

# SP1 Gateway Layout Instructions

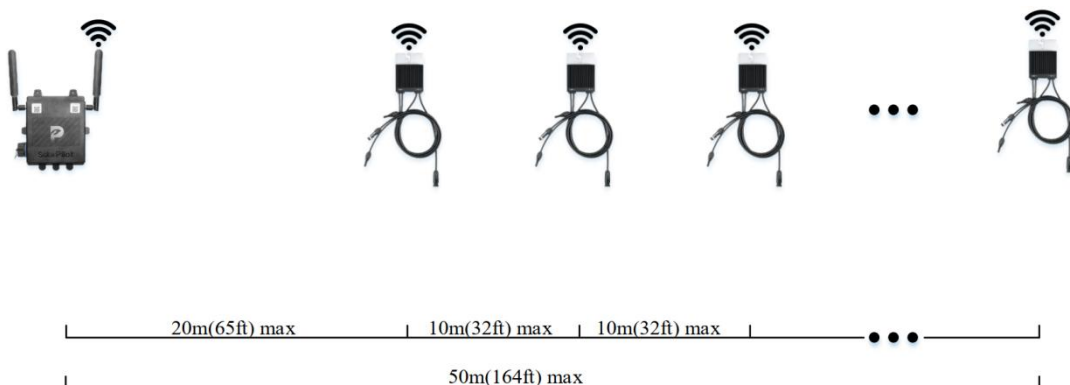
## Distance Requirements between Gateway and PV Optimizer

The SP1 gateway and the SP1 PV optimizer use the Zigbee protocol for data communication and support mesh topology (MESH). The PV optimizers will automatically select the optimal communication path to the SP1 gateway based on factors such as signal strength. This set-up offers self-organization and self-healing capabilities.

To ensure reliable communication of Zigbee, the placement of devices should follow the guidelines below:

In the absence of obstructions:

- The maximum distance between the SP1 gateway and the nearest PV optimizer should not exceed **20m(65ft)**.
- The maximum distance to the farthest PV optimizer should not exceed **50m(164ft)**.
- The maximum distance between PV optimizers should not exceed **10m(32ft)**, as shown below.



## Recommended Layout of Gateway and PV Optimizer

Based on the above distance requirements, according to the maximum ratio of 1:50 between the SP1 gateway and the SP1 PV optimizer, the optimal installation layout is shown in Fig.1:

All PV panels are equipped with SP1 PV optimizers, the SP1 gateway should be placed at the center of the PV array, and the PV array radius should not exceed **50m (164ft)**, ensuring that each SP1 PV optimizer is within the communication range of the SP1 gateway.

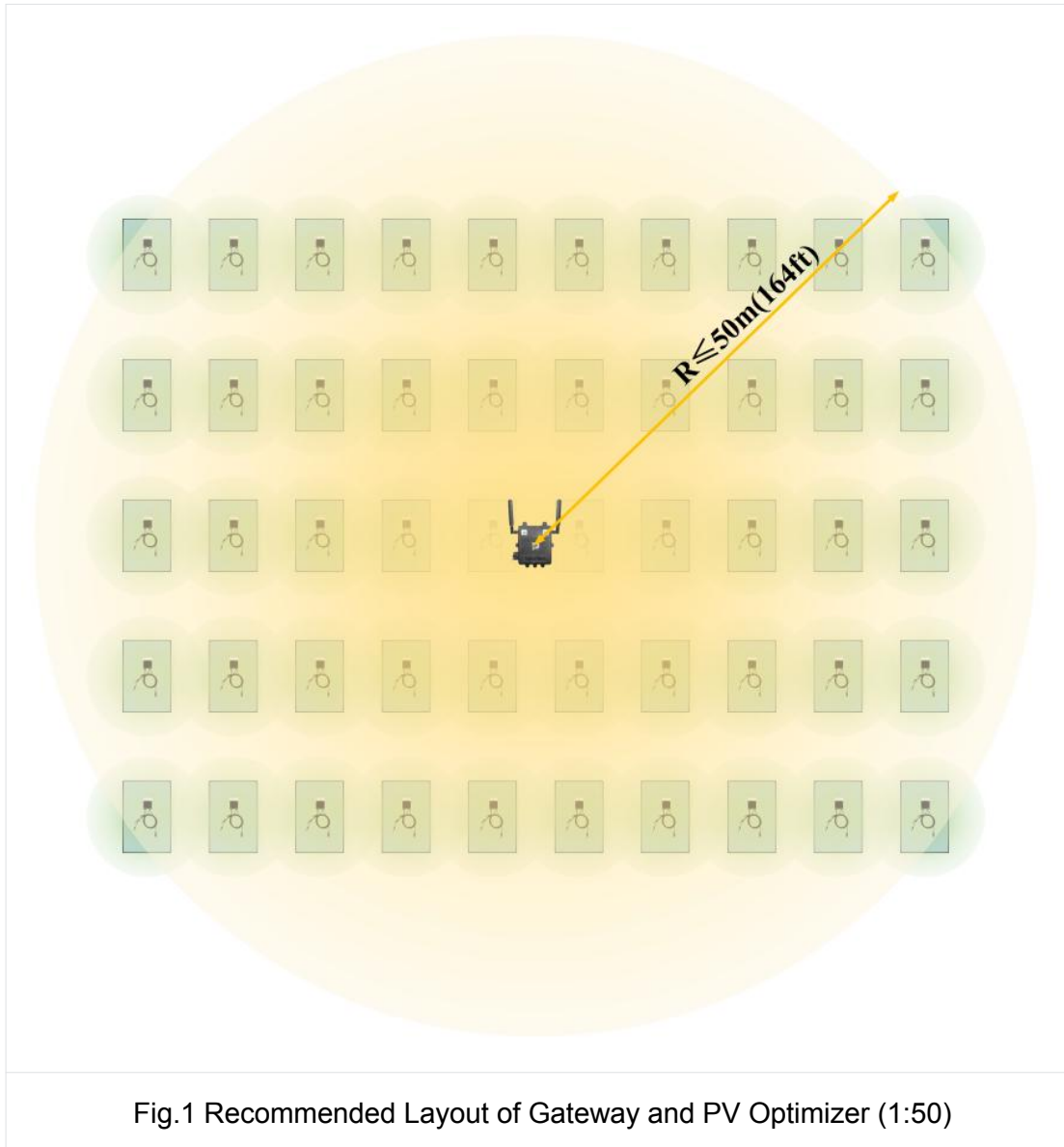


Fig.1 Recommended Layout of Gateway and PV Optimizer (1:50)

For example, suppose the on-site environment does not support the above-recommended layout. In that case, the PV array is not a complete rectangular array, or only the shaded components in the PV arrays are installed with PV optimizers, the installation location of the SP1 gateway and the SP1 PV optimizer should follow the following general principles, as shown in Fig.2:

The maximum distance between the SP1 gateway and the nearest PV optimizer should not exceed **20m (65ft)**, and the maximum distance to the farthest PV optimizer should not exceed **50m(164ft)**, the maximum distance between PV optimizers should not exceed **10m (32ft)**.

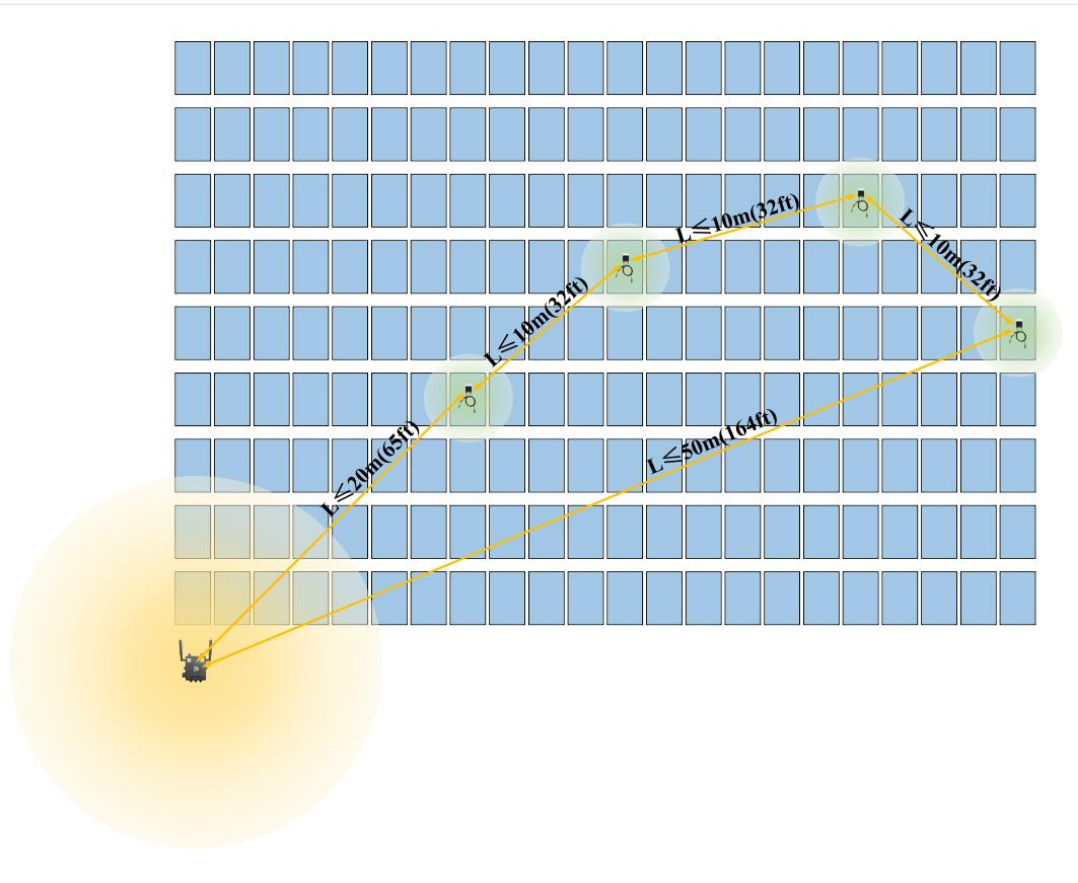


Fig.2 General layout requirements of SP1 gateway and SP1 PV optimizer

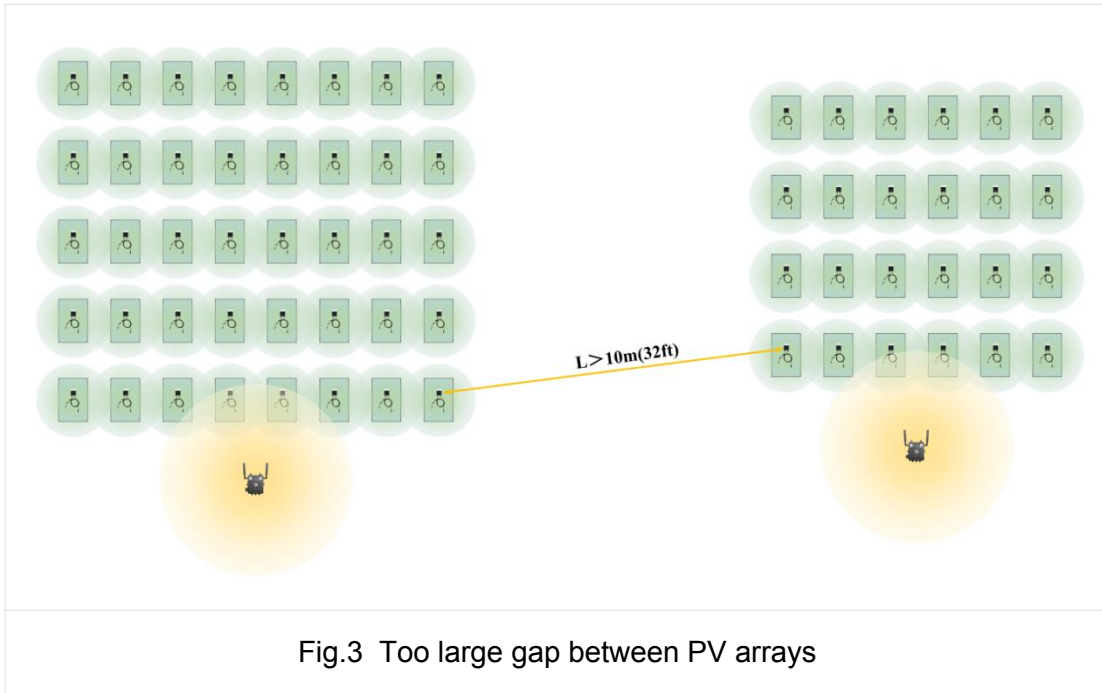
### Factors that affect reliable communication between the gateway and PV optimizer

Zigbee is a wireless signal. Although it has advantages such as flexibility and convenience, in some environments, wireless signals may be interfered with by other electronic devices or physical obstacles, affecting the stability of data transmission.

In actual applications, the long distance between PV arrays, obstructions on the communication path, roof materials, etc. may affect the stability of Zigbee communication.

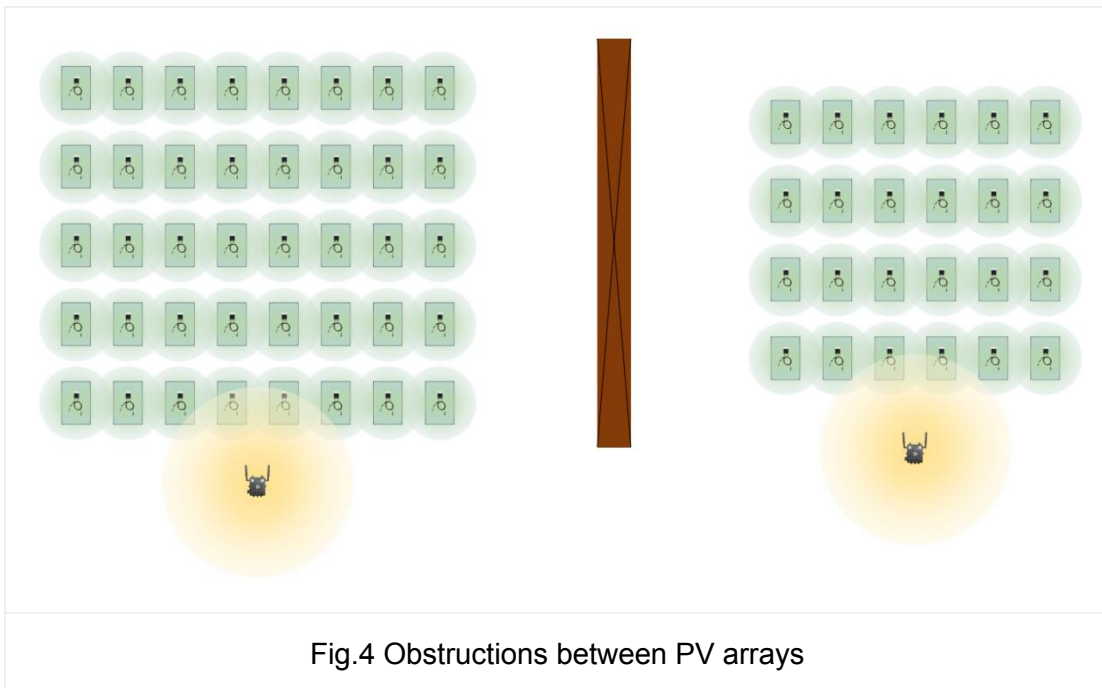
### The gap between PV arrays

If the gap between PV array A and PV array B exceeds 10m(32ft), the transmission quality may be compromised. In this case, it is recommended to use different gateways for communication between the arrays.



### Obstructions

Suppose there are obstructions such as solid walls, floor-to-ceiling windows, fully enclosed metal guardrails, etc. between PV arrays A and B, which will affect the transmission quality of wireless signals. In that case, it is recommended that PV arrays A and B use different gateways for communication.



### Roof material

If the roof is made of metal (such as aluminum alloy) and the distance to the PV optimizer does not exceed **0.2m (0.65ft)**, the transmission quality of the wireless signal may be affected. In such case, it is recommended to halve the distances in the general principles:

The maximum distance between the SP1 gateway and the nearest PV optimizer should not exceed **10m (32ft)**, and the maximum distance to the farthest PV optimizer should not exceed **25m(82ft)**, the maximum distance between PV optimizers should not exceed **5m (16ft)**.

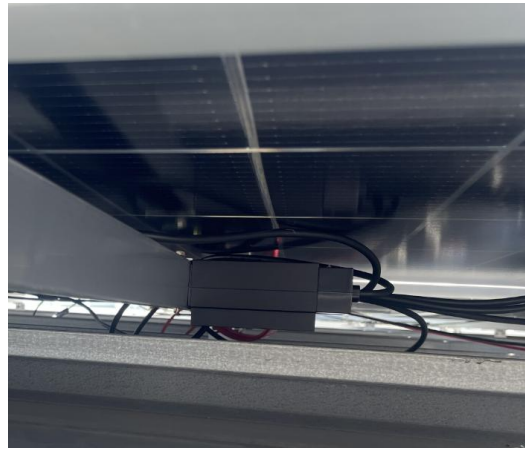


Fig.5 The roof is made of aluminum alloy