

# Cell LineChecker



Fault module detector

Type: SPLC-B-Y



Transmitter



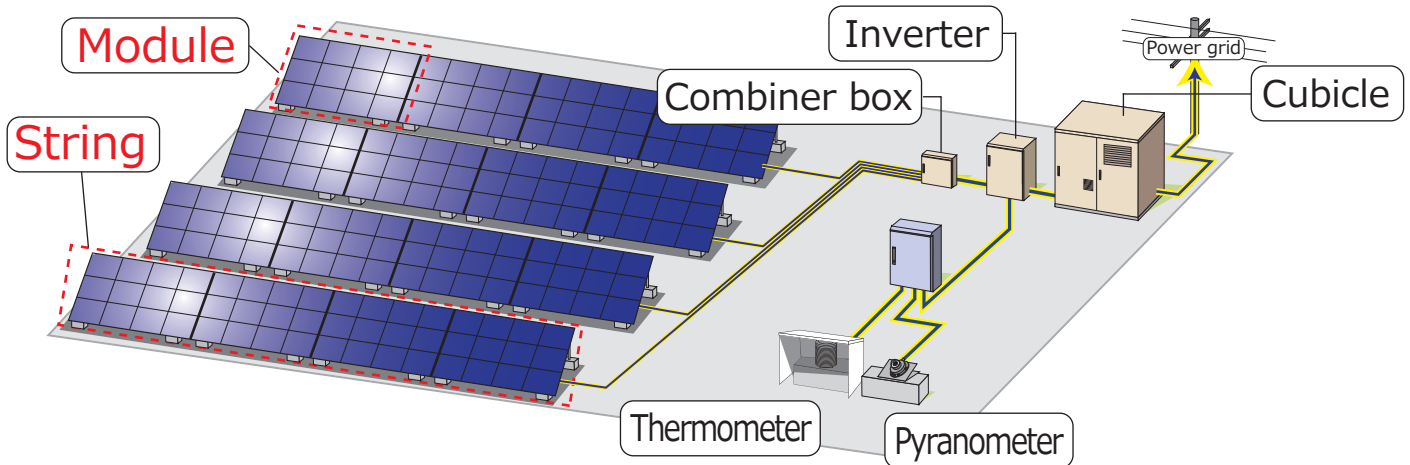
Receiver



## Present situation of photovoltaic (PV) power generation systems

Currently, the environmental problems, such as climate change, are worldwide concerns. In many countries, the laws and regulations related to the environmental issues are established, and expectation on the clean energy becomes higher than before. One of the clean energies deployed globally is **the photovoltaic power**.

### ■ PV power generation system (example)



**Module** : A panel directly converting the sunlight energy into electric energy (DC)

**String** : A unit of several modules connected in series in order to get the larger power output

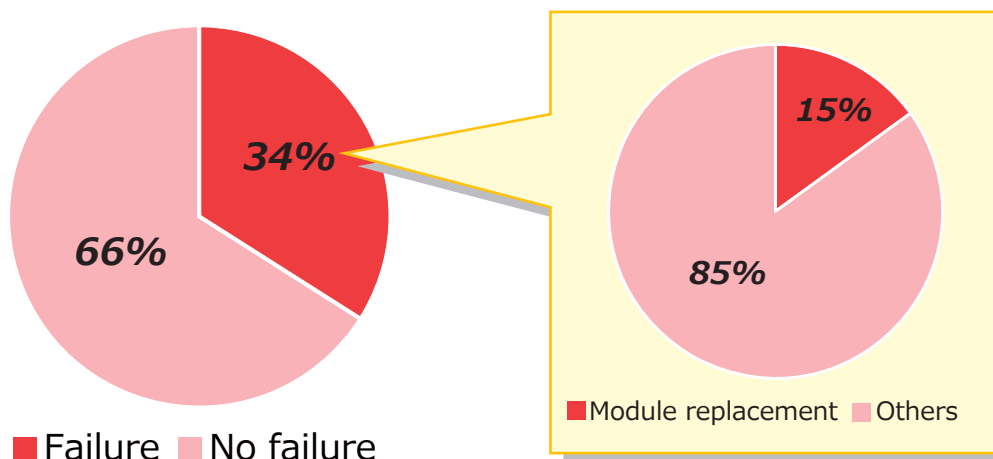
### ■ Is maintenance on PV system necessary?

For years, PV system was considered as maintenance-free power generation. However, there are several causes to lower the power output because of the severe outdoor installation environment, such as...

- Dirt on the module,
- Wiring failure/open-circuit caused by the heat generation, soldering defect, animal intrusion, natural disaster, etc.,
- Rust,
- Aged deterioration,
- Hot spot, etc.



**[Reference]** PV power generation system failure investigation adapted from "PV Generation System Failure Files" by Kazuhiko Kato





Periodic maintenance is necessary because the judgment by visual and hearing is very difficult for no sound is generated and no operation is necessary while the system is under operation.

Moreover, the power output changes from moment to moment in accordance with the surrounding environment and weather conditions. Therefore, measurement by the measuring device is essential for PV system in order to find any failure.

The first step is to find a fault string having a lower power output by I-V curve tracer or monitoring system.

Then, find one or more fault modules by using

## Cell LineChecker

Type: SPLC-B-Y



### Cell LineChecker users

Installers, O&M companies,  
EPC companies, contractors,  
system integrators,  
training organizations,  
technical colleges,  
and research institutions



## Benefit

- Manufacturer** ... Even if any failure, such as decline in output, occurs within the warranty period, only the defective module(s) should be changed, which can minimize the warranty expenses.
- Contractors** ... A fair negotiation with both user and manufacturer can be reached.
- Owner** ... Even if any failure, such as decline in output, occurs after the warranty period, you may only exchange the defective module(s), which enables to minimize the maintenance expense.

## Features

Detect the string configuration and fault module and cell at the time of PV systems installation and O&M.

- String configuration can be identified.
- Faults can be identified at module level.
- Multiple fault modules can be identified in a string.
- Cluster failure and opened bypass diode open circuit can be easily detected.
- Open circuit or loose connector between modules can be detected.
- Detection can be conducted under the cloudy weather.

### Commonly used method

Disconnect the connectors between modules and measure the values module by module.

Improve work efficiency

Shorten working hours

### Cell LineChecker

Connect transmitter to combiner box by strings, and find a fault module by contacting receiver above the modules.

## Detailed functions depending on module fault causes

Phenomenon	Details of failure phenomenon	Causes	Applicable functions
Decline of power output	No output from a string *Series circuit in a string is opened.	Broken/loose connector or disconnected wire between modules	[Electric field mode] <ul style="list-style-type: none"><li>• Detection of connector having defective continuity or wiring disconnection</li></ul>
	Declined output from a string *Series circuit in module is opened. (cluster failure)	(1) Opened busbar (2) Completely opened interconnector (3) Cell damage (severe)	[Magnetic field mode] <ul style="list-style-type: none"><li>• Detection of fault module</li><li>• Detection of fault cluster in the fault module</li><li>• Detection of fault cell in the fault module</li><li>• Detection of opened bypass diode</li></ul>
	Declined output from a string *Part of series circuit in module is damaged.	(1) Open-circuit of one of interconnectors (2) Cell damage (light)	

# Specifications

## ■ Condition of use

Item	Condition of use
Environment	Avoid using in the rain
Temperature range	-10°C to 50°C (14°F to 122°F)
Humidity range	Relative humidity: 80% or less (No condensation)
Storage temperature range	-20°C to 60°C (-4°F to 140°F)

## ■ Ratings of transmitter

Item	Description
Rated power voltage	9.0Vdc:Operation range 6.5Vdc to 9.0Vdc Using one 9Vdc battery Either manganese or alkaline
Applicable voltage range	Magnetic field mode 15.0V to 1000.0Vdc Electric field mode 0V to 1000.0Vdc
Detection method	-Current consumption with magnetic field mode -Signal input with electric field mode
Signal frequency	5kHz
Operation display	Green or blue LED(ON or flash)
Dimensions	205(H)×222(W)×80(D)mm (8.07×8.74×3.15inch)
Weight	Approx.1000g (2.2lb)(including a battery)
Other functions	Auto power off • Mg.field mode:A condition of input voltage less than 10V and no operation continues 10 minutes. • Elec.field mode:After non-operation for 2 hours

## ■ Ratings of receiver

Item	Description
Rated power voltage	9.0Vdc:Operation range 6.5Vdc to 9.0Vdc Using one 9Vdc battery Either manganese or alkaline
Receiver sensitivity selector	Select from 5 levels. Each level has 5 level adjust from -20% to +20%.
Receiver display	Receiving level display:Flashing 10 green LEDs Alarm sound synchronized with LED flash
Built-in sensor	Coil sensor:1 Electrode sensor:1
Dimensions	235(H)×60(W)×30(D)mm (9.25×2.36×1.18inch)
Weight	Approx.160g (5.64oz) (including a battery)
Other functions	Auto power off and silent mode Power off after 10 minutes of no signal input and no operation

## ■ Safety standard

- IEC61010-1 & 61010-2-030
- CAT II,1000V

# How to locate faults

## After installation

... locate an open-circuit or connection failure between modules.

## Electric field mode

①



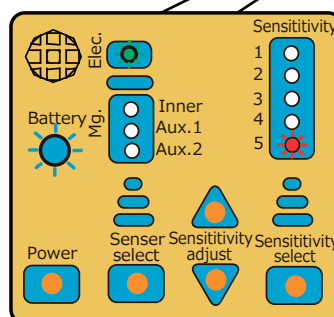
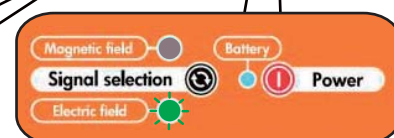
Turn off the CB or remove fuses of the string to be measured.

②

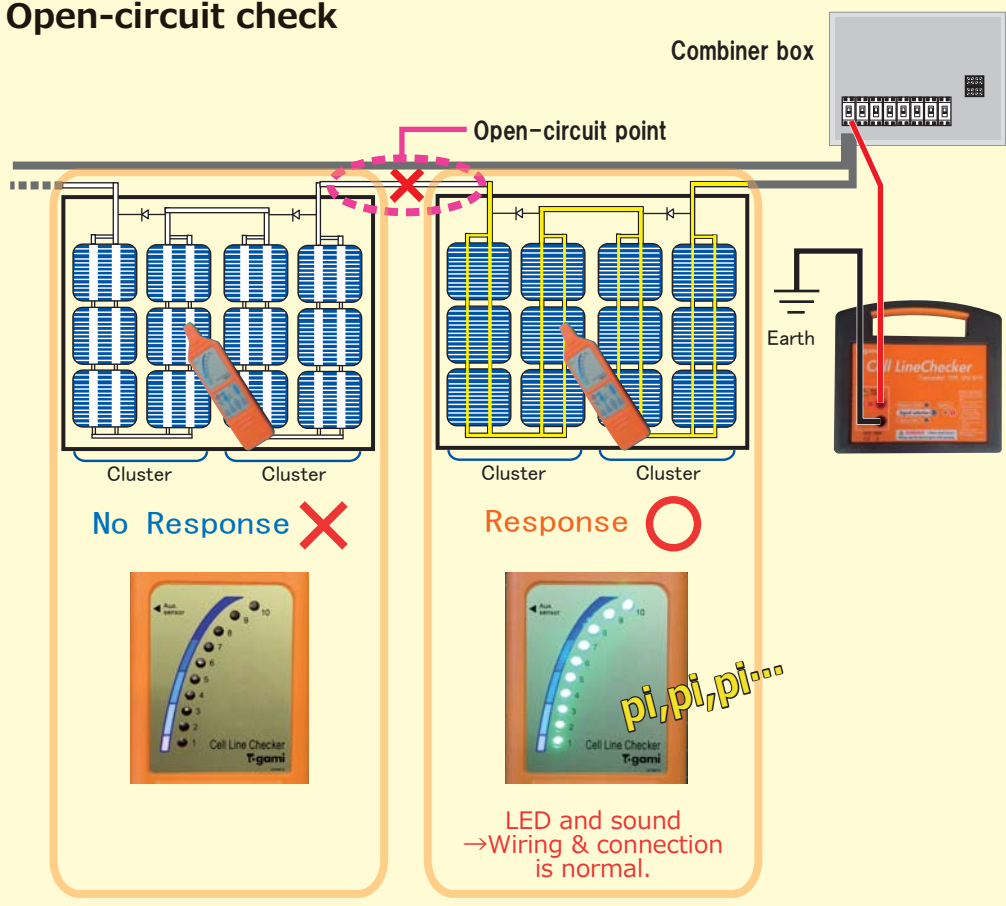


Connect the **RED** lead to the minus terminal and **BLACK** to the earth.

③



## Open-circuit check





## During inspection and maintenance

- ... locate a fault modules having lower power output or opened bypass diode, etc.

### ■ Magnetic field mode

①



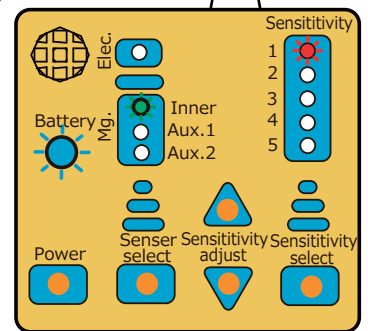
Turn off the CB or remove fuses of the string to be measured.

②



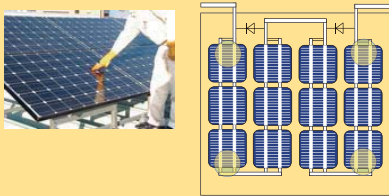
Connect the lead to the terminals of module side.

③



**First, check the module configuration in a string!**

#### (1) String configuration check



Scan at the four corners of module.

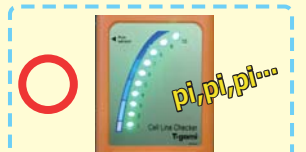
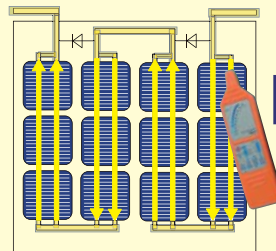


LED and sound  
→ The module is a part of the string.

#### (2)-1 Busbar & Interconnector failure



Scan on the busbar or Interconnector of module surface.

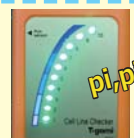
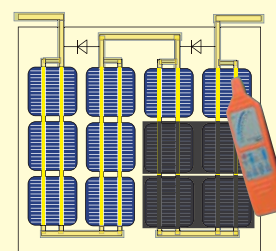


LED and sound  
→ The module is normal.

#### (2)-2 Bypass diode failure (open-circuit)



Cover cells with rubber sheets and scan over the module.



LED and sound  
→ Bypass diode has failure.



## Accessories



*Rubber sheet*

### *Clamps and test leads*



*Carrying bag*

## Options



### *Rod sensor*

Type:SPLC-B-F1Y  
Weight:Approx. 850g(without receiver)  
Rod length when detecting:Max. 2meters  
(0.92meter when storing)

### *Magnetic test probe*

Type:SPST-A-F4  
Length of cable:1.5meters



### *Needle probe*

Type:SPST-A-F3

# Togami

— Let's make society, the earth and the future affluent. —

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