CONTENTS

1 General Information

1.1 ⚠ Safety Instructions

Wherever you see this sign ⚠ you will find information on potential hazards. Please read these sections with particular care!

⚠ **Warning!** Before opening the TG 100 disconnect the mains plug!

⚠ **Attention!** Our instrument fuses are dimensioned in such a way that optimal protection is guaranteed for the instrument and the user. In industrial power supplies, which are extremely strongly loaded, the instrument fuses could respond sporadically due to high voltage peaks.
If the fuse has to be changed, use only G fuse-link 5 × 20 according to IEC 127 (see 4.1)!

1.2 ⚠ Switching the Operating Voltage 230 V~/115 V~

Your TG 100 left the factory to 230 V~. Switching to 115 V~ requires the TG 100 to be opened, which should only be done by trained personnel.

Setting the Operating Voltage 115 V~

1. Disconnect the TG 100 from the mains.
2. Remove upper caps and loosen the screws below.
3. Identify the mains voltage switch with the following illustration.
4. Switch the voltage mains voltage switch (slide switch) located under the power switch to the indication “120”.
5. Remove safety cover at the mains plug and replace the fuse with the fuse for 115 V supplied with the instrument.
6. Fasten upper caps and put the sticker supplied with the instrument for marking the switch-over to 115 V on to the type label.

Mains Voltage Switch

115 V Position

230 V Position

1.3 Mains Connection

The design of the unit meets the requirements of safety class I according to EN 61010-1, i.e. all metal parts accessible from outside and exposed to contact are connected with the protective conductor of the supply network.
Power is supplied via a mains cable with earthing contact.

1.4 Installing the TG 100

The TG 100 should not be operated close to equipment that develops heat.

1.5 Switching on

The TG 100 is switched on using the power switch at the front. The power switch separates the TG 100 completely from the primary side of the transformer.
The LED *I/O* serves as a status indicator.

1.6 EMC

The TG 100 is interference-free according to the EN 50081-1 and EN 50081-2. In order to fulfil the limiting values in line with present standards, it is absolutely essential that only cables which are in perfect condition be connected to the unit. The following information applies here:

- Metallic or metallized socket cases must be used for the serial interface RS-232C. The socket cases and the braided screen of the cables must be connected at the shortest distance possible. The signal earth must not be connected to the braided screen.
- After opening and closing the TG 100 check that all the fixing elements and contact springs are installed as before and that all the screws have been tightened.

1.7 Inspection and Maintenance

If service is needed, due attention should be paid to the regulations according to VDE 0701. The TG 100 should only be repaired by trained personnel.

1.8 Warranty

DIGIMESS guarantees the perfect working order of the TG 100 for 12 months as from delivery.
There is no warranty for faults arising from improper operation or from changes made to the unit or from inappropriate application.
If a fault occurs please contact or send your TG 100 to:

The TG 100 should be sent in appropriate packing - if possible in the original packing. Please enclose a detailed fault report (functions working incorrectly, deviating specifications and so on) including unit type and series number.
Kindly verify warranty cases by enclosing your supply delivery note. Any repairs carried out without reference to a valid warranty will initially be at the owner's expense.
Should the warranty have expired, we will, of course, be glad to repair your TG 100 as per our General Terms Of Assembly And Service.

1.9 Accessories Supplied

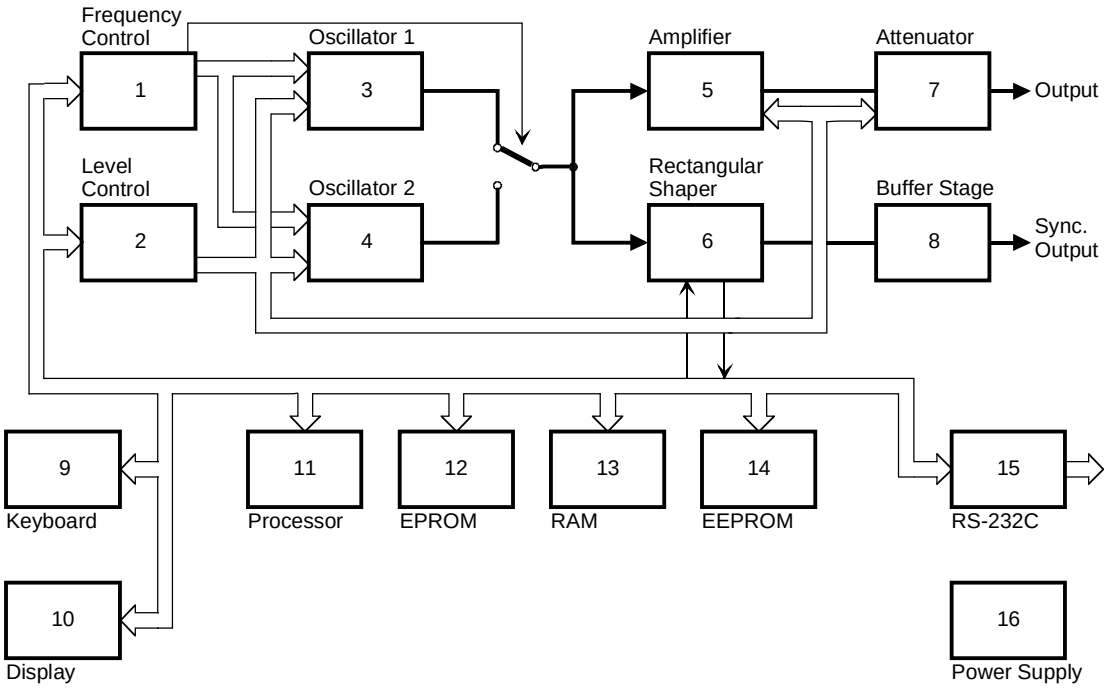
1	mains cable	
1	fine-wire fuse	T 63 L/250 V (230 V)
2	fine-wire fuses	T 125 L/250 V (115 V)
1	operating instructions	
1	label for indicating the switch-over to 115 V	

2 Application

- The precision tone generator TG 100, controlled by a microprocessor, is a compact, high value signal source in the frequency range of 1 Hz to 1 MHz. The TG 100 supplies a sinusoidal alternating voltage with a very small harmonic distortion.
- Furthermore, a rectangular signal (synchronisation signal) with a CMOS/TTL level can be picked off in the frequency range of 1 Hz to 1 MHz.
- All functions and measuring ranges can be set via menus by means of four keys and an incremental rotary switch. The chosen parameters of the output signal are clearly depicted on a two-line alphanumeric LCD matrix display.
- The TG 100 is equipped, as standard, with the serial interface RS-232C for communication with a PC. All functions and parameters can be set and set values and states of the TG 100 can be transmitted.

3 Configuration and Functional Description

3.1 Block Diagram



(1) Frequency control circuit
(2) Level control circuit
(3) Oscillator stage 1 (1 Hz ≤ f ≤ 99.99 kHz)
(4) Oscillator stage 2 (100 kHz ≤ f ≤ 1 MHz)
(5) Amplifier of oscillator signal
(6) Rectangular shaper - sinusoidal/rectangular signal converter
(7) Output attenuator from 0 to 70 dB
(8) Buffer stage of output signal and CMOS/TTL converter
(9) Keyboard
(10) Display
(11) Microprocessor
(12) Program memory EPROM
(13) Data memory RAM
(14) Memory EEPROM for calibrated data
(15) Interface RS-232C
(16) Power supply

3.2 Description

The instrument's internal operational procedures are controlled by the one-chip microprocessor MCS-51 (11) with support from additional switching circuits e. g. program memory EPROM (12), data memory RAM (13) and back-up memory EEPROM (14) for the calibrated data.
User communication is controlled via the keyboard with the incremental rotary switch (9) and via the display field (10).
The microprocessor controls communication with a PC via the serial interface RS-232C (15) at the same time.
After selecting the parameters, the microprocessor (11) carries out the instrument's configuration and hardware setting. First, oscillator stage 1 (3) (for frequencies of 1 Hz to 99.99 kHz) or oscillator stage 2 (4) (for frequencies of 100 kHz to 1 MHz) is switched through according to the entered frequency. The corresponding frequency range is then set and the parameters for the fine tuning of the required frequency are calculated.
The oscillator signal is fed to a rectangular shaper (6). The rectangular shaper is led to the synchronisation output via the buffer stage (8) with CMOS logic level. In addition, the rectangular signal is fed back to the microprocessor unit, where the period of the generated signal is measured. According to the measured standard deviation, the microprocessor (11) adjusts the required frequency value via the frequency control circuit (1).
The sinusoidal signal is fed, via the output attenuator, to the amplifier (5) with very small harmonic distortion. The amplification of the amplifier (5), and the damping of the output attenuator are set via the level control circuit (2) of the microprocessor according to the required level of the output signal. The signal from the attenuator (7) is then fed to the output socket of the instrument.

The TG 100 can be operated with four keys and an incremental rotary switch on the front of the instrument. The main functions of the TG 100 "FREQ", "LEVEL", "MENU" and "ENTER/LOC" are selected using the function keys F1 to F4. In other menu levels, keys F1 to F4 have different meanings. The incremental rotary switch is used to change parameters which have to be set.

4 Technical Data

4.1 General Data

Nominal temperature:	+ 23 °C ± 1 °C
Operating temperature:	+ 5 ... + 40 °C
Relative humidity:	20 ... 80 %
Atmospheric pressure:	70 ... 106 kPa
Operating position:	horizontal or inclined by ± 15 °
Operating voltage:	sinusoidal alternating voltage
	115/230 V (+ 10 %/– 15 %), internal switchable
	47 ... 60 Hz (± 5 %)
Power consumption:	max. 15 VA (max. 15 W)
Fuses:	T 63 L/250 V (230 V~)
	T 125 L/250 V (115 V~)
Safety class:	1, according to EN 61010 Part 1
Radio interference suppression:	EN 55011 Class B
Dimensions (L × H × D):	225 mm × 85 mm × 200 mm
Dimensions of packing:	315 mm × 115 mm × 270 mm
Weight of	
TG 100:	approx. 1.9 kg
incl. packing and accessories:	approx. 2.9 kg

4.2 Specification

Frequency range:	1 Hz ... 1 MHz
Frequency setting:	4 places
Accuracy of frequency setting	
(at nominal temperature):	± 0.5 %
	± 0.05 % after auto calibration
Duration for auto calibration of frequency:	approx. 100 ms for f > 100 Hz
	approx. 0.1 ... 15 s for f < 100 Hz
Temperature coefficient of frequency:	$< \pm 5 \cdot 10^{-4}$/K
Time coefficient of frequency:	$< \pm 1 \cdot 10^{-3}$/5 min after 30 min
Output signal:	sinusoidal signal
	rectangular signal (switchable)
Break-in period:	30 min

4.2.1 Sinusoidal Signal Output

Harmonic distortion of output signal:	≤ 0.02 % for 10 Hz ≤ f ≤ 10 kHz
	≤ 0.05 % for 10 kHz ≤ f ≤ 50 kHz
	< 0.5 % for 50 kHz ≤ f ≤ 100 kHz
	< 1 % for 100 kHz ≤ f ≤ 200 kHz
	< 3 % for 200 kHz ≤ f ≤ 1 MHz
Output impedance:	600 Ω ± 1.5 %, unsymmetric
Output voltage:	3.16 V/600 Ω

Accuracy of output voltage at 1 kHz:	± 0.5 dB
Temperature coefficient of output voltage:	$\pm 5 \cdot 10^{-3}$/K
Change of output voltage in response to frequency:	± 0.5 dB for 20 Hz ≤ f ≤ 20 kHz ± 1.0 dB for 1 Hz ≤ f ≤ 1 MHz
Output voltage divider:	0 ... – 70 dB in 0.1 dB steps
Accuracy of division:	± 0.7 dB

4.2.2 Rectangular Signal Output

Output impedance:	approx. 50 Ω
Output voltage U_{PP}:	5 V ± 10 % in the idling
Maximum output current:	10 mA
Pulse duty factor:	approx. 1:1

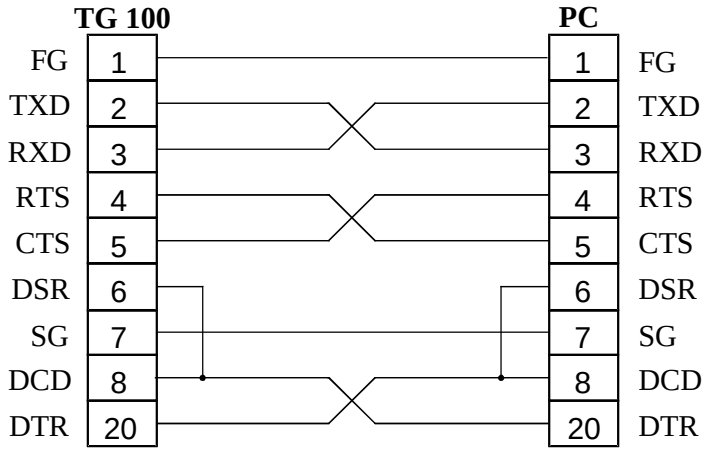
4.3 Display

The TG 100 is equipped with a 16-digit alphanumerical LC matrix display with lighting. It indicates setting parameters of the output signals or the functions by menu and system messages.

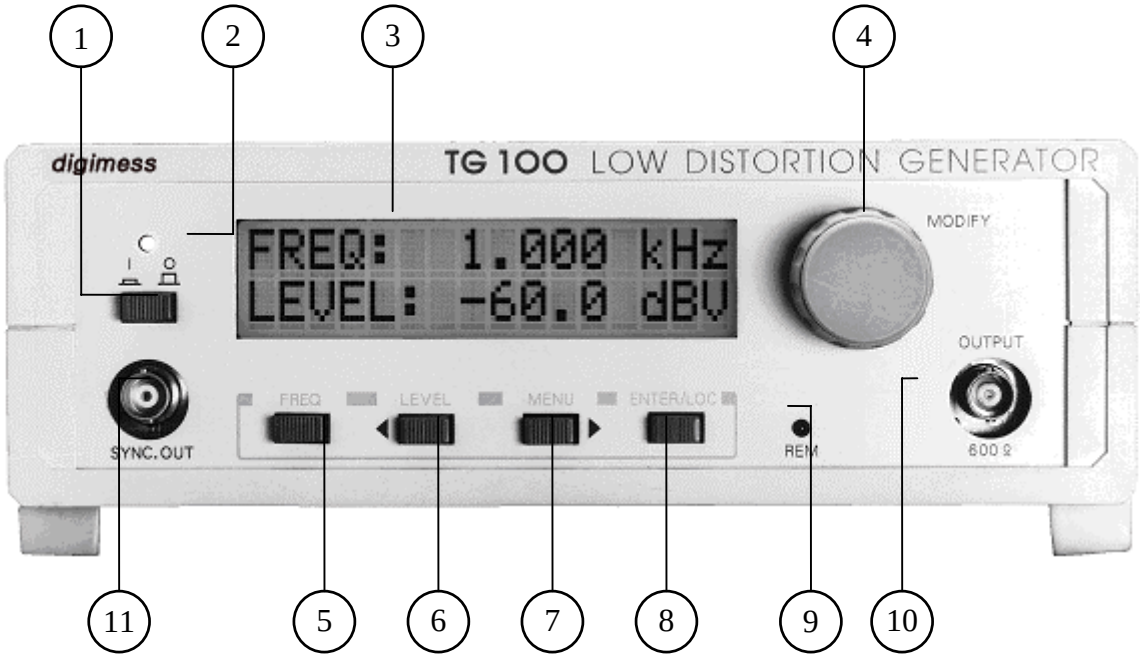
4.4 Remote Control

The TG 100 can be fully controlled and can be read out via the serial interface RS-232C. The TG 100 can be completely remote controlled via the serial interface RS-232C. The data transfer is based on the ASCII character set, and the data transmission rate can be selected.

Data transmission rate:	1,200, 2,400, 4,800, 9,600 Bd
Length of data character:	8 bit
Number of STOP bits:	1
Parity:	none
Protocol:	RTS/CTS, without (NONE)
End characters on receiving:	LF (10 dec.)
End characters on transmission:	CR + LF (13 dec. + 10 dec.)
Length of input buffer:	64 characters
Length of output buffer:	256 characters
Plug connections of cable:	



5 Control Elements



[1] **Power switch**

[2] **LED *I/O***

The LED indicates whether the unit is ready for operation.

[3] **Display**

See 4.3.

[4] **Rotary switch**

The TG 100 can be completely remote controlled via the serial interface RS-232C. The file transfer is based on the ASCII file, which means the data transmission rate can be selected.

[5] **Funktion button F1**

FREQ - The key opens the menu to set the frequency of the output signal.
- The key has different meanings in different levels.

[6] **Funktion button F2**

LEVEL - The key opens the menu to set the level of the output signal.
⇦ - The cursor is moved to the left.
- The key has different meanings in different levels.

[7] **Funktion button F3**

MENU - The key opens the menu to set further parameters of the TG 100.
⇨ - The cursor is moved to the right.
- The key has different meanings in different levels.

[8] **Funktion button F4**

ENTER - With the help of this button the new parameter setting are confirmed.
LOC - At remote control the TG 100 changes to local control.
- The key has different meanings in different levels.

[9] **LED *REM***
The LED lights up if data are sent via serial interface RS-232C.

[10] **BNC output socket of sinusoidal signal**

[11] **BNC output socket of rectangular signal**

The power is supplied by a **fused plug for non-heating appliances**. The TG 100 is protected by a fuse of T 63 L/250 V for 230 V~ or T 125 L/250 V for 115 V~ net voltage respectively. The **operating voltage indication** shows which operating voltage is to be used.
The serial interface **RS-232C** serves the purpose of data transmission on remote control via a PC.
The mains plug with fuse, the operating voltage indication, the serial interface and the **type plate** can be found at the back of the TG 100.

6 Operation of the TG 100

6.1 Starting

⚠ **Attention!** When the TG 100 is operated externally, the connecting cable of the system interface RS-232C must be connected before switching on the operating voltage.

- The TG 100 is connected to the power supply by the mains cable**.** After activating the power switch [1], the LED *I/O* [2] lights up and an internal test starts up. The following messages appears on the display [3]:

`LD GEN. <TG-100>` `PowerUp SelfTest`	and	`Testing: UNIT` `........ Passed`

  The variable `UNIT` stands for the unit which has just been tested. The appropriate functions of the processor (`CPU`), the data bus (`BUS`), the ROM memory (`ROM`), the RAM memory (`RAM`), the EEPROM memory (`EEPROM`), the display (`DISPLAY`), the keyboard (`KEYBOARD`) and the whole system (`SYSTEM`) are checked. On error-free conclusion of the test the following confirmation and current software version appear:

`LD GEN. <TG-100>` `READY`	and	`LD GEN. <TG-100>` `Ver: 2.30`

- After error-free testing, the settings correspond to those of the original state of operation:
  - f = 1 kHz,
  - V = – 60 dBV,
  - rectangular signal output - switched off,
  - baud rate - 9600 Bd,
  - transmission protocol - none (`NONE`) or last setting of the user.

  The following settings are shown on the display [3]:

```
FREQ:  1.000 kHz
LEVEL: -60.0 dBV
```

- Should a system error occur during the internal test, the TG 100 interrupts the test until the error is eliminated. The following message appear on the display [3]:

```
Testing: UNIT
........ ERROR
```

  The variable `UNIT` stands for the unit which has just been tested.

- If errors which have no direct effect on the function of the TG 100 occur in the component circuits, the test will continue. A warning with corresponding error characterization appears on the display [3]:

`LD GEN. <TG-100>` `WARNING:`	and	`Calibration` `Data Expired!`

6.2 Setting the Frequency

- After pressing the F1 button FREQ [5] the starting state of the TG 100 for frequency setting is reached and the following message appears on the display [3]:

```
FREQ:  1.000 kHz
LEVEL: -60.0 dBV
```

- Select the position with the help of the cursor buttons ⇦ [6] and ⇨ [7] and change the current frequency value of 1 Hz to 1 MHz with the help of the rotary switch [4].
- Store the new setting with the help of the F4 button ENTER [8].

The cursor disappears and the TG 100 returns to the starting state. The last position of the cursor is preserved.

The frequency of the output signal is tuned in exactly to the required value. While tuning, the symbol "~" appears on the display.

6.3 Setting the Output Level

- After pressing the F2 button LEVEL [6] the starting state of the TG 100 for level setting of sinusoidal output signal is reached and the following message appears on the display [3]:

```
FREQ:  1.000 kHz
LEVEL: -60.0 dBV
```

- Select the position with the help of the cursor buttons ⇦ [6] and ⇨ [7] and change the current output level value with the help of the rotary switch [4].
- Select the measuring range `dBV` and `dBm` for the output level or `V` und `mV` for the output voltage with the help of the F1 button [5].
- Store the new settings with the help of the F4 button ENTER [8].

  The cursor disappears and the TG 100 returns to the starting state. The last position of the cursor is preserved.

6.4 Selecting the Displayed Level Parameter

- After pressing the F3 button MENU [7] the main menu of the TG 100 is reached and the following message appears on the display [3]:

```
-- Main Menu --
DSP OUT AUX EXIT
```

  The function buttons F1, F2, F3 and F4 have the function which is indicated on the display.

- Call up the menu point `DSP` for setting the displayed measuring range of the output level with the help of the F1 button [5]. The following message appears on the display [3]:

```
Display Mode:
     LEVEL [dBV]
```

- Change the measuring range of the output level with the help of the rotary switch [4]. The following message appears on the display [3]:

Display Mode: LEVEL [V]	or	Display Mode: LEVEL [dBm]

- Store the new settings with the help of the F4 button ENTER [8].

  The TG 100 returns to the main menu. After pressing the F4 button EXIT [8] again, the settings are concluded and the TG 100 returns to the starting state.

6.5 Activating the Synchronization Output

- After pressing the F3 button MENU [7] the main menu of the TG 100 is reached and the following message appears on the display [3]:

-- Main Menu -- DSP OUT AUX EXIT

  The function buttons F1, F2, F3 and F4 have the function which is indicated on the display.

- Call up the menu point `OUT` for switching on and off the rectangular signal at the synchronization output with the help of the F2 button [6]. The following message appears on the display [3]:

Sync. Output: OFF

- Switch the synchronization output on or off with the help of the rotary switch [4].
- Store the new settings with the help of the F4 button ENTER [8].

  The TG 100 returns to the main menu. After pressing the F4 button EXIT [8] again, the settings are concluded and the TG 100 returns to the starting state.

6.6 Self-Diagnosis of the TG 100

- After pressing the F3 button MENU [7] twice the sub-menu of the TG 100 is reached and the following message appears on the display [3]:

--- Aux.Menu --- INT TST SPC EXIT

  The function buttons F1, F2, F3 and F4 have the function which is indicated on the display.

- Call up the menu point `TST` for self diagnosis of the TG 100 with the help of the F2 button [6].

Note: Testing equipment must be installed for a successful test.

After pressing the F4 button EXIT [8] the TG 100 returns to the main menu. After pressing the F4 button EXIT [8] again, the settings are concluded and the TG 100 returns to the starting state.

6.7 Special Device Functions

- After pressing the F3 button MENU [7] twice the sub-menu of the TG 100 is reached and the following message appears on the display [3]:

```
--- Aux.Menu ---
INT TST SPC EXIT
```

  The function buttons F1, F2, F3 and F4 have the function which is indicated on the display.

- Call up the menu point SPC for input the password with the help of the F3 button [7]. The following message appears on the display [3]:

```
Password:
        00000000
```

- Select the position with the help of the cursor buttons ⇦ [6] and ⇨ [7] and input the password correctly with the help of the rotary switch [4].

After confirmation with the F4 key ENTER [8], the special menu for service and calibration is opened to the authorised user (service technician).

7 Remote Control by Program

7.1 Preparation of the TG 100

Remote control of the TG 100 with a personal computer (PC) is possible via the serial interface RS-232C. The interface of the personal computer must be configured as described in paragraph 4.4. The connecting cable must not be longer than 15 m. Interface cables should be connected when the unit is off. After switching on the TG 100 is in starting position and can receive commands. The remote control is displayed on LED *REM* [9].

7.1.1 Selecting Interface Parameters

After switching on the TG 100 and after the following internal test is successfully completed the transmission parameters can be set by the menu.

- After pressing the F3 button MENU [7] twice the sub-menu is reached and the following message appears on the display [3]:

  ```
  --- Aux.Menu ---
  INT TST SPC EXIT
  ```

  The function buttons F1, F2, F3 and F4 acquire the indicated meaning.

- With the help of the F1 button [5] call the menu `INT` for selection of the interface parameters. The following message appears on the display [3]:

  ```
  -- RS 232 Set --
  BdR PRT     EXIT
  ```

  The function buttons F1, F2, F3 and F4 acquire the indicated meaning.

7.1.1.1 Baud Rate

- After pressing the F1 button `BdR` [5] the current baud rate is displayed, e. g.:

  ```
  BaudRate:
               9600
  ```

- Set the desired baud rate `1200`, `2400`, `4800` or `9600` with the help of the rotary switch [4].

- Save the new setting with the F4 button ENTER [8].

  The TG 100 returns to the menu `INT` for selection of the interface parameters.
  After pressing the F4 button EXIT [8] three times the settings are finished and the TG 100 returns to the starting state.

7.1.1.2 Transmission Protocol

- After pressing the F2 button `PRT` [6] the current transmission protocol is displayed, e. g.:

  ```
  Protocol:
           NONE
  ```

- Set a transmission protocol with RTS/CTS signals (`RTS/CTS`) or no transmission protocol (`NONE`) with the help of the rotary switch [4].

- Save the new setting with the F4 button ENTER [8].

  The TG 100 returns to the menu `INT` for selection of the interface parameters.
  After pressing the F4 button EXIT [8] three times the settings are concluded and the TG 100 returns to the starting state.

Note: After switching off the TG 100 the settings of the interface parameters are kept.

Communication with RTS/CTS protocol

Data received from PC:	signal `RTS=ON`	- TG 100 can receive data.
	signal `RTS=OFF`	- TG 100 cannot receive data.
Data transmitted to PC:	signal `CTS=ON`	- TG 100 transmits data.
	signal `CTS=OFF`	- TG 100 does not transmit data.

Communication without RTS/CTS protocol

Data received from PC:	signal `RTS=ON`	- TG 100 can always receive data, on overloading of the input buffer the error `INP.BUFFER FULL` is reported.
Data transmitted to PC:	signal `CTS=ON`	- TG 100 can always transmit data.

7.1.2 Remote Control ⇔ Local Control

On transmission of the command `REN` the TG 100 is in the REMOTE CONTROL status. This is indicated by the LED *REM* [9]. Afterwards control of the TG 100 by the local control elements is not possible (except with the F4 button LOC [8]).

- There are several ways of switching from remote control to local control:
  - by transmitting command `GTL` (Go To Local) from the PC,
  - by pressing the F4 button LOC [8] at the TG 100 if the keyboard has not been locked by the command `LLO` (Local Lock Out),
  - by switching the power switch [1] off and on.

Note: Block the F4 button LOC [8] with the help of the command `LLO`. Then all the commands of the PC are processed completely.

- The following commands can also be sent and received by the PC when the TG 100 is on local control:

  `*IDN?,*CLS,*ESR?,*ESE,*ESE?,*STB?,*SRE,*SRE?,ERR?,DER?.`

7.2 Messages of the TG 100 on Remote Control

7.2.1 Description of the Unit Status

The current status of the operating conditions of the TG 100 can be interrogated at any time via the EVENT STATUS REGISTER and the STATUS BYTE REGISTER.

7.2.1.1 ESR - EVENT STATUS REGISTER

The contents of the ESR register are filed in the output buffer and deleted by transmitting the command *ESR?. The ESR register is set on Ø (except bit 7 - PON) when switching on the TG 100, by transmitting the command *CLS or after changing the interface parameters.

Contents of the ESR register: ESR XXX

Bit **7**: (PON) Power On - operating readiness and interface activatities are displayed on 1.
6: (URQ) User Request - is not used, is always set on Ø.
5: (CME) Command Error - is set on 1 at instruction errors.
4: (EXE) Execution Error - is set on 1 at query errors and execution errors.
3: (DDE) Device Dependent Error - device errors are displayed on 1.
2: (QYE) Query Error - is set on 1 at query errors.
1: (RQC) Request Control - is not used, is always set on Ø.
Ø: (OPC) Operation Complete - is set on 1 by transmitting the command *OPC.

ESE - EVENT STATUS ENABLE REGISTER

- Various statuses and settings of the TG 100 can be checked. For this the contents of the ESR register are called with the help of a mask. The single bits are compared and evaluated by the following logical equation:

  $$ESB = (ESR7 \wedge ESE7) \vee (ESR6 \wedge ESE6) \vee (ESR5 \wedge ESE5) \vee (ESR4 \wedge ESE4) \vee (ESR3 \wedge ESE3) \vee (ESR2 \wedge ESE2) \vee (ESR1 \wedge ESE1) \vee (ESRØ \wedge ESEØ)$$

  The result ESB (Event Summary Bit) is entered in the STB register.

- The command *ESE XXX offers the possibility of initializing the ESE register with any mask. The value XXX has to be within the range of Ø to 255.

  Note: If the value is out of range from Ø to 255 the error VAL. OUT OF RANGE is reported.

- The current contents XXX are saved in the output buffer by transmitting the command *ESE?. The ESE register can set on Ø (except bit 7) when switching on the TG 100, by transmitting the command *ESE 0 or after changing the interface parameters.

7.2.1.2 STB - STATUS BYTE REGISTER

The contents of the STB register are filed in the output buffer by transmitting the command *STB?. The STB register can be set on Ø (except bit 4 - MAV) when switching on the unit, by transmitting the command *CLS or after changing the interface parameters.

Contents of the STB register: STB XXX

Bit **7**: is not used, is always set on Ø.
6: (MSS) Master Summary Bit - result during checkup of the STB register with a mask (SRE register, see below).
5: (ESB) Event Summary Bit - result during checkup of the ESR register with a mask (ESE register).
4: (MAV) Message Available - is set on 1 if a current message of the TG 100 is requested at the output buffer.
3: is not used, is always set on Ø.
2: is not used, is always set on Ø.
1: is not used, is always set on Ø.
Ø: is not used, is always set on Ø.

SRE - SERVICE REQUEST ENABLE REGISTER

- Various statuses and settings of the TG 100 can be checked. For this the contents of the ESR register are called with the help of a mask. The single bits (except SRE bit 6, which is always set on Ø) are compared and evaluated by the following logical equation:

  $$MSS = (STB7 \wedge SRE7) \vee (STB5 \wedge SRE5) \vee (STB4 \wedge SRE4) \vee (STB3 \wedge SRE3) \vee (STB2 \wedge SRE2) \vee (STB1 \wedge SRE1) \vee (STBØ \wedge SREØ)$$

  The result MSS (Master Summary Status) is entered in the STB register.

- The command *SRE XXX offers the possibility of initializing the ESE register with any mask. The value XXX has to be within the range of Ø to 255.

  Note: If the value is out of range from Ø to 255 the error VAL. OUT OF RANGE is reported.

- The current contents XXX are saved in the output buffer by transmitting the command *SRE?. The SRE register can be set on Ø when switching on the TG 100, by transmitting the command *SRE Ø or after changing the interface parameters.

7.2.2 Description of Results

The results are transmitted in the following format:

- Numeric argument of data within the range of 0 to 255: X or YX or ZXX

  Where: X - character from Ø to 9
  Y - character from 1 to 9
  Z - character from 1 to 2

- Output level [dBV] within the range of – 60.0 to + 10.0: SYX.X

  Where: X - character from Ø to 9
  Y - character from 1 to 6
  S - Vorzeichen (+/–)

- Output level [dBm] within the range of – 57.8 to + 12.2: SYX.X

  Where: X - character from Ø to 9
  Y - character from 1 to 5
  S - sign (+/–)

- Numeric argument which is implemented in the TG 100: from Z.XXXE+0Y
  to ZXX.XE+0Y

  Where: Z - character from 1 to 9
  X - character from Ø to 9
  Y - character Ø, 3 or 6

- Numeric argument which is implemented in the TG 100: from Z.XXES0Y
  to ZXXES0Y

  Where: Z - character from 1 to 9
  X - character from Ø to 9
  Y - character Ø or 3
  S - sign (+/–)

7.2.3 Description of Errors

- When errors occur in the remote-controlled settings and measurements, they are saved with a code in the error register. The contents (error message) of the error register can be called and deleted at any time by transmitting the command ERR?. If a error has been recorded, the corresponding error message is only deleted after the error has been eliminated.
- If several errors arise only the error codes of the first and last error are saved. On repeating transmission of the command ERR? the contents of the error codes are filed in the output buffer and initialized (deleted). The initializing of the error register is also started by transmitting the command *CLS (initializing of the state register).

Note: Before the transmission of the command ERR? the interface command DCL has to be send.

7.2.3.1 DER - DEVICE ERROR REGISTER

The contents of the DER register specify the device error in the error register and are filed in the output buffer by transmitting the command DER?. The contents of the register are not deleted after reading.

Contents of the DER register: DER XXX

Bit **7**: Is not used, is always set on Ø.
6: The calibration data are deleted.
5: Is not used, is always set on Ø.
4: Is not used, is always set on Ø.
3: Is not used, is always set on Ø.
2: Is not used, is always set on Ø.
1: Is not used, is always set on Ø.
Ø: Is not used, is always set on Ø.

- When a device error occurs the bit ESR3 (DDE) of the ESR register is set on 1.
- After following commands the DER register is set on Ø:
  – use of the command ERR? severals time (according to number of error),
  – initialization of status structure (*CLS).

7.2.3.2 Error Messages

The error messages are dependent on the operating status and the type of error.
At local control interface errors are displayed for only a short time. At remote control of the TG 100 interface errors are displayed until the contents of the error register are queried or initialized.
Device errors are displayed until new commands from the personal computer are transmitted.

List of Error Messages

Error code	Text of messages	Meaning of text
Ø	-	- faultless operation
	QUERY ERROR	**query error**
12Ø	BAD USING QUERY	- used query is wrong
	EXECUTION ERROR	**execution error**
131	NO EXECUTION	- cannot be executed
132	NOT EX. IN LOCAL	- cannot be executed in local control
134	VAL. OUT OF RANGE	- value is out of range
	COMMAND ERROR	**command error**
151	ILLEGAL COMMAND	- illegal command
	RS 232 error	**error of the RS-232C interface**
181	INP. BUFFER FULL	- input buffer is full

7.3 List of Commands on Remote Control

7.3.1 General Commands

REN (Remote) - transition from local control to remote control
ASCII: HT = 9 (dec.)

LLO (Local Lockout) - locking of the F4 button LOC [8]
ASCII: EM = 25 (dec.)

GTL (Go To Local) - transition from remote control to local control
ASCII: SOH = 1 (dec.)

DCL (Device clear) - initializing for the communication protocol of the interface, resetting or initializing of the partial circuits
ASCII: DC4 = 20 (dec.)

Note: The command DCL has no influence on the functions of the device. These have to be initialized by the general command *RST.

*RST (Reset) - initializing of device settings (starting state)
frequency of the output signal: 1.000 kHz
level of the output signal: -60 dBV
synchronization output (rectangular signal): switched off

The command correspond to instructions:
```
SQU_OFF;UNIT_DBV;
LEVEL -60.0;FREQ 1E3
```

Note: After switching on the TG 100 the commands DCL and *CLS are executed automatically and the contents of the ESE and SRE register are reset. Bit 7 (PON) of the ESR register is set on 1.

*TST? (Test) - start of internal test and saving of result
Meaning: Ø - test is successful
1 - test is not successful

*IDN? (Identification) - identification DIGIMESS,TG 100,X,Y
with X - production number or Ø
Y - software version or Ø

Note: The query *IDN? should be written at the end of the command line because subsequent data can be lost before transmission. Otherwise the error BAD USING QUERY is reported.

*CLS
(Clear Status Byte) - resetting of ESR- and STB register (except bit 4 - MAV)
Initializing of the error structure (see 7.2.3), ESE and SRE registers are not deleted.

*WAI (Waiting) - The following commands are executed only after completion of current operation.

*OPC
(Operation Complete) - After completion of current operation bit Ø (OPC) in the ESR register is set on 1.

*OPC? - After completion of current operation the number 1 is saved in the output buffer.

ERR? (Error) - reading and resetting of the error messages (see 7.2.3.2)
DER? - Contents of the DER register are filed in the output buffer.

*ESR?; *ESE XXX; *ESE? - reading and resetting of the ESR register (see 7.2.1.1)
*STB?; *SRE XXX; *SRE? - reading and resetting of the STB register (see 7.2.1.2)

7.3.2 Commands and Messages

7.3.2.1 Setting the Frequency

FREQ XXXXXX - frequency setting [Hz] within range (XXXXXX)
from 1.Ø to 1.ØØØ E6 (argument is rounded up)

Note: If the value is out of range the error 143 is reported.

FREQ? - The set frequency value is filed in the output buffer:
Z.XXE+0Y to ZX.XE+0Y

Where:
Z - character from 1 to 9
X - character from Ø to9
Y - sign Ø, 3 or 6

7.3.2.2 Setting the Output Level

Setting the measuring unit

UNIT_DBV - The measuring unit dBV for the level setting is selected.
UNIT_DBM - The measuring unit dBm for the level setting is selected.
UNIT_V - The measuring unit V for the level setting is selected.
UNIT? - Current selection UNIT_DBV, UNIT_DBM or UNIT_V of the measuring unit is filed in the output buffer.

Setting the output level with selected measuring unit

LEVEL XXXXXXXX - level setting with selected measuring unit within the range:
from -6Ø to +1Ø for measuring unit dBV
from -57.8 to +12.2 for measuring unit dBm
from 1.ØØE-Ø3 to 3.16 for measuring unit V

Note: If the value is out of range the error 143 is reported.

LEVEL? - Current output level is filed in the output buffer:
SXX.X - for measuring units dBV and dBM
Where:
X - character from Ø to 9
S - sign (+/–)
Z.XXE.X to ZX.XE+0Y - for measuring unit V
Where:
X - character from Ø to 9
Z - character from 1 to 9

7.3.2.3 Switching on and off the Rectangular Signal at the Synchronization Output

SQU_ON - The rectangular signal at the synchronization output is switched on.
SQU_OFF - The rectangular signal at the synchronization output is switched off.
UNIT? - Current selection SQU_ON or SQU_OFF is filed in the output buffer.

7.4 Measurement by Remote Control

- For remote control of the TG 100 the connecting cable of the serial interface RS-232C has to be connected before switching on the operating voltage. After switching on the TG 100 is in starting position and can receive commands. The remote control is displayed on LED *REM* [9].
- Single commands can be written one after the other in one command line, the length of which must not exceed 64 characters. In case errors occur, the command sequence is ignored and error `INP. BUFFER FULL` is indicated.
- It should be noted that single commands and device messages have to be separated by a semicolon (ASCII: `;` = 59) and finished by the end character (see below). Certain commands or messages can contain parameters or results which are separated by a separation character (see below) from the command.

Separation and end characters during transmission of commands:

	ASCII
Separation character	`SP` = 32 (dec.) `NUL` = 0 to 9 (dec.) `STX` to `BS` = 0 to 9 (dec.) `VT` to `DC3` = 0 to 9 (dec.) `NAK` to `CAN` = 0 to 9 (dec.) `SUB` to `US` = 11 to 31 (dec.)
End character	`LF` = 10 (dec.)

Separation and end characters during receiving of commands:

	ASCII
Separation character	`SP` = 32 (dec.)
End character	`CF+LF` = 13 (dec.) + 10 (dec.)

7.5 Program Example (Q-Basic)

```
10  REM ******************************************************
20  REM  THE EXAMPLE OF USING TG 100 WITH RS-232C INTERFACE
30  REM            PORT COM 2, BAUD RATE 1200 Bd
40  REM    GENERATOR SETTING - OUTPUTFREQUENCY: 1.234 kHz
50  REM                      - OUTPUT LEVEL   : 1 V
60  REM ******************************************************
70  REM
80      CLS
90  REM             *** ACTIVATE INTERFACE ***
100     IDCL$=CHR$(20):IREN$=CHR$(9):ILLO$=CHR$(25):IGTL$=CHR$(1)
110 REM
120 REM            *** CONFIGURATE INTERFACE ***
130     OPEN "com2:1200,n,8,1,CS30000,LF" FOR RANDOM AS #1
140 REM
150 REM              *** CONFIGURATE TG 100 ***
160     PRINT #1,IDCL$;IREN$;ILLO$;"*RST;*CLS"
170 REM
180 REM                *** SET FREQUENCY ***
190     PRINT #1,"FREQ 1.234E+3"
200 REM
210 REM              *** SET MEASURING UNIT ***
220     PRINT #1,"UNIT V"
230 REM
240 REM               *** SET OUTPUT LEVEL ***
250     PRINT #1,"LEVEL !"
260 REM
270 REM         *** TRANSITION TO LOCAL CONTROL ***
280     PRINT #1,"*OPC?"
290     INPUT #1,A$
300     PRINT #1,IGTL$
310 REM
320 REM                *** CLOSE STATEMENT ***
330     CLOSE #1
340 END
```

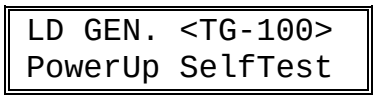
8 Maintenance

The TG 100 does not require special maintenance if it is used and handled correctly.
Only use a soft wet rag with some soap suds or a soft rinse liquid for cleaning. Avoid acrid cleanser and solvents.
Service work should only be done by trained personnel.
In case of repairs it is vital to ensure that the design features of the TG 100 are not changed, resulting in a reduction in operational safety, and that replacement parts match the original ones and are installed properly (original state).

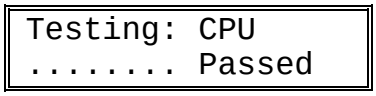
⚠ **Warning!** The TG 100 must be separated from all power sources before maintenance work is carried out and before parts or fuses are repaired or replaced.

9 Appendix

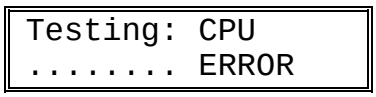
9.1 List of Messages on the Display



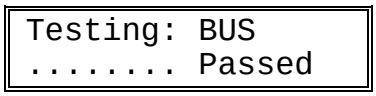
- internal test starts



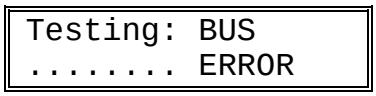
- faultless CPU test



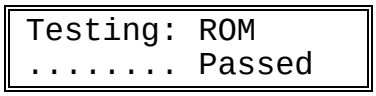
- error at the CPU test



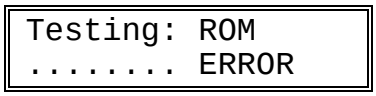
- faultless BUS test



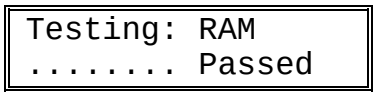
- error at the BUS test



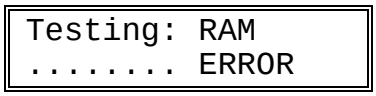
- faultless test of the ROM



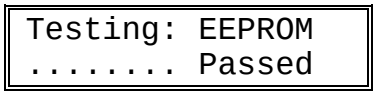
- error at the ROM test



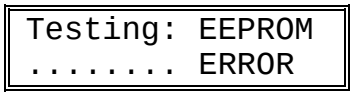
- faultless test of the RAM



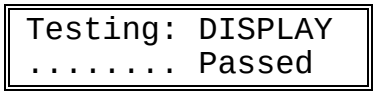
- error at the RAM test



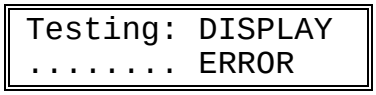
- faultless test of the EEPROM



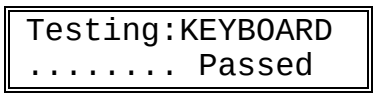
- error at the EEPROM test



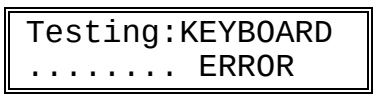
- faultless display test



- error at the display test



- faultless keyboard test



- error at the keyboard test

Testing: SYSTEM .... Passed	- faultless SYSTEM test
Testing: SYSTEM .... ERROR	- error at the SYSTEM test
LD GEN. <TG-100> READY	- operational readiness of the device
LD GEN. <TG-100> Ver: 2.30	- version of the firmware

LD GEN. <TG-100> WARNING:	- error in the partial circuit during the test is not interupted
Calibration Data Expired!	- error descriptions in the partial circuit, e. g. “Calibration Data Expired!”

Bad using query	- used query is wrong
Not Execution	- instruction cannot be executed
Not Ex. in Local	- instruction cannot be executed in local control
Val.Out of Range	- value is out of range
Illegal command	- illegal command
Inp. Buffer Full	- input buffer is full

Password: 00000000	- password input
Invalid password	- invalid password

9.2 Declaration of Conformity

digimess	**Konformitätserklärung** **Declaration of Conformity / Déclaration de Conformité** 132/**96**	CE

Der Hersteller/Importeur
The manufacturer/importer
Le producteur/importateur

digimess
Professional Electronics GmbH

Anschrift / Address / Adresse

Würzburger Straße 150
90766 Fürth
Germany

erklärt hiermit eigenverantwortlich, daß das Produkt:
declare under their sole responsibility that the product: / déclare, que le produit:

Bezeichnung / Name / Description

Programmierbarer Präzisions-Sinusgenerator
Programmable precision sine-wave generator
Générateur sinusoidal à précision programmable

Type / Model / Type

TG 100

Bestell-Nr. / Order-No. / Nº de réf.

H.UC 60-00

folgenden Normen entspricht:
is in accordance with the following specifications: / correspond aux normes suivantes:

EN 61010-1 (1994)

DIN EN 50081-1 (1993)DIN EN 50081-2 (1994)

EN 55011 (1991) Class B

EN 55022 (1987) Class B

Das Produkt erfüllt somit die Forderungen folgender EG-Richtlinien:
Therefore the product fulfils the demands of the following EC-Directives:
Le produit satisfait ainsi aux conditions des directives suivantes de la CE:

73/23/EWG **Richtlinie betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen**
Directive relating to electrical equipment designed for use within certain voltage limits
Directive relatives au matériel électrique destiné à être employé dans certaines limites de tension

89/336/EWG **Richtlinie über die elektromagnetische Verträglichkeit**
Directive relating to electromagnetic compatibility
Directive relatives à la compatibilité électromagnétique

Fürth, 4.4.1996

Henninger
Leiter Qualitätsmanagement
Q-Manager / Directeur Contrôle de Qualité