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Instruction manual

Horn Analyzer ST-10expert

for Series and Parallel resonance Resonators

Version 2.4

www.baer-elektronik.ch

Contents

Cursor control keys

Input keys

1 Cable connections

The instrument can be operated from 90-240VAC 50-60HZ.
The table mains part has an exit voltage of 12VDC 1.3A stabilized.
The BNC- plug is located at the HF- Exit.

Warning: ***1. The resonator unit is not allowed to be grounded!***
2. The horn must not be touched during the measurement. It must be able to oscillate freely!

2 Switch-on

1. Connect HF-Output with the converter.
2. Connect table mains part **ST1** (2P. Hol Plug 5.5mm/2.5mm).
3. Plug in mains plug.
4. Press 

mains switch.

3 First mask after switch-on

The different features are activated by the F-buttons. In the bottom row the different texts are dedicated to the buttons.

Changes have to be confirmed with 

.

Graphic 

:
Start of a graphical measurement

Menu 

:
The main menu is displayed

Analogue 

:
Start of an analogue measurement

Note:
The display lighting is reduced after 5 minutes.
With the use of the keyboard the lighting is reactivated!

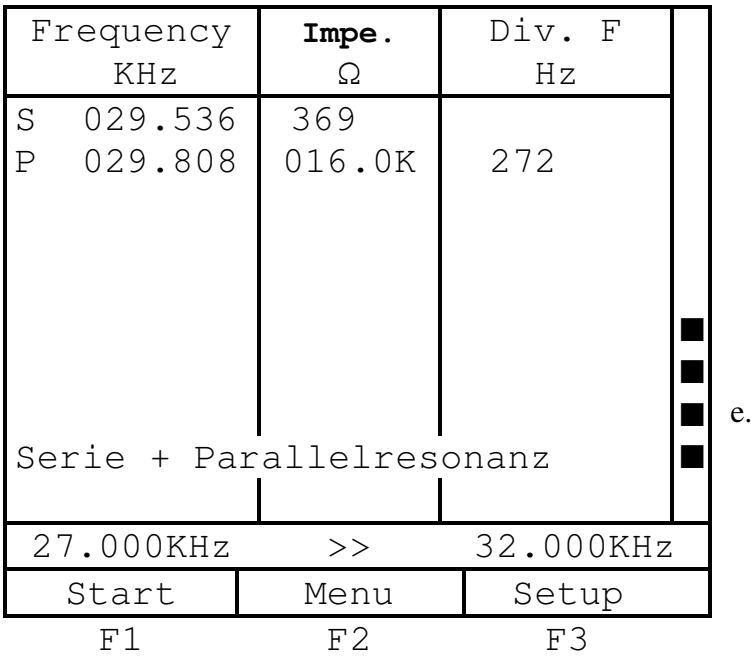
4 Analogue Measurement

The series and parallel resonance frequency is determined automatically.
The start and stop frequency has to be defined to wished range.

The measurement is started with the 

button.

4.1 The Mask on the display after the start:



Button
Start of the measurement

Button
The menu is displayed.
(See n.0)

Button
The measurement is aborted.

a. Frequency
Display of the resonance frequency
S= series resonance point
P= parallel resonance point

a. Performance

Display of the performance in Ohm.
Series resonance (Hz):
The smaller the impedance is the smaller is the power loss of the oscillating unit.
A good oscillating unit has low impedance.

Parallel resonance (KHz):
The bigger the impedance is the smaller is the power loss of the oscillating unit..
A good oscillating unit has high impedance.
A maximum of five resonance points are displayed. There is mostly only one resonance point within +/- 1000Hz in a normal oscillator.

b. Differential frequency
Parallel resonance – Series resonance = Differential frequency

c. Entry of the Start / Stop-frequency
Entry of the Start frequency (F-min. 100 Hz).
The search takes longer, if the frequency rage is chosen to big.

Ideal calibration: Start frequency = wished frequency -1000Hz
Stop frequency = wished frequency + 500Hz

For example wished working frequency 20`000 Hz
Start frequency = 19´000 Hz
Stop frequency = 20´500 Hz

Entry of the stop frequency (Max. 90'000 Hz).
The stop frequency always hat to be bigger than the start frequency.

The stop frequency can be entered by pressing the  button.

d. Serieresonanz

Select a Mode with the 

button.

- Series resonance
- Parallel resonance
- Series + Parallel resonance

e. Bar display
The bar display is running during the adjustment process.

Further menu items are shown with the cursor button downwards.

List>>	Range	Print
F1	F2	F3

Further resonances, if existent (list>>>), are shown with 

The areas 1-6, which are preset in **„menu -> range"**, can be chosen with 

.
E.g. 19.000 – 21.000 KHz

The resonance frequencies can be printed with 

.
These can be printed with a printer(RS232).

```
Tuning protocol    :   02.03.09  17.04.11
Frequency range    :   29000 ->  31000 Hz

  1  Resonance point
Series resonance   :   29.718 KHz    0383   Ohm
Parallel resonance :   30.024 KHz     015.0 KOhm
Difference frequency:       0306 Hz

  2  Resonance point
Series resonance   :   No Data
```

4.2 Setup Analogmode (Look at Chart Mode)

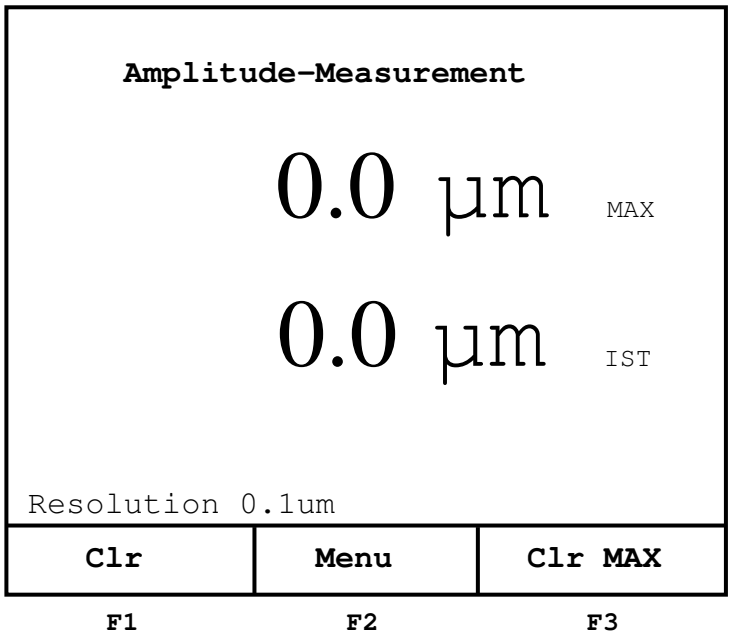
	Setup Analogue mode		
1.	Range		
2.	Limite	1500 Ohm	
3.	Print	ein	
	−	Analog	+
	F1	F2	F3

Amplitude measurement

The Amplitude can only be operated with our *digital gauge*.

Important:
Never switch on the ultrasound when the measuring sensor is on the catch!!
The digital gauge could be destroyed.

There are three Types available:
With 0.1µ , 0.5µ and 1 µ resolution.



a.

With 

the SHALL value is deleted.

With 

the MAX value is deleted.

With 

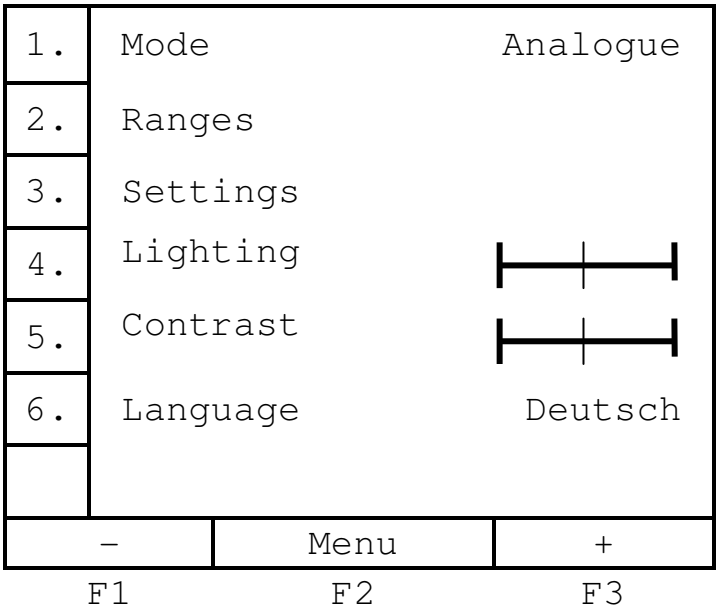
return to the main menu.

a. Resolution
Important:
The resolution must correspond with the connected *digital gauge*!

The resolution can be changed by using the  button.

The setting can be checked the following way:
If the sensor has a measurement range of 2mm, ca. 2500.0 µm must show up on the display, if the sensor is pressed to catch by hand.

5 Mainmenu



5.1 Mode

Available are:

1.	Mode	Analogue
		Amplitude
		Manuel
		Chart

The mode can be changed with F1 and F3.

Without affirmation with ENT, the chosen mode will start with F2.
But it will return to the old value after on/off.

If the mode shall be saved it has to be affirmed with ENT.

The chosen mode starts with F2.

5.2 Range Analogue mode

	Frequency Range
1.	14.000 – 16.000 KHz
2.	19.000 – 21.000 KHz
3.	29.000 – 31.000 KHz
4.	34.000 – 36.000 KHz
5.	39.000 – 41.000 KHz
6.	69.000 – 71.000 KHz

F-Start	Menu	F_Stop
F1	F2	F3

The range can be programmed arbitrarily.

The start frequency is entered with 

. It must be smaller than the stop frequency.

The start frequency is entered with 

.

With 

return to main menu.

Confirm with 

.

5.3 Settings

	Settings		
1.	Date	:	19.01.2009
2.	Time	:	10.00.01
3.	Day	:	Monday
4.	Baudrate	:	19200
5.	Cursor	:	8
6.	Flashing	:	0.5 sec
	–	Menu	+
	F1	F2	F3

5.3.1 Date
Date format = day, month, year

5.3.2 Time
Time format = hours, min, sec

5.3.3 Day

5.3.4 Baud rate
The baud rate is changed with F1 and F3.
There are three values available:

4.	Baudrate :	19200
		38400
		9600

5.3.5 Cursor Type
The type is changed with F1 und F3.
The height of the cursor can be adjusted.
There are eight types available.

5.3.6 Flashing time
The flashing time of the cursor can be chosen from 200ms to 1000ms.

5.4 Lighting

F1 button: darker

F3 button: brighter

F2 button: return to main menu

5.5 Contrast

F1 button: less contrast

F3 button: more contrast

Confirm with ENT .

F2 button: return to main menu

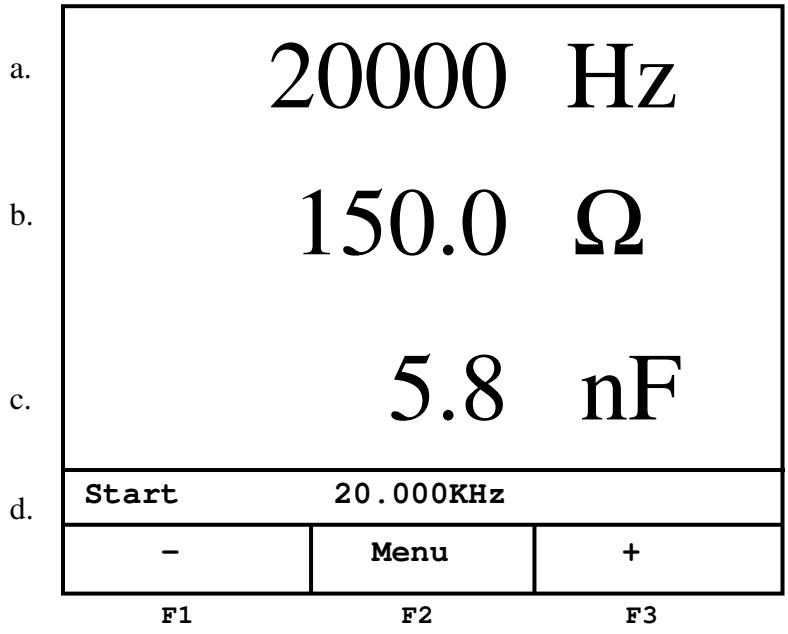
5.6 Language

The language can be changed between English and German with

F1 and F2 .

6.	Sprache	Deutsch
		English

6 Manual Adjustment



a. Display of the resonance frequency
b. Display of the performance in Ω or KΩ
c. Display of the capacity of the converter
d. Entry of the start frequency

Entry of the start frequency 100 - 90000Hz.

After the confirmation with 

the frequency is shown on the display in position a.

The frequency is decreased by 1 Hz with 

.

The frequency is increased by 1 Hz with 

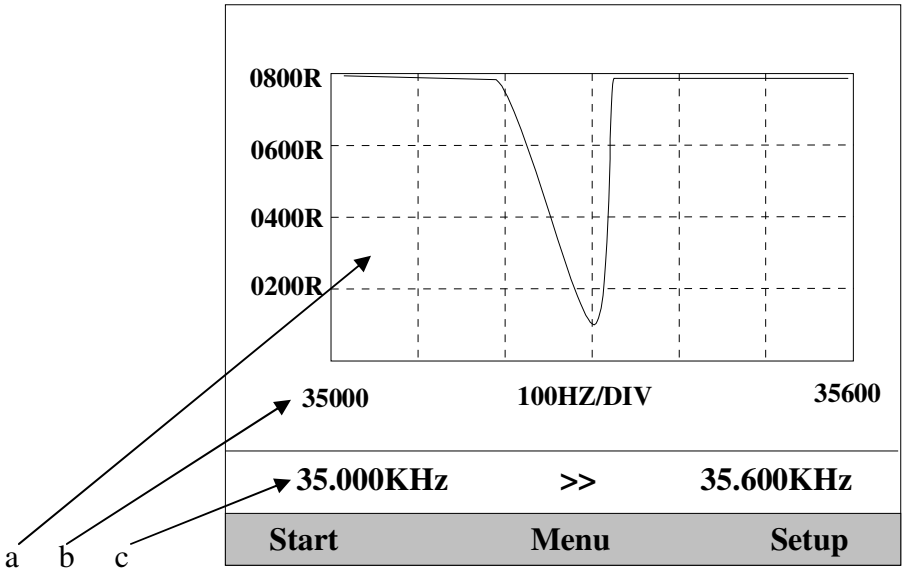
.
The display will increase automatically if the button is pressed longer than 2 seconds.
The appropriate performance is calculated continuously and displayed on position b.

7 Graphical Measurement

With the graphical measurement the impedance is shown in ration to the frequency. Depending on the settings this interpretation is not as accurate as the analogue measurement.

The frequency or the impedance may vary compared to the analogue measurement.

7.1 Mask on the Display after the Start:



Start
Start of the measurement.
The start frequency is always smaller than the stop frequency.
If the entry is false, the stop frequency is always set to „Start frequency+50“.

Menu
Return to main menu.

Setup
Miscellaneous settings for the graphical mode.

a. Graphical record of the impedance in ratio to the frequency.

b. Display of the Start / Stops- Frequency and Hz/DIV

c. Start / Stop- Frequency
Entry of the Start and Stop-Frequency.

Entry of the Stop-Frequency max. 200.000KHz.
The entry position is shown by the flashing of the cursor.

Next menu

7.2 F1- F2 - F3 Funktionen

Frequency KHz	**Impe.** Ω	Div. F Hz	
S 029.536 P 029.808	369 016.0K	272	
027.000KHz	>>	032.000KHz	
List	Range	Print	
F1	F2	F3	

= list
The found resonance points are shown in a list.
It's the same presentation as in the analogue mode!

The areas 1-6, which are preset in the „menu -> setup graphic mode mask 2", can be chosen with 

.
E.g. 019.000 – 021.000 KHz

The resonance frequencies can be printed with 

.
They can be printed with a matrix printer (RS232).

The graphic is displayed again with 

.

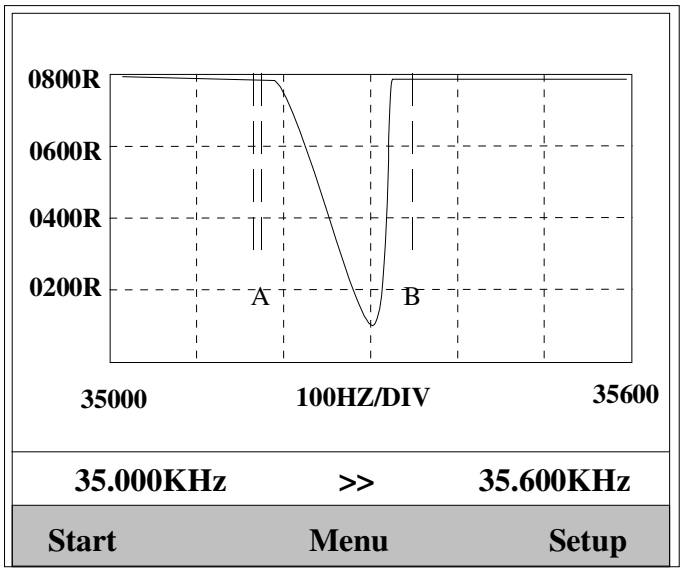
Tuning protocol : 02.03.09 17.04.11 Frequency range : 29000 -> 31000 Hz 1 Resonance point Series resonance : 29.718 KHz 0383 Ohm Parallel resonance : 30.024 KHz 015.0 KOhm Difference frequency: 0306 Hz 2 Resonance point Series resonance : No Data

 Next menu

.

7.3 Zoom Function

With the zoom function a particular area can be shown closely.
With the limitations A and B the wished area can be marked.



The „limitation A" can be moved with the buttons  .
The „limitation A" defines the start frequency.

 confirm

The „limitation B" can be moved with the buttons  .
The „limitation A" defines the stop frequency.

The zoom function is started with  **.**

8 Setup Chart mode Mask 1

	Setup Grafikmode	
1.	Range	400Ω
2.	Measuretime	01 ms
3.	Frequency Hub	01 Hz
4.	Sending delay	00 ms
5.	Separate with	;
6.	CR/LF send	off
—	Graphik	+ >>
F1	F2	F3

8.1 Range

There are 10 measurement ranges available.

The range is chosen with  and  .

1.	Range	400Ω
		800Ω
		1.5K
		3.5K
		7.0K
		15K
		25K
		35K
		55K
		75K
		95K

If the series resonance point is sought after, choose the range:
400Ω or 800Ω.
If the parallel resonance point is sought after, choose the range:
15KΩ or 35KΩ.

8.2 Test time:

Waiting time until the analogue value is measured.
Range 0-100 ms. (Standard value 5 ms)
By a longer waiting period the graph can be displayed more precisely.

8.3 Frequency Hub:

Range 1-50 Hz.
In graphical mode the frequency is increased by this value and the performance measured.
If the step size is increased, the accuracy of the performance worsens.
The accuracy of the frequency is dependent on the step size!
If a large frequency range is measured, increasing the step size can shorten the measurement time.

8.4 Sending delay:

If there is a problem collecting the data on the PC, increasing this time, may eliminate this fault.
Waiting time until the next figure is sent.
Range 0-10 ms. (Standard value 0 ms)

8.5 Separator:

A separator is necessary for easy insertation of the measurement data in to a chart calculation programme (e.g. Excel). A separator can be defined for the data output to a computer.

The figure is chosen with 

or 

.

5.	Trennen mit	;
		.
		:
		SPC
		off

Confirm with 

8.6 Sending CR/LF:

If this option is activated a CR/LF is sent after the separator.

The function is switched on or off with 

or 

.

 A further page is shown.

9 Setup Chart mode Mask 2

	Setup Graphic mode	
1.	Range	
2.	Limite	1500 Ohm
3.	Print	off
4.	Relais on	5K

−	Chart	+
F1	F2	F3

9.1 Range Chart mode

	Frequency Range
1.	014.000 – 16.000 KHz
2.	019.000 – 21.000 KHz
3.	029.000 – 31.000 KHz
4.	034.000 – 36.000 KHz
5.	039.000 – 41.000 KHz
6.	069.000 – 71.000 KHz

–	Chart	+
F1	F2	F3

The areas can be adjusted optionally.

The start frequency is inputted with F1. It must be smaller than the stop frequency.

The stop frequency is inputted with F3.

Return to the main menu with F2.

Confirmation with ENT.

1. Display of the frequency and the performance on the screen
The frequency and the performance are shown on the display at the end of the measurement.

The function is chosen with F1 or F3.

Series resonance
Parallel resonance
Series and Parallel resonance

9.2 Limit

This input determines the difference between the series and parallel resistance.
This value declares which points of resonance should be registered in the list.
At 200 Ohm weak resonance are also registered in the list of measured data.
If only strong resonances are regarded the value is chosen higher.
Input area from 200 till 2000 Ohm. (Standard value 1500 Ohm)

9.3 Print

Actuates the protocol output after the measurement.
If the value is on „on“, a protocol is outputted after completion of the measurement!

3.	Print
	off
	on

9.4 Relais on

If the measurement is not shown properly on the display, this value can be changed.
A swinging unit can influence the measured values at certain resonance points!
By changing the switchover point this mistake can be avoided.

4.	Relais on
	5 K
	7 K
	9 K

10 Data Storage in Graphic Mode:

A maximum of 10 KHz frequency hub are stored in graphic mode.
z.B. Frequency 10.000KHz -> 20.000KHz
The data is stored in **ASCII-Format** and are recallable with a control character via the RS232-interface.

The amount of measurements is calculated the following way:

Stop frequency – Start frequency = Amount of measurements

The following example shows the display with the settings:

1. Frequency increase **01Hz**
2. Separator (**;**)
3. CR/LF sending **off**
4. 35500 – 35000 = 500 Hz

Start frequency	**Separator**	**Stop frequency**	**Separator**	**Step size**	**Seperator**
3 5 0 0 0	**;**	**3 5 5 0 0**	**;**	**0 1**	**;**
Performance in Ohm	**Separator**	**Performance in Ohm**	**Separator**		
0 0 1 2 0	**;**	**0 0 1 2 5**	**;**		
Performance in Ohm	**Separator**	**Performance in Ohm**	**Separator**		
0 0 1 3 0	**;**	**0 0 1 4 8**	**;**		
Etc.. 500 Ohm values follow					
At the end of the data the figure „;0“ is sent					

Datenstring:

35000;35500;01;00120;00125;00130;00148;nnnnn;0

Datenstring with CR/LF:

35000;
35500;
01;
00120;
00125;
00130;
00148;
nnnnn;
0

String with “CR” ($0D) closed!

The data can for example be collected in an Excel- chart and valuated graphically.
With our Macro which was written to an Excel-chart, you can read out the data from the instrument with one click!
Only for Excel99!

10.1 Protocol

The protocol can be recalled over the RS232-Interface.
If the PC sends the control character „A“, the Analogue data is being sent.
Close the String with “CR” ($0D)!

```
Tuning protocol     :    17.10.08  10.33.08
Frequency range     :    34000 ->  36000 Hz

1. Resonance point
Parallel resonance  :    35.061 KHz     021.3 KOhm

2. Resonance point
Parallel resonance  :    No Data
```

If the PC sends the control character „G“, the Graphic data is being sent.
Close the String with “CR” ($0D)!

z.B.

```
34950;35050;0.833;1994;1987;1693;1361;1188;1247;1364;1347;1233
;1147;1165;1241;1298;1236;1171;1141;1170;1226;1235;1202;1148;1
126;1137;1163;1178;1164;1129;1101;1095;1104;1114;1116;1107;108
8;1063;1046;1042;1043;1044;1040;1027;1009;993;981;974;969;962;
956;949;938;922;906;894;879;869;857;846;837;828;815;800;785;76
9;753;737;725;714;700;687;672;656;643;629;612;598;583;569;554;
539;520;501;481;462;443;429;415;398;385;372;360;346;332;322;31
0;299;288;279;272;265;260;256;253;251;250;252;255;262;272;282;
300;324;357;392;448;528;578;707;849;1020;1237;1364;0;
```

RS232-Cable / D-Sub Plug >>> MiniDin:

9p. D-Sub Buchse	Mini-Din 5p. Plug	20p. D-Sub Buchse	Function
3	2	2	TxD
5	4	7	GND
2	5	3	RxD
4	3	20	DTR
PC-port	Horn-Analyzer	PC-port	

TxD = Transmit Data / PC exit
RxD = Receive Data / PC input
DTR = Data Terminal Ready / PC exit

The standard cable has a length of 2 meters.

11 Technical Data:

Power supply:	Table mains part AC100-240V Exit 12VDC 15W
Ouput voltage:	Sinus 8 Veff
Frequency range:	100Hz till 90.000 kHz +/- 1Hz
Impedance range:	1Ω bis 100 KΩ
Capacity:	500pF -> 50nF 20%