Solar-Powered Security Camera Guide Book

01 Installation Guideline

02 Working Mode Knowledge

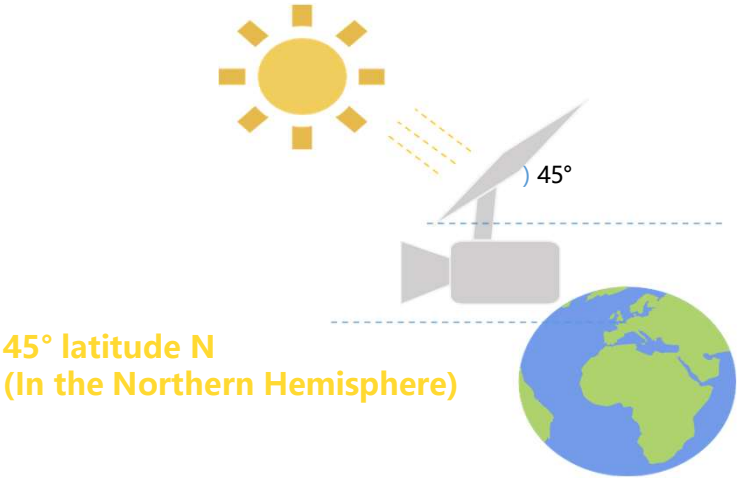
03 4G & Wireless Connection

04 FAQ

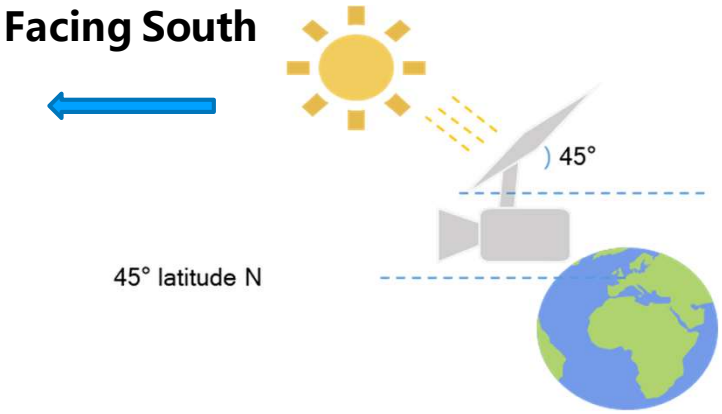
Solar Camera Installation Recommendation

Recommended installation height and angle

You can set the camera at any height as regular camera. The recommended angle is determined by local latitude, and the panel should directly face the midday sunlight with nothing to block the sunlight direct contact. For example, the panel of a camera **at 45-degree latitude north (face south and be set at a 45-degree angle from horizontal).**



Actual Installation



01 Installation Guideline

02 Working Mode Knowledge

03 4G & Wireless Connection

04 FAQ

Select working modes?

Mode	Preview	Recording	Communication (data transmission)	Smart Event
Not recommend **Performance** 4G/Wi-Fi	Continuous	Continuous	Continuous	Support
Default **Proactive** 4G/Wi-Fi	Auto stop the preview after 5 min	Continuous	Smart events, user access, timed schedule	Support
Standby /Sleep 4G/Wi-Fi	Wake up to preview, auto stop the preview after 5 min	No recording, only supports scheduled capture by setting Guarding Schedule	User access, timed schedule	N/A

Notes:
Performance mode: this is the mode when cameras work with full functions and high performance; however, the constant data communication, events and functions will not be turned on by default when switched to the mode; configuration is available.
Communication: there will be no constant data communication unless continuous streaming (live view or playback) is on. When live view or playback is off, the device withdraws data communication, except for regularly heartbeat confirmation.
Standby mode: the device goes into standby mode when the battery drops to 15% or lower.

Proactive Mode

Full-time recording and event alerting

Lots of users want to be reminded only when there’ s an event, but prefer a full-time recording

Without sunlight?

7-day continuous recording

When in continuous rainy days, a fully-charged battery can provide the cameras (the Advanced Series) with power for full-time recording with event alerts Up to **7 days**

The camera goes into sleep mode when the battery drops to 15% or lower.

Mode choosing tips:

- Commonly used in most areas
- Event alerting and ideal battery life

4G

Recommend

CMIP9C82W-28SD-4G

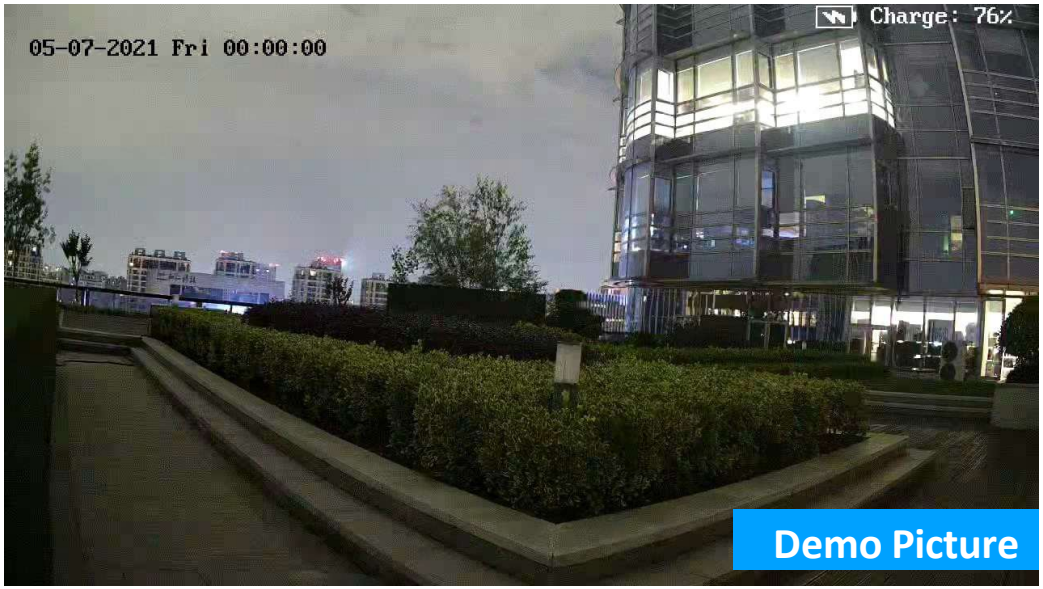
Performance Mode

4G

Not recommend

Around-the-clock watching and recording

This is the mode in which cameras can work with full functions and high performance



Without sunlight?

4-5 day continuous recording and communicating

When in continuous rainy days, a fully-charged battery can provide the cameras (The Advanced Series) with power for full-time recording and data transmission for **4-5 days**.

The camera goes into sleep mode when the battery drops to 15% or lower.

Mode choosing tips:

- Areas with sufficient sunlight
- 24/7 all-day preview for monitoring

Standby Mode

Event capture by operation
(Only support by the product with PIR)

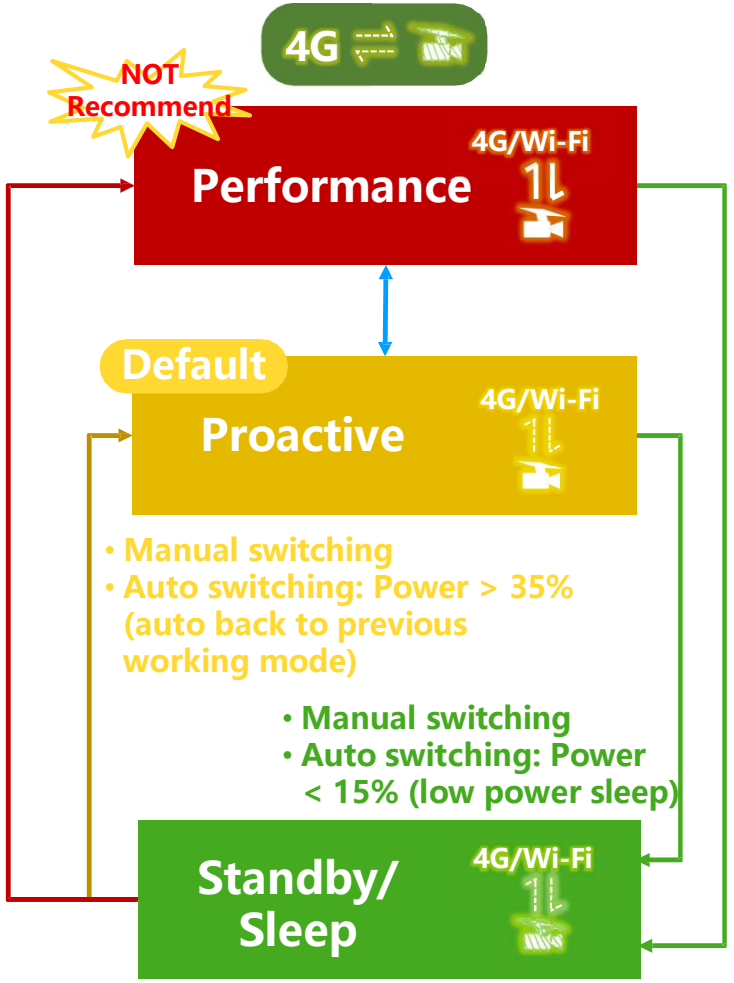
In most circumstances, users only want to be reminded when there's an event going on, especially in remote fields.

Without sunlight?

24-day standby

Mode choosing tips:

- Long cloudy and rainy days without sufficient battery power
- Scheduled capture and ultra-long battery life
- The camera will automatically switch to this mode when battery power drops to 15% or lower



Sustainability– Battery and Low Consumption

Battery Life

Larger battery capacity

= heavier camera setup

≠ longer operation time?

4G on IR off:
360Wh/2w = **180h**

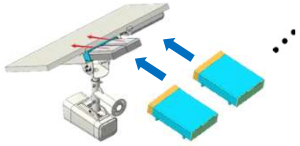
4G on IR on:
360Wh/3w = **120h**

Low Power Consumption

Just 2-3 Watt

Low consumption makes it possible to use solar power in security cameras.

Battery Management



Modular battery

For easy transport

Low battery warning

Timely warning

Automatic working mode (Proactive Mode)

more power saving and longer lasting

Battery Life Calculation

In continuous work (Performance Mode) without sunlight, how long the battery can last?

Battery life (H)=
battery capacity (WH) /
product average power consumption (W)

→Take the left system for example:

Battery life in cloudy/rainy days

= 360 WH / (2 -3 W + 4.5 W)

≈ 48 to 56 Hours

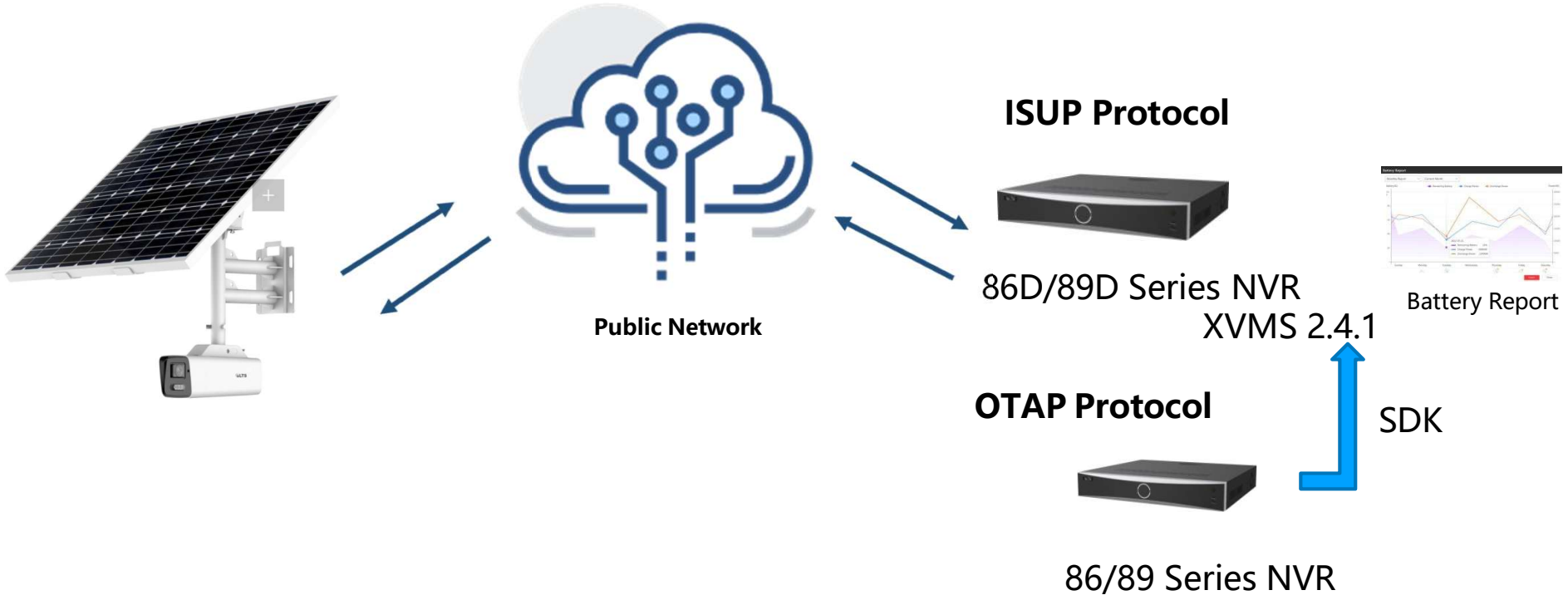
"The average power consumption of 24 hours (4G transmission is excluded): 3 W. The max. power consumption: 6 W "

Note: **The wireless bridge does not go to sleep when the camera goes to sleep, so it will constantly drain the power.**

Solar Camera Compatible Platforms and Functions

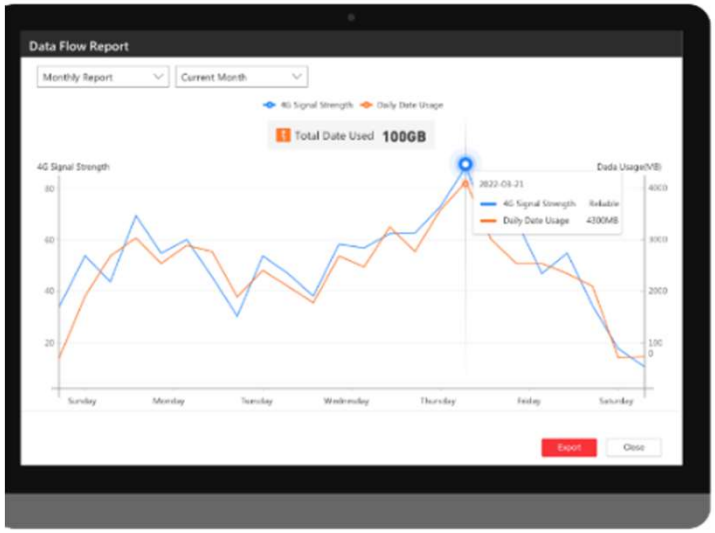
	86/89/86D/89D Fw: 5.0 or above	XVMS 2.4.1 VMS	LTS Connect App
Releasing time	July,2023	June, 2021	2022
Live view / wake up	√	√	√
playback / wake up	√	√	√
Video storage	√	Additional storage media is required	×
Working mode switching	×	×	√
Receiving event alarm	√	√	√
Event setting	×	√	√
Battery status	√	√ (also supports battery log)	√
Setting low-battery threshold	×	×	N/A
Low-battery alert	×	×	√
Scheduled standby setting	×	×	N/A
Scheduled capture setting	×	√	×
Remote firmware upgrade	×	√	×
Image configuration	×	√	×
Image OSD configuration	×	×	×
Setting supplement light	×	×	×
Two-way Audio	×	√	√

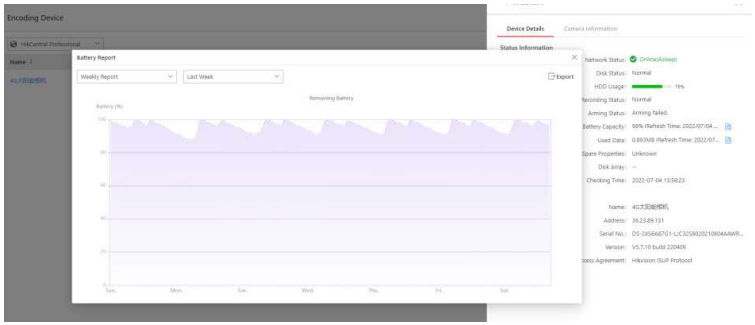
Longer Working Time Strategy



Note: **The wireless bridge does not go to sleep when the camera goes to sleep, so it will constantly drain the power. The camera will go to sleep in working modes other than Performance mode, and when it's asleep it can only be woken up by LTS connect/ISUP/OTAP protocol, not the normal IP SDK protocol (IP address/IP domain). That's why Performance mode is recommended when use IP address to connect.**

Data/Battery Report





Data/Battery Report

- Support data flow report and battery report on **XVMS V2.4.1** for battery management
- **Data flow report:** show and export daily/weekly/monthly data usage information
- **Battery report:** show and export daily/weekly/monthly remaining battery information

01 Installation Guideline

02 Working Mode Knowledge

03 4G & Wireless Connection

04 FAQ

T-Mobile

Purchase Option

-Retail Store walk in purchase (Preferred)
-Customer service phone call - 1-800-T-MOBILE
-Self Internet Purchase: https://prepaid.t-mobile.com/prepaid-internet

How to purchase and SIM card acquiring

- **Retail Store-**
  1. Ask store clerk for mobile internet pre-paid plan.
  2. Choose from below available plans

500Mbs	2GB	5GB	10GB	30GB	50GB
$5	$10	$20	$30	$40	$50

  3. Paid and card is being activated and ready to work
- **Customer Service Phone Call- 1-800-T-Mobile**
  1. Ask for mobile Internet Pre-Paid Plan:
  2. Answer all the corresponded question that customer service agent asked
     A. mentioned you have your own equipment

500Mbs	2GB	5GB	10GB	30GB	50GB
$5	$10	$20	$30	$40	$50

     A. opt out when ask for IMEI
  3. Paid with your selected pre-paid card, and Sim card should arrive in few days.

*Price is for reference only, please check with T-Mobile for the final price.

T-Mobile

3. Self-Internet purchase-https://prepaid.t-mobile.com/prepaid-internet

1.Choose from one of the below plan to start

500Mbs	2GB	5GB	10GB	30GB	50GB
$5	$10	$20	$30	$40	$50

2. Select as New Customer or Existing Customer (Log into your account)
3. Choose New Customer (myself example) and choose bring your own device
4. Select Skip when ask for IMEI number and check to consent the compatibility of your own device
5. Make sure Device is unlocked
6. Select I need to buy a T-Mobile SIM card
7. Choose a plan
8. Go to Cart to self-checkout
9. SIM Cart should arrive in few days and ready to work

Note: The above service plan detail on this document were copied from T-Mobile' s website, are based on the date and time it was written and are for reference purposes only. Reach out to your local carrier for accurate detailed service plan information.

Cellular Broadband Options

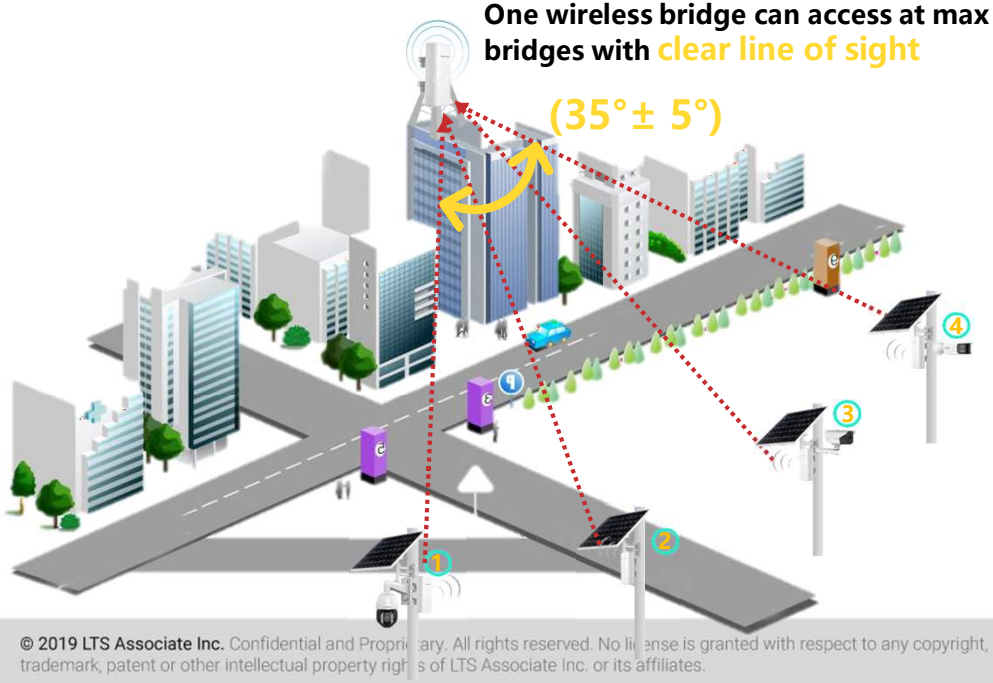
A few points to note:

- First, it is important to understand that not all cellular data plans are the same and not all will work with our product.
- Some post and prepaid cellular plans may not work as well
- Do not rely on a simple web search to find the assigned APN of a SIM, do not assume the APN of a SIM card, as each SIM card might have a unique APN based on the assigned carrier, region, private APN, and or reseller
  - As an example (below) you will find a map for Verizon broken into regions and the assigned APN for said region, however the customer is in Florida but his assigned APN is actually for Texas
- Cameras in the field that lose connection due to non-payment or account suspension from the carrier generally require a refresh from the carrier to reactivate the SIM on the network
- Connections that stopped may simply be a result of no more data, and would need to check with the carrier, and possibly refresh the connection after data is reloaded on the plan
- When Prepaid SIM cards go unpaid there is a grace period with some carriers that will automatically cancel service and may require a new SIM card
- Do not rely on using a SIM in a cellphone and putting it into our product as a means to prove there is an issue with the product, as mobile phone rate plans are provisioned to work differently then IoT rate plans and may not work
  - This is also true for iPhone versus Android, or tablets specific data plans
- Each data plan can have different tiers of speed, based on the region, Cell tower, and time of usage. Some plans are throttled, but some are also set with a lower priority on the network based on pricing

Wireless bridge is used to build up communication between two or more networks without wired connections.

Wireless Bridge Receiving End

One wireless bridge can access at max 4 bridges with clear line of sight



we recommend face to face installation for better data transmission quality

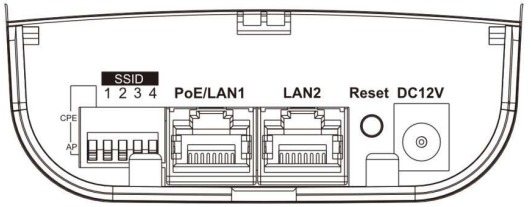
LTWB-5AC360 (up to 1 Mile)

- **One bridge connects max 1 cameras**
- **Supports 12 VDC and passive PoE**
- **Working Frequency Band:**

(Note: Available channel may vary with local regulations.)

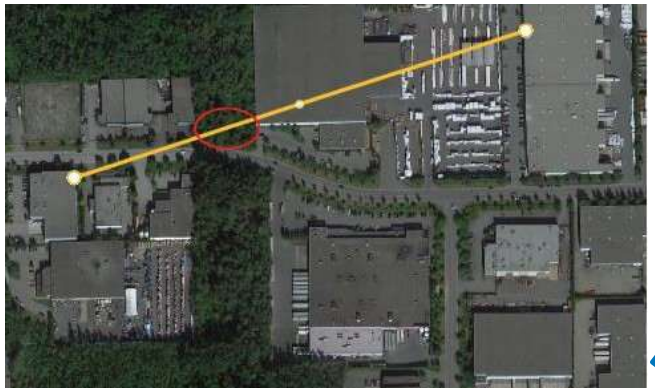
5150 to 5250 MHz;
5250 to 5350 MHz (DFS);
5470 to 5725 MHz (DFS);
5725 to 5850 MHz

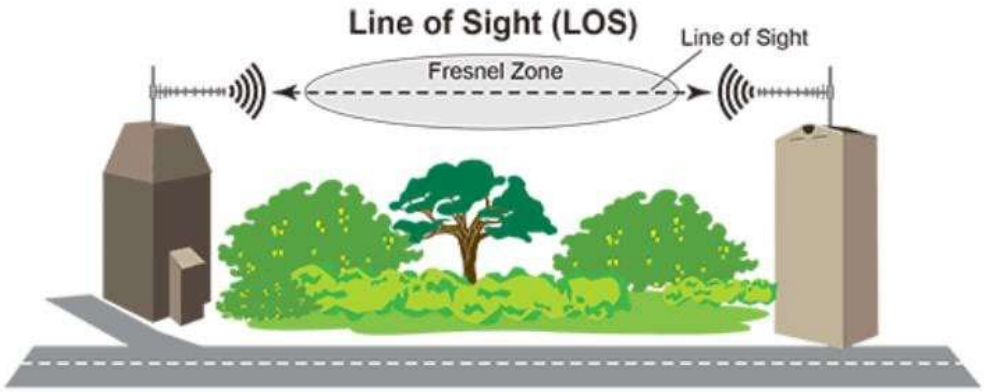
- **Channel Width: 20/40/80 MHz**

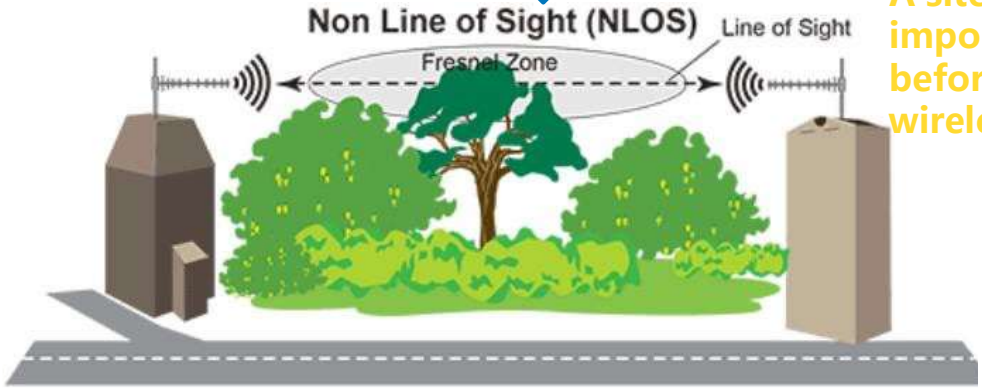


Installation Notes-Wireless Bridge

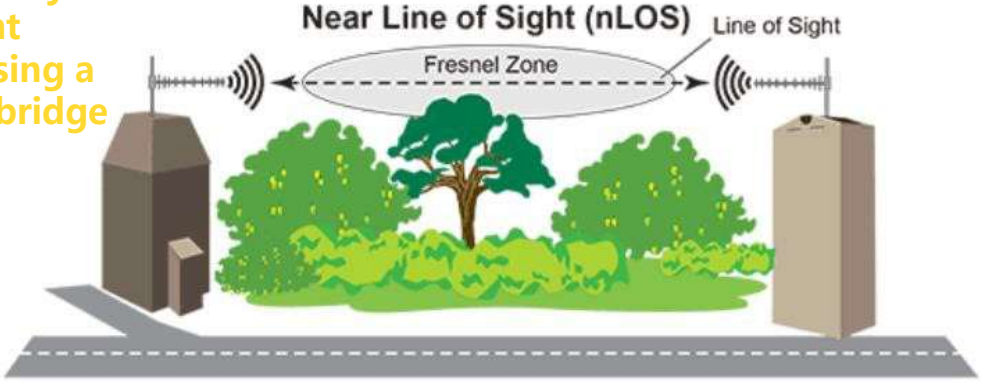
Satellite View of Application Site







A site survey is important before using a wireless bridge



Site Survey is Necessary

In general, a site survey is a valuable tool that can help you to **ensure that a product is installed correctly and safely** It is especially important for products that are complex or that are critical to the operation of a facility.

- **To understand the physical environment**. The site survey will help you to understand the physical environment of the installation site, such as the size of the area, the layout of the building, and the presence of any obstructions.

- **To identify any potential problems**. The site survey will help you to identify any potential problems that could affect the installation, This information will allow you to take steps to address these problems before the installation begins, which can help to avoid delays and costly mistakes.

- **To optimize the installation**. The site survey will help you to optimize the installation by identifying the best placement for the product and the best way to connect it to the surrounding infrastructure. This can help to ensure that the product performs as expected.

- **To get the necessary approvals**. In some cases, you may need to obtain approvals from a higher level engineer in the team to make sure the assurance of project deployment .

01 Installation Guideline

02 Working Mode Knowledge

03 4G & Wireless Connection

04 FAQ

Working Mode Notes

In winter or long rainy/cloudy days:

Set the working mode to proactive mode firstly, then according to the actual usage situation to adjust the area has low sunlight, might suggest turn off the supplemental light at the night, or set some hours (not necessary to monitor) in sleep mode in order to get longer battery life performance.

Special Notes for performance mode:

When involve with thinking using performance mode (24/7 not stop operation) for any potential projects,

- Involve regional SE to evaluate feasibility of running 24/7 because Solar Powered camera, unlike wired powered cameras, still rely on direct and no block Sunlight to recharge the batteries through Solar Panel. Charge may take few days if camera is constantly consuming power at the same time using performance mode. This might mean it needs to have strong sunny-days many days in the role as well.
- When areas have low sunlight and cold temperature during winters, the power saving mode such as proactive are recommended.
- if there is XVMS in the installation, always suggest to use battery report in XVMS to monitor battery consumption and recharging status.

FAQ

1.What's the operation mechanism in low power?

When the battery power is lower than the preset low battery sleep value, the device will be in sleep mode, The value of low power mode can be configured through the web, the minimum can be set 15%. If drop to 10% or lower, user will be prompted a fail message when accessing the device and the device will be shown offline. the battery will be protected and the platform cannot wake up the camera, which needs to be charged to the value over 20% of the preset low battery sleep value(For example: if preset is 15%, then charge to 35% could be recover

Power (sleep value preset as 15%)	Status	Function	The value for recovering to proactive mode
X＞15%	Proactive mode	normal	/
10%＜X＜15%	Sleep Mode	Online、can wake up	35% to proactive mode
X＜10%	Protection Mode	**Offline、cannot wake up**	30% back online 35% to proactive mode

2. When would a 4G solar camera stop working when battery level below what % ?

To resume camera operations such as video recording and snapshots, you need to wait for the battery charge to rise to 20% of the preset value. However, if the preset low battery value is 20%, you need to charge it to 40%. The camera will automatically change from sleep mode to low power real-time. model.

3. How long does it take for a solar panel to sustain light to fully charge the battery?

From empty power to full power, charging completely using solar energy has little practical application and reference significance. Our testing and estimation reference are carried out when the camera is working normally; for details, please refer to the table Slide 10 . Normally, there is light from 8 to 17 o'clock, and the estimated full charging time is about 3.5 hours a day. The charging power at other times varies, and the camera works normally. If there is 4.5 hours of full sunlight a day, the camera can basically be guaranteed to continue to operate normally.

4. LTS Connect is offline means the device is shut down?

LTS Connect is offline does not mean that the device is shut down. If the LED light under the device body does not light up, it means that the main control is shut down.

5. The discharge of batteries has such coefficient relationship with low-temperature :

Battery discharge capacity coefficient at 25℃ 0.900
Battery discharge capacity coefficient at 10℃ 0.800
Battery discharge capacity coefficient at 0℃ 0.700
Battery discharge capacity coefficient at -10℃ 0.600
Battery discharge capacity coefficient at -20℃ 0.500

6. What is the output voltage and current of the solar camera power supply, and what is the meaning of the distribution of the three modes of NC, NO and Power Saving of the power supply output?

The output voltage and current is 12V 1A.In the Power Saving (energy saving) mode, when the audio output or alarm output is generated, the external alarm is powered, and is powered off at other times to save power consumption. Including audio intercom, audio output, event-linked audio output, event-linked alarm output to power the external alarm, and power off at other times.
In NO (normally open) mode, the power output consistently maintains a high level output.
-Wireless Bridge
In NC (normally closed) mode, no external power supply is provided

FAQ

7. We had experienced in the field that using Wireless Bridges with IP Domain connections to have solar powered kits or Solar Camera Kits working like a regular wired IPC Power Sources caused battery drainage and unit failure.

Possible Resolution: As advised to the team with previous release 3 working mode. Low Sunlight Season, low temperature, and too many events will all cause battery to be consumed faster than it can be recharged. IP Domain connection and using wireless bridges in the application may need to POC first because none of the devices will have battery saving mechanisms. HQ suggests use Proactive mode, and it can be set to low power mode to save battery.

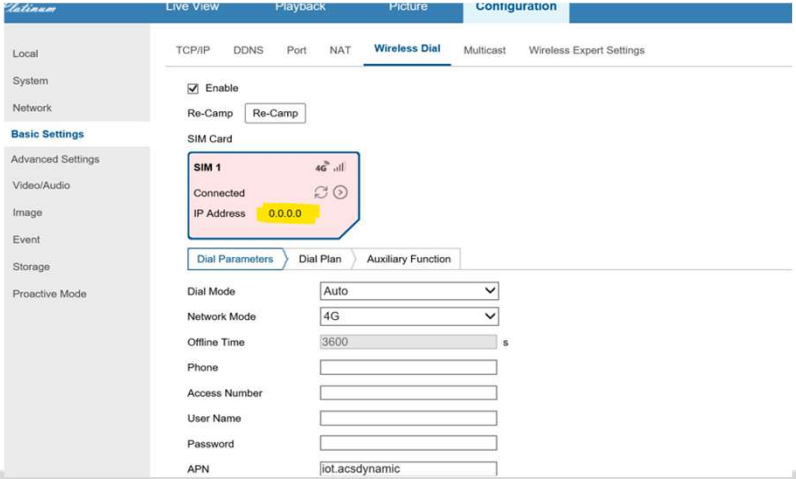
Mobile Communication	
SIM Card Type	MicroSIM
Frequency	LTE-TDD: Band 38 / 40 / 41 LTE-FDD: Band 1 / 3 / 5 / 7 / 8 / 20 / 28 WCDMA: Band 1 / 5 / 8 GSM: 850 / 900 / 1,800 MHz
Standard	LTE-TDD / LTE-FDD / WCDMA / GSM

Case Study: Troubleshooting

1. Intermittent Connect

A: These are the only supported bands that the solar camera supports out of the many that is available to the carrier cell towers. Camera is grayed out in the LTS Connect app meaning no connection and not an issue with data speeds. Customer tried to add to LPP for remote configuration abilities. I have told him that the camera is not supported on LPP. Most likely the issue is due to the connection frequency/bands. Recommended customer do one of two things:

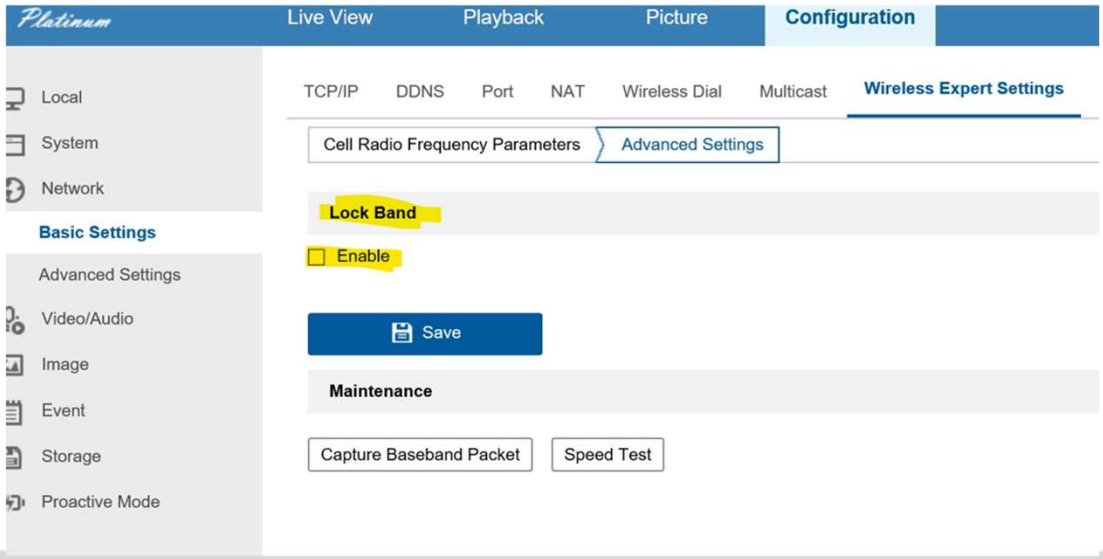
a) Check if cell data plan has static IP address purchased. If purchased then would save more time not needed to go out on site. He will be able to open web browser and use that IP address to get to the log in page of the solar camera to check settings.



b) If no static IP address, customer will need to go on site with a laptop and hard wire directly to the solar camera's LAN port.

Once connection is obtained he will need to do the following:

- When the camera has a steady connection on LTS Connect, meaning that the data transmission is successful, lock the band that it has connected from cell to carrier using. This would ensure that the camera is always using that frequency (that has provided a steady data transmission) even if the camera has it's signal handed off to a different tower.

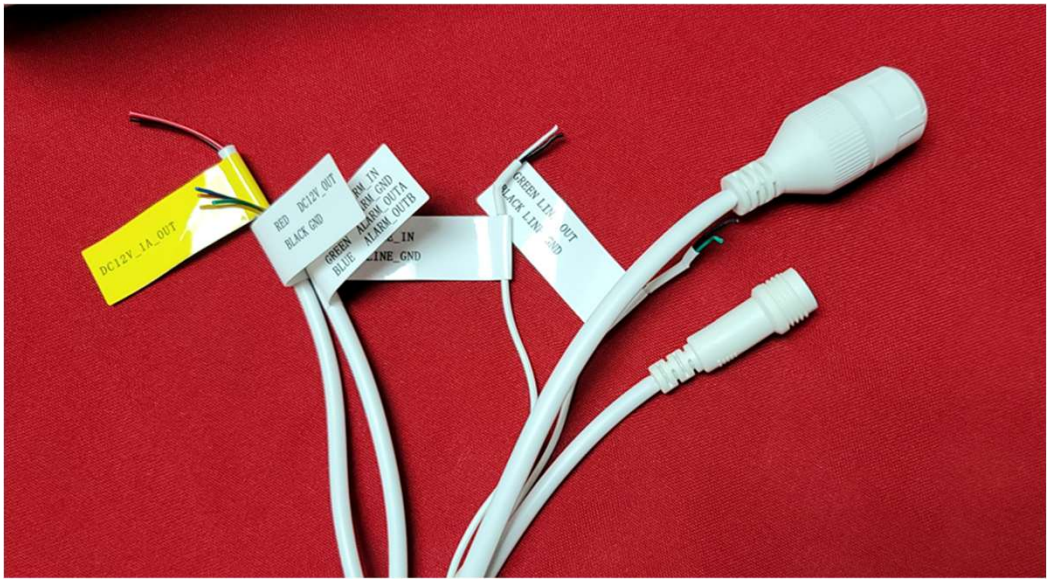


2. Power Issue

Due to the solar camera using a LTWB-5AC-12 antenna, there will always be the load from the antenna itself. This antenna will draw a continuous 4 watts. As the camera itself will most likely be kept awake by the antenna, it will also be drawing the max amount which is 4 watts. From our local office testing this setup will net a continuous draw of 8 watts which will drain the battery at 2% per hour. Due to this, the current power input from the solar panel is not able to keep up with the demand of supplying the load and charge up the battery to an ideal capacity.

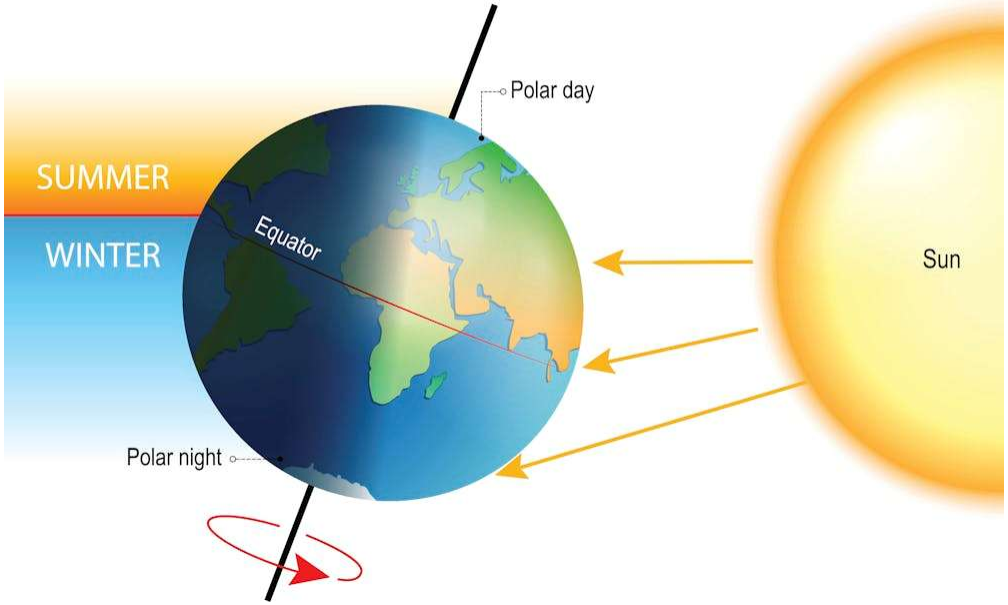
a) Start with the connectors. The solar panel uses industry standard MC4 connectors.

b) Check the connections to make sure the water resistance is maintained. If there was any moisture that has entered the connector, you will notice oxidation. This will come in the form of a green hue on the metal connections or a black burn mark in worse case scenarios. This will cause a higher resistance in the wires limiting the max power generated from the panel to decrease by the time this power goes through the solar charge controller. Verify other connections for water tightness. This would be the other wires on the main harness.



Pay most attention to the DC 12 volt out wires marked by the yellow label as those two conductors will be live. Moisture damage to those wires will also cause higher resistance which will cause increase power consumption.

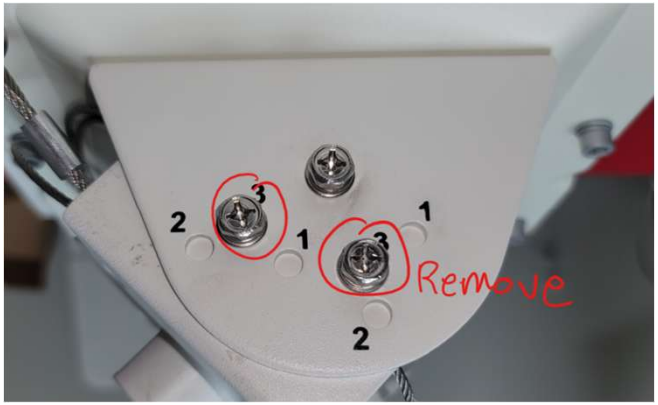
c) Check the direction and the angle of the solar panel. Make sure it's point to the south without any obstacles.



Keep in mind that due to the geographical location of certain area like NY along with the yearly tilting of the earth during the fall / winter, the panel would need to be at a more tilted angle during these months to capture the most sunlight.

d) Adjust tilt angle

An option with the most steep (vertical) angle will need to be selected on the main mounting bracket for the solar panel. Two screw on each side of the gauge will need to be removed while the remaining one screw on each side will be loosened to allow movement of the bracket.



Select the option with the steepest angle and retighten all screws.

One more aspect to be noted is that weather plays a part in how lithium ion is used. Cold environments will affect how the batteries charge and discharge. This is similar to the issues with electric cars and cold weather how they will have less range. Also the BMS in the solar camera will have a part in limiting the power able to go in and out. Usually these devices have a low and high temperature disconnect. I doubt that the stem of your issues is this but I wanted to mention it. Due to the fact that the batteries in the solar camera are four in parallel, the draw of the power as far as amperage is too small to be concerned.

Thanks!