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SAFETY

1. **TESTEL 200E** is designed for use by a competent telecom professionals.
2. Please read this manual thoroughly before using the instrument.
3. **Under no circumstances** must the **TESTEL 200E** be connected to the Public Switched Telephone Network or any PABX extension ports. The simulator is designed to look like an exchange, and as such, only telecommunications apparatus designed to connect to telephone lines, must be connected to it.
4. When using the **TESTEL 200E** to test the performance of unapproved telecommunication apparatus, due consideration must be paid to any hazard involved.
5. The Master and Extension sockets have high voltages present during Ringing and Pulse dialling. Although this is not hazardous, it can be painful.
6. The unit is designed to be powered from a 240V, 50Hz source and the mains plug fitted with a 3A fuse. For alternative mains sources please contact supplier.
7. If battery operation is required, then either charge overnight, or over a weekend. **Do not leave on charge over long periods.**
8. The mains switch at the IEC Socket needs to be in the Off position to isolate the instrument from the mains. The "POWER" switch at the front of the Simulator, does not isolate the instrument from the mains.
9. There are no user serviceable parts in this instrument. Under no circumstances should the user attempt to open the unit whilst powered, as dangerous voltages exist.
10. Should the Instrument require service, repair or calibration, please return it to a recognised dealer or to the address below:

Tele-Products Limited
Unit 1D Northminster Business Park
Northfield Lane Upper Poppleton
York YO26 6QU
Tel: 01904 794200

The product should be returned post paid. The owner will be advised of any costs prior to work commencing.

INTRODUCTION

Tele-Products designed **TESTEL 200E** to help in the testing of a wide range of telecommunications apparatus. The features make it an invaluable tool in design laboratories, service centres, small-scale production facilities and during installation or maintenance in the field.

The **TESTEL 200E** provides an accurate simulation of telephone lines. For example, the feed voltage applied to the unit under test is 48V, through a feed coil. The ring voltage is 80V, 25Hz near sinusoid signal with DC backing, ensuring that telecommunications apparatus which works on the **TESTEL 200E**, are sure to work on real telephone lines.

The Simulator has many useful features such as, the comprehensive range of test signals, (the user configurability of these), and the portability provided by the rechargeable batteries, (**TESTEL 200EB**).

APPLICATION

The **TESTEL 200E** can be used to test the following features on telecommunications apparatus.

- Pulse and tone dialling (P/T)
- Earth/timed break recall (R)
- Response to ringing (R)
- Response to meter pulses (M/P)
- Tone and/or speech levels (T/S)
- Response to pay tone etc., (or to single frequency tones) (TT)
- Response to polarity reversal of the battery feed (PR)
- Response to line current breaks (LB)
- Sensitivity of end to end attenuation (E-E)

The timing and level, (where appropriate), of signals can be varied to test for any marginality in the unit under test, i.e. operation under the worst conditions. The following matrix indicates how the features provided relate to the functional testing of various telecommunications apparatus.

	P/T	R	T/S	PR	E-E	M/P	T/T	L/B
Simple Phone	*	*	*	*				*
Handsfree Phone	*	*	*	*	*			*
Answering Machines		*	*	*	*		*	*
MF Tonepad	*		*		*			
Auto Dialler	*			*			*	*
Modem / Fax	*	*		*	*		*	*
PBX	*	*		*	*	*	*	*
Fax Switch		*	*	*	*		*	*
Payphone	*					*		

This is an indication of the usefulness of the **TESTEL 200E** in testing a wide range of apparatus. It is by no means an exhaustive list of equipment that can be tested.

OPERATION

1. SUPPLY

The unit is designed to be powered from the mains, (240V/50Hz), or from the internal battery, (sealed lead acid), where this option is fitted. If mains power is available, then using the IEC lead supplied, connect it to the IEC socket at the rear of the unit, and switch on and the "BATTERY ON CHARGE" led will come on. Use the "POWER" switch at the front of the unit to turn the equipment on. The "BATTERY ON CHARGE" led goes off and the "EQUIPMENT ON" led is lit. (The battery is only charged when mains is present, and the "POWER" switch is off.)

If no mains is present, then when the Power switch is on, the unit operates off the battery. A "LOW BATTERY INDICATOR" is also provided. If battery operation is required, it is advisable to charge the battery overnight. When operating off battery power, choosing the "LO CURRENT" setting for the Master socket whenever possible, will greatly extend the battery life.

2. MASTER SOCKET

When the unit plugged into the Master Socket (referred to as Master) seizes the line, the "LINE LOOPED" led comes on. If ringing was present, this is ceased. The ring trip operates during the quiet periods of the cadence. There is no ring trip when the continuous ring option is chosen. The polarity and current applied to the Master is dependent on the relevant switch positions. If there is any speech or tone on the line, its level is displayed on the bar graph.

When positive polarity is selected A is positive with respect to B. This is reversed when the negative polarity is selected. The S terminal is connected to the B terminal through a 1.8 μ F capacitor. The E terminal is used for applying longitudinal 50Hz metering pulses or for detecting the earth recall signal.

The pin configuration on the socket is representative of a standard phone socket on the wall and is as follows:

A	\Rightarrow	Pin 2
B	\Rightarrow	Pin 5
E	\Rightarrow	Pin 3
S	\Rightarrow	Pin 4

3. DIAL TONE

A single frequency dial tone is provided on first seizing of the line. This persists until the first dialled digit is detected. The frequency of this dial tone is dependant on the setting of the test signal switch. On the Pay, Engaged or Park tone positions, the frequency is 400Hz. In the User position, the frequency can be selected by operating the user control at the back of the unit. In the other positions the frequency is undefined.

4. RINGING

The cadence and level of the ringing can be selected by the user. A PSTN or PBX type cadence can be selected. Alternatively, the ringing can be applied continuously. The level can be set to High or Low or to a user pre-selected one. This is done by adjusting a Multi-turn pot at the rear of the unit, till the required level is obtained. Once selected, the ringing can be applied to the Master by operating the Start button.

The ringing is terminated, either by the Master seizing the line or by operating the Stop button. The same ringing cadence and level is applied to the extension when the Master dials "159". In this case, the ringing stops either when the extension seizes the line or when the Master goes "ON HOOK". No ring trip is provided on continuous ring option.

5. DIALLING

The digits dialled by the unit under test are shown on the 8 digit LCD. The digits can be LD, MF or both, the MF digits are shown with a dot underneath to differentiate them from the LD digits. The timing limit on the Make and Break of LD dialling are set carefully, to detect any problem that may exist. The level of MF tones are displayed on the Bar Graph.

A timed break recall signal is either displayed as a LD digit 1 or R, depending on its timing. If the break time is less than 80mS then a LD digit 1 is displayed. If break is greater than 80mS then an R is displayed. This way, the time limits for LD break are not compromised. An Earth Recall is shown as an E on the LCD display.

6. TEST SIGNALS

6.1. TIMING

The Timing section controls all the test signals. This is useful for evaluating apparatus under the worst case conditions. A number of timing options are available on the front panel. If one of the following is chosen, 50, 100, 250 or 500mS, then the appropriate test signal is pulsed for this time, when the start button is pressed. If the Continuous option is chosen, then the test signal is on, until the stop button is pressed. A user selectable timing option is also available, this is obtained by selecting User on the timing control knob, and adjusting the Multi-turn pot at the rear of the unit, gives the required timing.

6.2. METER PULSES

Three different types of Meter pulses are provided. The 50Hz longitudinal signal is for testing apparatus that is designed for the UK. The level of this signal is controlled by a Multi-turn pot at the rear of the unit.

The 12kHz and the 16kHz are both transverse pulses, and are used in other countries, therefore enabling equipment meant for export to be tested. The level of these are set to -4dBm, this can be reduced by using the attenuator switch, to -14 or -34dBm. Select required pulse, the level and timing, and operate by using the start button.

6.3. PAY ENGAGED AND PATH ENGAGED TONES

These are all 400Hz tones, cadenced at the appropriate rate. Their level is set for -6dBm at the Master socket interface. This can be reduced to -16 or -36dBm by the attenuator switch. Select required tone, timing and level, then operate the start button.

6.4. USER TONE

The frequency of this tone is selected by the user, using a Multi-turn pot at the rear of the unit. The level of this is set for -6dBm at the Master socket interface. This can be reduced to -16 or -36dBm by the attenuator switch. Select required tone, timing and level, then operate the start button.

6.5. LINE BREAK

This signal is used to break the line current to the Master socket for a specified time period. Select the required time and then operate by pressing the start button.

7. BAR GRAPH DISPLAY

This displays the level of signals (tone or speech) at the Master socket interface. For signals generated by the **TESTEL 200E** or the extension the bar graph display will be affected by the attenuator switch position. i.e. it will give the true level at the Master. For signals generated by the Master (e.g. speech/tones), the level displayed is not affected by the attenuator. However, the level presented to the **TESTEL 200E** or to the extension is affected by the attenuator.

8. ATTENUATOR

This is used to attenuate signals from and to the Master. When the Extension is "on-hook" then the level of test tones applied to the Master is controlled by the Attenuator. Also MF signal originating from the Master are controlled by the attenuator before being detected. When the Extension is Off-hook, signals between it and the Master are affected by the attenuator position.

9. EXTENSION SOCKET

The Extension can be rung from the Master by dialling 159 (LD, MF or mixed). The parameters of the ringing applied are as set on the ring control section. The ringing stops either when the extension comes off-hook or the Master goes on-hook.

The attenuation to speech or signals between the Master and Extension is controlled by the attenuator switch. This can be set to 0, 10 or 30dB of attenuation. Whenever the Extension seizes the line, a speech path is set up between it and the Master.

ADDITIONAL FEATURES

1. DISPLAY OF MORE THAN EIGHT DIGITS

When more than eight digits are dialled and there is a pause of more than five seconds, the display starts to scroll all the digits dialled. A maximum of 64 digits can be detected and displayed.

When the unit under test (U.U.T.) is on line, the display scrolling can be frozen by pressing the Ring "START" button. In the frozen mode the display flashes. The freeze can be terminated by the operation of the Ring "START" button or by dialling a digit. (Note: The display freeze only works in the on line mode, as in the Off-line mode, the Ring "START" button is used to turn the signal on.) The scrolling of the display continues in the Off- line mode.

2. EARTH RECALL DISPLAYED ON THE LCD

On newer telephones Earth Recall is a storable digit. Thus it is useful for it to be displayed as part of the number string on the LCD display. The **TESTEL 200E** provides this feature; a symbol "E" is used for this.

3. PULSE DIAL TIMINGS

Pulse dial Make/Break/IDP timings can be brought up on the display by dialling 200 after seizing the line. The displayed Make/Break timings are based on the last digit dialled and the IDP based on the last two digits dialled. Further digits (Pulse or Tone) can be timed by dialling these after 200. The display will automatically update to show the Make/Break timings of the last digit dialled, and the IDP between the last two digits.

ACCURACY IS \pm 2mS, WITH CURRENT SET TO HIGH.

4. TONE DIAL TIMINGS

Tone dialling on/off times can be displayed by entering 200 after seizing the line. On timings are based on the last digit dialled, whilst off timings are based on pause between last two digits dialled. Further digits (Pulse or Tone) can be timed by entering these after dialling 200.

ACCURACY IS \pm 2mS.

5. RING BACK TONE

When the extension is rang by keying in 159, Ring Back tone, at the selected cadence, is fed back to the unit plugged into the Master socket.

6. TWO-WAY DIALLING

The **TESTEL 200E** allows the unit plugged into the Master socket to dial up the unit plugged into the extension socket: this is done by dialling 159. **TESTEL 200E** additionally allows the unit plugged into the Extension socket to dial the unit plugged into the Master socket; as before dial 159.

7. PULSE DIAL TIMING CHECK

During pulse dialling, if the following timing errors are detected, an error message is flashed on the display.

MAKE TIMINGS:	Limits 33.3mS + 30%	
	Low timing gives an error	"MKE<23mS"
	High timing gives an error	"MKE>43mS"
BREAK TIMINGS:	Limits 66.6mS + 30%	
	Low timing gives an error	"MKE<46mS"
	High timing gives an error	"MKE>86mS"

(Transients of less than 5mS duration ignored).

The error message will time out after five seconds. However if a valid digit is detected or another error message is to be displayed, the error message will be overwritten.

8. DIAL UP SUPERVISORY TONES

Various supervisory tones can be dialled up by keying in specific codes from the unit plugged into the master socket. These are given below:

300	⇒	RING BACK TONE.
301	⇒	PAY TONE.
302	⇒	ENGAGED TONE.
303	⇒	PATH ENGAGED (PARK) TONE.
304	⇒	NUMBER UNOBTAINABLE.

NOTE 1: The frequency for all the above tones is set to 400Hz, when test signal switch is set to Pay Engaged or Park tone.

NOTE 2: In addition to the above, a couple of self-test features are provided.

100	⇒	GIVES ISSUE OF SOFTWARE.
999	⇒	TESTS LCD

9. EARTH LOOP START FEATURE

Select "BREAK" on the Test Signal switch and "CONTINUOUS" on the Timing switch. Pressing the "START" button, will initiate a break on the A or B leg, dependant on the polarity switch. When an earth recall signal is detected for the UUT, the **TESTEL 200E** will present a full loop voltage.

TEST EXAMPLES

1. FUNCTIONAL TEST OF TELEPHONES

Check ringer by plugging the phone into the Master Socket and push start button. Answer by coming Off-hook. Check receiver by listening to dial tone. Check Pulse and Tone dialling on display. Check microphone by speaking and observing on Bar Graph.

2. HANDSFREE TELEPHONES

Connect handsfree telephone to the Master socket, and the ordinary telephone to the Extension socket, through a 10m lead to another room. Check handsfree switching performance over 0, 10 and 30 dB attenuation and at low and high currents.

3. AUTO-ANSWER APPARATUS

Connect machine to Master socket and set to answer. Check that the specified low ringing signal (user selected) can still be detected.

4. AUTO DIALLER

Program the dialler to 300, 302 and 303 and ensure it performs correctly in the presence of these tones.

5. TIMING THE RECALL PERIOD

Set the U.U.T. to dial 200 followed by a TBR. The 200 sets the **TESTEL 200E** to start and display timings. When the TBR is detected, it's timing is displayed as if it were a digit 1 in pulse dialling. i.e. the break timing displayed is the timing for the TBR.

6. TIMING THE PAUSE PERIOD

Set the U.U.T. to dial 200 followed by pause and digit 1. When this is detected by the **TESTEL 200E**, the pause period will be displayed as an IDP. i.e. the period between the second 0 and the 1.

7. ANSWERING MACHINE: REMOTE INTERROGATION

Connect the answering machine to the extension socket. Place the telephone in the master socket, dial 159 and wait for answer. Use MF keys on the telephone, or MF tonepad, to control the answering machine in remote interrogation mode. Check that this works satisfactorily at 0, 10 and 30dB attenuation.

8. ANSWERING MACHINE: CLEARDOWN TEST

Connect the answering machine to the Master socket, and set to answer mode. Apply ringing, and on invitation to record a message, check that the machine clears down when Engaged or Path Engaged tone is applied. (Please note some machines clear down in other ways).

9. ANSWERING MACHINE: OUTGOING MESSAGE DELAY

Connect the answering machine to the master socket. Apply ringing, and when the answering machine answers, apply paytone for 10S. Check that the outgoing message is delayed until paytone stops.

10. PBX - GUARDED CLEARING

Set up a call on a PBX with the trunk line connected to **TESTEL 200E** . When the call clears, check that the PBX will not initiate another call on that line, until a line break signal is generated.

11. FAX MACHINE TEST

Operation of fax machines over a suitable dynamic range can be tested. Program one machine to dial 159, and connect to master. Connect the other to extension socket. Check the quality of transmission with the attenuation switch at 30dB.

12. PAYPHONES/CALL LOGGING EQUIPMENT

Connect the apparatus to the master socket, After dialling ceases, check that the meter pulses applied are recorded correctly. Check at the worst case specified values for level and timing.

13. "MERCURY BUTTON" TELEPHONES

Set user frequency to approximately 1111kHz. Set the timing to approximately 2S, set the U.U.T. to dial via the Mercury Network, then initiate a call. After the unit dials 131, initiate the Mercury Network tone. After the unit has finished dialling, check that all the digits dialled are correct, whilst the display scrolls.

14. TELEMETRY APPARATUS

Connect the modem to the master socket and the telemetry apparatus to the extension socket. The two way dialling allows the modem to dial up the telemetry equipment for programming purposes, and the latter to ring the modem up for reporting an alarm.

SPECIFICATION

FEED CONDITIONS	DC Voltage:	48V \pm 5% (Under Load)
MASTER SOCKET	Bridge:	Nominal 2 x 0.6H Inductance 2 x 200 Ω Coil Resistance
	DC Resistance:	180 Ω \pm 10% (Equal to 1km Line) 1.38K Ω (Equal to 7.5km Line)
EXTENSION SOCKET	Voltage:	48V \pm 5%
	S/C Current:	40mA \pm 1%
RINGING	Voltage:	80V \pm 10% RMS (O/C) 40V \pm 10% RMS (3K Load)
	Type:	AC, (Near Sinusoid), DC Backed
	User Level:	Adjustable from 0V to 95V RMS
	Frequency:	25Hz \pm 20%
TEST SIGNALS	Pay Tone:	400Hz (125mS on, 125mS off)
	Eng Tone:	400Hz (375mS on, 375mS off)
	Path Eng Tone:	400Hz (400mS on, 350mS off 225mS on, 525mS off)
	User Tone:	Adjustable from 250-2500Hz
	Timings:	50, 100, 250, 500mS and Cont
	User Timings:	Adjustable from 0mS to 10S
	Level:	-6, -16, -36dBm, 600 Ω
METERING PULSES	50Hz:	Longitudinal 50Hz \pm 10% Level adjustable, 0 to 40V RMS
	12KHz:	Transverse 12KHz Level -4, -14 or -34dBm
	16KHz:	Transverse 16KHz Level -4, -14 or -34dBm
PULSE DIALLING	Make:	25 - 41mS
	Break:	50 - 82mS
	IDP:	>200mS
	On-Hook:	>300mS
	Off-Hook:	>200mS
	TBR:	50 - 110mS
DTMF DIALLING	Time:	>40mS
	Frequency:	\pm 15%
BAR GRAPH DISPLAY	Reference:	Top LED Set to -1 \pm 1dBm
	Range:	3 \pm 1dBm Per LED

POWER

Mains: 240V, 50Hz, 40W
Battery: 1.2Ah Sealed Lead Acid.
(Where fitted). Typically 3 hours operation

TOLERANCE

Unless otherwise specified Frequency: $\pm 5\%$.
Timing: $\pm 10\%$.
Level: $\pm 3\text{dBm}$.