TEXIO
Test and Measurement Solutions

INSTRUCTION MANUAL

FUNCTION GENERATOR

FG-274

B71-0173-11

CONTENTS

■ About a trademark, a registered trademark

A company name and the brand name mentioned in this instruction manual are the trademark or the registered trademark of each company or group in each country and region.

■ About this instruction manual

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In addition, the specifications of the product and the contents of this instruction manual are subject to change without notice for improvement.

■ About export

When export or ship the product to overseas, please confirm laws and regulations about the export.

USING THE PRODUCT SAFELY

■ Preface

To use the product safely, read this instruction manual to the end.
Before using this product, understand how to correctly use it.
If you read this manual but you do not understand how to use it, please ask us or your local dealer. After you read this manual, save it so that you can read it, anytime as requied.

■ Pictorial indication

This instruction manual and product show the warning and caution items required to safely use the product. The following pictorial indication and warning character indication are provided.

<Pictorial indication>	
	Some part of this product or the instruction manual may shows this pictorial indication. In this case, if the product is incorrectly used in that part, a serious danger may be brought about on the user's body or the product. To use the part with this pictorial indication, be sure to refer to this instruction manual.
 	If you use the product, ignoring this indication, you may get killed or seriously injured. This indication shows that the warning item to avoid the danger is provided. If you incorrectly use the product, ignoring this indication, you may get slightly injured or the product may be damaged. This indication shows that the caution item to avoid the danger is provided.

Please be informed that we are not responsible for any damages to the user or to the third person, arising from malfunctions or other failures due to wrong use of the product or incorrect operation, except such responsibility for damages as required by law.

USING THE PRODUCT SAFELY

■ Do not remove the product's covers and panels

Never remove the product's covers and panels for any purpose.
Otherwise, the user's electric shock or fire may be incurred.

■ Warning on using the product

Warning items given below are to avoid danger to user's body and life and avoid the damage or deterioration of the product.
Use the product, observing the following warning and caution items.

■ Warning items on power supply

- Power supply voltage
  There are two kinds of products 'AC100V exclusive use model' and 'Change of AC115V/AC230V model' depending on the rated voltage. However, if the attached power cord is specified for a rating of AC125 V, and it is used at a power supply voltage exceeding AC125 V, it must be changed. If the power cord is not changed to one for AC250 V specification, an electric shock or fire may be incurred.

- Power cord
  (Important) The attached power cord set can be used for this device only.
  If the attached power cord is damaged, stop using it and call the company or each sales office. If the power cord is used without the damage being removed, an electric shock or fire may be caused.

- Protection fuse
  If an input protection fuse is blown, the product does not operate. When the fuse is blown, the user cannot replace it. It is needed to remove the product's covers and rear panel, for changing a fuse. In such case, keep the case closed and consult us or your local dealer.

- Changing the power supply voltage
  When the rated power supply voltage is AC100V exclusive use, the rated power supply voltage cannot be changed. When the rated power supply voltage is AC115V or AC230V change, the rated power supply voltage can be changed to AC230V or AC115V. Use the product only at the rated power supply voltage indicated on the product. Otherwise, a fire may occur. (Please use the power supply code corresponding to a set voltage.)

USING THE PRODUCT SAFELY

■ Warning item on Grounding

If the product has the GND terminal on the front or rear panel surface, be sure to ground the product to safely use it.

■ Warnings on Installation environment

- Operating temperature and humidity

  Use the product within the operating temperature indicated in the “rating” temperature column. If the product is used with the vents of the product blocked or in high ambient temperatures, a fire may occur.

  Use the product within the operating humidity indicated in the “rating” humidity column. Watch out for condensation by a sharp humidity change such as transfer to a room with a different humidity. Also, do not operate the product with wet hands. Otherwise, an electric shock or fire may occur.

- Use in gas

  Use in and around a place where an inflammable or explosive gas or steam is generated or stored may result in an explosion and fire. Do not operate the product in such an environment.

  Also, use in and around a place where a corrosive gas is generated or spreading causes a serious damage to the product. Do not operate the product in such an environment.

- Installation place

  Avoid installing the product on inclined places or on places subject to vibration. Otherwise, the product may slip or fall down to cause damages or injury accidents.

■ Do not let foreign matter in

Do not insert metal and inflammable materials into the product from its vent and spill water on it. Otherwise, electric shock or fire may occur.

■ Warning item on abnormality while in use

In abnormal situations, such as “smoke”, “fire”, “abnormal smell” or “irregular noise” occur from the product while in use, stop using the product, turn off the switch, and remove the power cord plug from the outlet. After confirming that no other devices catch fire, ask us or your local dealer.

USING THE PRODUCT SAFELY

■ Input / Output terminals

Maximum input to terminal is specified to prevent the product from being damaged. Do not supply input, exceeding the specifications that are indicated in the "Rating" column in the instruction manual of the product.

Also, do not supply power to the output terminals from the outside. Otherwise, a product failure is caused.

■ Calibration

Although the performance and specifications of the product are checked under strict quality control during shipment from the factory, they may be deviated more or less by deterioration of parts due to their aging or others.

It is recommended to periodically calibrate the product so that it is used with its performance and specifications stable.

For consultation about the product calibration, ask us or your local dealer.

■ Daily Maintenance

When you clean off the dirt of the product covers, panels, and knobs, avoid solvents such as thinner and benzene. Otherwise, the paint may peel off or resin surface may be affected.

To wipe off the covers, panels, and knobs, use a soft cloth with neutral detergent in it. During cleaning, be careful that water, detergent, or other foreign matters do not get into the product.

If a liquid or metal gets into the product, an electric shock and fire are caused. During cleaning, remove the power cord plug from the outlet.

Use the product correctly and safely, observing the above warning and caution items. Because the instruction manual indicates caution items even in individual items, observe those caution items to correctly use the product.

If you have questions or comments about the instruction manual, ask us or E-Mail us

1. FEATURES

The FG-274 is Synthesized Function Generators which apply Direct Digital Synthesis (DDS) technique and can generate accurate and stable frequency with high resolution. The main signal source generate waveform including Sine wave, Square wave and Triangle wave.

The main features are listed as follows:

- ✧ The design of DDS and FPGA technology provide high quality waveforms.
- ✧ High frequency stability and accuracy: 20ppm.
- ✧ Low Distortion at -55dBc.
- ✧ Wide output frequency range: 4MHz
- ✧ Digital operation user interface
- ✧ Output Waveforms of Sine, Square and Triangle.
- ✧ Maximum frequency resolution of full range: 100mHz.
- ✧ TTL/CMOS output
- ✧ Variable DC offset control
- ✧ Output overload protection
- ✧ Store/Recall function

2. SPECIFICATIONS

1. Main Output	
Output Function	Sine, Square, Triangle
Frequency Range	0.1Hz to 4MHz (For Sine, Square) 0.1Hz to 1MHz (For Triangle)
Resolution	0.1Hz
Stability	±20ppm
Accuracy	±20ppm
Aging	±5ppm/year
Amplitude Range	10Vp-p (into 50Ωload)
Impedance	50Ω±10%
Attenuator	-20dB±1dB ×2
DC Offset	＜-5V to ＞5V (into 50Ωload)
Duty Control Range	20% to 80% (1Hz to 1MHz, for square wave only)
Duty Control Resolution	1%
Display	9-digit LED display
2. Sine Wave	
Harmonics Distortion	From Amplitude control at maximum position without any attenuation to its 1/10 of any combination setting, TTL/COMS off. ≦-55dBc, 0.1Hz to 200kHz ≦-40dBc, 0.2MHz to 4MHz
Flatness(at the maximum amplitude relating to 1kHz)	＜±0.3dB, 0.1Hz to 1MHz ＜±2.0dB, 1MHz to 4MHz
3. Triangle Wave	
Linearity	≦2%, 0.1Hz to 100kHz ≦5%, 100kHz to 1MHz

4. Square Wave	
Symmetry	±(1% of period + 4ns) to 0.1Hz to 100kHz
Rise or Fall Time	≦25ns at maximum output. (into 50Ωload)
5. CMOS Output	
Level	4V ± 1Vp-p to 14.5V ± 1Vp-p , adjustable
Rise or Fall Time	≦120ns
6. TTL Output	
Level	≧3Vp-p
Fan Out	20 TTL load
Rise or Fall Time	≦25ns
7. Store/Recall Function	
Size	10 groups of setting memories
8. General	
Power Source	AC100V ± 10%, 50/60Hz or AC115V/ 230V ± 10%, 50/60Hz
Ratings Power Consumption	17W (21VA)
FUSE (built-in ※1)	T 0.250A/250V x1 (AC100V model) T 0.125A/250V x2 (AC115V/230V model)
Operation Environment	Indoor use Altitude: up to 2000m Operating temperature: 0℃ to 40℃ (+32°F to +104°F) Temperature to satisfy the specification: 18℃ to 28℃ (+64.4°F to +82.4°F) Relative Humidity: Up to 80% at 0 to 35 ℃, Up to 70% at 35 to 40℃ Installation Category II Pollution Degree 2

Storage Temperature & Humidity	-10℃ to 70℃. (+14°F to 158°F) 70% (Maximum).
Accessories	Accessory code (BNC-ALLIGATOR) ×1 Instruction manual ×1 AC cable ×1
Dimension	266(W) × 97(H) × 293(D) mm
Weight	Approx. 3.1kg
9. Regulation	
EMC	EN 61326-1: 2006
Safety	IEC/EN 61010-1-3rd edition: 2010

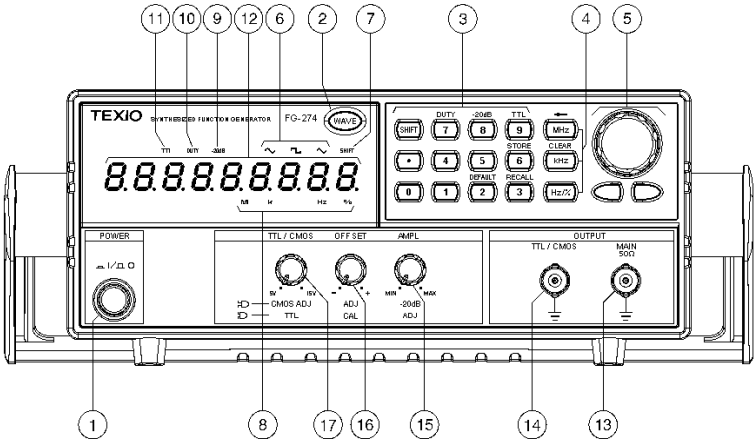
※1 When the fuse is blown, the customer cannot replace it. Contact to our distributor or to our sales office, for changing a fuse.

【note】Please pay attention to electric strength of connected equipment. A transitional output (in ratings) might go out of the terminal OUTPUT, when power supply is turned on and turned off.

【note】With square wave, jitter might be generated within the range of the specification of symmetry, except 50% duty cycle.

3. FRONT AND REAR PANELS

3.1. Front Panel



① **POWER button:**

Power on/off the instrument by pressing the button with the display on/off.

Note: Please pay attention to electric strength of connected equipment. A transitional output (in ratings) might go out of the terminal OUTPUT, when power supply is turned on and turned off.

② **Main Function keys:**

Press [WAVE] key to select main output waveform in the sequence of Sine, Triangle and Square. When the key is pressed, the corresponding waveform LED ⑥ will light.

③ **Entry keys:**

Press [0] to [9] and [.] keys to input value, then press a valid Units key to complete the setting.

Secondary Function keys:

The secondary function keys are activated by the combinations of SHIFT key and numerical keys labeled in blue.

- DEFAULT (SHIFT + 2 (DEFAULT)) will set this instrument to the default setup.
- STORE (SHIFT + 6 (STORE)) allows to store frequency and duty cycle setting up to 10 memories.
- RECALL (SHIFT + 3 (RECALL)) can recall the setup stored in this instrument.
- DUTY (SHIFT + 7 (DUTY)) allows to edit the duty cycle of square wave.

Note: The other functions are toggled between ON and OFF by repeating the same key combination operation.

For example, press SHIFT + 2 (DEFAULT) keys can recall the default value of the instrument.

④ **Units keys:**

Select one of the valid Units keys (MHz, kHz, Hz) MHz kHz Hz/% for the entered value of frequency and duty cycle (Hz/%).

⑤ **Modify keys:**

Press ◄ ► keys to shift the digit of input value.

Rotate the knob for increasing or decreasing that digit.

⑥ **Waveform LEDs:**

To indicate the current waveform of the main output.

⑦ **SHIFT key Status LED:**

To indicate the SHIFT key status. When this LED is on, the following numerical keys will be activated as the secondary function keys.

⑧ **Units LEDs:**

To indicate the units of frequency or duty cycle.

⑨ **Attenuator LED:**

When the [-20dB] LED is on, the –20dB attenuator is controlled by the [SHIFT] + [8 (-20dB)] keys are on.

⑩ **DUTY LED:**

When the DUTY LED is on, the parameter display will show the duty cycle and wait for editing (for square wave only).

⑪ **TTL/CMOS LED:**

When the [TTL] LED is on, that means the TTL/CMOS is enabled. (Always turn on when the MAIN output wave form is a square wave.)

⑫ **Parameter display:**

The 9 digits parameter display presents the parameter values and information, like counter frequency, duty cycle and save/recall.

⑬ **MAIN Output**

Main output with 50Ω output resistance.

⑭ TTL/CMOS Output

Press [SHIFT] + [9 (TTL)] keys, a TTL compatible waveform will be obtained from the output by pushing back and rotating the TTL/CMOS knob ⑰, and a CMOS compatible waveform (5Vp-p to 15Vp-p) will be obtained from the output while the TTL/CMOS knob is pulled out and rotated.

⑮ Output Amplitude Control with Attenuation operation

Turn the knob clockwise for increasing output level and invert for decreasing. Pull the knob out for an additional 20dB output attenuation. This attenuation will not change the LED status.

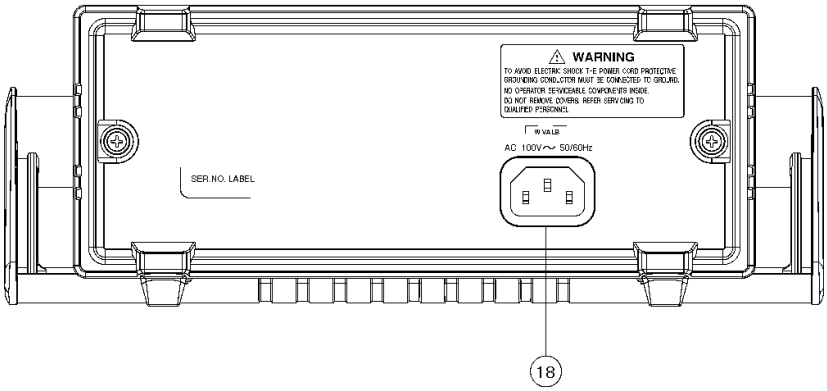
⑯ DC Offset Control

Pull out the knob to turn the DC offset of the waveform between –5V to +5V (into 50Ω load), turn the knob clockwise to set a positive going DC level waveform and turn reversely for a negative going DC level waveform.

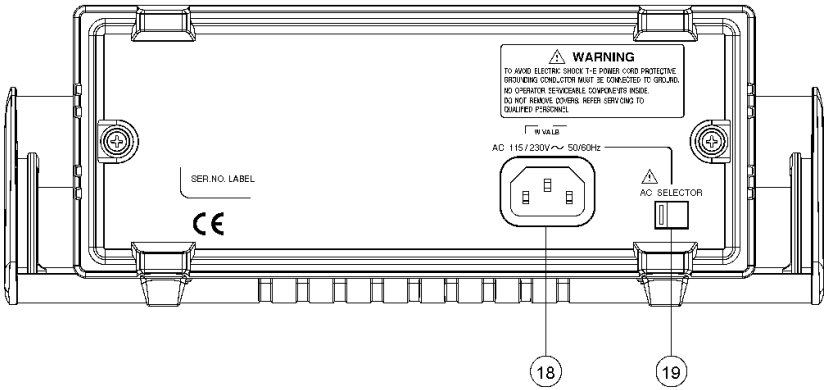
⑰ TTL/CMOS Selector

When the TTL/CMOS output is turn on, push back this knob to select the TTL as the output and pull out this knob to select CMOS. When the CMOS is selected, rotate the knob to set the CMOS level.

3.2. Rear Panel



AC100V exclusive use model



AC115V/230V change model

⑱ Power Entry Socket

AC input should be within the range of line voltage ±10%, 50/60Hz.

⑲ Line Voltage Selector

To switch the power line voltage between AC115V and AC230V.

4. OPERATION

4.1. The first time setup for the Instrument

1) Ensure that the voltage of main supply is compatible with this instrument. The selector on the rear panel states the required AC line voltage.（Only AC115V/230V change model）
2) Connect the instrument to main supply with the power cord.
3) Turn on the instrument, the model number will show up on the parameter display area first, then, the output is started by the factory default setting.

Note: Please pay attention to electric strength of connected equipment. A transitional output (in ratings) might go out of the terminal OUTPUT, when power supply is turned on and turned off.

4.2. Power-On Settings

Setting when factory is shipped and after initializing the memory

	Item	factory default settings	4.12.1) "DEFAULT" command	4.11 DELETE Setting
1)	Wave form	Sine	○	×
2)	Frequency	10.0000kHz	○	×
3)	Duty cycle	50%	○	×
4)	20dB ATT	OFF	○	×
5)	TTL/CMOS output	OFF	○	×
6)	Cursor position	0.1Hz digit	○	×
7)	STORE memory	All "nuLL" ※	×	○

When being turn on next time, the setting at turn off is succeeded.

For reset setting ,when factory is shipped. Execution DEFAULT command and Initializing the memory.

《Please refer to 4.12.1)“DEFAULT”，4.11 DELETE Setting》

※  There is no data in the memory.

4.3. Output Setting

1) Press WAVE key to select main output waveform. The waveform will be changed in the sequence of Sine, Square and Triangle waveform every time when the key is pressed, and the corresponding waveform LED ⑥ will light.
2) Set different duty cycle (not 50%) for Square waveform to get different Pulse width of the waveform (Please refer to 4.7 Duty Cycle Setting (for square wave only)).

4.4. Frequency Setting

1) Ensure that the Parameter display ⑫ is not in the Duty Cycle Setting mode, the DUTY LED ⑩ is off.
2) Key in the desired value of frequency.
3) Select a valid Unit key for the value.
4) In addition, you can use ◄ ► keys and rotating the knob ⑤ to adjust the desired main frequency value.

❖ ***Example of the Frequency Setting***

(1) Set the frequency to 250Hz. Press [2] [5] [0] and [Hz/%] .

(2) Change the frequency to 850Hz. Press [◄] or [►] to shift the flashing digit to “2” position, then change the digit to “8” by rotating the knob ⑤ clockwise.

Note: 1) The back space is possible, while inputting ten keys. Press [SHIFT] + [MHz (←)] .
And Press [SHIFT] + [kHz (CLEAR)] when all digits input can clear.

2) To be inputting ten keys is to push the unit key [MHz] , [kHz] , [Hz/%] , the setting is updated.
On the other hand, The setting is always updated while changing with the rotary encoder.

4.5. Amplitude and Attenuation Setting

1) Rotate AMPL ⑮ to control demanded output level.
2) Pull out AMPL ⑮ knob to get 20dB attenuation and press SHIFT + 8 (-20dB) keys can obtain an additional 20dB attenuation. Now, the -20dB LED ⑨ will light. It becomes 40dB when both keeping effective.

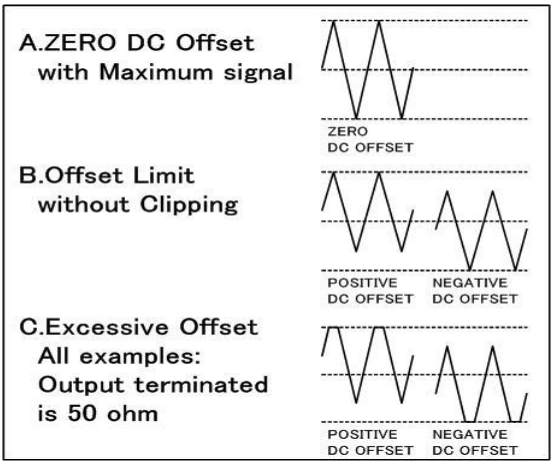
Note:
1) [-20dB] LED ⑨ is responding to [SHIFT] + [8 (-20dB)] attenuator only.
2) The functions are toggled between ON and OFF by repeating the to [SHIFT] + [8 (-20dB)] keys operation.

4.6. Offset Setting

1) Pull out the OFFSET ⑯ knob to activate the DC offset function, which allows to adjust the DC level of the waveform between -5V to +5V.
2) Rotate the knob clockwise to set a positive going DC level waveform and invert for a negative going DC level waveform.

Note: 1) However, signal added DC level is still limited to ±20V (no load) or ±10V (50Ω load). In case of over-voltage, the clip of waveform will appear as shown below.

2) If 20dB attenuator is turned on, the range of the offset changeability becomes small 20dB, too.



4.7. Duty Cycle Setting (for square wave only)

1) Press SHIFT + 7 (DUTY) keys until the DUTY LED ⑩ is on.
2) Key in the desired value of Duty cycle, then press Hz/% key to specify the value. Then the parameter display will return to display frequency.
3) In addition, you can use ◄ or ► keys and rotate the knob ⑤ to change the desired Duty cycle as well.

Note:
Any incomplete entry of the duty cycle will last for 5 seconds, then return to previous setting.

❖ ***Example of the Duty cycle Setting***

(1) Set the Square wave Duty cycle to 60%.

(2) Press [SHIFT] + [7 (DUTY)] keys, DUTY LED ⑩ is on, then press [6] [0] [Hz/%] .

(3) Change the Duty cycle to 30%.

(4) Use [◄] or [►] key to shift the flashing digit to "6" position, then change the digit to "3" by rotating the knob ⑤ counterclockwise.

Note:
The duty cycle limit : 20%～80%.
The frequency limit : 1Hz～1MHz.
（Though less than 1Hz can be set, It becomes DC output and High or Low is output. When you set less than 1Hz things except every 50% it compared with the duty cycle.）

4.8. TTL/CMOS Signal Output Function

This product provide a TTL/CMOS signal from Output ⑭. The frequency of TTL/CMOS output is identical to the main output frequency. If the frequency needs to be modified, please refer to 4.4 Frequency Setting.

1) Press SHIFT + 9 (TTL) button, The TTL LED ⑪ will light to indicate that the TTL output function is activated and a compatible TTL level signal will be obtained from TTL/CMOS Output BNC connector ⑭.

2) Pull out TTL/COMS knob ⑰, the CMOS output function is activated, then a compatible CMOS level signal will be obtained from TTL/CMOS Output BNC connector ⑭. Turn the TTL/COMS knob ⑰ to adjust to the desired CMOS signal level.

Note:

1) The main output waveform (Sine and Triangle wave) quality will be affected when TTL/CMOS is activated. So when a high quality Sine or Triangle wave is required, please turn off this function.
2) When you choose square wave, the TTL/CMOS function will always be activated.

❖ ***Example of the Setting of the TTL Output***

(1) To set the instrument:
- Frequency: 5kHz
- Signal type: TTL output

(2) Proceed the following steps:
- Set the main frequency to 5kHz (refer to the Setup of Frequency).
- Press SHIFT + 9 (TTL) keys to set TTL/CMOS output mode. The TTL LED ⑪ is on now.
- A 10kHz/TTL Level signal will be obtained from the connector ⑭.

Note:
1) Now the TTL/CMOS knob ⑰ is in the push back status.

2) The functions are toggled between TTL and CMOS by repeating the TTL/CMOS knob operation.

❖ ***Example of the Setting of the CMOS Output***

(1) To set the instrument:

- Frequency: 10kHz , Signal type: 10Vp-p CMOS output

(2) Set the main frequency to 10kHz (refer to 4.4 Frequency Setting).

(3) Press SHIFT + 9 (TTL) keys to set TTL/CMOS output mode. The TTL LED ⑪ is on now.

(4) Pull out and turn the TTL/COMS knob ⑰ to adjust the CMOS signal level to 10Vp-p.

(5) A 10kHz/CMOS Level signal will be obtained from the connector ⑭.

4.9. STORE Setting

The Store function allows to save the setup parameters (Frequency value and Duty cycle for square wave) of the instrument into its nonvolatile memory with the stored group number from 0 to 9, up to 10 groups totally.

1) Press SHIFT + 6 (STORE) keys, the message of “Store 0” will present on the parameter display ⑫.

（Then the parameter display will return to display frequency. when leaving it for about five seconds.）

2) Key in the group number from 0 to 9 . The message of “done” will present to complete the store function.

❖ ***Example of the STORE Setting***

(1) To save the parameters to the group 5.

(2) Press [SHIFT] + [6 (STORE)] keys first, then key in [5] .

4.10. RECALL Setting

The Recall function allows to retrieve the parameters (Frequency value and Duty cycle for square wave) saved in the nonvolatile memory.

1) Press SHIFT + 3 (RECALL) keys, the message of “Recall 0” will present on the parameter display ⑫.

（Then the parameter display will return to display frequency. when leaving it for about five seconds.）

2) Key in the group number from 0 to 9 . The message of "done" will present to complete the recall function. The setting should be changed accordingly.

❖ ***Example of the Setting of the RECALL***

(1) To retrieve the parameters from the group 6.

(2) Press [SHIFT] + [3(RECALL)] keys first, then key in [6] .

4.11. DELETE Setting

The Delete function allows to delete the parameter preserved in the nonvolatile memory.

1) Press [SHIFT] + [◄] + [►] + [SHIFT] + [8] + [4] + [2] + [6] + [kHz] keys sequentially, the deletion of the memory is executed, and the display returns to the frequency.

Note:

1) Only the content of the nonvolatile memory is deleted. There are no influences in a present frequency and the duty cycle, etc.
2) To return it to the state when the factory is shipped, the "Recall the default state of the instrument" along with "Delete Setting" should execute.

4.12. SHIFT Key and Function Keys

The SHIFT key is used to enable the secondary functions of certain function keys with blue printed letters. After pressing the button, the SHIFT LED ⑦ will light, only the keys labeled in blue are activated. Press SHIFT key again to release the secondary function.

❖ **The Secondary Functions**

1)	SHIFT + 2(DEFAULT)	Recall the default state of the instrument. The default state is defined as sine wave and 10kHz, all other functions are off.
2)	SHIFT + 6 (STORE)	Store the parameters (Frequency and Square wave duty cycle, etc.) to memory.
3)	SHIFT + 3 (RECALL)	Retrieve the parameters (Frequency and Square wave duty cycle, etc.) from memory.
4)	SHIFT + 7 (DUTY)	To get into Square wave Duty cycle enter mode.
5)	SHIFT + 8 (-20dB)	The 20dB attenuation is activated.
6)	SHIFT + 9 (TTL)	The TTL or CMOS level signal will output from the BNC ⑭.
7)	SHIFT + MHz (←)	Backspace.
8)	SHIFT + kHz(CLEAR)	A numeric input is cleared in all digits.

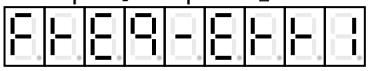
4.13. Error message of the instrument

The error message shows up when the illegal entry is performed. The categories of the error message is listed as the following table:

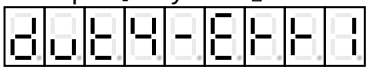
Error Code	Explanation (Limitation)
FrEq- Err1	Sine and Square wave Frequency over range.
FrEq- Err2	Triangle wave Frequency over range (1MHz).
FrEq- Err3	N/A
FrEq- Err4	Frequency over Resolution
duty- Err1	Not Square Waveform.
duty- Err2	Square wave Frequency over range when duty cycle is not 50:50 (1MHz)
duty- Err3	Duty cycle over range (80:20)
duty- Err4	Duty cycle over resolution (1%)

The display with the panel is as follows.

Example:『FrEq- Err1』



Example:『duty- Err1』



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