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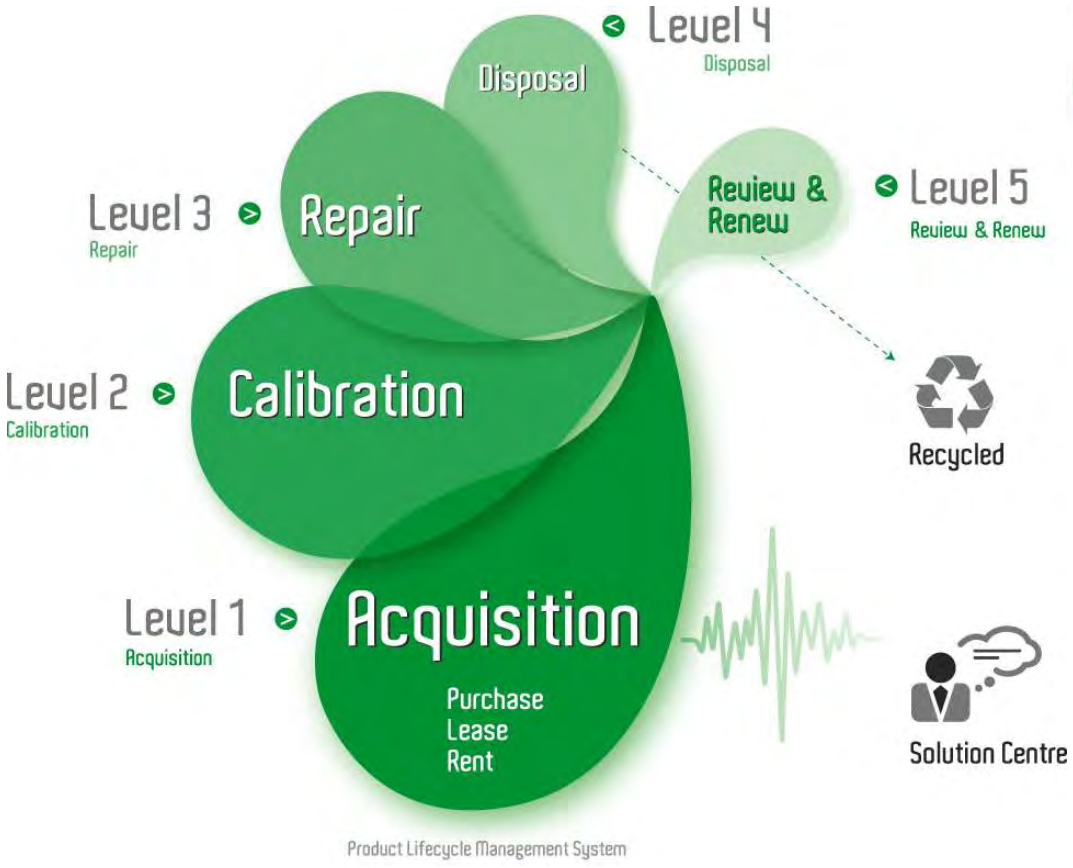


AEGIS
PTY LTD
CZ 6000 MK III
PIPE AND CABLE LOCATOR
OPERATING MANUAL

AEGIS

141 Christmas Street, Fairfield, Victoria, Australia 3078
Telephone 481 1422 Fax 489 4020
P.O. Box 1049, Thornbury 3071

CONTENTS

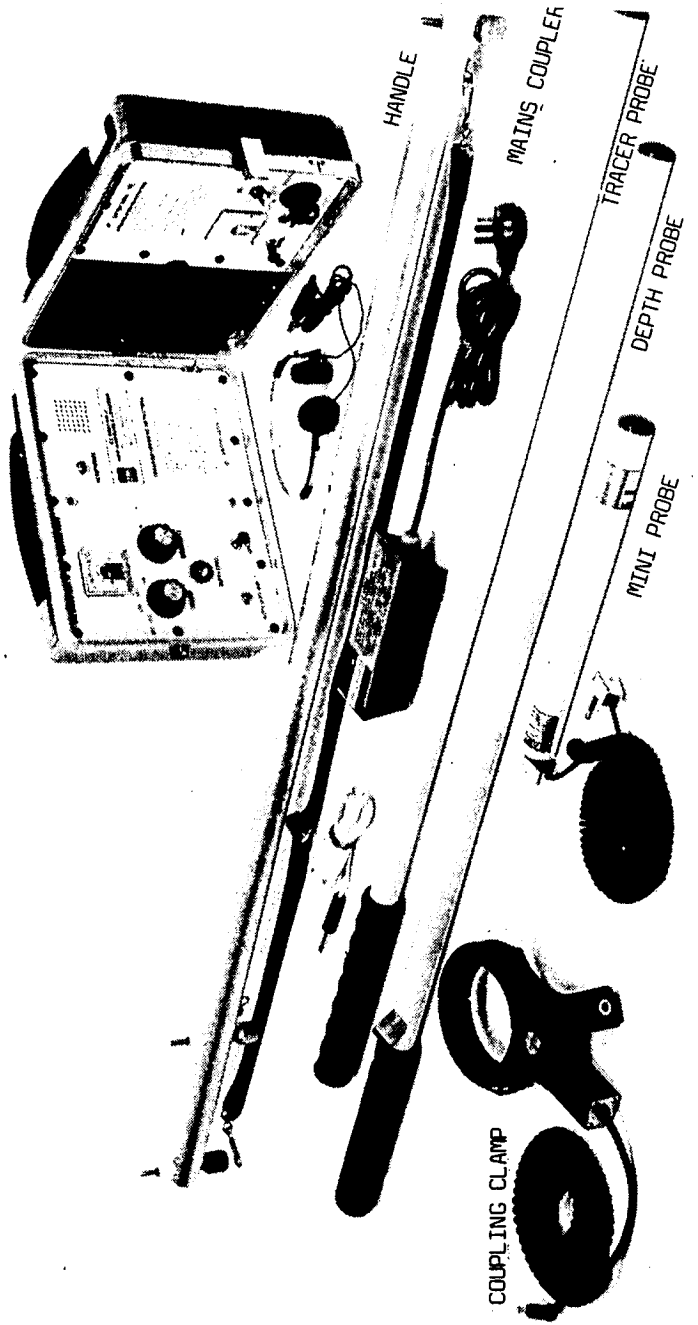

FIGURE 1 — CZ6000 Mk III Cable and Pipe Locator

1. INTRODUCTION

1.1 DESCRIPTION

The AEGIS CZ6000 Mk III cable and pipe locator is compact, portable, electronic instrument designed for detecting and accurately locating buried metal pipes and cables. It consists of a directional radio transmitter and receiver that can be used either mechanically coupled together or separately. It comes complete with conductive connecting wires and clips, carrying handle with strap (optional) and headphones. Optional tracing wands, coupling clamp and mains coupler increase the versatility of the CZ6000 Mk III. The locator and all accessories are shown in Figure 1.

1.2 THEORY OF OPERATION

The CZ6000 Mk III detects or traces metallic objects using the receiver to sense the transmitter signal which is coupled to the object to be traced.

There are two modes by which the transmitter can be coupled to the metallic object, either INDUCTIVELY or CONDUCTIVELY.

To the 'INDUCTIVE' mode the electromagnetic field is induced in the surrounding air and soil, as well as in the metal object, so the signal strength will depend upon the conductivity of the soil. In the 'CONDUCTIVE' mode the field is impressed directly into the metal object with no interference from the soil or surrounding metal objects.

There are three main ways of using the locator:

1. INDUCTIVELY with units mechanically coupled together. In this method the receiver and transmitter are attached to a handle at right angles to one another, (see Figure 4). The receiver is balanced to the exact 'null' signal position of the transmitter. When an underground metal object is bought into the transmitter antenna field the 'null' balance becomes distorted. This disturbance is indicated on the receiver meter and by an audible signal in the receiver.

2. INDUCTIVELY with units used separately.
In this mode the units are used separately, with the transmitter inducing the field and the receiver being used as the search unit. A maximum electromagnetic field is applied to the pipe when the plane (bottom edge) of the transmitter is directly over and in-line with (parallel and vertical to) the pipe to be located, (see Figure 6). The minimum electromagnetic field is applied when the transmitter is horizontally over the pipe to be located.
Similarly, the maximum response in the receiver (audible tone and meter reading) is obtained when the bottom edge of the receiver is directly over and inline with the pipe to be located. The minimum response (null signal) is when the receiver is placed on its back horizontally over the pipe to be located, (see Figure 8).

3. CONDUCTIVELY with units used separately
The transmitter is connected to the pipe to be located either directly using crocodile clips or via the coupling clamp and the receiver is used as the search unit.

NOTE: To get the most from the instrument the operator should first read these instructions and practice over known metal objects. The operator should be aware that random pieces of metal as well as unusual changes in the conductivity of the soil can sometimes cause a misleading signal.

1.3 APPLICATIONS

- Location of discrete metallic objects
- Tracing of pipes and cables
- Determining the depth of pipes or cables
- Tracing wires in buildings

1.4 SPECIAL FEATURES

Dual Tone Identifier (DTI)
The CZ6000 Mk III has two distinct audible signals. These are either a continuous tone or dual tone alternating signal readily distinguishable from outside interferences.

Battery Test Circuit
Both transmitter and receiver are fitted with built-in battery testers.

Easy Battery Access
Both transmitter and receiver have front panel battery access for quick battery replacement.
Each battery is in a compartment separated from the electronics to prevent instrument damage if battery leakage occurs.

Standard Batteries
The batteries are standard 276P, 9 volt dry cell batteries.

Auxiliary Input Socket
The receiver has an auxiliary input socket to accommodate any of three optional tracer probes.

Connector for Conductive Operation
The instrument is supplied with an extension cable with crocodile clips on one end and an input jack at the other. It is used to directly connect the transmitter to the pipe when using the conductive mode.

Lightweight Headset
The CZ6000 Mk III is supplied with a modern light weight headset. When plugged into the receiver it automatically turns the unit on.

1.5 ACCESSORIES

The CZ6000 Mk III can be supplied with the following accessories for specialised applications:

One piece handle and strap

Coupling Clamp
For tracing high voltage cable etc, or conductors where direct connection is not possible, the coupling clamp is attached to the pipe to be traced and connected to the transmitter. This induces a field in the required conductor that allows accurate location even if other metal objects are close by.

Tracer Probes
There are two tracer probes available for different applications. These are:

- Mini Probe - designed for work in tight areas, for example, identifying an individual wire
- Depth Probe - used to both trace and then determine the depth of pipes. It has an in-built level indicator.

Both probes come complete with a coil cord assembly and plug into the AUXILIARY INPUT socket on the receiver.

Mains Coupler
The AEGIS CZ6060 mains coupler allows effective tracing of active or inactive mains cables by simply plugging into a GPO. It operates by impressing the transmitter signal onto the mains cable for each tracing by the receiver.

2. CONTROLS AND FUNCTIONS

2.1 RECEIVER CONTROLS

1. Meter - Indicates signal strength and gives indication of battery strength
2. Sensitivity Control - Used to control sensitivity or gain
3. Handle Fixing Screwhole - Position of black adjusting knob on handle
4. Headphone Socket - Plugging in headphones automatically turns receiver on. Use for optimum audio measurement particuarly in nosiy areas.
5. Speaker
6. Battery Box
7. Handle fixing screwhole - Position for aluminium holding screw on handle
8. ON/OFF Pull Out Switch
9. Auxiliary Input Socket - For plugging in optional tracer probes
10. Depth Level Indicator
11. Battery Test and Power Selection Switch - Has four settings, BATT TEST, LO and HI POWER

2.2 TRANSMITTER CONTROLS

1. Battery Box
2. D.T.I. OFF/ON Switch - Turn 'ON' to generate dual tone identifier
3. Battery Test and Mode Selection Switch and has three settings, CONDUCTIVE, BATT TEST and INDUCTIVE
4. Conductive Socket - For connection of coupling clamp and conductive cables when 'CONDUCTIVE' mode is selected
5. ON/OFF Pull Out Switch
6. Battery Test Meter
7. Handle Position

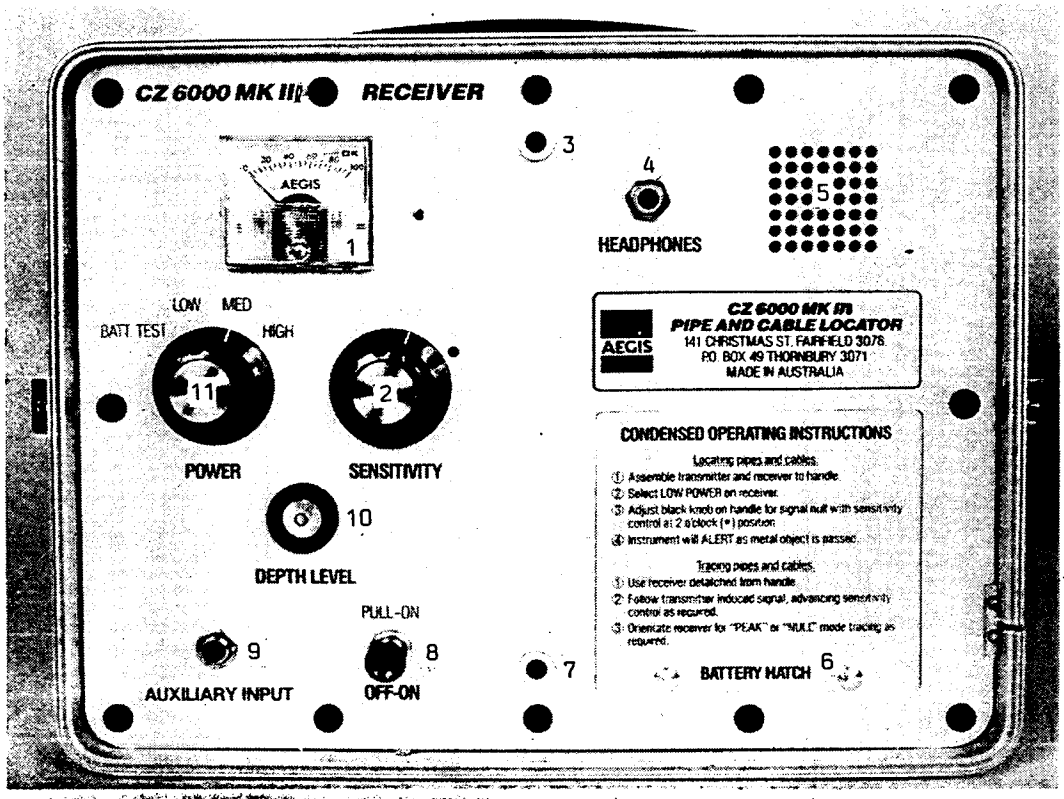

FIGURE 2a - CZ6000 Mk III Receiver Controls

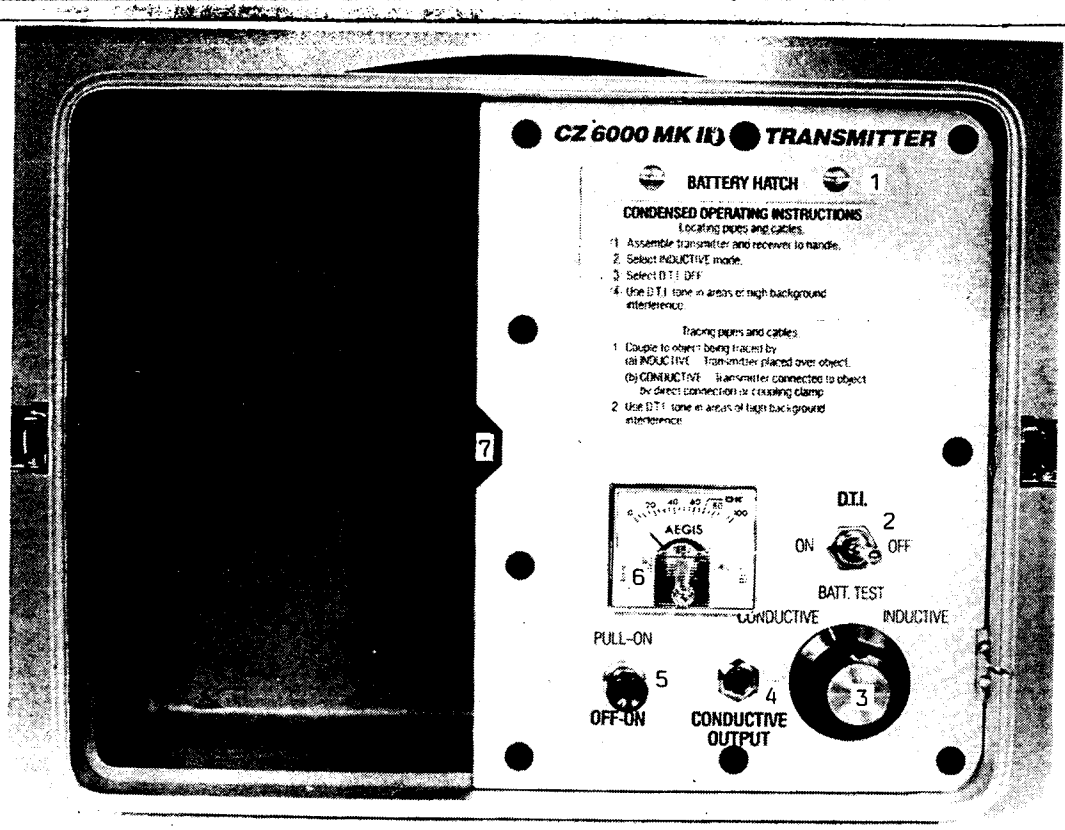

FIGURE 2b - CZ6000 Mk III Transmitter Controls

3 USING THE INSTRUMENT

3.1 INDUCTIVE LOCATION - UNITS COUPLED

This method is best for locating individual metal objects, eg. manhole covers, the tracing of unknown pipes and the preliminary location of lost and unknown metal pipes and conduits. It is suitable for single person operation.

NOTE: The instrument must be tuned and adjusted as described below, each time it is used.

ASSEMBLING THE INSTRUMENT

1. Place the transmitter on its back on the ground or on an elevated surface and connect the handle, at the end with one aluminium knob, to the transmitter as shown in Figure 3a

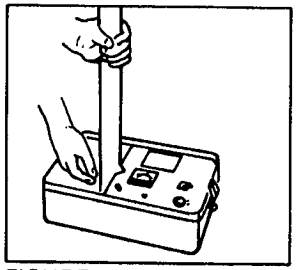

FIGURE 3a

2. With the transmitter on the ground, attach the receiver to the other end of the handle by tightly screwing in the aluminium knob but only screwing in the black knob until the spring pressure can be felt, see Figure 3b. (The back knob is used to the instrument)

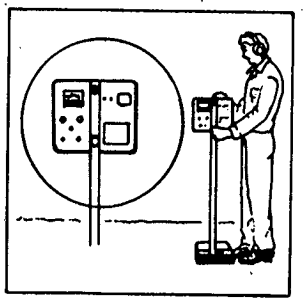

FIGURE 3b

3. Turn on the receiver by either plugging in the headphones or by pulling out the ON/OFF switch.
4. Check battery operation by turning the BATT TEST/POWER switch to the BATT TEST (far left) position. The meter should indicate past the 'OK' position, if it does not replace the battery as described in section 6

5. Turn the BATT TEST/POWER switch to the LO POWER position.

NEVER USE 'HI POWER' IN THE COUPLED MODE

6. Turn the SENSITIVITY control to the '2' position

NOTE: This is important to achieve proper adjustment

7. Turn the transmitter on by pulling out the OFF/ON switch. A loud speaker tone should sound and the meter reading on the receiver should be full scale
8. Test the battery on the transmitter by turning the CONDUCTIVE/BATT TEST/INDUCTIVE control to the BATT TEST position. The meter should read past the 'OK' position. If it does not change the battery as described in Section 6
9. Turn the transmitter CONDUCTIVE/BATT TEST/ INDUCTIVE control to the INDUCTIVE position

TUNING THE INSTRUMENT

The instrument is adjusted by turning the black knob, see Figure 3c, until the receiver is in the null of the transmitter signal as follows:

1. Keeping away from metal objects, eg. cars and fences hold the instrument parallel with the ground and at normal carrying height

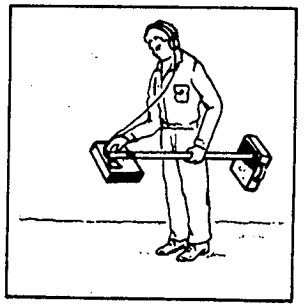

FIGURE 3c

2. Turn the black knob on the handle to the right (clockwise) until the spring is tight. This will produce a full meter reading and loud headphone or speaker tone
3. Turn the black knob to the left (anti-clockwise) in the direction of the arrow until no meter or headphone signal is obtained

4. Continue turning in the direction of the arrow until a slight meter and headphone signal is obtained

The instrument is now adjusted properly and ready to use.

Having mechanically coupled and nulled the instrument, grasp the middle of the handle with one hand so that the receiver projects out in front and the transmitter is behind, see Figure 4. The shoulder strap may be used to help keep the units parallel to the ground.

Crossing over metal objects will result in a sharp increase in meter reading and headphone or speaker indication. If the instrument doesn't appear to function properly repeat the above steps.

NOTE: If the instrument appears to be oversensitive, or it is impossible to obtain the adjustment described above, it may be necessary to reduce the setting on the sensitivity control.

Once the pipe or conduit has been located the meter reading or audible signal can be reduced by lowering the sensitivity setting (turn SENSITIVITY control anti-clockwise). This allows greater accuracy and enables closely adjacent pipes to be separated.

NOTE: When work is started at a new location the SENSITIVITY control should be returned to its original 2 o'clock position.

3.2 INDUCTIVE LOCATION - UNITS SEPARATE

For detailed location of buried pipes and conduits when the starting point is known, the transmitter and receiver are used as separate units with, typically, the transmitter placed on the ground above the pipe and the receiver used as a mobile detector. If the starting point is not known then two operators can be used, one holding the receiver and the other the transmitter, see Figure 5.

SETTING UP

1. Pull the receiver OFF/ON switch out to turn on the receiver, or plug in the headphones
2. Check battery operation by turning the BATT TEST/POWER switch to the 'BATT TEST' position. The meter should indicate past the 'OK' position, if it does not, replace the battery as described in Section 6
3. Turn receiver power switch to 'LO'
4. Turn the receiver SENSITIVITY control to the '2' o'clock position
5. Turn on the transmitter by pulling out the ON/OFF switch
6. Check battery operation by turning the CONDUCTIVE/BATT TEST/INDUCTIVE control to the BATT TEST position. The meter should indicate past the 'OK' position, if it does not, replace the battery as described in Section 6
7. Turn the transmitter CONDUCTIVE/BATT TEST/INDUCTIVE control to the INDUCTIVE position

USING THE INSTRUMENT

(a) Single Operator Use
The transmitter must always be placed on edge so that its long dimension is parallel to the direction of the pipe.

Starting at a distance of at least 9 metres from the transmitter, the receiver is used as a search unit to trace the position of the pipe. The receiver should be held so that its long dimension is parallel to the assumed direction of the pipe. The pipe position will be indicated by an increase in speaker or headphone tone and meter reading. Detailed descriptions for particular applications are given in Section 4.

(b) Two Operator Use
With two operators, both the transmitter and receiver are carried parallel to the ground facing the assumed direction of the pipe. This method is described in more detail in Section 4.1.2.

The receiver controls determine the signal strength received. Following a long course of pipe, the SENSITIVITY should be gradually increased so that the signal is always sharp and strong over the pipe. Maximum tracing distance is achieved when the SENSITIVITY control is full 'ON' and POWER switch is on 'HI'.

If the receiver and transmitter are too close together direct air coupling occurs, ie. the transmitter sends a strong direct signal to the receiver through the air. To overcome this the SENSITIVITY control can be set back when the units are not over a buried pipe or the distance between the two units can be increased until the air signal fades.

NOTE: With the sensitivity control full on and the power switch on 'LO', the distance between the two units must be at least 11 metres. Cutting back the setting of the sensitivity control will reduce the minimum distances.

3.3 CONDUCTIVE LOCATION - UNITS SEPARATE

The conductive method is used to trace individual pipes when one or more additional pipes are nearby. The desired pipe is energised by directly connecting it to the transmitter using the conductive clip and ground plate, or the coupling clamp, see Figure 7. This method is also used to trace non-metallic pipes by feeding a wire into the non-conductive pipe and connecting this to the transmitter via the clip and ground plate or coupling clamp.

NOTE: Ensure end of wire is earthed in both cases.

SETTING UP

1. Place the transmitter upright and as far from the pipe to be energised as the connecting cable will allow.
2. Connect clip to the pipe or surface connection, such as a hydrant, valve box etc., and insert the ground plate into the earth at right angles to the pipe. When earth grounding is not possible, lay plate on pavement parallel to pipe.

NOTE: The pipe should be thoroughly cleaned with a wire brush before making the connection to ensure clean metal to metal contact between clip and pipe to be energised.

3. Plug the conductive cable jack into the transmitter CONDUCTIVE CABLES socket.
4. Turn on the transmitter by pulling out the ON/OFF switch
5. Switch the INDUCTIVE/CONDUCTIVE switch to the 'CONDUCTIVE' position.

USING THE INSTRUMENT

The receiver is operated exactly as when using the instrument inductively as separate units except that it can be used closer to the transmitter. The strength of the signal obtained at the receiver is controlled by the setting of the SENSITIVITY switch. It is advisable to start with the SENSITIVITY full on and, once the pipe has been located, reduce the setting for more accurate location.

Either high or low power may be used. Low power is recommended for ordinary tracing work, high power for extended tracing. On 'LO' power the receiver can be used as close as 6 metres to the transmitter without air coupling. With 'HIGH' power and sensitivity full on, air coupling may occur up to 23 metres away.

4. SPECIAL APPLICATIONS

4.1 LOCATING UNKNOWN METAL PIPE OR CONDUIT

4.1.1. Inductively, Units Coupled

Assemble and adjust instrument as described in Section 3.1.1. The pipe or cable should be approached at approximately a right angle to the assumed direction of the pipe, see Figure 4. As the pipe is approached and crossed, the earphone tone and visual indicator reading will increase up to a maximum when the transmitter is directly over the buried pipe. Make a mark, eg. with your heel to indicate where the maximum reading was obtained. Repeat the above, but approaching from the opposite side. The location of the pipe will be midway between the two marks.

FIGURE 4 - Location of Unknown Pipe, Units Mechanically Coupled

4.1.2. Inductively with Units Separate

The transmitter and receiver units are each carried by separate operators at least 9 metres apart, see Figure 5. Both units are held approximately parallel to the assumed direction of the pipe. The two operators walk, at the same speed, towards the pipe keeping the units level with each other. When both operators are directly above the pipe the signal will reach a maximum, see Figures 5 and 6

This method can also be used by a single operator by placing the transmitter on the ground parallel to the assumed direction of the pipe and walking with the receiver held parallel and vertical in the same direction.

The transmitter will probably have to be moved several times until it is located approximately over the top of the pipe.

With the transmitter placed directly above the known pipe location the receiver can be used to establish the line's position up to 30 metres away, or until the transmitter signal becomes too weak to hear.

FIGURE 5 - Location of Unknown Pipe Using Two Operators

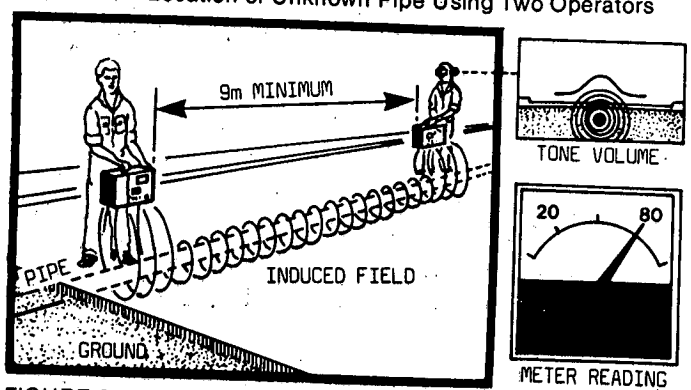

FIGURE 6 - Location Using Two Operators, Pipe Located

4.1.3. Conductively

This method is very similar to uncoupled inductive pipe location, described in Section 4.1.2., except that the transmitter is directly connected to the pipe, conduit or service, by either the conductive wire and crocodile clips or coupling clamps, see Figure 7. The

receiver must be held parallel and vertical to the pipe to obatin a maximum signal over the approximate position of the buried line and then held horizontally to pin-point the position (minimum signal) as described in Section 4.2

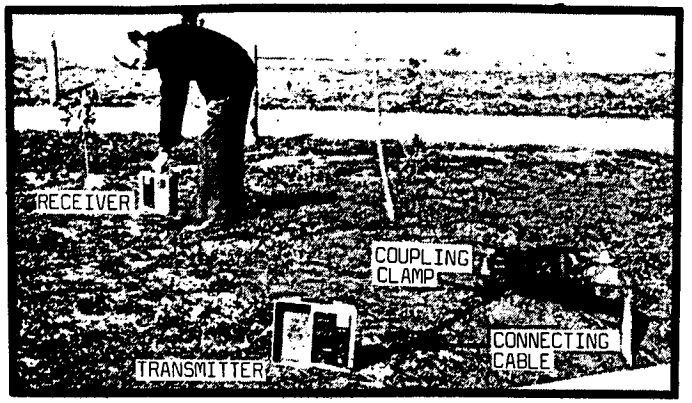

FIGURE 7 - Conductive Pipe Location Using the Coupling Clamp

NOTE: Remember that the transmitter should be placed upright on the ground and as far away from the line of the pipe as the connecting cables will allow, see Figure 7

4.2 Pinpoint Centering of the Pipeline

When the position of the pipeline is known, the centre line of the buried pipe can be determined with pin-point accuracy as follows: Set the transmitter on the ground directly over and parallel to the pipe. At a distance of at least 9 metres from the transmitter, hold the receiver with its back to the ground and move it back and forth across the pipe, see Figure 8.

The signal should increase and decrease with the movement. Directly above the centre line of the pipe a distinct 'null' or minimum signal will be obtained. This point should be marked with chalk or pegged. By progressively moving the positions of the transmitter and receiver the centre line can be obtained for the full course of the pipe or conduit.

FIGURE * - Pinpoint Centering of Pipe

4.3 DETERMINING THE DEPTH OF PIPE

The depth of the pipe is determined using the 'depth level bubble' on the receiver.

First locate the exact centre of the pipe as described in Section 4.2. Next place the transmitter upright and in line with the buried pipe. Starting at a point directly above the pipe centreline, at least 9 metres away from the transmitter to prevent air coupling, hold the receiver close to the ground and tilt it at an angle of 45° so that the depth level bubble lies between the outer edge of the centre ring and the black border of the level. Now move slowly away from the pipe, at right angles to the pipeline, maintaining the receiver at 45° to the ground, see Figures 9 and 10.

A new null point or minimum signal will be obtained after which the signal will increase again. The distance from the centre line of the pipe as previously determined and the 45° null position is the same as the distance from the horizontal null position to the centre of the pipe. As shown in Figure 10, a right angled triangle has been formed between the receiver, pipe and the

crossover of the horizontal line and vertical centre line of the receiver and pipe respectively. Study the illustrations so that the 45° angle will be obtained correctly.

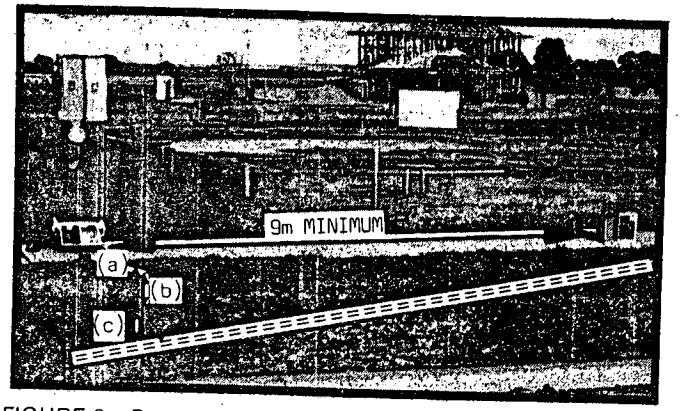

FIGURE 9 - Depth Determination of Buried Pipe

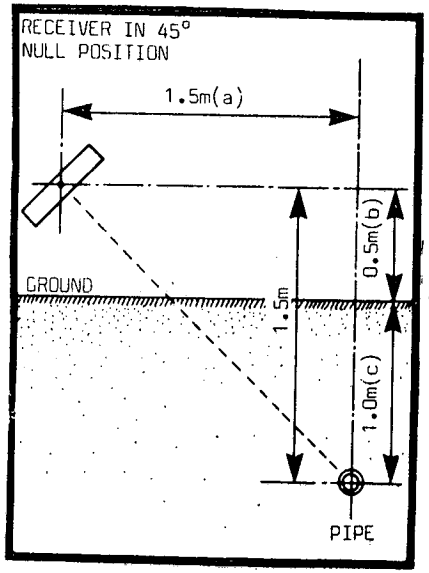

FIGURE 10 - Depth Determination Triangulation Diagram

Depth of pipe (c) = a-b
so c = 1.5 - 0.5
= 1.0 metre

(a) = Distance of pipe to null position

(b) = Height of receiver above ground

The depth of a pipe can also be found using the depth tracer probe, see Section 4.12.1.

4.4. LOCATING A LATERAL STUD OR SERVICE

4.4.1. Inductively, Units Coupled

Operate the unit as described in Section 4.1.1. but walking parallel to and several metres away from the known position of the main. A lateral stub or service will be indicated by an increase in earphone tone and meter reading, see Figure 11.

FIGURE 11 - Locating a Lateral, Units Mechanically Coupled

4.4.2. Inductively, Units Separate

Place the transmitter directly above and in-line with the known position of the main and holding the receiver vertically and parallel to the assumed direction of the stub, walk parallel to the main, see Figure 12.

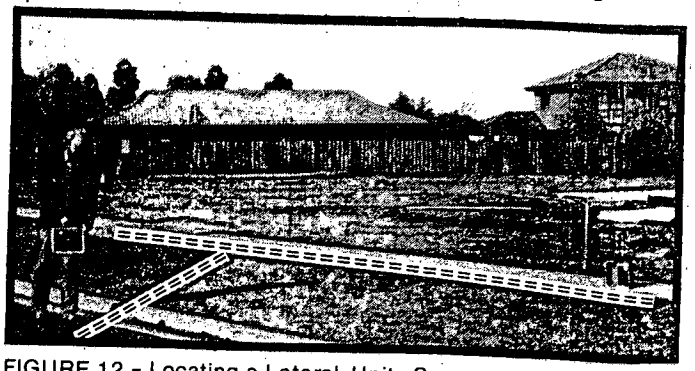

FIGURE 12 - Locating a Lateral, Units Separate

This procedure can also be carried out using the transmitter as the search unit and the receiver as the stationary unit. The signal, however, will still be obtained on the receiver.

4.4.3. Conductively

This method is similar to that described in Section 4.4.3. above, expect that the transmitter is connected to the main either directly or using the coupling clamp. The effective distance for locating services and stubs conductively depends on the conductivity of the ground, size of pipe and the number of studs and laterals present. An alternative method is to connect the transmitter to a meter or other service, or surface location of the lateral and trace the lateral backwards towards the main.

NOTE: Remember place the transmitter upright on the ground as far away as the connecting cables will allow.

4.5. LOCATING THE END OF A PIPE

4.5.1. Inductively, Units Coupled

The mechanically coupled instrument is carried at right angles to the know direction of the pipe, see Fig. 13, so that the transmitter is vertical and directly above the pipe or conduit. A maximum signal is obtained while over the pipe. This signal continues a few metres beyond the actual end of the pipe, so exavation should start 0.5 to 1 metre back along the pipeline from' where the signal started to fade.

FIGURE 13 - Determining End of Pipe, Units Mechanically Coupled

4.5.2. Inductively, Units Separate

The transmitter or receiver is set directly above and parallel to the known position of the pipe. The other unit is then carried vertically above and parallel to the position of the pipe, see Figure 14.

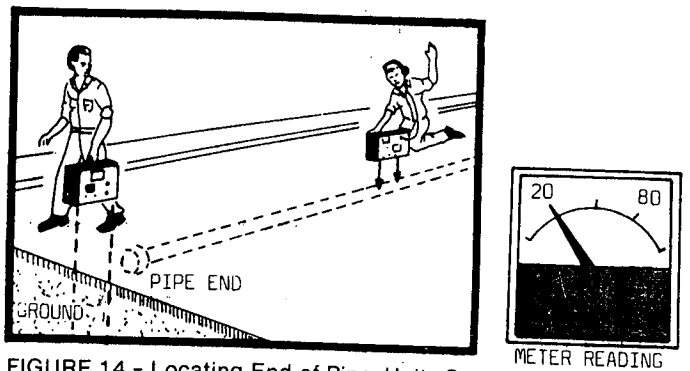

FIGURE 14 - Locating End of Pipe, Units Separate

A maximum sound and meter indication will be obtained as long as the carried unit is directly above the pipe. When the end of the pipe is passed the signal will start to fade. As indicated above the end of the pipe will be approximately 1 metre short of the indicated position.

NOTE: The two units must always be at least 9 metres apart to prevent air coupling.

4.6 INDIVIDUAL PIPE LOCATION

An individual pipe in the presence of others can be located using the inductive mode with the units separate or the conductive mode. The locator cannot be used with the units mechanically coupled for this application.

4.6.1. Inductively, Units Separate

The transmitter is set vertically and parallel to the line to be traced but approximately one to two meteres off to the side of the pipe desired, away from the pipe not wanted, see Figure 15. This energises the required line more strongly than any adjacent line and allows the operator to trace out its surface location using the receiver horizontally. The position of the second line can similarly be found with the transmitter on the other side of the second line.

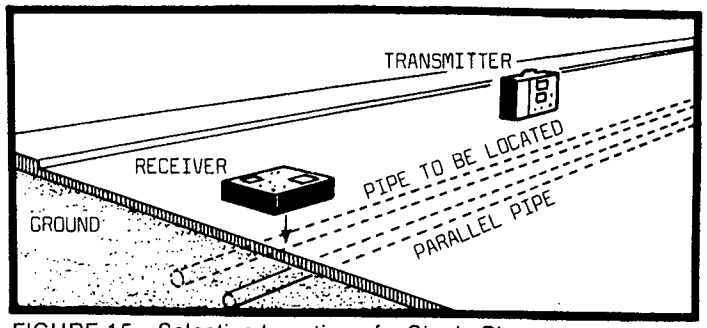

FIGURE 15 - Selective Location of a Single Pipe

Alternatively the transmitter can be set up so that its plane points towards the desired pipe, see Figure 16. This induces the maximum field in the desired pipe and a minimum field in the pipe not wanted.

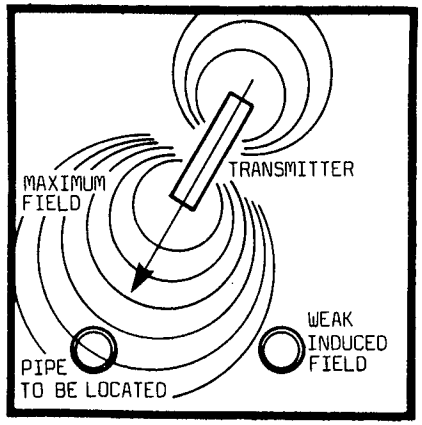

FIGURE 16 - Selectively Energising One Pipe

4.6.2 Conductively

This method gives best results as the required pipe is directly energised. The procedure is the same as that described in Section 4.1.3.

If there are several pipelines close together it is best to conductively trace each individual pipe and mark the surface location with chalk. The transmitter is attached to each pipeline in turn and the pipelines traced and marked on the surface. As work progresses the pattern of the pipelines will take shape. To reduce false indications start tracing operations away from the congested area and work towards the desired area.

4.7 LOCATING ISOLATED METAL OBJECTS

To locate isolated metal objects, such as manhole covers, the instrument is used in the mechanically coupled mode.

The area should be systematically traversed in lines approximately 1 to 2 metres apart. The metal object will be indicated by a rise in earphone tone as well as an increase in meter reading. Once the approximate location of the object is obtained it may be pin-pointed as follows: Hold the instrument in the normal operating position so that the handle is parallel to the surface of the ground. While standing in one spot slowly rotate the instrument through a complete horizontal circle of 360°. If the operators feet are directly over the centre of the metal object, the maximum reading on his meter will not change as he rotates. If not exactly above the object the reading will fluctuate as he turns. Practice over a known metal object will enable the operator to pin-point buried metal objects.

4.8 LOCATING VALVES, COVERS, TEES, RISES

The instrument is used in the inductive, mechanically coupled mode for this application.

The course of the main must first be located as previously described. Then, with the instrument coupled, stand directly over and in-line with the main, see Figure 17.

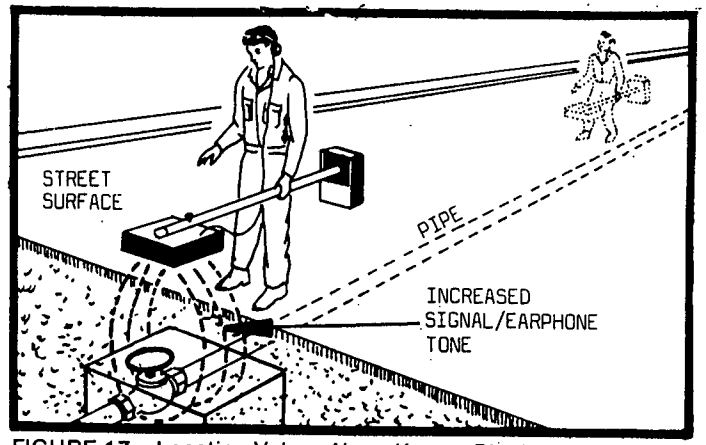

FIGURE 17 - Locating Valves Along Known Pipelines

It may be necessary to slightly reduce the sensitivity setting to obtain proper adjustment of the instrument. Now walk along the pipeline with the instrument. A valve, tee or stub is indicated by a slightly increased earphone tone or meter reading due to the increased metal surface area of the main. Laterals will also be indicated but these can be identified and traced to either the right or left of the main.

4.9 LOCATING A BEND

This is best done inductively with the units separate. Place the transmitter or receiver directly above and parallel to the last known position of the main, see Figure 18. Using the other unit as the search unit follow the procedure described in Section 4.4.2, for locating a lateral. The new direction of the pipe will be indicated by an increase in earphone tone and visual indicator reading.

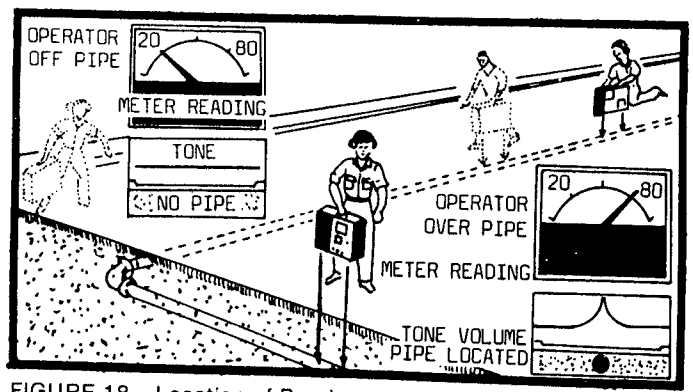

FIGURE 18 - Location of Bends

4.10 LOCATING NON-METALLIC PIPES

The conductive mode is the most suitable for this application.

A steel tape or cable is first run into the line to be traced. The cable or tape is then conductively connected to the transmitter using the coupling clamp. The procedure is then identical to that described for other conductive operations.

4.11 OBSTRUCTIONS IN NON-METALLIC PIPES

To locate obstructions in non-metallic sewers etc, insert a steel tape or metal cable into the line until the blockage is reached. Connect the tape or cable to the transmitter via the coupling clamp and trace the line with the receiver. The blockage is located in the same way as locating the end of a pipe as described in Section 4.5.

4.12 USING THE TRACER PROBES

All probes are plugged into the AUXILIARY INPUT socket on the receiver.

4.12.1 Depth Probe

The depth probe has a built-in DEPTH LEVEL indicator and is used in the same way as the receiver for depth determination, see Section 4.3. Once the position of the pipe is known, tilt the probe at an angle of 45° as indicated on the DEPTH LEVEL indicator, see Figure 19. Back away from the conductor at a right angle with the probe tip resting on the ground, until a null signal is obtained. Measure back from the 'null point to the pipe to get the depth reading. Use the controls on the receiver to adjust the sensitivity.

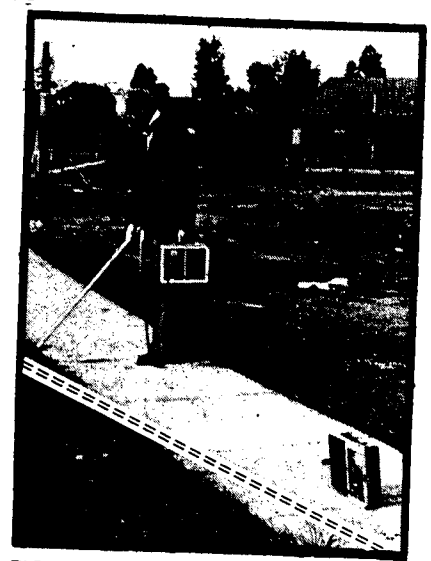

FIGURE 19 - Using the Depth Probe

4.12.2 Mini Probe

The mini probe is designed for use in tight areas, such as identifying a strand of cable. It can also be used to trace mains cables in walls when using the CZ6060 Mains Coupler (see Section 4.13). Connect the transmitter to the wire strand at a terminal or access point, or to the mains socket using the CZ6060. Put the transmitter into the CONDUCTIVE MODE and turn it ON. Plug the mini probe into the receiver at the AUXILIARY INPUT JACK. Turn the receiver on and turn the SENSITIVITY control full on. The wire or mains can now be traced using the mini probe.

4.13 USING THE CZ6060 MAINS COUPLER

Plug the CZ6060 Mains Coupler into the transmitter CONDUCTIVE CABLES output socket. Select the 'CONDUCTIVE' mode of operation on the transmitter. Plug the CZ6060 into a mains GPO and switch the mains to ON. The mains cable can now be traced using the receiver or the mini probe.

5. GENERAL OPERATING HINTS

Familiarity with the locator will only be achieved through practice. It is advisable to practice using the locator over known objects for the different applications. Gauging the correct sensitivity and power settings will also improve through practice.

5.1 USING THE SENSITIVITY CONTROL

The correct adjustment of the sensitivity control will determine your success in using the locator. While practising over known pipes, vary the sensitivity setting and note how this affects the instrument reading. Do this for the different applications.

NOTE: The setting of the SENSITIVITY control is crucial in Centreline and Depth determinations.

5.2 OPERATION IN CONDUCTIVE SOILS

When using the instrument mechanically coupled over conductive soils the suggested 2 o'clock position for the SENSITIVITY control may be too sensitive and it may be necessary to reduce the setting. Conductive soils are generally moist and contain large amounts of dissolved mineral salts. After each adjustment of the SENSITIVITY control, the instrument should be returned with the black knob as described in Section 3.1.

5.3 LOCATING LARGE PIPES

When locating near-surface or large pipes the width of the indication obtained can be narrowed to give more accurate indication by decreasing the SENSITIVITY control.

5.4 OPERATION NEAR NEWLY LAID PIPES

Newly laid pipes or pipes in open ditches provide a poor means of testing the locator and in many cases will not give an indication. This is because the detectability of a pipe increases with age and with soil compaction.

5.5 EQUIPMENT CHECK

It is always advisable to check the instrument over a known object before taking the instrument into the field to ensure that the controls are functioning properly.

6. MAINTENANCE

BATTERIES
The dry cell batteries are standard 276P 9 volt batteries.

REPLACING BATTERIES
Both the transmitter and receiver batteries are replaced from the front of the control panel.

OTHER REPAIRS
For repairs other than simply replacing a broken component the instrument should be returned to AEGIS by prepaid parcel post.

CAUTION
DO NOT TINKER WITH THE INSTRUMENT. Your pipe and cable locator is a proven electronic instrument and given reasonable care will give excellent service over an extended period.

7. CONDENSED OPERATING INSTRUCTIONS

The following are brief instructions for setting up the instrument. Refer to Section 3 for more detailed operating procedures.

7.1 INDUCTIVE DETECTION - UNITS COUPLED

Refer to Figures 3a to 3c to mechanically couple the instrument.

1. Attach the handle, at the end with one alumnium screw, to the transmitter and tightly screw up the aluminium screw
2. Attach the receiver to the handle by tightly screwing in the aluminium knob but screwing in the black knob only until spring pressure is felt

NOTE: The black knob is used to tune the locator

3. Turn on the receiver by either plugging in the headphones or pulling out the ON/OFF button
4. Check receiver battery condition
5. Turn on the transmitter and test the battery condition
6. Turn the receiver SENSITIVITY control to the 2 o'clock position, the receiver POWER switch to the 'LO' position and the transmitter CONDUCTIVE/INDUCTIVE switch to 'INDUCTIVE'
7. Tune the instrument with the black knob on the handle until the receiver is in the 'null' of the transmitter, as described in Section 3.1

NOTE: The instrument must be re-tuned each time it is used.

The instrument is now ready to use. If it appears oversensitive it may be necessary to reduce the SENSITIVITY setting.

REMEMBER to return the SENSITIVITY control to its original position whenever using the locator in a new position.

7.2 INDUCTIVE OPERATION - UNITS SEPARATE

1. Turn on the receiver by plugging in the headphones or pulling out the ON/OFF switch and check the battery condition
2. Turn the receiver SENSITIVITY Control to the '2' position and the POWER to 'LO'
3. Turn on the transmitter and check the battery condition
4. Turn the transmitter CONDUCTIVE/INDUCTIVE switch to the INDUCTIVE Mode

NOTE: The units must be operated at least 9 metres apart to avoid air coupling

7.3 CONDUCTIVE LOCATION

1. Plug either the conductive cables or the coupling clamp into the transmitter CONDUCTIVE CABLES socket.
2. Attach the crocodile clips or coupling clamp to the pipe

NOTE: Thoroughly clean the pipe with a wire brush before connecting to ensure a good metal contact if direct connection is used

3. Place the transmitter as far from the pipe as the cable will allow
4. Turn on the transmitter
5. The receiver is set up and used exactly as it is in the inductive mode, see 7.2 above.