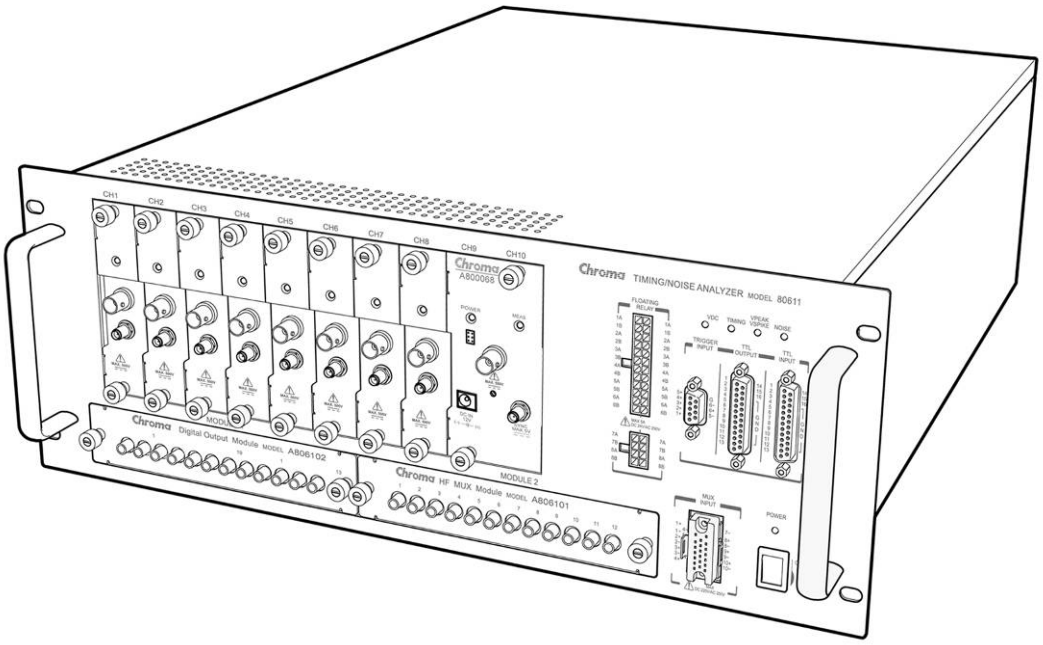
Chroma

Timing/Noise Analyzer

80611

User's Manual

Timing/Noise Analyzer
80611
User's Manual



Version 1.9
July 2016

Legal Notices

The information in this document is subject to change without notice.

Chroma ATE INC. makes no warranty of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Chroma ATE INC. shall not be held liable for errors contained herein or direct, indirect, special, incidental or consequential damages in connection with the furnishing, performance, or use of this material.

CHROMA ATE INC.
66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

Warranty

All of Chroma's instruments are warranted against defects in material and workmanship for a period of one year from date of shipment. Chroma agrees to repair or replace any assembly or component found to be defective, under normal use during this period. Chroma's obligation under this warranty is limited solely to repairing any such instrument, which in Chroma's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Purchaser is responsible for the shipping and cost of the service item to Chroma factory or service center. Shipment should not be made without prior authorization by Chroma.

This warranty does not apply to any products repaired or altered by persons not authorized by Chroma, or not in accordance with instructions furnished by Chroma. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Chroma assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Chroma assumes no liability for secondary charges or consequential damages and in any event, Chroma's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

Any recommendations made by Chroma regarding the use of its products are based upon tests believed to be reliable; Chroma makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Chroma any liability in connection with the sale of our products other than set forth herein.

CHROMA ATE INC.
66 Huaya 1st Road, Guishan,
Taoyuan 33383, Taiwan
Tel: 886-3-327-9999
Fax: 886-3-327-8898
e-mail: info@chromaate.com

http://www.chromaate.com

Material Contents Declaration

The recycling label shown on the product indicates the Hazardous Substances contained in the product as the table listed below.


: See **<Table 1>**.


: See **<Table 2>**.

<Table 1>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
PCBA	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

“O” indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

“×” indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

Disposal

Do not dispose of electrical appliances as unsorted municipal waste; use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with a new one, the retailer is legally obligated to take back your old appliances for disposal free of charge.

<Table 2>

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr^{6+}	PBB	PBDE
PCBA	×	O	O	O	O	O
CHASSIS	×	O	O	O	O	O
ACCESSORY	×	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

"O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

"×" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

1. Chroma is not fully transitioned to lead-free solder assembly at this moment; however, most of the components used are RoHS compliant.
2. The environment-friendly usage period of the product is assumed under the operating environment specified in each product's specification.

Disposal

Do not dispose of electrical appliances as unsorted municipal waste; use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with a new one, the retailer is legally obligated to take back your old appliances for disposal free of charge.

www.chromaate.com Chroma

CE

Declaration of Conformity

For the following equipment :

Timing/Noise Analyzer

(Product Name/ Trade Name)

80611

(Model Designation)

CHROMA ATE INC.

(Manufacturer Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Manufacturer Address)

Is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility (2014/30/EU) and Low Voltage Directive (2014/35/EU). For the evaluation regarding the Directives, the following standards were applied :

EN 61326-1:2013 Class A,

EN 61000-3-2:2014, EN 61000-3-3:2013

EN 61326-1:2013(industrial locations)

EN 61000-4-2:2009, EN 61000-4-3:2006+A1:2008+A2:2010, EN 61000-4-4:2012,

EN 61000-4-5:2006, EN 61000-4-6:2014, EN 61000-4-8:2010, EN 61000-4-11:2004

EN 61010-1:2010 and EN 61010-2-030:2010

The following importer/manufacturer or authorized representative established within the EUT is responsible for this declaration :

CHROMA ATE INC.

(Company Name)

66 Huaya 1st Road, Guishan, Taoyuan 33383, Taiwan

(Company Address)

Person responsible for this declaration:

Mr. Vincent Wu

(Name, Surname)

T&M BU Vice President

(Position/Title)

Taiwan	**2016.05.25**	Vincent Wu.
(Place)	(Date)	(Legal Signature)

Safety Summary

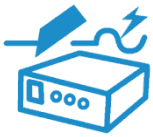
The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the instrument. *Chroma* assumes no liability for the customer's failure to comply with these requirements.

BEFORE APPLYING POWER

Verify that the power is set to match the rated input of this power supply.

PROTECTIVE GROUNDING

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.



NECESSITY OF PROTECTIVE GROUNDING

Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.

FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. The instrument should be used in an environment of good ventilation.

DO NOT REMOVE THE COVER OF THE INSTRUMENT

Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

Safety Symbols

	**DANGER –** High voltage.
	**Explanation:** To avoid injury, death of personnel, or damage to the instrument, the operator must refer to the explanation in the instruction manual.
	**High temperature:** This symbol indicates the temperature is hazardous to human beings. Do not touch it to avoid any personal injury.
	**Protective grounding terminal:** This symbol indicates that the terminal must be connected to ground before operation of the equipment to protect against electrical shock in case of a fault.
	**Functional grounding:** To identify an earth (ground) terminal in cases where the protective ground is not explicitly stated. This symbol indicates the power connector does not provide grounding.
	**Frame or chassis:** To identify a frame or chassis terminal.
	**Alternating Current (AC)**
	**Direct Current (DC) / Alternating Current (AC)**
	**Direct Current (DC)**
	**Push-on/Push-off power switch**
	The **WARNING** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.
	The **CAUTION** sign highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment.
	The **Notice** sign highlights an essential operating or maintenance procedure, condition, or statement.

Revision History

The following lists the additions, deletions and modifications in this manual at each revision.

Date	Revision	Revised Sections
Aug. 2007	1.0	Complete this manual.
Jan. 2008	1.1	Modify the following: – "*Front Panel*" section in the chapter of "*Front and Rear Panel Description*." – "*80611N*" section in the chapter of "*Specification*." Add the following: – "*A806101 HF MUX Module*" and "*A806102 Digital Output Module*" sections in the chapter of "*Front and Rear Panel Description*." – "*A806101 HF MUX Module Specification*" and "*A806102 Digital Output Module Specification*" sections in the chapter of "*Specification*." – "*PROTection Subsystem*", "*HF Subsystem*", "*DO Subsystem*" commands in the chapter of "*Commands Set*."
Mar. 2008	1.2	Modify the chapter of "*Commands Set*."
Aug. 2009	1.3	Modify the chapter of "*Commands Set*."
Sep. 2012	1.4	Replace the *"CE Declaration of Conformity*" Modify TIMeout parameter, time, wire color indicator and device picture, etc. Add "*Appendix A*"
Mar. 2014	1.5	Modify section "*Noise Card and VDC Input, LED Indicator, SYNC_N"* in the chapter of "*Front and Rear Panel Description*".
Jul. 2014	1.6	Modify the following: – "*Initial Inspection*" section in the chapter of "*Overview*." – "*VDC LED Indicator*" and "*Trigger Input (6 Pairs)*" sections in the chapter of "*Front & Rear Panel Description*." – "*Input/Output Rating*" section in the chapter of "*Specification*."
Oct. 2014	1.7	Update the figures of 80611 front panel and floating relays. Add Appendix B "*Old Front Panel & Floating Relays (for Models shipped before Oct. 2014*)."
Dec. 2015	1.8	Add A800068 Digital Measurement Card associate descriptions in the following chapters: – A800068 block diagram in the chapter of "*Block Diagram*". – A800068 Digital Measurement Card in the chapter of "*Front & Rear Panel Description*". – A800068 Digital Measurement specification in the chapter of "*Specification*". – A800068 Digital Measurement timing specification in the chapter of "*Timing Specification*". – A800068 Digital Measurement of Commands set in the chapter of "*Commands Set*". Add Appendix C "*A800068 Common Mode Noise Testing Methods*".
Jul. 2016	1.9	Replace the *"CE Declaration of Conformity*".

Table of Contents

1. Overview

The Chroma Model 80611 Timing/Noise Analyzer is a module specially designed to enhance the test capability of Chroma POWER PRO III Power Supply ATS system.

The 80611 contains the following functions:

- Maximum10 Channels for VDC input to measure timing/noise.
- 8 pairs of built-in relays and 16 bits TTL control signals output and input for user defined special controlling application.
- Provide user selections for 10 MUX/2 EXT/10 VDC input signals, and pass the selected signals to DVM output for measuring or monitoring.

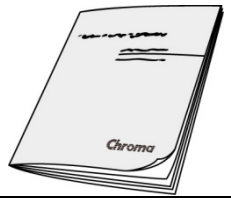
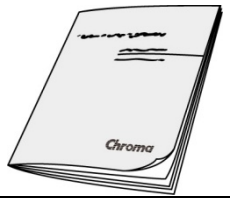
This special designed module can only be controlled by Chroma ATS Test Program through GPIB Bus. There is no option for keypad control or general GPIB command control.

1.1 Initial Inspection

Before shipment, this instrument was inspected and found to be free of mechanical and electrical defects. As soon as the instrument is unpacked, inspect for any damage that may have occurred in transit. Save all packing materials in case the instrument has to be returned. If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

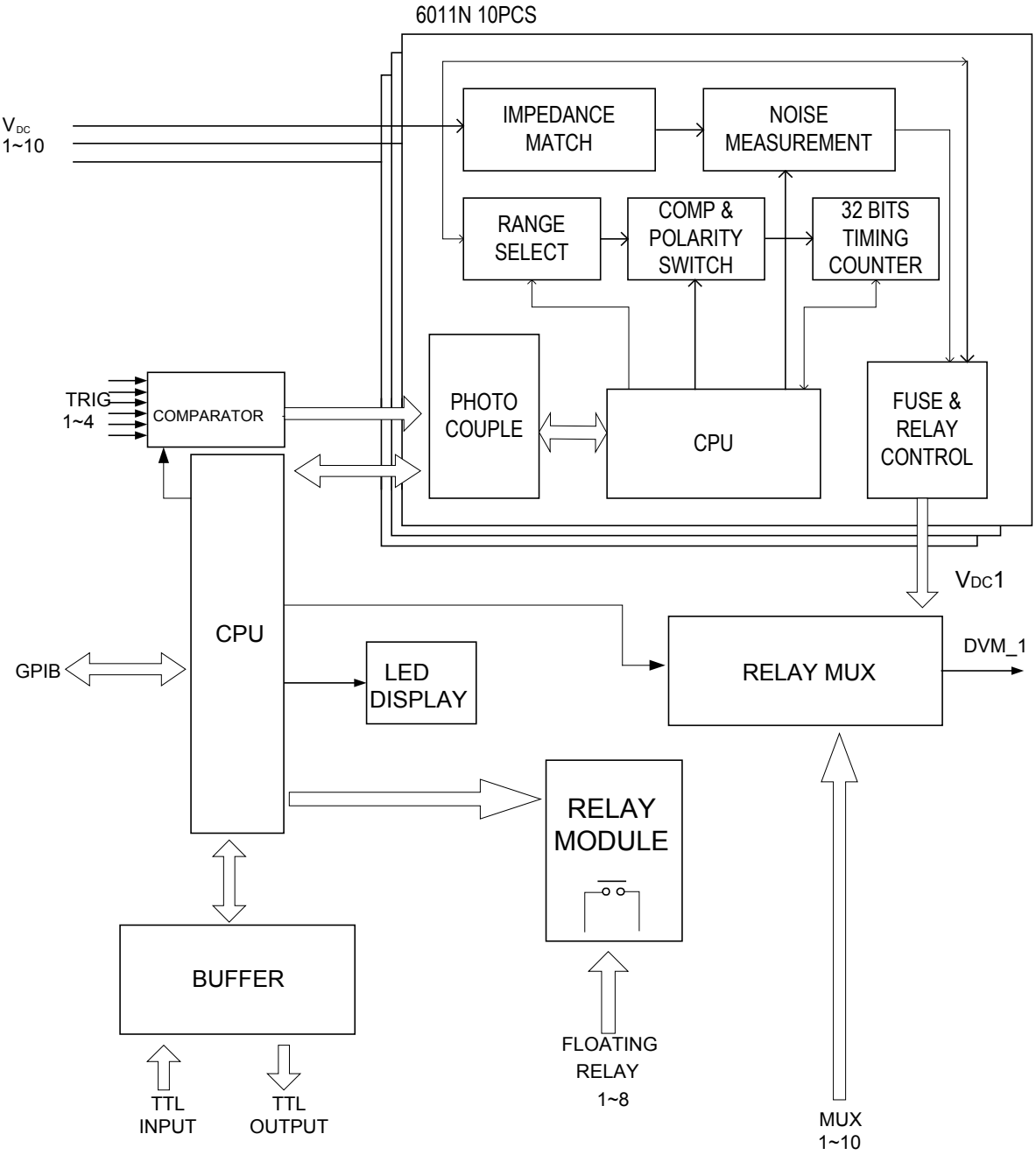
The standard accessories came with the instrument as listed in Table 1-1.

Table 1-1 Standard Accessories

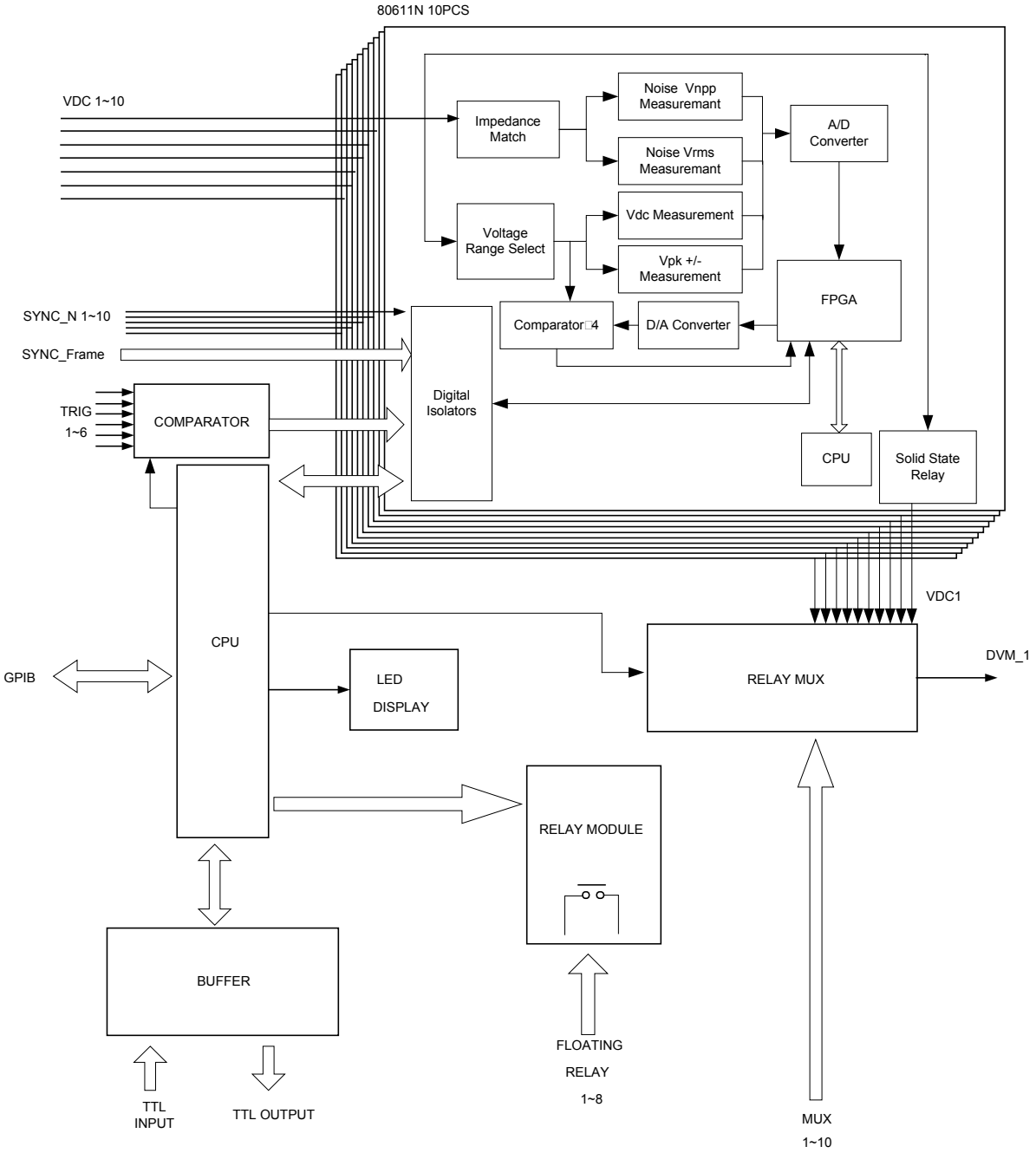
Item				
Name	80611 Quick Start Guide Traditional Chinese * 1pcs	80611 Quick Start Guide English * 1pcs	80611 User's Manual CD*1	US Power Cord 1.83M*1pc

2. Block Diagram

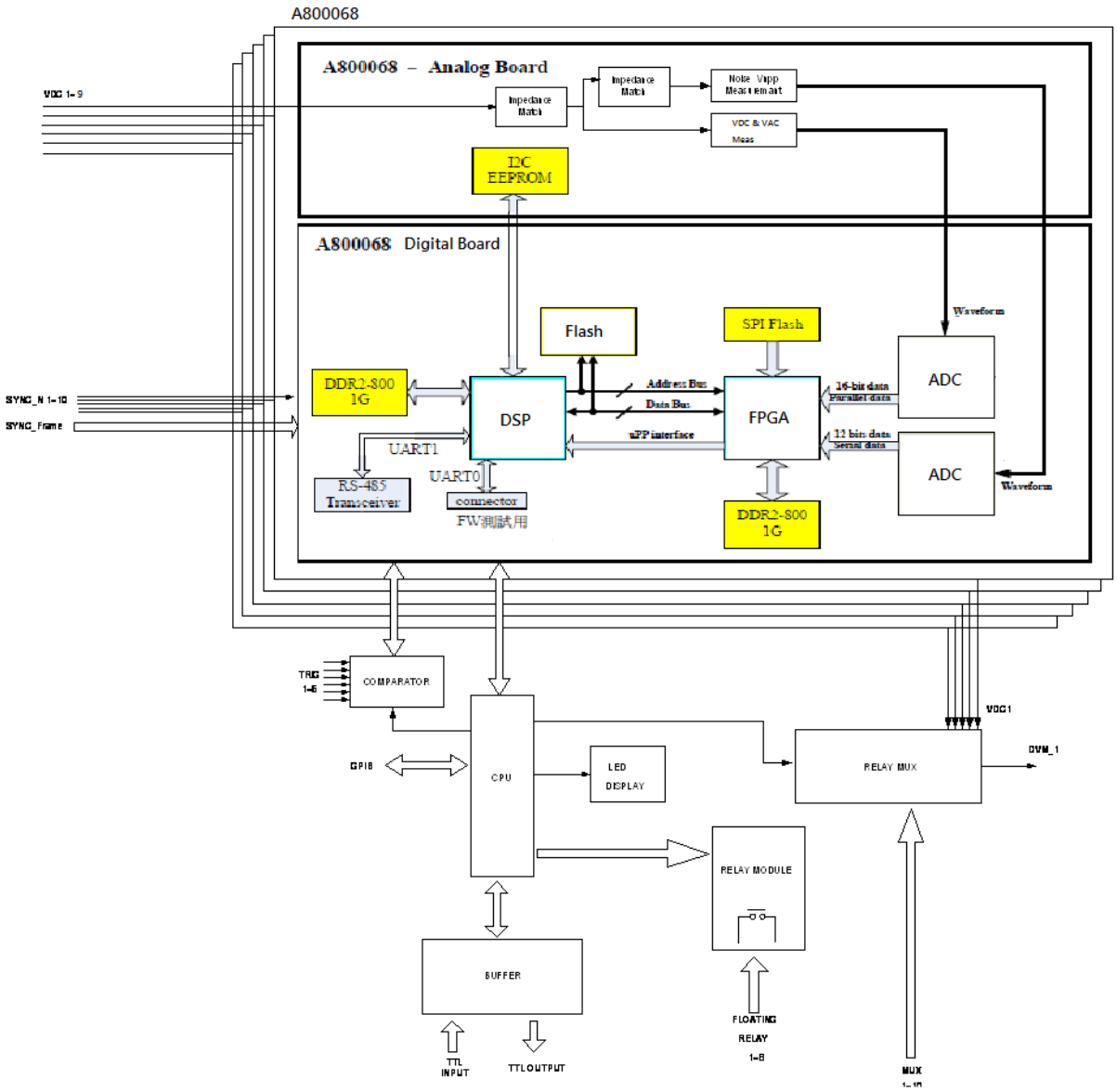
2.1 80611 with 6011N



2.2 80611 with 80611N



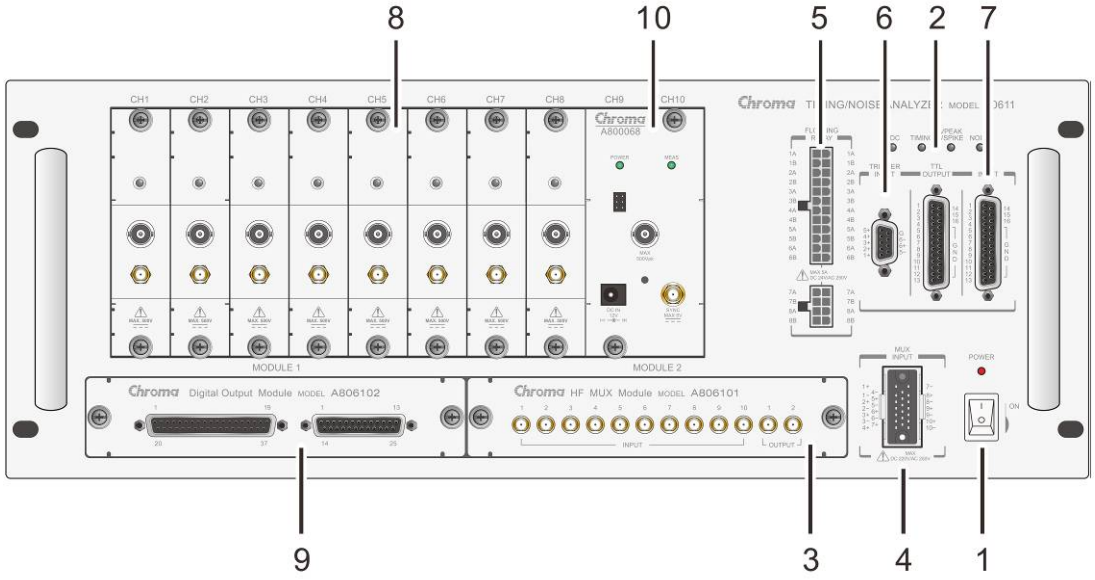
2.3 80611 with A800068



3. Front & Rear Panel Description

Following sections describe the functions of each port on the front and rear panel.

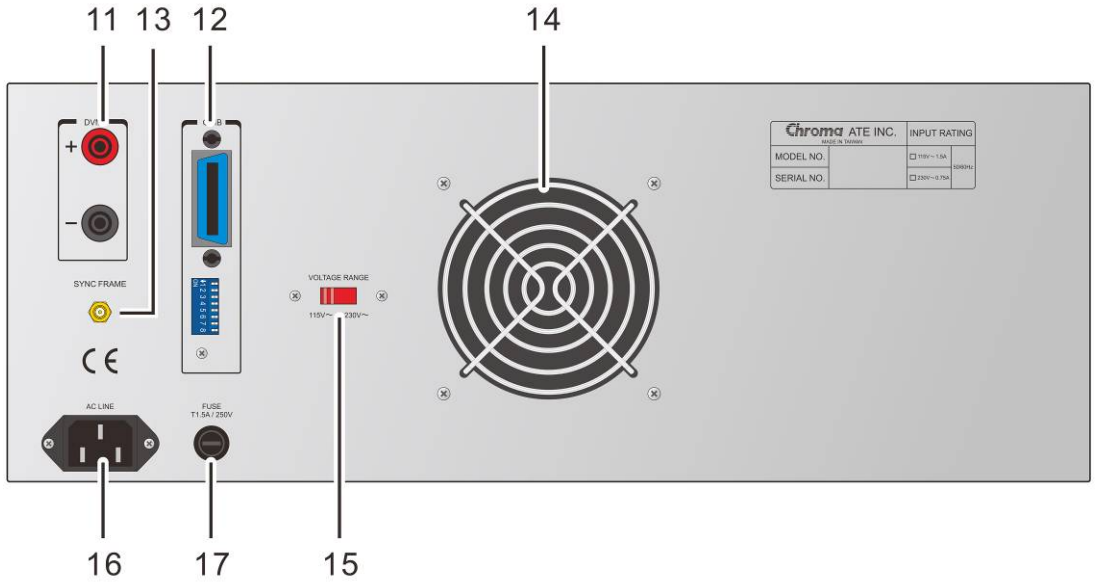
3.1 Front Panel



1. Power switch & LED indicator
2. LED indicators – NOISE, PEAK/SPIKE, TIMING &VDC
3. DVM Mux input (10 ports)
4. Floating relay (8 pairs DPST)
5. Trigger input (6 pairs)
6. TTL output (16 bits)
7. TTL input (16 bits)
8. 8-channel 80611N card (VDC input, LED indicator & SYNC_N trigger input)
9. Two extended modules that support A806101 HF MUX Module or A806102 Digital Output Module.
10. 2-channel A800068 card (VDC input, LED indicator & SYNC_N trigger input).This card should be 80611 version 4.00 or above (including 4.00).

Note The front panel serial number after 806110001495 (including this S/N) is in new production style. See *Appendix B* for old style.

3.2 Rear Panel



11. DVM Output (1 pairs)
12. GPIB Port
13. SYNC_Frame Trigger Input
14. Fan
15. AC LINE Voltage Range Selector
16. AC LINE Input Socket
17. AC LINE Fuse

3.3 Detail Description

3.3.1 Power Switch and POWER LED Indicator

This is the ON/OFF power switch of 80611 Timing/Noise Analyzer. The "POWER" LED will light up when the CPU performs the starting routine and results in ok. The LED blinks when the 80611 Timing/Noise Analyzer is downloading the program.

3.3.2 VDC LED Indicator

The "VDC" LED lights up when a VDC signal on the front panel sets output to the DVM port on the rear panel.

3.3.3 NOISE LED Indicator

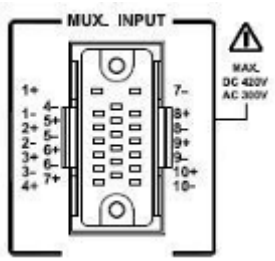
The "Noise" LED lights up when users execute noise, dc or spike measurement. The LED blinks when the 80611 Timing/Noise Analyzer is downloading the program.

3.3.4 TIMING LED Indicator

The “TIMING” LED lights up when the timing measurement is executed.

3.3.5 MUX Input (10 Pairs)

10 pairs of MUX input are provided for this port. It can be switched to the DVM output on the rear panel by relay to measure the voltage when required. Port 1 is allocated at pin 1 & pin 2 of this connector and up to port 10 at pin 19 & 20. This function is especially useful for checking the UUT’s internal circuit BIAS under OVP/UVP or short circuit condition. Also, it is a powerful tool for troubleshooting an ABNORMAL UUT. If more than 10 ports are required, an external multiplexed circuit, which is located on the front panel and controlled by the programmable 16 bits control signals, can be used for increase. The switch relationship between 10 MUX/10 VDC input and DVM output is programmable by Chroma ATS Test Program.

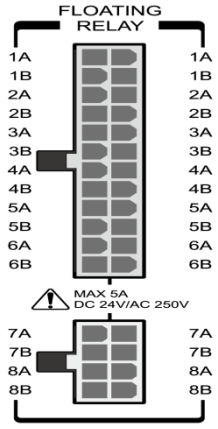


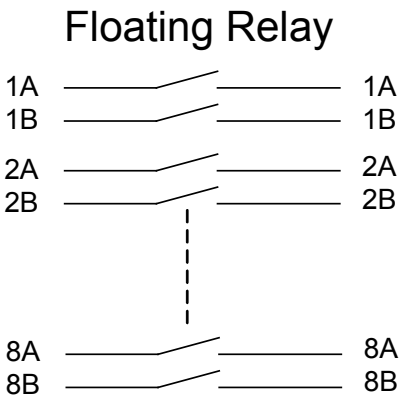
Pin No.	Color	Pin No.	Color	Pin No.	Color	Pin No.	Color
1+	Red	3-	Black	6+	Purple	8-	Black
1-	Black	4+	Green	6-	Black	9+	Red
2+	Orange	4-	Black	7+	Gray	9-	Brown
2-	Black	5+	Blue	7-	Black	10+	Orange
3+	Yellow	5-	Black	8+	White	10-	Brown

Notice Each pair has a number labeled, for instance if 1 is labeled for a pair, the 1+ is red and 1- is black and so forth.

3.3.6 Floating Relays (8 Pairs DPST)

The floating relays are user programmable for external device connection during the test. The applications of floating relays are the same as the 16 bit TTL control signals described in section 3.3.8. These relay connectors are electrically isolated from the 80611 device. Each DPST relay is in the following normal and open configuration.





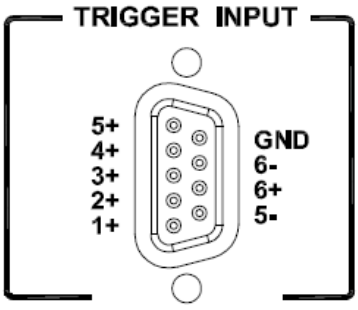
Pin No.	Color	Pin No.	Color	Pin No.	Color	Pin No.	Color
1A	Red	3A	Red	5A	Red	7A	Red
1A	Black	3A	Black	5A	Black	7A	Black
1B	Red	3B	Red	5B	Red	7B	Red
1B	Black	3B	Black	5B	Black	7B	Black
2A	Red	4A	Red	6A	Red	8A	Red
2A	Black	4A	Black	6A	Black	8A	Black
2B	Red	4B	Red	6B	Red	8B	Red
2B	Black	4B	Black	6B	Black	8B	Black

Notice Each pair has a number labeled, for instance if 1+ is labeled for a pair, the 1A is red and black, so is 1B if 1- is labeled and so forth.

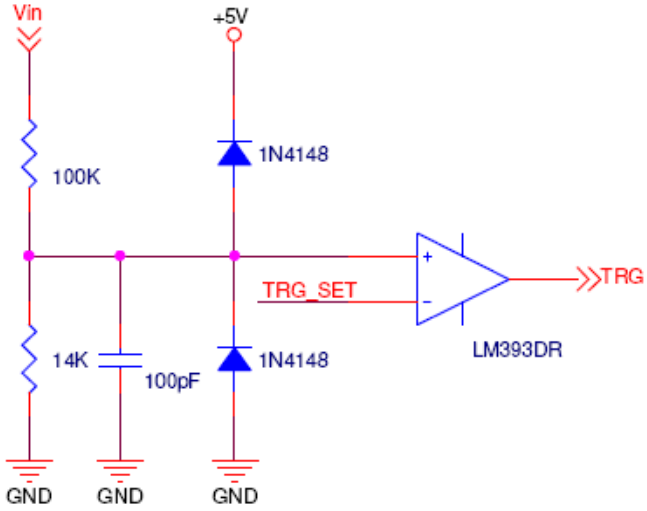
Relay 1 to 8 is controlled by the ATS test program via the relay status bit 0 (LSB) through bit 7 respectively. Relay will be closed when the bit data is specified as "1" and opened when specified as "0".

3.3.7 Trigger Input (6 Pairs)

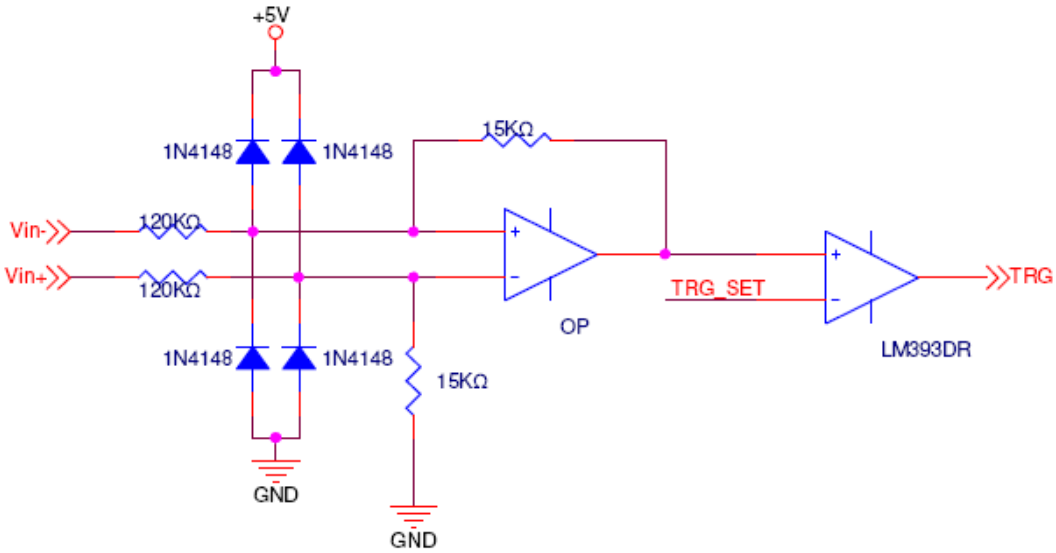
There are 6 special buffer ports for UUT's power good or fail signal. The trigger input is useful for timing measurement. The input impedance is about 100Kohms and it can adjust the trigger point to meet the measurement requirements when working with programmable trigger level. The range of programmable trigger level is 0 to 30V_{DC} and the default is 0V_{DC}. There are 4 pairs of ground to chassis trigger ports and 2 pairs of differential input trigger ports. The connector of trigger input is shown below.



TTL1~TTL4



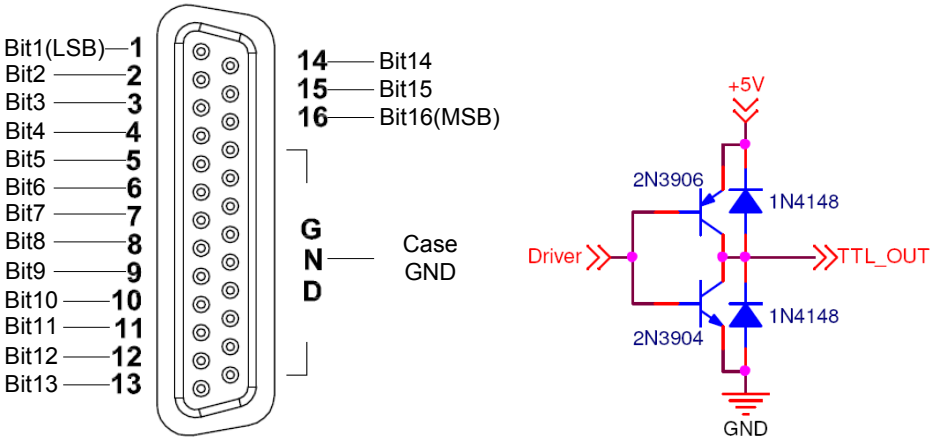
TTL5~TTL6



3.3.8 Programmable 16 Bits Output

A 25-pin connector contains 16 bits digital output for external device controlling use. The bits can be programmed for different tests such as set up test, OVP/UVP test, short circuit test, extended measurement test and etc. Pin 1 to 16 is assigned as bit 1 (LSB) through bit 16 (MSB) respectively. Pin 17 to 25 are control ground pins, which are shorted with the chassis ground.

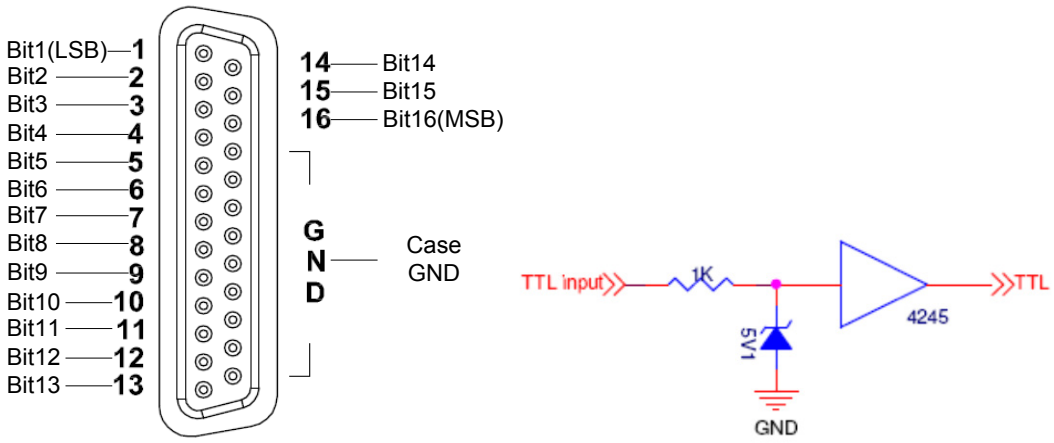
The pin assignment of output connector is shown as below.



The 16 bits digital output can provide maximum 500mA total output current and each set has maximum 25mA current output and loading capability. When over current occurs to output, the buzzer will give a long beep and then a short beep. Ensure the TTL output external device is in normal condition and then use GPIB Command to turn off the beep.

3.3.9 TTL Input (16 Bits)

Pin 1 to 16 is assigned as bit 1 (LSB) through bit 16 (MSB) respectively. Pin 17 to 25 are input signal ground pins, which are shorted with the chassis ground. The layout of TTL output connector is as shown below. Please avoid a floating input.



3.3.10 Noise Card and VDC Input, LED Indicator, SYNC_N

The slots of Noise Card (80611N) are 10 channels maximum. The slots of Digital Measurement Card (A800068) are 5 channels maximum. Each Noise Card can perform noise and timing measurement when working with VDC input, LED indicator and Sync_N input. The DC voltage is high impedance for low frequency input; however, for high frequency input, the input impedance is 50 ohms. The LED indicator on Noise Card will light up when the card is active.

⚠WARNING

- The Measurement Card is not hot swappable, be sure to turn off the 80611's power switch before plugging in or unplugging it.

- In order to ensure proper operation of Chroma 80611 Timing/Noise Analyzer and minimize the compatibility issue which might be contributed by the earlier F/W version, it is strongly recommended that the F/W of 80611 Noise Card should be updated to version 1.30 or above.
- To ensure proper operation of Chroma 80611 Timing/Noise Analyzer and minimize the compatibility issue which might be contributed by the earlier F/W version, it is strongly recommended that the F/W of A800068 Noise Card should be updated to version 4.00 or above.
- Before using A800068, please refer to installation instructions in A800068 Quick Start Guide to ensure a proper start.

3.3.11 DVM

1 pair of output connectors allows users to connect to external meter and measure the input signal voltage value as well as the input and output switching relationship. See also section 3.3.5.

3.3.12 GPIB Connector and Address Switch

This is a standard GPIB connector. Its pin assignment and details on how to set the address switch are described in Chapter 5.

3.3.13 Fan

A 12VDC 3000ppm fan without brush is installed for ventilation. To prevent the device from overheating damage, immediate replacement is required when broken.

When abnormal occurs to fan, the buzzer will give a long beep and then a short beep. Ensure the fan is in normal condition and then use GPIB Command to turn the beep off.

3.3.14 AC LINE Voltage Range Selector

Users can select 115VAC or 230VAC line voltage for AC LINE input by setting the range selector properly. The left is for 115VAC line voltage and the right is for 230VAC line voltage.

3.3.15 AC LINE

This is the AC LINE input for 80611 Timing/Noise Analyzer. It supplies power source to 80611 for normal operation. Refer to Chapter 4 *Specification* for power requirement regarding detail line voltage range.

3.3.16 Fuse

The user can place the rated fuse in the fuse holder as requested (slow blow 1 Amp current rating for 125VAC and 1.5 Amp for 250VAC).

3.3.17 Sync_Frame and Sync_N

The SMA connector is connected to Electronic Load's sync signal. It is necessary to connect the sync signal to Sync_A or Sync_N.

There are the SMA connectors for synchronous signal of DC Electronic Load. In spike measurement, users must connect Sync_A or Sync_N with a synchronous signal.

3.3.18 A806101 HF MUX Module

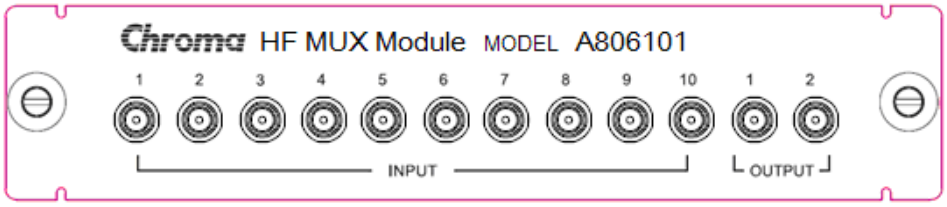
This module has 10 sets of SMA input terminals that can switch to 2 sets of SMA output terminals via relay. It is also a powerful tool that can connect to external oscilloscope to inspect signals and be programmed by Chroma ATS to perform auto test.

If one of the Input 01~10 is set to Output 1, its original state will be cleared when another Input is set to Output 1. Only last setting is kept and same for Output 2.

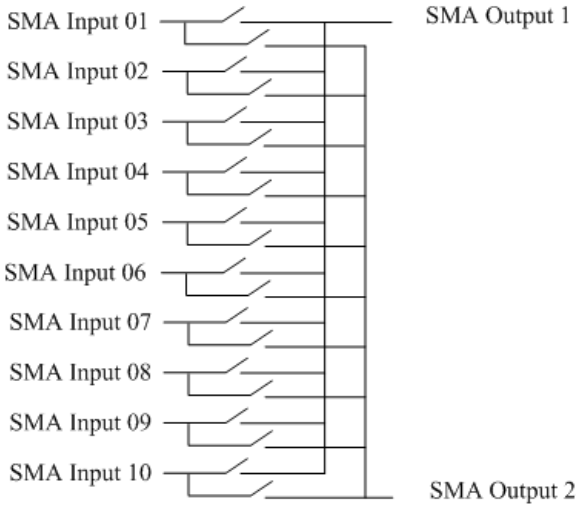
Notice

It is only applicable for 80611 firmware version 1.10 or above. This module cannot be hot swapped; therefore, it is necessary to shut off the 80611 power when plugging in or removing the module.

The figure below shows the outline of HF MUX Module.



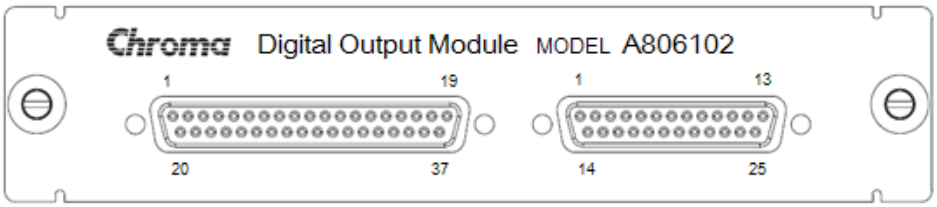
The assignment of internal circuit is shown as below:



Notice The signal ground of all input and output SMA terminals is short circuited. Also the signal ground of all SMA terminals is isolated from CHASSIS GND.

3.3.19 A806102 Digital Output Module

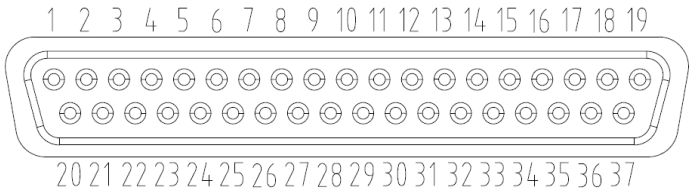
This module has 50 sets of BJT Arrays. It uses 37-Pin and 25-Pin D-sub connector to output. The output BJT is in the configuration of open collector that can sink 250mA$_{DC}$ current with maximum working voltage up to 30V$_{DC}$. The front panel is shown as below.



Notice It is only applicable for 80611 firmware version 1.10 or above. This module cannot be hot swapped; therefore, it is necessary to shut off the 80611 power when plugging in or removing the module.

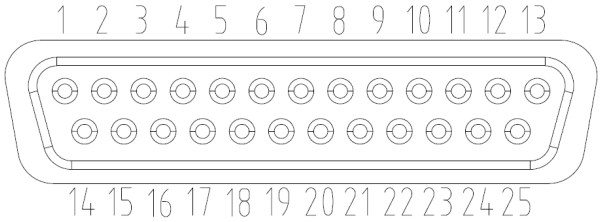
The Digital Output Module output terminal has two connectors – one is a 37-Pin D-sub male connector and the other is a 25-Pin D-sub male connector.

The pin assignment and definition of DB37 connector are listed as below:



Pin1	**Pin2**	**Pin3**	**Pin4**	**Pin5**	**Pin6**	**Pin7**	**Pin8**	**Pin9**	**Pin10**	**Pin11**	**Pin12**	**Pin13**	**Pin14**	**Pin15**	**Pin16**	**Pin17**	**Pin18**	**Pin19**
DO1	DO2	DO3	DO4	DO5	DO6	DO7	DO8	DO9	DO10	DO11	DO12	DO13	DO14	DO15	DO16	DO17	DO18	DO19
Pin20	**Pin21**	**Pin22**	**Pin23**	**Pin24**	**Pin25**	**Pin26**	**Pin27**	**Pin28**	**Pin29**	**Pin30**	**Pin31**	**Pin32**	**Pin33**	**Pin34**	**Pin35**	**Pin36**	**Pin37**	
DO20	DO21	DO22	DO23	DO24	DO25	DO26	DO27	DO28	DO29	DO30	Vdd1	Vdd2	Vdd3	GND	GND	GND	GND	

The pin assignment and definition of DB25 connector are listed as below:

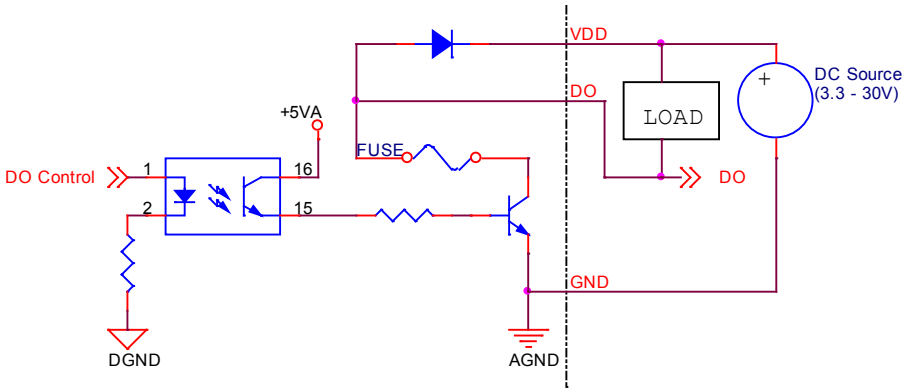


Pin1	**Pin2**	**Pin3**	**Pin4**	**Pin5**	**Pin6**	**Pin7**	**Pin8**	**Pin9**	**Pin10**	**Pin11**	**Pin12**	**Pin13**
DO31	DO32	DO33	DO34	DO35	DO36	DO37	DO38	DO39	DO40	Vdd4	GND	GND
Pin14	**Pin15**	**Pin16**	**Pin17**	**Pin18**	**Pin19**	**Pin20**	**Pin21**	**Pin22**	**Pin23**	**Pin24**	**Pin25**	
DO41	DO42	DO43	DO44	DO45	DO46	DO47	DO48	DO49	DO50	Vdd5	GND	

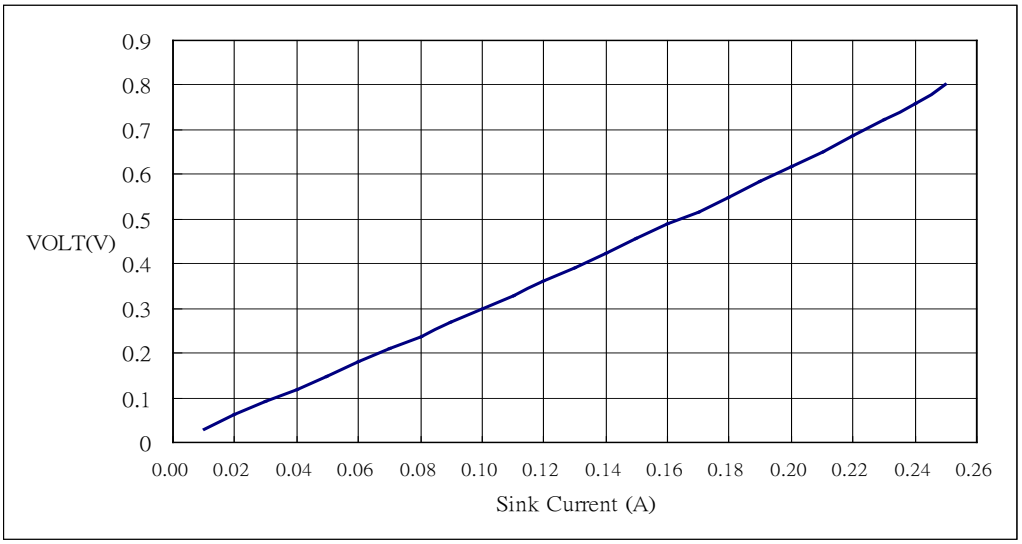
The output terminal Vdd and DO Port are categorized as shown below:

Vdd1 – DO1~DO10; Vdd2 – DO11~DO20; Vdd3 – DO21~DO30;
Vdd4 – DO31~DO40; Vdd5 – DO41~DO50

The layout of Digital Output Module:



Since the BJT in circuit has saturation voltage and voltage drop when the current goes through the fuse, different current has different voltage drop. The figure below is the relation curve of actual current and output voltage.



Notice

Each channel can drive 250mA; however, every GND pin can only withstand the current up to 3A. If the actual application of wiring is over 10 channels, at least one GND should be wired to avoid exceeding the pin withstand current. All GNDs are in common ground configuration.

4. Specification

Power Requirement

Voltage	: 115VAC±10%, 60Hz or 230VAC±10%, 50Hz
Current	: 1.5 amp for 110VAC, 0.75 amp for 230VAC
Dimension	: 177(H)*423(W)*563(D)
Weight	: 25 Kgs

4.1 Input and Output Rating

(1) 10 pairs of MUX. INPUT
10 pairs of MUX INPUT connect to 10 relays.

Voltage:	0~220VDC，0~250VAC
Current:	0~2Amp
Type:	DPST contacts
Relay Life:	50,000 cycles in life at 1800 operations/hour with rated load

Note The voltage difference between all relays should be less than 500Vpp.

(2) 8 pairs of FLOATING RELAY

Voltage:	0~24VDC, 0~250VAC
Current:	0~5Amp
Type:	Normal open
Life:	100,000 cycles in life

Note The voltage difference between all relays should be less than 500Vpp.

(3) 16 Bits TTL OUTPUT
It is a standard TTL output device.

(4) 16 Bits TTL INPUT
It is a standard TTL input device, maximum output 500mA for 5V.

(5) 6 ports of TRIGGER INPUT
It is a standard voltage comparator LM393 with programmable Vref.
The maximum trigger input voltage is 30VDC.

(6) 1 pair of DVM output port
It can output for external Voltage Meter connection.

4.2 Noise Specification

4.2.1 6011N

6011 Noise Card Spec.	
Noise Spec.	
Input Condition	
Input Noise Voltage	2V max (magnitude)
Input Impedance	50ohm (High Frequency) / 0.72Mohm (DC)
Input Voltage Range	400mV / 2V
Resolution	0.1mV / 1mV
Accuracy	
Accuracy	2% Reading ± 5mV / 2% Reading ± 15mV
Meas. Time:	Approx. 0.8 sec
Bandwidth	6Hz-10K/100K/500K/1M/20MHz
-3dB Tolerance	+/- 1dB
CMRR	50dB @ 20MHz

4.2.2 80611N

Noise Spec.	
Input Condition	
Input Noise Voltage	2Vmax
Input Impedance	50 ohm / 0.95M ohm (DC)
Voltage Rating	500Vdc
Withstand voltage (To GND)	500Vdc
Input Setting	
Input Voltage Range	400mV / 2V
Resolution	15bit/14Bit
Vp-p Measurement	
Accuracy	1% +5mV / 1% + 15mV (Normal: 0.5 sec, Fast: 0.1 sec **Note1**)
Bandwidth	6Hz-10K/100K/500K/1M/20MHz
-3dB Tolerance	+/- 1dB
CMRR	50dB @ 20MHz
Vrms Measurement	
Range	28mVrms (80mVpp)/140mVrms(400mVpp)/700m Vrms (2Vpp)
Accuracy	0.1% +0.5mV / 0.1% +1mV / 0.1% + 3mV
Bandwidth	6Hz-1MHz*2
-3dB Tolerance	+/- 1dB
Vpeak Spec.	
Input Setting	
Input DC Voltage Range	6V /30V / 120V / 500V
Resolution	15bit
Bandwidth	400KHz

Dynamic Vpk(+/-) Measurement	
Accuracy	0.4% + 6mV / 30mV / 120mV / 600mV
Droop Rate Error	0.25 / 1.25 / 5 / 25 mV/ms
Dynamic Vstable(+/-) Measurement	
Accuracy	0.4% + 6mV / 30mV / 120mV / 600mV
Dynamic Vspike(+/-) Measurement	
Accuracy	0.5% of F.S
Droop Rate Error	0.5 / 2.5 / 10 / 50 mV/ms
Offset Mode[*3]	
Input Spike Range	0.6V(6V) / 3V(30V) / 12V(120V) / 50V(500V)
Dynamic Vspike(+/-) Measurement	
Accuracy	0.5% + 4mV / 20mV / 80mV / 400mV
Droop Rate Error	0.05 / 0.25 / 1 / 5 mV/ms
Dync. Input	
Channel	1
Vdc Spec.	
Input DC Voltage Range	6V /30V / 120V / 500V
Accuracy	0.1%Reading+0.1%F.S. @20°C~30°C
Temperature Coefficient	0.02%F.S./ °C @0°C~40°C

Note

1. The measurement time should be larger than input signal period.
2.

2Vpp Range	0.707Vrms~0.2Vrms	BW 1MHz
	0.2Vrms~0.141Vrms	BW 600KHz
0.4Vpp Range	0.141Vrms~0.02Vrms	BW 1MHz
	0.02Vrms~0.01Vrms	BW 600KHz
0.08Vpp Range	0.028Vrms~0.004Vrms	BW 1MHz
	0.004Vrms~0.002Vrms	BW 600KHz

3. This superior accurate measurement is only applicable when the peak-to-peak voltage is less than 10% F.S.

4.2.3 A800068

A800068	
Input Condition	
DC Mode	
DC Voltage Range	6V/30V/120V/500V
Withstand voltage (To GND)	500Vdc
Resolution	16bit
Accuracy	0.05%Reading+0.05%F.S. @ 20°C~30°C
Temperature Coefficient	0.02%F.S./ °C @ 0°C~40°C
Dynamic Vpeak(+/-) Measurement	
Accuracy	0.4% reading + 0.1% F.S
Dynamic Vstable(+/-) Measurement	
Accuracy	0.4% reading + 0.1% F.S

Dynamic Vspike(+/-) Measurement	
Accuracy	0.5% reading + 0.1% F.S
AC Coupling Mode	
Bandpass Filter	
Bandwidth Selector	HPF: 6Hz ; 2KHz @ -3dB LPF: 2kHz, 10K,100K, 500K, 1M, 4M, 10M, 20M, 100M@ -3dB
-3dB Tolerance	+/- 1dB
Measurement	
Parameter	Vpp / Vrms
Voltage Range (Vp-p)	500mV/5V/25V
Resolution	10 bit or above
Accuracy	1%reading + 1%F.S(2kHz~20MHz Meas. time: 0.1 sec) 1%reading + 1.5%F.S (100MHz Meas. time: 0.1 sec)
Signal Bandwidth	6Hz~100MHz @ -3dB
Sampling Rate	400MS/s or above
AC Mode	
AC Voltage Range (rms)	20V/150V/350V
Resolution	16bit
Accuracy	0.5% reading+0.5% F.S.

Notice It is only applicable to 80611 firmware version 4.00 or above.

4.3 Timing Specification

4.3.1 6011N

Timing Spec.	
Input Voltage Range	
Max Input Range	300Vdc
Input Voltage Range	16V / 80V / 300V
Resolution	4mV/20mV/75mV
Accuracy	0.4% + 32mV / 0.16mV / 0.6V
Time Spec.	
Time Range	64 Sec
Resolution	1uS
Accuracy	20us + 100ppm

4.3.2 80611N

Timing Spec.	
Input Voltage Range	
Max Input Range	500Vdc
Input Voltage Range	6V /30V / 120V / 500V
Setting Resolution	11bit
Time Spec.	
Time Range	64 Sec
Resolution	1uS
Accuracy	(0.1%VSetting+ 0.5 % $V_{F.S.}$) / $Vin_{SlewRate}$+ 1us
Input / Output	
TTL Trigger Inputs	6 Channels

4.3.3 A800068

Time Spec.	
Max Input Range	500Vdc
Input Voltage Range	6V / 30V / 120V / 500V
Range	64 Sec
Setting Resolution	14bit
Accuracy	(0.1%VSetting+ 0.5 % $V_{F.S.}$)/ $Vin_{SlewRate}$+ 1us
Frequency Spec.	
Range	10Hz-10KHz/10KHz~5MHz
Measure time	100ms/50ms
Accuracy	0.02% reading
Trigger	
Trigger source	Internal & External source trigger(Front & rear trigger input port)
TTL trigger Inputs	6 Channels

Notice It is only applicable for 80611 firmware version 4.00 or above.

4.4 A806101 HF MUX Module Specification

A806101 HF MUX Module	
Slots Available	2 Slots
No. of Input	10 inputs
No. of Output	2 outputs
Input Voltage Rating	Up to 50Vdc
Connectors Location	Front Panel Of Option Card
Type of Connectors	SMA
Bandwidth	100MHz
Cross Talk	50dB (0 ~ 20MHz) / 40dB (20 ~ 100MHz)

Notice It is only applicable for 80611 firmware version 1.10 or above.

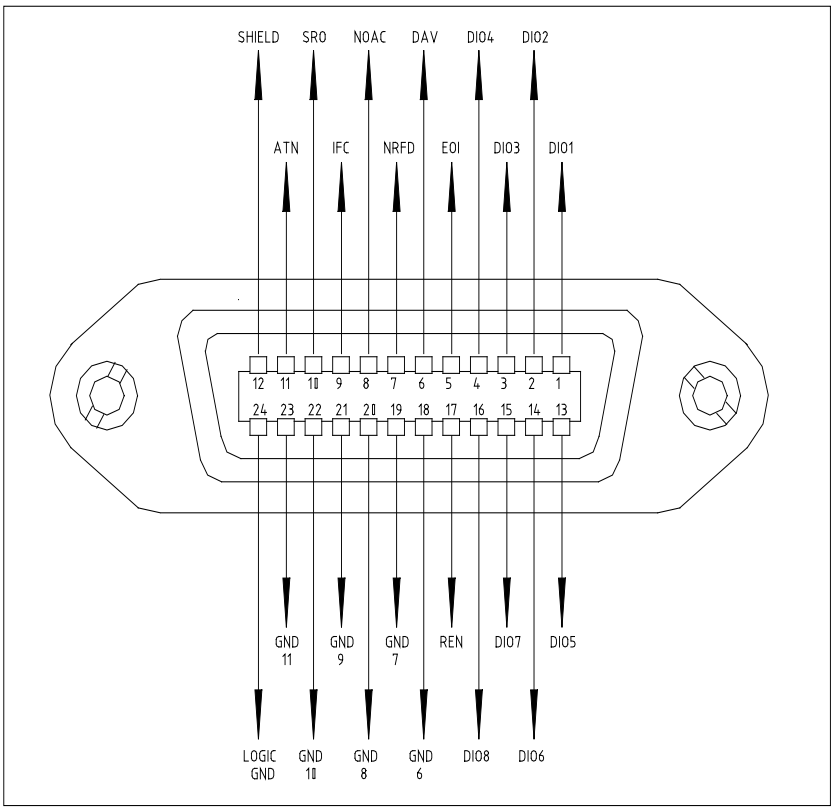
4.5 A806102 Digital Output Module

A806102 Digital Output Module	
Digital Output Port Number	50 Ports
Digital Output Control Mode	BJT Array (Open Collector)
Working Voltage Rating	30Vdc
Digital Output Port Sink Current	Max 250mA (Per Each Port 100% Duty Cycle)
Operating temperature	0 - 40°C
Storage temperature	-40 – 85°C

Notice It is only applicable for 80611 firmware version 1.10 or above.

5. GPIB Interface and Address Setting

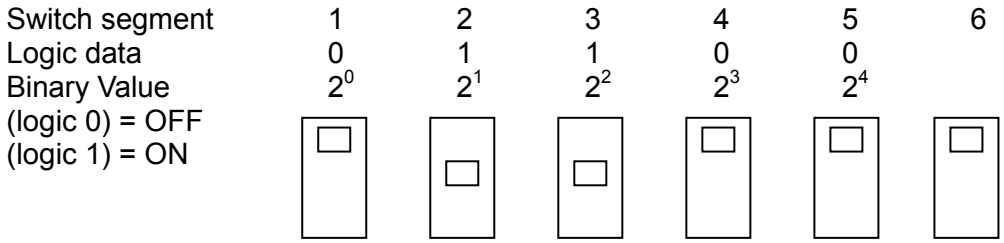
The 80611 Timing/Noise Analyzer is controlled by CHROMA POWER PRO III test system controller through GPIB bus. It is not designed for standalone operation for user control via GPIB commands. The GPIB connector pin assignment is as follows.



The GPIB address of 80611 can be preset via the DIP switches on the rear panel. Address number from 1 to 30 (decimal) is defined by the switch position set.

The 80611 CPU reads the address setting at power on only. Any address changes should follow by cycling the power for CPU to recognize the new address.

For instance, the figure below shows addresses 6 (decimal).



6. Installation

Follow the procedures to connect the 80611 Timing/Noise Analyzer:

Reset the IEEE-488 address using the DIP switch on the rear panel.

(1) Connect the IEEE-488 bus cable on the rear panel.
(2) Connect the MUX1~MUX10 on the front panel to the UUT internal test points as requested by users application.
(3) Connect the UUT TTL output signal as required (e.g. power good) to the TRIGGER INPUT on the front panel of 80611.
(4) Connect the FLOATING INPUT and 16 bit TTL OUTPUT on the front panel to external control circuits as required.
(5) Connect the VDC input on the front panel to UUT's power output as required for noise and timing measurement.
(6) Connect power cord to the power inlet on the rear panel and ensure the input voltage range is correct.
(7) Turn on the power switch on the front panel and the analyzer is now ready for use.

7. Commands Set

CHANNEL Subsystem

CHANnel
- Description: It sets the module address to be controlled.
- Syntax: CHANnel <NR1>
- Parameter: 0~10
  0 indicates all channels.
  NOISE CARD is 1~10.
- Example: CHAN 1
- Query: CHAN?
- Return: <NR1>

CHANnel:ID?
- Description: It responses the ID of set module.
- Syntax: CHANnel:ID?
- Query: CHAN:ID?
- Return: Chroma,80611,0,01.00,0
  Company Name: Chroma
  Model No.: 80611
  Serial No.: 0
  Version: 01.00
  Reserved No.: 0

CHANnel:NOISe
- Description: It sets the module address of NOISE CARD to be controlled.
- Syntax: CHANnel:NOISe <NR1>
- Parameter: 0~10
  0 indicates all channels.
  NOISE CARD is 1~10.
- Example: CHAN:NOIS 1
- Query: CHAN:NOIS?
- Return: <NR1>

N800068?
- Description: It queries if there are any A800068 cards in 10 channels.
- Syntax: N800068?
- Return: 0: No A800068 card.
  1: There are 800068 cards.

N80611?
- Description: It queries if there are any 80611 cards in 10 channels.
- Syntax: N80611?
- Return: 0: No A800068 card.
  1: There are 800068 cards.

CALibration:STATus?
- Model: A800068
- Description: It queries if A800068 has been calibrated.
- Syntax: CAL:STAT?
- Return: <NR1>

0: Not calibrated.
1: Have calibrated.

CALibration:MATCH?
Model: A800068
Description: It queries if the calibrated values of up/down 2 boards are match.
Syntax: CAL:MATCH?
Return: <NR1>
0: Mismatch
1: Match

DVM1 Subsystem

DVM1:INPut
Description: It sets the DVM1 input selection for measurement.
Syntax: DVM1:INPut <CHARACTER>
Parameter: OFF|0, VDC1|1, MUX|3
Example: DVM1:INP OFF
DVM1:INP 3
Query: DVM1:INP?
Return: <NR1>

DVM1:MULTiplie
Description: It sets the MUX for DVM1 input measurement.
Syntax: DVM1: MULTiplie <CHARACTER>
Parameter: M01|1, M02|2, M03|3, M04|4, M05|5,
M06|6, M07|7, M08|8, M09|9, M10|10
Example: DVM1: MULT 1
DVM1: MULT M08
Query: DVM1: MULT?
Return: <NR1>

FREQUENCY Subsystem

Notice The 80611firmware version 4.00 (included) or above is applicable for A800068.

FREQuency:RANGe
Model: A800068
Description: It sets the frequency measurement range.
Syntax: FREQ:RANG <CHARACTER>
Parameter: 0: 10Hz~10kHz
1: 10kHz~5MHz
Example: FREQ: RANG 1
Query: FREQ: RANG?
Return: <NR1>

FREQuency:MEASure:STARt
Model: A800068
Description: It starts the frequency measurement function.
Example: FREQ:MEAS:STAR

FREQuency:MEASure?
Model: A800068

Description: It queries the frequency measurement.
Query: FREQ:MEAS?
Return: <NR3> [UINT=Hz]

MEASURE Subsystem

MEAS:VDC
Description: It sets the voltage to be measured to VDC output port.
Syntax: MEAS:VDC <NR1>
Parameter: 0~1
0 stands for OFF.
Example: MEAS:VDC 1
Query: MEAS:VDC ?
Return: <NR1>

MEAS:CHANnel
Description: It sets the module address to be controlled.
Syntax: MEAS:CHANnel <NR1>
Parameter: 0~10
0 indicates all channels.
NOISE CARD is 1~10.
Example: MEAS:CHAN 1
Query: MEAS:CHAN?
Return: <NR1>

MEASURE MODE Subsystem

MEASure:MODE
Model: A800068
Description: Set Measurement mode
Syntax: MEAS:MODE <CHARACTER>
Parameter: DC|0, AC|1
Example: MEAS:MODE DC
MEAS:MODE 0
Query: MEAS:MODE?
Return: <NR1>

MEASure:MODE:ACCOUPling
Model: A800068
Description: Set AC Coupling Measurement mode
Syntax: AC:COUP <CHARACTER>
Parameter: OFF|0, ON|1
Example: MEAS:MODE:ACCOUP OFF
MEAS:MODE:ACCOUP 0
Query: MEAS:MODE:ACCOUP?
Return: <NR1>

NOISE Subsystem

NOISe:BWIDth
Description: It sets the bandwidth for measuring NOISE.
Syntax: NOISe:BWIDth <CHARACTER>
Parameter: F20M|1, F1M|2, F500K|3, F100K|4, F10K|5
F100M|6, F10M|7, F4M|8, F2K|9

Example: NOIS:BWID F20M
NOIS:BWID 5
Query: NOIS:BWID?
Return: <NR1>

Note F100M|6, F10M|7, F4M|8, F2K|9 Parameter for A800068 only.

NOISe:BWIDth:HIGH
Model: A800068
Description: Set NOISE Measurement BW（High Pass Filter）
Syntax: NOISe:BWIDth:HIGH <CHARACTER>
Parameter: F6|0, F2K|1
Example: NOIS:BWID:HIGH F1K
NOIS:BWID:HIGH 1
Query: NOIS:BWID:HIGH?
Return:<NR1>

NOISe:CHANnel
Description: It sets the module address to be controlled.
Syntax: NOISe:CHANnel <NR1>
Parameter: 0~10
0 indicates all channels.
NOISE CARD is 1~10.
Example: NOIS:CHAN 1
Query: NOIS:CHAN?
Return: <NR1>

NOISe:CONV
Description: It enables the measurement of NOISE.
Syntax: NOISe:CONV
Parameter: None.
Example: NOIS:CONV

NOISe:MEAS?
Description: It measures the voltage of NOISE.
Query: NOIS:MEAS?
Return: <NR2>
-1 : indicates the value of Noise Card is not measured yet.

NOISe:MEAS:TIME
Description: It sets the measurement speed of NEW NOISE.
Syntax: NOISe:MEAS:TIME <CHARACTER>
Parameter: NORMAL|1, FAST|2
Example: NOIS:MEAS:TIME FAST
NOIS:MEAS:TIME 1
Query: NOIS:MEAS:TIME?
Return: <NR1>

NOISe:MEAS:VRMS?
Description: It measures the voltage of NEW NOISE RMS.
Query: NOIS:MEAS:VRMS?
Return: <NR2>
-1: indicates the value of Noise Card is not measured yet.

NOISe:RANGe

Model:	80611N
Description:	It sets the measurement range of NOISE.
Syntax:	NOISe:RANGe <CHARACTER>
Parameter:	LOW|1, HIGH|2
Example:	NOIS:RANG HIGH NOIS:RANG 1
Query:	NOIS:RANG?
Return:	<NR1>

Model:	A800068
Syntax:	2, 4, 5 2 : 0.5V 4 : 5V 5 : 25V
Example:	NOIS:RANG 2
Query:	NOIS:RANG?
Return:	<NR1>

NOISe:RMS:RANGe

Model:	80611N
Description:	It sets the measurement range of VRMS.
Syntax:	NOISe:RMS:RANGe <CHARACTER>
Parameter:	LOW|1, MEDIUM|2, HIGH|3
Example:	NOIS:RMS:RANG HIGH NOIS:RMS:RANG 2
Query:	NOIS:RMS:RANG?
Return:	<NR1>

NOISe:TRIG:MODE <CHARACTER>

Model:	A800068
Description:	It sets NOISE trigger mode.
Syntax:	NOISe:TRIG:MODE <CHARACTER>
Parameter:	0: INTernal, 1: EXTernal
Example:	NOIS:TRIG:MODE 0
Query:	NOIS:TRIG:MODE?
Return:	<NR1>

NOISe:TRIG:INPut <CHARACTER>

Model:	A800068
Parameter:	0:No change 1:TTL1R, 2:TTL2R, 3:TTL3R, 4:TTL4R, 5:CMPAR, 6:CMPBR, 7:SWR 8:TTL1F, 9:TTL2F, 10:TTL3F, 11:TTL4F, 12:CMPAF, 13:CMPBF, 14:SWF, 15:CMPCR, 16:CMPDR, 17:CMPCF, 18:CMPDF, 19:SYNCR, 20:SYNCF, 21:TTL5R, 22:TTL6R, 23:TTL5F, 24:TTL6F, 25:CMPER, 26:CMPFR, 27:CMPEF, 28:CMPFF
Example:	NOIS:TRIG:INPut 1 NOIS:TRIG:INPut 2
Query:	NOIS:TRIG:INPut?
Return:	<NR1>

Note It has to set the NOISE measurement function trigger mode to 1 (EXTernal).

NOISe:SET:MEASure:TIME

Model: A800068
Description: It sets the measurement time for NOISE.
Syntax: NOISe:SET:MEASure:TIME < NR1>
Parameter: 1~65535 us
Example: NOIS:SET:MEAS:TIME 1
Query: NOIS:SET:MEAS:TIME?
Return: < NR1>

NOISe:SET:DELay:TIME

Model: A800068
Description: It sets the delay time for NOISE measurement.
Syntax: NOISe:SET:DELay:TIME < NR1>
Parameter: 0~65535 us
Example: NOIS:SET:DEL:TIME 1
Query: NOIS:SET:DEL:TIME?
Return: < NR1>

NOISe:SET:TIMeout

Model: A800068
Description: It sets time out for NOISE measurement.
Syntax: NOISe:SET:TIMeout < NR1>
Parameter: 0~65535 ms
Example: NOIS:SET:TIMEOUT 1
Query: NOIS:SET:TIMEOUT?
Return: < NR1>

OVERSHOOT Subsystem

Notice The 80611firmware version 4.00 (included) or above is applicable for A800068.

OVERSHOOT:TRIGger:LEVel

Model: A800068
Syntax: OVERSHOOT:TRIG:INPut <CHARACTER>
Parameter: 0: No change
1:TTL1R, 2:TTL2R, 3:TTL3R, 4:TTL4R, 5:CMPAR, 6:CMPBR, 7:SWR
8:TTL1F, 9:TTL2F, 10:TTL3F, 11:TTL4F, 12:CMPAF, 13:CMPBF
14:SWF, 15:CMPCR, 16:CMPDR, 17:CMPCF, 18:CMPDF, 19:SYNCR
20:SYNCF, 21:TTL5R, 22:TTL6R, 23:TTL5F, 24:TTL6F
25:CMPER, 26:CMPFR, 27:CMPEF, 28:CMPFF
Example: OVERSHOOT:TRIG:INPut 1

OVERSHOOT:TRIG:INPut

Query: OVERSHOOT:TRIG:INPut?
Return: <NR1>

OVERSHOOT:VOLTage:LEVel:MAXimum

Model: A800068
Description: It sets the maximum voltage for overshoot.
Syntax: OVERSHOOT:VOLTage:LEVel:MAXimum <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V

120V : 0~126V
500V : 0 ~525V
Example: OVERSHOOT:VOLT:LEV:MAX 10.0
Query: OVERSHOOT:VOLT:LEVel:MAX?
Return: <NR2>

OVERSHOOT:VOLTage:LEVel:MINimum
Model: A800068
Description: It sets the minimum voltage for overshoot.
Syntax: OVERSHOOT:VOLTage:LEVel:MINimum <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: OVERSHOOT:VOLT:LEV:MIN 10.0
Query: OVERSHOOT:VOLT:LEVel:MIN?
Return: <NR2>

OVERSHOOT:TIME
Model: A800068
Description: It sets the measurement time for overshoot.
Syntax: OVERSHOOT:TIME <NRf+>[sufix]
Parameter: 0~65.535S
Example: OVERSHOOT:TIME 1
Query: OVERSHOOT:TIME?
Return: <NR2> [UINT=Second]

OVERSHOOT:MEASure:ENABle
Model: A800068
Description: It sets the overshoot measurement function.
Syntax: OVERSHOOT:MEAS:ENABle <CHARACTER>
Parameter: OFF|0, ON|1
Example: OVERSHOOT:MEAS:ENAB 1
Query: OVERSHOOT:MEAS:ENAB?
Return: <NR1>

OVERSHOOT:MEASure:VOLTage?
Model: A800068
Description: It queries the measurement voltage for overshoot.
Syntax: OVERSHOOT:MEAS:VOLT?
Return: <NR2>

OVERSHOOT:MEASure:TIME?
Model: A800068
Description: It queries the measurement time for overshoot.
Syntax: OVERSHOOT:MEAS:TIME?
Return: <NR2>

PROTection Subsystem

PROTect:FRAMe:CLEar
Model: 80611N
Description: It clears the protection register.

Syntax: PROT:FRAM:CLE
Example: PROT:FRAMe: CLE

PROTect:FRAMe:CONDition?
Model: 80611N
Description: It queries the protection register.
Query: PROT:FRAM:COND?

PROTect:FRAMe:ENABle
Model: 80611N
Description: It sets the protection enable register.
Syntax: PROT:FRAM:ENAB <NR1>
Parameter: 0~255
Example: PROT:FRAM:ENAB 3
Query: PROT:FRAM:ENAB?
Return: <NR1>

PROTect:FRAMe:EVENt?
Model: 80611N
Description: It queries the protection event register.
Query: PROT:FRAM:EVEN?

PROTect:MODUle:CLEar
Model: A800068
Description: It clears the module protection.
Syntax: PROT:MODU:CLE
Parameter: No
Example: PROT:MODU:CLE

PROTect:MODUle:CONDition?
Model: A800068
Description: It queries the module protection.
Syntax: PROT:MODU:COND?
Return: <NR1>

Bit	1	2	3
Protection	OVP	RVP	HI ADC OVP

SET Subsystem

SET:LED
Description: It sets NOISE CARD LED ON/OFF.
Syntax: SET:LED <NR1>
Parameter: OFF|0, ON|1
Example: SET:LED OFF
SET:LED 1

SET:RELay
Description: It sets the RELAY output port.
Syntax: SET:RELay <NR1>
Parameter: 0~255
0 stands for OFF.

BIT	5	4	3	2	1	0
Weight	32	16	8	4	2	1

Example: SET:REL 0
SET:REL 5
Query: SET:REL?
Return: <NR1>

SET:TTLB
Description: It sets the TTL BIT output.
Syntax: SET:TTLB <NR1>
Parameter: 0~65535
0 stands for OFF.

BIT	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

Example: SET:TTLB 0
SET:TTLB 12
Query: SET:TTLB?
Return: <NR1>

SET:SW
Description: It sets the software enabling ON/OFF control for measurement.
Syntax: SET:SW<NR1>
Parameter: OFF|0, ON|1
Example: SET:SW OFF
SET:SW 1

TIME Subsystem

TIME
Description: It enables/disables the time measurement function.
Syntax: TIME <Boolean | CHARACTER>
Parameter: OFF|0, ON|1
Example: TIME OFF
TIME 1

TIME:CHANnel
Description: It sets the module address to be controlled.
Syntax: TIME:CHANnel <NR1>
Parameter: 0~10
0 indicates all channels.
NOISE CARD is 1~10.
Example: TIME:CHAN 1
Query: TIME:CHAN?
Return: <NR1>

TIME:EN1
Description: It enables the 1st set of time measurement.
Syntax: TIME:EN1 <CHARACTER>
Parameter: OFF|0, ON|1

Example: TIME:EN1 1
TIME:EN1 OFF
Query: TIME:EN1?
Return: <NR1>

TIME:EN2
Description: It enables the 2nd set of time measurement.
Syntax: TIME:EN2 <CHARACTER>
Parameter: OFF|0, ON|1
Example: TIME:EN2 1
TIME:EN2 OFF
Query: TIME:EN2?
Return: <NR1>

TIME:EN3
Description: It enables the 3rd set of time measurement.
Syntax: TIME:EN3 <CHARACTER>
Parameter: OFF|0, ON|1
Example: TIME:EN3 1
TIME:EN3 OFF
Query: TIME:EN3?
Return: <NR1>

TIME:END
Description: It sets the end point of time measurement.
Syntax: TIME:END <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20, TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24
Example: TIME:END 1
TIME:END TT2F
Query: TIME:END?
Return: <NR1>

TIME:END1
Description: It sets the end point of 1st set for time measurement.
Syntax: TIME:END1 <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20, TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24
Example: TIME:END1 1
TIME:END1 TTL2F
Query: TIME:END1?
Return: <NR1>

TIME:END2
Description: It sets the end point of 2nd set for time measurement.
Syntax: TIME:END2 <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20, TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24

Example: TIME:END2 1
TIME:END2 TTL2F
Query: TIME:END2?
Return: <NR1>

TIME:END3
Description: It sets the end point of 3rd set for time measurement.
Syntax: TIME:END3 <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20, TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24
Example: TIME:END3 1
TIME:END3 TTL2F
Query: TIME:END3?
Return: <NR1>

TIME:MEASure?
Description: It shows the result of time measurement (1st set).
Query: TIME:MEASure?
Return: <NR2> [UINT=Second]

TIME:MEAS1?
Description: It shows the result of 1st set time measurement.
Query: TIME:MEAS1?
Return: <NR2> [UINT=Second]

TIME:MEAS2?
Description: It shows the result of 2nd set time measurement.
Query: TIME:MEAS2?
Return: <NR2> [UINT=Second]

TIME:MEAS3?
Description: It shows the result of 3rd set time measurement.
Query: TIME:MEAS3?
Return: <NR2> [UINT=Second]

TIME:MULTiple
Description: It sets the multiple of time measurement (use 65.535S as base, the setting is the power of 2, 0 → to multiply the 0 power of 2 means to multiply 1; 1 → to multiply the 1st power of 2 means to multiply 2 and so forth.)
Syntax: TIME:MULTiple <NR1>
Parameter: 0 ~ 7
Example: TIME:MULT 2
Query: TIME:MULT?
Return: <NR1>

TIME:STARt
Description: It sets the start point of time measurement.
Syntax: TIME:STARt <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20,

TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24
Example: TIME:STAR 1
TIME:STAR TT2F
Query: TIME:STAR?
Return: <NR1>

TIME:TIMeout
Description: It sets timeout for Timing measurement.
Syntax: TIME:TIMeout <NRf+>[sufix]
Parameter: 0.001~65.535S
Example: TIME:TIM 1
Query: IME:TIM?
Return: NR2> [UINT=Second]

TRIGGER Subsystem

TRIGger
Description: It enables /disables TRIGGER INPUT.
Syntax: TRIGger <Boolean | CHARACTER>
Parameter: OFF|0, ON|1
Example: TRIG OFF
TRIG ON

TRIGger?
Description: It queries if TRIGGER INPUT acts.
Query: TRIGger?
Return: <NR1>

TRIGger:CHANnel
Description: It sets the module address to be controlled.
Syntax: TRIGger:CHANnel <NR1>
Parameter: 0~10
0 indicates all channels.
NOISE CARD is 1~10.
Example: TRIG:CHAN 1
Query: TRIG:CHAN?
Return: <NR1>

TRIGger:INPut
Description: It set the TRIGGER INPUT signal.
Syntax: TRIGger:INPut <CHARACTER>
Parameter: TTL1R|1, TTL2R|2, TTL3R|3, TTL4R|4, CMPAR|5, CMPBR|6, SWR|7, TTL1F|8, TTL2F|9, TTL3F|10, TTL4F11, CMPAF|12, CMPBF|13, SWF|14, CMPCR|15, CMPDR|16, CMPCF|17, CMPDF|18, SYNCR|19, SYNCF|20, TTL5R|21, TTL6R|22, TTL5F|23, TTL6F|24, 25:CMPER、26:CMPFR, 27:CMPEF, 28:CMPFF

Note CMPE and CMPF (25~28) parameters are only applicable to A800068.

Example: TRIG:INP 1
TRIG:INP TTL4F
Query: TRIG:INP?
Return: <NR1>

TTL Subsystem

TTL
Description: It can select TTL1, TTL2, TTL3, TTL4, TTL5 or TTL6.
Syntax: TTL <NR1>
Parameter: 1~6
Example: TTL 1
Query: TTL?
Return: <NR1>

TTL:INPut?
Description: It queries the TTL INPUT status.
Query: TTL:INP?
Return: <NR2>

TTL:LEVel
Description: It sets the level based on the selected TTL1, TTL2, TTL3, TTL4, TTL5 or TTL6.
Syntax: TTL:LEVel <NRf+>[suffix]
Parameter: 0.00~30.00V
Example: TTL:LEV 2.5
Query: TTL:LEV?
Return: <NR1>

UNDERSHOOT Subsystem

Notice The 80611firmware version 4.00 (included) or above is applicable for A800068.

UNDERSHOOT:TRIGger:LEVel <NRf+>[suffix]
Model: A800068
Syntax: UNDERSHOOT:TRIG:INPut <CHARACTER>
Parameter: 0: No change
1:TTL1R, 2:TTL2R, 3:TTL3R, 4:TTL4R, 5:CMPAR, 6:CMPBR, 7:SWR
8:TTL1F, 9:TTL2F, 10:TTL3F, 11:TTL4F, 12:CMPAF, 13:CMPBF, 14:SWF
15:CMPCR, 16:CMPDR, 17:CMPCF, 18:CMPDF, 19:SYNCR
20:SYNCF, 21:TTL5R, 22:TTL6R, 23:TTL5F, 24:TTL6F
25:CMPER, 26:CMPFR, 27:CMPEF, 28:CMPFF
Example: UNDERSHOOT:TRIG:INPut 1

UNDERSHOOT:TRIG:INPut 2
Query: UNDERSHOOT:TRIG:INPut?
Return: <NR1>

UNDERSHOOT:VOLTage:LEVel:MAXimum <NRf+>[suffix]
Model: A800068
Description: It sets the maximum voltage for undershoot.
Syntax: UNDERSHOOT:VOLTage:LEVel:MAXimum <NRf+>[suffix]
Parameter: <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V

Example: UNDERSHOOT:VOLT:LEV:MAX 10.0
Query: UNDERSHOOT:VOLT:LEVel:MAX?
Return: <NR2>

UNDERSHOOT:VOLTage:LEVel:MINimum <NRf+>[suffix]
Model: A800068
Description: It sets the minimum voltage for undershoot.
Syntax: UNDERSHOOT:VOLTage:LEVel:MINimum <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: UNDERSHOOT:VOLT:LEV:MIN 10.0
Query: UNDERSHOOT:VOLT:LEVel:MIN?
Return: <NR2>

UNDERSHOOT:TIME
Model: A800068
Description: It sets the measurement time for undershoot.
Syntax: UNDERSHOOT:TIME <NRf+>[sufix]
Parameter: 0~65.535S
Example: UNDERSHOOT:TIME 1
Query: OVERSHOOT:TIME?
Return: <NR2> [UINT=Second]

UNDERSHOOT:MEASure:ENABle
Model: A800068
Description: It enables undershoot function.
Syntax: UNDERSHOOT:MEAS:ENABle <CHARACTER>
Parameter: OFF|0, ON|1
Example: UNDERSHOOT:MEAS:ENAB 1
Query: UNDERSHOOT:MEAS:ENAB?
Return: <NR1>

UNDERSHOOT:MEASure:VOLTage?
Model: A800068
Description: It queries the measurement voltage for undershoot.
Query: UNDERSHOOT:MEAS:VOLT?
Return: <NR2>

UNDERSHOOT:MEASure:TIME?
Model: A800068
Description: It queries the measurement time for undershoot.
Query: UNDERSHOOT:MEAS:TIME?
Return: <NR2>

VOLTAGE Subsystem

VOLTage:CHANnel
Description: It sets the module address to be controlled.
Syntax: VOLTage:CHANnel <NR1>
Parameter: 0~10
0 indicates all channels.

NOISE CARD is 1~10.
Example: VOLT:CHAN 1
Query: VOLT:CHAN?
Return: <NR1>

VOLTage:MEAS:VAC?
Model: A800068
Description: It queries VAC measurement.
Query: VOLT:MEAS:VAC?
Return: <NR2>

VOLTage:MEAS:VAC:PKH?
Model: A800068
Description: It queries VAC Peak+ measurement.
Query: VOLT:MEAS:VAC:PKH?
Return: <NR2>

VOLTage:MEAS:VAC:PKL?
Model: A800068
Description: It queries VAC Peak- measurement.
Query: VOLT:MEAS:VAC:PKL?
Return: <NR2>

VOLTage:MEAS:VAC:PK?
Model: A800068
Description: It queries VAC Peak to Peak measurement.
Query: VOLT:MEAS:VAC:PK?
Return: <NR2>

VOLTage:RANGe:VAC
Model: A800068
Description: It queries NOISE CARD VAC voltage range.
Syntax: VOLTage:RANGe:VAC <CHARACTER>
Parameter: 1, 2, 3
1: 20V
2: 150V
3: 350V
Example: VOLT:RANG:VAC 1
Query: VOLT:RANG:VAC?
Return: <NR1>

VOLTage:VAC
Model: A800068
Description: It enables/disables VAC measurement.
Syntax: VOLTage:VAC<CHARACTER>
Parameter: OFF|0, ON|1
Example: VOLT:VAC ON
VOLT:VAC 0

VOLTage:CMPA
Description: It sets the voltage range for CMPA to measure the time.
Syntax: VOLTage:CMPA <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V

30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPA 10V
Query: VOLT:CMPA ?
Return: <NR2>

VOLTage:CMPB
Description: It sets the voltage range for CMPB to measure the time.
Syntax: VOLTage:CMPB <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPB 10V
Query: VOLT:CMPB?
Return: <NR2>

VOLTage:CMPC
Description: It sets the voltage range for CMPC to measure the time.
Syntax: VOLTage:CMPC <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPC 10V
Query: VOLT:CMPC?
Return: <NR2>

VOLTage:CMPD
Description: It sets the voltage range for CMPD to measure the time.
Syntax: VOLTage:CMPD <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPD 10V
Query: VOLT:CMPD?
Return: <NR2>

VOLTage:CMPE
Model: A800068
Description: It sets the voltage range for CMPE to measure the time.
Syntax: VOLTage:CMPE <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPE 10V
Query: VOLT:CMPE?

Return: <NR2>

VOLTage:CMPF
Model: A800068
Description: It sets the voltage range for CMPF to measure the time.
Syntax: VOLTage:CMPF <NRf+>[suffix]
Parameter: The ranges of input voltage are:
6V : 0~6.3V
30V : 0~31.5V
120V : 0~126V
500V : 0 ~525V
Example: VOLT:CMPF 10V
Query: VOLT:CMPF?
Return: <NR2>

VOLTage:PEAK
Description: It enables PEAK measurement.
Syntax: VOLTage:PEAK **<**Boolean | CHARACTER**>**
Parameter: OFF|0, ON|1
Example: VOLTage:PEAK OFF
VOLTage:PEAK 1

VOLTage:MEAS:PEAK?
Description: It queries the measurement of Peak to Peak.
Query: VOLT:MEAS:PEAK?
Return: <NR2>

VOLTage:MEAS:PKH?
Description: It queries the measurement of Peak+.
Query: VOLT:MEAS:PKH?
Return: <NR2>

VOLTage:MEAS:PKL?
Description: It queries the measurement of Peak-.
Query: VOLT:MEAS:PKL?
Return: <NR2>

VOLTage:MEAS:SPH?
Description: It queries the measurement of Spike+.
Query: VOLT:MEAS:SPH?
Return: <NR2>

VOLTage:MEAS:SPL?
Description: It queries the measurement of Spike-.
Query: VOLT:MEAS:SPL?
Return: <NR2>

VOLTage:MEAS:STAH?
Description: It queries the measurement of Stable+.
Query: VOLT:MEAS:STAH?
Return: <NR2>

VOLTage:MEAS:STAL?
Description: It queries the measurement of Stable-.

Query: VOLT:MEAS:STAL?
Return: <NR2>

VOLTage:MEAS:VDC?
Description: It queries the measurement of VDC.
Query: VOLT:MEAS:VDC?
Return: <NR2>

VOLTage:RANGe
Description: It sets the voltage range of NOISE CARD.
Syntax: VOLTage:RANGel <CHARACTER>
Parameter: V6|1, V30|2, V120|3, V500|4 (80611N)
Example: VOLT:RANG 1
VOLT:RANG V120
Query: VOLT:RANG?
Return: <NR1>

VOLTage:SPIKe
Description: It enables SPIKE measurement.
Syntax: VOLTage:SPIKe <Boolean | CHARACTER>
Parameter: OFF|0, ON|1
Example: VOLTage:SPIK OFF
VOLTage:SPIK 1

VOLTage:SYNC
Description: It sets Sync source.
Syntax: VOLTage:SYNC <CHARACTER>
Parameter: NBOARD | 0, FRAME | 1
Example: VOLT:SYNC FRAME
Query: VOLT:SYNC?
Return: <NR1>

VOLTage:SYNC:ONOF
Description: It sets Sync function.
Syntax: VOLTage:SYNC:ONOF <CHARACTER>
Parameter: OFF | 0, ON | 1
Example: VOLT:SYNC:ONOF ON
Query: VOLT:SYNC:ONOF?
Return: <NR1>

VOLTage:SYNC:ISHL
Description: It sets Sync Input Signal High Loading.
Syntax: VOLTage:SYNC:ISHL <CHARACTER>
Parameter: LOW | 1, HIGH | 2
Example: VOLT:SYNC:ISHL HIGH
Query: VOLT:SYNC:ISHL?
Return: <NR2>

VOLTage:TIME
Description: It sets the time out for Vpeak and Vspike measurement.
Syntax: VOLTage:TIME <NR1>
Parameter: 100 ~ 65535 ms
Example: VOLT:TIME 5000
Query: VOLT:TIME?

Return: <NR1>

VOLTage:TIME:BASE
Description: It sets the time unit for Vpeak and Vspike measurement.
Syntax: VOLTage:TIME:BASE <CHARACTER>
Parameter: US | 1, MS | 2
Example: VOLT:TIME:BASE MS
Query: VOLT:TIME:BASE?
Return: <NR1>

VOLTage:TIME:TPH
Description: It sets the time of TP+.
Syntax: VOLTage:TIME:TPH <NR1>
Parameter: 1 ~ 65535
Example: VOLT:TIME:TPH 50
Query: VOLT:TIME:TPH?
Return: <NR1>

VOLTage:TIME:TPL
Description: It sets the time of TP-.
Syntax: VOLTage:TIME:TPL <NR1>
Parameter: 1 ~ 65535
Example: VOLT:TIME:TPL 50
Query: VOLT:TIME:TPL?
Return: <NR1>

VOLTage:TIME:TSH
Description: It sets the time of TS+.
Syntax: VOLTage:TIME:TSH <NR1>
Parameter: 1 ~ 65535
Example: VOLT:TIME:TSH 50
Query: VOLT:TIME:TSH?
Return: <NR1>

VOLTage:TIME:TSL
Description: It sets the time of TS-.
Syntax: VOLTage:TIME:TSL <NR1>
Parameter: 1 ~ 65535
Example: VOLT:TIME:TSL 50
Query: VOLT:TIME:TSL?
Return: <NR1>

VOLTage:VDC
Description: It enables/disables VDC measurement.
Syntax: VOLTage:VDC<CHARACTER>
Parameter: OFF|0, ON|1
Example: VOLT:VDC ON
VOLT:VDC 0

HF Subsystem

Notice It is only applicable for the firmware version 1.10 or above.

HF1:OUT1
Description: It sets HF1 OUT1 for input.
Syntax: HF1:OUT1<NR1>
Parameter: 0~10
Example: HF1:OUT1 5
Query: HF1:OUT1?
Return: <NR1>

HF1:OUT2
Description: It sets HF1 OUT2 for input.
Syntax: HF1:OUT2<NR1>
Parameter: 0~10
Example: HF1:OUT2 5
Query: HF1:OUT2?
Return: <NR1>

HF2:OUT1
Description: It sets HF2 OUT1 for input.
Syntax: HF2:OUT1<NR1>
Parameter: 0~10
Example: HF2:OUT1 5
Query: HF2:OUT1?
Return: <NR1>

HF2:OUT2
Description: It sets HF2 OUT2 for input.
Syntax: HF2:OUT2<NR1>
Parameter: 0~10
Example: HF2:OUT2 5
Query: HF2:OUT2?
Return: <NR1>

DO Subsystem

Notice It is only applicable for the firmware version 1.10 or above.

DO1:SETBIT
Description: It sets DO1 BIT to ON.
Syntax: DO1:SETBIT <NR1>
Parameter: 1 ~ 50
Example: DO1:SETBIT 1

DO1:CLRBIT
Description: It sets DO1 BIT to OFF.
Syntax: DO1:CLRBIT <NR1>
Parameter: 1 ~ 50
Example: DO1:CLRBIT 1

DO1:SETALL
Description: It sets DO1 output port.
Syntax:DO1: SETALL <NR1>,<NR1>,<NR1>,<NR1>
Parameter: 0~65535, 0 means OFF.

1st Parameter

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	16
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

2nd Parameter

BIT	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

3rd Parameter

BIT	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

4th Parameter

BIT	49	50														
Weight	32768	16384														

Example: DO1:SETALL 32768, 32768, 32768, 32768 (BIT 1,17,33,49 ON)
DO1:SETALL 16384, 4096, 256, 16384 (BIT 2,20,40,50 ON)
Query: DO1:SETALL?
Return: <NR1>,<NR1>,<NR1>,<NR1>

DO2:SETBIT

Description: It sets DO2 BIT to ON.
Syntax: DO2:SETBIT <NR1>
Parameter: 1 ~ 50
Example: DO2:SETBIT 1

DO2:CLRBIT

Description: It sets DO2 BIT to OFF.
Syntax: DO2:CLRBIT <NR1>
Parameter: 1 ~ 50
Example: DO2:CLRBIT 1

DO2:SETALL

Description: It sets DO2 output port.
Syntax: DO2:SETALL <NR1>,<NR1>,<NR1>,<NR1>
Parameter: 0~65535, 0 means OFF.

1st Parameter

BIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	16
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

2nd Parameter

BIT	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

3rd Parameter

BIT	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Weight	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1

4th Parameter

BIT	49	50														
Weight	32768	16384														

Example: DO2:SETALL 32768, 32768, 32768, 32768 (BIT 1,17,33,49 ON)
DO2:SETALL 16384, 4096, 256, 16384 (BIT 2,20,40,50 ON)
Query: DO2:SETALL?
Return: <NR1>,<NR1>,<NR1>,<NR1>

Appendix A 80611N Card Specification

A.1 Noise Specification of 80611N Card

Noise Spec	
Input Setting	
Input Voltage Range	400mV / 2V
Resolution	15bit/14Bit
Vp-p Measurement	
Accuracy	1% +5mV / 1% + 15mV (Normal: 0.5 sec, Fast: 0.1 sec)
Bandwidth	6Hz-10K/100K/500K/1M/20MHz
-3dB Tolerance	+/- 1dB
CMRR	50dB @ 20MHz

(1) When calculating the accuracy of 80611N card, the Accuracy listed in the manual specification is often used for verification. Thus, when the actual 20MHz bandwidth and 2V/0.4V range of 80611N card are used to measure the signal of each frequency, the measurement of high bandwidth signal (>1MHz) is often found not within the specification.

0.4V range: 1% x Reading+5mV
2V range: 1% x Reading+ 15mV

The reason is that the specification represents when the input signal bandwidth is 100 times smaller than the bandwidth selected by the 80611N card only. (For instance: for 80611N 20MHz, the input source signal bandwidth is <200KHz.)

(2) It is often ignored that the 80611N is equivalent to the oscilloscope function in 8000 ATS. Oscilloscope on the level of signal restored is determined by the signal frequency and selected bandwidth. When the bandwidth of oscilloscope is not enough (in theory the bandwidth is enough when it is 10 times higher than signal frequency), the signal will be attenuated. When the signal frequency and bandwidth are the same, the signal amplitude will attenuate to 0.707 times which is -3dB. The same problem occurs to 80611N card too. So, when the bandwidths of signal source and 80611N are close (within 100 time), the specification of -3dB+/-1dB has to be taken into consideration to calculate the range of amplitude attenuation.

A.2 Bandwidth Range of 80611N Card

Table A-1 80611N Range vs. Input Voltage/Frequency Verification Table

80611N Range	Input Vpp / Frequency	Vpp High Limit @-2dB	Vpp Actual Reading	Vpp Low Limit @-4dB
2V / 20MHz	1Vpp / 6Hz	0.8193V		0.606V
	1Vpp / 10KHz	1.025V		0.975V
	1Vpp / 100KHz	1.025V		0.975V
	1Vpp / 500KHz	1.0248V		0.9745V
	1Vpp / 1MHz	1.0243V		0.9731V
	1Vpp / 20MHz	0.8193V		0.606V
2V / 1MHz	1Vpp / 6Hz	0.8193V		0.606V
	1Vpp / 10KHz	1.025V		0.9749V
	1Vpp / 100KHz	1.0221V		0.9675V
	1Vpp / 500KHz	0.9590V		0.8269V
	1Vpp / 1MHz	0.8193V		0.606V
	1Vpp / 20MHz	-----		-----
2V / 500KHz	1Vpp / 6Hz	0.8193V		0.606V
	1Vpp / 10KHz	1.0249V		0.9747V
	1Vpp / 100KHz	1.0135V		0.9461V
	1Vpp / 500KHz	0.8193V		0.606V
	1Vpp / 1MHz	-----		-----
	1Vpp / 20MHz	-----		-----
2V / 100KHz	1Vpp / 6Hz	0.8193V		0.606V
	1Vpp / 10KHz	1.0221V		0.9675V
	1Vpp / 100KHz	0.8193V		0.606V
	1Vpp / 500KHz	-----		-----
	1Vpp / 1MHz	-----		-----
	1Vpp / 20MHz	-----		-----
2V / 10KHz	1Vpp / 6Hz	0.8193V		0.606V
	1Vpp / 10KHz	0.8193V		0.606V
	1Vpp / 100KHz	-----		-----
	1Vpp / 500KHz	-----		-----
	1Vpp / 1MHz	-----		-----
	1Vpp / 20MHz	-----		-----

A.3 Conclusion

For calibration, the bandwidth range provided by the specification can be used to retrieve the frequency dots which are 10K/100K/500K/1M/20M; and for the input source bandwidth that is 100 times smaller than the bandwidth selected by 80611N card, the measurement specification can refer to the one in Accuracy. As to the rest of the signals, please refer to the specification of -3dB Tolerance equals +/-1dB plus the result of 80611N reading error.

A.4 -3dB Error Calculation for 80611N Card

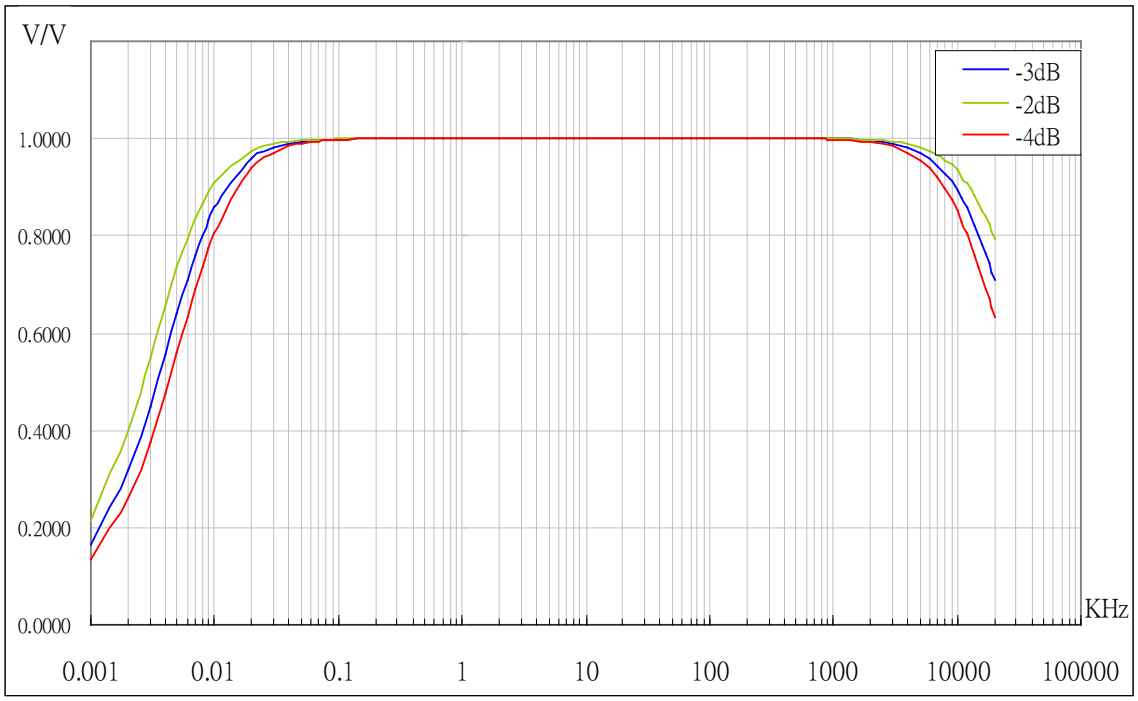


Figure A-1 20MHz Bandwidth in Different Frequencies for 80611N Card

(1) The -3dB Tolerance of 80611N card is +/-1dB. Taking 20MHz as an example, measure a 20MHz signal will have -3dB attenuation. The error is between -2dB and -4dB and the calculation formula is :

-4dB:

$$20\log_{10} A(j\omega)/A_0 = -4dB$$

$$A(j\omega)/A_0 = 10^{\frac{-4}{20}} = \frac{1}{\sqrt{1+\left(\frac{20MHz}{F-4db}\right)^2}} = 0.63095 = 0.631$$

It can calculate that when 20MHz is -4dB attenuation, the curve actual -3dB dot frequency is F_{-4dB}=16.26545MHz

Same as for -2dB:

$$20\log_{10} A(j\omega)/A_0 = -2dB$$

$$A(j\omega)/A_0 = 10^{\frac{-2}{20}} = \frac{1}{\sqrt{1+\left(\frac{20MHz}{F-2db}\right)^2}} = 0.79432$$

It can calculate that when 20MHz is -2dB attenuation, the curve actual -3dB dot frequency is F_{-2dB}=26.15131MHz. Do not forget to take the 80611N card reading error 1% x reading+5mV/15mV into consideration. If the signal voltage of 1Vpp/20MHz passes through the 80611N card 20MHz bandwidth measurement, the measured value should be between 0.606V (0.631-0.025) ~ 0.8193V (0.7943+0.025). (See Figure A-1)

(2) Thus, when the nominal bandwidth is 20MHz, but the signal attenuation error is +/-1dB which means the reading of 80611N card is 4dB, the actual bandwidth is 16.26545MHz. The actual bandwidth is 26.15131MHz when in 20MHz bandwidth and the 80611N card reading is -2dB. Use this error to back calculate the signal amplitude attenuation error. For instance, assuming the signal frequency is 1MHz:

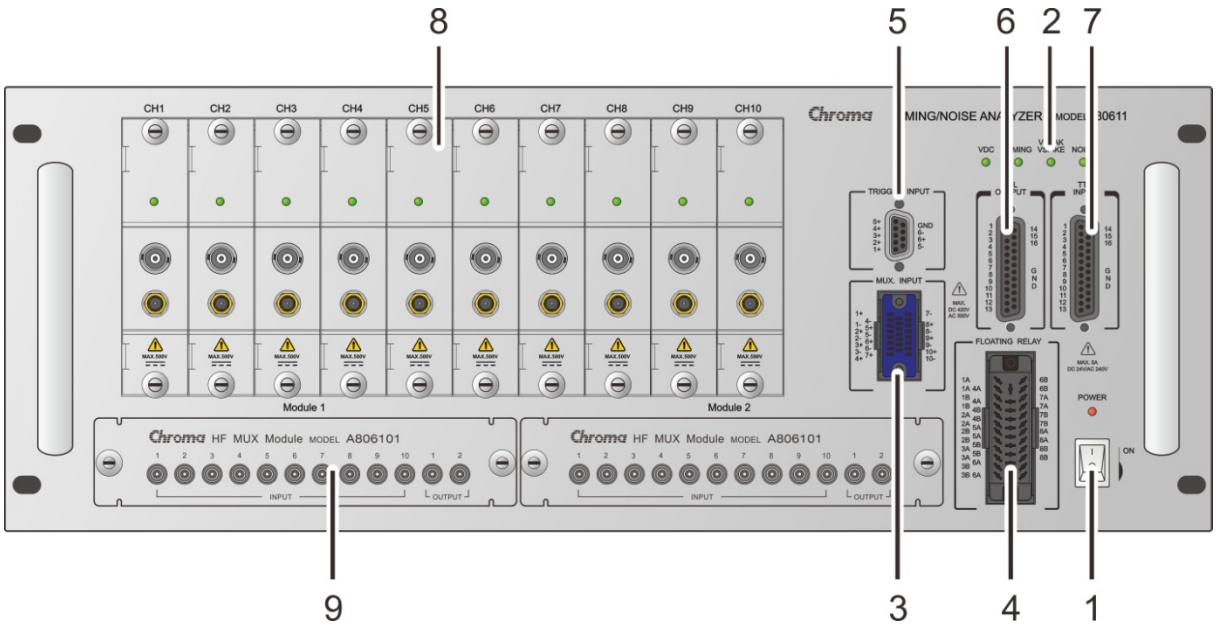
Low limit: $A(j\omega)/A_0 = \frac{1}{\sqrt{1+\left(\frac{1MHz}{16.26545MHz}\right)^2}} = 0.9981$

High limit: $A(j\omega)/A_0 = \frac{1}{\sqrt{1+\left(\frac{1MHz}{26.15131MHz}\right)^2}} = 0.9993$

Same as taking the reading error card 1% x reading+5mV/15mV of 80611N into consideration, if the signal voltage of 1Vpp/1MHz passes through 80611N card 20MHz bandwidth measurement, the measured value should be between 0.9731V (0.9981-0.025) ~ 1.0243V (0.9993+0.025).

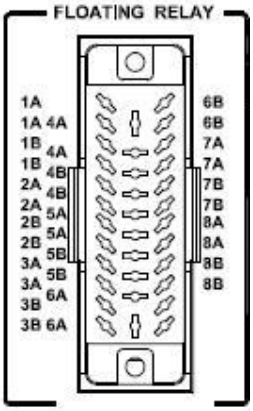
Appendix B Old Front Panel and Floating Relays (for Models shipped before Oct. 2014)

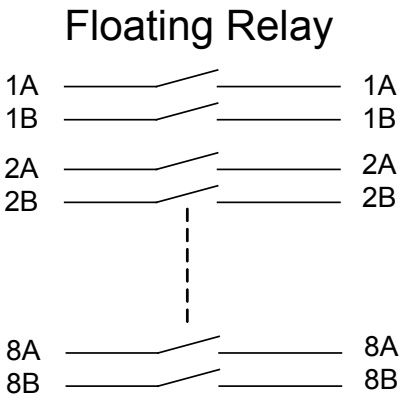
B.1 Old Front Panel



1. Power switch & LED indicator
2. LED indicators – NOISE, PEAK/SPIKE, TIMING &VDC
3. DVM Mux input (10 ports)
4. Floating relay (8 pairs DPST)
5. Trigger input (6 pairs)
6. TTL output (16 bits)
7. TTL input (16 bits)
8. 10-channel 80611N card (VDC input, LED indicator & SYNC_N trigger input)
9. Two extended modules that support A806101 HF MUX Module or A806102 Digital Output Module.

B.2 Old Floating Relays (8 Pairs DPST)





Appendix C A800068 Common Mode Noise Testing Methods

1. Testing methods compliance with 2011/12/15 IEC-62684 standards:

(1) If the width of Common Mode Noise (CMN) pulse composition (ring, transient overshoot and transient undershoot etc.) is smaller than 250ns, the amplitude is not calculated. See the figure below for actual waveform.

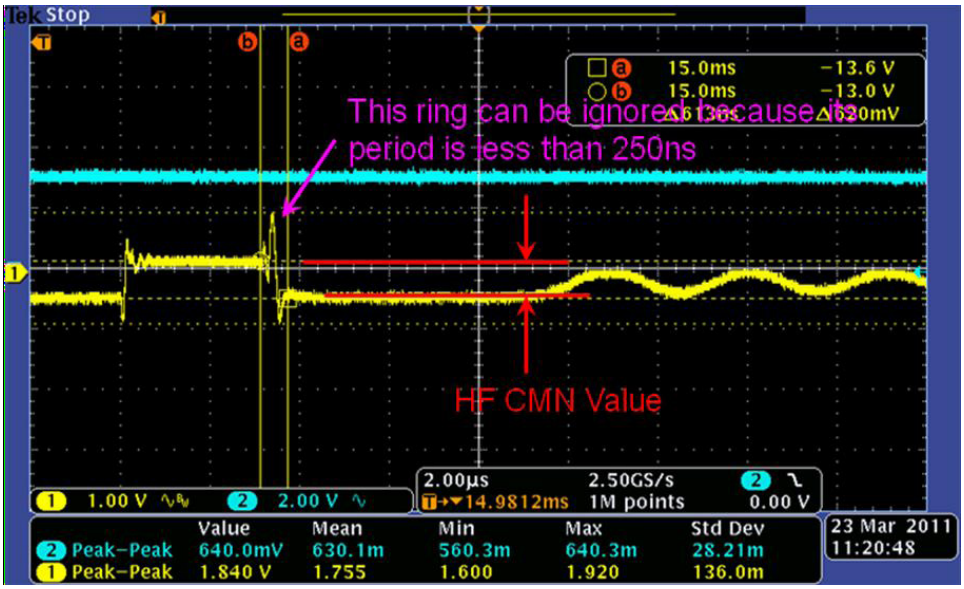


Figure C-1

(2) Add 4MHz cut-off frequency LPF to the measurement circuit and HPF to the front (cut-off frequency needs to be lower than switch frequency), and then filter out the DUT AC voltage fundamental frequency (50Hz) components.

(3) Smaller than 2Vpp is required for measuring VPP in CMN specification.

2. Following the standards described above, new CMN commands are added to A800068 for measurement:

(1) CMN measurement introduction:

a. The yellow signals in Figure C-2 are CMN voltage waveform of DUT output. The CMN maximum could appear on the output voltage peaks or troughs (varies with models). The blue signals are the input AC voltage.

b. Figure C-3 shows the signals that had filtered out 50Hz fundamental frequency. Using the above input AC voltage to do zero-crossing trigger signal (the Falling Edge in green curve starts from degree 0). It can set the measurement start of A800068 on the system and measurement time. As the table shown on the right of Figure C-3, the measured readings are varied with deferent delay times (the measurement time is fixed to 200us in the table). The delay and measurement time can be adjusted by DUTs to get the maximum CMN.

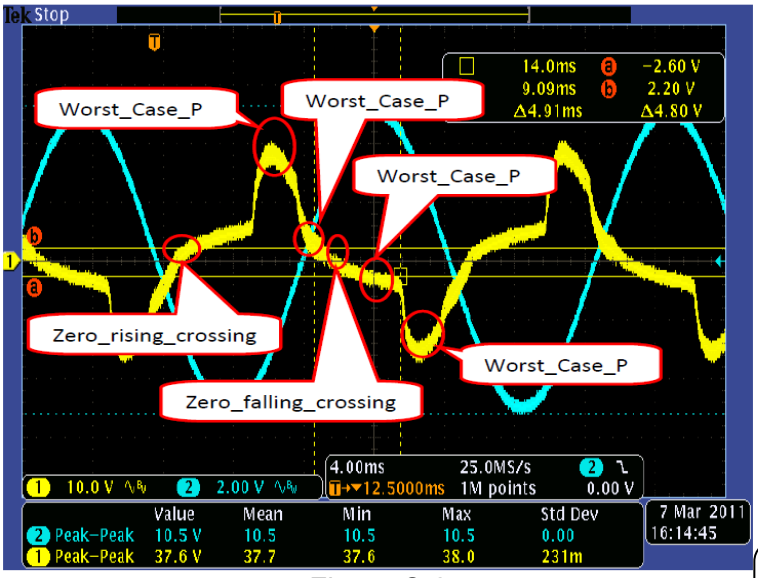
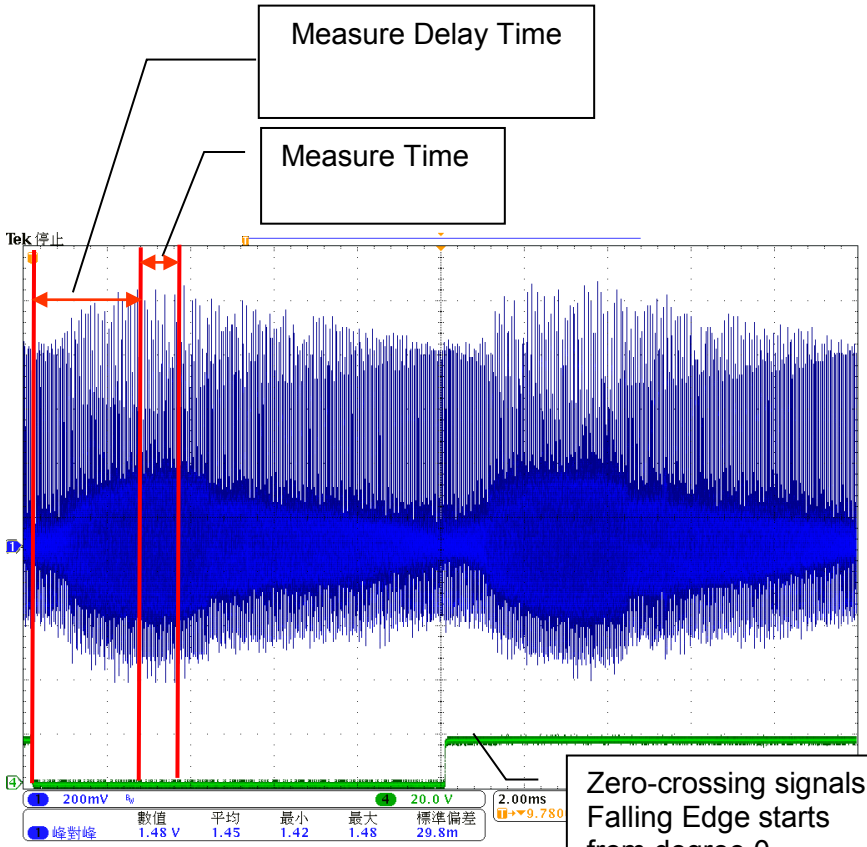


Figure C-2



Measure time 200us

Measure Delay(us)	Noise (Vpp)
10	1.134
1000	1.281
2000	1.560
3000	1.635
4000	1.515
5000	1.359
6000	1.356
7000	1.333
8000	1.322
9000	1.195
10000	1.098
11000	1.322
12000	1.560
13000	1.528
14000	1.508
15000	1.392
16000	1.349
17000	1.308
18000	1.308
19000	1.211

Figure C-3

(2) Example:
Use the zero-crossing signal of input AC voltage to connect to Trigger Input 2 of 80611 Frame as external trigger source and set Falling edge as trigger signal start. Set A800068 LPF bandwidth to 4MHz and Timeout to 1000ms. When trigger signal started, the Noise time interval for measurement is 1000us to 1200us which means the delay time is 1000us and measurement time is 200us.

The program is written as below: (//comments//)

NOIS:TRIG:MODE 1 //Setting “1” indicates using external trigger mode. //

NOIS:TRIG:INP 9 //Sett Trigger Input 2 Falling edge as measurement start.//

NOIS:SET:DEL:TIME 1000 //Set delay 1000us to start measurement.//

NOIS:SET:MEAS:TIME 200 //Set measurement time to 200us.//

NOIS:SET:TIMEOUT 1000 //Set to end the measurement if it is not done after given CONV commands for 1000ms.//

NOISE:BWID F4M //Set LPF bandwidth:4MHz.//

NOISe:CONV //Start NOISE measurement.//

Delay 100ms //At least delay 100ms to start getting measured value.//

NOIS:MEAS? //Return measured readings. //

CHROMA ATE INC.

致茂電子股份有限公司

66 Huaya 1st Road, Guishan,

Taoyuan 33383, Taiwan

台灣桃園市 33383 龜山區

華亞一路 66 號

T +886-3-327-9999

F +886-3-327-8898

Mail: info@chromaate.com

http://www.chromaate.com