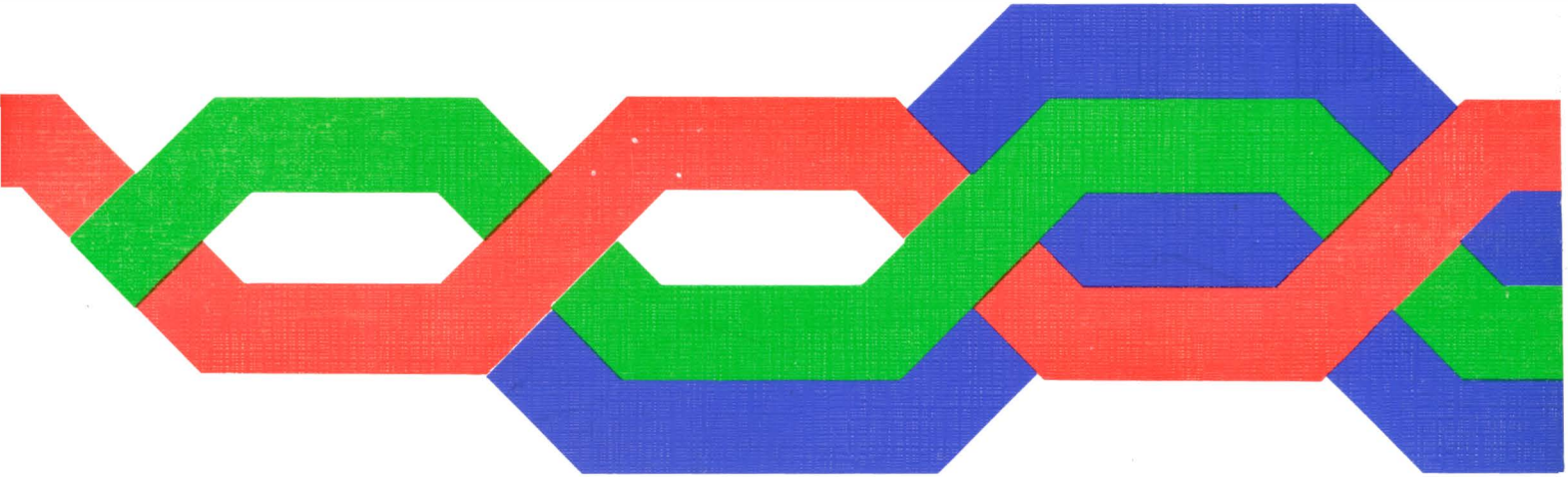
Post Office
Telecommunications

# Maintenance News 4

Spring 1974



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# Editorial

*Maintenance News*
Room 4034 Tenter House
Moorfields
London EC2Y 9TH

(01-432 1380)
Telex 883051

Our first correspondence columns in issue three showed we are getting letters straight from the shoulder – just the kind we want. So we are happy about quality and so far about quantity as well. I now make a plea for speed. With only three issues a year, letters received late have to be held over to the next issue but one – anything up to eight months later. This does not necessarily make the message stale as can be seen from Mr Houseman's letter in this issue about an article in issue two; but we should really strive for more immediacy. So please write in as soon as you can.

Your letters are not the only contributions we want from the field to make *Maintenance News* a both-way channel of communication. As I said in my first editorial we welcome contributions of news and views from Regions and Area EPCs, and this issue contains the first of these.

We do not necessarily approve local initiatives as being suitable for national application but we like to hear about them and assume our readers will also. So if you have an item of local news, perhaps of some successful trial you have been running, and you think it might be of national interest, send it to the *Maintenance News* agent in your Region. His official address and telephone number is listed on page 31.

The Editor

# A letter from the new Head of Maintenance (DD/SvD)

Dear Colleagues
In June THQ Service Department lost Jim Rees on promotion to Director of Management Services. His mantle as Deputy Director in charge of the Maintenance Divisions has fallen on me and I look forward to a very satisfying and challenging period of service.

In maintenance service we look to the challenge of the future – we are now introducing many new services and new types of plant. We are proud to be ever more readily consulted by our development and planning colleagues. Rightly so, for we have a major part to play to ensure that plant is developed and provided in a way that gives reliable service and easy maintenance.

In partnership with service there is also productivity. Our existing customers look for good service at a reasonable cost and it is our duty to find more efficient ways of maintaining our plant without losing the quality of service.

We are nearing the end of our first ten year plan for improving maintenance methods and plant. Now we are reviewing what will be the effect of the next ten years. What new plant must we maintain? What growth in system? What improvements in our existing plant?

Yes, there is a challenge in the developments in the future. There is also a challenge in eliminating the problems of working on our present plant. In my view the challenge here is communication. We need to recognise and accept that we are one integrated telephone service. Glasgow service affects subscribers in Bristol – and London. We must improve the communication channels carrying advice from THQ to Regions and Areas, information back to THQ, and working information between Areas.

It is often easier for us to help others communicate than for us to communicate between ourselves. That's a challenge I intend to face up to.

Yours sincerely
Trevor Urben
DD/SvD

# Letters

**Subscribers apparatus maintenance**

*(This letter and its reply have been abridged for reasons of space)*

I am an RCO at East Grinstead RSC and as an RSC is a nerve centre of the maintenance effort we become aware of many things that elude others.

I disagree with several things in your article on subscribers' apparatus maintenance policy. The statistics collected are largely useless and do not reveal the items that cause most of the faults. For instance the vast number of noisy Trimphones. It is ludicrous that this fault persists after about five years. It must cost the PO £5m per year. I sent in an A646 months ago, but of course heard nothing more.

You mention the plan set N625. I and many others have learnt about these the hard way and I disagree that an early decision can be made to change one. It is a lousy design: it should not be in three pieces requiring accurate assembly; the plastic buttons are not strong enough; the use of transistors causes faults with every thunderstorm. The manufacturers must think they are on to a good thing, with the PO continuing to buy such apparatus.

I would qualify your statement that 95 per cent of failures are due to mechanical reasons. I would say that about half the faults are caused by a small number of well-known fault liabilities, many attributable to particular makers of apparatus.

Diagrams are a great cause of trouble. Some are very poor; the N diagram index is an abortion and the folders are terrible. Hardly any faultsman has anywhere near a full set of diagrams.

It seems to me that to do a proper job of controlling faultsmen's work one needs for part of the time to see them doing it but this is not permitted. The AEE cannot exercise adequate supervision because he is in a separate room. It would be better if an AEE was allocated an area within which he would be responsible for fitting as well as maintenance. Men work much better as a team.

—H P Houseman, East Grinstead

*Part of the companion article, on plant reliability surveys, showed that we take good care in collecting statistics for particular classes of instrument. We have done a number of detailed field analyses on Trimphones, transmitters and dials. There was an article in issue three about the problem of noisy transmitters inset no 15.* — Editor

*I recognise that the A646 procedure must be discouraging if no feedback occurs; but in the case of transmitters inset no 15 there were so many A646s that it became impracticable to report back on them. It is one of the functions of Maintenance News to communicate these problems.*

*I particularly appreciate your identifying that it is probably not the generality of components that fail but rather those attributable to particular manufacturers. This is the kind of information we are always looking for from A646s.*

*The point about plan set maintenance was that we cannot afford the luxury of letting the faultsman spend a long time clearing a fault; it has to be appreciated that the object of a faulting visit is to restore service quickly. Hence with complex equipment an early decision to change must be made if the fault is not immediately apparent.*

*On diagrams we need to know a good deal more about the way you and your colleagues see the need for diagrams in particular applications. Perhaps faultsmen need a document similar to the A44 carried by fitters.*

*I commend your recognising the need for RSC staff to spend a part of the time in the field to keep up to date with problems. I have always understood it was a function of the AEE also to keep to a routine of outside visiting with staff to learn about the problems of poor installation, poor apparatus, inadequate tools and diagrams. Without such visits it would seem impossible to get to know the faultsmen and RSC staff thoroughly.*

— E V Partington
Sv5 (01-432 9015)

**Reference centres**

In the last but one paragraph of the article on reference centres in issue three, there is an error to which I should draw attention.

It is reference centre staff and not RCOs (repair control officers) who provide the exchange with details for fault location.

—B R Muir
Sv6.2.3 (01-432 1364)

**Trimphone transmitters**

May I first congratulate you on yet another excellent publication. I must, however, take issue with you about the footnote to the article (in issue three) on the Trimphone and noisy transmitters. What *do* THQ recommend to maintenance staff trying to placate irate subscribers when they can obtain neither the regulator 7A nor supplies of the transmitter inset no 15 itself?

—J D Campbell, Manchester South

*It is a fact that some of the methods adopted by faultsmen resulted in an unacceptable transmission loss – hence the warning. The regulator 7A is the best possible expedient at this time and it should be available to field staff well before this Maintenance News is issued.*

Sv5.3.2 (01-432 5535)

**Improvement of the STD service—PIP 5**

Most would agree that STD traffic is high and still growing. I would like to suggest that it is impossible to provide a reasonable STD service in Director areas until it can be arranged to test all local registers and MOJ relay-sets every day. It is therefore necessary to provide automatic routiners for them, with night routining facilities.

—P H Rowland, LTR

*PIP 5 was of course initiated to draw attention to these important items of plant. To reduce the effort required to test local registers we are automating tester TRT49 enabling it to be used as a routiner during the day, with an alarm being given when a faulty register is detected. Provision of a routiner for MOJ relay-sets would not solve the pulsing relay problem, which has caused a disproportionate number of call failures. Once adjusted correctly the relay gives trouble-free service for very long periods. We have revised the MRI for the relay after extensive field tests with tester TRT48 and are now satisfied with it as a service control measure.*

Sv6.2.3 (01-432 1364)

# Engineering Changes of Practice Committees –
## an important role in telecomms modernisation

This is a changing world, not least in telecommunications. We are modernising our switching systems, introducing 60MHz carriers, installing mobile radio telephone systems and radiopaging. We have changed our external plant maintenance organisation. These are examples of the sort of changes that have already taken place and that will continue year by year.

Development and change can be worrying when it means we have to alter the working methods we have used for years. Change always seems to bring with it teething troubles. In the PO we seek to overcome or at least reduce them by joint consultation between staff and management.

This is the function of the Engineering Changes of Practice Committees (ECOPC), where members of COPOU and THQ consider changes which may affect our working methods. ECOPC3 is concerned with internal maintenance and construction and there are two other committees dealing with external plant practices, safety and tools and transport. All three are subordinate committees set up under the Planning and Services section of the Business Joint Consultative Committee.

ECOPC3 meets four times a year but there is a constant interchange of information by correspondence. Information on any new plant or service offered to the public is given to the committee members as soon as it is available. There may be trials of the plant or the service which can be handled in the field by our normal working method. Alternatively, the new plant or service may demand a different working method. If this is likely then a field trial of the new working method or organisation is set up under specific ECOPC field trial procedure. The trial is subject to review by local management and staff, by the COPOU members of ECOPC and by THQ. It is the joint review that helps to remove, and soothe, any teething troubles. If the method reveals problems it can be altered easily before full application. The period of the field trial is a period for finding and overcoming difficulties jointly between staff side and management.

Also under ECOPC3 we review any work study assignments; the results of these can also lead to a change of working method which may be applied on a field trial basis.

We look further ahead too in ECOPC3. We keep a watch on developments that we know are under way for the future and we consider how these may affect working practices. We can then feed back, to the developers, advice on ways to make the new product easier to install and maintain.

So ECOPC3 considers anything that

might affect our engineering working practices. It surveys trials of changes and licks them into shape – or it may decide a change is not warranted and that the previous practice should continue.

Trials of changes can stem from new plant, from Area or Regional ideas, from work study or from THQ initiative, but all are subject to review and judgement by ECOPC3. In the Areas a similar role is played by the Engineering Productivity Committees. These supervise changes developed by local initiative and if they have Regional or national application they are referred to the appropriate ECOPC.

The EPC and ECOPC systems enable us to convert change from a chore to a challenge where we can all contribute.

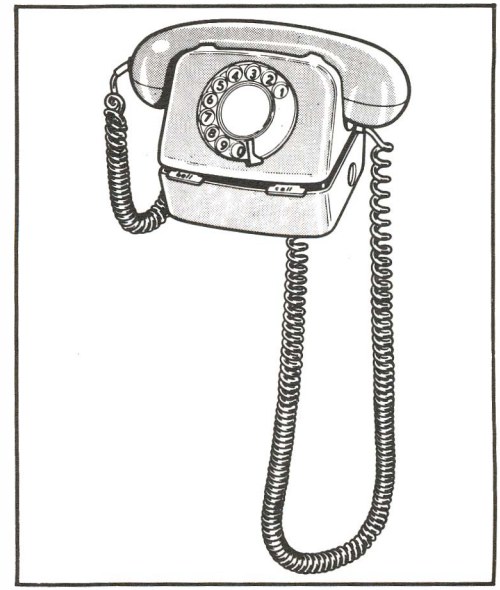
—T F A Urben, Chairman ECOPC3
DD/SvD (01-432 9012)

# The new style residential telephone

**This is the second in a series of articles intended to help SA &L faultsmen become aware of the new products which the PO is offering its customers. The first article in the series dealt with Keyphones.**

The new style telephone is the outcome of three years work by the PO working in conjunction with a commercial designer. Although specifically designed to meet the needs of residential customers the instrument may well find applications in business situations. The telephone is at present undergoing reliability studies in three Telephone Areas.

A wall-mounted plastic bracket holds the bell unit and doubles as a rest for the transportable telephone; an extensible cord connects the two. A simple metal bracket, which is concealed by the plastic bracket when in position, enables the instrument to be attached to a wall so

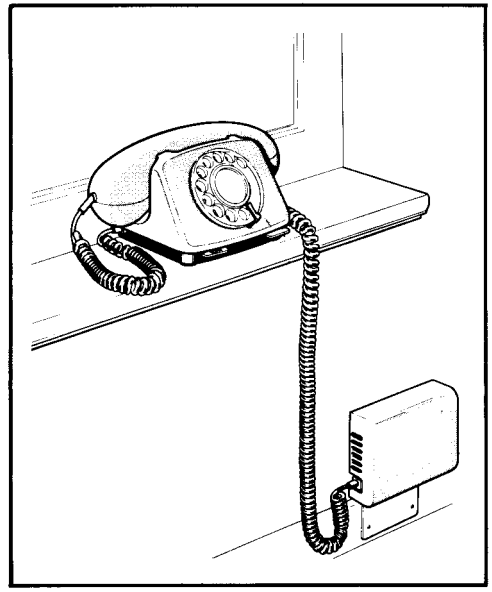


that in its basic presentation it is a wall-mounted telephone. In this configuration it is possible for the telephone to be removed from the top of the bracket and

to be handled to a radius of about three metres within the room.

The alternative method of mounting enables the bell unit to be detached from the plastic bracket and to be mounted separately, on a skirting board for example, leaving the instrument to be placed anywhere within the radius of the extensible cord. The telephone is of smaller dimensions than existing 700-type instruments which enables it to stand on a narrow ledge or window sill and to be carried easily. The bell unit has a suitable termination for drop wire in addition to termination for internal cable, so avoiding the need for a separate terminal block.

Maintenance of the telephone has been simplified employing 700-type standard components wherever possible, such as the automatic dial 21 and transmitter inset 16, and by the use of moulded parts secured mainly by snap action locking tabs. Particular attention has been paid to the design of the gravity switch mechanism which has a direct, positive action, and screw fixing of parts and components has been kept to a minimum.



The circuit of the telephone and the bell unit is of the 700-type and printed wiring boards are used to mount and connect components.

Sv5.3.2 (01-432 5535)

# Customer fault reports which prove RWT

If one excludes public call office faults, about a quarter of the fault reports made by customers are cleared as 'right when tested' – a high proportion. While most of these RWTs probably result from repair control officers' (RCO) tests involving no further engineering effort, it is known that many do involve a visit by a faultsman. For faultsmen to spend time dealing with faults that don't exist is clearly both time wasting and frustrating.

In some cases it is impossible to test a circuit from the repair service control (RSC) before sending a faultsman out. For instance PBX extensions cannot be tested from the RSC. Or perhaps there is no testing access available to the exchange concerned. But is this the whole story?

Generally speaking customers don't report trouble without, in their opinion, good cause. An RWT could be taken as our failure to deal properly with the report. While it is not suggested that RCOs should send faultsmen to look for faults that cannot be confirmed by testing, the form A1053 procedure* should be followed where a circuit is reported faulty three or more times in three months. It is probably more important to follow this procedure after a succession of RWTs than after a succession of faults cleared. When a test is not possible and a faultsman has to be sent he should, if there is no apparent trace of the reported trouble, fully examine the circuit and rectify any defects found. This could avoid subsequent reports and visits.

Here we have only scratched the surface of the RWT problem. We would welcome readers' letters with comments on this topic. Case histories that show ways of improving our present performances would be particularly helpful.

Sv5.1.3 (01-432 1386)

**See TIs E5 A1053 and E13 A1053.*

# Safety overhead

**Safety when working overhead is of prime concern to all, yet a recent maintenance survey of pole, ladder and step climbing practices in the SETR has highlighted a number of points which can be easily overlooked or which are contrary to recognised safety requirements. The following comments on the SETR survey may, we hope, help you to see whether the equipment or methods you use do reduce the possibility of accidents to an absolute minimum.**

## Ladders

There is evidence to suggest that a high percentage of ladders are not marked with a serial number and so miss the annual test they are supposed to take. So if your ladder does not have a serial number, ask your supervising officer to arrange for one to be allocated by the stores duty so that the proper test records can be kept (see TI A2 E5031).

Many maintenance staff do not have or do not use ladder ties. These are provided so that you can lash the bottom of a ladder to the pole before climbing. In your own interest make sure you have a ladder tie available and always use it on pole work. Also, when a ladder is erected on a sloping or uneven surface always ensure that adequate packing material is used under one of the ladder stiles. Recommended packing pieces are described in OP2 memo 2/73; and Areas have been asked to ensure that all ladder users are equipped accordingly.

Ladders 4A and 5M now being supplied are fitted with an indicator showing the correct angle of elevation. Make use of this facility, otherwise ensure that your ladder is always erected at a 4:1 height: base ratio. Check regularly that wood inserts and wire rungs or top roller fitments are in good condition and that safety catches work freely and are not liable to jam. And finally, *never use an unserviceable ladder.*

## Protective clothing & equipment

As with ladders, safety belts should be identified with a serial number; belts must be looked after and inspected regularly. Check that your belt has a serial number and is marked properly. Before using a belt, always ensure that it is in good condition and, each time before you climb, check that the snap hook is functioning correctly. Above all always use a belt when working aloft and when fastening a belt up a pole use the correct armhold described in TI A2 E5802.

Safety helmets are provided for your protection but it is apparent that not all maintenance men have them and those that do rarely wear them. Make sure that you are not one of these. Also when you do wear your helmet wear it with the chin strap under the chin. One might add that maintenance men are rarely seen wearing eyeshields, gloves or high visibility jerkins in conditions calling for their use. It was also found that although plenty of publicity is given to protective footwear only a few staff take advantage of wearing it.

## Poles

It was found that very few staff check the 3m (10ft) mark which gives an indication of a pole's depth in the ground; even fewer carry out the simple hammer test for soundness. Furthermore, too many staff fail to check for weakness or looseness of the pole steps before relying on the step to take their weight.

The modern recommended method of ascending a ladder by gripping the rungs (the fireman's hold) is only used by about 50 per cent of staff. The previous method in which the stiles are gripped is used mainly by older staff, who find it difficult to change their methods.

Many faultsmen impede their climbing action by carrying testers and other items in one hand or over the wrist or shoulder. This is extremely dangerous and a hand line and tool bass should always be used to pull these up after the faultsmen is securely belted to the pole. Small items can be carried in belts, pocket. Ladders and poles must always be climbed with the hands free and with no risk of any item obstructing or hindering climbing.

In conclusion, it seems to us that it is in the personal interests of every overhead maintenance man to consider the follow-

ing points and to take action as necessary to achieve safer working practices:

1 Have I all the safety equipment required and is it in good order?

2 Am I using the recommended practices?

3 Is the plant safe for me to work on?

First line supervisors can also play an important role in this field of operations by:

1 Ensuring that all staff are provided with and encouraged to use the appropriate safety aids. Personal example is the best form of persuasion.

2 Pursuing any cases of neglect of basic safety precautions.

3 Giving particular attention to correcting any malpractices observed.

4 Closely watching the condition of equipment used by their staff, both at the time of a routine inspection and when it is being used in the field.

5 Ensuring that plant defects are reported on forms A1024 and that these are dealt with in the proper way.

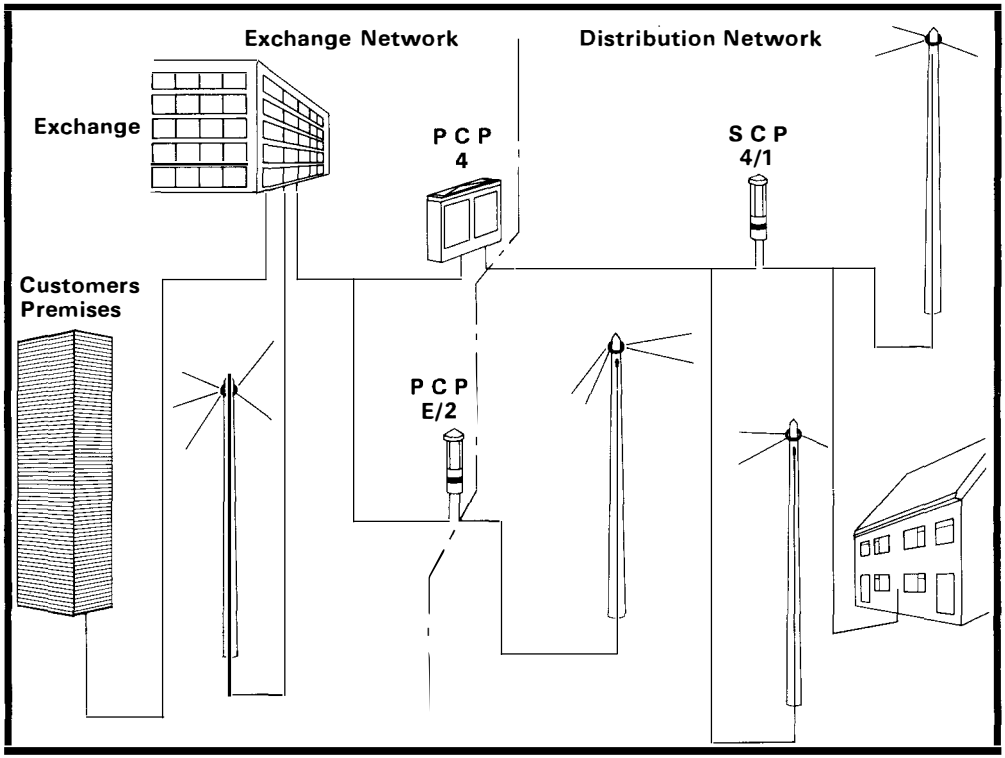
SETR/SM2 (0273) 201518

# Keeping tabs on local underground fault costs

Local underground cables radiating from exchanges contain up to 4800 pairs of wires whereas a single 15-pair cable may serve a pole-mounted block terminal, and a cable laid underground direct to a house will normally contain only two pairs of wires. In a tapering network of this type it is uneconomic to extend all pairs in the small cables directly to the exchange, and cross connection points are established in cabinets and pillars to provide the flexibility needed.

The large cables between the exchange and the first, or primary, cross connection point are laid in ducts, and the joints housed in manholes or joint boxes; these cables, except in small rural areas, are normally protected by pressurisation. The smaller cables now being installed between cross connection points and distribution points (DPs) or private houses are jelly filled and, together with the joints, these are often buried direct in the ground for a large proportion of the route. Inevitably with such a varied network the fault rates and upkeep costs of the different parts of the network vary widely but the present methods of recording fault reports and upkeep costs do not identify these differences.

The layout of the network, with a predominance of large cables on the exchange side of the primary cross connection point and smaller cables on the distribution side lends itself to treating the network as two logical subdivisions and recording fault reports and upkeep costs separately for each subdivision. Dividing data in this way would be useful at both Area and Regional levels and would also assist THQ to determine where a change in plant design or works practices is most likely to reduce fault rates and upkeep costs. It has therefore been decided that starting with the 1974/75 financial year the local underground network will be considered, for maintenance purposes, as being




divided into two sections as shown in the diagram.

The local exchange underground network will embrace all local cables terminated at the local exchange and serving primary cross connection points (PCPs) or directly connected DPs. The local distribution underground network will be all those cables which do not terminate in an exchange, for example cables from primary to secondary cross connection points (SCPs) or from cross connection points to DPs. Block terminals will be classified according to the cable to which they are connected. Primary cross connection points will be included in the exchange network whilst secondary cross connection points will be classed as part of the distribution network.

## Fault recording changes

For fault analysis purposes, line 8 on forms A26, 29, 49 and 51 will be subdivided into 81 for faults in the local underground exchange network and 82 for faults in the local underground distribution network. For the division of costs the maintenance sub-division F1A UL will be divided into F1A UDL and F1A UEL for the local underground distribution and exchange networks respectively; the renewal allocation, RLU will be similarly split into RLDU and RLEU. Instructions on the new procedures have been issued in time for implementation at the beginning of the 1974/75 year.

Sv5.1.1 (01-432 1378)

# Gas!

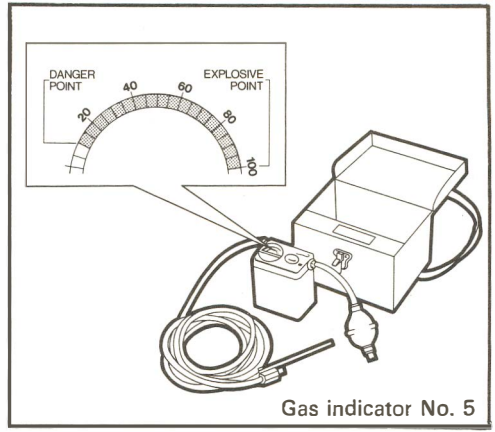
Have you seen the latest PO safety film on gas explosions? It is called *'Just a few minutes'* and it is certainly worthwhile spending a few minutes to see it if you get the chance. The film is an interesting, thought-provoking piece of safety publicity. The British Gas Corporation itself is favourably impressed with it and has bought copies for showing to its own staff.

Gas is becoming an increasing headache for the PO. Many hundreds of reports of gas are made to our External Plant Maintenance Controls (EPMC) every month. The main cause is not difficult to find – natural gas being ever more widely distributed.

Natural gas consists mainly of methane and is considerably drier than the old town gas. This dryness causes the joint caulking to shrink in the distribution pipework and, where the pipes are in a bad condition, this causes the surrounding soil to dry out. Together with the increased pressures now being used and vibration from road traffic, the result is that up to a tenth of the natural gas being put into the mains never reaches the consumers.

The gas authorities are however taking very strenuous steps to improve the position and are spending very large sums of money on pipe renewals and repair. One of their difficulties is in recruiting external staff, and we are wryly told that occasionally their men are tempted away to work on PO contracts!

There are three types of dangerous gases likely to be met in PO plant – explosive, poisonous and suffocating.



Gas indicator No. 5

Explosive gases are readily detectable by the PO gas indicator no 5 (IG5). This instrument works on the principle that the atmosphere to be sampled is passed over a heated platinum filament which forms one arm of a Wheatstone Bridge circuit. Any explosive gas present raises the filament temperature and so increases its resistance. This unbalances the bridge giving an indication on the meter. The scale of the meter is calibrated from 0 to 100 per cent of the lower explosive limit (LEL). Combustible gases mixed with air will burn only when their concentration reaches a certain minimum level known as the LEL. Thus natural gas has an LEL of 5·3 parts in 100 by volume of gas/air mixture.

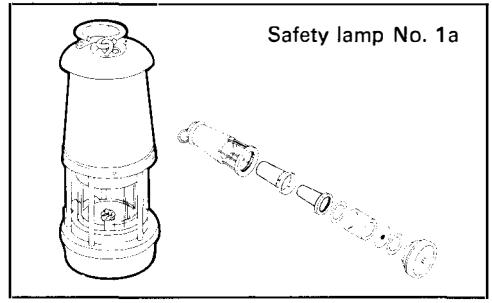
The PO have adopted the danger limit of 10 per cent or more of the LEL. In the case of natural gas this represents 0.53 parts by volume of gas in 100 parts of gas/air mixture and so there is a very adequate safety margin. Remember, any mixture that burns will explode whether partially or fully enclosed.

Apart from natural gas, the other explosive gases encountered in PO plant include the old type town gas, propane and petrol vapour. Propane, used in PO plumbing equipment, has an additional hazard as, unlike natural and town gas, it is heavier

than air. It can thus collect in deadly invisible pools and layers in low lying places. So be particularly careful to see that your plumbing equipment is leak free, and fully turned off and removed from underground plant when not in use. Bear this heavier than air property in mind too, when using bottled gas (either propane or butane) in your leisure hours. It can be particularly deadly in poorly ventilated places like boat bilges and caravans.

Only two poisonous gases are likely to be encountered in PO plant. These are carbon monoxide, a constituent of town gas and hydrogen sulphide which has a characteristic smell of rotten eggs. As they are both explosive they can be detected by the IG5. Carbon monoxide can be present in motor vehicle exhausts but although it is only just lighter than air it does not 'spill' into manholes because the exhaust fumes are hot and therefore rise.

Suffocating gases are those which, when sufficiently concentrated, prevent enough oxygen reaching the lungs to support life. Examples are carbon dioxide and air from which oxygen has been removed by combustion or by other means. Such gases cannot be detected by the IG5. The safety lamp no 1A will however clearly indicate the presence of suffocating gas because its flame will go out.


Safety lamp No. 1a

All gas being distributed by the gas undertakings in this country is being odorised to a standard such that there is a clearly noticeable smell when gas is present at a concentration of 1 per cent or more. Cases of deodorisation are rare and mainly occur when the gas passes through a special type of dry clay soil.

The nose can obviously be a help in detecting gases but do not rely on it alone. Be suspicious of unusual smells and check with your IG5 and then your safety lamp.

Before entering any place where explosive, poisonous or suffocating gases may be found, carry out the procedures set out in your Gas Precautions Handbook or TI E3 H1110. You haven't a Gas Precautions Handbook? Well it now has been given the official number A6181 and your stationery duty should be able to get one for you. The keynote of these instructions is safety, both for PO staff and for the public. Early reporting of positive explosive gas readings on the IG5 is vital. If you have one, use your radio to report to the External Plant Maintenance Control. Otherwise call the operator from the nearest telephone and ask for Freefone One Double One. If you are unable to obtain a reply, report direct either to the gas authority or the petroleum officer. Their telephone numbers should be entered in the first pages of your Gas Precautions Handbook.

Have a look at the duct and cable seals in cable chambers you visit to make sure that none has been damaged. A broken seal in the basement can put the whole staff working in a building in danger. And never leave a cable or duct entry unsealed when not actually working on it.

We, in maintenance, have a special responsibility to avoid gas accidents. If we carry out the procedures laid down and keep our wits about us we can make a very real contribution to the safety of the public and PO staff.

Sv5.2.2 (01-432 1306)

# Cleaning up the underground in Coventry

## The battle against the elements

Millions of pounds are spent annually on expanding and modernising the telephone network with complex switching equipment and sophisticated transmission systems but it must be acknowledged that the service to customers depends as much on the simple pair of wires between the exchange and telephone as upon any other factor.

Buried and out of sight for the most part it is nevertheless vulnerable to interference from *homo sapiens* and $H_2O$. Pressure over the last few years to provide new lines has allowed plenty of scope to both, with the result that the quality of service has suffered.

New methods and materials introduced in this period have proved worthwhile cost savers and productivity boosters; but a Maintenance Division which often finds itself mopping-up knows from bitter experience that these admirable objectives are not always compatible, nor synonymous with quality and reliability, when subjected to field conditions.

Consequently on the debit side we have had to cope with a high fault rate which has flooded RSCs and caused delay in Class A clearances, as well as frequent failure to connect new customers on the first visit because the installer has been unable to find the nominated pair(s) of wires. The following notes outline the measures that Coventry TA is taking to improve its performance in these fields of activity.

## Staff

An early action was to review staff complements, headquartering arrangements and chargeship functions to assess how they measured up to 'Cleaning up the Underground'. Several mutually agreed territorial changes were made, which resulted in more purposeful chargeship, and a few vacancies were filled. The results have been staff acceptance of the challenge to improve the network and a feeling at all levels that quality of service is a live issue.

## Black spot analysis

Starting with reference to the monthly A51 – Telephone Plant Analysis of Fault Reports – the underground fault indices (line 31) are extracted and entered on a local record under the appropriate exchange area. By scrutinising these results over a period it is possible to identify those exchange areas with performance consistently worse than a predetermined level.

Having identified these exchange areas, further division into cabinet areas is made, and high fault rate cabinet areas identified.

Remedial action in these black spot areas can be short term, to alleviate pressing needs or long term for overall network improvement. The short term work is carried out by the Maintenance Division's cable renewal group or by the Works Division on an agency basis. The Planning Division is brought in for the long term improvements.

## Locking cabinets

A large number of underground faults are misnomers since they occur above ground in cabinets (primary cross-connecting points) and pillars (secondary cross-connecting points). Because these are both useful fault locating points, and necessary connecting points for installers, they are fair game for disturbance, particularly when records are suspect.

We find hard-drawn aluminium cable terminations are a particular source of trouble because the conductors break easily when moved and we are now starting to change over to copper tails. This however amounts to paying a second time for work already done and introduces further interruptions to working lines.

Work is not always done with the care it deserves nor are working circuits always given the protection they warrant. We continue to find cases where wrong connectors have been used and evidence of the 'other chap' who uses wiring pliers and cutters instead of crimping pliers; and the appalling untidiness which cabinets can assume does nothing for maintenance jointers' morale.

We have come to the conclusion that cabinets are too vulnerable to be left unprotected and we have started a programme of locking the doors with a bar and padlock.

The priorities for locking cabinets are:

1 Those at risk, with hard drawn aluminium conductors or with a bad fault history.

2 New cabinets designed with enough preconnected pairs for a reasonable period of growth.

3 Those others which will, when work is complete, have enough pre-connected pairs for growth.

In general locked cabinets will be accessible only to Maintenance Division jointers until additional pairs are required. These will then be provided on instruction from the Planning Division by Works, accepted by Maintenance, and the doors then again locked.

## New housing estates

A disproportionately expensive section of the underground cable network to maintain is direct UG distribution on housing estates (DUD). Frequently within days of service being given, the maintenance staff are never quite sure whether they will find the cable buried(?) a few centimetres below the surface, or whether massive digging will be required to find it.

Cable depth depends greatly on the whim of the estate developer and his sub-contractors. The subsoil and final grading levels are often left to the mercy of labourers and too often last minute changes in estate layout details result in PO cables being buried beneath metres of subsoil, bricks and rubble.

Cable locating equipment is of course available (see the article on the Locator 6A in issue two); but interference from electricity service cables can make precise location difficult. Two or three metres of surplus cable buried under a next door neighbour's front garden can also prove embarrassing to the engineers when fault locating on an ohms/distance measurement.

In an attempt to improve the general standard on housing estates in the area, staff are encouraged to involve management by on-site visits and submission of photographs of sub-standard work brought to light by fault clearing activities.

It is suggested that the national policy on ELO duties should be reconsidered to include an increased element of supervision, ensuring that work done by builders and other non-PO contractors is carried out satisfactorily.

The expense incurred by maintenance in follow-up activities cannot be ignored when assessing planning and works costs, and it is both unfair and uneconomic that maintenance expenditure should follow so quickly on new provision.

Advice note controls whose installers cannot connect a new line on the first or second nominated pair submit an A496 to the RSC or EPMC for the apparent fault. When these are given to an RSC's faultsman jointer force in any significant numbers there is an immediate conflict of priorities between service-affected faults and new connections. This is particularly difficult at times of high fault rate, bulk release or local staff shortage. There is an understandable reluctance on the part of RCOs to divert men from service-affecting faults to new connections and unless storm cones are hoisted at DGM level the latter tends to come off second best.

To avoid this clash of priorities a mobile team under a T1 has been established to deal with A496s. It is attached to a field Inspector's group and covers several RSC areas, clearing up each in turn. In the main, their findings are:

1 pairs not existing;
2 pairs faulty;
3 records incorrect.

It is accepted that Works, Installation and Maintenance could all have contributed to this state of affairs, so to simplify accounting each Division contributes a number of manhours from its own allotment of CL, CS or MF. We find this sytem works well and cuts down the rummaging in cabinets for unnumbered pairs.

## LLIR

While the processing of LLIR printouts is a time consuming and unpopular activity in RSCs, particularly where jointing staff is not readily seen to be available to clear the incipient faults disclosed, its value is nevertheless undeniable. We are at present concentrating its use to the black spot areas so that staff can see its effectiveness in reducing the fault rate in them.

## Cable pressure

The pressure in local cables has not been kept up to the high standard achieved in the MU/CJ network. This is in some measure due to cable diversions, exchange transfers and network growth. It is considered that the Maintenance Division must increase its involvement in all pressure work and an increase in staff is planned to cover this.

## Conclusion

There is no room for complacency, but the UG maintenance staff has responded wholeheartedly to the challenge, and thanks to their efforts encouraging signs are already appearing in many exchange areas. It is too early for a true evaluation but A51 returns on 'treated' exchange areas totalling some 25 000 exchange connections show a very significant fall in the underground fault rate. We hope to be able to report some more conclusive results in a later issue.

EM/EM2 Coventry TA (0203) 28888

*FAULTS AT CROSS-CONNEXION POINTS. Since September 1971 THQ have forbidden the termination of aluminium conductors on horizontal distribution shelves, and have recommended that only copper conductors should be terminated on connexion strips no 1. The troubles now being experienced should therefore be limited to installations provided before 1972 and should decrease as renewals are effected.*

*Cable, polyethylene, twin, aluminium now being distributed by Supplies Division contains aluminium alloy conductors and THQ Circular A11/73 shows that these conductors are suitable for termina-*

*tion on cross-connexion strips no 1. Further trials are necessary to show whether they are satisfactory for use on distribution shelves. Pending the completion of these tests only copper conductors should be terminated on horizontal shelves.*

*The need to rummage in cabinets for unnumbered cable pairs arises only when distribution shelves, or some locally designed terminating strips are used. It is THQ/Sv5 current policy that new designs of assemblies, strips or shelves will only be approved if facilities are provided for the permanent location of all cable pairs in fixed, numerically identifiable positions.*

Sv5.1.1 (01-432 1378)

# A new procedure for PCO fault reports

A new method of dealing with certain fault reports in public call offices (PCO) of the pay-on-answer type has come into effect with the re-issue of TI D2 E0050 to operating staff. These faults are certain types of cut-off occurring before a call is established: NU tone immediately after coins inserted; continuous pay tone after coins inserted; or no pay tone.

Experience shows that attending to such reports individually, almost invariably results in a right when tested (RWT); this is a waste of effort both in the repair service control (RSC) and by faultsmen. The new arrangements will reduce the number of maintenance visits to PCOs and secure improvement in their fault rate.

Under the new procedure reports of these types received by the auto-manual centre (AMC) will not be passed to the RSC. Instead they will be recorded on a special form T222. A supervisor at the AMC will inspect this form every half hour and if a certain number of reports have been received about a particular PCO then it will be reported to the RSC, the nature of the reports being indicated. The minimum number of reports needed in the half hour period will be agreed locally.

The completed T222 forms are sent daily to the AEE in charge of the RSC so that he can arrange for action to be taken if a pattern of trouble emerges.

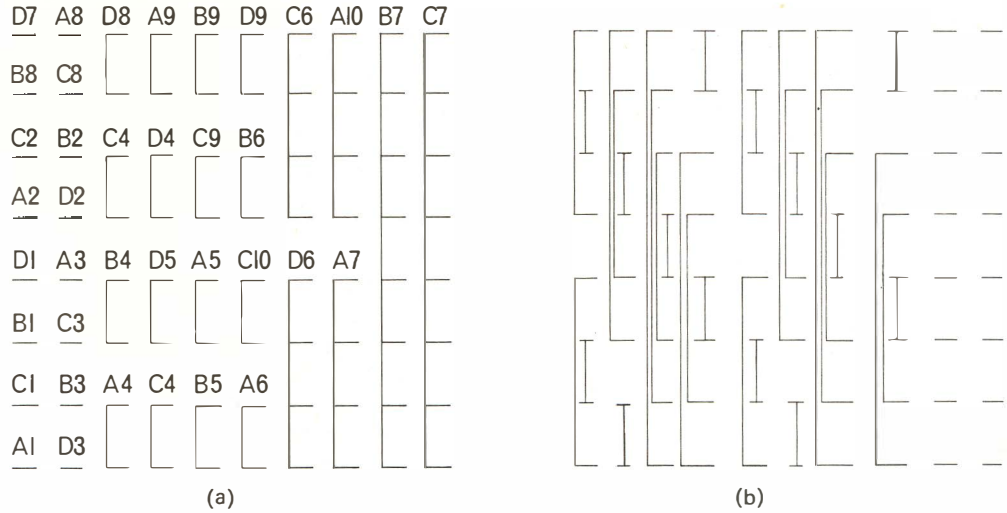
THQ will be watching the operation of the new arrangements in two Regions during 1974; this could result in some modifications to the procedure later on.

Sv5.1.3 (01-432 1386)

# Partially skipped gradings

It has been known for many years that more efficient grading formations are possible than the O'Dell gradings used at present in the BPO Strowger switching network. Only in recent years has it been feasible, with the aid of computer simulation, to analyse some of these formations sufficiently to formulate gradings suited to PO equipment. A study has been carried out which resulted in a form of partially skipped gradings (PSG) that have been tailored to existing equipment practices but at the same time give:

(a) Improved traffic carrying efficiency.
(b) Reduced sensitivity to unbalanced input traffic.
(c) Reduced work on grading design.
(d) Reduced construction work in exchanges.




(a) An 8-group, 38 trunk O'Dell grading.
(b) An 8-group grading showing the basic interconnection pattern, repeated once. Allocation of switches/junctions to contacts would follow the same principles as for O'Dell gradings.

Fully skipped grading is an embarrassment when used on graded racks. Therefore the PSG system has been specifically designed to meet the limited tie circuit capacity of the self-graded rack, and in order to have a unified scheme, PSG will be used in the majority of situations where gradings are required. In developing the system particular attention has been paid to manpower savings in re-

grading work, both for the addition of trunks and grading groups.

PSG offers the following advantages over the existing O'Dell gradings:

(a) The addition of trunks does not require compensatory adjustment of any other part of the gradings.

(b) The addition of grading groups requires a minimum of interference with the established groups, the formations being designed to grow successively from four to eighteen groups in increments of two groups. New groups are added at the growing end of the established formation, the rearrangement of a relatively small number of links is then required to complete the integration.

(c) The method of allocating ties ensures approximately even distribution and a minimum of disturbance when groups are added.

(d) The tolerance to unbalanced traffic conditions is greatly increased.

(e) The traffic handling capacity under balanced traffic conditions is increased.

The basic interconnection scheme is derived from four adjacent groups on one outlet, the centre pair and the outer pair being strapped. On successive outlets the formation is cyclically offset by one group, giving a pattern repeat of four outlets. Individuals, partial and full commons are also employed, but the distribution differs from the least sum of differences arrangement, employed on the existing O'Dell type of gradings. The optimum distribution employed with PSG has been determined using computer simulation.

PSG will be used on self-graded racks, TDFs and on racks where special grading facilities are not provided, such as in the UAX no 13 and the PABX nos 3 and 4.

Feasibility tests are at present being undertaken at selected exchanges to prove whether it is a practical proposition to introduce PSG. These tests are expected to be completed by June 1974, and a decision will then be taken on whether or not PSG should become the standard grading.

Sv6.5.6 (01-432 1342)

# Troubles with the TXE2

It is well known that whenever a new motor car is first introduced some flaws in its design or the production of its components only become apparent after the public has put it to the test under normal working conditions. These teething troubles afflict just about every type of machinery and equipment, and not even extensive prototype testing seems to get over these snags.

Unfortunately, telephone exchanges are just as prone to teething troubles as other types of equipment, and the TXE2 has proved no exception. The first of these radically new exchanges began coming into service in quantity some five years ago, and with around 500 TXE2 exchanges in service we are now able to identify a number of design and production problems which can produce difficulties in service, though these exchanges are, on the whole, working very satisfactorily. But let us see how these troubles are being corrected.

First let us consider reed relays. A typical TXE2 exchange contains 100 000 reed relay inserts, so any defects in these items can create widespread failures in an exchange and absorb a great deal of maintenance effort. Manufacturing problems seem to have beset a large number of reeds made in 1969, and these reeds found their way into several TXE2 exchanges. An analysis of reed insert failure rates at all TXE2 exchanges was made by THQ, and as a result some 85 exchanges with reed troubles were identified. A programme of replacement for the reeds in the units affected is now under way; but the speed at which the re-reeding can be undertaken is limited by the number of replacement units available for use in the exchanges, while the units concerned are sent away to the manufacturers for their attention. TXE2 has provided the first large scale proving ground for reeds, and as a result of our experience with this system, very much more is known about reed relays than was the case a year or so ago. A revised specification for reeds has now been drawn up, and the reeds reaching these new standards should get rid of the whole problem.

Turning now to the actual circuitry of the exchanges, it is true to say that weaknesses in certain areas of the exchange have come to light. Unlike Strowger exchanges, in which the exchange security is distributed throughout all the switches, TXE2 exchanges operate on the common control principle. The vital elements of the control are duplicated for security reasons; but certain weak spots in the security defences of the system were left unguarded and, as a result, a number of isolations and restrictions of service have occurred. One of the earliest and most serious examples to come to notice was the 'mark weld' condition in which a welded reed insert in a subscribers line circuit causes a permanent signal to be applied via the KT leads to the Call Control. Depending upon conditions at the time of the fault, this will result in serious disruption to the exchange and can, at worst, result in a complete exchange isolation.

Works specifications to overcome this security risk have been issued and have now been implemented at most exchanges – though the non-availability of a kit of parts has delayed progress at GEC exchanges. The modifications approach the problem in two ways – first they connect diodes in the KT leads of the SLUs, which restricts the effects of the failure to five subscribers; and secondly they provide diodes placed across the K relays in the SLUs to reduce the operating stress on the reed inserts by acting as quenches. The consequences of a contact weld are therefore reduced as is the likelihood of its happening at all.

A committee, with representatives from the PO and the three manufacturers involved in TXE2 has been set up; this is charged with coordinating design changes to TXE2 so improving its service performance. The first task of this committee is to inaugurate relatively minor changes to the TXE2 circuits, which will result in an immediate improvement to the security of the system.

The kind of work involved here includes changes such as improving the register busy limiter, preventing the locking-out of D switches in the event of a TC contact becoming short circuit, and ensuring that failures in the Maintenance Data Recorder cannot hold call control out of service. When acceptable solutions to the problems have been found and agreed they will be incorporated into production. Where appropriate, retrospective action will also be applied to units already in service. Much of the initial work of this committee has now been completed and it is now turning its attention to aspects of TXE2 design and maintenance philosophy requiring rather more development effort. For example,

the general security change-over arrangements will be examined together with the alarm and fault indications. The possibility of introducing an artificial traffic or routiner equipment will also be examined.

It must be appreciated that much more work remains to be done in this field, but undoubtedly the eventual outcome of these studies will be an overall improvement in the performance of TXE2 exchanges.

Looking back over the first few years of TXE2 we see that the exchange has not always had a smooth passage in service. Although isolations have occurred far more often than we would have wished, the customer has generally been protected from the effect of failures by the second attempt feature of TXE2, and exchanges have given good service to the customer at an acceptable maintenance cost.

However it should be realised that a great deal of effort is being directed towards rectifying the shortcomings of these exchanges; and now the troubles have shown themselves, corrective action will ensure that future TXE2 exchanges will give reliable and trouble-free operation.

Sv6.1.3 (01-432 1396)

# Changes in acceptance testing for Strowger exchanges

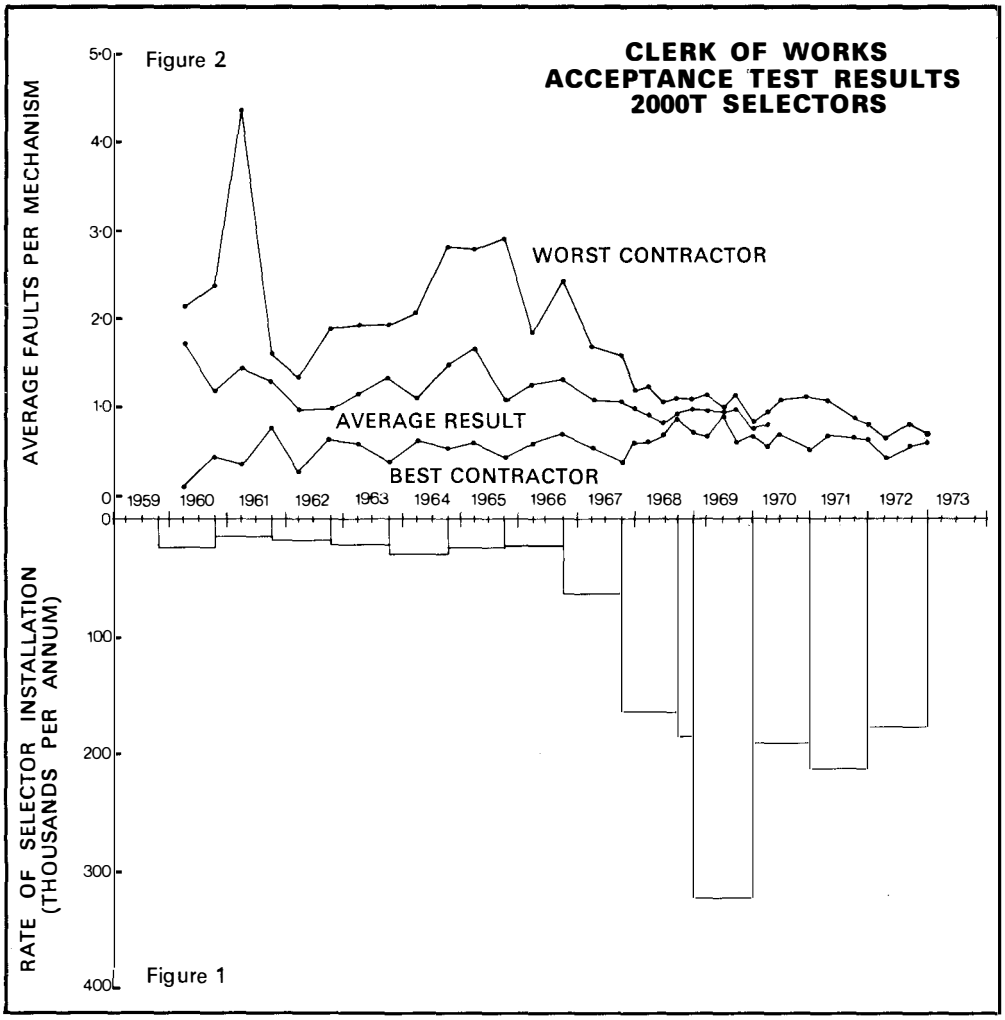
The rate of provision of exchange equipment has increased very considerably over the last few years. At the same time strenuous efforts have been made by the contractors and the Quality Assurance Branch of THQ to improve the quality of equipment. For one particular item – selectors – a marked improvement has been made. This fact is supported by:

(a) Factory test results;
(b) Life test results;
(c) CoW examination of selectors.

Figure 1 shows the increase in rate of provision and figure 2 the improvement in quality of adjustment as seen by CoWs. Assuming that quality ex-factory can be maintained or further improved it was decided to mount an experiment to see whether the detailed examination of adjustments on site was still necessary or desirable.

## Field trial

Eighteen installations were chosen – nine for the trial and nine as a control. At the trial installations the normal Clerk of Works check of adjustments of a sample of selectors and their associated relays was not carried out. To prevent any deterioration in adjustments due to rework on site, only very limited rework was permitted on any selector which failed a functional test; for any major readjustment it had to be returned to the works. At control sites, normal CoW tests were made and no special restrictions were placed upon the contractor. At every site a careful record was kept of all failures of selectors during functional tests and routinings, including those faults found and cleared by the contractor. In addition, the results of maintenance routine testing on the equipment were passed on to QA Branch during the first year of service.




## Conclusions

The following facts emerge from the experiment:

On average the trial sites had lower fault levels than the control sites and this continued after they were in service. Table 1 shows the installations in order of merit – it is apparent that trial sites tend to come at the top of the table and that control sites come towards the bottom. Statistical tests confirm that the difference is significant. Figure 3 shows that installations in service for 10 months or more appear to follow the same pattern. The conclusion seems inescapable that rework arising from CoW adjustment checks not only leads to more failures during installation functional testing but leaves an increased fault liability after the equipment goes into service. Although perhaps surprising at first, this should be expected when one considers the efforts made in the works to achieve satisfactory adjustment quality, and the relatively poor conditions on site for carrying out adjustment work; even a skilled adjuster making wholesale readjustments on site is liable to put on more faults than he clears.

Functional fault rates during installations are much too high. They not only cause delay and expense during installation but

**Functional/routining fault rates on installation–sites in order of merit**

| Trial (T) or Control (C) | Faults/ Selector |
|---|---|
| T | ·071 |
| T | ·086 |
| T | ·089 |
| T | ·096 |
| C | ·106 |
| C | ·162 |
| T | ·168 |
| C | ·190 |
| T | ·191 |
| C | ·194 |
| C | ·205 |
| T | ·245 |
| T | ·260 |
| C | ·263 |
| C | ·305 |
| C | ·344 |
| T | ·376 |
| C | ·679 |
| Mean T | ·174 |
| Mean C | ·213 |

Table 1

**Maintenance fault rate returns from selectors in service 10 months or more**

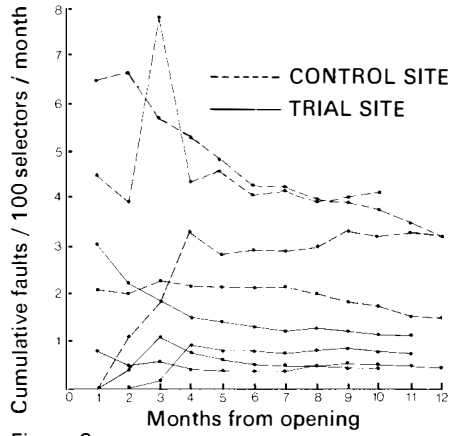



Figure 3

produce a peak of faults during the first few months the equipment is in service. We believe the best way of improving this situation is through more effective functional tests at works; greater care in transport and handling; and attention to routiners which reject good selectors and require them to be maladjusted to pass their tests. Thorough functional testing on site will still be necessary and CoWs will need to exercise close control of contractors' fault clearing.

The changes to CoW practice involved in ceasing adjustment checks are at present under discussion with staff associations. We are pressing contractors to improve their functional testing and handling of equipment. SvD is already aware of some weaknesses in routiners and has taken steps to improve them. Contact between P&SD/QA Branch and SvD will be maintained.

To sum up, the aim of QA Branch in the matter of CoW adjustment checks, as in the wider field of installation QA generally, is to use PO acceptance testing time to the best advantage by introducing contractors' and CoW procedures based on solid information and modern QA principles, which produce improved quality in equipment handed over to maintenance.

P&SD/P&S4.3.3 (01-739 3464 x529)

# Crossbar exchanges – some maintenance aspects

**This is the first half of a two-part article dealing with the maintenance of crossbar exchanges. Part two, to appear in the next issue of *Maintenance News*, will go on to examine safety hazards, major service failures and design weaknesses of the TXK 3/4.**

In an earlier issue of *Maintenance News* we gave a broad outline of the crossbar systems used for inland public exchanges:

TXK1 for local non-Directors, GSCs and SSCs;
TXK3 for local Directors and some large local non-Directors, and
TXK4 for transit switching centres.

THQ relies almost entirely on Area and Regional staff for information on the service performance of crossbar exchanges. In addition to reports such as isolations made to the Regional Network Co-ordination Centres, most information about the shortcomings of these systems comes from the A2752 two-part fault docket and the A646 procedures.

### What happens to A646 reports?

Those who have submitted A646 reports on crossbar equipment may wonder why it is that many months, or even years, may pass before action is taken.

Perhaps we should explain why these things take so long. When a report leaves the Area, it passes to Regional Service Division. The Region's function is to obtain as much information as possible about the problem before passing the report to THQ. Is the trouble due to some local circumstances affecting only the reporting exchange? Did that resistor burn out because of a fault in the wiring perhaps? Or was the problem more far-reaching and likely to occur in other exchanges? Maybe those resistors were not the type that should be fitted? If so, is this the only place where error has crept in or are there other units with a similar fault?

When the Region is satisfied that the circumstances are fully known, the report and supporting information is passed to THQ Service Department for action.

As we have already pointed out, the PO is not the design authority for crossbar systems and we are not always in a position to decide how a problem should be corrected. Accordingly the matter must be referred to the manufacturer by Development Department, who are responsible for technical liaison with manufacturers. Technical problems are not the only ones which have to be considered: the economic aspect is also

extremely important, and at any stage in an investigation it may be decided that no further action should be taken if the cost of putting the problem right outweighs the service benefits.

The manufacturer too has his problems. Design effort is not unlimited and design problems take their place alongside many others, perhaps referred from A646 reports. Naturally, serious service-affecting problems receive priority treatment but inevitably time elapses between report and cure.

Having decided on a solution to the problem the manufacturer submits his proposals to the PO using an agreed procedure. The details are checked for technical accuracy before passing to the THQ Department preparing the works specification. It may be that stores are required for the modification and, because we are dealing with a proprietary system, these generally have to be provisioned by the manufacturer as kits of parts for each modification.

Manufacturing schedules may be involved and long delays can occur. When, and only when, the stores are to hand can the specification be released to take its place in the queue in the Area works control.

To date a total of 426 A646 reports have been received for crossbar exchanges. Of these 297 relate to TXK1 local ND exchanges (reflecting the greater number of exchanges of this type in service), 86 relate to TXK3 local Director exchanges and 43 to TXK4 transit units.

The reports may be divided into three broad categories: circuit design or facility weaknesses; physical design aspects and documentation errors.

As might be expected the systems are not without weaknesses and on the TXK1 local exchanges, some of which have been in service since 1968, we hope we have now identified at least the major ones. Because of their relatively short time in service, our experience on the other systems is somewhat limited.

To merely catalogue the individual equipment and circuit difficulties that have been experienced would be of little interest so instead we shall identify major problem areas and also outline the current position.

## Record cards

When crossbar systems were introduced new record cards were needed, and although guesses could be made as to what might be necessary, experience was really required before their format could be agreed. As a result early TXK1 exchanges did not have complete sets of record cards, but they are now available.

TXK3 cards are available for the normal subscribers' connections and so on but

**A646 reports on crossbar exchanges**

| | Circuit Design | Physical Design | Documentation errors |
|---|---|---|---|
| TXK 1 | 34% | 49% | 17% |
| TXK 3 | 55% | 40% | 5% |
| TXK 4 | 50% | 25% | 25% |

cards for special services such as subscribers transfer, night busying, and interception still have to be produced.

In TXK4, there are no cards available as yet due to labelling difficulties. Discussions with the contractor about actual equipment designations are still taking place. In the meantime exchanges that are already in service are using locally produced temporary cards. Proper record cards should be available soon.

## Documentation

The TXK1 is a proprietary system and this means that the contractor is in sole charge of circuit documentation. The PO does not vet the diagrams, but merely has use of a duplicate master. Early crossbar exchanges have not only had to open without a complete file of diagrams and diagram notes, but the quality of the prints also left a lot to be desired. As exchanges are opened a large number of documentation errors become apparent. These are referred back to the manufacturer to be put right. The problem is further aggravated because as the equipment is manufactured by GEC as well as PTL a second set of documents is needed. Although both use the same circuits, their methods of construction and layouts are different. At present we also rely on the contractor to produce the documentation for individual exchange strapping information: this has not always been available where it was needed or in the form most useful to maintenance staff.

The situation with TXK3 and TXK4 has been very similar to that experienced with TXK1. It is worth noting that the symbols used in circuit diagrams and the method of detailing wiring runs are different from those used in Strowger, although staff seem to have little difficulty with this once they become familiar with the method. Service Department would like to place documentation under PO control, allowing quality and format to be improved and eventual standardisation within systems to be achieved.

## Tools

As TXK exchanges use different equipment and mountings from those used in Strowger, new tools are required. The initial approach was to place local orders with the manufacturers for the items required. The quality and cost of some of these were unacceptable, so Development Department was asked to develop equivalent items and, in some cases, design and develop new ones. All essential TXK1 tools are now available.

Difficulty in supplying TXK3/4 tools has been a problem but now a few of the tools can be obtained from PO sources; the rest are expected to be available shortly.

## TIs

Crossbar exchanges are not yet fully provided with TIs. For each of the systems, effort has been put into producing the more important ones. There is still a considerable amount of work to be done by THQ, but because of manpower shortages there will be a considerable delay in completing production.

*(To be concluded)*

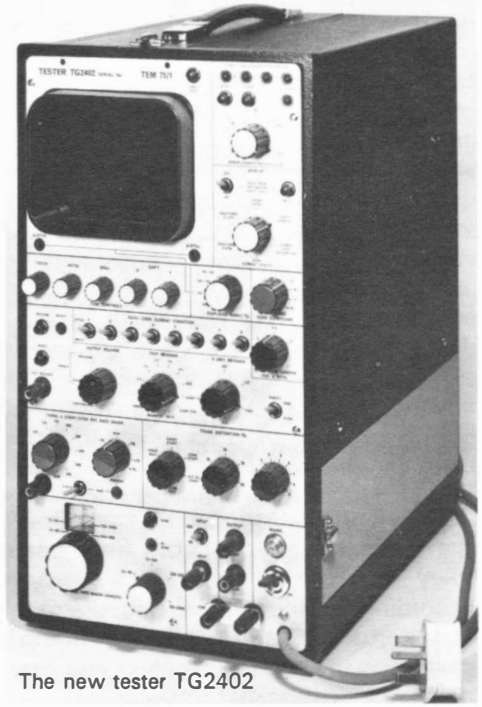
Sv6.1.1 (01-432 1391)

# TG 2402 – a new tester for measuring telegraph distortion

The range of techniques used to transmit telegraph signals has widened considerably over recent years. One aspect of this change is the introduction of higher speed transmission using the international alphabet of no 5 (IA5) teleprinter code, as well as the earlier IA2 used at lower speeds.

The IA5 is a 7-unit (information) code providing both capital and small letters as well as additional control signals which are necessary with modern data processing systems. The earlier IA2 is a 5-unit code.

Existing test equipment, TG 1157 and TDMS 5 & 6 are fast becoming inadequate to meet future needs. The tester TG 1157 has outlived its useful life, is uneconomic to repair and will need replacement in the not too distant future.

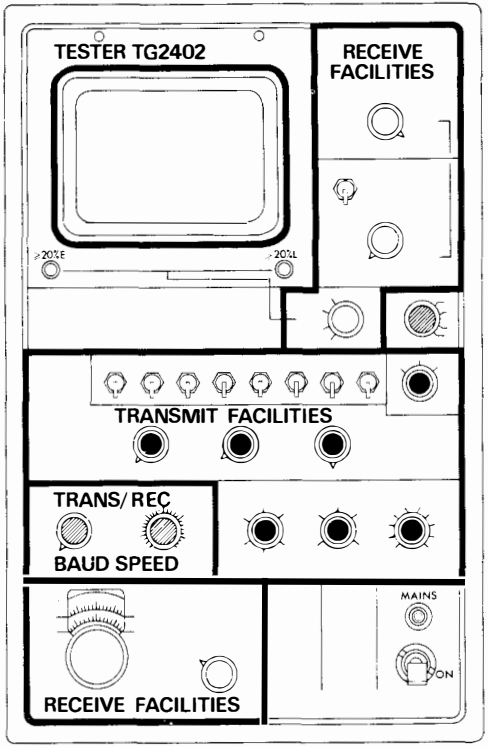


The new tester TG2402

There is also a need for greater accuracy in signalling speed and distortion measurements, continuous display of peak distortion with a 'hold peak distortion' facility, and a baud speed range consistent with present and future requirements. These factors were instrumental in the development of the new TDMS tester TG 2402.

The tester is a combined transmitter/receiver portable TDMS whose prime function is the generation of start/stop and isochronous signals at various baud speeds and the measurement of distortion of these signals. The essential difference between start/stop and isochronous signals is that isochronous signals do not have start/stop elements to achieve synchronisation. This allows for the use of every element for information, synchronisation being achieved another way.

The essential advantages of the new




The tester TG2402 showing the front divided into sections.

tester over the TDMS 5 & 6 are:

1 A larger CRT with a horizontal display.
2 The facility to continuously display element distortion and hold the peak.
3 Character error counter on the IA2 box test message.
4 Inbuilt signalling voltage supplies.
5 Preset baud speed range from 50-1200 and a continuously moveable speed range from 24-2400 bauds for 'remote working' isochronous measurements.
6 Waveform display facilities.
7 The provision of a 5-, 6-, 7- or 8-code element/character facility.

All the controls needed in the operation of the tester are fitted on the front panel. They can be divided into sections according to the need. (See diagram). Function knobs are in black, white and green for transmitter, receiver and common identification respectively.

The combined unit weighs approximately 15·5 kg (34 lbs) and measures 221 x 406 x 370 mm deep ($8\frac{11}{16}$in x 16in x $14\frac{9}{16}$in respectively).

It is intended to phase out the tester TG 1157 and replace it with the TG 2402. At the same time the new tester will augment the TDMS 5 & 6 at terminals where TG 2402 facilities are needed.

The calibration of the tester requires expensive test equipment to obtain the degree of accuracy needed; P&S servicing and calibration duty have taken on the responsibility for calibration. Until P&SD's existing stocks of TDMS 5 & 6 have been exhausted, the tester TG 2402 will be a General Sector item with user control, in the 'Vocabulary of Engineering Stores'.

Sv 6.4.2 (01-432 1316)

# Introduction of Regional Equipment Service Centres

**This article explains the current policy for the servicing and repair of PO electronic equipment, which has led to the establishment of RESCs to carry out centralised repair. It gives a brief history of the introduction of RESCs, and an insight into the types of equipment currently repaired.**

Towards the end of the 1960s it was realised that while existing repair arrangements were satisfactory for current equipment practices, a different approach was required for dealing with the modern electronic types of equipment being introduced into the telecommunications network. The basic philosophy for dealing with faults on electronic equipment emphasises rapid restoration of service by using the 'pull and replace' technique. On-site maintenance staff restore service by locating the faulty unit which is pulled out and replaced with a spare one. Spare unit provision means that the repair of faulty units is less urgent and can be carried out in a purpose built repair centre. Maintenance staff therefore are better able to concentrate their efforts on maintaining the required grade of service.

Rapid advances in electronic component technology lead to increases in the reliability of electronic units, resulting in on-site engineers having less opportunity to gain expertise in fault finding. In addition they cause problems with the replacement of components, requiring the use of special techniques. In most cases the new systems are more sophisticated than their previous counterparts, and require complicated and generally expensive test gear. It is desirable therefore to centralise expertise and test equipment.

These and other factors led to the formulation of the three echelon electronic equipment servicing policy of SvD. This is defined as follows:

(a) First Echelon repair. Certain equipments will be repaired on site where no reasonable alternative exists, or where it can be economically justifield.

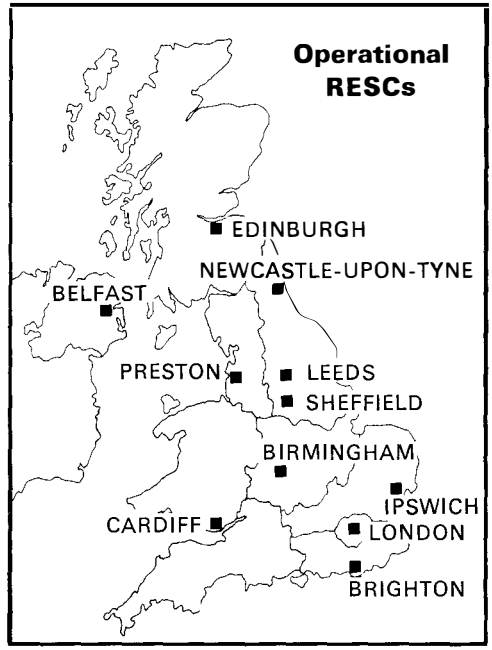
(b) Second Echelon repair. Equipments of removable unit form except items covered by (a) and (c), will be repaired at Regional Equipment Service Centres.

(c) Third Echelon repair. Units of equipment of which the population is substantial and the need for repair relatively non-urgent will, subject to agreement, be dealt with by P&SD Factories Division, or, in special cases, by manufacturers under maintenance contracts. Certain special arrangements, already existing with P&SD Control Division, Quality Assurance Branch, will continue.

As a direct result of this policy, Regional Directors were authorised in THQ circulars 177/71 and 14/73 to set up RESCs. The contents of these circulars have been incorporated in TI E1 D0520 to be issued shortly.

Initially RESCs were formed by merely renaming and combining existing telegraph, datel and transmission repair centres. Whilst centres are now open in all Regions, except South West and Wales and the Marches (to open early 1974), they are not as yet servicing all the equipment which is envisaged to be within the scope of the RESC concept. The difficulty in expanding RESCs is caused mainly by delays in obtaining new accommodation. Several Regions now have new buildings in the pipeline: the first of these, in Birmingham, will be operational by about the middle of 1974.

RESC staff are drawn from the Area in which the centre is located, with the day-to-day responsibility for operation vested in an AEE, Officer-in-Charge. Equipment is faulted by TOs with assistance from Technicians TIIA. In addition to the normal repair service, most RESCs provide an emergency service which results in the rapid repair and return of units to the field. RESCs in this way provide a back up for the general maintenance services of the Region, and has led to the nickname of RESCUE centre being used in some Regions. Centres also act as enquiry points to which all staff can turn for assistance with electronic equipment repair problems.




The main workload of the RESCs is at present centred on 24-channel PCM, audio, co-axial and Datel equipment. In addition the LTR repair telegraph, TV and radio equipment, whilst the Highlands and Islands radio system is repaired by the centre in Scotland. All RESCs will shortly undertake the repair of PO mobile radio equipment, and some centres will also deal with FSVF, Washington TV scheme, and customer wideband equipment in the near future. The majority of the centres are keen to accept new work, and there is no lack of enthusiasm among RESC staff.

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