RFID High Frequency Tag Tester
Model: FQ-5X

User Operation Manual

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1. Overview

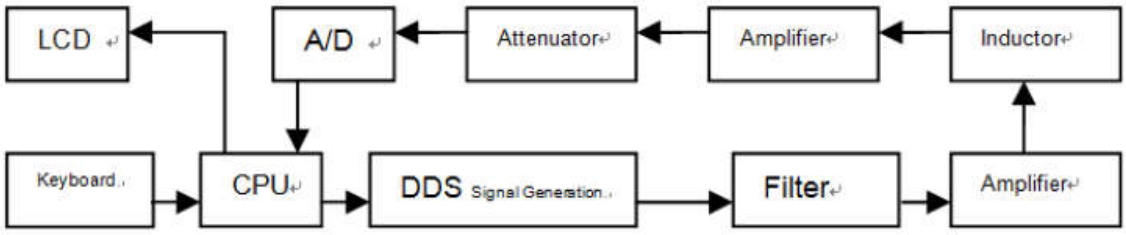
RFID HF Tag Tester (FQ-5X) is specially designed to test the resonance Frequency & Q value for all (Frequency in 1-30MHz) RFID cards & tags. Thanks the new inductive measurement technology, the testing results can be shown on LCD immediately by digital format which is easy to be read and known. Meanwhile, can tell whether the Frequency and Q value is in the qualified range or not.

This device supports various protocols for HF 13.56MHz, such as ISO 14443 Type A, B and ISO 15693, also 8.2 MHz for EAS. Also the result can be inputted to the computer via optional data port. It's a good and essential testing tool which can do many things in RFID industry!

2. Specification

- **Supported RFID Frequency & Protocol:** 13.56MHz ISO 14443 Type A, B and ISO 15693, also 8.2 MHz for EAS
- **Range of Frequency Testing:** 1MHz – 30MHz
- **Frequency Measurement Error:** 1 × 10-3 ± 1 character
- **Range of Q Value:** 0-999
- **Q Value Measurement Error:** ≤ 7%
- **Power Supply:** 220V±10%, 50Hz±2Hz, 10W
- **Environmental Conditions:** 0℃—+40℃, Humidity ≤80%(+40℃)
- **Outline Dimensions:** 240mm* 180mm *100mm (L*W*H)
- **Net Weight:** 1.4Kg
- **Optional Configuration:** PC Port, can upload the data to the computer

3. Working Principle



On the above block diagram, the core is a high-speed embedded microprocessor, which controls the digital frequency synthesizer to generate the RF analogue signal to send to the transmitter of the sensor. Then this signal will be converted to the digital signal and send back to the CPU to process data, identify, calculate and display.

4. Using

4.1 Preparations and precautions before using

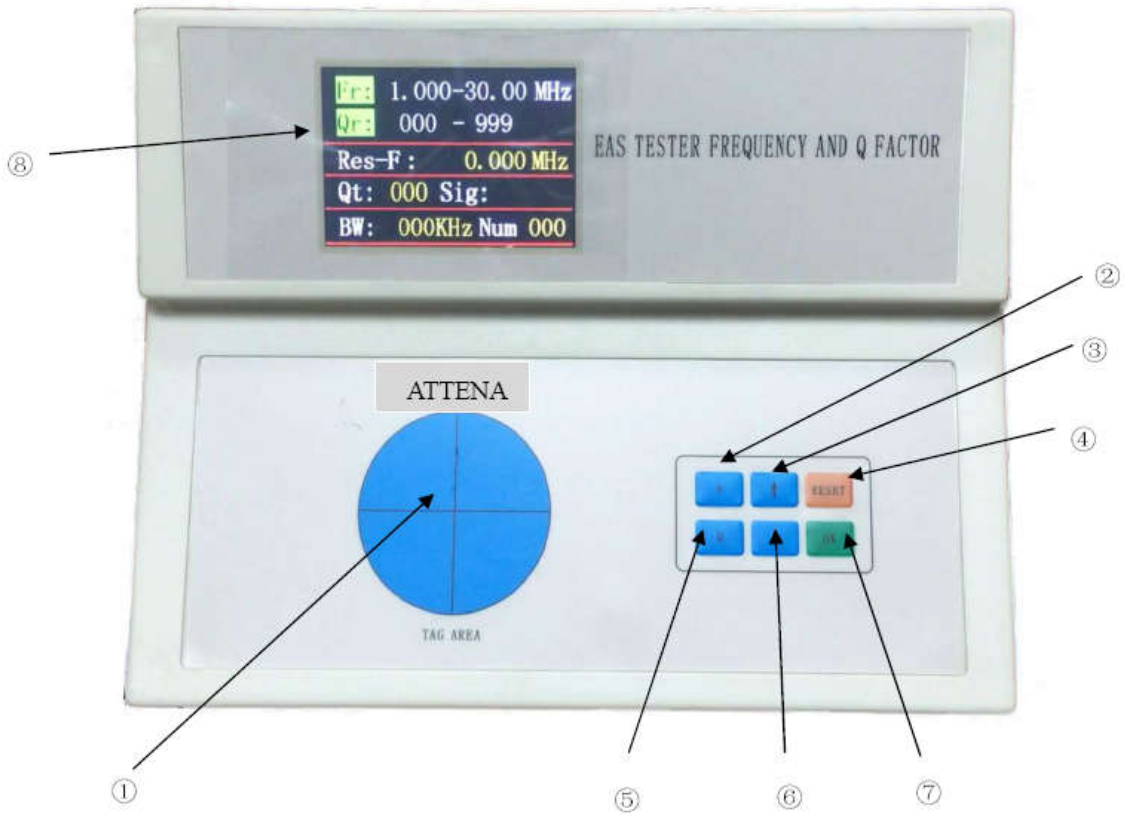
The operator should confirm that the 220V AC power input line is intact and grounding correctly and mounted electrical outlet box fuse. The fuse is 0.25A. The AC voltage should be oriented to the instructions provided for the rating of 220V, the deviation should be within ±10%. Then, open the power switch (power switch on the rear panel of the tester).

In the boot FQ-5X device or reset FQ-5X device, do not put RFID TAGS on the RFID AREA.

For the stable and precise work, before the tester should be warmed up for 3 minutes, in this period, RFID tags can not be placed on the RFID AREA. After this period, tester could be used in the ordinary mode.

4.2 Tester Panels

(a) Front panel buttons and display



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① **Testing plate**: Please test the RFID card or tag is placed in the center of the induction disk.

② **Frequency measurement range setting key**: The initial frequency range 1.000MHz - 30.00MHz.

- Press the F key (1st time): The search for the starting point of frequency is flashing. It can set the frequency of the search starting point.
- Again press the F key (2nd time): The end of the search frequency. It can be set to the end of the frequency of the search.
- Press the F key once more (3rd time): Set is ended, save the set value of the frequency range.

③ ↑ **Key**: Used to increment the starting point set the F, Q, or the end of the value. Press the ↑ key once: the frequency increments on 10 kHz or Q value increments on 10, long press can speed up the frequency step increment value.

④ **Reset button:** In case the tester crash down, may use Reset function to recover the preset frequency and Q values before crashed. **Before you press the reset key, you should remove the tags from the RFID AREA.**

⑤ **Q value measurement range setting key**: The initial Q value range is 0-999.
- Press the Q key (1st time): set the lower limit of the Q value.
- Press the Q key (2nd time): Set the Q value the upper of limit.
- Press the Q key (3rd time): Set is ended, saved the settings Q-range values.

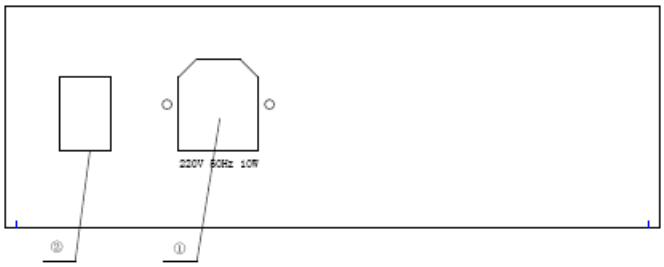
⑥↓ **Key**: Decreasing the set the F and Q starting point or end value.
Press the ↓ key once: frequency decreasing on 10 kHz or Q value decrease on 10, long press can speed up the frequency or decreasing value of the Q value.

⑦ **OK Button**: Open the Buzzer, show the Spectrum curve of tags, Restore factory settings.
1 Open the Buzzer: reference 6B
2 show the Spectrum curve of tags: reference 6H

3 Restore factory settings: Press F key (1st time)-> Press OK key(long time)-> Press F key (2nd time)-> Press F key (3rd time)

⑧ **Dot matrix LCD display.**

(b) Schematic description of the back panel

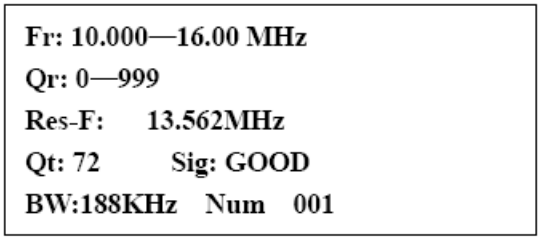


① AC voltage input socket and fuse holder.
② Power switch

5. Attention in process of measurement

5.1 In the boot FQ-5X device or reset FQ-5X device, do not put RFID TAGS on the RFID AREA.
5.2 For the stable and precise work, before the tester should be warmed up for 3 minutes, in this period, RFID tags can not be placed on the RFID AREA.
After this period, tester could be used in the ordinary mode.
5.3 When you need to speed up the test, you can narrow the frequency range.
For example: When you need test a tags in 13.56MHz, you can adjust to " F =10.00-16.00 MHz".
5.4 The center of RFID card or tag should be aligned with the center of the induction disk ①, also all surface of RFID card or tag should closely touch the surface of the induction disk is to reduce the measurement error.
5.5 When the quick measurement is not required, just put the RFID card or tag on the center of the disk, the tester will show resonant frequency and Q value automatically within one second.
5.6 If you want to compare & test the RFID tag's Frequency and Q value in qualified pre-setting range or not, Yes can do! The upper and lower limits of range could be set up by an operator. Then, operator uses one qualified RFID label to save its parameters as a sample (press OK key). If the measured values are in the range and judged as qualified tag, the tester gives a short sound signals, and the measured results will be shown on LCD screen as bellowing display. To remove the sample

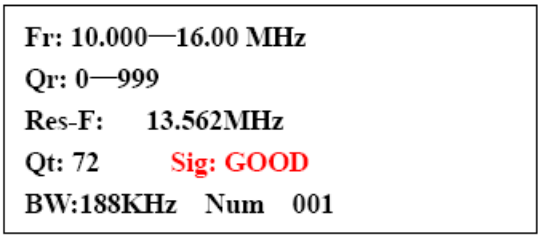
storage information, press RESET.



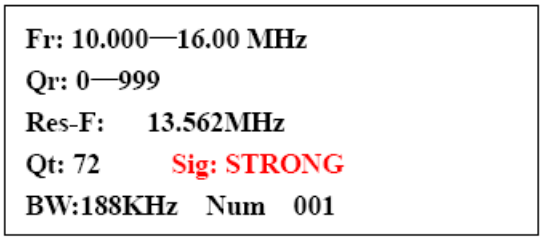
5.7 To reduce the influence of the internal inductive coil of the tester to a measuring result, suggest to put an additional transparent & insulating material between the testing plate and the tag, to get a little space between a tested RFID label and the tester.

5.8 four possible results of measurement

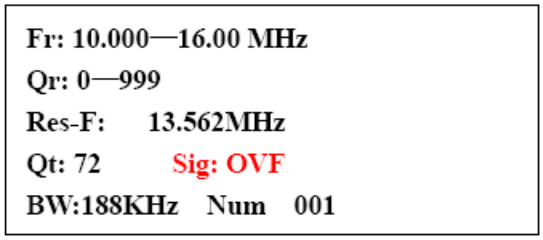
a) When LCD screen displays below information(Sig:GOOD), it means that measured RF signal intensity are in the best status.In this status, the value Q will be the most accurate.



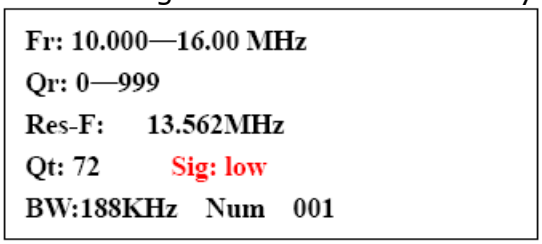
b) When LCD screen displays below information(Sig:STRONG), it means that measured RF signal intensity are STRONG. In this status, a little tags will be measured more accurate.



c) When LCD screen displays below information(Sig:OVF), it means that signal is too large, in overflow status. it will affect to test accuracy. You need to adjust the vertical distance between the RFID label and the testing plate until the LCD display will show (good or strong)status.



d) When LCD screen displays below information (Sig: low), it means that RFID test data signal is too small and may affect to test accuracy.

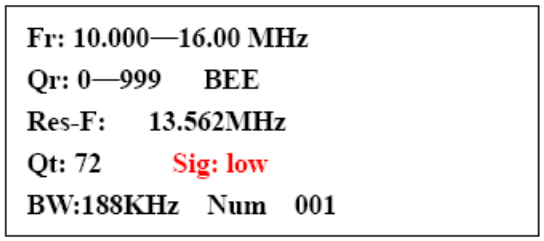


e) When the testing in GOOD or STRONG status, they all can be as a test reference.

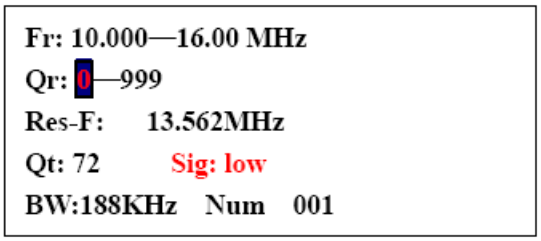
6. TFT LCD DISPLAY

A. Fr: 1.000—30.00 MHz The initial frequency range 1.000MHz - 30.00MHz.You can adjust the range to speed up the test

B. Qr: 0—999 BEE The initial Q range 0—999. BEE means the Buzzer is opened.When the tested tag parameters is in the range(Fr and Qr), it will ring.



Picture 1



Picture 2

As above picture-1,Res-F is in the rang of Fr, Qt is in the rang of Qr, and the bee is opened. The buzzer will ring.

How can I open the bee?

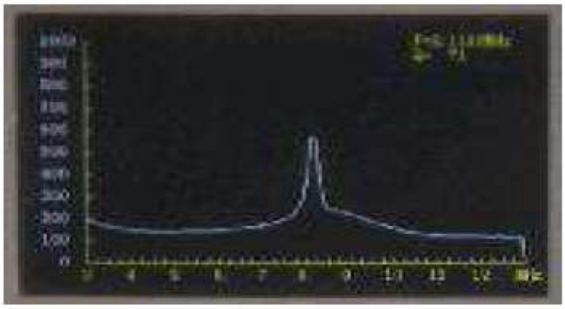
You can press Q key(1st time)->Picture 2-> press OK key-> press Q key(2st time)->press Q key. (3st time)

C. Res-F: Resonant frequency of the tested tags.

D. Qt: Q value of the tested tags.

E. Sig: Signal strength of tested tags, It is used to indicate that you need adjust the vertical distance between the measured tag and the antenna. It include four

possible:
F. BW: Effective bandwidth of the tested tags.
G. Num: Number of tested tags



Picture 3

H. As above picture-3,this is the Spectrum curve of tags. How can I show it?
When you are in picture-1 status, you can press OK key. Then you can get picture-3.

7. Maintenance

7.1 Working condition

7.1.1 The device should be placed in a dry and well ventilated place and kept clean, also do not wrap the tester in a plastic film.
7.1.2 The tester should not have the excessive vibration around, and also sources of high temperature and strong electromagnetic interference nearby.
7.1.3 The voltage should have stable 220V, 50Hz.

7.2 Troubleshooting

7.2.1 The device is not switched on. Please, check the power cord, socket and fuse.
7.2.2 If the fuse in intact, please open the case and firstly check the power connectors and then the control circuit.
7.2.3 An unstable power supply network could distort the measurement accuracy or even break the device. Please, check the plant power supply network before the running.

Note: if not familiar with the control circuit and maintenance methods, please send a nonworking tester to the nearest authorized center to repair.

8. Delivery Set

a) RFID High Frequency Tag tester FQ-5X – 1.
b) Tree-core power cord – 1.

c) Fuse 0.25A – 2.
d) User Manual – 1.

9. Initial Testing After Receiving

9.1 Checking Environment

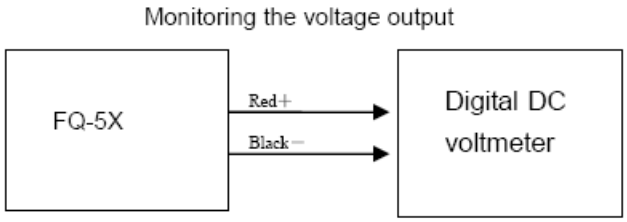
9.1.1 Ambient temperature: 20 ° C ± 2 ° C, relative humidity <50%.
9.1.2 Power supply: 220V ± 10V, 50Hz ± 1Hz.
9.1.3 To preheat the tester for more than 30 minutes.

9.2 Requirements before testing

9.2.1 The device should be in validated usage period
9.2.2 Preheating finished

9.3 Q-value accuracy test (may ignore such step for most users)

9.3.1 Tools: one Digital DC voltmeter, one RFID label and some instrument/tool to adjust height precisely. The connecting scheme is shown below.



9.3.2 Align the lifting instrument to the center of induct plate of the tester, put the RFID tag on lifting instrument, connect to a digital DC voltmeter. During the adjusting of the height, read the voltmeter's parameters.

9.3.3 Press the F key is to find the starting point of frequency.

9.3.4 Press the ↑ key and ↓ key to search for the resonant frequency of the RFID label (the instructions are in the lower right corner of the LCD screen), adjust the distance between the label and the sensor plate; If the lifting instrument is adjusted to the lowest distance and still cannot reach the indicated value in the 700-1000 range, you can remove the lifting device and place the RFID label directly on the sensor plate center.

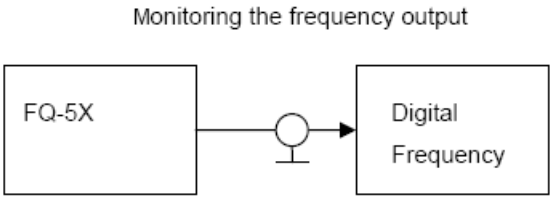
9.3.5 Press the ↑ key and ↓ keys, to find the maximum Vmax and record the resonant frequency f0 and the indicated value Vmax. Calculate the value of Vmax × 70% of the indicated value. Press ↑, the indicated value dropped to 70% Vmax – the frequency f1. Press the ↓ key to re-back to the resonant point, continue to press the ↓ key, so that the indicated value dropped to 70% Amax - f2. The Q value of the RFID

label is Q=f0÷(f1-f2).

9.3.6 Press the F key twice, the tester returns to automatic testing mode. Q value error, between the measured result and calculated result, should be ⩽ 7%.

9.4 Frequency measurement range testing (may ignore such step for most users)

9.4.1 Equipment: frequency counter. The connecting scheme is shown below.



9.4.2 BNC cable from the rear panel is connected to the frequency counter input.

9.4.3 Frequency counter technical requirements:
- Measuring range: 1000Hz-100MHz;
- Measurement error: <1×10-6;
- Measurement sensitivity: <30mV.

a) Test line requirements: high-frequency cable SYV-50-3.

b) Press the F key, then press ↑ and ↓ keys, the output signal frequency should be in 1MHz – 30MHz range.

9.5 The resonant frequency measurement error testing (may ignore such step for most users)

9.5.1 Equipments: digital frequency counter, RFID labels and some instrument to adjust height precisely. The connecting scheme is shown above.

9.5.2 Align the lifting instrument to the center of induct plate of the tester, put the RFID label on lifting instrument, connect to a digital frequency counter. During the adjusting of the height, read the frequency counter's parameters.

9.5.3 Press the F key is to find the starting point of frequency.

9.5.4 Press the ↑ and ↓ keys to search for the resonant frequency of the RFID label (indicated in the lower right corner of the LCD screen), and then record frequency f1 which given by digital frequency counter.

9.5.5 Press the F key twice, the tester returns to automatic testing mode. The difference between f1 and measured frequency by RFID tester should be consistent with the error requirement - 1 × 10-3 ± 1 character.