



www.kepco.co.kr/trustedpartner

Battery Test Lab.
Made in Korea

Proposal of 'CellScan' Battery Monitoring System

- ✓ Better quality & lower price!
- ✓ New product released in 2015!
- ✓ OEM available on a small order!
- ✓ The fastest speed to measure Voltage, Temperature and Internal Resistance!
- ✓ The quality & price competitiveness is the best!
- ✓ The world's first Battery Monitoring System with CAN bus!
- ✓ There are two key components; Master & Sensor!

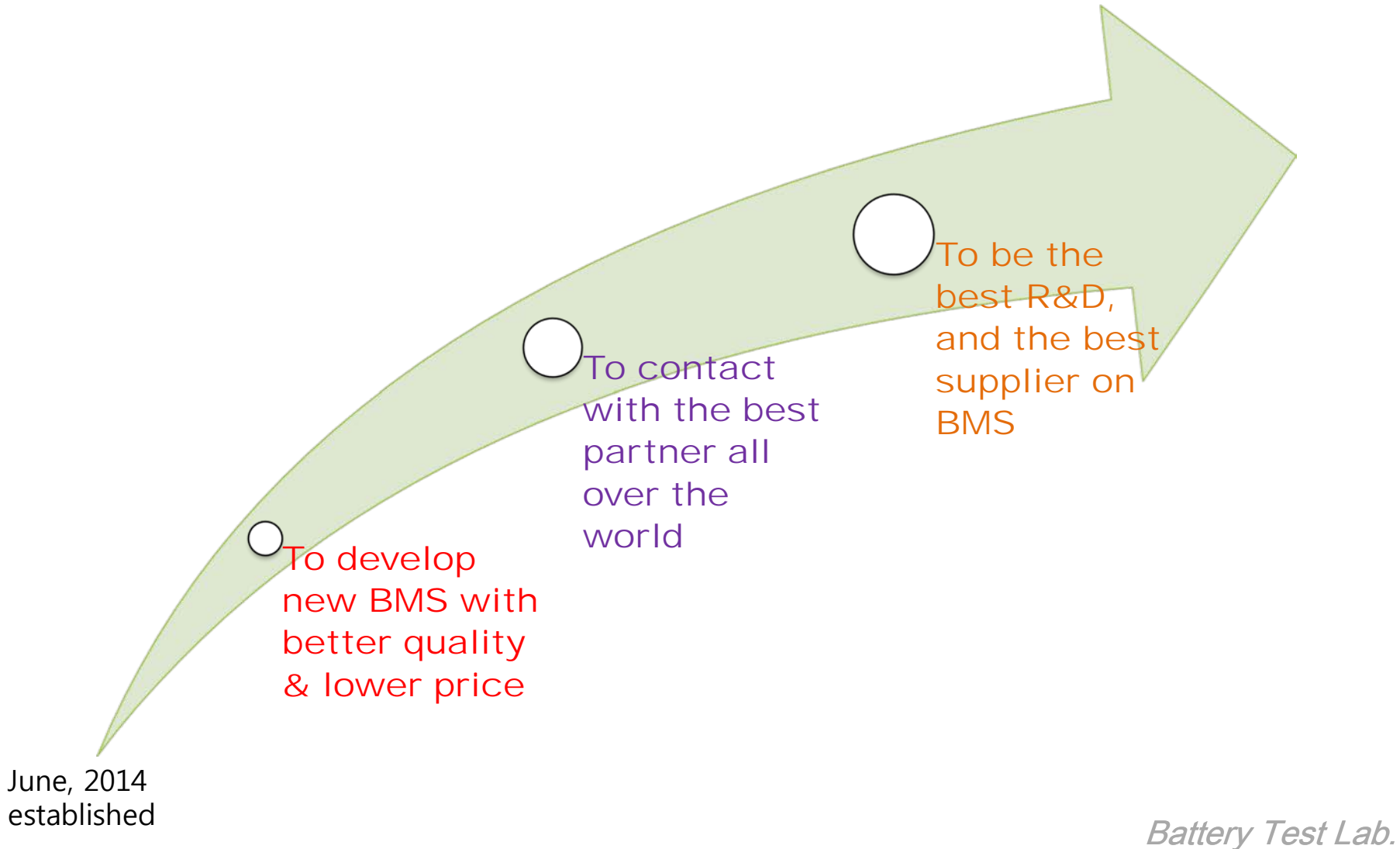


CAN BUS BMS

www.jsdata.co.kr

28 August 2016

Our Vision



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1 **What is difference?**

2 *What is CAN bus?*

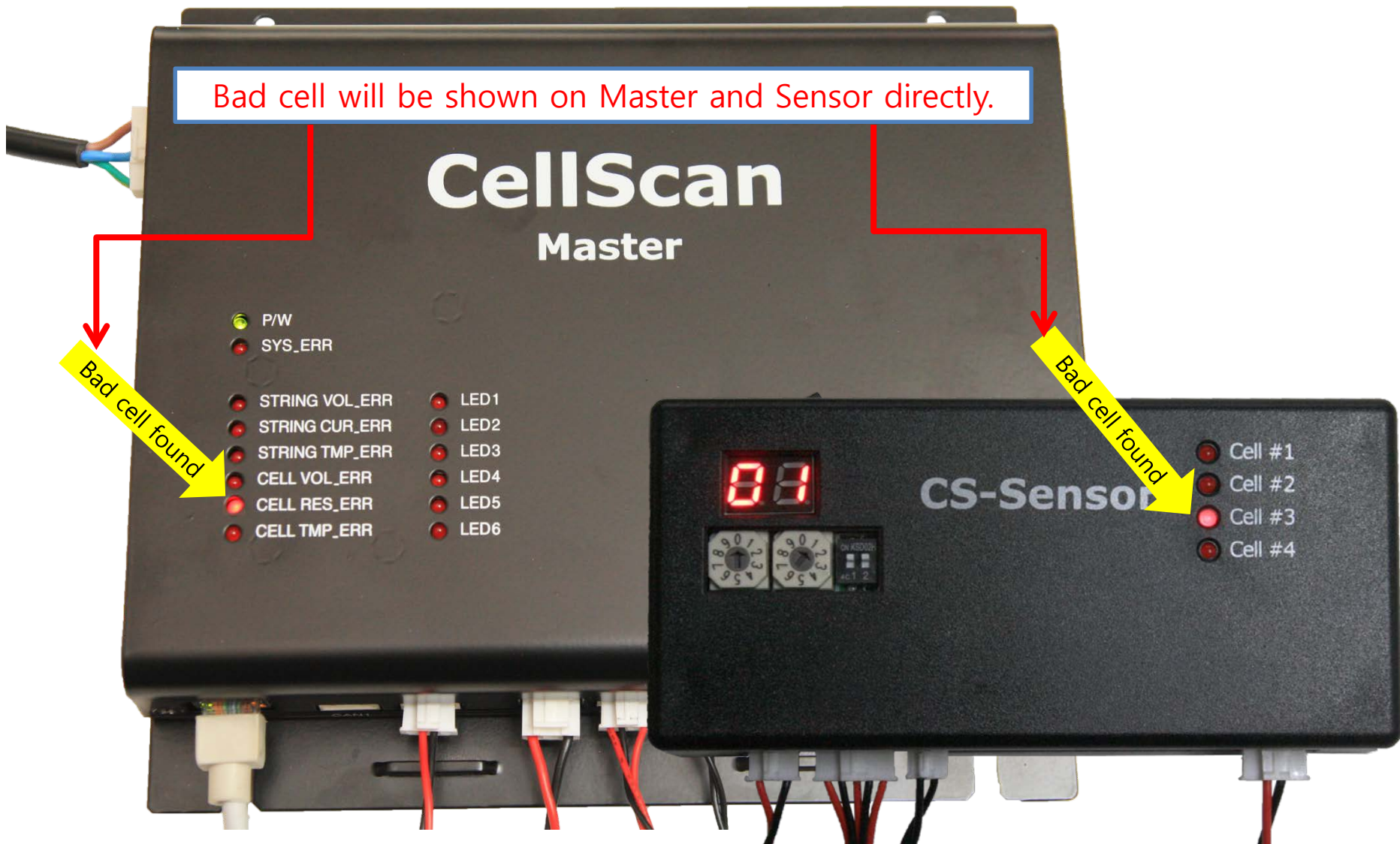
3 *Description of CellScan?*

4 *Options of CellScan?*

5 *Who developed?*

<p>CAN BUS BMS (this product)</p>	<p style="text-align: center;">▲ ▲ ▲</p> <p style="text-align: center;">Very fast by CAN BUS</p> <ul style="list-style-type: none"> •1sec to measure each voltage and temperature on 400 cells •30sec to measure each internal resistance on 400 cells 	<p style="text-align: center;">▲ ▲</p> <p style="text-align: center;">More easy</p> <ul style="list-style-type: none"> •Modular sensor to measure 4 cells or 3 blocks •CAN BUS to make a reliable Ring network between a Master and 100 sensors •Show a bad cell on sensors 	<p style="text-align: center;">Lower than existing BMSs</p> <p style="text-align: center;">▼ ▼</p>
<p>Comparison Item</p>	<p>Measuring Speed</p>	<p>Convenience to install and maintain</p>	<p>Price</p>
<p>Existing BMSs</p>	<p style="text-align: center;">Very slow by RS-485</p> <ul style="list-style-type: none"> •A few tens of minutes to measure each voltage and temperature on 400 cells •A few tens of minutes each internal resistance on 400 cells <p style="text-align: center;">▼ ▼</p>		

Bad cell will be shown on Master and Sensor directly.





Existing BMSs	Items	Function of Master
RS-485, Very slow	Communication method	Ring CAN bus, Very fast & reliable
A few tens minutes, difficult	Duration to measure each Voltage and Temperature on all 400cells	[1sec] , which can check a bad cell or inter-connection during a discharge.
Same as upper, Inconvenient	Duration to measure each an internal resistance all 400cells	[30sec] , which is very convenient during an installation and maintenance

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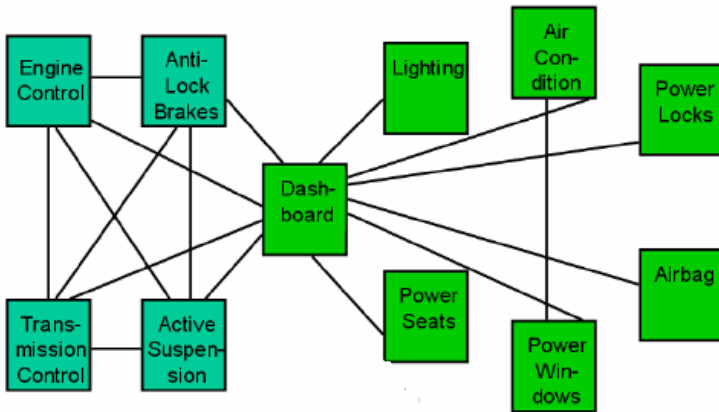
3 *Description of CellScan?*

4 *Options of CellScan?*

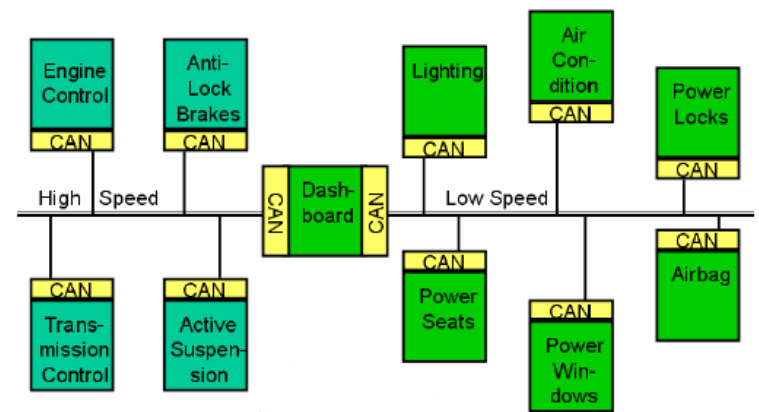
5 *Who developed?*

Brief

- **CAN bus** (for **controller area network**) is a **vehicle bus** standard designed to allow **microcontrollers** and devices to communicate with each other within a vehicle without a **host computer** sourced from 'Wikipedia'
- In an automobile, more electric instruments have been installed with the less fuel and exhaust fumes and more convenient.



● An existing method of 'point to point electric wiring' increases an installation cost and less reliability.



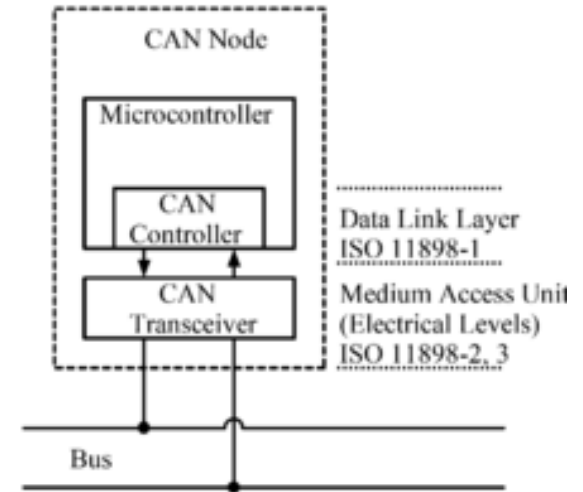
- According to solve this problem, CAN bus was developed.
- As this is to connect on BUS system, which is simple to install and increase reliability.

History

- Development of the CAN bus started originally in 1983 at [Robert Bosch GmbH](#).^[1] The protocol was officially released in 1986 at the [Society of Automotive Engineers](#) (SAE) congress in [Detroit, Michigan](#). The first CAN controller chips, produced by Intel and Philips, came on the market in 1987.
- In 1993 the International Organization for Standardization released the CAN standard ISO 11898 which was later restructured into two parts;
- CAN bus is one of five protocols used in the [on-board diagnostics](#) (OBD)-II vehicle diagnostics standard. The OBD-II standard has been mandatory for all cars and light trucks sold in the United States since 1996, and the [EOBD](#) standard has been mandatory for all petrol vehicles sold in the European Union since 2001 and all diesel vehicles since 2004.^[5]
- [Upper copied from 'Wikipedia](#)

Architecture

● CAN is a [multi-master serial bus](#) standard for connecting Electronic Control Units [ECUs] also known as nodes. Two or more nodes are required on the CAN network to communicate. Each node requires a:

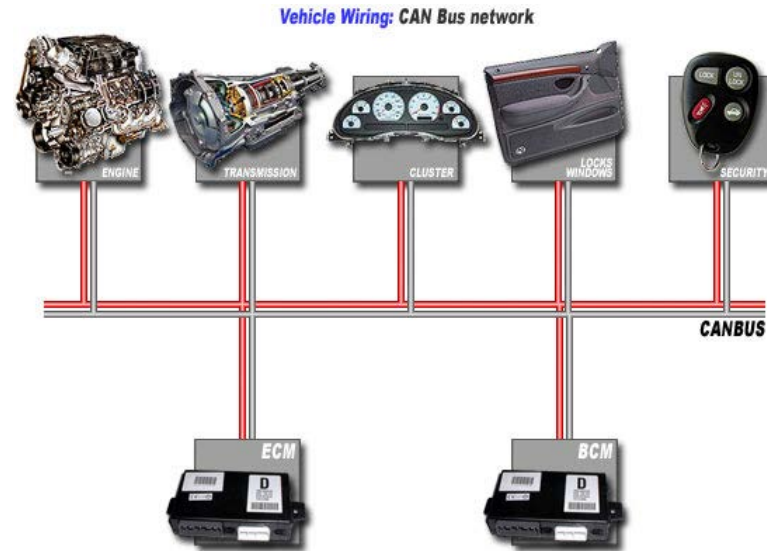


- ① [Central processing unit](#), microprocessor, or host processor
- ② CAN controller; often an integral part of the microcontroller
- ③ [Transceiver](#) Defined by ISO 11898-2/3 Medium Access Unit [MAU] standards
 - Receiving: it converts the data stream from CANbus levels to levels that the CAN controller uses. It usually has protective circuitry to protect the CAN controller.
 - Transmitting: it converts the data stream from the CAN controller to CANbus levels

Advantage of CAN bus



- Existing cabling is very complex



● CAN bus cabling is very simple

- More reliably, e.g., fewer plug-in connectors that might cause errors.
- Wiring less complicated, more economic.
- Easy to implement, changes, too.
- Additional elements (e.g., control units) are easy to integrate.
- Installation place exchangeable without electric problems.
- Wire may be diagnosed

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3 Description of CellScan?

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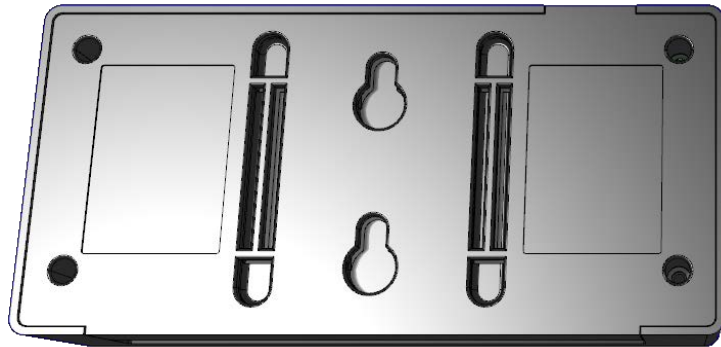
Dimensions (W×D×H): 201 × 151 × 37(45)mm



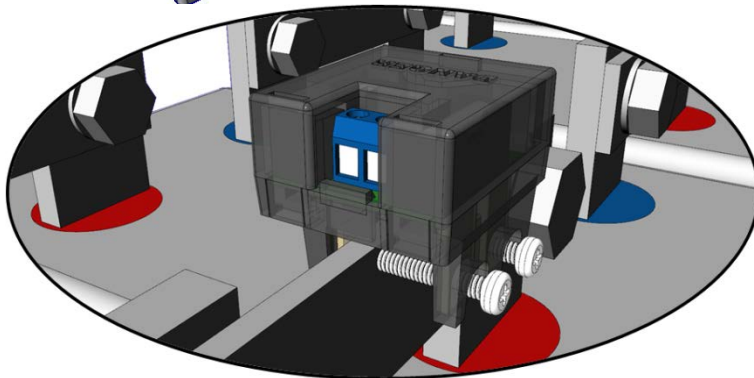
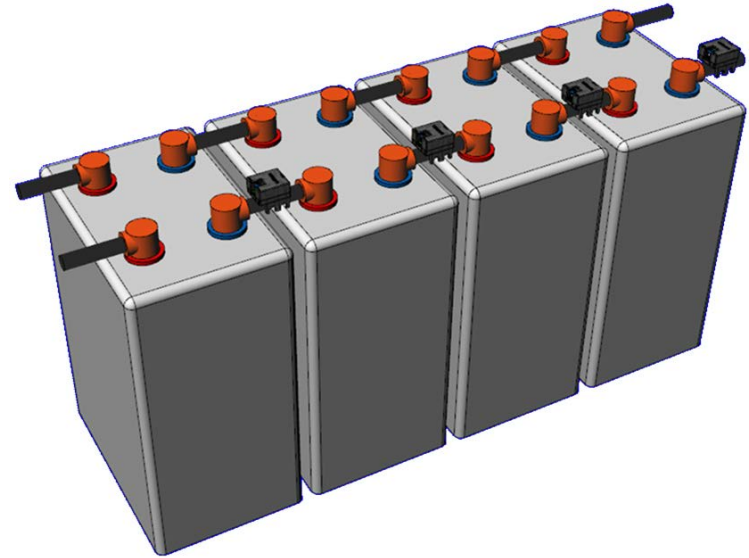
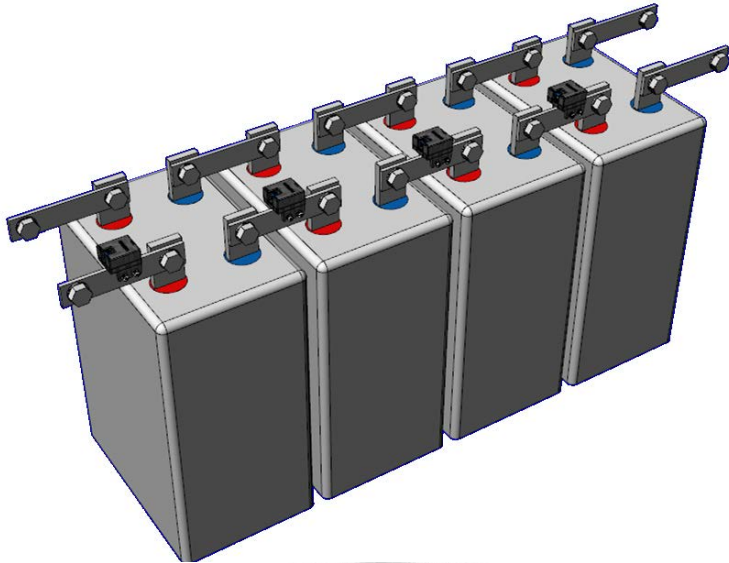
3 Description of CellScan?

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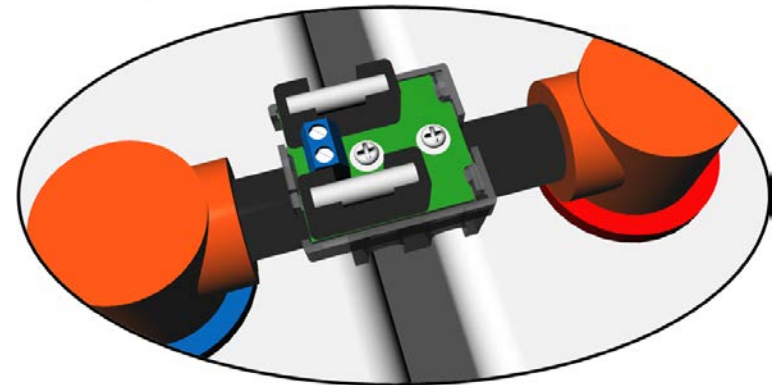
Dimensions (W×D×H): 128 × 61 × 35mm



Method to install 'two types of Clamp'



•In Bus-bar

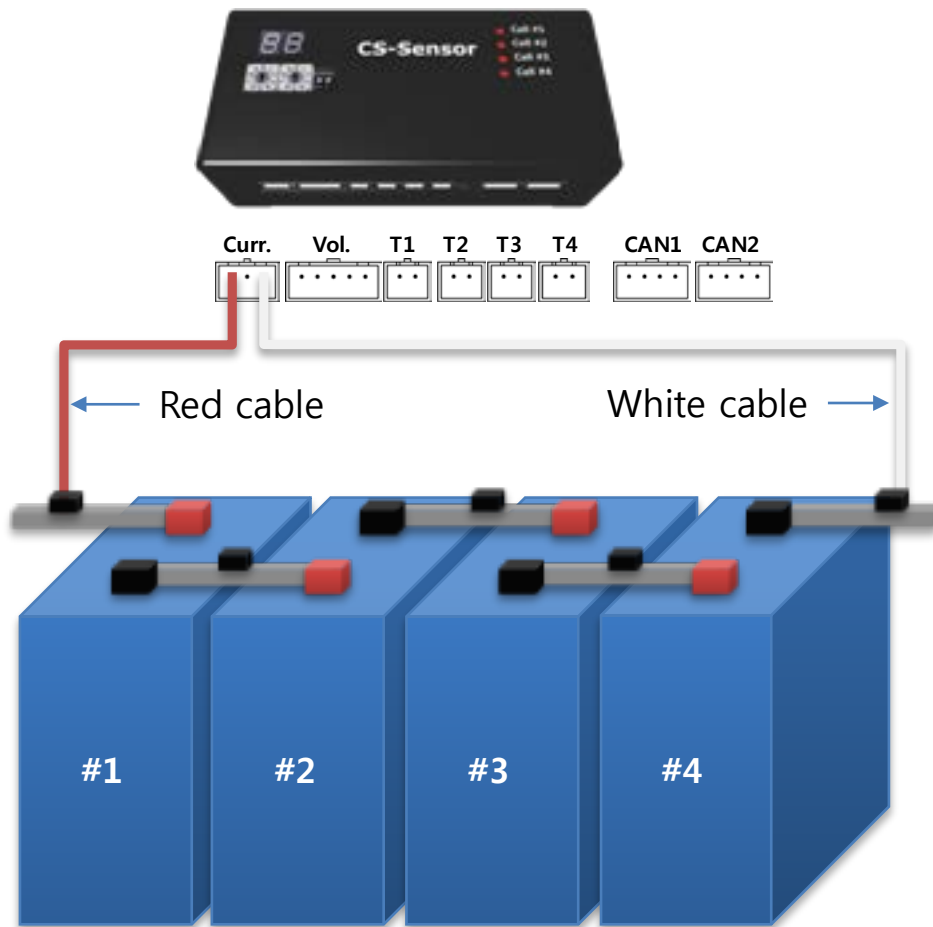


•In Cable-bar

3 Description of CellScan?

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[Procedure] #1. Install to 'Current cables'

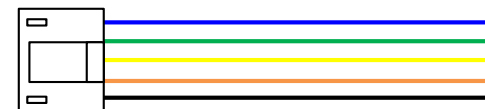
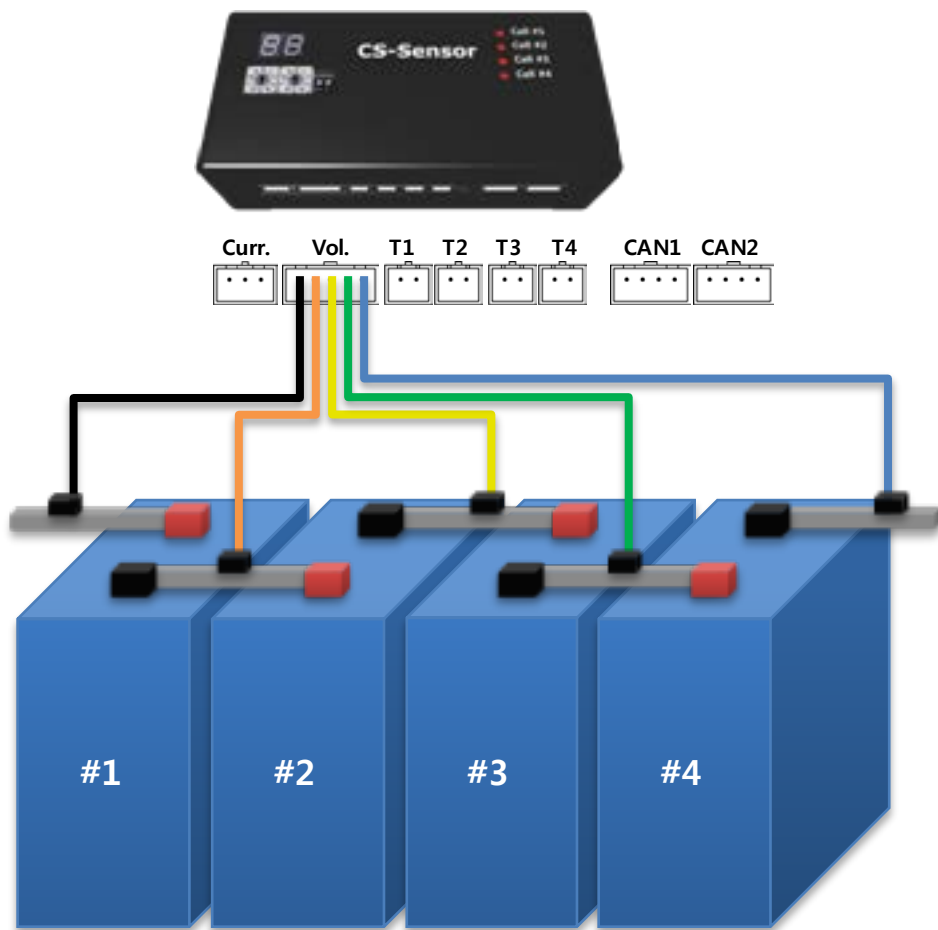


Pin	Color
1	Red
2	Not Used
3	White

3 Description of CellScan?

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[Procedure] #2. Install to 'Voltage cables'

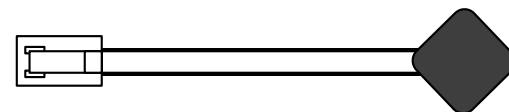
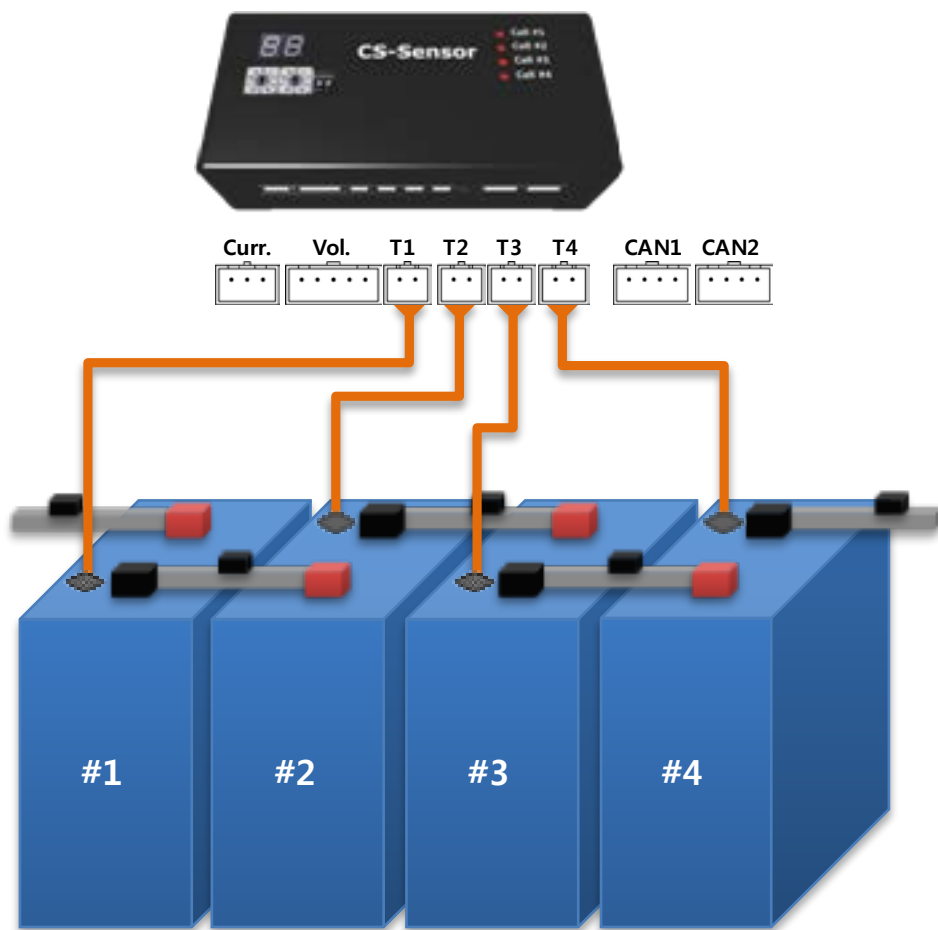


Pin	Color
1	Black
2	Orange
3	Yellow
4	Green
5	Blue

3 Description of CellScan?

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[Procedure] #3. Install to 'Temperature sensors'

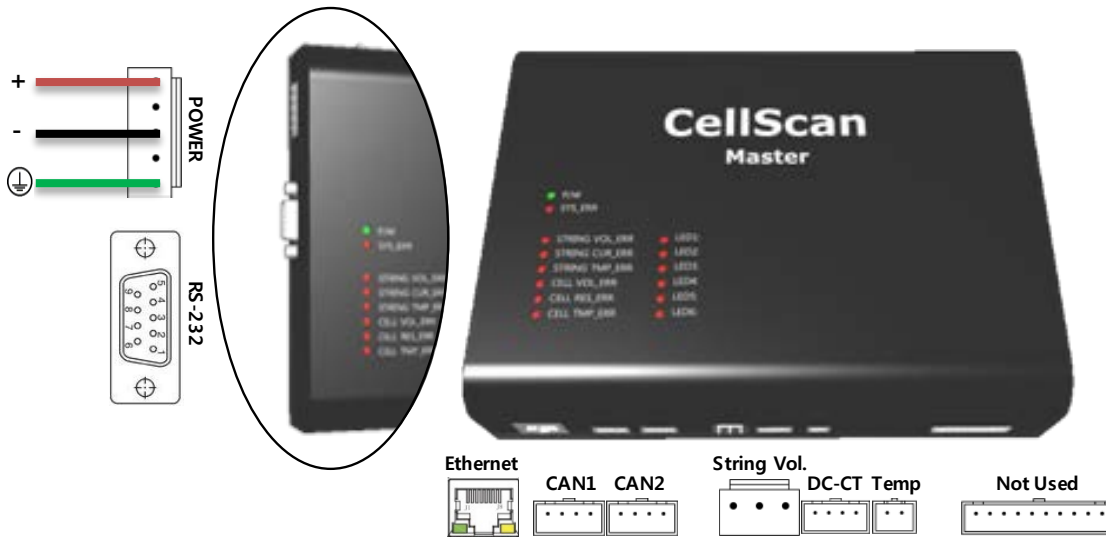


Pin	Color
1	Black
2	Black

3 Description of CellScan?

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[Procedure] #4. Install to 'Power to Master'



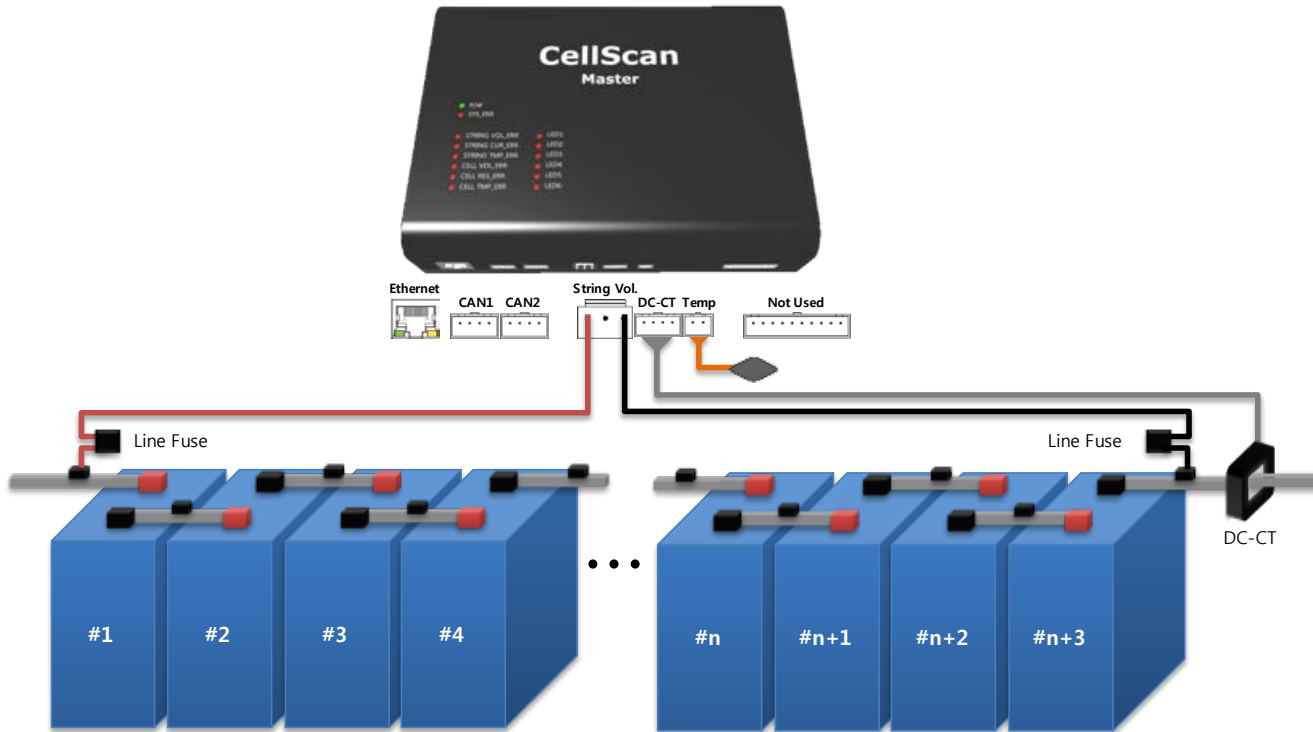
Pin	Color
1	Red
2	Not Used
3	Black
4	Not Used
5	Green

DC(12V, 24V, 48V), AC 옵션

3 Description of CellScan?

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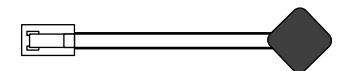
[Procedure] #5. Install to 'CT & PT to Master'



Pin	Color
1	Red
2	Not Used
3	Black
4	Not Used
5	Green



Pin	Color
1	Green
2	Blue
3	Not Used
4	Red

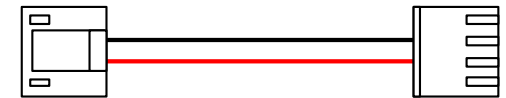
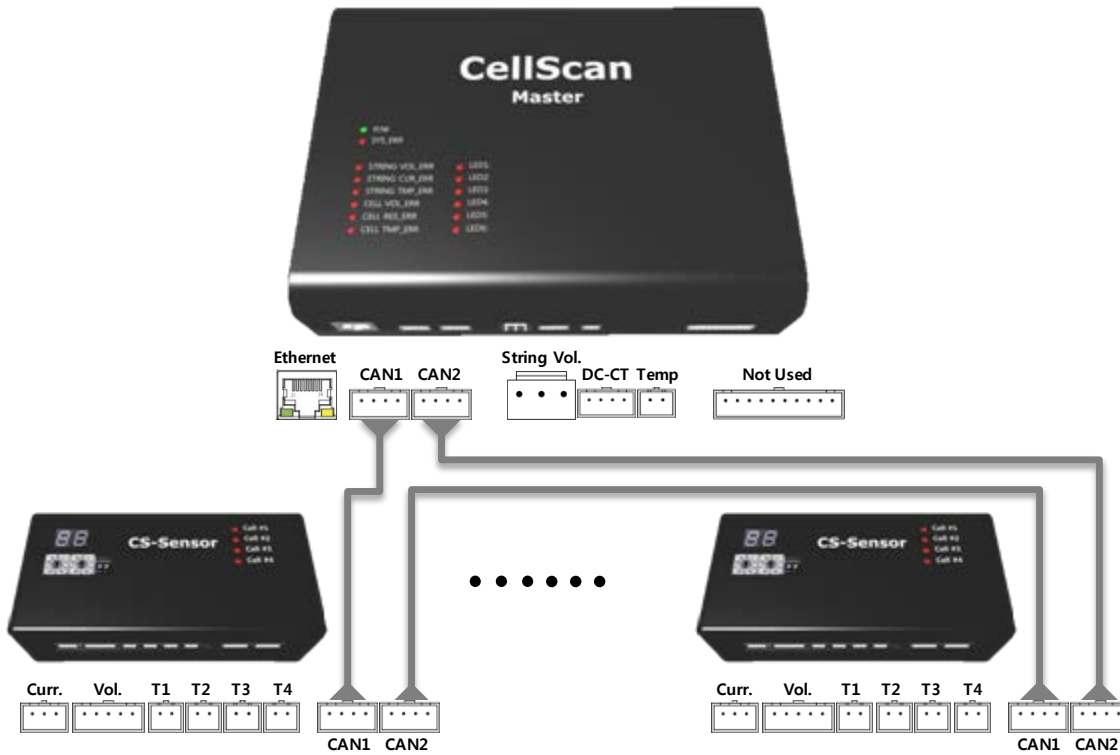


Pin	Color
1	Black
2	Black

3 Description of CellScan?

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[Procedure] #6. Install to 'CAN bus cables'

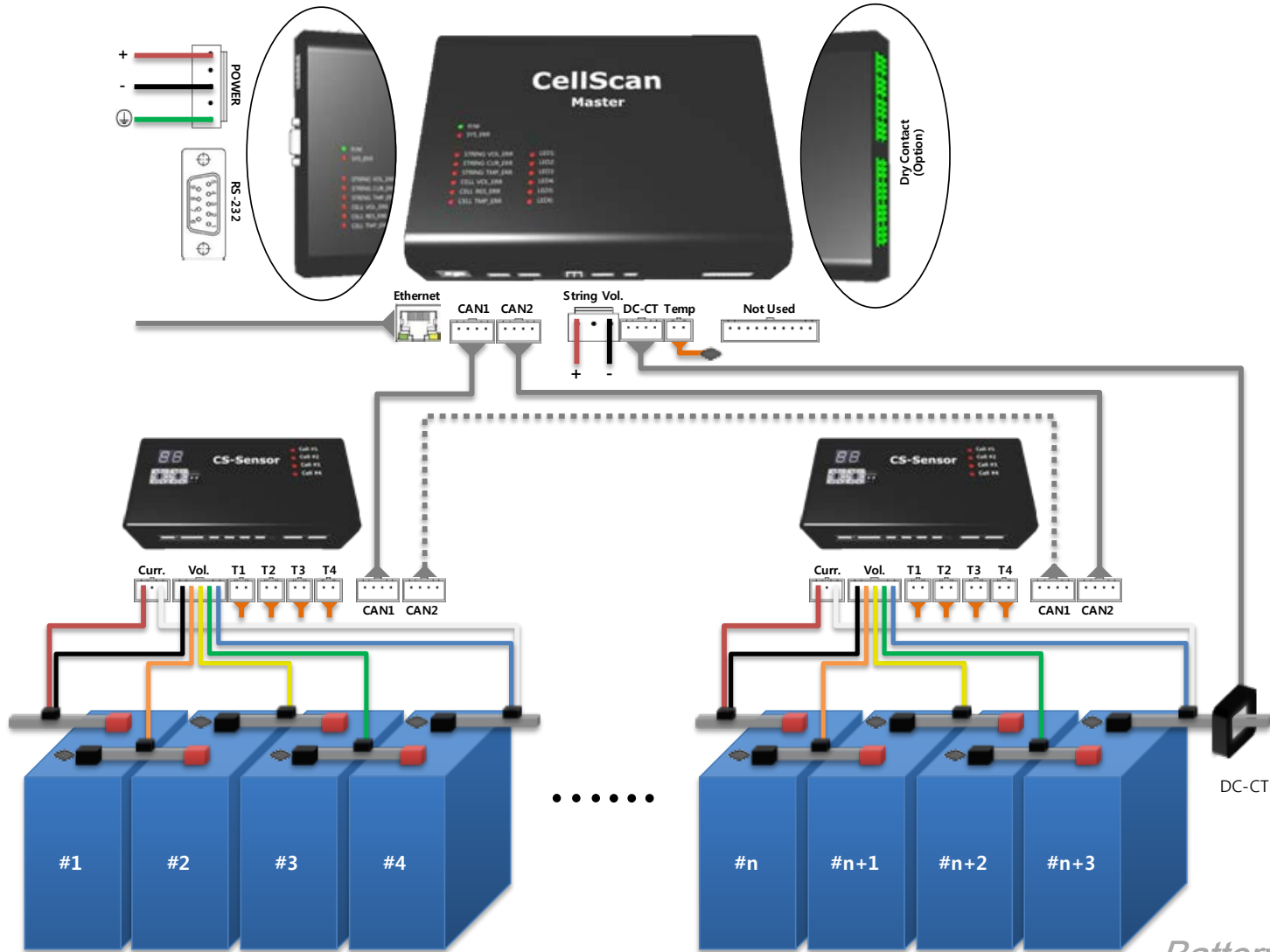


Pin	Color
1	Not Used
2	Red
3	Black
4	Not Used

3 Description of CellScan?

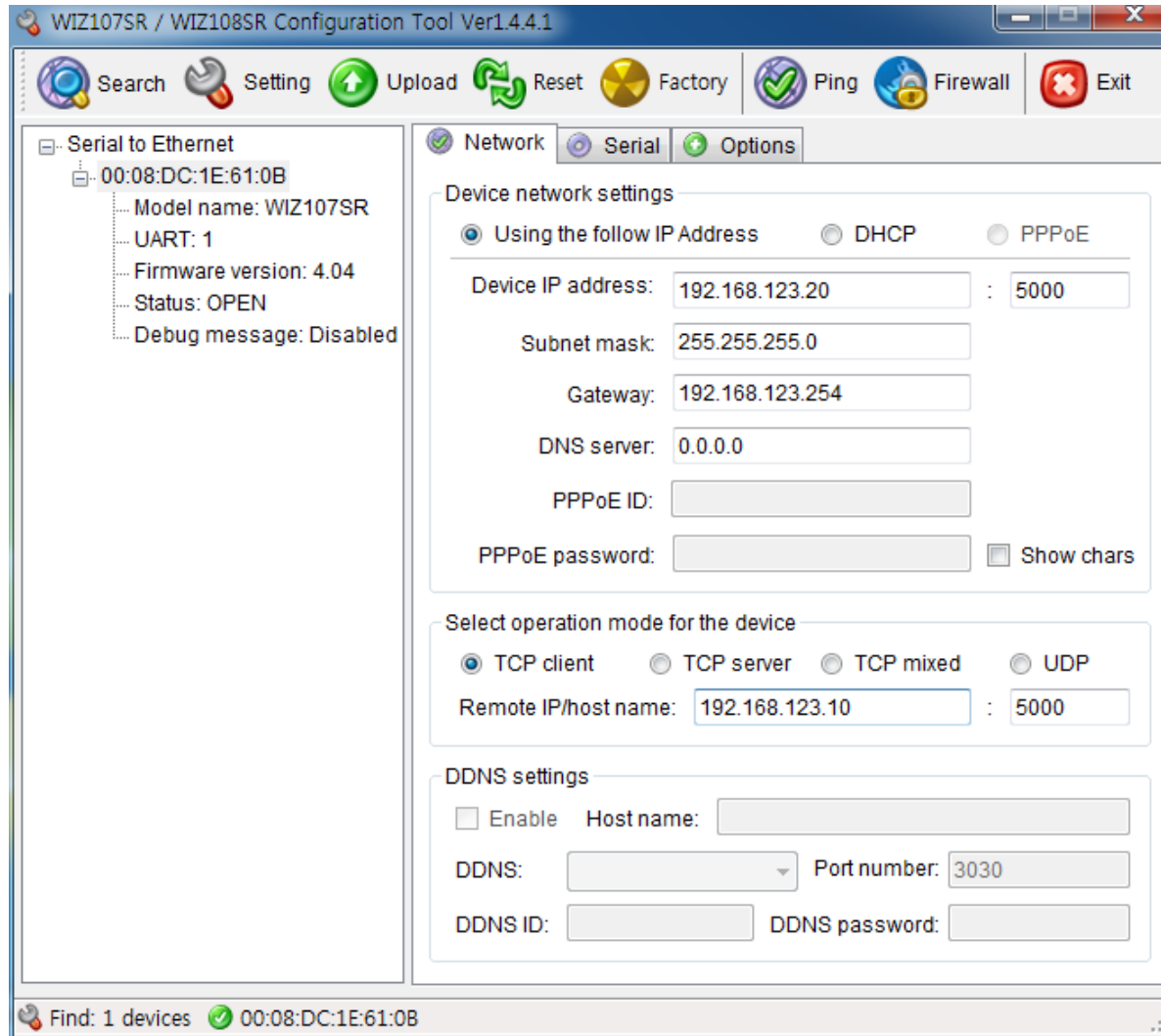
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[Procedure] #7. Overall line diagram finished

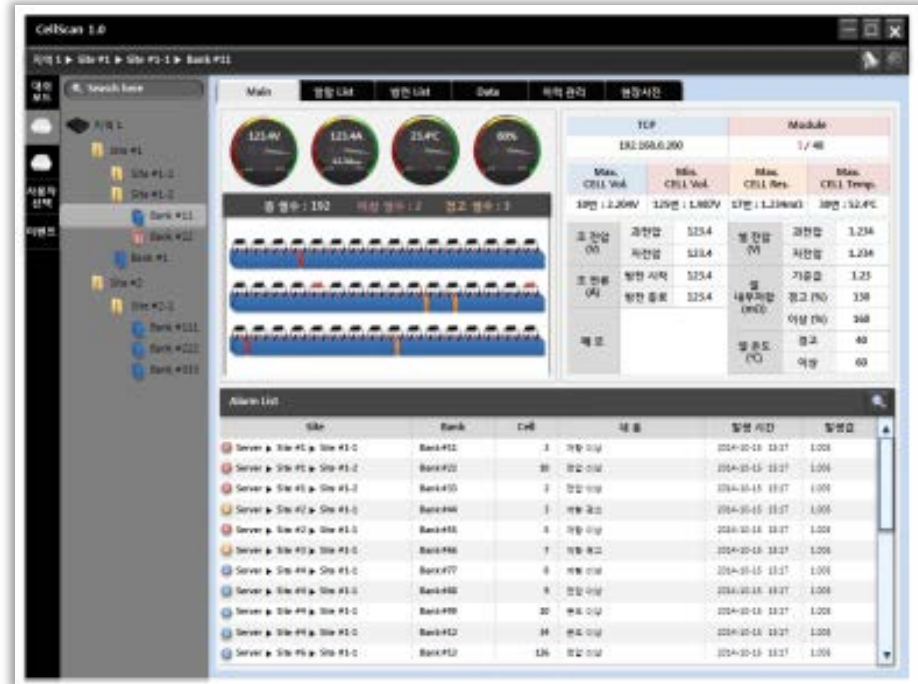


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[Procedure] #8. Network setting

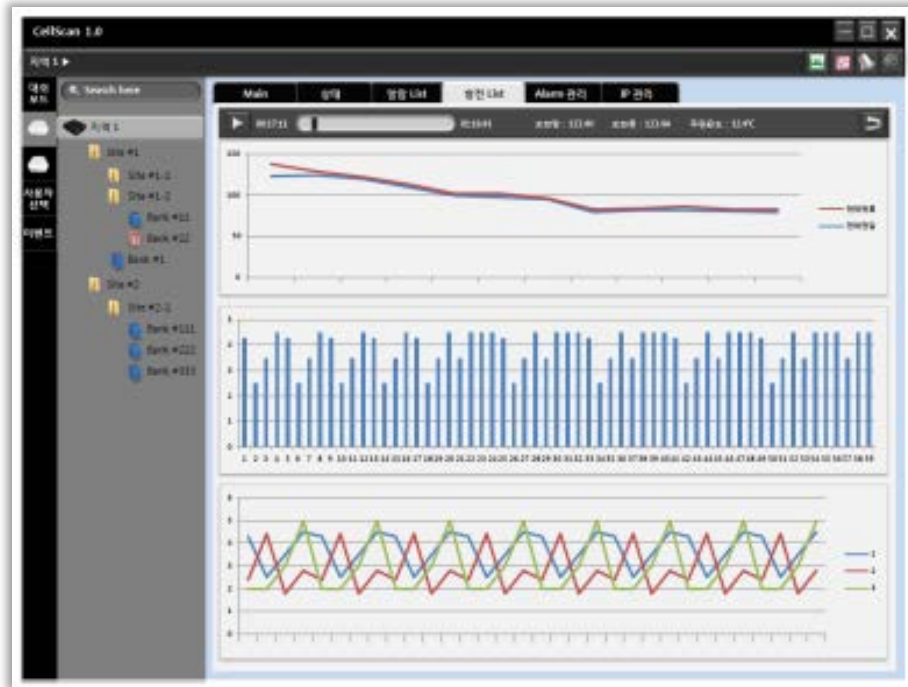


[Procedure] #9. Sample of Monitoring program ▸



- ▶ To monitor the measured data by CellScan analysis program in a real time.
- ▶ To show all statistical data on all strings of batteries measured by CellScan.
- ▶ To show all alarm list in a real time and to record all history to operate.
- ▶ To supply e-mail and SMS service (option)

[Procedure] #9. Sample of Monitoring program



- ▶ To show each Voltage, Temperature and Internal-Resistance measured.
- ▶ To show save a all measure data on a discharging and history information.
- ▶ To show the function of a discharging re-play.
- ▶ To show a charging and discharging current and ripple current (waveform & FFT analysis).

Technical specification of Master

Sort	Item	Description
System Capacity	Max q'ty of sensor	100 Sensor per 1 Master
	String current and voltage	Each 1 pcs
	Comm. port	CAN bus (2) to make Ring, Ethernet (1), RS-232 (1)
	Ambient temp.	1 pcs
Measuring Speed	String voltage	0.1 sec
Range & Accuracy	String voltage	~ 1,000VDC / $\pm 0.5\%$ of full scale
	String current	~ 1,000ADC / $\pm 1.0\%$ of full scale
	String ripple current	~ 1,000Ap-p / $\pm 5.0\%$ of full scale
	Ambient temp.	- 20 ~ 80°C / $\pm 1^\circ\text{C}$
Resolution	String voltage	0.1V / 0.1A String current
	String ripple current	0.1Ap-p / 0.1°C Ambient temperature
Dimensions & Environment	Dimensions	200 × 150 × 34mm (45mm)
	Environment	Temperature: 0 ~ 50 °C / under Humidity: 80%RH
Features	<ul style="list-style-type: none"> •A Master can connect with 100 sensors and measure string-voltage, current, temperature and ripple current. •A Master transforms the measured data into Ethernet data and transfers it to Server. •A Master show an abnormal status of power and system, string voltage/current, ambient temperature, cell voltage/current/internal resistance and user defined alarms (6 pcs) 	

Technical specification of Sensor

Sort	Item	Description	
Measuring Capacity	LV sensor	4 cell for 2V/4V/6V/8V sensor	LV or HV depend on cell or module's voltage
	HV sensor	3 cell for 12V sensor	
	Comm. port	2 lines of CAN BUS which is the high reliable.	
	Temperature sensor	4 pcs	
Measuring Speed	To measure each voltage and temperature on 400 cells		1 sec
	To measure an internal resistance on 400 cells		30 sec
Range & Accuracy	Cell voltage	~ 9.0V / ±0.1% of ±10mV (2V용)	
		~ 17.0V / ±0.1% of ±20mV (12V용)	
	Cell temperature	-20 ~ +80°C / ±1°C	
	cell internal-resistance	0.1mΩ (4,000Ah) ~ 100.0mΩ / ±2.0%	
Resolution	Cell voltage	1mV	
	Cell temperature	0.1 °C	
	cell internal-resistance	0.001mΩ	
Dimensions & Environment	Dimensions	128 × 61 × 35mm	
	Environment	Temperature: 0 ~ 50 °C / Humidity: less 80%RH	
Features	<ul style="list-style-type: none"> •When the digit of CAN ID flash, CAN bus is abnormal. •When CAN ID and its communication are abnormal, it will be displayed. •The measuring period on cell voltage and temperature is (1 sec), and to measure an internal resistance on all cells is (30 sec) in maximum, which are changeable. 		

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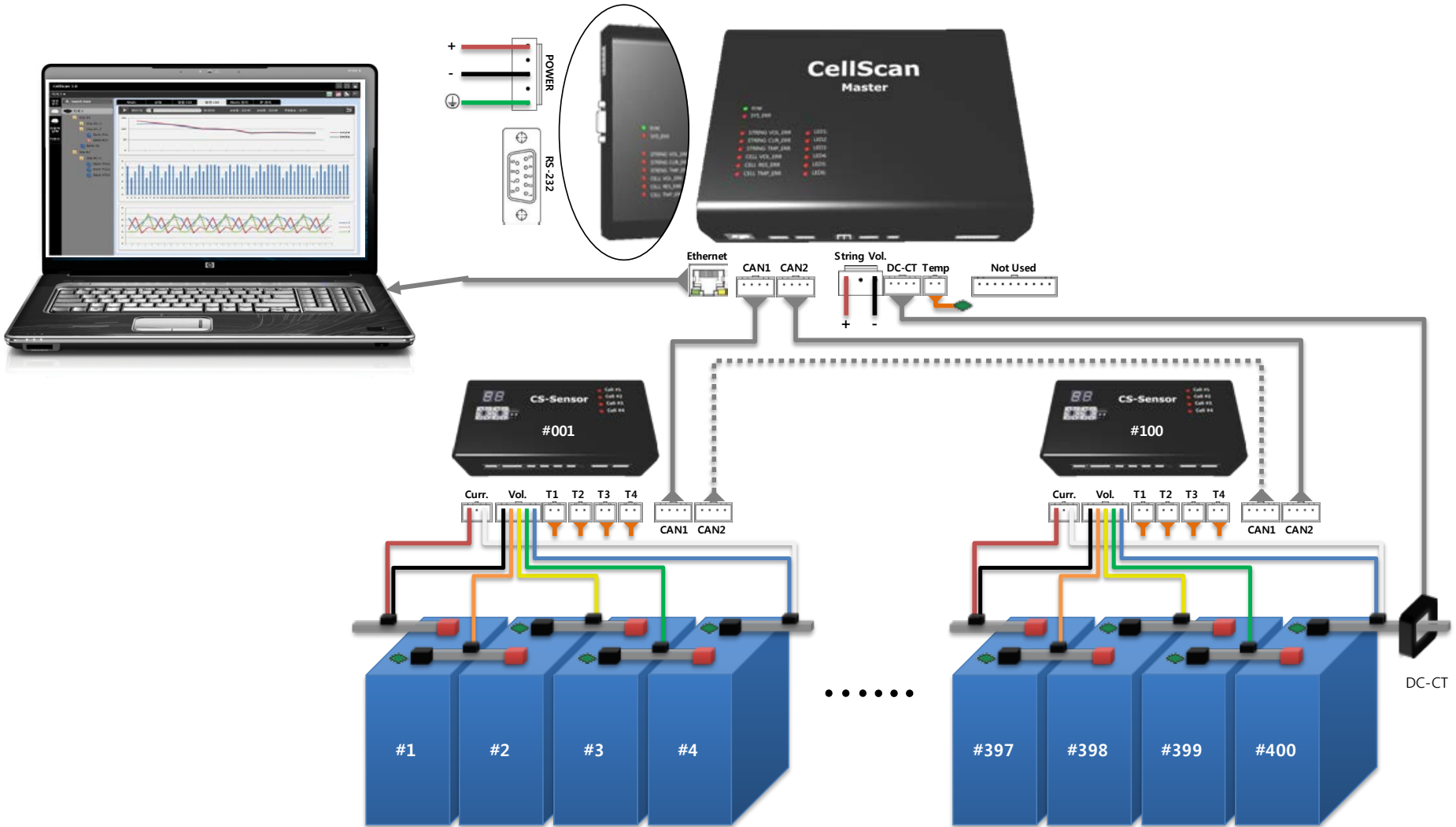
4 **Options of CellScan?**

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4 Options of CellScan?

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[Configuration] #1. Standard BMS

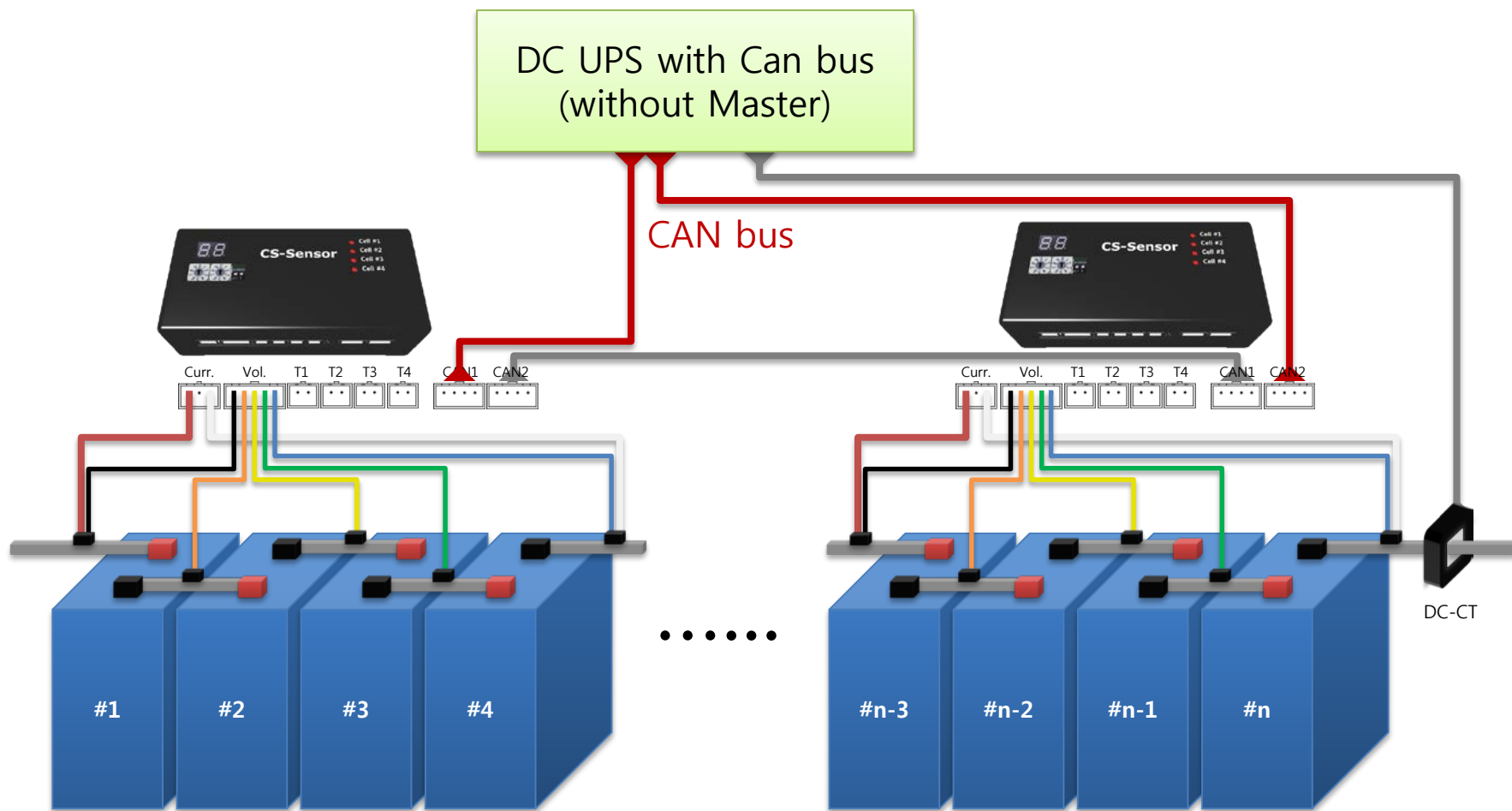


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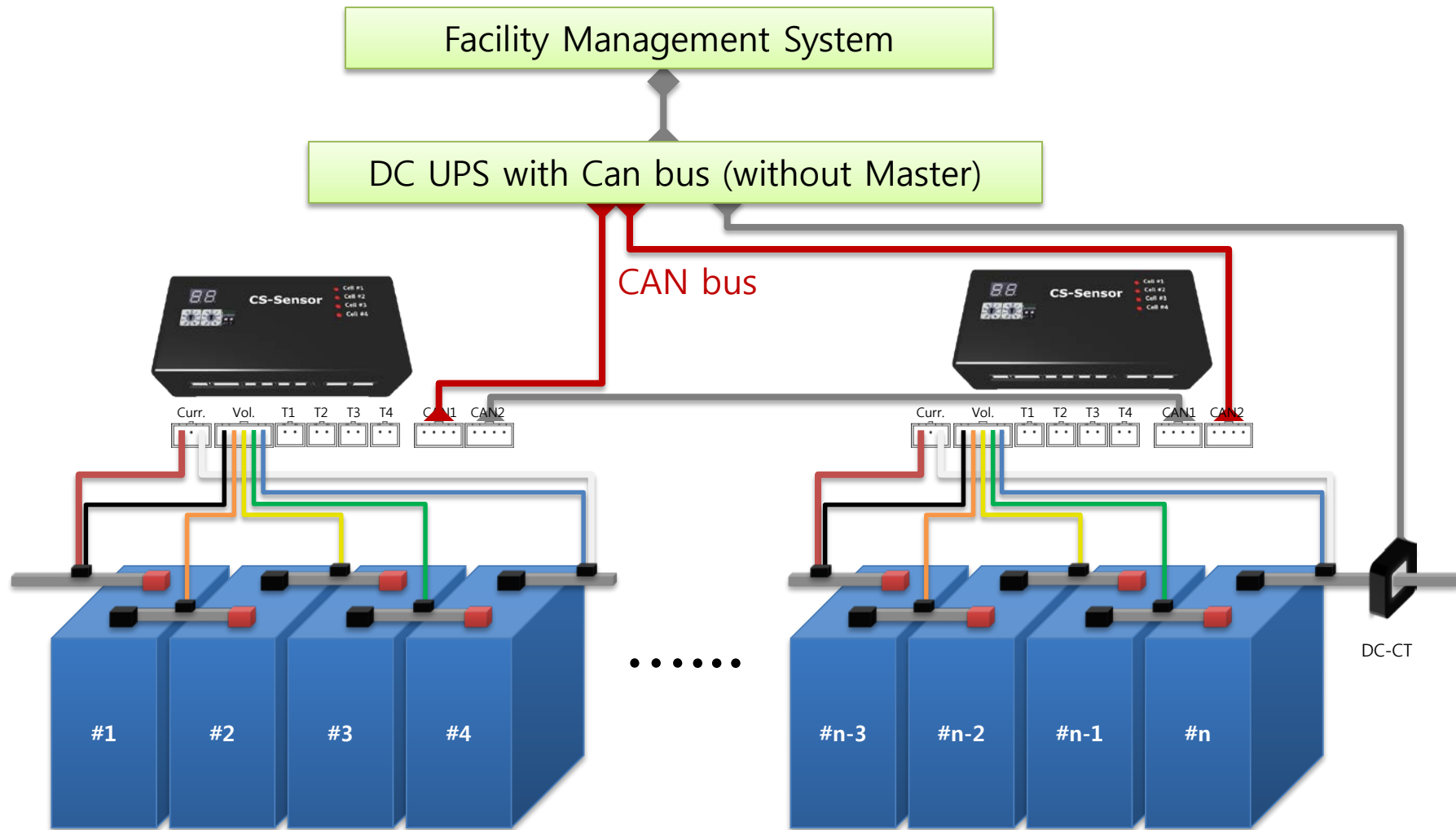
[Configuration] #2. To link with UPS by CAN bus directly



4 Options of CellScan?

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[Configuration] #3. To link with FMS by CAN bus directly



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Introduction

How are you!

Let me introduce our company briefly!

Our company was established in June, 2014, and our plan to develop new CAN bus's BMS (Battery Monitoring System) was succeeded in Jan, this year. The overall term to develop new BMS is only 7 months, which is a short period because our all staffs of HW, SW and tool have been experienced over 10 years each on R&D.

We know that there are 10 sorts of BMS are on the market all over the world; some are old-technology and the others are new, but our product is the newest technology to overcome defects of existing ones.

We are sure to that the quality & price competitiveness is the best.

We are possible to supply OEM on a small amount of an order.

Please contact with me!

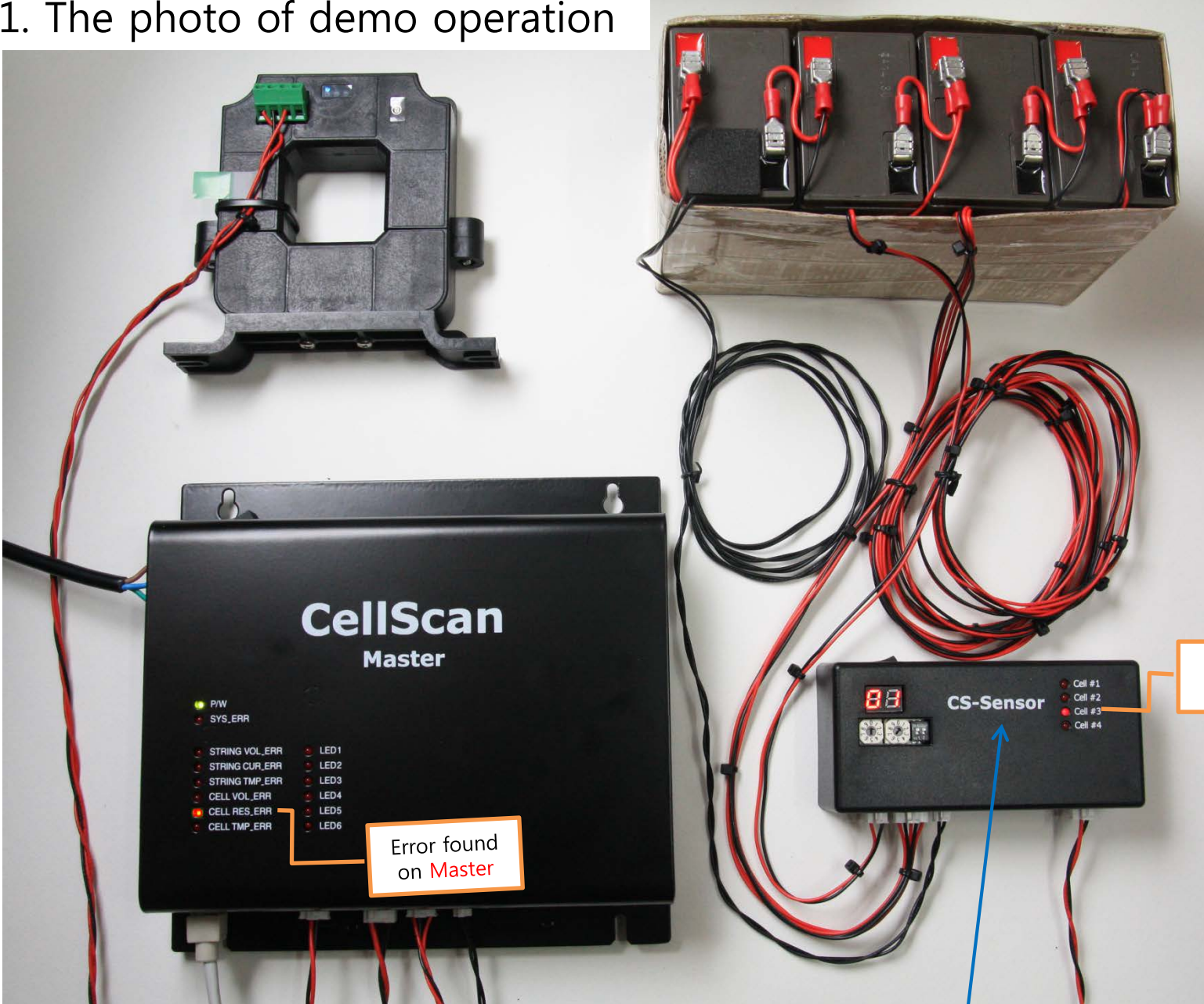
Charlie / CEO

82-10-2772-8315

charlie@batterytestlab.com

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Annex 1. The photo of demo operation



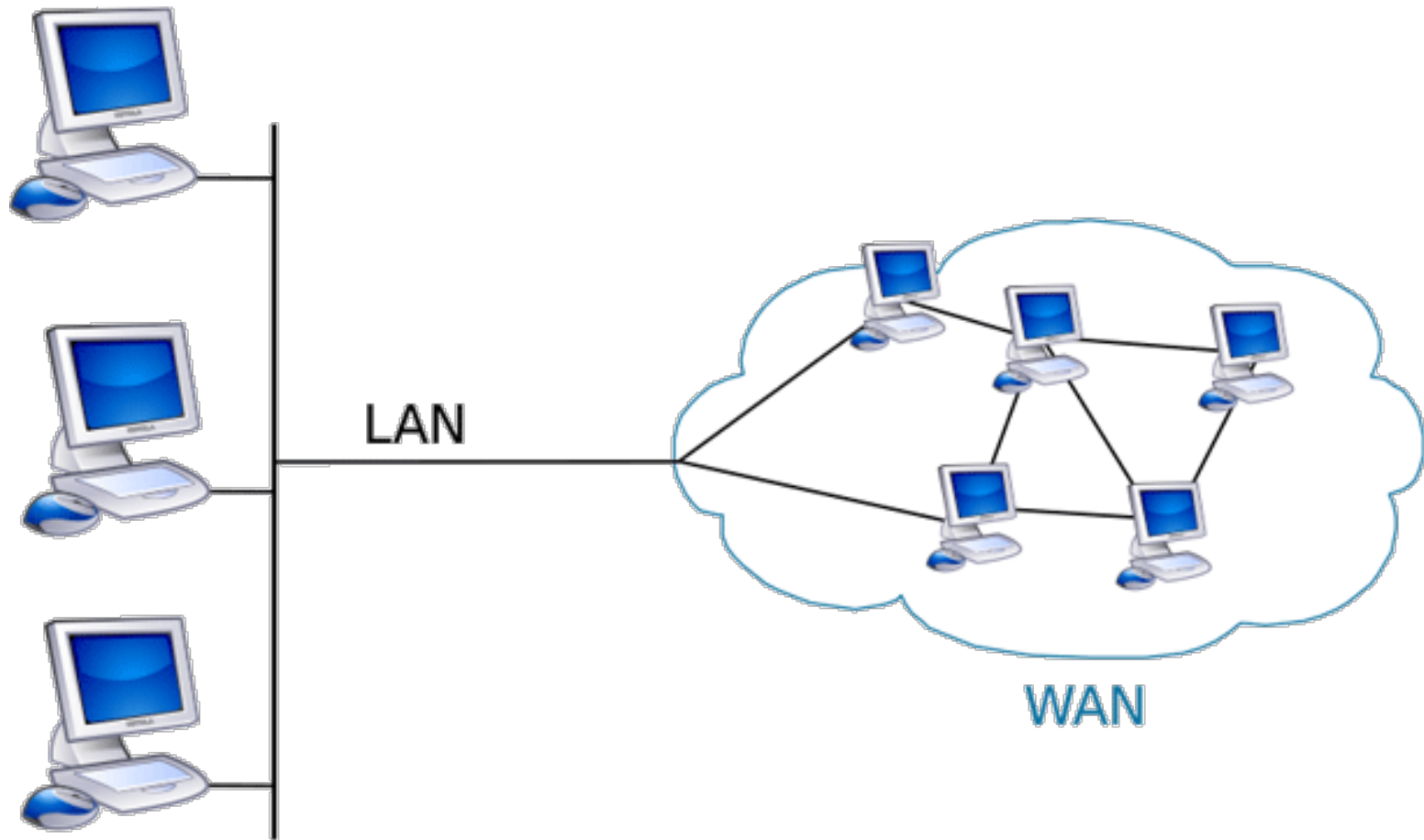
Error found on **Master**

Error found on **Sensor**

This sensor can measure '2N-3000AH, 0.1mΩ' at maximum in a floating charging.

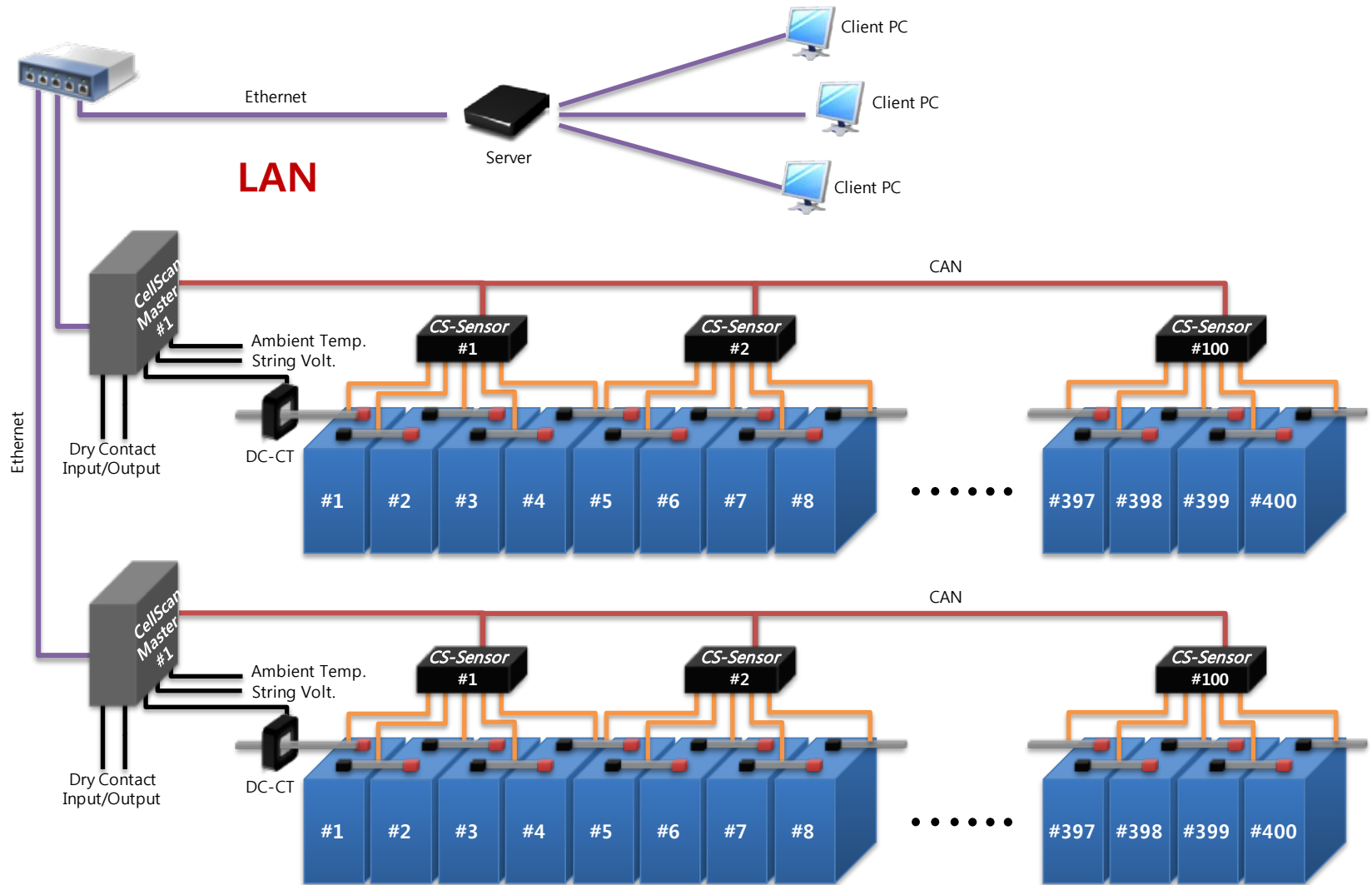
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Annex 2. LAN & WAN for Battery Monitoring System



- Many interconnected LANs can become part of a larger WAN.
- [http://www.diffen.com/difference/LAN vs WAN](http://www.diffen.com/difference/LAN_vs_WAN)

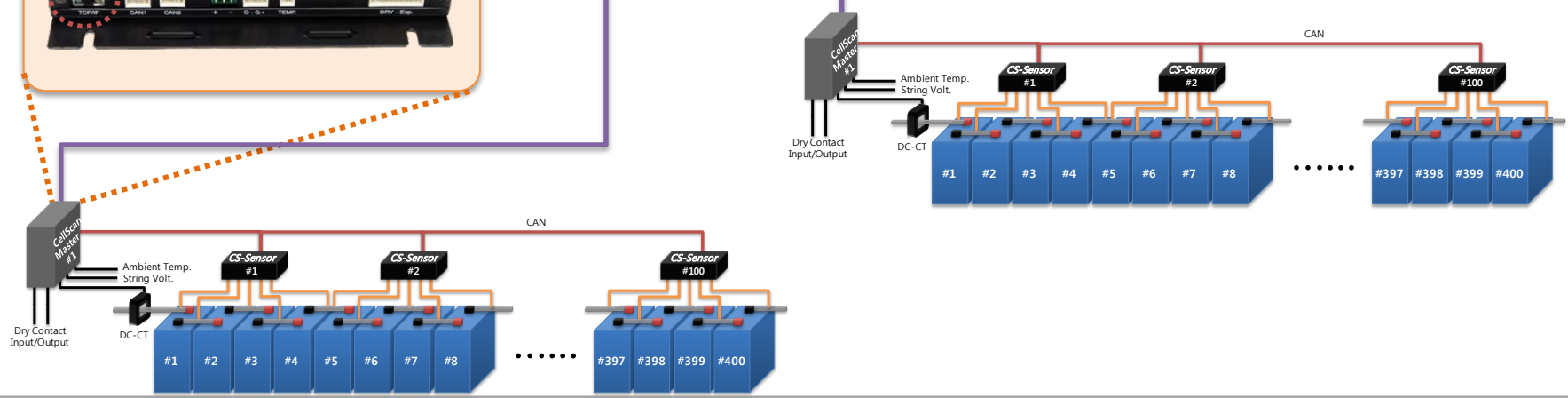
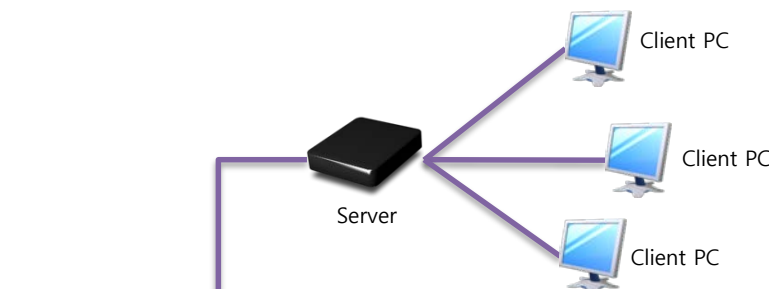
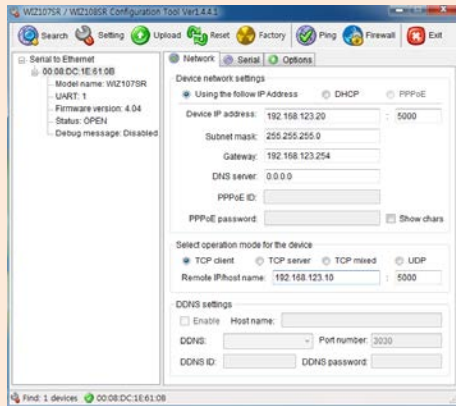
Block diagram of LAN (Local Area Network) For Battery Monitoring System



b.

Block diagram of WAN (Wide Area Network) For Battery Monitoring System

- Fixed IP & Server IP setup



b.