

# TESTER 301B

# Handbook





This handbook is for use with the Tester 301B,  
manufactured by Edgcumbe Instruments Ltd.

for



## **TESTER 301B HANDBOOK — CONTENTS**

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**Fig. 1 Tester 301B**

Used for location of disconnection and short circuit faults in local networks. Range 2.5 km.



## **1. INTRODUCTION**

### **1.1**

The Tester 301 B uses Time Domain Reflectometry (pulse echo principle) to locate disconnection (DIS) and short circuit (S/C) faults in a local cable network. Electrical pulses are transmitted along the pair by the Tester 301 B and reflected back to the sending end by a fault on the pair. The reflected pulse is detected by the Tester 301 B and displayed on a cathode ray tube (C.R.T.) 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. The distance (in kilometres) is read from a liquid crystal display after a narrow cursor line on the screen has been moved to coincide with the break point of the fault pulse.

### **1.2**

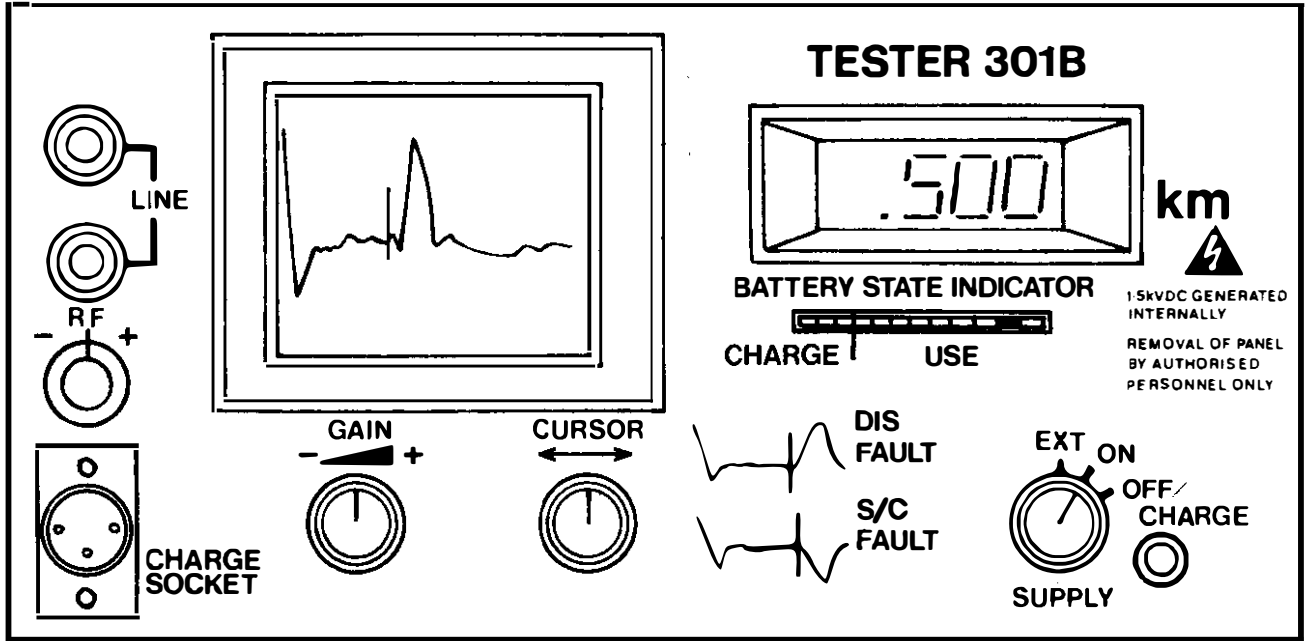
The Tester is housed in a plastic moulded box and supplied in a shower-proof carrying bag. It is intended to be used for the location of DIS and S/C faults in local network cables up to a maximum distance of 2.5 km in two overlapping ranges. It is not suitable for locating low insulation and battery or earth contact faults for which other equipment should be used.

### **1.3**

The Tester is powered from internal rechargeable cells which maybe charged from either a vehicle charging point (Rectifier 162A), or a mains charger unit (Rectifier 161 A).

### **1.4**

External supply facility is provided for use by the Training Schools only. For further details contact:—

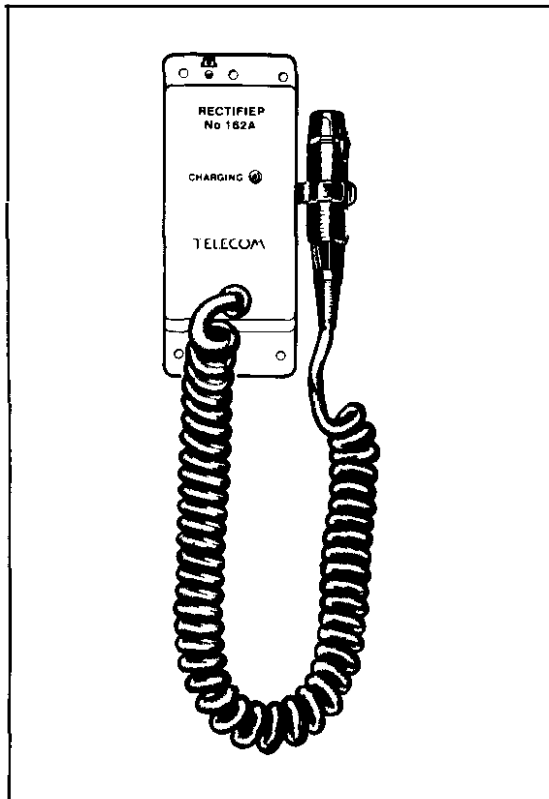


**Fig. 2**  
Tester 301B

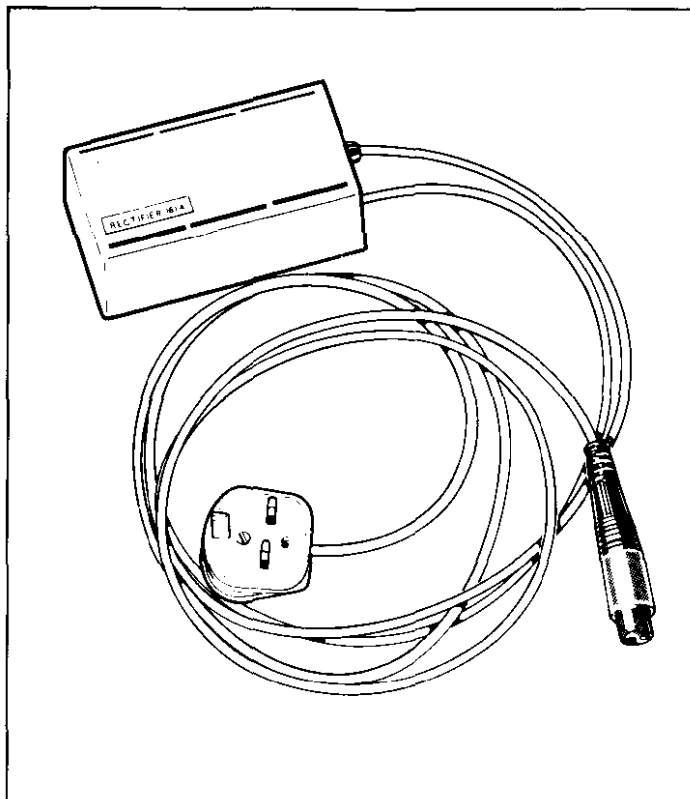
## 2. MAIN FEATURES

Fig. 2 shows the front panel of the Tester 301 B. The following points should be noted.

- (a) The pair under test is connected to the Tester 301 B line terminals via the test leads provided.
- (b) The supply select switch has three positions
  - (i) OFF/CHARGE
  - (ii) ON
  - (iii) EXT.
- (c) The gain and cursor controls are used in conjunction with the C.R.T. screen and display to determine:
  - (i) Type of fault
  - (ii) Distance to faultas fully explained in sections 5 to 8.
- (d) The R.F. control enables radio interference on the C.R.T. to be reduced to a minimum.



**Fig. 3.** Rectifier 162A



**Fig. 4.** Rectifier 161A

### **3. BATTERY CHARGING**

#### **3.1 NORMAL CHARGING**

Keep your Tester 301 B battery fully charged; always switch the tester off when not in use and keep it connected to a vehicle charging point (Rectifier 162A). Correct connection to the Tester 301 B is indicated by red lights on the Tester 301 B and the Rectifier 162A. The red lights will extinguish when the charging plug is disconnected from the Tester 301 B or automatically when the charging period is completed.

It is recommended that once a fortnight the Tester 301 B is charged overnight using a Rectifier 161 A for a period of 14 hours.

#### **3.2 T.E.C. CHARGING**

Should your vehicle not be equipped with a Rectifier 162A then check the Tester 301 B battery at the end of each working day (see 4.2). If there is any doubt about the state of charge then re-charge overnight as described in section 4.1 using a Rectifier 161 A.

NOTE: Charging can only be carried out with the Tester 301 B switched to the OFF/CHARGE position.

**WARNING:—** Car battery chargers must not be used, as this may result in serious damage to the Tester 301 B. The Tester 301 B has only to be used with Charger labelled Rectifier 161 A or B, or Rectifier 162A or B.

## **4. INITIAL CHARGING AND SUBSEQUENT USE**

### **4.1**

Before the Tester 301B is used for the first time the battery must be given a full charge using a 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.

### **4.2**

When the Tester 301B is disconnected from the charger, turn the selector switch to the ON position. The battery state indicator should indicate in the USE region, if not the battery should be recharged as in 4.1 and the test repeated. If the battery state indicator is still in, or near, the CHARGE region the Tester 301B should be switched off and returned for service in accordance with section 9.

### **4.3**

Setting the function switch to the ON position a trace should appear across the screen and the liquid crystal distance display should indicate. If this does not occur then switch off and return the tester for service.

#### **4.4**

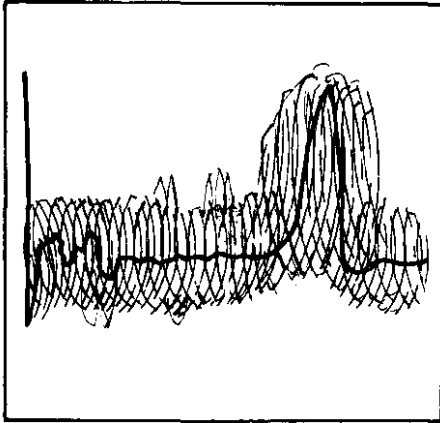
To check the test lead short the ends together. The display should alter. If this does not occur replace the test lead.

#### **4.5**

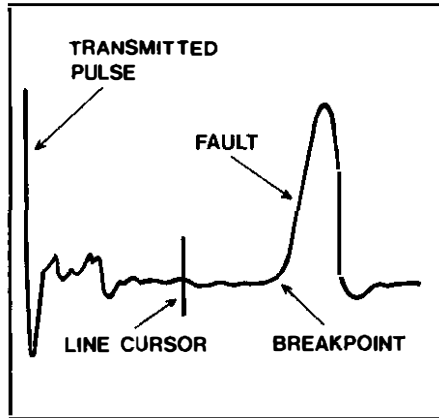
If the above tests are performed satisfactorily the instrument can be assumed to be in working order and should be switched off and connected to a vehicle charging point (Rectifier 162A — see fig. 3).

#### **4.6**

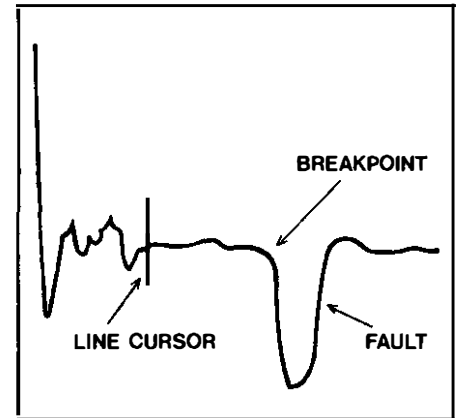
The procedures set out in 4.2 to 4.5 should be carried out before leaving the T.E.C. at the beginning of each working day.



**Fig. 5**  
Radio Frequency Interference



**Fig. 6**  
Disconnection or Open Circuit Fault



**Fig. 7**  
Short Circuit Fault

## **5. OPERATING INSTRUCTIONS**

**For your own safety**, check that there are no hazardous voltages on the cable pair to be tested. Safety is no accident.

### **5.1**

Connect the pair under test to the line terminals using the test leads provided.

### **5.2**

Set the gain and cursor control to the minimum settings (anti-clockwise). Set the R.F. control to the centre position.

### **5.3**

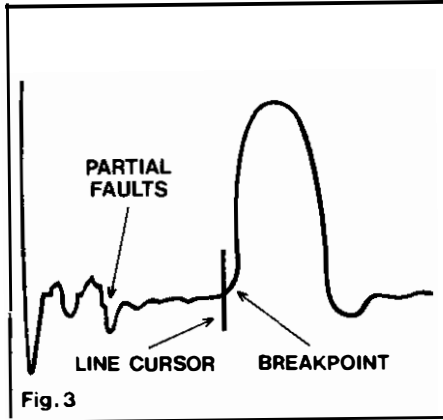
Turn the supply switch to the ON position. Note the position of the battery level on the battery state indicator. If the state of the batteries is in the CHARGE region, switch the supply to the OFF/CHARGE position and charge the batteries as described in section 3.

### **5.4**

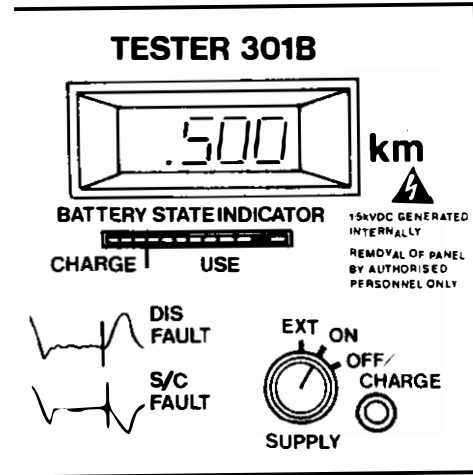
If there is any interference seen on the display, adjust the R.F. control to give a clear picture (see fig. 5).

### **5.5**

Adjust the gain and cursor controls, searching with the cursor until the fault pulse is clearly visible (see fig. 6 and fig. 7).



**Fig. 8** Correct Measurement



**Fig. 9** Distance-to-Fault  
Reading = .500 km  
= 500 metres

**5.6**

Adjust the cursor control until the line cursor coincides with the break point of the fault pulse (see fig. 8).

**5.7**

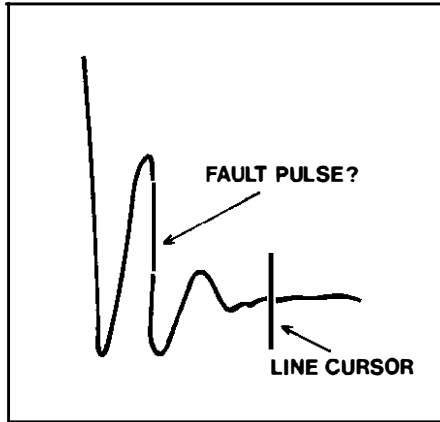
The distance to the fault (in kilometres) may now be read directly from the liquid crystal display (see fig. 8 and fig. 9).

**5.8**

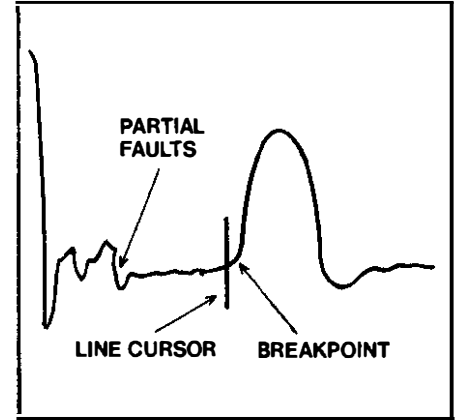
If the fault is closer than 100 metres from the testing point, the fault pulse will be indistinguishable from the transmitted pulse as shown in fig. 10 (see section 6).

**5.9**

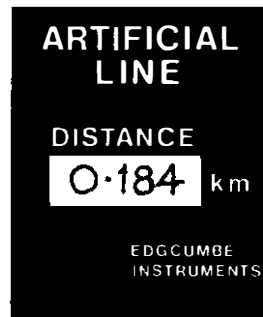
Turn the supply switch to OFF/CHARGE position.



**Fig. 10**  
Fault pulse hidden by  
transmitted pulse



**Fig. 11**  
Fault pulse clearly visible  
after either connecting approx.  
100m of jumper wire or installing  
the artificial line between the  
Tester 301 B and the pair under  
test.



**Fig. 12**

## **6. FAULTS LESS THAN 100 METRES FROM TESTING END**

### **6.1**

The procedure to be followed is the same as in section 5, but because of the short distance to the fault, the fault pulse may not be distinguishable from the transmit pulse, as shown in Fig. 10. To overcome this difficulty either install a length of jumper wire measuring 100 metres or the artificial line between the line terminals and the pair under test.

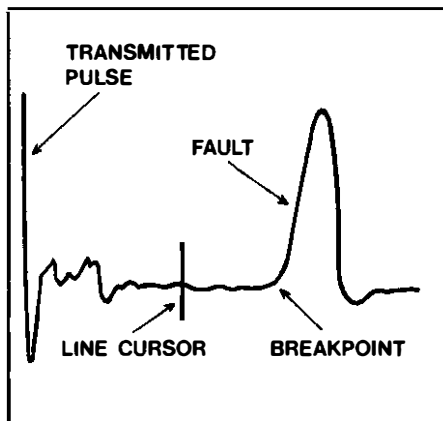
### **6.2**

If a length of jumper wire is installed, then this length of wire must be subtracted from the displayed reading to give the true fault location, i.e.:—

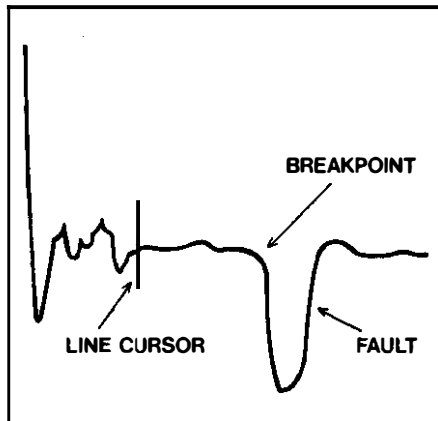
**DISTANCE TO FAULT = DISPLAYED READING — LENGTH OF JUMPER WIRE**

If the artificial line is used, then the distance, shown on the artificial line (see Fig. 12) must be subtracted from the displayed reading to give the true fault location, i.e.:—

**DISTANCE TO FAULT = DISPLAYED READING — 0.184 km — see Fig. 12.**



**Fig. 13**  
Disconnection or Open Circuit



**Fig. 14**  
Short Circuit Fault

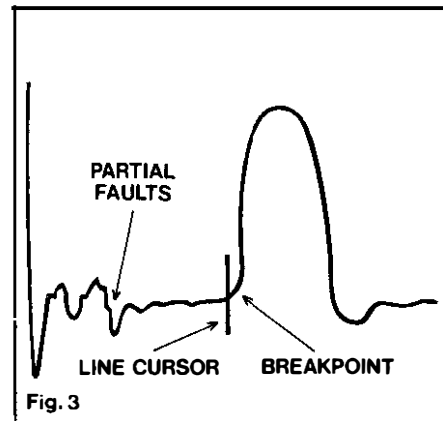


Fig. 3

**Fig. 15**  
Correct Measurement

## **7. PRACTICE USE OF THE TESTER 301B**

### **7.1**

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

### **7.2**

Turn the supply switch to ON, adjust the tester to measure the length of the jumper wire (using the method given in section 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.)

### **7.3**

Next watch the display and short the ends of the jumper wire together. The fault pulse will invert (see Fig. 14).

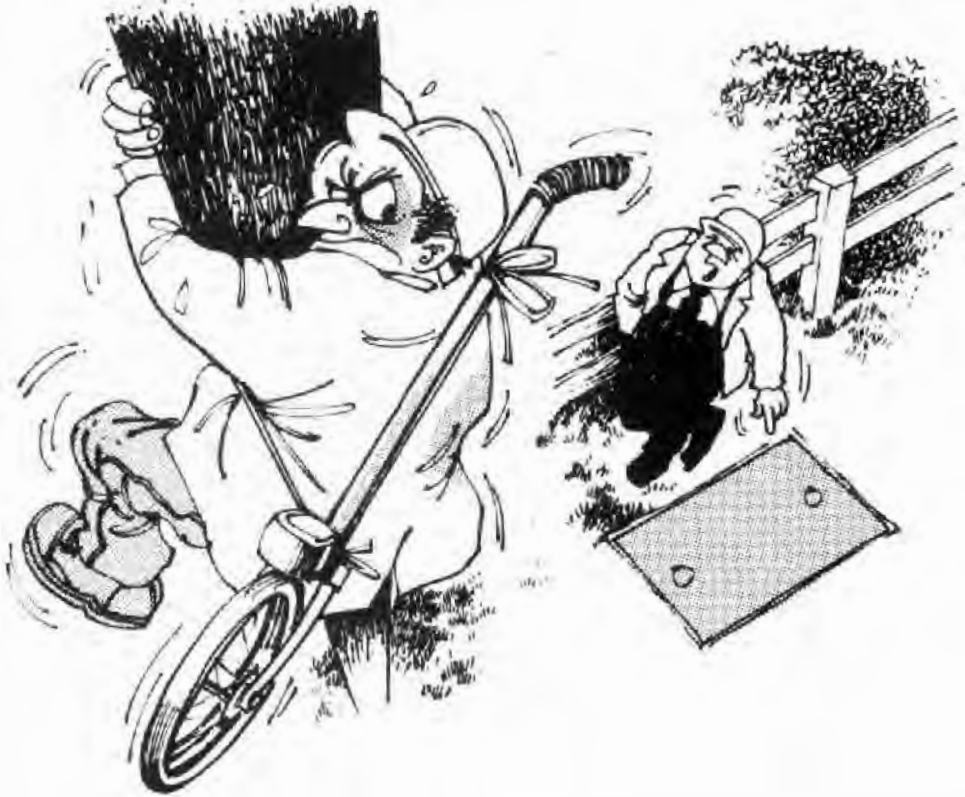
### **7.4**

The distance to fault measurement should be the same for both measurements.

### **7.5**

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!*



## **8. ACCURACY AND INTERPRETATION**

The accuracy obtainable with the Tester 301 B 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 301 B is generally adequate for fault location since:—

- (a) The fault will usually be in the joint nearest to the location given by the Tester 301 B. 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.

## 9. SERVICING

### 9.1

Before sending the Tester 301B for servicing ensure that the printed circuit board mounted fuses have not ruptured and the batteries are not faulty.

**Note:**— Checking and replacement of batteries and printed circuit board mounted fuses is to be carried out by authorised personnel only.

F1:— 2A Quick Blow                      Cartridge 20 x 5mm  
F2:— 500mA Quick Blow                Cartridge 20 x 5mm

### 9.2

Repairs within warranty period will be free of charge and should be sent to Edgcumbe Instruments — full address below. However, out of the warranty period, the districts concerned will be invoiced accordingly.

Before sending the Tester 301B 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 attached it to the Tester 301B.

Tester 301 B for service should be sent to:—

Edgcumbe Instruments Ltd  
Main Street, Bothwell,  
Glasgow G71 8EZ

## 10. ASSOCIATED EQUIPMENT

ITEM	ENGINEERING STORES CATALOGUE SECTION	EDGCUMBE PART No.	DESCRIPTION
RECTIFIER 161 A	12 (TPA-A)	—	MAINS POWERED CHARGER FOR TESTER 301.
RECTIFIER 162A	12 (TPA-A)	—	VEHICLE MOUNTED CHARGER FOR TESTER 301.
CORDSTEST 2/2000A	12 (TPA-B)	—	CORD TO CONNECT TESTER 301 TO PAIR UNDER TEST
BATTERY SECONDARY No. 38	7 (B-B)	—	NI CAD RECHARGEABLE BATTERIES WITH TAKBRO CONNECTOR 22
VIEWING HOOD	—	CMG1001	VIEWING HOOD TO INHIBIT SUNLIGHT OBSCURING THE VIEW ON THE TESTER 301 B
EXTERNAL SUPPLY LEAD	—	DFH1011	FOR USE BY THE TRAINING SCHOOLS ONLY
TESTER 301B HANDBOOK	—	F0301 B/8	ADDITIONAL COPIES OF THIS HANDBOOK
ARTIFICIAL LINE	—	F0301AL/2	TO ASSIST IN DETECTING FAULTS LESS THAN 100 METRES ON THE TESTER 301B





For Advice Contact:—

**NPA 1.7  
ALBAN PARK 2  
UNIT 1  
ST. ALBANS  
AL4 0JJ**

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