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Co-innovating tomorrow™

Top Gun Project
DL950 Success Stories

2025-02-18

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T&M System Dept. Organizations

DY KIM

T&M SYS Dept. Manager
Team Leader
Project Management, Risk Management

YG NOH

Hardware Part
Part Leader & Project Leader
H/W design drawing and sales assistant

Involved in HW part of all system

SW BAE

Software Part
Part Leader & Project Leader
C# BASE based engineer

Total career about 17 years

KJ KIM

Project Assistant
H/W design drawing
and sales assistant

EJ CHOI

Project Assistant
Schedule Management
and sales assistant

SB JUNG

Project Leader
LABVIEW based Engineer

Total career about 16 years

JJ PARK

Project Leader
LABVIEW based Engineer

Total career about 14 years
LG MAGNA ICCU Project

DH AHN

Project Assistant
LABVIEW based Engineer

Total career about 5 years
SL Wire-less Charge Prj
Kyungshin Li-ion Battery Prj

Self introduction

Profile

Name : BAE Seong woo(裵成友)
E-mail : seongwoo.bae@yokogawa.com
Birthday : 1980.05.03
Place of birth : Busan, Korea

Work(Assigned Task)

Develop programs to implement customer systems or services
Development Language : C++, C#, JAVA

Career

Power Noise Simulator
Hyundai mobis, Samsung SDI

Battery TEST system
Samsung SDI

Camera durability test system
Hyundai mobis, LG Innotek

Thermoelectric module and Peltier element efficiency and durability tester
Hyundai

Grid PV Simulator
Hanwha

DL950 Success Stories

Client

YURA TECH

auto parts manufacturer
(Major customers are Hyundai/Kia Motors and Hyundai Mobis.)

DL950 Sales volume – 6EA

Spark plug System

DL950-F-HK - 5EA
720211 20MHz -15EA
C60 SFP+ - 5EA
700929 Probe 1000 V - 30EA
701933 Current Probe 30A 50MHz - 5EA

Pre-charge Relay System

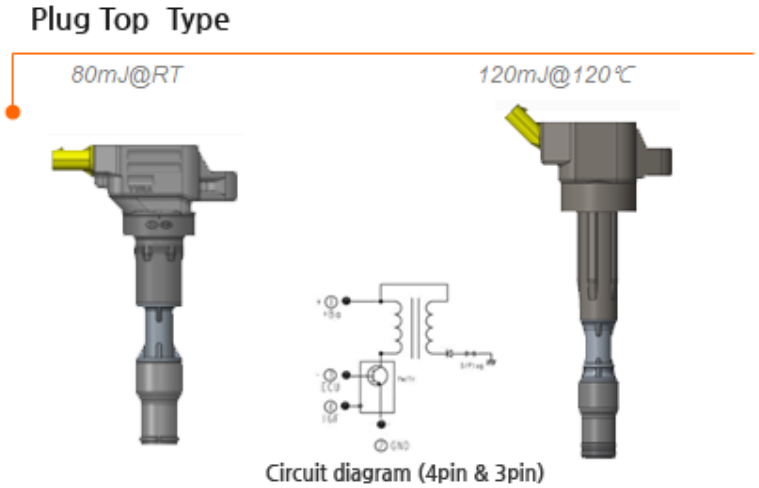
DL950-F-HK/M1 - 1EA
720268 1MS/s - 5EA
758933 Measurement lead set - 3EA
701904 1:1 Safety adapter lead - 3EA
758921 Fork Terminal adapters - 6EA
720256 4CH 10MS/s 12Bit Isolation Module - 1EA
CT60 Current Transducer(60Apeak) - 3EA
VZ20X -1EA
701930 Current Probe -1EA

DL950 Success Stories

Spark plug durability System

Customer Requirements

- Load resistance: 10Mohm
- Maximum voltage: 50kV
- 30CH normal operation and current level measurement
- Group 5EA each and determine whether the ignition coil is operating by measuring the current of the entire group.
- Provides 6 months of Hyundai Motor Company requirement waveform data storage

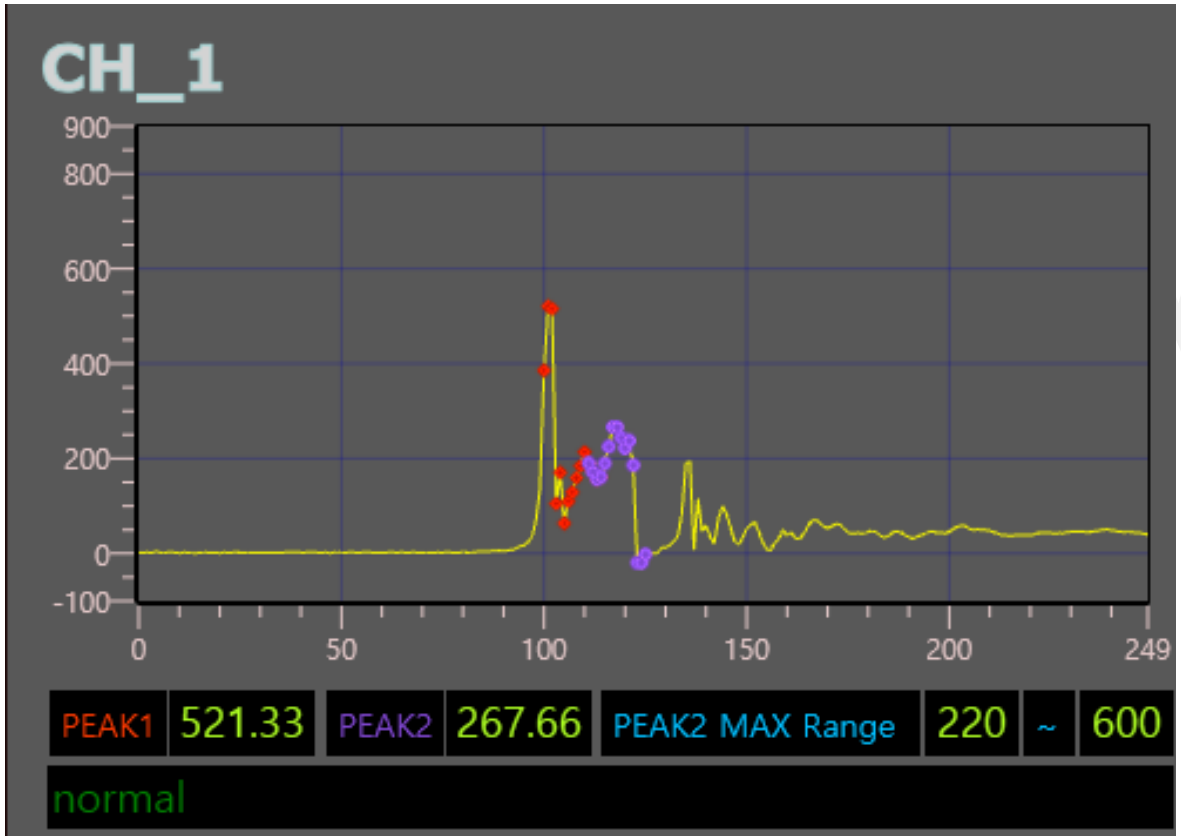


DUT - Spark plug

The core driving device of an engine that generates high-voltage current to cause spark discharge inside the engine.

DL950 Success Stories

Spark plug durability System – **S/W Program**



Waveform display(2M Sampling, Point-Point 2us)

1st peak measurement

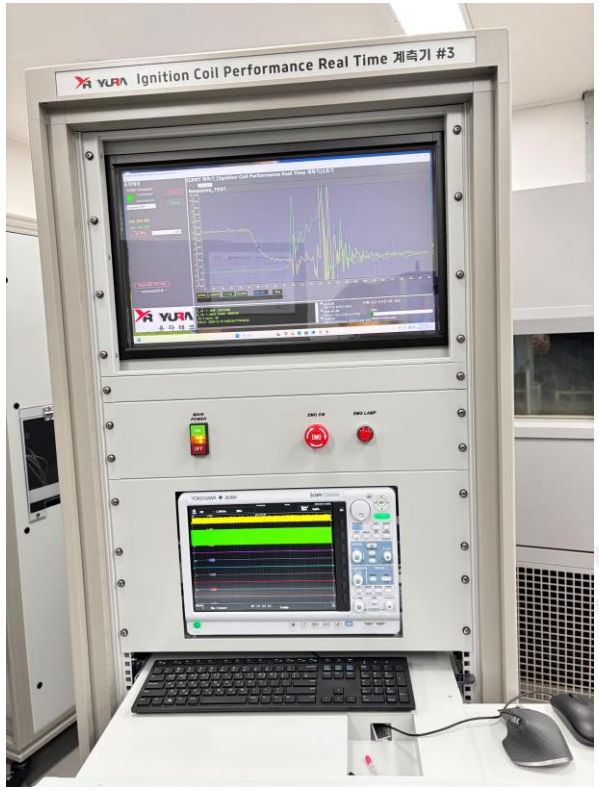
2nd peak measurement

2nd peak - Reading by range

- Normal range normal display
- Over display outside normal range
- 2nd peak Range: User configurable

DL950 Success Stories

Spark plug durability System - **Drive photos**



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Spark plug durability System - **On-site photos**

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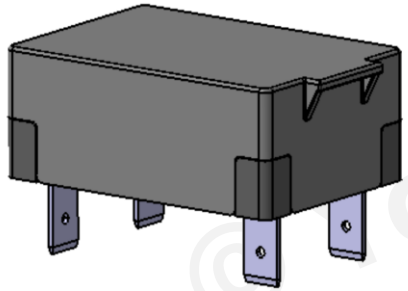
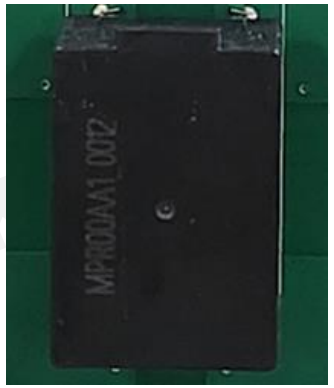
Pre-charge Relay System

Customer Requirements

DC up to 24V (voltage programming)
3Ch (up to 50A expected when controlled simultaneously) or 6Ch (up to 100A expected)
Monitoring, data storage, operation On/Off repeat control, overcurrent/high temperature alarm function,
Voltage operation control required according to each temperature and humidity chamber pattern section





DUT – Pre-Charge Relay

Key components that connect and disconnect electric vehicle (EV) batteries and inverters/chargers

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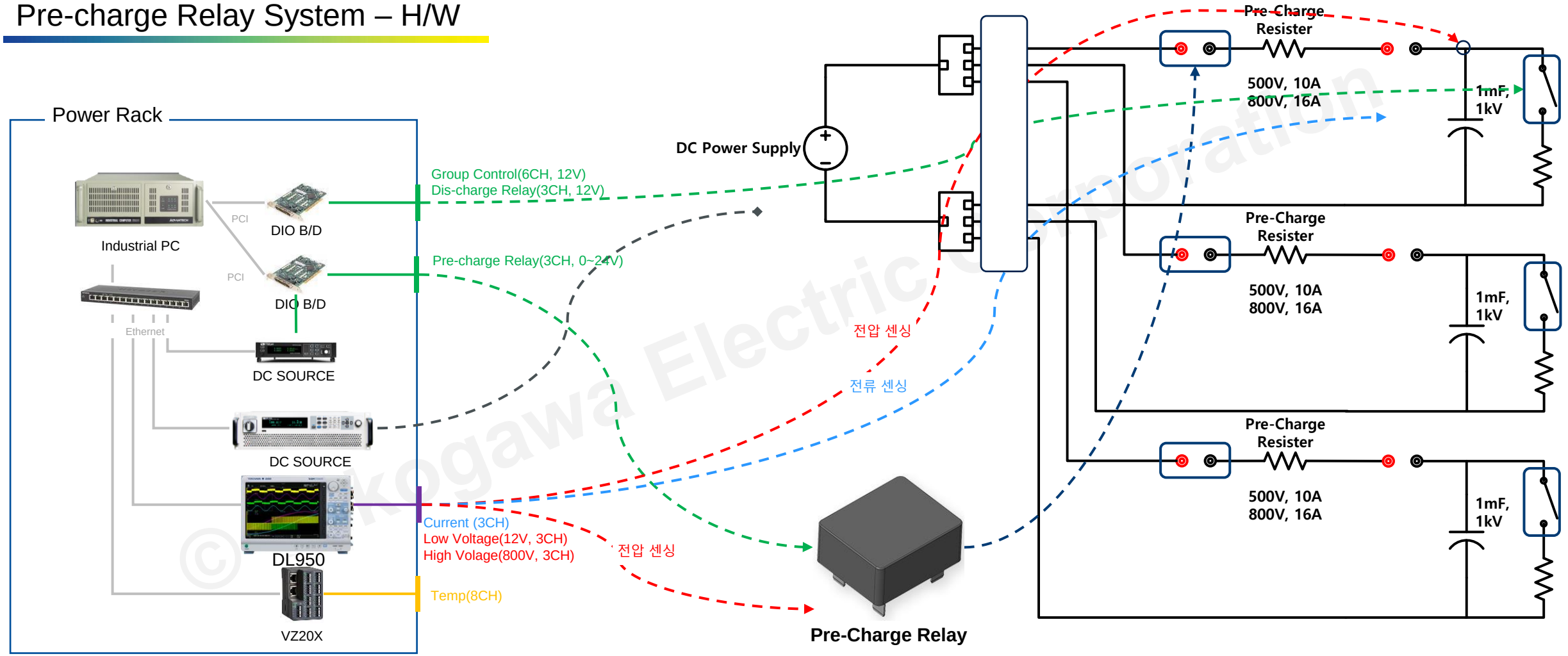
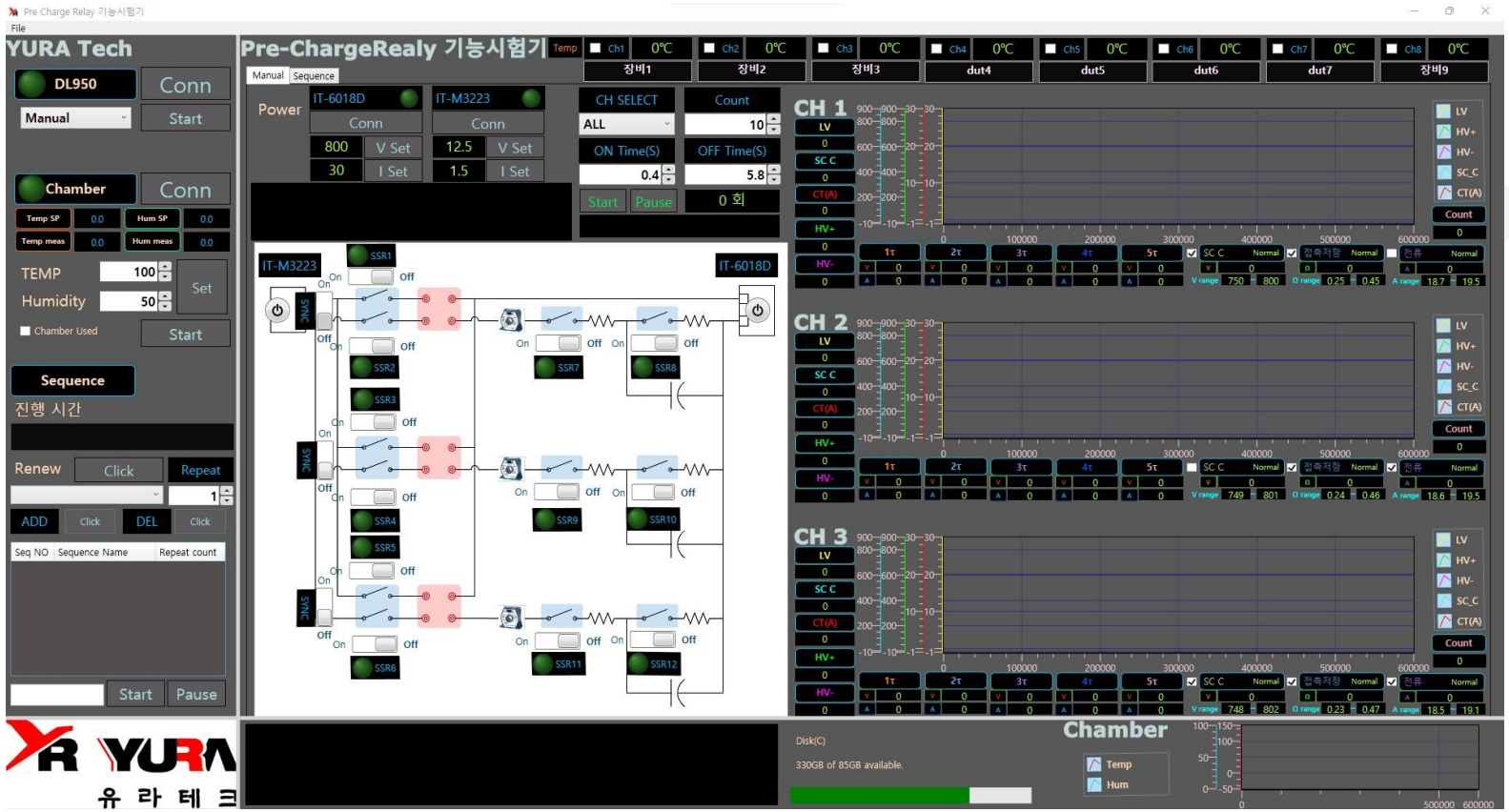
Pre-charge Relay System – H/W



DL950 Success Stories

Pre-charge Relay System – **S/W Program**



-ON OFF TIME Control Operation

-Chamber Control

-Tau Calculation Contact

-Resistance Calculation

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Pre-charge Relay System - **On-site photos**

Self introduction

Profile

Name : Jung Seungbae(丁陞陪)
E-mail : seungbae.jung@yokogawa.com
Birthday : 1982.01.23
Place of birth : Yangsan-si, Gyeongsangnam-do, Korea

Work(Assigned Task)

Programs Developer for PC Based Application

Development Tools : LabVIEW, C#

Career

Pre-Charge Relay Tester
Woojin

Li-ion Battery Charge/Dis-Charge Tester
KyungshinHoldings

EOL Tester for BDU Function
YURA Corporation

EOL Tester for ICCB Function tester
YURA Corporation

DL950 Success Stories

Customer Information

Company title: Woojin Industry Company Ltd.

Establishment: May, 1966

CEO: Ryu Si Hyuck

Location: 248, Sandan-ro, Danwon-gu, Ansan-si, Gyeonggi-do, Republic of Korea

Customers: Hyundai, Kia, GM, etc.

Products: Spark Plug, Oxygen Sensor, Glow Plug, etc.

Sales: 218.66599 billion won

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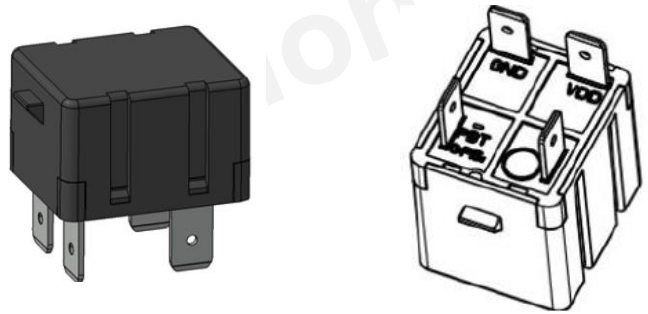
DUT(Device Under Test) Specifications

EPR, Electronic Pre-charge Relay

Item	Spec.	Remark
Coil Voltage	8~16Vdc	Max. 650 Vdc(Output)
Current Rating(Output)	11.25A	450Vdc, 40Ω, 1000uF(Output)
Pick Up Voltage	8Vdc Below	
Drop Out Voltage	3.1 +/- 0.5Vdc	12Vdc, 1kΩ @ 20℃(Output)
Operate Time	0.1 ~ 1.0ms	
Release Time	0.8 ~ 3.8ms	
Pickup current	5 ~40ms	
Contact Resistor(Output)	0.5 ~ 1.2Ω	12Vdc, 1A @ 20℃(Output)



EPR

As a PRA SUB part, it operates before the main relay operates and reduces the voltage difference within the circuit to prevent main relay overload.

Test Specification

Durability test, Environment reliability test and Mechanical reliability test for EPR
HYUNDAI MOTOR Engineering Standard

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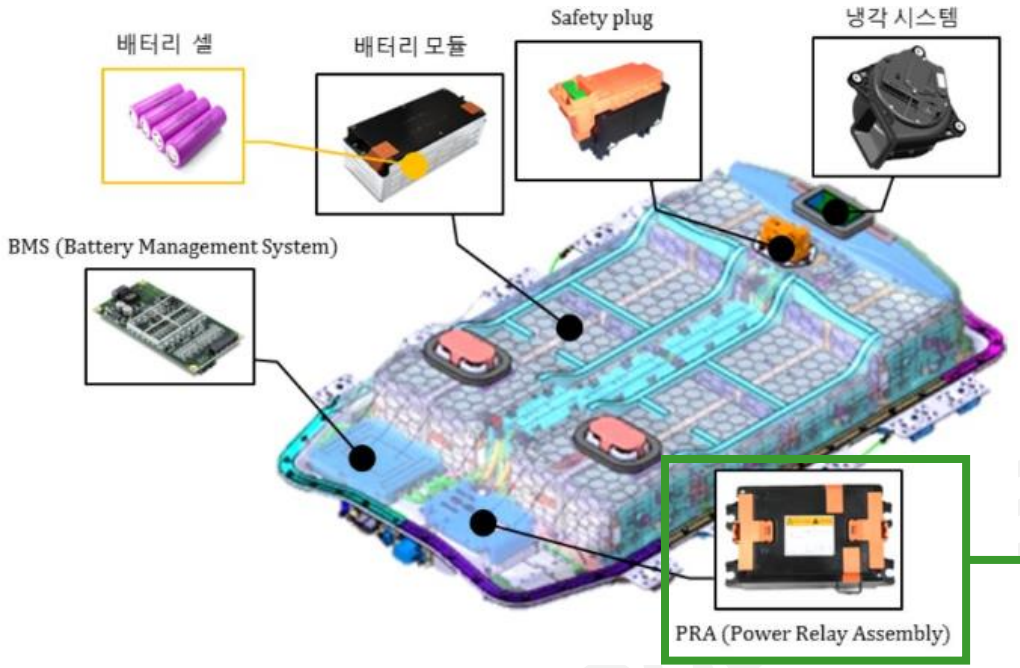
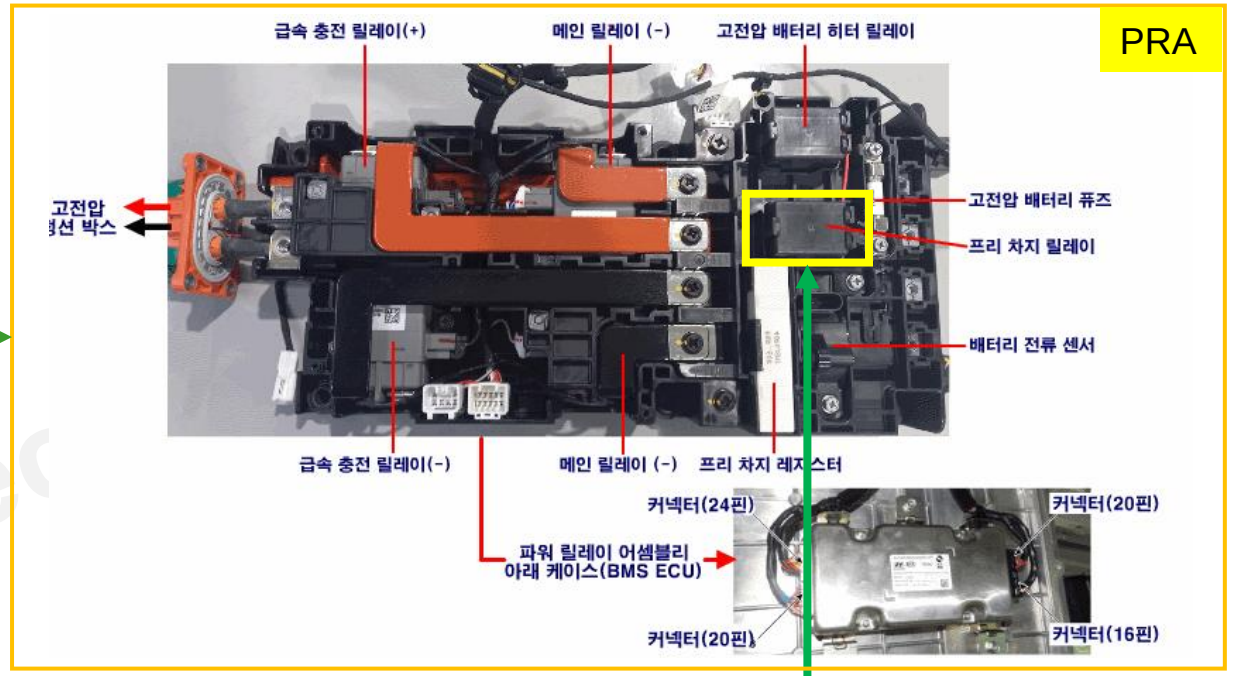
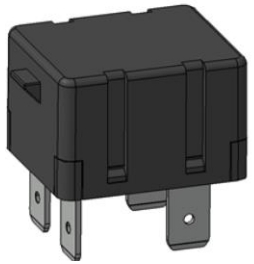
What is the EPR?







Pre-Charge Relay

The **Power Relay Assembly (PRA)** is a component that supplies and cuts off power for discharging or charging the high-voltage battery.
It is installed in the high-voltage battery system assembly (BSA) and electrically connects the battery and the inverter.

Applicable components include main relay, pre-charge relay, resistor, current sensor, temperature sensor, bus bar, etc.

As a PRA SUB part, it operates before the main relay operates.
reduces the voltage difference within the circuit to prevent main relay overload.

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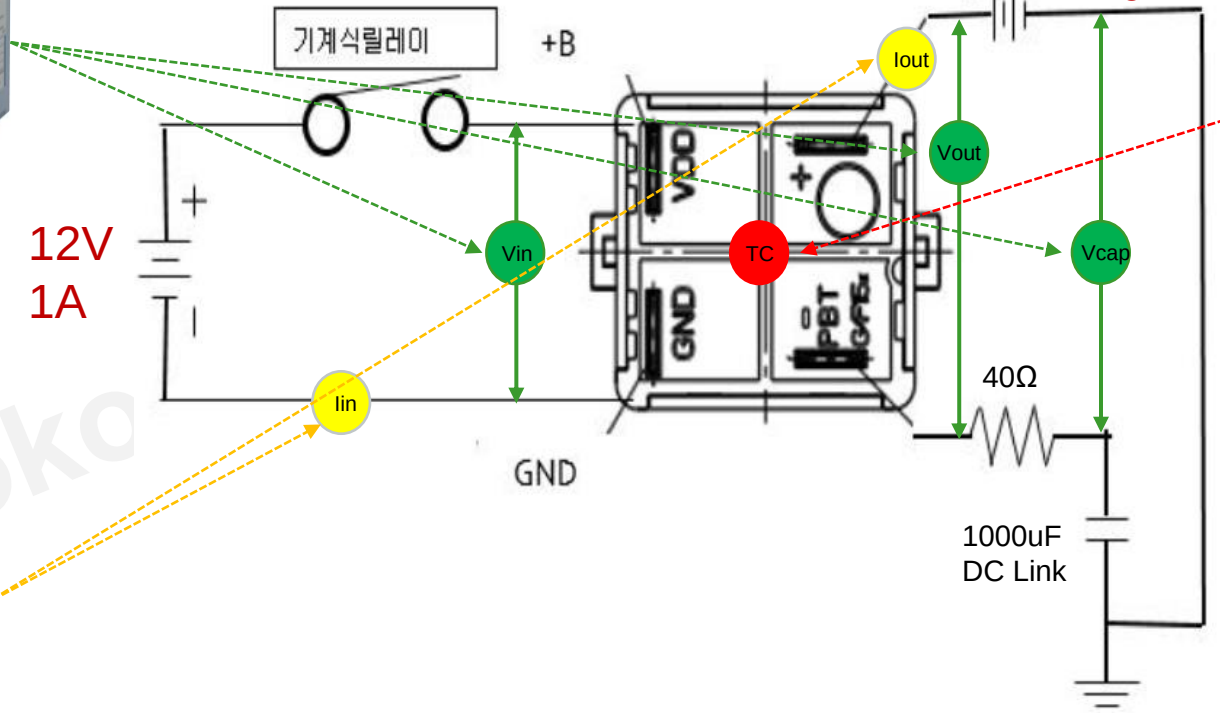
DL950 Modules for DUT test solution

720268 High Voltage Module 1MS/s

701265 High-Precision Temperature Input Module



701251 Analog Voltage Input Module

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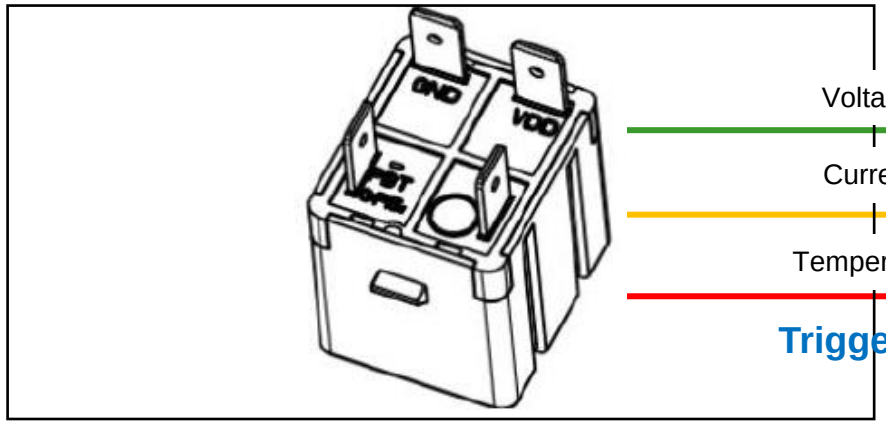
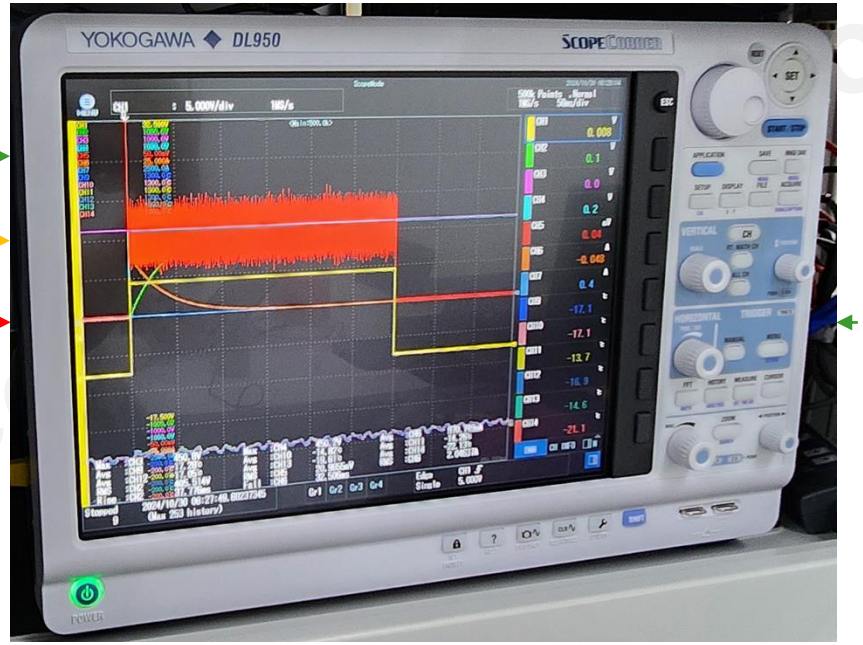
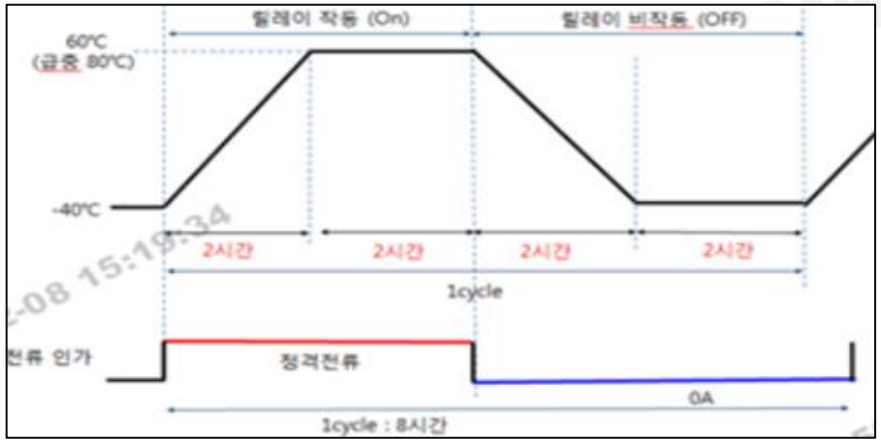
DL950 Solution for ES Test of High Voltage Relay



Items & Waveform triggered



Temperature Cycle Test(ES)



Sending command for handling DL950

```
:CHANNEL1:DISPLAY OFF;:CHANNEL2:DISPLAY OFF;:CHANNEL3:DISPLAY OFF;:CHANNEL4:DISPLAY
OFF;:CHANNEL5:DISPLAY OFF;:CHANNEL6:DISPLAY OFF;:CHANNEL1:DISPLAY ON;:CHANNEL2:DISPLAY
ON;:CHANNEL3:DISPLAY ON;:CHANNEL4:DISPLAY ON;:CHANNEL5:DISPLAY ON;:CHANNEL6:DISPLAY
ON;:CHANNEL7:DISPLAY ON;:CHANNEL8:DISPLAY ON;:CHANNEL9:DISPLAY ON;:CHAN1:VDIV 100;:CHAN2:VDIV
100;:CHAN3:VDIV 100;:CHAN4:VDIV 100;:CHAN5:VDIV 0.005;:CHAN6:VDIV 5;PROB C10;:STOP;:MEASURE:CHANNEL1:ALL
OFF;:MEASURE:CHANNEL2:ALL OFF;:MEASURE:CHANNEL3:ALL OFF;:MEASURE:CHANNEL4:ALL
OFF;:MEASURE:CHANNEL5:ALL OFF;:MEASURE:CHANNEL6:ALL OFF;:MEASURE:TRANGE -
5.05,0.15;:MEASURE:CHANNEL1:RISE:STATE.
…
```

Mechanical & Environment Test, 2EA

Test System

DL950 Modules used

720268 High Voltage Module 1MS/s

X 2

701265 High-Precision Temperature Input Module

X 2

701251 Analog Voltage Input Module

X 1

702916 Current Probe 120 MHz/ 0.5 ARMS, 5 ARMS, 30 ARMS

X 1

Durability Test, 1EA

Test System

DL950 Modules used

720268 High Voltage Module 1MS/s

X 2

701265 High-Precision Temperature Input Module

X 3

701251 Analog Voltage Input Module

X 1

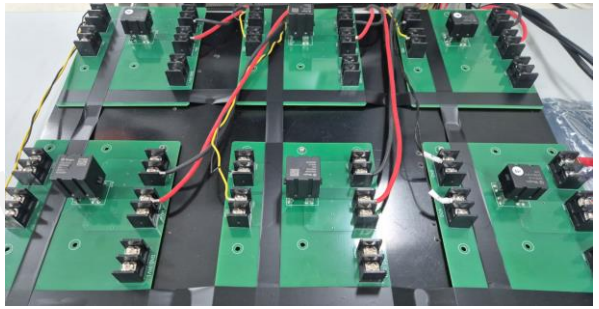
702916 Current Probe 120 MHz/ 0.5 ARMS, 5 ARMS, 30 ARMS

X 1

DL950 Success Stories

System solutions for installed customer sites

Sample JIG



DUT(Pre-Charge Relay)

Failed Sample (during work)

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DL950 Success Stories

Movie Link

Expectations for DL950

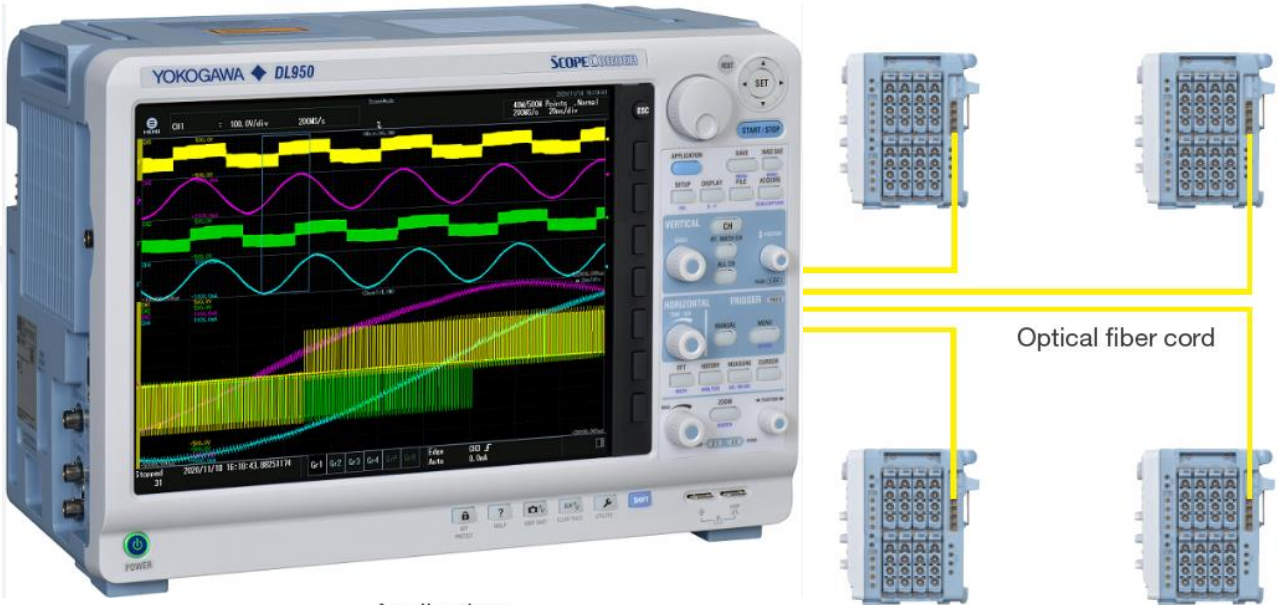
T&M System

It is expected to be a device that can replace NI DAQ products based on noise processing and isolation.

NI compactDAQ

NI PXI

Replacement for
Test Solution



Applications

- Battery cell evaluation
- Multi-point vibration analysis
- Multi-point strain test

*Please use the Optical Transceiver Module 720941 and the Optical Fiber Cord 720942.

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Sales opportunity of DL950

- **Samsung MX Division (Mobile)**
  - 1unit
  - Circuit board duration & current test
- **Stats Chip pack Korea**
  - 1unit
  - Semiconductor duration & looping test
- **Posco**
  - 2 units
  - Electricity quality monitoring for electrical substation in steel plant
- **Keyang Electric Machinery**
  - 1 unit
  - Vehicle sunroof motor test

Request for YMI Product (Sales)

Physical Layer Analysis

- CAN/CANFD or other serial signal physical layer decoding function like DLM series

Integrated Printer

- Integrated printer support instantaneous data output to tangible paper
- Heavy industry customers (Shipbuilding) started to change DL950 to other high speed DAQ with printer
- The market size that can sell DL950 in the maintenance market is bigger. However, the market is being lost due to the absence of a printer. A printer function that can be set up simply and printed is needed.

Weight

- Too heavy to carry to the test site

Request for YMI Product (Sales)

USB C Interface

- USB C interface should be applied(EX : replace VGA to USB C, USB C cable to External SSD)

Measure values order

- Measure values order that are displayed in the screen cannot be changed
- The order should be edited by user for the better analysis

Integrated DC power

- Integrated DC power helps not to carry external power bank or source.

Display size expansion

- The screen is relatively smaller than the DLM series. Display size expansion is required.

Request for YMI Product (Engineer)

Remote mode key Lock

- While in remote mode entire key locked, make us difficult to analysis the trend
- At least time axis should be changeable so that trend analysis will be possible

Data acquisition while waiting for Trigger

- In some cases, 720221, 701261 are used in same time with voltage input modules
- While waiting trigger, there is no way to gather temperature data

LabVIEW Driver

- Some commands are missing in LabVIEW driver
- The driver should support most of the functions in the communication commands

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