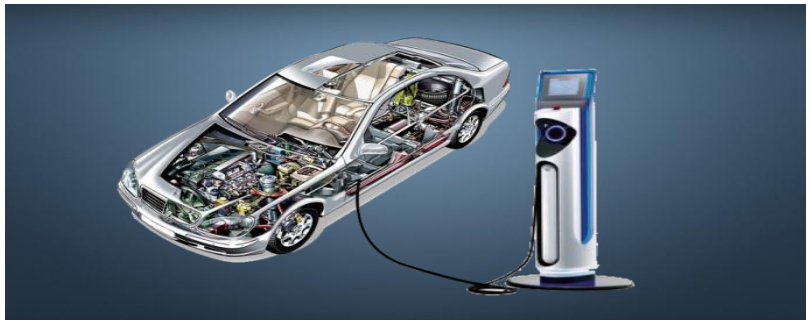
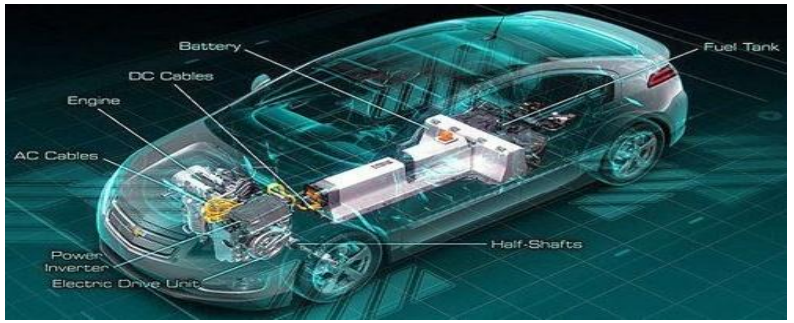
ITECH solutions for Automotive electronics

ITECH test solutions

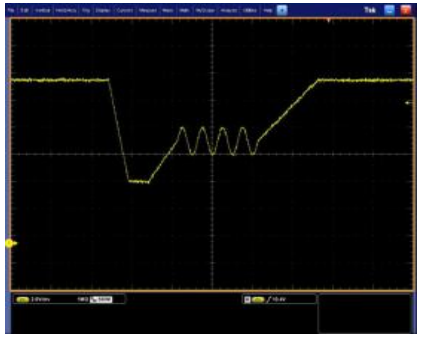


On-board charger/ external charger testing



EV Battery test

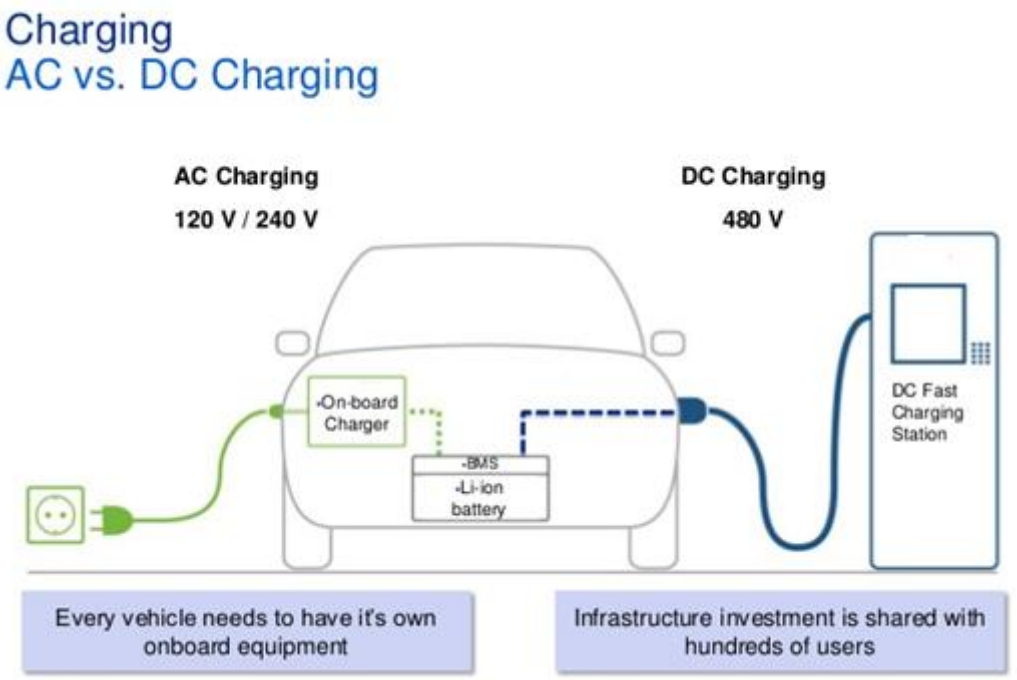
Automotive junction box test



Supply Voltage test

On-board charger/ external charger testing

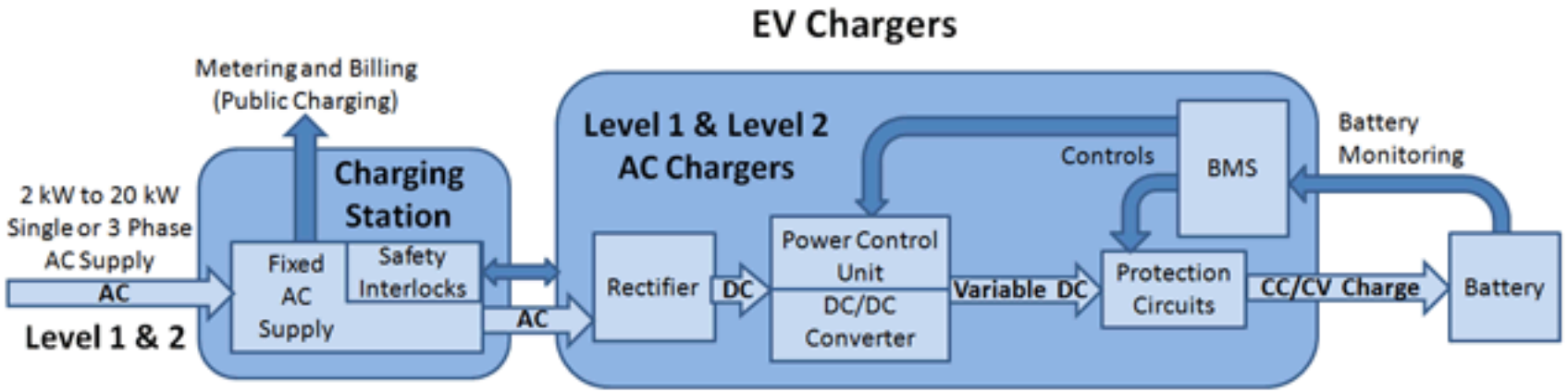
When charging electric vehicles, on board chargers work to transform AC power into DC power in order to recharge the electric vehicle's battery pack.
ITECH test system is suitable for low power charger testing, in Level 1 and level 2, applications the power conditioning which includes the AC to DC conversion, the power control unit which delivers a variable DC voltage to the battery, and various filtering functions are all carried out within the charger and can be implemented at a relatively low cost.



On-board charger/ external charger testing---- classification of low power charger

Level 1 refers to Single Phase Alternating Current (AC) using grounded receptacles as used in domestic applications. In North America this typically means 16 Amps at 120 Volts delivering 1.9 kW of power. In Europe it may be 13 or 16 Amps at 240 Volts delivering 3 kW of power. The EV may incorporate a standard domestic power cord to connect the vehicle to a domestic socket outlet or a Level 1 charging station.

Level 2 delivers up to 20 kW of power from either Single or Three Phase Alternating Current (AC) sources of 208-240V at up to 80Amps. In North America, the J1772 standard has been defined by the Society of Automotive Engineers - SAE to cover the connector and charging cable used in Level II applications. These cables are permanently fixed to the Level II charging station rather than the vehicle with the male connector being mounted in the vehicle itself. The connector is also commonly called a "coupler". Individuals can install a level 2 charging station at home, while businesses and local government can also provide level 2 charging for a fee or free if they wish.



On-board charger/ external charger testing----ITS9500 ATE

ITS9500 power supply auto test system

- Module design for easy to maintain
- highly cost effective
- Over 40 test items, high accuracy
- support testing multiple power supplies simultaneously
- test program management/editing function
- export test report, self-edit report template

On-board charger/ external charger testing-----Features of ITS9500 test system

ITECH on-board charger/charging pile test system

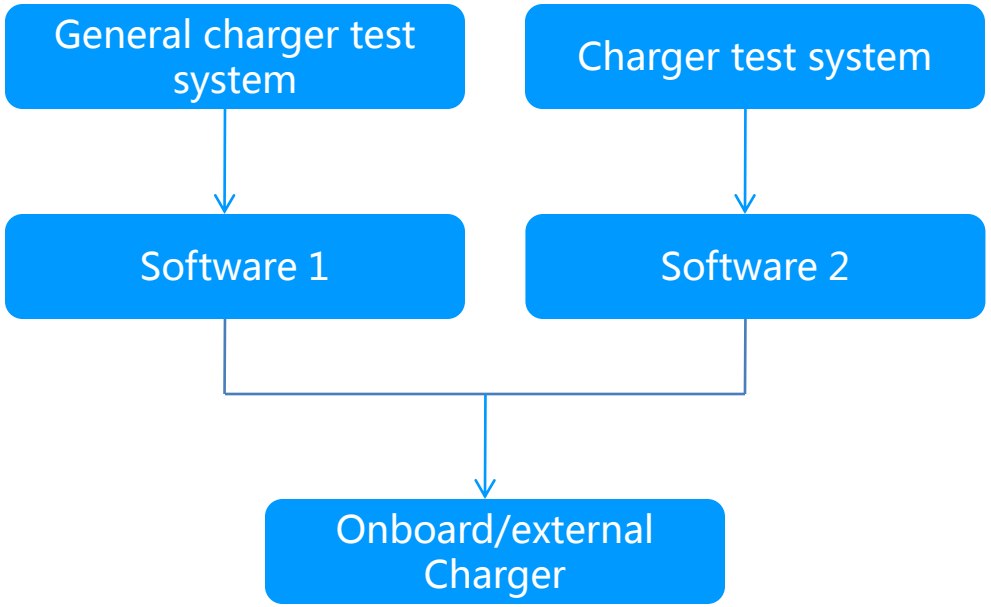
1	2	3	4
ITECH Software can not only control and monitor the testing system, but also on-board charger.	The system is suitable to test on-board charger, DC-DC converter, EV Charge Couplers, etc.	The system is flexible and can be customized to meet different standards in different countries.	Complete test items and cost effective.

On-board charger/ external charger testing-----software feature

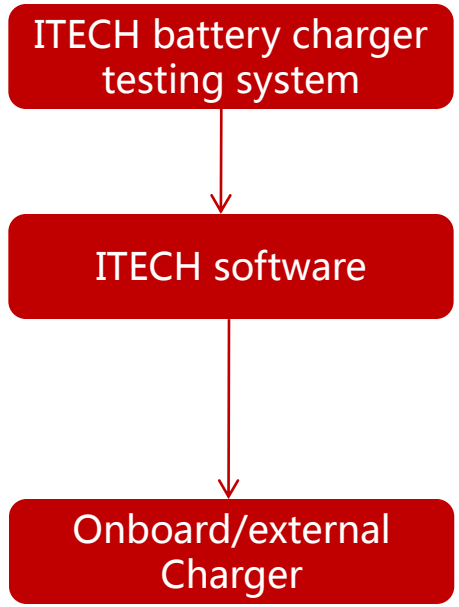
ITECH Software can not only control and monitor the testing system, but also on-board charger.

ITECH has simpler structure

General test solution



ITECH test solution

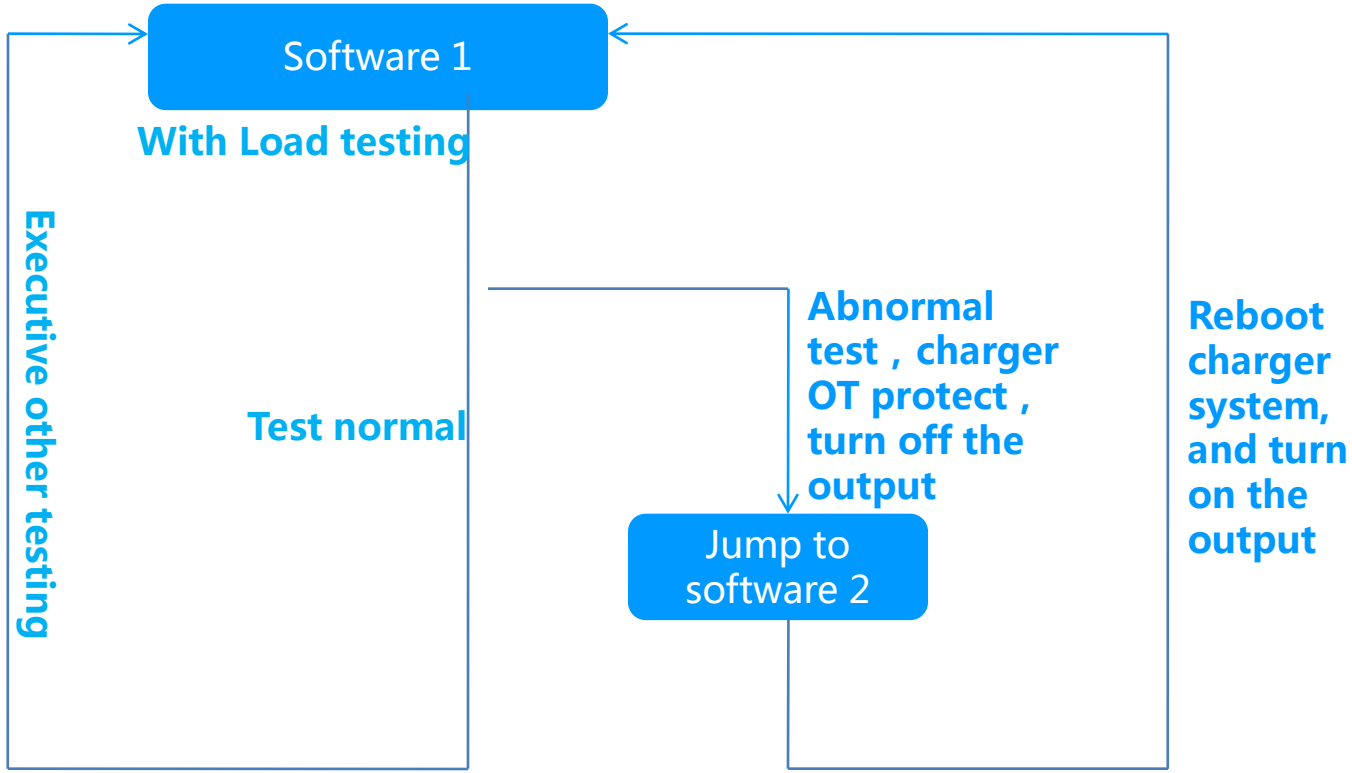


On-board charger/ external charger testing----software control steps

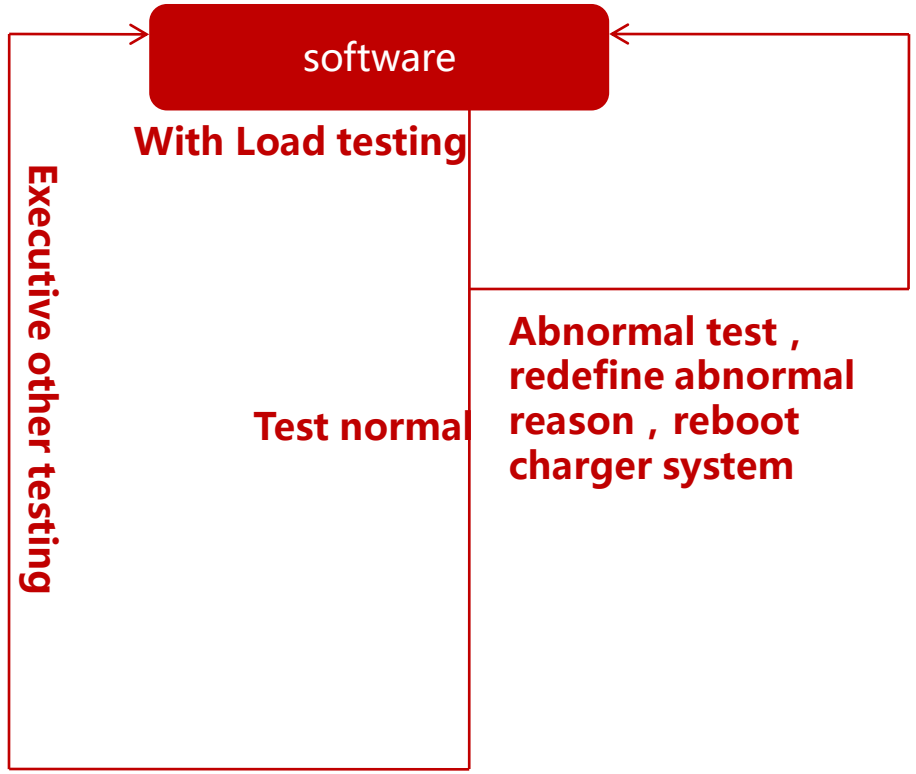
ITECH Software can not only control and monitor the testing system, but also on-board charger.

ITECH test steps are simpler

General test steps



ITECH test steps



On-board charger/ external charger testing----typical test items

ITECH on-board charger/charging pile test system

Typical Input test items

- Input power test
- PF test
- Efficiency test
- peak current test
- Inrush Current test
- power effect test
- power regulation test
- input voltage test
- input frequency test
- input disturbance test

Typical output test items

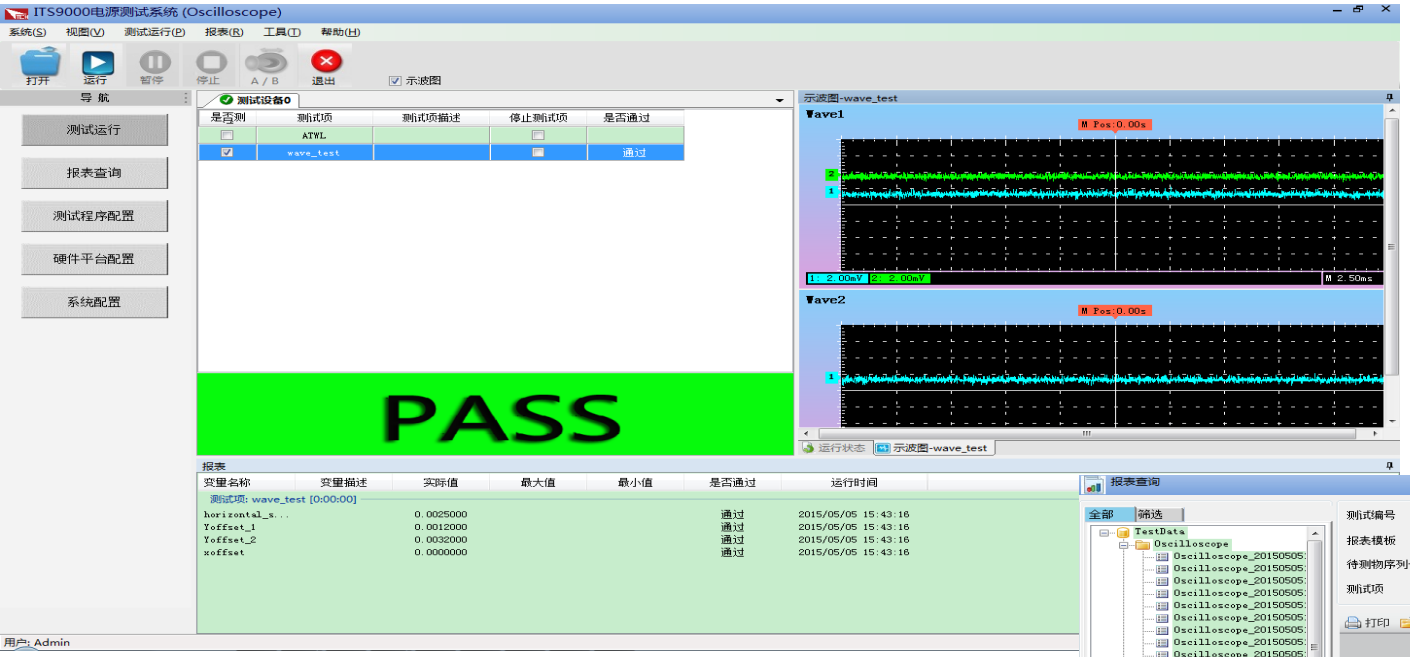
- output voltage/current/power test
- short circuit test
- ripple/noise index test
- OVP, UVP, OPP test and relevant time test
- output response time test
- voltage up/down time test
- load regulation test
- power off test
- turn on/off time test

On-board charger/ external charger testing-----software

Perfect management and supervision on charging station

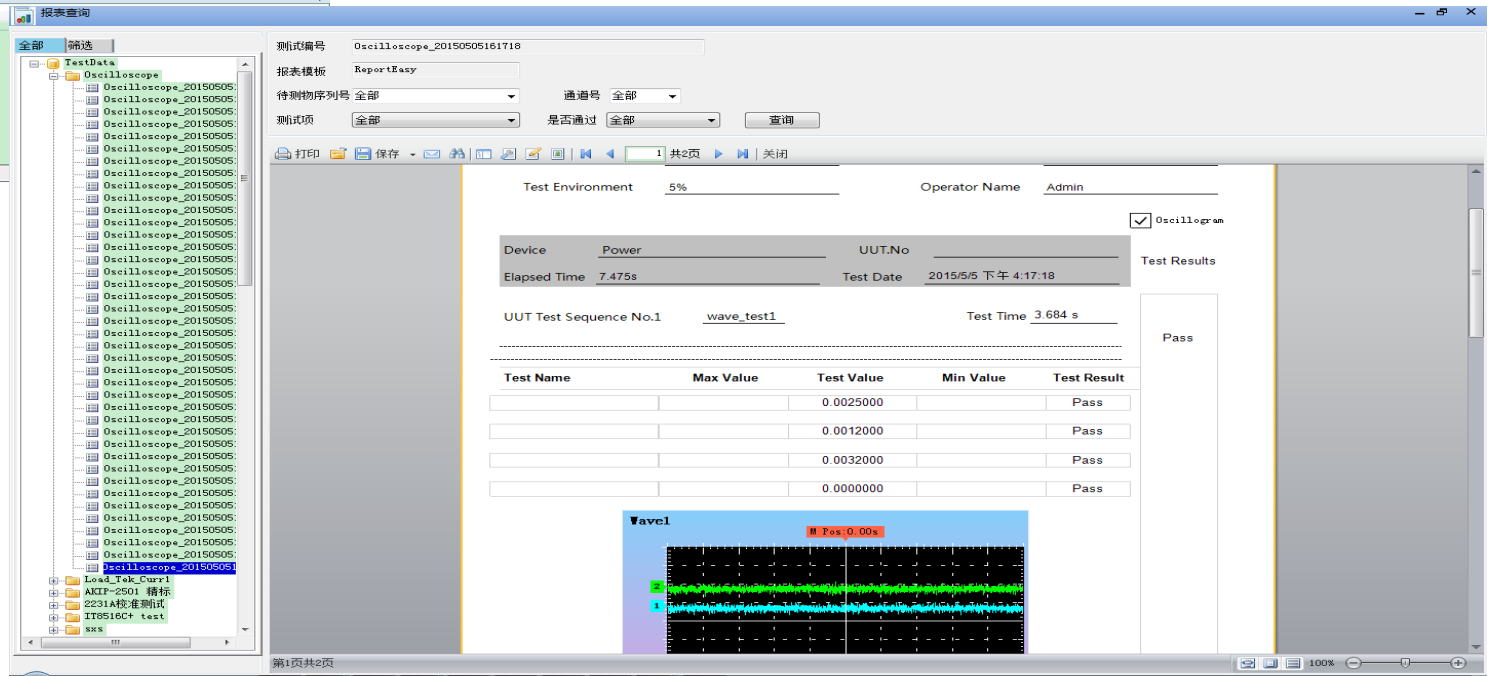
On-board charger/ external charger testing-----software

clear supervision interface



Running Result

Data report



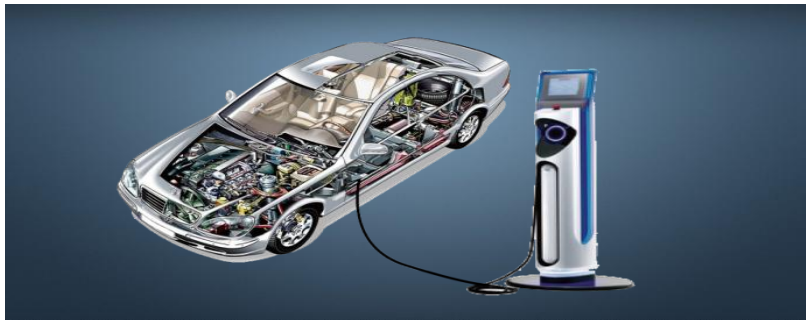
On-board charger/ external charger testing----star products: IT8800

ITECH IT8800 Fast Response High Accuracy
Programmable DC Electronic Loads

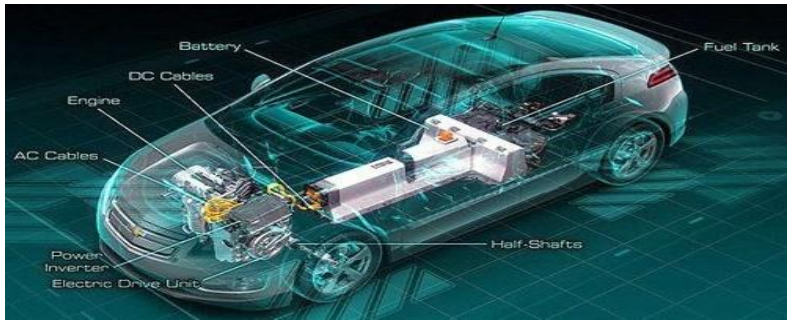
- 150-55KW/120-800V/15-1100A(Maximum power of single device 600KW)
- Testing speed of voltage and current 50KHz
- High resolution 0.1mV/0.01mA
- Dynamic test frequency can reach up to 25KHz
- CV/CC/CR/CW modes
- Adjustable current rising speed 0.0001A/us~2.5A/us
- OCP/OPP testing function
- Power-off memory function
- Built-in RS232/USB/GPIB interfaces

Brand		ITECH		CHROMA		ITECH		Chroma	
Model		IT8831B		63210		IT8831H		63211	
Rated value	Voltage	0~500V		0~600V		0~800V		10~1000V	
	Current	0~30A	0~300A	0~15A	0~150A	0~15A	0~150A	0~30A	0~150A
	Power	15000 W		1450W	14500W	15000 W		1560W	15600W
CV Mode	Range	0~50V	0~500V	0~150V	0~600V	0~80V	0~800V	0~250V	0~1000V
	Resolution	1mV	10mV	40mV	162mV	1mV	10mV	62.5mV	250mV
	Accuracy	0.025%+0.05%FS		0.05%+0.1%FS		0.05%+0.05%FS		0.05%+0.1%FS	
CC Mode	Range	0~30A	0~300A	0~15A	0~150A	0~15A	0~150A	0~30A	0~150A
	Resolution	1mA	10mA	4.9mA	39mA	1mA	10mA	7.5mA	37.5mA
	Accuracy	±(0.05%+0.05%FS)		0.1%+0.1%FS)	0.2%+0.1%FS	±(0.05%+0.05%FS)		0.1%+0.1%FS)	0.2%+0.1%FS
Readback Voltage	Range	0~50V	0~500V	0~150V	0~600V	0~80V	0~800V	0~250V	0~1000V
	Resolution	1mV	10mV	5.1mV	21mV	1mV	10mV	5mV	20mV
	Accuracy	±(0.025%+0.025%FS)		0.05%+0.05%FS		±(0.025%+0.025%FS)		0.05%+0.05%FS	
Readback Current	Range	0~30A	0~300A	0~15A	0~150A	0~15A	0~150A	0~30A	0~150A
	Resolution	1mA	10mA	0.64mA	5.1mA	1mA	10mA	0.6mA	3mA
	Accuracy	±(0.05%+0.05%FS)		0.1%+0.1%FS		0.05%+0.05%FS		0.1%+0.1%FS	
Readback power	Range	15KW		1450W	14500W	15KW		1560W	15600W
	Resolution	1W				1W			
	Accuracy	±(0.2%+0.2%FS)		0.3%+0.3%FS		±(0.2%+0.2%FS)		0.3%+0.3%FS	
Interface		GPIB,USB,RS232		GPIB,RS232		GPIB,USB,RS232		GPIB,RS232	
ITECH unique features		Dynamic frequency 25kHz		Dynamic frequency 20kHz		Dynamic frequency 25kHz		Dynamic frequency 20kHz	
		OCP/OPP tests		×		OCP/OPP tests		×	
		power-off memory		×		power-off memory		×	
		VFD display		LCD/LED display		VFD display		LCD/LED display	

ITECH test solutions

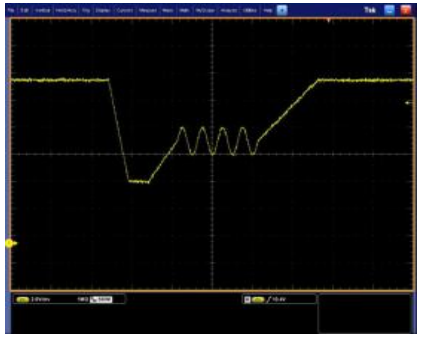


On-board charger/ charging pile testing



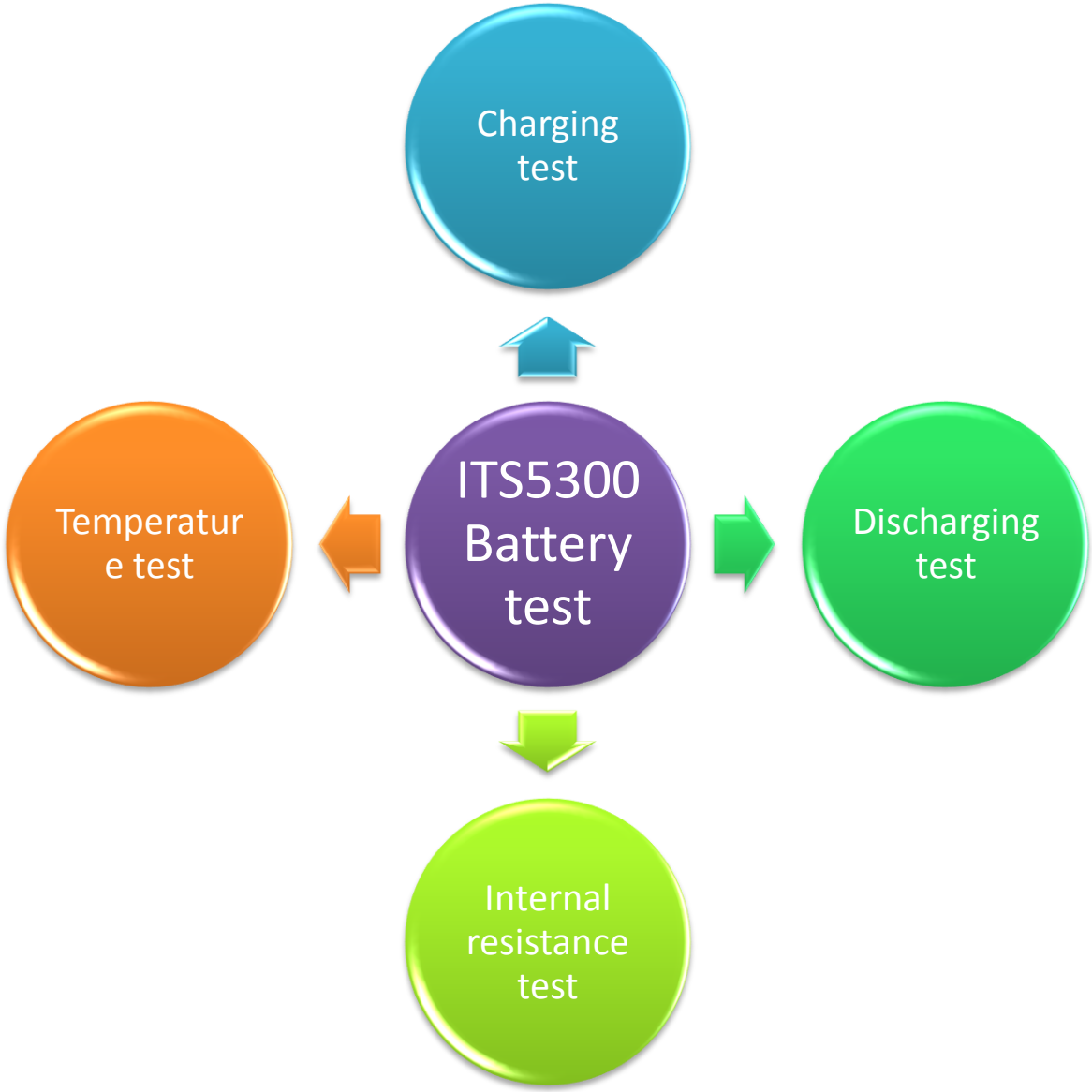
EV Battery test

Automotive junction box test



Supply Voltage test

EV battery testing



Applications:

- Battery types: All kinds of EV batteries (lead-acid, nickel hydrogen, lithium batteries, super capacitors, hydrogen fuel cells, etc.)
- Test Quantity: Hundreds of battery packs or 200 of hundred single cell performance simultaneously test.
- Test items: charge and discharge test, life cycle test, capacity test, quality inspection.

Benefits: Improves the efficiency and productivity of production line.

EV battery testing

ITS5000 Software

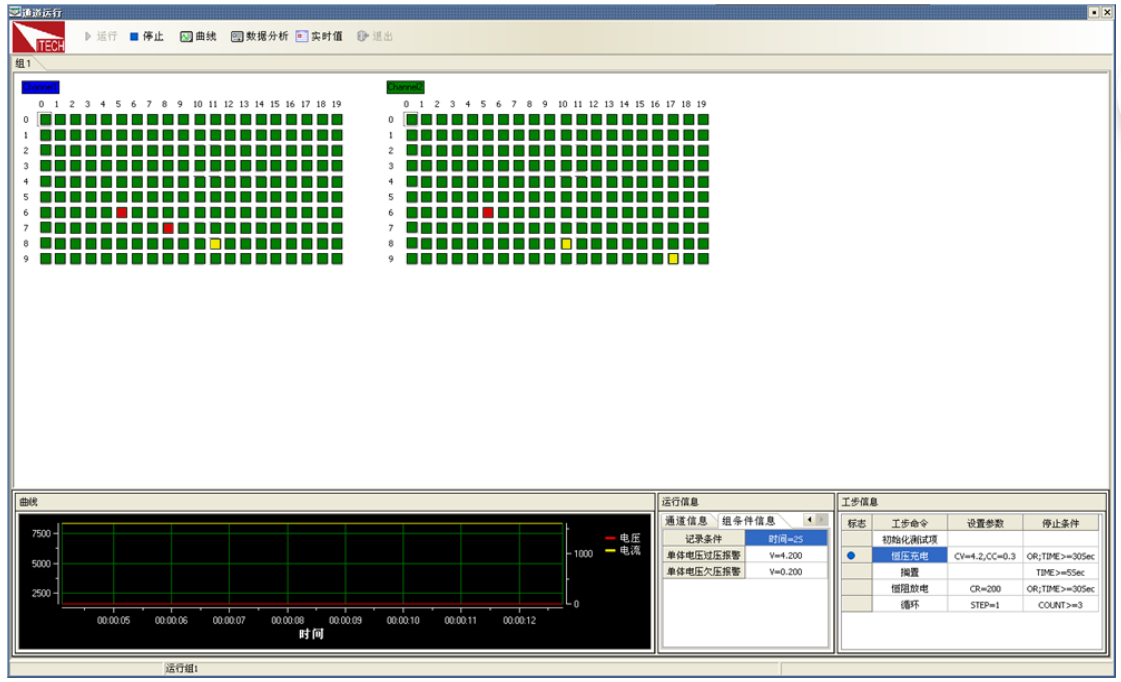
ITS5300 ATE hardware structure

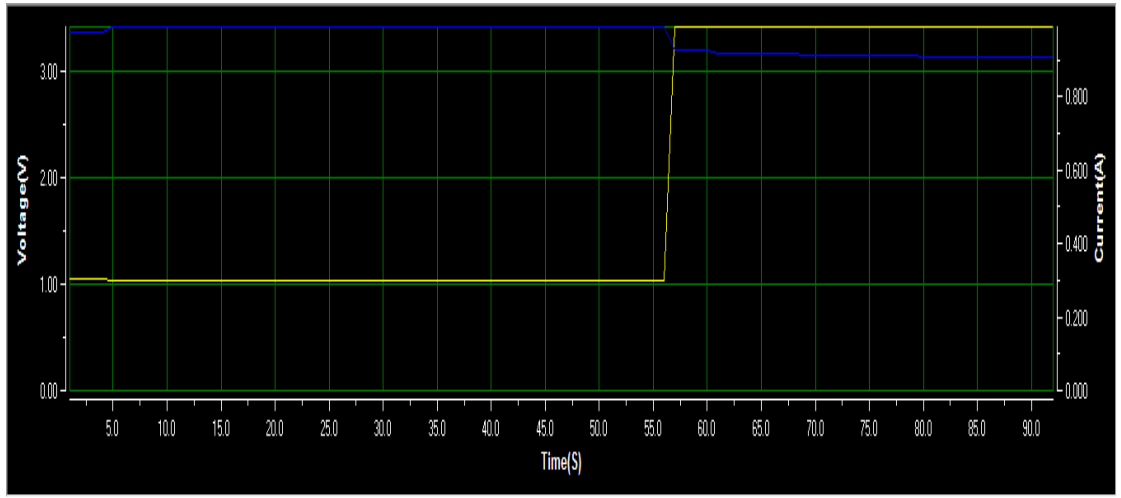
✓One software can test 6 sets of battery system simultaneously;

✓One set of battery system can test hundreds of battery pack simultaneously;

✓One battery pack share one set of power supply and e-load and can include 200 hundreds of battery cells connected in series.

EV battery test——ITS5300 ATE



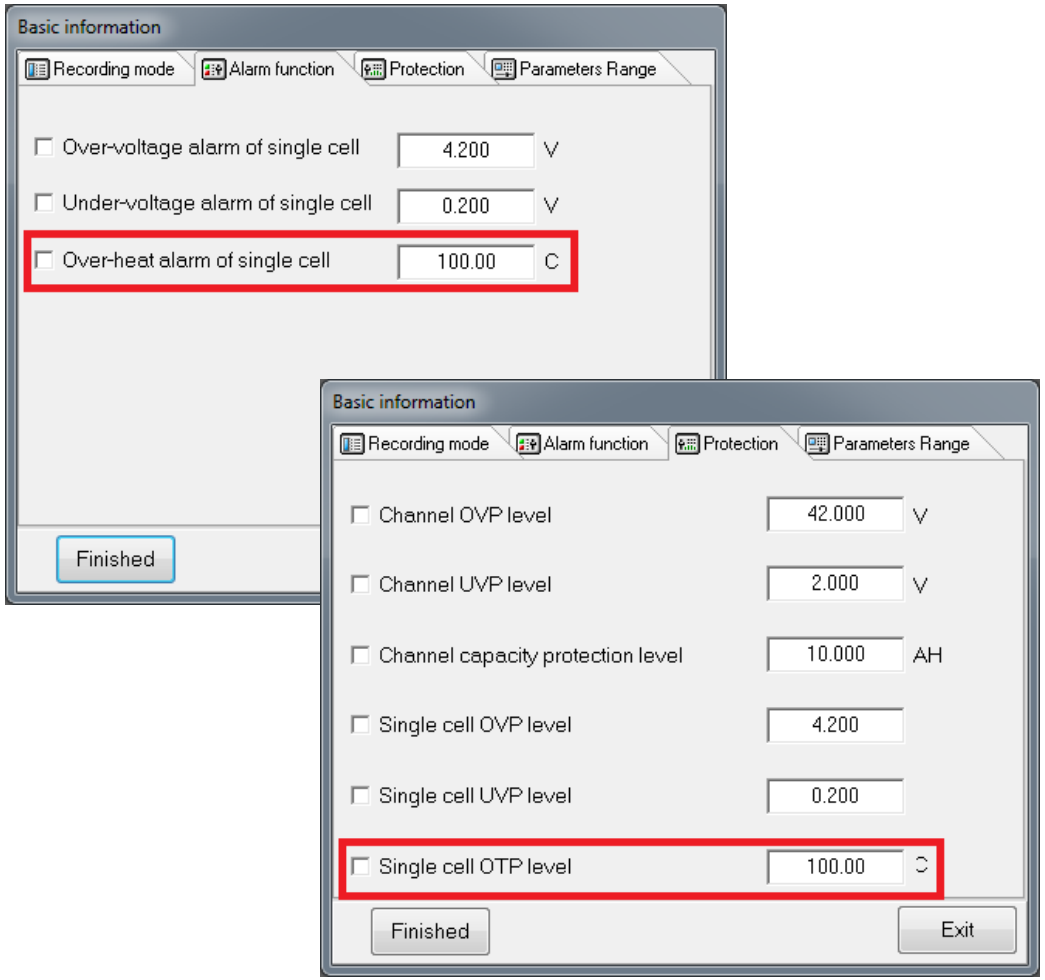


ITS5000 software

- Can monitor voltage, current, resistance, temperature and energy of each battery cell and channel.
- Charge mode :CV/CC,
  Discharge mode:CC/CW/CR
  Pulse charge and discharge function
- Optional discharge cut-off condition
- V/I current sampling rate :50KHz
- Power-off memory function
- Alarm protection
- Testing curve and data can be saved to Excel.

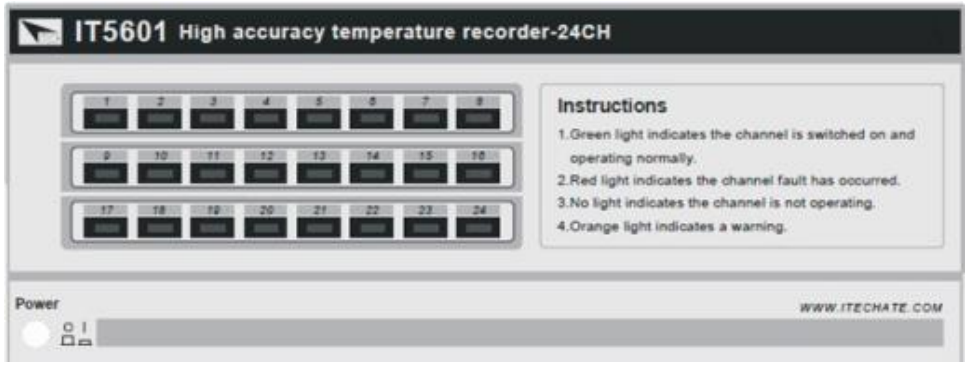
	A	B	C	D	E	F	G	H	I	J	K	L
1	Step Numb	Step comm	Voltage(V)	Current(A)	Capacity(A	Energy(Wh	Resistance(	Temperatur	Running tim	Cycle Cour	Save Time	Cell name
2	2	CC chargin	3.3554	0.3025	0.0001	0.0005	0.0764	1695.573	0:00:02	1	2016-05-2	BT1
3	2	CC chargin	3.3554	0.3018	0.0002	0.0005	0.0844	1693.694	0:00:02	1	2016-05-2	BT2
4	2	CC chargin	3.3554	0.3018	0.0002	0.0005	0.0783	1691.75	0:00:02	1	2016-05-2	BT3
5	2	CC chargin	3.3554	0.3018	0.0002	0.0005	0.0843	1695.277	0:00:02	1	2016-05-2	BT4
6	2	CC chargin	3.4069	0.301	0.0003	0.0011	0.0765	1695.606	0:00:04	1	2016-05-2	BT1
7	2	CC chargin	3.4069	0.3008	0.0004	0.0011	0.0843	1693.76	0:00:04	1	2016-05-2	BT2
8	2	CC chargin	3.4069	0.3008	0.0004	0.0011	0.0783	1691.717	0:00:04	1	2016-05-2	BT3
9	2	CC chargin	3.4069	0.3008	0.0004	0.0011	0.0842	1695.31	0:00:04	1	2016-05-2	BT4
10	2	CC chargin	3.4078	0.3005	0.0005	0.0017	0.0765	1695.573	0:00:06	1	2016-05-2	BT1
11	2	CC chargin	3.4078	0.3004	0.0005	0.0017	0.0843	1693.76	0:00:06	1	2016-05-2	BT2
12	2	CC chargin	3.4078	0.3004	0.0005	0.0017	0.0782	1691.783	0:00:06	1	2016-05-2	BT3
13	2	CC chargin	3.4078	0.3004	0.0005	0.0017	0.0842	1695.343	0:00:06	1	2016-05-2	BT4
14	2	CC chargin	3.4086	0.3003	0.0007	0.0023	0.0765	1695.54	0:00:08	1	2016-05-2	BT1
15	2	CC chargin	3.4086	0.3003	0.0007	0.0023	0.0843	1693.76	0:00:08	1	2016-05-2	BT2

EV battery test——Temperature testing

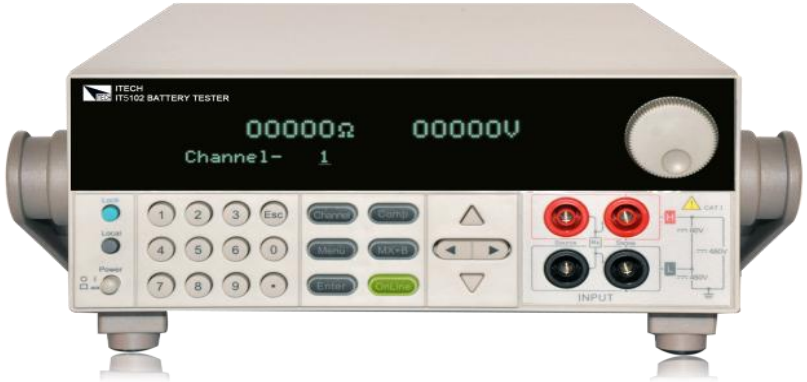


IT5601/E multi-channel IR tester

- IT5601 has 8-channel, 16-channel or 24-channel of temperature testing.
- ITS5000 Software can monitor the temperature status and record the waveform of each battery cell.
- Support all kinds of standard thermocouple： T, K, B, E, J, N, S, R, C.

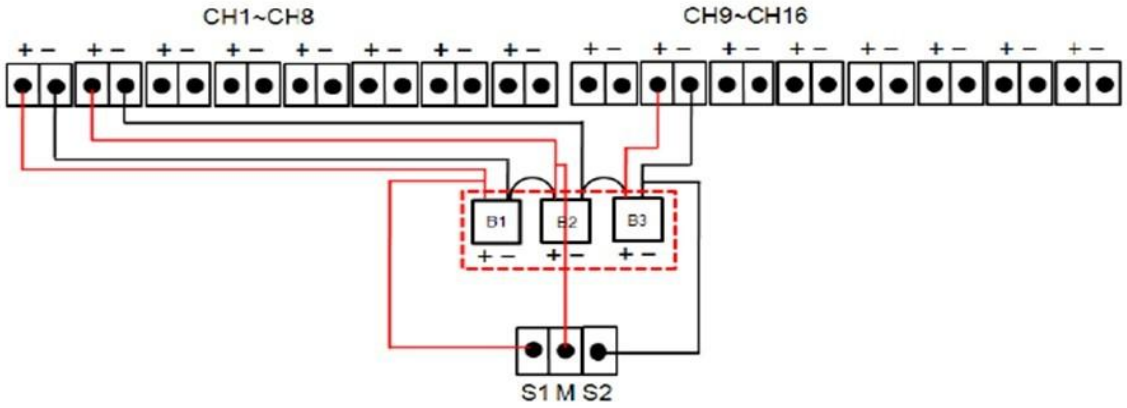


EV battery test——Internal resistance (IR) testing

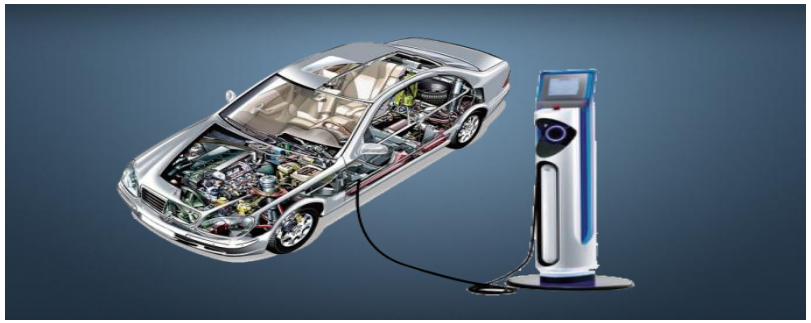


IT5102/E multi-channel IR tester

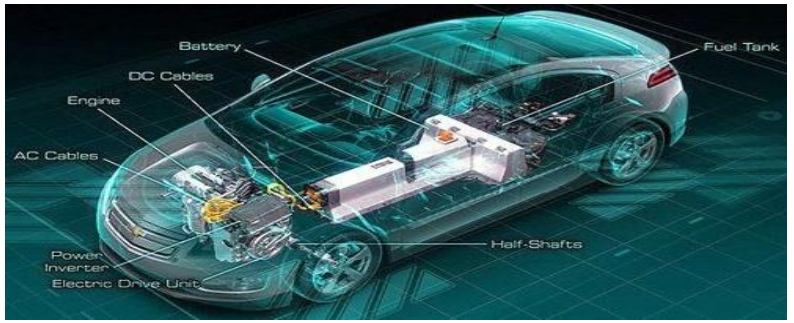
- Resolution of voltage and resistance is 0.1mV、0.1mΩ
- Single unit has 8-channel or 16-channel of voltage sensor
- Master-slave paralleling 17 units at most
- Support test working batteries (support on-line test)
- 500Hz or 1KHz AC testing
- Kelvin Resistance measurement
- Built-in LAN、RS232、RS485 interfaces
- support ITS5000 software



ITECH test solutions

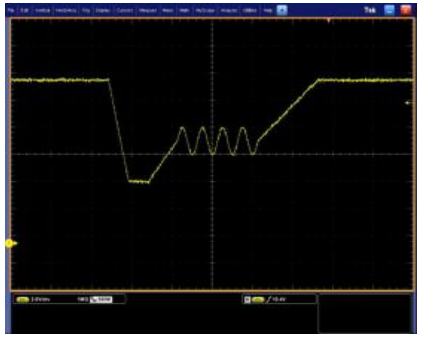


On-board charger/ charging pile testing



EV Battery test

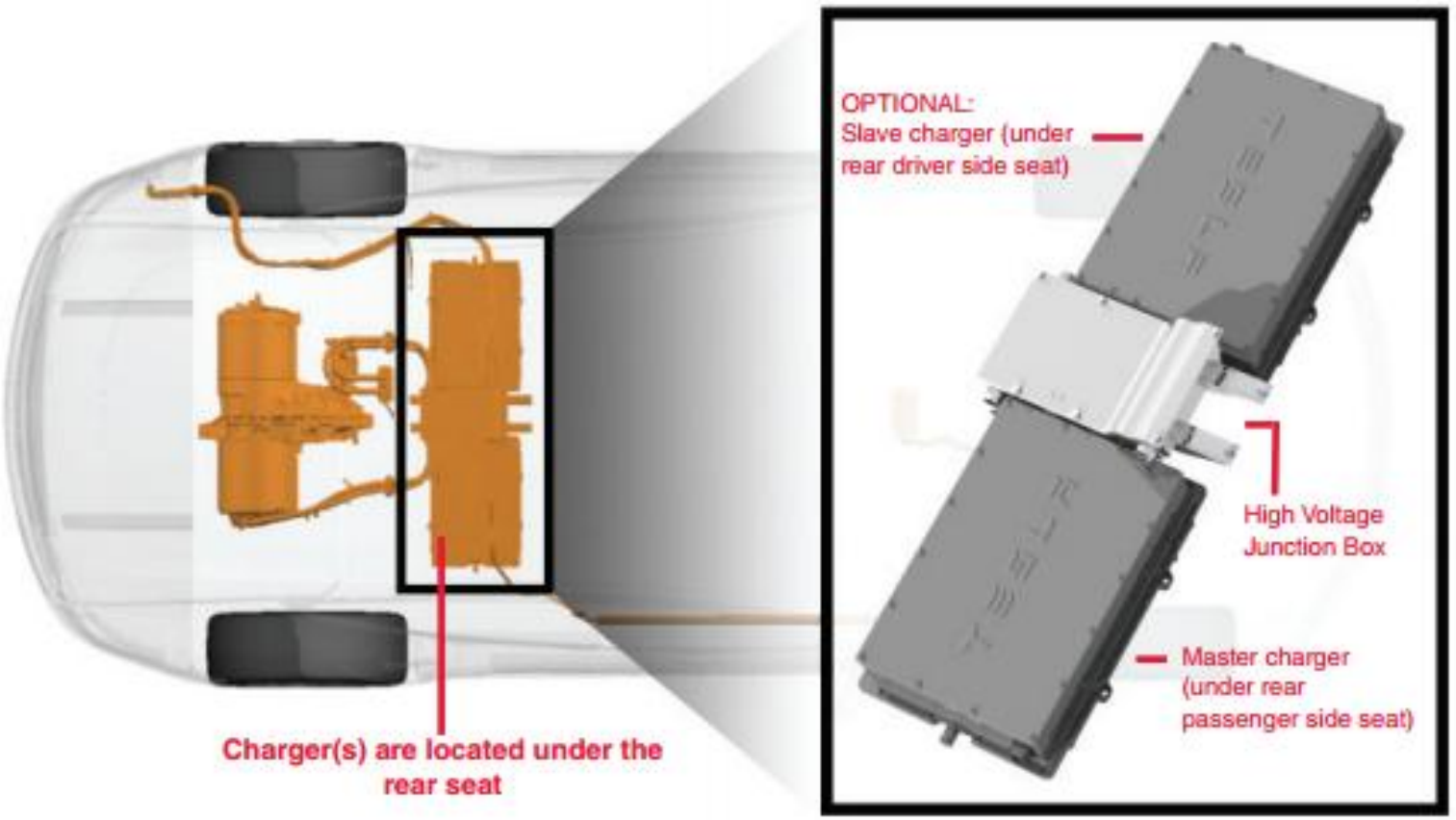
Automotive junction box test

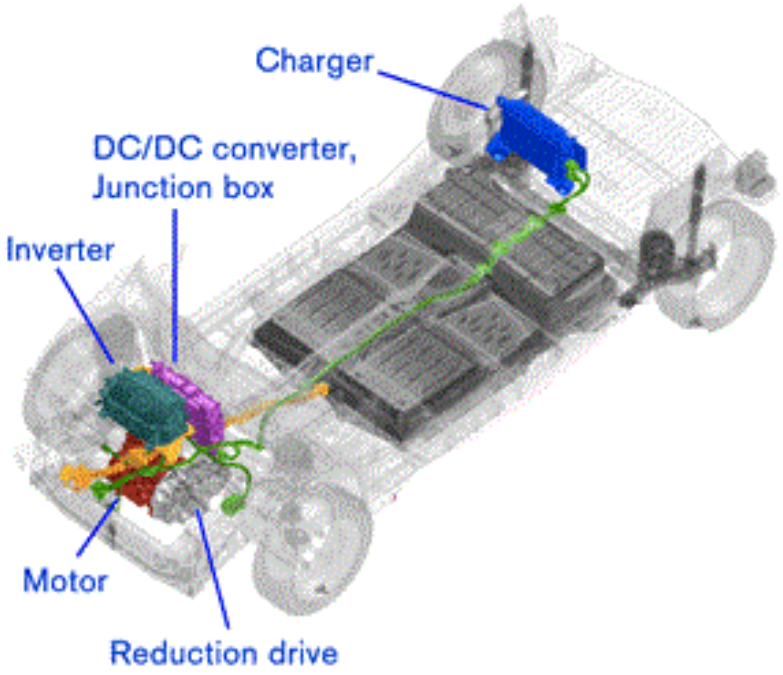


Supply Voltage test

Automotive junction box test

Junction box (vehicle electric devices' central control box) integrate fuse, breaker, relay into one body, and it can distribute high voltage to every unit, blocking a current pathway like a breaker when anomalies arise.

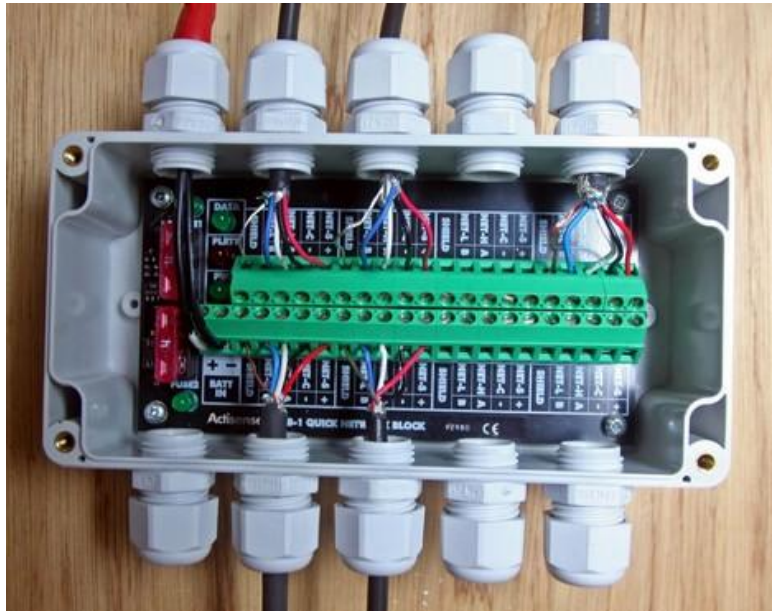




Automotive junction box test

Junction box (vehicle electric devices' central control box) integrate fuses, breakers, relays into one body, and it's the whole vehicle's circuit control center.

ITECH's junction box test system ITS9360 is composed of high-performance programmable electronic load, power supplies, and the ITS9360 software.



Automotive junction box test

Features：

■Highly automation

■ High accuracy

■ Intelligent

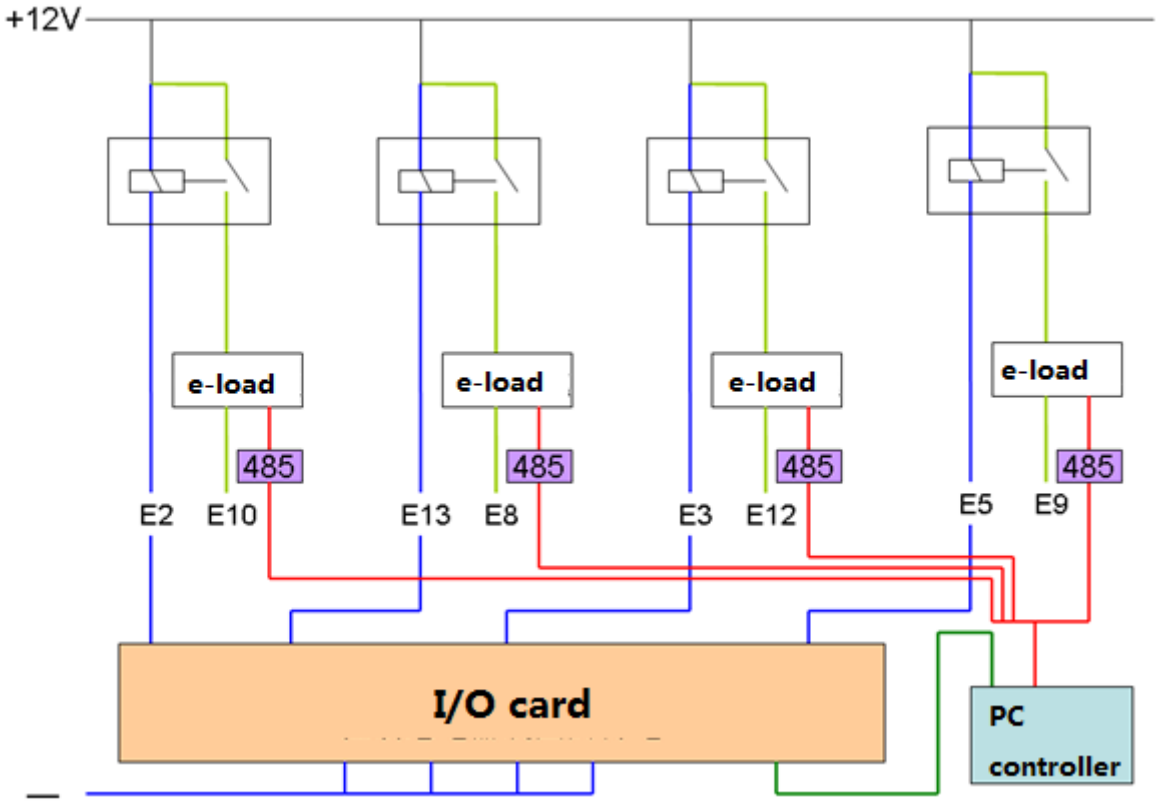
■ Module design

Customers can edit and name the e-load which simulates real EV load, such as Wiper, headlight, etc. When error occurs during control procedure, an alarm will be triggered, and this control circuit will stop immediately, with no influence on other control circuits.

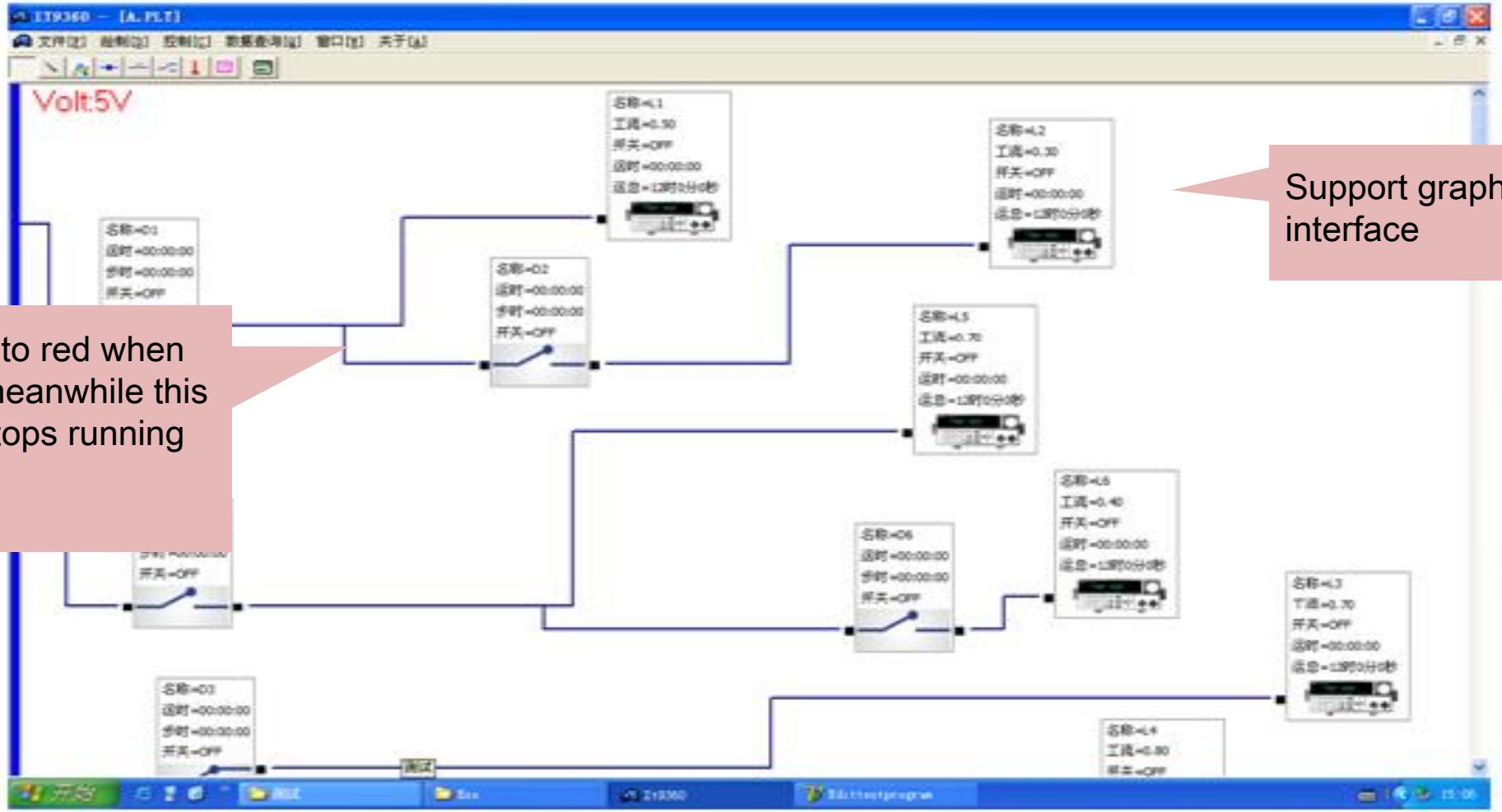
Automotive junction box test----ITS9360 junction box test system

Tests for accessories：

- Stability for long time running
- Life test for relays
- Fuse test
- Temperature monitor and troubles alarm
- others



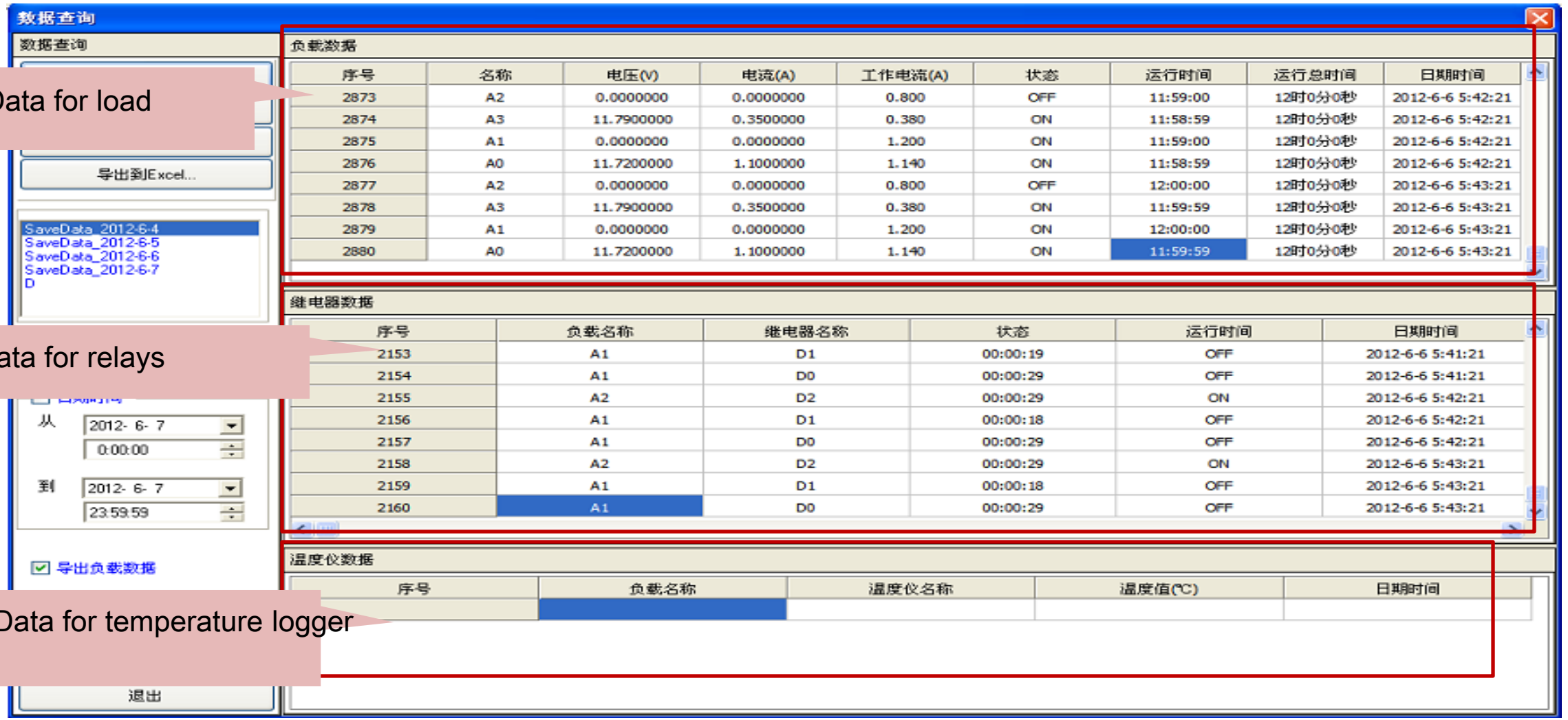
Automotive junction box test----ITS9360 junction box test system



Support graphic edit interface

Blue line turns to red when error occurs, meanwhile this control cycle stops running automatically

Automotive junction box test----ITS9360 junction box test system

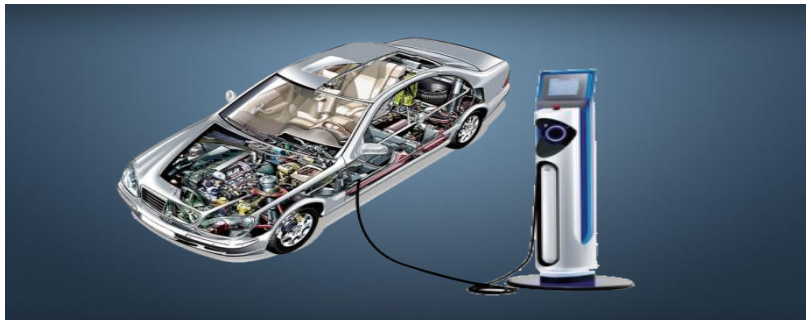


Data for load

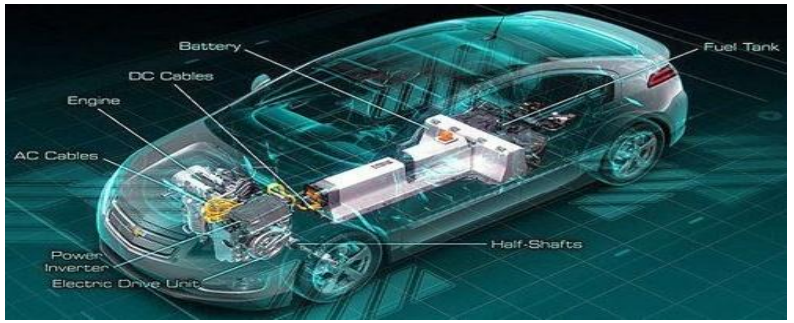
Data for relays

Data for temperature logger

ITECH test solutions

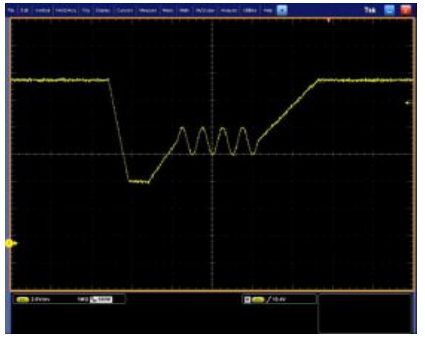


On-board charger/ charging pile testing



EV Battery test

Automotive junction box test



Supply Voltage test

Built-in Automotive Electronics Waveform Curve

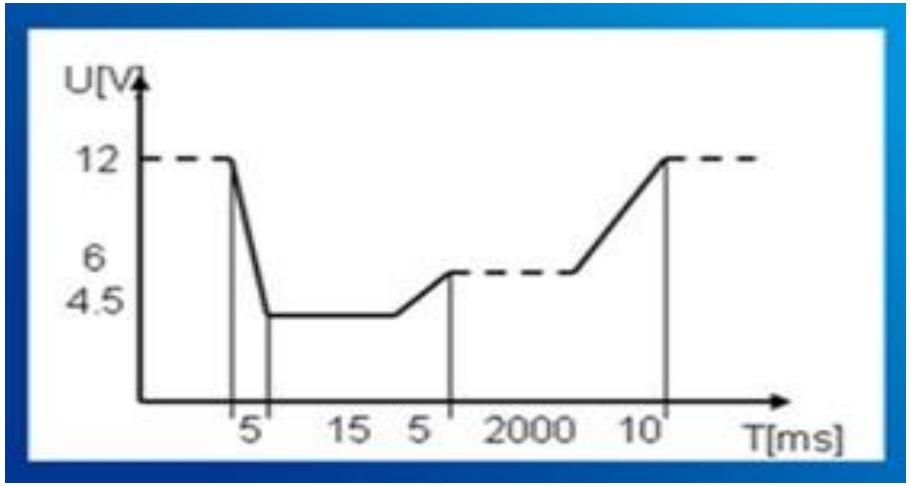
- For the convenience of the automotive electronics testing, IT6500C have built-in DIN40839 and ISO16750-2 waveforms.
- DIN40839 and ISO16750-2 standard waveforms are standard patterns for automotive electronics immunity tests.

Electromagnetic compatibility (EMC) in road vehicles——**DIN40839**

- German standard DIN 40839 ：Electromagnetic compatibility (EMC) in road vehicles

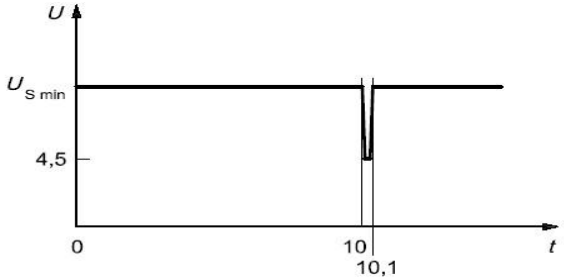
Automotive Electromagnetic Compatibility （ 12V and 24V wire disturbance in Auxiliary circuit ）

- DIN40839 Standard Application ：Simulation on Voltage disturbances when the car engine starts

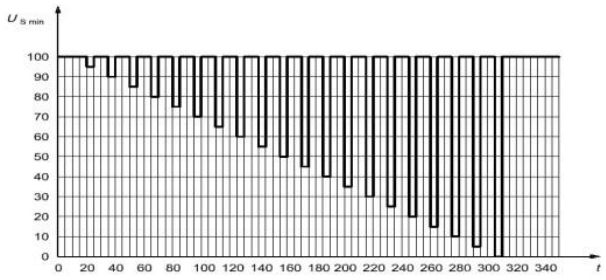


Electric and electronic equipment: Electrical loads for road vehicle—— **Built-in ISO-16750-2**

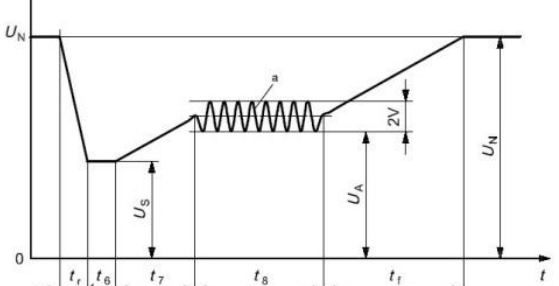
Our built-in waveforms can test electrical loads of **Discontinuities in supply voltage** include **momentary drop in supply voltage, Reset behavior at voltage drop and starting profile.**



1 momentary voltage drop in supply voltage



2 reset behavior at voltage drop

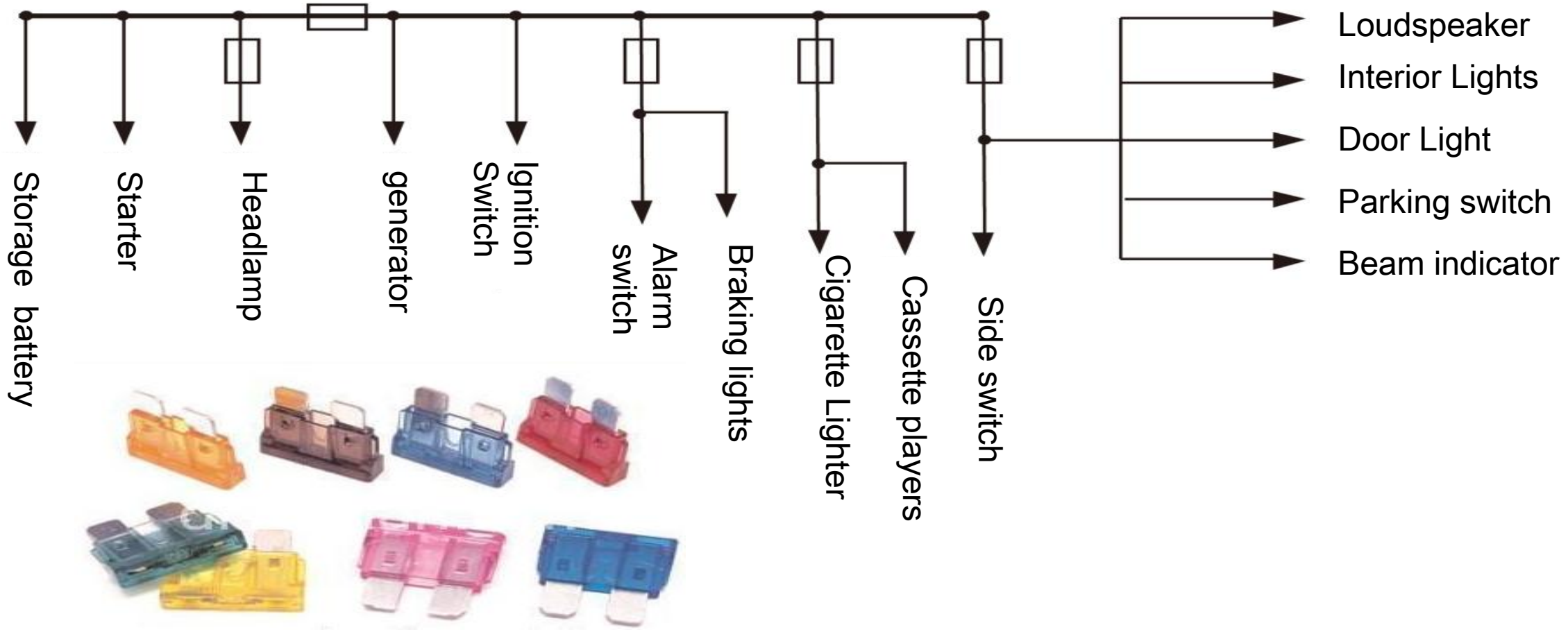


3 starting profile

- Class A: All functions of the device/system perform as designed during and after the test.
- Class B: All functions of the device/system perform as designed during the test. However, one or more may go beyond the specified tolerance. All functions return automatically to within normal limits after the test. Memory functions shall remain Class A.
- Class C: One or more functions of a device/system do not perform as designed during the test but return automatically to normal operation after the test.

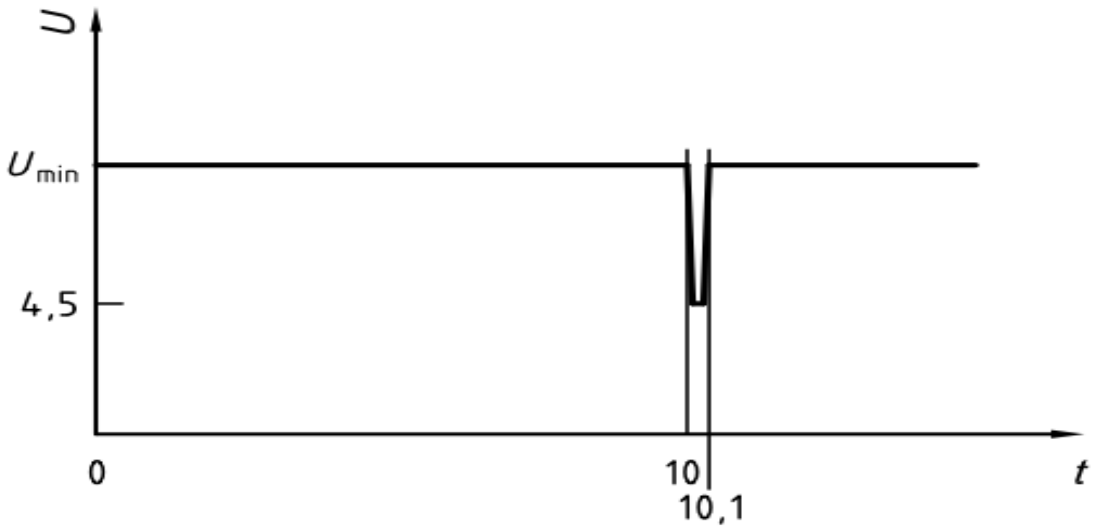
Automobile circuit ：

In the automotive complex circuits , to prevent a short circuit caused by the power failure ， Fuse be applied to various supply lines.



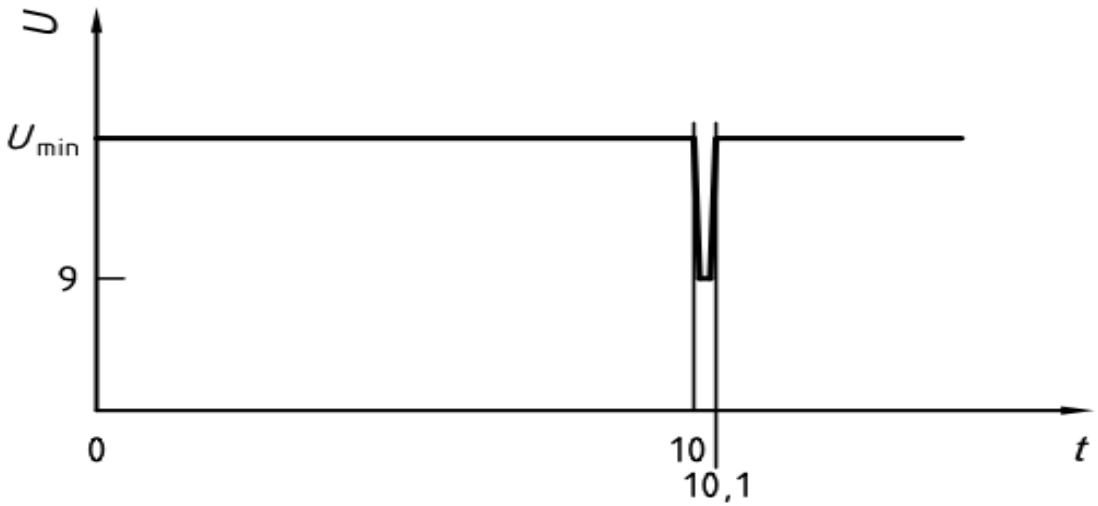
Momentary drop in supply voltage

This test simulates the effect when a conventional fuse element melts in another circuit. The rise time and fall time shall be <=10 ms.
Test:
Apply the test pulse simultaneously to all relevant inputs (connections) of the DUT.
Notice: The functional status shall be Class B.



U voltage, V
t time, s

U_N = 12 V systems



U_N = 24 V systems

Reset behaviour at voltage drop

This test verifies the reset behaviour of the DUT at different voltage drops. It is applicable to equipment with a reset function (e.g. equipment containing one or more microcontrollers).

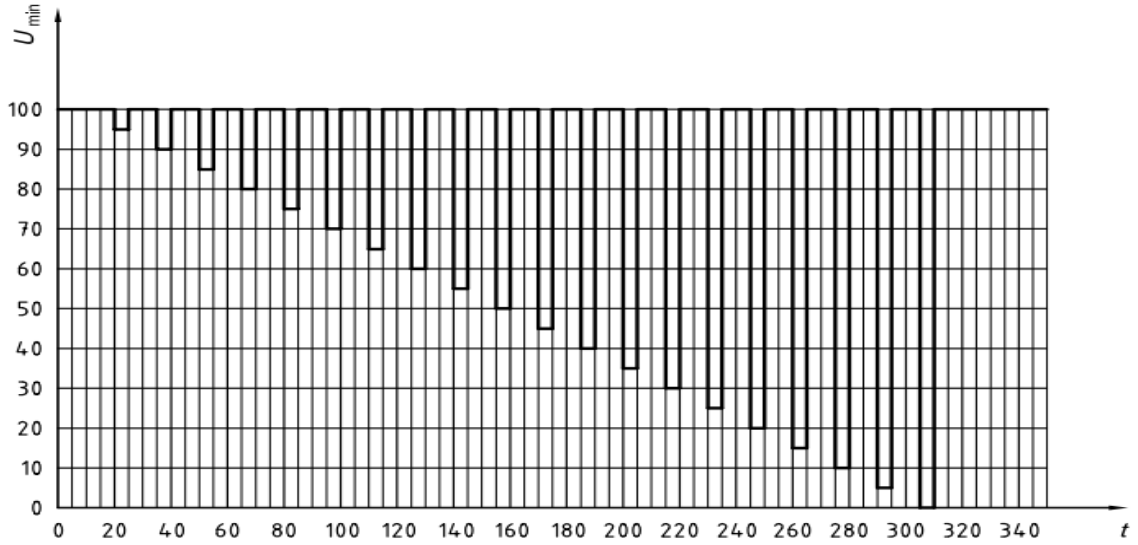
Test:

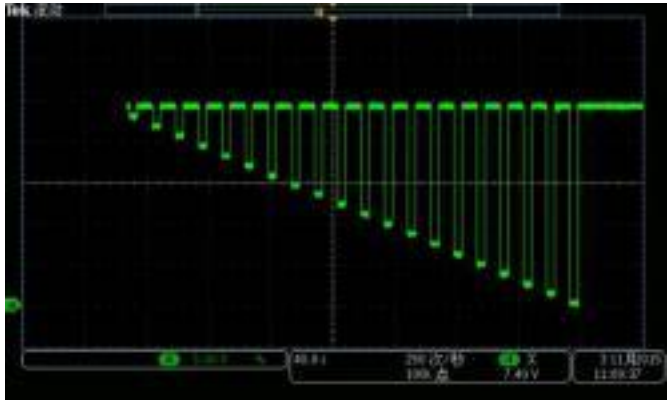
Apply the test pulse in accordance with Figure 6 simultaneously to all relevant inputs (connections) and check the reset behaviour of the DUT.

Notice: The functional status shall be Class C.

U_{min} minimum voltage, %

t time, s





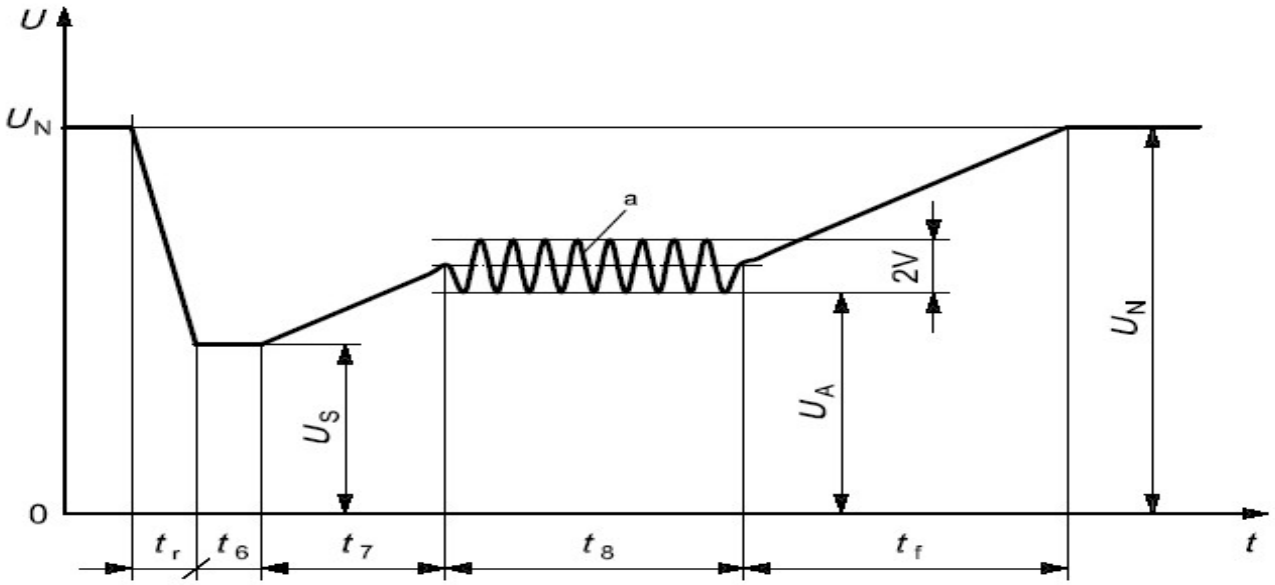
Starting profile

This test verifies the behaviour of a DUT during and after cranking.

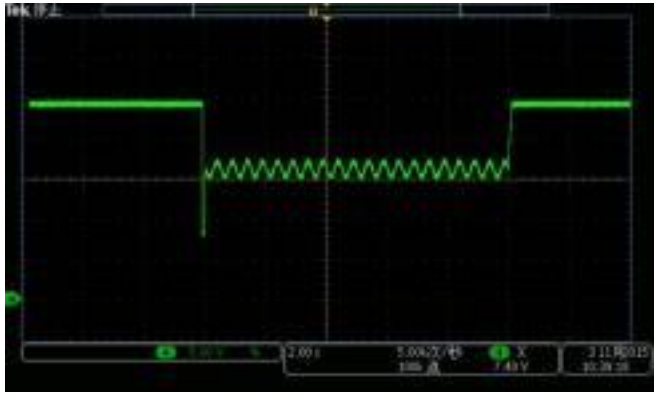
Test:

Apply the starting profile simultaneously to all relevant inputs (connections) of the DUT.

Notice: Relevant devices for vehicle function during cranking shall be Class A, others shall be Class C



U voltage, V
t time
a $f = 2$ Hz.



Slow decrease and increase of supply voltage

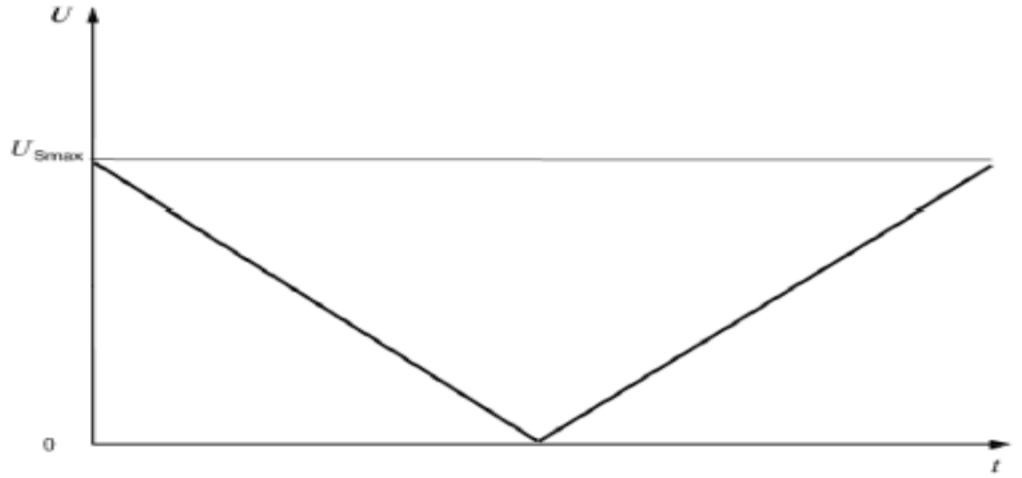
This test simulates a gradual discharge and recharge of the battery.

Test:

Decrease the supply voltage from Umax to 0 V and then increase it from 0 V to Umax, applying a change rate of (0,5 ± 0,1) V/min.

Notice: The functional status shall be a minimum of Class D and Class C where more stringent requirements are necessary.

Using “List” function to achieve this waveform.



Class D: One or more functions of a device/system do not perform as designed during the test and do not return to normal operation after the test until the device/system is reset by simple “operator/use” action.

Electric and electronic equipment: Electrical loads for road vehicle—— Applications

Car Navigations
MP3
CD Players
Cigarette Lighters
Car Stereo
Car Dashboards

DIN40839

ISO16750-2

Automotive Fuses
Electronic Fuel Injection Device
Idle Speed Control(ISC)
Anti-lock Brakes System (ABS)
Airbag Device
Electronically Controlled Windows & Doors
Active Suspension

Automotive engine testing requirements ----High power, CC/CV priority

- High power car motor testing need high power testing equipments.
- Paralleling up to 8 units in Master - Slave mode; Extension power up to 30KW.
- CC/CV priority function can avoid unwanted overshoot when engine starts.

Master

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Slave

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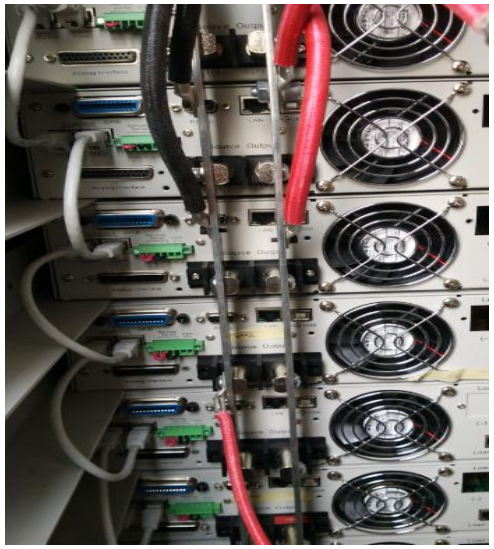
Slave



* IT6522C DC power supply in master-slave connection

Thank You!