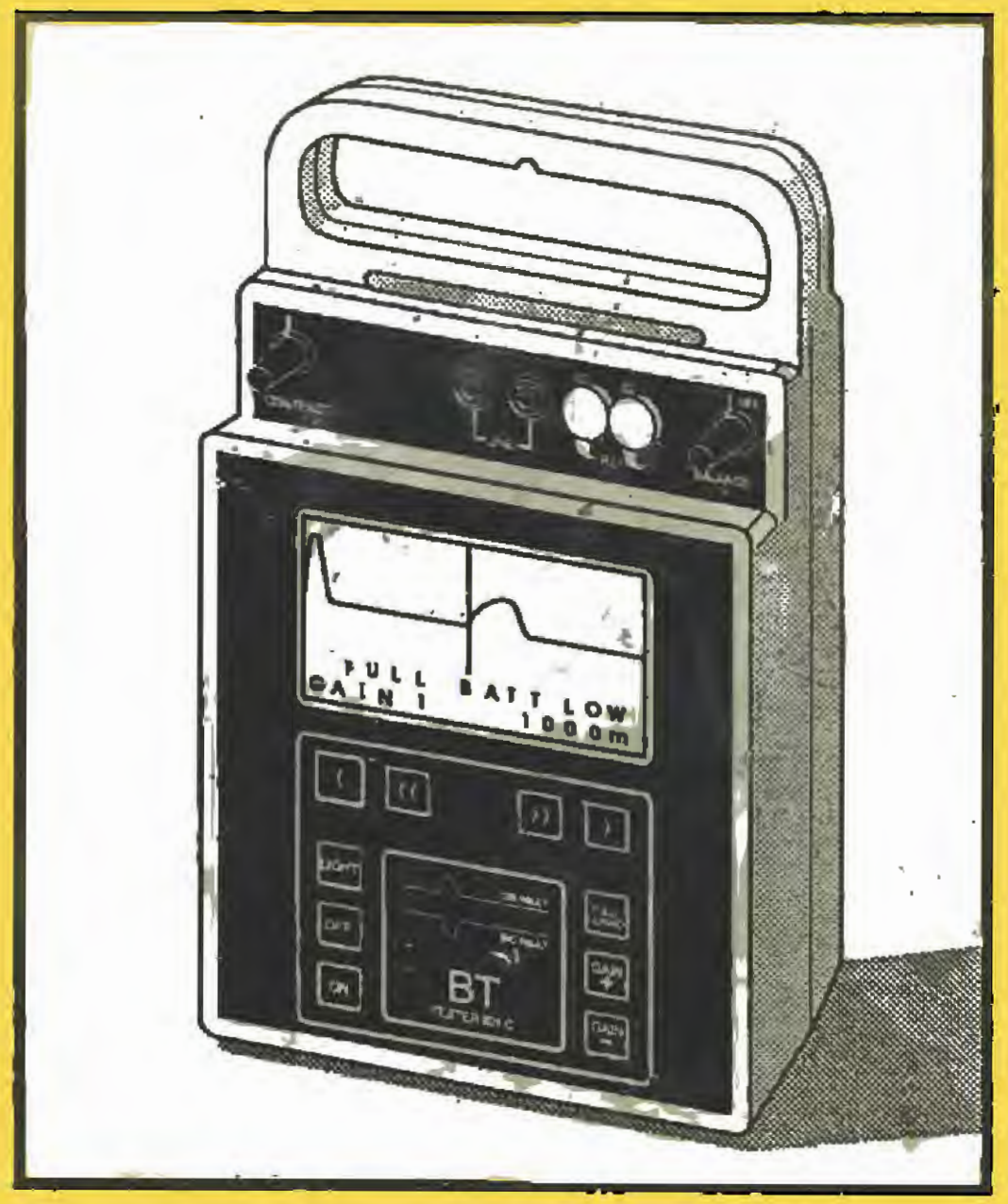


TESTER 301C

Handbook

BT

TESTER 301C HANDBOOK - CONTENTS

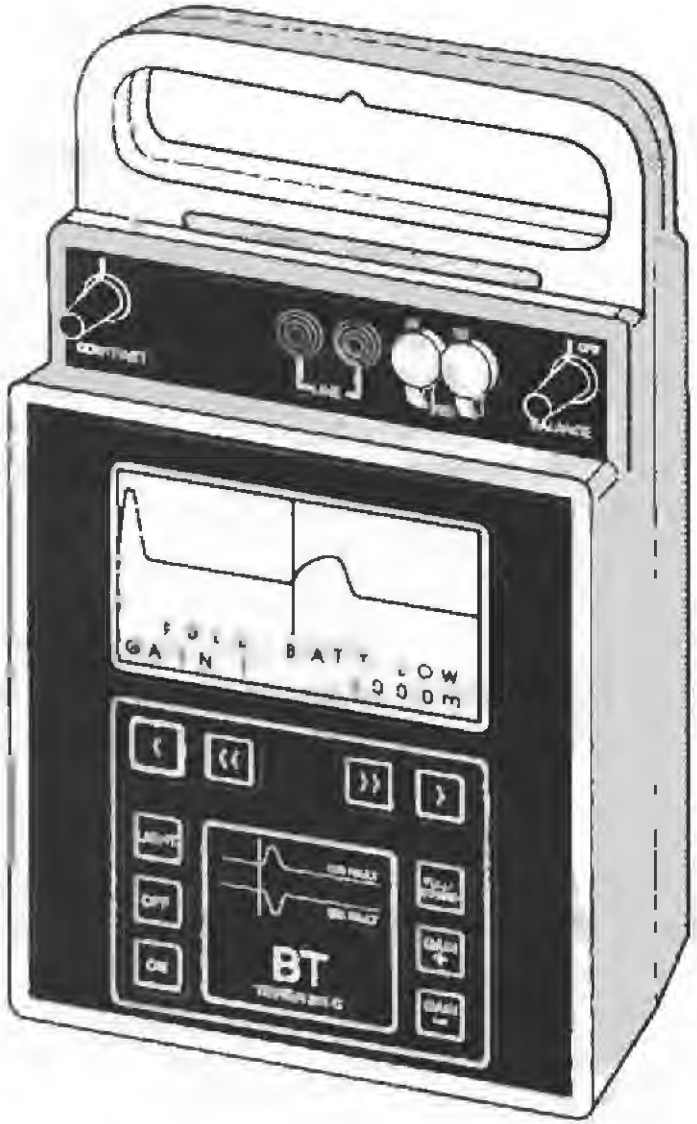


Figure 1 - Tester 301C

1. INTRODUCTION

1.1

The BT Tester 301C is a time domain reflectometer, also known as a pulse echo test set, that provides visual indication of cable faults in the access network. The Tester 301C transmits pulses into a cable pair that are reflected by imperfections such as short circuits (S/C) and open circuits such as disconnections (DIS). Both the transmit pulse and the reflected pulse(s) are shown on the display. The time taken by the pulse to travel to the fault and return to the Tester 301C is a measure of the distance to the fault. Distance in metres is displayed on the screen after the cursor is positioned to coincide with the start of the fault pulse.

1.2

The Tester, housed in a rugged plastic moulded box and supplied in a shower proof storage pouch, is a single range instrument that is intended for locating DIS and S/C faults in access network cables for distances up to 3km. It is not intended for locating low insulation, battery or earth contacts faults for which other equipment should be used.

1.3

The Tester is powered by 8 primary cells type LR14 housed in a compartment accessible from the rear of the Tester.

2. MAIN FEATURES

Figure 2 shows the front panel of Tester 301C.

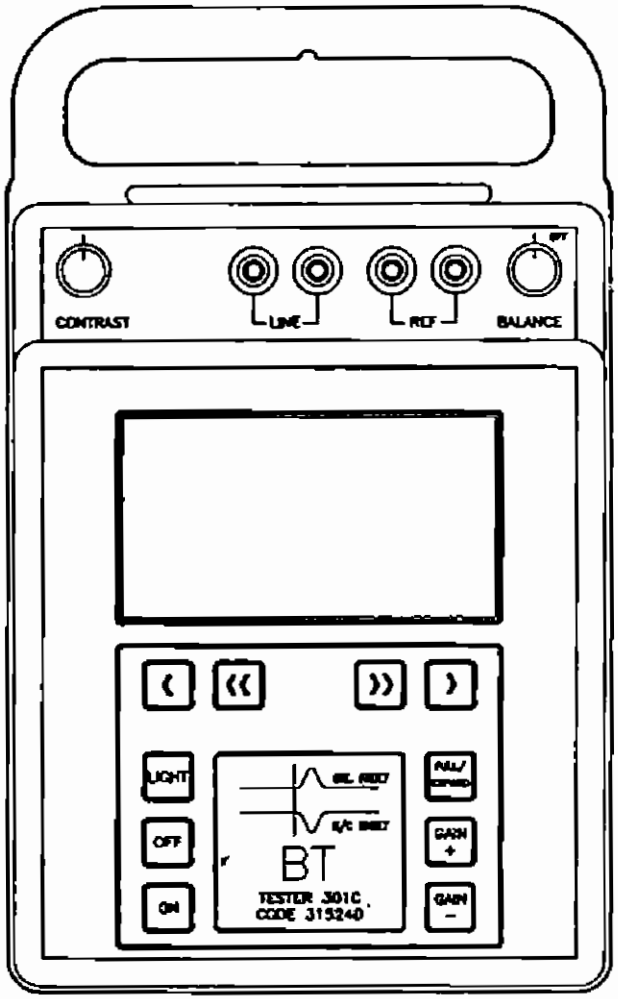


Figure 2

CONTROLS

Switches Tester ON. The Tester also has a battery saving automatic switch off 5 mins after the last key operation.

Switches Tester OFF.

Switches the Display backlight ON and OFF. The backlight also has battery saving automatic switch off after 5 mins.

Increases the Tester sensitivity in steps from minimum GAIN 1 to maximum GAIN 7

Decreases the Tester sensitivity in steps from maximum GAIN 7 to minimum GAIN 1.

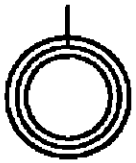
Switches the display between the full trace and an expanded section

Moves the cursor to the left at a slow speed when held down.

Moves the cursor to the left at a fast speed when held down.

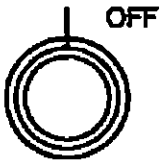
Moves the cursor to the right at a slow speed when held down.

Moves the cursor to the right at a fast speed when held down.



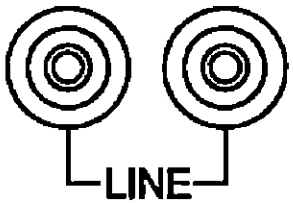
CONTRAST

Rotary control to adjust the contrast of the screen display.

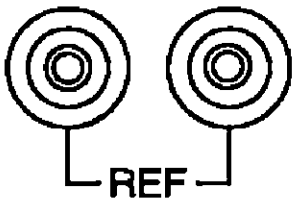


BALANCE

Rotary control used to balance out the transmitted pulse at the start of the trace for near end measurements in the absence of a reference pair. (Set to OFF if a reference pair is to be used).



2 x 4 mm sockets used to connect the pair under test using the test leads provided.



2 x 4 mm sockets covered by protective covers and normally not used. If required they are used to connect a reference pair. (See section 7).

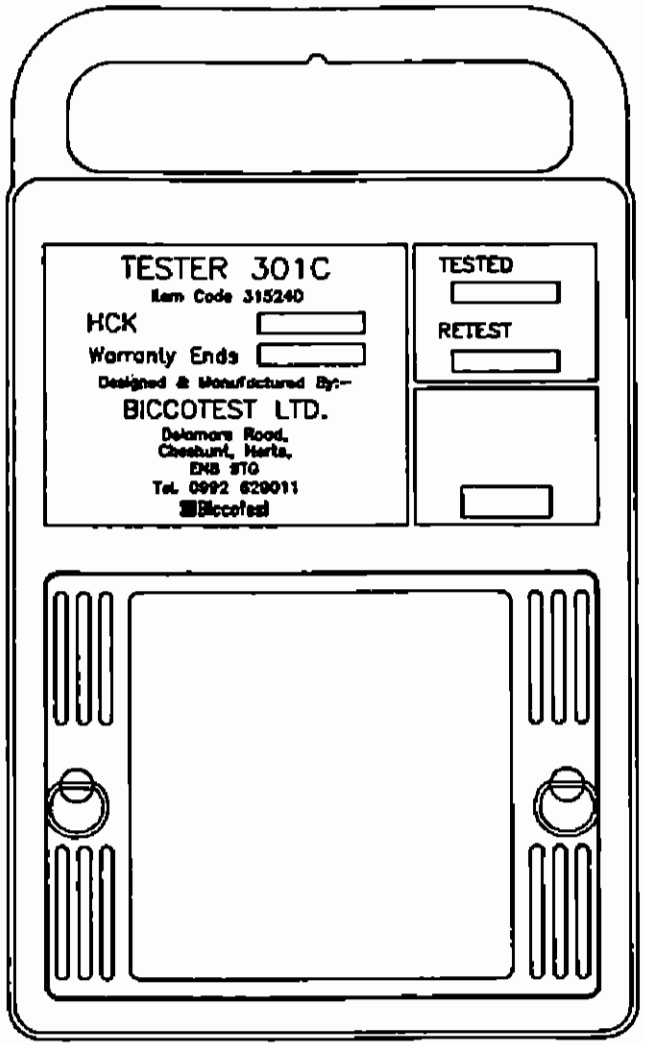


Figure 3 - Rear View

3. BATTERY

Figure 3 shows the rear view of Tester 301C.

The battery comprises 8 primary cells type LR14.

Cells are replaced by releasing the two fasteners securing the cover.

The indicated polarity must be observed when fitting new cells.

No damage will occur if a cell is fitted incorrectly.

At least 20 hours of normal operation is obtained from a set of new cells.

BATTERY REPLACEMENT

When changing batteries always check that all batteries are touching the contacts.

4. DISPLAY

Figure 4 shows the Tester 301C display.

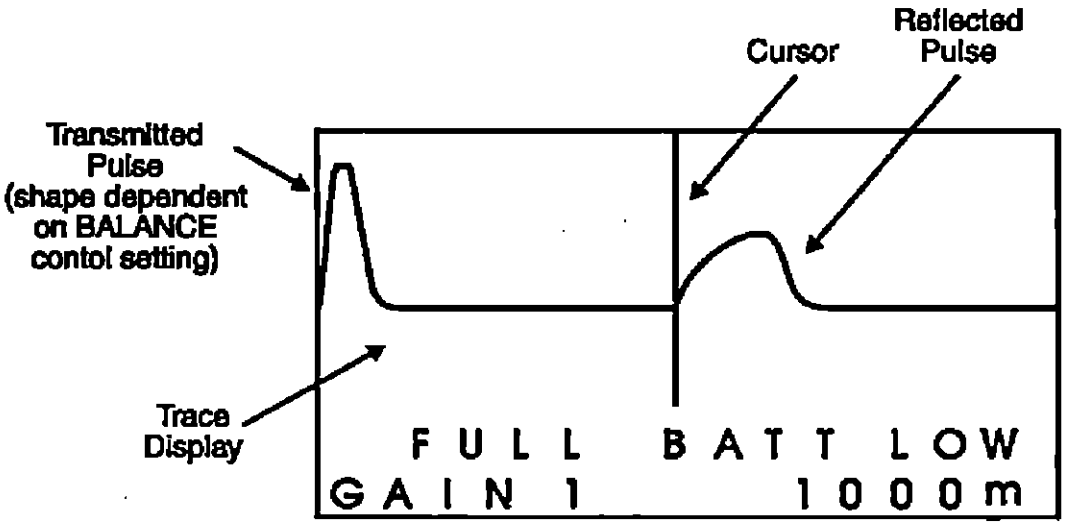


Figure 4

BATT LOW	Displayed only when approx. 2 hours operating time remains.
GAIN	Indicates the sensitivity setting from minimum (1) to maximum (7).
FULL/ EXPAND	Indicates if the full or an expanded section of the trace is being displayed.
1000m	Indicates the distance to the cursor position in the range 0000 to 4000m.

5. OPERATING INSTRUCTIONS

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

5.1

Connect the pair under test to the LINE sockets using one of the test leads provided.
(Normal operation only requires use of the LINE terminals. For information on the REF sockets see section 7).

5.2

Switch the Tester ON by depressing the ON button. The display should appear on the screen.

5.3

Adjust the CONTRAST control to obtain a bold, clear display.

5.4

Observe the trace display for evidence of a reflected pulse.

5.5

Adjust the Tester sensitivity by using the GAIN + and GAIN - controls to obtain a clearly visible reflected pulse. The BALANCE control can be used to position the trace on the screen at high GAIN settings. Note that the display takes about a second to react to any change.

5.6

Move the cursor by using the left and right, fast and slow cursor buttons and set it to the point where the reflected pulse just departs from the horizontal. See figures 5 and 6.

5.7

Depress the FULL/EXPAND button to obtain the expanded trace, which is confirmed by the word EXPAND replacing FULL on the screen.

5.8

Use the cursor right or left cursor controls to accurately set the cursor position.

5.9

The distance to fault in metres is displayed on the screen. **REMEMBER TO DEDUCT THE LENGTH OF THE TEST LEAD.** (The supplied leads are 2 m long).

5.10

If the fault is close to the near end and the reflected pulse cannot clearly be identified then refer to section 6.

5.11

Revert to FULL display by using the FULL/EXPAND control to test another pair.

TYPICAL EXPANDED DISPLAYS

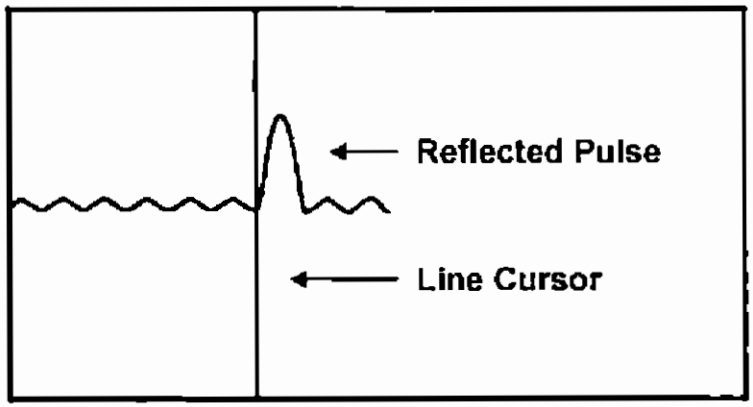


Figure 5

Disconnection (DIS) Faults
- upward reflection

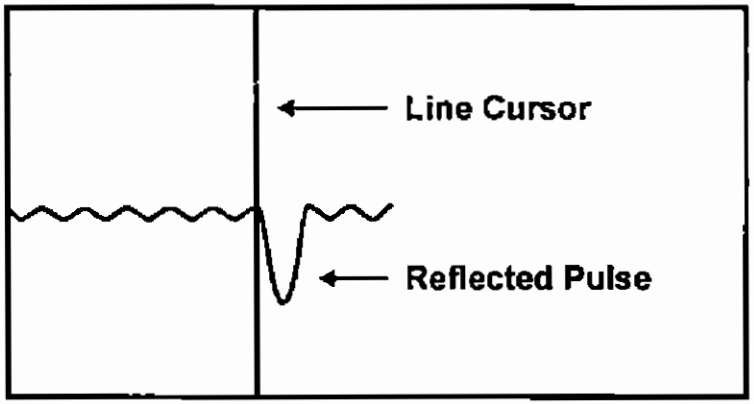


Figure 6

Short Circuit (S/C) Faults
- downward reflection

NB: The actual display obtained is dependent upon the pair under test, its length, number of joints, gain setting etc.

The displays above are for illustration purposes only.

6. NEAR END MEASUREMENTS (USING BALANCE CONTROL)

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

6.1

Refer to section 5, for initial setup (5.1, 5.2, 5.3).

6.2

Set the Tester sensitivity to 1 using the GAIN - control.

6.3

Move the cursor to the extreme left hand side of the screen.

6.4

Display the expanded trace by using the FULL/EXPAND control. The cursor will automatically position itself one third in from the left hand side of the screen (figure 7).

6.5

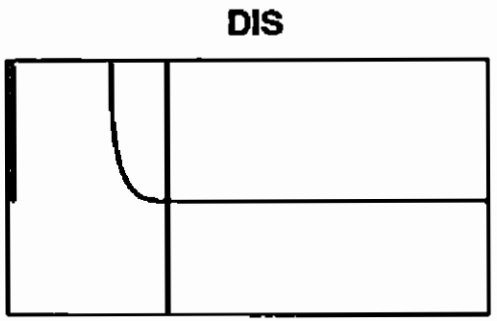
Rotate the BALANCE control very carefully, observing the display until the transmitted pulse is cancelled at the start of the trace i.e. as near horizontal as possible (figure 8).

6.6

Use the cursor right or left controls to accurately set the cursor position at the break point (figure 9).

6.7

The distance to fault in metres is displayed on the screen. **REMEMBER TO DEDUCT THE LENGTH OF THE TEST LEAD.** (The supplied leads are 2 m long).



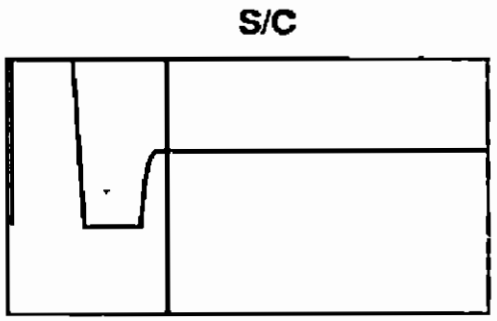
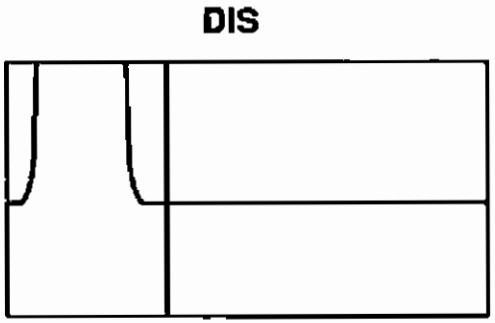


Figure 7

UNBALANCED



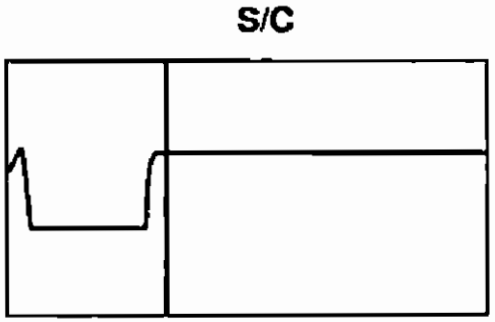
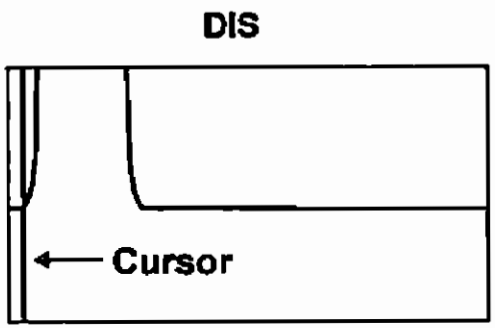


Figure 8

BALANCED



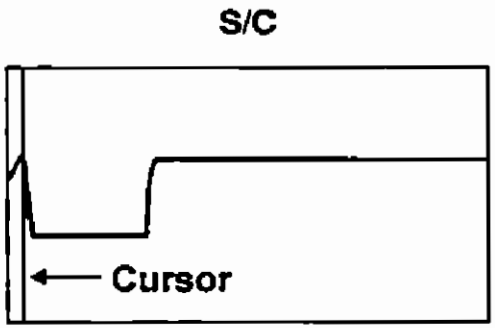


Figure 9

FAULT LOCATION

7. USE OF A REFERENCE PAIR

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

This is recommended when a second pair, ideally in the same quad, is available, when all common reflections, including the transmitted pulse cancel leaving only the fault reflection.

7.1

Refer to section 5, for initial setup (5.1, 5.2, 5.3).

7.2

Set the BALANCE control to OFF.

7.3

Connect a known good pair to the REF sockets using one of the test leads.

7.4

Connect the pair under test to the LINE sockets using one of the test leads.

7.5

Adjust the GAIN controls to display the fault reflection. If the two pairs are identical and have joints in the same places then only faults will show as significant reflections. The transmitted pulse will not be displayed.

7.6

Position the cursor as section 5 and read off the fault distance. **REMEMBER TO DEDUCT THE LENGTH OF THE TEST LEAD.** (The supplied leads are 2 m long).

7.7

Since the transmitted pulse is not displayed, this method is an alternative to the use of the BALANCE control for near end measurements, and can also be used for long distance fault finding.

7.8

If the two pairs are only identical for a limited length from where the Tester is connected then fault finding is still possible over this limited length.

8. PRACTICE USE OF THE TESTER 301C

8.1

Obtain a reel of jumper wire with both ends accessible. Connect one end to the line sockets using one of the test leads.

8.2

Switch the Tester ON and using the procedure described in section 5 determine the length. Note the upward reflection indicating a DIS.

8.3

Observe the display and short the far end of the jumper wire. Note the fault reflection is inverted.

8.4

The distance will be the same in both instances.

8.5

Using the procedure outlined in Section 6 use the BALANCE control to cancel out the transmitted pulse at the start of trace.

8.6

Using a second reel of jumper wire, of the same length, connected to the REF sockets, use the procedure outlined in Section 7, note that the transmitted pulse cancels out the start of trace. If the lengths are identical the reflected pulses from the end will cancel if they are either both open or shorted, and the reflection is doubled if one is shorted and the other open.

If the reels are of different lengths then reflections will be observed coinciding with their respective lengths.

Note: The reflections obtained from a pair connected to the REF sockets are opposite to those connected to the LINE sockets, e.g. S/C will be a positive upward reflection, and DIS will be a negative downward reflection.

9. ACCURACY AND INTERPRETATION

The accuracy of measurement is dependent upon:

1. The accuracy of the Tester itself which on the expanded screen is better than ± 1% of reading ± 1m.

2. The type of cable and its condition.

The unit is calibrated for solid polythene. There will be an error on paper core cables, jelly filled, or foam polythene or cables made up of different types, and whether water has penetrated the cable. The lay of the cable also has an effect.

The fault will usually be in the joint nearest to the location indicated by the Tester. If this proves not to be the case a second measurement from the joint itself may be necessary to obtain a more reliable location.

10. SPECIFICATION

RANGE	5 m to 4 km.		
RESOLUTION		FULL SCREEN	EXPANDED SCREEN
	Up to 1 km.	8 m	1·m
	From 1 km to 2 km.	15 m	2 m
	Above 2 km.	43 m	4 m
ACCURACY (EXPANDED SCREEN)	Better than ± 1% of reading. ± 1m.		
SENSITIVITY	0 - 36 dB in 6 dB steps (indicated as GAIN 1 to 7 on display).		
LINE AND REF CONNECTIONS	Dual 4 mm sockets capable of accepting fixed shrouded connectors.		
BATTERY	8 individual C size alkaline cells type LR14. Low battery Indication.		
OPERATING TIME	Greater than 20 hours continuous use without backlight.		