OPERATING INSTRUCTIONS FOR LOCATOR NO. 1B

1 GENERAL This instruction describes the use of the Locator No. 1B which can be used for detecting buried metal objects, and for locating and tracing the routes of buried cables or other metallic services. It may be used in the "on handle" mode which is suitable for detecting buried metal and preliminary location of services, or separately in induce or connect mode for tracing cables or for more precise location. The direct connect mode of operation will be of use where radio frequency interference is a problem, this will also provide an alternative means of track location in those situations where the normal Locator No. 2A is ineffective due to 50 Hz mains interference.

This item supersedes the Locator No. 1A, whose operation is essentially the same except that it has no loudspeaker in the receiver. The Locator No. 1B consists of:-

1.1 A transmitter and receiver which are used separately but are clipped together when stored.

1.2 Accessories A Handle Locator 1B for joining the transmitter and receiver together for certain tests.

Headphones for the receiver.

Satchel and carrying strap for use with the Handle Locator 1B.

2 BATTERY TESTS

2.1 Transmitter and Receiver Pull out the ON-OFF switch. Set function switch to BATT TEST and check that the meter pointer comes to rest in the "OK" portion of the scale. If not, renew the battery.

DETECTING BURIED METAL

3 SETTING UP This requires the transmitter and receiver to be connected by the Handle Locator 1B.

3.1 Hold the handle horizontal with the strap attachment brackets uppermost. Using the two adjusting screws situated above and below the handle just behind the pivot, alter the plane of the end section as follows. First make sure that the lower screw is sufficiently loosened, then tighten the upper screw until the end section is at maximum elevation, finally make the lower screw finger-tight. Attach transmitter to handle tightening knob firmly. Place the transmitter on the floor with the handle vertical.

3.2 Attach receiver to other end of handle tightening both knobs firmly.

3.3 To obtain correct operation in the "on handle" mode it is necessary to have the plane of the transmitter exactly at a right angle relative to the plane of the receiver. In this position the magnetic field produced by the transmitter does not link with the receiver aerial and thus no signal is detected. The presence of metal anywhere within the range of the instrument will distort the magnetic field from the transmitter causing the receiver to detect a signal.

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3.4 Set the transmitter function switch to INDUCE and the receiver function switch to LOW. Set the receiver speaker/headphone switch to SPEAKER.

3.5 Stand away from parked vehicles, metal fences etc and hold the instrument steady at normal carrying height with the handle horizontal.

3.6 Switch on the transmitter and receiver. This will give full meter reading and loud signal from the loudspeaker.

3.7 Unscrew the upper adjusting screw until there is no meter reading or loudspeaker signal.

3.8 Continue unscrewing the upper adjusting screw until a small meter reading and weak loudspeaker signal is obtained. To lock the position screw up the lower adjusting screw finger-tight. The instrument is now ready for use.

NOTE: Great care must be exercised in the use of the adjusting screws. Misuse will cause physical damage to the mountings.

3.9 If the instrument seems oversensitive, or it is impossible to obtain the adjustment described above, slightly reduce the setting of the SENSITIVITY control, repeat operations 3.1, 3.7 and 3.8.

4 SEARCHING

4.1 Lower the instrument close to the ground, using the strap if necessary. This will usually produce a strong signal.

4.2 Reduce SENSITIVITY as necessary to restore the original weak signal.

4.3 Walk slowly across the area being searched, keeping the instrument steady and at the same height from the ground.

4.4 Repeat the search in a direction at right angles to the first.

4.5 In noisy surroundings, plug in the headphones and switch to HEADPHONES.

5 DETECTING A sharp increase in signal will occur when the instrument passes over buried metal pipes, cables or other metal bodies.

6 LOCATING

6.1 When a signal is received, reduce the SENSITIVITY a little at a time while crossing and re-crossing the spot until the most accurate location is obtained.

6.2 Mark the spot, below the *receiver* at which maximum signal is obtained.

6.3 Repeat the procedure approaching from the opposite direction and make a second mark.

6.4 The buried service or object will be directly under a point midway between the two marks.

6.5 Repeat the test over the surrounding area to determine whether the signal is due to a continuous metal cable or pipe, or an isolated metal object.

6.6 With the locator in the position at which maximum signal is obtained:-

Manhole covers and other flat metal bodies are usually directly below the receiver, and cables and pipes are usually directly below the transmitter.

7 FURTHER SEARCHING Always return the SENSITIVITY control to its original position so that a weak signal is received.

LOCATING POSITION AND DEPTH OF CABLES

8 METHODS OF OPERATION The transmitter and receiver are used separately. The transmitter can be used in two ways:-

8.1 On INDUCE This is usually the most convenient as no connexion is required to the cable.

8.2 On CONNECT This can be used only when a connexion can be made to the cable. This usually gives a stronger signal and is suitable for identifying different services which are close together (see also par 30). It also enables the receiver to be used much closer to the transmitter as no direct radiation is being produced.

9 SETTING UP THE TRANSMITTER FOR THE 'INDUCE' METHOD

9.1 Set function switch to INDUCE.

9.2 Place the transmitter over the approximate route of the cable so that it is upright and in line with the cable. A swivel stay is fitted to the base of the transmitter. This may be pushed out and turned-through 90° to keep the transmitter upright in windy conditions.

9.3 Switch on the transmitter once the receiver is ready for use.

10 SETTING UP THE TRANSMITTER FOR THE 'CONNECT' METHOD

10.1 Set the function switch to CONNECT.

10.2 Connect the transmitter terminals to the cable and to an earth point preferably at right angles using suitable leads and clips (the clips must not be clamped directly onto lead cable sheaths). Earth spikes should be used where necessary.

10.3 Switch on the transmitter once the receiver is ready for use.

11 SETTING UP THE RECEIVER

11.1 Set the function switch to LOW, turn the SENSITIVITY control to a low setting and the speaker/headphone switch to SPEAKER.

11.2 Place the receiver at least 10 m away from the transmitter (except on connect, see par 8.2) and over the estimated position of the cable so that it is upright and in line with the cable (see also par 19). This is necessary to avoid direct air path coupling between transmitter and receiver.

11.3 In noisy surroundings, plug in the headphones and switch to HEADPHONES.

11.4 Switch on the receiver which is now ready for use.

12 LOCATING WITH THE RECEIVER

12.1 Increase SENSITIVITY of the receiver until a signal is received.

12.2 Move the receiver to the left or right, keeping it upright and in line with the cable, until the point of maximum signal is found.

12.3 Reduce SENSITIVITY as necessary to obtain the most accurate location.

12.4 The cable will be directly below the point of maximum signal.

13 FINDING THE EXACT CENTRE LINE OF THE CABLE ROUTE

13.1 Hold the receiver *horizontally* and close to the ground over the approximate centre line of the cable.

13.2 Increase SENSITIVITY until a signal is received.

13.3 Confirm that the receiver is level by checking that the bubble of DEPTH LEVEL is in the centre of the inner ring.

13.4 Move the receiver from side to side of the cable route and note the position where the signal drops to a minimum. The centre of the receiver is now directly over the centre line of the cable route.

13.5 Increase SENSITIVITY as necessary to obtain the most accurate location. Use the HIGH position of the function switch in this operation if necessary.

13.6 Mark the spot and repeat as necessary along the route to plot the exact line of the cable route.

14 DEPTH MEASUREMENT

14.1 Choose a straight section of the cable route, as measurements on sharp bends are unreliable, and mark the exact centre line of the route as described in par 13.

14.2 Lay the receiver flat on the ground just to one side of the cable route so that the handle is directly over the cable.

14.3 Raise the handle until the receiver is at an angle of approximately 45° and hold it just clear of the ground. Move the receiver horizontally away from the cable and check that the signal drops to a minimum and then increases again.

14.4 Find the point of minimum signal and confirm that the receiver is at 45° by setting the DEPTH LEVEL indicator at 45° to the receiver front panel and then positioning the bubble in the ring.

14.5 Increase SENSITIVITY as necessary to obtain the most accurate location. Use the HIGH position of the function switch if necessary.

14.6 Make a mark directly below the centre of the receiver rim, ie directly below either of the clasp attachments. Measure the distance between this mark and the centre line of the cable route. The depth of the cable is equal to this distance less 15 cm (the height of the rim centre above the ground).

Example:- Distance from centre line = 90 cm

Depth of cable = 90-15 = 75 cm

14.7 Repeat this procedure on the opposite side of the cable and take an average of the two results.

15 **PRECAUTIONS WHEN MEASURING DEPTH** The method described in par 14 is used for measuring depth on sites free from adjacent services and which are level or sloping evenly *along* the line of the route.

15.1 If the ground is generally uneven, place a flat board horizontally across the route and carry out the measurements on this board.

15.2 Adjacent services may cause false readings. Measure the depth from both sides of the route and take the average. If the two measurements are approximately equal, the indicated depth is reasonably accurate, but if they differ considerably, then there will be some error in the indicated depth (see also par 30).

TRACING THE ROUTES OF CABLES

16 **PROCEDURE** Follow the procedure described in par 8-12 then:-

16.1 Increase SENSITIVITY until a good signal is received.

16.2 Hold the receiver in line with the cable route and at normal carrying height, then trace out the route by following the line of maximum signal.

16.3 Increase SENSITIVITY as necessary whilst moving along the route. When the signal becomes too weak to follow, switch to HIGH and continue as before.

17 **LOCATING RANGE** The maximum distance which can be traced without moving the transmitter will generally be:-

17.1 **Low Range** 100-300 metres.

17.2 **High Range** 300-500 metres.

18 **EXTENDED RANGE** When it is necessary to trace over longer distances, move the transmitter as follows:-

18.1 **One Man** Trace the route as far as possible, then move the transmitter up to the furthest point reached and continue to trace from this new starting point. Repeat the procedure until the required distance has been covered.

18.2 **Two Men** Trace the route for 20-30 metres then ask assistant to pick up the transmitter and follow at this distance, keeping the transmitter over and in-line with the route. Continue until the required distance has been covered.

18.3 Maximum length will be traced when the cable is earthed at the far end. In this circumstance the signal will usually extend to a few metres beyond the end of the cable. If the end of the cable is disconnected, the signal will fade over the last few metres *before* the end of the cable is reached.

19 **PRECAUTIONS WHEN WORKING AT CLOSE RANGE** 'Direct coupling', ie receiving a signal direct from the transmitter and not via the cable, occurs at very short range and interferes with normal location. Avoid this as follows:-

19.1 **Low Range** The receiver should be at least 10 m from the transmitter.

19.2 **High Range** The receiver should be at least 30 m from the transmitter.

19.3 These distances can be decreased when necessary by reducing SENSITIVITY (as described in par 26).

20 **RADIO INTERFERENCE** The reception of Morse or other interference signals, normally only occurs on HIGH with high SENSITIVITY setting, but can affect normal location. Avoid this as follows:-

20.1 Reduce SENSITIVITY and bring the transmitter closer to the receiver until the interference is sufficiently weakened (but see also par 19).

20.2 Alternatively, or in addition to 20.1 above, use INTERRUPTED TONE instead of CONTINUOUS TONE. This makes the signal more distinctive in the presence of interference.

20.3 If possible use direct connection of the transmitter.

DETECTING SPURS ON A CABLE ROUTE

21 **PROCEDURE** Trace the route of the cable over the section involved, then:-

21.1 Hold the receiver upright but at *right angles* instead of in-line with the track. Check that a point of minimum signal exists at this angle. Maintain this angle during the search.

21.2 Walk parallel to the track and approximately one metre away from it in order to cross any spurs that may exist. A signal will be received as the receiver crosses over a spur.

21.3 Reduce SENSITIVITY as necessary to obtain the most accurate location.

22 **EXACT CENTRE LINE** It is not possible to find the exact centre line of a spur at the junction point with the main route because of signal pick-up from the main route itself when the receiver is horizontal. Instead find the exact centre line further along the spur and work back towards the junction as far as conditions permit. The junction point of the spur can then be estimated.

23 **WEAK SIGNALS** If there is any difficulty in locating spurs due to weak signals, obtain assistance and:-

23.1 Place the *receiver* over the main route in place of the transmitter.

23.2 Ask assistant to operate the receiver and to call out when signal is received.

23.3 Search as before, but carry the transmitter instead of the receiver.

23.4 If the signal from the spur is still weak, move the receiver along the main route until it is at the same distance on the far side of the spur. Place it in position over the main route and repeat the search with the transmitter.

DETECTING BURIED METAL OBJECTS ON A CABLE ROUTE

24 SETTING UP Establish the exact centre line of the route by the methods described in pars 8-13 then:-

24.1 Set up the combined transmitter and receiver as descrived in par 3.

24.2 Hold the instrument with the connecting handle above and in-line with the route.

24.3 Lower the instrument close to the ground and readjust SENSITIVITY to produce a small signal.

24.4 Check that rotating the instrument to the left or right produces a good signal and that the 'in-line' position is a position of minimum signal.

25 LOCATING

25.1 Walk along the line of the route holding the instrument as described in par 24. The signal will increase sharply when the instrument is above any large metal body existing on the route.

25.2 When this occurs, reduce SENSITIVITY a little at a time whilst crossing and re-crossing the spot until the most accurate location is obtained.

25.3 Mark the spot below the *receiver* at which maximum signal is obtained.

25.4 Repeat the procedure approaching from the opposite direction and make a second mark.

25.5 The buried object will be directly under a point midway between the two marks.

DETECTING BURIED SERVICE (RADIAL TEST)

This test is used for detecting cables or other metallic services which may be in the vicinity of sites where it is intended to excavate or bore pole holes etc. It requires the help of an assistant.

26 SETTING UP

26.1 Place the receiver over the site of the proposed excavation and ask the assistant to take the transmitter to a point approximately 8 m distant. Hold the transmitter and receiver so that the handles are uppermost and in-line with one another.

26.2 Set the receiver function switch to LOW and the transmitter function switch to INDUCE. Switch on both instruments.

26.3 Hold the receiver just clear of the ground and adjust SENSITIVITY as necessary until a weak signal is heard in the headphones.

26.4 Move the receiver to the left and right (keeping it upright and in-line with the transmitter) and note the effect on the signal. If the signal:-

(a) remains steady, it is due to 'direct coupling' and there is no indication of any cable or other service running between the two positions. Proceed with the 'radial' search (see par 27).

(b) increases and decreases, this indicates the presence of a cable or other service. Locate as described in pars 12 and 13.

26.5 If a service is detected and located, always check for adjacent services (see par 30).

26.6 If a further search for other services is required, ask the assistant to move the transmitter to the left or the right until clear of the signal from the first service. Then readjust SENSITIVITY to restore the original weak headphone signal and proceed with the 'radial' search.

27 RADIAL SEARCH

27.1 Ask the assistant to carry the transmitter around the receiver in a circle of approximately 10 metres radius, walking at a slow but steady pace, keeping the transmitter close to the ground and in line with the receiver.

27.2 As the assistant walks round, slowly turn the receiver to keep it in-line with the transmitter.

27.3 During the search, hold the receiver with one hand and use the other hand to adjust SENSITIVITY as necessary to maintain the signal at a low level except when a service is detected (see also par 29.1).

28 DETECTING AND LOCATING

28.1 A sudden rise and fall in signal will indicate that the transmitter has passed over a service which also passes close to the receiver.

28.2 If a service is indicated, ask assistant to stop and place the transmitter over the spot at which maximum signal is received on the receiver.

28.3 Locate the service as described in par 12 and 13.

28.4 Check for adjacent services (see par 30).

28.5 Continue the search as required until a full circle has been completed or as much as circumstances permit (frequently a wall or fence restricts the search to a half-circle).

29 PRECAUTIONS WHEN DETECTING BURIED SERVICES

29.1 **Separation Distance** During the 'radial' search the distance between the transmitter and receiver should be kept constant if possible, but narrow roads, parked vehicles or other obstructions may make it necessary to vary this separating distance. When this occurs, the signal will increase or decrease accordingly, so adjust the SENSITIVITY control to restore the original weak signal. Do not confuse the effect with the sudden increase and decrease of signal caused by crossing over a service.

29.2 Routes of Services When a service is detected, do not assume that it follows a straight path between the transmitter and receiver, as this is not always so. For example, at the initial detection, a service may appear to run diagonally across a road, but with further locating tests it may be found that the route follows the line of the road for some metres and then turns through a right angle before crossing the road.

To confirm this, trace the route a short distance, first turning the transmitter and receiver one at a time to find the line of maximum signal.

29.3 Diameter of Services The locator can indicate the center line of a service quite accurately, but it cannot determine the diameter of a service. For this reason do not excavate within 0.5 m of the indicated line of a service unless the diameter of the service is known.

30 ADJACENT SERVICES When services run close together it is frequently difficult to detect or trace them separately. A strong signal from one service may obscure a weak signal from a smaller (or less conductive) adjacent service.

To check this possibility:-

30.1 Place the receiver directly over the indicated centre line of the known service in an upright position (position of maximum signal).

30.2 Ask assistant to place transmitter *horizontally* over the centre line of the known service at a distance of not less than 8 m from the receiver.

30.3 Adjust SENSITIVITY until a good signal is received.

30.4 Ask assistant to move the transmitter a little to the left or right until the signal received on the receiver is at a *minimum*.

30.5 Repeat 30.3 and 30.4 until the signal received from the transmitter cannot be further reduced. The transmitter is now inducing a minimum signal into the known service, but will induce stronger signals into any adjacent services which are not directly below the transmitter.

30.6 Do not disturb the transmitter once it is in the final position.

30.7 Now move the *receiver* to the left and right. If the signal increases in either direction, an adjacent service is indicated. Locate the adjacent service using the receiver in the normal manner (see pars 12 and 13).

30.8 When it is known that more than one service exists and it is possible to make direct connexion to the services, use the 'CONNECT' method as described in pars 8.2 and 10 on each service in turn.

31 PERFORMANCE CHECK

31.1 Place the transmitter on the ground in an upright position at least 5 m away from any buried services which may be in the vicinity. Set the function switch to INDUCE and switch on the transmitter.

31.2 Hold the receiver not less than 2 m away from the transmitter, set the function switch to LOW and the SENSITIVITY control to maximum, and switch on. This will give a full meter reading and loud signal from the loud speaker.

31.3 Keeping the receiver in line with the transmitter, walk away from the transmitter until the meter reading drops to 50 divisions. The distance between the receiver and the transmitter at this point is the 'direct coupling' range and this should be at least 10 m. With the function switch on HIGH, the range should increase to approximately 30 m.

32 MAINTENANCE

32.1 To gain access to the battery for replacement give the battery compartment locking screws a quarter of a turn and remove the cover plate.

32.2 Switch off apparatus between tests to obtain maximum battery life.

32.3 Remove each battery before storing the instruments for any period which may be longer than one week.

32.4 When replacing faulty parts, use the following vocabulary items:-

Transmitter and receiver - Locator No. 1B

Headphone - Receivers Headgear No. 16T Black - 1

Connecting handle - Handle, Locator No. 1B

Batteries - Battery, Dry, No. 29.

32.5 The connecting leads and clips are not vocabulary items and should be made up locally.

33 REPAIR

33.1 Faulty accessories should be replaced as detailed in para 32. Repairs to the transmitter and receiver units should not be attempted locally. The F579 procedure 1 stated in TI G Supply 3 Supplies B4005 should be followed.

NOTE: The batteries must be removed before items are sent for repair.

OP10.5.4 E N D