FC-1300

FREQUENCY COUNTER

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OPERATING MANUAL

Read First

1. In order for a long period of trouble-free use of the instrument, please read carefully.

2. Be sure to verify whether the line voltage setting matches the line voltage used.
   Use a fuse with the correct rating only.

3. Use 3 pin power cable to avoid any damage caused by floating voltage.

4. Precaution
   ☞ Note :
   If the equipment is used in a manner not specified by the manufacturer,
   the protection provided by the equipment may be impaired.

- Avoid placing this instrument in an extremely hot or cold place.

- Do not use this instrument after bring it in from the cold.

- Do not expose the instrument to wet or dusty environment.

- Do not place liquid-filled container, such as coffee cups on top of this instrument

- Do not use this instrument where it is subject to serve vibration.

- Do not use this instrument in strong magnetic fields, such as near motors.

- Do not place heavy objects on the case or block the ventilation holes.

- Do not leave a hot soldering iron near the instrument.

- Cleaning :
  To clean stained case, lightly rub the stained area with a soft cloth dipped in a neutral detergent.

  Never use highly volatile material such as benzene or paint thinner.

Safety Symbols

The following symbols on instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

Warning ⚠
:A warning calls attention to a procedure, practice or the like which. if not correctly performed or adhered to, could result in injury or loss of life.

Caution ⚠
:A Caution calls attention to a procedure, practice or the like which. if not correctly performed or adhered to, could result in damage to or the destruction of part or all of the equipment

⏚	Earth Ground to chassis
⏚	Protective Conductor Terminal
⏚	Frame or chassis TERMINAL
⚠	Caution, risk of danger
⎍ ⎓	Out / In position

How to use Manual

- This manual is contains information which must be followed to ensure safe operation as follows.

CONTENTS

CHAPTER 1. GENERAL INFORMATION

1.1 INTRODUCTION

The model FC-1300 is a RF Frequency Counter designed for system and bench use with max 9 digits resolution, featuring RS-232 (option GPIB interfaces) interfaces with full remote control capability. The frequency range is from 10Hz to 3GHz (option 5GHz) and High speed, High resolution measurements are possible. It is also equipped with the measurement functions for period, peak voltage and auto trigger, auto limiting test.
The model FC-1300 is suited for use in R&D sections and production line such as cellular phone, personal radios, pagers and other equipment.

1.2 FEATURES

FEATURES — Freq1 : Channel 1 Frequency Measure
Period1 : Channel 1 Period Measure
Vpeak : Channel 1 Peak Voltage Measure
Freq2 : Channel 2 Frequency measure
CH1 Input : 10Hz to 220MHz
CH2 Input : Standard 3GHz (5GHz option 3)
▲▼ ◀▶ : Trigger level, Math, Parameter setting
Trigger : Select the trigger level (Auto/ Manual)

CHAPTER 2. INSTALLATION

2.1 INTRODUCTION

The following steps help you verify that this equipment is ready for use.

2.2 CHECK THE LIST OF SUPPLIED ITEMS

- Verify that you have received the following items with your equipment.
  If anything is missing, contact your nearest distributer or EZ digital Electronics Co., Ltd directly.

BNC-BNC CABLE ---------- ☐
One power cord ---------- ☐
Spare Fuse ---------- ☐
User's Guide ---------- ☐

2.3 SELECT PROPER LINE VOLTAGE AND FUSE

Line Voltage selection and rated Fuse Replacement

Line Voltage	Input Voltage	Rated Fuse
115V	100 ~ 125V	250V T630mA L
230V	207 ~ 250V	250V T315mA L

2.4 PRE-INSPECTION

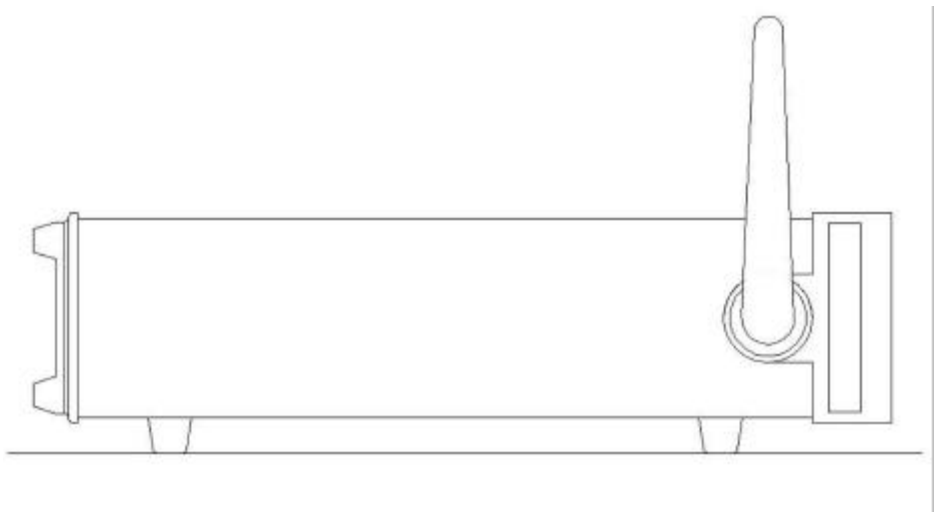
Careful inspection and calibration has been done before delivery of the equipment to customer.
Verify if there are any damage during transportation.

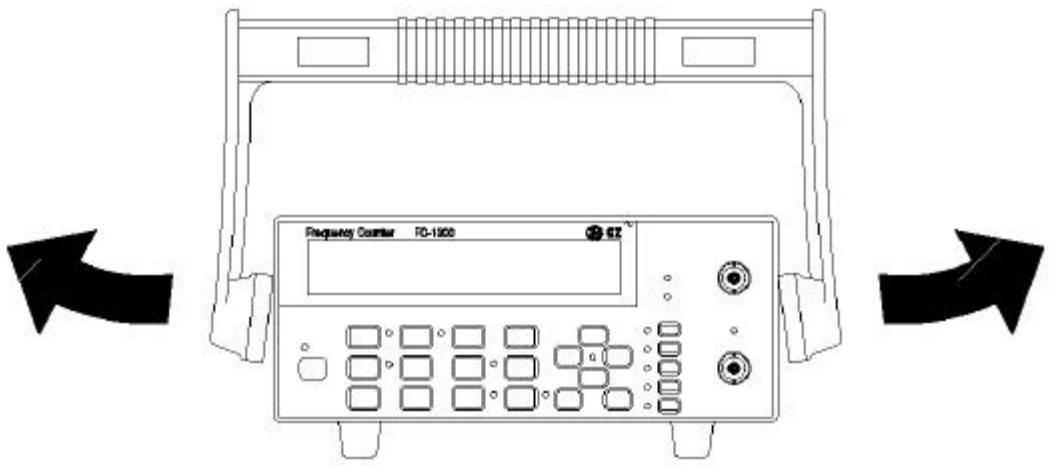
☞ OPERATION INSPECTION

When power switch is pressed, the equipment will display all annunciators for a second and then revision number(date) and come back to normal operation.
Press each function key and if the equipment displays the desired unit with short beep sound, it is normal.

2.5 TO ADJUST THE CARRYING HANDLE

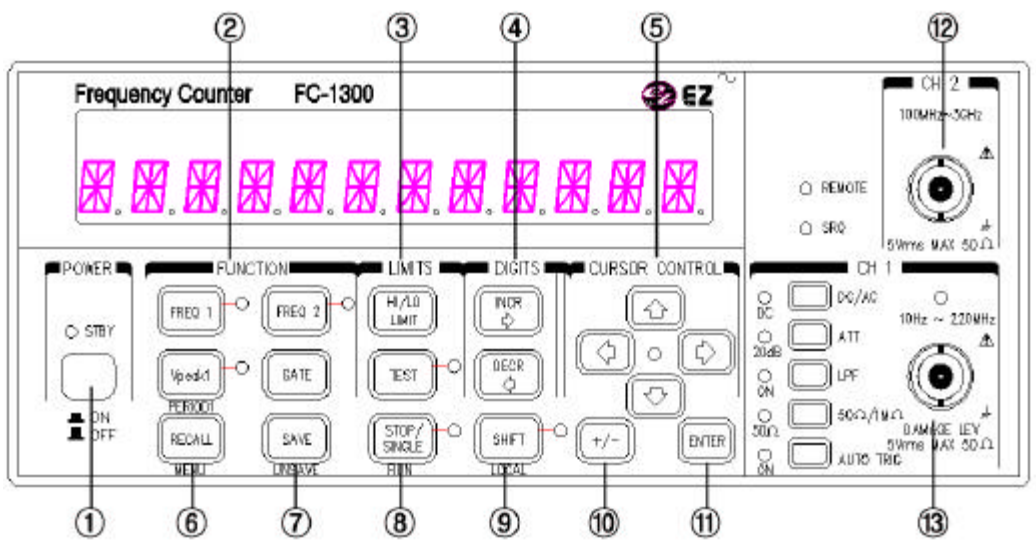
To adjust the position, grasp the handle by the sides and pull outward. Then, rotate the handle to the desired position. To rack mount the multimeter, rotate it to the vertical position and pull the ends outward to remove the handle like picture.





CHAPTER3. EASY OPERATION

3.1 FRONT DESCRIPTION



① POWER SWITCH : Operated by momentary.
Stand-by LED turns on when the key is off(OCXO OPTION 2)

② MEASURE MENU KEY

-. FREQ 1 : Select channel 1 Frequency.
The LED is on when key is selected.

-. FREQ 2 : Select channel 2 Frequency.
The LED is on when key is selected.

-. Vpeak : Measure peak voltage of ch1.

-. Gate : Select Gate time.

③ LIMIT MENU KEY

-. HI/LO LIMITS KEY : Set the HI/LO LIMIT of measure value.

-. TEST KEY : Select the limit test ON/OFF.
Fail go ON/ STOP and Sound ON/OFF mode.

④ DIGIT [⇦][⇨] : Increment or decrement digits.

⑤ CURSOR CONTROL KEY : Selection or data input.

⑥ RECALL KEY : Recall stored DATA

[SHIFT]+[RECALL] : Set GPIB address and RS-232 interface protocol

⑦ SAVE KEY : Store DATA

⑧ STOP/ SINGLE KEY

⑨ SHIFT KEY : Allows access to additional functions.

⑩ +/- KEY : Select the signs(+/-)

⑪ ENTER KEY : Terminate the numerical DATA inputs.

⑫ CH2 RF INPUT CHANNEL

: BNC CONNECTOR ; 5GHz option 3 (N connector)

⑬ CH1 RF INPUT CHANNEL : BNC CONNECTOR

-. DC/AC : Select DC/AC,

The LED is on when DC is selected.

-. ATT : Select 10dB attenuation.

The LED is on when ATT is selected.

-. LPF : Select 100kHz LOW PASS FILTER.

The LED is on when LPF is selected.

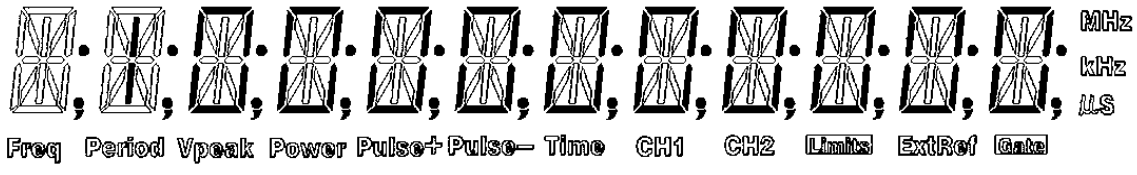
-. 50Ω/1MΩ : Select input impedance.

The LED is on when 50Ω is selected.

-. AUTO TRIG : Select AUTO/MANUAL trigger.

The LED is on when AUTO is selected.

3.2 DISPLAY DESCRIPTION



Freq : Frequency measure condition.

Period : Period measure condition.

Vpeak : Peak voltage of CH1.

Ch 1 : Select channel 1 input signal.

Ch 2 : Select channel 2 input signal.

Limit : Exceed the input limit DATA when limit function is ON.

ExtRef : The Display is on automatically when the time base is connected to the Ref in of rear panel.

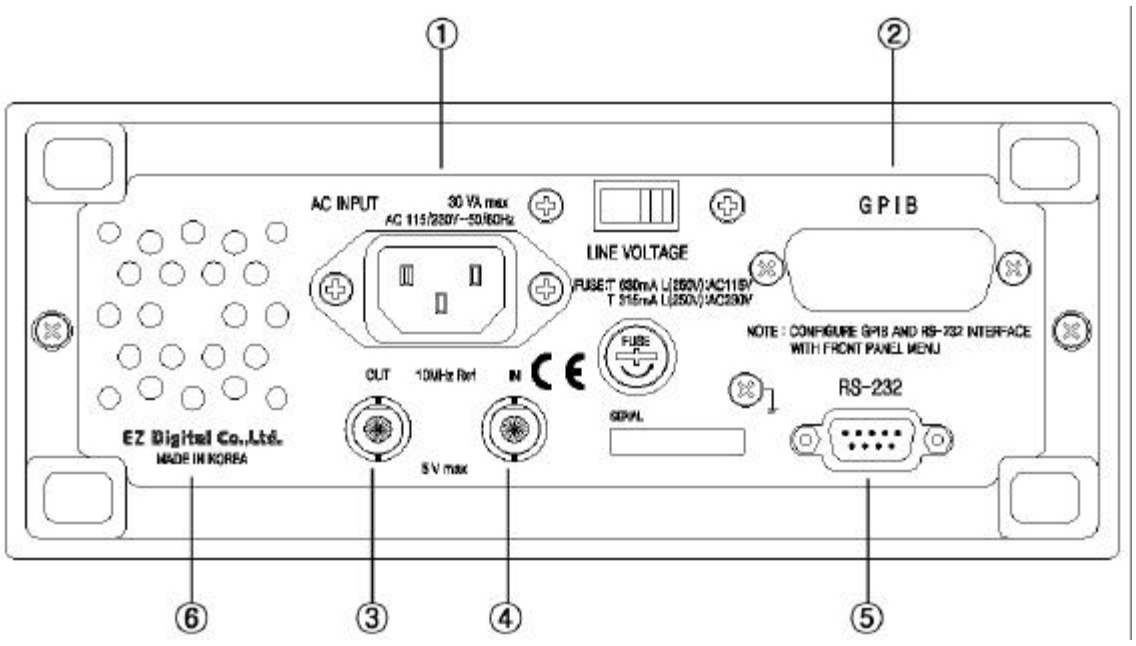
Gate : The gate display is ON when gate is open.

MHz : Data unit MHz

kHz : Data unit kHz

us : Data unit usec

3.3 REAR DESCRIPTION



① AC Input : AC input and line voltage selector.

② GPIB : GPIB Connector

③ Ref OUT : Output connector or internal time base

④ Ref IN : Input connector of external time base

⑤ RS - 232 : RS - 232 connector

⑥ FAN : OCXO option 2

CHAPTER 4. DETAILED OPERATION

4.1 FUNCTION MENU KEY

- FREQUENCY MEASUREMENT
  Connect the input signal to CH1 or CH2 and press the FREQ1(2) key. FREQ1(2) key select the frequency mode of operation for the channel input.
  When FREQ1(2) key is selected, The frequency at input is measured and displayed. Freq & ch1 or ch2 display annunciators turn on.

- PERIOD MEASUREMENT
  Connects the input signal to CH1 and press the SHIFT+ Vpeak1 key PERIOD key selects the period mode of operating for the channel 1 input when the period key is selected, the period of the signal at input1 is measured and displayed. Period & ch1 display annunciators turn on.

- PEAK VOLTAGE MEASUREMENT
  Connect the input signal to CH1 and press the Vpeak1 key. When Vpeak1 function is selected, Vpeak in CH1 is measured, displayed. And CH1 and Vpeak1 display annunicators turn on.

- GATE TIME SETTING
  It is possible to select the gate time(0.1sec, 0.5sec, 1sec, 10sec) when frequency or period is measured. Gate time is controlled by GATE key or GATE key + Arrow keys and press ENTER key, if not press ENTER key, The setting mode is selected automatically after 2secs.

4.2 LIMITS MENU KEY

Limits menu items.

- It is possible to set the upper and lower of measurement value.
  After selecting the HI/LO LIMIT key, set the value in Arrow keys and enter key.

- It is possible to control the limit test function.
  After selecting the limit test by pressing test key, select ON/OFF function by arrow keys and enter key.

- It is possible to stop the counter measurement when measurement values is out of limit values.
  After selecting fail by test key.
  Select fail : stop function with arrow keys and enter key.

- It is possible to continue the counter measurement when measurement values is out of limit values.
  After selecting fail by test key.
  Select fail ; go on function with arrow keys and enter key.

- We can hear Beep sound when measurement values in out of limit values. After selecting fail by test key,
  Select fail ; go on function with arrow keys and enter key.

4.3 DIGITS MENU KEY

INCR key and DECR keys can control numbers of digit when frequency or period is measured.

4.4 SAVE AND RECALL MENU KEY

- SAVE AND RECALL CONTENTS
  FUNCTION
  GATE TIME INTERVAL
  LIMIT PARAMETER
  RUN/SINGLE
  TRIGGER
  DC/AC COUPLING
  ATTENUATION
  FILTER
  INPUT IMPEDANCE

- SAVE
  After pressing SAVE key, select the SAVE number with arrow keys. And ENTER key, set up condition is stored in displayed number.

- RECALL
  After pressing RECALL key, select the number to be have been stored with arrow keys or the RECALL key.
  And Recall with ENTER key, if not ENTER key, It is recalled automatically after 2secs.

- UNSAVE (Clear)
  After pressing SHIFT + SAVE key, select the number to have been stored with arrow keys and un-save with ENTER key.

4.5 MEASUREMENT CONTROL KEY

The measurement is stoped when STOP/SINGLE key is pressed, and change the single mode.
When SHIFT + STOP/SINGLE is pressed, It is possible to measure continuously.

4.6 CH 1 INPUT CONTROL KEY

- DC/AC COUPLING SELECT
  After selecting the DC/AC function with DC/AC key, press the enter key.
  If not, it is selected automatically after 2secs.

- ATTENUATION SELECT
  After selecting the ATT function with ATT key, press the enter key.
  If not, it is selected automatically after 2secs.

- FILTER SELECT
  After selecting the FILTER function with FILTER key, press the enter key. If not, it is selected automatically after 2secs.

- INPUT IMPEDANCE SELECT
  After selecting the IMPEDANCE function with 50Ω/1MΩ key, press the enter key. It is selected automatically after 2secs.

- TRIGGER SELECT
  It is possible to control auto trigger.

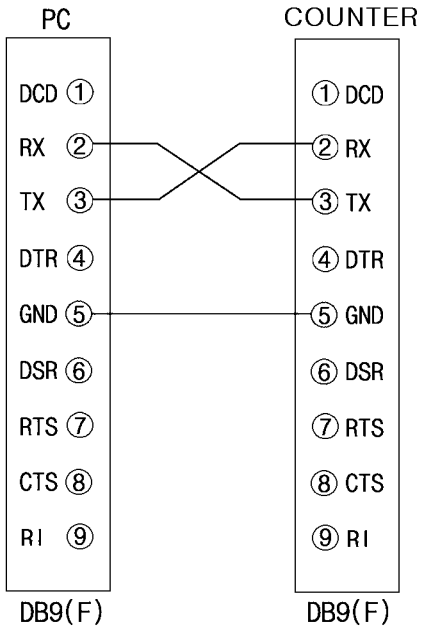
- TRIGGER LEVEL CONTROL
  It is possible to control the level with AUTO TRIGGER key, arrow keys.

CHAPTER 5. REMOTE CONTROL

5.1 RS-232 INTERFACE

- Connect to RS-232 interface with 9P serial connector of the rear panel.
  The protocol in using front menu key are as follows:
  · BAUD RATE : 300, 1200, 2400, 9600 , 19200 bps
  · PARITY : NONE, EVEN, ODD
  · START Bit : 1 · STOP Bit : 2

- Computer connection
  The computer is DTE (Data Terminal Equipment).
  DTE-DTE interface cable (crossover cable) see diagram.



RS-232 CONNECTION CABLE

- CONTROL COMMAND
  This equipment use SCPI(Standard Command for Programmable Instruments) language based on ASCII.
  Contact us if you need more information.

CHAPTER 6. SPECIFICATIONS

6.1 SPECIFICATIONS

FC-1300 Frequency Counter	
CHANNEL 1	
Frequency range	10Hz ~ 220MHZ
Resolution	9 digits/sec
Sensitivity (impedance: 50Ω)	100kHz ~ 100MHz : ≥ -20dBm (22 mVrms) 100MHz ~ 220MHz : ≥ -13dBm (50 mVrms)
Max input level	5Vrms MAX
Input conditioning	Impedance : 1MΩ or 50Ω Coupling : AC or DC LPF : 100kHz, switchable Attenuator : ×1 or ×10
Trigger level	Auto Trigger : Set level by percent of Signal level Manual Trigger :Set level by absolute voltage
Measurements	Period (usec), peak voltage (± 5V max, 0.01V step)
CHANNEL 2	
Frequency range	100MHz ~ 3GHz
Resolution	9digits/sec
Sensitivity	100MHz ~ 2GHz : ≥ -32dBm 2GHz ~ 3GHz : ≥ -25dBm
Max input level	5Vrms MAX
Analysis	Automatic limit testing
Gate time	0.1sec, 0.5sec, 1sec, 10sec selectable

Time base Internal External	Frequency : 10MHz Stability : Standard : ±0.5ppm TCXO Frequency : 10MHz Input level : 0.2Vrms ~ 5Vrms @ impedance 1kΩ
Interface	RS-232C, GPIB (Option 1)
Power	115/230 VAC ± 10% , 50/60Hz , 30 VA
Size and Weight	100mm(H) × 210mm(W) × 350mm(D), 3.6kg
Option	Option 1 : GPIB Interface Option 2 : High stability OCXO (5×10^{-8}) Option 3 : 5GHz channel
Environmental Conditions	Indoor Use Altitude up to 2000m Temperature 10℃ to 35℃ Relative Humidity 50% to 80% Installation (Over Voltage) Category II Pollution degree 2

CHAPTER 7. FRONT PANEL KEY TO SCPI COMMAND MAPS

7.1 SOME SCPI SYNTAX CONVENTIONS:

[ ] An element inside brackets is optional.
Note, the brackets are NOT part of the command and should NOT be sent to the Counter.

1 |2 Means use either 1 or 2.

<numeric_value> Means enter a number.

FUNCtion Means you MUST use either all the upper case letters or the entire word.
The lower case letters are optional.
For example, FUNC and FUNCTION are both valid. However, FUN is not valid.
(Note FUNCtion is used here as an example, but this convention is true for all SCPI commands.)

7.2 QUERYING PARAMETER SETTINGS

You can query the current value of most parameters by adding a question mark (?) to the command.
For example, the following command sets upper limit used in limit testing. "CALC2:LIM:UPP 1000000 HZ"
You can query the sample value by executing:
"CALC2:LIM:UPP?"

7.3 SCPI COMMAND TERMINATORS

A command string sent to the counter must terminate with a <new line> character.
The IEEE-488 EOI (end-or-identify) message is interpreted as a <new line> character and can be used to terminate a command string in place of a <new line> character. A <carriage return> followed by a <new line> is also accepted. Command string termination will always reset the current SCPI command path to the root level.

7.3.1 INPUT CHANNELS CONDITIONING KEYS TO SCPI COMMAND MAP

1. KEY - DC/AC - :INPut:COUPling AC | DC
2. KEY - ATT - :INPut:ATTenuation 1 | 10
3. KEY - LPF - :INPut:FILTer ON | OFF
4. KEY - 50Ω/1MΩ
   - :INPut:IMPedance <numeric_value>[OHM]
5. KEY - AUTO TRIG
   a. AUTO TRG
      - [:SENSe]:EVENt:LEVel[:ABSolute]:AUTO ON | OFF
   b1. LEV PCT
      - [:SENSe]:EVENt:LEVel:RELative <numeric_value> [PCT]
   b2. LEV V
      - [:SENSe]:EVENt:LEVel[:ABSolute] <numeric_value> [V]

7.3.2 INSTRUMENT CONTROL, MENU, RECALL, SAVE KEYS TO SCPI COMMAND MAP

1. KEY - MENU
   a. REV - *IDN?
   b. GPIB ADDR - No command
   c. BAUD
   - :STSTem:COMMunicate:SERial:TRANsmit:BAUD <numeric_value>
   d. PARITY
   - :STSTem:COMMunicate:SERial:TRANsmit:PARity [:TYPE] EVEN | ODD | NONE
   e. DIGIT DEC - No command
2. KEY - SAVE - *SAV <numeric_value>
3. KEY - RECALL - *RCL <numeric_value>
4. KEY - STOP/ SINGLE - :INITiate:CONTinuous OFF
   - :INITiate[:IMMediate]
5. KEY - RUN - :INITiate:CONTinuous ON

7.3.3 FUNCTION KEYS TO SCPI COMMAND MAP

1. KEY - FREQ 1
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]FREQuency [1]"
2. KEY - FREQ 2
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]FREQuency 2"
3. KEY - PERIOD 1
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]PERiod [1]"

4. KEY - VPEAK 1
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:MINimum [1]"
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:MAXimum [1]"
   - [:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:PTPeak [1]"

5. GATE
   - [:SENSe]:FREQuency:ARM:STOP:TIMer <numeric_value> [S]

7.3.4 LIMITS KEYS TO SCPI COMMAND MAP

1. KEY - HI/LO LIMIT

   a. UPPER

   -: CALCulate2:LIMit:UPPer[:DATA] <numeric_value> [HZ | S]

   b. LOWER

   -: CALCulate2:LIMit:LOWer[:DATA] <numeric_value> [HZ | S]

2. KEY - TEST

   a. LIM TEST - :CALCulate2:LIMit:STATe OFF | ON

   b. FAIL GO ON - :INITiate:AUTO ON | OFF

   c. SOUND - :CALCulate2:LIMit:SOUNd ON | OFF

7.3.5 DIGITS KEYS TO SCPI COMMAND MAP

1. KEY - INCR/DECR

   - :DISPLay[:WINDow]:TEXT:MASK <numeric_value>

7.4 FC-1300 COMMAND SUMMARY

:CALCulate2:LIMit:UPPer[:DATA] <numeric_value> [HZ | S]
Sets upper limit used in limit testing.
:CALCulate2:LIMit:LOWer[:DATA] <numeric_value> [HZ | S]
Sets lower limit used in limit testing.
:CALCulate2:LIMit:STATe OFF | ON
Sets the limit test enable.
:CALCulate2:LIMit:SOUNd ON | OFF
Disable or enable the beeper in limit testing.
:CONFigure[:VOLTage]:FREQuency [1]
:CONFigure[:VOLTage]:FREQuency 2
:CONFigure[:VOLTage]:PERiod [1]
:CONFigure[:VOLTage]:MAXimum [1]
:CONFigure[:VOLTage]:MINimum [1]
:CONFigure[:VOLTage]:PTPeak [1]
Configures instrument to perform specified measurement.
:DISPLay[:WINDow]:TEXT:MASK <numeric_value>
Sets the number of least significant display digits "masked" from the measurement result display.
:FETCh?
Queries the result. This Query returns the measurement taken by the :INITiate commands.
:INITiate:AUTO ON | OFF
AUTO ON enables the Counter to automatically stop measuring on a limit test failure. AUTO OFF disables the automatic stop.
:INITiate:CONTinuous ON | OFF
Sets the enable for continuously initiated measurements.

:INITiate[:IMMediate]
Causes the instrument to initiate measurements.
:INPut:ATTenuation 1 | 10
Sets input attenuation.
:INPut:COUPling AC | DC
Sets input coupling.
:INPut:FILTer ON | OFF
Allows a low pass filter to be inserted in the path of the measurement signal.
:INPut:IMPedance <numeric_value> [OHM]
Sets input impedance (50Ω or 1 MΩ).
:MEASure[:VOLTage]:FREQuency? [1]
:MEASure[:VOLTage]:FREQuency? 2
:MEASure[:VOLTage]:PERiod? [1]
:MEASure[:VOLTage]:MAXimum? [1]
:MEASure[:VOLTage]:MINimum? [1]
:MEASure[:VOLTage]:PTPeak? [1]
Configures instrument, initiates measurement, and queries for the result (i.e., provides complete measurement sequence).
:READ?
Initiates measurement, and queries for the result.
[:SENSe]:EVENt:LEVel[:ABSolute] <numeric_value> [V]
Sets the level at the center of the hysteresis window.
[:SENSe]:EVENt:LEVel[:ABSolute]:AUTO ON | OFF
Sets the "auto-trigger" enable.
[:SENSe]:EVENt:LEVel:RELative <numeric_value> [PCT]
Sets the percentage of the peak-to-peak range of the signal at which the instrument will auto trigger. 0-100%.

[:SENSe]:FREQuency:ARM:STOP:TIMer <numeric_value> [S]
Sets the gate time used in arming frequency, period measurements.
[:SENSe]:FUNCtion[:ON] "[:][XNONe:]FREQuency [1 | 2]"
Frequency on channel 1 or 2.
[:SENSe]:FUNCtion[:ON] "[:][XNONe:]PERiod [1]"
Period on channel 1.
[:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:MAXimum [1]"
Voltage Maximum on channel 1.
[:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:MINimum [1]"
Voltage Minimum on channel 1.
[:SENSe]:FUNCtion[:ON] "[:][XNONe:]VOLTage:PTPeak [1]"
Voltage Peak to Peak on channel 1.
STATus:PRESet
Clear all bits in the Questionable Data enable register.
STATus:QUEStionable:ENABle <enable value>
Enable bits in the Questionable Data enable register.
The selected bits are then reported to the Status Byte.
STATus:QUEStionable:EVENt?
Query the Questionable Data enable register.
:STSTem:COMMunicate:SERial:TRANsmit:BAUD <numeric_value>
Sets the baud rate of the RS-232C port.
:STSTem:COMMunicate:SERial:TRANsmit:PARity[:TYPE]
EVEN | ODD | NONE
Sets the parity of the RS-232C port.
power is turned on. [Stored in non-volatile memory]

:SYSTem:ERRor?

Query only. Queries the oldest error in the Error Queue and removes the error from the queue (first in, first out).

*CLS

Clear the Status Byte summary register and all event registers.

*ESE <enable value>

Enable bits in the Standard Event enable register.

The selected bits are then reported to the Status Byte.

*ESE?

Query the Standard Event enable register.

The counter returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register.

*ESR?

Query the Standard Event register. The counter returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register.

*IDN?

Read the counter's identification string.

*OPC

Sets the "operation complete" bits(bit 0) in the Standard Event after the command is executed.

*OPC?

Returns "1" to the output buffer after the command is executed.

*PSC {0| 1}

Power-on status clear. Clear the Status Byte and Standard Event register enable masks when power is turned on (*PSC 1). When *PSC 0 is in effect, the Status Byte and Standard Event register enable masks are not cleared when

*PSC?

Query the power-on status clear setting. Returns "0" (*PSC 0) or "1"(*PSC 1).

*RCL <numeric_value>

Restores the state of the Counter from a copy stored in local non-volatile memory (1 through 20 are valid memory registers).

*RST

Reset the counter to its power-on configuration.

*SAV <numeric_value>

Stores the current state of the Counter in local non-volatile memory (1 through 20 are valid memory registers).

*SRE <enable value>

Enable bits in the Status Byte enable register.

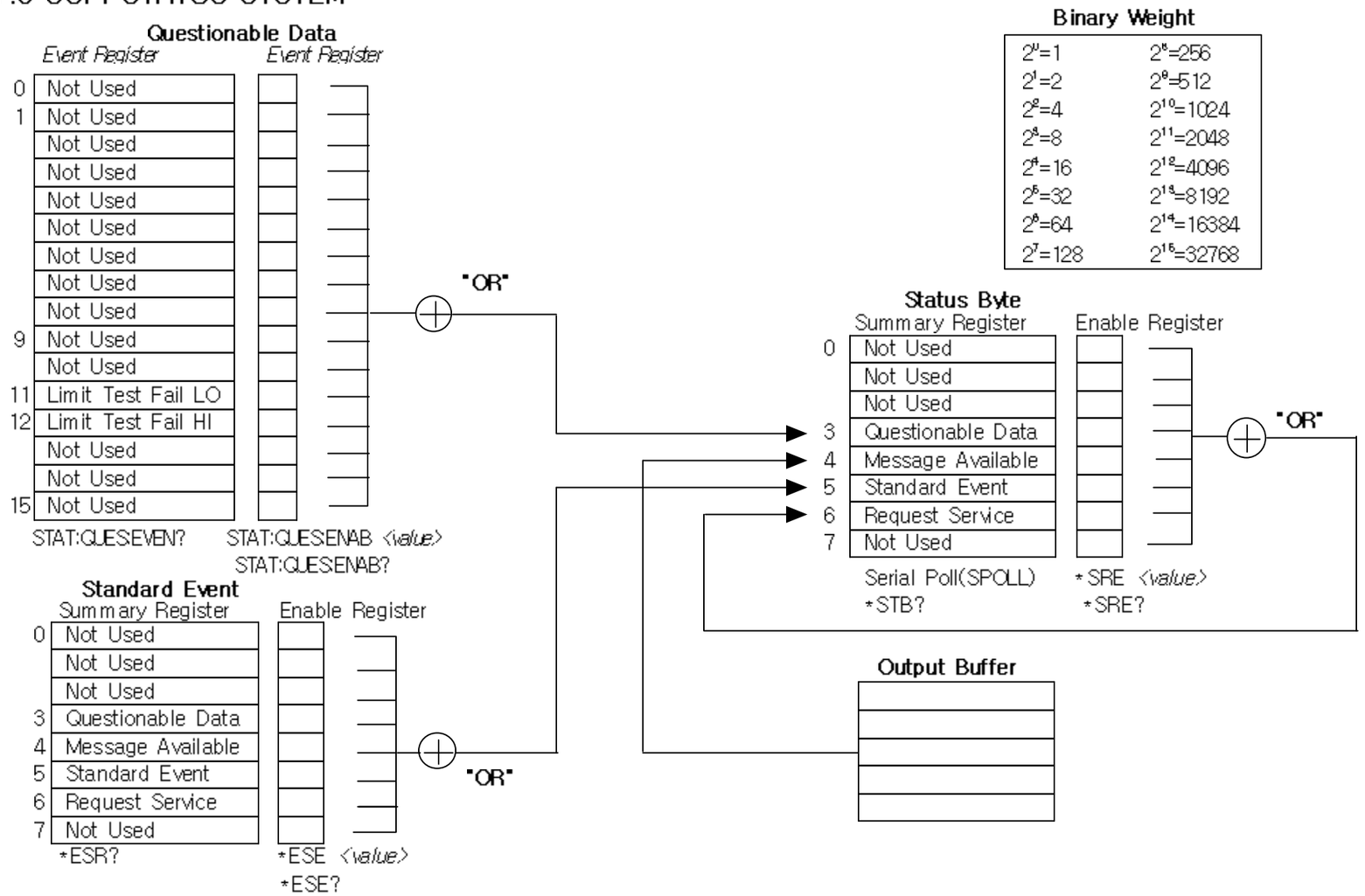
*SRE?

Query the Status Byte enable register. The counter returns a decimal value which corresponds to the binary-weighted sum of all bits set in the register.

*STB?

Query the Status Byte summary register. The *STB? command is similar to a serial poll but it is processed like any other instrument command. The *STB? command returns the same return as a serial poll but the "request service" bits(bit 6) is not cleared if a serial poll has occurred.

7.5 SCPI STATUS SYSTEM



7.6 THE SCPI STATUS MODEL

7.6.1 THE STATUS BYTE

The status byte summary register reports conditions from other status registers. Query data that is waiting in the counter's output buffer is immediately reported through the "message available" bit (bit 4). Bits in the summary registers are not latched. Clearing an event register will clear the corresponding bits in the status byte summary register. Reading all messages in the output buffer, including any pending queries, will clear the message available bit.

Bit Definitions - Status Byte Register

Bit	Decimal Value	Definition
0 Not Used	1	Always set to 0.
1 Not Used	2	Always set to 0.
2 Not Used	4	Always set to 0.
3 Questionable Data	8	One or more bits are set in the Questionable Data register (bits must be "enabled" in enable register).
4 Message Available	16	Data is available in the counter's output buffer.
5 Standard Event	32	One or more bits are set in the Standard Event register (bits must be "enabled" in enable register).
6 Request Service	64	The counter is requesting service (serial poll).
7 Not Used	128	Always set to 0.

The status byte summary register is cleared when:

- You execute a *CLS (clear status) command.
- Querying the standard event and questionable data registers will clear only the respective bits in the summary register.

The status byte enable register (request service) is cleared when:

- You turn on the power and you have previously configured the counter using the *PSC 1 command.
- You execute a *SRE 0 command.

The status byte enable register will not be cleared at power-on if you have previously configured the counter using *PSC 0.

7.6.2 THE STANDARD EVENT REGISTER

The standard event register reports the following types of instrument events: power-on detected, command syntax errors, command execution errors, self-test or calibration errors, query errors, or when an *OPC command is executed. Any or all of these conditions can be reported in the standard event summary bit through the enable register. You must write a decimal value using the *ESE (event status enable) command to set the enable register mask.

Bit Definitions - Standard Event Register

Bit	Decimal Value	Definition
0 Operation Complete	1	All commands prior to and including an *OPC command have been executed.
1 Not Used	2	Always set to 0.
2 Query Error	4	The counter tried to read the output buffer but it was empty. Or, a new command line was received before a previous query has been read.
3 Device Error	8	An Event bit which indicates an operation did not properly complete due to some condition of Counter.
4 Execution Error	16	An execution error occurred (see error numbers -211 through -230).
5 Command Error	32	A command syntax error occurred (see error numbers -101 through -158).
6 Not Used	64	Always set to 0.
7 Power On	128	Power has been turned off and on since the last time the event register was read or cleared.

The standard event register is cleared when:
- You send a *CLS (clear status) command.
- You query the event register using the *ESR? (event status register) command.

The standard event enable register is cleared when:
- You turn on the power and you have previously configured the counter using the *PSC 1 command.
- You execute a *ESE 0 command.

The standard event enable register will not be cleared at power-on if you have previously configured the counter using *PSC 0.

7.6.3 THE QUESTIONABLE DATA REGISTER

The questionable data register provides information about the quality of the counter's measurement results.

High/Low limit test result is reported.
Any or all of these conditions can be reported in the questionable data summary bit through the enable register. You must write a decimal value using the STATus:QUEStionable: ENABle command to set the enable register mask.

Bit Definitions - Questionable Data Register

Bit	Decimal Value	Definition
0 Not Used	1	Always set to 0.
1 Not Used	2	Always set to 0.
2 Not Used	4	Always set to 0.
3 Not Used	8	Always set to 0.
4 Not Used	16	Always set to 0.
5 Not Used	32	Always set to 0.
6 Not Used	64	Always set to 0.
7 Not Used	128	Always set to 0.
8 Not Used	256	Always set to 0.
9 Not Used	512	Always set to 0.
10 Not Used	1024	Always set to 0.
11 Limit Fail LO	2048	Reading is less than lower limit in limit test.
12 Limit Fail HI	4096	Reading exceeds upper limit in limit test.
13 Not Used	8192	Always set to 0.
14 Not Used	16384	Always set to 0.
15 Not Used	32768	Always set to 0.

The questionable data event register is cleared when:
- You execute a *CLS (clear status) command.
- You query the event register using STATus:QUEStionable:EVENt?.

The questionable data enable register is cleared when:
- You turn on the power (*PSC does not apply).
- You execute the STATus:PRESet command.
- You execute the STATus:QUEStionable:ENABle 0 command.

7.7 HOW TO PROGRAM THE COUNTER RESETTING THE COUNTER AND CLEARING THE GPIB INTERFACE

Before attempting any programming, it is a good idea to set the Counter to a known state.
The following command grouping shows how to reset the Counter. Before issuing these commands, execute a device clear to reset the interface and Counter.
Consult your interface card's documentation for how to issue a device clear since the device clear command will be specific to the interface you are using. Perform the following:

1. Issue a Device Clear
   (See your computer or interface card documentation for how to issue this command).
2. Issue the following commands:
   *RST
   *CLS
   *SRE 0
   *ESE0
   :STAT:PRES

Using the Standard Event Status Register to Trap an Incorrect GPIB command

The following command grouping shows how to use the Standard Event Status Register and the Status Byte Register to alert the computer when an incorrect command is sent to the Counter. The command *ESE 32 tells the Counter to summarize the command error bit (bit 5 of the Event Status Register) in the Status Byte Register. The command error bit is set when an incorrect command is received by the Counter.

The command *SRE 32 tells the Counter to assert the SRQ line when the Event Status Register summary bit is set to 1. If the Counter is serial polled after a command error, the serial poll result will be 96.

*ESE 32 Enable for bad command.
*SRE 32 Assert SRQ from Standard Event Status Register summary.

Using the *OPC Command to Assert SRQ

This method is recommended when the Counter is on the GPIB with many other instruments, any of which can assert SRQ. The commands *OPC, *ESE 1 and *SRE 32 are used to assert the SRQ line to alert the computer that the Counter has completed a measurement. It is up to the computer to use the serial poll command to determine which of the instruments on the bus requested service.

*ESE 1 Summarize OPC bit for Status Byte Register.
*SRE 32 SRQ when event summary bit is 1 .
Set up program to specify service routine and enable interrupt when SRQ is asserted.
:INIT Start measurements.
*OPC Enable OPC bit.

Program could be doing other things while waiting for SRQ. When SRQ occurs and the Counter has been identified as the cause of the SRQ, ask for the data:

:FETCH? Ask for measurement.

7.8 ERROR MESSAGES

-101 Invalid character
An invalid character was found in the command string.
You may have inserted a character such as #, $, or % in the command header or within a parameter.
Example) :INP:COUP#DC

-102 Syntax error
Invalid syntax was found in the command string.
You may have inserted a blank space before or after a colon in the command header, or before a comma.
Example) INP:ATT ,1

-103 Invalid separator
An invalid separator was found in the command string.
You may have used a comma instead of a colon, semicolon, or blank space or you may have used a blank space instead of a comma.

-108 Parameter not allowed
More parameters were received than expected for the command.
You may have entered an extra parameter, or you added a parameter to a command that does not accept a parameter.

-109 Missing parameter
Fewer parameters were received than expected for the command.
You omitted one or more parameters that are required for this command.
Example) INP:ATT

-113 Undefined header

A command was received that is not valid for this counter. You may have misspelled the command or it may not be a valid command. If you are using the short form of the command, remember that it may contain up to four letters.
Example) INPP:ATT 1

-121 Invalid character in number

An invalid character was found in the number specified for a parameter value.

-131 Invalid suffix

A suffix was incorrectly specified for a numeric parameter. You may have misspelled the suffix.
Example) EVEN:LEV 0 HZ

-138 Suffix not allowed

A suffix was received following a numeric parameter which does not accept a suffix.
Example) INP:ATT 1 HZ

-148 Character data not allowed

A discrete parameter was received but a character string or a numeric parameter was expected.
Check the list of parameters to verify that you have used a valid parameter type.

-151 Invalid string data

An invalid character string was received. Check to see if you have enclosed the character string in single or double quotes and that the string contains valid ASCII characters.
Example) FUNC "FREQ 1 (the ending quote is missing).

-213 Init ignored

An INITiate command was received but could not be executed because a measurement was already in progress.

-222 Data out of range

A numeric parameter value is outside the valid range for the command.

-224 Illegal parameter value

A discrete parameter was received which was not a valid choice for the command.

You may have used an invalid parameter choice.

Example) INP:FILT NONE (NONE is not a valid choice).

-350 Too many errors

The error queue is full because more than 20 errors have occurred. No additional errors are stored until you remove errors from the queue. The error queue is cleared when power has been off, or after a *CLS (clear status) command has been executed.

-410 Query INTERRUPTED

A command was received which sends data to the output buffer, but the output buffer contained data from a previous command (the previous data is not overwritten).

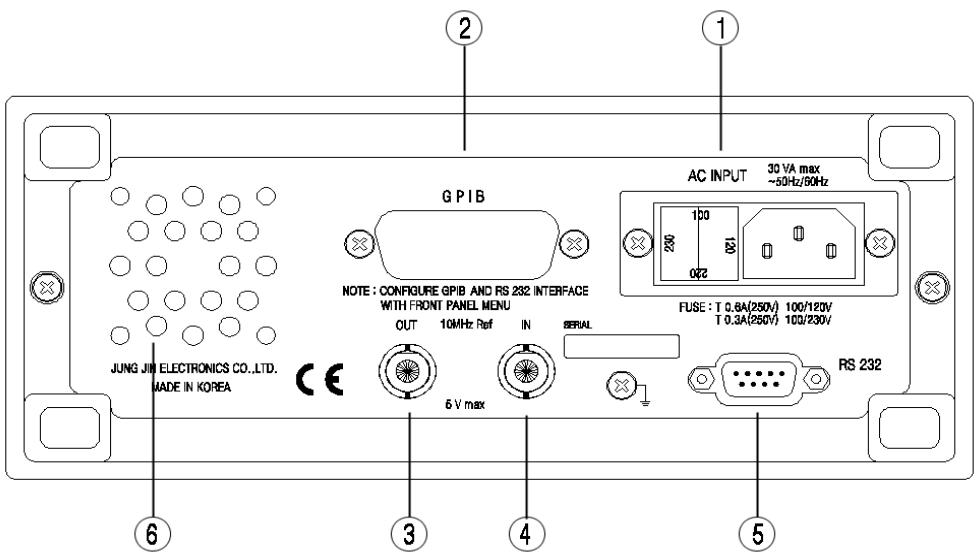
The output buffer is cleared when power has been off, or after a *RST (reset) command has been executed.

CHAPTER 8. Manual Updates

8.1 Rear design Updates

Fuse define as follows

Before : 100/120V (0.6A T), 220/230V (0.3A T)



After : 115V (630mA T), 230V (315mA T)