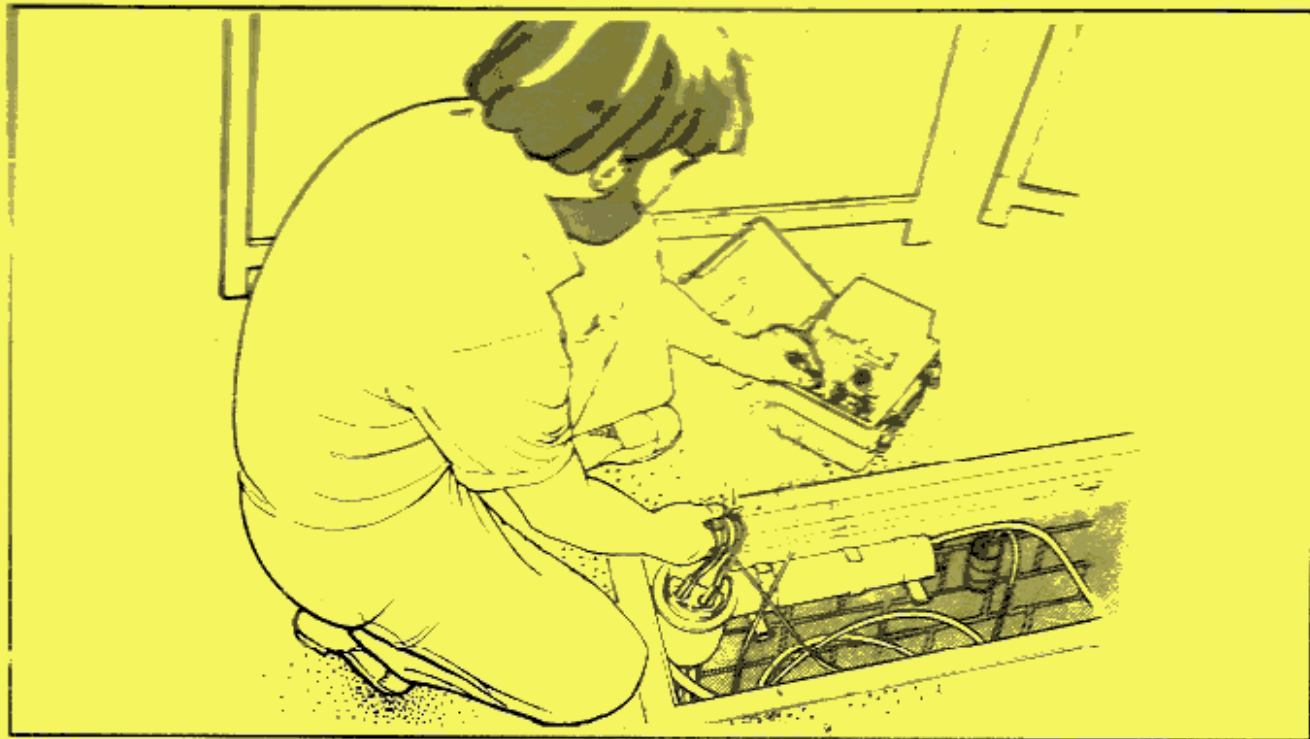


TESTER 301A

Handbook



British
TELECOM



TESTER 301A

Handbook



TESTER 301A HANDBOOK – CONTENTS

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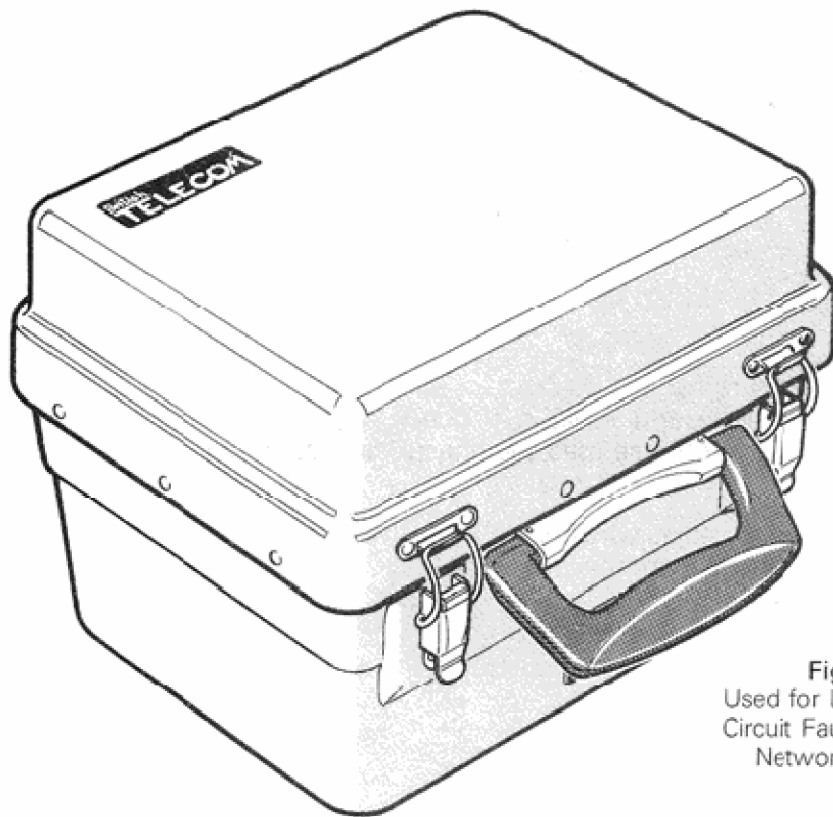


Fig. 1 Tester 301A
Used for Location of Dis and Short
Circuit Faults in Local Underground
Network. Range 1000 Metres.

1. INTRODUCTION

1.1 The Tester 301A uses the pulse echo principle to locate 'DIS' and 'S/C' faults in the local network. Electrical pulses are transmitted along the pair by the Tester 301A which are then reflected back to the sending end by a fault on the pair. The reflected pulse is detected by the Tester 301A and displayed with the send pulse on an illuminated screen.

The time taken for the pulse to travel to the fault point and return again is a measure of the distance to the fault. This distance is read from a calibrated dial whose position is manually set by adjustment until a narrow cursor line on the screen coincides with the leading peak of the reflected fault pulse.

1.2 The tester is mounted in a standard instrument case as shown in Fig 1. It is intended to be used for locating the position of 'DIS' and 'S/C' faults in local network cables up to a maximum distance of 1 km. It is not suitable for locating low insulation and battery or earth contact faults for which other equipment should be used.

1.3 The tester is powered from internal rechargeable cells which may be charged from either the vehicle charging point or the mains charging unit.

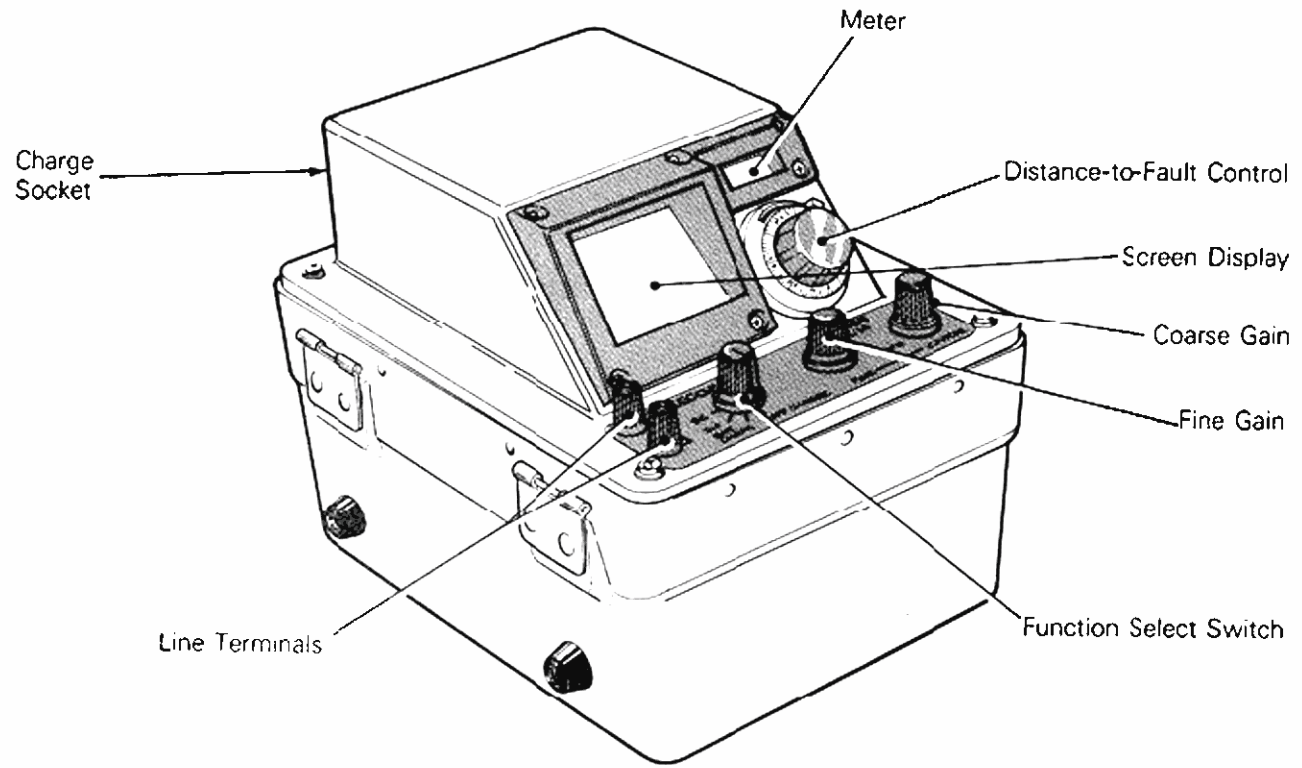


Fig. 2
Tester 301A

2. MAIN FEATURES

2.1 GENERAL

Fig 2 shows the Tester 301A with cover removed, in addition the following points should be noted:—

- a) the pair under test is connected to the Tester 301A line terminals via the test leads provided.
- b) the function select switch has four positions
 - i) OFF/CHARGE
 - ii) BAT. CHECK
 - iii) DIS.
 - iv) S/C
- c) the coarse and fine gain controls are used in conjunction with
 - i) screen display
 - ii) meter
 - iii) distance to fault control

as explained in sections 4 to 7.

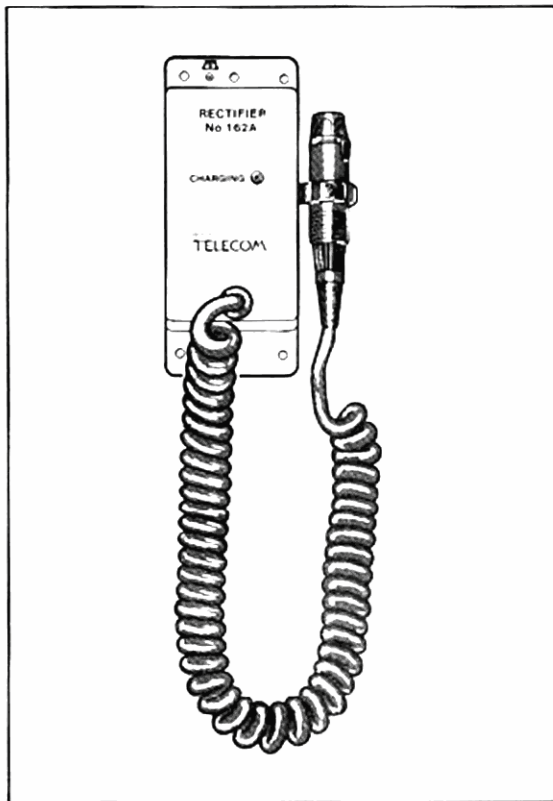


Fig 3. Rectifier 162A

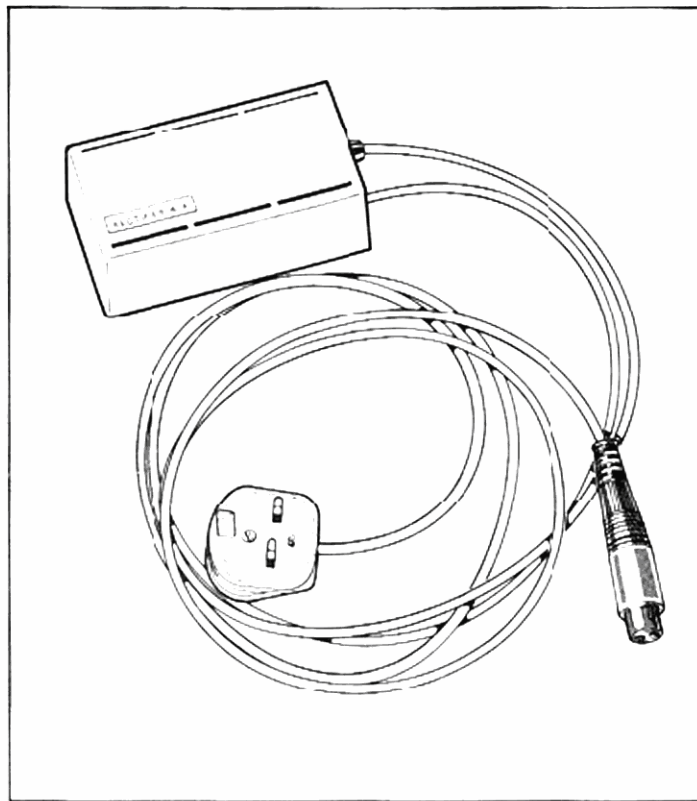


Fig 4. Typical Rectifier 161A

2.2 BATTERY CHARGING

The instrument is powered by an internal battery which is charged from the vehicle charging point (Rectifier 162A see Fig 3). Exceptionally the battery can be re-charged using the mains charging unit (Rectifier 161A see Fig 4) specially held for the purpose at the T.E.C.

2.2.1 NORMAL CHARGING

Keep your Tester 301A battery fully charged, always switch it off when not in use and keep it connected to the vehicle charging point (Rectifier 162A). Correct connection to the Tester 301A is indicated on the Rectifier 162A by a red light. The red light will extinguish when the charging plug is disconnected from the Tester 301A or automatically when the charging period is completed. The unit will normally be charged with the case lid closed.

2.2.2 T.E.C. CHARGING

Should your vehicle not be equipped with the Rectifier 162A then check the Tester 301A battery at the end of each working day (see battery test section 3.2). If there is any doubt about the state of charge then re-charge overnight as described in section 3.1 using the Rectifier 161A.

NOTE: Charging can only be carried out with the Tester switched to the OFF/CHARGE Position.

WARNING: Car Battery Chargers must not be used, as this may result in serious damage to the Tester 301A.

3. INITIAL CHARGING AND SUBSEQUENT USE

3.1 Before the Tester 301A is used for the first time the battery must be given a full charge using the mains powered charging unit (Rectifier 161A which is held at the T.E.C. see Fig. 4). The battery should be charged for at least 14 hours, care being taken to see that the selector switch is in the 'OFF/CHARGE' position.

3.2 When the Tester 301A is disconnected from the charger the cover should be removed and the selector switch turned to the 'BAT CHECK' position. (A high pitched whistle may then be heard from some testers). The needle should be above division 6 on the meter scale. If not the battery should be recharged as in 3.1 and the test repeated. If the meter needle is still on or below division 6 on the scale it should be switched off and returned for service in accordance with section 9.

3.3 Setting the function switch to the 'BAT CHECK' position a green trace should appear on the screen. If this does not occur then switch off and return the tester for service.

3.4 To check the test lead switch the tester to the DIS or S/C position and short the ends of the test lead together. The display should alter. If this does not occur replace the test lead.

3.5 If the above tests are performed satisfactorily the instrument can be assumed to be in working order and should be switched off and connected to the vehicle charging point (Rectifier 162A see Fig. 3).

3.6 The procedure set out in 3.2 to 3.5 should be carried out before leaving the T.E.C. at the beginning of each working day.

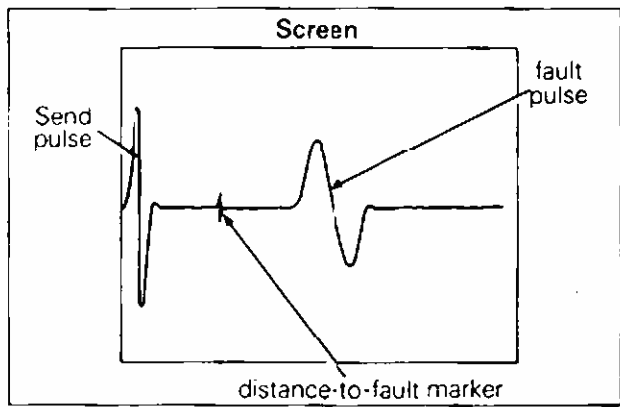


Fig. 5

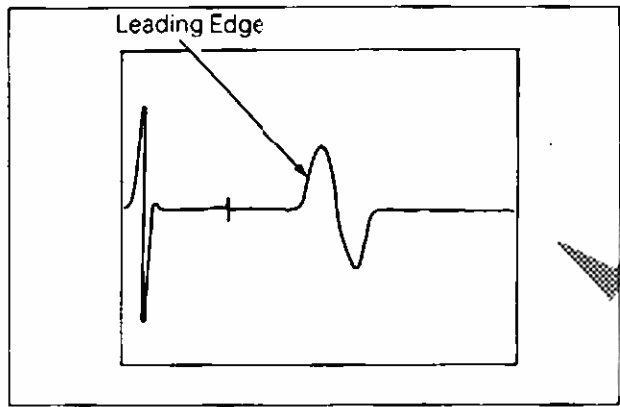


Fig. 7a Correct

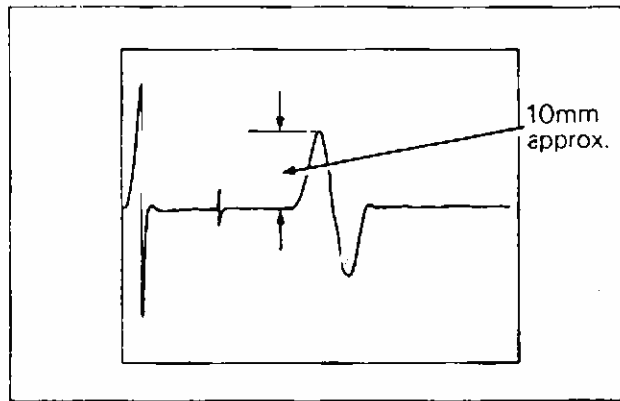


Fig. 6

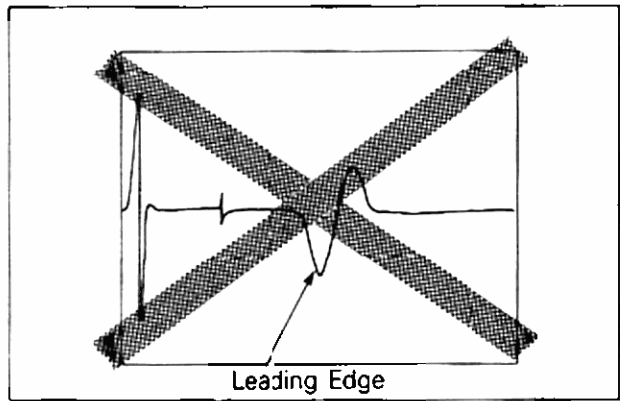
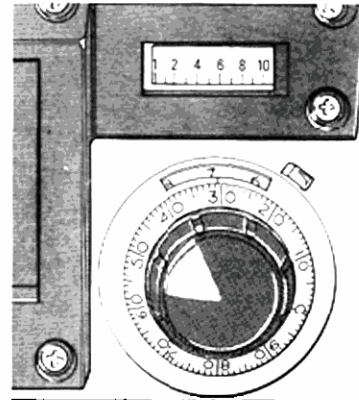
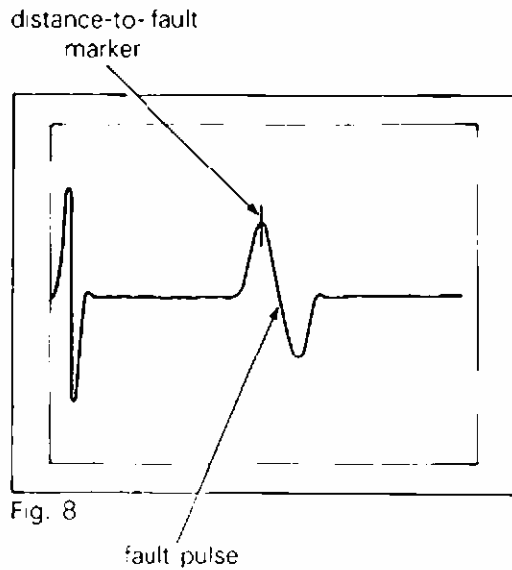


Fig. 7b Incorrect

4. OPERATING INSTRUCTIONS

- 4.1** Connect pair to line terminals using test leads provided.
- 4.2** Set the function switch to 'DIS' (or 'S/C' if the fault is known to be 'S/C').
- 4.3** Adjust 'Coarse Gain' control until fault pulse is clearly visible. (see Fig 5).
- 4.4** Check that the leading edge of the fault pulse is above the green horizontal line on the screen, if not change the function switch to the correct fault condition – 'DIS' or 'S/C' (see Fig 7 and Fig 12 for examples).
- 4.5** Turn 'Fine Gain' control fully clockwise, then using the 'Coarse Gain' control adjust the height of the fault pulse to approximately 10mm. (see Fig 6).



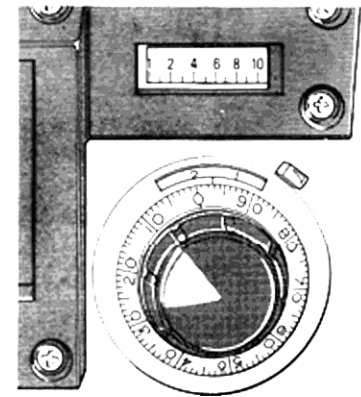
Tester 301A

Distance-to-Fault
Reading = 730 Metres

Fig. 9(a)

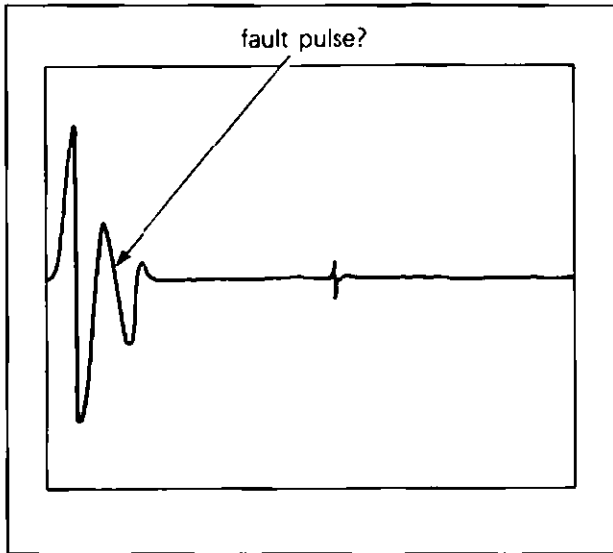
Distance-to-Fault
Reading = 197 Metres

Fig. 9(b)



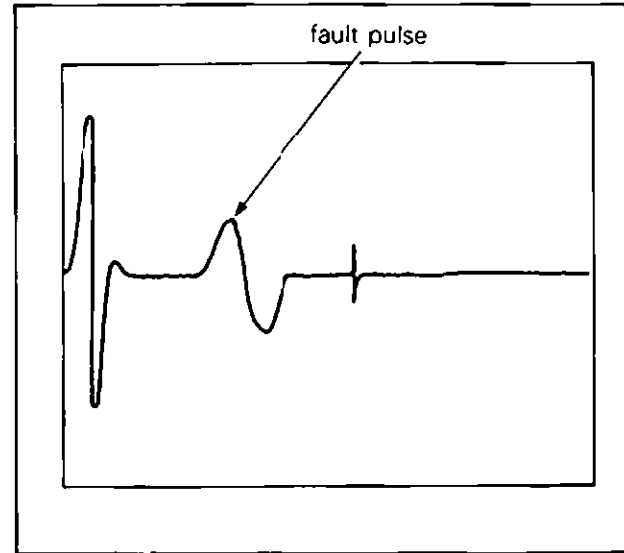
Tester 301A

- 4.6** If the fault is closer than 50 metres from the testing point the fault pulse will be indistinguishable from the send pulse as shown in Fig. 10 (see section 5).
- 4.7** Rotate the distance-to-fault control until the small cursor line coincides with the top of the fault pulse (see Fig. 8).
- 4.8** Turn the 'Fine Gain' control anticlockwise until the meter needle reads approximately two.
- 4.9** Adjust the distance to fault control to increase the meter reading.
- 4.10** Repeat steps 4.8 and 4.9 until adjustment of the distance-to-fault control does not increase the meter reading.
- 4.11** The distance to the fault, in metres, is then indicated by the reading on the distance-to-fault control dial (see Fig. 9(a) and Fig. 9(b) for examples).



Fault pulse hidden by send pulse.

Fig. 10



Fault pulse clearly visible after connecting approx.100m of jumper wire between the Tester 301A and the pair under test.

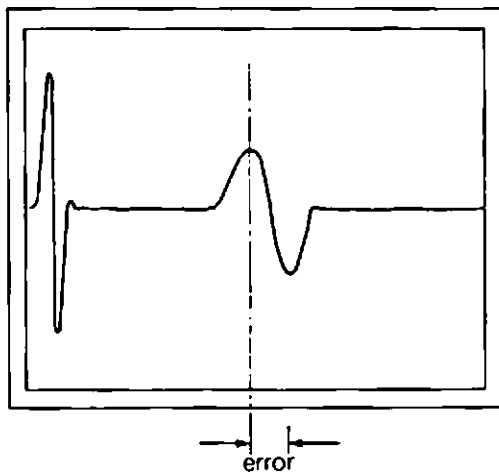
Fig. 11

5. FAULTS LESS THAN 50 METRES FROM TESTING END

5.1 The procedure to be followed is the same as in section 4. but because of the short distance to the fault, the fault pulse may not be distinguishable from the send pulse. To overcome this difficulty a length of jumper wire, measuring approximately 100m when tested with the Tester 301A, should be connected between the line terminals and the pair under test.

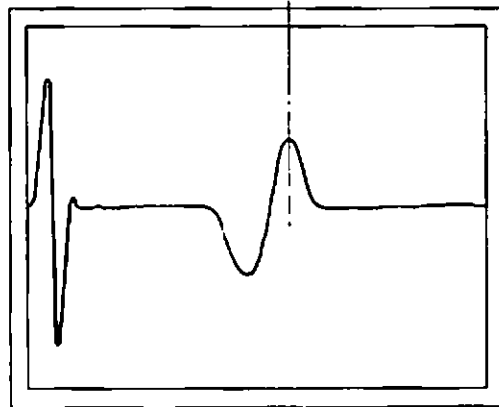
5.2 The actual length of the jumper wire must then be subtracted from the distance-to-fault measurement to give the true fault location. The length used may be measured using the Tester 301A after disconnecting the jumper wire from the pair under test.

$$\text{DISTANCE-TO-FAULT} = \text{MEASURED DISTANCE} - \text{LENGTH OF JUMPER WIRE}$$



Function select switch set to correct fault condition.

Fig. 12(a).



Function select switch set to incorrect fault condition.

Fig. 12(b)

6. PRACTICE USE OF THE TESTER 301A

6.1 Obtain a reel of jumper wire (length marked) with access to both ends, connect the Tester 301A to one end and leave the other end open circuit.

6.2 Select 'DIS' on the function select switch, adjust the tester to measure the length of the jumper wire (using the method given in sections 4. and 5.), and note this length. The measured electrical length should be approximately the same as marked on the reel. (The marked and measured 'electrical' lengths will not be the same because the jumper wire is coiled).

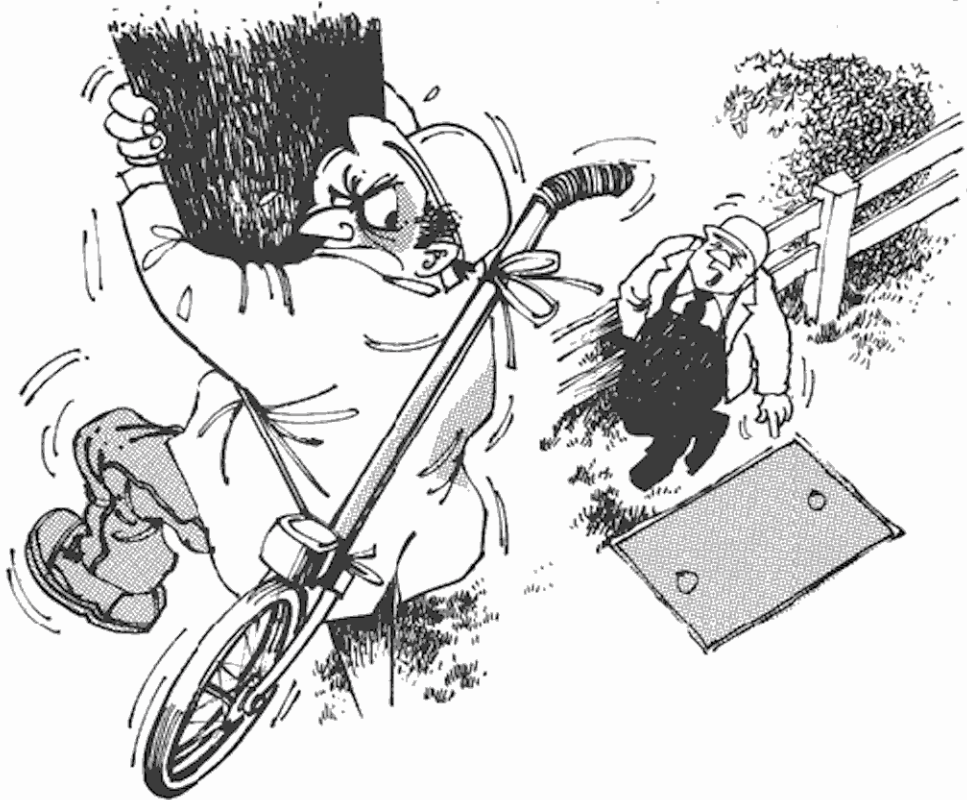
6.3 Next watch the display and short the ends of the jumper wire together, the fault pulse will invert.

6.4 Adjust the tester again to take a reading, this time the measurement will be incorrect unless the function select switch is altered to the 'S/C' position (see Fig. 12).

6.5 Readjust the Tester 301A, the distance-to-fault measurement should now be the same as previously noted.

6.6 The above exercise may be repeated using more than one reel of jumper wire connected together in series to simulate faults at various distances.

I STILL SAY THE FAULT'S DOWN HERE!



7. ACCURACY AND INTERPRETATION

7.1 The accuracy obtainable with the Tester 301A is dependent on:—

- a) the accuracy of the instrument itself:
- b) the condition and characteristics of the pair under test.

Water in a cable may alter its transmission characteristics and thus give an incorrect reading. Also the measured length and actual overground cable length may differ due to the lay of the cable pairs. However the accuracy of the Tester 301A is generally adequate for fault location since:—

- a) the fault will usually be in the joint nearest to the location given by the Tester 301A. Cases may occur where it is necessary to repeat the location procedure from the joint where the fault appeared to be in order to achieve a second and more reliable location;
- b) the accuracy of location is not greatly affected by conductor size. However it has been found that readings are likely to be approximately 10% short when testing on paper core cables and approximately 8% long on polyethylene aerial cables.

8. INTERFERENCE

The Tester 301A display can suffer if radio and other interfering signals are affecting the pair and in extreme cases location of the fault may be made difficult or even impossible. Sometimes the interference may be of short duration, in which case location of the fault may be possible if the test is repeated after a few minutes. If, however, the interference persists, location with the Tester 301A may have to be abandoned and some other method of fault location employed.

9. SERVICING

Before sending the Tester 301A for servicing ensure that the unit is switched off to avoid damaging the battery. It would be of considerable help during repair if you wrote a brief description of the fault on a label and firmly attach it to the Tester 301A.

10. ASSOCIATED EQUIPMENT

| TITLE | RATE BOOK SECTION | DESCRIPTION |
|--------------------|--------------------------|--|
| RECTIFIER 161A | 12 TP(A-A) | MAINS POWERED CHARGER FOR TESTER 301A. |
| RECTIFIER 162A | 12 TP(A-A) | VEHICULAR MOUNTED CHARGER FOR TESTER 301A. |
| CORDS TEST 2/2000A | 12 TP(A-B) | CORD TO CONNECT TESTER 301A TO PAIR UNDER TEST. |

11. NOTES

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