

TELEGRAPH AND DATA MESSAGE GENERATOR (TDMG)

BASIC DESCRIPTION - BR 1771(93)

1. The TDMG is the successor to the CT 473 and 5c BV3 TDMS. It provides a comprehensive selection of telegraph signals for the setting up, routine maintenance and fault location on dc telegraph equipment. It is the companion instrument of the Telegraph and Data Signal Analyser (TDSA).

CONTROLS AND FACILITIES PROVIDED

2. Test Message Switch. (Starting from extreme anti-clockwise position.)
- (1) Mark - a steady **output**, either -ve or +ve depending on the position of the Signal Polarity switch.
 - (2) 1:1
 - (3) 2:2
 - (4) 1:6
 - (5) 511 P-5 - a 511 bit pseudo random sequence.
 - (6) Ry - A 54 character sequence of alternate R and Y characters with Line Feed, Carriage Return automatically inserted before the commencement of each sequence. If distortion is applied the first Line Feed, Carriage Return remains undistorted to avoid over-printing.
 - (7) Q9S - Produces an 8 character sequence of: Letters, Space, Carriage Return, Line Feed, Q, Figure Shift, Space, 9. This sequence, together with sequences of positions (2), (3), (4) are recommended for circuit testing.
 - (8) Rep Char - produces a repetitive character by means of eight 'element' switch that can be set to MARK or SPACE.
 - (9) Blank.
 - (10) 5 Unit - Quick Brown Fox - produces a 60 character test message. If distortion is applied, the first Line Feed, Carriage Return remains undistorted to avoid over-printing.
 - (11) 8 Unit - Quick Brown Fox - produces a 116 character test message with seven element intelligence characters plus parity bit.
 - (12) Us - produces the equivalent test of alternate R and Y but with a seven intelligence element character.

ELEMENTS PER CHARACTER

3. A four position switch - set to determine the number of INTELLIGENCE ELEMENTS of the transmitted character.

STOP PULSE LENGTH

4. A four position switch - set to determine the length of the Stop Element.

SIGNAL POLARITY

5. A four position switch providing:

(1) START (A) polarity -ve MARK (Z) +ve

(2) START (A) polarity -ve MARK (Z) -ve

(3) START (A) polarity +ve MARK (Z) +ve

(4) START (A) polarity +ve MARK (Z) -ve

Position (1) being the most commonly used.

FREE RUN/SINGLE SHOT

6. The Free Run position allows the continuous transmission of the signal or signals as selected by the Test Message Switch.

The Single Shot position allows either a single character or a single 'Fox' test message to be transmitted by operating the START button when the READY (Red) lamp is lit. The lamp will extinguish during transmission and relight when transmission has ended.

A Reset button will return the 'Fox' test message to the start of the sequence whenever it is operated.

DELAY M/S

7. A variable control used to delay the start of the output transmission when used in conjunction with a Character Release Pulse (CRP). The control is set to match the delay produced between the CRP and the time the character actually starts from the electro-mechanical equipment. An external pulse must be applied to the generator to Pins 5 and 14 of the 25-way Cannon Socket located at the rear of the instrument. The pulse must be +ve going with an amplitude of more than 3 V and applied to Pin 5; the Common Line or Return being connected to Pin 14.

SPEED BITS/SEC

8. An eleven position rotary switch used in conjunction with a two position Lower Range/Upper Range switch and the Cal/Uncal switch in the Cal positions will produce output speeds of:

37.5, 45, 50, 75, 90, 100, 110, 150, 200, 220, 400, 600, 900, 1200, 1800, 2400, 3600, 4800, 7200 and 9600 bits per sec.

Alternatively by switching the Uncal (Red lamp will light) any variation of between $\pm 20\%$ of the above speeds can be obtained.

DISTORTION %

9. The output signal can be distorted by up to 49% in 1% steps by means of two rotary switches. The type of distortion being controlled by a further switch with the following functions:

- (1) Distortion off.
- (2) MARK bias.
- (3) SPACE bias.
- (4) Short START.
- (5) Long START.
- (6) Alternate MARK and SPACE bias.
- (7) Alternate short and long START.

OUTPUT

10. Output signals available:

- (1) 6/0/6 V between terminals V28 and Comm.

WARNING: IF THE 6/0/6 OUTPUT IS BEING USED, THE RELAY ON/OFF SWITCH MUST BE IN THE OFF POSITION.

- (2) A variable voltage output (Range 10 to 110 V) between terminals 10-110 V and Tel Earth. The voltage is set by means of a multi-turn dial.

- (3) An 'Open/Short Circuit' contact capable of switching voltages of up to 120 V at 100 m/a is provided between Tel Earth and a special terminal. This output can be used at bit rates up to 3600 bits/sec. This output only operates if the Single/Double current switch located at the rear top left-hand corner of the instrument is set to Double Current or to Single Current Negative. The relay contact being closed for the condition that would produce a negative output if working a high level.
- (4) Mark, Tongue and Space contacts from a relay are brought out to terminals on the front panel and may be used to switch externally applied normal telegraph signalling voltages.

The relay is driven by the normal generator output when the Relay Switch is set to ON.

Note: This relay will operate correctly up to 220 bits/sec only if the generator is mounted with its front panel vertical.

11. Appendix 1 attached describes the setting up to the TDMG to test Type 12 Teleprinters, Line Checks (High Level), Line Checks (Low Level).

TELEPRINTER AND LINE CHECKS

1. INITIAL SETTING UP OF TDMG

At Rear of TDMG

- 1.1 Set Mains Voltage Selector to correct supply voltage.
- 1.2 Set Output Signal Selector to Double Current working.

On Front of TDMG

- 1.3 Set Test Message switch to:
 - a. 5 unit (Quick Brown Fox) for ITA 2 code machines.
 - b. 8 unit (Quick Brown Fox) for ITA 5 code machines.
- 1.4 Set Elements per Character switch to:
 - a. 5 for ITA 2 code machines.
 - b. 8 for ITA 5 code machines.
- 1.5 Set Stop Pulse Length switch to:
 - a. 1½ for ITA 2 code machines.
 - b. 2 for ITA 5 code machines.
- 1.6 Set Signal Polarity switch to extreme left. (Mark -ve Start +ve).
- 1.7 Set Free Run/Single Shot switch to Free Run.
- 1.8 Set Delay Control fully anti-clockwise.
- 1.9 Set Speed Bits/Sec switch to appropriate Baud Speed and CA1 switch to Cal
- 1.10 Set Distortion switch to OFF and Distortion % controls to 0.

2. TESTING TYPE 12 TELEPRINTER IN CONJUNCTION WITH A TTU10

Reference: BR 2443 Volume 2, Appendix.

- 2.1 Connect the TDMG to TT10 as shown in the reference, using the relay contacts on the front panel of TDMG.

Top Terminal	-	Inactive (Z)
Centre Terminal	-	Tongue
Lower Terminal	-	Active (A)

- 2.2 Set Relay On/Off switch to ON.
- 2.3 Carry out tests as described in the reference.
- 2.4 Margin of Distortion/Orientation Check

Mark Bias

a. Set Distortion switch to Mark Bias and gradually increase distortion by means of the Distortion % Controls until printout is garbled. Read Off percentage distortion applied by settings on controls.

Space Bias

b. Repeat check as for Mark Bias with Distortion switch to Space Bias. Note percentage distortion applied. This should be the same as in a. above. (See Test 6 in Reference.)

Note: The TDMG front panel must be vertical when using the relay output.

3. LINE CHECKS (HIGH LEVEL)

Initial Setting Up

- 3.1 Set Test Message switch to 1:1.
- 3.2 Set Elements per Character switch to 5.
- 3.3 Set Stop Pulse Length switch to 0.
- 3.4 Set Signal Polarity switch to extreme left.
- 3.5 Set Free Run/Single Shot switch to Free Run.
- 3.6 Set Delay Control fully clockwise.
- 3.7 Set Speed Bits/Sec switch to max. Baud Speed of line to be tested, eg 50 to 100 Bauds.

- 3.8 Set Distortion switch to OFF.
- 3.9 Set Output Voltage Control to 80 V.
- 3.10 Set Relay switch to OFF.
- 3.11 Connect line to be tested across the 10-110 V and Tel Earth terminals.
- 3.12 Check the receive end of line to be tested is connected to the Telegraph and Data Signal Analyser, set up accordingly.
- 3.13 Switch Mains On/Off switch to ON.
- 3.14 Check for Synchronous Distortion on TDSA at receive end of line.

4. LINE CHECKS AND BAY CHECKS USING V28 OUTPUT (6/0/6)

- 4.1 V28 and Comm terminals provide a 6/0/6 output for checking lines requiring a low level input (eg Classified PJFs, Teleprinter Bays etc).
- 4.2 Set up TDMG as for Teleprinter Checks (Steps 1.1-1.8).
- 4.3 Ensure that the Relay On/Off switch is to OFF.

Note: Provision is made for either Telegraph Earth or Signal Common to be connected to Protective Earth by linking between terminals on the front panel.

PURPOSE

This signal analyser is used in conjunction with the Telegraph and Data Message Generator for testing telegraph and data equipment. It is the successor to CT 490 TDMS, and Telegraph Display Unit TDU.

INITIAL SETTING UP

1. Common connection and switch settings for measuring 80/0/80 or 6/0/6 V transmission at PJF.

At Rear of Instrument

- 1.1 Set Mains Voltage Selector to correct supply voltage.
- 1.2 Set 'Measurement' to Shunt. (Screwdriver control - top right-hand corner.)
- 1.3 Set 'Threshold' to 40. (Screwdriver control.)
- 1.4 Set 'W/F Display Amp' fully anti-clockwise.

On Front of Instrument

- 1.5 Input Switch to D CUR.
- 1.6 ST+ MK-/ST- MK+ set for appropriate transmission in Table on Page 2B.13.
- 1.7 Shunt Termination. THIS SWITCH MUST ALWAYS BE IN THE 100 K POSITION.
- 1.8 Horizontal Magnifier set to X1 (0%).
- 1.9 Speed Bits/Sec Controls:

Uncal/Cal	see Table on Page 2B.13.
Lower Range/Upper Range	see Table on Page 2B.13.
- 1.10 Measurement Mode: Start/Stop. Free Run. Synchronous. See Table on Page 2B.13.
- 1.11 Elements per Character (refers to intelligence elements only). See Table on Page 2B.13.
- 1.12 Display Control set to Input Waveform.

1.13 **WARNING:** RE-CHECK THAT SHUNT TERMINATION IS SET TO 100K BEFORE CONNECTING THE INPUT SIGNAL TO:

TEL EARTH COMM AND INPUT FOR 80/0/80
TEL EARTH COMM AND V28 for 6/0/6

1.14 Switch Mains On/Off to ON and adjust CRT controls Brill, Focus, Astig, X Shift and Y Shift to provide a sharp, clearly defined signal waveform.

2. BAUD SPEED CHECKING

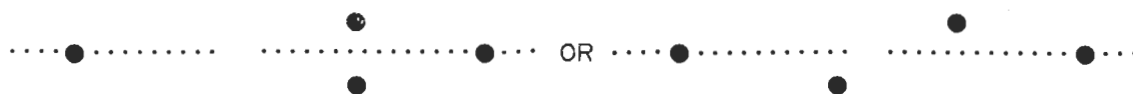
2.1 Switch Display Control to Separate Element Dist N.

2.2 Switch Measurement Mode to Free Run.

2.3 For standard speeds, ie 50, 75, 100 Bauds etc set Osc Selection switch to Cal. For other baud speeds switch to Uncal.

2.4 Set the Rotary Speed switch to the appropriate speed with the Lower - Upper Range switch in the required position.

2.5 If the speed is correct, bright dots will appear horizontally stationary above and below the calibrated trace:



2.6 If the speed is incorrect (dots are not stationary), switch to Uncal (Red lamp will light). Rotate the Percentage Control (20%) until the signal is stationary on the trace. The speed can then be calculated by adding or subtracting the % to the Rotary Speed switch setting.

Example: For a 96 Baud signal, set Speed Bits/Sec switch to 100 and adjust % control to -4, ie 100 minus 4% \pm 96.

Caution: It is possible to get the signal stationary with the Speed/Bits switch set to a harmonic of the signal, ie set to 50 Bauds for an input of 100 Bauds.

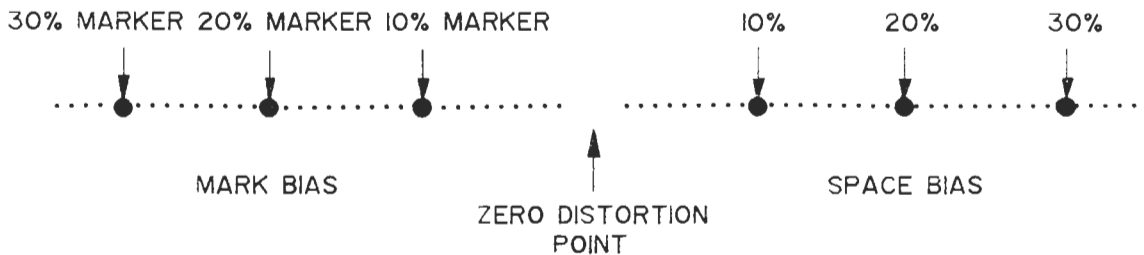
3. DISTORTION CHECKS

Start/Stop Transmissions

Having connected the equipment as in Paragraphs 1.1 to 1.4, and carried out the speed setting as in Paragraphs 2.1 to 2.6:

3.1 Switch Measurement Mode switch to Start/Stop.

Horizontal traces will now be displayed - one more than the setting on the Elements per Character switch. Adjust 'Y Shift' as necessary. Each trace will consist of a line or marker dots representing 1% divisions with every 10th dot brightened. The zero distortion point being identified by the absence of a dot in the trace centre.



Maximum distortion capable of being displayed is 49% early and 49% late. Trace 1 (top trace) displays the time of the transition from Start Space to the 1st Intelligence Element.

If the transition is from -ve to +ve, this will be displayed as a bright dot above the trace.



If the transition is from +ve to -ve, then the bright dot will be displayed below the trace.



If the polarity of the Start Space and the 1st Intelligence Element are the same, then no bright dot above or below the trace will be shown. Trace 2 displays the transition occurring at the start of Intelligence Element No. 2.

Trace 3 displays the start of Intelligence Element No. 3.

Trace 4 displays the start of Intelligence Element No. 4.

Trace 5 displays the start of Intelligence Element No. 5.

Trace 6 displays the start of the Stop Mark.

This is assuming that the character has five intelligence elements.

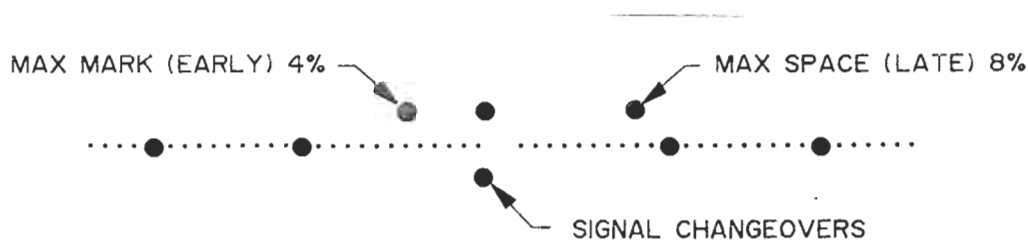
The amount of distortion present either early or late for any one element or elements can be read directly from the trace as a percentage.

3.2 If the distortion is intermittent and/or a Peak Distortion reading is required then:

Switch to Hold Peak Dist N and press the Reset button.

A single trace is now displayed, the signal changeovers being shown collectively as flashing dots and the maximum distortion that has occurred as a stationary bright dot. This is a continuous process, the maximum distortion being updated all the time.

Pressing the RESET button cancels the reading and starts the distortion count again.



Synchronous Transmissions

Connect the equipment as in Paragraphs 1.1 to 1.14 and carry out the speed setting as in Paragraphs 2.1 to 2.6.

3.3 Switch Measurement Mode switch to Synchronous.

The red 'In Sync' lamp will light and the signal changeovers will 'lock' into a position on the trace indicating the distortion.

Note: A single trace only with collective distortion is displayed in the Sync mode.

By switching to Hold Peak Dist N and operating the Reset button, the maximum distortion will be displayed as described in Paragraph 3.2

5. 'A' SCAN

The presence of tone can be detected by connecting the equipment as indicated in Paragraphs 1.1 to 1.14 with the input signal connected as for 6/0/6.

CIRCUIT	MEASUREMENT MODE START/STOP OR SYNC	SPEED UNCAL/CAL LOWER/UPPER	ELEMENTS PER CHARACTER	START POLARITY
BID 610	START/STOP	50 CAL LOWER	5	ST+ MK-
BID 610/700	START/STOP	50 CAL LOWER	5	ST+ MK-
EDC/BID 620	SYNC	96 UNCAL LOWER	ANY POSITION	ST+ MK-
BID 920	SYNC	75 CAL LOWER	ANY POSITION	ST+ MK-