

HIGH VOLTAGE AMPLIFIER

高壓放大器



INSTRUCTION MANUAL

使用説明書

CE

HA-400 400Vp-p / 80mA / 600KHz

HA-405 400Vp-p / 200mA / 1MHz

HA-800 800Vp-p / 35mA / 200KHz

HA-805 800Vp-p / 100mA / 300KHz

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High Voltage Amplifier

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PINTEK High Voltage Amplifier Selection Guide

2010 Jan 08

MODEL	HA-305	HA-400	HA-405	HA-800	HA-805	NOTE
Output DC Voltage (Max.)	± 150V	± 200V	± 200V	± 400V	± 400V	
Output AC Voltage (Max.)	300V-p-p	400V-p-p	400V-p-p	800V-p-p	800V-p-p	Continuous AC Peak To Peak
DC Current (Max.)	± 300mA	± 80mA	± 200mA	± 35mA	± 100mA	
AC Current (Max.)	600mA-p-p	160mA-p-p	400mA-p-p	70mA-p-p	200mA-p-p	Continuous AC Peak To Peak
Output Power (Max.)	90 VA	32 VA	80 VA	28 VA	80 VA	Continuous AC peak To Peak
Power Bandwidth	100KHz/150V-p-p	600KHz/200V-p-p	1 MHz/200V-p-p	200KHz/400V-p-p	300KHz/400V-p-p	-3dB
Slew Rate	50V/μs	300V/μs	500V/μs	200V/μs	300V/μs	
Output Resistance (Protection SW OFF)	10Ω	50Ω	50Ω	100Ω	100Ω	
Output Resistance (Protection SW ON)	500Ω/80watt	4KΩ/40watt	2KΩ/80watt	15KΩ/40watt	7.5KΩ/80watt	Protection Resistance + Ro
Safe Loading	≥ 500Ω/300V-p-p	≥ 2.5KΩ/400V-p-p	≥ 1KΩ/400V-p-p	≥ 11KΩ/800V-p-p	≥ 4KΩ/800V-p-p	
Input Voltage	0~20V-p-p	0~20V-p-p	0~20V-p-p	0~20V-p-p	0~20V-p-p	10 Turn VR
Voltage Gain	0~60	0~90	0~90	0~180	0~180	SW + 10Turn VR
DC OFFSET	0 or ± 150V	0 or ± 200V	0 or ± 200V	0 or ± 400V	0 or ± 400V	
Monitor Output	100 : 1	100 : 1	100 : 1	100 : 1	100 : 1	SYNC Output
Output Protection	1.FUSE 2.Protection Resister 3.Microprocess Control.	1.FUSE 2.Protection Resister	1.FUSE 2.Protection Resister 3.Microprocess Control.	1.FUSE 2.Protection Resister	1.FUSE 2.Protection Resister 3.Microprocess Control.	HA-400/HA-800 (Microprocess Control Are Option,USD 100)

HA-400

HIGH VOLTAGE AMPLIFIER

HA-400 HIGH VOLTAGE AMPLIFIER

1. SUMMARY

HA-400 is a very practical high voltage amplifier in testing and measuring industry. Its dimension is small, light weight and easy operation. The max voltage output is able to reach 400 Vp-p. The various advantages are very useful for users operation.

HA-400 serial current output is able to reach 80 mA, and it has output protection switch. In the output protection mode, it protects HA-400 is not damaged when get shorts or overload from outside. This can lower the defects and extend the unit lifetime.

The max voltage gains is to 90 times, and the output is able to adjust from 0V ~ 400Vp-p (use 10 turns variable resistor), and maximum frequency is 600 KHz (basic voltage output 200 Vp-p). These applications are suitable for different industries,

- Semiconductor High Voltage Driver
- TFT Field High Voltage Driver
- High Voltage Engineering
- MEMS Engineering
- Nano Technology
- PZT Driver
- Static Charge Engineering
- Biomedical Engineering

It is also used for Audio Signal Generator and Function Generator Amplifier.

2. SPECIFICATIONS

(1) Input

Input Voltage:

0 V ~ +/- 2.5 V (5 Vp-p), maximum +/- 10 V (20 Vp-p)

Input Currency:

DC ~ 600 KHz. Over frequency will get attenuate, and not damage unit.

Input Waveform: Direct current and any waveforms

(2) Output:

Output Voltage:

≤ 0 V ~ +/- 200 V (400 Vp-p). Direct connect to oscilloscope is PROHIBITED. It is necessary to connect with over 400 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

Voltage Gain:

≤ 0 ~ 90 times. Front panel indicates AMPL. It is 10 turns adjustable serial resistor.

Maximum Output Current:

≤ 80 mA (Protection SW OFF); ≤ 50 mA (Protection SW ON)

Output Bandwidth: ≤ 600 KHz (Basic Voltage Output 200Vp-p)

Slow Rate: 300 V/us

Output Resistance:

50Ω (Protection SW OFF); $4K\Omega$ (Protection SW ON)

Output Protection: One switch control

Output protection sets "ON", the output resistance raise up to $4K\Omega$. At this time, the positive and negative terminals get short and will not damage the unit.

Output protection sets "OFF", the output resistance down to 50Ω . It is PROHIBITED the output terminals get short. The serial output also needs to set under 80mA. (output 400Vp-p, the overload resistance needs over $2.5K\Omega$, this will not damage the unit)

DC Voltage Offset: $\leq 0 \sim +/- 200$ V DC, it is controlled by 10 turns adjustable resistor.

DC Voltage Offset Switch: One switch control.

When switch sets OFF, inside DC is 0V.

When switch sets ON, front panel indicates OFFSET control.

Monitor Output:

-40dB, output terminal 1/100 voltage, resistance is $10K\Omega$, maximum output ≤ 4 Vp-p. It is able to direct connect to oscilloscope to observe.

- (3) Input Power: AC 100 V ~ 240 V +/- 10%, 50 ~ 60 Hz
- (4) Power consumption: Max 100 WATT
- (5) Fuse: 1.5A/250, back panel under power core fuse box
- (6) Temperature: 0~40°C; 0~80%RH
- (7) Humid: 20~60°C; 0~90%
- (8) Dimension: 270 (W) x 95 (H) x 310 (H) mm
- (9) Weight: 4.2 KGs / 9.2 PB
- (10) Out Put protection.

(A)Built-in output fuse.

(B)Built-in Output Protect resistor.

Switch "ON" the Protect Switch. The output impedance of the equipment will be raised up to the Desired output resistor. The output current will be limited to the safety to the equipment even the output was shorted.

(C) Micro Process Overload Protection:

LED Slow Flash : The equipment was under Warming Up after switch ON or re-switch ON.

LED Quick Flash : The Micro Process have detected the Over Load. The equipment will be switch off and re- switch on automatically. The LED will Slow Flash and than quick flash. The process will be continually till the Over Load been Improved.

3. FRONT PANEL INDICATION

Figure 1.



- ① **Power On:** Turn on Power and LED light on.
- ② **DC Voltage OFFSET:** use 10 turns adjustable resistor is able to gain precised voltage. Please turn on “OFFSET Switch” at ON position.
- ③ **AMPL adjustment:** use 10 turns adjustable resistor with micro adjustment function. It is able to have 0 ~ 90 times voltage gains.
- ④ **Input:** $\leq 0 \sim +/- 2.5$ V. Maximum do not over $+/- 10$ V.
- ⑤ **Oscilloscope Monitor:** Attenuate (100:1) -40dB. Maximum voltage output only 4 Vp-p. It is safe to connect with oscilloscope to observe.
- ⑥ **Output:** It is PROHIBITED to connect with oscilloscope to observe. The maximum output is 400 Vp-p is able to damage any kind of oscilloscopes. It is necessary to connect with over 400 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

- ⑦ **DC Voltage OFFSET switch:** When the switch sets “ON”, please tune (2) knob. The DC is $\leq 0 \sim \pm 200V$. When switch sets “OFF”, it is back to DC 0V.
- ⑧ **Output Protection Switch:** Suggest to use under “Normal” situation. When switch sets “ON” is able to prevent the unit damage from short. When output connects with high voltage, it can resist the voltage. The bandwidth is not attenuate, but the resistance will raise up to $4K\Omega$. Overload will increase and output current will decrease.
When switch sets “OFF”, please be careful of using this unit. It is PROHIBITED the output terminals get short.

4. BACK PANEL INDICATION

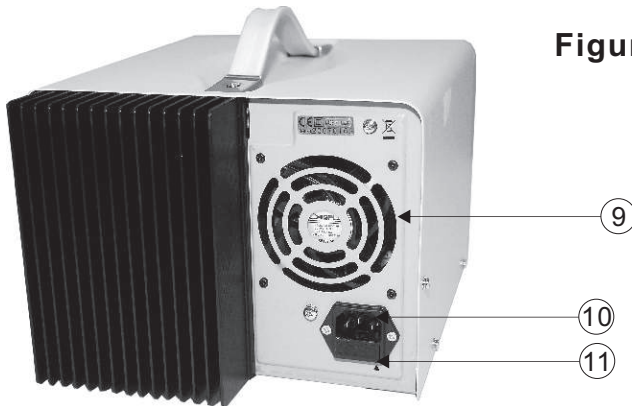


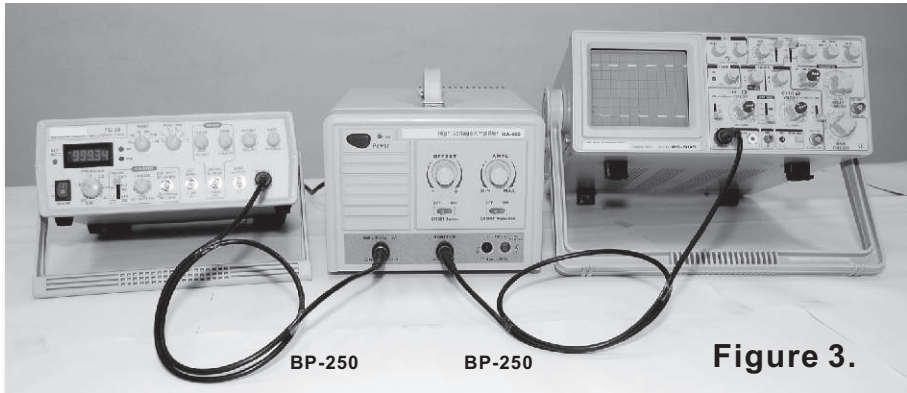
Figure 2.

- ⑨ **Fans:** suck out type. 24V / DC / 0.11A
- ⑩ **AC Power plug:** Please connect properly with enclosed power cord.
- ⑪ **Fuse:**

Power	Frequency	Fuse
100~240V +/- 10%	50/60 Hz	1.5 A/250V

5. OPERATING

5.1 Use Function Generator as input terminal, and directly connect HA-400 Monitor to Oscilloscope to observe the real amplified situation (Figure 3.)



- A. Set Function Generator frequency at 0 ~ 600 KHz. (Over frequency will not damage HA-400, but output will be distortion)
- B. Waveform Selection: Any
- C. Amplitude sets within 5Vp-p, and it is safe to set output within 20Vp-p. HA-400 maximum output need to remain at 400Vp-p, otherwise the waveform will be cut off.
- D. Use BP-250 to connect HA-400 Monitor terminal to oscilloscope. The oscilloscope amplitude multiply 100 is HA-400 real output.
- E. Monitor terminal maximum output is only 4Vp-p, which is not able to damage any kind of oscilloscope. It is very safe to use.

- F. OFFSET switch always sets at OFF position. When adjust DC VOLT, the switch sets at ON position. Turn the knob and able to get maximum +/- 200V DC.
- G. AMPL knob provides maximum 90 times Voltage Gain, and maximum output 400Vp-p.
- H. Please set Protection Switch always at ON position. It is able to limit the current within 50mA. When use over 50mA, the switch sets at OFF position.

CAUTION!

It is extremely prohibited to get short, and lower $2.5K\Omega$ (at 400p-p) loaded output.

5.2 Use Function Generator as input, and HA-400 output connects to Differential Probe as interface to transmit signal to oscilloscope to observe. (Figure 4.)

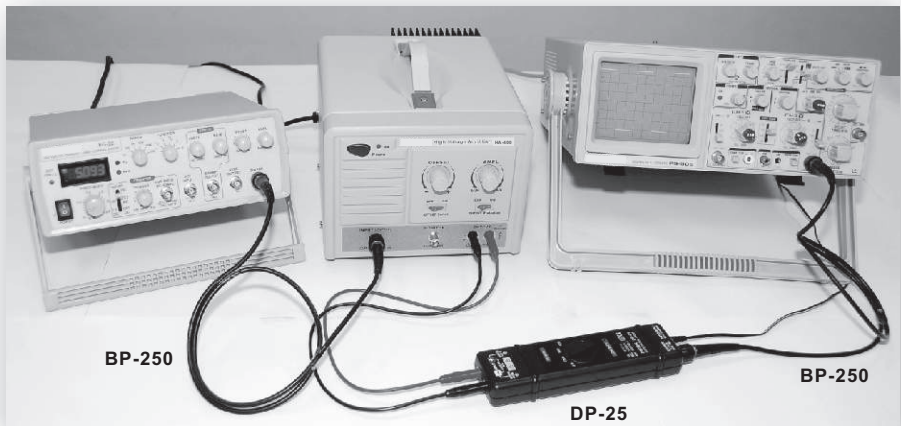


Figure 4.

- A. Function Generator and HA-400 setting conditions are the same as 4.1
- B. Set Differential Probe maximum input at 1000V. (Please select PINTEK DP-25, maximum input 1400Vp-p)
- C. HA-400 output terminal connects with Differential Probe input terminal.
- D. Differential Probe output terminal connects to oscilloscope to do the real observation.
- E. Oscilloscope indicated value multiply Differential Probe Amplitude is real HA-400 output value.
- F. Differential Probe is an isolated tested probe. No matter HA-400 output loaded is positive or negative, HA-400 will not damage any kind of oscilloscopes and very safe to use.

5.3 Use Function Generator as input, to observe the HA-400 Monitor and Output, and the real output situation from oscilloscope. (Figure 5.)

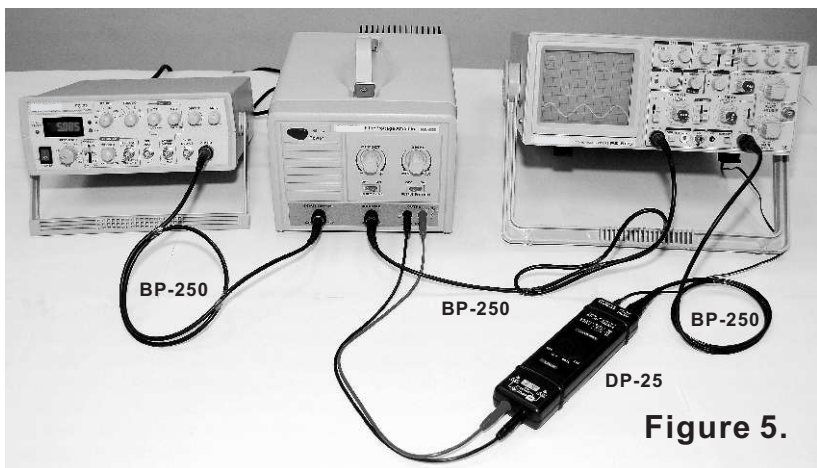


Figure 5.

- A. Function Generator and HA-400 setting conditions are the same as 5.1
- B. Use BP-250 to connect HA-400 Monitor to oscilloscope CH1.
- C. First to connect properly HA-400 output with Differential Probe input. Then, connect Differential Probe output with oscilloscope CH2.
- D. Oscilloscope CH1 real measured value needs to multiply 100 times. And CH2 real value is Differential Probe amplitude value multiply oscilloscope vertical voltage value.
- E. If connection is properly, CH1 and CH2 values on above “D” procedure shall be the same.

6. MAINTENANCE

For maintenance, only use specified spare parts.

The manufacturer can not be held responsible for any accident arising following a repair made other than its after sales service or approved repairers.

7. CLEANING

Remove any dirt, dust and grime whenever they become noticeable cleaning the outside cover with a soft cloth moistened with a mild cleaning solution.

8. WARRANTY

Unless notified to the contrary, our instruments are guaranteed against any manufacturing defect or material defect. They do not bear the specification known as the safety specification. Our guarantee, which may not under any circumstances exceed the amount of the invoiced price, goes no further than the repair of our faulty equipment, carriage paid to our workshops.

It is applicable for normal use of our instruments, and does not apply to damage or destruction caused, notably by error in mounting, mechanical accident, faulty maintenance, defective use, overload or exceed voltage.

Our responsibility being strictly limited to the pure and simple replacement of the faculty parts of our equipment, the buyer expressly renounces any attempt to find us responsible for damages or losses caused directly or indirectly.

Our guarantee is applicable for twelve (12) months after the date at which the equipment is made available. The repair, modification or replacement of a part during the guarantee period will not result in this guarantee being extended.

9. REPAIR

Maintenance, repairs under or out of guarantee. Please return to product to your distributor.

HA-405

HIGH VOLTAGE AMPLIFIER

1. SUMMARY

HA-405 is a very practical high voltage amplifier in testing and measuring industry. Its dimension is small, light weight and easy operation. The max voltage output is able to reach 400 Vp-p. The various advantages are very useful for users operation.

HA-405 serial current output is able to reach 200 mA, and it has output protection switch. In the output protection mode, it protects HA-405 is not damaged when get shorts or overload from outside. This can lower the defects and extend the unit lifetime.

The max voltage gains is to 90 times, and the output is able to adjust from 0V ~ 400Vp-p (use 10 turns variable resistor), and maximum frequency is 1MHz (basic voltage output 200 Vp-p). These applications are suitable for different industries,

- Semiconductor High Voltage Driver
- TFT Field High Voltage Driver
- High Voltage Engineering
- MEMS Engineering
- Nano Technology
- PZT Driver
- Static Charge Engineering
- Biomedical Engineering

It is also used for Audio Signal Generator and Function Generator Amplifier.

2. SPECIFICATIONS

(1) Input

Input Voltage:

0 V ~ +/- 2.5 V (5 Vp-p), maximum +/- 10 V (20 Vp-p)

Input Currency:

DC ~ 1MHz. Over frequency will get attenuate, and not damage unit.

Input Waveform: Direct current and any waveforms

(2) Output:

Output Voltage:

$\leq 0 \text{ V} \sim \pm 200 \text{ V}$ (400 Vp-p). Direct connect to oscilloscope is PROHIBITED. It is necessary to connect with over 400 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

Voltage Gain:

$\leq 0 \sim 90$ times. Front panel indicates AMPL. It is 10 turns adjustable serial resistor.

Maximum Output Current:

$\leq 200\text{mA}$ (Protection SW OFF); $\leq 100\text{mA}$ (Protection SW ON)

Output Bandwidth: $\leq 1\text{MHz}$ (Basic Voltage Output 200Vp-p)

Slow Rate: 500 V/us

Output Resistance:

50Ω (Protection SW OFF); $2\text{K}\Omega$ (Protection SW ON)

Output Protection: One switch control

Output protection sets "ON", the output resistance raise up to $2\text{K}\Omega$. At this time, the positive and negative terminals get short and will not damage the unit.

Output protection sets "OFF", the output resistance down to 50Ω . It is PROHIBITED the output terminals get short. The serial output also needs to set under 200mA. (output 400Vp-p, the overload resistance needs over $1.0\text{K}\Omega$, this will not damage the unit)

DC Voltage Offset: $\leq 0 \sim \pm 200$ V DC, it is controlled by 10 turns adjustable resistor.

DC Voltage Offset Switch: One switch control.

When switch sets OFF, inside DC is 0V.

When switch sets ON, front panel indicates OFFSET control.

Monitor Output:

-40dB, output terminal 1/100 voltage, resistance is $10K\Omega$, maximum output ≤ 4 Vp-p. It is able to direct connect to oscilloscope to observe.

- (3) Input Power: AC 100 V ~ 240 V $\pm 10\%$, 50 ~ 60 Hz
- (4) Power consumption: Max 150 WATT
- (5) Fuse: 3.0A/250, back panel under power core fuse box
- (6) Temperature: 0~40°C; 0~80%RH
- (7) Humid: 20~60°C; 0~90%
- (8) Dimension: 270 (W) x 95 (H) x 310 (H) mm
- (9) Weight: 5.2 KGs / 11.5 PB
- (10) Out Put protection.

(A) Built-in output fuse.

(B) Built-in Output Protect resistor.

Switch "ON" the Protect Switch. The output impedance of the equipment will be raised up to the Desired output resistor. The output current will be limited to the safety to the equipment even the output was shorted.

(C) Micro Process Overload Protection:

LED Slow Flash : The equipment was under Warming Up after switch ON or re-switch ON.

LED Quick Flash : The Micro Process have detected the Over Load. The equipment will be switch off and re- switch on automatically. The LED will Slow Flash and than quick flash. The process will be continually till the Over Load been Improved.

3. FRONT PANEL INDICATION

Figure 6.



- ① **Power On:** Turn on Power and LED light on.
- ② **DC Voltage OFFSET:** use 10 turns adjustable resistor is able to gain precised voltage. Please turn on “OFFSET Switch” at ON position.
- ③ **AMPL adjustment:** use 10 turns adjustable resistor with micro adjustment function. It is able to have 0 ~ 90 times voltage gains.
- ④ **Input:** $\leq 0 \sim +/- 2.5$ V. Maximum do not over $+/- 10$ V.
- ⑤ **Oscilloscope Monitor:** Attenuate (100:1) -40dB. Maximum voltage output only 4 Vp-p. It is safe to connect with oscilloscope to observe.
- ⑥ **Output:** It is PROHIBITED to connect with oscilloscope to observe. The maximum output is 400 Vp-p is able to damage any kind of oscilloscopes. It is necessary to connect with over 400 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

- ⑦ **DC Voltage OFFSET switch:** When the switch sets “ON”, please tune (2) knob. The DC is $\leq 0 \sim \pm 200V$. When switch sets “OFF”, it is back to DC 0V.
- ⑧ **Output Protection Switch:** Suggest to use under “Normal” situation. When switch sets “ON” is able to prevent the unit damage from short. When output connects with high voltage, it can resist the voltage. The bandwidth is not attenuate, but the resistance will raise up to $2K\Omega$. Overload will increase and output current will decrease.
When switch sets “OFF”, please be careful of using this unit. It is PROHIBITED the output terminals get short.

4. BACK PANEL INDICATION

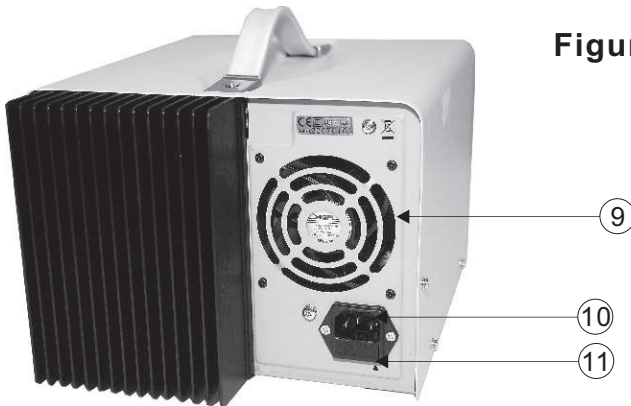


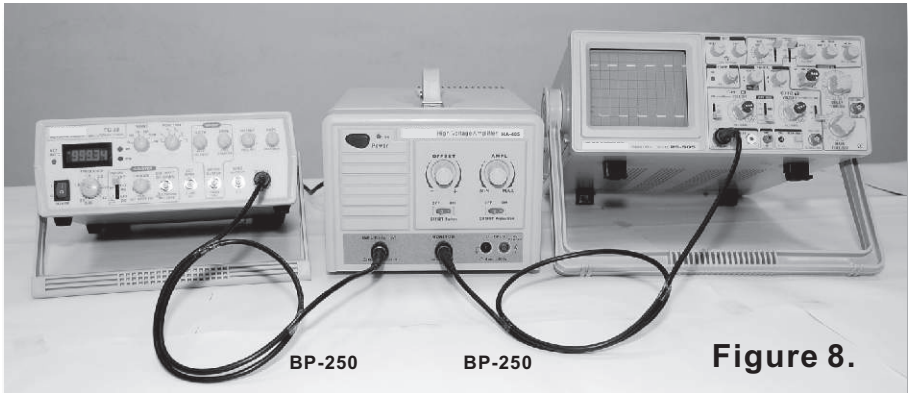
Figure 7.

- ⑨ **Fans:** suck out type. 24V / DC / 0.11A
- ⑩ **AC Power plug:** Please connect properly with enclosed power cord.
- ⑪ **Fuse:**

Power	Frequency	Fuse
100~240V +/- 10%	50/60 Hz	3.0 A/250V

5. OPERATING

5.1 Use Function Generator as input terminal, and directly connect HA-405 Monitor to Oscilloscope to observe the real amplified situation (Figure 8.)



- A. Set Function Generator frequency at 0 ~ 1MHz. (Over frequency will not damage HA-405, but output will be distortion)
- B. Waveform Selection: Any
- C. Amplitude sets within 5Vp-p, and it is safe to set output within 20Vp-p. HA-405 maximum output need to remain at 400Vp-p, otherwise the waveform will be cut off.
- D. Use BP-250 to connect HA-405 Monitor terminal to oscilloscope. The oscilloscope amplitude multiply 100 is HA-405 real output.
- E. Monitor terminal maximum output is only 4Vp-p, which is not able to damage any kind of oscilloscope. It is very safe to use.

- F. OFFSET switch always sets at OFF position. When adjust DC VOLT, the switch sets at ON position. Turn the knob and able to get maximum +/- 200V DC.
- G. AMPL knob provides maximum 90 times Voltage Gain, and maximum output 400Vp-p.
- H. Please set Protection Switch always at ON position. It is able to limit the current within 100mA. When use over 100mA, the switch sets at OFF position.

CAUTION!

It is extremely prohibited to get short, and lower $1.0K\Omega$ (at 400p-p) loaded output.

5.2 Use Function Generator as input, and HA-405 output connects to Differential Probe as interface to transmit signal to oscilloscope to observe. (Figure 9.)

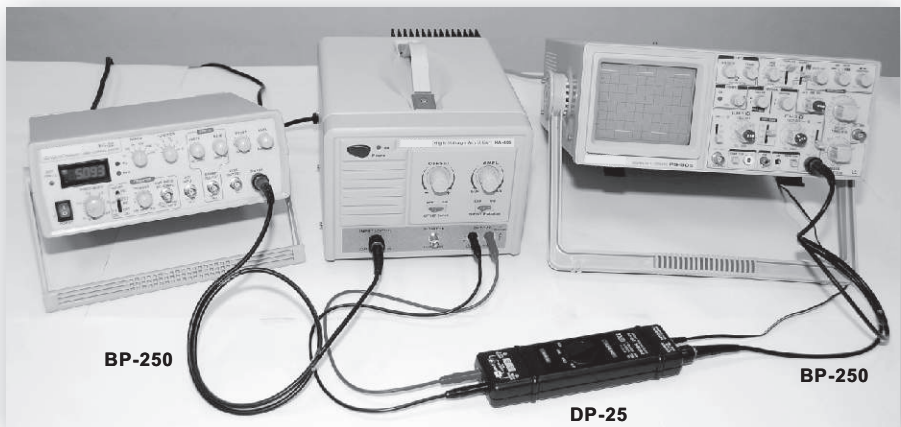


Figure 9.

- A. Function Generator and HA-405 setting conditions are the same as 4.1
- B. Set Differential Probe maximum input at 1000V. (Please select PINTEK DP-25, maximum input 1400Vp-p)
- C. HA-405 output terminal connects with Differential Probe input terminal.
- D. Differential Probe output terminal connects to oscilloscope to do the real observation.
- E. Oscilloscope indicated value multiply Differential Probe Amplitude is real HA-405 output value.
- F. Differential Probe is an isolated tested probe. No matter HA-405 output loaded is positive or negative, HA-405 will not damage any kind of oscilloscopes and very safe to use.

5.3 Use Function Generator as input, to observe the HA-405 Monitor and Output, and the real output situation from oscilloscope. (Figure 10.)

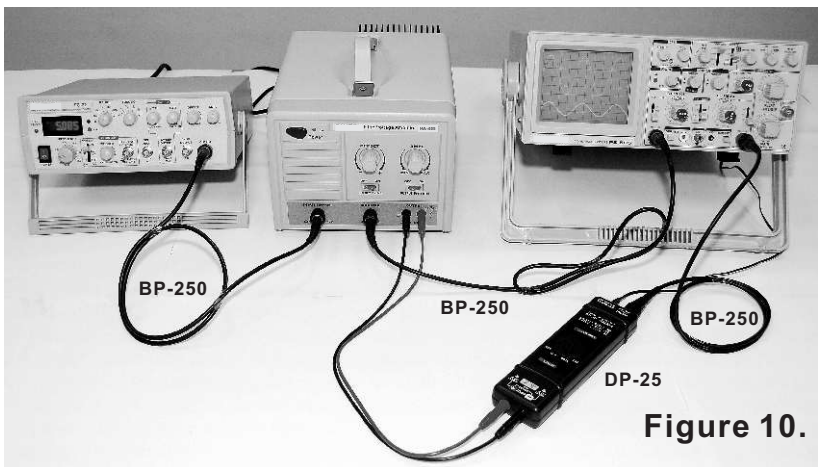


Figure 10.

- A. Function Generator and HA-405 setting conditions are the same as 5.1
- B. Use BP-250 to connect HA-405 Monitor to oscilloscope CH1.
- C. First to connect properly HA-405 output with Differential Probe input. Then, connect Differential Probe output with oscilloscope CH2.
- D. Oscilloscope CH1 real measured value needs to multiply 100 times. And CH2 real value is Differential Probe amplitude value multiply oscilloscope vertical voltage value.
- E. If connection is properly, CH1 and CH2 values on above “D” procedure shall be the same.

6. MAINTENANCE

For maintenance, only use specified spare parts.

The manufacturer can not be held responsible for any accident arising following a repair made other than its after sales service or approved repairers.

7. CLEANING

Remove any dirt, dust and grime whenever they become noticeable cleaning the outside cover with a soft cloth moistened with a mild cleaning solution.

8. WARRANTY

Unless notified to the contrary, our instruments are guaranteed against any manufacturing defect or material defect. They do not bear the specification known as the safety specification. Our guarantee, which may not under any circumstances exceed the amount of the invoiced price, goes no further than the repair of our faulty equipment, carriage paid to our workshops.

It is applicable for normal use of our instruments, and does not apply to damage or destruction caused, notably by error in mounting, mechanical accident, faulty maintenance, defective use, overload or exceed voltage.

Our responsibility being strictly limited to the pure and simple replacement of the faculty parts of our equipment, the buyer expressly renounces any attempt to find us responsible for damages or losses caused directly or indirectly.

Our guarantee is applicable for twelve (12) months after the date at which the equipment is made available. The repair, modification or replacement of a part during the guarantee period will not result in this guarantee being extended.

9. REPAIR

Maintenance, repairs under or out of guarantee. Please return to product to your distributor.

HA-800

HIGH VOLTAGE AMPLIFIER

1. SUMMARY

HA-800 is a very practical high voltage amplifier in testing and measuring industry. Its dimension is small, light weight and easy operation. The max voltage output is able to reach 800 Vp-p. The various advantages are very useful for users operation.

HA-800 serial current output is able to reach 35 mA, and it has output protection switch. In the output protection mode, it protects HA-800 is not damaged when get shorts or overload from outside. This can lower the defects and extend the unit lifetime.

The max voltage gains is to 180 times, and the output is able to adjust from 0V ~ 800Vp-p (use 10 turns variable resistor), and maximum frequency is 200 KHz (basic voltage output 400 Vp-p). These applications are suitable for different industries,

- Semiconductor High Voltage Driver
- TFT Field High Voltage Driver
- High Voltage Engineering
- MEMS Engineering
- Nano Technology
- PZT Driver
- Static Charge Engineering
- Biomedical Engineering

It is also used for Audio Signal Generator and Function Generator Amplifier.

2. SPECIFICATIONS

(1) Input

Input Voltage:

0 V ~ +/- 5 V (10 Vp-p), maximum +/- 10 V (20 Vp-p)

Input Currency:

DC ~ 200 KHz. Over frequency will get attenuate, and not damage unit.

Input Waveform: Direct current and any waveforms

(2) Output:

Output Voltage:

≤ 0 V ~ +/- 400 V (800 Vp-p). Direct connect to oscilloscope is PROHIBITED. It is necessary to connect with over 800 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

Voltage Gain:

≤ 0 ~ 180 times. Front panel indicates AMPL. It is 10 turns adjustable serial resistor.

Maximum Output Current:

≤ 35 mA (Protection SW OFF); ≤ 27 mA (Protection SW ON)

Output Bandwidth: ≤ 200 KHz (Basic Voltage Output 400Vp-p)

Slow Rate: 200 V/us

Output Resistance:

100 Ω (Protection SW OFF); 15K Ω (Protection SW ON)

Output Protection: One switch control

Output protection sets "ON", the output resistance raise up to 15K Ω . At this time, the positive and negative terminals get short and will not damage the unit.

Output protection sets "OFF", the output resistance down to 0 Ω . It is PROHIBITED the output terminals get short. The serial output also needs to set under 35mA. (output 800Vp-p, the overload resistance needs over 12K Ω , this will not damage the unit)

DC Voltage Offset: $\leq 0 \sim \pm 400$ V DC, it is controlled by 10 turns adjustable resistor.

DC Voltage Offset Switch: One switch control.

When switch sets OFF, inside DC is 0V.

When switch sets ON, front panel indicates OFFSET control.

Monitor Output:

-40dB, output terminal 1/100 voltage, resistance is $10K\Omega$, maximum output ≤ 8 Vp-p. It is able to direct connect to oscilloscope to observe.

- (3) Input Power: AC 100 V ~ 240 V $\pm 10\%$, 50 ~ 60 Hz
- (4) Power consumption: Max 100 WATT
- (5) Fuse: 1.5A/250, back panel under power core fuse box
- (6) Temperature: 0~40°C; 0~80%RH
- (7) Humid: 20~60°C; 0~90%
- (8) Dimension: 270 (W) x 95 (H) x 310 (H) mm
- (9) Weight: 4.2 KGs / 9.2 PB
- (10) Out Put protection.

(A) Built-in output fuse.

(B) Built-in Output Protect resistor.

Switch "ON" the Protect Switch. The output impedance of the equipment will be raised up to the Desired output resistor. The output current will be limited to the safety to the equipment even the output was shorted.

(C) Micro Process Overload Protection:

LED Slow Flash : The equipment was under Warming Up after switch ON or re-switch ON.

LED Quick Flash : The Micro Process have detected the Over Load. The equipment will be switch off and re- switch on automatically. The LED will Slow Flash and than quick flash. The process will be continually till the Over Load been Improved.

3. FRONT PANEL INDICATION

Figure 11.



- ① **Power On:** Turn on Power and LED light on.
- ② **DC Voltage OFFSET:** use 10 turns adjustable resistor is able to gain precised voltage. Please turn on “OFFSET Switch” at ON position.
- ③ **AMPL adjustment:** use 10 turns adjustable resistor with micro adjustment function. It is able to have 0 ~ 180 times voltage gains.
- ④ **Input:** $\leq 0 \sim \pm 5$ V. Maximum do not over ± 10 V.
- ⑤ **Oscilloscope Monitor:** Attenuate (100:1) -40dB. Maximum voltage output only 8 Vp-p. It is safe to connect with oscilloscope to observe.
- ⑥ **Output:** It is PROHIBITED to connect with oscilloscope to observe. The maximum output is 800 Vp-p is able to damage any kind of oscilloscopes. It is necessary to connect with over 800 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

- ⑦ **DC Voltage OFFSET switch:** When the switch sets “ON”, please tune (2) knob. The DC is $\leq 0 \sim \pm 400V$. When switch sets “OFF”, it is back to DC 0V.
- ⑧ **Output Protection Switch:** Suggest to use under “Normal” situation. When switch sets “ON” is able to prevent the unit damage from short. When output connects with high voltage, it can resist the voltage. The bandwidth is not attenuate, but the resistance will raise up to $15K\Omega$. Overload will increase and output current will decrease.
When switch sets “OFF”, please be careful of using this unit. It is PROHIBITED the output terminals get short.

4. BACK PANEL INDICATION

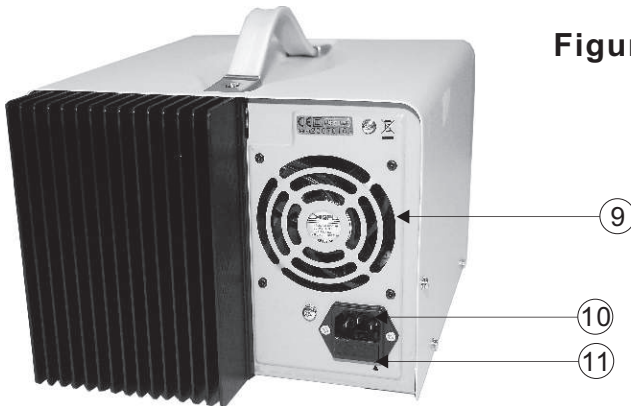


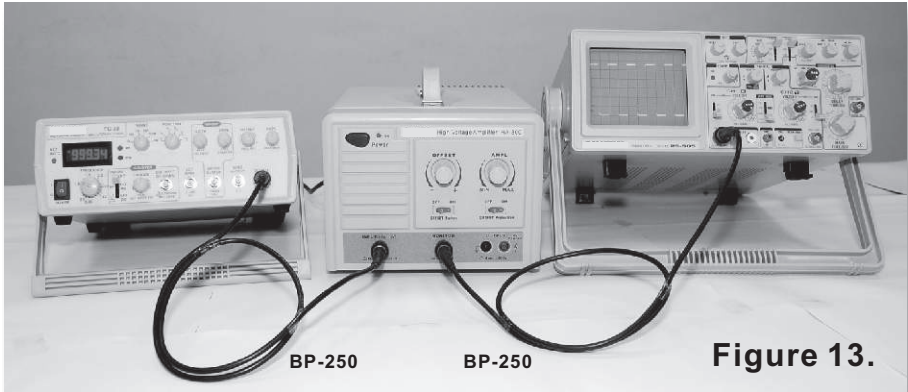
Figure 12.

- ⑨ **Fans:** suck out type. 24V / DC / 0.11A
- ⑩ **AC Power plug:** Please connect properly with enclosed power cord.
- ⑪ **Fuse:**

Power	Frequency	Fuse
100~240V +/- 10%	50/60 Hz	1.5 A/250V

5. OPERATING

5.1 Use Function Generator as input terminal, and directly connect HA-800 Monitor to Oscilloscope to observe the real amplified situation (Figure 13.)



- A. Set Function Generator frequency at 0 ~ 200 KHz. (Over frequency will not damage HA-800, but output will be distortion)
- B. Waveform Selection: Any
- C. Amplitude sets within 10Vp-p, and it is safe to set output within 20Vp-p. HA-800 maximum output need to remain at 800Vp-p, otherwise the waveform will be cut off.
- D. Use BP-250 to connect HA-800 Monitor terminal to oscilloscope. The oscilloscope amplitude multiply 100 is HA-800 real output.
- E. Monitor terminal maximum output is only 8Vp-p, which is not able to damage any kind of oscilloscope. It is very safe to use.

- F. OFFSET switch always sets at OFF position. When adjust DC VOLT, the switch sets at ON position. Turn the knob and able to get maximum +/- 400V DC.
- G. AMPL knob provides maximum 80 times Voltage Gain, and maximum output 800Vp-p.
- H. Please set Protection Switch always at ON position. It is able to limit the current within 27mA. When use over 27mA, the switch sets at OFF position.

CAUTION!

It is extremely prohibited to get short, maximum 35mA output and lower 12K Ω (at 800p-p) loaded output.

5.2 Use Function Generator as input, and HA-800 output connects to Differential Probe as interface to transmit signal to oscilloscope to observe. (Figure 14.)

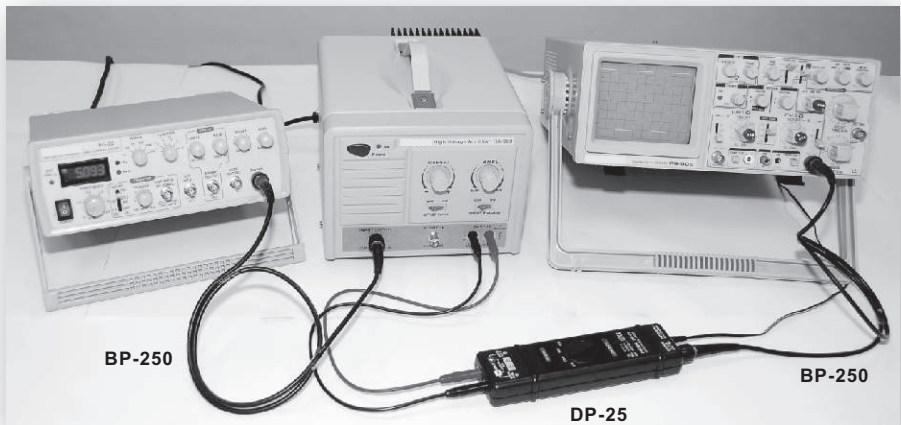


Figure 14.

- A. Function Generator and HA-800 setting conditions are the same as 4.1
- B. Set Differential Probe maximum input at 1000V. (Please select PINTEK DP-25, maximum input 1400Vp-p)
- C. HA-800 output terminal connects with Differential Probe input terminal.
- D. Differential Probe output terminal connects to oscilloscope to do the real observation.
- E. Oscilloscope indicated value multiply Differential Probe Amplitude is real HA-800 output value.
- F. Differential Probe is an isolated tested probe. No matter HA-800 output loaded is positive or negative, HA-800 will not damage any kind of oscilloscopes and very safe to use.

5.3 Use Function Generator as input, to observe the HA-800 Monitor and Output, and the real output situation from oscilloscope. (Figure 15.)

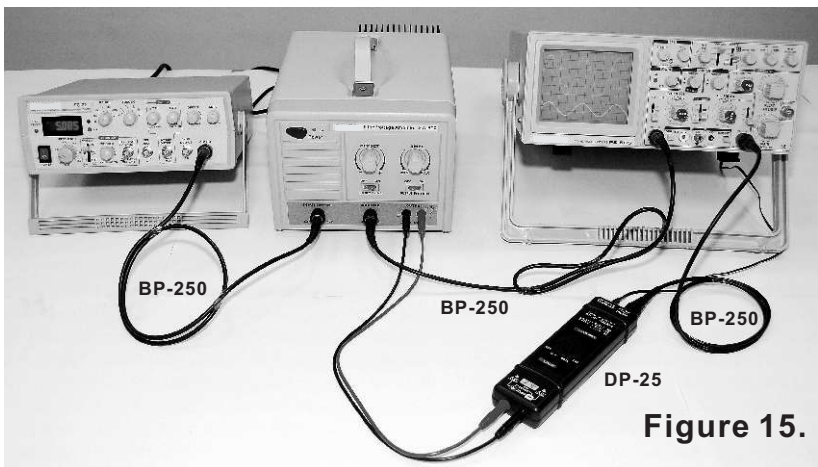


Figure 15.

- A. Function Generator and HA-800 setting conditions are the same as 5.1
- B. Use BP-250 to connect HA-800 Monitor to oscilloscope CH1.
- C. First to connect properly HA-800 output with Differential Probe input. Then, connect Differential Probe output with oscilloscope CH2.
- D. Oscilloscope CH1 real measured value needs to multiply 100 times. And CH2 real value is Differential Probe amplitude value multiply oscilloscope vertical voltage value.
- E. If connection is properly, CH1 and CH2 values on above “D” procedure shall be the same.

6. MAINTENANCE

For maintenance, only use specified spare parts.

The manufacturer can not be held responsible for any accident arising following a repair made other than its after sales service or approved repairers.

7. CLEANING

Remove any dirt, dust and grime whenever they become noticeable cleaning the outside cover with a soft cloth moistened with a mild cleaning solution.

8. WARRANTY

Unless notified to the contrary, our instruments are guaranteed against any manufacturing defect or material defect. They do not bear the specification known as the safety specification. Our guarantee, which may not under any circumstances exceed the amount of the invoiced price, goes no further than the repair of our faulty equipment, carriage paid to our workshops.

It is applicable for normal use of our instruments, and does not apply to damage or destruction caused, notably by error in mounting, mechanical accident, faulty maintenance, defective use, overload or exceed voltage.

Our responsibility being strictly limited to the pure and simple replacement of the faculty parts of our equipment, the buyer expressly renounces any attempt to find us responsible for damages or losses caused directly or indirectly.

Our guarantee is applicable for twelve (12) months after the date at which the equipment is made available. The repair, modification or replacement of a part during the guarantee period will not result in this guarantee being extended.

9. REPAIR

Maintenance, repairs under or out of guarantee. Please return to product to your distributor.

HA-805

HIGH VOLTAGE AMPLIFIER

1. SUMMARY

HA-805 is a very practical high voltage amplifier in testing and measuring industry. Its dimension is small, light weight and easy operation. The max voltage output is able to reach 800 Vp-p. The various advantages are very useful for users operation.

HA-805 serial current output is able to reach 100 mA, and it has output protection switch. In the output protection mode, it protects HA-805 is not damaged when get shorts or overload from outside. This can lower the defects and extend the unit lifetime.

The max voltage gains is to 180 times, and the output is able to adjust from 0V ~ 800Vp-p (use 10 turns variable resistor), and maximum frequency is 300 KHz (basic voltage output 400 Vp-p). These applications are suitable for different industries,

- Semiconductor High Voltage Driver
- TFT Field High Voltage Driver
- High Voltage Engineering
- MEMS Engineering
- Nano Technology
- PZT Driver
- Static Charge Engineering
- Biomedical Engineering

It is also used for Audio Signal Generator and Function Generator Amplifier.

2. SPECIFICATIONS

(1) Input

Input Voltage:

0 V ~ +/- 5 V (10 Vp-p), maximum +/- 10 V (20 Vp-p)

Input Currency:

DC ~ 300 KHz. Over frequency will get attenuate, and not damage unit.

Input Waveform: Direct current and any waveforms

(2) Output:

Output Voltage:

≤ 0 V ~ +/- 400 V (800 Vp-p). Direct connect to oscilloscope is PROHIBITED. It is necessary to connect with over 800 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

Voltage Gain:

≤ 0 ~ 180 times. Front panel indicates AMPL. It is 10 turns adjustable serial resistor.

Maximum Output Current:

≤ 100 mA (Protection SW OFF); ≤ 53 mA (Protection SW ON)

Output Bandwidth: ≤ 300 KHz (Basic Voltage Output 400Vp-p)

Slow Rate: 300 V/us

Output Resistance:

100 Ω (Protection SW OFF); 7.5K Ω (Protection SW ON)

Output Protection: One switch control

Output protection sets "ON", the output resistance raise up to 7.5K Ω . At this time, the positive and negative terminals get short and will not damage the unit.

Output protection sets "OFF", the output resistance down to 0 Ω . It is PROHIBITED the output terminals get short. The serial output also needs to set under 100mA. (output 800Vp-p, the overload resistance needs over 4.0K Ω , this will not damage the unit)

DC Voltage Offset: $\leq 0 \sim \pm 400$ V DC, it is controlled by 10 turns adjustable resistor.

DC Voltage Offset Switch: One switch control.

When switch sets OFF, inside DC is 0V.

When switch sets ON, front panel indicates OFFSET control.

Monitor Output:

-40dB, output terminal 1/100 voltage, resistance is $10K\Omega$, maximum output ≤ 8 Vp-p. It is able to direct connect to oscilloscope to observe.

- (3) Input Power: AC 100 V ~ 240 V $\pm 10\%$, 50 ~ 60 Hz
- (4) Power consumption: Max 150 WATT
- (5) Fuse: 3.0A/250, back panel under power core fuse box
- (6) Temperature: 0~40°C; 0~80%RH
- (7) Humid: 20~60°C; 0~90%
- (8) Dimension: 270 (W) x 95 (H) x 310 (H) mm
- (9) Weight: 5.2 KGs / 11.5 PB
- (10) Out Put protection.

(A) Built-in output fuse.

(B) Built-in Output Protect resistor.

Switch "ON" the Protect Switch. The output impedance of the equipment will be raised up to the Desired output resistor. The output current will be limited to the safety to the equipment even the output was shorted.

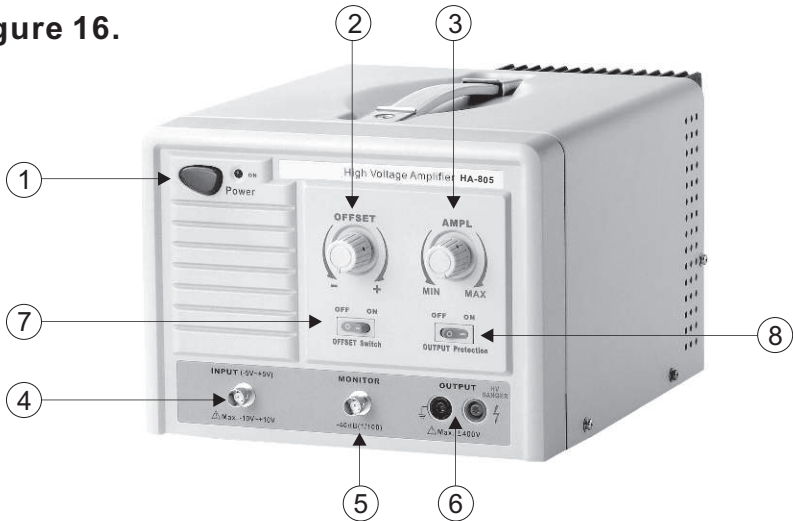
(C) Micro Process Overload Protection:

LED Slow Flash : The equipment was under Warming Up after switch ON or re-switch ON.

LED Quick Flash : The Micro Process have detected the Over Load. The equipment will be switch off and re- switch on automatically. The LED will Slow Flash and than quick flash. The process will be continually till the Over Load been Improved.

3. FRONT PANEL INDICATION

Figure 16.



- ① **Power On:** Turn on Power and LED light on.
- ② **DC Voltage OFFSET:** use 10 turns adjustable resistor is able to gain precised voltage. Please turn on “OFFSET Switch” at ON position.
- ③ **AMPL adjustment:** use 10 turns adjustable resistor with micro adjustment function. It is able to have 0 ~ 80 times voltage gains.
- ④ **Input:** $\leq 0 \sim \pm 5$ V. Maximum do not over ± 10 V.
- ⑤ **Oscilloscope Monitor:** Attenuate (100:1) -40dB. Maximum voltage output only 8 Vp-p. It is safe to connect with oscilloscope to observe.
- ⑥ **Output:** It is PROHIBITED to connect with oscilloscope to observe. The maximum output is 800 Vp-p is able to damage any kind of oscilloscopes. It is necessary to connect with over 800 V differential probe to observe. For instance, PINTEK DP-25 and DP-50.

- ⑦ **DC Voltage OFFSET switch:** When the switch sets “ON”, please tune (2) knob. The DC is $\leq 0 \sim \pm 400V$. When switch sets “OFF”, it is back to DC 0V.
- ⑧ **Output Protection Switch:** Suggest to use under “Normal” situation. When switch sets “ON” is able to prevent the unit damage from short. When output connects with high voltage, it can resist the voltage. The bandwidth is not attenuate, but the resistance will raise up to $7.5K\Omega$. Overload will increase and output current will decrease.
When switch sets “OFF”, please be careful of using this unit. It is PROHIBITED the output terminals get short.

4. BACK PANEL INDICATION

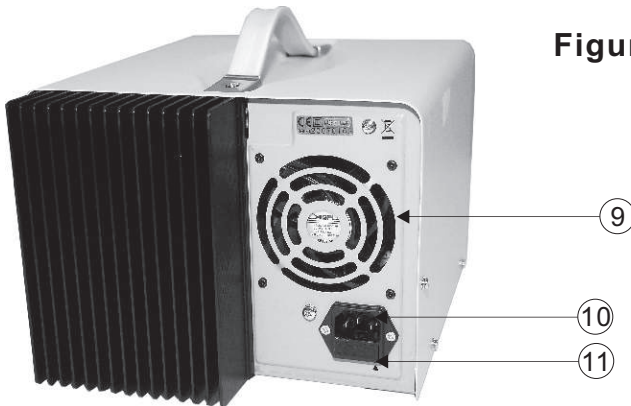


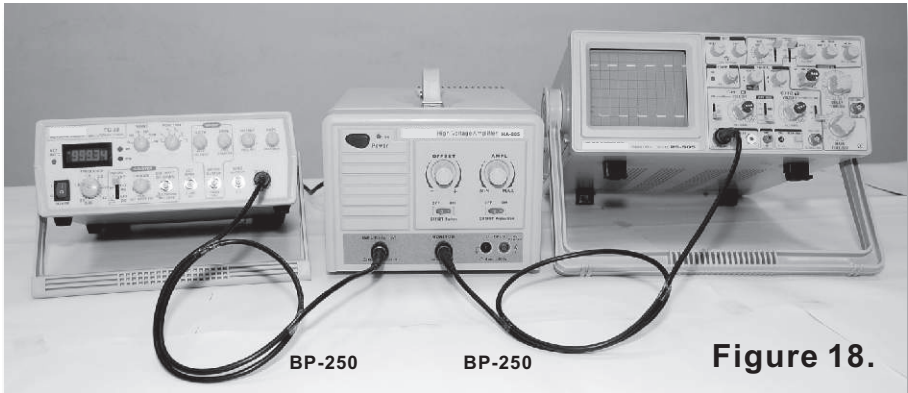
Figure 17.

- ⑨ **Fans:** suck out type. 24V / DC / 0.11A
- ⑩ **AC Power plug:** Please connect properly with enclosed power cord.
- ⑪ **Fuse:**

Power	Frequency	Fuse
100~240V +/- 10%	50/60 Hz	3.0 A/250V

5. OPERATING

5.1 Use Function Generator as input terminal, and directly connect HA-805 Monitor to Oscilloscope to observe the real amplified situation (Figure 18.)



- A. Set Function Generator frequency at 0 ~ 300 KHz. (Over frequency will not damage HA-800, but output will be distortion)
- B. Waveform Selection: Any
- C. Amplitude sets within 10Vp-p, and it is safe to set output within 20Vp-p. HA-800 maximum output need to remain at 800Vp-p, otherwise the waveform will be cut off.
- D. Use BP-250 to connect HA-800 Monitor terminal to oscilloscope. The oscilloscope amplitude multiply 100 is HA-800 real output.
- E. Monitor terminal maximum output is only 8Vp-p, which is not able to damage any kind of oscilloscope. It is very safe to use.

- F. OFFSET switch always sets at OFF position. When adjust DC VOLT, the switch sets at ON position. Turn the knob and able to get maximum +/- 400V DC.
- G. AMPL knob provides maximum 80 times Voltage Gain, and maximum output 800Vp-p.
- H. Please set Protection Switch always at ON position. It is able to limit the current within 53mA. When use over 53mA, the switch sets at OFF position.

CAUTION!

It is extremely prohibited to get short, maximum 100mA output and lower 4.0K Ω (at 800p-p) loaded output.

5.2 Use Function Generator as input, and HA-805 output connects to Differential Probe as interface to transmit signal to oscilloscope to observe. (Figure 19.)

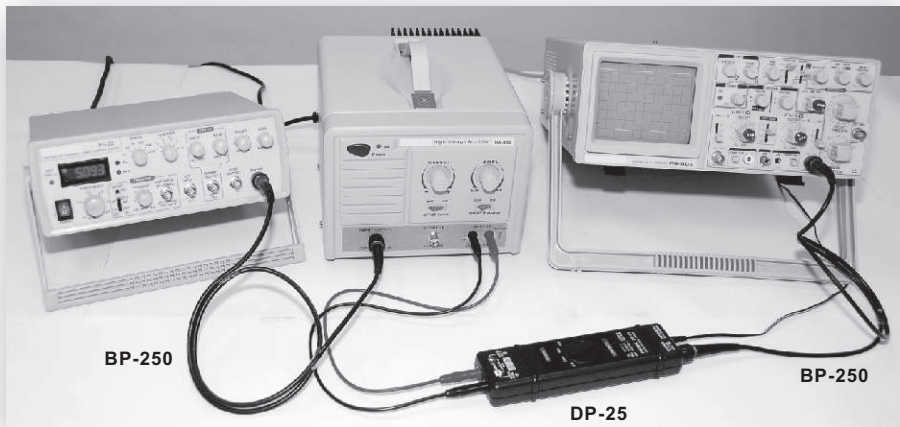


Figure 19.

- A. Function Generator and HA-805 setting conditions are the same as 4.1
- B. Set Differential Probe maximum input at 1000V. (Please select PINTEK DP-25, maximum input 1400Vp-p)
- C. HA-805 output terminal connects with Differential Probe input terminal.
- D. Differential Probe output terminal connects to oscilloscope to do the real observation.
- E. Oscilloscope indicated value multiply Differential Probe Amplitude is real HA-805 output value.
- F. Differential Probe is an isolated tested probe. No matter HA-805 output loaded is positive or negative, HA-805 will not damage any kind of oscilloscopes and very safe to use.

5.3 Use Function Generator as input, to observe the HA-805 Monitor and Output, and the real output situation from oscilloscope. (Figure 20.)

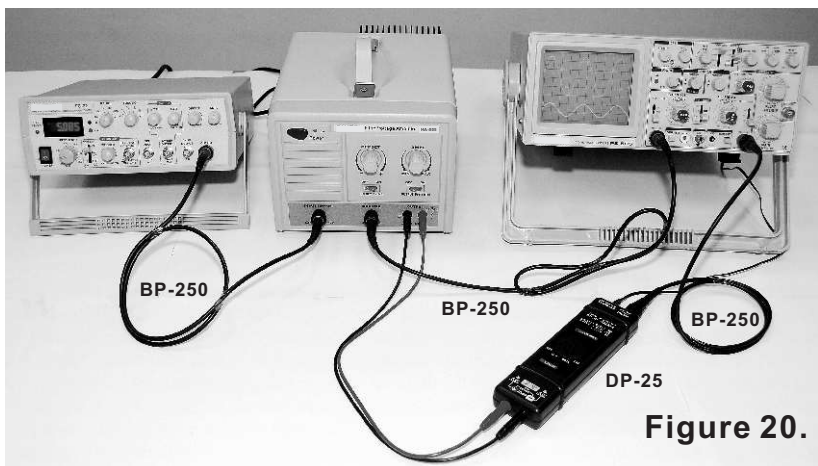


Figure 20.

- A. Function Generator and HA-805 setting conditions are the same as 5.1
- B. Use BP-250 to connect HA-805 Monitor to oscilloscope CH1.
- C. First to connect properly HA-805 output with Differential Probe input. Then, connect Differential Probe output with oscilloscope CH2.
- D. Oscilloscope CH1 real measured value needs to multiply 100 times. And CH2 real value is Differential Probe amplitude value multiply oscilloscope vertical voltage value.
- E. If connection is properly, CH1 and CH2 values on above "D" procedure shall be the same.

6. MAINTENANCE

For maintenance, only use specified spare parts.

The manufacturer can not be held responsible for any accident arising following a repair made other than its after sales service or approved repairers.

7. CLEANING

Remove any dirt, dust and grime whenever they become noticeable cleaning the outside cover with a soft cloth moistened with a mild cleaning solution.

8. WARRANTY

Unless notified to the contrary, our instruments are guaranteed against any manufacturing defect or material defect. They do not bear the specification known as the safety specification. Our guarantee, which may not under any circumstances exceed the amount of the invoiced price, goes no further than the repair of our faulty equipment, carriage paid to our workshops.

It is applicable for normal use of our instruments, and does not apply to damage or destruction caused, notably by error in mounting, mechanical accident, faulty maintenance, defective use, overload or exceed voltage.

Our responsibility being strictly limited to the pure and simple replacement of the faculty parts of our equipment, the buyer expressly renounces any attempt to find us responsible for damages or losses caused directly or indirectly.

Our guarantee is applicable for twelve (12) months after the date at which the equipment is made available. The repair, modification or replacement of a part during the guarantee period will not result in this guarantee being extended.

9. REPAIR

Maintenance, repairs under or out of guarantee. Please return to product to your distributor.

PINTEK 高壓放大器 選購指南

2010.Jan.07

MODEL	HA-305	HA-400	HA-405	HA-800	HA-805	NOTE
輸出直流電壓 (最大)	± 150V	± 200V	± 200V	± 400V	± 400V	
輸出交流電壓 (最大)	300V-p-p	400V-p-p	400V-p-p	800V-p-p	800V-p-p	連續輸出(峰對峰值)
輸出直流電流 (最大)	± 300mA	± 80mA	± 200mA	± 35mA	± 100mA	
輸出交流電流 (最大)	600mA-p-p	160mA-p-p	400mA-p-p	70mA-p-p	200mA-p-p	連續輸出(峰對峰值)
輸出功率 (最大)	90 VA	32 VA	80 VA	28 VA	80 VA	連續輸出(峰對峰值)
頻率響應 (頻寬)	100KHz/150V-p-p	600KHz/200V-p-p	1 MHz/200V-p-p	200KHz/400V-p-p	300KHz/400V-p-p	-3dB
爬升速率	50V/us	300V/us	500V/us	200V/us	300V/us	典型值
輸出阻抗 (Protection 開關 OFF)	10Ω	50Ω	50Ω	100Ω	100Ω	機器輸出內阻
輸出保護用電阻 (Protection 開關 ON)	500Ω/80watt	4KΩ/40watt	2KΩ/80watt	15KΩ/40watt	7.5KΩ/80watt	保護用電阻將與輸出內阻串接
安全使用負載值上限	≧500Ω/300V-p-p	≧2.5KΩ/400V-p-p	≧1KΩ/400V-p-p	≧11KΩ/800V-p-p	≧4KΩ/800V-p-p	
輸入波幅(電壓值)上限	0~20V-p-p	0~20V-p-p	0~20V-p-p	0~20V-p-p	0~20V-p-p	
AMPL(波幅放大倍數)	0~60	0~90	0~90	0~180	0~180	10 轉 VR
OFFSET(可調直流輸出)	0 or ± 150V	0 or ± 200V	0 or ± 200V	0 or ± 400V	0 or ± 400V	開關 + 10 轉 VR
Monitor (衰減輸出)	100 : 1	100 : 1	100 : 1	100 : 1	100 : 1	與主輸出端同步
輸出保護裝置	1.輸出專用 FUSE 2.Protection SW 保護電阻(開關) 3.微電腦控制過 負載保護電路	1.輸出專用 FUSE 2.Protection SW 保護電阻(開關)	1.輸出專用 FUSE 2.Protection SW 保護電阻(開關) 3.微電腦控制過 負載保護電路	1.輸出專用 FUSE 2.Protection SW 保護電阻(開關)	1.輸出專用 FUSE, 2.Protection SW 保護電阻(開關) 3.微電腦控制過 負載保護電路	HA-400 與 HA-800 可以選購使用第 3 項(微電腦控制過負載保護電路)

HA-400

高 壓 放 大 器

HA-400 高壓放大器

1. 簡述：

HA-400是一台非常實用的高電壓訊號放大器,它具有最小的體積、最輕的重量及最簡易的操做.非常高的電壓輸出(400Vp-p)等優點。

本機連續輸出電流量最大值達到80 mA,還有輸出保護開關,當選擇保護輸出時能確保本機不會外部短路,或外部電壓回饋而損壞,因此可大幅降低不良率,延長本機的使用壽命。電壓放大增益高達90倍,輸出從0V ~ 400Vp-p無限段調整(使用10轉的大型可變電阻),頻寬高達600KHz(基準電壓200Vp-p輸出),非常適合半導體高壓驅動、TFT產業高壓驅動、各種高壓工程、微機電工程、奈米科技、壓電材料驅動、靜電科技工程、生醫檢測工程等應用;也很適合當作音頻信號產生器或函數波形產生器的波形放大之用。

2. 規格：

(1) 輸入端：

指定輸入電壓: 0 V ~ +/- 2.5 V (5 Vp-p), 最大不得超過 +/- 10 V (20 Vp-p)

指定輸入頻率: DC ~ 600 KHz, 太高的頻率將會被衰減, 不會對本機造成損壞, 請放心使用。

輸入波形: 直流及任何波形。

(2) 輸出端：

輸出電壓：

≤ 0 V ~ +/- 200 V (400 Vp-p), 嚴禁直接連結到示波器觀測, 必須另行選購耐壓400V以上的差動測試棒轉接觀測, 如DP-25, DP-50等。

放大增益: ≤ 0 ~ 90倍, 面板標示AMPL, 由大型10轉可變電阻組成連續可變。

最大輸出電流: ≤ 80mA (保護開關OFF時); ≤ 50mA (保護開關ON時)

輸出阻抗: 50 Ω (保護開關OFF時); 40K Ω (保護開關ON時)

爬升數率: 300V/us

輸出頻寬: $\leq 600\text{KHz}$ (基準電壓 200Vp-p 輸出)

輸出保護:

由一組開關控制, 當輸出保護設定為ON時, 輸出阻抗指定提升為 $4\text{K}\Omega$, 此刻使用中輸出端兩極不慎短路也不會損壞本機, 但是如果"輸出保護"設定為OFF時, 輸出阻抗立刻降為" 50Ω ", 此時嚴禁輸出端短路, 連續輸出也要控制在 80mA 以下(換算 400Vp-p 輸出時負載阻抗必須大於 $2.5\text{K}\Omega$, 才不會造成本機損壞)。

直流抵補: $\leq 0 \sim \pm 200\text{VDC}$, 由10轉大型可變電阻操控。

直流抵補開關:

由一只開關選擇, 當開關選擇為OFF時, 內部設定DC為 0V , 當開關設定ON時, 由面板標示OFFSET旋鈕控制。

監視輸出:

-40dB , 約為輸出端的 $1/100$ 電壓位, 輸出阻抗為 $10\text{K}\Omega$, 最大輸出 $\leq 4\text{Vp-p}$, 因此可以直接連接到示波器觀測波形。

- (3) 電源輸入: $\text{AC } 100\text{V} \sim 240\text{V} \pm 10\%$, $50 \sim 60\text{Hz}$
- (4) 電源消耗: 最大 100WATT
- (5) 保險絲: 指定使用 $1.5\text{A} / 250\text{V}$, 放置於後鐵板電源線輸入下方Fuse專用盒。
- (6) 操作溫濕度: $0 \sim 40^\circ\text{C}$; $0 \sim 80\%\text{RH}$
- (7) 儲存溼濕度: $-20 \sim 60^\circ\text{C}$; $0 \sim 90\%$
- (8) 尺寸: $270(\text{寬}) \times 95(\text{高}) \times 310(\text{深})\text{mm}$
- (9) 重量: $4.2\text{KGS} / 9.2\text{PB}$
- (10) 輸出保護裝置:
 - (A) 內置輸出保險絲。
 - (B) 輸出保護電阻: 藉由Output Protection SW ON 輸出阻抗提高到預設的保護電阻, 因此短路電流會限制在安全範圍。
 - (C) 微電腦過載保護裝置:

LED慢閃: 開機預熱中或重新開機中。

LED急閃: 微電腦偵測到過負載信號, 此時會立即將切開輸出電路, 之後會重新開機。

3. 前面板指示說明

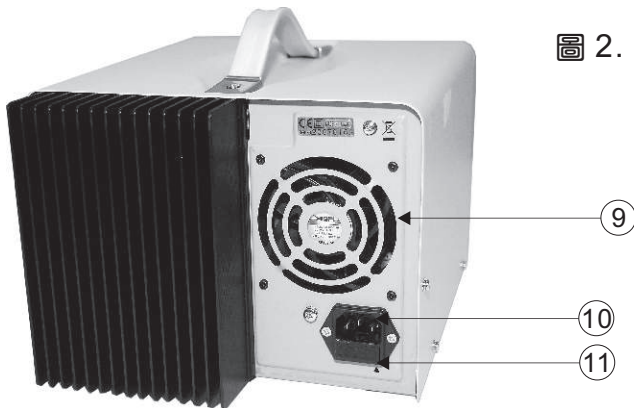
圖1.



- ① 電源開關: 電源ON時旁邊LED燈亮起。
- ② 直流抵補偏壓(OFFSET): 使用大型10轉的可變電阻, 能獲得更精確的電壓, 使用時必須先將(7)OFFSET Switch設定在ON的位置。
- ③ 振幅調整(AMPL): 使用大型10轉的可變電阻有微調的效果, 能獲得0-90倍的電壓增益。
- ④ 輸入端: 正常使用 $\leq 0 \sim \pm 2.5V$, 最大不能超過 $\pm 10V$
- ⑤ 示波器監看端(MONITOR): 衰減比例(100:1)-40dB, 因為最大輸出電壓僅4Vp-p因此能安全的連接在示波器觀測波形。
- ⑥ 輸出端: 禁止直接連結于示波器觀測波形, 因為最大輸出高達400Vp-p能擊毀任何示波器, 請另外選購耐電壓400V以上的差動測試棒量測.如DP-25或DP-50等。

- ⑦ 直流抵補偏壓(OFFSET)開關: 當開關設定為ON, 轉動(2)旋鈕, 可以獲得 $\leq 0 \sim \pm 400V$ 的DC偏壓, 當開關設定為OFF, 電路將自動恢復DC 0V。
- ⑧ 輸出保護開關: 建議一般使用狀況下將開關設定在ON, 可以避免輸出端不慎短路造成本機損壞, 或是輸出端接在更高的電路上時, 有反饋的電壓將會被有效的阻擋, 本裝置不會衰減頻寬, 但是會提高輸出阻抗為 $15K\Omega$, 負載效應將會適度提高, 最大輸出電流也會適度限縮, 如果將開關設定在OFF請更小心的使用本機, 嚴禁輸出端短路。

4. 後蓋指示說明:

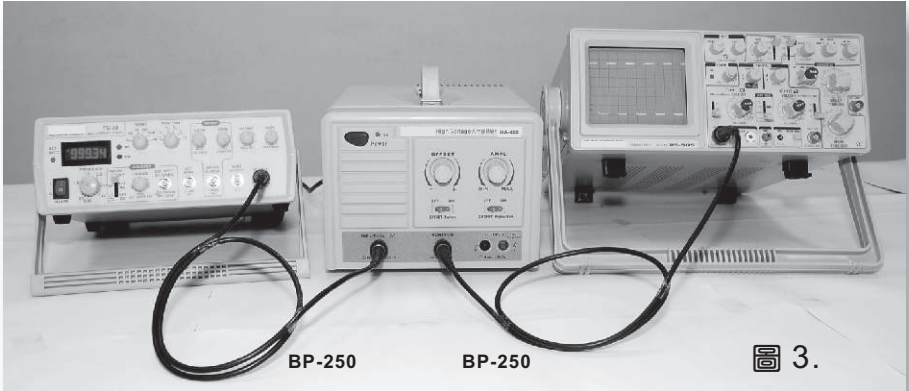


- ⑨ 散熱風扇: 吸出型, 使用 $24V/DC/0.11A$
- ⑩ AC電源輸入座: 請將隨機附的電源線插入, 並確實插妥。
- ⑪ 保險絲座:

電源	頻率	保險絲
100~240V +/- 10%	50/60 Hz	1.5 A/250V

5. 操作說明

5.1 使用函數波產生器當輸入，HA-400的Monitor 端子直接接到示波器觀測，放大實況。(如圖3)



- A. 將函數波形產生器的頻率設定在0 ~ 600 KHz。(頻率超過不會對HA-400產生任何破壞，但輸出會壓縮及變形)
- B. 波形選擇不受限制。
- C. 振幅原則是限縮在5Vp-p，但20Vp-p輸入也是安全的，可是放大器的最大輸出仍保持400Vp-p，超過將會被剪裁。
- D. 使用Cable線(BP-250)將Monitor 端子與示波器連結，示波器顯示的振幅 x 100倍就是HA-400的Output實況輸出。
- E. Monitor 端子最大輸出僅4Vp-p，不會對任何的示波器造成損壞，請放心使用。
- F. OFFSET Switch 平常SET 在OFF位置，當需要調整偏壓時才將開關SET在ON位置，並同時旋轉旋鈕可獲得最大值 +/- 200DC的改變。
- G. AMPL旋鈕提供最大90倍電壓增益及400Vp-p的最大輸出。
- H. 保護開關請平常SET在ON處，可限制電流在50mA內，這個額度不敷使用時，請改SET在OFF處，但仍嚴禁短路，以及禁止低於2.5K Ω (400Vp-p時)的輸出負載。

5.2 使用函數波形產生器當輸入，HA-400的OUT PUT端透過差動測試棒當介面傳輸到示波器觀測。(如圖4)

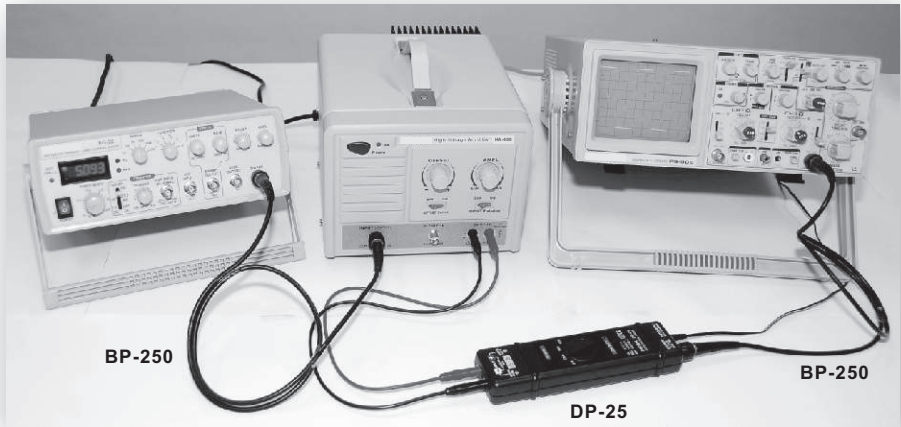


圖 4.

- A. 函數波形產生器及HA-400的設定條件全部與5.1項相同。
- B. 差動測試棒請直接選用最大輸入1000Vp-p 左右的比較適用。(如PINTEK DP-25最大輸入1400Vp-p)
- C. HA-400 的輸出端連結到差動測試棒的輸入端。
- D. 差動測試棒的輸出端連結到示波器做實際放大觀測。
- E. 示波器顯示值乘以差動測試棒的衰減量即為實際HA-400的輸出值。
- F. 差動測試棒是絕緣型的測試棒，不管HA-400輸出電荷有多正多負都不會破壞示波器，請放心使用。

5.3 使用函數波形產生器當輸入，並同時在HA-400的Monitor及Output同時在示波器觀測放大實況。(如圖5)

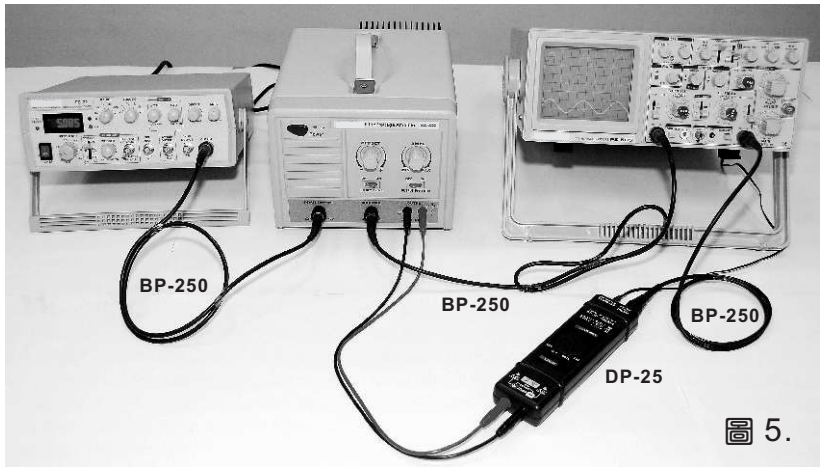


圖 5.

- A. 函數波形產生器及HA-400的設定條件同5.1。
- B. HA-400的Monitor直接透過Cable線(BP-250)與示波器CH1連接。
- C. HA-400的Output端必須先與差動測試棒的輸入端接受後再從差動測試棒的輸出端連接到示波器的CH2。
- D. 示波器CH1的實際量測值需 $\times 100$ 倍，但示波器CH2的實際值要依差動測試棒指示衰減量乘示波器垂直電壓即可。
- E. 若連接的方法無誤，以上”D”項CH1及CH2換算後的值必須相同。

6. 維護：

保養此產品時請使用原廠指定的工具，原廠將不負任何責任由其他不被認可的維修人員所做的維修。

本產品如超過60天不使用，請將電源線拔除並各別存放。

7. 清潔：

請用少許的清潔劑倒在柔軟微濕的軟布上輕輕的將灰塵及髒污清理掉。

8. 保固：

除了在人為上的特意損壞，本產品是受保固並可以維修的，並不包含在安全規範的責任。

保固是以不超出發票上的金額，零件的更換及運送的費用。

保固是僅在正常操作下而造成的損壞，並不包含任何刻意的損壞，操作上的錯誤，機械上的操作不當，保養不當，負載或過壓。

原廠的保固僅包含有限的單純更換損壞的零件，使用者將不可歸據直接或間接的責任在原廠。

原廠的保固是賣出後的12個月內，如有任意的非原廠的維修或更換零件，原廠保固將自然取消。

9. 維修：

有任何的維修，保養或更換零件是在保固以外，請將產品退回原廠維修。

HA-405

高 壓 放 大 器

HA-405 高壓放大器

1. 簡述：

HA-405是一台非常實用的高電壓訊號放大器，它具有最小的體積、最輕的重量及最簡易的操做，非常高的電壓輸出(400Vp-p)等優點。

本機連續輸出電流量最大值達到200 mA，還有輸出保護開關，當選擇保護輸出時能確保本機不會外部短路，或外部電壓回饋而損壞，因此可大幅降低不良率，延長本機的使用壽命。電壓放大增益高達80倍，輸出從0V ~ 400Vp-p無限段調整(使用10轉的大型可變電阻)，頻寬高達1MHz(基準電壓200Vp-p輸出)，非常適合半導體高壓驅動、TFT產業高壓驅動、各種高壓工程、微機電工程、奈米科技、壓電材料驅動、靜電科技工程、生醫檢測工程等應用；也很適合當作音頻信號產生器或函數波形產生器的波形放大之用。

2. 規格：

(1) 輸入端：

指定輸入電壓：0 V ~ +/- 2.5 V (5 Vp-p)，最大不得超過 +/- 10 V (20 Vp-p)

指定輸入頻率：DC ~ 1MHz，太高的頻率將會被衰減，不會對本機造成損壞，請放心使用。

輸入波形：直流及任何波形。

(2) 輸出端：

輸出電壓：

≤ 0 V ~ +/- 200 V (400 Vp-p)，嚴禁直接連結到示波器觀測，必須另行選購耐壓400V以上的差動測試棒轉接觀測，如DP-25, DP-50等。

放大增益：≤ 0 ~ 90倍，面板標示AMPL，由大型10轉可變電阻組成連續可變。

最大輸出電流：≤ 200mA (保護開關OFF時)；≤ 100mA (保護開關ON時)

輸出阻抗：50 Ω (保護開關OFF時)；2K Ω (保護開關ON時)

爬升數率：500V/us

輸出頻寬: $\leq 1\text{MHz}$ (基準電壓 200Vp-p 輸出)

輸出保護:

由一組開關控制, 當輸出保護設定為ON時, 輸出阻抗指定提升為 $2\text{K}\Omega$, 此刻使用中輸出端兩極不慎短路也不會損壞本機, 但是如果"輸出保護"設定為OFF時, 輸出阻抗立刻降為" 50Ω ", 此時嚴禁輸出端短路, 連續輸出也要控制在 200mA 以下(換算 400Vp-p 輸出時負載阻抗必須大於 $1.0\text{K}\Omega$, 才不會造成本機損壞)。

直流抵補: $\leq 0 \sim \pm 200\text{VDC}$, 由10轉大型可變電阻操控。

直流抵補開關:

由一只開關選擇, 當開關選擇為OFF時, 內部設定DC為 0V , 當開關設定ON時, 由面板標示OFFSET旋鈕控制。

監視輸出:

-40dB , 約為輸出端的 $1/100$ 電壓位, 輸出阻抗為 $10\text{K}\Omega$, 最大輸出 $\leq 4\text{Vp-p}$, 因此可以直接連接到示波器觀測波形。

- (3) 電源輸入: $\text{AC } 100\text{V} \sim 240\text{V} \pm 10\%$, $50 \sim 60\text{Hz}$
- (4) 電源消耗: 最大 150WATT
- (5) 保險絲: 指定使用 $3.0\text{A} / 250\text{V}$, 放置於後鐵板電源線輸入下方Fuse專用盒。
- (6) 操作溫濕度: $0 \sim 40^\circ\text{C}$; $0 \sim 80\%\text{RH}$
- (7) 儲存溼濕度: $-20 \sim 60^\circ\text{C}$; $0 \sim 90\%$
- (8) 尺寸: $270(\text{寬}) \times 95(\text{高}) \times 310(\text{深})\text{mm}$
- (9) 重量: $5.2\text{KGS} / 11.5\text{PB}$
- (10) 輸出保護裝置:
 - (A) 內置輸出保險絲。
 - (B) 輸出保護電阻: 藉由Output Protection SW ON 輸出阻抗提高到預設的保護電阻, 因此短路電流會限制在安全範圍。
 - (C) 微電腦過載保護裝置:

LED慢閃: 開機預熱中或重新開機中。

LED急閃: 微電腦偵測到過負載信號, 此時會立即將切開輸出電路, 之後會重新開機。

3. 前面板指示說明

圖6.



- ① 電源開關: 電源ON時旁邊LED燈亮起。
- ② 直流抵補偏壓(OFFSET): 使用大型10轉的可變電阻, 能獲得更精確的電壓, 使用時必須先將(7)OFFSET Switch設定在ON的位置。
- ③ 振幅調整(AMPL): 使用大型10轉的可變電阻有微調的效果, 能獲得0-90倍的電壓增益。
- ④ 輸入端: 正常使用 $\leq 0 \sim \pm 2.5V$, 最大不能超過 $\pm 10V$
- ⑤ 示波器監看端(MONITOR): 衰減比例(100:1)-40dB.因為最大輸出電壓僅 $4Vp-p$ 因此能安全的連接在示波器觀測波形。
- ⑥ 輸出端: 禁止直接連結于示波器觀測波形, 因為最大輸出高達 $400Vp-p$ 能擊毀任何示波器, 請另外選購耐電壓400V以上的差動測試棒量測, 如DP-25或DP-50等。

- ⑦ 直流抵補偏壓(OFFSET)開關: 當開關設定為ON, 轉動(2)旋鈕, 可以獲得 $\leq 0 \sim \pm 200V$ 的DC偏壓, 當開關設定為OFF, 電路將自動恢復DC 0V。
- ⑧ 輸出保護開關: 建議一般使用狀況下將開關設定在ON, 可以避免輸出端不慎短路造成本機損壞, 或是輸出端接在更高的電路上時, 有反饋的電壓將會被有效的阻擋, 本裝置不會衰減頻寬, 但是會提高輸出阻抗為 $2K\Omega$, 負載效應將會適度提高, 最大輸出電流也會適度限縮, 如果將開關設定在OFF請更小心的使用本機, 嚴禁輸出端短路。

4. 後蓋指示說明:

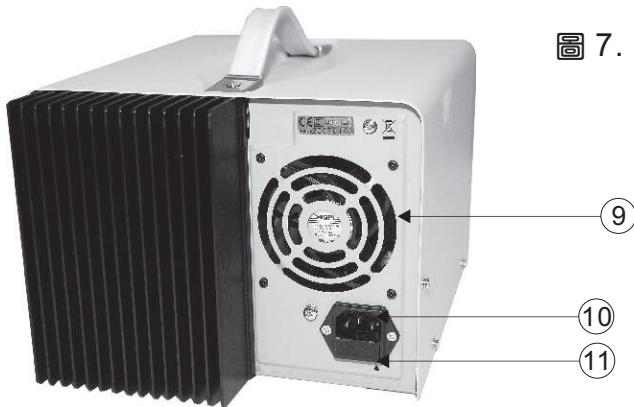


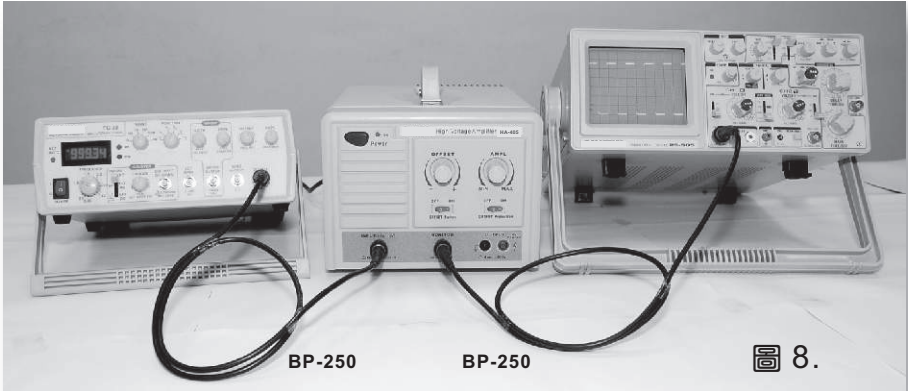
圖 7.

- ⑨ 散熱風扇: 吸出型, 使用 $24V/DC/0.11A$
- ⑩ AC電源輸入座: 請將隨機附的電源線插入, 並確實插妥。
- ⑪ 保險絲座:

電源	頻率	保險絲
100~240V +/- 10%	50/60 Hz	3.0 A/250V

5. 操作說明

5.1 使用函數波產生器當輸入，HA-405的Monitor 端子直接接到示波器觀測，放大實況。(如圖8)



- A. 將函數波形產生器的頻率設定在0 ~ 1MHz。(頻率超過不會對HA-405產生任何破壞，但輸出會壓縮及變形)
- B. 波形選擇不受限制。
- C. 振幅原則是限縮在5Vp-p，但20Vp-p輸入也是安全的，可是放大器的最大輸出仍保持400Vp-p，超過將會被剪裁。
- D. 使用Cable線(BP-250)將Monitor 端子與示波器連結，示波器顯示的振幅 x 100倍就是HA-405的Output實況輸出。
- E. Monitor 端子最大輸出僅4Vp-p，不會對任何的示波器造成損壞，請放心使用。
- F. OFFSET Switch 平常SET 在OFF位置，當需要調整偏壓時才將開關SET在ON位置，並同時旋轉旋鈕可獲得最大值 +/- 200DC的改變。
- G. AMPL旋鈕提供最大90倍電壓增益及400Vp-p的最大輸出。
- H. 保護開關請平常SET在ON處，可限制電流在100mA內，這個額度不敷使用時，請改SET在OFF處，但仍嚴禁短路，以及低於1.0K Ω (400Vp-p)的輸出負載。

5.2 使用函數波形產生器當輸入，HA-405的OUT PUT端透過差動測試棒當介面傳輸到示波器觀測。(如圖9)

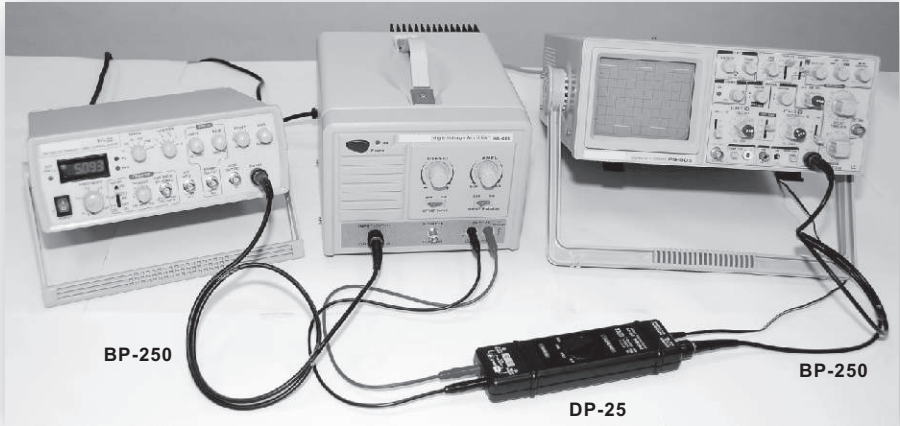


圖 9.

- A. 函數波形產生器及HA-405的設定條件全部與5.1項相同。
- B. 差動測試棒請直接選用最大輸入1000Vp-p 左右的比較適用。(如PINTEK DP-25最大輸入1400Vp-p)
- C. HA-405 的輸出端連結到差動測試棒的輸入端。
- D. 差動測試棒的輸出端連結到示波器做實際放大觀測。
- E. 示波器顯示值乘以差動測試棒的衰減量即為實際HA-405的輸出值。
- F. 差動測試棒是絕緣型的測試棒，不管HA-405輸出電荷有多正多負都不會破壞示波器，請放心使用。

5.3 使用函數波形產生器當輸入，並同時在HA-405的Monitor及Output同時在示波器觀測放大實況。(如圖10)

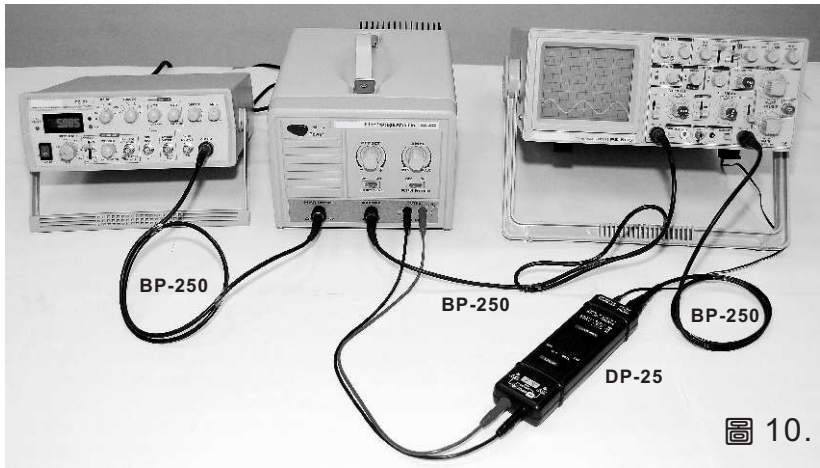


圖 10.

- A. 函數波形產生器及HA-405的設定條件同5.1。
- B. HA-405的Monitor直接透過Cable線(BP-250)與示波器CH1連接。
- C. HA-405的Output端必須先與差動測試棒的輸入端接受後再從差動測試棒的輸出端連接到示波器的CH2。
- D. 示波器CH1的實際量測值需 $\times 100$ 倍，但示波器CH2的實際值要依差動測試棒指示衰減量乘示波器垂直電壓即可。
- E. 若連接的方法無誤，以上”D”項CH1及CH2換算後的值必須相同。

6. 維護：

保養此產品時請使用原廠指定的工具，原廠將不負任何責任由其他不被認可的維修人員所做的維修。

本產品如超過60天不使用，請將電源線拔除並各別存放。

7. 清潔：

請用少許的清潔劑倒在柔軟微濕的軟布上輕輕的將灰塵及髒污清理掉。

8. 保固：

除了在人為上的特意損壞，本產品是受保固並可以維修的，並不包含在安全規範的責任。

保固是以不超出發票上的金額，零件的更換及運送的費用。保固是僅在正常操作下而造成的損壞，並不包含任何刻意的損壞，操作上的錯誤，機械上的操作不當，保養不當，負載或過壓。

原廠的保固僅包含有限的單純更換損壞的零件，使用者將不可歸據直接或間接的責任在原廠。

原廠的保固是賣出後的12個月內，如有任意的非原廠的維修或更換零件，原廠保固將自然取消。

9. 維修：

有任何的維修，保養或更換零件是在保固以外，請將產品退回原廠維修。

HA-800

高 壓 放 大 器

HA-800 高壓放大器

1. 簡述：

HA-800是一台非常實用的高電壓訊號放大器, 它具有最小的體積、最輕的重量及最簡易的操做, 非常高的電壓輸出(800Vp-p)等優點。

本機連續輸出電流量最大值達到35 mA, 還有輸出保護開關, 當選擇保護輸出時能確保本機不會外部短路, 或外部電壓回饋而損壞, 因此可大幅降低不良率, 延長本機的使用壽命。電壓放大增益高達180倍, 輸出從0V ~ 800Vp-p無限段調整(使用10轉的大型可變電阻), 頻寬高達200KHz(基準電壓400Vp-p輸出), 非常適合半導體高壓驅動、TFT產業高壓驅動、各種高壓工程、微機電工程、奈米科技、壓電材料驅動、靜電科技工程、生醫檢測工程等應用; 也很適合當作音頻信號產生器或函數波形產生器的波形放大之用。

2. 規格：

(1) 輸入端：

指定輸入電壓: 0 V ~ +/- 5 V (10 Vp-p), 最大不得超過 +/- 10 V (20 Vp-p)

指定輸入頻率: DC ~ 200 KHz, 太高的頻率將會被衰減, 不會對本機造成損壞, 請放心使用。

輸入波形: 直流及任何波形。

(2) 輸出端：

輸出電壓：

$\leq 0 \text{ V} \sim \pm 400 \text{ V}$ (800 Vp-p), 嚴禁直接連結到示波器觀測, 必須另行選購耐壓800V以上的差動測試棒轉接觀測, 如DP-25, DP-50等。

放大增益: $\leq 0 \sim 180$ 倍, 面板標示AMPL, 由大型10轉可變電阻組成連續可變。

最大輸出電流: $\leq 35 \text{ mA}$ (保護開關OFF時); $\leq 27 \text{ mA}$ (保護開關ON時)

輸出阻抗: 100Ω (保護開關OFF時); $15 \text{ K} \Omega$ (保護開關ON時)

爬升數率: 200V/us

輸出頻寬: $\leq 200\text{KHz}$ (基準電壓 400Vp-p 輸出)

輸出保護:

由一組開關控制, 當輸出保護設定為ON時, 輸出阻抗指定提升為 $15\text{K}\Omega$, 此刻使用中輸出端兩極不慎短路也不會損壞本機, 但是如果"輸出保護"設定為OFF時, 輸出阻抗立刻降為" 100Ω ", 此時嚴禁輸出端短路, 連續輸出也要控制在 35mA 以下(換算 800Vp-p 輸出時負載阻抗必須大於 $12\text{K}\Omega$, 才不會造成本機損壞)。

直流抵補: $\leq 0 \sim \pm 400\text{VDC}$, 由10轉大型可變電阻操控。

直流抵補開關:

由一只開關選擇, 當開關選擇為OFF時, 內部設定DC為 0V , 當開關設定ON時, 由面板標示OFFSET旋鈕控制。

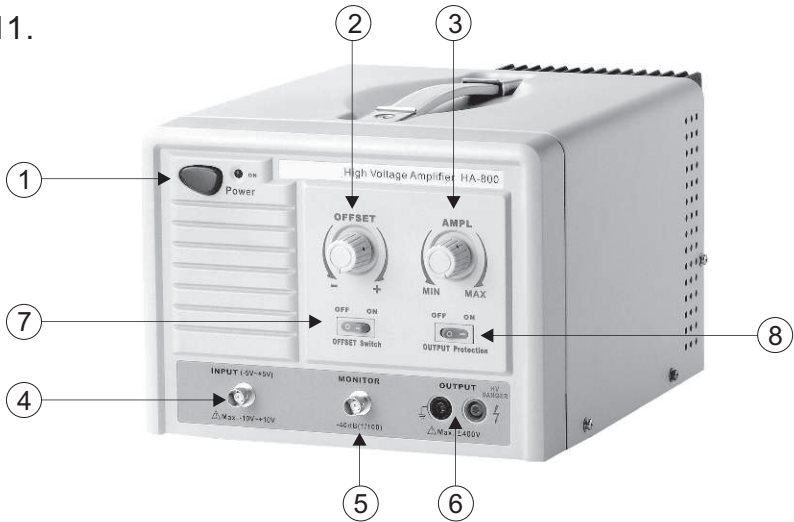
監視輸出:

-40dB , 約為輸出端的 $1/100$ 電壓位, 輸出阻抗為 $10\text{K}\Omega$, 最大輸出 $\leq 8\text{Vp-p}$, 因此可以直接連接到示波器觀測波形。

- (3) 電源輸入: $\text{AC } 100\text{V} \sim 240\text{V} \pm 10\%$, $50 \sim 60\text{Hz}$
 - (4) 電源消耗: 最大 100WATT
 - (5) 保險絲: 指定使用 $1.5\text{A} / 250\text{V}$, 放置於後鐵板電源線輸入下方Fuse專用盒。
 - (6) 操作溫濕度: $0 \sim 40^\circ\text{C}$; $0 \sim 80\%\text{RH}$
 - (7) 儲存溼濕度: $-20 \sim 60^\circ\text{C}$; $0 \sim 90\%$
 - (8) 尺寸: $270(\text{寬}) \times 95(\text{高}) \times 310(\text{深})\text{mm}$
 - (9) 重量: $4.2\text{KGS} / 9.2\text{PB}$
 - (10) 輸出保護裝置:
 - (A) 內置輸出保險絲。
 - (B) 輸出保護電阻: 藉由Output Protection SW ON 輸出阻抗提高到預設的保護電阻, 因此短路電流會限制在安全範圍。
- ◎微電腦過載保護裝置:
- LED慢閃: 開機預熱中或重新開機中。
- LED急閃: 微電腦偵測到過負載信號, 此時會立即將切開輸出電路, 之後會重新開機。

3. 前面板指示說明

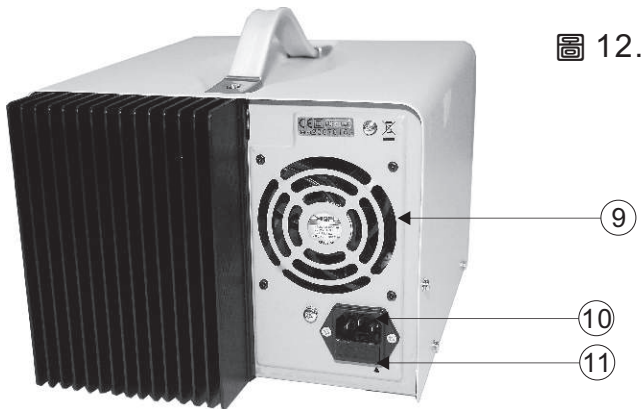
圖11.



- ① 電源開關: 電源ON時旁邊LED燈亮起。
- ② 直流抵補偏壓(OFFSET): 使用大型10轉的可變電阻, 能獲得更精確的電壓, 使用時必須先將(7)OFFSET Switch設定在ON的位置。
- ③ 振幅調整(AMPL): 使用大型10轉的可變電阻有微調的效果, 能獲得0-180倍的電壓增益。
- ④ 輸入端: 正常使用 $\leq 0 \sim \pm 5V$, 最大不能超過 $\pm 10V$
- ⑤ 示波器監看端(MONITOR): 衰減比例(100:1)-40dB, 因為最大輸出電壓僅8Vp-p因此能安全的連接在示波器觀測波形。
- ⑥ 輸出端: 禁止直接連結于示波器觀測波形, 因為最大輸出高達800Vp-p能擊毀任何示波器, 請另外選購耐電壓800V以上的差動測試棒量測, 如DP-25或DP-50等。

- ⑦ 直流抵補偏壓(OFFSET)開關: 當開關設定為ON, 轉動(2)旋鈕, 可以獲得 $\leq 0 \sim \pm 400V$ 的DC偏壓, 當開關設定為OFF, 電路將自動恢復DC 0V。
- ⑧ 輸出保護開關: 建議一般使用狀況下將開關設定在ON, 可以避免輸出端不慎短路造成本機損壞, 或是輸出端接在更高的電路上時, 有反饋的電壓將會被有效的阻擋, 本裝置不會衰減頻寬, 但是會提高輸出阻抗為 $15K\Omega$, 負載效應將會適度提高, 最大輸出電流也會適度限縮, 如果將開關設定在OFF請更小心的使用本機, 嚴禁輸出端短路。

4. 後蓋指示說明:

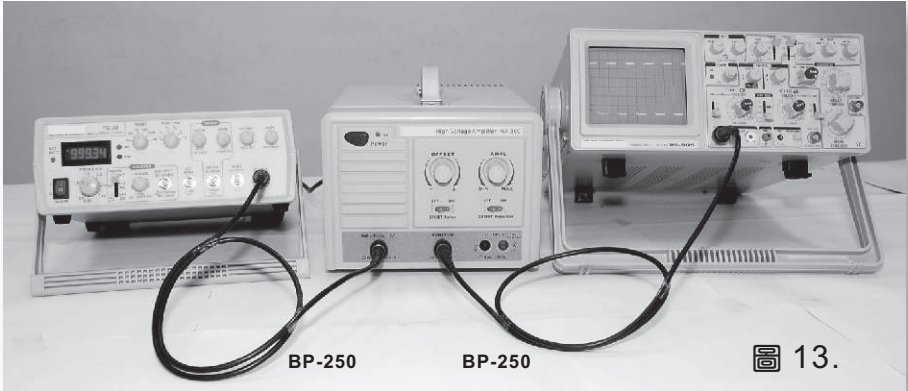


- ⑨ 散熱風扇: 吸出型, 使用 $24V/DC/0.11A$
- ⑩ AC電源輸入座: 請將隨機附的電源線插入, 並確實插妥。
- ⑪ 保險絲座:

電源	頻率	保險絲
100~240V +/- 10%	50/60 Hz	1.5 A/250V

5. 操作說明

5.1 使用函數波產生器當輸入，HA-800的Monitor 端子直接接到示波器觀測，放大實況。(如圖13)



- A. 將函數波形產生器的頻率設定在0 ~ 200 KHz。(頻率超過不會對HA-800產生任何破壞，但輸出會壓縮及變形)
- B. 波形選擇不受限制。
- C. 振幅原則是限縮在10Vp-p, 但20Vp-p以內輸入也是安全的，可是放大器的最大輸出仍保持800Vp-p, 超過將會被剪裁。
- D. 使用Cable線(BP-250) 將Monitor 端子與示波器連結, 示波器顯示的振幅 x 100倍就是HA-800的Output實況輸出。
- E. Monitor 端子最大輸出僅8Vp-p, 不會對任何的示波器造成損壞，請放心使用。
- F. OFFSET Switch 平常SET 在OFF位置，當需要調整偏壓時才將開關SET在ON位置，並同時旋轉旋鈕可獲得最大值 +/- 400DC的改變。
- G. AMPL旋鈕提供最大180倍電壓增益及800Vp-p的最大輸出。
- H. 保護開關請平常SET在ON處，可限制電流在27mA內，這個額度不敷使用時，請改SET在OFF處，但仍嚴禁短路，最大35mA輸出以及禁止低於12K Ω (800Vp-p)的輸出負載。

5.2 使用函數波形產生器當輸入，HA-800的OUT PUT端透過差動測試棒當介面傳輸到示波器觀測。(如圖14)

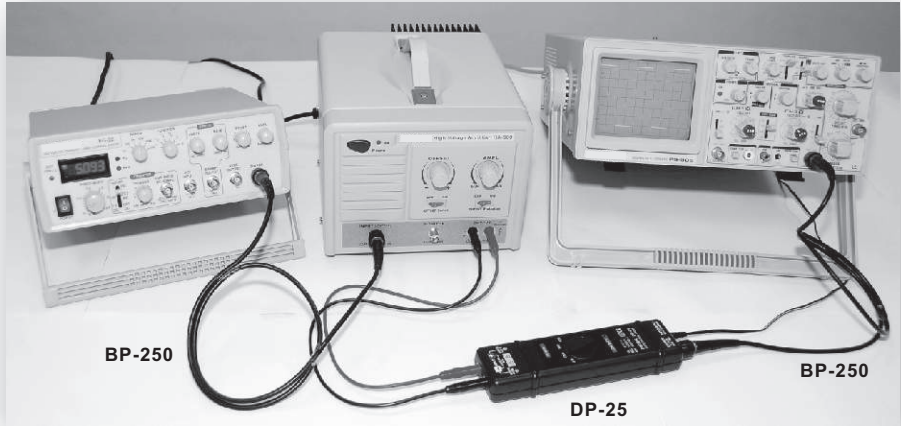


圖 14.

- A. 函數波形產生器及HA-800的設定條件全部與5.1項相同。
- B. 差動測試棒請直接選用最大輸入1000Vp-p 左右的比較適用。(如PINTEK DP-25最大輸入1400Vp-p)
- C. HA-800 的輸出端連結到差動測試棒的輸入端。
- D. 差動測試棒的輸出端連結到示波器做實際放大觀測。
- E. 示波器顯示值乘以差動測試棒的衰減量即為實際HA-800的輸出值。
- F. 差動測試棒是絕緣型的測試棒，不管HA-800輸出電荷有多正多負都不會破壞示波器，請放心使用。

5.3 使用函數波形產生器當輸入，並同時在HA-400的Monitor及Output 同時在示波器觀測放大實況。(如圖15)

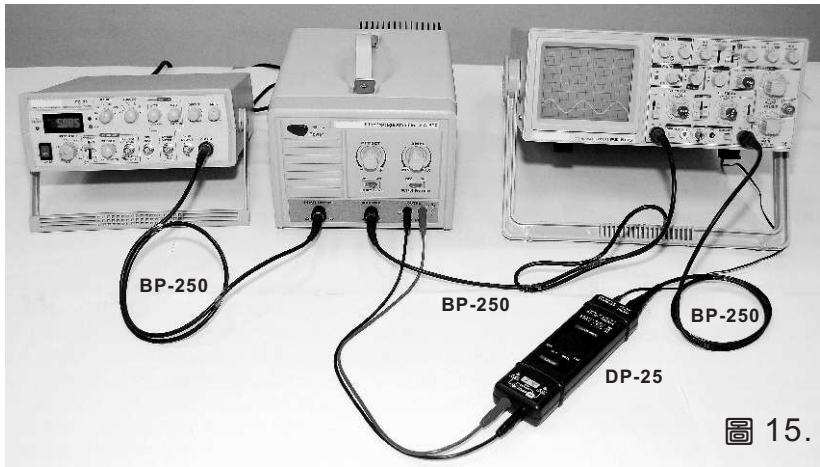


圖 15.

- A. 函數波形產生器及HA-800的設定條件同5.1。
- B. HA-800的Monitor直接透過Cable 線(BP-250)與示波器 CH1連接。
- C. HA-800的Output端必須先與差動測試棒的輸入端接受後再從差動測試棒的輸出端連接到示波器的CH2。
- D. 示波器CH1的實際量測值需 $\times 100$ 倍，但示波器CH2的實際值要依差動測試棒指示衰減量乘示波器垂直電壓即可。
- E. 若連接的方法無誤，以上”D”項CH1 及 CH2換算後的值必須相同。

6. 維護：

保養此產品時請使用原廠指定的工具，原廠將不負任何責任由其他不被認可的維修人員所做的維修。

本產品如超過60天不使用，請將電源線拔除並各別存放。

7. 清潔：

請用少許的清潔劑倒在柔軟微濕的軟布上輕輕的將灰塵及髒污清理掉。

8. 保固：

除了在人為上的特意損壞，本產品是受保固並可以維修的，並不包含在安全規範的責任。

保固是以不超出發票上的金額，零件的更換及運送的費用。

保固是僅在正常操作下而造成的損壞，並不包含任何刻意的損壞，操作上的錯誤，機械上的操作不當，保養不當，負載或過壓。

原廠的保固僅包含有限的單純更換損壞的零件，使用者將不可歸據直接或間接的責任在原廠。

原廠的保固是賣出後的12個月內，如有任意的非原廠的維修或更換零件，原廠保固將自然取消。

9. 維修：

有任何的維修，保養或更換零件是在保固以外，請將產品退回原廠維修。

HA-805

高 壓 放 大 器

HA-805 高壓放大器

1. 簡述：

HA-805是一台非常實用的高電壓訊號放大器,它具有最小的體積、最輕的重量及最簡易的操做,非常高的電壓輸出(800Vp-p)等優點。

本機連續輸出電流量最大值達到100 mA,還有輸出保護開關,當選擇保護輸出時能確保本機不會外部短路,或外部電壓回饋而損壞,因此可大幅降低不良率,延長本機的使用壽命。電壓放大增益高達180倍,輸出從0V ~ 800Vp-p無限段調整(使用10轉的大型可變電阻),頻寬高達300KHz(基準電壓400Vp-p輸出),非常適合半導體高壓驅動、TFT產業高壓驅動、各種高壓工程、微機電工程、奈米科技、壓電材料驅動、靜電科技工程、生醫檢測工程等應用;也很適合當作音頻信號產生器或函數波形產生器的波形放大之用。

2. 規格：

(1) 輸入端：

指定輸入電壓: 0 V ~ +/- 5 V (10 Vp-p), 最大不得超過 +/- 10 V (20 Vp-p)

指定輸入頻率: DC ~ 300 KHz, 太高的頻率將會被衰減, 不會對本機造成損壞, 請放心使用。

輸入波形: 直流及任何波形。

(2) 輸出端：

輸出電壓：

$\leq 0 \text{ V} \sim \pm 400 \text{ V}$ (800 Vp-p), 嚴禁直接連結到示波器觀測, 必須另行選購耐壓400V以上的差動測試棒轉接觀測, 如DP-25, DP-50等。

放大增益: $\leq 0 \sim 180$ 倍, 面板標示AMPL, 由大型10轉可變電阻組成連續可變。

最大輸出電流: $\leq 100 \text{ mA}$ (保護開關OFF時); $\leq 53 \text{ mA}$ (保護開關ON時)

輸出阻抗: 100Ω (保護開關OFF時); $7.5 \text{ K} \Omega$ (保護開關ON時)

爬升數率: 300 V/us

輸出頻寬: $\leq 300\text{KHz}$ (基準電壓 400Vp-p 輸出)

輸出保護:

由一組開關控制, 當輸出保護設定為ON時, 輸出阻抗指定提升為 $7.5\text{K}\Omega$, 此刻使用中輸出端兩極不慎短路也不會損壞本機, 但是如果"輸出保護"設定為OFF時, 輸出阻抗立刻降為" 100Ω ", 此時嚴禁輸出端短路, 連續輸出也要控制在 100mA 以下(換算 800Vp-p 輸出時負載阻抗必須大於 $4.0\text{K}\Omega$, 才不會造成本機損壞)。

直流抵補: $\leq 0 \sim \pm 400\text{VDC}$, 由10轉大型可變電阻操控。

直流抵補開關:

由一只開關選擇, 當開關選擇為OFF時, 內部設定DC為 0V , 當開關設定ON時, 由面板標示OFFSET旋鈕控制。

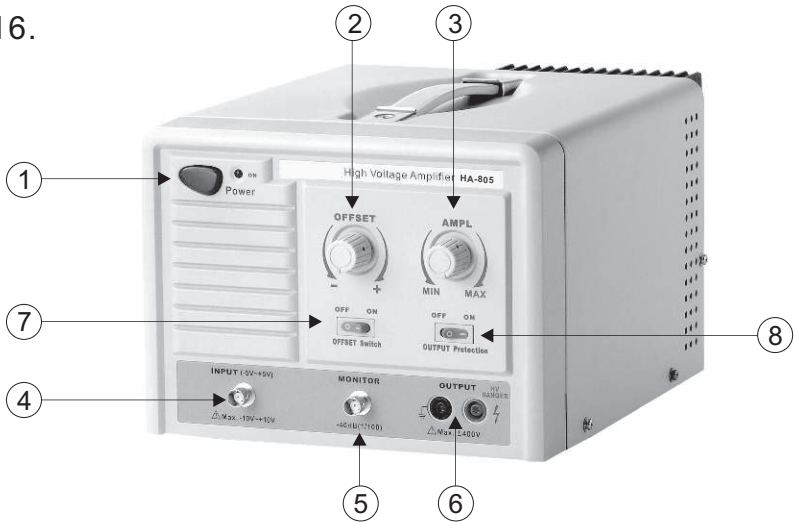
監視輸出:

-40dB , 約為輸出端的 $1/100$ 電壓位, 輸出阻抗為 $10\text{K}\Omega$, 最大輸出 $\leq 8\text{Vp-p}$, 因此可以直接連接到示波器觀測波形。

- (3) 電源輸入: $\text{AC } 100\text{V} \sim 240\text{V} \pm 10\%$, $50 \sim 60\text{Hz}$
 - (4) 電源消耗: 最大 150WATT
 - (5) 保險絲: 指定使用 $3.0\text{A} / 250\text{V}$, 放置於後鐵板電源線輸入下方Fuse專用盒。
 - (6) 操作溫濕度: $0 \sim 40^\circ\text{C}$; $0 \sim 80\%\text{RH}$
 - (7) 儲存溼濕度: $-20 \sim 60^\circ\text{C}$; $0 \sim 90\%$
 - (8) 尺寸: $270(\text{寬}) \times 95(\text{高}) \times 310(\text{深})\text{mm}$
 - (9) 重量: $5.2\text{KGS} / 11.5\text{PB}$
 - (10) 輸出保護裝置:
 - (A) 內置輸出保險絲。
 - (B) 輸出保護電阻: 藉由Output Protection SW ON 輸出阻抗提高到預設的保護電阻, 因此短路電流會限制在安全範圍。
- ◎微電腦過載保護裝置:
- LED慢閃: 開機預熱中或重新開機中。
- LED急閃: 微電腦偵測到過負載信號, 此時會立即將切開輸出電路, 之後會重新開機。

3. 前面板指示說明

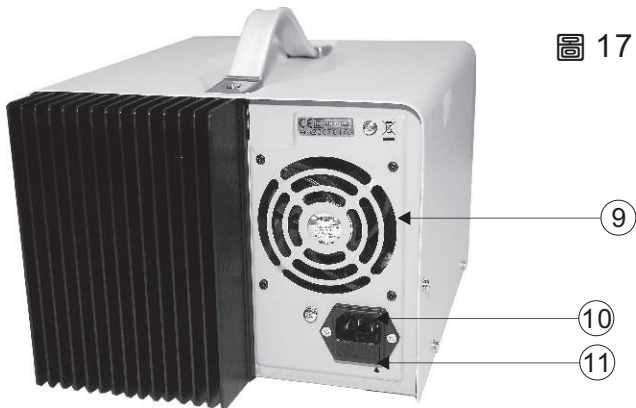
圖16.



- ① 電源開關: 電源ON時旁邊LED燈亮起。
- ② 直流抵補偏壓(OFFSET): 使用大型10轉的可變電阻, 能獲得更精確的電壓, 使用時必須先將(7)OFFSET Switch設定在ON的位置。
- ③ 振幅調整(AMPL): 使用大型10轉的可變電阻有微調的效果, 能獲得0-180倍的電壓增益。
- ④ 輸入端: 正常使用 $\leq 0 \sim \pm 5V$, 最大不能超過 $\pm 10V$
- ⑤ 示波器監看端(MONITOR): 衰減比例(100:1)-40dB, 因為最大輸出電壓僅8Vp-p因此能安全的連接在示波器觀測波形。
- ⑥ 輸出端: 禁止直接連結于示波器觀測波形, 因為最大輸出高達800Vp-p能擊毀任何示波器, 請另外選購耐電壓800V以上的差動測試棒量測, 如DP-25或DP-50等。

- ⑦ 直流抵補偏壓(OFFSET)開關: 當開關設定為ON, 轉動(2)旋鈕, 可以獲得 $\leq 0 \sim \pm 400V$ 的DC偏壓, 當開關設定為OFF, 電路將自動恢復DC 0V。
- ⑧ 輸出保護開關: 建議一般使用狀況下將開關設定在ON, 可以避免輸出端不慎短路造成本機損壞, 或是輸出端接在更高的電路上時, 有反饋的電壓將會被有效的阻擋, 本裝置不會衰減頻寬, 但是會提高輸出阻抗為 $7.5K\Omega$, 負載效應將會適度提高, 最大輸出電流也會適度限縮, 如果將開關設定在OFF請更小心的使用本機, 嚴禁輸出端短路。

4. 後蓋指示說明:



- ⑨ 散熱風扇: 吸出型, 使用 $24V/DC/0.11A$
- ⑩ AC電源輸入座: 請將隨機附的電源線插入, 並確實插妥。
- ⑪ 保險絲座:

電源	頻率	保險絲
100~240V +/- 10%	50/60 Hz	3.0 A/250V

5. 操作說明

5.1 使用函數波產生器當輸入，HA-805的Monitor 端子直接接到示波器觀測，放大實況。(如圖18)

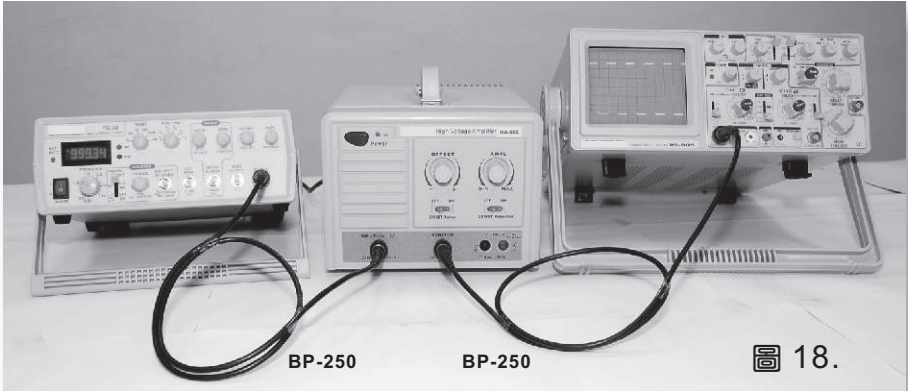


圖 18.

- A. 將函數波形產生器的頻率設定在0 ~ 300 KHz。(頻率超過不會對HA-805產生任何破壞，但輸出會壓縮及變形)
- B. 波形選擇不受限制。
- C. 振幅原則是限縮在10Vp-p, 但20Vp-p以內輸入也是安全的，可是放大器的最大輸出仍保持800Vp-p, 超過將會被剪裁。
- D. 使用Cable線(BP-250) 將Monitor 端子與示波器連結，示波器顯示的振幅 x 100倍就是HA-805的Output實況輸出。
- E. Monitor 端子最大輸出僅8Vp-p, 不會對任何的示波器造成損壞，請放心使用。
- F. OFFSET Switch 平常SET 在OFF位置，當需要調整偏壓時才將開關SET在ON位置，並同時旋轉旋鈕可獲得最大值 +/- 400DC的改變。
- G. AMPL旋鈕提供最大180倍電壓增益及800Vp-p的最大輸出。
- H. 保護開關請平常SET在ON處，可限制電流在53mA內，這個額度不敷使用時，請改SET在OFF處，但仍嚴禁短路，最大100mA輸出以及禁止低於4.0K Ω (800Vp-p)的輸出負載。

5.2 使用函數波形產生器當輸入，HA-805的OUT PUT端透過差動測試棒當介面傳輸到示波器觀測。(如圖19)

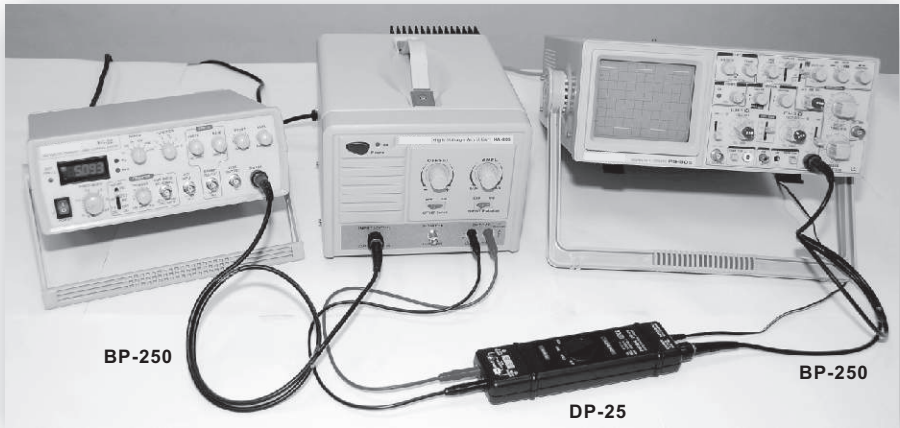


圖 19.

- A. 函數波形產生器及HA-805的設定條件全部與5.1項相同。
- B. 差動測試棒請直接選用最大輸入1000Vp-p 左右的比較適用。(如PINTEK DP-25最大輸入1400Vp-p)
- C. HA-805 的輸出端連結到差動測試棒的輸入端。
- D. 差動測試棒的輸出端連結到示波器做實際放大觀測。
- E. 示波器顯示值乘以差動測試棒的衰減量即為實際HA-805的輸出值。
- F. 差動測試棒是絕緣型的測試棒，不管HA-805輸出電荷有多正多負都不會破壞示波器，請放心使用。

5.3 使用函數波形產生器當輸入，並同時在HA-805的Monitor及Output 同時在示波器觀測放大實況。(如圖20)

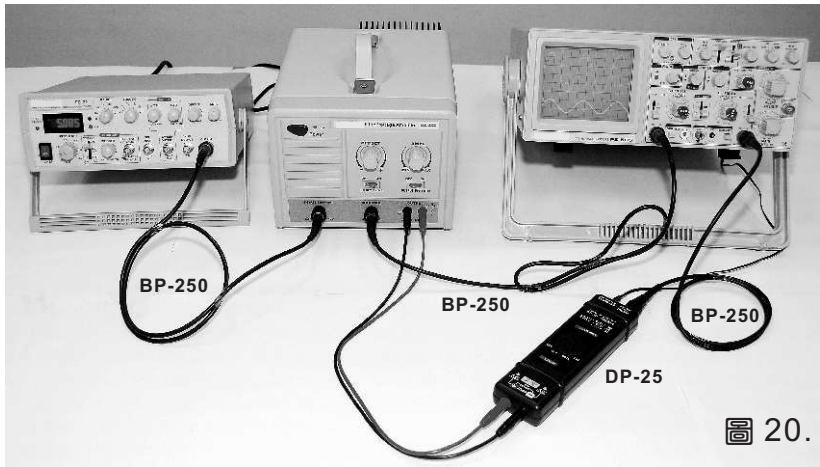


圖 20.

- A. 函數波形產生器及HA-805的設定條件同5.1。
- B. HA-805的Monitor直接透過Cable 線(BP-250)與示波器CH1連接。
- C. HA-805的Output端必須先與差動測試棒的輸入端接受後再從差動測試棒的輸出端連接到示波器的CH2。
- D. 示波器CH1的實際量測值需 $\times 100$ 倍，但示波器CH2的實際值要依差動測試棒指示衰減量乘示波器垂直電壓即可。
- E. 若連接的方法無誤，以上”D”項CH1 及 CH2換算後的值必須相同。

6. 維護：

保養此產品時請使用原廠指定的工具，原廠將不負任何責任由其他不被認可的維修人員所做的維修。

本產品如超過60天不使用，請將電源線拔除並各別存放。

7. 清潔：

請用少許的清潔劑倒在柔軟微濕的軟布上輕輕的將灰塵及髒污清理掉。

8. 保固：

除了在人為上的特意損壞，本產品是受保固並可以維修的，並不包含在安全規範的責任。

保固是以不超出發票上的金額，零件的更換及運送的費用。

保固是僅在正常操作下而造成的損壞，並不包含任何刻意的損壞，操作上的錯誤，機械上的操作不當，保養不當，負載或過壓。

原廠的保固僅包含有限的單純更換損壞的零件，使用者將不可歸據直接或間接的責任在原廠。

原廠的保固是賣出後的12個月內，如有任意的非原廠的維修或更換零件，原廠保固將自然取消。

9. 維修：

有任何的維修，保養或更換零件是在保固以外，請將產品退回原廠維修。

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