



## SWITCHING POWER SUPPLY AUTOMATIC TEST SYSTEM MODEL 8000

The Chroma Power Supply Automatic Test system Model 8000 is the ultimate solution for power electronic testing. The system includes a wide range of hardware choice such as AC/DC Sources, Electronic Loads, DMM, Oscillate Scope, Noise Analyzer and Short /OVP Tester. This flexibility combined with its open architecture software platform -PowerPro III, gives users a flexible, powerful and cost effective test system for almost all types of power supply testing.

The 8000 test system uses a unique test command optimization technology to prevent repetitive control commands from being sent to the system hardware devices. This improve test speed dramatically and makes the Chroma 8000 an ideal choice for both high speed production applications as well as design verification.

The 8000 test system includes a sophisticated test executive which includes pre-written test

items covering almost all industry standard power supply tests. User may also create new test items by using a special test item editing function. This gives users the capability to expand the test library unlimitedly.

PowerPro III also includes powerful report, statistic and management functions, making the system capable to generate various test documents and performing system administration. Because the test and statistical reports are critically important in modern factories for R/D evaluation, QA verification and production tests, these functions are an integral part of the system.

Working under Window98/2000/XP the model 8000 provides test engineers with a dedicated power supply test systems in an easy-to-learn Windows environment and allow access to resources provided by Windows.

### MODEL 8000

#### Key Features :

- Open architecture software
  - Expandable hardware support
  - Support GPIB instruments & RS232/RS485/I<sup>2</sup>C interface
  - User editable test item
  - User editable test programs
  - User editable report format
  - Statistic report
  - On-Line control function
  - User authority control
  - Release control
  - Activity log
  - Master/Slave control mode
  - Multi-UUT test capability for single-output PSU
  - Support barcode reader
  - Support shop-floor control
  - Remote monitoring via internet
- Test command optimizer helps to improve test speed
- Capable of coding for any power supply testing applications
- Comprehensive hardware modules provide high accuracy and repetitive measurements
- High test throughput by system default test items
- Microsoft word based evaluation report or UUT characterization
- Cost effective
- Other hardware expandable upon request
- Windows 98/2000/XP or higher based software



## Comprehensive Test Items

The Model 8000 automatic power supply test system comes standard with an off-the-shelf test item library covering most industry standard power supply tests. Unlike traditional ATE software, users do not need to have programming language background to create new test items. Instead the Model 8000 allow users to use pre-compiled test items and to simplify defining test conditions and specifications.

The comprehensive test items cover 7 categories of power supply testing requirements. OUTPUT PERFORMANCE checks the general performances of the UUT. INPUT CHARACTERISTIC verifies the input parameters of a power supply. REGULATION tests the stability of the UUT under varying line-in and loading changes. TIMING AND TRANSIENT measures the transient state during turn-on, turn-off or when events occurred. PROTECTION TESTS triggers the protection circuit of the power supply. Finally, the SPECIAL TEST and the SPECIAL FEATURES provides means to test the most sophisticated power supplies when unique test routines are needed.

### OUTPUT PERFORMANCES

1. DC output voltage
2. DC output current
3. Peak-Peak noise
4. RMS noise
5. Current ripple\*
6. Efficiency
7. In-test adjustment
8. Power good signal
9. Power fail signal
10. P/ S ON signal
11. Extended measure
12. Waveform capture
13. Overshoot voltage

### INPUT CHARACTERISTICS

14. Input Inrush current
15. Input RMS current
16. Input peak current
17. Input power
18. Current harmonics against regulations
19. Input power factor
20. Input voltage ramp
21. Input freq. ramp
22. AC cycle drop out
23. PLD simulation

### REGULATION TESTS

24. Current regulation
25. Voltage regulation
26. Total regulation

### TIMING AND TRANSIENT

27. Power up sequence
28. Power down sequence
29. Transient response time
30. Transient spike
31. Turn ON time
32. Rise time
33. Fall time
34. Hold-up time
35. Extra timing
36. Tracking

### PROTECTION TESTS

37. Short circuit
38. OV protection
39. UV protection
40. OL protection
41. OP protection

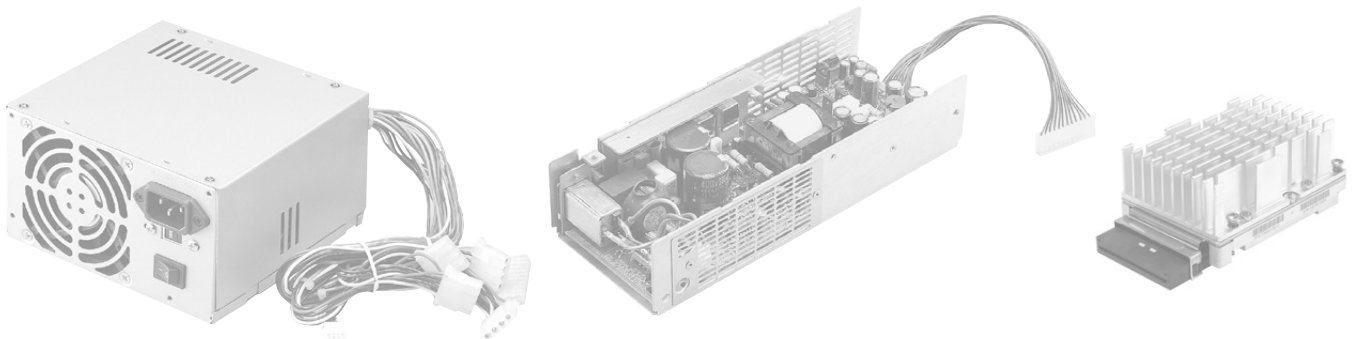
### SPECIAL TESTS

42. Fan speed
43. Correlation test
44. UUT measurement verification test

### SPECIAL FEATURE

45. Can bus read/ write
46. I<sup>2</sup>C read/ write\*
47. GPIB read/ write
48. RS-232 read/ write
49. RS-485 read/ write\*
50. TTL signal control
51. Relay control
52. Bar code scan\*
53. DMM measure

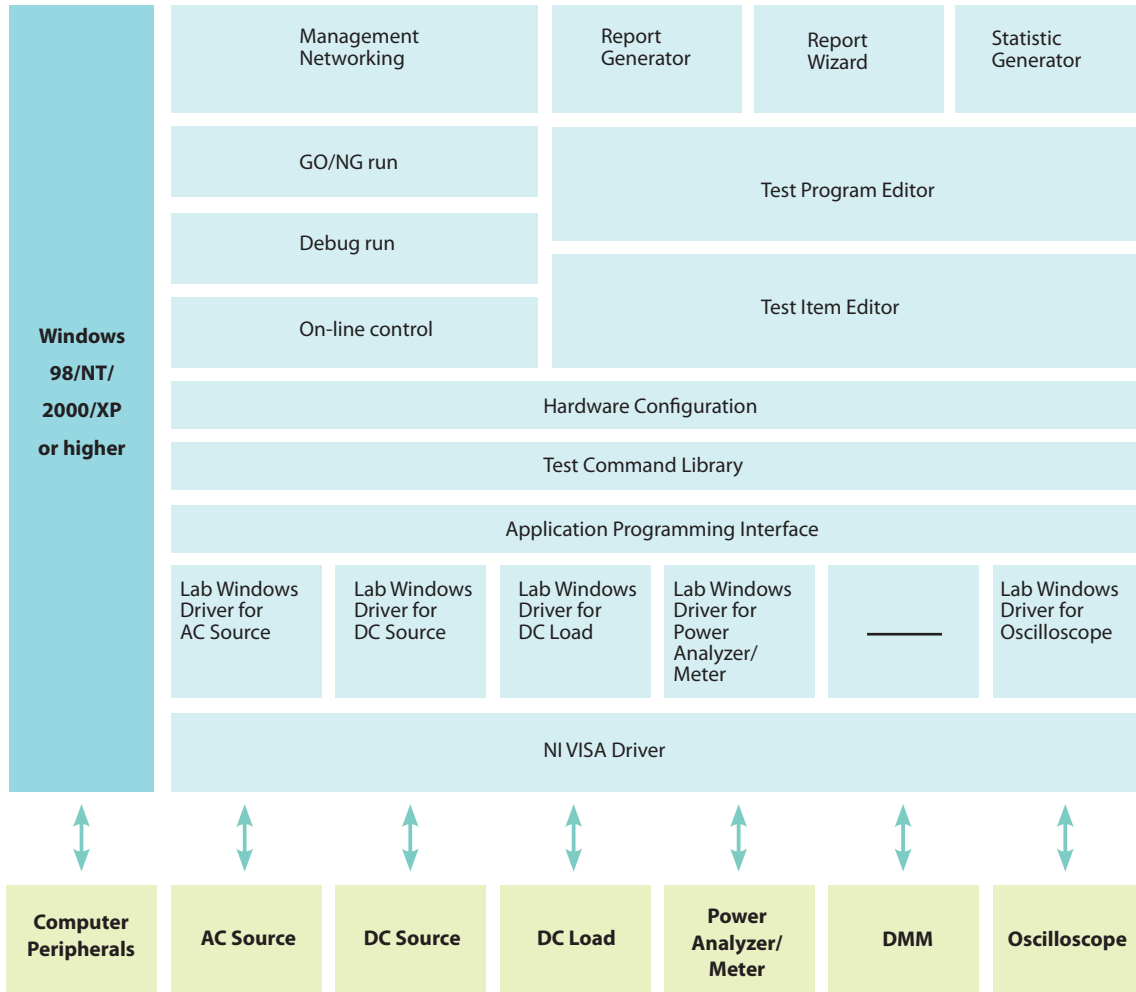
\*These test items need to be created by users by using test item editor due to the variety of the UUTs. And unlimited customized or user defined test items are allowed.



## New Millennium ATS Software Platform

The Model 8000 Test Systems include the industries most sophisticated power supply testing software platform, PowerPro III. PowerPro III provides users with an open software architecture suited for a wide range of applications and devices.

Power Pro III is a windows 98/NT/2000/XP or higher environment which provides necessary computer peripherals.



## Maximum flexibility and expendability

### NI VISA Driver

National Instrument VISA driver are used by PowerPro III to allow support to almost any instrument which uses VXI/PXI/GPIB/RS-232/RS-485 interface protocols. As a result, users do not have to concern about which interface is provided by individual instrument that may want to intergrate into system. By using these standard instrument drivers PowerPro III can incorporated almost any modern test device.

## Higher compatibility

### Application Programming Interface

When users want to change the equipment from one brand to the others, for traditional ATS design, users are prohibited to do that. The main problem is caused by the different format of the remote commands. Chroma PowerPro III provides a unique application programming interface which interprets the different remote commands of various instrument to a standard format. Thus, if the functions of two equipment are identical, even manufactured by two different suppliers, they still can be replaced directly by adding a new application programming interface driver in Chroma ATS software, PowerPro III.

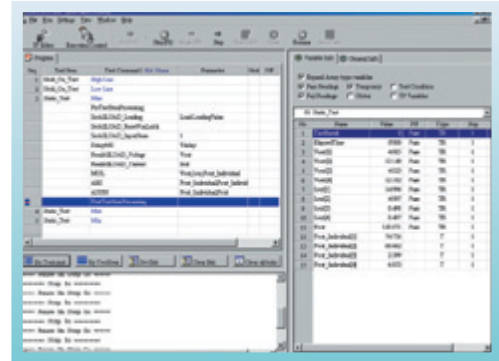


## Versatile and Powerful Execution Mode

Chroma PowerPro III software platform provides three execution modes. DEDUG RUN is used to verify the user-defined test items and test programs. For production line testing, GO/ NG RUN allows one key operation to perform Pass/ Fail test. And the On-LINE-CONTROL mode extends Chroma Power Supply Auto Test System model 8000 to control and monitor the hardware devices simultaneously. Thus, it is capable of simulating the manual test scenarios just like you did on the bench.

### Debug Run

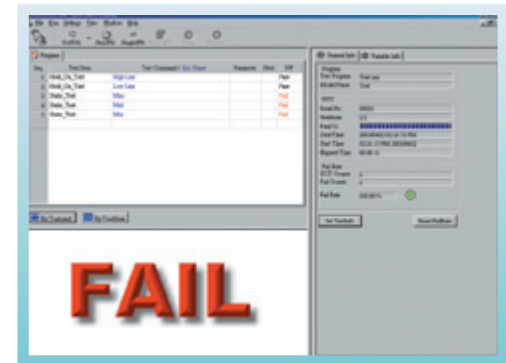
The debug run provides a versatile and immediate tool for users to verify the test items and test programs created before releasing them to operators. All the essential debugging tools are provided here, such as step run, set break point(s), run to break and simultaneous variables display. Users may use this to control the process of execution and at the mean time, monitor the test results and verify them. As a result, there's no risk for users to put an uncheck test item or test program onto production line.



The selected variables will be updated simultaneously when the test item or test program is under going.

### GO/ NG Run

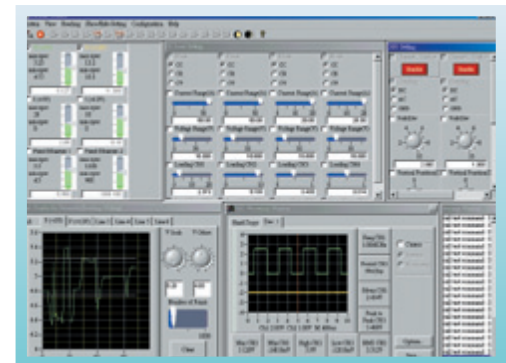
The GO/ NG run provides friendly and easy execution environment for production line and operators. All the test programs tested here need to be released in management function. This may minimize the risk of running a wrong or unchecked test program. The test results will be stored in hard drive of the system controller which may be used to create statistic and the test report. Plus the fail rate check, bar code scanner support, Pass/Fail indication TTL signal. All these powerful features make it an ideal tool for mass production testing.



Failure rate check function is available in GO/NG execution mode.

### On Line Control

The display tells it all. Users may achieve all the instrument on system to control them and get readings from them. The type of reading showing on display could be selected by user and user may even define specifications for them. Furthermore, user can also select them to show as a time graph in order to see the trends. And, the waveform measured by DSO can be merged onto the same display as well. The waveform can be downloaded as hard copy or digitizing waveform. Under digitizing mode. Users can select measurement parameters just like it provides in DSO. In a word, this execution mode is the implementation of virtual instrumentation.



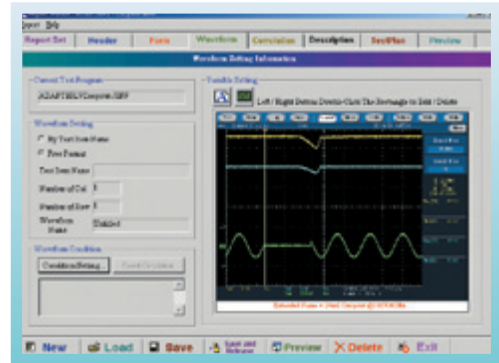
Users allow to create their own softpanel layout and store it for recall later.

# Comprehensive analyzing tools

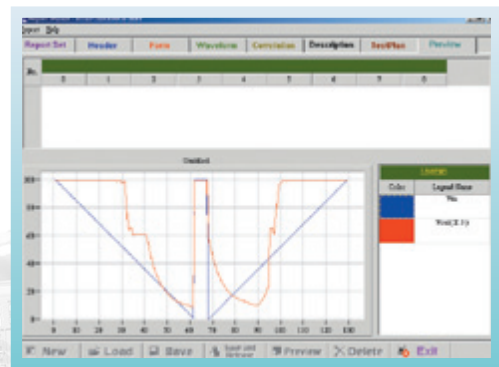
## Report Generator & Wizard

Documentation and offering a readable report has been the weakest part of the traditional auto test system. Users usually need to spend a lot of effort to modify the data stored by the auto test system to make it more recognizable to their customer. During the process, it has great chance to get an incorrect result due to typing error.

Now, Chroma PowerPro III, its outstanding report wizard and generator provide the total solution for any documentation requirement. From tabular test data, DSO waveform to correlation chart, it allows users to integrate different types of presentation in the same report. Users may also edit and store report format for next use, thus it saves a lot of precious time in creating test report. Meanwhile, to make the test report more portable, the output of the report wizard is already a standard M/S Word file.



Define parameters and waveform preview Report Wizard.



Preview the correlation chart in Report Wizard before converting it to M/S Word file.

**1 INPUT CHARACTERIZATION**

**1.1 EFFICIENCY / POWER FACTOR**

**Test condition:**  
The unit is set at different load conditions and values. Efficiency is computed and Power Factor

**Test Results:** (Pass sample#OTCA100)

The following data may be collected for all the Regulator version (sample#OTCA1)

Input (V)	Frequency (Hz)	I <sub>L</sub> (Amps)	P <sub>in</sub> (W)	P <sub>out</sub> (W)	Disipated Power (W)	Efficiency (%)	Power Factor
115	60	0.100	12.4	10.1	2.3	81.4%	0.99
230	60	0.200	45.6	37.3	8.3	81.8%	0.99

**Pass/Fail criteria:**  
The PSU shall survive over specified operating temperature test limits. A minimum Power ON/OFF only is allowed to ensure normal operations. AC power line cycle is NOT allowed to resume normal operations.

**Test Results:** (Pass sample#OTCA1)

**A. 100Vdc**  
Brownout/Recovery: Zinfandel, T<sub>a</sub> = 50°C, Date: 07-26-2002, P<sub>out</sub>=250W, 30min

Time (in sec.) PG shut down at: 165 V PG restart at: 169

**A. 200Vdc**  
Brownout/Recovery: Zinfandel, T<sub>a</sub> = 50°C, Date: 07-23-2002, P<sub>out</sub>=250W, 30min

Time (in sec.) PG shut down at: 76 V PG restart at: 77

**Efficiency Max Load 1:**

Input (V)	Frequency (Hz)	I <sub>L</sub> (Amps)	P <sub>in</sub> (W)	P <sub>out</sub> (W)	Disipated Power (W)	Efficiency (%)	Power Factor
115	60	0.100	12.4	10.1	2.3	81.4%	0.99
230	60	0.200	45.6	37.3	8.3	81.8%	0.99

**Efficiency Min Load:**

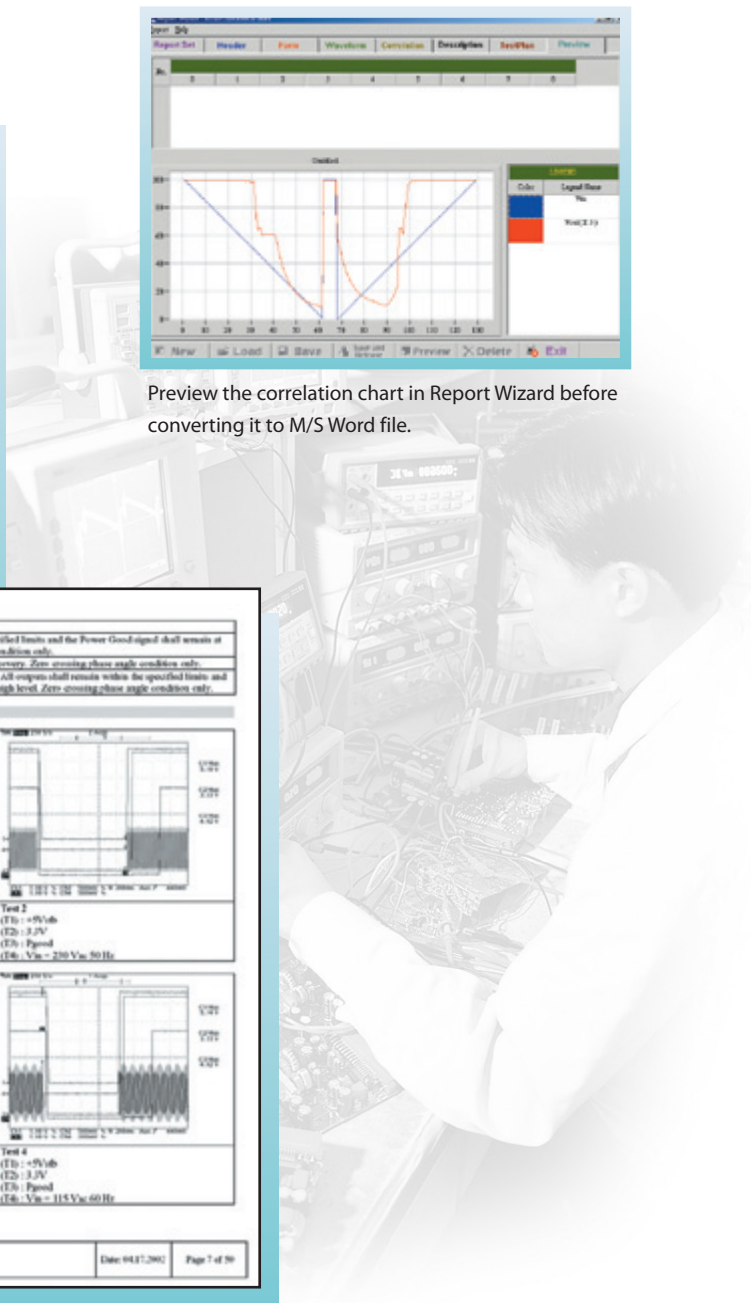
Input (V)	Frequency (Hz)	I <sub>L</sub> (Amps)	P <sub>in</sub> (W)	P <sub>out</sub> (W)	Disipated Power (W)	Efficiency (%)	Power Factor
115	60	0.010	1.24	1.01	0.23	81.4%	0.99
230	60	0.020	4.56	3.73	0.83	81.8%	0.99

**Test 1:**  
(T1): +5Vdb  
(T2): 3.3V  
(T3): Fixed  
(T4): V<sub>in</sub> = 230 Vdc, 60 Hz

**Test 2:**  
(T1): +5Vdb  
(T2): 3.3V  
(T3): Fixed  
(T4): V<sub>in</sub> = 230 Vdc, 60 Hz

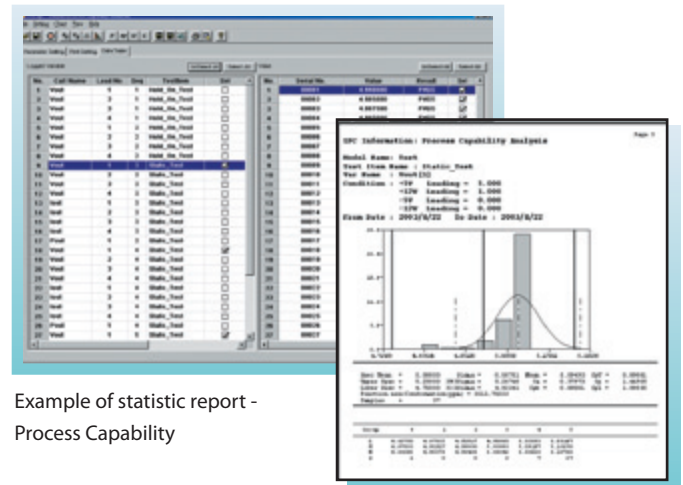
**Test 3:**  
(T1): +5Vdb  
(T2): 3.3V  
(T3): Fixed  
(T4): V<sub>in</sub> = 115 Vdc, 60 Hz

**Test 4:**  
(T1): +5Vdb  
(T2): 3.3V  
(T3): Fixed  
(T4): V<sub>in</sub> = 115 Vdc, 60 Hz



## Statistical Report

Chroma PowerPro III software provides off-the-shelf statistic report function. All the test conditions defined in the test program and the test readings can be stored and analyzed by statistic report function. In statistic report function, it provides process capability, Pareto, Xbar-R chart, Xbar-S chart, nP chart, P chart, U chart and C chart. Users may select test program, test date period and even include test data from remote computer via network connections. Then choose any one of the control chart to generate statistical report. The report may be printed out or stored in file. Or users may store the raw data as a text file directly which is able to be imported by Excel or similar word processor software package for further analysis.



Example of statistic report - Process Capability

## Complete System Administration

### MANAGEMENT FUNCTION

#### Management

Chroma Power Pro III provides a series of management functions for advance system control and management.

#### User Function

User function allows users to define authorized person list and their authorized level.

#### Activity log

Activity log records the historical log-in, log-out time and activated functions of the system users.

#### Release

Users are allowed to define the release flags of test programs and test items. These flags will be used to check if the test program can be executed by GO/ NG run. Or if the test item can be shown in user test item library.

#### Instrument

Instrument function is used to import and export H/ W instrument drivers.

#### Network

Network function provides interface for Power Pro III to communicate with external software package or system. For example, Shop-Floor or Product-Data-Management system. It is also used to define the source location of the test programs when users want to centralize them.

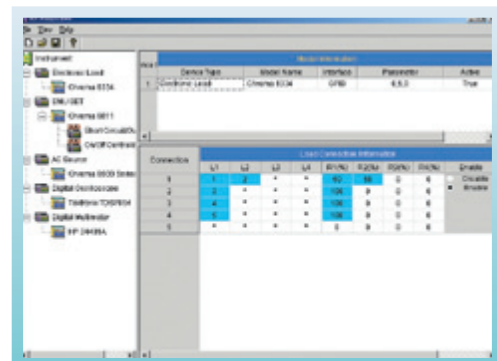
## Hardware Configuration

The hardware configuration function allows users to define the system configuration by selecting devices from the instrument list defined in the "Instrument" section of Management function.

## Shop-Floor Control System

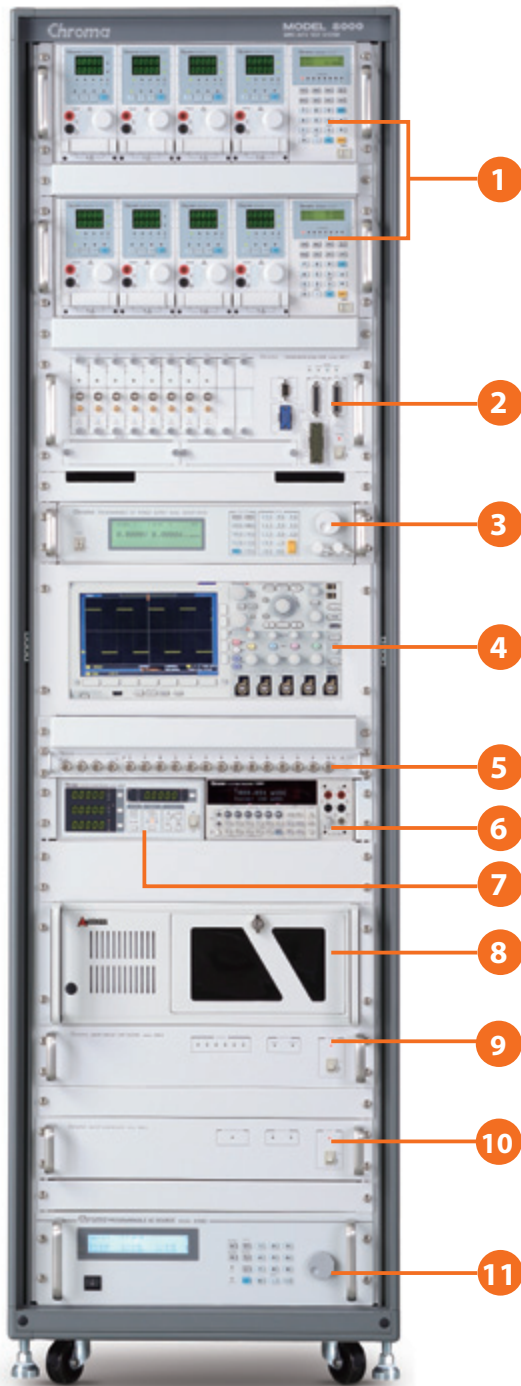
For modern mass production line, it is a big challenge to have the full control of the scenarios happened on production line. Therefore, Shop-Floor control system is widely used to improve fabrication process.

To satisfy customers' requirement, Chroma also provides customized Shop-Floor control system. For details, please contact your local representative of Chroma ATE INC.



Parallel setting for E-loads allow users to control multiple load channels as one.

## High Performance Hardware Devices



1. **Electronic Load** : Model 6310A / 6330A / 63200 / 63600 Series
2. **Timing / Noise Analyzer** : Model 6011 / 80611 / 80614
3. **DC Power Source** : Model 62000P / 62000H Series
4. **Digital Storage Oscilloscope** : TDS/DPO-3000, 5000, 7000 Series ; Other types or brands of DSO supported upon request
5. **Relay Multiplexer Box** : Model A800043
6. **Digital Multi-Meter** : Chroma 12061; Agilent - 34401A ; Other types or brand of DMM supported upon request
7. **Digital Power Meter** : Model 66200 Series
8. **System Controller** : Industrial PC
9. **Short Circuit / OVP Tester** : Model 6012 / 80612
10. **ON / OFF Controller** : Model 6013 / 80613
11. **AC Source** : Model 6400 / 6500 / 61500 / 61600 / 61700 / 61800 Series
12. **Breaker** : 30A / 60A selectable with emergency stop control
13. **EMI Filter** : 30A
14. **System Power Inlet** : 1Ø 3W / 30A, 60A selectable

\* Other devices supported upon request



## AC Power Source

Chroma power supply automatic test system model 8000 supports all Chroma Model 6400, 6500, 61500 ,61600 and 61700 / 61800 series AC power supplies. They provide stable and clean AC or DC (Model 61500/61600 series) output and power line disturbance simulation for advanced power supply input characteristic testing.



AC Power Source						
Model	6400 series	6500 series	61500 series	61600 series	61700 series	61800 series
Power rating	375-9000VA	1200-9000VA	500-18000VA	500-18000VA	1500-12000VA	45-60KVA
Voltage range	0-100V/600V	0-300V	0-300V	0-300V	0-300V	0-300V
Output phase	1 or 3 phase	1 or 3 phase	1 or 3 phase	1 or 3 phase	3 phase	3 phase
DC output	No	No	Yes	Yes	Yes	Yes
Output measurement	Yes	Yes	Yes	Yes	Yes	Yes
Harmonic measurement	No	No	Yes	No	No	Yes
Waveform simulation	No	Yes	Yes	No	Yes	Yes
Programmable impedance	No	No	Yes	No	No	No
Harmonic synthesis	No	Yes	Yes	No	Yes	Yes
Inter-harmonic synthesis	No	No	Yes	No	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

## DC Power Source

Chroma power supply automatic test system model 8000 supports all Chroma Model 62000P, 62000H series DC power sources which may be used as line-in or OVP sources.



DC Power Source		
Model	62000P series	62000H series
Power rating	600,1200,2400,5000W	10KW,15KW
Voltage range	0-100V/600V	0-600V/1000V
Programmable current limit	Yes	Yes
Programmable OV point	Yes	Yes
Analog programming	Yes	Yes
Remote sensing	Yes	Yes
Line-drop compensation	5V	10%/4%

\* Please refer to respective product catalogs for detail specifications.

## Digital Power Meter

Chroma power supply automatic test system model 8000 can also support all Chroma Model 66200 Series Digital Power Meter. They do not only provide traditional high precision power measurement, but also the voltage/current harmonics measurements defined in IEC and EN regulation.



Digital Power Meter				
Model	66201	66202	66203	66204
Measurement Channel	1	1	3	4
Power measurement range	12 ranges	24 ranges	48 ranges	48 ranges
Voltage measurement range	3 ranges	3 ranges	6 ranges	6 ranges
Current measurement range	4 ranges	8 ranges	8 ranges	8 ranges
Front panel display	Yes	Yes	Yes	Yes
Front panel editable	Yes	Yes	Yes	Yes
Harmonics measurement	No	Yes	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

## DC Electronic Load

Chroma power supply automatic test system model 8000 can support all Chroma Model 6310A, 6330A, 63200, 63600 series DC electronic load. They come with different powers, load modes, slew rates and features. This provides users maximum selection opportunities for different test application requirements.



DC Electronic Load				
Model	6310A series	6330A series	63200 series	63600 series
Load mode	CC/CR/CV	CC/CR/CV	CC/CR/CV/CP	CC/CR/CV/CP/CZ
Power rating	30-1200W	30-1200W	2000-12000W	100-400W
Voltage range	1-500V	1-500V	1-600V	1-600V
Current range	Up to 240A	Up to 240A	Up to 1000A	Up to 80A
Slew rate	Up to 10A/μs	Up to 10A/μs	Up to 41.6A/μs	Up to 8A/μs
Measurements	Voltage/Current/Power	Voltage/Current/Power	Voltage/Current/Power	Voltage/Current/Power
Monitoring output	No	No	Current	Voltage/Current
Current share measurement	No	No	No	No
Noise measurement	No	No	No	No
Voltage sense input	Yes	Yes	Yes	Yes
Sync dynamic	No	Yes	Yes	Yes

\* Please refer to respective product catalogs for detail specifications.

## Timing / Noise Analyzer

Chroma power supply automatic test system model 8000 provides an unique timing / noise analyzer, Chroma Model 6011/80611/80614. Its modular design allows users to expand up to 10 input measurement modules. Each module is capable of measuring timing period and noise level. Furthermore, it also provides 16 bits TTL signals and 8 pairs of floating relays for external control. Meanwhile, the 10 multiplexer inputs and 1DMM further extend the Chroma Model 80611 for advanced measurement requirements.

Timing/Noise Analyzer			
Model	6011	80611	80614
NO. of input module	Up to 10	Up to 10	Up to 4
Noise measurement range	2V/0.4V	2V/0.4V	2V/0.4V
Low Pass Filter	Up to 20MHz	Up to 20MHz	Up to 20MHz
Input circuit	Differential input	Differential input	Differential input
Timing range	0-64 second	0-64 second	0-64 second
NO. of trigger input	4 sets	6 sets	6 sets
NO. of comparator	2 Input module	4 Input module	4 Input module
Controllable TTL bits	16 output	16 output / 16 input	No
Controllable floating relay	6	8	6
NO. of multiplex input	10	10	No
NO. of multiplex output	2 for DMM &. 2 for DSO	1 for DMM	No



## Short Circuit / OVP Tester

Chroma Short circuit / OVP tester provides model 6012 and 80612 versatile tool for OVP/ UVP/ Short circuit. Its unique programmable impedance makes it ideal to simulate OV / UV situation for all types of power supplies.

Short Circuit/OVP Tester		
Model	6012	80612
NO. of input terminal	Up to 6	Up to 6
Short circuit impedance	< 0.1 ohm	< 0.05 ohm
Short current measurement	Yes	Yes
Sync. Signal for short circuit	6 relay signal	6 relay signal
OVP/UVP testing	Internal / External	Internal / External
Internal impedance range	1K-1M ohm	100-1M ohm
External OVP/UVP source	DC source	DC source
Measurement Capability	By external DMM	Internal
Control Interface	Via Chroma 6011	RS 485



## ON/ OFF Controller

Chroma ON / OFF controller Model 6013 and 80613 are used to control AC and DC inputs simultaneously. Meanwhile, it can control AC to turn on and off at any phase angle and measure the input inrush current of the UUT.

ON/OFF Controller		
Model	6013	80613
Input	AC/DC	AC/DC
ON/OFF range - AC	0-360 deg	0-360 deg
Voltage range - AC	250V	277V
Current range - AC	30A	30A
Voltage range - DC	200V	200V
Current range - DC	40A	60A
Measurement Capability	By external DMM	Internal
Control Interface	Via Chroma 6011	RS 485



## Digital Multi-Meter & Storage Oscilloscope

Chroma power supply auto test system model 8000 is capable to support Chroma12061, Agilent 34401A / 34970A and Keithley 2700 series DMM and most of Tektronix Scopes. Other DMM and DSO are supported upon request.

### SELECTION GUIDE

Model / Applications / Equipment	PC Power Supply	Server Power Supply	Adapter/Charger	Telecom Power Supply	DC-DC Converter	Industrial Power Supply
AC Source	61500, 61600, 6400, 6500	61500, 61600, 6400, 6500	61500, 61600, 6400	61500, 61600, 61700, 6400, 6500	-	61500, 61600, 6400, 6500
DC Source	62000H, 62000P	62000H, 62000P	62000H, 62000P	62000H, 62000P	62000H, 62000P	62000H, 62000P
Digital Power Meter	66200	66200	66200	66200	66200	66200
Electronic Load	63600, 6310A, 6330A	63600, 6310A, 63200, 6330A	63600, 6310A, 6330A	63600, 63200, 6330A	63600, 6310A, 63200, 6330A	63600, 6310A, 63200, 6330A
Timing Noise Analyzer	6011, 80611, 80614	6011, 80611, 80614	6011, 80611, 80614	6011, 80611, 80614	6011, 80611, 80614	6011, 80611, 80614
Short / OVP Tester	6012, 80612	6012, 80612	6012, 80612	6012, 80612	6012, 80612	6012, 80612
ON/OFF Controller	6013, 80613	6013, 80613	6013, 80613	6013, 80613	6013, 80613	6013, 80613
DSO	User Selectable	User Selectable	User Selectable	User Selectable	User Selectable	User Selectable
DMM	-	User Selectable	-	User Selectable	-	User Selectable
Other Instrument	-	-	-	Voice Band/RF Noise Meter	-	-
Other Interface Card	-	I <sup>2</sup> C	-	I <sup>2</sup> C/CAN BUSRS-485	-	I <sup>2</sup> C/CAN BUSRS-485

### ORDERING INFORMATION

**8000** : Switching Power Supply Auto Test System  
**6011/80611/80614** : Timing/Noise Analyzer  
**6011N/80611N** : Timing/Noise module  
**6012/80612** : Short Circuit/OVP Tester  
**6013/80613** : ON/OFF Controller  
**5004ATM** : System Controller  
**A800005** : PCI BUS GPIB Card (National Instrument)

**A800004** : 19" Rack for Model 8000  
**A800003** : 8000 software Package  
**A600011/A800027** : Test Fixture for Model 8000  
**DC Load Module**: Refer to 6310A, 63200, 6330A, 63600 Series  
**Digital Power Meter** : Refer to Model 66200 Series  
**AC Source** : Refer to Model 6400, 6500, 61500, 61600, 61700, 61800 Series  
**DC Source** : Refer to Model 62000H, 62000P Series

## APPLICATIONS

### DC to DC Converter Testing

**Software:** Special Design Test Items (Load Fault Power Dissipation Test, Switching Frequency Test, Synchronization Frequency Test)

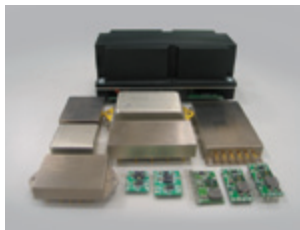
**Hardware:** Create Standard Test Fixture platform (Receiver)



DC to DC Converter ATS



DC to DC Converter Test Fixture



DC to DC Converter

### PV Inverter Test Solution

#### PV Inverter Testing

The Chroma 8000 ATS is equipped with optimized standard test items for PV inverters (the Unit Under Test), It meets IEEE1547, 1547.1, UL1741, GB/T 19939, CGC/GF004 preliminary test requirements. The user is only required to define the test conditions and specifications for the standard test items to perform the test.



PV Inverter ATS

### Electric Vehicle Test Solution

#### EVSE Testing

It is a customized system based on Chroma 8000 ATS specializing in verification of EV Supply Equipment (EVSE) and complying with SAE-J1772 in programming the test items for operation.



EVSE ATS

#### EV OBC & DC-DC Converter Testing

For EV On-Board Charger and DC-DC Converter of different UUT characteristics, integrated connecting panel and exclusive test items including basic electrical characteristics and communication protocol test items are provided to shorten the test time greatly.



OBC/DC-DC Converter ATS

Developed and Manufactured by :

#### CHROMA ATE INC.

**HEADQUARTERS**  
66 Hwaya 1st Rd., Kueishan  
Hwaya Technology Park,  
Taoyuan County 33383,  
Taiwan  
Tel: +886-3-327-9999  
Fax: +886-3-327-8898  
<http://www.chromaate.com>  
E-mail: [info@chromaate.com](mailto:info@chromaate.com)

**CHINA**  
**CHROMA ELECTRONICS**  
**(SHENZHEN) CO., LTD.**  
8F, No.4, Nanyou Tian An  
Industrial Estate, Shenzhen,  
China PC: 518052  
Tel: +86-755-2664-4598  
Fax: +86-755-2641-9620

**JAPAN**  
**CHROMA JAPAN CORP.**  
472 Nippa-cho, Kouhoku-ku,  
Yokohama-shi, Kanagawa,  
223-0057 Japan  
Tel: +81-45-542-1118  
Fax: +81-45-542-1080  
<http://www.chroma.co.jp>  
E-mail: [info@chromaate.com](mailto:info@chromaate.com)

**U.S.A.**  
**CHROMA SYSTEMS**  
**SOLUTIONS, INC.**  
19772 Pauling,  
Foothill Ranch, CA 92610  
Tel: +1-949-600-6400  
Fax: +1-949-600-6401  
<http://www.chromausa.com>  
E-mail: [sales@chromausa.com](mailto:sales@chromausa.com)

**EUROPE**  
**CHROMA ATE EUROPE B.V.**  
Morsestraat 32, 6716 AH Ede,  
The Netherlands  
Tel: +31-318-648282  
Fax: +31-318-648288  
<http://www.chroma.eu.com>  
E-mail: [sales@chromaeu.com](mailto:sales@chromaeu.com)

Worldwide Distribution and  
Service Network