

Perfect-Integrated Lightning Surge Protection Solution for Military Tactical Operation Vehicle Systems by <eca3G>

- Perfect surge protection without lightning rod, grounding rod -

the 3rd **Generation Digital** Grounding Apparatus
for Perfect Lightning Surge Protection
without burying Ground

US PATENT 7,652,865 B2 SIRIM TEST : IEC 61643-1



Nov 01. 2013

GROUND CO., LTD

GROUND Co., Ltd. Korea

◆ GROUND !

100% Lightning Protection, **100%** Assurance,
Quality Assurance for **10 years**. Promise to the customers

◆ **3,553** sites during **15** years, Protection success **99.88%**

- Apply KS C-IEC standard → perform equi-potential system

◆ **3RD** Generation Digital Lightning protection device

- World first Digital Lightning Protection Device not need to be buried in ground
- US Patent, International Patent, Korea Patent, SIRIM Test certificate

HQ : #209, Suntech-city 2, 52, Sagimakgol-ro, Joongwon-Gu, Seongnam-si, Kyunggi province

Factory, R & D : 960, Deokgum-ro, Keumwang-eup, Eumseong-gun, Chungbuk

TEL : +82-2-572-0008 **FAX :** +82-2-572-3224 **Factory :** +82-43-883-2374

E-mail ground@ground.co.kr

◆ **eca3G** Effects for Mobile Military Operation Vehicles

Lightning Damages Review for Military Tactical Communication Vehicles, Shelters

- During field operation, mostly Vehicles/Shelters are at higher places such as mountain top, higher possibility of direct lightning rather than lower places.
- Difficult to maintain external lightning rod, grounding rod because of mobility limitation.
- Potential difference occurs from separate located Generator.
- In general, High grounding resistance at field area.

1. Mobile Shelter Vehicles do not need to install Lightning Air Terminal.

- a) Vehicles under 20M height do not need lightning rod.
- b) Mostly, Shelter vehicles are covered by steel plate over 0.5 mm thickness which can be Natural conductive component as Lightning Rod, and can accept direct lightning as like normal lightning air terminals .
- c) Metal sheet covered shelter provide Faraday Cage Effect, no need lightning rod for physical damage.
But induced surge can intrude via external communication line or power supply line from generator into electric, electronic, communication systems in the vehicle. <eca3G> can provide perfect equipment protection and human being protection from electric shock .

2. With <eca3G>, Mobile Shelter Vehicle does not need to install Grounding Rod,

and will secure perfect lightning protection for the systems in the vehicle with common grounding, equi-potential environment.

- <eca3G> / 3RD Digital Lightning Protection Device with grounding element will be installed at DB
- Eliminate intruded surge via power supply line from the Generator, external Power source
- All the grounding points of equipment will be connected to MGB (Main Ground Bar) at <eca3G> as equi-potential unit to form equi-potential / common grounding , which enable to solve induced surge troubles and potential difference problem from the power supply source.
- <eca3G> has US patent as the grounding device which not need to be buried, no need to install grounding rod, support fast, efficient military operation.

* These are proved at various Military Operation Vehicles in Korean Army, Navy and Air force.

◆ CONCLUSION

Army → Always complete combat readiness

- ◆ Equipment damages by induced surge, reverse surge intrusion
Electronic, Electric, ICT system damages / causing system mul-function
- ◆ Install **eca3G** (3rd generation digital surge protection device)
 - Perfect protection from induced surge, reverse surge
 - Bad weather, lightning, thunder cloud alert → normal operation
 - ▶ 24 hours operation of C4i SR systems
 - Healthy operation, reduce maintenance cost → economic army operation

Field Test for < eca3G > effect

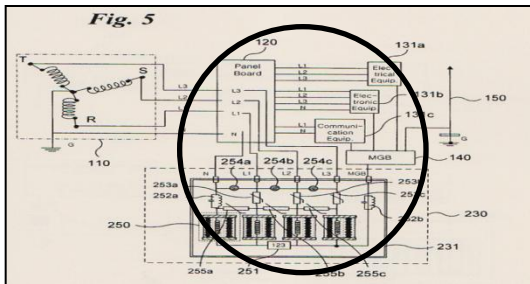
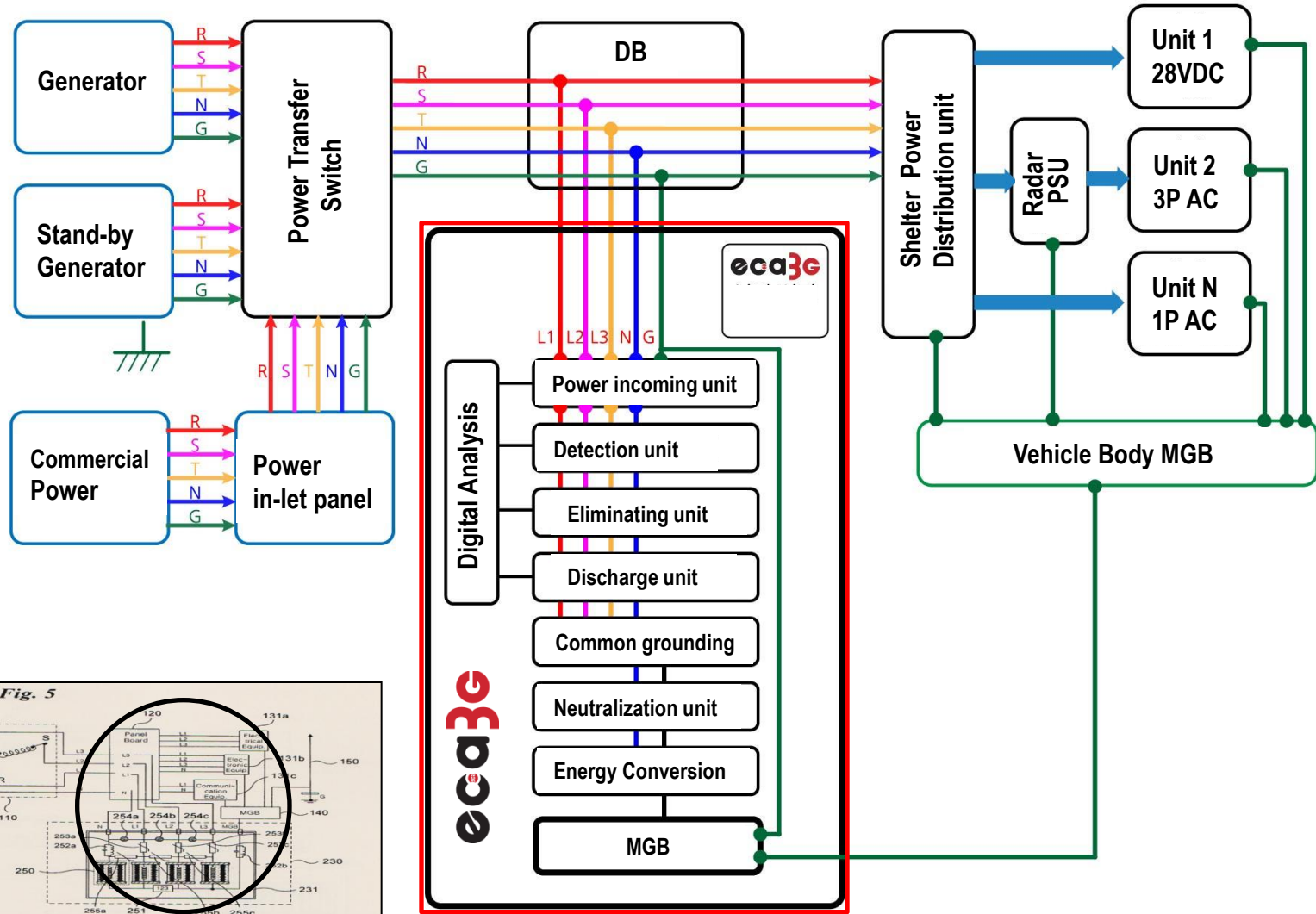
- * Tested by 00 Communication Unit, 000 Battalion, 00 Company
- * Tested during Team operation exercise at 2008.
- * Test : Communication quality test during FTX Exercise with <eca3G>
- * Tested Equipment : UHF Multi-channel
 - Local Level : -57dBm / Local & Remote receiving power -76dBm.
 - BER : OE-6 (error rate) / no error from one million
- * Test result of communication quality
 - There is no electric static, electric shock after install <eca3G>.
 - No Communication quality drop under many parties access.
 - Enable for rapid force deployment, because no need to install grounding rod.
 - No need to install / remove the grounding rod, no need to get low earthing resistance.
 - * very good at frozen ground during winter season exercise .



<Measure communication quality>

표시 내용	설 명
LOCAL -76 0E-6 REMOTE -76 0E-6	● 자국과 타국의 수신세력이 -76dBm 이며, 현재 BER은 데이터 100만개 중에 에러가 하나도 없음을 나타낸다.
LOCAL LEVEL -75 [||||||| ] BER : 0E-6	● 자국의 수신세력이 -75dBm 이며, 현재 BER은 데이터 100만개 중에 에러가 하나도 없음을 나타낸다.
REMOTE LEVEL -75 [||||||| ] BER : 1E-6	● 타국의 수신세력이 -75dBm 이며, 현재 BER은 데이터 100만개 중에 에러가 1개 있음을 나타낸다
REFLECTED POWER 5%	● 송신 출력 대비 반사파의 비율이 5% 양을 나타내며, 안테나가 양호함을 나타낸다. ● 30% 이상이면 케이블 및 다이플, 케이블 견박선 등을 확인이 필요합니다.

◆ eca3G Configuration in the Vehicle



About **eca3G**

the 3rd **Generation Digital** Grounding Apparatus
for Perfect Lightning Surge Protection
without burying Ground
US PATENT 7,652,865 B2
SIRIM TEST : IEC 61643-1

eca3G 3rd Generation Digital Lightning Protection Device

◆ **3,553** sites for **15** years with **99.88%** success rate

- ▶ Do not need to be buried in Ground,
- ▶ Eliminate lightning current, abnormal current via energy conversion
- ▶ Common grounding → form equi-potential environment
- ▶ Real-time function monitoring / alert (optional)

24 hours Power-On / Normal Operation under bad weather

Total Integrated Lightning Protection System



◆ Comparison of Grounding Rod and

item	Grounding Rod	eca3G
Technical Measure	Isolate Grounding (TT)	Common Grounding (TN)
	<ul style="list-style-type: none"> ▶ Grounding Rod discharge surge current to the ground which is isolate grounding (TT), may occur secondary damages to neighbor systems which are connected by grounding cable, communication cable, and ground . ▶ < eca3G > provide common grounding (TN) linked with electricity supply circuit. ▶ Common grounding is meet with international standard (IEC, ITU etc). 	
Electrical Measure	Physical function	Electric Circuit operation
	<ul style="list-style-type: none"> ▶ Existing grounding system is to discharge noise source of protecting equipment to the ground, or provide route for noise source electricity with bonding each grounding point by conductive metal. ▶ <eca3G> provide reference potential (ground level) of electric circuit consist of electric, electronic components, and provide the route of electric circuit system to block noise source generation, 	
Grounding Performance	Earthing resistance value	Potential : zero ground level
	<ul style="list-style-type: none"> ▶ The performance of existing grounding is evaluated by the earthing resistance level (low or high). ▶ <eca3G> is defined whether potential of electric circuit ground is near to ZERO, and is targeting to get the potential below 0.05V. 	
Noise treatment	Discharge to the Ground	Energy conversion unit
	<ul style="list-style-type: none"> ▶ Noise treatment by existing grounding rod is to discharge noise to the contacted ground. ▶ <eca3G> is the grounding device not buried in the ground, minimize intrusion of unnecessary noise from the ground, eliminate via energy conversion in the electric circuit. 	

◆ eca3G application effect on Army operation

◆ Functional side

- ▶ Perfect lightning protection from Lightning current, Surge current.
- ▶ Built-in diagnosis unit enables real-time monitoring of protection function.
- ▶ Portable grounding device, eco-friendly lightning protection system not to be buried
- ▶ SPD function to eliminate Surge, Electrostatic, Noise with common grounding device to make equi-potential environment.

👉 3,553 successful sites during 15 years · 99.88% success rate · 100% assurance

◆ Mission performance side

- ▶ 24 hours operation under bad weather, thundercloud alert without power off
- ▶ No need to install/remove during operation, winter season 👉 immediate operation
- ▶ Rapid, accurate, efficient communication 👉 trusty command and communication
- ▶ Secure constant operation capability without troubles

◆ eca3G application effect on Army operation

◆ Operation side

- ▶ Stable power supply, efficient system operation ➡ 24 hours Operation
- ▶ Protect human from electric shock, electrostatic , provide comfortable operation
- ▶ Install on the ground, enable to provide perfect maintenance
- ▶ Built in diagnosis function to check abnormal status of <eca3G>
- ▶ 2 years After Service

◆ Economical side

- ▶ No need to install Grounding Rod => no installation cost, effort
- ▶ No lightning rod, No grounding work, No SPD=> perfect protection with eca3G
- ▶ Equipment protection from lightning, secure long life operation => save cost
- ▶ Very low operation cost of eca3G (below 5W), long life design
- ▶ 100% assurance and PL insurance (max usd 1mil in Korea)/ economic loss.

◆ INTRODUCTION

* **eca3G (eka three G) is :**

- Energy Conversion Apparatus 3RD Generation
- US Patent : Grounding Device not need to be buried in Ground
(US PATENT 7,652,865 B2)
- Total Integrated surge protection solution with grounding, equi-potential .
- Multi functional & Multi-coverage with Grounding + SPD+ Integrated Protection

* **Increasing Damages of Electronic Systems**

- Exposed to increase of more Lightning upon Global warming
- Advanced systems adopt more IC chips for Automation, Integration, Networking
- Integration level of IC chips high => weaker Resistance from external surges.

* **Right understanding for Lightning Protection Systems**

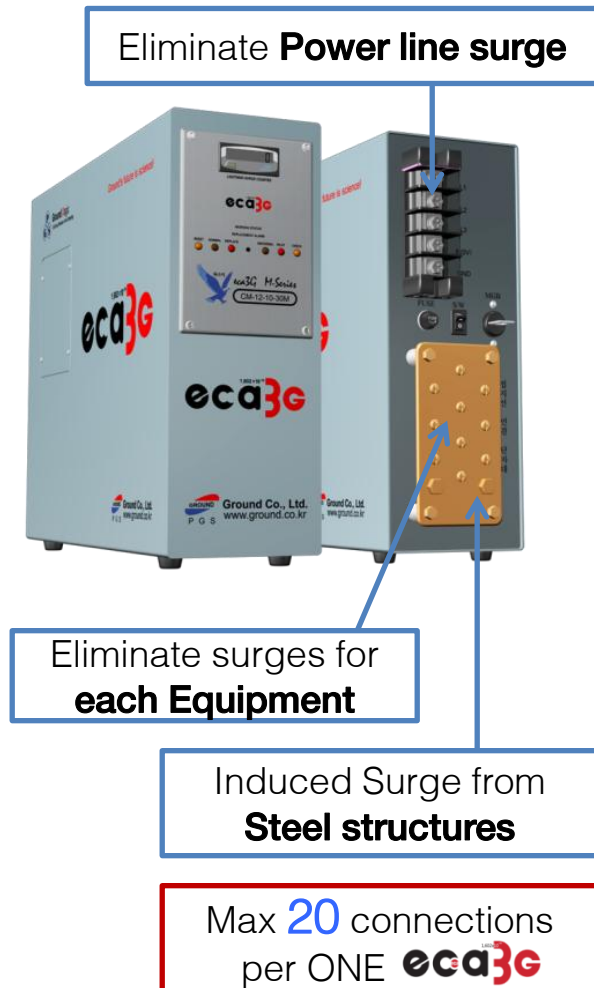
- Lightning Arrestor for physical strike damage, not protect electronic system.
- NOT Low earthing resistance => Proper Grounding system
- SPD cannot protect surges from ground, water pipe, conductive structures.

* **eca3G is the SOLUTION for *WHY SYSTEM EQUIPMENT STILL DAMAGED even AFTER INSTALLING ALL TYPES of Surge PROTECTION DEVICES for electronic, electrical, communication, telecommunication, automation systems, data center, broadcasting & radar systems, and so on including mobile shelters.***

◆ eca3G – Major Function

- US Patent : Grounding Device which not need to be buried in Ground
- Multi functional / Multi Coverage with Grounding + SPD+ Integrated Lightning Protection
- Integrated surge protection for electronic system, communication-IT system, instrumentation- control system, broadcasting system, radar system, PLC, CCTV surveillance system etc.
- Eliminate induced surge from power line, communication line, grounding line
- Eliminate induced surge from water pipe, gas pipe, conductive structures
- Eliminate induced surge from Ground / Grounding system (**GPR** : Ground Potential Rise), secondary surge discharged from SPD via energy conversion
- Perform grounding & surge protection function together
- Provide common grounding & equi-potential system
- Multi-Lightning response system (patent) – Global warming environment
- Grounding devise without burying in ground-easy & fast installation, transfer.
- Good for **Poor grounding environment i.e. island, rocky, hilly and highlands**
- Mobile vehicle system surge protection such as Mobile communication vehicle, RF testing vehicle etc in army, government.

◆ Integrated Perfect Lightning Surge Protection



WITH

- + Various kinds, numbers of Lightning Rods
- + Very low Earthing Resistance of Grounding
- + Numbers of Surge Protection Devices (SPD)
(each SPD has different characteristics, and SPD need to connect to GROUND)

CANNOT protect various systems, equipment from Lightning Surge
 from Induced Lightning Surge
 from Reverse surge
 from surges via steel structures, other conductive structures routes



- * Eliminate surges from Power Line, Data line
- * Eliminate Induced Lightning surge via steel structures
- * Grounding for each equipment with equi-potential to protect every equipment from any surges.
- * Protect from Induced lightning surge, Reverse surge
- * **US patented : eca3G itself is the Good GROUND**

◆ **eca3G** : eka three G

- * Energy Conversion Apparatus Third Generation
- * US Patent : Earthing Device which not need to be buried
- * Integrated surge protection with Grounding function
- * Integrated perfect surge protection, Enable to protect various surges from Power Line, Data Line, various equipments, steel structures, surrounding grounded conductive parts to cover all the possible surges.
- * One **eca3G** enable to connect to max 20 surge protection points.

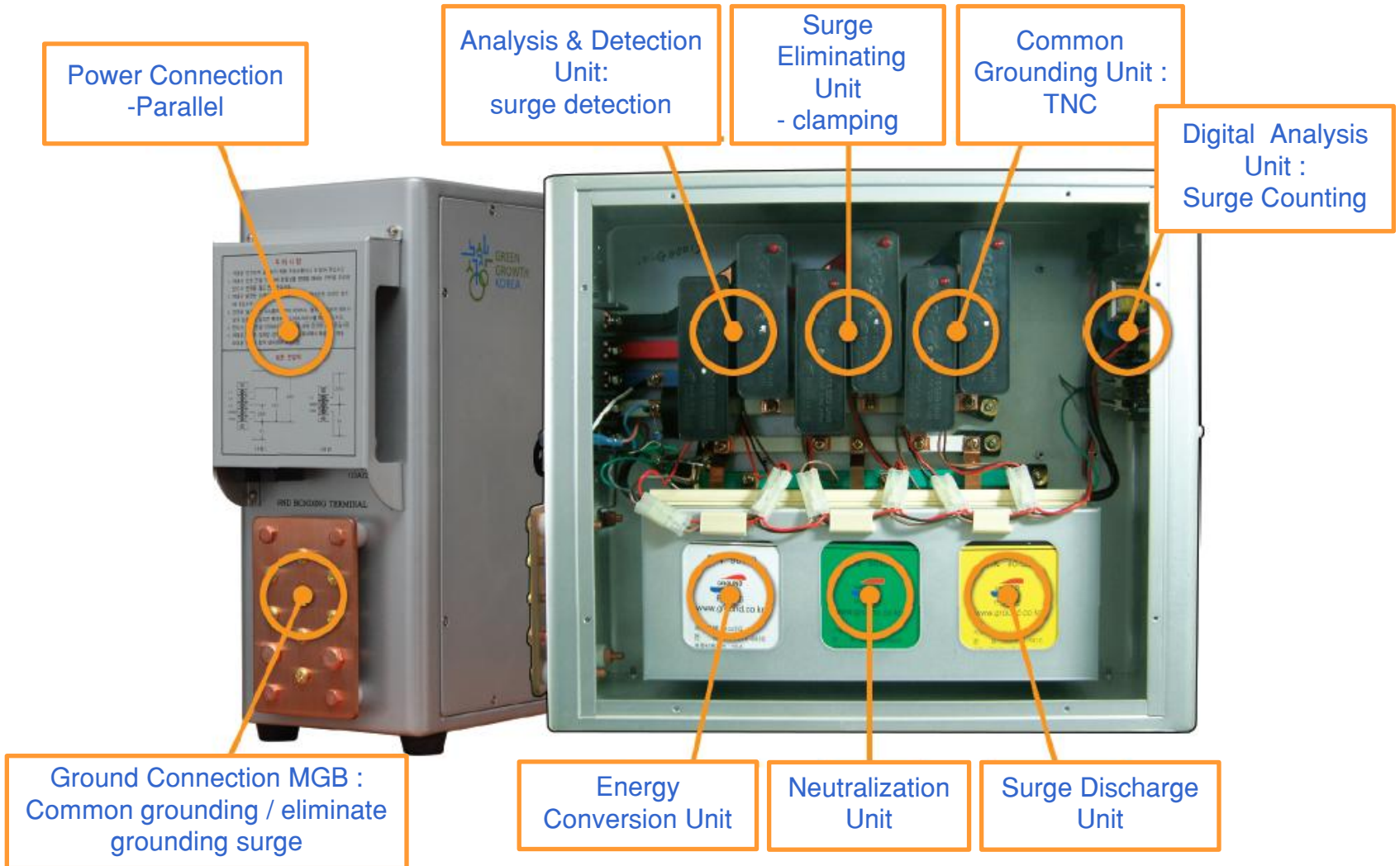
eca3G can detect surge, surge energy conversion, neutralize, eliminate all the surges which may enter into the systems via power line, data line, external conductive parts (such as water & gas piping lines, hydrant, steel structures) .

eca3G has energy conversion and neutralization function to convert electric characteristics of surge into arc, heat, neutralization, and eliminate the surges.

eca3G makes EQUI-POTENTIAL environment of all the equipment and conductive parts, etc , which improve earthing resistance automatically.

eca3G provide INTEGRATED SURGE PROTECTION to be able to connect max 20 points.

◆ eca3G Component Unit



◆ **eca3G** - 3rd Generation Digital Grounding Apparatus

3rd Generation Digital Grounding Apparatus

World First <3rd Generation Digital Grounding Device>
for perfect surge protection with neutralization energy conversion.

- 1) No dig in the ground to install, easy install (plug in plug)
- 2) Install on the ground, easily move the location.
- 3) Provide Product Liability Insurance to cover 100% warranty from lightning damages in Korea
- 4) No affect to environment and soil pollution without digging, environmental friendly. ISO 14001
- 5) Fast response for lightning protection
- 6) Neutralize electric characteristic energy conversions of lightning surges, eliminate
- 7) Eliminate induced lightning surge and prohibit abnormal voltage rising
- 8) Nano Carbon catalyst provide high frequency-low impedance characteristics

- 1) ISO Certificate - ISO14001:2004
- 2) CE-Certificate - No. PGS-0101 ~ 3
- 3) KETI Authorizes Test Report (Korea Electric Test Institute)
- 4) Advanced new Technology Venture Product - No. 061625231-1-00669
- 5) INNOBIZ Company Product - No. 6066-3249
- 6) Export Promising Company Product - No.2006-27
- 7) International patent - PCT/KR2006002907
- 8) Patent Registration - No. 10-0599359
- 9) SME Performance Certificate - No. 27-098
- 10) Superior Supply Certificate to the Government - No.2007093

11) US PATENT No. : 7,652,865 B2

◆ Surge Protection Device covers 17% of Surge only

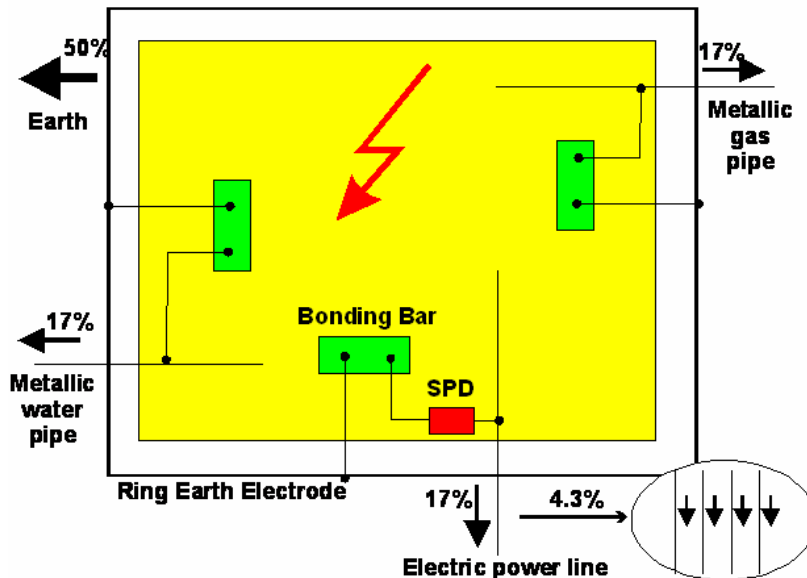
IEC 61643-1. Annex A. Fig A.1 : General distribution of Lightning current

Abt 50% of total Lightning current enters into the earth termination of the lightning protection system of the building, the OTHER 50% is distributed among the services entering the building, such as external conductive parts such as steel structure, water piping, gas piping and communication lines, etc (33%), and electric power lines (17%).

SPD only can protect surges from power line(17%), **eca3G** can protect from most of 50% Surges

IEC 61643-1 / Annex A (informative)

Consideration for SPDs when Class I Tests are to be applied



IEC 61643-1. Annex A. Fig A.1

Determining the current distribution through SPD in case of direct lightning to the structure equipped with an external lightning protection system, **17% of current is via power line which may be protected by SPD.**

SPD' capacity is designed as below : 17% for power line surge, each R.S.T.N line take 4.3% of 17% lightning current

SPD has no coverage for the other surges via Gas & Water piping line Surges etc (33%) .

General distribution of Lightning Surge

IEC 61643-1/Annex A

Point 5 33% of Induced Surge

- Conductive Structures
- SPD can't protect

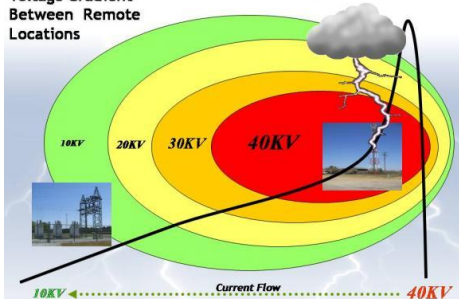
Metallic Water Pipe

Metallic Gas Pipe

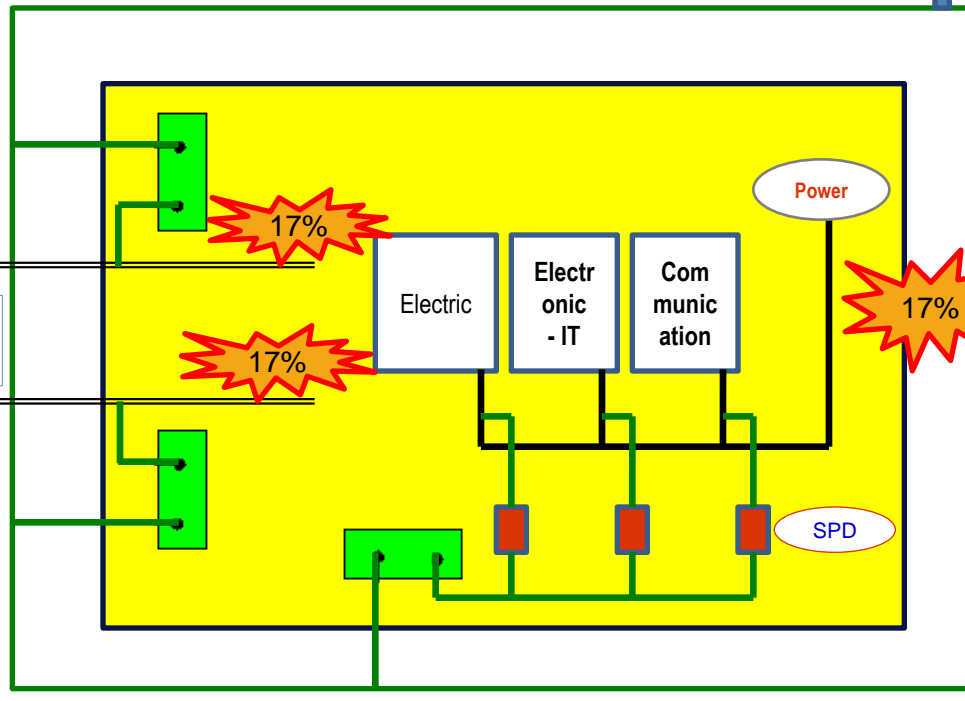
Point 4 GPR

- Isolate Grounding : Potential difference damage
- Reverse Surge Damages
- SPD can't protect

Voltage Gradient Between Remote Locations



Lightning Rod



Grounding Ring & ROD

Point 1 Lightning ROD

- Lightning Attractor
- Unnecessary places
- Protect from physical damage, can't protect electronic systems.
- cause induced surge

eca3G is
THE SOLUTION

50%

EARTHING

Point 3 SPD—17% of Induced Surge

- Different Response time per SPD Models: surge damage by Neighbor
- Degradation/poor grounding damage
- Cannot take 33% of Induced surges

Point 2 Earthing Resistance

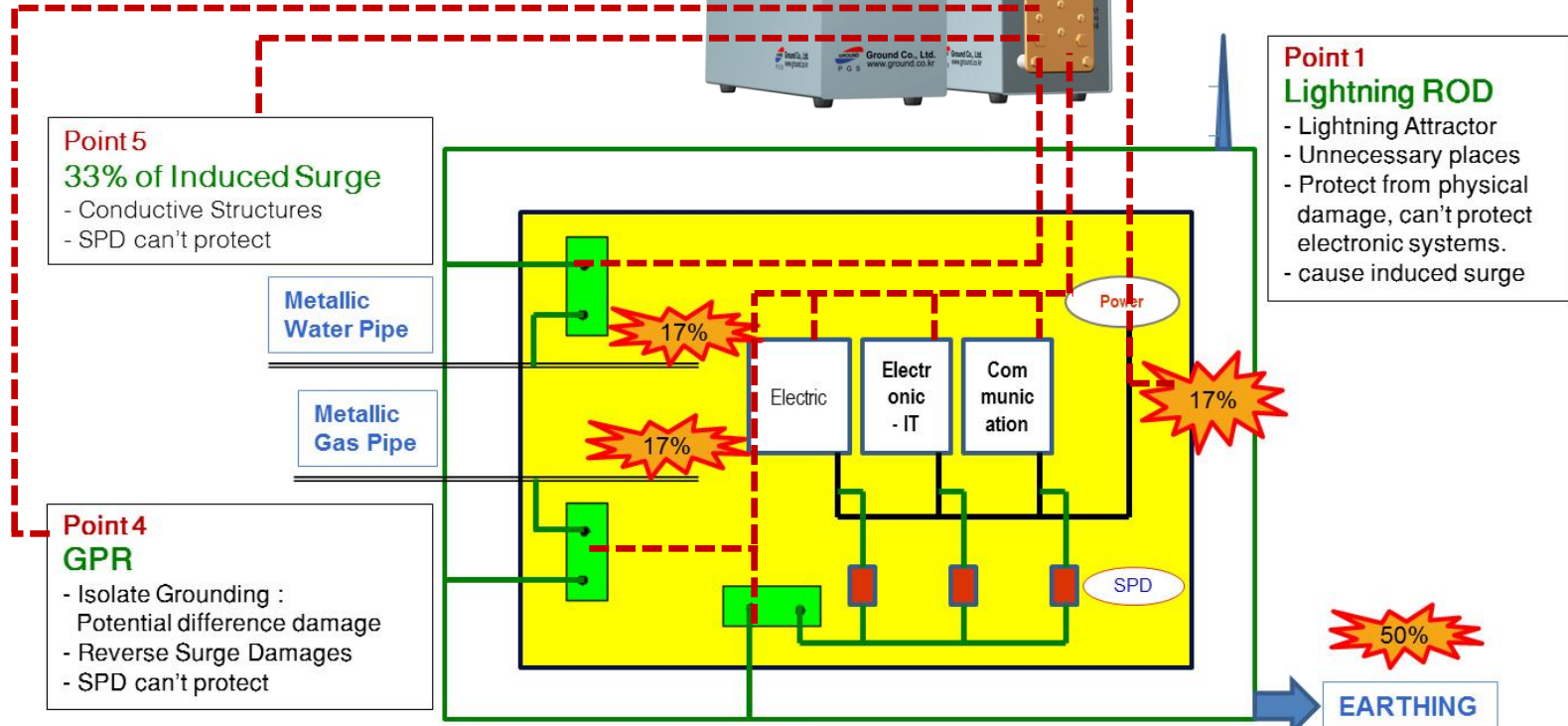
- Low earthing Resistance can't protect electronic systems
- Route of Reverse Surge

<eca3G> is THE SOLUTION , HOW ?
 Multi Coverage, Integrated-perfect
 Lightning surge protection



*ECA3G protect most of induced surges

*ECA3G provide equi-potential < .05V



Point 5
33% of Induced Surge
 - Conductive Structures
 - SPD can't protect

Metallic Water Pipe

Metallic Gas Pipe

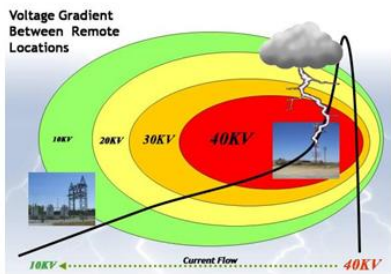
Point 4
GPR
 - Isolate Grounding :
 Potential difference damage
 - Reverse Surge Damages
 - SPD can't protect

Point 1
Lightning ROD
 - Lightning Attractor
 - Unnecessary places
 - Protect from physical damage, can't protect electronic systems.
 - cause induced surge

Grounding Ring & ROD

50%

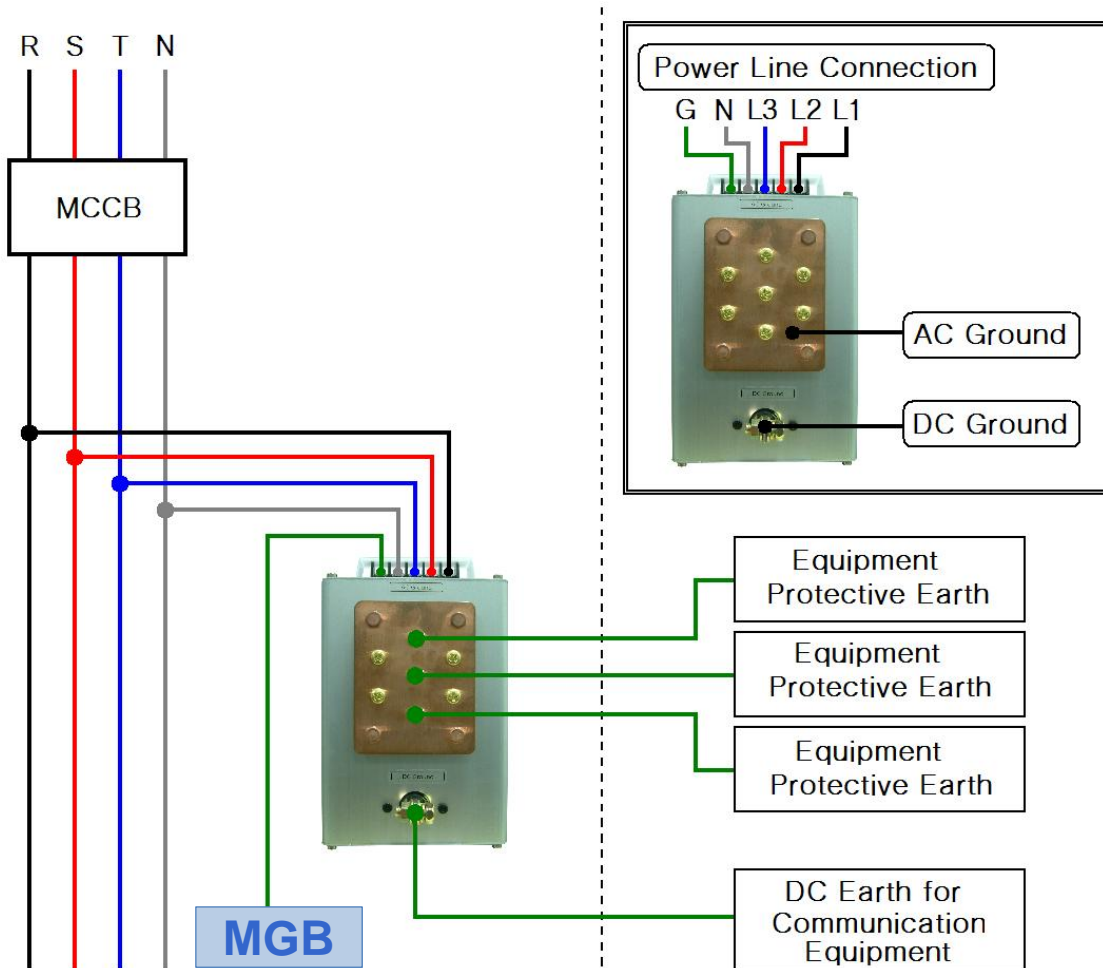
EARTHING



Point 3
SPD—17% of Induced Surge
 - Different Response time per SPD
 Models: surge damage by Neighbor
 - Degradation/poor grounding damage
 - Cannot take 33% of Induced surges

Point 2
Earthing Resistance
 - Low earthing Resistance
 can't protect electronic systems
 - Route of Reverse Surge

◆ Connection of eca3G LP



< eca3G BOLEH >

: Customized eca3G for TM Outdoor Cabinet

=> Connect as like normal Surge Protection Device (R,S,T,N,G)

< eca3G BOLEH > will show integrated surge protection performance without physical grounding

- Parallel connection
- Power line surge
- Equipment surge
- Steel structure surge
- Equi-potential Base
- Improve earthing resistance as GROUND



US007652865B2

(12) **United States Patent**
Woo et al.

(10) **Patent No.:** **US 7,652,865 B2**
(45) **Date of Patent:** **Jan. 26, 2010**

(54) **EARTHING DEVICE WHICH NEEDS NOT BE BURIED UNDER GROUND**

(75) Inventors: **Jea Wook Woo**, Seoul (KR); **Jin Seok Huh**, Gyeonggi-do (KR); **Seungjoon Ahn**, Daejeon (KR); **Seong Joon Ahn**, Seoul (KR); **Chul Geun Park**, Chungcheongnam-do (KR); **Ho Sub Son**, Seoul (KR); **Jin Seok Jin**, Seoul (KR); **Hyung Gu Jeon**, Gyeonggi-do (KR)

(73) Assignee: **Ground Co., Ltd.**, Seongnam-Si (KR)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 455 days.

(21) Appl. No.: **11/587,413**

(22) PCT Filed: **Jul. 24, 2006**

(86) PCT No.: **PCT/KR2006/002907**

§ 371 (c)(1),
(2), (4) Date: **Oct. 24, 2006**

(87) PCT Pub. No.: **WO2007/114543**

(52) **U.S. Cl.** **361/220**; 361/40; 361/117;
361/126; 174/2; 174/6

(58) **Field of Classification Search** 174/2,
174/6; 361/40, 117, 126, 220, 435, 436
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,004,534	A *	9/1911	Creighton	.....	361/500
1,437,189	A *	11/1922	Mershon	.....	361/436
2,195,431	A *	4/1940	Harlow et al.	.....	422/186.04
3,769,538	A *	10/1973	Harris	.....	313/233
4,577,053	A	3/1986	Kies		
4,713,092	A *	12/1987	Kikuchi et al.	.....	96/70
7,008,244	B2	3/2006	Alladice		

FOREIGN PATENT DOCUMENTS

JP	A-04-126377	4/1992
JP	A 10-312840	11/1998
KR	1999-0073507 A1	10/1999

* cited by examiner

Primary Examiner—Stephen W Jackson

Assistant Examiner—Scott Bauer

(74) *Attorney, Agent, or Firm*—Oliff & Berridge, PLC

(65) **Prior Publication Data**

US 2008/0002327 A1 Jan. 3, 2008

(30) **Foreign Application Priority Data**

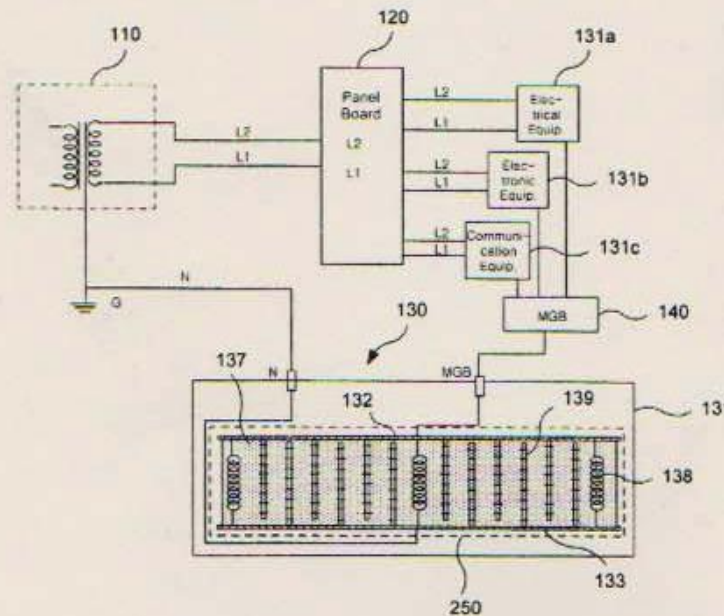
Apr. 3, 2006 (KR) 10-2006-0030163

(51) **Int. Cl.**

- H05F 3/02 (2006.01)
- H02H 7/04 (2006.01)
- H02H 9/06 (2006.01)
- H02H 1/00 (2006.01)
- H02G 13/00 (2006.01)
- H01R 4/66 (2006.01)

An earthing device which needs not be buried under the ground is provided. The earthing device includes an earthing panel and a discharging device mounted inside the earthing panel. The discharging device includes at least one electrode plate, multiple discharging electrodes coupled to the electrode plate, and catalyst filled between the discharging electrodes. Since an earth electrode needs not be buried under the ground, it requires less construction costs, time and area, and environmental pollution (especially, soil pollution) does not happen. Further, the earthing device can be simply and economically installed regardless of place.

19 Claims, 6 Drawing Sheets



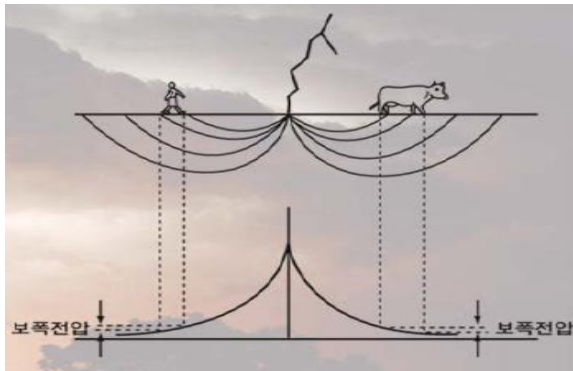
Ground Potential Rise

GPR (Ground Potential : field engineer calls “Reverse Surge”) is more troublesome to the outdoor systems caused by near-by lightning (not direct lightning).

If there is a lightning at distance, center of lightning strike is few 100K volt, and voltage is decreased upon distance from the center, and out-door system is exposed from this Ground Potential Rise.

GPR can attack the system (so we call GPR as reverse surge).

If internal systems are not equi-potential, system can be damaged as like step voltage of cow. We can easily see at Kampong Villages , TVs, Meters are damaged by the strike to near-by hill, <eca3G > can make equi-potential, and eliminate this surge, no other solution can do.



Ground Potential Rise

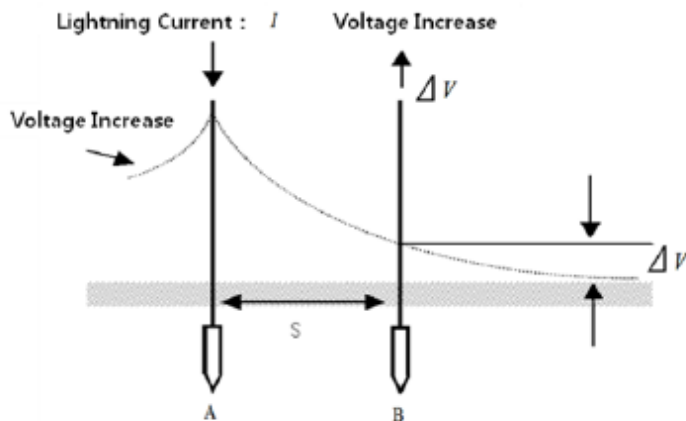
Near-by Lightning Strike generates **GROUND POTENTIAL RISE(GPR)** at the Cabinet position which can make so called **REVERSE SURGES** damages to the Cabinet. When GPR is higher than **<Dielectric Breakdown Potential Gradient>** of grounded steel cabinet, power line and data line which means insulation part is forced to conduct electricity, **Arc Discharge** is generated and damage the systems. Many lightning damages to the systems are from GPR. Under individual grounding and poor grounding, GPR damages will be generated frequently by near-by lightning.

As per figure as below, Near-by lightning Strike with I (Lightning Current), Ground Potential Rise- Induced Ground Voltage (ΔV) is generated at the CABINET position (B) which is at distance S from Lightning Strike position (A). ΔV is **Ground Potential Rise** induced by Lightning Current (I), Earth Resistance, and distance(S) from lightning point. mostly considered as reverse surge by field engineers.

CABINET will be under sudden GPR affect upon near-by Lightning. Under poor equi-potential condition of CABINET, GPR can generate Arc Discharge from metal structures, power line or inter-connected lines etc, and may damage the IC Chips of the communication, electronic, electric systems in the cabinet. Normal Surge Arrester or Surge Protection system cannot eliminate these surges. **eca3G SOLVE THIS PROBLEM** with equi-potential, surge elimination.

$$\Delta V = \frac{\rho I}{2\pi S}$$

ΔV : induced Ground Voltage .
 I : Lightning Current
 S : Distance from Lightning point ,
 ρ : Earth Resistance



ΔV : Voltage Increase at B Point - S distance from A Point

In case Lightning strike at A point, B point (S distance from A) would have Voltage ΔV which can generate damages.

High earth Resistance can make higher voltage ΔV .

A point :
near-by Lightning Strike position

B point :
TM CABINET position

*** equi-potential with eca3G**
- below 0.05 V

◆ CERTIFICATES OF **eca3G**

ISO 9001, ISO 14001, Superior product certified by the Public Procurement Service, Performance certification, CE mark, NT & INNOBIZ enterprise, Meritz PL insurance, joining performance guarantee insurance of Machinery mutual aid association and so on.

US PATENT 7,652,865 B2

NAME	CERTIFICATE NO	AUTHORITY
US PATENT	US 7,652,865,B2	US Patent and Trademark Office
3G Grounding Device:eca3G	PCT/KR2006002907	Int'l PATENT
Korea PATENT	제10-05993559호	PATENT OFFICE
ISO9001:2000	4867	TCL
ISO14001:2004	E0268	TCL
CE	GROUND-0101-3	Communaute Europeene
Superior Product Cert	2007093(2007~2012.5)	Public Procurement Service
R & D Venture Enterprise	제20080400327호	SME Promotion Corp
INNOBIZ Enterprise	제6066-3249호	SME Authority



US Patent



Superior
Defense
SME Goods



Korean
Patent



CE
MARK



ISO9001:2000
ISO14001:2004



INNOBIZ
Enterprise



R&D Venture
Enterprise



Performance
TEST by
KERI

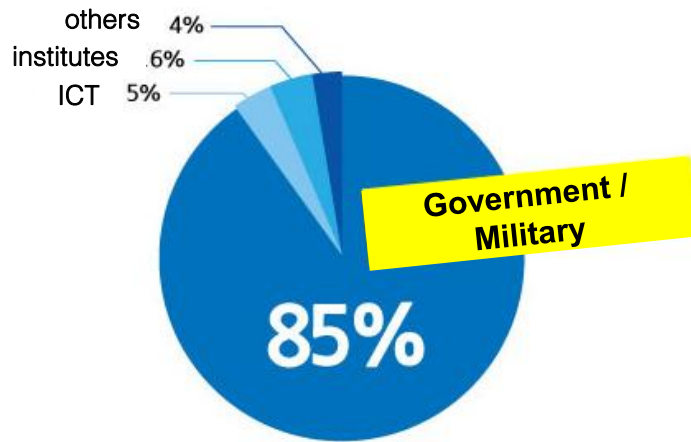


USD TWO
mil PL
insurance

◆ Performance

◆ **15 years, 3,553 sites**
Protection Success 99.88%

154 sites for NAVY for 10 years
Mandatory lightning protection for NAVY
 ☞ **365 days Operation support !**



item	Site Name	Nos	Application
TOTAL		3,553	Lightning protection
NAVY	1,2,3 Fleet HQ/Operation / Regional HQs Mobile ○○○ Vehicle	154	Radar / Command & Control / Control Center / CCTV / Sonar
MARINE	Po○ /Yon○ /Baek○/ Kang ○	13	Post / Computer room / CCTV
AIR FORCE	Airport – 7 sites Radar station – 7 sites ○○Tactical Control vehicle	15	Communication / Surveillance / Anti-air artillery
ARMY	Capital Div/ Logistics 1-3-5-6-7-15-22-28-31 DIV/ Scientific Training Corps/ Anti Air Artillery / Overseas dispatched troops – 2	118	Boarder surveillance system/ Control center / Radar station / Terminal station / Relay station / Mobile operation vehicle
Comm Corps	Command HQ	4	○○ Testing Vehicle
○○ Region	○○ Region	8	CCTV
○○ institute	Surveillance, Communication	36	CCTV / Communication
Government GLC	Government agencies / Local Government/ GLC	1,556	Computer / IT / Communication / Testing system / Broadcasting system / Metrologic system
Broadcasting Relay station	Broadcasting / Relay station/ Transmission/ Others	1,649	Transmission/ Receiving antenna / Transmission System/ Computer system

◆ Major Clients

Special Government Agencies, ARMY, Public Enterprise

- ◎ Presidential Office
- ◎ NAVY Head Quarters (for 15 years, become NAVY's standard)
- ◎ NAVY Regional HQ and all the Radar Station
- ◎ MARINE, Air Force base
- ◎ Defence Intelligence Command,
Integrated Army HQ (Kyeryongdae)
- ◎ Korea Highway Corporation . Radio Research Agency .
Korea Tourism Organization • Korea Water Resources Corporation
- ◎ Korea Electric Power Corporation •
Korea Hydro-Nuclear Power Corporation
- ◎ Maritime Fishery Offices at Incheon, Kunsan, Daesan, Seosan, Pusan
National Forest Service , Fire fighting & Rescue
- ◎ **99.88% successful protection records for 15 years .**

◆ KEY PERFORMANCES

1. [Hydro-Power Dam](#) Surveillance system protection (11 Dams)
2. 30units of [Royal Tombs of the Joseon Dynasty](#)
(UNESCO World Heritage)
3. Unmanned Forest Fire Monitoring System
4. [Army](#) Scientific Perimeter Surveillance System
5. Perimeter Surveillance System for [the President Office](#)
6. NAVY-MARINE facility protection with [5 Yellow Sea Islands](#)
7. ROK [ARMY](#) Lightning Protection
8. Drinking / Sewage Water Treatment Plant
9. KBS DTVR - Digital TV Relay Station
10. Fire Service HQ : Fire fighting Wireless communication system
11. Mobile Communication / Radar system vehicle
12. Malaysia : Telekom Malaysia / ATM (Bank) / Royal Malaysia Police
/ Army PABX / Highway Authority(PLUS) Toll management
13. Thailand : GISTDA Satellite Station, Ammunition depot surveillance system,
Quartermaster surveillance system, Post engineering building
14. Taiwan : Electric Bicycle battery charging stand



<eca3G> for Mobile Vehicle

- Mobile Communication Vehicle
- Mobile RF Test Vehicle
- Mobile Power Generator DB
- Mobile Satellite Communication Vehicle
- Mobile Radar Control Shelter

<eca 3G > in the mobile communication vehicle : NO MORE GROUNDING ROD !



Army ○○ Corps ○○ Battalion



◆ Army Corps RF Test Vehicle(2007)



◆ Army Corps RF Test Vehicle(2008)



○○ Army Corps Communication Vehicle



◆ Army Corps Mobile Communication Vehicle(2008)





◆ Mobile Tactical ○○○○ Vehicle



◆ Mobile Tactical ○○○○ Vehicles with <eca3G>



TPS-830 Low-Altitude Surveillance Radar

enables early detection of moving targets infiltrating in low altitudes and transmits target specifications including the azimuth, speed, proximity, sweepback angle and distance - to air defense weapons via cable or radio to allow early response. * Won National Defense Science R&D Award (Nov 1997)

http://www.lignex1.com:8001/en_US/product/product_detail.jsp?pid=19&scode1=&scode2=&scode3=&skey



Next-Generation Local Air Defense Radar

is 3D radar developed to detect the altitude of flight vehicles to boost the capability to respond to North Korea's low-altitude aerial attack and penetration threats, which is a significant improvement compared with the existing 2D radar detecting only the distance and direction of aircraft.

http://www.lignex1.com:8001/en_US/product/product_detail.jsp?pid=18&scode1=&scode2=&scode3=&skey

◆ Mobile Tactical ○○○○ Vehicles with <eca3G>



Firing Artillery Locating Radar System

is a stand alone C-band medium-range weapon-locating system that detects and locates enemy fire. It utilises a passive phased-array antenna technology for optimised battlefield performance. The technology provides the perfect balance between mobility, range, accuracy, ECCM (Electronic counter-countermeasures), operational availability and operational cost.

<http://www.army-guide.com/eng/article/article.php?forumID=2090>



Air force Command & Control vehicle for KM-SAM missile

< KM-SAM missile > is the Middle range Surface-to-Air missile developed for Korean Air Force, consist of 1 Multi-Functional Radar vehicle, 1 Command & Control vehicle and 8 missile launching vehicles

<http://blog.naver.com/PostView.nhn?blogId=khhong1&logNo=70090793435>

Lightning Rod and Vehicles

- Advertisement at news paper -

Heavy Raining day, CARs are dangerous from Lightning ?

국방·군사 시설기준, KS C IEC, 무선설비규칙에 근거한 직격뢰에 대한 낙뢰방호 대책 검토/분석

1. 높이가 20m 미만 차량의 직격뢰 대책에 대한 규정/분석

- 가. 한국산업규정(KS C IEC)은 차량에 대한 직격뢰 대책인 뇌 보호시스템(피뢰침과 접지)은 제외하였다.
- 나. 국방·군사 시설기준(2009년 10월)/피뢰설비 설치기준에서도 차량은 높이 60m 이하의 뇌보호시스템(LPS)의 설계 및 시공 대상에서 제외 하였다.
- 다. 직격뢰 대상(피뢰침과 접지 설치)은 20m 이상의 건축물 등으로 규정하고 있다.
- 라. 무선설비규칙 제19조는 낙뢰대책으로 “피뢰침은 제외한다”라고 규정하였다.

소결: KS C IEC, 국방·군사 시설기준, 무선설비규칙 등과 같이 관계법규에서 조차도 차량은 피뢰침과 접지 설치 대상에서 제외한 것은, 직격뢰의 가능성도 없을 뿐더러 설령 직격뢰를 맞더라도, KSC IEC와 IEC 규정/규격에서도 명백하게 규정했듯이 차량과 같은 금속체 등은 피뢰침(수뢰부)으로 사용할 수 있기에 충분히 안전하다고 해석할 수 있다.

2. 직격뢰를 맞아도 문제가 없는 조건/수뢰부(피뢰침)로 간주 할 수 있는 건축부재

- 가. 피보호 범위를 덮는 금속판으로 전기적 연속성과 내구성이 있고 절연재료로 피복되지 않아야 하고 보호범위 내에는 비금속 재료가 없어야 하며, 금속판은 다음 표를 참조하여 최소두께를 가져야 한다.
(단, 금속판 하부의 가연물발화 등을 고려하지 않는 경우는 두께 0.5[mm]이상으로 가능하다)
- 나. 금속제 지붕구조재료(트러스, 철근 등)
- 다. 홈통, 장식계, 레일 등의 금속제 부분으로 단면적이 가.에서 정한 값 이상인 경우.
- 라. 두께 2.5[mm]이상 금속 제관 등으로 구멍공이 생겨도 괜찮은 경우.
- 마. 두께가 가.에서 정한 값 이상 재료로 만든 관 등으로 뇌격점 내표면 온도상승이 위험의 원인이 되지 않을 경우.

소결: 국방·군사 시설기준, KS C IEC, IEC, 무선설비규칙 등에 의거하여, 차량과 같은 설비는 두께 0.5[mm]이상으로 수뢰부(피뢰침)로 간주 할 수 있고, 따라서 직격뢰를 맞아도 피뢰침을 설치한 것과 같은 효과가 있다고 분석할 수 있다.

Lightning rod ?
Then, How to
install grounding
rod and Airplane ?

Install
lightning Rod
at Car ?

How to enter
building
parking lot ?

Should install
lightning Rod
at Car ?

Thank you.

Please contact : jbkimjb@gmail.com