which is to train birds to stay away from the crop by deterring them as they enter it.

False alarm rates that seem repetitious and consistently exceed once every 15 minutes can be caused by the following :

1. Poor radar link

Firstly, there is too much distance between radar transmitter and receiver (see page 5). Secondly, the microwave 'path' between the radar transmitter and receiver is obstructed: remember that the radar transmitter and receiver should be able to 'see' each other.

2. Nearby moving objects

These include vehicles on a busy road or railway line. It is also recommended that the radar system be placed as far away as is practical from windbreaks to minimize the effect of large amounts of movement from windbreak trees.

3. Microwave radio interference

Mobile telephone repeater stations or other microwave links can cause problems. Ensuring that the radar receiver does not point in their direction can minimize radio interference from these sources. Mobile phones within 100m of the radar receiver should also be switched off.

4. Sensitivity has been incorrectly set

The radar receiver sensitivity can be adjusted using an internal 10-position switch. This is normally factory preset to position 5. See section below on sensitivity adjustment.

Sensitivity Adjustment

The radar receiver unit has built in automatic adjustment of its sensitivity, which it will either decrease or increase depending on radar spacing, crop movement or interference. Some additional adjustment is available so that the unit can be tailored to specific needs.

The sensitivity control can be found at the top, center of the bottom circuit board inside the control box. The position of the switch can be adjusted by rotating it. Position 1 is the most sensitive position and position 9 is the least sensitive. If the setting is too sensitive excessive false alarms will occur. If the setting is too insensitive birds will not be detected. If excessive false alarms do occur the sensitivity could be shifted to position 6 or seven. If the unit is to be placed in a low movement area position 4 could be considered. If the unit is to be placed in a no movement area position 3 could be considered. If the poles need to be spaced at greater than 200m the sensitivity will need to be reduced.

VHF radio link

1. A switch inside the radar receiver control box switches the VHF radio transmitter on continuously. This may be used to activate the sound deterrent unit or Electric Hawk. To switch on the VHF link for continuous operation, slide the switch toward the top of the control box.
2. When the VHF link at the radar receive site is turned on, the LED at the base of the sound deterrent unit and electric Hawk control box should also turn on. In addition the deterrent unit should activate.
3. If the deterrent unit cannot be activated by turning on the VHF link then
 - The radar receiver and the deterrent unit may be separated by greater than 3km or not have line of sight between them.
 - The VHF antennas have not been screwed on
 - The radar system has not been installed correctly (see radar receiver and transmitter diagnostics).

Deterrent Module

The Deterrent Module Control Box is illustrated on page 13. The Control Box has one LED on its base to indicate the 'status' of the unit. If the unit is operating correctly, this LED should flash on briefly once every two minutes. If the LED does not flash at all, this indicates that the battery is not connected or requires recharging. When the unit is initially connected to the battery the following sequence of events should occur.

1. The LED at the base of the unit should flash once. This indicates that the battery has been connected. The LED will then continue to flash once per second a number of times depending on the battery voltage. Each flash after the first represents 0.25 Volts. E.g. if after the first flash there are two more flashes, the battery voltage is approximately 12.5V.
2. The deterrents on the unit will now activate in the following order :
 - 2.1 Hawk will be raised
 - 2.2 Speakers will each activate in sequence for two seconds
 - 2.3 Hawk will be lowered
 - 2.4 Lights will flash

This is a self-test of the system and checks that all deterrents are functioning.

System Test

Throw a *solid* object, such as a rock, across the front of the receiver radar horn (this object should be at least 100mm in diameter). The first detection LED should come on at the radar receiver followed by the second detection LED. The second LED will stay on, the first detection LED may flash for a short period. The radar receiver has now switched on the VHF radio transmitter. The VHF receiver located at the deterrent unit receives these signals.

The LED on the underside of the deterrent unit will then come on within 5 seconds of receiving the radio signal. The system will then start a sequence of events including speakers, hawk and flashing light. The order in which deterrents are activated will vary in a seemingly random fashion from one activation to another. The entire sequence will however not last for more than 30 seconds.

The LED at the base of the deterrent control unit will turn itself off after the deterrent sequence has finished.

Speakers Not Operating

If the LED at the base of the deterrent unit comes on, (indicating that the deterrent module has been activated) and yet no deterrent sounds are heard, this indicates that either the volume control has been set too low or the speakers are faulty. Check this by disconnecting the unit, briefly shorting together the positive and negative terminals on the power cable and then reconnecting the unit to the battery. If the unit unsuccessfully completes its start up test sequence, then the unit is faulty.

FCC COMPLIANCE STATEMENT

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

Warning: Any changes or modifications not expressly approved by the party responsible for compliance (Grantee), could void the user's authority to operate this equipment.