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1 General Information

1.1 ⚠ Safety Instructions

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

⚠ **Warning!** Before opening the FG 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~

⚠ **Attention!** Your SC 600 left the factory set to 230 V. Switching to 115 V requires the SC 600 to be opened, which should only be done by trained personnel.

Setting the operating voltage 115 V~

1. Disconnect the SC 600 from the mains.
2. Remove upper caps and loosen the screws below.
3. Identify the mains voltage switch by means of the following illustration.
4. Switch the mains voltage switch (slide switch) located under the power switch to the indication “115”.
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

⚠ **Attention!** 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 FG 100

⚠ **Attention!** The FG 100 should not be operated close to equipment that develops heat.

1.5 Switching on

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

1.6 EMC

Interference suppression: The FG 100 is interference-free according to EN 50081-1 and EN 50081-2.

Prerequisite for EMC: 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 FG 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

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

1.8 Warranty

Conditions for warranty

DIGIMESS guarantees the perfect working order of the FG 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.

Returning the FG 100

If a fault occurs please contact or send your FG 100 to:

The FG 100 should be returned 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 serial number.

Identification

Kindly verify warranty cases by enclosing your 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 FG 100 as per our General Terms Of Assembly And Service.

1.9 Accessories Supplied

Contents

1 mains cable	1XK64100
1 coaxial cable	1AK64220
1 fine-wire fuse	T 80 L/250 V (230 V)
2 fine-wire fuses	T 160 L/250 V (115 V)
1 operating instructions	
1 label for indicating the switch-over to 115 V	

2 Application

Performance features

The function generator FG 100, controlled by a microprocessor, is a compact signal source in the frequency range of 0.5 Hz to 20 MHz.
The FG 100 supplies:

- Sinusoidal alternating voltages
- Square-wave voltages and triangular voltages with adjustable pulse duty factor
- Sawtooth voltages

Additional functions

The amplitude and the direct voltage offset of the output signal can be adjusted within a wide range.
The FG 100 is fitted with a sweep function.
Furthermore, a square-wave signal (synchronization signal) with a CMOS/TTL level can be picked off.

Operation via keybord

All functions and measuring ranges can be set via menus by means of four buttons and an rotary switch.
The chosen parameters of the output signal are clearly depicted on a two-line alphanumeric LC matrix display.

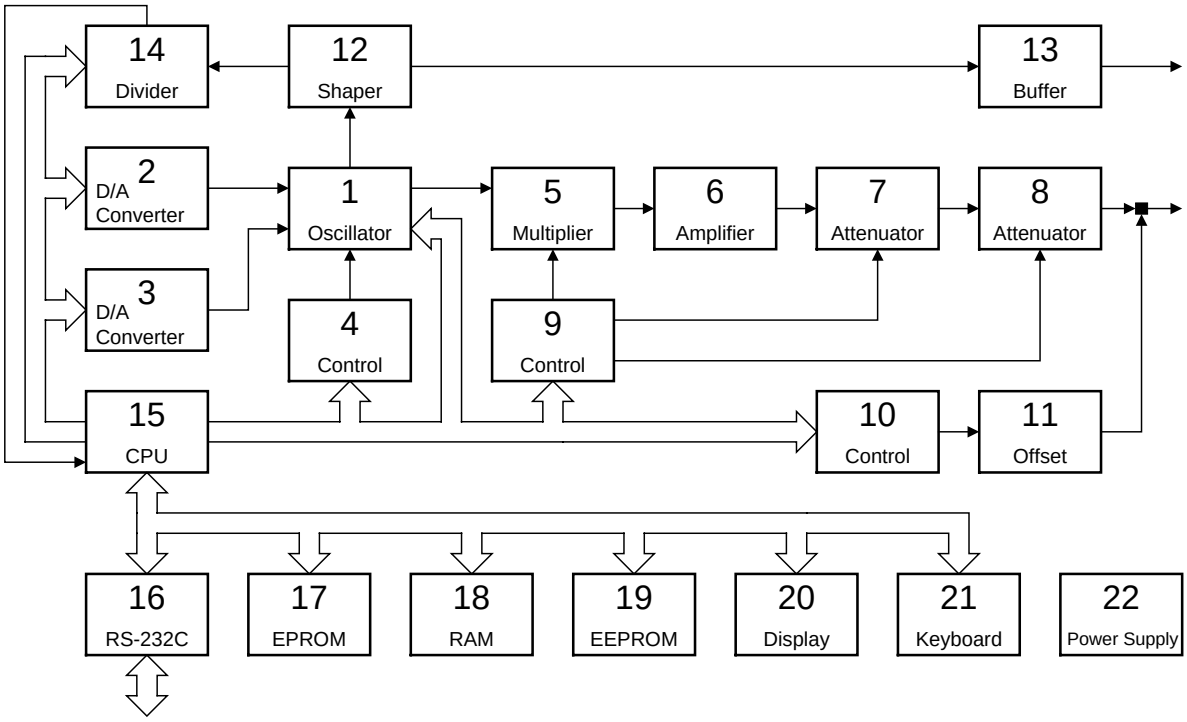
Remote control via RS-232C

The FG 100 is equipped, as standard, with the serial interface RS-232C for communication with a PC.

- All functions and parameters can be set.
- Set values and states of the FG 100 can be transmitted.

3 Configuration and Functional Description

3.1 Block Diagram



(1) Oscillator
(2) D/A converter for control of the output signal frequency
(3) D/A converter for control of the pulse duty ratio of the output signal
(4) Switchover of condensers in the oscillator
(5) Analog multiplier
(6) Signal amplifier
(7) Output attenuator for 20 dB
(8) Output attenuator for 20 dB
(9) Level control of the output signal
(10) Offset control of the output signal
(11) Generator of the offset voltage (direct voltage moving)
(12) Square-wave signal shaper
(13) Buffer stage of output signal and CMOS/TTL converter
(14) Predivider stage
(15) Microprocessor
(16) RS-232C interface
(17) Program memory EPROM
(18) Data memory RAM
(19) EEPROM memory for calibrated data
(20) Display
(21) Keyboard
(22) Power supply

3.2 Description

Internal control unit

The instrument's internal operational procedures are controlled by the one-chip microprocessor MCS-51 (15) with support from additional switching circuits e. g. program memory EPROM (17), data memory RAM (18) and back-up memory EEPROM (19) for the calibrated data.

Operating the FG 100

The FG 100 can be operated locally via the keyboard with the rotary switch (21) and via the LC display (20).
Remote control by a PC takes place via the serial interface and is controlled by the microprocessor.

Power supply

The modules are supplied by the internal power supply (22).

Configuration of FG 100

Setting the Frequency

The microprocessor (15) carries out the configuration and sets the hardware of the FG 100 after the parameters have been selected. Firstly, depending on the frequency which has been entered, the appropriate capacitor for the oscillator is selected and the appropriate control current (2) for fine tuning the frequency is set

Frequency fine tuning

The synchronization signal from the oscillator is fed to a square-wave signal shaper (12). The square-wave signal is led through the buffer stage (13) with CMOS logic level to the synchronization output. In addition, the square-wave signal is fed back to the microprocessor unit through the frequency distributor (14), where the generated signal period is measured. According to the measured standard deviation, the microprocessor (15) adjusts the required frequency value via the D/A converter (2) (programmable current source).

Output level

The generated signal is fed to the analog multiplier (5). The output level is set within the range from 0 to 20 dB by means of this circuit. The signal is also led to the amplifier (6) and to the output attenuators (7), (8) with attenuation of 0, 20 or 40 dB. According to the required value of the output level, the analog multiplier (5) and subsequently the damping of the output attenuators (7), (8) are set via the level control circuit (9). The signal from the attenuator (8) is led to the output socket of the FG 100.

Offset voltage and pulse duty ratio

The offset voltage generator - programmable current source (11) - is also connected to the output socket. The current source (11) is controlled by the microprocessor (15) via the control circuit (10). The offset voltage generator permits setting of the dc voltage part of the output signal within a wide voltage range.
The pulse duty factor of the output signal can be set with the D/A converter (3).

4 Technical Data

4.1 General Data

Nominal temperature:	+ 23 °C ± 2 °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 %), internally switchable 47 ... 60 Hz (± 5 %)
Power consumption:	max. 20 VA (max. 20 W)
Fuses:	T 80 L/250 V (230 V~) T 160 L/250 V (115 V~)
Safety class:	I, 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	
FG 100:	approx. 1.9 kg
incl. packing and accessories:	approx. 2.9 kg

4.2 Specification

Frequency range:	0.5 Hz ... 20 MHz
Frequency setting:	4 places
Accuracy of frequency setting (at nominal temperature):	± 0.5 % ± 0.05 % after auto calibration for f > 10 Hz
Duration for auto calibration of frequency:	approx. 0.8 s for f > 100 Hz approx. 0.8 ... 30 s for f < 100 Hz
Temperature coefficient of frequency:	$< \pm 5 \cdot 10^{-4}$/K
Time coefficient of frequency:	$< \pm 10^{-3}$/5 min after 30 min
Break-in period:	30 min

4.2.1 Signal Output

Output impedance:	50 Ω ± 1.5 %, unsymmetric
Output voltage V_{PP}:	10 mV ... 10 V/50 Ω
Maximum output level incl. offset voltage:	$V_{PP} + \lvert 2\ V_{Offset} \rvert \leq 10.00$ V
Setting the output voltage:	3 places
Accuracy of output voltage at f = 1 kHz:	± 3 %

Additional frequency error of output voltage:	± 5 % in the range 10 Hz ... 100 kHz ± 10 % in the range 0.5 Hz ... 20 MHz
Temperature coefficient of output voltage:	$< \pm 5 \cdot 10^{-3}$/K
Direct voltage offset of signal (V_{Offset}):	± 2.5 V/50 Ω
Setting of direct voltage offset:	in 10 mV steps
Accuracy of setting of direct voltage offset:	± (2 % + 20 mV)
Output signal:	sinusoidal signal square-wave signal triangular signal sawtooth signal
Distortion of sinusoidal signal:	< 1 % for 20 Hz ... 20 kHz < 3 % for 10 Hz ... 100 kHz < 5 % for 100 kHz ... 10 MHz
Rise time of square-wave signal:	< 15 ns
Nonlinearity of triangular signal (5 ... 95 %):	< 1 %
Pulse duty ratio setting:	15 ... 85 % for square-wave signal and triangular signal
Setting of pulse duty ratio:	in 1 % steps
Sweep function:	internal, digital, discreet
Frequency change at the sweep function:	max. 1 : 50, linear, discreet
Repetition period at the sweep function:	10 ms ... 60 s

4.2.2 Synchronization Output

Output impedance:	approx. 50 Ω
Output voltage V_{PP}:	5 V ± 10 % in the idling
Maximum output current:	10 mA
Pulse duty ratio for periodical signals:	approx. 1 : 1
at the sweep function:	“start” puls with a breadth of approx. 5 µs

4.3 Display

Set-up and display contents

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

4.4 Remote Control

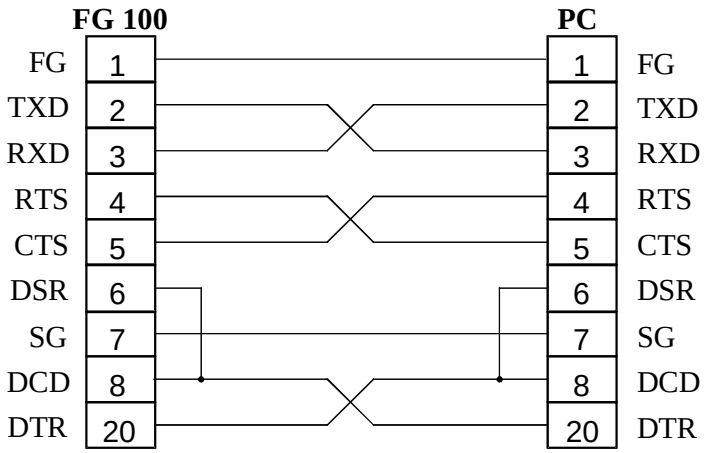
Performance range

The FG 100 can be fully controlled and read out via the serial interface RS-232C. The data transfer is based on the ASCII character set.

Data transmission parameter

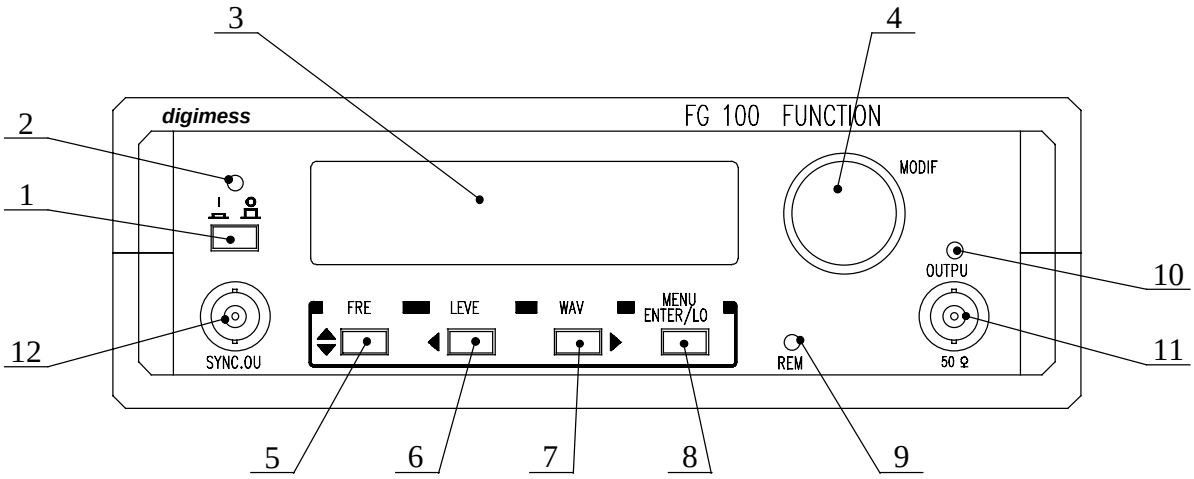
Baud rate (eligible):	1200, 2400, 4800, 9600 Bd
Length of data character:	8 Bit
Number of STOP bits:	1
Parity:	none
Protocol:	RTS/CTS, without (NONE)
Length of input buffer:	64 characters
Length of output buffer:	256 characters
End character on receiving:	LF (10 dec.)
End characters on transmission:	CR + LF (13 dec. + 10 dec.)

Plug connections of cable

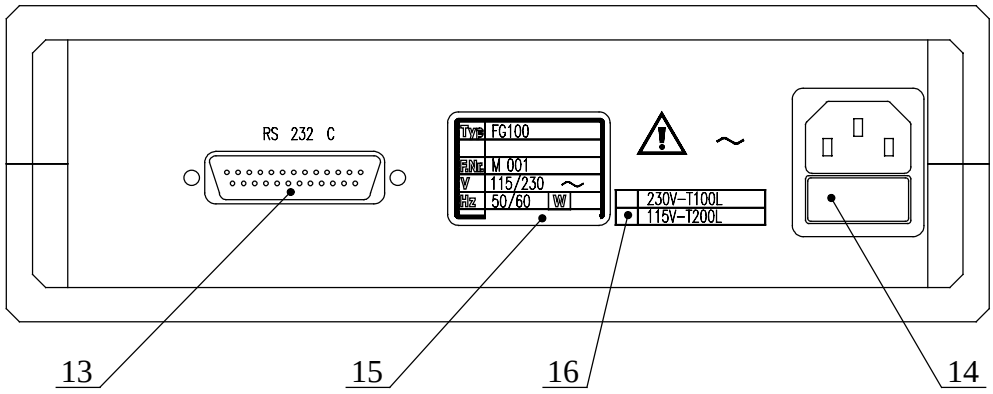


5 Control Elements

Front side of FG 100



Rear side of FG 100



[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
With the rotary switch the parameters can be set and the current menus can be scrolled forwards and backwards.

[5] Function button F1 (with multiple allocation)
FREQ - The button opens the menu to set the frequency of the output signal.
⇳ - The button changes between first and second line of the display.
- The button has different meanings in the menu levels.

[6] Function button F2 (with multiple allocation)

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

[7] Function button F3 (with multiple allocation)

WAVE - The button opens the menu to set the wave form of the output signal.
⇨ - The cursor is moved to the right.
- The button has different meanings in the menu levels.

[8] Function button F4 (with multiple allocation)

MENU - The button opens the menu to set further parameters of the FG 100.
ENTER - With the help of this button the new parameter setting is confirmed.
LOC - On remote control the FG 100 changes to local control.
- The button has different meanings in the menu levels.

[9] LED *REM*

The LED lights up if the FG 100 is being remote controlled via the PC.

[10] LED *OUTPUT*

The LED lights up if the signal output is switched on.

[11] BNC socket of signal output

[12] BNC socket of synchronization output

[13] Plug of RS-232C interface

[14] Fused plug for non-heating appliances

The FG 100 is protected by a fuse of T 80 L/250 V for 230 V~ or T 160 L/250 V for 115 V~ net voltage respectively.

[15] Type plate

[16] Operating voltage indication

The operating voltage indication shows which operating voltage is to be used.

6 Operation of the FG 100

6.1 Starting

⚠ **Attention!**

When the FG 100 is operated remotely via PC the connecting cable of the system interface must be connected before switching on the operating voltage.

Switching on the FG 100

1. Connect the FG 100 with the mains cable to the mains system.
2. Press the power switch [1].
   – The LEDs *I/O* [2], *REM* [9] and *OUTPUT* [10] light up and the following message appears on the display [3]:

```
GENERATOR<FG100>
      READY
```

Starting the initialization test

An internal initialization test starts up.
The following message appears on the display [3]:

```
Testing: UNIT
........ PASSED
```

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

- Processor (CPU)
- Data bus (BUS)
- ROM memory (ROM)
- RAM memory (RAM)
- EEPROM memory (EEPROM)
- Display (DISPLAY)
- Keyboard (KEYBOARD)
- Whole system (SYSTEM)

☞ **Note**

The test routine can be switched off (see 6.9.1).
In this case, the initialization test is started only if a button is pushed while switching the instrument on.

Fault-free test

On error-free conclusion of the test the following confirmation and current software version appear, e. g.:

```
GENERATOR<FG100>
      READY
```

and

```
GENERATOR<FG100>
     Ver:2.00
```

Operating state

After fault-free testing the LEDs *REM* [9] and *OUTPUT* [10] go out and the parameters of the FG 100 correspond to the following presettings:

Frequency of the output signal:	1.000 kHz
Frequency fine tuning:	single
Output voltage V_{PP}:	1.00 V
Direct voltage offset at the output:	0.00 V
Output signal:	sinusoidal
Pulse duty ratio of the output signal:	50 %
Signal output:	switched off
Synchronization output:	switched off
Sweep function:	switched off
Start frequency:	1.000 kHz
Stop frequency:	50.00 kHz
Sweep period:	100 ms
Baud rate:	9600 Bd
Data transmission protocol:	without (NONE)
Initializing test:	switched on

The FG 100 is ready for operation and the following message appears on the display [3]:

```
FREQ:   1.000 kHz
WAVE:   SINE
```

☞ **Note**

If you have saved your own instrument settings, these are loaded after the instrument is switched on (see 6.9.4).

Faulty test

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

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

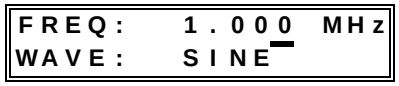
The variable UNIT stands for the unit which has just been tested (see above).
If errors which have no direct effect on the function of the FG 100 occur in the component circuits, the test will continue. A warning with corresponding error characterization appears on the display [3], e. g.:

```
GENERATOR<FG100>
Calibration OFF!
```

6.2 Setting the Frequency

Calling up the menu point

1. Press the F1 button FREQ [5] when the instrument is in operation.
   – The cursor appears on the display [3] on the last position of the frequency value:



Changing the parameter

2. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
3. Change the current frequency value of 0.5 Hz to 20 MHz with the help of the rotary switch [4].

☞ **Note**

If you try to exceed the limit values the message Limit! is signalled on the display.

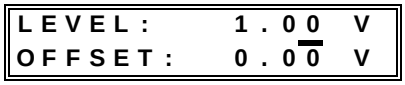
Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The cursor disappears and the FG 100 returns to the operating state. The last position of the cursor is preserved.
   – The frequency of the output signal is set exactly to the required value. During fine tuning the output signal does not correspond to the value which has been entered and the symbol "~" appears on the display [3].

6.3 Setting the Output Level

Calling up the menu point

1. Press the F2 button LEVEL [6] when the instrument is in operation.
   – The last settings of the output voltage and the direct voltage offset appear on the display [3]:



Changing the parameter

2. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
3. Change the output voltage with the help of the rotary switch [4].
   – You can shift between the setting of output voltage for the setting of voltage offset with the F1 button ⇳ [5].

☞ **Note**

If you try to exceed the limit values the message Limit! is signalled on the display.

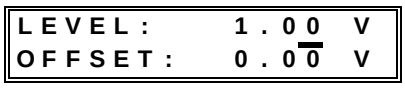
Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The cursor disappears and the FG 100 returns to the operating state. The last position of the cursor is preserved.

6.4 Setting the Direct Voltage Offset of the Output Signal

Calling up the menu point

1. Press the F2 button LEVEL [6] when the instrument is in operation.
   – The last settings of the output voltage and the direct voltage offset appear on the display [3]:



Changing the parameter

2. Shift from the setting of the output voltage to the setting of the voltage offset with the F1 button ⇳ [5].
3. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
4. Change the direct voltage offset within the range of ± 2.5 V with the help of the rotary switch [4].

☞ **Note**

If you try to exceed the limit values the message Limit! is signalled on the display.

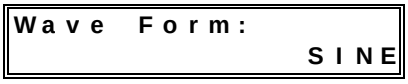
Saving the change

5. Save the new settings with the help of the F4 button ENTER [8].
   – The cursor disappears and the FG 100 returns to the operating state. The last position of the cursor is preserved.

6.5 Selection of the Wave Form

Calling up the menu point

1. Press the F3 button WAVE [7] when the instrument is in operation.
   – The current setting of the wave form appears on the display [3], e. g.:



Changing the parameter

2. Change the form of the generated output signal with the help of the rotary switch [4]:
   - SINE - sinusoidal signal
   - SQUARE - square-wave signal
   - TRIANGLE - triangular signal
   - RAMP UP/RAMP DOWN - sawtooth signal

Saving the change

3. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 changes to the operating state.

6.6 Setting the Pulse Duty Ratio of the Output Signal

Calling up the menu point

1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
DCY OUT SWP NEXT
```

2. Press the F1 button DCY [5].
   – The last setting of the pulse duty ratio appears on the display [3], e. g.:

```
Duty Cycle:
                50 %
```

Changing the parameter

3. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
4. Change the pulse duty ratio within the range of 15 to 85 % with the help of the rotary switch [4].

☞ **Note** If you try to exceed the limit values the message Limit! is signalled on the display.

Saving the change

5. Save the new setting with the help of the F4 button ENTER [8].
   – The cursor disappears and the FG 100 returns to the main menu. The last position of the cursor is preserved.

Changing to the operating state

6. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - 2nd stage of the main menu
   - Press × 2 - operating state

6.7 Activating the Outputs

Calling up the menu

1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
DCY OUT SWP NEXT
```

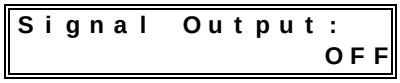
2. Call up the menu of settings of the signal output and the synchronization output with the help of the F2 button OUT [6].
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
_ Outputs Menu _
SYNC SIGNAL EXIT
```

6.7.1 Switching on/off the Signal Output

Calling up the menu point

1. Call up the menu of settings of the signal output and the synchronization output (see 6.7).
2. Press the F2 button SIGNAL [6].
   – The current state of the signal output appears on the display [3], e. g.:



Changing the parameter

3. Change the state with the help of the rotary switch [4]:
   - OFF - signal output is switched off
   - ON - signal output is switched on

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the signal output and the synchronization output.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - 2nd stage of the main menu
   - Press × 3 - operating state
   – The switched on signal output is displayed with the LED *OUTPUT* [10].

6.7.2 Switching on/off the Square-wave Signal at the Synchronization Output

Calling up the menu point

1. Call up the menu of settings of the signal output and the synchronization output (see 6.7).
2. Press the F1 button SYNC [5].
   – The current state of the synchronization output appears on the display [3], e. g.:

Changing the parameter

3. Change the state with the help of the rotary switch [4:
   - OFF - synchronization output is switched off
   - POSITIVE - positive square-wave signal at the synchronizatic output
   - NEGATIVE - negative square-wave signal at t synchronization output

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the signal output and the synchronization output.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - 2nd stage of the main menu
   - Press × 3 - operating state

6.8 Activating the Sweep Function

Calling up the menu point

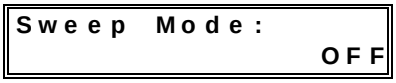
1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

2. Call up the menu for setting the sweep function with the help of the F3 button SWP [7]
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

6.8.1 Switching on/off the Sweep Function

Calling up the menu point

1. Call up the menu for setting the sweep function (see 6.8).
2. Press the F1 button MOD [7].
   – The current state of the sweep function appears on the display [3], e. g.:



Changing the parameter

3. Change the state with the help of the rotary switch [4]:
   - OFF - sweep function is switched off
   - LINEAR - linear frequency change

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for the settings of the sweep function.

Changing to the operating state

5. Press the F4 button EXIT [8].
   – The FG 100 is configured anew. Either the sweep function is stopped or the new frequency settings are started.
   – The FG 100 changes to the operating state.

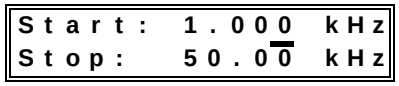
☞ **Note**

The frequency of the FG 100 is not adjusted if the sweep function is switched on.

6.8.2 Setting the Frequency Limits

Calling up the menu point

1. Call up the menu for setting the sweep function (see 6.8).
2. Press the F2 button FREQ [6].
   – The current settings of the frequency limits appear in the display [3], e. g.:



Changing the parameter

3. Change with the F1 button [5] between the upper limit (Start) and lower limit (Stop) of the frequency change.
4. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
5. Change the upper and lower limit with the help of the rotary switch [4].
   – Note the relationship: Start / Stop = max. 1 : 50 or 50 : 1.

☞ **Note**

If you try to exceed the limit values the message Limit! is signalled on the display.

Saving the change

6. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the sweep function.

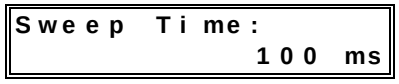
Changing to the operating state

7. Press the F4 button EXIT [8].
   – The FG 100 is configured anew. Either the sweep function is stopped or the new frequency settings are started.
   – The FG 100 changes to the operating state.

6.8.3 Setting the Period

Calling up the menu point

1. Call up the menu for setting the sweep function (see 6.8).
2. Press the F3 button ST [7].
   ▪ The current setting of the period appears in the display [3], e. g.:



Changing the parameter

3. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
4. Change the period within the range of 100 ms to 60 s with the help of the rotary switch [4].

☞ **Note**	If you try to exceed the limit values the message L i m i t ! is signalled on the display.

Saving the change

5. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the sweep function.

Changing to the operating state

6. Press the F4 button EXIT [8].
   – The FG 100 is configured anew. Either the sweep function is stopped or the new frequency settings are started.
   – The FG 100 changes to the operating state.

6.9 User Settings of the FG 100

Calling up the menu

1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
DCY OUT SWP NEXT
```

2. Change with the help of the F4 button NEXT [8] to the 2nd stage of the main menu.
   – Further menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
INT USR SPC EXIT
```

3. Call up the menu of the user settings with the help of the F2 button USR [6].
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ User Menu __
PS TEST FAD NEXT
```

6.9.1 Switching on/off the Initialization Test

Calling up the menu point

1. Call up the menu of the user settings (see 6.9).
2. Press the F1 button PS [5].
   – The current state of the initialization test after switching on the FG 100 appears in the display [3], e. g.:

```
PowerUp SelfTest
                ON
```

Changing the parameter

3. Change the state with the help of the rotary switch [4]:
   - ON - initialization test is switched on
   - OFF - initialization test is switched off

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu of the users settings.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - 2nd stage of the menu of the user settings
   - Press × 2 - main menu
   - Press × 3 - operating state

☞ **Note**

If the initialization test is switched off (OFF), it is still possible to activate the test routine when the FG 100 is switched on. This is done by pressing any button while switching on the instrument. When the FG 100 is switched off, the current state for the initialization test is preserved.

6.9.2 Self-Diagnosis of the FG 100

☞ **Note**

For successful performance of the test, testing equipment is necessary.

Calling up the menu point

1. Call up the menu of the user settings (see 6.9).

Starting the self-diagnosis

2. Press the F2 button TEST [6].
   – The internal diagnostic test routines are started.
   – After fault-free test the FG 100 returns to the menu of the user settings.

Changing to the operating state

3. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - 2nd stage of the menu of the user settings
   - Press × 2 - main menu
   - Press × 3 - operating state

6.9.3 Fine Tuning of the Frequency Setting

Calling up the menu point

1. Call up the menu of the user settings (see 6.9).
2. Press the F3 button FAD [7].
   – The current type of fine tuning at the frequency setting of the generated signal appears on the display [3], e. g.:

```
Freq. Adjust:
                SINGLE
```

Changing the parameter

3. Change the type of fine tuning with the help of the rotary switch [4]:
   - SINGLE - single fine tuning
   - CONTINUOUS - continuous fine tuning
   - OFF - fine tuning is switched off

   – During fine tuning the output signal does not correspond to the value which has been entered and the symbol "~" appears on the display [3].
   – During continuous fine tuning (CONTINUOUS) the sign "c" appears on the display [3].

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu of the user settings.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - 2nd stage of the menu of the user settings
   - Press × 2 - main menu
   - Press × 3 - operating state

☞ **Note**

The instrument settings are carried out fastest (approx. 100 ms) when the fine tuning is switched off (OFF). However, technical specifications (see 4.2) **cannot** then be observed.

6.9.4 Instrument Settings

Calling up the menu

1. Call up the menu of the user settings (see 6.9).
2. Change with the help of the F4 button NEXT [8] to the 2nd stage of the menu.
   – Further menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ User Menu __
STO RCL LCD EXIT
```

☞ **Note**

The menu point LCD is only displayed when the FG 100 has the option "Display Settings" (see 6.9.5).

6.9.4.1 Saving the Current Instrument Settings

Calling up the menu point

1. Call up the 2nd stage of the menu of the user settings (see 6.9.4).

Saving the parameters

2. Save the current settings of the FG 100 with the F1 button STO [5].
   – The following message appears on the display [3]:

```
Current Setting
........ SAVING
```

Changing to the operating state

3. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - operating state
   – The saved settings are called after every switching on the FG 100.

☞ **Note**

The interface setting, initialization test activation and display setting are **not** saved. When the FG 100 is switched on, those parameters which were current before switching off are set.

6.9.4.2 Loading the Instrument Settings of the Manufacturer

Calling up the menu point

1. Call up the 2nd stage of the menu of the user settings (see 6.9.4).

Loading the parameters

2. Press the F2 button RCL [6].
   – The user's current settings are cleared and the manufacturer's instrument settings are loaded.
   – The following message appears on the display [3]:

```
Default Setting
........ LOADING
```

3. After the manufacturer's instrument settings are loaded, the FG 100 returns to the menu of the user settings.

Changing to the operating state

4. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - operating state

☞ **Note**

The interface setting, initialization test activation and display setting are **not** saved. When the FG 100 is switched on, those parameters which were current before switching off are set.

6.9.5 Display

☞ **Note**	Display settings can only be changed if the FG 100 is equipped with this function.

Calling up the menu

1. Call up the menu of the user settings (see 6.9).
2. Change with the help of the F4 button NEXT [8] to the 2nd stage of the menu.
   – Further menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ User Menu __
STO RCL LCD EXIT
```

3. Call up the menu for the display settings with the help of the F3 button LCD [7].
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ LCD Adjust __
CONT BRIGHT EXIT
```

6.9.5.1 Contrast Setting of the Display

Calling up the menu point

1. Call up the menu for the display settings (see 6.9.5).
2. Press the F1 button CONT [5].
   – The current contrast setting appears on the display [3], e. g.:

```
Contrast Adjust:
              75 %
```

Changing the parameter

3. Change the contrast within the range of 0 to 100 % in 5 % steps with the help of the rotary switch [4].

☞ **Note**	If you try to exceed the limit values the message `Limit!` is signalled on the display.

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for the display settings.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - operating state

☞ **Note**	When the FG 100 is switched off, the last contrast setting is preserved.

6.9.5.2 Brightness Setting of the Display

Calling up the menu point

1. Call up the menu for the display settings (see 6.9.5).
2. Press the F2 or F3 button BRIGHT [6, 7].
   – The current brightness setting appears on the display [3], e. g.:

```
Bright Adjust:
                75 %
```

Changing the parameter

3. Change the brightness within the range of 0 to 100 % in 5 % steps with the help of the rotary switch [4].

☞ **Note** If you try to exceed the limit values the message Limit! is signalled on the display.

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for the display settings.

Changing to the operating state

5. Repeated pressing of the F4-button [8] allows the user to shift between the different menu levels and to the operating state of the FG 100:
   - Press × 1 - main menu
   - Press × 2 - operating state

☞ **Note** When the FG 100 is switched off, the last contrast setting is preserved.

6.10 Special Functions of the FG 100

Calling up the password input

1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
DCY OUT SWP NEXT
```

2. Change to the 2nd stage of the main menu with the help of the F4 button NEXT [8].
   – Further menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
INT USR SPC EXIT
```

3. Press the F3 button SPC [7].
   – The field for the input of the password appears on the display [3]:

```
Password:
        00000000
```

Entering the password

4. With the cursor buttons ⇦ [6] and ⇨ [7], select the parameter position to be changed.
5. Enter the right password with the help of the rotary switch [4].
6. Press the F4 button ENTER [8].
   – The special menu is opened to the authorized user (service technicians) for service and calibration work.

Wrong password input

At wrong input of the password the following message appears on the display [3] and the instrument returns to the main menu:

```
Password:
          ILLEGAL!
```

7. Press the F4 button ENTER [8].
   – The FG 100 returns to the operating state.

6.11 Protection of the Signal Output

Operation

The signal output OUTPUT [11] is equipped with a protective circuit (Reverse Power Protection).
If an external voltage V > ± 15 V is connected to the active signal output [11] of the FG 100, the signal output switches itself off automatically.

Error message

The LED *OUTPUT* [10] at the front of the FG 100 is cleared when the FG 100 is switched off and the following error message appears on the display [3]:

```
** Error: 31  **
  RPP Tripped!
```

Only after the error is removed, is the operating state of the signal output automatically restored and the error message disappears.

7 Remote Control by Program

7.1 Preparation of the FG 100

⚠ **Attention!**	For remote control of the FG 100 the connecting cable of the serial interface RS-232C has to be connected before switching on the operating voltage.
Prerequisite	Remote control of the FG 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 0. The connecting cable must not be longer than 15 m.
Connecting the connecting cable	1. Connect the connecting cable to the FG 100 [13] and the PC. 2. Screw in tight the connections.
☞ **Note**	Make sure that the phase of the mains voltage at the FG 100 and PC is the same, the earth connection was removed and the ESD regulations are observed.
Switching on the FG 100	3. Switch on the FG 100. – After the initialization test the FG 100 can receive commands.

7.1.1 Selecting the Interface Parameters

Calling up the menu

1. Call up the main menu with the help of the F4 button MENU [8] when the instrument is in operation.
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
DCY OUT SWP NEXT
```

2. Change with the help of the F4 button NEXT [8] to the 2nd stage of the main menu.
   – Further menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ Main Menu __
INT USR SPC EXIT
```

3. Call up the menu for setting the interface parameters with the help of the F1 button INT [5].
   – Different menu points, which are assigned to function buttons F1-F4, appear on the bottom line of the display:

```
__ RS 232 Set __
BDR PROT      EXIT
```

7.1.1.1 Setting the Baud Rate

Calling up the menu point

1. Call up the menu for setting the interface parameters (see 7.1.1).
2. Press the F1 button BDR [5].
   – The current baud rate appears on the display [3], e. g.:

```
Baud Rate:
                9600
```

Changing the parameter

3. Change the baud rate (1200, 2400, 4800, oder 9600 Bd) with the help of the rotary switch [4].

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the interface parameters.

Changing to the operating state

5. Press the F4 button EXIT [8].
   – The FG 100 is configured anew and returns to the operating state.

☞ **Note** After switching off the FG 100 the current setting of the baud rate is kept.

7.1.1.2 Setting the Transmission Protocol

Calling up the menu point

1. Call up the menu for setting the interface parameters (see. **오류! 참조 원본을 찾을 수 없습니다.**).
2. Press the F2 button PROT [5].
   – The current setting of the transmission protocol appears on the display [3], e. g.:

```
Protocol:
                NONE
```

Changing the parameter

3. Change the setting of the transmission protocol with the help of the rotary switch [4]:
   - NONE - communication without transmission protocol
   - RTS/CTS - communication with RTS/CTS protocol

Saving the change

4. Save the new setting with the help of the F4 button ENTER [8].
   – The FG 100 returns to the menu for setting the interface parameters.

Changing to the operating state

5. Press the F4 button EXIT [8].
   – The FG 100 is configured anew and returns to the operating state.

☞ **Note** After switching off the FG 100 the current setting of the transmission protocol is kept.

Communication with RTS/CTS protocol

Data received from PC	Signal RTS=ON – FG 100 can receive data. Signal RTS=OFF – FG 100 cannot receive data.
Data transmitted to PC	Signal CTS=ON – FG 100 transmitting data. Signal CTS=OFF – FG 100 not transmitting data.

Communication without RTS/CTS protocol

Data received from PC	Signal RTS=ON – FG 100 can always receive data, on overloading of the input buffer the error 131 INP.BUFFER FULL is reported.
Data transmitted to PC	Signal CTS=ON – FG 100 can always transmit data.

7.1.2 Local Control ⇔ Remote Control

Activating the remote control	Send the command REN via the PC. – The FG 100 is in the REMOTE CONTROL status. This is indicated by the LED *REM* [9]. Afterwards control of the FG 100 by the local control elements is not possible (except with the F4 button LOC [8]).

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

Activating the local control	– 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 FG 100 if the keyboard has not been locked by the command LLO (Local Lock Out) ▪ By switching the power switch [1] off and on – The button field is ready for use after the transition for the local control again. The LED *REM* [9] goes out.
Remote control at local control	– The following commands can also be sent and received by the PC when the FG 100 is on local control: ▪ ∗IDN?, ∗CLS, ∗ESR?, ∗ESE,∗ ESE?, ∗STB?, ∗SRE, ∗SRE?, ERR?, DER?.

7.2 Messages of the FG 100 on Remote Control

7.2.1 Description of the Unit Status

Introduction

The current status of the operating conditions of the FG 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

Reading and deleting the register

The current contents XXX are saved in the output buffer by transmitting the command *ESR?.
The ESR register can set on Ø after the following operations (except bit 7):

- Switching on the FG 100
- Transmitting the command *CLS
- Changing the interface parameters

Contents of the ESR register

Bit 7: (PON) Power On
Operating readiness and interface activities are displayed on 1.

Bit 6: (URQ) User Request
Is not used, is always set on Ø.

Bit 5: (CME) Command Error
Is set on 1 at instruction errors.

Bit 4: (EXE) Execution Error
Is set on 1 at query errors and execution errors.

Bit 3: (DDE) Device Dependent Error
Device errors are displayed on 1.

Bit 2: (QYE) Query Error
Is set on 1 at query errors.

Bit 1: (RQC) Request Control
Is not used, is always set on Ø.

Bit 0: (OPC) Operation Complete
Is set on 1 by transmitting the command *OPC.

ESE - EVENT STATUS ENABLE REGISTER

Meaning of the register

Various statuses and settings of the FG 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) $\vee$ (ESR0 $\wedge$ ESE0)

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

Describing the 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 0 to 255. Otherwise the error 134 VAL. OUT OF RANGE is reported.

Reading and deleting the register

The current contents XXX are saved in the output buffer by transmitting the command *ESE?.
The ESE register can set on Ø after the following operations:

- Switching on the FG 100 (except bit 7)
- Transmitting the command *ESE 0
- Changing the interface parameters

7.2.1.2 STB - STATUS BYTE REGISTER

Reading and deleting the register

The contents of the STB register are filed in the output buffer by transmitting the command *STB?.
The STB register can set on Ø after the following operations (except bit 4 - MAV):

- Switching on the FG 100
- Transmitting the command *CLS
- Changing the interface parameters

Contents of the STB register

Bit 7: Is not used, is always set on Ø.
Bit 6: (MSS) Master Summary Bit
Result during checkup of the STB register with a mask (SRE register, see below).
Bit 5: (ESB) Event Summary Bit
Result during checkup of the ESR register with a mask (ESE register).
Bit 4: (MAV) Message Available
Is set on 1 if a current message of the FG 100 is requested at the output buffer.
Bit 3: Is not used, is always set on Ø.
Bit 2: Is not used, is always set on Ø.
Bit 1: Is not used, is always set on Ø.
Bit 0: Is not used, is always set on Ø.

SRE - SERVICE REQUEST ENABLE REGISTER

Meaning of the register

Various statuses and settings of the FG 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) $\vee$ (STB0 $\wedge$ SRE0)

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

Describing the register

The command *SRE <XXX> offers the possibility of initializing the SRE register with any mask. The value XXX has to be within the range of Ø to 255. Otherwise the error 134 VAL. OUT OF RANGE is reported.

Reading and deleting the register

The current contents XXX are saved in the output buffer by transmitting the command *SRE?.
The SRE register can set on Ø after the followings (except bit 7):

- Switching on the FG 100
- Transmitting the command *SRE 0
- Changing the interface parameters

7.2.2 Description of Errors

Contents of the fault register

When errors occur in the remote-controlled settings and measurements, they are saved with a code in the error register.

Reading and deleting the register

The contents of the error register can be called and deleted at any time by transmitting the command ERR?.
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 transmission of the command ERR? the interface command DCL has to be send.

7.2.2.1 DER - DEVICE ERROR REGISTER

Meaning of the register

The contents of the DER register specify the device error in the error register.

Reading and deleting the register

The contents of the register XXX within the range of 0 to 255 are filed in the output buffer by transmitting the command DER?.
The DER register can set on Ø after the following commands:

- Repeated use of the command ERR? (according to the number of errors)
- Initializing of status structure (*CLS)

Contents of the DER register

Bit 7: Is not used, is always set on Ø.
Bit 6: Is set on 1, if the calibration data are deleted.
Bit 5: Is set on 1, if the frequency value of the output signal is not set and cannot be set.
Bit 4: Is set on 1, if an external voltage of > ± 15 V is connected at the output and the output was switched off.
Bit 3: Is not used, is always set on Ø.
Bit 2: Is not used, is always set on Ø.
Bit 1: Is not used, is always set on Ø.
Bit 0: Is not used, is always set on Ø.

☞ **Note**

When a device error occurs the bit 3 (DDE) of the ESR register is set on 1.

7.2.2.2 Error Messages

Dependence of the error message

The error messages are dependent on the operating status and the type of error.

- On local control interface errors are displayed for only a short time. On remote control of the FG 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
0	-	Faultless operation
	DEVICE ERROR	**Device error**
31	RPP TRIPPED	Output overload with external voltage
98	INVALID PASSWORD	Wrong password
	DEVICE DEPENDENT ERROR	**Errors in the instrument function**
	INTERFACE ERROR	**Interface error**
	QUERY ERROR	**Query error**
120	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 on local control
134	VAL. OUT OF RANGE	Value is out of range
	COMMAND ERROR	**Command error**
151	ILLEGAL COMMAND	Unknown 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

7.3.1.1 Interface commands

REN
(Remote)

– Transition from local control to remote control

ASCII	Character (dec.)
HT	9

LLO
(Local Lock Out)

– Locking of the F4 button LOC [8]

ASCII	Character (dec.)
EM	25

GTL
(Go To Local)

– Transition from remote control to local control

ASCII	Character (dec.)
SOH	1

DCL
(Device Clear)

– Initializing for the communication protocol of the interface
– Resetting or initializing of the partial circuits

ASCII	Character (dec.)
DC4	20

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

7.3.1.2 Initializing the Instrument Settings

∗RST
(Reset)

– Resetting the FG 100 in the operating state

Frequency of the output signal:	1.000 kHz
Frequency fine tuning:	single
Output voltage V_{PP}:	1.00 V
Direct voltage offset of the output signal:	0.00 V
Output signal:	sinusoidal
Pulse duty ratio of the output signal:	50 %
Signal exit:	switched off
Synchronization output:	switched off
Sweep function:	switched off
Start frequency:	1.000 kHz
Stop frequency:	50.00 kHz
Period:	100 ms

☞ **Note** After switching on the FG 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.

7.3.1.3 Self-Diagnosis of the FG 100

***TST?**
(Test)
– Start of internal test and saving of result
where: 0 - test is successful
1 - test is not successful

7.3.1.4 Identification of the FG 100

***IDN?**
(Identification)
– Identification DIGIMESS,FG100,X,Y
where: X - production number or 0
Y - software version or 0

☞ **Note** The query *IDN? should be written at the end of the command line because subsequent data can be lost before transmission. Otherwise the error120 BAD USING QUERY is reported.

7.3.1.5 Initializing the Error Register

***CLS**
(Clear Status Byte)
– Resetting of ESR and STB register (except bit 4 - MAV)
ESE and SRE registers are not deleted.
– Initializing of the error structure (see 7.2.2)

7.3.1.6 Synchronization Commands

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

***OPC**
(Operation Complete)
– After completion of current operation bit 0 (OPC) in the ESR register is set on 1.

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

☞ **Note** While the commands *OPC and *OPC? are executed, the command *WAI does not have any effect.

7.3.1.7 Query of the Instrument Status

ERR?
(Error)
– Reading and resetting of the error messages (see 7.2.2)

DER?
– Contents of the DER register are filed in the output buffer.

***ESR?**
***ESE <XXX>**
***ESE?**
– Reading of the ESR register (see 7.2.1.1)

***STB?**
***SRE <XXX>**
***SRE?**
– Reading of the STB register (see 7.2.1.2)

7.3.2 Instrument Settings and Messages

7.3.2.1 Output Frequency

FREQ <X...X> – Frequency setting [Hz] within the range of 0.5 to 2.000E7 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the value is out of range the error 134 VAL. OUT OF RANGE is reported.

FREQ? – The set frequency value [Hz] is filed in the output buffer with the following format:
X.XXXE+0Y or ZX.XXE+0Y or ZXX.XE+0Y
where: Z - character from 1 to 9
X - character from 0 to 9
Y - character 0, 3 or 6

7.3.2.2 Output Level

LEVEL <X...X> – Level setting [V] within the range of 10.0E-03 to 10 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the value is out of range the error 134 VAL. OUT OF RANGE is reported.

LEVEL? – The set output level [V] is filed in the output buffer with the following format:
Z.XXE+00 to ZX.XE+00 or ZX.XE-03 to ZXXE-03
where: X - character from 0 to 9
Z - character from 1 to 9

7.3.2.3 Direct Voltage Offset of the Output Signal

OFFSET <X...X> – Setting the direct voltage offset of the output signal [V] within the range of -2.5 to +2.5 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the value is out of range the error 134 VAL. OUT OF RANGE is reported.

OFFSET? – The set direct voltage offset [V] is filed in the output buffer with the following format:
TZ.XXE+00
where: X - character from 0 to 9
Z - character from 0 to 2
T - character (-/Blank)

7.3.2.4 Wave Form

W_SINE – The sine output signal is selected.

W_SQUARE – The square-wave output signal is selected.

W_TRIANGLE – The triangular output signal is selected.

W_RAMPUP – The sawtooth output signal (Ramp Up) is selected.

W_RAMPDN – The sawtooth output signal (Ramp Down) is selected.

WAVE? – The current selection of the wave form at the output of the FG 100: W_SINE, W_SQUARE, W_TRIANGLE, W_RAMPUP or W_RAMPDN is filed in the output buffer.

7.3.2.5 Pulse Duty Ratio of the Output Signal

DCY <X...X> – Setting the pulse duty ratio of the output signal [%] within the range of 15 to 85 (in the free format).
The numeric argument is rounded up.

☞ **Note** If the value is out of range the error 134 VAL. OUT OF RANGE is reported.

DCY? – The set pulse duty ratio of the output signal [%] is filed in the output buffer with the following format:
ZX
where: X - character from 0 to 9
Z - character from 1 to 8

7.3.2.6 Switching State of the Signal Output

OUT_ON – The signal output is switched on.

OUT_OFF – The signal output is switched off.

OUT? – The current state of the signal output: OUT_ON or OUT_OFF is filed in the output buffer.

7.3.2.7 Square-wave Signal at the Synchronization Output

SOUT_OFF – The square-wave signal at the synchronization output is switched off.

SOUT_POS – The positive square-wave signal at the synchronization output is switched on.

SOUT_NEG – The negative square-wave signal at the synchronization output is switched on.

SOUT? – The current status: SOUT_OFF, SOUT_POS or SOUT_NEG is filed in the output buffer.

7.3.2.8 Sweep Function

SWP_OFF – The sweep function is switched off.

SWP_LIN – The linear sweep function is switched on.

SWP? – The current state of the sweep function: SWP_OFF or SWP_LIN is filed in the output buffer.

SWP_START <X...X> – Setting the lower frequency limit [Hz] within the range of 0.5 to 2.000E7 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the relationship between stop and starting frequency is bigger than 50, the error 134 VAL. OUT OF RANGE is reported.

SWP_START? – The set lower frequency limit [Hz] is filed in the output buffer with the following format:
X.XXXE+0Y or ZX.XXE+0Y or ZXX.XE+0Y
where: Z - character from 1 to 9
X - character from 0 to 9
Y - character 0, 3 or 6

SWP_STOP <X...X> – Setting the upper frequency limit [Hz] within the range of 0.5 to 2.000E7 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the relationship between stop and starting frequency is bigger than 50, the error 134 VAL. OUT OF RANGE is reported.

SWP_STOP? – The set upper frequency limit [Hz] is filed in the output buffer with the following format:
X.XXXE+0Y or ZX.XXE+0Y or ZXX.XE+0Y
where: Z - character from 1 to 9
X - character from 0 to 9
Y - character 0, 3 or 6

SWP_TIME <X...X> – Setting the period [s] within the range of 10E-3 to 60 (in the free format)
The numeric argument is rounded up.

☞ **Note** If the value is out of range the error 134 VAL. OUT OF RANGE is reported.

SWP_TIME? – The set period [s] is filed in the output buffer with the following format:
ZXE-03 or ZXXE-03 or Z.XXE+00 or ZX.XE+00
where: Z - character from 1 to 9
X - character from 0 to 9

7.3.2.9 Type of Frequency Fine Tuning

FADJ_SNGL – Single fine tuning of the set frequency value

FADJ_CONT – Continuous fine tuning of the set frequency value

FADJ_OFF – The fine tuning of the set frequency value is switched off.

FADJ? – The current type of frequency fine tuning: FADJ_SNGL, FADJ_CONT or FADJ_OFF is filed in the output buffer.

7.3.2.10 Password Input

PASSWORD <X...X> – Input the 8-digit password (in the free format) for access to the service functions

☞ **Note** If the password is wrong, the error 98 INVALID PASSWORD is reported. The following commands are ignored.

7.4 Programming Notes

Command line

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 181 INP. BUFFER FULL is indicated.

Separation and end characters

Commands and device messages have to be separated by a semicolon:

ASCII	Character (dec.)
;	59

An end character is at the end of every command line.

- During transmission of commands:

ASCII	Character (dec.)
LF	10

- During receiving of commands:

ASCII	Character (dec.)
CR + LF	13 + 10

Parameter separator characters

Certain commands or messages can contain parameters or results which are separated from the command by a parameter separator characters.

- During transmission of commands:

ASCII	Character (dec.)
SP	32
NUL	0
STX to BS	2 to 8
VT to DC3	11 to 19
NAK to CAN	21 to 24
SUB to US	26 to 31

- During receiving of commands:

ASCII	Character (dec.)
SP	32

7.5 Program Example (Q-Basic)

```
'************************************************************
'              THE EXAMPLE IN MICROSOFT Q BASIC
'           OF USING FG 100 WITH RS232C INTERFACE
'          Serial port is com1 and Bd rate is 9600
'      Generator settings - output frequency: 1.234 kHz
'                         - output level: 2 V
'                         - wave form: square-wave
'************************************************************

CLS

'**** Set up interface commands ****
      IDCL$ = CHR$(20): IREN$ = CHR$(9): ILLO$ = CHR$(25):
      IGTL$ = CHR$(1)

'**** Opening communication file ****
OPEN  "COM1:9600,n,8,1,CS30000,LF" FOR RANDOM AS #1

'**** Set up device and status reporting ****
PRINT #1, IDCL$; IREN$; ILLO$; "*RST;*CLS"

'**** Frequency setting ****
PRINT #1, "FREQ 1.234E+3"

'**** Output wave form setting ****
PRINT #1, "W_SQUARE"

'**** Output level setting ****
PRINT #1, "LEVEL 2"

'**** Signal output setting ****
PRINT #1, "OUT_ON"

'**** Set local mode ****
PRINT #1, "*OPC?"
INPUT #1, A$
PRINT #1, IGTL$

'**** Close statement ****
CLOSE #1

END
```

8 Maintenance

⚠ **Warning!**	The FG 100 must be separated from all power sources before maintenance work is carried out and before parts or fuses are repaired or replaced.
Care	Only use a soft wet rag with some soap suds or a soft rinse liquid for cleaning. Avoid acrid cleanser and solvents.
Maintenance	The FG 100 does not require special maintenance if it is used and handled correctly. Service work should only be done by trained personnel. In case of repairs it is vital to ensure that the design features of the FG 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).

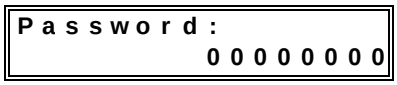
9 Appendix

9.1 List of all Instrument Messages

GENERATOR<FG100> PowerUp SelfTest	- Internal test starts
Testing: CPU ..... PASSED	- Faultless CPU test
Testing: CPU ..... ERROR	- Error during CPU test
Testing: BUS ..... PASSED	- Faultless BUS test
Testing: BUS ..... ERROR	- Error during BUS test
Testing: ROM ..... PASSED	- Faultless ROM test
Testing: ROM ..... ERROR	- Error during ROM test
Testing: RAM ..... PASSED	- Faultless RAM test
Testing: RAM ..... ERROR	- Error during RAM test
Testing: EEPROM ..... PASSED	- Faultless EEPROM test
Testing: EEPROM ..... ERROR	- Error during EEPROM test
Testing: DISPLAY ..... PASSED	- Faultless display test
Testing: DISPLAY ..... ERROR	- Error during display test
Testing:KEYBOARD ..... PASSED	- Faultless keyboard test
Testing:KEYBOARD ..... ERROR	- Error during keyboard test
Testing: SYSTEM ..... PASSED	- Faultless SYSTEM test
Testing: SYSTEM ..... ERROR	- Error during SYSTEM test
GENERATOR<FG100> Ver:2.00	- Version of the firmware

- Operational readiness of the device

- Warning with fault characteristics



- Password input

- Invalid password

- Signal output is overloaded with external voltage