GUIDE NOTES

TGN 0029

NOT TO BE SHOWN OUTSIDE BRITISH TELECOM

Line Concentrator ELD 96 BT (Gfeller)

British TELECOM

LCS TD7.3.8.F

ISSUE 1
DEC '83

Difficulties

The responsible groups in LCS depend to a large extent on the A646 procedure to bring to their notice difficulties which staff experience with items of equipment. Please take advantage of this procedure to inform LCS LLS 2.1.4. of any difficulties so that correct action may be taken.

The A646 procedure is described fully in TI E1 A0001.

Line Concentrator ELD 96 BT

These guide notes are intended to assist staff who are inolved with the Line Concentrator ELD 96 during the normal course of their duties, particularly installation and RCS staff. The ELD 96 is often referred to as the Gfeller Line Concentrator. These notes are based on standard instructions and you should check that they conform with current issues. You must always follow the practices and procedures specified in current instructions.

Contents

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1. Introduction

The Line Concentrator ELD 96 BT is a system used to provide relief when there is a shortage of cable pairs between an exchange and a Primary Connexion Point (PCP). In most applications the use is intended to be an expedient until by one means or another additional cable pairs become available.

Briefly the system comprises an Exchange Terminal (ET) and a Remote Terminal (RT) both of which contain a system control and mini crossbar switch. It enables up to 95 customers to share 16 cable pairs, or trunks, between the exchange and PCP (see Fig 1). An additional cable pair is required to form a link between the ET and RT system controls and a further pair is used to provide speaker facilities for installation purposes. The Trunks are numbered 0-15 and the customers from 0-95 although subscriber 0 is used for test purposes only.

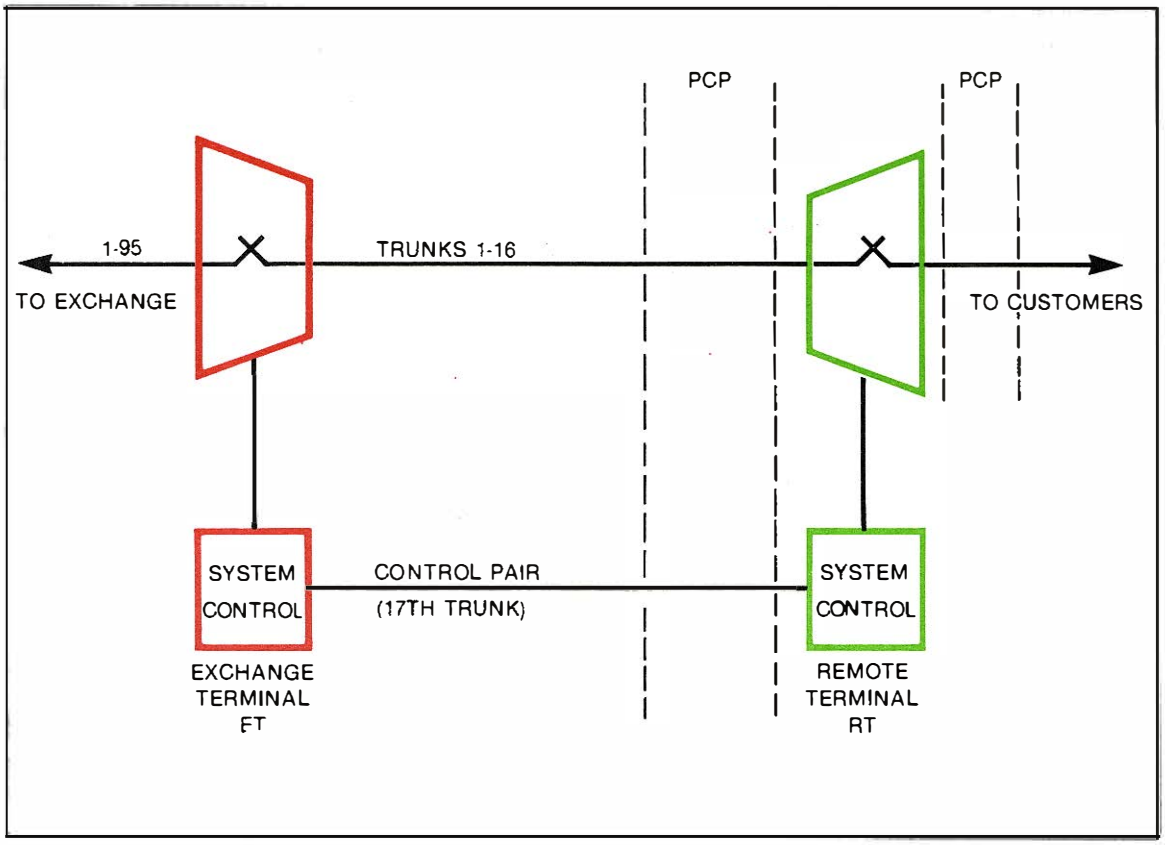


Fig 1

2. Outline of System

2.1 General Description

The Exchange Terminal (ET) comprises Control and Switching equipment mounted on printed circuit boards known as Apparatus Slide in Units (ASUs). The complete unit is normally mounted on the Miscellaneous Equipment Rack or the Miscellaneous Electronic Equipment Rack depending on the type of exchange (see Fig 2). Special arrangements are available for UAX13.

The ET is powered by the exchange – ve 50 V supply fused at 3 amps and connexions are made to the exchange prompt and deferred alarms.

The Remote Terminal (RT) comprises frame mounted ASUs pre-wired to gas discharge tube line protection units and mounted in a steel cabinet (see Fig 3). This cabinet is positioned alongside the PCP that is to be relieved. A duct is provided between the RT and PCP jointing chamber to facilitate the cabling between them. The RT is powered by a 24 V battery which is charged by current fed over the control pair and free trunks.

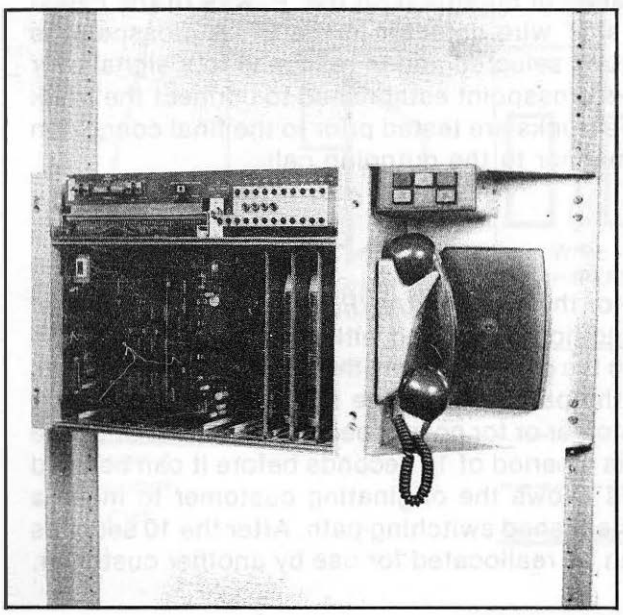


Fig 2 Exchange Terminal

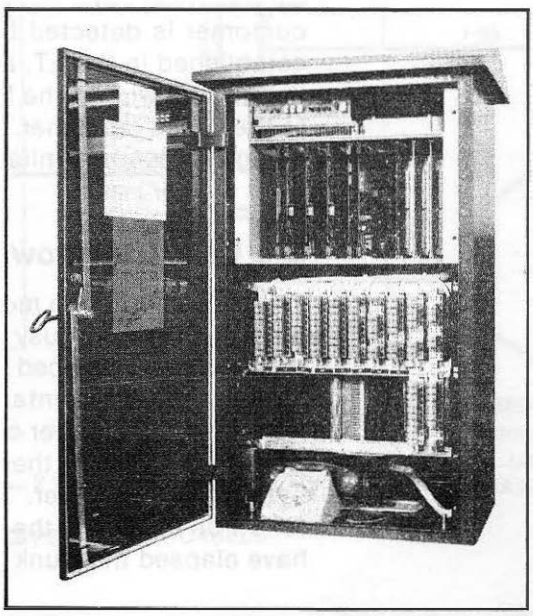


Fig 3 Remote Terminal

2.2 Outgoing Calls

When a customer originates a call the telephone loop is detected by the Loop Scanner circuit in the RT. The RT informs the ET which allocates a suitable trunk and sets up a connexion through the crossbar switch in the ET. A signal is then sent to the RT to set up a similar connexion. Dial tone is returned to the customer and the call continues in the usual fashion. Before the final connexion is made to the customer, the allocated trunk and selected crosspoints are tested for faults. If a fault is found an alternative trunk is selected and a deferred alarm is given.

The total connexion time for a single calling customer should not exceed 800 ms. If two or more customers originate a call simultaneously, they will be dealt with sequentially. This means the second customer may wait up to 1600 ms and so on.

2.3 Incoming Calls

On incoming calls the change of condition on the 'P' wire of the called customer is detected by a 'P' wire detector in the ET. A crosspoint is established in the ET, a trunk selected and in response to a signal over the control wire to the RT a crosspoint established to connect the trunk to the called customer. The trunks are tested prior to the final connexion being made in a similar manner to the outgoing call.

2.4 Call Clear Down

The ET continues to monitor the earth on the 'P' wire for the duration of the call. When the busy condition is removed, either due to call cleardown or the line being placed into the park condition, the ET will regard the trunk as free but will maintain the path through the switching matrix until it is required by another customer or for power feeding purposes. Once the trunk becomes free there is a period of 10 seconds before it can be used by another customer. This allows the originating customer to make a follow on call using the established switching path. After the 10 seconds have elapsed the trunk can be reallocated for use by another customer.

3. Typical Cabling Arrangements *(See Fig 4)*

The system is designed in such a way that once the initial installation has been completed, any further provision or recovery of customers lines follows a similar procedure to that of ordinary lines apart from an extra single wire jumper required in the exchange. Figure 4 shows a typical cabling and jumpering arrangement.

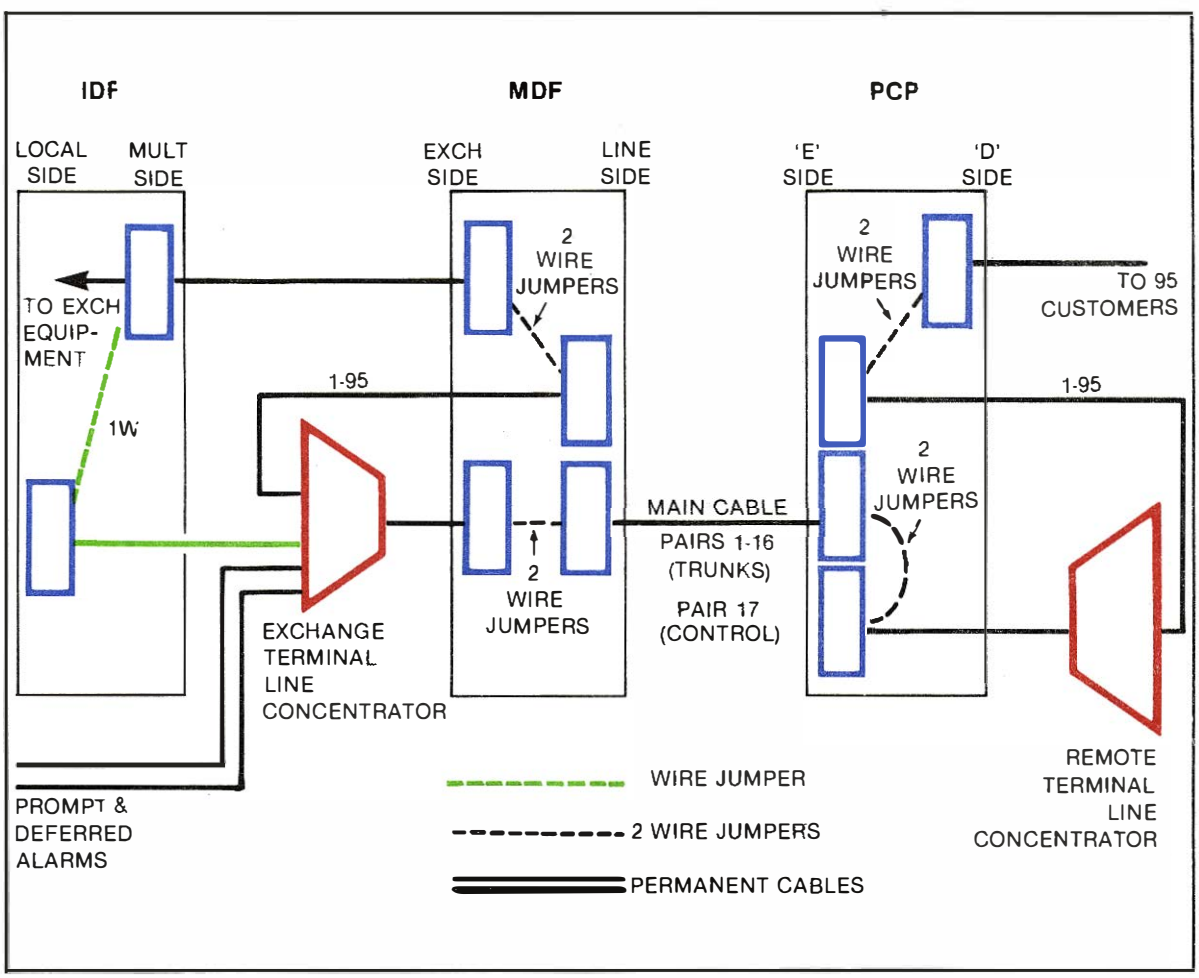


Fig 4

4. External Connexions PCP (*See Fig 5*)

The 95 customers lines, terminating on the 'D' sides of the PCP are cross connected to the 'E' side in the normal manner. The 'E' side cable is routed to the RT where traffic is concentrated onto 16 cable pairs referred to as 'System Trunks'. The 16 Trunks plus the Control and Speaker pairs are cabled back to the PCP where they are terminated on an 'E' side position. They are then cross connected to the 'E' side cable which is routed back to the exchange.

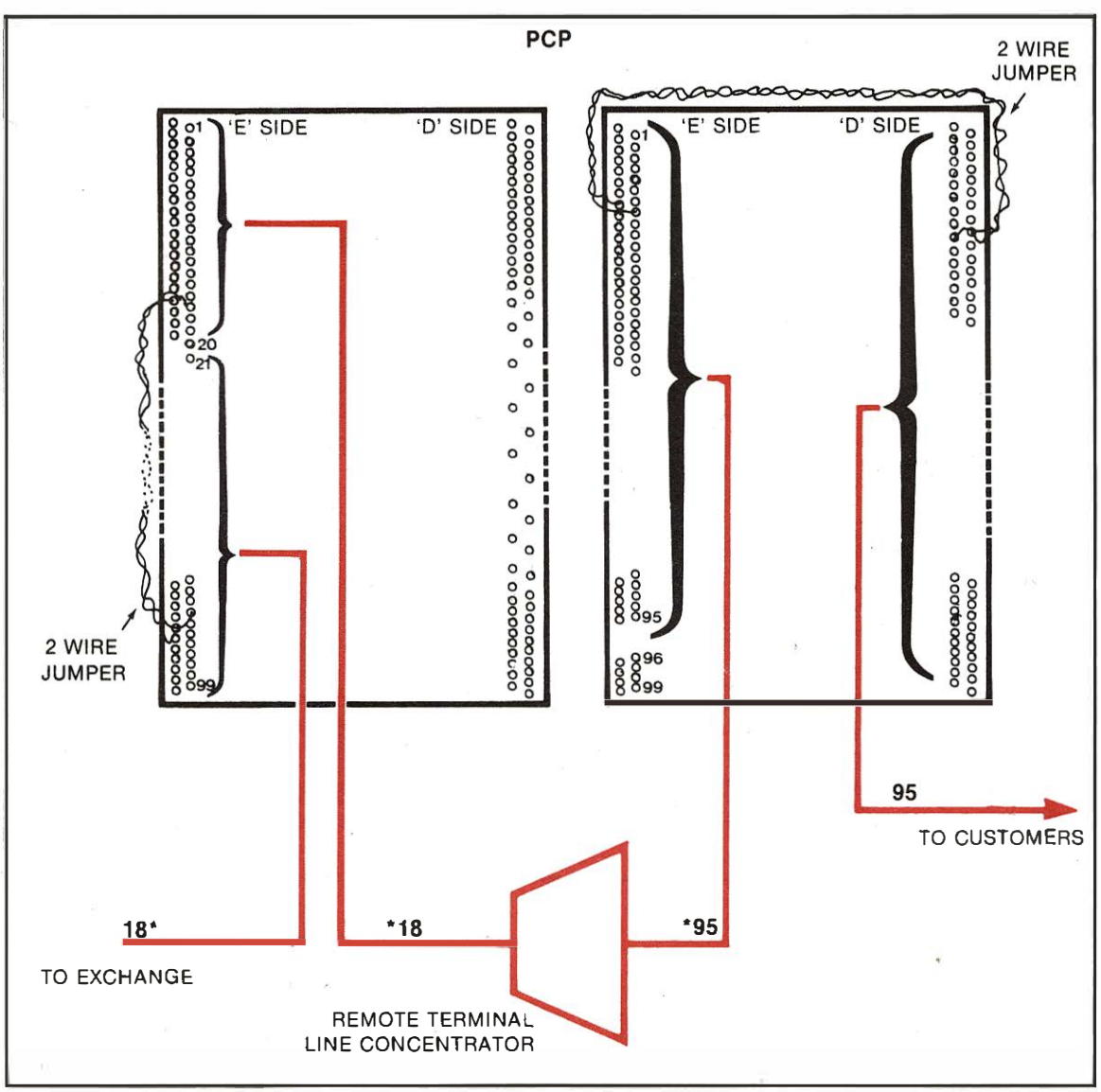


Fig 5

5. Exchange Connexions

IDF *(See Fig 6)*

Jumpering on the IDF is provided in the normal way for each customer. However, an additional single wire jumper has to be provided from the customer's 'P' wire on the MULTIPLE SIDE to a block on the LOCAL SIDE, which is cabled to the ET Concentrator.

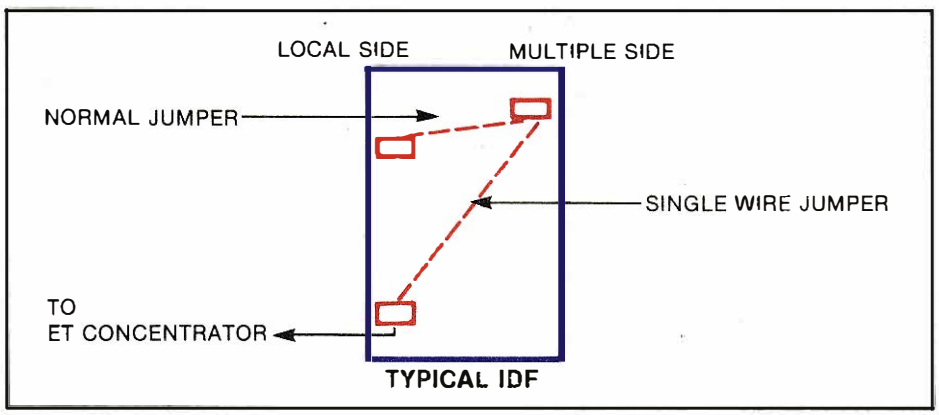


Fig 6

MDF *(See Fig 4)*

Two wire jumpers, for each of the 95 customers, are run from the customers numbers on the Exchange side to a block on the Line side which is cabled to the ET Concentrator. The 16 trunks, that carry the concentrated traffic, along with the Control and Speaker pairs, are cabled from the ET to a block on the EXCHANGE SIDE and then jumpered across to the cable pairs which are terminated on the LINE SIDE.

When the system is installed, the 18 jumpers from the 'E' side to 'E' side in the PCP are provided to connect the main cable pairs to the RT Concentrator. Similarly, the 18 jumpers from the Line side to the Exchange side are provided on the MDF in the exchange to connect the main cable pairs to ET Concentrator. These jumpers DO NOT need to be touched unless it becomes necessary to change from one main cable pair to another. This means that when a new customer is connected to the Gfeller system the only jumpering required is as follows:-

1. A TWO WIRE JUMPER FROM THE 'D' SIDE TO THE 'E' SIDE IN THE PCP.

2. A TWO WIRE JUMPER ON THE MDF, FROM THE LINE SIDE (THIS IS GIVEN A BAR PAIR NUMBER) TO THE CUSTOMERS NUMBER ON THE EXCHANGE SIDE.

3. A SINGLE WIRE JUMPER ON THE IDF, FROM THE CONCENTRATOR BLOCK ON THE LOCAL SIDE TO THE 'P' WIRE OF THE CUSTOMER'S NUMBER ON THE MULTIPLE SIDE.

6. UAX12 and UAX13 Exchanges

These exchanges use an earth or disconnexion for a busy condition on the customers 'P' wire rather than the standard earth condition used in other exchanges. Alteration of strapping on the card frame enables the Concentrator to recognise both conditions. However, as a spare line also leaves the 'P' wire disconnected it becomes necessary to provide the means for the Concentrator to discriminate between spare and busy lines. This is done by using an additional ASU called the 'P' wire control card that, by means of a switch, puts a resistive battery condition onto the 'P' wire when a line is spare. (See Fig 7). YOU MUST REMEMBER TO MOVE THE SWITCH UP WHEN A LINE IS BROUGHT INTO SERVICE AND DOWN WHEN A LINE IS MADE SPARE.

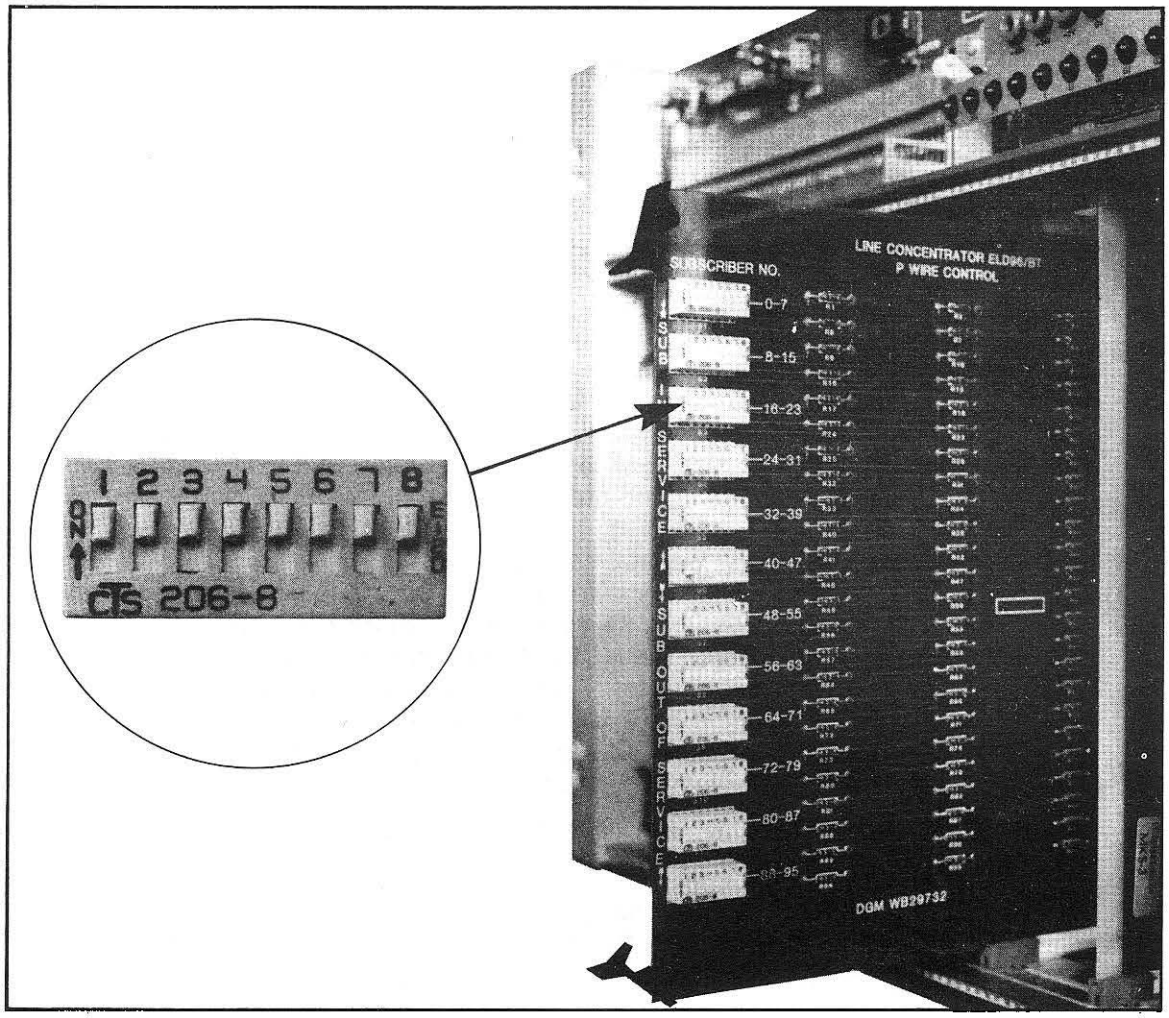


Fig 7

7. Types of Customer to be Connected to the Concentrator System

The following classes of customer SHOULD NOT be connected to the system:-

1. HIGH CALLING RATE CUSTOMERS eg business DELs and PBX lines. This is because 16 Trunks have to carry the traffic of 95 customers.

2. CUSTOMERS THAT REQUIRE THE EXCLUSIVE USE OF A PAIR OF WIRES eg Line charged battery keyphones, WB systems, Call transfer equipment.

3. PREFERENCE 1 AND 2 CUSTOMERS AND ANY OTHERS THAT REQUIRE EMERGENCY CALL OUT SERVICE.

4. COINBOXES.

SHARED SERVICE LINES

Shared service lines which are teed in the distribution network beyond the RT can be provided on the system but, to minimise the risk of congestion, the total number of customers on a fully equipped system should not exceed 95. Therefore, for each pair of shared service customers connected, ie for two customers using one pair of wires to the concentrator, one customer position on the system must be left spare.

NOTE: If exchange equipment and 'D' side line plant is available, shared service customers could be given DEL facilities.

8. Partially Loaded Systems

Where the number of customers is significantly less than 95, the number of trunks can be reduced. In order to provide the best grade of service it is preferable to provide as many trunks as possible although the following guidelines are offered for partial loading:-

32 customer system.....at least 8 trunks
64 customer system.....at least 12 trunks

9. Testing Arrangements

TESTING FROM THE EXCHANGE *(See Fig 8)*

The customers line can be accessed by the test desk in the normal way via the test access equipment. When testing to line, the correct condition IS NOT bell set capacitance as would normally be expected but approximately – ve 10 V on the 'A' leg and – ve 35 V on the 'B' leg (see Fig 8a), these potentials being applied to the line at the RT. For this reason the customer's record card should have these test conditions written in the remarks column along with the fact that the line is connected to the Concentrator system. On TXE2 exchanges the potentials on the line are reversed ie – ve 10 V on the 'B' leg and – ve 35 V on the 'A' leg.

Because the potentials are applied at the RT it is only possible to test as far as the RT from the test desk. If there is a disconnexion fault on the 'D' side of the RT, the line would still test correctly from the exchange. To prove the disconnexion, you will have to test the 'D' side from the PCP.

The only way to check from the exchange that the line is working is to apply ringing current and wait for the customer to answer.

The Trunks are automatically tested by the Concentrator. As soon as a Trunk becomes faulty, an alarm will appear in the exchange and the Trunk is taken out of service.

Figures 8b-8e give typical examples of common faults found on the 'D' side and indicate the conditions that would be detected when testing from the exchange.

When testing into the exchange from the RSC, normal conditions should be detected.

TESTING FROM THE 'D' SIDE OF THE PCP

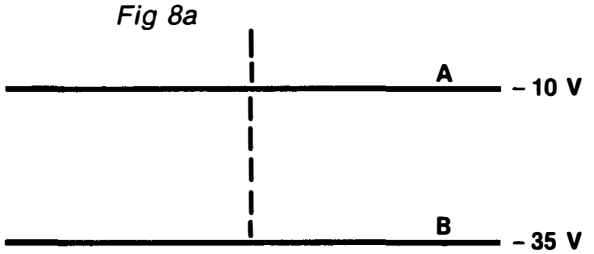
When testing towards the exchange the correct condition will be 24 V between the 'A' and 'B' legs.

When testing towards the customer normal conditions should be detected.
THE LINE MUST BE ISOLATED IN THE PCP IN THE NORMAL WAY WHEN MAKING TESTS FROM THE 'D' SIDE TO THE CUSTOMER

TESTING FROM THE EXCHANGE – EXCHANGE TEST DESK

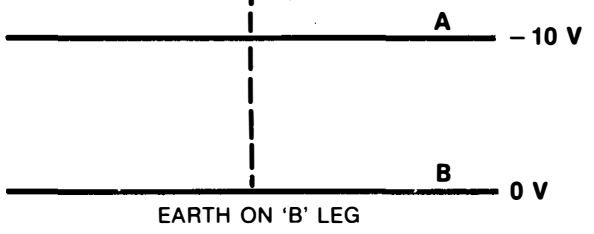
(ALL FAULTS SHOWN ARE ON THE 'D' SIDE OF THE RT)

Fig 8a



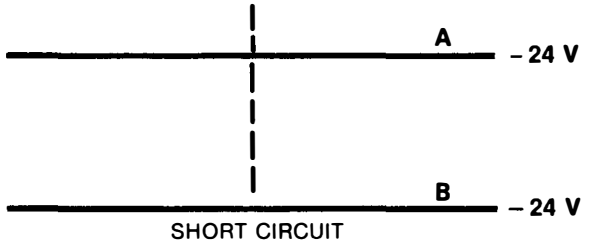
CORRECT TEST CONDITIONS (THE LINE COULD STILL BE DIS. ON THE 'D' SIDE)

Fig 8b



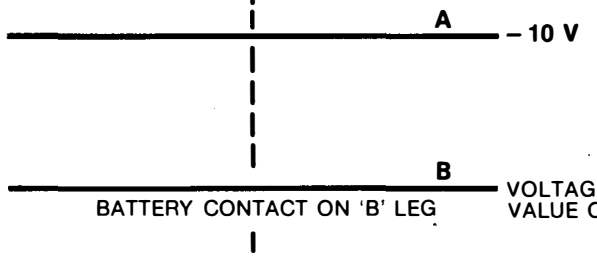
EARTH ON 'B' LEG

Fig 8c



SHORT CIRCUIT

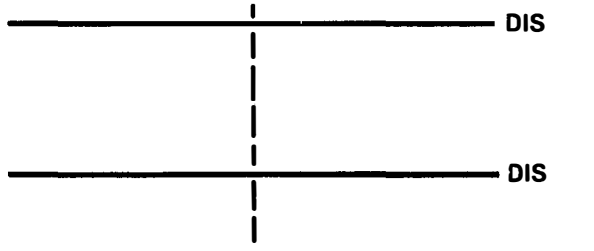
Fig 8d



BATTERY CONTACT ON 'B' LEG

VOLTAGE READING DEPENDS ON VALUE OF POTENTIAL

Fig 8e



POSSIBLE FAULTS

1. CONCENTRATOR WILL NOT SET UP A PATH
2. LINE IN PARK (COMMON CONTROL EXCHANGES)
3. FAULT IN THE EXCHANGE

NOTES: 1. **ON TXE2 EXCHANGES THE POTENTIALS ON THE A AND B WIRES ARE REVERSED.**
2. THE EXAMPLES ABOVE SHOW MAXIMUM POTENTIALS. IN PRACTICE THEY WILL BE REDUCED DEPENDING ON THE LINE RESISTANCE.

Fig 8

10.
PG Conditions

A PG condition on a line exists when a calling condition, either real or false (ie a fault), has been applied to that line for longer than a given period.

If a line on the concentrator system has a PG condition it will hold one of the trunks unnecessarily. With 95 lines having to share 16 trunks the grade of service soon becomes degraded when trunks become occupied as a result of PG conditions.

TESTING PG LINES

10.1 Common Control Exchanges

Common control exchanges have a facility of placing PG lines into a 'parked' condition. The concentrator recognises if a line has been parked by the exchange and will make available the trunk for reallocation to another customer when required. When the trunk is reallocated, the exchange park condition is released. The concentrator then applies its own park condition to the PG line and anyone calling that number will receive Busy Tone. The line then remains parked until the customer replaces the handset or the fault is cleared.

TO TEST A PG LINE THAT HAS BEEN PLACED IN PARK YOU SHOULD:-

1. Dial and hold a special number known as the 'PARKED LINE ACCESS NUMBER' (PLAN). This number is connected to 'subscriber 0' of the ET. The concentrator detects when the PLAN is called and allows incoming access to lines that it has placed in park.

2. ACCESS THE LINE TO BE TESTED FROM THE TEST DESK IN THE USUAL WAY. Normal testing procedures should then be carried out.

NOTE: THE 'PLAN' MUST BE RELEASED AS SOON AS YOU FINISH TESTING TO REDUCE THE RISK OF OTHER CUSTOMERS GAINING ACCESS TO PARKED LINES.

10.2 Strowger Exchanges

On Strowger Exchanges including UAXs the concentrator does not automatically put a PG line into PARK as described for common control exchanges. The line or lines, therefore, continue to hold a trunk or trunks and so increase the probability of blocking on the concentrator system. If all trunks are in use, an All Trunks Busy Alarm is extended to the exchange prompt alarm. Lines that are PG should be wedged out on the Concentrator Jacks Test on the Line Side of the MDF. This allows the concentrator to place the line into PARK which makes the trunk available for other customers to use. The wedges must then be removed, so that when the handset is replaced or the fault is cleared, the park condition is automatically removed and the customer has normal service.

TO TEST A LINE THAT IS PG YOU SHOULD:-

1. Wedge out the line on the concentrator Jacks Test on the line side of the MDF.
2. Operate the Trunk initialize key on the concentrator ET.
3. Remove the wedges from the MDF.
4. Dial and hold the PLAN.
5. Access the line from the test desk in the usual way and carry out normal testing procedure.
6. Release the call to the PLAN.

NOTE: The modification described on page 8 removes the PARK facility from UAX12 and UAX13 which is why the above procedure has to be followed for these exchanges.

11.
Maintenance

Faults that occur on the system will bring up an alarm in the exchange. Serious faults that affect service will give a prompt alarm and less serious faults that allow the system to function reasonably well will give a deferred alarm. Area policy decides which type of alarm is to be connected for the particular type of fault. The alarm condition can be disconnected from the exchange by pressing the RECEIVING ATTENTION button on the alarm unit mounted on the side of the ET. (See Fig 9.) The button will then light and the person responsible for the maintenance of the system should immediately be informed that a fault exists on the system, especially if it was a prompt alarm.

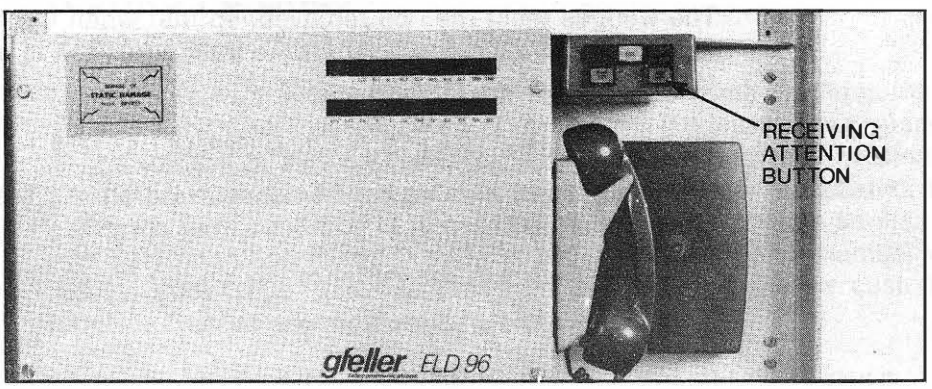


Fig 9

12.
TOS

If a line on the concentrator system is to be made TOS, it is necessary to disconnect the additional green wire on the IDF. On Strowger exchanges that are jumpered to WBW 29616 sht 2 the strap can be removed between PU and PF tags on the MULTIPLE SIDE of the IDF instead of disconnecting the green wire.

13. References

LIST OF TIs

A2 C1090	SYSTEM DESCRIPTION General use covering the main points of system. Gives a list of association instructions and associated drawings. Lists codes used to question the system in order to find faults and read traffic records.
A2 C1091	INSTALLATION AND COMMISSIONING For use by internal and external planners, internal construction and external works groups.
E6 A5151	SYSTEM MAINTENANCE For use by maintenance staff for the purpose of maintaining both the Exchange Terminal and Remote Terminal.
A2 L2510	LOCAL LINE PLANT RECORDS For use by external planners and routing and record officers.