A-MP PICABOND CONNECTORS

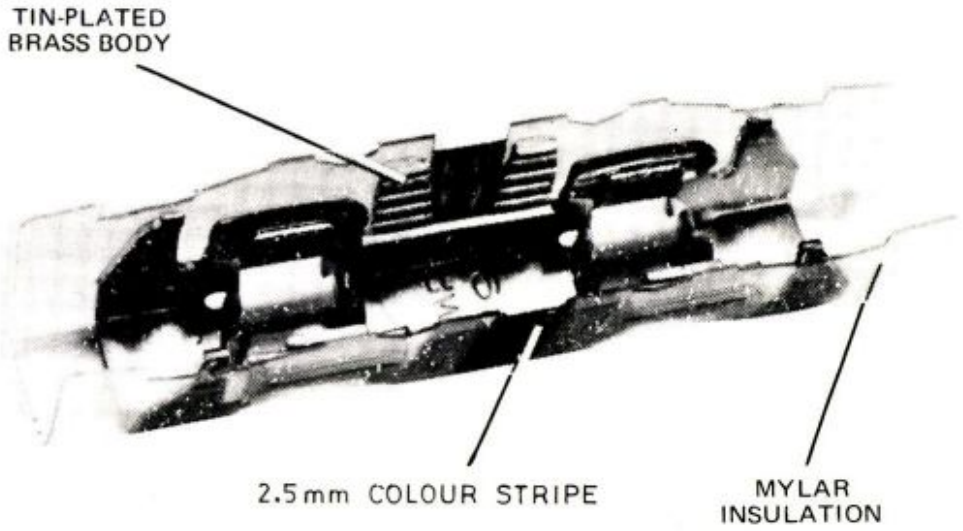
DESCRIPTION

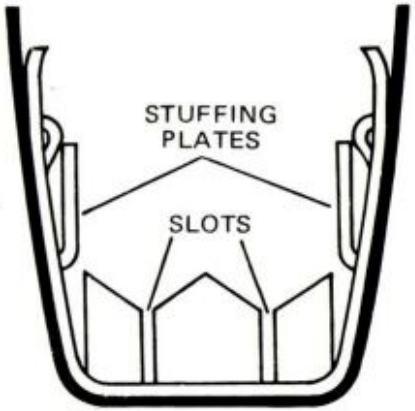
The A-MP Picabond Connector consists of a channel shaped brass element, insulated with a clear mylar convering with a 2.5 mm coloured stripe. The base of the metal channel contains slots into which the insulated wires are forced when the connector is compressed with a crimping tool. The insulation is sheared by the element and electrical contact made with the wires.

The connector may be used for in-line jointing of 3 or 4 paper or plastic insulated wires. Three sizes (see table page P-2) cater for combinations of copper & aluminium conductors from 0.32 to 0.90 mm.

The use of A-MP standard connectors must be confined to those cases where multiple jointing is required. For 2 wire in-line jointing see page P-15.

Connectors are supplied as individual units for use with hand tool Model MR-1 (S.114/116) or semi-automatic jointing machine Model MA-6B (S.114/111).





A-MP PICABOND CONNECTOR

A-MP PICABOND CONNECTORS - TYPES AND SIZES

ORANGE CONNECTORS SERIAL 114/161			GREEN CONNECTORS SERIAL 114/162			RED CONNECTORS SERIAL 114/163		
WIRE DIAMETERS (mm)								
WIRE 1	WIRE 2	WIRE 3	WIRE 1	WIRE 2	WIRE 3	WIRE 1	WIRE 2	WIRE 3
0.32	0.32	0.32	0.40 cu	0.40 cu	0.40 cu	0.51 cu	0.51 cu	0.81 Al
0.32	0.32	0.40	0.40 cu	0.40 cu	0.51 cu	0.51 cu	0.51 cu	0.90 cu
0.32	0.32	0.51	0.40 cu	0.40 cu	0.52 Al	0.51 cu	0.64 cu	0.90 cu
0.32	0.40	0.40	0.40 cu	0.40 cu	0.64 cu	0.51 cu	0.81 Al	0.81 Al
0.32	0.40	0.51	0.40 cu	0.51 cu	0.51 cu	0.51 cu	0.90 cu	0.90 cu*
0.32	0.51	0.51	0.40 cu	0.51 cu	0.64 cu	0.64 cu	0.64 cu	0.81 Al
	NIL		0.40 cu	0.64 cu	0.64 cu	0.64 cu	0.64 cu	0.90 cu
	ALUMINIUM		0.51 cu	0.51 cu	0.51 cu	0.64 cu	0.81 Al	0.81 Al
			0.51 cu	0.51 cu	0.64 cu	0.64 cu	0.90 cu	0.90 cu*
			0.51 cu	0.64 cu	0.64 cu	0.81 Al	0.81 Al	0.81 Al
			0.52 Al	0.52 Al	0.52 Al	0.81 Al	0.81 Al	0.90 cu
			0.52 Al	0.52 Al	0.64 cu	0.81 Al	0.90 cu	0.90 cu*
			0.52 Al	0.64 cu	0.64 cu			
			0.64 cu	0.64 cu	0.64 cu			

JOINTS MADE WITH A-MP PICABOND CONNECTORS

*NOTE : Red connectors may be used to joint two 0.90 and one 0.64 mm wires but not three 0.90 mm wires ie. only one 0.90 mm conductor in each end of connector.

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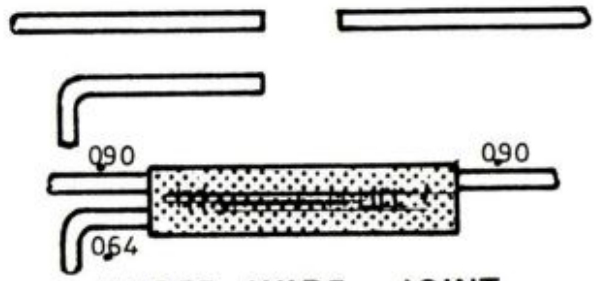
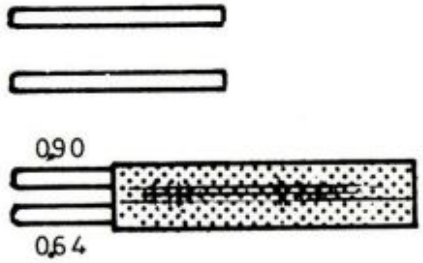
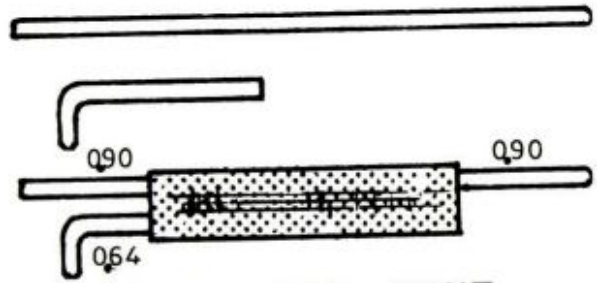
A-MP PICABOND CONNECTORS - TYPES AND SIZES



THREE WIRE JOINT



SINGLE END JOINT



THREE WIRE JOINT
(EXISTING THROUGH WIRE)

MULTIPLE JOINTS MADE WITH A-MP CONNECTORS

A-MP HAND TOOL - TYPE MR-1

DESCRIPTION

The Model MR-1 hand tool (S.114/116) may be used with any of the A-MP Picabond connectors listed in the table on Page P-2.

The tool applies the connectors to the wires by crimping them between a set of dies (the anvil and the crimpers).

The wires supports hold the conductors in the correct position to align them properly in the connector.

A wire cutter on the anvil automatically cuts off excess length before the wires are crimped in the connector.

The moving handle contains an over-centre mechanism and a release lever. When the handles are fully closed they snap over centre and lock, indicating that crimping is complete. The release lever permits the jaws to be opened for removal of the tool.

MAINTENANCE OF TOOL

Wash tool occasionally in methylated spirits and dry thoroughly.

Lubricate tool at the points shown with WD-40 or equivalent and an all-purpose grease.

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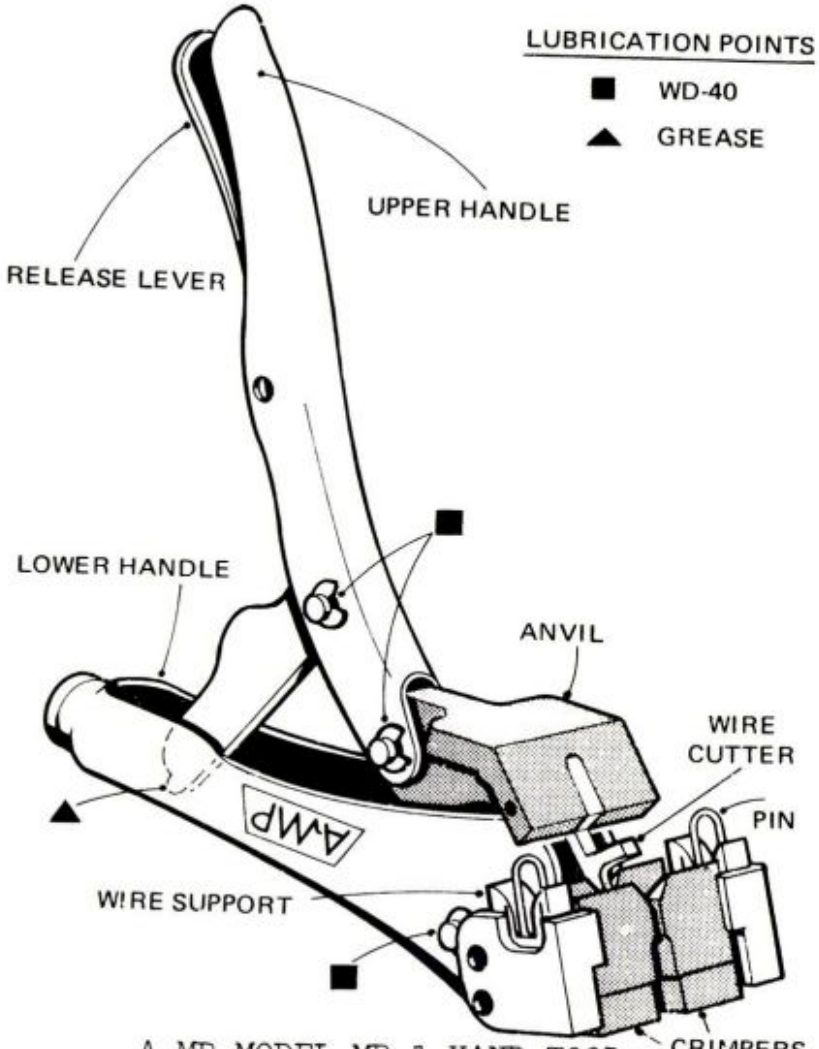


A-MP MODEL MR-1 HAND TOOL

OPERATING TOOL, MULTIPLE JOINTS (3-4 WIRES)
Through Conductor Ends Available.

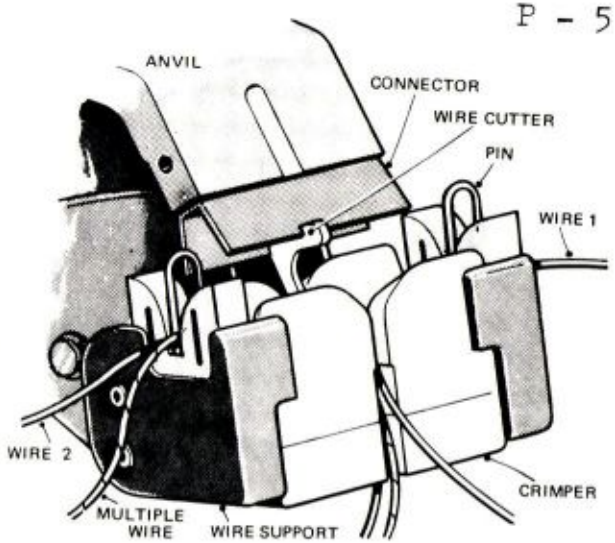
1. Place conductors of through cable below the pins in the wire supports.
2. Place conductors from branch cable above the pins in the wire supports.

Through Conductor Ends Not Available. (e.g. connecting new lateral cable into an existing cable). Two methods of jointing may be used:

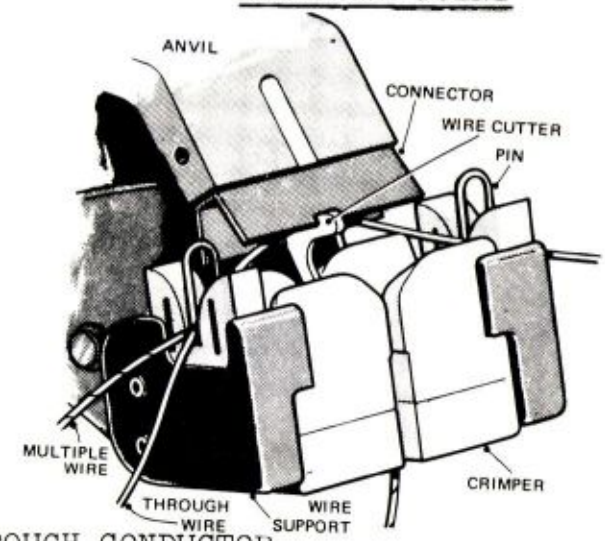
1. Where it is permissible to cut the through conductor, place wires in the tool as above except that the through conductor is inserted in one piece.
2. Where through conductor is not to be cut, e.g. working cable, place new cable conductor below the support pin and the through conductor between the wire cutter and the anvil so that it just enters the wire support above the pins. Insert connector carefully, pivotting it into place so that it does not disturb the through conductor.

JOINT BUILD-UP
Arrange connectors in groups along the cable opening in order to build a uniform compact joint.

TESTING JOINTS. See page P-13.



MULTIPLE JOINT



THROUGH CONDUCTOR NOT CUT

JOINTING MACHINE A-MP TYPE MA-6B

DESCRIPTION

The A-MP Model MA-6B Jointing Machine is supplied in a kit which consists of a Jointing Head (Applicator), Support Rig and Extension Bar, Legs for the Support Rig, Extension Legs, Crimp Gauge, Connector Container, Cleaning Kit, and a Carrying Case.

The jointing head or applicator applies the connectors to the wires by crimping them between a set of dies (the anvil and crimpers). A wire cutter on the anvil automatically cuts off excess wire when the machine is cycled. Wire supports hold the conductors in the correct position to align them properly in the connector.

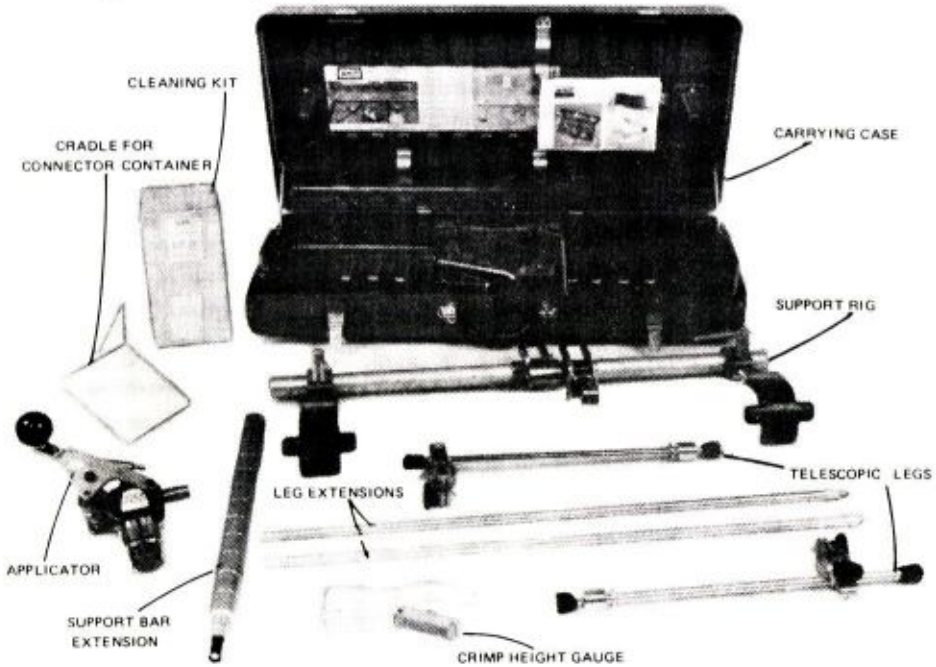
The jointing head is mounted on the support rig which is attached to the cable by clamps and supported by the legs.

When not in use the machine should be dismantled and stored in the carrying case.

CABLE PREPARATION

Prepare cables for jointing as described in Section L.

Fit preformed lead bases on moisture barrier cable before removing the sheath for jointing.

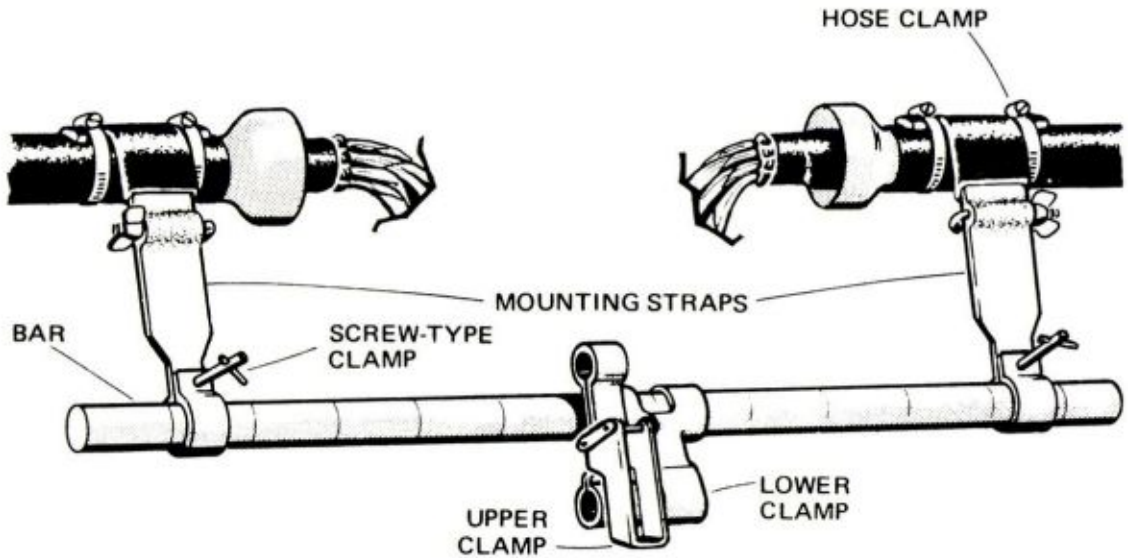


A-MP TYPE MA-6B JOINTING MACHINE KIT

SETTING UP JOINTING MACHINE (Fitting Support Rig).

1. Open the screw clamps on the support rig mounting straps. Position the straps so that that they fit on the cable just outside the lead joint bases and they are the same distance from the centre of the support bar. With the straps correctly positioned, tighten the clamps on the support bar.

2. Attach the support rig to the cable using two hose clamps on each mounting strap. Before tightening the hose clamps make sure that the mounting straps are fairly parallel when viewed from the side and are below the cable at about 45^{o} to the horizontal. (Where necessary the position of the support bar may be changed to suit jointing conditions.)



ATTACHING MOUNTING STRAPS TO CABLE

SETTING UP JOINTING MACHINE (Fitting Legs).

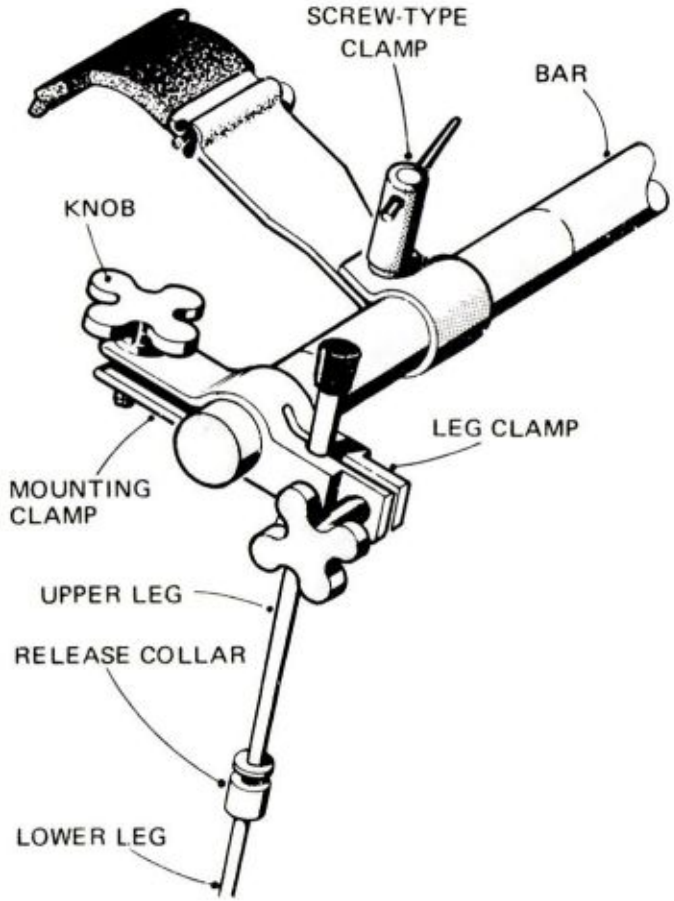
3. Slide one of the legs over each end of the support bar. Angle the legs towards the rear of the cable then tighten the mounting clamps.

4. Loosen the leg clamps and slide the legs up or down according to the height of the cable. Then tighten the leg clamps.

5. Lift up slightly on the support rig and pull each lower leg down until it rests firmly on the floor. (To return legs to closed position squeeze rings on adjusting collars and slide inner leg into outer).

6. If the legs tend to slide remove the rubber feet from the ends. The sharp points on the ends will provide a better grip on some surfaces.

7. If the legs are too short, even when fully extended, remove the rubber feet and slide on the extension legs. Then adjust the height as in No. 5. If necessary, the legs may be placed against the wall.



FITTING LEGS TO SUPPORT RIG

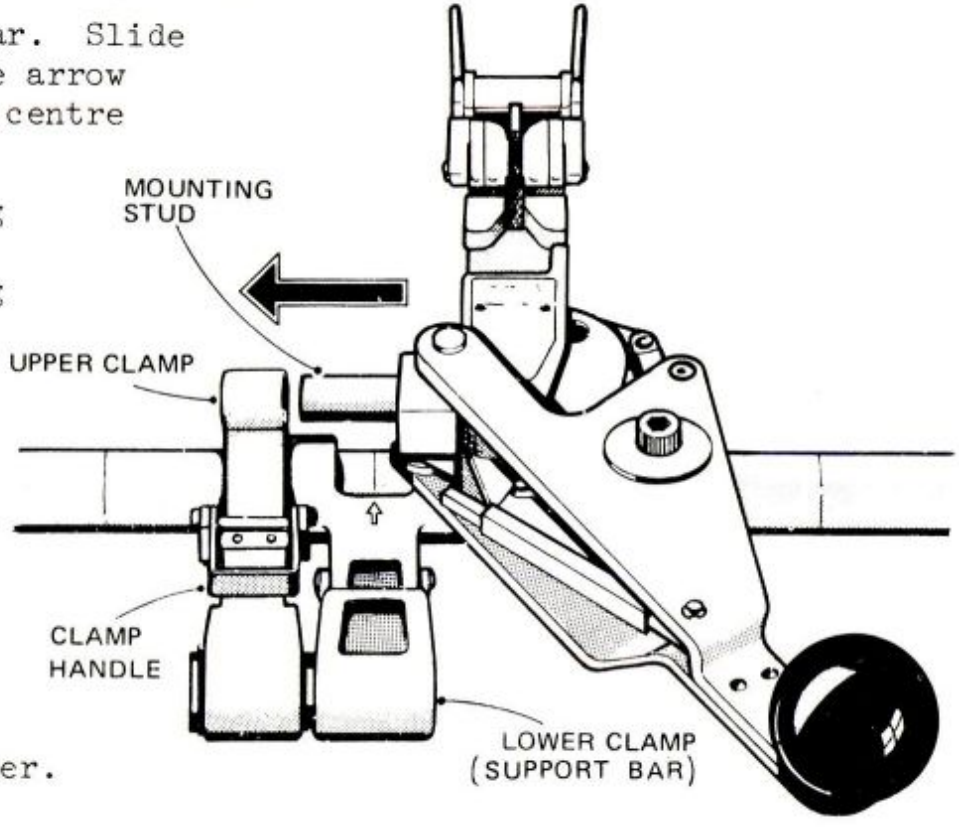
SETTING UP JOINTING MACHINE (Fitting Jointing Head)

8. Loosen the lower clamp on Support bar. Slide the clamp left or right so that the arrow on the lower clamp aligns with the centre index mark on the bar.

9. Mount the jointing head by releasing the upper handle on the jointing head clamp and sliding the mounting stud of the head into the clamp. Do not close the clamp at this stage.

10. With the jointing head clamp in the centre of the support rod withdraw a pair of wires from the top front of the bottom rear cable unit on both sides of the opening.

11. Gently tension the wires across the joint opening and twist them together. This is the setting-up pair for positioning the jointing head.

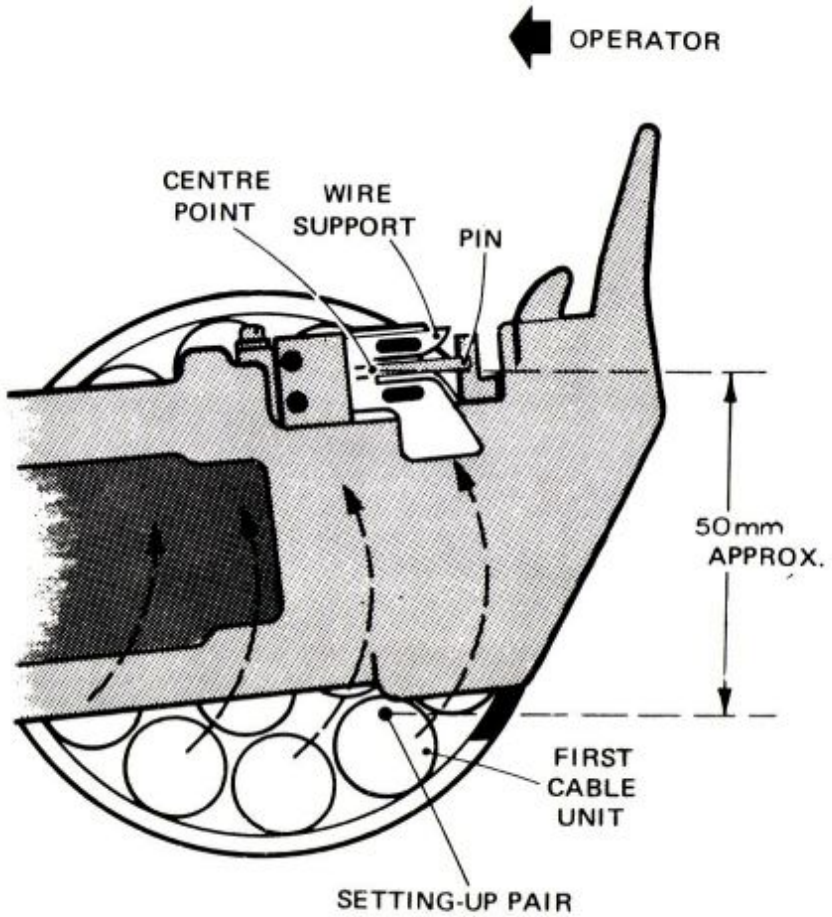


FITTING JOINTING HEAD TO SUPPORT RIG.

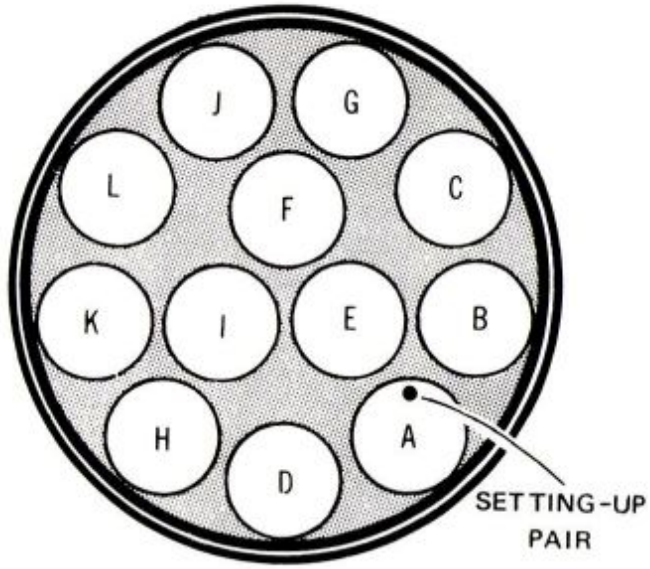
12. Loosen the upper and lower jointing head clamps and pivot the head around the support bar until its centre point is about 50 mm above the setting-up pair. Then close upper and lower clamps.

13. Place a backsight (Dwg CL 1242) in position behind the unit being jointed by lightly wedging it between convenient units. Tie it in position if necessary.

JOINTING MACHINE – TYPE MA-6B



POSITIONING JOINTING HEAD FOR JOINTING



SEQUENCE OF UNITS TO BE JOINTED

DO NOT WORK IN A MANHOLE WHERE GAS HAS BEEN DETECTED UNTIL TESTS SHOW THAT THE GAS HAS BEEN CLEARED AND WORKING CONDITIONS ARE SAFE.

JOINT BUILD UP

Commence jointing with the jointing head at the centre position.

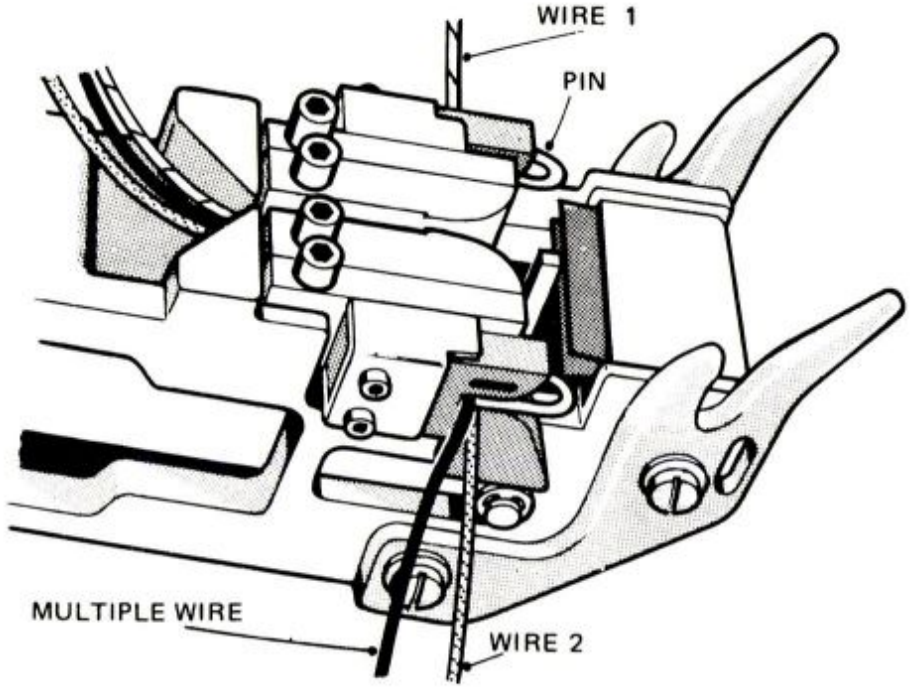
Reposition the head every 5 to 10 pairs so that a uniform compact joint is obtained. Do not locate joints closer than 125 mm from the sheath ends.

To shift the head loosen the lower clamp and slide the head along the support bar until the arrow on the clamp aligns with the next index mark.

MULTIPLE JOINTS (3 or 4 CONDUCTORS) - WHERE CONDUCTOR ENDS ARE AVAILABLE

Place conductors from the through cable into the wire supports below the pins and wires from the branch cable above the pins.

Keep joints at least 125 mm away from the cable ends.



MULTIPLE JOINT - CONDUCTOR ENDS AVAILABLE

PREVENT WORKMEN OR MEMBERS OF THE PUBLIC STEPPING INTO OPEN MANHOLES BY PLACING MANHOLE GUARDS AROUND THEM BEFORE REMOVING THE COVERS.

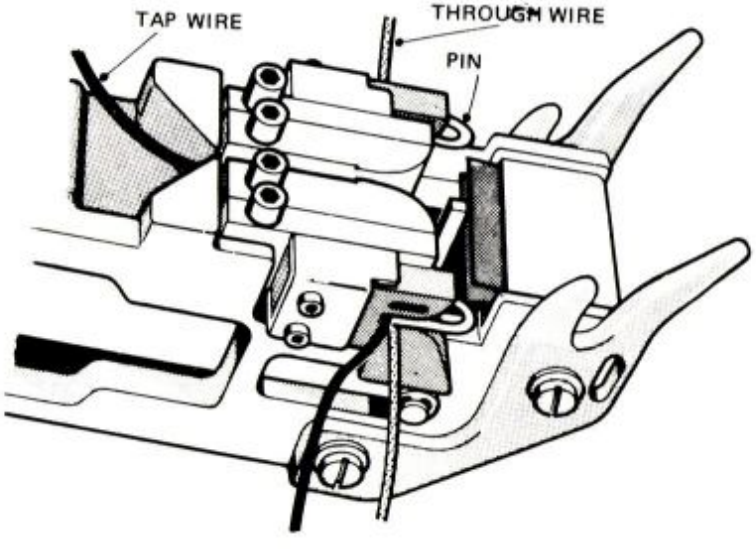
PROVIDE RED LIGHTS ON EQUIPMENT LEFT OVERNIGHT IN A POSITION WHICH COULD CREATE A TRAFFIC HAZARD.

MULTIPLE JOINTS - CONDUCTOR ENDS NOT AVAILABLE

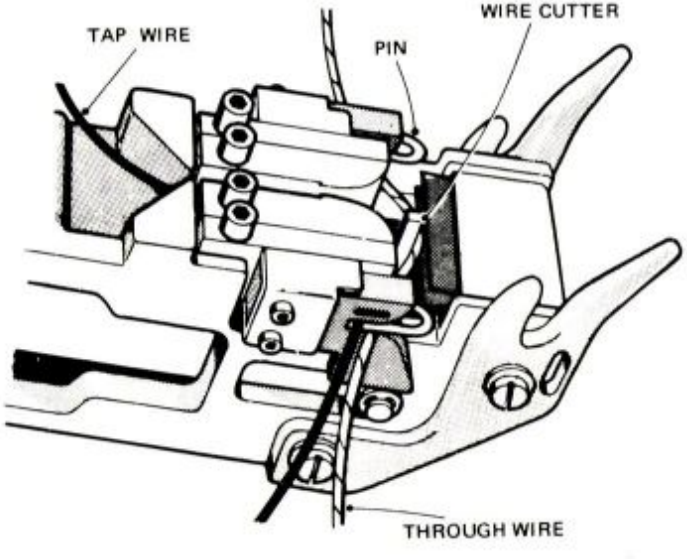
This condition normally occurs where a new lateral cable is connected to an existing joint or straight through cable. Two methods of jointing may be used.

1. Where it is permissible to cut the through conductor. Wires are placed in the jointing head as described on page P-11 except that through wire is in one piece.

2. Where through conductor is not to be cut, e.g. working lines, data circuits, fire alarm lines, etc., place the through wire into a connector, insert the connector into the supports. The through wire must be slack. Place the branch conductor in the upper slots in the wire supports.
   When operating the lever, hook two fingers of the left hand over the through wire and pull it back into the wire support.



MULTIPLE JOINT - METHOD 1

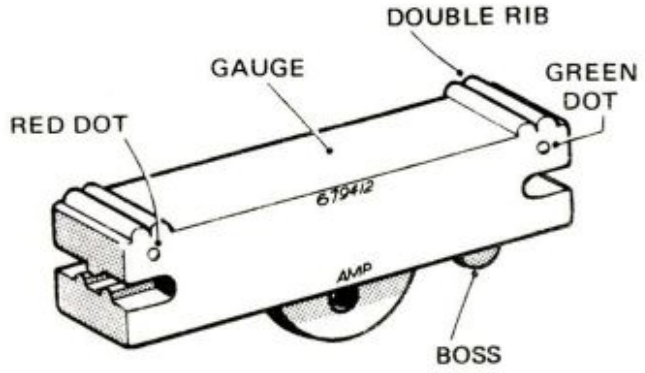


MULTIPLE JOINT - METHOD 2

TESTING CONNECTOR JOINTS

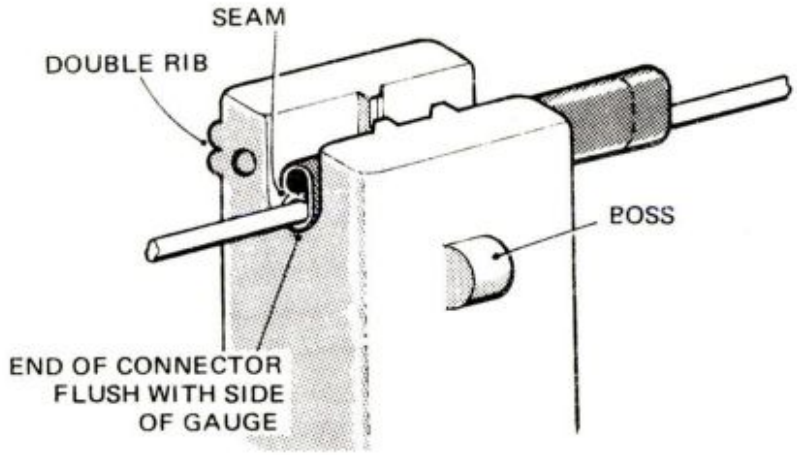
To check that the machine is making satisfactory joints make the following tests:

(1) Crimp height test - Made at commencement of jointing and after every 100 pairs.
(2) Visual inspection of completed joints.
(3) Electrical conductivity test - Made at commencement of jointing, commencement of each shift, and other times as required.



Crimp Height Test

1. Make a joint using scrap wire from cable and a connector from batch being used.
2. Select correct end of gauge, red connectors go in end with red dot, green and orange connectors in end with green dot. Loop gauge chain around wrist.
3. Place connector in gauge so that its seam aligns with the double rib on the gauge and its end is flush with the side of the gauge.

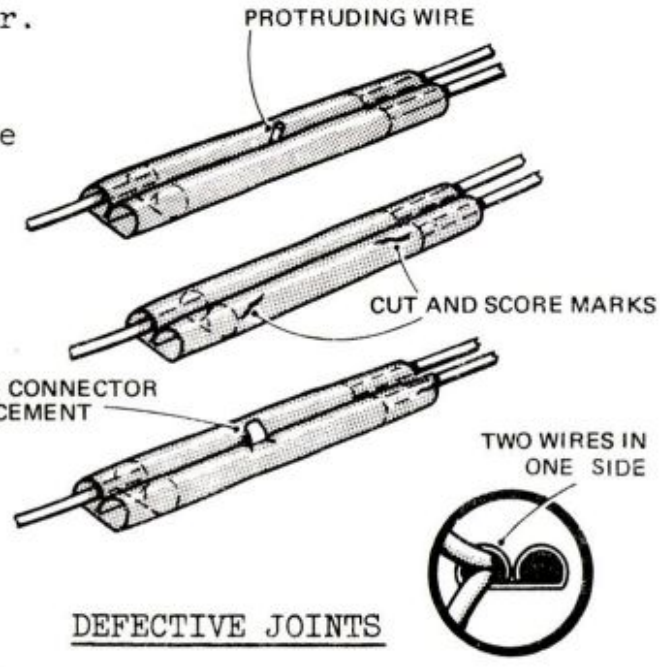


CHECKING CONNECTORS WITH CRIMP GAUGE

4. Hold the free end of the connector and release the gauge. It should fall off the connector. If it does repeat with other end of connector.
5. If either end of the connector sticks in the gauge the joint is defective. Make a few more sample joints and gauge them. If they don't gauge properly, replace the jointing head. In either case gauge all joints made since last gauging and replace or recrimp any defective joints.

VISUAL INSPECTION OF COMPLETED JOINTS

1. Check for wire protruding from centre of connector. If any can be seen, joint is faulty and must be replaced.
2. Examine connector insulation for any cuts or score marks. If any are found, check for foreign matter or burrs on the anvil or crimper. Clean head to remove foreign matter or replace it if die faces or anvil are burred. Replace damaged joints.
3. Check for metal leg protruding from centre of connector. This is caused by improper location of the connector in the tool. Replace such joints. Be especially careful to insert connectors in the applicator so that the slot in the connector engages the wire cutter.
4. Check that multiple joints have one wire on each side of connector seam. If two wires are on one side, replace joint. Wires must be placed in the wire supports correctly i.e. one above and one below the pin.
5. Periodically check wire supports on applicator for damage. Pins in the supports must be smooth and centred with the crimping area of the crimpers.



DEFECTIVE JOINTS

Electrical Conductivity Test - The use of the conductor resistance measuring set to measure the resistance of sample joints is described on page S-1.

CLEARING JAMMED JOINTING HEAD

If jaws jam because of a misplaced connector and will not open push the operating lever forward until the ratchet releases. Then replace the damaged connector. If the jam is due to some hard metallic object lodged between the anvil and the crimpers replace the

CLEANING AND LUBRICATION OF MACHINE.

A cleaning kit consisting of brushes and pressure packs of industrial solvent and WD-40 lubricant is supplied with the jointing machine to enable it to be cleaned and lubricated at regular intervals in the field. In dirty conditions daily cleaning may be necessary.

To clean the jointing head, first use bristle brush to remove loose particles. Then spray surfaces lightly with solvent cleaner to clean internal parts. Operate tool several times to ensure removal of small particles. Use the soft tube cleaner to clean crimping dies, anvil and all exterior surfaces. Before use, bend the end of the tube cleaner back 50 mm to avoid scratching the polished surfaces.

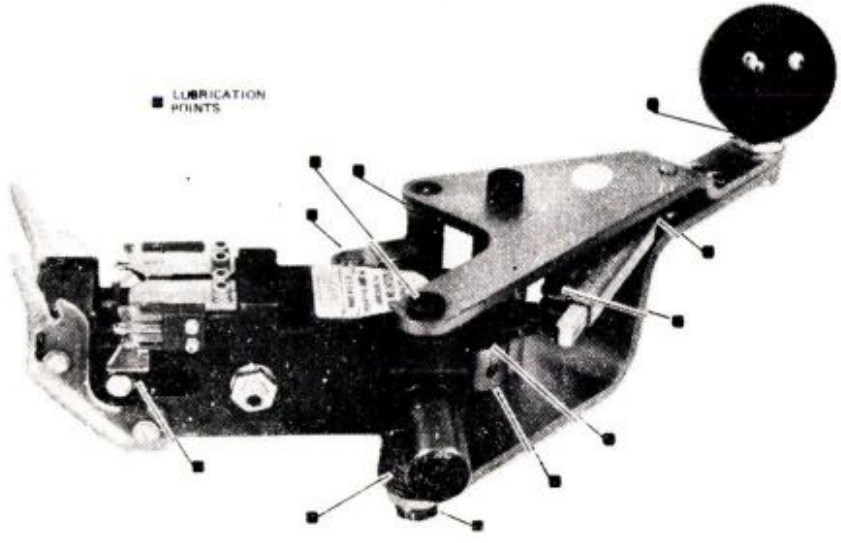
Relubricate immediately after cleaning using the WD-40 lubricant on all pivot points and bearing surfaces as shown below. Keep crimping surfaces clean and free of oil. Wipe with a cloth if necessary.

In addition to the above, thoroughly clean and lubricate the machine after every 10,000 cycles and before putting it into storage, as follows:-

(i) Immerse head in methylated spirits. Remove it from solvent and dry thoroughly, preferably with blasts of compressed air.

(ii) Wipe plastic parts clean with a dry cloth.

(iii) Lubricate machine as above.



LUBRICATION POINTS ON JOINTING HEAD

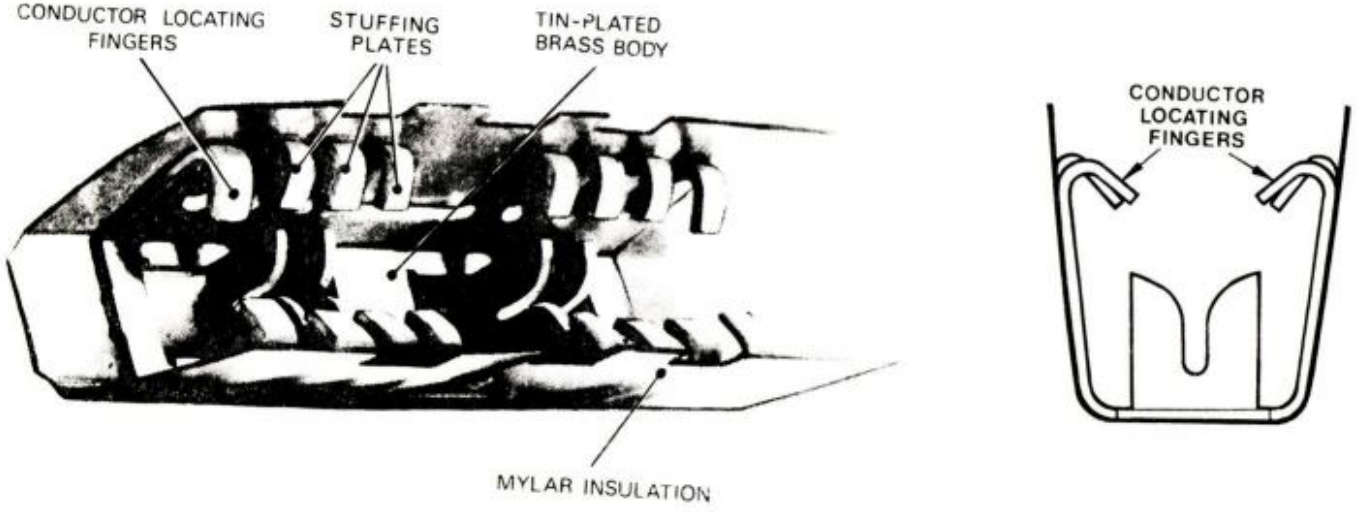
A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING

DESCRIPTION

Mini connectors differ from Standard A-MP connectors in that they accept and joint together only two wires whereas the Standard connector can make multiple joints between a maximum of four wires.

As the mini connector is the lower cost item, it must be used in preference to the Standard wherever straight two wire jointing is required.

The construction details of an A-MP mini connector are illustrated.



A-MP MINI CONNECTOR

A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING

PINK CONNECTOR S114/57		BLUE CONNECTOR S114/58		BROWN CONNECTOR S114/59	
Wire Diameter (mm) and material		Wire Diameter (mm) and material		Wire Diameter (mm) and material	
WIRE 1	WIRE 2	WIRE 1	WIRE 2	WIRE 1	WIRE 2
0.32 Cu	0.32 Cu	0.40 Cu	0.40 Cu	0.51 Cu	0.51 Cu
0.32 Cu	0.40 Cu	0.40 Cu	0.51 Cu	0.51 Cu	0.64 Cu
0.32 Cu	0.51 Cu	0.40 Cu	0.52 Al	0.51 Cu	0.81 Al
0.40 Cu	0.40 Cu	0.40 Cu	0.64 Cu	0.51 Cu	0.90 Cu
0.40 Cu	0.51 Cu	0.51 Cu	0.51 Cu	0.64 Cu	0.64 Cu
0.40 Cu	0.52 Al	0.51 Cu	0.52 Al	0.64 Cu	0.81 Al
0.52 Al	0.52 Al	0.51 Cu	0.64 Cu	0.64 Cu	0.90 Cu
		0.52 Al	0.52 Al	0.81 Al	0.81 Al
		0.52 Al	0.64 Cu	0.81 Al	0.90 Cu
		0.64 Cu	0.64 Cu	0.90 Cu	0.90 Cu

Notes (i) A-MP Mini Connectors are for two wire straight jointing only.

(ii) Only the wire combinations shown are to be jointed in each particular size of connector.

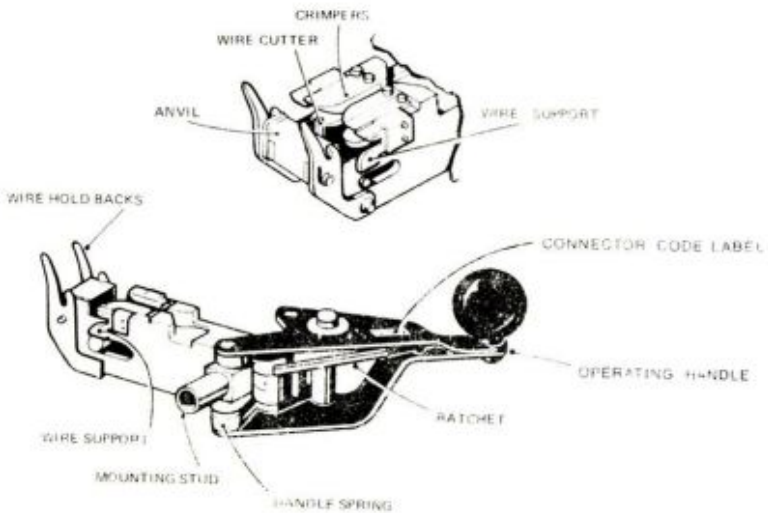
CONDUCTOR COMBINATIONS JOINTED BY A-MP MINI CONNECTORS

A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING

THE MA6 MINI CABLE JOINTING MACHINE

The MA6 Mini machine is similar in most respects to the standard A-MP MA6B manual cable jointing machine described in Section P. The support assembly is identical but the applicator head and its adjustment is different in the following respects.

The MA6 Mini applicator head can be identified by the colour of the operating handle which is black in contrast to the bright plated finish of the Standard MA6B applicator. In addition it has a connector code label affixed to the operating handle which has Pink, Blue and Brown dots to indicate that it accepts mini connectors of those colours only. A further important distinguishing feature is that the wire supports, being designed to hold one wire only on each side of the head unlike the standard tool do not have a metal pin for separating two wires.



MA6 MINI APPLICATOR HEAD

A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING

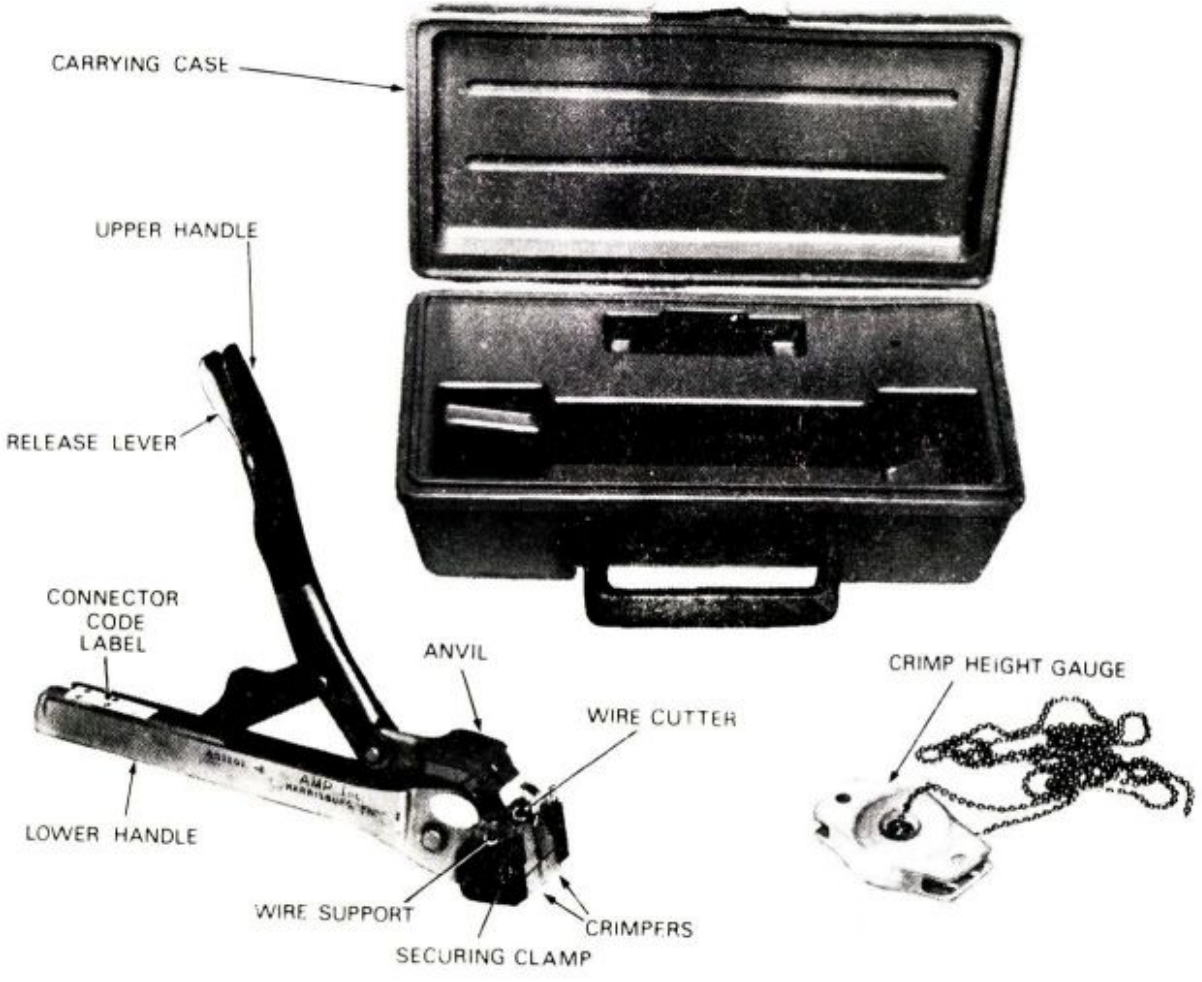
The gauge which is supplied with the MIni applicator is of distinctive appearance.

The gauge has a slot width at one end suitable for gauging Pink and Blue Connectors and this end is marked with two dots, one pink and one blue. The opposite end of the gauge has a wider slot marked with brown dots and is used with brown mini connectors.

THE MR1 MINI HANDTOOL

The A-MP MR1 Mini handtool is almost identical in apperance with the standard MR1 handtool. The distinguishing features are also of similar nature i.e. the mini handtool has a black Upper moving handle and the wire supports lack a metal separating pin. In addition the plastic wire support securing clamps are black instead of blue as with the standard MR1 handtool. Also the tool has a connector code label situated on the lower handle having Pink, Blue and Brown dots for connector identification.

A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING



A-MP TYPE MR1 MINI HANDTOOL

cause of the generally similar appearance of the A-MP mini and standard tooling as reviously described, care must be exercised to ensure that only "mini" type tooling is used with the A-MP mini series of connectors and vice versa.

Note (i) STANDARD AND MINI A-MP TOOLING IS NOT INTERCHANGEABLE.

(ii) STANDARD AND MINI A-MP CRIMP HEIGHT GAUGES ARE NOT INTERCHANGEABLE.

HANDTOOL HOLDER AND SUPPORT ASSEMBLY

A tool holder designed to hold the handtool and incorporating a clamp for securing to any convenient supporting member is available under Serial 114/64.

additional accessory consisting of a simple support assembly bar and two captive clamps is provided under S114/65. The tool holder and support assembly are also applicable for use with Standard MR1 handtools.

A-MP 'MINI' CABLE JOINTING CONNECTORS AND APPLICATOR TOOLING

TOOL HOLDER AND SUPPORT ASSEMBLY

APPLICATION OF MINI CONNECTORS AND TOOLING

The mini connectors and associated tooling are not suitable for jointing plastic distribution cables in openable joint enclosures, untailed terminal boxes and above ground jointing posts. For connector jointing in the distribution cable network refer to page D-28.

MACHINE AND TOOL PERFORMANCE CHECKS

Crimp Height Test

To ensure that the jointing machine and handtool are in correct adjustment and will crimp the connectors satisfactorily, a crimp height test is performed utilising the crimp height gauge supplied. See page P-14.

Joint Resistance Test

The use of the Conductor Resistance Measuring Set is described on page S-1.

MAINTENANCE

It is the responsibility of the user to ensure that all components of the machine and handtool are kept in a dry, clean and properly lubricated condition at all times. Cleaning and lubrication procedures are the same as for the standard A-MP machine and handtool and is described on page P-16.

SEALING JOINTS IN LEAD SHEATHED CABLES

JOINT SLEEVE

Joints in lead sheathed cables are sealed by means of a sleeve formed from sheet lead which is plumbed to the cable sheath with wiping solder (S.4/1).

For large joints preformed lead bases may be used as described on page Q-5.

SLEEVES CONSTRUCTED FROM SHEET LEAD

Diameter of Lead Sleeve	Gauge of Sheet Lead	Serial/Item No.
Up to 50 mm	2 mm	86/1
Over 50 mm	3 mm	86/3

GAUGE OF SHEET LEAD REQUIRED FOR JOINT SLEEVE

NOTE: Use 3 mm. sheet lead on all joints in cables maintained under gas pressure.

LEAD SLEEVE DIMENSIONS

Width of sheet lead - circumference of largest portion of joint plus amount of overlap shown in the table below. The sleeve must not be a tight fit.

Length of sheet lead - length of joint opening between ends of cable sheath plus overlap shown in the table below.

Diameter of Cable	Amount of Overlap of Seam	Amount of Overlap at Cable Ends
25 - 40 mm	25 mm	25 mm
41 - 50 mm	25 mm	40 mm
Over 50 mm	25 mm	50 mm

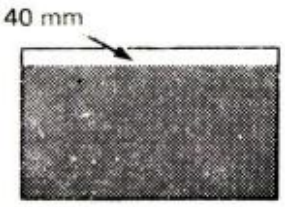
AMOUNTS OF OVERLAP TO BE PROVIDED ON LEAD SLEEVE

LEAD IS POISONOUS, WASH YOUR HANDS AND FACE BEFORE YOU EAT, DRINK, OR SMOKE.

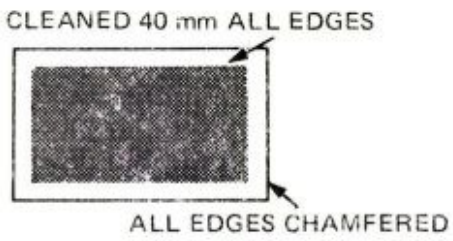
PREPARING SHEET LEAD SLEEVE

Form cylindrical sleeve from sheet lead as shown below:

(1) Cut lead sheet to size.

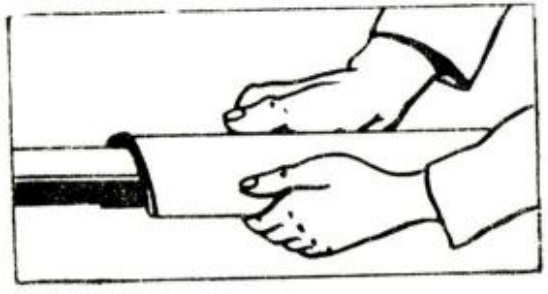


(2) Clean inside surface.

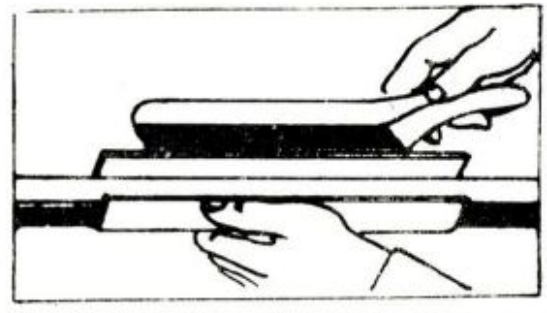


(3) Clean outside surface.

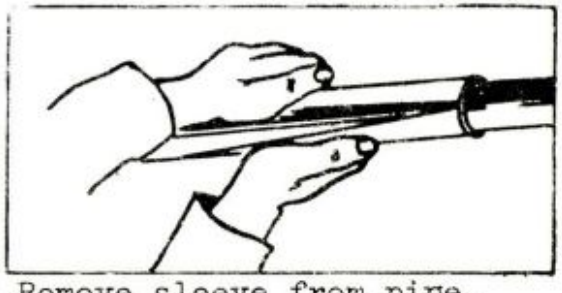
Clean and chamfer edges of the sleeve as shown above with a wire brush and shave hook. Cover the cleaned surfaces immediately with Stearine to prevent oxidation of the lead.



(4) Bend lead over a suitable pipe.



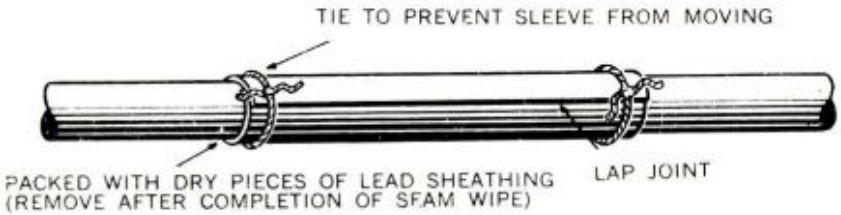
(5) Dress around pipe to cylindrical shape.



(6) Remove sleeve from pipe.

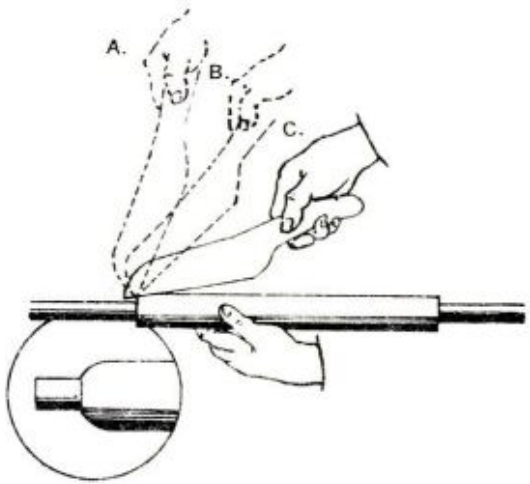
(7) Sleeve prepared.

PLUMBING LEAD SLEEVE – STRAIGHT JOINT

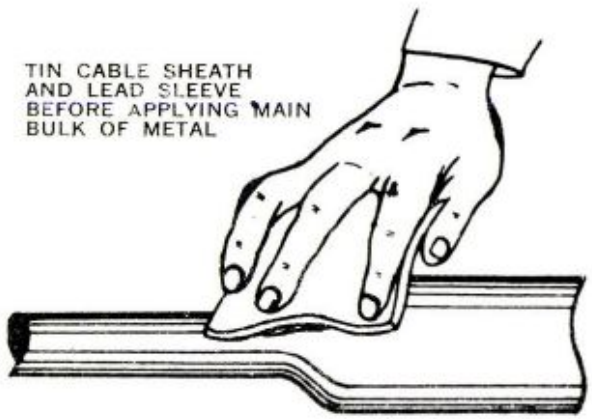


(1) Fit sleeve centrally over joint and dress in sides until edges overlap by 25 mm. Secure sleeve with wire ties 25 mm from ends and pack ends to prevent movement.

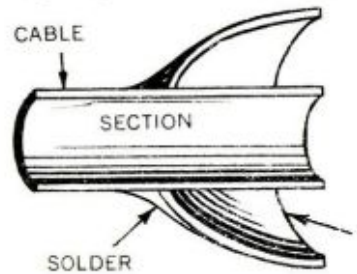
(2) Plump the seam with wiping metal.(S.4/1)



(3) Dress the ends of the sleeve to fit neatly around the cable.



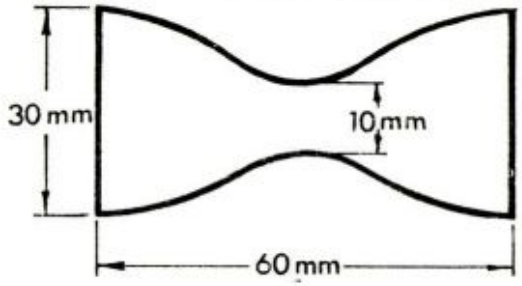
(4) Plumb ends of sleeve to cable sheath.



(5) Completed fillet wipe. Pressure test joints as described on Pages T4-T5.

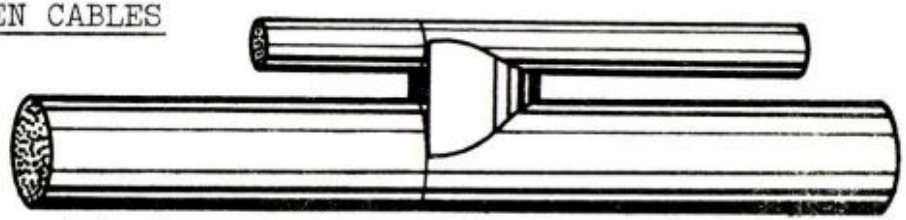
PLUMBING LEAD SLEEVE – BRANCH JOINT

USE OF LEAD GUSSET TO FILL SPACE BETWEEN CABLES

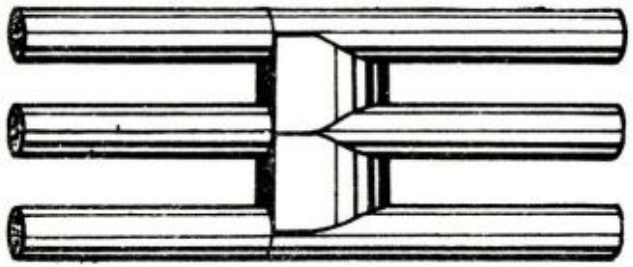


(1) LEAD GUSSET (S.86/15) FOR CABLES UP TO 100 PAIR

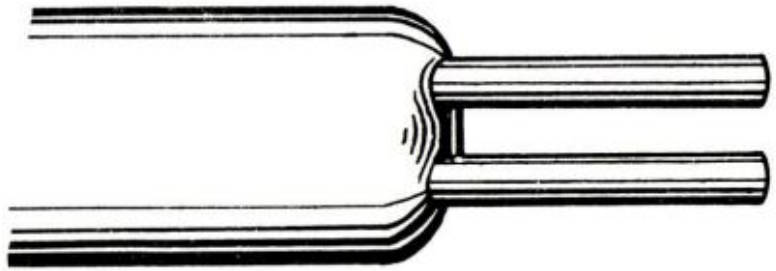
For larger cables cut gusset from sheet lead to suit cable diameter.



(2) Solder gusset into position using Resin Cored Solder where end of sleeve will be, before removing sheath for jointing.



(3) GUSSETS FITTED FOR 3-WAY JOINT



(4) Fit sleeve and plumb to gusset and cable. Position sleeve so that the end is level with outer edge of gusset and dress sleeve in as close as possible to the gusset and cable before plumbing.

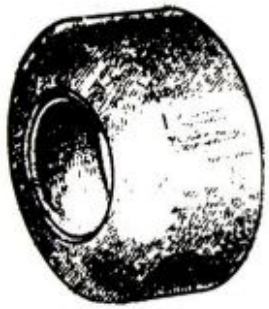
TABBED SLEEVE (Alternative Method).

When forming the lead sleeve, tabs may be cut and shaped to fit between the branch cables thus avoiding the need for fitting a gusset.

Issue 5, 1979

PLUMBING LEAD SLEEVES USING JOINT BASES

The sealing of joints in large size cables is simplified by the use of preformed lead joint bases. The use of bases also facilitates the fitting of temporary lead sleeves to seal the cable overnight when jointing in locations where storm flooding of manholes is likely.



TYPICAL LEAD JOINT BASE

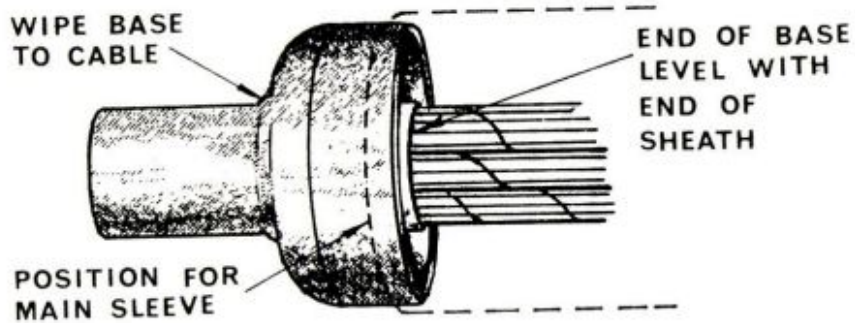
Thread joint base over end of cable and plumb in position before removing sheath for jointing.

End of the base should be level with the point for removal of sheath.

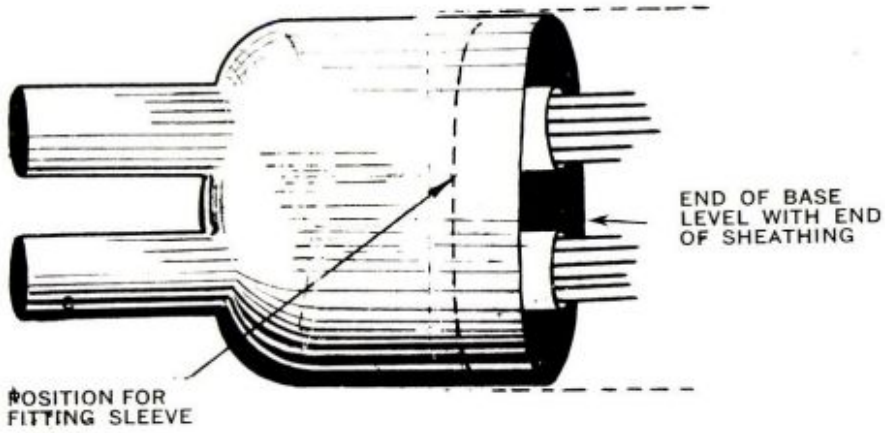
On completion of jointing fit main lead sleeve constructed from sheet lead between the joint bases allowing sleeve to overlap base by 20 - 25 mm at each end.

Plumb sleeve to bases.

For branch joints a lead base may be fabricated from sheet lead.



FITTING PREFORMED LEAD BASE



FITTING FABRICATED LEAD BASE ON BRANCH JOINT

Q-6 SEALING JOINTS IN MOISTURE BARRIER CABLES

DESCRIPTION M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

Joints in moisture barrier sheathed cables may be sealed by means of a lead sleeve plumbed to lead bases which are fitted on the cable prior to the commencement of jointing. The bases are bonded to the polyethylene sheath with adhesive lined thermoshrinkable tubing.

Four kits are available to cover the complete range of moisture barrier cable sizes. (See table page Q-7). Each kit comprises:

(a) - 1 Spun lead base.
(b) - 1 Inner sleeve, 125 mm length, Thermoshrinkable tubing.
(c) - 1 Outer sleeve, 250 mm length, Thermoshrinkable tubing.
(d) - 1 Adhesive backed aluminium foil.
(e) - 1 Abrasive tape.

These items are not interchangeable with different sized kits.

Two kits are required for straight through joints and three or more for branch joints according to the number of cables entering the joint.

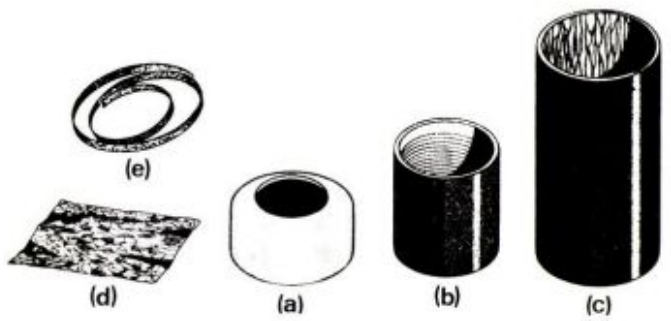
These kits are suitable only where unjointed ends of cable are available.

SPECIAL TOOLS

Standard LPG plumbing burners are unsuitable for use with heat-shrinkable tubing as the flame is too severe and may damage the material. Use only the special LPG soft-flame burner provided for the purpose.

A wooden wiping jig (Dwg. CL 1244) simplifies assembly of the lead joint base.

Use a glass fibre blanket (S.654/74)to protect adjacent cables from heat when shrinking tubing.



MOISTURE BARRIER JOINT CLOSURE KIT

M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

Kit No.	Cable Dia. Range	Inner Diameter of Tubing		Cable Size at Appropriate Conductor Diameter						
		As Supplied	Fully Recovered	0.32mm Cu	0.40mm Cu	0.52mm Al	0.64mm Cu	0.81mm Al	0.90mm Cu	1.15mm Al
MBK1 S.433/157	23mm to 30mm	43mm	18mm		100 150 200		70			
MBK2 S.433/158	30mm to 48mm	58mm	25mm	600	300 400 600	150 300 400	100 150 200	150 200	50 70 100	
MBK3 S.433/159	48mm to 71mm	86mm	35mm	1200 1800 2400	800 1000 1200 1400 1500	600 800 1000	300 400 600	300 400	150 200 300	150 200
MBK4 S.433/160	71mm to 94mm	105mm	54mm	3000 3600 4200	1800 2100 2400 2700	1200 1500 1800	800 1000 1200	600 800	400 600	300 400

CABLE SIZES COVERED BY MOISTURE BARRIER CLOSURE KITS

PREPARING CABLES FOR JOINTING

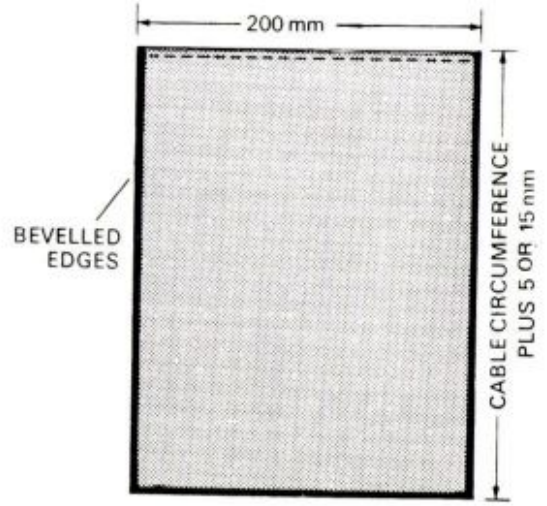
Set up cables and mark position for the joint opening as described in Section L. Cut cables to a suitable length for jointing and clean sheath for 1.5 metres from the cable ends using cotton waste moistened with Shellsol T or Isopar H solvent.

M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

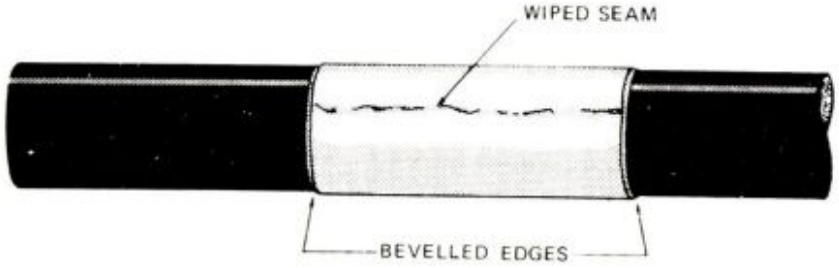
PREPARING LEAD BASES

The spun lead base supplied with the kit must be fitted to a lead tube tailored from sheet lead to suit the cable diameter, as follows:

1. Use 2 mm lead for cables in MBK-1 kit range and 3 mm for cables in the MBK-2, 3 and 4 range to measure 200 mm x circumference of the cable plus 5 mm for cables up to 51 mm diameter and 15 mm for larger diameter cables.
2. Bevel one of the 200 mm edges on one surface and bevel the remaining three edges on the opposite surface.
3. Form sheet lead around a section of sheath which will later be removed for jointing.
4. Butt edges of the lead together and wipe in usual manner.
5. Clean outside of tube with a wire brush.



SHEET LEAD CUT TO SIZE AND BEVELLED



SHEET LEAD FORMED AROUND CABLE AND SEAM WIPED

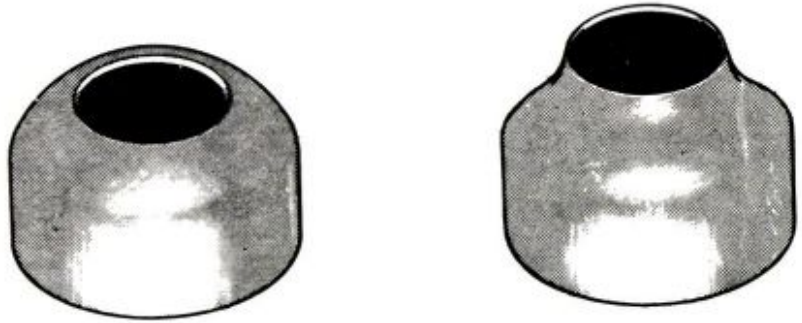
PREPARING LEAD BASES

6. Take the spun lead base and dress out the central hole just enough to provide a close fit over the auxiliary sleeve.

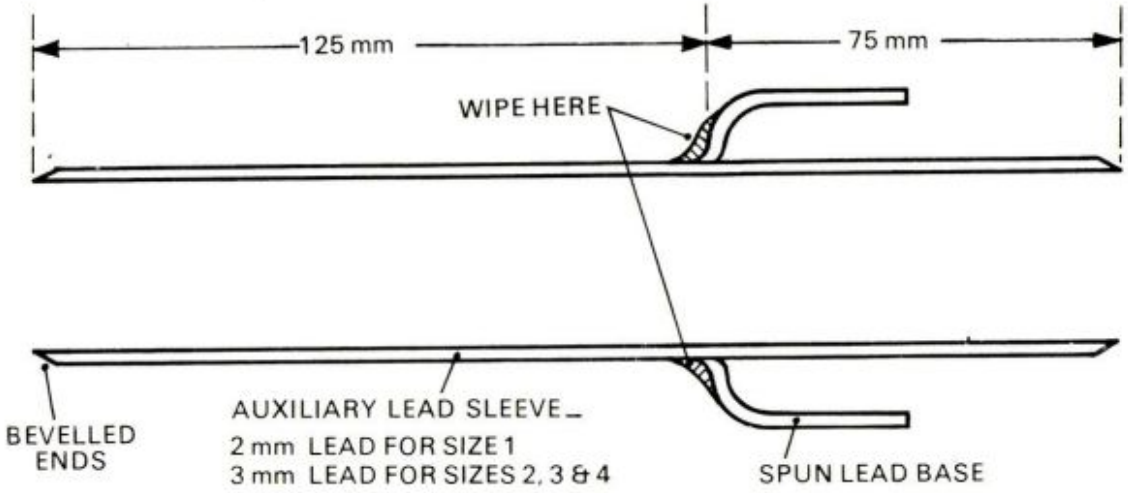
7. Remove auxiliary sleeve from the cable and fit it with the base on to the appropriate face of the wiping jig. (See page Q-10).

8. Wipe base on to the lead sleeve then thoroughly clean surface of sleeve with a wire brush.

9. Repeat the above steps to provide a base for the other cable end.

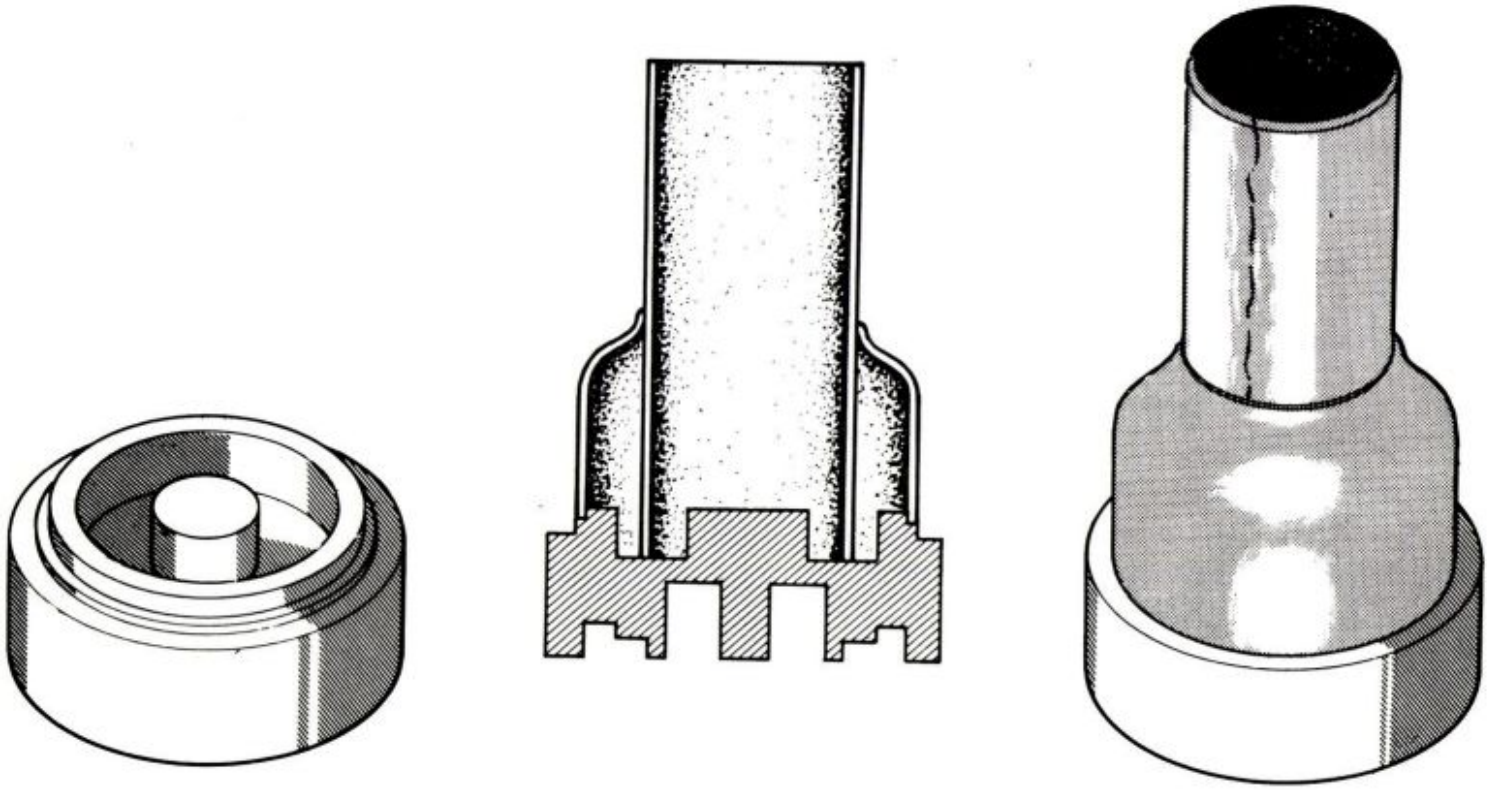


HOLE IN BASE ENLARGED TO FIT OVER SLEEVE



COMPLETED AUXILIARY SLEEVE AND BASE ASSEMBLY

M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS



(a) Wiping Jig (b) Section View of Assembly (c) Assembly

USE OF WIPING JIG (DWG. CL 1244)

The wiping jig ensures that the spun lead base is positioned squarely over the lead sleeve and that correct spacing is maintained during the wiping operation.

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M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

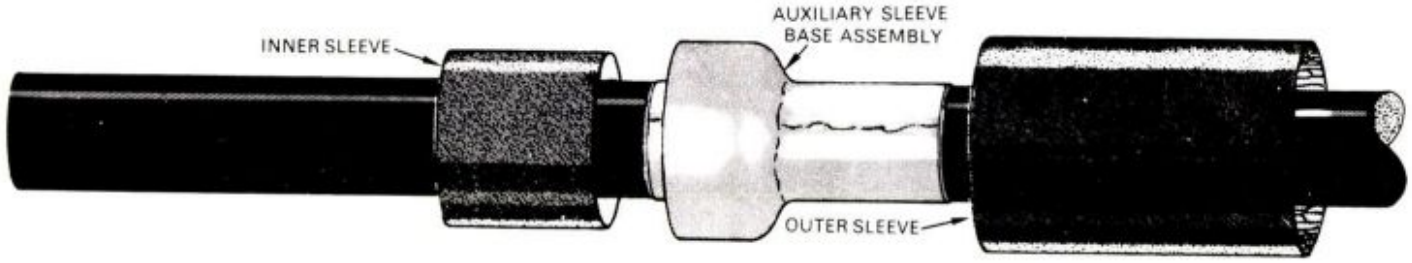
1. Some Additional tools to those normally held by cable jointers are required. These are listed below.

TITLE	USE
L.P.G. Burner. Any of the following fitted to a standard hand piece S414/82 is suitable:	For shrinking thermofit tubing
(a) Companion Burner 1060 (S414/77) with No. 74432 nipple.	(STANDARD BURNERS USED FOR LEAD WIPING MUST NOT BE USED).
(b) Companion Burner 2241 (S414/56) with No. 74432 nipple.	
(c) Companion Burner 741 with No. 24132 nipple.	
(d) Raychem Part No. FH 2605 and adaptor.	
Continuity Wire Kit (S433/212)	For screen continuity.
Glass Fibre Blanket 915 x 915 mm (S654/74).	For protection of adjacent cables while shrinking heat-shrink tubing.
Screen Continuity riveting tool and rivets. Refer page Q-15. (S114/47 and S114/48).	For Aluminium Screen continuity.
Wiping Jig (Drg. No. CL 1244 refers).	For positioning and wiping the lead base onto the auxiliary sleeve.

Q-12 M.B. CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

FITTING LEAD BASES TO CABLE

1. Lightly abrade the sheath with the abrasive tape supplied for a distance of 450 mm o the cable side of the joint opening mark to aid adhesion of thermoshrinkable tubing. Apply abrasive tape around the circumference of the cable, not along it. Wipe abraded section with cotton waste moistened with Shellsol T or Isopar H solvent.
2. Place over the cable in the following order, the outer sleeve, the lead base assembly with open end of base facing towards the cable end and the inner sleeve. Ensure that the adhesive free end of each sleeve is facing towards the lead base.



ORDER OF PLACING BASE COMPONENTS ON CABLE

3. Position the inner end of the lead base 65 mm on the cable side of the joint opening mark.
4. Dress the lead tube firmly down on to the cable sheath, avoid abrupt changes in diameter at seam and at bevelled ends.
5. Starting 100mm from the auxiliary lead sleeve, wrap the M.B. cable sheath with aluminium foil for a distance of 150mm away from the joint. Dress the edges of the aluminium foil to prevent protrusion through the heatshrink tube.
6. Using the appropriate burner (See page Q 11.) gently preheat the outer tube of the lead base to raise the temperature to just above that which is comfortable to to touch.

FITTING LEAD BASE TO CABLE

. Position the 250mm length of thermoshrink tubing so that it butts against the spun lead base and overlaps the aluminium tape by approximately 25mm.

SHRINKING OUTER SLEEVE

8. Beginning at the end adjacent to the spun lead base, apply heat to the sleeve uniformly around its circumference at the end. Working to the opposite end, apply heat to the sleeving until it shrinks onto the auxiliary lead sleeve and the cable sheath.
9. Continue to heat uniformly the entire sleeve, until the heat sensitive point changes colour and adhesive exudes around the entire circumference at each end of the sleeving.
10. Allow sleeve to cool without disturbing.
11. Repeat steps 2 to 9 for the other cable end.
12. On each end position the 125mm length tubing so that its adhesive free end abuts the inner side of the spun lead base.
13. Shrink only the small section of tubing under the spun lead base. Apply heat uniformly around its circumference.
14. Allow to cool.
15. Similarly repeat for other end.
16. On each end of the partly shrunk 125mm inner sleeves, re-apply heat, and fully shrink.
17. Allow inner sleeves to cool, without distrubing.

SHRINKING INNER SLEEVE

MB CABLE – THERMOSHRINKABLE TUBING JOINT CLOSURE KITS

Q-14

BRANCH JOINTS

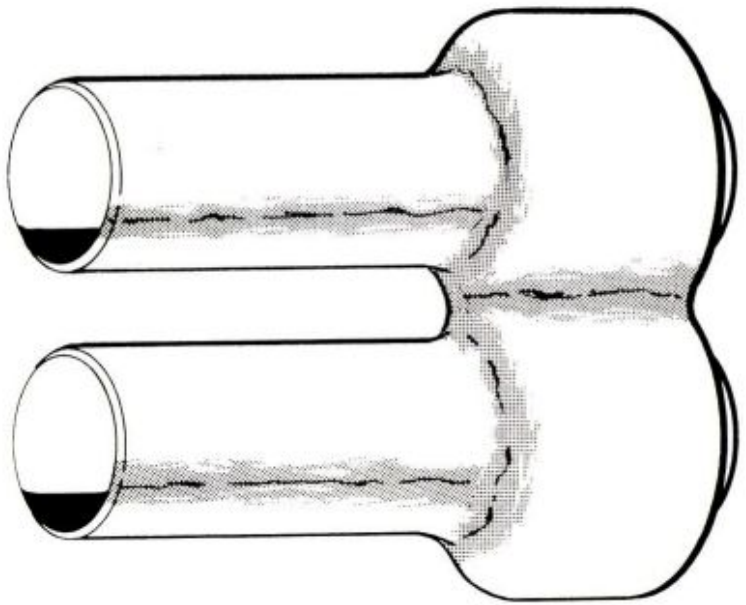
Branch joints may be made between moisture barrier cables or between moisture barrier and lead cables.

Branch joints in moisture barrier cables are normally made by fitting individual lead bases to the cables as for straight joints. The spun lead ends are then dressed flat where they abut and wiped together to form a composite end piece.

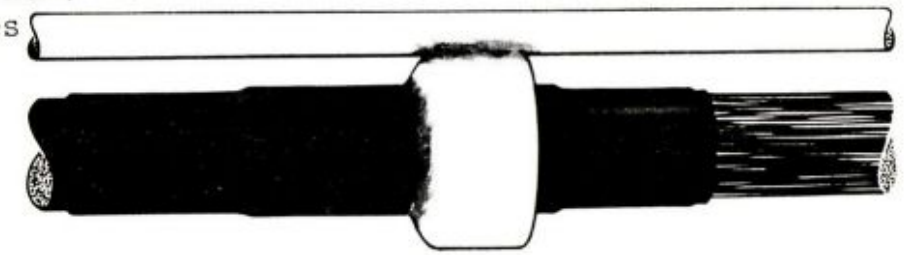
Where this base would be too bulky an end-piece may be tailored from sheet lead to suit the lead tubes on the cables.

Where one of the branch cables is lead sheathed, fit a preformed lead base on the moisture barrier cable in the normal manner. Then dress a slight recess into the side of the spun lead base to accomodate the lead cable and wipe in position.

NOTE. The polyethylene sheathing of Moisture Barrier Cable has a low melting point and great care must be exercised when using L.P. gas torches in its vicinity. Lead cables under air pressure are also susceptible to damage. All cables not being worked on should be protected by a glass fibre blanket.



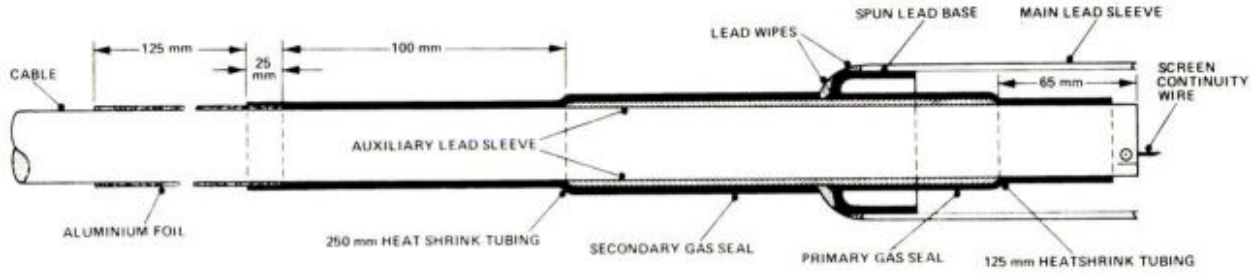
COMPOSITE ENDPIECE



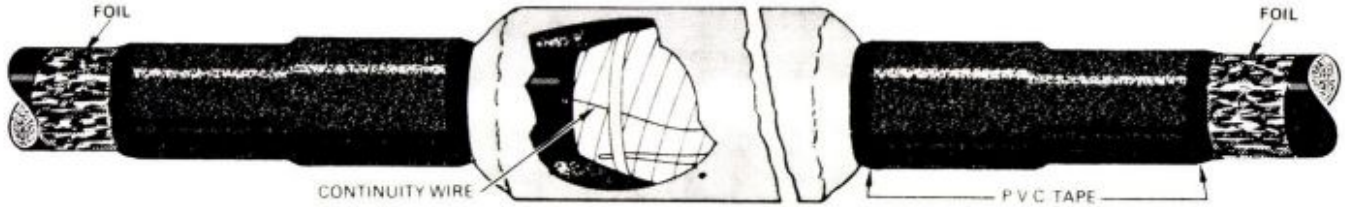
LEAD TO MOISTURE BARRIER CABLE BRANCH JOINT

FITTING MAIN SLEEVE

On completion of jointing wrap conductors with kraft paper as described on page M-10.
Provide a continuity wire between the aluminium foil moisture barrier on each side of the joint to make it electrically continuous as described on page Q-16. Provide additional lapping of kraft paper over continuity wire.
Prepare the main sleeve from sheet lead and wipe it to the lead bases.
Around each exposed end of outer thermoshrinkable tubing apply a lapping of PVC tape to protect the tubing and cover any adhesive which has leaked from the sleeve.



SECTION SHOWING POSITION OF COMPONENTS IN COMPLETED JOINT



COMPLETED JOINT

MOISTURE BARRIER CABLE JOINT CLOSURE

CONTINUITY OF ALUMINIUM FOIL MOISTURE BARRIER

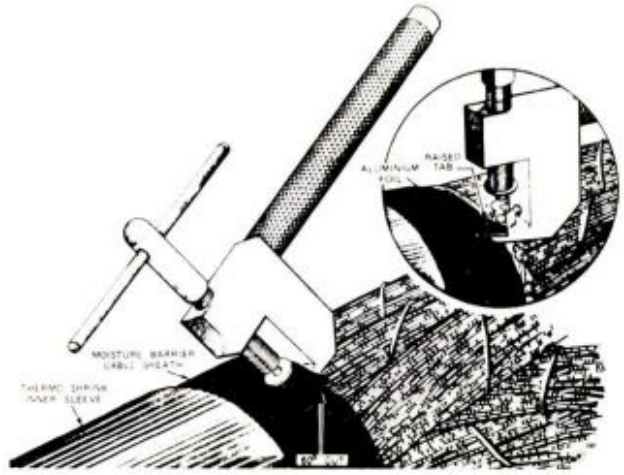
Make the aluminium screen electrically continuous by connecting a continuity wire to each side of the joint as follows:

- A continuity wire kit is available under Serial 433/212. The kit consists of two E1551 MB sheath connectors (S.114/48) connected by two metres of 23/0.2 green wire and washers.

- If the continuity wire kit is not available, cut a length of 23/0.2 mm copper insulated wire about 2 metres in length. Strip off the insulation for about 20 mm from each end of the wire and twist strands together and double over. Insert doubled end of wire into the tubular section of the rivet and solder.

- Fully unscrew threaded spindle of rivetting tool. (S114/47). Load tool with connector (S114/48) (spikes upwards) in hole in base and rivet and washer on the pin on the threaded spindle.

- Insert foot of tool carefully between cable sheath and conductors, selecting a position between two units. Where difficulty is experienced, e.g. on small or tightly packed cables, make a cut approx. 60° to the sheath end and slightly raise the tab of sheath for insertion of the tool.



RIVETTING CONNECTOR TO SHEATH

LINEMENS HANDBOOK CABLE JOINTING NO.1

Moisture Barrier Cable Joint Closure SE LC 3/13

Continuity of Aluminium Foil Moisture Barrier and Provision of Earthing Facility. At exchange MDF and in cabinet/pillar manhole.

At a Straight Joint

Before the Continuity Wire Kit (Serial 433/212) is connected an additional short length (200mm approx.) of insulated stranded wire must be soldered to the spare lug on one end connector which will be used to connect the continuity wire to the aluminium foil. After connection to the aluminium foil is completed, the free end of the short length must be soldered to the spun end.. See Figure 1.

At a Y Joint

Cut a length of 150mm of 24/0.2mm green PVC insulated flexible wire. (Available PW store). Strip 14mm of insulation from each end and solder one end to the spare lug on the Egerton connector on one end of the long continuity wire S433/212 and solder the other

Contd.

end of the short wire to a lug on a separate Egerton connector S114/48. Thus we have a continuity wire to rivet to the screens of all three cables. As for a straight joint, terminate a tail of 200mm on the spare lug of the long continuity wire and on the spun end lead base. See Figure 1.

At a pillar/cabinet manhole

At a pillar or cabinet tail the MB screen is thus extended to the lead sheath of the tail cable.

At the pillar/cabinet, the earth wire soldered to the lead sheath is connected to the earth lug on the vertical.

In the Pillar/Cabinet manhole, all lead sheaths and MB joint enclosure sleeve should be bonded and connected to an earth electrode.

At the Exchange Termination

(1) Cut two lengths of 24/0.2mm green insulated earth wire long enough to reach the MDF earth bar.

Contd.

(ii) Strip 10mm of insulation off one end of each wire, tin and then solder to Egerton connectors S114/48.

(iii) Rivet the Egerton connectors to opposite sides on the aluminium screen of the cable in the pothead.

(iv) Extend the earth wires up through and to the back of the cable units up to the MDF earth rail.

(v) Solder both wires to suitable lugs, clean the contact areas with abrasive paper, and terminate on the earth rail.

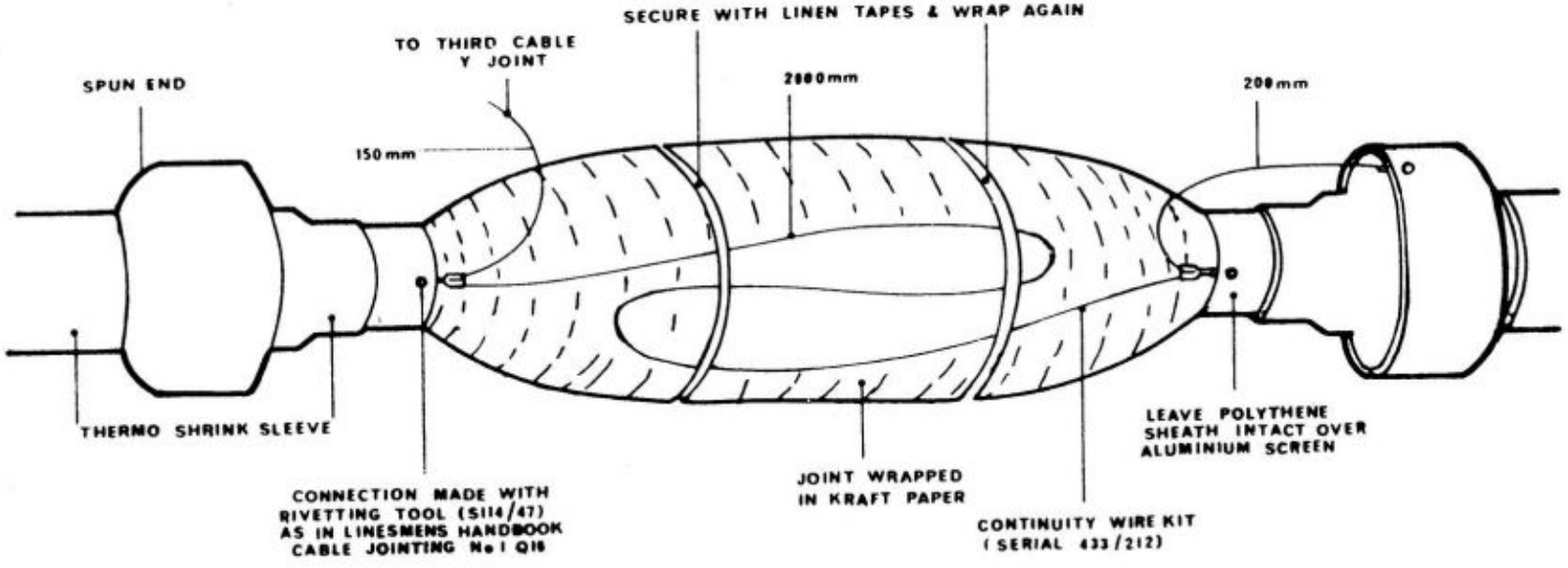
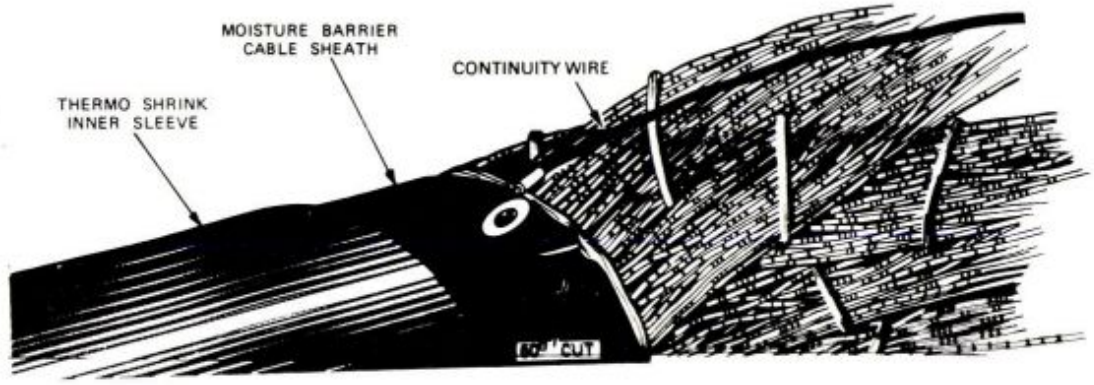

SECURE WITH LINEN TAPES & WRAP AGAIN
TO THIRD CABLE
Y JOINT
SPUN END
2000mm
200mm
150mm
THERMO SHRINK SLEEVE
CONNECTION MADE WITH
RIVETTING TOOL (S114/47)
AS IN LINESMENS HANDBOOK
CABLE JOINTING No 1 Q16
JOINT WRAPPED
IN KRAFT PAPER
CONTINUITY WIRE KIT
(SERIAL 433/212)
LEAVE POLYTHENE
SHEATH INTACT OVER
ALUMINIUM SCREEN

FIGURE 1

- Tighten thread spindle fully to compress rivet.
- Break locating lug away from connector to eliminate damage to conductors. Press sheath back into place after wire is connected.
- Press the raised tabs back into position, fold continuity wire across the joint and secure with linen tape.



ATTACHING CONTINUITY WIRE

- At joints between MB cable and lead cable solder the continuity wire to the lead cable sheath.
- Where it is necessary to earth the screen at a joint the continuity wire is connected to the lead base. Make a hold in the rim of the base in a position which will be covered by the main sleeve. Pass bared wire through the hole, secure with one or two twists around itself and solder to the base. The earth connection is made externally to the lead base in the normal manner.

Q-18 LABELLING CABLES FOR IDENTIFICATION

LABELLING REQUIRED

To enable cables to be readily identified they should be labelled in each manhole or jointing pit with the following information:

Main and Junction Cables	- Cable Number, Number of Pairs and Conductor Diameter. Where two cables of the same size are jointed to the one cable, label each with the range of pairs carried.
Branch Cables	- Cabinet Designation, Number of Pairs and Conductor Diameter. In the cabinet manhole, label each cable with the range of "B" pairs to which it is connected in the cabinet.
Distribution Cables	- Number of Pairs. In the pillar terminal manhole or jointing pit label each cable with the range of "0" pairs to which it is connected.

NOTE: Prior to the introduction of the metric system of weights and measurements the conductor size was shown in pounds per mile.

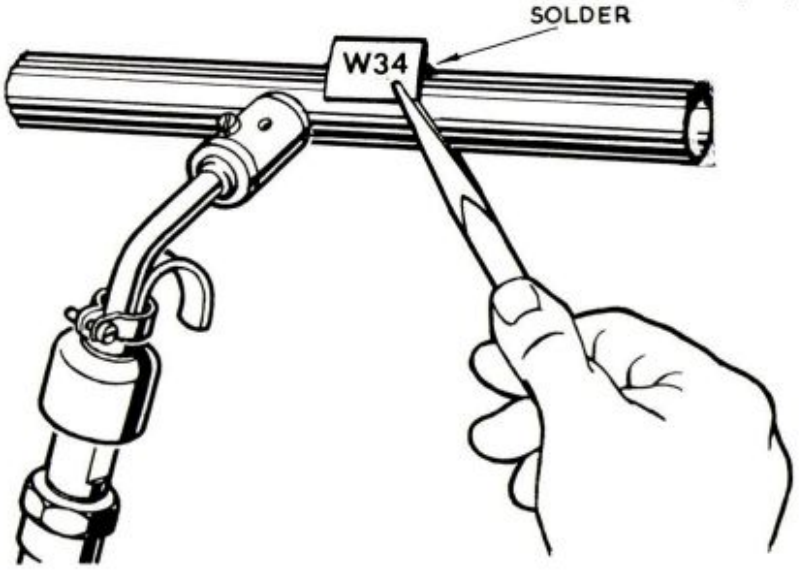
POSITION FOR ATTACHING LABELS

Cable Number	- Exchange side of joint.
Cabinet Designation	- Cabinet side of joint.
Cable Size and Wire Diameter	- The exchange side only at straight joints where there is no change in the cable size. - On both sides of the joint where the cables are of different sizes. - On all cables at a branch joint.

BEWARE OF LEAD POISIONING - AFTER HANDLING LEAD OR LEAD COVERED CABLE, WASH YOUR HANDS AND FACE THOROUGHLY WITH SOAP AND WATER BEFORE EATING OR SMOKING.

LABELLING LEAD CABLES

Cut labels from scrap lead and stamp cable details with number and letter punches.
For large cables the cable number, size and conductor diamter may be shown on the one label.
Solder label to the cable sheath.



SOLDERING LABEL TO LEAD CABLE SHEATH

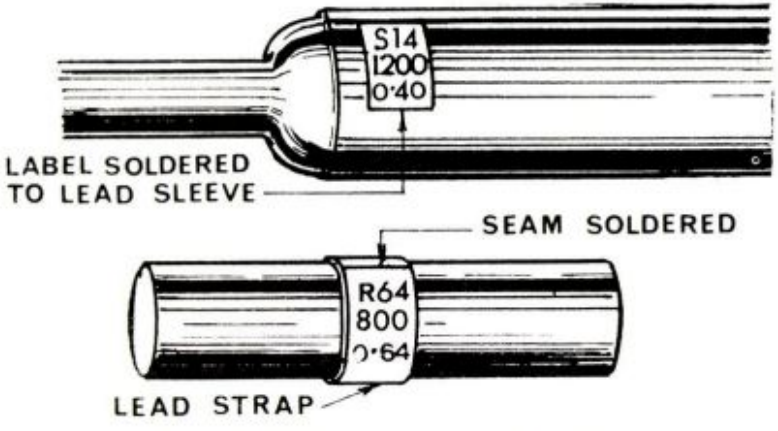
LABELLING MOISTURE BARRIER CABLES

Where a lead sleeve is fitted labels may be soldered to the sleeve close to each end.

Alternatively, the information may be stamped on a lead strap which is fitted around the cable and soldered.

WARNING.

DANGEROUS GASES CAN ACCUMULATE IN MANHOLES AND TUNNELS. BEFORE ENTERING EITHER CHECK FOR THE PRESENCE OF GAS.



ATTACHING LABELS TO MB CABLES

Q-20

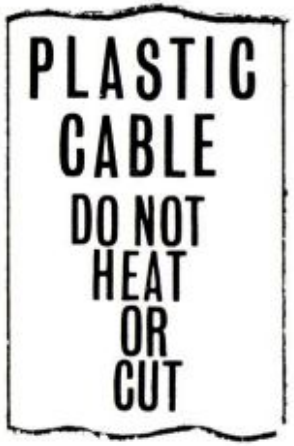
CABLE MARKING TAPES

PLASTIC SHEATHED CABLES

Band all large size plastic sheathed cables (i.e. moisture barrier polyethylene, polyethylene, alpeth and stalpeth sheathes) with adhesive backed green PVC Cable Marking Tape "PLASTIC CABLE" (S.433/170) to distinguish these cables from plastic jacketed lead sheathed cable which has a similar external appearance.

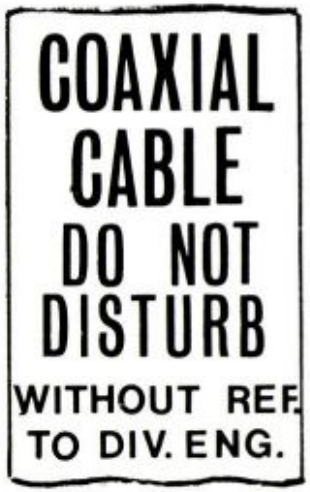
Apply two bands of marking tape around the cable in every manhole or jointing pit, one near each cable bearer. It is important that cables be branded in "pull through" manholes where there is no other positive means of identification.

The tape will normally be applied during cable hauling but cable jointers should ensure that all cables are branded before completion of jointing operations.



COAXIAL CABLES

Provide ready identification for coaxial cables by placing bands of blue Cable Marking Tape (S.443/16) "COAXIAL CABLE" around the cable in all manholes and other locations such as exchange cable entries where the cable is exposed.



CABLES UNDER GAS PRESSURE

Place bands of yellow Cable Marking Tape (S.421/88) "GAS, DO NOT OPEN" around cables under gas pressure in all manholes and jointing pits.

SOME PEOPLE WATCHING YOU WORK ARE TRYING TO FIND FAULT. DON'T MAKE IT EASY FOR THEM.

Issue 5, 1979

Cable Jointing No 1

TPH 0057

Additions to Handbook

Insert New Pages Q-21 to Q-41

June 1982

AIR SEALS FOR EXCHANGE ENTRY CABLES Q-21

Directly Terminated Exchange Entry Cables

This section covers :

- Housing the entry cable.
- Preparation and extension of cable units to M.D.F. verticals.
- Insertion of nylon air line tube.
- Earthing of the moisture barrier screen.

Description of Material

Moulds. The moulds are available in four sizes designated No. 1, 2, 3 and 4 to suit various cable diameters.

MOULD	CABLE SIZE, TYPE AND CONDUCTOR DIAMETER							
	0.32 mm		0.40 mm		0.64 mm		0.90 mm	
	PEIUT	C PEIUT	PEIUT	C PEIUT	PEIUT	C PEIUT	PEIUT	C PEIUT
 No 1 S433/182			200	200	200	200		
			300	300 400				
			400	600		300*		150*
 No 2 S433/183			600		300		200	200
			800	800	400	400		
			1000	1000		600		
				1200				
 No 3 S433/184			1200		600	800	300	300
			1400	1400		1000		400
			1600	1600				
	2400		1800	1800				
	2700			2100				
 No 4 S433/185			2100		800		400	600
			2400	2400	3000	3200		
				2700				
	3000							
	3600							

*NOTE: IF EXTERNAL CABLE DIAMETER IS GREATER THAN 43mm USE NO 2 MOULD

MOULD AND CABLE SIZES Issue 5, 1982

AIR SEALS FOR EXCHANGE ENTRY CABLES

P.V.C. Tubing. Black flexible PVC tubing is used over 100 pair units or, in the case of smaller cables, over 2 x 50 or 4 x 25 units as appropriate.

Tubing Diameter	UNIT SIZE AND CONDUCTOR DIAMETER							
	0.32 mm		0.40 mm		0.64 mm		0.90 mm	
	PEIUT	CPEIUT	PEIUT	CPEIUT	PEIUT	CPEIUT	PEIUT	CPEIUT
16 mm S433/233		1x100PR						
17 mm S433/234	1x100PR							
20 mm S433/235			1x100PR 2x50 PR 4x25 PR	1x100PR 2x50 PR 4x25 PR				
30 mm S433/236					1x100PR 2x50 PR 4x25 PR	1x100PR 2x50 PR 4x25 PR	1x50PR 2x25PR	1x50PR 2x25PR

TUBING SLEEVE AND UNIT SIZE

Epoxy Resin. Field pack (S433/66) must be used.

Mould Support Brackets. The brackets are used for attaching the top of the mould to the cable chamber ironwork.

Mould Size	Serial Item	Approx. Number of epoxy field Packs	Support Bracket No.	Serial Item
1	433/182	2	1	433/186
2	433/183	3	2	433/187
3	433/184	5	3	433/188
4	433/185	8	4	433/189

EPOXY RESIN QUANTITIES AND BRACKET SIZES

BE VERY CAREFUL TO AVOID BURNS WHEN OPERATING L.P.G. PLUMBING EQUIPMENT AND SOLDERING IRONS.

AIR SEALS FOR EXCHANGE ENTRY CABLES

Selection of Air Seal Position

- Vertically - The top of the mould is to be level with the upper horizontal support member.

- Horizontally - The horizontal position of the cable and air seal depends on :

  - Allocated position of cable on the M.D.F.
  - Number of pairs in cable.
  - Number of pairs to be accommodated on each M.D.F. vertical.
  - Position of cable previously installed.

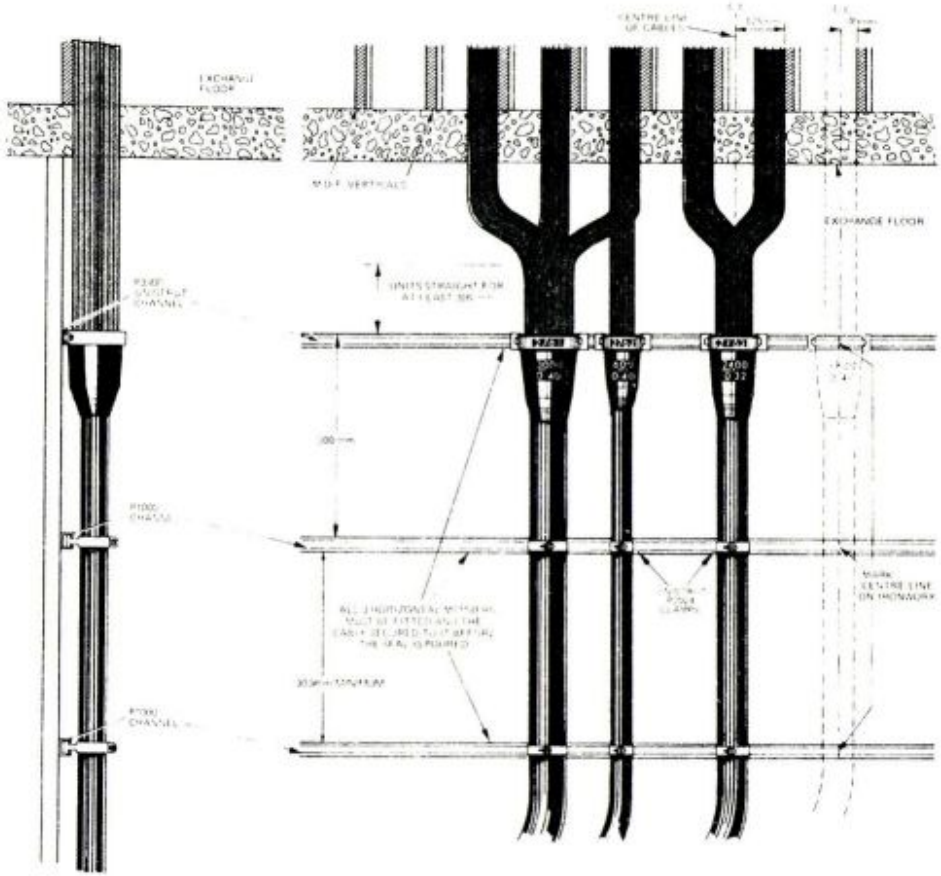
- Where the cable is to be terminated on one vertical only, it should be installed so that its vertical centre line is 40 mm to the left of the centre of the M.D.F. vertical, when viewed from the line side.

- Where the cable is terminated on more than one vertical, the cable centre line will be 125 mm to the left of the right hand vertical.

- When the cable position is selected, a vertical centre line should be marked down across the horizontal members with the aid of a plumb bob and pencil.

CLEAN UP PROPERLY WHEN THE JOB IS COMPLETED. ENDEAVOUR TO LEAVE THE WORK AREA AT LEAST AS TIDY AS IT WAS BEFORE THE WORK WAS COMMENCED.

Issue 5, 1982



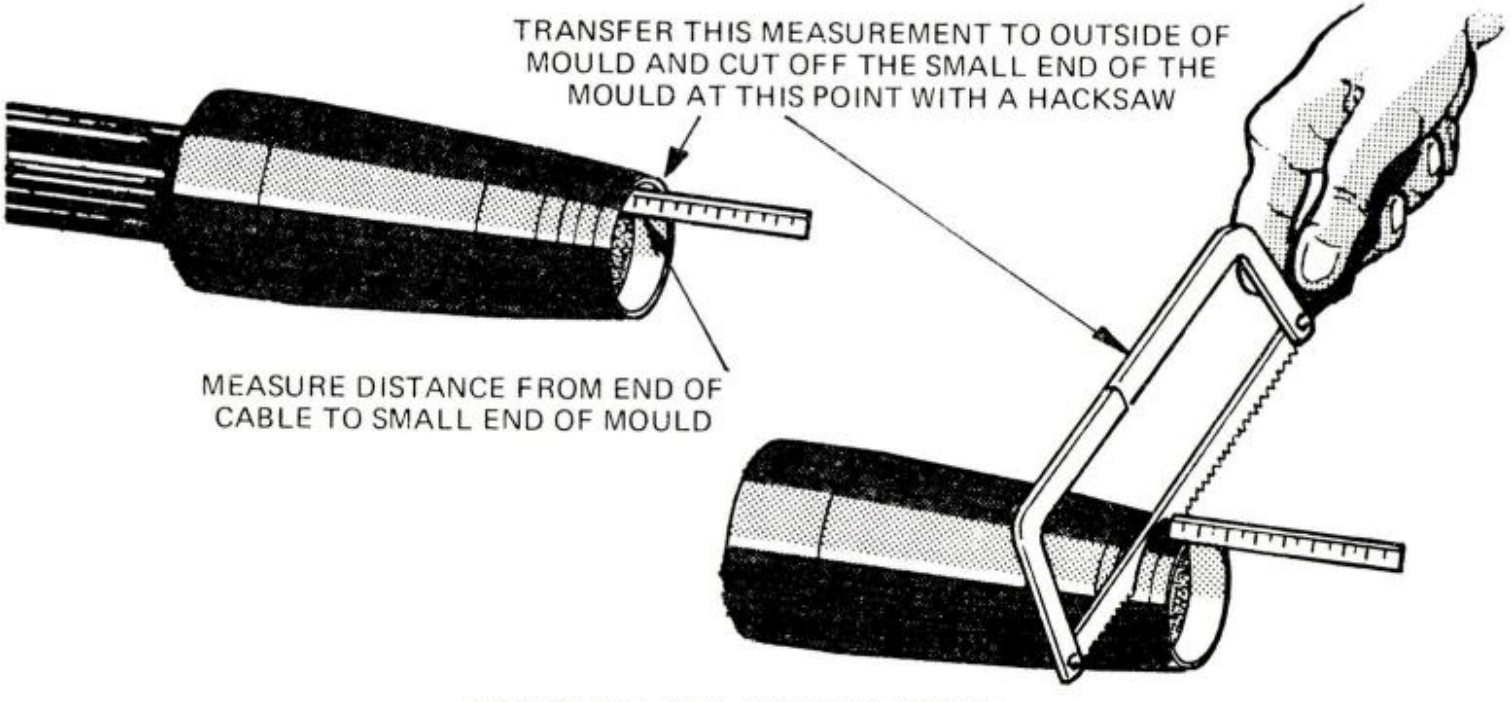
TYPICAL CABLE CHAMBER IRONWORK AND
PROPOSED CABLE INSTALLATION

AIR SEALS FOR EXCHANGE ENTRY CABLES

Mould Preparation

Select the correct size mould and push mould, large end first, onto the cable until it stops. Measure the inside distance from small end of mould to end of cable. Transfer this measurement to the outside of mould and cut off any excess mould with a hacksaw. The circumferential guide marks are intended to aid in keeping the cut straight.

Push mould onto cable, narrow end first, and push along the cable to a point past where the sheath will be removed.



MEASURING AND CUTTING MOULD

AIR SEALS FOR EXCHANGE ENTRY CABLES

Measuring Cable for Sheath Removal

Measure length of mould after cutting, deduct 55 mm and note this measurement. This is measurement "X" and is referred to again later (e.g. if mould is 190 mm long after cutting, measurement "X" would be 190 - 55 = 135 mm).

Ensure cable is lying in its correct position on the runway or bearers.

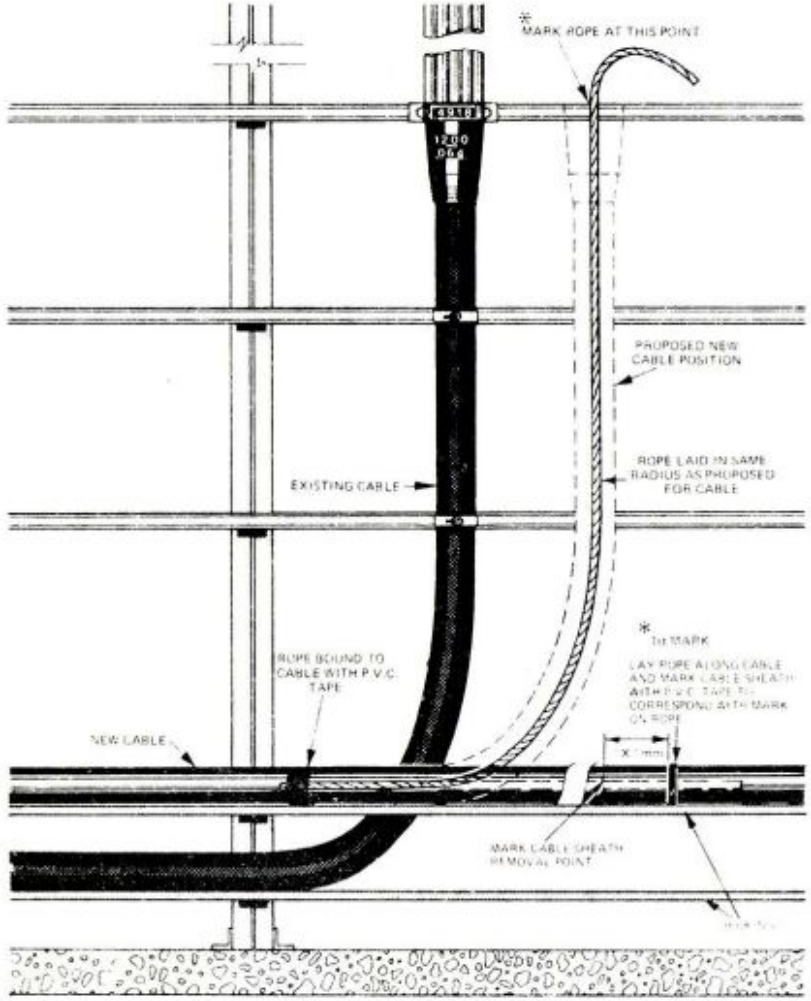
With the aid of a rope, simulate the cable bend and vertical position by taping the rope to the cable and bending it up in the same radius as intended for the cable. Mark the rope at the top of the upper horizontal support bar.

Drop the rope and extend the marked end along the cable.

Mark the cable sheath at a distance X mm back from the point corresponding to the mark on the rope. The sheath will be removed between this mark and the end of the cable. PVC tape applied to the cable sheath at a point corresponding to the mark on the rope will readily identify the sheath removal point.

WHEN REMOVING THE CABLE SHEATH WEAR INDUSTRIAL GLOVES FOR PROTECTION FROM THE SHARP EDGES ON MOISTURE BARRIER SHEATHED CABLES.

AIR SEALS FOR EXCHANGE ENTRY CABLES



MEASURING CABLE FOR SHEATH REMOVAL

Removing Sheath

Before removing cable sheath, lay a canvas or thick plastic sheet on the floor or decking to protect the exposed cable core and lower the section of cable to be cut onto it.

The cable should be straight for one metre either side of sheath removal point.

- Circular cut. Using the braided nylon line, with suitable handles made from dowelling, cut the polyethylene sheath down to the moisture barrier.
- Cut the cable sheath open longitudinally with a hack knife and hammer.

Remove the sheath by folding the end flat and walking along the cable sheath from the circular cut to the cable end. To avoid injury, the jointer shall wear industrial gloves while separating the sheath.

Cable Preparations

After removing the sheath, tie linen tape over the paper wrapping on the cable core as close as practical to the sheath edge. Slide portion under the sheath. Cables with loosely bound cores may require additional turns of linen tape.

Remove about one metre of core wrapping from the end of the cable. Tie off and bind the end of each unit with paper backed tape (S677/372). Write the appropriate pair range of the unit on the tape.

INDIVIDUAL UNIT LABELLED WITH PAIR RANGE

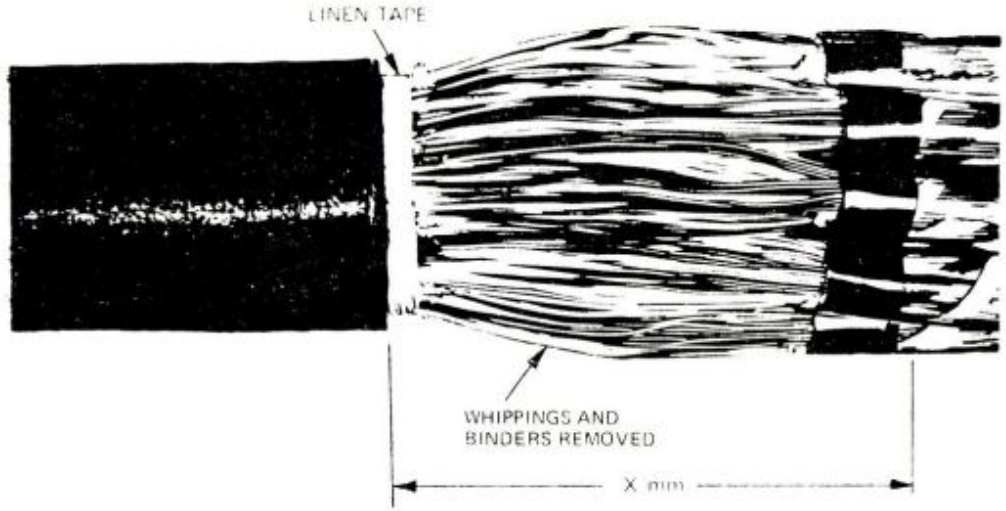
AIR SEALS FOR EXCHANGE ENTRY CABLES

Remove the core wrappings between the linen tape tie and the end of the cable.

Unravel units from each other between the sheath and the cable end and lay side by side along the protecting sheet. It is not necessary to remove the wrapping tapes or unit binders.

Apply two turns of PVC tape around each unit so that the top of the tape is at distance "X" mm from the sheath end.

Remove all unit binders between the linen tape tie and the PVC tape around each unit. It is essential that all binders are removed from the seal area as they can create voids due to shrinkage during the epoxy resin curing process. When all units are neatly in position remove the rubber bandage from around the air block position.



UNIT PREPARTION SHEATH END

AIR SEALS FOR EXCHANGE ENTRY CABLES

Installing PVC Tubing

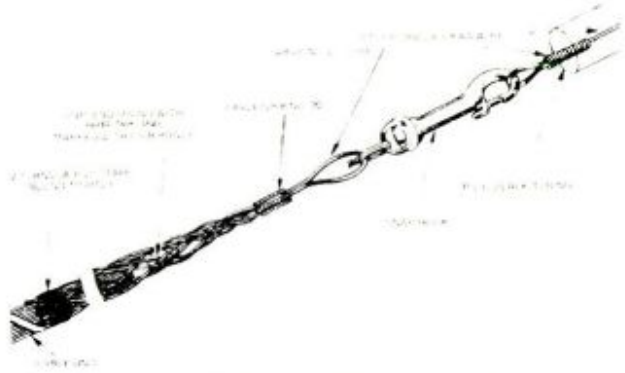
Cut lengths of PVC tubing appropriate to the respective pair range indicated on each unit, allowing sufficient length to reach the corresponding terminating block on the MDF vertical from each PVC tape marker on units at the sheath end.

Push cable grip No. 00(S114/1) onto unit and tightly bind trailing end only with PVC tape.

Thread 3.15 mm diameter GI draw wire (S62/23) through first length of tubing. If possible, lay wire and tubing in a straight line and attach far-end of wire to some fixed object.

Attach near end of wire to cable grip using a snap hook which can be permanently attached to the cable grip if desired. Tape the draw wire end with PVC tape to prevent the wire catching on the tubing.

Slide the tubing over unit as far as the bottom of the PVC tape on the sheath end of the unit. Two men should perform this operation, one holding the far end of wire while the other slides the tubing along. If the unit and wire are kept straight it is easier to slide the tubing on.



DRAWING UNIT INTO PVC TUBING

AIR SEALS FOR EXCHANGE ENTRY CABLES

Talcum powder can be sprinkled onto the unit to act as a lubricant. On no account use any other lubricant. Keep talcum powder away from the end of the PVC tubing and below the PVC tape markers.

Installing Nylon Air Line

Cut a length of nylon air line tubing 1.5 metres long. Clean that section of the tubing that will be encased in the resin using clean cotton waste lightly moistened with Isopar H or similar solvent.

NOTE : USE ONLY SPECIFIED SOLVENTS. AVOID SKIN CONTACT WITH ANY SOLVENT BY WEARING RUBBER GLOVES OR PROTECTIVE PLASTIC BAGS AS PROVIDED WITH EPOXY RESIN FIELD PACKS.

Cut a length of 3.15 mm diameter G.I. wire to the same length and bend back 50 mm at one end to form a loop. Straighten any kinks or bends out of the rest of the wire.

Insert the wire into the air line tubing. Ensure that the wire is not protruding from the end of the tubing which penetrates the cable.

Insert the air line tubing and wire assembly into the centre of the cable between units for about 350 mm twisting from left to right. The stiffening wire should then be withdrawn.

If the tubing does not go down relatively easily withdraw it and insert it in another spot near the cable centre. Do not use lubricants of any kind as they may prevent contact between epoxy and air line and an air leak could result.

A length of 6 mm dia. fibreglass rod, its end rounded off, can be used to make room for the nylon air line.

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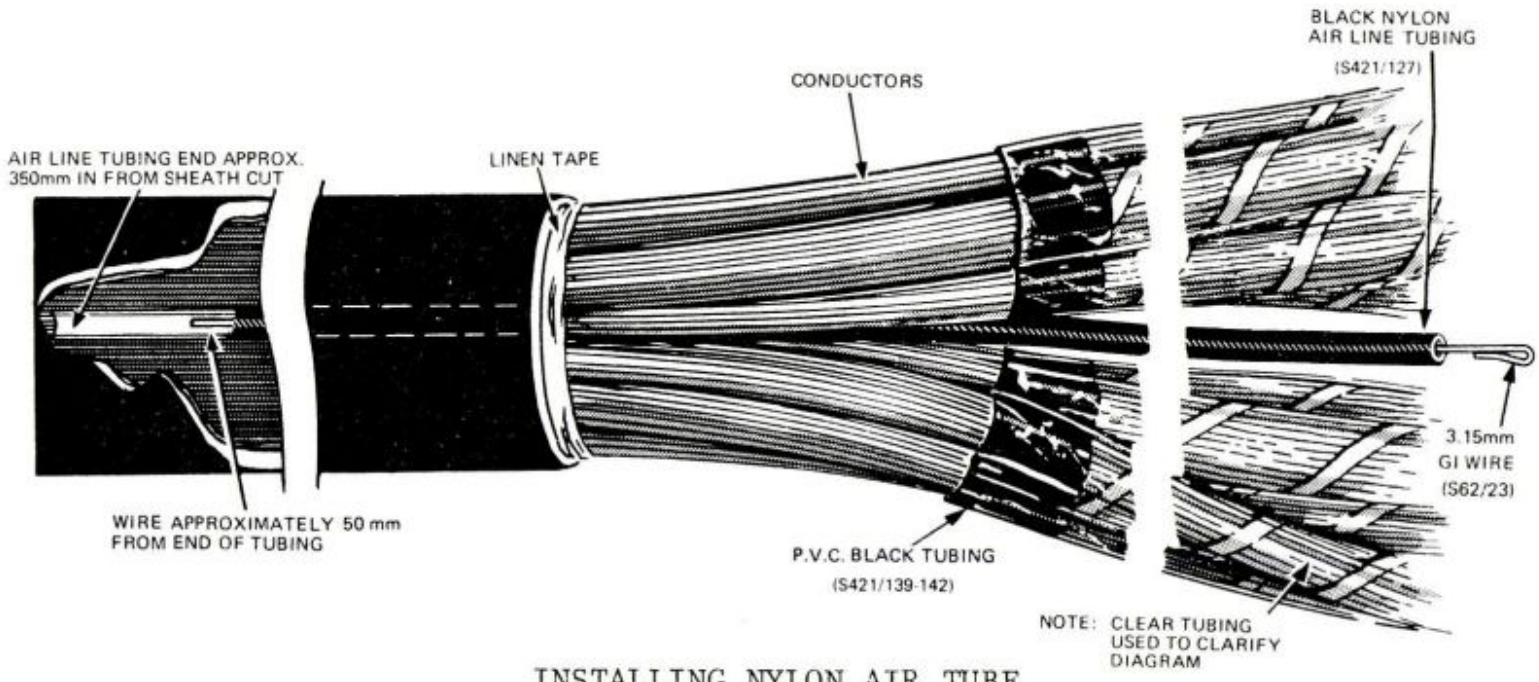


INSTALLING NYLON AIR TUBE

Attaching Units to Ironwork

Tightly bind the cable from 100 mm below the sheath cut to 150 mm above the ends of the PVC tubes with a rubber bandage (S116/102).

Position mould so that it is about 200 mm from the sheath end.

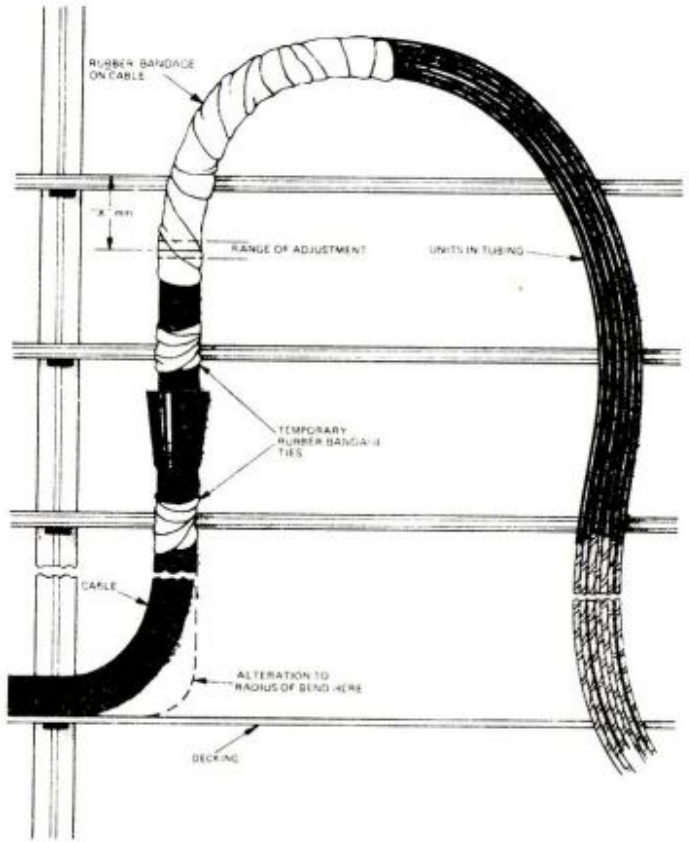
Lift the sheathed section of cable into its final position and house the cable so that it is exactly vertical and lines up with the pencil marks on the horizontal ironwork.

Temporarily attach the vertical section of the cable to the ironwork with rubber bandages.

AIR SEALS FOR EXCHANGE ENTRY CABLES

Measure distance from top of sheath to top of upper horizontal support bar, the outline of the sheath end should be visible under the rubber bandage. It should be distance "X" mm, (refer page 27). Adjust as necessary by releasing the temporary ties and increasing or decreasing the radius in the cable bend until the measurement is exact.

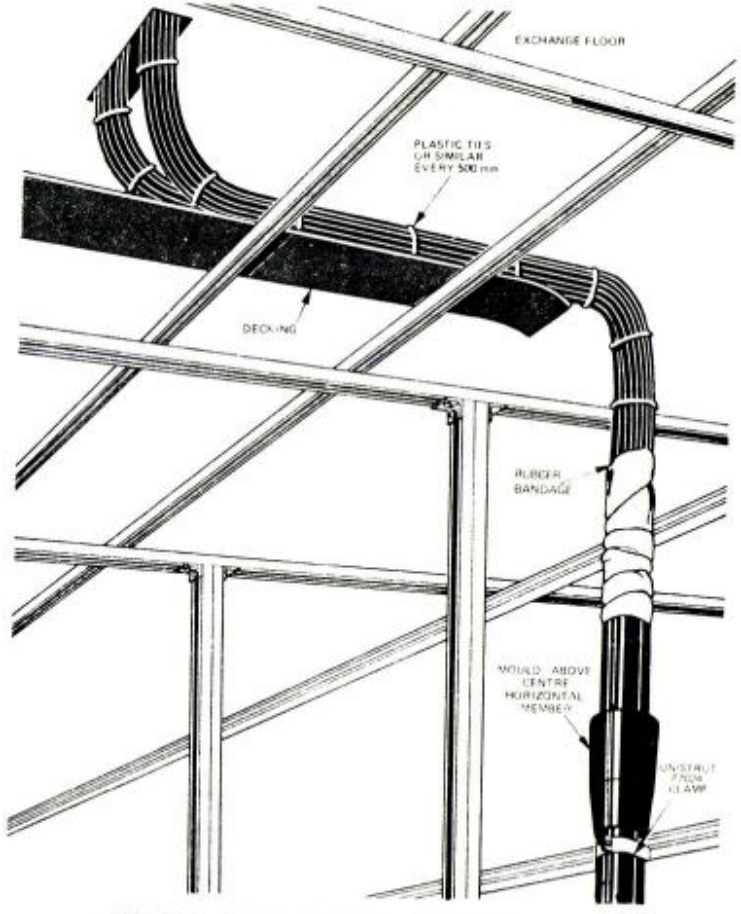
Permanently clamp the cable to the horizontal support using a suitable size of Unistruct P2024 series clamp.



HOUSING CABLE

Feed the units one at a time, up through the M.D.F. and to their respective terminal blocks. At the same time ensure that the air line tubing is positioned at the back of the cable.

When all units are neatly in position remove the rubber bandage from around the air block position.



CABLE AND UNITS HOUSED

AIR SEALS FOR EXCHANGE ENTRY CABLES

Connection of Earth Wires

Connection to Aluminium Cable Screen

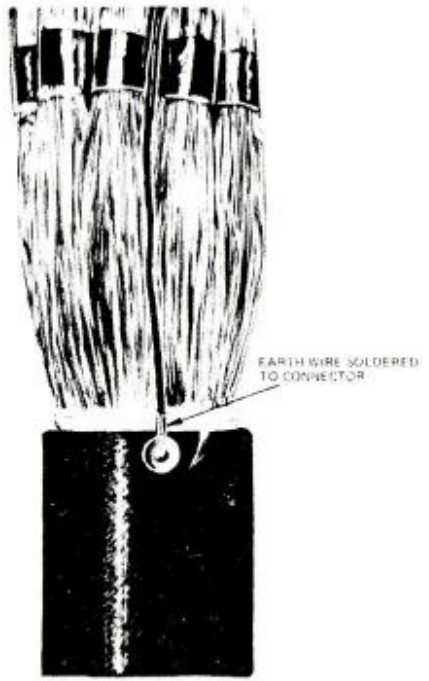
Cut two lengths of 24/0.2 mm insulated earth wire (S192/444) long enough to reach the MDF earth rail. Strip 10 mm of insulation off one end of each wire, tin and then solder to Egerton connectors (S114/48).

Rivet the Egerton connectors on opposite sides on the cable sheath.

Extend the earth wires up through and to the back of the units and up to the MDF earth rail or alternatively the ironwork earth rail where provided.

Connection to MDF

Both earth wires should be soldered to suitable lugs and attached to the earthing bus bar. Clean the contact areas thoroughly with fine abrasive paper. Good contact is essential as these wires reduce induced voltage on the shield to a safe level and also reduce 'noise' on pairs in the cable.



CONNECTION OF EARTH WIRES

Preparation Prior to Fitting Mould

Check that the linen tape tie around the cable core fills the cavity between the core and sheath. If not apply additional tape and push into the cavity, this will prevent loss of epoxy resin down the cable core.

Measure 55 mm down from the sheath end and apply 2 turns of PVC tape around the sheath so that the top of the tape is on the 55 mm mark. Clean the area above the PVC tape with a clean cloth moistened with Isopar H or similar solvent.

NOTE : Do not touch the cleaned area as this will contaminate the sheath and adversely effect resin bond subsequently achieved.

OBSERVE SAFETY PRECAUTIONS AS DETAILED ON PAGE 32 WHEN USING SOLVENTS

Positioning Mould

Ensure that the nylon air line tube and the earth wires are at the back of the cable. Create a separation between individual conductors and also a 2 mm clearance between the outer layer of conductors and the inner surface of the mould. Secure the units to the ironwork above the mould position and the earth wire to the cable core above the mould position.

Slide mould into position so that its base is at the top of the PVC tape mark on the sheath and fit the support bracket. Use butyl putty to fill any void between the mould base and the cable sheath. Bind PVC tape around and over the mould, cable sheath and butyl putty (if used) for approximately 25 mm above and below the end of the mould.

Q-38

AIR SEALS FOR EXCHANGE ENTRY CABLES

Check that :-

- The end of each black PVC tube is about 15 mm - 20 mm below the top of the mould so that it will be encapsulated in the epoxy seal.
- The mould and cable are in a vertical position.

NOTE : If the cable has a tendency to bend, attach a rope to the cable just below the mould and firmly tie the other end to a convenient ironwork member.

Pouring Epoxy Resin (Temperature Below 30°C)

The epoxy resin unit pack is suitable for all pours, using 1 to 9 packs.

Only standard epoxy resin field packs, S433/66, shall be used. Unit packs must be mixed thoroughly before pouring. No waiting time between packs is necessary providing that the epoxy is poured as soon as it is mixed and that the temperature is below 30°C.

Pour sufficient epoxy resin down the side of the mould using as many packs as is necessary to bring the epoxy resin level to just below the top of the mould and encasing the ends of the PVC tubing.

Wait no more than approximately one half hour and if required add more epoxy. Topping up the seal after the epoxy has fully cured can result in non-adhesion.

FOLLOW THE INSTRUCTIONS IN THE FIELD PACK WHEN MIXING AND POURING EPOXY RESIN.

Issue 5, 1982

Temperature's Above 30°C. Care must be exercised to avoid the high epoxy curing temperatures that can occur when the temperature rises above 30°C. In these adverse conditions the curing temperature could be high enough to melt the polyethylene insulation and accordingly pours under these conditions should be avoided.

If sealing cables where the cable chamber/manhole temperature is likely to exceed 30°C during setting, the epoxy should be poured in stages as follows.

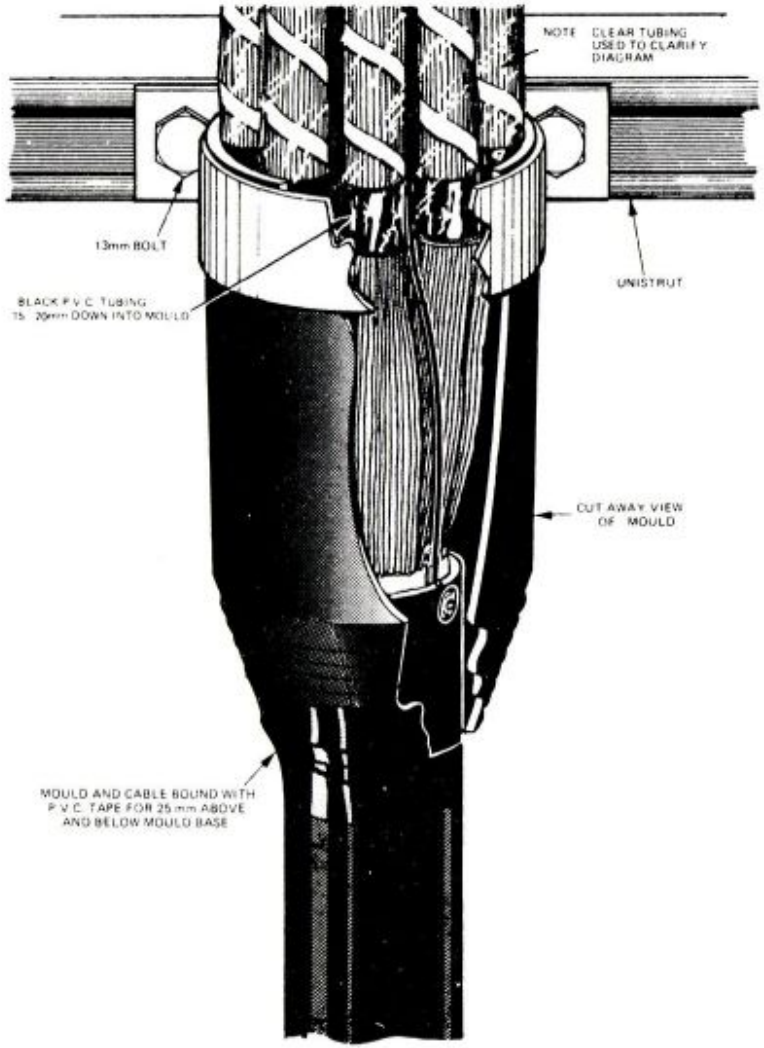
Stagger Pouring. When necessary, this involves pouring two packs only (down the side of the mould) and then pouring one pack every 30 minutes until the mould is full.

Longer periods between pours (i.e. more than 30 minutes) are not recommended because at elevated temperatures the epoxy resin can gel rapidly, resulting in non-adhesion between pours.

After Pouring. The cable and mould must not be moved or repositioned during the curing period (24 hours minimum) as this could introduce air leaks.

WASH YOUR HANDS, ARMS AND FACE THOROUGHLY WITH SOAP AND CLEAN RUNNING WATER IMMEDIATELY AFTER HANDLING EPOXY RESIN AND DRY THEM ON PAPER TOWELS.

AIR SEALS FOR EXCHANGE ENTRY CABLES



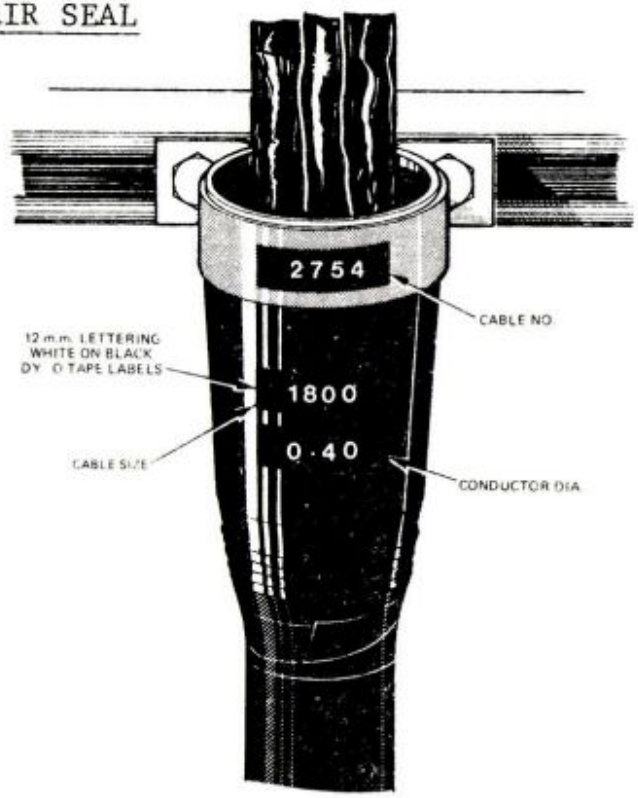
POSITIONED MOULD READY FOR POURING

AIR SEALS FOR EXCHANGE ENTRY CABLES

LABELLING SEAL

. Seals shall be labelled using a 'Dymo' tape machine and a black labelling tape. Place the labels on the mould and the support bracket.

COMPLETED AIR SEAL



References

LINES Cables J3910 "Epoxy Resin Air Seals For Exchange Entry Cables".
LINES Cables J3601 "Epoxy Resin Field Packs".
LINES Cables J3423 "Moisture Barrier Cable - Screen Riveting Tool". Issue 5, 1982

LINEMANS HANDBOOK : CABLE JOINTING NO.1
CONDUCTOR IDENTIFICATION - TESTING

SE LZ 10/13

Prevention of Interference to Working Services

For the information of jointers and supervising staff and filing in Handbook.

1). The Cable Pair Identification Set Type GP must not be used in the VF mode for sending tone to line on working circuits as the send level may cause an excessively high sound pressure level to be transmitted from the earpiece of the telephone equipment into the ear of a customer or operator using the circuit.

2) A warning label has now been placed on all GP sets re 1) above.

3) Other testing instruments that can cause high sound pressure levels to be emitted from the earpiece of telephone equipment are :-

(a) Cable Pair Identification Set Type F (S419/41)

(b) The "Woodpecker".

(c) "Ampos" Fault Location and Cable and Metallic Pipe Tracer (S140/94).

4. These instruments also must not be used on working circuits and the "Ampos" and "Woodpecker" must not be used on any cable pairs of cables containing working circuits.

September 1983

CABLE IDENTIFICATION

AND TESTING

SECTION R – IDENTIFYING CABLE PAIRS
TYPE A C D AND F IDENTIFICATION SETS.

DEVEY CABLE PAIR IDENTIFIER MK. 11.

SECTION S – TESTING CONDUCTOR JOINTS
TESTING I.R. NEW CABLES
LINES TEST SET NO. 1
SUBS. AUTOMATIC LINE TESTER

NOTE
For further information regarding the use of testing instruments refer to LINEMENS HANDBOOK. LINES TESTING AND INSTRUMENTS.

Issue 5, 1979

IDENTIFYING CABLE PAIRS

Type	Serial/Item	Use
A	419/1	With another Type A set for checking continuity of pairs in non-working cables and identifying pairs in rotation jointed working cable. With Type C for identifying pairs in cables not jointed in rotation and large working cables jointed in rotation. With Type D for identifying pairs in wet cables. As a continuity buzzer for resistance up to 1 000 ohms.
C	419/3	With Type A for identifying pairs in cables not jointed in rotation or large working cables jointed in rotation. Has hand search facility.
D	419/4	With Type A for identifying wires in wet cables.
F	419/41	For identification of working and non-working pairs in all cables. Cannot be used on wet cables where the insulation resistance is less than 10 000 ohms.

CABLE IDENTIFICATION SETS

Types A, C and D identification sets are always used in conjunction with another set depending upon the function required. The Type F identification set is a two-part unit comprising oscillator and search probe receiver which will perform all of the functions of the other sets except identification of wet cable.

A Head and Breast Set is supplied with Type A, C and D identification sets to provide speaking facilities between operators. The facility is not provided with the Type F set

BEFORE ENTERING ANY MANHOLE CHECK FOR THE PRESENCE OF GAS.

Issue 5, 1979

Identification Set	Accessory or Replacement Part	Quantity Required	Serial/Item
Type A (S.419/1)	Battery Type R25 (Eveready X71) 1.5 volt or	2	2/12
	Type R20 (Ev 1050) 1.5v with Adaptor S268/47	2	2/34
	Battery Type 30F90 (Eveready 482) 45 volt	1	2/18
	Head Set No. 2	1	5/69
	Pricker Assembly	1	419/6
Type C (S.419/3)	Battery Type R40, 1.5 volt (Valve set 2,	1	2/31
	Transistor 1)		2/18
	Battery Type 30F90 (Ev 482) 45v (For valve set)	1	2/36
	Battery Type 6F22 (Ev 216) 9v (Transistor set)	1	
	Head Set No. 2	1	5/69
Type D (S.419/4)	Battery Type R40, 1.5 volt	2	2/31
	Head Set No. 2	1	5/69
Type F (S.419/41) (Complete)	Oscillator, Type F (Replacement)	1	419/42
	Probe, Type F (Replacement)	1	419/43
	Earphone, Magnetic, 2000 ohms	1	419/44
	Cord, Earphone	1	419/45
	Test Leads (Oscillator)	1	419/46
	Ear Loop	1	419/47
	Ear Plug	1	419/48
	Adaptor, Ear plug	1	419/49
	Battery 3 volt, Eveready Type 712 (Oscillator)	1	2/43
	Battery Type 6F22 9 volt, Eveready 216 (Probe)	1	2/36

NOTE: Older A, C & D Sets are fitted with Head & Breast Sets (S.419/30).

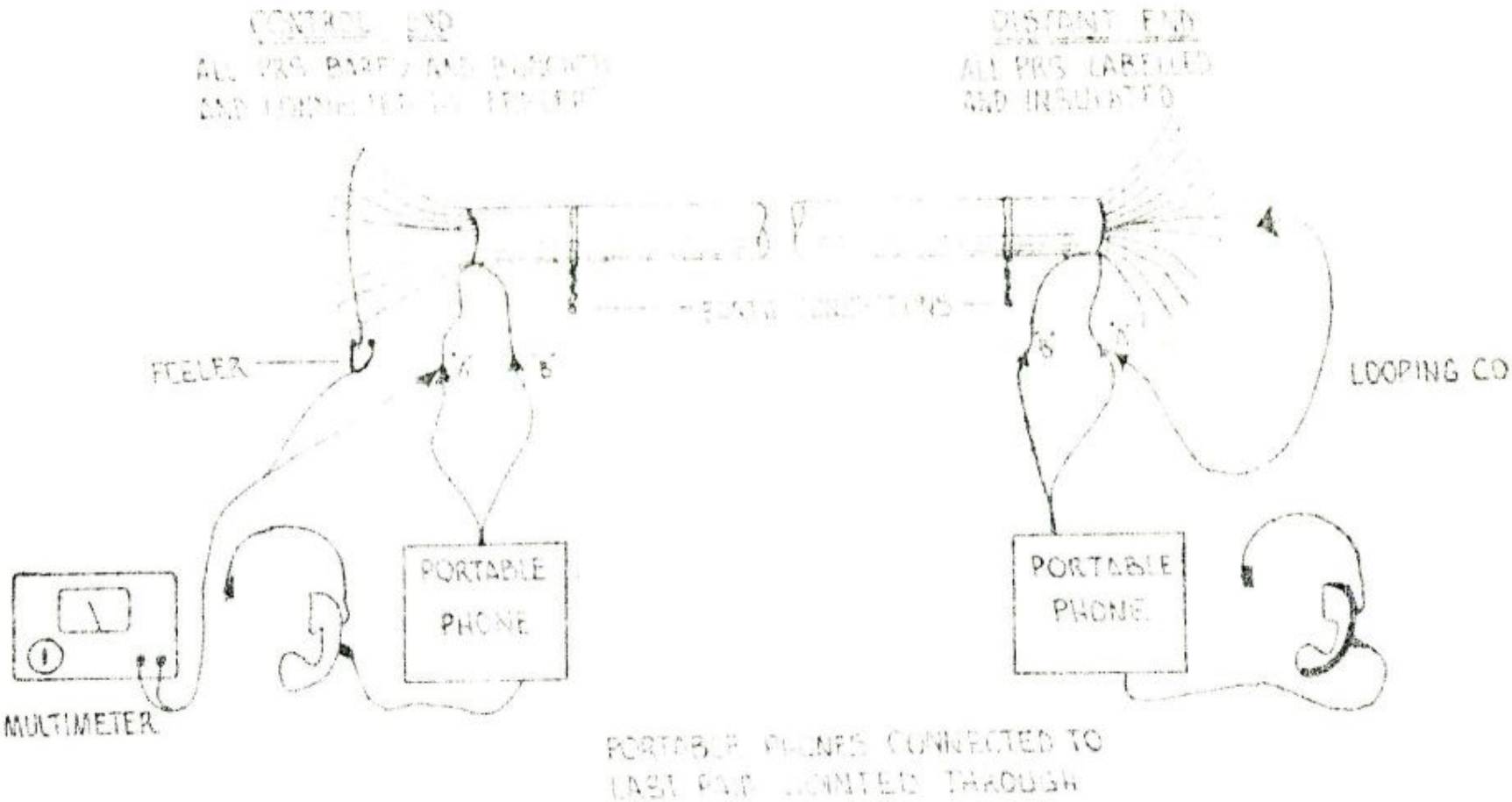
IDENTIFYING CABLE PAIRS – TYPE A IDENTIFICATION SETS

IDENTIFYING NON-WORKING CABLES JOINTED IN ROTATION

Locate a Type A identification set at each end of cable section to be identified.
Plug in headsets and leave keys of both sets in normal position.
Insert PRICKER plug of Set No. 2 in CONTACT jack.
Arrange speaker circuit by connecting LINE clips to a known pair in the cable (usually first or last pair) and EARTH clips to lead cable sheath or aluminium screen of moisture barrier sheath.
If it is necessary to identify a pair connect TONE clip Set No. 1 (exchange end) to one leg of a pair, LINE clip to other leg and EARTH clip to cable sheath. Jointer at Set No. 2 identifies this pair by loud click tone received when correct wire is pricked. He then connects LINE clip to other leg of pair and completes speaking circuit.
At control end select first pair or quad to be identified and connect the TONE clip to the first wire. If immediate click tone is heard this indicates that the wire is earthed.
Jointer at Search end identifies the wire and checks remaining wires of the pair or quad for tone. If tone is heard on more than one wire then these wires are contacting.
Search end jointer signals to Control end to connect tone to next wire by giving three short bursts of tone on the identified wire.

IDENTIFYING SPARE CABLE PAIR.

Type A set may be used in conjunction with buttinski to identify a spare cable pair e.g. between pillar or cabinet and terminal box.
Connect TONE clip to one leg of pair and EARTH clip to the other. Switch key to ON position. Click tone will be heard when buttinski is connected across pair. The dialling and speaking key on the buttinski should be in the off position during searching.
Alternatively tone may be connected between both legs of the pair and earth and the search made with one lead of the buttinski connected to earth.


FEELER
PORTABLE PHONE
MULTIMETER
PORTABLE PHONE
LOOPING CO

TWO MAN CONTINUITY TESTS

Two Man Continuity Tests will locate the following faults:-

1. OPEN CIRCUITS
2. EARTHS
3. CONTACTS NOT MAKING PROPERLY
4. SPLIT PAIRS
5. TRANSPOSED PAIRS
6. REVERSED LEGS
7. LOCKED FAULT OR S/C (Short Circuit)

The distant end of the cable is labelled and insulated.
The control end has all wires bared and bunched and connected to the feeler of the Multimeter.
Bond any unplumbed joints.

Carry out tests in the following order -

1. TEST FOR OPENS, TRANSPOSITIONS AND LOCKED FAULTS.
2. TEST FOR EARTHS.
3. TEST FOR SPLIT PAIRS.
4. TEST FOR CONTACT RESISTANCE.
5. TEST FOR MUTUAL LOOP LOADING.
6. TEST ALL PAIRS.

(1) Test Phones, Multimeter and Looping Cord:
Connect Phones together, check speech and ringing circuits.
To test Multimeter and Looping Cord – connect looping cord to [illegible] feeler and Clip-Switch to X10 OHM [illegible] should appear and disappear when disconnected.

(2) Test for Earths:
With the feeler connected to the bunch [illegible] place the clip of the Multimeter on the cable sheath. No throw, no earths.

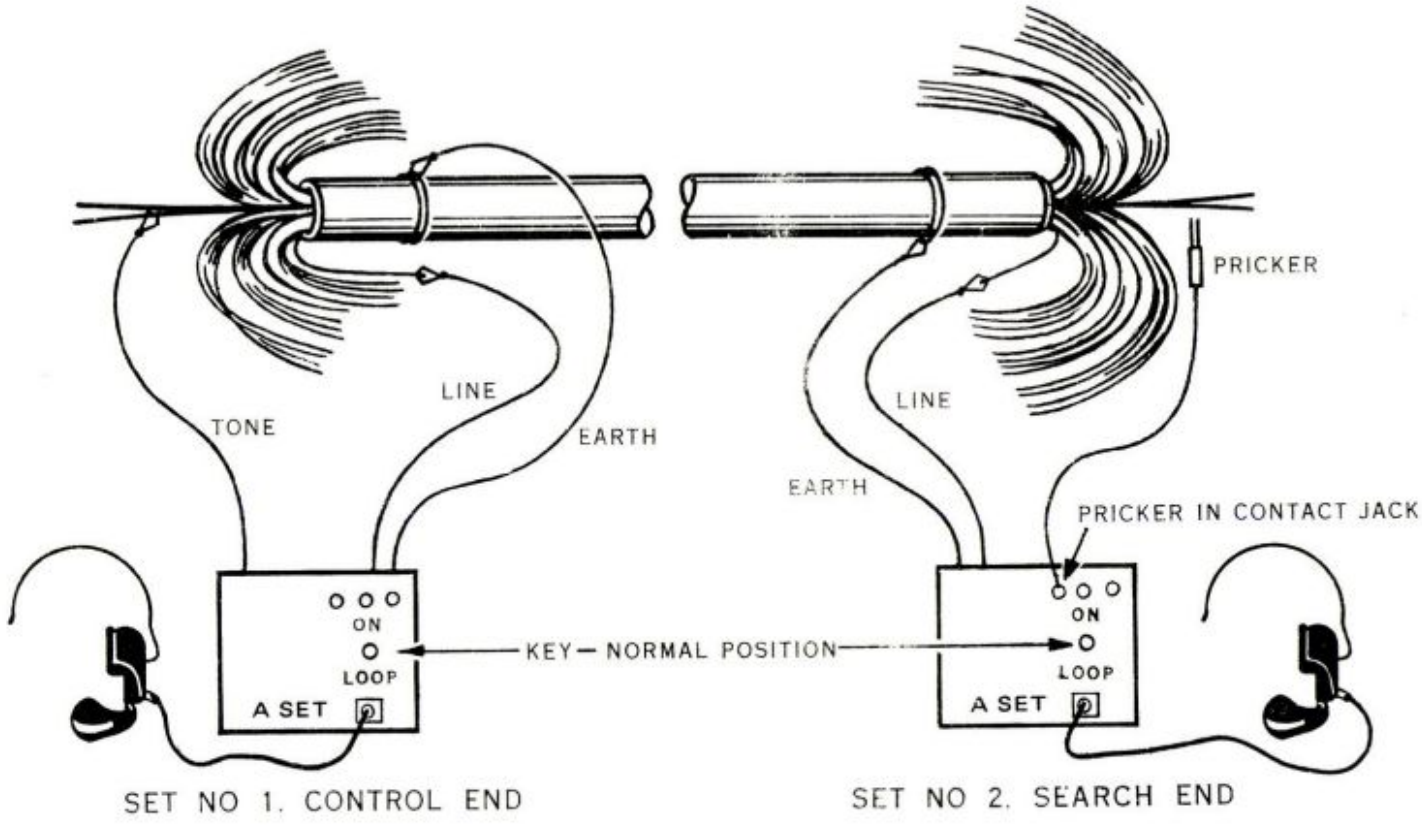
(3) Test for Phone Pair:
Remove clip from earth and attach to one leg of last pair jointed through, removed from the bunch. No throw indicates no loop or contact with any other wire. Leave this leg out of the bunch and test other leg of last pair in a similar manner. Send note to distant end to connect phone to last pair, and to earth the "A" leg of phone pair, using looping cord. Then there is an earth on an "A" leg should the phone pair be misjointed.

(4) Test for Common Return: (While mate [illegible] only, [illegible] must: Return both legs of phone pair [illegible] of multimeter is placed on earth (Cable Sheath). Throw will [illegible] when "B" leg of phone pair is removed from bunch. [illegible] pair, and clip side of multimeter permanently to "B" leg of pair.

(5) Test for Initial Loop Reading:
Ask mate to remove [illegible] "B" leg of phone pair for 10 seconds. "B" leg of phone pair [illegible] back on bunch, and a throw is registered on the Initial Loop Reading.

(6) Test all Pairs:
To test the first pair ask mate to [illegible] "B" of the first pair, a throw is now registered on the multimeter and is lost when the "B" is removed from the bunch, proving this wire. Then ask mate to put looping cord on "A" wire of the first pair and a throw should appear, and is lost when the "A" wire is removed from the bunch, proving this wire. Thus proving the loop of the first pair [illegible] "B" leg. The remainder of the pairs [illegible] labelled.

IDENTIFYING CABLE PAIRS – TYPE A IDENTIFICATION SETS



IDENTIFYING NON-WORKING CABLES (PAIRS JOINTED IN ROTATION)

THOROUGHLY DRY OUT PAPER INSULATION ON COMPLETION OF IDENTIFICATION WORK.

IDENTIFYING CABLE PAIRS – TYPE A IDENTIFICATION SETS

IDENTIFYING WORKING PAIRS IN CABLES JOINTED IN ROTATION

Automatic Exchange

Set up a Type A identification set at each end of the cable section to be identified. One set will normally be at the exchange, cross-connecting cabinet or pillar terminal.

Plug in head sets. Operate key Set No. 1 to ON position.

Insert pricker plug in INDUCTION jack Set No. 2.

Arrange speaking circuit on previously identified pair in cable. Connect the EARTH clips to a good earth (lead cable sheath or manhole earth) at both sets.

At Set No. 1 (Control end) connect TONE clips to both wires of pair to be identified simultaneously so as to avoid interference to a working line.

Operator at Set No. 2 (Search end) pricks through pairs at the joint and identifies wanted pair by loud click tone on each leg of pair.

Remove TONE clips from both wires simultaneously to avoid interference.

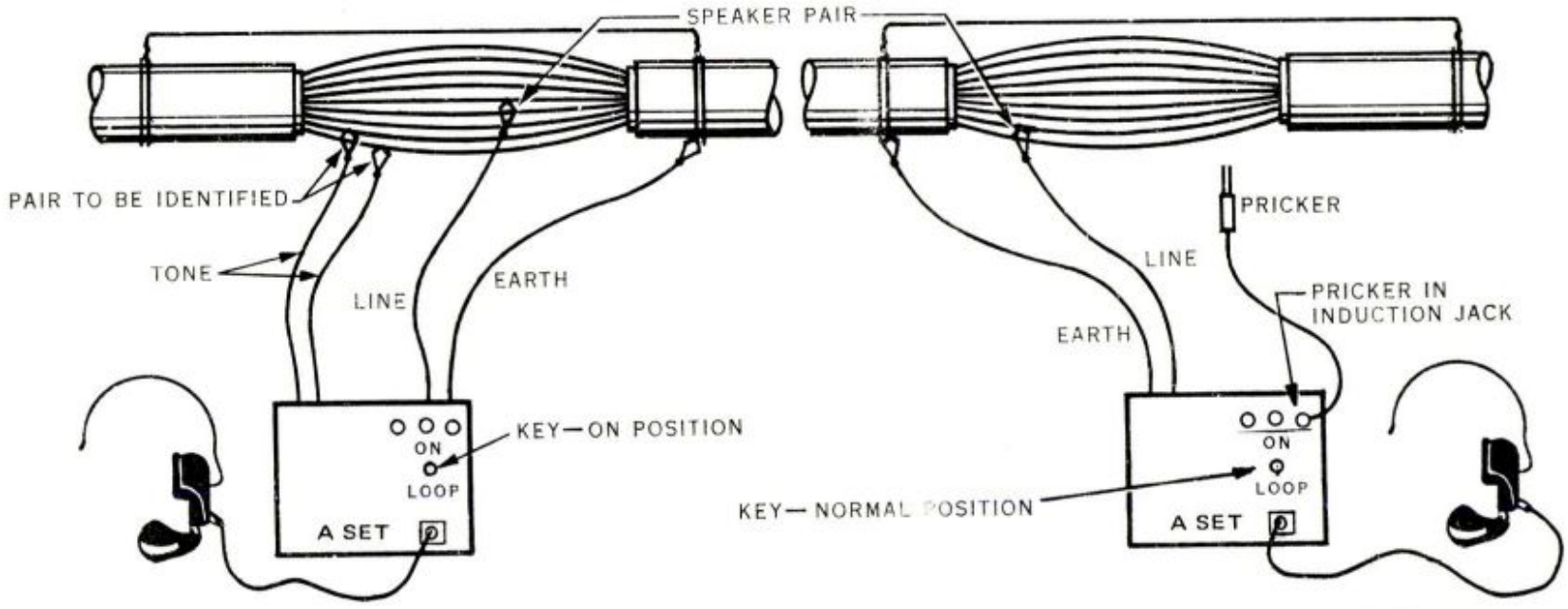
If loud tone is heard on one leg only throw key at Set. 1 to LOOP position and tone of equal strength should be heard on both legs of pair with dial tone in the background. If volume of the click tone does not increase then it is not the correct wire.

Where there is a possibility of the legs of pairs being reversed such as where there are intermediate cable joints interrupt the tone by removing one clip first at Set No. 1 while operator at Set 2 identifies the other leg.

Central Battery Exchange Working pairs are identified as described for automatic exchanges above. If the LOOP key is operated, instead of receiving dial tone the exchange telephonist will answer. Advise the exchange supervisor of proposed cable identification work.

Magneto Exchange. One TONE lead may be used and each leg of the pair identified separately.

IF YOU OBSERVE ANY FAULTY OR DANGEROUS PLANT (EITHER AERIAL OR UNDERGROUND) INFORM YOUR SUPERVISORY OFFICER IMMEDIATELY. PREPARE FORM E.71 (LM16).



IDENTIFYING WORKING CABLES (PAIRS JOINTED IN ROTATION)

NOTE: Where the control set is located at a pillar, cabinet or exchange MDF, the circuit connections are similar to the above but the EARTH lead is connected to the earth terminal in pillars and cabinets or to the frame of the MDF.

WHEN USING A PRICKER TAKE CARE NOT TO DAMAGE THE PAPER INSULATION MORE THAN IS NECESSARY.

DO NOT USE PRICKER WITH PLASTIC CABLE.

IDENTIFYING CABLE PAIRS – TYPE A AND C IDENTIFICATION SETS

IDENTIFYING PAIRS IN LARGE WORKING CABLES NOT JOINTED IN ROTATION

Set up A set at exchange end and establish speaker circuit with C set at point where pairs are to be identified.

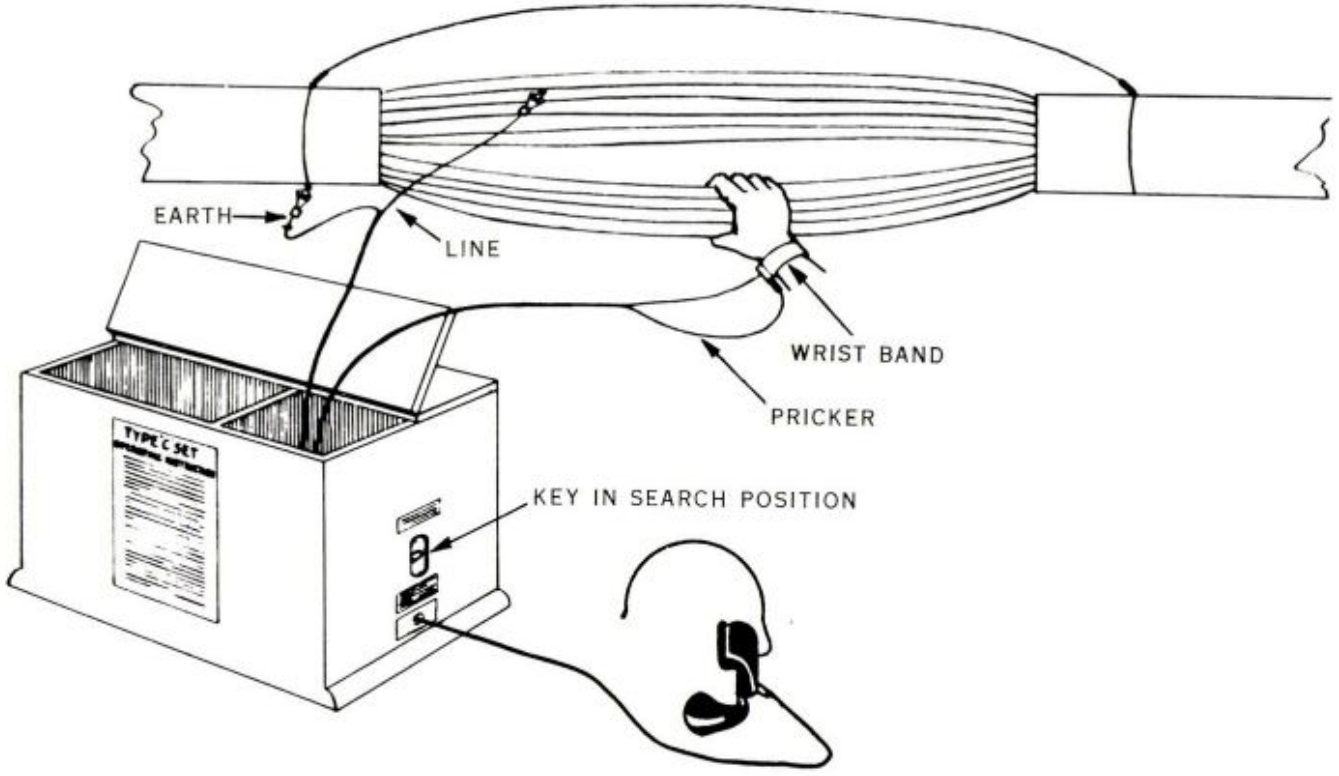
Throw key of A set to "ON" position and connect TONE to one leg at a time if identifying non working pairs or to both legs if identifying working pairs.

If a pricker is used to identify pairs, switch key of C set to normal position, or to locate a cable pair by means of the hand capacity search feature:

(1) Fasten wrist band to either wrist and put on headset.
(2) Operate key to SEARCH position.
(3) Divide cable pairs into groups. Grasp each group separately and select the one which gives the loudest click tone. Halve this group and select again. Continue halving until only a few pairs remain.
(4) Restore the search key to NORMAL position. Now use the PRICKER lead to select the required pair from the remaining pairs.
(5) They key of the C set must be in the NORMAL position to be able to use the speaking circuit to the operator at the A set.

When using hand capacity search feature, operator must be insulated from walls and floor of manhole. Wear rubber boots or stand on dry boards or rubber mat. If signal is faint, support body at least 75 mm from manhole walls and floor. Avoid touching bare wires with the hand or false signals may result.

Alternatively, where all of the cables pairs are to be identified, the "send" A set may be located at the cable joint and pairs identified in rotation by the second operator checking the terminals at the M.D.F., Cabinet or Pillar Terminal with another A set.



TYPE "C" CABLE IDENTIFICATION SET WITH HAND CAPACITY SEARCH FEATURE

NOTE: 1. The circuit connections for the Type A set used in conjunction with the Type C set are as shown for Set No. 1, Control End, Page R-6.
2. The tone search facility provided by the Type F. identification set is superior to the use of the Type C set for this purpose.

IDENTIFYING CABLE PAIRS – TYPE A AND D IDENTIFICATION SETS

IDENTIFYING AND CUTTING OVER FAULTY WET CABLES

The combination of Type A and Type D identification sets is used for the "wire by wire" cutover of a section of faulty cable to a length of new cable.

Whenever possible arrange for links or fuses on the exchange or P.A.B.X. M.D.Fs. to be removed from all faulty pairs in the wet cable.

Locate D set at manhole on exchange side of fault and A set on distant side.

Connecting D and A Sets

Operate switch on D set to WET CABLE position.

To avoid interference from foreign battery on faulty pairs connect EARTH clips of both sets to a known pair in the new cable and not to earth. For lengths over 100 metres use several pairs twisted together.

Connect LINE clips of both sets to known wire in new cable (e.g. marker pair outer layer) for speaker circuit.

Plug pricker lead of A set into WET CABLE Jack.

Adjusting D set for Cut Over

First check the relay and the buzzer. Rotate rheostat to R-MAX position. Tap RELAY lead to earth clip. Relay should operate and buzzer sound in receivers at both ends.

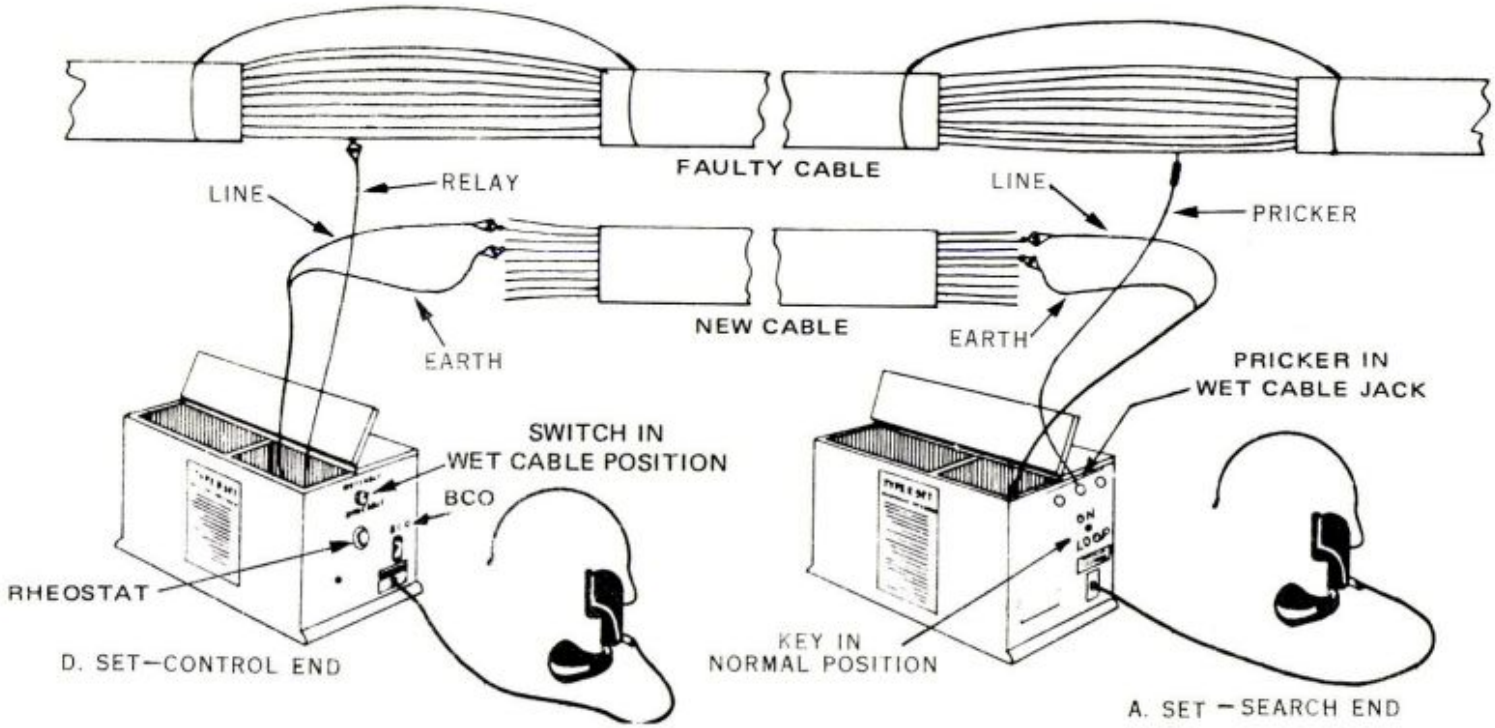
To set up for particular cable length where old and new cables are the same wire weight, rotate rheostat fully to R-MIN position. Have operator at far end connect PRICKER lead of A set to one leg of known pair in new cable (e.g. one leg of first marker pair) Slowly rotate rheostat towards R-MAX until tone is just heard, but no further. Leave rheostat in this position throughout identification.

Where wire sizes of old and new cables differ or the cables vary greatly in length the relay must be adjusted over a known wire in the faulty cable (e.g. one leg of first pair in cable). This will ensure that the buzzer will not be operated when wires adjacent to the correct wire are contacted with the pricker.

DO NOT DISCONNECT OR INTERFERE IN ANY WAY WITH ELECTROLYTIC BONDS IN MANHOLE

Identifying and Cutting Over

(1) At D set end cut the first pair in rotation in the faulty cable.
(2) Attach RELAY clip to one leg and advise operator at A set end to test wires with PRICKER. When he pricks the correct wire the buzzer will sound in both receivers.
(3) Identify the other wire of the faulty pair then the first pair in the new cable.
(4) Identify old and new pairs throughout the cables in this manner, cutting over to the new cable one wire at a time to avoid splitting or reversing pairs.



CUTTING OVER FAULTY CABLE TO NEW CABLE WITH D AND A SETS

R-12 IDENTIFYING CABLE PAIRS – TYPE F IDENTIFICATION SET

DESCRIPTION

The Type F Identification Set (S.419/41) may be used to identify pairs in working or non-working cables. Pairs are identified without the need to puncture the insulation.
The set comprises two items, an oscillator (sender) and a search probe (receiver).
The oscillator sends a balanced audio tone to line which is detected by the probe at the distant end when the tip is held close to the wanted conductor.
An earpiece is provided which plugs into the receiver housing.
Alternatively the probe may be connected to a linemen's portable telephone, loud speaking intercom. unit or small amplifier. (leads and plug should be made up locally).

APPLICATION

Subscribers Circuits. The set may be used to identify working circuits provided a call is not in progress. Always check that the service is not in use before connecting the oscillator.

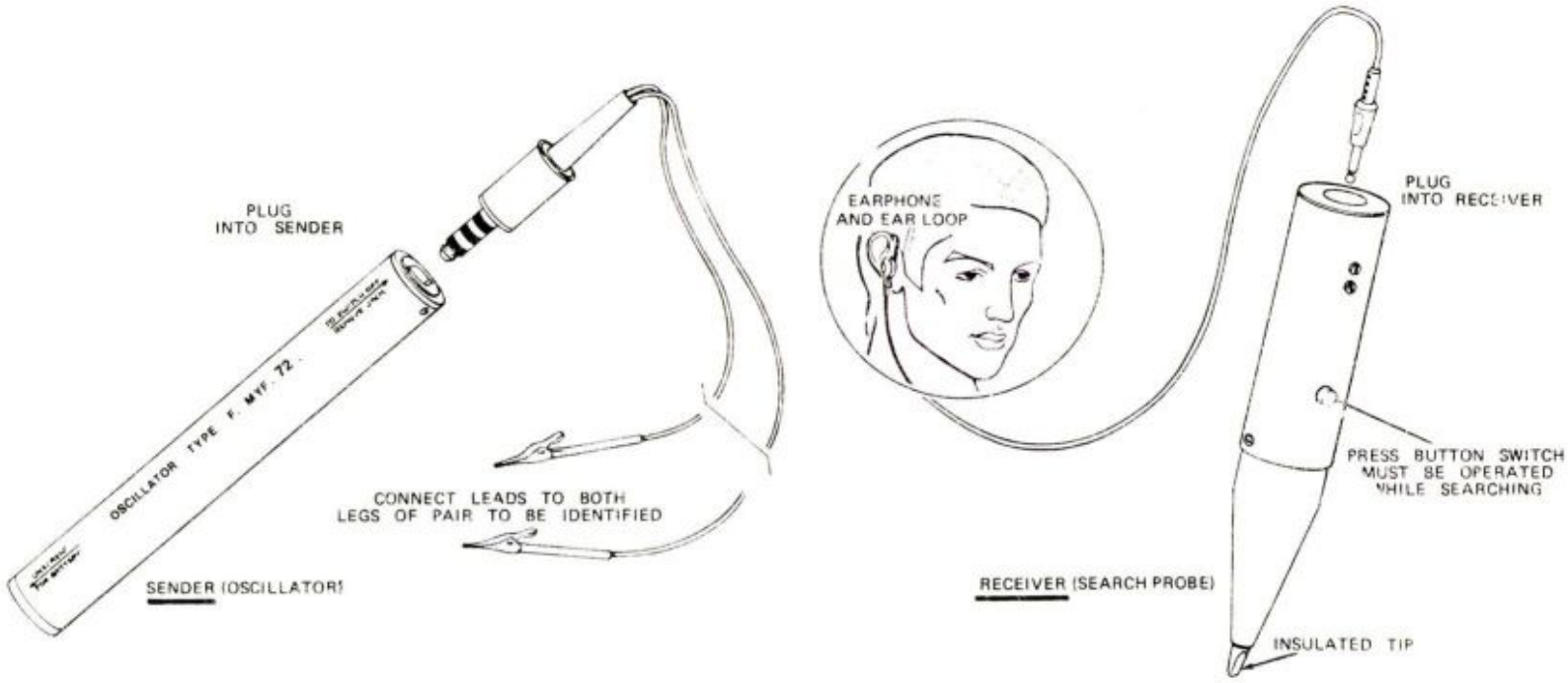
Junction Circuits. Arrange with the exchanges concerned for the junctions to be taken out of service before connecting the oscillator. Operation of the set on working junction circuits could cause interference to traffic, lost calls etc.

Miscellaneous Circuits. Special procedures are necessary when identifying circuits such as fire alarms, telex circuits, data circuits etc. to avoid interference to the circuit or inconvenience to the subscriber. It is normally desirable to arrange for the circuit to be temporarily disconnected during identification.

Wet Cable. The set is unsatisfactory in most instances particularly where the insulation resistance of the conductors is less than 10 000 ohms. The A and D set combination is used for identifying and cutting over wet cables.

PEOPLE WATCH YOU AT YOUR WORK. FILL IN IDLE PERIODS WITH MAINTENANCE WORK ON YOUR TOOLS AND AVOID UNFAVOURABLE COMMENT.

Issue 5, 1979



TYPE F IDENTIFICATION SET (SERIAL 419/41)

OPERATION OF SET

Sender (Oscillator). The sender is automatically switched on when the test leads are plugged into the case. To conserve the batteries the leads must be unplugged when the sender is not in use.

Receiver (Probe). The press-button ON-OFF switch must be operated while searching. The earphone plugs into the end of the receiver case. For operation with portable telephone, loud speaking telephone etc. leads and plug should be made up locally.

PLAN YOUR WORK SO THAT IT WILL BE DONE IN SAFETY AND WITH MINIMUM INCONVENIENCE TO OTHERS.

R-14 IDENTIFYING CABLE PAIRS – TYPE F IDENTIFICATION SET

IDENTIFYING PAIRS IN WORKING OR NON-WORKING CABLES

1. Check that a call is not in progress on pair to be identified.
2. Connect the sender leads to both legs of pair to be identified. (Do not connect between one leg and earth as this will cause tone to spread through other pairs in the cable).
3. At the point where identification is required pass the probe tip through the conductors and listen for the tone which will be loudest on the correct pair.
4. Locate the pair giving the loudest tone and check for a much lower level of tone (called a "null") when the probe is held midway between the two wires. The absence of a null indicates incorrect identification e.g. split pair and further search is necessary.
5. Where identification is made from a joint to a pillar, cabinet or M.D.F. a high search rate can be achieved by holding the receiver in one hand clear of the tag strip while a finger of the other hand is brushed over the tags. Tone will be heard only when the operators finger contacts the correct tag.

TRACING JUMPERS IN PILLARS AND CABINETS

1. Connect the sender to both legs of pair at known end.
2. Hold receiver in one hand and run a finger of other hand over the tags to make initial identification. Then confirm with the probe by checking for a null between the pair of tags.
3. If identification is not successful by this method run the probe down the tag strip close to the tags. Do not rub the probe tip along the tags or the insulation on the tip may be damaged.

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THE DEVY IDENTIFIER MARK 11

The Devey Identifier Mark II permits rapid automatic identification of random jointed, non-working Junction and Main subscriber cable pairs during new cable installations. This equipment is used to identify individual wires and indicate wire pairs in terms of "A" and "B" leg terminations. This is effected between the exchange Main Distribution Frame (MDF) link mounting blocks and a remote jointer.

While the system's primary function is to provide rapid identification of the terminated designation of any wire in a group of 200, it also has the capability of detecting the following cable fault conditions;

- Open circuits. o/c.
- Short circuits between the two wires of a pair. Loop
- Short circuits between wires of different pairs. (contacts)
- Split pairs. S.
- Earthed conductors. E

So that the identifier may be connected to the three different types of MDF link mounting block terminals currently in use, three different types of contact blocks are provided. They are -

- 100 Pair Contact Block, Serial 419/32.
- 50 Pair Contact Block, Type I Serial 419/33.
- 50 Pair Contact Block, Type II Serial 419/34.

THE DEVY IDENTIFIER MARK 11

Electronic Control Unit

The control unit contains circuitry for the cable identification and the built-in-talk facility. A 15 V No 2510 (S2/52) and two 1.5V No1035 (S2/41) Eveready Batteries are housed in the unit to drive the identification circuitry and the built-in-talk set respectively.

The power ON/OFF switch, digital indicators, probe terminal (T1), talk pair terminals (T2/T3) and headset plug are all mounted on the front panel of the control unit.

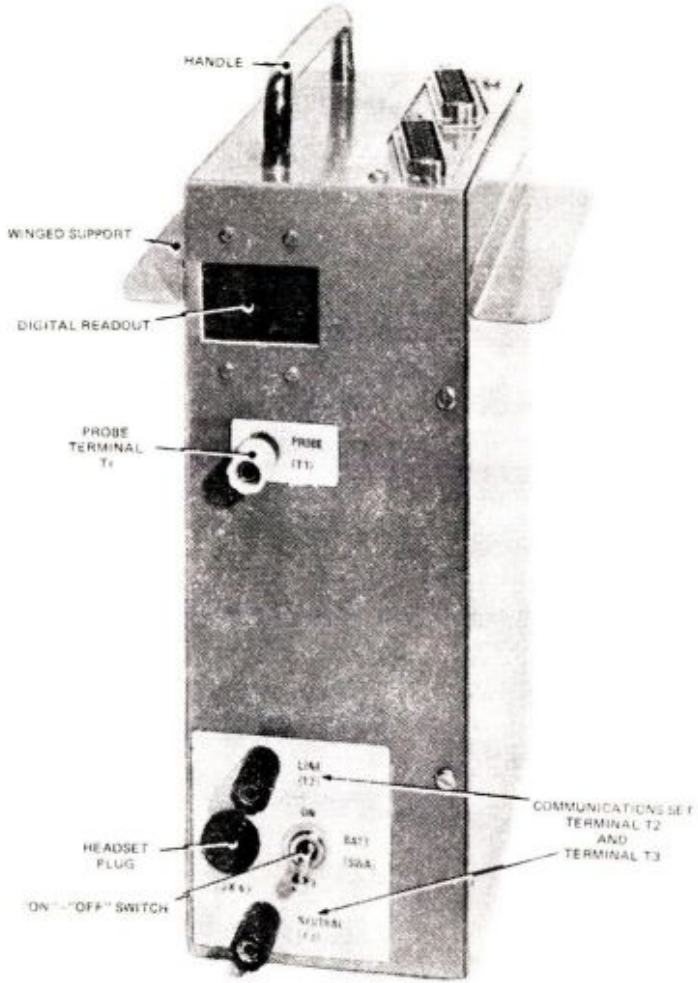
The complete system consists of the various components as follows :-

1. Exchange or Terminated MDF End.
   - . Electronic Control Unit.
   - . Contact Block (1 x 100 or 2 x 50 pair units), Extension Cables and Connectors.
   - . Talk Set Leads.
   - . Lightweight Headset.
   - . Probe Leads.
2. Remote or Identifying End.
   - . Remote End Talk Set.
   - . Talk Set Leads.
   - . Lightweight Headset.
   - . Probe Lead.

THE DEVY IDENTIFIER MARK 11

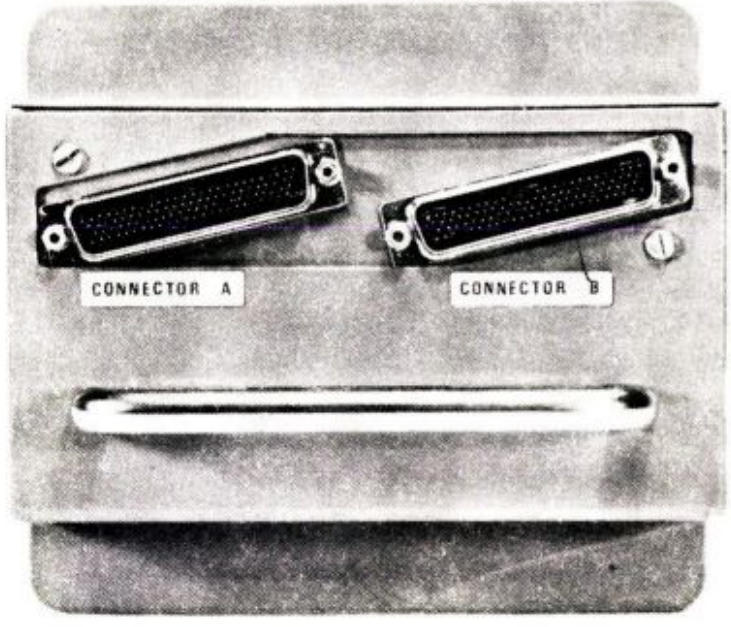
DEVEY CABLE PAIR IDENTIFIER MK II AND ATTACHMENTS Issue 5, 1979

THE DEVY IDENTIFIER MARK 11



ELECTRONIC CONTROL UNIT (FRONT VIEW)

The 100 pair contact block is extended via two separate 50 pair cables the ends of each cable being terminated by a 100 point connector. The connectors are designated as "Connector A" which contains the A and B legs of those pairs corresponding to MDF termination 1 to 50 and "Connector B" which contains pairs corresponding to MDF termination 51 to 100.



ELECTRONIC CONTROL UNIT TOP SHOWING CONNECTOR A AND CONNECTOR B POSITION

Connector A and Connector B mate, to similarly marked male part connectors provided on the top of the electronic control unit.

THE DEVY IDENTIFIER MARK 11

100 PAIR CONTACT BLOCK

50 or 100 Pair Spring Loaded Contact Blocks

These contact blocks are designed to make simultaneous positive contact with all the line side terminals of a 50 or 100 pair M.D.F. link mounting block.

50 Pair Block

Two screw type quick release nuts are utilised to pull a contactor block onto a link mounting block once the two arms, one at the top and one at the bottom of the contactor block are positioned to hook onto the MDF link mounting bracket.

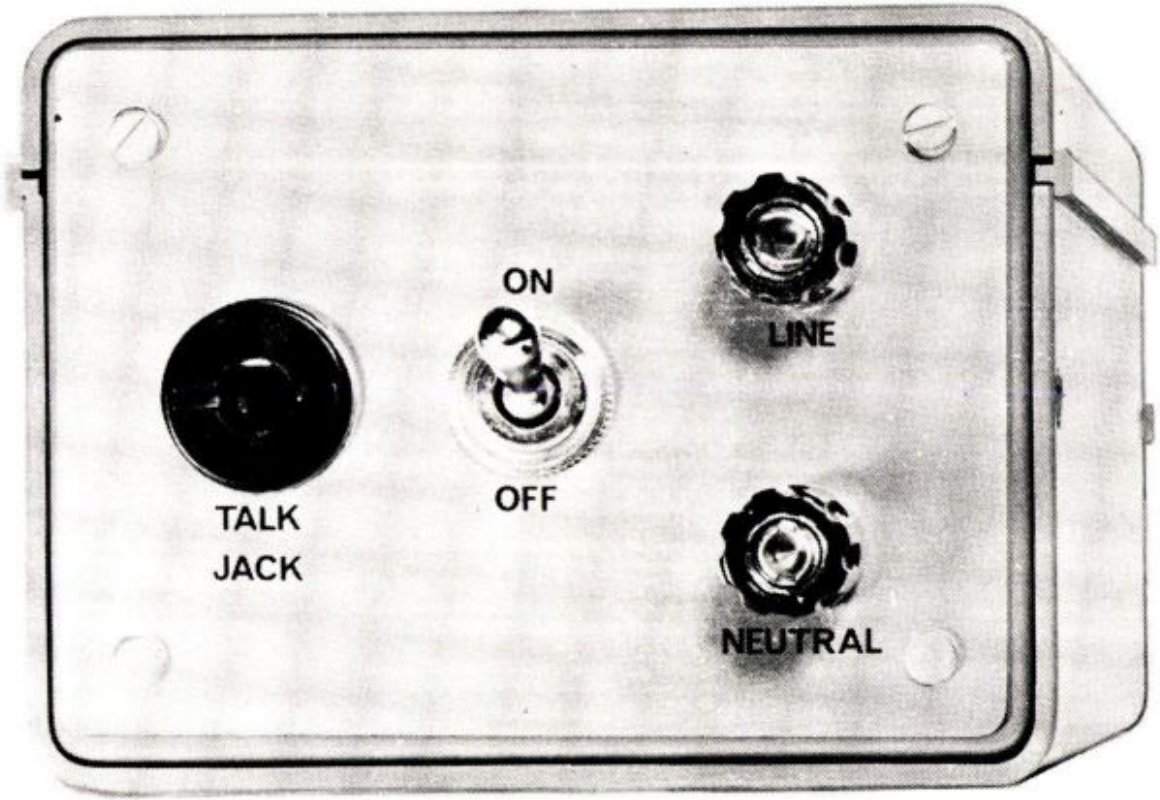
100 Pair Block

Attachment of the contact block to the 100 pair MDF link mounting block is achieved by two spring loaded arms which grip the link mounting when the single over centre locking lever is operated.

Note: All links must be removed from the MDF link mounting before attaching the contact block.

Remote End Talk Set

The remote-end talk set is used by the jointer at the location remote from the exchange where the identification is required.



REMOTE END TALK SET

THE DEVY IDENTIFIER MARK 11

PROCEDURE FOR USING IDENTIFIER

Establishing Communications

- A speaking pair is established between the terminated end of the cable to be identified at the exchange and the remote jointer. For convenience this can be set up over the outer layer marker pair of a previously specified 100 pair unit other than the unit to be identified. The standard practice of jointing straight through all outer layer marker pairs and terminating them on pair 100 of each link mounting block facilitates this operation. The exchange side of this marker pair is connected to "Line" and Neutral" terminals of the remote end talk set. These connections are made with the leads provided with the equipment.

- When the telephonists headsets are plugged into the concentric jacks situated on the control unit and remote end talk set and the power of both units switched "On", communication is established.

Establishing 15 Volt Probe Lead

Locate any convenient wire in the cable in a unit other than that which is to be identified e.g. another outer layer marker pair. At the exchange end connect the MDF appearance of this wire to the "Probe" (T1) terminal on the face panel of the control unit. At the remote end using the probe extension lead provided connect to the selected wire to facilitate applying the 15 Volt probe potential to the cable conductors to be identified.

THE DEVY IDENTIFIER MARK 11

Identifying Cable Conductors

- The remote jointer touches the marking lead onto one wire of any pair in the unit to be identified, the exchange end jointer reads out the identification i.e. "27 A" over the speaker circuit. The remote jointer than contacts the second wire of the same pair and the normal read out i.e. "27 B" being indicated, is called by the exchange jointer. The pair may then be jointed through, or if required, tagged with its appropriate number, by slipping the tag over the "A" wire and twisting the pair together. This serves to retain the A and B identity of the wires. The remainder of the pairs in the unit are similarly identified.

- Subsequent units may be identified without disturbance of the speaking pair or marking wire until only the unit/s containing them remain. These circuits are then transferred to marker pairs in a previously identified unit and the identification of the cable may be completed.

FAULT FINDING CAPABILITIES OF THE IDENTIFIER

- The existance of an "open" fault is revealed when the marking of a wire in the unit produces no numerical display. However, an open circuit indication may also result from improper contact between the identifier spring loaded pins and the M.D.F. terminals. It is necessary that the terminal ends be free of excess solder or resin and staff engaged in the terminating should be advised accordingly.

- The existance of a shorted cable pair is revealed by the consecutive appearance of the decimal point accompanying the numberals of that pair as each leg of the pair is probed.

THE DEVY IDENTIFIER MARK 11

- The existance of shorts between wires of different pairs (cross fault) is revealed by superimposed multiple numerals display corresponding to the numerals associated with the short wires.
- Split pairs are readily detected since a split pair produces a numeral display for the A-leg different to that displayed for the B-leg.
- The identifier can be further extended to test for earth faults. This test requires the 15 Volt DC probe to be connected to earth at some convenient point e.g. MDF Earth, lead cable sheath, or aluminium screen of MB cable. The numerals of a cable wire that is earthed, will be displayed on the indicator unit. If more than one wire is earthed, the indicator will display superimposed numerals corresponding to those wires.

MAINTENANCE

- The only maintenance to be carried out in the field is the replacement of batteries.
- Dimming of the digital readout indicates that the identification circuitry battery requires replacement.
- The need to replace batteries in the built-in and remote end talk sets is indicated by reduction in transmitted speech volume, sufficient to make hearing difficult.
- For any malfunction other than that specified above, the electronic control unit and associated contact blocks must be returned for attention to an Instrument Repair Centre in accordance with State practice.

CONDUCTOR JOINT RESISTANCE TESTS

USE OF CONDUCTOR RESISTANCE MEASURING SET

This instrument is designed to measure the resistance of joints made with connector jointing machines and hand tools to ensure that the required electrical conductivity standards are met. It may also be used to check the resistance of other types of conductor joints.

The instrument may be operated from its own internal 6V battery supply or from the 24V supply provided for jointing machines.

1. Operating instructions are contained in the lid of each instrument.

Electrical conductivity tests are made on sample joints when the machine is first set up at the beginning of each shift, and at other times as required. Tests are normally made in conjunction with the crimp height tests specified for the various machines.

CONDUCTOR RESISTANCE MEASURING SET MK1.

PREPARING SAMPLE JOINT FOR TESTING

1. Make three sample joints with the jointing machine or hand tool using short lengths of conductor from the cable being jointed and connectors from the batch it is proposed to use.
2. Cut test samples to 150 mm length and remove insulation. Take care not to stress the joint during this operation.
3. Straighten wires so that they are in line with the connector. (For single ended, pigtail type connectors, bend wires at right angles where they emerge from the connector.

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2. SAMPLE JOINTS AND COMMENCEMENT OF EACH JOINT
3. TEST AFTER ANY MACHINE MALFUNCTION
4. TEST IF ANY [illegible] JOINTING

CONDUCTOR JOINT RESISTANCE TESTS

TESTING SAMPLE JOINT

1. Place sample joint in the wire contacting elements of the resistance measuring set with the connector centred in the space between the two inner contact elements and the wire ends secured under the outer elements.
2. Where external 24V DC supply is available, connect instrument power lead.
3. Set power switch to the ON position for the supply being used (i.e. 6V or 24V). The power indicator will glow and the meter will indicate a current flow through the joint.
4. Turn "Adjust Test Current" control until the deflection of the meter needle coincides with the red "Test Current" mark on the outer scale. (Note: If this condition is not met, do not proceed with test. Check wire connections, battery supply, etc. Substitute bare wire for the sample. If meter is still faulty return it for service).
5. Press "Measure Resistance" switch and read resistance of joint in milliohms directly from the meter. The resistance should not be greater than that shown in the table above for the wire gauge. All three sample joints must pass the test.

Conductor Diameter mm	Maximum Resistance (Milliohms)
Copper	
0.32	10
0.40	8
0.51	7
0.64	5
0.90	4
Aluminium	
0.52	8
0.81	5
1.15	4

MAXIMUM PERMISSIBLE RESISTANCE

INTERNAL BATTERY TEST AND REPLACEMENT

To test battery insert a 150 mm length of bare wire under contact elements and operate power switch to INTERNAL 6V position. Turn ADJUST TEST CURRENT control fully clockwise. The meter needle should deflect beyond the red TEST CURRENT mark on the scale. If this condition is not met replace the battery.

To replace battery remove two screws from battery compartment cover and fit new 6V leakproof battery, S.2/28 (Eveready Lantern Battery Type 509 or equivalent.)

INSULATION RESISTANCE TESTING OF NEW CABLES

NECESSITY FOR INSULATION RESISTANCE TESTING

Insulation resistance testing during and on completion of jointing is necessary to ensure that the IR does not fall below acceptable standards.

When supplied from the factory, cables have a high insulation resistance value. The overall insulation resistance of the cable is reduced during jointing by moisture entering and travelling along the cable.

To reduce the amount of moisture entering the cable, protect the cable against moisture as described in section M.

TESTING DURING JOINTING OF CABLE

Check the insulation resistance of the cable over each loading section for trunk and junction cables and at intervals of about 1.5 kilometres for subscribers cables.

On subscribers cables the IR test may be made from joints where pair identification is necessary or where there is a change in cable size.

Make the IR test on a group of 22 pairs selected at random as described on page S-4.

Where a cable has less than 22 pairs, apply the test to all pairs.

For loading sections of 1830 metres or unloaded cables up to this length an insulation resistance of at least 50 megohms must be obtained.

TESTING ON COMPLETION OF JOINTING AND TERMINATING

Make an IR test over the entire length of cable on 22 pairs randomly selected.

Multiply the IR figure obtained by the length of the cable in kilometres. The insulation resistance is satisfactory if the result is greater than 80 Meg ohms km.

ACTION REQUIRED WHEN TEST RESULTS DO NOT MEET STANDARD

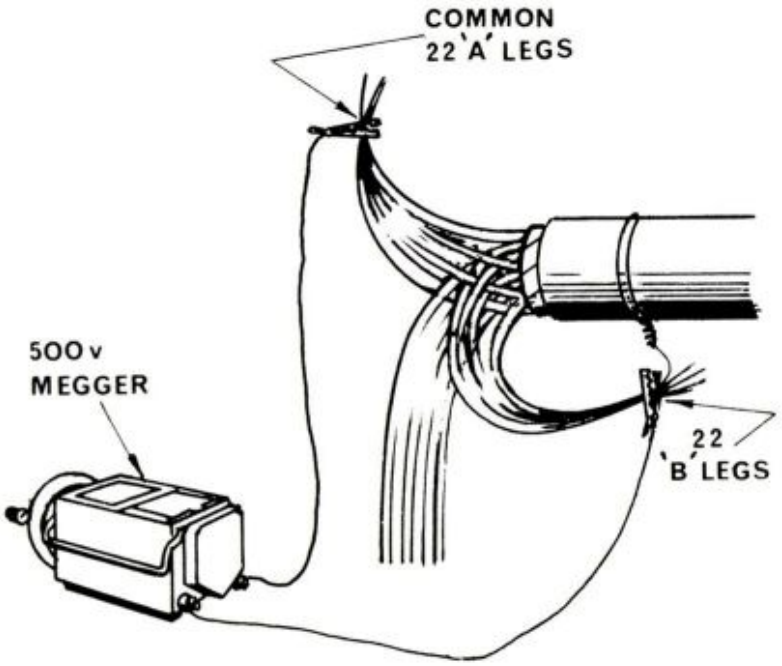
Where IR readings obtained on test are less than the above limits action must be taken to dry out the cable by passing dry air through it, heating joints, etc. As the paper insulation on new cables is considerably drier than "dry" air supplied in cylinders an endeavour should be made to locate low insulation points (normally close to joints) to avoid passing air through long lengths of cable and thus degrading the overall IR of the paper.

PROTECT CABLE CONDUCTORS AGAINST CONTACT WITH MOIST MANHOLE WALLS.

INSULATION RESISTANCE TESTING OF NEW CABLES

METHOD OF TESTING INSULATION RESISTANCE.

1. Select 22 pairs at random throughout the cable, taking at least one pair from each unit to obtain a good spread. Where the cable is smaller than 22 pairs use all pairs for the test.
2. Check that the 22 pairs selected are open circuit at the far end.
3. At the testing end, strip about 40 mm of insulation from each leg of the 22 pairs. Separate "A" and "B" legs.
4. Common the 22 "A" legs and common the 22 "B" legs.
5. Earth the "B" legs to the cable sheath if it is lead cable or to the aluminium foil screen if it is moisture barrier sheathed cable.
6. Using an Insulation Resistance Tester (e.g. 500V Megger, Metrohm, etc.) measure the insulation resistance between the 22 "A" legs and 22 "B" legs.
7. Remove the earth connection from the "B" legs and earth the "A" legs.
8. Repeat the IR test as described in Paragraph 6.
9. Multiply the test readings (megohms) by the length of cable tested in kilometres. The insulation resistance is satisfactory if the result is greater than 80 Megohm kilometres.



INSULATION RESISTANCE TESTING USING 500V MEGGER

LOADING EXISTING CABLES

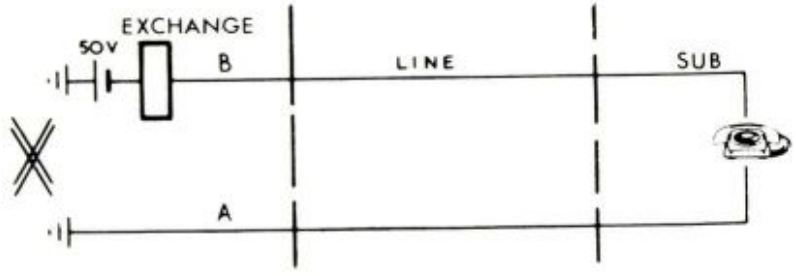
Check IR of cable and, if necessary, dry out before fitting loading coils.

STANDARD LINE CONDITIONS IN WORKING CABLES S-5

DIRECT EXCHANGE LINES - AUTOMATIC AND CENTRAL BATTERY EXCHANGES.

When no call is in progress "A" leg of the pair is connected to the exchange earth and "B" leg is connected via a relay to the negative terminal of the exchange battery.
Correct voltages when tested with voltmeter:
"A" leg to Earth - Zero voltage.
"B" leg to Earth - 50 volts.
"B" leg to A leg - 50 volts.

When a call is in progress the "A" leg is connected via a relay to the exchange earth and the "B" leg via a relay to the negative terminal of the exchange battery. There is also a voltage between legs. The three voltages will not normally be equal.



AUTO. EXCHANGE LINE - NO CALL IN PROGRESS

DIRECT EXCHANGE LINES - MAGNETO EXCHANGES

These lines have no voltage between legs or between either leg and earth.

OTHER LINES - FIRE ALARM, TELEGRAPH, DATA TRANSMISSION, CONTROL LINES, PRIVATE LINES ETC.

These line have a variety of voltages between legs and to earth. Avoid testing such circuits as connection of the Test Set may interfere with their correct operation.

SPARE PAIRS

There should be no voltage between legs or between either leg and earth.

ALL CABLE PAIRS

Insulation Resistance between "A" and "B" legs or between "A" or "B" leg and earth should be greater than 1 megohm. (Less than 0.1 megohms is classed as a short circuit or earth, 0.1 megohm to 1 megohm is classed as Low IR).

Foreign Battery. Lines should have zero voltage when disconnected at exchange MDF.

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LINES TEST SET No. 1

DESCRIPTION.

The Lines Test No. 1 consists of a portable voltmeter/megohmeter (S.140/85) in a leather carrying case (S.399/20).

A switch on the front panel enables the instrument to be used as:

(i) Voltmeter - Scale 0 to 80 volts

(ii) Megohmeter - Scale 0 to 5 megohms
(1 megohm = 1 000 000 ohms)

Some locally constructed instruments have additional facilities, e.g. low resistance (continuity) scale 0-1000 ohms, rotary switching, etc.

The instrument may be used to determine the electrical condition of a line and to assist in fault location.

LINES TEST SET NO.1

OPERATING TEST SET

Connecting leads. Plug red lead into socket marked EARTH and "+" and black lead into socket marked "-".

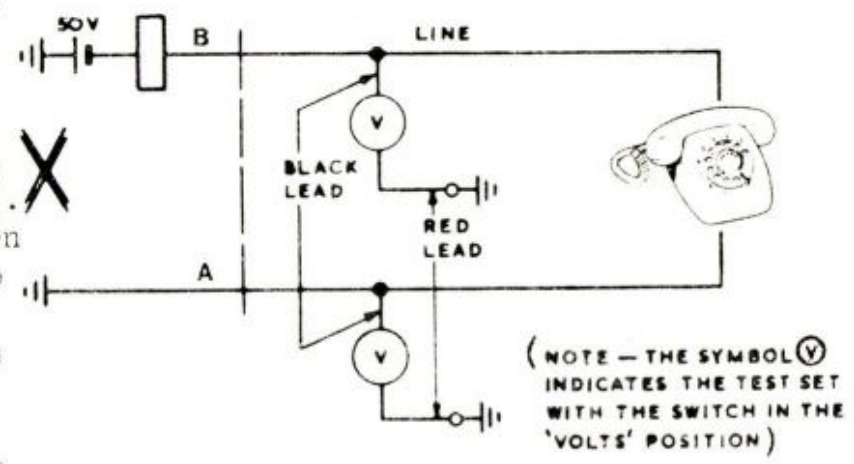
Battery Check. With switch in MEGOHMS position, short test leads for a few seconds. If pointer does not give a reading within the "BATTERY OK" range fit new batteries. (Two 15 volt, No. 411 Eveready Minimax).

Safeguarding Meter From Electrical Damage. Always make first test with switch in VOLTS position. If test shows any voltage on the line do not make any tests with switch in the MEGOHMS position as this may result in electrical damage to the instrument. To safeguard instrument return switch to VOLTS position after any MEGOHMS test.

LINES TEST SET NO. 1 - TESTING DIRECT EXCHANGE LINE

TESTING FOR EXCHANGE BATTERY AND EARTH AND CONTINUITY OF "A" AND "B" LEGS

1. Check with buttinski to ensure that line is not in use.
2. Switch meter to VOLTS position.
3. Connect red lead to earth (lead cable sheath, earth tag of pillar or cabinet, or test probe inserted in moist ground).
4. Tap black lead on each leg of pair. When "A" leg is tested, meter will read zero volts unless it has foreign battery on it. "B" leg will read approx. 50 volts if it has continuity to exchange or zero volts if it is open circuit. A reading below 45 volts indicates either foreign battery or an earth fault on the "B" leg.



TESTING FOR EXCHANGE BATTERY AND CONTINUITY

5. If "B" leg has continuity connect black lead to "B" leg and tap red lead on "A" leg. The meter will read about 50 volts if the "A" leg is continuous to exchange or is earthed and zero volts if it is open circuit. If it is suspected that the "A" leg is earthed in the cable have it opened at the exchange and repeat test - a 50 volt reading indicates an earth fault.
6. If "B" leg is faulty, connect the red lead to earth and the black lead to "A" leg. If meter reads zero volts there is no foreign battery on the "A" leg. Switch meter to MEGOHMS. An almost full scale deflection indicates that the "A" leg has continuity to exchange while no deflection indicates that the "A" leg is open circuit.
7. Return switch to VOLTS position after testing.

BEWARE - CONTACT WITH THE LIVE CONDUCTORS OF A POWER CABLE CAN CAUSE SERIOUS INJURY OR DEATH.

LINES TEST SET NO. 1 - TESTING DIRECT EXCHANGE LINES

TESTING FOR FOREIGN BATTERY - "COUNTRY SIDE"

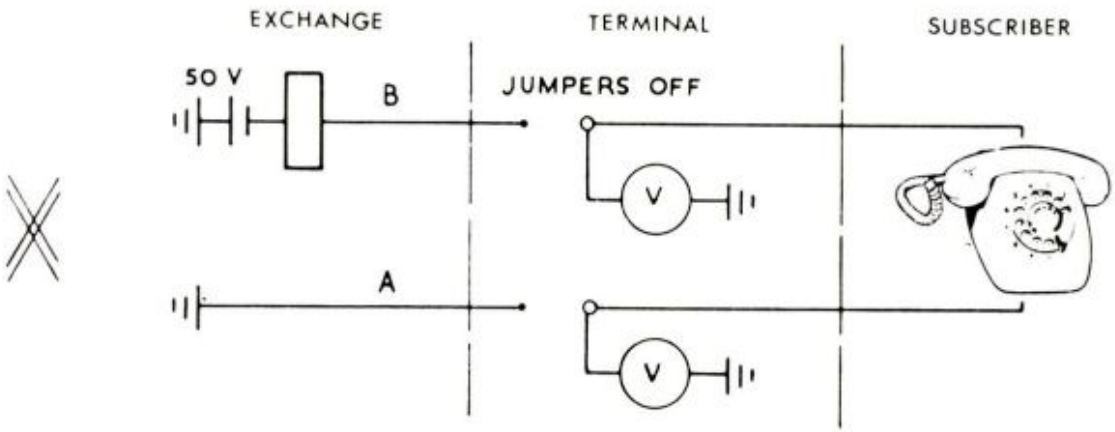
1. Remove exchange battery by opening both legs of the pair at the point of test.

2. Connect each leg to earth for a few seconds to discharge telephone capacitor.

3. Switch meter to VOLTS position.

4. Connect red lead to earth.

5. Connect black lead to the country side "A" leg than to the "B" leg. The meter reading indicates the foreign battery voltage on each leg. If the reading is zero on both legs of the pair there is no foreign battery present on the country side of the test point.

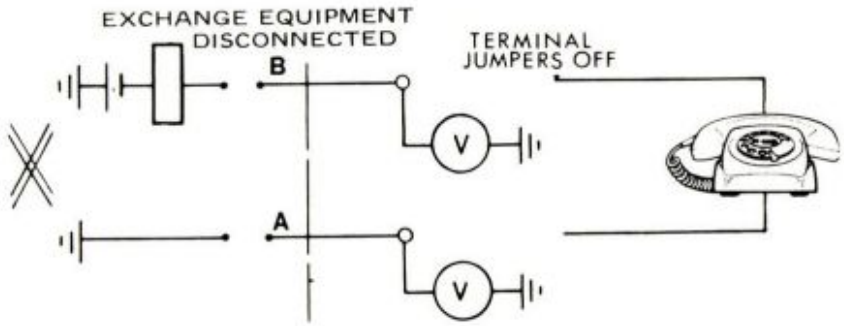


TESTING FOR FOREIGN BATTERY ON COUNTRY SIDE OF TEST POINT

LINES TEST SET NO. 1 - TESTING DIRECT EXCHANGE LINES

TESTING FOR FOREIGN BATTERY-EXCHANGE SIDE

1. Open both legs of pair at test point and arrange for exchange staff to remove links or fuses from the pair at the MDF.
2. Switch meter to VOLTS position.
3. Connect red lead to earth.
4. Connect black lead to exchange side "A" leg then to "B" leg.
   The meter reading shows the foreign battery voltage on each leg. If the reading is zero there is no foreign battery on the exchange side of the test point.



TESTING FOR FOREIGN BATTERY - EXCHANGE SIDE OF TEST POINT

TESTING INSULATION RESISTANCE - EXCHANGE SIDE

Note. Do not make this test if any foreign battery has been detected on the pair.

1. Open both legs of pair at test point and at exchange.
2. Switch meter to MEGOHMS position.
3. Connect one lead to each leg of the pair. The reading obtained is the insulation resistance between legs. Almost full scale deflection indicates a short circuit.

(Note. When the leads are connected to very long lines the meter pointer may momentarily deflect part way across the scale due to the "capacitance" of the cable pair. This may be ignored.)

4. Test each leg separately to earth to determine its insulation resistance to earth.
5. Return meter switch to VOLTS position on completion of test.

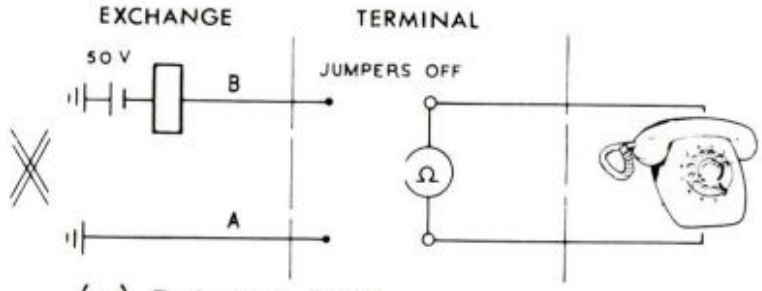
ONLY BY WORKING SAFELY TODAY CAN YOU BE SURE THAT YOU WILL BE ABLE TO WORK TOMORROW.

LINES TEST SET NO. 1 - TESTING DIRECT EXCHANGE LINES

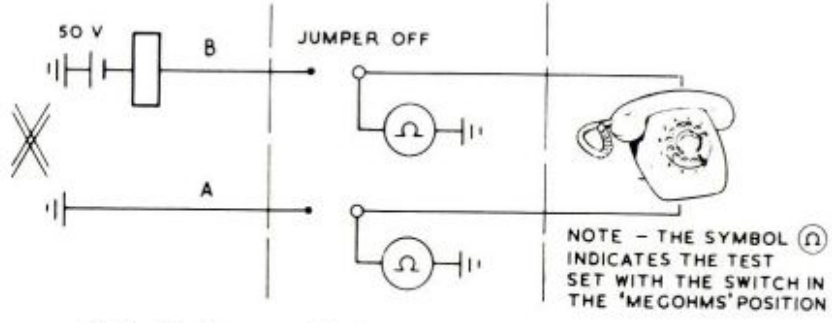
TESTING INSULATION RESISTANCE - COUNTRY SIDE

(Note. Do not make this test if any foreign battery has been detected on the pair.)

1. Switch meter to MEGOHMS.
2. Connect one lead to each leg of pair. As the second lead is connected a momentary, almost full scale deflection will occur if the line is continuous to the telephone. This is due to the testing voltage charging the capacitor in the telephone. After this deflection, the steady reading indicates the insulation resistance between legs. If no or only slight deflection is observed the pair is open circuit in one or both legs between the test point and the phone. If near full scale deflection is maintained the pair is shortcircuited. To confirm the test switch back to VOLTS, wait five seconds for capacitor to discharge, return switch to MEGOHMS and watch for the deflection.



(a) Between Legs



(b) "A" and "B" Legs to Earth

TESTING INSULATION RESISTANCE-COUNTRY SIDE

3. Test each leg separately to earth to determine its insulation resistance to earth.

(Note. In some cases, particularly with plastic cable, the fault condition tends to diminish due to polarisation and may even disappear if the test voltage (30V.DC) is left on for a minute or two. If the meter leads are reversed the effects of polarisation will disappear for a short time. Take the meter reading approximately 10 seconds after connection of leads.)

LINES TEST SET NO. 1 - TESTING SPARE PAIRS

TESTING FOR FOREIGN BATTERY

Test may be made either towards exchange or country side of pair.

1. Switch meter to VOLTS position.
2. Connect red lead to earth.
3. Connect black lead to "A" leg then to "B" leg.
   The meter reading indicates the foreign battery voltage on each leg.

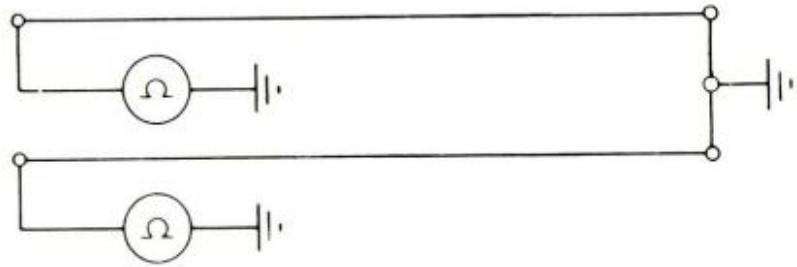
INSULATION RESISTANCE. (SHORT CIRCUIT AND EARTH TESTS).

This test must not be made if foreign battery has been detected on the pair.

1. Switch meter to MEGOHMS.
2. Connect one lead to each leg of the pair. Reading shows insulation resistance between legs which should be greater than 1 megohm. An almost full scale deflection indicates a short circuit.
3. Test each leg separately to earth to measure its insulation resistance to earth which should be at least 1 megohm.

CONTINUITY TEST

1. Connect both legs to earth at far end.
2. Switch to MEGOHMS.
3. Connect red lead to earth.
4. Connect black lead to "A" leg then to "B" leg. Full scale deflection indicates leg is continuous, no deflection indicates open circuit.
5. Return meter to VOLTS position on completion of test.



TESTING SPARE PAIRS FOR CONTINUITY.

A.P.R. AUTOMATIC SUBSCRIBERS LINE TESTER

APPLICATION - This equipment is installed at certain automatic exchanges to enable telephones and line conditions to be tested from the Subscriber's end without the services of a Telecommunication Technical Officer.

TESTING NEW TELEPHONE SERVICES
- For most installations it will only be necessary to test the insulation resistance of the line to earth and between legs (Tests 1, 2 and 3). A check of the bell operation is obtained during these tests.
- Where 300 or 400 Type telephones are installed test the loop resistance of the line to determine whether a resistor should be fitted (Test No. 4).

OPERATION OF A.P.R.
- Access to A.P.R. testing equipment is obtained by dialling the special number allotted to the particular exchange.
- It is only necessary to obtain access to the A.P.R. tester once. All subsequent tests may be made by dialling the code digit for that test.
- Tests Nos. 1-7 are listed on the following pages. THESE TESTS MAY BE PERFORMED IN ANY ORDER OR INDEPENDENT OF EACH OTHER WITHOUT THE NEED TO RELEASE THE TESTER.

TO OBTAIN ACCESS TO A.P.R. TESTER:

(i) Dial access code number for particular exchange:
  (a) If the tester is free, Ring Tone is heard immediately. Proceed with Step (ii).
  (b) If no tone is heard immediately, WAIT for Busy Tone (max. 55 seconds) then hang up, and dial again.
  (c) If while waiting for Busy Tone the tester becomes free, Ring Tone will be heard. Proceed with Step (ii).

(ii) Hang up and wait for the phone bell to ring (about 4 seconds).

(iii) Lift receiver on ring back. If A.P.R. tone (900 Hz) is heard the circuit is ready for testing to proceed (See Tests 1-7).

EST NO. 1 - INSULATION OF "A" LEG TO EARTH:

(i) Dial 5 - Listen for Busy Tone.
(ii) Hang up - Wait for phone bell to ring.
(iii) Lift receiver on ring back.
(iv) Listen to Tone - Dial Tone = Line OK. (Insulation Resistance over 1 megohm).
- NU Tone = Line Faulty. (Insulation Resistance 0.5-1 megohm).
- Ring Tone = Line Faulty. (Insulation Resistance under 0.5 megohm).

TEST NO. 2 - INSULATION OF "B" LEG TO EARTH:

(i) Dial 6 - Listen for Busy Tone.
(ii) Continue as for Test No. 1, Steps (ii), (iii) and (iv).

TEST NO. 3 - INSULATION RESISTANCE BETWEEN "A" AND "B" LEGS:

(i) Dial 7 - Listen for Busy Tone.
(ii) Continue as for Test No. 1, Steps (ii), (iii) and (iv).

TEST NO. 4 - LINE LOOP RESISTANCE:

(i) Dial 8.
(ii) Listen to tone - NU Tone = Line OK.
- Dial Tone = Loop resistance too high (note on Tel. Order).
- Ring Tone = Loop resistance 200 ohms or less. (Fit resistor in 300 and 400 Type telephones).

TEST NO. 5 - DIAL SPEED TEST:

(i) Dial 1 then 0 .

(ii) Listen to tone - NU Tone = Dial speed OK.
- Dial Tone = Dial fast (Replace instrument).
- Ring Tone = Dial slow (Replace instrument).

TEST NO. 6 - BELL OPERATION TEST (FULL VOLTAGE):

(i) Dial 3 - Listen for Busy Tone.

(ii) Hang up - Ringing commences in 4-5 seconds.

(iii) Lift receiver to stop ringing.

TEST NO. 7 - BELL OPERATION TEST (HALF VOLTAGE):

(i) Dial 4 - Listen for Busy Tone.

(ii) Continue as for Test No. 6, Steps (ii) and (iii).

RELEASING A.P.R. TESTER:

(i) After completing any test, replacing the handset without dialling another Test digit will release the A.P.R. tester after approximately 3 minutes.

(ii) Failure to lift the handset on ringback during any test will release the A.P.R. tester after approximately 3 minutes.

(iii) If the A.P.R. tester is unintentionally released due to (i) or (ii), access to A.P.R. must again be obtained before making further tests.

S.A.L.T. SUBSCRIBERS AUTOMATIC LINE TESTER

APPLICATION - This equipment is installed at certain automatic exchanges to enable telephones and line conditions to be tested from the subscribers end without the services of a Telecommunication Technical Officer.

TESTING NEW TELEPHONE SERVICES - For most installations it will only be necessary to test the insulation resistance of the line to earth and between legs (Test No. 1). A check of the bell operation is obtained during this test.

- Where 300 or 400 Type telephones are installed, check the loop resistance (Test No. 4) and if under 200 ohms fit a 330 ohm resistor.

OPERATION OF S.A.L.T. - Access to S.A.L.T. testing equipment is obtained by dialling the special number allotted to the particular exchange.

- It is only necessary to obtain access to the S.A.L.T. tester once. All subsequent tests may be made by dialling the code digit for that test.

- Tests Nos. 1-7 are listed on the following pages. THESE TESTS MAY BE PERFORMED IN ANY ORDER OR INDEPENDENT OF EACH OTHER WITHOUT THE NEED TO RELEASE THE TESTER.

TO OBTAIN ACCESS TO S.A.L.T. TESTERS:

(i) Dial access code number for particular exchange;

(a) If the tester is free, Ring Tone is heard immediately. Proceed with Step (ii).

(b) If no tone is heard immediately, WAIT for Busy Tone (max. 55 seconds) then hang up, and dial again.

(c) If while waiting for Busy Tone the tester becomes free, Ring Tone will be heard. Proceed with Step (ii).

(ii) Hang up and wait for the phone bell to ring (about 4 seconds).

(iii) Lift receiver on ring back. If dial tone is heard the circuit is ready for testing to proceed. (See Tests Nos. 1-7).

S.A.L.T. SUBSCRIBERS AUTOMATIC LINE TESTER

TEST NO. 1 - INSULATION TEST: (a) Of "A" and "B" Leg to Earth:
(b) Between "A" and "B" Legs:

(i) Dial 5 - Listen for Ring Tone.
(ii) Hang up - Wait for phone bell to ring.
(iii) Lift receiver on ring back.
(iv) Listen to Tone - 900 Hz Tone = Line OK. (Insulation Resistance over 1 megohm).
- Busy Tone = Line Faulty. (Insulation Resistance 0.5-1 megohm).
- NU Tone = Line Faulty. (Insulation Resistance 0.5 megohm).

TEST NO. 2 - INSULATION TEST OF "A" AND "B" LEG TO EARTH:

(i) Dial 6 - Listen for Ring Tone.
(ii) Continue as for Test No. 1, Steps (ii), (iii) and (iv).

TEST NO. 3 - INSULATION TEST BETWEEN "A" AND "B" LEGS:

(i) Dial 7 - Listen for Ring Tone.
(ii) Continue as for Test No. 1, Steps (ii), (iii) and (iv).

TEST NO. 4 - LINE LOOP RESISTANCE TEST:

(i) Dial 8.
(ii) Listen to tone - 900 Hz Tone = Line OK.
- Busy Tone = Loop resistance too high.
- NU Tone = Loop resistance 200 ohms or less.
(Check for resistor in 300 and 400 Type telephones).

EST NO. 5 - DIAL TEST:

(i) Dial 1 then 0.
(ii) Listen to tone - 0.5 sec. Tone (900 Hz) then Ring Tone = Dial Pulse and Count OK.
- NU Tone = Pulses Faulty (Replace Dial).
- NO Tone = Count Faulty (Replace Dial).

TEST NO. 6 - BELL OPERATION TEST (FULL VOLTAGE):

(i) Dial 3 - Listen for Ring Tone.
(ii) Hang up - Ringing commences in 4-5 seconds.
(iii) Lift receiver to Stop ringing.

TEST NO. 7 - BELL OPERATION TEST (HALF VOLTAGE):

(i) Dial 4 - Listen for Ring Tone.
(ii) Continue as for Test No. 6, Steps (ii) and (iii).

RELEASING S.A.L.T. TESTER:

(i) After completing any test, replacing the handset without dialling another Test digit will release the S.A.L.T. tester after approximately 3 minutes.

(ii) Failure to lift the handset on ring back during any test will release the S.A.L.T. tester after approximately 3 minutes.

(iii) If the S.A.L.T. tester is unintentionally released due to (i) or (ii), access to S.A.L.T. must again be obtained before making further tests.

TELEPHONE NUMBERS

Exchange	Access No.	
	S.A.L.T.	A.P.R.
WHYALLA	100	
" JENKINS	199	
CROYDON	4606	
FRANKLIN	5106	
GEPPS CROSS	26206	
GLENUNGA	72	
NORWOOD	335	
PROSPECT	449916	
ST. PETERS	4206	
UNLEY	7436	

Name	Phone No.
WHYALLA F.D.C.	452900
TEST DESK	457900
CABLE ASS.	456291
LINE DEPOT	457039
" "	456217
LINE DEPOT (PRIVATE)	451476

RECORD OF S.A.L.T. AND A.P.R. TESTS.

CABLE PROTECTION AND MAINTENANCE

SECTION T – OPENING WORKING CABLES

REPAIRING CABLES

Issue 5, 1979

OPENING WORKING CABLES

Except in emergent conditions, e.g. cable breakdowns, cables carrying trunk or junction circuits and subscribers main cables 100 pair and larger should not be opened without **prior** instruction or approval from an Engineer or Technical Officer. A Works Authority **may** be taken as authority to open cable joints necessary for completion of that work.

Major trunk cables, including coaxial cables and lead-in cables carrying multi-channel carrier circuits must not be opened without the direct authority of the responsible Engineer or Technical Officer.

AUTHORITY TO OPEN ~~GAS~~ AIR FILLED CABLES.

Do not open cables which are under ~~gas~~ air pressure without prior approval from the officer responsible for the maintenance of ~~gas~~ air pressure alarm systems.

If possible arrange for work of short duration (1-2 days) to be carried out early in the week to allow sufficient time for repressurising the cable before the weekend.

To avoid frequent recharging of the cable with air which can cause fatigue cracks in the sheath and joints, complete all forseeable work on the cable while pressure is removed.

Air pressure must never be left off a major trunk or coaxial cable except in cases of emergency and when work is actually being performed on the cable.

Immediately work has been completed arrange for the cable to be recharged with air.

SAFETY PRECAUTIONS.

Do not attempt to remove a sleeve from a joint while pressure remains in the cable.

To release pressure, remove the Schrader valve or flange screw from the closest test point to the joint being opened. Where there is no test point readily available, make a small cut in the sleeve with a hack knife before applying any heat. Air pressure in the cable at the point where the sleeve is being removed is thus quickly reduced and the possibility of spraying molten metal or causing a fire in the joint is considerably reduced.

PRECAUTIONS BEFORE OPENING CABLES.

Obtain from the Cable Assigner details of any important circuits, Fire Alarm lines, data circuits etc. which may be affected by the work. (This information will normally be shown on Forms E94 and E95 where rearrangements of transfers are involved).

Advise the exchange Technician of the proposed work and the circuits which will be affected. Where necessary arrange for the subscriber or officer to be notified, e.g. Fire Alarms.

PRECAUTIONS DURING JOINTING OPERATIONS.

Do not make alterations to working pairs other than those shown on transfer sheets without obtaining prior approval and consulting the Cable Assigner.

Make sure spare pairs are clear of faults before cutting them into working circuits.

Make transfers wire by wire to avoid reversing the two legs of a pair. Faults will be caused if the 'A' and 'B' legs of pairs carrying Public Telephones, Junction, Trunk or special circuits are reversed. Circuits of this nature will be indicated on Forms E94 and E95.

Before cutting wires make sure that a conversation is not in progress.

Arrange for each working line to be tested by the exchange test desk as soon as possible after making alterations.

Bond lead cable sheaths across the sheath opening before removing the sleeve, for protection against electric shock and to ensure that electrolytic protection is maintained and any earth return circuits are not interrupted.

Where work on a joint is incomplete at the end of the day adequate precautions must be taken to prevent moisture entering the joint. Fit a temporary lead sleeve on all trunk and junction cables and in all cases where there is any possibility of the manhole being flooded. Use rubber bandages in safe locations only and for no longer than a single night unless special approval is given by the Engineer or Technical Officer.

On completion of plumbing, pressure test joints in cables 100 pairs and over or cables containing trunks or junctions.

REPAIRING CABLES

Linemens handbook - Line Faults, is now available and deals service restoration and plant repair work. The handbook provides techniques for fault localization and repair practices currently in use.

HUNTER

THERMOFIT WRAPAROUND REPAIR SLEEVES

For CABLE PRESSURISATION AND ALARM SYSTEMS, and CABLE JOINTING N°1 these pages are new additions.

For LINE FAULTS replace existing pages H1 to H10 with these pages.

ONLY BY WORKING SAFELY TODAY CAN YOU BE SURE THAT YOU WILL BE ABLE TO WORK TOMORROW.

Issue 1 1983

THERMOFIT WRAPAROUND REPAIR SLEEVES

GENERAL

Wraparound Repair Sleeves (WRS) (see Fig. 1) are used to repair moisture barrier

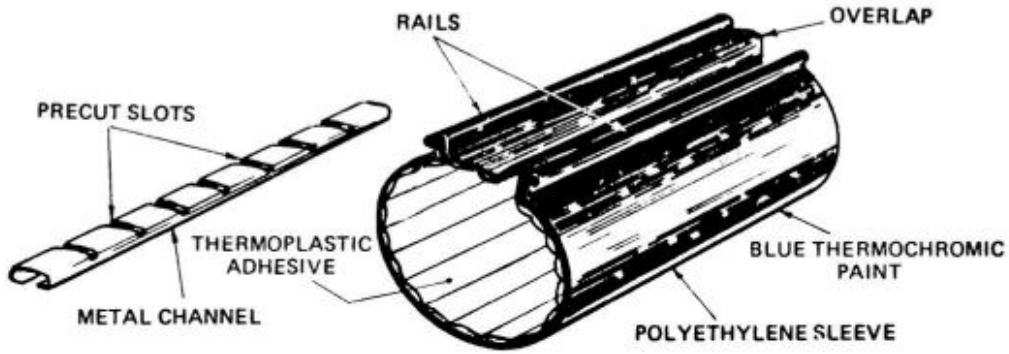


FIG. 1 : THERMOFIT WRAPAROUND REPAIR SLEEVE

or lead sheathed cables. Tables 1, 2 & 3 should be used as a guide to the required size of WRS for various cable sizes. If in doubt about the correct size of WRS required, measure the cable or sleeve and select the largest sleeve which will shrink down on to the cable (see Columns 4 and 5). The sleeve must be a loose fit over the cable in all cases as too tight a fit can result in splitting of the material during the shrinking process.

WHEN USING A LADDER SECURE THE BOTTOM AGAINST SLIPPING. TIE THE HEAD OF THE LADDER TO THE POLE.

THERMOFIT WRAPAROUND REPAIR SLEEVES

GENERAL (Continued)

SERIAL ITEM	PART N°	SIZE	CABLE DIAMETER	CABLE CIRCUMFERENCE
433/215	WRST 34-10	A	10 to 20mm	31 to 63mm
433/216	WRST 50-15	B	20 to 35mm	63 to 110mm
433/217	WRST 76-22	C	35 to 55mm	110 to 173mm
433/218	WRST 139-38	D	55 to 100mm	173 to 314mm

TABLE 1 THERMOFIT WRAPAROUND REPAIR SLEEVE SIZES

NOTE: The WRS material is supplied in 1.5m lengths with metal channel in 760 mm lengths.

THERMOFIT WRAPAROUND REPAIR SLEEVES

PREPARING CABLE FOR WRAPAROUND REPAIR SLEEVES

Before fitting WRS prepare the sheath as follows:

Moisture Barrier Sheath

(i) Clean sheath over sleeve area with methylated spirits and wipe dry.

(ii) If sheath has been damaged trim away any projections.

(iii) Lightly abrade sheath with a length of emery cloth tape over the area to be covered by the sleeve. Apply emery cloth around the circumference of the cable, not longitudinally along its length.

(iv) Apply aluminium tape around the cable sheath, at outer ends of cleaned sections, so approx 10mm of each tape width will be covered by WRST.

Lead Sheath or Lead Joint Base

(i) Lightly abrade lead with emery cloth tape to remove oxide and dirt.

(ii) Wipe clean and dry.

Polythene Jacketed Lead Sheath

(i) For repair of polythene jacket only, prepare cable as described for moisture barrier sheath above.

(ii) Where the lead sheath has been damaged, trim away damaged polythene jacket and repair lead sheath by plumbing. Clean polythene jacket and lead sheath thoroughly as described above.

THERMOFIT WRAPAROUND REPAIR SLEEVES

FITTING WRS ON PRESSURISED CABLES

WRS cannot be applied over a leak in a pressurised cable

Cables under air pressure must be vented and bled to zero pressure before and during application of the sleeve. The thermoplastic adhesive solidifies in 15 minutes and air pressure may then be restored to the cable.

LPG BURNER FOR SHRINKING WRS

Use only a special "soft flame" LPG burner for shrinking WRS. Plumbing type burners are unsuitable for use with thermoshrinkable tubing as the flame is too concentrated and may damage the material.

FITTING WRAPAROUND REPAIR SLEEVE

(i) Select a WRS of the size required (see Tables 1, 2 and 3).

(ii) Cut WRS to length allowing 150 mm overlap beyond the point to be sealed. Thus minimum length will be 300 mm, which is the correct length to use when repairing a nail hole in the sheath.

Cut WRS cleanly with no ragged edges using scissors, metal shears or a sharp knife and straight edge. Make the cut square with the sides of the WRS so that the rails coincide when the material is folded.

(iii) Break the metal channel by flexing at the desired point so that it overlaps the WRS by 2 to 6 mm at each end. After breaking, the channel will have two rough protrusions at the end which must be cut off and the edges dulled with a file before sliding the channel onto the WRS.

THERMOFIT WRAPAROUND REPAIR SLEEVES

FITTING WRAPAROUND REPAIR SLEEVE (Continued)

(iV) Apply soft flame lightly to cleaned and abraded sheath areas. Do not 'flame' sheath beyond aluminium tapes.

(V) Wrap WRS around the cable with the rails on top (see Fig. 2). The overlap section should face the jointer to ensure that this area will receive sufficient heat when shrinking the sleeve.

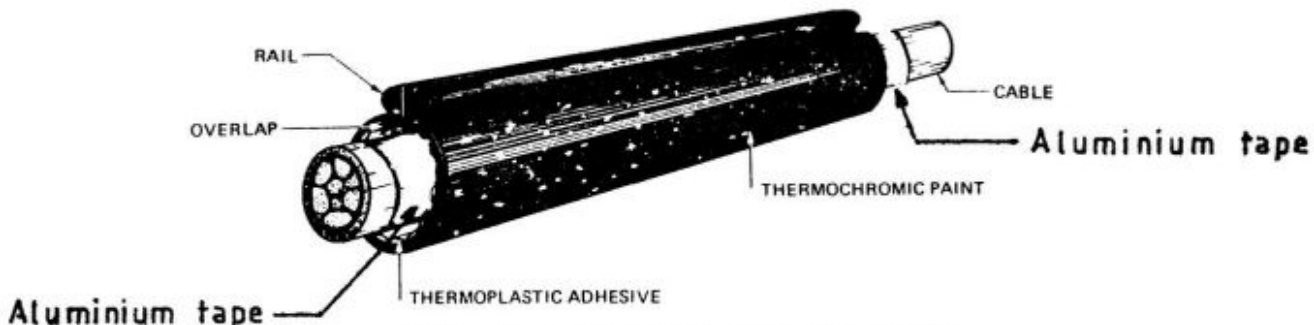


FIG. 2 : FITTING WRS ON CABLE

(Vi) Place rails together so that they are flush and aligned at ends.

(Vii) Slide a length of closure channel over the WRS rails (see Fig. 3) to hold the sleeve together. The channel should extend 2 to 6 mm beyond each end of the sleeve.

PROTECT CABLE CONDUCTORS AGAINST CONTACT WITH MOIST MANHOLE WALLS.

THERMOFIT WRAPAROUND REPAIR SLEEVES

FITTING WRAPAROUND REPAIR SLEEVE (Continued)

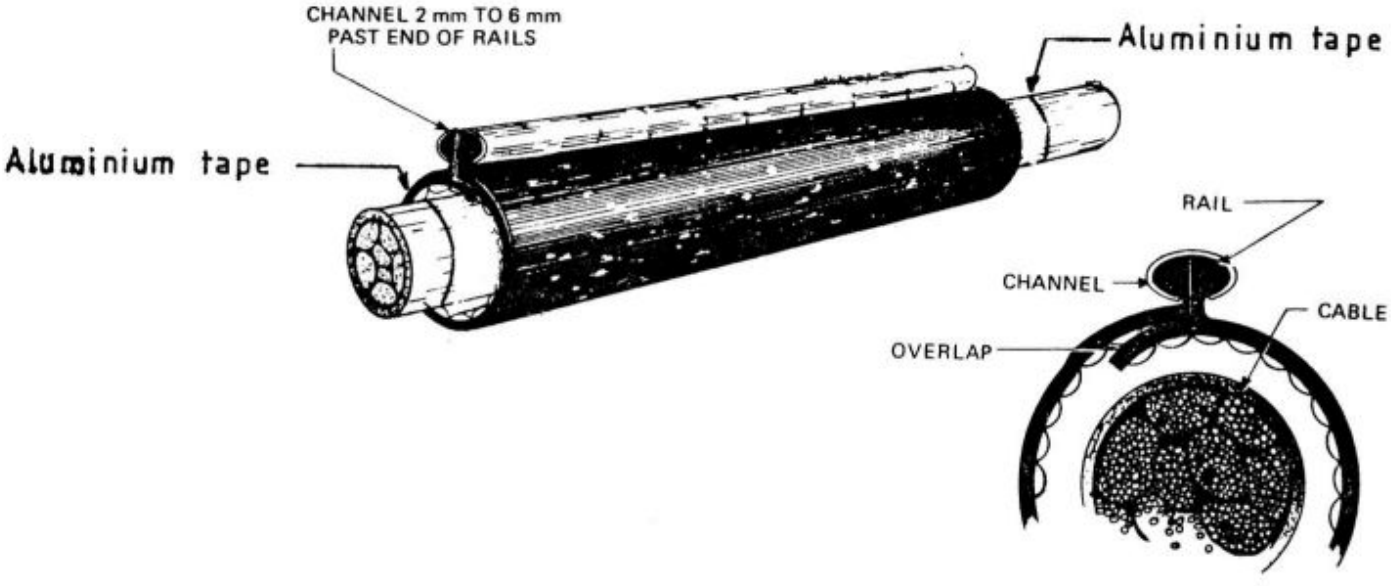


FIG. 3 : FITTING CLOSURE CHANNEL

(Viii) To joint two short lengths of channel, fit short channels over rails leaving a 10 mm gap at the center (see Fig. 4). Place a 125 mm Retaining Clip centrally over the gap and snap tightly over the channel with a light tap.

THERMOFIT WRAPAROUND REPAIR SLEEVES

FITTING WRAPAROUND REPAIR SLEEVE (Continued)

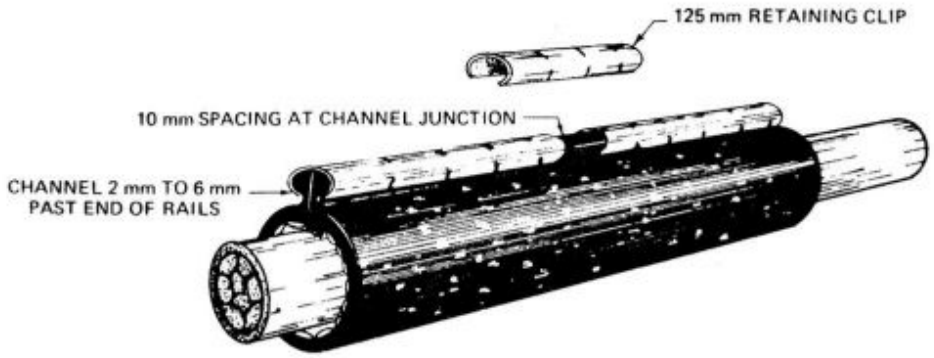


FIG. 4 : JOINTING TWO SHORT LENGTHS OF CHANNEL

(iX) Heat WRS with a soft flame (i.e.,predominantly yellow) to shrink it down on to the cable and to melt the thermoplastic adhesive on its undersurface. Use only the special soft flame LPG burner for this purpose.

Heat the WRS with an oscillating motion (see Fig. 5) of the flame keeping the yellow portion of the flame on the tubing and moving it

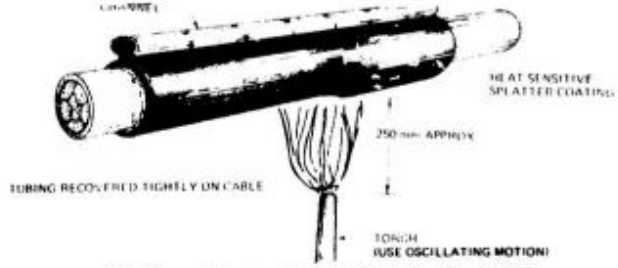


FIG. 5 : SHRINKING WRS

THERMOFIT WRAPAROUND REPAIR SLEEVES

FITTING WRAPAROUND REPAIR SLEEVE (Continued)

continually to ensure an even distribution of the heat. Start heating at one end of the WRS and work towards the other end of the sleeve. Do not heat the sleeve from both ends towards the center as this will create a trapped air bubble. Start at the bottom of the sleeve applying heat over all surfaces until shrinking occurs. Continue applying heat until the heat sensitive blue colour spots on the surface turn a light brown indicating the proper temperature has been reached and the thermoplastic adhesive has melted.

Wrinkles will develop between the heated and unheated parts of the sleeve as shrinking occurs. These will disappear when the sleeve has been heated to the correct temperature. Move flame back and forth and gradually work across the entire length of the sleeve. Apply more heat to areas where blue paint spots have not changed colour. Adhesive forced out of the ends of the sleeve indicates that heating can be discontinued.

The thermoplastic adhesive solidifies in approximately 15 minutes and the cable can then be placed under air pressure.

REMOVING WRAPAROUND REPAIR SLEEVE

Should it ever become necessary to remove a WRS sleeve or other thermoshrinkable tubing proceed as follows:

(i) Release any air pressure in the cable.

THERMOFIT WRAPAROUND REPAIR SLEEVES

REMOVING WRAPAROUND REPAIR SLEEVE (Continued)

(ii) Using a similar torch as for the installation, heat the entire length of the sleeve until the thermochromic paint spots turn brown indicating that sufficient heat has been applied to melt the adhesive. Care should be taken not to overheat the adhesive at the ends of the sleeve as it can catch alight.

(iii) Using a sharp knife cut the sleeve along its length over the overlapping section to minimise the possibility of damage to the cable sheath. Only light cutting pressure is needed as the sleeve will be softened by heating. The sleeve will now split along the length of the cut when further heat is applied.

(iv) By grasping the metal channel with pliers the sleeve can be peeled from the cable. If the adhesive has solidified in any places, removal will be impeded but a little more heat will remelt the adhesive allowing complete removal.

(v) Discard the old sleeve and metal channel.

A new sleeve may be readily applied over the original area if required. Any adhesive already on the cable will melt and blend into the adhesive of the new sleeve when heat is applied. If the cable has been handled it should first be cleaned with methylated spirits.

NOTE: The thermochromic paint on WRS will change back to a blue colour by absorbing moisture from the air, and on cold, wet days this can take place in as little as 30 minutes.

WRST Heat Shrink Sleeve

[redacted]ABLE N°2

Sleeve Sizes for Various Cable Sizes

	PIUT																APIUT					
N° of Pairs	0·32mm				0·40mm				0·64mm				0·90mm				0·52mm		0·81mm		1·15mm	
	UA	PJ	MB	PEMB	UA	PJ	MB	PEMB	UA	PJ	MB	PEMB	UA	PJ	MB	PEMB	MB	PEMB	MB	PEMB	MB	PEMB
6	-	-	-	-	-	-	-	-	A	-	-	-	A	-	-	-	-	-	-	-	-	-
10	-	-	-	-	A	A	-	A	A	A	-	A	A	B	-	B	-	-	-	-	-	-
20	-	-	-	-	A	A	-	A	A	B	-	B	B	B	-	B	-	-	-	-	-	-
30	-	-	-	-	A	A	-	B	A	B	-	B	B	B	-	B	-	-	-	-	-	-
50	-	-	-	-	A	B	-	B	B	B	-	B	B	C	B	C	-	-	-	-	-	-
[redacted]	-	-	-	-	A	B	-	B	B	B	-	B	B	C	C	C	-	-	-	-	-	-
100	-	-	-	-	B	B	B	B	B	B	B	B	C	C	C	C	B	-	C	-	C	-
150	-	-	-	-	B	B	B	B	B	C	C	C	C	C	C	C	B	C	C	C	D	D
200	-	-	-	-	B	B	B	B	C	C	C	C	C	D	D	D	B	C	C	C	D	D
300	-	-	-	-	B	C	B	C	C	C	C	C	D	D	D	D	C	C	D	D	D	D
400	-	-	-	-	C	C	C	C	C	D	C	D	D	D	D	D	C	C	D	D	D	D
600	B	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	C	D	D	D	-	-
800	-	-	-	-	C	D	C	D	D	D	D	D	-	-	-	-	D	D	D	D	-	-
1000	-	-	-	-	C	D	D	D	D	D	D	D	-	-	-	-	D	D	-	-	-	-
1200	C	C	C	C	D	D	D	D	D	D	D	D	-	-	-	-	D	D	-	-	-	-
1400	-	-	-	-	D	D	D	D	-	-	-	-	-	-	-	-	D	D	-	-	-	-
1500	-	-	-	-	-	-	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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[redacted]0	-	-	-	-	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2400	D	D	D	D	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2700	-	-	-	-	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3000	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3600	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4200	D	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Cable Pressurisation and Alarm Systems G20(S)
Cable Jointing N°1 T16(S)
Line Faults H12(S)

WRST Heat Shrink Sleeve

TABLE N°3

Sleeve Sizes for Various Cable Sizes

	PIQL												PEIUQ			CPEIUT			PEIUT				CPFUT		
	0·51mm			0·64mm			0·90mm			1·27mm			0·40	0·64	0·90	0·40	0·64	0·90	0·32	0·40	0·64	0·90	0·40	0·64	0·90
	UA	PJ	MB	UA	PJ	MB	UA	PJ	MB	UA	PJ	MB	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
6	-	-	-	-	A	-	A	A	-	A	-	-	-	-	A	-	-	-	-	-	A	A	-	A	A
10	-	-	-	A	A	-	A	A	-	A	-	-	-	A	A	-	-	-	-	-	A	A	-	A	A
20	A	-	-	A	A	-	A	B	-	B	-	-	A	A	A	-	-	-	-	A	A	A	A	A	B
30	-	-	-	A	A	-	A	B	-	-	-	-	A	A	B	-	-	-	-	A	A	B	A	B	B
50	-	-	-	A	B	-	B	B	-	-	-	-	A	B	B	-	-	-	-	A	B	B	A	B	B
70	-	-	-	B	B	-	B	B	-	-	-	-	A	B	B	-	-	-	-	A	B	C	A	B	C
100	B	-	-	B	B	-	B	C	-	C	-	-	B	B	C	-	-	-	-	B	B	C	B	B	B
150	B	-	-	B	B	B	C	C	C	C	-	-	-	-	-	-	-	C	-	-	-	-	-	-	-
200	B	-	-	B	C	B	C	C	C	D	-	-	B	C	C	B	C	D	-	B	C	D	-	-	-
300	B	-	-	C	C	C	C	D	C	-	-	-	B	C	D	B	C	D	-	C	C	D	-	-	-
400	C	-	-	C	C	C	D	D	D	-	-	-	C	C	D	C	C	D	-	C	D	D	-	-	-
500	C	-	-	C	C	C	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
540	-	-	-	-	-	-	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
600	C	-	-	C	D	C	D	D	D	-	-	-	C	D	D	C	D	-	-	C	D	-	-	-	-
800	C	-	-	D	D	D	-	-	-	-	-	-	C	D	-	C	D	-	-	C	D	-	-	-	-
1000	D	-	-	D	D	D	-	-	-	-	-	-	D	D	-	D	D	-	-	D	D	-	-	-	-
1100	-	-	-	D	D	D	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1200	D	-	-	D	D	D	-	-	-	-	-	-	D	D	-	D	D	-	-	D	-	-	-	-	-
1400	D	-	-	D	D	D	-	-	-	-	-	-	D	-	-	D	-	-	-	D	-	-	-	-	-
1500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	D	-	-	-	-	
1800	D	-	-	-	-	-	-	-	-	-	-	-	D	-	-	D	-	-	-	D	-	-	-	-	
2100	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	D	-	-	-	D	-	-	-	-	
2400	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	D	-	-	D	D	-	-	-	-	-
2700	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	D	-	-	D	-	-	-	-	-	-
3000	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	D	-	-	-	-	-	-
3600	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-
4200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	D	-	-	-	-	-	-

CABLE TERMINAL EQUIPMENT

SECTION U – CABLE TERMINAL BOXES AND BLOCKS

SECTION V – CABLE TERMINAL PILLARS

CROSS CONNECTING CABINETS

NOTE at all cabinets and pillars, all important circuits (this includes non-exchange (nex) services). Use blue/blue white switchboard wire (S 3/290) for jumpering, place a 15mm length of black plastic over each terminal tag.

Issue 5, 1979

CABLE TERMINAL BOXES

Serial/Item	Title	Cable Tail
77/76	Box Cable, 2 pair, Protected	2 pair PE cable.
77/81	Box Cable, 2 pair, Unprotected	Untailed.
77/78	Box Cable, 10 pair, Protected	10 pair PE cable
77/75	Box Cable, 10 pair, Unprotected	10 pair PE cable
77/79	Box Cable, 15 pair, Protected	15 pair PE cable
77/70	Box Cable, Carrier Trunk, Protected	24 pair 1.27 mm P.I.Q.C. cable Boxes assembled in Workshops as required.
77/82 83,84	Box Cable, 12 pair, Untailed	No cable tail fitted. Boxes assembled in field from Items 82, 83 and 84.
77/91	Washer, Insulation crushing	For maintenance use with 3 pair terminal strip (S.77/82) of Untailed Box.

CABLE TERMINAL BOXES - TYPES AND SIZES

Requisition arresters for protected boxes separately.
All tailed boxes are fitted with a cable tail 9 metres in length.
Pair sequence of cable tail is anticlockwise looking towards the cable box.
Use a 2 B A socket spanner (S.453/66) to tighten terminal nuts.

REGARD ALL POWER WIRES AND FITTINGS ON POWER POLES AS "LIVE" AND DO NOT TOUCH THEM.

TWO PAIR CABLE TERMINAL BOX - UNPROTECTED U-3

FIELD OF USE

The 2 pair unprotected terminal box is used for the following:

(i) On poles to connect one or teo aerial lines to underground cables.

(ii) At customers premises where bridle or drop wire or plastic lead-in cable cannot be extended to the telephone. Fit box at junction between indoor and outdoor cabling in a sheltered position readily accessible for testing.

The box is constructed of plastic and is supplied without a cable tail.

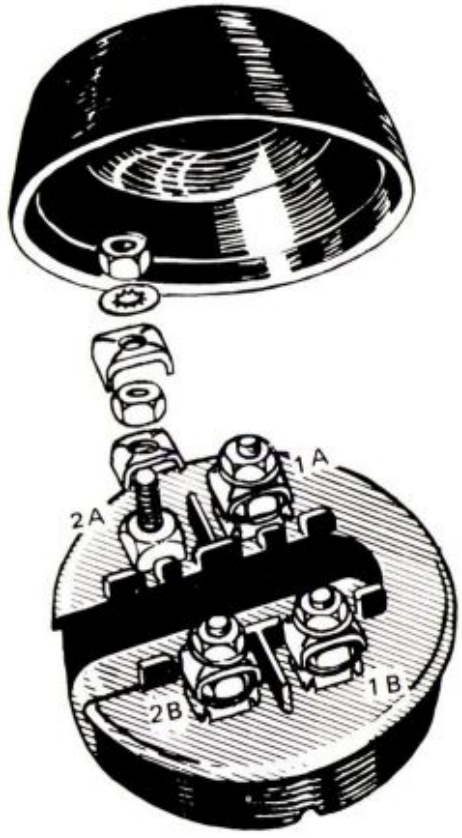
FITTING BOX

Attach box to wooden surfaces with two 25 mm × No 8 wood screws.

CONNECTING CABLE AND DROP OR BRIDLE WIRE

Insert cable conductor under the lower lipped washer without removing the insulation. Connection is made by crushing the insulation when the lower nut is tightened.

Remove 10 mm insulation from drop wire before terminating under the top lipped washer.

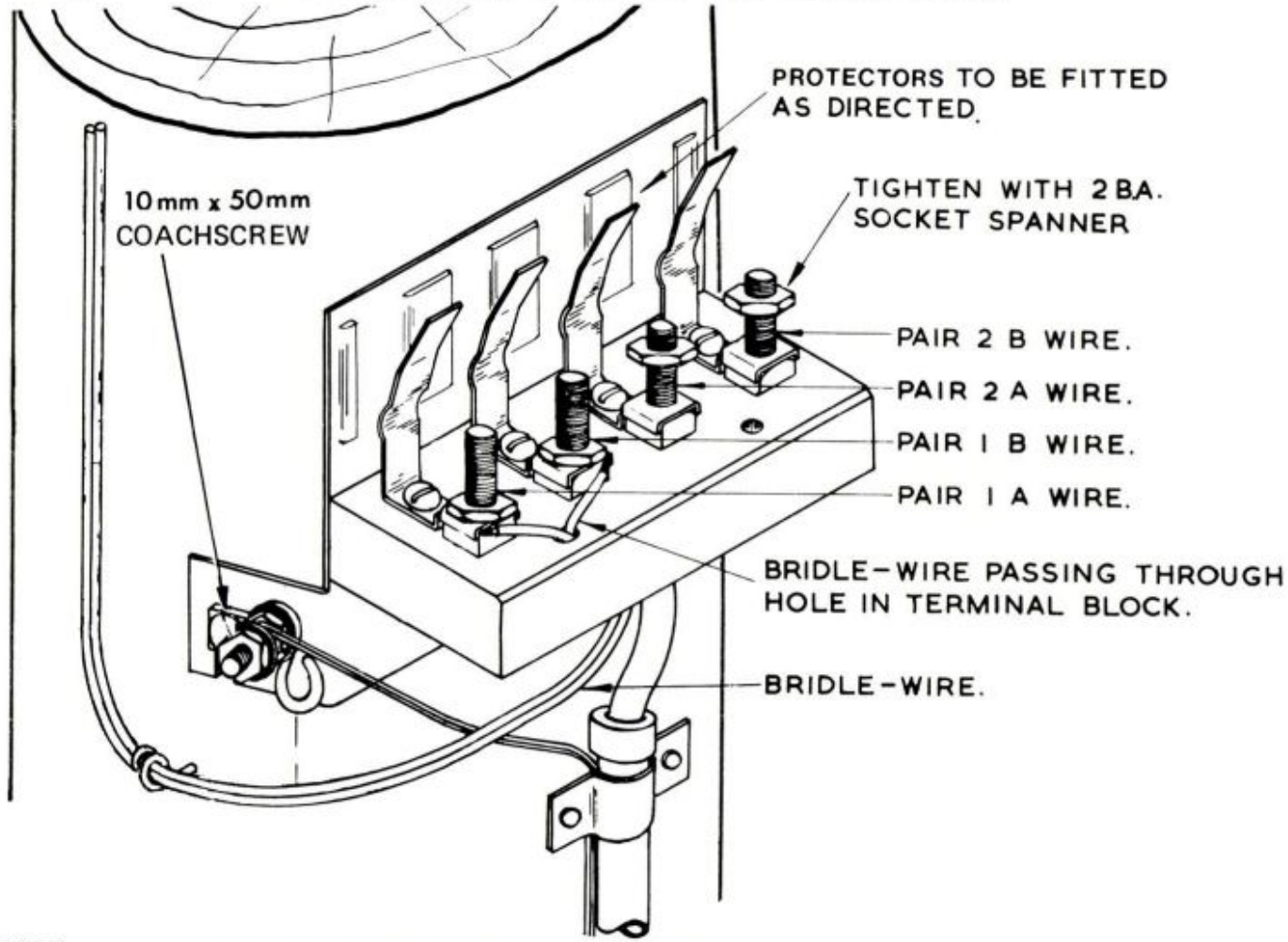


BOX CABLE 2 PAIR UNPROTECTED
(S.77/81)

Issue 5, 1979

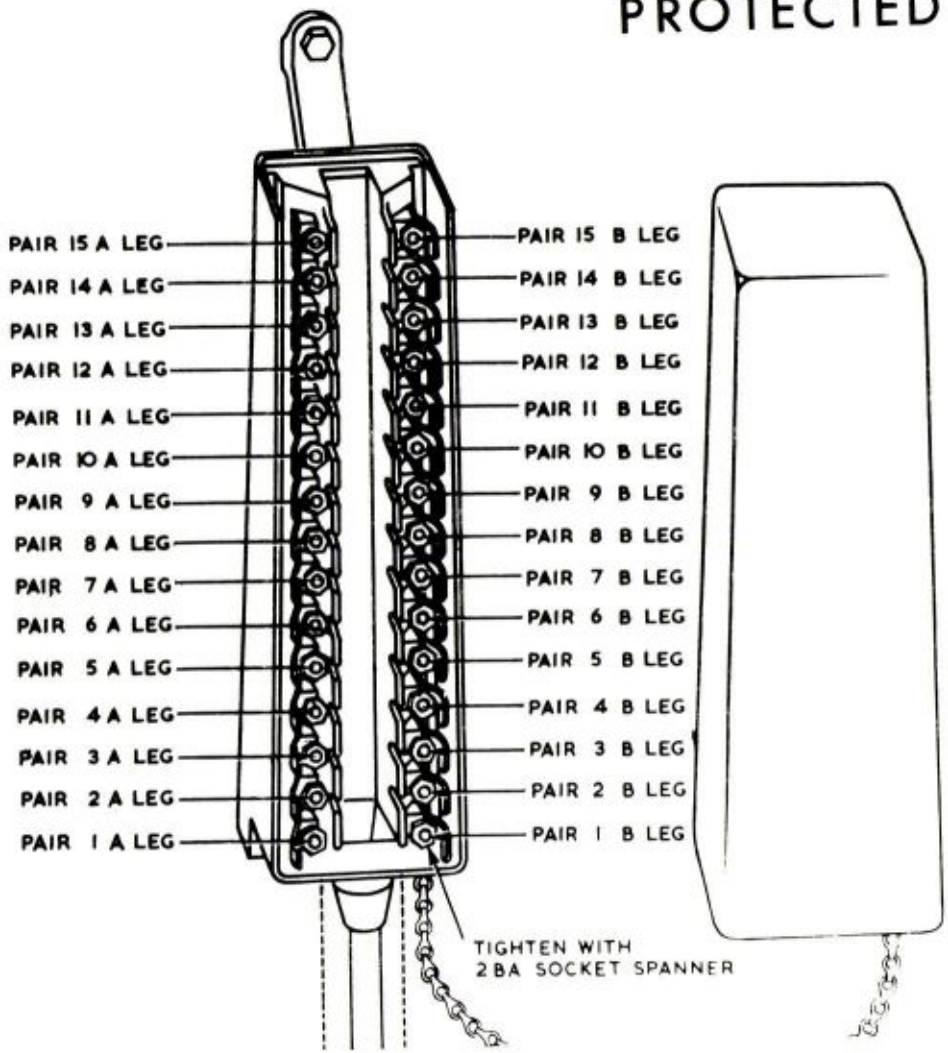
TWO PAIR CABLE TERMINAL BOX - PROTECTED

This box is supplied with a 2 pair plastic cable tail 9 metres in length. It is used on poles for the connection of one or two aerial lines.



BOX CABLE, TWO PAIR, PROTECTED - SERIAL 77/76.

10 AND 15 PAIR CABLE TERMINAL BOXES - PROTECTED



SAFETY PRECAUTIONS WHEN WORKING ON POLES

WHEN USING A LADDER SECURE THE BOTTOM AGAINST SLIPPING.

TIE THE HEAD OF THE LADDER TO THE POLE.

BEFORE CLIMBING ANY POLE EXAMINE AND TEST IT AND MAKE SURE THAT IT IS SAFE.

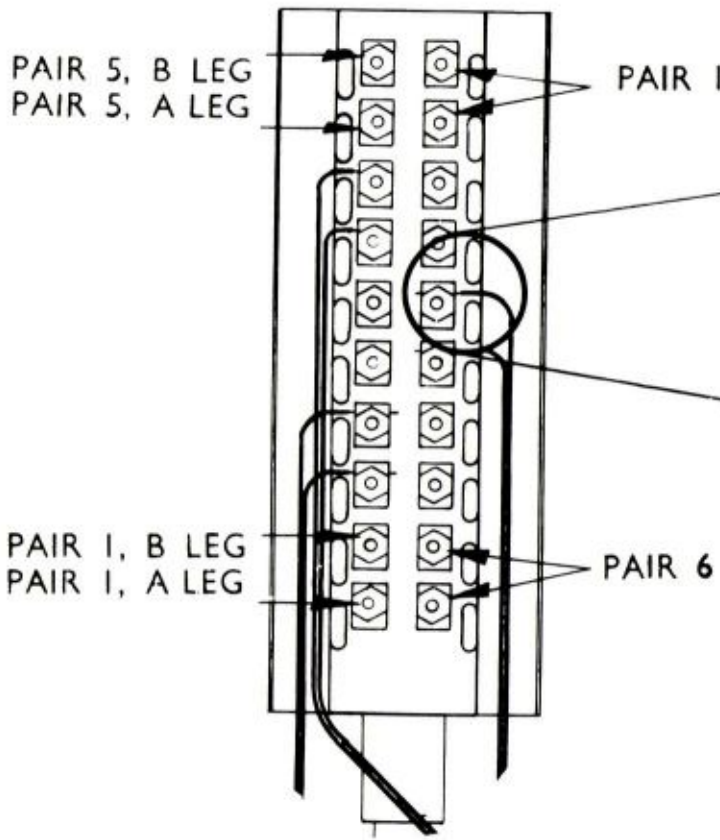
DO NOT CLIMB A CONDEMNED POLE (MARKED X OR XX) UNTIL IT HAS BEEN PROPERLY SUPPORTED.

ALWAYS WEAR A SAFETY BELT WHEN WORKING ALOFT.

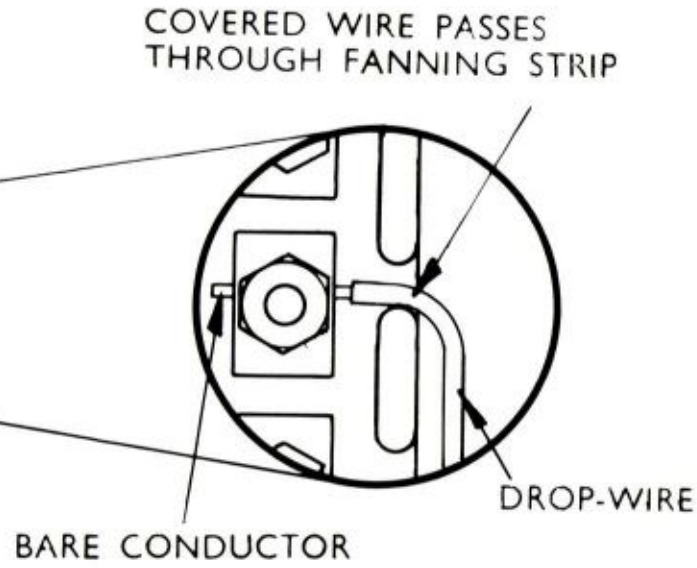
REGARD ALL POWER WIRES AND FITTINGS AS "LIVE" AND DANGEROUS.

TEN PAIR CABLE TERMINAL BOX - UNPROTECTED

The 10 pair unprotected terminal box (S.77/75) is similar in construction to the 10 pair protected box but the protector springs are omitted and the terminal arrangement is varied as shown below:



TERMINAL ASSEMBLY



BARE ABOUT 10mm OF CONDUCTOR, PLACE UNDER LIPPED WASHER AND TIGHTEN DOWN TERMINAL NUT WITH 2 BA SOCKET SPANNER

CONNECTING DROP WIRE

UNTAILED TERMINAL BOX

FIELD OF USE

The untailed terminal box is used with either underground or aerial plastic cable where protection is not required. The cable is terminated directly on three-pair terminal strips mounted in the box.

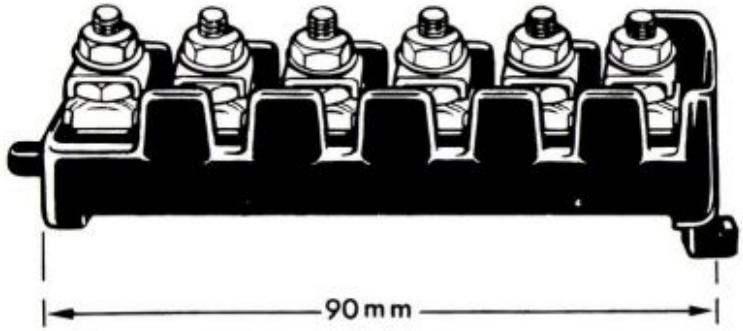
The box may also be used as an enclosure for jointing plastic cables on poles (see Page G-4). Some of the jointed pairs may be terminated.

In most installations the cable is looped through the box and some of the pairs terminated.

COMPONENTS

The box is assembled in the field using:

Frame, Untailed Box (S.77/83) - 1
Cover, Untailed Box (S.77/84) - 1
Strip, Untailed Box (S.77/82) - 1 to 4 depending upon the number of pairs to be terminated.



TERMINAL STRIP (S.77/82)

LOCATION OF BOX ON COMMISSION POLES

Underground Cable - approximately 3.56 m above gorund to the top bolt hole normally on the property side of the pole.

Aerial Cable - as close to the level of the cable as practicable (Above or below) and on the same side of the pole. (See Page H-2).

LOCATION OF BOX ON JOINT USE POLES

In accordance with the local agreement with the electricity authority. Normally installed on the property side of the pole. Boxes on underground cable are mounted approximately 3.56 m above ground, to the top bolt hole.

UNTAILED TERMINAL BOX

FITTING BOX TO POLE

.Underground cable is looped up and down each terminal pole through protecting PVC pipe so that the cable projects 700 mm above end of the pipe. Arrange free ends of cable similarly for entry into box for jointing.

.For aerial cables provide sufficient slack cable to loop into the box or for entry of free ends.

.Remove sheath of cable for 400 mm from the top of the loop or end of cables.

.Place a single turn of PVC tape around cable on the exchange side 200 mm from the sheath end.

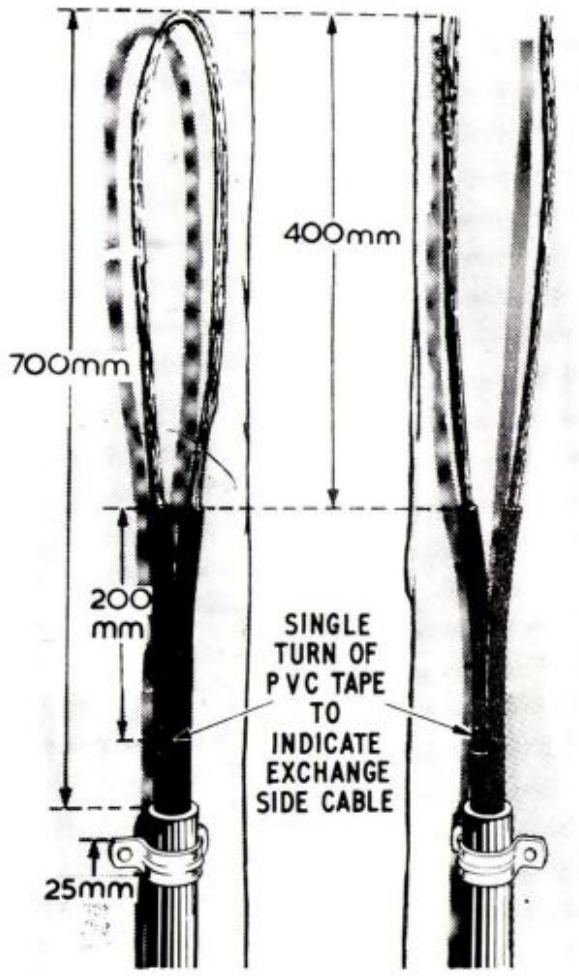
.Holding the frame on the cable with the top 20 mm below the end of the sheath, mark position for screws through holes in the mounting bracket.

.Attach the frame with two 10 mm x 50 mm coach-screws (treated poles) or 10 mm x 65 mm coach-screws (untreated poles).

.Attach cover chain with a galvanised clout (S.633/2) or a staple (S.633/14).

.Fit cable through slot in base of frame and secure it in position by binding it with scrap 0.64 mm or 0.90 mm insulated wire to the posts in the base and top horizontal cross-member so that the sheath protrudes 20 mm above the cross-member

.Connect through IB cable screen as shown on Page H-3. Where cable is not jointed fold conductors so that they do not project more than 75 mm above the top of the frame.

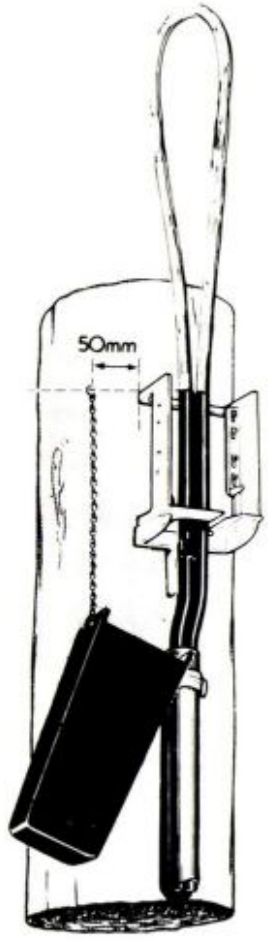


Looped Cable Free Ends

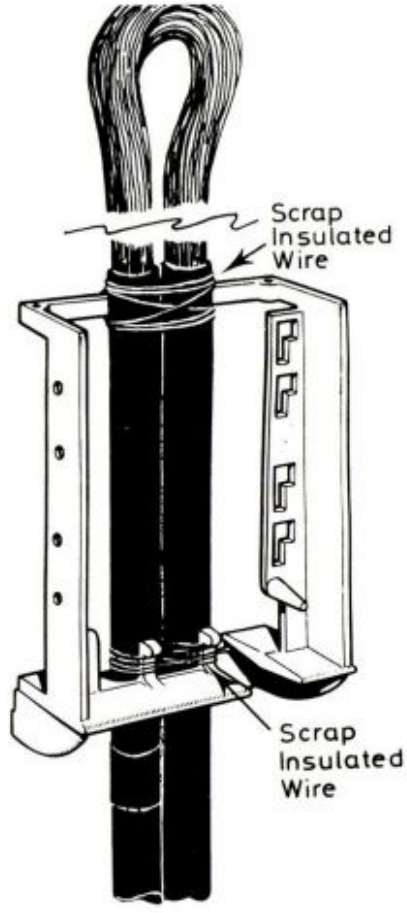
REMOVING CABLE SHEATH

UNTAILED TERMINAL BOX

Marking Coach-screw Positions



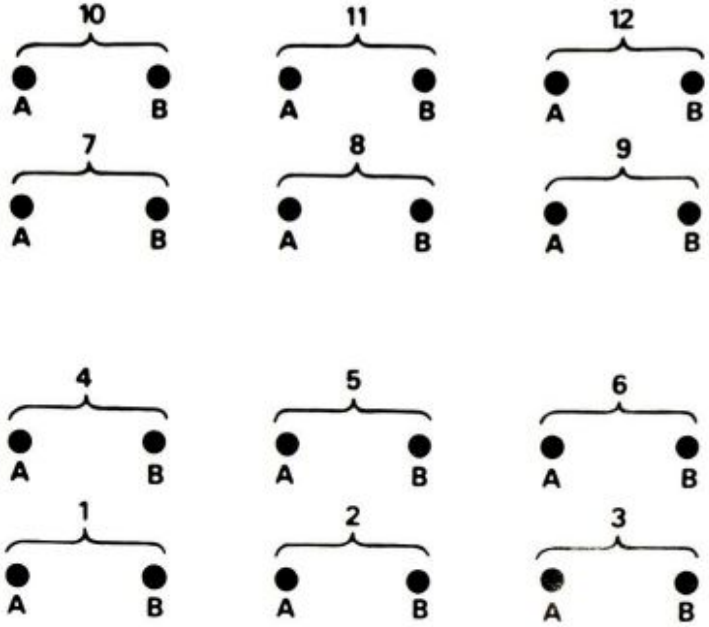
Attaching Cover Chain



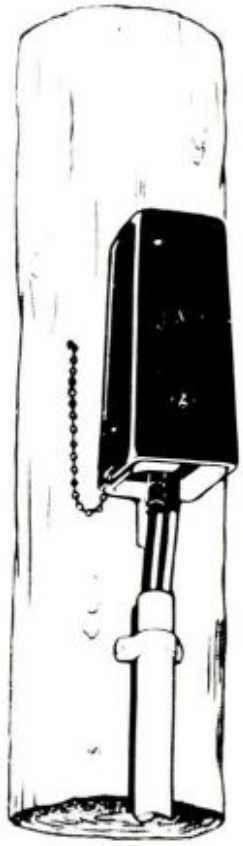
Securing Cables to Frame

MOUNTING BOX ON POLE

UNTAILED TERMINAL BOX



PAIR NUMBERING OF TERMINAL STRIPS



Wooden Pole

Steel Beam Pole

COMPLETED INSTALLATION

BE CONSTANTLY ON GUARD AGAINST AN ACCIDENT AND DO NOT COMMENCE A JOB UNTIL YOU ARE SURE THAT YOU CAN WORK IN SAFETY.

ERMINATING CONDUCTORS ON TERMINAL STRIPS

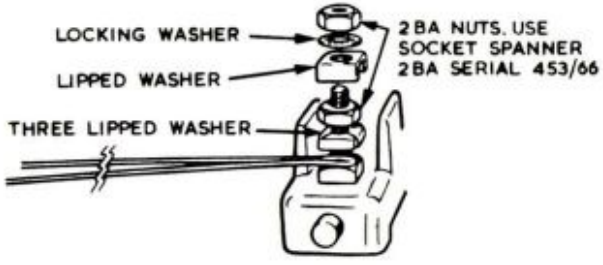
ermination of conductors in the box may involve connection of looped conductors, jointed conductors or free conductor ends.

Terminate conductors as follows:

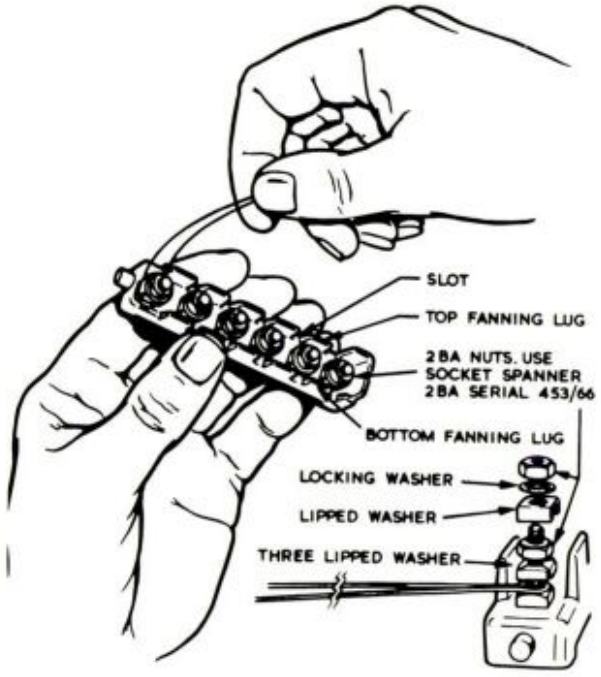
0.64 and 0.90 mm conductors - Place a single loop of insulated wire around the terminal post between its base and the lipped washer.

0.40 mm conductors - Double conductor at top of loop or, if a free end, fold conductor back along itself for about 10 mm and then push doubled conductor under the lipped washer between the terminal post and sides of the washer.

Tighten terminal nut to crush insulation and make contact with conductor.



TERMINATING 0.40 mm CONDUCTORS

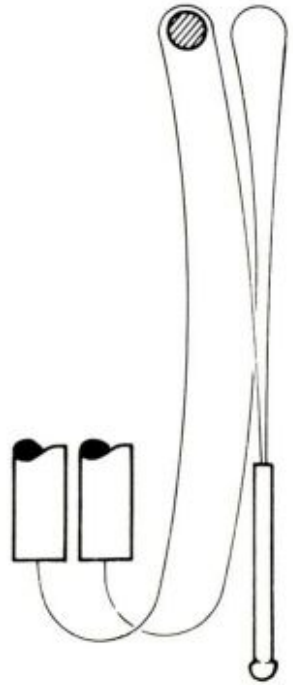


TERMINATING 0.64 AND 0.90 mm CONDUCTORS

UNTAILED TERMINAL BOX

TERMINATING CONDUCTORS ON TERMINAL STRIPS

1. Unravel conductors to be terminated. Do not cut looped or jointed conductors. Adequate slack can be obtained by working the twist back towards the sheath ends.
2. While holding the terminal strip in one hand with the small round projection pointing to the left, remove the top nut, lock washer and lipped washer from the left hand terminal and loosen the bottom nut.
   Place nuts and washers on posts made from pieces of drop wire fitted into the holes in the top of the frame, nuts on one post and washers on the other.
3. Select wire to be terminated and form a small loop : -
   (i) Free end - near end of conductor.
   (ii) Unjointed loop - at centre of loop.
   (iii) Jointed wire - on exchange side of loop as far from the joint as practicable.
4. Pass the conductor through appropriate slot in fanning strip and place under the lipped washer as described on Page U-11. Tighten the nut until resistance of insulation is felt. Then tighten nut a further half turn of 0.40 mm conductor or three-quarters of a turn of 0.64 or 0.90 mm conductor, to crush the insulation and make contact. Ensure that the left hand edge of the terminal nut is parallel with the left hand edge of the terminal base so that the two-lipped washer will fit squarely over the terminal. Cut off any free ends of wire projecting from the terminal.
5. Replace two-lipped washer, lock washer and nut on terminal.
6. Similarly terminate other conductors as required.



FORMING LOOP IN JOINTED CONDUCTOR

UNTAILED TERMINAL BOX

FITTING TERMINAL STRIP IN FRAME

Fit first strip into the bottom position on the frame and progressively fill other positions.

Do not fit spare terminal strips.

On the first and third strips the conductors pass through the top fanning slots and on the second and fourth they pass between the bottom fanning slots.

Thread spare nuts and washers on to holding posts on frame. Twist ends of holding post wire together to prevent nuts and washers from being accidentally dislodged.

ARRANCING CONDUCTORS IN FRAME

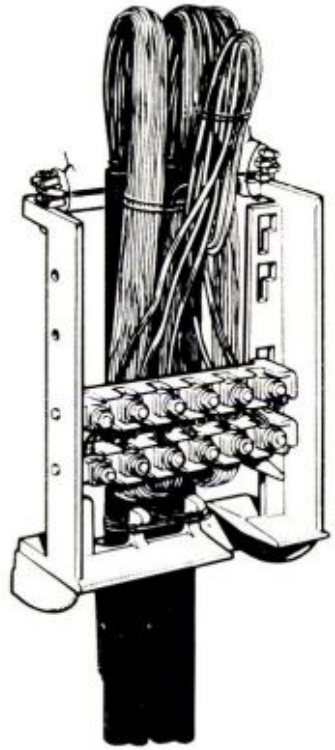
Form slack conductors behind terminal strips into compact bunches, making seperate bunches of:

(i) unterminated units,
(ii) unterminated wires in remaining units,
(iii) the slack in the terminated units.

Tie each bunch with insulated wire so that conductors do not project more than 75 mm above the top of the frame.

Tie the bunches together.

WASHERS ON POST

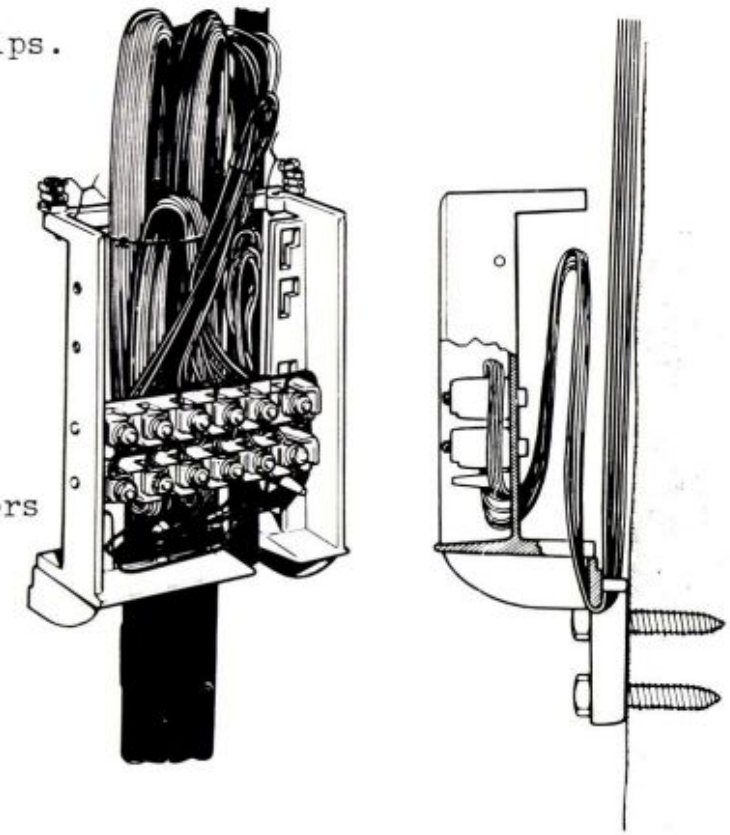


TERMINAL STRIPS FITTED IN FRAME

UNTAILED TERMINAL BOX

CONNECTING DROP WIRES

1. Pass end of drop wire (bearer removed) down behind the frame, through the entry slot, in the base and up in front of the terminal strips.
2. Take up slack and cut drop wire about 300 mm above the top of the frame.
3. Form all of the drop wires into a loop behind the right hand side of the frame.
4. Pass wires to be terminated on bottom strip along shelf at bottom of the box and up through lower fanning slots in the strip.
5. Pass conductors to be terminated on 2nd, 3rd and 4th strips around the pin in lower right hand corner of the frame and up the channel between terminal strips and the side of the box. On the 2nd and 4th strips pass conductors through the upper fanning slots and, on the 3rd strip, pass conductors through the lower fanning slots.
6. Cut drop wire to length required, seperate conductors for 50 mm and remove 10 mm insulation.
7. Place bared end under two-lipped washer and tighten terminal nut to hold wire firmly.
8. Do not leave any unecessary slack drop wire in the box.



TERMINATING DROP WIRE

DO NOT CLIMB ANY POLE UNTIL YOU EXAMINE IT AND ARE SURE THAT IT IS SAFE

INSTRUMENT PLUG NO. 603 AND SOCKET NO. 610

USE

Plug No.603 (S.268/39) and Socket No. 610 (S.268/40) are supplied with all 800 Series telephones and are also to be used for new installations of Ericofon, 300 and 400 type instruments.

The combination serves as a terminal block for a fixed telephone or as a plug and socket connection for portable services.

MOUNTING SOCKET

Mount socket horizontally so that the plug is inserted from the side. Socket openings on portable services must not face upwards or dust will accumulate on the contacts and cause faults. Do not install sockets in damp locations.

Secure socket with a 20 mm × 5 or 6 screw in hole A and a 16 mm × 5 or 6 screw in hole B. (See drawing Page U-16).

Tighten socket cover holding screw securely.

CABLE ENTRY

Remove appropriate cut-away at end of sides of socket with a sharp pocket knife. The end entry between a and a' (See drawing Page U-16) will accommodate up to three 2 pair cables. When another cable is necessary, enlarge the opening by removing sections a-b and a' - b.

CAPTIVE PLUGS

Plugs may be left so that they can be removed form the sockets or made captive by a 20 mm × 5 or 6 screw through holes B and C. (See Page U-16).

DISCONNECTING TELEPHONE

When a telephone is recovered leave the socket in position unless the customer requests its removal.

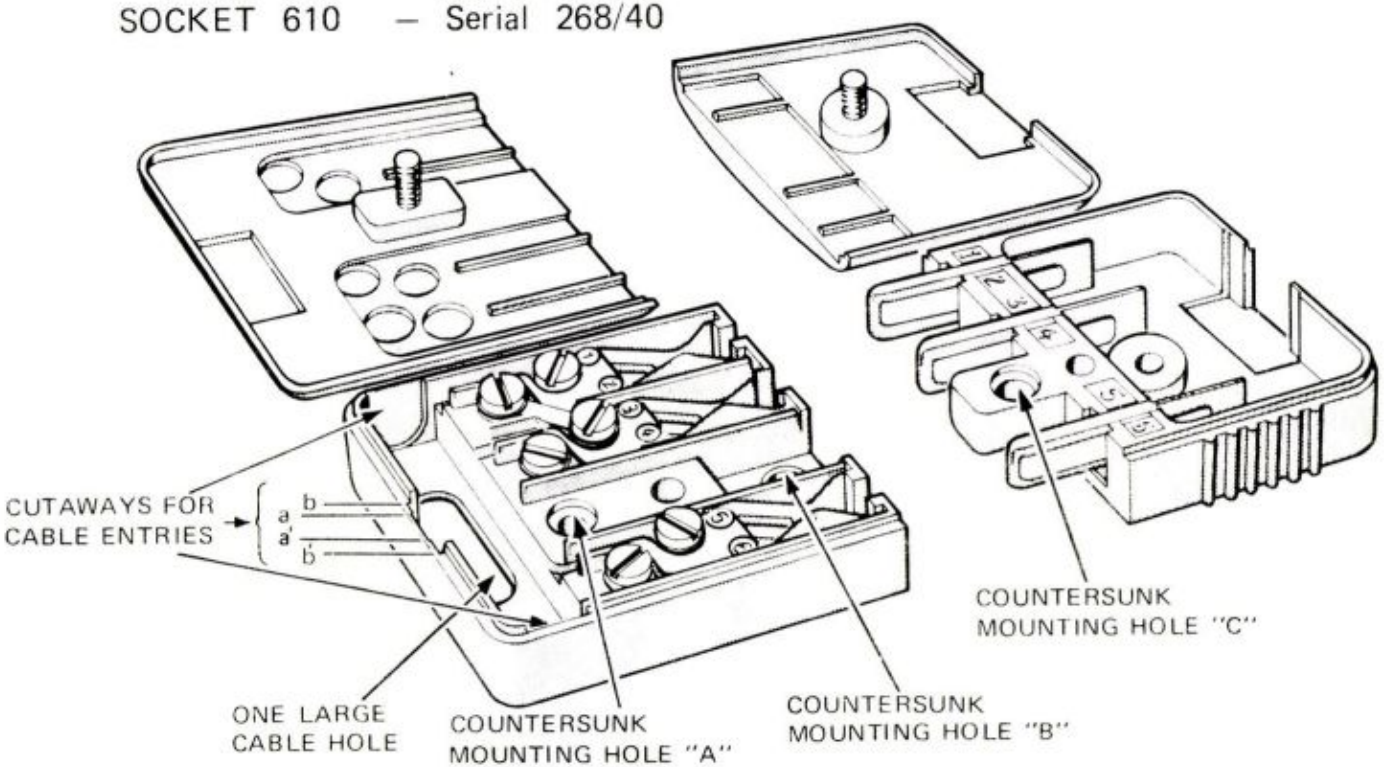
FOR FURTHER INFORMATION refer Linemen's Handbook, Installing Telephone Services.

Issue 5, 1979

INSTRUMENT PLUG NO. 603 AND SOCKET NO. 610

TELEPHONE PLUG AND SOCKET

PLUG 603 – Serial 268/39
SOCKET 610 – Serial 268/40



WHEN WORKING AT CUSTOMERS PREMISES AVOID DIRTYING WALLS WITH YOUR HANDS OR SCRATCHING PAINTED OR POLISHED SURFACES WITH TOOLS OR EQUIPMENT.

TERMINAL BLOCKS 5 AND 10 PAIR - INTERNAL

FIELD OF USE

Terminal Blocks are used for terminating external cables up to 10 pair at customer premises.

TYPES AND SIZES

Serial/Item	Stock Tile
29/115	Block Terminal - 5 pair
29/26	Block Terminal - 10 pair

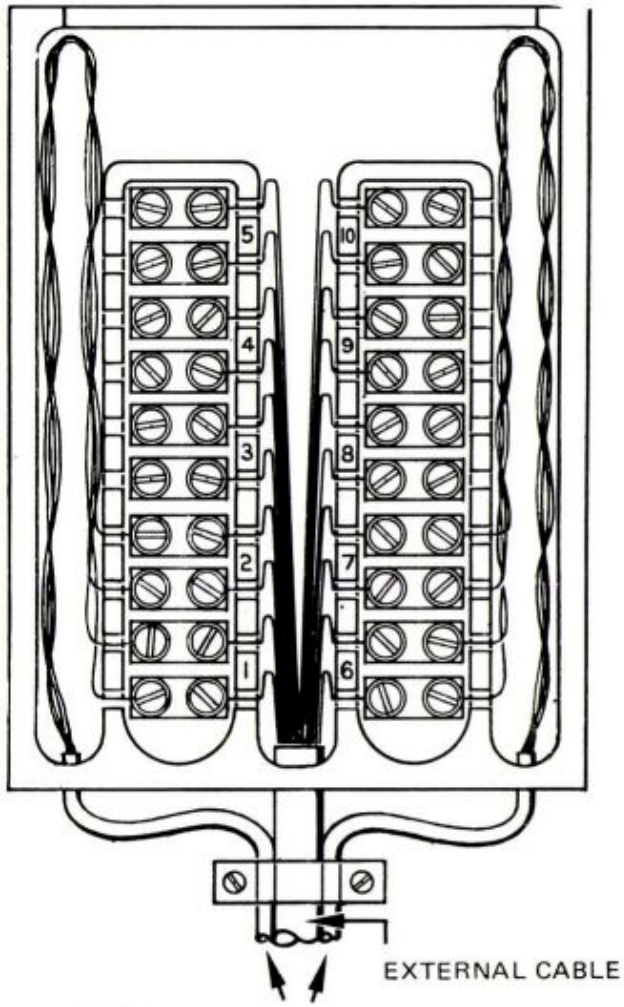
TERMINATING CONDUCTORS

Pass bared conductor in a clockwise direction under terminal washer and tighten the screw.

The conductor insulation should end at the washer.

The wire must not cross over itself under the head of the screw or it may be cut through when the screw is tightened.

TAKE CARE TO AVOID DAMAGE TO PRIVATE PROPERTY.
REPORT ACCIDENTAL DAMAGE IMMEDIATELY.



TERMINATING CABLE IN 10 PR. BLOCK

Issue 5, 1979

CABLE TERMINAL PILLAR - 300 PAIR

Cable Terminal Pillars are installed at the junction between Main or Branch cables and Distribution cables to facilitate crossconnection of pairs for subscribers services.

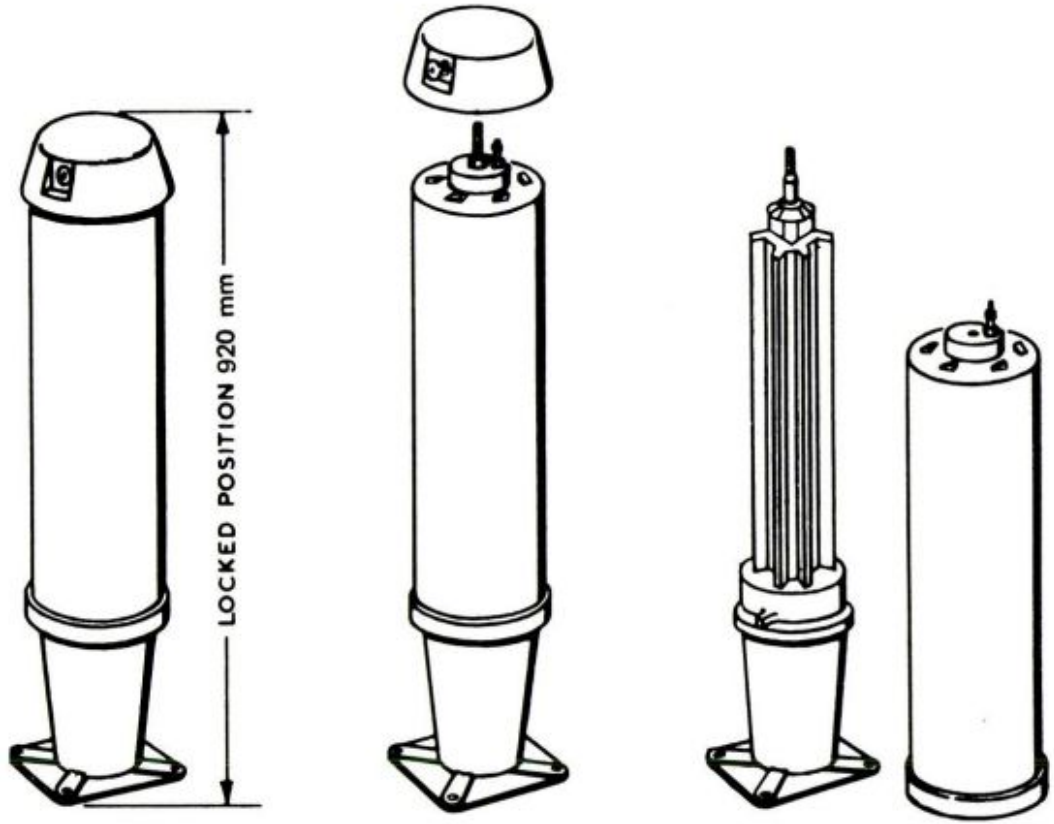
CONSTRUCTION FEATURES

The body of the pillar comprises three main parts, base, cover and cap, which are cast from aluminium alloy.

Unlocking and removal of the cap gives access to a captive nut which when unscrewed allows the cover to be removed. The method of removing the cover is described on Page V-7.

The pillar accommodates up to two 100 pair and two 50 pair terminal units which are available with either lead or plastic covered cable tails. (See Page V-2).

Units may be installed or removed as required.



(A) Locked (B) Cap Off (C) Cover Off

300 PAIR PILLAR TERMINAL, UNIT TYPE

Issue 5, 1979

300 PAIR CABLE TERMINAL PILLAR

ASSEMBLY AND JOINTING ARRANGEMENTS

The 300 pair pillar terminal will accommodate up to two 100 pair and two 50 pair terminal units.

At installation, pillars are usually restricted to 250 prs. thus allowing any unforeseen development to be met by the addition of a further 50 pr. unit.

Normal arrangement of pairs is 100 main and 150 distribution but other combinations, e.g. 50-100, 100-100, 150-100 or 150-150 may be used to suit particular circumstances.

Units are assembled in the pillar so that main and distribution units alternate.

Viewing the base from above, cable entry holes are allocated as follows:

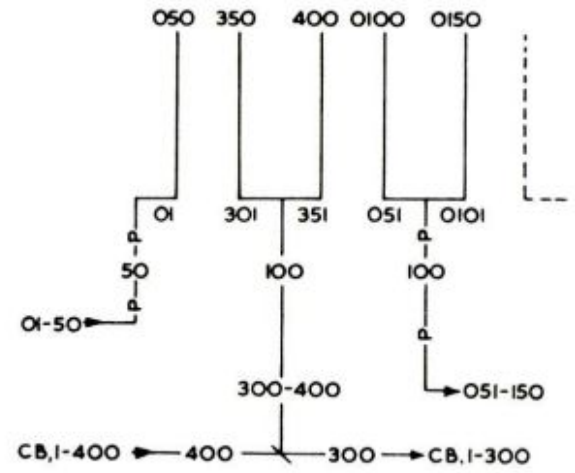
(i) Large hole - 100 pair Unit Lead or Plastic - Main Cable.

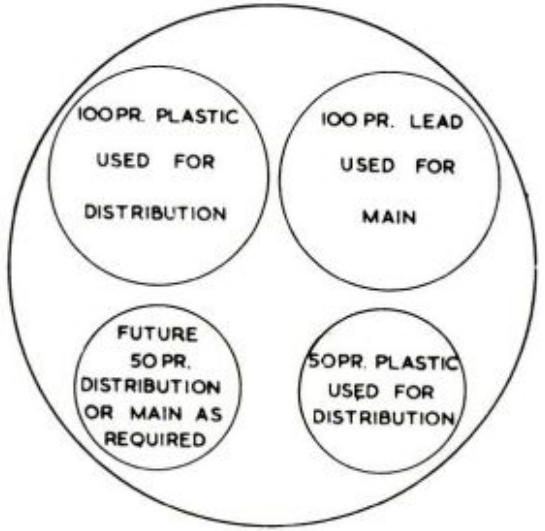
(ii) Small hole - 50 pair Unit, Plastic - Distribution cable.

(iii) Small hole - 50 pair Unit, Lead for Main Cable, Plastic for additional distribution cable.

(iv) Large hole - 100 pair Unit, Lead or Plastic - Distribution cable.

The 100 pair lead and plastic units are identical and may be used in either large hole. The 50 pr. units are different and may be used only in the correct position. "Additional" plastic units fit in the lead cable hole.





TYPICAL PILLAR CABLE LAYOUT

PRESSURE TESTING THE PILLAR (OR CABINET)

Refit cover and tighten down.

Internal Air Pressure rises to 7–14 K.P.A.

Momentarily depress air valve core.

If air is heard escaping seals are fair.

Leave pillar closed and check again after 10 minutes.

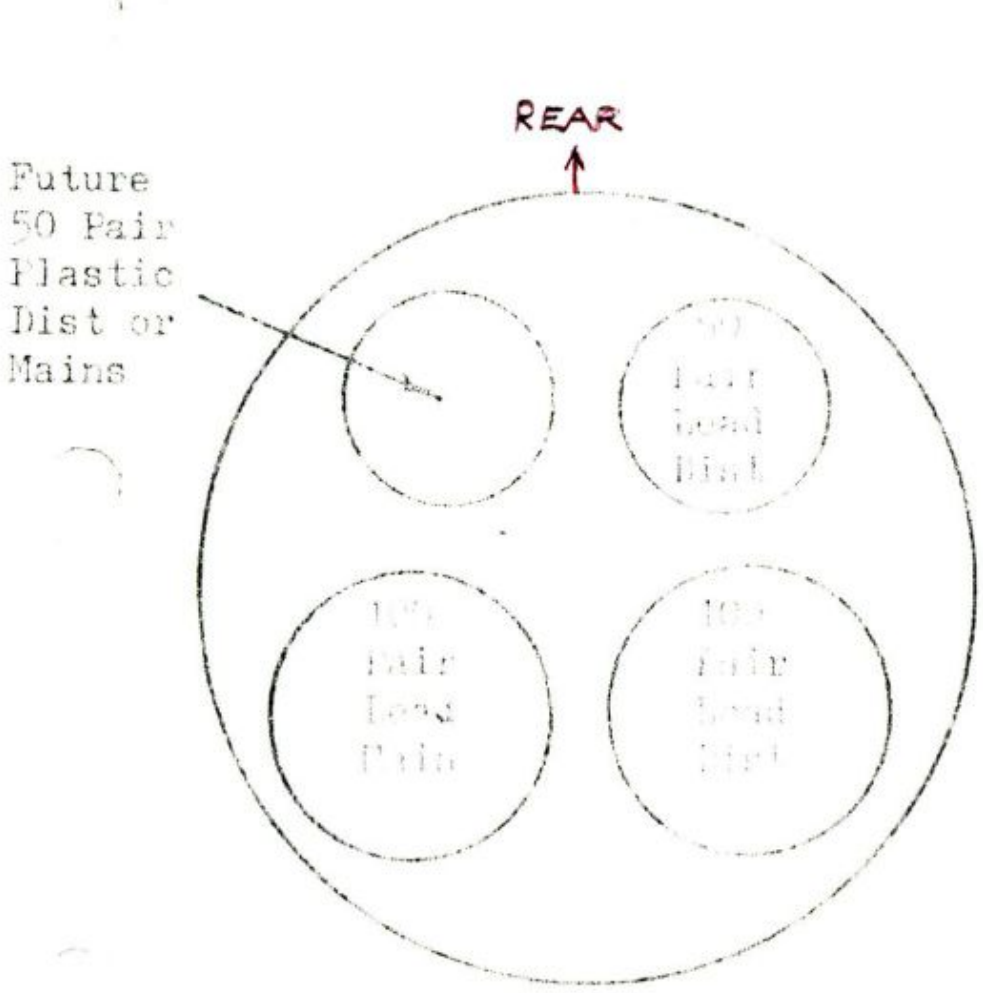
If air escapes after valve core is pressed seals are good.

If pillar does not hold air check visually the cover sealing ring, for cracks and other deterioration – fit new one if necessary. Remove sealing plugs and check – clean and replace.

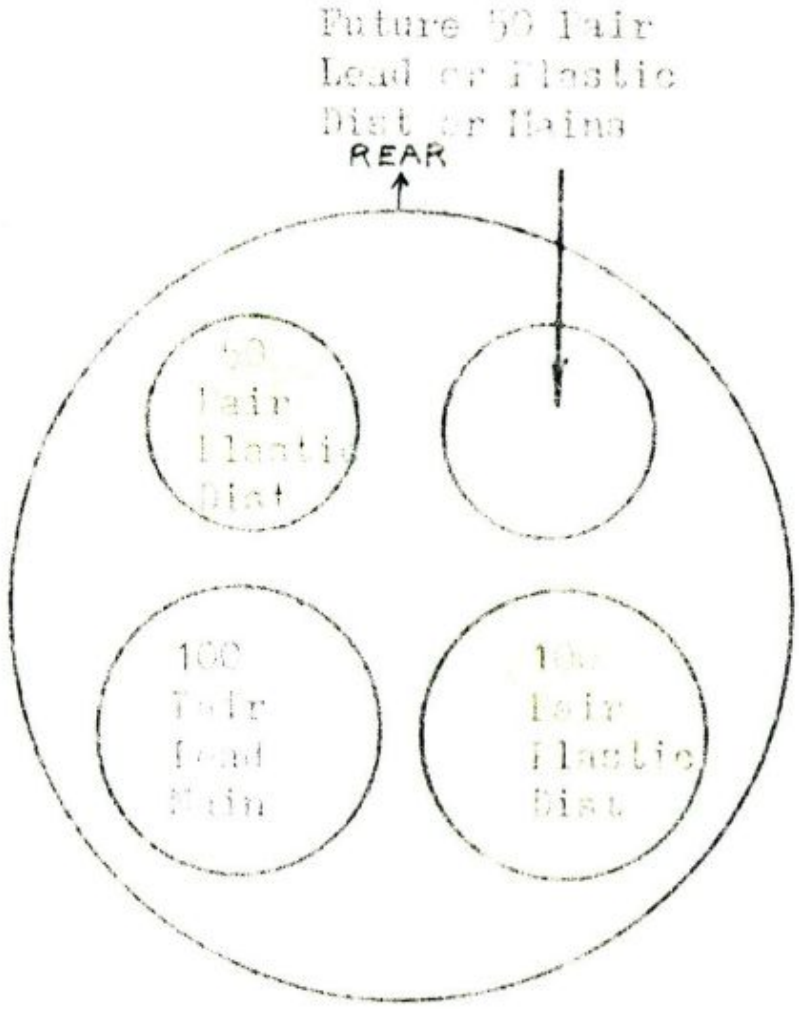
Refit cover and tighten down.

Press valve core, if air escapes – seals now good.

If pillar still leaks check seals around terminal units and captive nut.



ALL LEAD



LEAD PAIR PLASTIC DISTRIBUTION

300 PAIR CABLE TERMINAL PILLAR – COMPONENTS

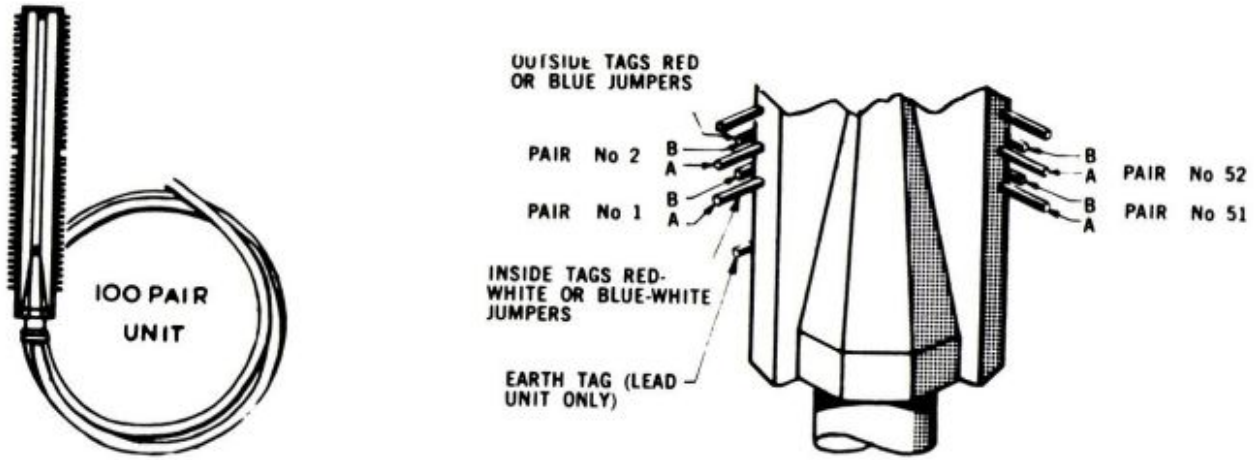
Item	Serial/ Item	Remarks
Pillar, 300 pr., unit type	430/50	Cast aluminium base and cover assembly. Order 100 and 50 pr. terminal units separately.
Terminal Unit, 100 pr., AUA, 6 m	430/51	Cable tail 100/0.40 PIUT, 6 metres
Terminal Unit, 100 pr., AUA, 12 m	430/61	Cable tail 100/0.40 PIUT, 12 metres
Terminal Unit, 100 pr., AUA, 18 m	430/62	Cable tail 100/0.40 PIUT, 18 metres
Terminal Unit, 100 pr., PE, 6 m	430/52	Cable tail 100/0.40 PEIUT, 6 metres
Terminal Unit, 100 pr., PE, 12 m	430/63	Cable tail 100/0.40 PEIUT, 12 metres
Terminal Unit, 100 pr., PE, 18 m	430/64	Cable tail 100/0.40 PEIUT, 18 metres
Terminal Unit, 50 pr., AUA, 6 m	430/54	Cable tail 50/0.40 PIUT, 6 metres
Terminal Unit, 50 pr., AUA, 12 m	430/67	Cable tail 50/0.40 PIUT, 12 metres
Terminal Unit, 50 pr., AUA, 18 m	430/68	Cable tail 50/0.40 PIUT, 18 metres
Terminal Unit, 50 pr., PE, 6 m	430/53	Cable tail 50/0.40 PEIUT, 6 metres
Terminal Unit, 50 pr., PE, 12 m	430/65	Cable tail 50/0.40 PEIUT, 12 metres
Terminal Unit, 50 pr., PE, 18 m	430/66	Cable tail 50/0.40 PEIUT, 18 metres
Terminal Unit, 50 pr., PE, 6 m	430/69	Cable tail 50/0.40 PEIUT, 6 metres
Additional Distribution (See ASSEMBLY AND JOINTING ARRANGEMENTS Part (iii) Page V-2)		For use where more than 150 pairs are connected to plastic cable.
Terminal Unit, 50 pr., PE 18 m	430/71	Cable tail 50/0.40 PEIUT, 18 metres
Additional Distribution See ASSEMBLY AND JOINTING ARRANGEMENTS Part (iii) Page V-2		For use where more than 150 pairs are connected to plastic cable.
Ring, Pillar Base Sealing	430/55	For replacement purposes.

PILLAR TERMINAL COMPONENTS

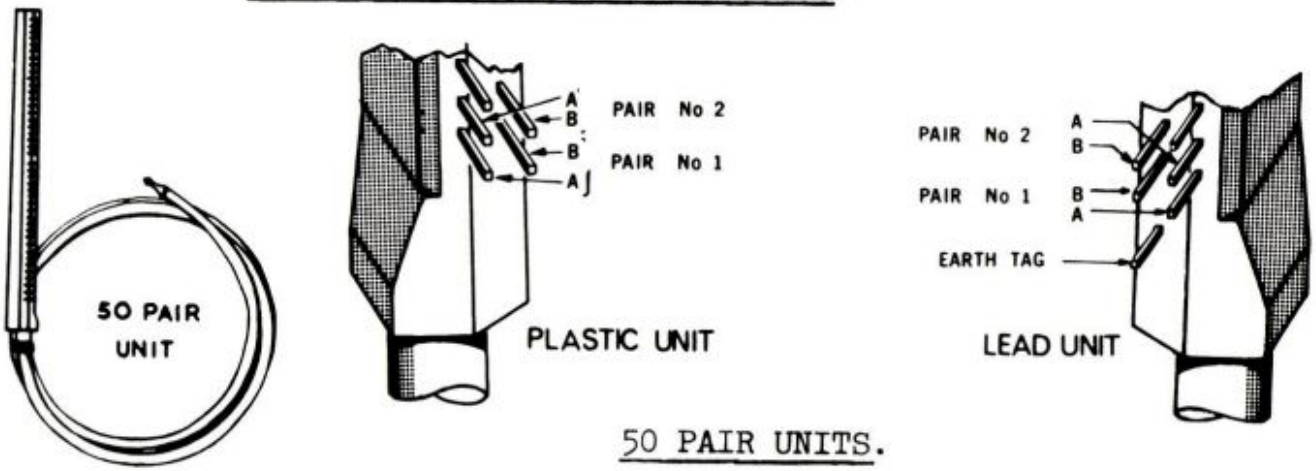
HANDLING TERMINAL UNITS:

To avoid damage to epoxy resin terminal block and cable during transport, do not unpack units from the factory pack until delivered to the pillar for installation.

300 PAIR CABLE TERMINAL PILLAR



100 PAIR UNIT, LEAD OR PLASTIC.



50 PAIR UNITS.

UNIT IDENTIFICATION

Lead cable tailed units read anticlockwise and plastic tailed units read clockwise at the end of the cable tail looking towards the terminal unit. IDENTIFY

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FITTING UNITS

1. Remove cap and cover from pillar.
2. Remove appropriate fanning strip assembly by loosening the clamping plate.
3. Remove sealing plug from appropriate cable entry hole. Return plug to store as scrap.
4. If necessary provide a draw-wire from the cable entry hole to the jointing chamber.
5. Remove terminal unit from its carton and check that the sealing ring is in position on ferrule at bottom of unit. Thread or pull the cable tail from the pillar into the manhole or pit. Square the terminal unit by turning the cable and unit AS A WHOLE. Embossed lines on the base indicate the correct location. Extreme care is necessary to avoid damage to the seal between the epoxy block and cable sheath.
6. Wipe surface of cable entry hole clean and dry.
7. Press terminal unit squarely and firmly into position so that the sealing ring rolls evenly between the aluminium ferrule and the walls of the cable entry hole and is compressed to form an effective seal. The cable tail or unit must not be twisted after the unit has been pressed into position. If a slight adjustment in position is necessary raise unit about 20 mm until the sealing ring is free then turn both unit and cable tails.
8. Remove the two fixing screws from inserts in terminal unit, replace fanning strip and tighten clamping plate. Secure unit to fanning strip with the two screws.
9. When the second 50 pr. unit is installed after the first 50 pr. unit is in use the jumpers make complete removal of the fanning strip impracticable. The new unit may be installed by loosening locating screw and moving fanning strip aside.
10. Push cable tails back into bend of footing so that it will be easier to install the next unit.

SEALING PLUGS

The pillar base is supplied with four sealing plugs fitted in the cable entry holes. In service each hole must be sealed with either a terminal unit or a sealing plug.

300 PAIR CABLE TERMINAL PILLAR

JUMPERING

1. Locate the main and distribution pairs to be connected and clean the terminal tags if there is any sign of corrosion or grease.
2. Starting at the main pair, thread the end of the jumper wire up the jumper space past the top of the unit across to the ring above the distribution unit and down the jumper space to the distribution pair. Always keep the jumper wire behind the guard wires of the fanning strip. Do not route jumpers via the space at the bottom of the units.
3. Pass one end of the jumper wire below the fanning strip tooth opposite the allotted tags, strip insulation and terminate.
4. Tension the jumper wire just sufficiently to keep it from falling forward out of the jumper guard. Pass the end through the fanning strip and terminate on tags. Use a jumper terminating and removing tool as illustrated on page V-22 .
5. If main and distribution pairs are side by side on adjacent terminal units run the jumper wire directly between the tags as shown for Cabinets on Page V-19.
6. SOLDER ALL JUMPER WIRE TERMINATIONS. Avoid applying excessive heat to the resin block. Make sure that one leg of the jumper is not contacting the tag on which the other leg is terminated. Use resin cord 65/35 solder (S.4/5). Check that no solder droppings have lodged on lower tags or jumper wires.
7. On important circuits place a 15 mm length of black plastic tubing over the tags to protect and identify the termination.
8. Jumpering material and tools are listed on Page V- 22.

BEFORE REMOVING JUMPERS TO EFFECT TRANSFERS MAKE SURE THAT A CONVERSATION IS NOT IN PROGRESS.

C. HUNTER.

V-6A (S)
October 1982

LINEMANS HANDBOOK : CABLE JOINTING NO.1
CABLE TERMINAL PILLARS AND CABINETS (FILE SE LC 22/1)

1. GENERAL

This instruction supplements Linemens Handbook CJ No.1 V-6 and V-18 providing a more specific instruction on the method of jumpering in 300 pair cable terminal pillars and cross connecting cabinets.

Ref. LINES Cables TC 3301 (S).

2. METHOD

2.1 When running jumpers, place a piece of 15mm.-25mm. diameter plastic tubing on top of the terminal unit to ensure that sufficient slack is left in the jumper. This prevents the conductor cutting through the insulation of the jumper wires due to pressure at turning points. The plastic tubing is withdrawn when jumper terminated.

2.2 When the jumper is passed below the fanning strip tooth to the allotted tags, the 'B' wire must pass with clearance under the A terminal.

REMOVING AND REPLACING PILLAR COVER

To remove the cap, turn key in lock and spin the cap off. (Standard key fits all pillar terminals and cabinets.) Key cannot be removed from the unlocked cap.
Unscrew captive nut on cover until cover is raised sufficiently to return sealing ring to its recess in the base. Then turn cover by hand until the thread disengages.
Lift cover clear of pillar, and place it where sealing surfaces cannot be damaged.
Before replacing cover, check that the interior is clean and dry and sealing ring is correctly located in its recess.
Tighten the captive nut with a spanner to draw the cover down to the sealed position.
Check that the key is in the unlocked position before replacing the cap.

PILLAR DESIGNATION

Stencil designation directly on the aluminium cover in 40 mm black lettering.

PILLAR AREA PLAN

Place a copy of the pillar area plan inside the pillar terminal between the fanning strip and the centre column in partially equipped pillars or at the top of the pillar in the jumper space if all units are fitted.
Keep the plan clear of the tags on terminal strips as it may cause low IR faults.

UNIT IDENTIFICATION LABELS

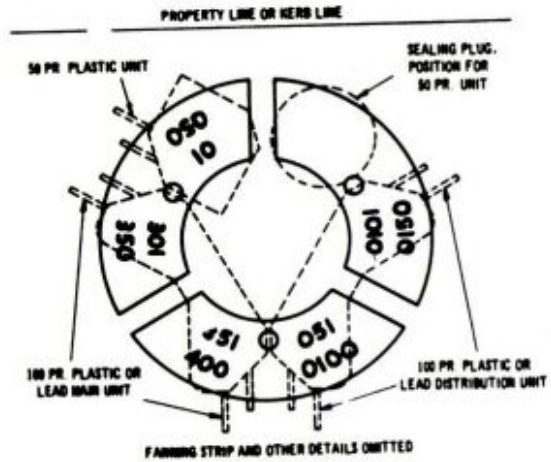
Stamp cable and pair sequence details of each terminal unit on the identification labels fitted above the units.

EARTHING

Where wiring is to be earthed connect to the EARTH tag at the bottom of the lead units. If the unit is connected to a moisture barrier sheathed cable other earthing arrangements will be necessary.

INSTALLING PILLAR FOOTING AND CONDUITS

Refer Linemens Handbook, Cables and Conduits.



IDENTIFICATION LABELS.

Issue 5, 1979

CABLE TERMINAL PILLAR - 180 PAIR

The 180 pair pillar terminal is obsolete but a number remain in service.

TERMINAL ARRANGEMENT

The standard arrangement of terminals provides for 74 Main pairs and 106 Distribution pairs as shown on Page V-9.

REPLACEMENT ITEMS STILL SUPPLIED

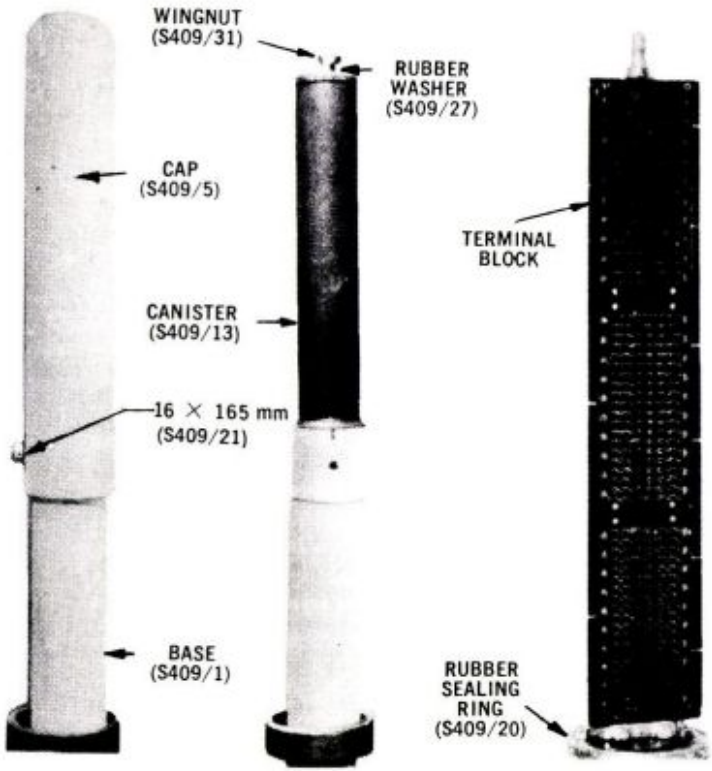
S.409/20 - Rubber Ring 120 mm
S.409/21 - Bolt, square head, 16 mm × 165 mm
S.409/27 - Washer, rubber, 32 mm

RECOVERED MATERIAL

Return recovered components such as caps, canisters, wing nuts and bolts to District Store for maintenance purposes.

SEALING CANISTERS

Proper sealing of the canister is necessary to avoid faults due to moisture condensation on jumpers and terminals.
Examine rubber sealing ring and rubber washer under wing nut and replace if faulty.
Remove any pieces of wire, solder etc. which are fouling the surface of the rubber ring.
Check that the canister is circular and is seating firmly on the rubber ring so as to make an effective seal.
Keep canister clean and dry while working on the pillar.

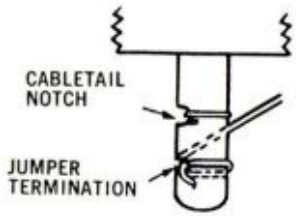


180 PAIR PILLAR TERMINAL

UMPERING

1. Where a Main pair is to be cross-connected to a Distribution pair on the same horizontal level - Run the jumper across the face of the terminal assembly.

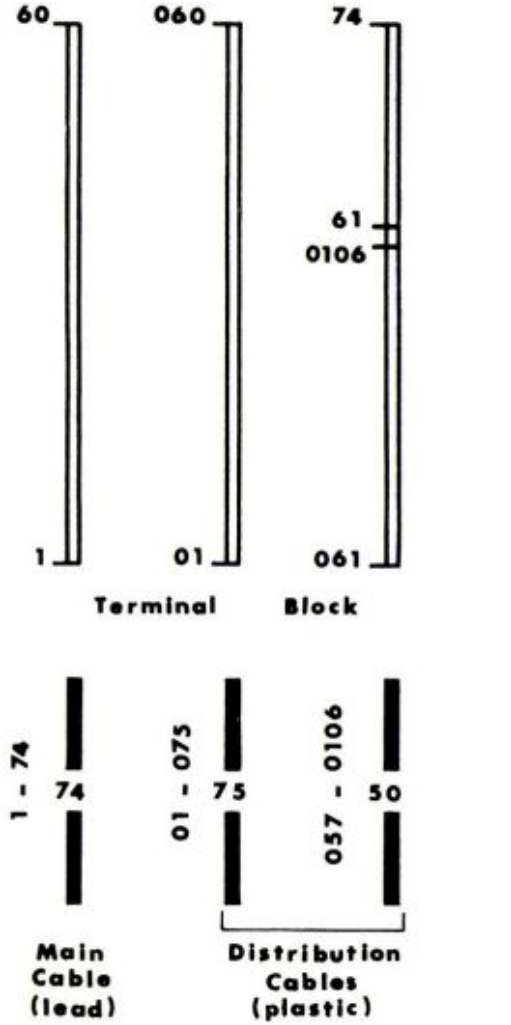
2. Where a Main pair is to be cross-connected to a Distribution pair on a different horizontal level - Run jumper from the main pair tag via the hole in the terminal block level with the tag, across the back of the assembly and via the hole in the terminal block level with the distribution tag, to the tag.



TERMINATING JUMPER WIRE

Before working on terminals place bolt back in pillar base to prevent assembly moving and fracturing the cable tails.

BEFORE LEAVING A PILLAR TERMINAL CHECK THAT ALL JUMPERS ARE SOLDERED.



CABLE AND TERMINAL NUMBERING

900 AND 1,800 PAIR CROSS-CONNECTING CABINETS

CONSTRUCTION FEATURES

The cabinet body comprises a base, cover and cap of cast aluminium.

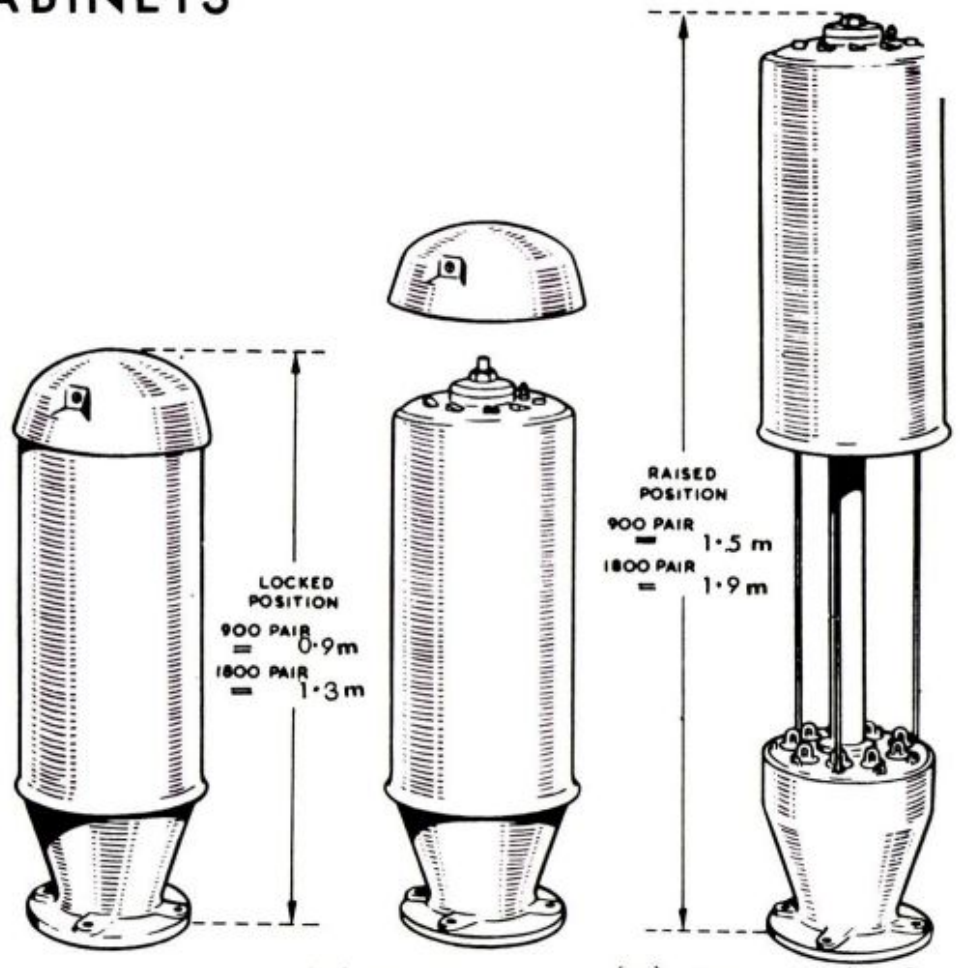
Both 900 and 1800 pair cabinets are cylindrical and the same diameter. They use the same bases and caps but the 1800 pair cover is 413 mm longer than the 900 pair cover.

All caps are fitted with identical locks.

Removal of the cap gives access to a captive nut which when unscrewed allows the cover to be raised. It is automatically latched and held in the raised position.

The cabinets will accommodate up to nine terminal units (100 pair for 900 pair cabinet and 200 pair for 1800 pair cabinet) to provide the combination of main and distribution pairs required.

Units may be added or removed as desired.



(A) Locked (B) Cap Off (C) Cover Raised

CROSS-CONNECTING CABINET

Item	Serial/ Item	Remarks
Cabinet, Cross-Connecting 900 pr. Unit Type	430/9	Cast aluminium base and cover assembly supplied with sealing plugs, identification labels and 150 mm asbestos cement bend. Order terminal units separately.
Terminal Unit 100 pr. AUA, 6 m tail	430/12	For use in 900 pr. cabinet. Cable tail 100/0.40 PIUT, 6 m long.
Terminal Unit 100 pr. AUA, 12 m tail	430/37	Cable tail 100/0.40 PIUT, 12 m long.
Terminal Unit 100 pr. AUA, 18 m tail	430/38	Cable tail 100/0.40 PIUT, 18 m long.
Terminal Unit 100 pr. PE, 6 m tail	430/23	Cable tail 100/0.40 PEIUT, 6 m long.
Terminal Unit 100 pr, PE, 12 m tail	430/41	Cable tail 100/0.40 PEIUT, 12 m long.
Terminal Unit 100 pr. PE, 18 m tail	430/42	Cable tail 100/0.40 PEIUT, 18 m long.
Cabinet, Cross-Connecting 1800 pr. Unit Type	430/10	Cast aluminium base and cover assembly supplied with sealing plugs, identification labels and 150 mm asbestos cement bend. Order terminal units separately.
Terminal Unit 200 pr. AUA, 6 m	430/21	Cable tail, 200/0.40 PIUT, 6 m long.
Terminal Unit 200 pr. AUA, 12 m	430/39	Cable tail, 200/0.40 PIUT, 12 m long.
Terminal Unit 200 pr. AUA, 18 m	430/40	Cable tail, 200/0.40 PIUT, 18 m long.

200PR PEIUT 6m 430/73
200PR PEIUT 12m 430/74

900 AND 1800 PAIR CROSS-CONNECTING CABINETS

ASSEMBLY AND JOINTING ARRANGEMENTS

The 900 and 1800 pair cabinets may be used as large Pillars serving subscribers direct or as Cabinets feeding through a number of Pillars. In some cases they perform both functions.

For design purposes the 900 pair cabinets are normally restricted to a maximum of 700 terminated pairs at installation i.e. 300 main and 400 branch or distribution pairs, and 1800 pair cabinets to 1400 pairs i.e. 600 main and 800 branch or distribution pairs. Unforeseen development can then be met by the addition of further units.

Units are installed in the cabinet so that main and branch units occupy alternate positions. A typical cable layout is shown below.

REMOVING AND REPLACING COVER

Unlock cap and spin off. Key cannot be removed from unlocked cap.

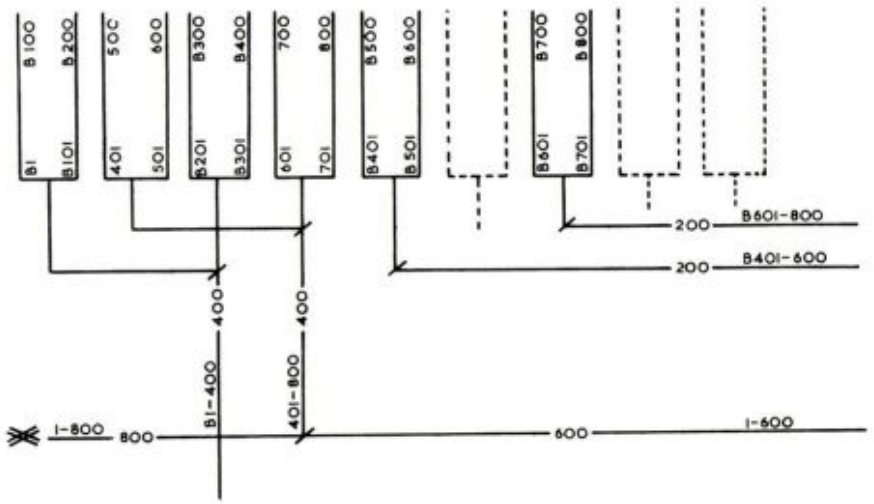
Unscrew captive nut holding cover down during last few turns to prevent it jumping upwards when the nut is released.

Lift cover up to latched position.

Before replacing cover check that sealing ring is correctly placed in the recess near the top of the base.

Take weight of cover, release latch and lower cover until the spring takes the weight.

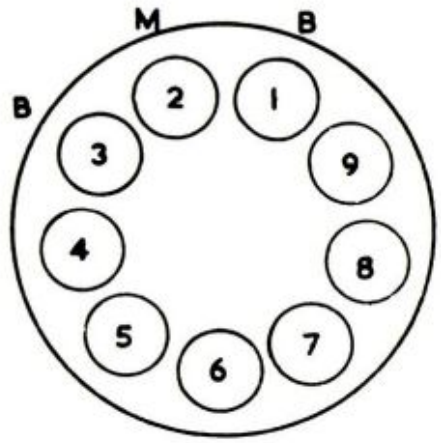
Press downwards on cover until the captive nut engages with the threaded spindle. Turn nut (not cover) until tight. Replace cap and lock.



TYPICAL CABLE LAYOUT - 1800 PR. CABINET.

FITTING TERMINAL UNITS

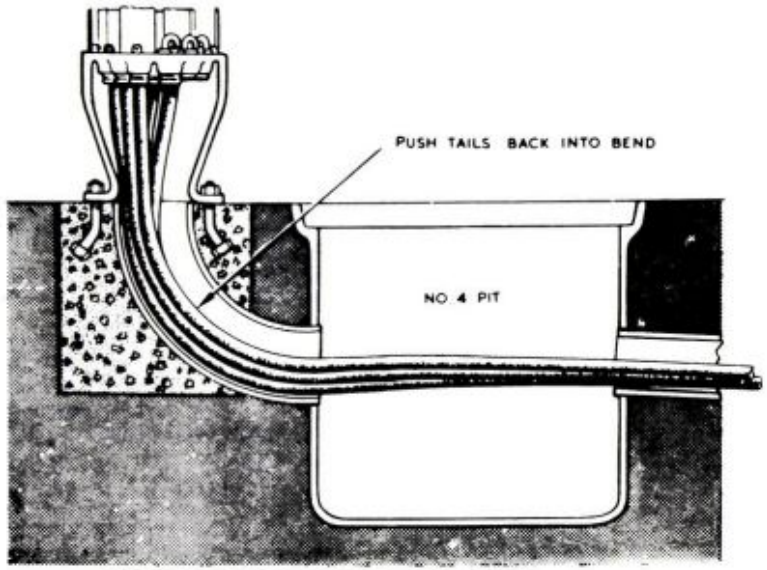
1. Remove cap and take cover right off cabinet. Keep the cover clean and do not allow sealing surfaces to be damaged or interior to become damp.
2. Determine entry holes for terminal units. Alternate main and branch units around the base in an anticlockwise direction starting from the lowest reading branch unit (normally opposite the kerb line) followed by the lowest reading main unit, etc.
3. Remove sealing plugs from the cable entry holes. Return plugs to Store as scrap metal.
4. Remove the guard wires if any are fitted in the positions to be used.
5. Provide a draw wire from the cable entry hole to the jointing chamber if necessary.
6. Clean and dry the surfaces of cable entry holes.
7. Remove terminal unit from box. Check that sealing ring is in position on the bottom of the unit and that the jumper guard/fanning strip is firmly screwed to the unit.
8. Thread or pull cable tail from cabinet to manhole. Square the terminal unit by turning both the unit and the tail cable. The embossed lines on the cabinet base indicate the correct location. Use extreme care when squaring the unit or the seal between the epoxy terminal block and the cable sheath will be broken thus allowing moisture to enter the tail cable.



ORDER OF INSTALLATION OF TERMINAL UNITS

FITTING TERMINAL UNITS (CONTD.)

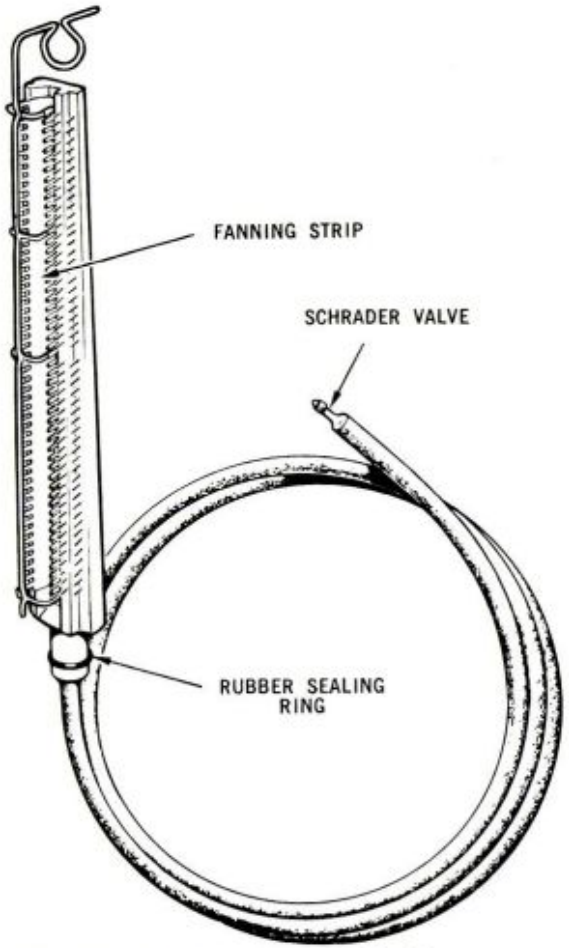
9. Press terminal unit firmly into position so that the sealing ring rolls evenly between the ferrule and the sides of the cable entry hole and is compressed to form the effective seal.
10. Check that the unit is correctly positioned. Do not attempt to twist terminal block after it has been pressed into position. If slight adjustment is necessary raise unit about 25 mm until ring is free and then turn both block and cable tail.
11. Remove split pin from jumper guard/fanning strip, insert wire into the support plate at top of the centre column and refit the split pin.
12. Push cable tail into the rear of the bend in the cabinet footing, so that it will be easier to install the next unit.
13. Repeat Items 6 to 12 for all terminal units.
14. Place lead cable tails under 70 Kilopascals gas pressure.
15. Refit guard wires in any remaining unoccupied positions. These will prevent the cover contacting the tags or damaging jumpers.
16. Place a bag of silica gel inside cabinet.
17. Replace the cover and cap on the cabinet.



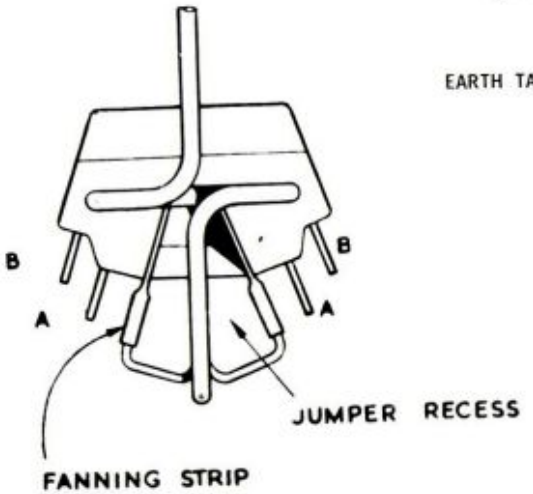
INSTALLING TAIL CABLES

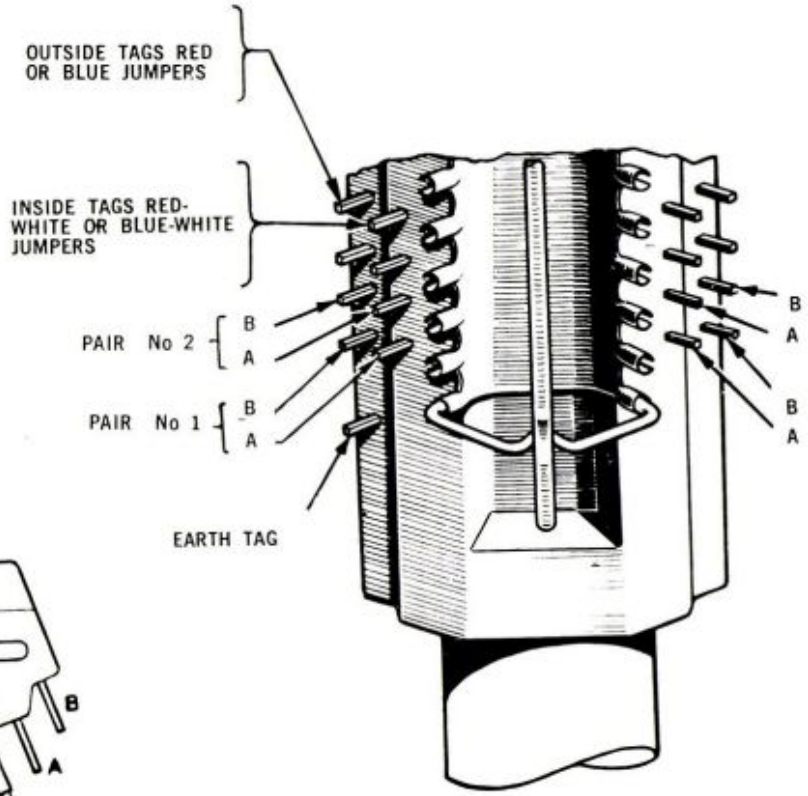
CABINET KEYS

All cabinets and pillars locks have identical keys. A key is supplied with each assembly.



TERMINAL UNIT - 100 Pr.





UNIT WIRING DETAILS

CHECK FOR THE PRESENCE OF GAS BEFORE ENTERING MANHOLES.

PRESSURE TESTING CABINET

After installation of terminal units and when additional units are installed, check the cabinet seals as follows:

1. Refit cover and tighten down. This raises internal air pressure by 7-14 Kilopascals. Momentarily depress core of valve on cover. If no air is heard escaping the cabinet seals are faulty.
2. If initial test is satisfactory leave cabinet closed for 10 mins. and then recheck valve. If again air is heard escaping seals are satisfactory.
3. If cabinet does not hold air, remove cover and check sealing ring for cracks, etc. Fit new ring if necessary.
4. Remove all sealing plugs, dry all surfaces, fit new rubber rings and refit plugs.
5. Replace cover and recheck seal as in 1.
6. If cabinet leaks, check terminal unit seals and refit if necessary.
7. If cabinet still leaks the seal around the captive nut or the cover itself may be defective. Check these by pressurising the cabinet to 35 Kilopascals with a foot operated dessicator pump.
8. Do not joint cable tails until seals are satisfactory.

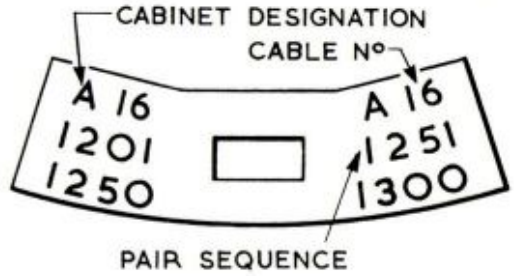
JOINTING CABLE TAILS

Joint cable tails to main cable so that terminal readings of the cabinet are in numerical sequence and coincide with the exchange M.D.F.
Direction of rotation of the cable tails looking towards the terminal unit:

900 pair Cabinet - 100 pr. lead cable - Anticlockwise; 100 pr. plastic - Clockwise
1800 pair Cabinet - 200 pr. lead cable - Clockwise

IDENTIFICATION LABELS

Stamp cable and pair sequence details for each terminal unit on aluminium identification labels.
Fit label over the lug near the base of each terminal unit.
Labels are supplied with the cabinets and are also available separately as Serial 430/18.



IDENTIFICATION LABEL

PLANS AND RECORDS

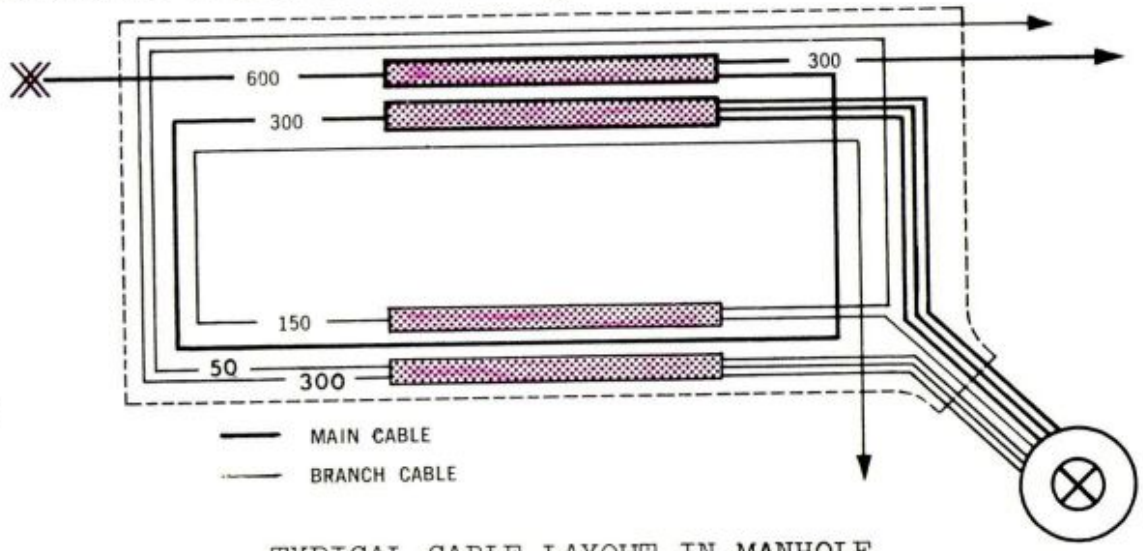
Place a copy of the cabinet area plan in the cabinet between the terminal units and the centre column if all units are installed or at the top of the cabinet in the jumper space if all terminal units are fitted.
Do not allow plan to touch terminals or low IR faults may occur.

CABINET DESIGNATION

Stencil designation on cover in 40 mm black lettering.

CABLE LAYOUT

Arrange cable tails in manhole or jointing pit to provide the most satisfactory 'flow'.
Where it would be necessary to take more than three cables into a joint install an approach cable of appropriate size.



TYPICAL CABLE LAYOUT IN MANHOLE

LEAD CABLES MUST BE PROPERLY SUPPORTED TO PREVENT SHEATH FATIGUE AND FRACTURE.

900 AND 1800 PAIR CROSS-CONNECTING CABINETS

JUMPERING

1. Locate the main and branch pairs to be connected and clean the terminal tags if there is any sign of corrosion or grease.

2. If main and branch pairs are side by side on adjacent units, install the jumper wire directly between the tags as shown on Page V-19.

3. In other cases, start near the main pair and thread the end of the jumper wire up the jumper space, past the top of the terminal unit, through the wire ring above the unit, across to the ring above the branch pair unit and down the jumper space to the branch pair. Always keep the jumper wire behind the guard wires of the fanning strip.

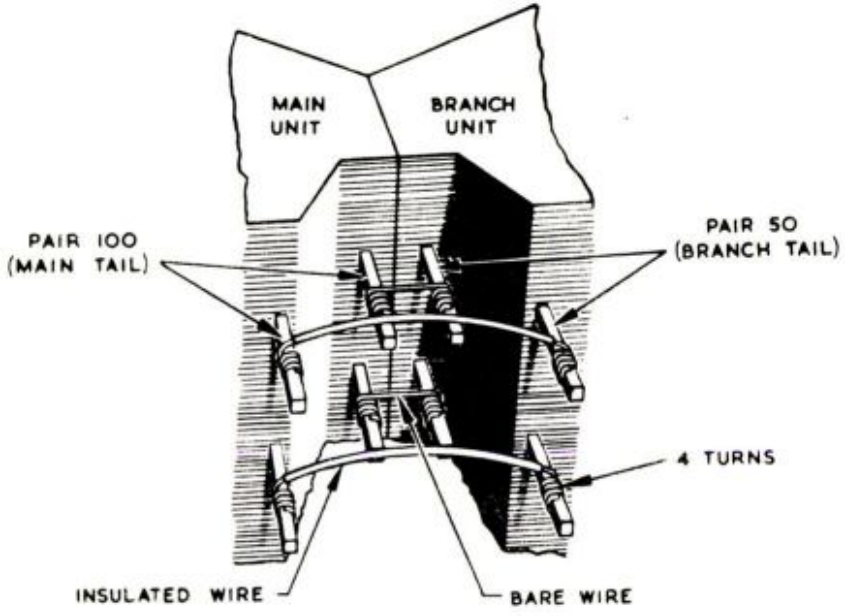
4. When the main and branch units are side by side, do not run the jumpers through the wire rings above the units but run them directly across the top of the terminal units as shown on Page V-19.

5. Pass the branch end of the jumper below the fanning strip opposite the allotted tag, strip the end of the wire and terminate. Tension the jumper wire just sufficiently to keep it from falling forward out of the jumper guard. Pass the main end of the jumper through the fanning strip and terminate on main pair tags. Use the jumper terminating and removing tool, S.93/39 (See Page V-22).

   (Note: In early type cabinets without jumper rings, run jumpers directly across the top of the units from the main to the branch unit recess).

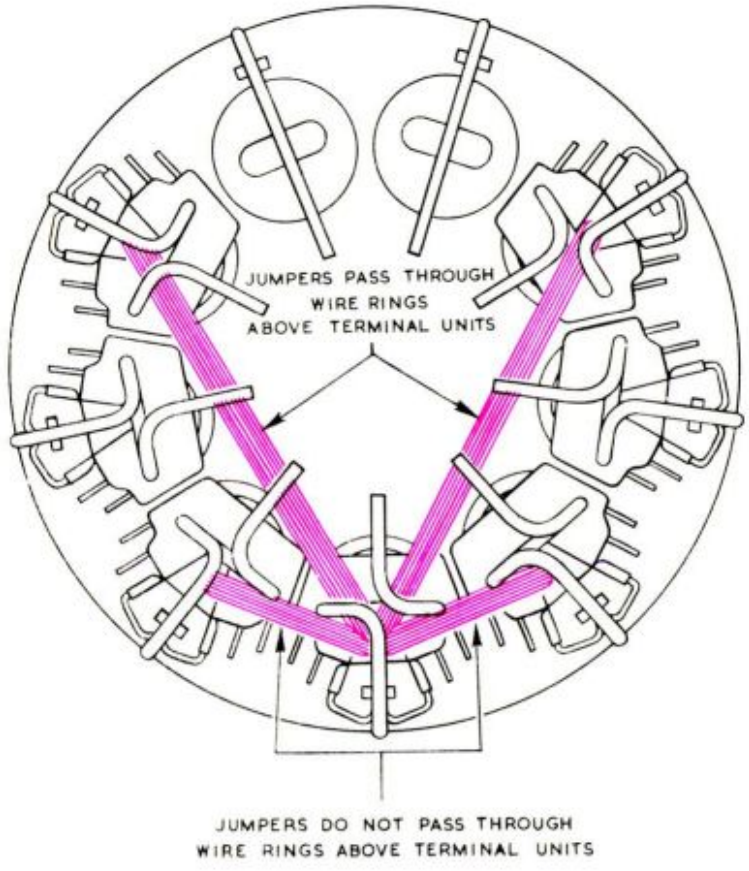
6. Make sure B leg of the jumper is not resting on the A leg terminal then solder the connections using activated resin cored, 65/35 solder (S.4/5). Make sure that no solder droppings have lodged on lower tags or jumper wires.

7. On important circuits place a length of ~~black~~ COLOURED plastic tubing over each terminal tag.



DIRECT JUMPERS

Installed where main and branch pairs are side by side.



PATH OF JUMPERS ACROSS TOP OF CABINET

BEFORE LEAVING A CABINET CHECK THAT ALL JUMPER WIRE TERMINATIONS ARE SOLDERED.

CABINET MAINTENANCE

Routine Inspection made every 2 years. Check for dry joints, jumpers outside jumper guard, too many jumpers for recess, captive nut stiff to turn, cover support latch not operating properly, lock difficult to open, evidence of faulty seals and silica gel requiring replacement.

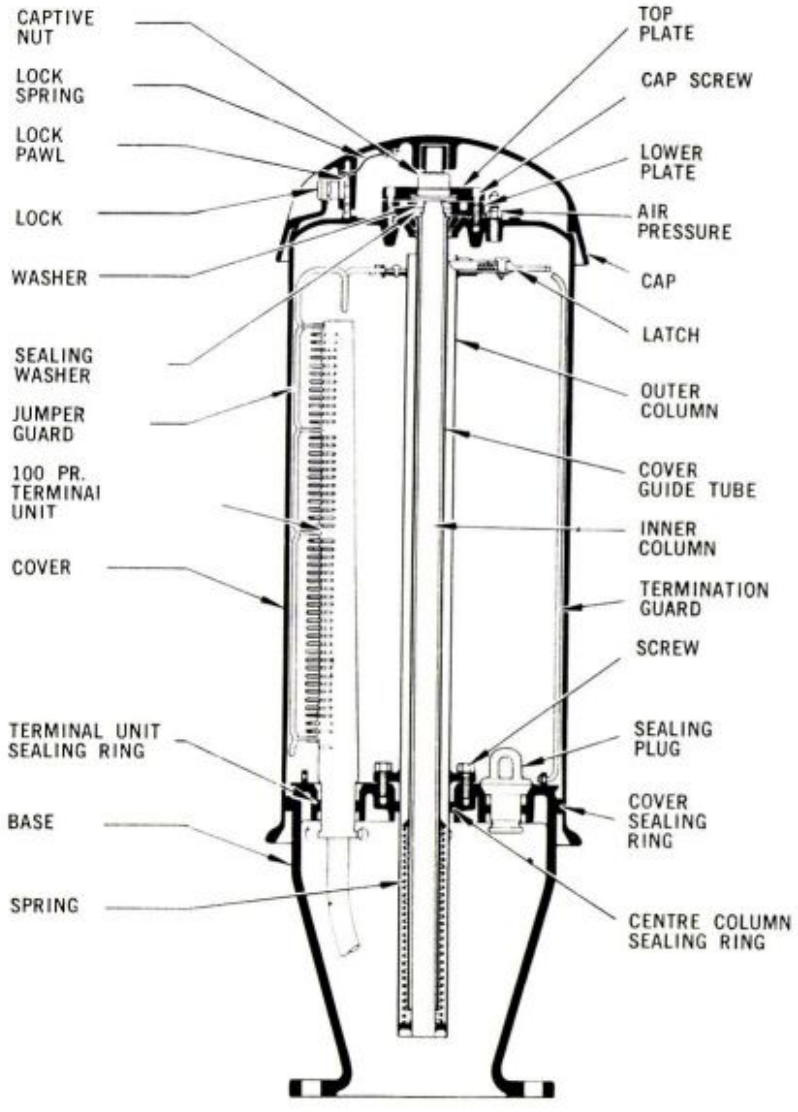
Lubrication. Keep centre column threads lightly lubricated with graphite loaded waterproof grease.

Centre Column Thread. If captive nut is stiff to turn it is likely that the nut or centre column threads have been damaged. Restore threads if possible with die nuts. If necessary replace damaged centre column and captive nut.

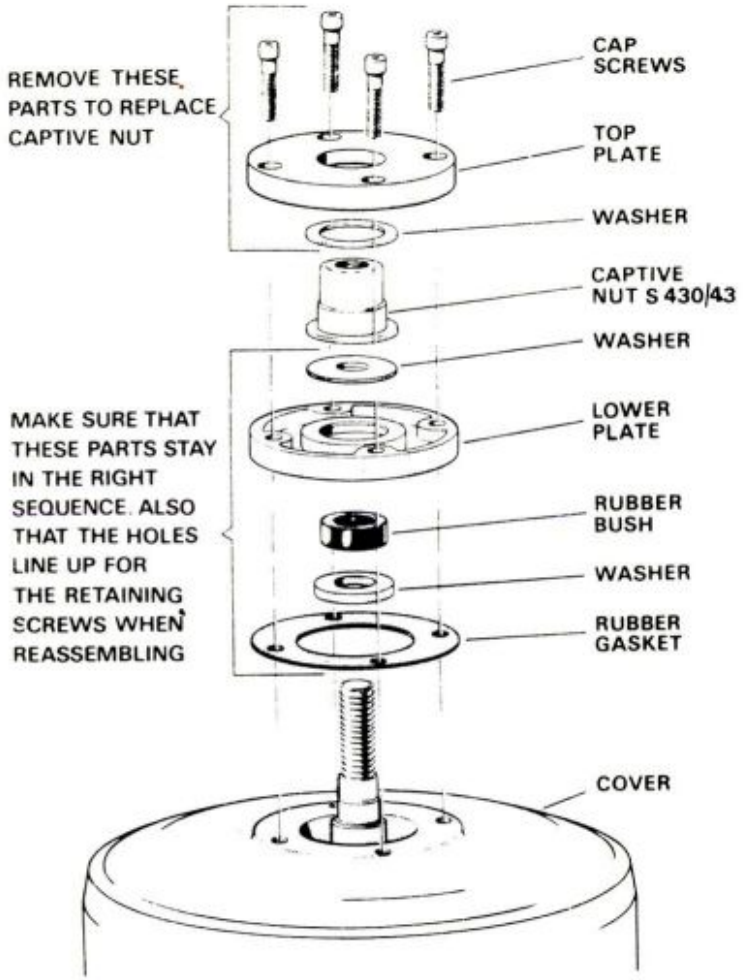
SPARE PARTS

The following spare parts are held in stock:

Ring, Cover Sealing	- S.430/16
Ring, Terminal Unit Sealing	- S.430/14
Assembly, Centre Column 900 pr	- S.430/25
Assembly, Centre Column1800 pr	- S.430/26
Nut, Captive (Nylon)	- S.430/43



900 AND 1800 PAIR CROSS-CONNECTING CABINETS



Capative Nut Replacement. To replace a faulty captive nut with a new Nylon 11 captive nut, (S430/43).

. Unlock the caplock and spin the cap off.

. Unscrew the captive nut with a tube spanner (S453/84) and allow the cover to rise under control.

. Lift the cover clear of the centre column.

. Remove the four top plate retaining cap screws with a 3/16" Allen key.

. Remove the top plate and faulty captive nut noting position of the washers.

. Replace the faulty captive nut with a new nylon nut (S430/43) and reassemble in reverse order.

JUMPERING MATERIAL AND TOOLS

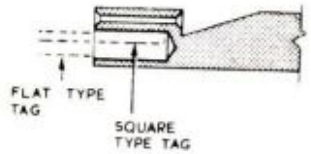
Serial/Item	Stock Title	Use
3/290	Wire Switchboard 2/0.50 (Blue/Blue White)	Jumpering all important circuits.
3/295	Wire Switchboard 2/0.50 (Red/Red White)	Jumpering ordinary circuits.

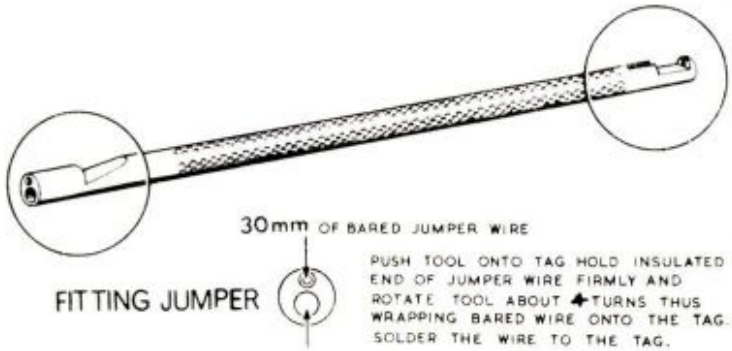
JUMPER WIRE FOR PILLAR TERMINALS AND CABINETS

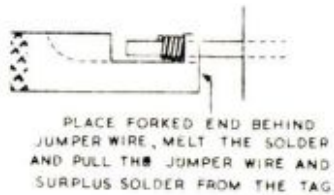
Terminate red-white or blue-white jumper wire to "A" terminal and plain red or blue wire to "B" terminal using Jumper Terminating Tool (S.93/39).

Do not use the jumper wire used on exchange M.D.F's as it has heavier conductors and thicker insulation so that the required number of jumpers will not fit in the jumper space. Scrap plastic insulated cable conductor is also unsuitable as the insulation is much softer and therefore more easily damaged that switchboard wire.

Clean terminal tags if there is any sign of corrosion or grease. Solder terminations using activated resin cored 65/35 solder (S.4/5).







JUMPER TERMINATING TOOL (S.93/39)

PORTABLE COMBUSTIBLE GAS DETECTORS

MODEL AE 10-40
MSA MODEL 2
COSMOS MODEL XP 301 – B

Issue 5, 1979

PORTABLE COMBUSTIBLE GAS DETECTOR MODEL AE 10-40

GENERAL

Model AE 10-40 is used to spot test for combustible gas before and after entering underground structures. After removing the aspirator attachment it is used to continuously monitor the atmosphere for combustible gas while work is in progress. Normally, the detector is used by staff who work for a substantial part of their time in manholes in areas of gas reticulation, or anywhere where combustible gas is a known hazard.

DETECTING CARBON MONOXIDE

A carbon monoxide gas detector must be used where manufactured gas which has a carbon monoxide content is reticulated, or anywhere else where carbon monoxide is suspected (for example, exhaust fumes from petrol, oils, or gas fuelled internal combustion engines).

Almost any concentration of carbon monoxide is extremely toxic. The model AE 10-40 portable combustible gas detector can only detect combustible concentrations of carbon monoxide but such concentrations are rarely encountered, however, if such a situation is suspected, both detectors must be used.

DESCRIPTION

The detector has a meter indicating 0-100% of the Lower Explosive Limit (LEL), with an audio and visual alarm which operate when the atmosphere being sampled or monitored exceeds 10% of the LEL. The meter scale has a red band from 10% to 100% of the LEL, with a "BATT" band to indicate the condition of the batteries when they are tested. The circuitry includes built-in alarm and battery test facilities, together with fail-safe facilities to indicate when the instrument is not in operating condition, for example a circuit fault or when the batteries need re-charging.

Issue 5, 1979

ANNUAL TESTING OF PORTABLE COMBUSTIBLE GAS DETECTORS

ANNUAL TESTING

The sensitive elements of all gas detectors are prone to deterioration from dust, petrol fumes and other agencies. In additon to periodic and casual checks as described on pp 8-9 of EI LINES General TE 4450, annual checks must be made of each instrument at the Instrument Repair Centre at the Engineering Service Depot (ESD), Building Branch, Engineering Division.

The annual check will include repairs and calibration and ESD will initiate the action to call in instruments according to a schedule and provide a replacement instrument. The system operates as a changeover service so that field staff will always be in posession of a Detector. A number of Detectors will be sent to the Depot/Store and the same number delivered to ESD.

RESPONSIBILITY

Each officer on whose tool kit the gas detector is issued

ANNUAL TESTING OF GAS DETECTORS (Contd)

RESPONSIBILITY (Contd)

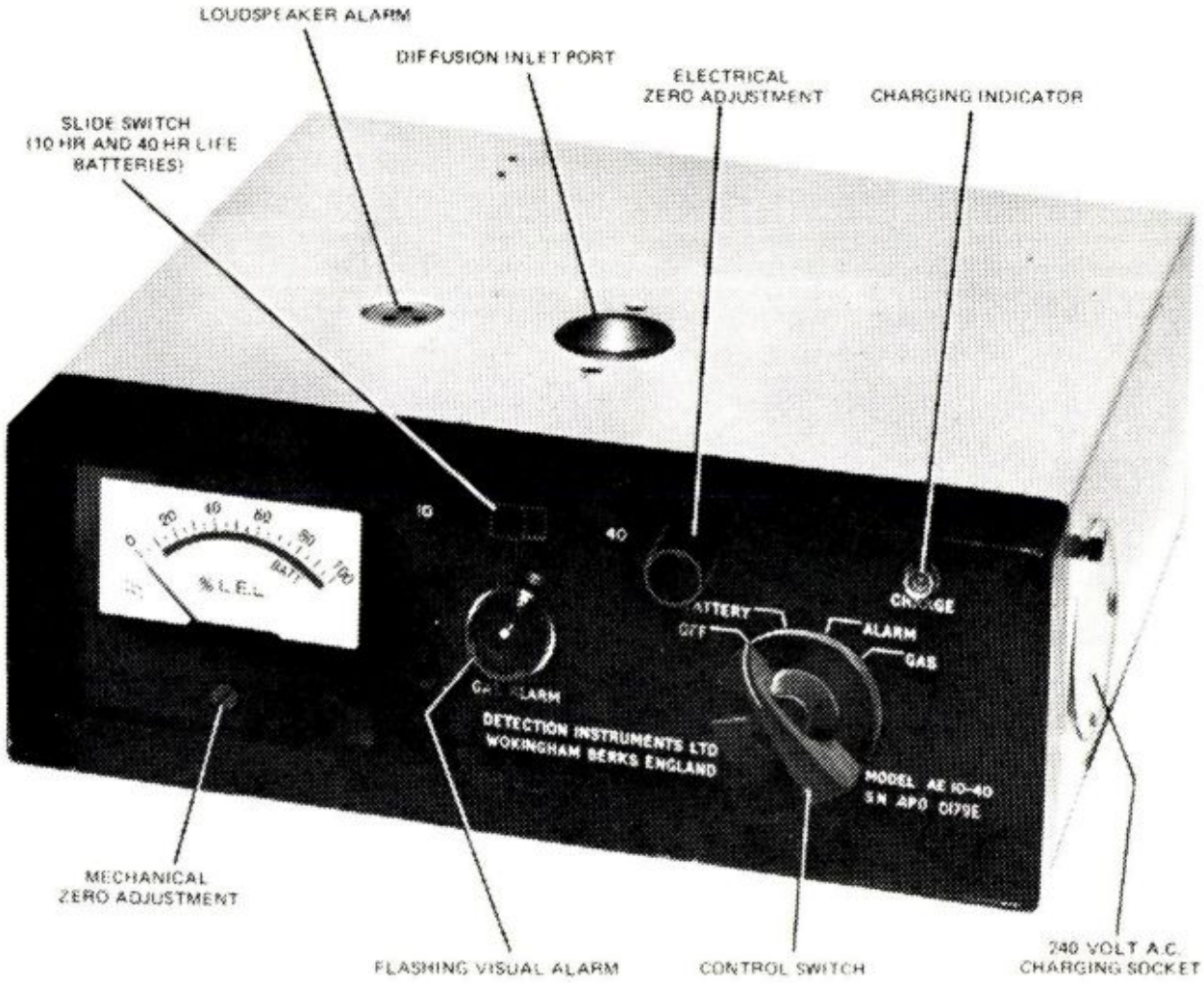
shall be responsible for having the instrument tested annually. While the ESD system should take care automatically of the annual calibration and test, each officer must ensure his instrument is on the ESD list and that the calibration period does not exceed one year.

PACKACING AND DESPATCH

A supervisory officer of appropriate grade (e.g. Lines Officer) shall oversight the packing of instruments. They are to be carefully packed in foam rubber or crushed newspaper etc. and delivered to :-

Supervisor Grade 2 (Workshop)
Instrument Repair Centre
Engineering Services Depot
Adelaide Area,
KIDMAN PARK, SA.

END



MODEL AE 10-40 PORTABLE COMBUSTIBLE GAS DETECTOR. Issue 5, 1979

ACCESSORIES.

The accessories include an adjustable carrying strap fixed to the detector, a vinyl carrying satchel, aspirator attachment with a 2 m length of sampling hose fitted with a stainless steel probe 150 mm long, a battery charging lead 2 m long for connecting the detector to a 240 volt a.c. mains outlet, two Allen keys, and instruction book.

MODEL AE 10-40 DETECTOR IN SATCHEL WITH ACCESSORIES.

OPERATION.

To operate make the following adjustments in FRESH AIR.

Mechanical Zero. Check mechanical zero with control switch at OFF. If necessary adjust meter needle to zero by the screw centrally located near base of meter.

Electrical Zero. Turn control switch to GAS/ON wait for instrument to stabilise and adjust electrical zero.

THIS MUST BE DONE IN FRESH AIR BEFORE MAKING THE BATTERY CHECK AND ALARM CHECK. INCORRECT ADJUSTMENT OF THE ELECTRICAL ZERO, FOR EXAMPLE BELOW ZERO, CAN RENDER THE DETECTOR INOPERATIVE.

Battery Check. Turn control switch to BATTERY and check that meter needle deflects to the "BATT" band and settles within the meter scale. Operate slide switch to 10 and 40 respectively to check that both batteries are charged. During operation the battery alarm will operate if either battery needs re-charging.

Alarm Check. Turn selector switch to ALARM. The alarms will operate and the meter needle will deflect to a positive reading to indicate that the circuitry is satisfactory.

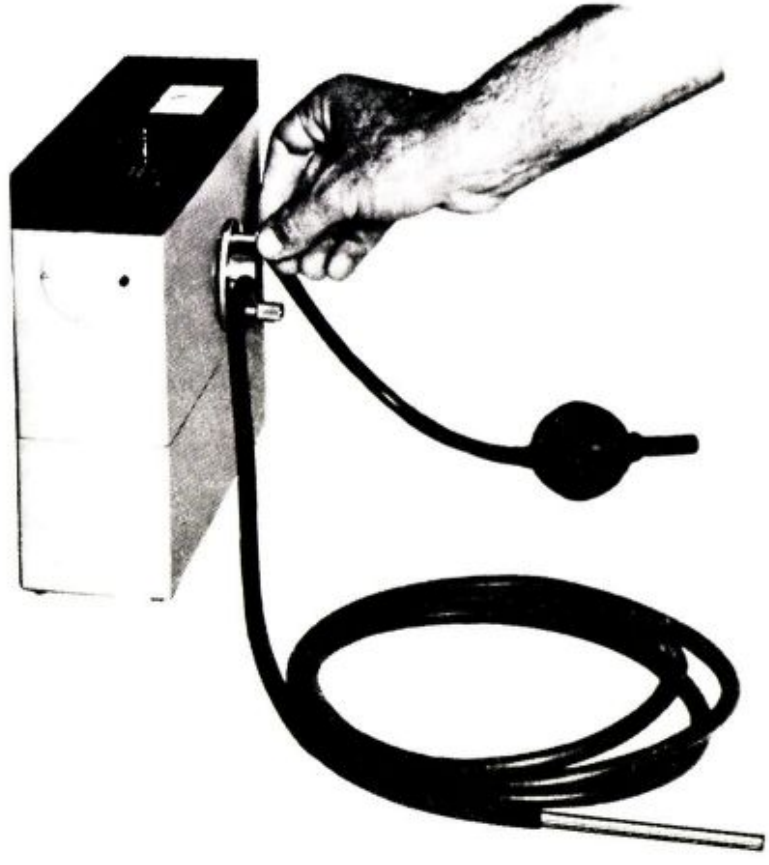
To Spot Sample or Monitor. Turn selector switch to GAS/ON and the meter needle will settle at zero.

BEFORE ANY WORK IS COMMENCED OR ANY SPARK OR FLAME (OR CIGARETTE) IS BOUGHT NEAR AN UNDERGROUND OPENING. MAKE NECESSARY TESTS USING A COMBUSTIBLE GAS DETECTOR.

FITTING ASPIRATOR ATTACHMENT

Fit the aspirator attachment to the diffusion inlet and alternately tighten the two thumb screws (finger tight only). DO NOT USE PLIERS, otherwise the threads can be damaged.

Squeeze the aspirator bulb and release it after blocking the probe inlet with a finger. The rubber bulb will inflate very slowly to show that a satisfactory seal has been obtained.



FITTING ASPIRATOR ATTACHMENT.

TO SPOT TEST FOR GAS

Test the atmosphere in the manhole by placing the probe in the appropriate position and squeeze the aspirator bulb 10 times for each test.
(See page No C-6 and 7 and manhole testing procedure).

Any reading on the meter is a positive indication of combustible gas. The alarm will operate when the meter needle deflects to or beyond 10% of the LEL. (See Section C page 8 for action to take if gas is detected).

DOUBLE CHECK FOR PRESENCE OF GAS

After completing the spot tests, squeeze the rubber bulb 10 times and sample in fresh air, remembering to watch the meter needle for any deflection up scale. This is a double check for the presence of a rich gas mixture. It also clears any damaging gas vapour from the detector and protects the filament.

When spot testing, be careful to keep the probe out of any water in the manhole or ducts. Drawing water into the detector will make it unserviceable.

Continuous Monitoring while at Work Underground.

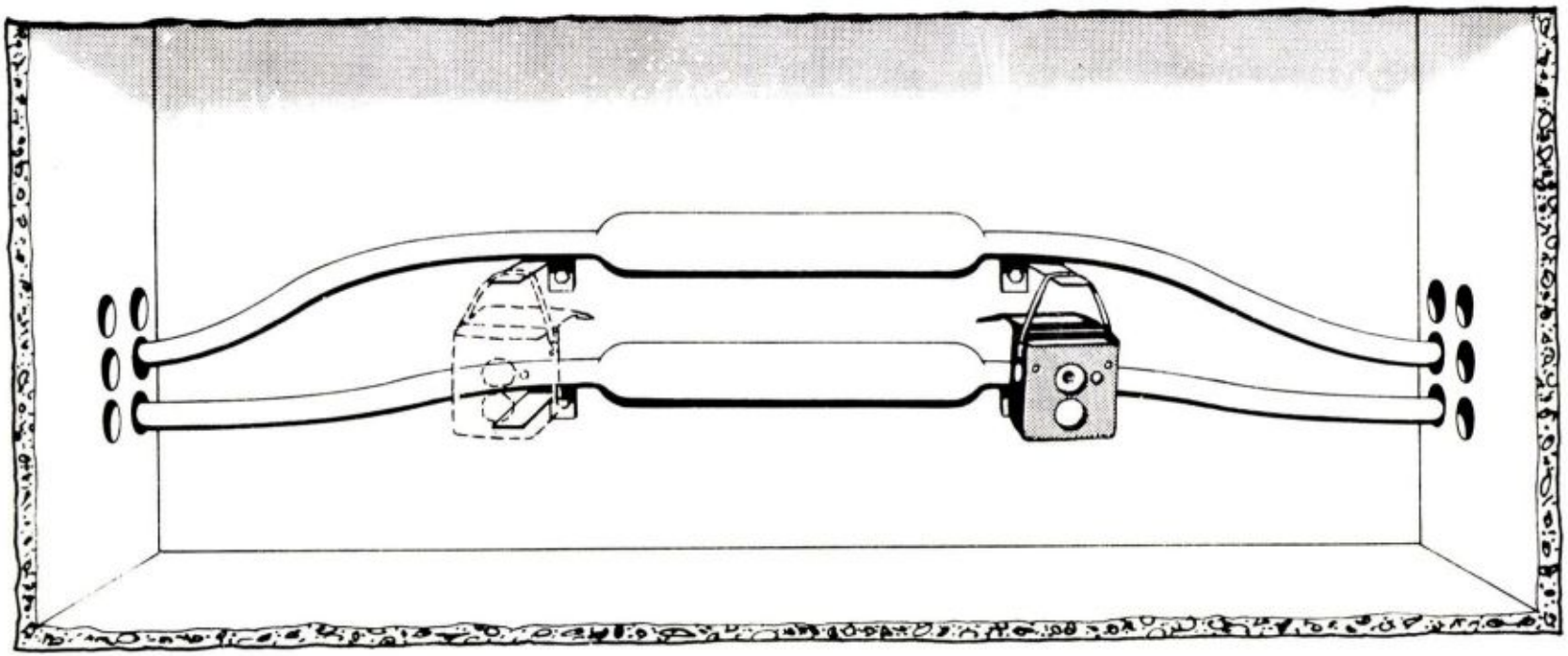
Remove the aspirator attachment after completing spot tests.

Hang the detector on a cable bearer about midway between the duct entries at about the working level in the manhole.

Before using any flame, (this includes smoking) spark producing equipment (flint lighter, electric powertools, battery connections) or if gas is suspected at any time, move the detector around the manhole, for example near the floor, roof and at duct entries to check for any pockets of gas which may accumulate while at work. Watch the meter all the time to observe any positive readings below the alarm point of 10% L.E.L.

SEE SECTION C PAGE 8 FOR ACTION TO TAKE IF GAS IS DETECTED.

PORTABLE COMBUSTIBLE GAS DETECTOR MODEL AE 10-40



POSITIONING MODEL AE 10-40 DETECTOR FOR CONTINUOUS MONITORING IN A MANHOLE.

Issue 5, 1979

DETECTOR FAULTY

While the detector is switched to GAS/ON and being used to spot test or monitor for gas, it is possible for the alarms to operate to indicate that the detector is faulty. For example, to warn the operator that the battery requires charging or to indicate a circuit fault. Where the operation of a detector is suspect, further tests for gas should be made with another detector. The suspect instrument should then be checked by the Line Supervisor or Line Officer using the Field Test Kit.

BATTERIES AND BATTERY CHARGING.

The Model AE 10-40 detector is powered by three 1.2 V nickel cadmium batteries internally (10 hour life) and six 1.2 V nickel cadmium batteries in the detachable battery pack (40 hour life). The voltage of the batteries when fully charged is 3.6 volts d.c. An important fail safe feature is that the audio and visual alarms will operate for a short time to warn the operator when the appropriate battery requires charging, and to switch over to the other battery.

The detector may be stored with the batteries discharged with no adverse effect and the batteries must be charged before the detector is issued. Detectors should not be stored with charged or partly charged batteries, for prolonged periods, for example no longer than 2 months.

Battery Charging through the Detector. This must be done in a safe area, for example in a Line Depot or Exchange. Charging the batteries in a tunnel or exchange cable chamber is Dangerous.

PORTABLE COMBUSTIBLE GAS DETECTOR MODEL AE 10-40

Charging Procedure	Minimum Charging Period	
	10 Hour Battery	40 Hour Battery
Push slide switch to 10 or 40 to select appropriate battery for charging. Turn control switch to BATTERY. Open battery charger socket cover on side of detector. Plug battery charging lead into battery charging socket. Connect 3 pin plug to 240 V a.c. power outlet and switch on the power. The amber charging lamp will light up and remain alight while the detector is connected to the mains power supply to provide a warning that the detector is connected to a 240 volt mains supply. When the appropriate batteries are charged:- Turn off the 240 V mains supply. Disconnect the battery charging lead. Turn the control switch to OFF. Close the charging entry cover with the Allen key before taking the detector on the job.	12 hours	28 hours
	NOTE: The minimum charging time must be adhered to, to ensure the full working capacity of battery life. When charging procedure complete, make battery check (see page W-5).	

BATTERY CHARGING PROCEDURE.

PORTABLE COMBUSTIBLE GAS DETECTOR
M.S.A. Model 2

GENERAL

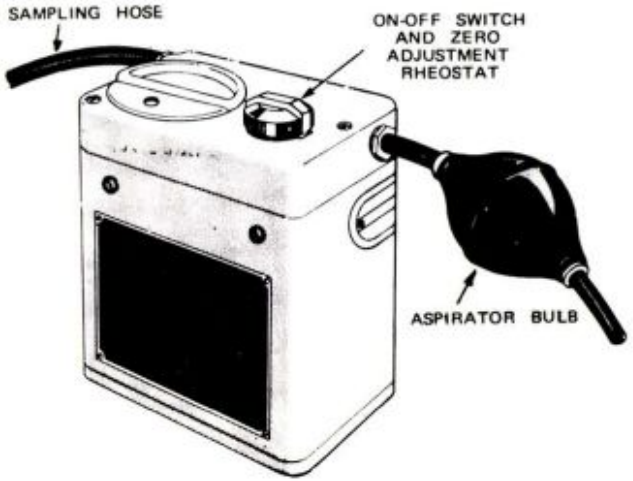
The M.S.A. Model 2 portable combustible gas detector is normally used by staff who work at pits or spend limited periods in manholes but can be used anywhere where gas may be a hazard. It may also be used for longer periods in manholes where a continuous monitoring gas detector is not available.

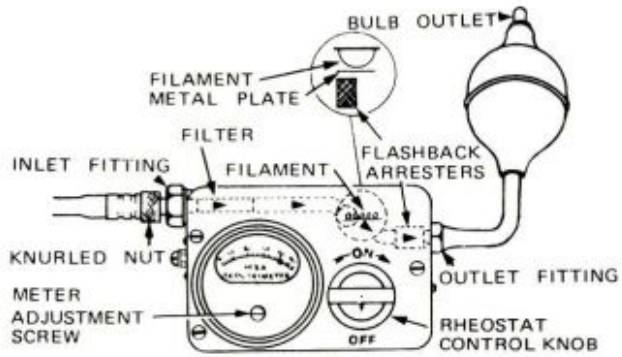
DETECTING CARBON MONOXIDE

A carbon monoxide gas detector must be used where manufactured gas which has a carbon monoxide content is reticulated, or anywhere else where carbon monoxide is suspected, (for example, exhaust fumes from petrol, oil, or gas fuelled internal combustion engines).

Almost any concentration of carbon monoxide is extremely toxic.

The M.S.A. Model 2 portable combustible gas detector can only detect combustible concentrations of carbon monoxide but such concentrations are rarely encountered, however, if such a situation is suspected, both detectors must be used.





PORTABLE COMBUSTIBLE GAS DETECTOR M.S.A. Model 2

Petrol Vapour.

One test of petrol vapour without an inhibitor filter fitted in the detector can contaminate the filament with a deposit of tetra ethyl lead thus making any further readings misleading and dangerous.

DESCRIPTION.

The M.S.A. Model 2 combustible gas detector has a meter with a scale which indicates 0-100% of the Lower Explosive Limit (L.E.L.)

The Control knob has three functions:

(i) The ON/OFF Switch. (The metal flag on the control knob which is raised before turning the control knob, is provided as a reminder that the detector is switched on).

(ii) The battery test - The control knob is turned clockwise until a reading of 20% is obtained on the scale which indicates that the batteries are satisfactory.

(iii) The electrical zero adjustment. The control knob is turned anti-clockwise until the meter needle settles at zero.

The mechanical zero adjustment screw is centrally located below the meter needle. This may be adjusted with a small screwdriver when necessary.

The power supply is provided by six 1.5 V dry cells (S2/34), connected in parallel and located in the battery compartment in the base of the detector.

The detector is equipped with an aspirator bulb and the accessories include a sampling hose, a probe and carrying straps.

OPERATION

To operate the M.S.A. Model 2 portable combustible gas detector check and adjust it in FRESH AIR as follows:

(i) Connect the sampling hose to the inlet port making sure that the connecting nut is airtight.

(ii) Attach the probe to the other end of the sampling hose making sure that the connection is airtight.

(iii) Check mechanical zero with control switch OFF. If necessary adjust the meter needle to zero by the screw centrally located near the base of the meter.

(iv) Raise the metal flag on the control knob and switch the detector on. The meter needle will move rapidly up-scale and return to zero or below.

NOTE: If the meter needle DOES NOT move up-scale and return to zero it indicates that the batteries are discharged.
If the meter needle moves up-scale and stays there, it indicates that the filament is faulty.

PORTABLE COMBUSTIBLE GAS DETECTORS M.S.A. Model 2

To check the battery condition, turn the control knob clockwise until a reading of 20% is obtained on the meter. (If a reading of 20% cannot be obtained with the control knob turned to its maximum, it indicates that the batteries are discharged and need replacing).

To adjust electrical zero turn the control knob anti-clockwise until the meter needle settles at zero.

Spot Testing for Gas before entering a manhole.

Squeeze the aspirator bulb and release it after blocking the probe inlet with a finger. The rubber bulb will inflate very slowly to show that all connections are airtight. Test the atmosphere in the manhole by placing the probe in the appropriate position and squeeze the aspirator bulb 10 times. (See Section C pages 6 and 7 for manhole testing procedure).

Any reading on the meter is a positive indication of combustible gas. Note that the meter needle fluctuates between 0 and 3% L.E.L. while the aspirator bulb is being operated. See page No. C-8 for action to take when gas is detected.

GOOD WORKMANSHIP MEANS BETTER SERVICE FOR CUSTOMERS AND REDUCES THE POSSIBILITY OF SERVICE INTERRUPTIONS.

COMPLETION OF SPOT TEST

Squeeze the rubber bulb 10 times and sample in fresh air, remembering to watch the meter needle for any deflection up scale. This is a double check for the presence of a rich gas mixture. It also clears any damaging gas or vapour from the detector and protects the filament. Switch the detector off after completing the tests.

When spot testing, be careful to keep the probe out of any water in the manhole or ducts. Water can be avoided by inserting the probe no more than 150 mm through a keyhole or test hole or up a duct. Drawing water into the detector will make it unserviceable.

Verifying Rich Gas/Air Mixtures by Fresh Air Test.

It is extremely important to watch the meter face continually while sampling for gas and to recognise the reading because very rich gas mixtures when diluted with more air may be violently explosive.

IF GAS IS DETECTED SEE SECTION C PAGE 8 FOR ACTION TO BE TAKEN

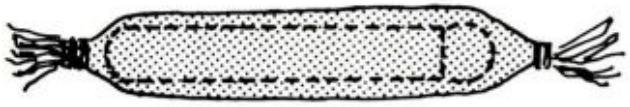
PORTABLE COMBUSTIBLE GAS DETECTOR M.S.A. Model 2

USE WITH PETROL VAPOUR

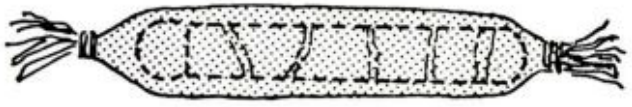
If an M.S.A. Model 2 combustible gas detector gives a positive indication of gas and it is evident that the detected gas is petrol vapour, do not use the detector again until the combustion system has been checked with the field test kit because petrol vapour can have a harmful effect on the detection qualities of the filament. Where further tests in petrol vapour are necessary, fit the instrument with an inhibitor filter, in place of the cotton filter. The inhibitor filter must be replaced daily while tests in the petrol vapour area continue.

TO FIT INHIBITOR FILTER

To fit or replace the inhibitor filter, unscrew the sampling hose, thoroughly crush the glass inhibitor filter within its sock in several places with a pair of pliers and slid the filter (still in its sock) into the inlet chamber of the indicator. Restore the sampling hose connection. After use, remove the inhibitor filter and dispose it safely (the sock contains glass splinters) and fit the cotton filter back in the instrument.



Whole



Broken inside Sock

INHIBITOR FILTER

After petrol vapour tests, notify your Supervisor who will check the combustion system to ensure that it is still operating satisfactorily.

Batteries

When the meter needle remains below zero and cannot be brought up to zero even when the control knob is turned to its extreme clockwise position, the batteries may be exhausted and need replacing. Access to the battery compartment is obtained by loosening two screws in the cover at the base of the detector. The batteries (six 1.5 V-(S2/34) operate in parallel and are installed with their tops toward the top of the battery case. All batteries must be replaced as a group. Check for corrosion in the battery compartment.

PORTABLE COMBUSTIBLE GAS DETECTOR COSMOS MODEL XP301-B

GENERAL

The Cosmos Model EX301-B portable combustible gas detector samples with an electrically operated pump, it is the most convenient gas detector to use for surveying an area of the network for combustible gas or to check for gas leaks from adjacent gas pipes during excavating operations. Normally, the detector is used by staff who work at pits or spend limited periods in manholes and exchange cable chambers in areas of gas reticulation.

DETECTING CARBON MONOXIDE

A carbon monoxide gas detector must be used where manufactured gas which has a carbon monoxide content is reticulated, or anywhere else where carbon monoxide is suspected (for example, exhaust fumes from petrol, oil, or gas fuelled internal combustion engines). Almost any concentration of carbon monoxide is extremely toxic. The cosmos model XP301-B portable combustible gas detector can only detect combustible concentrations of carbon monoxide but such concentrations are rarely encountered, however, if such a situation is suspected, both detectors must be used.

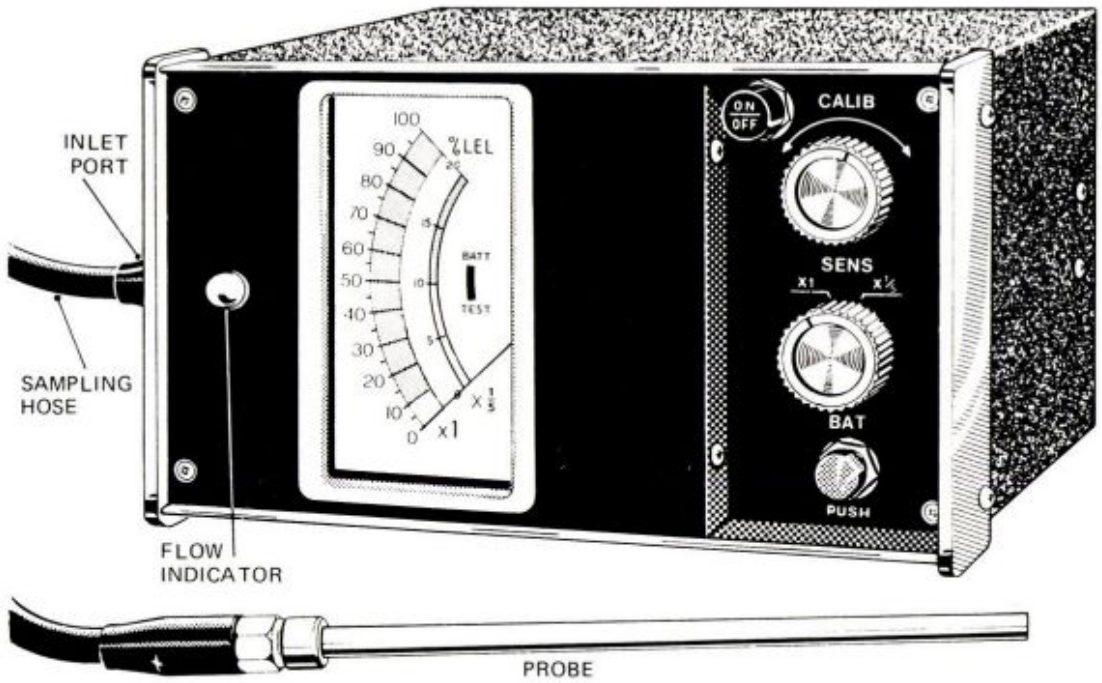
DESCRIPTION

The detector has a meter with 2 scales:

X_1 indicating 0 - 100% of the Lower Explosive Limit (L.E.L.).

$\frac{X_1}{5}$ (increased sensitivity) indicating 0-20% of the L.E.L.

The scales are designated X_1 and $X\frac{1}{5}$ to match the sensitivity control knob positions. Both meter scales have a yellow band from 0 - 10% while the X_1 and $X\frac{1}{5}$ scales have a red band from 10 - 100% and 10 - 20% of the L.E.L. respectively. A black band "BATT TEST" is provided for the meter needle to indicate the condition of the batteries when the battery test button is depressed and held in position.



COSMOS MODEL XP301-B PORTABLE GAS DETECTOR

FLOW INDICATOR

An important safety feature is the flow indicator fitted in the sampling path of the pump. When the plastic float is visible in the indicator, it shows that the pump is actually sampling, because the sound of the pump operating does not mean that it is sampling if the pump diaphram is defective.

NOTE: Instrument should be upright for the flow indicator to operate correctly.

PORTABLE COMBUSTIBLE GAS DETECTOR COSMOS MODEL XP301-B

BATTERY CONTAINER

The detector is powered with four 1.5 V (3 Volt in operation) series/parallel connected dry cells (S2/34). The battery container fits into the base of the detector to provide a quick and simple battery change.

The detector is supplied with a carrying satchel, with brief operating instruction fitted in the cover. The pouch at the side of the satchel carries the sampling hose approximately 2 m long, metal probe 150 mm long, and a rubber cap which can be used on the end of the metal probe when tracing a gas leak in a pipe.

OPERATION

High Sensitivity Scale

Normally tests for combustible gas are made with the 'SENS' control knob at $X\frac{1}{5}$ which gives a full scale reading of 20% of the L.E.L. on the $X\frac{1}{5}$ scale. When a full scale reading is obtained on the $X\frac{1}{5}$ scale, ONLY then should the 'SENS' control be switched to X_1 to check the percent L.E.L.

To Operate the Cosmos Model XP301-B Gas detector.

Make the following adjustments in FRESH AIR:

(i) Connect the sampling hose to the inlet port making sure that the connecting nut is air tight.

(ii) Attach the metal probe to the other end of the sampling hose making sure that the connection is air-tight.

(iii) Press the ON/OFF button and release it to switch on the detector. The electric pump can be heard operating.

(iv) Turn 'SENS' knob to $X\frac{1}{5}$.

(v) Adjust 'CALIB' knob until the meter needle settles at zero.

(vi) Press 'BAT' button and hold in position. The needle moves to within the black band marked "BATT TEST" to show that the batteries are satisfactory. (The battery test can be made with the 'SENS' control at either $X\frac{1}{5}$ of X_1).

When the meter needle remains at the low end of the black band, the batteries must be replaced, because even though the pump operates there is insufficient current to heat the filament.

(vii) Check the flow indicator to ensure that the plastic float is visible which shows the electric pump is sampling.

The detector is now ready to sample the atmosphere to be tested for gas.

Spot Testing for Gas Before Entering a Manhole.

Test the atmosphere in the manhole by placing the probe in the appropriate position for about one minute at each testing position. (See page C-6 for manhole testing procedure).

Watch the meter needle for any indication of gas.
See Section C Page 8 for action to take if gas is detected.

After completing the spot tests, sample FRESH AIR with the probe, remembering to watch the meter needle for any momentary deflection up-scale. This is a double check for a rich gas mixture. It also **clears** any damaging gas or vapour from the detector and protects the filament.

While testing, keep the probe out of any water in the manhole or ducts. Drawing water into the detector will make it unservicable.

Switch off the detector after the tests are completed.

BEFORE ANY WORK IS COMMENCED OR ANY SPARK OR FLAME (OR CIGARETTE) IS BOUGHT NEAR AN UNDERGROUND OPENING MAKE THE NECESSARY TESTS USING A COMBUSTIBLE GAS DETECTOR.

Issue 5, 1979

PORTABLE COMBUSTIBLE GAS DETECTOR CROWCON

GAS-CHECK 74 GC

Some of these gas detectors are in field use; refer to EI Lines General TE4470(a copy of which should be held with the detector) for operating and maintenance instructions.

CABLE RECORDS AND PLANS

SECTION X - SUBSCRIBERS CABLE PAIR RECORDS
PLAN SYMBOLS
TYPICAL CABLE PLANS

Issue 5, 1979

SUBSCRIBERS CABLE PAIR RECORDS

Except in cases of emergency, e.g. clearance of faults after hours, no cable pair may be brought into use, disconnected, or transferred to another pair unless authority is given on a Telephone Service Order, Cable Pair Transfer Advice, Form E.95 or Cable Pair Alteration and Advice, Form E.94.

Forms E.94 and E.95 are jointing schedules prepared in the District Sectional Office from records maintained by the Cable Assigner, to indicate to the Cable Jointer and Technician carrying out the work the existing and proposed cable arrangement, pair by pair. On completion of the work the forms are amended where necessary and returned to the Cable Assigner and Drafting Section for amendment of records.

SUBSCRIBERS SERVICES.

The cable pairs to be used for new services will be shown on the Telephone Service Order.

Where it is necessary to transfer one or two lines to make a pair available for a new service, details will be shown on Form E.95 Cable Pair Transfer Advice which will accompany the Telephone Service Order. Make the transfers in conjunction with the Exchange Technician and, on completion, sign and return the Form E.95.

Where any allotted pair is faulty or not available contact the Cable Assigner who will allot a new pair or advise what alternative action should be taken. The Cable Assigner will issue a sequence number as authority for the alteration. Amend the Telephone Service Order or Form E.95 to show the cable pairs used and quote the sequence number.

Prepare Telephone Order Direct Lead Sketch Plan Form E.89 for lead-in cables.

Where necessary amend pillar or cabinet plan and the works sketch plan to show the work carried out.

WHEN ENTERING CUSTOMERS PREMISES, IDENTIFY YOURSELF AS A TELECOM. OFFICER AND EXPLAIN THE REASON FOR YOUR VISIT.

Original

Telecom Australia

CABLE PAIR TRANSFER ADVICE

LINES OFFICER EASTHILLS

Please arrange to transfer the following services as indicated.

BLACKWOOD Exchange

	DIST AREA	MAIN CABLE		CABINET		PILLAR		CABLE TERMINAL BOX	CUSTOMER	
	Cable & Cond.	Code	Pair	Desig-nation	'B' Pair	Desig nation	O' Pair		No.	Address
FROM	9	4	457					K2	304	13 PALM AVE
TO		4	463					K2		
FROM		4	460					K2	540	CRN. PALM AVE & HIGHFIELD RD.
TO		4	464					K2	P.T.	
FROM										
TO										

CABLE ASSIGNER

The transfers have been completed as above and local records amended.

W Brooks ..... Lines Serviceman

1 / 8 /19 77

CHIEF DRAFTSMAN

The transfers have been completed as above and local records amended.

..... Cable Assigner

..... / ..... /19.....

E95

USE OF FORM E.95 FOR TRANSFER OF CABLE PAIRS.

SUBSCRIBERS CABLE PAIR RECORDS

NEW CABLE INSTALLATIONS AND ALTERATIONS.

Details of existing and proposed cable pair allocations will be shown on Form E.94 Cable Pair Alteration and Advice, for alterations to cable pairs for:-

(i) Extension of main, branch or distribution cables.
(ii) Installation of pillars or cabinets.
(iii) Rearrangement of pairs within a cable.
(iv) Transfer of a lateral from one cable to another.
(v) Transfer of a cable from one exchange to another.

Form E.94 read in conjunction with the sketch plan of the work provides all of the information necessary to carry out the required alterations to the cable pairs. Transfers of main pairs will be carried out in conjunction with the Exchange Technician who will also be supplied with a copy of Form E.94.

Amend any entries on the form which are found to be incorrect when the cable pairs are identified with the exchange, pillar terminal or cabinet. The completed form should represent a true record of cable pairs so that cable records may be corrected where necessary.

If any pair allotted is faulty or not available, contact the Cable Assigner who will allot a new pair and advise a sequence number.

FAULTS.

Where it is necessary to transfer a service to another pair to clear a fault contact the Cable Assigner who will allot a new pair and a sequence number. If the transfer is necessary after hours advise the Cable Assigner as soon as possible.

Prepare Form E.95 showing pairs transferred and forward original and duplicate copies to the Lines Officer.

Where cables are opened between existing joints or pits for repair or testing purposes, prepare Form E.88 showing the exact location of the new joint.

CABLE PAIR ALTERATION AUTHORITY AND ADVICE

ORIGINAL
Sheet No.

LINES OFFICER CLARENDON
Please arrange for alterations to cable pairs as detailed below.

Exchange Area CLAR'N
From Exchange
Tel Order No. •
Works Auth. No. 15/5708

J. Brown DTM ESM 1 877

From DA 158 Cable 5				To DA Cable 5				Customer			Cross Connection
Cabinet — Pillar C				Cabinet A Pillar E							
MAIN PAIR	'B' PAIR	'C' PAIR	Terminal	MAIN PAIR	'B' PAIR	'C' PAIR	Terminal	OLD NUMBER	NEW NUMBER	ADDRESS	
		081-096				066-080				JOHNSON ST.	
521		081		406	206	066			2537	11 JOHNSON ST.	
522		082		407	207	067			3648	13 JOHNSON ST.	
		083				068					
523		084		408	209	069			2091	17 JOHNSON ST.	
501		085		435	210	070			5432	19 JOHNSON ST.	
502		086		411	217	071			5432 Ex.	19 JOHNSON ST.	
		087				072					
528		088		414	213	073			2277	10 JOHNSON ST.	
		089				074					
529		090		415	215	075			3998	14 JOHNSON ST.	
531		091		416	216	076			2542	16 JOHNSON ST.	
		092				077					
		093				078					
		094				079					
535		096		420	220	080			4118	20 JOHNSON ST.	

LINES OFFICER
The alterations have been effected as shown above.

A. Jointer Lines Serviceman 10 8 77

NOTE — If actual alterations made differ from those planned amend this copy in red.

E 94

1. CABLE ASSIGNER 2. CHIEF DRAFTSMAN

The Depot pair records • have been amended / were not affected

Lines Officer ___/___/___

RECORDING SUBS. LEAD-IN CABLES

TELEPHONE ORDER DIRECT LEAD SKETCH PLAN, FORM E.89.

Form E.89 is used for advice to the Cable Assigner and Drafting Section of the installation or alteration of direct underground leads of one or two pair cable to customers premises.

The Lines Serviceman who completes the Telephone Service Order or alters the cable is responsible for preparation and submission of the Form E.89. A separate form is required for each lead-in. Prepare form in triplicate. Give original and duplicate copy to the Lines Officer and retain triplicate in book.

All of the normal methods of providing a direct lead are shown on the form in broken lines. Overdraw in black pencil or ball point pen the actual method used.

Do not show the length of cable unless it exceeds 30 metres or make any differentiation between armoured cable and cable in pipe. Do not show length of pipe.

Insert the following information in the spaces provided:-

Name of street or road and street number of the premises concerned.

Size of the existing street cable.

Size of the pit in the street at the tap-out point. (If this is a new pit fitted over an existing cable, show the distance to adjacent pits in both directions along the street).

Draw in the property lines.

Draw in direct lead in appropriate position and also any other leads from the same tap-out point.

Show size of cable and cable pair readings. (Both pairs if two pair cable).

Where there are no street numbers show the north point, direction of exchange, name of nearest cross street and measurement to cross street or other readily identified point on plan.

Where the lead-in cable is larger than 2 pair, furnish details on Form E.88.

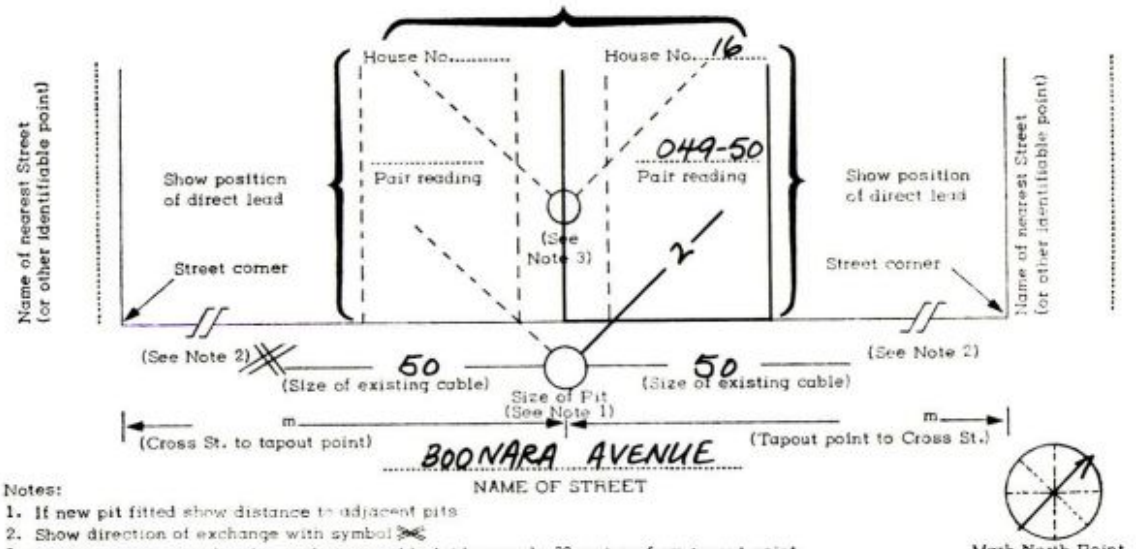
TAKE CARE TO AVOID DAMAGING PRIVATE PROPERTY. REPORT ACCIDENTAL DAMAGE IMMEDIATELY.

FORM E.89 TELEPHONE ORDER DIRECT LEAD SKETCH PLAN

Telecom Australia ORIGINAL

TELEPHONE ORDER DIRECT LEAD SKETCH PLAN

TEL. ORDER NO. X 14712	*THIS FORM TO BE USED FOR 2 PAIR DIRECT LEADS ONLY*	EXCHANGE AREA HAMPTON
MAIN CABLE NO. 4		DISTRICT AREA NO. OR PILLAR DESIGNATION P2



Notes:
1. If new pit fitted show distance to adjacent pits
2. Show direction of exchange with symbol
3. Measurements must be shown if pit or cable laid exceeds 30 metres from tapout point

Mark North Point

LINES OFFICER

Work completed by

C Smith 28/2/76

Lines Serviceman

CHIEF DRAFTSMAN

Information shown above has been checked and all essential details shown.

G Harris 29/2/76

Lines Officer

E 89

PLAN SYMBOLS - CABLE

1. FORM OF CABLE

(a) LEAD COVERED

(b) MOISTURE BARRIER — MB

(c) PLASTIC — P

(d) ALUMINIUM — AL

(e) ARMOURED

TYPES OF ARMOUR :–

STEEL TAPE ARMOURED	: ST
LIGHT WIRE ARMOURED	: LW
SINGLE HEAVY WIRE ARMOURED	: HW
DOUBLE WIRE ARMOURED	: DW

SHOWN THUS — HW

(f) JACKETED

(i) PLASTIC JACKET (Polyethylene) — PJ

(ii) HARD PLASTIC JACKET (Nylon) — HJ

(g) SCREENED

(i) COPPER — C

(ii) ALUMINIUM — AL

(iii) COREFILLED — F

2. CABLE SIZE (PAIRS) AND CONDUCTOR DIAMETER (mm)

—100/0·40—

3. TYPE OF CABLE

—24/1·27QC—

(Illustrating 24 pr 1·27mm Quad, Carrier)

ABBREVIATIONS FOR CABLE TYPE

DISC INSULATED STAR QUAD	DIQC	QUAD, TRUNK TYPE	QT
COAXIAL	CX	TWIN	TW
QUAD, CARRIER TYPE	QC	UNIT TWIN	PEIUT
QUAD, LOCAL TYPE	QL	CELLULAR POLYETHYLENE FILLED UNIT TWIN	CPFUT

4. JOINT

(a) GENERAL

(b) OPENABLE JOINT — OJ

(c) IDENTIFIED (All pairs identified) — IJ

(d) REPAIR JOINT — RJ

5. CABLE CUT AND INSULATED

6. LEFT IN SITU OR RECOVERED

7. LOADING COIL

(Illustrating 24 coils, 88 millihenrys) — 24/88

8. FORM OF CONSTRUCTION

(a) IN CONDUIT (Multi-duct or pipe)

(b) IN TUNNEL OR

(c) AERIAL (Includes on wall)

(i) AERIAL INTEGRAL BEARER IB

(ii) MULTI-PAIR DROPWIRE MD

(d) BURIED

(i) Not used in case of armoured cable.

(e) SHARED TRENCH

9. DEVELOPMENT SURVEY FIGURES

1974 (30)
82 (46)
94 (60)

(i) In this illustration, the symbol indicates:—

30 services at date of survey in 1974

46 services at 8 year period in 1982

60 services at 20 year period in 1994

10. EXCHANGE

11. MARKER Ⓜ

12. CABLE TERMINAL BOX

(a) ON POLE (Unprotected)

(b) ON POLE, DROP WIRE DISTRIBUTION (Unprotected)

(c) ON POLE (Protected)

(d) ON POLE, DROP WIRE DISTRIBUTION (Protected)

(e) ON OUTSIDE WALL (Unprotected)

(f) ON OUTSIDE WALL (Protected)

(g) ON INSIDE WALL (Unprotected)

(h) ON INSIDE WALL (Protected)

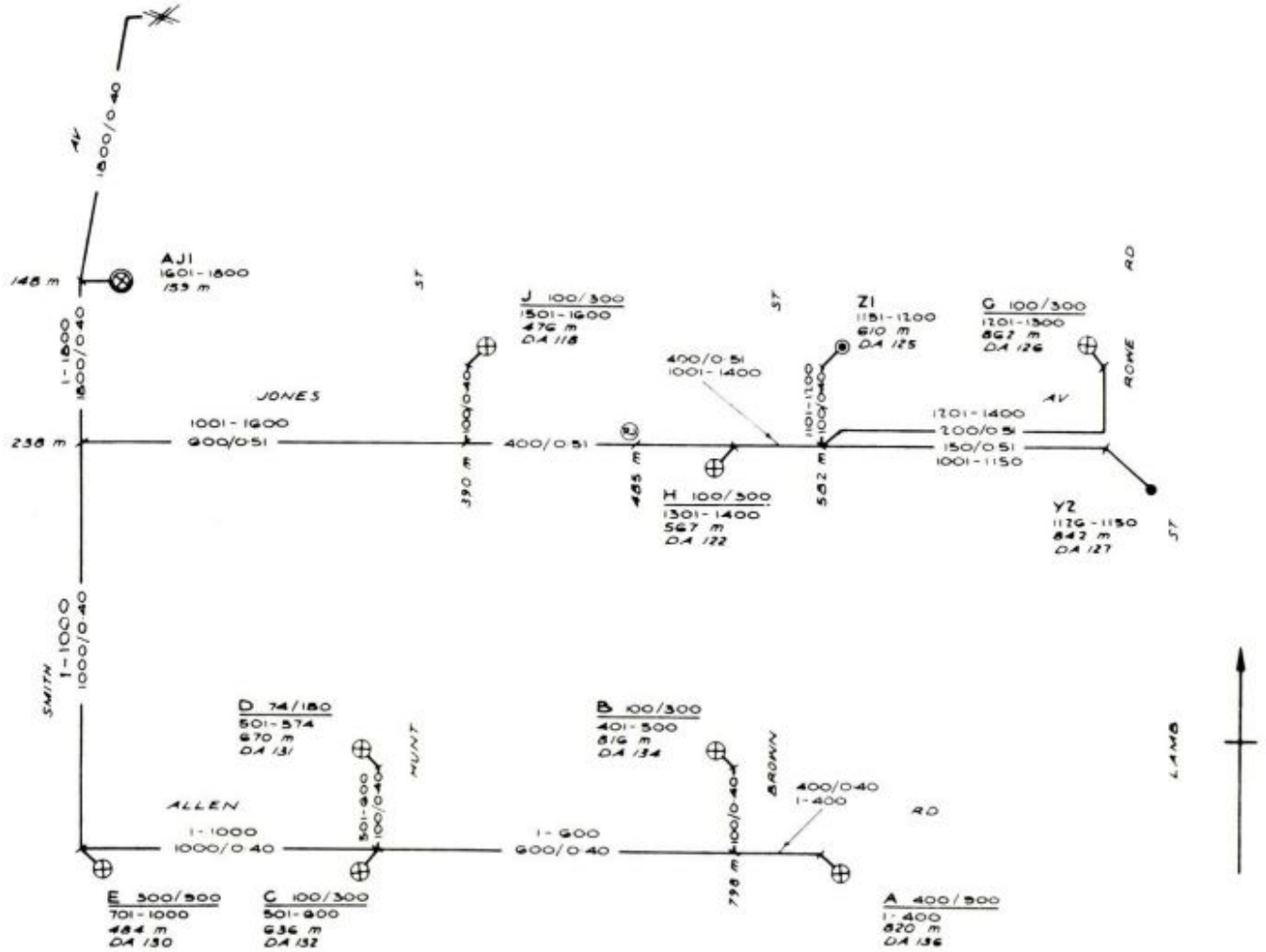
(i) ON JOINT USE POLE

13. PILLAR

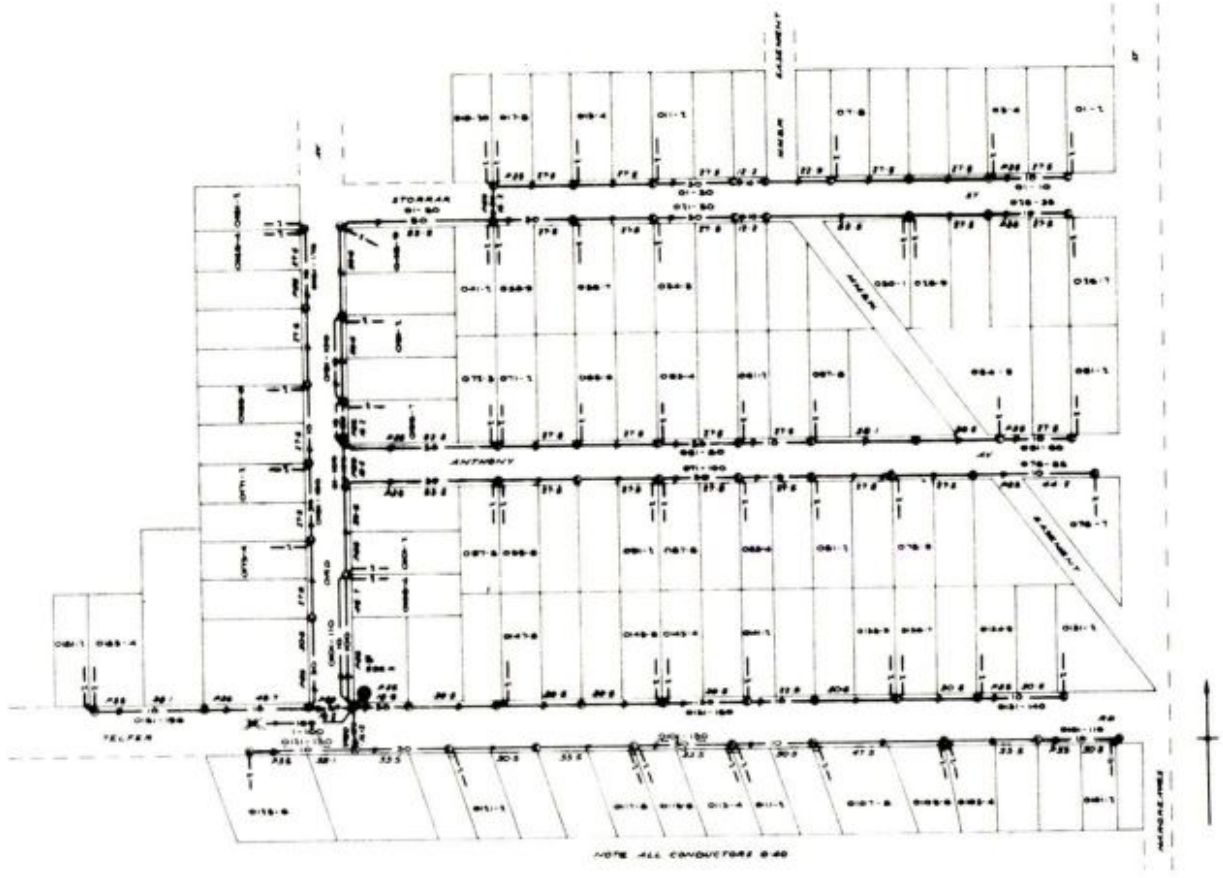
14. CABINET

15. INDOOR CABLE TERMINAL UNIT

SUBSCRIBERS CABLE PLANS

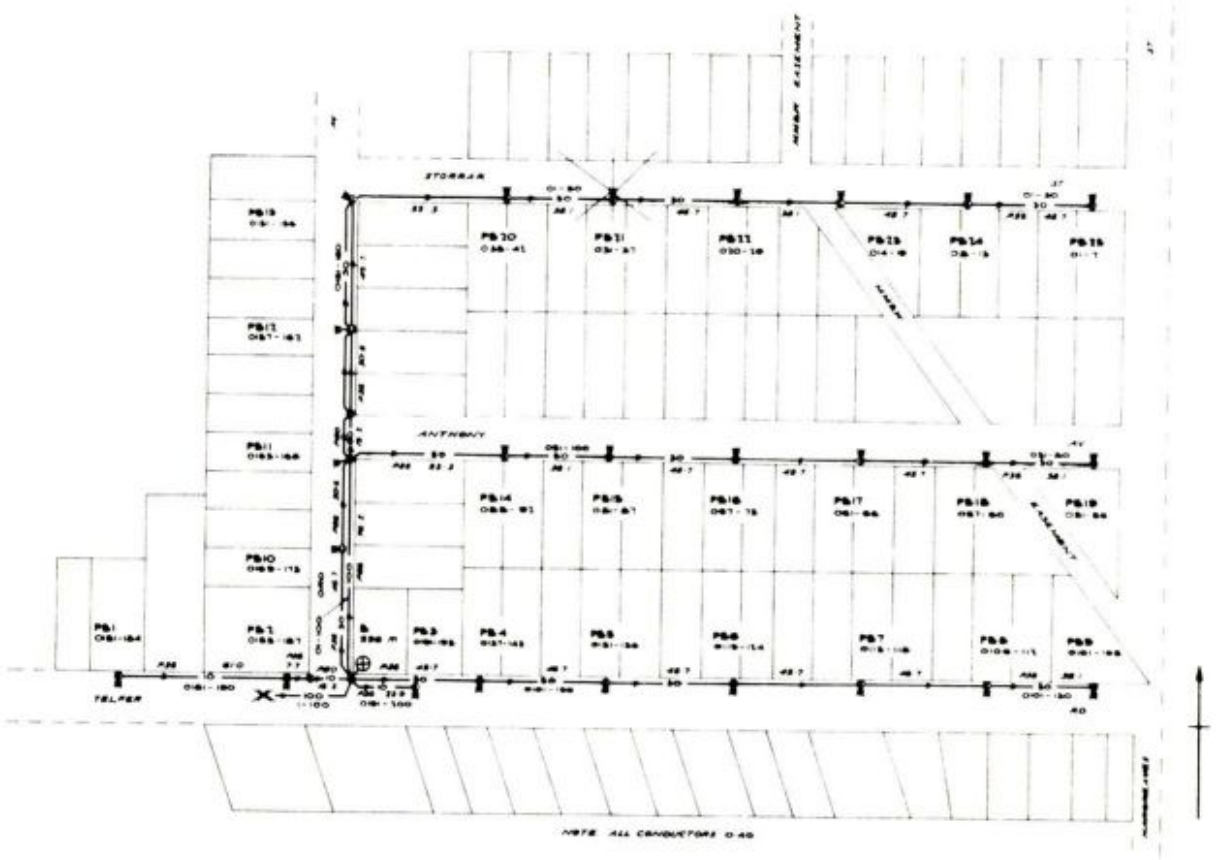


EXTRACT FROM TYPICAL SUBSCRIBERS CABLE PLAN.



TYPICAL SUBSCRIBERS DISTRIBUTION - FULLY UNDERGROUND CABLE.

SUBSCRIBERS DISTRIBUTION CABLES



TYPICAL SUBSCRIBERS DISTRIBUTION - UNDERGROUND CABLE SERVING I.T.P's.

CASH AWARDS

ARE PAID FOR GOOD IDEAS WHICH SAVE TIME, MONEY OR MATERIALS SEND YOURS NOW TO:

FREEPOST 13,
EXECUTIVE OFFICER,
STAFF SUGGESTIONS BOARD,
TELECOM AUSTRALIA.
COMMUNICATIONS HOUSE
199 WILLIAM STREET,
MELBOURNE. VIC. 3000

ENQUIRIES TELEPHONE 03 630 7254

Write a brief description of your idea, include sketches where possible and post direct to the above address.

To avoid disappointment and wasting Telecom's time in investigating your suggestion make sure that your ideas are practical. Discuss them with your supervisor and if possible try them out first.

ON THE LINE

Lines Construction Branch, Development Division, Engineering Department, Telecom Australia

CORRESPONDENCE: EDITOR, 570 BOURKE ST, MELBOURNE, AUSTRALIA, 3000 — 03 — 630 6881

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ON THE LINE is over 20 years old and your efforts have kept it afloat. Don't hesitate to contribute a story or your experiences, whether personal, technical, on or off the job. Assistance is available to help you prepare an article; on the next page we have listed a few pointers.

Send your contribution to:

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Issue 5, 1979

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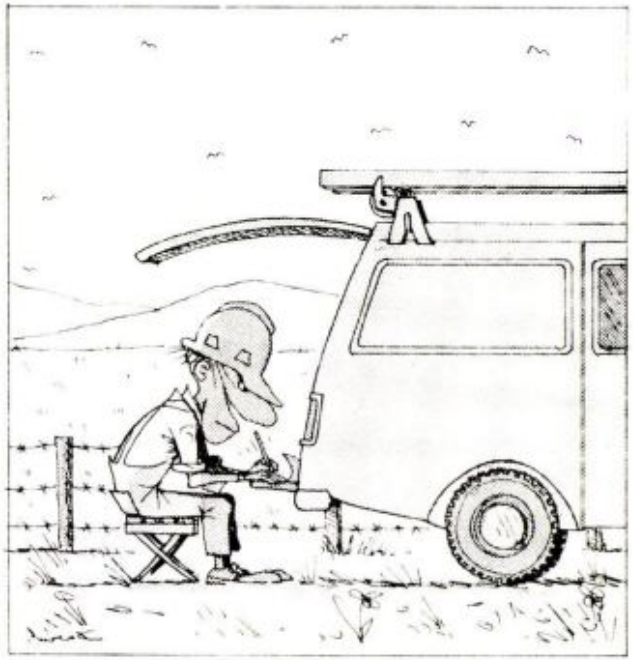

IN THE ACT OF SENDING IN FACTS

- Photographs can be arranged by your supervisor or District Telecom Office.
- Drawings, sketches or cartoons can be organised by District Telecom Office.
- If you supply the facts by phone or mail, "On the Line" can organise a story.
- Names do not need to be published but would be appreciated.
- Nothing submitted, nothing published. Remember its your newspaper.

Issue 5, 1979